FINAL
31 OCTOBER 2011

Third Five-Year Review

Former Adak Naval Complex

Adak, Alaska

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

EXECUTIVE SUMMARY

As lead agency for environmental cleanup of the former Adak Naval Complex, Adak Island, Alaska, the U.S. Navy has completed this third 5-year review of the remedial actions at Operable Unit A (OU A) and OU B-1 conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300). Progress towards remedy selection for OU B-2 sites was also reviewed. The purpose of this 5-year review is to ensure that the remedial actions selected in the Records of Decision (RODs) for OU A and OU B-1 at Adak remain protective of human health and the environment. This review is required because contaminants have been left at Adak above levels that allow for unlimited use and unrestricted exposure. This third 5-year review was prepared in accordance with the *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Reviews* (U.S. Navy 2011h) and the U.S. Environmental Protection Agency's *Comprehensive Five-Year Review Guidance* (USEPA 2001). This review is considered a statutory, rather than a policy, review. The triggering action for this review was the execution by the U.S. Navy (Navy) of the second 5-year review on December 13, 2006. This review is required because contaminants have been left at Adak above levels that allow for unlimited use and unrestricted exposure. In accordance with Navy guidance, this review covers the entire former Adak Naval Complex, including both CERCLA and non-CERCLA sites. This review also provides a summary of progress on sites and OUs without RODs or state decision documents to ensure a comprehensive review. This 5-year review evaluates data collected at the site during the 2006 through 2010 field seasons.

This 5-year review concludes that the remedy is functioning as intended by the OU A ROD and the State-Adak Environmental Restoration Agreement (SAERA) decision documents for all but four of the 179[1] OU A and post-ROD sites on Adak. All of the remedy components required by the OU A ROD have been implemented and are functioning as intended by the ROD, with the exception of four sites discussed in Section 7.1 of this 5-year review and mentioned below under the protectiveness discussion. The landfill caps and covers have been constructed and are regularly inspected and maintained. The ponds at SWMU 17, Power Plant No. 3, have been drained, dredged, and restored. Impacted sediment has been removed from South Sweeper Creek, and limited soil removals have been completed at all of the petroleum sites selected for this remedy component. Interim remedial action product recovery has been performed at the 14 free-product recovery petroleum sites.

[1]This includes 62 petroleum sites removed from the OU A ROD and the Tango Pad site.

An Institutional Control Management Plan (ICMP) is in place, and institutional control (IC) inspections occur annually. Deficiencies are identified and corrective action is consistently taken. The inspection and associated follow-up is functioning as intended. Long-term monitoring has been initiated and is ongoing. The long-term monitoring goals and requirements are periodically revisited to maintain focus on the endpoint goals. The Navy and U.S. Geological Survey have shown that natural attenuation of petroleum compounds continues to occur on Adak, and natural attenuation monitoring is part of the long-term monitoring program. Where the data support a quantitative estimate, it appears that natural attenuation can be reasonably expected to achieve endpoint criteria within 75 years of ROD execution.

The final remedy established under SAERA decision documents and the additional actions required by those documents have been implemented at all of the 14 free-product sites. Limited groundwater monitoring, implementation of ICs, and monitored natural attenuation have been implemented where required through adjustments to the Comprehensive Monitoring Plan.

This 5-year review also concludes that the OU B-1 remedy is functioning as intended by the OU B-1 ROD. The selected remedies have been implemented at all of the 50 action sites identified in the OU B-1 ROD, although the remedy cannot be considered complete at all 50 sites until all documentation is complete and concurrence from the regulatory agencies is received. Complete documentation and final regulatory concurrence will be assembled as part of the preparation of the remedial action completion report. Conditional closure has been achieved for 18 of the 50 sites.

Changes in the applicability or relevant and appropriate requirements (ARARs) or exposure and toxicity assumptions that have occurred since the RODs and SAERA decision documents were signed do not affect the protectiveness of the remedies. Concentrations of many chemicals in groundwater remain above the remediation goals (RGs) within the downtown area of Adak at the majority of locations where long-term monitoring is occurring. This results in the need for continued ICs to prevent exposure and ongoing monitoring. Although some of the RGs might be lower if selected today, the remedy components continue to protect against exposures, just as they did at the time the ROD was signed. ICs preventing exposure and ongoing monitoring will need to continue until concentrations of chemicals of concern in groundwater are below the RGs.

The protectiveness of the remedies for the OU A sites is discussed in this report by grouping the sites into categories of protectiveness. Of the 179[2] OU A and post-ROD sites, 175 fall into the categories of either "remedy is complete and protective," or "remedy is operating and is expected to be protective. Three sites fall into the category of "not protective, unless follow-up actions are

[2]This includes 62 petroleum sites removed from the OU A ROD and the Tango Pad site.

taken to ensure protectiveness."[3] Sites in these three categories are listed by name in Section 9 of this 5-year review.

The OU A remedy remains protective for the 138[4] sites where the remedy is complete and Alaska Department of Environmental Conservation (ADEC) has concurred with a status of No Further Action (NFA) or No Further Remedial Action Planned (NFRAP). At these sites, the NFA status selected in the ROD, the NFA/NFRAP status achieved post-ROD, or the completeness of the remedy are not called into question by new information, including changes in ARARs or risk assessment assumptions.

The OU A remedy for 39 sites is expected to be protective when the operating OU A remedy (monitored natural attenuation in many cases) is complete. In the interim, exposure pathways that could result in unacceptable risks are being controlled through implementation of the ICMP.

The remedies for the three OU A sites listed below are concluded not to be protective, unless the actions identified in Section 8 of this 5-year review are taken to ensure protectiveness. Note that these sites have been removed from the OU A ROD and are now regulated under SAERA (see Section 2 of this 5-year review).

- Former Power Plant, Building T-1451
- SWMU 60, Tank Farm A
- NMCB Building Area, T-1416 Expanded Area

At these sites, trends in product thicknesses observed in surface water protection wells, or ongoing impacts to adjacent surface water call into question the protectiveness of the remedy. Follow-up actions are needed at these sites for the final remedy to be protective.

The remedy for OU B-1 is expected to be protective of human health and the environment upon completion. Although the remedy is in place at all OU B-1 sites, regulatory concurrence has not been achieved for all sites. Until concurrence is achieved and the remedies can be considered complete, institutional controls are in place to control exposure pathways that could result in unacceptable risks. Documentation of completion of the OU B-1 remedy at all OU B-1 sites, as

[3]One of the three sites included in the last category (NMCB Building Area) is a combination of two previous NMCB sites within the original 178 OU A sites (adding Tango Pad to the 178 OU A ROD sites gives 178 + 1 = 179). This is the reason that the number of sites in the last two categories (3 sites) added to the number of sites in the first two categories (175 sites) appears not to add up to the total number of sites (179).

[4]Because some sites are considered "remedy complete and protective" under one program (e.g., CERCLA), but considered "remedy is operating and expected to be protective" under another program (e.g., SAERA), some double-counting of sites occurs in the paragraphs that follow and in Section 9. This results in site counts that do not sum to the original site totals, however accurately describe the sites with each category.

well as documentation of regulatory concurrence with remedy completion, will be assembled in the remedial action completion report. This information will be drawn from the final after action reports.

The remedy for OU B-2 has not been selected. In the interim, land use controls are in place to control exposure pathways that could result in unacceptable risks to human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Adak Naval Air Station

EPA ID *(from WasteLAN)*: AK4170024323

Region: 10	**State:** AK	**City/County:** Aleutians West

SITE STATUS

NPL status: Final **X** Deleted Other (specify)_____

Remediation status (choose all that apply): Under Construction **X** Operating **X** Complete

Multiple OUs?* YES **X** NO	**Construction completion date:**

Has site been put into reuse? YES **X** NO

REVIEW STATUS

Lead agency: EPA State Tribe Other Federal Agency: Navy

Author name: Aaron Vernik

Author title: Remedial Project Manager	**Author affiliation:** Naval Facilities Engineering Command Northwest

Review period:** Data field seasons 2006 through 2010

Date(s) of site inspection: August 20–26, 2010

Type of review:

Post-SARA **X** Pre-SARA NPL-Removal only
Non-NPL Remedial Action Site NPL State/Tribe-lead
Regional Discretion

Review number: **3** (third)

Triggering action:

Actual RA Onsite Construction at OU 1 ~~Actual RA Start at OU 1~~
Construction Completion Previous Five-Year Review Report
Other (specify):_____

Triggering action date *(from WasteLAN)*: Navy signature December 13, 2006

Due date *(five years after triggering action date)*: December 13, 2011

*["OU" refers to operable unit.]

**[Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (Cont.)

Issues:

Sitewide

- The Comprehensive Monitoring Plan (CMP), Institutional Control Management Plan (ICMP), and Operation and Maintenance (O&M) Plan need to be updated to reflect site-by-site changes in monitoring and product recovery requirements recommended in this document and by the Optimization Work Groups, to formalize institutional control (IC) requirements pertaining to the continued presence of petroleum-contaminated soil at some sites, to remove inconsistencies, to ensure that the criteria for free-product monitoring and recovery are clear and driven by decision documents, and to result in free-product monitoring and recovery documentation that is sufficiently detailed to allow independent review.
- The document repositories on Adak and in Anchorage are incomplete, especially with regard to recent documents generated during this 5-year review period.
- Action items were identified during the 2010 site inspections.
- Organizations involved in responding to munitions and explosives of concern (MEC) finds have requested materials detailing the procedures for local officials to follow in the event of a MEC discovery, the organization responsible for responding based on the location of the MEC item found, and the historical MEC recoveries across the island.

OU A – SAERA Petroleum Sites

- Former Power Plant, Building T-1451, or a nearby source yet to be identified, is impacting surface water quality in East Canal.
- Groundwater samples collected from SWMU 60, Tank Farm A, wells near South Sweeper Creek contained total aromatic hydrocarbon and total aqueous hydrocarbon concentrations that exceeded Alaska Department of Environmental Conservation (ADEC) surface water criteria, and seeps and sheens have been observed along South Sweeper Creek and Sweeper Creek Lagoon.
- Free-product thickness measurements in three surface water protection wells at NMCB Building Area appear to be increasing, indicating that the remedy may not be functioning as intended and that additional investigation is warranted.

Recommendations and Follow-Up Actions:

Sitewide

- As part of the current Optimization Work Group effort for optimization of monitoring and product recovery on Adak, update the CMP and O&M Plan to address the items listed in Issue No. 1 on Table 7-9 and as detailed in Sections 4.1.4 and 6.4 of this 5-year review. In addition, update the ICMP (and its equivalent to Table 4-1 of this 5-year review) to be consistent with source documentation (executed RODs, decision documents, and conditional closure letters).
- Update the document repositories.
- Address the action items identified during the 2010 site inspections (see Section 6.5 of this 5-year review).
- Create a munitions response desk guide for limited distribution (see Section 6.2.3 of this 5-year review).

OU A – SAERA Petroleum Sites

- Complete the ongoing assessment of additional remedial action at Former Power Plant, Building T-1451.
- Complete the ongoing evaluation of potential additional action for SWMU 60, Tank Farm A, based on impacts to South Sweeper Creek.
- Evaluate additional actions to protect surface water at NMCB Building Area in accordance with the decision document.

Five-Year Review Summary Form (Cont.)

Protectiveness Statement(s):

The protectiveness of the remedies for the OU A sites is discussed in this report by grouping the sites into categories of protectiveness. Of the 179[1] OU A and post-ROD sites, 175 fall into the categories of either "remedy is complete and protective," or "remedy is operating and is expected to be protective." Three sites fall into the category of "not protective, unless follow-up actions are taken to ensure protectiveness."[2] Sites in these three categories are listed by name in Section 9 of this 5-year review.

The OU A remedy remains protective for the 138[3] sites where the remedy is complete and ADEC has concurred with a status of No Further Action (NFA) or No Further Remedial Action Planned (NFRAP). At these sites, the NFA status selected in the ROD, the NFA/NFRAP status achieved post-ROD, or the completeness of the remedy are not called into question by new information, including changes in ARARs or risk assessment assumptions.

The OU A remedy for 39 sites is expected to be protective when the operating OU A remedy (monitored natural attenuation in many cases) is complete. In the interim, exposure pathways that could result in unacceptable risks are being controlled through implementation of the ICMP.

The remedies for the three OU A sites listed below are concluded not to be protective, unless the actions identified in Section 8 of this 5-year review are taken to ensure protectiveness. Note that these sites have been removed from the OU A ROD and are now regulated under SAERA (see Section 2 of this 5-year review).

- Former Power Plant, Building T-1451
- SWMU 60, Tank Farm A
- NMCB Building Area, T-1416 Expanded Area

At these sites, trends in product thicknesses observed in surface water protection wells, or ongoing impacts to adjacent surface water call into question the protectiveness of the remedy. Follow-up actions are needed at these sites for the final remedy to be protective.

The remedy for OU B-1 is expected to be protective of human health and the environment upon completion. Although the remedy is in place at all OU B-1 sites, regulatory concurrence has not been achieved for all sites. Until concurrence is achieved and the remedies can be considered complete, ICs are in place to control exposure pathways that could result in unacceptable risks. Documentation of completion of the OU B-1 remedy at all OU B-1 sites, as well as documentation of regulatory concurrence with remedy completion, will be assembled in the remedial action completion report. This information will be drawn from the final after action reports.

The remedy for OU B-2 has not been selected. In the interim, land use controls are in place to control exposure pathways that could result in unacceptable risks to human health and the environment.

Other Comments: None.

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[1]This includes 62 petroleum sites removed from the OU A ROD and the Tango Pad site.

[2]One of the three sites included in the last category (NMCB Building Area) is a combination of two previous NMCB sites within the original 178 OU A (adding the post-ROD Tango Pad site gives 178 + 1 = 179). This is the reason that the number of sites in the last two categories (3 sites) added to the number of sites in the first two categories (175 sites) appears not to add up to the total number of sites (179).

[3]Because some sites are considered "remedy complete and protective" under one program (e.g., CERCLA), but considered "remedy is operating and expected to be protective" under another program (e.g., SAERA), some double-counting of sites occurs in the paragraphs that follow and in Section 9. This results in site counts that do not sum to the original site totals, however accurately describe sites within each category.

Signature sheet for the former Adak Naval Complex, Adak Island, Alaska, third 5-year review report.

Cindy L O'Hare — 13 Dec 11

Cindy L. O'Hare, PE
Former Adak Naval Complex, Base Realignment and Closure Environmental Coordinator
U.S. Navy

Date

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TABLES

ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
ARAR	applicable or relevant and appropriate requirement
ARC	Adak Reuse Corporation
AST	aboveground storage tanks
ATV	all-terrain vehicle
avgas	aviation gasoline
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMP	Comprehensive Monitoring Plan
COC	chemical of concern
CRP	Community Relations Plan
DCE	dichloroethene
DIN	dissolved inorganics
DMM	discarded military munition
DRMO	Defense Reutilization Marketing Office
DRO	diesel-range organics
DVD	digital video disc
EC	engineering control
EE/CA	engineering evaluation/cost analysis
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
ERL	effects range low
ERM	effects range medium
ESHA	explosives safety hazard assessment
FFA	Federal Facility Agreement
FFCA	Federal Facilities Compliance Agreement
FS	feasibility study
FFS	focused feasibility study
g/day	gram per day
GRO	gasoline-range organics
HI	hazard index
HQ	hazard quotient

ABBREVIATIONS AND ACRONYMS (Continued)

IC	institutional control
ICMP	Institutional Control Management Plan
IRIS	Integrated Risk information System
JP-5	jet petroleum No. 5
loran	long-range navigation
LUC	land use control
MAUW	Modified Advanced Underwater Weapons
MC	munitions constituent(s)
MCL	maximum contaminant level
MEC	munitions and explosives of concern
µg/kg	microgram per kilogram
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
mm	millimeter
mogas	motor gasoline
MW	monitoring well
NAP	natural attenuation parameter
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action (abbreviation used in OU A ROD)
NFRAP	No Further Remedial Action Planned
NMCB	Naval Marine Construction Battalion
NOFA	No Further Action (abbreviation used in the OU B-1 ROD)
NPL	National Priorities List
NSGA	Naval Security Group Activity
O&M	operation and maintenance
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppm	parts per million
PQL	practical quantitation limit
PSE	preliminary source evaluation
RAB	Restoration Advisory Board
RAO	remedial action objective

ABBREVIATIONS AND ACRONYMS (Continued)

1	RBSC	risk-based screening concentration
2	RCRA	Resource Conservation and Recovery Act
3	RDX	royal demolition explosive (cyclonite)
4	RG	remediation goal
5	RI	remedial investigation
6	ROD	Record of Decision
7	ROICC	resident officer in charge of construction
8	RRO	residual-range organics
9	RSL	Regional Screening Level
10	SA	source area
11	SAERA	State-Adak Environmental Restoration Agreement
12	SARA	Superfund Amendments and Reauthorization Act
13	SVOC	semivolatile organic compound
14	SWMU	solid waste management unit
15	TAC	The Aleut Corporation
16	TAH	total aromatic hydrocarbons
17	TAqH	total aqueous hydrocarbons
18	TCE	trichloroethene
19	TDS	total dissolved solids
20	TIN	total inorganics
21	UPS	uninterrupted power system
22	USFWS	U.S. Fish and Wildlife Service
23	USGS	U.S. Geological Survey
24	UXO	unexploded ordnance
25	UST	underground storage tank
26	VOC	volatile organic compound
27	WQP	water quality parameter

1.0 INTRODUCTION

This report presents the results of the third 5-year review performed for the former Adak Naval Complex, Adak Island, Alaska, National Priorities List (NPL) site (Figure 1-1). The purpose of a 5-year review is to determine whether the remedies selected for implementation in the Record of Decision (ROD) for a site are protective of human health and the environment. The methods, findings, and conclusions of 5-year reviews are documented in 5-year review reports, which identify issues and provide recommendations to address them. The triggering action for this review was the execution by the U.S. Navy (Navy) of the second 5-year review on December 13, 2006. This review is required because contaminants have been left at Adak above levels that allow for unlimited use and unrestricted exposure.

The Navy, the lead agency for Adak, prepared this 5-year review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). CERCLA Section 121(c) states the following:

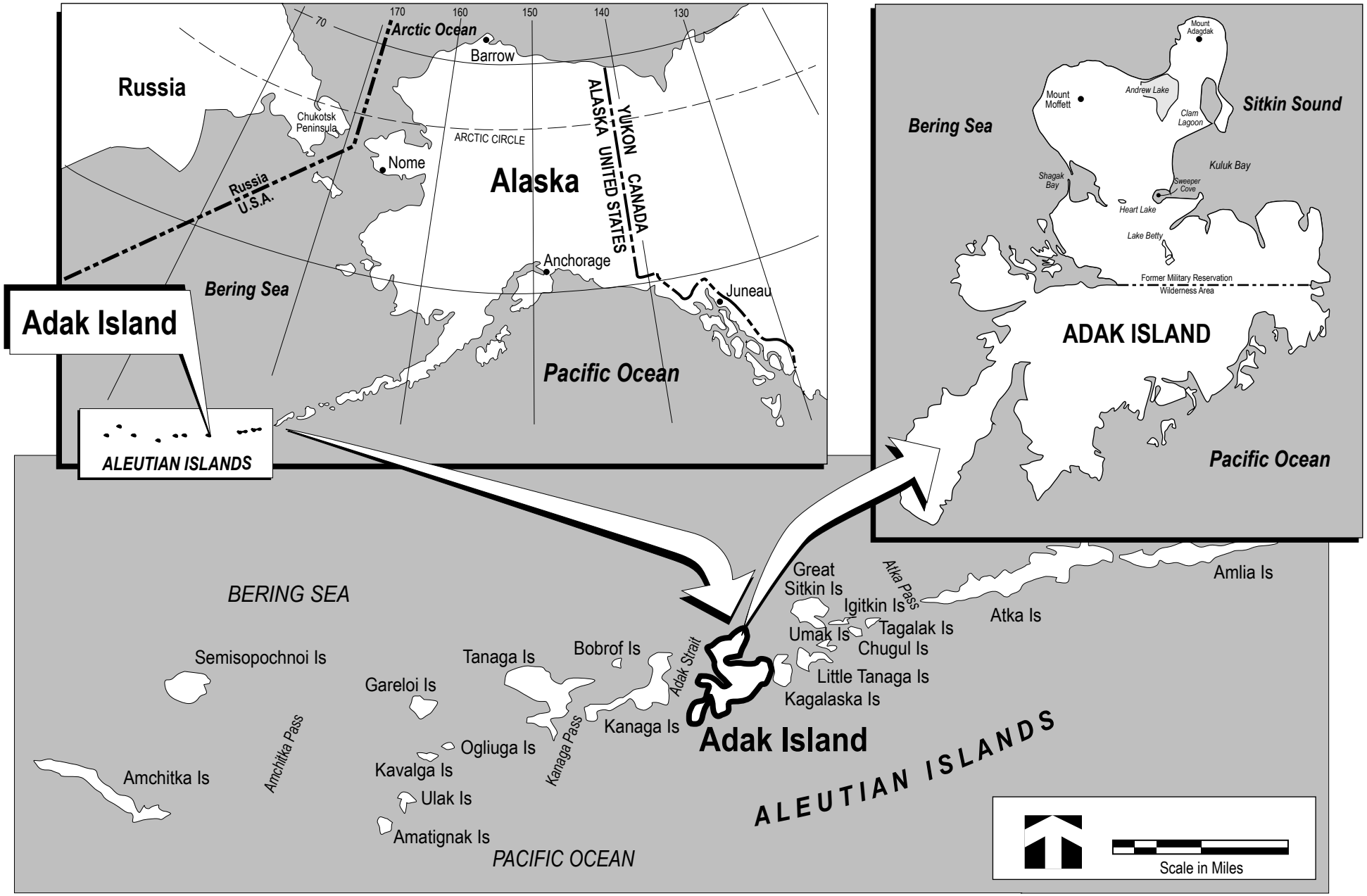
> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

While the former Adak Naval Complex is listed on the NPL as a single listing, the former Adak Naval Complex includes multiple CERCLA- and NCP-regulated sites, which are referred to as solid waste management units (SWMUs), source areas (SAs), or individual areas of investigation. This report covers the remedies selected for each of these sites in the signed RODs for Operable Unit A (OU A) and OU B-1 (U.S. Navy, USEPA, and ADEC 1995, 2000, and 2001) and the signed decision documents for 14 petroleum sites (U.S. Navy and ADEC 2005a, 2006a, 2006b, 2006c, and 2007). The status of the CERCLA process for OU B-2 sites is also summarized.

The RODs documenting the remedies implemented at OU A and OU B-1 were signed after October 17, 1986 (the effective date of the Superfund Amendments and Reauthorization Act [SARA]). Therefore, this is considered a statutory, rather than a policy, review. In general, reviews of RODs signed after the effective date of SARA are termed "statutory reviews," while reviews of RODs signed before the effective date of SARA (or when certain other conditions apply) are termed "policy reviews."

Naval Facilities Engineering Command Northwest (NAVFAC Northwest) conducted this 5-year review during the time period June 2010 through August 2011 by reviewing data collected at the site during the 2006 through 2010 field seasons. This report documents the results of the review. In accordance with Navy guidance, this review covers the entire former Adak Naval Complex, including both CERCLA and non-CERCLA sites.

This report was prepared using Navy and U.S. Environmental Protection Agency (EPA) guidance (U.S. Navy 2011h and USEPA 2001). The numerous SWMUs and SAs at the former Adak Naval Complex and the complex regulatory, investigative, and remedial history of the island complicate efforts to comprehensively and yet succinctly summarize the 5-year review for the island as a whole in a single document. In an effort to meet this challenge, this 5-year review presents overview information in the body of the report and presents many details of individual SWMUs and SAs in a Site Catalog attached as Appendix A. The Site Catalog is intended to be a living document that is updated annually. The Site Catalog will be used as a reference document and also a source document for SWMU- and SA-specific information (such as background text) to be used in other documents (such as the Comprehensive Monitoring Plan [CMP]).



U.S.NAVY

Figure 1-1
Adak Island Location Map

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

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2.0 SITE CHRONOLOGY

This section provides a narrative chronology of site events related to environmental investigation and remediation, with a tabulated summary provided in Table 2-1. The chronology of land transfer activities is summarized in Section 3.

In 1986, an initial assessment study was conducted on Adak as the first phase of the Navy Assessment and Control of Installation Pollutants Program (U.S. Navy 1986). Thirty-two sites were examined during the initial assessment study. The initial assessment study recommended that sampling be conducted at 20 of the 32 sites. Therefore, sampling was conducted at these sites in 1989 as part of a site inspection (U.S. Navy 1989). Two of the sites were combined into one during the site inspection. Therefore, a total of 19 sites were investigated. In 1990, a Resource Conservation and Recovery Act (RCRA) remedial facility assessment was completed by EPA, which identified and gathered information on potentially contaminated sites. A total of 68 sites, which includes the 19 sites investigated in the site inspection, were identified in the remedial facility assessment. EPA issued a Federal Facility Compliance Agreement in November 1990. Adak was proposed for the NPL in October 1992 (57 Federal Register 47204) and formally listed in May 1994 (59 Federal Register 27989).

In 1993, the Navy, EPA, and Alaska Department of Environmental Conservation (ADEC) signed the Adak Federal Facility Agreement (FFA), which incorporates the EPA's cleanup process under CERCLA, as amended by 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 State-Adak Environmental Restoration Agreement (SAERA), was signed in April 1994.

For technical and administrative purposes, Adak was divided into two OUs in 1998, OU A and OU B, through an amendment to the FFA. In May 1997, the Navy and ADEC 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 ROD for OU A was prepared for both the petroleum-contaminated and the hazardous-substance-release sites. The interim action ROD for SWMUs 11 and 13 and the final ROD for OU A were signed in March 1995 and April 2000, respectively.

A listing of the sites included in the OU A ROD is included in Table 2-2. A total of 180 sites were evaluated for OU A. Two of these sites were deferred to OU B (SWMU 8 and SA 93) because ordnance was present at these sites (U.S. Navy, USEPA, and ADEC 2000). Of the

remaining 178 sites, 121 were petroleum sites, 50 were investigated under CERCLA, 5 were investigated under both CERCLA and SAERA (SWMUs 14, 15, 17, 55, and 74), and 2 were investigated under both RCRA and SAERA (SWMUs 24 and 77). Figure 2-1 presents an overview of the process used to evaluate OU A CERCLA sites, and Figure 2-2 presents an overview of the process used to evaluate OU A petroleum sites.

The original number of sites began with the FFA, which listed 84 SWMUs and SAs that needed to be evaluated within OU A. Twenty-six of the original 84 sites were petroleum-only sites administered under the SAERA agreement. Two of the remaining 58 sites were deferred to OU B-2 (SWMU 8 and SA 93); the CERCLA portion of one combined CERCLA and SAERA site was deferred to the OU B process, but remained a SAERA site (SWMU 1); the minefield portion of one CERCLA site was deferred to the OU B process, but the landfill portion remained as a CERCLA site (SWMU 2); SWMUs 53 and 59 were combined with SWMU 52; and one site was deferred to the SAERA process (SWMU 12). This left a total of 52 CERCLA sites, including 3 state-permitted landfills (SWMUs 18, 19, and 25), 5 combined CERCLA and petroleum sites (SWMUs 14, 15, 17, 55, and 74), and 2 combined RCRA and petroleum sites (SWMU 24 and SA 77). An additional 93 petroleum sites were included in OU A between 1994 and 1997 (U.S. Navy, USEPA, and ADEC 2000). The five water bodies that could be impacted by site contamination were not originally part of the FFA, but were added to the OU A site list around the time of the remedial investigation (RI). These water bodies were evaluated under CERCLA and include Sweeper Cove, South Sweeper Creek, Clam Lagoon, Andrew Lake, and Kuluk Bay. The addition of the water bodies brought the total number of CERCLA sites to 57. The OU A ROD selected final remedies for each of the 57 CERCLA sites, including 50 CERLCA-only sites, 5 combined CERCLA and petroleum sites (SWMUs 14, 15, 17, 55, and 74), and 2 combined RCRA and petroleum sites (SWMU 24 and SA 77).

The OU A ROD selected final or interim remedies for each of 128 petroleum-contaminated sites, counting the NMCB Building Area, T-1416 Expanded Area and NMCB Building (UST T-1416-A) as separate sites. This includes 121 petroleum-only sites, 5 combined CERCLA and petroleum sites (SWMUs 14, 15, 17, 55, and 74), and 2 combined RCRA and petroleum sites (SWMU 24 and SA 77). The interim remedy, free-product recovery, was selected for 14 sites that contained measurable quantities of free-phase petroleum product ("14 sites" is arrived at by counting NMCB Building Area, T-1416 Expanded Area and NMCB Building [UST T-1416-A] as one combined site and not two separate sites). In addition, the OU A ROD specified that these 14 sites would require future final remedy selection pursuant to the two-party SAERA. To clarify regulatory authority, the OU A ROD was amended in 2003 to remove these 14 petroleum sites and 47 others from CERCLA authority. Therefore, final remedies for the 14 petroleum-contaminated sites were to be selected in accordance with Alaska State regulation 18 Alaska Administrative Code (AAC) 75.325 through 75.390, which provides the regulatory procedures and requirements for petroleum cleanup decisions.

The OU A ROD concluded that no further action was required for 114 sites (31 CERCLA sites, which include 2 water bodies, 1 combined CERCLA and SAERA site [SWMU 74], 1 combined RCRA and SAERA site [SWMU 24], the RCRA portion of 1 combined RCRA and SAERA site [SA 77], the SAERA portion of 1 combined CERCLA and SAERA site [SWMU 55], and 79 petroleum sites) (U.S. Navy, USEPA, and ADEC 2000). These sites are listed in Tables 2-3 and 2-4. Petroleum sites for which no further action was required under the OU A ROD were also considered to have met all requirements of the SAERA agreement. In addition, those petroleum sites for which a final remedy was selected in the OU A ROD, and which met the OU A ROD remediation goals, were considered to have met all requirements of the SAERA agreement (U.S. Navy, USEPA, and ADEC 2003).

Sixty-six OU A sites required remedial action (19 CERCLA sites [includes 3 water bodies and 3 state-permitted landfills], 3 combined CERCLA and petroleum sites [SWMUs 14, 15, and 17], the CERCLA portion of 1 combined CERCLA and petroleum site [SWMU 55], the SAERA portion of 1 combined RCRA and petroleum site [SA 77], and 42 petroleum sites [including the NMCB Building Area, T-1416 Expanded Area and NMCB Building (UST T-1416-A) as separate sites]). (Note that SA 77 is included as a no further action site under RCRA and as a remedial action site under SAERA. In addition, SWMU 55 is included as a no further action site under SAERA and as a remedial action site under CERCLA. Because of this double counting of SWMU 55 and SA 77, 114 no further action sites plus 66 remedial action sites equals 180 and not 178 sites.) Of these sites, Figure 2-3 shows the locations of the chemical-release sites administered under CERCLA and RCRA retained for further action. Figure 2-4 shows the locations of the petroleum sites administered under SAERA retained for further action.

Removal actions and interim remedial actions at some CERCLA sites were completed prior to the completion of the OU A ROD. Removal actions were also completed at some of the 128 petroleum sites. Most of the physical remedy construction was completed at the last OU A site in 2003 (except for those transferred to SAERA) with the closure of Roberts Landfill. OU A remedy construction was completed in 2006 after soil was removed from ASR-8 Facility (UST 42007-B) and SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area. With the remedy in place at OU A in 2006, the CERCLA milestone of "remedy construction complete" was achieved. However, EPA has not concurred with the preliminary remedial action completion report. The Institutional Control Management Plan (ICMP), a component of the remedy for many of the OU A sites, was written in 2000 and has been revised by the Navy four times, the latest in 2010 (U.S. Navy 2010a).

In 2001, OU B was further divided into OU B-1 and OU B-2 to accommodate land transfer under the Base Realignment and Closure program to a combination of private and public entities. The OU B-1 ROD and the first 5-year review were both signed in December 2001. Implementation of the remedies selected in the OU B-1 ROD began in 2001. Remedial actions at the OU B-1 sites continued during the 2002, 2004, 2008, 2009, and 2010 field seasons. The remedial action

implementation at the OU B-1 sites was completed in 2010. However, the unexploded ordnance (UXO) awareness education program remains a component of the remedy for all of the OU B-1 sites. The ICMP outlines the requirements of the awareness educational program. As discussed in the previous paragraph, the ICMP was most recently updated in 2010.

In March of 2002, the FFA and SAERA were amended to administratively move 62 petroleum sites included in OU A out of OU A (and out of the FFA). From the date of this amendment forward, all future decisions regarding the moved sites were to be made based on State of Alaska regulations (under SAERA), rather than federal regulations (U.S. Navy, USEPA, and ADEC 2002). This change was subsequently reflected in an OU A ROD amendment signed October 10, 2003 (U.S. Navy, USEPA, and ADEC 2003). Fourteen petroleum sites removed from the OU A ROD potentially required further action under SAERA. The selected interim remedy for these 14 sites under the OU A ROD was free-product recovery. A decision document memorializing final remedies at 10 of these sites was signed May 20, 2005 (U.S. Navy and ADEC 2005a). Decision documents memorializing the final remedies for the four remaining sites (NMCB Building Area, T-1416 Expanded Area; SWMU 62, New Housing Fuel Leak Site; South of Runway 8-36 Area; and SWMU 17, Power Plant No. 3 Area) were signed on March 22, 2006, August 22, 2006, October 3, 2006, and January 4, 2007, respectively (U.S. Navy and ADEC 2006a, 2006b, and 2006c, and 2007).

During the second 5-year review period, "No Further Action" (NFA) or "No Further Remedial Action Planned" (NFRAP) status was approved by ADEC for 19 OU A sites (ADEC 2005a, 2005b, 2005c, and 2005d). NFA closure is used for sites at which all media meet the most stringent levels of remediation (Method 2 for soil, Table C for groundwater). NFRAP is a conditional closure that requires the implementation of institutional controls (ICs). This status is used when a site has met the remedial action objectives (RAOs) of protection of human health and the environment, but has not yet met final closure standards.

During this review period, ADEC approved site closure status for one OU A site (ASR-8, UST 42007-B) and conditional closure status for two OU A sites (SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area, and Yakutat Hangar, UST T-2039-A). Site closure status is the same as the NFA status approved during the second 5-year review period, and conditional closure status is the same as NFRAP status approved during the second 5-year review period. Furthermore, the ADEC concurred that the limited soil removal action at SA 82, P-80/P-81 Building is complete. During this review period, ADEC also approved conditional site closure status for 16 OU B-1 sites and 1 OU B-2 site (LJ-02A).

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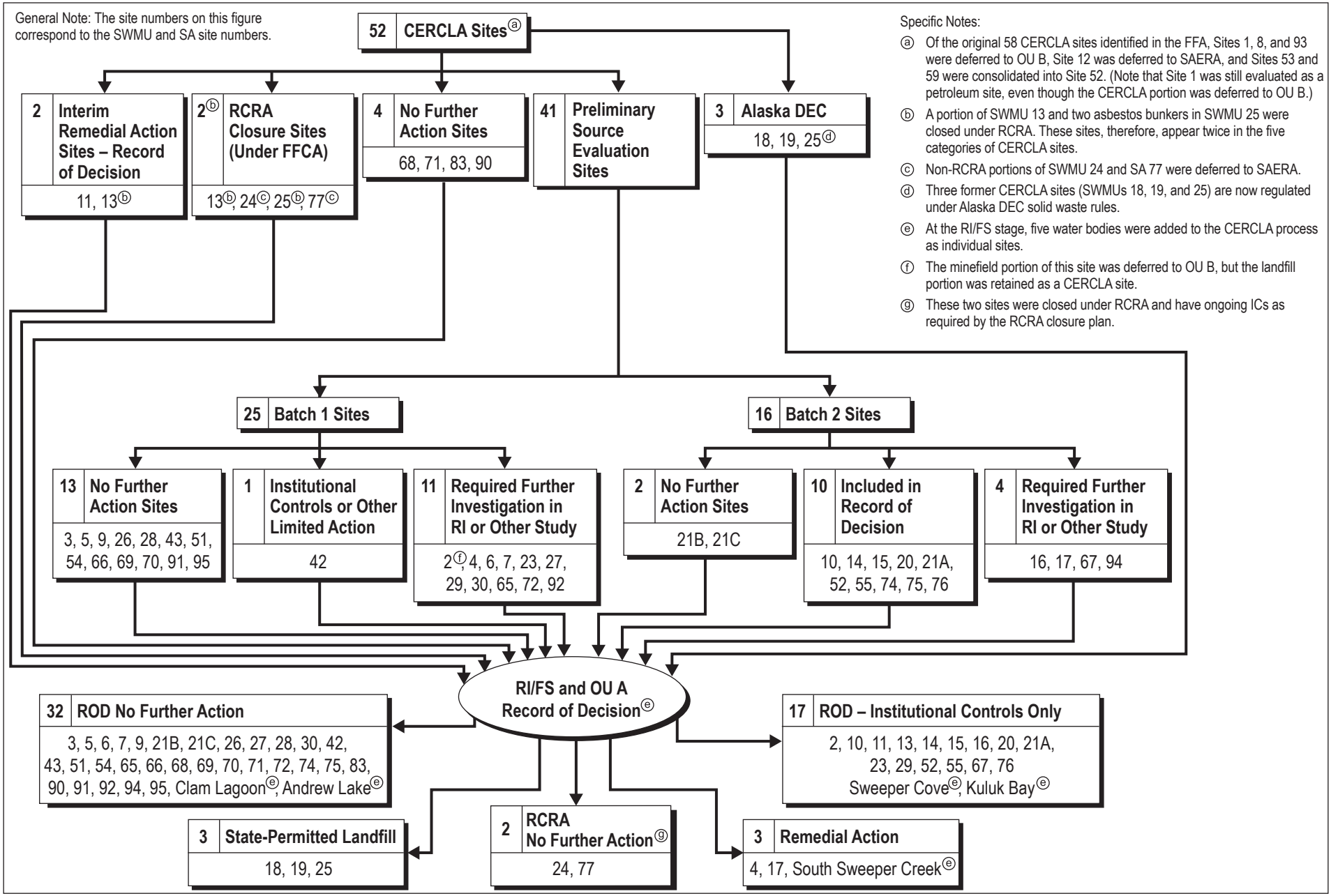
General Note: The site numbers on this figure correspond to the SWMU and SA site numbers.



Specific Notes:

ⓐ Of the original 58 CERCLA sites identified in the FFA, Sites 1, 8, and 93 were deferred to OU B, Site 12 was deferred to SAERA, and Sites 53 and 59 were consolidated into Site 52. (Note that Site 1 was still evaluated as a petroleum site, even though the CERCLA portion was deferred to OU B.)

ⓑ A portion of SWMU 13 and two asbestos bunkers in SWMU 25 were closed under RCRA. These sites, therefore, appear twice in the five categories of CERCLA sites.

ⓒ Non-RCRA portions of SWMU 24 and SA 77 were deferred to SAERA.

ⓓ Three former CERCLA sites (SWMUs 18, 19, and 25) are now regulated under Alaska DEC solid waste rules.

ⓔ At the RI/FS stage, five water bodies were added to the CERCLA process as individual sites.

ⓕ The minefield portion of this site was deferred to OU B, but the landfill portion was retained as a CERCLA site.

ⓖ These two sites were closed under RCRA and have ongoing ICs as required by the RCRA closure plan.

U.S.NAVY

Figure 2-1
Summary of CERCLA Site Process at Former Adak Naval Complex

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

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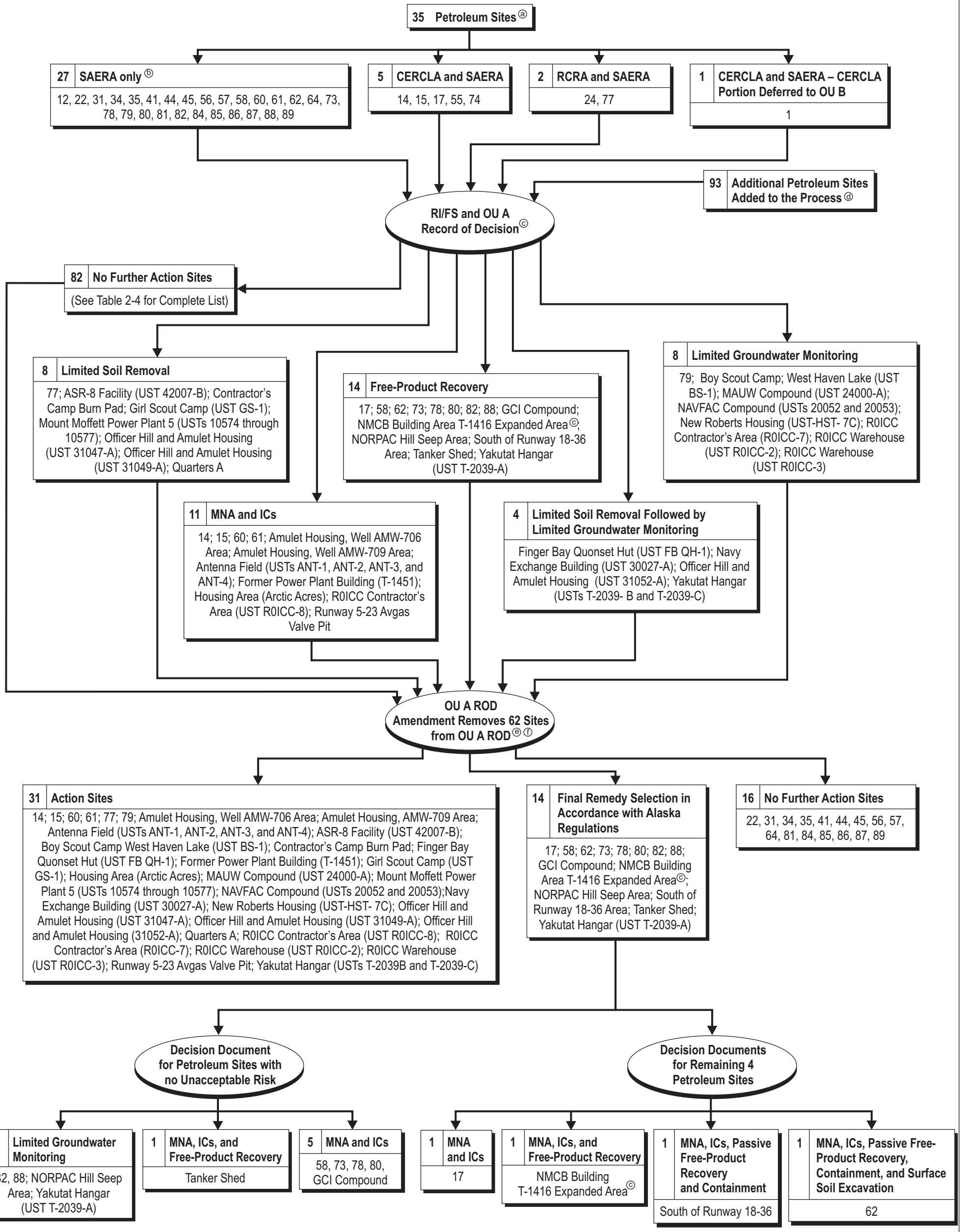

General Note:

The site numbers on this figure correspond to the SWMU and SA site numbers.

Specific Notes:

ⓐ Original number of petroleum sites from FFA.

ⓑ SWMU 12 was originally listed as a CERCLA site in the FFA. It was transferred to the SAERA process.

ⓒ NMCB Building (UST T-1416-A) was combined with this site.

ⓓ A complete listing of these sites is provided in Table 2-1 of the OU A ROD (and Table 2-2 of this document) and includes SA 96 and SA 97 and all the sites without a SWMU or SA number, except does not include the five water bodies (Sweeper Cove, South Sweeper Creek, Clam Lagoon, Andrew Lake, and Kuluk Bay).

ⓔ This count includes the two NMCB sites as separate sites. Therefore, if combined, the total number of sites removed from the OU A ROD is 61.

ⓕ Sixty-six no further action sites were not removed from the OU A ROD and are not included in the flow chart below this point.

U.S.NAVY

Figure 2-2
Summary of Petroleum Site Process at Former Adak Naval Complex

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

SWMU 52 (53 and 59), Former Loran Station

Mt. Adagdak

BERING SEA

Hill
1045

Andrew Bay

Sitkin
Sound

Andrew
Lake

SWMU 4, South Davis Road Landfill

SWMU 2, Causeway Landfill

Clam
Lagoon

SWMU 1

SWMU 11, Palisades Landfill

Legend:

- These Sites are State-Permitted Landfills
- CERCLA Site Boundary
- Surface Drainage Divide
- * These Sites are also Petroleum Sites
- ** These Water Bodies are CERCLA Sites

Note: By mutual agreement among Alaska DEC, EPA, and the Navy, all removal actions at SWMUs 18, 19, and 25 have been addressed through operational and closure requirements of State of Alaska solid waste regulations.

SWMUs 18/19, White Alice Landfill

SWMU 20, White Alice/Trout Creek Disposal Area

SWMU 16, Former Firefighting Training Area

SWMU 21A, White Alice Upper Quarry

SWMU 17, Power Plant 3 Area*

SWMU 67, White Alice PCB Spill Site

SWMU 10, Old Baler Building

Kuluk Bay**

SWMU 13, Metals Landfill

SA 76, Old Line Shed Building

SWMU 14, Old Pesticide Disposal Area*

SWMU 15, Future Jobs/DRMO*

SWMU 55, Public Works Transportation Department Waste Storage Area

South Sweeper Creek**

Sweeper Cove**

SWMU 25, Roberts Landfill

SWMU 23, Heart Lake Drum Disposal Area

SWMU 29, Finger Bay Landfill

Finger Bay

Little
Thumb
Bay

Thumb Bay

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U.S. NAVY

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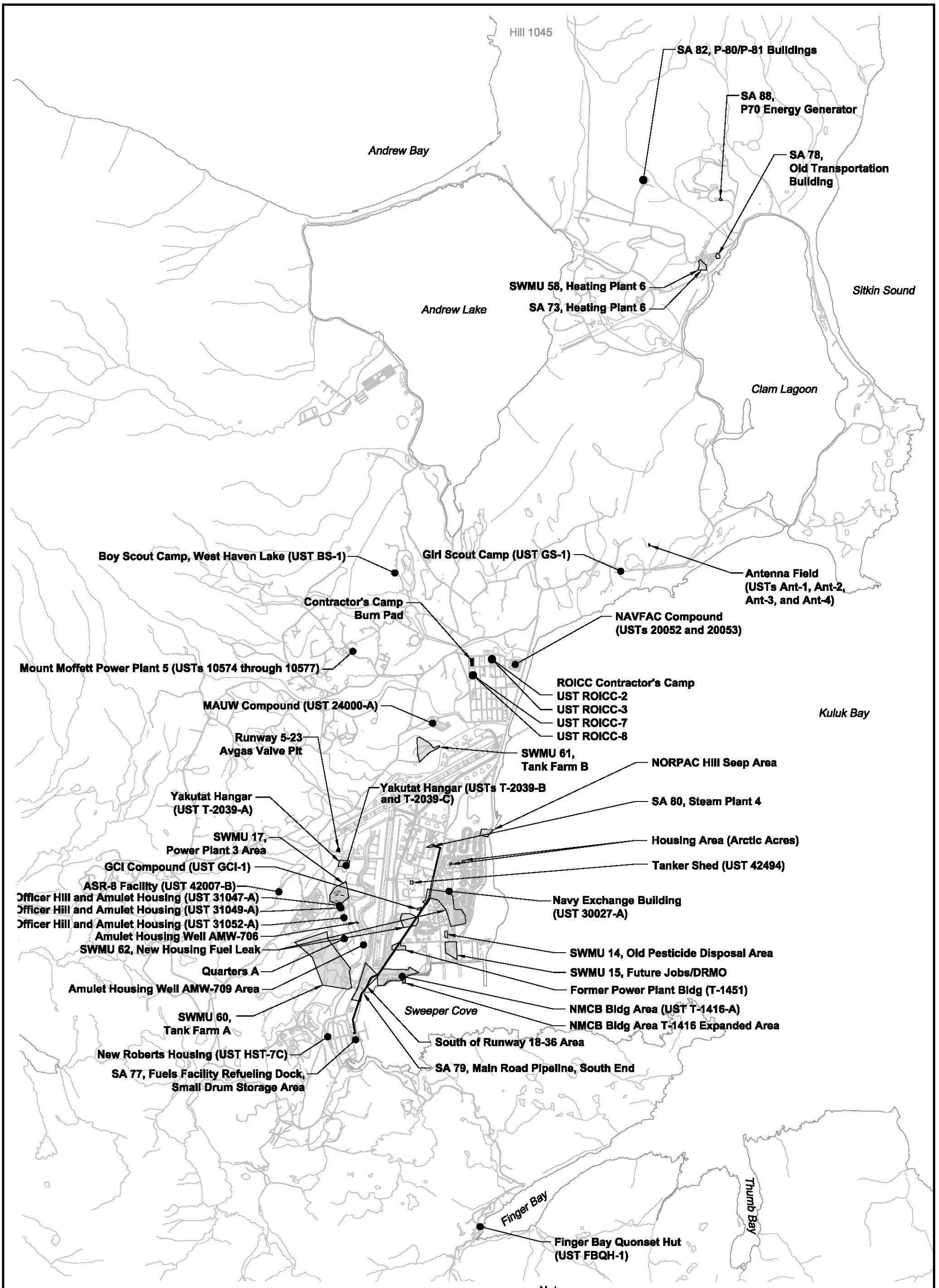
Figure 2-3
Operable Unit A CERCLA Sites That Require Further Action

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW



Notes:
1. SWMUs 14, 15, and 17 are also CERCLA Sites.
2. SA 77 is also a RCRA Site, but no further action required under RCRA.

U.S. NAVY

0 2,000 4,000
SCALE IN FEET

Figure 2-4
Operable Unit A Petroleum Sites
That Require Further Action

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

T:\ADAK\IDIQ\Sub-Tasks\DO 19\3rd 5 Year Review\FIG 2-4 OU A.dwg
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Table 2-1
Chronology of Site Events

Event	Date
Initial assessment study performed	1986
Site inspection	1989
RCRA remedial facility assessment	1990
Federal Facility Compliance Agreement under RCRA signed by EPA	November 20, 1990
Adak proposed for listing to the National Priorities List	October 1992
Formal National Priorities List listing	May 1994
FFA signed	1993
Two-party agreement (SAERA) regarding petroleum sites signed	April 1994
ROD for interim remedial action signed for Sites 11 and 13	March 1995
SAERA amended	August 1996
Operational closure of Adak Naval Air Station	March 1997
FFA amended to designate OU B	1998
ROD for OU A signed	April 2000
Institutional Control Management Plan implemented	2000
OU B divided into OU B-1 and OU B-2	2001
OU B-1 ROD signed	December 2001
First 5-year review executed	December 2001
FFA and SAERA amended to move petroleum sites from OU A to SAERA	March 2002
OU A remedy in place at all non-SAERA sites	2003
OU A ROD amended to move all petroleum sites with further action from OU A to SAERA	October 2003
Completion of land relinquishment by the Navy to DOI, with subsequent transfer to TAC, City of Adak, and the State of Alaska Department of Transportation and Public Facilities	March 2004
Decision document for final remedy at 10 OU A SAERA sites	May 2005
Decision document for final remedy at NMCB Building Area, T-1416 Expanded Area	March 2006
Decision document for final remedy at SWMU 62, New Housing Fuel Leak Site	August 2006
Decision document for final remedy at South of Runway 18-36 Area	October 2006
Second 5-year review executed	December 2006
Decision document for final remedy at SWMU 17, Power Plant No. 3 Area	January 2007
OU A remedy in place at all OU A SAERA sites	October 2006
OU B-1 remedy in place at all sites (pending agency concurrence)	September 2010

Notes:
DOI - U.S. Department of the Interior
EPA - U.S. Environmental Protection Agency
FFA - Federal Facilities Agreement
OU - operable unit
RCRA - Resource Conservation and Recovery Act
ROD - Record of Decision
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
TAC - The Aleut Corporation

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
1	Andrew Lake Waste Ordnance Demolition Range[c] (a.k.a. Andrew Lake OB/OD and Range)	CERCLA and SAERA	CERCLA Portion Deferred to OU B	OU A ROD
2	Causeway Landfill and Minefield[c]	CERCLA	NA	OU A ROD
3	Clam Lagoon Landfill	CERCLA	NA	OU A ROD
4	South Davis Road Landfill	CERCLA	NA	OU A ROD
5	North Davis Road Landfill	CERCLA	NA	OU A ROD
6	Andrew Lake Drum Disposal Area 1	CERCLA	NA	OU A ROD
7	Andrew Lake Drum Disposal Area 2	CERCLA	NA	OU A ROD
8	Andrew Lake Landfill and Shoreline[c]	CERCLA	Deferred to OU B	Deferred to OU B
9	Black Powder Club	CERCLA	NA	OU A ROD
10	Old Baler Building	CERCLA	NA	OU A ROD
11	Palisades Landfill	CERCLA	1995 ROD	OU A ROD
12	Quartermaster Road Debris Disposal Area (a.k.a. Quartermaster Site)	SAERA	NA	OU A ROD
13	Metals Landfill	CERCLA and RCRA	1995 ROD	OU A ROD
14	Old Pesticide Disposal Area (a.k.a. Old Pesticide Storage and Disposal Area)	CERCLA and SAERA	NA	OU A ROD
15	Future Jobs/DRMO (Former Hazardous Waste Storage)	CERCLA and SAERA	NA	OU A ROD
16	Former Firefighting Training Area (including SWMUs 32 and 33)	CERCLA	NA	OU A ROD
17	Power Plant No. 3 Area (including SWMUs 36–40 and 63) (a.k.a. Power Plant 3)	CERCLA and SAERA	OU A ROD, as amended	2007 Decision Document
18	South Sector Drum Disposal Area (now part of White Alice Landfill)	DEC-SW and CERCLA	NA	OU A ROD
19	Quarry Metal Disposal Area (now White Alice Landfill)	DEC-SW and CERCLA	NA	OU A ROD
20	White Alice/Trout Creek Disposal Area	CERCLA	NA	OU A ROD
21A	White Alice Upper Quarry	CERCLA	NA	OU A ROD
21B	White Alice Lower Quarry	CERCLA	NA	OU A ROD
21C	White Alice East Disposal Area	CERCLA	NA	OU A ROD
22	Avgas Drum Storage Area South of Tank Farm A (a.k.a. Avgas Drum Storage Area South of Tank Farm A)	SAERA	NA	OU A ROD
23	Heart Lake Drum Disposal Area	CERCLA	NA	OU A ROD
24	Hazardous Waste Container Storage Facility (a.k.a. Hazardous Waste Storage Facility)	RCRA and SAERA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
25	Roberts Landfill	DEC-SW and RCRA	NA	OU A ROD
26	Mitt Lake Drum Disposal Area	CERCLA	NA	OU A ROD
27	Lake Leone Drum Disposal Area	CERCLA	NA	OU A ROD
28	Lake Betty Drum Disposal Area	CERCLA	NA	OU A ROD
29	Finger Bay Landfill	CERCLA	NA	OU A ROD
30	Magazine 4 Landfill	CERCLA	NA	OU A ROD
31	Runway 18-36 Aviation Gas Drum Disposal	SAERA	NA	OU A ROD
34	Steam Plant 4 Used Oil Storage Area (a.k.a. Steam Plant 4 Used Oil AST)	SAERA	NA	OU A ROD
35	GSE Used Oil Tank (a.k.a. Ground Support Equipment Building)	SAERA	NA	OU A ROD
41	Ground Support Equipment (GSE) Used Oil Storage Area	SAERA	NA	OU A ROD
42	GSE Steam Clean Oil/Water Separator	CERCLA	NA	OU A ROD
43	AIMD Acid Battery Storage Area	CERCLA	NA	OU A ROD
44	AIMD Used Oil Storage Area	SAERA	NA	OU A ROD
45	Sewage Treatment Plant (including SWMUs 46, 47, 48, 49, and 50) (a.k.a. Sewage Treatment Plant Petroleum Contamination)	SAERA	NA	OU A ROD
51	NSGA Transportation Bldg. 10354 Waste Storage Area	CERCLA	NA	OU A ROD
52	Former Loran Station (including SWMUs 53 and 59)	CERCLA	NA	OU A ROD
54	NMCB Battery Storage	CERCLA	NA	OU A ROD
55	Public Works Transportation Department Waste Storage Area	CERCLA and SAERA	NA	OU A ROD
56	Public Works Transportation Department Storage Tank	SAERA	NA	OU A ROD
57	Refueling Dock Oil/Water Separator (a.k.a. Fuels Facility Refueling Dock)	SAERA	NA	OU A ROD
58	NSGA 10348 JP-5 Tank (a.k.a. Heating Plant 6)	SAERA	OU A ROD, as amended	2005 Decision Document
60	Tank Farm A	SAERA	NA	OU A ROD
61	Tank Farm B	SAERA	NA	OU A ROD
62	Housing Area Fuel Leak (a.k.a. New Housing Fuel Leak)	SAERA	OU A ROD, as amended	2006 Decision Document
64	Tank Farm D	SAERA	NA	OU A ROD
65	Contractor's Camp Fire/Demolition Site	CERCLA	NA	OU A ROD
66	Palisades Lake PCB Spill	CERCLA	NA	OU A ROD
67	White Alice PCB Spill Site	CERCLA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
68	New Pesticide Storage Area (no evaluation done)	CERCLA	NA	OU A ROD
69	Ski Lodge Waste Pile	CERCLA	NA	OU A ROD
70	Davis Road Asphalt Drums	CERCLA	NA	OU A ROD
71	NSGA Fueling Facility	CERCLA	NA	OU A ROD
72	NSGA Transportation Building 10354	CERCLA	NA	OU A ROD
73	NSGA Oil/Water Separator (a.k.a. Heating Plant 6)	SAERA	OU A ROD, as amended	2005 Decision Document
74	Old Batch Facility	CERCLA and SAERA	NA	OU A ROD
75	Asphalt Storage Area	CERCLA	NA	OU A ROD
76	Old Line Shed Building	CERCLA	NA	OU A ROD
77	Fuel Division Area Drum Storage (a.k.a. Fuels Facility Refueling Dock, Small Drum Storage Area)	RCRA and SAERA	NA	OU A ROD
78	NSGA Building USTs (a.k.a. Old Transportation Building)	SAERA	OU A ROD, as amended	2005 Decision Document
79	Main Road Pipeline (a.k.a. Main Road Pipeline, North End [MRP-MW15] and South End)	SAERA	NA	OU A ROD
80	Steam Plant 4 USTs (a.k.a. Steam Plant 4)	SAERA	OU A ROD, as amended	2005 Decision Document
81	NSGA Gun Turret Hill USTs (a.k.a. Gun Turret Hill)	SAERA	NA	OU A ROD
82	NSGA P80, P81 USTs (a.k.a. P-80/P-81 Buildings)	SAERA	OU A ROD, as amended	2005 Decision Document
83	Former Chiefs Club Station (no evaluation done)	CERCLA	NA	OU A ROD
84	Sand Shed	SAERA	NA	OU A ROD
85	New Baler Building	SAERA	NA	OU A ROD
86	Old Happy Valley Child Care Center	SAERA	NA	OU A ROD
87	Old Zeto Point Wizard Station	SAERA	NA	OU A ROD
88	NSGA P70 Energy Generator (a.k.a. P-70 Energy Generator)	SAERA	OU A ROD, as amended	2005 Decision Document
89	Tank Farm C	SAERA	NA	OU A ROD
90	Husky Road Landfill (no evaluation done)	CERCLA	NA	OU A ROD
91	Airplane Crash Sites	CERCLA	NA	OU A ROD
92	Waste Ordnance Pile (Fin Field)	CERCLA	NA	OU A ROD
93	World War II Mortar Impact Area[c]	CERCLA	Deferred to OU B	Deferred to OU B
94	Chemical Weapons Disposal Area	CERCLA	NA	OU A ROD
95	Transformer Disposal Area	CERCLA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
96	NORPAC Hill Debris Site	SAERA	NA	OU A ROD
97	Generator Debris Site	SAERA	NA	OU A ROD
None[d]	Sweeper Cove	CERCLA	NA	OU A ROD
	South Sweeper Creek	CERCLA	NA	OU A ROD
	Clam Lagoon	CERCLA	NA	OU A ROD
	Andrew Lake	CERCLA	NA	OU A ROD
	Kuluk Bay	CERCLA	NA	OU A ROD
	Administration Building (UST 30004-A)	SAERA	NA	OU A ROD
	Amulet Housing, Well AMW-706 Area	SAERA	NA	OU A ROD
	Amulet Housing, Well AMW-709 Area	SAERA	NA	OU A ROD
	Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	SAERA	NA	OU A ROD
	Armory (UST 10311-A)	SAERA	NA	OU A ROD
	Artillery Battalion (USTs ART-1 and ART-2)	SAERA	NA	OU A ROD
	ASR-8 Facility (UST 42007-B)	SAERA	NA	OU A ROD
	Bering Chapel (UST 42090-A)	SAERA	NA	OU A ROD
	Boy Scout Camp, South Haven Lake (UST BS-2)	SAERA	NA	OU A ROD
	Boy Scout Camp, West Haven Lake (UST BS-1)	SAERA	NA	OU A ROD
	CDAA Complex (USTs 10580 and 10654)	SAERA	NA	OU A ROD
	Clam Road Truck Fill Stand	SAERA	NA	OU A ROD
	Cold Storage Facility (AST T-1440)	SAERA	NA	OU A ROD
	Contractor's Camp Burn Pad	SAERA	NA	OU A ROD
	Contractor's Pad UST T-1706 (Navy Pad)	SAERA	NA	OU A ROD
	Drum Disposal Area at Tank Farm D	SAERA	NA	OU A ROD
	Elementary School (UST 42017-A)	SAERA	NA	OU A ROD
	Finger Bay Quonset Hut (UST FBQH-1)	SAERA	NA	OU A ROD
	Former Power Plant, Building T-1451	SAERA	NA	OU A ROD
	GCI Compound (UST GCI-1)	SAERA	OU A ROD, as amended	2005 Decision Document
	Girl Scout Camp (UST GS-1)	SAERA	NA	OU A ROD
	Housing Area (Arctic Acres)	SAERA	NA	OU A ROD
	Housing Outfall Area (Sandy Cove)	SAERA	NA	OU A ROD
	Kuluk Housing (UST HST-6C)	SAERA	NA	OU A ROD
	Kuluk Recreation Center (UST 30034)	SAERA	NA	OU A ROD
	Line Crew Building (USTs 2776, 2776-B, and 2776-C)	SAERA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
	Loran Station (USTs V149A, V149B, and V149C)	SAERA	NA	OU A ROD
	MAUW Compound (UST 24000-A)	SAERA	NA	OU A ROD
	MAUW Compound (UST 24032-B)	SAERA	NA	OU A ROD
	McDonalds UST	SAERA	NA	OU A ROD
	Medical Center (UST 27088)	SAERA	NA	OU A ROD
	Mount Moffett Power Plant 5 (Used Oil AST)	SAERA	NA	OU A ROD
	Mount Moffett Power Plant 5 (Used Oil Pit)	SAERA	NA	OU A ROD
	Mount Moffett Power Plant 5 (USTs 10574 through 10577)	SAERA	NA	OU A ROD
	Mount Moffett Tower (Mogas AST and Used Oil AST)	SAERA	NA	OU A ROD
	NAVFAC Compound (USTs 20052 and 20053)	SAERA	NA	OU A ROD
	Navy Exchange Building (UST 30026)	SAERA	NA	OU A ROD
	Navy Exchange Building (UST 30027-A)	SAERA	NA	OU A ROD
	Navy Exchange Building (UST 30033)	SAERA	NA	OU A ROD
	New Roberts Housing (UST HST-7C)	SAERA	NA	OU A ROD
	New Transportation Building (O/W 10644)	SAERA	NA	OU A ROD
	New Transportation Building (UST 10590)	SAERA	NA	OU A ROD
	New Transportation Building (UST 10591)	SAERA	NA	OU A ROD
	NMCB Building Area, T-1416 Expanded Area	SAERA	OU A ROD, as amended	2006 Decision Document
	NMCB Building (UST T-1416-A)	SAERA	OU A ROD, as amended	2006 Decision Document
	NORPAC Hill Seep Area	SAERA	OU A ROD, as amended	2005 Decision Document
	NSGA Filling Station, Mogas and JP-5 ASTs	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31047-A)	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31049-A)	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31050-A)	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31051-A)	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31052-A)	SAERA	NA	OU A ROD
	Officer Hill and Amulet Housing (UST 31053-A)	SAERA	NA	OU A ROD
	Old Fuel Truck Shop (UST 10520-A)	SAERA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
	Old Fuel Truck Shop (UST 10520-B)	SAERA	NA	OU A ROD
	Pantograph Pad (UST RT-1)	SAERA	NA	OU A ROD
	Pumphouse 5 Area	SAERA	NA	OU A ROD
	Quarters A	SAERA	NA	OU A ROD
	ROICC Contractor's Area (UST ROICC-5)	SAERA	NA	OU A ROD
	ROICC Contractor's Area (UST ROICC-6)	SAERA	NA	OU A ROD
	ROICC Contractor's Area (UST ROICC-7)	SAERA	NA	OU A ROD
	ROICC Contractor's Area (UST ROICC-8)	SAERA	NA	OU A ROD
	ROICC Warehouse (UST ROICC-1)	SAERA	NA	OU A ROD
	ROICC Warehouse (UST ROICC-2)	SAERA	NA	OU A ROD
	ROICC Warehouse (UST ROICC-3)	SAERA	NA	OU A ROD
	ROICC Warehouse (UST ROICC-4)	SAERA	NA	OU A ROD
	Runway 5-23 Avgas Valve Pit	SAERA	NA	OU A ROD
	Sewage Lift Station 10 (UST 42483-A)	SAERA	NA	OU A ROD
	Sewage Lift Station 11 (UST 42484-A)	SAERA	NA	OU A ROD
	Shack O-52 (UST O-52)	SAERA	NA	OU A ROD
	Shack O-69 (UST B)	SAERA	NA	OU A ROD
	South Avgas Pipeline at North Sweeper Creek	SAERA	NA	OU A ROD
	South of Runway 18-36 Area	SAERA	OU A ROD, as amended	2006 Decision Document
	Tanker Shed (UST 42494)	SAERA	OU A ROD, as amended	2005 Decision Document
	Telephone Exchange Building (UST 10324-A)	SAERA	NA	OU A ROD
	Telephone Substation T-100 (UST T-100-B)	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area A	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area B	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area C	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area D	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area E (Truck Fill Stand)	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area F	SAERA	NA	OU A ROD
	TFB to TFC Pipeline—Area G	SAERA	NA	OU A ROD
	TFC to NSGA Pipeline—Area A	SAERA	NA	OU A ROD
	TFC to NSGA Pipeline—Area B	SAERA	NA	OU A ROD
	TFC to NSGA Pipeline—Area C	SAERA	NA	OU A ROD
	TFC to NSGA Pipeline—Area D	SAERA	NA	OU A ROD
	TFC to NSGA Pipeline—Area E (Truck Fill Stand)	SAERA	NA	OU A ROD

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

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under	Interim Remedy	Final Remedy
	USGS (NOAA) Building (USTs NOAA-A, -C, and -D)	SAERA	NA	OU A ROD
	Yakutat Hangar (UST T-2039-A)	SAERA	OU A ROD, as amended	2005 Decision Document
	Yakutat Hangar (USTs T-2039-B and T-2039-C)	SAERA	NA	OU A ROD

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

Notes:
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DEC-SW - Alaska Department of Environmental Conservation Solid Waste Regulation
DRMO - Defense Reutilization Marketing Office
GCI - General Communications, Inc.
GSE - ground support equipment
JP-5 - jet petroleum No. 5
Loran - long-range navigation
MAUW - modified advanced underwater weapons
NA - not applicable
NAVFAC - Naval Facility
NMCB - Naval Mobile Construction Battalion
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
OB/OD - open burn/open detonation
O/W - oil/water separator
PCB - polychlorinated biphenyl
RCRA - Resource Conservation and Recovery Act
ROD - record of decision
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C
USGS - U.S. Geological Survey
UST - underground storage tank

Table 2-3
No Further Action CERCLA Sites as Documented in the OU A ROD

Site[a]
SWMU 3, Clam Lagoon Landfill
SWMU 5, North Davis Road Landfill
SWMU 6, Andrew Lake Drum Disposal Area 1
SWMU 7, Andrew Lake Drum Disposal Area 2
SWMU 9, Black Power Club
SWMU 21B, White Alice Lower Quarry
SWMU 21C, White Alice East Disposal Area
SWMU 24, Hazardous Waste Storage Facility — RCRA Closure under FFCA[b]
SWMU 26, Mitt Lake Drum Disposal Area
SWMU 27, Lake Leone Drum Disposal Area
SWMU 28, Lake Betty Drum Disposal Area
SWMU 30, Magazine 4 Landfill
SWMU 42, GSE Steam Clean Oil/Water Separator
SWMU 43, AIMD Acid Battery Storage Area
SWMU 51, NSGA Transportation Bldg. 10354 Waste Storage Area
SWMU 54, NMCB Battery Storage
SWMU 65, Contractor's Camp Fire/Demolition Site
SWMU 66, Palisades Lake PCB spill
SWMU 68, New Pesticide Storage Area
SWMU 69, Ski Lodge Waste Pile
SWMU 70, Davis Road Asphalt Drums
SWMU 71, NSGA Fueling Facility[c]
SWMU 72, NSGA Transportation Building 10354
SWMU 74, Old Batch Facility
SA 75, Asphalt Storage Area
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area — RCRA Closure under FFCA[e]
SA 83, Former Chiefs Club Station
SA 90, Husky Road Landfill
SA 91, Airplane Crash Sites
SA 92, Waste Ordnance Pile (Fin Field)
SA 94, Chemical Weapons Disposal Area
SA 95, Transformer Disposal Area
Clam Lagoon
Andrew Lake

[a]The total number of no further action CERCLA sites is 34, and the total number of no further action petroleum sites is 82 (see Table 2-4). However, the total number of no further action sites is 114 not 116, because SWMUs 24 and 74 are listed under both CERCLA and petroleum sites.
[b]SWMU 24, Hazardous Waste Storage Facility is included as a no further action site for both RCRA and petroleum sites (see Table 2-4).
[c]SWMU 74, Old Batch Facility is included as a no further action site for both CERCLA and petroleum sites (see Table 2-4).

Table 2-3 (Continued)
No Further Action CERCLA Sites as Documented in the OU A ROD

[d]This site is both a RCRA and SAERA site. This site is a no further action site under RCRA, as shown in this table. The selected remedial alternative under SAERA is limited soil removal (see Figure 2-2).

Notes:
This list of sites only includes those sites that were designated as no further action sites in the OU A ROD. Sites that have achieved no further action status after the execution of the ROD are not included in this table.
AIMD - Aircraft Intermediate Maintenance Detachment
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
FFCA - Federal Facilities Compliance Agreement
GSE - ground support equipment
NMCB - Naval Mobile Construction Battalion
NSGA - Naval Security Group Activity
OU - operable unit
PCB - polychlorinated biphenyl
RCRA - Resource Conservation and Recovery Act
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit

1 **Table 2-4**
2 **No Further Action Petroleum Sites as Documented in the OU A ROD**
3

Site[a]
Administration Building (UST 30004-A)
Armory (UST 10311-A)
Artillery Battalion (USTs ART-1 and ART-2)
Bering Chapel (UST 42090-A)
Boy Scout Camp, South Haven Lake (UST BS-2)
CDAA Complex (USTs 10580 and 10654)
Clam Road Truck Fill Stand
Cold Storage Facility (AST T-1440)
Contractor's Pad UST T-1706 (Navy Pad)
Drum Disposal Area at Tank Farm D
Elementary School (UST 42017-A)
Housing Outfall Area (Sandy Cove)
Kuluk Housing (UST HST-6C)
Kuluk Recreation Center (UST 30034)
Line Crew Building (USTs 2776, 2776-B, and 2776-C)
Loran Station (USTs V149A, V149B, and V149C)
MAUW Compound (UST 24032-B)
McDonald's UST
Medical Center (UST 27088)
Mount Moffett Power Plant 5 (Used Oil AST)
Mount Moffett Power Plant 5 (Used Oil Pit)
Mount Moffett Tower (Mogas AST and Used Oil AST)
Navy Exchange Building (UST 30026)
Navy Exchange Building (UST 30033)
New Transportation Building (O/W 10644)
New Transportation Building (UST 10590)
New Transportation Building (UST 10591)
NSGA Filling Station, Mogas and JP-5 ASTs
Officer Hill and Amulet Housing (UST 31050-A)
Officer Hill and Amulet Housing (UST 31051-A)
Officer Hill and Amulet Housing (UST 31053-A)
Old Fuel Truck Shop (UST 10520-A)
Old Fuel Truck Shop (UST 10520-B)
Pantograph Pad (UST RT-1)
Pumphouse 5 Area
ROICC Contractor's Area (UST ROICC-5)
ROICC Contractor's Area (UST ROICC-6)
ROICC Warehouse (UST ROICC-1)
ROICC Warehouse (UST ROICC-4)
SA 81, Gun Turret Hill
SA 84, Sand Shed

Table 2-4 (Continued)
No Further Action Petroleum Sites as Documented in the OU A ROD

Site[a]
SA 85, New Baler Building
SA 86, Old Happy Valley Child Care Center
SA 87, Old Zeto Point Wizard Station
SA 89, Tank Farm C
SA 96, NORPAC Hill Debris Site
SA 97, Generator Debris Site
Sewage Life Station 10 (UST 42483-A)
Sewage Lift Station 11 (UST 42484-A)
Shack O-52 (UST O-52)
Shack 0-69 (UST B)
South Avgas Pipeline at North Sweeper Creek
SWMU 1, Andrew Lake OB/OD and Range
SWMU 12, Quartermaster Road Debris Disposal Area
SWMU 22, Avgas Drum Storage Area South of Tank Farm 1
SWMU 24, Hazardous Waste Storage Facility[b]
SWMU 31, Runway 18-36 Aviation Gas Drum Disposal
SWMU 34, Steam Plant 4 Used Oil AST
SWMU 35, Ground Support Equipment Building
SWMU 41, GSE Used Oil Storage Area
SWMU 44, AIMD Used Oil Storage Area
SWMU 45, Sewage Treatment Plan Petroleum Contamination (including SWMUs 46 through 50)
SWMU 55, Public Works Transportation Department Waste Storage Area[c]
SWMU 56, Public Works Transportation Department Storage Tank
SWMU 57, Fuels Facility Refueling Dock
SWMU 64, Tank Farm D
SWMU 74, Old Batch Facility[d]
Telephone Exchange Building (UST 10324-A)
Telephone Substation T-100 (UST T-100-B)
TFB to TFC Pipeline—Area A
TFB to TFC Pipeline—Area B
TFB to TFC Pipeline—Area C
TFB to TFC Pipeline—Area D
TFB to TFC Pipeline—Area E (Truck Fill Stand)
TFB to TFC Pipeline—Area F
TFB to TFC Pipeline—Area G
TFC to NSGA Pipeline—Area A
TFC to NSGA Pipeline—Area B
TFC to NSGA Pipeline—Area C
TFC to NSGA Pipeline—Area D
TFC to NSGA Pipeline—Area E
USGS (NOAA) Building (USTs NOAA-A, -C, and -D)

Table 2-4 (Continued)
No Further Action Petroleum Sites as Documented in the OU A ROD

[a]The total number of no further action petroleum sites is 82, and the total number of no further action CERCLA sites is 34 (see Table 2-3). However, the total number of no further action sites is 114 not 116, because SWMUs 24 and 74 are both listed under CERCLA and petroleum sites.
[b]SWMU 24, Hazardous Waste Storage Facility is included as a no further action site for both RCRA (see Table 2-3) and SAERA sites.
[c]This site is both a CERCLA and SAERA site. This site is a no further action site under SAERA as shown in this table. The selected remedial alternative under CERCLA is institutional controls (see Figure 2-1).
[d]SWMU 74, Old Batch Facility is included as a no further action site for both CERCLA (see Table 2-3) and SAERA sites.

Notes:
This list of sites only includes those sites that were designated as no further action sites in the OU A ROD. Sites that have achieved no further action status after the execution of the ROD are not included in this table.
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
GSE - ground support equipment
JP-5 - jet petroleum No. 5
loran - long-range navigation
MAUW - modified advanced underwater weapons
mogas - motor vehicle gasoline
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
OB/OD - ordnance burn, ordnance detonation
OU - operable unit
RCRA - Resource Conservation and Recovery Act
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C
USGS - U.S. Geological Survey
UST - underground storage tank

3.0 BACKGROUND

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 Interim Conveyance document issued by the U.S. Department of the Interior, Bureau of Land Management. 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 Interim Conveyance document is published as Attachment D-1 of the ICMP, which is Appendix D of the CMP, Revision 4 (U.S. Navy 2010a). The land transfer included all of the downtown area, housing units, and industrial facilities. Excluded from this transfer are 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; and those improvements owned by the United States and managed by the U.S. Fish and Wildlife Service (USFWS). TAC transferred the portion of the former Adak Naval Complex known as Adak Airport, associated facilities, and aviation easements, not including Federal Aviation Administration navigation aids or weather reporting equipment, to the State of Alaska.

3.1 OPERABLE UNIT A

OU A addresses chemical releases to the environment throughout the entire military reservation. The investigation and remediation of OU A sites involved state regulations, as well as CERCLA and RCRA procedures. As discussed in Section 2, a total of 180 sites were evaluated for OU A. Two of these sites were deferred to OU B (SWMU 8 and SA 93). Of the remaining 178 sites, 121 sites were petroleum sites, 50 sites were investigated under CERCLA (including the 5 water bodies), 5 were investigated under both CERCLA and SAERA, and 2 were investigated under both RCRA and SAERA. Figure 2-1 presents an overview of the process used to evaluate OU A CERCLA sites, and Figure 2-2 presents an overview of the process used to evaluate OU A petroleum sites.

The site history, use, wastes generated, and chemicals of concern (COCs) are summarized in the Site Catalog (Appendix A) for each CERCLA, RCRA, and SAERA site that required remedial action. Information in the Site Catalog includes the basis for taking action at each site and summarizes activities up through signing of the OU A ROD (this is the information typically included in Section 3 of a 5-year review). The Site Catalog also includes information for each site that would typically be included in later sections of the 5-year review report, such as remedy implementation and operation, maintenance, and monitoring.

3.2 OPERABLE UNIT B

Overall, OU B addresses ordnance explosive safety hazards and human health and ecological risks associated with munitions constituents (MC). Because CERCLA does not include specific provisions associated with explosive hazards related to ordnance, the OU B Project Team was created to develop an investigation and cleanup approach for OU B consistent with the CERCLA process and acceptable to Adak stakeholders. The OU B Project Team originally consisted of representatives from the Navy, EPA, ADEC, USFWS, TAC, and the Aleutian/Pribilof Island Association. Currently TAC and the Aleutian/Pribilof Island Association do not participate, but are kept apprised. The Project Team was tasked to design an Adak-unique, CERCLA-consistent approach to identify, evaluate, and remediate sites potentially contaminated with ordnance.

The Project Team developed a two-part evaluation of risk, based on an evaluation of hazard assessment approaches. Part 1 was considered the preliminary assessment, an initial screening to determine if potential sites should be retained for evaluation through the remedial investigation/feasibility study (RI/FS) process or designated as sites requiring no further action (NOFA) and elimination from the RI/FS process. NOFA is different from NFA, the designation used for OU A sites. NOFA includes the continuation of the Adak Land Use Control (LUC) and Unexploded Ordnance (UXO) Education Awareness Program and the inclusion of a deed notice pursuant to CERCLA 120(h)(3)(A)(i) or other suitable information on munitions and explosives

of concern (MEC) in the Bureau of Land Management's permanent file concerning the conveyance.[1] Under Part 1, 183 ordnance sites were initially evaluated, and 78 of the sites were given a NOFA designation, as reported in the preliminary assessment report (U.S. Navy 2000c). During the preliminary assessment process, four new sites were added to the overall list (see Figure 3-1).

Part 2 was the development of a site-specific explosives safety hazard assessment (ESHA) methodology to evaluate data provided by the RI process. The ESHA methodology is qualitative in nature, but makes use of both qualitative and quantitative inputs in a framework that results in a relative-risk ranking ranging from low risk (A) to extreme risk (E). Sites scored as an "A" or "B" were recommended for NOFA. Those scored with a "C" or "D" were recommended for further investigation or remediation. No site received a score of "E." In addition to potential explosive safety hazards, an evaluation of risk-based screening criteria for MC in soils was developed for sites on Adak where limited releases of MC may have occurred.

In 2001, OU B was subdivided into OU B-1 and OU B-2 to expedite transfer of real estate by placing a higher priority on completing the investigation and remediation of OU B-1 sites located within real estate planned for transfer to TAC (OU B-1 sites are shown on Figure 3-2 and OU B-2 sites undergoing the RI/FS process are shown on Figure 3-3). Parcel 4 includes all of the land currently retained by the Navy on Adak Island (see Figure 3-3 for the Parcel 4 boundaries) and encompasses a small percentage of the OU B-1 sites and all of the OU B-2 sites identified for further evaluation in the preliminary assessment. As shown on Figure 3-1, 155 sites are addressed under OU B-1, 6 sites will be addressed under the Formerly Used Defense Site program, and the remainder will be addressed as part of OU B-2.

3.2.1 Operable Unit B-1

The sites in OU B-1 include the downtown and remote exchange areas identified for land transfer. Of the 183 sites identified in the preliminary assessment, 118 were designated as OU B-1 sites (see Figure 3-1). In addition, 2 new sites were added to OU B-1 after completion of the preliminary assessment, and 12 additional sites were created after completion of the preliminary assessment by splitting 7 existing sites into between 2 and 6 new sites. Therefore, a total of 132 sites were originally designated as OU B-1 sites. Twenty-three sites were later transferred from OU B-2 to OU B-1, including MM-04, MM-22, and MM-23. (A listing of all of

[1]Note that during the development of the OU B-2 RI/FS the term "NOFA" was changed to "Limited Action" in order to more clearly show that limited actions, or more specifically institutional controls, are required at these sites (U.S. Navy 2011f). However, the use of NOFA is retained in this document when discussing the results of the preliminary assessment for all OU B sites and for all discussions pertaining to OU B-1 sites in order to be consistent with the terminology used in the preliminary assessment and the OU B-1 ROD (U.S. Navy 2000c and U.S. Navy, USEPA, and ADEC 2001).

the transferred sites is included in the footnotes of Table 3-1.) Therefore, the OU B-1 ROD included 155 sites (U.S. Navy, USEPA, and ADEC 2001). Table 3-1 presents the results of the preliminary assessment for all the OU B-1 sites that were included in the ROD. Two sites, MM-22 and MM-23, were incorporated into MM-04, reducing the number of OU B-1 sites to 153. During the 2004 field season, the Navy established two new sites (MM-10F and MM-10G) within the boundaries of MM-10E. In addition, a new site (MM-10H) was established within the boundaries of MM-10E during a site certification meeting on December 8, 2004. As a result, the final count of OU B-1 sites is 156.

Of the 156 sites, 62 sites were identified as NOFA in the preliminary assessment, including 60 sites originally designated as OU B-1 sites and 2 sites transferred from OU B-2 to OU B-1. Three of the 62 sites originally categorized as NOFA were later determined to require further investigation in the RI (U.S. Navy 2001c). The remaining 94 sites, which include 17 new sites added after the preliminary assessment, required either a site inspection, RI, or evaluation in the FS (U.S. Navy 2001c).

Site background, removal actions (if any), and RI/FS results for the 50 sites that required further action in the OU B-1 ROD (including the three new sites, MM-10F, MM-10G, and MM-10H, identified in 2004 that are located within or adjacent to MM-10E) are provided in the Site Catalog (Appendix A). Selected remedies, implementation, and operation and maintenance for the sites are presented in Section 4.

3.2.2 Operable Unit B-2

OU B-2 addresses ordnance explosive safety hazards and human health and ecological risks associated with MC in areas identified for possible retention by the Navy. Of the 183 sites identified in the preliminary assessment, 59 were designated as OU B-2 sites (see Figure 3-1). In addition, three new sites JM-01, MM-23, and LJ-02A were added after completion of the preliminary assessment. Therefore, a total of 62 sites were originally designated as OU B-2 sites. Twenty-three of these 62 sites were later transferred to OU B-1, including MM-23. A listing of all of the transferred sites is included in the footnotes of Table 3-1. Therefore, 39 sites are currently designated as OU B-2. These sites are listed in Table 3-2, and site background information is provided for each site. In the preliminary assessment, 16 of the 39 sites were identified as NOFA sites, and 23 of the 39 sites were identified as requiring further evaluation in an RI. (Note that for all OU B-2 sites the current term for NOFA is “Limited Action.” [Refer to footnote 1 in Section 3.2.]) One of the 16 sites originally identified as a NOFA site was later identified as requiring further evaluation in the RI. Therefore, 24 OU B-2 sites are in the RI/FS stage of the CERCLA process (U.S. Navy 20011e and 2011f). The 24 OU B-2 sites undergoing the RI/FS process are shown on Figure 3-3 and are within land transfer Parcel 4.

Data at OU B-2 sites potentially contaminated with MEC and MC were collected in 1999, 2000, and 2008 (U.S. Navy 2011e). In addition, data were collected in 2004 at one OU B-2 site, LJ-02A, during OU B-1 remedial actions. Data from the these investigations were reviewed to determine whether the information was adequate to assess risk and evaluate remedial alternatives in an FS. Data gaps were identified at 18 of the OU B-2 sites. The RI was conducted in 2008 to fill the identified data gaps at the 18 sites. Existing information was deemed sufficient to conclude that Limited Action was required at five OU B-2 sites (BC-03, JM-01, LJ-02A, MM-10D, and RR-03). (Note: In the 2011 draft final FS, the term NOFA was replaced by Limited Action, as discussed previously [U.S. Navy 2011f]). In addition to the five Limited Action sites, earlier investigations had concluded that conditions at one site (RG-01) were sufficiently hazardous to merit removal of MEC under a non-time-critical removal action, so further investigation of this site was not performed during the 2008 RI. The non-time-critical removal action at RG-01 was conducted during the 2006 and 2008 field seasons. Data collected at RG-01 during the removal action were summarized in the RI to complete the ESHA and chemical risk assessment evaluations that were used to determine whether further action is required at the site. The RI/FS concluded that characterization and remediation of RG-01 was completed during the non-time-critical removal action, and only Limited Action was required at RG-01 (U.S. Navy 2011e and 2011f).

The MEC data collected during the 1999, 2000, and 2008 investigations were used to determine the nature and extent of contamination, complete the Adak conceptual site model, and as input to an Adak-specific ESHA tool used to determine the potential magnitude of the risk/hazard present at MEC sites. The data used for this analysis included reconnaissance observations concerning site accessibility and the potential for MEC to be transported beyond site boundaries by erosion or slope failure, instrument-aided visual surveys for the presence of MEC, and geophysical/intrusive investigation data. In addition, samples were collected at 11 sites for chemical analysis during the 2008 RI. Analytical data were used to characterize potential risks posed to human and ecological receptors exposed to MC in site soils, sediment, surface water, and groundwater. The nature of potential MC contamination in soil, sediment, surface water, and groundwater was characterized by comparing the individual sample results collected at the site (including samples collected during previous investigations) to conservative risk-based screening levels. The results of the MEC and MC risk evaluations were used to determine the need for further action to address unacceptable risk.

Potential remedial alternatives for addressing the identified risks are being evaluated and documented in an FS report (U.S. Navy 2011e). The Navy continues to monitor and maintain access deterrents, signs, and fences as interim engineering controls (ECs) to limit access to OU B-2 sites while a remedy is being selected for the OU B-2 sites.

3.3 OTHER ENVIRONMENTAL CONCERNS

This section summarizes environmental work performed on Adak that was not specifically identified in any of the RODs or decision documents. This work includes the investigation and remediation of the new Tango Pad site in 2006, RI/FS activities at the new Area 303 site from 2006 through 2008, and fuel pipeline decommissioning activities in the downtown area in 2009. The work described in this section is not related to CERCLA and is being performed in accordance with SAERA. Information on these environmental activities is summarized below.

3.3.1 Tango Pad

During 2000, surface soil staining was observed in the vicinity of an aboveground storage tank (AST) at the Tango Pad site (ADEC 2000). The 1,500-gallon AST was formerly used by Tango Construction to store motor gasoline (mogas). The site is located along Forest Road near the southeastern corner of the Contractor's Camp area. The former AST is located at the north end of a raised concrete pad. The stained soil was observed at the base of the northern end of the raised concrete pad, beneath the AST. An unknown quantity of gasoline-range fuel was released at the site, resulting in the observed soil staining.

A limited soil removal was performed at the time of the release discovery, and all remaining fuel was removed from the AST. A quantity of petroleum-contaminated soil sufficient to fill one 55-gallon drum was removed for treatment and/or disposal. The soil removal was terminated at a depth of approximately 1.5 feet bgs.

During 2006, an investigation of the Tango Pad site was conducted (U.S. Navy 2007a). Investigation activities at the Tango Pad site consisted of groundwater and soil sampling. Groundwater samples were collected from four locations at the site between June 5 and 24, 2006. Total lead was the only analyte detected at concentrations in excess of its ADEC groundwater cleanup level. Total lead was detected at only one location slightly above its ADEC groundwater cleanup level. This location is to the west of the former AST. Dissolved lead was not detected, in any of the submitted samples above method detection limits.

Drilling and soil sampling were conducted between June 4 and 7, 2006. A total of nine soil borings were advanced in the general area of the former spill. Soil samples were collected at the surface of the primary groundwater unit (approximately 8 feet bgs) in all borings. At the three locations nearest to the spill area, soil samples were also collected from the vadose zone. Exceedances of the ADEC soil cleanup levels were detected in samples from two borings. These samples were collected near the top of the groundwater in both borings.

Based on the results of the soil investigation at the Tango Pad site, a small zone of soil was identified as being impacted above the applicable ADEC soil cleanup levels. This zone is

located near the groundwater surface at approximately 7 to 9 feet bgs, surrounding two borings where detected concentrations of petroleum hydrocarbons exceeded the ADEC soil cleanup levels. Detections of total petroleum hydrocarbons, volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbon (PAHs) (below their respective criteria) were also noted in one additional boring. However, a subsurface obstruction prevented the advancement of that boring past 4 feet bgs. Since this boring is closer to the former fuel AST than the two other borings that showed exceedances, the soils at this location are likely also impacted at levels above the ADEC soil cleanup levels.

The Tango Pad removal action was conducted in July 2006 and included the following activities: cleaning the AST, excavating petroleum-contaminated soil exceeding ADEC cleanup levels, collecting and analyzing confirmation samples, and restoring the site (U.S. Navy 2007b). The AST was emptied of approximately 50 gallons of water and residual fuel and cleaned by triple rinsing on July 13. Once cleaned, the tank was labeled empty and left in place. The excavation of petroleum-contaminated soil was centered on the soil boring with the highest concentrations of petroleum compounds. It proceeded to a depth of 8.3 feet, with horizontal dimensions of approximately 20 by 10 feet. Contaminated soil was generally found at depths of 5 and 8 feet bgs, which corresponds to the site investigation sampling results. In total, 26 cubic yards of petroleum-contaminated soil was excavated. Following excavation, confirmation soil samples were collected. The excavation and confirmation soil sampling were completed on July 22. Following the confirmation sampling, the Tango Pad site was backfilled and restored to its pre-excavation conditions.

Four confirmation soil samples and one field duplicate were collected at the bottom of the north, south, east, and west sidewalls of the excavation area. These samples were analyzed for gasoline-range organics (GRO), benzene, toluene, ethylbenzene, and xylenes. The analytical results for these compounds are as follows:

- Benzene was not detected at the site above reporting limits, which ranged from 0.008 to 0.013 mg/kg.
- GRO was detected in one sample at a concentration of 15 mg/kg.
- Ethylbenzene was detected in one sample at a concentration of 0.440 mg/kg.
- Toluene was detected in two samples at concentrations of 0.015 and 0.026 mg/kg.
- Xylenes were detected in samples collected from three locations at concentrations ranging from 0.022 to 4.3 mg/kg.

Results of the sampling confirmed that no chemical contamination exists at the site above the ADEC cleanup levels. Therefore, the closure report recommended no further action for this site. ADEC concurred that the Tango Pad Spill Area met ADEC's requirements for full site closure (ADEC 2007b).

3.3.2 Area 303

The petroleum-release site designated Area 303 is located in downtown Adak between the air terminal and the former high school building. It is bounded by Airport Road to the north, Sandy Cove Housing area and the former high school building to the east, Eagle Bay Housing area and an unnamed dirt road to the south, and the air terminal to the west. Area 303 occupies approximately 23.8 acres that include disturbed commercial/industrial areas and open grass-covered areas.

Area 303 was not one of the petroleum-contaminated sites included in the OU A ROD. Area 303 was identified during a 2002 U.S. Geological Survey (USGS) investigation to monitor natural attenuation of petroleum in groundwater (USGS 2005). During the investigation, the USGS collected groundwater samples from 10 locations between the GCI Compound and the East Canal. The chemical analyses conducted on these samples identified the presence of GRO at concentrations that greatly exceeded the concentrations from samples collected within the GCI Compound source area. The distribution of GRO concentrations in the primary aquifer beneath Area 303 caused the USGS to conclude that a second overlapping GRO plume existed in this area. The USGS further stated that the second GRO plume was emanating from an unidentified source somewhere south or southwest of the GCI Compound source area.

Subsequent to the USGS investigation, the Navy conducted a follow-on investigation to characterize the GRO release, evaluate human health and ecological risks, and develop and evaluate remedial action alternatives (U.S. Navy 2008b). During the follow-on investigation, free product was identified at the site, and concentrations of petroleum-related chemicals were detected at concentrations above project screening levels. The results of the investigation suggested that the 8-inch-diameter aviation gasoline (avgas) pipeline along the eastern side of Main Road was likely the GRO source. Pipeline decommissioning activities performed in 2009 support this conclusion (see Section 3.3.5). Specifically, sections of the avgas pipeline within Area 303 failed the integrity test conducted as part of the decommissioning activities. Furthermore, none of the portions of the jet petroleum No. 5 (JP-5) pipeline within Area 303 failed the integrity test.

Human health and ecological risk assessments were conducted to assess whether petroleum at Area 303 would pose a potential unacceptable risk to human health or the environment if no cleanup actions were to take place. Risks (human health only) and hazards (human health and ecological) from exposure to petroleum compounds were estimated for each complete exposure

pathway. The complete exposure pathways evaluated in the human health risk assessment included ingestion, dermal contact, and inhalation of chemicals in soil by construction workers and dermal contact and inhalation of chemicals in groundwater by construction workers. Risks and hazards resulting from exposure to soil and groundwater were estimated based on groundwater not being used as drinking water source, because institutional controls (ICs) prohibit the use of groundwater. The potential risks to construction workers resulting from exposure to subsurface soil and groundwater were found to be below target health goals. Therefore, petroleum-related chemicals at the site pose no unacceptable risk, provided that ICs remain in effect prohibiting the use of groundwater as a drinking water source. In addition, the ecological risk assessment concluded that no ecological threat exists to ecological receptors at Area 303.

Based on risks being below target health goals and regulatory requirements, three RAOs were established for the site: reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to ADEC groundwater cleanup levels, minimize exposure to free product, and prevent migration of petroleum hydrocarbons to surface water that would lead to an exceedance of ADEC surface water quality criteria. Four alternatives were evaluated for Area 303 in the focused feasibility study (FFS), including no action, limited groundwater monitoring, monitored natural attenuation and ICs, and free-product recovery (U.S Navy 2008b). In a draft proposed plan submitted to ADEC and the stakeholders in July 2008, monitored natural attenuation, ICs, and free-product recovery were proposed by the Navy as the cleanup alternatives for the site (U.S. Navy and ADEC 2008a).

Following submittal of the draft proposed plan, the regulatory agencies and stakeholders questioned whether the proposed cleanup alternatives would be protective of human health for Eagle Bay Housing units adjacent to the site, or if buildings were constructed over contaminated areas at the site. To address these concerns, the Navy sampled soil vapor in 2010 at three locations (four depths at two locations and a single depth at one location because of shallow groundwater) within the Area 303 boundaries and used the data to characterize the movement of soil vapor through the subsurface and to predict indoor air concentrations in existing residential, future residential, and/or future commercial structures.

The results of the supplemental risk assessment performed using the 2010 soil vapor data (U.S. Navy 2011d) were that soil vapor concentrations in shallow soil vapor are unlikely to be present in concentrations that represent a health concern for the vapor intrusion pathway. The decommissioning of the gasoline pipeline has mitigated the potential for continued release to the environment and is expected to result in continued reduction of soil vapor concentrations beneath the site. In addition, fixed-gas data indicate that conditions are mostly favorable for petroleum biodegradation, further reducing the concern associated with vapor intrusion.

However, the elevated soil vapor concentrations measured at location SV-303-2 in the area where free product is present are indicative of a potential hot spot for construction workers (no indoor air hazards at this location). If construction activities (digging) were to occur over this location and assuming no attenuation of vapor concentrations has occurred, appropriate protective measures should be implemented to protect worker safety.

The recommendations of the 2008 FFS (monitored natural attenuation and ICs with free-phase product recovery) are still valid and protective of public health at the site. Because of a lack of analysis for chlorinated solvents in groundwater and the single detection of tetrachloroethene (PCE) in soil gas, the risk assessment recommended that the next round of groundwater monitoring include VOC analysis by EPA Method 8260 to evaluate the potential presence of chlorinated VOCs in Area 303 groundwater. Specifically, the following wells near the PCE detection in the soil vapor sample from SV-303-2-C should be sampled: MW-303-28, MW-303-29, MW-303-30, 03-107, HMW-303-5, and HMW-303-6. A revised proposed plan is being prepared for submittal to ADEC and stakeholders.

3.3.3 Fuel Pipeline Decommissioning

In 2009, fuel pipelines were decommissioned that were located in the downtown area of Adak where no documentation was available indicating that the pipelines had been previously cleaned and closed (U.S. Navy 2010c). These pipelines were decommissioned because residual fuel in the pipelines could potentially be an ongoing source of petroleum hydrocarbons to the subsurface. Pipelines were closed in accordance with state and federal regulatory requirements and included the following:

- The 6-inch JP-5 pipeline (Main Road pipeline) from the fuels facility to Steam Plant 4
- The 8-inch avgas pipeline from former Fuel Dock No. 7 to former Tank Farm B
- The 4-inch diesel pipeline from former Fuel Dock No. 7 to the intersection of Kagalaska Drive and Main Road
- The 12-inch diesel pipeline from former Fuel Dock No. 7 to former Tank Farm A
- The 8-inch mogas pipeline from former Fuel Dock No. 7 to former Tank Farm A
- The 3-inch mogas pipeline from the depression to just east of Building T-1446 (identified during decommissioning activities as an 8-inch line)
- Branch pipelines associated with the pipelines listed above

During the decommissioning efforts, some of the sections of pipelines listed above were found to have been previously decommissioned. Although the date of the previous decommissioning is unknown, visual inspection and verification in the field confirmed the completion of prior decommissioning. As a result of the field activities, 48,107 linear feet of pipelines were either physically decommissioned or were documented as having been previously decommissioned. The following pipelines were identified to have been previously decommissioned (sectioned and cut and filled with concrete):

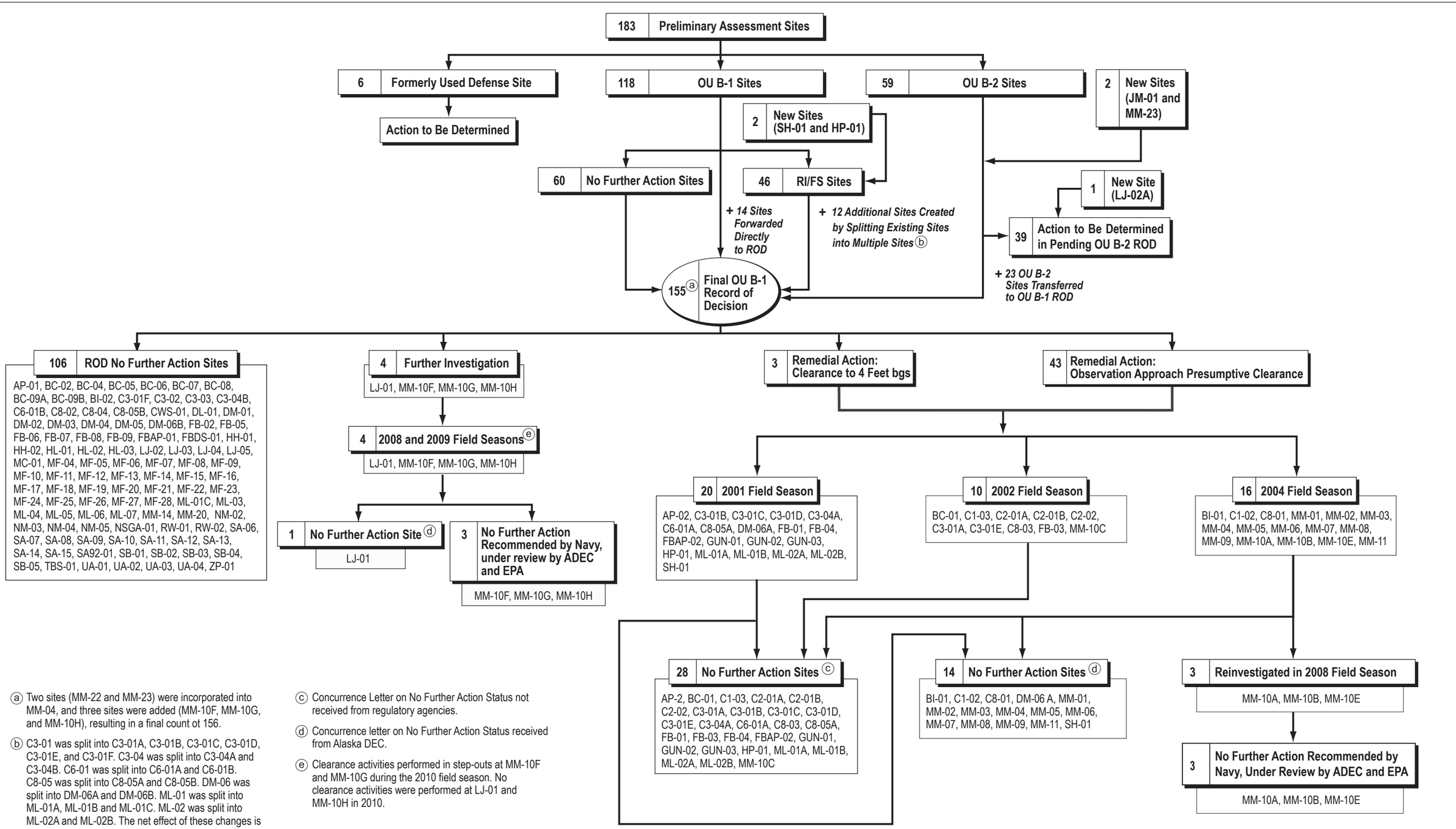
- The portion of the 8-inch mogas pipeline and the 12-inch diesel pipeline from former Fuel Dock No. 7 to former Tank Farm A located west of South Sweeper Creek
- The portion of the 4-inch diesel pipeline from former Fuel Dock No. 7 to the intersection of Kagalaska Drive and Main Road located parallel to the Main Road
- A portion of the 8-inch avgas pipeline north of Runway 5-23 and another portion just north of the former Fuel Dock No. 7
- The 6-inch avgas lateral in the vicinity of the Air Terminal Building and a portion of the 6-inch avgas lateral south of the Air Terminal Building area

Vacuum leak testing and field sampling of soils were implemented to identify areas of potential concern during the decommissioning activities. Six sections of pipeline failed the integrity testing, and only one of these sections was located in an area where contamination had not been previously documented. The four remaining sections were located in the vicinity of an area of known contamination. Along the one section of pipeline that failed the integrity test and was not located in an area of known contamination, six excavation/test pit soil samples were collected along the pipeline. No contamination was detected above the project screening values in the samples collected, nor were visual observations documented that identified the presence of contamination.

Field sampling procedures included visual observations made by the field team (e.g., odor, staining, discolored soil, and sheen) and use of a photoionization detector for detecting elevated volatile organics in the soil. In addition, 73 soil samples were collected and analyzed at an off-site laboratory for GRO, benzene, toluene, ethylbenzene, and xylenes (BTEX), and diesel-range organics (DRO). Of these 73 samples collected, only 9 samples had concentrations of petroleum hydrocarbons greater than project screening levels. Of these nine samples, only three were not associated with areas of known contamination. Further investigation in the vicinity of the six samples associated with areas of known contamination is not necessary. Two areas (representing the three samples) not associated with areas of known contamination require further investigation and include the following:

- A portion of the 8-inch avgas pipeline south of Runway 5-23
- A portion of 2.5-inch JP-5 lateral pipeline just north of Buildings 30022 and 30027

Further investigation of these two areas is not currently scheduled.



ⓐ Two sites (MM-22 and MM-23) were incorporated into MM-04, and three sites were added (MM-10F, MM-10G, and MM-10H), resulting in a final count ot 156.

ⓑ C3-01 was split into C3-01A, C3-01B, C3-01C, C3-01D, C3-01E, and C3-01F. C3-04 was split into C3-04A and C3-04B. C6-01 was split into C6-01A and C6-01B. C8-05 was split into C8-05A and C8-05B. DM-06 was split into DM-06A and DM-06B. ML-01 was split into ML-01A, ML-01B and ML-01C. ML-02 was split into ML-02A and ML-02B. The net effect of these changes is the addition of 12 sites.

ⓒ Concurrence Letter on No Further Action Status not received from regulatory agencies.

ⓓ Concurrence letter on No Further Action Status received from Alaska DEC.

ⓔ Clearance activities performed in step-outs at MM-10F and MM-10G during the 2010 field season. No clearance activities were performed at LJ-01 and MM-10H in 2010.

U.S.NAVY

Figure 3-1
Summary of OU B-1 Site Process at Former Adak Naval Complex

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

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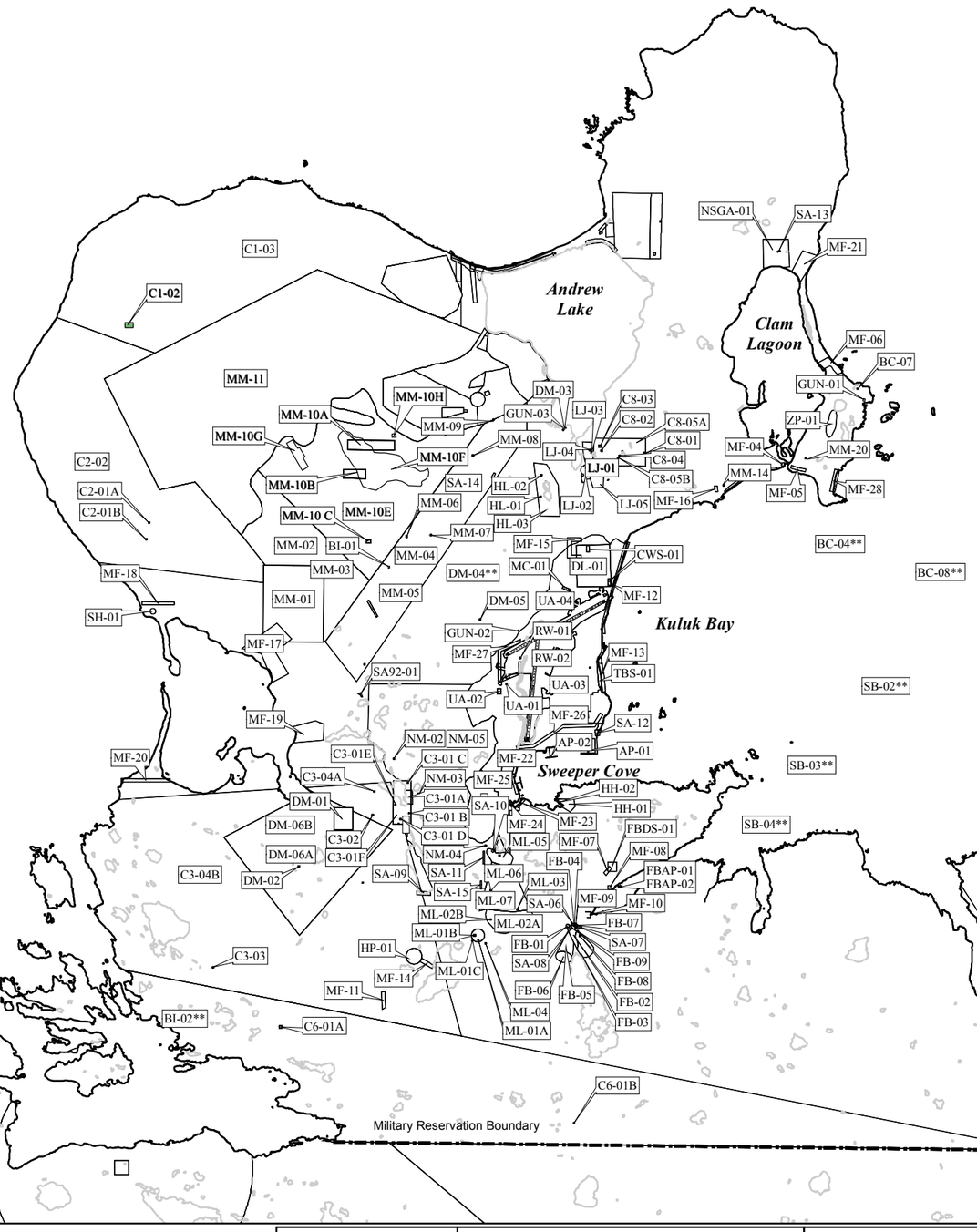

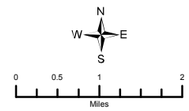

**** Range Safety Fan:** **BC-04**
BC-08
BI-02
DM-04
SB-02
SB-03
SB-04

Notes:
1) MM-10A, B, C, F, G and H are located within the boundaries of MM-10E.
2) GUN-03 is included for deletion and encompasses 29 locations throughout the former military complex.

U.S. NAVY	Delivery Order 0019 Adak Island, AK THIRD FIVE-YEAR REVIEW	**Figure 3-2** **Operable Unit B-1 Sites**

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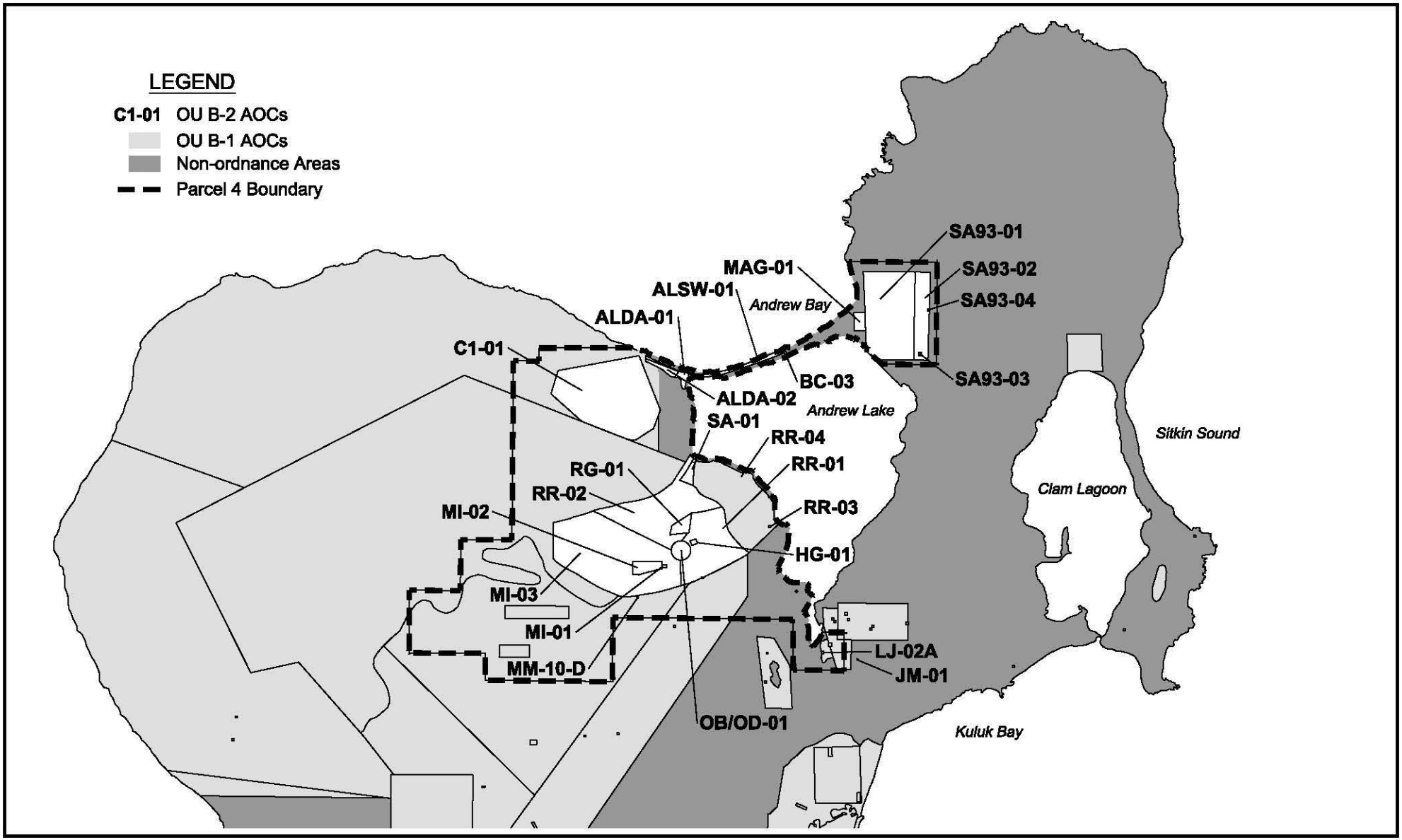

U.S. NAVY

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Figure 3-3
Operable Unit B-2 RI/FS Sites

Delivery Order 0019
Adak Island, AK
THIRD FIVE-YEAR REVIEW

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1 **Table 3-1**
2 **Results of Preliminary Assessment for OU B-1 Sites**

Candidate Site Name	Site Identifier/Name	Results of Preliminary Assessment[f]		
		NOFA	RI/ Inspect. Comp.	FS Comp.
Bay of Islands	BI-01[a]		√	
Bay of Islands Impact Area	BI-02	√		
Blind Cove/Campers Cove Impact Area	BC-01, BC-05, BC-06, BC-07, BC-08, BC-09A		√	
	BC-02, BC-04, BC-09B	√		
Chemical Warfare Materials Warehouses	CWS-01	√		
Combat Range #1	C1-02[a]		√	
	C1-03[a]	√		
Combat Range #2	C2-01A[a], C2-01B[a]		√	
	C2-02[a]	√		
Combat Range #3	C3-01 (C3-01A, C3-01B, C3-01C, C3-01D, C3-01E), C3-04 (C3-04A)	See Note[b]		
	C3-01 (C3-01F), C3-02, C3-03, C3-04 (C3-04B)		√	
Combat Range #6	C6-01 (C6-01A)	See Note[b]		
	C6-01B		√	
Combat Range #8	C8-01, C8-02, C8-03, C8-04, C8-05 (C8-05B)		√	
	C8-05 (C8-05A)	See Note[b]		
Davis Lake Ordnance Warehouses	DL-01	√		
Finger Bay Ammunition Pier	FBAP-01	√		
	FBAP-02		√	
Finger Bay Dynamite Storage	FBDS-01	√		
Finger Bay Impact Area	FB-01, FB-02, FB-04, FB-05		√	
	FB-03[c], FB-06, FB-07, FB-08, FB-09		√	
Gun Emplacements	GUN-01, GUN-02, GUN-03		√	
Gun Emplacement	Shagak Bay (SH-01)			√
Hammer Head Cover Impact Area	HH-01, HH-02	√		
Haven Lake Ordnance Area	HL-01, HL-02		√	
	HL-03	√		
Lake DeMarie Impact Area	DM-01, DM-02, DM-03, DM-04, DM-05, DM-06B		√	
	DM-06 (DM-06A)	See Note[b]		
Lake Jean Ammunition Complex	LJ-01, LJ-02, LJ-03, LJ-04		√	
	LJ-05	√		
MAUW Complex	MC-01	√		

Table 3-1 (Continued)
Results of Preliminary Assessment for OU B-1 Sites

Candidate Site Name	Site Identifier/Name	Results of Preliminary Assessment[f]		
		NOFA	RI/ Inspect. Comp.	FS Comp.
Minefields	Candlestick East (MF-04), Candlestick West (MF-05), Clam Lagoon Spit (MF-06), Finger Bay North Road (MF-07), Finger Bay NW (MF-08), Finger Bay SE (MF-09), Finger Bay SW (MF-10), Husky Pass (MF-11), Kuluk Bay (MF-12), Kuluk Bay South (MF-13), Lake Bonnie Rose (MF-14), NAVFAC (MF-15), Palisades (MF-16), Shagak Bay NE (MF-17), Shagak Bay NW (MF-18), Shagak Bay SE (MF-19), Shagak Bay SW (MF-20), Sweeper Cove North (MF-22), Sweeper Cove NW (MF-23), Sweeper Cove South (MF-26), Sweeper Cove SW (MF-25), Sweeper Cove West (MF-24), Yakutat (MF-27), Zeto Point (MF-28)	√		
	SWMU 2 Clam Lagoon (MF-21)			√
Mount Moffett	MM-01[a], MM-02[a], MM-03[a], MM-04[a] (encompasses MM-22[a] and MM-23[a,d]), MM-05[a], MM-06[a], MM-07[a], MM-08[a], MM-09[a], MM-10A[a] (includes two chemical sampling targets), MM-10B[a], MM-10C[a], MM-10E[a], MM-11[a], MM-14, MM-20		√	
	MM-10F, MM-10G, MM-10H	See Note[e]		
Husky Pass	a.k.a., Husky Pass Training (HP-01)			√
Mitt Lake Impact Area	ML-01 (ML-01A, ML-01B), ML-02 (ML-02A)	See Note[b]		
	ML-01 (ML-01C), ML-02 (ML-02B), ML-03, ML-04, ML-05		√	
	ML-06, ML-07	√		
NAF Adak/Lake DeMarie Ammunition Complex	NM-02, NM-03, NM-04		√	
	NM-05	√		
NSGA Magazine Complex	NSGA-01	√		
Scabbard Bay Impact Area	SB-01, SB-02, SB-03, SB-04, SB-05		√	
Small Arms Ranges	Finger Bay Pistol Range (SA-06), Finger Bay Rifle Range (SA-07), Finger Bay Submachine Gun Range (SA-08), Lake DeMarie Rifle Range (SA-09), Mitt Lake Sportsman's Pistol Range (SA-10), Mitt Lake Sportsman's Rifle Range	√		

Table 3-1 (Continued)
Results of Preliminary Assessment for OU B-1 Sites

Candidate Site Name	Site Identifier/Name	Results of Preliminary Assessment[f]		
		NOFA	RI/ Inspect. Comp.	FS Comp.
Small Arms Ranges (Cont.)	(SA-11), NSGA Rifle Range (SA-13), NAF Trap and Skeet Range (SA-12), Nurses Creek Rifle Range (SA-14), Radar Hill Rifle Range (SA-15)			
Urban Area	UA-01, UA-02		√	
	UA-03, UA-04	√		
WWII Ammunition Pier (Sweeper Cove)	AP-01	√		
	AP-02		√	
WWII (Near Runways)	RW-01		√	
	RW-02	√		
WWII Temp Bomb Storage (Kuluk Beach)	TBS-01	√		
Finn Field Bomb Burn Pile	SA92-01	√		
Zeto Point Impact Area	ZP-01[a]		√	

[a]Sites that were transferred to OU B-1 from OU B-2 include C1-02, C1-03, C2-01A, C2-01B, C2-02, BI-01, MM-01, MM-02, MM-03, MM-04 (encompasses MM-22 and MM-23), MM-05, MM-06, MM-07, MM-08, MM-09, MM-10A (includes two chemical sampling targets), MM-10B, MM-10C, MM-10E, MM-11, and ZP-01.
[b]Twelve sites that did not undergo preliminary assessment, but were evaluated in the RI include C3-01 (C3-01A, C3-01B, C3-01C, C3-01D, C3-01E); C3-04 (C3-04A); C6-01 (C6-01A); C8-05 (C8-05A); DM-06 (DM-06A); ML-01 (ML-01A, ML-01B); and ML-02 (ML-02A).
[c]FB-03 was transferred from NOFA to Final Characterization, based on the discovery of additional archival information following completion of the Proposed Plan.
[d]MM-23 did not undergo preliminary assessment.
[e]During the 2004 field season, the Navy established two new sites (MM-10F and MM-10G) within MM-10E. In addition, a new site (MM-10H) was established adjacent to the eastern border of MM-10E during a site certification meeting on December 8, 2004.
[f]Many of the sites identified for further investigation in the preliminary assessment were subsequently investigated and given a NOFA designation in the OU B-1 Record of Decision.

Notes:
FS Comp. - feasibility study has been completed
MAUW - modified advance underwater weapons
NAF - Naval Air Facility
NSGA - Naval Security Group Activity
NOFA - no further action
OU - operable unit
RI/Inspect. Comp. - a remedial investigation and/or site inspection completed
WWII - World War II

Table 3-2
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
ALDA-01	Andrew Lake Disposal Area – Landfill Area	ALDA-01 is a large-scale burial area, with possible wash-up of DMM from the munitions dump located offshore of the Andrew Lake seawall. This is the same munitions dump discussed in the ALSW-01 site description. ALDA-01 is located at the northwest corner of Andrew Lake and covers 6.7 acres. The site boundary is dog-legged and is wider at the north end of the site near Andrew Bay. Most of this site lies at elevations ranging from about 6.1 to 12.2 meters (20 to 40 feet) asl; however, a cliff on the west side of this site rises to heights of more than 200 feet asl. There is a distinct elevation break running across the site from northwest to southeast that separates the low-lying portion of the site into higher and lower elevation areas. The elevation difference of this feature is about 8 feet. The lower elevation area is a depositional environment from Andrew Bay, with this portion of the site experiencing possible wash-up of DMM from the munitions dump located offshore of the Andrew Lake seawall. This site is bordered by ALDA-02 to the west, Andrew Lake to the east, ALSW-01 to the northeast, and a thin strip of ALSW-01 to the north. Parcel 4 areas outside of OU B-2 border this site to the southwest. There is direct access to this site via the main access road running along the western shore of Andrew Lake. This road is gated with a locking steel gate near the south end of the lake to deter general access. The terrain is generally flat, except for steep slopes along the western edge. A line of craters trends northwest to southeast across the site. Vegetation is predominantly grass ranging in height from 12 to 18 inches, which is sparser toward the beach area, but still thick enough to hide the underlying cobbled surface. The geology of the site is characterized by shallow bedrock with a thin layer of soil. The soil is dominated by cobbles and boulders. There should be no groundwater because of the shallow bedrock.
ALDA-02[b]	Andrew Lake Disposal Area – Beach Crater Area	ALDA-02 is a potential aerial bombing range based on review of aerial photography showing craters in the site. However, no targets were present in the photographs. The craters form a long straight line that is atypical of an aerial bombing range with a target. ALDA-02 is located adjacent to the beaches of Andrew Bay and northwest of Andrew Lake in the northwestern portion of OU B-2. The site covers 9.5 acres. The area is roughly rectangular, with the long sides of the rectangle running parallel to the Andrew Bay shoreline. Elevations in ALDA-02 range from about 6.1 to 61 meters (20 to 220 feet) asl, with the vast majority of the elevation gain in the form of a cliff along the southern edge of the site. This site is bordered by ALDA-01 to the east and by C1-01 to the southwest. There is indirect access to this site via overland walk from the main access road running along the western shore of Andrew Lake to the east of this site. This road is gated with a locking steel gate near the south end of the lake to deter general access. The terrain is rolling and irregular, and transitions over a strip approximately 50 meters wide from a cobble beach in the north to a rocky cliff in the south. Vegetation is tall grass, which is thick at most locations. The thick vegetation impedes access and hides holes and hummocks in the uneven terrain. An

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
ALDA-02[b] (Cont.)	Andrew Lake Disposal Area – Beach Crater Area	ephemeral drainage channel from C1-01 cuts across ALDA-02, discharging over a cliff to a rocky shelf beside Andrew Bay. The geology of the site is characterized predominantly by bedrock with a very thin layer of soil. There should be limited groundwater because of the shallow bedrock.
ALSW-01[c]	SWMU 8, Andrew Lake Seawall	ALSW-01 is a wash-up area for disposal at sea and potential disposal area (burial). ALSW-01 consists of the western portion of the seawall located along the north shoreline of Andrew Lake and covers 10 acres. The Andrew Lake seawall is narrow and elongated, similar to a dike with a narrow flat top and steep sides. The seawall separates the freshwater lake from Andrew Bay to the north, which is an embayment of the Bering Sea. A munitions dump is located offshore of the Andrew Lake seawall. This is the same munitions dump discussed in the ALDA-01 site description. The location and amount of munitions in the offshore dump area are unknown. Elevations in the upland portion of the site range from about 3 to 9.1 meters (10 to 30 feet) asl. This site is bordered by ALDA-01 to the west, Andrew Lake to the south, the Andrew Bay beach area to the north, and non-OU B-2 areas to the east. The Navy periodically performs sweeps on the Andrew Bay beach, within the tidal zone, to remove MEC items that have washed up from offshore dump sites. The area below the mean higher high water mark on the Andrew Bay side of the seawall is owned by the Alaska Department of Natural Resources. There is direct access to this site via an unimproved road originating on the east side of Andrew Lake near the Recreation Center. There is a locked steel gate and rock barrier on this roadway just north of the Recreation Center to deter public access. There is also indirect access via a walk from main access road running along the western shore of Andrew Lake. This road is gated (locked steel gate) near the south end of the lake to deter general access. The terrain transitions from generally flat atop the seawall to very steep along the sides (north and south). Vegetation consists of short, relatively sparse grass atop the wall and tussocks of taller grass along the sides where adequate soil is present. A natural spillway at the northwest corner of Andrew Lake allows some flow of freshwater into Andrew Bay. At times, the spillway is obstructed and discharge is limited to water flowing through the cobble substrate of the seawall to Andrew Bay. The seawall is a man-made feature composed of boulders, cobbles, gravel, large metal debris, and wood.
BC-03[b]	Blind Cove/ Campers Cove – Firing Point #1	BC-03 is a firing point for 155-mm projectiles. This site is located atop the seawall, near the center of the dike-like feature, and covers 0.02 acre of land. This site is a small, roughly square site that is surrounded on all sides by land that is not part of OU B-2. The elevation of BC-03 is about 9.1 meters (30 feet) asl. A small portion of this site was inaccessible for investigation because of the presence of Quonset hut debris. There is direct access to this site via an unimproved road originating on the east side of Andrew Lake near the Recreation Center. There is a locked steel gate and rock barrier on this roadway just north of the Recreation Center to deter public access. The terrain is relatively flat. Vegetation is relatively sparse because of the

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
BC-03[b] (Cont.)	Blind Cove/ Campers Cove – Firing Point #1	unsuitability of the soils to sustain vegetation, and consists of grasses 8 to 18 inches tall. The site geology is similar to ALSW-01, which is a man-made feature composed of boulders, cobbles, gravel, large metal debris, and wood.
C1-01	Combat Range #1 – Mortar Target Area	C1-01 is a target/impact area that covers 387 acres. C1-01 is located north of the former Range Complex at Andrew Lake. It is roughly oval in shape. C1-01 is situated on a sloping plateau above and west of ALDA-01 on the flanks of Mount Moffett. Elevations range from about 152 to 396 meters (500 to 1,300 feet) asl. It is bordered on all sides by C1-03. ALDA-01and ALDA-02 are located northeast of this site, and Andrew Lake lies to the east. There is indirect access to this site via a moderate hike from the Andrew Lake range area. Access to the range area is via a locked steel gate near the south end of Andrew Lake. The terrain is moderately steep and rocky in most areas, and the site is inaccessible along the northern boundary. Vegetation consists primarily of sparse short grasses, lichens, and small alpine flowers ranging in height from 1 to 4 inches. An ephemeral drainage channel cuts across C1-01, discharging north over a steep cliff to a rocky shelf beside Andrew Bay. The geology of the site is characterized by shallow soils with rock outcrops. Groundwater is anticipated to be deep due to the elevation of the site (500 to 1,300 feet) relative to nearby permanent surface water features at Andrew Bay and Andrew Lake.
HG-01	Andrew Lake Hand Grenade Range	HG-01 is a target/impact area. It is a small, square area of about 2 acres located within the former Range Complex at Andrew Lake. Remnants of a berm with incorporated throwing pits are located near the east side of the range. The pits are reinforced with heavy timbers and, at one time, offered protection from exploding grenades during training exercises. The elevation in this site is approximately 33.5 meters (110 feet) asl. This site is located wholly within RR-01. There is direct access to this site via the gravel range entry road, which branches from the main access road along the western side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is relatively flat. There are steep slopes on the berm protecting the throwing pits. Vegetation consists of tall tundra grasses up to 18 inches tall interspersed with wildflowers. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater is anticipated to be shallow, and there may be intermittent standing water at certain times of the year.
JM-01[b]	Candidate Chemical Weapons Disposal Site	This site was thought to be located in the Lake Jean area, just west of Combat Range 8. Thirteen sites were evaluated, and none was judged to be the actual location. The site was described by a WWII veteran ("J.M.") as a small, rectangular area enclosed by a barbed wire fence that was used for a one-time chemical weapons disposal via earth-tamped detonation. The general area where the site was thought to be located includes diverse terrain. The center

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
JM-01 (Cont.)	Candidate Chemical Weapons Disposal Site	of the area is a relatively flat, meadow-like area cut by meandering streams that form deep, winding ravines. On three sides (north, east, and south) of this area, the terrain rises in a series of ridges and ravines. To the west, the terrain falls steeply toward Andrew Lake. Vegetation in the general area consists predominantly of tall tundra grass. There are some areas near the hilltops where heaths and mosses are plentiful.
LJ-02A[b]	Lake Jean Disposal Area	LJ-02A is located just south of Lake Jean within the Lake Jean Ammunition Complex and covers approximately 0.4 acre. It is contained wholly within LJ-02, an OU B-1 site. This site was originally part of LJ-02 until potential evidence of buried items was found during the search for JM-01 in this area. As a result, a new OU B-2 site was created in 2002. There is direct access to this site via a rutted dirt road around the perimeter of LJ-02. The terrain is generally undulating and hummocky. Vegetation consists of lowland tundra species ranging from 12 to 24 inches in height. Because the site is approximately 16 to 24 meters (60 to 80 feet) above the Lake Jean shoreline, groundwater is expected to be relatively deep.
MAG-01[b]	WWII Magazine – Andrew Lake Seawall	MAG-01 is a storage magazine that covers 12.3 acres. It is located at the eastern end of the Andrew Lake seawall along the north-central shoreline of Adak Island. The area is a small rectangle that is located at the base of a cliff that rises to meet SA93-01 to the east. To the north, west, and south, the site is bordered by property lying outside of OU B-2. The elevation ranges from 6 to 12 meters (20 to 40 feet) asl in the accessible portion of the site. It rises rapidly to elevations above 79.2 meters (260 feet) asl in the eastern portion of the site. There is direct access via unimproved road originating on the east side of Andrew Lake near the Recreation Center. There is a locked steel gate and rock barrier on this roadway just north of the Recreation Center to deter public access. The terrain is relatively flat in the western portion of the site and very steep (cliff-like) in the eastern portion. The vegetation consists of moderately thick beach grass ranging in height from 8 to 12 inches in the lower areas, with little vegetation in the steeper areas. A small lake or pond, which may be man-made, is located in the central portion. Because of the site's proximity to Andrew Lake and Andrew Bay and its similar elevation, groundwater is expected to be shallow.
MF-01	Andrew Lake East Minefield	MF-01 is located at the eastern end of the Andrew Lake Seawall, which is located along the north shoreline of Andrew Lake. The site has not been intrusively investigated for mine-related debris. However, a historical pistol/ rifle range and magazine nearby were investigated during the preliminary source evaluation for chemical contamination. Based upon the data available and the intense utilization of this area, it is not realistic to conclude that this minefield was ever installed. Therefore, the site met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.]) MF-02 is

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MF-02	Andrew Lake Seawall Minefield	located along the entire length of the Andrew Bay Seawall along the north shoreline of Andrew Lake. The seawall is narrow, and elongated, and similar to a dike with a narrow flat top and steep sides. The seawall is a man-made feature composed of boulders, cobbles, gravel, large metal debris, and wood. The site has not been intrusively investigated for mine-related debris. However, the site was visited during the preliminary source evaluation, and periodic sweeps have been conducted along the seawall to remove ordnance washed up by frequent violent storms. Based on the field data and the extensive historical use of this area for daily/routine activities, it is not realistic to conclude that this minefield was ever installed. Therefore, this site met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MF-03	Andrew Lake West Minefield	MF-03 is located northwest of Andrew Lake in the vicinity of ALDA-01 and ALDA-02. The site has not been intrusively investigated for mine-related debris. However, the site was investigated during the 1999 field season in areas that overlap ALDA-01. No mine or related waste was found. Therefore, the site met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MI-01	Andrew Lake Mortar Impact Area – Rocket Disposal Area	MI-01 is a target/impact area that covers 0.7 acre. It is located along the southern side of the mortar impact valley in the Range Complex at Andrew Lake (west of Andrew Lake). It is bordered by MI-02 immediately to the west and OB/OD-01 to the east, and is otherwise surrounded by MI-03. Elevation in the site ranges from 48 to 55 meters (160 to 180 feet) asl. There is indirect access to this site via the gravel range entry road that terminates at OB/OD-01, which branches from the main access road along the western side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain at the site slopes gently to the north toward the floor of the mortar impact valley. Dominant vegetation is a mixture of grasses and lowland tundra species ranging in height from 12 to 24 inches. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Based on the elevation and proximity to stream channels, groundwater is anticipated to be shallow in lowland areas.
MI-02	Andrew Lake Mortar Impact Area – 40-mm Projectile Impact Area	MI-02 is a target/impact area that covers 19 acres. It is located along the southern side of the mortar impact valley in the Range Complex at Andrew Lake (west of Andrew Lake). It is bordered by MI-01 to the east and is otherwise surrounded by MI-03. The elevation in this site ranges from about 49 to 104 meters (160 to 340 feet) asl. There is indirect access to this site via a

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MI-02 (Cont.)	Andrew Lake Mortar Impact Area – 40-mm Projectile Impact Area	gravel range entry road that terminates at OB/OD-01, which branches from the main access road along the western side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is relatively flat, rising moderately to the west toward Mount Moffett. The area is somewhat flatter in the eastern portion closer to Andrew Lake. The area is bordered on the south by steep terrain that becomes inaccessible near the top of the ridge delineating the southern boundary of MI-02 and the Range Complex at Andrew Lake. Steep terrain also forms the northern boundary of this site to the west. Vegetation is grassy with lowland tundra species ranging in height from 12 to 24 inches. Intermittent standing water in the eastern portion of the site (i.e., lowland area) may possibly be present due to shallow groundwater. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater in upper portions of this site is anticipated to be relatively deep compared with shallow depths expected along the valley floor.
MI-03	Andrew Lake Mortar Impact Area – Mortar Impact Area	MI-03 is a target/impact area that covers 425 acres. It consists of a steep valley draining west to east from the flanks of Mount Moffett toward Andrew Lake. MI-03 is bordered by OU B-1 (MM-11 and various components of MM-10) to the west, south, and north. Three OU B-2 sites border MI-03 to the east: OB/OD-01, RR-01, and RR-02. MI-01and MI-02 are located wholly within this site. The elevation in MI-03 ranges from about 40.1 meters (130 feet) asl at the eastern edge to about 280 meters (920 feet) asl along the western edge on the flanks of Mount Moffett. There is indirect access to this site via a gravel range entry road that terminates at OB/OD-01, which branches from the main access road along the western side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain ranges from relatively low and flat in the eastern portion nearest the OB/OD area to steep and inaccessible at the western end and along the southern border. There is a steep ridgeline near the northern side of the site with a relatively flat top. The top of this ridge is shared with RR-02. Vegetation is grassy in the east with lowland tundra species ranging in height from 12 to 24 inches. The vegetation transitions to upland species (mixed grasses, heaths, and mosses) of shorter stature in the west. Runoff channels or streams within the site run easterly toward Moffett Creek, which is partially located within this site. Groundwater is anticipated to be shallow in the lowland areas, which provides the potential for groundwater seeps. Small ponds or lakes are present at two locations. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater in upper portions of the site is anticipated to be relatively deep compared with shallow depths expected along the valley floor.

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MM-10D[b]	Mt. Moffett Impact Area – Central Impact Area Lone 81-mm Mortar	MM-10D is a target/impact area that covers 0.2 acre. It is a small, square site on the eastern flanks of Mount Moffett, where a lone, partial 81-mm mortar (frag) was found. MM-10D is located adjacent to the southern boundary of MI-03 directly south of the western edge of MI-02. The elevation of this site is approximately 213 meters (700 feet) asl. Access to this site is difficult given the steep embankment to the north, which separates the site from the mortar impact valley in the Range Complex at Andrew Lake. The terrain slopes gently to the east; however, just north of the site the terrain falls very steeply into the Range Complex at Andrew Lake. Vegetation is sparse and consists of short tundra grasses, lichens, mosses, and alpine flowers. Groundwater is anticipated to be quite deep based on the terrain and elevation.
MM-12	Mt. Moffett Impact Area – Range Safety Fan #1	MM-12 is a roughly triangular area that includes the range safety fan for the historical southwestern 155-mm impact area on Mount Moffett. It passes over Andrew Lake and then across the Andrew Lake Range Complex and the lower flanks of Mount Moffett to the impact area. The terrain in this area varies a great deal and includes relatively flat areas and areas where rolling hills and ravines dominate. Near the impact area, the terrain becomes quite steep and inaccessible. Many portions of the range safety fan area were investigated during the 1999 field season as part of the investigation in the Andrew Lake Range Complex areas and the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in any of the fan areas examined. Therefore, MM-12 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-13	Mt. Moffett Impact Area – Range Safety Fan #2	MM-13 is a roughly triangular area that includes the range safety fan for Firing Point #2 for the Mt. Moffett Impact Area. It passes over open country between Firing Point #2 at Andrew Lake and the impact area. The terrain in this area varies a great deal and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. A portion of the range safety fan area was investigated during the 1999 field season as part of the investigation in the Andrew Lake Range Complex west of Andrew Lake and the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in the fan area examined. Therefore, MM-13 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-15	Mt. Moffett Impact Area – Range Safety Fan #3	MM-15 is a roughly triangular area that includes the range safety fan for Firing Point #3 for the Mt. Moffett Impact Area. It passes over open country between Firing Point #3 on the shoreline of Kuluk Bay and the 90-mm Impact Area at the crest of Mount Moffett. The terrain in this area varies a great deal

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MM-15 (Cont.)	Mt. Moffett Impact Area – Range Safety Fan #3	and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. About half of the range fan area overlaps Range Safety Fan #2. A portion of the range safety fan area was investigated during the 1999 field season as part of the investigation in the Lake Jean Ammunition Complex, the Haven Lake Ordnance Area, and the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in the fan area examined. Therefore, MM-15 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-16	Mt. Moffett Impact Area – Range Safety Fan #4	MM-16 is a roughly triangular area that includes the range safety fan for Firing Point #4 for the Mt. Moffett Impact Area. It passes over open country between Firing Point #4 near downtown Adak and the 90-mm Impact Area at the crest of Mount Moffett. The terrain in this area varies a great deal and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. It should be noted that about half of the range fan area overlaps Range Safety Fans #2 and #3. A portion of the range safety fan area was investigated during the 1999 field season as part of the investigation in the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in the fan area examined. Therefore, MM-16 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to Footnote 1 in Section 3.2.])
MM-17	Mt. Moffett Impact Area – Firing Point #5	MM-17 is situated in the eastern central portion of downtown Adak near the shoreline of Kuluk Bay. The firing point was used during training exercises to shoot at the Mt. Moffett Impact Area and at Scabbard Bay. This area is currently the location of abandoned housing units. This rectangular area surrounds the former location of a 90-mm gun battery and roughly represents the area where unfired ordnance may have been stored, dropped, discarded, or disposed of during World War II-era military operations. The terrain in this area is characterized by rolling hills and ravines. This firing point was not investigated during the 1999 field effort. However, it was part of the investigation area in 1997 when the Priority I and II Areas of downtown Adak were evaluated. At that time, 100 percent of the accessible Priority I and II Areas was successfully cleared and geophysically evaluated, including this firing point. There has also been a great deal of construction activity in this area, including the installation of utilities and the construction of streets and housing. No ordnance has been found at this site. Furthermore, it is highly unlikely that any ordnance that may have been left at this site remains undiscovered. Therefore, MM-17 met the requirements for NOFA in the

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MM-17 (Cont.)	Mt. Moffett Impact Area – Firing Point #5	preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-18	Mt. Moffett Impact Area – Range Safety Fan #5	MM-18 is a roughly triangular area that includes the range safety fan for Firing Point #5 for the Mt. Moffett Impact Area. It passes over both open areas and developed areas of Adak between Firing Point #5 in downtown and the 90-mm Impact Area at the crest of Mount Moffett. The terrain in this area varies a great deal and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. It should be noted that about two-thirds of the range fan area overlaps Range Safety Fans #2, #3, and #4. A large portion of the range safety fan area was investigated during the 1997 and 1998 field seasons as part of the investigation in the Priority I, II, and III Areas over which the fan passes. No ordnance was found in the fan area examined. Therefore, MM-18 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-19	Mt. Moffett Impact Area – Range Safety Fan #6	MM-19 is a roughly triangular area that includes the range safety fan for Firing Point #6 for the Mt. Moffett Impact Area. It passes over open country between NAF Adak/Lake DeMarie Ammunition Complex and the impact area. The terrain in this area varies a great deal and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. It should be noted that about half of the range fan area overlaps Range Safety Fans #2, #3, #4, and #5. A portion of the range safety fan area was investigated during the 1999 field season as part of the investigation in the NAF Adak/Lake DeMarie Ammunition Complex and the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in the fan area examined. Therefore, MM-19 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
MM-21	Mt. Moffett Impact Area – Range Safety Fan #7	MM-21 is a roughly triangular area that includes the range safety fan for Firing Point #7 for the Mt. Moffett Impact Area. It passes over open country between Clam Lagoon and the 155-mm impact area on Mount Moffett. The terrain in this area varies a great deal and includes relatively flat areas near the firing point and very steep, inaccessible rocky areas toward the impact area at the western end of the fan. A portion of the range fan also passes over Clam Lagoon. A large portion of the range safety fan area was investigated during the 1999 field season as part of the investigation in Combat Range #8, the Lake Jean Ammunition Complex, and the Mt. Moffett Impact Area over which the fan passes. No ordnance was found in any of the fan areas examined.

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
MM-21 (Cont.)	Mt. Moffett Impact Area – Range Safety Fan #7	Therefore, MM-21 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
OB/OD-01	Andrew Lake Open Burn/Open Detonation Disposal Range	OB/OD-01 is a circular area with a radius of 182 meters (600 feet) that covers 18 acres. The boundary encompasses visible historical demolition craters and an ample buffer zone around the craters to account for kick-outs during disposal operations. It is bordered by RR- 02 to the northwest; RR-01 to the northeast, east, and southeast; and MI-03 to the south and west. The elevation in this site ranges from about 33 to 40 meters (110 to 130 feet) asl. There is direct access to this site via the gravel range entry road, which branches from the main access road along the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is relatively flat, but hummocky in some locations and marshy in others. There are several craters in this area resulting from previous disposal events. The site is generally covered in knee-high, grassy tundra; however, there are relatively barren areas surrounding some of the disposal craters. Moffett Creek runs from west to northeast through the northwestern portion of the site. In addition, standing water has been observed in the disposal craters. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. The groundwater is shallow, as evidenced by standing water in the disposal craters. Groundwater is in hydraulic communication with the creek (i.e., there is interconnection between the creek and the groundwater aquifer in this area).
RG-01[b]	Andrew Lake 40-mm Rifle Grenade Range	RG-01 is a target/impact area that covers 16 acres. This site is located on a hillside northwest of the HG-01. The area is trapezoidal in shape, narrowing from the target line near the base of a hill to the crown of the hill. RG-01 is bordered by RR-01 to the east and southeast, and is otherwise surrounded by RR-02. The elevation in this site ranges from about 34 meters (110 feet) asl near the target line to about 125 meters (410 feet) asl at the top of the hill behind the targets. A non-time critical removal action was conducted at RG-01 in 2006 and 2008. There is direct access to this site via the gravel road running from the range entry road up to the firing line area. This road connects ultimately to the main access road for the general range area on the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is steep and largely inaccessible in the western portion of the site. Vegetation consists of tundra grass up to 18 inches tall with a very thick rootmat near the firing line. Steeper areas generally consist of shorter grasses interspersed with alpine flowers and some moss. Intermittent standing water in the southeastern portion of the site (i.e., lowland area) may possibly be present due to shallow groundwater.

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
RR-01	Andrew Lake Range Remainder – Hand Grenade/40-mm Area	RR-01 is a target/impact area that covers 182 acres. It is located in the southern central portion of the Range Complex at Andrew Lake. RR-01 is bordered by RR-02 to the north; OU B-1 to the south; RR-04 to the east; and OB/OD-01, RG-01, and MI-03 to the west. HG-01 is located wholly within this site. The elevation in this site ranges from about 15 to 152 meters (50 to 500 feet) asl. There is direct access to this site via the range entry road, which branches from the main access road along the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is generally flat in northern portion, but can be uneven and marshy. The steep slopes to the south make the southern third of the site largely inaccessible. The vegetation is predominantly dense, lush tundra grass in lowland accessible portions. Moffett Creek runs from west to northeast through the northern portion of this site. Lowland areas bordering this creek are often saturated with pooled water at certain times of the year. Groundwater is in hydraulic communication with the creek. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. The groundwater is anticipated to be shallow in lowland areas.
RR-02[b]	Andrew Lake Range Remainder – Mortar Impact Area	RR-02 is a potential target/impact area based on the finding of material potentially presenting an explosive hazard in 1999. This site is located along the northern side of the valley containing the former Range Complex at Andrew Lake and covers 231 acres. RR-02 includes a valley running east and west that connects the flank of Mount Moffett with the lowlands on the western shore of Andrew Lake. This site shares a steep ridgeline and plateau area atop the ridge with MI-03 to the south. RR-02 is bordered by OU B-1 to the north; SA-01and RR-04 to the east; MI-03 to the west; and RG-01, RR-01, and OB/OD-01 to the south. Elevations in this site range from about 12 to 238 meters (40 to 780 feet) asl. There is direct access to this site via a small dirt road, which branches from the main access road along the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. The terrain rises from the flatlands near Andrew Lake to a narrow, steep valley bordered by steep hillsides (north, south, and west). An inaccessible ridge runs along the south side of this site, which has a relatively flat top. Vegetation is grassy with lowland tundra species ranging in height from 12 to 24 inches. There are also scattered areas containing mosses, heaths, and alpine flowers. Vegetation is sparser at higher elevations. An ephemeral drainage channel cuts across this site to SA-01 and ultimately to Andrew Lake. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater is anticipated to be shallow in lowland areas in the eastern portion. Groundwater is expected to be deep at the higher elevations to the west.

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
RR-03[b]	Andrew Lake Range Remainder – Flare Site	RR-03 is range buffer zone that covers 0.2 acre. This site is a small, square site located near the southeastern boundary of the former Range Complex at Andrew Lake. It is wholly within RR-04 and was created to allow evaluation of a lone, abandoned, signal flare found in 1999. The elevation in this site is about 12 meters (40 feet) asl. There is indirect access to this site via the gravel road that branches from the main access road along the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. A locked cable barrier also deters access to the range entry road. The terrain is relatively flat. Vegetation consists of tall, lush grass ranging in height from 12 to 18 inches. Groundwater is anticipated to be relatively shallow based on this site's proximity to Andrew Lake.
RR-04[b]	Andrew Lake Range Remainder – Remainder	RR-04 is range buffer zone that covers 253 acres. It encompasses most of the lower valley at the former Range Complex at Andrew Lake. The site is bordered by a narrow strip of shoreline along Andrew Lake on the north and northeast; RR-01 to the southwest; SA-01 to the northwest; and RR-02 to the west; and undesignated portions of Parcel 4 to the south. RR-03 is located wholly within RR-04. The elevation in most of the site is 6 to 12 meters (20 to 40 feet) asl. A steep ridge on the south side of this site rises to just over 67 meters (220 feet) asl. There is direct access to this site via the gravel range entry road that runs through this site. This road connects ultimately to the main access road on the west side of Andrew Lake, which currently has a locked steel gate near the south end of the lake to deter public access. A locked cable barrier also deters access to the range entry road. The terrain is generally flat, except along the southern side of the former Range Complex at Andrew Lake, where a steep hillside forms the southern valley wall. Vegetation is grassy with lowland tundra species ranging in height from 12 to 24 inches. There are also scattered areas containing mosses, heaths, wetland species, and alpine flowers. Moffett Creek runs from southwest to northeast through the central portion of this site. The lowland areas bordering this creek are often saturated with pooled water or are subject to overland sheet flow at certain times of the year. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater is anticipated to be relatively shallow based on this site's proximity to Andrew Lake. Groundwater is in hydraulic communication with the creek. RR-04 met the requirements for NOFA in the preliminary assessment. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.]) However, Alaska Department of Environmental Conservation requested that additional investigation work be performed at this site. This work was performed in 2008 as part of the remedial investigation.
SA-01[b]	Andrew Lake Machine Gun and Sub-Caliber Training Range	SA-01 is a small arms range that covers 10.2 acres. It is located at the northern edge of the former Range Complex at Andrew Lake (on the west side of Andrew Lake). SA-01 is bordered by SA-02 to the north, RR-04 to the east, and RR-02 to the west and south. Elevation in this site ranges from about 12

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
SA-01[b]	Andrew Lake Machine Gun and Sub-Caliber Training Range (continued)	to 49 meters (40 to 160 feet) asl. Direct access to this site is provided by the small arms range access road to the north, which branches from the main access road along the west side of Andrew Lake. This main road is gated (locked steel gate) near the south end of the lake to deter general access. The terrain is relatively flat in most areas, but slopes upward in the southwestern corner. Vegetation is primarily tall, lush grasses ranging in height from 6 to 18 inches. An ephemeral drainage channel cuts across the abutting RR-02 through this site to Andrew Lake. The valley floor is composed of a silty, gravelly, sand, alluvial/colluvial, and/or outwash material overlying andesitic basalt bedrock or consolidated ash tuff. Groundwater is anticipated to be relatively shallow based on this site's proximity to Andrew Lake.
SA-02	Andrew Lake Pistol Range	SA-02 is located along the northern hillside that defines the valley containing the range complex. The site was identified as a pistol range and .22 caliber antiaircraft and antitank weapons training area. This range is described as a 1,000-inch range, which indicates that it was scaled down to allow training using full-size weaponry firing small caliber munitions. A site inspection was performed on October 27, 1999. No live ordnance was located during the site visit. Therefore, SA-02 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
SA-03	Andrew Lake Seawall Pistol Range	SA-03 is located at the eastern end of the Andrew Lake seawall. The range consisted of two firing lines and one target line. The target line was at the eastern end of the range located at the base of a small hill. A site visit was conducted on March 14, 1997. The wooden walkways and the target posts are still visible. An investigation of the backstop located .45 caliber bullets down to a depth of 14 inches below ground surface. Bullet scarring was still evident behind the target posts. No live ordnance was located at the site. Therefore, SA-03 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
SA-04	Andrew Lake Seawall Rifle Range	SA-04 is located at the eastern end of the Andrew Lake seawall and is approximately 300 yards long. The range had a single firing line at the western end. There were three target lines at 100, 200, and 300 yards to the east of the firing line. The range had both fixed targets and raised targets. A site visit was conducted on March 14, 1997. The range area is still littered with range debris and the target lines are still visible. Small caliber rifle slugs were located in the subsurface soils at all three target lines. Bullet scarring at this range was minimal in comparison to other ranges located on Adak. No live ordnance was located during the visit. Therefore, SA-04 met the requirements for NOFA in the preliminary assessment and did not require

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
SA-04 (Cont.)	Andrew Lake Seawall Rifle Range	further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
SA-05	SWMU 9, Black Powder Sportsman's Club	The Black Powder Sportsman's Club, also known as SWMU 9, is located along the southwest shore of Andrew Lake. The site was used by the Black Powder Sportsman's Club for recreational target practice. Prior to its use as a firing range, the site was used as a disposal area for metal debris (1970s and 1980s). The area also may have been used for small arms training in the late 1970s. The site is 200 by 100 feet. A site visit performed in 1993 located steel drums perforated with bullet holes. No live ordnance or bullet slugs were noted during the visit. Therefore, SA-05 met the requirements for NOFA in the preliminary assessment and did not require further evaluation in the remedial investigation. (Note that for all OU B-2 sites, the current terminology for NOFA is "Limited Action." [Refer to footnote 1 in Section 3.2.])
SA93-01	Source Area #93 – Multiple Ordnance Impact Area	SA93-01 is a target/impact area that covers 263 acres. It is located to the northeast of Andrew Lake. Most of the site is on a plateau some 91 to 122 meters (300 to 400 feet) above the lake, but a small strip of this site along the southwestern corner abuts the shoreline of the lake. This site is bordered by SA93-02 to the east, areas lying outside Parcel 4 to the north and south, and Andrew Lake to the southwest. It is also bordered by MAG-01 to the west, but the two areas are not physically contiguous because of a steep cliff (i.e., MAG-01 is at the base of the cliff). Elevations in the central portion of this site range from about 67 to 98 meters (220 to 320 feet) asl. Along the western edge of this site, a steep ridge rises to just over 152 meters (500 feet) and then falls very rapidly (cliff) to elevations below 100 feet asl. To the north, a steep ridge rises to over 213 meters (700 feet) on the flanks of a small mountain peak. There is indirect access to this site via walking from the gravel road originating from the east side of Andrew Lake near the Recreation Center. The entire historical impact area in which this site resides is currently fenced (4-strand barbed wire), with posted signage to deter public access. On the west side of this site, a steep ridge forms a cliff above Andrew Lake. To the east of this ridge, the terrain falls gently toward a deep drainage ravine near the east side of this site. Vegetation is generally a mixture of grasses, sedges, mosses, and heaths ranging in height from 18 to 30 inches. A deep ravine at the eastern edge of the site carries runoff southward toward Andrew Lake. Also, there are areas of standing water or streams in the south-central portion of the site. Groundwater is expected to be deep, given the elevation of this site compared with Andrew Lake and Andrew Bay.
SA93-02[b]	Source Area #93 – Eastern Impact Area	SA93-02 is a potential storage area (or staging site) based on its proximity to roadway and covers 78 acres. This site is a long, narrow strip (rectangle) running along the eastern edge of SA93-01. It is bordered by areas lying outside of Parcel 4 to the north, south, and east. SA93-03 and SA93-04 are both located wholly within SA93-02. Elevations in this site range from about

Table 3-2 (Continued)
OU B-2 Sites

Site Designation[a]	Site Name	Site Description
SA93-02[b] (continued)	Source Area #93 – Eastern Impact Area	61 to 91 meters (200 to 300 feet) asl; however, a deep drainage ravine running through the center of this site drops to an elevation below 12 meters (40 feet) asl. There is direct access to this site via a gravel road originating from the east side of Andrew Lake near the Recreation Center. The entire historical impact area in which this site resides is currently fenced (4-strand barbed wire), with posted signage to deter public access. The terrain is generally rolling with the exception of the very steep ravine running through the southern two-thirds of this site, from the north-central area to the southwestern corner. This ravine impedes pedestrian ingress from the road on the eastern side. Vegetation is generally a mixture of grasses, sedges, mosses, and heaths ranging in height from 12 to 24 inches. Mitchell Creek traverses this site in the north-south direction, within the deep drainage ravine. Groundwater is anticipated to be deep based on this site's elevation compared with Andrew Lake and Andrew Bay.
SA93-03	Source Area #93 – Firing Point	SA93-03 is a target/impact area that covers 0.6 acre. This small, rectangular site is located wholly within SA93-02 near the southern boundary of that site. This area was initially believed to be the principal firing point for 2.36-inch rockets found within SA93-01 (located across the ravine to the west). On the basis of items found during the 1999 site inspection, however, this site is now thought to be a rocket impact area. Nevertheless, the original name of this site has been retained to prevent confusion. The elevation of this site is about 29 meters (95 feet) asl, but a deep ravine abuts the site, falling to about 12 meters (40 feet) asl. There is indirect access to this site via walking from the gravel road originating from the east side of Andrew Lake near the Recreation Center. The entire historical impact area in which this site resides is currently fenced (4-strand barbed wire), with posted signage to deter public access. The terrain is generally flat. However, a deep ravine abuts the site on the west. Vegetation consists of low-growing upland tundra species ranging in height from 6 to 12 inches. Groundwater is anticipated to be deep based on this site's elevation compared with Andrew Lake and Andrew Bay.
SA93-04[b]	Source Area #93 – Eastern Disposal Site	SA93-04 is a potential storage area and covers 0.25 acre. This site consists of a small area located on the eastern border of SA93-02, abutting the gravel access road serving the former long-range navigation Coast Guard Station to the north. It is bordered by SA93-02 to the north, south, and west, and by an area lying outside of Parcel 4 to the east. The elevation in this small, square site is about 76 meters (250 feet) asl. There is direct access to this site via the gravel road originating from the east side of Andrew Lake near the Recreation Center. The entire historical impact area in which this site resides is currently fenced (4-strand barbed wire), with posted signage to deter public access. The terrain is relatively flat. Vegetation is generally a mixture of grasses, sedges, mosses, and heaths ranging in height from 12 to 24 inches. Groundwater is anticipated to be deep based on this site's elevation compared with Andrew Lake and Andrew Bay, although standing water and marshy areas have been observed.

Table 3-2 (Continued)
OU B-2 Sites

[a]Information on the OU A and OU B-1 sites is included in the Site Catalog.
[b]These sites are currently proposed as "Limited Action" sites in the OU B-2 draft final feasibility study (U.S. Navy 2011f).
[c]The subsurface portion of this site is currently proposed as "Limited Action."

Notes:
asl - above sea level
DMM - discarded military munitions
mm - millimeter
NAF - Naval Air Facility
NOFA - no further action
OB/OD - open burn/open detonation
OU - operable unit
SA - source area
SWMU - solid waste management unit
WWII - World War II

4.0 REMEDIAL ACTIONS

The ROD for interim remedial actions (U.S. Navy, USEPA, and ADEC 1995) and the OU A ROD (U.S. Navy, USEPA, and ADEC 2000) for Adak required remedial actions for 66 OU A sites (19 CERCLA sites, which include 3 water bodies and 3 state-permitted landfills [SWMUs 18, 19 and 25], three combined CERCLA and petroleum sites [SWMUs 14, 15, and 17], the CERCLA portion of one combined CERCLA and petroleum site [SWMU 55], the SAERA portion of one combined RCRA and petroleum site [SA 77], and 42 petroleum sites [counting the two NMCB sites as separate sites]). Remedial actions were required in accordance with State of Alaska or RCRA requirements at five of the OU A sites and were included in the OU A ROD (U.S. Navy, USEPA, and ADEC 2000). Landfill closures were required at three landfills as part of the permit conditions enforced by the State of Alaska through 18 AAC 60 (SWMUs 18, 19 and 25), and two sites were closed under RCRA (SWMU 24 and SA 77). Although SWMU 24 and SA 77 were both NFA sites under RCRA, both have ongoing ICs as required by the RCRA closure plan. The OU B-1 ROD (U.S. Navy, USEPA, and ADEC 2001) required further investigation or remedial actions for 50 OU B-1 sites (including the 3 new sites, MM-10F, MM-10G, and MM-10H, identified in 2004 that are located within or adjacent to MM-10E). This section provides a brief description of the RAOs, the selected remedy, and the remedial actions for these sites.

4.1 OU A

4.1.1 OU A Remedial Action Objectives

CERCLA Sites

The 23 CERCLA sites (which includes four combined CERCLA and petroleum sites) and 46 petroleum sites (which includes three combined CERCLA and petroleum sites and one combined RCRA and petroleum site) where the 2000 OU A ROD and the 1995 ROD required some type of response action can be grouped into four major categories of sites, each with different primary RAOs. These categories include the following:

- Landfills where landfill covers were installed (six sites: SWMUs 4, 11, 13, 18/19, and 25)

- CERCLA sites with long-term monitoring and/or ICs only (15 sites: SWMUs 2, 10, 14, 15, 16, 20, 21A, 23, 29, 52, 55, and 67, SA 76, Sweeper Cove, and Kuluk Bay)

- CERCLA sites where soil and/or sediment were removed (two sites: SWMU 17 and South Sweeper Creek)

- Petroleum sites where remedial actions were required, including the two NMCB sites as separate sites and SWMUs 14, 15, and 17 (46 sites)

The RAOs for each of these categories are described in the sections below.

Landfills with Covers. Landfill covers have been installed at the following sites: SWMUs 4, 11, 13, 18/19, and 25. Landfill covers were constructed as required under the 1995 interim action ROD for SWMUs 11 and 13 and under the 2000 OU A final ROD for SWMU 4. The OU A ROD selected the capping of the permitted landfills at SWMUs 18, 19, and 25 under State of Alaska solid waste regulations (18 AAC 60) as the final action for these SWMUs (U.S. Navy, USEPA, and ADEC 2000, page 4-6). The OU A ROD did not establish explicit RAOs for SWMUs 18, 19, or 25. The RAOs for the sites that required landfill covers under the OU A ROD are the following:

- SWMU 4: Prevent ingestion of and contact with chemically affected subsurface soils within the landfill debris and protect ecological receptors that may ingest on-site plants (plants may uptake subsurface chemicals) (U.S. Navy, USEPA, and ADEC 2000, page 10-6).

- SWMUs 11 and 13: Protect human health and ecological receptors from exposure to landfill debris and soil that could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above an hazard index (HI) of 1.0 (U.S. Navy, USEPA, and ADEC 2000, page 10-2).

CERCLA Sites with Institutional Controls Only. The following chemical-release sites administered under CERCLA require ICs only under the OU A ROD: former landfills at SWMUs 2 and 29; the water bodies Sweeper Cove and Kuluk Bay; and SWMUs 10, 14, 15, 16, 20, 21A, 23, 52, 55, 67, and SA 76. Two additional sites, SWMU 24 and SA 77, were closed under RCRA and have ongoing ICs, as required in the RCRA closure plan. The OU A ROD did not explicitly establish RAOs for SWMU 24 and SA 77 as CERCLA chemical release sites, although an RAO was established for SA 77 as a petroleum site. Note that ICs are also required at the landfills and SWMU 17 (Section 4.1.2). The RAOs for CERCLA sites with ICs only are the following:

- The RAOs for the landfills at SWMUs 2 and 29 are to protect human and ecological receptors from exposure to landfill debris and soil that could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above an HI of 1.0 (U.S. Navy, USEPA, and ADEC 2000, page 10-2).

- The RAOs for Sweeper Cove and Kuluk Bay consist of the protection of subsistence fishers from ingestion of fish and shellfish containing polychlorinated biphenyls (PCBs) that could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above a HI of 1.0 (U.S. Navy, USEPA, and ADEC 2000, page 10-4).

- The RAOs for the remaining SWMUs and SAs consist of protection of human or ecological exposure to soil or groundwater. This exposure could result in a cancer risk greater than 1×10^{-5}, or a noncancer risk above a HI of 1.0.

CERCLA Soil and Sediment Removal Sites – SWMU 17 and South Sweeper Creek. The RAOs at the SWMU 17 waste oil and retention ponds are to protect benthic infauna from contacting impacted freshwater sediments, and birds from ingesting surface water. The sediments and surface water were estimated to have an ecological HI in excess of 1.0 (U.S. Navy, USEPA, and ADEC 2000, page 10-9).

The RAO at South Sweeper Creek is to protect benthic infauna from contacting and ingesting sediments affected by PCBs (U.S. Navy, USEPA, and ADEC 2000, page 10-13).

Petroleum Sites

RAOs for media impacted by petroleum releases were based on 18 AAC 75. The RAOs for petroleum sites established in the OU A ROD were the following:

- Reduce petroleum concentrations in soil.
- Reduce volume of petroleum free product.
- Mitigate potential for downgradient migration.
- Reduce potential for direct exposure.

One or more of these RAOs is applicable to each of the 46 petroleum sites that required remedial action under the OU A ROD. Sixty-two petroleum sites, including the 46 petroleum sites that required remedial action under the OU A ROD, were removed from the OU A ROD by a ROD amendment. Final cleanup decisions for 14 of the 62 petroleum sites, as well as the implementation of all cleanup decisions and necessary monitoring for all 62 petroleum sites, was thereafter to be conducted in accordance with 18 AAC 75 and pursuant to the SAERA between the Navy and ADEC.

Fourteen petroleum sites removed from the OU A ROD potentially required further action under SAERA. A SAERA decision document memorializing final remedies at 10 of these sites was

signed May 20, 2005 (U.S. Navy and ADEC 2005a) and included the following RAOs, which are both applicable to all 10 sites:

- Prevent future exposure to petroleum-related chemicals in soil and groundwater at the site.
- Over the long term, reduce concentrations of petroleum-related chemicals in groundwater to levels below ADEC groundwater cleanup levels.

The decision documents memorializing the final remedies for NMCB Building Area, T-1416 Expanded Area; SWMU 62, New Housing Fuel Leak; South of Runway 18-36 Area; and SWMU 17, Power Plant No. 3 Area (U.S. Navy and ADEC 2006a, b, and c, and 2007) included the RAOs listed in the subsections below, by site.

NMCB Building Area, T-1416 Expanded Area:

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

SWMU 62, New Housing Fuel Leak:

- Prevent human and ecological exposure to petroleum hydrocarbons in soil that would result in adverse health effects.
- Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the ADEC groundwater cleanup levels established for groundwater used as a drinking water source.
- Minimize exposure to free-phase product in soil, groundwater, and surface water.
- Prevent migration of free product to surface water that would result in an exceedance of the ADEC surface water quality standard (sheen only).

South of Runway 18-36 Area:

- Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the ADEC 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 petroleum product.
- Prevent the migration of petroleum hydrocarbons to sediments that would result in adverse health effects to ecological receptors.
- Prevent the migration of petroleum hydrocarbons to surface water that would result in adverse health effects to ecological receptors and/or an exceedance of the Alaska surface water quality standards.

SWMU 17, Power Plant No. 3 Area:

- Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the ADEC 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 petroleum product.

4.1.2 OU A Remedy Selection

CERCLA Sites

To achieve RAOs, the remedial action components for CERCLA sites specified in the interim action ROD for SWMUs 11 and 13 and the OU A ROD (including the OU A water bodies and downtown groundwater) included the following:

- Placement of landfill covers
- Implementation of ICs to prohibit unacceptable exposure to residual hazardous substances left on site. ICs include a combination of restrictions on land use, groundwater use, and soil excavations; deed restrictions; fishing advisories; and educational orientation. The ICs program requires annual visual inspections, sample collection and analysis, and periodic site reviews to ensure the protectiveness of the controls.

- Excavation and treatment by thermal desorption of contaminated sediments and use of treated sediments as daily cover material at the Roberts Landfill

The specific remedial actions selected for each CERCLA site are provided in the Site Catalog included as Appendix A. ICs were selected as the primary remedy or as a part of the remedy for most sites that required a remedy. Details of IC requirements for all OU A sites are shown in Table 4-1.

Petroleum Sites

To achieve RAOs, the remedial action components for petroleum sites specified in the OU A ROD included the following:

- Free-product recovery to the maximum extent practicable as an interim remedial measure, followed by an evaluation of remedial alternatives per the FFS to achieve final cleanup levels under 18 AAC 75 for soils and groundwater
- Monitored natural attenuation of petroleum chemicals in soil and groundwater
- Limited soil removal, including treatment of petroleum-contaminated soils to meet 18 AAC 75 requirements and use of the treated soil as daily cover material at the on-island Roberts Landfill
- ICs to minimize the potential for direct contact, to restrict groundwater use, or to restrict excavation until remedial objectives have been met
- Limited groundwater monitoring at sites where hydrocarbon concentrations in soil exceed ADEC soil cleanup levels (18 AAC 75.340), but where concentrations in groundwater do not exceed 18 AAC 75.345 Table C values

The remedy selection for each petroleum site is provided in the Site Catalog included as Appendix A. The ICs for all OU A sites where ICs are required are described in Table 4-1.

In the 2003 OU A ROD Amendment No. 1 (U.S. Navy, USEPA, and ADEC 2003), there were two significant revisions to the OU A ROD (U.S. Navy, USEPA, and ADEC 2000). The first was the replacement of subsistence fish advisory signs along Kuluk Bay and Sweeper Cove with fish advisory fact sheets provided to Adak residents. The fishing advisory signs were removed at the request of the property owner with the concurrence of the Navy and regulatory agencies. The Navy issued and distributed the fact sheet to Adak residents in October 2003. The second was the removal of 62 petroleum sites from the OU A ROD to streamline regulatory oversight of the petroleum cleanup and to expedite the partial delisting of the downtown area from the NPL. Of

the 62 sites removed from the OU A ROD, 46 sites were further action sites and 16 were NFA sites.

Final remedies were selected under SAERA for 14 of the 62 sites removed from the OU A ROD during the time frame 2005 to 2007 and memorialized in five decision documents (U.S. Navy and ADEC 2005a, 2006a, b, and c, and 2007). The 14 sites are the following:

- GCI Compound, UST GCI-1
- NORPAC Hill Seep Area
- SA 78, Old Transportation Building
- SA 80, Steam Plant 4, USTS 27089 and 27090
- SA 82, P-80/81 Buildings
- SA 88, P-70 Energy Generator (UST 10578)
- SWMU 58 and SA 73, Heating Plant 6
- Tanker Shed, UST 42494
- Yakutat Hangar
- NMCB Building Area, T-1416 Expanded Area
- South of Runway 18-36 Area
- SWMU 17, Power Plant No. 3
- SWMU 62, New Housing Fuel Leak

SWMU 58 and SA 73 are two sites combined into one action.

Selected remedies at all of these sites included one or more of the remedy components, ICs, limited groundwater monitoring, or monitored natural attenuation. In addition, free-product recovery or containment was selected as a remedy component for Tanker Shed, UST 42494; NMCB Building Area, T-1416 Expanded Area; and South of Runway 18-36 Area. Natural recovery for surface water and sediment was included as a remedy component for South of Runway 18-36 Area, and surface soil excavation was included as a remedy component for SWMU 62, New Housing Fuel Leak.

The decision document covering 10 of these sites (U.S. Navy and ADEC 2005a) required follow-on actions at 6 of the sites in support of the selected remedy. These follow-on actions consisted of the following:

- SA 80, Steam Plant No. 4 – additional soil and groundwater sampling and free-product recovery as needed

- SA 82, P-80/P-81 Buildings – additional limited soil removal

- SA 88, P-70 Energy Generator – additional groundwater sampling and free-product recovery as needed
- SWMU 58 and SA 73, Heating Plant No. 6 – additional soil, groundwater, and surface water sampling and free-product recovery as needed
- Tanker Shed – additional soil sampling and additional groundwater monitoring well installation and sampling
- Yakutat Hangar – additional surface water sampling

4.1.3 OU A Remedy Implementation

CERCLA and Petroleum Sites - Remedy Components Required by the OU A ROD

Most of the physical remedy construction required by the ROD was completed at OU A by 2003 with the closure of Roberts Landfill. The OU A remedy construction was considered complete in 2006, when the limited soil removal component of the remedy was performed at the two petroleum sites ASR-8 Facility (UST 42007-B) and SA-77, Fuels Facility Refueling Dock (Small Drum Storage Area). ADEC approved site closure status for ASR-8 Facility, UST 42007-B (ADEC 2007c) and conditional closure status for SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area (ADEC 2007d). The dates of the implementation of the selected remedial actions, and a summary of the remedial actions performed at each CERCLA and petroleum site are included in the Site Catalog (Appendix A). A summary of the sites that have achieved partial or complete closure status since execution of the ROD is provided in Tables 4-2 and 4-3.

Where required by the OU A ROD, product recovery, as an interim remedial action, limited groundwater monitoring, or monitored natural attenuation have been implemented and are ongoing, as described in Section 4.1.4. The practical endpoint for product recovery as an interim action under the OU A ROD has been met for all 14 sites where product recovery was required (U.S. Navy 1999, 2000b, 2002, and 2006c).

In 2005, data from 46 petroleum sites were evaluated to assess the effectiveness of the site-specific remedies under the OU A ROD and to evaluate the current site status. The informal review concluded that 19 sites were candidates for NFA or NFRAP consideration. The rationale for the recommended status was provided in the cleanup report (U.S. Navy 2005b). Under SAERA, ADEC and EPA concurred with NFA status for the following sites:

- Girl Scout Camp (UST GS-1)
- Officer and Amulet Housing (UST 31049-A)

- Quarters A

ADEC and EPA concurred with NFRAP status at the following sites (ADEC 2005b):

- Amulet Housing, Well AMW-706 Area
- Amulet Housing, Well AMW-709 Area
- Boy Scout Camp, West Haven Lake (UST BS-1)
- Contractor's Camp Burn Pad
- Finger Bay Quonset Hut (UST FBQH-1)
- MAUW Compound (UST 24000-A)
- Mount Moffett Power Plant 5 (USTs 10574 through 10577)
- NAVFAC Compound (USTs 20052 and 20053)
- Navy Exchange Building (UST 30027-A)
- New Roberts Housing (UST HST-7C)
- Officer Hill and Amulet Housing (UST 31047-A)
- Officer Hill and Amulet Housing (UST 31052-A)
- ROICC Contractor's Area (UST ROICC-8)
- ROICC Warehouse (UST ROICC-2)
- ROICC Warehouse (UST ROICC-3)
- Yakutat Hangar (USTs T-2039-B and T-2039-C)

Petroleum Sites - Post-OU A ROD Remedy Components Under SAERA

The final remedies have been implemented at the 14 petroleum sites removed from the OU A ROD and requiring further action under SAERA. Where required by the SAERA decision documents, limited groundwater monitoring, implementation of ICs, or monitored natural attenuation have been implemented through adjustments to the CMP. The additional remedy components required under the SAERA decision documents for the NMCB Expanded Area, SWMU 62 (New Housing Fuel Leak) and South of Runway 18-36 Area were implemented in 2006 (U.S. Navy 2007c). These additional components included soil hot spot removal, additional monitoring, free-product recovery wells and trenches, and initiation of free product-recovery systems. More information regarding the final remedy implementation at each site is provided in the Site Catalog (Appendix A).

In addition to remedy implementation, the follow-on actions have been implemented as required for SA 80, SA 82, SA 88, SWMU 58/SA 73, Tanker Shed, and Yakutat Hangar. In addition to these follow-on actions, the Navy conducted additional investigation activities at the following sites at the request of ADEC (U.S. Navy 2010f):

- Antenna Field

- Former Power Plant, Building T-1451
- SA 79, Main Road Pipeline, South End
- SWMU 60, Tank Farm A
- SWMU 61, Tank Farm B

The additional investigation activities conducted for these sites during this 5-year review period were the result of concerns expressed by ADEC in their comments on the annual groundwater monitoring report covering the 2006 and subsequent monitoring seasons (ADEC 2007e and U.S. Navy 2007e). The results of the additional investigations are summarized in the Site Catalog (Appendix A) entries for these sites.

Concurrent with the limited soil removal at ASR-8 and SA-77 under the OU A ROD, limited soil removal was also performed at SA 82 as required by the May 20, 2005 decision document (U.S. Navy and ADEC 2005a). ADEC concurred that cleanup was complete at SA 82, with ICs required (ADEC 2010).

A summary of the sites that have achieved partial or complete closure status since execution of the ROD is provided in Tables 4-2 and 4-3.

4.1.4 OU A Operation, Maintenance, and Monitoring

Since the second 5-year review in 2006 (U.S. Navy 2006b), the Navy has continued operation, maintenance, and monitoring of the OU A remedies for both CERCLA and petroleum sites. The Navy has operated, maintained, monitored, or inspected 50 OU A sites since 2006. Operation, maintenance, and monitoring activities on Adak included groundwater, surface water, sediment, and marine tissue monitoring; education program maintenance; ICs inspections; sign and soil cover inspections; shoreline inspections for the presence of free product; free-product monitoring; and free-product recovery operations. Site-specific summaries of ongoing operation, maintenance, and monitoring activities are provided in Appendix A, Site Catalog. A summary of island-wide activities is provided in the sections below.

Monitoring and Operation and Maintenance Plans

Operation, maintenance, and monitoring of the OU A remedies on Adak are specified in the CMP (U.S. Navy 2010a) (except for South of Runway 18-36 Area and SWMU 62, New Housing Fuel Leak site), which describes the monitoring requirements for ICs, groundwater, surface water, sediment, and tissue. The CMP is periodically revised, generally on a 2- to 3-year cycle. The CMP includes an overview of the status and types of monitoring to be conducted, and a summary of changes since the last revision. Appendices to the CMP include the groundwater monitoring plan, landfill monitoring plan, marine tissue monitoring plan, quality assurance project plan, and the ICMP. During data review performed for this 5-year review (Section 6.4),

some discrepancies were identified in the current version of the CMP (U.S. Navy 2010a), although this plan represents concurrence between the Navy and regulatory agencies. Where identified by this 5-year review, site-specific CMP discrepancies are called out in the site-specific write-ups in Section 6.4. Discrepancies in monitoring plans can lead to the collection of unnecessary data, or data that are not sufficient to document the continued protectiveness of the remedy. Discrepancies in the CMP will be corrected when they are identified.

Operation and Maintenance (O&M) activities related to free-product recovery at two sites, South of Runway 18-36 Area and SWMU 62, New Housing Fuel Leak, together with sorbent boom maintenance activities at various locations, are also covered by a separate O&M plan (U.S. Navy 2009a).

The Navy maintains the ICMP (an appendix to the CMP) to ensure the reliability and effectiveness of the ICs as required by the OU A ROD, the OU B-1 ROD, and the SAERA decision documents. The ICMP was originally published in 2001 as an appendix to the CMP, which was updated in 2004, 2005, 2007, and 2010 (U.S. Navy 2001a, 2004, 2005c, 2007d, and 2010a). The ICMP was revised to reflect the remedial activities and property transfer actions that have taken place since 2001 and revisions to IC management practices to ensure efficacy of ICs. Specifically, the following was included in the most recent version of the document:

- Summaries of recent remedial decisions and actions taken at petroleum sites in OU A under SAERA
- Changes to the UXO Awareness Education Plan, the IC Excavation Notification Form, and the Primary Inspection Checklist
- Resolution of the dispute regarding OU B-1 sites with slopes greater than 30 degrees

When the property was transferred to TAC, land use restrictions and excavation prohibitions were included in the Interim Conveyance. The land use restrictions and excavation prohibitions "run with the land" and are binding on all subsequent owners. Additional details regarding the current IC program on Adak are included in Sections 6.2.2 and 6.2.3.

Review of the ICMP during this 5-year review revealed that ICs are not currently documented in the ICMP for the following sites, even though petroleum hydrocarbons remain at the site above residential cleanup levels and ADEC has not granted full site closure: Contractor's Camp Burn Pad, NAVFAC Compound, Navy Exchange Building, New Roberts Housing, Officer Hill and Amulet Housing (UST 31047-A), Officer Hill and Amulet Housing (UST 31052-A), ROICC Warehouse (UST ROICC-2), ROICC Warehouse (UST ROICC-3), and Yakutat Hangar (USTs T-2039B and T-2039C). IC inspections are not being conducted at these sites. This 5-year

review recommends (Section 8) updating the ICMP to address these sites and resolve other discrepancies between the source documents that establish ICs and the IC requirements listed in the ICMP in the equivalent to Table 4-1 of this 5-year review.

Site-Wide Land Use Control Monitoring

The Navy monitors and assesses the effectiveness of the land use controls (LUCs), including both ICs and ECs selected in the OU A and OU B-1 RODs at the former Adak Naval Complex. The Navy verifies that LUCs remain effective on an annual basis. In addition, maintenance activities are identified during the annual inspections that are needed to ensure the continued effectiveness of the ICs and ECs. In 2006, 2007, 2008, and 2010 maintenance activities included fence repairs, gate installation, sign installation, drainage repairs at Roberts, Metals, and Palisades Landfills, and supplemental inspection of drainage swale liners at Metals, White Alice, and Palisades Landfills (U.S. Navy 2007c, 2008a, and 2009b). A discussion of the inspection results and repairs during each year of this 5-year review period is provided in Section 6.5. Major maintenance activities conducted during this 5-year review period are discussed below. More substantial IC repairs sometimes require additional time for planning and contracting and are completed as soon as practical, but not necessarily by the next field season after they are identified.

Fence repairs included repairing and/or replacing 300 feet of existing fence along the east perimeter of the SA 93 site in 2006 and 160 feet of existing fence near the new gates in 2007. Fence repairs were also completed in 2008. Approximately 2,500 feet of fencing was repaired on the west side of Andrew Lake within Parcel 4, on the east and southeast side of SA 93, on southwest side of Roberts Landfill, and on the east side of White Alice Landfill.

Steel swing gates were installed at the entrance road on the west side of Andrew Lake to deter access into Parcel 4 and at the main entrances to the White Alice, Roberts, and Metals Landfills. In addition, each of the new gates at the landfills included the installation of 20 feet of 4-strand barbed wire fence on either side (120 feet) to discourage drive-arounds.

The Navy implemented a sign improvement program in 2006. This included the installation of ten warning signs at four landfills during 2006: SWMU 2 (Clam Lagoon Causeway Landfill), SWMU 4 (South Davis Road Landfill), SWMU 13 (Metals Landfill), and SWMU 29 (Finger Bay Landfill). One sign was installed at the Metals Landfill, and three signs were installed at each of the other landfills. Wording on the signs included: "Warning, Buried Landfill" and "Digging within this area strictly prohibited." Sign installations continued in 2007 and included the posting of over 99 new signs at locations where existing signs were either previously removed or an insufficient number of signs were present for adequate public warning. Five types of signs were installed as part of the maintenance and upgrades: (1) warning signs (Type A-1) showing Navy approval is required prior to excavation, (2) warning signs (Type A-2) at locations

where digging is strictly prohibited, (3) "Danger, Do Not Enter" signs (Type A-5) at the entrance to landfills, (4) small "Danger, Live Munitions Present" signs (Type A-3) along the perimeter fencing of Parcel 4, and (5) larger "Live Munitions Present" signs (A-4) along the Andrew Lake seawall warning boaters of the presence of ordnance hazards. In 2008, "No Trespassing" signs (Type A-6) were posted at the former Caretaker Site Office cabin and the recreational cabin located next to Lake Jean, both of which are within the Parcel 4 boundary.

4.2 OU B-1

4.2.1 OU B-1 Remedial Action Objectives

The goal of the OU B-1 investigation and remediation activities on Adak Island was to take steps to effectively reduce and manage potential explosive hazards and risks posed by MEC to protect human health and the environment for current and reasonably expected future land use. The RAOs were intended to support an unrestricted (i.e., residential) future land use that included the possibility of activity that could disturb subsurface MEC. Two RAOs were established: one addressed explosive safety issues and the other addressed the chemical residues in soil resulting from past ordnance use.

The RAO pertaining to the explosive safety aspect of the ordnance is to reduce any remaining potential explosive safety hazards throughout OU B-1 through the application of the ESHA process and subsequent clearance of MEC, as necessary, to support current and reasonably expected future land use. Cleanup levels are typically numeric expressions of RAOs. However, for explosive hazards associated with the OU B-1 sites, the cleanup level goal entails removing all known MEC items to a depth of 4 feet bgs that are located in reasonably accessible areas, using an ordnance detection system that meets performance criteria established for Adak.

The RAO for potential MC risks is to prevent future residents and recreational users from being exposed to explosives-related contamination in soils above the cleanup levels. The cleanup levels established in the ROD are the EPA Region 9 preliminary remediation goals for residential soil. This chemical-risk RAO is applicable at the seven locations identified in the ROD as having potential chemical risks and at the additional locations where subsequent field investigations indicated the potential for chemical residues.

4.2.2 OU B-1 Remedy Selection

Some action was required at 47 sites by the OU B-1 ROD to meet the RAOs. (The OU B-1 ROD did not include remedies for MM-10F, MM-10G, and MM-10H, because these sites were not identified until 2004.) The actions required by the OU B-1 ROD fall into three categories:

- Three sites were to be cleared of MEC to a depth of 4 feet bgs (C3-01A, C6-01A, and ML-01A).

- Forty-four sites were to be investigated to identify locations of MEC contamination and, if necessary, remove potential MEC anomalies to a depth of 4 feet bgs.

- Nine sites were selected in the OU B-1 ROD for Alternative 4, soil samples collected and analyzed for MC.

The number of sites listed in the bullets above does not equal 47, because more than one action was selected for some of the sites. In addition to the actions listed above, maintenance of the facility-wide ordnance awareness program is also applicable to the 47 sites.

As indicated above, three new sites were identified in 2004 within the boundaries of MM-10E. These three sites are MM-10F, MM-10G, and MM-10H. Based on the addition of these three sites, the total number of OU B-1 sites requiring actions is 50. Because these three sites are within the boundaries of MM-10E, remedial actions specified in the OU B-1 ROD for MM-10E are applicable to MM-10F, MM-10G, and MM-10H.

For the remaining OU B-1 sites, the selected remedy was No Further Action (abbreviated as "NOFA" in the OU B-1 ROD) with maintenance of a facility-wide ordnance awareness program. The NOFA selection for these sites was considered protective of human health and the environment, based on the evaluation processes developed and implemented during the preliminary assessment and site investigation process that resulted in determinations of little or no MEC hazards, or the results of RI and ESHA evaluations that resulted in similar determinations. The process of intrusive investigation and clearance of MEC during field activities associated with one of these steps resulted in the effective clearance of MEC at the site, thereby supporting the NOFA selection.

4.2.3 OU B-1 Remedy Implementation

Remedial action selection and implementation at OU B-1 is summarized by site in the Site Catalog (Appendix A). The selected remedies have been implemented at nearly all of the 50 OU B-1 action sites. Conditional closure has been achieved for 18 of the 50 sites (Table 4-3). ADEC and EPA have not yet concurred with all of the remedial actions, and, therefore, the remedy cannot be considered complete at all sites.

Documentation of OU B-1 remedy implementation was found to be incomplete in several instances during this 5-year review. For example, documentation of the destruction of several UXO items at one site could not be found, documentation of the excavation of soil containing

MCs at concentrations exceeding cleanup levels at one site could not be found, and documentation of chemical sampling required by the OU B-1 ROD at several sites could not be found. However, the incomplete documentation did not impair the assessment of remedy protectiveness. Complete documentation will be assembled as part of the preparation of the remedial action completion report for OU B-1.

A concurrence letter from ADEC (or EPA) has not been received for the OU B-1 site remediation performed in 2001 and 2002. This includes the following sites: AP-02, C3-01B, C3-01C, C3-04A, C6-01A, C8-05A, FB-01, FB-04, FBAP-02, GUN-01, GUN-02, GUN-03, HP-01, ML-01A, ML-01B, ML-02A, ML-02B, BC-01, C1-03, C2-01A, C2-01B, C2-02, C3-01A, C3-01E, C8-03, FB-03, and MM-10C.

A concurrence letter was received from ADEC for MM-10E on January 16, 2008. However, ADEC revoked conditional closure status for MM-10E in a letter dated April 7, 2009, because numerous munitions debris items were identified and removed from MM-10E in 2008. These items were discovered during installation of geophysical prove-out areas for remediation activities at MM-10F, MM-10G, and MM-10H.

A concurrence letter from ADEC (or EPA) has not been received specifically for MM-10A and MM-10B. However, remediation of these sites was performed in conjunction with MM-10F. The after action report covering clearance activities at Mount Moffett sites MM-10E, MM-10F, MM-10G, and MM-10H through 2010 has not yet been finalized, and, therefore, the remedy at these sites cannot be considered complete. ADEC concurrence of MM-10E, MM-10F, MM-10G, and MM-10H (including MM-10A and MM-10B) remediation completion is pending resolution of comments on the 2008, 2009, and 2010 field season after action report.

A summary of the sites that have achieved partial or complete closure status since execution of the ROD is provided in Tables 4-2 and 4-3.

4.2.4 OU B-1 Operation, Maintenance, and Monitoring

Since the second 5-year review in 2006 (U.S. Navy 2006b), the Navy has continued operation, maintenance, and monitoring of the OU B-1 remedies. Operation, maintenance, and monitoring activities associated with the OU B-1 sites on Adak included education program maintenance, ICs inspections, and sign inspections. These activities are implemented on an island-wide basis. There are no site-specific operation, maintenance, and monitoring activities for OU B-1 sites. Details of the island-wide activities applicable to the OU B-1 sites are provided in Section 4.1.4 and 6.2.3.

Table 4-1
Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A Sites

Site Name	Source[n]	Institutional Controls					ECs		Operation and Maintenance					
		Land Use Restrictions[a]	Equitable Servitude[b]	Groundwater Restrictions[c]	Soil Excavation Restrictions[d]	Fishing Advisory[e]	Comprehensive Monitoring[j]	Signage	Education[f,g]	Site/Remedy Condition Inspections and Reporting[e,g]	Sign Inspection[h]	Soil Cover Inspections[i]	Free-Product Monitoring and Recovery[p]	Visual Inspection[q]
CERCLA Sites														
Kuluk Bay	ROD					X	X		X	X				
SA 76, Old Line Shed Building	ROD	X	X	X	X					X				
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area[r]	RCRA, ADEC 2007c	X	X	X	X			X	X	X				
Sweeper Cove	ROD					X	X		X	X				
SWMU 2, Causeway Landfill**	ROD	X	X		X			X		X	X	X		
SWMU 4, South Davis Road Landfill**	ROD	X	X		X			X		X	X	X		
SWMU 10, Old Baler Building	ROD	X	X	X	X			X		X	X			
SWMU 11, Palisades Landfill**	ROD	X	X		X		X	X		X	X	X		
SWMU 13, Metals Landfill**	ROD	X	X	X	X		X	X		X	X	X		
SWMU 14, Old Pesticide Disposal Area*	ROD	X	X	X	X		X	X		X	X			
SWMU 15, Future Jobs/DRMO*	ROD	X	X	X	X		X	X		X	X			
SWMU 16, Former Firefighting Training Area	ROD	X	X	X	X			X		X	X			
SWMU 17, Power Plant 3 Area*	ROD, DD	X	X	X	X		X	X		X	X			
SWMU 18, South Sector Drum Disposal Area (White Alice Landfill) and SWMU 19, Quarry Metal Disposal Area (White Alice Landfill)**	ROD[s]	X	X		X		X	X		X	X	X		
SWMU 20, White Alice/Trout Creek Disposal Area	ROD	X	X		X			X		X	X			
SWMU 21A, White Alice Upper Quarry	ROD	X	X		X			X		X	X	X		

Table 4-1 (Continued)
Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A Sites

Site Name	Source[n]	Institutional Controls					ECs		Operation and Maintenance						
		Land Use Restrictions[a]	Equitable Servitude[b]	Groundwater Restrictions[c]	Soil Excavation Restrictions[d]	Fishing Advisory[e]	Comprehensive Monitoring[j]	Signage	Education[f,g]	Site/Remedy Condition Inspections and Reporting[e,g]	Sign Inspection[h]	Soil Cover Inspections[i]	Free-Product Monitoring and Recovery[p]	Visual Inspection[q]
SWMU 23, Heart Lake Drum Disposal Area	ROD	X	X		X			X		X	X			
SWMU 24, Hazardous Waste Storage Facility[r]	RCRA	X	X	X	X			X		X	X			
SWMU 25, Roberts Landfill**	ROD[s]	X	X	X	X		X	X		X	X	X		
SWMU 29, Finger Bay Landfill**	ROD	X	X		X			X		X	X	X		
SWMUs 52, 53, 59, Former Loran Station	ROD	X	X		X			X		X	X			
SWMU 55, Public Works Transportation Department Waste Storage Area	ROD	X	X	X	X		X	X		X	X			
SWMU 67, White Alice PCB Spill Site	ROD	X	X		X			X		X	X	X		
Petroleum Sites														
Amulet Housing, Well AMW-706 Area	ROD	X	X	X	X			X		X	X			
Amulet Housing, Well AMW-709 Area	ROD	X	X	X	X			X		X	X			
Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4	ROD	X	X	X	X		X	X		X	X			
Boy Scout Camp, West Haven Lake, UST BS-1	ADEC 2005a				X			X			X			
Finger Bay Quonset Hut, UST FBQH-1	ADEC 2005a				X			X			X			
Former Power Plant, Building T-1451	ROD	X	X	X	X		X	X		X	X			
GCI Compound, UST GCI-1[m]	ROD, DD	X	X	X	X		X	X		X	X		X	

Table 4-1 (Continued)
Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A Sites

Site Name	Source[n]	Institutional Controls					ECs		Operation and Maintenance						
		Land Use Restrictions[a]	Equitable Servitude[b]	Groundwater Restrictions[c]	Soil Excavation Restrictions[d]	Fishing Advisory[e]	Comprehensive Monitoring[j]	Signage	Education[f,g]	Site/Remedy Condition Inspections and Reporting[e,g]	Sign Inspection[h]	Soil Cover Inspections[i]	Free-Product Monitoring and Recovery[p]	Visual Inspection[q]
Housing Area (Arctic Acres)	ROD	X	X	X	X		X	X		X	X			
MAUW Compound, UST 24000-A	ADEC 2005a				X			X			X			
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	ADEC 2005a				X			X			X			
NMCB Building Area, T-1416 Expanded Area[k,o]	DD	X	X	X	X	X	X	X		X	X		X	X
NORPAC Hill Seep Area[k]	ICMP	X	X	X	X		X	X		X	X			X
ROICC Contractor's Area (UST ROICC 7)	ICMP						X	X			X			
ROICC Contractor's Area (UST ROICC 8)	ROD	X	X	X	X			X		X	X			
Runway 5-23 Avgas Valve Pit	ROD	X	X	X	X		X	X		X	X			
SA 73/SWMU 58, Heating Plant 6[m]	DD	X	X	X	X		X	X		X	X			
SA 78, Old Transportation Building USTs[m]	DD	X	X	X	X		X	X		X	X			
SA 79, Main Road Pipeline	ICMP			X			X				X			X
SA 80, Steam Plant 4, USTs 27089 and 27090[m]	DD	X	X	X	X		X	X		X	X			
SA 82, P-80/P-81 Buildings[m]	ADEC 2010	X	X		X		X	X		X	X			
SA 88, P-70 Energy Generator, UST 10578[m]	ICMP	X	X		X		X	X		X	X			
South of Runway 18-36 Area[k,o]	DD	X	X	X	X		X	X		X	X		X	X
SWMU 14, Old Pesticide Disposal Area*	ROD	X	X	X	X		X	X		X	X			
SWMU 15, Future Jobs/DRMO*	ROD	X	X	X	X		X	X		X	X			

Table 4-1 (Continued)
Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A Sites

Site Name	Source[n]	Institutional Controls					ECs		Operation and Maintenance						
		Land Use Restrictions[a]	Equitable Servitude[b]	Groundwater Restrictions[c]	Soil Excavation Restrictions[d]	Fishing Advisory[e]	Comprehensive Monitoring[j]	Signage	Education[f,g]	Site/Remedy Condition Inspections and Reporting[e,g]	Sign Inspection[h]	Soil Cover Inspections[i]	Free-Product Monitoring and Recovery[p]	Visual Inspection[q]
SWMU 17, Power Plant 3 Area*[m]	ROD, DD	X	X	X	X		X	X		X	X			
SWMU 60, Tank Farm A	ROD	X	X	X	X		X	X		X	X			X
SWMU 61, Tank Farm B	ROD	X	X	X	X		X	X		X	X			X
SWMU 62, New Housing Fuel Leak[o]	DD	X	X	X	X		X	X		X	X		X	X
Tanker Shed, UST 42494[l]	DD	X	X	X	X		X	X		X	X		X	
Yakutat Hangar, UST T-2039-A[k]	ADEC 2007a	X	X	X	X		X	X		X	X			
Downtown Exchange Area Groundwater*	ROD	X	X	X	X		X		X	X				

[a]Land use restrictions are required to ensure that the land will not be used in a way inconsistent with the land use assumptions set forth in the RODs.
[b]Land use restrictions/prohibitions have been included in the Interim Conveyance.
[c]The Downtown groundwater is restricted from domestic use.
[d]Excavation notification is required at all sites. Excavation is prohibited at the landfills and sites with a soil cover.
[e]Fishing advisory to recommend limiting subsistence consumption of bottom fish and mussels; fact sheets on the advisory available to City of Adak residents.
[f]Education Program (required for shellfish/fishery advisory and for ordnance hazards).
[g]Inspection and reporting of institutional controls annually, or as necessary and appropriate. Assess the need to take additional action or to reduce controls, as appropriate. A review of these sites will be reported every 5 years. The Downtown Exchange Area groundwater will be inspected by driving existing roads for evidence of domestic wells in use.
[h]Place and annually inspect signage for excavation restrictions, ordnance (at Parcel 4), and landfill hazards.
[i]Annually inspect soil covers to ensure they remain intact.
[j]Comprehensive monitoring is conducted annually and could include compliance groundwater monitoring required by the OU A ROD, limited groundwater monitoring, natural attenuation monitoring, etc. Details of the comprehensive monitoring program are provided in the Site Catalog (Appendix A).
[k]Site has met endpoint criteria for interim free-product recovery under the OU A ROD and received ADEC concurrence via approval of the final closure report (U.S. Navy 2006c).

Table 4-1 (Continued)
Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A Sites

[l]Site has met endpoint criteria for final free-product recovery and received ADEC concurrence via approval of the final closure report (U.S. Navy 2006c).
[m]Site has met endpoint criteria for interim free-product recovery under the OU A ROD. ADEC concurred via approval of the final decision document for the site (U.S. Navy and ADEC 2005a).
[n]Regulatory source of the requirements in this table. "ROD" refers to the OU A ROD (Table 10-1 unless otherwise indicated). "DD" refers to State-Adak Environmental Restoration Agreement decision documents executed after the OU A ROD. "RCRA" refers to RCRA closure requirements. "ADEC 2007" and "ADEC 2005" refer to concurrence letters issued by ADEC (see Section 11 for references). "ICMP" means that the institutional control requirements are not listed in any ROD, DD, or ADEC concurrence letter, but have historically been included in the ICMP.
[o]Free-product recovery is part of the final remedy for South of Runway 18-36 Area, SWMU 62, and the NMCB Building Area, T-1416 Expanded Area
[p]This box is marked for sites with a current free-product recovery requirement based on a ROD or DD, and where endpoint criteria have not been met. Details of the current free-product monitoring and recovery requirements and activities provided in Section 6.4.
[q]Visual inspection of adjacent shoreline and surface water for petroleum seeps and sheens.
[r]Although this site is a RCRA No further Action site, institutional controls remain in place to restrict land use to commercial/industrial in accordance with the RCRA closure report. The remaining institutional controls are applicable because of the location of these sites in the downtown area.
[s]Institutional control requirements for White Alice and Roberts Landfills are not summarized in Table 10-1 of the OU A ROD, but are described in Section 10.4 of the OU A ROD.

Notes:
*CERCLA and petroleum institutional controls apply
**CERCLA landfill closures
ADEC - Alaska Department of Environmental Conservation
avgas - aviation gasoline
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DD - decision document
DRMO - Defense Reutilization Marketing Office
ECs - engineering controls
GCI - General Communication Inc.
ICMP - Institutional Control Management Plan
OU - operable unit
PCB - polychlorinated biphenyl
RCRA - Resource Conservation and Recovery Act
ROD - Record of Decision
ROICC - resident officer in charge of construction
SA - source area
SWMU - solid waste management unit
UST - underground storage tank

Table 4-2
Sites Achieving No Further Action Status Since Execution of the ROD

Site Name	Operable Unit	Type of Site	Date[a]
Girl Scout Camp (UST GS-1)	A	Petroleum	11/23/2005
Officer Hill and Amulet Housing (UST 31049-A)	A	Petroleum	11/23/2005
Quarters A	A	Petroleum	11/23/2005
Tango Pad Spill Area[b]	NA	Petroleum	7/6/2007
ASR-8 Facility (UST 42007-B)	A	Petroleum	7/19/2007

[a]This is the date of Alaska Department of Environmental Conservation concurrence letter.
[b]This site was not included in the Operable Unit A ROD.

Notes:
NA - not applicable
ROD - Record of Decision

Table 4-3
Sites Achieving Conditional Site Closure Status Since Execution of the ROD

Site Name	Operable Unit	Type of Site	Date[a]
Amulet Housing, Well AMW-706 Area	A	Petroleum	11/23/2005
Amulet Housing, Well AMW-709 Area	A	Petroleum	11/23/2005
Boy Scout Camp, South Haven Lake (UST BS-2)	A	Petroleum	11/23/2005
Contractor's Camp Burn Pad	A	Petroleum	11/23/2005
Finger Bay Quonset Hut (UST FBQH-1)	A	Petroleum	11/23/2005
MAUW Compound (UST 24000-A)	A	Petroleum	11/23/2005
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	A	Petroleum	11/23/2005
NAVFAC Compound (USTs 20052 and 20053)	A	Petroleum	11/23/2005
Navy Exchange Building (UST 30027-A)	A	Petroleum	11/23/2005
New Roberts Housing (UST HST-7C)	A	Petroleum	11/23/2005
Officer Hill and Amulet Housing (UST 31047-A)	A	Petroleum	11/23/2005
Officer Hill and Amulet Housing (UST 31052-A)	A	Petroleum	11/23/2005
ROICC Contractor's Area (UST ROICC-8)	A	Petroleum	11/23/2005
ROICC Warehouse (UST ROICC-2)	A	Petroleum	11/23/2005
ROICC Warehouse (UST ROICC-3)	A	Petroleum	11/23/2005
Yakutat Hangar (USTs T-2039-B and T-2039-C)	A	Petroleum	11/23/2005
Yakutat Hangar (UST T-2039-A)	A	Petroleum	5/1/2007
SA 77, Fuel Division Area Drum Storage	A	Petroleum	7/16/2007
SA 82, NSGA P80, P81 Buildings	A	Petroleum	7/30/2007
BI-01	B1	Munitions	1/16/2008
C1-02	B1	Munitions	1/16/2008
C8-01	B1	Munitions	1/16/2008
DM-06A	B1	Munitions	1/16/2008
MM-01	B1	Munitions	1/16/2008
MM-02	B1	Munitions	1/16/2008
MM-03	B1	Munitions	1/16/2008
MM-04	B1	Munitions	1/16/2008
MM-05	B1	Munitions	1/16/2008
MM-06	B1	Munitions	1/16/2008
MM-07	B1	Munitions	1/16/2008
MM-08	B1	Munitions	1/16/2008
MM-09	B1	Munitions	1/16/2008
MM-11	B1	Munitions	1/16/2008
SH-01	B1	Munitions	1/16/2008
LJ-01	B1	Munitions	9/14/2010
LJ-02A	B1	Munitions	1/16/2008

[a]This is the date of Alaska Department of Environmental Conservation concurrence letter.

Notes:
Institutional controls are still in effect for these sites, and additional sampling would be required to achieve No Further Action status. However, all other remedial actions have been completed.
ROD - Record of Decision

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This section summarizes the status of recommendations and follow-up actions from the last review, the results of implemented actions, including whether they achieved the intended purpose, and the status of any other prior issues. A summary of follow-up actions is detailed in Table 5-1. The Navy has completed all of the actions recommended by the last 5-year review. Efforts to improve communication with the community and stakeholders are ongoing.

Table 5-1
Actions Taken Since Previous 5-Year Review

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Revise endpoint criteria used to evaluate sediment concentrations at SWMU 11, Palisades Landfill, to more closely reflect potential health risks from sediment exposures at SWMU 11.	05/21/2007	Implemented through revisions to the CMP.	U.S. Navy 2007d
Implement recommendations and/or required repairs indicated in the 2005 IC inspection report for SWMUs 2, 4, 13, 25, and 29.	2007	Except for new sign placement and new gate installation at SMWU 25 in 2007, all other recommendations were implemented in 2006.	U.S. Navy 2007g, 2008e
Complete limited soil removal component of OU A remedy at the ASR-8 Facility and SA 77.	10/13/2007	ADEC approved site closure status for ASR-8 and conditional closure status for SA 77.	U.S. Navy 2007b; ADEC 2007c, 2007d
Evaluate, select, and implement additional land use controls to protect human health at OU B-1 and OU B-2 sites, where the selected remedy is not complete, while a remedy is selected (OU B-2) and a revised remedy is evaluated (OU B-1). Incorporate the selected land use controls in the next revision of the Institutional Control Management Plan.	2007	Land use controls were improved and the UXO/land use controls awareness materials were thoroughly revised in 2007 (see Section 6.2.3). Land use controls for OU B-2 sites are included in the Institutional Control Management Plan. However, a ROD formalizing the land use controls for OU B-2 has not yet been executed.	U.S. Navy 2008a
Resolve with regulators the MEC clearance approach for Mount Moffett sites and the issues related to the 2004 after action report for OU B-1 remedy implementation.	1/16/2008	The Navy has worked with the EPA and the ADEC to resolve the MEC clearance approach for the Mount Moffett sites and the issues related to the 2004 after action report. The 2004 after action report was revised in 2006, and a memorandum of resolution was appended to the report in 2007, which was executed by EPA, ADEC, and Navy in December of 2007 (U.S. Navy 2007h). The Navy agreed to complete the ROD-specified remedy of clearance to 4 feet below ground surface at	ADEC 2008a

Table 5-1 (Continued)
Actions Taken Since Previous Five-Year Review

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
		MM-10F, MM-10G, and MM-10H in the memorandum of resolution. The remedy was implemented in 2008 and completed in 2010. The after action report for the 2008, 2009, and 2010 field seasons is currently being reviewed by the agencies. In addition, ADEC approved conditional closure for all of the other OU B-1 sites addressed during the 2004 field season.	
Continue to improve the ordnance awareness training program.	2007	New UXO and land use controls awareness DVD program was prepared and utilized (see Section 6.2.3 for more details).	U.S. Navy 2008a
Provide a sufficient supply of ordnance awareness hiking maps at the Refuge.	2007	Revised materials were provided to the U.S. Fish and Wildlife Service.	U.S. Navy 2008a
Address communication issues raised by stakeholders.	Ongoing	Stakeholders generally report improvements in their 2010 interview responses. However, some stakeholders still feel that communication could still be improved (see Section 6.5).	Interview responses (see Appendix B)
Work with Alaska Department of Transportation and Public Facilities to resolve their concern regarding written excavation procedures for the airport.	8/25/2010	Excavation notification procedures and absolute prohibitions regarding excavation were clarified in the August 2010 version of the Institutional Control Management Plan.	U.S. Navy 2010a
Because of the free product measured in the surface water protection well at the NORPAC Hill Seep Area site in 2005, add visual inspections for seeps and sheens to the annual monitoring protocol starting in 2006.	05/21/2007	Implemented through revisions to the CMP.	U.S. Navy 2007d

Table 5-1 (Continued)
Actions Taken Since Previous Five-Year Review

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Re-evaluate the selected final remedy for site SA 88, P-70 Energy Generator, considering the free product measured in wells at this site in 2005.	May 2007	Navy and ADEC agreed to add monthly free-product recovery for this site following the 2006 field season.	U.S. Navy 2010e, Appendix K
Conduct visual monitoring of shoreline and surface water for petroleum seeps and sheens at SWMU 61 in the vicinity of wells 14-113 and 14-210.	05/21/2007	Implemented through revisions to the CMP.	U.S. Navy 2007d
Implement future monitoring recommendations detailed in Section 6.4.	05/21/2007	Implemented through revisions to the CMP.	U.S. Navy 2007d

Notes:
ADEC - Alaska Department of Environmental Conservation
CMP - Comprehensive Monitoring Plan
EPA - U.S. Environmental Protection Agency
MEC - munitions and explosives of concern
OU - operable unit
Refuge - Alaska Maritime National Wildlife Refuge
ROD - Record of Decision
SWMU - solid waste management unit
UXO - unexploded ordnance

6.0 FIVE-YEAR REVIEW PROCESS

6.1 FIVE-YEAR REVIEW TEAM

The Navy is the lead agency for this 5-year review. Personnel from NAVFAC Northwest represented the Navy in this 5-year review. Project managers and other staff from the EPA and ADEC, the Alaska Department of Transportation and Public Facilities (ADOT&PF), and the other 5-year review team members have also participated in the review process. Both the EPA and ADEC are cosignatories of the RODs for the former Adak Naval Complex. All team members had the opportunity to provide input to this report.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

CERCLA Section 117(a), as amended, has specific requirements, including the distribution of certain reports to the public and that the public be notified of proposed cleanup plans and remedial actions. The community notification and involvement activities are described below.

6.2.1 Community Involvement During the Five-Year Review

A fact sheet was mailed to community members on November 4, 2010, advising that the Navy was performing a 5-year review and providing an opportunity for public review and comment. Community members (primarily Restoration Advisory Board [RAB] members) were interviewed as part of the site interview process described in Section 6.6. Aside from the interview responses, the Navy received no responses on the 5-year review.

6.2.2 History of Community Involvement

The Navy has maintained an ongoing community involvement program since environmental investigations were initiated at Adak. The community has been informed of activities at the site through fact sheets, public notices, open houses, public meetings, a Web site, and toll-free hot lines. Proposed plans were distributed for public comment prior to finalization of the RODs. Details of the community involvement history are provided in the following sections.

Information Repositories

The Information Repository, which includes a copy of the Administrative Record, is located at the University of Alaska, Reserve Room, 3211 Providence Drive, Anchorage, Alaska, and is available to the public. The Administrative Record includes all documents used by the parties to the FFA in decision making regarding Adak remediation. The official copy of the Administrative Record is located at NAVFAC Northwest, Silverdale, Washington. In addition,

documents regarding the environmental investigation of Adak and the cleanup process are available to individuals on Adak at the Bob Reeve High School. The entire body of documents produced relative to CERCLA actions is intended to be available on Adak, together with copies of community and RAB briefing materials, newsletters, and fact sheets. It is not clear that the document repositories on Adak and in Anchorage are complete, especially with recent documents generated during this 5-year review period. Recently issued documents are, however, available at the Web site for Adak environmental cleanup, *www.AdakUpdate.com*. This 5-year review includes a recommendation to inventory and update the document repositories if necessary.

Community Relations Plan

The Community Relations Plan (CRP) formalizes the process for involving the Adak Island community, members of the public, and the extended community interested in environmental restoration and property reuse. The first CRP was prepared in 1993 and has been revised several times. The current CRP was updated in 2011.

Restoration Advisory Board

The Adak RAB was formed in 1996 to advise the Navy on decisions concerning cleanup on Adak. One of the RAB's activities is to review technical reports and provide comments and recommendations to the Navy.

The RAB originally consisted of approximately 45 interested private citizens and representatives of various organizations, such as TAC and the ARC. RAB membership has fluctuated since 1996. Since 2000, the Adak RAB membership has been updated periodically. Because Adak's population is transient, possible RAB candidates are identified and solicited by the on-island RAB co-chair and invited to an upcoming RAB meeting, where their names are presented for election to the board.

The RAB meets biannually, and all RAB meeting information is regularly posted on the Web site *www.AdakUpdate.com*. Meetings are held in Anchorage or on Adak Island, and facilities are provided to allow interested parties to participate by telephone. In the spring of 1999, the RAB received a Technical Assistance Public Participation grant from the Navy and was able to obtain a technical advisor (Dr. Ron Scrudato) to review documents and provide technical support. Since the time of the grant, the RAB members who applied for the grant have left the RAB, and the newer RAB members did not reapply.

Mailing List

The Navy maintains a mailing list as part of maintaining regular communication with the community. The list is updated regularly, as additional individuals request information or involvement.

Fact Sheets and Newsletters

Since September 1999, over 40 newsletters or fact sheets have been distributed. These newsletters, titled *Adak Update,* or fact sheets have been published as new issues, notifications, and significant documents are prepared. The newsletter is distributed to individuals and groups on the general mailing list. Additional copies of the newsletter and fact sheets are sent to the information repository on Adak and to the *www.AdakUpdate.com* Web site.

Hot Lines and E-mail

To support the local reuse authority and the RAB, the Navy established a toll-free hot line in December 1995. RAB members and citizens interested in reuse or environmental restoration of Adak are encouraged to call and to leave a message regarding their questions or concerns. Messages are retrieved daily and responded to as soon as possible, generally within 3 days. The excavation notification e-mail site is *AdakExcaNot@Navy.mil.* The hot-line telephone number is 1-866-239-1219.

Stakeholder Relations

As part of the current CRP, one-on-one stakeholder meetings continue to be conducted both in person and by telephone on a periodic basis. As an addendum to the formal public comment and communication requirements of the CERCLA process, this informal avenue of communication with island residents, by telephone calls, e-mail exchange, or through personal visits, often clarifies and supplements the Navy's understanding of on-island sentiment regarding the Navy cleanup process. This more casual style of communication with the island community parallels the required formal process, but better accommodates the Alaskan oral customs and traditions. Years of consistent and direct response to island concerns, voiced either formally or informally, has resulted in an expectation by residents that their concerns will be both understood and addressed by Navy.

Several on-island visits have also been conducted by Navy technical and project management staff in the course of oversight of field investigation and construction projects.

Web Site

A project Web site *www.AdakUpdate.com* is currently on line. The site is accessible through common Internet search engines. Information is added and updated on a regular basis. The site contains all project newsletters, materials prepared for the RAB, fact sheets and news releases. Links are also provided to appropriate technical documents and information on RAB meetings and public meetings and to state and federal agency sites. The Web site includes Adak history, photographs, and interactive maps. There are currently more than 90 individuals/groups who receive an e-mail notification when content is posted or updated. Stakeholders and the public may also e-mail their questions and comments using contacts listed on the site.

Signs

In the past, the Navy has posted ordnance signs, landfill signs, and fishing restriction signs on the island. In late 2003, the fishing advisory signs were removed at the request of the property owner with the concurrence of the Navy and regulatory agencies. The fishing advisory signs were replaced by an information pamphlet.

Fact sheets containing information on the fish/shellfish consumption and related advisories were sent to on-island residents in October 2003, July 2004, January 2006, August 2006, February 2008, and June 2010. The Navy intends to continue to issue fact sheets to on-island residents on a biannual basis.

The Navy implemented a sign improvement program in 2006, as discussed in detail in Section 4.1.4.

6.2.3 UXO Awareness Education

The Navy implemented a resident-focused UXO awareness education program on Adak Island in 1998. Under this program the Navy is responsible for ensuring that island residents and visitors are aware of the potential to encounter MEC on Adak Island and know proper procedures for reporting such encounters. In addition, the program provides notification of access restrictions that exist for Parcel 4. To carry out these responsibilities, the Navy:

- Provides informational materials to residents of Adak (e.g., bookmarks, maps, and water bottles). These materials convey information regarding how to report potential encounters with MEC.

- Provides hiking maps, DVDs, posters, and other informational materials to the City of Adak for distribution and dissemination to residents and visitors to Adak.

- Provides hiking maps to USFWS Adak office to be provided to applicants of commercial special use permits. These maps provide information on access restrictions and reporting procedures for potential MEC encounters. USFWS reports these maps are extremely useful to the visiting population on Adak.

- Inspects access restriction notifications and barriers to ensure they function properly

- Communicates with City of Adak and on island employers to ensure awareness of access restrictions and the Navy's intent to enforce them.

- Reviews any incident related to potential MEC encounters on Adak Island to assess the need for revising existing provisions of the Adak LUC and UXO Education Awareness Program and IC.

While no requirement exists under a CERCLA ROD to maintain ICs within Parcel 4 areas at this time, the Navy has placed signage and fencing, as well as blocked access roads to Parcel 4 areas to reduce access and exposure to these areas since 1999. Since then, the Navy has continued to review and make improvements to the IC program to reduce explosive hazard exposure in this area and has included Parcel 4 in the ICMP.

During the second 5-year review, issues were raised regarding the effectiveness of the education awareness program, the LUCs, and communications with stakeholders. Because of these issues, the Navy has completed a thorough overhaul of the educational awareness materials on the island. This overhaul included installation of a television monitor and DVD player at the airport, updates to the LUC and UXO awareness DVD, and updates to the LUC and UXO awareness materials and maps. The Navy has also continued to provide fact sheets on a regular basis to provide updated information on ICs.

In July 2007, a television monitor and DVD player were installed at the airport terminal to run automatically during plane arrivals/departures (U.S. Navy 2008a). This system plays on a timed run, from 1 hour before each commercial flight to 1 hour after each commercial flight, for viewing by island visitors. The controller is also capable of manual playback for non-commercial/scheduled flights. The system was set up with an uninterrupted power supply (UPS) to ensure the system remains operational during power outages. Since the system was installed, there have been a few minor power outages during which the UPS was able to maintain power to the system. However, there were two occasions where the system had been unplugged from the electrical outlet. If the UPS is left unplugged for more than 4 hours, this causes it to be unable to repower the system, requiring a manual reboot. To prevent future tampering with the wall plug, the system was plugged into an electrical outlet above the drop ceiling in 2008 (U.S. Navy

2009b). In addition, the system was reprogrammed in November 2007, shortly after a change to the flight schedules.

The existing UXO awareness DVD was replaced with a newly prepared LUC and UXO awareness DVD program in 2007 (U.S. Navy 2008a). This new DVD was updated utilizing UXO awareness content from the previously prepared DVD. However, in this version, the children's portion of the video was removed and was released separately. In addition, a completely new section was added to this DVD that specifically addresses LUCs in place at various sites across the island. The DVD also includes an advertisement section for on-island businesses. Business advertisements were included to foster a community-shared vision in the execution of the Adak LUC and UXO Education Awareness Program. Copies of both the adult and child version were distributed to all island residents, with extra copies available for distribution by USFWS to visitors. In 2008, the DVD was replaced with a new one containing updated business information (U.S. Navy 2009b).

The Navy updated the LUC and UXO awareness maps and materials in 2007 (U.S. Navy 2008a), and a new update is scheduled for completion in early 2011. In the 2007 update, the existing large hiking trail map was updated to include new LUC documentation. In addition, a smaller version of the hiking trail map was developed to provide visitors and residents with a more easily handled pocket version. The new maps were prepared on tear-proof, waterproof paper. In addition to the new maps, the bookmark was updated to include the new LUC documentation, and a new water bottle design was created. Maps, bookmarks, and water bottles were distributed to all island residents. Multiple copies of the maps were provided the USFWS at their Homer and Adak, Alaska, offices. Additional quantities of the water bottles and bookmarks were also provided to the USFWS office on Adak for distribution to visitors to the island. The Adak school also received materials for the children on the island, including the child version of the LUC and UXO awareness DVD, together with coloring books, highlighters, and water bottles.

In 2011, the Navy will be preparing a munitions response desk guide that provides the following:

- Procedures for local officials to follow in the event of a MEC discovery. These procedures are already in place as part of the ICMP. However, this desk guide will make the information more accessible and establish a mechanism for verifying the information every 6 months.

- Identification of which areas of the island are generally the responsibility of the U.S. Army Alaska Fort Richardson Explosive Ordnance Disposal (EOD) Unit and versus the U.S. Navy Naval Air Station Whidbey EOD Mobile Unit Eleven for munitions response and a summary of exceptions that may occur.

- A geographic information system-based graphic showing historical MEC recoveries across the island, so that responders will know what has been found in an area they are mobilizing to.

The distribution of the desk guide will be limited to organizations with an active role in MEC response on Adak, including the City of Adak, the Adak police department, U.S. Army Alaska Fort Richardson EOD Unit, U.S. Navy Naval Air Station Whidbey EOD Mobile Unit Eleven, EPA, and ADEC. The desk guide is expected to be completed in the last calendar quarter of 2011.

6.3 DOCUMENT REVIEW

Documents reviewed during this 5-year review were primarily those describing the construction and monitoring of the selected remedies, including ICs monitoring and site inspections, up through the 2010 field season. The primary documents that were reviewed are listed below, and all of the documents reviewed are listed in Section 11.

- The signed RODs and amendments (U.S. Navy, USEPA, and ADEC 1995, 2000, 2001, 2002, and 2003)
- The signed decision documents (U.S. Navy and ADEC 2005a, 2006a, 2006b, 2006c, and 2007)
- The first and second 5-year review reports (U.S. Navy 2001b and 2006b)
- The current and previous versions of the CMP (U.S. Navy 2001a, 2004, 2005c, 2007d, and 2010a)
- Proposed long-term monitoring technical memoranda for NMCB Building Area, T-1416 Expanded Area; South of Runway 18-36 Area; SWMU 17, Power Plant No. 3; and SWMU 62, New Housing Fuel Leak site (U.S. Navy 2005d, 2006a, 2006e, and 2006f)
- The most recent groundwater and landfill monitoring reports and data
- Annual and monthly free-product recovery reports
- Various closure, cleanup, and completion reports
- Historical site assessment, inspection, and RI/FS reports

Review of these documents provided much of the information included in Sections 3 and 4 regarding the description of the sites, the RAOs and selected remedy components for each site, and the status of remedy implementation and monitoring at each site.

6.4 DATA REVIEW

This section describes trends in data collected through monitoring programs at the former Adak Naval Complex, with emphasis on data collected since the last 5-year review. The monitoring programs are described in Section 4, and the implications of the data on the functionality and protectiveness of the remedies are discussed in Sections 7 and 8. Trends for the data summarized herein are detailed in the annual groundwater monitoring report (U.S. Navy 2011a) and the annual landfill monitoring report (U.S. Navy 2011b). These documents are available for review in the document repositories in Anchorage, on Adak Island, and in Silverdale, Washington (see Section 6.2.2). Appendix C provides historical and current monitoring data in Excel spreadsheets. Statistical significance of a trend is defined in the OU A ROD (U.S. Navy, USEPA, and ADEC 2000) as a trend with a degree of confidence that is at least 80 percent. Trend evaluations included in the most recent groundwater monitoring report are summarized in this document. In addition, the Mann-Kendall trend summary table for the data summarized in this section and figures will be included in the Site Catalog for each site (Appendix A). Remedy status and changes to the monitoring program are briefly restated, as appropriate, in this section for context.

Most of the data collected at the former Adak Naval Complex between October 1, 2005 and September 30, 2010 have been collected in support of long-term monitoring at OU A sites, or in support of remedy selection and implementation at OU A and OU B-1 sites. Data collected in support of remedy selection or implementation have been documented in decision documents or closure reports, respectively. These data are not discussed in detail in this section, but are incorporated into site-specific data trend discussions where appropriate. However, data collected in support of remedy implementation are summarized in the Site Catalog entries for each site (Appendix A).

In general, monitoring has been conducted at OU A sites annually. Monitoring at OU A has been prescribed by the CMP for OU A, which has been revised four times since 2001 (U.S. Navy 2001a, 2004, 2005c, 2007d, and 2010a). Revisions have been reviewed and approved by ADEC and EPA. The CMP has been revised for the following reasons:

- To reflect site status changes as remedial progress is realized, with corresponding changes to monitoring programs

- To augment monitoring requirements for sites at which monitoring was previously prescribed, but remedial decisions were recently documented

- To incorporate monitoring requirements at additional sites for which remedial decisions have been recently documented

Free-product monitoring (product-thickness) has been performed annually at all petroleum sites as part of the annual groundwater monitoring activities, and monthly at petroleum sites where free-product recovery has been performed as part of remedy implementation or at the request of ADEC. Locations where free-product thickness measurements have been collected are documented in the monitoring history section of the Site Catalog (Appendix A). Product thickness data are summarized in two Excel spreadsheets in Appendix C. The Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" provides the product thickness data collected during the annual groundwater monitoring activities. Only nonzero product thickness data are included in this spreadsheet. The Excel spreadsheet titled "Recovered Product Thickness Summary 2006 through 2010" provides a summary of product thickness data collected during the monthly free-product recovery activities. Information is provided for each year of free-product recovery activities (September 2006, October 2006 through September 2007, October 2007 through September 2008, October 2008 through September 2009, and October 2009 through September 2010) including minimum, maximum, and average product thickness, and number of months product found. This information is provided for each well where monthly free-product activities occurred during this 5-year review period.

Recovered product volume data are also summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 through 2010." Information is provided for each year of free-product recovery activities, including the minimum, maximum, average, and total monthly volume of recovered product for each year of activities and the total volume recovered during this 5-year review period. This information is provided for each well where free-product recovery activities have occurred, including any free product recovered during the annual groundwater monitoring events. The total volume of product recovered at each site during each year of product recovery and the total volume recovered at each site during this 5-year review period are also provided in this spreadsheet.

Free-product monitoring and free-product recovery activities are described in this section on a site-specific basis, including a discussion of product thickness and recovered product volume data. The text in this section is not intended to be a comprehensive discussion of all of the data collected in conjunction with the free-product recovery activities, but is meant to highlight the significant data.

The data review is summarized on a site-specific basis. Analytical results for groundwater, surface water, and sediment monitoring are compared to the endpoint criteria specified in the

CMP (U.S. Navy 2010a). For most of the sites, the endpoint criteria for groundwater are based on the ADEC groundwater cleanup levels (18 AAC 75.345). However, there are nine sites where the groundwater endpoint criteria are 10 times the ADEC groundwater cleanup levels, as specified in the decision documents for these sites (U.S. Navy and ADEC 2005a, 2006a, 2006b, 2006c, and 2007). These nine sites are the following:

- NMCB Building Area, T-1416 Expanded Area
- NORPAC Hill Seep Area
- SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs
- SA 82, P-80/P-81 Buildings, USTs 10587, 10579, and AST 10333
- SA 88, P-70 Energy Generator, UST 10578
- South of Runway 18-36 Area
- SWMU 17, Power Plant No. 3
- SWMU 58/SA 73, Heating Plant 6
- Yakutat Hangar, UST T-2039-A

At the conclusion of each of the site-specific data review sections (Sections 6.4.2 through 6.4.31), recommendations are made regarding future monitoring. In some cases, recommendations are also included regarding future free-product recovery, additional investigation, or remedy optimization. As recommended in Section 8, recommendations developed in this section should be incorporated into the analysis being performed by the existing Optimization Work Groups lead by NAVFAC Atlantic and NAVFAC Engineering Services Center. These Optimization Work Groups are in the process of optimizing the remedies and monitoring approach for Adak (see reference to these Optimization Work Groups in the interview response by ADEC in Appendix B). The primary objective of the optimization effort is to ensure that the monitoring program provides the quantity and quality of monitoring data necessary to make informed decisions regarding remedial system operation, including passive remedies, to verify progress toward remediation goals, and when possible, to achieve cost savings without impacting data quality. The optimization effort includes evaluation of program goals and objectives, number and location of monitoring wells, monitoring frequency, list of analytes, reporting, and data trends.

During the data review it was observed that the remedial action summary reports for free-product recovery at NMCB Building Area, SWMU 62, New Housing Fuel Leak, and South of Runway 18-36 Area did not provide adequate documentation of the free-product recovery operations at the site, including types of equipment installed in each well or recovery sump and maintenance activities performed (see also Section 4.1.3).

6.4.1 Natural Attenuation

Natural attenuation is a remedial component for many of the OU A sites. Natural attenuation parameters (NAPs), which are indicators of natural attenuation activity, have been measured at applicable sites by the Navy since at least 1999. NAPs were monitored annually until 2004. NAPs monitoring frequency was reduced to once every 5 years, with the last monitoring conducted in 2009. NAP monitoring results and interpretation of these results is presented in the 2009 annual groundwater monitoring report (U.S. Navy 2010e). In addition, the USGS characterized the effectiveness of natural attenuation processes for remediating petroleum-contaminated groundwater at OU A at the former Adak Air Complex (USGS 2005).

Both the Navy and USGS data indicate that natural attenuation of petroleum hydrocarbons, via biological and or chemical means, is ongoing at Adak. The USGS study (USGS 2005) and annual reports prepared for the 2001 through 2005 monitoring events document the evidence used and provide the rationale for this conclusion.

One of the three objectives in the ROD (Section 10.2.2 of the ROD) is to estimate the rate of natural attenuation to demonstrate achievement of endpoint criteria within 75 years. In the event that the natural attenuation estimate does not demonstrate that the 75-year time frame will be met, enhancement of monitored natural attenuation or use of alternative remedial actions will be evaluated and discussed with ADEC.

The CMP (U.S. Navy 2010a) specifies use of the Mann-Kendall test to indicate if a concentration trend is significantly different from zero (i.e., concentrations are decreasing or increasing). The Mann-Kendall test is applied to groundwater data sets from wells that demonstrate COC concentrations above cleanup levels and have at least four data points. The Sen's test is applied to data sets that demonstrate a Mann-Kendall trend that is decreasing. A Mann-Kendall statistic greater than zero indicates an increasing trend. A Mann-Kendall statistic less than zero indicates a decreasing trend. If the concentration of a chemical in groundwater is greater than the endpoint criterion at an individual well, and the Mann-Kendall test indicates a decreasing concentration trend, the Sen's test (Gilbert 1987) is to be used to calculate the slope (i.e., concentration change over time) of the trend line. This slope can then be used to estimate the time that the endpoint criterion at an individual well for an individual analyte may be achieved based on the existing data.

In some cases where a Sen's slope was not calculated in the 2010 annual report and a decreasing trend is apparent but not necessarily at an 80 percent confidence interval, a simple linear regression was used in this 5-year review to provide a very rough estimate of time for monitored natural attenuation to achieve endpoint criteria. No level of confidence is applied to the regressions or the estimated time to achieve the endpoint criterion. The results should be

considered as a basic approach to see if the 75-year monitored natural attenuation time frame is still reasonable.

At the locations where data are sufficient to support an estimate, the following subsections indicate that analyte concentrations will decrease to the endpoint criteria well before the 75-year time frame expires, via natural attenuation processes. Where the available data are insufficient to draw conclusions, or where data trends indicate either stable or increasing concentrations, no estimation of the time to reach the endpoint criteria is possible.

The statistical approach specified in the CMP (U.S. Navy 2010a) was based on small data sets. The monitoring program has matured and the data sets are now larger. The programmatic conclusion is that consideration should be given to revising the statistical approach specified in the CMP to provide more meaningful interpretation of the data.

6.4.2 Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at one location (ANT-601) at the Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4) from 2006 through 2010. Monitored natural attenuation is the remedy selected for this site (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected from this well to evaluate groundwater quality relative to the endpoint criteria (for this site the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring. Groundwater samples were collected from well ANT-601 for DRO and NAPs analyses. DRO analyses were conducted annually, and NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. Since increasing trends in DRO concentrations were observed at this site in 2006, 2007, and 2008, the Navy performed a supplemental investigation of this site in 2010 to further characterize the extent of petroleum hydrocarbons in soil and groundwater and to determine if additional cleanup is required. The investigation included monitoring well installation to assess groundwater flow at the site. During this supplemental investigation, fourteen soil borings were sampled and six additional wells were installed at the site. Soil boring results are discussed in the Site Catalog included as Appendix A. All new well locations were dry. Therefore, only one groundwater sample was collected in July 2010 from the existing well, ANT-601, and this sample was analyzed for DRO.

The 2010 field observations resulted in a refined understanding of the site geography. It was long thought that ANT-601 was approximately 75 feet downgradient of the largest former UST excavation. However, the field observations were that ANT-601 is positioned immediately adjacent to the largest former UST excavation. Exploratory borings were completed to confirm

this observation and significantly revise the site map (U.S. Navy 2010f). It has been very difficult to produce sufficient water volume from ANT-601 in the past to collect groundwater samples for analysis. With this refined understanding, the presence of groundwater in ANT-601 is likely a result of water buildup in the former UST excavation and not representative of an appreciable groundwater resource at the site. If that is the case, then the wells installed in 2010 will remain essentially dry.

The Site Catalog in Appendix A includes a figure that shows the location of monitoring well ANT-601 relative to potential source areas. Monitoring well ANT-601 is positioned immediately adjacent to the largest former UST excavation.

Analytical Results. DRO was reported in groundwater samples collected at well ANT-601 from 2006 to 2010 at concentrations ranging from 1,100 to 4,300 µg/L. Samples collected in September 2009 and July 2010 did not exceed the endpoint criterion of 1,500 µg/L. Samples collected in September 2006, September 2007, September 2008, and September 2010 exceeded the endpoint criterion. The highest DRO concentration was measured in the 2006 sample from this well.

As discussed above, DRO concentrations at location ANT-601 exhibited increasing trends in 2006, 2007, and 2008. As a result, the supplemental investigation was performed. DRO concentrations measured in September 2009 (annual groundwater monitoring) and July 2010 (supplemental investigation) were 1,400 and 1,100 µg/L, respectively, which are both below the endpoint criterion. Although the concentration at location ANT-601 in September 2010 increased to 2,100 µg/L, the results of the supplemental investigation suggest that the groundwater has a limited extent at the site. Furthermore, concentrations in ANT-601 in 2009 and 2010 did not exhibit a statistically significant increasing trend.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Antenna Field site (USTs ANT-1, ANT-2, ANT-3, and ANT-4). Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Future Monitoring Recommendations

Although DRO concentrations in samples collected from ANT-601 were above the endpoint criterion, which is based on the ADEC cleanup level, in September 2006, September 2007, September 2008, and September 2010, monitoring should be discontinued at this site. The results of the supplemental investigation indicate that groundwater in ANT-601 is likely a result of water buildup in the former UST excavation and not representative of an appreciable

groundwater resource at the site. Furthermore, ADEC concurs with discontinuing monitoring, because of the inconsequential volume of groundwater at this site.

6.4.3 Former Power Plant, Building T-1451

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at locations 01-118, 01-150, 01-151, and E-701 at the Former Power Plant, Building T-1451 site from 2006 through 2010. Monitored natural attenuation is the remedy selected for this site (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected from these wells to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring.

Background monitoring for DRO, GRO, residual-range organics (RRO), BTEX, and NAPs was initiated at well E-701 during 2002. Based on results through 2004, ADEC and EPA concurred with discontinuing DRO, GRO, RRO, and BTEX monitoring at well E-701. Annual NAPs monitoring at well E-701 was performed from 2006 through 2009 to document background conditions. After the 2009 monitoring event, the frequency of NAPs monitoring in E-701 was decreased to once every 5 years.

Monitoring of well 01-118 was initiated in 1999, and monitoring of wells 01-150 and 01-151 was initiated in 2003. From 2006 through 2010, groundwater samples have been collected from each of these three wells for DRO analysis. NAPs monitoring is conducted every 5 years in these three wells, with the most recent sampling event occurring in 2009. In addition, the samples collected from 01-118 were analyzed for RRO from 2006 through 2008, and samples collected from 01-151 were analyzed for semivolatile organic compounds (SVOCs) and BTEX (to determine concentrations of total aromatic hydrocarbons [TAH] and total aqueous hydrocarbons [TAqH]) from 2007 through 2010. Analysis of samples collected from 01-118 for RRO was discontinued after the 2008 sampling event, because concentrations were below the endpoint criterion for two sampling events and trend analysis showed a decreasing trend. The 2006 groundwater monitoring report recommended analyzing the sample collected from 01-151 for TAH and TAqH as a one-time event, because of its proximity to surface water and because the concentration of DRO in this well exceeded the endpoint criterion. Because the concentration of TAqH exceeded surface water quality criteria in 2007, monitoring for these two parameters continued through 2010.

The 2008 groundwater monitoring report recommended that shoreline inspections of East Canal between SWMU 62, New Housing Fuel Leak Area and South of Runway 18-36 Area be conducted annually, because an oil seep is located downgradient of this site in East Canal.

Furthermore, the 2009 groundwater monitoring report recommended that one surface water (analyzed for DRO, TAH, and TAqH) and one sediment sample (analyzed for DRO and PAHs) be collected annually in East Canal downstream of boom 9 (location NL-08). These activities were implemented in 2009 and 2010, respectively.

Since increasing trends in DRO concentrations were observed at wells 01-150 and 01-151 and visible petroleum contamination has been observed in East Canal at this site in 2007, 2008, and 2009, options to augment the existing remedy at this site were evaluated through an engineering evaluation/cost analysis (EE/CA). Additional data were collected in 2009 during an additional site investigation and in 2010 during a supplemental investigation to assess impacts to surface water and sediment in East Canal and improve delineation of the extent of petroleum-impacted soils, in support of the EE/CA. During the 2009 investigation, four surface water and sediment locations within East Canal were sampled. The location immediately upgradient of boom 9 (EC-02) was sampled to assess whether SWMU 62 is impacting East Canal in the vicinity of the Former Power Plant, Building T-1451 site. One location adjacent to the seep at boom 9 (EC-03) was sampled to characterize seep contaminants. Two locations downgradient of boom 9 were sampled to determine the downgradient edge of the seep (EC-04) and to determine if contaminants are entering the transfer pipe to West Canal (EC-05). The surface water samples were analyzed for DRO, GRO, BTEX, and PAHs, and the sediment samples were analyzed for RRO, DRO, GRO, and BTEX. In addition, nine subsurface soil borings were advanced upland of the visual petroleum contamination at the boom 9 seep. No sample was collected from these borings, but materials from the borings were visually inspected for the presence of free product. During the 2010 supplemental investigation, 15 soil borings were sampled. Soil boring results are discussed in the Site Catalog attached as Appendix A. No groundwater sampling was performed as part of these additional investigations.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells and the surface water and sediment sampling location NL-08 relative to potential source areas at the Former Power Plant, Building T-1415 site and the downgradient surface water body, East Canal of the airport ditch system. Monitoring wells 01-118, 01-150, and 01-151 are located within the dissolved petroleum plume downgradient from the former petroleum-release area at this site and upgradient from the East Canal. Monitoring well E-701 is located approximately 400 feet south from the former petroleum release area. This well is located beyond the dissolved-petroleum plume and has been identified as a background monitoring location for the downtown area on Adak Island. NL-08 is located within East Canal downgradient of the site. The 2009 surface water and sediment sampling locations are included in the technical memorandum for this additional sampling activity (U.S. Navy 2010b).

Analytical Results. DRO was reported in groundwater samples collected at well 01-118 from 2006 to 2010 at concentrations ranging from 7,000 to 9,300 µg/L, and RRO was reported at concentrations ranging from undetected (with a reporting limit of 2,000 µg/L) to 890 µg/L. The

highest DRO and RRO concentrations at well 01-118 were measured in the 2008 sample. Concentrations of DRO in samples collected from well 01-118 from 2006 through 2010 all exceeded the endpoint criterion of 1,500 µg/L. Detected concentrations of RRO in this well for this time period did not exceed the endpoint criterion of 1,100 µg/L.

DRO was reported in groundwater samples collected at well 01-150 from 2006 to 2010 at concentrations ranging from 1,100 to 3,400 µg/L. The highest DRO concentration at this well was measured in the 2008 sample. This value exceeded the endpoint criterion of 1,500 µg/L. All other DRO concentrations in this well for this 5-year review period were below the endpoint criterion. DRO was reported in the downgradient well 01-151 from 2006 through 2010 at concentrations ranging from 3,000 to 4,600 µg/L. The highest DRO concentration at well 01-151 was measured in the 2010 sample. TAH was reported in well 01-150 from 2007 through 2010 at concentrations ranging from 4.56 to 6.76 µg/L, and TAqH was reported at concentrations ranging from 19.1 to 35.2 µg/L. The highest TAH and TAqH concentrations were measured in the 2009 sample. Concentrations of DRO in samples collected from well 01-151 from 2006 through 2010 all exceeded the endpoint criterion of 1,500 µg/L, and concentrations of TAqH in samples collected from this well from 2007 through 2010 exceeded the ADEC surface water quality standard of 15 µg/L. TAH concentrations were below the ADEC surface water quality standard of 10 µg/L.

DRO was reported in surface water samples collected in 2009 at a concentrations ranging from 160 to 310 µg/L. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water sample collected at EC-03 adjacent to the seep is greater than the endpoint criterion established for the South of Runway 18 36 Area (250 µg/L). All other DRO concentrations were less than the endpoint criterion. GRO was reported in surface water samples collected in 2009 at a concentrations ranging from 61 to 220 µg/L. No ADEC surface water quality criterion exists for GRO, but the concentration detected in the surface water sample collected at EC-05 near the transfer pipe to West Canal is greater than the endpoint criterion established for the South of Runway 18 36 Area (114 µg/L). Indeno (1,2,3-cd) pyrene was not detected in the surface water samples collected in 2009. TAH was reported in the 2009 surface water samples at concentrations ranging from 3.69 to 20.55 µg/L, and TAqH was reported at concentrations ranging from 3.75 to 21.54 µg/L. TAH and TAqH concentrations were below the ADEC surface water quality standards of 10 and 15 µg/L, respectively, in all surface water samples except the sample collected from EC-05. (Note that GRO, TAH, and TAqH concentrations at EC-03, which is adjacent to the site, and EC-04, which is just downgradient of the site, did not exceed endpoint criteria or surface water quality criteria.)

DRO was reported in the surface water sample collected at NL-08 in 2010 at a concentration of 240 µg/L. TAH and TAqH were reported in the 2010 surface water sample at concentrations of 6.2 and 6.3 µg/L, respectively. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water is less than the endpoint criterion established for the

South of Runway 18-36 Area (250 µg/L). Both the TAH and TAqH concentrations are below the ADEC surface water quality standards.

RRO was reported in sediment samples collected in 2009 at concentrations ranging from 100 to 620 mg/kg. DRO was reported in sediment samples collected in 2009 at concentrations ranging from 78 to 660 mg/kg. GRO and BTEX were not detected in the sediment samples collected from locations EC-02, EC-03, and EC-04, and benzene and toluene were not detected in the sediment sample collected from location EC-05. GRO, ethylbenzene, and total xylenes were detected in the sediment sample collected from EC-05 at concentrations of 76, 0.11, and 0.326 mg/kg, respectively. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO and GRO were compared to the South of Runway 18-36 Area endpoint criteria. The DRO concentration was above the South of Runway 18-36 endpoint criterion of 90.6 mg/kg in the samples collected from locations EC-02, EC-04, and EC-05. The GRO concentration was above the South of Runway 18-36 endpoint criterion of 12.2 mg/kg in the samples collected from location EC-05. (Note that concentrations at EC-03, which is adjacent to the site, and EC-04, which is just downgradient of the site, did not exceed endpoint criterion.) Endpoint criteria were not established for RRO or BTEX at the South of Runway 18-36 Area.

DRO was reported in the sediment sample collected at NL-08 in 2010 at a concentration of 51 mg/kg. Eight PAHs were reported in the 2010 sediment sample at concentrations ranging from 1.1 to 1.7 µg/kg. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO were compared to South of Runway 18-36 Area endpoint criterion, and detected PAH compounds were compared to the most stringent ADEC soil cleanup levels. The DRO concentration was below the South of Runway 18-36 Area endpoint criterion of 90.6 mg/kg, and the detected PAH concentrations were all well below the most stringent ADEC soil cleanup levels. A visual inspection of the shoreline of East Canal downgradient of the site was performed in 2009 and 2010. In 2009 and 2010, inspectors noted the presence of a seep downgradient of the Former Power Plant, Building T-1451 site, a petroleum hydrocarbon odor, and a sheen on the water. Petroleum is seeping out of ground at boom 8, and sheen and petroleum-stained sediments were observed along the entire length of East Canal.

DRO concentrations at well 01-118 generally exhibited a decreasing trend from 2006 through 2010. As discussed above, DRO concentrations at location 01-151 exhibited increasing trends in 2006 through 2010. DRO concentrations at location 01-150 were below endpoint criterion for the last two years of monitoring. Therefore, a trend analysis was not performed for this well in the 2010 annual groundwater monitoring report. Because of the increasing trends in DRO concentrations in 2007, 2008, and 2009 at wells 01-150 and 01-151 and because visible petroleum contamination has been observed in East Canal at this site, options to augment the

existing remedy at this site were evaluated through an EE/CA and a supplemental investigation was performed in 2010.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Former Power Plant, Building T-1451 site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" located in Appendix C. The following summarizes the significant product thickness data for the Former Power Plant, Building T-1451 site.

Between September 1999 and September 2010, monitoring wells within the vicinity of the Former Power Plant, Building T-1451 have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. Between October 2005 and September 2010, four monitoring wells within the vicinity of the Former Power Plant, Building T-1451 site have been gauged for the presence of free product. Free product was detected once in well 01-118 in September 2009, at a thickness of 0.01 foot. It was not detected in 2010.

Natural Attenuation Assessment

Sulfate concentrations (0.16 to 0.07 mg/L) for wells within the contaminant plume are depleted compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (5 to 50 mg/L) are elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the Former Power Plant site, as demonstrated by elevated methane concentrations in plume and downgradient wells ranging from 4,600 to 12,000 µg/L compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates anaerobic natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2010e) are summarized in Table 6-1. The DRO concentrations in samples from well 01-118 are decreasing. DRO concentrations in samples from well 01-151 exhibit an increasing trend. Using the median and lower slope limits and the 2010 DRO concentration in groundwater at well 01-118, DRO could

reach the endpoint criterion in 2016 to 2024, if the 2010 trend continues. DRO concentrations were increasing in samples from wells 01-150 and 01-151. So an estimated time to achieve the endpoint criterion is not appropriate.

Future Monitoring Recommendations

DRO concentrations in two of the three wells (01-118 and 01-151) were consistently above the endpoint criterion, which is based on the ADEC cleanup level. The DRO concentrations in one of the wells (01-150) exceeded the endpoint criterion in 2008. Furthermore, DRO concentrations exhibited an increasing trend in well 01-151. The TAqH concentrations in well 01-151, which is located adjacent to East Canal, were consistently above the ADEC surface water quality standard.

The concentration of DRO in surface water collected at EC-03 in 2009 adjacent to the site exceeded the South of Runway 18-36 Area endpoint criterion. However, DRO concentrations did not exceed the South of Runway 18-36 Area endpoint criterion in surface water samples collected in 2009 downgradient of the site (EC-04 and EC-05). GRO, TAH, and TAqH concentrations in the surface water sample collected from EC-05 in 2009 were above either the ADEC surface water quality criteria or South of Runway 18-36 Area endpoint criteria. As indicated above, the exceedance of the GRO endpoint criterion and the exceedance of TAH and TAqH surface water quality criteria at EC-05 are most likely unrelated to the Former Power Plant, Building T-1451 site, because concentrations at EC-03, which is adjacent to the site, and EC-04, which is just downgradient of the site, did not exceed endpoint criteria or surface water quality criteria. The concentration of DRO in sediment samples collected in 2009 at EC-02, EC-04, and EC-05 exceeded the South of Runway 18-36 Area endpoint criterion, and the concentration of GRO in the sediment sample collected in 2009 at EC-05 exceeded the South of Runway 18-36 Area endpoint criterion. As indicated above, the exceedance of the GRO endpoint criterion at EC-05 is most likely unrelated to the Former Power Plant, T-1451 site, because concentrations at EC-03, which is adjacent to the site, and EC-04, which is just downgradient of the site, did not exceed endpoint criteria. No exceedance of ADEC surface water quality criteria or South of Runway 18-36 Area endpoint criteria was detected in the surface water sample collected at NL-08 in 2010, and no exceedance of ADEC soil cleanup levels or South of Runway 18-36 Area endpoint criteria was detected in the sediment sample collected at this same location. However, the 2010 visual inspection noted the presence of a seep. In addition, a petroleum hydrocarbon odor, a sheen on the water, and petroleum-stained sediments were observed along the entire length of East Canal.

Based on the exceedances of the South of Runway 18-36 Area surface water and sediment endpoint criteria in 2009 and the presence of a free-product seep at the site, additional sediment and surface water sampling and an evaluation of site-specific risks are recommended for this site. This additional evaluation is recommended because the risk-based endpoint criteria for the South of Runway 18-36 Area may not be representative of risks associated with the Former Power

Plant, T-1451 site. Additional investigation of the GRO, TAH, and TAqH exceedances in surface water and the GRO exceedance in sediment at EC-05 is also recommended. Furthermore, annual groundwater, surface water, and sediment monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), and visual inspection of East Canal should also be continued.

6.4.4 GCI Compound, UST GCI-1

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the GCI Compound, UST GCI-1 site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected monitored natural attenuation with ICs as the final remedy for this site (U.S. Navy and ADEC 2005a). Groundwater samples were collected at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate NAPs.

Monitoring at well 04-701 was initiated in 1999, and monitoring at 04-100 was initiated in 2003. Monitoring of wells 04-202 and 04-210 was initiated in 2005 as part of final remedy implementation. Monitoring of wells 04-204, 04-213, MRP-MW9 was initiated in 2006. Well 04-204 was added to assess the presence or absence of an upgradient source based on a recommendation made in the 2005 groundwater monitoring report, and wells 04-213 and MRP-MW9 were added based on a request by ADEC for a one time sampling event in these wells. Since concentrations in MRP-MW9 were well below endpoint criteria, monitoring was discontinued in this well following the 2006 sampling event. However, concentrations in the sample collected at 04-213 were above the endpoint criteria. Therefore, continued annual sampling of this well was performed. The Navy has conducted annual groundwater monitoring at five locations (04-100, 04-202, 04-204, 04-210, and 04-213) from 2006 through 2010. The Navy has also conducted groundwater monitoring at 04-701 in even years. The frequency of monitoring was reduced at 04-701, because GRO and BTEX have not migrated in groundwater to this downgradient monitoring point at concentrations greater than endpoint criteria.

Groundwater samples have been collected from each well where sampling was planned for DRO, GRO, benzene, BTEX, and/or NAPs analyses. A sample was not collected from well 04-202 in 2006 and 2007, because free product was present in the well. In 2006, samples were collected from all wells except 04-202, and analyzed for GRO and BTEX. In addition, groundwater samples collected from well 04-100, 04-204, 04-213, and MRP-MW9 were also analyzed for DRO. In 2007, samples were collected from well 04-100, 04-204, 04-210, and 04-213, and analyzed for GRO. In addition, samples collected from well 04-100, 04-204, and 04-210 were

analyzed for BTEX, and the sample collected from 04-100 was analyzed for DRO. In 2008, samples were collected from wells 04-100, 04-202, 04-204, 04-210, 04-213, and 04-701, and analyzed for GRO. In addition, samples collected from well 04-100, 04-202, 04-204, and 04-210 were analyzed for BTEX, the sample collected from 04-100 was analyzed for DRO, and the sample collected from 04-701 was analyzed for benzene. In 2009, samples at all wells where sampling was planned were analyzed for NAPs. In addition, samples collected from well 04-100, 04-202, 04-204, and 04-210 were analyzed for GRO and benzene, and the sample collected from 04-213 was analyzed for GRO. Finally, in 2010, samples at all wells where sampling was planned were analyzed for GRO. In addition, samples collected from well 04-100, 04-202, and 04-701 were analyzed for benzene, and the sample collected from 04-204 was analyzed for DRO.

Monitoring for DRO in well 04-204 was discontinued in 2007, because DRO was not detected in this well above the endpoint criterion. Monitoring for DRO and BTEX in well 04-213 was discontinued in 2007, because ADEC requested one time monitoring in 2006 and these constituents were not detected above their respective endpoint criteria. However, monitoring GRO in this well was continued, because the concentration exceeded the endpoint criterion. The 2008 groundwater monitoring report recommended discontinuing DRO, toluene, ethylbenzene, and xylenes at 04-100 and toluene, ethylbenzene, and xylenes at 04-202, 04-204, 04-210, and 04-701, because no exceedance of endpoint criteria for DRO, toluene, ethylbenzene, and total xylenes had been observed since monitoring commenced in 2004. Therefore, monitoring for these constituents in these wells was discontinued. A one-time sampling of DRO in well 04-204 was conducted in 2010.

The Site Catalog in Appendix A includes a figure that shows the location of these monitoring wells relative to potential source areas at the GCI Compound site. This figure is accessed through the "Current Monitoring" link for this site in the Site Catalog. Wells 04-202 and 04-210 are located along the centerline of the dissolved plume, with 04-202 near the former source area and 04-210 located approximately 180 feet downgradient. Well 04-701 is located near the leading edge of the plume approximately 380 feet downgradient of 04-202, and well 04-100 is located south of the plume centerline approximately 150 feet southeast of well 04-202. Wells MRP-MW9 and 04-203 are located upgradient of the plume, approximately 140 feet northeast and 50 feet southeast of the former UST location, respectively. Well 04-213 is located approximately 90 feet south of the former UST, cross gradient to the plume.

Analytical Results. GRO and BTEX have not been measured at concentrations greater than their endpoint criteria or practical quantitation limits (PQLs) in groundwater samples collected from wells 04-204, 04-701, and MRP-MW9 during the 2006 through 2010 time period. In addition, DRO was not detected at a concentration greater than its endpoint criterion in the groundwater samples collected from 04-204 and MRP-MW9 in 2006. DRO was detected at a concentration greater than its endpoint criterion in the groundwater sample collected from

04-204 in 2010. Furthermore, concentrations of GRO at 04-701, which is located at the downgradient edge of the plume, appear to be generally increasing.

GRO was reported in groundwater samples collected at well 04-100 from 2006 to 2010 at concentrations ranging from 3,100 to 5,200 µg/L. The highest GRO concentration was measured in the 2006 groundwater sample. The GRO concentrations have all been greater than the endpoint criterion of 1,300 µg/L. DRO and BTEX constituents have not been measured at concentrations greater than their endpoint criteria or PQLs in groundwater samples from this well.

GRO was reported in groundwater samples collected at well 04-202 from 2006 to 2010 at concentrations ranging from 3,300 to 5,200 µg/L. The highest GRO concentration was measured in the 2009 groundwater sample. The GRO concentrations have all been greater than the endpoint criterion of 1,300 µg/L. BTEX constituents have not been measured at concentrations greater than their endpoint criteria or PQLs in groundwater samples from this well.

GRO and benzene were reported in groundwater samples collected at well 04-210 from 2006 to 2010 at concentrations ranging from 4,800 to 8,300 µg/L and undetected (at a detection limit of 1 µg/L) to 6.3 µg/L, respectively. The highest GRO and benzene concentrations were measured in the 2007 groundwater sample. The GRO concentrations have all been greater than the endpoint criterion of 1,300 µg/L. Benzene was measured only once at a concentration slightly above the endpoint criterion of 5 µg/L. Toluene, ethylbenzene, and total xylenes were not measured in the groundwater sample from this well at concentrations greater than their respective endpoint criteria.

GRO was reported in groundwater samples collected at well 04-213 from 2006 to 2010 at concentrations ranging from 3,300 to 6,900 µg/L. The highest GRO concentration was measured in the 2008 groundwater sample. The GRO concentrations have all been greater than the endpoint criterion of 1,300 µg/L. DRO and BTEX constituents were not measured at concentrations greater than their endpoint criteria or PQLs in the groundwater sample collected from this well in 2006.

GRO concentrations at well 04-202, 04-210, and 04-213 have generally been stable from 2006 through 2010. GRO concentrations at well 04-100 exhibited a decreasing trend. However, the trend was not statistically significant. Benzene concentrations during the last three monitoring events have been below the endpoint criterion, so no trend evaluation was performed for this compound. Toluene, ethylbenzene, and xylenes have not been monitored since 2008, because concentrations were below their respective endpoint criteria. DRO has not been monitored since 2008, except for a one-time monitoring event in well 04-204 in 2010.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the GCI Compound, UST GCI-1 site. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at one well (04-202) based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 through 2010." The following summarizes the significant product thickness data for the GCI Compound, UST GCI-1 site.

Between September 1996 and September 2010, monitoring wells within the vicinity of the GCI Compound have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, one well (04-202) was gauged monthly from May 2007 through May 2010, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Between October 2005 and September 2010, free product has been detected in three wells, 04-202, 04-203, and 04-204, at the site. The maximum measured free-product thickness in well 04-203 was 0.11 foot, measured in September 2007. The maximum measured free-product thickness in well 04-202 was 0.04 foot, measured in September of 2006 and 2007, and the maximum free-product thickness in well 04-204 was 0.01 foot, measured in September of 2009. Free product has not been detected at this site since September 2009.

Free-Product Recovery. Interim free-product recovery at the GCI Compound was discontinued in November 1997, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). In addition, free-product recovery is not a component of the final remedy for this site. However, in May of 2007, ADEC requested that the Navy resume free-product recovery at selected wells, including well 04-202, as discussed above. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. No free-product recovery occurred in well 04-202 during monthly free-product recovery activities, because thicknesses greater than 0.5 foot were not measured in this 2-inch well. Monthly free-product recovery activities at well 04-202 were discontinued in June of 2010, because free-product had not been measured in that well since September of 2007. As discussed at the beginning of Section 6.4, recovered product

volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 through 2010. "

Natural Attenuation Assessment

Sulfate concentrations (0.25 to 0.10 mg/L) for plume and downgradient wells are depleted compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (30 to 50 mg/L) are elevated compared to background (0 mg/L), strongly indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the GCI Compound site, as demonstrated by elevated methane concentrations in site wells ranging from 750 to 2,300 µg/L, compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual monitoring report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. A decreasing trend was identified for GRO concentrations in samples from well 04-100. No trends were identified using the Mann-Kendall test for GRO in groundwater from wells 04-210, and 04-213. The Mann-Kendall test was not applied to GRO results for samples from wells 04-202 and 04-204.

The Sen's slope was calculated for GRO concentrations in groundwater samples over time from well 04-100 in the 2010 annual monitoring report (U.S. Navy 2011a). Using the median and lower slope limits and the 2010 GRO concentration in groundwater at well 04-100, GRO could reach the endpoint criterion in 2013 to 2022, if the 2010 trend continues. Simple linear regression was applied to GRO results for 04-100 and 04-213, because GRO concentrations in samples from these two wells do show a general decreasing trend. No level of confidence is applied to the regression. Applying the slope of the regressed line to the 2010 concentration provides a very rough estimate for time to achieve the endpoint criterion if the observed trend continues. If the current trends continue, GRO concentrations in groundwater from wells 04-100 and 04-113 could reach the endpoint criterion in 2017 and 2018, respectively.

Future Monitoring Recommendations

GRO concentrations remain above the endpoint criterion, which is based on the ADEC cleanup level, along the centerline of the plume (04-100 and 04-202) and in one well to the south of the main plume (04-213). In addition, product was observed in three wells located near the source area (04-202, 04-203, and 04-204). However, free product has not been detected at the site since September of 2009. GRO concentrations are not greater than the endpoint criterion at the surface

water protection monitoring point (04-701). Although DRO, GRO, and BTEX concentrations at well 04-204 from 2006 through 2010 have been well below their respective endpoint criteria, free product was detected in this well in September of 2009. Annual groundwater monitoring should be continued at the GCI Compound, UST GCI-1 site as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with one addition. Monitoring of DRO in well 04-204 should be continued, because the concentration in the sample collected in 2010 exceeded the endpoint criterion.

6.4.5 Housing Area (Arctic Acres)

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Housing Area (Arctic Acres) from 2006 through 2010. Monitored natural attenuation is the ROD-specified remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate NAPs.

Groundwater samples were collected from wells 03-416, 03-420, 03-421, 03-422, 03-890, AA-01, AA-02 and AA-06 for DRO and NAPs analyses. Samples were not collected from wells 03-421 and 03-890 in 2006, 2007, and 2008, because of the presence of free product. DRO analyses were conducted annually at 03-420 through 2009, during even years only at 03-416 and AA-01, twice in 2009 and 2010 at wells 03-421 and 03-890, and once in 2010 at 03-422, AA-02, and AA-06. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. NAPs were not monitored in wells 03-422, AA-02, and AA-06 from 2006 through 2010. Monitoring of well AA-01 was discontinued after the 2006 sampling event, because concentrations were below endpoint criteria for two consecutive sampling events. After the 2009 sampling event, DRO analyses at 03-420 was changed to every other year (odd years only), because a statistically significantly decreasing trend in DRO concentration was observed in this well, exceedances pose no threat to downgradient receptors, and NAPs data indicate that natural attenuation is progressing. The Site Catalog in Appendix A includes a figure that shows the location of these monitoring wells at the Housing Area (Arctic Acres).

Analytical Results. DRO was reported in groundwater samples collected at well 03-416 from 2006 to 2010 at concentrations ranging from 1,300 to 1,500 µg/L. The highest DRO concentration was measured in the 2006 sample from this well. DRO was reported in the groundwater sample collected in 2006 from well AA-01 at a concentration of 660 µg/L. Samples collected at these two locations did not exceed the endpoint criterion of 1,500 µg/L. DRO was reported in groundwater samples collected in 2010 at wells 03-422, AA-02, and AA-06 at

concentrations of 120, 98, and 48 µg/L, respectively. Samples collected in 2010 at these three locations did not exceed the endpoint criterion.

DRO was reported in groundwater samples collected at well 03-420 from 2006 to 2010 at concentrations ranging from 2,200 to 3,800 µg/L. The highest DRO concentration was measured in the 2006 sample from this well. The DRO concentrations in this well have all been greater than the endpoint criterion of 1,500 µg/L. DRO was reported in groundwater samples collected at well 03-421 in 2009 and 2010 at concentrations of 15,000 and 3,800 µg/L, respectively. DRO was reported in groundwater samples collected at well 03-890 in 2009 and 2010 at concentrations of 44,000 and 10,000 µg/L, respectively. These values are greater than the endpoint criterion.

DRO concentrations at wells 03-421 have generally been stable from 2006 through 2010. DRO concentrations at wells 03-420 and 03-890 exhibited a decreasing trend. Trend evaluations were not performed for 03-416 and 03-890, because concentrations of DRO were less than the endpoint criterion during the last two monitoring events at this location.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Housing Area (Arctic Acres) site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" located in Appendix C. The following summarizes the significant product thickness data for the Housing Area (Arctic Acres) site.

Between September 1996 and September 2010, monitoring wells within the vicinity of the Housing Area (Arctic Acres) have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. Between October 2005 and September 2010, free product has been detected in two wells, 03-421 and 03-890, at the site during three annual groundwater monitoring events. The maximum measured free-product thickness in well 03-421 was 0.29 feet, measured in September 2007. The maximum measured free-product thickness in well 03-890 was 0.82 foot, measured in September of 2006. Free product has not been detected during the last two annual groundwater monitoring events.

Free-Product Recovery. Although free-product recovery is not a component of the final remedy for this site and is not required by the ROD or the CMP, free-product recovery was performed during two annual groundwater monitoring events. Free product was detected in two wells at Housing Area (Arctic Acres) between October 2005 and September 2010 during three

annual groundwater monitoring events (see paragraph above). Both of these wells are 2-inch-diameter wells. Free product was recovered from well 03-890 in September of 2006 and in September of 2008, because the free-product thickness was greater than 0.5 foot, which is the minimum thickness specified in the CMP for free-product recovery in 2-inch diameter wells at SA 80, Steam Plant 4, USTs 27089 and 27090; SA 88, P-70 Energy Generator, UST 10578; SWMU 58/SA 73, Heating Plant 6; SWMU 17, Power Plant No. 3; and Tanker Shed, UST 42494. Note that the CMP did not require free-product recovery for the Housing Area (Arctic Acres). Free product was not measured at thicknesses greater than 0.5 foot in well 03-421 during any of the annual groundwater monitoring events during this same time period. One-half gallon of free product was recovered in 2006 and 1.2 gallons of free product was recovered in 2008. Therefore, a total of 1.7 gallons of free product was recovered from the Housing Area (Arctic Acres) site between October 2005 and September 2010. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 through 2010."

Natural Attenuation Assessment

Sulfate concentrations (0.20 [nondetected] to 1.82 mg/L) for plume and downgradient wells are depleted compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (12.5 to 45 mg/L) are elevated compared to background (0 mg/L), indicating the occurrence of iron reduction. Evidence of methanogenesis is observed at the Housing Area (Arctic Acres) site, as demonstrated by elevated methane concentrations in three of the four site wells (220 to 2,000 µg/L), compared to background (an estimated 0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1 (U.S. Navy 2010e and 2011a). Decreasing trends were identified using the Mann-Kendall test for DRO in groundwater from wells 03-421 and 03-890. No trend was identified for 03-421. The Mann-Kendall test was not applied to results from wells 03-416, 03-422, AA-02, and AA-06.

The Sen's slope was calculated for DRO concentrations in groundwater samples over time from well 03-420 in the 2009 annual report (U.S. Navy 2010e and 2011a). Using the median and lower slope limits and the 2010 DRO concentration in groundwater at well 03-420, DRO could reach the endpoint criterion in 2012 or 2013, if the 2009 trend continues. Data were not sufficient for statistical estimation of endpoint achievement at the remaining site wells, or DRO concentrations are already below the endpoint.

Future Monitoring Recommendations

Because DRO concentrations remain above the endpoint criterion, which is based on the ADEC cleanup level, in groundwater samples collected from wells 03-421 and 03-890 and because of the past observance of free product in these wells, monitoring should continue at these wells as prescribed in the CMP, Revision 4 (U.S. Navy 2010a). Monitoring should also be continued at well 03-420 as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), because concentrations in this well remain above endpoint criteria. Only one round of monitoring was performed at wells 03-422, AA-02, and AA-06 during this last review period because they were sampled in 2010 in support of the 5-year review. The results of the sampling at these wells confirm that contamination has not migrated downgradient to these locations. Sampling at these three wells will be performed annually, as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), because petroleum compounds continue to be detected at concentrations greater than endpoint criteria at wells upgradient of these three wells. The concentration of DRO in samples collected at well 03-416 during this 5-year review period did not exceed the endpoint criterion. Therefore, it is recommended that monitoring at this location be discontinued.

Free-product monitoring should be continued in conjunction with annual groundwater monitoring. However, free-product recovery is not required by the ROD or the CMP if free product is detected in the site wells during the annual groundwater monitoring. Therefore, all free-product recovery activities should be discontinued at this site.

6.4.6 Kuluk Bay

Data Review

Data Collection During This 5-Year Review Period. The Navy has conducted marine tissue monitoring in Kuluk Bay since 1999. Initially, this monitoring was conducted annually in accordance with the OU A ROD. In 2003, the 5-year marine tissue monitoring program required by the OU A ROD was completed. The 2003 technical memorandum for marine monitoring recommended continued sampling for rock sole and blue mussel from Kuluk Bay at a frequency of every other year through the next 5-year review period to evaluate the changes in total PCB concentrations. Therefore, the Navy has conducted marine tissue monitoring at Kuluk Bay every odd year from 2004 through 2010 (U.S. Navy 2010d). Marine tissue monitoring and ICs is the ROD-selected remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Blue mussel and rock sole tissue samples are collected from Kuluk Bay to document the temporal change in PCB concentrations in mussels and fish in Kuluk Bay and to determine the date for rescinding institutional controls advising subsistence and commercial seafood harvesters of the potential risk associated with consumption of certain species of fish and shellfish from Kuluk Bay. Marine tissue samples have been analyzed for PCB cogeners, lipid analysis, and moisture content.

Analytical Results. The mean concentration of PCBs in blue mussel tissue in 2007 and 2009 was 15 and 18.1 µg/kg, respectively. The mean concentration in rock sole tissue in 2007 and 2009 was 12.1 and 6.4 µg/kg, respectively. During this 5-year review period, the mean concentration of PCBs in blue mussel tissue was below the risk-based action level of 31 µg/kg, but concentrations were slightly higher in 2009 than 2007. The mean concentration of PCBs in rock sole tissue was above the risk-based action level of 6.5 µg/kg in 2007, but dropped below the action level in 2009. Analytical data for marine tissue samples collected in Kuluk Bay are included in Appendix B. Historical data and data from the current 5-year review period are included in this table.

Mean total PCB concentrations in blue mussel tissue from Kuluk Bay ranged from 4.07 µg/kg in 1999 to 32.0 µg/kg in 2005 (Appendix B). Mean total PCB concentrations for each year, with the exception of 2005, are below the risk-based action level of 31 µg/kg. PCB tissue concentrations in blue mussel collected from Kuluk Bay for the period 1999 through 2009 were plotted for best fit regression and trendline analysis. This analysis determined that there was a statistically significant increasing trend in PCB concentrations (U.S. Navy 2010d).

Mean total PCB concentrations in rock sole tissue from Kuluk Bay ranged from 4.94 µg/kg in 2002 to 32.4 µg/kg in 1996 (Appendix B). The mean concentration for each year has not consistently increased or decreased over time, but has fluctuated. The mean total PCB concentration of the samples collected from 1996 through 2009, with the exception of samples collected in 2000, 2002, and 2009, was above the risk-based action level of 6.5 µg/kg. PCB tissue concentrations in rock sole collected from Kuluk Bay from 1999 through 2009 were normally distributed and were plotted for best fit regression and trend-line analysis. No statistically significant trend in the PCB concentrations was found (U.S. Navy 2010d).

Future Monitoring Recommendations

Based on the assessment of the marine tissue monitoring data collected through 2009, continued collection of blue mussel and rock sole in Kuluk Bay every other year is recommended.

6.4.7 NMCB Building Area, T-1416 Expanded Area

Data Review

Data Collection During This 5-Year Review Period. The Navy conducted annual groundwater monitoring at the NMCB Building Area, T-1416 Expanded Area site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected free-product recovery, monitored natural attenuation, and ICs as the final remedy for this site (U.S. Navy and ADEC 2006a). In addition, the decision document specified that six new wells would

be installed at the site for surface water protection monitoring, natural attenuation monitoring and free-product recovery; soil samples would be collected during the drilling of five of the six wells; and annual inspection of the Sweeper Cove shoreline for seeps and sheens. Results of this additional soil sampling are discussed in the Site Catalog in Appendix A. Groundwater samples were collected during the annual groundwater monitoring activities at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]), to evaluate NAPs, and to evaluate groundwater quality downgradient of the site to serve as a warning for potential impacts to the downgradient surface water body (Sweeper Cove).

Groundwater samples were collected from wells 02-453, 02-455, 02-479, 02-818, NMCB-07, NMCB-08, NMCB-10, NMCB-11, and NMCB-11 for surface water protection and natural attenuation monitoring. Monitoring was conducted annually in these nine wells, except when free product was present in a well. Samples were not collected from well 02-455 in 2009, from well 02-818 in 2006 and 2010, from well NMCB-07 in 2006, 2008, 2009, and 2010, and NMCB-10 in 2009 and 2010, because of the presence of free product. DRO, GRO, BTEX, and total lead analyses were conducted annually at all surface water protection monitoring wells from 2006 through 2009. Dissolved lead analysis was initiated in 2007. Following the 2009 annual groundwater monitoring event, sampling for toluene, ethylbenzene, total xylenes, and total and dissolved lead was discontinued at all site wells, because concentrations of these contaminants had not exceeded endpoint criteria in any sample collected at the site since sampling commenced in 2006. Therefore, samples collected from this site were only analyzed for DRO, GRO, and benzene in 2010. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009.

Groundwater samples were collected from wells 02-451, 02-452, 02-461, 02-478, 02-813, 02-817, E-201, NMCB-04, NMCB-05, and NMCB-09 for natural attenuation monitoring. Although monitoring was planned at well 02-489, monitoring was not performed at this location during this 5-year review period because the well could not be located during the initial monitoring event and is presumed destroyed. Monitoring was conducted annually in these 10 wells, except when free product was present in the well. Samples were not collected from NMCB-04 in 2006, 2008, and 2010, because of the presence of free product. Sampling at location 02-813 was discontinued following the 2008 groundwater monitoring event, because endpoint criteria had not been exceeded for any contaminant of concern at this well since monitoring began in 2006, and this well is cross-gradient to the site and not likely to be impacted by the site. Sampling at location NMCB-05 was discontinued following the 2009 groundwater monitoring event, because endpoint criteria had not been exceeded for any contaminant of concern for four consecutive sampling events at this downgradient well, and endpoint criteria had also not been exceeded in wells upgradient of this well. DRO, GRO, BTEX, and total lead analyses were conducted annually at all MNA wells from 2006 through 2009. At the request of

ADEC, the groundwater sample from well 02-452 was also analyzed for ordnance compounds as a one-time event. Dissolved lead analysis was initiated in 2007.

Shoreline inspections were conducted in 2007, 2008, 2009, and 2010. Because exceedances of endpoint criteria had occurred in well NMCB-07 over the last three monitoring events, the 2008 groundwater monitoring report recommended that a sediment sample be attempted downgradient of this well within the armor rock wall at low tide. Therefore, sediment samples were collected in 2009 and 2010.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the NMCB Building Area, T-1416 Expanded Area site relative to site features. Monitoring wells 02-479, NMCB-12, NMCB-11, 02-455, NMCB-10, NMCB-08, 02-453, NMCB-07, 02-818, and 02-451 are located along the shoreline of Sweeper Cove from east to west. Wells 02-452, 02-461, and 02-817 are located to the west of Building T-1416. Wells 02-478 and NMCB-09 are located to the east of T-1416. NMCB-04 and E-201 are located northwest and downgradient of the site. NMCB-05 is also located northwest and downgradient of the site, but this well is located approximately 190 feet further downgradient than E-201. Well 02-813 is located approximately 400 feet to the east and cross-gradient of the site.

Marine Sediment Sampling Results. GRO and BTEX were not detected above method reporting limits in sediment sample NL-05 in 2009, and GRO and benzene were not detected above method reporting limits in the sample collected in 2010. DRO was reported in the sediment samples collected from NL-05 in 2009 and 2010 at concentrations of 40 and 61 mg/kg, respectively. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO were compared to South of Runway 18-36 Area endpoint criterion. The DRO concentrations were below the South of Runway 18-36 endpoint criterion of 90.6 mg/kg. Total lead was reported in the sediment sample collected from NL-05 in 2009 at a concentration of 13.2 mg/kg. No endpoint criterion has been established for total lead in sediment.

A visual inspection of the shoreline of Sweeper Cove downgradient of the site was performed in 2007, 2008, 2009 and 2010. During 2007, no seeps, petroleum odor, or sheens were observed by inspectors at the site. During the shoreline inspection conducted near NMCB-07 in 2008, no seeps were observed. In 2009, an inspection was conducted along the Sweeper Cove shoreline between wells 02-451 and 02-479. No groundwater seeps were observed at this site, but a petroleum odor was observed downgradient of well NMCB-07. Odor could not be attributed to a specific shoreline location, but was observed in the general area downgradient of the well. No evidence of petroleum contamination was observed at this site during the 2010 shoreline inspection.

Groundwater Sampling Results. Toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells during this 5-year review period. DRO concentrations were below the endpoint criterion in all samples collected from wells 02-451, 02-452, 02-453, 02-455, 02-461, 02-478, 02-479, 02-818, E-201, NMCB-04, NMCB-05, NMCB-07, NMCB-09, NMCB-10, NMCB-11, and NMCB-12 during this 5-year review period. GRO concentrations were below the endpoint criterion in all samples collected from wells 02-451, 02-452, 02-453, 02-455, 02-478, 02-479, 02-817, 02-818, NMCB-04, NMCB-05, NMCB-08, NMCB-09, NMCB-10, NMCB-11, and NMCB-12 during this 5-year review period. Benzene concentrations were below the endpoint criterion in all samples collected from wells 02-451, 02-452, 02-453, 02-455, 02-461, 02-478, 02-479, 02-817, 02-818, E-201, NMCB-04, NMCB-05, NMCB-08, NMCB-09, NMCB-11, and NMCB-12 during this 5-year review period. Total lead concentrations were below the endpoint criterion in all samples collected from wells 02-451, 02-452, 02-453, 02-455, 02-478, 02-479, 02-817, 02-818, E-201, NMCB-04, NMCB-05, NMCB-07, NMCB-08, NMCB-09, NMCB-10, NMCB-11, and NMCB-12 during this 5-year review period. Finally, dissolved lead concentrations were below the endpoint criterion in all samples collected from all site wells during this 5-year review period.

GRO was reported in groundwater samples collected at well 02-461 from 2006 to 2010 at concentrations ranging from 8,600 to 14,000 µg/L. The highest GRO concentration in this well was measured in the 2007 sample. The GRO concentrations in samples collected from this well were less than the endpoint criterion of 13,000 µg/L, except for the sample collected in 2007. Total lead was reported in groundwater samples collected at well 02-461 from 2006 to 2009 at concentrations ranging from 64.7 to 180 µg/L. The highest total lead concentration in this well was measured in the 2006 sample. Total lead concentrations in samples collected from this well were less than the endpoint criterion of 150 µg/L, except for the sample collected in 2006.

DRO was reported in groundwater samples collected at well 02-817 from 2006 to 2010 at concentrations ranging from 6,500 to 16,000 µg/L. The highest DRO concentration in this well was measured in the 2007 sample. The DRO concentrations in samples collected from this well were less than the endpoint criterion of 15,000 µg/L, except for the sample collected in 2007.

GRO was reported in groundwater samples collected at well E-201 from 2006 to 2010 at concentrations ranging from 9,400 to 14,000 µg/L. The highest GRO concentration in this well was measured in the 2006 sample. The GRO concentrations in samples collected from this well were less than the endpoint criterion of 13,000 µg/L, except for the samples collected in 2006 and 2007.

GRO was reported in the groundwater sample collected at well NMCB-07 in 2007 at a concentration of 17,000 µg/L. The GRO concentration in this well was greater than the endpoint criterion of 13,000 µg/L. Benzene was reported in the groundwater sample collected at well

NMCB-07 in 2007 at a concentration of 71 µg/L. The benzene concentration in this well was greater than the endpoint criterion of 50 µg/L.

DRO was reported in groundwater samples collected at well NMCB-08 from 2006 to 2010 at concentrations ranging from 5,300 to 20,000 µg/L. The highest DRO concentration in this well was measured in the 2007 sample. The DRO concentrations in samples collected from this well were less than the endpoint criterion of 15,000 µg/L, except for the sample collected in 2007.

Benzene was reported in groundwater samples collected at well NMCB-08 from 2006 to 2010 at concentrations ranging from 6.8 to 53 µg/L. The highest benzene concentration in this well was measured in the 2006 sample. The benzene concentrations in samples collected from this well were less than the endpoint criterion of 50 µg/L, except for the sample collected in 2006.

Because no endpoint criterion (10 times ADEC cleanup levels) has been exceeded in the last 2 years for any of the analytes tested, no statistical analysis was performed.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the NMCB Building Area, T-1416 Expanded Area site. Free-product recovery is a component of the final remedy for this site (U.S. Navy and ADEC 2006a). Therefore, monthly monitoring and free-product recovery were performed at this site during this 5-year review period. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 through 2010." The following summarizes the significant product thickness data for the NMCB Building Area, T-1416 Expanded Area site.

Between September 1997 and September 2010, monitoring wells within the vicinity of the NMCB Building Area, T-1416 Expanded Area site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, eight wells (02-300, 02-497, 02-815, 02-818, NMCB-04, NMCB-07, NMCB-08 and NMCB-09) were gauged monthly from September 2006 through September 2008 as part of final remedy implementation (free-product recovery), and seven wells (02-300, 02-455, 02-463, 02-818, NMCB-07, NMCB-09, and NMCB-10) were gauged monthly from June 2010 to September 2010, based on a recommendation in the 2009 annual groundwater monitoring report. The frequency of product thickness measurements at wells 02-300, 02-497, 02-815, 02-818, NMCB-07, NMCB-08 and NMCB-09 was decreased from monthly to annually

after September 2008, because free-product recovery using a passive recovery system met the practicable endpoint established for the shutdown of product recovery specified in the decision document (U.S. Navy and ADEC 2006a). (Note that the decision document for the NMCB Building Area, T-1416 Expanded Area site references the OU A ROD for the endpoint criterion for free-product recovery.) However, the frequency of product thickness measurements at wells 02-300, 02-455, 02-463, 02-818, NMCB-07, NMCB-09, and NMCB-10 was increased to monthly in June 2010 based on a recommendation in the 2009 annual groundwater monitoring report to restart free-product recovery at NMCB due to the presence of free product in these wells during the 2009 annual groundwater monitoring event.

Between October 2005 and September 2010, free product has been detected in fifteen wells, 02-300, 02-455, 02-461, 02-463, 02-497, 02-815, 02-818, 02-819, NMCB-04, NMCB-05, NMCB-07, NMCB-08, NMCB-09, NMCB-10, and NMCB-11, at the site. The maximum measured thickness of free product reported at the site since October 2005 was 1.91 feet, in well 02-300 in November 2006. The maximum measured thickness of free product reported in other site wells where free product was measured at thicknesses greater than 0.1 foot was:

- 0.15 foot in September 2010 at 02-463
- 0.50 foot in September 2010 at 02-497
- 1.08 feet in September 2010 at 02-815
- 0.66 foot in September 2010 at 02-818,
- 1.17 feet in September 2006 at NMCB-04
- 1.03 feet in November 2006 at NMCB-07
- 0.71 foot in November 2006 at NMCB-08,
- 0.58 foot in September 2010 at NMCB-10

Free-Product Recovery. Interim free-product recovery at this site was conducted between September 1997 and July 2005, using passive recovery devices installed in site wells. Interim free-product recovery efforts were discontinued in July 2005, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the final closure report for interim action free-product recovery (U.S. Navy 2006c). Free-product recovery was selected as part of the final remedy for the site in the decision document (U.S. Navy and ADEC 2006a). These additional free-product recovery activities were implemented at the site in September 2006. As discussed in the paragraphs above, free-product recovery was discontinued in October 2008, because free-product recovery using a passive recovery system met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD. However, free-product recovery was restarted in June 2010 at selected wells after product was detected in multiple wells at the site during the 2009 annual groundwater monitoring event. As discussed at the beginning of Section 6.4,

recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 through 2010."

Free product was recovered from site wells at NMCB Building Area, T-1416 Expanded Area site during the annual groundwater monitoring events. Free-product recovery activities were also performed at eight wells (02-300, 02-497, 02-815, 02-818, NMCB-04, NMCB-07, NMCB-08 and NMCB-09) during monthly free-product recovery activities from September 2006 through September 2008, and at seven wells (02-300, 02-455, 02-463, 02-818, NMCB-07, NMCB-09, and NMCB-10) during monthly free-product activities from June 2010 to September 2010.

Approximately 3.37 gallons of free product were recovered from the NMCB Building Area, T-1416 Expanded Area site during the annual groundwater monitoring events from 2006 through 2010. Of this, 1 gallon was recovered from NMCB-04 during the September 2006 annual groundwater monitoring event, 0.52 gallon was recovered from site wells during the 2007 annual groundwater monitoring event, 0.63 gallon was recovered from well 02-300 during the 2008 annual groundwater monitoring event, 0.2 gallon was recovered from site wells during the 2009 annual groundwater monitoring event, and 1.02 gallons were recovered from wells 02-300 (0.1 gallon), 02-497 (0.11 gallon), 02-815 (0.24 gallon), 02-818 (0.19 gallon), and NMCB-07 (0.38 gallon) during the 2010 annual groundwater monitoring event. The 2007 and 2009 annual groundwater monitoring reports did not report the wells where product recovery was conducted. From September 2006 through September 2008, approximately 8.82, 0.11, 1.43, 1.79, 0.54, 8.15, and 7.49 gallons were recovered during monthly product-recovery activities from wells 02-300, 02-497, 02-815, 02-818, NMCB-04, NMCB-07, and NMCB-08, respectively. From June 2010 through September 2010, approximately 0.59, 0.21, 0.2, 0.68, and 0.18 gallons were recovered from wells 02-300, 02-463, 02-818, NMCB-07, and NMCB-10, respectively. Free product was not recovered from wells 02-455 and NMCB-09. Therefore, the total volume of free product recovered from the NMCB Building Area, T-1416 Expanded Area site for the period October 2005 through September 2010 was 33.56 gallons. The maximum volume of free product (10.14 gallons) was recovered from well 02-300 for the time period October 2005 through September 2010. In addition, 9.21 gallons were recovered from NMCB-07, and 7.49 gallons were recovered from NMCB-08 during this same time period.

Natural Attenuation Assessment

Sulfate concentrations for plume and plume edge wells 02-478, 02-817, 02-818, E-201, NMCB-09, and NMCB-12 are depleted (0.19 to 2.06 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (5 to 50 mg/L) are elevated (except in well NMCB-05) compared to background (0 mg/L), indicating the occurrence of iron reduction. Evidence of methanogenesis is observed at the NMCB site, as demonstrated by elevated methane concentrations. Methane concentrations at seven

source/plume edge wells have concentrations of 1,000 µg/L or higher, and all site wells exceed that of background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site.

No endpoint criteria have been exceeded in the last two years for any of the analytes tested; therefore no statistical analysis was performed (U.S. Navy 2010e).

Future Monitoring Recommendations

Petroleum hydrocarbons have not been detected at concentrations greater than the endpoint criteria, which are based on 10 times the ADEC cleanup levels, during the last three consecutive monitoring events. However, free product continues to be detected at the site. Monitoring at 02-451, a cross-gradient well, should be discontinued, because petroleum hydrocarbon concentrations from 2006 through 2010 have been below the endpoint criteria. Although petroleum hydrocarbon concentrations are less than the endpoint criteria, annual groundwater monitoring should be continued at all other wells at NMCB Building, Area T-1416 Expanded Area site as prescribed in the CMP, Revision 4 (U.S. Navy 2010a). Continued monitoring is recommended because of the presence of free product at this site. In addition, visual inspection of the shoreline should be continued, as well as sediment sampling in Sweeper Cove.

The frequency of product thickness measurements and free-product recovery, if required, should be decreased from monthly to annually for well 02-455, because free product has not been detected since September 2009. Furthermore, free product has never been recovered from this well. The frequency of product thickness measurements and free-product recovery, if required, should be increased to six times per year at wells 02-461, 02-497, 02-815, 02-819, NMCB-04, and NMCB-05, because free product was detected in these wells during the 2010 annual groundwater monitoring event. Product thickness measurements and free-product recovery, if required, should be decreased from monthly to six times per year at wells 02-300, 02-463, 02-818, NMCB-07, NMCB-09, and NMCB-10, because of low product thicknesses and recovered product volumes. Additionally, many wells are typically inaccessible during the winter months of January through March because of poor weather, snowy conditions, and icy roads. The type of free-product recovery equipment installed in each well should be clearly documented for each month of operation in the annual remedial action summary report. More specifically, the date of installation and date of removal should be included in the documentation. In addition, if bailing was used instead of an automated passive skimmer, passive skimmer, or sorbent sock, this should also be clearly documented. This information is necessary to verify that free-product recovery activities are being performed consistent with the decision document.

The presence of free product is intermittent at this site. For example, in well 02-300, no free product was detected in October of 2006, but nearly 2 feet were detected in November 2006. Because of the intermittent nature of the free product, it is recommended that product recovery equipment be left in place for a longer period of time, even when free product is not detected in a well for one month. This could potentially result in higher volumes of free product recovered. Detection of free product thicknesses less than a given level for a year, or the lack of recoverable free product from a well for a full year, may be more appropriate justifications for changing the type of equipment installed in a well. For example, if free product has not been detected at thicknesses greater than 0.1 foot over a year, and no product has been recovered, then a sorbent sock could replace a passive skimmer. These recommendations should be considered by the Optimization Work Group.

The decision document for the site requires that additional actions be initiated at the site if one of the following conditions are met:

- Analytical results for petroleum compounds exceed the groundwater criteria and an increasing trend in concentrations is found over three consecutive measurements in the surface water protections wells.

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

As discussed above, analytical results for petroleum hydrocarbons have not exceeded the endpoint criteria in any wells, including the surface water protections wells, at the site over the last three consecutive monitoring events. However, free-product thicknesses appear to be increasing in three surface water protection wells (02-818, NMCB-07, and NMCB-10). Furthermore, free-product thicknesses have increased for three consecutive monitoring events in two surface water protection wells (NMCB-07 and NMCB-10). In addition, the maximum free-product thickness measured at the site since monitoring began in 2006 was measured in 2010 at nine wells, including three surface water protection wells (02-818, NMCB-07, and NMCB-10). Therefore, the need for additional actions to protect surface water should be evaluated.

6.4.8 NORPAC Hill Seep Area

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the NORPAC Hill Seep Area site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected limited groundwater monitoring as the final remedy for this site (U.S. Navy and ADEC 2005a). Groundwater samples were

collected at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]) and groundwater quality downgradient of the site to serve as a warning for potential impacts to the downgradient surface water body (Kuluk Bay).

Groundwater samples were collected from 04-145, 04-146, 04-147, 04-403, 04-405, and NS-2 for DRO analysis. Although annual sampling of well 04-146 was planned for 2006 through 2010, samples were not collected from this well in 2006 and 2008 because of the presence of free product. DRO analyses were conducted annually at 04-145, 04-147, 04-403, 04-405, and NS-02 through 2007. Monitoring was discontinued at wells 04-145 and NS-2 following the 2007 groundwater monitoring event, because DRO concentrations had never exceeded the endpoint criterion since monitoring began in 2005. The frequency of monitoring at wells 04-147, 04-403, and 04-405 was reduced to once every 2 years during even years following the 2007 groundwater monitoring event.

The 2005 groundwater monitoring report recommended that visual inspections for seeps and sheens along the adjacent shoreline of Kuluk Bay should be conducted during subsequent annual monitoring events, because free product was observed in surface water protection well 04-146. Because free product was observed in well 04-146 in 2008 and a shoreline inspection downgradient of this well revealed a sheen in the ocean, the 2008 groundwater monitoring report recommended that one sediment sample (analyzed for DRO) be collected during low tide along the embankment if sheen was observed during the 2009 shoreline inspection (location NL-06). Furthermore, because the 2009 shoreline inspection downgradient of well 04-146 revealed a groundwater seep with a sheen, the 2009 groundwater monitoring report recommended that that a sediment sample be collected again and analyzed for DRO if the seep or sheen was observed during the 2010 shoreline inspection. It was further recommended that surface water be collected for DRO analysis at this location, if conditions allow. These activities were implemented in 2006, 2009 and 2010, respectively.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells and the surface water and sediment sampling location NL-06. This figure is accessed through the "Current Monitoring" link for this site in the Site Catalog. Wells NS-2, 04-145, 04-403, and 04-405 are located in or near a housing area. Well 04-146 and 04-147 are located downgradient of the housing area and are monitored for surface water protection purposes. NL-06 is located along the Kuluk Bay embankment downgradient of well 04-146.

Analytical Results. DRO was reported in groundwater samples collected at well 04-145 in 2006 and 2007 at concentrations of 95 and 260 µg/L, respectively. DRO was not detected in the sample collected from NS-2 in 2007 above its detection limit of 60 µg/L, and DRO was reported in the groundwater sample collected from this location in 2006 at a concentration of 160 µg/L. DRO was reported in groundwater samples collected at well 04-403 from 2006 to 2010 at

concentrations ranging from 640 to 1,000 µg/L. Samples collected at these three locations did not exceed the endpoint criterion of 15,000 µg/L during this 5-year review period.

DRO was reported in groundwater samples collected at well 04-146 in 2007, 2009, and 2010 at concentrations of 7,000, 3,200, 6,400 µg/L, respectively. The detected concentration in the 2007 sample may be elevated due to the presence of free-phase product in this well prior to sampling. Product was bailed prior to collecting the sample. These values are less than the endpoint criterion.

DRO was reported in groundwater samples collected at well 04-147 from 2006 to 2010 at concentrations ranging from 610 to 2,100 µg/L. DRO was reported in groundwater samples collected at well 04-405 from 2006 to 2010 at concentrations ranging from 1,400 to 2,900 µg/L. The highest DRO concentration was measured in the 2008 sample collected from these wells. Samples collected at these two locations did not exceed the endpoint criterion of 15,000 µg/L.

DRO was not detected above method reporting limits in sediment sample NL-06 in 2009. DRO was reported in the sediment sample collected from NL-06 in 2010 at a concentration of 26 mg/kg. The seep flow was not sufficient in 2009 or 2010 for the collection of a surface water sample. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO were compared to South of Runway 18-36 Area endpoint criterion. The DRO concentration was below the South of Runway 18-36 Area endpoint criterion of 90.6 mg/kg.

A visual inspection of the shoreline of Kuluk Bay downgradient of well 04-146 was performed in 2007, 2008, 2009 and 2010. A shoreline inspection was planned for 2006, but no information on this inspection was provided in the 2006 groundwater monitoring report. During 2007, no seeps, petroleum odor, or sheens were observed by inspectors. During the 2008 shoreline inspection, garbage and marine debris was observed on the shoreline and a sheen was also observed in the ocean near the debris. Because no seep was observed along the shoreline or embankment downgradient of the site, it is uncertain whether contamination from site groundwater was the source of the sheen. Inspectors noted the presence of a seep, a petroleum hydrocarbon odor, and a sheen during the 2009 shoreline inspection. In 2010, a groundwater seep was identified at the base of the cliff below well 04-146. Petroleum odor but no sheen was observed at this seep.

Trend evaluations are not performed for sites with limited groundwater monitoring as the selected remedy.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the NORPAC Hill Seep Area site. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy

and ADEC 2005a), monthly monitoring and free-product recovery were performed at one well (04-146), based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 through 2010." The following summarizes the significant product thickness data for the NORPAC Hill Seep Area site.

Groundwater monitoring wells within the vicinity of the NORPAC Hill Seep Area have been periodically gauged for petroleum product. Gauging commenced in September 1996 and proceeded until November 2001. Free-product thickness measurement was restarted in September 2005 as part of the annual monitoring program. Only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, one well (04-146) was gauged monthly, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, T-1416 Expanded Area, and SWMU 62, New Housing Fuel Leak. Between October 2005 and September 2010, free product has been detected in one well, 04-146, at the site. The maximum measured free-product thickness in this well was 0.13 foot, measured in May 2007.

Free-Product Recovery. Interim free-product recovery at the NORPAC Hill Seep Area was discontinued in November 2001, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the free-product recovery closure report (U.S. Navy 2006c). In addition, free-product recovery is not a component of the final remedy for this site. However, in May of 2007, the ADEC requested that the Navy resume free-product recovery at selected wells, including well 04-146. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. Although well 04-146 is a 2-inch well, and measured thicknesses were below 0.5 foot, the Navy performed free-product recovery at this well. Between May 2007 and September 2010, 0.19 gallon of free product was recovered. In addition, during the 2007 annual groundwater monitoring event, 0.09 gallon of free product was bailed so that a groundwater sample could be collected from this well. As a result, a total of 0.28 gallon of free product was recovered from well 04-146 between May 2007 and September 2010. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Future Monitoring Recommendations

DRO concentrations have been below the endpoint criterion, which is based on 10 times the ADEC groundwater cleanup level, in all wells at this site during this 5-year review period. No free product has been observed since monitoring began in 2001 at wells 04-147, 04-403, and 04-405. While a shoreline inspection downgradient of well 04-146 revealed a groundwater seep with slight petroleum odor and free product was again observed in this well at a minimal thickness of 0.01 foot twice over the last year, a sediment sample collected at the seep showed DRO concentrations below method detection limits. Because of these observations, it is recommended that monitoring be discontinued at this site.

6.4.9 ROICC Contractor's Area, UST ROICC-7

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the ROICC Contractor's Area (UST ROICC-7) from 2006 through 2010. Limited groundwater monitoring was the remedy selected for this site (U.S. Navy, USEPA, and ADEC 2000). However, monitoring results obtained between 1999 and 2003 identified benzene concentrations in groundwater above the Alaska groundwater cleanup levels. Because benzene concentrations in groundwater exceed cleanup levels, the site failed to achieve endpoint criteria established for the limited groundwater monitoring remedy in the OU A ROD. Therefore, the Navy initiated monitored natural attenuation at this site. Groundwater samples were collected from this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate NAPs.

Groundwater samples were collected from 08-175, 08-200, and 08-202 for GRO, BTEX, and NAPs analyses. GRO analyses were conducted annually in well 08-175 through 2007. BTEX analyses were conducted every other year in well 08-175 through 2006, based on a recommendation made in the 2004 groundwater monitoring report. GRO and BTEX analyses were conducted annually in wells 08-200 and 08-202 through 2007. Monitoring for GRO, toluene, ethylbenzene, and xylenes was discontinued in all wells following the 2007 sampling event, because these compounds have not been detected above the endpoint criteria in any groundwater sample collected since 1999. Therefore, monitoring for benzene was conducted annually in wells 08-200 and 08-202 from 2008 through 2010, and every other year (even years) in well 08-175. Finally, NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells relative to the UST.

Analytical Results. GRO, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all three wells in 2006 and 2007. Benzene concentrations in downgradient well 08-175 were also below the endpoint criterion of 5 µg/L during this 5-year review period. Benzene was reported in groundwater samples collected at well 08-200 from 2006 to 2010 at concentrations ranging from 250 to 320 µg/L. Benzene was reported in groundwater samples collected at well 08-202 from 2006 to 2010 at concentrations ranging from 12 to 16 µg/L. The highest benzene concentrations in these two wells were measured in the 2008 samples. The benzene concentrations in these two wells have all been greater than the endpoint criterion of 5 µg/L during this 5-year review period.

Benzene concentrations at well 08-200 have generally been stable from 2006 through 2010. Benzene concentrations at well 08-202 exhibited a statistically significant decreasing trend. GRO, toluene, ethylbenzene, and xylenes have not been monitored since 2007, because concentrations were below the endpoint criteria.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the ROICC Contractor's Area (UST ROICC-7) site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Natural Attenuation Assessment

Sulfate concentrations for the site are depleted (0.07 to 0.10 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (75 mg/L) are elevated compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the ROICC site, as demonstrated by elevated methane concentrations in on-site wells (10,000 to 16,000 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. Decreasing trends were identified using the Mann-Kendall test for benzene in groundwater from well 08-202. No trend was identified for benzene concentration in samples from 08-200. The Mann-Kendall test was not applied to results from well 08-175, because benzene concentrations in samples from this well are below the endpoint criterion.

The Sen's slope was calculated for benzene concentrations in groundwater samples over time from well 08-202 in the 2010 annual report (U.S. Navy 2011a). Using the median and lower slope limits and the 2010 benzene concentration in groundwater at well 08-202, benzene in groundwater could reach the endpoint criterion in 2017 or 2019, if the 2010 trend continues. There is no apparent trend in the data set for benzene in groundwater from well 08-200.

Future Monitoring Recommendations

Benzene remains in groundwater at concentrations greater than the endpoint criterion, which is based on the ADEC cleanup level, in the near source area. However, benzene has not migrated to the downgradient monitoring point at concentrations greater than the endpoint criterion. Annual monitoring should be continued as prescribed by the CMP, Revision 4 (U.S. Navy 2010a).

6.4.10 Runway 5-23 Avgas Valve Pit

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Runway 5-23 Avgas Valve Pit site from 2006 through 2010. Monitored natural attenuation is the remedy selected for this site (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected from this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate NAPs.

Groundwater samples were collected from wells 14-100 and 14-110 and analyzed for GRO, BTEX, and NAPs. GRO analyses were performed annually in well 14-100, and in 2007, 2008, and 2010 in well 14-110. Sampling for GRO at Runway 5-23 Avgas Valve Pit well 14-110 was inadvertently not performed in 2006. BTEX analyses were performed every other year (even years) in well 14-110, and in 2006 in well 14-110. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. The frequency of BTEX monitoring was reduced at both locations (14-100 and 14-110) to once every other year (even years) after the 2005 sampling event because BTEX concentrations had met the endpoint criteria at both locations, but GRO had remained above its endpoint criterion in groundwater at location 14-100. After the 2006 sampling event, monitoring of BTEX at 14-110 was discontinued, because BTEX concentrations were consistently well below the endpoint criteria. The frequency of GRO monitoring at well 14-110 was reduced to once every other year (even years) in 2008, because this well is downgradient of the source plume. Monitoring of BTEX was discontinued in well 14-100 following the 2008 sampling event, because no exceedance of the endpoint criteria for these compounds has been detected in this well since 2001.

The Site Catalog in Appendix A includes a figure that shows the location of these monitoring wells at the Runway 5-23 Avgas Valve Pit site. Wells 14-100 and 14-110 are located approximately 30 and 80 feet downgradient of the former source area.

Analytical Results. Benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from both wells during this 5-year review period. GRO concentrations in downgradient well 14-110 were also below the endpoint criterion of 1,300 µg/L during this 5-year review period. GRO was reported in groundwater samples collected at well 14-100 from 2006 to 2010 at concentrations ranging from 2,000 to 3,500 µg/L. The highest GRO concentration in this well was measured in the 2009 sample. The GRO concentrations in this well have consistently been greater than the endpoint criterion of 1,300 µg/L during this 5-year review period. GRO concentrations at well 14-110 have generally been stable from 2006 through 2010.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Runway 5-23 Avgas Valve Pit site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Natural Attenuation Assessment

Sulfate concentrations for the site are depleted (0.05 and 0.10 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (25 and 35 mg/L) are elevated compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the Runway 5-23, Avgas Valve Pit site, as demonstrated by elevated methane concentrations in on-site wells (3,600 and 8,100 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. No trend and stable conditions were identified using the Mann-Kendall test for GRO in groundwater from well 14-100. The Mann-Kendall test was not applied to results from well 14-110, because GRO concentrations in samples from this well are below the endpoint criterion.

The Sen's slope was not calculated for GRO concentrations in groundwater samples over time from well 14-100 in the 2010 annual report (U.S. Navy 2011a) and GRO groundwater samples from well 14-110 is below the endpoint criterion. Based on these conditions, the existing data are not sufficient to estimate the time at which endpoint criterion may achieved and simple linear regression will not support an estimate.

Future Monitoring Recommendations

GRO concentrations in groundwater from the near source well (14-100) are greater than the endpoint criterion, which is based on the ADEC cleanup level. However, GRO has not migrated to the downgradient monitoring point (14-110) at concentrations greater than the endpoint criterion. Annual monitoring at both wells should be continued as prescribed by the CMP, Revision 4 (U.S. Navy 2010a).

6.4.11 SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs site from 2006 through 2010. The ROD-specified interim remedy for this site was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC selected monitored natural attenuation with ICs as the final remedy for this site (U.S. Navy and ADEC 2005a). Groundwater samples were collected at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]), to evaluate NAPs, and to evaluate groundwater quality downgradient of the site to serve as a warning for potential impacts to the downgradient surface water body (Clam Lagoon).

Groundwater samples were collected from 12-145, 12-152, MW-116, MW-117, 12-801, and 12-802 for DRO, GRO, BTEX, and NAPs analysis. Although annual sampling of well 12-145 was planned for 2006 through 2010, samples were not collected from this well in 2006 and 2008 because of the presence of free product. DRO, GRO, and BTEX analyses were conducted in 2006, 2007, and 2009 at MW-116, in 2006, 2007, and 2008 at MW-117, and every other year (even years) at 12-801 and 12-802. BTEX analyses were conducted in 2006 at 12-152. DRO and GRO were not analyzed in the sample collected from this well in 2006, because an adequate volume of water could not be collected. This same well was not sampled in 2007 and 2008, because of insufficient water. As a result, monitoring of well 12-152 was discontinued in 2009. Sampling of well 12-801 was discontinued following the 2008 monitoring event, because concentrations of contaminants in this well met endpoint criteria. However, groundwater elevation and product thickness measurements were continued in this well. Monitoring of

toluene, ethylbenzene, and xylenes was discontinued following the 2009 sampling event, because concentrations of these compounds were either not detected above reporting limits or detected at concentrations less than the endpoint criteria. Monitoring frequencies at 12-801, 12-802, MW-116, and MW-117 did not follow the 2005 or 2007 CMPs, which required annual monitoring for DRO, GRO, and BTEX. Monitoring at these four locations also did not consistently follow the recommendations made in the annual groundwater monitoring reports. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. However, annual NAPs analyses were performed in well 12-802 from 2006 through 2009. Frequency of NAPs analyses was reduced to once every 5 years in well 12-802 following the 2009 sampling event.

The 2009 groundwater monitoring report recommended that a visual inspection be conducted of Clam Lagoon shoreline downgradient of surface water protection well 12-802 in 2010, because free product was observed in this well. Furthermore, the 2009 groundwater monitoring report recommended that a surface water and sediment sample be collected in 2010 from the shoreline if petroleum contamination is observed during the visual inspection. The surface water sample would be analyzed for DRO, GRO, BTEX, TAH, and TAqH, and the sediment sample would be analyzed for DRO, GRO, BTEX, and PAHs. Petroleum contamination was not observed during the visual inspection. Therefore, neither a surface water nor a sediment sample was collected.

The Site Catalog in Appendix A includes a figure that shows the location of these monitoring wells at the SA 78, Old Transportation Building site. Well 12-145 is located within a former UST excavation and inferred source area. Well 12-152 is located approximately 220 feet downgradient of the former UST excavation, and wells MW-116 and MW-117 are located approximately 290 and 240 feet from the former UST excavation, respectively. Well MW-116 is positioned south of the plume centerline, and MW-117 is positioned north of the plume centerline. Well 12-801 is located in a surface drainage swale approximately 800 feet from the former UST excavation along a line drawn between wells 12-145 and MW-117. Well 12-802 is located approximately 780 feet from the former UST excavation along an approximate line drawn between wells 12-152 and MW-116.

Analytical Results. Benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells during this 5-year review period. DRO and GRO concentrations in all samples collected from surface water protection wells 12-801 and 12-802 and wells MW-116 and MW-117 were below their respective endpoint criteria during this 5-year review period. Finally, the GRO concentrations in all samples collected from well 12-145 were below the endpoint criterion.

DRO was reported in groundwater samples collected at well 12-145 from 2006 to 2010 at concentrations ranging from 2,000 to 38,000 µg/L. The highest DRO concentration in this well

was measured in the 2007 sample. Only the DRO concentration in the sample collected in 2007 from this well exceeded the endpoint criterion of 15,000 µg/L.

In 2010, no contaminant had been detected above the endpoint criteria in any well at the site for the last two monitoring events. Therefore, no trend analyses were performed at the site.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs site. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at one well (12-145), based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 through 2010" in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 through 2010." The following summarizes the significant product thickness data for the SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs site.

Between November 1996 and September 2010, monitoring wells within the vicinity of the SA 78, Old Transportation Building site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, one well (12-145) was gauged monthly from May 2007 through May 2010, concurrently with free product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Between October 2005 and September 2010, free product has been detected in two wells, 12-145 and 12-802, at the site. The maximum measured free-product thickness in well 12-145 was 0.46 foot, measured in September 2006. Free product was only measured once in 12-802 in September 2009 at a thickness of 0.01 foot. The frequency of product thickness measurements at well 12-145 was decreased from monthly to annually after May 2010, because free product had not been observed at this well since January of 2009.

Free-Product Recovery. Interim free-product recovery at the SA 78, Old Transportation Building site was discontinued in June 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). In addition, free-product recovery is not a component of the final remedy for this site. However, in May of 2007, the ADEC requested that the Navy resume free-product recovery at selected wells, including

well 12-145. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. Although well 12-145 is a 2-inch well, and measured thicknesses above 0.5 foot have not been detected, the Navy performed free-product recovery at this well in December 2008. A total of 0.01 gallon of free product was recovered from this well in December 2008. Because free product was not recovered during any other month during this 5-year review period, the total volume of free product recovered from the SA 78, Old Transportation Building site for the period October 2005 through September 2010 is 0.01 gallon. Monthly product thickness measurements and free-product recovery, if required, were discontinued in well 12-145 after May 2010, because free product had not been observed in this well since January 2009, and only 0.01 gallon of free product was recovered from this well from May 2007 through May 2010. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 through 2010."

Natural Attenuation Assessment

Sulfate reduction appears to be occurring in the source well 12-145 on site. This well has a lower sulfate concentration (1.93 mg/L) than background well E-701 (2.52 mg/L). The ferrous iron concentration is elevated above background (0 mg/L) at two site wells, source well 12-145 (12.5 mg/L) and cross-gradient well MW-117 (5 mg/L), which indicates that iron reduction may be occurring. Strong evidence of methanogenesis is observed at the SA 78, Old Transportation Building site, as demonstrated by elevated methane concentrations in source well 12-145 (2,400 µg/L) and cross-gradient well MW-117 (330 µg/L), compared to background (0.38 µg/L). It should be noted that well 12-802 is located adjacent to a creek in a wetland and the depleted oxygen and elevated sulfate and carbon dioxide concentrations observed in this well are suspected to be due to the microbial degradation of naturally occurring organic matter associated with wetland saturated soils (U.S. Navy 2010e).

The 2009 annual report concluded that these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

No Mann-Kendall and Sen's trend evaluation was conducted for DRO, GRO, and benzene in groundwater at this site, because results for these analytes have been below the endpoint criteria.

Future Monitoring Recommendations

DRO, GRO, benzene, toluene, ethylbenzene, and total xylene concentrations have been below their respective endpoint criteria, which are based on 10 times the ADEC cleanup levels, for at least two years. Strong evidence of natural attenuation was shown to be occurring in on-site

groundwater in 2009, and data supporting the continuation of natural attenuation were again observed in 2010. Free product has not been observed at this site since January of 2009, and no evidence of petroleum contamination was observed during the shoreline inspection. Based on these observations, it is recommended that one more year of monitoring be conducted at this site before it is recommended for closure, provided concentrations remain below endpoint criteria.

6.4.12 SA 79, Main Road Pipeline, South End

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 79, Main Road Pipeline, South End site from 2006 through 2010. Limited groundwater monitoring is the selected remedy for the site (U.S. Navy, USEPA, and ADEC 2000). However, the site did not achieve limited groundwater monitoring endpoints and reverted to natural attenuation monitoring. Groundwater samples were collected from this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]), to verify that natural attenuation is occurring at the south end of the site, and to evaluate groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (Sweeper Cove).

Groundwater samples were collected from 02-230, E-403, MRP-MW8, and NL-01 for DRO, TAH, TAqH, and NAPs analysis. DRO analysis was conducted annually at 02-230 and MRP-MW8, in 2008 and 2009 at E-403, and in 2007 and 2008 at NL-01. TAH and TAqH analysis was conducted in 2008 and 2009 at 02-230 and MRP-MW8, and in 2008 at NL-01. NAPs analyses were conducted every 5 years in wells 02-230 and MRP-MW8, with the most recent sampling event occurring in 2009. Monitoring for DRO at NL-01, which is a temporary drive-point well installed at the shore of Sweeper Cove downgradient of well 02-230, was initiated in 2007 to assess impacts to Sweeper Cove. Monitoring for DRO at E-403 and monitoring for TAH and TAqH at 02-230, MRP-MW8, and NL-01 was initiated in 2008 based on the recommendations in the final petroleum summary report (U.S. Navy 2008c) and the 2007 groundwater monitoring report. The 2008 groundwater monitoring report recommended that monitoring at NL-01 be discontinued, because there is no technically sound method of collecting representative groundwater in the intertidal zone. The tide continually flushes away the lighter fresh water and hydrocarbons in the intertidal area. The 2008 groundwater monitoring report concluded that dissolved groundwater contaminants from the site are entering the marine environment based on the close proximity of contaminated wells to the shoreline, even though samples collected from the temporary well point have yielded results that have been below endpoint criteria. Monitoring at E-403 was discontinued after 2009 groundwater monitoring event, because concentrations of DRO in this well met the endpoint criterion. Monitoring for

TAH and TAqH was discontinued at the site following the 2009 groundwater monitoring event, because concentrations met endpoint criteria.

Because DRO concentrations in the 2003 and 2004 groundwater samples from wells 02-230 and MRP-MW8 were greater than the endpoint criterion, a visual inspection of the shoreline in the area of these wells has been conducted annually since 2005. The purpose of the inspection is to identify petroleum seeps on the shoreline, or sheens on the surface water of Sweeper Cove. No seep, sheen, odor, or discoloration was observed during any of the annual shoreline inspections conducted between 2006 and 2010.

Because of uncertainty regarding impacts of the DRO plume on Sweeper Cove, additional data were collected at SA 79, Main Road Pipeline, South End. The objective of the additional characterization at the site was to collect sufficient data to determine if DRO is migrating in groundwater to the adjacent surface water body (Sweeper Cove) at concentrations greater than ADEC surface water criteria. During this supplemental investigation, eight soil borings were sampled. Two soil borings were completed as wells, and groundwater samples were collected from these two new wells and two existing wells (02-230 and MPRP-MW8). The results of this groundwater sampling are discussed below.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SA 79, Main Road Pipeline, South End site. Wells 02-230 and MRP-MW8 are located approximately 70 and 100 feet from the shoreline of Sweeper Cove respectively. E-403 is located approximately 100 feet southwest of the mouth of Sweeper Creek. NL-01 is located at the shore of Sweeper Cove downgradient of well 02-230. New well 601 is located approximately 80 feet upgradient of well MRP-MW8, and new well 602 is located approximately 400 feet south of 02-230 downgradient of an area of elevated DRO concentrations in soil.

Analytical Results. TAH and TAqH were either not detected or detected at concentrations below the ADEC surface water quality standards in all samples collected from all wells during this 5-year review period. DRO was either not detected or detected at concentrations below the endpoint criterion of 1,500 µg/L in all groundwater samples collected from wells E-403, NL-01, and 602 during this 5-year review period.

DRO was reported in groundwater samples collected at surface water protection well 02-230 from 2006 to 2010 at concentrations ranging from 2,400 to 5,500 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. DRO was reported in groundwater samples collected at well MRP-MW8 from 2006 to 2010 at concentrations ranging from 2,400 to 4,700 µg/L. This highest DRO concentration was measured in the 2007 sample from this well. The DRO concentrations in these two wells have consistently been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period. DRO was reported in the groundwater

sample collected from well 601 in July 2010 at a concentration of 2,500 µg/L, which exceeds the endpoint criterion.

DRO concentrations at wells MRP-MW8 and 02-230 have generally been stable from 2006 through 2010.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SA 79, Main Road Pipeline, South End site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Natural Attenuation Assessment

The past occurrence of aerobic digestion is demonstrated at this site by the depletion of dissolved oxygen concentration (1 mg/L), compared to the background concentration of 11 mg/L. However, the carbon dioxide concentration in the on-site well (13 mg/L) was only slightly elevated, compared to the background well E-701 (less than 10 mg/L). The alkalinity concentration is higher in the site well (93 mg/L) than background (18.9 mg/L) and indicates that well MRP-MW8 is within the contaminant plume. The sulfate concentration for the site is not depleted (21.7 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is not occurring at the site. The ferrous iron concentration (12.5 mg/L) is elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. However, it should be noted that well MRP-MW8 is tidally influenced and elevated sulfate and ferrous iron concentrations may be due to saltwater intrusion. Weak evidence of methanogenesis is observed at the SA 79, Main Road Pipeline, South End site, as demonstrated by a slightly elevated methane concentration in the on-site well (2.1 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data provide only weak evidence that biodegradation is occurring at the site, possibly by aerobic digestion (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. No trend and stable conditions were identified using the Mann-Kendall test for DRO in groundwater from wells MRP-MW8 and 02-230. As a result, the Sen's slope was not calculated for DRO data over time from each of these wells, and an estimate to achieve endpoint criterion is not possible. The data also do not support use of simple linear regression to estimate a time when the endpoint criterion may be achieved for either monitored well.

Future Monitoring Recommendations

Dissolved DRO has migrated to the surface water protection point at a concentration greater than the endpoint criterion, which is based on the ADEC cleanup level. However, petroleum seeps or sheens have not been observed along the adjacent shoreline of Sweeper Cove, and TAH and TAqH concentrations were below surface water quality criteria in all site wells during this review period. Annual monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a). In addition, the two new site wells (601 and 602) should be included in annual monitoring activities at this site, because the concentration of DRO in well 601 is greater than the endpoint criterion and because well 602 is located downgradient of an area of high DRO concentrations in soil.

6.4.13 SA 80, Steam Plant 4, USTs 27089 and 27090

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 80, Steam Plant 4, USTs 27089 and 27090 site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC selected monitored natural attenuation with ICs as the final remedy for this site (U.S. Navy and ADEC 2005a). In addition, the decision document specified that two additional soil samples would be collected at the site to evaluate natural attenuation processes within the vadose zone soil, and one additional groundwater sample would be collected in well 04-173 to evaluate petroleum concentrations in the area where free product was historically detected. Results of this additional soil and groundwater sampling are discussed in the Site Catalog (Appendix A). Groundwater samples were collected from SA 80, Steam Plant 4, USTs 27089 and 27090 site during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring.

Groundwater samples were collected from 04-103, 04-158, 04-159, 04-173, 04-801, and SP4-3 for DRO and NAPs analysis. Although annual sampling of wells 04-158 and 04-173 was planned for 2006 through 2010, samples were not collected from these two wells in 2006 through 2009 because of the presence of free product. DRO analyses were conducted annually at wells 04-159 and 04-801, in 2006 and 2008 at well 04-103, and in 2006, 2007, 2008, and 2010 at well SP4-3. NAPs analyses were conducted every 5 years in wells 04-159, 04-801, and SP4-3, with the most recent sampling event occurring in 2009. NAPs analyses were not performed in wells 04-158 and 04-173, because of the presence of free product. The frequency of DRO monitoring was reduced at well 04-103 to once every other year (even years) after the 2006 sampling event, because the DRO concentration had met the endpoint criterion and this cross-gradient well is

located a long distance from wells exhibiting exceedances of the endpoint criteria. Sampling of well 04-103 was discontinued following the 2008 monitoring event, because concentrations of contaminants in this cross-gradient well met endpoint criteria for six consecutive monitoring events. The frequency of DRO monitoring was reduced at well SP4-3 to once every other year (even years) after the 2008 sampling event, because the DRO concentrations had met endpoint criterion and exhibited a decreasing trend. However, monitoring for free phase product was continued at this location on an annual basis.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SA 80, Steam Plant 4, USTs 27089 and 27090 site. Wells 04-158 and 04-173 are located in the general former source area. Wells 04-159 and 04-801 are located within the dissolved plume at increasing downgradient distances, respectively. SP4-3 is located south of the centerline, and 04-103 is located substantially south of the plume centerline and further downgradient than SP4-3.

Analytical Results. DRO was either not detected or detected at concentrations below the endpoint criterion of 1,500 µg/L in all groundwater samples collected from wells 04-103 and 04-801 during this 5-year review period. DRO was reported in groundwater samples collected at well 04-159 from 2006 to 2010 at concentrations ranging from 3,800 to 9,800 µg/L. The highest DRO concentration was measured in the 2008 sample from this well. The DRO concentrations in this well have consistently been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period. DRO was reported in groundwater samples collected at well SP4-3 from 2006 to 2010 at concentrations ranging from 500 to 5,700 µg/L. The highest DRO concentration was measured in the 2010 sample from this well. Samples collected from this well exceeded the endpoint criterion in 2006 and 2010. DRO was reported in groundwater samples collected at wells 04-158 and 04-173 in 2010 at concentrations of 13,000 and 3,200 µg/L, respectively. Both of these concentration exceed the endpoint criterion.

DRO concentrations at wells 04-159 and SP4-3 have generally been stable from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SA 80, Steam Plant 4, USTs 27089 and 27090 site. Although only limited free-product recovery activities, conducted during the regularly scheduled annual groundwater monitoring activities, are part of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at several wells based on requests by ADEC. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled

"Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SA 80, Steam Plant 4, USTs 27089 and 27090 site.

Between October 1996 and September 2010, monitoring wells within the vicinity of the SA 80, Steam Plant 4 site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, four wells (04-155, 04-158, 04-173, and SP4-2) were gauged monthly from May 2007 through September 2010, and two wells (04-157 and 04-164) were gauged monthly from October 2008 through September 2010. Monthly gauging (and free-product recovery) activities were performed concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Wells 04-155, 04-158, 04-173, and SP4-2 were identified for potential free-product recovery, based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. Wells 04-157 and 04-164 were added to the monthly gauging in October 2008 based on a request by ADEC, because free product was detected in well 04-157 in September 2008, and 04-164 is downgradient of wells 04-157, 04-158, and 04-173, all of which contained free product in September 2008.

Between October 2005 and September 2010, free product has been detected in eight wells, 04-155, 04-157, 04-158, 04-159, 04-164, 04-173, SP4-2, and SP4-3, at the site. The maximum measured thickness of free product reported at the site since October 2005 was 1.34 feet, in well 04-157 in March 2009. The maximum measured thickness of free product reported in wells 04-155, 04-158, 04-159, 04-164, 04-173, SP4-2, and SP4-3 was 0.41 foot in September 2007, 0.75 foot in May 2007, 0.01 foot in September 2009, 0.01 foot in September 2009 and September 2010, 0.74 foot in September 2006, 0.02 foot in July and August 2007, and 0.01 foot in September 2009, respectively.

Free-Product Recovery. Interim free-product recovery at the SA 80, Steam Plant 4 site ceased in June 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). However, the final decision document for this site specified that annual free-product recovery be performed as part of the scheduled annual groundwater monitoring activities (U.S. Navy and ADEC 2005a). Furthermore, the decision document states that free product will be removed in wells with measured free-product thicknesses above 0.5 foot in a 2-inch well and 0.1 foot in a 4- or 6-inch well. In May of 2007, the ADEC requested that the Navy resume monthly free-product recovery at selected wells, including wells 04-155, 04-158, 04-173, and SP4-2. Wells 04-157 and 04-164 were added to the monthly gauging in October 2008, also at the request of ADEC. As discussed at the beginning

of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free product was recovered from well 04-173 during annual groundwater monitoring events in September 2006, September 2007, and September 2008, and from wells 04-155, 04-157, 04-158, and 04-173 during monthly free-product recovery activities that occurred between May 2007 and September 2010. Approximately 2.67 gallons of free product was recovered from 04-173 during the annual groundwater monitoring events from October 2005 through September 2010. Approximately 0.22, 3.21, 1.7, and 0.58 gallons were recovered during the monthly free-product recovery activities from May 2007 through September 2010 from wells 04-155, 04-157, 04-158, and 04-173, respectively. Therefore, the total volume of free product recovered from the SA 80, Steam Plant 4 site for the period October 2005 through September 2010 was 8.38 gallons. Although the maximum volume of free product was recovered from 04-173 during this time period, the maximum volumes recovered for October 2008 through September 2009 and October 2009 through September 2010 have been from wells 04-157 and 04-158. It should also be noted that free product was recovered in September 2004 from well 04-173 during additional groundwater sampling required by the decision document. The report describing these activities was not available when the last 5-year review was prepared. Therefore, this information is provided here. Approximately 6 gallons of free product were recovered from well 04-173 during the September 2004 sampling event.

From 2006 through 2008, free product was not always recovered from wells 04-155, 04-157, and 04-173 when free-product thicknesses were greater than 0.1 foot. Wells 04-155 and 04-157 are 4-inch-diameter wells, and well 04-173 is a 6-inch-diameter well. During the 2006 annual groundwater monitoring event, free product was not recovered from well 04-155, though the product thickness was 0.14 foot. During the 2008 annual groundwater monitoring event, free product was not recovered from well 04-157, though the product thickness was 0.17 foot. During the August 2007 monthly free-product recovery activities, free product was not recovered from well 04-173, though the product thickness was 0.25 foot. Finally, during the September 2007 monthly free-product recovery activities, free product was not recovered from wells 04-155 and 04-173, though product thickness were 0.41 and 0.22 foot, respectively. Since September 2008, free-product has been recovered from all wells as required by the decision document.

Natural Attenuation Assessment

Sulfate concentrations for the plume source wells are depleted (0.07 and 0.11 mg/L), compared to background (2.52 mg/L), indicating strong evidence that sulfate reduction is occurring at the site. Plume source well ferrous iron concentrations (100 and 112.5 mg/L) are elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the SA 80, Steam Plant 4 site, as demonstrated by elevated

methane concentrations in contaminated source wells (1,300 and 5,100 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data strongly indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. No trend and stable conditions were identified using the Mann-Kendall test for DRO in groundwater from wells 04-159 and SP4-3. There are not enough data to calculate the Mann-Kendall statistic for wells 04-158 and 04-173. DRO concentrations are below the endpoint criterion in groundwater samples form well 04-801. As a result, the Sen's slope was not calculated for DRO data over time from each of these wells, and an estimate to achieve endpoint criterion is not possible. The data also do not support use of simple linear regression to estimate the time when endpoint criterion may be achieved for these wells.

Future Monitoring Recommendations

DRO is present in groundwater at concentrations greater than the endpoint criterion, which is based on the ADEC cleanup level, in the former source area and immediately downgradient. DRO has not migrated to the downgradient monitoring points at concentrations greater than PQLs. Annual monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with one modification. The monitoring frequency of DRO in well SP4-3 should be increased to annually, because the concentration in the sample collected in 2010 exceeded the endpoint criterion. In addition, product thickness measurements and free-product recovery, if required, should be reduced to six visits per year at wells where monthly measurements are currently being performed. The observance of low product thicknesses and recovered product volumes warrants a reduction in the monthly product recovery activity frequency. In addition, free-product recovery often cannot be performed or is severely limited during winter months because of poor weather, snowy conditions, and icy roads.

6.4.14 SA 82, P-80/P-81 Buildings

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring or product thickness measurements at the SA 82, P-80/P-81 Buildings site from 2006 through 2009. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected limited groundwater monitoring as the final remedy for this site (U.S. Navy and ADEC

2005a). In addition, the decision document specified that a limited soil removal would be conducted at this site. Groundwater samples were collected from SA 82, P-80/P-81 Buildings site during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (Clam Lagoon).

Groundwater samples were collected from 12-170, 12-172, 12-180, 12-194, and 12-401 for DRO and RRO analysis. DRO analysis was conducted in 2006 and 2008 at wells 12-170 and 12-172, in 2006 at 12-401, in 2007 and 2008 at 12-180, and in 2008 at 12-194. RRO analysis was conducted in 2008 at well 12-194. It is unclear why the sample collected from 12-194 was analyzed for RRO. Sampling of well 12-401 was discontinued following the 2006 monitoring event, because concentrations of contaminants in this well met endpoint criteria for five consecutive monitoring events. The frequency of DRO monitoring was reduced at wells 12-170 and 12-172 to once every other year (even years) after the 2006 sampling event, because DRO had not been measured at concentrations greater than the endpoint criterion of 15,000 µg/L in samples collected from these wells. A sample was not collected at well 12-180 in 2006 because of the presence of free product. Monitoring of well 12-194 was started in 2008, because free product was detected in this well in 2007. Monitoring was discontinued at this site following the 2008 groundwater monitoring event, because concentrations of DRO have been less than the endpoint criterion. ADEC granted the site "cleanup complete with institutional controls" on June 22, 2010.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SA 82, P-80/P-81 Buildings site. Wells 12-170 and 12-180 are each positioned within individual former UST excavations that are separated by approximately 110 feet. Well 12-172 is located approximately 90 feet downgradient of well 12-170. Wells 12-401 and 12-194 are located approximately 220 feet downgradient of well 12-170, and are approximately 50 feet apart.

Analytical Results. DRO was either not detected or detected at concentrations below the endpoint criterion of 15,000 µg/L in all groundwater samples collected from all wells at this site during this 5-year review period. Since no groundwater DRO concentrations have exceeded the endpoint criterion during any monitoring event no trend analysis has been performed for this site.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SA 82, P-80/P-81 Buildings site. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at one well (12-180) based on a request by ADEC during comment resolution on the 2006 annual

groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SA 82, P-80/P-81 Buildings site.

Between October 1996 and October 2009, monitoring wells within the vicinity of the SA 82, P-80/P-81 Buildings site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, one well (12-180) was gauged from May 2007 through October 2009, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Between October 2005 and October 2009, free product has been detected in two of the six wells (12-180 and 12-194) gauged for free product at the site. The maximum measured thickness of free product in well 12-180 was 0.25 in September 2006. Monthly product thickness measurements at the site were discontinued after October 2009, because free product has not been detected at the site since January 2009. ADEC granted the site "cleanup complete with institutional controls" on June 22, 2010.

Free-Product Recovery. Interim free-product recovery at the SA 82, P-80/P-81 Buildings was discontinued in June 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). In addition, free-product recovery is not a component of the final remedy for this site. However, in May of 2007, ADEC requested that the Navy resume free-product recovery at selected wells, including well 12-180, as discussed above. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. Free product was recovered from well 12-180 during the September 2006 annual groundwater monitoring event. Approximately 0.4 gallon of free product was recovered from this 4-inch well. No free product was recovered from well 12-180 during the monthly free-product recovery activities that occurred between May 2007 and October 2009, because the maximum free-product thickness detected was 0.04 foot. Therefore, the total volume of free product recovered from the SA 82, P-80/P-81 Buildings site for the period October 2005 through October 2009 was 0.4 gallon. Free-product recovery activities at well 12-180 were discontinued after October of 2009, because free product has not been detected at the site since January 2009. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Future Monitoring Recommendations

Monitoring is no longer being performed at this site, because ADEC granted the site "cleanup complete with institutional controls" on June 22, 2010.

6.4.15 SA 88, P-70 Energy Generator, UST 10578

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 88, P-70 Energy Generator, UST 10578 site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC selected limited groundwater monitoring as the final remedy for this site (U.S. Navy and ADEC 2005a). In addition, the decision document specified that four additional groundwater samples would be collected from wells 12-252, 12-162, 12-163, and 12-198 to obtain current information on petroleum concentrations in the area. Groundwater samples were collected from the SA 88, P-70 Energy Generator, UST 10578 site during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (Clam Lagoon).

Groundwater samples were collected from 12-162, 12-163, 12-197, 12-198, 12-252, 12-253, 12-701, and 12-702 for DRO analysis. Although annual sampling of wells 12-162, 12-163, 12-197, 12-198, 12-252 was planned for 2006 through 2010, samples were not collected from these wells during some of the annual groundwater events because of the presence of free product. Samples were not collected from any of these wells in 2006, samples were not collected from 12-198 during the 2007 groundwater monitoring event, and samples were not collected from 12-163, 12-198, and 12-252 during the 2008 groundwater monitoring event. DRO analyses were conducted annually on samples collected at wells 12-253, 12-701, and 12-702. However, monitoring was discontinued at wells 12-701 and 12-702 following the 2009 groundwater monitoring event, because DRO concentrations had remained less than the endpoint criterion in these wells for four consecutive sampling events. Monitoring for free product continued at these two wells on an annual basis.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SA 88, P-70 Energy Generator, UST 10578 site. Well 12-701 is located outside of the dissolved petroleum plume, approximately 170 feet downgradient of the former UST at this site and approximately 300 feet upgradient of a drainage ditch that drains to Clam Lagoon. Well 12-162 is located within the former UST excavation limits at the site. Well 12-163 is located

approximately 20 feet downgradient of the former UST excavation. Well 12-198 is located approximately 15 feet upgradient of the former UST excavation. Well 12-252 is located approximately 40 feet downgradient of the former UST excavation. Well 12-253 is located approximately 40 feet downgradient of well 12-252. Wells 12-197 and 12-702 are located cross gradient of the plume centerline.

Analytical Results. DRO concentrations were below the endpoint criterion in all samples collected from all site wells during this 5-year review period. Since no well has been observed to exceed endpoint criteria, no statistical analysis was performed. However, concentrations appear to be generally stable or declining in all wells at the site.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SA 88, P-70 Energy Generator, UST 10578 site. Although only limited free-product recovery activities, conducted during the regularly scheduled annual groundwater monitoring activities, are part of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at five wells, based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SA 88, P-70 Energy Generator, UST 10578 site.

Between October 1996 and September 2010, monitoring wells within the vicinity of the SA 88, P-70 Energy Generator, UST 10578 site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, five wells (12-162, 12-163, 12-197, 12-198, and 12-252) were gauged monthly from May 2007 through September 2010, concurrently with free product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Between October 2005 and September 2010, free product has been detected in six of the eight wells, 12-162, 12-163, 12-197, 12-198, 12-252, and 12-253, at the site. The maximum measured thickness of free product reported at the site since October 2005 was 0.92 foot, in well 12-198 in September 2008. The maximum measured thickness of free product reported in wells 12-162, 12-163, 12-197, 12-252, and 12-253 was 0.75 foot in September 2006, 0.29 foot in September 2006, 0.61 foot in September 2006, 0.19 foot in September 2006, and 0.01 foot in September

2008, respectively. Free product has not been detected at wells 12-162 and 12-197 since September 2006.

Free-Product Recovery. Interim free-product recovery at the SA 88, P-70 Energy Generator, UST 10578 site ceased in June 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). However, the final decision document for this site specified that annual free-product recovery be performed as part of the scheduled annual groundwater monitoring activities (U.S. Navy and ADEC 2005a). Furthermore, the decision document states that free product will be removed in wells with measured free-product thicknesses above 0.5 foot in a 2-inch well and 0.1 foot in a 4- or 6-inch well. In May of 2007, the ADEC requested that the Navy resume monthly free-product recovery at selected wells, including wells 12-162, 12-163, 12-197, 12-198, and 12-252. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free product was recovered from well 12-198 during annual groundwater monitoring events in September 2006, September 2007, and September 2008 from wells 12-162 and 12-197 during the September 2006 annual groundwater monitoring event and from wells 12-162, 12-163, and 12-198 during monthly free-product recovery activities that occurred between May 2007 and September 2010. Approximately 1.85 gallons of free product were recovered from 12-198 during the annual groundwater monitoring events from October 2005 through September 2010. Approximately 0.25 and 0.50 gallon of free product was recovered from wells 12-162 and 12-197, respectively, during the September 2006 annual groundwater monitoring event. Approximately 0.14, 0.26, and 3.84 gallons were recovered during the monthly free-product recovery activities from May 2007 through September 2010 from wells 12-162, 12-163, and 12-198, respectively. Therefore, the total volume of free product recovered from the SA 88, P-70 Energy Generator, UST 10578 site for the period October 2005 through September 2010 was 6.84 gallons. The maximum volume of free product was recovered from well 12-198 during this time period. Furthermore, the maximum volume was recovered from well 12-198 for the period from October 2009 through September 2010. It should also be noted that free product was recovered in September 2004 from well 12-198 during additional groundwater sampling required by the decision document. The report describing these activities was not available when the last 5-year review was prepared. Therefore, this information is provided here. Approximately 1.21 gallons of free product was recovered from well 12-198 during the September 2004 sampling event.

From 2006 through 2007, free product was not always recovered from wells 12-198 and 12-252 when free-product thicknesses were greater than 0.1 feet. Wells 12-198 and 12-252 are 4-inch-diameter wells. During the 2006 annual groundwater monitoring event, free product was not recovered from well 12-252, though the product thickness was 0.19 foot. During the August

2007 and October 2007 monthly free-product recovery activities, free product was not recovered from well 12-198 even though the product thicknesses were 0.48 and 0.41 foot, respectively. Since October 2007, free product has been recovered from all wells as required by the decision document.

Future Monitoring Recommendations

The DRO concentrations in source area wells were less than endpoint criterion, which is based on 10 times the ADEC groundwater cleanup level, from 2006 through 2010. In addition, free product has not been detected at thicknesses greater than 0.5 foot during the last two years of monthly free-product recovery activities. Since DRO concentrations have remained less than the endpoint criterion in all on-site wells for at least two consecutive sampling events, and only trace amounts of observed free product persist at this site, it is recommended that monitoring at this site be discontinued.

6.4.16 South of Runway 18-36 Area

Data Review

Data Collection During This 5-Year Review Period. The Navy conducted annual monitoring at the South of Runway 18-36 Area site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected passive free-product recovery and containment, monitored natural attenuation for groundwater, natural recovery for surface water and sediment, and ICs as the final remedy for this site (U.S. Navy and ADEC 2006c). In addition, the decision document specified that a free-product recovery trench would be installed at the site adjacent to South Sweeper Creek for product recovery and seven new wells would be installed at the site for surface water protection monitoring, natural attenuation monitoring, and free-product recovery.

Groundwater samples were collected during the annual groundwater monitoring activities at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]), to evaluate natural attenuation parameters, and to evaluate groundwater quality downgradient of the site to serve as a warning for potential impacts to the downgradient surface water body (South Sweeper Creek). Sediment and surface water samples were collected during the annual monitoring activities at this site to evaluate the natural recovery of surface water and sediments in South Sweeper Creek relative to endpoint criteria established in the decision document and ADEC surface water quality criteria.

Groundwater samples were collected from wells 02-231, 02-232, AS-1, E-208, E-218, and RW-18/36-03 for surface water protection and natural attenuation monitoring. Monitoring was

conducted annually in these wells, except for in wells AS-1, E-208, and RW-18/36-03. A sample was not collected from well AS-1 in 2006, because of the presence of free product. Samples were not collected from E-208 in 2008 and 2010, because the frequency of monitoring was reduced to every other year (odd years) following the 2007 groundwater monitoring event because endpoint criteria had not been exceeded in this well during any of the monitoring events. A sample was not collected from well RW-18/36-03 in 2007, because well 18/36-03 was inadvertently sampled instead of RW-18/36-03. DRO, GRO, BTEX, TAH, and TAqH analyses were conducted at all surface water protection monitoring wells from 2006 through 2009. Following the 2009 annual groundwater monitoring event, sampling for GRO was discontinued at the surface water protection monitoring wells, because GRO had not been detected at concentrations above the endpoint criterion in any groundwater samples collected at the site for at least four consecutive sampling events. Therefore, samples collected from this site were only analyzed for DRO, BTEX, TAH, and TAqH in 2010. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009.

Groundwater samples were collected from wells 18/36-05, E-206, and MRP-12 for natural attenuation monitoring. Monitoring was conducted annually in these 3 wells in 2006 and 2007. Following the 2007 annual groundwater monitoring event, the frequency of monitoring was reduced to every other year (odd years), because endpoint criteria had not been exceeded in these three wells during any of the monitoring events. Sampling at wells MRP-12, 18/36-05, and E-206 was discontinued following the 2009 groundwater monitoring event, because contaminant concentrations had remained below endpoint criteria for at least four sampling events and because NAPs data indicated that natural attenuation was progressing on site. Samples collected from these three wells were analyzed for DRO during every monitoring event. NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009.

Surface water and sediment samples were collected annually from locations 852, NSWSD-01, NSWSD-02, NSWSD-03, NSWSD-04, NSWSD-05, NSWSD-06, NSWSD-07, and NSWSD-08 for natural recovery monitoring. DRO, GRO, TAH, TAqH, and indeno(1,2,3-cd)pyrene analyses were conducted at all surface water monitoring locations from 2006 through 2009. DRO, GRO, 2-methyl naphthalene, and phenanthrene analyses were conducted at all sediment monitoring locations from 2006 through 2009. Following the 2009 monitoring event, GRO analysis was discontinued because GRO had not been detected at concentrations above the endpoint criterion in any surface water or sediment samples collected at the site for at least four consecutive sampling events. In addition, a one-time surface water sample was collected in 2007 at new location NL-02 from the discharge side of the transfer pump between West Canal and South Sweeper Creek and analyzed for DRO, TAH, TAqH, and TSS. The purpose of this sample was to determine whether contaminants were migrating from West Canal to South Sweeper Creek. Shoreline inspections were conducted annually from 2006 through 2010.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells and surface water and sediment monitoring locations at the South of Runway 18-36 Area site relative to site features. Wells E-218, 02-231, AS-1, 02-232, RW-18/36-03, and E-208 are located along the shoreline of South Sweeper Creek or Sweeper Cove from north to south. Wells E-206, 18/36-05, and MRP-12 are located upgradient of the source area from north to south. Surface water and sediment sampling locations NSWSD-08, NSWSD-01, NSWSD-02, NSWSD-03, NSWSD-04, NSWSD-05, 852, NSWSD-06, NSWSD-07 are located with South Sweeper Creek from north to south. NSWSD-08 is located upgradient of the South of Runway 18-36 Area site. All other surface water and sediment sampling locations are downgradient of the source area.

Groundwater Sampling Results. GRO, benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells during this 5-year review period. DRO concentrations were below the endpoint criterion in all samples collected from wells 02-232, 18/36-05, AS-1, E-206, E-208, E-218, RW-18/36-03, and MRP-12 during this 5-year review period. TAH and TAqH concentrations were below their respective surface water quality criteria in all samples collected from wells 02-232, 18/36-05, E-206, E-208, E-218, RW-18/36-03, and MRP-12 during this 5-year review period.

DRO was reported in groundwater samples collected at well 02-231 from 2006 to 2010 at concentrations ranging from 6,700 to 20,000 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were greater than the endpoint criterion of 15,000 µg/L in 2006, 2007, and 2008. TAH was reported in groundwater samples collected at well 02-231 from 2006 to 2010 at concentrations ranging from 287 to 395 µg/L. The highest TAH concentration in this well was measured in the 2009 sample. The TAH concentrations in this well have consistently been greater than the ADEC surface water criterion of 10 µg/L during this 5-year review period. TAqH was reported in groundwater samples collected at well 02-231 from 2006 to 2010 at concentrations ranging from 291 to 646.4 µg/L. The highest TAqH concentration in this well was measured in the 2010 sample. The TAqH concentrations in this well have consistently been greater than the ADEC surface water quality criterion of 15 µg/L.

TAH was reported in groundwater samples collected at well AS-1 from 2006 to 2010 at concentrations ranging from 31.6 to 86 µg/L. The highest TAH concentration in this well was measured in the 2007 sample. The TAH concentrations in this well have consistently been greater than the ADEC surface water criterion of 10 µg/L during this 5-year review period. TAqH was reported in groundwater samples collected at well AS-1 from 2006 to 2010 at concentrations ranging from 51.8 to 286 µg/L. The highest TAqH concentration in this well was measured in the 2009 sample. The TAqH concentrations in this well have consistently been greater than the ADEC surface water quality criterion of 15 µg/L.

DRO concentrations at well 02-231 were generally stable from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria or for wells for which there were less than four data points. Furthermore, statistical trend evaluations were not performed for TAH and TAqH. However, TAH and TAqH concentrations in well 02-231 appear to be increasing and in well AS-1 appear to be stable.

Surface Water Sampling Results. GRO, indeno(1,2,3-cd)pyrene, TAH, and TAqH were not detected above endpoint criteria in any of the surface water samples collected at surface water sampling locations 852 and NSWSD-01 through NSWSD-08 during this 5-year review period. DRO was not detected above its endpoint criterion in any of the surface water samples collected at sampling locations NSWSD-01 and NSWSD-03 through NSWSD-08 during this 5-year review period. DRO, TAH, and TAqH were not detected above endpoint criteria in the one-time surface water sample collected at location NL-02 in 2007.

DRO was reported in surface water samples collected at location NSWSD-02 from 2006 through 2010 at concentrations ranging from 29 to 260 µg/L. The highest DRO concentration was measured in the 2006 sample, which was the only sample that exceeded the endpoint criterion at this location during this 5-year review period. DRO was reported in surface water samples collected at location 852 from 2006 through 2010 at concentrations ranging from 84 to 1,000 µg/L. The highest DRO concentration at this location was measured in the 2009 sample. The DRO concentrations in surface water at this location were above the endpoint criterion in samples collected in 2006, 2009, and 2010. Since NSWSD-03 through NSWSD-07 did not exceed the endpoint criterion for DRO, and location 852 is closer to SWMU 60 than the South of Runway 18-36 Area site, it is probable that exceedances at location 852 are associated with SWMU 60.

Sediment Sampling Results. GRO was not detected above the endpoint criterion in any of the sediment samples collected at any of the sediment sampling locations at the site. 2-Methylnaphthalene was not detected above the endpoint criterion in any of the sediment samples collected at locations NSWSD-03 through NSWSD-08. Phenanthrene was not detected above the endpoint criterion in any of the sediment samples collected at locations NSWSD-01 through NSWSD-08. DRO was not detected above the endpoint criterion in any of the sediment samples collected at locations NSWSD-06 and NSWSD-07.

DRO was reported in sediment samples collected at location NSWSD-01 from 2006 to 2010 at concentrations ranging from 22 to 14,000 mg/kg. The highest DRO concentration at this location was measured in the 2009 sample. The DRO concentrations at this location were greater than endpoint criterion of 90.5 mg/kg in 2006, 2007, 2009, and 2010. 2-Methylnapthalene was reported in sediment samples collected at location NSWSD-01 from 2006 to 2010 at concentrations ranging from 0.00088 to 0.023 mg/kg. The highest 2-methylnaphthalene concentration at this location was measured in the 2009 sample. The

2-methylnaphthalene concentration at this location was greater than endpoint criterion of 0.0202 mg/kg in 2009.

DRO was reported in sediment samples collected at location NSWSD-02 from 2006 to 2010 at concentrations ranging from 270 to 15,000 mg/kg. The highest DRO concentration at this location was measured in the 2009 sample. The DRO concentrations at this location were consistently greater than endpoint criterion of 90.5 mg/kg during this 5-year review period. 2-Methylnapthalene was reported in sediment samples collected at location NSWSD-02 from 2006 to 2010 at concentrations ranging from 0.0032 to 0.14 mg/kg. The highest 2-methylnaphthalene concentration at this location was measured in the 2009 sample. The 2-methylnaphthalene concentration at this location was greater than endpoint criterion of 0.0202 mg/kg in 2009.

DRO was reported in sediment samples collected at location 852 from 2006 to 2010 at concentrations ranging from 260 to 4,100 mg/kg. The highest DRO concentration at this location was measured in the 2010 sample. The DRO concentrations at this location were consistently greater than endpoint criterion of 90.5 mg/kg during this 5-year review period. 2-Methylnapthalene was reported in sediment samples collected at location 852 from 2006 to 2010 at concentrations ranging from 0.0068 to 0.19 mg/kg. The highest 2-methylnaphthalene concentration at this location was measured in the 2010 sample. The 2-methylnaphthalene concentration at this location was greater than endpoint criterion of 0.0202 mg/kg in 2010. Phenanthrene was reported in sediment samples collected at location 852 from 2006 to 2010 at concentrations ranging from 0.031 to 0.6 mg/kg. The highest phenanthrene concentration at this location was measured in the 2007 sample. The phenanthrene concentrations at this location were greater than endpoint criterion of 0.225 mg/kg in 2007 and 2010. As discussed for the surface water sampling results, it is probable that exceedances at location 852 are associated with SWMU 60. Furthermore, the 2010 CMP only includes monitoring at location 852 for SWMU 60.

DRO was reported in sediment samples collected at location NSWSD-03 from 2006 to 2010 at concentrations ranging from 74 to 2,000 mg/kg. The highest DRO concentration at this location was measured in the 2010 sample. The DRO concentrations at this location were greater than endpoint criterion of 90.5 mg/kg in 2007, 2008, 2009, and 2010. DRO was reported in sediment samples collected at location NSWSD-04 from 2006 to 2010 at concentrations ranging from 120 to 330 mg/kg. The highest DRO concentration at this location was measured in the 2006 sample. The DRO concentrations at this location were consistently greater than endpoint criterion of 90.5 mg/kg during this 5-year review period. DRO was reported in sediment samples collected at location NSWSD-05 from 2006 to 2010 at concentrations ranging from 36 to 340 mg/kg. The highest DRO concentration at this location was measured in the 2010 sample. The DRO concentrations at this location were greater than endpoint criterion of 90.5 mg/kg in 2006, 2007, 2009, and 2010. DRO was reported in sediment samples collected at location NSWSD-08 from

2006 to 2010 at concentrations ranging from 94 to 380 mg/kg. The highest DRO concentration at this location was measured in the 2008 sample. The DRO concentrations at this location were consistently greater than endpoint criterion of 90.5 mg/kg during this 5-year review period.

Visual Inspections. Visual inspections of the shoreline of South Sweeper Creek were performed annually during this 5-year review period. During the 2006 monitoring event, localized sheens were observed on the sediment adjacent to the NSWSD-4 and NSWSD-8 sampling locations, a petroleum seep was observed adjacent to the NSWSD-5 sampling location, black subsurface sediment was observed in the area of sample location 852, and petroleum sheens were observed on the surface water adjacent to sample locations NSWSD-8, NSWSD-5, and 852. During the 2007 monitoring event, one seep was identified near sampling location 852 (indicating possible migration of petroleum contaminants in the area of SWMU 60 to surface water near location 852), odors were observed in the area of sample locations 852, RW-18/36-03, and NSWSD-06, and petroleum sheens were observed on the surface water adjacent to sample locations 852, RW-18/36-03, NSWSD-02, NSWSD-05, and NSWSD-06. During the shoreline inspection conducted in 2008, odor and sheen were observed along the shoreline of South Sweeper Creek at sediment sampling locations NSWSD-4 and 852. Petroleum sheen, but no seep, was observed in South Sweeper Creek during the 2009 shoreline inspection near sampling location NSWSD-04. Additionally, petroleum sheen and odor were observed along the shoreline adjacent to South of Runway 18/36 at sediment sample locations NSWSD-1 through NSWSD-06 when the sediment was disturbed. A sulfur odor but no seep or sheen, was observed in South Sweeper Creek during the 2010 shoreline inspection downgradient of the South of Runway 18/36 Area product recovery trench. Oily sediments, petroleum sheen, and odor were observed along the shoreline adjacent to South of Runway 18/36 at sediment sample locations NSWSD-1 through NSWSD-05 when the sediment was disturbed during sampling activities.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the South of Runway 18-36 Area site. Free-product recovery is a component of the final remedy for this site (U.S. Navy and ADEC 2006c). Therefore, monthly monitoring and free-product recovery were performed at this site during this 5-year review period. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the South of Runway 18-36 Area site.

Between June 1997 and September 2010, monitoring wells within the vicinity of the South of Runway 18-36 Area site have been gauged periodically for the presence of free product.

However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, 26 wells were gauged monthly from September 2006 through September 2008, 17 wells were gauged monthly from October 2008 through September 2009, and 14 wells were gauged monthly from October 2009 through September 2010 as part of final remedy implementation (free-product recovery). The frequency of product thickness measurements at nine wells (18/36-01, 18/36-02, 18/36-03, RW-18/36-01, RW-18/36-02, RW-18/36-03, RW-18/36-05, RW-18/36-06, and RW-18/36-07) was decreased from monthly to annually after September 2008, because free product had not been observed for six months in these wells. The frequency of product thickness measurements at well AS-1 was decreased from monthly to annually after September 2009, because free product had not been observed for 12 months in this well. The frequency of product thickness measurements at well RW-18/36-01 was increased to monthly in October 2009, because free product was detected in this well during the 2008 annual groundwater monitoring event and because it was inadvertently dropped from the monthly monitoring program. The October 2008 to September 2009 remedial action summary report recommended that monthly monitoring and free-product recovery activities at well Z3-2 should be initiated, because 0.17 foot of product was observed in this well during the September 2009 annual groundwater monitoring event. Monitoring in this well was initiated in October 2010. Continued monitoring of E-213, E-215, RW-18/36-04 was also recommended in the September 2009 annual groundwater monitoring event. Although monitoring of these wells was discontinued in October 2009, it was restarted in October 2010.

Between October 2005 and September 2010, free product has been detected in 26 wells at the site. The maximum measured thickness of free product reported at the site since October 2005 was 1.78 feet, in well E-216 in September 2010. The maximum measured thickness of free product reported in other site wells where free product was measured at thicknesses greater than 0.1 foot was the following:

- 0.37 foot in September 2006 at 02-231
- 0.28 foot in September 2006 at AS-1
- 0.3 foot in March 2007 at 18/36-R2
- 0.52 foot in September 2007 at E-215
- 0.86 foot in February 2008 at E-207
- 0.31 foot in July 2008 at E-217
- 0.45 foot in February 2008 at RW-18/36-01
- 1.75 feet in March 2009 at E-209
- 0.17 foot in September 2009 at Z3-2
- 0.22 foot in September 2010 at RW-18/36-04

Free-Product Recovery. Interim free-product recovery at this site was conducted between June 1997 and July 2005, using passive recovery devices installed in site wells. Interim free-product recovery efforts were discontinued in July 2005, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the final closure report for interim action free-product recovery (U.S. Navy 2006c). Free-product recovery was selected as part of the final remedy for the site in the decision document (U.S. Navy and ADEC 2006c). These additional free-product recovery activities were implemented at the site in September 2006. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free-product recovery activities were performed at 26 wells at South of Runway 18-36 Area site during monthly free-product recovery activities from September 2006 through September 2008, at 17 wells during monthly free-product recovery activities from October 2008 to September 2009, and at 14 wells from October 2009 through September 2010. Monthly product recovery activities were discontinued at nine wells (18/36-01, 18/36-02, 18/36-03, RW-18/36-01, RW-18/36-02, RW-18/36-03, RW-18/36-05, RW-18/36-06, and RW-18/36-07) after September 2008, because free product had not been observed for 6 months in these wells. Monthly product recovery activities were discontinued at well AS-1 after September 2009, because free product had not been observed for 12 months in this well. Monthly product recovery activities were restarted at well RW-18/36-01 in October 2009, because free product was detected in this well during the 2008 annual groundwater monitoring event and because it was inadvertently dropped from the monthly product-recovery program. The October 2008 to September 2009 remedial action summary report recommended that monthly monitoring and free-product recovery activities should be initiated at well Z3-2, since 0.17 foot of product was observed in this well during the September 2009 annual groundwater monitoring event. Monitoring in this well was initiated in October 2010. Continued monitoring of E-213, E-215, and RW-18/36-04 was also recommended in the September 2009 annual groundwater monitoring event. Although monitoring of these wells was discontinued in October 2009, it was restarted in October 2010.

No free product was recovered from the South of Runway 18-36 Area site during the annual groundwater monitoring events from 2006 through 2010. From September 2006 through September 2008, approximately 2.39, 0.01, 0.09, 0.23, 6.20, 4.9, 0.47, 7.29, 0.2, and 0.78 gallons were recovered during monthly free-product recovery activities from wells 02-231, 18/36-R1, 18/36-R2, 18/36-R5, E-207, E-209, E-215, E-216, E-217, and RW-18/36-01, respectively. From October 2008 through September 2009, approximately 0.4, 0.59, 1.52, and 1.4 gallons were recovered from wells 02-231, E-207, E-209, and E-216, respectively. From October 2009 through September 2010, approximately 1.17, 2.99, 3.03, and 0.44 gallons were recovered during monthly free-product recovery activities from wells E-207, E-209, E-216, and RW-18/36-01, respectively. Therefore, the total volume of free product recovered from the

South of Runway 18-36 Area site for the period October 2005 through September 2010 was 34.10 gallons. The maximum volume of free product (11.72 gallons) was recovered from well E-216 for the time period October 2005 through September 2010. In addition, 9.41 gallons were recovered from E-209 and 7.96 gallons from E-207 during this same time period.

The technically practicable endpoint for passive recovery in site wells has been met at the South of Runway 18-36 Area site. The requirement states that "the practicable endpoint for recovery will be reached when the monthly volume of recovered product, averaged over the most recent 6 months (6-month moving average), is less than 5 gallons per month for a period of 12 months of product recovery." The 6-month moving average of product recovered was less than 5 gallons per month from October 2009 through September 2010. However, the practicable endpoint for the recovery trenches has not met the endpoint criterion. Product was observed one time in one of the eight recovery sumps (18/36-R4) between October 2009 and September 2010. The endpoint criterion for the recovery sumps is that product has been reduced to less than 0.01 inch, or no sounding of the oil/water probe has been experienced for one year.

Natural Attenuation Assessment

Sulfate concentrations for plume and plume edge wells 02-231 and AS-1 are depleted (0.27 and 0.09 mg/L, respectively), compared to background (6.53 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated in well 02-321 (50 mg/L), 02-232 (30 mg/L), and AS-1 (50 mg/L), compared to background (0 mg/L), indicating the occurrence of iron reduction. Evidence of methanogenesis is observed at the South of Runway 18-36 Area site as demonstrated by elevated methane concentrations. Methane concentrations ranging from 5.3 to 8,300 µg/L at on-site wells exceed that of background (0.32 µg/L) (U.S. Navy 2010e).

The 2009 annual monitoring report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Since groundwater in all wells has been below endpoint criteria for at least 2 consecutive years, trend evaluations were not performed at this site (U.S. Navy 2011a).

Future Monitoring Recommendations

DRO was only detected above its endpoint criterion in surface water at location NSWSD-02 in 2006, and at location 852 in 2006, 2009, and 2010. As discussed above, exceedances at location 852 are most likely from SWMU 60, not from South of Runway 18-36 Area. Because concentrations of contaminants in surface water have not exceeded endpoint criteria at locations

NSWSD-01 through NSWSD-06 for four consecutive monitoring events, monitoring surface water at these locations should be discontinued. Although concentrations at NSWSD-07 and NSWSD-08 also have not exceeded endpoint criteria for four consecutive monitoring events, monitoring will be continued at these two locations. These two locations, which are located downgradient and upgradient of the site, will be monitored because concentrations of TAH and TAqH, continue to be above surface water quality criteria in surface water protection monitoring wells 02-231 and AS-1. Monitoring of location 852 is no longer part of the monitoring program for this site. This location is being monitored as part of the SWMU 60 monitoring program.

DRO, TAH, and TAqH concentrations in surface water protection well 02-231 and TAH and TAqH concentrations in surface water protection well AS-1 exceeded endpoint criteria during this 5-year review period. DRO concentrations are stable, but TAH and TAqH concentrations appear to be increasing at 02-231. However, no statistical trend analysis is currently being performed for TAH and TAqH. Therefore, trend analysis should be included in the annual monitoring reports for TAH and TAqH, if concentrations exceed endpoint criteria. Furthermore, selected wells within the area where free product has been detected in the past should be added to the monitoring program, as free product levels decline at the site. No wells within the source area are currently being monitored, and monitoring of these wells should be performed to demonstrate that natural attenuation is occurring within the source area.

DRO, 2-methylnaphthalene, and phenanthrene were detected above endpoint criteria in sediment samples collected at locations 852, NSWSD-01 through NSWSD-05, and NSWSD-08. However, no trend analysis is currently being performed for these contaminants in sediment. Therefore, trend analysis should be included in the annual monitoring reports for these compounds, if concentrations exceed endpoint criteria. Odors, seeps, and sheens have been observed during annual visual inspections. Therefore, annual monitoring should continue as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), except with the changes noted above.

Because free-product recovery activities in site wells have met the endpoint criterion, free-product recovery activities in site wells should be discontinued. However, free-product recovery in the recovery trenches has not met the endpoint criterion. The frequency of product thickness measurements and free-product recovery, if required, should be decreased from monthly to six times per year at the eight free-product recovery sumps because of low product thicknesses and recovered product volumes. Additionally, many sites are typically inaccessible during the winter months of January through March because of poor weather, snowy conditions, and icy roads. The type of free-product recovery equipment installed in each sump should be clearly documented for each month of operation in the annual remedial action summary report. More specifically, the dates of installation and removal should be included in the documentation. In addition, if bailing was used instead of an automated passive skimmer, passive skimmer, or sorbent sock, this should also be clearly documented. This information is necessary to verify whether free-product recovery activities are being performed consistent with the decision

document. The recommendations for the NMCB Building Area, T-1416 Expanded Area site regarding the placement and use of product recovery equipment should also be considered by the Optimization Work Group for the South of Runway 18-36 Area site.

6.4.17 Sweeper Cove

Data Review

Data Collection During This 5-Year Review Period. The Navy has conducted marine tissue monitoring in Sweeper Cove since 1999. Initially, this monitoring was conducted annually in accordance with the OU A ROD. In 2003, the 5-year marine tissue monitoring program required by the OU A ROD was completed. The 2003 technical memorandum for marine monitoring recommended continued sampling for rock sole and blue mussel from Sweeper Cove at a frequency of every other year through the next 5-year review period to evaluate the changes in total PCB concentrations. Therefore, the Navy has conducted marine tissue monitoring at Sweeper Cove every other year from 2004 through 2010 (U.S. Navy 2010d). Marine tissue monitoring and ICs is the ROD-selected remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Blue mussel and rock sole tissue samples are collected from Sweeper Cove to document the temporal change in PCB concentrations in mussels and fish in Sweeper Cove and to determine the date for rescinding ICs advising subsistence and commercial seafood harvesters of the potential risk associated with consumption of certain species of fish and shellfish from Sweeper Cove. Marine tissue samples have been analyzed for PCB cogeners, lipid analysis, and moisture content.

Analytical Results. The mean concentration of PCBs in blue mussel tissue in 2007 and 2009 was 47.9 and 42.5 µg/kg, respectively. The mean concentration in rock sole tissue in 2007 and 2009 was 59.1 and 44.5 µg/kg, respectively. During this 5-year review period, the mean concentration of PCBs in blue mussel and rock sole tissue was above the risk-based action levels of 31 µg/kg and 6.5 µg/kg, respectively. Analytical data for marine tissue samples collected in Sweeper Cove are included in Appendix C.

Mean total PCB concentrations in blue mussel tissue from Sweeper Cove ranged from 24.4 µg/kg in 2001 to 133 µg/kg in 2005 (Appendix C). The mean total PCB concentrations detected in 1996, 1999, 2000, 2003, 2005, 2007, and 2009 were above the risk-based action level of 31 µg/kg. The mean total PCB concentrations in 2001 and 2002 were below the risk-based action level. PCB tissue concentrations in blue mussels collected from Sweeper Cove for the period 1999 through 2009 were plotted for best fit regression and trendline analysis. No statistically significant trend in the PCB concentrations was found (U.S. Navy 2010d).

Mean total PCB concentrations of rock sole data from Sweeper Cove ranged from 19.5 µg/kg in 2005 to 186 µg/kg in 1996 (Appendix C). For each sampling event, the mean concentration is

above the risk-based action level of 6.5 µg/kg. PCB tissue concentrations in rock sole collected from Sweeper Cove for the period 1999 through 2009 were normally distributed and were plotted for best fit regression and trendline analysis. No statistically significant trend in the PCB concentrations was found (U.S. Navy 2010d).

Future Monitoring Recommendations

Based on the assessment of the marine tissue monitoring data collected through 2009, continued collection of blue mussel and rock sole in Sweeper Cove every other year is recommended through 2013. The 2011 data are currently being validated and evaluated. It is expected that the technical memorandum for the 2011 Adak marine monitoring (draft due in October 2011) will include a recommendation to re-evaluate the monitoring program after the 2013 sampling event.

6.4.18 SWMU 14, Old Pesticide Disposal Area

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 14, Old Pesticide Disposal Area site from 2006 through 2010. The combination of monitored natural attenuation and compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected from SWMU 14, Old Pesticide Disposal Area site during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring. The natural attenuation monitoring is related to petroleum hydrocarbons observed in groundwater at the site. Groundwater samples were also collected as part of compliance monitoring to evaluate groundwater quality relative to the OU A ROD CERCLA cleanup criteria. Compliance monitoring is related to chlorinated solvents, total lead, and dissolved lead observed in groundwater at the site. Finally, the 2009 groundwater monitoring report recommended that downgradient samples be collected from this site during the 2010 groundwater monitoring event to support the evaluation of the remedy performed in the 5-year review. This monitoring was related to DRO, GRO, total lead, and dissolved lead.

Groundwater samples were collected from 01-153, 55-145, 55-146, MW14-5, and MW15-3 for DRO, GRO, and BTEX analysis; groundwater samples were collected from 01-153, 55-145, 55-146, MW14-5, and MW15-3 for total and dissolved lead analysis; and groundwater samples were collected from 01-153 and MW14-5 for NAPs analysis. Monitoring was conducted annually unless otherwise noted below. Monitoring for DRO, GRO, and BTEX in 01-153 was discontinued following the 2006 groundwater monitoring event, because these compounds had met endpoint criteria. However, free product was detected in this well during the 2007

groundwater monitoring event. Therefore, the 2007 groundwater monitoring report recommended that monitoring for these compounds be restarted in 2008. Monitoring for DRO, GRO, and BTEX in 01-153 was discontinued again following the 2008 groundwater monitoring event, because endpoint criteria had been met for four consecutive monitoring events. Since total and dissolved lead had not exceeded its endpoint criterion in well 01-153 for at least two sampling periods, sampling for these parameters at this location was discontinued after the 2009 groundwater monitoring event. Monitoring for BTEX in MW14-5 was discontinued following the 2006 groundwater monitoring event, because these compounds had met endpoint criteria. Based on the recommendation in the 2008 groundwater monitoring report, annual monitoring for DRO, GRO, and total and dissolved lead at well 55-146 was initiated in 2009 to assess downgradient migration of these contaminants. Furthermore, DRO, GRO, and total and dissolved lead monitoring was conducted at wells MW-15-3, 55-145 and 55-146 in 2010 as a one-time event to assess downgradient migration of these contaminants based on a recommendation in the 2009 groundwater monitoring report. NAPs analyses were conducted of samples collected from wells 01-153 and MW14-5 every 5 years, with the most recent sampling event occurring in 2009.

Groundwater samples were collected from 01-153 and MW14-5 for chlorinated solvents analysis. Chlorinated solvents analyses, including trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dichloroethene (DCE), cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride, were conducted annually on samples collected at well 01-153. The groundwater sample collected from MW14-5 was analyzed for methylene chloride during the 2006 groundwater monitoring event. Although the 2006 groundwater monitoring report indicated that methylene chloride had not met the endpoint criterion, monitoring for methylene chloride at this location was discontinued after the 2006 groundwater monitoring event. Presumably, this analyte was dropped from the monitoring program because it had never been detected, and the reporting limit during the 2006 groundwater monitoring event was below the OU A ROD cleanup level.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 14, Old Pesticide Disposal Area site. MW14-5 is located nearest to the inferred source area at the site and well 01-153 is located approximately 230 feet cross-gradient. Well MW15-3 is located near the inferred source area of SWMU 15, Future Jobs/DRMO and about 600 feet downgradient of well 01-153. Wells 55-145 and 55-146 are located downgradient of both the SWMU 14, Old Pesticide Disposal Area and the SWMU 15, Future Jobs/DRMO source areas. Well 55-145 is approximately 1,400 feet downgradient of well MW14-5 and well 55-146 is approximately 1,600 feet downgradient of well MW14-5.

Analytical Results. DRO and GRO concentrations were below their endpoint criteria in all samples collected from wells 01-153, 55-145, 55-146, and MW15-3 during this 5-year review period. DRO was reported in groundwater samples collected at well MW14-5 from 2006 to 2010 at concentrations ranging from 1,900 to 4,100 µg/L. The highest DRO concentration was

measured in the 2007 sample from this well. The concentrations of DRO in the samples from well MW14-5 were consistently greater than the endpoint criterion of 1,500 µg/L. GRO was reported in groundwater samples collected at well MW14-5 from 2006 to 2010 at concentrations ranging from 9,000 to 15,000 µg/L. The highest GRO concentration was measured in the 2009 sample from this well. The concentrations of GRO in the samples from well MW14-5 were consistently greater than the endpoint criterion of 1,300 µg/L. BTEX concentrations were below their respective endpoint criteria in all samples collected from all wells at this site during this 5-year review period.

Methylene chloride, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, TCE, and vinyl chloride were below their OU A ROD cleanup levels in all samples collected from wells at this site during this 5-year review period. PCE was reported in groundwater samples collected at well 01-153 from 2006 to 2010 at concentrations ranging from 3.6 to 11 µg/L. The highest PCE concentration was measured in the 2006 sample from this well. The concentrations of PCE in the samples from well 01-153 were greater than the OU A ROD cleanup level of 5 µg/L in all samples collected from this well, except the sample collected in 2009.

Total and dissolved lead were below the OU A ROD cleanup level in all samples collected from wells 55-145, 55-146, and MW15-3. Total lead was reported in groundwater samples collected at well MW14-5 from 2006 to 2010 at concentrations ranging from 14.5 to 41.5 µg/L. The highest total lead concentration was measured in the 2007 sample from this well. Dissolved lead was reported in groundwater samples collected at well MW14-5 from 2006 to 2010 at concentrations ranging from 14 to 36.8 µg/L. The highest dissolved lead concentration was measured in the 2007 sample from this well. The concentrations of total and dissolved lead in the samples collected from well MW14-5 were greater than the OU A ROD cleanup level of 15 µg/L, except the sample collected in 2010. Total lead was reported in groundwater samples collected at well 01-153 from 2006 to 2010 at concentrations ranging from 3.65 to 18.7 µg/L. The highest total lead concentration was measured in the 2006 sample from this well. Dissolved lead was reported in groundwater samples collected at well 01-153 from 2006 to 2010 at concentrations ranging from 3.79 to 18.2 µg/L. The highest dissolved lead concentration was measured in the 2006 sample from this well. During the last 2 years of monitoring (in 2008 and 2009), the concentrations of total and dissolved lead in the samples collected from well 01-153 were less than the OU A ROD cleanup level of 15 µg/L.

PCE concentrations at well 01-153 exhibited a decreasing trend from 2006 through 2010. DRO and GRO concentrations at well MW14-5 exhibited a decreasing trend from 2006 through 2010. However, the trend was not statistically significant. Total and dissolved lead concentrations at well MW14-5 exhibited a statistically significant decreasing trend from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 14, Old Pesticide Disposal Area site. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000), monthly monitoring and free-product recovery were performed at one well (01-153) based on a request by ADEC. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SWMU 14, Old Pesticide Disposal Area site.

Between August 1999 and September 2010, monitoring wells within the vicinity of the SWMU 14, Old Pesticide Disposal Area have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, one well (01-153) was gauged monthly from October 2008 through May 2010, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Well 01-153 was added to the monthly gauging in October 2008, based on a request by ADEC, because free product was detected in this well in September 2007. Between October 2005 and September 2010, free product has been detected in one well, 01-153, at the site. Free product was only measured once in well 01-153 in September 2007 at a thickness of 0.03 foot. The frequency of product thickness measurements at well 01-153 was decreased from monthly to annually after May 2010, because free product had not been observed at this well since September of 2007.

Free-Product Recovery. Free-product recovery is not a component of the final remedy for this site. However, in May of 2007, the ADEC requested that the Navy perform free-product recovery at selected wells, including well 01-153, as discussed above. Free-product recovery was to be performed if the measured thickness was greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. Free product was recovered from well 01-153 in September of 2007 during the annual groundwater monitoring event even though the product thickness was only 0.03 foot. One-half gallon of free product was recovered in 2007 from this well. Free product was not detected in well 01-153 during any of the other annual groundwater monitoring events between October 2005 and September 2010, nor was it detected during the monthly free-product recovery activities from October 2008 through May 2010. Therefore, a total of 0.5 gallon of free product was recovered from the SWMU 14, Old Pesticide Disposal Area between October 2005 and September 2010. Monthly product thickness measurements and

free-product recovery, if required, were discontinued in well 01-153 after May 2010, because free product had not been observed in this well since September 2007. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Natural Attenuation Assessment

The 2009 NAPs results show that the dissolved oxygen concentrations at the site (1 and 3 mg/L) are depleted, compared to the background condition (11 mg/L). The site wells have higher carbon dioxide concentrations (30 and 32 mg/L) than the background well E-701 (less than 10 mg/L). Alkalinity concentrations are also higher at the site wells (53 and 63 mg/L) than background (18.9 mg/L) and indicates that wells 01-153 and MW-14-5 are within the contaminant plume (U.S. Navy 2010e).

Sulfate is not depleted at this site, with concentrations higher than background (2.52 mg/L) indicating that sulfate reduction is not occurring. Additionally, the ferrous iron concentrations (2.5 and 4 mg/L) are only slightly elevated above background (0 mg/L), indicating weak iron reduction may be occurring. Methane concentrations at this site (0.99 and 13 µg/L) are similar to background (0.38 µg/L), indicating that methanogenesis is probably not occurring at the site within the plume.

The 2009 annual monitoring report concluded that these combined data show only weak evidence that biodegradation is occurring at the site, possibly by aerobic digestion and iron reduction (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1. Decreasing trends were identified for DRO, GRO, and PCE concentrations in groundwater samples from well 01-153 over time. Trends were not evaluated for DRO and GRO in groundwater samples from well MW14-5. Decreasing trends were identified for total and dissolved lead in groundwater samples from well MW14-5, but the 2010 groundwater sample did not contain total and dissolved lead above the endpoint criterion (U.S Navy 2011a).

DRO and GRO were below the endpoint criteria when the last analyses were conducted on groundwater samples from 01-153. As a result, the time for DRO and GRO to meet the endpoint criteria in groundwater from well 01-153 was not estimated. The Sen's slope was calculated for PCE concentrations in groundwater samples over time from well 01-153 in the 2010 annual monitoring report (U.S. Navy 2011a). Using the median slope limit and the 2010 concentration in groundwater at well 01-153, PCE in groundwater could reach the endpoint criterion in 2011 or 2012, if the 2010 trend continues.

The Mann-Kendall and Sen's trend evaluation was not conducted during the 2010 annual report for DRO and GRO in groundwater (U.S. Navy 2011a) from well MW14-5. Simple linear regression was applied to DRO and GRO results for groundwater samples from MW14-5, because DRO and GRO concentrations in samples from this well do show a general decreasing trend. No level of confidence is applied to the regression. Applying the slopes of the regressed lines to the 2010 concentration provides a very rough estimate for time to achieve endpoint criteria if the observed trend continues. If the current trends continue, DRO and GRO concentrations in groundwater from MW14-5 could reach the endpoint criteria in 2018 and 2029, respectively.

Future Monitoring Recommendations

DRO, GRO, total lead, and dissolved lead concentrations in well MW14-5 near the inferred source area remain above their respective endpoint criteria, which are based on the ADEC cleanup levels. No exceedance of petroleum hydrocarbons was detected in downgradient wells (55-145, 55-146, and MW15-3). (It should be noted that well 55-145 is also used for compliance monitoring of chlorinated VOCs at SWMU 55, and concentrations of PCE exceed the endpoint criterion in this well. However, this well is not used for monitoring of chlorinated VOCs at SWMU 14. It is only used for monitoring of petroleum hydrocarbons at this site.) PCE concentrations in well 01-153 remain above the endpoint criterion. All contaminants exhibited either a stable or decreasing trend at the site. Since DRO, GRO, and BTEX met endpoint criteria in well 01-153, NAPs monitoring in this well should be discontinued. (Note that the DRO, GRO, and BTEX monitoring were discontinued after the 2008 groundwater monitoring event.) Downgradient wells 55-145, 55-146, and MW15-3 should be monitored once in 2015 prior to the next 5-year review for any contaminants that remain above endpoint criteria at the site. All other monitoring should continue as prescribed in the CMP, Revision 4 (U.S. Navy 2010a) until endpoint criteria are met.

6.4.19 SWMU 15, Future Jobs/DRMO

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at one location (MW15-3) at the SWMU 15, Future Jobs/DRMO site from 2006 through 2010. The combination of monitored natural attenuation and compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, USEPA, and ADEC 2000). The ADEC and EPA concurred with the 2003 recommendation to discontinue monitored natural attenuation for petroleum hydrocarbons. The ADEC and EPA also concurred with the 2003 recommendation to discontinue compliance monitoring for chlorinated solvents and methylene chloride at MW15-424 and compliance monitoring for methylene chloride at well MW15-3. As a result, annual compliance monitoring for chlorinated solvents (TCE, PCE,

1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) at MW15-3 is the only monitoring that has been conducted at this site since 2004. The CMP, Revision 4 (U.S. Navy 2010a) specified that sampling of downgradient well MW15-424 was to be performed in 2010 to support the evaluation of the remedy performed in the 5-year review. This location was inadvertently not included in the scope for the 2010 groundwater monitoring event.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 15, Future Jobs/DRMO site. Well MW15-3 is located near the inferred source area, and well MW15-424 is located approximately 420 feet downgradient of MW15-3.

Analytical Results. Groundwater samples were collected as part of compliance monitoring to evaluate groundwater quality relative to the OU A ROD CERCLA cleanup criteria. 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride were below OU A ROD cleanup levels in all samples collected from MW15-3 during this 5-year review period. PCE was reported in groundwater samples collected at well MW15-3 from 2006 to 2010 at concentrations ranging from 3.1 to 8.1 µg/L. The highest PCE concentration was measured in the 2009 sample from this well. The concentrations of PCE in the samples from well MW15-3 were greater than the OU A ROD cleanup level of 5 µg/L in all samples collected from this well, except the samples collected in 2008 and 2010. TCE was reported in groundwater samples collected at well MW15-3 from 2006 to 2010 at concentrations ranging from 2.7 to 8 µg/L. The highest TCE concentration was measured in the 2007 sample from this well. The concentrations of TCE in the samples from well MW15-3 were greater than the OU A ROD cleanup level of 5 µg/L in samples collected from this well in 2007 and 2008.

PCE concentrations at well MW15-3 exhibited a decreasing trend from 2006 through 2010. However, the trend is not statistically significant. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 15, Future Jobs/DRMO site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Natural Attenuation Assessment

The 2009 NAPs results show that the dissolved oxygen concentration at the site (3 mg/L) is depleted, compared to the background condition (11 mg/L). The site well also has an elevated carbon dioxide concentration (24 mg/L), compared to the background well E-701 (less than

10 mg/L), indicating that aerobic digestion has occurred. The alkalinity concentration is also higher at the site well (136 mg/L) than background (18.9 mg/L), and indicates that well MW-15-3 is within the contaminant plume (U.S. Navy 2010e).

Sulfate is not depleted at this site and the on-site concentration (19.2 mg/L) is higher than background (2.52 mg/L), indicating that sulfate reduction is not occurring. Additionally, no ferrous iron was detected in well MW15-3, indicating no iron reduction is occurring. Methane was also undetected at this site (0.50 µg/L), indicating that methanogenesis is also not occurring at the site (U.S. Navy 2010e).

That 2009 annual monitoring report concluded these combined data show only weak evidence that biodegradation may be occurring at the site through aerobic digestion. However, cis-1,2-DCE and trans-1,2-DCE have been detected at very low concentrations in groundwater onsite and are breakdown products of PCE and TCE. PCE and TCE continue to exhibit decreasing concentration trends in groundwater while trans- and cis-1,2-DCE have remained at or below detection limits. The decreasing concentrations of PCE and TCE, coupled with the stable trends in degradation products, is an indication that natural attenuation is occurring in groundwater, and demonstrates that dechlorination is most likely taking place at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. PCE was below the endpoint criterion in the 2010 groundwater sample from well MW15-3 and, therefore, no Sen's slope was calculated.

Future Monitoring Recommendations

PCE and TCE concentrations have decreased, but were still measured intermittently at concentrations greater than the OU A ROD cleanup levels over this 5-year review period. Annual monitoring should continue as prescribed by the CMP, Revision 4 (U.S. Navy 2010a). Since MW15-424 was not sampled in 2010, this location should be sampled in 2011 to verify that contaminants are not migrating to this downgradient well at concentrations above the OU A ROD cleanup levels. In addition, downgradient well MW15-424 should be monitored once in 2015 prior to the next 5-year review, if chlorinated solvent concentrations remain above the OU A ROD cleanup levels at the site.

6.4.20 SWMU 17, Power Plant No. 3 Area

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at SWMU 17, Power Plant No. 3 Area from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery for petroleum

and compliance monitoring for nonpetroleum chemicals (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC selected ICs and monitored natural attenuation as the final remedy for this site (U.S. Navy and ADEC 2007). Groundwater samples were collected from SWMU 17, Power Plant No. 3 Area during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring. The natural attenuation monitoring is related to petroleum hydrocarbons observed in groundwater at the site. Groundwater samples were also collected as part of compliance monitoring to evaluate groundwater quality relative to the OU A ROD CERCLA cleanup criteria. Compliance monitoring is related to chlorinated solvents observed in groundwater at the site.

Groundwater samples were collected from 05-375, 05-810, 05-811, 05-815, HC-2, HC-3, PP-05, R-1, R-2, R-5, and R-6 for DRO, GRO, and BTEX analysis, and groundwater samples were collected from 05-375, HC-2, HC-3, PP-05, R-1, R-2, R-5, and R-6 for NAPs analysis. Surface water protection monitoring for DRO, GRO, and BTEX in wells 05-375, 05-810, 05-811, 05-815 was discontinued following the 2006 groundwater monitoring event. Interim petroleum monitoring for DRO in wells R-1 and R-6 was also discontinued following the 2006 groundwater monitoring event (a sample was not collected from well R-6 during the 2006 monitoring event because of the presence of free product in the well). Surface water protection monitoring and interim petroleum monitoring were replaced with natural attenuation monitoring in 2007 as part of the implementation of the final remedy at the site. Natural attenuation monitoring was initiated in wells 05-375, HC-2, HC-3, PP-05, R-1, R-2, R-5, and R-7. Samples collected from these wells were analyzed for DRO. Initially, monitoring was conducted in all eight wells annually. Following the 2007 groundwater monitoring event, the frequency of monitoring was reduced to every other year (even years) in wells 05-375, R-1, and R-2. However, samples were not collected in well HC-2 in 2007 and in well PP-05 in 2007 and 2008, because free product was present in these wells during those monitoring events. NAPs analysis was conducted every 5 years, with the most recent sampling event occurring in 2009.

Groundwater samples were collected from well 05-735 for chlorinated solvents analysis. Chlorinated solvents analyses, including methylene chloride, TCE, PCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride, were conducted annually on samples collected at this well.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at SWMU 17, Power Plant No. 3 Area. Wells 05-375, HC-2, HC-3, PP-05, R-1, R-2, R-5, and R-6 are installed within the dissolved petroleum plume or within the area of residual free product northeast from the Power Plant building. Wells 05-810, 05-811, and 05-815 are located downgradient from the dissolved petroleum plume in close proximity to downgradient surface water bodies. These wells are located approximately 125, 200, and 60 feet, respectively,

upgradient from the downgradient surface water bodies. Well 05-735 is located approximately 50 feet downgradient from Building 10203, which formerly contained a dry cleaning facility.

Analytical Results. DRO, GRO, and BTEX concentrations were below their respective endpoint criteria in all samples collected from surface water protection monitoring locations (05-375, 05-810, 05-811, and 05-815) during the 2006 groundwater monitoring event. (Note that wells 05-810, 05-811, and 05-815 were only sampled in 2006, and well 05-375 was only sampled for GRO and BTEX in 2006.) DRO concentrations were below its endpoint criterion in all samples collected from all site wells during this 5-year review period.

Methylene chloride, TCE, 1,1-DCE, and trans-1,2-DCE were below OU A ROD cleanup levels in all samples collected from well 05-735 during this 5-year review period. PCE was reported in groundwater samples collected at well 05-735 from 2006 to 2010 at concentrations ranging from 1.3 to 8.5 µg/L. The highest PCE concentration was measured in the 2006 sample from this well. The concentrations of PCE in the samples from well 05-735 were less than the OU A ROD cleanup level of 5 µg/L, except the sample collected in 2006. cis-1,2-DCE was reported in groundwater samples collected at well 05-735 from 2006 to 2010 at concentrations ranging from 340 to 570 µg/L. The highest cis-1,2-DCE concentration was measured in the 2007 sample from this well. The concentrations of cis-1,2-DCE in all samples from well 05-735 were greater than the OU A ROD cleanup level of 100 µg/L. Vinyl chloride was reported in groundwater samples collected at well 05-735 from 2006 to 2010 at concentrations ranging from 3.4 to 7.4 µg/L. The highest vinyl chloride concentration was measured in the 2006 sample from this well. The concentrations of vinyl chloride in all samples from well 05-735 were greater than the OU A ROD cleanup level of 2 µg/L.

Vinyl chloride and cis-1,2-DCE concentrations have generally been stable from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including SWMU 17, Power Plant No. 3 Area. Although free-product recovery is not a component of the final remedy for this site (U.S. Navy and ADEC 2007), monthly monitoring and free-product recovery were performed at two wells (HC-02 and PP-05), based on a request by ADEC. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The

following summarizes the significant product thickness data for the SWMU 17, Power Plant No. 3 site.

Between March 1993 and September 2010, monitoring wells within the vicinity of SWMU 17, Power Plant No. 3 Area have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, two wells (HC-02 and PP-05) were gauged monthly from October 2008 through May 2010, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. These wells were added to the monthly gauging in October 2008, based on a request by ADEC, because free product was detected in these wells during the September 2007 annual groundwater monitoring event.

Between October 2005 and September 2010, free product has been detected in six wells at the site: 05-375, HC-02, PP-05, R-1, R-2, and R-6. The maximum measured thickness of free product reported at the site since October 2005 was 0.43 feet, in well PP-05 in March 2009. The maximum measured thickness of free product reported in wells 05-375, HC-02, R-1, R-2, and R-6 was 0.01 foot in September 2010, 0.03 foot in September 2007, 0.01 foot in September 2010, a trace in September 2009 and September 2010, and 0.03 foot in September 2006, respectively. The frequency of product thickness measurements at wells HC-02 and PP-05 was decreased from monthly to annually after May 2010, because free product had not been observed at these wells since September of 2007 and January 2009, respectively.

Free-Product Recovery. Interim free-product recovery at the SWMU 17, Power Plant No. 3 Area was discontinued in July 2002, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2002). In addition, free-product recovery is not a component of the final remedy for this site. However, following the September 2007 annual groundwater event, the Navy added HC-02 and PP-05 to the list of wells identified for monthly free-product recovery, based on a request by ADEC. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. Although well PP-05 is a 2-inch well and measured thicknesses above 0.5 foot have not been detected, the Navy performed free-product recovery at this well in March 2009 as part of the monthly free-product recovery activities. A total of 0.1 gallon of free product was recovered from this well. Since free product was not recovered from PP-05 during any other months of this 5-year review period and free product was not recovered from any of the other wells at the site because product thicknesses were less than 0.1 foot, the total volume of free product recovered from SWMU 17, Power Plant No. 3 Area for the period October 2005 through September 2010 is 0.1 gallon. Monthly product thickness measurements and free-product recovery, if required, were discontinued in wells HC-02 and PP-05 after May 2010, because free product had not been observed in well HC-02 since September 2007 and in well

PP-05 since January 2009, and only 0.1 gallon of free product was recovered from well PP-05 from October 2008 through May 2010. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Natural Attenuation Assessment

With one exception, sulfate concentrations for the site are depleted (0.07 to 1.30 mg/L), compared to background (2.52 mg/L), indicating that sulfate reduction is occurring at the site. Except at well R-2 where ferrous iron was not detected, on-site ferrous iron concentrations (6 to 50 mg/L) are elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the SWMU 17, Power Plant No. 3 site, as demonstrated by elevated methane concentrations in on-site wells (74 to 3,300 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual monitoring report concluded these combined data strongly indicate that biodegradation of petroleum hydrocarbons is occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates that natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy 2011a) are summarized in Table 6-1. DRO was not measured at concentrations above the endpoint criterion in any of the groundwater samples from wells sampled during 2010. PCE was not measured at a concentration above the endpoint criterion in the groundwater sample from well 05-735 during 2010. A decreasing trend was identified for cis-1,2-DCE and vinyl chloride in groundwater samples from well 05-735. However, the data do not support calculation of the Sen's slope. The data also do not support the use of simple linear regression to estimate the time when endpoint criteria might be achieved for cis-1,2-DCE or vinyl chloride in groundwater samples from well 05-735.

Future Monitoring Recommendations

DRO has been below the endpoint criterion, which is based on 10 times the ADEC groundwater cleanup level, in all wells at this site during this 5-year review period. Groundwater parameter data strongly indicate that anaerobic biodegradation is occurring at the site. Monthly free-product recovery activities performed at this site from October 2009 to May 2010 yielded no recovered product. Product in site wells was observed only twice during the monthly free-product recovery activities at 0.02 foot or less. Free product was detected during annual groundwater monitoring events at thicknesses less than or equal to 0.01 foot over the last two monitoring events. Based on these observations, it is recommended that DRO monitoring be discontinued at wells HC-1, HC-2, HC-3, and R-2 through R-6. Because trace amounts of free

product continue to be detected at the site, monitoring at locations PP-05, R-1, and 05-375 should be continued at the site at a reduced frequency of every other year. Groundwater samples from well 05-735 have contained PCE, cis-1,2-DCE, and vinyl chloride at concentrations greater than the OU A ROD cleanup levels during this 5-year review period. Therefore, annual monitoring should be continued as specified in the CMP, Revision 4 (U.S. Navy 2010a) at well 05-735 for chlorinated VOCs.

6.4.21 SWMU 55, Public Works Transportation Department Waste Storage Area

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at two locations (55-145 and 55-146) at the SWMU 55, Public Works Transportation Department Waste Storage Area site from 2006 through 2010. Compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples are collected from these wells to evaluate groundwater quality relative to OU A ROD CERCLA cleanup criteria.

Groundwater samples were collected from 55-145 and 55-146 for chlorinated solvents analysis. Chlorinated solvents analyses, including TCE, PCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride, were conducted annually on samples collected at well 55-145. The frequency of chlorinated solvents monitoring was reduced at well 55-146 to once every other year (even years) after the 2004 sampling event, because chlorinated solvents had not been measured at concentrations greater than their reporting limits or their OU A ROD cleanup levels in any samples since compliance monitoring began at the site. However, because well 55-146 is downgradient of 55-145, where measured concentrations were above OU A ROD cleanup levels, continued monitoring at the reduced frequency was recommended in the 2004 groundwater monitoring report. Monitoring for chlorinated solvents in 55-146 was discontinued following the 2008 groundwater monitoring event, because concentrations of contaminants have not exceeded endpoint criteria in this well and PCE concentrations in upgradient well 55-145 exhibited a statistically significant decreasing trend.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 55, Public Works Transportation Department Waste Storage Area site. Well 55-145 is located near the inferred source area and well 55-146 is located approximately 300 feet downgradient.

Analytical Results. As discussed above, concentrations of chlorinated solvents were either not detected or detected at concentrations less than the OU A ROD cleanup levels at well 55-146 since compliance monitoring began at this site. TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride concentrations were either not detected or detected at concentrations below

OU A ROD cleanup levels in all samples collected from well 55-145 during this 5-year review period. PCE was reported in groundwater samples collected at well 55-145 from 2006 to 2010 at concentrations ranging from 50 to 110 µg/L. The highest PCE concentration was measured in the 2006 sample from this well. The concentrations of PCE in all samples from well 55-145 were greater than the OU A ROD cleanup level of 5 µg/L. The PCE concentration exhibits a statistically significant decreasing trend in well 55-145.

Free-Product Monitoring. Although SWMU 55, Public Works Transportation Department Waste Storage Area is not a petroleum site, two monitoring wells within the vicinity of the site have been gauged for the presence of free product during the annual groundwater monitoring events. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C. During the September 2010 annual groundwater monitoring event, a trace of free product was detected in well 55-146. Free product had not been previously detected at this site.

Natural Attenuation Assessment

Compliance monitoring is the remedy for this site. However, a Mann-Kendall and Sen's trend evaluation was conducted for PCE concentration in groundwater samples from well 55-145 over time. Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1. A decreasing trend was identified for PCE in groundwater samples from well 55-145 over time (U.S Navy 2011a). The Sen's slope was calculated for PCE concentration in groundwater samples over time from well 55-145 in the 2010 annual monitoring report (U.S. Navy 2011a). Using the median and lower slope limits and the 2010 concentration in groundwater, PCE in groundwater could reach the endpoint criterion in 2013 or 2014, if the 2010 trend continues.

Future Monitoring Recommendations

PCE in groundwater remains above OU A ROD cleanup levels near the source area. However, PCE concentrations are decreasing. Chlorinated solvents have not migrated in groundwater to the downgradient monitoring point. Annual monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a).

6.4.22 SWMU 58/SA 73, Heating Plant 6

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 58/SA 73, Heating Plant 6 site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected monitored natural attenuation with ICs as the final remedy for this site (U.S. Navy and ADEC 2005a). In addition, the decision document specified that one additional soil sample would be collected during the replacement of well 12-203 to evaluate natural attenuation processes within the vadose zone soil, two additional groundwater samples would be collected in wells 12-203 and 12-110 to provide updated petroleum concentrations in these two locations, and one surface water sample from the downstream end of the two on-site drainage ditches prior to the CDAA Creek to evaluate contaminant loading from groundwater into surface water. Results of this additional soil, groundwater, and surface water sampling are discussed in the Site Catalog attached as Appendix A. Groundwater samples were collected from SWMU 58/SA 73, Heating Plant 6 site during annual groundwater monitoring to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times Alaska groundwater cleanup levels [18 AAC 75.345]), to verify that natural attenuation is occurring, and to evaluate groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (Clam Lagoon).

Groundwater samples were collected from wells 12-601, 12-604, and 12-611 for surface water protection monitoring. Samples from these wells were collected annually in wells 12-601 and 12-611, and every other year at well 12-604. Although petroleum hydrocarbons were either not detected or detected at concentrations below the endpoint criteria during all groundwater monitoring events at well 12-604, monitoring was continued at this well at the reduced frequency of every other year (even years) following the 2006 groundwater monitoring event because it is located downgradient of wells containing free product. Groundwater samples were collected for DRO, GRO, and BTEX analysis from 2006 through 2008. Following the 2008 groundwater monitoring event, sampling for GRO and BTEX was discontinued because these contaminants had not exceeded endpoint criteria in any well at the site since at least 2001.

Groundwater samples were collected from wells 12-101, 12-105, 12-114, 12-120, 12-121, and 12-203 for natural attenuation monitoring. Annual monitoring was planned for well 12-121 and 12-203. However, samples were not collected from well 12-203 in 2006, 2007, and 2008 and from well 12-121 in 2006 and 2008, because of the presence of free product. Furthermore, sampling of well 12-110 was planned for 2006 through 2008, but samples were not collected because of the presence of free product. Well 12-105 was sampled in 2008 and 2010. This well was sampled in 2008 as an alternate to well 12-110, because free product was detected in well

12-110. The 2008 groundwater monitoring report recommended that well 12-105 be sampled annually instead of well 12-110, because free product was consistently detected in well 12-110 and the construction of a 0.5-inch piezometer is not optimal for groundwater monitoring. Although annual monitoring of well 12-105 was planned beginning in 2009, this well was not sampled in 2009 because free product was present in the well. Groundwater samples were collected from wells 12-101 and 12-120 in 2006. Monitoring in these two wells was discontinued following the 2006 groundwater monitoring event, because endpoint criteria had been met. Groundwater samples were collected from well 12-114 every other year (even years). Although this location met endpoint criteria, this well is located at the plume edge downgradient of well 12-203, where concentrations have exceeded endpoint criteria. Therefore, the frequency of monitoring was reduced to every other year following the 2006 groundwater monitoring event. Groundwater samples were collected for DRO, GRO, and BTEX analysis from 2006 through 2008. As discussed above, following the 2008 groundwater monitoring event, sampling for GRO and BTEX was discontinued because these contaminants had not exceeded endpoint criteria in any well at the site since at least 2001. Groundwater samples were collected for NAPs analysis in 2009.

The 2008 groundwater monitoring report recommended that shoreline inspections of the small on-site stream be conducted adjacent to well 12-601 in 2009, because free product was observed in this well in 2007. Furthermore, if free product is detected in well 12-601 during the 2009 groundwater monitoring event or elevated petroleum concentrations are observed, surface water and sediment sampling were to be performed. Because free product was detected during the 2009 groundwater monitoring event, a surface water and a sediment sample were collected from location NL-07 and analyzed for DRO. A sample was not collected in 2010, because no evidence of contamination was observed during the shoreline inspection of the stream.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 58/SA 73, Heating Plant 6 site. Well 12-611 is within the dissolved plume immediately downgradient of the source area, while wells 12-601 and 12-604 are approximately 200 to 300 feet from the source area and 350 to 550 feet from the downgradient water body, Clam Lagoon. Wells 12-101, 12-105, 12-110, 12-114, 12-120, 12-121, and 12-203 are generally located within or near the former source area.

Analytical Results. GRO, benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells at this site during this 5-year review period. DRO concentrations were below its endpoint criterion in all samples collected from wells 12-101, 12-105, 12-120, 12-162, 12-601, 12-604, and 12-611 during this 5-year review period.

DRO was reported in groundwater samples collected at well 12-121 from 2006 to 2010 at concentrations ranging from 1,300 to 28,000 µg/L. The highest DRO concentration was

measured in the 2007 sample from this well. The concentration of DRO in the sample collected from well 12-121 was greater than the endpoint criterion in 2007. DRO was reported in the groundwater sample collected in 2010 at well 12-203 at a concentration of 17,000 µg/L, which is greater than the endpoint criterion.

DRO was reported in the surface water sample collected at NL-07 in 2010 at a concentration of 86 µg/L. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water is less than the endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). DRO was reported in the sediment sample collected at NL-08 in 2010 at a concentration of 200 mg/kg. ADEC has not established cleanup levels for DRO in sediment. Therefore, sample results for DRO were compared to South of Runway 18-36 Area endpoint criterion. The DRO concentration was greater than the South of Runway 18-36 Area endpoint criterion of 90.6 mg/kg. Even though elevated concentrations of DRO (200 mg/kg) were observed in sediment NL-07, no evidence of petroleum contamination was observed when the sediment was disturbed. Additionally, biogenic sheen was observed at this marshy location and the laboratory indicated that the sediment DRO detection did not resemble a petroleum product. Therefore, this result is believed to be a false positive caused by naturally occurring organic material.

A visual inspection of the shoreline of the stream at the site was performed in 2009 and 2010. In 2009, sheen but no odor or seep was observed on the surface water of the creek downgradient of well 12-601. This area was very marshy, and the sheen appeared to be naturally occurring organic material. During the 2010 visual inspection, naturally occurring bio-sheen was observed on the surface water of the creek downgradient of well 12-601. No petroleum seep, sheen, odor, or discoloration was observed during the shoreline inspection.

Trend evaluations were not conducted for wells at this site, because analytes have not been detected above the endpoint criteria for the last two monitoring events or less than four data points were available for the wells at the site.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 58/SA 73, Heating Plant 6 site. Although only limited free-product recovery activities, conducted during the regularly scheduled annual groundwater monitoring activities, are part of the final remedy for this site (U.S. Navy and ADEC 2005a), monthly monitoring and free-product recovery were performed at three wells based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data

collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SWMU 58/SA 73, Heating Plant 6 site.

Between October 1996 and September 2010, monitoring wells within the vicinity of SWMU 58/SA 73 Heating Plant 6 have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, three wells (12-110, 12-121, and 12-203) were gauged monthly from May 2007 through September 2010, concurrently with free product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak. Monthly free-product thickness measurements and free-product recovery activities were discontinued in well 12-110 after September 2007, because product recovery equipment could not fit inside the well casing of this 0.5-inch piezometer. Furthermore, following the 2008 annual groundwater monitoring event, monitoring of 12-110 was discontinued, and 12-105 was added as a replacement.

Between October 2005 and September 2010, free product has been detected in eight of the seventeen wells at the site: 12-105, 12-108, 12-110, 12-114, 12-121, 12-125, 12-203, and 12-601. The maximum measured thickness of free product reported at the site since October 2005 was 2.47 feet, in well 12-203 in September 2006. The maximum measured thickness of free product reported in wells 12-105, 12-108, 12-110, 12-114, 12-121, 12-125, and 12-601 was 0.09 foot in September 2009, 0.01 foot in September 2008, 1.11 foot in September 2007, a trace in September 2009, 0.15 foot in September 2006, 0.01 foot in September 2009, and 0.01 foot in September 2008 and 2009, respectively.

Free-Product Recovery. Interim free-product recovery at SWMU 58/SA 73, Heating Plant 6 was discontinued after July 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy 2000b). However, the final decision document for this site specified that annual free-product recovery be performed as part of the scheduled annual groundwater monitoring activities (U.S. Navy and ADEC 2005a). Furthermore, the decision document states that free product will be removed in wells with measured free-product thicknesses above 0.5 foot in a 2-inch well and 0.1 foot in a 4- or 6-inch well. In May of 2007, the ADEC requested that the Navy resume monthly free product recovery at selected wells, including wells 12-110, 12-121, and 12-203. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free product was recovered from well 12-203 during the 2006, 2007, 2008, and 2009 annual groundwater monitoring events, from well 12-110 during the 2006 annual groundwater

monitoring event, and from wells 12-121 and 12-203 during monthly free-product recovery activities that occurred between May 2007 and September 2010. (It should be noted that in August 2007, free product was not recovered from the well 12-203, a 2-inch diameter well, though the thickness was 0.6 foot.) Approximately 3.85 gallons of free product was recovered from 12-203 during the annual groundwater monitoring events from October 2005 through September 2009, and approximately 0.50 gallon of free product were recovered from well 12-110 during the September 2006 annual groundwater monitoring event. Approximately 0.07 and 5.48 gallons were recovered during the monthly free-product recovery activities from May 2007 through September 2010 from wells 12-121 and 12-203, respectively. Therefore, the total volume of free product recovered from the SWMU 58/SA 73, Heating Plant 6 for the period October 2005 through September 2010 was 9.90 gallons. The maximum volume of free product was recovered from well 12-203 during this time period. It should also be noted that free product was recovered in September 2004 from well 12-110 during additional groundwater sampling required by the decision document. The report describing these activities was not available when the last 5-year review was prepared. Therefore, this information is provided here. Less than 0.01 gallon (0.003 gallon) of free product was recovered from well 12-110 during the September 2004 sampling event.

Natural Attenuation Assessment

Sulfate concentrations for the site are depleted in source plume well 12-121 (0.11 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (4.5 and 50 mg/L) are elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. Evidence of methanogenesis is observed at the SWMU 58 and SA 73, Heating Plant 6 site, as demonstrated by elevated methane concentrations in on-site wells (480 and 2,900 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

DRO was not measured at concentrations above the endpoint criterion in 2010 samples from wells 12-105, 12-114, and 12-121 (U.S. Navy 2011e). There have been only two samples collected from well 12-203. Because of these conditions, trend evaluations were not conducted for the 2010 annual report.

Future Monitoring Recommendations

DRO was detected at concentrations greater than the endpoint criterion, which is based on 10 times the ADEC cleanup level, in two wells at the site during this 5-year review period. Furthermore, DRO continues to exceed the endpoint criterion in source well 12-203, and free product continues to be observed at the site. Groundwater monitoring results indicate that the dissolved plume has not migrated to the downgradient monitoring points at concentrations greater than the endpoint criteria and that the downgradient surface water body is not currently at risk. Surface water and sediment sampling results confirm these groundwater monitoring results. However, free product was detected in surface water protection well 12-601 in 2008 and 2009 at a thickness of 0.01 foot. Based on these observations, it is recommended that DRO monitoring be discontinued in wells 12-601 and 12-604. Concentrations in these wells are below the endpoint criterion, and the wells are located downgradient of sentinel well 12-611. However, it is recommended that these wells continue to be gauged annually for the presence of free product. All other monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a).

In addition, product thickness measurements and free-product recovery, if required, should be reduced to six visits per year at wells where monthly measurements are currently being performed. The observance of low product thicknesses and recovered product volumes warrants a reduction in the monthly product recovery activity frequency. In addition, free product recovery often cannot be performed or is severely limited during winter months due to poor weather, snowy conditions, and icy roads.

6.4.23 SWMU 60, Tank Farm A

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 60, Tank Farm A site from 2006 through 2010. Monitored natural attenuation and ICs is the remedy selected for this site (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples have been collected from this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring.

From 2006 through 2010, groundwater samples were collected annually from two wells at the site (LC5A and MW E006). Samples from well LC5A were analyzed for DRO. Beginning in 2008, samples collected from well LC5A were also analyzed for SVOCs and BTEX (to determine concentrations of TAH and TAqH) based on a recommendation made in the petroleum summary report (U.S. Navy 2008c). These analyses were added because of concerns that

concentrations of petroleum hydrocarbons in soil and groundwater at the site may be impacting surface water and sediment in South Sweeper Creek. Samples from well MW E006 were analyzed for BTEX from 2006 through 2009 and for benzene only in 2010. Monitoring of toluene, ethylbenzene, and total xylenes was discontinued in well MW E006 after the 2009 groundwater monitoring event, because these chemicals had not been detected above endpoint criteria since 2003. NAPs monitoring is conducted every 5 years in these two wells, with the most recent sampling event occurring in 2009.

Visual inspection of the shoreline of South Sweeper Creek in the vicinity of LC5A for petroleum seeps or sheens was initiated in 2005, because concentrations of DRO consistently exceeded the endpoint criterion at well LC5A and a statistically significant increasing trend was identified at this location. Visual inspections continued through this 5-year reporting period. In addition, a surface water and sediment sample were collected from South Sweeper Creek in 2007 at location NL-03 based on a recommendation made in the 2006 groundwater monitoring report. Sampling was performed based on concerns that concentrations of petroleum hydrocarbons in soil and groundwater at the site may be impacting surface water and sediment in South Sweeper Creek. The surface water sample was analyzed for DRO, TAH, and TAqH, and the sediment sample was analyzed for DRO and BTEX. Because the Navy was already collecting surface water and sediment samples at location 852, which is located near NL-03, as part of the natural recovery remedy for South of Runway 18/36 Area, sampling of NL-03 was not performed in 2008, 2009, or 2010.

Because of the uncertainty regarding the potential impacts of the DRO plume on South Sweeper Creek, additional data was collected at SWMU 60, Tank Farm A. The objective of the additional characterization at SWMU 60, Tank Farm A was to determine if DRO is migrating to South Sweeper Creek at concentrations greater than ADEC surface water criteria. During this supplemental investigation, six soil borings were sampled. Soil boring results are discussed in the Site Catalog in Appendix A. Four soil borings were completed as wells, and groundwater samples were collected from three of the four new wells and one existing well (LC5A). One of the new wells was not sampled, because of the presence of free product in the well. The results of this groundwater sampling are discussed below.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 60, Tank Farm A site relative to existing structures and surface water bodies. Well MW E006 is installed adjacent to an unnamed creek that drains the central portion of Tank Farm A. Well LC5A is located downgradient from the Tank Farm, approximately 80 feet upgradient from South Sweeper Creek. New wells 650, 651, and 652 are located immediately adjacent to South Sweeper Creek, in a line from north to south. New well 653 is located approximately 70 feet southwest of well LC5A. NL-03 and 852 are located within South Sweeper Creek, near the western shoreline and downgradient of well LC5A.

Analytical Results. Toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from well MW E006 at this site during this 5-year review period. DRO was reported in groundwater samples collected at well LC5A from 2006 through 2010 at concentrations ranging from 860 to 3,000 µg/L. The highest DRO concentration was measured in the 2006 sample from this well. The concentrations of DRO in the samples from well LC5A were less than the endpoint criterion of 1,500 µg/L, except for in the sample collected in 2006. DRO was reported in groundwater samples collected from new wells 650, 651, and 652 in July 2010 at concentrations of 1,400, 1,100, and 3,700 µg/L, respectively. Only the concentration of DRO in the sample collected from well 652 exceeded the endpoint criterion.

TAH was reported in groundwater samples collected at well LC5A from 2008 through 2010 at concentrations ranging from 62 to 88 µg/L. The highest TAH concentration was measured in the 2009 sample from this well. The concentrations of TAH in all samples were greater than the ADEC surface water cleanup level of 10 µg/L. TAH was reported in groundwater samples collected from new wells 650, 651, and 652 in July 2010 at concentrations of 9.4, 96, and 170 µg/L, respectively. The concentrations of TAH in the samples from these three wells were greater than the ADEC surface water cleanup level, except for in the sample collected from well 650.

TAqH was reported in groundwater samples collected at well LC5A from 2008 through 2010 at concentrations ranging from 62 to 123 µg/L. The highest TAqH concentration was measured in the 2008 and 2009 samples from this well. The concentrations of TAqH in all samples were greater than the ADEC surface water cleanup level of 15 µg/L. TAqH was reported in groundwater samples collected from new wells 650, 651, and 652 in July 2010 at concentrations of 9.4, 96, and 170 µg/L, respectively. The concentrations of TAqH in the samples from these three wells were greater than the ADEC surface water cleanup level, except for in the sample collected from well 650.

Benzene was reported in groundwater samples collected at well MW E006 from 2006 through 2010 at concentrations ranging from 4.8 to 16 µg/L. The highest benzene concentration was measured in the 2008 sample from this well. The concentrations of benzene in the samples from well MW E006 were greater than the endpoint criterion of 5 µg/L, except for the sample collected in 2007. Benzene was reported in groundwater samples collected from new wells 650, 651, and 652 in July 2010 at concentrations of 7, 1.8, and 4 µg/L, respectively. The concentrations of benzene in the samples from these three wells were less than the endpoint criterion, except for in the sample collected from well 650.

DRO was not detected in the surface water sample collected at NL-03 in 2007. DRO was reported in surface water samples collected from 852 from 2006 through 2010 at concentrations ranging from 84 to 1,000 µg/L. The highest DRO concentration was measured in the 2009

sample from this location. No ADEC surface water quality criterion exists for DRO, but the concentrations detected in the surface water in 2006, 2009, and 2010 are greater than the endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). TAH and TAqH concentrations in the surface water samples collected from NL-03 and 852 during this 5-year review period were less the ADEC surface water quality criteria.

DRO was reported in the sediment sample collected at NL-03 in 2007 at a concentration of 900 mg/kg. DRO was reported in sediment samples collected from 852 from 2006 through 2010 at concentrations ranging from 260 to 4,100 mg/kg. The highest DRO concentration was measured in the 2010 sample from this location. ADEC has not established cleanup levels for DRO in sediment. Therefore, sample results for DRO were compared to South of Runway 18-36 Area endpoint criterion. The DRO concentrations in all samples collected at locations NL-03 and 852 were greater than the South of Runway 18-36 endpoint criterion of 90.6 mg/kg.

Visual inspections of the east shoreline of South Sweeper Creek were performed annually from 2006 through 2010. The 2006 visual inspection did not identify any petroleum seeps or sheens along the shoreline of South Sweeper Creek in the area of LC5A. In 2007, one seep was identified near sampling location 852 indicating possible migration of petroleum contaminants from SWMU 60 to surface water near location 852. A petroleum sheen, but no seep, was also reported near location LC5A during the 2007 visual inspection. Because a seep was not observed at this location, it is possible that the sheen may be from an upgradient source rather than at SWMU 60. In 2008, a seep was observed during the inspection that had petroleum odor and sheen/discoloration. A seep was observed on the west side of Sweeper Creek lagoon adjacent to the west culvert and at the 852 sampling location during the 2009 inspection. This seep had a petroleum odor and sheen/discoloration. Additionally, petroleum sheen and odor were observed when sediments were disturbed during the sample collection at 852. During the 2010 visual inspection, a petroleum seep was observed on the west side of Sweeper Creek lagoon adjacent to the west culvert and at the 852 sampling location. Petroleum sheen and odor were observed when sediments were disturbed during the sample collection at 852.

Benzene concentrations have generally been stable at well MW E006 from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria in the last 2 years or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 60, Tank Farm A site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in

the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "*Summary of Product Thickness Data 2005 Through 2010"* located in Appendix C. The following summarizes the significant product thickness data for the SWMU 60, Tank Farm A site.

Between September 1999 and September 2010, monitoring wells within the vicinity of SWMU 60, Tank Farm A have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. Between October 2005 and September 2010, three monitoring wells within the vicinity of the SWMU 60, Tank Farm A site have been gauged for the presence of free product. Free product was detected once in well LC5A in September 2007 at a thickness of 0.01 foot.

Natural Attenuation Assessment

Sulfate concentration is depleted in downgradient well LC5A (nondetected at 0.20 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (10 and 17.5 mg/L) are moderately elevated, compared to background (0 mg/L), indicating the occurrence of some iron reduction. Strong evidence of methanogenesis is observed at the SWMU 60, Tank Farm A site as demonstrated by elevated methane concentrations in on-site wells (1,100 and 2,900 µg/L), compared to background (0.38 µg/L) (U.S. Navy 2010e).

The 2009 annual monitoring report concluded that these combined data strongly indicate that biodegradation of petroleum hydrocarbons is occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1. DRO was not measured at a concentration above the endpoint criterion in groundwater samples from well LC5A. There was no trend identified for benzene concentrations in groundwater samples from well MW E006. Because of these conditions, a Sen's slope was not calculated for either of these analytes (U.S. Navy 2011a).

Applying the slopes of the regressed line to the 2010 benzene concentration provides a very rough estimate for time to achieve the endpoint criterion if the observed trend continues. No level of confidence is applied to the regression. If the current trend continues, benzene in groundwater from MWE006 could reach the endpoint criterion in 2014.

Future Monitoring Recommendations

Monitoring of toluene, ethylbenzene, and total xylenes was discontinued in well MW E006 after the 2009 groundwater monitoring event, because these chemicals had not been detected above endpoint criteria since 2003. DRO concentrations in samples collected from LC5A have decreased to levels less than the endpoint criterion, which is based on the ADEC cleanup level. Therefore, monitoring for DRO at this location should be discontinued. However, TAH and TAqH concentrations exceeded ADEC surface water cleanup levels in well LC5A. Therefore, annual monitoring for TAH and TAqH should be continued in this well. The four newly installed wells, 650, 651, 652, and 653, will be sampled annually for DRO, BTEX, and PAHs. BTEX and PAH concentrations will be used to calculate TAH and TaqH for comparison to ADEC surface water criteria. These wells are being added to the monitoring program because the DRO concentration in well 652, TAH and TAqH concentrations in wells 651 and 652, and benzene concentration in well 650 exceeded endpoint criteria, and free product was detected in well 653. Benzene concentrations remain above the endpoint criterion at MW E006. DRO concentrations in surface water samples and sediment samples from location 852 exceeded the endpoint criterion for South of Runway 18-36 Area. Although TAH and TAqH concentrations in surface water samples did not exceed ADEC surface water criterion, continued monitoring is recommended because samples from wells adjacent to South Sweeper Creek exceeded the endpoint criteria. Therefore, monitoring at MW E006 and 852 should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a).

6.4.24 SWMU 61, Tank Farm B

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at three locations (14-113, 14-210, and TFB-MW-4B) at the SWMU 61, Tank Farm B site from 2006 through 2010. The remedy specified for this site in the OU A ROD is monitored natural attenuation and ICs (U.S. Navy, USEPA, and ADEC 2000). Groundwater samples were collected from SWMU 61, Tank Farm B to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]), to verify that natural attenuation is occurring, and to evaluate groundwater quality downgradient of the site, to serve as a warning indicator for potential impacts to the downgradient surface water body (North Sweeper Creek). Groundwater samples were collected from all three wells for GRO, BTEX, and NAPs analyses. GRO and BTEX analyses were conducted annually, and NAPs analyses were conducted every 5 years, with the most recent sampling event occurring in 2009. Samples collected from well 14-113 were also analyzed for SVOCs and BTEX (to determine concentrations of TAH and TAqH) beginning in 2007. These analyses were added because of concerns that concentrations of petroleum hydrocarbons in soil and groundwater at the site may be impacting surface water and

sediment in North Sweeper Creek. In addition, samples collected from wells 14-113 and TFB-MW-4B in 2009 were analyzed for DRO. The reason for analyzing the samples for DRO in 2009 was not provided in the groundwater monitoring report.

Visual inspection of the shoreline of North Sweeper Creek in the vicinity of well 14-113 for petroleum seeps or sheens was initiated in 2004, because groundwater containing petroleum hydrocarbons appeared to be migrating into North Sweeper Creek. Visual inspections continued through this 5-year reporting period. In addition, surface water and sediment samples were collected from North Sweeper Creek at three locations, NL-04, NL-D-04, and NL-U-04 during this 5-year review period. Sampling of NL-04 was initiated in 2007, based on a recommendation made in the 2006 groundwater monitoring report. Surface water and sediment sampling of NL-D-04 and NL-U-04 was initiated in 2009. Sampling at NL-D-04 was performed to determine whether petroleum contamination from groundwater is impacting surface water. Sample NL-D-04 was collected approximately 70 feet downstream of NL-04. NL-U-04 was collected approximately 85 feet upgradient of location NL-04 to determine if contamination from potential upgradient sources is impacting the creek. Because petroleum hydrocarbons were not detected at concentrations greater than endpoint criteria in the surface water and sediment sample collected at NL-U-04 in 2009, monitoring at this location was discontinued. Surface water samples were analyzed for GRO, TAH, and TAqH. Sediment samples were analyzed for GRO and BTEX. Beginning in 2009 surface water and sediment samples were also analyzed for DRO. Again, the reason for analyzing the samples for DRO was not provided.

Because groundwater data reported for samples collected from wells 14-210 and 14-113 suggest that petroleum-related chemicals are being transported towards North Sweeper Creek at concentrations above endpoint criteria, the Navy recommended that options to augment the existing remedy at this site be evaluated through an EE/CA. Additional data were collected in 2010 during a supplemental investigation to improve delineation of the extent of petroleum-impacted soils in support of the EE/CA and potential soil excavation in the vicinity of North Sweeper Creek. During this supplemental investigation, seven soil borings were sampled. Soil boring results are discussed in the Site Catalog in Appendix A. No groundwater sampling was performed as part of this supplemental investigation.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 61, Tank Farm B site relative to potential source areas at the site and the downgradient surface water body, North Sweeper Creek. Well TFB-MW-4B is located within the source area. Monitoring wells 14-113 and 14-210 are located within the dissolved petroleum plume, approximately 150 and 250 feet, respectively, downgradient from the former petroleum-release area at this site and approximately 50 and 175 feet, respectively, from North Sweeper Creek.

Analytical Results. Benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from well 14-210 at this site during this 5-year review period. Toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from well 14-113 at this site during this 5-year review period. DRO concentrations at wells 14-113 and TFB-MW-4B in 2009 were below the endpoint criterion of 1,500 µg/L.

GRO was reported in groundwater samples collected at well 14-113 from 2006 through 2010 at concentrations ranging from 2,700 to 6,300 µg/L. The highest GRO concentration was measured in the 2006 sample from this well. GRO was reported in groundwater samples collected at well 14-210 from 2006 through 2010 at concentrations ranging from 3,400 to 4,500 µg/L. The highest GRO concentration was measured in the 2009 sample from this well. GRO was reported in groundwater samples collected at well TFB-MW-4B from 2006 through 2010 at concentrations ranging from 40,000 to 53,000 µg/L. The highest GRO concentration was measured in the 2009 sample from this well. The concentrations of GRO in the samples from wells 14-113, 14-210, and TFB-MW-4B were all greater than the endpoint criterion of 1,500 µg/L.

Benzene was reported in groundwater samples collected at well 14-113 from 2006 through 2010 at concentrations ranging from 9.6 to 16 µg/L. The highest benzene concentration was measured in the 2006 sample from this well. Benzene was reported in groundwater samples collected at well 14-210 from 2006 through 2010 at concentrations ranging from 29 to 39 µg/L. The highest benzene concentration was measured in the 2007 sample from this well. The concentrations of benzene in the samples from wells 14-113 and TFB-MW-4B were all greater than the endpoint criterion of 5 µg/L. Toluene was reported in groundwater samples collected at well TFB-MW-4B from 2006 through 2010 at concentrations ranging from 3,500 to 4,800 µg/L. The highest toluene concentration was measured in the 2009 sample from this well. Ethylbenzene was reported in groundwater samples collected at well TFB-MW-4B from 2006 through 2010 at concentrations ranging from 1,400 to 2,100 µg/L. The highest ethylbenzene concentration was measured in the 2010 sample from this well. Total xylenes were reported in groundwater samples collected at well TFB-MW-4B from 2006 through 2010 at concentrations ranging from 10,800 to 15,700 µg/L. The highest total xylenes concentration was measured in the 2010 sample from this well. The concentrations of toluene, ethylbenzene, and total xylenes in the samples collected from well TFB-MW-4B were all greater than their respective endpoint criteria of 1,000, 700, and 10,000 µg/L.

TAH was reported in groundwater samples collected at well 14-113 from 2007 through 2010 at concentrations ranging from 748 to 1,453 µg/L. The highest TAH concentration was measured in the 2009 sample from this well. The concentrations of TAH in all samples were greater than the ADEC surface water cleanup level of 10 µg/L. TAqH was reported in groundwater samples collected at well 14-113 from 2007 through 2010 at concentrations ranging from 748 to

1,453 µg/L. The highest TAqH concentration was measured in the 2009 sample from this well. The concentrations of TAqH in all samples were greater than the ADEC surface water cleanup level of 15 µg/L.

DRO was not detected or was detected at concentrations less than the endpoint criterion established for the South of Runway 18-36 Area (250 µg/L) in surface water samples collected from all locations at the site during this 5-year review period. GRO was not detected or was detected at concentrations less than the endpoint criterion established for the South of Runway 18-36 Area (114 µg/L) in surface water samples collected from all locations at the site during this 5-year review period. TAH and TAqH were not detected or were detected at concentrations less than the ADEC surface water quality criteria (10 and 15 µg/L, respectively) in surface water samples collected from all locations at the site during this 5-year review period.

DRO was detected at a concentration less than the endpoint criterion established for the South of Runway 18-36 Area (90.6 mg/kg) in the sediment sample collected from NL-U-04. DRO was reported in the sediment samples collected at NL-04 from 2009 and 2010 at concentrations of 89 and 160 mg/kg, respectively. The highest DRO concentration was measured in the 2010 sample from this location. This sample exceeded the South of Runway 18-36 endpoint criterion of 90.6 mg/kg. DRO was reported in the sediment samples collected at NL-D-04 from 2009 and 2010 at concentrations of 370 and 1,200 mg/kg, respectively. The highest DRO concentration was measured in the 2010 sample from this location. Both samples exceeded the South of Runway 18-36 endpoint criterion of 90.6 mg/kg. GRO was not detected in samples collected from NL-U-04 or NL-D-04. However, reporting limits were generally higher than the endpoint criterion established for the South of Runway 18-36 Area (12.2 mg/kg). GRO was reported in the sediment samples collected at NL-04 from 2007 through 2010 at concentrations ranging from 2.8 to 300 mg/kg. The highest GRO concentration was measured in the 2008 sample from this location. Concentrations in all samples exceeded the South of Runway 18-36 endpoint criterion of 12.2 mg/kg, except the sample collected in 2007.

Visual inspections of the shoreline of North Sweeper Creek were performed annually from 2006 through 2010. The 2006 and 2007 visual inspections did not identify any seep or sheen on the shoreline, and sheen was not observed on the surface water. In 2008, no seep was observed along the shoreline, but odor and sheen were observed when sediment was disturbed during sampling. In 2009, sheen and petroleum odor were identified when sediment was disturbed during sampling activities at downgradient locations NL-04 and NL-D-04. Additionally, petroleum odor was observed near well 14-113 and along the shoreline of North Sweeper Creek approximately 80 feet both up and downstream of the well. In 2010, petroleum odor but no sheen was observed when sediment was disturbed during the collection of sediment sample NL-04. No petroleum contamination was observed during the collection of a sample from location NL-D-04.

GRO exhibited an increasing trend at well TFB-MW-4B. GRO concentrations at wells 14-113 and 14-210 were generally stable from 2006 through 2010, and benzene concentrations at wells 14-113 and TFB-MW-4B exhibited a decreasing trend from 2006 through 2010. Toluene, ethylbenzene, and total xylenes concentrations at well TFB-MW-4B exhibited increasing trends from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 61, Tank Farm B site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy, USEPA, and ADEC 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Free product was not detected at this site during this 5-year review period.

Natural Attenuation Assessment

Sulfate concentrations for the site are depleted in site wells (0.07 and 0.25 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. Onsite ferrous iron concentrations (10 to 50 mg/L) are elevated, compared to background (0 mg/L), indicating the occurrence of iron reduction. Finally, evidence of methanogenesis is observed at the SWMU 61, Tank Farm B site, as demonstrated by elevated methane concentrations in on-site wells (620 and 1,500 µg/L), compared to background (0.38 µg/L).

Well 14-113 is located in the wetland associated with North Sweeper Creek and depleted oxygen and elevated methane and carbon dioxide concentrations observed in this well are suspected to be due at least in part to the microbial degradation of naturally occurring organic matter associated with wetland saturated soils.

The annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates that natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1. Decreasing trends were identified for benzene concentrations in groundwater samples from wells 14-113 and TFB-MW4B. The remaining concentration data sets were identified as having no trend or an increasing trend (U.S. Navy 2011a).

The Sen's slope was calculated for benzene concentrations in groundwater samples over time from wells 14-113 and TFB-MW4B in the 2010 annual monitoring report (U.S. Navy 2011a). Using the median and lower slope limits and the 2010 concentration in groundwater, benzene in

groundwater from 14-113 could reach the endpoint criterion in 2012 or 2013, and 2016 to 2020 in groundwater from TFB-MW4B. These endpoint dates assume that the 2010 trend continues.

Future Monitoring Recommendations

Dissolved petroleum hydrocarbons remain at concentrations above endpoint criteria, which are based on the ADEC cleanup levels, in groundwater samples from all wells at the site. In addition, TAH and TAqH concentrations in the well closest to North Sweeper Creek are above ADEC surface water criteria. However, concentrations of petroleum hydrocarbons in surface water samples collected from North Sweeper Creek are below endpoint criteria. DRO and GRO concentrations are generally above endpoint criteria in sediment samples collected from NL-04, and DRO concentrations are above the endpoint criterion in sediment samples collected from NL-D-04. Sheens and odors have been observed in the surface water adjacent to the site during this 5-year review period. Annual monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a). Note that despite the increasing concentrations at certain locations on site, the recommendation to continue monitoring as prescribed, rather than implement additional remedial actions at the site, is because of the sensitive nature of the wetland environment. An EE/CA (U.S. Navy 2010j) was completed, and it was determined by the Navy and ADEC that further action at the site would result in more harm than benefit to the wetland environment.

6.4.25 SWMU 62, New Housing Fuel Leak

Two areas of SWMU 62, New Housing Fuel Leak are currently being monitored: Eagle Bay Housing Area and Sandy Cove Housing 102, 107, and 146 Area. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected passive free-product recovery and containment, monitored natural attenuation for groundwater, surface soil excavation in Sandy Cove Housing 102, 107, and 146 Area, and ICs as the final remedy for this site (U.S. Navy and ADEC 2006b). In addition, the decision document specified that a free-product recovery trench would be installed at the site adjacent to East Canal for product recovery, four new wells would be installed at the site for surface water protection monitoring, natural attenuation monitoring, and free-product recovery, and visual inspections of East Canal would be performed. Groundwater samples were collected during the annual groundwater monitoring activities at this site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]), to evaluate natural attenuation parameters, and to evaluate groundwater quality downgradient of the site to serve as a warning for potential impacts to the downgradient surface water body (East Canal).

Eagle Bay Housing Area Data Review

Data Collection During This 5-Year Review Period. Groundwater samples were collected from wells 03-109, 03-898, AMW-704, RW-303-13, RW-303-14, and RW-303-16 for surface water protection and natural attenuation monitoring. Monitoring was conducted annually in these wells, except for in well RW-303-13. A sample was not collected from this well in 2007, because of a field error. Well RW-303-15 was sampled instead of RW-303-13 (see next paragraph.) DRO, GRO, and BTEX analyses were conducted at all surface water protection monitoring wells from 2006 through 2010. NAPs analyses were conducted in 2006 and 2009.

Groundwater samples were collected annually during this 5-year review period from wells 03-103, 03-502, HMW-303-12, and MW-303-14 for natural attenuation monitoring. DRO, GRO, and BTEX analyses were conducted annually at all monitored natural attenuation wells from 2006 through 2010. NAPs analyses were conducted in 2006 and 2009. In addition, one sample was inadvertently collected from RW-303-15 in 2007 and analyzed for DRO, GRO, and BTEX.

Visual inspections of East Canal were performed annually from 2007 through 2010. It is unclear why a visual inspection was not performed in 2006, because visual inspection was a requirement of the decision document for this site. The 2009 annual groundwater monitoring report recommended that one surface water sample and one sediment sample be collected in East Canal downstream of boom 8 (location NL-09). The surface water was to be analyzed for DRO, GRO, BTEX, TAH and TAqH; and sediment was to be analyzed for DRO, GRO, BTEX, and PAHs. This sampling was implemented in 2010. In addition, one surface water sample and one sediment sample were collected from a seep at boom 8 in 2009 to characterize seep contaminants (EC-01). The surface water sample was analyzed for DRO, GRO, BTEX, and PAHs, and the sediment sample was analyzed for RRO, DRO, GRO, and BTEX.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing Area relative to existing structures at the site. Apparent groundwater flow is to the west towards East Canal. Wells 03-898, AMW-704, RW-303-13, and RW-303-14 are located at the downgradient edge of the site near East Canal. The remainder of the sampled wells are located within the site, with the data used to monitor the extent of groundwater impacts. The 2009 surface water and sediment sampling location is included in the technical memorandum for this additional sampling activity (U.S. Navy 2010b).

Analytical Results. During this 5-year review period, DRO, GRO, and BTEX concentrations were below their respective endpoint criteria in all samples collected from wells 03-109, 03-898, HMW-303-12, and RW-303-14. GRO and BTEX concentrations were below their respective endpoint criteria in all samples collected from wells 03-103, AMW-704, RW-303-13, and RW-

303-16. Toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from well 03-502 during this 5-year review period.

DRO was reported in groundwater samples collected at well 03-103 from 2006 to 2010 at concentrations ranging from 190 to 1,900 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were less than the endpoint criterion of 1,500 µg/L during this 5-year review period, except in the sample collected in 2006. DRO was reported in groundwater samples collected at well AMW-704 from 2006 to 2010 at concentrations ranging from 1,200 to 3,800 µg/L. The highest DRO concentration in this well was measured in the 2010 sample. The DRO concentrations in this well have been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period, except in the sample collected in 2009. DRO was reported in groundwater samples collected at well MW-303-14 from 2006 to 2010 at concentrations ranging from 310 to 1,800 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were less than the endpoint criterion of 1,500 µg/L during this 5-year review period, except in the sample collected in 2006. DRO was reported in groundwater samples collected at well RW-303-13 from 2006 to 2010 at concentrations ranging from 200 to 3,400 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were greater than the endpoint criterion of 1,500 µg/L in 2006, 2008, and 2010. DRO was reported in groundwater sample collected at well RW-303-15 in 2007 at a concentration of 5,500 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well have consistently been greater than the endpoint criterion during this 5-year review period. DRO was reported in groundwater samples collected at well RW-303-16 from 2006 to 2010 at concentrations ranging from 2,500 to 10,000 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well have consistently been greater than the endpoint criterion during this 5-year review period.

DRO was reported in groundwater samples collected at well 03-502 from 2006 to 2010 at concentrations ranging from 1,200 to 8,200 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were greater than the endpoint criterion of 1,500 µg/L in 2006, 2007, and 2008. GRO was reported in groundwater samples collected at well 03-502 from 2006 to 2010 at concentrations ranging from 1,500 to 8,200 µg/L. The highest GRO concentration in this well was measured in the 2006 sample. The GRO concentrations in this well have consistently been greater than the endpoint criterion during this 5-year review period. Benzene was reported in groundwater samples collected at well 03-502 from 2006 to 2010 at concentrations ranging from 0.15 to 5.4 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The benzene concentrations in this well were less than the endpoint criterion of 5 µg/L during this 5-year review period, except in the sample collected in 2006.

DRO and GRO were reported in the surface water sample collected at EC-01 in 2009 at concentrations of 120 and 61µg/L, respectively. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water is less than the endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). No ADEC surface water criterion exists for GRO either, but the concentration detected in the surface water is less than the endpoint criterion established for the South of Runway 18-36 Area (114 µg/L). Indeno(1,2,3-cd)pyrene was not detected in the surface water sample collected in 2009. TAH and TAqH were reported in the 2009 surface water sample at concentrations of 3.69 and 3.75 µg/L, respectively. Both the TAH and TAqH concentrations were below the ADEC surface water quality standards of 10 and 15 µg/L, respectively.

DRO and GRO were reported in the surface water sample collected at NL-09 in 2010 at concentrations of 280 and 230 µg/L, respectively. TAH and TAqH were reported in the 2010 surface water sample at concentrations of 29 and 29.2 µg/L, respectively. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water is greater than the endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). No ADEC surface water criterion exists for GRO either, but the concentration detected in the surface water is greater than the endpoint criterion established for the South of Runway 18-36 Area (114 µg/L). TAH and TAqH were reported in the surface water sample collected at NL-09 in 2010 at concentrations of 29 and 29.25 µg/L, respectively. Both the TAH and TAqH concentrations were above the ADEC surface water quality standards of 10 and 15 µg/L, respectively.

RRO and DRO were reported in the sediment sample collected at EC-01 in 2009 at concentrations of 290 and 460 mg/kg, respectively. GRO and BTEX were not detected in the sediment sample. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO were compared to the South of Runway 18-36 Area endpoint criterion. The DRO concentration was above the South of Runway 18-36 endpoint criterion of 90.6 mg/kg. An endpoint criterion was not established for RRO at the South of Runway 18-36 Area.

DRO was reported in the sediment sample collected at NL-09 in 2010 at a concentration of 39 mg/kg. GRO was not detected in the sediment sample. Three PAHs were reported in the 2010 sediment sample at concentrations ranging from 0.9 to 3.5 µg/kg. ADEC has not established cleanup levels for specific compounds in sediment. Therefore, sample results for DRO were compared to the South of Runway 18-36 Area endpoint criterion, and detected PAH compounds were compared to the most stringent ADEC soil cleanup levels. The DRO concentration was below the South of Runway 18-36 endpoint criterion of 90.6 mg/kg, and the detected PAH concentrations were all well below the most stringent ADEC soil cleanup levels.

Visual inspections were performed in 2007, 2008, 2009, and 2010. No visual inspection was performed at SWMU 62, New Housing Fuel Leak site in 2006. During the 2007 visual inspection, no seep, sheen, or odor was identified in East Canal downgradient of the SWMU 62, New Housing Fuel Leak site. During the 2008 visual inspection, several areas of black, oily petroleum contamination were observed along the shoreline in East Canal downgradient of SWMU 62, New Housing Fuel Leak that were causing sheen on East Canal waters. An increase in the amount of oil seeping into East Canal has been observed since March 2008 after Adak experienced a 6.7 magnitude earthquake. Several areas of black, oily petroleum contamination were observed during the 2009 visual inspection along the shoreline of East Canal downgradient of SWMU 62, New Housing Fuel Leak and Former Power Plant Building T-1451. These were causing a sheen on East Canal waters. In addition, petroleum sheen was observed to ooze from shoreline sediments when pressure was applied at locations along the entire length of East Canal between SWMU 62 and the southern canal outlet. In 2010, a large petroleum seep, approximately 150 feet in length and up to 10 feet in width was observed downgradient of the free product recovery trench. Oily sediments, pooled free product, surface water sheen, petroleum odor, and iron staining were observed at this location.

GRO concentrations at well 03-502 exhibited a statistically significant decreasing trend. DRO concentrations at wells AMW-704, RW-303-13, and RW-303-16 have generally been stable from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing Area. Free-product recovery is a component of the final remedy for this site (U.S. Navy and ADEC 2006b). Therefore, monthly monitoring and free-product recovery were performed at this site during this 5-year review period. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing.

Between November 1992 and September 2010, monitoring wells within the vicinity of the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater

monitoring events. In addition, 34 wells were gauged weekly in September 2006 as part of free-product recovery system startup and 38 wells were gauged monthly from October 2006 through September 2008, 24 wells were gauged monthly from October 2008 through September 2009, and 17 wells were gauged monthly from October 2009 through September 2010 as part of final remedy implementation.

The frequency of product thickness measurements at 15 wells was decreased from monthly to annually after September 2008. In addition, the frequency of product thickness measurements at one well was increased from annually to monthly after September 2008. Therefore, the total number of wells monitored monthly for free product for October 2008 through September 2009 was 24. However, the remedial action summary report for the period October 2007 to September 2008 recommended that monthly monitoring be continued at 11 monitoring wells and the 6 recovery sumps, for a total of 17 wells. Three wells recommended for monthly monitoring were not monitored from October 2008 through September 2009, and 10 wells that were not recommended for continued monthly monitoring were monitored. It appears that the three wells that were recommended for continued monthly monitoring were accidentally dropped from the program, and monthly monitoring was resumed in October 2009. No rationale was provided for monitoring the 10 wells that were not recommended for continued monthly monitoring. Free product was not detected in any of these wells from October 2007 through September 2008 and free product was detected during the 2007 and 2008 annual groundwater monitoring events in only some of the ten wells. Furthermore, free product was detected during the 2007 and 2008 annual groundwater monitoring events in wells that were not added to the monthly monitoring program.

The frequency of product thickness measurements at 10 wells was decreased from monthly to annually after September 2009. In addition, the frequency of product thickness measurements at three wells was increased from annually to monthly after September 2009. Therefore, the total number of wells monitored monthly for free product from October 2009 through September 2010 was 17. The recommendations made in the remedial action summary report for the period October 2007 to September 2008 were implemented in September 2009. However, the remedial action summary report for the period October 2008 to September 2009 recommended continued monitoring at five wells where monitoring was discontinued in October 2009. These five wells are CTO-MW15, MW-303-5, MW-303-8, RW-303-12, and RW-303-7. This report also recommended discontinuing monitoring at one well (RW-303-4) where monitoring was continued in October 2009, because free product had not been observed at this location for 12 months.

Between October 2005 and September 2010, free product has been detected in 36 wells at the site. The maximum measured thickness of free product reported at the site since October 2005 was 2.03 feet in well HMW-303-11 in September 2006. The maximum measured thickness of

free product reported in other site wells where free product was measured at thicknesses greater than 0.1 foot was as follows:

- 0.77 foot in September 2006 at 03-107
- 1.89 feet in September 2006 at 03-518
- 0.31 foot in September 2006 at HMW-303-10
- 0.32 foot in September 2006 at HMW-303-2
- 1.96 feet in September 2006 at HMW-303-3
- 0.3 foot in September 2006 at MW-303-10
- 0.59 foot in September 2006 at MW-303-12
- 1.02 feet in September 2006 at MW-303-7
- 1.63 feet in September 2006 at MW-303-8
- 0.6 foot in September 2006 at RW-303-12
- 0.8 foot in September 2006 at RW-303-4
- 0.82 foot in October 2006 at HMW-303-5
- 0.35 foot in October 2006 at HMW-303-9
- 0.44 foot in February 2007 at RW-303-15
- 0.46 foot in August 2007 at SWMU62-R3
- 0.18 foot in September 2007 at SWMU62-R4
- 1.18 feet in March 2009 at CTO124-MW15
- 1.26 feet in March 2009 at 03-101
- 1.78 feet in March 2009 at 03-102

Free-Product Recovery. Interim free-product recovery at this site was conducted between 1989 and 2000, using active recovery systems (a dual-pump system from 1989 until October 1996 and a total-fluids product-recovery system from November 1996 until May 2000). The Navy prepared the *Draft Free-Product Recovery Closure Report for SWMU 62, New Housing Fuel Leak* that presented a comparison of the system recovery to endpoint criteria (U.S. Navy 1999). Based on the comparison of the volume of recovered product with the volume of total fluids pumped during 1999, the product-recovery system at the SWMU 62, New Housing Fuel Leak site was shown to have met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD. Subsequently, the product-recovery system was shut down on May 1, 2000. Free-product recovery was selected as part of the final remedy for the site in the decision document (U.S. Navy and ADEC 2006b). These additional free-product recovery activities were implemented at the site in September 2006. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free-product recovery was conducted, if required, at 34 wells in the vicinity of the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing during September 2006. Free-product recovery was conducted, if required, at 38 wells from October 2006 through September 2008, at 24 wells from October 2008 through September 2009, and at 17 wells from October 2009 through September 2010. Monthly product recovery activities were discontinued at 15 wells after September 2008, because free product had not been observed for 6 months in these wells. Monthly product recovery activities were initiated at one well after September 2008. Therefore, the total number of wells where monthly free-product activities was performed for the period from October 2008 through September 2009 was 24. However, the remedial action summary report for the period October 2007 to September 2008 recommended that monthly product recovery activities be continued at 11 monitoring wells and the 6 recovery sumps, for a total of 17 wells. Three wells recommended for monthly product recovery were not monitored from October 2008 through September 2009, and 10 wells that were not recommended for continued monthly product recovery were included in the monthly product recovery program. It appears that the three wells that were recommended for continued monthly product recovery activities were accidentally dropped from the program, and monthly product recovery was resumed in October 2009. No rationale was provided for continuing monthly product recovery at the 10 wells that were recommended for discontinuation of the monthly product recovery.

Free-product recovery at 10 wells was decreased from monthly to annually after September 2009. In addition, free-product recovery at three wells was increased from annually to monthly after September 2009. Therefore, the total number of wells monitored monthly for free product from October 2009 through September 2009 was 17. Therefore, the recommendations made in the remedial action summary report for the period October 2007 to September 2008 were implemented in September 2009. However, the remedial action summary report for the period October 2008 to September 2009 recommended continued monthly free-product recovery at five wells where monitoring was discontinued in October 2009. These five wells are CTO-MW15, MW-303-5, MW-303-8, RW-303-12, and RW-303-7. This report also recommended discontinuing monthly free-product recovery at one well (RW-303-4) where monthly monitoring was continued in October 2009, because free product had not been observed at this location for 12 months.

Approximately 1.52 gallons of free product were recovered from the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing during the annual groundwater monitoring events from 2006 through 2010. Of this, 1.5 gallons were recovered from RW-303-4 during the September 2006 annual groundwater monitoring event, and 0.02 gallon was recovered from HMW-303-3 during the 2007 annual groundwater monitoring event. No free product was recovered during the 2008, 2009, and 2010 annual groundwater monitoring events.

In September 2006, approximately 58.12 gallons of free product were recovered from SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing during monthly free-product

recovery activities. Approximately 25.73, 9.13, 8.3, and 11.43 gallons were recovered during monthly free-product recovery activities at SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing from October 2006 to September 2007, from October 2007 to September 2008, from October 2008 through September 2009, and from October 2009 through September 2010, respectively. The total volume of free product recovered from SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing for the period October 2005 through September 2010 was 114.23 gallons. The maximum volume of free product (22.80 gallons) was recovered from well HMW-303-3 for the time period October 2005 through September 2010. In addition, 18.86 gallons from 03-518, 14.76 gallons from HMW-303-11, and 13.85 gallons from 03-102 during this same time period.

The technically practicable endpoint for passive recovery in site wells has been met at the SWMU 62, New Housing Fuel Leak site. The requirement states that "the practicable endpoint for recovery will be reached when the monthly volume of recovered product, averaged over the most recent 6 months (6-month moving average), is less than 5 gallons per month for a period of 12 months of product recovery." The 6-month moving average of product recovered was less than 5 gallons per month from October 2009 through September 2010. However, the practicable endpoint for the recovery trenches had not met the endpoint criterion. Product was observed at least once in five of the six recovery sumps between October 2009 and September 2010. The endpoint criterion for the recovery sumps is that product has been reduced to less than 0.01 inches, or no sounding of the oil/water probe has been experienced for 1 year.

Future Monitoring Recommendations

GRO and BTEX concentrations were below endpoint criteria in all site wells except 03-502. Therefore, monitoring for GRO and BTEX should be discontinued at all site wells, except 03-502 and downgradient well RW-303-14. Monitoring at wells HMW-303-12 and MW-303-14 should be discontinued, because concentrations of petroleum hydrocarbons in these upgradient wells have been below the endpoint criteria for at least the last four consecutive groundwater monitoring events. Selected wells within the area where free product has been detected in the past should be added to the monitoring program, as free product levels decline at the site. No well within the source area is currently being monitored, and monitoring of these wells should be performed to demonstrate that natural attenuation is occurring within the source area. Annual monitoring should continue at all other site wells as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with the modifications noted above.

DRO, GRO, TAH, and TAqH concentrations in the surface water sample collected at NL-09 exceeded the endpoint criteria established for the South of Runway 18-36 Area, and the DRO concentration in the sediment sample collected at EC-01 exceeded the endpoint criterion established for the South of Runway 18-36 Area. Therefore, continued monitoring of surface water and sediment, as prescribed in the CMP, Revision 4, is recommended.

Although free-product recovery activities in site wells have met the endpoint criterion, free-product recovery activities in site wells will be continued because free product continues to be detected in site wells at thicknesses greater than 0.02 foot. Free-product monitoring and recovery will be continued at the following eight wells: 03-101, 03-102, 03-518, HMW-303-9, HMW-303-11, RW-303-4, RW-303-13, and RW-303-15. Free-product monitoring and recovery activities will be initiated at wells MW-15, MW-303-8, and MW-303-10 and will be continued at MW-303-12 since greater than 0.02 foot of product was observed in these wells during the September 2010 annual groundwater monitoring activities. Finally, free-product monitoring and recovery activities at wells HMW-303-3 and RW-303-11 should be discontinued since product has not been observed at these locations during the past 12 months. Free-product recovery in the recovery trenches has not met the endpoint criterion. Therefore, free-product monitoring and recovery should be continued in the recovery trenches. The frequency of product thickness measurements and free-product recovery, if required, should be decreased from monthly to six times per year, because of low product thicknesses and recovered product volumes. Additionally, many sites are typically inaccessible during the winter months of January through March because of poor weather, snowy conditions, and icy roads. The type of free-product recovery equipment installed in each sump should be clearly documented for each month of operation in the annual remedial action summary report. More specifically, the date of installation and date of removal should be included in the documentation. In addition, if bailing was used instead of an automated passive skimmer, passive skimmer, or sorbent sock, this should also be clearly documented. This information is necessary to verify whether free-product recovery activities are being performed consistent with the decision document. The recommendations regarding the placement and use of product recovery equipment made for the NMCB Building Area, T-1416 Expanded Area site should also be considered by the Optimization Work Group for the SWMU 62, New Housing Fuel Leak site.

Sandy Cove Housing Area Data Review

Data Collection During This 5-Year Review Period. Groundwater samples were collected from wells 03-104, 03-155, 03-619, 03-697, 03-778, 03-802, 03-895, HMW-102-6, HMW-102-8, HMW-107-2, HMW-139-3, HMW-146-3, MRP-MW-2, MRP-MW-3, MW-107-1, MW-134-11, MW-146-1, and MW-187-1 for natural attenuation monitoring. Although monitoring was planned at wells 03-716, 03-808, HMW-184-1, HMW-184-2, MW-107-4, and MW-134-3, monitoring was not performed at these locations during this 5-year review period because these wells could not be located and are presumed destroyed. Monitoring was also planned for wells MW-139-2, MW-139-3, and MW-146-6. A sample could not be collected from MW-139-2, because the sample tubing clogged with biomaterials as a result of low water volumes in the well during the 2006 sampling event. It was subsequently removed from the sampling program. It is unclear why sampling was not performed at MW-139-3, because this well was included in the 2007 CMP and no reasons were provided in the 2007 annual

groundwater monitoring report explaining why sampling was not performed. A sample was not collected from well MW-146-6, because this well was abandoned. Monitoring was conducted annually in the 18 wells listed above during this 5-year review period, with the following exceptions. Samples were not collected from well 03-104 in 2006 and from well MRP-MW-2 in 2008, because of the presence of free product. Sampling of wells 03-619 and MW-146-1 was initiated in 2007. Therefore, sampling was not performed in these wells in 2006. HMW-102-8 was sampled once in 2006, instead of sampling RW-102-2, which had free-product recovery equipment installed in the well and could not be sampled. MRP-MW-2 was not sampled in 2008, because the well was dry. Finally, RW-102-2 was not sampled in 2007 through 2010, but no explanation is provided as to why this location was dropped from the monitoring program. DRO, GRO, and BTEX analyses were conducted annually at all monitored natural attenuation wells from 2006 through 2010. NAPs analyses were conducted in 2006 and 2009.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 62, New Housing Fuel Leak, Sandy Cove Housing Area site relative to existing structures at the site. Apparent groundwater flow is to the southwest towards East Canal and to the south toward Sweeper Cove.

Analytical Results. Toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells, except MRP-MW-3, during this 5-year review period. GRO concentrations were below the endpoint criterion in all samples collected from all wells, except wells MRP-MW-2 and MRP-MW-3, during this 5-year review period. Benzene concentrations were below the endpoint criterion in all samples collected from all wells, except wells MRP-MW-2, MRP-MW-3, and MW-187-1 during this 5-year review period. DRO concentrations were below the endpoint criterion in all samples collected from wells 03-619, 03-697, 03-802, 03-895, HMW-102-6, HMW-107-2, HMW-139-3, and MRP-MW-2 during this 5-year review period.

DRO was reported in groundwater samples collected at well 03-104 from 2006 to 2010 at concentrations ranging from 4,800 to 9,000 µg/L. The highest DRO concentration in this well was measured in the 2007 sample. The DRO concentrations in this well have consistently been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period. DRO was reported in groundwater samples collected at well 03-155 from 2006 to 2010 at concentrations ranging from 1,500 to 3,300 µg/L. The highest DRO concentration in this well was measured in the 2008 sample. The DRO concentrations in this well have been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period, except for in the sample collected in 2006. DRO was reported in groundwater samples collected at well 03-778 from 2006 to 2010 at concentrations ranging from 860 to 2,400 µg/L. The highest DRO concentration in this well was measured in the 2010 sample. The DRO concentrations in this well were greater than the endpoint criterion of 1,500 µg/L in 2006, 2007, and 2010. DRO was reported in groundwater samples collected at well HMW-146-3 from 2006 to 2010 at concentrations ranging from 1,100

to 1,900 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. The DRO concentrations in this well were greater than the endpoint criterion of 1,500 µg/L in 2006 and 2010.

GRO was reported in groundwater samples collected at well MRP-MW-2 from 2006 to 2010 at concentrations ranging from 2,300 to 8,400 µg/L. The highest GRO concentration in this well was measured in the 2007 sample. The GRO concentrations in this well have consistently been greater than the endpoint criterion of 1,300 µg/L during this 5-year review period. Benzene was reported in groundwater samples collected at well MRP-MW-2 from 2006 to 2010 at concentrations ranging from 39 to 75 µg/L. The highest benzene concentration in this well was measured in the 2009 sample. The benzene concentrations in this well have consistently been greater than the endpoint criterion of 5 µg/L during this 5-year review period.

DRO was reported in groundwater samples collected at well MRP-MW-3 from 2006 to 2010 at concentrations ranging from 1,800 to 6,300 µg/L. The highest DRO concentration in this well was measured in the 2007 sample. GRO was reported in groundwater samples collected at well MRP-MW-3 from 2006 to 2010 at concentrations ranging from 38,000 to 40,000 µg/L. The highest GRO concentration in this well was measured in the 2009 sample. The DRO and GRO concentrations in this well have consistently been greater than their respective endpoint criteria during this 5-year review period. Benzene was reported in groundwater samples collected at well MRP-MW-3 from 2006 to 2010 at concentrations ranging from 2.4 to 5.5 µg/L. The highest benzene concentration in this well was measured in the 2009 sample. The benzene concentration in this well was greater than the endpoint criterion of 5 µg/L in 2009. Ethylbenzene was reported in groundwater samples collected at well MRP-MW-3 from 2006 to 2010 at concentrations ranging from 1,500 to 2,500 µg/L. The highest ethylbenzene concentration in this well was measured in the 2006 sample. The ethylbenzene concentrations in this well have consistently been greater than the endpoint criterion of 700 µg/L during this 5-year review period. Total xylenes were reported in groundwater samples collected at well MRP-MW-3 from 2006 to 2010 at concentrations ranging from 8,400 to 13,100 µg/L. The highest total xylenes concentration in this well was measured in the 2006 sample. The total xylenes concentrations in this well were greater than the endpoint criterion of 10,000 µg/L in 2006 and 2009.

DRO was reported in groundwater samples collected at well MW-107-1 from 2006 to 2010 at concentrations ranging from 3,400 to 4,400 µg/L. The highest DRO concentration in this well was measured in the 2010 sample. DRO was reported in groundwater samples collected at well MW-134-11 from 2006 to 2010 at concentrations ranging from 4,700 to 6,300 µg/L. The highest DRO concentration in this well was measured in the 2006 sample. DRO was reported in groundwater samples collected at well MW-146-1 from 2006 to 2010 at concentrations ranging from 6,800 to 13,000 µg/L. The highest DRO concentration in this well was measured in the 2010 sample. DRO was reported in groundwater samples collected at well MW-187-1 from 2006 to 2010 at concentrations ranging from 2,400 to 4,400 µg/L. The highest DRO

concentration in this well was measured in the 2010 sample. The DRO concentrations in these four wells have consistently been greater than the endpoint criterion of 1,500 µg/L during this 5-year review period. Benzene was reported in groundwater samples collected at well MW-187-1 from 2006 to 2010 at concentrations ranging from 3.6 to 18 µg/L. The highest benzene concentration in this well was measured in the 2006 sample. The benzene concentrations in this well have been greater than the endpoint criterion of 5 µg/L during this 5-year review period, except for in the sample collected in 2010.

DRO concentrations at wells 03-104, 03-788, HMW-146-3, MW-107-1, MW-134-11, MW-146-1, and MW-187-1 have generally been stable from 2006 through 2010. DRO concentrations at well 03-155 exhibited an increasing trend. GRO and benzene concentrations at well MRP-MW2 have generally been stable from 2006 through 2010. Benzene concentrations at well MW-187-1 have exhibited a statistically significant decreasing trend. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing Area. Free-product recovery is a component of the final remedy for this site (U.S. Navy and ADEC 2006b). Therefore, monthly monitoring and free-product recovery were performed at this site during this 5-year review period. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness Summary 2006 Through 2010." The following summarizes the significant product thickness data for the SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing.

Between November 1992 and September 2010, monitoring wells within the vicinity of the SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, nine wells were gauged weekly in September 2006 as part of free-product recovery system startup, nine wells were gauged monthly from October 2006 through September 2008, and two wells were gauged monthly from October 2008 through September 2009 as part of final remedy implementation. Although monitoring of MW-187-3 was planned as part of free-product recovery implementation, this well was not monitored because it could not be located.

Monitoring of well MW-134-8 was discontinued after September 2006, because the well was dry. The frequency of product thickness measurements at one well (03-104) was increased from annually to monthly after September 2006, because free product was detected in this well during the 2006 annual groundwater monitoring event. The frequency of product thickness measurements at seven wells was decreased from monthly to annually after September 2008. Therefore, the total number of wells monitored monthly for free product from October 2008 through September 2009 was two. These changes were based on recommendations made in the October 2006 to September 2007 remedial action summary report. This report indicated that monitoring was to be discontinued at these wells because product had not been detected at these wells in the past 6 months (April 2007 through September 2007). However, product was detected in wells HMW-102-1, MW-107-11, and RW-102-4 between October 2007 and September 2008. Free-product thickness measurements at SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing were discontinued after September 2009. The remedial action summary report for the period October 2008 through September 2009 recommended that monthly monitoring be discontinued at 03-104, because free product had not been detected for 12 months. No recommendation to either continue or discontinue monitoring at HMW-139-2 was made in this report. However, free product was detected in HMW-139-2 twice from October 2008 through September 2009.

Between October 2005 and September 2010, free product has been detected in five wells at the site. The maximum measured thickness of free product reported at the site since October 2005 was 2.7 feet, in well HMW-102-1 in September 2006. The maximum measured thickness of free product reported in other site wells where free product was measured at thicknesses greater than 0.1 foot was as follows:

- 0.23 foot in October 2006 at HMW-139-2
- 0.83 foot in September 2006 at MW-107-11

Free-Product Recovery. As discussed above for SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing, interim free-product recovery at this site was conducted between 1989 and 2000, using active recovery systems (a dual-pump system from 1989 until October 1996 and a total-fluids product-recovery system from November 1996 until May 2000). The Navy prepared the *Draft Free-Product Recovery Closure Report for SWMU 62, New Housing Fuel Leak* that presented a comparison of the system recovery to endpoint criteria (U.S. Navy 1999). Based on the comparison of the volume of recovered product with the volume of total fluids pumped during 1999, the product recovery system at the SWMU 62, New Housing Fuel Leak site was shown to have met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD. Subsequently, the product recovery system was shut down on May 1, 2000. Free-product recovery was selected as part of the final remedy for the site in the decision document (U.S. Navy and ADEC 2006b). These additional free-product recovery

activities were implemented at the site in September 2006. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free-product recovery was conducted, if required, at nine wells in the vicinity of SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing during September 2006. Free-product recovery was conducted, if required, at nine wells from October 2006 through September 2008, and at two wells from October 2008 through September 2009. Monthly product recovery activities were discontinued at well MW-134-8 after September 2006, because the well was dry. Monthly product recovery activities were initiated at one well (03-104) after September 2006, because free product was detected in this well during the 2006 annual groundwater monitoring event. Monthly product recovery activities were discontinued at seven wells after September 2008 based on recommendations made in the October 2006 to September 2007 remedial action summary report. This report indicated that monthly free product recovery activities were to be discontinued at these wells, because product had not been detected at these wells in the past 6 months (April 2007 through September 2007). However, product was detected in wells HMW-102-1, MW-107-11, and RW-102-4 between October 2007 and September 2008. Monthly free-product recovery activities at SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing were discontinued after September 2009. The remedial action summary report for the period October 2008 through September 2009 recommended that monthly free-product recovery activities be discontinued at 03-104, because free product had not been detected for 12 months. No recommendation to either continue or discontinue free-product recovery activities at HMW-139-2 was made in this report. However, free product was detected in HMW-139-2 twice from October 2008 through September 2009.

No free product was recovered from the SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing during the annual groundwater monitoring events from 2006 through 2010. In September 2006, approximately 0.22 and 1.23 gallons were recovered during weekly free-product recovery activities from wells HMW-102-1 and MW-107-11, respectively. From October 2006 through September 2007, approximately 0.83 and 0.3 gallon was recovered from wells HMW-139-2 and MW-107-11, respectively. Free product was not recovered from any well during monthly free-product recovery activities from October 2007 through September 2009. Therefore, the total volume of free product recovered from SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing for the period October 2005 through September 2010 was 2.58 gallons. The maximum volume of free product (1.53 gallons) was recovered from well MW-107-11 for the time period October 2005 through September 2010.

As discussed for the Eagle Bay Housing area, the technically practicable endpoint for passive recovery in site wells has been met at the SWMU 62, New Housing Fuel Leak site. The requirement states that "the practicable endpoint for recovery will be reached when the monthly volume of recovered product, averaged over the most recent 6 months (6-month moving

average), is less than 5 gallons per month for a period of 12 months of product recovery." The 6-month moving average of product recovered was less than 5 gallons per month from October 2009 through September 2010.

Natural Attenuation Assessment (Both Sandy Cove and Eagle Bay)

Sulfate concentrations in 12 plume and downgradient wells are depleted (0.04 to 2.13 mg/L), compared to background (2.47 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated (0.01 to 100 mg/L), compared to background (0 mg/L), indicating the on-site occurrence of iron reduction. Finally, evidence of methanogenesis is observed at the SWMU 62, New Housing Fuel Leak site, as demonstrated by elevated methane concentrations in 20 on-site wells ranging from 1.8 to 10,000 µg/L, which exceed background (nondetected at 0.50 µg/L) (U.S. Navy 2010e).

Six wells do not appear to have significant biodegradation occurring, including 03-103, 03-109, 03-802, 03-898, HMW-303-12, and RW-303-13. All have concentrations of petroleum compounds below endpoint criteria and near or below method detection limits. NAPs data for the remaining wells within the contaminant plume strongly indicate that biodegradation of petroleum hydrocarbons is occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates that natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation for the Sandy Cove portion of the site are summarized in Table 6-1. A decreasing trend was identified for benzene concentrations in groundwater samples from well MW-187-1. The remaining data sets were identified as having no trend or an increasing trend (U.S. Navy 2011a). The 2010 benzene concentration for MW-187-1 was below the endpoint criterion. As such, none of the data support estimation of the time to achieve endpoint criteria for the Sandy Cove portion of the site.

Results of the Mann-Kendall and Sen's trend evaluation for the Eagle Bay portion of the site are summarized in Table 6-1. A decreasing trend was identified for GRO concentrations in groundwater samples from well 03-502. The remaining data sets were identified as having no trend (U.S. Navy 2011a).

The Sen's slope was calculated for GRO concentrations in groundwater samples over time from well 03-502 in the 2010 annual report (U.S. Navy 2011a). Using the median and lower slope limits and the 2010 concentration in groundwater, GRO in groundwater from 03-502 could reach the endpoint criterion in 2011 or 2012. These endpoint dates assume that the 2010 trend continues. The remaining data sets do not support estimation of the time to achieve endpoint criteria.

Future Monitoring Recommendations

GRO and BTEX concentrations were below endpoint criteria, which are based on the ADEC cleanup levels, in all site wells, except MRP-MW-2, MRP-MW-3, and MW-187-1. Therefore, monitoring for GRO and BTEX should be discontinued at all site wells, except for these three. Monitoring at well HMW-139-3 should be discontinued, because concentrations of petroleum hydrocarbons in this cross-gradient well have been below the endpoint criteria during this 5-year review period. Although concentrations of petroleum hydrocarbons at cross-gradient well HMW-102-6 have been less than endpoint criteria, the concentration of DRO has been increasing in this well, and the concentration during the most recent sampling event was at the endpoint criterion. Annual monitoring should continue at all other site wells as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with the modifications noted above.

Free-product monitoring and recovery activities at well MRP-MW3 will be initiated since greater than 0.02 foot of product was observed in this well during the September 2010 annual groundwater monitoring activities. The frequency of product-thickness measurements and free-product recovery at MRP-MW3, if required, should be performed six times per year.

6.4.26 Tanker Shed, UST 42494

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Tanker Shed, UST 42494 site from 2006 through 2010. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected monitored natural attenuation with ICs and free-product recovery as the final remedy for this site (U.S. Navy and ADEC 2005a). In addition, the decision document specified that one additional soil sample would be collected from a location half way between locations TSSF9 and TSSB10 to evaluate the lateral extent of petroleum-related chemicals identified in this area, and one additional groundwater monitoring well would be installed downgradient of existing well 04-601 and upgradient of East Canal. Soil samples were to be collected during this new well installation. Results of this additional soil, groundwater, and surface water sampling are discussed in the Site Catalog in Appendix A. Groundwater samples were collected from Tanker Shed, UST 42494 site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]), to verify that natural attenuation is occurring and to evaluate groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (East Canal).

Groundwater samples were collected from wells 04-601, TS-01 and TS-05 for surface water protection monitoring. Samples were collected annually from well 04-601. Samples were

collected annually from wells TS-01 and TS-05 from 2006 through 2008 and every other year (even years) thereafter. The frequency of monitoring was reduced for these two wells, because no contaminant has exceeded endpoint criteria for at least 3 years and monitoring will continue to occur at well 04-601, which is located upgradient from these wells.

Groundwater samples were collected for DRO, GRO, and BTEX analysis from 2006 through 2007 in all three wells. Following the 2007 groundwater monitoring event, sampling for BTEX was discontinued at wells TS-01 and TS-05, because these contaminants had not exceeded endpoint criteria during the previous two monitoring events. Following the 2008 groundwater monitoring event, monitoring for toluene, ethylbenzene, and total xylenes was discontinued in well 04-601 and the frequency of monitoring for GRO and benzene was reduced to every other year (even years). Toluene, ethylbenzene, and total xylenes concentrations in this well have been less than endpoint concentrations since 2002. Continued monitoring of GRO and benzene was recommended at the reduced frequency, because these contaminants are detected at concentrations above endpoint criteria in upgradient wells.

Groundwater samples were collected from wells 04-175, 04-290, 04-306 and 04-601 for natural attenuation monitoring. The groundwater sampling conducted at 04-601 is discussed in the paragraph above and is not repeated here, because well 04-601 is used for both surface water protection monitoring and natural attenuation monitoring. Annual monitoring was planned for wells 04-175, 04-290, and 04-306. However, samples were not collected from well 04-306 in 2006 and 2007, because of the presence of free product. Groundwater samples were collected for DRO, GRO, and BTEX analysis in 2006 and 2007. Following the 2007 groundwater monitoring event, BTEX monitoring was discontinued at well 04-175, because these contaminants had not exceeded endpoint criteria in this well since annual monitoring began at the site. BTEX monitoring continued at wells 04-290 and 04-306 through 2009. Following the 2009 groundwater monitoring event, toluene, ethylbenzene, and total xylenes monitoring was discontinued at wells 04-290 and 04-306, because concentrations of these compounds were below endpoint criteria for at least two consecutive sampling events. Groundwater samples were collected for NAPs analysis in 2009.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the Tanker Shed, UST 42494 site relative to the inferred source area. Wells 04-601 and TS-01 are approximately 400 and 600 feet downgradient of the source area at this site. Wells 04-175, 04-306, and 04-290 are located along the approximate centerline of the dissolved plume at increasing distances from the source area, respectively. Well TS-05 is located approximately 600 feet downgradient of the source area and approximately 80 feet north of TS-01.

Analytical Results. Benzene, toluene, ethylbenzene, and total xylenes concentrations were below their respective endpoint criteria in all samples collected from all wells at this site during this 5-year review period. DRO concentrations were below the endpoint criterion in all samples

collected from surface water protection wells 04-601, TS-01, and TS-05 during this 5-year review period, and GRO concentrations were equal to or less than the endpoint criterion in all samples collected from all wells, except well 04-306, during this 5-year review period.

DRO was reported in groundwater samples collected at well 04-175 from 2006 through 2010 at concentrations ranging from 4,700 to 11,000 µg/L. The highest DRO concentration was measured in the 2006 sample from this well. The concentrations of DRO in the samples from well 04-175 were all greater than the endpoint criterion of 1,500 µg/L. DRO was reported in groundwater samples collected at well 04-290 from 2006 through 2010 at concentrations ranging from 1,000 to 9,000 µg/L. The highest DRO concentration was measured in the 2006 sample from this well. The concentrations of DRO in the samples from well 04-290 were all greater than the endpoint criterion, except for the sample collected in 2007. DRO was reported in groundwater samples collected at well 04-306 from 2008 through 2010 at concentrations ranging from 4,300 to 5,200 µg/L. The highest DRO concentration was measured in the 2008 sample from this well. The concentrations of DRO in the samples from well 04-306 were all greater than the endpoint criterion. GRO was reported in groundwater samples collected at well 04-306 from 2008 through 2010 at concentrations ranging from 1,500 to 1,800 µg/L. The highest GRO concentration was measured in the 2008 sample from this well. The concentrations of GRO in the samples from well 04-306 were all greater than the endpoint criterion of 1,300 µg/L.

DRO concentrations at well 04-175, 04-290, and 04-306 were generally stable from 2006 through 2010, and GRO concentrations at well 04-306 were generally stable from 2006 through 2010. Trend evaluations were not conducted for wells with analytes that have not been detected above the endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Tanker Shed, UST 42494 site. Free-product recovery is a component of the final remedy for this site (U.S. Navy and ADEC 2005a). However, free-product recovery was discontinued in July 2005, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the final closure report (U.S. Navy 2006c). Although free-product recovery was discontinued in July 2005, monthly monitoring and free-product recovery were performed at three wells during this 5-year review period, based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C, and product thickness data collected during monthly free-product recovery activities are summarized in the Excel spreadsheet titled "Recovered Product Thickness

Summary 2006 Through 2010." The following summarizes the significant product thickness data for the Tanker Shed, UST 42494 site.

Between October 1996 and September 2010, monitoring wells within the vicinity of the Tanker Shed site have been gauged periodically for the presence of free product. However, only data collected since October 2005 are summarized here. As discussed above, monitoring wells were gauged during the annual groundwater monitoring events. In addition, three wells (04-176, 04-306, and 04-309) were gauged monthly from May 2007 through May 2010, concurrently with free-product recovery activities at South of Runway 18-36 Area, NMCB Building Area, and SWMU 62, New Housing Fuel Leak.

Between October 2005 and September 2010, free product has been detected in 11 wells, 04-175, 04-176, 04-178, 04-290, 04-302, 04-303, 04-304, 04-306, 04-309, 04-311, and 04-312, at the site. The maximum measured thickness of free product reported at the site since October 2005 was 1.38 feet in well 04-309 in September 2006. The maximum measured thickness of free product reported in wells 04-176 and 04-306 was 0.31 foot in September 2006 and 0.05 foot in September 2006, respectively. The thicknesses measured in all other wells were either 0.01 foot or a trace. The frequency of product thickness measurements at wells 04-176, 04-306, and 04-309 was decreased from monthly to annually after May 2010, because free product had not been observed at these wells since September of 2006, June of 2009, and September of 2008, respectively.

Free-Product Recovery. Interim free-product recovery was conducted at the Tanker Shed, UST 42494 site from January 1997 through November 2001. Product-recovery activities were restarted in August 2004 as part of final remedy implementation. Free-product recovery at the Tanker Shed site was discontinued after July 2005, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the free-product recovery closure report (U.S. Navy 2006c). However, in May of 2007, ADEC requested that the Navy resume free-product recovery at selected wells, including wells 04-176, 04-306, and 04-309, as discussed above. Free-product recovery was to be performed if the measured thickness is greater than 0.5 foot in a 2-inch well and greater than 0.1 foot in a 4- or 6-inch well. As discussed at the beginning of Section 6.4, recovered product volume data are summarized in Appendix C in an Excel spreadsheet titled "Recovered Product Volume Summary 2006 Through 2010."

Free product was recovered from well 04-309 during the 2006 and 2007 annual groundwater monitoring events. No free product was recovered from wells 04-176, 04-306, and 04-309 during monthly free-product recovery activities that occurred between May 2007 and May 2010. Approximately 7 gallons of free product were recovered from 04-309 during the annual groundwater monitoring events from October 2005 through September 2010. Note that the free product recovered during the 2007 annual groundwater monitoring event was emulsified.

Therefore, the reported volume includes water. As noted in the paragraph above, monthly product thickness measurements and free-product recovery, if required, were discontinued in wells 04-176, 04-306, and 04-309 after May 2010, because free product had not been observed in any site wells since June 2009.

From 2006 through 2008, free product was not always recovered from well 04-309 when free product thicknesses were greater than 0.1 foot. Well 04-309 is a 4-inch-diameter well. During the September 2007 monthly free-product recovery activities, free product was not recovered from well 04-309, though the product thickness was 0.14 foot. During the 2008 annual groundwater monitoring event, free product was not removed from the well, even though the product thickness was 0.14 foot. Since September 2008, free product has not been detected at thicknesses greater than 0.1 foot.

Natural Attenuation Assessment

Sulfate concentrations are depleted in wells 04-290 (0.56 mg/L) and 04-306 (0.35 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated (1 to 30 mg/L), compared to background (0 mg/L), indicating the on-site occurrence of iron reduction. Evidence of methanogenesis is observed at the Tanker Shed site, as demonstrated by elevated methane concentrations in on-site wells ranging from 2.8 to 3,200 µg/L, which exceed background conditions (0.38 µg/L) (U.S. Navy 2010e).

The 2009 NAPs results indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrates natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy 2010e).

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1. All evaluated data sets were identified as having no trend. As a result, Sen's slopes were not calculated (U.S. Navy 2011a).

Simple linear regression was applied to DRO results for 04-175, because DRO concentrations in samples from this well do show a general decreasing trend. No level of confidence is applied to the regression. Applying the slope of the regressed line to the 2010 concentration provides a very rough estimate for time to achieve the endpoint criterion if the observed trend continues. If the current trends continue, DRO concentrations in groundwater from 04-175 could reach the endpoint criterion in 2014. The remaining data sets are not sufficient for use in estimating time to achieve endpoint criteria using simple regression.

Future Monitoring Recommendations

DRO and GRO are present in groundwater at concentrations above their respective endpoint criteria, which are based on the ADEC cleanup levels, in the source area. GRO has not exceeded its endpoint criterion in well 04-290 during this 5-year review period. Therefore, GRO monitoring should be discontinued at this well. Benzene concentrations have not exceeded the endpoint criterion in any wells during this 5-year review period. Therefore, benzene monitoring should be discontinued at this site. Concentrations of DRO, GRO, and benzene have remained below endpoint criteria in downgradient wells 04-601, TS-01, and TS-05 since 2006. Since well 04-601 acts as a sentinel well for downgradient wells TS-01 and TS-05, it is recommended that monitoring of 04-601 be continued and monitoring of TS-01 and TS-05 be discontinued. Monitoring should continue as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with the exceptions noted above.

6.4.27 Yakutat Hangar, UST T-2039-A

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Yakutat Hangar, UST T-2039-A site through 2006. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, USEPA, and ADEC 2000). The Navy and ADEC have selected limited groundwater monitoring as the final remedy for this site (U.S. Navy and ADEC 2005a). In addition, the decision document specified that two additional surface water samples would be collected from the site. One sample was to be collected within the drainage ditch downgradient of the product recovery trench and one at the point where the ditch discharges into South Sweeper Creek, which is the regulatory point of compliance. Results of this additional surface water sampling are discussed in the Site Catalog in Appendix A. Groundwater samples were collected from Yakutat Hangar, UST T-2039-A site to evaluate groundwater quality relative to the endpoint criteria (for this site, the endpoint criteria are equal to 10 times the ADEC groundwater cleanup levels [18 AAC 75.345]) and groundwater quality downgradient of the site to serve as a warning indicator for potential impacts to the downgradient surface water body (South Sweeper Creek).

Groundwater samples were collected from wells 05-389 and 05-801 for surface water protection monitoring, and groundwater samples were collected from wells 05-221, 05-244, 05-250, and MW-2 for natural attenuation monitoring. Groundwater samples were collected from all six wells in 2006 and analyzed for DRO. Monitoring was discontinued at this site following the 2006 groundwater monitoring event, because concentrations of DRO had been less than the endpoint criterion during all monitoring events. ADEC granted the site "conditional closure with institutional controls" on May 1, 2007.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the Yakutat Hangar, UST T-2039-A site relative to potential source areas at the site and the downgradient surface water body, South Sweeper Creek. Monitoring wells 05-389 and 05-801 are located approximately 400 and 300 feet, respectively, downgradient of the source areas at the site and approximately 60 feet from the downgradient surface water body, South Sweeper Creek. Wells 05-244 and 05-250 are located near the source area and wells MW-2 and 05-221 are located within the dissolved plume at increasing downgradient distances.

Analytical Results. DRO concentrations were below the endpoint criterion (15,000 µg/L) in all samples collected from all wells at this site from 1999 through 2006.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all petroleum sites, including the Yakutat Hangar, UST T-2039-A site. Free-product recovery is not a component of the final remedy for this site (U.S. Navy and ADEC 2005a). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. As discussed at the beginning of Section 6.4, all of the locations where free-product thickness measurements have been collected at this site are documented in the Site Catalog (Appendix A). Product thickness data collected during annual groundwater monitoring activities are summarized in the Excel spreadsheet titled "Summary of Product Thickness Data 2005 Through 2010" located in Appendix C. The following summarizes the significant product thickness data for the Yakutat Hangar, UST T-2039-A site.

Groundwater monitoring wells within the vicinity of the Yakutat Hangar, UST T-2039-A site have been periodically gauged for petroleum product. Gauging commenced in October 1996 and proceeded until September 2006. However, only data collected since October 2005 are summarized here. As part of the 2006 annual groundwater monitoring event, nine monitoring wells within the vicinity of the Yakutat Hangar, UST T-2039-A site were gauged for the presence of free product. Free product was not detected in any of the site wells in 2006.

Free-Product Recovery. Interim free-product recovery at the Yakutat Hangar, UST T-2039-A site was discontinued in November 2000, because free-product recovery met the practicable endpoint established for the shutdown of product recovery specified in the OU A ROD, as detailed in the free-product recovery closure report (U.S. Navy 2006c). In addition, free-product recovery is not a component of the final remedy for this site. Therefore, free-product recovery activities were not conducted at this site during this 5-year review period.

Future Monitoring Recommendations

Monitoring is no longer being performed at this site, because ADEC granted the site "conditional closure with institutional controls" on May 1, 2007.

6.4.28 SWMU 4, South Davis Road Landfill

Data Review

Data Collection During This 5-Year Review Period. Periodic monitoring of this site is not performed, because the remedy specified in the OU A ROD is landfill cover installation and ICs (U.S. Navy, USEPA, and ADEC 2000). Although periodic monitoring is not required, one sediment sample was collected during this 5-year review period. During the annual inspection of ICs in 2008, a groundwater seep was observed flowing out of the toe of the landfill along the shoreline and into adjacent Lake Andrew. A sediment sample (DL-01) was collected in 2009 to assess if contaminants in the landfill are migrating to adjacent Lake Andrew via this seep. Because no seep was observed flowing from the landfill at the time of the sampling, a seep sample was not collected. Lake water levels were observed to be higher than the previous year when the seep was observed and may have covered the area where the seep was located. The sediment sample collected at location DL-01 was analyzed for PCB, PAHs, including bis(2-ethylhexyl)phthalate, and 13 total priority pollutant metals. Since no sediment endpoint criteria have been developed for SWMU 4, sediment analytical results were compared to the endpoint criteria for sediments at SWMU 11, Palisades Landfill. The sediment sampling location is included in the technical memorandum for this additional sampling activity (U.S. Navy 2010i).

Analytical Results. Bis(2-ethylhexyl)phthalate was detected in the sediment sample at an estimated concentration of 110 µg/kg, which is below the endpoint criterion of 4,560 µg/kg. Target PAHs (benzo[a]pyrene, benzo[b]fluoranthene, and benzo[g,h,i]perylene) were detected in the sediment sample for which the sum was 7.0 µg/kg, well below the endpoint criterion of 1,700 µg/kg. Nontarget PAHs detected in the sample included naphthalene, 2-methylnaphthalene, phenanthrene, fluoranthene, pyrene, and chrysene, which ranged in concentration from 0.78 to 2.6 µg/kg. Aroclor-1260 was detected in the sediment sample (32 µg/kg) at a concentration above the endpoint criterion of 22.7 µg/kg. No other PCB was detected above method reporting limits. No target inorganic analytes was detected above endpoint criteria. However, concentrations below endpoint criteria of antimony, arsenic, chromium, and nickel were observed in the sediment sample. Concentrations of nontarget analytes, including beryllium, cadmium, copper, lead, mercury, selenium, thallium, and zinc, were also detected at very low levels in the sediment samples.

Future Monitoring Recommendations

The concentration of the PCB Aroclor-1260 in the one sediment sample collected at the site was found to slightly exceed the endpoint criterion for the Palisades Landfill. No endpoint criteria have been developed for the SWMU 4, South Davis Landfill site, and the risk-based endpoint criteria for the Palisades Landfill site may not be representative of risks associated with the SWMU 4, South Davis Road Landfill site. Therefore, additional sediment and surface water

sampling are recommended for this site to verify site concentrations and to assess whether a site-specific risk assessment is warranted.

6.4.29 SWMU 11, Palisades Landfill

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform surface water and sediment monitoring at SWMU 11, Palisades Landfill from 2006 through 2010. The remedy specified for this site in the OU A ROD is landfill cover installation and ICs (U.S. Navy, USEPA, and ADEC 2000). Per OU A ROD requirements, surface water and sediment are monitored to evaluate the effectiveness of the remedy (landfill cover).

From 2006 through 2010, sediment samples were collected annually from three locations at the site (101, 102, and 103). Following the 2004 monitoring event, the frequency of PCB sampling was reduced to every other year (even years). Therefore, in 2006, samples were analyzed for SVOCs, PCBs, selected total metals, total organic carbon, and grain size. Following the 2006 monitoring event, sampling for total organic carbon and grain size was discontinued based on the 2007 CMP. Total organic carbon analysis was no longer required, because the endpoint criterion for PAHs was revised in the 2007 CMP, and carbon normalization of PAH concentration data was no longer required for comparison to the new endpoint criterion. From 2006 through 2008, surface water samples were collected every other year (even years) from two locations at the site (101 and 102). Samples were analyzed for selected total and dissolved metals. Following the 2006 landfill monitoring event, the frequency of surface water sampling was reduced to every other year (even years), because of low concentrations of total and dissolved metals. Following the 2008 landfill monitoring event, surface water sampling was discontinued, also because of low concentrations of total and dissolved metals since 1998. Specific analytes are total PCBs, Aroclors, bis(2-ethylhexyl)phthalate, selected PAHs, antimony, arsenic, chromium, and nickel.

The endpoint criteria for total PCBs, PAHs, arsenic, chromium, and nickel were revised in the 2007 CMP. Monitoring endpoint criteria for target analytes in sediments at SWMU 11 monitoring locations, including total PCBs as Aroclors, were changed to the effects range low (ERL) values. Marine ERLs, as specified by Long et al. 1995, were selected for PCBs, PAHs, arsenic, chromium, and nickel, because the primary exposure environment of concern is Kuluk Bay. The endpoint criterion for PAHs is the high molecular weight ERL of 1.7 mg/kg, which is compared to the sum of selected detected PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene). Similarly, the endpoint criterion for total PCBs is the ERL of 22.7 µg/kg. Long et al. 1995 does not specify ERLs for bis(2-ethylhexyl)phthalate and antimony. Therefore, the monitoring endpoint criteria for these two compounds were not changed.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring locations at the SWMU 11, Palisades Landfill relative to site features. Sampling location 101 represents the upgradient location along the Palisades Creek flow path northwest of the landfill before it enters the ponded area. Sampling location 102 is located where the surface water exits the landfill at the base of the metal debris. Sampling location 103 is located in the sandy bank of Palisades Creek just before it enters Kuluk Bay and represents a downgradient sampling point intended to evaluate the migration of contaminants beyond location 102. Sediment samples from locations 101 and 102 are considered freshwater sediment samples, and the sediment sample from location 103 is considered a marine sediment sample.

Sediment Monitoring Results. The sum of selected detected PAHs was below the endpoint criterion of 1,700 µg/kg in all sediment samples collected at this site during this 5-year review period. Bis(2-ethylhexyl)phthalate and chromium concentrations were below their endpoint criteria of 4,560 and 81,000 µg/kg, respectively, in all sediment samples collected at this site during this 5-year review period. Total PCBs, antimony, arsenic, and nickel concentrations were less than or equal to their endpoint criteria of 22.7, 2,000, 8,200, and 20,900 µg/kg, respectively, in sediment samples collected from locations 101 and 103 at this site during this 5-year review period.

Total PCBs were reported in sediment samples collected at location 102 from 2006 through 2010 at concentrations ranging from 1.5 to 300 µg/kg. The highest total PCB concentration was measured in the 2006 sample from this location. The concentrations of total PCBs in the samples from location 102 were greater than the endpoint criterion of 22.7 µg/kg, except for the sample collected in 2008. Antimony was reported in sediment samples collected at location 102 from 2006 through 2010 at concentrations ranging from undetected to 2.51 mg/kg. The highest antimony concentration was measured in the 2007 sample from this location. The concentrations of antimony in the samples from location 102 were greater than the endpoint criterion of 2 mg/kg, except for the samples collected in 2006 and 2008. Arsenic was reported in sediment samples collected at location 102 from 2006 through 2010 at concentrations ranging from 6.57 to 17.1 mg/kg. The highest arsenic concentration was measured in the 2008 sample from this location. The concentrations of arsenic in the samples from location 102 were greater than the endpoint criterion of 8.2 mg/kg, except for the samples collected in 2006 and 2010. Nickel was reported in sediment samples collected at location 102 from 2006 through 2010 at concentrations ranging from 8.1 to 33.4 mg/kg. The highest nickel concentration was measured in the 2007 sample from location 102. The concentrations of nickel in the samples from location 102 were greater than the endpoint criterion of 20.9 mg/kg, except for the samples collected in 2008 and 2010.

Surface Water Monitoring Results. Antimony, arsenic, chromium, and nickel were either not detected or detected at concentrations less than endpoint criteria. As a result, monitoring of surface water was discontinued following the 2008 landfill monitoring event.

Future Monitoring Recommendations

Although PAH and SVOC concentrations were below endpoint criteria in sediment samples collected from all locations at the site, the 2010 annual groundwater monitoring report recommended continued sampling for these constituents. PCBs and metals continue to be detected in sediment samples collected from location 102 at concentrations greater than endpoint criteria. Therefore, continued monitoring for these chemicals at all locations is recommended, as prescribed in the CMP, Revision 4 (U.S. Navy 2010a).

6.4.30 SWMU 13, Metals Landfill

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform groundwater monitoring at SWMU 13, Metals Landfill from 2006 through 2010. The remedy specified for this site in the OU A ROD is landfill cover installation and ICs (U.S. Navy, USEPA, and ADEC 2000). Per OU A ROD requirements, groundwater is monitored to evaluate the effectiveness of the remedy (landfill cover).

From 2006 through 2008, groundwater samples were collected every other year from eight locations at the site (MW13-1, MW13-2, MW13-3, MW13-4, MW13-5, MW13-603, MW13-604, and MW13-605) for VOC and SVOC analysis. For this same time period, groundwater samples were collected annually for total and dissolved metals analysis (arsenic and barium). Following the 2008 monitoring event, the frequency of total and dissolved metals analysis was decreased to every other year, because of continued low concentrations of these compounds. Analysis of samples collected from the site for VOCs and SVOCs was also discontinued following the 2008 monitoring event, because SVOC concentrations had not exceeded endpoint criteria since 2000 and VOC concentrations had never exceeded endpoint criteria. Specific target analytes are bis(2-ethylhexyl)phthalate, chlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, ethenes, arsenic, and barium.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 13, Metals Landfill relative to site features. All of the wells are located parallel to the shoreline of Kuluk Bay and are located downgradient of the center of the landfill.

Analytical Results. SVOC and VOC concentrations were below their respective endpoint criteria in all samples collected from all wells at this site during this 5-year review period. Dissolved and total arsenic and barium concentrations in groundwater have not been detected above endpoint criteria since sampling began in 1996. However, dissolved arsenic is routinely seen above the Adak background level of 2 µg/L in five of the eight wells at the site. During this 5-year review period, the maximum dissolved arsenic concentration was detected in well

MW13-2 at a concentration of 8.54 µg/L. Concentrations of barium were highest in samples collected from well MW-605 with concentrations of 52.9 to 60.7 µg/L dissolved barium and 55.1 to 67.1 µg/L total barium during this 5-year review period. Adak background levels for dissolved and total barium are 45.2 and 54.4 µg/L, respectively. Therefore, dissolved and total barium concentrations detected in well MW-605 were consistently greater than the Adak background concentration. Sample results for arsenic and barium have remained stable with relatively no change in trend, with the exception of total and dissolved arsenic concentrations in well MW13-2, which appear to be increasing.

Future Monitoring Recommendations

Target analytes have not been detected at concentrations greater than endpoint criteria in groundwater samples collected from eight monitoring wells at the site since 2001. Based on these results, RAOs are being met. Although endpoint criteria have been met in all eight wells at this site for more than two consecutive sampling rounds, the 2010 annual landfill monitoring report recommended continued sampling at a reduced frequency of once every 5 years.

6.4.31 SWMUs 18/19, White Alice Landfill

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform groundwater and surface water monitoring at SWMUs 18/19, White Alice Landfill from 2006 through 2010. The remedy specified for this site in the OU A ROD is soil cover installation and ICs (U.S. Navy, USEPA, and ADEC 2000). Per OU A ROD and State of Alaska solid waste regulations, the performance of landfill closure actions (landfill cover) is monitored at the site.

The Navy conducted groundwater monitoring at two locations (21-3 and 21-4) and surface water monitoring at three seep locations (WASW01, WASW02, and WASW03) at SWMUs 18/19, White Alice Landfill every other year (even years) during this 5-year review period. In 2006 and 2008, the samples were analyzed for VOCs, total inorganics (TIN), dissolved inorganics (DIN), water quality parameters (WQPs), and total dissolved solids (TDS). Following the 2008 landfill monitoring event, monitoring for VOCs was discontinued, based on historical data of VOC sampling at White Alice Landfill combined with the lack of exceedances of the endpoint criteria. Specific target analytes are arsenic, barium, nickel, and chromium.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMUs 18/19, White Alice Landfill relative to site features. Well 21-3 is located downgradient of the landfilled area to the southwest, and well 21-4 is located to the northeast of the landfill. Seep sampling location WASW01 is located west of the landfilled area along a small, south-southwest flowing creek that drains the landfill cap. Seep sampling location

WASW02 is located approximately 600 feet south of WASW01. Seep sampling location WASW03 is located to the east of the landfill.

Seep Monitoring Results. VOCs were either not detected or detected at concentrations less than the endpoint criteria in surface water samples collected from this site during this 5-year review period. No DIN or TIN included on the target analyte list for the White Alice Landfill was detected above the endpoint criteria during this 5-year review period. However, dissolved mercury was detected in the sample collected from WASW03 in 2006 at a concentration slightly greater than the endpoint criterion of 0.15 µg/L. In addition, the reporting limit was greater than the endpoint criteria for samples collected in 2008 and 2010 at all surface water sampling locations at this site.

Groundwater Monitoring Results. VOCs were either not detected or detected at concentrations less than the endpoint criteria in groundwater samples collected from this site during this 5-year review period. No DIN or TIN included on the target analyte list was detected in groundwater above the endpoint criteria during this 5-year review period. One inorganic on the target analyte list was detected above the Adak background concentration in the groundwater collected from well 21-3 during the 2006 landfill monitoring event. Dissolved arsenic was detected at a concentration of 4.7 µg/L, which is above the Adak background concentration of 2 µg/L. All inorganics not on the target analyte list were detected at concentrations less than Alaska groundwater cleanup levels (18 AAC 75.345) during this 5-year review period.

Future Monitoring Recommendations

Target analytes were not detected in surface water or groundwater at concentrations greater than endpoint criteria or Alaska groundwater cleanup levels (18 AAC 75.345). However, the nontarget analyte mercury exceeded the endpoint criterion in the surface water sample collected from WASW03 in 2006. In addition the reporting limit was greater than the endpoint criterion during all sampling events after 2006. Therefore, monitoring should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a).

6.4.32 SWMU 25, Roberts Landfill

Data Review

Data Collection During This 5-Year Review Period. The Navy continued to perform groundwater and surface water monitoring at SWMUs 25, Roberts Landfill from 2006 through 2010. The remedy specified for this site in the OU A ROD is soil cover installation and ICs (U.S. Navy, USEPA, and ADEC 2000). Per OU A ROD and State of Alaska solid waste regulations, the performance of landfill closure actions (landfill cover) is monitored at the site.

The Navy conducted annual groundwater monitoring at four locations (A-2, A-3, A-5, and B-1) and annual surface water monitoring at five locations (RLSW01, RLSW02, RLSW03, RLSW04, and RLSW05) at SWMU 25, Roberts Landfill during this 5-year review period. The samples have been analyzed for VOCs, TIN, DIN, WQPs, and TDS. However, following the 2007 annual landfill monitoring event, the frequency of VOC analysis was reduced to every other year (odd years), because VOCs had not been detected at concentrations above endpoint criteria in groundwater or surface water samples collected at Roberts Landfill from 2001 through 2007. The 2007 sampling event concluded 5 years of annual post-closure monitoring since the landfill was closed in 2002. Furthermore, the 2007 landfill monitoring report recommended that VOCs be removed from the monitoring program at this landfill if, during the next two sampling events, VOCs continue to be reported below the endpoint criteria. A sixth surface water sample, RLSW06, was collected in 2009 immediately on the east side of Happy Valley Road, downgradient of where surface water originating from the ponded area at location RLSW03 sheet flows across a concrete pad, into the roadside ditch and then through a culvert under Happy Valley Road. A sample was collected at this new location to determine if aluminum and copper exceedances at RLSW03 are impacting Mitt Creek. Because concentrations of aluminum and copper exceeded endpoint criteria at RLSW06, the 2009 landfill monitoring report recommended collecting two additional surface water samples in 2010 (NL-11 and NL-12). One was collected in the drainage below RLSW06 and immediately upstream of the confluence of Mitt Creek and the other one was to be collected in Mitt Creek immediately downstream of confluence with the northern surface water pathway. The samples from RLSW06, NL-11, and NL-12 were analyzed for total aluminum and total copper. Finally, during the 2010 landfill monitoring event, one additional surface water sample (NL-13) was collected at SWMU 25, Roberts Landfill. This sample was collected at a new seep identified during the sampling event. This sample was also analyzed for TIN and DIN. The specific target analytes for Roberts Landfill are ethenes, BTEX, priority pollutant total metals antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

The Site Catalog in Appendix A includes a figure that shows the location of the monitoring wells at the SWMU 25, Roberts Landfill relative to site features. Well A-2 is located along the northwestern perimeter of the landfill, while wells A-3 and A-5 are located downgradient of the eastern boundary. Well B-1 is located near the southern boundary. Surface water sampling locations RLSW01 and RLSW02 lie within the landfill boundary. Surface water sampling location RLSW03 is located downgradient of the eastern boundary between wells A-3 and A-5 in a small creek that runs parallel to the eastern boundary and empties into Sweeper Cove. Surface water sampling locations RLSW04 and RLSW05 are located within a creek that is east of the RLSW03 creek, which flows to the north-northeast and also empties into Sweeper Cove.

Surface Water Monitoring Results. VOCs were either not detected or detected below endpoint criteria in surface water samples collected at this site during this 5-year review period. Except

for aluminum and copper, total and dissolved metals were either not detected or detected at concentrations below endpoint criteria in surface water samples collected at this site during this 5-year review period. However, the reporting limit for mercury was generally greater than the endpoint criterion.

Total aluminum was reported in surface water samples collected at location RLSW03 from 2006 through 2010 at concentrations ranging from 1,270 to 3,700 µg/L. The highest total aluminum concentration was measured in the 2008 sample from this location. The concentrations of total aluminum in the samples from location RLSW03 were all greater than the endpoint criterion of 87 µg/L. Total aluminum was reported in the surface water sample collected in 2009 at location RLSW06, which is downgradient of RLSW03, at a concentration of 136 µg/L. The concentration of total aluminum in the sample from this location was greater than the endpoint criterion. Total aluminum was not detected at concentrations above endpoint criterion in any samples collected at locations RLSW01, RLSW02, RLSW04, RLSW05, NL-11, NL-12, and NL-13 during this 5-year review period. No endpoint criterion has been established for dissolved aluminum.

Total copper was reported in surface water samples collected at location RLSW03 from 2006 through 2010 at concentrations ranging from 92.9 to 161 µg/L. The highest total copper concentration was measured in the 2008 sample from this location. The concentrations of total copper in the samples from location RLSW03 were all greater than the endpoint criterion of 12 µg/L. Total copper was reported in the surface water sample collected in 2009 at location RLSW06, which is downgradient of RLSW03, at a concentration of 112 µg/L. Total copper was reported in the surface water sample collected in 2009 at location NL-11, which is downgradient of both RLSW03 and RLSW06, at a concentration of 32.4 µg/L. The concentration of total copper in the samples from RLSW06 and NL-11 were both greater than the endpoint criterion. Total copper was reported in surface water samples collected at location RLSW05 from 2006 through 2010 at concentrations ranging from 23.5 to 44.8 µg/L. The highest total copper concentration was measured in the 2009 sample from this location. The concentrations of total copper in the samples from location RLSW05 were all greater than the endpoint criterion of 12 µg/L. Total copper was not detected at concentrations above endpoint criterion in any samples collected at locations RLSW01, RLSW02, RLSW04, NL-12, and NL-13 during this 5-year review period. No endpoint criterion has been established for dissolved copper.

Groundwater Monitoring Results. VOCs were either not detected or detected below endpoint criteria in surface water samples collected at this site during this 5-year review period. Total and dissolved metals, except chromium, were either not detected or detected at concentrations below endpoint criteria in groundwater samples collected at this site during this 5-year review period. Total chromium was reported in surface water samples collected at well A-3 from 2006 through 2010 at concentrations ranging from 1.4 to 107 µg/L. The highest total chromium concentration was measured in the 2010 sample from this location. The concentrations of total chromium in

the samples from location A-3 were all less than the endpoint criterion of 100 µg/L, except the concentration in the sample collected in 2010. Total copper was detected at concentrations above the Adak background concentration in the groundwater samples collected from well A-3 from 2006 through 2010. Total copper was reported at concentrations ranging from 104 to 531 µg/L, which are all above the Adak background concentration of 69.5 µg/L.

Future Monitoring Recommendations

Total aluminum and total copper have been measured at concentrations greater than the endpoint criterion in surface water samples from the site. Because concentrations of aluminum and copper exceeded endpoint criteria at RLSW06 in 2009, this location should be added to the landfill monitoring program. Monitoring at NL-11 should be continued, because the concentration of copper exceeded the endpoint criterion in 2010. In addition, monitoring at NL-12 should also be continued, because this location is within Mitt Creek downstream of NL-11. Monitoring at the newly observed seep (NL-13) should be discontinued, because endpoint criteria were not exceeded.

VOCs have not been detected in surface water or groundwater at the site at concentrations above endpoint criteria. If concentrations of VOCs are below endpoint criteria during the 2011 landfill monitoring event, sampling for VOCs in surface water and groundwater may be recommended to be discontinued. Because more than five years of post-closure monitoring data have been collected at Roberts Landfill and concentrations of total and dissolved metals in groundwater were below endpoint criteria during this 5-year review period at all wells except A-3, monitoring for metals in groundwater should be discontinued at site wells except A-3. Therefore, annual surface water monitoring for total and dissolved inorganics and annual groundwater monitoring at well A-3 for total and dissolved inorganics should be continued as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), with the changes discussed above. Monitoring for VOCs in surface water and groundwater should only be performed in 2011, as prescribed in the CMP, Revision 4 (U.S. Navy 2010a), unless VOCs are detected above endpoint criteria in 2011.

6.5 RESULTS OF SITE INSPECTION

Inspections have been conducted annually at OU A, OU B-1, and OU B-2 sites beginning in 2002. In addition to the annual inspections, site inspections were also performed in 2010 as part of this 5-year review (Section 6.5.5). The discussion in the sections below is based on a review of inspection reports generated for years 2006 through 2010 (U.S. Navy 2007g, 2008e, 2009d, 2010h, and 2011b).

The ICMP (U.S. Navy 2001a, 2005c, 2007d and 2010a) establishes the requirements for inspections and management of ICs and ECs on Adak. Sites where ICs and/or ECs have been

established were inspected as part of the annual monitoring events conducted during September or October of each year. The annual inspections are intended to ensure that ICs and ECs remain effective in protecting human health and the environment. Sites at which ICs or ECs did not appear to be functioning as intended or have been damaged are discussed below, together with corrective measures that have been implemented. Sites at which ICs and ECs are functioning as intended are not discussed. The current IC and EC requirements for all sites are tabulated in Section 4 (Table 4-1). In addition to the annual inspections, separate site inspections were performed during the summer of 2010 to independently assess the effectiveness of the ICs or ECs as part of this 5-year review (Section 6.5.5).

Given the remote nature of Adak Island, the limited field season, and weather conditions that challenge air access, the Navy plans actions to address deficiencies in ICs and ECs identified during annual inspections after the report has been finalized and then implements the remedies during the next field season. More substantial landfill repairs sometimes require additional time for planning and contracting and are completed as soon as practical, but not necessarily during the next field season after they are identified.

6.5.1 Results of 2006 Institutional Controls Inspections

Recommendations based on observations made during the 2006 inspections are discussed in this section together with actions the Navy took during the 2006 field season to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not discussed in this section were deemed to be functioning as intended and protective of human health and the environment.

Excavation Notifications and Restrictions

The City Manager for the City of Adak reported that no excavation notifications were filed between September 2005 and September 2006. However, the City reported one excavation, for a waterline repair, across the street from the SWMU 15, Future Jobs/DRMO IC area. It is unclear why an excavation notification was not prepared for the waterline repair. However, compliance with the excavation notification requirements has improved since 2006. NAVFAC Northwest received one excavation notification from City Electric at the end of August 2006 to install fiber optic telephone and cable service throughout the SWMU 62, New Housing Fuel Leak site.

No sites were impacted by the excavations performed during this period, except for the ongoing Navy IC repairs (landfill cap and erosion repairs at SWMUs 13 and 25) and remedy installation (product recovery trench at South of Runway 18-36) performed by a Navy contractor following regulator-approved work plans.

At some sites, such as former landfills (or where the remedy in place is a protective cover), excavation by non-Navy personnel is prohibited, with exceptions for a very few specific

circumstances. Additionally, excavation for the purpose of digging domestic water wells is prohibited in the downtown area and in the Remote Area sites, where it is necessary to protect the integrity of the ongoing petroleum cleanups. During September 2005 through September 2006, no excavation was observed at any site where excavation was prohibited.

Education Program

During the 2006 institutional controls inspections, the Navy conducted informal interviews with on-island personnel regarding the educational program and potential improvements. Interviews were conducted with residents and visitors. These interviews were intended to ensure that educational programs were functioning in accordance with the ICMP and applicable RODs.

Surveys were performed with several residents and visitors. The surveys indicated that, in general, the community and visitors were aware of land use restriction, 13 of 14 (93 percent). Fewer were aware of the fish consumption advisory, 9 of 14 (64 percent). Ten of 14 (71 percent) were aware of the ordnance safety awareness video. Only 4 of 13 (31 percent) were aware of the excavation notification requirements, and only 4 of 13 (31 percent) were aware of the toll-free telephone number and e-mail address to contact for additional information on institutional controls (U.S. Navy 2007g).

Kuluk Bay and Sweeper Cove

An updated marine monitoring fact sheet was made available in January 2006. The January 2006 fact sheet described the results of the 1999 through 2003 and 2005 monitoring of the rock sole and blue mussels in Sweeper Cove and Kuluk Bay (U.S. Navy 2007g).

SWMU 2, Causeway Landfill

The ICs at SWMU 2 are listed in Table 4-1. During the inspection in September 2006, there were no indications of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 2 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. As recommended in the 2005 IC inspection report, new signs indicating the presence of a buried landfill were placed between the causeway road and the landfill (U.S. Navy 2007g).

SWMU 4, South Davis Road Landfill

The ICs at SWMU 4 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 4 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. As recommended in the 2005 IC inspection report, new signs indicating the presence of a buried landfill were placed between the access road and the landfill (U.S. Navy 2007g).

SWMU 11, Palisades Landfill

The ICs at SWMU 11 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 11 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. One sign at the southwestern corner of the landfill was discovered to be damaged, and replacement was recommended (U.S. Navy 2007g).

SWMU 13, Metals Landfill

The ICs at SWMU 13 are listed in Table 4-1. During the 2006 inspection, there was no indication of a change in land use in this area. The site did not appear to be in use. No residential construction had occurred at the site. There was no indication that groundwater was being used at the site. There was no indication of excavation activity, except for repair work on the drainage swale area that had been identified during the 2005 IC inspection. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 13 are listed in Table 4-1. During the 2005 inspection, the drainage swale liner on the north side of the landfill was damaged in some locations, and there was a recommendation to place a sign at the entrance to the landfill. Corrective action was taken in August of 2006 to repair the swale liners. The liners were in good condition when inspected later in 2006. Signs were present at the perimeter of the landfill. A new sign has been installed at the main gate on the west side of landfill, as recommended from the 2005 inspection. The main gate consists of a lockable cable that prohibits vehicle access. The ECs appear to be

functioning as intended to protect human and ecological receptors from exposure to soil or groundwater (U.S. Navy 2007g).

SWMU 25, Roberts Landfill

The ICs at SWMU 25 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. The site did not appear to be in use, and no residential construction had occurred at the site. There was no indication that groundwater was being used at the site, nor of excavation activities. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 25 are listed in Table 4-1. At the time of inspection, vegetation was found to be sparse in two locations on the cap. One location coincided with that described by the inspector in 2004. The other area where vegetation is sparse was located just south of a small pond on the west side of the landfill. Runoff from the pond was flowing directly south on the cap and was bypassing two existing drainages. Erosion had occurred in the area between the two drainages, and some landfill debris had been exposed. Along the western perimeter of the landfill, soil under one section of fencing had eroded. The erosion was due to the presence of a natural drainage in the area. The fence in this location was in good condition. The fence around the remainder of the landfill was also intact and in good condition. During the 2006 field season, areas of erosion noted in 2005 were repaired and minor fencing repairs were made (U.S. Navy 2007g).

SWMU 29 Finger Bay Landfill

The ICs at SWMU 29 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 29 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. As recommended in the 2005 IC inspection report, new signs indicating the presence of a buried landfill were placed between the access road and the landfill (U.S. Navy 2007g).

SWMU 62, New Housing Fuel Leak

The ICs and ECs at SWMU 62 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication that groundwater was being used at the site.

Trenching had been done throughout the residential area and along the Adak main road by City Electric under contract for Adak Cable and Telephone in Anchorage. Adak Cable started trenching activities under the impression that they had right-of-way privileges and would not need a permit. Adak Cable submitted an excavation notification request to the on-site Navy Technical Representative when they became aware that the notification request was required. Additionally, a remedial action excavation to install a fuel recovery trench along the east side of Runway 18-36 was in progress during the inspection and was scheduled to be completed in October. No other excavation was identified during the inspection. The excavated areas were planned to be revegetated (U.S. Navy 2007g).

SWMU 67, White Alice PCB Spill Site

The ICs at SWMU 67 are listed in Table 4-1. During the inspection in September 2006, there was no indication of a change in land use in this area. No residential construction had occurred at the site. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2007g).

The ECs at SWMU 67 are listed in Table 4-1. At the time of inspection in September 2006, the cover appeared to be intact and undisturbed. There was no sign identifying that excavation in this area was prohibited, as required by the ICMP (U.S. Navy 2007g).

OU B-1 and OU B-2 Ordnance Areas

In 2006, Navy personnel conducted an inspection of the OU B sites to look for areas where security could be improved around the perimeter of Parcel 4. Fence repairs were conducted in 2006, including replacing 300 feet of existing fence along the east perimeter of the SA 93 site.

The Navy EOD team responded to the discovery of approximately 70 smoke pots during 2006. In early September 2006, the EOD team moved the smoke pots from TAC land to Parcel 4, where the smoke pots were burned. Burning is the preferred method of disposal for smoke pots.

6.5.2 Results of 2007 Institutional Controls Inspections

Recommendations based on observations made during the 2007 inspections are discussed in this section, together with actions the Navy took during the 2007 field season to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not discussed in this section were deemed to be functioning as intended and protective of human health and the environment.

Excavation Notifications and Restrictions

One Excavation Notification Request form was submitted in 2007 for placement of Bureau of Land Management survey markers and accessories in eight SWMUs. There was no evidence of unauthorized excavation in the downtown area during IC inspections.

At some sites, such as former landfills (or where the remedy in place is a protective cover), excavation by non-Navy personnel is prohibited, with exceptions for a very few specific circumstances. Additionally, excavation for the purpose of digging domestic water wells is prohibited in the downtown area and in the Remote Area sites, where it is necessary to protect the integrity of the ongoing petroleum cleanups. During September 2006 through September 2007, no excavation was observed at any sites where excavation was prohibited.

Education Program

During the 2007 ICs inspections, the Navy conducted informal interviews with on-island personnel regarding the educational program and potential improvements. Interviews were conducted with residents and visitors. These interviews were intended to ensure that educational programs were functioning in accordance with the ICMP and applicable RODs.

Surveys conducted in September 2007 indicated that, in general, the community and visitors were aware of land use restriction, 16 of 16 (100 percent). Fewer were aware of the fish consumption advisory, 11 of 13 (85 percent). Eleven of 13 (85 percent) were aware of the ordnance safety awareness video. Eleven of 13 (85 percent) were aware of the excavation notification requirements and 9 of 13 (69 percent) were aware of the toll-free telephone number and e-mail address to contact for additional information on ICs (U.S. Navy 2008e).

SWMU 11, Palisades Landfill

The ICs at SWMU 11 are listed on Table 4-1. During the inspection in September 2007, there were no indications of a change in land use in this area. No residential construction had occurred at the site. There were no indications of excavation activities. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

The ECs at SWMU 11 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. One sign that was observed as being damaged in 2006 had been replaced along with the addition of one more sign. The inspectors noted minor damage to both the east and west drainage swales (U.S. Navy 2008e).

SWMU13, Metals Landfill

The ICs at SWMU 13 are listed in Table 4-1. During the inspection in September 2007, there was no indication of a change in land use in this area. The site did not appear to be in use. No residential construction had occurred at the site. There was no indication that groundwater is being used at the site, nor of excavation activities at the site. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

The ECs at SWMU 13 are listed in Table 4-1. A few small tears were observed in the Channel #7 swale liner. Three new signs were identified around the perimeter of the landfill. In addition, a new sign was installed at the main gate on the west side of the landfill, as recommended from the 2005 inspection. A new gate was also installed during the 2006 repair activities. The gate was upgraded and consisted of a lockable swing-type 6-inch pipe with center post that prohibits vehicle access. During a supplemental inspection conducted in August 2007, the inspection identified the need for repairs at two drainage swales (#4 and #9). Other than these two drainage swales and the swale mentioned above, the ECs appear to be functioning as intended to protect human and ecological receptors from exposure to soil or groundwater (U.S. Navy 2008e).

SWMU 17, Power Plant 3

The ICs and ECs at SWMU 17 are listed in Table 4-1. During the September 2007 inspection, there was no indication of a change in land use in this area. However, ADEC identified petroleum staining beneath a waste oil tank during this site inspection. ADEC directed the City of Adak to address this issue. No residential construction had occurred at the site. There was no indication that groundwater was being used at the site. There was no indication of excavation activity, and no excavation notification had been filed the previous year for this site. Therefore, ICs appear to be functioning as intended in the OU A ROD to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

SWMUs 18/19, White Alice Landfill

The ICs at SWMUs 18/19 are listed in Table 4-1. During the inspection in September 2007, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

The ECs at SWMUs 18/19 are listed in Table 4-1. At the time of the 2007 inspection, the cover appeared to be intact and undisturbed. In general, the fencing and signage were intact, except for a small approximately 30-foot portion of fencing along South Sector Road (U.S. Navy 2008e).

SWMU 25, Roberts Landfill

The ICs at SWMU 25 are listed in Table 4-1. During the September 2007 inspection, there was no indication of a change in land use in this area. The site did not appear to be in use. No residential construction had occurred at the site. There was no indication that groundwater is being used at the site, nor excavation activity. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

The ECs at SWMU 25 are listed in Table 4-1. At the time of 2007 inspection, vegetation was found to be growing in the sparse area observed during the 2006 inspection. Other areas of the landfill have lush vegetation. Along the western perimeter of the landfill, soil under one section of fencing had eroded. This area is well outside and off of the landfill cap. The fence in this location was still in good condition, and the soil surrounding the fence posts has not been compromised. The fence around the remainder of the landfill was also intact and in good condition. During the 2007 field season, there were five fence repairs made to areas identified in 2006 where strands of barbed wire had broken (U.S. Navy 2008e).

SWMU 67, White Alice PCB Spill Site

The ICs at SWMU 67 are listed in Table 4-1. During the inspection in September 2007, there was no indication of a change in land use in this area. No residential construction had occurred at the site. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2008e).

The ICs at SWMU 67 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. The "No Excavation" signs that were absent from the site in September 2006 were installed during the 2007 field season (U.S. Navy 2008e).

OU B-1 and OU B-2 Ordnance Areas

The Navy has imposed access restrictions at the OU B, Parcel 4 area. Besides maintaining the UXO awareness program for OU B sites, the Navy has implemented some additional ECs at Parcel 4 to limit access to Navy-retained lands. The ECs include partial perimeter fencing with attached warning signs and blocked roadways with locked gates.

During July and August 2007, perimeter fencing around the northeast side of Parcel 4 was repaired. In addition, 15 new UXO warning signs were installed along the east, south, and west boundaries. During the September 2007 inspection of Parcel 4, the south and east boundaries were inspected and the new signs were observed to be in place. The perimeter fencing along the northeast perimeter was also confirmed to have been repaired. The gate along the southeast

entrance to Parcel 4 was found to be locked and in good condition. A new UXO warning sign was also observed at this entrance.

Overall, the ECs for Parcel 4, including the new LUC/UXO awareness video at the air terminal, were concluded in the 2007 inspection report to be helping to ensure that unauthorized access to Parcel 4 is limited.

In 2007 a hunting guide reported a broken 75-mm round on the ground, located approximately 20 minutes by foot from Lake Betty. The item was located on a ridgeline, with no water body nearby. The guide flagged the discarded military munition (DMM), recorded Global Positioning System coordinates, and notified the Navy. The Navy EOD team responded to the find and destroyed the DMM.

Also in 2007, hunters reported to the guide making the report regarding the 75-mm round that they had seen the tail fins of a DMM item projecting more than 1 foot out of the ground. This item was reported to be located at the extreme northern tip of the south spit of Shagak Bay. NAVFAC Northwest instructed the City of Adak to contact the EOD team regarding this item.

In 2007 the EOD team also destroyed a cache of commercial small arms ammunition collected by island authorities. This cache included several boxes of rusted shotgun shells and other small ammunition recovered from the old police station. Also included were empty commercial cartridge cases from a 3-inch gun that had been dug up by a contractor working in the Small Boat Harbor in the 2004-2005 time frame.

6.5.3 Results of 2008 Institutional Controls Inspections

Recommendations based on observations made during the 2008 inspections are discussed in this section, together with actions the Navy took during the 2008 field season to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not discussed in this section were deemed to be functioning as intended and protective of human health and the environment.

Excavation Notifications and Restrictions

No Excavation Notification Request forms were submitted from September 2007 through September 2008, even though extensive excavations took place at four sites, including MAUW Compound; Mount Moffett Power Plant 5; SWMU 58/SA 73, Heating Plant 6; and SA 88, Building P-70 Energy Generator. There have also been reports of the City performing excavations in the SWMU 62, New Housing Fuel Leak residential area to repair or install utility lines. The IC requirement for excavation notifications appears to have been disregarded during this period.

At some sites, such as former landfills (or where the remedy in place is a protective cover), excavation by non-Navy personnel is prohibited, with exceptions for a very few specific circumstances. Additionally, excavation for the purpose of digging domestic water wells is prohibited in the downtown area and in the Remote Area sites, where it is necessary to protect the integrity of the ongoing petroleum cleanups. During September 2007 through September 2008, no excavation was observed at any site where excavation was prohibited.

Education Program

During the 2008 ICs inspections, the Navy conducted informal interviews with on-island personnel regarding the educational program and potential improvements. Interviews were conducted with residents and visitors. These interviews were intended to ensure that educational programs were functioning in accordance with the ICMP and applicable RODs (U.S. Navy 2009d).

Surveys were performed with several residents and visitors and indicated that, in general, the community and visitors were nearly all aware of land use restriction, 14 of 15 (93 percent). Fewer were aware of the fish consumption advisory, 9 of 15 (60 percent). Eight of 15 (53 percent) were aware of the ordnance safety awareness video. Eleven of 15 (73 percent) were aware of the excavation notification requirements, and 8 of 15 (53 percent) were aware of the toll-free telephone number and e-mail address to contact for additional information on ICs (U.S. Navy 2009d).

SWMU 4, South Davis Road Landfill

The ICs at SWMU 4 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ICs at SWMU 4 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and mostly undisturbed, except for some tire tracks/ruts at the southeastern portion of the landfill. Standing water was noted in the north drainage swale, and water was seeping out of the toe of the west-central part of the landfill on the shoreline of Lake Andrew (U.S. Navy 2009d).

SWMU 11 Palisades Landfill

The ICs at SWMU 11 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be

functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ECs at SWMU 11 are listed in Table 4-1. At the time of the September 2008 inspection, the cover appeared to be intact, undisturbed, and heavily vegetated. Deficient swale liners noted in 2007 had been recently repaired. However, the southwest drainage swale liner had small holes and tears of less than 1 inch present. The southeast sign was partially broken and in need of repair. A small pond approximately 15 feet in diameter was observed in the upper portion of the ravine on the landfill. Slightly southwest of the ravine, a sinkhole was observed of approximately 8 to 10 feet deep and 8 feet in diameter. Metal and landfill debris was exposed inside of the sinkhole. Erosion was observed on the slope immediately above the sinkhole (U.S. Navy 2009d).

SWMU 13, Metals Landfill

The ICs at SWMU 13 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. The site did not appear to be in use. No residential construction had occurred at the site. There was no indication that groundwater is being used at the site, nor of excavation activity at the site. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ECs at SWMU 13 are listed in Table 4-1. During the September 2008 inspection several EC deficiencies were noted by the inspector. Drainage swales #2, #3, #4, and #7 did not have any gravel cover on the swale lining. Drainage swale #7 was observed to have several small holes with dandelions growing through the liner. On the northeast corner of the landfill, a large quantity of old metal debris is located on the armor wall down to the shoreline. Adak residents had complained to Navy representatives that they want this metal debris removed, since it represents a safety and environmental hazard because of the proximity of a recreational beach to the north. North of where drainage swale #7 meets the coast of Kuluk Bay, approximately 200 yards in length of the cliff edge and parts of the armor wall had eroded away. It was recommended that the armor wall be reinforced in this area and the eroded area at the top of the cliff be repaired. Gravel had eroded away in drainage swale #2, where it meets the shoreline armor wall. It was recommended that the armor wall be reinforced in this area and the gravel replaced in the swale. South of drainage swale #2, approximately 50 yards of the cliff edge and parts of the armor wall had eroded away. This erosion along the armor rock seawall had exposed debris from the landfill, causing the debris to fall down the beach along the shoreline. It was recommended that the exposed debris be removed, the armor wall be reinforced, and eroded area at the top of the cliff be repaired (U.S. Navy 2009d).

SWMU 15, Future Jobs/Defense Reutilization Marketing Office

The ICs and ECs at SWMU 15 are listed in Table 4-1. During the September 2008 inspection, no change to the site was observed, compared to the 2007 inspection results. The site was being used or commercial purposes including fishing equipment storage, which is appropriate under the ICMP. No residential construction had occurred at the site. No indication of groundwater use or excavation activity was found. The "Excavation Restriction" sign had been wedged into the fence to keep it erect. It was recommended a new sign be erected. The ICs appear to be functioning as intended in the OU A ROD to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

SWMU 17, Power Plant 3

The ICs and ECs at SWMU 17 are listed in Table 4-1. During the 2007 inspection, petroleum staining was observed beneath the waste oil tank, and ADEC notified the City of Adak to address this issue. This staining was still observed to be present during the September 2008 inspection. Additionally, approximately one-hundred-fifty 55-gallon drums were observed stacked three high behind a fenced area on the northwest side of the building. Visible drums were labeled "Heavy Duty SAE 40 Engine Oil" and were sitting directly on the ground with no liner or pallet underneath the drums. No other change to the site was observed, compared to the 2007 inspection results. No residential construction had occurred at the site. No indication of groundwater use or excavation activity was found. Excavation restriction signs were clearly visible. Therefore, ICs appear to be functioning as intended in the OU A ROD to protect human receptors from exposure to soil or groundwater. However, it was recommended that the City of Adak be notified regarding the oil spill and drum storage issues (U.S. Navy 2009d).

SWMUs 18/19, White Alice Landfill

The ICs at SWMUs 18/19 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ECs at SWMUs 18/19 are listed in Table 4-1. At the time of the 2008 inspection, the cover appeared to be intact and undisturbed, except on the southwest corner of the landfill immediately on the outside of the fencing where a large eroded area was observed on the steep hillside. A smaller eroded area was also observed at the southern fence line. The perimeter fencing at the site had several damaged sections along the western and southern boundaries totaling approximately 120 feet (U.S. Navy 2009d).

SWMU 20, White Alice/Trout Creek Disposal Area

The ICs at SWMU 20 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ECs at SWMU 20 are listed in Table 4-1. At the time of the 2008 inspection, one of the two signs located at this site was found to be damaged and barely attached to the sign post. Additionally, debris eroding out of the hillside was found, and a large sinkhole had formed on the edge of the cliff face that contained pooled water and debris. The drainage swale on this site contained some standing water and did not appear to be working effectively. The vegetation along the ridge and hillside appeared to be stressed or dead (U.S. Navy 2009d).

SWMU 25, Roberts Landfill

The ICs at SWMU 25 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. The site did not appear to be in use, and no residential construction had occurred at the site. There was no indication that groundwater is being used at the site and no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009d).

The ECs at SWMU 25 are listed in Table 4-1. During the site inspection, many changes to the site were noted. It was found that approximately 16 areas of multiple sections of fencing along the perimeter of the landfill were damaged, for a total of about 3,220 feet in need of repair. Approximately nine signs along the perimeter of the landfill were in need of repair. The northern boundary of the landfill had three road entrances that did not have gates or signs present restricting entry. One area on the east central boundary has a gate consisting of a heavy duty cable attached to gate posts but the cable was loose and was almost resting on the ground. All-terrain vehicle (ATV) tracks/ruts were observed on the landfill cap next to caribou droppings, indicating the landfill was potentially being used by hunters. The southern boundary was found to be securely gated. Approximately six areas along the fence line had erosion occurring underneath the fence. One area of erosion occurred on the southernmost gate entrance on the inside portion of the road. The largest of the erosion areas occurred on the eastern boundary on a hill face, measuring approximately 20 feet long by 15 feet high. The remaining eroded areas under the fence ranged in size from 15 to 50 feet. Sinkholes on the western and eastern borders were found ranging from 2 to 8 feet deep by 3 to 20 feet in length and 1 to 3 feet in width. Areas of standing water were present on the landfill and varied in size from small puddles to large

puddles of roughly 70 feet in diameter noted on the south end of landfill. Throughout the landfill, numerous areas of bare soil and sparse vegetation were found (U.S. Navy 2009d).

SWMU 29, Finger Bay Landfill

The ICs at SWMU 29 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2009x).

The ECs at SWMU 29 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. Minor ponding was observed, although no impact to the overall site condition was noted by the inspector (U.S. Navy 2009d).

NMCB Building Area, T-1416 Expanded Area

The ICs and ECs at the NMCB Building Area, T-1416 Expanded Area are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater. Inspectors noted five polyethylene overpack drums staged on the south side of the building with an approximately 5-foot-diameter area of oil-stained soil observed under the drums. A portable 150-gallon gasoline tank was located on the west side of the east building in a lined, bermed area. Two tanker fuel trucks were parked in front of the east building, and three 55-gallon drums of SAE 30 motor oil and a car battery were sitting on the ground next to the northeast corner of the east building. Because these poor housekeeping practices may be contributing to groundwater contamination, it was recommended that the owners be directed to address the areas of actual or potential spills (U.S. Navy 2009d).

SWMU 58/SA 73, Heating Plant 6

The ICs and ECs for SWMU 58/SA 73 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area and no residential construction had occurred at the site. However, unauthorized excavations were noted by the inspectors by contractors salvaging copper from former power supply lines and systems. It was recommended by the inspectors that the Navy notify the City and Aleut Enterprise Corporation of the deficiencies and reinforce the need for excavation permits. Additionally, this site lacked "no excavation" signs and it was recommended that two signs be installed (U.S. Navy 2009d).

SA 88, P-70 Energy Generator

The ICs and ECs for SA 88 are listed on Table 4-1. During the inspection in September 2008, there were no indications of a change in land use in this area and no residential construction had occurred at the site. However, unauthorized excavations were noted by the inspectors by contractors salvaging copper from former power supply lines and systems. It was recommended by the inspectors that the Navy notify the City and Aleut Enterprise Corporation of the deficiencies and reinforce the need for excavation permits. Additionally, transformer oil was noted to have been spilled from these operations. ADEC performed a PCB analysis of the oil using a field test kit. Results did not indicate the presence of PCBs. Two wells were also noted to have been destroyed at this site, and an excavation sign was dug up and replaced (U.S. Navy 2009d).

Mount Moffett Power Plant 5 (USTs 10574 through 10577)

The ICs and ECs for Mount Moffett Power Plant 5 are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. However, the inspectors noted unauthorized excavations by contractors salvaging copper from former power supply lines and systems. It was recommended by the inspectors that the Navy notify the City and AEC of the deficiencies and reinforce the need for excavation permits (U.S. Navy 2009d).

MAUW Compound (UST 24000-A)

The ICs and ECs for MAUW Compound are listed in Table 4-1. During the inspection in September 2008, there was no indication of a change in land use in this area and no residential construction had occurred at the site. However, the inspectors noted unauthorized excavations by contractors salvaging copper from former power supply lines and systems. It was recommended by the inspectors that the Navy notify the City and Aleut Enterprise Corporation of the deficiencies and reinforce the need for excavation permits (U.S. Navy 2009d).

OU B-1 and OU B-2 Ordnance Areas

The September 2008 IC inspection included visual assessment of these Parcel 4 ECs from outside Parcel 4. Specifically, fencing on the northern, eastern, and southern perimeters of SA 93 WWII Mortar Impact Area and the gate at the Lake Andrew recreational cabin were inspected. Additionally, the southern and eastern perimeter fencing and the southern gate at SWMU 1 Lake Andrew Waste Ordnance Demolition Range were inspected. Changes to the site compared to 2007 observations are discussed in the remainder of this section.

On the northern boundary of SA 93, over 16 sections of fencing in need of repair were found. In addition to the 16 sections, fencing was down for approximately one-half mile along the northwest corner, and signs were observed on the ground. Some of this fencing appears to have been intentionally cut to drive ATVs through, as evidenced by tracks leading into the parcel.

Some sections of fencing were also observed in need of repair along the eastern and southern sections of SA 93. Fencing is intact in many spots along this perimeter, but many sections of fencing along the eastern and southern boundary are fully or partially buried by tall grass and tundra. Also, two eroded areas were observed along the eastern perimeter, jeopardizing fence integrity or allowing easy access under the fence. The gate along the southwestern entrance to SA 93 at the Lake Andrew recreational cabin was inspected and found to be locked and in good condition.

The gate along the southeast entrance to SWMU 1, Lake Andrew Waste Ordnance Demolition Range was inspected and found to be locked and in good condition. Inspectors were escorted by the UXO contractor past the gate to inspect the fencing along the lake shore road, which is easily accessible to hikers. Several sections of fencing and signs were observed to be damaged along this section of the perimeter.

The following recommendations were made based on the 2008 inspection:

- Repair all sections of damaged perimeter fencing and damaged signs.
- Install a gate at the northern boundary of SA 93 that contractors may use when work must be conducted within the site boundary so Parcel 4 access can be controlled.
- Evaluate whether tall tundra grass is detrimental to the effectiveness of the barrier fence.
- Install erosion controls and repair the two damaged eroded areas along the eastern perimeter of SA 93.

In September 2008, there was a report of a 155-mm projectile (DMM) found in the rocks near the Metals Landfill. The NAVFAC Northwest Navy Technical Representative reported that the round was unfired and appeared to have washed out of the landfill. The item was reported to the EOD team, which was arriving on island on Thursday of the week of the report.

6.5.4 Results of 2009 Institutional Controls Inspections

Recommendations based on observations made during the 2009 inspections are discussed in this section, together with actions the Navy took during the 2009 field season to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not discussed in this section were deemed to be functioning as intended and protective of human health and the environment.

Excavation Notifications and Restrictions

No Excavation Notification Request forms were submitted to the City from September 2008 through September 2009. The City clerk stated that she was unaware of the requirement to submit excavation notifications to the Navy. There was no evidence of unauthorized excavation in the downtown area during IC inspections. It is recommended that a method be instituted for annually informing City employees.

At some sites, such as former landfills (or where the remedy in place is a protective cover), excavation by non-Navy personnel is prohibited, with exceptions for a very few specific circumstances. Additionally, excavation for the purpose of digging domestic water wells is prohibited in the downtown area and in the Remote Area sites, where it is necessary to protect the integrity of the ongoing petroleum cleanups. During September 2008 through September 2009, no excavation was observed at any site where excavation was prohibited.

Education Program

During the 2009 ICs inspections, the Navy conducted informal interviews with on-island personnel regarding the educational program and potential improvements. Interviews were conducted with residents and visitors. These interviews were intended to ensure that educational programs were functioning in accordance with the ICMP and applicable RODs.

Surveys were performed with 15 residents and visitors. The survey questionnaire was more extensive than in previous years. The surveys indicated that 73 percent of the residents, school children, and visitors (11 of 15) were aware of the ordnance awareness video. All (100 percent) residents, school children, and visitors were aware of land use restriction. One of five residents (20 percent) was aware of the fish consumption advisory. Two of five (40 percent) residents were aware of the ordnance safety awareness video. Four of five (80 percent) residents know to call 911 if they find suspected ordnance material. Five of five (100 percent) residents were aware that land use restrictions apply to some areas on Adak. Three of five (60 percent) residents were aware that digging on Adak requires Navy approval. Nine of ten (90 percent) residents and visitors were aware that entry onto Navy-retained property (Parcel 4) is prohibited. Only one of five (20 percent) residents was aware of the Navy outreach Web site and toll-free telephone number. Nine of ten (90 percent) residents and visitors were aware of the hiking maps

detailing the land use restrictions and ordnance awareness. Four of five (80 percent) residents were aware that there are areas on Adak that cannot be excavated at all. Two of five (40 percent) residents were aware that groundwater use in the downtown area is prohibited (U.S. Navy 2010h).

SWMU 4, South Davis Road Landfill

The ICs at SWMU 4 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 4 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and mostly undisturbed, except for some tire tracks/ruts at the southeastern portion of the landfill. Flowing water was noted in the north drainage swale, and water was seeping out of the toe of the west-central part of the landfill on the shoreline of Lake Andrew. These conditions are similar to what was observed in 2008. Additionally, approximately 30 feet of landfill liner was exposed along the shoreline of Lake Andrew (U.S. Navy 2010h).

SWMU 11, Palisades Landfill

The ICs at SWMU 11 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 11 are listed in Table 4-1. At the time of the inspection, the cover appeared to be intact, undisturbed, and heavily vegetated. Deficient swale liners noted in 2007 had been recently repaired. However, the southwest drainage swale liner had small holes and tears of less than 1 inch present. The southeast sign was partially broken and in need of repair. A small pond approximately 15 feet in diameter was observed in the upper portion of the ravine on the landfill. Slightly southwest of the ravine, a sinkhole was observed of approximately 8 to 10 feet deep and 8 feet in diameter. Metal and landfill debris was exposed inside of the sinkhole. Erosion was observed on the slope immediately above the sinkhole. These conditions are similar to what was observed in 2008 (U.S. Navy 2010h).

SWMU 13, Metals Landfill

The ICs at SWMU 13 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. The site did not appear to be in use. No

residential construction had occurred at the site. There was no indication that groundwater is being used at the site. There was no indication of excavation activity at the site. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater.

The ECs at SWMU 13 are listed in Table 4-1. During the September 2009 inspection, several EC deficiencies were noted. Drainage swales #2, #3, #4, and #7 did not have any gravel cover on the swale lining. Drainage swale #7 was observed to have several small holes with dandelions growing through the liner. On the northeast corner of the landfill, a large quantity of old metal debris is located on the armor wall down to the shoreline. Adak residents had complained to Navy representatives that they want this metal debris removed, since it represents a safety and environmental hazard because of the proximity of a recreational beach to the north. North of where drainage swale #7 meets the coast of Kuluk Bay, approximately 200 yards in length of the cliff edge and parts of the armor wall have eroded away. It is recommended that the armor wall be reinforced in this area and the eroded area at the top of the cliff be repaired. Gravel has eroded away in drainage swale #2, where it meets the shoreline armor wall. It is recommended that the armor wall be reinforced in this area and the gravel replaced in the swale. South of drainage swale #2, approximately 50 yards of the cliff edge and parts of the armor wall has eroded away. This erosion along the armor rock seawall has exposed debris from the landfill causing the debris to fall down the beach along the shoreline (U.S. Navy 2010h).

SWMU 15, Future Jobs/Defense Reutilization Marketing Office

The ICs and ECs at SWMU 15 are listed in Table 4-1. During the September 2009 inspection, no indication of groundwater use or of excavation activity was found, and no residential construction had occurred at the site. The site is used for commercial purposes, including fishing equipment storage, which is appropriate under the ICMP (U.S. Navy 2010h).

The "Excavation Restriction" sign that had been wedged into the fence to keep it erect in 2008 was missing. It was recommended that a new sign be erected. The ICs appear to be functioning as intended in the OU A ROD to protect human receptors from exposure to soil or groundwater.

SWMU 17, Power Plant No. 3

The ICs and ECs at SWMU 17 are listed in Table 4-1. During the 2007 inspection, petroleum staining was observed beneath the waste oil tank and ADEC directed the City of Adak to address this issue. This staining was still observed to be present during the September 2009 inspection. The approximately one-hundred-fifty 55-gallon drums had been removed that were observed stacked three high behind a fenced area on the northwest side of the building. No other change to the site was observed, compared to the 2008 inspection results. No residential construction had occurred at the site. No indication that groundwater was being used, nor of excavation

activity was found. Excavation restriction signs were clearly visible. Therefore, ICs appear to be functioning as intended in the OU A ROD to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

SWMUs 18/19, White Alice Landfill

The ICs at SWMUs 18/19 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activities. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 18/19 are listed in Table 4-1. At the time of the 2009 inspection, the cover appeared to be intact and undisturbed, except on the southwest corner of the landfill immediately on the outside of the fencing, where a large eroded area was observed on the steep hillside. A smaller eroded area was also observed at the southern fence line. The perimeter fencing at the site had several damaged sections along the western and southern boundaries, totaling approximately 120 feet. These conditions are similar to what was observed in 2008. Additionally, new erosion was noted to have occurred on the south, northeast, and northwest portions of the landfill (U.S. Navy 2010h).

SWMU 20, White Alice/Trout Creek Disposal Area

The ICs at SWMU 20 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 20 are listed in Table 4-1. At the time of the inspection, one of the two signs located at this site was found to be damaged and barely attached to the sign post. Additionally, debris eroding out of the hillside was found, and a large sinkhole had formed on the edge of the cliff face that contained pooled water and debris. The drainage swale on this site contained some standing water and did appear to be working effectively. The vegetation along the ridge and hillside appeared to be stressed or dead. These conditions are similar to what was observed in 2008 (U.S. Navy 2010h).

SWMU 25, Roberts Landfill

The ICs at SWMU 25 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. The site did not appear to be in use, and

no residential construction had occurred at the site. There was no indication that groundwater is being used at the site, and there was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 25 are listed in Table 4-1. During the September 2009 site inspection, none of the repairs recommended in the 2008 IC inspection report were observed to have been completed. In addition, the following concerns were noted. It was found that approximately 16 areas of multiple sections of fencing along the perimeter of the landfill were damaged, for a total of about 3,220 feet in need of repair. Approximately nine signs along the perimeter of the landfill were in need of repair. The northern boundary of the landfill has three road entrances that do not have gates or signs present restricting entry. One area on the east central boundary has a gate consisting of a heavy duty cable attached to gate posts, but the cable is loose and is almost resting on the ground. The ATV tracks noted last year appear to be filling with vegetation. The southern boundary is securely gated.

Approximately six areas along the fence line had erosion occurring underneath the fence. One area of erosion occurred on the southernmost gate entrance on the inside portion of the road. The largest of the erosion areas occurred on the eastern boundary on a hill face approximately 20 feet long by 15 feet high. The remaining eroded areas under the fence ranged in size from 15 to 50 feet. Sinkholes on the western and eastern borders were found ranging from 2 to 8 feet deep by 3 to 20 feet in length and 1 to 3 feet in width. The sinkhole south of well MWA-2 had a perennial stream flowing through it, which originated on the landfill and is the cause of the sinkhole. Areas of standing water were present on the landfill and varied in size from small puddles to large ponds of roughly 70 feet in diameter noted on the south end of landfill. Throughout the landfill, numerous areas of bare soil and sparse vegetation were found. Repairs were recommended.

No indication of a change in land use in this area was found. The site did not appear to be in use. No residential construction had occurred at the site. No indication of groundwater use or excavation activity was found at the site (U.S. Navy 2010h).

SWMU 29, Finger Bay Landfill

The ICs at SWMU 29 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2010h).

The ECs at SWMU 29 are listed in Table 4-1. The landfill cover appeared to have some eroded areas in the west central portion. A 100- by 30-foot eroded area adjacent to a smaller 40- by 30-foot eroded area contained some metal debris protruding through the cap along with areas of standing water. A 30-foot-diameter area of ponded water (considered minor by the inspector), which was observed in the central region of the landfill in 2008, was observed again in 2009. A second small, square ponded area approximately 8 feet in length and located between the two eroded areas was also observed during the inspection. Water was observed flowing overland from the two ponded areas to the wetland located to the south of the landfill. Because of the flat topography, the stream flow was very low and did not appear to be impacting the landfill cap. It was recommended that eroded areas be repaired and revegetated and surface water runoff control measures be installed to prevent further erosion and landfill debris from surfacing (U.S. Navy 2010h).

SA 78, Old Transportation Building

The ICs and ECs for SA 78 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site, and there was no evidence of excavation. The site lacked a "No Excavation" sign, and it was recommended that one be installed (U.S. Navy 2010h).

SWMU 58/SA 73, Heating Plant 6

The ICs and ECs for SWMU 58/SA 73 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. Unauthorized excavations noted in 2008 had been filled and leveled. Additionally, this site still lacked "No Excavation" signs noted in 2008, and it was recommended that two signs be installed (U.S. Navy 2010h).

SA 88, P-70 Energy Generator

The ICs and ECs for SA 88 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. Unauthorized excavations noted in 2008 had been filled and leveled. Additionally, two wells noted to have been destroyed had not been properly decommissioned (U.S. Navy 2010h).

Mount Moffett Power Plant 5 (USTs 10574 through 10577)

The ICs and ECs for Mount Moffett Power Plant 5 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area, and no

residential construction had occurred at the site. Unauthorized excavations noted in 2008 had been filled and leveled (U.S. Navy 2010h).

MAUW Compound (UST 24000-A)

The ICs and ECs for the MAUW Compound are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. Unauthorized excavations noted in 2008 had been filled and leveled (U.S. Navy 2010h).

NMCB Building Area, T-1416 Expanded Area

The ICs at the NMCB Building Area, T-1416 Expanded Area are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater. Inspectors noted five polyethylene overpack drums staged on the south side of the building with an approximately 5-foot-diameter area of oil-stained soil observed under the drums. A portable, 150-gallon gasoline tank was located on the west side of the east building in a lined, bermed area. Two tanker fuel trucks were parked in front of the east building and three 55-gallon drums of SAE 30 motor oil and a car battery were sitting on the ground next to the northeast corner of the east building. Because these poor housekeeping practices may be contributing to groundwater contamination, it was recommended that the owners be notified to address the areas of actual or potential spills. These conditions are similar to what was observed in 2008 (U.S. Navy 2010h).

OU B-1 and OU B-2 Ordnance Areas

Fencing on the northern, eastern, and southern perimeters of SA 93 WWII Mortar Impact Area and the gate at the Lake Andrew recreational cabin were inspected in 2009. Additionally, the southern and eastern perimeter fencing and the southern gate at SWMU 1, Lake Andrew Waste Ordnance Demolition Range were inspected. Observations of SA 93 were generally the same as 2008 and included the following:

- On the northern boundary approximately 25 sections of fencing were found in need of repair.

- In addition to the 25 sections, fencing is down for approximately one-half mile along the northwest corner, and signs were observed on the ground. Some of this fencing appears to have been intentionally cut to drive ATVs through, as evidenced by tracks leading into the parcel, which was also observed in 2008.

- At the fence-line road and SA 82 road intersection on the eastern boundary, erosion was observed to still be occurring next to a large sinkhole filled with water. Water was flowing from the sinkhole across the road and under the fence, "causing erosion of the road" and at the fence. Nine sections of fence were observed in need of repair at this location.

- An additional six sections of fencing were down along the eastern perimeter approximately one-quarter mile south of the sink hole.

- Several sections of fencing were down along the southern perimeter, the same as observed in 2008.

- Fencing is generally intact along this perimeter, but many sections of fencing along the eastern and southern boundaries are fully or partially buried by tall grass and tundra.

- The gate along the southwestern entrance to SA 93 at the Lake Andrew recreational cabin was inspected and found to be locked and in good condition.

The 2009 inspection results for SWMU 1 were generally the same as those from 2008 and included the following:

- The gate along the southeast entrance to SWMU 1 was inspected and found to be locked and in good condition.

- Southern perimeter fencing near the gate appears to be intact.

- Only one UXO warning sign was observed along the southern approach routes to Lake Andrew and SWMU 1.

- Four of the UXO warning signs that were placed in this area could not be located.

Recommendations for this site include the following:

- Repair all sections of damaged perimeter fencing and damaged signs.

- Install a gate at the northern boundary of SA 93 that contractors may use when work must be conducted within the site boundary so that Parcel 4 access can be controlled.

- Evaluate whether tall tundra grass is detrimental to the effectiveness of the barrier fence.

- Install erosion controls and repair the damaged eroded areas along the eastern perimeter of SA 93.

- Replace four UXO danger signs along the Lake Andrew entrances to Parcel 4.

In May 2009 there was a report by Adak residents of 50-caliber bullets on the hill behind the Metals Landfill. The Navy Remedial Project Manager explained the process for DMM reporting to the City of Adak and provided the contact information for the EOD team. The EOD team elected not to respond, because these items are not considered an explosive hazard, and recommended that the items be handled by personnel already on island.

6.5.5 Results of 2010 Institutional Controls and 5-Year Review Site Inspections

IC inspections occurred in August and September 2010. In addition, in August 2010, site inspections were performed to support the 5-year review. Recommendations based on observations made during the 2010 IC and 5-year review site inspections (Appendix D) are discussed in this section, together with actions the Navy took during the 2010 field season to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not discussed in this section were deemed to be functioning as intended and protective of human health and the environment.

Excavation Notifications and Restrictions

From September 2009 through September 2010, seven Excavation Notification Request forms were submitted to the Navy and none were to the City. There was no evidence of unauthorized excavation in the downtown area during IC inspections.

No site was impacted by the excavations performed during this period, except for the ongoing Navy operational and maintenance activities, including the 2010 IC repairs (landfill cap and erosion repairs) performed by a Navy contractor and remedy evaluation using soil vapor probes, soil borings, and additional monitoring wells performed by the Navy contractor. The repair and site characterization work was performed following regulator-approved work plans.

At some sites, such as former landfills (or where the remedy in place is a protective cover), excavation by non-Navy personnel is prohibited, with exceptions for a very few specific circumstances. Additionally, excavation for the purpose of digging domestic water wells is prohibited in the downtown area and in the Remote Area sites, where it is necessary to protect

the integrity of the ongoing petroleum cleanups. During September 2009 through September 2010, no excavation was observed at any site where excavation was prohibited.

Education Program

During the 2010 ICs inspections, the Navy conducted informal interviews with on-island personnel regarding the educational program and potential improvements. Interviews were conducted with residents and visitors. These interviews were intended to ensure that educational programs were functioning in accordance with the ICMP and applicable RODs.

Surveys were performed with 22 residents and visitors. Eighty-one percent of the residents, school children, and visitors (18 of 22) were aware of the ordnance awareness video. All (100 percent) residents, school children, and visitors were aware of land use restriction. Fourteen of 16 residents (88 percent) were aware of the fish consumption advisory. Fourteen of 16 (88 percent) residents were aware of the ordnance safety awareness video. All (100 percent) residents know to call 911 if they find suspected ordnance material. All (100 percent) residents were aware that land use restrictions apply to some areas on Adak. Thirteen of 16 (81 percent) residents were aware that digging on Adak requires Navy approval. All (100 percent) residents and visitors were aware that entry onto Navy-retained property (Parcel 4) is prohibited. Twelve of 16 (75 percent) residents were aware of the Navy outreach Web site and toll-free telephone number. All (100 percent) residents and visitors were aware of the hiking maps detailing the land use restrictions and ordnance awareness. All (100 percent) residents were aware that there are areas on Adak that cannot be excavated at all. Twelve of 16 (75 percent) residents were aware that groundwater use in the downtown area is prohibited (U.S. Navy 2011b).

SA 86, Happy Valley Child Care Center

In August 2010 a site inspection was performed to support the 5-year review. A black 55-gallon drum was observed within the debris of the former buildings. The drum contained an unknown foul-smelling liquid. It is recommended that the landowner remove the drum and dispose of the contents in accordance with state and federal laws.

SWMU 4 South Davis Road Landfill

The ICs at SWMU 4 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 4 are listed in Table 4-1. At the time of inspection, the cover appeared to be intact and undisturbed. The deficiencies to the landfill liner on the north end of the lake

shoreline noted in 2009 were repaired during the summer 2010 field season. It was noted that the northern swale had approximately 1 inch of ponded water and was overgrown with vegetation. It was therefore recommended that the vegetation be removed from this swale (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 4 as were documented by the annual inspection. Additionally, minor amounts of metal debris were evident along the Lake Andrew shoreline near the northern portion of the landfill.

SWMU 10, Old Baler Building

The ICs and ECs at SWMU 10 are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. The site appeared to be used as a storage location for cement cinder blocks. No residential construction had occurred at the site. No indication of groundwater use or excavation activities was found. The ICs required at this location include soil excavation restrictions. However, no sign was present at the site. Therefore, placement of a soil excavation restriction sign at the site was recommended.

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 10 as were documented by the annual inspection, but also noted the presence of a few abandoned petroleum, oil, or lubricant drums. These are not Navy drums or issues. However, the observations were recorded as part of both the annual inspection and the 5-year review inspection.

SWMU 11, Palisades Landfill

The ICs at SWMU 11 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 11 are listed in Table 4-1. At the time of the inspection, the cover appeared to be intact, undisturbed, and heavily vegetated. The deficiencies to the swale liner, sinkhole, and signs noted during the 2008 and 2009 inspections were repaired during the summer 2010 field season. Two minor deficiencies were noted in 2010. A small area of metal debris north of the repaired sinkhole was noted during the inspection. A small pond is still present in the north-central portion of the landfill within the ravine, but does not appear to be affecting the landfill cap integrity. This ponding has been noted in previous years. Both of these minor deficiencies will be monitored during subsequent inspections (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 11 as were documented by the annual inspection.

SWMU 13, Metals Landfill

The ICs at SWMU 13 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. The site did not appear to be in use. No residential construction had occurred at the site. There was no indication that groundwater is being used at the site. There was no indication of excavation activity at the site. Signs were in good condition. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 13 are listed in Table 4-1. All of the existing deficiencies identified during the 2008 and 2009 inspections were addressed. The drainage swale liners were all repaired and regraveled. Swale #2 was extended for better drainage. Metal debris eroding out of the armored shoreline was removed. The areas of erosion along the rock armor wall were repaired, reseeded, and fertilized. Most nonvegetated areas were reseeded and fertilized, with new grass appearing on the landfill cap. The large quantity of metal debris along the northern shoreline noted during the 2008 and 2009 inspections was again observed in 2010. However, this debris lies outside of the landfill boundaries and was not considered to be associated with the Metals Landfill. Some areas of the landfill remain sparsely vegetated, exposing soil. During the time of inspection, areas had recently been reseeded and grass was beginning to grow. These areas will continue to be monitored (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 13 as were documented by the annual inspection. However, it appeared to the 5-year review inspection team that the debris that has been interpreted as lying beyond the Metals Landfill boundary does belong within the boundaries of Metals Landfill. It is recommended that this debris be removed and the documented boundaries of the landfill be extended to cover this area.

SWMU 14, Old Pesticide Disposal Area

The ICs and ECs at SWMU 14 are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. The site did not appear to be in use. No residential construction had occurred at the site. No indication that groundwater was being used or of excavation activity was found at the site. The ICs required at this location include soil excavation restriction. However, no sign was present at the site. Therefore, placement of a soil excavation restriction sign at the site was recommended.

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 14 as were documented by the annual inspection, but also noted the presence wood and plastic debris scattered at the site.

SWMU 15, Future Jobs/Defense Reutilization Marketing Office

The ICs and ECs at SWMU 15 are listed in Table 4-1. During the September 2010 inspection, no indication of groundwater use or of excavation activity was found, and no residential construction had occurred at the site. The site is used for commercial purposes, including fishing equipment storage, which is appropriate under the ICMP. The ICs required at this location include soil excavation restriction, and a new excavation restriction sign has been installed on the east perimeter of the site, which was a deficiency noted in previous IC inspections (U.S. Navy 2011b).

During the 2010 inspection, the northwest section of the site was being used to store approximately thirty to fifty 55-gallon drums of what appeared to be petroleum product. Drums were staged on pallets and directly on the ground. Many drums were leaking and large pools of black oil approximately 20 feet in diameter and up to approximately 6 inches deep were observed on the surface of the ground under the drums. Other items stored on the site included cylinders of refrigerant Forane 22, numerous 5-gallon buckets containing unknown material, wood and metal debris, and fish-processing equipment. On the far southern portion of the site near well MW15-424, an AST was observed with approximately six to eight 55-gallon drums with oil-stained soil under them. The oil staining was observed in an adjacent drainage ditch. In addition, on the far northwest corner of the site, a water-main break had occurred, had created a sinkhole approximately 6 feet in diameter, and was observed to be flowing into the roadside ditch. The sinkhole had been filled with 55-gallon drums and debris in an apparent attempt to plug the hole (U.S. Navy 2011b).

The poor housekeeping practices associated with the on-site drum storage, underlying contaminated soil, and water-main sinkhole with debris have impacted site soils and may be impacting underlying groundwater. It is recommended that the site owners be requested to remove the drums, pooled oil, and stained soil; remove the debris in the sinkhole; address the AST; and improve site housekeeping practices. It is further recommended that the City be contacted and asked to repair the water-main break and repair the sinkhole (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 15 as were documented by the annual inspection. ADEC representatives were on site during the inspection and documented the conditions.

SWMU 17, Power Plant No. 3

The ICs and ECs at SWMU 17 are listed in Table 4-1. The site is currently being used as the active power plant for the City. During the 2007 through 2009 inspections, petroleum staining was observed beneath the waste oil tank located on the east side of the building, and ADEC requested that the City address this issue. During the August 2010 inspection, the waste-oil tank observed in 2009 had been removed, but the oil-stained soil under the tank was still present, although it had been mostly covered by several inches of clean dirt. Additionally, approximately 150 crushed 55-gallon drums were observed to be located on pallets on the northeast corner of the building next to and inside the large fuel tank secondary containment. Heavily stained oily soil was observed under the drums, which are located approximately 100 feet upgradient of well PP-05. Additionally, two large transformers were observed within the secondary containment. One transformer (approximately 80 gallons) was observed to have a "No PCBs" sticker. The second transformer, approximately 50 gallons, had the letters "BAD" stenciled on it (U.S. Navy 2011b).

No other changes to the site were observed, compared to the 2009 inspection results. No residential construction had occurred at the site. There was no indication that groundwater was being used, and no indication of excavation activity was found. Excavation restriction signs were clearly visible. Poor housekeeping practices persist at this site and may be impacting site soils and underlying groundwater. It is recommended that the crushed drums and transformers be properly disposed of and the oil-stained soil be excavated from under the drums and former AST location on the east side of the building. It is further recommended that the power plant operator be notified to improve housekeeping and waste management practices (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 17 as were documented by the annual inspection. The inspection team noted that oil droplets were on the building and foundation next to the former AST and that vegetation next to the tank was stressed, indicating a possible breach in the tank. Approximately eight drums of oily soil were observed south of the former AST location. These drums were poorly maintained, and one had a hole in it, spilling some of the contents to the ground. The inspection team believes this soil was removed from below the former AST in an attempt to clean up a spill. Sandy sludge, similar to the contents of the eight drums was noted on the road next to the former AST. Further south of the eight drums, an AST was observed with a spill-containment vessel for a discharge valve filled with oil/oily water and a drum of unknown hazardous material in a yellow poly drum. Below the power plant near a Quonset hut, several drums were found on their sides. One contained oily water, and minor staining was observed next to the drum. Near well HC-3, excavation or grading had occurred, although no excavation request had been made. This area is hydraulically downgradient of the power plant and may indicate a release of oil or oily water had occurred. Lastly, a product-recovery system with a

tank is present near the Quonset hut. It is recommended the Navy investigate dismantling the system. ADEC representatives were on site during the inspection and documented the conditions.

SWMUs 18/19, White Alice Landfill

The ICs at SWMUs 18/19 are listed in Table 4-1. During the inspection in September 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMUs 18/19 are listed in Table 4-1. The landfill cap appeared to be intact, undisturbed, and well vegetated, except at two sparsely vegetated areas. Findings and recommendations listed in the 2008 and 2009 IC inspection reports had been addressed by the time of the 2010 inspection and included repair of all perimeter fencing and repair and reseeding of all eroded areas. The reseeded areas were observed to be sprouting new vegetation and will continue to be monitored as vegetation is established (U.S. Navy 2011b).

During the 2010 inspection, several new concerns were noted. The swale located on the northeast corner is clogged with vegetation and was observed to have standing water. Ponding was observed outside and adjacent to the northern landfill perimeter fence and receives surface water from the northeast swale and roadside ditch. This pond may be contributing to the erosion of the areas on the northern portion of the landfill that were recently repaired. A sparsely vegetated area approximately 75 by 50 feet was observed on the northern portion of the landfill near where reseeding was performed and downgradient from the pond described above. A second 50- by 100-foot sparsely vegetated area was observed near the old building foundation on the south inside the fence. One large eroded area outside of the southwestern corner of the landfill has been present for a number of years and appears to be stable. It is currently not affecting landfill cap integrity, but will continue to be monitored for stability and possible encroachment into the landfill. To address these deficiencies, it was recommended that the two bare areas be reseeded and fertilized, vegetation removed from the northeastern swale, and the surface water pathway be rerouted outside the northern landfill boundary so that water does not pond (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMUs 18/19 as were documented by the annual inspection.

SWMU 20, White Alice/Trout Creek Disposal Area

The ICs at SWMU 20 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 20 are listed in Table 4-1. The EC repairs recommended in 2008 and 2009 were completed during the 2010 field season. The repairs included stabilizing, filling, grading, and seeding an eroded cliff face, removal of debris, and sign placement (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 20 as were documented by the annual inspection.

SWMU 24, Hazardous Waste Storage Facility

The ICs and ECs at SWMU 24 are listed in Table 4-1. During the inspection in September 2010, there was no indication of a change in land use in this area. The site did not appear to be in use, and no residential construction had occurred at the site. There was no indication that groundwater is being used at the site nor of excavation activities (U.S. Navy 2011b).

The current land owner uses the site for an island metal debris staging area. During the August 2010 inspection, wastes observed on site and at the recycling center in general included scrap metal debris, wood debris, numerous dilapidated vehicles, appliances (including refrigerators), various-sized tanks, several hundred crushed and whole 55-gallon drums with underlying stained soil, approximately seventy-five 5-gallon poly and metal containers with unknown liquids and underlying stained soil, approximately fifteen 50-gallon transformers with oil leaking out of some and onto the ground, car batteries, a large pile of tires, computers, and possible asbestos-containing materials (lagging, asbestos concrete) (U.S. Navy 2011b).

There is no restricted access or soil barrier at the site. An excavation restriction sign to the northwest of the site boundary along Public Works Road was present. Due to the conditions observed on site, there is a concern that contaminants associated with on-site wastes or materials are a threat to residents and are potentially impacting site soils and underlying groundwater. It is therefore recommended that the site owners, ADEC, and EPA be notified of the site conditions and that appropriate investigation and cleanup of the site be requested to be performed (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 24 as were documented by the annual inspection. ADEC representatives were on site during the inspection and documented the conditions.

SWMU 25, Roberts Landfill

The ICs at SWMU 25 are listed in Table 4-1. During the inspection in September 2010, there was no indication of a change in land use in this area. The site did not appear to be in use and no residential construction had occurred at the site. There was no indication that groundwater is being used at the site, nor of excavation activity. Therefore, ICs appeared to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 25 are listed in Table 4-1. During the inspection, it was noted that repairs had been performed during the 2010 field season on the perimeter fence, and new gates had been installed on the north and east entrances as recommended in 2009. Additionally, areas of erosion and sinkholes noted during the 2008 and 2009 inspections were repaired with jute mat and reseeded. Bulldozer tracks made during the noted repairs were reseeded/fertilized and will continue to be monitored for vegetative growth. Three small eroded areas were observed just outside the western fence line and approximately 30 feet west of the landfill cap. These areas were also observed during the 2009 inspection, but do not appear to be affecting cap integrity and will continue to be monitored for possible future encroachment onto the landfill cap. One new eroded area was observed in the south-central portion of the landfill that is approximately 100 feet in diameter. Sparsely vegetated areas noted during the 2009 inspection still remain across the landfill cap. Most notably, a large sparsely vegetated area approximately 400 by 200 yards is located in the central portion of the cap near the main gate. Wooden and metal debris associated with a collapsed building is located on the northeast side of the landfill; however, this is not located on the landfill cap. The pond located on the southern portion of the landfill near the gates that was observed during the 2009 inspection is still present. A groundwater seep was observed on the Mitt Lake access road downgradient from the landfill and uphill from sampling location RLSW05. The seep has bright-orange precipitate, is approximately 3 by 2 feet in size, and flows at approximately 2 liters per minute. It is flowing eastward into a heavily vegetated area that is upgradient approximately 100 feet from Mitt Creek. A surface water sample was collected from the seep as part of the long-term monitoring activities and analyzed for total and dissolved priority pollutant metals plus aluminum and WQPs. Analytical result showed that no result exceeded endpoint criteria or Alaska Water Quality Standards (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 25 as were documented by the annual inspection.

SWMU 29, Finger Bay Landfill

The ICs at SWMU 29 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

The ECs at SWMU 29 are listed in Table 4-1. The 2010 inspection noted that repairs to the landfill were made based on the 2008 and 2009 IC inspections results and included removal of metal debris and filling, regarding, reseeding, and fertilizing a small square ponded area. The 2010 inspection also noted that the large 30- by 10-foot pond noted in 2009 on the east side of the site high point is still present, but appears to be outside the landfill cap and not affecting landfill integrity. A small pond approximately 15 feet in diameter was observed on the northwest portion of the landfill and was observed to contain wood debris. Since landfill boundaries are unclear, it is uncertain if this pond is on the landfill cap. This pond does not appear to be affecting the landfill cap. The nonvegetated areas observed during the 2008 and 2009 inspections are presumably where bedrock outcrops exist near the landfill cap. They do not appear to be affecting the integrity of the landfill cap, but these areas of bare soil will be monitored annually. A seep was observed at the former location of the square pond that was reported in 2009. This area was regraded and filled with gravel approximately 50 feet in diameter since last year's inspection. The seep was orange in color and flowing out of the gravel toward the south at less than 1 liter per minute. One small (approximately 1 by 4 feet) piece of metal debris was observed in the central portion that has been noted in previous investigations. It does not appear to be affecting the landfill cap (U.S. Navy 2011b).

In August 2010 a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 29 as were documented by the annual inspection.

SWMU 55, Public Works Transportation Department Waste Storage Area

The ICs and ECs at SWMU 55 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. The site is currently used as a storage area for dilapidated vehicles, machinery, tires, and miscellaneous debris. Numerous areas of oil-stained soil were observed, and a car battery was noted near a monitoring well. One of the tires contained antifreeze. Additionally, the shed located on the site was observed to have a large quantity of a variety of presumably virgin petroleum-type products in 5-, 35- and 55-gallon containers. Many of these containers were stacked on top of each other, leaning, and did not appear to be stable (U.S. Navy 2011b).

There is no restricted access or soil barrier at the site. An excavation restriction sign to the northwest of the site boundary along Public Works Road was present. Because of the conditions observed on site, there is a concern that contaminants associated with on-site wastes or materials are a threat to residents and are potentially impacting site soils and underlying groundwater. It is therefore recommended that the site owners, ADEC, and EPA be notified of the site conditions and that appropriate investigation and cleanup of the site be requested to be performed (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 55 as were documented by the annual inspection. ADEC representatives were on site during the inspection and documented the conditions.

SWMU 58/SA 73, Heating Plant 6

The ICs and ECs at SWMU 58/SA73 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. Three new "No Excavation" signs were installed at the site during the 2010 field season. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SWMU 58/SA73 as were documented by the annual inspection. The inspection team noted a 2½-foot-deep excavation in a berm west of the former UST locations. It is assumed this was from copper-salvaging operations. Additionally, stripped and abandoned transformers and switch banks were noted just north of the site. Oily staining was observed on and next to the equipment. Stripped cables were discovered next to Building 10348, and oily staining under the cables was observed. It is recommended that the landowner collect soil samples and analyze for PCBs at both the transformer/switch-bank locations and under the cables. ADEC representatives were on site during the inspection and documented the conditions.

SWMU 61, Tank Farm B

The ICs and ECs at SWMU 61 are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. No indication of a change in land use in this area was found, and no residential construction had occurred at the site. No indication of groundwater use or excavation activity was found, and the excavation restriction sign was clearly visible (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. Accompanied by ADEC, an existing 420,000-gallon field-constructed tank (10262-A1) that last contained mogas was inspected.

SA 76, Old Line Shed Building

The ICs and ECs at SA 76 are listed in Table 4-1. During the inspection in August 2010, one dumpster was observed on site. No residential construction had occurred at the site. No indication of groundwater use or excavation activity was found. No change to the site was observed, compared to the 2009 inspection results. Usage of the site remains within the IC

requirements of commercial/industrial. The ICs required at this location include soil excavation restriction. However, no sign was present at the site. Therefore, placement of a soil excavation restriction sign at the site was recommended.

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SA 76 as were documented by the annual inspection.

SA 78, Old Transportation Building

The ICs and ECs for SA 78 are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. There was no evidence of excavation. Four new "No Excavation" signs were installed at the site during the 2010 field season (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SA 78 as were documented by the annual inspection.

SA 88, P-70 Energy Generator

The ICs and ECs for SA 88 are listed in Table 4-1. During the inspection in September 2009, there was no indication of a change in land use in this area, and no residential construction had occurred at the site. There was no evidence of excavation. Two new "No Excavation" signs were installed at the site during the 2010 field season, and two damaged monitoring well casings noted last year have been removed and have been decommissioned per ADEC requirements (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at SA 88 as were documented by the annual inspection.

ASR-8

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted lead acid and nickel cadmium batteries within the building. Since this building was a secure facility during hazardous material inspections, they would not have been noted by the inspector. It is recommended that the Navy remove these batteries from the building and check for emergency lighting fixtures for batteries.

Finger Bay Quonset Hut, UST FBHQ-1

The ICs and ECs at the Finger Bay Quonset Hut are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. No indication of a change in land use in this area was found, and no residential construction had

occurred at the site. No indication of groundwater use or excavation activity was found, and the excavation restriction sign was clearly visible. The sign was observed to have bullet holes in it, but it was still completely legible. However, the sign is not located where the building was. It is therefore recommended that an additional excavation restriction sign be placed closer to the Quonset hut's former location (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at the Finger Bay Quonset Hut as were documented by the annual inspection. Additionally, the inspectors noted the backfill from the limited soil removal requires revegetation.

MAUW Compound, UST 24000-A

The ICs and ECs at the MAUW Compound UST 24000-A are listed in Table 4-1. During the inspection in August 2010, no indication that groundwater was being used was found at this site. No residential construction has occurred at the site. No indication of excavation activity was found, and excavation restriction signs were clearly visible. A land use change was noted: a rental car storage and maintenance facility has been established in the farthest west bunker (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at the MAUW Compound as were documented by the annual inspection. Because there is vehicle maintenance being performed, there is the possibility of fluid leaks from activities at the site. Any such leaks would not be a Navy issue.

Mount Moffett Power Plant 5, USTs 10574 through 10577

The ICs and ECs at the Mount Moffett Power Plant 5 are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. No indication of a change in land use in this area was found, and no residential construction had occurred at the site. No indication of groundwater use or excavation activity was found, and the excavation restriction sign was clearly visible (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at the site as were documented by the annual inspection. However, the inspectors noted several leaking transformers on the northwest corner of Building 10359 near the site. It is recommended that the landowner collect soil samples and analyze for PCBs at both the transformer/switch-bank locations and under the cables. ADEC representatives were on site during the inspection and documented the conditions.

NMCB Building Area, T-1416 Expanded Area

The ICs and ECs at the NMCB Building Area, T-1416 Expanded Area are listed in Table 4-1. During the inspection in August 2010, no indication that groundwater was being used was found at this site. No residential construction has occurred at the site. No indication of excavation activity was found, and excavation restriction signs were clearly visible. No indication of a change in land use in this area was found, compared to last year. Compared to last year's inspection, some of the same findings were observed, including trash, rock debris, and old equipment being stored on the south side and between the two buildings. Additionally, five poly drums were observed to be located in the same place on the south side of the west building. An approximately 5-foot-diameter area of oil-stained soil was observed under the drums. A portable, 150-gallon gasoline tank was located on the west side of the east building in a lined, bermed area which is in poor condition. The two tanker trucks in front of the east building noted last year have been removed, as well as the three 55-gallon drums of motor oil. One car battery remains on the northeast corner of the east building. Because these poor housekeeping practices may be contributing to groundwater contamination, it is recommended that the owners be notified to remove the on-site wastes, address the areas of actual or potential spills, and improve housekeeping practices (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at the NMCB Building Area, T-1416 Expanded Area as were documented by the annual inspection.

Old Fuel Truck Stop

In August 2010, a site inspection was performed at SA 85, New Baler Building to support the 5-year review. This site is next to the Old Fuel Truck Stop that was investigated prior to the ROD and is listed as an NFA site. Located just east of SA 85, the Old Fuel Truck Stop site is used to burn municipal garbage. It is unknown if a fuel source is used to light the garbage. When the garbage is burned, black smoke is highly visible. The contents of the garbage are unknown. However, there is no recycling program on Adak, and therefore, what may normally be recycled elsewhere (notably plastics) is burned here. It is recommended that the Navy request that municipal garbage burning is performed on a concrete or asphalt surface away from one of the Navy's former investigation sites.

South of Runway 18-36 Area

The ICs and ECs at South of Runway 18-36 Area are listed in Table 4-1. During the inspection in August 2010, there was no indication of a change in land use in this area. No residential construction had occurred at the site. There was no indication of excavation activity. No indication of tampering with the product-recovery system was found. Therefore, ICs appear to be

functioning as intended to protect human receptors from exposure to soil or groundwater (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at South of Runway 18-36 Area as were documented by the annual inspection. Additionally the inspectors noted an unused product-recovery system. It is recommended the Navy investigate dismantling the system.

Sweeper Cove

The ICs at Sweeper Cove are listed in Table 4-1. Educational surveys were conducted to evaluate the effectiveness of the fish advisory fact sheet that was distributed to every resident in 2010. The survey asked if the participant was aware that fish advisories were in existence. Fourteen of 16 residents were aware of the fish advisory. Based on this, the IC fact sheet appears to be effective in distributing the fish advisory (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspectors noted that significant dredging of sediment was being performed to deepen the small boat harbor.

Tanker Shed

The ICs and ECs at Tanker Shed are listed in Table 4-1. During the inspection in August 2010, no change to the site was observed, compared to the 2009 inspection results. An abandoned remediation system was observed on site that contains two 55-gallon drums and hoses in a poly container. During the inspection, the site appeared not to be in use. No residential construction had occurred at the site, and excavation restriction signs were clearly visible. No indication of groundwater use or excavation activity was found at the site. Therefore, ICs appear to be functioning as intended to protect human receptors from exposure to soil or groundwater. However, it is recommended that the Navy consider removing the abandoned remediation system from the site (U.S. Navy 2011b).

In August 2010, a site inspection was performed to support the 5-year review. The inspection noted similar site conditions at Tanker Shed as were documented by the annual inspection.

OU B-1 and OU B-2 Ordnance Areas

The perimeter fencing and access gates of SA 93 WWII Mortar Impact Area were inspected. The 2010 inspection results included the following:

- All areas of damaged fence noted in the 2008 and 2009 IC inspection reports have been repaired.

- All missing signage along the fence lines previously noted have been replaced.
- A new gate and signs were installed on the northeast corner of SA 93.
- The eroded/sinkhole area at the eastern SA 93 perimeter fence-line road and the SA 82 road intersection had been repaired.

The southern perimeter fencing and southern gate of SWMU 1 Lake Andrew Waste Ordnance Demolition Range was inspected. The 2010 inspection results included the following:

- The gate along the southeast entrance to SWMU 1 was inspected and found to be locked and in good condition.
- Southern perimeter fencing near the gate appears to be intact.
- The two signs on both sides of the road at the south entrance road appeared to be in good condition.
- One new sign was installed on the road at the southern tip of Lake Andrew (Lake Jean) entrance a few days after the 2010 inspection at the direction of the Navy Technical Representative.
- The gate along the southwestern entrance to SA 93 at the Lake Andrew recreational cabin was inspected and found to be locked and in good condition. There is no sign present at the gate, and it is recommended that one be installed at the gate location.

During the inspection of Sites C3-01A through C3-01F and a portion of the western shore of Heart Lake, no evidence of landslides, sloughing, or obvious erosion was observed. At site C3-01A, the stream flowing into Heart Lake flows through the site. Additionally, an access road and hiking trails pass through the site and evidence of recreational use (e.g., fishing line and foot prints on the lake shore) was observed in this area. Access to this area is not restricted. An area of tall Rommel stakes was observed to the right (south) approximately 50 feet south of where the access road intersects the lake shoreline. Additionally, ATV tracks were observed adjacent to sites C3-01B, C3-01D, and C3-01F, but not on them. No other evidence of erosion, debris, structures, or usage was observed at sites C3-01A through C3-01F. Because there is evidence of recreation use near the remediated MEC area of C3-01A, the 2010 inspection report recommended that a general munitions warning sign be placed on the access road at the entrance of the site.

During the August 2010 inspections of Finger Bay sites FB-01 and FB-02, no evidence of landslides, sloughing, or obvious erosion was observed. The stream flowing into Finger Bay

flows through site FB-02. Additionally, an access road and hiking trails with ATV tracks appear to pass through site FB-02, and evidence of recreational use (e.g., hiking) was observed in this area. Two hikers were observed on the ridge above and behind FB-02. No other evidence of erosion, debris, structures, or usage was observed at the sites. Because there is recreation use near and possibly in these sites, it is recommended that a MEC warning sign be placed at the trailhead at the end of Finger Bay Cove road.

The inspections of Sweeper Cove Site HH-01 and Husky Pass Sites ML-01A, ML-01B, and ML-01C found no evidence of landslides, sloughing, obvious erosion, structures, debris, or use of any kind of the sites. ICs appear to be functioning properly.

The dispute resolution decision regarding OU B-1 sites signed in February 2003 by EPA, ADEC, and the Navy states, "Navy will use the attached checklist (Attachment 1) to carry out the required CERCLA five-year reviews for Adak Island for OU B-1 sites (including C3-01A and FB-03) to ensure that the remedial actions taken remain protective of human health and the environment." Sites with slopes greater than 30 degrees and one 2004 field season site that were readily accessible were inspected during this 5-year review period. The inspection of this subset of the OU B-1 sites met the expectations of ADEC and EPA, as expressed during the kickoff meeting with the agencies prior to the start of the 5-year review, and met the requirements of the ICMP. The OU B-1 sites with slopes exceeding 30 degrees for which inspections are required by the ICMP every 5 years are C3-01A, C3-01B, C3-01C, C3-01D, C3-01E, C3-01F, FB-01, FB-03, HH-01, ML-01A, ML-01B, and ML-01C.

In January 2010, TAC reported finding 36 WWII-era blasting caps during cleanup of a fuel spill. The find was reported to EOD, who responded and disposed of the blasting caps by detonation in February 2010.

In July 2010, a DMM find was reported, possibly a 155-mm round without a fuze. The item was located outside of site MM-10G, but within Parcel 4. The find was forwarded to the EOD team for disposal in August 2010.

6.6 RESULTS OF INTERVIEWS

Interviews were conducted with persons familiar with the CERCLA and SAERA actions at Adak. Interviewees were selected from the Navy (NAVFAC Northwest), current property owners, regulatory and advisory agencies, and community members. Interview instructions and questions were sent to potential interviewees via hard-copy mail or e-mail. Responses to questions were returned either in writing, or through telephone interviews. Not all those invited to comment chose to do so. Interview responses are documented in Appendix B. Highlights of the interview responses are summarized in the following sections.

6.6.1 Navy Personnel

The Navy respondents reported an overall intensification of Navy efforts to educate the public and strengthen ICs and EC and noted that public involvement and buy-in was critical to successful ICs. See Section 6.5 for a discussion of updates to the ICs.

The Navy respondents were aware of a few community concerns regarding remedy implementation and overall protectiveness. One respondent noted a community concern regarding wheel-rut erosion on Mount Moffett. A community concern regarding community outreach was reported to have been addressed to the satisfaction of the RAB community co-chair. In one instance, the community expressed confusion in the response and notification requirements for an incidental munitions find. This issue was addressed by the Navy through a revision to the notification process. Regular operation, maintenance, and monitoring were reported as ongoing by the Navy respondents, and no unexpected difficulty was reported.

The Navy respondents reported that some instances of unauthorized access, unauthorized excavation, and vandalism to fences occurred during this 5-year review period. Releases of petroleum products or poor housekeeping related to petroleum products by entities other than the Navy were noted in the interview responses.

6.6.2 Landowners

The landowners providing interview responses included representatives from ADOT&PF, the City of Adak, and TAC. Respondents reported feeling either poorly informed about the environmental cleanup activities on Adak, or suggested that communications could be improved. The landowners reported a perception that cleanup activities were moving slowly, with an overall decrease in activity. None of the landowners reported any change in site conditions that could impact the protectiveness of the remedies. No landowner reported any vandalism, trespassing, or other incident that could impact the protectiveness of the remedy, and no landowner was aware of any community concerns regarding remedy implementation.

TAC expressed a concern that the IC components of the remedy limit redevelopment activity and requested more involvement in remedy decisions.

6.6.3 Agency Personnel

The agencies providing responses included ADEC and EPA. Responses from these agencies are summarized in the separate subsections that follow.

ADEC Interview Responses

The ADEC respondents reported feeling generally well informed overall regarding environmental actions on Adak. However, one respondent noted a lack of coordination regarding quality control issues during the 2009 field season and stated that this coordination issue has continued to persist through ongoing OU B-1 and OU B-2 activities. ADEC stated that better coordination was needed.

ADEC noted no change to land use, but expressed a concern that the increasing levels of DRO in groundwater indicate that monitored natural attenuation is not a sufficient remedy. ADEC also acknowledged ongoing concerns with the adequacy of the IC program, though it was also noted that the program had recently been greatly improved by the Navy.

With regard to changes in applicable or relevant and appropriate requirements (ARARs) and new scientific findings potentially calling into question remedy protectiveness, ADEC reported that 18 AAC 75 was amended as of January 2009.

ADEC indicated that there are environmental housekeeping issues (leaking drums, oil stains, etc.) at several sites, including SWMUs 15, 17, and 55. The Navy has documented this in the annual ICs inspection reports, and ADEC and EPA are working with the landowner to address these issues.

ADEC reported no complaint or violation requiring their response.

ADEC reported the discovery of a case of blasting caps that required EOD response. ADEC noted that it took several weeks for the response, but that a more timely response was likely during any future incidents, based on the resolution to this incident. ADEC also noted a transformer oil release and destruction of signs and monitoring wells caused by a contractor hired by the property owner to recover metal. The Navy contacted the property owner and this salvage operation ceased.

ADEC noted a community concern regarding clearing the area around Andrew Lake so that residents can access the lake. ADEC noted that the Navy addressed the community concern of large-diameter borings in the downtown area.

Regarding suggestions for monitoring of the remedies, ADEC noted that a team has been created to optimize the monitoring of petroleum sites.

EPA Interview Responses

The EPA respondent reported feeling well informed overall regarding environmental actions on Adak. With regard to changed site conditions that could impact remedy protectiveness, EPA noted a concern regarding the property owners' commitment to LUCs.
With regard to changes in ARARs and new scientific findings potentially calling into question remedy protectiveness, EPA noted that the maximum contaminant level (MCL) for arsenic in drinking water is 10.0 µg/L as of January 23, 2006. Changes to ARARs are addressed in this 5-year review in Section 7.2.

EPA noted that ADEC and the U.S. Coast Guard had responded to a large petroleum spill that was not the responsibility of the Navy. EPA also noted that work implemented at OU B-1 was not done pursuant to the approved work plans, which may impact assessment of the functionality of the remedy. EPA also noted in the response to this question that the landowners have not consistently adhered to the LUCs.

EPA reported that the TAC representatives on the RAB have complained that the LUCs prevent usage of the land. EPA suggested that the Navy maintain vigilant oversight of LUC adherence.

Regarding suggestions for monitoring of the remedies, EPA suggested that there be an increase of real-time monitoring and an increased focus on preserving the institutional knowledge regarding monitoring procedures.

6.6.4 Community

Six community members provided interview responses. Respondents included representatives of the Alaska Maritime National Wildlife Refuge, which is managed by the USFWS, a Sierra Club volunteer, and several current and former citizens of Adak. All of the respondents reported feeling well informed about environmental cleanup activities on Adak. One respondent, however, made specific recommendations regarding presentation materials and content and methods of communication. This respondent stated the opinion that signs and occasional presentations were not enough for robust ICs. Another respondent noted that the maps available on the website don't show overlays of the OU B boundaries.

The USFWS reported entry into a closed area by scientists working under a permit that did not allow access to the area entered. The USFWS took steps to reduce the risk of repeat incidents. The USFWS expressed concerns regarding the adequacy of UXO cleanup as planned. USFWS also noted that remediation equipment is not always removed when a project is complete, and it should be.

Community members expressed a concern that more island services could be used as part of the cleanup and noted that "there is still fuel coming out of the ground." One community member expressed the opinion that the UXO remediation was "somewhat overdone."

Several respondents indicated that the remediation efforts to date have had positive results in the community and are generally appreciated.

Table 6-1
Concentration Trend Evaluation for Monitored Natural Attenuation Sites

Site	Well ID	Target Analyte	Initial Monitored Concentration (µg/L)	Latest Result (µg/L)	Current Endpoint (µg/L)	Number of Sampling Periods	Latest Mann-Kendall Statistic	Mann-Kendall Trend			Sen's Slope			
								Trend at 80% C.I.	Trend at 95% C.I.	Stable	Median Slope	Statistically Significant Trend	Lower Limit	Upper Limit
Former Power Plant, Building T-1451	01-118	DRO	7,080	7,100	1,500	10	-14	Decreasing	No trend	Yes	-400	No	-820	NC
	01-150	DRO	394	1,300	1,500	7	12	Increasing	No trend	No	NC	NC	NC	NC
	01-151	DRO	1,590	4,600	1,500	8	14	Increasing	No trend	No	NC	NC	NC	NC
GCI Compound, UST GCI-1	04-100	GRO	5,300	3,100	1,300	8	-9	Decreasing	No trend	No	-160	No	-367	214
	04-202	GRO	5,100	3,300	1,300	4	-2	No trend	No trend	Yes	NC	NC	NC	NC
	04-204	GRO	230	300	1,300	5	NC	NC	NC	No	NC	NC	NC	NC
	04-210	GRO	5,000	4,800	1,300	7	3	No trend	No trend	Yes	NC	NC	NC	NC
	04-213	GRO	3,800	3,300	1,300	5	-2	No trend	No trend	Yes	NC	NC	NC	NC
Housing Are (Arctic Acres)	03-416	DRO	3,450	1,300	1,500	3	NC	NC	NC	NC	NC	NC	NC	NC
	03-420	DRO	12,300	2,200	1,500	9	-23	Decreasing	Decreasing	No	-581	Yes	-1,100	-320
	03-421	DRO	81,300	3,800	1,500	4	-2	No trend	No trend	No	NC	NC	NC	NC
	03-422	DRO	90,600	120	1,500	5	NC	NC	NC	NC	NC	NC	NC	NC
	03-890	DRO	5,600	10,000	1,500	4	-4	Decreasing	No trend	No	NC	NC	NC	NC
	AA-02	DRO	455	98	1,500	2	NC	NC	NC	NC	NC	NC	NC	NC
	AA-06	DRO	250	48	1,500	2	NC	NC	NC	NC	NC	NC	NC	NC
ROICC Contractor's Area, UST ROICC-7	08-175	Benzene	1.1	0.15	5	10	NC	NC	NC	NC	NC	NC	NC	NC
	08-200	Benzene	390	310	5	10	-4	No trend	No trend	Stable	NC	NC	NC	NC
	08-202	Benzene	24	12	5	10	-28	Decreasing	Decreasing	NA	-0.8	Yes	-1.14	-0.64
Runway 5-23 Avgas Valve Pit	14-100	GRO	1,000	2,200	1,300	10	-1	No trend	No trend	Stable	NC	NC	NC	NC
	14-110	GRO	920	730	1,300	10	NC	NC	NC	NC	NC	NC	NC	NC
SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs	12-145	DRO	850	2,000	15,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	12-145	GRO	4,500	4,100	13,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	12-145	Benzene	160	6.4	50	7	NC	NC	NC	NC	NC	NC	NC	NC
	12-802	DRO	250 U	26 J	15,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	12-802	GRO	18.9 UJ	100 U	13,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	12-802	Benzene	0.5 U	0.5 U	50	7	NC	NC	NC	NC	NC	NC	NC	NC
	MW-116	DRO	77 J	28 J	15,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	MW-116	GRO	12 J	NP	13,000	7	NC	NC	NC	NC	NC	NC	NC	NC
	MW-116	Benzene	1.0 U	NP	50	7	NC	NC	NC	NC	NC	NC	NC	NC
	MW-117	DRO	1,200	1,100	15,000	5	NC	NC	NC	NC	NC	NC	NC	NC
	MW-117	GRO	3,500	2,300	13,000	5	NC	NC	NC	NC	NC	NC	NC	NC
	MW-117	Benzene	29	3.3	50	5	NC	NC	NC	NC	NC	NC	NC	NC
SA 79, Main Road Pipeline, South End	MRP-MW8	DRO	2,790	2,700	1,500	10	2	No trend	No trend	Yes	NC	NC	NC	NC
	02-230	DRO	4,230	4,000	1,500	10	-1	No trend	No trend	Yes	NC	NC	NC	NC

Table 6-1 (Continued)
Concentration Trend Evaluation for Monitored Natural Attenuation Sites

Site	Well ID	Target Analyte	Initial Monitored Concentration (µg/L)	Latest Result (µg/L)	Current End point (µg/L)	Number of Sampling Periods	Latest Mann-Kendall Statistic	Mann-Kendall Trend			Sen's Slope			
								Trend at 80% C.I.	Trend at 95% C.I.	Stable	Median Slope	Statistically Significant Trend	Lower Limit	Upper Limit
SA 80, Steam Plant 4, USTs 27089 and 27090	04-158	DRO	7,310	13,000	1,500	2	NC	NC	NC	NC	NC	NC	NC	NC
	04-159	DRO	1,410	4,000	1,500	6	5	No trend	No trend	Yes	NC	NC	NC	NC
	04-173	DRO	2,560	3,200	1,500	2	NC	NC	NC	NC	NC	NC	NC	NC
	04-801	DRO	250	15 J	1,500	5	NC	NC	NC	NC	NC	NC	NC	NC
	SP4-3	DRO	3,400	5,700	1,500	7	-3	No trend	No trend	Yes	NC	NC	NC	NC
South of Runway 18-36 Area	02-231	DRO	1,200	7,100	15,000	11	NC	NC	NC	NC	NC	NC	NC	NC
	02-232	DRO	160	2,400	15,000	11	NC	NC	NC	NC	NC	NC	NC	NC
	AS-1	DRO	2,800	1,500	15,000	4	NC	NC	NC	NC	NC	NC	NC	NC
	E-208	DRO	270	49	15,000	10	NC	NC	NC	NC	NC	NC	NC	NC
	E-218	DRO	190	1,600	15,000	11	NC	NC	NC	NC	NC	NC	NC	NC
	RW-18/36-03	DRO	120	77	15,000	4	NC	NC	NC	NC	NC	NC	NC	NC
SWMU 14, Old Pesticide Storage and Disposal Area	01-153	DRO	540	430	1,500	10	-11	Decreasing	No trend	NA	-90	No	NC	NC
	01-153	GRO	1,700	100	1,300	10	-13	Decreasing	No trend	NA	-375	No	NC	NC
	01-153	PCE	27	6	5	8	-6	Decreasing	Decreasing	NA	-0.995	Yes	-2.8	-0.29
	MW14-5	DRO	3,800	1,900	1,500	8	NC	NC	NC	NC	NC	NC	NC	NC
	MW14-5	GRO	13,000	9,000	1,300	8	NC	NC	NC	NC	NC	NC	NC	NC
	MW14-5	Total Lead	83.6	14.4	15	10	-21	Decreasing	Decreasing	NA	-1.75	Yes	-2.87	-0.95
	MW14-5	Dissolved Lead	84.6	13.8	15	10	-21	Decreasing	Decreasing	NA	-1.67	Yes	-3.6	-0.74
SWMU 15, Future Jobs/DRMO	MW15-3	PCE	12.3	4.2	5	10	-15	Decreasing	No trend	NA	-0.59	No	NC	NC
SWMU 17, Power Plant No. 3	05-735	DRO	698	690	15,000	9	NC	NC	NC	NC	NC	NC	NC	NC
	05-735	PCE	10	1.3	5	10	NC	NC	NC	NC	NC	NC	NC	NC
	05-735	Cis-1,2-DCE	189	400	70	10	-5	No trend	No trend	Yes	NC	NC	NC	NC
	05-735	Vinyl chloride	4.18	4.3	2	10	-3	No trend	No trend	Yes	NC	NC	NC	NC
	HC-2	DRO	2,100	2,900	15,000	3	NC	NC	NC	NC	NC	NC	NC	NC
	HC-3	DRO	1,300	810	15,000	4	NC	NC	NC	NC	NC	NC	NC	NC
	PP-05	DRO	8,500	8,500	15,000	2	NC	NC	NC	NC	NC	NC	NC	NC
	R-1	DRO	3,730	1,300	15,000	8	NC	NC	NC	NC	NC	NC	NC	NC
	R-2	DRO	77	220	15,000	3	NC	NC	NC	NC	NC	NC	NC	NC
	R-5	DRO	1,900	1,800	15,000	4	NC	NC	NC	NC	NC	NC	NC	NC
	R-6	DRO	12,000	5,000	15,000	7	NC	NC	NC	NC	NC	NC	NC	NC
SWMU 55, Public Works Transportation Department Storage Tank	55-145	PCE	180	49	5	10	-41	Decreasing	Decreasing	NA	-12.75	Yes	-18.2	-9
SWMU 58 and SA 73, Heating Plant 6	12-105	DRO	7,800	6,400	15,000	2	NC	NC	NC	NC	NC	NC	NC	NC
	12-114	DRO	9,400	4,300	15,000	5	NC	NC	NC	NC	NC	NC	NC	NC
	12-121	DRO	19,000	1,300	15,000	5	NC	NC	NC	NC	NC	NC	NC	NC
	12-203	DRO	51,000	17,000	15,000	2	NC	NC	NC	NC	NC	NC	NC	NC

Table 6-1 (Continued)
Concentration Trend Evaluation for Monitored Natural Attenuation Sites

Site	Well ID	Target Analyte	Initial Monitored Concentration (µg/L)	Latest Result (µg/L)	Current End point (µg/L)	Number of Sampling Periods	Latest Mann-Kendall Statistic	Mann-Kendall Trend			Sen's Slope			
								Trend at 80% C.I.	Trend at 95% C.I.	Stable	Median Slope	Statistically Significant Trend	Lower Limit	Upper Limit
SWMU 60, Tank Farm A	LC-5A	DRO	1,100	860	1,500	9	NC	NC	NC	NC	NC	NC	NC	NC
	MW-E006	Benzene	19	8.1	5	8	-3	No trend	No trend	Yes	NC	NC	NC	NC
SWMU 61, Tank Farm B	14-113	GRO	2,000	3,800	1,300	8	-3	No trend	No trend	Yes	NC	NC	NC	NC
	14-113	Benzene	34	12	5	8	-24	Decreasing	Decreasing	NA	-3.35	Yes	-4.88	-2.14
	14-210	GRO	5,900	4,200	1,300	10	9	No trend	No trend	Yes	NC	NC	NC	NC
	TFB-MW4B	GRO	36,500	46,000	1,300	10	19	Increasing	No trend	NA	NC	NC	NC	NC
	TFB-MW4B	Benzene	54	30	5	10	-30	Decreasing	Decreasing	NA	-2.71	Yes	-4.6	-0.17
	TFB-MW4B	Toluene	3,270	4,600	1,000	10	11	Increasing	No trend	NA	NC	NC	NC	NC
	TFB-MW4B	Ethyl-benzene	1,100	2,100	700	10	17	Increasing	No trend	NA	NC	NC	NC	NC
	TFB-MW4B	Total xylenes	7,850	15,700	10,000	10	27	Increasing	Increasing	NA	NC	NC	NC	NC
SWMU 62, New Housing Fuel Leak, Sandy Cove	03-104	DRO	9,000	5,200	1,500	4	0	No trend	No trend	Yes	NC	NC	NC	NC
	03-155	DRO	750	2,500	1,500	8	14	Increasing	No trend	NA	NC	NC	NC	NC
	03-778	DRO	1,800	2,400	1,500	5	0	No trend	No trend	Yes	NC	NC	NC	NC
	HMW-146-3	DRO	1,900	1,700	1,500	5	0	No trend	No trend	Yes	NC	NC	NC	NC
	MRP-MW2	GRO	3,100	2,300	1,300	4	-2	No trend	No trend	Yes	NC	NC	NC	NC
	MRP-MW2	Benzene	39	43	5	4	2	No trend	No trend	Yes	NC	NC	NC	NC
	MW-107-1	DRO	3,400	4,400	1,500	5	5	No trend	No trend	Yes	NC	NC	NC	NC
	MW-134-11	DRO	7,450	4,900	1,500	7	-6	No trend	No trend	Yes	NC	NC	NC	NC
	MW-146-1	DRO	12,000	13,000	1,500	4	1	No trend	No trend	Yes	NC	NC	NC	NC
	MW-187-1	DRO	3,900	4,400	1,500	5	0	No trend	No trend	NA	NC	NC	NC	NC
	MW-187-1	Benzene	18	3.6	5	5	-8	Decreasing	Decreasing	NA	-3.47	Yes	-6	-1.5
SWMU 62, New Housing Fuel Leak, Eagle Bay	03-502	GRO	8,200	1,500	1,300	5	-10	Decreasing	Decreasing	NA	-1,610	Yes	-1,900	-1,450
	AMW-704	DRO	2,500	3,800	1,500	5	2	No trend	No trend	Yes	NC	NC	NC	NC
	RW-303-13	DRO	3,400	2,100	1,500	4	-2	No trend	No trend	Yes	NC	NC	NC	NC
	RW-303-16	DRO	10,000	8,600	1,500	5	0	No trend	No trend	Yes	NC	NC	NC	NC
Tanker Shed, UST 42494	04-175	DRO	16,900	6,100	1,500	6	-5	No trend	No trend	Yes	NC	NC	NC	NC
	04-290	DRO	9,220	4,300	1,500	6	2	No trend	No trend	Yes	NC	NC	NC	NC
	04-306	DRO	2,500	4,300	1,500	4	0	No trend	No trend	Yes	NC	NC	NC	NC
	04-306	GRO	1,460	1,500	1,300	4	0	No trend	No trend	Yes	NC	NC	NC	NC

Notes:
C.I. - confidence interval
DCE - dichloroethene
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated concentration
µg/L - microgram per liter
NC - evaluation not conducted
PCE - tetrachloroethene
U - not detected

7.0 TECHNICAL ASSESSMENT

7.1 FUNCTIONALITY OF REMEDY

This section answers the question, "Is the remedy functioning as intended by the decision documents?" The functionality of the remedy components applicable to each site is summarized by OU in the sections that follow.

7.1.1 Functionality of Remedy for Operable Unit A

Is the OU A remedy functioning as intended by the OU A ROD and SAERA decision documents? The remedy is functioning as intended by the OU A ROD and the SAERA decision documents for 174[1] of 179[2] of the OU A and post-ROD sites on Adak. All of the remedy components required by the OU A ROD have been implemented and are functioning as intended by the ROD for all of the OU A sites, other than those four discussed below. The landfill caps and covers have been constructed and are regularly inspected and maintained. The ponds at SWMU 17, Power Plant No. 3 have been drained, dredged, and restored. Impacted sediment has been removed from South Sweeper Creek, and limited soil removals have been completed at all of the petroleum sites selected for this remedy component. Interim remedial action product recovery has been performed at the 14 free-product recovery petroleum sites.

An ICMP is in place, and IC inspections occur annually. Deficiencies are identified and corrective action is consistently taken. The inspection and associated follow-up is functioning as intended. Excavation notification and management processes improved over the course of this review period (see year-by-year discussions in Section 6.5) and are functioning well. Long-term monitoring has been initiated and is ongoing. The long-term monitoring goals and requirements are periodically revisited to maintain focus on the endpoint goals. The Navy and USGS have shown that natural attenuation of petroleum compounds continues to occur on Adak, and natural attenuation monitoring is part of the long-term monitoring program. Where the data support a quantitative estimate, it appears that natural attenuation can be reasonably expected to achieve endpoint criteria within 75 years of ROD execution.

The final remedy established under SAERA decision documents has been implemented at all of the 14 free-product sites. Limited groundwater monitoring, implementation of ICs, and

[1]Although the remedy is considered to not be functioning as intended for only four sites (listed later in this section), one of those four sites (NMCB Building Area) is actually a combination of two NMCB sites that were part of the 178 sites in the OU A ROD.
[2]178 OU A sites (see Section 3.1) plus the Tango Pad site (post-ROD site)

monitored natural attenuation have been implemented where required through adjustments to the CMP.

The additional remedy components required under the SAERA decision documents for the NMCB Building Area, SWMU 62, and South of Runway 18-36 were implemented in 2006 (U.S. Navy 2007c). These additional components included soil hot spot removal, additional monitoring and free product recovery wells and trenches, and deployment and operation of free-product recovery systems. Implementation of the last component, deployment and operation of free-product recovery systems, may have been implemented at these three sites in accordance with the decision documents. Although the deviation of the free-product recovery methodology from the decision document methodology would not, by itself, necessarily indicate that the remedies were not functioning as intended at these sites, other evidence calls into question the functionality of the remedy at NMCB Building Area, as discussed further below.

The remedy is not functioning as intended for the following four sites:

- Former Power Plant, Building T-1451
- SWMU 60, Tank Farm A
- SWMU 61, Tank Farm B
- NMCB Building Area, T-1416 Expanded Area

At the Former Power Plant and SWMU 60, ongoing impacts at adjacent surface water bodies indicate that the monitored natural attenuation remedy selected in the OU A ROD is not functioning as intended. Additional investigation was performed at these sites in 2010 in preparation for additional action.

At SWMU 61, Tank Farm B, increasing or elevated concentrations in groundwater samples from monitoring wells and the surface water protection well call into question the functionality of the remedy. However, dissolved petroleum hydrocarbons have not been measured in surface water above ADEC criteria, despite the occasional observation of a sheen. The area where impacted groundwater is present is a wetland, and the potential harm of any additional remedial action to supplement monitored natural attenuation selected in the ROD outweighs the potential benefit.

At NMCB Building Area, free-product thicknesses appear to be increasing in three surface water protection wells (02-818, NMCB-07, and NMCB-10). In addition, the maximum free product thickness measured at the site since monitoring began in 2006 was measured in 2010 at five wells, including two surface water protection wells (02-818 and NMCB-10). This product thickness trend calls into question the functionality of the remedy at this site, and additional actions should be evaluated as required by the decision document.

7.1.2 Functionality of Remedy for Operable Unit B-1

Is the OU B-1 remedy functioning as intended by the OU B-1 ROD? The OU B-1 remedy is functioning as intended by the OU B-1 ROD.

The selected remedies have been implemented at all of the 50 action sites identified in the OU B-1 ROD, although the remedy cannot be considered complete at all 50 sites until all of the after-action reports are complete, documentation of remedy implementation is complete, and concurrence from the regulatory agencies is received (see Section 4.2.3 for a discussion of these outstanding items). Conditional closure has been achieved for 18 of the 50 sites. ADEC and EPA have not yet concurred with all of the remedial actions, and, therefore, the remedy cannot be considered complete at all sites.

Key components of the OU B-1 remedy are the ICs and LUCs, including the ordnance awareness program and the excavation restrictions. The functionality of these remedy components is much improved, compared to the previous 5-year review. However, the interview responses and annual survey results indicate that improvements to the ordnance awareness program will be an ongoing effort by the Navy. A key measure of the functionality of these components is the frequency and severity of ordnance encounter incidents. One or more incidents of ordnance encounters by the public or contractors were reported during this 5-year review period (see Section 6.5). In each case, the ordnance finds were reported to the EOD team as required by the ordnance awareness training, indicating that ordnance awareness is functioning well.

7.1.3 Operation and Maintenance Costs

O&M costs were generally stable over this 5-year review period and totaled $1.78 million for this 5-year review period. Monitoring costs were similar from year to year and totaled $9.64 million for this 5-year review period. Landfill repair costs were incurred during several repair events over the course of this 5-year review period. The costs of landfill repairs compared to historical costs did not indicate a trend of increasing repair activity.

The trends in operation, maintenance, and monitoring costs are not indicative of any remedy problems.

7.2 CONTINUED VALIDITY OF ROD ASSUMPTIONS

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes.

This section reviews any changes to ARARs used to establish remediation goals (RGs) in the RODs and SAERA decision documents and reviews any changes to risk assessment assumptions (exposure and toxicity) to evaluate the protectiveness of the remedy. The findings documented in this section are that changes in the ARARs, exposure, and toxicity assumptions that have occurred since the RODs and SAERA decision documents were signed do not affect the protectiveness of the remedies. Concentrations of many chemicals in groundwater remain above the RGs within the downtown area of Adak at the majority of locations where long-term monitoring is occurring. This results in the need for continued ICs to prevent exposure and the need for ongoing monitoring. Although some of the RGs might be lower if selected today, the remedy components continue to protect against exposures, just as they did at the time the ROD was signed. ICs preventing exposure and ongoing monitoring will need to continue until COC concentrations in groundwater are below the RGs. As per the second 5-year review recommendation, the endpoint criteria being used to evaluate sediment concentrations at SWMU 11, Palisades Landfill were found to be unnecessarily restrictive and were revised in the CMP, Revision 4, to more closely reflect potential health risks due to sediment exposures at SWMU 11. Therefore, the CMP, Revision 4, values are presented here, and earlier endpoint criteria do not require assessment.

7.2.1 Review of Applicable or Relevant and Appropriate Requirements

In the preamble to the NCP, EPA stated that ARARs are generally "frozen" at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA 2001) indicates that the question of interest in developing the 5-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether this change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old and the new standards and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still below the ROD-specified acceptable excess cancer risk range maximum of 1×10^{-5}[3]. If the old standard is not considered protective, a new cleanup standard may need to be adopted after the 5-year review through CERCLA's processes for modifying a remedy.

During the first and second 5-year review for Adak, no substantive change was found to ARARs that would call into question the protectiveness of the remedy. For this 5-year review, all the ARARs identified in the RODs for OU A and OU B-1 were again reviewed for changes that could affect the assessment of whether the remedy is protective.

[3]This number is both the ADEC risk goal and the target risk goal established in the ROD. However, the EPA's acceptable standard risk range is from 1×10^{-4} to 1×10^{-6}.

Some ARARs that were used in the determination of cleanup levels have been amended since publication of one or both of the two RODs. These amended regulations are the following:

- Alaska 18 AAC 75 cleanup levels (ADEC 2009)
- Federal and state drinking water regulations (MCLs) (USEPA 2009)
- Federal national recommended water quality criteria for protection of surface water (USEPA 2009)

The result of the amendments to the regulations is sometimes the lowering of a numeric ARAR. In these instances, the revised ARAR must be evaluated to determine whether there is a negative effect on the protectiveness of the remedy (in other instances, the ARAR remains unchanged, or has been raised).

Operable Unit A – CERCLA Sites

As discussed in earlier sections, the CERCLA sites were divided into three broad categories: landfills, sites requiring ICs because of excess health risks (either human or ecological), and sites requiring active cleanup. Two additional landfills, Roberts and White Alice Landfills (SWMUs 25 and 18/19), are included in this discussion, although they are being addressed under the State's solid waste disposal regulations, rather than CERCLA. Numeric RGs were established only for marine tissue and for sediment at SWMU 17. For ongoing monitoring of groundwater and sediments at SWMU 11, Palisades Landfill, the first long-term monitoring plan (U.S. Navy 2001a, Appendix E) established "criteria endpoints" that have been used to evaluate the groundwater and sediment results. No numeric RG was established in the ROD for groundwater or soil at CERCLA sites. Changes to ARARs and endpoint criteria because of changes in the regulations are discussed below by media.

Soil. The OU A ROD did not identify any COC in soil, and therefore no RG or criterion endpoint was established for CERCLA sites. The impact of changes in soil ARARs on sites that were previously designated as "no further action" are discussed in Section 7.2.2 under risk assessment assumptions.

Groundwater. For all groundwater that could be used as drinking water, the ROD established criteria endpoints as the federal MCLs or Alaska State MCLs (18 AAC 73.345, Table C) (but did not provide numeric RGs in the ROD itself). Additionally, for all groundwater, regardless of its potential use as a drinking water source, the ROD established state and federal surface water quality standards as RGs at groundwater monitoring locations between impacted areas and downgradient surface water (again, numeric RGs were not specified in the ROD). Ongoing groundwater monitoring is occurring at SWMUs 14, 15, 17, and 55 and at all four landfills with

active monitoring (SWMUs 11, 13, 18/19, and 25). The groundwater COCs identified in the OU A ROD because of exceedances above MCLs at the time of the ROD (Section 10.3 of the OU A ROD; U.S. Navy, USEPA, and ADEC 2000) are the following:

- Benzene
- Bis(2-ethylhexyl)phthalate
- GRO
- Lead
- Methylene chloride
- Tetrachloroethene
- Ethylbenzene
- Thallium
- Toluene
- Trichloroethene

Table 7-1 compares current ARAR values for the groundwater pathway with the endpoint criteria that have been used in the long-term monitoring program (the numeric values were based on the regulations cited in Section 10.3.5 of the OU A ROD as the applicable cleanup criteria, but were formalized in the first CMP published in 2001; the current CMP is the fourth revision and was published in 2010). There has been only one change to the MCL ARARs for the COCs listed in the ROD. The 18 AAC 75 groundwater cleanup level for GRO has increased, making the value less stringent. Therefore, the endpoint criteria used in the long-term monitoring program are still protective.

For the surface water criteria that the ROD indicated would be used to evaluate groundwater discharging to surface water, there are also cases where state and federal surface water quality standards for the COCs have changed. Where these standards have changed, the standards are now lower for some chemicals and higher for others. Surface water criteria changes are also noted in Table 7-1. Changes to surface water criteria do not affect the protectiveness of the remedy, because (1) all the groundwater monitoring at the CERCLA sites is of water that could be used as a drinking water source, and, thus, concentrations of COCs would have to meet MCLs before monitoring could be discontinued, and (2) with the exception of lead, all surface water ARARs shown in Table 7-1 are at higher concentrations than their respective MCLs, and the ARAR for lead in surface water has not changed.

The ongoing long-term groundwater monitoring occurring at the site has evaluated a much longer list of chemicals than the ROD COCs, varying by specific well and SWMU. This longer list of analytes was intended to include all detected chemicals in the analytical program (U.S. Navy 2004, Appendices A and B). Potential changes in ARARs for these additional chemicals were not evaluated in this 5-year review, because these chemicals are not COCs. As

recommended in Section 8, periodic updates to the CMP should consider ARAR changes for all analytes, including these additional chemicals. Although the CMP cannot change an endpoint criterion or RG that is established in a ROD or SAERA decision document, the CMP can note when changes to ARARs have occurred so that the project team can consider whether changing ARARs has any ramification for the monitoring program.

Surface Water. No specific COCs were provided in the OU A ROD for the surface water monitoring that the ROD required at landfill SWMUs 11, 13, 18/19, and 25. However, the ROD stated that surface water monitoring for SWMUs 11 and 13 should follow the requirements listed for groundwater. Consequently, the CMP established the state water quality standards (18 AAC 70) as the endpoint criteria and developed a list of COCs based on detected chemicals. Federal water quality criteria were used if no state criterion was available. Table 7-2 lists the COCs and endpoint criteria established in the CMP and compares current ARAR values for the surface water COCs and endpoint criteria presented in the long-term monitoring plan in the first CMP (U.S. Navy 2001a, Appendix F). The endpoint criteria in the CMP have been used as indicators for whether surface water at SWMUs 11, 18/19, and 25 requires continued monitoring or whether COCs in surface water can be considered to be without an appreciable human or ecological health risk.

For the majority of the surface water COCs, state and federal surface water quality standards have changed. Where these standards have changed, the standards are now lower for some chemicals and higher for others. The following ecological ARARs for surface water have decreased (become more stringent): arsenic, cadmium, chromium III, copper, mercury, nickel, and zinc. For human health ARARs, the following chemicals now have lower endpoint criteria as well: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, PCBs, toluene, trichloroethene, ethylbenzene, antimony, and thallium. For the chemicals trans-1,2-dichloroethene and selenium, there are now human health ARARS available while there were none prior to new criteria changes. These ARAR changes do not affect the protectiveness of the remedy, because the COCs are no longer being detected for the majority of these chemicals, or detections are low and relatively infrequent. Summary reports from the most recent annual landfill monitoring reports for SWMU 11 and SWMUs 18/19 report mostly nondetect results, with detected results all lower than current surface water ARARs (U.S. Navy 2007f, 2008d, 2009c, 2010g, and 2011c). The most recent annual landfill monitoring reports for SWMU 25 report data for copper only exceeding the old and current ecological ARAR for surface water. However, no other chemical exceeded new human health or ecological ARARs (U.S. Navy 2007f, 2008d, 2009c, 2010g, and 2011c).

Sediment. Cleanup levels for sediment removal at the SWMU 17 waste oil pond were based on 18 AAC 75 soil criteria for the site COCs: PCBs (1 mg/kg), antimony (3 mg/kg), and mercury (1.4 mg/kg). Soil criteria were used to determine when cleanup was complete, because the pond's water and sediment were removed and the remaining material would be soil, not

sediment. Sediment that was removed was treated until DRO and RRO concentrations met disposal requirements for Roberts Landfill (100 and 2,000 mg/kg, respectively). Neither cleanup levels nor treatment levels have changed since the OU A ROD was signed. PCBs were the only COC in sediments in the retention pond (also at SWMU 17) and the sediments in South Sweeper Creek. The PCB cleanup level used at those locations was also 1 mg/kg, based on state soil criteria. This value has also not changed. Therefore, the sediment removal remedies implemented at SWMU 17 and South Sweeper Creek remain protective, based on this assessment of ARARs changes.

Both fresh and marine sediments are part of the long-term monitoring of the effectiveness of the landfill cover (i.e., part of the engineering controls) at SWMU 11. No COC or RG was established in the ROD. Therefore, the risk-based levels used to screen sites in the preliminary source evaluation 2 (PSE-2) process (U.S. Navy 1996a) were selected as the endpoint criteria for SWMU 11 sediments, and COCs were selected based on historical chemical detections. Table 7-3 presents the endpoint criteria listed in Appendix F of the CMP, Revision 4 (U.S. Navy 2010a) and indicates whether they were based on human or ecological health. The lower of the two values was selected as the endpoint criteria. The risk basis of the endpoint criteria has changed since the ROD was signed. Based on recommendations from the second 5-year review, the endpoint criteria were reevaluated in the final CMP (U.S. Navy 2010a), because the previous values were unnecessarily protective. The final CMP values have been accepted by the stakeholders and are presented on Table 7-3.

Table 7-3 compares the ecologically based endpoint criteria with current Alaska soil cleanup levels (18 AAC 75) protective of human health and, for metals, site-specific background levels. There are no cleanup levels established for sediment. In most cases, values based on human health soil cleanup levels would be higher. Therefore, the endpoint criteria remain protective for both ecological and human receptors.

Marine Tissue. The ROD established risk-based RGs for fish and shellfish in Kuluk Bay and Sweeper Cover. PCBs were the only COC. The PCB RGs of 0.0065 and 0.031 mg/kg for fish and shellfish, respectively, would not be different if the risk-based levels were calculated today, because the toxicity and exposure criteria have not changed. The toxicity and exposure criteria used to calculate these RGs are discussed further in Section 7.2.2.

Operable Unit A – Petroleum Sites

Separate RGs were established for the petroleum and CERCLA sites. Table 7-4 lists the ROD RGs for the petroleum COCs in soil and groundwater. The ROD petroleum RGs were all based on Alaska state regulations 18 AAC 75.340, 341, and 345. Table 7-4 also indicates which values have changed since the signing of the ROD. Over half the soil RGs would be different if established today; only 3 out of 26 groundwater RGs would be different. However, none of the

changes affects the protectiveness of the remedy. Specific changes are discussed below by media.

Sixty-two petroleum sites were withdrawn from the OU A ROD via the OU A ROD Amendment 1, signed in 2003, and are being administered by State-lead cleanup regulations. Of the 62 sites removed from the OU A ROD, 46 sites were further action sites and 16 were NFA sites. All OU A ROD cleanup levels for the petroleum sites were based on state regulations. Therefore, for sites that have been previously remediated to the OU A ROD RG levels, the amendment does not affect cleanup or the protectiveness of the remedy.

Soil. ARAR values for soil have changed for many of the COCs, because 18AAC 75 soil cleanup level calculations now consider the dermal pathway (meaning exposures through both incidental ingestion of soil and through dermal absorption of the contaminant from soil). Table 7-4 shows that the majority of chemicals would have lower RGs if established today. Though many of the soil cleanup levels have changed for most COCs, DRO was the soil COC driving cleanup at the petroleum sites. Sites where soil petroleum concentrations exceeded 18 AAC 75 soil criteria for DRO were selected for limited soil removal. The 18 AAC 75 soil cleanup level for DRO has not changed. None of the changes to soil COC ARARs would affect the protectiveness of the remedy. Based on a review of soil data at petroleum sites, although most of the numeric soil ARARs changed to approximately half of their value (because of changes in exposure factors), these changes would not cause any new petroleum-related chemicals risk drivers. Xylenes (total) is the only chemical that was lowered by a significant amount (approximately one order of magnitude) from its ROD-listed RG. However, no soil data for petroleum sites have xylene concentrations above the new ARAR of 16,600 mg/kg.

Groundwater. The ARARs used to establish groundwater RGs for the petroleum sites were both those for groundwater as a source of drinking water and for groundwater as a contributor to surface water. Naphthalene is the only chemical listed in the OU A ROD for which the new ARAR value is lower (more stringent). The 18 AAC 75 groundwater cleanup level for naphthalene for the drinking water pathway is currently 0.7 mg/L, while the previous cleanup level was 1.46 mg/L. This change does not affect the protectiveness of the remedy, as long as ICs remain in place. Even if ICs were to be removed, naphthalene has never been detected in groundwater above 0.7 mg/L. The ARAR value for GRO has changed and is now higher (less stringent), indicating that the RG for GRO remains protective. Prior to this 5-year review, phenanthrene did not have a groundwater cleanup level, however now the 18 AAC 75 groundwater cleanup level is listed as 11 mg/L. This new ARAR does not affect the protectiveness of the remedy, because the chemical is no longer being detected in groundwater.

Free-Product Petroleum Sites—No Unacceptable Risk Sites

For the 14 free-product sites, site-specific RGs have been calculated based on risk assessments conducted according to ADEC guidance (ADEC 2000). These risk-based cleanup levels are different than the Alaska cleanup levels shown in Table 7-4. The following 10 of the 14 free-product sites were determined to pose no unacceptable risk to human health or the environment under current land use conditions. The remaining four free-product petroleum sites are discussed separately below.

- GCI Compound
- SA 80, Steam Plant 4
- Tanker Shed
- SA 78, Old Transportation Building
- SA 82, P-80/P-81 Buildings
- SA 88, P-70 Energy Generator
- SWMU 58, Heating Plant 6
- SA 73, Heating Plant 6
- Yakutat Hangar
- NORPAC Hill Seep Area

The RGs for these 10 sites were selected and approved by ADEC in the *Final Decision Document for Petroleum Sites With No Unacceptable Risk* (U.S. Navy and ADEC 2005a). It should be noted that although SWMU 58 and SA 73 were established as separate sites, they are both located at Heating Plant 6 and are addressed as a single site. The RGs selected for these 10 sites are discussed below.

Soil. Under the ADEC Method Four cleanup levels for soil, site-specific alternative cleanup levels (ACLs) may be proposed based upon results of the risk assessment conducted for an individual site. Proposed ACLs are submitted to the ADEC for approval. These ACLs are designated for an individual site if the ADEC agrees that they are protective of human health, safety, and welfare and of the environment (18 AAC 75.340[f]). Because the risk assessments for these 10 sites established that the concentrations in soil do not pose a risk to humans or the environment above target health goals at their present contamination level, separate ACLs were not calculated, and, by default, the existing contaminant levels at each site become the site-specific RGs. The risk assessment findings of no unacceptable risk remain valid, providing that the assumed land uses for the site, as per the Adak Reuse Plan, do not change.

Groundwater. RGs specified for groundwater at these 10 free-product petroleum sites are based on the use of groundwater as a drinking water source (18 AAC 75.345[b][1], Table C), or 10 times these levels if the groundwater is not reasonably expected to be a potential future source

of drinking water (18 AAC 75.345[b][2]). Groundwater at the GCI Compound, SA 80, and Tanker Shed sites is considered to be a reasonably expected potential future source of drinking water. Groundwater cleanup levels for these sites are those specified in Table C of 18 AAC 75.345(b)(1) (Table 7-4). Groundwater at the seven remaining sites is not considered to be a reasonably expected potential future source of drinking water. Groundwater cleanup levels for these sites are 10 times the levels specified in Table C of the Alaska regulations (Table 7-4). As previously stated, naphthalene is the only chemical of which the new ARAR value is lower (more stringent). However, the remedy (ICs preventing water use) remains protective. In any case, naphthalene has never been detected in groundwater above its current Table C value.

ADEC's 2009 revisions to its cleanup regulations have removed the provision for the "10 times" rule from the groundwater cleanup regulations (previously 18 AAC 75.345[b][2]). Therefore, if groundwater cleanup levels were established today at the seven sites where groundwater is not expected to be a source of drinking water (SA 78, SA 82, SA 88, SWMU 58/SA 73, Yakutat Hangar, and NORPAC Hill Seep Area), different cleanup levels would apply. However, the rationale provided in the Decision Document for these sites as to why groundwater would not be a future drinking water source still applies (U.S. Navy and ADEC 2005a). Because the groundwater beneath these sites could not be used for domestic supply, remedies remain protective. Specifically, SA 78, SA 82, SA 88, and SWMU 58/SA 73 are located outside the downtown aquifer area where groundwater yield would be insufficient to support a domestic water supply well, because of the geologic conditions (e.g., tephra deposits). Although both Yakutat Hangar and NORPAC Hill Seep Area (the remaining two "no drinking water" sites) are technically located within the designated downtown area, neither location could support a groundwater supply well. Groundwater at Yakutat Hangar is located at too shallow a depth to meet minimum well and source water protection requirements in the Alaska regulations, and NORPAC Hill Seep Area is located so close to Kuluk Bay that a supply well would draw too much salt water during pumping. In any case, ICs preventing groundwater use for drinking are in place for all locations. If ICs were ever removed, drinking water standards would have to be met. Consequently, the remedy remains protective.

Free-Product Petroleum Sites—Unacceptable Risk Sites

The remaining 4 free-product petroleum sites were determined to pose unacceptable risk to human health and/or the environment and were evaluated separately from the 10 free-product sites discussed above. The decision documents for the NMCB Building Area (T-1416 Expanded Area), South of Runway 18-36 Area, SWMU 62 (New Housing Fuel Leak), and SWMU 17 (Power Plant No. 3 Area) were finalized in 2006 and 2007 (U.S. Navy and ADEC 2006a, 2006b, 2006c, and 2007). The RGs for all of these sites are presented in Table 7-5 and are discussed below.

Soil. For both SWMU 17, Power Plant No. 3 Area and South of Runway 18-36 Area, the risk assessments established that the concentrations in soil do not pose a risk to humans or the environment above target health goals at their present level. Therefore, as discussed above for the no-risk sites, no separate ACLs were calculated for these sites and, by default, the existing contaminant levels at the site become the site-specific RGs (U.S. Navy and ADEC 2005a and 2007). For the NMCB Building Area, T-1416 Expanded Area, the RGs are based on the ACLs calculated for DRO and GRO in soil protective of construction worker exposures to soil (U.S. Navy and ADEC 2006a). The RGs for the SWMU 62, New Housing Fuel Leak site are based on the ACLs calculated for DRO in soil protective of child residential exposures (U.S. Navy and ADEC 2006b). Any changes of numeric calculations based on risk are addressed in Section 7.2.2 under toxicity criteria and exposure parameters. As described in Section 7.2.2, there is no significant change.

Groundwater. RGs specified for groundwater at these four free-product petroleum sites are based on the use of groundwater as a drinking water source (18 AAC 75.345[b][1], Table C), or 10 times these levels if the groundwater is not reasonably expected to be a potential future source of drinking water (18 AAC 75.345[b][2]). Groundwater at the SWMU 62, New Housing Fuel Leak site is considered to be a reasonably expected potential future source of drinking water. Groundwater cleanup levels for this site are those specified in Table C of 18 AAC 75.345(b)(1) (Table 7-5). Groundwater at NMCB Building Area, T-1416 Expanded Area, South of Runway 18-36 Area, and SWMU 17, Power Plant No. 3 area sites are not considered to be a reasonably expected potential future source of drinking water. Groundwater cleanup levels for these sites are 10 times the levels specified in Table C of the Alaska regulations (Table 7-5), of which only one change to the Table C values is applicable to the COCs at these sites. Although the ARAR for GRO has changed, it is now higher (less conservative) and therefore still protective of the remedy.

As noted above for the petroleum sites without health risks, ADEC's 2009 revisions to its cleanup regulations have removed the provision for the "10 times" rule from the groundwater cleanup regulations. Therefore, if groundwater cleanup levels were established today at NMCB Building Area, South of Runway 18-36 Area, and SWMU 17, different cleanup levels would apply. However, also as noted above, the rationale provided in the Decision Document for these sites as to why groundwater would not be a future drinking water source still applies (U.S. Navy and ADEC 2006a, 2006c, and 2007). Salt water intrusion would be an issue at NMCB Building Area and South of Runway 18-36 Area because of the proximity of these sites to Sweeper Cove. At SWMU 17, the upland area's geological conditions would not allow sufficient yield for a water supply well, and the groundwater in the lowland area is located at too shallow a depth to meet minimum well and source water protection requirements in the Alaska regulations. In any case, ICs preventing groundwater use for drinking are in place at these locations. If ICs were

ever removed, drinking water standards would have to be met. Consequently, the remedy remains protective.

Surface Water and Sediment. For surface water bodies of the state, Alaska regulation 18 AAC Chapter 70 establishes water quality standards based on water use classes and subclasses. The water quality standards established for this use class and subclass specify that petroleum hydrocarbons, oils, and grease may not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines and that surface waters must be virtually free from floating oils (18 AAC 70.020[b][5][B][ii]). These standards or ARARs have not changed. These water quality standards apply to three of the four free-petroleum sites with unacceptable risks: the NMCB Building Area, South of Runway 18-36 Area, and SWMU 17, Power Plant No. 3 Area (U.S. Navy and ADEC 2006a, 2006c, and 2007). In addition to ARARs for film sheen or discoloration, compound-specific numeric risk-based cleanup levels were established for surface water and sediment.

For the South of Runway 18-36 Area site, because Alaska State Regulations do not establish surface water cleanup levels for individual chemicals, DRO, or GRO, the results of the ecological risk assessment were used to establish additional risk-based cleanup levels for chemicals in surface water that may result in a potential risk to ecological receptors (U.S. Navy and ADEC 2006c). These risk-based cleanup levels are additional RGs for surface water and do not replace the TAqH and TAH criteria specified in 18 AAC Chapter 70.

Likewise, Alaska State regulations do not establish chemical-specific cleanup levels for sediment. Therefore, for the South of Runway 18-36 Area, sediment cleanup levels were established based on the results of the ecological risk assessment (U.S. Navy and ADEC 2006c). Risk-based cleanup levels were only established for those chemicals that could potentially pose an unacceptable risk to ecological receptors from exposure to sediment in South Sweeper Creek.

There are currently no significant input parameters that would change the calculated values for the ecologically based cleanup levels for either surface water or sediment of the South of Runway 18-36 Area. Therefore, the cleanup levels remain protective.

For the NMCB Building Area, SWMU 62, New Housing Fuel Leak, and SWMU 17, Power Plant No. 3 Area, sediment cleanup levels were not established, because results of the ecological risk assessment found no ecological risk above target health goals in sediment. Therefore, cleanup levels are not necessary for sediment at these sites (U.S. Navy and ADEC 2006a, 2006b, and 2007). However, ongoing monitoring of sediment at these sites reference the South of Runway 18-36 Area sediment cleanup levels as a screening tool to provide information on the progress of contamination reduction at these locations.

Migration-to-Groundwater ARAR Screening of NFA Sites (Both CERCLA and Petroleum Sites)

Soil RGs were not established for the CERCLA sites, but were established for the petroleum sites based on direct human or ecological contact with the soil (discussed below). At neither CERCLA nor petroleum sites were concentrations of COCs in soil evaluated against Alaska's soil cleanup levels protective of groundwater—referred to as migration-to-groundwater cleanup levels (18 AAC 75). As described above, groundwater contamination has been empirically assessed at OU A by evaluating concentrations of chemicals in groundwater. Areas of impacted groundwater on Adak have been identified and are being addressed by the various remedies discussed in this review. However, for sites that were designated as NFA, either during the RI/FS process or after the ROD, groundwater was not identified as impacted and there is no ongoing monitoring. As an assessment of the potential for residual contamination in soil to have a future adverse effect on groundwater, the chemical soil data at NFA sites was compared to current migration-to-groundwater cleanup levels according to the following process:

- The soil data for the NFA sites were compared to current Alaska migration-to-groundwater ARARs.
- NFA sites with a maximum concentration of a chemical exceeding a current migration-to-groundwater ARAR were identified for further evaluation (see Table E-1 in Appendix E for the complete list of these 47 sites).
- Further evaluation consisted of answering the following questions:

    1. Were exceedances of current ARARs present in more than 10 percent of the data, and was the maximum exceedance greater than 2 times the cleanup level?
    2. Were exceedances of current ARARs greater than background levels?
    3. Is there a possible groundwater pathway?
    4. Were the migration-to-groundwater pathways previously evaluated and were risks evaluated for chemicals exceeding ARARs (hazards or risks did not exceed target goals)?

The NFA sites that answered yes to questions 1 and 2 were further evaluated to ensure there was an associated groundwater pathway for actual migration to occur. If these sites did have a continuous groundwater pathway, then site information presented in the PSE-1 and PSE-2 reports for Batch 1 and Batch 2 sites (U.S. Navy 1995a, 1995b, 1996a, and 1996b) was

reviewed for each site to assess whether (1) the migration to groundwater pathway had been previously evaluated and (2) any chemicals were identified as having the potential to exceed a target health goal. If a chemical had already been previously evaluated, the site was eliminated as a potential concern (i.e., the NFA status does not need to be reviewed [details are presented in Appendix E, Table E-1]). Table 7-6 presents the 16 NFA sites that answered yes to questions 1, 2, and 3 above and were identified in question 4 as having a chemical/pathway combination that had not been previously evaluated. Of these 16 sites, 10 have at least one concentration of a metal exceeding a current migration-to-groundwater level (lead at all 10 sites, plus chromium at 2 of the 10 sites, arsenic at 1 of the 10 sites, and vanadium at 1 of the 10 sites). While the maximum concentrations did exceed background levels established for Adak and the migration-to-groundwater ARAR, soil at these sites is unlikely to pose a threat to groundwater for the following reasons:

- Concentrations are all relatively low, with generally few exceedances above an ARAR.

- Arsenic, chromium, and vanadium were not identified as COCs in groundwater anywhere on Adak and have not been detected in groundwater above background levels or MCLs.

- Lead was identified as a COC in groundwater in the ROD and is already being tracked in groundwater at many sampling locations. Therefore, for the NFA sites within areas where groundwater is being monitored (e.g., the downtown area) where there are some exceedances of migration-to-groundwater levels, no additional action would be required. One site, SWMU 12, in Table 7-6 is not near or in an area with ongoing groundwater monitoring. This site is in a remote area of the island where groundwater is unlikely ever to be used.

Therefore, the 10 “metals” sites in Table 7-6 do not need any additional actions and their NFA status remains appropriate.

For the remaining six NFA sites shown in Table 7-6, petroleum constituents were identified as having at least one soil concentration exceeding a migration-to-groundwater ARAR as follows:

- Benzene, one site (already identified as a COC in groundwater)
- Xylenes, three sites
- Naphthalene, one site
- Benzo(a)pyrene, three sites
- Benzo(b)fluoranthene, one site

As shown in the final column of Table 7-6, soil samples were collected at these sites in the early 1990s, and, because petroleum compounds degrade, concentrations today are almost certainly lower than the maximum values listed on Table 7-6. In addition, only one or two of these historical samples exceeded the ARAR. Therefore, as with the metals site, none of the petroleum constituent sites on Table 7-6 needs any additional action, and their NFA status remains appropriate.

Operable Unit B-1

Soil. Table 7-7 compares current ARAR values for the soil pathway with those presented in Table 8-1 in the OU B-1 ROD (U.S. Navy, USEPA, and ADEC 2001). The current 2010 screening values for two chemicals (nitroglycerin and tetryl) are now lower than the values listed in the ROD. The former EPA Region 9 preliminary remediation goal numbers used in the previous 5-year review have now been replaced with the EPA 2010 regional screening values (USEPA 2010a). Nitroglycerin was 35 mg/kg, and the current value is 6.1 mg/kg. Tetryl was 610 mg/kg, and the current value is 240 mg/kg. The current cleanup values for 2,4,6-trinitrotoluene and RDX are now higher (less restrictive) and therefore protective. Soil sampling results from 2001 and 2002 were well below the new cleanup levels. Therefore, the selected RGs and remedies, with respect to chemical contamination, remain protective.

7.2.2 Review of Risk Assessment Assumptions

Risk assessment assumptions (both human and ecological) were also reviewed as part of the requirement to assess the continued protectiveness of the remedies. The 14 petroleum-site risk assessments were finalized in recent years, and risk assumptions for these sites are current for this 5-year review. Therefore, the discussions in this section apply mainly to the CERCLA sites for which remediation decisions were based on the results of historical risk assessments from as long ago as 1995 and for those sites (both CERCLA and petroleum) determined to require NFA during the RI/FS process, as determined by a risk assessment screening process (PSE-1 and PSE-2). It is these NFA sites where changes in risk assessment assumptions might affect the protectiveness of the remedy. For both the CERCLA sites evaluated in the RI/FS process and for NFA sites, important risk assessment assumptions can be divided into two broad categories: (1) assumptions regarding chemical toxicity, and (2) assumptions regarding chemical exposure.

OU A CERCLA Sites Evaluated in the Remedial Investigation and Feasibility Study and OU A Record of Decision

Toxicity Criteria. The toxicity criteria were reviewed for those chemicals where RGs and endpoint criteria are site-specific risk-based concentrations. The only risk-based RGs established in the OU A ROD are those established for fish and shellfish tissue in Kuluk Bay and Sweeper Cove and the sediment endpoint criteria established for SWMU 11, Palisades Landfill. There

have been no changes to toxicity criteria used to calculate the risk-based RGs or endpoint criteria. The toxicity criteria for PCBs (used to calculate fish tissue RGs) and the human health risk-based criteria shown in Table 7-3 have not changed since the ROD was signed, based on a review of the latest toxicity criteria presented in EPA's Integrated Risk Information System (IRIS), EPA's online database of toxicity criteria (USEPA 2010b). Therefore, no toxicity criterion change has occurred. For the ecological risk-based criteria shown in Table 7-3 (PCBs, antimony, chromium, and nickel), toxicity criteria were reviewed as recently as 2009, and there is no new change.

Exposure Parameters for Human Health. Risk assessments were conducted for the sites within OU A (the CERCLA sites) that "failed" the PSE-1 and PSE-2 screening process (i.e., were identified as requiring further evaluation). This section focuses on human health exposure parameters, because the land use changes discussed here would not affect ecological receptors. Ecological exposures have not significantly changed since the ROD was signed. At the time the risk assessments were completed, Adak was an active military facility. Therefore, the risk calculations for human health assumed that the maximum length of time for exposures on Adak was 15 years for civilians and 5 years for military personnel. Therefore, the residential exposure calculations included a 15-year exposure duration (6 years as a child and 9 years as an adult), and the occupational and recreational exposures were assumed to be 5 years in duration. EPA's default exposure duration for residential and occupational exposures is 30 and 25 years, respectively.

Because the land use on Adak has changed from an active military installation to regular civilian use, EPA default exposure durations are more appropriate for evaluating health risks. Because risk and hazard calculations are linear, a doubling of the exposure duration (from 15 to 30 years) would result in a doubling of the estimated health risks and hazards. Estimated risks for occupational and recreational exposures would thus increase by a factor of five (from 5 years to 25 years). For example, for arsenic, the risk driver for SWMU 4, the calculated risks for residential exposure to ingestion of soil was 3×10^{-5} using an exposure duration of 15 years, but would be 6×10^{-5} using an exposure duration of 30. For SWMU 1, occupational risks to ingestion of soil for benzopyrene was 1.5×10^{-8} at an exposure duration of 5 years, but would be 7.7×10^{-8} at an exposure duration of 25 years. Table E-2 in Appendix E presents the 18 OU A CERCLA sites where a human health risk assessment was conducted and presents the original risk results and the risk results if risks were calculated today using current land use assumptions. An increase in risks and hazards by factors of two to five would affect the protectiveness of the remedy under the following circumstances:

- Sites were determined to have risks below target health goals, and risks would be above target health goals if risks were doubled or increased by a factor of five (see further discussion under section titled Sites Selected for NFA).

- Sites with ICs that allow commercial use but not residential would exceed target risk goals for commercial use if commercial risks were increased by a factor of five.

- Sites were remediated using risk-based cleanup levels that were based on a 15- or 5-year exposure duration and, thus, contamination may have been left in place that would exceed a 30- or 25-year risk-based cleanup level.

- Sites were not evaluated for vapor intrusion.

The last three bullets, which pertain to CERCLA sites, are discussed further in the following paragraphs. The first bullet is discussed further under Sites Selected for NFA in the succeeding section.

Sites Selected for Institutional Controls. Of the 18 sites with human health risk assessments shown in Table E-2 in Appendix E, all have some type of institutional control preventing:

- Residential land use
- Groundwater used as a drinking water source
- Seafood ingestion (water body sites)

For sites preventing residential development or use of groundwater for drinking, increased risks do not affect the remedy, because ICs are already in place to prevent those types of exposure. However, because recreational or industrial/commercial land uses were allowed at these sites, the remedy could be considered not protective. Risks based on changes in exposure factors because of civilian land use would increase recreational or commercial/industrial risks to a level exceeding the target risk goals in the ROD of 1×10^{-5}[4] for cancer and/or a hazard quotient (HQ) of 1 for noncancer chemicals. The revised risks shown in Table E-2 (Appendix E) identify only two sites, SA 76 and SWMU 23, as having a potential for recreational or occupational target health goals to be exceeded. At SA 76, a revised risk of 2×10^{-5} was calculated because of exposures of indeno(1,2,3-cd)pyrene in surface soil. At SWMU 23 a revised HQ of 1.5 was calculated for surface soil due to exposures to arsenic. The exceedances above target health goals at both sites are very slight and not likely to warrant a change in the IC for either location. For SA 76, the concentration of indeno(1,2,3-cd)pyrene in surface soil that was the risk driver is likely much lower today, because of the weathering and biodegradation of petroleum compounds. At SWMU 23, the highest detected value of arsenic was 10 mg/kg, which was well below the background value of 80 mg/kg (U.S. Navy and ADEC 2000). Based on the low

[4]This number is both the ADEC risk goal and the target risk goal established in the ROD; however, the EPA's acceptable standard risk range is from 1×10^{-4} to 1×10^{-6}.

potential exceedances above target health goals and the chemicals involved, both of these sites likely have acceptable levels of risk for recreational and residential exposures, the remedy remains protective, and no additional action is warranted.

For the water-body sites, risk-based values were selected as RGs and ICs preventing seafood ingestion were to remain in place until the ROD RGs were met. These RGs in fish and shellfish tissue were calculated assuming a 30-year exposure, and none of the other exposure parameters in the equation have changed. Therefore, the change from a military installation to a civilian community does not affect the RGs. The ingestion rates used to calculate the cleanup levels were 126 g/day for finfish and 26 g/day for shellfish and are assumed to be protective of a high fish-consuming subsistence population. Thus, the cleanup goals are appropriate and the remedies in place are protective. An ingestion rate of 152 g/day for all seafood (finfish plus shellfish) is lower than 95th percentile ingestion rates from several other subsistence populations, but is within the range of ingestion rates identified for subsistence populations of 132 to 258 g/day (ranges from Toy et al. 1996; CalEPA 2001; USEPA 1991, 1997, and 2002; and Sechena et al. 2003). Consequently, the seafood ingestion rate used in the RG calculations appears to remain appropriate in the absence of a site-specific study that identifies a significantly different value.

Sites With Possible Vapor Intrusion Pathways. Vapor intrusion was not an exposure pathway that was evaluated for all CERCLA and petroleum sites on Adak at the time of the ROD. In some cases, this pathway was evaluated, but evaluation methods have changed. Therefore, the 2010 site inspections conducted for this 5-year review included an assessment of site conditions relative to potential vapor intrusion risks. Vapor intrusion screening considered whether each site had (1) inhabited or in-use buildings, (2) currently detected concentrations of volatiles, and (3) no previous vapor intrusion evaluation.

The vapor intrusion screening identified six sites for further evaluation: Former Power Plant, Building T-1451, MAUW Compound UST 24000-A, SWMU 17, SWMU 35, SWMU 62, and Area 303. There are 16 other sites where abandoned or unused buildings are present, but no current populations would be at risk from exposure to volatile vapors. If the status of any of these the buildings were to change, the vapor intrusion pathway would need to be assessed. Furthermore, if new buildings were to be constructed above plumes of volatile contaminants, the potential for vapor intrusion would also need to be assessed.

For three of the six sites identified by the vapor intrusion screening, the potential for vapor intrusion has already been assessed or is in the process of being assessed. The vapor migration pathway for SWMU 62 was quantified in the FFS for SWMU 62, New Housing Fuel Leak for on-site workers and adult/child residents. The FFS concluded that on-site worker and child/adult residential risks to groundwater vapors were well below target health goals (U.S. Navy 2005e). The risk assessment for Area 303, which is in final process, also quantified the vapor migration

pathway for the on-site worker, concluding that there was no future indoor air risk. The Area 303 residential vapor pathway was considered insignificant and incomplete. For site SWMU 17, Power Plant No. 3 Area, the vapor migration pathway was considered an incomplete pathway in the FFS (U.S. Navy 2006d).

The three sites that have not had vapor intrusion pathways assessed, but where buildings are currently in use, are MAUW Compound, UST 24000-A, Former Power Plant, Building T-1451, and SWMU 35. The MAUW Compound site status was changed to NFRAP in 2005 with ADEC concurrence (ADEC 2005a). The COC at the site is DRO. During the last groundwater monitoring round of 2002, no DRO concentration exceeded the groundwater endpoint criterion. Therefore, it is unlikely that there would ever be a vapor intrusion issue at this site from volatile contaminants in groundwater.

As discussed in Section 2, SWMU 35 is a NFA site. However, prior to conducting site inspections for this 5-year review, chemical concentrations historically detected at NFA sites were screened against the most recent ARAR values to evaluate whether or not there was a potential need to reconsider the NFA designation. Based on the screening step, SWMU 35 was included in the list of sites to be inspected and retained for further evaluation. The only volatile chemical documented at SWMU 35 that exceeds current ARARs was naphthalene in groundwater. However, the highest concentration of naphthalene in groundwater was 2.2 µg/L, which is substantially below the recommended ADEC vapor screening values for volatile chemicals in groundwater under both residential and commercial scenarios (ADEC 2009, Appendix G). The maximum concentration of naphthalene is also well below the 18 AAC 75 Table C value of 700 µg/L (0.7 mg/L) and is not a concern for drinking water. Although the maximum concentration of naphthalene did exceed the value used in screening sites for possible vapor concerns (May 2010 Regional Screening Level [RSL] of 0.14 µg/L for tap water), the screening value is not an ARAR and does not affect the protectiveness of the remedy.

The Former Power Plant, Building T-1451 is the only site of the six sites with occupied buildings that could have a potentially complete vapor intrusion pathway. However, the potential risk would be insignificant. The Former Power Plant, Building T-1451 has two buildings currently being occupied: the GEM building used for vehicle repair and storage (welding shop) and a storage shed (outbuilding) used for machine shop activities. The COC at the site is DRO. Recent soil and groundwater sampling results reported in the 2010 site characterization report and 2010 groundwater monitoring report showed exceedances of ADEC cleanup levels for DRO in both soil and groundwater. The sampling locations of the DRO exceedances are near both of the occupied buildings (U.S. Navy 2010e and 2010f).

In spite of the DRO exceedances in soil and groundwater near the Former Power Plant, the vapor intrusion risks are insignificant, because of the relatively low volatility of DRO and the high likelihood of chemical biodegradation of DRO in vapor. ADEC defines DRO as containing

carbon chain lengths from C_{10} to C_{25}. Not all the carbon chain lengths from C_{10} to C_{25} are volatile; only the lighter end of the DRO compound range is considered volatile (C_{10} to C_{16}). Even if chemicals that comprise DRO were volatile, biodegradation could cause petroleum vapors to attenuate rapidly as they move away from the source (ADEC 2009). It has been shown that biodegradation will prevent vapor intrusion when the source strength is low, at least 2 feet of fine-grained sand are present, and the soil contains at least 3 percent oxygen (ADEC 2009).

Although the natural attenuation parameters in groundwater currently suggest anaerobic conditions, source concentrations in the subsurface do exhibit a decreasing trend. Eventually, it is expected that more favorable conditions for petroleum biodegradation will result as the source concentrations reduce and oxygen is replenished resulting in increasing reduction in source concentrations. Therefore, the risks and hazards associated with the vapor intrusion pathway are not expected to be significant and will continue to decrease in the future as petroleum biodegradation occurs. The remedy remains protective with regard to the vapor intrusion pathway.

Sites Selected for No Further Action

Toxicity Criteria. The toxicity criteria of chemicals that exceeded RBSCs for the OU A CERCLA sites that did not have residential risks in excess of target health goals (were not selected for further investigation in the OU A ROD) were also reviewed to identify any toxicity changes that could affect the protectiveness of the remedy. Toxicity changes were identified for Aroclor 1254, benzene, beryllium, chromium, manganese, vanadium, and 4-amino-2,6-dinitrotoluene and are presented in Table 7-8. Although the effect of some of the toxicity changes would result in higher risks from these COCs, the increased risks would be marginal and would not affect the conclusions of the risk assessments in the PSE-1 and PSE-2 for Batch 1 and Batch 2 sites. The screening processes for the Batch 1 and Batch 2 sites remain protective, and no site would now "screen-in" because of toxicity changes.

Exposure Parameters for Human Health. The process by which sites were selected for NFA during the PSEs 1 and 2 (U.S. Navy 1996a, 1996b, 1995a, and 1995b) was sufficiently health protective, such that even a five-fold increase in exposure would not result in a health risk at a site that was selected as NFA. The first step in the process involved screening maximum concentrations against EPA Region 10 residential risk-based screening concentrations (RBSCs). The Region 10 RBSCs assumed a 30-year exposure duration with a target cancer goal of 1×10^{-7} and a HQ of 0.1. The target cancer goals in the ROD were 1×10^{-5} and the target hazards were 1.0. Therefore, because the risk equations are linear, an RBSC calculated assuming a target cancer goal of 1×10^{-7} would be 100 times lower than an RBSC calculated assuming a goal of 1×10^{-5} (i.e., the larger the target risk goal, the larger the acceptable concentration), and the exposure duration matches current land uses. Consequently, any site that was selected as NFA

because no chemical exceeded Region 10 RBSCs would not represent a health risk under current conditions and was appropriately designated as NFA.

For sites where maximum chemical concentrations exceeded a Region 10 screening value, a 95 percent upper confidence limit was calculated (or the maximum concentration was used if the data set was small). The value was compared first to Adak-specific residential values and then, if there were exceedances and the site was not residential, to recreational or occupational RBSCs (U.S. Navy 1996a). All risks and hazards were considered additive, and a site was only eliminated as a concern if the total risk was less than 1×10^{-6} or the total hazard was less than 1.0. As with the EPA Region 10 RBSCs, the Adak-specific RBSCs were also derived assuming a target cancer goal of 1×10^{-7} and a target hazard goal of 0.1. The use of a lower target risk goal than the ROD requires provided an adequate margin of safety to select sites, even though the exposure time may have been underestimated. Thus, sites were appropriately selected as NFA during the PSE process and no additional remedial actions is warranted.

7.3 NEW INFORMATION

Has any other information come to light that could call into question the protectiveness of the remedy? No other information, other than that discussed in other sections of this 5-year review report, has come to light that could call into question the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

The remedy is functioning as intended by the OU A ROD and the SAERA decision documents for most of the OU A sites on Adak. The remedy is not functioning as intended for the following four sites:

- Former Power Plant, Building T-1451
- SWMU 60, Tank Farm A
- SWMU 61, Tank Farm B
- NMCB Building Area, T-1416 Expanded Area

The OU B-1 remedy is functioning as intended by the OU B-1 ROD, although the remedy cannot be considered complete at all 50 OU B-1 action sites until all of the after-action reports are complete, documentation of remedy completion is finalized, and concurrence from the regulatory agencies is received.

Changes in the ARARs, exposure, and toxicity assumptions that have occurred since the RODs and SAERA decision documents were signed do not affect the protectiveness of the remedies. Concentrations of many chemicals in groundwater remain above the RGs within the downtown area of Adak at the majority of locations where long-term monitoring is occurring. This results in the need for continued ICs to prevent exposure and the need for ongoing monitoring. Although some of the RGs might be lower if selected today, the remedy components continue to protect against exposures, just as they did at the time the ROD was signed. ICs preventing exposure and ongoing monitoring will need to continue until COC concentrations in groundwater are below the RGs.

7.5 ISSUES

Table 7-9 lists the issues identified as a result of the 5-year review technical assessment of the remedies at Adak.

Table 7-1
Endpoint Criteria for Groundwater at CERCLA Sites

Analyte	Alaska Cleanup Levels 18 AAC 75.345 (µg/L)[a]	Federal MCLs (µg/L)	Protection of Surface Water			
			State		Federal	
			Chronic	HH (Organisms Only) (µg/L)	Chronic	HH (Organisms Only) (µg/L)
Benzene	5	5	--	--	--	**510**(710)
Bis(2-ethylhexyl)phthalate	6	--	--	--	--	**22** (59)
Ethylbenzene	700	700	--	**29,000** (3,280)	--	**2,100** (--)
GRO	**2,200** (1,300)	--	--	--	--	--
Lead	15	15	3.2 TR at 100 mg/L hardness	--	--	--
Methylene chloride	5	--	--	--	--	59,000
Tetrachloroethene	5	5	--	--	--	33
Thallium	2	2	--	**6.3** (48)	--	4.7
Toluene	1,000	1,000	--	**200,000** (424,000)	--	150,000
Trichloroethene	5	5	--	--	--	**300** (810)

[a]Cleanup levels shown are applicable if groundwater is a source of drinking water at the site. A concentration equal to 10 times the concentration shown may be used if Alaska Department of Environmental Conservation determines groundwater is not a current source of drinking water.

Notes:
Bolded value is the revised number, and the number in parentheses is the endpoint criterion listed in the CMP.
AAC - Alaska Administrative Code
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
HH - human health
MCLs - maximum contaminant level
µg/L - microgram per liter
mg/L - milligram per liter
TR - total recoverable

Table 7-2
Endpoint Criteria for Fresh Surface Water at SWMUs 11, 18/19, and 25

Analyte	Alaska Water Quality Standards, 18 AAC 70[a]	
	Aquatic Life - Chronic (µg/L)	Human Health - Organisms Only (µg/L)
Semivolatile Organic Compounds		
Benzo(a)pyrene	None	**0.18**[c] (0.31[b])
Benzo(b)fluoranthene	None	**0.18**[c] (0.31[b])
Benzo(g,h,i)perylene	None	None
Benzo(k)fluoranthene	None	**0.18**[c] (0.31[b])
Bis(2-ethylhexyl)phthalate	None	**22**[c] (59[b])
Pesticides/Aroclors		
PCBs	0.014	**0.00064**[c] (0.0045[b])
Volatile Organic Compounds		
1,1-Dichloroethene	None	**None** (320)
Benzene	None	**None** (710[b])
Cis-1,2-dichloroethene	None	None
Toluene	None	**15,000** (424,000)
Trans-1,2-dichloroethene	None	**10,000** (None)
Trichloroethene	None	**300**[c] (810)
Ethylbenzene	None	**2,100** (3,280)
Total xylenes	None	None
Inorganics		
Antimony	None	**4,300** (45,000)
Arsenic	**150** (190 [As III]) dissolved	1.4[b]
Beryllium	**None** (190)	**None** (1.4)
Cadmium	**0.3 TR** (1.1 TR) at 100 mg/L hardness	None
Chromium III	**74 TR** (210 TR) at 100 mg/L hardness	None
Chromium VI	11 TR	None
Copper	**9.3 TR** (12 TR) at 100 mg/L hardness	None
Lead	2.5 TR at 100 mg/L hardness	None
Mercury	**0.77 dis** (0.012 TR)	**None** (0.15)
Nickel	**52 TR** (160 TR) at 100 mg/L hardness	**4,600** (100)
Selenium	5 TR	**4,200** (None)
Silver	None	None
Thallium	None	**0.47** (48)
Zinc	**120 TR** (110 TR) at 100 mg/L hardness	**26,000 u** (None)

[a]Criteria existing in 18 AAC 70 when Record of Decision for Operable Unit A and landfills were signed. (Changes to some of these criteria were adopted in an 18 AAC 70 amendment on March 24, 2003, but these changes are not shown in this table.)

[b]Human health criteria for carcinogens come from EPA promulgation of human health criteria for carcinogens for Alaska at the 10^{-5} risk level in the National Toxics Rule (40 CFR 131.36), in accordance with on-line Alaska Department of Environmental Conservation guidance at <www.state.ak.us/dec/dawq/wqs/documents/carcinogens.htm>, accessed April 10, 2003.

Table 7-2 (Continued)
Endpoint Criteria for Fresh Surface Water at SWMUs 11, 18/19, and 25

[c]Human health criterion came from EPA National Recommended Water Quality Criteria and are based on a carcinogenicity of 10^{-5} risk (USEPA 2009)

Notes:
Bolded value is the revised number and the number in parenthesis is the endpoint criterion listed in the Comprehensive Monitoring Plan.
EPA - U.S. Environmental Protection Agency
µg/L - microgram per liter
mg/L - milligram per liter
PCBs - polychlorinated biphenyls
TR - total recoverable

Table 7-3
Endpoint Criteria for Freshwater/Marine Sediments for SWMU 11

Analyte	CMP Endpoint Criterion (mg/kg)[a]	Basis	Current Alaska Soil Cleanup Level Table B of 18 AAC 75, Direct Contact of Soil (mg/kg)	Background From RI/FS (mg/kg)
Semivolatile Organic Compounds				
Benzo(a)anthracene	1.7	High molecular weight polynuclear aromatic hydrocarbons (Long et al. 1995)	4	--
Benzo(a)pyrene			0.4	--
Benzo(b)fluoranthene			4.0	--
Benzo(g,h,i)perylene			1,100	--
Benzo(k)fluoranthene			40	--
Indeno(1,2,3-cd)pyrene			4	--
Bis(2-ethylhexyl)phthalate	4.56	HH RBSC[b]	180	--
Pesticides/Aroclors				
Sum of PCBs as Aroclor 1016 through Aroclor 1260	0.0227	Long et al. 1995	1	--
Total Inorganics				
Antimony	2	Eco RBSC[b]	33	10 (1.5)[c]
Arsenic	8.2	Long et al. 1995	3.7	5.46 (7.5)[c]
Chromium	81	Long et al. 1995	250	12.91 (6.04)[c]
Nickel	20.9	Long et al. 1995	1,700	10.05 (5.01)[c]

[a]Total organic carbon normalization is not required for comparison to endpoint criterion.
[b]Preliminary source evaluation guidance document for Adak (U.S. Navy 1996a)
[c]The value listed is for freshwater sediment and the value in parenthesis is for marine sediment.

Notes:
AAC - Alaska Administrative Code
CMP - Comprehensive Monitoring Plan (U.S. Navy 2010a)
Eco - ecological
HH - human health
mg/kg - milligram per kilogram
RBSC - risk-based screening concentration
RI/FS - remedial investigation/feasibility study (U.S. Navy 1997)

1 **Table 7-4**
2 **Soil and Groundwater Remediation Goals for Petroleum Sites**

Chemical	Soil RGs[a]			Groundwater RGs[a,b]	
	Ingestion (mg/kg)	Inhalation (mg/kg)	Migration to Groundwater (mg/kg)	Groundwater Cleanup Level (mg/L)	10 Times Groundwater Cleanup Level (mg/L)
Acenaphthene	**2,300** (5,000)	NA	190	2.2	22
Anthracene	**16,800** (24,900)	NA	3,900	11	110
Antimony	33	NA	3	0.006	0.06
Aroclor 1254	1	1	1	0.0005	0.005
Aroclor 1260	1	1	1	0.0005	0.005
Benzene	120	**8.5** (6.4)	0.02	0.005	0.05
Benzo(a)anthracene	**4** (9)	NA	**3.6** (5.5)	0.001	0.01
Benzo(b)fluoranthene	**4** (9)	NA	17	0.001	0.01
Benzo(k)fluoranthene	**40** (93)	NA	**120** (170)	0.01	0.1
Benzo(a)pyrene	**0.4** (0.9)	NA	**2.1** (2.4)	0.0002	0.002
Bis(2-ethylhexyl)phthalate	**180** (490)	NA	**13** (1,100)	0.006	0.06
Chrysene	**400** (930)	NA	550	0.1	1
Dibenzo(a,h)anthracene	**0.4** (0.9)	NA	**4** (5)	0.0001	0.001
DRO	8,250	12,500	230	1.5	15
Ethylbenzene	8,300	**81** (89)	**5** (6.9)	0.7	7
Fluorene	**1,900** (3,300)	NA	**220** (240)	1.46	14.6
GRO	1,400	1,400	260	**2.2** (1.3)	**22** (13)
Indeno(1,2,3-cd)pyrene	9	NA	50	0.001	0.01
Lead	**400**(NA)	**400**(NA)	NA	0.015	0.15
Mercury	**25** (NA)	13	**1.4** (1.24)	0.002	0.02
Naphthalene	**1,100** (1,700)	**21** (92)	**20** (19)	**0.7** (1.46)	**7** (14.6)
Phenathrene	**16,800** (NA)	NA	**3000** (NA)	**11** (NA)	**1,100** (NA)

Table 7-4 (Continued)
Soil and Groundwater Remediation Goals for Petroleum Sites

Chemical	Soil RGs[a]			Groundwater RGs[a,b]	
	Ingestion (mg/kg)	Inhalation (mg/kg)	Migration to Groundwater (mg/kg)	Groundwater Cleanup Level (mg/L)	10 Times Groundwater Cleanup Level (mg/L)
Pyrene	**2,500** (1,100)	NA	**1,000** (1,400)	1.1	11
RRO	8,300	22,000	9,700	1.1	11
Toluene	**6,600** (17,000)	**220** (180)	**6.5** (4.8)	1	10
Xylenes (total)	**16,600** (166,000)	**63** (81)	**63** (69)	10	100

[a]Based on 18 AAC 75.340, 341, and 345
[b]Alaska Department of Environmental Conservation's 2009 revisions to its cleanup regulations have removed the provision for the "10 times" rule from the groundwater cleanup regulations, previously 18 AAC 75.345[b][2]. Therefore, none of the RG values listed in this column would be the same if established today.

Notes:
Bolded value is the revised number, and the number in parenthesis is the RG from the ROD.
AAC - Alaska Administrative Code
AK - Alaska
DRO - diesel-range organics (per Method AK 102)
GRO - gasoline-range organics (per Method AK 101)
mg/kg - milligram per kilogram
mg/L - milligram per liter
NA - not available
RGs - remediation goals
RRO - residual-range organics (per Method AK 103)

1 **Table 7-5**
2 **Site-Specific Alternative Cleanup Levels for Free-Product Sites**

Chemical	Site-Specific ACL for Soil (mg/kg)[a]	Basis for Soil[a]	Site-Specific ACL for Groundwater (mg/L)	Basis for Groundwater[b]	Site-Specific ACL for Surface Water (mg/L)	Basis for Surface Water	Site-Specific ACL for Sediment (mg/kg)	Basis for Sediment
NMCB Building Area, T-1416 Expanded Area								
Diesel-range organics	31,000	18 AAC 75.340(a)(4)	15	10 times 18 AAC 75.345(b)(1)	--	--	--	--
Gasoline-range organics	1,700	18 AAC 75.340(a)(4)	22 (13)	10 times 18 AAC 75.345(b)(1)	--	--	--	--
Benzene	--	--	0.05	10 times 18 AAC 75.345(b)(1)	--	--	--	--
Lead	--	--	0.15	10 times 18 AAC 75.345(b)(1)	--	--	--	--
SWMU 62, New Housing Fuel Leak								
Diesel-range organics	6,111	18 AAC 75.340(a)(4)	1.5	18 AAC 75.345(b)(1)	--	--	--	--
Gasoline-range organics	--	--	2.2 (1.3)	18 AAC 75.345(b)(1)	--	--	--	--
Benzene	--	--	0.005	18 AAC 75.345(b)(1)	--	--	--	--

Table 7-5 (Continued)
Site-Specific Alternative Cleanup Levels for Free-Product Sites

Chemical	Site-Specific ACL for Soil (mg/kg)[a]	Basis for Soil[a]	Site-Specific ACL for Groundwater (mg/L)	Basis for Groundwater[b]	Site-Specific ACL for Surface Water (mg/L)	Basis for Surface Water	Site-Specific ACL for Sediment (mg/kg)	Basis for Sediment
Ethylbenzene	--	--	0.7	18 AAC 75.345(b)(1)	--	--	--	--
Toluene	--	--	1	18 AAC 75.345(b)(1)	--	--	--	--
Trichloroethene	--	--	0.005	18 AAC 75.345(b)(1)	--	--	--	--
South of the Runway 18-36 Area								
Diesel-range organics	--	--	15	10 times 18 AAC 75.345(b)(1)	0.00025	Eco RBSC[c] (PQL)	90.6	Eco RBSC[c]
Gasoline-range organics	--	--	--	--	0.114	Eco RBSC	12.2	Eco RBSC[c]
Indeno(1,2,3-cd)pyrene	--	--	--	--	0.00028	Eco RBSC	--	--
TAH	--	--	--	--	0.01	18 AAC.70	--	--
TAqH	--	--	--	--	0.015	18 AAC.70	--	--
2-Methylnaphthalene	--	--	--	--	--	--	0.0202	Eco RBSC[c]
Phenanthrene	--	--	--	--	--	--	0.225	Eco RBSC[c]
SWMU 17, Power Plant No. 3								
Diesel-range organics	--	--	15	10 times 18 AAC 75.345(b)(1)	--	--	--	--

Table 7-5 (Continued)
Site-Specific Alternative Cleanup Levels for Free-Product Sites

[a]Soil cleanup levels based on Alaska Department of Environmental Conservation Method Four, a calculated risk value discussed in the text.
[b]Cleanup levels are based on 10 times the tabulated groundwater cleanup levels because groundwater is not reasonably expected to be a potential source of drinking water, or the full tabulated value if groundwater is considered to be a reasonably expected potential source of drinking water.
[c]If the PQL was lower than the ecological risk based cleanup level, the cleanup level was set to the PQL.

Notes:
Bolded chemical has new groundwater cleanup level; old value is in parenthesis.
AAC - Alaska Administrative Code
ACL - alternative cleanup level
Eco - ecological
mg/L - milligram per liter
mg/kg - milligram per kilogram
PQL - practical quantitation limit
RSBC - risk-based screening concentration
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

Table 7-6
Summary of Adak No Further Action Sites With Soil Exceedances of Current Migration-to-Groundwater ARARs

Site Name	Chemical Exceeding Current ARAR	Maximum Value Detected (mg/kg)	ARAR Value[a] (mg/kg)	Detection Frequency	Total No. Samples	No. of Exceedances	Greater Than 2 X Cleanup Level	Greater Than 10% F of E	Greater Than Background Level[b]
Petroleum Sites									
Drum Disposal Area at Tank Farm D	Lead	103	40	2/2	2	1	Yes	Yes	Yes
Navy Exchange Building (UST 30033)	Benzene	0.501	0.025	3/17	17	2	Yes	Yes	NA
	Xylenes, Total	39.6	6.3	2/2	2	1	Yes	Yes	NA
NSGA Filling Station, Mogas and JP-5 ASTs	Xylenes, Total	38	6.3	2/4	4	1	Yes	Yes	NA
Pumphouse 5 Area - Pipeline C	Lead	402	40	11/11	11	7	Yes	Yes	Yes
SWMU 12, Quartermaster Site	Lead	212	40	14/21	21	3	Yes	Yes	Yes
SA 87, Old Zeto Point Wizard Station	Benzo(a)pyrene	0.3	0.04	1/9	9	1	Yes	Yes	NA
SA 86, Old Happy Valley Child Care Center	Lead	269	40	32/32	32	4	Yes	Yes	Yes
SA 84, Sand Shed	Lead	135	40	6/6	6	1	Yes	Yes	Yes
SWMU 24, Hazardous Waste Container Storage Facility (Evaluated under RCRA)	Chromium, Total	55.8	25	25/26	26	4	Yes	Yes	Yes
	Vanadium	140	58	24/24	24	23	Yes	Yes	Yes
SWMU 35,Ground Support Equipment Building (UST 27044)	Xylenes, Total	75	6.3	3/5	5	2	Yes	Yes	NA

Table 7-6 Continued)
Summary of Adak No Further Action Sites With Soil Exceedances of Current Migration-to-Groundwater ARARs

Site Name	Chemical Exceeding Current ARAR	Maximum Value Detected (mg/kg)	ARAR Value[a] (mg/kg)	Detection Frequency	Total No. Samples	No. of Exceedances	Greater Than 2 X Cleanup Level	Greater Than 10% F of E	Greater Than Background Level[b]
Mount Moffett Power Plant 5 Tank Farm B, Tank Farm C	Lead	2210	40	66/70	70	10	Yes	Yes	Yes
(USTs 10574 Through 10577)	Benzo(a)pyrene	0.53	0.04	1/2	2	1	Yes	Yes	NA
	Benzo(b)fluoranthene	0.82	0.4	1/2	2	1	Yes	Yes	NA
	Naphthalene	42	3.6	2/2	2	2	Yes	Yes	NA
CDAA Complex (UST 10580)	Arsenic	100.8	0.37	38/49	49	38	Yes	Yes	Yes
UST 10591 - NSGA	Lead	187.1	40	42/52	52	7	Yes	Yes	Yes
UST 31051-A O-59	Benzo(a)pyrene	0.16	0.04	2/6	6	2	Yes	Yes	NA
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites									
SA 77, Fuel Division Area Drum Storage	Chromium, Total	78.3	25	10/10	10	6	Yes	Yes	Yes

[a]Alaska Table B1, Method Two Soil Cleanup Levels (January 2009): Migration to Groundwater
[b]Maximum detected values were compared to background values listed in Table 4-2 of the background study report (U.S. 1995c).

Notes:
ARAR - applicable or relevant and appropriate requirement
F of E - frequency of exceedance
mg/kg - milligram per kilogram
NA - not applicable

Table 7-7
OU B-1 ROD Soil Cleanup Levels for Ordnance Compounds

Chemical	ROD-Specified Cleanup Level (mg/kg)	Current Cleanup Level (mg/kg)
Dinitrotoluene (mixture)	0.72	0.72
2,4,6-Trinitrotoluene	18	**19**
Nitroglycerin	35	**6.1**
Nitroguanidine	6100	6100
Tetryl (trinitrophenylmethylnitramine)	610	**240**
RDX (cyclonite)	4.4	**5.5**

Notes:
Bolded values have changed.
Values are 2010 Regional Screening Values.
mg/kg - milligram per kilogram
ROD - Record of Decision

Table 7-8
Toxicity Changes for No Further Action Sites

Chemical of Concern	Toxicity Criteria	OU A ROD Value[a] (Unit of Measure)	Current Value (Unit of Measure)
Vanadium	Oral RfD	7.00 E-03 (mg/kg-day)	5.00 E-03 (mg/kg-day)
Benzene	Oral CSF	2.90 E-02 $(mg/kg\text{-}day)^{-1}$	5.50 E-02 $(mg/kg\text{-}day)^{-1}$
Chromium VI[b]	Oral RfD	5.00 E-03 (mg/kg-day)	3.00 E-03 (mg/kg-day)
Aroclor 1254	Oral CSF	7.00 E+00 $(mg/kg\text{-}day)^{-1}$	2.00 E+00 $(mg/kg\text{-}day)^{-1}$
Aroclor 1260	Oral CSF	7.00 E+00 $(mg/kg\text{-}day)^{-1}$	2.00 E+00 $(mg/kg\text{-}day)^{-1}$
Beryllium	Oral RfD	5.00 E-03 (mg/kg-day)	2.00 E-03 (mg/kg-day)
4,Amino-2,6-dinitrotoluene	Oral RfD	1.00 E-03 (mg/kg-day)	2.00 E-03 (mg/kg-day)
Manganese	Inhalation RfD	1.10 E-04 (mg/kg-day)	5.50 E-0 5(mg/kg-day)

[a]The ROD values for the no further action sites are based on the PSE-1 and PSE-2 risk analysis from 1995 and 1996.
[b]Chromium VI now has an Oral CSF of 5.0E-01.

Notes:
Bolded chemical would have a slightly higher hazard or risk if calculated today.
CSF - cancer slope factor
mg/kg-day - milligram per kilogram per day
OU - operable unit
PSE - preliminary source evaluation
RfD - reference dose
ROD - Record of Decision

Table 7-9
Issues

No.	Issue	Affects Protectiveness?	
		Current	Future
Sitewide			
1	The Comprehensive Monitoring Plan, Institutional Control Management Plan, and Operation and Maintenance Plan need to be updated to reflect site-by-site changes in monitoring and product recovery requirements recommended in this document and by the Optimization Work Group, to formalize institutional control requirements pertaining to the continued presence of petroleum-contaminated soil at some sites, to remove inconsistencies, to ensure that the criteria for free-product monitoring and recovery are clear and driven by decision documents, and to result in free-product monitoring and recovery documentation that is sufficiently detailed to allow independent review.	Yes	Yes
2	The document repositories on Adak and in Anchorage are incomplete, especially with regard to recent documents generated during this 5-year review period.	No	No
3	Action items were identified during the 2010 site inspections.	Yes	Yes
4	Organizations involved in responding to MEC finds have requested materials detailing the procedures for local officials to follow in the event of a MEC discovery, the organization responsible for responding based on the location of the MEC item found, and the historical MEC recoveries across the island.		
OU A – SAERA Petroleum Sites			
5	Former Power Plant, Building T-1451, or a nearby source yet to be identified, is impacting surface water quality in East Canal.	Yes	Yes
6	Groundwater samples collected from SWMU 60, Tank Farm A, wells near South Sweeper Creek contained total aromatic hydrocarbon and total aqueous hydrocarbon concentrations that exceeded Alaska Department of Environmental Conservation surface water criteria, and seeps and sheens have been observed along South Sweeper Creek and Sweeper Creek Lagoon.	Yes	Yes
7	Free-product thickness measurements in three surface water protection wells at NMCB Building Area appear to be increasing, indicating that the remedy may not functioning as intended and additional investigation is warranted.	Yes	Yes

Notes:
MEC - munitions and explosives of concern
OU - operable unit
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This section presents the recommendations and follow-up actions identified as a result of the 5-year review process. Table 8-1 summarizes the recommendations. In general, the recommendations focus on improving the remedy functionality for three of the OU A sites, documenting and closing out the completed remedy implementation at some OU B-1 sites, and continuing to improve ordnance awareness training materials and communication with the public and other stakeholders.

Table 8-1
Recommendations and Follow-Up Actions

No.	Recommendation/Follow-Up Action	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness	
				Current	Future
Sitewide					
1	As part of the current Optimization Work Group effort for optimization of monitoring and product recovery on Adak, update the Comprehensive Monitoring Plan and Operation and Maintenance Plan to address the items listed in Issue No. 1 on Table 7-9 and as detailed in Sections 4.1.4 and 6.4. In addition, update the Institutional Control Management Plan (and its equivalent to Table 4-1 of this 5-year review) to be consistent with source documentation (executed RODs, decision documents, and conditional closure letters).	ADEC	12/31/2011	Yes	Yes
2	Update the document repositories.	EPA, ADEC	12/31/2011	No	No
3	Address the action items identified during the 2010 site inspections (see Section 6.5).	EPA, ADEC	12/31/2012	Yes	Yes
4	Create a munitions response desk guide for limited distribution (see Section 6.2.3).	EPA, ADEC	12/31/2011	No	No
OU A – SAERA Petroleum Sites					
5	Complete the ongoing assessment of additional remedial action at Former Power Plant, Building T-1451.	ADEC	12/31/2013	Yes	Yes
6	Complete the ongoing evaluation of potential additional action for SWMU 60, Tank Farm A, based on impacts to South Sweeper Creek.	ADEC	12/31/2012	Yes	Yes
7	Evaluate additional actions to protect surface water at NMCB Building Area in accordance with the decision document.	ADEC	12/31/2012	Yes	Yes

Notes:
ADEC - Alaska Department of Environmental Conservation
EPA - U.S. Environmental Protection Agency
OU - operable unit
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit

9.0 CERTIFICATION OF PROTECTIVENESS

9.1 PROTECTIVENESS OF OU A REMEDIES

The OU A sites are grouped in the sections below for the purposes of discussing protectiveness.

9.1.1 OU A Sites Where the Remedy Is Complete and Protective

The OU A remedy remains protective for the sites selected for NFA or NFRAP and sites where the remedy is complete, but an NFA/NFRAP designation has not been made (such as South Sweeper Creek) (Table 9-1). At these sites, the NFA status selected in the ROD, the NFA/NFRAP status selected in later documents, or the completeness of the remedy are not called into question by new information, including changes in ARARs or risk assessment assumptions. ICs still apply to some of these sites because of their location within the downtown area, where area-wide LUCs apply. The three OU A sites that achieved NFA or NFRAP status during this 5-year review period will not be discussed in detail in the next 5-year review. These three sites are the following:

- SA 77, Fuel Division Area Drum Storage
- SA 82, NSGA P80, P81 Buildings
- Yakutat Hangar, UST T-2039-A

9.1.2 OU A Sites Where the Remedy Is Operating and Expected to Be Protective

The OU A remedy for the sites listed in Table 9-2 is expected to be protective when the operating OU A remedy (monitored natural attenuation in many cases) is complete. In the interim, exposure pathways that could result in unacceptable risks are being controlled through implementation of the ICMP. Potential changes in site conditions that could affect protectiveness at these sites are also being monitored and evaluated through the annual groundwater monitoring program. Through this program, the ongoing natural attenuation of COCs is documented, and surface water protection wells are monitored to allow evaluation of COC migration and thereby ensure the protection of surface water. Free-product thickness is monitored at sites where free product has been or could be a concern, and the monitoring protocols include free-product removal when sufficient product thickness is measured.

For certain sites, such as those with landfill caps, ICs are an integral component of the remedy in perpetuity (e.g., excavation through a landfill cap is not expected to ever be permissible). For these sites, the IC component of the remedy is protective and is expected to remain so as long as the ICs are maintained, with documentation via annual inspections.

9.1.3 OU A Sites Where the Remedy Is Not Protective Unless Followup Actions Are Taken to Ensure Protectiveness

At two of the sites where the OU A remedy consists of monitored natural attenuation, ongoing impacts to adjacent surface water bodies calls into question the protectiveness of the remedy. Follow-up actions are needed at the two sites listed below for the remedy to be protective:

- Former Power Plant, Building T-1451
- SWMU 60, Tank Farm A

At one of the OU A sites where the final remedy was selected under SAERA, NMCB Building Area, T-1416 Expanded Area, trends in product thicknesses observed in surface water protection wells call into question the protectiveness of the remedy. Follow-up actions are needed at this site for the final remedy to be protective.

9.2 PROTECTIVENESS OF OU B-1 REMEDY

The remedy for OU B-1 is expected to be protective of human health and the environment upon completion. Although the remedy is in place at all OU B-1 sites, regulatory concurrence has not been achieved for all sites. Until concurrence is achieved and the remedies can be considered complete, ICs are in place to control exposure pathways that could result in unacceptable risks. Documentation of completion of the OU B-1 remedy at all OU B-1 sites, as well as documentation of regulatory concurrence with remedy completion, will be assembled in the remedial action completion report. This information will be drawn from the final after action reports.

9.3 PROTECTIVENESS OF OU B-2 REMEDY

The remedy for OU B-2 has not been selected. In the interim, LUCs are in place to control exposure pathways that could result in unacceptable risks to human health and the environment.

Table 9-1
OU A Sites Where the Remedy Is Complete

Site	Regulatory Authority	Regulatory Designation	Timing of Regulatory Designation
CERCLA Sites			
South Sweeper Creek	CERCLA	Remedy complete	Post-first 5-year review
SWMU 3, Clam Lagoon Landfill	CERCLA	NFA	OU A ROD
SWMU 5, North Davis Road Landfill	CERCLA	NFA	OU A ROD
SWMU 6, Andrew Lake Drum Disposal Area 1	CERCLA	NFA	OU A ROD
SWMU 7, Andrew Lake Drum Disposal Area 2	CERCLA	NFA	OU A ROD
SWMU 9, Black Power Club	CERCLA	NFA	OU A ROD
SWMU 21B, White Alice Lower Quarry	CERCLA	NFA	OU A ROD
SWMU 21C, White Alice East Disposal Area	CERCLA	NFA	OU A ROD
SWMU 24, Hazardous Waste Storage Facility — RCRA Closure under FFCA	RCRA	NFA	OU A ROD
SWMU 26, Mitt Lake Drum Disposal Area	CERCLA	NFA	OU A ROD
SWMU 27, Lake Leone Drum Disposal Area	CERCLA	NFA	OU A ROD
SWMU 28, Lake Betty Drum Disposal Area	CERCLA	NFA	OU A ROD
SWMU 30, Magazine 4 Landfill	CERCLA	NFA	OU A ROD
SWMU 42, GSE Steam Clean Oil/Water Separator	CERCLA	NFA	OU A ROD
SWMU 43, AIMD Acid Battery Storage Area	CERCLA	NFA	OU A ROD
SWMU 51, NSGA Transportation Bldg. 10354 Waste Storage Area	CERCLA	NFA	OU A ROD
SWMU 54, NMCB Battery Storage	CERCLA	NFA	OU A ROD
SWMU 65, Contractor's Camp Fire/Demolition Site	CERCLA	NFA	OU A ROD
SWMU 66, Palisades Lake PCB Spill	CERCLA	NFA	OU A ROD
SWMU 68, New Pesticide Storage Area	CERCLA	NFA	OU A ROD
SWMU 69, Ski Lodge Waste Pile	CERCLA	NFA	OU A ROD
SWMU 70, Davis Road Asphalt Drums	CERCLA	NFA	OU A ROD
SWMU 71, NSGA Fueling Facility	CERCLA	NFA	OU A ROD
SWMU 72, NSGA Transportation Building 10354	CERCLA	NFA	OU A ROD
SWMU 74, Old Batch Facility[a]	CERCLA	NFA	OU A ROD
SA 75, Asphalt Storage Area	CERCLA	NFA	OU A ROD
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area	RCRA	NFA	OU A ROD
SA 83, Former Chiefs Club Station	CERCLA	NFA	OU A ROD
SA 90, Husky Road Landfill	CERCLA	NFA	OU A ROD
SA 91, Airplane Crash Sites	CERCLA	NFA	OU A ROD
SA 92, Waste Ordnance Pile (Fin Field)	CERCLA	NFA	OU A ROD
SA 94, Chemical Weapons Disposal Area	CERCLA	NFA	OU A ROD
SA 95, Transformer Disposal Area	CERCLA	NFA	OU A ROD
Clam Lagoon	CERCLA	NFA	OU A ROD

Table 9-1 (Continued)
OU A Sites Where the Remedy Is Complete

Site	Regulatory Authority	Regulatory Designation	Timing of Regulatory Designation
CERCLA Sites (Continued)			
Andrew Lake	CERCLA	NFA	OU A ROD
Petroleum Sites			
Administration Building (UST 30004-A)	SAERA	NFA	OU A ROD
Amulet Housing, Well AMW-706 Area	SAERA	NFRAP	Post-first 5-year review
Amulet Housing, Well AMW-709 Area	SAERA	NFRAP	Post-first 5-year review
Armory (UST 10311-A)	SAERA	NFA	OU A ROD
Artillery Battalion (USTs ART-1 and ART-2)	SAERA	NFA	OU A ROD
ASR-8 Facility (UST 42007-B)	SAERA	NFA	Post-second 5-year review
Bering Chapel (UST 42090-A)	SAERA	NFA	OU A ROD
Boy Scout Camp, West Haven Lake (UST BS-1)	SAERA	NFRAP	Post-first 5-year review
Boy Scout Camp, South Haven Lake (UST BS-2)	SAERA	NFA	OU A ROD
CDAA Complex (USTs 10580 and 10654)	SAERA	NFA	OU A ROD
Clam Road Truck Fill Stand	SAERA	NFA	OU A ROD
Cold Storage Facility (AST T-1440)	SAERA	NFA	OU A ROD
Contractor's Camp Burn Pad	SAERA	NFRAP	Post-first 5-year review
Contractor's Pad UST T-1706 (Navy Pad)	SAERA	NFA	OU A ROD
Drum Disposal Area at Tank Farm D	SAERA	NFA	OU A ROD
Elementary School (UST 42017-A)	SAERA	NFA	OU A ROD
Finger Bay Quonset Hut, UST FBQH-1	SAERA	NFRAP	Post-first 5-year review
Girl Scout Camp (UST GS-1)	SAERA	NFA	Post-first 5-year review
Housing Outfall Area (Sandy Cove)	SAERA	NFA	OU A ROD
Kuluk Housing (UST HST-6C)	SAERA	NFA	OU A ROD
Kuluk Recreation Center (UST 30034)	SAERA	NFA	OU A ROD
Line Crew Building (USTs 2776, 2776-B, and 2776-C)	SAERA	NFA	OU A ROD
Loran Station (USTs V149A, V149B, and V149C)	SAERA	NFA	OU A ROD
MAUW Compound (UST 24000-A)	SAERA	NFRAP	Post-first 5-year review
MAUW Compound (UST 24032-B)	SAERA	NFA	OU A ROD
McDonald's UST	SAERA	NFA	OU A ROD
Medical Center (UST 27088)	SAERA	NFA	OU A ROD
Mount Moffett Power Plant 5 (Used Oil AST)	SAERA	NFA	OU A ROD
Mount Moffett Power Plant 5 (Used Oil Pit)	SAERA	NFA	OU A ROD
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	SAERA	NFRAP	Post-first 5-year review
Mount Moffett Tower (Mogas AST and Used Oil AST)	SAERA	NFA	OU A ROD
NAVFAC Compound (USTs 20052 and 20053)	SAERA	NFRAP	Post-first 5-year review
Navy Exchange Building (UST 30026)	SAERA	NFA	OU A ROD
Navy Exchange Building (UST 30027-A)	SAERA	NFRAP	Post-first 5-year review

Table 9-1 (Continued)
OU A Sites Where the Remedy Is Complete

Site	Regulatory Authority	Regulatory Designation	Timing of Regulatory Designation
Petroleum Sites (Continued)			
Navy Exchange Building (UST 30033)	SAERA	NFA	OU A ROD
New Roberts Housing, UST HST-7C	SAERA	NFRAP	Post-first 5-year review
New Transportation Building (O/W 10644)	SAERA	NFA	OU A ROD
New Transportation Building (UST 10590)	SAERA	NFA	OU A ROD
New Transportation Building (UST 10591)	SAERA	NFA	OU A ROD
NSGA Filling Station, Mogas and JP-5 ASTs	SAERA	NFA	OU A ROD
Officer Hill and Amulet Housing, UST 31047-A	SAERA	NFRAP	Post-first 5-year review
Officer Hill and Amulet Housing (UST 31049-A)	SAERA	NFA	Post-first 5-year review
Officer Hill and Amulet Housing (UST 31050-A)	SAERA	NFA	OU A ROD
Officer Hill and Amulet Housing (UST 31051-A)	SAERA	NFA	OU A ROD
Officer Hill and Amulet Housing (UST 31052-A)	SAERA	NFRAP	Post-first 5-year review
Officer Hill and Amulet Housing (UST 31053-A)	SAERA	NFA	OU A ROD
Old Fuel Truck Shop (UST 10520-A)	SAERA	NFA	OU A ROD
Old Fuel Truck Shop (UST 10520-B)	SAERA	NFA	OU A ROD
Pantograph Pad (UST RT-1)	SAERA	NFA	OU A ROD
Pumphouse 5 Area	SAERA	NFA	OU A ROD
Quarters A (UST 42200)	SAERA	NFA	Post-first 5-year review
ROICC Contractor's Area (UST ROICC-5)	SAERA	NFA	OU A ROD
ROICC Contractor's Area (UST ROICC-6)	SAERA	NFA	OU A ROD
ROICC Contractor's Area (UST ROICC-8)	SAERA	NFRAP	Post-first 5-year review
ROICC Warehouse (UST ROICC-1)	SAERA	NFA	OU A ROD
ROICC Warehouse (UST ROICC-2)	SAERA	NFRAP	Post-first 5-year review
ROICC Warehouse (UST ROICC-3)	SAERA	NFRAP	Post-first 5-year review
ROICC Warehouse (UST ROICC-4)	SAERA	NFA	OU A ROD
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area	SAERA	NFRAP	Post-second 5-year review
SA 81, Gun Turret Hill	SAERA	NFA	OU A ROD
SA 82, NSGA P80, P81 Buildings	CERCLA	NFRAP	Post-second 5-year review
SA 84, Sand Shed	SAERA	NFA	OU A ROD
SA 85, New Baler Building	SAERA	NFA	OU A ROD
SA 86, Old Happy Valley Child Care Center	SAERA	NFA	OU A ROD
SA 87, Old Zeto Point Wizard Station	SAERA	NFA	OU A ROD
SA 89, Tank Farm C	SAERA	NFA	OU A ROD
SA 96, NORPAC Hill Debris Site	SAERA	NFA	OU A ROD
SA 97, Generator Debris Site	SAERA	NFA	OU A ROD
Sewage Life Station 10 (UST 42483-A)	SAERA	NFA	OU A ROD
Sewage Lift Station 11 (UST 42484-A)	SAERA	NFA	OU A ROD
Shack O-52 (UST O-52)	SAERA	NFA	OU A ROD
Shack 0-69 (UST B)	SAERA	NFA	OU A ROD

Table 9-1 (Continued)
OU A Sites Where the Remedy Is Complete

Site	Regulatory Authority	Regulatory Designation	Timing of Regulatory Designation
Petroleum Sites (Continued)			
South Avgas Pipeline at North Sweeper Creek	SAERA	NFA	OU A ROD
SWMU 1, Andrew Lake OB/OD and Range	SAERA	NFA	OU A ROD
SWMU 12, Quartermaster Road Debris Disposal Area	SAERA	NFA	OU A ROD
SWMU 22, Avgas Drum Storage Area South of Tank Farm 1	SAERA	NFA	OU A ROD
SWMU 24, Hazardous Waste Storage Facility	SAERA	NFA	OU A ROD
SWMU 31, Runway 18-36 Aviation Gas Drum Disposal	SAERA	NFA	OU A ROD
SWMU 34, Steam Plant 4 Used Oil AST	SAERA	NFA	OU A ROD
SWMU 35, Ground Support Equipment Building	SAERA	NFA	OU A ROD
SWMU 41, GSE Used Oil Storage Area	SAERA	NFA	OU A ROD
SWMU 44, AIMD Used Oil Storage Area	SAERA	NFA	OU A ROD
SWMU 45, Sewage Treatment Plan Petroleum Contamination (including SWMUs 46 through 50)	SAERA	NFA	OU A ROD
SWMU 55, Public Works Transportation Department Waste Storage Area	SAERA	NFA	OU A ROD
SWMU 56, Public Works Transportation Department Storage Tank	SAERA	NFA	OU A ROD
SWMU 57, Fuels Facility Refueling Dock	SAERA	NFA	OU A ROD
SWMU 64, Tank Farm D	SAERA	NFA	OU A ROD
SWMU 74, Old Batch Facility[a]	SAERA	NFA	OU A ROD
Tango Pad Spill Area	SAERA	NFA	Post-second 5-year review
Telephone Exchange Building (UST 10324-A)	SAERA	NFA	OU A ROD
Telephone Substation T-100 (UST T-100-B)	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area A	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area B	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area C	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area D	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area E (Truck Fill Stand)	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area F	SAERA	NFA	OU A ROD
TFB to TFC Pipeline—Area G	SAERA	NFA	OU A ROD
TFC to NSGA Pipeline—Area A	SAERA	NFA	OU A ROD
TFC to NSGA Pipeline—Area B	SAERA	NFA	OU A ROD
TFC to NSGA Pipeline—Area C	SAERA	NFA	OU A ROD
TFC to NSGA Pipeline—Area D	SAERA	NFA	OU A ROD
TFC to NSGA Pipeline—Area E	SAERA	NFA	OU A ROD

Table 9-1 (Continued)
OU A Sites Where the Remedy Is Complete

Site	Regulatory Authority	Regulatory Designation	Timing of Regulatory Designation
Petroleum Sites (Continued)			
USGS (NOAA) Building (USTs NOAA-A, -C, and -D)	SAERA	NFA	OU A ROD
Yakutat Hangar, USTs T-2039-B and T-2039-C	SAERA	NFRAP	Post-first 5-year review
Yakutat Hangar, UST T-2039-A	SAERA	NFRAP	Post-second 5-year review

[a]SWMU 74, Old Batch Facility is included as a no further action site for both CERCLA and petroleum.

Notes:
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
FFCA - Federal Facilities Compliance Agreement
GSE - ground support equipment
JP-5 - jet petroleum No. 5
loran - long-range navigation
MAUW - modified advanced underwater weapons
mogas - motor gasoline
NFA - no further action
NFRAP - no further remedial action planned
NMCB - Naval Mobile Construction Battalion
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
OU - operable unit
RCRA - Resource Conservation and Recovery Act
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C
USGS - U.S. Geological Survey
UST - underground storage tank

Table 9-2
OU A Sites Where the Remedy Is Operating and Expected to Be Protective

Site Name	Regulatory Authority	Operating Remedy
Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4	SAERA	MNA/IC
Former Power Plant, Building T-1451	SAERA	MNA/IC
GCI Compound, UST GCI-1	SAERA	MNA/IC
Housing Area (Arctic Acres)	SAERA	MNA/IC
Kuluk Bay	CERCLA	MTM/IC
NORPAC Hill Seep Area	SAERA	LM
ROICC Contractor's Area, UST ROICC-7	SAERA	LM/MNA
Runway 5-23 Avgas Valve Pit	SAERA	MNA/IC
SA 76, Old Line Shed Building	CERCLA	IC
SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs	SAERA	MNA/ /IC
SA 79, Main Road Pipeline	CERCLA, SAERA	LM
SA 80, Steam Plant 4, USTs 27089 and 27090	SAERA	MNA/IC
SA 88, P-70 Energy Generator, UST 10578	SAERA	LM
Sweeper Cove	CERCLA	MTM/IC
SWMU 2, Causeway Landfill	CERCLA	IC
SWMU 4, South Davis Road Landfill	CERCLA	IC
SWMU 10, Old Baler Building	CERCLA	IC
SWMU 11, Palisades Landfill	CERCLA	PCM/IC
SWMU 13, Metals Landfill	CERCLA	PCM/IC
SWMU 14, Old Pesticide Disposal Area	CERCLA, SAERA	MNA/CGWM/IC
SWMU 15, Future Jobs/DRMO	CERCLA, SAERA	MNA/CGWM/IC
SWMU 16, Former Firefighting Training Area	CERCLA	IC
SWMU 17, Power Plant 3		
SWMUs 18/19, White Alice Landfill	ADEC solid waste regulations	PCM/IC
SWMU 20, White Alice/Trout Creek Disposal Area	CERCLA	IC
SWMU 21A, White Alice Upper Quarry	CERCLA	IC
SWMU 23, Heart Lake Drum Disposal Area	CERCLA	IC
SWMU 24, Hazardous Waste Storage Facility	RCRA	IC
SWMU 25, Roberts Landfill	ADEC solid waste regulations	PCM/IC
SWMU 29, Finger Bay Landfill	CERCLA	IC
SWMUs 52, 53, and 59, Former Loran Station	CERCLA	IC
SWMU 55, Public Works Transportation Department Waste Storage Area	CERCLA	CGWM/IC
SWMU 58 and SA 73, Heating Plant 6	SAERA	MNA/IC

Table 9-2 (Continued)
OU A Sites Where the Remedy is Operating and Expected to Be Protective

Site Name	Regulatory Authority	Operating Remedy
SWMU 61, Tank Farm B	CERCLA, SAERA	MNA/IC
SWMU 67, White Alice PCB Spill Site	CERCLA	IC
Tanker Shed, UST 42494	SAERA	MNA /IC/FP

Notes:
ADEC - Alaska Department of Environmental Conservation
AST - aboveground storage tank
avgas - aviation gasoline
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CGWM - compliance groundwater monitoring
DRMO - Defense Reutilization and Marketing Office
FP - free product
IC - institutional control
LM - limited groundwater monitoring
MNA - monitored natural attenuation
MTM - marine tissue monitoring
PCB - polychlorinated biphenyl
PCM - post-closure monitoring
RCRA - Resource Conservation and Recovery Act
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
UST - underground storage tank

10.0 NEXT REVIEW

The next 5-year review is scheduled for completion in December 2016.

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