

Final

December 2016



Fourth Five-Year Review

Former Adak Naval Complex

Adak Island, Alaska

Department of the Navy

Naval Facilities Engineering Command Northwest

1101 Tautog Circle

Silverdale, WA 98315



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**FINAL
FOURTH FIVE-YEAR REVIEW
FORMER ADAK NAVAL COMPLEX
ADAK ISLAND, ALASKA**

**Prepared by
Battelle
Columbus, Ohio**

**Prepared for
Naval Facilities Engineering Command Northwest
Silverdale, Washington**

**U.S. Navy Contract No. N44255-14-D-9013
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December 13, 2016

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EXECUTIVE SUMMARY

As lead agency for environmental cleanup of the former Adak Naval Complex, Adak Island, Alaska, the U.S. Navy has completed this fourth five-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 (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). The purpose of this five-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 (UU/UE). This five-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), the U.S. Environmental Protection Agency's (U.S. EPA's) *Comprehensive Five-Year Review Guidance* (U.S. EPA, 2001) and the *State-Adak Environmental Restoration Agreement with Amendments* (SAERA; U.S. Navy, 2006g).

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 of the third five-year review on December 13, 2011. This review covers the entire former Adak Naval Complex, including both CERCLA and non-CERCLA sites. The entire former Adak Naval Complex is divided into three OUs (OU A, OU B-1, and OU B-2) and SAERA sites. This five-year review evaluates data collected at the site during the 2011 through 2015 field seasons.

After completion of the OU A ROD, the petroleum sites were removed through a ROD amendment and a SAERA was amended to address these sites. The 2003 ROD Amendment states: Remove sixty-two (62) petroleum sites from the OU A ROD, consistent with the *Naval Air Station Adak Federal Facility Agreement (FFA)* and the *Naval Air Station Adak State-Adak Environmental Restoration Agreement (SAERA)* as amended in March 2002. SAERA included a requirement to include the state-regulated petroleum sites in the five-year review cycle. The SAERA dictates cleanup of petroleum sites under the State of Alaska Department of Environmental Conservation (ADEC) Regulation 18 Alaska Administrative Code (AAC) 75, the Site Cleanup Rule. The terminology for cleanup under ADEC varies slightly from CERCLA terminology, and both are used throughout this document. ADEC tracks the status of all sites in its database using both ADEC and CERCLA milestones as defined in the glossary on page xxiii. Sites are managed using the CERCLA process and ADEC site closure terminology differs from typically CERCLA terms as explained in the glossary on page xxiii. Throughout this document, sites that were formerly identified as part of OU A and have since been reclassified under the SAERA will be identified as SAERA sites.

The ROD for interim remedial actions (U.S. Navy, U.S. EPA, and ADEC, 1995) and the OU A ROD (U.S. Navy, U.S. EPA, and ADEC, 2000) for Adak required remedial actions for 66 OU A sites (19 CERCLA sites, which include three water bodies and three 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 Resource Conservation and Recovery Act (RCRA) and petroleum site [SA 77], and 42 petroleum sites [counting the two Naval Marine Construction Battalion {NMCB} sites as separate sites]). The petroleum sites were later removed in the 2003 OU A ROD amendment and were added to the 2002 SAERA amendment for follow up under a separate petroleum program. 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, U.S. EPA, 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 no further action (NFA) sites under RCRA, both have ongoing institutional controls (ICs) as required by the RCRA closure plan. The OU B-1 ROD (U.S. Navy, U.S. EPA, and ADEC, 2001) required further investigation or remedial actions for 50 OU B-1 sites (including the three new sites, MM-10F, MM-10G, and MM-10H, identified in 2004 that are located within or adjacent to MM-10E).

With the exception of the three sites discussed below, this five-year review concludes that the remedy is functioning as intended by the OU A ROD and the SAERA decision documents (DDs) for the remaining 64 OU A and SAERA sites on Adak. Changes in the applicability or relevant and appropriate requirements (ARARs) or exposure and toxicity assumptions that have occurred since the RODs and SAERA DDs were signed do not affect the protectiveness of the remedies. Concentrations of many chemicals in groundwater remain above the remediation goals (RGs) or ROD/DD endpoint criteria at sites where long-term monitoring is occurring. This results in the requirement for continued ICs to prevent exposure and ongoing monitoring.

The technical assessment conducted as part of this five-year review determined that the remedy is not functioning as intended for the following three SAERA sites:

- SWMU 60: Surface water and sediment conditions in South Sweeper Creek and free product in groundwater adjacent to South Sweeper Creek.
- SWMU 62: Surface water and sediment conditions in East Canal exceed water quality standards.
- Former Power Plant, Building T-1451: Surface water and sediment conditions in East Canal exceed water quality standards.

Additionally, a vapor intrusion evaluation conducted as part of this five-year review identified six wells within the portions of Area 303 (east of Main Road), and SWMU 62 with results indicating that a potential vapor intrusion issue may be present. The results of this vapor intrusion evaluation do not necessarily mean that unacceptable risk from vapor intrusion exists. Rather, this evaluation indicates that further sampling of groundwater and potentially soil vapor should be conducted under SAERA to produce data that confirm the downtown area of Adak is protective based on vapor intrusion into indoor air.

Perfluorinated chemicals (PFCs) have been identified as an emerging contaminant in drinking water. Based on a review of historical site use, the Former Fire Fighting Training Area (SWMU 16) exhibits the characteristics of a site at which aqueous fire-fighting foams (AFFFs) could have

been used in a manner that could result in the release of PFCs to the environment. Consumption of impacted groundwater is one of the primary routes of human exposure to PFCs, which would not be considered a complete exposure pathway due to ICs in place restricting groundwater for domestic use for the Former Fire Fighting Training Area. All drinking water is obtained from surface water (i.e., Lake Bonnie Rose) and there are no potential sources of PFCs to the lake. The Navy is closely monitoring regulatory and technical developments related to PFCs and proactively evaluating an appropriate approach for PFCs at SWMU 16. As the Navy develops a national plan to sample suspect PFC contaminated sites, sites identified at Adak will be sampled by 2019.

The remedies in place for all other OU A and SAERA sites are considered protective of human health and the environment. The extent of contamination is defined, and ICs are in place to prevent exposure to contaminated soil and groundwater. ICs are assessed biennially or every five years. The selected remedies will continue to be protective for these sites.

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. In August 2014, the Remedial Action Completion Report (RACR; U.S. Navy, 2014f) was finalized for OU B-1, which documented that the remedial actions specified in the OU B-1 ROD had been completed and no further response actions are necessary. A key component of the OU B-1 remedy is the land use controls (LUCs) which are functioning as intended.

The proposed remedies for OU B-2 sites have been identified; however, a ROD has not been finalized. In the interim, LUCs are in place to control exposure pathways that could result in unacceptable risks to human health and the environment. Since this is a pre-ROD, OU B-2 will not be evaluated for protectiveness.

An Institutional Control Management Plan (ICMP) is in place, and IC inspections occur biennially or every five years. When deficiencies are identified, corrective action is taken. The inspection and associated follow up is functioning as intended. Long-term monitoring is ongoing. The long-term monitoring goals and requirements are periodically revisited to maintain focus on the endpoint goals. The Navy has shown that natural attenuation of petroleum compounds continues to occur on Adak, and natural attenuation monitoring is part of the long-term monitoring program conducted under SAERA. However, the presence of free product and significant residual contaminant mass do not allow current evaluation techniques to reliably estimate whether ROD/DD endpoint criteria will be achieved in groundwater within 75 years of ROD execution, which is the target remediation timeframe for monitored natural attenuation (MNA). This is because wells in which free product is observed are not sampled and generally have insufficient data to support a statistical evaluation. As a result, estimates for meeting ROD/DD endpoint criteria do not take the most contaminated wells (i.e., those with free product) into account.

The final remedy established under SAERA DDs and the additional actions required by those documents have been implemented at all of the 15 free-product sites. Limited groundwater

monitoring, implementation of ICs, and MNA have been implemented where required through adjustments to the Comprehensive Monitoring Plan (CMP).

The three SAERA sites with recommended follow-up actions (i.e., SWMU 60, Tank Farm A; SWMU 62, New Housing Fuel Leak; and Former Power Plant, Building T-1451) will be protective once follow-up removal actions are complete. Removal actions at SWMU 62 and Former Power Plant, Building T-1451 were completed during the 2016 field season.

Administrative Issues and Recommendations

There were several items identified during this five-year review that do not affect protectiveness for any of the sites evaluated. The issues identified and proposed recommendations to optimize the Navy efforts to close out sites are:

- Issue: CERCLA OU A. EPA recently modified exposure and toxicity data assumptions in OSWER 9200.1-120, thus changing the endpoint criteria for fish/shellfish in Kuluk Bay and Sweeper Cove.

Recommendation: Prepare an Explanation of Significant Differences (ESD) to change endpoint criteria and update CMP.

- Issue: CERCLA/SAERA. The OU A ROD referred to ARARs 18 AAC 70 or 40 CFR 131.36 to establish surface water endpoint criteria for SWMUs 11, 18/19 and 25. Changes occurred in 2008 to 18 AAC 70 that impacted some of the endpoint criteria values generated at the time of the OU A ROD signing. Table 7-3 identifies which values have changed and proposes new values.

Recommendation: Prepare an ESD to change endpoint criteria and update CMP.

- Issue: In 2008, ADEC revoked the 10 times rule in 18 AAC 75. This has an impact on endpoint criteria at NMCB Building and South of Runway 18-36.

Recommendation: Evaluate the impact on NMCB Building and South of Runway 18-36. Determine the appropriate mechanism to change cleanup levels in the DDs through an ESD or DD amendment. Update the CMP as necessary.

- Issue: CERCLA. At SWMU 11, after 15 years of monitoring no endpoint criteria are identified in the ROD. Over that period, sample results for antimony, arsenic and nickel have been at consistent levels at sample locations 101, 102 and 103. Sediment sample 102 was the only sample for which concentrations of target metals were observed to be above endpoint criteria. Sample location 103 is downgradient of location 102 and represents chemical of concern (COC) impact to marine sediments. No other samples had target metals exceeding endpoint criteria, which indicates that the exposure pathway for ecological risk in Kuluk Bay is not completed.

Recommendation: Evaluate sediment monitoring at SWMU 11, following the next planned monitoring event, and determine if continued monitoring is appropriate.

SITE IDENTIFICATION

Site Name: Adak Naval Air Station

EPA ID: AK4170024323

Region: 10

State: AK

City/County: Aleutians West

SITE STATUS

NPL Status: Final

Multiple OUs?
Yes

Has the site achieved construction completion?
No

REVIEW STATUS

Lead agency: Other Federal Agency
[If "Other Federal Agency", enter Agency name]: Navy

Author name (Federal or State Project Manager): Steve Saepoff

Author affiliation: Naval Facilities Engineering Command Northwest

Review period: 1/1/2011 – 12/31/2015

Date of site inspection: 8/27/2015 – 9/3/2015

Type of review: Statutory

Review number: 4

Triggering action date: 12/13/2011

Due date (five years after triggering action date): 12/13/2016

ISSUES

1. SAERA. Surface water and sediment conditions in East Canal at the groundwater seep near Boom 3 continue to exceed Water Quality Standards. These findings suggest the remedy at SWMU 62 may not be functioning as intended at one or more locations.
2. SAERA. The vapor intrusion evaluation conducted as part of this five-year review has identified three wells (see Figure 7-1) within the residential area at Adak with results indicating that a potential vapor intrusion issue for naphthalene may be present.
3. SAERA. Surface water and sediment conditions in East Canal at the groundwater seep near Boom 11 continue to exceed Water Quality Standards. These findings suggest the remedy at Building T-1451 may not be functioning as intended at one or more locations.
4. SAERA. Surface water and sediment conditions in South Sweeper Creek and free product observed in groundwater adjacent to South Sweeper Creek at SWMU 60 suggest the remedy may not be functioning as intended.
5. CERCLA OU A. The remedy at SWMU 4 currently protects human health and the environment in the short term because at the current depth of Andrew Lake, the landfill is contained. However, once remedial activity at OU B-2 is complete, periodic clearance of the mouth of Andrew Lake may no longer occur, impacting Lake drainage. The elevation of the Lake surface could rise to

threaten the landfill cap. Long-term protectiveness could be an issue that requires evaluation during the next 5 years.

6. CERCLA OU A. Heightened interest in the emerging contaminant, PFCs, are resulting in DoD-wide investigations to determine the potential presence at sites that AFFF was historically used. SWMU 16 has been identified as a potential site. Long-term protectiveness could be an issue that requires evaluation during the next 5 years.

RECOMMENDATIONS AND FOLLOW-UP ACTIONS

1. At SWMU 62, a removal action under the SAERA petroleum program is being conducted to protect surface water downgradient of the sites.
2. Collect additional data to determine if vapor intrusion is an issue. Compare results to appropriate screening criteria.
3. In East Canal near Building T-1451, a removal action under the SAERA petroleum program is being conducted to protect surface water downgradient of the sites.
4. In South Sweeper Creek near SWMU 60, determine if and what additional action under SAERA may be required to protect surface water downgradient of the site.
5. Evaluate the potential impacts of discontinued clearing of the Andrew Lake spillway and the resulting elevated lake levels on SWMU 4. Determine if alternative actions are required to either manage the elevation of Andrew Lake or enhance the landfill shoreline protection to ensure protectiveness at the site in the long term.
6. Sample for PFC per Navy guidance at SWMU 16. Since OU A ROD established a groundwater restriction for use as drinking water, this exposure pathway is not complete.

PROTECTIVENESS STATEMENTS

OU A Sites are Protective

OU A - Under CERCLA, all OU A sites are remedy in place and are protective of human health and the environment. There is no current exposure at these sites because all exposure pathways that could result in unacceptable risks are being controlled through the implementation of ICs, and where applicable engineering controls. 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. ICs are assessed biennially or every five years to ensure the remedy remains protective.

SAERA Sites are or Will be Protective

With the exception of SWMU 60, SWMU 62 and Building T-1451, all SAERA sites that are either Active (in LTM) or Cleanup complete with ICs are protective of human health and the environment. There is no current exposure at these sites as all exposure pathways that could result in unacceptable risks are being controlled through the implementation of ICs. For these sites, the IC component of the remedy is protective and is expected to remain so as long as the ICs are maintained. ICs are assessed biennially or every five years to ensure the remedy remains protective.

Under SAERA, follow-up actions are recommended at the following sites to ensure the remedy is protective due to the presence of surface water and sediment contamination:

- SWMU 60, Tank Farm A

- SWMU 62, New Housing Fuel Leak
- Former Power Plant, Building T-1451

For these sites with recommended follow-up actions, the sites will be protective after the completion of the remedial activities.

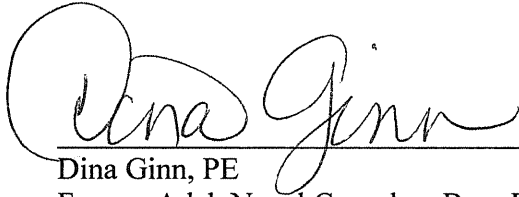
OU B-1 Sites are Protective

Under CERCLA, the Remedial Action Completion Report (U.S. Navy, 2014f) was finalized for OU B-1, which documented that the remedial actions specified in the OU B-1 ROD had been completed and no further response actions are necessary. The RAOs were determined to have been achieved, however, ongoing ICs were determined necessary to ensure that human health and the environment are protected. The remedy for OU B 1 is protective of human health and the environment as long as ICs remain in place to control exposure pathways that could result in unacceptable risks.

FOURTH FIVE-YEAR REVIEW
Former Adak Naval Complex, Adak Island, Alaska
Naval Facilities Engineering Command Northwest

Signature Page
Revision No.: 0
Date: December 2016
Page xiii

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

A handwritten signature in cursive script, reading "Dina Ginn", written over a horizontal line.

Dina Ginn, PE
Former Adak Naval Complex, Base Realignment
and Closure Environmental Coordinator
U.S. Navy

12/13/2016
Date

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ADEC	Alaska Department of Environmental Conservation
ADOT	Adak Department of Transportation and Public Facilities
AFFF	aqueous fire-fighting foam
ARAR	applicable or relevant and appropriate requirement
ARC	Adak Reuse Corporation
AST	aboveground storage tank
ATV	all-terrain vehicle
avgas	aviation gasoline
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
BW	body weight
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
CSF	cancer slope factor
DCE	dichloroethene
DD	decision document
DMM	discarded military munition
DON	Department of Navy
DRMO	Defense Reutilization Marketing Office
DRO	diesel-range organics
EC	engineering control
ED	exposure duration
EOD	explosive ordnance disposal
EPC	exposure point concentration
ESHA	explosives safety hazard assessment
FFA	Federal Facility Agreement
FFCA	Federal Facilities Compliance Agreement
FS	feasibility study
FFS	focused feasibility study
GCI	General Communications Inc.
g/day	gram per day
GRO	gasoline-range organics

HI	hazard index
HQ	hazard quotient
IC	institutional control
ICMP	Institutional Control Management Plan
JP-5	jet petroleum No. 5
loran	long-range navigation
LUC	land use control
LUST	leaking underground storage tank
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
MNA	monitored natural attenuation
NAF	Naval Air Facility
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 the 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
NTCRA	Non-Time Critical Removal Action
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PFC	perfluorinated compound

PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PQL	practical quantitation limit
PSE	preliminary source evaluation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	remedial action objective
RA-O	Remedial Action Operation
RBSC	risk-based screening concentration
RCRA	Resource Conservation and Recovery Act
RDX	royal demolition explosive (cyclonite)
RG	remediation goal
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
ROICC	resident officer in charge of construction
RRO	residual-range organics
RSL	Regional Screening Level
SA	source area
SAERA	State-Adak Environmental Restoration Agreement
SARA	Superfund Amendments and Reauthorization Act
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAC	The Aleut Corporation
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TCE	trichloroethene
TDS	total dissolved solids
TKN	Total Kjeldahl Nitrogen
UCL	upper confidence limit
U.S. EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance
UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
VISL	Vapor Intrusion Screening Level
VOC	volatile organic compound

ADEC Milestones*

Cleanup Complete

The Cleanup Complete status generally includes sites where remediation efforts are complete and any remaining contamination is below the threshold that would require ICs (with periodic reporting), or it is determined that the remaining contamination does not pose a threat to potential receptors and therefore, ICs are not necessary.

Active

Non-Leaking Underground Storage Tank (LUST) sites with confirmed contamination above action levels or LUST sites with a confirmed release in any amount, where remediation efforts are not complete; or when confirmed contamination is below action levels but is determined by a project manager not to be representative of site conditions and more investigation will be required.

Cleanup Complete – Institutional Controls

The Cleanup Complete – ICs status generally includes sites where no further remediation is planned and the potential for future exposure to residual contamination warrants the use of ICs (with periodic reporting).

DoD CERCLA Milestones (DoD, 2012)

Response Complete (RC)

This milestone signifies that the RAOs have been met and the RA-O phase, if required, has achieved cleanup goals specified in the ROD or DD. Formal documentation for the RC milestone is essential to ensure recognition of completion of cleanup goals at the site. Prior to claiming completion of the RC milestone, regulatory concurrence of this documentation is required.

Remedy in Place (RIP)

This milestone is achieved when the construction of a long-term remedy is complete and the remedy is operating as planned to meet project RAOs in the future, or a short-term remedy has been successfully implemented and the final documentation is being prepared. Determination of achieving the RIP milestone is a Navy decision and regulatory concurrence for this milestone is not needed.

Remedial Action Operation (RA-O)

This phase involves operation, maintenance, and monitoring actions for the remediation system and site. The RA-O phase may also include implementation, and management/maintenance of LUCs, if these were part of the selected remedial action in the ROD or DD. The RA-O phase continues until a remediation system achieves cleanup goals. For sites with monitored natural

*ADEC maintains a database for all sites on Adak which use ADEC and CERCLA milestones. To manage CERCLA sites to both ADEC and DoD milestones, both DoD CERCLA and ADEC milestones will be used for CERCLA sites. Only ADEC milestones are used for SAERA sites.

attenuation (MNA) or other passive remedies, the RA-O phase includes long-term monitoring (LTM) until the cleanup goals are met for the site.

Adak-Specific Term

NOFA

NOFA is an Adak specific term. It applies to munitions sites that are Cleanup Complete – Institutional Controls.

NOFA is different from NFA, the [RCRA] designation used for OU A sites. NOFA includes the continuation of the Adak 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.

1.0 INTRODUCTION

This report presents the results of the fourth five-year review performed for the former Adak Naval Complex, Adak Island, Alaska (Figure 1-1). The purpose of this five-year review is to determine whether the remedies selected for implementation in the Records of Decision (RODs) and SAERA decision documents (DDs) are protective of human health and the environment. This review is required because contaminants have been left at Adak above levels that do not allow for unlimited use and unrestricted exposure (UU/UE).

The Navy, the lead agency for former Adak Naval Complex, prepared this five-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 National Priorities List (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. The corrective action requirements of Resource Conservation and Recovery Act (RCRA) of 1976 apply to SWMUs at RCRA-permitted facilities. CERCLA and RCRA corrective action requirements address the investigation and cleanup of contaminated property through slightly different but functionally equivalent processes. This functional equivalence means that when CERCLA investigation requirements are met, the RCRA requirements for SWMUs also are fulfilled.

This report covers the remedies selected for each of these sites in the signed RODs for Operable Unit (OU) A and OU B-1 (U.S. Navy, United States Environmental Protection Agency [U.S. EPA], and Alaska Department of Environmental Conservation [ADEC], 1995, 2000, and 2001) sites covered under State-Adak Environmental Restoration Agreement (SAERA) (former OU A sites) and the signed DDs for 14 petroleum sites (U.S. Navy and ADEC, 2005a, 2006a, 2006b, 2006c, 2007, and 2012a). The first and second OU A ROD amendments removed the petroleum sites from consideration under CERCLA and established a SAERA with Amendments 1 and 2 that require that the petroleum sites are subject to the CERCLA five-year review process (U.S. Navy and ADEC, 2002a, 2006g). Throughout this document, sites that were formerly identified

as part of OU A and have since been reclassified under the SAERA, will be identified as SAERA sites.

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. Since the ROD for OU B-1 was signed prior to DoD managing munitions sites under CERCLA, Adak specific terminology was established and that has been carried forward for consistency with the OU B-1 ROD.

Naval Facilities Engineering Command (NAVFAC) Northwest conducted this five-year review during the time period July 2015 through August 2016 by reviewing data collected at the site during the 2011 through 2015 field seasons. This report documents the results of the review. This review covers protectiveness for OU A, SAERA, and OU B-1 sites on the former Adak Naval Complex. The proposed remedies for OU B-2 sites have been identified; however, a ROD has not been finalized. In the interim, LUCs are in place to control exposure pathways that could result in unacceptable risks to human health and the environment. Since this is a pre-ROD, OU B-2 will not be evaluated for protectiveness; however, the status of OU B-2 is discussed in this review.

This report was prepared using Navy and U.S. EPA guidance (U.S. Navy, 2011h; U.S. EPA 2001; U.S. Navy, 2006b). 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 five-year review for the island as a whole in a single document. In an effort to meet this challenge, this five-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 has been updated as part of the five-year review process for Adak. 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]). The site catalog is a Microsoft® Access database that can be generated as a pdf document.

This five-year review has been streamlined to minimize information that has been presented in the previous three five-year reviews. The intent is to focus on the actions, monitoring, and issues over the last 5 years and recommendations and protectiveness for the next 5 years. To facilitate this, references are provided in the appropriate sections of this document that will lead the reader to information for that section in the third five-year review. In the PDF version of this document, these references are hyperlinked to reference documents provided on the accompanying CD.

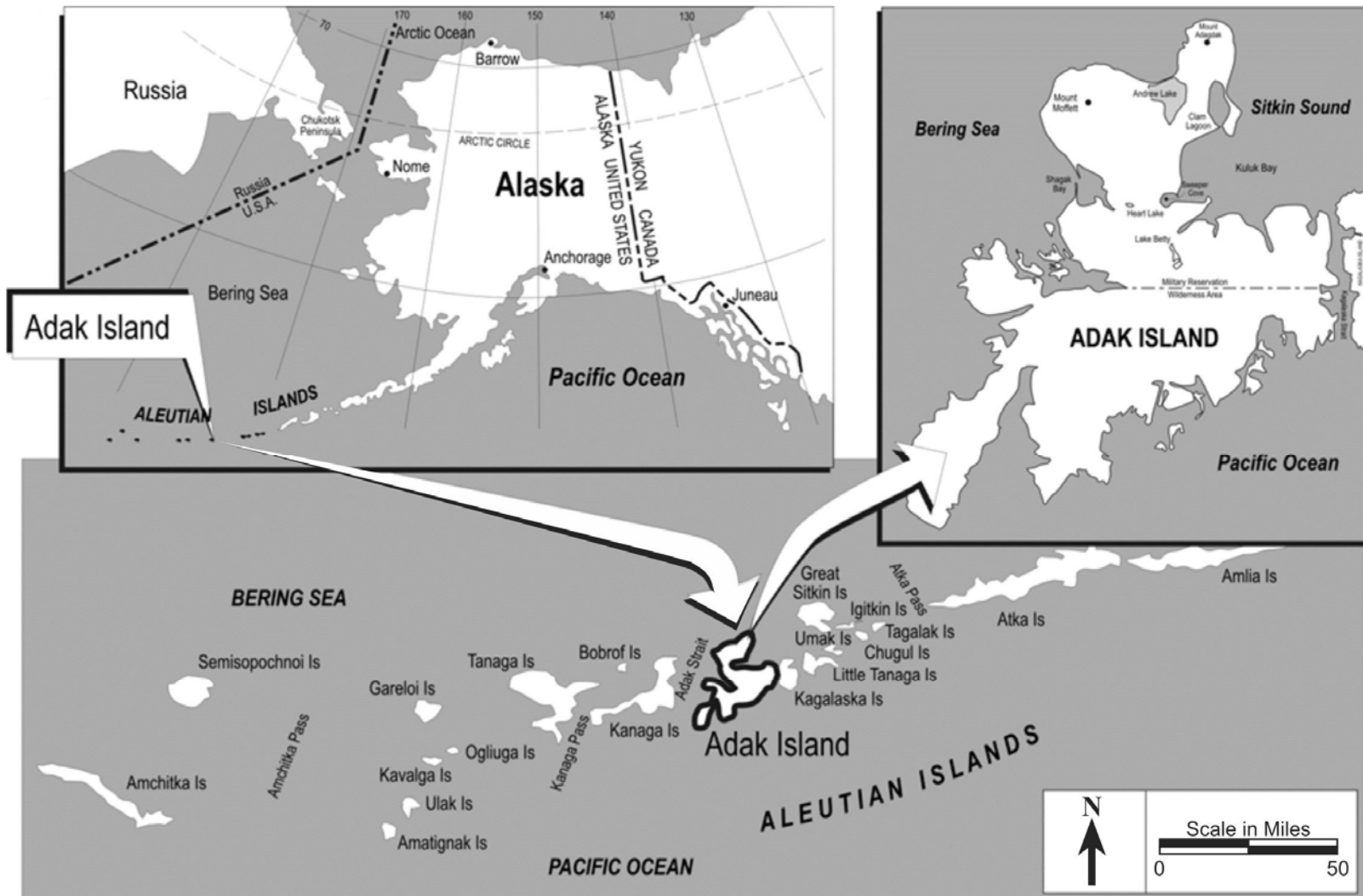


Figure 1-1. Adak Island Location Map

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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 summary provided in Table 2-1.

For pre-2011 information, please see Section 2.0 of U.S. Navy, 2011a, *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 2.0, U.S. Navy, 2011a](#)).

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, U.S. EPA, and ADEC, 2000). Of the remaining 178 sites, 121 were petroleum sites, 50 were investigated under CERCLA, five were investigated under both CERCLA and SAERA (SWMUs 14, 15, 17, 55, and 74), and two 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 SAERA sites.

During this (fourth) five-year review period (between September 2011 and October 2014), ADEC approved cleanup complete with ICs for seven SAERA sites including Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4); NORPAC Hill Seep Area; Runway 5-23 Avgas Valve Pit; SA 78, Old Transportation Building (USTs 10583, 10584, ASTs); SA 88, P-70 Energy Generator, UST 10578; SWMU 15, Future Jobs/DRMO; and SWMU 58/SA 73, Heating Plant 6. In addition (between December 2011 and November 2016), ADEC approved cleanup complete status for five sites including Contractor's Camp Burn Pad; SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area; Amulet Housing, Well AMW-706 Area; Amulet Housing, Well AMW-709 Area; and Boy Scout Camp, UST BS-1. Figures 2-3 and 2-4 show the current status of CERCLA and SAERA sites, respectively, that were determined to require further action in the OU A ROD. In addition, ADEC approved cleanup complete with ICs for six OU B-1 sites including MM-10A, MM-10B, MM-10E, MM-10F, MM-10G, and MM-10H.

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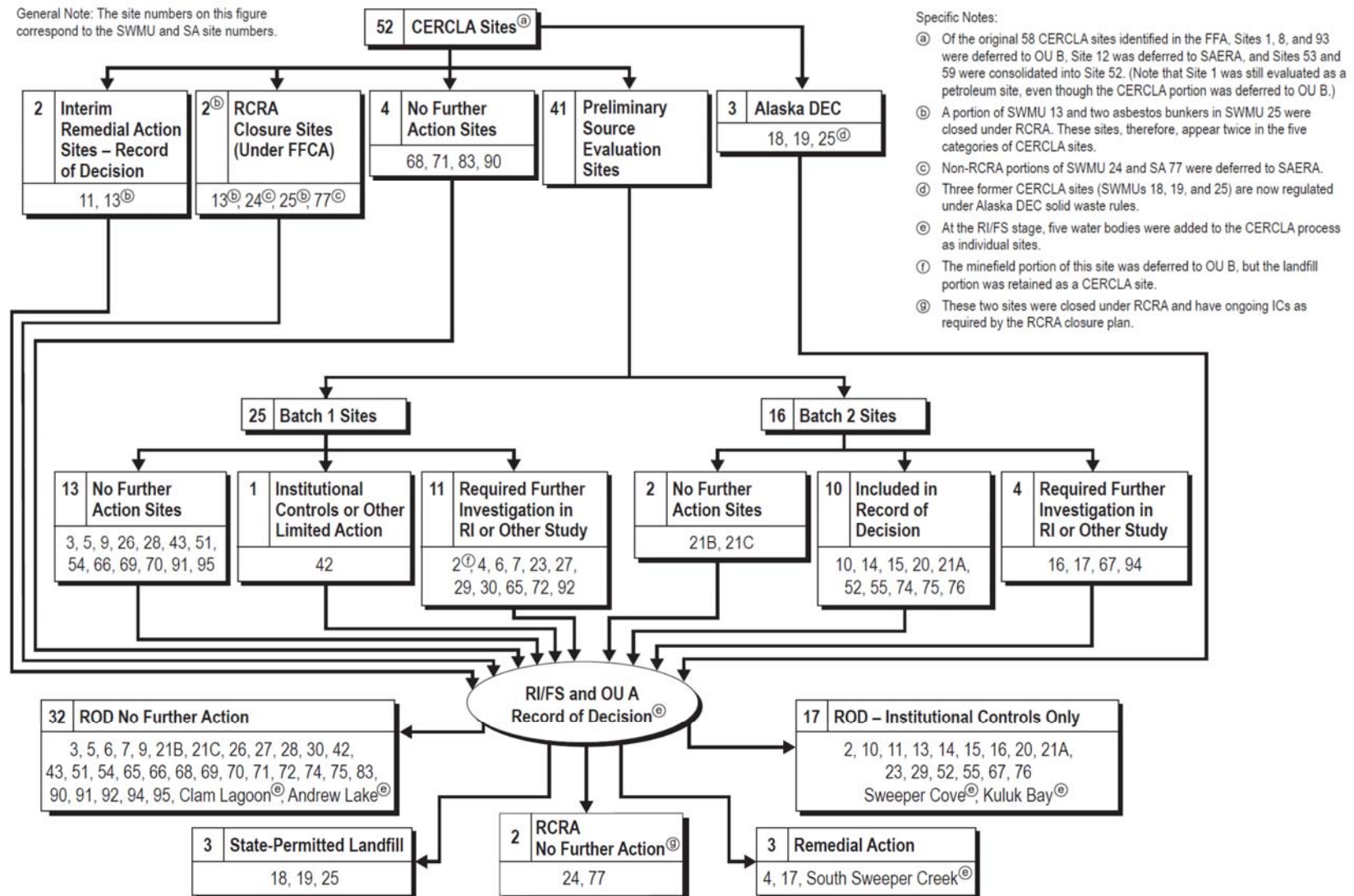


Figure 2-1. Summary of CERCLA Site Process at Former Adak Naval Complex

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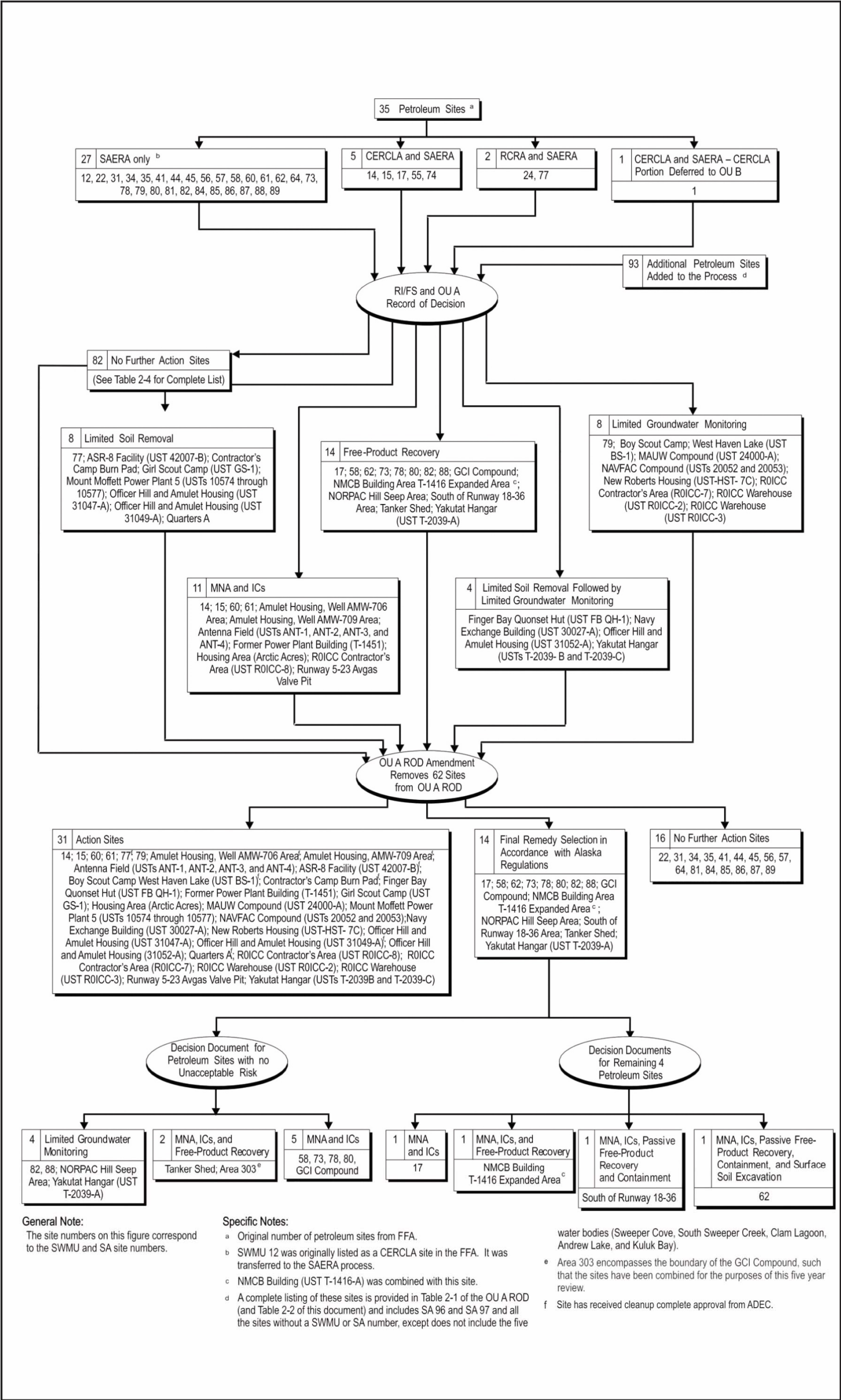


Figure 2-2. Summary of Petroleum (SAERA) Site Process of Former Adak Naval Complex

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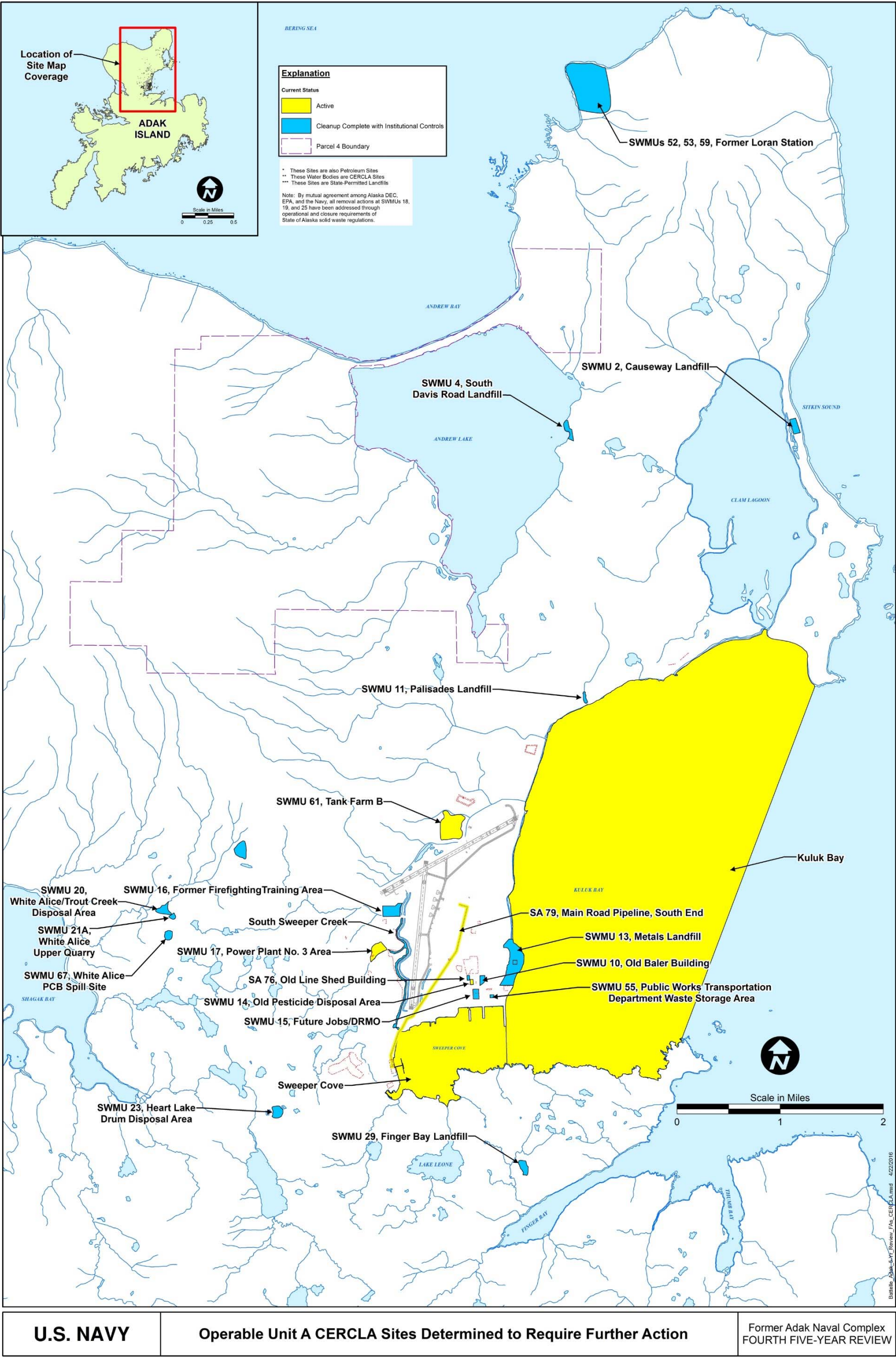


Figure 2-3. Operable Unit A CERCLA Sites That Require Further Action

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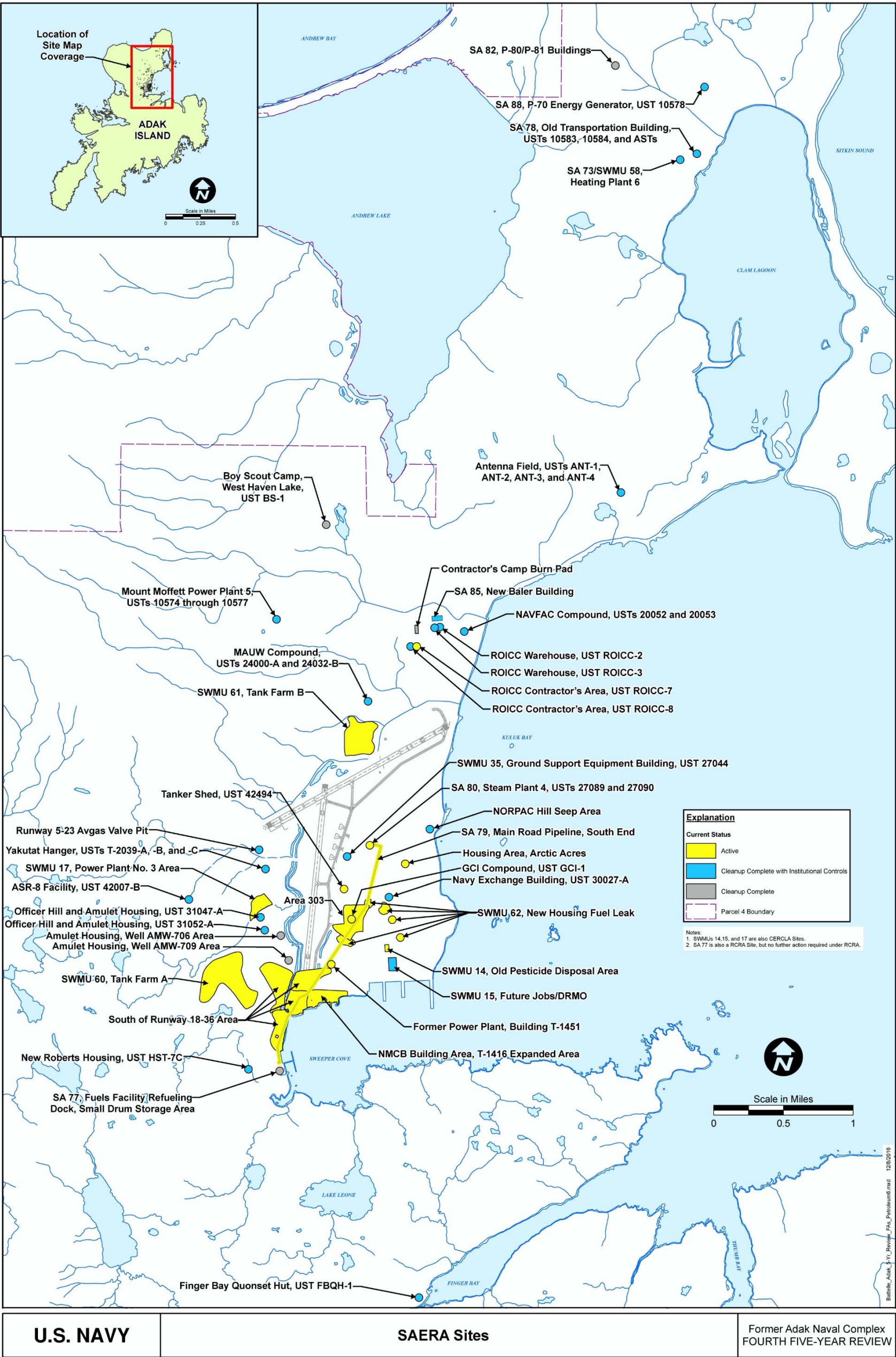


Figure 2-4. SAERA Sites That Require Further Action

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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
Final 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 five-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
OU A remedy in place at all OU A SAERA sites	October 2006
Second five-year review executed	December 2006
Decision document for final remedy at SWMU 17, Power Plant No. 3 Area	January 2007
OU B-1 remedy in place at all sites	September 2010
Third five-year review executed	December 2011
Decision document for final remedy at Area 303	March 2012
Final OU A RACR (for soil and surface water)	September 2012
Final RACR for OU B-1	August 2014

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

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3.0 BACKGROUND

This section summarizes the sites included in the two OUs at former Adak Naval Complex. The OUs include OU A, sites formerly within OU A (now under SAERA), and OU B-1.

The contents of this section that were presented in previous reviews are available in the third five-year review. Readers of the hard copy version of this fourth five-year review who want more information will find it in Section 3 of the third five-year review (U.S. Navy, 2011a). In the PDF version of this fourth five-year review, the links below are to the reference document included on the CD provided.

For pre-2011 information, please see the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 3.0, U.S. Navy, 2011a](#)).

3.1 Operable Unit A and SAERA

OU A and SAERA address 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. For pre-2011 information, please see the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 3.1, U.S. Navy, 2011a](#)).

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 five-year review). The Site Catalog also includes information for each site that would typically be included in later sections of the five-year review report, such as remedy implementation and operation, maintenance, and monitoring.

3.2 Operable Unit B

Overall, OU B addresses ordnance explosives safety hazards and human health and ecological risks associated with munitions constituents (MC).

For pre-2011 information, please see the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 3.2, U.S. Navy, 2011a](#)).

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 The Aleut Corporation (TAC) (OU B-1 sites are shown on Figure 3-1). Parcel 4 includes all of the land currently retained by the Navy on Adak Island (see Figure 3-1 and Figure 3-2 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. As shown on Figure 3-3, 155 sites are addressed under OU B-1, 6 sites will be addressed under the Formerly

Used Defense Site (FUDS) program, and the remainder will be addressed as part of OU B-2. FUDS sites are sites that encompass areas outside the military reservation.

3.2.1 Operable Unit B-1

The sites in OU B-1 include the downtown and remote exchange areas identified for land transfer. Table 3-1 presents the results of the preliminary assessment and ROD for all the OU B-1 sites.

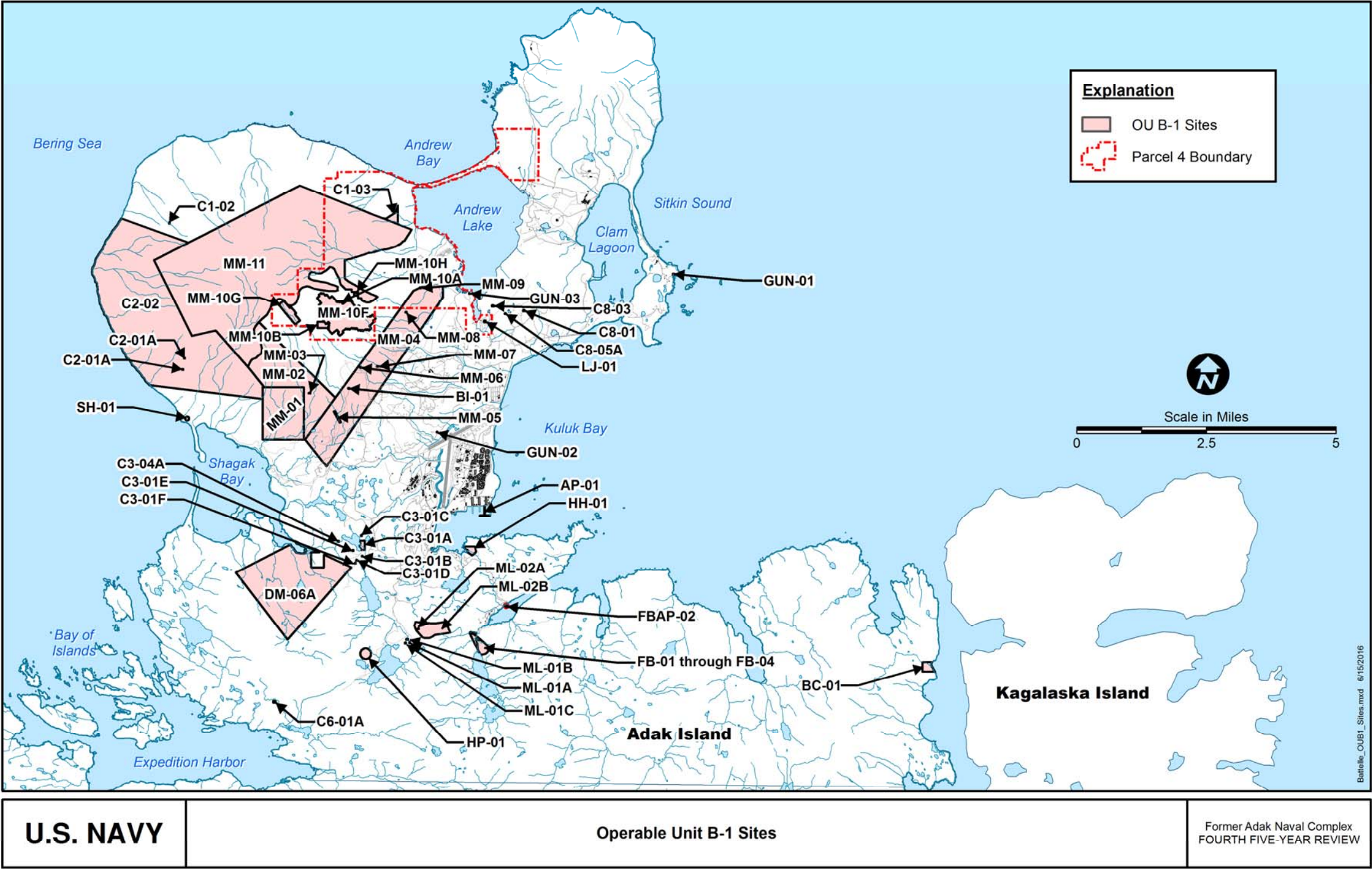
For pre-2011 information, please see the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 3.2.1, U.S. Navy, 2011a](#)).

3.2.2 Operable Unit B-2

Twenty-four OU B-2 sites were evaluated under the RI/FS stage of the CERCLA process which was completed in 2012 (U.S. Navy, 2012c), which address ordnance explosive safety hazards and human health and ecological risks associated with MC. The proposed plan for OU B-2 was also completed in 2012. The 24 OU B-2 sites are shown on Figure 3-2 and are within land transfer Parcel 4.

The Navy is conducting a NTCRA at OU B-2 and there are island-wide ICs and engineering controls implemented to protect human health and the environment.

For pre-2011 information, please see Section 3.2.2 of U.S. Navy, 2011a, *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 3.2.2, U.S. Navy, 2011a](#)).



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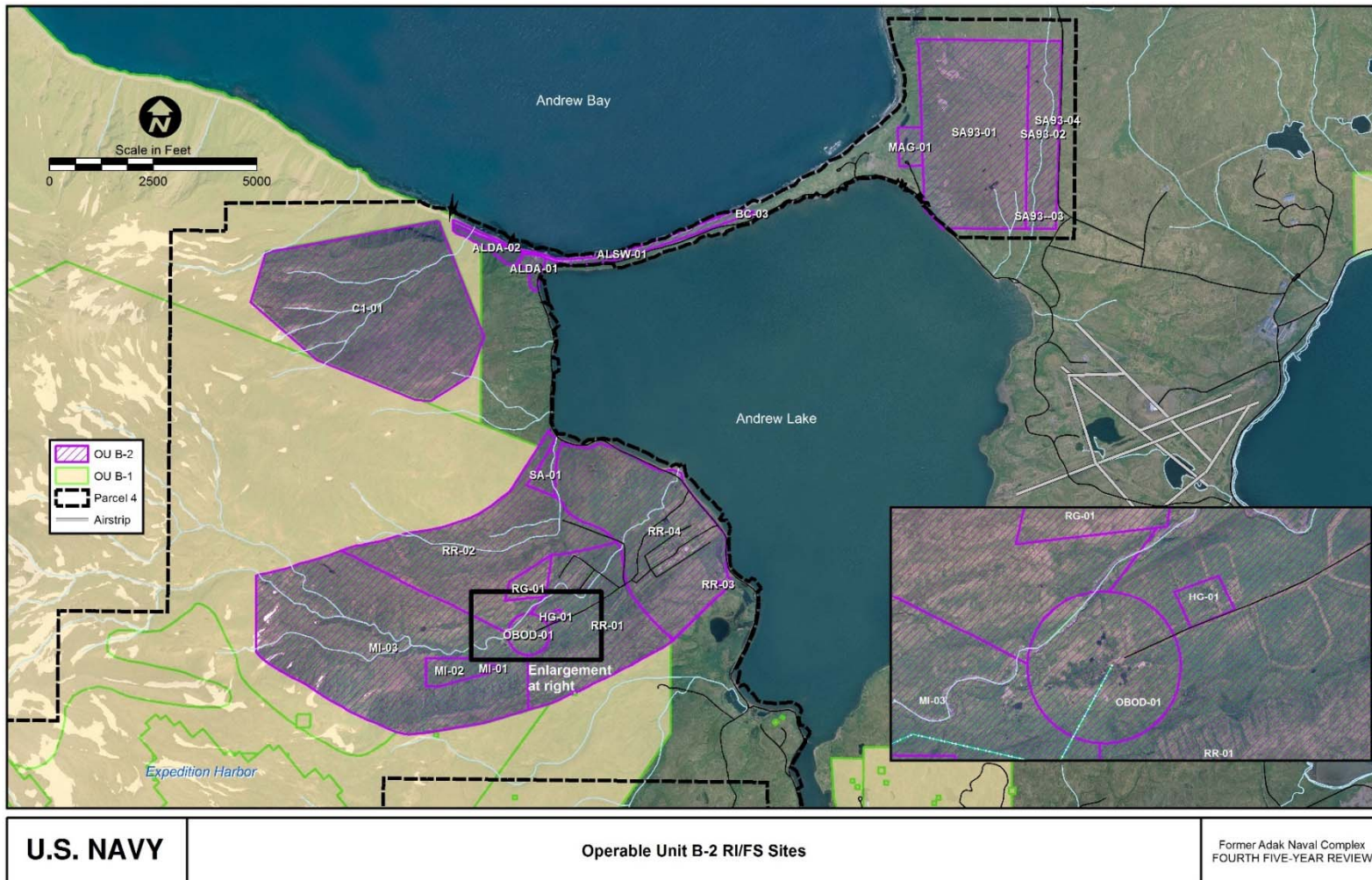
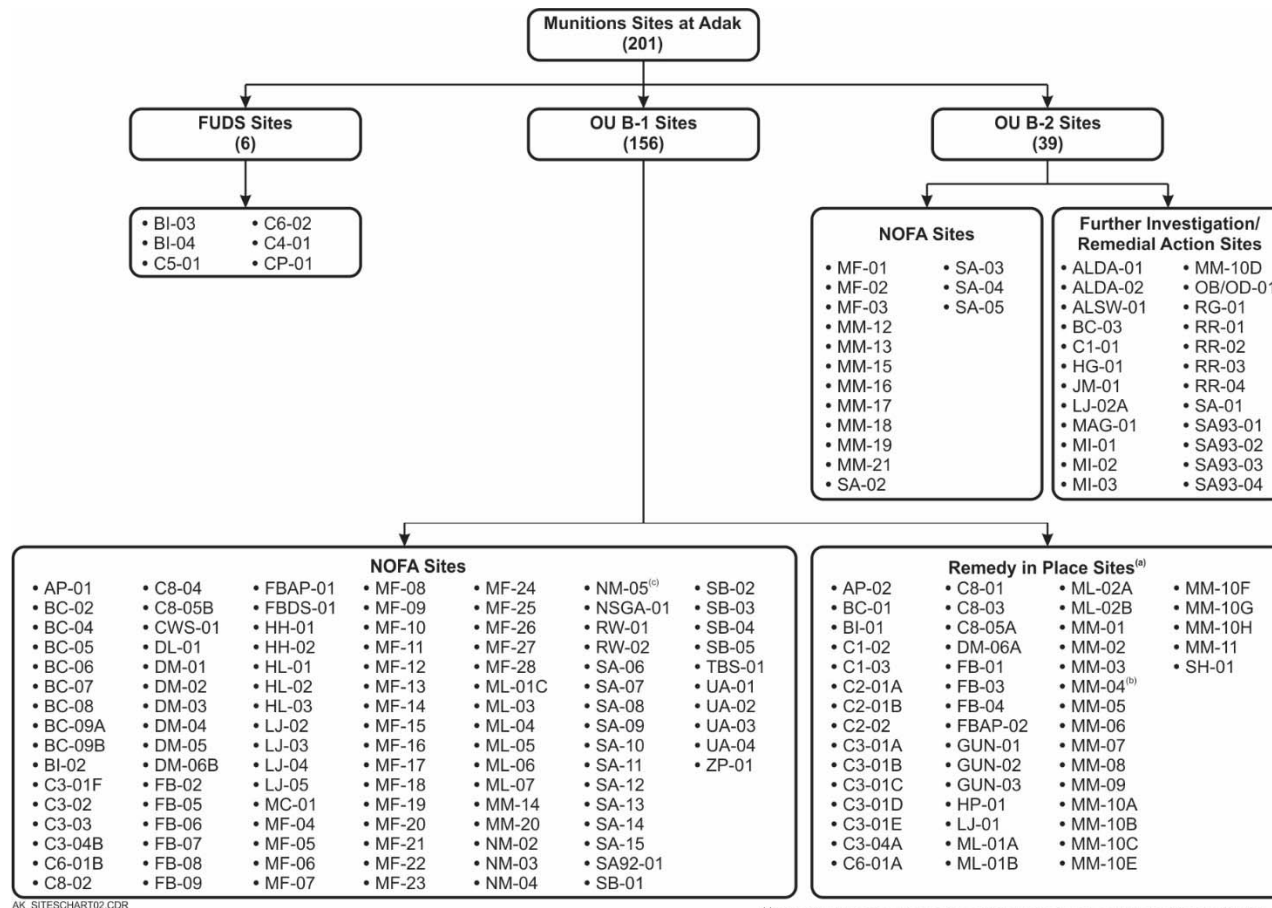


Figure 3-2. Operable Unit B-2 Sites at Former Adak Naval Complex



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^(a)Investigations and remedial actions have been completed for all OU B-1 sites and they have achieved Remedy in Place/Cleanup Complete with ICs status.

^(b)MM-22 and MM-23 have been incorporated into MM-04 and have been removed from the list of OU B-1 sites.

^(c)MEC was discovered in NM-05 in 2012 and additional investigation was conducted in 2014.

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

Table 3-1. Results of Preliminary Assessment/Site Investigation and ROD for OU B-1 Sites

Site	PA/SI			ROD					Year ROD RIP
	NOFA	RI/ inspect	FS	ESHA score	NOFA	Clearance to 4 ft	Final Characterization	Chemical Sampling	
Bay of Island Impact Area									
BI-01		√					√		2004
BI-02	√			N/A	√				
Blind Cove/Campers Cove Impact Area									
BC-01		√		A			√		2002
BC-02	√			N/A	√				
BC-04	√			N/A	√				
BC-05		√		A	√				
BC-06		√		A	√				
BC-07		√		A	√				
BC-08		√		N/A	√				
BC-09A		√		A	√				
BC-09B	√			A	√				
Chemical Warfare Materials Warehouse									
CWS-01	√			N/A	√				
Combat Range #1									
C1-02							√		2004
C1-03							√		2002
Combat Range #2									
C2-01A							√		2002
C2-01B							√		2002
C2-02							√		2002
Combat Range #3									
C3-01A				D		√		√	2002
C3-01B				N/A			√		2001
C3-01C				N/A			√		2001
C3-01D				N/A			√		2001
C3-01E				N/A			√		2002
C3-01F		√		A	√				
C3-02		√		B	√				
C3-03		√		A	√				
C3-04A				N/A			√	√	2001
C3-04B		√		A	√				
Combat Range #6									
C6-01A				C		√		√	2001
C6-01B		√		A	√				
Combat Range #8									
C8-01		√		A			√	√	2004
C8-02		√		A	√				
C8-03		√		N/A			√		2002
C8-04		√		B	√				
C8-05A				N/A			√	√	2001
C8-05B		√		B	√				
Davis Lake Ordnance Warehouses									
DL-01	√			N/A	√				

**Table 3-1. Results of Preliminary Assessment/Site Investigation and ROD for OU B-1 Sites
(Continued)**

Site	PA/SI			ROD					Year ROD RIP
	NOFA	RI/ inspect	FS	ESHA score	NOFA	Clearance to 4 ft	Final Characterization	Chemical Sampling	
Finger Bay Ammunition Pier									
FBAP-01	√			N/A	√				
FBAP-02		√		N/A			√		2001
Finger Bay Dynamite Storage									
FBDS-01	√			N/A	√				
Finger Bay Impact Area									
FB-01		√		N/A			√		2001
FB-02		√		N/A	√				
FB-03 ^(a)		√		A			√		2002
FB-04		√		N/A			√		2001
FB-05		√		N/A	√				
FB-06		√		A	√				
FB-07		√		A	√				
FB-08		√		A	√				
FB-09		√		A	√				
Gun Emplacements									
GUN-01		√		N/A			√		2001
GUN-02		√		N/A			√		2001
GUN-03		√		N/A			√		2001
Shagak Bay									
SH-01			√	N/A			√		2001
Hammer Head Cove Impact Area									
HH-01	√			N/A	√				
HH-02	√			N/A	√				
Haven Lake Ordnance Area									
HL-01		√		A	√				
HL-02		√		A	√				
HL-03	√			N/A	√				
Lake DeMarie Impact Area									
DM-01		√		A	√				
DM-02		√		A	√				
DM-03		√		N/A	√				
DM-04		√		N/A	√				
DM-05		√		N/A	√				
DM-06A				N/A			√		2004
DM-06B		√		A	√				
Lake Jean Ammunition Complex									
LJ-01		√		N/A			√	√	2008
LJ-02		√		A	√				
LJ-03		√		A	√				
LJ-04		√		A	√				
LJ-05	√			N/A	√				
Moffett Advanced Underwater Weapons (MAUW) Complex									
MC-01	√			N/A	√				

Site	PA/SI			ROD					Year ROD RIP
	NOFA	RI/ inspect	FS	ESHA score	NOFA	Clearance to 4 ft	Final Characterization	Chemical Sampling	
<i>Minefields</i>									
MF-04	√			N/A	√				
MF-05	√			N/A	√				
MF-06	√			N/A	√				
MF-07	√			N/A	√				
MF-08	√			N/A	√				
MF-09	√			N/A	√				
MF-10	√			N/A	√				
MF-11	√			N/A	√				
MF-12	√			N/A	√				
MF-13	√			N/A	√				
MF-14	√			N/A	√				
MF-15	√			N/A	√				
MF-16	√			N/A	√				
MF-17	√			N/A	√				
MF-18	√			N/A	√				
MF-19	√			N/A	√				
MF-20	√			N/A	√				
MF-21			√	N/A	√				
MF-22	√			N/A	√				
MF-23	√			N/A	√				
MF-24	√			N/A	√				
MF-25	√			N/A	√				
MF-26	√			N/A	√				
MF-27	√			N/A	√				
MF-28	√			N/A	√				
<i>Husky Pass</i>									
HP-01			√	N/A			√		2001
<i>Mitt Lake Impact Area</i>									
ML-01A				C		√			2001
ML-01B				N/A			√		2001
ML-01C		√		A	√				
ML-02A				N/A			√		2001
ML-02B		√		A				√	2001
ML-03		√		A	√				
ML-04		√		A	√				
ML-05		√		A	√				
ML-06	√			N/A	√				
ML-07	√			N/A	√				
<i>Mount Moffett</i>									
MM-01							√		2004
MM-02							√		2004
MM-03							√		2004
MM-04							√		2004
MM-05							√		2004

**Table 3-1. Results of Preliminary Assessment/Site Investigation and ROD for OU B-1 Sites
(Continued)**

Site	PA/SI			ROD					Year ROD RIP
	NOFA	RI/ inspect	FS	ESHA score	NOFA	Clearance to 4 ft	Final Characterization	Chemical Sampling	
MM-06							√		2004
MM-07							√		2004
MM-08							√		2004
MM-09							√		2004
MM-10A							√		2009
MM-10B							√		2009
MM-10C							√		2004
MM-10E							√		2009
MM-10F							√		2010
MM-10G							√		2009
MM-10H							√		2008
MM-11							√		2004
MM-14 ^(a)				N/A	√				
MM-20 ^(a)				N/A	√				
<i>NAF Adak Lake DeMarie Ammunition Complex</i>									
NM-02		√		A	√				
NM-03		√		A	√				
NM-04		√		A	√				
NM-05 ^(b)	√			N/A	√				
<i>NSGA Magazine Complex</i>									
NSGA-01	√			N/A	√				
<i>Scabbard Bay Impact Area</i>									
SB-01		√		A	√				
SB-02		√		N/A	√				
SB-03		√		N/A	√				
SB-04		√		N/A	√				
SB-05		√		N/A	√				
<i>Small Arms Ranges</i>									
SA-06	√			N/A	√				
SA-07	√			N/A	√				
SA-08	√			N/A	√				
SA-09	√			N/A	√				
SA-10	√			N/A	√				
SA-11	√			N/A	√				
SA-12	√			N/A	√				
SA-13	√			N/A	√				
SA-14	√			N/A	√				
SA-15	√			N/A	√				
<i>Urban Area</i>									
UA-01		√		A	√				
UA-02		√		A	√				
UA-03	√			N/A	√				
UA-04	√			N/A	√				

**Table 3-1. Results of Preliminary Assessment/Site Investigation and ROD for OU B-1 Sites
(Continued)**

Site	PA/SI			ROD					Year ROD RIP
	NOFA	RI/ inspect	FS	ESHA score	NOFA	Clearance to 4 ft	Final Characterization	Chemical Sampling	
WWI Ammunition Pier (Sweeper Cove)									
AP-01	√			N/A	√				
AP-02				N/A			√		2001
WWI (Near Runways)									
RW-01		√		A	√				
RW-02	√			N/A	√				
WWII Temp Bomb Storage (Kuluk Beach)									
TBS-01	√			N/A	√				
Finn Field Bomb Burn Pile									
SA92-01	√			N/A	√				
Zeto Point Impact Area									
ZP-01		√		A	√				
Total OU B-1 Sites	57	58	3		106	3	46	8	44

(a) MM-14 and MM-20 were not included in the OU B-1 RI/FS process; however, these sites were recommended for NOFA in the OU B-1 ROD and are checked as NOFA in RI in this table.

(b) MEC was discovered in 2012 in NM-05 and additional investigation was conducted in 2014.

ESHA – explosive safety hazard assessment (scores of ‘A’ or ‘B’ indicate NOFA and ‘C’ or ‘D’ indicate a site was recommended for further investigation or remediation)

N/A – not applicable

NOFA – no further action

PA/SI – preliminary assessment/site investigation

RI – remedial investigation

ROD – record of decision

WWI – World War I

WWII – World War II

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4.0 REMEDIAL ACTIONS

The ROD for interim remedial actions (U.S. Navy, U.S. EPA, and ADEC, 1995) and the OU A ROD (U.S. Navy, U.S. EPA, and ADEC, 2000) for Adak required remedial actions for 66 OU A sites (19 CERCLA sites, which include three water bodies and three 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, U.S. EPA, 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, U.S. EPA, and ADEC, 2001) required further investigation or remedial actions for 50 OU B-1 sites (including the three new sites, MM-10F, MM-10G, and MM-10H, identified in 2004 that are located within or adjacent to MM-10E). This section, as well as Appendix A, provides a brief description of the RAOs, the selected remedy, and the remedial actions for these sites.

4.1 Operable Unit A and SAERA

For a discussion of ROD-specified OU A remedial action objectives (RAOs), selected remedies, remedy components and implementation, and ongoing operation, maintenance, monitoring, and land use controls implemented prior to this review period (pre-2011), please see the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 4.1, U.S. Navy, 2011a](#)).

4.1.1 OU A and SAERA Remedial Action Objectives

RAOs were established for 69 OU A sites (23 CERCLA and 46 petroleum) that required some type of response action per the OU A ROD (1995 or 2000) and SAERA DDs. These sites were grouped into the following four categories: 1) landfills where landfill covers were installed; 2) CERCLA sites with long term monitoring and/or ICs only; 3) CERCLA sites where soil and/or sediment were removed; and 4) SAERA sites where remedial actions were required.

For site-specific details on RAOs and COCs refer to Tables 4-1, 4-2 and Appendix A, the site catalog.

4.1.1.1 OU A Remedial Action Objectives

OU A Remedial Action Objectives

Landfills with Covers. Landfill covers have been installed at the following sites: SWMUs 4, 11, 13, 18/19, and 25. These were done as requirements under the 1995 interim ROD for SWMUs 11 and 13, under the 2000 OU A final ROD for SWMU 4, or as requirements of permit conditions for landfills permitted by the State of Alaska for SWMUs 18/19 and 25. The RAOs for these sites are the following:

- Prevent ingestion of and contact with chemically affected subsurface soils within the landfill debris and protect ecological receptors that may ingest on-site plants. (The plants may uptake subsurface chemicals.)
- Limit off-site migration of chemicals and materials from the landfill.

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 76. SWMU 24 was closed under RCRA and has ongoing IC requirements. SA 77 was also closed under RCRA and is now cleanup complete under SAERA.

- The RAOs for the landfills at SWMUs 2 and 29 are to protect human or ecological receptors (or both) from exposure to landfill debris and soil that could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above a hazard risk (HI) of 1.0.
- The RAOs for Sweeper Cove and Kuluk Bay entail the protection of subsistence fishers from ingestion of fish (rock sole) and shellfish (blue mussel) containing Aroclors 1260 and 1254, respectively, that could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above an HI of 1.0.
- The RAOs for the remaining SWMUs involve 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 an HI of 1.0 under a conservative residential risk exposure scenario for these commercial/industrial sites.

SWMU 17, Power Plant 3 Area, and South Sweeper Creek. The RAOs at the SWMU 17 waste oil and retention ponds are to prevent uptake of and contact with impacted freshwater sediments by benthic infauna and impacted surface water by birds. The RAOs at South Sweeper Creek are to protect benthic infauna from contacting and ingesting sediments affected by COCs.

4.1.1.2 SAERA Remedial Action Objectives

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 DD memorializing final remedies at 10 of these sites was signed on 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 DDs memorializing the final remedies for NMCB Building Area, T-1416 Expanded Area; SWMU 62, New Housing Fuel Leak; South of Runway 18-36 Area; SWMU 17, Power Plant No. 3 Area, and Area 303 (U.S. Navy and ADEC 2006a, b, and c, 2007, 2012a) 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.
- Prevent migration of free product to surface water that would result in an exceedance of the ADEC surface water quality standard (sheen only).
- Minimize exposure to free-phase product in soil, groundwater, and surface water.

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.

Area 303:

- Reduce petroleum hydrocarbons or VOCs 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.

- Prevent migration of petroleum hydrocarbons or VOCs to surface water at levels that would result in an exceedance of the ADEC surface water quality standards.

4.1.2 OU A and SAERA Remedy Selection

To achieve RAOs, the remedial action components for the OU A sites were specified in the OU A ROD and SAERA DDs. The details of the remedy selection for the CERCLA and petroleum (SAERA) sites are described in Section 4.1.2 of the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 4.1.2, U.S. Navy, 2011a](#)).

4.1.3 OU A and SAERA Remedy Implementation

Most of the physical remedy construction required by the ROD was completed at OU A by 2003. Where required by the OU A ROD and SAERA DDs, product recovery, as an interim remedial action, limited groundwater monitoring, or MNA have been implemented and are ongoing, as described in Section 4.1.4. The remedy components of the OU A sites are described in detail in Section 4.1.3 of the *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 4.1.3, U.S. Navy, 2011a](#)).

4.1.4 OU A and SAERA Operation, Maintenance, and Monitoring

Since the third five-year review in 2011 (U.S. Navy, 2011a), the Navy has continued operation, maintenance, and monitoring of the OU A remedies for both CERCLA and SAERA sites. The Navy has operated, maintained, monitored, or inspected 58 OU A and SAERA sites since 2011. Operation, maintenance, and monitoring activities on Adak included groundwater, surface water, sediment, and marine tissue monitoring; education program maintenance; IC inspections; sign and soil cover inspections; shoreline inspections for the presence of free product; free-product monitoring; and free-product recovery operations. Table 4-3 summarizes the ICs and engineering controls (ECs), remedies, and operation and maintenance requirements for these sites. 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.

A summary of the sites that have achieved cleanup complete with ICs / remedy in place status since execution of the ROD is provided in Table 4-4.

4.1.4.1 Monitoring and Operation and Maintenance Plans

Operation, maintenance, and monitoring of the OU A and SAERA remedies on Adak are specified in the CMP (U.S. Navy, 2014a), 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 is an OU A ROD requirement and 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.

When the CMP was updated in 2012, changes made to the document included:

- document was restructured into three stand alone SAPs (groundwater monitoring, landfill monitoring, and marine monitoring) and an ICMP. These SAPs also were modified to conform to the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) format;
- changes were made to the sampling program based on decisions made through the 2011 sampling season; and
- sampling was discontinued at several sites that had received “cleanup complete with ICs” determination from ADEC (U.S. Navy, 2012d).

The CMP was updated a second time during this five-year review period in 2014 and changes to the document included:

1. changes to the sampling program based on decisions made from the 2012 and 2013 sampling seasons; and
2. biennial sampling was synchronized across all sampling plans so that all biennial sampling is conducted during even years. Five-year review sampling has been changed to an alternating 4- and 6-year cycle so that data can be incorporated into the five-year review (U.S. Navy, 2014a).
3. 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 DDs. The ICMP was originally published in 2001 as an appendix to the CMP, which was updated in 2004, 2005, 2007, 2010, 2012 and 2014 (U.S. Navy, 2001a, 2004, 2005c, 2007d, 2010a, 2012d, and 2014a). 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.

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 Section 6.5.

Based on the review of the ICMP during the third five-year review, it was revealed that IC inspections were not documented in the ICMP for several sites because inspections are not being conducted at these sites. The following eight sites have been added into Revision 6 of the ICMP as recommended in the third five-year review (U.S. Navy, 2014a): 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-2039-B and T2039-C.

Contractor’s Camp Burn Pad was also reported in the third five-year review as not being included in the ICMP; however, this site was issued a “cleanup complete” determination in 2011 and does not require IC inspections. Therefore, this site is not included in the ICMP, Revision 6.

Although these eight sites listed above are included in the ICMP with a requirement for ICs to be inspected on a five-year schedule, they were not inspected during the 2011 to 2015 review period because these sites were not included on Table 5-1 of the ICMP, Revision 5 as a site that requires an inspection form to be completed. The sites were added to the table of the ICMP, Revision 6; however, were not added to the site inspection schedule. These are scheduled to be inspected every 5 years and should be added to the inspection schedule to comply with the ICMP.

In addition to this discrepancy between the CMP and IC inspection reports, another discrepancy identified was that the CMP identified FB-03 as an OU B-1 site to be included as part of the IC inspections once every five years and FB-02 was the OU B-1 site inspected in 2014.

4.1.4.2 Site-Wide Land Use Control Monitoring

The Navy monitors and assesses the effectiveness of the LUCs, including both ICs and ECs selected in the OU A and OU B-1 RODs and SAERA DDs at the former Adak Naval Complex. The Navy annually verifies that LUCs remain effective. In addition, maintenance activities are identified during the annual inspections that are needed to ensure the continued effectiveness of the ICs and ECs. The majority of the maintenance and repair identified during IC inspections were conducted in 2015. A discussion of the inspection results and repairs during each year of this five-year review period is provided in Section 6.5. Major maintenance activities conducted during this five-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.

The major IC repairs were completed during the 2015 field season. Repairs were conducted at 10 OU A sites. Activities including sign replacement/installation, erosion and sinkhole repair, fence repair, and debris removal were conducted at 10 sites including SWMU 4, SWMU 11, SWMU 13, SWMU 15, SWMUs 18/19, SWMU 20, SWMU 24, SWMU 25, SWMU 29, and SWMU 55.

4.2 OU B-1

For a discussion of ROD-specified OU B-1 remedial action objectives (RAOs), selected remedies, remedy components and implementation, and ongoing operation, maintenance, monitoring, and land use controls implemented prior to this review period (pre-2011), please see Section 4.2 of U.S. Navy, 2011a, *Third Five-Year Review, Former Adak Naval Complex, Adak, Alaska* ([link to Section 4.2, U.S. Navy, 2011a](#)).

4.2.1 OU B-1 Remedial Action Objectives

Cleanup levels are typically numeric expressions of RAOs. For explosive hazards, the cleanup level would entail removing all known ordnance and explosive/UXO that can be located with the methods developed for Adak. For site-specific details on RAOs and COCs refer to Table 4-5 and Appendix A, the site catalog.

4.2.2 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 all of the 50 OU B-1 action sites. Cleanup Complete with ICs / Remedy in Place has been achieved for all 50 sites (Table 4-2). The Final Remedial Action Completion Report (RACR) was approved in August 2014 by ADEC and U.S. EPA and ADEC and U.S. EPA have concurred with all of the remedial actions.

4.2.3 OU B-1 Operation, Maintenance, and Monitoring

Since the third five-year review in 2011 (U.S. Navy, 2011a), 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. Other than the 12 sites listed in Table 4-1, 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 6.2.2.7.

Table 4-1. CERCLA Sites That Require Institutional Controls Due to Adverse Risk

Site Designation	Impacted Environmental Media, Potentially Threatened Receptors and COCs	Postremoval ^b Site Risk			Remedial Actions to Date	Remedial Action Objectives and Principal ARARs
		Human Health		Ecological		
		Cancer	Non-Cancer			
SWMU 2 - Landfill	Ecological exposure to subsurface soil	1 x 10 ⁻⁵	0.08	85	A soil cover was placed over portions of the site after disposal practices ceased.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 10	Human health exposure to surface soil. <u>Soil</u> <i>Aroclor 1260</i> <i>Indeno(1,2,3-cd)pyrene</i>	6 x 10 ⁻⁵	0.07	59	None.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 14	Human health exposure to soil and groundwater. <u>Groundwater</u> <i>Bis(2-ethylhexyl)phthalate</i> , <i>Ethylbenzene</i> , <i>GRO</i> , <i>Lead</i> , <i>Tetrachloroethene</i> , <i>Thallium</i> , <i>Toluene</i> , <u>Soil</u> <i>Benzo(a)pyrene</i>	4 x 10 ⁻⁵	2	NC	None.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375) Federal MCLs (40 CFR 141) AK Groundwater Cleanup Levels (18 AAC 75.345)
SWMU 15	Human health exposure to soil and groundwater. <u>Groundwater</u> <i>Tetrachloroethene</i> , <i>Trichloroethene</i>	7 x 10 ⁻⁵	0.04	NC	Potentially impacted construction materials, debris, and soils were sampled and disposed of as appropriate.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375)
SWMU 16	Human health and ecological exposure to soil. <u>Groundwater</u> <i>Aroclor 1260</i>	4 x 10 ⁻⁵	< 0.01	27	Impacted soils, sludges, and surface water from the burn pits were treated or disposed of.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 20	Human health and ecological exposure to soil. <u>Soil</u> <i>Aroclor 1260</i>	2 x 10 ⁻⁵	< 0.01	160	Drums and soil were removed and disposed. ^c	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 21A	Human health and ecological exposure to soil. <u>Soil</u> <i>Aroclor 1260</i>	1 x 10 ⁻⁵	NC	28	Soil was removed and residual impacted soil was covered with an impervious cover system.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)

Table 4-1. CERCLA Sites That Require Institutional Controls Due to Adverse Risk (Continued)

Site Designation	Impacted Environmental Media, Potentially Threatened Receptors and COCs	Postremoval ^b Site Risk			Remedial Actions to Date	Remedial Action Objectives and Principal ARARs
		Human Health		Ecological		
		Cancer	Non-Cancer			
SWMU 23	Human health and ecological exposure to soil. Ecological exposure to sediments. <u>Soil</u> <i>Arsenic, Manganese</i>	1 x 10 ⁻⁵	7	92	Drums and tank were removed.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 29	Ecological exposure to subsurface soil and sediments. <u>Soil</u> <i>Aroclor 1254</i>	3 x 10 ⁻⁵	0.6	170	A soil cover was placed over portions of the site after disposal practices ceased.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 52 (53,59)	Human health and ecological exposure to soil and debris. <u>Soil</u> <i>Arsenic, Benzo(a)pyrene</i>	5 x 10 ⁻⁵	0.6	260	Hazardous materials were removed and underground storage tanks were decommissioned. ^d	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 55	Human health exposure to groundwater. <u>Groundwater</u> <i>Antimony, Bis(2-ethylhexyl)phthalate, Methylene chloride, Tetrachloroethene</i>	1 x 10 ⁻⁴	1	NC	None	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375) Federal MCLs (40 CFR 141) AK Groundwater Cleanup Levels (18 AAC 75.345)
SWMU 67	Human health and ecological exposure to soil. <i>No COCs were identified in the OU A ROD. Aroclors were major ecological risk drivers in sediment and surface soil.</i>	7 x 10 ⁻⁶	NC	86	Impacted soils were left in place beneath an impermeable cover system. ^e	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SA 76	Human health exposure to soil and groundwater. Ecological exposure to soil. <u>Groundwater</u> <i>Lead</i> <u>Soil</u> <i>Arsenic, Indeno(1,2,3-cd)pyrene</i>	9 x 10 ⁻⁵	0.6	11	None.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)

Table 4-1. CERCLA Sites That Require Institutional Controls Due to Adverse Risk (Continued)

^aAdverse risk based on residential exposure.

^bPostremoval does not apply to SWMUs 10, 14, 55, and 76.

^cData indicate a small volume (less than 7 cubic yards) of soil containing Aroclors remains at the site. However, inaccessibility of the impacted soil and high groundwater conditions made additional removal infeasible. It is reasonable to assume that actual ecological risk is lower than the calculated risk for postremedial action conditions. The surface area of the remaining soil contamination is small relative to the home range of any ecological receptor.

^dIt is reasonable to assume that actual ecological risk is much lower than the calculated risk for postremedial action conditions. There were low frequencies of detection for COPCs and few exceedances of RBSCs. These were single-point exceedances for two semivolatile organic compounds and a few exceedances for lead and zinc (URS 1996a).

^eInstitutional controls are required to keep cover over soils intact to prevent adverse risk to human or ecological receptors. Postremedial site risk to humans is based on a recreational exposure scenario.

Notes:

AAC - Alaska Administrative Code

AK - Alaska

ARAR - applicable or relevant and appropriate requirement

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act CFR -
Code of Federal Regulations

COPC - chemical of potential concern

MCL - maximum contaminant level

NC - none calculated

RBSC - risk-based screening concentration SA - source area

SWMU - solid waste management unit

Table 4-2. Remedial Action Criteria for CERCLA Sites

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

Table 4-2. Remedial Action Criteria for CERCLA Sites (Continued)

Site Designation	Site Type	Remedial Action Objectives and Principal ARARs	Impacted Environmental Media	Chemicals of Concern	Action Level Concentrations ^a	Basis for Action Level ^b	General Response Action
SWMU 17 Waste Oil Pond (Cont.)	P/W	HW Land Disposal Restrictions: 40 CFR 268 AK Clean Air: 18 AAC 50		Zinc	960	A	
				Lead	530	A	
				Benzo(a)pyrene	1.6	A	
				Benzo(k)fluoranthene	3.6	A	
SWMU 17 Retention Pond	P/W	<u>Environmental Protection</u> Prevent uptake of and contact with impacted freshwater sediments by benthic infauna. ARARs: See Waste Oil Pond	Freshwater sediments (organic carbon normalized)	Aroclor 1260	1	A	
				2-Methylnaphthalene	0.67	A	
				Fluorene	0.54	A	
				Mercury	0.59	A	
				Acenaphthene	0.5	A	
				Nickel	51.6	A	
				Manganese	1,100	A	
				Fluoranthene	2.5	A	
				Zinc	960	A	
				Pyrene	3.3	A	
		<u>Environmental Protection</u> Prevent uptake and contact of impacted surface water by birds.	Surface water	Mercury	0.144	C	
				Zinc	110	C	
				Iron	1,000	C	
				Lead	2.5	C	
				Copper	11	C	
Sweeper Cove	RWB	<u>Protection of Human Health</u> Prevent ingestion of impacted fish and shellfish by subsistence fishers. AK Inst. Cont.: 18 AAC 75.375 Clean Water: 33 USC 1342-1344 HW Identification: 40 CFR 261 HW Treatment & Disposal: 40 CFR 264 HW Land Disposal Restrictions: 40 CFR 268 Haz Materials Transport: 49 CFR 171	Tissue: Fish	Aroclor 1260	0.0065	<u>A</u>	
			Tissue: Shellfish	Aroclor 1260	0.031	<u>A</u>	

Table 4-2. Remedial Action Criteria for CERCLA Sites (Continued)

Site Designation	Site Type	Remedial Action Objectives and Principal ARARs	Impacted Environmental Media	Chemicals of Concern	Action Level Concentrations ^a	Basis for Action Level ^b	General Response Action
Sweeper Cove (Cont.)	RWB	Solid Waste: 40 CFR 258 Coastal Zone: 16 USC 1451 AK Coastal Zone: 6 AAC 80 Rivers & Harbors: 33 USC 401 AK Water Quality: 18 AAC 70 AK Solid Waste: 18 AAC 60	Tissue: Fish Tissue: Shellfish	Aroclor 1260	0.0065	A	No action Institutional controls Containment Removal
				Aroclor 1260	0.031	A	
South Sweeper Creek ^c	RWB	<u>Environmental Protection</u> Prevent ingestion of and contact with impacted freshwater sediments by benthic infauna. Allow natural recovery processes to reduce chemical concentration in prey tissues to below acceptable levels over time.	Freshwater sediments (dry weight concentration)	PCBs	1	A	No action Institutional controls Containment Removal
			Tissue	Lead	0.064	A	
				Cadmium	0.042	A	

Table 4-2. Remedial Action Criteria for CERCLA Sites (Continued)

Site Designation	Site Type	Remedial Action Objectives and Principal ARARs	Impacted Environmental Media	Chemicals of Concern	Action Level Concentrations ^a	Basis for Action Level ^b	General Response Action
		AK Inst. Cont.: 18 AAC 75.375 Clean Water: 33 USC 1342-1344 HW Identification: 40 CFR 261 HW Treatment & Disposal: 40 CFR 264 HW Land Disposal Restrictions: 40 CFR 268 Haz Materials Transport: 49 CFR 171 Solid Waste: 40 CFR 258 Coastal Zone: 16 USC 1451 AK Coastal Zone: 6 AAC 80 Rivers & Harbors: 33 USC 401 AK Water Quality: 18 AAC 70 AK Solid Waste: 18 AAC 60		Chromium	0.26	A	
Kuluk Bay	RWB	<u>Protection of Human Health</u> Prevent ingestion of impacted fish and shellfish by subsistence fishers. AK Inst. Cont.: 18 AAC 75.375 Clean Water: 33 USC 1342-1344 HW Identification: 40 CFR 261 HW Treatment & Disposal: 40 CFR 264 HW Land Disposal Restrictions: 40 CFR 268 Haz Materials Transport: 49 CFR 171 Solid Waste: 40 CFR 258 Coastal Zone: 16 USC 1451 AK Coastal Zone: 6 AAC 80 Rivers & Harbors: 33 USC 401 AK Water Quality: 18 AAC 70 AK Solid Waste: 18 AAC 60	Tissue: Fish	Aroclor 1254	0.0065	A	No action Institutional controls
			Tissue: Shellfish	Aroclor 1254	0.031	A	

Table 4-2. Remedial Action Criteria for CERCLA Sites (Continued)

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

^bBasis for action level is as follows:

A - risk-based level

B - 18 AAC 75 level for soil

C - 33 USC Section 1314, Ambient Water Quality Criteria

^cRemedial action criteria for South Sweeper Creek were reevaluated (URSG 1998b) subsequent to additional sediment sampling conducted after issuance of the draft ROD. The action level for PCBs in soil protective of ecological receptors was updated from the preliminary remediation goal of 0.09 mg/kg to 1.0 mg/kg during review of the draft ROD. A concentration of 1.0 mg/kg is consistent with EPA guidance for protection of wildlife as well as human health (U.S. EPA 1990b). It is also consistent with prior remedial actions conducted on Adak by the Navy.

Notes:

AAC - Alaska Administrative Code

AK - Alaska

ARAR - applicable or relevant and appropriate requirement

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CFR - Code of Federal Regulations

EPA - U.S. Environmental Protection Agency

HW - hazardous waste

LF - landfill

NPDES - National Pollutant Discharge Elimination System

PCB - polychlorinated biphenyl

PSE - preliminary source evaluation

P/W - product/waste storage area

RI/FS - remedial investigation/feasibility study

ROD - Record of Decision

RWB - receiving water body

SW - surface water

SWMU - solid waste management unit

TCDD - tetrachlorodibenzo-p-dioxin

TSCA - Toxic Substances Control Act

USC - U.S. Code

Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA, and OU B Sites

Site Name	Regulatory Source of Institutional Controls	Institutional Controls					Engineer-ing Controls		Operations and Maintenance							
		Land Use Restrictions ^a	Equitable Servitude ^b	Groundwater Restrictions ^c	Soil Excavation Restrictions ^d	Fishing Advisory ^e	Signage	Fencing	Monitoring ^f	Education ^g	Site/Remedy Condition Inspections and Reporting ^h	Sign and Fencing Inspection ⁱ	Soil Cover Inspections ^j	Free-Product Monitoring and Recovery ^k	Visual Inspection ^l	Treatment System ^m
Downtown Groundwater*	OU A ROD/SAERA		X	X	d1					X	h1					
Amulet Housing, Well AMW-706 Area	OU A ROD/SAERA	a1	X	X	d1											
Amulet Housing, Well AMW-709 Area	OU A ROD/SAERA	a1	X	X	d1											
Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4	OU A ROD/SAERA	a1	X		d1		X				h2	X				
Area 303	ADEC 2005	a1	X	X	d1				X		h1					
Boy Scout Camp, West Haven Lake, UST BS-1	ADEC 2005	a2	X		d1											
Contractor's Camp Burn Pad	OU A ROD/SAERA	a1	X	X	d1											
Finger Bay Quonset Hut (UST FBQH-1)	ADEC 2005	a2	X		d1		X				h2	X				
Former Power Plant, Building T-1451	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X				
GCI Compound, UST GCI-1 ^o	U.S. Navy and ADEC 2005	a1	X	X	d1		X		X		h1	X				
Housing Area, Arctic Acres ^o	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X				
Kuluk Bay	OU A ROD					X			X	X	h1					
MAUW Compound, UST 24000-A	ADEC 2005	a1	X		d1		X				h1	X				
Mount Moffett Power Plant 5, USTs 10574 through 10577	ADEC 2005	a1	X		d1		X				h2	X				
NAVFAC Compound, USTs 20052 and 20053	OU A ROD/SAERA	a1	X	X	d1						h2	X				
Navy Exchange Building, UST 30027-A	OU A ROD/SAERA	a1	X	X	d1						h2	X				

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

Site Name	Regulatory Source of Institutional Controls	Institutional Controls					Engineer-ing Controls		Operations and Maintenance							
		Land Use Restrictions ^a	Equitable Servitude ^b	Groundwater Restrictions ^c	Soil Excavation Restrictions ^d	Fishing Advisory ^e	Signage	Fencing	Monitoring ^f	Education ^g	Site/Remedy Condition Inspections and Reporting ^h	Sign and Fencing Inspection ⁱ	Soil Cover Inspections ^j	Free-Product Monitoring and Recovery ^k	Visual Inspection ^l	Treatment System ^m
New Roberts Housing, UST HST-7C	OU A ROD/SAERA	a1	X	X	d1						h2	X				
NMCB Building Area, T-1416 Expanded Area ^q	U.S. Navy and ADEC 2006d	a1	X	X	d1		X		X		h1	X		X	X	X
NORPAC Hill Seep Area ^o	U.S. Navy and ADEC 2005	a1	X	X	d1		X				h1	X				
Officer Hill and Amulet Housing, UST 31047-A	OU A ROD/SAERA	a3	X	X	d1						h2	X				
Officer Hill and Amulet Housing, UST 31052-A	OU A ROD/SAERA	a3	X	X	d1						h2	X				
ROICC Contractor's Area, UST ROICC 7	U.S. Navy 2002b	a1	X	X	d1		X		X		h1	X				
ROICC Contractor's Area, UST ROICC 8	OU A ROD/SAERA	a1	X	X	d1		X				h2	X				
ROICC Warehouse, UST ROICC 2	OU A ROD/SAERA	a1	X	X	d1						h2	X				
ROICC Warehouse, UST ROICC 3	OU A ROD/SAERA	a1	X	X	d1						h2	X				
Runway 5-23 Avgas Valve Pit	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X				
SA 73, Heating Plant 6 ^o	U.S. Navy and ADEC 2005	a1	X		d1		X				h2	X			X	
SA 76, Old Line Shed Building	OU A ROD	a1	X	X	d1		X				h2	X				
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area ⁿ	RCRA and ADEC 2007b	a1	X	X	d1											
SA 78, Old Transportation Building USTs ^o	U.S. Navy and ADEC 2005	a1	X		d1		X				h2	X			X	

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

Site Name	Regulatory Source of Institutional Controls	Institutional Controls					Engineer-ing Controls		Operations and Maintenance							
		Land Use Restrictions ^a	Equitable Servitude ^b	Groundwater Restrictions ^c	Soil Excavation Restrictions ^d	Fishing Advisory ^e	Signage	Fencing	Monitoring ^f	Education ^g	Site/Remedy Condition Inspections and Reporting ^h	Sign and Fencing Inspection ⁱ	Soil Cover Inspections ^j	Free-Product Monitoring and Recovery ^k	Visual Inspection ^l	Treatment System ^m
SA 79, Main Road Pipeline	U.S. Navy 2002b	a1	X	X	d1		X		X		h1	X			X	
SA 80, Steam Plant 4, USTs 27089 and 27090 ^o	U.S. Navy and ADEC 2005	a1	X	X	d1		X		X		h1	X				
SA 82, P-80/P-81 Buildings ^o	U.S. Navy and ADEC 2005	a1	X		d1		X				h2	X				
SA 88, P-70 Energy Generator, UST 10578 ^o	U.S. Navy and ADEC 2005	a1	X		d1		X				h2	X				
South of Runway 18-36 Area ^o	U.S. Navy and ADEC 2006b	a1	X	X	d1		X		X		h1	X			X	X
SWMU 2, Causeway Landfill**	OU A ROD	a2	X		d2		X				h1	X	X			
SWMU 4, South Davis Road Landfill**	OU A ROD	a2	X		d2		X				h1	X	X			
SWMU 10, Old Baler Building	OU A ROD	a1	X	X	d1		X				h2	X				
SWMU 11, Palisades Landfill**	OU A ROD	a2	X		d2		X		X		h1	X	X			
SWMU 13, Metals Landfill**	OU A ROD	a2	X	X	d2		X	X	X		h1	X	X			
SWMU 14, Old Pesticide Disposal Area*	OU A ROD/SAERA	a1	X	X	d1		X		X		h2	X				
SWMU 15, Future Jobs/DRMO*	OU A ROD/SAERA	a1	X	X	d1		X				h1	X				
SWMU 16, Former Firefighting Training Area	OU A ROD	a1	X	X	d1		X				h2	X				
SWMU 17, Power Plant 3 Area* ^p	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X				

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

Site Name	Regulatory Source of Institutional Controls	Institutional Controls					Engineer-ing Controls		Operations and Maintenance							
		Land Use Restrictions ^a	Equitable Servitude ^b	Groundwater Restrictions ^c	Soil Excavation Restrictions ^d	Fishing Advisory ^e	Signage	Fencing	Monitoring ^f	Education ^g	Site/Remedy Condition Inspections and Reporting ^h	Sign and Fencing Inspection ⁱ	Soil Cover Inspections ^j	Free-Product Monitoring and Recovery ^k	Visual Inspection ^l	Treatment System ^m
SWMU 18, South Sector Drum Disposal Area (White Alice Landfill) and SWMU 19, Quarry Metal Disposal Area (White Alice Landfill)**	ADEC	a2	X		d2		X	X			h1	X	X			
SWMU 20, White Alice/Trout Creek Disposal Area	OU A ROD	a1	X		d1		X				h1	X				
SWMU 21A, White Alice Upper Quarry	OU A ROD	a2	X		d2		X				h2	X	X			
SWMU 23, Heart Lake Drum Disposal Area	OU A ROD	a2	X		d1		X				h2	X				
SWMU 24, Hazardous Waste Storage Facility ⁿ	RCRA	a1	X	X	d1		X				h1	X				
SWMU 25, Roberts Landfill	ADEC	a2	X	X	d2		X	X	X		h1	X	X			
SWMU 29, Finger Bay Landfill**	OU A ROD	a2	X		d2		X				h1	X	X			
SWMUs 52, 53, 59, Former LORAN Station	OU A ROD	a1	X		d1		X				h2	X				
SWMU 55, Public Works Transportation Department Waste Storage Area	OU A ROD	a1	X	X	d1		X		X		h1	X				
SWMU 58 and SA 73, Heating Plant 6 ^o	U.S. Navy and ADEC 2005	a1	X		d1		X				h2	X			X	
SWMU 60, Tank Farm A	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X			X	
SWMU 61, Tank Farm B	OU A ROD/SAERA	a1	X	X	d1		X		X		h1	X			X	
SWMU 62, New Housing Fuel Leak ^q	U.S. Navy and ADEC 2006c	a3	X	X	d1		X		X		h1	X		X	X	X
SWMU 67, White Alice PCB Spill Site	OU A ROD	a1	X		d2		X				h1	X	X			

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

Site Name	Regulatory Source of Institutional Controls	Institutional Controls					Engineer-ing Controls		Operations and Maintenance							
		Land Use Restrictions ^a	Equitable Servitude ^b	Groundwater Restrictions ^c	Soil Excavation Restrictions ^d	Fishing Advisory ^e	Signage	Fencing	Monitoring ^f	Education ^g	Site/Remedy Condition Inspections and Reporting ^h	Sign and Fencing Inspection ⁱ	Soil Cover Inspections ^j	Free-Product Monitoring and Recovery ^k	Visual Inspection ^l	Treatment System ^m
Sweeper Cove	OU A ROD					X			X	X	h1					
Tanker Shed, UST 42494 ^o	U.S. Navy and ADEC 2005	a1	X	X	d1		X		X		h1	X				
Yakutat Hangar, UST T-2039-A ^o	U.S. Navy and ADEC 2005	a1	X	X	d1		X				h2	X				
Yakutat Hangar, UST T-2039-B and T-2039-C	OU A ROD/SAERA	a1	X	X	d1						h2	X				
Ordnance Sites^r																
Downtown	OU B-1 ROD		X		d1					X	h2					
C3-01A, C3-01B, C3-01C, C3-01D, C3-01E, C3-01F, FB-01, FB-03, HH-01, ML-01A, ML-01B, ML-01C	OU B-1 ROD		X							X	h2					

^aLand use restrictions are required to ensure that the land will never be used in a way inconsistent with the land use assumptions set forth in the Adak Island RODs. Land use restrictions:

- a1: Commercial and Industrial
- a2: Outdoor Recreational
- a3: Residential

^bLand use restrictions/prohibitions have been included in the Interim Conveyance.

^cThe downtown groundwater is restricted from domestic use.

^dExcavation notification is required at all sites. Excavation is prohibited at the landfills and sites with a soil cover. Excavation restrictions:

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

d1: Excavation Notification Required

d2: Excavation Absolutely Prohibited

^eFishing advisory to recommend limiting subsistence consumption of rock sole and blue mussels; fact sheets on the advisory available to City of Adak residents.

^fMonitoring is conducted on a site-specific basis. Details of the monitoring program are provided in the stand-alone Groundwater Monitoring SAP, Landfill Monitoring SAP, and Marine Monitoring SAP.

^gEducation Program (required for shellfish/fishery advisory and for ordnance hazards).

^hInspection and reporting of institutional controls. 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 area groundwater will be inspected by driving existing roads. The inspection will entail looking for evidence of domestic wells in use. Inspections conducted:

h1: Biennially during odd years, beginning in 2013

h2: Every 4 or 6 years

ⁱInspect signage for excavation restrictions, ordnance (at Parcel 4), and landfill hazards during inspection of ICs.

^jBiennially inspect soil covers to ensure they remain intact.

^kThis is marked for sites with a current free-product recovery requirement based on a ROD or DD and where ROD/DD endpoint criteria have not been met.

^lVisual inspection of adjacent shoreline and surface water for petroleum seeps and sheens.

^mTreatment systems installed as part of final remedies selected for the site.

ⁿAlthough this 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.

^oSite has met ROD/DD endpoint criteria for interim free-product recovery under the OU A ROD. ADEC concurred via approval of the DD for petroleum sites with no unacceptable risk (U.S. Navy and ADEC 2005).

^pSite has met ROD/DD endpoint criteria for interim free-product recovery under the OU A ROD and received ADEC concurrence via approval of the final decision

document (U.S. Navy and ADEC 2006a).

^qFree-product recovery is part of the final remedy for SWMU 62 (U.S. Navy and ADEC 2006c), and the NMCB Building Area, T-1416 Expanded Area (U.S. Navy and ADEC 2006d).

^rDetails of the ICs and site inspections required for OU B-1 sites are discussed in Section 7 of the ICMP.

^sFencing is not currently installed at Metals Landfill and because of the topography, has not been needed. A gate across the access road restricts vehicular access to the landfill.

*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

DRMO - Defense Reutilization Marketing Office

GCI - General Communication, Inc.

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

**Table 4-3. Institutional Controls, Engineering Controls, and Operation and Maintenance for OU A, SAERA and OU B-1 Sites
(Continued)**

SAP - Sampling and Analysis Plan
SWMU - solid waste management unit
UST - underground storage tank

Table 4-4. Sites Achieving Cleanup Complete with ICs or Remedy in Place Status since Execution of the ROD

Site Name	Operable Unit	Type of Site	Date ^a
HP-01	B-1	Munitions	2001 ^(b)
SWMU 2, Causeway Landfill	A	CERCLA	6/2/2004
BC-01	B-1	Munitions	6/2/2004
C1-03	B-1	Munitions	6/2/2004
C2-01A	B-1	Munitions	6/3/2004
C2-01B	B-1	Munitions	6/3/2004
C2-02	B-1	Munitions	6/3/2004
C3-01A	B-1	Munitions	6/3/2004
C3-01B	B-1	Munitions	6/3/2004
C3-01C	B-1	Munitions	6/3/2004
C3-01D	B-1	Munitions	6/3/2004
C3-01E	B-1	Munitions	6/3/2004
C3-01E	B-1	Munitions	6/3/2004
C8-03	B-1	Munitions	6/3/2004
C8-05A	B-1	Munitions	6/3/2004
FB-01	B-1	Munitions	6/4/2004
FB-02	B-1	Munitions	6/4/2004
FB-03	B-1	Munitions	6/4/2004
FB-04	B-1	Munitions	6/4/2004
FBAP-02	B-1	Munitions	6/4/2004
GUN-01	B-1	Munitions	6/4/2004
GUN-02	B-1	Munitions	6/4/2004
GUN-03	B-1	Munitions	6/4/2004
HH-01	B-1	Munitions	6/4/2004
SWMU 16, Former Firefighting Training Area	A	CERCLA	6/4/2004
SWMU 23, Heart Lake Drum Disposal Area	A	CERCLA	6/4/2004
SWMU 24, Hazardous Waste Storage Facility	A	RCRA	6/4/2004
SWMU 29, Finger Bay Landfill	A	CERCLA	6/4/2004
SWMU 35, Ground Support Equipment Building, UST 270044	SAERA	Petroleum	6/4/2004
SWMU 10, Old Baler Building	A	CERCLA	8/30/2004
SWMU 13, Metals Landfill	A	CERCLA	8/31/2004
SWMUs 52, 53, 59, Former Loran Station	A	CERCLA	8/31/2004
ML-01A	B-1	Munitions	8/31/2004
ML-01B	B-1	Munitions	8/31/2004
ML-01C	B-1	Munitions	8/31/2004
ML-02A	B-1	Munitions	8/31/2004
ML-02B	B-1	Munitions	8/31/2004
AP-02	B-1	Munitions	9/1/2004
SWMU 4, South Davis Road Landfill	A	CERCLA	9/1/2004
SWMU 11, Palisades Landfill	A	CERCLA	9/1/2004
SWMUs 18/19, White Alice Landfill	A	ADEC Solid Waste Regulations	9/1/2004
SWMU 20, White Alice/Trout Creek Disposal Area	A	CERCLA	9/1/2004
SWMU 21A, White Alice Upper Quarry	A	CERCLA	9/1/2004
SWMU 67, White Alice PCB Spill	A	CERCLA	9/1/2004
C3-04A	B-1	Munitions	10/21/2004
C6-01A	B-1	Munitions	10/22/2004

Table 4-4. Sites Achieving Cleanup Complete with IC or Remedy in Place Status since Execution of the ROD (Continued)

Site Name	Operable Unit	Type of Site	Date ^a
SWMU 25, Roberts Landfill	A	ADEC Solid Waste Regulations	10/26/2004
South Sweeper Creek	A	CERCLA	2/15/2005
Sweeper Cove	A	CERCLA	2/15/2005
Finger Bay Quonset Hut (UST FBQH-1)	SAERA	Petroleum	11/23/2005
MAUW Compound (UST 24000-A)	SAERA	Petroleum	11/23/2005
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	SAERA	Petroleum	11/23/2005
NAVFAC Compound (USTs 20052 and 20053)	SAERA	Petroleum	11/23/2005
Navy Exchange Building (UST 30027-A)	SAERA	Petroleum	11/23/2005
New Roberts Housing (UST HST-7C)	SAERA	Petroleum	11/23/2005
Officer Hill and Amulet Housing (UST 31047-A)	SAERA	Petroleum	11/23/2005
Officer Hill and Amulet Housing (UST 31052-A)	SAERA	Petroleum	11/23/2005
ROICC Contractor's Area (UST ROICC-8)	SAERA	Petroleum	11/23/2005
ROICC Warehouse (UST ROICC-2)	SAERA	Petroleum	11/23/2005
ROICC Warehouse (UST ROICC-3)	/SAERA	Petroleum	11/23/2005
Yakutat Hangar (USTs T-2039-B and T-2039-C)	SAERA	Petroleum	11/23/2005
Yakutat Hangar (UST T-2039-A)	SAERA	Petroleum	5/1/2007
BI-01	B-1	Munitions	1/16/2008
C1-02	B-1	Munitions	1/16/2008
C8-01	B-1	Munitions	1/16/2008
DM-06A	B-1	Munitions	1/16/2008
MM-01	B-1	Munitions	1/16/2008
MM-02	B-1	Munitions	1/16/2008
MM-03	B-1	Munitions	1/16/2008
MM-04	B-1	Munitions	1/16/2008
MM-05	B-1	Munitions	1/16/2008
MM-06	B-1	Munitions	1/16/2008
MM-07	B-1	Munitions	1/16/2008
MM-08	B-1	Munitions	1/16/2008
MM-09	B-1	Munitions	1/16/2008
MM-11	B-1	Munitions	1/16/2008
SH-01	B-1	Munitions	1/16/2008
LJ-01	B-1	Munitions	9/14/2010
SA 82, NSGA P80, P81 Buildings	SAERA	Petroleum	6/22/2010
NORPAC Hill Seep Area	SAERA	Petroleum	9/19/2011
SA 88, P-70 Energy Generator, UST 10578	SAERA	Petroleum	9/19/2011
Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4	SAERA	Petroleum	9/19/2011
MM-10A	B-1	Munitions	2/22/2013
MM-10B	B-1	Munitions	2/22/2013
MM-10E	B-1	Munitions	2/22/2013
MM-10F	B-1	Munitions	2/22/2013
MM-10G	B-1	Munitions	2/22/2013
MM-10H	B-1	Munitions	2/22/2013
SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs	SAERA	Petroleum	6/21/2013
SWMU 58/SA 73, Heating Plant 6	SAERA	Petroleum	8/26/2013
SWMU 15, Future Jobs/DRMO	A and SAERA	CERCLA/Petroleum	3/13/2014

Table 4-4. Sites Achieving Cleanup Complete with IC or Remedy in Place Status since Execution of the ROD (Continued)

Site Name	Operable Unit	Type of Site	Date ^a
Runway 5-23 Avgas Valve Pit	SAERA	Petroleum	10/6/2014

^aThis is the date listed on the ADEC Web site (<http://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/Search>).

^bExact date unknown. Cleanup was completed in 2001.

ICs are still in effect for these sites, and additional sampling would be required to achieve NFA status. However, all other remedial actions have been completed.

ROD - Record of Decision

Table 4-5. Cleanup Levels for Soil Chemicals of Concern

Chemical of Concern	Cleanup Level (ppm or mg/kg)	Basis for Cleanup Level	Risk at Cleanup Level
Dinitrotoluene (mixture)	0.72	EPA Region 9 Residential RBSC	10 ⁻⁶
2,4,6-Trinitrotoluene	18	EPA Region 9 Residential RBSC	10 ⁻⁶
Nitroglycerin	35	EPA Region 9 Residential RBSC	10 ⁻⁶
Nitroguanidine	6,100	EPA Region 9 Residential RBSC	10 ⁻⁶
Tetryl (Trinitrophenylmethylnitramine)	610	EPA Region 9 Residential RBSC	10 ⁻⁶
RDX (Cyclonite)	4	EPA Region 9 Residential RBSC	10 ⁻⁶

RBSC – Risk Based Screening Concentration

Notes: Dinitrotoluene (mixture) represents a mixture of 2,4-dinitrotoluene and 2,6-dinitrotoluene.

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5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This section summarizes the status of recommendations and follow-up actions from the last five-year review, the results of implemented actions, and documentation that the necessary follow-up actions have been taken. A summary of follow-up actions is detailed in Table 5-1, which supports that the Navy has completed all of the actions recommended by the last five-year review.

Table 5-1. Actions Taken since Previous Five-Year Review

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Complete the ongoing evaluation of potential additional action for SWMU 60, Tank Farm A, based on impacts to South Sweeper Creek.	September 2011	Monthly product recovery activities were initiated in September 2011 when free product was encountered in two recently installed monitoring wells. Product recovery has continued at SWMU 60 and boom 10 is also maintained to control the migration of petroleum sheen to surface water.	Navy. 2013c. Final Remedial Action Summary Report, Free Product Recovery, SWMU 62 and Additional Sites, Former Adak Naval Complex. February 4.
Update the document repositories.	December 31, 2011	After the completion of the third five-year review, efforts were made by the Navy to ensure document repositories were updated and maintained. The document repository on island was reviewed and organized so to ensure all relevant documents are available. Electronic copies of the reports are also made available on the http://www.bracpmo.navy.mil/brac_base/other_west/former_naf_adak.html web site.	Not Applicable
Complete DD for Area 303.	March 21, 2012	A DD for Area 303 was completed in 2012 to select a cleanup remedy for the site. Monitored natural attenuation, ICs, and free-phase produce recovery was the cleanup remedy selected for Area 303.	Navy. 2012a. Decision Document Area 303, Former Adak Naval Complex, Adak, Alaska. March 21.
Create a munitions response desk guide for limited distribution.	May 3, 2012	A Munitions Response Desk Guide was finalized in 2012. The desk guide provides the following information: <ul style="list-style-type: none"> Procedures for local officials to follow in the event of a MEC discovery; Identification of which areas of the island are generally the responsibility of Army Alaska Fort Richardson Explosives Ordnance Disposal (EOD) Unit vs U.S. Navy Naval Air Station Whidbey EOD Mobile Unit Eleven; A geographic information system-based graphic showing historical MEC recoveries across the island. 	Navy. 2012e. Final Report, Munitions Response Desk Guide, Former Naval Air Facility Adak Island. May 3.
As part of the current Optimization Work Group effort for optimization of monitoring and product recovery on Adak, update the CMP and Operation and Maintenance Plan to address	August 17, 2012	The CMP and associated ICMP have been updated twice (2012 and 2014) since the last five-year review. Revision 5 to the CMP was finalized in 2012 and included updates that were intended to address the follow-up actions identified in the third five-year review. Additional	Navy. 2012d. Final Comprehensive Monitoring Plan, Revision 5, Former Adak Naval Complex. August 17. Navy. 2014a. Final Comprehensive Monitoring

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
the items listed in Recommendation No. 1 on Table 8-1 and as detailed in Sections 4.1.4 and 6.4. In addition, update the ICMP (and its equivalent to Table 4-1 of this five-year review) to be consistent with source documentation (executed RODs, DDs, and conditional closure letters).		details on the changes made in the Rev 5 and Rev 6 of the CMP are provided in Section 4.1.4.1.	Plan, Revision 6, Former Adak Naval Complex. August 6.
Evaluate additional actions to protect surface water at NMCB Building Area in accordance with the DD.	December 31, 2012	Free product recovery activities and sampling to protect surface water have been ongoing at the NMCB Building and the NMCB Expanded Area over the last five years and are considered to be protective of surface water.	Navy. 2016c. Final Remedial Action Summary Report, Free Product Recovery, SWMU 62 and Additional Sites, Former Adak Naval Complex. January 11.
Complete the ongoing assessment of additional remedial action at Former Power Plant, Building T-1451.	April 2013	Site investigation and characterization activities were conducted from May 2012 to July 2012 and the results were presented in an Interim Removal Action Report finalized in April 2013. Additional activities under SAERA are planned for the site to enhance MNA and protect surface water from petroleum contamination and it will be protective upon completion of the activities.	Navy. 2013b. Final Interim Removal Action Report Building T-1451 and East Canal Site Investigation/ Characterization Former Adak Naval Complex. April.
Well decommissioning activities at 19 sites.	June 2013	Well decommissioning activities were conducted at the following sites in 2013: Antenna Field; GCI Compound; NMCB; NORPAC Hill Seep Area; SA 80; South of Runway 18-36; SWMU 17; SWMU 60; Tanker Shed; Arctic Acres; SA 78, SA 79; SA 82; SA 88; SWMU 58/SA 73; SWMU 62; Yakutat Hangar; ROICC Contractor's Area; USTs ROICC-7 and ROICC-8.	Navy. 2014e. Well Decommissioning and Repair Summary Report, Former Naval Complex. April 18.
The following sites received cleanup complete with ICs status from ADEC: Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4; NORPAC Hill Seep Area; Runway 5-23 Avgas Valve Pit; SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs; SA 88, P-70 Energy Generator, UST 10578; SWMU 15, Future	2011 - 2015	During this five-year review period, eight SAERA sites and six OU B-1 sites were changed from the "Active" status to "Cleanup complete with ICs" by ADEC. This is equivalent to Remedy in Place for the OU B-1 CERCLA sites.	ADEC Contaminated Sites Program Database: http://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/Search

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Jobs/DRMO; SWMU 58/SA 73, Heating Plant 6; MM-10A, MM-10B, MM-10E, MM-10F, MM-10G, and MM-10H.			
Repairs/improvements to LUCs were conducted at ten sites in 2015 including: SWMU 4, SWMU 11, SWMU 13, SWMU 15, SWMU 18, SWMU 20, SWMU 24, SWMU 25, SWMU 29, SWMU 55.	August 20, 2015	Repairs/improvements conducted at the ten OU A sites included fencing and gate repair/replacement, sign repair/replacement, additional sign installation, landfill cap repairs, swale repairs, armor wall repairs, erosion control, filling of sinkholes, and site restoration.	Navy, 2016a. Final Land Use Controls and Institutional Controls Repair/Improvement Completion Report. February.

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Five-Year Review Team

The Navy is the lead agency for this five-year review. Personnel from NAVFAC Northwest represented the Navy in this five-year review. Project managers and other staff from the U.S. EPA and ADEC, and the other five-year review team members have also participated in the review process. Both the U.S. 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 notifying the public 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 August 3, 2015, advising that the Navy was performing a five-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. One Adak resident and a representative from Aleutian Probilof Islands Association, Inc. responded to interview requests. Interview responses are provided in Appendix B.

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 and DDs. The proposed plan for Area 303 was reviewed in 2011. Details of the community involvement history are provided in the following subsections.

6.2.2.1 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 Bob Reeve High School. All documents produced relative to CERCLA actions are intended to be available on Adak, together with copies of community and RAB briefing materials, newsletters, and fact sheets. Recently issued documents are available at

the Web site for Adak environmental cleanup,
http://www.bracpmo.navy.mil/brac_bases/other_west/former_naf_adak.html (replaces
www.adakupdate.com).

6.2.2.2 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 latest CRP was updated in 2011.

6.2.2.3 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 meets biannually, and all RAB meeting information is regularly posted at http://www.bracpmo.navy.mil/brac_bases/other_west/former_naf_adak.html. Meetings are held in Adak, and resources are provided to allow interested parties to participate by telephone. During this five-year review period, ten RAB meetings were held in April and October/November of each year from 2011 through 2015.

6.2.2.4 Fact Sheets and Newsletters

Since September 1999, over 40 newsletters or fact sheets have been distributed. These newsletters, titled *Adak Island Update*, or fact sheets have been published as new issues, notifications, and significant documents are prepared. The newsletters are distributed to individuals and groups on the general mailing list. Additional copies of newsletters and fact sheets are sent to the information repository on Adak and an electronic copy is made available on the http://www.bracpmo.navy.mil/brac_bases/other_west/former_naf_adak.html Web site.

Fact sheets containing information on fish/shellfish consumption and related advisories were sent to on-island residents in October 2003, July 2004, January 2006, August 2006, February 2008, June 2010, November 2012, and February 2014, and March 2016 (U.S. Navy, 2016f). The Navy intends to continue to issue fact sheets to on-island residents on a biennial basis until tissue concentrations in fish and shellfish meet cleanup levels.

6.2.2.5 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 the 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.

6.2.2.6 Web Site

A project Web site

(http://www.bracpmo.navy.mil/brac_bases/other_west/former_naf_adak.html) 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 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.

6.2.2.7 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:

1. 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.
2. Provides hiking maps, digital video disks, posters, and other informational materials to the City of Adak for distribution and dissemination to residents and visitors to Adak.
3. 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.
4. Inspects access restriction notifications and barriers to ensure they function properly.
5. Communicates with residents of the City of Adak and on-island employers to ensure awareness of access restrictions and the Navy's intent to enforce them.

6. 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.

6.3 Document Review

Documents reviewed during this five-year review were primarily those describing the construction and monitoring of the selected remedies, including IC monitoring and site inspections, up through the 2015 field season. The primary documents that were reviewed are listed below, and all of the documents reviewed are listed in Section 10.

1. The signed RODs and amendments (U.S. Navy, U.S. EPA, and ADEC, 1995, 2000, 2001, 2002, and 2003)
2. The signed DDs (U.S. Navy and ADEC, 2005a, 2006a, 2006b, 2006c, 2007, and 2012a)
3. The first, second, and third five-year review reports (U.S. Navy, 2001b, 2006b, and 2011a)
4. The current and previous versions of the CMP (U.S. Navy, 2001a, 2004, 2005c, 2007d, 2010a, 2012d, and 2014a)
5. The most recent groundwater and landfill monitoring reports and data
6. Annual free-product recovery reports
7. Various closure, cleanup, and completion reports
8. 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 five-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 and landfill monitoring report (U.S. Navy, 2015a). These documents are available for review in the document repositories in Anchorage, on Adak Island, and in Silverdale, Washington (see Section 6.2.2.1). Appendix C provides historical and current monitoring data. Statistical significance of a trend is defined in the OU A ROD (U.S. Navy, U.S. EPA, 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. 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, 2010 and September 30, 2015 have been collected in support of long-term monitoring at OU A and SAERA sites, or in support of remedy selection and implementation at SAERA and OU B-1 sites. Data collected in support of remedy selection or implementation have been documented in DDs 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).

Monitoring has generally been conducted at OU A and SAERA sites annually, biennially, or every five years. Monitoring at OU A and SAERA has been prescribed by the CMP, which has been revised six times since 2001 (U.S. Navy, 2001a, 2004, 2005c, 2007d, 2010a, 2012d and 2014a). Revisions have been reviewed and approved by ADEC and U.S. EPA. The CMP has been revised for the following reasons:

1. To reflect site status changes as remedial progress is realized, with corresponding changes to monitoring programs
2. To augment monitoring requirements for sites at which monitoring was previously prescribed, but remedial decisions were recently documented
3. 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 SAERA sites as part of the annual groundwater monitoring activities, and semi-monthly at SAERA sites where free-product recovery has been performed as part of remedy implementation or at the request of ADEC.

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 ROD/DD endpoint criteria specified in the CMP (U.S. Navy, 2014a). Numeric remediation goals (RGs) were established only for sediment at SWMU 17 which were risk-based values. For ongoing monitoring activities, “criteria endpoints” have been established to provide comparison values for contaminants included in the monitoring program. No numeric RG was established in the ROD for groundwater or soil at CERCLA sites. For most of the sites, the ROD/DD endpoint criteria for groundwater are based on the ADEC groundwater cleanup levels (18 AAC 75.345). However, there are nine sites where the groundwater ROD/DD endpoint criteria are 10 times the ADEC groundwater cleanup levels, as specified in the DDs for these sites (U.S. Navy and ADEC, 2005a, 2006a, 2006b, 2006c, and 2007). These nine sites are the following:

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

In 2008, the ten times rule was revoked and no longer applies to sites that remain active. The active sites include NMCB Building Area, T-1416 Expanded Area, South of Runway 18-36 Area, and SWMU 17, Power Plant No. 3. The endpoint criteria for these three sites will need to be revised in the CMP.

6.4.1 Natural Attenuation

Natural attenuation is a remedial component for many of the OU A and SAERA 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. NAP monitoring frequency was reduced to once every 5 years, with the last monitoring conducted in 2014. NAP monitoring results and interpretation of these results is presented in the 2014 annual groundwater monitoring report (U.S. Navy, 2015a).

The Navy data indicate that natural attenuation of petroleum hydrocarbons, via biological and/or chemical means, is ongoing at Adak. The annual reports prepared for the 2011 through 2015 monitoring events document the evidence used and provide the rationale for this conclusion.

One of the three objectives in the OU A ROD (Section 10.2.2 of the ROD) is to estimate the rate of natural attenuation to demonstrate achievement of ROD/DD 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 MNA or use of alternative remedial actions will be evaluated and discussed with ADEC.

The CMP (U.S. Navy, 2014a) 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 ROD/DD 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 ROD/DD endpoint criterion at an individual well for an individual analyte may be achieved based on the existing data.

The Sen's slope was used to estimate a timeframe that an analyte will reach its ROD/DD endpoint criteria at sites where all analytes were demonstrating a decreasing trend at all wells. For other sites, the estimates are not provided since there is not enough information to predict a timeframe. In addition, sites such as Building T-1451, SWMU 60, and SWMU 62 which have planned removal actions will not be evaluated until the removal actions are complete and there is sufficient data to conduct an analysis. A timeframe to reach ROD/DD endpoint criteria was estimated for two sites (SWMU 17 and SWMU 55) which are discussed in Sections 6.4.18 and 6.4.19, respectively.

Data from the groundwater and landfill monitoring reports produced over the past five years were used to develop the site summaries in this section (U.S. Navy, 2012f, 2012g, 2013d, 2014b, 2015a, 2016d).

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

6.4.2.1 Data Review

Data Collection during This Five-Year Review Period. No data were collected at Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4 during this five-year review period.

On September 19, 2011, ADEC provided a "Cleanup Complete with Institutional Controls Determination for Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4" (ADEC, 2011a). ICs are inspected every five years in accordance with the ICMP.

6.4.3 Former Power Plant, Building T-1451

6.4.3.1 Data Review

Data Collection during This Five-Year Review Period. MNA is the remedy selected for this site (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA. Groundwater samples were collected from these wells to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring.

In 2012, a NTCRA was conducted at Former Power Plant, Building T-1451 under the petroleum program covered under SAERA to enhance MNA for a more effective treatment of the contaminants at the site per recommendations in the third five-year review. Approximately 875 cubic yards of petroleum contaminated soil was removed from the site to reduce the contaminant source. Approximately 3,400 pounds of Oxygen BioChem chemical amendment and 1,000 pounds of wood fiber mulch were applied to the backfill material placed in the MNA treatment area excavation to potentially reduce the petroleum contaminant concentrations migrating

through the groundwater and entering East Canal. In addition, nine monitoring wells were installed during the construction of the MNA treatment area in 2012 and added to the annual groundwater monitoring program (U.S. Navy, 2013b).

Groundwater samples were collected from 13 wells (four existing and nine new) during this five-year review period, as well as, one sediment and surface water location. One of the wells was removed in 2012 and; therefore, was only sampled in 2011.

In April 2013, a one-time groundwater sampling event was conducted at Former Power Plant T-1451 to collect baseline data for the RAO and to determine which wells should be included in the CMP for RAO requirements for this site. Three wells (MW-1451-1, MW-1451-6, and MW-1451-7) contained free product during this sampling event. There were no exceedances of ROD/DD endpoint criteria for BTEX, polycyclic aromatic hydrocarbon (PAH) or total aromatic hydrocarbons (TAH) in the samples from the wells tested. Diesel-range organics (DRO) were detected in excess of the ROD/DD endpoint criterion of 1,500 µg/L in five wells. Total aqueous hydrocarbons (TAqH) concentrations exceeded the ROD/DD endpoint criterion in one well (U.S. Navy, 2013e).

DRO, BTEX, and PAHs (for TAH and TAqH) were analyzed in some or all of the wells sampled between 2011 and 2015. No sample was collected in MW-1451-1 in 2014 and 2015, MW-1451-7 in 2013, 2014, or 2015, or MW-1451-9 in 2013 due to the presence of free product in the wells at the time of sample collection. The surface water sample (NL-08) was analyzed for DRO, BTEX, and PAHs and the sediment sample (NL-08) was analyzed for DRO and PAHs between 2011 and 2015. Visual inspections were also conducted at the eastern shoreline of East Canal at the Former Power Plant, Building T-1451 site annually from 2011 to 2015.

Although the ROD-required remedy for Former Power Plant, Building T-1451 is MNA, a removal action was completed in 2012 to address petroleum in surface water. Monthly free product recovery began in June 2013 at nine wells as a follow-up to the removal action. Between June 2013 and September 2013, 2.37 gallons of free product was removed from MW-1451-7. Free product was not observed in any other well (except MW-1451-1, which was too thin for recovery).

In addition to product recovery, booms have been placed on East Canal downgradient of Former Power Plant, Building T-1451 Boom 11 is located parallel to the eastern shoreline adjacent to a known shoreline seep. Boom 9 is located across the width of East Canal at the southern end of the culvert near well MW-1451-2 and Boom 12 is located across the width of East Canal downgradient of Boom 11. Booms are used to absorb petroleum directly at the identified shoreline seeps and prevent migration of sheen and oil to the extent practicable from shoreline seeps downstream in East Canal.

In June and July 2012, sources of petroleum contamination in the soil and seeps along the shoreline on East Canal in the area of Boom 9 were removed. The shoreline was excavated, replaced with clean fill, and recontoured. Boom 9 remains in place and will be monitored monthly to evaluate the effectiveness of the remediation. A smaller shoreline petroleum seep is located in East Canal approximately 85 feet downstream (south) from Boom 9. At this seep,

sheen, oily sediments, and stressed vegetation were observed during monthly inspections of Boom 11. Booms 9 and 12 were repositioned in May 2014 and separated in the remedial action reports after that time. A total of six 10-foot sections of Boom were replaced between October 2014 and September 2015. The Booms were determined to be effectively controlling the migration of sheen on the surface water.

Additional removal activities were conducted during the 2016 field season to eliminate the petroleum sheen on the surface water in East Canal. Activities included excavation of soil along East Canal, and application of oxygen amendments to enhance MNA at the site. Groundwater monitoring wells were installed to monitor MNA parameters, the presence or absence of free product, and petroleum hydrocarbon concentrations in groundwater.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells and the surface water and sediment sampling location relative to potential source areas at the Former Power Plant, Building T-1451 site and the downgradient surface water body, East Canal.

Analytical Results. DRO was reported in the three existing groundwater wells from 2011 to 2015 at concentrations ranging from 1,300 to 12,000 µg/L. Concentrations of DRO in samples collected from well 01-118 and 01-151 from 2011 through 2015 exceeded the ROD/DD endpoint criterion of 1,500 µg/L. With the exception of the 2014 sample, DRO concentrations in well 01-150 were below the ROD/DD endpoint criterion. Well 01-151 was removed in 2012 and replaced with well MW-1451-2.

Nine monitoring wells were installed at the site in 2012 and sampled during the subsequent groundwater monitoring events. The lowest concentration of DRO was in well MW-1451-4 at 39 µg/L and the highest concentration was in well MW-1451-2 at 6,200 µg/L. Well MW-1451-1 was not sampled in 2014 or 2015, MW-1451-6 was not sampled in 2015, MW-1451-7 was not sampled in 2013, 2014 or 2015, and MW-1451-9 was not sampled in 2013 due to presence of free product in the wells. Six of the nine wells sampled at least once in 2013, 2014, and 2015 exceeded the ROD/DD endpoint criterion of 1,500 µg/L for DRO. One well (MW-1451-7) has not been sampled yet due to the presence of free product the last three years. TAH and TAqH were analyzed in three of the wells and TAqH exceeded its ROD/DD endpoint criterion of 15 µg/L in one well (MW-1451-2) all three years at concentrations between 20 and 29 µg/L.

A surface water and sediment sample (NL-08) were collected at the Former Power Plant, Building T-1451 site annually from 2011 to 2015. DRO concentrations ranged from 130 µg/L to 310 µg/L in surface water and 29 mg/kg to 990 mg/kg in sediment. Only the 2014 surface water sample exceeded the ROD/DD endpoint criterion for DRO of 250 µg/L and three of the five sediment samples exceeded the ROD/DD endpoint criterion for DRO of 90.6 mg/kg. The surface water sample was also analyzed for indeno(1,2,3-cd)pyrene, TAH, and TAqH and no results were above ROD/DD endpoint criteria for these analytes. However, the surface water quality did not meet standards set in 18 AAC 70 due to sheen observed on the surface water at this location from 2011 through 2013. There was no sheen observed in 2014 or 2015 but there was a petroleum odor at this location. The sediment sample was also analyzed for 2-methylnaphthalene and phenanthrene and there were also no results in these samples that

exceeded ROD/DD endpoint criteria for these analytes. Note that ROD/DD endpoint criteria have not been established for East Canal so endpoints for South Sweeper Creek were used for this analysis.

A visual inspection of the shoreline of East Canal downgradient of the site was performed annually from 2011 to 2015. Between 2011 and 2015, petroleum sheen, odor and stressed vegetation have been observed at the Booms located near and downgradient from the Former Power Plant, Building T-1451 site.

DRO concentrations at wells 01-118 and 01-150 exhibited no trend from 2011 through 2015 and indicate the concentration is stable. The newly installed wells did not provide enough data to perform a trend analysis.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including the Former Power Plant, Building T-1451 site. Free-product recovery is not a component of the final remedy for this site in the OU A ROD; however, a removal action was completed in 2012 to address petroleum in surface water (U.S. Navy, U.S. EPA, and ADEC, 2000). After the completion of the removal action, free product recovery began in 2013 on a monthly basis. The following summarizes the significant product thickness data for the Former Power Plant, Building T-1451 site.

Between October 2013 and September 2015, free product has been measured in three monitoring wells (MW-1451-1, MW-1451-6, and MW-1451-7) at thicknesses between 0.02 and 1.31 ft. Free product recovery has been performed in these wells between 2013 and 2015 and 14.14 gallons of free product has been recovered during that period.

6.4.3.2 Natural Attenuation Assessment

NAPs were analyzed during both the 2013 and 2014 groundwater monitoring events in all wells at the Former Power Plant, Building T-1451 site. Sulfate concentrations in several wells within the contaminant plume are depleted compared to background (3.1 mg/L), indicating sulfate reduction is occurring at the site. On-site iron (II) concentrations (as high as 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 up to 10,000 µg/L compared to background (<1.3 µg/L) (U.S. Navy, 2015a).

The 2013 and 2014 annual reports concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrate anaerobic natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

Results of the Mann-Kendall trend evaluation (U.S. Navy, 2015a) are summarized in Table 6-1. The DRO concentrations in wells 01-118 and 01-150 are stable.

6.4.4 GCI Compound, UST GCI-1/Area 303

6.4.4.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the GCI Compound, UST GCI-1/Area 303 sites from 2011 through 2015. The interim remedy specified for this site in the OU A ROD for GCI Compound was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected MNA with ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a). For Area 303, the selected cleanup alternative was MNA with ICs and free product recovery under the petroleum program covered under SAERA (U.S. Navy, 2012a). Groundwater samples were collected at this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to evaluate NAPs.

Prior to 2013, only wells from the GCI site were sampled. Area 303 sampling did not begin until 2013. Once Area 303 monitoring was added to the program it was determined that the contamination from Area 303, GCI Compound, and several wells from SWMU 62 was commingled in this area. To facilitate annual monitoring the well networks for Area 303, GCI Compound, and a subset of SWMU 62 wells were combined and evaluated together in the annual monitoring report. Although they are separate sites, they will be discussed together in this five-year review.

The Navy has conducted groundwater monitoring at 14 locations (03-103, 03-104, 03-518, 03-778, 03-502, MRP-MW2, MRP-MW3, 04-100, 04-202, 04-204, 04-210, 04-213, 04-701, AMW-704) at least once between 2011 and 2015. Nine existing wells (03-102, 03-107, 04-211, MW-303-28, MW-303-30, MW-303-31, MW-303-32, MW-303-33, and MW-303-37) and seven newly installed wells (MW-303-38, MW-303-39, MW-303-40, MW-303-41, MW-303-42, MW-303-43, and MW-303-44) were also sampled at least once between 2013 and 2015. Sampling was discontinued in well MRP-MW9 after the 2006 sampling event; however, one sample was collected from this well in 2011 and analyzed for DRO.

Groundwater samples have been collected from each well where sampling was planned for DRO, gasoline-range organics (GRO), benzene, toluene, ethylbenzene, and total xylenes (BTEX), lead, PAHs, dibenzo(a,h)anthracene, and/or NAPs analyses. A sample was not collected from well MW-302-28 in 2013 or well 04-202 in 2011 or 2014 because free product was present in the well. In 2013, no samples were collected from well MW-303-42 due to the well being dry. In 2014, samples at all wells where sampling was planned were analyzed for NAPs.

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, UST GCI-1/Area 303 sites. In addition, Appendix A includes information on the GCI Compound, UST GCI-1/Area 303 sites such as monitoring schedule and sampling results.

Analytical Results. GRO has not been measured at concentrations greater than their ROD/DD endpoint criteria or practical quantitation limits (PQLs) in groundwater samples collected from wells 03-012, 03-103, 03-104, 03-518, 03-778, 04-204, 04-701, AMW-704, MW-303-31, MW-303-32, MW-303-33, MW-303-37, MW-303-39, MW-303-40, and MW-303-41 during this five-year review period. In addition, DRO was not detected at a concentration greater than its ROD/DD endpoint criterion in the groundwater samples collected from 03-012, 03-103, 03-502, MW-303-33, and MW-303-37 during this five-year review period.

GRO was reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 2,200 µg/L in 15 wells between 2011 and 2015. The highest GRO concentration was measured in the 2013 groundwater sample at 60,000 µg/L in well MRP-MW3. DRO was reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 1,500 µg/L in seven wells between 2011 and 2015. The highest DRO concentration was measured in the 2014 groundwater sample at 12,000 µg/L in wells 03-104 and MRP-MW3.

Benzene was reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 5 µg/L in four of the 14 wells analyzed for benzene between 2011 and 2015. The highest benzene concentration was measured in the 2015 groundwater sample at 100 µg/L in well MRP-MW2. Ethylbenzene was reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 700 µg/L in three wells between 2011 and 2015. The highest ethylbenzene concentration was measured in the 2013 sample at 2,200 µg/L in well MRP-MW3. Xylenes was reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 10,000 µg/L in one well (MRP-MW3) between 2011 and 2015 with the highest concentration being 12,600 µg/L collected in 2013. Toluene and dibenzo(a,h)anthracene were not measured in the groundwater sample from any well at concentrations greater than their respective ROD/DD endpoint criterion.

TAH and TAqH were reported in groundwater samples at concentrations greater than the ROD/DD endpoint criteria of 10 and 15 µg/L, respectively, in one of two wells between 2013 and 2015. The highest concentrations of TAH and TAqH were measured in the 2014 sample at 524 µg/L and 515 µg/L, respectively, in well MW-303-37. Total and dissolved lead were reported in groundwater samples at concentrations greater than the ROD/DD endpoint criterion of 15 µg/L in five of the 11 wells analyzed for lead between 2013 and 2015. The highest concentrations of total and dissolved lead were measured in the 2015 sample at 97.8 and 96.9 µg/L, respectively, in well MW-303-28.

A visual inspection was conducted at the GCI Compound, UST GCI-1/Area 303 sites in 2015 on the East Canal. Water levels in East Canal have been elevated due to infrequent operation of dike pumps, causing petroleum sheen to move from Boom 8 into upstream marshy areas. The area was heavily vegetated and marshy.

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy, 2016d) are summarized in Table 6-1. DRO concentrations exhibit an increasing trend in well MRP-MW2 and no trend in wells 03-104, 03-778 and MRP-MW3. GRO concentrations exhibit a decreasing trend at wells 04-210 and 04-213 and no trend in wells MRP-MW2 and MRP-MW3. Ethylbenzene

concentrations exhibit no trend in wells MRP-MW2 and MRP-MW3. Benzene and total xylenes concentrations exhibit no trend in wells MRP-MW2 and MRP-MW3, respectively.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including the GCI Compound, UST GCI-1/Area 303 sites. The following summarizes the significant product thickness data for the GCI Compound/UST GCI-1/Area 303 sites.

Between September 1996 and September 2015, monitoring wells within the vicinity of the GCI Compound, UST GCI-1/Area 303 sites have been gauged periodically for the presence of free product. However, only data collected since October 2010 are summarized here. As part of the Area 303 DD, free product recovery began at this site in June 2013. Seventeen wells were monitored throughout the year during the second half of 2013 and in 2014.

A total of 0.22 gallons of free product was recovered from one well (MW-303-28) in 2013. No free product was observed or recovered from any of the 17 wells in 2014. Therefore, free-product monitoring was reduced from 17 wells to three wells after the 2014 monitoring period (October 2013 to September 2014). No free product was observed or recovered from the three wells between October 2014 and December 2014. ROD/DD endpoint criteria were met in December 2014 and free product monitoring was discontinued at the site.

6.4.4.2 Natural Attenuation Assessment

Sulfate concentrations (less than 0.20 mg/L) for plume wells are depleted compared to background (3.1 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (up to 37.5 mg/L) are elevated compared to background (0 mg/L), indicating the occurrence of iron reduction. Strong evidence of methanogenesis is observed at the GCI Compound, UST GCI-1/Area 303 sites, as demonstrated by elevated methane concentrations in site wells up to 3,700 µg/L, compared to background (<1.3 µg/L).

The 2014 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 demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

6.4.5 Housing Area, Arctic Acres

6.4.5.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Housing Area, Arctic Acres from 2011 through 2015. MNA is the ROD-specified remedy for this site (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA. Groundwater samples were collected at this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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, and 03-890 for DRO and NAP analyses in 2011, 2013, and 2014. Samples were not collected from well 03-890 in 2014 due to the presence of free product. NAP analyses were conducted every 5 years, with the most recent sampling event occurring in 2014. Monitoring of wells 03-422, AA-02, and AA-06 was discontinued after the 2010 sampling event.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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 wells 03-416, 03-420, 03-421, and 03-890 between 2011 and 2014 at concentrations between 1,200 and 13,000 µg/L. With the exception of one sample from well 03-416, all DRO concentrations were above the ROD/DD endpoint criterion of 1,500 µg/L. No sample was collected from well 03-890 in 2014 due to the presence of free product.

Results of the Mann-Kendall and Sen's trend evaluation are summarized in Table 6-1 (U.S. Navy, 2015a). DRO concentrations at well 03-416, 03-420, and 03-421 have generally been stable from 2011 through 2014.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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, U.S. EPA, and ADEC, 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. The following summarizes the significant product thickness data for the Housing Area, Arctic Acres site.

Between September 1996 and September 2015, 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 2010 are summarized here. Between October 2010 and September 2014, free product has been detected in one well, 03-890, at the site during three annual groundwater monitoring events. The free-product thickness in well 03-890 was 0.02 foot, measured in August of 2014. Free product recovery was not performed or necessary at this site because the measured product thickness was less than 0.5 feet. Free product was not detected during any other annual groundwater monitoring events.

6.4.5.2 Natural Attenuation Assessment

Sulfate concentrations (0.65 to 1.9 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 iron (II) concentrations (20 to 40 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 the three site wells (300 to 1,500 µg/L), compared to background (an estimated 0.38 µg/L).

The 2014 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis,

which demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

6.4.6 Kuluk Bay

6.4.6.1 Data Review

Data Collection during This Five-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 five-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 five-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 2005 through 2015 (U.S. Navy, 2015b). Marine tissue monitoring and ICs is the ROD-selected remedy for this site (U.S. Navy, U.S. EPA, 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 ICs 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 congeners, lipid analysis, and moisture content.

Analytical Results. The mean concentration of PCBs in blue mussel tissue in 2011, 2013 and 2015 was 18.3, 9.97 and 7.08 $\mu\text{g/kg}$, respectively. The mean concentration in rock sole tissue in 2011, 2013, and 2015 was 12.9, 1.73 and 4.96 $\mu\text{g/kg}$, respectively. During this five-year review period, the mean concentration of PCBs in blue mussel tissue was below the risk-based action level of 31 $\mu\text{g/kg}$, but concentrations were slightly higher in 2011 than 2009. The mean concentration of PCBs in rock sole tissue was above the risk-based action level of 6.5 $\mu\text{g/kg}$ in 2011, but dropped below the action level in 2013. The mean concentration remained below the risk-based action level in 2015. The city of Adak conducted dredging in the small boat harbor in 2010 and 2011. The impacts of these events correlate with the data provided.

Fact sheets containing information on fish/shellfish consumption and related advisories were sent to on-island residents in October 2003, July 2004, January 2006, August 2006, February 2008, June 2010, November 2012, February 2014, and March 2016 (U.S. Navy, 2016f). The Navy intends to continue to issue fact sheets to on-island residents on a biennial basis until tissue concentrations in fish and shellfish meet cleanup levels.

Mean total PCB concentrations in blue mussel tissue from Kuluk Bay ranged from 4.07 $\mu\text{g/kg}$ in 1999 to 32.0 $\mu\text{g/kg}$ in 2005. Mean total PCB concentrations for each year, with the exception of 2005, are below the risk-based action level of 31 $\mu\text{g/kg}$. PCB tissue concentrations in blue mussel collected from Kuluk Bay for the period 1999 through 2015 were plotted for best fit regression and trendline analysis. This analysis determined that there was a statistically significant increasing trend in PCB concentrations although there has been a decrease in mean concentration over the past two sampling events (U.S. Navy, 2015b).

Mean total PCB concentrations in rock sole tissue from Kuluk Bay ranged from 1.73 µg/kg in 2011 to 32.4 µg/kg in 1996. 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 2015, with the exception of samples collected in 2000, 2002, 2009, 2013 and 2015, 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 2015 were normally distributed and were plotted for best fit regression and trendline analysis. A very slightly decreasing trend in the PCB concentrations was found which was determined to be not statistically significant (U.S. Navy, 2015b).

The background locations in the Bay of Islands were last sampled in 2013 to assess regional PCB trends. The Navy does not anticipate sampling in the Bay of Islands again in the foreseeable future. The mean total PCB concentrations in rock sole and blue mussel samples collected in 2013 from Bay of Islands (background area) were similar to historical concentrations measured between 1999 and 2003. Therefore, a change in global PCB concentrations is not evident based on these results.

6.4.7 NMCB Building Area, T-1416 Expanded Area

6.4.7.1 Data Review

Data Collection during This Five-Year Review Period. The Navy conducted annual groundwater monitoring at the NMCB Building Area, T-1416 Expanded Area site from 2011 through 2015. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected free-product recovery, MNA, and ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2006a). Groundwater samples were collected during the annual groundwater monitoring activities at this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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). The 10 times rule was revoked in 2008; therefore, the endpoint criteria will need to be revised in the CMP.

Groundwater samples were collected from 16 wells at this site during this five-year review period. Monitoring was conducted annually or biennially in these nine wells, except when free product was present in a well. Samples were not collected from well 02-818 in 2012, and NMCB-10 in 2012, 2013, and 2014 due to the presence of free product. Although sampling was planned for NMCB-07 during this five-year review period, no samples were collected due to free product presence every year.

Shoreline inspections were conducted annually from 2011 through 2014. Sediment sampling at NL-05 was conducted in 2011 through 2013 and was discontinued after the 2013 monitoring event.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the NMCB Building Area, T-1416 Expanded Area site relative to site features.

Marine Sediment Sampling Results. GRO and benzene were not detected above method reporting limits in sediment sample NL-05 in 2011 or 2012. GRO was the only analyte sampled for in 2013 and it was not detected above reporting limits. DRO was reported in the sediment samples collected from NL-05 in 2011 and 2012 at concentrations of 120 and 59 mg/kg, respectively. ADEC has not established cleanup levels for specific compounds in sediment; therefore, sample results were compared to South of Runway 18-36 ROD/DD endpoint criteria. The ROD/DD endpoint criteria for DRO and GRO at South Sweeper Creek are 90.6 mg/kg and 12.2 mg/kg, respectively. There is no ROD/DD endpoint criterion for benzene at South Sweeper Creek. Only one sample in 2011 exceeded the ROD/DD endpoint criterion for DRO. Benzene was not detected in either the 2011 or 2012 sample. Sampling was discontinued in sediment after the 2013 sampling event.

A visual inspection of the shoreline of Sweeper Cove downgradient of the site was performed annually from 2011 through 2014. An inspection was conducted along the Sweeper Cove shoreline between wells 02-451 and 02-479 annually from 2011 through 2014. No groundwater seeps, odor or sheen were observed during the shoreline inspection in 2011 through 2013. In 2014, a slight petroleum odor was noted on the shoreline south of well NMCB-07.

Groundwater Sampling Results. DRO and benzene concentrations were below the ROD/DD endpoint criterion in all samples collected in 2011 and 2012. DRO and benzene sampling was discontinued after the 2012 groundwater monitoring event. GRO concentrations were below the ROD/DD 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-08, NMCB-09, NMCB-10, NMCB-11, and NMCB-12 during this five-year review period.

GRO was reported in groundwater samples collected at wells 02-461 and E-201 from 2011 to 2014 at concentrations ranging from 7,000 to 17,000 µg/L. The GRO concentrations in samples collected from these wells were less than the ROD/DD endpoint criterion of 13,000 µg/L, except for the samples collected in 2011.

No groundwater samples were collected at well NMCB-07 between 2011 and 2014 due to the presence of free product in the well.

Because groundwater contaminant concentrations in all wells have been below ROD/DD endpoint criteria for the sampling events conducted in 2013 and 2014, no statistical analysis was performed.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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 five-year review period. The following summarizes the significant product thickness data for the NMCB Building Area, T-1416 Expanded Area site.

Between September 1997 and September 2015, 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 2010 are summarized here.

Between September 2011 and September 2015, free product has been detected in 10 wells at the site. The maximum measured thickness of free product reported at the site since September 2011 was 1.1 feet, in well NMCB-08 in October 2014. Free product was reported at a thickness greater than 0.1 in four additional wells including 02-300, NMCB-04, NMBC-07, and NMCB-10 at the site.

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 DD (U.S. Navy and ADEC, 2006a). These additional free-product recovery activities were implemented at the site in September 2006. 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.

Free product was recovered from site wells at NMCB Building Area, T-1416 Expanded Area site during the annual groundwater monitoring events when the measured thickness was greater than 0.5 feet.

Approximately 0.12 gallons of free product were recovered from well NMCB-08 during the 2014 annual groundwater monitoring event. The total volume of free product recovered from the NMCB Building Area, T-1416 Expanded Area site for the period October 2010 through September 2015 was 14.15 gallons. The maximum volume of free product (4.95 gallons) was recovered from well NMCB-08 for the time period October 2014 through September 2015.

6.4.7.2 Natural Attenuation Assessment

Sulfate concentrations for plume and plume edge wells 02-818 and NMCB-09 are depleted (0.12 to 1.3 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (10 to 40 mg/L) are elevated 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 concentration in NMCB-09 is 1,200 µg/L and ranges from 4.2 to 76 in the other three wells sampled, and all exceed the background (0.38 µg/L).

The 2014 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, 2015a).

6.4.8 NORPAC Hill Seep Area

6.4.8.1 Data Review

Data Collection during This Five-Year Review Period. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC selected limited groundwater monitoring as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a). Groundwater samples were collected at this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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). The Navy discontinued groundwater monitoring at the NORPAC Hill Seep Area site after the 2010 sampling event.

ADEC issued a "Cleanup Complete with Institutional Controls" determination on September 19, 2011. Minimal product has been recovered from site wells from 2007 to 2010, and so free product recovery ceased after March 2011. Concentrations of DRO in groundwater are below 10 times the ADEC groundwater cleanup level; however, they are above the most stringent values, therefore ICs are required. Results of the sediment samples at the seep were below the endpoint established for South of Runway 18/36 in both 2009 and 2010.

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.

6.4.9 ROICC Contractor's Area, UST ROICC-7

6.4.9.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the ROICC Contractor's Area, UST ROICC-7 from 2011 through 2015. Limited groundwater monitoring was the remedy selected for this site (U.S. Navy, U.S. EPA, 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 ROD/DD endpoint criteria established for the limited groundwater monitoring remedy in the OU A ROD. Therefore, the Navy initiated MNA at this site under the petroleum program covered under SAERA. Groundwater samples were collected from this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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 benzene analyses. Benzene analyses were conducted in 2012 in well 08-175 and discontinued after the 2012 groundwater monitoring event. None of the wells were sampled in 2011. NAP analyses were conducted in 2014.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells relative to the UST at ROICC Contractor's Area, UST ROICC-7.

Analytical Results. Benzene concentrations in downgradient well 08-175 were below the ROD/DD endpoint criterion of 5 µg/L in 2012 which is the only year the well was sampled during this five-year review period. Benzene was reported in groundwater samples collected at wells 08-200 and 08-202 from 2012 to 2014 at concentrations ranging from 9.3 to 280 µg/L. The benzene concentrations in these two wells have all been greater than the ROD/DD endpoint criterion of 5 µg/L during this five-year review period.

Benzene concentrations at well 08-200 have generally been stable from 2012 through 2014. Benzene concentrations at well 08-202 exhibited a statistically significant decreasing trend.

6.4.9.2 Natural Attenuation Assessment

Sulfate concentrations for the site are depleted (non-detect to 0.19 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations (50 to 100 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 (9,900 to 11,000 µg/L), compared to background (0.38 µg/L).

The 2014 annual report concluded these combined data indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy, 2014b) 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 ROD/DD endpoint criterion.

6.4.10 Runway 5-23 Avgas Valve Pit

6.4.10.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform groundwater monitoring at the Runway 5-23 Avgas Valve Pit site at two wells in 2012 and one well in 2013. MNA is the remedy selected for this site (U.S. Navy, U.S. EPA, and ADEC,

2000). The remedy for this site is now covered under SAERA. Groundwater samples were collected from this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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. Sampling was discontinued in well 14-110 after the 2012 sampling event and in well 14-100 after the 2013 sampling event. GRO levels at the site were below ROD/DD endpoint criteria for the third consecutive sampling event in 2013 so the site was recommended for closure.

Runway 5-23 Avgas Valve Pit site received a “cleanup complete with ICs” designation from ADEC on October 6, 2014.

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.

Analytical Results. GRO concentrations in well 14-100 (1,800 and 1,600 µg/L) were below the ROD/DD endpoint criterion of 2,200 µg/L in 2012 and 2013. Because the concentrations were below the ROD/DD endpoint criterion for three consecutive sampling events (2010 concentration was 2,200 µg/L), it was recommended that sampling be discontinued and the site should be closed with ICs.

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

6.4.11.1 Data Review

Data Collection during This Five-Year Review Period. The Navy performed groundwater monitoring at the SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs site in 2012. The ROD-specified interim remedy for this site was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC selected MNA with ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a). Groundwater samples were collected at this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD endpoint criteria are equal to 10 times the Alaska groundwater cleanup levels [18 AAC 75.345]), 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, MW-116, and 12-802 for benzene, DRO and/or GRO analysis.

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. Visual inspection of Clam Lagoon shoreline was conducted in 2012.

On June 21, 2013, ADEC provided a “Cleanup Complete with Institutional Controls determination for SA 78, Old Transportation Building, USTs 10583 and 10584” (ADEC, 2013). Institutional controls are inspected in accordance with the ICMP.

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.

Analytical Results. DRO, GRO, and benzene concentrations in all samples were below their respective ROD/DD endpoint criteria during the 2012 sampling event.

DRO concentrations in the 2012 samples ranged from 12 to 2,200 µg/L, well below the ROD/DD endpoint criterion of 15,000 µg/L. GRO concentrations ranged from non-detect to 1,200 µg/L, well below the ROD/DD endpoint criterion of 12,000 µg/L. Benzene concentrations ranged from non-detect to 1.4 µg/L which is also below the ROD/DD endpoint criterion of 50 µg/L.

In addition to groundwater analysis, visual inspection of Clam Lagoon was conducted at this site in 2012. No contamination was observed during the visual inspection.

6.4.12 SA 79, Main Road Pipeline, South End

6.4.12.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 79, Main Road Pipeline, South End site from 2011 through 2015. Limited groundwater monitoring is the selected remedy for the site (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA. 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 ROD/DD endpoint criteria (for this site, the ROD/DD 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, MRP-MW8, 601, and 602 for DRO and NAP analysis. Sampling was discontinued after the 2011 sampling event at well 602. NAP analyses were conducted every five years in wells 02-230, MRP-MW8, and 601, with the most recent sampling event occurring in 2014.

Because DRO concentrations in the 2003 and 2004 groundwater samples from wells 02-230 and MRP-MW8 were greater than the ROD/DD endpoint criterion, a visual inspection of the shoreline in the area of these wells has been conducted annually since 2005. No seep, sheen, odor, or discoloration was observed during any of the annual shoreline inspections conducted between 2011 and 2014.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the SA 79, Main Road Pipeline, South End site.

Analytical Results. DRO was not detected in the groundwater sample collected from well 602 in 2011, which was the only year a sample was collected from this well.

DRO was reported in groundwater samples collected at wells 02-230, MRP-MW8, and 601 from 2011 to 2014 at concentrations ranging from 1,800 to 4,300 µg/L. The DRO concentrations in these three wells have consistently been greater than the ROD/DD endpoint criterion of 1,500 µg/L during this five-year review period.

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy, 2015a) are summarized in Table 6-1. No trend and stable conditions were identified using the Mann-Kendall test for DRO in groundwater from wells 601, MWP-MW8, and 02-230.

Free-Product Monitoring. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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, U.S. EPA, and ADEC, 2000). Therefore, monthly free-product monitoring and free-product recovery were not performed at this site. Other than a trace in well 602, free product was not detected at this site during this five-year review period.

6.4.12.2 Natural Attenuation Assessment

The occurrence of aerobic digestion is demonstrated at this site by the depletion of dissolved oxygen concentrations (0 to 0.8 mg/L), compared to the background concentration of 11 mg/L. Carbon dioxide concentrations (50 to 75 mg/L) were also elevated, compared to the background well E-701 (less than 10 mg/L). The alkalinity concentrations are higher at the site (63 to 115 mg/L) than background (18.9 mg/L). The sulfate concentrations for the site are not depleted (2.1 to 21.7 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is not occurring at the site. The ferrous iron concentrations (20 to 30 mg/L) are 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 elevated methane concentrations in the on-site well (0.98 to 14 µg/L), compared to background (0.38 µg/L).

The 2014 annual report concluded these combined data provide only weak evidence that biodegradation is occurring at the site, possibly by aerobic digestion (U.S. Navy, 2015a).

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

6.4.13.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SA 80, Steam Plant 4, USTs 27089 and 27090 site from

2011 through 2015. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC selected MNA with ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a). 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 ROD/DD endpoint criteria (for this site, the ROD/DD 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 04-158, 04-159, 04-173, 04-801, and SP4-3 for DRO and NAP analysis. The frequency of DRO monitoring was reduced at well SP4-3 to once every other year after the 2008 sampling event because the DRO concentrations had met ROD/DD endpoint criterion and exhibited a decreasing trend. However, monitoring for free-phase product was continued at this location on an annual basis. Sampling was discontinued in well 04-801 after the 2012 groundwater monitoring event.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the SA 80, Steam Plant 4, USTs 27089 and 27090 site.

Analytical Results. DRO was detected at concentrations below the ROD/DD endpoint criterion of 1,500 µg/L in all groundwater samples collected from wells 04-801 during this five-year review period. DRO was reported in groundwater samples collected at wells 04-159, SP4-3, 04-158, 04-173 and from 2011 to 2014 at concentrations ranging from 2,400 to 8,700 µg/L. The DRO concentrations in these wells have consistently been greater than the ROD/DD endpoint criterion of 1,500 µg/L during this five-year review period. No sample was collected from wells 04-158 and 04-173 in 2011 due to the presence of free product.

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy, 2015a) are summarized in Table 6-1. No trend and stable conditions were identified using the Mann-Kendall test for DRO in groundwater from wells 04-158, 04-159, 04-173 and SP4-3. DRO concentrations are below the ROD/DD endpoint criterion in groundwater samples from well 04-801.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including the SA 80, Steam Plant 4, USTs 27089 and 27090 site. 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); however, at the request of ADEC, monthly monitoring and free-product recovery were performed at several wells. The following summarizes the significant product thickness data for the SA 80, Steam Plant 4, USTs 27089 and 27090 site.

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 DD 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 DD 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. Monthly free-product recovery at six wells (04-155, 04-157, 04-158, 04-164, 04-173, and SP4-2) was measured in 2011 and was reduced to three wells (04-155, 04-157, and 04-158) by 2014.

Between October 1996 and September 2015, 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 2010 are summarized here.

Between October 2010 and September 2015, free product has been detected in six wells, 04-155, 04-157, 04-158, 04-164, 04-173, and 04-801, at the site. The maximum measured thickness of free product reported at the site since October 2010 was 1.25 feet, in well 04-157 in May 2011.

The total volume of free product recovered from the SA 80, Steam Plant 4 site for the period October 2010 through September 2015 was 8.52 gallons.

6.4.13.2 Natural Attenuation Assessment

Sulfate concentrations for two plume source wells are depleted (non-detect to 0.80 mg/L), compared to background (2.52 mg/L), indicating strong evidence that sulfate reduction is occurring at the site. Sulfate concentrations in the other two wells (04-158 and 04-173) were 2.2 and 2.0 mg/L, respectively. Plume source well ferrous iron concentrations (12.5 to 67.5 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 (51 to 1,800 µg/L), compared to background (0.38 µg/L).

The 2014 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 demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2016c).

6.4.14 South of Runway 18-36 Area

6.4.14.1 Data Review

Data Collection during This Five-Year Review Period. The Navy conducted annual monitoring at the South of Runway 18-36 Area site from 2011 through 2015. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected passive free-product recovery and containment, MNA for groundwater, natural recovery for surface water and sediment, and ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2006c). In addition, the DD 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 ROD/DD endpoint criteria (for this site, the ROD/DD 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 (South Sweeper Creek). The 10 times rule was revoked in 2008; therefore, the endpoint criteria will need to be revised in the CMP. 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 ROD/DD endpoint criteria established in the DD 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.

Surface water and sediment samples were collected annually from locations NSWSD-07 and NSWSD-08 for natural recovery monitoring. Sediment monitoring was also conducted at locations NSWSD-2, NSWSD-4, and NSWSD-5 from 2011 through 2014. Shoreline inspections were conducted annually from 2011 through 2014.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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.

Groundwater Sampling Results. BTEX concentrations were below their respective ROD/DD endpoint criteria in all samples collected from all wells during this five-year review period. DRO concentrations were below the ROD/DD endpoint criterion in all samples collected from wells 02-231, 02-232, AS-1, E-208, E-218, and RW-18/36-03 during this five-year review period. TAH and TAqH concentrations were below their respective surface water quality criteria in all samples collected from wells 02-232, E-208, and RW-18/36-03 during this five-year review period.

TAH was reported in groundwater samples collected at wells 02-231 and AS-1 from 2011 to 2014 at concentrations ranging from 3.1 to 368 µg/L. With the exception of the 2011 sample in well AS-1, the TAH concentrations in this well have consistently been greater than the ADEC surface water criterion of 10 µg/L during this five-year review period. TAqH was reported in groundwater samples collected at wells 02-231 and AS-1 from 2011 to 2014 at concentrations ranging from 7.3 to 491 µg/L. With the exception of the 2011 sample in well AS-1, the TAqH concentrations in these wells have consistently been greater than the ADEC surface water quality criterion of 15 µg/L.

Statistical trend evaluations were not performed for TAH and TAqH; however, the concentrations in well 02-231 appear to be decreasing and appear to be stable in well AS-1.

Surface Water Sampling Results. DRO, indeno(1,2,3-cd)pyrene, TAH, and TAqH were not detected above ROD/DD endpoint criteria in any of the surface water samples collected at surface water sampling locations NSWSD-07 and NSWSD-08 during this five-year review period. Because the concentrations of all analytes were below ROD/DD endpoint criteria during this five-year review period, surface water sampling was discontinued after the 2013 monitoring event.

Sediment Sampling Results. 2-Methylnaphthalene and phenanthrene were not detected above the ROD/DD endpoint criterion in any of the sediment samples collected at any of the sediment sampling locations at the site during this five-year review period. PAH analysis in sediment samples was discontinued after the 2013 monitoring event.

DRO was reported in sediment samples collected at location NSWSD-2, NSWSD-4, and NSWSD-5 from 2011 to 2014 at concentrations ranging from 97 to 9,900 mg/kg. The DRO concentrations at these three locations were consistently greater than ROD/DD endpoint criterion of 90.5 mg/kg during this five-year review period.

Visual Inspections. Visual inspections of the shoreline of South Sweeper Creek were performed annually during this five-year review period. Petroleum sheens and seeps, along with black sediment was observed during the shoreline inspections of South Sweeper Creek between 2011 and 2014. In addition, odors were noted near sample locations NSWSD-2 and NSWSD-5 in 2012.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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 five-year review period from October 2010 through February 2012.

Between June 1997 and September 2015, 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 2010 are summarized here.

Between October 2010 and September 2015, free product has been detected in nine wells at the site. The maximum measured thickness of free product reported at the site since October 2010 was 2.24 feet, in well E-209 in February 2011. Free product was measured at thicknesses greater than 0.1 foot in the following wells: 02-231, e-207, E-216, Z3-2, and RW-18/36-04.

Free-product recovery activities were implemented at the site in September 2006. Free-product recovery activities were performed at 10 wells and eight recovery sumps at South of Runway 18-36 Area site during monthly free-product recovery activities from October 2010 through February 2012.

No free product was recovered from the South of Runway 18-36 Area site during the annual groundwater monitoring events from 2011 through 2014. From October 2010 through February 2012, approximately 2.46 gallons were recovered during monthly free-product recovery

activities from six wells. Free-product recovery activities ended in February 2012 and then restarted in October 2014. From October 2014 through September 2015, 0.79 gallons of free product were recovered from well E-216 (one of the two wells monitored during this time period). A total of 3.25 gallons of free product were recovered from the South of Runway 18-36 Area site during this five-year review period.

6.4.14.2 Natural Attenuation Assessment

Sulfate concentrations for plume and plume edge wells 02-231, 02-232, and AS-1 are depleted (non-detect to 1.1 mg/L), compared to background (6.53 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated in the three wells (50 mg/L to 65 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 140 to 6,600 µg/L at on-site wells exceed that of background (0.32 µg/L).

The 2014 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 demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

6.4.15 Sweeper Cove

6.4.15.1 Data Review

Data Collection during This Five-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 five-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 five-year review period to evaluate the changes in total PCB concentrations. The third five-year review also recommended continued monitoring on a biennial basis. Therefore, the Navy has conducted marine tissue monitoring at Sweeper Cove every other year from 2004 through 2015 (U.S. Navy, 2010d). Marine tissue monitoring and ICs is the ROD-selected remedy for this site (U.S. Navy, U.S. EPA, 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 congeners, lipid analysis, and moisture content. The city of Adak conducted dredging in the small boat harbor in 2010 and 2011. The impacts of these events correlate with the data provided.

Fact sheets containing information on fish/shellfish consumption and related advisories were sent to on-island residents in October 2003, July 2004, January 2006, August 2006, February 2008, June 2010, November 2012, February 2014, and March 2016 (U.S. Navy, 2016f). The Navy

intends to continue to issue fact sheets to on-island residents on a biennial basis until tissue concentrations in fish and shellfish meet cleanup levels.

Analytical Results. The mean concentration of PCBs in blue mussel tissue in 2011, 2013 and 2015 was 54.1, 32.3, and 19.3 $\mu\text{g/kg}$, respectively. The mean concentration in rock sole tissue in 2011, 2013, and 2015 was 69.9, 51.6 and 53.5 $\mu\text{g/kg}$, respectively. With the exception of blue mussel in 2015, the mean concentration of PCBs in blue mussel and rock sole tissue was above the risk-based action levels of 31 $\mu\text{g/kg}$ and 6.5 $\mu\text{g/kg}$, respectively during this five-year review.

Mean total PCB concentrations in blue mussel tissue from Sweeper Cove ranged from 19.3 $\mu\text{g/kg}$ in 2015 to 133 $\mu\text{g/kg}$ in 2005. The mean total PCB concentrations were above the risk-based action level of 31 $\mu\text{g/kg}$ nine times and below the risk-based action level three times. 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. There is a slightly decreasing trend in PCB concentrations in blue mussel tissue, though this decrease was not determined to be statistically significant (U.S. Navy, 2015b).

Mean total PCB concentrations of rock sole data from Sweeper Cove ranged from 19.5 $\mu\text{g/kg}$ in 2005 to 186 $\mu\text{g/kg}$ in 1996. For each sampling event, the mean concentration is above the risk-based action level of 6.5 $\mu\text{g/kg}$. PCB tissue concentrations in rock sole collected from Sweeper Cove for the period 1999 through 2015 were normally distributed and were plotted for best fit regression and trendline analysis. There is a decreasing trend over time, though this decrease was not determined to be statistically significant (U.S. Navy, 2015b).

The background locations in the Bay of Islands were last sampled in 2013 to assess regional PCB trends. The Navy does not anticipate sampling in the Bay of Islands again in the foreseeable future. The mean total PCB concentrations in rock sole and blue mussel samples collected in 2013 from Bay of Islands (background area) were similar to historical concentrations measured between 1999 and 2003. Therefore, a change in global PCB concentrations is not evident based on these results.

6.4.16 SWMU 14, Old Pesticide Disposal Area

6.4.16.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 14, Old Pesticide Disposal Area site from 2011 through 2015. The combination of MNA and compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA, as well as CERCLA. Groundwater samples were collected from SWMU 14, Old Pesticide Disposal Area site during annual groundwater monitoring to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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 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.

After the 2010 sampling event, the number of wells sampled was reduced from five (including two downgradient wells only sampled in 2010) to two (01-153 and MW-14-5). Groundwater samples were collected from 01-153 for volatile organic compounds (VOCs), and MW14-5 for DRO, GRO, total and dissolved lead and NAP analysis. NAP analyses were conducted of samples collected from well MW14-5 every five years, with the most recent sampling event occurring in 2014.

Groundwater samples were collected from 01-153 for chlorinated solvent analysis, including trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dichloroethene (DCE), cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. Chlorinated solvent sampling was discontinued in well 01-153 after the 2013 sampling event because concentrations of chlorinated VOCs remained below ROD/DD endpoint criteria for two consecutive years. This met the requirements for discontinuing compliance monitoring at this site per the CMP, Revision 5 (U.S. Navy, 2012d).

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the SWMU 14, Old Pesticide Disposal Area site.

Analytical Results. DRO was reported in groundwater samples collected at well MW14-5 from 2011 to 2014 at concentrations ranging from 2,800 to 5,100 µg/L, which were consistently greater than the ROD/DD endpoint criterion of 1,500 µg/L. GRO was reported in groundwater samples collected at well MW14-5 from 2011 to 2015 at concentrations ranging from 4,700 to 11,000 µg/L, which were also consistently greater than the ROD/DD endpoint criterion of 2,200 µg/L.

PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride were collected from well 01-153 at this site during this five-year review period. PCE and TCE were reported in groundwater at concentrations below the cleanup levels of 5 µg/L for both analytes. No other chlorinated compound was detected in the 2012 and 2013 samples.

Total and dissolved lead were reported in groundwater samples collected at well MW14-5 from 2012 to 2014 at concentrations ranging from 17.2 to 28.5 µg/L and 17.0 to 27.9 µg/L, respectively. The concentrations of total and dissolved lead in the samples collected from well MW14-5 were greater than the cleanup level of 15 µg/L.

DRO total and dissolved lead concentrations exhibited no trend and GRO concentrations exhibited a statistically significant decreasing trend at well MW14-5 from 2011 through 2014.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including the SWMU 14, Old Pesticide Disposal Area site.

Between August 1999 and September 2014, 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 2010 are summarized here. Between September 2011 and September 2015, free product has not been detected in either well (01-153 or MW-14-5) that was measured annually. Free-product recovery was not conducted at this site between 2011 and 2015.

6.4.16.2 Natural Attenuation Assessment

The 2014 NAP results show that the dissolved oxygen concentrations at the site (0.60 mg/L) are depleted, compared to the background condition (11 mg/L). The site wells have higher carbon dioxide concentrations (30 mg/L) than the background well E-701 (less than 10 mg/L). Alkalinity concentrations are also higher at the site (57 mg/L) than background (18.9 mg/L) and indicates that well MW-14-5 is within the contaminant plume.

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 (6 mg/L) are only slightly elevated above background (0 mg/L), indicating weak iron reduction may be occurring. Methane concentrations at this site (<1.3 µg/L) are similar to background (0.38 µg/L), indicating that methanogenesis is probably not occurring at the site within the plume.

The 2014 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, 2015a).

6.4.17 SWMU 15, Future Jobs/DRMO

6.4.17.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at one location (MW15-3) at the SWMU 15, Future Jobs/DRMO site through 2011. The combination of MNA and compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, U.S. EPA, and ADEC, 2000). 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. Groundwater monitoring was discontinued after the 2011 sampling event. ADEC approved the site “cleanup complete with institutional controls” determination which is equivalent to “remedy in place” on March 13, 2014.

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.

Analytical Results. Groundwater monitoring was discontinued following the 2011 monitoring event as the site had met ROD/DD endpoint criteria for two consecutive years.

6.4.18 SWMU 17, Power Plant No. 3 Area

6.4.18.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at SWMU 17, Power Plant No. 3 Area from 2011 through 2015. 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, U.S. EPA, and ADEC, 2000). The Navy and ADEC selected ICs and MNA as the final remedy for this site under the petroleum program covered under SAERA (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 ROD/DD endpoint criteria (for this site, the ROD/DD 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 10 times rule was revoked in 2008; therefore, the endpoint criteria will need to be revised in the CMP. Groundwater samples were also collected as part of compliance monitoring to evaluate groundwater quality relative to the OU A ROD CERCLA cleanup criteria.

Groundwater samples were collected from 05-375, PP-05, and R-1 for DRO analysis, and groundwater samples were collected from 05-735 for VOC and NAP analysis. Sampling was discontinued in wells HC-2, HC-3, R-2, and R-6 after the 2010 sampling event and in 05-375, PP-05 and R-1 after the 2012 sampling event. NAP analysis was conducted every five years, with the most recent sampling event occurring in 2014.

Groundwater samples were collected from well 05-735 for chlorinated solvent analysis, including methylene chloride, TCE, PCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at SWMU 17, Power Plant No. 3 Area.

Analytical Results. DRO concentrations were below the ROD/DD endpoint criterion in all samples collected from all site wells during this five-year review period.

TCE, PCE, 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 five-year review period. cis-1,2-DCE was reported in groundwater samples collected at well 05-735 from 2011 to 2014 at concentrations ranging from 180 to 280 µg/L, which were greater than the ROD/DD endpoint criteria of 70 µg/L. Vinyl chloride was reported in groundwater samples collected at well 05-735 from 2011 to 2014 at concentrations ranging from 2.7 to 3.3 µg/L, which were greater than the ROD/DD endpoint criteria of 2 µg/L.

Results of the Mann-Kendall and Sen's trend evaluation (U.S. Navy, 2015a) are summarized in Table 6-1. A decreasing trend was identified for cis-1,2-DCE and vinyl chloride in groundwater samples from well 05-735. Using the Sen's slope, concentrations of 1,2-DCE should reach its

ROD/DD endpoint criterion in approximately three to six years and vinyl chloride should reach its ROD/DD endpoint criterion in approximately three to ten years.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including SWMU 17, Power Plant No. 3 Area. No free product was measured in any well at SWMU 17, Power Plant No. 3 during this five-year review period. No free-product recovery was conducted between 2011 and 2015.

6.4.18.2 Natural Attenuation Assessment

On-site ferrous iron concentrations (18 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 an elevated methane concentration (310 µg/L), compared to background (0.38 µg/L). Natural attenuation by dechlorination is occurring as evidenced by the decreasing concentrations of PCE, TCE, and daughter products as well as the observed reducing environment. Water quality parameters collected during 2014 and continued decreasing concentrations of chlorinated VOCs in groundwater provide evidence of continued natural attenuation and dechlorination as shown by the reducing environment (negative oxidation reduction potential) and depleted dissolved oxygen (0.50 mg/L) (U.S. Navy, 2015a).

6.4.19 SWMU 55, Public Works Transportation Department Waste Storage Area

6.4.19.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform groundwater monitoring at one location (55-145) at the SWMU 55, Public Works Transportation Department Waste Storage Area site from 2011 through 2014. Compliance monitoring is the selected remedy for this site, together with ICs (U.S. Navy, U.S. EPA, 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 well 55-145 for chlorinated solvents analysis, including TCE, PCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. NAPs were also analyzed in samples from well 55-145 in 2014.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the SWMU 55, Public Works Transportation Department Waste Storage Area site.

Analytical Results. 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 five-year review period. PCE was reported in groundwater samples collected at well 55-145 from 2011 to 2014 at concentrations ranging from 38 to 57 µg/L, which were greater than the OU A ROD cleanup level of 5 µg/L.

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, 2015a). Using Sen's slope, it is estimated that PCE should reach its ROD/DD endpoint criterion in approximately four to seven years.

Free-Product Monitoring. Although SWMU 55, Public Works Transportation Department Waste Storage Area is not a SAERA 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. Free product was not detected in wells 55-145 or 55-146 between 2011 and 2014.

6.4.19.2 Natural Attenuation Assessment

The 2014 NAPs data showed only weak evidence that biodegradation may be occurring at the site, possibly by aerobic digestion.

6.4.20 SWMU 58/SA 73, Heating Plant 6

6.4.20.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 58/SA 73, Heating Plant 6 site through 2012. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected MNA with ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a). Groundwater samples were collected from SWMU 58/SA 73, Heating Plant 6 site during annual groundwater monitoring to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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 monitoring was discontinued after the 2012 sampling event.

Groundwater monitoring was discontinued after the 2012 sampling event. ADEC approved the site "cleanup complete with ICs" on August 26, 2013.

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.

Analytical Results. DRO concentrations were below its ROD/DD endpoint criterion in all samples collected from wells 12-105, 12-114, 12-121, and 12-203 in 2011 and 2012 (Note: 12-114 was only sampled in 2012 and 12-121 was only sampled in 2011).

DRO was reported in groundwater samples collected at well 12-121 in 2011 at a concentration of 6,800 µg/L. A sample could not be collected from this well in 2012 due to presence of free product in the well. DRO was reported in the groundwater samples collected in 2011 and 2012

at well 12-203 at concentrations of 15,000 and 14,000 µg/L, respectively, which is below the ROD/DD endpoint criterion of 15,000 µg/L.

A visual inspection of the shoreline of the stream at the site was performed in 2012. No petroleum seep, sheen, odor, or discoloration was observed during the shoreline inspection.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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. The following summarizes the significant product thickness data for the SWMU 58/SA 73, Heating Plant 6 site.

Between October 1996 and August 2012, 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 2010 are summarized here.

Between August 2011 and August 2012, free product has been detected in one of the 11 wells at the site (12-121) in 2012 at a thickness of 0.03 ft. Free product was not detected in any of the 11 wells in 2011. Free-product measurements were discontinued after the 2012 sampling event.

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 specified in the OU A ROD, as detailed in the draft free-product recovery closure report (U.S. Navy, 2000b). However, the final DD 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 DD 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, ADEC requested that the Navy resume monthly free-product recovery at selected wells, including wells 12-110, 12-121, and 12-203.

Free product was only detected in one well in 2011 at 0.03 ft so no free-product recovery was conducted at this site during this five-year review period. The site received cleanup complete with ICs status from ADEC in 2013, so no additional free-product removal is planned at this site.

6.4.21 SWMU 60, Tank Farm A

6.4.21.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the SWMU 60, Tank Farm A site from 2011 through 2015. MNA and ICs are the remedies selected for this site (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA. Groundwater samples have been collected from this site to evaluate groundwater quality relative to the ROD/DD endpoint criteria

(for this site, the ROD/DD endpoint criteria are equal to the Alaska groundwater cleanup levels [18 AAC 75.345]) and to verify that natural attenuation is occurring.

From 2011 through 2015, groundwater samples were collected annually from six wells at the site (LC5A, MW E006, 650, 651, 652, and 653). NAPs monitoring is conducted every five years in these six wells, with the most recent sampling event occurring in 2014. In addition, surface water and sediment samples (852) were collected annually.

Visual inspection of the shoreline of South Sweeper Creek in the vicinity of LC5A for petroleum seeps or sheens was initiated in 2005 and continued through this five-year reporting period.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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.

Analytical Results. Toluene, ethylbenzene, and total xylenes concentrations were below their respective ROD/DD endpoint criteria in all samples collected from wells LC5A, 650, 651, 652, and 653 at this site during this five-year review period. Benzene concentrations were below its ROD/DD endpoint criterion in wells 651, 653, and LC5A during this five-year period. Free product was present in well 653 for all years except 2012 so only one sample has been collected from this well. DRO concentrations were below its ROD/DD endpoint criterion in wells 651 and LC5A during this five-year review period. With the exception of a slight exceedance of TAH in 2012 in well 650, TAH and TAqH concentrations have been below their respective ROD/DD endpoint criteria in wells 650 and 653 during this five-year review period.

DRO was reported in groundwater samples collected at wells 650, 652, and 653 from 2011 through 2015 at concentrations ranging from 830 to 4,600 µg/L. The concentrations of DRO in the samples from well 650 exceeded the ROD/DD endpoint criterion of 1,500 µg/L in two of the five samples and all of the samples collected from wells 652 and 653. Free product was present in well 653 in 2011, 2013, and 2014 so no samples were collected in those years.

TAH was reported in groundwater samples collected at wells LC5A, 651, and 652 from 2011 through 2015 at concentrations ranging from 56 to 152 µg/L. The concentrations of TAH in all samples from these three wells were greater than the ADEC surface water cleanup level of 10 µg/L. TAH was reported in groundwater samples collected at well 653 in 2012 and 2015 at concentrations of 7.4 and 355 µg/L, respectively. The concentration of TAH in the 2015 sample exceeded the cleanup level of 10 µg/L.

TAqH was reported in groundwater samples collected at well LC5A, 651, 652, and 653 from 2011 through 2015 at concentrations ranging from 10.3 to 228 µg/L. The concentrations of TAqH in all samples from these four wells were greater than the cleanup level of 15 µg/L.

Benzene was reported in groundwater samples collected at wells 650, 652, and 653 from 2011 through 2015 at concentrations ranging from non-detect to 10 µg/L. The most recent sample collected in each well exceeded the ROD/DD endpoint criteria for benzene.

DRO was reported in surface water samples collected from 852 from 2011 through 2014 at concentrations ranging from 63 to 1,200 µg/L. No ADEC surface water quality criterion exists for DRO, but the concentration detected in the surface water in 2011 is greater than the ROD/DD endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). Indeno(1,2,3-cd)pyrene, TAH, and TAqH concentrations in the surface water samples collected from 852 during this five-year review period were less than the ADEC surface water quality criteria. However, because a sheen was observed at this location during visual inspection, surface water quality does not comply with the water quality standards of 18 AAC 70.

DRO was reported in sediment samples collected from 852 from 2011 through 2015 at concentrations ranging from 1,100 to 10,000 mg/kg. The DRO concentrations in all samples collected at location 852 were greater than the South of Runway 18-36 ROD/DD endpoint criterion of 90.6 mg/kg.

Visual inspections of the east shoreline of South Sweeper Creek were performed annually from 2011 through 2015. In 2011 and 2012, a petroleum seep, along with iron staining, sheen, and petroleum odor were observed near the culvert (Boom 10). At surface water/sediment sample 852, a sheen was observed on the surface water and black sediment was noted with sheen and heavy petroleum odor. In 2013, 2014 and 2015, a petroleum seep, along with oily, black sediment, a sheen, and a moderate to heavy petroleum odor were observed north and adjacent to the culvert (Boom 10). A second area of sheen was observed inside the northern end of Boom 10. At surface water/sediment sample 852, there was a moderate odor of petroleum but no sheen was observed (in 2015 a heavy petroleum odor and sheen was observed on surface water). Black sediment was noted with sheen and heavy petroleum odor when disturbed. The surface water sample in 2013 was collected approximately 75 ft from the sediment location due to low tide.

DRO and benzene concentrations have generally been stable at well 650 through 2014.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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, U.S. EPA, and ADEC, 2000). Therefore, monthly free-product monitoring and free-product recovery were not required at this site. However, during annual LTM activities, free product was observed in newly installed monitoring wells, as well as, continued observance of a petroleum shoreline seep downgradient of the site. Semi-monthly product recovery activities were started at this site in September 2011 when 0.16 gallons of free product was removed from two of the newly installed monitoring wells, 652 and 653.

Between September 1999 and September 2015, 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 2010 are summarized here. Between October 2010 and September 2015, two monitoring wells within the vicinity of the SWMU 60, Tank Farm A site have detected free product including 652 and 653. The maximum thickness of free product was 0.6 ft measured in well 653 in 2011.

In September 2011, after free product was observed in newly installed wells, semi-monthly free-product recovery was initiated at SWMU 60, Tank Farm A. From September 2011 through September 2015, approximately 0.36 gallons were recovered during free-product recovery activities from well 653. All free product has been recovered from this site prior to January 2012 using absorbent socks in wells 652 and 653 and maintained during free-product recovery activities.

6.4.21.2 Natural Attenuation Assessment

Sulfate concentrations are depleted in site wells (0.33 to 1.7 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. Well 651 had a sulfate concentration of 4.3 mg/L, which is above background. On-site ferrous iron concentrations (10 and 40 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 (130 and 1,600 µg/L), compared to background (0.38 µg/L).

The 2014 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 demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2016c, 2015a).

6.4.22 SWMU 61, Tank Farm B

6.4.22.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at three locations at the SWMU 61, Tank Farm B site from 2011 through 2015. The remedy specified for this site in the OU A ROD is MNA and ICs (U.S. Navy, U.S. EPA, and ADEC, 2000). The remedy for this site is now covered under SAERA. Groundwater samples were collected from SWMU 61, Tank Farm B to evaluate groundwater quality relative to the ROD/DD endpoint criteria (for this site, the ROD/DD 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).

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 five-year reporting period. In addition, surface water and sediment samples were collected from North Sweeper Creek at two locations, NL-04 and NL-D-04 during this five-year review period.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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.

Analytical Results. BTEX concentrations were below their respective ROD/DD endpoint criteria in all samples collected from well 14-210 at this site during this five-year review period. Toluene, ethylbenzene, and total xylenes concentrations were below their respective ROD/DD endpoint criteria in all samples collected from well 14-113 at this site during this five-year review period.

GRO was reported in groundwater samples collected at wells 14-113, 14-210, and TFB-MW4B from 2011 through 2014 at concentrations ranging from 1,600 to 51,000 µg/L. The concentrations of GRO in the samples from wells TFB-MW-4B were all greater than the ROD/DD endpoint criterion of 1,500 µg/L. Wells 14-113 and 14-210 had two samples and three samples, respectively, which were greater than the ROD/DD endpoint criterion.

Benzene was reported in groundwater samples collected at wells 14-113 and TFB-MW4B from 2011 through 2014 at concentrations ranging from 4.3 to 24 µg/L. With the exception of the 2014 sample from well 14-113, the concentrations of benzene in the samples from wells 14-113 and TFB-MW-4B were all greater than the ROD/DD endpoint criterion of 5 µg/L.

Toluene, ethylbenzene, and total xylenes were reported in groundwater samples collected at well TFB-MW4B from 2011 through 2014 at concentrations ranging from 4,000 to 4,800 µg/L, 1,900 to 2,100 µg/L, and 13,900 to 15,600 µg/L, respectively. The concentrations of toluene, ethylbenzene, and total xylenes in the samples collected from well TFB-MW-4B were all greater than their respective ROD/DD endpoint criteria of 1,000, 700, and 10,000 µg/L.

TAH and TAqH were reported in groundwater samples collected at well 14-113 from 2011 through 2014 at concentrations ranging from 339 to 864 µg/L and 340 to 865 µg/L, respectively. The concentrations of TAH and TAqH in all samples were greater than the ADEC surface water cleanup level of 10 and 15 µg/L, respectively.

DRO and GRO were not detected or were detected at concentrations less than the ROD/DD 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 in 2011 and 2012 and the analysis of DRO was discontinued in surface water samples after the 2011 monitoring event. 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 five-year review period. Surface water sampling at NL-D-04 was discontinued after the 2012 sampling event.

DRO was detected at a concentration less than the ROD/DD endpoint criterion established for the South of Runway 18-36 Area (90.6 mg/kg) in the sediment sample collected from NL-04 and NL-D-04 in 2011 when using silica gel cleanup prior to analysis. DRO analysis was discontinued in sediment samples after the 2011 monitoring event. GRO was not detected in samples collected from NL-04 or NL-D-04. However, reporting limits were higher than the

ROD/DD endpoint criterion established for the South of Runway 18-36 Area (12.2 mg/kg). BTEX concentrations were non-detect in NL-04 and NL-D-04 during this five-year review period.

Visual inspections of the shoreline of North Sweeper Creek were performed annually from 2011 through 2014. The 2012 through 2014 visual inspections did not identify any seep or sheen on the shoreline, and sheen was not observed on the surface water. In 2011, no seep was observed along the shoreline and no odor was noted, however, iron staining was observed in the streambed and at the NL-04 sediment location.

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. GRO concentrations exhibit a decreasing trend in well 14-113 and no trend in wells 14-210 and TFB-MW4B. Total xylenes exhibit an increasing trend and ethylbenzene and toluene concentrations exhibit no trend in well TFB-MW4B (U.S. Navy, 2015a).

6.4.22.2 Natural Attenuation Assessment

Sulfate concentrations for the site are depleted in site wells (0.19 to 0.39 mg/L) compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. Onsite ferrous iron concentrations (10 to 40 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 (410 to 1,300 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 2014 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, 2015a).

6.4.23 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 Area. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected passive free-product recovery and containment, MNA for groundwater, surface soil excavation in Sandy Cove Housing Area, and ICs as the final remedy for this site under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2006b). In addition, the DD 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 ROD/DD endpoint criteria (for this site, the ROD/DD endpoint criteria are equal to 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 (East Canal). Groundwater wells adjacent to East Canal are additionally monitored for TAH and TAqH, both ROD/DD endpoint criteria for surface water quality.

Additional removal activities were conducted during the 2016 field season to eliminate the petroleum sheen on the surface water in East Canal. Activities included removal of the free product recovery trench, excavation of soil along East Canal, and application of oxygen amendments to enhance MNA at the site. Groundwater monitoring wells were installed to monitor MNA parameters, the presence or absence of free product, and petroleum hydrocarbon concentrations in groundwater. Eagle Bay Housing Area Data Review

Data Collection during This Five-Year Review Period. Groundwater samples were collected from eight wells between 2011 and 2015 including: 03-103, 03-109, 03-898, AMW-704, MW-303-7, RW-303-13, RW-303-14, and RW-303-16. Sampling was discontinued in wells 03-109 and 03-898 after the 2012 monitoring event and in well RW-303-14 after the 2013 monitoring event.

Visual inspections of East Canal were performed annually from 2011 through 2014. A surface water and sediment sample (NL-09) were collected annually from 2011 through 2014 and analyzed for DRO, GRO, BTEX, and PAHs.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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.

Analytical Results. In 2011, GRO and BTEX concentrations were below their respective ROD/DD endpoint criteria in all wells; therefore, these analytes were discontinued after the 2011 monitoring event. DRO concentrations were below its ROD/DD endpoint criteria during this five-year review period in wells 03-103, 03-109, 03-898, and RW-303-14. Therefore, sampling was discontinued in these wells after the 2012 monitoring event.

DRO was reported in groundwater samples collected from eight wells between 2011 and 2014 at concentrations ranging from 17 µg/L to 21,000 µg/L. As of 2014, DRO continues to exceed the ROD/DD endpoint criterion of 1,500 µg/L in wells AMW-704 and MW-303-7. In addition, free product was measured in well RW-303-16; therefore, no sample was collected and DRO concentrations remained above its ROD/DD endpoint criterion in this well in 2013.

DRO and GRO were reported in the surface water sample collected at NL-09 from 2011 through 2014 at concentrations ranging from 110 to 1,500 µg/L and from 230 to 260 µg/L, respectively.

No ADEC surface water quality criterion exists for DRO; however, two of the samples collected during this five-year period had concentrations of DRO that exceeded the ROD/DD endpoint criterion established for the South of Runway 18-36 Area (250 µg/L). No ADEC surface water criterion exists for GRO either; however, the concentrations detected in the surface water were greater than the ROD/DD endpoint criterion established for the South of Runway 18-36 Area (114 µg/L). TAH and TAqH were reported in the 2011 through 2014 surface water samples at concentrations ranging from 19 to 36 µg/L and 19 to 37 µg/L, respectively. All TAH and TAqH concentrations were above the ADEC surface water quality standards of 10 and 15 µg/L, respectively.

DRO was reported in the sediment samples collected at NL-09 from 2011 through 2014 at concentrations ranging from 69 to 1,900 mg/kg. GRO was not detected in any of the sediment samples collected during this five-year review period. BTEX, 2-methylnaphthalene, and phenanthrene were analyzed but not detected in any of the samples with the exception of phenanthrene in 2014 at 0.085 mg/kg. ROD/DD endpoint criteria have not been established for East Canal; therefore, endpoints for South of Runway 18/36 were used. The DRO concentrations exceeded ROD/DD endpoint criterion of 90.6 mg/kg in 2011 and 2014 (no sample was collected in 2013). There were no exceedances for GRO; however, the detection limit in the 2014 sample (15 mg/kg) slightly exceeded the ROD/DD endpoint criterion of 12.2 mg/kg. The phenanthrene detection in 2014 was below the ROD/DD endpoint criterion of 0.225 mg/kg.

Visual inspections were performed annually from 2011 to 2014. Boom 8 was placed along the east shoreline adjacent to the product recovery trench approximately 3 ft by 130 ft in length to mitigate a petroleum seep that was observed. Sheen, black oily sediments, iron staining, stressed vegetation, and light petroleum odors were also observed. From 2013 through 2015, East Canal water level was uncharacteristically high due to irregular pump operation. In the area where the NL-09 sample was collected, a moderate petroleum odor and light sheen were observed, as well as a light sheen when sediment was disturbed. Also, in 2011 the sheen bubbled up when the sediment was disturbed. No sediment sample was collected in 2013 due to high water.

DRO concentrations at wells AMW-704 and MW-303-7 have generally been stable from 2011 through 2014. Trend evaluations were not conducted for wells with analytes that have not been detected above the ROD/DD endpoint criteria, or for wells for which there were less than four data points.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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 five-year review period. 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 2015, monitoring wells within the vicinity of the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing have been gauged for the presence

of free product. However, only data collected since October 2010 are summarized here. Eighteen wells were gauged periodically between October 2010 and September 2015. In addition to the wells, six sumps were also gauged on the same schedule.

Between October 2010 and September 2015, free product has been detected in 13 wells and five sumps at the site. The maximum measured thickness of free product reported at the site since October 2010 was 0.80 feet in well 03-102 in December 2014. Free product was measured at a thickness of greater than 0.1 foot in seven additional wells and sumps including: 03-101, MW-15, HMW-303-3, RW-303-15, RW-303-16, SWMU62-R3, and SWMU62-R4.

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). Free-product recovery was selected as part of the final remedy for the site in the DD (U.S. Navy and ADEC, 2006b). These additional free-product recovery activities were implemented at the site in September 2006. Free product recovery efforts began on a monthly basis but the frequency was reduced to six times per year when the volume of free produce recovered was minimal. Free product recovery is currently conducted using passive skimmer canisters and/or absorbant socks. In 2015 the passive skimmer canisters were emptied more frequently during the six product recovery events, resulting in a larger volume of recovered product for the year than in previous years.

The total volume of free product recovered from SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing for the period October 2010 through September 2015 was 104.68 gallons. The maximum volume of free product (28.35 gallons) was recovered from sump SWMU62-R3 for the time period October 2014 through September 2015. The product recovery procedure implemented from October 2014 to September 2015 was somewhat more effective than carried out in prior years, resulting in a larger volume of recovered product. The new procedure involved an increased frequency of canister recovery per day at the recovery sumps.

An additional 1.61 gallons of free product were recovered from the SWMU 62, New Housing Fuel Leak site, Eagle Bay Housing during the annual groundwater monitoring event in 2014. No free product was recovered during the 2011, 2012, or 2013 groundwater monitoring events.

The technically practicable endpoint for passive recovery in site wells has not 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 5.3 gallons per month in September 2015. Therefore, the practicable endpoint for the recovery trench has not been met. Product was observed at least once in five of the six recovery sumps between October 2010 and September 2015. The ROD/DD endpoint criterion for the recovery sumps is that product thickness has been reduced to less than 0.01 foot, or no sounding of the oil/water probe has been experienced for one year.

6.4.23.1 Sandy Cove Housing Area Data Review

Data Collection during This Five-Year Review Period. Groundwater samples were collected from 13 wells between 2011 and 2014 including 03-155, 03-619, 03-697, 03-802, 03-895, HMW-102-6, HMW-1-7-2, HMW-139-3, HMW-146-3, MW-107-1, MW-134-11, MW-146-1, and MW-187-1. Sampling was discontinued in wells 03-697, HMW-102-6, HMW-107-2, and HMW-139-3 after the 2011 monitoring event and in wells 03-802, 03-895, and HMW-146-3 after the 2012 monitoring event.

Wells RW-102-4, 03-104, 03-778, MRP-MW2, and MRP-MW3 were presented in the SWMU 62 section of the groundwater monitoring reports from 2011 through 2013 and were moved to the GCI Compound, UST GCI-1/Area 303 section after 2013. Therefore, results from these wells are not discussed as part of SWMU 62 in this five-year review.

The site catalog in Appendix A includes a figure that shows monitoring schedule, sampling results, and 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. BTEX and GRO concentrations were below their respective ROD/DD endpoint criteria in all samples collected from all wells during this five-year review period. DRO concentrations were below the ROD/DD 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 HMW-146-3 during this five-year review period.

DRO concentrations ranged from 2,300 to 11,000 µg/L in the five wells (03-155, MW-107-1, MW-134-11, MW-146-1, and MW-187-1) with at least one exceedance of the ROD/DD endpoint criterion of 1,500 µg/L during this five-year review period. In 2014, DRO exceeded ROD/DD endpoint criterion in the four wells where samples were collected. No sample was collected from MW-107-1 in 2014 due to presence of free product in the well; however, DRO concentrations exceeded the ROD/DD endpoint criterion in the sample collected in 2013.

DRO concentrations at wells at Sandy Cove Housing Area have generally been stable from 2011 through 2015.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA 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 five-year review period. 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 2014, 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 2010 are summarized here.

Between October 2010 and September 2014, free product has been detected in one well (MW-107-1) at the site at 0.04 ft in 2014.

No free product was recovered from the SWMU 62, New Housing Fuel Leak site, Sandy Cove Housing during the annual groundwater monitoring events from 2011 through 2015.

6.4.23.2 Natural Attenuation Assessment (Both Sandy Cove and Eagle Bay)

Sulfate concentrations in eight plume and downgradient wells are depleted (0.14 to 6.1 mg/L), compared to background (2.47 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated (non-detect to 105 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 eight on-site wells ranging from non-detect to 12,000 µg/L, which exceed background (less than 0.50 µg/L).

NAP data for the majority of the wells within the contaminant plume strongly indicate that biodegradation of petroleum hydrocarbons is occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrate that natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

6.4.24 Tanker Shed, UST 42494

6.4.24.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform annual groundwater monitoring at the Tanker Shed, UST 42494 site from 2011 through 2014. The interim remedy specified for this site in the OU A ROD was free-product recovery (U.S. Navy, U.S. EPA, and ADEC, 2000). The Navy and ADEC have selected MNA with ICs and free-product recovery as the final remedy for this site along with additional soil and groundwater sampling under the petroleum program covered under SAERA (U.S. Navy and ADEC, 2005a).

Groundwater samples were collected from four wells between 2011 and 2014 including 04-175, 04-290, 04-306, and 04-601.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the Tanker Shed, UST 42494 site relative to the inferred source area.

Analytical Results. DRO was reported in groundwater samples at concentrations ranging from 55 to 11,000 µg/L. DRO concentrations continued to exceed the ROD/DD endpoint criterion of 1,500 µg/L in three of the four wells. All samples collected from well 04-601 were below the ROD/DD endpoint criterion.

GRO was reported in groundwater samples collected in three wells in 2011 and 2012. The concentrations of GRO ranged from 670 µg/L to 1,200 µg/L which were all below the ROD/DD endpoint criterion of 1,300 µg/L. Therefore, GRO sampling was discontinued at the site following the 2012 monitoring event.

Benzene was reported in the groundwater sample collected at wells 04-306 and 04-290 from 2011 at concentrations of 1.3 and 0.44 µg/L, respectively. The concentrations of benzene in the sample from these wells were below the ROD/DD endpoint criterion of 5 µg/L and benzene sampling was discontinued after the 2011 monitoring event.

DRO concentrations at wells 04-175, 04-290, and 04-306 were generally stable from 2011 through 2014.

Free-Product Monitoring and Recovery. Free-product monitoring is performed as part of the annual groundwater monitoring at all SAERA sites, including the Tanker Shed, UST 42494 site. Free-product recovery is a component of the final remedy for this site under the petroleum program covered under SAERA (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 the third five-year review period, based on a request by ADEC during comment resolution on the 2006 annual groundwater monitoring report. The following summarizes the significant product thickness data for the Tanker Shed, UST 42494 site.

Between October 1996 and September 2014, 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 2011 are summarized here.

Between October 2010 and September 2014, free product has been detected in one well (04-301) at the site. In 2011, 0.01 ft of free product was detected in well 04-301 and a trace of free product was detected in 2012.

No free-product recovery was performed at this site during this five-year review period because no wells contained free product at a thickness greater than 0.1 ft.

6.4.24.2 Natural Attenuation Assessment

Sulfate concentrations are depleted (<0.2 mg/L to 0.97 mg/L), compared to background (2.52 mg/L), indicating sulfate reduction is occurring at the site. On-site ferrous iron concentrations are elevated (27.5 to 40 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 1,000 to 2,300 µg/L, which exceed background conditions (0.38 µg/L).

The 2014 NAP results indicate that biodegradation of petroleum hydrocarbons is likely occurring by iron (II) reduction, sulfate reduction, and methanogenesis, which demonstrate natural attenuation of dissolved petroleum in groundwater is occurring at the site (U.S. Navy, 2015a).

6.4.25 SWMU 11, Palisades Landfill

6.4.25.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform surface water and sediment monitoring at SWMU 11, Palisades Landfill in 2011, 2013, and 2014. Sampling was reduced to every other year in 2011; however, sampling was conducted in 2014 in order to prepare for the five-year review. The remedy specified for this site in the OU A ROD is landfill cover installation and ICs (U.S. Navy, U.S. EPA, and ADEC, 2000). Per OU A ROD requirements, surface water and sediment are monitored to evaluate the effectiveness of the remedy (landfill cover).

Sediment samples were collected annually through 2014 from three locations at the site (101, 102, and 103) and analyzed for PCBs, antimony, arsenic, and nickel. Visual inspections of the sediment sampling locations were also completed during the monitoring events. No visual evidence of contamination was observed at any sampling location.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring locations at the SWMU 11, Palisades Landfill relative to site features.

Sediment Monitoring Results. Total PCBs were below the ROD/DD endpoint criterion of 22.7 µg/kg at sampling locations 101 and 103. Total PCBs were reported in sediment samples collected at location 102 in 2013 and 2014 at concentrations of 82 and 500 µg/kg, respectively, which were greater than the ROD/DD endpoint criterion.

Antimony, arsenic and nickel concentrations were also above the ROD/DD endpoint criteria at location 102 in 2011, 2013, and 2014. The concentrations of antimony in the samples from location 102 were greater than the ROD/DD endpoint criterion of 2 mg/kg, ranging from 2.43 to 3.33 mg/kg. Arsenic concentrations were also greater than the ROD/DD endpoint criterion of 8.2 mg/kg at location 102, ranging from 8.86 to 18.3 mg/kg. Nickel was reported in sediment samples collected at location 102 at concentrations ranging from 19.4 to 55.8 mg/kg. The concentrations of nickel in two samples from location 102 were greater than the ROD/DD endpoint criterion of 20.9 mg/kg.

SVOCs and PAHs were also analyzed in 2013 samples and the concentrations did not exceed ROD/DD endpoint criteria for any of the target analytes. Therefore, SVOC and PAH sampling was discontinued after the 2013 monitoring event.

6.4.26 SWMU 13, Metals Landfill

6.4.26.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform groundwater monitoring at SWMU 13, Metals Landfill. The remedy specified for this site in the OU A ROD is landfill cover installation and ICs (U.S. Navy, U.S. EPA, and ADEC, 2000). Per OU A ROD requirements, groundwater is monitored to evaluate the effectiveness of the remedy (landfill cover). In 2010, groundwater monitoring was reduced to every five years. The last sampling event occurred in 2014 and the next scheduled sampling is 2019.

The site catalog in Appendix A includes monitoring schedule, sampling results, and 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. Groundwater samples were collected from eight monitoring wells in 2014 and analyzed for total and dissolved arsenic and barium, as well as water quality parameters (including Total Kjeldahl Nitrogen [TKN], ammonia, alkalinity, sulfate, chemical oxidation demand, and total dissolved solids [TDS]).

Total and dissolved arsenic concentrations ranged from 0.2 µg/L to 8.5 µg/L and total and dissolved barium concentrations ranged from 0.65 µg/L to 48.6 µg/L. All detections of arsenic or barium were below the ROD/DD endpoint criteria of 10 µg/L and 2,000 µg/L, respectively.

Dissolved and total arsenic and barium concentrations in groundwater have not been detected above ROD/DD endpoint criteria since sampling began in 1996. Sample results for arsenic and barium have remained stable with relatively no trend. Concentrations of all non-target analytes were observed to remain low and similar to historical data. These data support the conclusion that landfill controls remain effective in preventing release of contaminants.

6.4.27 SWMUs 18/19, White Alice Landfill

6.4.27.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform groundwater monitoring at SWMUs 18/19, White Alice Landfill. The remedy specified for this site in the OU A ROD is soil cover installation and ICs (U.S. Navy, U.S. EPA, 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. In 2010, groundwater monitoring was reduced to every five years. The last sampling event occurred in 2014 and the next scheduled sampling is 2019.

Per the CMP (U.S. Navy, 2014a), target analytes are arsenic, barium, nickel, and chromium. In addition, the 2014 monitoring for both groundwater and surface water included analysis for non-

target analytes, including priority pollutant dissolved and total metals and water quality parameters.

The site catalog in Appendix A includes monitoring schedule, sampling results, and a figure that shows the location of the monitoring wells at the SWMUs 18/19, White Alice Landfill relative to site features.

Seep Monitoring Results. No total or dissolved metals included on the target analyte list for the White Alice Landfill were detected above the ROD/DD endpoint criteria during the 1997 to 2014 time period. Arsenic was detected in one surface water sample collected from location WASW02 in 1996. Several metals not on the target analyte list exceeded ROD/DD endpoint criteria from 1996 to 2003 but concentrations have steadily decreased so ROD/DD endpoint criteria were not exceeded from 2004 to 2014.

Groundwater Monitoring Results. No dissolved or total metals have been detected above the ROD/DD endpoint criteria since monitoring began in 1996. In general, detected concentrations of metals have remained steady with no observed increasing or decreasing trend.

6.4.28 SWMU 25, Roberts Landfill

6.4.28.1 Data Review

Data Collection during This Five-Year Review Period. The Navy continued to perform groundwater and surface water monitoring at SWMUs 25, Roberts Landfill from 2011 through 2015. The remedy specified for this site in the OU A ROD is soil cover installation and ICs (U.S. Navy, U.S. EPA, 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 four locations (A-2, A-3, A-5, and B-1) and surface water monitoring at six locations (RLSW03, RLSW04, RLSW05, NL-11, NL-12, and NL-14) at SWMU 25, Roberts Landfill during this five-year review period. The samples have been analyzed for VOCs, total and dissolved inorganics, water quality parameters, and TDS. 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 monitoring schedule sampling results, and a figure that shows the location of the monitoring wells relative to site features at the SWMU 25, Roberts Landfill.

Surface Water Monitoring Results. VOCs were either not detected or detected below ROD/DD endpoint criteria in surface water samples collected at this site during this five-year review period. Except for aluminum and copper, total and dissolved metals were either not detected or detected at concentrations below ROD/DD endpoint criteria in surface water samples collected at this site during this five-year review period. However, the reporting limit for mercury was generally greater than the ROD/DD endpoint criterion.

Total aluminum was reported in surface water samples collected at location RLSW03 from 2011 through 2014 at concentrations ranging from 1,410 to 2,460 µg/L. The concentrations of total aluminum in the samples from location RLSW03 were all greater than the ROD/DD endpoint criterion of 87 µg/L. Total aluminum was also detected at location NL-14 at concentrations of 180 and 20,200 µg/L in 2013 and 2014, respectively which are greater than the ROD/DD endpoint criterion. Total aluminum was not detected at concentrations above ROD/DD endpoint criterion in any samples collected at locations RLSW02, RLSW04, RLSW05, NL-11, NL-12, and NL-13 during this five-year review period.

Total copper was reported in surface water samples collected at locations RLSW03, RLSW05, NL-11, and NL-14 from 2011 through 2014 at concentrations ranging from 12.2 to 2,330 µg/L. The concentrations of total copper in the samples from these four locations were all greater than the ROD/DD endpoint criterion. Total copper was not detected at concentrations above ROD/DD endpoint criterion in any samples collected at locations RLSW02, RLSW04, NL-12, and NL-13 during this five-year review period. No ROD/DD endpoint criterion has been established for dissolved copper so concentrations were compared to the criterion for total copper.

In 2014, the NL-14 sample location had concentrations of total cadmium and total zinc of 5.23 and 1,240 µg/L, respectively, which is above their respective ROD/DD endpoint criteria of 1.1 and 110 µg/L.

Groundwater Monitoring Results. VOCs were either not detected or detected below ROD/DD endpoint criteria in groundwater samples collected at this site during this five-year review period. Total and dissolved metals were either not detected or detected at concentrations below ROD/DD endpoint criteria in groundwater samples collected at this site during this five-year review period. Total copper was detected at concentrations above the Adak background concentration in the groundwater sample collected from well A-3 in 2011. Total copper was reported at a concentration of 103 µg/L, which is above the Adak background concentration of 69.5 µg/L. Samples collected at well A-3 in 2013 and 2014 were below background for copper.

6.5 Analysis of IC Effectiveness

In accordance with OSWER Directive 9355.7-18, an analysis was conducted to determine whether the ICs have been effective in achieving their intended purpose. The site-specific ICs are provided in Table 4-1 and are included in the ICMP, Revision 6 developed for Adak (Navy, 2014a). The results of IC inspections are described this section and results of interviews, which included questions on ICs, are provided in Section 6.6 as well as Appendix D. The analysis concluded that ICs are effective in ensuring sites remain protective. Any IC issues identified are being addressed before protectiveness is affected.

Inspections have been conducted annually at OU A, SAERA, and OU B-1 sites since 2002. In addition to the annual inspections, site inspections were performed in 2015 as part of this five-year review. The information in this section is based on a review of inspection reports generated for years 2011 through 2015 (U.S. Navy, 2012h, 2013a, 2014c, 2015c, and 2016e). Site inspection forms for the five-year review site inspection conducted in August 2015 are included in Appendix D.

The ICMP (U.S. Navy, 2001a, 2005c, 2007d, 2010a, 2012d, and 2014a) 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 2015 to independently assess the effectiveness of the ICs or ECs as part of this five-year review.

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 implement 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.

No issues were identified at any of the sites in 2014. In the 2014 Annual IC Inspection Report, IC inspections were recommended to be discontinued at several sites due to contaminant concentrations below ADEC criteria and no IC issues identified. These sites include: SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area; Amulet Housing, Well AMW-706 Area; Amulet Housing, Well AMW-709 Area; Yakutat Hangar, UST T-2039-A; Boy Scout Camp, West Haven Lake, UST BS-1; Mount Moffett Power Plant 5, USTs 10574 through 10577; SA 88, P-70 Energy Generator, UST 10578. However, upon further review by ADEC, only four of these qualified for cleanup complete status. These sites include: SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area, Amulet Housing, Well AMW-706 Area; Amulet Housing, Well AMW-709 Area; and Boy Scout Camp, UST BS-1. These four sites received cleanup complete status from ADEC in October/November 2016.

Recommendations based on observations made during the 2011 through 2015 inspections are presented in this section together with actions the Navy took during the field seasons to ensure that the ICs and ECs remain protective. The ICs and/or ECs at sites not presented in this section were deemed to be functioning as intended and protective of human health and the environment. A separate task was completed in 2015 to conduct major maintenance on ICs and ECs at the sites.

Individual site visits were conducted from August 27 through September 3, 2015 in support of this five-year review. Sixty-five OU A and SAERA sites and 15 OU B-1 sites were inspected for the five-year review (see Appendix D for site inspection forms for each individual site). The findings of the site visits relative to the protectiveness of the ICs and ECs are also included in this section. No detail is provided for sites where no issues or concerns were identified that would not be relevant to the protectiveness.

Additional detail of IC inspections and the five-year review site visit are provided in Appendix D.

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

During the five-year review site visit in August 2015, there were eroded areas, metallic wires sticking out of the ground, and debris observed at the site. The site is in poor condition. A drum filled with water was labeled as U.S. Army property. Also, no sign was located during the five-year review site visit.

6.5.2 GCI Compound, UST GCI-1/Area 303

During the inspections in 2013 and 2015, two metal drums were observed on the north side of the building. Two drums within secondary containment were observed on the west side of the building. In 2015, a hole in the secondary containment, and associated stained soil, were also noted.

6.5.3 Finger Bay Quonset Hut, UST FBQH-1

The Finger Bay Quonset Hut sign is located at a turn-around area and not at the building pad. It was recommended that an additional excavation restriction sign be placed closer to the Quonset Hut near the former stairs.

6.5.4 Former Power Plant Building T-1451

During the five-year review site visit at Former Power Plant, Building T-1451, an excavation was observed near a street culvert. A slight stain with no odor was also observed at the site. A boom was also seen on the ground at Former Power Plant, Building T-1451. Housekeeping at the site should continue to be monitored.

6.5.5 NMCB Building Area, T-1416 Expanded Area

The following items were observed during all four inspections between 2011 and 2015 at NMCB Building Area, T-1416 Expanded Area: five poly drums were observed to be located in the same place on the southern side of the west building; an approximately 5-foot-diameter area of oil-stained soil under the drums; and a car battery on 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 remove the on-site wastes, address the areas of actual or potential spills, and improve housekeeping practices.

In addition to the items listed above, a drainage ditch was observed along the south side of the site in 2013 and 2015. The drainage ditch was installed when tidal flooding occurred on site to help drain water off site. The ditch is less than 2 feet deep, therefore, a permit with the Navy was not required.

6.5.6 SA 76, Old Line Shed Building

The ICs required at SA 76, Old Line Shed Building include soil excavation restriction, but no sign was present. Therefore, it is recommended that a soil excavation sign be placed at the site.

In 2012 and 2013, it was reported that no sign was onsite; however, there were several signs located near the site. In 2014, it was reported that a sign was located at the northeast end of the site but it is not evident whether a new sign was installed at the site or if this was the location of a nearby sign.

6.5.7 SA 79, Main Road Pipeline

An excavation restriction sign was present at SA 79, Main Road Pipeline, but the sign is located north of Sweeper Creek and is not indicative of the actual site location. Therefore, an additional sign should be posted at the site near South Sweeper Creek and the monitoring wells. As of September 2015, it does not appear that an additional sign has been posted as recommended in the 2011 IC inspection report.

6.5.8 SWMU 4, South Davis Road Landfill

During the inspection in 2015 at SWMU 4, South Davis Road Landfill, the seep, first observed during the 2013 inspections, at the southeast end of the landfill approximately 20 feet south of the southern swale was still present. Another small seep was identified at the north end of the landfill with minimal flow and clear, odorless water.

During the five-year review site visit in August 2015, erosion was present at South Davis Road Landfill in the south end of the site near the repaired seep area. A seep was observed at the southeast end of the landfill's damaged silt fence. Metal debris was present on the beach below the swale. Drainage issues, including persistent ponding, are evident in the south central area connected to the repaired seep. In addition, there is a drainage issue and seep at the north end of the landfill as well as significant ponding near an installed sign. There was also persistent ponding noted on the southern end of the site.

6.5.9 SWMU 15, Future Jobs/DRMO

During the inspection in 2015 at SWMU 15, Future Jobs/DRMO, oily-stained soil was observed in the same location as the oily-stained areas observed in 2011. Housekeeping practices onsite are improved and appear adequate. However, potentially contaminated soil remaining onsite may be impacting underlying groundwater. It is recommended that housekeeping practices continue to be monitored at this site (U.S. Navy, 2016e).

6.5.10 SWMU 17, Power Plant No. 3 Area

Housekeeping practices have improved at SWMU 17, Power Plant No. 3 Area but should continue to be monitored and it is recommended the owners are notified to remove the on-site wastes, address the areas of actual or potential spills, and improve housekeeping practices. It is

further recommended that the City be notified that the open excavation observed at the site should be filled in (U.S. Navy, 2016e).

6.5.11 SWMU 24, Hazardous Waste Storage Facility

Due to the wastes and conditions observed at this site, there is a concern that contaminants associated with on-site wastes are a threat to residents and are potentially impacting site soils and underlying groundwater at SWMU 24, Hazardous Waste Facility. It is recommended that the housekeeping at the site continue to be monitored (U.S. Navy, 2016e).

6.5.12 SWMU 25, Roberts Landfill

After the IC repairs in 2015, the following actions are recommended at SWMU 25 in order for ICs to function as intended to protect human receptors from exposure to contaminated soil or groundwater:

1. Continue to monitor the four small eroded and repaired areas along the western fence line.
2. Sample surface water at the blue seep on the northwest side of the landfill (NL-14) in 2016 to determine if metals continue to exceed cleanup criteria. Take appropriate actions as determined by ADEC, U.S. EPA, and the Navy, if needed.
3. Notify Adak Fuels Facility to keep the northern cable gate locked to prevent vehicle access to the site.
4. The sinkhole located near monitoring well B-1 is not located on the landfill cap or impacting the integrity of the cap but should continue to be monitored (U.S. Navy, 2016e).

During the five-year review site visit in August 2015, drainage issues were observed primarily on the northern portion of the site. Multiple drainage swales in the northeast end of the site were submerged with no indication of flow. There were also multiple areas of puddling/ponding within the north and south central areas of the site.

6.5.13 SWMU 29 Finger Bay Landfill

In general, ICs are functioning as intended at SMWU 29, Finger Bay Landfill, however, the following is recommended:

1. The seep identified in 2011 should be monitored.
2. Debris should be removed from the surface of the cap and pond.
3. The two on-site ponds and the hole at the south end of the landfill should be evaluated to determine if action is needed.

During the five-year review site visit, there was evidence of gravel patches and indications of reseeded (including possible truck tracks that had been reseeded). There was more ponding

noted with visible and audible bubbling through the puddles. This area possibly indicates a significant biologic sheen and bubbling possibly from landfill gas generation.

6.5.14 SWMU 60, Tank Farm A

During the five-year review site visit at SWMU 60, Tank Farm A, a fair amount of recent sloughing was present at the site along with a possible sinkhole with a recently formed pond located in the southern portion of the site.

6.5.15 SWMU 67, White Alice PCB Spill Site

During the 2011 IC inspection at SWMU 67, White Alice PCB Spill Site, installation of a new cellular tower and cable with new fencing and concrete pads was being conducted. Evidence of excavations was observed around the newly installed concrete pads and fencing. No evidence of exposed liner or contaminated material was observed. An excavation notification was submitted to and reviewed by the Navy prior to excavation activities although the permit indicated excavation activities were not to be conducted on the site.

Upon completion of the inspection, the Navy informed Windy City (the permit applicant) of the non-compliance. Windy City believed that since the digging activities that took place at the site were shallow and hand-dug, that they did not constitute an “excavation.” The Navy will revise the wording on future excavation permits to clearly state that no soil disturbance shall occur in excavation prohibited areas.

6.6 Results of Interviews

Five-year review 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 postal mail or e-mail. Responses to questions were returned either in writing, or through telephone interviews. Not all of 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 subsections.

6.6.1 Navy Personnel

The Navy respondents are not aware of any changes in land uses, public access to land, or site conditions that they feel may impact the protectiveness of the remedies selected in the RODs or DDs. One respondent does have concerns about the public accessing MM-10F in Parcel 4 where ATV tracks have been observed which may be accelerating erosion in the area.

The only concern the Navy is aware of from the local community is the desire to have access to the repository in Adak for site education and a concern over the possibility of a cancelled field season for 2016 at the MRP sites.

All Navy respondents agree that there has continued to be a regular program of on-site inspection and operation, maintenance, and monitoring since 2011. Examples listed include yearly inspections and minor repairs/sign replacements, major repairs every five years, upgraded presentations to townspeople and school children, and increased visibility of Navy personnel.

Unexpected difficulties associated with operation, maintenance, and monitoring include water level fluctuations in the airport ditches/canals which have impacted the effectiveness of containment booms the Navy has deployed, the ability for personnel to access sample and survey location East Canal shoreline, and free product recovery efforts. Alaska Department of Transportation maintains and operates a pumping system to regulate water levels to support airport operations, but the float mechanism that starts the pumps automatically failed approximately two years ago and the pumps must now be turned on/off manually. The Navy has discussed the concerns with Alaska Department of Transportation and is hopeful that a plan is underway to fix the pump system.

Vandalism of signs and fences is another concern of Navy respondents since these are in place to protect the citizens of Adak while cleanup efforts take place.

The only substantial change to inspection and operation, maintenance, and monitoring requirements or activities mentioned by Navy personnel was an increase in bailing (product recovery) frequency that has resulted in more petroleum being recovered. This is noted as a good change in the operation, maintenance, and monitoring program.

Vandalism of signs and fences and trespassing in prohibited areas such as Parcel 4 are the two violations that Navy personnel are aware of that could impact the protectiveness of the remedy at the sites.

Measures to implement ICs required by the RODs include regular inspections and minor repairs/sign replacements, major repairs every five years, upgraded presentations to townspeople and school children, continued awareness and education program, and increased visibility of Navy personnel.

6.6.2 Agency Personnel

The agencies providing responses included ADEC and U.S. EPA. Responses from these agencies are summarized in the subsections that follow.

6.6.2.1 ADEC Interview Responses

The ADEC respondent reported feeling generally well informed overall regarding environmental actions on Adak.

ADEC noted no change to land use or site conditions that would impact protectiveness. ADEC feels the community seems satisfied with the level of communications, progress on the site, and the overall results of the cleanup process.

ADEC reported one complaint regarding the deteriorated housing along Bay Shore Drive. ADEC believes this is an issue for TAC to address with the ADEC Solid Waste Program and the issue has been discussed with TAC.

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 the issue of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) related to the use of firefighting foam should be evaluated at the former fire training areas. ADEC is currently evaluating changes to cleanup levels in its regulations. However, these changes will likely not be final for some time and will need to be evaluated in the next five-year review.

Regarding suggestions for implementation of the remedies, ADEC suggests to keep up sustained progress on the OU B-2 NTCRA. ADEC also suggests the Navy needs to optimize monitoring and remedies at some of the SAERA sites. There are several sites where some additional effort at characterization/cleanup now may significantly reduce the duration of long-term management in the future.

6.6.2.2 U.S. EPA Interview Responses

The U.S. EPA respondent reported feeling well informed overall regarding environmental actions on Adak. U.S. EPA is not aware of any changed site conditions or in ARARs that could impact remedy protectiveness.

U.S. EPA believes that remedies appear to remain protective and there have been no changes that impact protectiveness.

There have been no complaints, violations, or other incidents that have required response by the U.S. EPA office. U.S. EPA believes the community is satisfied with past work and current work at OU B.

Regarding suggestions for implementing the remedies, U.S. EPA suggested to maintain the existing ICs and routinely verify that they are being complied with.

6.6.3 Community

Five community members provided interview responses by filling out questionnaires including a representative from the Aleutian Pribilof Islands, Association, Inc., U.S. EPA Tribal Coordinator, a current citizen of Adak, and two anonymous participants. After the questionnaires were sent to Adak residents by mail, the RAB co-chair followed up with residents to request interviews; there was no response from Adak residents.

Respondents reported being well informed about the environmental cleanup activities on Adak and feel that the Navy answers questions landowners have about the activities. There was a positive response to the remedy implementation's effect on the community. There were no concerns regarding the implementation of the remedies.

Respondents were not aware of any events such as vandalism, trespassing, or emergency response at the environmental cleanup or ordnance sites. There were no concerns noted on the level and quality of information provided to the RAB members through RAB meetings, associated presentations or the Adak web site.

One respondent expressed concern over the houses on the island that are coming apart. The respondent feels that the TAC has not taken care of these houses and the reason for concern provided is due to asbestos in the houses.

One respondent expressed concern that there is no cleanup end in sight. The respondent believes the island and oil beneath it is unfixable. There is concern that if the monitoring of the oil plumes ceased regarding the sites below ground, there is potential of escape of that petroleum or even fuel entering the ocean waters.

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	8,700	6,200	1,500	10	0	No trend	No trend	Stable	NC	NC	NC	NC
	01-150	DRO	1,400	1,300	1,500	10	6	No trend	No trend	Stable	NC	NC	NC	NC
GCI Compound, UST GCI-1/Area 303	03-104	DRO	9,000	8,700	1,500	9	10	Increasing	No trend	NA	NC	NC	NC	NC
	03-778	DRO	1,800	1,500	1,500	10	0	No trend	No trend	Stable	NC	NC	NC	NC
	MRP-MW2	DRO	840	3,300	1,500	9	14	Increasing	Increasing	NA	NC	NC	NC	NC
		GRO	3,100	8,700	2,200	9	15	Increasing	No trend	NA	NC	NC	NC	NC
		Benzene	39	100	5	9	16	Increasing	No trend	NA	NC	NC	NC	NC
		Ethylbenzene	94	490	700	9	22	Increasing	No trend	NA	NC	NC	NC	NC
	MRP-MW3	DRO	1,800	6,700	1,500	8	-12	Increasing	No trend	NA	NC	NC	NC	NC
		GRO	38,000	30,000	2,200	8	-4	Decreasing	No trend	NA	-1155	No	-2000	0
		Ethylbenzene	2,500	1,900	700	8	7	No trend	No trend	Stable	NC	NC	NC	NC
		Total xylenes	13,100	12,300	10,000	8	12	No trend	No trend	Stable	NC	NC	NC	NC
	04-210	GRO	5,000	3,800	2,200	10	-29	Decreasing	Decreasing	NA	-225	Yes	-400	-78
	04-213	GRO	3,800	5,700	2,200	10	-15	Decreasing	Decreasing	NA	-167	No	-475	17
Housing Area, Arctic Acres	03-416	DRO	3,450	1,200	1,500	8	0	No trend	No trend	Stable	NC	NC	NC	NC
	03-420	DRO	4,900	3,400	1,500	10	-16	Decreasing	No trend	NA	-291	Yes	-533	-150
	03-421	DRO	81,300	2,400	1,500	7	-11	Decreasing	No trend	NA	-1875	No	-11200	2000
ROICC Contractor's Area, UST ROICC-7	08-200	Benzene	288	280	5	10	3	No trend	No trend	Stable	NC	NC	NC	NC
	08-202	Benzene	16	9.9	5	10	-31	Decreasing	Decreasing	NA	-0.83	Yes	-1	-0.68
SA 79, Main Road Pipeline, South End	MRP-MW8	DRO	3,700	3,400	1,500	10	-11	Decreasing	No trend	NA	13	No	-40	87
	601	DRO	2,100	1,900	1,500	4	-1	No trend	No trend	Stable	NC	NC	NC	NC
	02-230	DRO	4,060	4,300	1,500	10	-11	Decreasing	No trend	NA	-43	No	-157	36
SA 80, Steam Plant 4, USTs 27089 and 27090	04-158	DRO	7,310	8,700	1,500	5	1	No trend	No trend	Stable	NC	NC	NC	NC
	04-159	DRO	1,410	2,400	1,500	10	-7	No trend	No trend	Stable	NC	NC	NC	NC
	04-173	DRO	2,560	2,800	1,500	5	0	No trend	No trend	Stable	NC	NC	NC	NC
	SP4-3	DRO	3,400	4,300	1,500	10	3	No trend	No trend	Stable	NC	NC	NC	NC
SWMU 14, Old Pesticide Storage and Disposal Area	MW14-5	DRO	2,770	2,800	1,500	10	3	No trend	No trend	Stable	NC	NC	NC	NC
		GRO	12,600	5,400	2,200	10	-24	Decreasing	Decreasing	NA	-729	Yes	-933	-500
		Total Lead	21.5	17.4	15	10	-1	No trend	No trend	Stable	NC	NC	NC	NC
		Dissolved Lead	25.3	17.1	15	10	-9	No trend	No trend	Stable	NC	NC	NC	NC
SWMU 17, Power Plant No. 3	05-735	cis-1,2-DCE	542	190	70	10	-34	Decreasing	Decreasing	NA	-29.3	Yes	-39	-19
		Vinyl chloride	7.2	3.3	2	10	-27	Decreasing	Decreasing	NA	-0.29	Yes	-0.43	-0.13
SWMU 55, Public Works Transportation Department Storage Tank	55-145	PCE	112	57	5	10	-36	Decreasing	Decreasing	NA	-10.1	Yes	-12	-8

Table 6-1. Concentration Trend Evaluation for Monitored Natural Attenuation Sites (Continued)

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
SWMU 60, Tank Farm A	650	Benzene	4.6	8.5	5	5	2	No trend	No trend	Stable	NC	NC	NC	NC
SWMU 61, Tank Farm B	14-113	GRO	3,900	1,900	2,200	10	-28	Decreasing	Decreasing	NA	-295	Yes	-497	-83
		Benzene	22.7	4.3	5	10	-40	Decreasing	Decreasing	NA	-2.2	Yes	-2.7	-1.5
	14-210	GRO	3,560	3,700	2,200	10	-4	No trend	No trend	Stable	NC	NC	NC	NC
	TFB-MW4B	GRO	46,700	40,000	2,200	10	-8	No trend	No trend	Stable	NC	NC	NC	NC
		Benzene	49.5	20	5	10	-35	Decreasing	Decreasing	NA	-2.7	Yes	-3.5	-2
		Toluene	4,580	4,300	1,000	10	3	No trend	No trend	Stable	NC	NC	NC	NC
		Ethyl-benzene	1,750	1,900	700	10	17	Increasing	No trend	NA	NC	NC	NC	NC
		Total xylenes	12,500	14,200	10,000	10	21	Increasing	Increasing	NA	NC	NC	NC	NC
SWMU 62, New Housing Fuel Leak, Sandy Cove	03-155	DRO	2,070	2,400	1,500	10	17	Increasing	No trend	NA	NC	NC	NC	NC
	MW-134-11	DRO	3,500	9,000	1,500	10	8	No trend	No trend	Stable	NC	NC	NC	NC
	MW-146-1	DRO	12,000	6,100	1,500	8	-13	Decreasing	No trend	NA	-821	Yes	-1333	-140
	MW-187-1	DRO	3,900	4,700	1,500	9	-3	No trend	No trend	Stable	NC	NC	NC	NC
SWMU 62, New Housing Fuel Leak, Eagle Bay	AMW-704	DRO	2,500	1,700	1,500	9	-4	No trend	No trend	Stable	NC	NC	NC	NC
	MW-303-7	DRO	21,000	16,000	1,500	4	0	No trend	No trend	Stable	NC	NC	NC	NC
Tanker Shed, UST 42494	04-175	DRO	7,080	2,900	1,500	10	-16	Decreasing	No trend	NA	-250	No	-800	0
	04-290	DRO	2,890	3,800	1,500	10	8	No trend	No trend	Stable	NC	NC	NC	NC
	04-306	DRO	2,500	4,600	1,500	8	2	No trend	No trend	Stable	NC	NC	NC	NC

C.I. - confidence interval
DCE - dichloroethene
DRO - diesel-range organics
GRO - gasoline-range organics
µg/L - microgram per liter
NA – not applicable
NC - evaluation not conducted
PCE - tetrachloroethene

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 (see also Table 7-1).

7.1.1 Functionality of Remedy for Operable Unit A

Is the OU A remedy functioning as intended by the OU A ROD? Yes, all of the remedy components required by Decision Documents for OU A sites have been or are being implemented and are functioning as intended and considered protective of human health and the environment. The extent of contamination is defined, and ICs are in place to prevent exposure to contaminated soil or groundwater. ICs are assessed on a biennial or five-year schedule. The selected remedies will continue to be protective.

During the last five-year period, a final RACR was issued in 2012 to document that active remediation was complete for soils and surface water at all OU A sites (U.S. Navy, 2012b). This conclusion addressed all OU A sites, with the exception of two water bodies, Kuluk Bay and Sweeper Cove. The RAOs for soils and surface water specified in the RODs have been achieved although ongoing ICs are necessary to ensure that human health and the environment are protected. The Navy, U.S. EPA, and ADEC have determined that all response actions for soils and surface waters are complete, and that no further remediation-related construction is anticipated. Remaining activities are primarily related to the Navy’s long-term inspection, maintenance and monitoring activities at those sites with limited surface and subsurface soil concentrations above unrestricted land use (i.e., residential) levels. Based on current land use, there continues to be no human or ecological health risk from exposure to residual chemicals. Ongoing monitoring is limited to groundwater within the downtown area, groundwater, surface water and sediment at isolated locations outside the downtown area, and marine tissue in Kuluk Bay and Sweeper Cove.

The landfill caps and covers have been constructed and are regularly inspected and maintained. Interim remedial action product recovery has been performed at the 14 free-product recovery SAERA sites. Within the last five years, actions have been taken to address free product and enhance MNA at Area 303 and T-1451. 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 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. However, the presence of free product and significant residual contaminant mass do not allow current evaluation techniques to reliably estimate whether ROD/DD endpoint criteria will be achieved in groundwater within 75 years of ROD execution

which is the target remediation timeframe for MNA. This is because wells in which free product is observed are not sampled and generally have insufficient data to support a statistical evaluation. As a result, estimates for meeting ROD/DD endpoint criteria do not take the most contaminated wells (i.e., those with free product) into account.

Based on the available information and evaluations conducted as part of this five-year review, the remedy is functioning as intended by the ROD for all 25 OU A sites on Adak.

7.1.2 Functionality of Remedy for SAERA Sites

Is the SAERA remedy functioning as intended by the SAERA Decision Documents? No, remedy components required by Decision Documents for SAERA sites are not functioning as intended and considered protective of human health and the environment at three sites. With the exception of the three sites listed below, the extent of contamination is defined, and ICs are in place to prevent exposure to contaminated soil or groundwater. ICs are assessed on a biennial or five-year schedule. The selected remedies will continue to be protective.

Remedies at SAERA sites SWMU 60, SWMU 62, and Former Power Plant, Building T-1451 are not functioning as intended, thus the remedial action objectives are not being achieved resulting in contamination of surface water. The following three site remedies will be protective once the remedies are in place and will require additional efforts to ensure it remains protective:

1. SWMU 60: The remedy is not complete at SWMU 60 under SAERA due to a seep impacting South Sweeper Creek at Boom 10. Additional investigation/remediation will be considered to mitigate surface water impacts. Once the remedy is in place, the site will be protective.
2. SWMU 62: The remedy is not complete under SAERA for SWMU 62 due to a seep impacting East Canal downgradient of the free product recovery trench. Additional removal activities were conducted during the 2016 field season in an effort to eliminate the petroleum sheen on the surface water in East Canal. Activities included removal of the free product recovery trench, excavation of soil along East Canal, and application of oxygen amendments to enhance MNA at the site. Groundwater monitoring wells were installed to monitor MNA parameters, the presence or absence of free product, and petroleum hydrocarbon concentrations in groundwater. Once the remedy is in place, the site will be protective.
3. Former Power Plant, Building T-1451: The remedy is not complete under SAERA at Former Power Plant, Building T-1451 due to a seep impacting East Canal. Additional removal activities were conducted during the 2016 field season in an effort to eliminate the petroleum sheen on the surface water in East Canal. Activities included excavation of soil along East Canal, and application of oxygen amendments to enhance MNA at the site. Groundwater monitoring wells were installed to monitor MNA parameters, the presence or absence of free product, and petroleum hydrocarbon concentrations in groundwater. Once the remedy is in place, the site will be protective.

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 MNA have been implemented where required through adjustments to the CMP. Based on the available information and evaluations conducted as part of this five-year review, the remedy is functioning as intended by the SAERA Decision Documents for 38 of 41 of the OU A and SAERA sites on Adak.

7.1.3 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. In August 2014, the RACR (U.S. Navy, 2014f) was finalized for OU B-1, which documented that the remedial actions specified in the OU B-1 ROD had been completed and no further response actions are necessary. The RAOs were determined to have been achieved, however ongoing ICs were determined necessary to ensure that human health and the environment are protected. The Navy, U.S. EPA, and ADEC have determined that all sites are remedy in place/ICs, and that no further remediation-related activity is anticipated. One hundred and fifty-six sites are located within OU B-1. The majority (106 out of 156) were recommended for NOFA in either the Preliminary Assessment or ROD. Additional investigation and remedial action were recommended for 47 sites in the ROD and an additional three sites were added following the completion of the ROD, making a total of 50 sites to undergo remedial actions.

A key component of the OU B-1 remedy are the LUCs. During the site visit, these remedy components were in place and functioning as intended. Records indicate one incident within the five-year review period in which an ordnance item was encountered. The item was discovered by a contractor in the White Alice area in November 2011. The ordnance find was reported and EOD personnel were notified, suggesting that ordnance awareness training is functioning well.

7.1.4 Operation and Maintenance Costs

Costs to maintain the environmental program at OU A, SAERA, and OU B-1 Adak were generally stable with some increased costs noted in 2014, which correspond to completion of major IC repairs. A summary of annual costs is provided below:

1. 2011:	\$1,486,447
2. 2012:	\$1,602,431
3. 2013:	\$1,548,831
4. 2014:	\$2,823,479
5. 2015:	\$1,219,949
6. Total:	\$8,681,137

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. 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.

7.2.1 Review of Applicable or Relevant and Appropriate Requirements

For this five-year review, all of the ARARs identified in the RODs for OU A, SAERA, and OU B-1 were again reviewed for changes that could affect the assessment of whether the remedy is protective.

Some ARARs that were used in the determination of cleanup levels have been amended since publication of one or both of the RODs. Federal and state drinking water regulations (maximum contaminant levels [MCLs]) were amended in February 2013.

While this regulation was identified as ARARs, the amendments to these regulations in the last five years were administrative in nature and do not impact the numeric criteria adopted in the RODs.

7.2.1.1 Operable Unit A – CERCLA Sites

The CERCLA sites were divided into three categories: landfills, sites requiring ICs because of excess health risks, 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 sediment at SWMU 17 which were risk-based values. For ongoing monitoring activities, "criteria endpoints" have been established to provide comparison values for contaminants included in the monitoring program. No numeric RG was established in the ROD for groundwater or soil at CERCLA sites. Changes to ARARs and ROD/DD endpoint criteria because of changes in the regulations are presented 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 75.345, 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). In the last five years there have been no changes to the numeric criteria listed for site-related contaminants under federal MCLs, Alaska State MCLs (18 AAC 75.345, Table C) and state and federal surface water quality standards. Revision 6 of the CMP was finalized in 2014 and provides ROD/DD endpoint criteria for groundwater that are up to date and align with relevant ARARs identified in the ROD (see Table 7-2).

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 ROD/DD 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 7-3 lists the COCs and ROD/DD endpoint criteria established in CMP, Revision 6 and compares them to current ARAR values for the surface water COCs monitored at landfill sites. Based on Table 7-3, there are several ROD/DD endpoint criteria in the CMP, Revision 6 that do not align with the current ARAR values for landfill COCs.

ROD/DD endpoint criteria cannot be changed in the CMP updates without a ROD or DD amendment; however, changes in ARAR values can be noted and then the project team should evaluate whether changing ARARs has any ramifications for the monitoring program. Differences in the ROD/DD endpoint criteria do not affect the protectiveness of the remedy because with the exception of arsenic, no additional exceedances were noted in 2014 when compared to the current ARAR values. Arsenic values at both SWMUs 18/19 and SWMU 25 only slightly exceed the current ARAR value of 0.14 µg/L (i.e., the largest arsenic detection at these sites in 2014 was 0.4 J µg/L). In addition, ICs are in place to ensure the sites remain protective.

Sediment. Cleanup levels for sediment removal at the SWMU 17 waste oil pond were risk-based values. Sediment that was removed was treated until DRO and RRO concentrations met disposal requirements for Roberts Landfill (100 and 2,000 mg/kg, respectively); the disposal criteria for Roberts Landfill has not 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.

Fresh and marine sediments were included in the long-term monitoring detailed in Revision 6 to the CMP to evaluate the effectiveness of the landfill cover (i.e., part of the ECs) at SWMU 11. No COC or RG was established in the ROD for SWMU 11. The sediment endpoint criteria for SWMU 11 listed in Revision 6 to the CMP are risk-based values based on the lower of risk to humans or ecological receptors. There are no changes in sediment ARARs; therefore, the remedy remains protective for both ecological and human receptors.

Marine Tissue. The toxicity criteria and exposure assumptions were reviewed for those COCs where RGs and ROD/DD endpoint criteria are site-specific risk-based concentrations. The only

risk-based RGs established in the OU A ROD were those established for fish and shellfish tissue in Kuluk Bay and Sweeper Cove. No other site-specific numeric RGs were established in the ROD for marine tissue at the CERCLA sites; therefore, the remedy remains protective.

7.2.1.2 SAERA Sites

RGs for SAERA sites are all based on Alaska state regulations 18 AAC 75.340, 341, and 345. In the last five years there have been no changes to the numeric criteria listed for site-related contaminants under 18 AAC 75 and state and federal surface water quality standards. Revision 6 of the CMP was finalized in 2014 and provides ROD/DD endpoint criteria for groundwater that are up to date and align with relevant ARARs identified in the DDs (see Table 7-2).

7.2.1.3 Free-Product SAERA Sites—No Unacceptable Risk Sites

For the 15 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 cleanup levels based directly on numeric criteria included in Alaska state regulations 18 AAC 75.340, 341, and 345. The following 11 of the 15 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 SAERA sites [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)] are discussed separately below.

1. Area 303
2. GCI Compound
3. SA 80, Steam Plant 4
4. Tanker Shed
5. SA 78, Old Transportation Building
6. SA 82, P-80/P-81 Buildings
7. SA 88, P-70 Energy Generator
8. SWMU 58, Heating Plant 6
9. SA 73, Heating Plant 6
10. Yakutat Hangar
11. NORPAC Hill Seep Area

The RGs for Area 303 were selected and approved in the *Final Decision Document for Area 303* finalized in 2012 (U.S. Navy, 2012a). The RGs for the remaining 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).

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 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 11 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 are considered protective. The risk assessment findings of no unacceptable risk remain valid, providing that land uses for the sites do not change.

Groundwater. RGs specified for groundwater at these 11 free-product SAERA 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] dated 1999). Groundwater at Area 303, 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 consistent with those specified in Table C of 18 AAC 75.345(b)(1), see Table 7-2. Groundwater at the seven remaining sites is not considered to be a reasonably expected potential future source of drinking water. Therefore, cleanup levels for these sites are 10 times the levels specified in Table C of the Alaska regulations. ADEC revoked the 10 times rule in 2008 in 18 AAC 75. Regardless of a site's classification as a potential drinking water source, ICs preventing groundwater use for drinking are in place for all locations. Therefore, the remedy remains protective.

7.2.1.4 Free-Product SAERA Sites—Unacceptable Risk Sites

The remaining four free-product SAERA sites were determined to pose unacceptable risk to human health and/or the environment and were evaluated separately from the 11 free-product sites discussed above. The DDs 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 these sites are presented in Table 7-4 and are discussed below.

Soil. For 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 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 SAERA 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]). In 2008, changes to 18 AAC 75 revoked the 10 times groundwater rule.

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 7-4). Once interim removal action at SWMU 62 is complete, the remedy will be protective.

Per the OU A ROD, 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 were 10 times the levels specified in Table C of the Alaska regulations (Table 7-4); however, with the 2008 change to 18 AAC 75, establishment of new endpoint criteria is warranted. ICs preventing groundwater use for drinking are in place at NMCB Building Area, T-1416 Expanded Area, South of Runway 18-36 Area, and SWMU 17, Power Plant No. 3 area locations; therefore, 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 SAERA 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 references the South of Runway 18-36 Area sediment cleanup levels for screening purposes only and to provide a baseline against which ongoing monitoring results are compared.

7.2.1.5 Operable Unit B-1

Soil. Table 7-5 compares current ARAR values for the soil pathway with those presented in the OU B-1 ROD (U.S. Navy, U.S. EPA, and ADEC, 2001) and those identified in the third five-year review (Navy, 2011). As shown in Table 7-5, cleanup levels for all ordnance compounds identified in the OU B-1 ROD have changed over the last five years, with a majority of the cleanup levels increasing from those previously identified in the last five-year review. Tetryl is the only ordnance compound for which a more conservative cleanup level has been identified, with the numeric criteria decreasing from 240 mg/kg to 160 mg/kg. Detected concentrations of tetryl were three orders of magnitude below the 2015 regional screening levels (RSLs) and, as a result, site conditions remain protective.

7.2.2 Review of Risk Assessment Assumptions

Risk assessment assumptions (both human and ecological) were reviewed as part of the requirement to assess the continued protectiveness of the remedies. 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. For the CERCLA sites evaluated in the RI/FS process, important risk assessment assumptions can be divided into two broad categories: (1) assumptions regarding chemical toxicity, and (2) assumptions regarding chemical exposure.

7.2.2.1 OUA CERCLA Sites Evaluated in the Remedial Investigation and Feasibility Study and OU A Record of Decision

Risk-based RGs for COCs. The toxicity criteria and exposure assumptions were reviewed for those COCs where RGs and ROD/DD endpoint criteria are site-specific risk-based concentrations. The only risk-based human health RGs established in the OU A ROD were those established for fish and shellfish tissue in Kuluk Bay and Sweeper Cove. In the ROD, numeric RGs for sediment were provided for SWMU 17 ponds; however, these values are ARARs promulgated in 18 AAC 75, not risk-based, and therefore are not included in this review. No site-specific numeric RGs were established in the ROD for groundwater or soil at the CERCLA sites. The ROD established risk-based tissue RGs for fish and shellfish in Kuluk Bay and Sweeper Cove. Total PCBs were the only COC identified in the ROD. The total PCB RGs were calculated to be 0.0065 and 0.031 mg/kg for fish and shellfish, respectively.

A review of the fish tissue RGs determined that the oral cancer slope factor (CSF) of 2.0 (mg/kg-day)⁻¹ for total PCBs remains the same. However, U.S. EPA common default parameters for

exposure duration (ED) and body weight (BW) were revised in 2014 and are reported in U.S. EPA Office of Solid Waste and Emergency Response (OSWER) Directive (U.S. EPA, 2014). The RGs were recalculated for this five-year review and are shown in Table 7-6. Both the fish and shellfish RG concentrations are higher when the updated default exposure parameters are used in the equation (see Table 7-6 for updated default exposure parameters and revised RG in bold, italic font). Therefore, because the OU A ROD RG values are lower than the revised 2015 values, original RGs remain protective.

For ecological concerns, both fresh and marine sediments are part of the long-term monitoring of the effectiveness of the landfill cover at SWMU 11. No COC or RG was established in the ROD. Risk-based levels were established in the final CMP (U.S. Navy, 2010a). The monitoring program is reviewed after the completion of each field effort. Changes to the monitoring program are proposed in the annual monitoring reports, discussed by the Navy and stakeholders, and agreed to as stated in the final monitoring report. The final CMP values for the current fresh and marine sediments have been accepted by the stakeholders and will not be further evaluated here because they are protective. Use of ECs (e.g., landfill covers) prevents exposure to ecological receptors; thus, the remedy remains protective and no additional remedial action is warranted at these sites.

Exposure Parameters Used in the Risk Assessments. Since the last five-year review (Navy, 2011a), U.S. EPA common default parameters have been revised and are reported in OSWER Directive 9200.1-120 (U.S. EPA, 2014). The adult residential ED decreased from 24 years to 20 years for a revised total residential exposure of 26 years (20 years as an adult and 6 years as a child) instead of 30 years (24 years as an adult and 6 years as a child). Also, the adult BW of 70 kg increased to 80 kg. Use of these revised exposure parameters in the historical risk assessments would result in lowering cancer risk and noncancer hazard estimates.

At the time the risk assessments were completed, Adak was an active military facility and 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. Thus, the residential exposure calculations included a 15 year ED (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. This change in land use on Adak, from an active military installation to regular civilian use, after the OU A CERCLA risk assessments were conducted, was reported and addressed in the 2010 five-year review. The consequences associated with the land use change, as discussed in the 2010 five-year review, were increased risks above target health goals for potential recreational or occupational receptors at two of 18 OU A sites (i.e., SA 76 and SWMU 23); however, it was determined that based on the low potential exceedances above target health goals and the chemicals involved, both of those sites were deemed likely to have acceptable levels of risk for recreational and residential exposures, and the remedies were still considered to be protective.

The 2014 exposure parameter changes discussed above would result in lowering the risk and hazard estimates. Therefore, changes in exposure parameter values do not affect the protectiveness of the remedy to recreational or commercial receptors, nor does it impact risks to residential receptors because ICs continue to effectively prevent residential exposure.

7.2.2.2 Sites with Possible Vapor Intrusion Pathways

Vapor intrusion was not an exposure pathway that was evaluated for all CERCLA and SAERA sites on Adak at the time of the ROD. In some cases, this pathway was evaluated, but evaluation methods have changed. During the site visit for the fourth five-year review, a vapor intrusion checklist was completed to evaluate buildings that were present at SAERA and CERCLA sites. Based on observations made during the site visit, a majority of the buildings inspected were not occupied and have deteriorated such that a majority of the buildings are not inhabitable, were condemned and/or do not provide a competent structure to support an accumulation of vapors in indoor air. However, there are buildings in the downtown area of Adak that are both competent and potentially occupied, such that the vapor intrusion pathway could potentially be complete. In addition, widespread petroleum and free product issues are currently being managed and monitored through free product recovery and sampling. Groundwater data within the downtown area suggest that both DRO and GRO are a concern in the downtown area of Adak.

Based on observations made during the site visit for this five-year review, the downtown area of Adak has the potential for complete vapor intrusion exposure pathways and a possible source of volatile chemicals in environmental media. Therefore, an evaluation of historical environmental data was conducted for residential areas in the downtown area of Adak to assess whether current conditions are protective of the vapor intrusion pathway. The sites that coincide with potentially occupied residential areas include portions of Area 303 (east of Main Road), and SWMU 62. The fact that Arctic Acres is currently not occupied and TAC has condemned the properties, prevents the vapor intrusion pathway from being completed. Based on a review of the risk assessments for each of these sites, SWMU 62 was the only instance where the pathway was evaluated as a complete exposure pathway. The risk assessment for Area 303 concluded the vapor intrusion exposure pathway to be insignificant for residential buildings and the risk assessment for Arctic Acres did not include an evaluation of vapor intrusion. Furthermore, while the risk assessment for SWMU 62 did include an evaluation of vapor intrusion, exposure point concentrations (EPCs) were calculated as the 95% upper confidence limit (UCL) using the available groundwater dataset. However, this approach is not consistent with U.S. EPA guidance, which requires that maximum concentrations be established as EPCs for vapor intrusion. As a result, the current risk assessment for SWMU 62 has the potential to underestimate risks, especially in instances where residential buildings overly areas with contaminant concentrations that exceed the calculated EPC.

U.S. EPA has developed a spreadsheet tool, titled the Vapor Intrusion Screening Level (VISL) Calculator, which supports the calculation of recommended, but not mandatory, screening levels that can inform evaluations of vapor intrusion. The spreadsheet calculates VISLs using the recommended approaches outlined in U.S. EPA guidance documents to evaluating vapor intrusion. U.S. EPA VISLs were calculated for the list of petroleum hydrocarbons and chlorinated solvents for which ROD/DD endpoint criteria have been established for Adak groundwater sites (both SAERA and CERCLA). The VISLs calculated to support this vapor intrusion evaluation were adjusted to a cancer risk of 1×10^{-5} and a hazard index of 1.0 in order to be consistent with previous assessments conducted under SAERA and CERCLA. Table 7-7 provides a summary of the VISLs calculated to support this investigation.

Historical data for downtown area wells were evaluated using the VISLs presented in Table 7-8. The evaluation involved a comparison of all detected concentrations in downtown area monitoring wells to the VISLs. In instances where a detected result exceeded a VISL, the corresponding well and chemical were considered to pose a potential vapor intrusion issue that required further evaluation of the data for the corresponding well. Table 7-9 provides a summary of the wells and corresponding chemicals that exceeded VISLs in the historical groundwater data for the downtown area of Adak. The analytical results for the list of wells and chemicals shown in Table 7-9 were further evaluated to determine whether time-series data indicated that subsequent sampling results (i.e., collected after the exceedance of the VISL) showed that concentrations had decreased to below the VISL in more recent sampling. In addition, the general magnitude of the VISL exceedance and the timeframe in which the exceedance occurred were also taken into consideration in determining whether further evaluation is required. Specifically, slight exceedances of the VISL for results that were more than 10 years were determined to require no further evaluation due to the likelihood that contaminant degradation would be expected to reduce concentrations to below VISLs over time.

Based on this evaluation, five existing wells were determined to indicate a potential vapor intrusion issue:

1. 03-421 (Arctic Acres): Naphthalene
2. 03-890 (Arctic Acres): Naphthalene
3. HMW-134-2 (SWMU 62): Benzene, Ethylbenzene, Naphthalene, and Total Xylenes
4. MW-134-10 (SWMU 62): Naphthalene and TCE
5. MW-303-25 (Area 303): Total Xylenes

Referring to Figure 7-1, currently the structures around wells 03-890, HMW-134-2, and MW-134-10 are not occupied; however, if there is a potential for these structures to be occupied in the future, additional evaluation would need to be conducted to determine if vapor intrusion is an issue.

As shown above, a majority of the wells and chemicals exhibiting a potential vapor intrusion concern correspond to petroleum-related chemicals in groundwater, with only one instance where a chlorinated solvent-related chemical was determined to pose a potential concern (i.e., TCE in MW-134-10).

In addition to the data evaluation described above, monitoring results from 2014 and 2015 were evaluated to identify wells within the residential portion of the downtown area of Adak in which measurable free product was observed. Based on this evaluation, there were two instances in which petroleum free product was measured in wells located within the area of interest:

1. 03-890 (Arctic Acres)
2. MW-107-1 (SWMU 62)

Figure 7-1 provides a map of the downtown residential area that summarizes the results of the vapor intrusion evaluation. Based on the results of this evaluation, a total of six wells either have

historical exceedances of the VISLs provided in Table 7-8 or measurable free product observed in 2014 or 2015. The results of this evaluation do not indicate that unacceptable risk from vapor intrusion exist, but rather that further evaluation is necessary to provide data to support the site is protective based on vapor intrusion into indoor air in the downtown area of Adak. One noteworthy observation of these results is that naphthalene is the most common driver of the need to conduct further evaluations. Naphthalene can be associated with releases of both gasoline and diesel fuels. Based on the documents reviewed as part of this five-year review, diesel fuel is commonly discussed as being non-volatile, which is generally true. However, naphthalene is a common SVOC associated with releases of diesel fuel. As shown in Table 7-7, the VISL for naphthalene is 46 µg/L, which is an order of magnitude less than the current ROD/DD endpoint criteria for naphthalene. Based on the relatively low magnitude of the VISL for naphthalene and its association with diesel fuel, in the future, potential vapor intrusion issues should not be discounted for areas impacted with DRO until naphthalene has been appropriately considered.

7.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? In 2016, U.S. EPA published a PFOA Health Advisory which identified perfluorinated chemicals (PFCs) as an emerging contaminant. Based on a review of historical site use, the Former Fire Fighting Training Area (SWMU 16) exhibits the characteristics of a site at which aqueous fire-fighting foams (AFFFs) could have been used in a manner that could result in the release of PFCs to the environment. Consumption of impacted groundwater is a route of human exposure to PFCs, which would not be considered a complete exposure pathway for the Former Fire Fighting Training Area. In addition, Adak's drinking water source is Lake Bonnie Rose which, due to its location, is not impacted by PFCs. As the DON develops a national plan to sample suspect PFC contaminated sites, sites identified at Adak will be sampled by 2019.

In addition, changes to 18 AAC 75 dealing with cleanup levels for soil and groundwater and how they are calculated for contaminated sites and leaking underground storage tanks will become effective on November 6, 2016. The impact of those changes will be evaluated in the 5th five-year review.

Finally, part of the removal action at OU B-2 includes periodic clearance of the mouth of Andrew Lake, which supports lake drainage and maintains a stable lake elevation. Discontinuing clearance activities at the end of the OU B-2 removal action may result in a change in the elevation of the lake, thus impacting 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 and SAERA sites on Adak. The remedy will be protective for the three following sites as discussed in Section 7.1.1:

SAERA sites

1. SWMU 60, Tank Farm A
2. SWMU 62, New Housing Fuel Leak
3. Former Power Plant, Building T-1451

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. In August 2014, the RACR (U.S. Navy, 2014f) was finalized for OU B-1, which documented that the remedial actions specified in the OU B-1 ROD had been completed and no further response actions are necessary. A key component of the OU B-1 remedy are the LUCs which are functioning as intended.

The vapor intrusion evaluation conducted as part of this five-year review has identified six wells within the residential area at Adak with results indicating that a potential vapor intrusion issue may be present. These six wells either have historical exceedances of the VISLs provided in Table 7-8 or measurable free product observed in 2014 or 2015. The results of this vapor intrusion evaluation do not necessarily mean that unacceptable risk from vapor intrusion exist. Rather, this evaluation indicates that further sampling of groundwater and potentially soil vapor should be conducted to produce data that confirm the downtown area of Adak is protective based on vapor intrusion into indoor air.

7.5 Issues

Table 7-9 lists the issues identified as a result of the five-year review technical assessment of the remedies at Adak.

There were several items identified during this five-year review that do not affect protectiveness for any of the sites evaluated. The issues identified and proposed recommendations to optimize the Navy efforts to close out sites are:

- Issue: CERCLA OU A. EPA recently modified exposure and toxicity data assumptions in OSWER 9200.1-120, thus changing the endpoint criteria for fish/shellfish.

Recommendation: Prepare an Explanation of Significant Differences (ESD) to change endpoint criteria and update the CMP.

- Issue: CERCLA/SAERA. The OU A ROD referred to ARARs 18 AAC 70 or 40 CFR 131.36 to establish surface water endpoint criteria for SWMUs 11, 18/19 and 25. Changes occurred in 2008 to 18 AAC 70 that impacted some of the endpoint criteria values generated at the time of the OU A ROD signing. Table 7-3 identifies which values have changed and proposes new values.

Recommendation: Prepare an ESD to change endpoint criteria and update CMP.

- Issue: In 2008, ADEC revoked the 10 times rule in 18 AAC 75. This has an impact on endpoint criteria at NMCB Building and South of Runway 18-36.

Recommendation: Evaluate the impact on NMCB Building and South of Runway 18-36. Determine the appropriate mechanism to change cleanup levels in the DDs through an ESD or DD amendment. Update the CMP as necessary.

- Issue: CERCLA. At SWMU 11, after 15 years of monitoring no endpoint criteria are identified in the ROD. Over that period, sample results for antimony, arsenic and nickel have been at consistent levels at sample locations 101, 102 and 103. Sediment sample 102 was the only sample for which concentrations of target metals were observed to be above endpoint criteria. Sample location 103 is downgradient of location 102 and represents chemical of concern (COC) impact to marine sediments. No other samples had target metals exceeding endpoint criteria, which indicates that the exposure pathway for ecological risk in Kuluk Bay is not completed.

Recommendation: Evaluate sediment monitoring at SWMU 11 and determine if continued monitoring is appropriate.

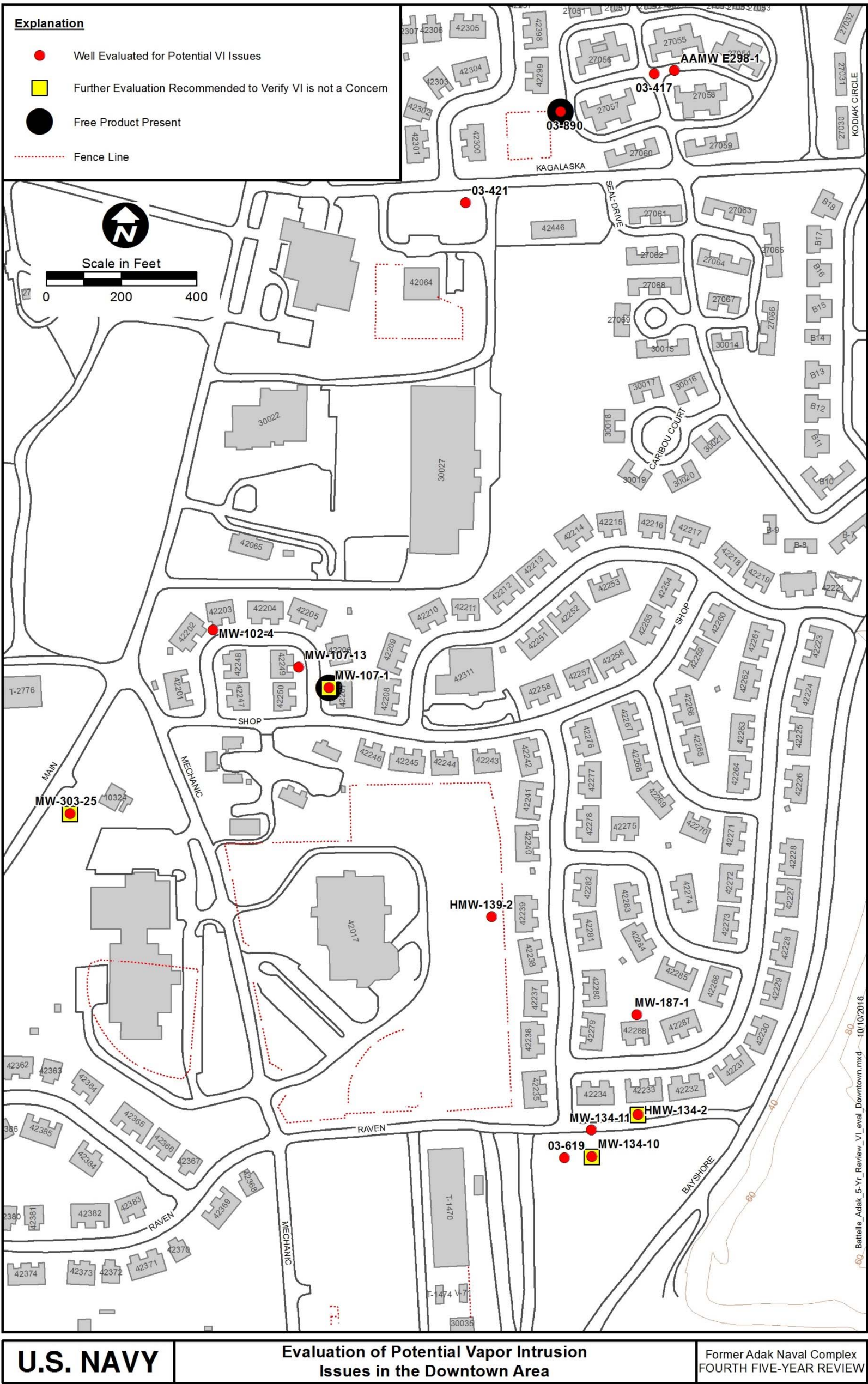


Figure 7-1. Evaluation of Potential Vapor Intrusion Issues in the Downtown Area

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Table 7-1. Status Summary for OU A and SAERA Sites


Site	Regulatory Authority	Current Status	Timing of Regulatory Designation	Protectiveness Statement
Amulet Housing, Well AMW-706 Area ^(b)	SAERA ^(a)	Cleanup Complete	Post-first five-year review	Protective
Amulet Housing, Well AMW-709 Area ^(b)	SAERA ^(a)	Cleanup Complete	Post-first five-year review	Protective
Boy Scout Camp, West Haven Lake (UST BS-1) ^(b)	SAERA ^(a)	Cleanup Complete	Post-first five-year review	Protective
Contractor's Camp Burn Pad ^(b)	SAERA ^(a)	Cleanup Complete	Post-first five-year review	Protective
Finger Bay Quonset Hut, UST FBQH-1	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
MAUW Compound (UST 24000-A)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
NAVFAC Compound (USTs 20052 and 20053)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
Navy Exchange Building (UST 30027-A)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
New Roberts Housing, UST HST-7C	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
Officer Hill and Amulet Housing (UST 31052-A)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
Officer Hill and Amulet Housing, UST 31047-A	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
ROICC Contractor's Area (UST ROICC-8)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
ROICC Warehouse (UST ROICC-2)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
ROICC Warehouse (UST ROICC-3)	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area ^(b)	SAERA ^(a)	Cleanup Complete	Post-second five-year review	Protective
SA 82, NSGA P80, P81 Buildings	SAERA ^(a)	Cleanup Complete with ICs / Remedy in Place	Post-second five-year review	Protective
Yakutat Hangar, UST T-2039-A	SAERA ^(a)	Cleanup Complete with ICs	Post-second five-year review	Protective
Yakutat Hangar, USTs T-2039-B and T-2039-C	SAERA ^(a)	Cleanup Complete with ICs	Post-first five-year review	Protective
South Sweeper Creek	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 15, Future Jobs/DRMO	CERCLA, SAERA ^(a)	Remedy in Place Cleanup Complete with ICs	Post-third five-year review	Protective

Table 7-1. Status Summary for OU A and SAERA Sites (Continued)

Site	Regulatory Authority	Current Status	Timing of Regulatory Designation	Protectiveness Statement
Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
NORPAC Hill Seep Area	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
Runway 5-23 Avgas Valve Pit	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
SA 88, P-70 Energy Generator, UST 10578	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
SWMU 58 and SA 73, Heating Plant 6	SAERA ^(a)	Cleanup Complete with ICs	Post-third five-year review	Protective
SA 76, Old Line Shed Building	CERCLA	Remedy in Place / Cleanup Complete with ICs	OU A ROD	Protective
SWMU 2, Causeway Landfill	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 4, South Davis Road Landfill	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 10, Old Baler Building	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 16, Former Firefighting Training Area	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 20, White Alice/Trout Creek Disposal Area	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 21A, White Alice Upper Quarry	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 23, Heart Lake Drum Disposal Area	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 29, Finger Bay Landfill	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMUs 52, 53, and 59, Former Loran Station	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 67, White Alice PCB Spill Site	CERCLA	Remedy in Place / Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 24, Hazardous Waste Storage Facility	RCRA	Cleanup Complete with ICs	Post-first five-year review	Protective
SWMU 11, Palisades Landfill	CERCLA	Closed Landfill with Monitoring and ICs / Cleanup Complete with ICs	In Progress	Protective
SWMU 13, Metals Landfill	CERCLA	Closed Landfill with Monitoring and ICs / Cleanup Complete with ICs	In Progress	Protective
SWMU 25, Roberts Landfill	ADEC solid waste regulations	Closed Landfill with Monitoring and ICs	In Progress	Protective

Table 7-1. Status Summary for OU A and SAERA Sites (Continued)

Site	Regulatory Authority	Current Status	Timing of Regulatory Designation	Protectiveness Statement
SWMUs 18/19, White Alice Landfill	ADEC solid waste regulations	Closed Landfill with Monitoring and ICs	In Progress	Protective
GCI Compound, UST GCI-1	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Protective
Area 303	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Protective
Former Power Plant, Building T-1451	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Will be protective
Housing Area, Arctic Acres	SAERA ^(a)	Active - MNA/IC	In Progress	Protective
NMCB Expanded Area	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Protective
ROICC Contractor's Area, UST ROICC-7	SAERA ^(a)	Active - MNA/IC	In Progress	Protective
SA 79, Main Road Pipeline	CERCLA, SAERA ^(a)	Remedy in Place/Active - MNA/IC	In Progress	Protective
SA 80, Steam Plant 4, USTs 27089 and 27090	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Protective
South of Runway 18/36	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Protective
SWMU 14, Old Pesticide Disposal Area	CERCLA, SAERA ^(a)	Remedy in Place/Active - MNA/IC	In Progress	Protective
SWMU 17, Power Plant 3	CERCLA, SAERA ^(a)	Remedy in Place/Active - LTM/IC	In Progress	Protective
SWMU 55, Public Works Transportation Department Waste Storage Area	CERCLA	Remedy in Place - LTM/IC	In Progress	Protective
SWMU 60, Tank Farm A	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Will be protective
SWMU 61, Tank Farm B	CERCLA, SAERA ^(a)	Remedy in Place/Active - MNA/IC	In Progress	Protective
SWMU 62, New Housing Fuel Leak	SAERA ^(a)	Active - MNA/IC/FPR	In Progress	Will be protective
Tanker Shed, UST 42494	SAERA ^(a)	Active - MNA/IC	In Progress	Protective
Kuluk Bay	CERCLA	Remedy in Place - MTM/IC	In Progress	Protective
Sweeper Cove	CERCLA	Remedy in Place - MTM/IC	In Progress	Protective

 Denotes a site at which has been identified through the five-year review process to require follow-up actions; therefore, the sites will be protective or are protective in the short term.

(a) The regulatory authority for sites conducted under is ADEC 18 AAC 75.

(b) Contractor's Camp Burn Pad and SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area were changed from "Cleanup Complete with ICs" to "Cleanup Complete" on December 28, 2011 and October 17, 2016, respectively which occurred during the fourth five-year review period. In addition, Amulet Housing, Well AMW-706 Area; Amulet Housing, Well AMW-709 Area; and Boy Scout Camp, West Haven Lake, UST BS-1 sites were changed from "Cleanup Complete with ICs" to "Cleanup Complete" on November 8, 2016.

FPR – free product recovery
IC – institutional control
MNA – monitored natural attenuation
MTM – marine tissue monitoring
NFA – no further action

MNA – monitored natural attenuation
MTM – marine tissue monitoring
NFA – no further action

Table 7-2. Endpoint Criteria for Groundwater at CERCLA and SAERA Sites

Analyte	Alaska Cleanup Levels 18 AAC 75.345 (µg/L)
Petroleum Hydrocarbons	
GRO (AK 101)	2,200
DRO (AK 102)	1,500
TAH ^a	10
TAqH ^a	15
Volatile Organic Compounds	
Benzene	5
Ethylbenzene	700
Toluene	1,000
Total xylenes	10,000
1,1-Dichloroethene	7
cis-1,2-Dichloroethene	70
trans-1,2-Dichloroethene	100
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2
Inorganics	
Lead	15
Polycyclic Aromatic Hydrocarbons	
Fluorene	1,460
Indeno(1,2,3-c,d)pyrene	1
Naphthalene	700
Phenanthrene	11,000
Pyrene	1,100

^aTAH is calculated by summing the detected concentrations of BTEX when one or more was detected and by summing the LOQs when none was detected. TAqH is calculated by summing the detections of BTEX and 16 PAHs when one or more was detected and by summing the LOQs when none was detected. The TAH and TAqH ROD/DD endpoint criteria are based on Alaska Department of Environmental Conservation water quality standards as specified in 18 AAC 70.

Table 7-3. Comparison of Surface Water ROD/DD Endpoint Criteria for SWMUs 18/19, and 25 from the CMP, Revision 6 to Updated ARARs Values

Analyte	Aquatic Life (Chronic) (µg/L)			Human Health (Organisms Only) (µg/L)		
	Rev 6 CMP	40 CFR 131.36	18 AAC 70	Rev 6 CMP	40 CFR 131.36	18 AAC 70
1,1-Dichloroethene	None	None	None	320	3.2	None
cis-1,2-dichloroethene	None	None	None	None	None	None
trans-1,2-dichloroethene	None	None	None	None	None	140,000
Benzene	None	None	None	710	71	None
Ethylbenzene	None	None	None	3,280 ^(a)	29,000	29,000
Toluene	None	None	None	424,000	200,000	200,000
Trichloroethene	None	None	None	810	81	None
Total Xylenes	None	None	None	None	None	None
Aluminum	87	None	87	None	None	None
Antimony	None	None	None	45,000	4,300	4,300
Arsenic	190	190	150	1.4 ^(b)	0.14	None
Beryllium	190	None	None	1.4	None	None
Cadmium	1.1	1.03	0.25	None	None	None
Chromium III	210	178	74	None	None	None
Chromium VI	11	10	11	None	None	None
Copper	12	11.35	8.96	None	None	None
Lead	3.2	2.52	2.52	None	None	None
Mercury	0.012	0.012	0.9081	0.15	0.15	0.051
Nickel	160	157	52	100	4,600	4,600
Selenium	5	5	5	None	None	11,000
Silver	0.12	None	None	None	None	None
Thallium	None	None	None	48	6.3	6.3
Zinc	110	104.5	118	None	None	69,000

CMP, Revision 6 values do not reflect current ARAR values; however, are values determined at the signing of the ROD.

Bold font indicates most conservative value.

- (a) Human health criteria for carcinogens come from U.S. 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.
- (b) Human health criterion came from U.S. EPA National Recommended Water Quality Criteria and are based on a carcinogenicity of 10⁻⁵ risk (U.S. EPA, 2009).

Table 7-4. 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	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)	1.5	18 AAC 75.345(b)(1)	--	--	--	--
Gasoline-range organics	1,700	18 AAC 75.340(a)(4)	2.2 (1.3)	18 AAC 75.345(b)(1)	--	--	--	--
Benzene	--	--	0.005	18 AAC 75.345(b)(1)	--	--	--	--
Lead	--	--	0.015	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)	--	--	--	--
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	--	--	1.5	18 AAC 75.345(b)(1)	0.00025	Eco RBSC ^b (PQL)	90.6	Eco RBSC ^b
Gasoline-range organics	--	--	--	--	0.114	Eco RBSC	12.2	Eco RBSC ^b
Indeno(1,2,3-cd)pyrene	--	--	--	--	0.00028	Eco RBSC	--	--
TAH	--	--	--	--	0.01	18 AAC.70	--	--
TAqH	--	--	--	--	0.015	18 AAC.70	--	--

Table 7-4. Site-Specific Alternative Cleanup Levels for Free-Product Sites (Continued)

Chemical	Site-Specific ACL for Soil (mg/kg) ^a	Basis for Soil ^a	Site-Specific ACL for Groundwater (mg/L)	Basis for Groundwater	Site- Specific ACL for Surface Water (mg/L)	Basis for Surface Water	Site-Specific ACL for Sediment (mg/kg)	Basis for Sediment
2-Methylnaphthalene	--	--	--	--	--	--	0.0202	Eco RBSC ^b
Phenanthrene	--	--	--	--	--	--	0.225	Eco RBSC ^b
SWMU 17, Power Plant No. 3								
Diesel-range organics	--	--	1.5	18 AAC 75.345(b)(1)	--	--	--	--

^aSoil cleanup levels based on ADEC Method Four, a calculated risk value discussed in the text.

^bIf the PQL was lower than the ecological risk based cleanup level, the cleanup level was set to the PQL.

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 7-5. Soil Cleanup Levels for Ordnance Compounds Identified in the OU B-1 ROD

Chemical	ROD-Specified Cleanup Level (mg/kg)	2010 RSLs (from the third five-year review) (mg/kg)	2015 RSLs (mg/kg)
Dinitrotoluene (mixture)	0.72	0.72	0.8
2,4,6-Trinitrotoluene	18	19	21
Nitroglycerin	35	6.1	6.3
Nitroguanidine	6100	6100	6300
Tetryl (trinitrophenylmethylnitramine)	610	240	160
RDX (cyclonite)	4.4	5.5	6.1

Bolded values have decreased since the third five-year review (i.e., 2010 RSLs).

Table 7-6. Comparison of OU A ROD and 2015 Revised Risk-based Total PCB RGs for Fish and Shellfish Tissue in Kuluk Bay and Sweeper Cove

Fish Ingestion		ED years	EF days/yr	IR g/day	FI unitless	CF kg/g	BW kg	AT days	CSF (mg/kg-day) ⁻¹	TR unitless	RG mg/kg
OU A ROD	Tot PCBs	30	365	126	1	0.001	70	25550	2.00E+00	1.E-05	0.0065
2015 Review	Tot PCBs	20	365	126	1	0.001	80	25550	2.00E+00	1.E-05	0.0111
Shellfish Ingestion		ED years	EF meals/yr	IR g/meal	FI unitless	CF kg/g	BW kg	AT days	CSF (mg/kg-day) ⁻¹	TR unitless	RG mg/kg
OU A ROD	Tot PCBs	30	365	26	1	0.001	70	25550	2.00E+00	1.E-05	0.0314
2015 Review	Tot PCBs	20	365	26	1	0.001	80	25550	2.00E+00	1.E-05	0.0538

Note: exposure parameters obtained from Table 6-2 in the 2000 OU A ROD.

AT – averaging time
BW – body weight
CF – conversion factor
ED – exposure duration
EF – exposure frequency
FI – fraction ingested
IR – ingestion rate
RG – remedial goal
TR – target risk level

Table 7-7. U.S. EPA Vapor Intrusion Screening Levels (VISLs) for Groundwater

Analyte	Alaska Cleanup Levels 18 AAC 75.345 (µg/L)	VISL GW Screening Level (Cancer Risk =1 x 10 ⁻⁵)	Result
Chlorinated Solvents			
1,1-Dichloroethene	7	200	The VI screening levels calculated for all chlorinated solvents are greater than or equal to the endpoint criteria under 18 AAC 75.345.
cis-1,2-Dichloroethene	70	NE	
trans-1,2-Dichloroethene	100	NE	
Tetrachloroethene	5	58	
Trichloroethene	5	5.2	
Vinyl chloride	2	2	
Petroleum Hydrocarbons			
Benzene	5	16	ROD/DD endpoint criteria exceeds the VI screening level.
Ethylbenzene	700	35	Both ROD/DD endpoint criteria exceed the VI screening level.
Toluene	1,000	19,000	Both ROD/DD endpoint criteria are below the VI screening level.
Total xylenes	10,000	380	Both ROD/DD endpoint criteria exceed the VI screening level.
Fluorene	1,460	NE	NA
Indeno(1,2,3-c,d)pyrene	1	NV	NA
Naphthalene	700	46	ROD/DD endpoint criterion is below the VI screening level.
Phenanthrene	11,000	NE	NA
Pyrene	1,100	NE	NA

Denotes an analyte for which the current ROD/DD endpoint criteria may not be protective of vapor intrusion into indoor air

NE = Not Established (i.e., based on the output of the U.S. EPA VISL calculator)

NV = Not Volatile

NA = Not Applicable

Table 7-8. Summary of Results for Recommendations for Wells Indicating a Potential Vapor Intrusion Issue

Well ID	Analyte	Results	Recommendation
03-417	Naphthalene	Detected at 46 µg/L in October 1996, no subsequent sample results.	No further evaluation. Detected concentration is equal to the VISL and is 20 years old; degradation would be expected over time.
03-421	Naphthalene	Detected at 86.3 µg/L in October 2001, no subsequent sample results.	No further evaluation. Nearby housing units have been condemned and are unoccupied. Exposure pathway is not complete.
03-619	Benzene	Benzene concentrations reduced to below VISL after June 2000.	No further evaluation.
	Ethylbenzene	Ethylbenzene concentrations reduced to below VISL after June 2000.	No further evaluation.
03-890	Ethylbenzene	Last ethylbenzene result was from October 2002 (34 µg/L) and was below the VISL.	No further evaluation.
	Naphthalene	Last naphthalene result was from October 2002 (86.2 µg/L) and was above the VISL.	No further evaluation. Nearby housing units have been condemned and are unoccupied. Exposure pathway is not complete.
AAMW E298-1	Naphthalene	Last naphthalene result was from October 1996 (59 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
HMW-134-2	Benzene	Last benzene result was from September 2001 (152 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of benzene in groundwater. Housing boarded up.
	Ethylbenzene	Last ethylbenzene result was from September 2001 (302 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of ethylbenzene in groundwater. Housing boarded up.
	Naphthalene	Last naphthalene result was from January 1997 (177 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of naphthalene in groundwater. Housing boarded up.
	Total Xylenes	Last total xylenes result was from September 2001 (373 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of total xylenes in groundwater. Housing boarded up.

Table 7-8. Summary of Results for Recommendations for Wells Indicating a Potential Vapor Intrusion Issue (Continued)

Well ID	Analyte	Results	Recommendation
HMW-139-2	Benzene	Last benzene result was from September 2001 (19.4 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
	Ethylbenzene	Last ethylbenzene result was from September 2001 (43.4 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
	Naphthalene	Last naphthalene result was from January 1997 (63.9 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
MW-102-4	Naphthalene	Last naphthalene result was from February 1997 (48 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
MW-107-13	Naphthalene	Last naphthalene result was from February 1997 (46.1 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
MW-134-10	Benzene	Last benzene result was from September 2001 (7.22 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
	Ethylbenzene	Last ethylbenzene result was from September 2001 (44.2 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
	Naphthalene	Last naphthalene result was from September 1996 (106 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of naphthalene in groundwater.
	Trichloroethene	Last TCE result was from July 1993 (180 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of TCE in groundwater.

Table 7-8. Summary of Results for Recommendations for Wells Indicating a Potential Vapor Intrusion Issue (Continued)

Well ID	Analyte	Results	Recommendation
MW-134-11	Benzene	Benzene concentrations reduced to below VISL after September 1996.	No further evaluation.
	Ethylbenzene	Ethylbenzene concentrations reduced to below VISL after September 1996.	No further evaluation.
	Naphthalene	Last naphthalene result was from September 1996 (61 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.
MW-187-1	Benzene	Benzene concentrations reduced to below VISL after September 2006.	No further evaluation.
	Ethylbenzene	Ethylbenzene concentrations reduced to below VISL after September 2010.	No further evaluation.
MW-303-25	Total Xylenes	Last total xylenes result was from June 2006 (1,280 µg/L) and was above the VISL.	Further evaluation recommended to assess current concentrations of total xylenes in groundwater.
MW-303-7	Ethylbenzene	Last ethylbenzene result was from September 2011 (36 µg/L) and was above the VISL.	No further evaluation. Detected concentration is only slightly greater than the VISL and contaminant degradation would be expected over time.

Denotes wells that are recommended for further evaluation for vapor intrusion

Note: MW-107-1 is also recommended for further evaluation due to the presence of free product in the well. No BTEX compounds exceeded the VISL. Naphthalene data was not available for this well.

Table 7-9. Issues Identified for the Fourth Five-Year Review

No.	Issue	Affects Protectiveness?	
		Current	Future
1	SAERA. Surface water and sediment conditions in East Canal at the groundwater seep near Boom 3 continue to exceed Water Quality Standards. These findings suggest the remedy at SWMU 62 may not be functioning as intended at one or more locations.	Yes	No
2	SAERA. The vapor intrusion evaluation conducted as part of this five-year review has identified three wells (see Figure 7-1) within the residential area at Adak with results indicating that a potential vapor intrusion issue for naphthalene may be present.	No	Yes
3	SAERA. Surface water and sediment conditions in East Canal at the groundwater seep near Boom 11 continue to exceed Water Quality Standards. These findings suggest the remedy at Building T-1451 may not be functioning as intended at one or more locations.	Yes	No
4	SAERA. Surface water and sediment conditions in South Sweeper Creek and free product observed in groundwater adjacent to South Sweeper Creek at SWMU 60 suggest the remedy may not be functioning as intended.	Yes	Yes
5	CERCLA OU A. The remedy at SWMU 4 currently protects human health and the environment in the short term because at the current depth of Andrew Lake, the landfill is contained. However, once remedial activity at OU B-2 is complete, periodic clearance of the mouth of Andrew Lake may no longer occur, impacting Lake drainage. The elevation of the Lake surface could rise to threaten the landfill cap. Long-term protectiveness could be an issue that requires evaluation during the next 5 years.	No	Yes
6	CERCLA OU A. Heightened interest in the emerging contaminant, PFCs, are resulting in DoD-wide investigations to determine the potential presence at sites that AFFF was historically used. SWMU 16 has been identified as a potential site. Long-term protectiveness could be an issue that requires evaluation during the next 5 years.	No	Yes

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This section presents the recommendations and follow-up actions to address issues identified through the five-year review process. Tables 8-1 summarizes the protectiveness recommendations/follow-up actions, respectively and identifies the responsible party, the oversight agency, and the milestone date for completing the follow-up action.

Table 8-1. Protectiveness Recommendations and Follow-Up Actions

No.	Recommendation/Follow Up Action	Responsible Party	Oversight Agency	Milestone Date
1	At SWMU 62, a removal action under the SAERA petroleum program is being conducted to protect surface water downgradient of the sites.	Navy	ADEC	6/30/2017 ^(a)
2	Collect additional data to determine if vapor intrusion is an issue. Compare results to appropriate screening criteria.	Navy	ADEC, U.S. EPA	12/13/2018
3	In East Canal near Building T-1451, a removal action under the SAERA petroleum program is being conducted to protect surface water downgradient of the sites.	Navy	ADEC	6/30/2017 ^(a)
4	In South Sweeper Creek near SWMU 60, determine if and what additional action under SAERA may be required to protect surface water downgradient of the site.	Navy	ADEC	4/30/2018
5	Evaluate the potential impacts of discontinued clearing of the Andrew Lake spillway and the resulting elevated lake levels on SWMU 4. Determine if alternative actions are required to either manage the elevation of Andrew Lake or enhance the landfill shoreline protection to ensure protectiveness at the site in the long term.	Navy	ADEC, U.S. EPA	12/13/2018
6	Sample for PFC per Navy guidance at SWMU 16. Since OU A ROD established a groundwater restriction for use as drinking water, this exposure pathway is not complete.	Navy	ADEC, U.S. EPA	12/13/2019

(a) This milestone represents that the field work is complete and the Navy has submitted the report documenting the results of the removal action to ADEC.

9.0 NEXT REVIEW

The next five-year review is scheduled for completion in December 2021.

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- . 2000. *Final Record of Decision for Operable Unit A, Former Adak Naval Complex, Adak Island, Alaska*. Prepared by URS Greiner, Inc., for Engineering Field Activity, Northwest, under CLEAN Contract No. N62474-89-D-9295. Poulsbo, Washington. April 13, 2000.
- . 1995. *Draft Final Record of Decision, Naval Air Facility Adak, Site 11 (Palisades Landfill) and Site 13 (Metals Landfill), Adak Island, Alaska*. Prepared by URS Greiner, Inc., for Engineering Field Activity, Northwest, under CLEAN Contract No. N62474-89-D-9295. Poulsbo, Washington. March 31, 1995. Accepted as final May 1995.