THE UNITED STATES AIR FORCE
INSTALLATION RESTORATION PROGRAM

FINAL

FIVE-YEAR ROD REVIEW REPORT

Prepared for:

EIELSON AIR FORCE BASE, ALASKA

SEPTEMBER 2008

This page intentionally left blank

Preface

This document was prepared for the United States Air Force (USAF) by EA Engineering, Science, and Technology, Inc. (EA) to aid in the implementation of long-term environmental monitoring under the Air Force Installation Restoration Program (IRP). The limited objectives of this document and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this document, as subsequent facts may become known that may make this document premature or inaccurate.

Government agencies and their contractors registered with the Defense Technical Information Center should direct requests for copies of this document to Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22304-6145.

Non-government agencies may purchase copies of this document from National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

This page intentionally left blank

USEPA concurrence letter

This page intentionally left blank

ADEC concurrence letter

This page intentionally left blank

USAF acceptance letter

This page intentionally left blank

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	**2. REPORT DATE** *September 2008*	**3. REPORT TYPE AND DATES COVERED** *Five-Year ROD Review, Sept 28, 2003 to Sept 28, 2008*

4. TITLE AND SUBTITLE
FIVE-YEAR ROD REVIEW REPORT, EIELSON AIR FORCE BASE, ALASKA

5. FUNDING NUMBERS
FA8903-04-D-8685-0009

6. AUTHOR(S) ***Mark Wilkinson, Jodie Pang, John Harding***

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
EA Engineering, Science & Technology, Inc.
3544 International Street
Fairbanks, AK 99701

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Center for Engineering and the Environment
HQ AFCEE/ERD-AK (Ms. Cindy Hood)
10471 20th Street, Suite 317
Elmendorf Air Force Base, AK 99506-2200

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
N/A

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
AFCEE/IWP-AK, Elmendorf Air Force Base, AK
354 CES/CEAN, Eielson Air Force Base, AK
Alaska Department of Environmental Conservation (ADEC), Fairbanks, AK
United States Environmental Protection Agency (USEPA) Region 10, Seattle, WA

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 word)
Five-year ROD Review for Operable Units 1 through 6 and Sitewide at Eielson AFB, Alaska.

14. SUBJECT TERMS
Eielson Air Force Base
- *Five-year ROD Review for source areas requiring further action as required under CERCLA §121 and 40 C.F.R Part 300.430(f)(4)(ii)*

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT *Unclassified*	**18. SECURITY CLASSIFICATION OF THIS PAGE** *Unclassified*	**19. SECURITY CLASSIFICATION OF ABSTRACT** *Unclassified*	***20. LIMITATION OF ABSTRACT***

This page intentionally left blank

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (Concluded)

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ARARs	Applicable or Relevant and Appropriate Requirements
asl	above sea level
AST	aboveground storage tank
BEP	bis-2-ethylhexyl phthalate
bgs	below ground surface
BLRA	Baseline Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and xylene(s)
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of Concern
CRREL	Cold Regions Research and Engineering Laboratory
cy	cubic yards
DCE	dichloroethene
DDD	2,2-bis(para-chlorophenyl)-1,1-dichloroethane
DDE	1,1-dichloro-2,2-bis(para-chlorophenyl)-ethylene
DDT	dichlorodiphenyltrichloroethane
DHC	Dehalococcoides ethenogenes
DRO	Diesel Range (Petroleum Hydrocarbon) Organic Compounds
DQOM	Data Quality Objective Monitoring
EA	EA Engineering, Science, and Technology
Eielson AFB	Eielson Air Force Base
FFA	Federal Facility Agreement
FNSB	Fairbanks North Star Borough
ft	feet
GRO	Gasoline Range (Petroleum Hydrocarbon) Organic Compounds
ft	Hazardous Materials
IC	Institutional Control
IRA	Interim Remedial Action
IRP	Installation Restoration Program
km	kilometer

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
MEC	munitions and explosives of concern
mg/Kg	milligram(s) per kilogram
µg/Kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
mg/Kg-day	milligram(s) per kilogram per day
MOGAS	motor gasoline
NAPL	non-aqueous phase liquid
NBW	North Boundary Wells
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety & Health Administration
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene; also known as perchloroethene
POL	Petroleum, Oil, and Lubricant
ppm	parts per million
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPMs	Remedial Project Managers
RPO	Remedial Process Optimization
SARA	Superfund Amendments and Reauthorization Act of 1986
SOPs	Standard Operating Procedures

LIST OF ACRONYMS AND ABBREVIATIONS (Concluded)

SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWMP	Sitewide Monitoring Program
TCE	trichloroethene
TI	Technical Impracticability
TPH	total petroleum hydrocarbons
TRC	Technical Review Committee
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	volatile organic compound

This page intentionally left blank

EXECUTIVE SUMMARY

This report documents the third Five-Year Review for the Installation Restoration Program (IPR) at Eielson Air Force Base (AFB), Alaska. The IRP at Eielson AFB consists of Operable Units (OU) 1 through 6 and the Sitewide OU. This report reviews remedies selected in the individual Record of Decision (ROD) documents that resulted in hazardous substances, pollutants, or contaminants remaining at the sites above levels allowing unlimited use and unrestricted exposure, Remedial Action Objectives (RAOs), current technical assessments, and any current issues.

OU 1 contains source areas ST20, ST48, and SS50-SS52, requiring a Five-Year Review. The remedy for OU1 is expected to be protective of human health and the environment, and the interim exposure pathways that could potentially pose unacceptable risks are being controlled. The remedy for OU1 source areas has been addressed through a combination of bioventing, product recovery, groundwater monitoring, and the implementation of Institutional Controls (ICs) to prevent exposure to, ingestion of, or the inhalation of vapor from contaminated groundwater. Bioventing systems located at ST20 and ST48 ceased operation in 2002 as respiration rates indicated that soil remediation goals were achieved. The product recovery system located at SS50-SS52 ceased operation in 2004 due to impracticability. Contamination at SS50-SS52 presents minimal risks to human health and the environment due to the remote site location and groundwater immobility. Product recovery efforts at SS50-SS52 had limited success, and were not significantly reducing the time to reach remediation goals. No issues were identified relating to the protectiveness of the remediation processes at the OU1 source area. Groundwater monitoring and the implementation of ICs will continue at the OU1 source area until RAOs are achieved.

OU 2 contains source areas ST10/SS14 and ST13/DP26, requiring a Five-Year Review. The remedy for OU2 is expected to be protective of human health and the environment, and the interim exposure pathways that could potentially pose unacceptable risks are being controlled. The remedy for the OU2 source areas has been addressed through a combination of bioventing, product recovery, groundwater monitoring, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater. Bioventing systems located at ST10/SS14 and ST13/DP26 ceased operation during the summer 2008 as respiration rates indicated that soil remediation goals had been achieved. Free product recovery had minimal success, and was largely discontinued in 2002. No issues were identified relating to the protectiveness of the remediation processes at the OU2 source area. Groundwater monitoring and the implementation of ICs will continue at the OU2 source area until RAOs are achieved.

OUs 3, 4, and 5 are combined under the OU3,4,5 ROD. This Five-Year ROD Review was conducted for OU3 source areas DP44, WP45/SS57, ST56, and SS61, OU4 source areas DP25 and ST58, and OU5 source areas LF03/FT09. The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by United States Environmental Protection Agency (USEPA) guidance because RAOs are not expected to be met. The remedy for OUs 3, 4, and 5 source areas has been addressed through a combination of natural attenuation, groundwater monitoring, providing an outside drinking water supply, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater. No issues were identified relating to the protectiveness of the remediation process for OUs 3, 4, and 5 source areas. Issues not related to protectiveness include OU3 source areas DP44, WP45/SS57, ST56, and SS61 not obtaining RAOs as chlorinated solvent concentrations are not decreasing. See Section 4 of this report for OU3 source area recommendations. Groundwater monitoring and the implementation of ICs will continue at the OU3, 4, and 5 source areas until RAOs are achieved.

OU 6 contains source area WP38, requiring a Five-Year Review. The remedy at OU6 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met. The remedy for the OU6 source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater. No issues were identified relating to the protectiveness of the remediation processes at the OU6 source area. Issues not related to protectiveness include OU6 source area WP38 not obtaining RAOs as Constituent of Concern (COC) concentrations remain above the Maximum Contaminant Levels (MCLs). See Section 7 of this report for the OU6 source area recommendation. Groundwater monitoring and the implementation of ICs will continue at the OU6 source area until RAOs are achieved.

A protectiveness determination of the remedy for the Sitewide OU, which contains source area SS67 (Garrison Slough), cannot be made until further information is obtained. Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of polychlorinated biphenyl (PCB) contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

Based on the results of this report, while six of the seven OUs are expected to be protective when remedial actions are complete, an overall protectiveness determination for the Eielson AFB Site cannot be made at this time until further information is obtained for the Sitewide OU/Garrison Slough remedy. Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of PCB contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

EPA's Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Eielson Air Force Base		
EPA ID: AK 1570028646		
Region: 10	**State: AK**	**City/County: Fairbanks North Star Borough**
SITE STATUS		
NPL status: Final **X** Deleted Other (specify)		
Remediation status (choose all that apply): Under Construction Operating **X** Complete		
Multiple OUs?* YES **X** NO	**Construction completion date:** 09/30/1998	
Has site been put into reuse? YES **X**** NO	** = portions of the site for industrial use, but with continued Institutional Controls	
REVIEW STATUS		
Lead agency: EPA State Tribe Other Federal Agency _US Air Force__		
Author name: Prepared by EA Engineering, Science, and Technology, Inc. under Air Force Center for Engineering and the Environment contract number FA8903-04-D-8685-0009.		
Author title:	**Author affiliation:**	
Review period: 09/28/2003 to 09/28/2008		
Date(s) of site inspection: 07/14/2008		
Type of review: Post-SARA_**X**___ Pre-SARA_____ NPL-Removal only_______ Non-NPL Remedial Action Site_____ NPL State/Tribe-lead______ Regional Discretion_______		
Review number: 1 (first) 2 (second) 3 (third) **X** Other (specify) __________		
Triggering action: Actual RA Onsite Construction at OU #_____ Actual RA Start at OU#_____ Construction Completion_____ Previous Five-Year Review Report _**X**____ Other (specify) __________		
Triggering action date *(from WasteLAN)*: 09/28/2003		
Due date *(five years after triggering action date)*: 09/28/2008		

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, Continued

Issues:

For Operable Unit 1:

No issues were identified for the protectiveness and remediation processes at Operable Unit 1 source areas.

For Operable Unit 2:

No issues were identified for the protectiveness and remediation processes at Operable Unit 2 source areas.

For Operable Unit 3, 4, and 5:

Source Area DP44, ST56, and SS61:
Issues related to remediation processes at OU3 include source areas DP44, ST56, and SS61 Chlorinated VOC concentrations at these source areas are not reaching MCLs.

Source Area WP45/SS57:
The vertical and lateral extent and stability of the TCE plume is unknown. Soil contamination within the source area exceeds the RAOs for TCE, potentially allowing continued leaching into the local groundwater. In addition, the results of the 2006 natural attenuation study indicate that inappropriate redox conditions and insufficient carbon substrate sources are present for the favorable reductive dechlorination of TCE. The vapor intrusion pathway is currently under evaluation using recently developed guidance by the USEPA and ADEC. These issues are not currently known to affect the protectiveness of the remedy. Institutional controls continue to prevent the ingestion of, and inhalation during use of contaminated groundwater.

No additional issues were identified for the protectiveness and remediation processes at Operable Unit 3, 4, and 5 source areas.

For Operable Unit 6:

Source Area WP38.
Issues related to remediation processes at OU6 include not achieving RAOs at source area WP38. The RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future.

No additional issues were identified for the protectiveness and remediation processes at the Operable Unit 6 source area.

For the Sitewide Operable Unit:

Source Area SS67.
Implementation of the selected remedy for the Sitewide OU has resulted in a reduction of PCB concentrations in sediments and levels available to human receptors, but did not fully achieve the cleanup goal of 10,000 ug/Kg. Fish tissue concentrations also did not meet the RAOs.

No additional issues were identified for the protectiveness and remediation processes at the Sitewide Operable Unit.

Five-Year Review Summary Form, Continued

Recommendations and Follow-up Actions:

For Operable Unit 1:

General:
Groundwater monitoring and the implementation of Institutional Controls (ICs) will continue at Operable Unit 1 source areas until RAOs are achieved.

For Operable Unit 2:

General:
Groundwater monitoring and the implementation of ICs will continue at Operable Unit 2 source areas until RAOs are achieved.

For Operable Unit 3, 4, and 5

Source Areas DP44, ST56, and SS61:
Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals. Eielson AFB will also evaluate a TI waiver for source area ST56.

Source Area WP45/SS57:
The RAOs for WP45/SS57 include preventing continued migration of TCE and benzene into the groundwater at concentration presenting a risk to potential future groundwater users. Eielson AFB will perform a pilot study injecting a carbon and zero valiant iron solution centered at monitoring well 45MW08. The pilot study will allow Eielson AFB to establish the parameters for remediation and scale up to a full design. Eielson AFB will perform additional down gradient and vertical groundwater monitoring to further evaluate the current plume extent.

General:
Groundwater monitoring and the implementation of ICs will continue at Operable Unit 3, 4, and 5 source areas until RAOs are achieved.

For Operable Unit 6:

Soruce Area WP38:
Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals or determine if a TI waiver is applicable for this source area. Groundwater monitoring and the implementation of ICs will continue at the Operable Unit 6 source area until RAOs are achieved.

General:
Groundwater monitoring and the implementation of ICs will continue at Operable Unit 3, 4, and 5 source areas until RAOs are achieved.

For the Sitewide Operable Unit:

Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of PCB contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

Five-Year Review Summary Form, Continued

General:
ICs will continue at the Sitewide Operable Unit until RAOs are achieved.

Protectiveness Statement(s):

For Operable Unit 1:
The remedy for Operable Unit 1 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for Operable Unit 1 source areas has been addressed through a combination of bioventing, product recovery, groundwater monitoring, and the implementation of ICs to prevent exposure to, ingestion of, or the inhalation of vapor from contaminated groundwater.

For Operable Unit 2:
The remedy for Operable Unit 2 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the Operable Unit 2 source areas has been addressed through a combination of bioventing, product recovery, groundwater monitoring, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater.

For Operable Units 3, 4, and 5:
The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met. The remedy for the Operable Units 3, 4, and 5 source areas has been addressed through a combination of natural attenuation, groundwater monitoring, providing an outside drinking water supply, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater.

For Operable Unit 6:
The remedy at OU6 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met. The remedy for the Operable Unit 6 source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent exposure to, or ingestion of, contaminated groundwater.

For the Sitewide Operable Unit:
A protectiveness determination of the remedy for the Sitewide OU, which contains source area SS67 (Garrison Slough), cannot be made until further information is obtained. Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of PCB contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

Five-Year Review Summary Form, Concluded

Comprehensive Protectiveness Statement:
Based on the results of this report, while six of the seven OUs are expected to be protective when remedial actions are complete, an overall protectiveness determination for the Eielson AFB Site cannot be made at this time until further information is obtained for the Sitewide OU/Garrison Slough remedy. Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of PCB contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

Other Comments:

None

This page intentionally left blank

1 INTRODUCTION

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Eielson Air Force Base (AFB) is required to conduct a Record of Decision (ROD) Review every five years. This Five-Year Review has been prepared in accordance with the United States Environmental Protection Agency (USEPA) Comprehensive Five-year Review Guidance, June 2001, USEPA 540-R-01-007, and Office of Solid Waste and Emergency Response No. 9355.77-03B-P.

1.1 Overview of the Five-Year Review Process

The purpose of this Five-Year Review is to determine whether the remedies implemented at the Eielson AFB sites are protective of human health and the environment through review of available documents. In addition, this document identifies issues found during the review, if any, and provides recommendations to remedy them.

This review is required as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA), that was added to CERCLA. A Five-Year Review is required when a remedial action results in hazardous materials, pollutants, or contaminants remaining on site above levels that would allow unlimited use and unrestricted exposure. A Five-Year Review is also required only for sites with a ROD or Decision Document signed on or after the October 17, 1986 effective date of SARA.

CERCLA §121(c), as amended, 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 judgement 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 action taken as a result of such reviews.

The agency interpreted this requirement further in the National Oil and Hazardous Substances Pollution Contingency Plan; 40 Code of Federal Regulations (CFR) Part 300.430(f)(4)(ii), states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the remedial action.

The United States Air Force (USAF) has conducted two previous Five-Year Reviews of the remedial actions implemented at Operable Units (OU)s 1 through 6 and the Sitewide OU at Eielson AFB, where selected remedies resulted in hazardous substances, pollutants, or contaminants remaining at the sites above levels allowing unlimited use and unrestricted exposure.

This Five-Year ROD Review Report documents the third ROD Review for the Eielson AFB Installation Restoration Program (IRP). This Five-Year Review covers the period of September 28, 2003 through September 28, 2008. The first Five-Year Review was triggered by construction of the OU1 Interim Remedial Action. The trigger for this Five-Year Review is the September 29, 2003 signature date of the second Five-Year Review document.

1.2 Public Involvement at Eielson AFB

1.2.1 Community Relations

After the signing of the Federal Facility Agreement (FFA) with the State of Alaska and the USEPA, and the listing of Eielson AFB on the National Priorities List (NPL), the USAF began its Superfund Clean-up Program. As part of this program, in accordance with CERCLA Sections 113 and 117, an extensive community relations program was initiated to involve the community in the decision-making process.

The community relations staff interviewed 40 local residents and community leaders to develop plans to keep residents informed about clean-up activities at Eielson AFB. Follow-up interviews and questionnaires of more than 100 residents helped revise the Community Relations Plan. An environmental clean-up newsletter was drafted and mailed to anyone who requested to be on the mailing list. Fact sheets on various topics related to the clean-up operations were also prepared and distributed. Several times a year articles describing significant clean-up events were released to the Base newspaper, *Goldpanner*, and the *Fairbanks Daily News Miner*. All of these efforts were designed to involve the community in the cleanup process.

1.2.2 Restoration Advisory Board

A Technical Review Committee (TRC) was established in 1992 that included three representatives from the community (selected by local officials and the University of Alaska Fairbanks Chancellor), industry representatives, and environmental agency representatives. In October 1994 the Eielson AFB TRC was disbanded and replaced with a Restoration Advisory Board (RAB). The RAB included members of government, concerned area residents, and members of the local environmental groups. Government members included representatives of USEPA Region 10, Alaska Department of Environmental Conservation (ADEC), and official(s) from the towns of Moose Creek and North Pole. Eielson AFB RAB meetings were held on a quarterly basis until December 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006. At RAB meetings Eielson AFB presents technical briefings and RAB members and attendees have had the opportunity to voice their concerns about environmental issues at Eielson AFB.

1.2.3 Community Involvement During Five-Year Review

The Five-Year ROD Review is an important milestone for public involvement. The public was informed of the Eielson AFB Five-Year Review as follows:

- A notice of the Five-Year ROD Review was distributed to EAFB RAB members, who are encouraged to disseminate this information with other community members.

- Notice of the Five-Year ROD Review Public Interview Period was published in the Fairbanks *Daily News Miner* on 21 July 2008. The public interview period was from 21 July 2008 through 15 August 2008. No interview requests were received.

- The RAB co chairs Terry Huisman and Dick Tomany were interviewed as part of this Five-Year ROD Review. The interviews are provided in Appendix B.

1.3 Facility Location and Description

Eielson AFB is an active military installation that has been used for military operations since its establishment in 1944. The mission of Eielson AFB is to train and equip personnel for close air support of ground troops in an arctic environment. Eielson AFB operations include industrial areas, aircraft maintenance and operations, an active runway and associated facilities, administrative offices, and residential and recreational facilities. Eielson AFB provides housing for resident military personnel and their dependents, and employment and services for civilians from the surrounding area. The Base extends for 19,700 acres, most of which is forest, wetlands, lakes, and ponds beyond the approximately 3,650 acres which have been improved or partially improved, and are used for the bulk of Base activities. An additional two-acre facility, called the Blair Lakes Target Range, has also been included in the Eielson AFB OU1. The Blair Lakes site is approximately 40 kilometers (km) southwest of the main Base, but is included in the cleanup activities because of its proximity to the Base and the similarity of the contaminants.

Eielson AFB is within the Fairbanks North Star Borough (FNSB), a county-scale municipality. Fairbanks is the urban center of the FNSB (Figures 1-1 and 1-2). North Pole, Moose Creek, and Salcha are suburban/rural areas within FNSB. North Pole (population 1,680; 30,440 outlying) is approximately 11 km northwest of the Base and Moose Creek (population 610) is approximately 4.8 km north of the Base. The community of Salcha (population 350) is located approximately 16 km south of the Base. The Trans-Alaska Pipeline transects the middle of the Base for a distance of approximately 8 km (Figures 1-1, 1-2).

Land surrounding Eielson AFB is primarily used for military training associated with Fort Wainwright, an active United States Army installation located northwest of Eielson AFB. The U.S. Army owns the land north and east of Eielson AFB, and west of the Tanana River. The town of Moose Creek and the Chena River Flood Control Project are located northwest of Eielson AFB. Eielson AFB owns the land west to Piledriver Slough. The land located between Piledriver Slough and the Tanana River is privately held. The land southwest of Eielson AFB is the private subdivision of Twenty-three Mile Slough.

Approximately 5,500 people live on Eielson AFB. Military housing is located in the central portion of the Base, east of Industrial Drive. Eielson AFB includes an elementary school, a junior high school, and a high school that are administered by the FNSB School District. Some children who live off Base also attend these schools. Some Base property is used for recreational purposes, including: athletics, gardening, berry picking, fishing, recreational vehicle camping (summer months), hunting and trapping (seasonal), and skiing (winter months).

Table 1-1: Source Area Status Summary

Source Area	Grouping	Description	Decision Document	IC's	Current Remedy or Status
ST20	OU1	E-7, E-9 Complexes (Refueling Loop)	OU1 ROD	Y	Biov.; NAPL Recovery, ICs
ST48	OU1	Power Plant Area	OU1 ROD	Y	Biov.; NAPL Recovery, ICs
SS50	OU1	Blair Lakes Vehicle Maintenance	OU1 ROD	Y	NAPL Recovery, ICs
SS51	OU1	Blair Lakes Ditch	OU1 ROD	Y	NAPL Recovery, ICs
SS52	OU1	Blair Lakes Diesel Spill	OU1 ROD	Y	NAPL Recovery, ICs
ST20	OU1	E-8 Complex (Refueling Loop)	OU1 ROD	N	NFA; Monitoring
ST49	OU1	Alert Hangar	OU1 ROD	N	NFA, Monitoring
SS53	OU1	Blair Lakes Fuel Spill	OU1 ROD	N	SC
DP54	OU1	Blair Lakes Drum Disposal Site	OU1 ROD	N	SC
ST10	OU2	E-2 POL Storage	OU2 ROD	Y	Biov.; NAPL Recovery, ICs
ST13	OU2	E-4 Fuel Saturated Area	OU2 ROD	Y	Biov.; NAPL Recovery, ICs
SS14	OU2	E-2 RR JP4 Fuel Spill Area	OU2 ROD	Y	Grouped with ST10
DP26	OU2	Fuel Tank Sludge Burial Area	OU2 ROD	Y	Grouped with ST13
LF05	OU2 (SER)	Old Army Landfill	OU2 ROD	Y	NFA; Monitoring
ST11	OU2	Fuel Saturated Area	OU2 ROD	N	NFA; Monitoring
ST18	OU2	Oil Boiler Fuel Saturated Area	OU2 ROD	N	NFA; Monitoring
ST19	OU2	JP4 Fuel Line Spill	OU2 ROD	N	NFA; Monitoring
SS31	OU2 (SER)	PCB Storage Facility	OU2 ROD	N	NFA; Monitoring
WP66	OU2 (SER)	New Auto Hobby Shop	OU2 ROD	N	NFA
LF07	OU2 (SER)	Test Landfill	OU2 ROD	N	SC
FT08	OU2 (SER)	Firefighter Training Area, Past	OU2 ROD	N	SC
SS12	OU2 (SER)	JP4 Fuel Spill, Building 2354	OU2 ROD	N	SC
ST15	OU2 (SER)	Multi-product Fuel Line	OU2 ROD	N	SC
SS16	OU2 (SER)	MOGAS Fuel Line Spill	OU2 ROD	N	SC
SS17	OU2 (SER)	Canol Pipeline Spill	OU2 ROD	N	SC
SD21	OU2 (SER)	Road Oiling-Quarry Road	OU2 ROD	N	SC
SD22	OU2 (SER)	Road Oiling-Industrial Road	OU2 ROD	N	SC
SD23	OU2 (SER)	Road Oiling-Manchu Road	OU2 ROD	N	SC
SD24	OU2 (SER)	Road Oiling-Gravel Haul Road	OU2 ROD	N	SC
DP28	OU2 (SER)	Fly Ash Disposal Site	OU2 ROD	N	SC
DP29	OU2 (SER)	Drum Burial Site	OU2 ROD	N	SC
SS30	OU2 (SER)	PCB Storage Facility	OU2 ROD	N	SC
DP40	OU2 (SER)	Power Plant Sludge Pit	OU2 ROD	N	SC
SS41	OU2 (SER)	Auto Hobby Shop, Past	OU2 ROD	N	SC
SS42	OU2 (SER)	Misc. Storage and Disposal Facility	OU2 ROD	N	SC
SS47	OU2 (SER)	Commissary Parking Lot Fuel Spill	OU2 ROD	N	SC
WP60	OU2 (SER)	Auto Hobby Shop	OU2 ROD	N	SC
SS62	OU2 (SER)	Garrison Slough (Central)	OU2 ROD	N	SC

NOTES:
ADEC—Alaska Department of Environmental Conservation
Biov—Bioventing
DP—Disposal Pit
EOD—Explosive Ordnance Disposal
FT—Firefighter Training Area
ICs—Institutional Controls
IRP—Installation Restoration Program
JP—Jet Propellant
LF—Landfill
Misc.—Miscellaneous
MOGAS—Motor Gasoline
NAPL—non-aqueous phase liquid
NFA—No Further Action
OU—Operable Unit
PCB—polychlorinated biphenyl
POL—Petroluem, Oil, Lubricant
RR — Railroad
ROD—Record of Decision
SC—Site Closed in 2002
SD—Surface Disposal
SER—Source Evaluation Report
SS—Spill Site
ST—Storage Tank
WP—Waste Pile

Table 1-1: Source Area Status Summary (Concluded)

Source Area	Grouping	Description	Decision Document	IC's	Current Remedy or Status
DP44	OU3	Battery Shop Leach Field Building	OU3,4,5 ROD	Y	Monitoring; ICs
WP45	OU3	Photo Lab, Building 1163	OU3,4,5 ROD	Y	Monitoring; ICs
SS57	OU3	Fire Station Parking Lot	OU3,4,5 ROD	Y	Grouped with WP45
ST56	OU3	Engineer Hill Fuel Spill Area	OU3,4,5 ROD	Y	Wellhead treatment; Monitoring; ICs
SS61	OU3	Vehicle Maintenance, Building 3213	OU3,4,5 ROD	Y	Monitoring; ICs
DP25	OU4	E-6 Fuel Tank Sludge Burial Pit	OU3,4,5 ROD	Y	Monitoring; ICs
ST58	OU4	Old Quartermaster Service Station	OU3,4,5 ROD	Y	Monitoring; ICs
SS35	OU4	Asphalt Mixing Area	OU3,4,5 ROD	N	NFA, Monitoring
ST27	OU4	E-11 Fuel Tank Storage Area	OU3,4,5 ROD	N	NFA
WP32	OU4 (SER)	Sewage Treatment Plant Spill	OU3,4,5 ROD	N	NFA
WP33	OU4	Treated Effluent Infiltration Pond	OU3,4,5 ROD	N	NFA
SS36	OU4	Drum Storage Site	OU3,4,5 ROD	N	NFA
SS37	OU4	Drum Storage, Asphalt Mixing Area	OU3,4,5 ROD	N	NFA
SS39	OU4	Asphalt Lake	OU3,4,5 ROD	N	NFA
SS63	OU4	Asphalt Lake Spill Site	OU3,4,5 ROD	N	NFA
SS64	OU4	Trans Maintenance Spill Site	OU3,4,5 ROD	N	NFA
DP55	OU4 (SER)	Birch Lakes Burial Site	OU3,4,5 ROD	N	SC
LF03	OU5	Inactive Base Landfill	OU3,4,5 ROD	Y	Monitoring; ICs
FT09	OU5	Firefighter Training Area	OU3,4,5 ROD	Y	Grouped with LF03
LF01	OU5 (SER)	Original Base Landfill	OU3,4,5 ROD	N	NFA; Monitoring
LF02	OU5	Old Base Landfill	OU3,4,5 ROD	N	NFA; Monitoring
LF04	OU5	Old Army Landfill and EOD Area	OU3,4,5 ROD	N	NFA; Monitoring
LF06	OU5	Old Landfill	OU3,4,5 ROD	N	NFA; Monitoring
WP38	OU6	Ski Lodge Well Contamination	OU6 ROD	Y	Monitoring; ICs
SS67	Sitewide	Garrison Slough (PCB Contamination)	Sitewide ROD	Y	Removal action; Monitoring, ICs
SS01	None	Building 500	IRP/ADEC	N	Discussing closure procedures with ADEC
LF43	None	Asbestos Landfill	IRP/ADEC	N	NFA
SS46	None	KC-135 Crash Site, Gate 2	IRP/ADEC	N	NFA
ST59	None	Dining Hall	IRP/ADEC	N	NFA

NOTES:
ADEC—Alaska Department of Environmental Conservation
Biov—Bioventing
DP—Disposal Pit
EOD—Explosive Ordnance Disposal
FT—Firefighter Training Area
ICs—Institutional Controls
IRP—Installation Restoration Program
JP—Jet Propellant
LF—Landfill
Misc.—Miscellaneous
MOGAS—Motor Gasoline
NAPL—non-aqueous phase liquid
NFA—No Further Action
OU—Operable Unit
PCB—polychlorinated biphenyl
POL—Petroluem, Oil, Lubricant
RR — Railroad
ROD—Record of Decision
SC—Site Closed in 2002
SD—Surface Disposal
SER—Source Evaluation Report
SS—Spill Site
ST—Storage Tank
WP—Waste Pile

This page intentionally left blank

Figure 1-1: Eielson Air Force Base Location

This page intentionally left blank

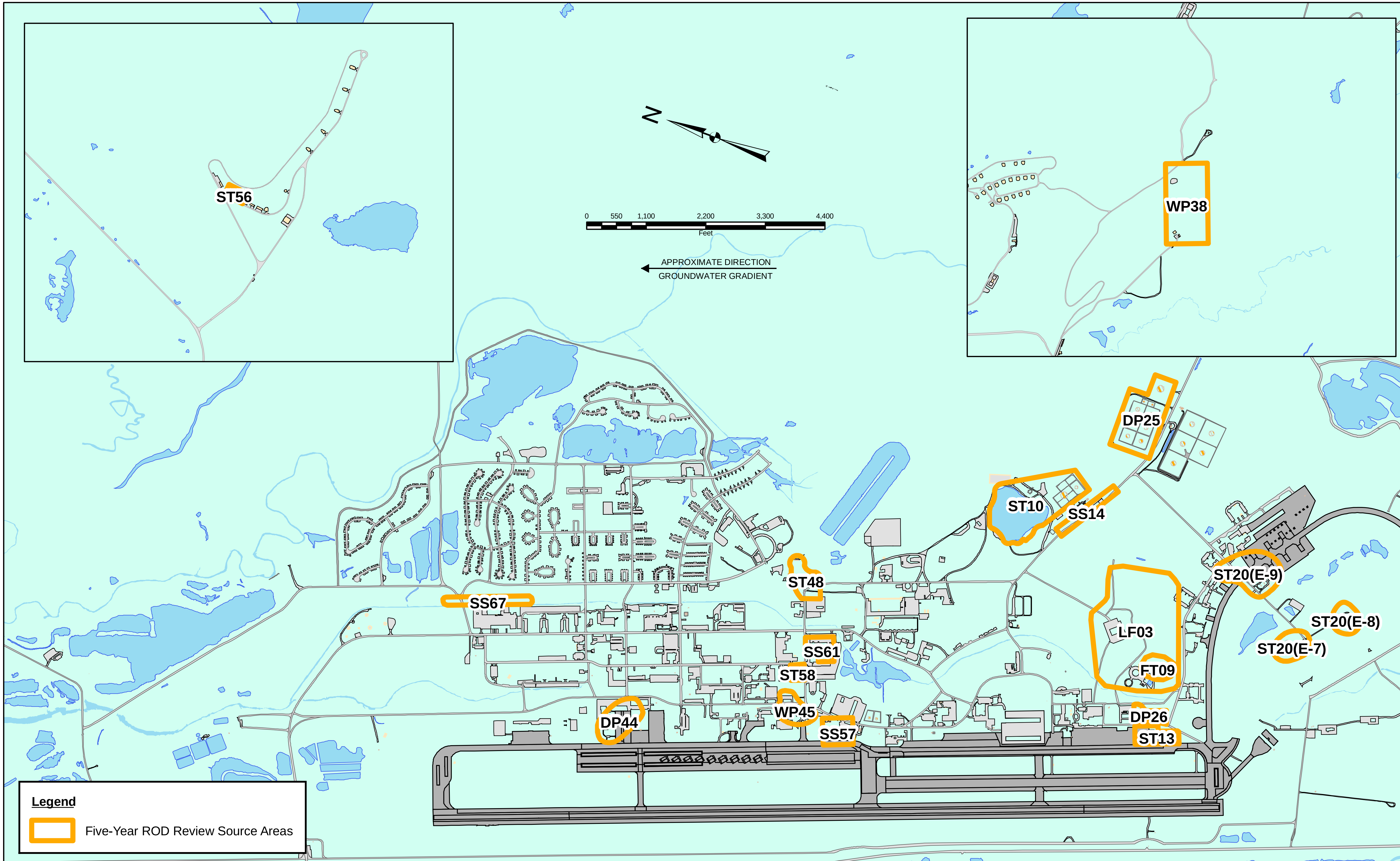


Figure 1-2: Source Area Locations, Eielson AFB, Alaska

This page intentionally left blank

Groundwater from Base water supply wells is treated to remove iron and sulfate and is then distributed for drinking water, industrial, domestic, agricultural, and fire-fighting uses.

In addition to the Base water supply wells, there are two power plant cooling wells, seven small-capacity wells serving remote Base areas, and 12 fire suppression wells. Forty-one private wells are located within 5 km of the Base, mostly north-northwest of the Base, in or near the community of Moose Creek (HLA, 1991).

Groundwater Chemistry

Background groundwater quality in the alluvial aquifer at Eielson AFB has been characterized through collection and analysis of samples from 16 wells located in contamination-free areas of the lowland (developed) portion of the Base. Background groundwater samples were collected in 1992, 1993, and 1994, and analyzed for total and dissolved metals, major anions, total organic carbon, alkalinity, total dissolved solids, and total petroleum hydrocarbons (TPH). Results were reported in the Sitewide Remedial Investigation (RI) Report. No organic compounds were detected in the background groundwater samples. Average iron and manganese concentrations in groundwater typically exceeded the secondary Maximum Contaminant Levels (MCLs) for drinking water. Arsenic was detected at concentrations greater than the primary MCL. The arsenic MCL that was in effect during the Remedial Investigation/Feasibility Studies (RI/FS) process was 50 micrograms per liter (µg/L). Subsequently, in 2002, the USEPA adopted a new MCL for arsenic of 10 µg/L. In general, metals are not considered constituents of concern (COCs) at Eielson AFB. Arsenic in particular is not considered a COC in OU3, 4, and 5 source areas due to the elevated background concentrations observed in groundwater locally. As such 50 µg/L is used as a screening level for arsenic in groundwater. Lead concentrations in groundwater exceeding the regulatory screening limit of 15 µg/L were retained as a COC (USAF, 1998d).

Total metal concentrations observed in the 1994 sampling event were generally higher than in prior sampling rounds. Battelle Pacific Northwest Laboratory reported in the 1994 Sitewide Monitoring Program (SWMP) Report that the laboratory preparation for the 1994 samples included a digestion before analysis. This differed from prior samples that were not digested prior to analysis.

Table 1-2: Average Metals Concentrations in Background Groundwater Samples

Concentration (µg/L)				
Metal	June 1992	June 1993	August 1993	September 1994
Total				
Aluminum	NA	142	129	7,538
Arsenic	8.9	8.7	9.7	25
Barium	107	107	108	269
Calcium	49,000	47,813	49,750	58,625
Chromium	<20	<5.4	<5.4	20
Copper	<20	<2.7	<2.7	75
Iron	2,374	2,420	2,218	16,938
Lead	<5	<1	<0.6	21
Magnesium	10,588	10,006	9,938	17,375
Manganese	1,457	1,545	1,604	3,875
Nickel	<30	<18	<18	31
Potassium	3,175	3,125	3,213	5,650
Sodium	4,619	3,675	3,844	8,363
Vanadium	<30	<3.8	<3.8	24
Zinc	<10	<3.4	<3.4	63
Dissolved				
Aluminum	NA	<33	<33	43
Arsenic	NA	6.9	8.8	8.3
Barium	100	100	106	101
Calcium	48,494	47,563	49,688	51,750
Chromium	<20	<5.4	<5.4	<1.0
Copper	<20	<2.7	<2.7	2.4
Iron	1,694	1,790	1,825	1,736
Lead	NA	<1	<0.6	<1.0
Magnesium	10,319	9,988	9,869	10,450
Manganese	1,409	1,542	1,577	1,789
Nickel	<30	<18	<18	2.3
Potassium	3,175	2,829	3,150	3,400
Sodium	4,438	3,619	3,838	4,563
Vanadium	<30	<3.8	<3.8	<1.0
Zinc	<10	<3.4	<3.4	5.6

1.3.1 Facility Investigation History

In November 1989 Eielson AFB was listed on the NPL of Federal Superfund sites by the USEPA. The USAF, USEPA, and the ADEC signed the FFA for Eielson AFB in May 1991. The FFA identified 60 potential sources of contamination. Seven additional sources were not included in the FFA, source areas WP34, LF43, SS46, SS59, SS01, SS02, and SS67. Source areas WP34, LF43, SS46, and SS59 were closed out prior to the FFA. Source areas SS01 and SS02 are not located on Eielson AFB. Source area SS67 was added after the FFA. Source areas SS01 and SS02 were later combined under SS01, which brings the total number of source areas to 66.

Of the 66 source areas, 61 were addressed in a ROD document. The 60 potential source areas identified in the FFA were addressed in RI/FS, or through a source evaluation report, and were included in RODs for OUs 1 through 6. An additional source area, SS67, was addressed in the Sitewide RI/FS, and included in the Sitewide ROD. Source areas WP34, LF43, SS46, SS59, and SS01 were not addressed in any of the ROD documents.

ROD documents containing OUs 1 through 6 and the Sitewide OU were signed by the USEPA, ADEC, and the USAF. ROD documents for OU1, OU2, and OU6 were signed in 1994. OUs 3, 4, and 5 were combined under the OU3,4,5 ROD, that was signed in 1995. The final ROD under the FFA, the Sitewide ROD, was signed in 1997. Amendments to the OU2 ROD and the OU3,4,5 ROD were completed and signed in 1998. Of the 61 source areas addressed in the RODs, 20 were designated for further action/long term monitoring with Institutional Controls.

The SWMP was established in 1992 to document information about groundwater and surface water quality to support ongoing RI/FS work and to establish a framework for continued monitoring during remedial activities. Environmental media sampling under the SWMP occurs at sites selected by the USEPA and ADEC. In addition, groundwater elevations were recorded from 1992 through 1999, and in 2002. The data collected from 1992 through 1994 were presented in the Sitewide RI/FS Report (USAF, 1995a). Data obtained since 1995 are presented in the annual SWMP reports. These documents have been reviewed and approved by the USEPA, ADEC, and USAF. Sites may be added or removed from the SWMP upon review and mutual consent of all three parties.

1.4 Institutional Controls

Exposure to contaminated groundwater and soil at the OUs are prevented through Institutional Controls (ICs). These controls prevent human exposure to contaminants at concentrations above federal and state standards by restricting activities at the sites. ICs at the source areas include the following components (USAF, 1998e):

- A prohibition on the installation or use of drinking water wells.
- A requirement that all monitoring wells are secured with locks to prevent unauthorized access to groundwater.
- A requirement for fishing restrictions in Garrison Slough. Base fishing licenses require a briefing advising against consuming fish caught in Garrison Slough.

- Any activity that may result in access to contaminated groundwater or affect the movement of contaminated groundwater requires approval by Environmental Flight (CES/CEV).

- Any activity that may result in the disturbance of any remedial action requires approval by Environmental Flight (CES/CEV).

- Any activity that may result in exposure to or removal of contaminated soil requires approval by Environmental Flight (CES/CEV).

- In the event that contaminated soil or groundwater is removed from the source area it will be disposed of or treated in accordance with applicable state and federal regulations.

- A requirement of notice to and approval by ADEC and USEPA of any proposal to add to or alter land use controls.

- A requirement to notify ADEC and USEPA of any proposal to change the existing land use.

- Groundwater monitoring is conducted under the SWMP to maintain an accurate definition of the area of contamination.

North Boundary Wells (NBW) were installed down hydrologic gradient of Eielson AFB based on concerns expressed from surrounding communities. These wells are sentry wells, and act as a second line of defense to ensure that groundwater contamination is not leaving Base. The NBW are sampled for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

Approval for any activity that may result in access to contaminated groundwater and/or soil at source areas will be granted only if that activity does not pose an unacceptable risk to human health and the environment.

To ensure long-term integrity of the above land-use controls, the USAF has developed a Basewide IC process, which includes standard operating procedures (SOPs) for the implementation of ICs at each source area. These SOPs are incorporated into the Base Management Plan to ensure that ICs are considered prior to any future land use decisions. ICs will remain in place as long as the contaminant concentrations in groundwater exceed MCLs. An IC report is completed annually detailing controls implemented at source areas where ICs are required. The IC report is included as an appendix to the annual SWMP Report.

In addition to the IC report, Eielson AFB completed and maintains a Basewide environmental GIS layer. The GIS layer displays source area boundaries, and is available for review during the construction planning process. Future GIS Layer expansion includes linked folders containing documents and decisions associated with each source area for quick reference.

ICs are strictly enforced through the Eielson AFB dig permit process. No violations of ICs have been determined. Eielson AFB IRP personnel frequently visit source areas with institutional controls to ensure the strict adherence. Compliance with ICs is also reviewed during the Five-Year ROD Review site visits. ICs are expected to remain protective for the foreseeable future.

1.5 Roles and Responsibilities

EA Engineering, Science, and Technology, Inc. (EA) has been contracted by the USAF to prepare this Five-Year ROD Review for Eielson AFB with their review and input. The review team includes the USAF, USEPA Region 10, and ADEC.

1.6 Organization of Report

This Five-Year ROD Review covers source areas where the selected remedy required further action/long term monitoring with ICs. Chapter 1 of this report presents the introduction and description of the Five-Year Review process, description and background of Eielson AFB, and community awareness. Chapters 2 through 8 present the separate OUs with selected remedies and recommendations. Chapter 9 lists references cited in this document.

1.7 Next Five-Year Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

This page intentionally left blank

2 OPERABLE UNIT 1

OU1 consists of eight source areas where fuel contaminants were released to the soil and groundwater. Separate-phase fuel or non-aqueous phase liquid (NAPL) has been detected at each of the following source areas. This Five-Year ROD Review only covers source areas ST20, ST48, SS50, SS51, and SS52 requiring further action and ICs. All other OU1 source areas have been designated for no further action (NFA), and no Five-Year ROD Review is required. Source areas SS50, SS51, and SS52 are discussed together because they are located close to each other, have similar types of contaminants, and the individual releases to groundwater have created an overlapping groundwater contaminant plume.

Source Area	Remedy or Status as Identified in the ROD
ST20 E-7, E-8, and E-9 Complexes (Fueling Loops)	Bioventing, NAPL Recovery, ICs
ST48 Power Plant Area	Bioventing, NAPL Recovery, ICs
SS50 Blair Lakes Vehicle Maintenance	NAPL Recovery, ICs
SS51 Blair Lakes Ditch	NAPL Recovery, ICs
SS52 Blair Lakes Diesel Spill	NAPL Recovery, ICs

Source areas ST49, SS53, and SS54 were designated for NFA with groundwater monitoring in the OU1 ROD. Groundwater monitoring is conducted under the SWMP.

Source Area	Remedy or Status as Identified in the ROD
ST49 Alert Hangar	NFA, Monitoring
SS53 Blair Lakes Fuel Spill	NFA, Site Closed in 2002
SS54 Blair Lakes Drum Disposal Site	NFA, Site Closed in 2002

Remedial Action Objectives

Remedial Action Objectives (RAOs) are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation goals.

Environmental Media	**RAO**
Groundwater	
For Human Health	
	Prevent use of water having carcinogens in excess of MCLs
	Prevent use of water having noncarcinogens in excess of MCLs or reference doses
For Environmental Protection	
	Restore aquifer to its designated beneficial use as a drinking water source
Soil	
For Environmental Protection	
	Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Benzene, toluene, ethylbenzene, and xylene (BTEX) compounds are COCs for OU1 (USAF, 1994b). The following table lists RAOs and Applicable or Relevant and Appropriate Requirements (ARARs) established to address groundwater quality at OU1 source areas.

COC	**RAOs/Final Groundwater Remediation Goals (µg/L)**	**Soil Remediation Goals in Milligrams per Kilogram (mg/Kg)**
Benzene	5	0.2
Toluene	1,000	80
Ethylbenzene	700	140
Xylenes	10,000	760

The primary RAO is protection of groundwater. Soils do not pose an unacceptable risk for human ingestion or dermal contact. The secondary remediation goals developed for soil are based on fate and transport modeling for protecting groundwater and may be modified if alternate levels are found to be protective of groundwater.

2.1 Chronology of Events

November 1982–July 1991 IRP investigations and reports.

Field Season 1991 Bioventing pilot system installed at ST20 (E-7 Complex).

September 1992 OU1B Interim ROD signed by USAF, USEPA, and ADEC (USAF, 1992). Bioventing system installed at ST48.

Field Season 1993 Bioventing system installed at ST20 (E-9 Complex).

May 1994	OU1 RI/FS (USAF, 1994b) completed.
September 1994	OU1 ROD signed by USAF, USEPA, and ADEC (USAF, 1994f).
Fall 1994	United States Army Corps of Engineers (USACE) and Cold Regions Research and Engineering Laboratory (CRREL) conducted plume investigations at OU1 using microwells (CRREL, 1995a).
February 1995	Bioventing Feasibility Study completed at ST20 (E-7 Complex) (Battelle, 1993 & 1995a).
March 1995	Permafrost and groundwater study at Blair Lakes (CRREL, 1995b).
November 1995	Remedial Action Workplan and Design completed (EA 1995a, 1995b).
March 1997	Groundwater flow and contaminant transport modeling study at ST48 completed (CRREL, 1995b).
August 1998	Remedial Action Summary Report completed (USAF, 1998e).
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
December 2002	Remedial Process Optimization (RPO) Phase II Technical Report completed (USAF, 2002c).
September 2003	Second Five-Year ROD Review completed (USAF, 2003c)

2.2 Community Involvement

The RI/FS and the Proposed Plan for OU1 documents were released to the public in May 1994. These documents were made available to the public in both the Administrative Record and at the Information Repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks.

The public comment period for the Proposed Plan was held from May 30 to June 30, 1994. Comments received during this period are summarized in the Responsiveness Summary of the OU1 ROD. The Proposed Plan for OU1 was advertised in the *Fairbanks Daily News Miner* on June 4, 1994. An article about the Proposed Plan also appeared in the *North Pole Independent*, June 3, 1994. The public meeting for OU1 was advertised in the *Fairbanks Daily News Miner*, June 21, 1994. A news release was sent to all local news media announcing the Proposed Plan and public meeting.

The USAF's preferred cleanup alternatives were presented to the TRC on January 27, 1994. At this meeting, representatives from the USAF, ADEC, and USEPA responded to questions from a committee representing the University of Alaska, the city of North Pole, and various state and federal agencies.

At a public meeting held on June 22, 1994 representatives from the USAF, ADEC, and USEPA answered questions about problems at the OU1 sites and the remedial alternatives under consideration. Twenty-five people attended. The majority of those attending were civilian or military employees of Eielson AFB.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

2.3 ST20 E-7, E-8, and E-9 Complexes (Fueling Loops)

2.3.1 Background

Source area ST20 is located in the industrial area of Eielson AFB along the southern end of the runway. Source area ST20 contains three fueling complexes each approximately one acre in size with flat surface gradients. Groundwater at ST20 ranges from approximately 5 to 8 feet (ft) below ground surface (bgs). The current land use is industrial. While the current land use is unlikely to change, the OU1 Baseline Risk Assessment (BLRA) considered industrial and residential future land use scenarios. Land use restrictions for the ST20 source area in the OU1 ROD include preventing exposure to contaminated groundwater and providing safeguards in the event of a land transfer.

Site E-7 is located along Cargain Road, on the north side of the refueling loop. The site consists of an asphalt pad and adjacent gravel and grass areas. The large area enclosed by the taxiway loop north of the complex contains surface water ponds. Garrison Slough is approximately 1,000 ft southwest of the complex. The complex is served by a fuel pump house (Building 1315), three 50,000-gallon underground storage tank (UST)s, a 25,000-gallon defueling UST, and underground fueling and defueling lines.

Site E-8 is located along Cargain Road on the south side of the refueling loop. The site consists of an asphalt pad and adjacent areas of gravel and grass. The complex is served by a fuel pump house (Building 1321), three 50,000-gallon USTs, a 25,000-gallon defueling UST, and underground fueling and defueling lines.

Site E-9 is located along Cargain Road, on the northern side of the refueling loop. The site consists of an asphalt pad and adjacent areas of gravel and grass. The complex is served by a fuel pump house (Building 1305), three 50,000-gallon USTs, a 25,000-gallon defueling UST, and underground fueling and defueling lines

History of Contamination

The quantity of fuel release at the ST20 source area is unknown. The source of contamination at E-7 is believed to be leaks in the subsurface JP-4 fueling and defueling transfer pipes. The source of contamination at E-8 is believed to be surface spills of JP-4 resulting from overfilling of USTs at the site. Eielson AFB Liquid Fuels Department records show three fuel releases from fuel piping at the E-9 Refueling Loop.

Initial Responses

E-7 In July 1987, NAPL was observed in a ditch excavated during work on an underground defueling line immediately north of the E-7 pump house. Three static recovery wells, installed and operated until February 1988, removed 885 gallons of JP-4. An additional static recovery well, installed in late 1988, removed 11 gallons of JP-4. Floating product was later encountered in 1992 at a test hole at the E-7 pump house.

E-8 No interim remedial action was conducted at the E-8 site. NAPL was encountered during a 1989 field investigation north of the E-8 pump house, however product was not found at the location during 1988 and 1991 field investigations.

E-9 In August 1988, a leak in fuel piping was discovered at E-9. The leak was repaired in June 1989. A second leak was observed during leak testing and repaired in June 1989. A passive skimmer was installed in 1989 removing less than 5 gallons of product. In June 1992, a third leak was discovered in the line to the defueling tank at E-9. The leak was repaired in July 1992.

Interim remedial actions (IRAs) were implemented at some OU1 source areas concurrent with completion of an RI/FS. The IRAs, conducted from 1992 through 1994, included construction and operation of NAPL recovery and bioventing systems. Bioventing systems were installed at E-7 and E-9. Free product was removed at E-9 in recovery trenches and one recovery well. Less than 10 gallons free product was removed.

Basis for Taking Action

The RI/FS and BLRA identified BTEX compounds exceeding groundwater MCLs. The exposure pathways of potential concern are the prolonged contact, consumption, and inhalation of vapor from contaminated groundwater.

2.3.2 Remedial Actions

The COCs at ST20 are BTEX compounds. Based on the RI/FS and BLRA, the remedy selected by the OU1 ROD includes the following:

- Passive product recovery where mobility is sufficient
- Bioventing/soil vapor extraction (SVE) to reduce NAPL and remediate soil contamination to prevent leaching to groundwater
- Groundwater monitoring including increased monitoring near Base water supply wells until cleanup goals are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for the ST20 source area include the following:

- Prevent use of water having carcinogens in excess of MCLs
- Prevent use of water having noncarcinogens in excess of MCLs or reference doses
- Restore aquifer to its designated beneficial use as a drinking water source
- Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Remedy Implementation

The OU1 ROD documented IRAs, and recorded a selected remedy that included continuation of previous actions. The OU1 Remedial Design document was finalized in November 1995 and documented the existing remedial systems and the required monitoring for these systems. The Remedial Design document also presented scoping for the final remedial action. Based on the scoping, it was agreed that remediation systems constructed as IRAs fulfilled Remedial Design requirements, and that only minor additional effort was required to implement full-scale remediation at OU1 sites.

The area to be remediated by the bioventing system was the area bounded by the 100 µg/L dissolved benzene contour and the historical presence of NAPL. The 100 µg/L contour was adopted as a pragmatic design criterion to estimate the location of the fuel source in the smear zone. The bioventing system at E-7 was modified in 1996 and 1997 with the addition of nine air injection wells and the construction of an air distribution manifold. The bioventing system at E-9 was upgraded in 1998 by replacing previous air injection piping with new piping buried at a depth of 24 to 28 inches.

Groundwater samples were collected under the 1995, 1996, 1997, 2002, and 2007 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/Operation and Maintenance

Operations and maintenance (O&M) checks were performed on average of once per week. Flows and pressures in the distribution manifolds were measured and adjusted as required for equal air distribution to all areas under the influence of the bioventing system. Blowers and air inlet filters were replaced as needed.

Respiration tests and site evaluations were conducted on an annual basis. The bioventing systems were shut down during the respiration test and site evaluations. Respiration tests were performed to evaluate hydrocarbon biodegradation rates in the subsurface soil. The site evaluations were performed to determine the condition of well covers and system components.

O&M also includes monitoring well maintenance under the SWMP, and maintaining ICs to prevent access to potentially contaminated groundwater.

2.3.3 Progress Since the last Five-Year Review

The bioventing systems at ST20 E-7 and E-9 were ceased in 2002 then decommissioned in 2003 per recommendations from RPO efforts. Groundwater samples were collected under the 2007 SWMP. ICs were implemented to prevent exposure to potential contaminated soil and groundwater.

2.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 2.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the annual Remedial Action Operation reports.

Data Review

Site E-7

Average biodegradation rates decreased from 4-5 mg/Kg per day (mg/Kg-day) in 1991 to 0.5 mg/Kg-day in 2001. Respiration test data were used to estimate that approximately 13,700 gallons of fuel had biodegraded between 1991 and 2002.

No groundwater samples were collected during this Five-Year ROD Review period. Benzene concentrations in groundwater collected in 2002 exceeded the MCL in three source area samples (20M03 at 591 µg/L, 20M04 at 829 µg/L, and 53M04 at 406 µg/L) and in one down hydrologic gradient sample (20PMW02 at 21 µg/L). Toluene concentrations in groundwater collected in 2002 exceeded the MCL in one source area sample (53M04 at 1,060 µg/L) (Figure ST20 (E-7)-1). Groundwater monitoring indicates a stable and attenuating plume, but contamination likely remains within the source area. Data Quality Objective Monitoring (DQOM) projections suggest ST20-E7 will reach MCLs in 2017.

Soil samples were collected in 2001 as part of the RPO (USAF, 2002c). Soil sample results for BTEX were below levels identified by the OU1 ROD that are protective of groundwater. However, three soil samples collected inside Loop Rd had benzene detection limits above cleanup criteria. A soil gas survey conducted as part of the RPO also reported low BTEX concentrations in the vadose soils. One sample location had elevated benzene and toluene results indicating residual contamination inside the loop area. The RPO Phase II Technical Report recommended decommissioning the bioventing system in 2003, and excavating soils inside Loop Road to groundwater during the 2004 taxiway expansion construction project. The bioventing system was shut down in September 2002, and decommissioned began in August 2003. The taxiway expansion construction project did not include contaminated soil excavation, as expected. Contaminated soils likely remain in place inside Loop Road with benzene and toluene concentrations exceeding the MCLs.

Site E-8

Groundwater sampling data collected in 2002 and previous years indicate that BTEX concentrations have decreased since 1993 to present-day levels below MCLs. Groundwater samples collected in 2002, from monitoring well 20M06, (in the source area) had detectable benzene, ethylbenzene, and xylenes at concentrations below MCLs. Hydrologically down gradient monitoring well 20M15 had non-detect BTEX, which is consistent with historical data (Figure ST20 (E-8)-1).

Site E-9

Average biodegradation rates decreased from >5 mg/Kg-day in 1995 to 0.7 mg/Kg-day in 2001. Respiration test data were used to estimate that approximately 13,900 gallons of fuel had biodegraded between 1993 and 2002.

Three groundwater samples were collected from in 2007 within the ST20 (E-9) source area (Figure ST20(E-9)-1). Benzene exceeded the MCL in monitoring well 20PP58B at 8.7 µg/L. Toluene, ethylbenzene, and xylenes were also detected in monitoring well 20PP58B, but at concentrations below their MCLs. Xylenes were also detected in monitoring wells 20M07 and 20PS22VB, but at concentrations below the MCL. DQOM calculations suggested ST20-E7 would reach MCLs in 2007. Groundwater monitoring indicates benzene concentrations still slightly exceeding the MCL.

Soil samples were collected in 2001 as part of the RPO (USAF, 2002c). Soil sample results for BTEX were below OU1 ROD cleanup criteria, except for five soil samples that had benzene detection limits above cleanup criteria. A soil gas survey, conducted as part of the RPO, reported mostly low BTEX concentrations in the vadose soils. Elevated benzene concentrations still persist inside the Loop Road area and near the bioventing system enclosure. The RPO Phase II Technical Report recommended continued operation of the bioventing system at locations where BTEX concentrations remain above the OU1 ROD cleanup criteria until the fuel complex facility is removed in the spring of 2004. The bioventing system was shut down in September 2002. In March 2003, the system was restarted to further remediate areas of elevated BTEX concentrations as recommended by the RPO process. The bioventing system was shut down, and decommissioning began in August 2003. Contaminated soils likely remain in place inside Loop Road area with BTEX concentrations exceeding the MCLs.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. The inspection team discussed recent monitoring activities. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the source area. There are no facilities on site for vapor intrusion issues. DQOM will be applied to this source area.

2.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area ST20 is performing as expected. Groundwater monitoring and RPO Phase II results indicate continued decreasing BTEX concentrations. Respiration tests conducted at the bioventing system locations indicate that approximately 27,600 gallons of fuel have been biodegraded. ICs are still being implemented to prevent exposure to contaminated groundwater. Groundwater monitoring indicates a stable and attenuating plumes at ST20 E-7 and E-9 with residual contamination remaining within the source area.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the ROD. The bioventing systems have effectively biodegraded fuels at sites E-7 and E-9, decreasing BTEX concentrations in the local groundwater. The bioventing systems were shut down in September 2002, and decommissioned in August 2003. Operation of the bioventing system at E-9 operated briefly between March 2003 and August 2003. All previous assumptions for the ST20 source area are still valid.

2.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area ST20.

2.3.7 Recommendations and Follow-Up Actions

Respiration testing, groundwater monitoring, and RPO Phase II results indicate the RAOs for ST20 are being achieved. Groundwater monitoring will continue as determined by the Remedial Project Managers (RPMs) at E-7 and E-9 until BTEX concentrations meet the MCLs. Groundwater monitoring at E-8 indicates that RAOs have been achieved. Land use restrictions at E-7 and E-9 will remain in effect until RAOs are achieved. Source Area ST20 E-8 will continue to be flagged during the Eielson dig permit process and ADEC will be notified if any activities are scheduled that could expose humans to the soil or water at the site or if the soil is to be moved offsite. DQOM projections suggest that COCs should reach MCLs at E-7 in 2016. Updated DQOM projections suggest that E-9 should reach MCLs during the next two years (USEPA, 2002).

2.3.8 Protectiveness Statement

The remedy at OU1 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source area has been addressed through bioventing and the implementation of ICs to prevent the prolonged contact, consumption, and inhalation of vapor from contaminated groundwater.

2.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for ST20:

List of Tables for ST20:

This page intentionally left blank

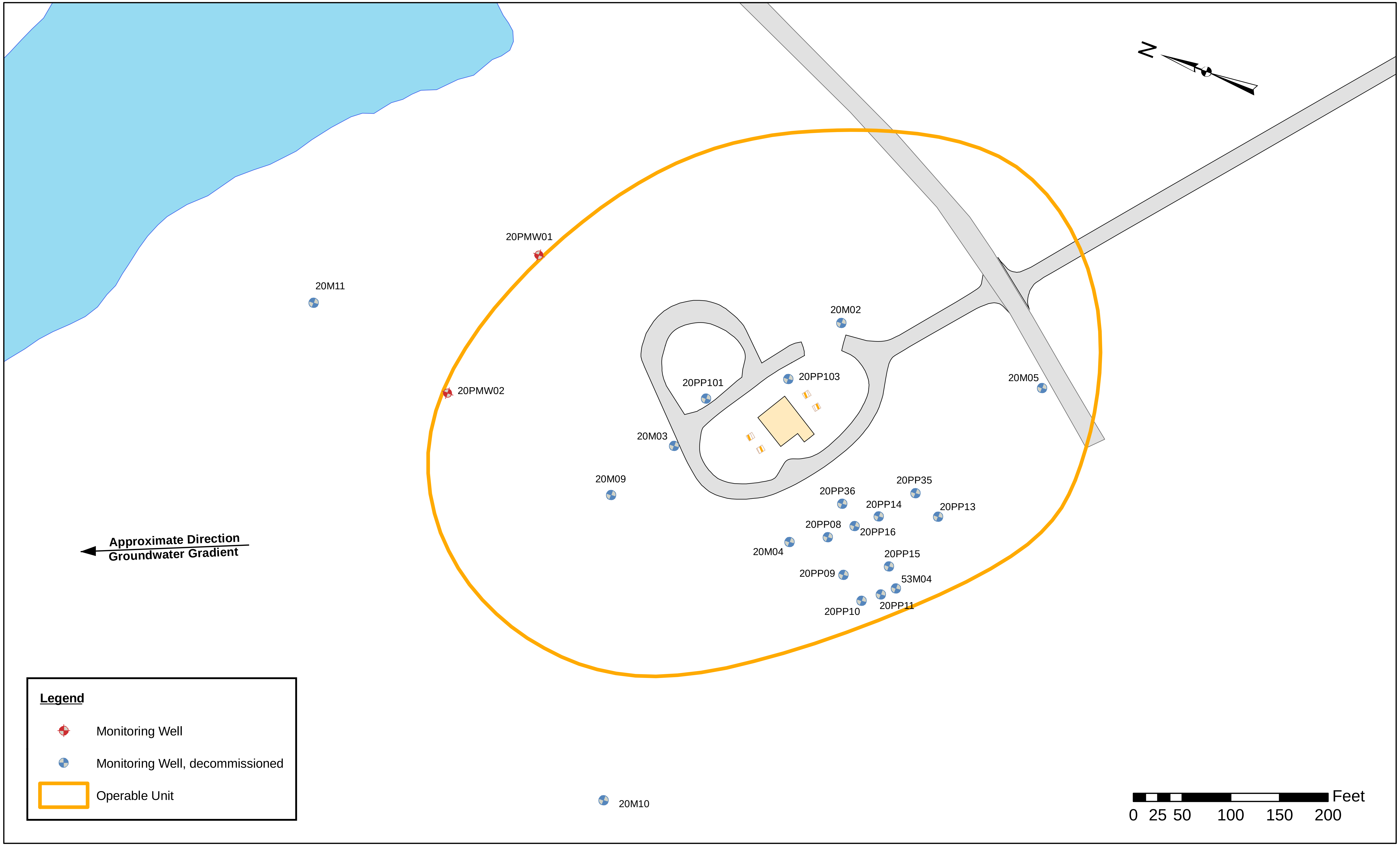


Figure ST20 (E-7)-1: E-7 Refueling Complex, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST20(E-7)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-7) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]			**18 AAC 80.300**
20PMW01	09/30/02	10.7	<0.5	<2.0	<2.0	<2.0	--	--	11	e	USAF 2002 SWMPR
20PMW02	09/11/02	10.7	**21**	<2.0	<2.0	<2.0	--	--	11	e	USAF 2002 SWMPR
20M02	09/05/89		<0.2	<0.3	<0.5	<0.4	--	--	1		HLA 1992 RI/FS; BEAR
20M02	1989		**33**	<0.3	<0.5	<0.9	--	--			BEAR
20M02	05/23/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M02	07/12/94		<1.0	<1.0	<1.0	<1.0	<50	500	1-3		USAF 1995 OU1 RD
20M02	09/29/94		<1.0	<1.0	<1.0	<1.0	<50	<100	1-3		USAF 1995 OU1 RD
20M02	09/18/02	11.40	1.3	<2.0	2.3	13	--	--	11		USAF 2002 SWMPR
20M03	09/05/89		**262**	31	6.3	29	--	--	1		HLA 1992 RI/FS; BEAR
20M03	1989		**1,190**	348	87	290	--	--			BEAR
20M03	05/23/93		**110**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M03	07/14/94		**120**	6.8	18	40	370	1,000	1-3		USAF 1995 OU1 RD
20M03	09/29/94		**300**	<1.0	23	77	930	270	1-3		EA 1995 OU1 RD
20M03	07/05/95		**120**	5.2	3.4	16	340	**2,200**	1-3	a	USAF 1995 OU1 RD
20M03	07/29/96		**65**	<1.0	<1.0	1.6	--	--	1		USAF 1996 SWMPR
20M03	09/17/02	7.6	**591**	<40	<40	41	--	--	11		USAF 2002 SWMPR
20M04	09/06/89		**7,170**	**13,200**	**1,030**	3,820	--	--	1		HLA 1992 RI/FS; BEAR
20M04	1989		**11,500**	**15,800**	**1,130**	3,820	--	--			BEAR
20M04	05/24/93		**190**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M04	07/14/94		**5,300**	810	**3,700**	9,400	**35,000**	**22,000**	1-3		USAF 1995 OU1 RD
20M04	09/30/94		**6,000**	**7,700**	**880**	3,790	**26,000**	**1,900**	1-3		USAF 1995 OU1 RD
20M04	07/10/95		**2,800**	**3,800**	480	3,200	**50,000**	**9,900**	1-3		USAF 1995 OU1 RD
20M04	07/29/96		**2,400**	**2,500**	580	1,920	--	--	1		USAF 1996 SWMPR
20M04	09/30/02	8.8	**829**	472	558	1,665	--	--	11		USAF 2002 SWMPR
20M05	1989		0.3	0.8	<0.5	<0.4	--	--	1		HLA 1992 RI/FS; BEAR
20M05	1989		<0.2	0.8	<0.5	<0.9	--	--			BEAR
20M05	07/12/94		<1.0	<1.0	<1.0	<1.0	<50	1,200	1-3		USAF 1995 OU1 RD
20M05	09/29/94		<1.0	<1.0	<1.0	<1.0	<50	260	1-3		USAF 1995 OU1 RD
20M05	09/23/96		<1.0	<1.0	<1.0	1.3	--	--	1		USAF 1996 SWMPR

TABLE ST20(E-7)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-7) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
20M09	1989		**1,120**	<0.3	25	<0.9	--	--			BEAR
20M09	05/24/93		**90**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M09	07/12/94		**430**	8.9	18	18	900	750	1-3		USAF 1995 OU1 RD
20M09	09/30/94		**430**	3.3	1.6	6.3	1,100	240	1-3		USAF 1995 OU1 RD
20M09	07/10/95		**370**	<1.0	2.4	9.1	1,000	710	1-3	a	USAF 1995 OU1 RD
20M09	09/23/96		**240**	<1.0	<1.0	1.1	--	--	1		USAF 1996 SWMPR
20M09	08/28/97		**140**	<1.0	<1.0	<1.0	--	--	1,5	b	USAF 1997 SWMPR
20M10	09/01/89		2.7	<0.3	<0.5	<0.4	--	--			BEAR
20M10	1989		4.7	<0.3	<0.5	<0.9	--	--			BEAR
20M10	07/13/94		<1.0	<1.0	<1.0	<1.0	<50	130	1-3		USAF 1995 OU1 RD
20M10	09/29/94		<1.0	<1.0	<1.0	<1.0	<50	120	1-3		USAF 1995 OU1 RD
20M11	09/14/89		1.3	1.7	<0.5	1.2	--	--	1		HLA 1992 RI/FS; BEAR
20M11	05/23/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M11	07/13/94		<1.0	<1.0	<1.0	<1.0	<50	940	1-3		USAF 1995 OU1 RD
20M11	09/29/94		<1.0	<1.0	<1.0	1.1	<50	1,200	1-3		USAF 1995 OU1 RD
20M11	03/09/95		1.3	1.4	<1.0	3.5	<100	**2,400**	1-3		USAF 1995 OU1 RD
20M11	07/05/95		<1.0	<1.0	<1.0	<1.0	<50	**2,300**	1-3	a	USAF 1995 OU1 RD
20M11	09/23/96		<1.0	2.0	<1.0	1.3	--	--	1		USAF 1996 SWMPR
20M11	08/28/97		<1.0	<1.0	<1.0	<1.0	--	--	1,5	c	USAF 1997 SWMPR
20M12	09/13/89		<0.2	<0.3	<0.5	<0.4	--	--	1		HLA 1992 RI/FS; BEAR
20M12	05/23/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M12	07/13/94		<1.0	<1.0	<1.0	<1.0	<50	460	1-3		USAF 1995 OU1 RD
20M12	09/29/94		<1.0	<1.0	<1.0	<1.0	<50	<100	1-3		USAF 1995 OU1 RD
53M04	09/06/89		**6,980**	**15,900**	**1,120**	3,350	--	--	1		HLA 1992 RI/FS; BEAR
53M04	1989		**12,000**	**19,700**	**1,050**	3,830	--	--			BEAR
53M04	05/24/93		<2.0	--	**--**	--	--	--	1,4,5		PNL 1994 OU1 RI
53M04	07/15/94		**4,400**	**720**	**2,400**	**11,820**	**210,000**	**20,000**	1-3		USAF 1995 OU1 RD
53M04	09/29/94		**2,100**	**6,000**	460	1,690	**53,000**	**5,000**	1-3		USAF 1995 OU1 RD
53M04	07/10/95		**4,200**	**10,000**	520	3,300	**79,000**	**9,600**	1-3		USAF 1995 OU1 RD
53M04	09/23/96		**8,600**	**12,000**	**1,000**	3,710	--	--	1		USAF 1996 SWMPR
53M04	08/28/97		**1,800**	**6,900**	**890**	3,440	--	--	1,5	d	USAF 1997 SWMPR
53M04	09/30/02	9.6	**406**	**1,060**	424	1,012	--	--	11		USAF 2002 SWMPR

TABLE ST20(E-7)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-7) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]			**18 AAC 80.300**
20PP17	07/25/95		**11,000**	**22,000**	**1,500**	5,700	**41,000**	**8,600**	1-3		USAF 1995 OU1 RD
20PP101	07/25/95		**150**	58	110	700	**4,300**	**12,000**	1-3		USAF 1995 OU1 RD
20PP104	07/31/95		**12,000**	**22,000**	**1,800**	5,100	**92,000**	**7,900**	1-3		USAF 1995 OU1 RD

Notes:
- a. TPH DRO chromatogram is dominated by large peak not characteristic of diesel.
- b. Other compounds detected: phenol - 3 µg/L, bis (2-ethylhexyl) phthalate - 2 µg/L
- c. Other compounds detected: 4-methylphenol - 5 µg/L.
- d. Other compounds detected: phenol - 37 µg/L, 2-methylphenol - 160 µg/L, 4-methylphenol - 82 µg/L, 2,4-dimethylphenol - 46 µg/L, benzoic acid - 30 µg/L, naphthalene - 76 µg/L, 2-methylnaphthalene - 48 µg/L, bis (2-ethylhexyl) phthalate - 17 µg/L.
- e. New well.
- MCL maximum contaminant level
- **Bold** Bold text indicates concentration exceeds MCL.
- TPH GRO Total Petroleum Hydrocarbons Gasoline Range Organics
- TPH DRO Total Petroleum Hydrocarbons Diesel Range Organics

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
11. 8021

This page intentionally left blank

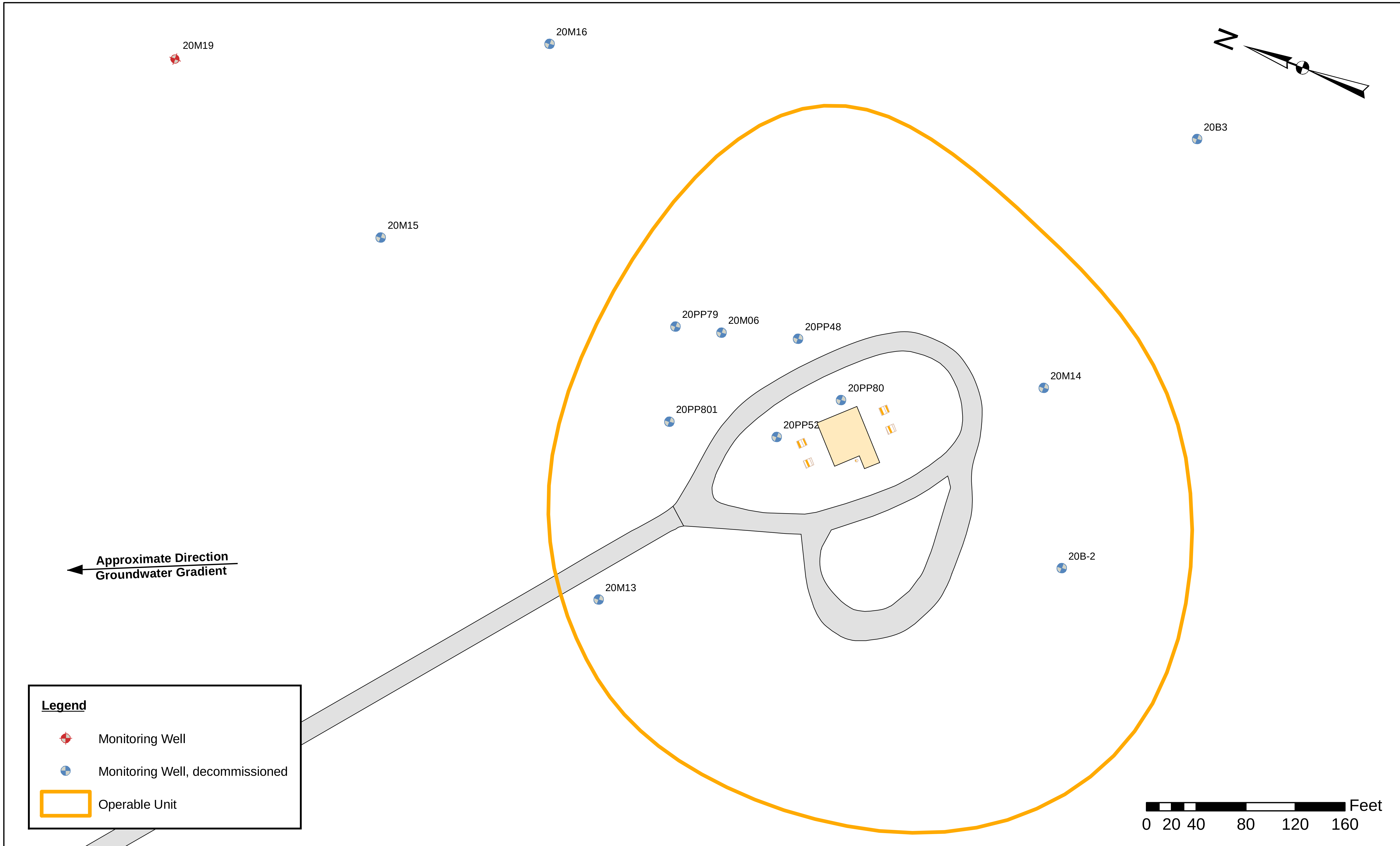


Figure ST20 (E-8)-1: E-8 Refueling Complex, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST20(E-8)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, A

ST20 (E-8) REFUELING LOOP, EIELSON AFB, ALASK

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
20M06	09/06/89		**62**	**3,040**	431	1,550	--	--	1,5	a	HLA 1992 RI/FS; BEAR
20M06	1989		**481**	939	87	236	--	--			BEAR
20M06	05/20/93		**570**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M06	07/11/94		**19**	16	6.2	66	**3,500**	**2,100**	1-3		USAF 1995 OU1 RD
20M06	09/28/94		**77**	250	27	63	870	240	1-3		USAF 1995 OU1 RD
20M06	03/09/95		1.5	1.9	<1.0	<1.0	380	200	1-3	c	USAF 1995 OU1 RD
20M06	07/06/95		1.6	72	24	45	**3,400**	**4,000**	1-3	b	USAF 1995 OU1 RD
20M06	07/30/96		<1.0	<1.0	<1.0	1.1	--	--	1		USAF 1996 SWMPR
20M06	09/05/02	10.2	0.6	<2.0	2.2	4.3	--	--	11		USAF 2002 SWMPR
20M13	09/12/89		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	HLA 1992 RI/FS; BEAR
20M13	05/24/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M13	07/11/94		<1.0	<1.0	<1.0	<1.0	<50	110	1-3		USAF 1995 OU1 RD
20M13	09/28/94		<1.0	<1.0	<1.0	<1.0	<50	100	1-3		USAF 1995 OU1 RD
20M14	09/13/89		0.5	0.9	<0.5	<0.4	--	--	1,5	a	HLA 1992 RI/FS; BEAR
20M14	05/25/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M14	07/12/94		<1.0	<1.0	<1.0	<1.0	<50	380	1-3		USAF 1995 OU1 RD
20M14	09/29/94		<1.0	6.1	<1.0	<1.0	<50	230	1-3		USAF 1995 OU1 RD
20M15	09/14/89		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	HLA 1992 RI/FS; BEAR
20M15	05/25/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
20M15	07/11/94		<1.0	<1.0	<1.0	<1.0	<50	150	1-3		USAF 1995 OU1 RD
20M15	09/28/94		<1.0	<1.0	<1.0	<1.0	<50	130	1-3		USAF 1995 OU1 RD
20M15	03/09/95		<1.0	<1.0	<1.0	<1.0	<100	<100	1-3		USAF 1995 OU1 RD
20M15	07/30/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
20M15	09/05/02	9.6	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR

TABLE ST20(E-8)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, A

ST20 (E-8) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300^{ADEC}**	**1500^{ADEC}**			**18 AAC 80.300**
20M16	09/14/89		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	HLA 1992 RI/FS; BEAR
20M16	07/11/94		<1.0	<1.0	<1.0	<1.0	67	<100	1-3		USAF 1995 OU1 RD
20M16	09/28/94		<1.0	<1.0	<1.0	<1.0	110	180	1-3		USAF 1995 OU1 RD
20M16	03/09/95		1.3	1.1	<1.0	1.5	<100	150	1-3		USAF 1995 OU1 RD
20M16	07/06/95		<1.0	<1.0	<1.0	<1.0	54	420	1-3	b	USAF 1995 OU1 RD
20M16	07/30/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
20PP48	07/27/95		<1.0	<1.0	<1.0	<1.0	180	**1,500**	1-3		USAF 1995 OU1 RD
20PP48	08/07/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
20PP52	07/27/95		<1.0	<1.0	<1.0	<1.0	78	320	1-3		USAF 1995 OU1 RD
20PP79	07/31/95		**400**	**5,900**	**1,100**	2,200	**10,000**	**1,500**	1-3		USAF 1995 OU1 RD
20PP79	08/07/96		**46**	**2,400**	**920**	1,730	--	--	1		USAF 1996 SWMPR
20PP80	07/27/95		**7.6**	<1.0	1.5	1.9	180	1,100	1-3		USAF 1995 OU1 RD
20PP801	08/01/95		<1.0	<1.0	<1.0	<1.0	200	390	1-3		USAF 1995 OU1 RD
20PP801	08/07/96		2.1	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR

Notes:

a. For semivolatile compounds detected, see reference.
b. TPH DRO chromatogram is dominated by large peak not characteristic of diesel.
c. Sampled without purging

Bold Bold text indicates concentration exceeds MCL.
TPH GRO Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO Total Petroleum Hydrocarbons Diesel Range Organics
MCL maximum contaminant level

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M.
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 8021

Figure ST20 (E-9)-1: E-9 Refueling Complex, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST20 (E-9)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-9) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
20PMW03	09/19/02	13	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
20M01	1989		3.0	60	24	432	--	--	1,5	a	USAF 1994 OU1 RI
20M01	1989		**3,060**	**2,010**	24	2,200	--	--	1		USAF 1994 OU1 RI
20M01	05/19/93		<2.0	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M01	07/15/94		**37**	82	390	530	**8,200**	**3,700**	1-3		USAF 1995 OU1 RD
20M01	09/28/94		**5.1**	6.9	5.0	54	630	1,100	1-3		USAF 1995 OU1 RD
20M01	03/10/95		<1.0	2.7	<1.0	3.7	100	<100	1-3		USAF 1995 OU1 RD
20M01	07/06/95		3.9	88	25	260	**3,400**	**2,300**	1-3	b	USAF 1995 OU1 RD
20M01	07/29/96		<1.0	<1.0	1.9	6.6	--	--	1		USAF 1996 SWMPR
20M01	09/30/02	12	0.72	7.7	67	282	--	--	11		USAF 2002 SWMPR
20M07	09/12/89		**4,430**	**6,600**	387	1,590	--	--	1,5	a	USAF 1994 OU1 RI
20M07	1989		0.5	0.28	<0.5	<0.85	--	--	1		USAF 1994 OU1 RI
20M07	05/20/93		**660**	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M07	07/19/94		**750**	**2,300**	320	1,950	**25,000**	**14,000**	1-3		USAF 1995 OU1 RD
20M07	09/28/94		**350**	230	190	550	**5,100**	--	1,2	c	USAF 1995 OU1 RD
20M07	03/16/95		**280**	460	210	830	**9,000**	**6,800**	1-3	c	USAF 1995 OU1 RD
20M07	07/10/95		**220**	230	120	550	**3,700**	**9,400**	1-3		USAF 1995 OU1 RD
20M07	07/29/96		**180**	70	81	466	--	--	1		USAF 1996 SWMPR
20M07	08/28/97		**63**	17	37	252	--	--	1,4		USAF 1997 SWMPR
20M07	09/30/02	13	**11**	5.1	12	50	--	--	11		USAF 2002 SWMPR
20M07	09/18/07	13	<0.4	<1.0	<1.0	2.6	--	--	7		USAF 2007 SWMPR
20M08	09/06/89		**98**	1.7	1.2	3.4	--	--	1,5	a	USAF 1994 OU1 RI
20M08	1989		1.3	1.20	<0.46	2.3	--	--	1		USAF 1994 OU1 RI
20M08	05/20/93		**440**	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M08	07/18/94		**140**	<1.0	<1.0	<1.0	300	940	1-3		USAF 1995 OU1 RD
20M08	09/28/94		**25**	<1.0	3.4	2.1	160	160	1-3		USAF 1995 OU1 RD
20M08	03/10/95		**39**	<1.0	<1.0	2.8	<100	<100	1-3		USAF 1995 OU1 RD
20M08	07/06/95		**72**	<1.0	<1.0	1.3	260	1,300	1-3	c	USAF 1995 OU1 RD
20M08	07/29/96		**16**	<1.0	<1.0	2.8	--	--	1		USAF 1996 SWMPR

TABLE ST20 (E-9)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-9) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
20M08	08/28/97		<1.0	<1.0	<1.0	<1.0	--	--	1,4		USAF 1997 SWMPR
20M08	09/18/02	11	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
20M20	09/14/89		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	USAF 1994 OU1 RI
20M20	1989		--	--	--	--	--	--	1		USAF 1994 OU1 RI
20M20	05/19/93		<2.0	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M20	07/18/94		<1.0	<1.0	<1.0	<1.0	<50	500	1-3		USAF 1995 OU1 RD
20M20	09/27/94		<1.0	<1.0	<1.0	<1.0	<50	110	1-3		USAF 1995 OU1 RD
20M21	05/19/93		<2.0	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M21	07/18/94		<1.0	<1.0	<1.0	<1.0	<50	560	1-3		USAF 1995 OU1 RD
20M22	09/15/89		**31**	<0.3	<0.5	<0.4	--	--	1,5	a	USAF 1994 OU1 RI
20M22	1989		--	--	--	--	--	--	1		USAF 1994 OU1 RI
20M22	05/25/93		<2.0	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M22	07/27/94		<1.0	<1.0	<1.0	<1.0	<50	180	1-3		USAF 1995 OU1 RD
20M22	09/27/94		<1.0	<1.0	<1.0	<1.0	<50	120	1-3		USAF 1995 OU1 RD
20M23	09/15/89		**178**	1.1	11.2	<0.4	--	--	1,5	a	USAF 1994 OU1 RI
20M23	1989		--	--	--	--	--	--	1		USAF 1994 OU1 RI
20M23	05/20/93		2.1	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M23	07/18/94		<1.0	<1.0	<1.0	<1.0	<50	510	1-3		USAF 1995 OU1 RD
20M23	09/27/94		<1.0	<1.0	<1.0	<1.0	<50	180	1-3		USAF 1995 OU1 RD
20M23	07/29/96		<1.0	<1.0	<1.0	1.2	--	--	1		USAF 1996 SWMPR
20M23	08/28/97		<1.0	<1.0	<1.0	<1.0	--	--	1,4		USAF 1997 SWMPR
20M23	09/18/02	9	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
20M24	09/26/89		2.3	0.6	<0.5	<0.4	--	--	1,5	a	USAF 1994 OU1 RI
20M24	1989		--	--	--	--	--	--	1		USAF 1994 OU1 RI
20M24	05/20/93		0.9	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M24	07/18/94		1.6	<1.0	<1.0	2.4	<50	530	1-3		USAF 1995 OU1 RD
20M24	09/27/94		<1.0	<1.0	<1.0	<1.0	<50	180	1-3		USAF 1995 OU1 RD
20M25	07/27/94		**16**	29	12	129	**1,300**	1,200	1-3		USAF 1995 OU1 RD
20M25	09/28/94		4.2	2.2	5.0	38	**1,700**	--	1,2		USAF 1995 OU1 RD
20M25	07/10/95		4.2	1.9	1.4	5.1	400	610	1-3		USAF 1995 OU1 RD

TABLE ST20 (E-9)-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST20 (E-9) REFUELING LOOP, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
20M26	05/24/93		<2.0	--	--	--	--	--	1,4,5		USAF 1994 OU1 RI
20M26	07/27/94		<1.0	<1.0	<1.0	<1.0	<50	<100	1-3		USAF 1995 OU1 RD
20M26	09/27/94		<1.0	<1.0	<1.0	<1.0	<50	120	1-3		USAF 1995 OU1 RD
20M26	06/18/95		Did not sample because well is located in restricted area.								USAF 1996 SWMPR
20PP58	07/31/95		**190**	48	26	530	**2,000**	870	1-3		USAF 1995 OU1 RD
20PP58B	09/17/07	13	**8.7**	1.2	13	300	--	--	7		USAF 2007 SWMPR
20PP115	08/01/95		**340**	**3,600**	270	4,200	**14,000**	**27,000**	1-3		USAF 1995 OU1 RD
20PP115	10/02/02	14	2.1	22	12	99	--	--	11		USAF 2002 SWMPR
20PS22V	08/01/95		**22**	**2,200**	520	3,200	**10,000**	**9,900**	1-3		USAF 1995 OU1 RD
20PS22VB	09/17/07	13	<0.4	0.6J	<1.0	14J	--	--	7		USAF 2007 SWMPR
20PS27V	08/01/95		<1.0	<1.0	<1.0	<1.0	270	500	1-3		USAF 1995 OU1 RD

Notes:

a.	For semivolatile compounds detected, see reference
b.	TPH DRO chromatogram is dominated by large peak not characteristic of diesel.
c.	Product detected in well, sampled without purging.
MCL	maximum contaminant level
Bold	Bold text indicates concentration exceeds MCL.
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
J	Indicates that the analyte was positively identified; however the quantitation is estimated.

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
11. 8021

This page intentionally left blank

2.4 ST48 Power Plant Area

2.4.1 Background

Source area ST48 is located in the east-central portion of Eielson AFB, near the intersection of Division Street and Industrial Drive. The source area is approximately 1.5 acres in size with a flat surface gradient. Groundwater at ST48 ranges from approximately 7 to 10 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU1 BLRA considered industrial and residential future land use scenarios.

The fuel release is located south and east of the Base power plant. Water supply well D, located north of the power plant building, pumps groundwater from approximately 130 ft bgs and supplies potable water to the Base drinking water distribution system. Three nested monitoring wells (48M04, 48M05, and 48M06) permit sampling groundwater from discrete depths within the aquifer near the Base supply well. In addition there are two cooling water supply wells located east of the ST48 source area.

History of Contamination

The quantity of fuel released at the ST48 source area is unknown. The source of hydrocarbon contamination is believed to be leakage from a buried multi-fuel pipeline. In 1987, benzene, toluene, and trichloroethene (TCE) were detected in water supply well D. NAPL was also observed in dewatering wells north of the power plant. Other chlorinated VOCs have also been detected in monitoring wells at this source area. The suspected chlorinated hydrocarbon source is a previously existing dry well at building 3423, approximately 500 ft south of ST48, that may have been used for solvent disposal. The chlorinated hydrocarbons are not considered COCs at ST48 as their removal would not significantly reduce the risk level (USAF, 1994f).

Initial Response

Six monitoring wells and a static recovery well were installed in 1988. The static recovery well failed to remove a significant product quantity. A free product recovery system was installed in 1992, however the system was ineffective. Later the same year the system was modified to operate as a bioventing system.

Basis for Taking Action

The RI/FS and BLRA identified BTEX compounds that exceeded MCLs. The exposure pathways of potential concern are the prolonged contact, consumption, and inhalation of vapor from contaminated groundwater.

2.4.2 Remedial Actions

The COCs at ST48 are BTEX. Based on the RI/FS and BLRA, the selected remedy cited in the OU1 ROD includes the following:

- Passive product recovery where mobility is sufficient
- Bioventing/SVE to reduce NAPL and remediate soil contamination to prevent leaching to groundwater

- Groundwater monitoring including increased monitoring near Base water supply wells until cleanup goals are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for the ST48 source area include the following:

- Prevent use of water having carcinogens in excess of MCLs
- Prevent use of water having noncarcinogens in excess of MCLs or reference doses
- Restore aquifer to its designated beneficial use as a drinking water source
- Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Remedy Implementation

The OU1 ROD documented IRAs, and recorded a selected remedy that included continuation of previous actions. The OU1 Remedial Design document was finalized in November 1995 and documented the existing remedial systems and the required monitoring for these systems. The Remedial Design document also presented scoping for the final Remedial Action. Based on the scoping, it was agreed that remediation systems constructed as IRAs fulfilled Remedial Design requirements, and that only minor additional effort was required to implement full-scale remediation at OU1 sites.

The area to be remediated by the bioventing system was the area bounded by the 100 µg/L dissolved benzene contour and the historical presence of NAPL. The bioventing system at ST48 was modified in 1996 with the installation of two air injection points. The system was further modified in 1997 with the construction of a new air distribution manifold, the replacement and burial of all distribution piping, and the completion of all air injection points below surface grade with flush mount well covers.

Groundwater samples were collected under the 1995, 1996, 1997, 2002, and 2006 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M checks are performed on average of once per week. Flows and pressures in the distribution manifolds are measured and adjusted as required for equal air distribution to all areas under the influence of the bioventing system. Blowers and air inlet filters are replaced as needed.

Respiration tests and site evaluations have been conducted on an annual basis. The bioventing systems are shut down during the respiration test and site evaluations. Respiration tests are performed to evaluate hydrocarbon biodegradation rates in the subsurface soil. The site evaluations are performed to determine the condition of well covers and system components.

O&M also includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

2.4.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2006 SWMP.

2.4.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 2.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the annual Remedial Action Operation reports.

Data Review

Average biodegradation rates decreased from 3 mg/Kg-day in 1992 to 1 mg/Kg-day in 2001. Respiration tests were used to estimate that approximately 12,900 gallons of fuel have biodegraded between 1992 and 2002.

Groundwater samples collected in 2006 had benzene (23 µg/L), toluene (1,400 µg/L) and ethylbenzene (900 µg/L) exceeding the MCL in source area monitoring well 48M08B. Xylene (3,000 µg/L) was detected in 48M08B at a concentration below the MCL. All BTEX compounds were non-detect in the down gradient groundwater sample from 18-6B. Groundwater sampling results from 2002 for chlorinated compounds were either non-detect or detected at concentrations below their respective MCL (Figure ST48-1). Limited free product recovery attempts in 2002 removed approximately 3 gallons NAPL from monitoring well 48M01, and were discontinued due to insufficient recharge. Groundwater monitoring indicates a stable and attenuating plume.

Soil samples were collected in 2001 as part of the RPO (USAF, 2002c). All soil sample results for BTEX were below levels identified by the OU1 ROD to protect groundwater. A soil gas survey conducted as part of the RPO also reported BTEX concentrations in the vadose soils below the 5 µg/L detection limit.

The RPO Phase II Technical Report recommended shutting down the bioventing system. The RPO also concluded soil BTEX levels may still exist above OU1 ROD cleanup criteria north of Division Street, near well 48M08, outside the area of influence of the existing bioventing system. The bioventing system was shut down in September 2002, and decommissioned in August 2003.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. The inspection team looked at space between monitoring wells 48M01 and 48M03. ADEC wants to evaluate the vapor intrusion pathway due to the high COC concentrations and the potential drinking water well. ADEC requested information regarding the drinking water well sampling frequency and sampling method. ADEC discussed down gradient groundwater monitoring at ST48. Eielson AFB will sample the cluster wells at ST48 in 2008. DQOM will be applied to this source area.

2.4.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area ST48 is performing as expected. Groundwater monitoring and RPO Phase II results indicate continued decreasing BTEX concentrations. Respiration tests conducted at the bioventing system locations were used to estimate that approximately 12,900 gallons of fuel have been biodegraded. ICs are still being implemented to prevent exposure to contaminated groundwater. Groundwater monitoring indicates a stable and attenuating plume at ST48.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the ROD. The bioventing system has effectively biodegraded fuels at the source area, decreasing BTEX concentrations in the local groundwater. The bioventing system was shut down in September 2002, and decommissioned in August 2003. All previous assumptions for the ST48 source area are still valid.

2.4.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area ST48.

2.4.7 Recommendations and Follow-Up Actions

Respiration testing, groundwater monitoring, and RPO Phase II results indicate the RAOs for ST48 are being achieved. Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs, projected in 2016. Eielson AFB will evaluate the vapor intrusion pathway and determine if the pathway presents an unacceptable risk. Cluster wells 48MW04, 48MW05, and 48MW06 will be sampled in 2008. Land use restrictions will remain in effect until RAOs are achieved.

2.4.8 Protectiveness Statement

The remedy at OU1 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source area has been addressed through bioventing and the implementation of ICs to prevent the prolonged contact, consumption, and inhalation of vapor from contaminated groundwater.

2.4.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for ST48:

List of Tables for ST48:

This page intentionally left blank

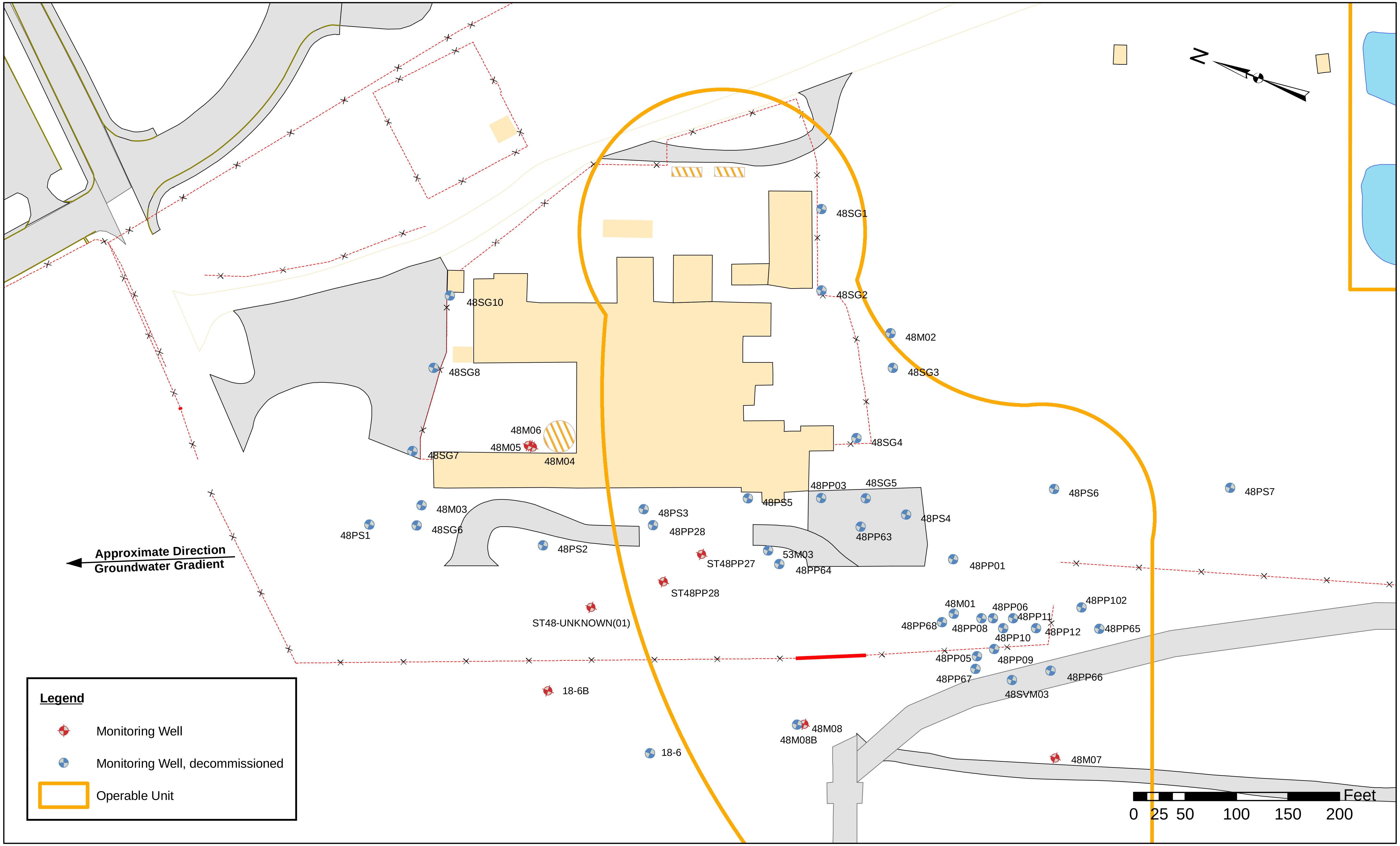


Figure ST48-1: ST48, Power Plant Area, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST48-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST48, POWER PLANT AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	TCE	1,2-DCA	trans-1,2-DCE	Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**5**	**5**	**100**	**1,460**			**18 AAC 80.300**
18-6	1986		<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	--			BEAR
18-6	1986		<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	--			BEAR
18-6	09/15/91		<5.0	<5.0	<5.0	<5.0	--	--	<5.0	--	--	--	5,6,8	a	PNL 1993 OU2 RI
18-6	05/18/93		<2.0	--	--	--	--	--	<1.0	--	--	--			PNL 1994 OU1 RI
18-6	07/26/94		<1.0	<1.0	<1.0	<1.0	<50	<100	<1.0	--	--	--	1-4	b	USAF 1995 OU1 RD
18-6	10/04/94		<1.0	<1.0	<1.0	<1.0	<50	600	<1.0	--	--	--	1-4	b	USAF 1995 OU1 RD
18-6B	09/15/06	14.0	<0.1	<0.2	<0.2	<0.2	--	--	--	--	--	--	7		USAF 2006 SWMPR
48M01	1989		**1,390**	49	143	1,550	--	--	--	--	--		1,5	a	HLA 1992 RI/FS
48M01	05/19/93		**910**	--	--	--	--	--	<1.0	--	--		1,4,5		PNL 1994 OU1 RI
48M01	07/27/94		**3,900**	350	230	1,960	**14,000**	**230,000**	<1.0	**36**	--		1-4	b,d,e	USAF 1995 OU1 RD
48M01	10/04/94		**3,600**	82	170	1,240	**13,000**	--	<1.0	**54**	--		1,2,4	d	USAF 1995 OU1 RD
48M01	07/27/95		**2,900**	200	110	1,100	**4,600**	**50,000**	<25	**32**	--		1-4	b	USAF 1995 OU1 RD
48M01	09/08/95		**3,300**	89	480	5,100	**25,000**	**97,000**	<20	<20	--		1-4	b,d,i	USAF 1995 OU1 RD
48M01	07/29/96		**4,600**	87	290	1,980	--	--	<5.0	**14**	--		1,4	b,j	USAF 1996 SWMPR
48M01	09/11/97		**3,800**	62	220	1,420	--	--	<1.0	4	<1.0		1,4	b,k	USAF 1997 SWMPR
48M03	10/06/89		0.3	<0.3	<0.5	<0.9	--	--	--	--	--				BEAR
48M03	10/06/89		<0.02	<0.3	<0.5	<0.4	--	--	--	--	--		1,5	a	HLA 1992 RI/FS; BEAR
48M03	05/18/93		<2.0	--	--	--	--	--	0.31	--	--		1,4,5		PNL 1994 OU1 RI
48M03	07/25/94		<1.0	<1.0	<1.0	<1.0	<50	270	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M03	10/04/94		<1.0	<1.0	<1.0	<1.0	<50	120	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M03	07/24/95		<1.0	<1.0	<1.0	1.1	<50	**2,900**	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M04	09/29/89		<0.02	<0.3	<0.5	<0.4	--	--	--	--	--		1,5	a	HLA 1992 RI/FS; BEAR
48M04	05/17/93		0.1	--	--	--	--	--	<1.0	--	--		1,4,5		PNL 1994 OU1 RI
48M04	07/21/94		<1.0	<1.0	<1.0	<1.0	<50	120	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M04	08/03/94		<1.0	<1.0	<1.0	<1.0	--	--	<0.5	<0.5	--		1,4	b	PNL 1994 SWGMP
48M04	10/05/94		<1.0	<1.0	<1.0	<1.0	<50	130	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M04	09/08/95		<1.0	<1.0	<1.0	<1.0	<50	150	<1.0	<1.0	--		1-4	b	USAF 1995 SWMPR
48M04	07/23/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	--		1,4	b,j	USAF 1996 SWMPR
48M04	09/15/97		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0		1,4	b,k	USAF 1997 SWMPR
48M04	09/18/02	18	<0.5	<1.0	<1.0	<2.0	--	--	<1.0	<1.0	<1.0	<2.0	7		USAF 2002 SWMPR
48M05	09/29/89		**29**	<0.3	<0.5	1.6	--	--	--	--	--				BEAR
48M05	09/29/89		3.0	<0.3	<0.5	<0.4	--	--	--	--	--		1,5	a	HLA 1992 RI/FS; BEAR
48M05	05/17/93		1.3	--	--	--	--	--	0.6	--	--		1,4,5		PNL 1994 OU1 RI
48M05	07/21/94		1.3	<1.0	<1.0	<1.0	<50	230	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M05	08/03/94		<1.0	<1.0	<1.0	<1.0	--	--	<0.5	<0.5	--		1,4	b	PNL 1994 SWGMP
48M05	10/05/94		<1.0	<1.0	<1.0	<1.0	<50	**2,100**	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M05	09/07/95		2.2	<1.0	<1.0	<1.0	56	<100	<1.0	<1.0	--		1-4	b	USAF 1995 SWMPR
48M05	07/24/96		1.2	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	--		1,4	b,j	USAF 1996 SWMPR
48M05	09/15/97		**5.0**	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0		1,4	b,k	USAF 1997 SWMPR
48M05	09/04/02	41	<0.5	<1.0	<1.0	<2.0	--	--	<1.0	<1.0	<1.0	<2.0	7		USAF 2002 SWMPR
48M06	09/28/89		<0.2	<0.3	<0.5	<0.9	--	--	--	--	--				BEAR
48M06	09/28/89		<0.2	<0.3	<0.5	<0.4	--	--	--	--	--		1,5	a	HLA 1992 RI/FS; BEAR
48M06	05/17/93		<2.0	--	--	--	--	--	0.6	--	--		1,4,5		PNL 1994 OU1 RI
48M06	07/26/94		<1.0	<1.0	<1.0	<1.0	<50	140	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M06	08/03/94		<1.0	<1.0	<1.0	<1.0	--	--	<0.5	<0.5	--		1,4	b	PNL 1994 SWGMP
48M06	10/05/94		<1.0	<1.0	<1.0	<1.0	<50	**2,900**	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M06	09/07/95		<1.0	<1.0	<1.0	<1.0	<50	<100	<1.0	<1.0	--		1-4	b	USAF 1995 SWMPR

TABLE ST48-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST48, POWER PLANT AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	TCE	1,2-DCA	trans-1,2-DCE	Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**5**	**5**	**100**	**1,460**			**18 AAC 80.300**
48M06	07/25/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	--		1,4	b,j	USAF 1996 SWMPR
48M06	09/15/97		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0		1,4	b	USAF 1997 SWMPR
48M07	10/09/89		3.6	<0.3	<0.5	<0.4	--	--	--	--	--		1,5	a	HLA 1992 RI/FS; BEAR
48M07	05/18/93		0.4	--	--	--	--	--	2.1	--	--		1,4,5		PNL 1994 OU1 RI
48M07	07/20/94		<1.0	<1.0	1.1	2.0	300	1,100	<1.0	<1.0	--		1-4	b,f	USAF 1995 OU1 RD
48M07	10/04/94		<1.0	<1.0	<1.0	<1.0	<50	520	<1.0	<1.0	--		1-4	b	USAF 1995 OU1 RD
48M07	03/16/95		**6.3**	15	7.8	28	360	390	1.8	<1.0	--		1-4	b,g	USAF 1995 OU1 RD
48M07	07/25/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	--		1,4	b,f,j	USAF 1996 SWMPR
48M08	05/27/93		**130**	--	--	--	--	--	--	--	--		1,4,5		PNL 1994 OU1 RI
48M08	07/24/95		**210**	**3,200**	**830**	3,700	**11,000**	**4,500**	<25	<25	--		1-4	b	USAF 1995 OU1 RD
48M08	07/25/96		**570**	**2,300**	550	2,160	--	--	<1.0	<1.0	--		1,4	b,f,j	USAF 1996 SWMPR
48M08	09/26/02	12	**882**	**12,500**	**1,600**	6,820	--	--	2.2	<1.0	<1.0	754	7	m	USAF 2002 SWMPR
48M08B	09/12/06	13	**23**	**1,400**	**900**	3,000	--	--	--	--	--	--	7		USAF 2006 SWMPR
48PP13	07/26/95		**7,200**	**5,400**	370	1,800	**32,000**	**60,000**	<25	**47**	--		1-4	b	USAF 1995 OU1 RD
48PP13	07/18/96		**6,700**	**3,700**	250	1,360	--	--	<20	**61**	--		1,4	b,j	USAF 1996 SWMPR
48PP28	07/26/95		**64**	540	480	4,100	**14,000**	**180,000**	<25	<25	--		1-4	b	USAF 1995 OU1 RD
48PP28	07/18/96		<1.0	150	280	3,600	--	--	<1.0	<1.0	--		1,4	b,j	USAF 1996 SWMPR
48PP101	07/26/95		**250**	11	160	960	**7,800**	**58,000**	<5.0	<25	--		1-4		USAF 1995 OU1 RD
48PP102	07/18/96		**6.2**	5.0	160	660	--	--	<1.0	<1.0	--		1,4	b,f,j	USAF 1996 SWMPR
48PS1A	09/09/94	3	ND	ND	ND	ND	ND	ND						n	USAF 1995J
48PS1B	09/09/94	6	ND	ND	ND	8.0	ND	ND						n	USAF 1995J
48PS1C	09/09/94	9	ND	ND	ND	3.0	ND	ND						n	USAF 1995J
48PS1D	09/12/94	12	ND	ND	ND	5.0	ND	ND						n	USAF 1995J
48PS2A	9/12,15/1994	4	**900**	**4,900**	500	4,000	**32,000**	**370,000**						n	USAF 1995J
48PS2B	9/14,15/1994	7	**110**	280	90	460	5,000	17,000						n	USAF 1995J
48PS3A	09/10/94	6	**12**	<2.0	<3.0	<6.0	<120	<700						n	USAF 1995J
48PS3B	9/9,10/1994	9	**13**	<2.0	5.7	16	210	<700						n	USAF 1995J
48PS3C	09/10/94	12	<2.0	<2.0	<3.0	8.5	<120	<700						n	USAF 1995J
48PS3D	09/12/94	15	<2.0	<2.0	<3.0	<6.0	<120	<700						n	USAF 1995J
48PS4A	09/09/94	6	**140**	59	130	206	**4,200**	**110,000**						n	USAF 1995J
48PS4B	09/09/94	9	**48**	18	77	85	**2,500**	**22,000**						n	USAF 1995J
48PS4C	9/9,10/1994	12	**24**	5.3	<3.0	25	800	**3,600**						n	USAF 1995J
48PS4D	09/09/94	15	**20**	<2.0	<3.0	12	130	<700						n	USAF 1995J
48PS4E	09/12/94	18	<2.0	<2.0	<3.0	5.0	<120	<700						n	USAF 1995J
48PS5A	9/9,10/1994	4	2	3.8	8.5	21	780	**1,600**						n	USAF 1995J
48PS5B	9/9,10/1994	7	**200**	8	68	98	**2,000**	<700						n	USAF 1995J
48PS5C	09/09/94	10	**20**	3.3	<3.0	35	130	<700						n	USAF 1995J
48PS5D	09/09/94	13	<2.0	<2.0	<3.0	<6.0	<120	<700						n	USAF 1995J
48PS5E	09/12/94	16	2.8	2.7	<3.0	34	<120	<700						n	USAF 1995J
48PS5F	9/12,15/1994	19	<2.0	<2.0	<3.0	13	<120	<700						n	USAF 1995J
48PS6A	9/9,10/1994	4	<2.0	<2.0	<3.0	15	750	**3,300**						n	USAF 1995J
48PS6B	09/09/94	7	**5.4**	<2.0	<3.0	8.9	470	**1,500**						n	USAF 1995J
48PS6C	09/10/94	10	3.1	3.5	<3.0	22	160	<700						n	USAF 1995J
48PS6D	9/9,10/1994	13	<2.0	<2.0	<3.0	<6.0	<120	<700						n	USAF 1995J
48PS7A	09/12/94	4	<2.0	<2.0	<3.0	<6.0	<120	<700						n	USAF 1995J

TABLE ST48-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, ST48, POWER PLANT AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	TCE	1,2-DCA	trans-1,2-DCE	Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**5**	**5**	**100**	**1,460**			**18 AAC 80.300**
48PS7B	9/12,15/1994	7	<2.0	<2.0	<3.0	5.5	<120	<700						n	USAF 1995J
53M03	10/06/89		**299**	53	<0.5	1,990	--	--	--	--	--				BEAR
53M03	9/91		**460**	53	100	890	--	--	1.0	<5.0	--		5,6,8	a	PNL 1993 OU2 RI
53M03	05/18/93		**120**	--	--	--	--	--	0.4	--	--		1,4,5		PNL 1994 OU1 RI
53M03	07/27/94		**220**	44	110	660	**9,100**	**45,000**	<1.0	2.3	--		1-4	b	USAF 1995 OU1 RD
53M03	10/05/94		**460**	11	27	164	**3,000**	**56,000**	<1.0	1.2	--		1-4	b	USAF 1995 OU1 RD
53M03	03/10/95		1.9	2.9	1.6	9.3	<100	230	2.1	<1.0	--		1-4	b	USAF 1995 OU1 RD
53M03	07/24/95		**190**	15	27	260	**2,400**	**61,000**	<1.0	1.5	--		1-4	b,h	USAF 1995 OU1 RD
53M03	09/08/95		**240**	25	47	490	**2,300**	**7,000**	<1.0	<1.0	--		1-4	b	USAF 1995 SWMPR
53M03	07/25/96		**390**	26	87	410	--	--	<1.0	<1.0	--		1,4	b,j	USAF 1996 SWMPR
53M03	09/02/97		**170**	21	72	570	--	--	<1.0	<1.0	<1.0		1,4	b,k	USAF 1997 SWMPR
53M03	09/26/02	14	**25**	4.6	11	68	--	--	<1.0	<1.0	<1.0	62	7	l	USAF 2002 SWMPR

Notes:

a	For additional compounds detected, see reference.
b	No compounds other than those listed or noted were detected above the reporting limits.
d	Sampled without purging, sampled after 10 gal. purged 16 March 1995.
e	Additional compounds detected: chloroethane - 3.2 µg/L.
f	Additional compounds detected: chloromethane - 2.7 µg/L, 48M07 - 5.6 mg/L, 48M08 - 1.8 mg/L, 48 PP102 - 2.2 mg/L.
g	Well was frozen, hot water was introduced and 3 gal. purged before sampling.
h	Additional compounds detected: 1,4 dichlorobenzene - 2.4 µg/L.
i	Additional compounds detected: chloroform - 58 µg/L, probably the result of laboratory dilution water contamination.
j	Methylene chloride detected in concentrations ranging from 2.6 - 84 ug/L, suspected to be the result of laboratory contamination.
k	Additional compound detected: chloromethane - 2 mg/L (48M01), 0.7 mg/L (48M04), 1.0 mg/L (18-3,48M05, 53M03).
l	Additional compounds detected (µg/L): 2-butanone (MEK) 55.8, isopropylbenzene 1.33, n-propylbenzene 1.30, 1,3,5-TMB 14.6, 1,2,4-TMB 33.0, and 4-isopropyltoluene 1.69.
m	Additional compounds detected (µg/L): chromomethane 1.02, chloroethane 2.67, 1,2-dobromoethane 4.84, isopropylbenzene 46.1, n-propylbenzene 111.0, 1,3,5-TMB 469.0, 1,2,4-TMB 1600.0, sec-butylbenzene 4.91, 4-isopropyltoluene 3.80, n-butylbenzene 7.39.
n	Analyses performed by on-site gas chromotograph
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
TCE	Trichloroethene
DCA	Dichloroethane
DCE	Dichloroethene
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
MCL	Maximum contaminant level
Bold	Bold text indicates concentration exceeds MCL.

Complete references are provided in Appendix B.

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102

This page intentionally left blank

2.5 SS50-SS52 Blair Lakes Vehicle Maintenance, Ditch, and Fuel Spill

2.5.1 Background

Source areas SS50-SS52 are at the remote Blair Lakes Target Facility located approximately 20 miles southwest of Eielson AFB. The source areas total approximately 2 acres in size with a flat surface gradient. Groundwater at Blair Lakes ranges from approximately 4 to 6 ft bgs. The current land use is industrial. Land surrounding the facility is undeveloped. While the current land use is unlikely to change, the OU1 BLRA considered industrial and residential future land use scenarios.

The facility is accessible by air throughout the year and every other winter by an ice road. Power and water are supplied to the facility by generators and a water supply well located southeast of the vehicle maintenance shop. The original water supply well was located in the vehicle maintenance shop. The well was taken out of service when petroleum odors were noted in the water. A crack in the casing of the well near the surface is believed to be the pathway for surface contamination entering the water.

History of Contamination

The suspected source of contamination for SS50 is heating oil spills at the storage tank and leaks from the abandoned buried fuel lines. During construction activities, diesel fuel was found in the ditch designated as SS51; however, the source of the fuel is unknown. A diesel fuel spill of unknown quantity from a line located near the generator building was the source of contamination at SS52.

Initial Response

Monitoring wells and product probes were installed in 1988 and 1989 during the Stage 3 and Stage 4 field investigations. An isolated NAPL accumulation was observed in the area around the vehicle maintenance building. Two extraction trenches and three recovery wells were installed in 1992. Six product probes were also installed in 1992 to investigate the lateral distribution of NAPL near the maintenance and generator buildings. Three product probes were installed in 1993 to test for the presence of NAPL near the pump islands. Approximately 760 gallons of NAPL were recovered through July 1995.

Basis for Taking Action

The RI/FS and BLRA identified BTEX compounds exceeding MCLs. The exposure pathways of potential concern are the prolonged contact, consumption, and use of contaminated groundwater.

2.5.2 Remedial Actions

The COCs at SS50-SS52 are BTEX. Based on the RI/FS and BLRA, the selected remedy cited in the OU1 ROD includes the following:

- Active product recovery
- Passive product recovery where mobility is sufficient
- Bioventing/SVE to reduce free product and remediate soil contamination to prevent leaching to groundwater

- Perform supplemental soil and groundwater sampling at and in the vicinity of monitoring well 50M05 to confirm that no significant contamination remains
- Groundwater monitoring, including increased monitoring near Base water supply wells until cleanup goals are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for SSS50-SS52 include the following:

- Prevent use of water having carcinogens in excess of MCLs
- Prevent use of water having noncarcinogens in excess of MCLs or reference doses
- Restore aquifer to its designated beneficial use as a drinking water source
- Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Remedy Implementation

The OU1 ROD documented IRAs, and recorded a selected remedy that included continuation of previous actions. The OU1 Remedial Design document was finalized in November 1995 and documented the existing remedial systems and the required monitoring for these systems. The Remedial Design document also presented scoping for the final remedial action. Based on the scoping, it was agreed that remediation systems constructed as IRAs fulfilled Remedial Design requirements, and that only minor additional effort was required to implement full-scale remediation at OU1 sites.

Additional study of the permafrost beneath the Blair Lakes facility was required by the OU1 ROD prior to initiating bioventing. Subsequent studies have concluded that shallow pockets of permafrost could be affected by bioventing, and that the mobility of product could be hindered resulting in decreased product recovery. As a result, the bioventing/SVE component of the selected remedy was not implemented.

Confirmation groundwater samples were collected from monitoring well 50M05 in 1995 and 1996. Elevated benzene concentration (120 µg/L) remained during the 1996 sampling event. Monitoring well 50M05 was subsequently destroyed by frost heaving and facility maintenance equipment, and was not sampled after 1996. A replacement monitoring point (50HMW01) was installed and sampled 50 ft southeast of 50M05 in 2002. 2002 sample results were non-detect for BTEX compounds. Confirmation soil samples were not collected as elevated BTEX concentrations likely remain in the subsurface soils at this source area.

Additional groundwater samples were collected under the 1995, 1996, 1997, and 2002 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

A pneumatic NAPL recovery pump system was installed in wells 50RW02 and 50RW03, and is operated by compressed air delivered and controlled from inside the maintenance building. The O&M duties at SS50-SS52 include a monthly check of components for the NAPL pumping system, and gauging of probes and wells at the site. Recovered NAPL is stored in a 1,000-gallon aboveground storage tank (AST) located inside the maintenance building. Recovered NAPL is removed from the holding tank and transported to the Base Hazardous Materials (HAZMAT) Facility by truck, over the winter ice bridge.

O&M also includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

2.5.3 Progress Since the last Five-Year Review

Free product recovery continued until December 2004 when the recovery system was decommissioned. Existing monitoring wells were also decommissioned due to frost heaving.

2.5.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 2.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the annual Remedial Action Operation reports.

Data Review

Product recovery decreased since the initial system operation. Approximately 1133 gallons NAPL was recovered from 1992 to 2004. The system ceased operating from 1998 to 2000 due to mechanical malfunctions, and was permanently decommissioned in December 2004. Approximately 83 gallons of NAPL were recovered after resuming system operation in 2000. The product recovery decrease is likely the result of local permafrost and product immobility.

Groundwater samples collected in 2002 had benzene concentrations exceeding the MCLs in one down gradient sample (50HMW03 at 13µg/L). A new monitoring point (50HMW01) was installed near 50M05 and had non-detect BTEX. BTEX constituents were also non-detect in the sample collected from monitoring well 50HMW02. Product thickness in 50M01, located approximately 25 ft hydrologically up gradient from recovery well 50RW2, ranged between 2.2 ft and 3.9 ft (Figure SS50-52-1). Product thickness is recovery wells 50RW1, 50RW2, and 50RW3 general ranged 0.2 ft to 0.5 ft.

RPO studies were conducted in August 2002 (USAF, 2002c). The RPO studies included a site visit and document review. No samples were collected as part of the RPO studies. The RPO studies conclude that product recovery efforts will not reduce the time frame to achieve remediation goals. The RPO Phase II report recommends groundwater monitoring with land use controls.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. The inspection team discussed the remote location. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the Blair Lakes source areas. Vapor intrusion issues do not pertain to the facilities remaining on site. DQOM will be applied to this source area.

2.5.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source areas SS50-52 is performing as expected. The selected remedy included bioventing dependent on its applicability. The result of data gap work indicated bioventing would likely interfere with product recovery efforts. Free product recovery has been accomplished to the maximum extent practicable as defined by 18 Alaska Administrative Code (AAC) 75.990. Groundwater monitoring indicates a stable and attenuating plumes at SS50-52. ICs prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review, the RAOs were addressed as intended by the ROD. 2002 groundwater monitoring results and the presence of NAPL indicate BTEX concentrations remain above MCLs. The free product recovery system was decommissioned in 2004 as efforts were not significantly reducing the time to reach remediation goals. All previous assumptions for the SS50-SS52 source areas are still valid.

2.5.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area SS50-52

2.5.7 Recommendations and Follow-Up Actions

Elevated benzene concentrations remain at SS50-52 due to the existence of NAPL. Contamination at this source area presents minimal risks to human health and the environment due to the remote site location and groundwater immobility. Groundwater monitoring will continue as determined by the RPMs at SS50-52 until BTEX concentrations meet the MCLs, projected in 2009. Additional land use restrictions include limitations on excavation and construction activities and the extraction of shallow groundwater.

2.5.8 Protectiveness Statement

The remedy at OU1 is protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are controlled. The remedy for the source area has been addressed through product recovery, groundwater monitoring, and the implementation of ICs to prevent the prolonged contact, consumption, and use of contaminated groundwater. Land use restrictions will remain in effect until RAOs are achieved.

2.5.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for SS50-SS52:

List of Tables for SS50-SS52:

This page intentionally left blank

50M10	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	<0.2	<0.3	<0.5
05/93	0.8	--	--
12/94	<1.0	<1.0	<1.0

50M06	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	3.9	<0.3	<0.5
12/89	3.0	<0.3	<0.5
5/93	<2.0	--	--
12/94	<1.0	<1.0	<1.0
9/95	<1.0	<1.0	<1.0
10/96	<1.0	<1.0	<1.0
10/97	<1.0	<1.0	<1.0

50PS10	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/95	<1.0	1.2	<1.0

50PS11	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/94	160	230	510

50PS12	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/94	990	45	160

50HMW01	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/02	<0.5	<2.0	<2.0

50HMW03	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/02	13	<2.0	<2.0

50HMW02	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/02	<0.5	<2.0	<2.0

50M01	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	335	2,080	2,210
12/89	65	261	332
05/93	28	--	--
09/95	450	620	420
10/96	FROZEN NO SAMPLE		
10/97	FROZEN NO SAMPLE		

50M02	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	<0.2	<0.3	<0.5
12/89	<0.2	<0.3	<0.5
05/93	<2.0	--	--
12/94	<1.0	<1.0	<1.0

50M07	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	3.8	2.7	0.9
05/93	<2.0	--	--
12/94	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0
10/96	4.0	6.0	3.5
10/97	<1.0	<1.0	<1.0

50M05	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
10/89	108	8.4	342
12/89	44	53	136
05/93	290	--	--
12/94	4.0	1.3	39
09/95	5.8	1.1	15
10/96	120	2.6	56

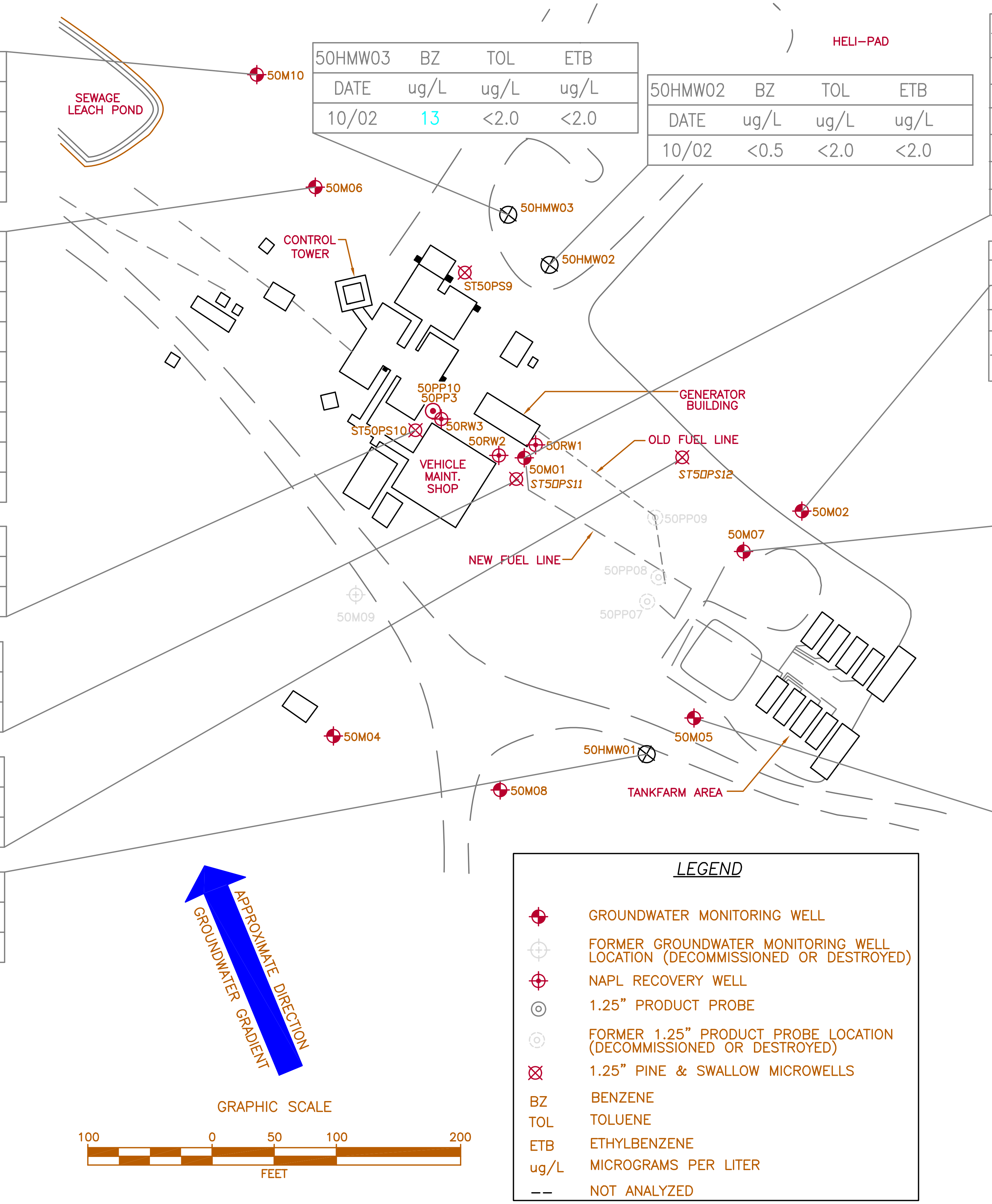


Figure SS50–52–1: SS50–52, Blair Lake Facility, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE SS50-SS52-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, A

SS50-SS52 BLAIR LAKE FACILITY, EIELSON AFB, ALASK

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**NA**	**NA**			**18 AAC 80.300**
50HMW01	10/4/2002	10.2	<0.5	<2.0	<2.0	<2.0	[illegible]	[illegible]	11	e	USAF 2002 SWMPR
50HMW02	10/4/2002	9.9	<0.5	<2.0	<2.0	<2.0	--	--	11	e	USAF 2002 SWMPR
50HMW03	10/4/2002	9.9	**13**	<2.0	<2.0	<2.0	--	--	11	e	USAF 2002 SWMPR
50M01	10/02/89		**335**	**2,080**	**2,210**	6,940	--	--	1,4,5		HLA 1992 RI/FS
50M01	12/31/89		**65**	261	332	1,860	--	--			BEAR
50M01	05/26/93		**28**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
50M01	09/14/95		**450**	620	420	2,400	5,500	490,000	1-3		
50M01	10/09/96			No sample was collected - well was frozen.							USAF 1996 SWMPR
50M01	10/10/97			No sample was collected - well was frozen.							USAF 1997 SWMPR
50M02	10/01/89		<0.2	<0.3	<0.5	<0.4	--	--	1,4,5		HLA 1992 RI/FS
50M02	12/31/89		<0.2	<0.3	<0.5	<0.9	--	--			BEAR
50M02	05/25/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
50M02	12/14/94		<1.0	<1.0	<1.0	<1.0	59	<100	1-3		USAF 1995 OU1 RD
50M05	10/02/89		**108**	8.4	342	126	--	--	1,4,5		HLA 1992 RI/FS
50M05	12/31/89		**44**	53	136	602	--	--			BEAR
50M05	05/25/93		**290**	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
50M05	12/14/94		4.0	1.3	39	54	660	590	1-3		USAF 1995 OU1 RD
50M05	09/14/95		**5.8**	1.1	15	16	<50	990			
50M05	10/09/96		**120**	2.6	56	177	--	--	1		USAF 1996 SWMPR
50M06	10/01/89		3.9	<0.3	<0.5	<0.4	--	--	1,4,5		HLA 1992 RI/FS
50M06	12/31/89		3.0	<0.3	<0.5	<0.9	--	--			BEAR
50M06	05/24/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
50M06	12/14/94		<1.0	<1.0	<1.0	<1.0	<50	130	1-3		USAF 1995 OU1 RD
50M06	09/14/95		<1.0	<1.0	<1.0	<1.0	<50	170	1-3		
50M06	10/09/96		<1.0	<1.0	<1.0	1.6	--	--	1		USAF 1996 SWMPR
50M06	10/10/97		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1997 SWMPR
50M07	10/02/89		3.8	2.7	0.9	11	--	--	1,4,5		HLA 1992 RI/FS
50M07	05/24/93		<2.0	--	--	--	--	--	1,4,5		PNL 1994 OU1 RI
50M07	12/14/94		<1.0	<1.0	<1.0	<1.0	50	<100	1-3		USAF 1995 OU1 RD
50M07	09/14/95		<1.0	<1.0	<1.0	<1.0	<50	63	1-3		
50M07	10/09/96		4.0	6.0	3.5	18	--	--	1		USAF 1996 SWMPR
50M07	10/10/97		<1.0	<1.0	<1.0	4.0	--	--	1		USAF 1997 SWMPR

TABLE SS50-SS52-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, A

SS50-SS52 BLAIR LAKE FACILITY, EIELSON AFB, ALASK

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**NA**	**NA**			**18 AAC 80.300**
50M10	05/24/93		[illegible]		[illegible]	[illegible]			1,4,5		PNL 1994 OU1 RI
50M10	12/14/94		<1.0	<1.0	<1.0	<1.0	60	<100	1-3		USAF 1995 OU1 RD
50PS3	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS4	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS7	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS8	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS10	09/14/95		<1.0	1.2	<1.0	6.8	<50	2,700	1-3		USAF 1995 OU1 RD
50PS11	10/06/94		**160**	230	510	1060	8,400	250,000	--	d	CRREL 1995
50PS12	10/06/94		**990**	45	160	180	1,700	<700	--	d	CREEL 1995
50PS14	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS16	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS17	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995
50PS18	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	d	CRREL 1995

Notes:
- a. No compounds other than those listed were detected above the reporting limits
- b. No compounds other than those listed were detected above the reporting limits set forth in the SWMP Workplan (USAF 1995)
- c. Chromatogram is dominated by large peak not characteristic of diesel
- d. Field gas chromatograph was used for sample analysis
- e. New well.
- MCL Maximum contaminanat level
- **Bold** Bold text indicates concentration exceeds MCL
- TPH GRO Total Petroleum Hydrocarbons Gasoline Range Organics
- TPH DRO Total Petroleum Hydrocarbons Diesel Range Organics

Analytical Methods:

1. 8020	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 8021
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	

3 OPERABLE UNIT 2

OU2 consists of seven source areas where fuel contaminants were released to the soil and groundwater. Free product, or NAPL, has been detected in some of the source areas. This Five-Year ROD Review only covers source areas ST10, ST13, SS14, and DP26. All other OU2 source areas are NFA, and no Five-Year ROD Review is required. Source areas ST10 and SS14, and ST13 and DP26 are discussed together because they are located close to each other, have similar types of contaminants, and the individual releases to groundwater have created an overlapping groundwater contaminant plume.

Source Area	Remedy or Status as Identified in the ROD
ST10 E-2 Petroleum, Oil, & Lubricant (POL) Storage	Bioventing, NAPL Recovery, ICs
ST13 E-4 Fuel Saturated Area	Bioventing, NAPL Recovery, ICs
SS14 E-2 Railroad JP-4 Fuel Spill Area	Bioventing, NAPL Recovery, ICs
DP26 Fuel Tank Sludge Burial Area	Bioventing, NAPL Recovery, ICs

Sources ST11, ST18, and ST19 were designated for NFA with groundwater monitoring in the OU2 ROD. Groundwater monitoring is conducted under the SWMP.

Source Area	Remedy or Status as Identified in the ROD
ST11 Fuel Saturated Area	NFA, Monitoring
ST18 Oil Boiler Fuel Saturated Area	NFA, Monitoring
ST19 JP-4 Fuel Spill	NFA, Monitoring

Twenty-one areas previously identified as potential sources of contamination were included in the OU2 ROD as “Other Areas”. These sites were designated for NFA because existing information indicated that they do not present an unacceptable risk to human health and the environment. Nineteen of the potential source areas were considered NFA with no ARARs in 2002. Two of the potential source, LF05 and SS31, are monitored under the SWMP to verify that contamination levels remain within acceptable screening levels.

These NFA source areas include:

LF05 Old Army Landfill (SWMP)	DP28 Fly Ash Disposal Site
LF07 Test Landfill	DP29 Drum Burial Site
FT08 Firefighter training Area, Past	SS30 Polychlorinated Biphenyl (PCB) Storage Area
SS12 JP-4 Fuel Spill, Building 2351	SS31 PCB Storage Area (SWMP)
ST15 Multiproduct Fuel Spill	DP40 Power Plant Sludge Pit
ST16 MOGAS Fuel Line Spill	SS41 Former Auto Hobby Shop
ST17 Canol Pipeline Spill	SS42 Miscellaneous Storage/Disposal Area
SD21 Road Oiling, Quarry Road	SS47 Commissary Parking Lot Fuel Spill
SD22 Road Oiling, Industrial Road	WP60 New Auto Hobby Shop
SD23 Road Oiling, Manchu Road	SS62 Garrison Slough
SD24 Road Oiling, Gravel Haul Road	

RAOs

RAOs are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation goals.

Environmental Media	**RAO**
Groundwater	
For Human Health	
	Prevent use of water having carcinogens in excess of MCLs
	Prevent use of water having noncarcinogens in excess of MCLs or reference doses
For Environmental Protection	
	Restore aquifer to its designated beneficial use as a drinking water source
Soil	
For Environmental Protection	
	Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

BTEX compounds, naphthalene, and lead are COCs for OU2 (USAF, 1994g). The following table lists RAOs and ARARs established to address groundwater quality at OU2 source areas.

COC	RAOs/Final Groundwater Remediation Goals (µg/L)	Soil Remediation Goals (mg/Kg)
Benzene	5	0.2
Toluene	1,000	80
Ethylbenzene	700	140
Xylenes	10,000	760
Naphthalenes	620 (AWQC Aquatic Life Freshwater Chronic only)	
Lead	15	500

The primary RAO is protection of groundwater. Soils do not pose an unacceptable risk for human ingestion or dermal contact. The secondary remediation goals developed for soil (except lead which was based on the biokinetic uptake model) are based on fate and transport modeling for protecting groundwater and may be modified if alternate levels are found to be protective of groundwater. Groundwater cleanup levels for BTEX and lead compounds are based on chemical-specific ARARs. The cleanup level for naphthalenes are for Aquatic Life Freshwater Chronic only (USAF, 1993c).

3.1 Chronology of Events

November 1982–July 1991 IRP Investigations and Reports.

October 1993 OU2 RI/FS (USAF, 1993c) completed

September 1994 OU2 ROD signed by USAF, USEPA, and ADEC (USAF, 1994g).

November 1995 Remedial Action Workplan and Remedial Design completed (USAF, 1995i). Bioventing systems were operable by late November.

February 1996 Treatability Study Informal Technical Information Report completed (USAF, 1996c).

July 1996 Soil investigation at ST10 drum and sand blast grid storage area (USAF, 1996g).

October 1996 SVE system installed at Building 6225.

January 1997 Utah Water Research Laboratory contracted to investigate site conditions at ST13/DP26.

July 1997 AGRA contracted to remove three tanks buried adjacent to utilidor near ST13/DP26.

June 1998	Final Treatment System Report OU2 completed (USAF, 1998a).
July 1998	OU2 ROD Amendment eliminated groundwater pump and treat remediation and replaced active product recovery with passive recovery at ST13/DP26 (USAF, 1998c).
August 1998	Remedial Action Summary Report completed (USAF, 1998e).
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
October 1998	Final Utilidor Investigation/Treatability Report completed (USAF, 1998g).
September 2003	Second Five-Year ROD Review completed (USAF, 2003c)
July 2004	EA contracted to upgrade the bioventing system at source areas ST10/SS14.
July 2005	EA contracted to upgrade the bioventing system at source areas ST13/DP26.

3.2 Community Involvement

The RI/FS and Proposed Plan for OU2 Eielson AFB were released to the public in November 1993. These documents were made available to the public in both the administrative record and an information repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks.

The public comment period for the Proposed Plan was held from November 8 to December 7, 1993. The comment period was extended to December 20, 1993 to compensate for a typographic error. Comments received during this period are summarized in the Responsiveness Summary of the OU2 ROD. The public comment period and public meeting were advertised on November 12 in the *Goldpanner* Base newspaper. A 9-inch display ad that highlighted the cleanup efforts was placed in the *North Pole Independent* on November 5 and 12, and in the *Fairbanks Daily News Miner* on November 5, 15, and 16. In addition, more than 3,500 copies were added as an insert in the Base newspaper and delivered to every home in the Eielson AFB housing area. A news release announcing the Proposed Plan and public meeting was sent to all local news media and the story ran on the front page of the Base newspaper. The meeting was advertised on the Base access cable channel and in the Base information bulletin as well as on at least one local area radio station. The Base First Sergeants Group was briefed on the plan and public meeting to encourage their people to attend. Copies of the plan were delivered to various information repositories, plus the North Pole City Hall.

The Proposed Plan was presented to the TRC on November 16, 1993. At this meeting, representatives from the USAF, ADEC, and USEPA responded to questions from an audience representing the University of Alaska, the city of North Pole, and various State and federal agencies.

A public meeting was held on November 17, 1993. At this meeting, representatives from the USAF, ADEC, and USEPA answered questions about the problems at the sites and discussed the remedial alternatives under consideration. Approximately 30 people attended.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

This page intentionally left blank

3.3 ST10/SS14 E-2 POL Storage Area/E-2 Railroad JP-4 Spill

3.3.1 Background

Source areas ST10 and SS14 are located in the southeastern portion of Eielson AFB, along Quarry Road (Figure ST10/SS14-1). The combined size of both source areas is approximately 10 acres. The source areas have flat surface gradients with groundwater ranging 4-7 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU2 BLRA considered industrial and residential future land use scenarios.

ST10 includes the E-2 POL storage area and Spruce Lake. The storage area formerly contained six 672,000-gallon ASTs. Each AST was surrounded by a containment dike and was used for JP-4, JP-8, and leaded fuels storage. Five former ASTs were demolished in June 2002. A 4,200,000 gallon AST was constructed in 2002 to replace the five demolished tanks. Source area SS14 consists of refueling stands and unloading headers from the fuel pipelines located east of the railroad tracks. The area was used for rail delivery of fuel until 1977.

History of Contamination

The quantity of fuel released at the ST10/SS14 source areas is unknown. Suspected contamination sources at ST10 include leaks from the storage tanks and associated piping. There was a significant spill at ST10 within the diked area surrounding AST 6236 in 1967. Suspected sources at SS14 include leaks from fuel lines and spills that occurred during unloading and refueling operations. A sheen was observed on the surface of Spruce Lake every spring from at least 1978 until 1982.

Initial Response

Soil and groundwater samples were collected at ST10/SS14 in 1986, 1987, and 1988 to characterize the type and extent of groundwater contamination. The OU2 RI began in 1991. NAPL was detected in two monitoring wells in 1991 and identified as JP-4. Eighteen product probes were installed in 1992 to characterize the extent of NAPL. The 1992 investigation concluded that two separate coalescing NAPL plumes intersected at Spruce Lake. The estimated total volume of NAPL was 48,000 gallons. The distribution headers at SS14 were pressure tested in 1993, and leaking pipes were replaced.

Basis for Taking Action

The RI/FS and BLRA identified BTEX and lead exceeding MCLs. The exposure pathways of potential concern are the consumption and use of contaminated groundwater.

3.3.2 Remedial Actions

The COCs at ST10/SS14 are BTEX and lead. Based on the RI/FS and BLRA, the selected remedy cited in the OU2 ROD includes the following site remedies:

- Passive product recovery where mobility is sufficient
- Bioventing/SVE to reduce free product and remediate soil contamination to prevent leaching to groundwater
- Groundwater monitoring to evaluate contaminant levels and migration until remediation levels are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for the ST10/SS14 source areas include the following:

- Prevent use of water having carcinogens in excess of MCLs
- Prevent use of water having noncarcinogens in excess of MCLs or reference doses
- Restore aquifer to its designated beneficial use as a drinking water source
- Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Remedy Implementation

The OU2 Remedial Design documents were finalized in November 1995. A bioventing system was constructed at ST10/SS14 during the 1995 field season. The system included air injection below the water table. The area to be remediated by the bioventing system was the area bounded by the 100 µg/L dissolved benzene contour and the historical presence of NAPL. Six product recovery wells were also installed in 1995. In 1996, a SVE system was installed around Building 6225 in response to reports of hydrocarbon vapors inside the building. The SVE system purpose is to address potential indoor air quality issues.

Groundwater samples were collected under the 1994, 1995, 1996, 2001, 2002, 2003, and 2007 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M checks are performed on average of once per week. Flows, pressures, and air temperatures in the system are measured and adjusted as required to ensure proper operation of the system. Blowers and air inlet filters are replaced as needed.

Air samples are collected quarterly from the SVE system exhaust and analyzed for VOCs. Air samples are also collected quarterly from inside Building 6225 and analyzed for BTEX.

Respiration tests and site evaluations are conducted on an annual basis. The bioventing systems are shut down during the respiration test and site evaluations. Respiration tests are performed to evaluate hydrocarbon biodegradation rates in subsurface soil. The site evaluations are performed to determine the condition of well covers and system components.

O&M includes monitoring well maintenance under the SWMP and implementing ICs to prevent exposure to contaminated groundwater.

3.3.3 Progress Since the last Five-Year Review

During the summer of 2003, a plume delineation study was conducted at ST10/SS14. The data collected during the study established the current lateral extent of the 100 μg/L dissolved benzene contour north of the E-2 fueling facility. Data derived from general O&M, field investigations, and the delineation were utilized to redesign the system that is currently operating on the site.

Existing air injection points at Shed A were replaced in July 2004 with new injection points with screens straddling the water table, as was previously successful in the OU1 bioventing systems. The new screening further enhances remediation and prolongs injection point function by adding air directly to the vadose zone soils reducing the potential for increasing pressure within the current air injection points. Existing air injection points 10VW11 and 10VW12 were no longer operating, and could not be located during previous site evaluations as the points were sealed under asphalt. Injection points 10VW11 and 10VW12 were not replaced as they are located within the trailing edge of the benzene plume.

The bioventing system at Shed B was re-designed and constructed in 2004 to cover the current lateral plume extent determined from the 2003 plume delineation. The bioventing system expansion included installing six additional air injection points and separate lateral air supply lines. The air supply lines connect to the manifold in the existing bioventing system blower assembly located in Shed B. In addition, existing air injection points were replaced with new injection points with screens straddling the water table. Former air injection point 10VW07 was not replaced as the injection point was removed prior to installation of an AST.

Bioventing and SVE system operations continued during the current review period. Groundwater samples were collected under the 2003 RAO plume delineation, and the 2005 and 2007 SWMPs.

3.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 3.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the annual Remedial Action Operation reports.

Data Review

Average biodegradation rates decreased from 1.9 mg/Kg-day in 1996 to 0.6 mg/Kg-day in 2007. Respiration test data were used to estimate that approximately 14,800 gallons of fuel had biodegraded between 1995 and 2007. The current biodegradation rate of 0.6

mg/Kg-day indicates that the bioventing systems degraded the BTEX soil contamination. Additional bioventing efforts will not significantly reduce the time to reach remediation goals.

Groundwater monitoring results from the 2003, 2005, and 2007 sampling events continue exceeding the BTEX and lead MCLs within the source area boundaries. Sample results from 2007 indicate decreasing benzene concentrations immediately down gradient of the ST10/SS14 Source Area. Benzene concentrations from sample locations within or near the central source area remained within their historic range during the 2005 sampling event. No groundwater samples were collected in 2007 within or near the central source area due to high seasonal frost extending to the shallow water table. Hydrologically up gradient samples, collected in 2002, were non-detect for BTEX and lead.

Six product recovery wells were installed in 1995 at source areas ST10/SS14. Approximately 260 gallons of NAPL were recovered by 1998, the majority from well 10RW02. Minor amounts of NAPL were also recovered from 10RW01, 10RW03, and 10RW06. Product recovery efforts ceased due to insufficient recharge. NAPL was still present in 2007 in two groundwater monitoring wells. Monitoring well 10PMW01, located down gradient from SSS14, contained 1.1 ft NAPL. Monitoring well 10PMW02, located cross gradient from ST10, contained 0.8 ft NAPL.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC requested review of the vapor intrusion pathway and further evaluation of Spruce Lake water quality. Bioventing systems at the OU2 source area will be decommissioned beginning late summer 2008 as per the RPO results. DQOM will be applied to these source areas.

3.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area ST10/SS14 is performing as expected. Groundwater monitoring indicates decreased COC concentrations down gradient of the source area. Respiration tests conducted at the bioventing system locations estimate that approximately 14,800 gallons of fuel have been biodegraded. ICs are still being implemented to prevent exposure to contaminated groundwater. Groundwater monitoring indicates a stable and attenuating plume at ST10/SS14.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks or impacts, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the ROD. The bioventing system has effectively biodegraded fuels at the source area, remediating the BTEX contamination source. Groundwater monitoring indicates contamination levels hydrologically down gradient from the source areas were reduced and remain below MCLs. All previous assumptions for the ST10/SS14 source areas are still valid.

3.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at the ST10/SS14 source areas.

3.3.7 Recommendations and Follow-Up Actions

Respiration testing, groundwater monitoring, and RPO results indicate the RAOs for ST10/SS14 are being achieved. Bioventing systems at ST10/SS14 met objectives, and currently provide biodegradation equivalent to background rates. Bioventing systems will shut down in August 2008 with complete decommissioning planned by summer 2009. The SVE system for Building 6225 will also shut down in 2008. The SVE system will remain in place until indoor air quality monitoring within Building 6225 indicates that COCs remain below Occupational Safety & Health Administration (OSHA) levels.

Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs, projected in 2025. Eielson AFB will evaluate the vapor intrusion pathway and determine if the pathway presents an unacceptable risk. Land use restrictions will remain in effect until RAOs are achieved.

3.3.8 Protectiveness Statement

The remedy at OU2 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source areas has been addressed through product recovery, bioventing, groundwater monitoring, and the implementation of ICs to prevent the consumption and use of contaminated groundwater.

3.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for ST10/SS14:

List of Tables for ST10/SS14:

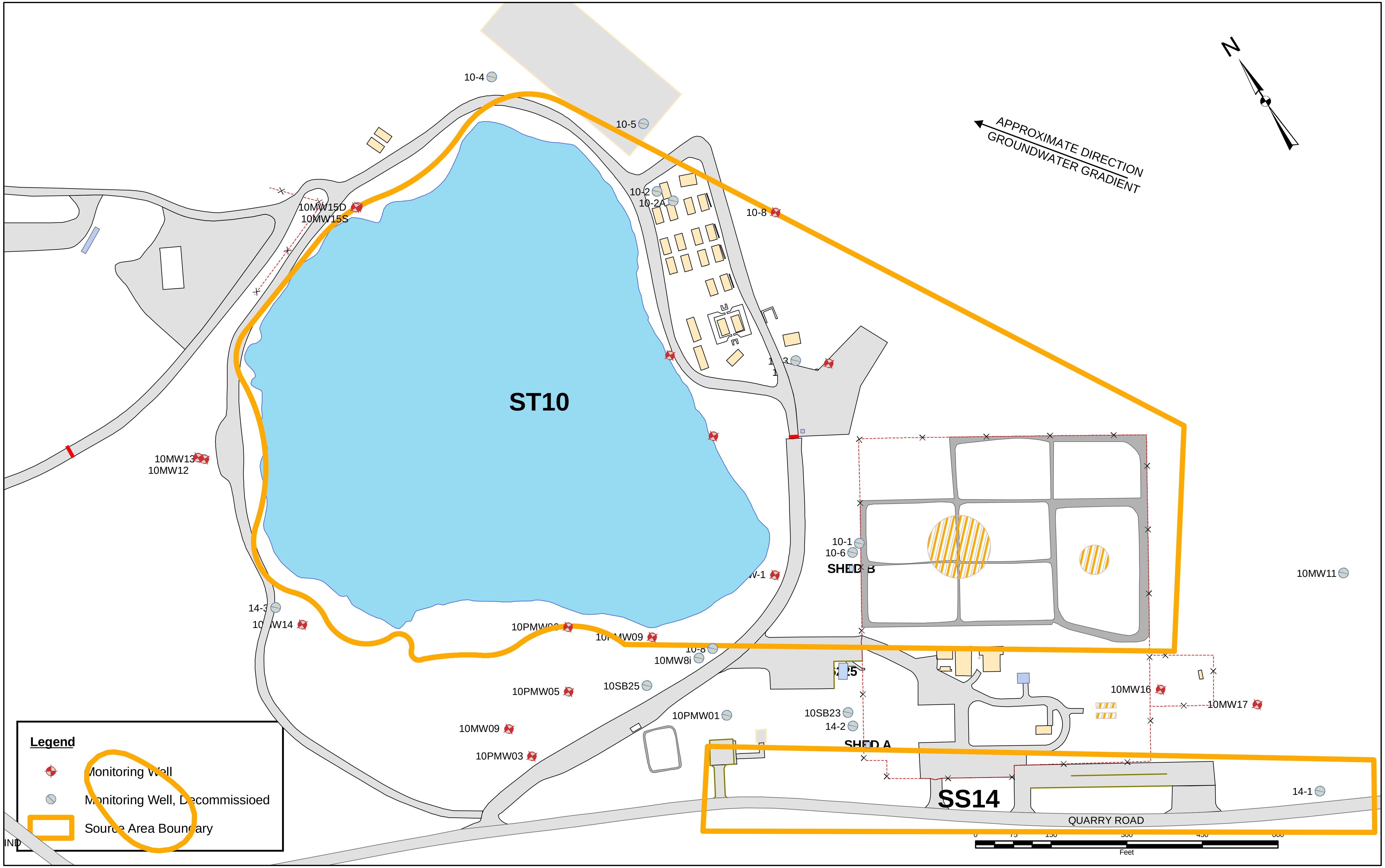


Figure ST10/SS14-1: ST10/SS14, E-2 POL Storage Area/E-2 Railroad JP4 Fuel Spill, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST10/SS14-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST10/SS14, E-2 POL STORAGE AREA/E-2 RAILROAD JP4 FUEL SPILL, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	2- Methyl-naphthalene	Naphthalene	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]	**NA**	**NA**	**15**[1]			**18 AAC 80.300.**
10-1	09/01/91		**1,300**	**9,500**	290	2,800	--	--	--	--	**46**	5,6,8,11	a,b	USAF 1993 OU2 RI
10-1	09/27/95		**120**	900	<50	490	**3,700**	**5,700**	--	--	--	1-3		USAF 1995 SWMPR
10-1	08/28/96		**29**	57	4.1	35	--	--	--	--	--	1		USAF 1996 SWMPR
10-1	09/10/97		1.0	9.0	<1.0	7.0	--	--	<10	<10	--	1,5	i	USAF 1997 SWMPR
10-2A	09/01/91		**5.0**	2.0	7.0	130	--	--	--	--	3.3	5,6,8,11	a	USAF 1993 OU2 RI
10-2A	08/06/98		**19**	2.1	5.2	72	**1,400**	834	--	--	--	1,9,10	j	USAF 1998 SWMPR
10-3	09/01/91		**30**	5.0	24	220	--	--	--	--	10	5,6,8,11	a	USAF 1993 OU2 RI
10-3	08/28/96		<1.0	<1.0	<1.0	4.1	--	--	--	--	--	1		USAF 1996 SWMPR
10-3	09/10/97		**150**	4.0	1.0	9.0	--	--	<10	<10	--	1,5	f	USAF 1997 SWMPR
10-3	09/02/98		**135**	<100	<100	<100	**18,000**	1,030	--	--	--	1,9,10	k, l, m	USAF 1998 SWMPR
10-4	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	2.6 B	5,6,8,11	a	USAF 1993 OU2 RI
10-4	08/28/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10-5	09/01/91		1.0	3.0	<5.0	<5.0	--	--	--	--	2.2 B	5,6,8,11	a	USAF 1993 OU2 RI
10-5	08/05/98		4.1	<1.0	<1.0	<1.0	380	179	--	--	--	1,9,10	j	USAF 1998 SWMPR
10-6	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	1.9 B	5,6,8,11	a	USAF 1993 OU2 RI
10-6	09/09/96		<1.0	1.2	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10-6	08/11/05	12	0.3F	1.2F	<2.0	<4.0	--	--	--	--	1.2	13, 14		USAF 2005 SWMPR
10-8	09/01/91		**430**	**2,700**	110	750	--	--	--	--	**26**	5,6,8,11	a,c	USAF 1993 OU2 RI
10-8	08/28/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10-8	10/01/97		<1.0	<1.0	<1.0	<1.0	<100	310	--	--	--	1,9,10	h	USAF 1997 SWMPR
10-8	08/11/05	10	<0.5	0.66F	<2.0	<4.0	--	--	--	--	<1.0	13, 14		USAF 2005 SWMPR
10-8	09/07/07	10	<0.4	<1.0	<1.0	<3.0	--	--	--	--	<1.0	7,14		USAF 2007 SWMPR
10MW8I	09/01/91		2.0	<5.0	<5.0	<5.0	--	--	--	--	<3.0	5,6,8,11	a	USAF 1993 OU2 RI
10MW8I	09/09/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10MW8I	08/07/98		4.1	<1.0	<1.0	<1.0	<40	190	--	--	--	1,9,10	o,q	USAF 1998 SWMPR
10MW09	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	4.0	5,6,8,11	a	USAF 1993 OU2 RI
10MW09	08/28/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10MW10	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	<3.0	5,6,8,11	a	USAF 1993 OU2 RI
10MW10-A	09/24/02	9	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13		USAF 2002 SWMPR
10MW10-B	09/24/02	25	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13		USAF 2002 SWMPR
10MW11	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	<3.0	5,6,8,11	a,q	USAF 1993 OU2 RI
10MW12	10/10/94		**9.0**	<2.0	<2.0	<2.0	--	--	--	--	--	1		IT 1995 TS
10MW12	02/01/95		**11**	0.3	<0.2	<0.4	--	--	--	--	--	1,4	d	USAF 1993 OU2 RI
10MW12	10/11/95		<1.0	<1.0	<1.0	<1.0	<50	150	--	--	--	1-3		USAF 1995 SWMPR
10MW12	09/09/96		**6.3**	<1.0	<1.0	<1.0	--	--	--	--	--	1		USAF 1996 SWMPR
10MW12	09/15/97		3.0	<1.0	<1.0	<1.0	--	--	<10	<10	--	1,5		USAF 1997 SWMPR
10MW12	08/17/98		<1.0	1.1	<1.0	1.1	<40	297	--	--	--	1,9,10	l	USAF 1998 SWMPR
10MW12	08/10/99		<0.5	<2.0	<2.0	2.1	<90	<297	--	--	--	1,9,10		USAF 1999 SWMPR
10MW12	09/24/02	32	<0.5	<2.0	<2.0	<2.0	--	--	--	--	5.3	12, 13		USAF 2002 SWMPR
10MW12	09/24/02	32	<0.5	<2.0	<2.0	<2.0	--	--	--	--	5.6	12, 13	*	USAF 2002 SWMPR

TABLE ST10/SS14-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST10/SS14, E-2 POL STORAGE AREA/E-2 RAILROAD JP4 FUEL SPILL, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	2- Methyl-naphthalene	Naphthalene	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]	**NA**	**NA**	**15**[1]			**18 AAC 80.300.**
10MW13	09/01/98		<1.0	<1.0	<1.0	<1.0	<40	108	--	--	--	1, 9, 10	p	USAF 1998 SWMPR
10MW13	07/23/99		<0.5	<2.0	<2.0	<2.0	<90	<300	--	--	--	1,9,10		USAF 1999 SWMPR
10MW13	09/24/02	7.9	<0.5	<2.0	<2.0	<2.0	--	--	--	--	9.0	12, 13		USAF 2002 SWMPR
10MW14	10/03/98		<1.0	1.2	<1.0	3.8	<40	128	--	<200	--	1, 9, 10, 11	p	USAF 1998 SWMPR
10MW14	08/10/99		<0.5	<2.0	<2.0	2.1	<90	<297	--	--	--	1,9,10		USAF 1999 SWMPR
10MW14	08/11/05	13	<0.5	<2.0	<2.0	<2.0	--	--	--	--	**15**	13, 14		USAF 2005 SWMPR
10MW14	09/07/07	13	<0.4	<1.0	<1.0	<3.0	--	--	--	--	<1.0	7,14		USAF 2007 SWMPR
10MW15-S	08/10/99		<0.5	<2.0	<2.0	2.1	<90	<297	--	--	--	1,9,10	p	USAF 1999 SWMPR
10MW15-S	09/23/02	11	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13		USAF 2002 SWMPR
10MW15-D	08/10/99		<0.5	<2.0	<2.0	2.8	<90	<297	--	--	--	1,9,10	p	USAF 1999 SWMPR
10MW15-D	09/24/02	45	<0.5	<2.0	<2.0	2.1	--	--	--	--	<5.1	12, 13		USAF 2002 SWMPR
10MW16	08/19/02	35	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13	p	USAF 2002 SWMPR
10MW16	08/19/02	51	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13	p	USAF 2002 SWMPR
10MW16	08/19/02	51	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13	p,*	USAF 2002 SWMPR
10MW17	08/20/02	15	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13	p	USAF 2002 SWMPR
10MW17	08/20/02	31	<0.5	<2.0	<2.0	<2.0	--	--	--	--	<5.0	12, 13	p	USAF 2002 SWMPR
10SB23	08/11/05	14	**3,930J**	**21,700J**	334J	2186J	--	--	--	--	--	13		USAF 2005 SWMPR
10SB25	08/12/05	12	**17J**	<2.0	3.3J	6.3J	--	--	--	--	--	13	r	USAF 2005 SWMPR
10PMW01	10/01/02	12	**299**	444	90	393	--	--	--	--	**61**	12, 13	p	USAF 2002 SWMPR
10PMW01	08/09/05	13	**18J**	30J	6.7F	31J	--	--	--	--	7.4	13, 14		USAF 2005 SWMPR
10PMW02	10/01/02	12	**40**	3.2	16	124	--	--	--	--	**30**	12, 13	p	USAF 2002 SWMPR
10PMW02	08/09/05	12	<0.5	<2.0	9.9J	71J	--	--	--	--	3.9	13, 14		USAF 2005 SWMPR
10PMW02	09/11/07	12	<0.4	<1.0	5.3	33	--	--	--	--	1.4	7,14		USAF 2007 SWMPR
10PMW03	08/08/05	12	**8.6J**	1.7UJ	<2.0	2.8F	--	--	--	--	**38**	13, 14	s	USAF 2005 SWMPR
10PMW03	09/19/07	12	<0.4	<1.0	<1.0	<3.0	--	--	--	--	<1.0	7,14		USAF 2007 SWMPR
10PMW04	08/08/05	15	**7,270J**	**22,290J**	639J	3930J	--	--	--	--	**17**	13, 14		USAF 2005 SWMPR
10PMW04	08/08/05	15	**6,860J**	**21,400J**	625J	3710J	--	--	--	--	**20**	13, 14	*	USAF 2005 SWMPR
10PMW05	08/10/05	16	**8.6**	6.8J	10J	17J	--	--	--	--	1.4	13, 14		USAF 2005 SWMPR
10PMW06	08/10/05	17	**66J**	1.6J	2.1J	4.0F	--	--	--	--	4.2	13, 14		USAF 2005 SWMPR
10PMW07	08/09/05	9	**12J**	29J	25J	276J	--	--	--	--	4.2	13, 14		USAF 2005 SWMPR
10PMW07	09/19/07	9	**9.5**	33	30	208	--	--	--	--	<1.0	7,14		USAF 2007 SWMPR
10PMW08	08/09/05	11	**8.5J**	2.5J	<2.0	9.1J	--	--	--	--	0.58F	13, 14		USAF 2005 SWMPR
10PMW08	09/07/07	11	<0.4	<1.0	<1.0	<3.0	--	--	--	--	<1.0	7,14		USAF 2007 SWMPR
10PMW09	08/10/05	10	**177J**	8.7J	77J	175J	--	--	--	--	2.2	13, 14		USAF 2005 SWMPR
10PMW09	09/11/07	10	**67**	1.6	17	5.9	--	--	--	--	6.1	7,14		USAF 2007 SWMPR
14-2	09/01/91		**800**	**1,200**	150	700	--	--	--	--	14	5,6,8,11	a	USAF 1993 OU2 RI
14-2	08/28/96		**83**	330	160	540	--	--	--	--	--	1		USAF 1996 SWMPR
14-2	09/10/97		**460**	490	110	410	--	--	27	44	--	1,5	g,i	USAF 1997 SWMPR
14-3	09/01/91		<5.0	<5.0	<5.0	<5.0	--	--	--	--	4.9	5,6,8,11	a	USAF 1993 OU2 RI
14-3	08/06/98		--	--	--	--	--	--	--	--	--	--	n,q	USAF 1998 SWMPR
W-1	09/01/91		**200**	2.0	<5.0	3.0	--	--	--	--	19	5,6,8,11	a	USAF 1993 OU2 RI
W-1	08/28/96		**110**	3.0	<1.0	10.2	--	--	--	--	--	1		USAF 1996 SWMPR
W-1	09/10/97		**71**	16	<1.0	24	--	--	<10	<10	--	1,5	e,i	USAF 1997 SWMPR
W-1	10/01/02	10	**142**	8.1	3.7	23	--	--	--	--	<5.1	12, 13		USAF 2002 SWMPR
W-1	08/11/05	10	**122J**	4.3J	<2.0	9.1J	--	--	--	--	1.4	13, 14		USAF 2005 SWMPR
W-1	09/20/07	10	**49**	0.7UJ	<1.0	<3.0	--	--	--	--	0.4UJ	7,14		USAF 2007 SWMPR

TABLE ST10/SS14-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST10/SS14, E-2 POL STORAGE AREA/E-2 RAILROAD JP4 FUEL SPILL, EIELSON AFB, ALASKA

Well	No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	2- Methyl-naphthalene	Naphthalene	Total Lead	Analytical Methods	Notes	Reference
MCLs				**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**	**NA**	**NA**	**15[1]**			**18 AAC 80.300.**

Notes:

--	Not analyzed
*	Duplicate sample
a.	For additional compounds detected, see reference
b.	Additional compounds detected (µg/L): 2-butanone - 12
c.	Additional compounds detected (µg/L): 2-butanone - 20
d.	Additional compounds detected (µg/L): cis-1,2-DCE - 0.30
e.	Additional compounds detected (µg/L): phenol - 4
f.	Additional compounds detected (µg/L): bis (2-ethylhexyl) phthalate - 2500
g.	Additional compounds detected (µg/L): phenol - 3.0 , 2-methylphenol - 4.0, 4-methylphenol - 2.0, benzoic acid - 12
h.	Chromatographic pattern of DRO analysis does not appear to be indicative of a petroleum product.
i.	Bis (2-ethylhexyl) phthalate was detected below reporting limits, suspected to be the result of laboratory contamination (also detected in the method blank)
j.	DRO-pattern consistent with highly weathered gasoline.
k.	GRO/BTEX - surrogates do not meet QC goals due to matrix interference.
l.	DRO - Unknown hydrocarbon with several peaks.
m.	1/8 " of unknown product floating on top of water in well.
n.	Well not sampled due to bentonite in well.
o.	DRO- pattern consistent with highly weathered middle distillate.
p.	New well.
q.	Well decommissioned.
r.	Lead analysis not performed due to high turbidity resultant of damaged well.
s.	Turbidity increased during sample collection process. Hand purging well increased turbidity and could possibly result in elevated concentrations of lead.
ADEC	Alaska Department of Environmental Conservation
MCL	Maximum Contaminant Level
Bold	Bold text indicates concentration exceeds MCL.
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
B	Result is greater than the instrument detection limit but less than the CDRL
1	Background UCL for Lead.
F	Indicates value greater than or equal to the Method Detection Limit (MDL).
J	Indicates that the analyte was positively identified, however the quantitation is estimated.
UJ	Indicates estimated detection limit.

Analytical Methods:

1. 8020	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 6010/7000	13. 8021
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	12. 7421	14. 6020

This page intentionally left blank

3.4 ST13/DP26 E-4 Fuel Saturated Area/Fuel Tank Sludge Burial Area

3.4.1 Background

ST13 is a diesel spill site located near the fuel outlets along the southeast end of the main taxiway. DP26 is located directly east of ST13. When the OU2 ROD was completed there were 10 large USTs at ST13; nine USTs contained JP-4 and one UST contained diesel. The tanks may have previously stored aviation gasoline or motor gasoline (MOGAS). Source area DP26 was a weathered tank sludge burial site where tank sludge was spread within a containment berm until 1980. No sludge burial has been identified. The combined size of both source areas is approximately 7 acres. The source areas have flat surface gradients with groundwater ranging from 5-9 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU2 BLRA considered industrial and residential future land use scenarios.

History of Contamination

Spills and leaks from fueling equipment at ST13/DP26 resulted in NAPL and dissolved fuel constituents in groundwater. The quantity of fuel release at the ST13/DP26 source areas is unknown. In 1987, a large AST, Tank 300, was replaced at DP26. Petroleum-impacted soil within the containment berm was excavated down to groundwater and replaced with clean fill. Two leaking 25,000-gallon USTs were taken out of service at ST13 in 1990 and removed in 1994. The fuel hydrant system was upgraded in 1994, which included the removal of ten 25,000-gallon USTs, one 3,000-gallon UST, and one 1,000-gallon UST. Building 1240 was also demolished as part of the upgrades. Approximately 10,250 cubic yards (cy) of impacted soil were removed from the site.

Initial Response

Soil and groundwater samples were collected at ST13/DP26 in 1986, 1987, and 1988 to characterize the type and extent of groundwater contamination. The RI began in 1991. NAPL, identified as jet fuel, was detected in two monitoring wells in 1991. Eleven product probes were installed in 1992 to characterize the extent of NAPL. The NAPL thickness, based on well measurements, ranged from 0.06 ft to 1.13 ft. The estimated total volume of NAPL was 7,000 gallons. The floating plume extended hydrologically down gradient from former Tank 300 to approximately Outer Loop Road.

Basis for Taking Action

The RI/FS and BLRA identified BTEX and lead exceeding MCLs. The exposure pathways of potential concern are the consumption and use of contaminated groundwater.

3.4.2 Remedial Actions

The COCs at ST13/DP26 are BTEX and lead. The selected remedy cited in the OU2 ROD and the OU2 Amended ROD includes the following:

- Passive product recovery where mobility is sufficient
- Bioventing/SVE to reduce free product and remediate soil contamination to prevent leaching to groundwater

- Groundwater monitoring to evaluate contaminant levels and migration until remediation levels are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for the ST13/DP26 source areas include the following:

- Prevent use of water having carcinogens in excess of MCLs
- Prevent use of water having noncarcinogens in excess of MCLs or reference doses
- Restore aquifer to its designated beneficial use as a drinking water source
- Prevent migration of contaminants that would result in groundwater contamination in excess of MCLs or health-based levels

Remedy Implementation

Following the OU2 ROD, the remedial design and installation of a bioventing system was completed in 1995. Six product recovery wells were also installed in 1995.

A natural attenuation study (USU/UWRL, 1995) and lead treatability study were conducted (IT Corporation, 1995) in 1995. The natural attenuation study indicated the plume is shrinking in size and that the mobility of lead is low. Organic lead is attenuating naturally in groundwater at ST13/DP26, and the lead plume has not migrated significantly since monitoring was initiated in 1991. The treatability study concluded that the treatment of lead was impractical, and that no completed exposure pathways exist for lead to groundwater. As a result, a technical impracticability (TI) waiver was approved in the OU2 Amended ROD so that lead concentrations in groundwater can exceed the USEPA action limit within the TI waiver zone.

The action level for lead is waived within the TI waiver area to 30 ft below the annual average water table depth (USAF, 1998c). The TI waiver area, shown in Figure ST13/DP26-2, has the following boundaries:

- Flightline Avenue to the west
- Outer Loop Road to the north
- A line running north and south along the east boundary fence of the ft yard
- A line running east and west along the north boundary fence for Tanks 3 and 4, the former location of Tank 300

Groundwater samples were collected under the 1994, 1995, 1996, 1997, 1998, 1999, 2002, 2003, 2005, and 2007 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M checks are performed on average of once per week. Flows, pressures, and air temperatures in the bioventing systems are measured and adjusted as required to ensure proper operation. Blowers and air inlet filters are replaced as needed. The weekly O&M checks include gauging recovery wells and the fuel collection drum at the utilidor product recovery system.

Respiration tests and site evaluations have been conducted on an annual basis. The bioventing systems are shut down during the respiration test and site evaluations. Respiration tests are performed to evaluate hydrocarbon biodegradation rates in the subsurface soil. The site evaluations are performed to determine the condition of well covers and system components.

O&M includes monitoring well maintenance under the SWMP and implementing ICs to prevent exposure to contaminated groundwater.

3.4.3 Progress Since the last Five-Year Review

Existing air injection points were replaced in July 2005 with new injection points with screens straddling the water table, as was previously successful in the OU1 bioventing systems. The new screening further enhances remediation and prolongs injection point function by adding oxygen directly to the vadose zone soils, reducing the potential for increasing pressure within the current air injection points.

Additionally, existing soil vapor monitoring points were decommissioned and new points installed. Newly installed monitoring points were placed within the radius of influence of each injection well and offset from the prior locations to reduce short-circuiting of vadose zone air flow.

Bioventing and product recovery system operations continued during the current review period. Groundwater samples were collected as part of the 2003, 2005, and 2007 SWMPs.

3.4.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 3.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the annual Remedial Action Operation reports.

Data Review

Average biodegradation rates decreased from 2.3 mg/Kg-day in 1996 to 0.49 mg/Kg-day in 2007. Respiration test data were used to estimate that approximately 18,400 gallons fuel had biodegraded between 1996 and 2007.

The 2007 sampling results indicate BTEX decreased in monitoring wells 26-1, 26-12, and 26MW23R. Benzene concentration in source area monitoring well 26-1 decreased from 97 µg/L in 2002 to 4.2 µg/L in 2007. Benzene concentration in down gradient monitoring well 26-12 decreased from 8 µg/L in 2002 to <0.4 µg/L in 2007. Benzene concentration in immediately down gradient monitoring well 26MW23R decreased from 29 µg/L in 2002 to 3.6 µg/L in 2007. The lead concentration exceeded the MCL in source area monitoring well 26-1 (80 µg/L). Lead monitoring results immediately down gradient of the TI waiver boundary were non detect (<1.0 µg/L in 26MW23R) or detected below the MCL (3.3 µg/L in 26MW25).

Six product recovery wells were installed in 1995 at source areas ST13/DP26. Only minor amounts of product were recovered from well 26RW02, located northwest of former Tank 300. Product recovery efforts ceased due to insufficient recharge (USAF 1998a). In 1997, additional product recovery wells were installed at the 795 utilidor location, considered Source Area SS37. The utilidor product recovery system removed approximately 200-gallons NAPL, but ceased operation in 2005 due to insufficient recharge. The 795 utilidor is hydrologically down gradient from ST13/DP26, and was not defined in the OU2 ROD as part of the source area.

Fingerprint samples were collected and analyzed in 2004 from monitoring wells 37RW01 and 26RW04 for TPH Diesel Range Organic Compounds (DRO). The TPH-DRO samples were used to determine whether the DP26 and SS37 plumes are related or are from different contaminant sources. Fingerprint analysis results indicate different contaminant sources for ST13/DP26 and SS37. Analysis results for DRO in 26RW04 were 23,800 µg/L. Analysis results for DRO in 37RW1 were 838,000 µg/L. Chromatographs also show differing peaks that do not represent the same constituents. While fingerprint results indicate different contaminant sources, plumes from the source areas likely overlap due to the close down gradient proximity of SS37.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the source areas. ADEC requested review of the vapor intrusion pathway due to the high COC concentrations. DQOM will be applied to these source areas.

The inspection team also discussed Source Area SS37, which is down gradient from ST13/DP26 containing similar contamination. Additional USTs and buried drums were removed near the 795 utilidor, located immediately adjacent to Source Area SS37 but not shown within the SS37 boundary. Eielson AFB will flag the area for construction planning north of SS37 near the 795 utilidor as potentially containing buried debris, but will not consider the location as an additional source area until evidence suggests an additional release location.

3.4.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area ST13/DP26 is performing as expected. Groundwater monitoring indicates decreased COC concentrations down gradient of the source area. Respiration tests conducted at the bioventing system locations indicate that approximately 18,400-gallons of fuel have biodegraded. ICs are still being implemented to prevent exposure to contaminated groundwater. Groundwater monitoring indicates a stable and attenuating plume at ST13/DP26.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the ROD. The bioventing system has effectively biodegraded fuels at the source area, remediating the BTEX contamination source.

The ROD amendment and associated TI waiver exempts lead cleanup inside the waiver area. Lead concentration in groundwater continues to exceed cleanup levels within the waiver area. However, lead concentrations are below the MCL down gradient of the TI waiver area (Table ST13/DP26-1). Benzene concentrations within the source areas likely remain above the MCL (5 µg/L). Benzene was not detected above the MCL in 2007, but likely remains above the MCL up gradient from 26-1. Groundwater monitoring indicates that the benzene plume currently extends down gradient to approximately Outer Loop Rd., and with concentrations decreasing from historic levels.

All previous assumptions for the ST13/DP26 source areas are still valid.

3.4.6 Issues

No issues were identified relating to the protectiveness of the remediation process at the ST10/SS14 source areas.

3.4.7 Recommendations and Follow-Up Actions

Respiration testing, groundwater monitoring, and RPO results indicate the RAOs for ST13/DP26 are being achieved. Bioventing systems at ST13/DP26 met objectives, and currently provide biodegradation equivalent to background rates. Bioventing systems will shut down in August 2008 with complete decommissioning planned by summer 2009.

Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs, projected in 2017. Land use restrictions will remain in effect until RAOs are achieved.

3.4.8 Protectiveness Statement

The remedy at OU2 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source areas has been addressed through product recovery, bioventing, groundwater monitoring, and the implementation of ICs to prevent the consumption and use of contaminated groundwater.

3.4.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for ST13/DP26:

List of Tables for ST13/DP26:

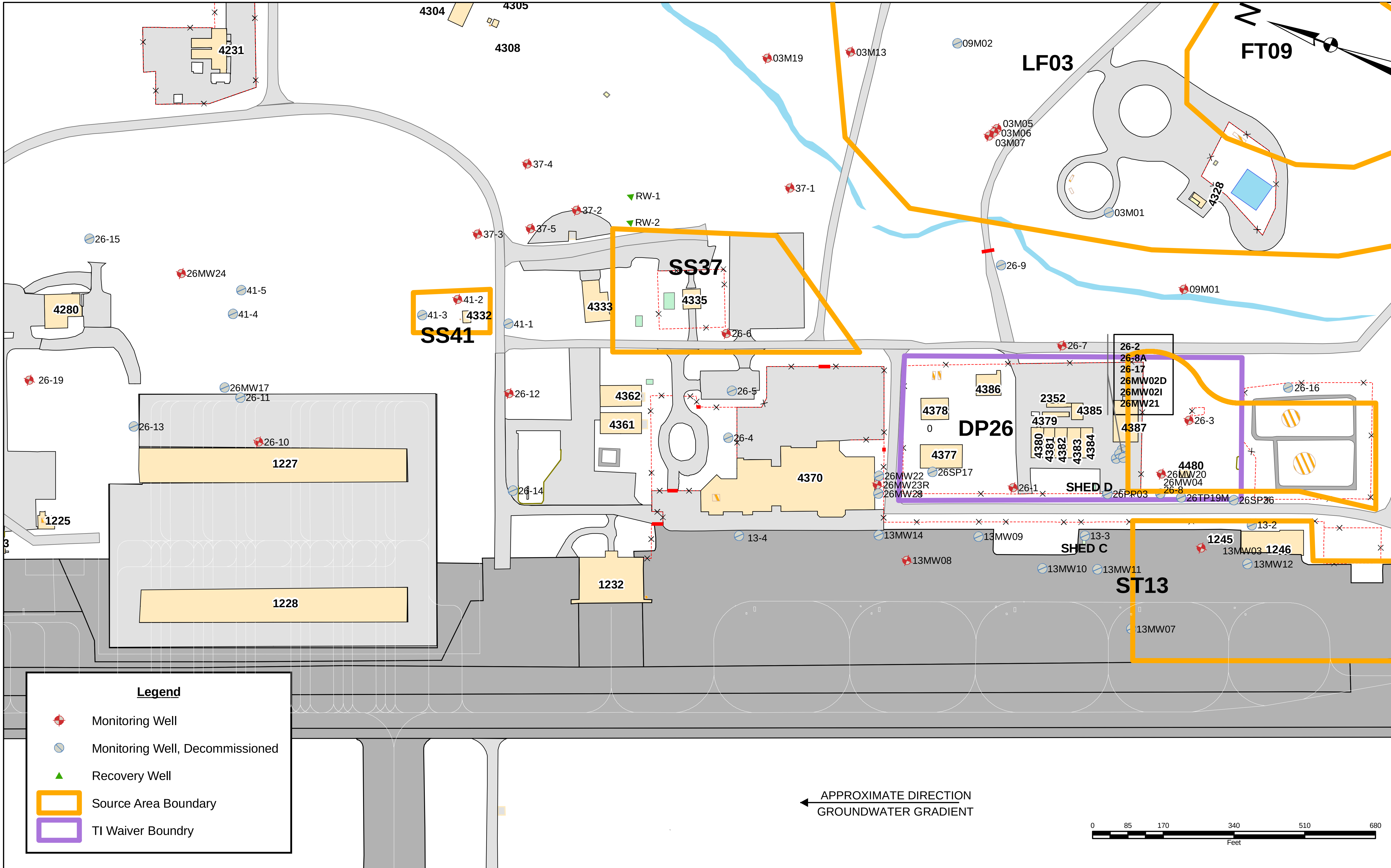


Figure ST13/DP26-1: ST13/DP26, E-4 Diesel Fuel Spill/E-10 Fuel Tank Sludge Burial Site, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST13/DP26-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES
ST13/DP26, E-4 DIESEL FUEL SPILL/E-10 FUEL TANK SLUDGE BURIAL SITE, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**NA**	**15**			**18 AAC 80.300**
37RW01	06/15/04	12	--	--	--	--	--	**838,000**	--	--	10	w	USAF 2004 SWMPR
37-2	08/13/92		**13**	<2.0	<2.0	<2.0	--	--	--	<5.0	1		USAF 1995 RI
37-2	08/17/94		<1.0	<1.0	<1.0	<1.0	--	--	--	<1.0	1		USAF 1995 RI
37-2	09/05/02	16	**10**	<2.0	<2.0	<2.0	--	--	--	--	1		USAF 2002 SWMPR
37-2	10/01/07	16	4.2	0.3J	<1.0	<3.0	--	--	--	<1.0	7,13		USAF 2007 SWMPR
37-3	09/22/04	15	<1.0	<1.0	<1.0	<3.0	--	--	--	1.2	1,13		USAF 2004 SWMPR
37-3	09/22/04	15	--	--	--	--	--	--	--	1.2	13	*	USAF 2004 SWMPR
37-3	09/27/07	14	<0.4	0.3UJ	<1.0	<3.0	--	--	--	0.4M	7,13		USAF 2007 SWMPR
37-4	08/21/92		3.8	<2.0	<2.0	<1.0	--	--	--	<1.0	1		USAF 1995 RI
37-4	08/17/94		<1.0	<1.0	<1.0	<1.0	--	--	--	<1.0	1		USAF 1995 RI
37-4	10/01/07	17	<0.4	0.4J	<1.0	<3.0	--	--	--	<1.0	7,13		USAF 2007 SWMPR
37-5	11/06/02		**14**	<2.0	<2.0	2.7	--	--	--	**242**	1	●	USAF 2002 SWMPR
37-5	06/02/03		**5.2**	<2.0	<2.0	<2.0	--	--	--	<5.1	1, 11		USAF 2003 SWMPR
37-5	09/26/07	13	**6.8**	<1.0	<1.0	2.1	--	--	--	1.2M	7,13		USAF 2007 SWMPR
41-2	09/20/04	13	1.6	<1.0	<1.0	<3.0	--	--	--	2.5	1,13		USAF 2004 SWMPR
13-1	9/91		1.0	<5.0	<5.0	<5.0	--	--	--	3.3	5,6,8,11	a	USAF 1993 OU2 RI
13-2	9/91		**68**	720	320	2,100	--	--	--	**41**	5,6,8,11	a	USAF 1993 OU2 RI
13-3	9/91		**58**	31	34	160	--	--	--	1.9	5,6,8,11	a	USAF 1993 OU2 RI
13-3	7/95		--	--	--	--	--	--	<3.0	3.6	11		IT 1995 TS ITIR
13-4	9/91		**170**	6.0	26	49	--	--	--	6.3	5,6,8,11	a	USAF 1993 OU2 RI
13-4	7/95		--	--	--	--	--	--	<3.0	<3.0	11		IT 1995 TS ITIR
13MW05	10/91		<5.0	<5.0	<5.0	<5.0	--	--	--	<3.0	5,6,8,11	a	USAF 1993 OU2 RI
13MW06	7/95		**87**	240	110	790	**6,200**	560	<3.0	5.1	1,9-11		IT 1995 TS ITIR
13MW07	7/95		**380**	680	330	1,500	**13,000**	910	<3.0	9.4	1,9-11		IT 1995 TS ITIR
13MW07	08/28/96		**610**	**1,600**	630	4,200	--	--	--	5.5	1,4,11	e,f	USAF 1996 SWMPR
13MW07	09/10/97		**560**	**1,600**	680	4,000	--	--	--	--	1,5	g,j	USAF 1997 SWMPR
13MW07	08/13/99		**793**	870	108	2,687	**16,000**		5	<111	1,5,12		USAF 1999 SWMPR
13MW07	08/28/00		**302**	420	64	1,303	**12,700**	602	--	--	1,9,10	r, u, v	USAF 2000 SWMPR
13MW07	09/17/02	9	**89**	318	74	465	--	--	--	--	1		USAF 2002 SWMPR
13MW08	7/95		**33**	<5.0	5.3	34	490	<500	<3.0	<3.0	1,9-11		IT 1995 TS ITIR
13MW08	09/17/02	8	**232**	<20	128	1,200	--	--	--	<5.1	1		USAF 2002 SWMPR
13MW13	09/27/07	19	2.1J	22	35	219J	--	--	--	9.9M	7,13		USAF 2007 SWMPR

TABLE ST13/DP26-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES
ST13/DP26, E-4 DIESEL FUEL SPILL/E-10 FUEL TANK SLUDGE BURIAL SITE, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**	**NA**	**15**			**18 AAC 80.300**
26RW04	06/15/04	13	--	--	--	--	--	**23,800**	--	--	10	w	USAF 2004 SWMPR
26-1	0'9/91		**510**	**3,000**	**1,100**	6,300	--	--	--	**334**	5,6,8,11	a	USAF 1993 OU2 RI
26-1	08/21/93		**780**	**7,000**	**1,200**	9,800	--	--	99	**420**	1,4,11		USAF 1993 SWMPR
26-1	07/95		**360**	**2,700**	**950**	6,400	**11,000**	**4,500**	85	**150**	1,9-11		IT 1995 TS ITIR
26-1	10/10/95		**450**	**3,200**	**1,200**	8,300	**24,000**	**5,100**	--	--	1-3		USAF 1995 SWMPR
26-1	08/28/96		**360**	**3,300**	**1,200**	9,500	--	--	--	**216**	1,4,11	e	USAF 1996 SWMPR
26-1	09/11/97		**240**	**2,600**	**1,200**	7,200	--	--	41	**91**	1,5,11,12	h	USAF 1997 SWMPR
26-1	08/11/98		**311**	**3,950**	**1,410**	9,770	**35,000**	**7,630**	77	**141**	1,9,10,11,12		USAF 1998 SWMPR
26-1	08/13/99		**218**	**3,110**	**1,050**	7,130	**28,000**	**9,010**	67	**194**	1,9,10,11,12		USAF 1999 SWMPR
26-1	08/28/00		**126**	**1,830**	**731**	5,070	**26,200**	**13,000**	--	--	1,9,10	r, s, u, v	USAF 2000 SWMPR
26-1	09/26/02	14	**97**	**2,530**	**832**	5,860	--	--	--	**427**	1		USAF 2002 SWMPR
26-1	09/26/07	14	4.2F	933	667	4460J	--	--	--	**80M**	7,13		USAF 2007 SWMPR
26-2	09/91		**140**	150	40	230	--	--	--	1.3	5,6,8,11	a	USAF 1993 OU2 RI
26-2	08/20/92		**37**	37	8.1	53	--	--	--	--	5,6,8		USAF 1993 OU2 RI
26MW02I	10/91		**53**	<5.0	11	11	--	--	--	4.0	5,6,8,11	a,d	USAF 1993 OU2 RI
26MW02I	08/20/92		**14**	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a	USAF 1993 OU2 RI
26MW02I	07/95		<5.0	<5.0	<5.0	<5.0	<250	<500	<3.0	<3.0	1,9-11		IT 1995 TS ITIR
26MW02D	09/14/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a,d	USAF 1993 OU2 RI
26MW02D	07/95		<5.0	<5.0	<5.0	<5.0	<250	<500	<3.0	<3.0	1,9-11		IT 1995 TS ITIR
26-3	09/91		**75**	<5.0	1.0	5.0	--	--	--	1.4	5,6,8,11	a	USAF 1993 OU2 RI
26-3	07/95		--	--	--	--	--	--	<3.0	<3.0	11		IT 1995 TS ITIR
26-4	09/91		**220**	31	15	120	--	--	--	<1.0	5,6,8,11	a	USAF 1993 OU2 RI
26-5	09/91		**92**	7.0	7.0	70	--	--	--	<1.0	5,6,8,11	a	USAF 1993 OU2 RI
26-5	08/11/99		**61**	<2.0	<2.0	<2.0	350	515	<5.0	<111	1,9,10,11,12	k,l	USAF 1999 SWMPR
26-5	08/25/00		**102**	<4.0	<4.0	7.4	801	908		<67	1,9,10,13	q, u, v	USAF 2000 SWMPR
26-6	09/91		2.0	<5.0	<5.0	1.0	--	--	--	<1.0	5,6,8,11	a	USAF 1993 OU2 RI
26-6	08/21/93		0.4	<0.2	<0.05	<0.2	--	--	--	--	1,4	a	USAF 1993 SWMPR
26-6	08/02/94		<1.0	<1.0	<1.0	<1.0	--	--	--	--	1,4	a	USAF 1994 SWMPR
26-6	08/11/99		<0.5	<2.0	<2.0	<2.0	<90	<297	<5.0	<111	1,9,10,11,12	l	USAF 1999 SWMPR
26-6	08/11/00		<0.5	<2.0	<2.0	<2.0	<90	<361	--	--	1,9,10,13,14		USAF 2000 SWMPR
26-6	09/17/02	14	<0.5	<2.0	<2.0	<2.0	--	--	--	**347**	1, 11		USAF 2002 SWMPR
26-6	06/12/03	12	<0.5	<2.0	<2.0	<2.0	--	--	--	<5.1	1, 11		USAF 2003 SWMPR
26-6	06/12/03	12	<0.5	<2.0	<2.0	<2.0	--	--	--	<5.1	1, 11	*	USAF 2003 SWMPR
26-6	09/25/07	12	<0.4	<1.0	<1.0	<3.0	--	--	--	0.3M	7,13		USAF 2007 SWMPR

TABLE ST13/DP26-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES
ST13/DP26, E-4 DIESEL FUEL SPILL/E-10 FUEL TANK SLUDGE BURIAL SITE, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**NA**	**15**			**18 AAC 80.300**
26-7	09/91		<5.0	<5.0	<5.0	<5.0	--	--	--	<1.0	5,6,8,11	a	USAF 1993 OU2 RI
26-7	07/95		<5.0	<5.0	<5.0	<5.0	<250	<500	<3.0	<3.0	1,9-11		IT 1995 TS ITIR
26-8	09/91		**1,400**	**4,200**	610	5,400	--	--	--	**795**	5,6,8,11	a	USAF 1993 OU2 RI
26-8	08/21/93		**2,700**	**8,500**	**990**	9,100	--	--	55	**690**	1,4, 11	a,c	USAF 1993 SWMPR
26-8	07/95		**3,100**	**8,200**	**830**	9,800	**31,000**	**250,000**	490	**5,100**	1,9-11		IT 1995 TS ITIR
26-8A	09/91		**280**	520	220	2,300	--	--	--	**72**	5,6,8,11	a,c	USAF 1993 OU2 RI
26-10	09/91		**16**	<5.0	<5.0	<5.0	--	--	--	1.8	5,6,8,11	a	USAF 1993 OU2 RI
26-10	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a	USAF 1993 OU2 RI
26-10	08/17/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a	USAF 1993 OU2 RI
26-10	09/18/02	12	<0.5	<2.0	<2.0	<2.0	--	--	--	<5.0	1, 11		USAF 2002 SWMPR
26-11	09/91		**59**	<5.0	<5.0	<5.0	--	--	--	2.4	5,6,8,11	a	USAF 1993 OU2 RI
26-11	06/11/92		**41**	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a,b	USAF 1993 OU2 RI
26-11	08/17/92		**11**	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a	USAF 1993 OU2 RI
26-12	09/91		**140**	2.0	<5.0	<5.0	--	--	--	3.0	5,6,8,11	a	USAF 1993 OU2 RI
26-12	10/03/95		**44**	100	12	34	610	260	--	--	1-3		USAF 1995 SWMPR
26-12	08/28/96		**32**	4.0	4.0	39	--	--	--	<1.0	1,4,11		USAF 1996 SWMPR
26-12	09/10/97		**18**	<1.0	<1.0	<1.0	--	--	--	--	1,5	j	USAF 1997 SWMPR
26-12	07/26/99		**7.2**	<2.0	<2.0	<2.0	190	539	<5.0	<111	1,9,10,11,12	l	USAF 1999 SWMPR
26-12	08/24/00		1.9	<2.0	<2.0	<2.0	147	615	--	--	1,9,10,13,14	p, u, v	USAF 2000 SWMPR
26-12	09/19/02	13	**8.0**	16.0	22.0	66.1	--	--	--	<5.0	1, 11		USAF 2002 SWMPR
26-12	09/26/07	13	<0.4	0.5UJ	0.4F	18	--	--	--	1.8M	7,13		USAF 2007 SWMPR
26-13	09/91		<5.0	<5.0	<5.0	<5.0	--	--	--	3.2	5,6,8,11	a	USAF 1993 OU2 RI
26-13	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	5,6,8,11	a	USAF 1993 OU2 RI
26-13	08/17/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	5,6,8	a	USAF 1993 OU2 RI
26-13	08/21/93		0.2	<0.1	0.1	0.6	--	--	--	--	1,4	a	USAF 1993 SWMPR
26-14	09/91		**110**	<5.0	10	7.0	--	--	--	<1.0	5,6,8,11	a	USAF 1993 OU2 RI
26-15	09/91		<5.0	<5.0	<5.0	<5.0	--	--	--	1.4	5,6,8,11	a	USAF 1993 OU2 RI
26-15	08/28/96		<1.0	1.1	1.0	11.1	--	--	--	2.3	1,4,11	e	USAF 1996 SWMPR
26-15	09/11/97		<1.0	<1.0	<1.0	<1.0	--	--	--	--	1,5	i	USAF 1997 SWMPR
26-15	07/26/99		<0.5	<2.0	<2.0	<2.0	<90	367	<5.0	<111	1,9,10,11,12	l,n	USAF 1999 SWMPR

TABLE ST13/DP26-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES
ST13/DP26, E-4 DIESEL FUEL SPILL/E-10 FUEL TANK SLUDGE BURIAL SITE, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**	**NA**	**15**			**18 AAC 80.300**
26-16	07/95		--	--	--	--	--	--	<3.0	<3.0	11		IT 1995 TS ITIR
26-16	08/29/96		<1.0	<1.0	<1.0	<1.0	--	--	--	<1.0	1,4,11	e	USAF 1996 SWMPR
26MW19	1994		<0.2	0.4	<0.2	<0.4	--	--	--	--	1,4	a	USAF 1995 SWRI
26MW19	10/11/95		<1.0	<1.0	<1.0	<1.0	<50	280	--	--	1-3		USAF 1996 SWMPR
26MW19	09/23/04	11	<0.4	<0.5	<0.5	<0.5	--	--	--	2.0	1,13		USAF 2004 SWMPR
26MW19	09/21/07	11	<0.4	0.5UJ	<1.0	2.5	--	--	--	2.1	7,13		USAF 2007 SWMPR
26MW20	08/28/96		**110**	530	170	1,860	--	--	--	6.6	1,4,11		USAF 1996 SWMPR
26MW20	09/02/98		**154**	708	289	2,610	120	124	<5.0	<114	1,9,10,11,12		USAF 1998 SWMPR
26MW20	09/26/02	13	**35**	27	53	639	--	--	--	<5.0	1, 11		USAF 2002 SWMPR
26MW21	07/95		**8.5**	<5.0	1.9	6.3	360	<500	<3.0	<3.0	1,9-11	d	IT 1995 TS ITIR
26MW22	07/95		**32**	<5.0	<5.0	<5.0	230	<500	<3.0	<3.0	1,9-11		IT 1995 TS ITIR
26MW22	08/10/98		**138**	3.3	15	222	**1,800**	905	<5.6	<5.6	1,9,10,11,12	m	USAF 1998 SWMPR
26MW23	07/95		**300**	<5.0	34	640	**3,000**	540	<3.0	<3.0	1,9-11	d	IT 1995 TS ITIR
26MW23	08/11/99		**173**	<5.0	59	531	**4,000**	1,360	<5.0	<111	1,9,10,11,12		USAF 1999 SWMPR
26MW23R	11/06/02	14	**29**	<2.0	<2.0	<2.0	--	--	--	<5.0	1	●	USAF 2002 SWMPR
26MW23R	09/27/07	14	3.6J	1.7	0.4F	16	--	--	--	0.3M	7,13		USAF 2007 SWMPR
26MW24	09/30/03	9	<0.4	<1.0	<1.0	<2.0	--	--	--	<5.0	7, 11		USAF 2003 SWMPR
26MW24	09/30/03	9	<0.4	<1.0	<1.0	<2.0	--	--	--	--	7, 11	*	USAF 2003 SWMPR
26MW24	09/28/04	9	<1.0	<1.0	<1.0	<3.0	--	--	--	0.1	1,13	1, 13	USAF 2004 SWMPR
26MW24	09/21/07	9	<0.4	0.5UJ	<1.0	<3.0	--	--	--	<1.0	7,13		USAF 2007 SWMPR
26MW25	09/25/07	12	**12**	49	51	3810J	--	--	--	3.3M	7,13		USAF 2007 SWMPR
26PP03	09/08/00		**31**	18	74	425	--	--	28.8	--	1,13,14		USAF 2000 SWMPR
26SP17	09/08/00		**18**	351	130	1,747	--	--	523	--	1,13,14		USAF 2000 SWMPR
26SP36	09/08/00		**764**	**3,960**	649	6,810	--	--	309	--	1,13,14		USAF 2000 SWMPR
26TP19M	09/11/00		**2,670**	**9,980**	**2,020**	**11,770**	--	--	--	<14	1,13,14	t, v	USAF 2000 SWMPR

TABLE ST13/DP26-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES

ST13/DP26, E-4 DIESEL FUEL SPILL/E-10 FUEL TANK SLUDGE BURIAL SITE, EIELSON AFB, ALASKA

Notes:

BGM	Background mean concentrations for lead: dissolved, <1.0 µg/L; total, 21 µg/L	1	Background UCL for lead
BGMX	Background maximum concentrations for lead: dissolved, <1.0 µg/L; total, 48 µ	2	OU2 ROD final remediation goal
BGMUC	Background 95 percent UCL concentrations for lead: dissolved, <1.0 µg/L; total, 33 µg/L		
●	Replacement well.		
--	Analysis not perfomed on sample.		
*	Duplicate Sample		
a.	For additional compounds detected, see reference		
b.	Additional compounds detected: chloroform - 1.4 µg/L, cis-DCE - 1.1 µg/L		
c.	Well abandoned in 1995.		
d.	Not screened in shallow part of aquifer ·		
e.	Additional compounds detected: methylene chloride - between 1.4 and 1.8 mg/L, suspected result of laboratory contamination (detected in laboratory method blank at 1.3 mg/L		
f.	Additional compounds detected: 1,2 Dibromoethane - 39 mg/L		
g.	Additional compounds detected: 2,4-dimethylphenol -2 mg/L, benzoic acid - 17 mg/L, acetophenone - 9 mg/L		
h.	Additional compounds detected: 2-methylphenol -19 mg/L, 4-methylphenol - 19 mg/L, 2,4-dimethylphenol - 79 mg/L, diethylphthalate -3 mg/L, pentachlorophenol - 39 mg/L, bis (2-ethylhexyl)phthalate - 11 mg/L (laboratory contamination suspected), acetophenone - 24 mg/l		
i.	Additional compound detected: bis (2-ethylhexyl) phthalate - 3 mg/L, suspected to be the result of laborator contamination (also detected in laboratory method blank)		
j.	Bis (2-ethylhexyl) phthalate was detected below reporting limits, suspected to be the result of laboratory contamination (also detected in the method blank		
k.	MS/MSD reported: 98.2 µg/L, benzene; 146 µg/L, toluene; 25.4 µg/L ethylbenzene; 126.6 µg/L xylenes; 1,220 µg/L, GRO; 4,450 µg/L DR		
l.	Point-of-Compliance Well		
m.	Well removed in 1998.		
n.	Field duplicate sample collected.		
p.	DRO analysis had an unknown hydrocarbon w/several peaks		
q.	DRO pattern consistent with highly weathered middle distillate		
r.	DRO pattern consistent with weathered gasoline		
s.	DRO surrogate recovery outside control limits due to hydrocarbon interference		
t.	GRO/BTEX surrogate recovery outside control limits due to dilution		
u.	GRO/BTEX surrogate recovery biased high due to matrix interference		
v.	DRO sample results may be biased high since LCS/LCSD surrogate recoveries were biased high due to interference by method required petroleum spike		
w.	Well sampled by hand with bailer.		
µg/L	Micrograms per liter		
MCL	maximum contaminant level		
Bold	Bold text indicates concentration exceeds MCL, EPA Action Limit, or BGUCL		
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics		
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics		
F	Indicates value that is greater than or equal to the MDL		
J	Indicates that the analyte was positively identified; however the quantitation is estimated		
UJ	Indicates estimated detection limit.		
M	Indicates that the concentration is estimated due to a matrix effect.		

Analytical Methods:

1. 8021	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 7421	13. 6020
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	12. 6010	14. ASTM D-1945M

This page intentionally left blank

4 OPERABLE UNIT 3

OUs 3, 4, and 5 are combined under the OU3,4,5 BLRA, RI/FS, and ROD. The OU3,4,5 ROD includes 23 potential source areas. Twenty source areas are identified in individual OU sections of this report. The OU3,4,5 ROD includes three potential source areas (LF01, WP32, and DP55) as “Other Areas”. These three sites were designated for NFA because existing information indicated that they do not present an unacceptable risk to human health and the environment, and are not further discussed in this document.

OU3 consists of five source areas where solvents were released to the soil and groundwater. This Five-Year ROD Review covers all five OU3 source areas. Source areas WP45 and SS57 are discussed together because they are located close to each other, have similar types of contaminants, and the individual releases to groundwater have created an overlapping groundwater contaminant plume.

Source Area	Remedy or Status as Identified in the ROD or Amended ROD
DP44 Battery Shop Leach Field	Monitoring, ICs
WP45 Photo Lab	Monitoring, ICs
ST56 Engineer Hill Spill Site	Monitoring, Wellhead Treatment, ICs
SS57 Fire Station Parking Lot	Monitoring, ICs
SS61 Vehicle Maintenance Building 3213	Monitoring, ICs

RAOs

RAOs are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation levels, which are defined as acceptable contaminant levels for each exposure route. The primary RAO for OU3 is protection of groundwater.

Source Area	RAO
All	Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
DP44	Ensure that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease
WP45/SS57	Prevent the continued migration of TCE and benzene into the groundwater at concentrations that present a risk to future groundwater users
ST56	Supply drinking water, apply wellhead treatment (as applicable), and prevent use of groundwater that exceeds state or federal drinking water standards
SS61	Determine if an additional source of contaminants exists on the north side of the building and if so, prevent the continued migration of TCE into the groundwater at concentrations that present a risk to future groundwater users

BTEX compounds and chlorinated VOCs are COCs for OU3 (USAF, 1995d). The following table lists RAOs and ARARs established to address groundwater quality at OU 3, 4, and 5 source areas.

COC	RAOs/Final Groundwater Remediation Goals (µg/L)	Soil Cleanup Levels (mg/Kg)
Benzene	5	0.2
Toluene	1,000	80
Ethylbenzene	700	140
Xylenes	10,000	760
1,4-Dichlorobenzene	75	--
1,2-Dichloroethane	5	--
cis-1,2-Dichloroethene	70	--
trans-1,2-Dichloroethene	100	--
TCE	5	0.4
Tetrachloroethene	5	--
Vinyl Chloride	2	--
DDT	4.2	--
Chlordane	2	--
Lead	15	--
Silver	100	--

Groundwater cleanup levels are action-specific ARARs that are technology or activity based requirements or limitations relating to specific remedial actions. Compliance with action-specific ARARs was evaluated as part of the detailed evaluation of alternatives conducted in the Feasibility Study process. The cleanup level for silver in groundwater is the secondary MCL as stated in the OU3,4,5 ROD. Soil cleanup levels are designed to prevent contaminant levels in groundwater from exceeding a health-based safe drinking water level through the leachate pathway.

4.1 Chronology of Events

November 1982-July 1991 IRP Investigations and Reports.

May 1995 OU3,4,5 RI/FS completed (USAF, 1995c).

September 1995 OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1995d).

December 1995 Intrinsic Remediation Engineering Evaluation/Cost Analysis completed for Site WP45/SS57 (USU/UWRL, 1995).

August 1997 OU3,4,5 Remedial Action Workplan and Remedial Design completed (USAF, 1997b,c).

July 1998 OU3,4,5 ROD amended (USAF 1998c). Selected remedies at DP44, SS35, ST58, and LF03/FT09 modified.

August 1998	OU3,4,5 Remedial Action Summary Report completed (USAF, 1998e).
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
December 2002	RPO Phase II Technical Report completed (USAF, 2002c)
September 2003	Second Five-Year ROD Review completed (USAF, 2003c)
December 2006	WP45/SS57 Plume Delineation and Natural Attenuation Study completed, Remedial Action Operations Report for OU3 (USAF, 2006c)
December 2007	WP45/SS57 Plume Delineation and Feasibility Study completed, Remedial Action Operations Report for OU3 (USAF, 2007d)

4.2 Community Involvement

The RI/FS, BLRA, and the Proposed Plan for OUs 3,4,5 and Other Areas of Eielson AFB were released to the public in May 1995. These documents were made available to the public in the administrative record and at an information repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks. The selected remedies presented in the OU3, 4, & 5 ROD are based on information contained in the Administrative Record.

The public comment period for the Proposed Plan was from May 18 to June 17, 1995. Comments received during this period are summarized in the Responsiveness Summary in an attachment at the end of the OU3, 4, &5 ROD. Five verbal comments were received during the public comment period. No written comments were received.

The public comment period, public meeting, and Proposed Plan for OUs 3, 4, and 5 were advertised four times in two local newspapers. The advertisements appeared in the *Fairbanks Daily Newsminer* on May 18 and 30, 1995 and in the *North Pole Independent* on May 19 and 26, 1995. In addition, more than 3,500 copies of this notice were added as an insert in the Base newspaper, the *Goldpanner*, and delivered to every home in the Eielson AFB housing area on May 19. Proposed Plans were mailed to more than 150 people on the cleanup mailing list on May16. Flyers announcing the public meeting were placed on store bulletin boards in the Moose Creek and North Pole communities.

A public meeting was held on May 31, 1995 in North Pole. Approximately 15 people attended the meeting, including representatives of the Air Force, USEPA, ADEC, and the public.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

4.3 DP44 Battery Shop Leach Field

4.3.1 Background

Source area DP44 is located near the large aircraft maintenance hangar. As originally defined, DP44 included the battery shop (Building 1141) and the area around Building 1138, between the runway taxiway and Flightline Avenue west of the North Street intersection. DP44 is approximately 1.5 acres and has a flat surface gradient. Groundwater at DP44 ranges 6 to 9 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

History of Contamination

DP44 was designated as a source area because the battery shop and Building 1138 may have discharged waste into a leach field system within the area. However, subsequent investigations have revealed that most of the contamination is located south of the hangar and is probably related to past jet engine maintenance activities in the hangar.

Initial Response

Groundwater and soil samples were collected during the IRP investigations and the RI/FS. Groundwater sample results indicated benzene and chlorinated solvent concentrations above MCLs both north and south of Building 1140. One groundwater sample hydrologically down gradient of DP44 had a benzene concentration exceeding the MCL.

Soil sampling indicated elevated TPH within the top 6 inches of soil covering approximately 216,000 square ft northwest of Building 1140. Trace concentrations of dichloroethene (DCE) (1 microgram per kilogram [µg/Kg]) were found at approximately 40 ft bgs immediately down gradient of monitoring well 44M04. Trace concentrations of tetrachloroethene (PCE) (2 µg/Kg) were found at well 44M04. Soil gas survey results indicated solvent contamination extended west of well 44M04 under the aircraft parking ramp, and north toward Building 1140. Soil samples revealed TCE and DCE concentrations below action levels, with highest concentrations found 4 to 6 ft bgs. All soil contaminant concentrations were below the USEPA risk-based screening levels for hazards associated with direct contact.

Basis for Taking Action

The RI/FS and BLRA identified BTEX, TCE, and PCE exceeding MCLs. The exposure pathways of potential concern are the ingestion of, and inhalation during use of contaminated groundwater.

4.3.2 Remedial Actions

The COCs for DP44 are BTEX and chlorinated VOCs (TCE & PCE). DP44 was originally selected for remedial action under the OU3,4,5 ROD with groundwater monitoring and ICs.

The amended OU3,4,5 ROD changed the selected remedy to the following:

- NFA of soils
- Monitor groundwater to confirm that contamination is not migrating and that contaminant levels are continuing to decrease
- ICs to prevent use of the contaminated groundwater in this area

The RAOs for DP44 include the following:

- Ensure that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease
- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer

Remedy Implementation

Data gap work at DP44 included a SVE pilot test. The SVE pilot test determined that residual soil contamination was not expected to be a source of continuing groundwater contamination. The OU3,4,5 ROD was amended in 1998. The selected remedy for DP44 was amended to groundwater monitoring and ICs. Groundwater samples were collected under the 1995, 1996, 1997, 2002, 2004, and 2007 SWMPs to verify COC concentration. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

4.3.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2004 and 2007 SWMP.

4.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 4.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Well 44M04 is hydrologically upgradient of both the northern and southern source areas. High concentrations of chlorinated VOCs (TCE and cis-1,2 DCE) were observed in samples collected from well 44M04, between 1992 and 1996. This well was damaged and was decommissioned after 1996. Groundwater samples collected in 2002, from nearby 44MW11I, had non-detect BTEX, TCE, and trans-1,2 DCE, but did have trace concentrations (1.8 µg/L) of cis-1,2 DCE (Figure DP44-1). Monitoring well 44MW11I has a lower screened interval than well 44M04, and the results are not comparable. In 2004, a temporary monitoring well (44M04B) was installed with a similar screened interval to replace 44M04. The temporary well was decommissioned after the 2004 sampling event, and another temporary well installed for the 2007 sampling event (44M04C). TCE concentrations in 44M04B and 44M04C ranged 21 µg/L to 24 µg/L during the two sampling events, a decrease from the 1996 concentrations of 78 µg/L detected in 44M04. Cis-1,2 DCE ranged 18 µg/L to 45 µg/L in 44M04B and 44M04C, a decrease from the 1996 concentration of 130 µg/L detected in 44M04. BTEX and trans-1,2 DCE concentration remain at or below the method detection limit at the 44M04 location.

Samples collected using groundwater probes in 1994 identified high benzene, TCE, and cis-1,2 DCE concentrations west of 44M04, up hydrologic gradient from 44MW11I. No groundwater samples have since been collected within the plume boundaries identified by the groundwater probes. The plume location indicates that chlorinated solvent contamination may extend beneath Hanger 1140. No samples have been collected from beneath the hanger floor. Groundwater monitoring results down gradient of Hanger 1140 at well 44M07 are non-detect for TCE and below the MCL for cis-1,2 DCE when last sampled in 1996. Groundwater monitoring results indicate that any potential plume beneath the hanger is not migrating.

Well 44M08 is within the southern source area. The 2002 and previous results from 44M08 have all been below MCLs.

Well 44M02 is within the northern source area. The 2002 and previous results from 44M02 have all been below MCLs.

Well 44M05 is located hydrologically down gradient of the two source areas. Benzene was detected at concentrations (5.3 µg/L) just above the MCL in the sample collected in 1992. Well 44M05 was subsequently damaged by Base activities, and decommissioned.

Additional down gradient monitoring wells sampled during the 2002 and 2007 sampling events include 44PMW01, 44M01, 44M03, 44M09, and 44M12. Low level TCE concentrations were detected in 44M01, 44M09, and 44M12 during the 2007 sampling event. All concentrations were <1 µg/L. Low level cis-1,2 DCE and trans-1,2 DCE were also detected in several down gradient monitoring well with concentration at or above the method detection limits.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. The vapor intrusion pathway will not be evaluated for this site as the facility at the source area is an active hanger. Groundwater monitoring will occur at DP44 every five years.

4.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The amended RAOs for DP44 include ensuring that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing. There is no projected date to reach the MCL as the TCE degradation trend has not been established on Eielson AFB.

Groundwater is monitored to identify any changes to the plume configuration until cleanup goals are achieved. ICs prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

The amended RAOs for DP44 include ensuring that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing.

BTEX concentration remains below the MCL within the source area and hydrologically down gradient. Elevated TCE and cis-1,2 DCE concentrations likely remains were previously identified south of Hanger 1140 near monitoring well 44M04. TCE and cis-1,2 DCE remain below MCLs at all other locations within the DP44 source area, and hydrologically down gradient, with the exception of 44M04 located near the southeast corner of Hanger 1140.

The 2004 and 2007 TCE concentration in temporary monitoring wells 44M04B and 44M04C continue to exceed the MCL. Concentrations at the 44M04 location have stabilized, but are not currently decreasing. The elevated TCE concentration centered at temporary monitoring well 44M04C indicates a continued chlorinated solvent plume, possibly extending beneath Hanger 1140. Continued low level chlorinated solvent concentrations down gradient in monitoring well 44M03 indicates that the plume is stable and not expanding. All previous assumptions for the source area are still valid.

4.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area DP44. Additional issues that do not necessarily affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The amended RAOs for DP44 include ensuring that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing.	N	Uncertain

4.3.7 Recommendations and Follow-Up Actions

The amended RAOs for DP44 include ensuring that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. A comparison of 2007 and previous groundwater analytical results indicate that BTEX concentrations remain below MCLs within the DP44 source area, and hydrologically down gradient. Groundwater monitoring indicates that chlorinated VOC concentrations have stabilized, but are not decreasing. Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
The amended RAOs for DP44 include ensuring that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing.	Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals	USAF	USEPA, ADEC	Determine applicability of pilot study at WP45/SS57 for further remediation at DP44	N	Uncertain

Groundwater monitoring will continue as determined by the RPMs at DP44 until VOC concentrations meet the MCL. Minimally, Eielson AFB will perform groundwater monitoring prior to the next Five-Year ROD Review. There is no projected date to reach the MCL as the TCE degradation trend has not been established on Eielson AFB. Land use restrictions will remain in effect until RAOs are achieved.

4.3.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met.

The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of, and inhalation during use of contaminated groundwater.

4.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for DP44:

List of Tables for DP44:

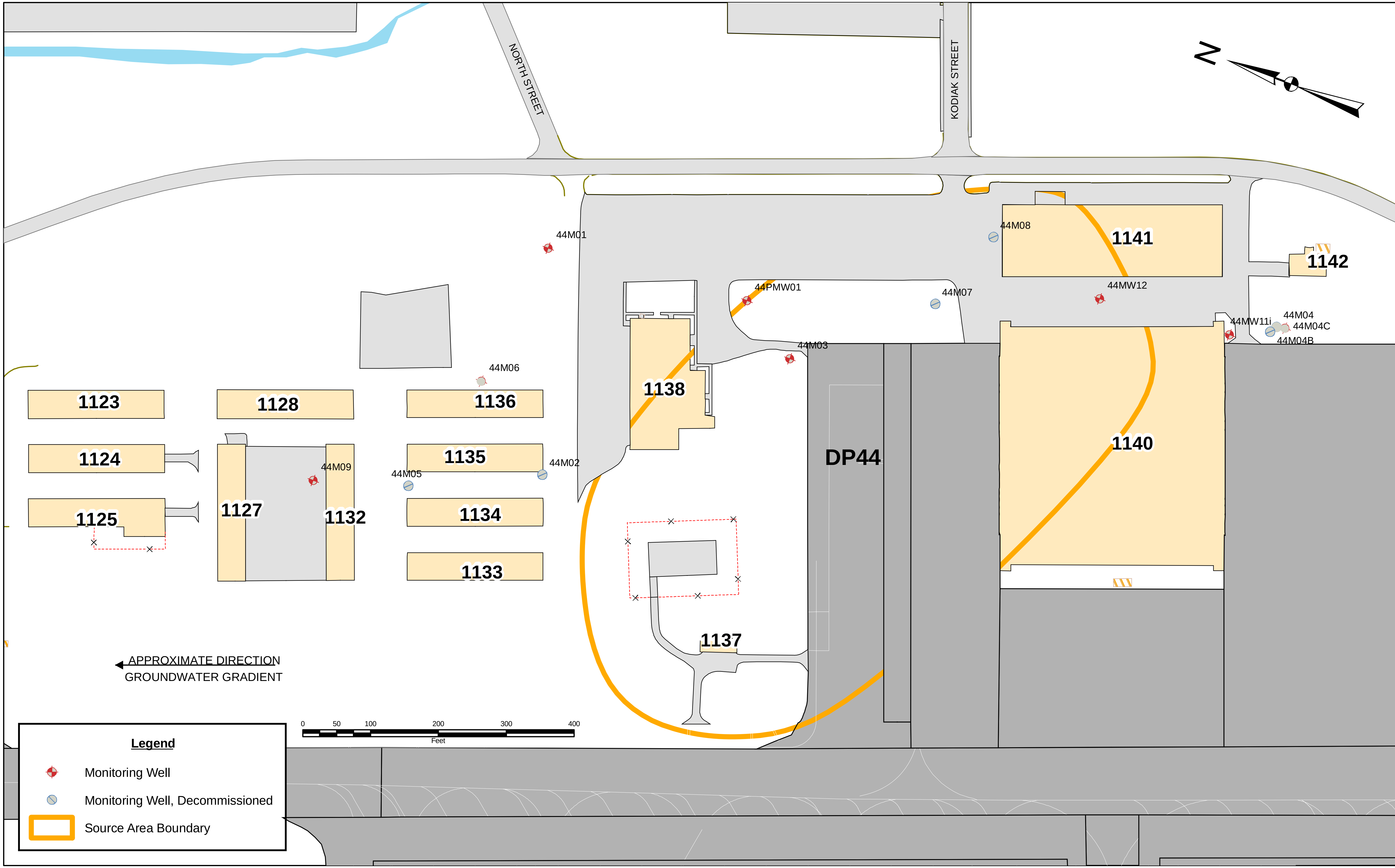


Figure DP44-1: DP44, Battery Shop Leach Field, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE DP44-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, DP44, BATTERY SHOP LEACH FIELD, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TCE	c-1,2-DCE	t-1,2-DCE	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**5**	**70**	**100**			**18 AAC 80.300**
44PMW01	08/29/02	18	<0.5	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	11	a,d	USAF 2002 SWMPR
44PMW01	08/28/07	18	0.3F	0.5UJ	<1.0	<3.0	<1.0	0.9F	0.7F	12		USAF 2007 SWMPR
44M01	08/15/94		<0.5	<1.0	<0.5	<0.5	<1.0	3.2	4.1	1,4	a	USAF 1995 OU3,4,5 RI
44M01	08/27/07	14	<0.4	<1.0	<1.0	<3.0	0.5F	0.8F	0.9F	12	a	USAF 2007 SWMPR
44M02	06/10/92		<2.0	<2.0	<2.0	<5.0	<1.0	<1.0	<1.0	1,4	a	USAF 1993 OU2 RI
44M02	08/18/92		<2.0	<2.0	<2.0	<5.0	<1.0	1.1	<1.0	1,4	a	USAF 1995 OU3,4,5 RI
44M02	08/15/94		1.1	<1.0	<0.5	<0.5	<1.0	1.5	0.7	1,4	a	USAF 1995 OU3,4,5 RI
44M03	06/10/92		<2.0	<2.0	<2.0	<5.0	1.2	6.1	1.4	1,4	a	USAF 1993 OU2 RI
44M03	08/15/94		<0.5	<1.0	<0.5	<0.5	<1.0	7.9	3.0	1,4	a	USAF 1995 OU3,4,5 RI
44M03	08/30/07	14	<0.4	<1.0	<1.0	<3.0	<1.0	1.4J	0.5F	12	a	USAF 2007 SWMPR
44M04	06/10/92		<2.0	<2.0	<2.0	<5.0	**2,500**	**260**	5.4	1,4	a	USAF 1993 OU2 RI
44M04	08/19/92		<2.0	<2.0	<2.0	<5.0	**48**	**93**	2.9	1,4	a	USAF 1995 OU3,4,5 RI
44M04	08/15/94		<0.5	<1.0	<0.5	<0.5	**109**	**118**	2.9	1,4	a	USAF 1995 OU3,4,5 RI
44M04	08/20/96		<1.0	4.3	2.5	18	**78**	**130**	<1.0	1,4	a, c	USAF 1996 SWMPR
44M04B	09/28/04	15	<0.4	<0.5	<0.5	<0.5	**22**	20	0.5	12	a	USAF 2004 SWMPR
44M04B	09/28/04	15	<0.4	<0.5	<0.5	<0.5	**24**	18	<0.5	12	*	USAF 2004 SWMPR
44M04C	08/30/07	15	<0.4	<1.0	<1.0	<3.0	**21**	45J	0.6F	12	a	USAF 2007 SWMPR
44M05	06/10/92		3.7	<2.0	<2.0	<5.0	<1.0	5.9	1.3	1,4	a	USAF 1993 OU2 RI
44M05	08/18/92		**5.3**	<2.0	<2.0	<5.0	<1.0	10	1.5	1,4	a	USAF 1995 OU3,4,5 RI
44M06	06/10/92		<2.0	<2.0	<2.0	<5.0	<1.0	5.5	2.1	1,4	a	USAF 1993 OU2 RI
44M06	08/19/92		<2.0	<2.0	<2.0	<5.0	<1.0	5.0	1.9	1,4	a	USAF 1995 OU3,4,5 RI
44M06	08/15/94		<0.5	<1.0	<0.5	<0.5	<1.0	4.9	3.0	1,4	a	USAF 1995 OU3,4,5 RI
44M07	06/11/92		<2.0	<2.0	<2.0	<5.0	<1.0	<1.0	<1.0	1,4	a	USAF 1993 OU2 RI
44M07	08/28/92		<2.0	<2.0	<2.0	<5.0	<1.0	1.8	<1.0	1,4	a	USAF 1995 OU3,4,5 RI
44M07	08/15/94		<0.5	<1.0	<0.5	<0.5	<1.0	2.9	0.8	1,4	a	USAF 1995 OU3,4,5 RI
44M07	08/20/96		<1.0	4.2	2.4	17	<1.0	<1.0	<1.0	1,4	a, c	USAF 1996 SWMPR

TABLE DP44-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, DP44, BATTERY SHOP LEACH FIELD, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TCE	c-1,2-DCE	t-1,2-DCE	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**5**	**70**	**100**			**18 AAC 80.300**
44M08	08/16/94		<0.5	<1.0	<0.5	<0.5	1.4	2.9	1.2	1,4	a	USAF 1995 OU3,4,5 RI
44M08	08/20/96		<1.0	2.6	1.6	12	1.2	2.1	<1.0	1,4	a, c	USAF 1996 SWMPR
44M08	08/29/02	13	<0.5	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	11	a	USAF 2002 SWMPR
44M09	06/11/92		<2.0	<2.0	<2.0	<5.0	<1.0	2.6	<1.0	1,4	a,b	USAF 1993 OU2 RI
44M09	08/19/92		<2.0	<2.0	<2.0	<5.0	<1.0	2.9	<1.0	1,4	a	USAF 1995 OU3,4,5 RI
44M09	08/29/02	13	<0.5	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	11	a	USAF 2002 SWMPR
44M09	08/29/07	13	<0.4	<1.0	<1.0	<3.0	0.5F	<1.0	<1.0	12		USAF 2007 SWMPR
44MW11I	09/15/92		<2.0	<2.0	<2.0	<5.0	<1.0	<1.0	<1.0	1,4	a	USAF 1995 OU3,4,5 RI
44MW11I	08/16/94		**5.2**	6.0	0.7	5.1	<1.0	<1.0	0.5	1,4	a	USAF 1995 OU3,4,5 RI
44MW11I	09/03/96		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1,4	a	USAF 1996 SWMPR
44MW11I	09/04/02	42	<0.5	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	11	e	USAF 2002 SWMPR
44MW12	08/29/02	18	<0.5	<1.0	<1.0	<2.0	<1.0	1.8	<1.0	11	a	USAF 2002 SWMPR
44MW12	08/29/02	18	<0.5	<1.0	<1.0	<2.0	<1.0	2.2	<1.0	11	a,*	USAF 2002 SWMPR
44MW12	09/20/07	18	<0.4	<1.0	<1.0	<3.0	0.3F	1.6J	<1.0	12	a	USAF 2007 SWMPR

Notes:

a.	No compounds other than those listed or noted were detected above the reporting limits.
b.	Additional compounds detected: perchloroethene - 0.7 µg/L
c.	Concentrations of toluene, ethylbenzene, and xylenes may be the result of field cross contamination.
d.	New well
e	Sample taken with Passive Diffusion Bag.
*	Duplicate sample
I	intermediate depth well
TCE	trichloroethene
c-1,2-DCE	cis-1,2,-dichloroethene
t-1,2-DCE	trans-1,2-dichloroethene
MCL	Maximum contaminant level
Bold	Bold text indicates concentration exceeds MCL.
µg/L	Micrograms per liter
F	Indicates value that is greater than or equal to the MDL.
J	Indicates that the analyte was positively identified; however the quantitation is estimated.
UJ	Indicates estimated detection limit.

Analytical Methods:

1. 8020	3. ADEC 8100M	5. 8270	9. AK101	11. 8021
2. ADEC 8015M	4. 8010	6. 8080	10. AK102	12. 8260

4.4 WP45/SS57 Photo Lab/Fire Station Parking Lot

4.4.1 Background

WP45/SS57 Photo Lab/Fire Station Parking Lot are two source areas located adjacent to each other near the main taxiway along the west side of Flightline Avenue. Source area WP45 is situated around Building 1183, in which a small photography laboratory operated. Source area SS57 is situated around the fire station Building 1206. A portion of WP45 is down gradient of SS57. The source areas are considered together because they are closely positioned, and groundwater contamination at the sites overlap. Source areas WP45/SS57 are approximately 11 acres combined and have flat surface gradients. Groundwater ranges 5 to 9 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

History of Contamination

Contamination at WP45 was thought to originate from a drywell at the western corner of Building 1183. Chlorinated VOCs were later found at higher concentrations up gradient of the drywell near a former maintenance shed located at the northwest corner of SS57. Petroleum contamination was discovered at SS57 in 1990 during repaving operations. Soils beneath the asphalt parking lot had fuel contaminated soil to a depth of at least 2m. Gasoline and JP-4 were likely spilled during fuel handling activities, penetrating the asphalt through cracks impacting subsurface soil and groundwater. Past fire-training activities at SS57 included digging small pits, dumping waste fuel and solvents into the pits, and lighting the waste flammables on fire.

Initial Response

Groundwater and soil samples were collected during the IRP investigations and the RI/FS at WP45/SS57. Groundwater sample results indicated BTEX and chlorinated solvent concentrations above MCLs. Studies identified two chlorinated solvent source areas: a minor source associated with the drywell in WP45 and a major source associated with the north corner of Building 1206 at SS57. Elevated BTEX concentrations were found up gradient of WP45 near well 45MW08, and west of Building 1206.

A natural attenuation study was conducted prior to finalizing the OU3,4,5 ROD. Results confirmed that the TCE and benzene plumes were relatively stable, soil contamination was at low levels, and that degradation of TCE through anaerobic dechlorination was occurring. The study concluded that natural attenuation would remediate the site at approximately the same rate as action remediation techniques.

Basis for Taking Action

The RI/FS and BLRA identified BTEX, TCE, and DCE exceeding MCLs. The exposure pathways of potential concern are the ingestion of, and inhalation during use of contaminated groundwater.

4.4.2 Remedial Actions

The COCs for WP45/SS57 are BTEX and chlorinated VOCs (TCE & DCE). Based on the RI/FS and BLRA, the selected remedy cited in the OU3,4,5 ROD includes the following site remedies:

- Monitor the groundwater to evaluate contaminant levels and identify changes to contaminant plume configuration until remediation levels are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for WP45/SS57 include the following:

- Prevent the continued migration of TCE and benzene into the groundwater at concentrations that present a risk to future groundwater users
- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer

Remedy Implementation

Groundwater samples were collected under the SWMP in 1996, 1997, 2000, 2001, 2002, 2004, and 2007 SWMPs to verify COC concentration. Groundwater and soil samples were also collected under OU3 Remedial Action Operations. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and implementing ICs to prevent exposure to contaminated groundwater.

4.4.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2004 and 2007 SWMPs. Soil and groundwater samples were also collected under the 2006 and 2007 OU3 Remedial Action Operations.

4.4.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 4.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports and the 2006 and 2007 OU3 Remedial Action Operations Report.

Data Review

Since 1992 benzene concentrations have decreased at source area monitoring well 45M08 (9.7 µg/L to <0.4 µg/L). TCE concentrations remain above the MCL within the source area, and have not significantly decreased since the RI. Push probes installed in 2001 prior to the 2003 Five-Year ROD Review identified TCE concentrations up to 61,000 µg/L in the vicinity of monitoring well 45M08 (USAF, 2002c) (Figure WP45/SS57-1).

The 2003 Five-Year ROD Review recommended further study of current anaerobic dechlorination at the source area to determine if additional remedial action was required. Discussion also included determining the current COC concentrations and plume extent. The remedial actions for WP45/SS57 presented in the OU3,4,5 ROD were based upon benzene acting as a carbon donor to enhance anaerobic dechlorination of TCE in the source. The continued elevated TCE concentrations and decreasing benzene concentrations indicated that anaerobic dechlorination may cease and TCE currently bound to the carbon (benzene) may release and migrate down gradient.

Soil sampling was conducted during the 2006 Plume Delineation and Natural Attenuation Study under OU3 Remedial Action Operations. Twenty-three soil borings were advanced using direct push methods for soil sampling. The borings were placed using a grid pattern with 50-foot spacing in areas where previous investigations identified contamination. Soil samples were collected from each boring at 3 ft bgs and 8 ft bgs (capillary fringe/water table smear zone). The soil samples were analyzed for aromatic and chlorinated VOCs by USEPA Method SW8260B. Select samples were also analyzed for total organic carbon.

At 3 ft bgs, benzene was not detected; however, TCE concentrations ranging from 560 to 22,000 µg/kg exceeding the RAO of 400 µg/kg at four locations.

At 8 ft bgs, benzene concentrations exceeded the RAO of 20 µg/kg at two locations, and TCE concentrations ranging from 490 to 110,000 µg/kg exceeded the RAO at six locations. The TCE and benzene concentrations in soil are shown in Figure WP45/SS57-2.

Groundwater samples were collected from temporary monitoring wells installed in each of the 23 direct push soil borings. The groundwater samples collected from shallow and deep wells (12 ft and 27 ft bgs, respectively) were analyzed for aromatic and chlorinated VOCs. Select samples were also analyzed for total organic carbon and other parameters to evaluate natural attenuation. The TCE and benzene concentrations in groundwater are shown in Figure WP45/SS57-5. At 12 ft bgs (shallow groundwater zone), TCE concentrations exceeded the RAO of 5 µg/L throughout the study area, with the exception of three up gradient locations. The highest TCE concentration in the shallow groundwater zone was reported at location 45/57-F (89,000 µg/L). At 27 ft bgs (deeper groundwater zone), the RAO for TCE was exceeded only at location 45/57-S (1,100 µg/L), though the number of samples from 27 ft bgs was limited (4). This data, however, indicated that the TCE plume has migrated deeper into the aquifer (down gradient of the suspected source area as a diving plume) than previously suspected.

The results of the 2006 plume delineation study and natural attenuation study identified data gaps that required additional soil and groundwater sampling. The additional sampling was completed under the 2007 Remedial Action Operations Report and Feasibility Study.

The 2007 effort focused on advancing eighteen shallow soil borings between the previous grid spacing to further delineate the TCE contaminated soil for narrowing the cost estimate range associated with the focused feasibility study. Eighteen shallow soil borings were advanced using direct push methods. The borings were set in a grid pattern, over areas identified from the 2006 investigation as potentially contaminated with chlorinated hydrocarbons. Two soil samples were collected from each boring (at approximate depths of 3 and 8 ft bgs). The locations of the soil borings are presented in Figures WP45/SS57-2 and WP45/SS57-3.

At 3 ft bgs, benzene contamination was detected in the sample collected from 45/57-6, at a concentration of 105 µg/kg. TCE was detected at concentrations exceeding the RAOs for the site at one location (45/57-12 at 892 µg/kg).

At 8 ft bgs, Benzene was not detected at concentrations exceeding the RAO at any of the sampling locations. TCE was detected at concentrations exceeding the RAOs for the site at two locations (45/57-2 and 45/57-6). TCE concentrations at these locations were 848 and 872 µg/kg, respectively. It is apparent from the 2007 sampling event that the area of soil with concentrations of contaminants exceeding the RAOs has been defined.

To complete this delineation at the site, additional groundwater samples were collected during the 2007 sampling event. Groundwater samples were collected from direct push points using a Geoprobe Screen Point 16 groundwater sampler. During the field sampling event, the groundwater samples were field screened for TCE and related compounds using a portable gas chromatograph instrument. The samples were field screened to enable timely evaluation of the extent of the groundwater plume, and to select samples for laboratory analysis. If the field screening data indicated that groundwater contaminants exceeded the RAOs, the points were advanced in depth and groundwater samples were collected at 10-foot intervals until the screening data indicated that contaminant concentrations did not exceed the RAOs, or a definite trend in the decrease of contaminant concentrations was evident. Groundwater sampling points were advanced in order from near source locations to down gradient locations in order to effectively isolate and follow the plume.

Eleven deep groundwater sample points were driven to at least 40 ft bgs to further delineate the vertical extent of the plume. An additional 16 groundwater points were driven and sampled to define the lateral extent of the groundwater plume. The groundwater sample locations are shown in Figure WP45/SS57-6.

Vertical profiling and field gas chromatograph screening first identified TCE contamination at 100 ft bgs in 45/57-WSP-1. Further sampling identified higher TCE contamination at the 100 ft depth up gradient in 45/57-WSP-2. TCE was not identified at the 100 ft depth in the four vertical profiles down gradient from 45/57-WSP-1 and 45/57-WSP-2. The field decision was made to extend the vertical profile to the equipment maximum of 200 ft at the highest concentration location (45/57-WSP-2) and again 100 ft down gradient (45/57-WSP-3).

TCE migrated deepest in two localized areas (45/57-WSP-1 and 45/57-WSP-2). At one location, around the suspected primary source area, 45/57-WSP-2, contamination was detected as deep as 200 ft. At this location, the vertical extent of contamination was not delineated since the geoprobe was unable to advance more than 200 ft. TCE was not identified above the MCL at the 200 foot depth in 45/57-WSP-3 approximately 100 ft down gradient from 45/57-WSP-2. TCE was also detected in low concentrations at depths 80 to 100 ft bgs at locations 45/57-WSP-1, 45/57-WSP-7 and 45/57-WSP-8. Away from those areas, TCE concentrations exceeding the RAO are found at much shallower depths. It appears that the depth of TCE concentrations exceeding the RAO decreases as the distance from the suspected source area increases. This is depicted clearly in Figures 4-3 though 4-6.

A summary of both the laboratory and gas chromatograph results for TCE are presented in Table WP45/SS57-5. Figures WP45/SS57-7, WP45/SS57-8, and WP45/SS57-9 present the vertical isocontours of TCE concentrations.

The full vertical extent of TCE contamination was not defined at locations 45/57-WSP-1, 45/57-WSP-2, or 45/57-WSP-6.

In addition to the wells used for vertical delineation, groundwater samples were collected from thirteen additional locations to define the lateral extent of TCE in the shallow groundwater at site 45/57, to cover the areas assessed in 2006 where boundaries were not defined.

The investigation results indicate that the Eastern boundary is successfully defined using the results from sample locations 45/57-WSP-18 and 45/57-WSP-19. These wells all exhibited concentrations of TCE less than the RAO of 5 µg/L.

On the southern boundary of the plume, the investigation results from sample locations successfully defined the plume boundary. Concentrations of TCE from groundwater samples collected from sample locations 45/57-WSP-26 and 45/57-WSP-28, and 45/57-WSP-17, the samples collected from the southern edge of the investigation area contained concentrations of TCE lower then the RAO.

On the western edge of the site, the limits of the plume are not defined. However, it is not feasible to collect samples any further west, since the site is bordered on the west by an active flight line. The TCE concentrations detected in groundwater samples collected from the sample locations on the western boundary of the site, at 12 ft bgs were: 45/57-WSP-14 (61 µg/L), 45/57-WSP-15 (192 µg/L), 45/57-WSP-16 (129 µg/L).

The 2007 investigation was also unable to define the area of contamination on the north boundary of the site. The TCE concentrations detected in groundwater samples collected from the sample locations on the north boundary of the site, at 12 ft bgs were:
45/57-WSP-21 (98 µg/L) and 45/57-WSP-23 (216 µg/L),
45/57-WSP-24 (5.7 µg/L) and WSP-25 (9.2 µg/L).

The results of the 2006 natural attenuation study indicated that inappropriate redox conditions and insufficient carbon substrate sources are present for the favorable reductive dechlorination of TCE. However, reductive dechlorination has occurred at the location (45/57-F) where TCE, benzene, and total organic carbon concentrations are highest. The 2006 plume delineation study also identified soil contamination exceeding levels determined present in the OU3,4,5 ROD, and that TCE contamination in groundwater remains at levels identified in the OU3,4,5 ROD.

To further evaluate the efficiency of natural attenuation to breakdown the chlorinated VOCs in groundwater at the site, groundwater samples were collected from well 45/57-

MW08, and from the direct push location 45/57-F for the analysis of the presence of Dehalococcoides ethenogenes (DHC), a bacterial strain known to reductively dechlorinate TCE. DHC was not identified in either sample at detectable concentrations.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. These source areas were discussed as part of the RPO and included Ross Miller and Rafael Vazquez via teleconference. The inspection team discussed indoor air monitoring in buildings 1168, 1176, 1183, 1190, 1191, and 1206. Eielson AFB will monitor buildings dependent upon use. Vapor intrusion evaluation will include indoor air only, and not sub grade. Eielson AFB agrees to look at source areas with vapor intrusion potential. Documentation will include building use and interviews of building workers to determine potential exposure duration.

The USEPA advocates an injection pilot study as the site is not reaching MCLs, which is the justification for the pilot study and further remedial action. Eielson AFB agrees. Both Eielson AFB and the USEPA agree that the remedy at WP45/SS57 is protective as there is no known issue with vapor intrusion. The ADEC discussed that the plume extent is unknown, MNA is not favorable, and that the source areas did not reach MCLs in seven years as per the OU3,4,5 ROD. Further delineation and discussion is required for these source areas.

4.4.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The RAOs include preventing the continued migration of TCE and benzene into the groundwater at concentrations that present a risk to future groundwater users. The 2006 and 2007 investigations identified TCE contamination in soil exceeding levels identified in the OU3,4,5 ROD, potentially allowing continued leaching into the local groundwater. TCE contamination in groundwater remains at levels identified in the OU3,4,5 ROD. The vertical extent of TCE contamination is unknown in the central source area. The horizontal TCE plume boundary is unknown west and north (down gradient) of the source area. Current groundwater monitoring results do not provide evidence that the TCE plume is stable or the occurrence of continued reductive dechlorination.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

The 2006 and 2007 investigations identified soil contamination >100ppm exceeding levels determined present in the OU3,4,5 ROD, potentially allowing continued leaching into the local groundwater. TCE contamination in groundwater remains at levels identified in the OU3,4,5 ROD. TCE was detected during the 2007 investigation at 200 ft bgs. At this location, the vertical extent of contamination was not delineated since the geoprobe was unable to advance more than 200 ft. TCE was not identified above the RAO at the 200 foot depth approximately 100 ft down gradient. At the majority of other sampling locations, TCE was not measured at concentrations exceeding the RAO lower than 40 ft bgs.

The horizontal TCE plume boundary is unknown at the west and north (down gradient) of the source area. Current groundwater monitoring results do not provide evidence that the TCE plume is stable. Eielson AFB will conduct a further investigation late 2008 through 2009. The investigation will include a source area remediation pilot study, down gradient groundwater sampling, and vapor intrusion monitoring for down gradient facilities.

4.4.6 Issues

The vertical and lateral extent and stability of the TCE plume is unknown. Soil contamination within the source area exceeds the RAOs for TCE, potentially allowing continued leaching into the local groundwater. The direct contact pathway for TCE contaminated soil remains protective due to ICs. In addition, the results of the 2006 natural attenuation study indicate that inappropriate redox conditions and insufficient carbon substrate sources are present for the favorable reductive dechlorination of TCE. The vapor intrusion pathway is currently under evaluation using recently developed guidance by the USEPA and ADEC.

No issues were identified relating to the protectiveness of the remediation process at source area WP45/SS57. Additional issues that do not necessarily affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The vertical extent and of the TCE plume is unknown	N	Uncertain
The lateral extent of the TCE plume is unknown	N	Uncertain
The stability of the TCE plume is unknown	N	Uncertain

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Soil contamination within the source area exceeds the ARAR for TCE, not obtaining the RAO of preventing the continued migration of TCE into the groundwater at concentrations that present a risk to future groundwater users	N	Uncertain
Inappropriate redox conditions and insufficient carbon substrate sources are present for the favorable reductive dechlorination of TCE	N	Uncertain

4.4.7 Recommendations and Follow-Up Actions

The RAOs for WP45/SS57 include preventing continued migration of TCE and benzene into the groundwater at concentration presenting a risk to potential future groundwater users. The current remedy is not expected to meet the RAOs. Eielson AFB will perform a pilot study injecting a carbon and zero valiant iron solution centered at monitoring well 45MW08. The pilot study will allow Eielson AFB to establish the parameters for remediation and scale up to a full design. Eielson AFB will perform additional down gradient groundwater monitoring to further evaluate the current plume extent. Additional vertical delineation is currently under evaluation by the RPMs. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
The vertical extent and of the TCE plume is unknown	Conduct additional veritcal delineation. Evaluate a TI waiver for TCE contamination at depth.	USAF	USEPA, ADEC	09/30/09	N	Uncertain
The lateral extent of the TCE plume is unknown	Conduct additional down gradient groundwater monitoring	USAF	USEPA, ADEC	09/30/09	N	Uncertain
The stability of the TCE plume is unknown	Conduct additional down gradient groundwater monitoring	USAF	USEPA, ADEC	09/30/09	N	Uncertain

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N) Current	Affects Protectiveness? (Y/N) Future
Soil contamination within the source area exceeds the ARAR for TCE, not obtaining the RAO of preventing the continued migration of TCE into the groundwater at concentrations that present a risk to future groundwater users	Evaluate ARAR for TCE in soil. Evaluate if additional remedial action is necessary to obtain RAO.	USAF	USEPA, ADEC	05/01/10	N	Uncertain
Inappropriate redox conditions and insufficient carbon substrate sources are present for the favorable reductive dechlorination of TCE	Perform pilot study injecting carbon and zero valent iron to establish the parameters for remediation and scale up to a full design	USAF	USEPA/ ADEC	09/30/09	N	Uncertain

Groundwater monitoring will continue as determined by the RPMs at WP45/SS57 until chlorinated VOC concentrations meet the MCLs. Land use restrictions will remain in effect until RAOs are achieved.

4.4.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met.

The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of, and inhalation during use of contaminated groundwater. The effectiveness of the remedy for WP45/SS57 is under evaluation.

4.4.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for WP45/SS57:

List of Tables for WP45/SS57:

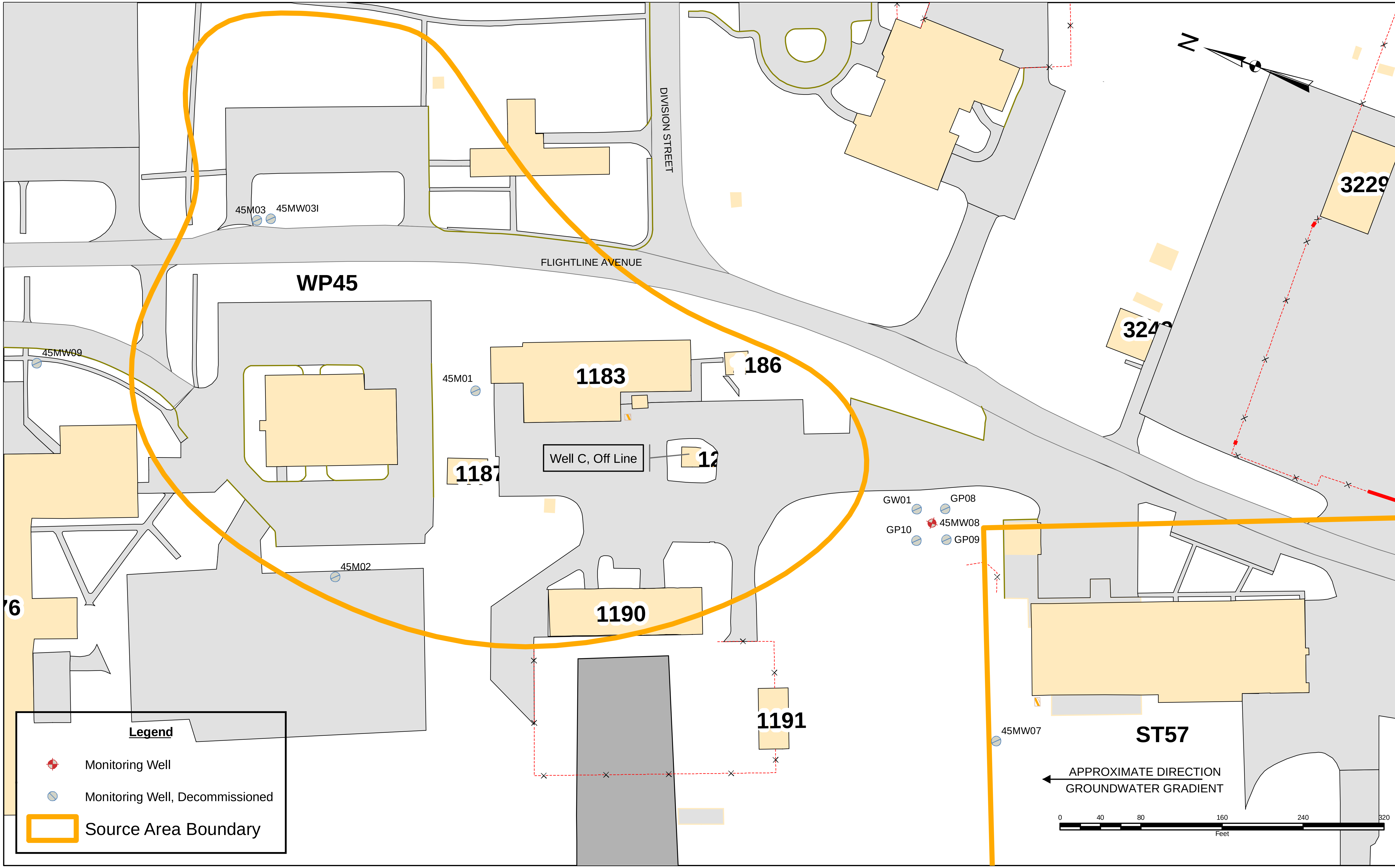


Figure WP45/SS57-1: WP45/SS57, Photo Lab/Fire Station Parking Lot, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

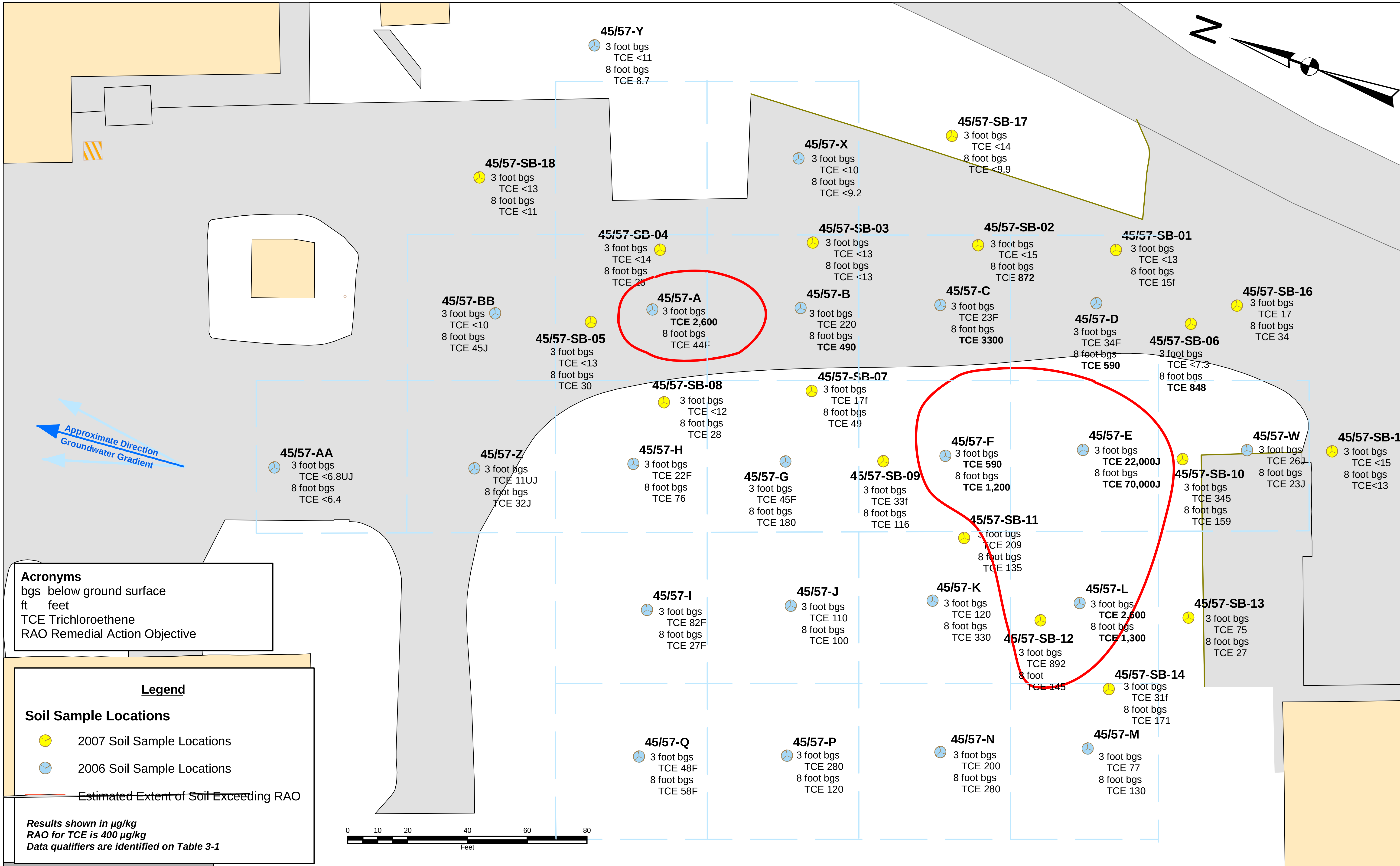


Figure WP45/SS57-2: WP45/SS57, Estimated Extent of Soil with TCE Concentrations Exceeding RAO at 3 feet bgs, Eielson AFB, Alaska

This page intentionally left blank

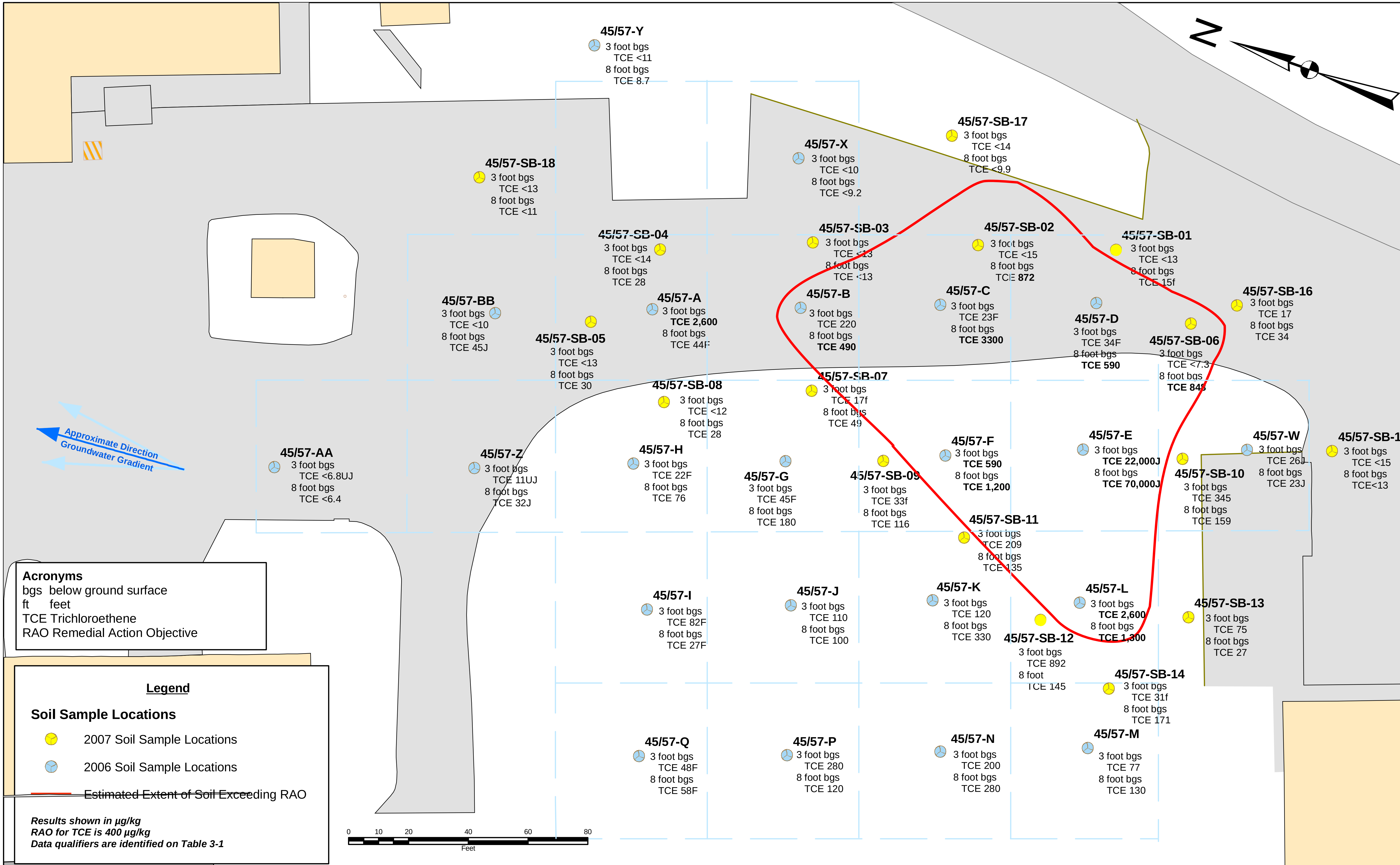


Figure WP45/SS57-3: WP45/SS57, Estimated Extent of Soil with TCE Concentrations Exceeding RAO at 8 feet bgs, Eielson AFB, Alaska

This page intentionally left blank

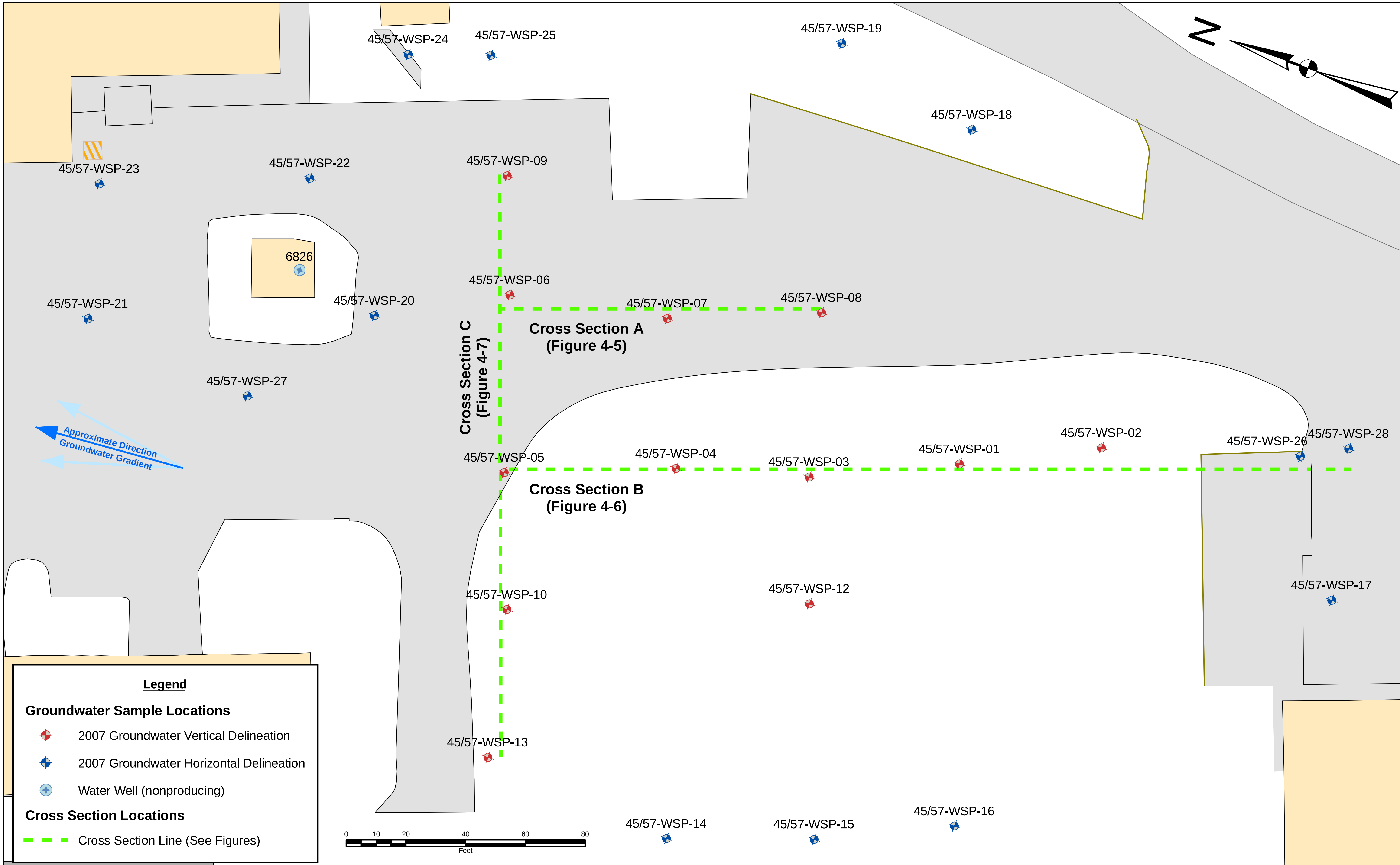


Figure WP45/SS57-4: WP45/SS57, 2007 Groundwater Sample Results Cross Sections, Eielson AFB, Alaska

This page intentionally left blank

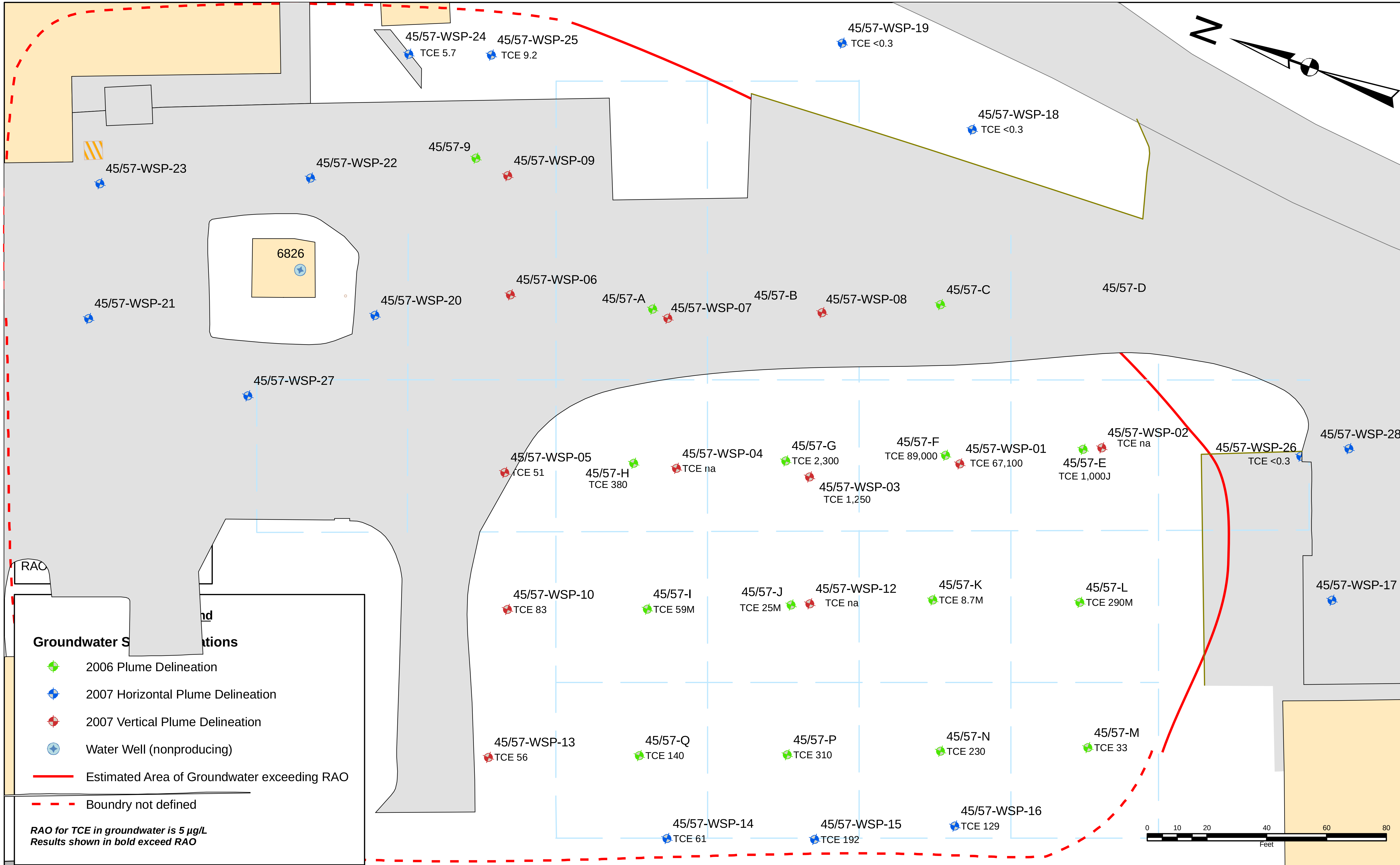


Figure WP45/SS57-5: WP45/SS57, Estimated Extent of Groundwater Concentrations Exceeding RAO in Shallow Groundwater, Eielson AFB, Alaska

This page intentionally left blank

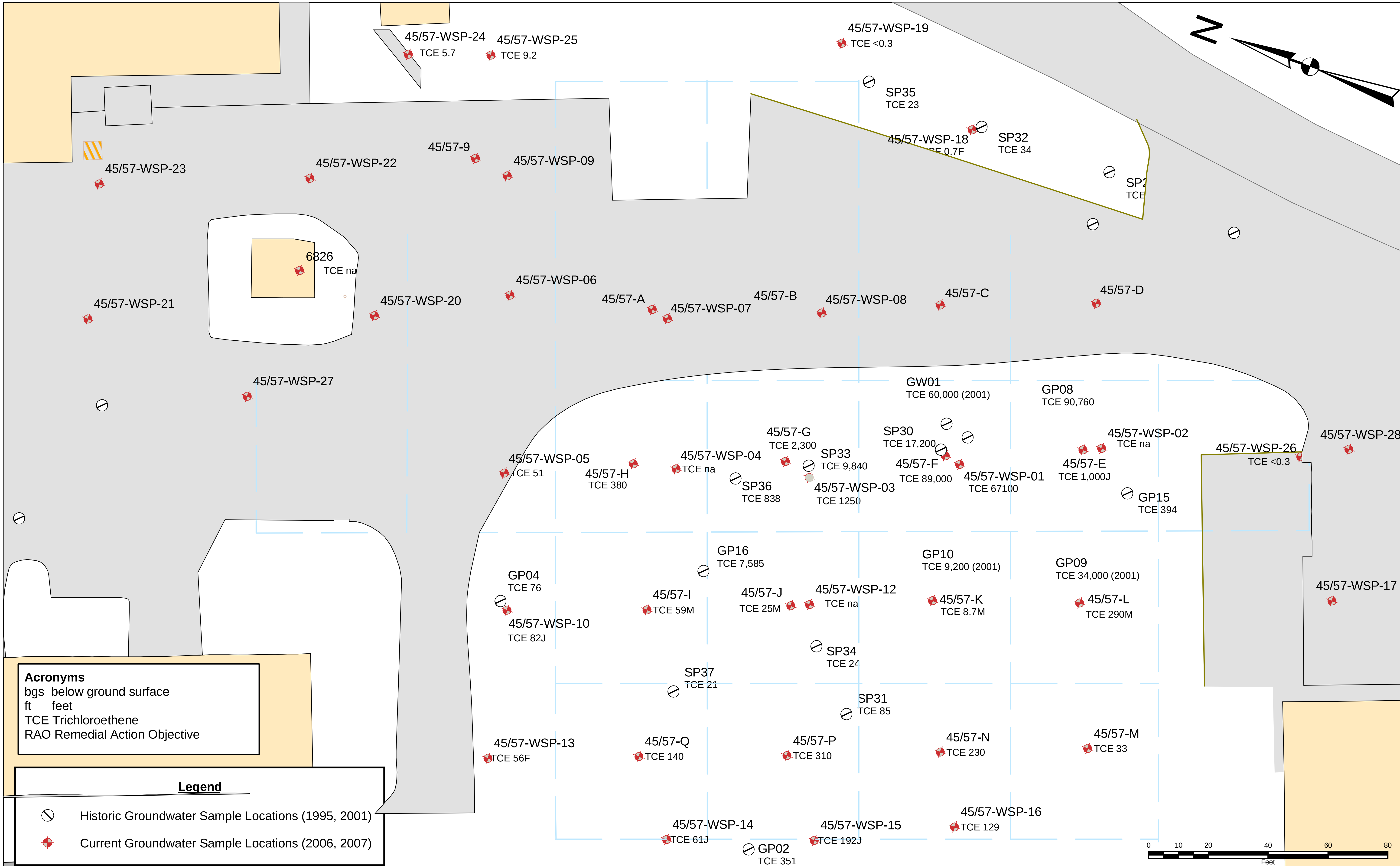


Figure WP45/SS57-6: WP45/SS57, Groundwater Concentrations from 1995, 2001, 2006 and 2007, Eielson AFB, Alaska

This page intentionally left blank

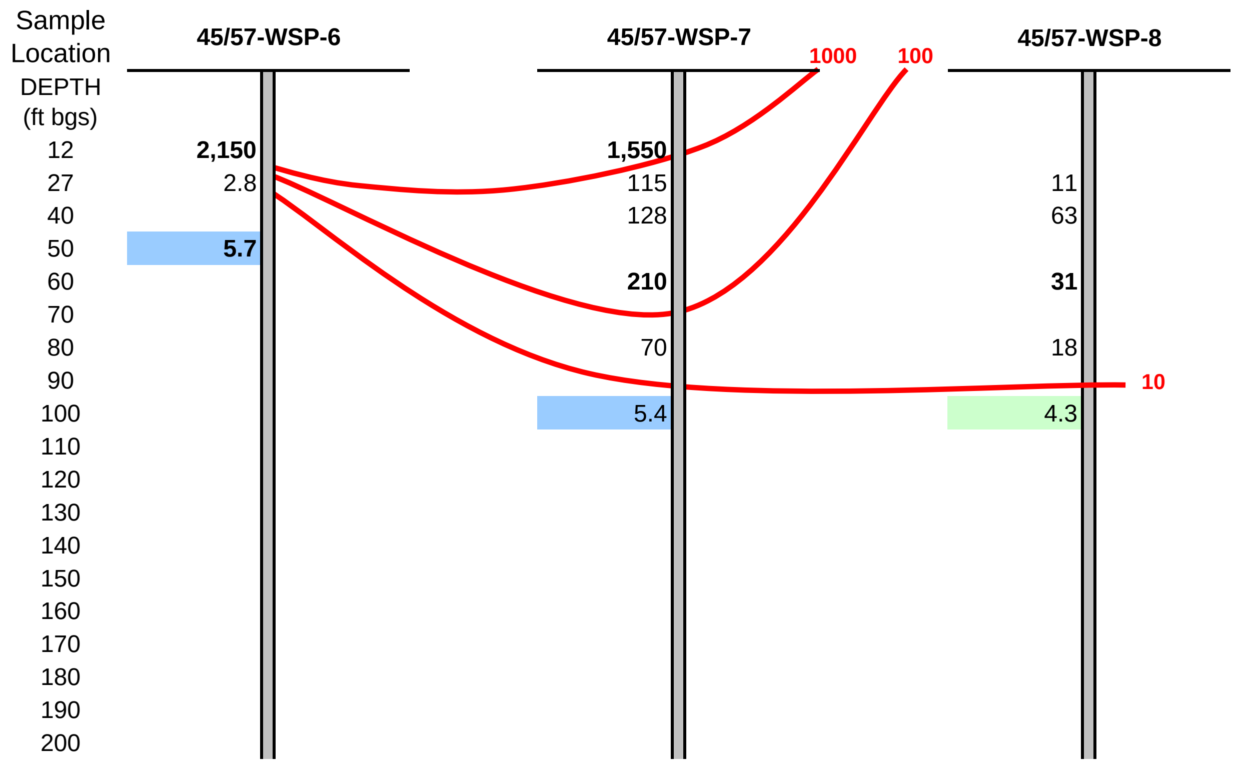


Figure not drawn to scale.
Laboratory Data Contour Interval log10. Concentrations reported in µg/L.

Figure WP45/SS57-7: WP45/SS57, Cross Section A Showing Vertical Contour of TCE Concentration in Groundwater, Eielson AFB, Alaska

This page intentionally left blank

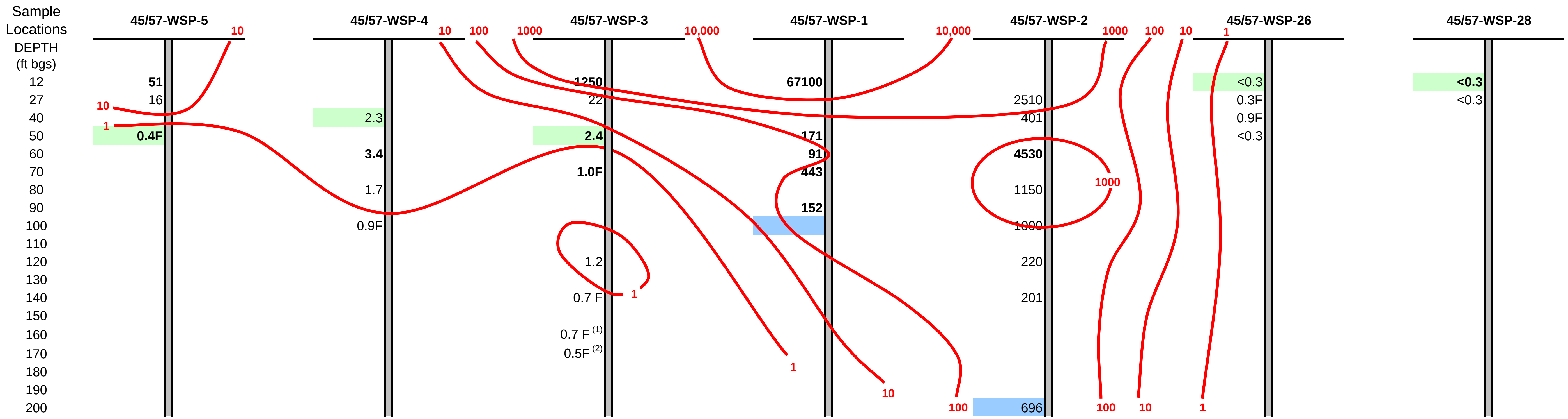


Figure not drawn to scale.
Laboratory Data Contour Interval log10. Concentrations reported in µg/L.

Figure WP45/SS57-8: WP45/SS57, Cross Section B Showing Vertical Contour of TCE Concentration in Groundwater, Eielson AFB, Alaska

This page intentionally left blank

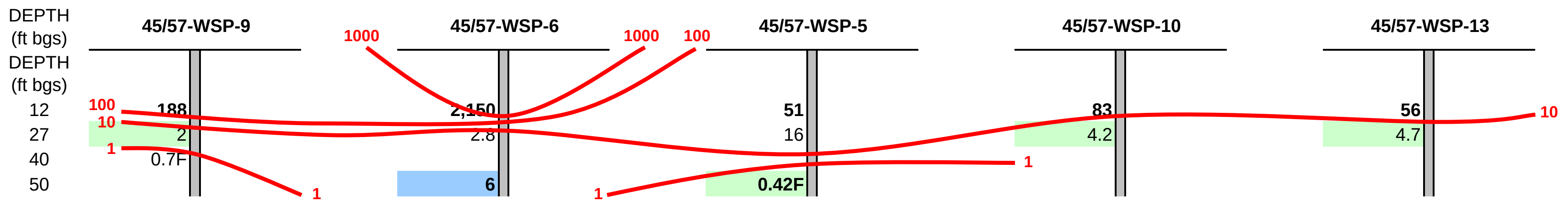


Figure not drawn to scale.
Laboratory Data Contour Interval log10. Concentrations reported in µg/L.

Figure WP45/SS57-9: WP45/SS57, Cross Section C Showing Vertical Contour of TCE Concentration in Groundwater, Eielson AFB, Alaska

This page intentionally left blank

TABLE WP45/SS57-1: CONCENTRATIONS (µg/L) OF BTEX AND NATURAL ATTENUATION PARAMETERS IN GROUNDWATER SAMPLES, WP45/SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	Methane	Ethane	Ethene	Total Iron	Dissolved Iron	Dissolved Sulfide	Analytical Methods	Reference
MCLs			**5**	**1,000**	**700**	**10,000**						**mg/L**		**18 AAC 80.300.**
MDLs	(µg/L)						0.2	0.39	0.4	0.002	0.002	--		
45M01	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M01	08/18/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M01	08/27/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1996 SWMPR
45M01	09/07/00		<0.5	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 2000 SWMPR
45M01	08/22/02	13	<0.5	<1.0	<1.0	<2.0	--	--	--	--	--	--	1	USAF 2002 SWMPR
45M01	09/27/04	13	0.3	<0.5	<0.5	<0.5	59	0.4	0.4	3.0	2.9	--	7,9,10	USAF 2004 SWMPR
45M02	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M02	08/18/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M03	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M03	08/18/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M03	08/28/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1996 SWMPR
45M03	08/22/02	12	0.6	<1.0	<1.0	<2.0	--	--	--	--	--	--	1	USAF 2002 SWMPR
45M03	09/27/04	14	<0.4	<0.5	<0.5	<0.5	84	0.4	0.4	2.1	1.2	0.02	7,9,10	USAF 2004 SWMPR
45MW03I	08/31/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45MW03I	09/11/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1996 SWMPR
45M04	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M04	08/18/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M04	08/08/94		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1994 SWMPR
45M04	09/12/95		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1-3	USAF 1995 SWMPR
45M04	08/22/96		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1996 SWMPR
45M04	09/06/00		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1,7	USAF 2000 SWMPR
45M04	09/27/04	13	<0.4	<0.5	<0.5	<0.5	57	0.4	0.4	2.7	2.6	0.02	7,9,10	USAF 2004 SWMPR
45M05	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
							--	--	--	--	--	--		
45M06	06/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45M06	09/14/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45MW07	09/15/92		**30**	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45MW07	08/08/94		<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1994 SWMPR
45MW07	08/28/96		**12**	<1.0	<1.0	<1.0	--	--	--	--	--	--	1	USAF 1996 SWMPR
45MW07	09/06/00		**17**	<1.0	<1.0	<1.0	--	--	--	--	--	--	1,7	USAF 2000 SWMPR
45MW07	08/22/02	16	**13**	<1.0	<1.0	<2.0	--	--	--	--	--	--	1	USAF 2002 SWMPR

TABLE WP45/SS57-1: CONCENTRATIONS (µg/L) OF BTEX AND NATURAL ATTENUATION PARAMETERS IN GROUNDWATER SAMPLES, WP45/SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	Methane	Ethane	Ethene	Total Iron	Dissolved Iron	Dissolved Sulfide	Analytical Methods	Reference
MCLs			**5**	**1,000**	**700**	**10,000**						**mg/L**		**18 AAC 80.300.**
MDLs	(µg/L)						0.2	0.39	0.4	0.002	0.002	--		
45MW08	09/15/92		**9.7**	210	35	260	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45MW08	09/18/95		**11**	120	18	128	--	--	--	--	--	--	1-3	USAF 1995 SWMPR
45MW08	08/22/96		3.6	14	4.3	21	--	--	--	--	--	--	1	USAF 1996 SWMPR
45MW08	09/06/00		**6.1**	23	9.9	39	--	--	--	--	--	--	1,7	USAF 2000 SWMPR
45MW08	09/06/00		**5.1**	19	8.2	32	--	--	--	--	--	--	7	USAF 2000 SWMPR
45MW08	08/22/02	13	2.1	46	12	76	--	--	--	--	--	--	1	USAF 2002 SWMPR
45MW08	08/22/02	13	2.0	43	12	73	--	--	--	--	--	--	1, *	USAF 2002 SWMPR
45MW08	09/27/04	15	4.5	130	24	235	55	1.9	0.4	10	11	0.0	7, 9, 10	USAF 2004 SWMPR
45MW08	09/27/04	15	--	--	--	--	59	1.9	0.4	11	10	--	9,10	USAF 2004 SWMPR
45MW08	09/20/07	15	<0.4	3.6	4.5	35F	--	--	--	--	--	--	7	USAF 2007 SWMPR
45MW09	09/14/92		<2.0	<2.0	<2.0	<5.0	--	--	--	--	--	--	1	USAF 1995 OU3,4,5 RI
45MW09	08/22/02	15	<0.5	<1.0	<1.0	<2.0	--	--	--	--	--	--	1	USAF 2002 SWMPR
45MW09	09/27/04	17	<0.4	<0.5	<0.5	<0.5	56	0.4	0.4	3	2.8	0.03	7,9,10	USAF 2004 SWMPR
Building 2699	10/12/07	130	<0.4	<1.0	<1.0	<3.0	--	--	--	--	--	--	7	USAF 2007 SWMPR

Notes:

MCL	maximum contaminant level
MDL	method detection limit in micrograms per liter
Bold	Bold text indicates concentration exceeds MCL.
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
I	intermediate depth well
DNA	Data not available
*	Duplicate sample
--	Not analyzed
µg/L	micrograms
mg/L	milligrams per Liter

Analytical Methods:

1. 8020/8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
7. 8260
8. 8240
9. 6010B ICP
10. RSK SOP-175

TABLE WP45/SS57-2: CONCENTRATIONS (µg/L) OF VOCs IN GROUNDWATER SAMPLES, WP45/SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Chloro-methane	Vinyl Chloride	1,1-DCE	Methylene Chloride	c-1,2-DCE	t-1,2-DCE	1,1-DCA	Chloro-form	1,2-DCA	1,1,1-TCA	TCE	PCE	Analytical Methods	Notes	Reference
MCLs			NA	**2**	**7**	NA	**70**	**100**	NA	NA	**5**	**200**	**5**	**5**			18 AAC 80.300.
45M01	06/10/92		--	<2.0	--	<5.0	47	13	<1.0	<0.5	<0.5	<0.5	**330**	<0.5	4	a	USAF 1995 OU3,4,5 R
45M01	08/18/92		--	<2.0	--	<5.0	39	39	<1.0	<0.5	<0.5	<0.5	**370**	<0.5	4	a	USAF 1995 OU3,4,5 R
45M01	08/27/96		<1.0	<1.0	<1.0	<1.0	40	52	<1.0	<1.0	<1.0	<1.0	**440**	<1.0	4,13	a	USAF 1996 SWMPR
45M01	09/07/00		<1.0	<1.0	<1.0	<5.0	10	22	<1.0	<1.0	<1.0	<1.0	**46**	<1.0	7	a	USAF 2000 SWMPR
45M01	08/22/02	13	<1.0	<1.0	<1.0	<5.0	4.7	15	<1.0	<1.0	<1.0	<1.0	**19**	<1.0	7	a	USAF 2002 SWMPR
45M01	09/27/04	13	<1.0	<0.5	0.5	<2.0	50	**110**	<0.5	<0.3	<0.5	<0.5	**120**	<0.5	7	a	USAF 2004 SWMPR
45M02	06/10/92		--	<2.0	--	<5.0	<1.0	1.2	<1.0	<0.5	<0.5	<0.5	**37**	<0.5	4	a	USAF 1995 OU3,4,5 R
45M02	08/18/92		--	<2.0	--	<5.0	3.6	6.6	<1.0	<0.5	<0.5	<0.5	1.3	<0.5	4	a	USAF 1995 OU3,4,5 R
45M03	06/11/92		--	<2.0	--	<5.0	9	2.5	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	4	a	USAF 1995 OU3,4,5 R
45M03	08/18/92		--	<2.0	--	<5.0	25	11	<1.0	<0.5	<0.5	<0.5	**100**	<0.5	4	a	USAF 1995 OU3,4,5 R
45M03	08/28/96		<1.0	<1.0	<1.0	1.4	16	12	<1.0	<1.0	<1.0	<1.0	**85**	<1.0	4,13	a,b	USAF 1996 SWMPR
45M03	08/22/02	12	<1.0	<1.0	<1.0	<5.0	15	18	<1.0	<1.0	<1.0	<1.0	**95**	<1.0	7	a	USAF 2002 SWMPR
45M03	09/27/04	14	<1.0	<0.5	<1.0	<2.0	17	24	<0.5	<0.3	<0.5	<0.5	**73**	<0.5	7	a	USAF 2004 SWMPR
45MW03I	08/31/92		--	<2.0	--	<5.0	2.6	<1.0	<1.0	<0.5	<0.5	<0.5	1.7	<0.5	4	a	USAF 1995 OU3,4,5 R
45MW03I	09/11/96		1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	4,13	a	USAF 1996 SWMPR
45M04	06/11/92		--	<2.0	--	<5.0	1.4	<1.0	<1.0	<0.5	<0.5	<0.5	2.6	<0.5	4	a	USAF 1995 OU3,4,5 R
45M04	08/18/92		--	<2.0	--	<5.0	2.2	<1.0	<1.0	<0.5	<0.5	<0.5	4.4	<0.5	4	a	USAF 1995 OU3,4,5 R
45M04	08/08/94		<1.0	<0.5	<0.5	<1.0	--	<1.0	<1.0	<1.0	<0.5	<1.0	4.7	<0.5	4	a	USAF 1994 SWMPR
45M04	09/12/95		<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	3.3	<1.0	4	a	USAF 1995 SWMPR
45M04	08/22/96		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.3	<1.0	4,13	a	USAF 1996 SWMPR
45M04	09/06/00		<1.0	<1.0	<1.0	<5.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	4.8	<1.0	7	a	USAF 2000 SWMPR
45M04	09/27/04	13	<1.0	<0.5	<1.0	<2.0	1.3	<0.5	<0.5	<0.3	<0.5	<0.5	2.3	<0.5	7	a	USAF 2004 SWMPR
45M05	06/11/92		--	<2.0	--	<5.0	<1.0	<1.0	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	4	a	USAF 1995 OU3,4,5 R
45M06	06/11/92		--	<2.0	--	<5.0	<1.0	<1.0	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	4	a	USAF 1995 OU3,4,5 R
45M06	09/14/92		--	<2.0	--	<5.0	<1.0	<1.0	<1.0	<0.5	<0.5	<0.5	<1.0	<0.5	4	a	USAF 1995 OU3,4,5 R
45MW07	09/15/92		--	<2.0	--	<5.0	3.5	<1.0	<1.0	<0.5	1.1	<0.5	2.0	0.9	4	a	USAF 1995 OU3,4,5 R
45MW07	08/08/94		<1.0	<0.5	<0.5	<1.0	--	<1.0	<1.0	<1.0	1.2	<1.0	2.0	0.8	4	a	USAF 1994 SWMPR
45MW07	08/28/96		<1.0	<1.0	<1.0	1.7	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	4,13	a,b	USAF 1996 SWMPR
45MW07	09/06/00		<1.0	<1.0	<1.0	<5.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0	2.9	<1.0	7	a	USAF 2000 SWMPR
45MW07	08/22/02	16	<1.0	<1.0	<1.0	<5.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	7	a	USAF 2002 SWMPR

TABLE WP45/SS57-2: CONCENTRATIONS (µg/L) OF VOCs IN GROUNDWATER SAMPLES, WP45/SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Chloro-methane	Vinyl Chloride	1,1-DCE	Methylene Chloride	c-1,2-DCE	t-1,2-DCE	1,1-DCA	Chloro-form	1,2-DCA	1,1,1-TCA	TCE	PCE	Analytical Methods	Notes	Reference
MCLs			NA	**2**	**7**	NA	**70**	**100**	NA	NA	**5**	**200**	**5**	**5**			18 AAC 80.300.
45MW08	09/15/92		--	<2.0	--	<5.0	31	<1.0	6.6	100	<0.5	100	**7,200**	1.0	4	a	USAF 1995 OU3,4,5 R
45MW08	09/18/95		1.8	<1.0	1.1	1.1	--	<1.0	4.7	81	<1.0	66	**2,300**	1.5	4	a	USAF 1995 SWMPR
45MW08	08/22/96		<1.0	<1.0	<1.0	<1.0	8.0	<1.0	2.1	46	<1.0	30	**2,000**	<1.0	4,13	a	USAF 1996 SWMPR
45MW08	09/06/00		<1.0	<1.0	<1.0	<5.0	8.6	<1.0	2.9	48	<1.0	<1.0	**3,470**	<1.0	7	d	USAF 2000 SWMPR
45MW08	09/06/00		<1.0	<1.0	<1.0	<5.0	7.3	<1.0	2.5	41	<1.0	34	**3,190**	<1.0	7	c, e	USAF 2000 SWMPR
45MW08	08/22/02	13	<1.0	<1.0	<1.0	<5.0	3.1	<1.0	<1.0	8.9	<1.0	16	**1,500**	<1.0	7	f	USAF 2002 SWMPR
45MW08	08/22/02	13	<1.0	<1.0	<1.0	<5.0	3.1	<1.0	<1.0	8.4	<1.0	15	**1,400**	<1.0	7	g	USAF 2002 SWMPR
45MW08	09/27/04	15	<1.0	<0.5	2.5	<2.0	8.8	<0.5	2.5	38	<0.5	50	**4,100**	2.7	7		USAF 2004 SWMPR
45MW08	09/20/07	15	--	<1.0	<1.0	<1.0	2.7 J	<1.0	<1.0	3.6	<0.5	7.0	**837**	0.6 F	7	h	USAF 2007 SWMPR
45MW09	09/14/92		--	<2.0	--	<5.0	9.8	25	<1.0	<0.5	<0.5	<0.5	**14**	<0.5	4	a	USAF 1995 OU3,4,5 R
45MW09	08/22/02	15	<1.0	<1.0	<1.0	<5.0	6.3	1.7	<1.0	<1.0	<1.0	<1.0	**7**	<1.0	7		USAF 2002 SWMPR
45MW09	09/27/04	17	<1.0	<0.5	<1.0	<2.0	9.6	25	<0.5	<0.3	<0.5	<0.5	3.2	<0.5	7		USAF 2004 SWMPR
GW01	2001		DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	**60,000**	DNA			USAF 2002 RPO
GP08	2001		DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	**61,000**	DNA			USAF 2002 RPO
GP09	2001		DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	**34,000**	DNA			USAF 2002 RPO
GP10	2001		DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	**9,200**	DNA			USAF 2002 RPO
Building 2699	10/12/07	130	--	<1.0	<1.0	<1.0	1.5 J	<1.0	<1.0	<0.4	<0.5	<1.0	<1.0	<1.0	7	a	USAF 2007 SWMPR

Notes:

a. No compounds other than those listed were detected above method reporting limits.
b. Methylene chloride suspected to be the result of laboratory contamination (compound detected in laboratory method blank at 1.3 ug/L).
c. Duplicate sample
d. Additional compounds detected (µg/L): bromochloromethane - 5.31; 1,1,1-TCA - 42.2; n-propylbenzene - 1.19; 1,3,5-TMB - 3.23; 1,2,4-TMB - 10.6; naphthalene - 4.64
e. Additional compounds detected (µg/L): bromochloromethane - 4.82; 1,3,5-TMB - 2.68; 1,2,4-TMB - 8.54; napthalene - 4.36.
f. Additional compounds detected (µg/L): Isopropylbenzene 1.52; n-Propylbenzene 2.38 ; 1,3,5-TMB 5.69; 1,2,4-TMB 18.7; 4-Isopropyltoluene 1.09; Napthalene 6.40.
g. Additional compounds detected (µg/L): Isopropylbenzene 1.54; n-Propylbenzene 2.32;, 1,3,5-TMB 5.60; 1,2,4-TMB 18.5; 4-Isopropyltoluene 1.12; Napthalene 5.87.
h. Additional compounds detected (ug/L): n-Butylbenzene 2.2; 1,2,4-Trimethylbenzene 9.7; 1,3,5-Trimethylbenzene 1.3; Isopropylbenzene 0.42 F; Napthalene 4.1; p-Isopropyltoluene 1.1.

DCE	Dichloroethene	DNA	Data Not Usable
DCA	Dichloroethane	I	intermediate depth well.
TCA	Trichloroethane	MCL	maximum contaminant level
TCE	Trichloroethene	**Bold**	Bold text indicates concentration exceeds MCL.
PCE	Tetrachloroethene	µg/L	Micrograms per liter
--	Not analyzed		
F	Indicates value greater than or equal to the method detection limit (MDL) and below the reporting limit.		
J	Indicates that the analyte was positively identified; however the quantitation is estimated.		

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 7421
12. 6020
13. 8310

TABLE WP45/SS57-3: CONCENTRATIONS (µg/kg) OF VOCs IN 2007 SOIL SAMPLES
WP45SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AFB, ALASKA

Sample ID	Date Sampled	Benzene	1,1,2-Trichloroethane	TCE	Analytical Method	Notes
Remedial Action Objective		**20**		**400**		
45/57-SB-1A-080607	6-Aug-2007	<5.4 UJ	<6.7 UJ	<13 UJ	SW8260B	
45/57-SB-1B-080607	6-Aug-2007	<5.6 UJ	<7.0 UJ	15 F	SW8260B	
45/57-SB-2A-080607	6-Aug-2007	<5.8 UJ	<7.3 UJ	<15 UJ	SW8260B	a
45/57-SB-2B-080607	6-Aug-2007	<3.9 UJ	<4.9 UJ	**872 J**	SW8260B	a
45/57-SB-3A-081107	11-Aug-2007	<5.1 UJ	<6.4 UJ	<13 UJ	SW8260B	
45/57-SB-3B-081107	11-Aug-2007	<5.4 UJ	<6.7 UJ	<13 UJ	SW8260B	
45/57-SB-4A-081107	11-Aug-2007	<5.6 UJ	<7.0 UJ	<14 UJ	SW8260B	
45/57-SB-4B-081107	11-Aug-2007	<4.3 UJ	<5.4 UJ	28 J	SW8260B	
45/57-SB-5A-081107	11-Aug-2007	<5.1 UJ	<6.4 UJ	<13 UJ	SW8260B	
45/57-SB-5B-081107	11-Aug-2007	<5.8 UJ	<7.2 UJ	30 J	SW8260B	
45/57-SB-6A-081107	11-Aug-2007	**105 J**	<7.3 U	<15 UJ	SW8260B	a
45/57-SB-6B-081107	11-Aug-2007	<6.3 UJ	297 J	**848 J**	SW8260B	a
45/57-SB-7A-081107	11-Aug-2007	<4.6 UJ	<5.7 UJ	19 F	SW8260B	a
45/57-SB-7B-081107	11-Aug-2007	<5.9 UJ	<7.4 UJ	49 J	SW8260B	a
45/57-SB-7BB-081107	11-Aug-2007	<4.6 UJ	<5.8 UJ	46 J	SW8260B	*
45/57-SB-8A-081107	11-Aug-2007	<4.9 UJ	<6.1 UJ	<12 UJ	SW8260B	
45/57-SB-8B-081107	11-Aug-2007	<4.3 UJ	<5.4 UJ	28 J	SW8260B	
45/57-SB-9A-081107	11-Aug-2007	<6.7 UJ	<8.4 UJ	33 F	SW8260B	
45/57-SB-9B-081107	11-Aug-2007	<5.1 UJ	<6.4 UJ	116 J	SW8260B	
45/57-SB-10A-081107	11-Aug-2007	<4.9 UJ	<6.1 UJ	345 J	SW8260B	a
45/57-SB-10B-081107	11-Aug-2007	<4.6 UJ	<5.7 UJ	159 J	SW8260B	a
45/57-SB-10BB-081107	11-Aug-2007	<6.9 UJ	<8.6 UJ	127 J	SW8260B	*
45/57-SB-11A-081107	11-Aug-2007	<6.9 UJ	<8.6 UJ	209 J	SW8260B	
45/57-SB-11B-081107	11-Aug-2007	<4.7 UJ	<5.9 UJ	135 J	SW8260B	
45/57-SB-12A-081107	11-Aug-2007	<6.1 UJ	<7.6 UJ	**892 J**	SW8260B	
45/57-SB-12B-081107	11-Aug-2007	8.8 F	<7.6 U	145 J	SW8260B	a
45/57-SB-13A-081107	11-Aug-2007	10 F	<8.5 UJ	75 J	SW8260B	a
45/57-SB-13B-081107	11-Aug-2007	15 F	<8.7 UJ	27 F	SW8260B	a
45/57-SB-14A-081107	11-Aug-2007	<7.3 UJ	<9.2 UJ	31 F	SW8260B	a
45/57-SB-14B-081107	11-Aug-2007	<5.2 UJ	<6.5 UJ	171 J	SW8260B	
45/57-SB-15A-081607	16-Aug-2007	<6.1 UJ	<7.6 UJ	<15 UJ	SW8260B	
45/57-SB-15AA-081607	16-Aug-2007	<5.0 UJ	<6.2 UJ	<12 UJ	SW8260B	*
45/57-SB-15B-081607	16-Aug-2007	<5.0	<6.3	<13 UJ	SW8260B	
45/57-SB-16A-081607	16-Aug-2007	<5.7 UJ	<7.1 UJ	17 F	SW8260B	
45/57-SB-16B-081607	16-Aug-2007	<4.9 UJ	<6.1 UJ	34 J	SW8260B	
45/57-SB-17A-081607	16-Aug-2007	<5.6	<7.0	<14 UJ	SW8260B	
45/57-SB-17B-081607	16-Aug-2007	<4.0 UJ	<5.0 UJ	<9.9 UJ	SW8260B	
45/57-SB-18A-081607	16-Aug-2007	<5.2 UJ	<6.5 UJ	<13 UJ	SW8260B	
45/57-SB-18B-081607	16-Aug-2007	<4.3 UJ	<5.4 UJ	<11 UJ	SW8260B	
45/57-SB-18BB-081607	16-Aug-2007	<4.3 UJ	<5.3 UJ	<11 UJ	SW8260B	*

Notes:

*	Duplicate sample
<	Symbol used to identify non-detect concentrations.
Bold	Bold text indicates concentration exceeds soil Remedial Action Objective.
F	Indicates that the analyte was positively identified but the associated numerical value is below the reporting limit.
J	Indicates that the analyte was positively identified; however the quantitation is estimated.
U	Indicates that the analyte was not detected at concentrations exceeding the method reporting limit.
UJ	Indicates that the analyte was not detected; however, the quantitation limit is estimated due to discrepancies in the associated quality control criteria.

TABLE WP45/SS57-4: CONCENTRATIONS (µg/L) OF VOCs IN 2007 GROUNDWATER SAMPLES, WP45SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AIR FORCE BASE, ALASKA

Sample Identification	Date Sampled	Benzene	TCE	Field GC TCE	Analytical Methods	Notes
Remedial Action Objective		**5.0**	**5.0**	**5.0**		
45/57-WSP-1A-080607	6-Aug-2007	<6	**67,100**	**200**	1	
45/57-WSP-1D-081307	13-Aug-2007	0.19 F	**171**	**118**	1	
45/57-WSP-1E-081307	13-Aug-2007	<0.12 UJ	**91 J**	**100**	1	
45/57-WSP-1F-081307	13-Aug-2007	0.89	**443**	**114**	1	
45/57-WSP-1H-081307	13-Aug-2007	0.21 F	**152**	**93**	1	
45/57-WSP-2B-080807	8-Aug-2007	0.40	**2,510**	**600**	1	
45/57-WSP-2C-080807	8-Aug-2007	<0.12	**401** J	**300**	1	
45/57-WSP-2E-080807	8-Aug-2007	0.67	**4,530**	**>500**	1	
45/57-WSP-2ED-080807	8-Aug-2007	NT	NT	NT		
45/57-WSP-2G-080807	8-Aug-2007	<0.12	**1,150**	**300**	1	
45/57-WSP-2I-080807	8-Aug-2007	<0.12	**1,000** J	**>500**	1	
45/57-WSP-2K-081407	14-Aug-2007	<0.12	**220** J	**400**	1	
45/57-WSP-2M-081407	14-Aug-2007	<0.12	**201** J	**500**	1	
45/57-WSP-2T-081407	14-Aug-2007	<0.12	**696**	**>500**	1	
45/57-WSP-3A-080707	7-Aug-2007	0.70	**1,250**	**450**	1	
45/57-WSP-3B-080707	7-Aug-2007	<0.12	**22**	**8**	1	
45/57-WSP-3D-080707	7-Aug-2007	<0.12	2.4	**5**	1	
45/57-WSP-3F-080707	7-Aug-2007	<0.12	1.0 F	<5	1	
45/57-WSP-3I-080707	7-Aug-2007	NT	NT	**5**		
45/57-WSP-3K-081507	15-Aug-2007	<0.12	1.2	**22**	1	
45/57-WSP-3M-081507	15-Aug-2007	<0.12	0.7 F	**21**	1	
45/57-WSP-3O-081507	15-Aug-2007	<0.12	0.7 F	**23**	1	
45/57-WSP-3Q-081607	16-Aug-2007	<0.12	0.5 F	**21**	1	
45/57-WSP-3T-081507	15-Aug-2007	<0.12	0.7 F	**22**	1	
45/57-WSP-4C-080707	7-Aug-2007	<0.12	2.3	<5	1	
45/57-WSP-4E-080707	7-Aug-2007	<0.12	3.4	**5**	1	
45/57-WSP-4G-080807	8-Aug-2007	<0.12	1.7 UJ	<5	1	
45/57-WSP-4I-080807	8-Aug-2007	<0.12	0.9 UJ	<5	1	
45/57-WSP-5A-081007	10-Aug-2007	<0.12 UJ	**51** J	**22**	1	
45/57-WSP-5B-081007	10-Aug-2007	0.17 F	**16**	**20**	1	
45/57-WSP-5D-081007	10-Aug-2007	<0.12	0.4 F	<5	1	
45/57-WSP-6A-081007	10-Aug-2007	**13** J	**2,150** J	**>500**	1	
45/57-WSP-6B-081007	10-Aug-2007	0.18 F	**5.8**	**11**	1	
45/57-WSP-6D-081007	10-Aug-2007	<0.12	**5.7**	**11**	1	
45/57-WSP-7A-081007	10-Aug-2007	**7.64** J	**1,550** J	**400**	1	
45/57-WSP-7B-081007	10-Aug-2007	<0.12 UJ	**115** J	**95**	1	
45/57-WSP-7C-081107	11-Aug-2007	<0.12 UJ	**128** J	**5**	1	
45/57-WSP-7E-081307	13-Aug-2007	0.57 J	**410** J	**193**	1	
45/57-WSP-7G-081307	13-Aug-2007	<0.12 UJ	**70** J	**64**	1	
45/57-WSP-7I-081507	15-Aug-2007	<0.12 UJ	**5.4** J	**44**	1	
45/57-WSP-8B-080907	10-Aug-2007	0.26 F	**10**	**15**	1	
45/57-WSP-8C-080907	10-Aug-2007	<0.12	**63**	**29**	1	
45/57-WSP-8E-080907	10-Aug-2007	<0.12	**31**	**33**	1	
45/57-WSP-8G-080907	10-Aug-2007	<0.12 UJ	**18** J	**15**	1	
45/57-WSP-8I-080907	9-Aug-2007	<0.12	4.3	**6**	1	
45/57-WSP-9A-081007	10-Aug-2007	1.5	**188** J	**167**	1	
45/57-WSP-9B-081007	10-Aug-2007	0.20 F	2.0 J	**7**	1	
45/57-WSP-9D-081007	10-Aug-2007	<0.12	0.7 F	<5	1	
45/57-WSP-10A-081407	14-Aug-2007	<0.12	**82.5** J	**45**	1	
45/57-WSP-10B-081407	14-Aug-2007	<0.12	4.2	<5	1	
45/57-WSP-12B-080907	9-Aug-2007	<0.12	1.8 J	**5**	1	
45/57-WSP-12C-080907	9-Aug-2007	<0.12	0.8 UJ	<5	1	

TABLE WP45/SS57-4: CONCENTRATIONS (µg/L) OF VOCs IN 2007 GROUNDWATER SAMPLES, WP45SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AIR FORCE BASE, ALASKA

Sample Identification	Date Sampled	Benzene	TCE	Field GC TCE	Analytical Methods	Notes
Remedial Action Objective		**5.0**	**5.0**	**5.0**		
45/57-WSP-12E-080907	9-Aug-2007	NT	NT	**5**		
45/57-WSP-12G-080907	9-Aug-2007	<0.12	0.9 UJ	<5	1	
45/57-WSP-12I-080907	9-Aug-2007	<0.12	0.9 F	<5	1	
45/57-WSP-13A-081407	14-Aug-2007	<0.12	**56 J**	**32**	1	
45/57-WSP-13B-081407	14-Aug-2007	<0.12	4.7	<5	1	
45/57-WSP-14A-081107	11-Aug-2007	<0.12 UJ	**61 J**	NT	1	
45/57-WSP-15A-081107	11-Aug-2007	<0.12	**192**	NT	1	
45/57-WSP-16A-081107	11-Aug-2007	<0.12 UJ	**129** J	NT	1	
45/57-WSP-17A-081107	11-Aug-2007	0.48	1.5	NT	1	
45/57-WSP-18A-081107	11-Aug-2007	<0.12	0.7 F	NT	1	
45/57-WSP-19A-081107	11-Aug-2007	<0.12	<0.3	NT	1	
45/57-WSP-20A-081107	11-Aug-2007	<0.12	**174**	**140**	1	
45/57-WSP-20AA-081107	11-Aug-2007	<0.12	**175**	NT	1	*
45/57-WSP-21A-081607	16-Aug-2007	<0.12	**72**	**102**	1	
45/57-WSP-21AA-081607	16-Aug-2007	<0.12	**98**	NT	1	*
45/57-WSP-22A-081607	16-Aug-2007	<0.12	**272** J	**400**	1	
45/57-WSP-23A-081607	16-Aug-2007	<0.12	**216**	**300**	1	
45/57-WSP-24A-081607	16-Aug-2007	<0.12	**5.7**	**56**	1	
45/57-WSP-25A-081607	16-Aug-2007	0.13 F	**9.2**	**73**	1	
45/57-WSP-26A-081507	15-Aug-2007	<0.12	<0.3	**94**	1	
45/57-WSP-26B-081507	15-Aug-2007	<0.12 UJ	0.4 J	**42**	1	
45/57-WSP-26C-081507	15-Aug-2007	<0.12 UJ	1.0 J	**77**	1	
45/57-WSP-26D-081507	15-Aug-2007	<0.12	<0.3	**24**	1	
45/57-WSP-27A-081607	16-Aug-2007	<0.12	**43**	**60**	1	
45/57-WSP-28A-081607	16-Aug-2007	<0.12	<0.3	**22**	1	
45/57-WSP-28B-081607	16-Aug-2007	<0.12	<0.3	**22**	1	
45/57-WSP-28BB-081607	16-Aug-2007	<0.12	<0.3	**22**	1	*
45/57-WSP-R-081107	11-Aug-2007	<0.12	<0.3	NT	1	
45/57-R-082007	20-Aug-2007	<0.12	0.8 F	NT	1	
45/57-W-082007	20-Aug-2007	<0.12	**14**	NT	1	

Notes:

Analytical Methods: 1. 8260B

*	Duplicate sample
<	Symbol used to identify non-detect concentrations.
µg/L	micrograms per liter
NT	not tested
TCE	Trichloroethene
Bold	Bold text indicates concentration exceeds Remedial Action Objective.
F	Indicates value greater than or equal to the method detection limit and below the reporting limit.
J	Indicates estimated value.
U	Indicates that the analyte was not detected at concentrations exceeding the method reporting limit.
UJ	Indicates that the analyte was not detected; however the quantitation limit is estimated due to discrepancies in the associated quality control criteria.

This page intentionally left blank

TABLE WP45/SS57-5: VERTICAL DISTRIBUTION OF TCE CONCENTRATIONS (µg/L) IN GROUNDWATER
WP45SS57, PHOTO LAB/FIRE STATION PARKING LOT, EIELSON AIR FORCE BASE, ALASKA

Sample Location	45/57-WSP-1		45/57-WSP-2		45/57-WSP-3		45/57-WSP-4		45/57-WSP-5		45/57-WSP-6		45/57-WSP-7		45/57-WSP-8		45/57-WSP-9		45/57-WSP-10		45/57-WSP-12		45/57-WSP-13		45/57-WSP-26		45/57-WSP-28	
DEPTH (ft bgs)	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**	**Lab**	**Field**
12	67,100	200		300	1,250	450		158	51 J	22	2,150 J	> 500	1,550 J	400		400	188 J	167	83 J	45		22	56 J	32	<0.3	147	<0.3	22
27		86	2510	600	22	8		123	16	20	5.8	11	115 J	95	10	15	2.0 J	7	4.2	ND	1.8 J	5	4.7	ND	0.4 J	42	<0.3	22
40		31	401 J	300		7	2.3	ND		75		6	128 J	5	63	29	0.7 F	ND			0.8 UJ	ND			1.0 J	77		
50	171	118		45	2	5		ND	0.4 F	ND	5.7	11		90		14		ND				ND			<0.3	24		
60	91 J	100	4,530	>500		5	3	5					410 J	193	31	33						5						
70	443	114		400	1.0 F	ND		8						40		25						ND						
80		55	1,150	300		ND	1.7 UJ	ND					70 J	64	18.4 J	15					0.9 UJ	ND						
90	152	93		300		ND		ND						56		6						8						
100		67	1,000 J	>500		5	0.9 UJ	ND					5.4 J	44	4.3	6					0.8 F	ND						
110																												
120			220 J	400	1.2	22																						
130																												
140			201 J	500	0.7 F	21																						
150																												
160					0.7F	23																						
170				>500																								
180																												
190																												
200			696	>500	0.5F	22																						

Notes

green shading indicates extent of vertical contamination
determined by comparing lab results to cleanup level (5 µg/L).

blue shading indicates vertical extent not determined

bgs	below ground surface
ft	feet
GC	Gas chromatograph
ND	not detected by the field GC
>	sample result exceeds value indicated. Concentration of TCE exceeded range of instrument calibration.
F	Indicates value greater than or equal to the method detection limit and below the reporting limit.
J	Indicates estimated value.
U	Indicates that the analyte was not detected at concentrations exceeding the method reporting limit.
UJ	Indicates that the analyte was not detected; however the quantitation limit is estimated due to discrepancies in the associated quality control criteria.

This page intentionally left blank

4.5 ST56 Engineer Hill Fuel Spill Area

4.5.1 Background

The ST56 source area is an active munitions storage and maintenance compound located approximately 3 miles north-northeast of the main part of the Base (Figure ST56-1). Active military personnel use the facility during duty hours. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

Engineer Hill is composed of Paleozoic quartz-mica schists, phyllites, and quartzite. The bedrock has a distinct fracture orientation plunging 20° toward the southeast (USAF, 1995c). The southeast boundary of ST56 source area is approximately 450 meters from Lily Lake.

PCE and fuel-related compounds have been detected in both the old and new water supply wells. Drillers' logs from the two water supply wells indicate that the wells are completed entirely in schist bedrock, with several softer zones ranging 1 to 3 meters thick encountered between depths of 90 to 120 meters. A 12-meter thick soft interval was encountered between a depth of 120 to 133 meters. The old water supply well is screened from 102 to 133 meters. The new supply well is screened from 126 to 139 meters. The radial distance between the old and new supply wells is 8.7 meters. A constant rate test conducted at the old and new supply wells estimated transmissivity at 1.7 m^2/day, which applies to the aquifer depth from 90 to 133 meters, and conductivity of 0.09 meters/day, suggesting extremely slow transport velocity for any contaminant in the deep aquifer (USAF, 1995c).

Groundwater elevation measurements collected during the RI from wells 56MW04 and 56MW05, located at the base of Engineer Hill were 169 and 171 meters above sea level (asl), respectively. The groundwater elevation at the new water supply well NWS56WH was 160 meters asl, suggesting the hydrologic gradient is orientated in a northward direction, into the hill. An attempt to further characterize groundwater flow direction in 1994 was unsuccessful. Additional groundwater monitoring probes installed around the base of Engineer Hill were unsuccessful in penetrating through shallow permafrost, approximately 20 ft bgs.

Drinking water is transported to the facility and stored in holding tanks. Until 2002, groundwater use was restricted to toilets, sinks, and the boilers with warning signs that the water is not potable. Eielson Bioenvironmental took the water supply wells off line in 2002, and potable water is delivered via trucks to the facilities for all water needs.

Additional ICs for source area ST56 include:

- Provision and storage of drinking water from an off site supply until contaminant levels in the onsite water supply well are below MCLs

History of Contamination

The quantity of chlorinated solvent release at ST56 is unknown. The original source of the contamination has not been identified (USAF, 1995c). Activities at ST56 involved light vehicle and trailer maintenance in Building 6161. A tank of Stoddard^{TM} solvent was kept in Building 6161 but was removed. Seven USTs and three ASTs supplied the facility with fuel oil, gasoline, and diesel. The only reported spill at ST56 was a 16-gallon diesel release in January 1989, but all the diesel was recovered and properly disposed (USAF, 1995c). Two tanks were removed in 1992 from Building 6158 and 6128. Soil under the tank from Building 6128 had staining and TPH concentrations ranging 1,100 mg/Kg to 2,100 mg/Kg. The USTs and associated piping were tested in 1993 and all passed. Floor drains were found in Building 6122, 6154, 6158, 6159, and 6161. The floor drains discharge to the septic system or to the surface (USAF, 1995c). Samples collected during data gap work in 1996 and 1997 from the septic tank concluded that the floor drains were not an ongoing source of contamination.

Initial Response

Prior to 1995, wastewater from the facility was discharged to the old septic-system leach field located at the bottom of the hill near monitoring well 56MW03. A new septic leach field was constructed in 1995 and currently receives the facility discharge. As part of the RI, soil samples were collected from the wooden crib surrounding the old leach field and analyzed for VOCs, SVOCs, and total metals. Detected constituents were either below USEPA risk-based screening levels or background concentrations. Of the three hydrologically down gradient monitoring wells, COCs were only detected in 56MW03, which is located just down gradient of the septic-system leach field. Based on these sample results and due to the low transmissivity of the bedrock aquifer, the RI concluded that the COCs were relatively isolated within the bedrock and did not include ST56 in the Feasibility Study.

Water at the site has been provided by the old and new water supply wells (Figure ST56-1). Starting in 1986, the Air Force has collected quarterly samples from the old water supply well. Various compounds have been detected intermittently at low concentrations, except for PCE, which regularly exceeded the MCL, and TCE, which exceeded the MCL in the June 1989 sample (Table ST56-1). In 1990 a new water supply well was installed and samples had similar PCE and TCE concentrations. Since 1991, the facility has been supplied with drinking water via tanker trucks.

Basis for Taking Action

The RI/FS and BLRA identified PCE and TCE exceeding MCLs. The exposure pathways of potential concern are the consumption and use of contaminated groundwater.

4.5.2 Remedial Actions

The COCs at ST56 are BTEX and chlorinated VOCs. The selected remedy cited in the OU3,4,5 ROD for ST56 includes the following:

- Monitor the groundwater to evaluate contaminant levels and identify any changes to the plume configuration until cleanup goals are achieved
- Treat the water at the wellhead to prevent exposure to contaminants above regulatory levels
- ICs to prevent exposure to contaminated groundwater

The RAOs for ST56 include the following:

- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
- Supply drinking water, apply wellhead treatment (as applicable), and prevent use of groundwater that exceeds state or federal drinking water standards

Remedy Implementation

Wellhead treatment was selected as a remedy in the ROD to protect human health from drinking contaminated water, and to protect the environment from discharging contaminated water into the waste water system leach field. Potable water supplied to the facility and ICs protect human health from the ingestion of contaminated well water. Samples collected during data gap work in 1996 and 1997 from the septic tank concluded that chlorinated VOCs in the well water volatilizes from the wastewater before discharge into the leach field. The OU3,4,5 BLRA concluded that inhalation of vapor from chlorinated VOC contaminated groundwater presents insignificant risk. Based on these results, wellhead treatment was determined as unnecessary.

Groundwater samples were collected under the 1996, 1997, 2001, 2002, and 2007 SWMP and analyzed for VOCs. Water supply wells at ST56 were taken off line to prevent exposure to contaminated groundwater.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and implementing ICs to prevent exposure to contaminated groundwater.

4.5.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2007 SWMP. Water supply wells at ST56 were taken off line to prevent exposure to contaminated groundwater.

4.5.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 4.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Historic PCE concentrations have varied in supply wells OWS56WH and NWS56WH, ranging from non-detect to 59 µg/L. Groundwater samples collected from supply well NWS56WH under the SWMP had PCE ranging 3.4 µg/L to 25 µg/L. BTEX compounds were last detected in supply well OWS56WH in 1989, at concentrations below the MCLs. Groundwater samples collected from wells 56MW04, and 56MW05 at the base of Engineer Hill have had non-detect BTEX and PCE.

The TCE concentration exceeded the MCL in well 56MW03 during the 1993 sampling event, located near the wastewater leach field. Samples could not be collected from 56MW03 during three additional attempts because the well was dry. A replacement temporary monitoring well (56MW03B) was installed in 2007 immediately adjacent to

56MW03. Groundwater samples were non-detect for chlorinated VOCs. Toluene was detected in 56MW03B during the 2007 sampling event but below the MCL.

Water samples collected from the septic tank in 1996 and 1997 were non-detect for BTEX and TCE (Figure ST56-1).

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding protectiveness at the source area. The vapor intrusion pathway will be evaluated for ST56.

4.5.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy selected for ST56 was limited action with groundwater monitoring and ICs. Groundwater is monitored to identify any changes to the plume configuration until cleanup goals are achieved. Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future. ICs are still being implemented to prevent exposure to contaminated groundwater. Potable water is supplied to the facility.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based cleanup levels established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Chlorinated VOC concentrations continued to exceed MCLs in water supply wells when last sampled in 2002. Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future. Groundwater monitoring results indicate COC concentrations remain below detection limits at the base of Engineer Hill, suggesting an incomplete pathway from the bedrock aquifer to Lily Lake and the surrounding aquifer.

4.5.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area ST56. Additional issues that do not necessarily affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future	N	Uncertain

4.5.7 Recommendations and Follow-Up Actions

The RAOs for ST56 are to supply drinking water for the facility, apply wellhead treatment, prevent the use of groundwater that exceeds state or federal drinking water standards, and restore the beneficial uses of the aquifer. Chlorinated VOC concentrations likely continue to exceed the MCL within the source area aquifer. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future	Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals or determine if a TI waiver is applicable for this source area	USAF	USEPA, ADEC	1/31/2010	N	N Uncertain

Groundwater monitoring will continue for ST56 as determined by the RPMs until chlorinated VOC concentrations meet the MCL. There is no projected date to reach MCLs as the PCE and TCE degradation trend have not been established on Eielson AFB. Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals or determine if a TI waiver is applicable for this source area. Land use restrictions will remain in effect until RAOs are achieved.

4.5.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met.

The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, outside drinking water supply, and the implementation of ICs to prevent the consumption and use of contaminated groundwater.

4.5.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for ST56:

List of Tables for ST56:

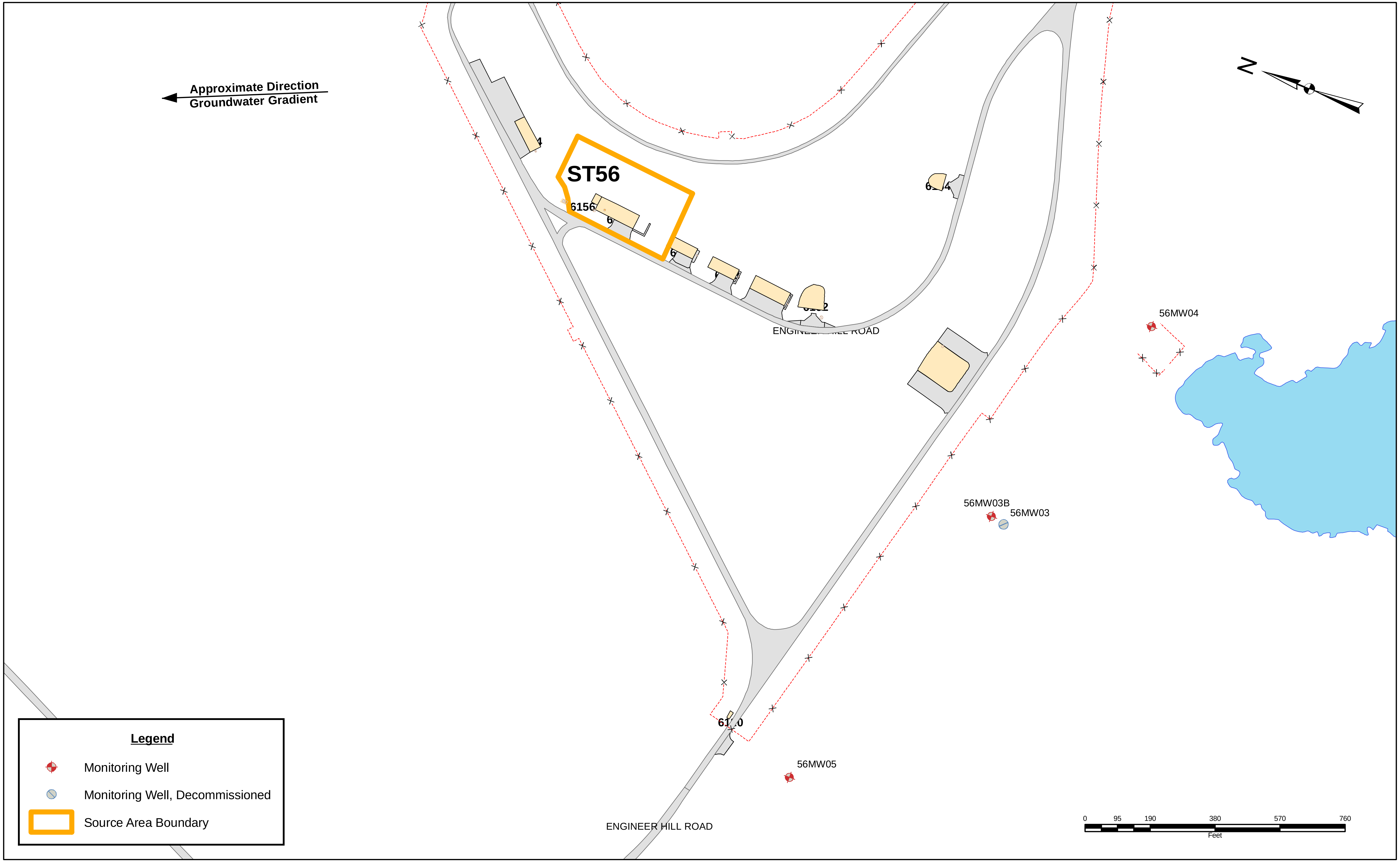


Figure ST56-1: ST56, Engineer Hill Fuel Spill Area, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST56-1: CONCENTRATIONS (ug/L) OF BTEX COMPOUNDS IN GROUNDWATER SAMPLES, ST56, ENGINEER HILL SPILL AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Methods	Notes	Analytical Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
56MW03	08/01/93		0.1	1.0	0.2	1.1	--	--	1		USAF 1995 OU1,3,4,5 RDWP
56MW03	09/05/96	DRY WELL				No Sample Collected					USAF 1996 SWMPR
56MW03	07/18/01	DRY WELL				No Sample Collected					USAF 2001 SWMPR
56MW03	09/23/02	DRY WELL				No Sample Collected					USAF 2002 SWMPR
56MW03B	09/24/07	60.00	0.1UJ	0.4F	0.3UJ	0.9UJ	--	--	7		USAF 2007 SWMPR
56MW04	08/17/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU1,3,4,5 RDWP
56MW04	09/05/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
56MW04	09/23/02	31.3	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
56MW04	10/03/07	31	<0.4	0.7UJ	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
56MW05	08/17/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU1,3,4,5 RDWP
56MW05	09/05/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
56MW05	09/23/02	45.5	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
56MW05	09/24/07										
56MW05	10/03/07					Dry Well, No Sample Collected					USAF 2007 SWMPR
6152 tap	01/25/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 OU3,4,5 RD
6152 tap	08/29/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
NWS56WH	01/25/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 OU3,4,5 RD
NWS56WH	08/29/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
NWS56WH	09/08/97		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1997 SWMPR
NWS56WH	09/24/02	TAP	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
septic tank	01/25/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 OU3,4,5 RD
septic tank	08/29/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
septic tank	09/08/97		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1997 SWMPR
OWS56	09/05/01	141.2	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2001 SWMPR

Notes:

--	Not analyzed	TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
NWS	New water supply well	TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
WH	well head	NA	Not applicable
MCL	maximum contaminant level		
Bold	Bold text indicates concentration exceeds MCL.		
UJ	Indicates that the analyte was detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific QC criteria.		

Analytical Methods:

1. 8020	3. ADEC 8100M	5. 8270	7. 8260	9. AK101
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102

TABLE ST56-2: CONCENTRATIONS (ug/L) OF VOC'S IN, GROUNDWATER SAMPLES, ST56, ENGINEER HILL SPILL AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Methylene Chloride	TCE	PCE	1,3-DCB	cis-1,2-DCE	trans-DCE	Analytical Methods	Notes	Reference
MCLs			**5**	**5**	**5**	**NA**	**70**	**100**			**18 AAC 80.300.**
56MW03	08/01/93		0.1	**6.5**	0.1	0.1	ND	ND	4	a	USAF 1995 OU1,3,4,5 RDWP
56MW03	09/05/96	DRY WELL				No Sample Collected					USAF 1996 SWMPR
56MW03	07/18/01	DRY WELL				No Sample Collected					USAF 2001 SWMPR
56MW03	09/23/02	DRY WELL				No Sample Collected					USAF 2002 SWMPR
56MW03B	09/24/07	60.00	0.3UJ	0.3UJ	0.3UJ	0.3UJ	0.3UJ	0.3UJ	7	a	USAF 2007 SWMPR
56MW04	08/17/94		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a	USAF 1995 OU1,3,4,5 RDWP
56MW04	09/05/96		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a,b	USAF 1996 SWMPR
56MW04	09/23/02	31.25	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	7	a	USAF 2002 SWMPR
56MW04	10/03/07	31	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7	a	USAF 2007 SWMPR
56MW05	08/17/94		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a	USAF 1995 OU1,3,4,5 RDWP
56MW05	09/05/96		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a	USAF 1996 SWMPR
56MW05	09/23/02	45.5	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	7	a	USAF 2002 SWMPR
56MW05	10/03/07			Dry Well, No Sample Collected							USAF 2007 SWMPR
6152 tap	01/25/96		<1.0	<1.0	**13**	<1.0	ND	ND	4	a	USAF 1996 OU3,4,5 RD
6152 tap	08/29/96		1.4	<1.0	**15**	<1.0	ND	ND	4	a,b	USAF 1996 SWMPR
NWS56WH	01/25/96		<1.0	<1.0	4.2	<1.0	ND	ND	4	a	USAF 1996 OU3,4,5 RD
NWS56WH	08/29/96		1.7	<1.0	3.4	<1.0	ND	ND	4	a,b	USAF 1996 SWMPR
NWS56WH	09/08/97		<1.0	<1.0	4.0	<1.0	ND	ND	4	a	USAF 1997 SWMPR
NWS56WH	09/24/02	TAP	<5.0	<1.0	**21**	<1.0	<1.0	<1.0	7	a	USAF 2002 SWMPR
septic tank	01/25/96		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a	USAF 1996 OU3,4,5 RD
septic tank	08/29/96		1.4	<1.0	<1.0	<1.0	ND	ND	4	a,b	USAF 1996 SWMPR
septic tank	09/08/97		<1.0	<1.0	<1.0	<1.0	ND	ND	4	a	USAF 1997 SWMPR
OWS56	09/05/01	141.2	<5	<1	2.4	<1	<1	<1	7	a	USAF 2001 SWMPR

Notes:
- a — No compounds other than those listed were detected above the reporting limits.
- b — Methylene chloride suspected laboratory contamination (compound detected in lab method blank at 1.3 ug/L).
- -- — Not analyzed
- MCL — maximum contaminant level
- **Bold** — Bold text indicates concentration exceeds M
- ND — Not detected
- NWS — New water supply well
- WH — well head
- UJ — Indicates estimated detection limit.
- TCE — Trichloroethene
- DCE — Dichloroethene
- PCE — Tetrachloroethene
- DCB — Dichlorobenzene

Analytical Methods:
1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102

4.6 SS61 Vehicle Maintenance Building 3213

4.6.1 Background

Source area SS61 is located in the center portion the main Base, just north of the water treatment plant pond on Garrison Slough. SS61 includes the area beneath, to the east, and to the south of the Vehicle Maintenance Shop (Building 3213) (Figure SS61-1). The shop was built in 1954 and expanded in 1992. SS61 is approximately 3 acres and has a flat surface gradient. Groundwater at SS61 ranges 7 to 9 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

History of Contamination

Waste generated in Building 3213 included waste fuels, oils, solvents, antifreeze, and water from maintenance activities. Wastewater from the shop was discharged into the bottom of two former dry wells, located on the south side of the building. Drywell depths were reportedly 8 to 12 ft, indicating wastewater was discharged directly to the groundwater limiting soil contamination. The predominant contaminant source is suspected to be the western-most of two former dry wells.

Initial Response

Prior to construction activities in 1992, the water in the dry wells and the surrounding soil were sampled for TPH, BTEX, and VOCs. Elevated TPH concentrations were detected in the soil surrounding the dry wells. PCE concentrations, exceeding the MCL, were detected in the water collected from the western dry well. As a result, the two dry wells were removed in 1993 along with the surrounding soil during construction of the addition to Building 3213.

Groundwater and soil samples were collected during the RI. Groundwater monitoring wells were drilled north of each of the two dry wells, with a third well drilled further north of Building 3213 and hydrologically down gradient. Soil and groundwater sample results near the eastern drywell (monitoring well 61MW01) and also the down gradient well (monitoring well 61MW03) were below action levels. Groundwater sample results near the western dry well (monitoring well 61MW02) were above the 5.0 µg/L MCL for TCE. Soil samples also exceeded cleanup levels for PCE and BTEX. The RI concluded that the contaminated soil would not act as a significant source for continued groundwater contamination because the wastes were directly discharged into the groundwater.

In 1994 twenty microwells were installed for a plume delineation study (CRREL, 1994). Groundwater results indicated that TCE and cis-1,2 DCE exceed MCLs north of Building 3213 and west of monitoring well 61MW03. BTEX compounds were also detected but below MCLs. The study concluded that the plume extended from monitoring well 61MW02, beneath the building, to approximately Division Street.

Basis for Taking Action

The RI/FS and BLRA identified chlorinated VOCs exceeding MCLs. The exposure pathways of potential concern are the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

4.6.2 Remedial Actions

The COCs for SS61 are BTEX and chlorinated VOCs. Based on the RI/FS and BLRA, the selected remedy cited in the OU3,4,5 ROD includes the following site remedies:

- Groundwater monitoring to evaluate contaminant levels, and identify any changes to the plume configuration until remediation levels are achieved
- ICs to prevent exposure to contaminated groundwater

The RAOs for SS61 include the following:

- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
- Determine if an additional source of contaminants exists on the north side of Building 3213 and if so, prevent the continued migration of TCE into the groundwater at concentrations that present a risk to future groundwater users

Remedy Implementation

Groundwater samples were collected under the 1996, 1997, 1998, 2001, 2002, 2005, and 2007 SWMPs to verify COC concentration. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

4.6.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2005 and 2007 SWMPs.

4.6.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 4.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Historic groundwater sampling at SS61 indicated PCE, TCE, and cis-1,2-DCE concentrations exceeding MCLs in the vicinity of monitoring well 61MW02, extending beneath Building 3213 to approximately Division Street. PCE only exceeded the MCL in monitoring well 61MW02 at 15 µg/L. TCE exceeded the MCL in multiple locations, with the highest concentration (1,100 µg/L) at 61PS3, located near the northwest corner of Building 3213. Cis-1,2,-DCE also exceeded the MCL in multiple locations, with highest concentrations in the down gradient plume area. All chlorinated VOC contamination was highest in the upper aquifer (10-20 ft bgs) with decreasing concentration at depth.

Groundwater samples collected since the 2003 Five-Year ROD Review show continued chlorinated VOC contamination. Groundwater samples collected in 2005 at 61MW02 were 8.9 µg/L TCE, still exceeding the MCL. Previous TCE concentrations at 61MW02 ranged 10 µg/L to 78 µg/L. PCE was detected above the cleanup level in 61MW02 during the 2002 groundwater sampling event, but was below the cleanup level during the 2007 sampling event. Cis-1,2,-DCE remains below the cleanup level in 61MW02.

Two temporary monitoring wells were installed in 2007 to assess groundwater contamination levels north of Building 3213, wells 61PMW02 and 61PMW03. Groundwater samples results from both wells were below the MCL for TCE and PCE. Cis-1,2,-DCE at 89 µg/L in 61PMW03 exceeded the MCL. Cis-1,2-DCE was detected below the MCL in 61PMW02.

Temporary monitoring well 61PMW01 was installed in 2002 to monitor hydrologically down gradient VOC concentrations. TCE, cis-1,2-DCE, and trans-1,2,DCE were detected during the 2005 sampling event, but at concentrations below MCLs. TCE was not detected in 61PMW01 during the 2002 sampling event.

BTEX concentrations in groundwater remain below MCLs at all sampling locations.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding protectiveness at the source area. ADEC requested review of the vapor intrusion pathway due to the high COC concentrations. Groundwater will be monitored minimally every five years.

4.6.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The RAOs for SS61 include preventing human exposure to contaminated groundwater, restoring the beneficial uses of the aquifer, and determining if an additional source of contaminants exists on the north side of Building 3213 and if so, prevent the continued migration of TCE into the groundwater at concentrations that present a risk to future groundwater user. Institutional controls prevent human exposure to contaminated groundwater. Groundwater monitoring north of Building 3213 has not identified an additional source of contamination. Restoring the beneficial uses of the aquifer is not expected in the immediate future. While chlorinated VOCs are not migrating off site, concentrations are not significantly decreasing. There is no projected date to reach the MCL as the TCE and cis-1,2-DCE degradation trend degradation trend have not been established on Eielson AFB.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: <u>Has any other information come to light that could call into question the protectiveness of the remedy?</u>

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by OU3,4,5 ROD. TCE and cis-1,2-DCE concentrations remain above MCLs within the source area. TCE concentrations are above the MCL at 61MW02, near the previous drywell, but decreased below the MCL north of Building 3213. Cis-1,2-DCE concentrations remain above the MCL north of Building 3213. COC concentrations from hydrologically down gradient well 61PMW01 are below MCLs.

Groundwater monitoring north of Building 3213 has not identified an additional source of contamination. Restoring the beneficial uses of the aquifer is not expected in the immediate future. While chlorinated VOCs are not migrating off site, concentrations are not decreasing. There is no projected date to reach the MCL as the TCE and cis-1,2-DCE degradation trend degradation trend have not been established on Eielson AFB.

Additional documentation of the vapor intrusion pathway evaluation will be developed subsequently to this Five-Year ROD Review.

4.6.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area SS61. Additional issues that do not necessarily affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The amended RAOs for SS61 include ensuring that chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing.	N	Uncertain

4.6.7 Recommendations and Follow-Up Actions

The RAOs for SS61 include preventing human exposure to contaminated groundwater, restoring the beneficial uses of the aquifer, and determining if an additional source of contamination exists north of Building 3123. BTEX concentrations in groundwater remain below the MCLs. Chlorinated VOC contamination exceeds MCLs within the source area. Low COC concentrations north of Building 3213 indicate that the plume has stabilized. Groundwater monitoring north of Building 3213 has not identified an additional source of contamination. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
The amended RAOs for SS61 include ensuring that chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. While chlorinated VOCs are not migrating off site, concentrations are not decreasing.	Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals.	USAF	USEPA, ADEC	Determine applicability of pilot study at WP45/SS57 for further remediation at SS61	N	Uncertain

Groundwater monitoring will continue for SS61 as determined by the RPMs until chlorinated VOC concentrations meet the MCLs. There is no projected date to reach MCLs as the TCE and cis-1,2-DCE degradation trend have not been established on Eielson AFB. Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals. Groundwater will be monitored minimally every five years. Land use restrictions remain until RAOs are achieved.

4.6.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met.

The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

4.6.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for SS61:

List of Tables for SS61:

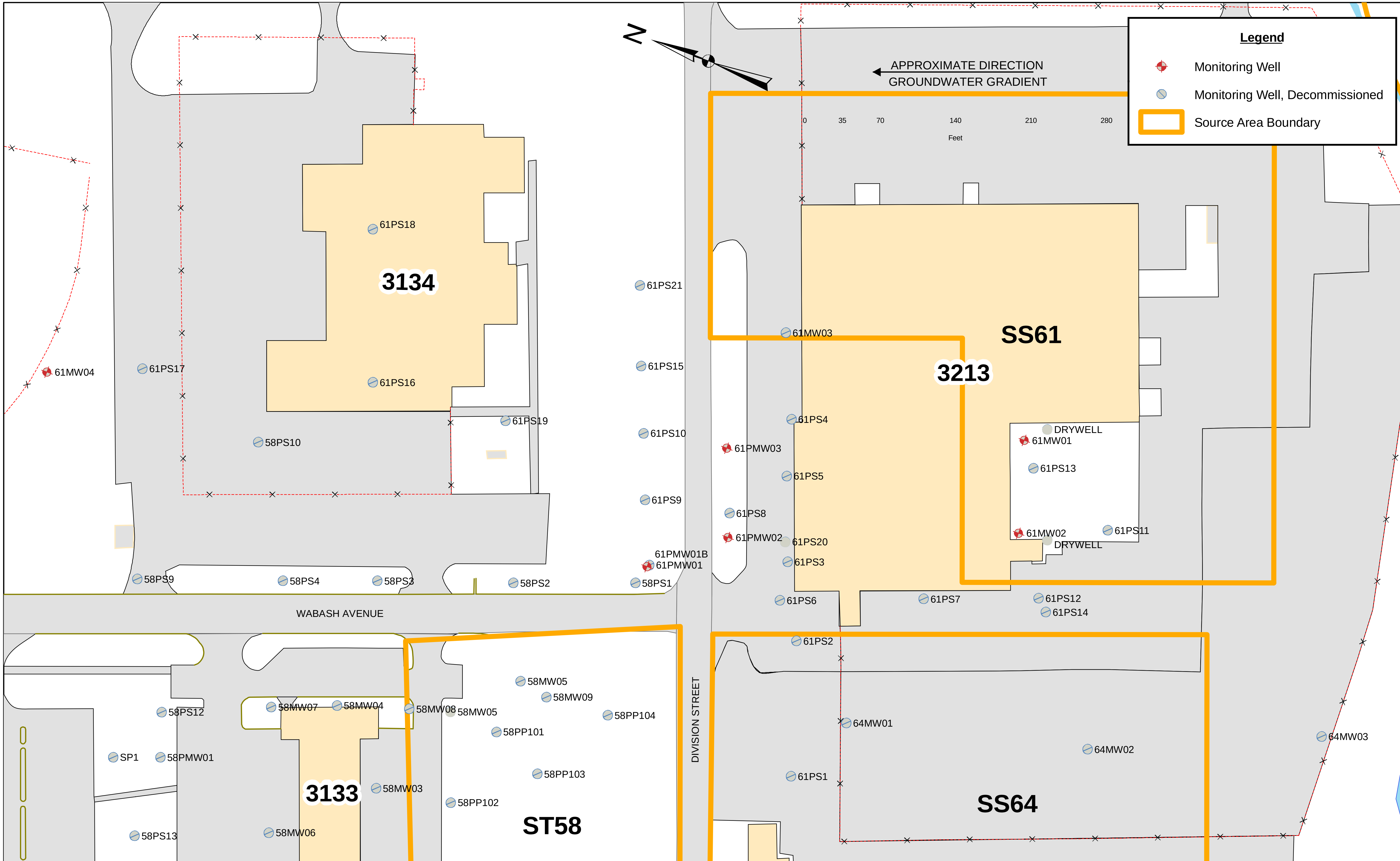


Figure SS61-1: SS61, Vehicle Maintenence Building 3213, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE SS61-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS IN GROUNDWATER SAMPLES, SS61, VEHICLE MAINTENANCE BUILDING 3213, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**			**18 AAC 80.300**
58MW13	08/15/02	15	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
61PMW01	08/14/02	17	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
61PMW01B	08/31/05	11	<0.4	<1.0	<1.0	<3.0	--	--	7		USAF 2005 SWMPR
61PMW01B	08/31/05	11	<0.4	<1.0	<1.0	<2.0	--	--	7	*	USAF 2005 SWMPR
61PMW02	08/27/07	17	<0.4	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
61PMW03	08/27/07	17	<0.4	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
61MW01	08/18/94		2.8	6.8	3.6	26	--	--	1		USAF 1995 OU3,4,5 RI
61MW01	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
61MW02	08/18/94		<100	250	<100	290	--	--	1		USAF 1995 OU3,4,5 RI
61MW02	09/16/96		3.8	29	7.6	43	--	--	1		USAF 1996 SWMPR
61MW02	07/19/01	15	1.2	4.5	2.4	14	--	--	7		USAF 2001 SWMPR
61MW02	08/15/02	15	1.5	9.2	1.3	9.2	--	--	7		USAF 2002 SWMPR
61MW02	09/01/05	15	0.4	4.3	2.5	22	--	--	7		USAF 2005 SWMPR
61MW03	08/17/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
61MW03	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
61MW04	09/01/98		<1.0	<1.0	<1.0	<1.0	40	191	1,9,10		USAF 1998 SWMPR
61PS3	09/16/94		<2.0	<2.0	<3.0	<3.0	<120	<700	7,9,10		CRREL 1995a
61PS3	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	1, 11		USAF 1996 SWMPR
61PS17	09/21/94		<2.0	<2.0	<3.0	12	<120	<700	7,9,10		CRREL 1995a
61PS17	09/23/96		<1.0	<1.0	<1.0	<1.0	--	--	1, 11		USAF 1996 SWMPR

Notes:

*	Duplicate sample	--	Not analyzed
MCL	Maximum Contaminant Level	TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
Bold	Bold text indicates concentration exceeds MCL.	TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
ADEC	Alaska Department of Environmental Conservation		

Analytical Methods:

1. 8020/8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 7421

TABLE SS61-2: CONCENTRATIONS (µg/L) OF NON-BTEX ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, SS61, VEHICLE MAINTENANCE BUILDING 3213, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	TCE	PCE	cis-1,2 DCE	trans-1,2 DCE	Chloro-methane	1,2-DCB	Naph-thalene	3/4-Methyl-Naphthalene	2-Methyl Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**5**	**70**	**100**	**NA**	**600**	**NA**	**NA**	**NA**			**18 AAC 80.300**
58MW13	09/01/98		<1.0	ND	<1.0	<1.0	ND	ND	ND	ND	ND	1,5,7,9-12,14		USAF 1998 SWMPR
58MW13	08/15/02	15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	--	7	a	USAF 2002 SWMPR
61PMW01	08/14/02	17	<1.0	<1.0	12	1.6	<1.0	<1.0	<2.0	--	--	7	a	USAF 2002 SWMPR
61PMW01B	08/31/05	11	2.2	<1.0	6.9	0.5F	<1.0	<1.0	<1.0	--	--	7	f	USAF 2005 SWMPR
61PMW01B	08/31/05	11	2.3	<1.0	7.0	0.5F	<1.0	<1.0	<1.0	--	--	7	f,*	USAF 2005 SWMPR
61PMW02	08/27/07	17	0.4F	<1.0	20J	1.7J	<1.0M	<1.0	<1.0	--	--	7	a	USAF 2007 SWMPR
61PMW03	08/27/07	17	2.9	<1.0	**89J**	3.9J	<1.0M	<1.0	<1.0	--	--	7	a	USAF 2007 SWMPR
61MW01	08/18/94		1.0	--	--	--	--	18	12	16	6.0	4,5	a	USAF 1995 OU3,4,5 RI
61MW01	09/12/96		<1.0	<1.0	1.5	<1.0	<1.0	9.5	--	--	--	4	a	USAF 1996 SWMPR
61MW01	09/16/96		<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.8	--	--	4,11,12	a	USAF 1996 SWMPR
61MW02	08/18/94		**78**	--	--	--	--	<10	38	<10	16	4,5	a	USAF 1995 OU3,4,5 RI
61MW02	09/12/96		**28**	3.3	9.8	1.4	<1.0	1.7	--	--	--	4	a	USAF 1996 SWMPR
61MW02	09/16/96		**21**	3.1	9.8	1.3	<1.0	1.3	11	--	--	4,11,12	a	USAF 1996 SWMPR
61MW02	07/19/01	15	**10**	3.6	13	1.1	<1	<1	8.2	--	--	7	c	USAF 2001 SWMPR
61MW02	08/15/02	15	**33**	**15**	7.3	<1.0	<1.0	<1.0	2.1	--	--	7	d	USAF 2002 SWMPR
61MW02	09/01/05	15	**8.9**	4.9	5.4	1.0F	<1.0	1.0	11	--	--	7	e	USAF 2005 SWMPR
61MW03	08/17/94		<0.5	--	--	--	--	1.9	<10	<10	<10	4,5	a	USAF 1995 OU3,4,5 RI
61MW03	09/12/96		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--	4	b	USAF 1996 SWMPR
61MW03	09/16/96		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.8	--	--	4,11,12	a	USAF 1996 SWMPR
61MW04	09/01/98		<1.0	<1.0	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5, 7	a	USAF 1998 SWMPR
61PS1-A	09/15,16/94	6.5-16.2	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS1-B	09/15,16/94	16.2-25.9	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS1-C	09/15/94	25.9-35.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS2-A	09/15,16/94	8.7-18.5	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS2-B	09/15,16/94	28.2-37.9	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS2-C	09/15,16/94	37.9-47.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS3-A	09/15,16/94	10.4-20.1	**1,100**	<1.0	**3,200**	35	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS3-B	09/16/94	20.1-29.8	**110**	<1.0	**230**	7.9	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS3-C	09/16/94	29.8-39.5	**5.6**	<1.0	9.9	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS3-D	09/16/94	39.5-49.2	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS3	09/12/96		<1.0	<1.0	<1.0	<1.0	3.5	<1.0	--	--	--	4	a	USAF 1996 SWMPR
61PS3	09/16/96		<1.0	<1.0	<1.0	<1.0	2.4	<1.0	<1.8	--	--	4,11,12	a	USAF 1996 SWMPR
61PS4-A	9/15,21/94	10.4-20.1	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS4-B	9/15,21/94	20.1-29.8	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS4-C	09/15/94	29.8-39.5	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a

TABLE SS61-2: CONCENTRATIONS (µg/L) OF NON-BTEX ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, SS61, VEHICLE MAINTENANCE BUILDING 3213, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	TCE	PCE	cis-1,2 DCE	trans-1,2 DCE	Chloro-methane	1,2-DCB	Naph-thalene	3/4-Methyl-Naphthalene	2-Methyl Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**5**	**70**	**100**	**NA**	**600**	**NA**	**NA**	**NA**			**18 AAC 80.300**
61PS5-A	09/16,21/94	9.4-19.1	**27**	<1.0	14	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS5-B	09/16,21/94	19.1-28.8	3.8	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS5-C	09/16,21/94	28.8-38.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS6-A	09/19,21/94	10.4-20.1	**33**	<1.0	**3,100**	56	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS6-B	09/19,21/94	20.1-29.8	3.6	<1.0	**220**	6.4	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS6-C	09/19,22/94	29.8-39.5	<1.0	<1.0	32	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS6-D	09/20,26/94	39.5-49.2	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS7-A	09/16,21/94	8.4-18.1	1.1	<1.0	9.2	19	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS7-B	09/16,22/94	18.1-27.9	<1.0	<1.0	<6.0	2.2	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS7-C	09/16,22/94	27.9-37.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS8-A	09/16/94	6.5-16.2	<1.0	<1.0	**85**	27	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS8-B	09/16,22/94	16.2-25.9	**16**	<1.0	**330**	**140**	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS8-C	09/16,22/94	25.9-.35.6	<1.0	<1.0	14	3.2	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS8-D	09/19,22/94	35.6-45.4	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS9-A	09/19,23/94	3.6-13.3	<1.0	<1.0	24	7.9	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS9-B	09/19,21/94	13.3-23	<1.0	<1.0	14	3.6	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS9-C	09/20,26/94	23-32.7	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS10-A	09/19,22/94	1.6-11.3	<1.0	<1.0	**160**	42	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS10-B	09/19,22/94	11.3-21.1	<1.0	<1.0	**89**	26	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS10-C	09/20,26/94	21.1-30.8	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS11-A	09/19,22/94	8.4-18.1	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS11-B	09/19,23/94	18.1-27.9	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS11-C	09/19,23/94	27.9-37.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS11-D	09/20,26/94	37.6-47.3	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS12-A	09/19,23/94	8.1-17.8	**20**	<1.0	13	4.0	---	--	--	--	--	7,9,10	g	CRREL 1995a
61PS12-B	09/19,23/94	17.8-27.5	2.5	<1.0	18	13	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS13-A	09/19,23/94	9.4-19.1	<1.0	<1.0	68	18	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS13-B	09/19,23/94	19.1-28.8	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS13-C	09/19,23/94	28.8-38.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS14-A	09/20,26/94	8.4-18.1	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS14-B	09/20,26/94	18.1-27.9	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS14-C	09/20,26/94	27.9-37.6	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a

TABLE SS61-2: CONCENTRATIONS (µg/L) OF NON-BTEX ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, SS61, VEHICLE MAINTENANCE BUILDING 3213, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	TCE	PCE	cis-1,2 DCE	trans-1,2 DCE	Chloro-methane	1,2-DCB	Naph-thalene	3/4-Methyl-Naphthalene	2-Methyl Naphthalene	Analytical Methods	Notes	Reference
MCLs			**5**	**5**	**70**	**100**	**NA**	**600**	**NA**	**NA**	**NA**			**18 AAC 80.300**
61PS15-A	09/20,26/94	2.3-12	1.6	<1.0	<6.0	4.2	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS15-B	09/20,26/94	12-21.7	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS16-A	09/20,27/94	2.3-12	4.8	<1.0	31	8.5	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS16-B	09/20,27/94	12-21.7	<1.0	<1.0	21	6.3	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS16-C	09/21,27/94	21.7-31.4	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS17-A	09/21,27/94	2.3-12	<1.0	<1.0	14	4.6	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS17-B	09/21,27/94	12-21.7	<1.0	<1.0	12	4.5	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS17	09/23/96		<1.0	<1.0	24	4.4	<1.0	<1.0	<1.8	--	--	4,11,12	a	USAF 1996 SWMPR
61PS18-A	09/21,27/94	2.3-12	<1.0	<1.0	13	11	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS18-B	09/21,27/94	12-21.7	<1.0	<1.0	<6.0	<3.0	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS19-A	09/21,28/94	2.3-12	1.8	<1.0	44	12	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS19-B	09/21,28/94	12-21.7	1.1	<1.0	48	14	--	--	--	--	--	7,9,10	g	CRREL 1995a
61PS20	09/21,28/94	8.4-18.1	**920**	<1.0	**2200**	45	--	--	--	--	--	7,9,10	g	CRREL 1995a

Notes:

a	No compounds other than those listed were detected above the reporting limits.
b	Additional compounds detected (µg/L): Dichlorodifluoromethane - 1.0
c	Additional compounds detected (µg/L): n-Propylbenzene - 2.13 , sec-Butylbenzene - 1.84, 4-Isopropyltoluene - 2.18 , n-Butylbenzene - 1.86 1,3,5-trimethylbenzene - 7.48, 1,2,4-trimethylbenzene - 22.5
d	Additional compound detected (µg/L): 1,2,4-trimethylbenzene - 6.06
e	Additional compounds detected (µg/L): isopropylbenzene - 1.2, n-propylbenzene - 2.3, 1,3,5 - trimethylbenzene - 7.6, 1,2,4 - trimethylbenzene - 28, sec-butylbenzene - 2.1, n-butylbenzene - 1.9
f	Additional compound detected (µg/L): chloroform - 0.64
g	Analyses performed on-site by PSA using a mobile laboratory with laboratory-grade gas
--	Not analyzed
ND	Not detected
TCE	Trichloroethene
DCB	Dichlorobenzene
DCE	Dichloroethene
PCE	Tetrachlorethene
MCL	Maximum Contaminant Level
Bold	Bold text indicates concentration exceeds MCL.
A-D	Extensions represent different subsequent sampling depths
F	Indicates value that is greater than or equal to the MDL.
M	Indicates that the concentration is estimated due to a matrix effect.
J	Indicates that the analyte was positively identified; however the quantitation is estimated.

Analytical Methods:

1. 8021	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 7421	13. 8310
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	12. 6010	14. 8081

TABLE SS61-3: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, SS61, VEHICLE MAINTENANCE BUILDING 3213, EIELSON AFB, ALASKA

Well No.	Date Sampled	Aluminum	Antimony	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Lead	Nickel	Selenium	Vanadium	Zinc	Reference
MCLs		**NA**	**6**	**50 (MCL 10)**	**2,000**	**4**	**100**	**NA**	**1,300[1]**	**15**	**100**	**50**	**NA**	**NA**	**18 AAC 80.300**
61MW01	10/94	24,200	--	30	1,340	--	56	--	1.8	**15**	**153**	--	165	340	USAF 1995 OU3,4,5 RI
61MW01	09/16/96	--	--	--	--	--	--	--	--	1.9	--	--	--	--	USAF 1996 SWMPR
61MW02	10/94	8,670	--	**81**	243	--	27	--	51	**31**	51	--	101	149	USAF 1995 OU3,4,5 RI
61MW02	09/16/96	--	--	--	--	--	--	--	--	<1.0	--	--	--	--	USAF 1996 SWMPR
61MW03	10/94	6,740	--	21	534	--	12	--	70	**40**	41	--	29	99	USAF 1995 OU3,4,5 RI
61MW03	09/16/96	--	--	--	--	--	--	--	1, 11	<1.0	--	--	--	--	USAF 1996 SWMPR
61MW04	09/01/98	--	<227	<114	515	<2.3	45	--	82	<114	37	<227	59	73	USAF 1998 SWMPR
61PS3	09/16/96	--	--	--	--	--	--	--	--	3.3	--	--	--	--	USAF 1996 SWMPR
61PS17	09/23/96	--	--	--	--	--	--	--	--	7.6	--	--	--	--	USAF 1996 SWMPR
Background Concentration															
BGM	09/94	7,538	--	25	269	--	20	--	75	21	31	--	24	63	USAF 1994 SWMP
BGMX	09/94	18,000	--	63	420	--	46	--	140	48	77	--	52	120	USAF 1994 SWMP
BGUCL	09/94	11,500	--	37	342	--	30.4	--	105	32.6	48.8	--	36	88.8	USAF 1994 SWMP

Notes:

1	EPA Action Level.
2	Background UCL for Lead.
MCL	Maximum Contaminant Level
Bold	Bold text indicates concentration exceeds MCL, EPA Action Level, or BGUCL.
--	Not analyzed
NA	Not available

This page intentionally left blank

5 OPERABLE UNIT 4

OUs 3, 4, and 5 are combined under the OU3,4,5 BLRA, RI/FS, and ROD.

OU4 consists of ten source areas that had land disposal of fuel tank sludge, drums, and asphalt. This Five-Year ROD Review only covers source areas DP25 and ST58. All other OU4 source areas are NFA, and no Five-Year ROD Review is required. The OU3,4,5 ROD specified remedial action and ICs for Source Area SS35. The Amended OU3,4,5 ROD changed the selected remedy for SS35 to NFA under Superfund with no IC's. As per the Amended OU3,4,5 ROD, no Five-Year ROD Review is required for SS35.

Source Area	**Remedy or Status as Identified in the ROD or Amended ROD**
DP25 E-6 Fuel Storage Tank Area	Monitoring, ICs
ST58 Old Quartermaster Service Station Site	Monitoring, ICs

Eight source areas were designated for NFA with groundwater monitoring in the OU3,4,5 ROD. Groundwater monitoring is conducted under the SWMP.

Source Area	**Remedy or Status as Identified in the ROD**
ST27 E-11 Fuel Storage Tank Area	NFA, Monitoring
WP33 Wastewater Plant Effluent Infiltration Pond	NFA, Monitoring
SS35 Asphalt Mixing and Drum Burial Area	NFA, Monitoring (Amended OU3,4,5 ROD)
SS36 Drum Storage Area	NFA, Monitoring
SS37 Drum Storage Area	NFA, Monitoring
SS39 Asphalt Lake	NFA, Monitoring
SS63 Asphalt Lake Spill Site	NFA, Monitoring
SS64 Transportation Maintenance Drum Storage Site	NFA, Monitoring

RAOs

RAOs are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation levels, which are defined as acceptable contaminant levels for each exposure route. The primary RAO for OU4 is protection of groundwater.

Source Area	RAO
All	Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
DP25	Monitor groundwater to evaluate contaminant levels and migration until remediation levels are achieved
ST58	NFA of soils
	Ensure that benzene and lead are not migrating off site and that their concentrations continue to decrease

BTEX compounds and lead are COCs for OU4 (USAF, 1995d). The following table lists RAOs and ARARs established to address groundwater quality at OU 3, 4, and 5 source areas.

COC	RAOs/Final Groundwater Remediation Goals (µg/L)	Soil Cleanup Levels (mg/Kg)
Benzene	5	0.2
Toluene	1,000	80
Ethylbenzene	700	140
Xylenes	10,000	760
1,4-Dichlorobenzene	75	--
1,2-Dichloroethane	5	--
cis-1,2-DCE	70	--
trans-1,2-DCE	100	--
TCE	5	0.4
PCE	5	--
Vinyl Chloride	2	--
DDT	4.2	--
Chlordane	2	--
Lead	15	--
Silver	100	--

Groundwater cleanup levels are action-specific ARARs that are technology or activity based requirements or limitations relating to specific remedial actions. Compliance with action-specific ARARs was evaluated as part of the detailed evaluation of alternatives conducted in the Feasibility Study process. The cleanup level for silver in groundwater is the secondary MCL as stated in the OU3,4,5 ROD. Soil cleanup levels are designed to prevent contaminant levels in groundwater from exceeding a health-based safe drinking water level through the leachate pathway.

5.1 Chronology of Events

November 1982-July 1991	IRP Investigations and Reports.
May 1995	Field investigation and contaminated soil excavation at ST58 (Battelle, 1995b).
May 1995	OU3,4,5 RI/FS completed (USAF, 1995c).
September 1995	OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1995d).
August 1997	OU3,4,5 Remedial Action Workplan and Remedial Design completed (USAF, 1997b,c).
July 1998	OU3,4,5 ROD amended (USAF 1998c). Selected remedies at DP44, SS35, ST58, and LF03/FT09 modified.
August 1998	OU3,4,5 Remedial Action Summary Report completed (USAF, 1998e).
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
December 2002	RPO Phase II Technical Report completed (USAF, 2002c)
September 2003	Second Five-Year ROD Review completed (USAF, 2003c)

5.2 Community Involvement

See section 4.1 for OU3, 4, and 5 community involvement.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

This page intentionally left blank

5.3 DP25 E-6 Fuel Tank Storage Area

5.3.1 Background

DP25 is located on the north side of Quarry Road at the E-6 Fuel Storage Tank Area, approximately 1,500 ft southeast of Spruce Lake (Figure DP25-1). The fence-enclosed complex of eight fuel ASTs was built in the 1950s. The area is actively used for storage of JP-8. Previous fuel storage included JP-4. DP25 is approximately 25 acres and has a flat surface gradient. Groundwater at DP25 ranges 2 to 5 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

History of Contamination

Local fuel contamination appears to originate from leaks in the tanks and/or fuel-distribution system. Sludge from periodic cleaning of fuel tanks was reportedly buried in shallow trenches between the fuel storage tanks until 1980. The sludge consisted primarily of water, rust, dirt, and fuel. No evidence of the buried sludge was found during investigations.

There were two recent fuel spills near DP25. In 1987, a pipeline fuel spill of JP-4 was reported along Quarry Road adjacent to DP25. There was a 3,750-gallon JP-8 release along Quarry Road, south of the E-6 complex, in March 2001. The 2001 release occurred inside and adjacent to Building 6248. The Eielson AFB HAZMAT team conducted cleanup operations and reported recovering all but 200 gallons of the JP-8.

Initial Response

Groundwater and soil samples were collected during the IRP investigations and the RI/FS. Groundwater sample results indicated BTEX concentrations above MCLs up hydrologic gradient, within, and down gradient of the E-6 complex. Lead concentrations exceeded the MCL in groundwater samples collected in 1989. In subsequent groundwater samples, lead concentrations have been mostly below the MCL.

Soil samples collected indicated the presence of lead, but at concentrations below the USEPA industrial preliminary remediation goal. BTEX compounds were absent from soil, suggesting fuel was released directly to the shallow groundwater, or VOCs volatilized from the shallow soil depths.

NAPL thickness ranged from zero to 1.1 ft in measurements collected from 1988 to 1993. Samples collected identified the NAPL as JP-4. NAPL was not observed at well 53M01, near the 1987 JP-4 fuel release. NAPL has not been observed during subsequent sampling events conducted under the SWMP.

Basis for Taking Action

The RI/FS and BLRA identified BTEX and lead exceeding MCLs. The exposure pathways of potential concern are the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

5.3.2 Remedial Actions

The COCs for DP25 are BTEX and lead. Bioventing was not selected for DP25 in the OU3,4,5 ROD due to the shallow groundwater and presence of tanks, piping, and proposed liners. The selected remedy cited in the OU3,4,5 ROD includes the following site remedies:

- Monitor groundwater to evaluate contaminant levels and identify changes to contaminant configuration until remediation levels are achieved
- ICs to prevent exposure to contaminated groundwater

RAOs for DP25 include the following:

- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
- Prevent the continued migration of contaminants (BTEX) into the groundwater from the floating product and smear zone

Remedy Implementation

Groundwater samples were collected under the 1996, 2002, and 2006 SWMP to verify COC concentration. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

5.3.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2006 SWMP.

5.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 5.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Groundwater sampling indicates BTEX concentrations exceeding MCLs within the E-6 complex boundaries, but with decreasing concentrations. In 2006, monitoring well 53M01 had 24 µg/L benzene, a decrease from the 1996 benzene concentration of 95 µg/L. Additional wells sampled in 2006 include a new monitoring well 25M07 and an existing temporary monitoring well 27PMW01. Monitoring well 25M07 had 140 µg/L benzene. Temporary monitoring well 27PMW01 had 530 µg/L benzene, and decrease from the 2002 concentration of 1,990 µg/L (Figure DP25-1).

In 2002, BTEX concentration decreased below MCLs near the E-6 complex boundaries at wells B-1 and 25M01. Lead concentration exceeded the MCL in several samples collected during RI/FS activities, however, lead has not exceeded the action level since 1993.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the source area. Vapor intrusion issues do not pertain to the facilities at DP25. DQOM will be applied to this source area.

5.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area DP25 is performing as expected. Groundwater monitoring evaluates the COC concentrations in groundwater, and will continue to do so until cleanup goals are achieved. ICs prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks, and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the OU3,4,5 ROD. Groundwater monitoring indicates decreasing BTEX and lead concentrations. The narrow soil profile with shallow groundwater disallowed presumptive site remedies such as bioventing to be implemented. Current groundwater monitoring indicates that the soil is not acting as a continuing contamination source.

The 2002 sample results from within the bermed E-6 complex had COCs below MCLs. However, elevated COC concentrations likely remain in the central E-6 complex area, and near tank 22. All previous assumptions for the DP25 source area are still valid.

The 2002 and 2006 groundwater monitoring results exceeded the benzene MCL up gradient from the DP25 source area in the vicinity of the 1987 and 2001 jut fuel releases. Benzene concentrations in 2006 ranged 24 µg/L to 530 µg/L, a decrease from 2002 concentrations. All other BTEX constituents were below the MCL during the 2006 sampling event. The decreasing BTEX concentrations indicate that the plume resulting from the 1987 and 2001 jet fuel releases between IRP source areas DP25 and ST27 is stable and attenuating.

Buildings located at DP25 are not occupied, so the vapor intrusion pathway will not be evaluated.

5.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area DP25.

5.3.7 Recommendations and Follow-Up Actions

The RAOs for DP25 are to ensure that BTEX and lead concentrations in groundwater remain at levels protective of human health and the environment, and are not migrating off site. Groundwater monitoring indicates the RAOs for DP25 are being achieved. Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs, projected in 2015. Land use restrictions will remain in effect until RAOs are achieved.

5.3.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

5.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for DP-25:

List of Tables for DP25:

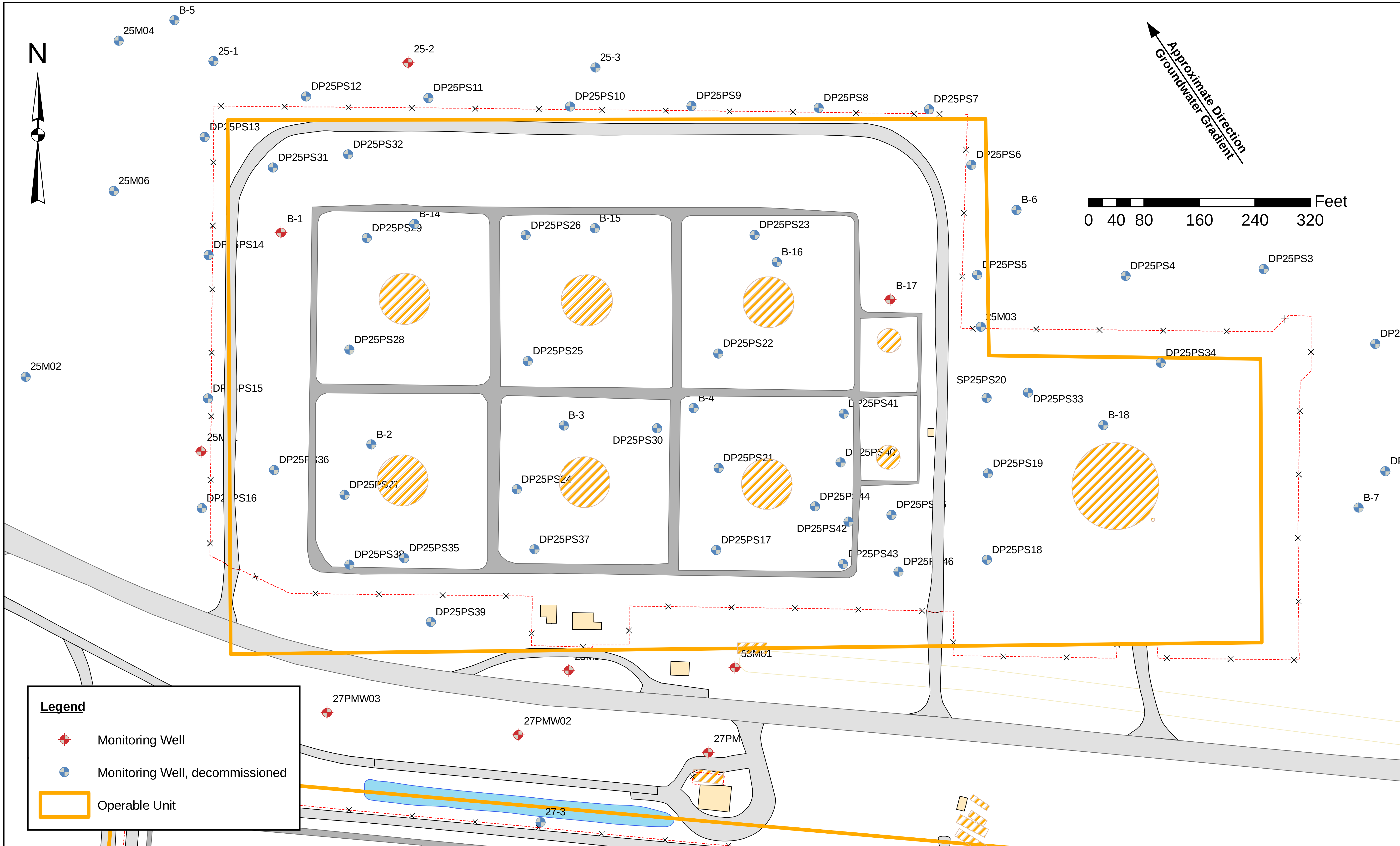


Figure DP25-1: DP25 E-6 Fuel Tank Sludge Burial Pit, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE DP25-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, DP25, E-6 FUEL TANK SLUDGE BURIAL PIT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**	**NA**	**15[1]**			**18 AAC 80.300**
B-1	1988		**290**	--	--	--	--	--	--	--	1,4,11		PNL 1995 OU 3,4,5 RI
B-1	06/10/92		**61**	<2.0	22	180	--	--	--	--	1,4,11		PNL 1995 OU 3,4,5 RI
B-1	08/10/92		**83**	<2.0	<2.0	280	--	--	--	--	1,4,11		PNL 1995 OU 3,4,5 RI
B-1	04/06/93		**150**	<5.0	--	300	<2,000	**1,600**	--	<5	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-1	9/20,23/94		**69**	28	24	135	**1,700**	<700	--	--			Pine & Swallow, 1994
B-1	08/21/02	8.1	2.1	<2.0	3.8	16	--	--	--	9.4	13, 11		USAF 2002 SWMPR
B-2	1988		**250**	--	--	--	--	--	--	--			PNL 1995 OU 3,4,5 RI
B-3	1988		3.0	10	2.0	15	--	--	--	--	1,4,11		PNL 1995 OU 3,4,5 RI
B-4	1988		--	**34,000**	--	--	--	--	--	--	1,4,11		PNL 1995 OU 3,4,5 RI
B-4	04/06/93		<5.0	250	--	2,600	**1,900**	1,100	--	12	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-4	9/20,23/94		**480**	710	**840**	1,710	**19,000**	**7,400**	--	--			Pine & Swallow, 1994
B-4	08/20/96		**17**	69	330	2,630	--	--	--	1.4	1,11		USAF 1996 SWMPR
B-5	04/07/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	12	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-6	04/08/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	**42**	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-7	04/08/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	**40**	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-14	1988		--	--	--	--	--	--	--	**362**	1,4,11		PNL 1995 OU 3,4,5 RI
B-14	04/06/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	**33**	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-14	9/20,23/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
B-15	1988		**150**	**1,200**	--	--	--	--	--	**291**	1,4,11	a	PNL 1995 OU 3,4,5 RI
B-15	08/12/92		**53**	210	150	480	--	--	--	<5.0	1,4,11		PNL 1995 OU 3,4,5 RI
B-15	04/14/93		**20**	36	--	230	950	1,100	--	9.2	8,11	a,b	PNL 1995 OU 3,4,5 RI
B-15	9/20,23/94		**31**	94	150	230	**4,300**	**2,800**	--	--			Pine & Swallow, 1994
B-16	1988		46	**6,800**	**1,000**	8,600	--	--	--	5.0	1,4,11		PNL 1995 OU 3,4,5 RI
B-17	1988		3.0	7.0	<5.0	13	--	--	--	**44**	1,4,11		PNL 1995 OU 3,4,5 RI
B-17	04/14/93		<5.0	<5.0	--	<5.0	--	--	--	**60**	8,11	a	PNL 1995 OU 3,4,5 RI
B-17	08/21/02	6.2	1.4	<2.0	<2.0	<2.0	--	--	--	6.6	13, 11		USAF 2002 SWMPR
B-18	1988		**7,900**	**24,000**	**2,000**	9,100	--	--	--	**66**	1,4,11		PNL 1995 OU 3,4,5 RI
B-18	04/14/93		**1,700**	**8,900**	**1,900**	3,400	--	--	--	**21**	8,11	a	PNL 1995 OU 3,4,5 RI
B-18	1994		**2,810**	**11,300**	**1,100**	--	--	--	--	--		c	CRREL, 1994
B-18	10/06/94		**1,700**	**6,100**	**1,100**	2,340	**28,000**	**17,000**	--	--			Pine & Swallow, 1994
B-18	08/20/96		**1,300**	**8,900**	**1,000**	5,200	--	--	--	5.8	1,11		USAF 1996 SWMPR

TABLE DP25-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, DP25, E-6 FUEL TANK SLUDGE BURIAL PIT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**NA**	**15**[1]			**18 AAC 80.300**
25-1	1986		<1.0	<1.0	<1.0	<1.0	--	--	--	--	13		SAIC 1987
25-2	1986		<1.0	<1.0	<1.0	<1.0	--	--	--	--	13		SAIC 1987
25-3	1986		<1.0	<1.0	<1.0	<1.0	--	--	--	--	13		SAIC 1987
25M01	1988		<2.0	<0.3	<0.5	<0.9	--	--	<1.0	**49**	1,4,11		PNL 1995 OU 3,4,5 RI
25M01	08/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	<5.0	1,4,11	a	PNL 1995 OU 3,4,5 RI
25M01	04/07/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	5.7	8,11	a	PNL 1995 OU 3,4,5 RI
25M01	08/21/02	7.3	<0.5	<2.0	<2.0	<2.0	--	--	--	<5.0	13, 11		USAF 2002 SWMPR
25M02	1988		--	<0.3	<0.5	<0.9	--	--	<1.0	**16**	1,4,11		PNL 1995 OU 3,4,5 RI
25M02	08/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	<5.0	1,4,11	a	PNL 1995 OU 3,4,5 RI
25M02	04/07/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	<5.0	8,11	a	PNL 1995 OU 3,4,5 RI
25M03	1988		3.3	<0.3	<0.5	1.1	--	--	<1.0	6.0	1,4,11		PNL 1995 OU 3,4,5 RI
25M04	1988		<0.2	<0.3	<0.5	<0.9	--	--	<1.0	**55**	1,4,11		PNL 1995 OU 3,4,5 RI
25M04	08/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	<5.0	1,4,11	a	PNL 1995 OU 3,4,5 RI
25M04	04/07/93		<5.0	<5.0	--	<5.0	<2,000	<100	<1.0	<5.0	8,11	a,b	PNL 1995 OU 3,4,5 RI
25M04	08/20/96		<1.0	<1.0	<1.0	<1.0	--	--	--	<1.0	1,11		USAF 1996 SWMPR
25M05	1988		<0.2	<0.3	<0.5	<0.9	--	--	--	8.0	1,4,11		PNL 1995 OU 3,4,5 RI
25M06	1988		<0.2	<0.3	<0.5	<0.9	--	--	--	**46**	1,4,11		PNL 1995 OU 3,4,5 RI
25M06	08/11/92		<2.0	<2.0	<2.0	<5.0	--	--	--	<5.0	1,4,11	a	PNL 1995 OU 3,4,5 RI
25M06	04/07/93		<5.0	<5.0	--	<5.0	<2,000	<100	--	<5.0	8,11	a,b	PNL 1995 OU 3,4,5 RI
25M07	08/31/06	13	**140**	6.2	70	200	--	--	--	--	7		USAF 2006 SWMPR
25PS1	09/12/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS1	10/5,6/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS2	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS3	09/12/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS4	09/12/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS5	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS5	10/5,6/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS6	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS6	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS7	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994

TABLE DP25-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, DP25, E-6 FUEL TANK SLUDGE BURIAL PIT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**	**NA**	**15[1]**			**18 AAC 80.300**
25PS8	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS9	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS10	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS11	9/13,15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS12	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS13	9/13,15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS14	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS15	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS16	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS17	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS18	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS19	9/13,14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS20	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS21	1994		**1,680**	**11,500**	**1,510**	--	--	--	--	--		c	CRREL, 1994
25PS21	9/13,14/94		**540**	**5,500**	**850**	2,200	**15,000**	**4,000**	--	--			Pine & Swallow, 1994
25PS21	10/5,6/94		**1,100**	**7,600**	**1,000**	3,850	**20,000**	1,100	--	--			Pine & Swallow, 1994
25PS22	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS23	9/14,15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS24	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS25	9/13,14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS25	10/5,6/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS26	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS27	09/14/94		**170**	56	390	17	**2,500**	**1,900**	--	--			Pine & Swallow, 1994
25PS28	09/13/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994

TABLE DP25-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, DP25, E-6 FUEL TANK SLUDGE BURIAL PIT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300[ADEC]**	**1,500[ADEC]**	**NA**	**15[1]**			**18 AAC 80.300**
25PS29	10/4,5/94		**900**	**1,000**	**700**	741	**33,000**	>330,000					
25PS30	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS30	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS31	09/14/94		**38**	27	38	171	**1,900**	1,400	--	--			Pine & Swallow, 1994
25PS32	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS32	10/4,5/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS33	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS33	10/06/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS34	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS35	9/22,28/94		**160**	280	310	490	**7,900**	**5,100**	--	--			Pine & Swallow, 1994
25PS36	9/22,28/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS37	9/26,27/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS38	9/26,28/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS39	9/26,28/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS40	9/27,28/94		**280**	330	280	175	**9,200**	**22,000**	--	--			Pine & Swallow, 1994
25PS41	9/27,30/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS42	9/28,30/94		**410**	**1,100**	510	1,140	**20,000**	**55,000**	--	--		c	CRREL, 1994
25PS43	09/29/94		<2.0	<2.0	<3.0	<3.0	<120	--	--	--			Pine & Swallow, 1994
25PS44	1994		**780**	**5,180**	**1,340**	--	--	--	--	--		c	CRREL, 1994
25PS44	09/29/94		**780**	**3,800**	**1,100**	3,800	**37,000**	**26,000**	--	--			Pine & Swallow, 1994
25PS44	10/5,6/94		**760**	**3,600**	**990**	3,500	**37,000**	**25,000**	--	--			Pine & Swallow, 1994
25PS45	09/29/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS46	09/29/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
25PS46	10/5,6/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	--			Pine & Swallow, 1994
27-1	1986		<1.0	<1.0	<1.0	<1.0	--	--	--	--	13		SAIC 1987

TABLE DP25-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, DP25, E-6 FUEL TANK SLUDGE BURIAL PIT, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl benzene	Xylenes	TPH GRO	TPH DRO	Dissolved Lead	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]	**NA**	**15**[1]			**18 AAC 80.300**
27PMW01	08/21/02	8.8	**1,990**	**1,670**	325	2,232	--	--	--	**33.4**	11,13	c	USAF 2002 SWMPR
27PMW01	09/12/06	12	**530**	120	140	310	--	--	--	**--**	7	c	USAF 2006 SWMPR
27PMW03	08/21/02	6.6	<0.5	<2.0	<2.0	<2.0	--	--	--	**33.0**	12	c	USAF 2002 SWMPR
53M01	1988		**985**	**4,680**	**902**	2,810	--	--	<1.0	**16**	1,4,11		PNL 1995 OU 3,4,5 RI
53M01	04/08/93		**60**	170	**740**	730	<2,000	**3,800**	--	<5.0	8,11	a	PNL 1995 OU 3,4,5 RI
53M01	9/27,30/94		**150**	580	**860**	680	**19,000**	**39,000**	--	--			Pine & Swallow, 1994
53M01	08/20/96		**95**	210	150	820	--	--	--	<1.0	1,11		USAF 1996 SWMPR
53M01	08/31/06	16.8	**24**	170	160	550	--	--	--	--	7		USAF 2006 SWMPR

Notes:

a	For additional compounds detected, see reference.
b	TPH GRO and TPH DRO were analyzed by Data Chem Labs by EPA Method 8015, not ADEC GRO (8015M) and ADEC DRO (8100M).
c	Only results above the MCL for BTEX compounds were reported.
1	USEPA Action Level
MCL	Maximum Contaminant Level
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Bold	Bold text indicates concentration exceeds MCL, USEPA Action Limit, ADEC action level, or background upper confidence level (BGUCL).
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics

Background mean concentrations for lead: dissolved, <1.0 µg/L; total, 21 µg/L.
Background maximum concentrations for lead: dissolved, <1.0 µg/L; total, 48 µg/L.
Background 95 percent upper confidence limit concentrations for lead: dissolved, <1.0 µg/L; total, 33 µg/L.

-- Not analyzed

Analytical Methods:

1. 8020	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 7421	13. 8021
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	12. 8310	

This page intentionally left blank

5.4 ST58 Old Quartermaster Service Station Site

5.4.1 Background

ST58 is located on the northwest corner of the intersection of Division Street and Wabash Avenue. The Quartermaster service station operated from 1970 to 1988. The service station used four 25,000-gallon ASTs, containing leaded and unleaded MOGAS and diesel. Two drums of motor oil were also stored at the service station. Underground piping running parallel to Division Street supplied fuel to ST58. The source area is approximately 1 acre and has a flat surface gradient. Groundwater at ST58 ranges from approximately 9 to 12 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

History of Contamination

No fuel releases were reported at ST58. Fuel stored at the Quartermaster service station appears to have been released or leaked from piping and the ASTs. The service station was decommissioned in 1988. During decommissioning, the ASTs and some of the underground piping were removed. Workers removing the underground fuel piping supplying the ASTs noted evidence of fuel releases. The quantity of fuel release is unknown. The surface was covered with 3 ft of fill after the ASTs and piping were removed.

Initial Response

Investigations at ST58 were conducted from 1991 to 1994 using various geotechnical and chemical analyses. Benzene and lead were detected in groundwater samples at concentrations exceeding the MCLs. No NAPL was observed. A soil-gas survey and laboratory analysis of soil samples were used in 1993 to identify locations of fuel contaminated soil. Approximately 700 cy soil with elevated benzene, lead, and TPH concentrations was excavated for a composting demonstration. The composted soil was stockpiled and spread at Landfarm Area 2 (USAF, 1995e). A delineation investigation in 1994 characterized the plume extent along Wabash Avenue and Division Street.

Basis for Taking Action

The RI/FS and BLRA identified benzene and lead exceeding MCLs. The exposure pathways of potential concern are the ingestion and inhalation during use of contaminated groundwater.

5.4.2 Remedial Actions

The COCs at ST58 are benzene and lead. The remedy selected by the OU3,4,5 Amended ROD includes the following:

- NFA of soils
- Groundwater monitoring to confirm that groundwater lead or petroleum contamination is not migrating and is remaining with the currently established containment area
- ICs to prevent exposure to contaminated groundwater

RAOs for ST58 include the following:

- Ensure that benzene and lead are not migrating off site and that their concentrations continue to decrease
- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer

Remedy Implementation

Data gap work at ST58 in 1995 included a soil vapor survey and groundwater sampling in the area of the BTEX plume. The investigation indicated that dissolved BTEX compounds were present at much lower concentrations than detected prior to the excavation of the 700 cy contaminated soil.

A natural attenuation study (USU/UWRL, 1995) and lead treatability study were conducted (IT, 1995) in 1995 at ST13/DP26. The results of the studies were considered applicable to lead in groundwater at ST58. The USEPA concluded that lead at ST13/DP26 was no longer mobile and was not amenable to pump and treat technology. Based on these findings, it was determined that active remediation of lead in groundwater would not be conducted at ST58 or ST13/DP26.

The amended RAOs included monitoring the groundwater to confirm that lead and petroleum contamination remain within the established containment area and ICs. The action level for lead is waived within the containment area (TI waiver area) to 30 ft below the annual average water table depth (USAF, 1996d). The TI waiver area has the following boundaries (Figure ST58-1).

- Wabash Avenue to the east
- Division Street to the south
- Flightline Avenue to the west
- A line running east and west along the south side of Building 3129

Groundwater samples were collected under the 1995, 1996, 2002, and 2007 SWMPs to verify COC concentration. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

5.4.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2007 SWMP.

5.4.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 5.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Groundwater monitoring results indicate that benzene concentration decreased below the MCLs in wells within the source area and down hydrologic gradient. Lead concentration exceeded the MCL (15 µg/L) in 2002 from well 58PMW01 (34 µg/L) located down hydrologic gradient from the source area but within the TI waiver boundary. Lead results from wells 58MW10, 58MW11, and 58MW12, with historically high concentrations, decreased to below the MCL (Figure ST58-1). The two temporary monitoring wells installed during the 2007 sampling event had lead concentrations below the MCL.

TCE was detected in sample ST58PS10 (collected in 1994 and 1996) at concentrations exceeding the MCL. The sample ST58PS10 location is hydrologically down gradient from source area SS61, with known chlorinated VOC contamination. In 2007, TCE was detected in temporary monitoring well 58PMW03 at 0.4 µg/L, below the 5 µg/L MCL. TCE was non-detect in all other samples and is not a COC.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the source area. Vapor intrusion issues do not pertain to ST58 as benzene levels are below the MCL. No additional monitoring events will occur at this source area as benzene levels met the MCL.

5.4.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area ST58 is performing as expected. Groundwater monitoring evaluates the plume configuration. ICs prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the Amended ROD. Benzene decreased to below the MCL within and down hydrologic gradient of the source area. Lead concentration in groundwater exceeded the MCL in 2002 from one sample collected within the TI waiver boundaries. All other lead results are below the MCL. All previous assumptions for the ST58 source area are still valid.

5.4.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area ST58.

5.4.7 Recommendations and Follow-Up Actions

The RAOs for ST58 include restoring groundwater to its designated beneficial use as a drinking water source, and ensuring that benzene and lead are not migrating off site. A comparison of 2007 and previous groundwater analytical results indicate that benzene concentration within and hydrologically down gradient of the source area decreased to levels below the MCL. Groundwater monitoring is not anticipated unless site conditions change. Institutional controls will continue at ST58 for lead contamination in the soil in accordance with the TI Waiver for the source area (USAF 1995d). Source Area ST58 will continue to be flagged during the Eielson dig permit process and construction activities will follow the institutional control procedures.

5.4.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is protective of human health and the environment. The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion and inhalation during use of contaminated groundwater.

5.4.9 Next Review

Source Area ST58 no longer requires a Five-Year ROD Review as RAOs are achieved.

List of Figures for ST58:

List of Tables for ST58:

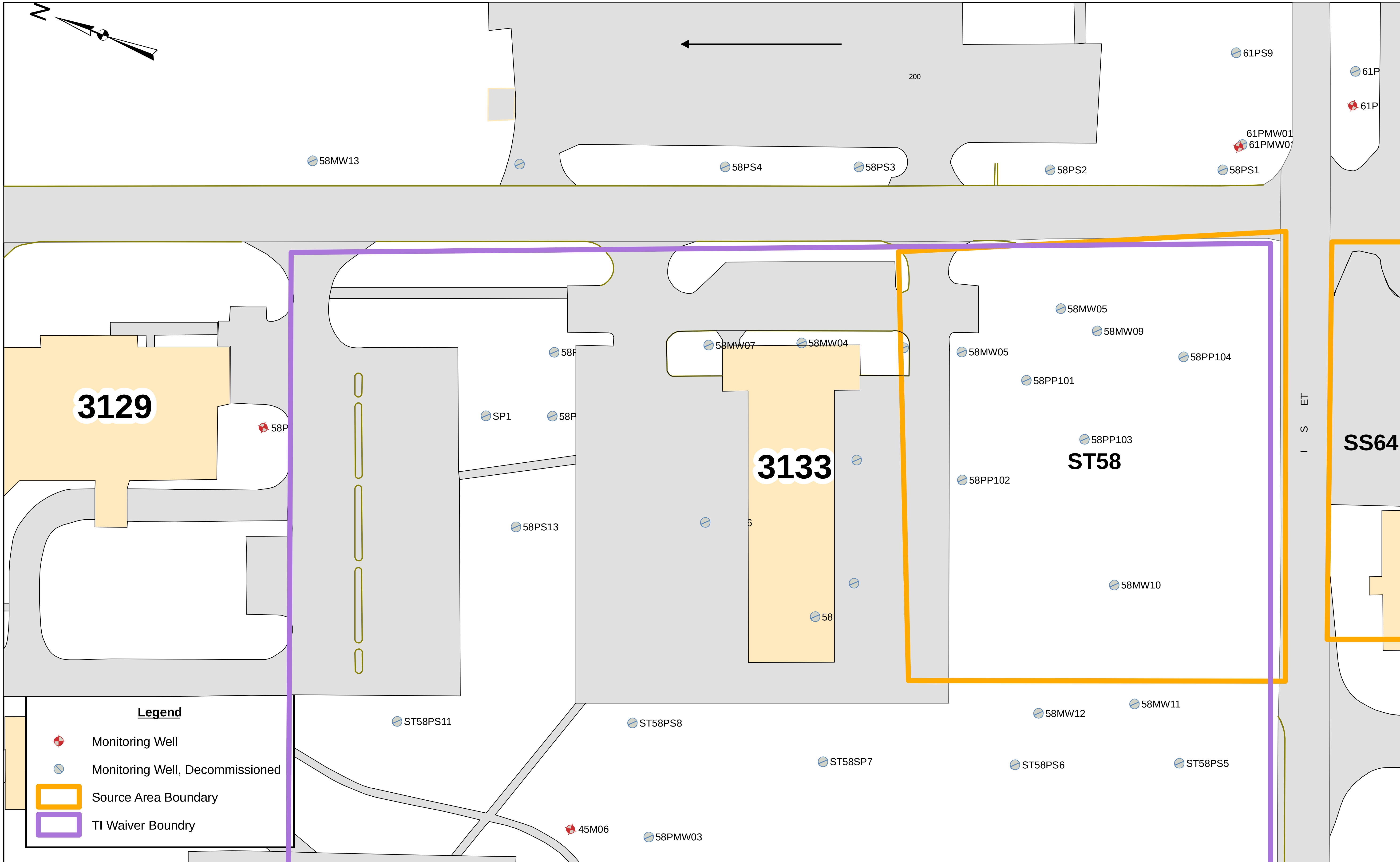


Figure ST58-1: ST58, Old Quarter Master Service Station, Groundwater Sample Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE ST58-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST58, OLD QUARTER MASTER SERVICE STATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Methylene Chloride	cis-1,2 DCE	trans-1,2 DCE	TCE	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**	**5**	**70**	**100**	**5**	**33[1]**			**18 AAC 80.300**
58PMW01	08/14/02	15	<0.5	<2.0	<2.0	<2.0	--	--	--	--	--	--	**34**	1,11	c	USAF 2002 SWMPR
58PMW02	09/17/07	15	<0.4	<1.0	<1.0	<3.0	--	--	--	--	--	--	10F	7,15	c	USAF 2007 SWMPR
58PMW03	08/20/07	15	<0.4	<1.0	<1.0	<3.0	--	--	<1.0	<0.5	<1.0	0.4F	2.8	7,15		USAF 2007 SWMPR
58MW01	01/92		<0.2	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW01	04/93		<0.7	<0.7	<0.5	<1.7	<2,000	200	1.8	--	--	--	**35**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW02	01/92		<0.2	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW02	04/93		<0.7	<0.7	<0.5	<1.7	<2,000	<100	<1.6	--	--	--	**39**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW03	01/92		**5.4**	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW03	04/93		3.7	<0.7	<0.5	<1.7	<2,000	<100	2.3	--	--	--	**41**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW04	01/92		**72**	<1.5	1.4	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW04	04/93		**98**	<0.7	<0.5	<1.7	--	300	2.3	--	--	--	**63**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW05	01/92		**85**	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW05	04/93		**29**	<0.7	<0.5	<1.7	<2,000	100	2.3	--	--	--	**40**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW06	01/92		<0.2	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW06	04/93		<0.7	<0.7	<0.5	<1.7	<2,000	<100	2.3	--	--	--	**44**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW07	01/92		<0.2	<1.5	<1.0	<3.0	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW07	04/93		<0.7	<0.7	<0.5	<1.7	<2,000	100	2.4	--	--	--	**110**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW08	01/92		**145**	<1.5	43	14	--	--	<1.0	--	--	--	--	8	a	USAF 1995 OU3,4,5 RI
58MW08	04/93		**180**	<0.73	110	29	<2,000	700	2.2	--	--	--	**51**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW09	04/93		**24**	2.8	--	45	**260,000**	**99,000**	2.3	--	--	--	**130**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW10	04/93		**450**	140	--	830	<2,000	**7,000**	**9.0**	--	--	--	**89**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW10	09/25/95		**30**	24	110	610	**1,800**	--	--	--	--	--	--	1,2	a	USAF 1995 OU1,3,4,5 RDWP
58MW10	09/03/96		<1.0	<1.0	3.9	15	--	--	<1.0	<1.0	<1.0	<1.0	10	1,4,11,13	c	USAF 1996 SWMPR
58MW10	08/10/98		<1.0	<1.0	<1.0	2.8	<40.0	208	--	--	--	--	<5.0	1,11,12		USAF 1998 SWMPR
58MW10	08/14/02	16.7	<0.5	<2.0	2.8	12	--	--	--	--	--	--	<5.0	1, 11	c	USAF 2002 SWMPR
58MW11	04/93		1.3	1.1	--	--	<2,000	100	2.0	--	--	--	**170**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW11	10/04/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7		USAF 1994 SWMPR
58MW11	09/03/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	7.2	1,4,11,13	c	USAF 1996 SWMPR

TABLE ST58-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST58, OLD QUARTER MASTER SERVICE STATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Methylene Chloride	cis-1,2 DCE	trans-1,2 DCE	TCE	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]	**5**	**70**	**100**	**5**	**33**[1]			**18 AAC 80.300**
58MW12	04/93		<0.7	<0.7	<0.5	<1.7	<2,000	300	2.0	--	--	--	**180**	8,11	a,b	USAF 1995 OU3,4,5 RI
58MW12	09/03/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	6.3	1,4,11,13	c	USAF 1996 SWMPR
58MW13	09/01/98		<1.0	<1.0	<1.0	<1.0	<40.0	180	<5.0	<1.0	<1.0	<1.0	<5.0	1,5,7,9-12,14	g	USAF 1998 SWMPR
58MW13	08/15/02		0.5	<1.0	<1.0	<2.0	--	--	<5.0	<1.0	<1.0	<1.0	--	7	c	USAF 2002 SWMPR
58PP101	09/22/95		<1.0	1.1	1.1	<1.0	<50	--	--	--	--	--	--	1,2		USAF 1995 OU1,3,4,5 RDWP
58PP101	09/05/96		<1.0	<1.0	2.0	4.6	--	--	<1.0	<1.0	<1.0	<1.0	**78**	1,4,11,13	c	USAF 1996 SWMPR
58PP102	09/22/95		<1.0	<1.0	<1.0	<1.0	<50	--	--	--	--	--	--	1,2		USAF 1995 OU1,3,4,5 RDWP
58PP102	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	30	1,4,11,13	c	USAF 1996 SWMPR
58PP103	09/22/95		<1.0	2.2	22	54	**5,000**	--	--	--	--	--	--	1,2		USAF 1995 OU1,3,4,5 RDWP
58PP103	09/05/96		<1.0	<1.0	1.7	4.2	--	--	<1.0	<1.0	<1.0	<1.0	**62**	1,4,11,13	d	USAF 1996 SWMPR
58PP104	09/22/95		<1.0	<1.0	<1.0	<1.0	<50	--	--	--	--	--	--	1,2		USAF 1995 OU1,3,4,5 RDWP
58PS1	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS2	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	8.1	<3.0	<1.0	--	7	f	CRREL 1994
58PS3	09/14/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS3	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	6.4	<1.0	<1.0	13	1,4,11,13	e	USAF 1996 SWMPR
58PS4	09/15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS4	10/04/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS5	09/15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS6	09/15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS7	09/15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS8	09/15/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS9	09/16/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS9	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	4.3	1,4,11,13	e	USAF 1996 SWMPR

TABLE ST58-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS AND LEAD IN GROUNDWATER SAMPLES, ST58, OLD QUARTER MASTER SERVICE STATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	TPH GRO	TPH DRO	Methylene Chloride	cis-1,2 DCE	trans-1,2 DCE	TCE	Total Lead	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]	**5**	**70**	**100**	**5**	**33**[1]			**18 AAC 80.300**
58PS10	09/16/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	22	5.7	**14**	--	7	f	CRREL 1994
58PS10	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	15	2.7	**12**	1.9	1,4,11,13	c	USAF 1996 SWMPR
58PS11	09/21/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS12	10/04/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS12	09/16/96		<1.0	<1.0	<1.0	<1.0	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	1,4,11,13	c	USAF 1996 SWMPR
58PS13	10/04/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994
58PS14	10/04/94		<2.0	<2.0	<3.0	<3.0	<120	<700	--	<6.0	<3.0	<1.0	--	7	f	CRREL 1994

Notes:
- -- Not analyzed
- a. For additional compounds detected, see reference.
- b. TPH GRO and TPH DRO were analyzed by Data Chem Labs by EPA Method 8015, not ADEC GRO (8015M) and ADEC DRO (8100M). Methylene chloride is suspected to be a laboratory contaminant for these samples (found in laboratory blanks).
- c. No compounds other than those listed were detected above the reporting limits.
- d. Additional compounds detected: naphthalene - 1.4 mg/L, fluorene - 0.18 mg/L, phenanthrene - 0.37 mg/L, benzo[a]fluoranthene - 0.017 mg/L, benzo[a]pyrene - 0.048 mg/L.
- e. Additional compounds detected: chloromethane - 58PS3 - 1.7 mg/L, 58PS9 - 1.4 mg/L.
- f. Field gas chromatograph was used for sample analysis.
- g. well installed in 1998.
- 1 Background Upper Control Limit for total lead.
- MCL maximum contaminant level
- **Bold** Bold text indicates concentration exceeds MCL, EPA Action Limit, or BGUCL.
- TPH GRO Total Petroleum Hydrocarbons Gasoline Range Organics
- TPH DRO Total Petroleum Hydrocarbons Diesel Range Organics
- F Indicates value greater than or equal to the method detection limit (MDL) and below the reporting limit.

Background mean concentrations for lead: dissolved, <1.0 µg/L; total, 21 µg/L.
Background maximum concentrations for lead: dissolved, <1.0 µg/L; total, 48 µg/L.
Background 95 percent UCL concentrations for lead: dissolved, <1.0 µg/L, total, 33 µg/L.

F Indicates value that is greater than or equal to the MDL.

Analytical Methods:

1. 8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 7421
12. 6010
13. 8310
14. 8081
15. 6020

This page intentionally left blank

6 OPERABLE UNIT 5

OUs 3, 4, and 5 are combined under the OU3,4,5 BLRA, RI/FS, and ROD.

OU5 consists of five source areas that are landfills. This Five-Year ROD Review only covers source areas LF03 and FT09. All other OU5 source areas are NFA, and no Five-Year ROD Review is required. Source areas LF03 completely encompasses FT09, and are discussed together.

Source Area	Remedy or Status as Identified in the Amended ROD
LF03 Inactive Base Landfill	Monitoring, ICs
FT09 Firefighter training Area	Monitoring, ICs

Three source areas were designated for NFA with groundwater monitoring in the OU3,4,5 ROD. Groundwater monitoring is conducted under the SWMP.

Source Area	Remedy or Status as Identified in the ROD
LF02 Old Base Landfill	NFA, Monitoring
LF04 Old Army Landfill	NFA, Monitoring
LF06 Old Landfill	NFA, Monitoring

RAOs

RAOs are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation levels, which are defined as acceptable contaminant levels for each exposure route. The primary RAO for OU5 is the protection of groundwater.

Source Area	RAO
LF03/FT09	Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
	Prevent direct human contact with landfill contents

The primary COCs for OU5 source areas included benzene, 1-4-dichlorobenzene, TCE, PCE, and vinyl chloride (USAF, 1995d). Post-closure care, including maintenance and monitoring, is conducted in accordance with 40 CFR 258 Appendix I, CFR 264.117, CFR 264.228 and the State of Alaska Solid Waste Regulations for Class III landfills (18AAC 60.396).

The following table lists RAOs and ARARs established to address groundwater quality at OU 3, 4, and 5 source areas.

COC	RAOs/Final Groundwater Remediation Goals (µg/L)	Soil Cleanup Levels (mg/Kg)
Benzene	5	0.2
Toluene	1,000	80
Ethylbenzene	700	140
Xylenes	10,000	760
1,4-Dichlorobenzene	75	--
1,2-Dichloroethane	5	--
cis-1,2-DCE	70	--
trans-1,2-DCE	100	--
TCE	5	0.4
PCE	5	--
Vinyl Chloride	2	--
DDT	4.2	--
Chlordane	2	--
Lead	15	--
Silver	100	--

Groundwater cleanup levels are action-specific ARARs that are technology or activity based requirements or limitations relating to specific remedial actions. Compliance with action-specific ARARs was evaluated as part of the detailed evaluation of alternatives conducted in the Feasibility Study process. The cleanup level for silver in groundwater is the secondary MCL as stated in the OU3,4,5 ROD. Soil cleanup levels are designed to prevent contaminant levels in groundwater from exceeding a health-based safe drinking water level through the leachate pathway.

6.1 Chronology of Events

November 1982-July 1991 IRP Investigations and Reports.

May 1995 OU3,4,5 RI/FS completed (USAF, 1995c).

September 1995 OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1995d).

September 1996 Eielson AFB Landfill 03 soil cover repaired.

August 1997 OU3,4,5 Remedial Action Workplan and Remedial Design completed (USAF, 1997b,c).

July 1998 OU3,4,5 ROD amended (USAF 1998c). Selected remedies at DP44, SS35, ST58, and LF03/FT09 modified.

August 1998 OU3,4,5 Remedial Action Summary Report completed (USAF, 1998e).

September 1998 First Five-Year ROD Review completed (USAF, 1998f).

December 2002 RPO Phase II Technical Report completed (USAF, 2002c)

September 2003 Second Five-Year ROD Review completed (USAF, 2003c)

6.2 Community Involvement

See section 4.1 for OU3, 4, and 5 community involvement.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

This page intentionally left blank

6.3 LF03/FT09 Old Base Landfill/Firefighter Training Area

6.3.1 Background

LF03/FT09 occupies approximately 100 acres located near the southern end of the runway and north of the refueling loop (Figure LF03/FT09-1). LF03 is located west of the ADEC-permitted asbestos landfill. The FT09 location is within the west-central part of LF03. Groundwater at LF03/FT09 ranges 7 to 11 ft bgs. The current land use is industrial. While the current land use is unlikely to change, the OU3,4,5 BLRA considered industrial and residential future land use scenarios.

The present land surface at LF03/FT09 is relatively level. The buried waste is covered with ash from the Eielson AFB power plant and a layer of soil. Some of the landfill surface area has been used as a land farm to store, segregate, and treat fuel-impacted soil encountered during construction operations and from leaking UST sites at the Base. Piles of clean soil, asphalt debris, and digested sludge from the Eielson AFB wastewater treatment plant have also been stored at LF03 since 1992. PCB-contaminated soil and sediment with concentrations less than 50 mg/kg from source area SS67 were disposed of at LF03 in 1996, 1997, and 1998 (Figure LF03/FT09-1).

History of Contamination

LF03 was used as the Base landfill from 1967 to 1987. The majority of the landfill, within the source boundary and west of the new asphalt pad, received wastes before 1980. After 1980, long trenches, located beneath and to the east of the new asphalt pad, were excavated to receive waste. LF03 received household garbage, construction debris, and empty cans and drums from the Flightline industrial shops. LF03 also reportedly received waste oils, solvents, paint residues, and thinners. A subsequent search of USAF and FNSB records after the signing of the original ROD could not confirm this disposal of hazardous waste (USAF, 1998c).

FT09 was used for firefighter training exercises from 1955 to 1989 where fuel, waste oils, and solvents were reportedly burned.

Initial Response

Groundwater, surface water, sediment, and soil samples were collected during the IRP investigations and the RI/FS. Groundwater samples collected from wells 03M02, 03M04, 03M05, 03M08, 03M13, 03M14, 03M18, and 09M02 had benzene concentrations exceeding the MCL. The main benzene plume appeared to be concentrated near and down hydrologic gradient from the firefighter training facility. Potential sources for this plume include soil contamination at the firefighter training facility, or the pipeline paralleling the northern boundary of LF03. A second benzene plume appeared to be located within the northeast corner of the landfill near well 03M08. Potential sources for this plume include local buried refuse, as the well is located in the area where waste trenches were used to dispose debris. Groundwater samples collected at both locations had chlorinated solvent concentrations that exceeded MCLs, with highest concentration observed in the sample collected from well 03M08. Bis-2-ethylhexyl phthalate (BEP) was the only SVOC detected at concentrations exceeding

MCLs, in the sample collected from 03MW03. Arsenic, cadmium, and lead concentrations in groundwater exceeded action levels in several samples collected within and outside the LF03 source area.

Soil samples were collected to investigate the benzene plume at the firefighter training facility. Sample results delineated areas of soil where TPH concentrations exceeded 100 mg/Kg. The main area of soil contamination was approximately 100 ft by 200 ft, with a depth of 3 to 6 ft, and located at FT09. Two smaller areas of TPH-contaminated soil were observed west of FT09—at well 03M01, and north of FT09—at well 03M13.

Basis for Taking Action

LF03 is identified as a landfill with subsurface disposal. The RI/FS and BLRA identified VOC concentrations at LF03/FT09 exceeding MCLs. The exposure pathways of potential concern are the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

6.3.2 Remedial Actions

The COCs for LF03/FT09 include benzene, 1-4-dichlorobenzene, and TCE, PCE, and vinyl chloride (USAF, 1995d). The OU3,4,5 ROD and Amended OU3,4,5 ROD proposed continued groundwater monitoring with ICs as the selected remedy for LF03/FT09. The remedy selected includes the following:

- A cover to address the direct contact threat will be maintained in accordance with relevant and appropriate requirements of the Resource Conservation and Recovery Act (RCRA) Part 264
- Monitor groundwater at and adjacent to the landfill (waste management area) to verify that contaminant concentrations remain below acceptable regulatory levels
- ICs to restrict land use to prevent direct exposure to landfill waste

The RAOs for LF03/FT09 include the following:

- Prevent human exposure to groundwater contaminated above drinking water standards and restore the beneficial uses of the aquifer
- Prevent direct human contact with landfill contents

Arsenic, while not considered a COC in the OU3,4,5 ROD, is a RCRA metal and included in groundwater monitoring according to post-closure care requirements. Post-closure care, including maintenance and monitoring, is conducted in accordance with 40 CFR 258 Appendix I, CFR 264.117, CFR 264.228 and 18AAC 60.396.

Remedy Implementation

The remedy selected by the OU3,4,5 ROD included an impermeable cover to prevent movement of water through the landfill. The Amended OU3,4,5 ROD clarified that, with no documentation of hazardous waste disposal, Subtitle C requirements were relevant and appropriate but not applicable. Groundwater concentrations at the edge of the landfill (waste management area) are below regulatory levels; therefore, an impermeable cover is not warranted. A soil cover is sufficient to prevent human contact with the refuse.

ICs were implemented to control assess to the groundwater and prevent unauthorized dumping. Groundwater samples were collected annually under the SWMP.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

6.3.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2003, 2004, 2005, 2006, and 2007 SWMP.

6.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 6.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Groundwater samples collected under the SWMP continue to exceed the benzene MCL at wells 03M13, 03M19, and 09M02, which are hydrologically down gradient from FT09. PCE and TCE concentrations continue to exceed the MCLs in samples collected from well 03M08, which is located within the northeast portion of LF03. Metal concentrations in several source are wells exceed the MCL for arsenic (10 µg/L), but not the action level (50 µg/L). SVOC concentrations in groundwater remain below cleanup levels. PCB concentrations remain non-detect from monitoring well 03M09, hydrologically down gradient from the PCB burial location (Figures LF03/FT09-1 and LF03/FT09-2).

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding the current remedy and protectiveness at the source areas. Vapor intrusion evaluation is required for facilities at LF03/FT09. Due to buried debris, groundwater monitoring will occur at these source areas every five years. Also, Eielson AFB will collect surface water samples from Garrison Slough adjacent to LF03 every five years.

6.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area LF03/FT09 is performing as expected. Groundwater monitoring evaluates the COC concentrations in groundwater, and will continue to do so until cleanup goals are achieved. ICs prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the OU3,4,5 ROD. Groundwater monitoring indicates benzene, PCE, and TCE concentrations exceed the MCLs within the source area, but stable hydrologically down gradient. PCB concentration in groundwater remains non detect. Metal concentrations decreased below MCLs except arsenic, which decreased below the action level. All previous assumptions for the LF03/FT09 source area are still valid.

6.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source areas LF03/FT09.

6.3.7 Recommendations and Follow-Up Actions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires compliance with ARARs at the edge of the waste management area (i.e., the landfill). Groundwater monitoring will continue as determined by the RPMs at LF03/FT09 until benzene, PCE, and TCE meet the MCLs. There is no projected date to reach MCLs as the PCE and TCE degradation trend have not been established on Eielson AFB. Minimally, Eielson AFB will perform groundwater monitoring prior to the next Five-Year ROD Review. Groundwater down gradient of the waste management area will continue to be monitored to verify that contaminant concentrations remain below regulatory action levels. Also, Eielson AFB will collect surface water samples from Garrison Slough adjacent to LF03 every five years.

Land use restrictions will remain in effect to prevent direct human contact with landfill contents and to ensure that future land use remains industrial.

6.3.8 Protectiveness Statement

The remedy at OU3, 4, and 5 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source areas has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of, dermal contact with, and inhalation during use of contaminated groundwater.

6.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for LF03/FT09:

List of Tables for LF03/FT09:

This page intentionally left blank

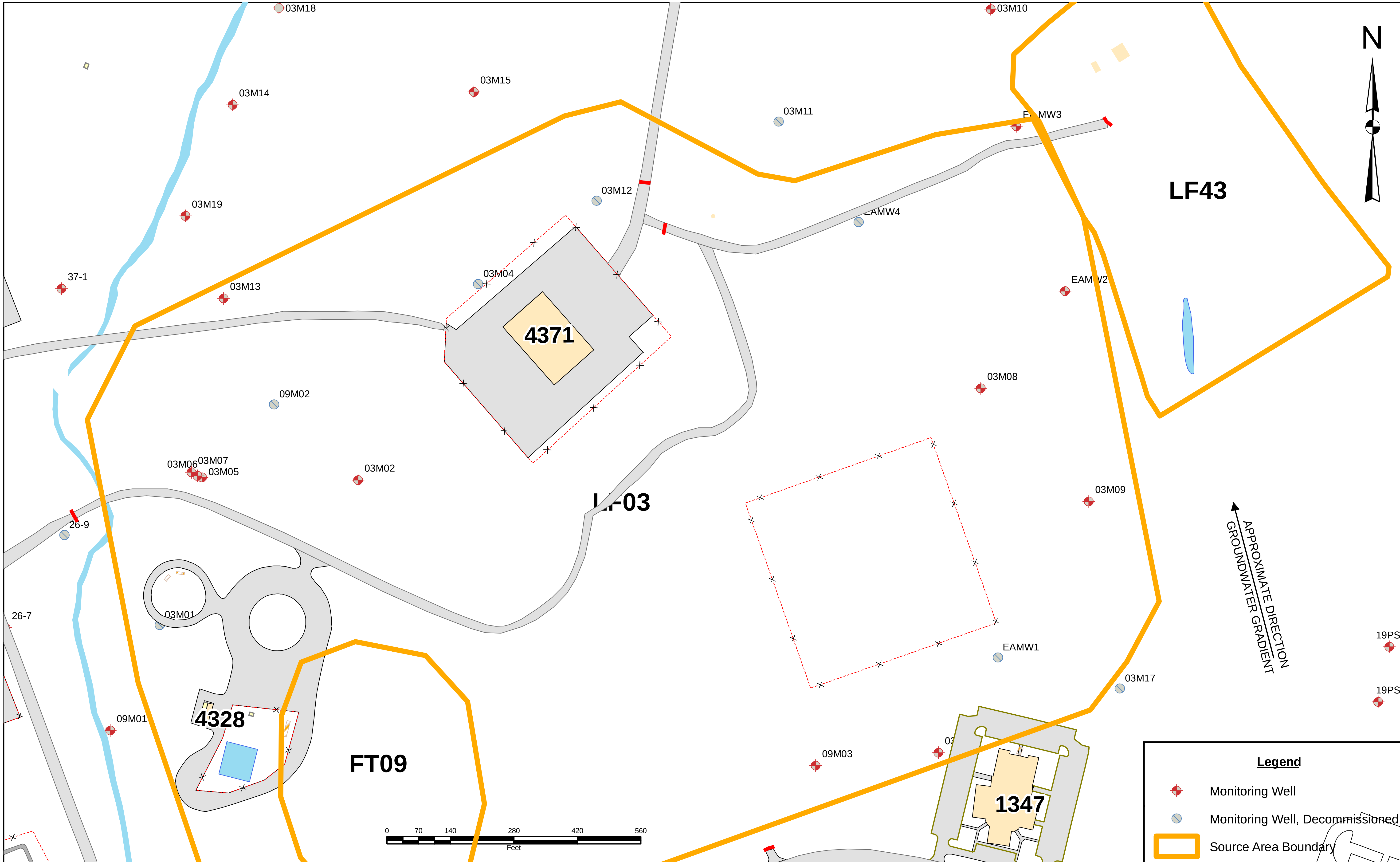


Figure LF03/FT09-1: LF03/FT09, Inactive Base Landfill/Fire Training Area, Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

Figure LF03/FT09-2. LF03/FT09 Site Plan Showing Locations of Groundwater Monitor Wells and Subsurface Disposal, Eielson AFB, Alaska

This page intentionally left blank

TABLE LF03/FT09-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS, TPH GRO, AND TPH DRO IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]			**18 AAC 80.300**
03-SW-GS	09/30/03		<0.4	<1.0	<1.0	<2.0	--	--	7	f	USAF 2003 SWMPR
03M01	1988		0.9	0.8	3.7	19	--	--	1		USAF 1995 OU3,4,5 RI
03M01	1989		0.8	1.4	5.6	18	--	--	1		USAF 1995 OU3,4,5 RI
03M01	06/01/92		<2.0	<2.0	<2.0	7.0	--	--	1		USAF 1995 OU3,4,5 RI
03M01	08/21/92		<2.0	<2.0	<2.0	5.5	--	--	1		USAF 1995 OU3,4,5 RI
03M01	08/05/94		1.7	<1.0	1.5	5.9	--	--	1		USAF 1995 OU3,4,5 RI
03M01	09/27/95		<1.0	1.4	<1.0	2.4	<50	1,000	1-3		USAF 1995 OU1,3,4,5 RDWP
03M01	08/07/96		<1.0	<1.0	0.4	1.8	--	--	7		USAF 1996 SWMPR
03M01	08/11/98		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 1998 SWMPR
03M01	07/22/99		<1.0	<1.0	<1.0	4.0	--	--	7		USAF 1999 SWMPR
03M01	08/15/00		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 2000 SWMPR
03M01	07/16/01	16	0.9	<1.0	<1.0	8.0	<900	751	7, 9, 10	b, d	USAF 2001 SWMPR
03M02	1988		**12**	82	25	72	--	--	1		USAF 1995 OU3,4,5 RI
03M02	1989		3.9	1.8	0.8	4.0	--	--	1		USAF 1995 OU3,4,5 RI
03M02	08/05/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M02	08/28/03	16	0.6	<1.0	<1.0	<2.0	--	--	7		USAF 2003 SWMPR
03M02	09/16/04	17	0.3	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR
03M03	1988		0.7	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
03M03	1989		<0.2	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M03	08/05/94		<1.0	2.5	1.7	1.6	--	--	1		USAF 1995 OU3,4,5 RI
03M04	1988		**6.5**	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
03M04	1989		4.0	<0.3	1.1	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M04	08/07/96		2.0	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M05	1988		0.4	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
03M05	1989		0.3	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M05	06/12/92		**6.6**	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M05	08/21/92		**5.9**	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M05	08/08/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M05	08/14/96		0.3	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M05	09/20/02	20	<0.5	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
03M05	09/20/02	20	<0.5	<1.0	<1.0	<2.0	--	--	7	*	USAF 2002 SWMPR
03M05	09/16/04	17	0.4	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR

TABLE LF03/FT09-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS, TPH GRO, AND TPH DRO IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]			**18 AAC 80.300**
03M06	1988		<0.2	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
03M06	1989		<0.2	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M06	06/12/92		<2.0	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M06	08/21/92		<2.0	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M06	08/08/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M06	08/14/96		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M07	1988		<0.2	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
03M07	1989		<0.2	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M07	06/12/92		<2.0	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M07	08/21/92		<2.0	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M07	08/08/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M07	08/14/96		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SMWPR
03M08	1989		--	--	--	--	--	--	1		USAF 1995 OU3,4,5 RI
03M08	08/09/94		**20**	460	38	91	--	--	1		USAF 1995 OU3,4,5 RI
03M08	10/04/95		**14**	430	27	77	**17,000**	**47,000**	1-3		USAF 1995 OU1,3,4,5 RDWP
03M08	08/07/96		**8.0**	350	28	66	--	--	7		USAF 1996 SWMPR
03M08	08/11/98		1.6	52	3.1	10	--	--	7		USAF 1998 SWMPR
03M08	07/22/99		--	--	--	--	--	--	--	c	USAF 1999 SWMPR
03M08	08/17/00		1.9	133	9.7	21	--	--	7		USAF 2000 SWMPR
03M08	09/05/01	17	2.0	71	8.2	<10	388	**17,700**	7	e	USAF 2001 SWMPR
03M08	09/20/02	14	<5.0	241	20	33	--	--	7		USAF 2002 SWMPR
03M08	08/17/05	14	2.3	83	7.2	14	--	--	7		USAF 2005 SWMPR
03M08	10/01/07	14	1.2	117	12	20	--	--	7		USAF 2007 SWMPR
03M09	1989		0.9	6.8	5.0	10	--	--	1		USAF 1995 OU3,4,5 RI
03M09	08/09/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M10	1989		0.24	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M10	08/09/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M10	08/13/96		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M10	08/03/98		--	--	--	--	--	--	--	a	USAF 1998 SWMPR
03M10	07/22/99		--	--	--	--	--	--	--	a	USAF 1999 SWMPR
03M10	09/17/04	11	<0.4	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR
03M10	10/04/07	11	<0.4	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
03M11	1989		0.4	5.7	3.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M11	08/09/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M11	08/13/96		0.6	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M11	08/03/98		--	--	--	--	--	--	--	a	USAF 1998 SWMPR
03M11	07/22/99		--	--	--	--	--	--	--	a	USAF 1999 SWMPR

TABLE LF03/FT09-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS, TPH GRO, AND TPH DRO IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]			**18 AAC 80.300**
03M12	08/09/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M12	08/07/96		<1.0	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M12	07/22/99		--	--	--	--	--	--	--	a	USAF 1999 SWMPR
03M13	1989		**46**	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M13	06/12/92		**24**	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M13	08/21/92		**35**	<2.0	<2.0	<5.0	--	--	1		USAF 1995 OU3,4,5 RI
03M13	08/10/94		1.8	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M13	10/04/95		<1.0	<1.0	<1.0	<1.0	230	130	1-3		USAF 1995 OU1,3,4,5 RDWP
03M13	08/07/96		**42**	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
03M13	08/12/98		**32**	<1.0	<1.0	<1.0	--	--	7		USAF 1998 SWMPR
03M13	07/23/99		**17**	<1.0	<1.0	<1.0	--	--	7		USAF 1999 SWMPR
03M13	08/15/00		**25**	<1.0	<1.0	<1.0	--	--	7		USAF 2000 SWMPR
03M13	09/05/01	12	**16**	<1.0	<1.0	<2.0	<90		7, 9, 10	e	USAF 2001 SWMPR
03M13	09/05/01	12	**16**	<1.0	<1.0	<2.0	<90		7, 9, 10	e, *	USAF 2001 SWMPR
03M13	09/19/02	13	**19**	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
03M13	08/27/03	13	**18**	<1.0	<1.0	<2.0	--	--	7	g	USAF 2003 SWMPR
03M13	08/15/05	13	**21**	<1.0	<1.0	<3.0	--	--	7		USAF 2005 SWMPR
03M13	08/15/05	13	**22**	<1.0	<1.0	<3.0	--	--	7	*	USAF 2005 SWMPR
03M13	08/31/06	13	**17**	<0.2	<0.2	<0.4	--	--	7		USAF 2006 SWMPR
03M13	10/04/07	13	**13**	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
03M14	1989		**8.9**	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M14	08/10/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M14	07/16/01	12	3.8	<1.0	<1.0	<2.0	<90	<526	7, 9, 10		USAF 2001 SWMPR
03M14	08/27/03	13	3.6	<1.0	<1.0	<2.0	--	--	7		USAF 2003 SWMPR
03M14	08/30/06	12	3.1	<0.2	<0.2	<0.4	--	--	7		USAF 2006 SWMPR
03M15	1989		<1.0	<1.0	<1.0	<1.0	--	--	1		HLA 1991
03M15	08/10/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M15	08/27/03	12	<0.4	<1.0	<1.0	<2.0	--	--	7	h	USAF 2003 SWMPR
03M15	08/27/03	12	<0.4	<1.0	<1.0	<2.0	--	--	7	*, h	USAF 2003 SWMPR
03M15	09/17/04	13	0.5	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR
03M15	08/30/06	13	0.5	<0.2	<0.2	<0.4	--	--	7		USAF 2006 SWMPR
03M16	1989		<1.0	<1.0	<1.0	<1.0	--	--	1		HLA 1991
03M16	08/10/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M17	1989		<1.0	<1.0	<1.0	<1.0	--	--	1		HLA 1991
03M17	08/10/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI

TABLE LF03/FT09-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS, TPH GRO, AND TPH DRO IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1,300**[ADEC]	**1,500**[ADEC]			**18 AAC 80.300**
03M18	1989		**6.2**	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
03M18	08/10/94		2.4	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
03M18	08/14/98		2.7	<1.0	<1.0	<1.0	--	--	5,7,14		USAF 1998 SWMPR
03M18	07/23/99		2.5	<10	<10	<10	--	--	5,7,14		USAF 1999 SWMPR
03M18	08/15/00		2.2	<1.0	<1.0	<1.0	--	--	7		USAF 2000 SWMPR
03M18	08/15/00		2.3	<1.0	<1.0	<1.0	--	--	7	*	USAF 2000 SWMPR
03M18	09/05/01	12	2.4	<1.0	<1.0	<2.0	<90	--	7, 9, 10	e	USAF 2001 SWMPR
03M18	09/19/02	15	2.0	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
03M18	09/17/04	14	3.3	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR
03M18	08/15/05	14	2.2	<1.0	<1.0	<3.0	--	--	7		USAF 2005 SWMPR
03M18	08/30/06	14	2.3	<0.2	<0.2	<0.4	--	--	7		USAF 2006 SWMPR
03M18	10/05/07	14	0.4	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
03M19	09/30/03		**7.4**	<1.0	<1.0	<2.0	--	--	7		USAF 2003 SWMPR
03M19	09/20/04	11	**11**	<0.5	<0.5	<0.5	--	--	7		USAF 2004 SWMPR
03M19	08/15/05	11	**7.0**	<1.0	<1.0	<3.0	--	--	7		USAF 2005 SWMPR
03M19	08/30/06	11	**7.6**	<0.2	<0.2	<0.4	--	--	7		USAF 2006 SWMPR
03M19	10/05/07	11	**6.3**	<1.0	<1.0	<3.0	--	--	7		USAF 2007 SWMPR
09M01	08/12/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
09M02	1988		**20**	<0.3	<0.5	<0.9	--	--	1		USAF 1995 OU3,4,5 RI
09M02	1989		**14**	<0.3	<0.5	<0.4	--	--	1		USAF 1995 OU3,4,5 RI
09M02	08/11/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
09M02	08/07/96		**13**	<1.0	<1.0	<1.0	--	--	7		USAF 1996 SWMPR
09M02	08/12/98		**10**	<1.0	<1.0	<1.0	--	--	5,7,14		USAF 1998 SWMPR
09M02	07/23/99		**8.1**	<1.0	<1.0	<1.0	--	--	5,7,14		USAF 1999 SWMPR
09M02	08/16/00		**8.2**	<1.0	<1.0	<1.0	--	--	5,7,14		USAF 2000 SWMPR
09M03	08/12/94		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1995 OU3,4,5 RI
EAMW1	10/12/95		<1.0	<1.0	<1.0	<1.0	<50	160	1-3		USAF 1995 OU1,3,4,5 RDWP
EAMW2	10/12/95		<1.0	<1.0	<1.0	<1.0	<50	800	1-3		USAF 1995 OU1,3,4,5 RDWP
EAMW2	08/26/03	13	<0.4	<1.0	<1.0	<2.0	--	--	7		USAF 2003 SWMPR
EAMW3	10/10/95		<1.0	<1.0	<1.0	<1.0	<50	<100	1-3		USAF 1995 OU1,3,4,5 RDWP
EAMW3	09/19/02	16	3.1	<1.0	<1.0	<2.0	--	--	7		USAF 2002 SWMPR
EAMW3	08/12/05	14	2.4	<1.0	<1.0	<3.0	--	--	7		USAF 2005 SWMPR
EAMW4	10/10/95		1.8	<1.0	<1.0	<1.0	<50	230	1-3		USAF 1995 OU1,3,4,5 RDWP

TABLE LF03/FT09-1: CONCENTRATIONS (µg/L) OF BTEX COMPOUNDS, TPH GRO, AND TPH DRO IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Notes:		
	*	Duplicate sample
	--	Analysis not performed on sample.
	a	Only groundwater parameters were collected for this well.
	b	MS/MSD collected with this sample.
	c	No sample collected due to no/low water.
	d	DRO result is estimated due to low recovery of spiked compounds and surrogate recovery out of method control limits.
	e	Resample due to cooler temperature exceedance.
	f	Surface water sample from Garrison Slough-in line with well no. 03M19.
	g	cis-1,2-Dichloroethene also detected in 03M13 at 2.2 µg/L.
	h	cis-1,2-Dichloroethene also detected in 03M15 primary and duplicate at 2.8 µg/L and 2.8 µg/L respectively.
	ADEC	Alaska Department of Environmental Conservation
	µg/L	Micrograms per liter
	MCL	Maximum Contaminant Level
	Bold	Bold text indicates concentration exceeds MCL.
	TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
	TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics

Analytical Methods:

1. 8021	3. ADEC 8100M	5. 8270	7. 8260	9. AK101	11. 7421	13. 8310
2. ADEC 8015M	4. 8010	6. 8080	8. 8240	10. AK102	12. 6020	14. 6010

This page intentionally left blank

TABLE LF03/FT09-2: CONCENTRATIONS (µg/L) OF NON-BTEX VOCs AND PCBs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	MIBK	2-Hexanone	DCDFM	Chloro-methane	Vinyl Chloride	Chloro-ethane	TCFM	Methylene Chloride	c-1,2-DCE	t-1,2-DCE	Total 1,2-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	TCE	PCE	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TMB	1,3.5-TMB	Naphtha-lene	PCB	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**2**	**NA**	**NA**	**5**	**70**	**100**	**70**	**NA**	**5**	**200**	**5**	**5**	**NA**	**75**	**600**	**NA**	**NA**	**NA**	**0.5**			**18 AAC 80.300**
03-SW-GS	09/30/03		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7	j	USAF 2003 SWMPR
03M01	1988		--	--	--	--	**2.1**	--	--	--	--	--	<0.4	--	--	--	<0.5	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M01	1989		--	--	5.2	2.5	**5.3**	2.4	--	<1.4	--	--	--	0.6	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M01	06/92		--	--	--	--	**9.5**	--	--	<5.0	4.3	<1.0	4.3	1.6	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M01	08/21/92		--	--	--	--	**4.5**	--	--	<5.0	3.4	<1.0	3.4	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M01	08/05/94		--	--	5.8	<1.0	1.3	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<2.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M01	09/27/95		<10	<10	15	6.9	**5.1**	<1.0	<1.0	<1.0	<5.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	4,7	b	USAF 1995 SWMPR
03M01	08/07/96		--	--	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	2.0	<1.0	2.0	0.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M01	08/11/98		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	1.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7	a	USAF 1998 SWMPR
03M01	07/22/99		<10	<10	<1.0	<1.0	<1.0	<10	<1.0	<5.0	1.9	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.0	ND	ND	--	5, 7	a	USAF 1999 SWMPR
03M01	08/15/00		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	ND	ND	--	7	g	USAF 2000 SWMPR
03M01	07/16/01	16	<10	<10	<1.0	<1.0	<2.0	1.9	<1.0	<5.0	4.3	<1.0	4.3	1.8	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.2	<1.0	4.7	--	7	a	USAF 2001 SWMPR
03M02	1988		--	--	--	--	<0.2	--	--	--	--	--	<0.4	--	--	--	2.5	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M02	1989		--	--	<0.6	8.2	0.8	<0.7	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M02	08/05/94		--	--	2.2	<1.0	<0.5	<1.0	--	<1.4	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M02	08/28/03	13	<10	<10	<1.0	2.2	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
03M02	09/16/04	17	<10	<10	<1.0	<1.0	0.9	<1.0	<2.0	<2.0	1.3	<0.5	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M03	1989		--	--	<0.6	10	<0.2	<0.7	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M03	08/05/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M04	1988		--	--	--	--	<0.2	--	--	--	--	--	0.4	--	--	--	2.0	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M04	1989		--	--	<0.6	3.7	0.3	<0.7	--	<1.4	--	--	--	<0.4	--	--	2.3	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M04	08/07/96		--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10	0.4	10	<1.0	<1.0	<1.0	0.9	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a,c	USAF 1996 SWMPR
03M05	1988		--	--	--	--	1.0	--	--	--	--	--	0.4	--	--	--	<0.5	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M05	1989		--	--	1	<0.4	1.8	<0.7	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M05	06/92		--	--	--	--	**2.5**	--	--	<5.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M05	08/21/92		--	--	--	--	**2.2**	--	--	<5.0	1.6	<1.0	1.6	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M05	08/08/94		--	--	1.2	<1.0	0.7	<1.0	--	<1.0	--	<1.0	<1.0	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M05	08/14/96		--	--	<1.0	<1.0	0.6	<1.0	<1.0	<1.0	1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M05	09/20/02	20	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	1.2	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--			USAF 2002 SWMPR
03M05	09/20/02	20	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	1.3	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7	*	USAF 2002 SWMPR
03M05	09/16/04	17	<10	<10	<1.0	<1.0	0.8	<1.0	<2.0	<2.0	1.3	<0.5	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M05	09/16/04	17	<10	<10	<1.0	<1.0	0.8	<1.0	<2.0	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7	*	USAF 2004 SWMPR
03M06	1988		--	--	--	--	0.9	--	--	--	--	--	<0.4	--	--	--	<0.5	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M06	1989		--	--	1.0	<0.4	**2.6**	<0.7	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M06	06/92		--	--	--	--	<2.0	--	--	<5.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M06	08/21/92		--	--	--	--	**2.3**	--	--	<5.0	1.2	<1.0	1.2	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M06	08/08/94		--	--	<1.0	<1.0	0.8	<1.0	--	1.0	--	<1.0	<1.0	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M06	08/14/96		--	--	<1.0	<1.0	0.5	<1.0	<1.0	<1.0	0.5	<1.0	0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWPMR
03M07	1988		--	--	--	--	<0.2	--	--	--	--	--	<0.4	--	--	--	<0.5	--	--	--	--	ND	ND	ND	--	4		USAF 1995 OU3,4,5 RI
03M07	1989		--	--	<0.6	<0.4	<0.2	<0.7	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	ND	ND	ND	--	4		HLA 1991
03M07	06/92		--	--	--	--	<2.0	--	--	<5.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M07	08/24/92		--	--	--	--	<2.0	--	--	<5.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M07	08/08/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	<1.0	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M07	08/14/96		--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M08	1989		--	--	<0.6	<0.4	<0.2	13	--	**19**	--	--	--	<0.4	--	--	**8.6**	--	--	5.1	--	ND	ND	ND	--	4		HLA 1991
03M08	08/09/94		--	--	650	<10	**17**	<10	--	**250**	--	<10	<10	33	<5.0	<10	**150**	**53**	<10	**82**	25	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M08	10/04/95		120	620	24	13	<1.0	49	2.9	**67**	45	<1.0	--	13	1.4	<1.0	**40**	**14**	2.3	31	14	ND	ND	ND	--	4,7	a	USAF 1995 SWMPR
03M08	08/06/96		--	--	39	<1.0	0.8	<1.0	<1.0	**17**	31	0.3	31	11	<1.0	<1.0	**63**	**31**	5.0	39	27	18	6.0	ND	<1.0	6,7	d	USAF 1996 SWMPR
03M08	08/11/98		50	<200	<1.2	<1.0	<1.0	<1.0	<1.0	**12**	12	<1.0	12	7	2.1	<1.0	**23**	**20**	1.0	24	2.0	ND	ND	ND	--	5,7		USAF 1998 SWMPR
03M08	08/17/00		47	<500	4.7	<1.0	<1.0	3.0	6.0	<5.0	40	<1.0	--	4.3	<1.0	<1.0	**19**	**19**	1.2	27	3.2	3.9	1.5	7.5	--	7	e,f,g	USAF 2000 SWMPR
03M08	09/05/01	17	<50	236	<5.0	<5.0	<10	<5.0	<5.0	<25	43	<5.0	43	<5.0	<4.0	<5.0	**22**	**13**	<5.0	20	<5.0	<5.0	<5.0	<10	--	7	a, h	USAF 2001 SWMPR
03M08	09/20/02	14	<100	542	<10	<10	<10	<10	<10	<50	69	<10	69	<10	<10	<10	**34**	**23**	<10	28	<10	<10	<10	<20	--	7	i	USAF 2002 SWMPR
03M08	08/17/05	14	22	--	6.4	<1.0	0.5F	1.8	2.4	2.5	52	<1.0	52	1.7	<0.5	<1.0	**13**	**12**	0.9F	22	1.2	2.8	1.0F	3.9	--	7		USAF 2005 SWMPR
03M08	10/01/07	14	10.8	--	4.6	<1.0	0.7 F	1.4	7.7	<1.0	69 J	<1.0	69	1.2	<0.5	<1.0	**16**	**16**	0.98 F	27	1.2	<1.0	0.7 F	4.7	--	7	l	USAF 2007 SWMPR

TABLE LF03/FT09-2: CONCENTRATIONS (µg/L) OF NON-BTEX VOCs AND PCBs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	MIBK	2-Hexanone	DCDFM	Chloro-methane	Vinyl Chloride	Chloro-ethane	TCFM	Methylene Chloride	c-1,2-DCE	t-1,2-DCE	Total 1,2-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	TCE	PCE	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TMB	1,3.5-TMB	Naphtha-lene	PCB	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**2**	**NA**	**NA**	**5**	**70**	**100**	**70**	**NA**	**5**	**200**	**5**	**5**	**NA**	**75**	**600**	**NA**	**NA**	**NA**	**0.5**			**18 AAC 80.300**
03M09	08/09/94		--	--	2.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M09	10/24/96		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.0	6		USAF 1996 SWMPR
03M09	09/08/97		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.0	6	a	USAF 1997 SWMPR
03M09	08/11/98		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<990	12		USAF 1998 SWMPR
03M09	07/22/99		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<990	12		USAF 1999 SWMPR
03M09	08/16/00		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	12		USAF 2000 SWMPR
03M09	08/16/00		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	12	*	USAF 2000 SWMPR
03M09	07/17/01	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	12	a	USAF 2001 SWMPR
03M10	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M10	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	1.5	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M10	08/13/96		--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.4	<1.0	0.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M10	09/17/04	11	<10	<10	<1.0	<1.0	<0.5	<1.0	<2.0	<2.0	0.4J	<0.5	0.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M10	10/04/07	11	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2007 SWMPR
03M11	1989		--	--	<0.6	<0.4	<0.2	2.0	--	0.8	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M11	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M11	08/13/96		--	--	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	2.0	<1.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M12	1989		--	--	12.4	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M12	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	--	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M12	08/07/96		--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	1.0	<1.0	<1.0	<1.0	0.4	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M13	1989		--	--	<0.6	<0.4	0.6	--	--	<1.4	--	--	--	<0.4	--	--	1.1	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M13	06/92		--	--	--	--	<2.0	--	--	<5.0	2.9	<1.0	2.9	<1.0	<0.5	<0.5	<1.0	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M13	08/21/92		--	--	--	--	<2.0	--	--	--	4.1	<1.0	4.1	<1.0	<0.5	<0.5	1.1	<0.5	--	<2.0	--	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M13	08/10/94		--	--	<1.0	<1.0	0.5	<1.0	--	<1.0	--	<1.0	<1.0	<1.0	<0.5	<1.0	0.8	<0.5	<1.0	<1.0	<1.0	ND	ND	ND	--	4	a	USAF 1995 OU3,4,5 RI
03M13	10/04/95		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	4,7	a	USAF 1995 SWMPR
03M13	08/07/96		--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	<1.0	3.0	<1.0	<1.0	<1.0	0.7	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a	USAF 1996 SWMPR
03M13	08/12/98		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.7	<1.0	2.7	<1.0	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7	e	USAF 1998 SWMPR
03M13	07/23/99		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7		USAF 1999 SWMPR
03M13	08/15/00		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	7	a	USAF 2000 SWMPR
03M13	09/05/01	12	<10	<10	<1.0	<1.0	<2.0	<1.0	<1.0	<5.0	1.7	<1.0	1.7	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7	a, h	USAF 2001 SWMPR
03M13	09/05/01	12	<10	<10	<1.0	<1.0	<2.0	<1.0	<1.0	<5.0	1.6	<1.0	1.6	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7	a, h, *	USAF 2001 SWMPR
03M13	09/19/02	13	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.4	<1.0	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2002 SWMPR
03M13	08/27/03	13	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.2	<1.0	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
03M13	08/15/05	13	<10	--	0.46F	0.38F	0.59F	<1.0	<1.0	<1.0	3.2	<1.0	3.2	<1.0	<0.5	<1.0	0.52F	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7		USAF 2005 SWMPR
03M13	08/15/05	13	<10	--	0.54F	0.53F	0.55F	<1.0	<1.0	<1.0	3.3	<1.0	3.3	<1.0	<0.5	<1.0	0.51F	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	*	USAF 2005 SWMPR
03M13	08/31/06	13	<0.3	--	0.57F	<0.2	0.6F	<0.3	<0.2	<1.0	3.6	<0.2	--	<0.2	<0.1	<0.2	0.6F	<0.1	<0.2	<0.2	<0.3	<0.1	<0.2	<0.1	--	7	a	USAF 2006 SWMPR
03M13	10/04/07	13	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.2	<1.0	--	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2007 SWMPR
03M14	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	1.5	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M14	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	--	<0.5	<1.0	1.3	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
03M14	07/16/01	12	<10	<10	<1.0	<1.0	<2.0	<1.0	<1.0	<5.0	5.9	<1.0	5.9	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7	a	USAF 2001 SWMPR
03M14	08/27/03	13	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	5.5	<1.0	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
03M14	08/30/06	12	<0.3	--	<0.2	<0.2	<0.3	<0.3	<0.2	<1.0	6.1	<0.2	--	<0.2	<0.1	<0.2	0.8F	<0.1	<0.2	<0.2	<0.3	<0.1	<0.2	<0.1	--	7	a	USAF 2006 SWMPR
03M15	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	3.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M15	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	--	<0.5	<1.0	2.2	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
03M15	08/27/03	12	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.8	<1.0	2.8	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
03M15	08/27/03	12	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.8	<1.0	2.8	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7	*	USAF 2003 SWMPR
03M15	09/17/04	13	<10	<10	<1.0	<1.0	<0.5	<1.0	<2.0	<2.0	4.5	<0.5	4.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M15	08/30/06	13	<0.3	--	<0.2	<0.2	<0.3	<0.3	<0.2	<1.0	5.3	<0.2	--	<0.2	<0.1	<0.2	1.4	<0.1	<0.2	<0.2	<0.3	<0.1	<0.2	<0.1	--	7	a	USAF 2006 SWMPR
03M16	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M16	08/09/94		--	--	--	--	<0.5	<1.0	--	--	--	--	--	--	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
03M17	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M17	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	--	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI

TABLE LF03/FT09-2: CONCENTRATIONS (µg/L) OF NON-BTEX VOCs AND PCBs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	MIBK	2-Hexanone	DCDFM	Chloro-methane	Vinyl Chloride	Chloro-ethane	TCFM	Methylene Chloride	c-1,2-DCE	t-1,2-DCE	Total 1,2-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	TCE	PCE	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TMB	1,3.5-TMB	Naphtha-lene	PCB	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**2**	**NA**	**NA**	**5**	**70**	**100**	**70**	**NA**	**5**	**200**	**5**	**5**	**NA**	**75**	**600**	**NA**	**NA**	**NA**	**0.5**			**18 AAC 80.300**
03M18	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	1.8	--	--	<1.0	--	--	--	--	--	4		HLA 1991
03M18	08/09/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	--	<0.5	<1.0	1.4	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
03M18	08/14/98		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	4.7	<1.0	4.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7		USAF 1998 SWMPR
03M18	07/23/99		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	5.1	<1.0	5.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7		USAF 1999 SWMPR
03M18	08/15/00		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	4.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	7	f	USAF 2000 SWMPR
03M18	08/15/00		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	4.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	7	f, *	USAF 2000 SWMPR
03M18	09/05/01	12	<10	<10	<1.0	<1.0	<2.0	<1.0	<1.0	<5.0	6.0	<1.0	6.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7	a, h	USAF 2001 SWMPR
03M18	09/19/02	15	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	5.2	<1.0	5.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2002 SWMPR
03M18	09/17/04	14	<10	<10	<1.0	<1.0	<0.5	0.6J	<2.0	<2.0	6.4	<0.5	6.4	0.3J	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M18	08/15/05	14	<10	--	<1.0	1.0F	<1.0	<1.0	<1.0	<1.0	5.2	<1.0	5.2	<1.0	<0.5	<1.0	0.7F	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2005 SWMPR
03M18	08/30/06	14	<0.3	--	<0.2	<0.2	<0.3	<0.3	<0.2	<1.0	5.9	<0.2	--	<0.2	<0.1	<0.2	0.6F	<0.1	<0.2	<0.2	<0.3	<0.1	<0.2	<0.1	--	7	a	USAF 2006 SWMPR
03M18	10/05/07	14	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.7	<1.0	--	<1.0	<0.5	<1.0	0.6J	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2007 SWMPR
03M19	09/20/04		<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
03M19	09/20/04	11	<10	<10	<1.0	<1.0	0.4	<1.0	<2.0	<2.0	1.8	<0.5	1.8	<0.5	<0.5	<0.5	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7		USAF 2004 SWMPR
03M19	10/06/04	11	<10	<10	0.3	<1.0	0.4	<1.0	<2.0	<2.0	2.2	0.1	2.3	<0.5	<0.5	<0.5	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	7	k	USAF 2004 SWMPR
03M19	08/15/05	11	<10	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	1.1	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2005 SWMPR
03M19	08/30/06	11	<0.3	--	<0.2	<0.2	<0.3	<0.3	<0.2	<1.0	1.7	<0.2	--	<0.2	<0.1	<0.2	<0.2	<0.1	<0.2	<0.2	<0.3	<0.1	<0.2	<0.1	--	7	a	USAF 2006 SWMPR
03M19	10/05/07	11	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2007 SWMPR
EAMW2	08/26/03	13	<10	<10	31	<1.0	<1.0	2.6	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2003 SWMPR
EAMW3	09/19/02	16	<10	<10	2.5	<1.0	<1.0	2.5	<1.0	<0.5	1.9	<1.0	1.9	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	--	7		USAF 2002 SWMPR
EAMW3	08/12/05	14	<10	--	<1.0	<1.0	<1.0	1.1	<1.0	0.3F	1.5	<1.0	1.5	0.7F	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	--	7	a	USAF 2005 SWMPR
09M01	1989		--	--	<0.6	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
09M01	8/12/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	--	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
09M02	1988		--	--	--	--	1.0	--	--	--	--	--	0.5	--	--	--	0.6	--	--	--	--	--	--	--	--	4		USAF 1995 OU3,4,5 RI
09M02	1989		--	--	<0.6	0.41	0.6	--	--	<1.4	--	--	--	<0.4	--	--	0.8	--	--	<1.0	--	--	--	--	--	4		HLA 1991
09M02	08/11/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	0.6	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI
09M02	08/07/96		--	--	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	<1.0	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	<1.0	6,7	a,c	USAF 1996 SWMPR
09M02	08/12/98		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.9	<1.0	2.9	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7		USAF 1998 SWMPR
09M02	07/23/99		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.7	<1.0	2.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	5, 7		USAF 1999 SWMPR
09M02	08/16/00		<10	<10	1.2	<1.0	<1.0	<1.0	<1.0	<5.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ND	ND	ND	--	7	f	USAF 2000 SWMPR
09M03	1989		--	--	3.4	<0.4	<0.2	--	--	<1.4	--	--	--	<0.4	--	--	<0.6	--	--	<1.0	--	--	--	--	--	4		HLA 1991
09M03	08/12/94		--	--	<1.0	<1.0	<0.5	<1.0	--	<1.0	--	<1.0	--	<1.0	<0.5	<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	--	--	--	--	4	a	USAF 1995 OU3,4,5 RI

Notes:

- * Duplicate sample.
- -- Analysis not performed on sample.
- a No compounds other than those listed or noted were detected above method reporting limits, with the exception of BTEX compound shown on previous table
- b Chloromethane and vinyl chloride data reported are EPA Method 8010 results. Both compounds were reported at <5 µg/L using EPA Method 8260.
- c Additional compounds detected (µg/L): isopropylbenzene between 0.4 to 0.8
- e MS/MSD collected with this sample.
- f The analyte was positively identified but the associated numerical value is below the reporting limit.
- g Some non-detect analytes biased high or low due to a bias in the associated CCV or LCS/LCSD samples.
- h MIBK result is estimated due to a low bias in for the associated CCV sample.
- i Resample due to cooler temperature exceedance.
- j Sample no. 03M08 has detection limits for Methylene Chloride and 1,2-DCA greater than MCLs by an order of magnitude of 10 and 2 respectively. The sample was diluted prior to analysis because of high concentrations of 2-Hexanone.
- k Surface water sample collected in Garrison Slough- in line with well no. 03M19
- l Resample due to lack of trip blank with initial samples.
- m Additional compounds detected (µg/L): Acetone - 166 and isopropylbenzene - 5.9
- F Indicated Value greater than or equal to the Method Detection Limit (MDL)

- µg/L Micrograms per liter
- **Bold** Bold text indicates concentration exceeds MCL.
- MCL Maximum Contaminant Level.
- DCDFM Dichlorodifluoromethane
- TCFM Trichlorofluoromethane
- DCE Dichloroethene
- DCA Dichloroethane
- TCA Trichloroethane
- TCE Trichloroethene
- PCE Tetrachloroethene
- DCB Dichlorobenzene
- PCB Polychlorinated biphenyl
- TMB Trimethylbenzene
- MIBK Methyl Isobutyl Ketone (4-Methyl-2-pentanone)
- CCV Continued calibration verification
- LCS Laboratory control spike
- LCSD Laboratory control spike duplicate
- F Indicates value that is greater than or equal to the Method Detection Limit (MDL).
- J Indicates that the analyte was positively identified; however the quantitation is estimated.

Analytical Methods:

1. 8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 6010
12. 8082

This page intentionally left blank

This page intentionally left blank

TABLE LF03/FT09-3: CONCENTRATIONS (μg/L) OF SVOCs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Phenol	3&4-Methyl-phenol	Benzoic Acid	Naph-thalene	Dimethyl phthalate	Pentachloro-phenol	bis - (2-Ethylhexyl) phthalate	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**NA**	**1**	**6**			**18 AAC 80.300**
03M01	1989		--	--	--	3.6	--	--	--	13		HLA 1991
03M01	08/05/94		<10	<10	<50	<10	<10	<50	3.5	5,6		USAF 1995 OU3,4,5 RI
03M01	09/27/95		4.0	<10	4.0	<10	<10	<50	**9.0**	5,6	a	USAF 1995 SWMPR
03M01	08/07/96		3.0	<10	5.0	1.5	<10	<50	<10	5-7,13	a,e,f	USAF 1996 SWMPR
03M01	08/11/98		<1.0	<1.0	<51	<1.0	<1.0	<51	<1.0	5, 7		USAF 1998 SWMPR
03M01	07/22/99		<9.9	<9.9	<50	<9.9	<9.9	<50	<9.9	5, 7		USAF 1999 SWMPR
03M01	08/15/00		<9.9	<9.9	<50	<9.9	<9.9	<50	<9.9	5	l	USAF 2000 SWMPR
03M01	07/16/01	16	<11	<11	<54	<11	<11	<54	<11	5	a	USAF 2001 SWMPR
03M02	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M02	08/05/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M02	09/16/04	17	<5.3	<5.3	<110	<11	<5.3	<5.3	<5.3	5		USAF 2004 SWMPR
03M03	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M03	08/05/94		<10	<10	<50	<10	<10	<50	**78**	5,6		USAF 1995 OU3,4,5 RI
03M04	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M04	08/07/96		<10	<10	<50	<1.0	<10	<10	**97**	5-7,13	a, f	USAF 1996 SWMPR
03M05	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M05	08/08/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M05	08/14/96		<10	<10	<50	<1.0	<10	<50	<10	5-7,13	a, f	USAF 1996 SWMPR
03M05	09/16/04	17	<5.2	<5.2	<100	<10	<5.2	<5.2	<5.2	5	a	USAF 2004 SWMPR
03M06	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M06	08/08/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M06	08/14/96		<10	<10	<50	<1.0	<10	<50	**6.0**	5-7,13	a	USAF 1996 SWMPR
03M06	09/16/04											
03M07	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M07	08/08/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M07	08/14/96		<10	<10	<50	<1.0	<10	<50	**10**	5-7,13	a	USAF 1996 SWMPR
03M08	1989		--	--	--	0.6	--	--	--	13		HLA 1991
03M08	08/09/94		250	6,200	<1,000	<200	<200	<1,000	<200	5,6		USAF 1995 OU3,4,5 RI
03M08	10/04/95		<10	4,400	6,400	15	120	**20**	<10	5,6	a,b,c	USAF 1995 SWMPR
03M08	08/07/96		<10	<10	<50	22	17	<50	<10	5-7,13	a,c,d	USAF 1996 SWMPR
03M08	08/11/98		66	742	<57	<11	<11	<57	<11	5	g	USAF 1998 SWMPR
03M08	07/22/99		--	--	--	--	--	--	--		j	USAF 1999 SWMPR
03M08	08/17/00		33	<10	<50	12	19	<50	<10	5	k, l, n	USAF 2000 SWMPR
03M08	09/05/01	17	22	$720^{\perp}$	<50	<20	<20	<140	<20	5	a,o	USAF 2001 SWMPR
03M08	08/17/05	14	77F	$1,100^{\perp}$	1,400	<100	<100	<520	<100	5		USAF 2005 SWMPR
03M08	10/01/07	14	44 F	974	943	<50	<50	<25	<50	5	a	USAF 2007 SWMPR

TABLE LF03/FT09-3: CONCENTRATIONS (µg/L) OF SVOCs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Phenol	3&4-Methyl-phenol	Benzoic Acid	Naph-thalene	Dimethyl phthalate	Pentachloro-phenol	bis - (2-Ethylhexyl) phthalate	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**NA**	**1**	**6**			**18 AAC 80.300**
03M09	08/09/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M10	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M10	08/09/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M10	08/13/96		<10	<10	<50	<1.0	<10	<50	<10	5-7,13	a	USAF 1996 SWMPR
03M10	08/03/98		--	--	--	--	--	--	--	--	h	USAF 1998 SWMPR
03M10	09/17/04	11	<5.2	<5.2	<100	<10	<5.2	<5.2	<5.2	5		USAF 2004 SWMPR
03M10	10/04/07	11	<10	<20	<50	<10	<10	<50	<10	5	p	USAF 2007 SWMPR
03M11	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M11	08/09/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M11	08/13/96		<10	<10	<50	<1.0	<10	<50	<10	5-7,13	a	USAF 1996 SWMPR
03M11	08/03/98		--	--	--	--	--	--	--	--	h	USAF 1998 SWMPR
03M12	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M12	08/09/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M12	08/07/96		<10	<10	<50	<1.0	<10	<50	<10	5-7,13	a	USAF 1996 SWMPR
03M13	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M13	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M13	10/04/95		<10	<10	<50	<10	<10	<50	<10	5,6	a	USAF 1995 SWMPR
03M13	08/07/96		<10	<10	3.0	<1.0	<10	<50	<10	5-7,13	a	USAF 1996 SWMPR
03M13	08/12/98		<10	<10	<50	<10	<10	<50	<10	5, 7, 14	i	USAF 1998 SWMPR
03M13	07/23/99		<9.9	<9.9	<50	<9.9	<9.9	<50	<9.9	5,7,14		USAF 1999 SWMPR
03M13	08/15/00		<10	<10	<50	<10	<10	<50	<10	5	n	USAF 2000 SWMPR
03M13	07/17/01	12	<11	<11[⊥]	<53	<11	<11	<53	<11	5	a	USAF 2001 SWMPR
03M13	07/17/01	12.15	<11	<11[⊥]	<53	<11	<11	<53	<11	5	a, *	USAF 2001 SWMPR
03M13	08/15/05	13	<11	<21	<53	<11	<11	<53	<11	5		USAF 2005 SWMPR
03M13	08/15/05	13	<10	<21	<52	<10	<10	<52	<10	5	a,l,*	USAF 2005 SWMPR
03M13	08/31/06	13	<0.5	<0.8	1.1M	<0.6	<0.4	<0.7	0.7f	5		USAF 2006 SWMPR
03M13	10/04/07	13	<10	<21	<52	<10	<10	<52	<10	5	a	USAF 2007 SWMPR
03M14	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M14	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M14	07/16/01	12	<11	<11[⊥]	<57	<11	<11	<57	<11	5	a	USAF 2001 SWMPR
03M14	08/30/06	12	0.5UJ	0.8UJ	1.1M	0.6UJ	0.4UJ	0.7UJ	0.4UJ	5		USAF 2006 SWMPR
03M15	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M15	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M15	09/17/04	13	<5.2	<5.2	<100	<10	<5.2	<5.2	<5.2	5		USAF 2004 SWMPR
03M15	08/30/06	13	0.5UJ	0.8UJ	1.1M	0.6UJ	0.4UJ	0.6UJ	0.4UJ	5		USAF 2006 SWMPR
03M16	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M16	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI

TABLE LF03/FT09-3: CONCENTRATIONS (µg/L) OF SVOCs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Phenol	3&4-Methyl-phenol	Benzoic Acid	Naph-thalene	Dimethyl phthalate	Pentachloro-phenol	bis - (2-Ethylhexyl) phthalate	Analytical Methods	Notes	Reference
MCLs			**NA**	**NA**	**NA**	**NA**	**NA**	**1**	**6**			**18 AAC 80.300**
03M17	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M17	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M18	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
03M18	08/10/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
03M18	08/14/98		<9.9	<9.9	<50	<9.9	<9.9	<50	<9.9	5,7,14		USAF 1998 SWMPR
03M18	07/23/99		<9.9	<9.9[1]	<50	<9.9	<9.9	<50	<9.9	5	a	USAF 1999 SWMPR
03M18	08/15/00		<10	<10	<50	<10	<10	<50	<10	5	l	USAF 2000 SWMPR
03M18	07/17/01	12	<11	<11[1]	<54	<11	<11	<54	<11	5, 7	a	USAF 2001 SWMPR
03M18	09/17/04	14	<5.2	<5.2	<100	<10	<5.2	<5.2	<5.2	5		USAF 2004 SWMPR
03M18	08/15/05	14	<10	<20	<50	<10	<10	<50	<10	5	a,l	USAF 2005 SWMPR
03M18	08/30/06	14	0.5UJ	0.8UJ	1.0M	0.6UJ	0.4UJ	0.6UJ	0.4UJ	5		USAF 2006 SWMPR
03M18	10/05/07	14	<10	<20	<50	<10	<10	<50	<10	5	a	USAF 2007 SWMPR
03M19	09/30/03		<15	<30[1]	<74	<15	<15	<74	<15	5		USAF 2003 SWMPR
03M19	09/20/04	11	<5.0	<5.0	<100	<10	<5.0	<5.0	5.0	5		USAF 2004 SWMPR
03M19	09/20/04	11	<5.0	<5.0	<100	<10	<5.0	<5.0	<5.0	5	*	USAF 2004 SWMPR
03M19	10/06/04	11	<52	<52	<1000	<100	<52	<52	<52	5		USAF 2004 SWMPR
03M19	08/15/05	11	<10	<20	<50	<10	<10	<50	<10	5	l*	USAF 2005 SWMPR
03M19	08/30/06	11	0.5UJ	0.8UJ	1.0M	0.6UJ	0.4UJ	0.6UJ	0.4UJ	5		USAF 2006 SWMPR
03M19	10/05/07	11	<10	<21	<52	<10	<10	<52	<10	5	p	USAF 2007 SWMPR
09M01	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
09M01	08/12/94		<10	<10	<50	<10	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
09M02	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
09M02	08/11/94		<10	<10	<50	<10	1.1	<50	<10	5,6		USAF 1995 OU3,4,5 RI
09M02	08/07/96		<10	<10	<50	<1.0	<10	<50	<10	5-7,13	a	USAF 1996 SWMPR
09M02	08/12/98		<1.0	<1.0	<50	<1.0	<1.0	<50	<1.0	5,7,14		USAF 1998 SWMPR
09M02	07/23/99		<9.9	<9.9	<50	<9.9	<1.0	<50	<9.9	5,7,14		USAF 1999 SWMPR
09M02	08/16/00		<10	33	<50	<10	<10	<50	<10	5	l	USAF 2000 SWMPR
09M03	1989		--	--	--	<0.5	--	--	--	13		HLA 1991
09M03	08/12/94		<10	<10	<50	1.3	<10	<50	<10	5,6		USAF 1995 OU3,4,5 RI
EAMW03	08/12/05	14	<10	<20	<50	<10	<10	<50	<10	5	a	USAF 2005 SWMPR

TABLE LF03/FT09-3: CONCENTRATIONS (µg/L) OF SVOCs IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Notes:

*	duplicate sample
--	Analysis not performed on sample
a	No semivolatile compounds other than those listed were detected above reporting limits.
b	Other compounds detected: alpha-BHC - 0.057 µg/L.
c	Due to matrix interference some SVOC results may exhibit a slight negative bias.
d	Other compounds detected: alpha-BHC - 0.10 mg/L, beta-BHC - 0.70 mg/L, Heptachlor Epoxide - 0.19 mg/L, Acenaphthylene - 4.5 mg/L and Fluorene - 0.19 mg/L.
e	Other compounds detected: Acenaphthylene - 1.1 mg/L.
f	The analyte was positively identified but the associated numerical value is below the reporting limit.
g	Other compound detected: 1,4-Dichlorobenzene - 13 mg/L.
h	Only parameters were collected at this well.
i	MS/MSD sample collected with this sample.
j	No sample collected due to no/low water.
k	Other compounds detected: 1,4-dichlorobenzene - 12.1 µg/L.
l	Some non-detected analytes biased high or low due to a bias in a sample surrogate or the associated LCS/LCSD samples.
M	A matrix effect was present.
n	Tentatively identified compounds (butanoic acid, pentanoic acid, 2-methyl-pentanoic acid, etc.) detected at very high concentrations.
o	Resample due to cooler temperature exceedance.
p	Other compound detected: 3,3'-dichlorobenzidine - 3.9 F µg/L.
UJ	The analyte was not detected; however, the quantitation limit is estimated due to discrepancies in the associated quality control criteria
µg/L	Micrograms per liter
MCL	Maximum Contaminant Level
Bold	Bold text indicates concentration exceeds MCL.

Analytical Methods:

1.	8021	3.	ADEC 8100M	5.	8270	7.	8260	9.	AK101	11.	7421	13.	8310
2.	ADEC 8015M	4.	8010	6.	8080	8.	8240	10.	AK102	12.	6020	14.	6010

TABLE LF03/FT09-4: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Notes	Reference
MCLs			**6**	**50 (MCL 10)**	**2,000**	**4**	**5**	**100**	**NA**	**1,300**[1]	**15**[1]	**2**	**100**	**50**	**NA**	**2**	**NA**	**NA**		**18 AAC 80.300**
EAMW2	08/26/03	13	<1.0	21	169	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	<4.0	<10	<2.0	<1.0	<50	<25		USAF 2003 SWMPR
EAMW3	09/19/02	16	--	31	804	--	<2.1	<4.1	--	--	<2.1	--	--	<5.1	<2.1	--	--	--		USAF 2002 SWMPR
EAMW3	08/17/05	14	--	39	918J	--	0.7F	3.2F	--	--	0.8F	0.7	--	5.4F	<2.0	--	--	--		USAF 2005 SWMPR
<u>DISSOLVED</u>																				
03M01	6/93		<69.4	3.0	860	<0.814	<4.70	<5.42	<4.05	<2.65	<1.0	--	<17.9	--	4.3	--	<3.84	<3.44		USAF 1993 SWMPR
03M01	8/93		<69.4	2.3	1,100	0.82	<4.70	<5.42	<4.05	<2.65	--	--	<17.9	--	<2.87	--	4.4	5.0		USAF 1993 SWMPR
03M01	08/05/94		<1.0	10.5	772	<2.0	<1.0	11.6	<1.0	<1.0	<1.0	--	5.0	--	<1.0	--	4.1	4.9		USAF 1995 OU3,4,5 RI
03M01	10/06/95		--	4.9	396	--	--	<5.0	--	<4.0	1.2	--	<9.0	--	--	--	<4.0	<6.0		USAF 1995 SWMPR
03M02	08/05/94		<1.0	25.3	251	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	2.6	--	<1.0	--	1.5	4.1		USAF 1995 OU3,4,5 RI
03M03	08/05/94		<1.0	5.3	143	<2.0	<1.0	2.0	<1.0	<1.0	<1.0	--	3.3	--	<1.0	--	1.6	5.9		USAF 1995 OU3,4,5 RI
03M05	06/12/92		<200	--	180	<3.0	<10	<20	<20	<20	--	--	<30	--	<20	--	<30	--		USAF 1995 OU3,4,5 RI
03M05	08/08/94		<1.0	22.3	179	<1.0	<1.0	<1.0	<1.0	<1.0	1.3	--	1.9	--	<1.0	--	<1.0	8.5		USAF 1995 OU3,4,5 RI
03M06	06/12/92		<200	--	150	<3.0	<10	<20	<20	<20	--	--	<30	--	<20	--	<30	--		USAF 1995 OU3,4,5 RI
03M06	08/08/94		<1.0	14.3	132	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	1.0	--	<1.0	--	<1.0	6.3		USAF 1995 OU3,4,5 RI
03M07	06/12/92		<200	--	120	<3.0	<10	<20	<20	<20	--	--	<30	--	<20	--	<30	--		USAF 1995 OU3,4,5 RI
03M07	08/08/94		<1.0	4.5	128	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--	<1.0	--	<1.0	5.5		USAF 1995 OU3,4,5 RI
03M08	08/09/94		1.6	3.5	406	<2.0	<1.0	26	2.1	172	**18.6**	--	30.6	--	<1.0	--	4.7	172		USAF 1995 OU3,4,5 RI
03M08	10/04/95		--	5.7	309	--	--	9.1	--	<40	1.3	--	16.9	--	--	--	<4.0	32.2		USAF 1995 SWMPR
03M08	09/05/01	16.69	0.71	5.3	444	<0.5	<2	16.4	1.31	<3	1.52	--	9.01	<2.5	<1	<0.5	<10	<10	b	USAF 2001 SWMPR
03M09	08/09/94		<1.0	25.2	188	<1.0	<1.0	<1.0	1.4	<1.0	1.5	--	3.8	--	<1.0	--	<1.0	3.6		USAF 1995 OU3,4,5 RI
03M10	08/09/94		<1.0	24.3	145	<1.0	<1.0	<1.0	<1.0	<1.0	4.2	--	2.9	--	<1.0	--	<1.0	3.8		USAF 1995 OU3,4,5 RI
03M10	08/03/98		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		USAF 1998 SWMPR
03M11	08/09/94		<1.0	16.0	318	<2.0	<1.0	1.8	2.6	7.1	<1.0	--	4.8	--	<1.0	--	<1.0	7.1		USAF 1995 OU3,4,5 RI
03M11	08/03/98		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		USAF 1998 SWMPR
03M12	08/09/94		4.8	**362.0**	182	1.6	3.8	92	18	12	10.6	--	9.3	--	<1.0	--	20.9	8.3		USAF 1995 OU3,4,5 RI
03M13	08/10/94		<1.0	6.7	166	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	--	1.9	--	<1.0	--	<1.0	2.8		USAF 1995 OU3,4,5 RI
03M13	10/04/95		--	13.3	157	--	--	6.0	--	<4.0	1.1	--	12.2	--	--	--	<4.0	<6.0		USAF 1995 SWMPR
03M14	08/10/94		<1.0	18.6	178	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	2.5	--	<1.0	--	<1.0	3.4		USAF 1995 OU3,4,5 RI
03M15	08/10/94		<1.0	4.5	106	<1.0	<1.0	<1.0	1.5	1.7	1.2	--	3.2	--	<1.0	--	<1.0	<2.0		USAF 1995 OU3,4,5 RI
03M16	08/10/94		<1.0	5.3	89.5	<1.0	<1.0	<1.0	1.8	1.1	<1.0	--	2.0	--	<1.0	--	<1.0	<2.0		USAF 1995 OU3,4,5 RI
03M17	08/10/94		1.8	**69.1**	132	1.2	2.9	8.6	3.6	4.8	3.4	--	2.4	--	<1.0	--	3.8	5.5		USAF 1995 OU3,4,5 RI
03M18	08/10/94		<1.0	17.6	180	<1.0	<1.0	<1.0	1.5	<1.0	<1.0	--	2.9	--	<1.0	--	<1.0	<2.0		USAF 1995 OU3,4,5 RI
09M01	08/12/94		<1.0	<3.0	156	<1.0	<1.0	<1.0	2.0	2.8	<1.0		5.2	--	<1.0	--	<1.0	2.1		USAF 1995 OU3,4,5 RI

TABLE LF03/FT09-4: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Notes	Reference
MCLs			**6**	**50 (MCL 10)**	**2,000**	**4**	**5**	**100**	**NA**	**1,300[1]**	**15[1]**	**2**	**100**	**50**	**NA**	**2**	**NA**	**NA**		**18 AAC 80.300**
09M03	08/12/94		<1.0	14.9	140	<1.0	<1.0	<1.0	<1.0	<1.0	2.2	--	3.4	--	<1.0	--	<1.0	2.8		USAF 1995 OU3,4,5 RI
Background Concentrations																				
BGM	09/94		--	8.3	101	<1.0	<1.0	<1.0	1.3	2.4	<1.0	--	2.3	--	<1.0	--	<1.0	5.6		USAF 1994 SWMPR
BGMX	09/94		--	23.0	160	<1.0	<1.0	<1.0	3.0	4.0	<1.0	--	5.0	--	<1.0	--	1.0	19		USAF 1994 SWMPR
BGUCL	09/94		--	14.5	129	<1.0	<1.0	<1.0	<3.0	3.1	<1.0	--	3.2	--	<1.0	--	1.0	10		USAF 1994 SWMPR
TOTAL																				
03M01	1988		--	**65**	**15,300**	--	--	**1,890**	--	**5,440**	**1,130**	--	**18,400**	--	--	--	2,430	18,400		USAF 1995 OU3,4,5 RI
03M01	08/21/92		<200	--	1,100	<3.0	<10	<20	<20	<20	--	--	<30	--	<20	--	<30	110		USAF 1995 OU3,4,5 RI
03M01	06/93		<69	3.0	970	<0.8	<4.7	<5.4	<4.1	<2.7	2.0	--	<18	--	4.3	--	<3.8	44		USAF 1993 SWMPR
03M01	08/93		<69	32	1,200	1.1	<4.7	9.2	<4.1	9.7	--	--	20	--	<2.9	--	14	170		USAF 1993 SWMPR
03M01	08/05/94		3.5	33	1,070	<2.0	<1.0	16	6.7	34	**36**	--	24	--	<1.0	--	27	390		USAF 1995 OU3,4,5 RI
03M01	10/06/95		--	7.0	424	--	--	<5.0	--	<4.0	2.4	--	<9.0	--	--	--	<4.0	<6.0		USAF 1995 SWMPR
03M01	08/07/96		3.4	3.0	672	<1.0	<1.0	<6.0	<11	<6.0	1.4	--	<15	7.0	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M01	08/11/98		<227	<114	304	<2.3	<23	<11	<11	<11	<114	--	<2.3	<227	<11	<5.7	<11	<23		USAF 1998 SWMPR
03M01	07/22/99		<222	<111	587	<2.2	<22	<11	<11	<11	<111	--	<22	<222	<11	<5.6	<11	<22		USAF 1999 SWMPR
03M01	08/15/00		<22	13	732	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<28	<222		USAF 2000 SWMPR
03M01	07/16/01	16	<1.0	7.0	955	<1.0	<2.0	8.4	<0.8	<6.2	<2.1	--	5.4	12	<2.0	<1.0	<21	<26		USAF 2001 SWMPR
03M02	08/05/94		<1.0	**81**	503	<2.0	**12**	29	16	90	**62**	--	41	--	<1.0	--	34	1,030		USAF 1995 OU3,4,5 RI
03M02	08/28/03	16	1.1	<20	198	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	<4.0	<10	<2.0	<1.0	<50	<25		USAF 2003 SWMPR
03M02	09/16/04	17	--	15	181	--	0.3	0.7	--	--	1.2	<0.0002	--	<0.5	<2.0	--	--	--		USAF 2004 SWMPR
03M02	09/16/04	17	--	15	180	--	0.2	0.6	--	--	1.0	<0.0002	--	0.04	0.2	--	--	--	*	USAF 2004 SWMPR
03M03	08/05/94		<1.0	12	249	<2.0	<1.0	14	6.5	56	**16**	--	20	--	<1.0	--	20	64		USAF 1995 OU3,4,5 RI
03M04	08/07/96		2.0	27	186	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	<2.0	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M05	08/08/94		1.0	45	311	<1.0	<1.0	17	9.8	64	**19**	--	28	--	1.0	--	18	99		USAF 1995 OU3,4,5 RI
03M05	08/14/96		<2.0	33	246	<1.0	<1.0	<6.0	<11	8.7	5.9	--	<15	<73	<4.0	<1.0	<8.0	15		USAF 1996 SWMPR
03M05	09/20/02	20	--	18	204	--	<2.0	<4.0	--	--	<2.0	--	--	<5.0	<2.0	--	--	--		USAF 2002 SWMPR
03M05	09/20/02	20	--	20	204	--	<2.0	<4.0	--	--	<2.0	--	--	<5.0	<2.0	--	--	--	*	USAF 2002 SWMPR
03M05	09/16/04	17	--	19	252	--	<2.0	0.3	--	--	0.2	<0.0002	--	0.2	<2.0	--	--	--		USAF 2004 SWMPR
03M06	08/08/94		1.0	22	192	<1.0	<1.0	9.1	3.3	50	**15**	--	15	--	1.0	--	11	43		USAF 1995 OU3,4,5 RI
03M06	08/14/96		<2.0	13	133	<1.0	<1.0	<6.0	<11	<6.0	2.5	--	<15	<73	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M07	08/08/94		1.0	5.1	131	<1.0	<1.0	1.5	<1.0	12	1.4	--	4.3	--	1.0	--	<1.0	30		USAF 1995 OU3,4,5 RI
03M07	08/14/96		<2.0	4.0	129	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	<73	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M08	08/09/94		1.5	5.4	375	<1.0	1.9	21	2.3	20	11	--	27	--	1.0	--	4.9	249		USAF 1995 OU3,4,5 RI
03M08	10/04/95		--	<5.0	371	--	--	9.1	--	<40	**24**	--	16	--	--	--	<4.0	250		USAF 1995 SWMPR
03M08	08/07/96		2.5	2.3	388	<1.0	<1.0	<6.0	<11	<300	4.2	--	<15	15	<4.0	<1.0	<8.0	168		USAF 1996 SWMPR
03M08	08/11/98		<227	<114	200	**19**	<23	<11	<11	<11	<114	--	<23	<227	18	<5.7	13	58		USAF 1998 SWMPR
03M08	08/17/00		<22	<11	691	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<2.2	350		USAF 2000 SWMPR
03M08	09/05/01	17	<1.0	5.7	430	<1.0	<2.0	16	1.5	<6.0	3.3	--	9.7	<5.0	<2.0	<1.0	<20	<25	b	USAF 2001 SWMPR
03M08	09/20/02	14	--	6.8	440	--	<2.1	11	--	--	**31**	--	--	5.7	<2.1	--	--	--		USAF 2002 SWMPR
03M08	08/17/05	14	--	9.9F	589	--	0.8F	9.3	--	--	9.6	0.3	--	7.2F	<2.0	--	--	--		USAF 2005 SWMPR
03M08	10/01/07	14	--	<10	282	--	<2.0	<4.0	--	--	0.8 F	<0.2	--	3.3 F	<2.0	--	--	--	12, 15	USAF 2007 SWMPR

TABLE LF03/FT09-4: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Notes	Reference
MCLs			**6**	**50 (MCL 10)**	**2,000**	**4**	**5**	**100**	**NA**	**1,300[1]**	**15[1]**	**2**	**100**	**50**	**NA**	**2**	**NA**	**NA**		**18 AAC 80.300**
03M09	08/09/94		1.0	45	208	<1.0	<1.0	2.2	3.3	15	1.9	--	10	--	1.0	--	3.4	18		USAF 1995 OU3,4,5 RI
03M10	08/09/94		1.0	35	169	<1.0	<1.0	2.1	1.1	15	1.5	--	7.7	--	1.0	--	2.1	20		USAF 1995 OU3,4,5 RI
03M10	08/13/96		<2.0	19	158	<1.0	<1.0	<6.0	<11	<6.0	12	--	<15	<73	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M10	09/17/04	11	--	32	158	--	<2.0	<4.0	--	--	0.1J	<0.0002	--	0.1J	0.1JB	--	--	--		USAF 2004 SWMPR
03M10	10/04/07	11	--	17	107	--	<2.0	<4.0	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--	12, 15	USAF 2007 SWMPR
03M11	08/09/94		1.0	47	400	<1.0	<1.0	5.9	7.8	40	10	--	18	--	1.0	--	13	50		USAF 1995 OU3,4,5 RI
03M11	08/13/96		<2.0	37	310	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	<73	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M12	08/09/94		1.8	**71**	340	<1.0	1.1	24	23	136	**41**	--	53	--	1.0	--	43	131		USAF 1995 OU3,4,5 RI
03M12	08/07/96		2.0	9.6	161	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	<2.0	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M13	08/10/94		<1.0	11	189	<1.0	<1.0	1.2	1.6	5.7	1.3	--	4.9	--	<1.0	--	1.4	20		USAF 1995 OU3,4,5 RI
03M13	10/04/95		--	13	163	--	--	<5.0	--	<4.0	1.5	--	9.7	--	--	--	<4.0	11		USAF 1995 SWMPR
03M13	08/07/96		<2.0	9.4	153	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	<2.0	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
03M13	08/12/98		<227	<114	150	<2.3	<23	<11	<11	<11	<114	--	<23	<227	<1.4	<5.7	<11	<23		USAF 1998 SWMPR
03M13	07/23/99		<222	<111	126	<2.2	<22	<11	<11	<11	<111	--	<22	<222	<11	<5.6	<11	<22		USAF 1999 SWMPR
03M13	08/15/00		<22	13	143	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<2.2	<56		USAF 2000 SWMPR
03M13	09/05/01	12	<1.0	16	144	<1.0	<2.0	<6.0	1.3	<6.0	<2.0	--	2.8	<5.0	<2.0	<1.0	<20	<25	b	USAF 2001 SWMPR
03M13	09/05/01	12.15	<1.0	15	147	<1.0	<2.0	<6.0	1.2	<6.0	<2.0	--	2.7	<5.0	<2.0	<1.0	<20	<25	b, *	USAF 2001 SWMPR
03M13	09/19/02	13	--	14	148	--	<2.0	<4.0	--	--	<2.0	--	--	<5.0	<2.0	--	--	--		USAF 2002 SWMPR
03M13	08/27/03	13	<1.0	<20	180	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	<4.0	<10	<2.0	<1.0	<50	<25		
03M13	08/15/05	13	--	18	211	--	<2.0	<4.0	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--		USAF 2005 SWMPR
03M13	08/15/05	13	--	18	227	--	<2.0	<4.0	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--	*	USAF 2005 SWMPR
03M13	08/31/06	13	--	18J	200	--	0.5F	0.4F	--	--	0.1F	<0.1	--	0.7J	<0.1	--	--	--	12	USAF 2006 SWMPR
03M13	10/04/07	13	--	<10	152	--	<2.0	<4.0	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--	12, 15	USAF 2007 SWMPR
03M14	08/10/94		<1.0	28	218	<1.0	<1.0	2.9	2.3	25	5.6	--	8.2	--	<1.0	--	5.4	28		USAF 1995 OU3,4,5 RI
03M14	07/16/01	12	<1.0	25	203	<1.0	<2.0	<6.0	<0.8	<6.0	<2.0	--	3.2	<5.0	12	<1	<20	<25		USAF 2001 SWMPR
03M14	08/27/03	13	<1.0	<20	203	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	<4.0	<10	<2.0	<1.0	<50	<25		USAF 2003 SWMPR
03M14	08/30/06	12	--	25J	220	--	0.3F	0.5F	--	--	0.2F	<0.1	--	0.1UJ	<0.1	--	--	--	12	USAF 2006 SWMPR
03M15	08/10/94		<1.0	16	323	<1.0	1.1	22	18	99	**22**	--	40	--	<1.0	--	30	71		USAF 1995 OU3,4,5 RI
03M15	08/27/03	12	<1.0	<20	109	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	6.8	<10	<2.0	<1.0	<50	<25		USAF 2003 SWMPR
03M15	09/17/04	13	--	6J	151	--	0.1J	<4.0	--	--	0.1J		--	0.4J	<2.0	--	--	--		USAF 2004 SWMPR
03M15	08/30/06	13	--	3.5UJ	110	--	0.2F	0.4F	--	--	0.2F	<0.1	--	0.7J	<0.1	--	--	--	12	USAF 2006 SWMPR
03M16	08/10/94		<1.0	**100**	389	<1.0	<1.0	19	16	84	**38**	--	33	--	<1.0	--	29	92		USAF 1995 OU3,4,5 RI
03M17	08/10/94		<1.0	11	269	<1.0	<1.0	10	6.4	48	14	--	15	--	<1.0	--	15	51		USAF 1995 OU3,4,5 RI
03M18	08/10/94		<1.0	38	632	<1.0	2.5	32	26	252	**51**	--	57	--	1.4	--	49	126		USAF 1995 OU3,4,5 RI
03M18	08/14/98		<227	<114	182	<2.3	<23	<11	<11	<11	<114	--	<23	<227	<11	<5.7	<11	<23		USAF 1998 SWMPR
03M18	07/23/99		<222	<111	203	<2.2	<22	<11	<11	<11	<111	--	<22	<222	<11	<5.6	<11	<22		USAF 1999 SWMPR
03M18	08/15/00		<22	26	184	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<2.2	<56		USAF 2000 SWMPR
03M18	08/15/00		<22	27	180	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<2.2	<56	*	USAF 2000 SWMPR
03M18	09/05/01	12	<1.0	26	198	<1.0	<2.0	<6.0	1.4	<6.0	<2.0	--	2.4	<5.0	<2.0	<1.0	<20	<25	b	USAF 2001 SWMPR
03M18	09/19/02	15	--	25	183	--	<2.0	<4.0	--	--	<2.0	--	--	<5.0	<2.0	--	--	--		USAF 2002 SWMPR
03M18	09/17/04	14	--	27	255	--	<2.0	0.03JB	--	--	0.1J		--	0.4J	<2.0	--	--	--		USAF 2004 SWMPR
03M18	08/15/05	14	--	27	211	--	<2.0	<4.0	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--		USAF 2005 SWMPR
03M18	08/30/06	14	--	30J	210	--	<0.1	0.4F	--	--	0.1F	<0.1	--	0.1UJ	<0.1	--	--	--	12	USAF 2006 SWMPR
03M18	10/05/07	14	--	26	192	--	<2.0	5.1	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--	12, 15	USAF 2007 SWMPR

TABLE LF03/FT09-4: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, LF03/FT09, INACTIVE BASE LANDFILL/FIRE TRAINING AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Notes	Reference
MCLs			**6**	**50 (MCL 10)**	**2,000**	**4**	**5**	**100**	**NA**	**1,300[1]**	**15[1]**	**2**	**100**	**50**	**NA**	**2**	**NA**	**NA**		**18 AAC 80.300**
03M19	09/30/03	10	<1.0	<20	169	<1.0	<2.0	<7.0	<3.0	<6.0	<2.0	--	<4.0	<10	<2.0	<1.0	<50	<25		USAF 2003 SWMPR
03M19	09/20/04	11	--	13	207	--	<2.0	0.3	--	--	0.2	<0.0003	--	0.5	0.2	--	--	--		USAF 2004 SWMPR
03M19	08/15/05	11	--	12	178	--	<2.0	<4.0	--	--	<1.0	0.5	--	<10	<2.0	--	--	--		USAF 2005 SWMPR
03M19	08/30/06	11	--	14J	160	--	0.2F	0.5F	--	--	<0.1	<0.1	--	0.1UJ	<0.1	--	--	--	12	USAF 2006 SWMPR
03M19	10/05/07	11	--	<10	155	--	<2.0	8.9	--	--	<1.0	<0.2	--	<10	<2.0	--	--	--	12, 15	USAF 2007 SWMPR
09M01	08/12/94		<1.0	5.5	208	<1.0	<1.0	2.3	3.6	19	2.4	--	8.8	--	<1.0	--	3.7	26		USAF 1995 OU3,4,5 RI
09M02	08/11/94		<1.0	25	473	<1.0	2.0	4.7	3.2	27	8.8	--	14	--	<1.0	--	7.9	37		USAF 1995 OU3,4,5 RI
09M02	08/07/96		<2.0	17	360	<1.0	<1.0	<6.0	<11	<6.0	<1.0	--	<15	5.0	<4.0	<1.0	<8.0	<12		USAF 1996 SWMPR
09M02	08/12/98		<227	<114	342	<2.3	<23	<11	<11	<11	<114	--	<23	<227	<11	<5.7	<11	<23		USAF 1998 SWMPR
09M02	07/23/99		<222	<111	321	<2.2	<22	<11	<11	<11	<111	--	<22	<222	<11	<5.6	<11	<22		USAF 1999 SWMPR
09M02	08/16/00		<22	20	380	<0.8	<1.1	<22	<3.3	<67	<67	--	<67	<11	<4.4	<0.2	<2.2	<56		USAF 2000 SWMPR
09M03	08/12/94		<1.0	16	176	<1.0	<1.0	4.3	2.4	25	6.6	--	8.3	--	<1.0	--	7.7	33		USAF 1995 OU3,4,5 RI
<u>Background Concentrations</u>																				
BGM	9/94		<1.0	25	269	<1.0	<1.0	20	14	75	21	--	31	--	<1.0	--	24	63		USAF 1994 SWMP
BGMX	9/94		2.0	63	420	<1.0	<1.0	46	31	140	48	--	77	--	<1.0	--	52	120		USAF 1994 SWMP
BGUCL	9/94		<2.0	37	342	<1.0	<1.0	30	21	105	33	--	49	--	<1.0	--	36	89		USAF 1994 SWMP

Notes:

b Resample due to cooler temperature exceedance.
* Duplicate sample
-- Analysis not performed on sample.
µg/L micrograms per liter

MCL Maximum Contaminant Level
1 EPA Action Level
J Indicates that the analyte was positively identified; however the quantitation is estimated.
B Analyte was detected in the laboratory method blank.
F The analyte was positively identified but the associated numerical value is below the reporting limit.
UJ The analyte was not detected; however, the quantitation limit is estimated due to discrepancies in the associated quality control criteria.
Bold Bold text indicates concentration exceeds MCL, EPA Action Level, or BGUCL.

Analytical Methods:
1. 8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 7421
12. 6020
13. 8310
14. 6010
15. 7470

7 OPERABLE UNIT 6

OU6 consists of one source area where fuel contaminants were released into the soil and groundwater.

Source Area	Remedy or Status as Identified in the ROD
WP38 Ski Lodge Well Contamination	Monitoring, ICs

RAOs

RAOs are developed to specify actions and contaminant levels necessary to protect human health and the environment. RAOs define the COCs, exposure routes and receptors, and remediation levels, which are defined as acceptable contaminant levels for each exposure route.

Source Area	RAO
WP38	Prevent ingestion/direct contact with groundwater containing contaminants in excess of MCLs or having non-zero Maximum Contaminant Level Goals (MCLGs)
	For contaminants for which there are no MCLs, prevent the inhalation of vapors from groundwater that contains carcinogens that could result in a cancer risk higher than 1E-4 to 1E-6
	For contaminants for which there are no MCLs, prevent ingestion or direct contact with groundwater containing non-carcinogenic toxic substances at concentrations that could cause adverse effects (result in a Hazard Index of more than 1)
	Attain residual contaminant levels that would restore the groundwater as a potential source of drinking water

BTEX constituents are COCs for OU6 (USAF, 1994e). The following table lists RAOs and ARARs established to address groundwater quality at the OU 6 source area.

COC	RAOs/Final Groundwater Remediation Goals (µg/L)
Benzene	5
Toluene	1,000
Ethylbenzene	700
Xylenes	10,000

Groundwater cleanup levels are action-specific ARARs that are technology or activity based requirements or limitations relating to specific remedial actions. Compliance with action-specific ARARs was evaluated as part of the detailed evaluation of alternatives conducted in the Feasibility Study process.

The results from the RI and BLRA indicated that contaminant concentrations present in the site soils are low and that there is currently no identifiable source of further groundwater contamination. Therefore, no remediation of the site soils was deemed necessary, and no RAOs were developed for the site soils.

7.1 Chronology of Events

November 1982-July 1991	IRP Investigations and Reports.
November 1989-	Eielson AFB added to the NPL of federal Superfund sites by the USEPA
April 1993-	Public meeting on OU6 Proposed Plan
March 1994	OU6 RI/FS completed (USAF, 1994c).
September 1994-	OU6 ROD signed (USAF, 1994e).
August 1998	OU6 Remedial Action Summary Report completed (USAF, 1998e).
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
September 2003	Second Five-Year ROD Review completed (USAF, 2003c).

7.2 Community Involvement

The RI/FS documents (USAF, 1994c) and the Proposed Plan for OU6 of Eielson AFB were released to the public in March 1994. The documents were made available in both the Administrative Record office at the Base and in an information repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks.

The Proposed Plan for OU6 was advertised twice in two local newspapers, and more than 3,500 copies were added as an insert in the Base newspaper and delivered to every home in the Base housing area. A news release announcing the Proposed Plan and a public meeting on 12 April 1994 was sent to all local news media (radio, television, newspapers), and the story ran on the front page of the Base newspaper. The meeting was advertised on Base access cable channel and in the Base information bulletin, and on at least one local area radio station as well. The First Sergeants Group (the senior enlisted leadership for each unit on Base) was briefed on the plan and public meeting, to encourage their people to attend. Copies of the plan were delivered to various information repositories and to the North Pole City Hall.

A public meeting for the Proposed Plan was held on 12 April 1994. At that meeting, representatives from the Air Force, ADEC, and USEPA answered questions about problems at the sites and the remedial alternatives under consideration. Approximately 10 members of the public attended.

The public comment period on the Proposed Plan ran from 22 March through 22 April 1994. Comments received during that period, and the Air Force responses, are summarized in the Responsiveness Summary of the OU6 ROD.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

This page intentionally left blank

7.3 WP38 Ski Lodge Well Contamination

7.3.1 Background

OU6 (WP38) includes approximately 200 acres of southwest-facing hillside near the Eielson AFB Ski Lodge. Present uses of the area include downhill and cross-country skiing, winter survival training, snowmobiling, archery range, and setting of permitted trapping lines. The current land use is considered industrial/recreational. While the current land use is unlikely to change, the OU6 BLRA considered industrial and residential future land use scenarios.

The depth to groundwater within OU6 ranges from approximately 3 ft bgs in the lowlands to 270 ft bgs at the top of the ridge. Groundwater movement in the aquifer at OU6 is difficult to characterize because of the geologically complex setting. The higher elevations of the ski hill are underlain by heavily fractured and foliated schist bedrock. The bedrock contains an unknown but probably large amount of permafrost down to approximately 120-150 ft bgs at the site. The alluvial aquifer at the base of the hill contains discontinuous permafrost (USAF, 1994e).

History of Contamination

The immediate source area was a fuel storage area built in 1956. Eight 50,000-gallon ASTs and a number of smaller ASTs were located on the crest of the ridge, along the southwest side of "B" Battery Road. The tanks were used to store aviation and/or diesel fuel. Use of the tanks was discontinued in 1972, and the tanks and their associated piping and concrete sub-bases were removed in 1977.

Groundwater contamination was first discovered at WP38 in a drinking water well within the Ski Lodge. The contamination in the groundwater is believed to be from leaked aviation or diesel fuel from the storage tanks. An extensive program that consisted of soil borings, groundwater sampling, and a geophysical survey show that the petroleum-related contaminants moved through the soils and weathered bedrock at the top of the ridge into the highly fractured schist bedrock below. Once into that portion of the schist, the contaminants are thought to have continued to move downward through the bedrock along fractures until they reached groundwater.

Fate and transport modeling during the RI/FS suggested that contaminants will enter the alluvium over the next 20 years. It was suspected that the contaminants would decrease through natural attenuation to the point of non-detection in less than 30 years.

Initial Response

Soil and groundwater samples were collected along with soil vapor surveys and geophysical investigations in 1986, 1988, 1989, and 1993 to characterize the extent of groundwater contamination and mobility of contaminants within the geologic formation at WP38. Soil samples were analyzed for TPH and VOCs. Groundwater was analyzed for VOCs, purgeable aromatics, total dissolved solids, and common anions. BTEX compounds were detected at concentrations exceeding MCLs from groundwater samples collected from the Ski Lodge supply wells and two monitoring wells.

Routine groundwater sampling at the Ski Lodge drinking water supply well (38SLW) on 15 August 1986 revealed benzene concentrations of 145 µg/L, exceeding the MCL (5 µg/L). A confirmation sample, collected on 30 August 1986, had a benzene concentration of 115 µg/L. The next sample, collected in 1993, had a benzene concentration of 140 µg/L. Benzene has also been detected at concentrations greater than the MCL in monitoring wells 8626 and 38M01. Benzene was detected at concentrations below the MCL in 38M04 and 38M05.

Basis for Taking Action

The RI/FS identified BTEX exceeding MCLs. The exposure pathways of potential concern include ingestion of groundwater, inhalation of, and dermal contact with contaminants during groundwater use. The primary media of concern at WP38 is groundwater.

7.3.2 Remedial Actions

The COCs for WP38 are BTEX constituents. Based on the results of the OU6 RI/FS and BLRA, the selected remedy cited in OU6 ROD includes the following:

- Groundwater monitoring to detect and evaluate any changes in contaminant concentrations
- ICs to prevent current and future exposure to the contaminated groundwater

The RAOs for WP38 include the following.

- Prevent ingestion/direct contact with groundwater containing contaminants in excess of MCLs or having non-zero MCLGs
- For contaminants for which there are no MCLs, prevent the inhalation of vapors from groundwater that contains carcinogens that could result in a cancer risk higher than 1E-4 to 1E-6
- For contaminants for which there are no MCLs, prevent ingestion or direct contact with groundwater containing non-carcinogenic toxic substances at concentrations that could cause adverse effects (result in a Hazard Index of more than 1)
- Attain residual contaminant levels that would restore the groundwater as a potential source of drinking water

Remedy Implementations

Groundwater samples were collected under the 1995, 1996, 1997, 2002, and 2004 SWMPs. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

System Operation/O&M

O&M includes monitoring well maintenance under the SWMP and maintaining ICs to prevent access to contaminated groundwater.

7.3.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2004 SWMP.

7.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 7.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Soil samples were collected from soil borings near the tank sub-bases and down slope along potential migration pathways. The highest benzene concentrations were near sub-base 1 (38M09 at 36 mg/Kg and 38M10 at 28 mg/Kg) and sub-base 7 (38M11 at 25 mg/Kg). The highest BTEX concentrations were identified within the first 30 ft at sub-base 7, and 5 ft bgs at sub-base 1. Sub-base 1 is located at the northwest end of the line of tank sub-bases. Sub-base 7 is located near the southeast end of the line of sub-bases, directly uphill from the Ski Lodge. Lead concentrations in the soil samples ranged 2.3 to 35 mg/Kg, and were highest in the schist (Figure WP38-1).

Soil vapor surveys indicated total BTEX concentrations above 100 parts per million (ppm) in the vicinity of tank sub-bases 1, 3, 4, and 5. The maximum concentration was observed around sub-base 3, with toluene accounting for 94% of the value. Soil vapor survey results from other portions of the source area and around the Ski Lodge varied from non-detect to 70 ppm for total BTEX.

Six sediment samples were collected in 1993 from surface water bodies located along the base of the hill. Benzene was detected at a concentration of 0.001 mg/Kg in a surface water body approximately 3,000 ft west of the Ski Lodge, and at the hill base. Toluene was detected in five sediment samples collected at the hill base.

Surface water samples were collected in 1998 from the Ski Lodge pond and nearby French Creek, and analyzed for BTEX, Gasoline Range Organic Compounds (GRO), and DRO. Sample results were non-detect for BTEX and GRO. DRO results ranged 579 to 597 µg/L, highest in the Ski Lodge pond.

Groundwater samples collected from former supply wells 38SLW and 8621, and monitoring wells 38M01 and 8626 have benzene concentrations exceeding the MCL. All other groundwater sampling locations had BTEX constituents either non detect or detected at concentrations below their respective MCLs. Barium, chromium, nickel, and lead concentrations in groundwater exceeded action levels in several area wells. High metal results may be the result of elevated background concentrations and are not COCs at WP38.

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC and USEPA have no issues regarding protectiveness at the source area. Vapor intrusion evaluation is required for facilities at WP38. DQOM will be applied to this source area.

Eielson AFB desires to utilize the groundwater at WP38 to make snow for recreational activities. The institutional controls established for this source area limit access to the contaminated groundwater disallowing its use for making snow. The Eielson AFB IRP will continue to disallow future attempts to utilize the groundwater within the source area at WP38.

7.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for source area WP38 is performing as expected. Groundwater monitoring evaluates the COC concentrations in groundwater, and will continue to do so until cleanup goals are achieved. Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future. ICs are still being implemented to prevent exposure to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

There are no changes in exposure pathways or populations at risk. The risk-based MCLs established by the ROD have not changed. The RAOs established by the ROD are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Based on the data review and site inspection, the remedy is functioning as intended by the OU6 ROD. Benzene concentrations in previous water supply wells and monitoring wells near the base of the Ski Hill continue to exceed the MCL. Groundwater samples collected in 1989, 1996, and 2002 from locations within the alluvium remain non-detect for BTEX. Several metal concentrations exceeded action levels during 1994, 1995, and 1996 sampling events. High metal results were likely caused by high turbidity and background concentrations. Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future. All previous assumptions for the WP38 source area are still valid.

7.3.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area WP38. Additional issues that do not necessarily affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future	N	Uncertain

7.3.7 Recommendations and Follow-Up Actions

The RAOs for WP38 include groundwater monitoring and ICs until BTEX concentration reduces to levels that would restore the groundwater as a potential source of drinking water. Groundwater monitoring results indicate that COC concentrations remain above the MCLs. The bedrock fractures and permafrost make determining COC migration extremely difficult. Due to the complex geology at this site, drinking water wells should not be installed in the hydrologically down gradient alluvial deposits, and ICs should also protect the alluvium. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N) Current	Affects Protectiveness? (Y/N) Future
Achieving the RAO of restoring the beneficial uses of the aquifer is not expected in the immediate future	Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals or determine if a TI waiver is applicable for this source area	USAF	USEPA, ADEC	1/31/2010	N	Uncertain

Groundwater monitoring will continue as determined by the RPMs at WP38 until BTEX meet the MCLs. The complex geology of the bedrock aquifer disallows accurate projection for COCs to meet MCLs. Basewide degradation trends indicate that benzene will reach the MCL in approximately 2018. Eielson AFB will evaluate applicable new and emerging technologies as they become available to reduce the time to reach remediation goals or determine if a TI waiver is applicable for this source area. Land use restrictions remain in affect until RAOs are achieved.

7.3.8 Protectiveness Statement

The remedy at OU6 is protective in the Short Term because ICs are in place, and therefore there is no current or potential exposure. Follow up actions as described in this report are necessary to address long-term protectiveness as defined by USEPA guidance because RAOs are not expected to be met.

The remedy for the source area has been addressed through natural attenuation, groundwater monitoring, and the implementation of ICs to prevent the ingestion of groundwater, inhalation of, and dermal contact with contaminants during groundwater use.

7.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for WP38:

List of Tables for WP38:

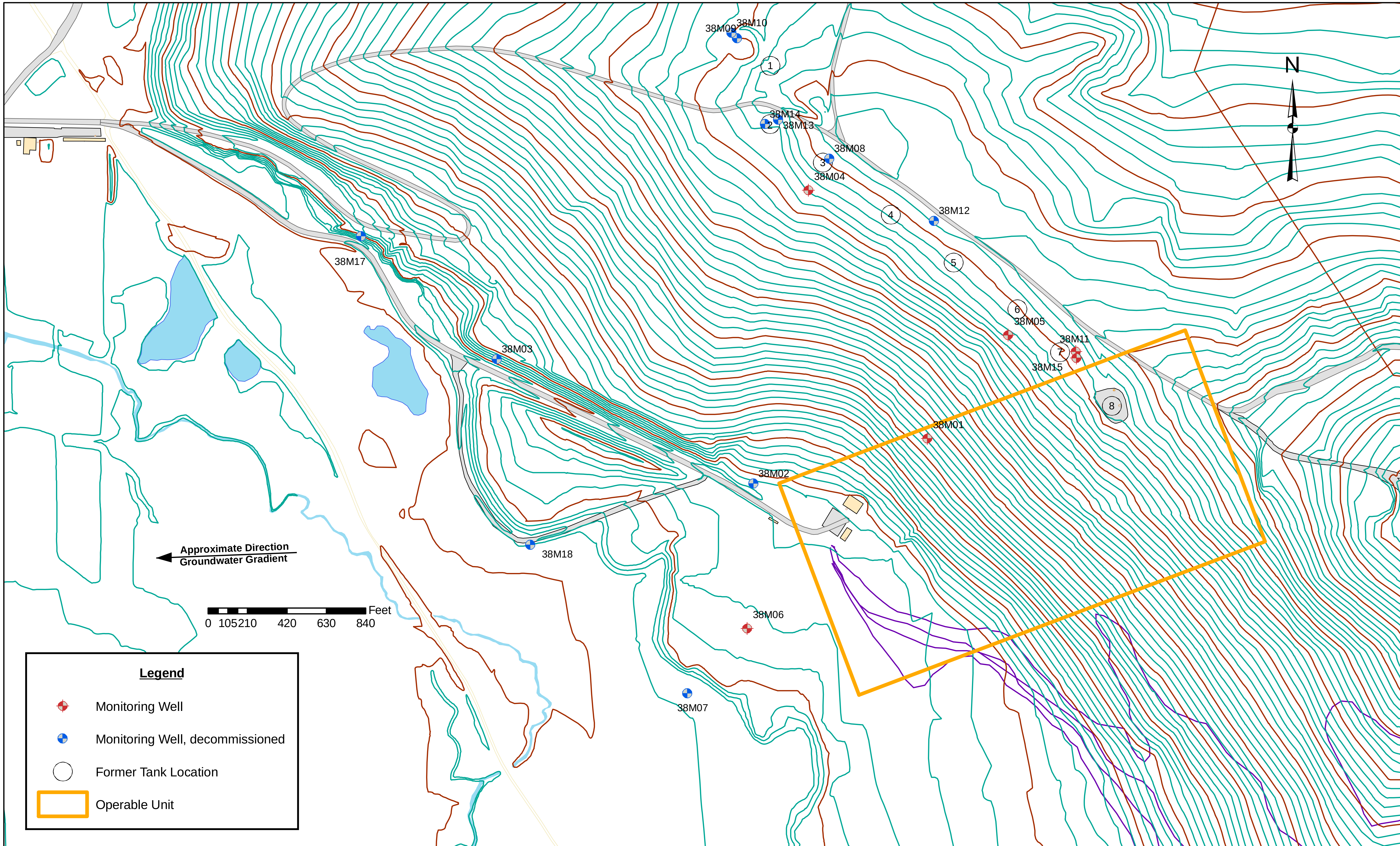


Figure WP38-1: WP38, Ski Lodge Well Contamination Showing Topographic Relief and Groundwater Monitoring Locations, Eielson AFB, Alaska

This page intentionally left blank

TABLE WP38-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, WP38, SKI LODGE WELL CONTAMINATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
38M01	1988		**868**	**1,400**	318	1,890	--	--	1,5	a	ES 1994 OU6 RI
38M01	1989		**510**	97	21	230	--	--	1,5	a	ES 1994 OU6 RI
38M01	1992		**590**	5.9	4.4	28	--	--		c	ES 1994 OU6 RI
38M01	07/09/93		**910**	27	<6.0	50	**3,760**	1,340	1,9,10		ES 1994 OU6 RI
38M01	08/09/94		**400**	<100	<100	<100	--	--	1,4		PNL 1994 SWMPR
38M01	10/17/96		**490**	1.4	1.6	3.2	--	--	1	g	USAF 1996 SWMPR
38M01	09/04/02	240	**1190**	<2.0	<2.0	2.7	--	--	11		USAF 2002 SWMPR
38M02	1988		<0.2	0.6	<0.5	<0.9	--	--	1,5	a	ES 1994 OU6 RI
38M02	1989		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI
38M02	1992		<2.0	<2.0	<2.0	<5.0	--	--		c	ES 1994 OU6 RI
38M02	07/09/93		<0.3	<0.3	<0.3	<0.7	<60	<85	1,9,10		ES 1994 OU6 RI
38M02	08/06/94		<1.0	<1.0	<1.0	<1.0	--	--	1,4	b	PNL 1994 SWMPR
38M02	12/29/94		<0.2	<0.3	0.2	2.5	--	--			USAF 1995 SWMWP
38M02	10/11/95		<1.0	<1.0	<1.0	<1.0	<50	160	1-3		USAF 1995 SWMPR
38M02	08/19/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
38M02	09/23/02	45	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
38M03	1988		<0.2	<0.3	<0.5	<0.9	--	--	1,5	a	ES 1994 OU6 RI
38M03	1989		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI
38M03	1992		<2.0	<2.0	<2.0	<5.0	--	--		c	ES 1994 OU6 RI
38M03	07/09/93		<0.3	<0.3	<0.3	<0.7	<60	<85	1,9,10		ES 1994 OU6 RI
38M03	8/6/94		<1.0	<1.0	<1.0	<1.0	--	--	1,4	b	PNL 1994 SWMPR
38M03	12/29/94		<0.2	<0.3	<0.2	<0.4	--	--			USAF 1995 SWMWP
38M04	1988		3.8	2.2	<0.5	<0.9	--	--	1	a	ES 1994 OU6 RI
38M04	1989		<0.2	2.0	<0.5	<0.4	--	--	1	a	ES 1994 OU6 RI
38M04	1992		<2.0	<2.0	<2.0	<5.0	--	--		c	ES 1994 OU6 RI
38M04	07/10/93		<0.3	<0.3	<0.3	<0.7	<60	820	1,9,10		ES 1994 OU6 RI
38M04	09/22/04	300	DNU	DNU	DNU	DNU	--	--	11	h	USAF 2004 SWMPR

TABLE WP38-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, WP38, SKI LODGE WELL CONTAMINATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]			**18 AAC 80.300**
38M05	1988		0.2	0.4	0.8	<0.9	--	--	1,5	a	ES 1994 OU6 RI
38M05	1989		0.4	1.1	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI
38M05	1992		<1.0	<2.0	<2.0	<5.0	--	--		c	ES 1994 OU6 RI
38M05	07/10/93		<0.3	<0.3	<0.3	<0.7	<60	830	1,9,10		ES 1994 OU6 RI
38M05	09/22/04	300	DNU	DNU	DNU	DNU	--	--	11	h	USAF 2004 SWMPR
38M06	1989		<0.2	<0.3	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI
38M06	08/10/94		<1.0	<1.0	<1.0	<1.0	--	--	1,4	b	PNL 1994 SWMPR
38M06	10/01/96		<1.0	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
38M07	1989		<0.2	15	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI
38M07	1993		1.0	1.2	1.0	2.0	338	<20	1,9,10		ES 1994 OU6 RI
38M07	03/30/95		--	--	--	--	--	--		e	USAF 1995 SWMWP
38M07	08/22/96		<1.0	1.0	<1.0	<1.0	--	--	1,4		USAF 1996 SWMPR
38M16	07/08/93		<0.3	<0.3	<0.3	0.8	<60	940	1,9,10		ES 1994 OU6 RI
38M16	08/04/94		<1.0	<1.0	<1.0	<1.0	--	--	1,4	b	PNL 1994 SWMPR
38M16	12/29/94		0.3	<0.3	0.4	1.5	--	--			USAF 1995 SWMWP
38M17	07/08/93		<0.3	<0.3	<0.3	<0.7	<60	<85	1,9,10		ES 1994 OU6 RI
38M17	08/06/94		<1.0	<1.0	<1.0	<1.0	--	--	1,4	b	PNL 1994 SWMPR
38M17	12/29/94		0.2	0.7	<0.2	0.8	--	--			USAF 1995 SWMWP
38M18	09/18/96		<1.0	1.3	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
38M18	10/02/02	10	<0.5	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
38SLW	07/08/93		**140**	<2.0	<2.0	<4.0	<300	560	1,9,10		ES 1994 OU6 RI
38SLW	03/09/94		**20**	<1.0	<1.0	<1.0	--	--	1,4	d	PNL 1994 SWMPR
38SLW	12/29/94		**45**	0.9	<0.2	0.9	--	--		f	USAF 1995 SWMWP
38SLW	01/96		**45**	<1.0	<1.0	<1.0	<100	220	1-3		USAF 1995 SWMPR
38SLW	09/18/96		**110**	<1.0	<1.0	<1.0	--	--	1		USAF 1996 SWMPR
38SLW	09/25/02	45	**33**	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
38SLW	09/24/04	50	**58**	<1.0	<1.0	<3.0	--	--	11		USAF 2004 SWMPR
38SLW	09/24/04	50	**59**	<1.0	<1.0	<3.0	--	--	11	*	USAF 2004 SWMPR
38SLW	09/24/04	38	DNU	DNU	DNU	DNU	--	--	11	h	USAF 2004 SWMPR

TABLE WP38-1: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES, WP38, SKI LODGE WELL CONTAMINATION, EIELSON AFB, ALASKA

Well No.	Date Sampled	Sampling Depth(ft)	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs			**5**	**1,000**	**700**	**10,000**	**1300[ADEC]**	**1500[ADEC]**			**18 AAC 80.300**
8621	10/17/96		**340**	3.0	3.8	5.5	--	--	1	g	USAF 1996 SWMPR
8621	07/21/01		**217**	<20	<20	<40	--	--	7		USAF 2001 SWMPR
8621	09/04/02	161	**1820**	<2.0	<2.0	<2.0	--	--	11		USAF 2002 SWMPR
8626	1988		**15**	<0.3	<0.5	<0.9	--	--	1,5	a	ES 1994 OU6 RI
8626	1989		**17**	3.0	<0.5	<0.4	--	--	1,5	a	ES 1994 OU6 RI

Notes:

a	For other compounds detected, see reference.
b	No compounds other than those listed were detected above the reporting limits.
c	1992 samples analyzed by EPA Method 503.1. 1,2-Dichloroethane (DCA) was detected at 10 µg/L in well 38M01. Additional 503.1 compounds detected were not available in the ES 1994 OU6 RI reference.
d	Additional compounds detected: 1,2-DCA - 0.65 µg/L.
e	A sample was collected by the Air Force on 30 March 1995 from 38M07. Tetrachloroethene was detected - 8.54 µg/L; trichloroethane (sic) was detected - 0.82 µg/L.
f	trichlorofluoromethane was detected in a sample collected on 30 March 1995 by the Air Force from 38SLW - 0.94 µg/L.
g	Well was sampled without purge.
h	Data not usable, sample collected from a passive diffusion bag
MCL	Maximum contaminant level
Bold	Bold text indicates concentration exceeds MCL.
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics
DNU	Data not usable
µg/L	Micrograms per liter

Analytical Methods:

1. 8020
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102
11. 8021

TABLE WP38-2: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, WP38, SKI LODGE AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Arsenic	Barium	Chromium	Copper	Iron	Lead	Mercury	Sodium	Vanadium	Zinc	Notes	Reference
MCLs		**50 (MCL 10)**	**2,000**	**100**	**1,300**[1]	**NA**	**33**[2]	**2**	**NA**	**NA**	**NA**		**18 AAC 80.300**
38M01	07/9/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M01	08/10/94	<3.0	9.6	1.4	6.2	560	3.1	--	15,000	<1.0	67		PNL 1994 SWGMPR
38M01	10/17/96	2.7	<22	<6.0	<6.0	428	5.5	--	11,900	<8.0	1,710	a	USAF 1996 SWMPR
38M02	1988	--	263	23	35	13,600	17	--	30,100	18	84		ES 1994 OU6 RI
38M02	07/9/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M02	08/6/94	24	1,100	76	250	180,000	**89**	--	23,000	93	260		PNL 1994 SWGMPR
38M02	10/11/95	**391**	**3,860**	**616**	777	663,000	**420**	--	26,800	1,000	1,560		USAF 1995 SWMPR
38M02	08/19/96	**153**	**2,420**	**342**	494	422,000	**169**	--	26,800	566	995		USAF 1996 SWMPR
38M03	1988	--	204	<6.0	<3.0	665	5.2	--	14,700	<10	154		ES 1994 OU6 RI
38M03	07/9/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M03	08/6/94	<3.0	140	<1.0	<1.0	58	<1.0	--	6,000	<1.0	9.3		PNL 1994 SWGMPR
38M04	1988	--	83	<6.0	15	5,720	13	--	8,190	11.2	337		ES 1994 OU6 RI
38M04	07/10/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M05	1988	--	175	**51**	29	22,500	15	--	24,300	45	907		ES 1994 OU6 RI
38M05	07/10/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M06	08/10/94	**91**	**2,400**	**670**	650	330,000	**210**	--	11,000	400	80		PNL 1994 SWGMPR
38M06	10/01/96	**115**	**2,440**	**667**	543	326,000	**155**	--	10,400	562	977		USAF 1996 SWMPR
38M07	08/22/96	**89**	433	50	43	119,000	19	--	6,750	86	185	b	USAF 1996 SWMPR
38M16	07/08/93	**--**	--	7.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M16	08/04/94	**100**	970	48	100	180,000	31	--	39,000	75	160		PNL 1994 SWGMPR
38M17	07/08/93	**--**	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38M17		**110**	440	8.8	29	49,000	7.9	--	12,000	28	62		PNL 1994 SWGMPR

TABLE WP38-2: CONCENTRATIONS (µg/L) OF METALS IN GROUNDWATER SAMPLES, WP38, SKI LODGE AREA, EIELSON AFB, ALASKA

Well No.	Date Sampled	Arsenic	Barium	Chromium	Copper	Iron	Lead	Mercury	Sodium	Vanadium	Zinc	Notes	Reference
MCLs		**50 (MCL 10)**	**2,000**	**100**	**1,300[1]**	**NA**	**33[2]**	**2**	**NA**	**NA**	**NA**		**18 AAC 80.300**
38M18	09/18/96	<34	562	34	22	239,000	21	--	20,300	57	73		USAF 1996 SWMPR
38SLW	07/08/93	--	--	<4.0	--	--	<2.0	--	--	--	--		ES 1994 OU6 RI
38SLW	08/09/94	<3.0	74	1.6	7.3	4,900	2.8	--	6,900	<1.0	22		PNL 1994 SWGMPR
38SLW	01/06/96	1.5	85	<5.0	<4.0	5,560	<1.0	--	6,510	<4.0	70		USAF 1995 SWMPR
38SLW	09/18/96	<2.0	70	<6.0	<6.0	5,300	<1.0	--	6,870	<8.0	167		USAF 1996 SWMPR
8621	10/17/96	<2.0	<22	<6.0	<6.0	3,690	4.4	--	17,400	<8.0	859	a	USAF 1996 SWMPR
8626	1988	--	189	<6.0	10	5,480	1.6	--	7,800	<10	526		ES 1994 OU6 RI
Background Concentrations													
BGM	09/94	25	269	20	75	16,938	21		8,363	24	63		PNL 1994 SWMP
BGMX	09/94	63	420	46	140	33,000	48		9,800	52	120		PNL 1994 SWMP
BGUCL	09/94	37	342	30	105	23,800	33		9,260	36	89		PNL 1994 SWMP

Notes:

a	Well sampled without purge
b	Additional metals detected: Antimony - 3.1 mg/L, Cobalt - 45.7 mg/L and Selenium - 7.3 mg/L
MCL	maximum contaminant level
Bold	Bold text indicates concentration exceeds MCL, EPA Action Limit, or BGUCL.
BGM	Mean concentration of samples collected from background wells in 1994.
BGMX	Maximum concentration of samples collected from background wells in 1994.
BGUCL	95% Upper confidence limits of samples collected from background wells in 1994.
µg/L	Micrograms per liter
1	EPA Action Level
2	Background UCL for Lead

TABLE WP38-3: CONCENTRATIONS (µg/L) OF ORGANIC COMPOUNDS IN SURFACE WATER SAMPLES, WP38, SKI LODGE AREA, EIELSON AFB, ALASKA

Sample ID	Date Sampled	Benzene	Toluene	Ethylbenzene	Xylenes	TPH GRO	TPH DRO	Analytical Methods	Notes	Reference
MCLs		**5**	**1,000**	**700**	**10,000**	**1300**[ADEC]	**1500**[ADEC]			**18 AAC 80.300**
Ski Lodge Pond	08/18/98	<1.0	<1.0	<1.0	<1.0	<40	593	1, 9, 10		USAF SWMPR 1998
French Creek	08/18/98	<1.0	<1.0	<1.0	<1.0	<40	579	1, 9, 10		USAF SWMPR 1998

Notes:

MCL	maximum contaminant level
µg/L	Micrograms per liter
Bold	Bold text indicates concentration exceeds MCL.
TPH GRO	Total Petroleum Hydrocarbons Gasoline Range Organics
TPH DRO	Total Petroleum Hydrocarbons Diesel Range Organics

Analytical Methods:

1. 8021
2. ADEC 8015M
3. ADEC 8100M
4. 8010
5. 8270
6. 8080
7. 8260
8. 8240
9. AK101
10. AK102

8 SITEWIDE OU

The sitewide investigation evaluated basewide contamination that is not confined or attributable to specific source areas identified and addressed in the FFA as well as cumulative risks to human health and the environment posed by contamination on a sitewide basis. No previously unidentified groundwater contamination was found in the sitewide investigation. Surface water bodies evaluated to determine whether they were affected by contamination from one or more source areas include Garrison Slough, French Creek, Moose Creek, Piledriver Slough, Flightline Pond, and Lily Lake. Of these surface water bodies, Garrison Slough is the only one that poses an unacceptable risk to human health and the environment.

Source Area	Remedy or Status as Identified in the ROD
SS67 Garrison Slough	Institutional and Engineering (i.e., fish weir) controls; Excavation of contaminated sediments and soils with concentrations > 10 mg/kg; Onsite disposal of material with PCB concentrations less than 50 mg/kg; Offsite disposal or treatment of material with PCB concentrations greater than 50 mg/kg; and Environmental monitoring of soils, sediments, surface water, fish, and groundwater.

RAOs

The BLRA indicated that unacceptable potential risks (i.e., excess cancer risk > 10^{-4} and/or hazard index > 1) exist in or adjacent to Garrison Slough and French Creek. Exposure to PCBs through soil and fish ingestion accounts for almost all of the potential risk.

Environmental Media	RAO
Soil	Prevent ingestion of soils in excess of the acceptable carcinogenic risk range as defined by CERCLA
	Prevent additional loading to Garrison Slough via surface water runoff
Sediment	Reduce the potential risk to human health from the consumption of PCB-contaminated fish by (1) preventing ingestion of contaminated fish from lower Garrison Slough and (2) reducing the mass of PCBs available for uptake by water column organisms, including fish, so that concentrations of PCBs in fish tissue will eventually achieve acceptable levels

PCBs (Aroclor 1260) are COCs for the Sitewide OU (USAF, 1996f). The following table lists RAOs and ARARs established to address unacceptable exposure scenarios.

RAOs for Garrison Slough				
Medium	**COC**	**Exposure Route**	**Receptor**	**Remediation Goal**
Fish	PCBs (Aroclor 1260)	Ingestion	Human	2.69 µg/Kg (wet weight)
Sediment	PCBs (Aroclor 1260)	Ingestion	Human (through fish ingestion)	Remove PCBs > 10 mg/Kg
Soils	PCBs (Aroclor 1260)	Ingestion	Human	Remove PCBs > 10 mg/Kg

The remediation goal for fish is based on a back calculation for the fish tissue PCB concentration that would produce a total excess cancer risk of less than 10^{-6}. Remediation goals for sediment and soil are based on calculations for reduced contaminant loading to Garrison Slough that would achieve the fish remediation goal. The soil cleanup level is also based upon acceptable exposure for an industrial land use scenario.

8.1 Chronology of Events

1988 Harding and Lawson Associates: Surface water and sediment samples were collected as part of the IRP from 1988 through 1990. In 1988 surface water and sediment samples were collected near four source areas on Base. In 1990 eleven surface water and sediment samples were collected throughout the length of Garrison Slough.

1992- USAF-ERP Bioenvironmental Engineering Services personnel at Eielson AFB collected surface water samples from Garrison Slough as part of ongoing monitoring program.

1993-1994 Surface Water and Sediment Investigation, characterize nature and extent of surface water, sediment, and biota contamination in 6 surface water bodies throughout Eielson AFB, including Garrison Slough.

1994 Surface Water and Sediment Investigation, Final Report, Eielson AFB, Alaska (USAF, 1994d).

1995-1996 Investigations conducted to delineate the extent of PCB impact in the drainage ditch and Garrison Slough through extensive soil and sediment sampling.

August 1995 Sitewide RI completed (USAF, 1995a)

August 1995 Sitewide Biological Risk Assessment completed (USAF, 1995b).

September 1996 Sitewide ROD signed (USAF, 1996f)

1998	Soil and sediment removal in Garrison Slough completed.
December 1998	Remedial Actions at Garrison Slough Drainage Ditch Final Report completed (USAF, 1998h)
September 1998	First Five-Year ROD Review completed (USAF, 1998f).
1998-2002	Continued monitoring of fish tissues and sediment in accordance with the Sitewide ROD.
September 2003	Second Five-Year ROD Review completed (USAF, 2003c).
2003-2007	Continued monitoring of fish tissues in accordance with the Sitewide ROD and Second Five-Year ROD Review.
May 2007	Garrison Slough Geophysical Survey.

8.2 Community Involvement

The Sitewide RI/FS and Sitewide Proposed Plan for Eielson AFB were released to the public in August 1995. These documents were made available to the public in both the administrative record and an information repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks.

The public comment period on the Sitewide Proposed Plan was held from September 1, 1995 through September 30, 1995. Comments received during that period are summarized in the Responsiveness Summary in the Sitewide ROD.

The Sitewide Proposed Plan was advertised in three newspapers. The public comment period and public meeting were advertised on August 31, 1995 in the *Fairbanks Daily News Miner*, and on September 1, 1995 in the *North Pole Independent*. An advertisement also appeared on September 1, 1995 in the *Goldpanner* Base newspaper. In addition, more than 3,500 copies of the Sitewide Proposed Plan were added as an insert in the Base newspaper and delivered to every home in the Eielson AFB housing area.

A public meeting held on September 21, 1995, was attended by approximately 21 people. At this meeting, representatives from the USAF, ADEC, and the USEPA answered question about problems at the site and the remedial alternatives under consideration.

No public comments were received in response to the Sitewide Proposed Plan. A summary of community participation and the public meeting are included in the Responsiveness Summary in the Sitewide ROD.

Interviews

Interviews conducted for this Five-Year Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a quarterly basis in 1995 and 1996, semi-annually from 1997 to 2003, annually from 2003 to 2006, and upon request after 2006.

8.3 SS67 Garrison Sough

8.3.1 Background

Garrison Slough begins in a marshy area at the south end of Eielson AFB, near the old Army landfill (LF05). The slough flows north-northwest through the developed portion of Eielson AFB. Garrison Slough passes directly through the developed portion of Eielson AFB, and consists primarily of engineered drainage channels 10 to 50 ft wide.

Surface water levels in Garrison Slough (relative to groundwater elevations) indicate the slough receives water from the aquifer along most of its length. One exception is a 0.5-mile long section located immediately downstream of the water treatment plant overflow pond, where the slough loses water to the aquifer.

The water surface in the slough is approximately 8 to 10 ft below surrounding grade, and the water in the slough is approximately 2 to 4 ft deep. The water generally has a visibly moving current downstream of the water treatment plant pond. Upstream from the water treatment plant pond, the slough contains shallow, standing water that is dry during periods of low precipitation, but fills with surface drainage water after storm events. Excess water from the water supply wells is discharged into the pond behind the water treatment plant. Drainage from Garrison Slough flows into Moose Creek, which drains into Piledriver Slough, before entering the Tanana River approximately 2 miles northwest of the Base.

Land use in Garrison Slough is currently recreational, and is projected to remain recreational. The land surrounding Garrison Slough is industrial or undeveloped. While no known potable use of surface water occurs on or near the Base, people have been known to fish and play near some water bodies.

History of Contamination

PCBs were found in a drainage channel and a portion of Garrison Slough. The PCBs apparently originated from past releases to surface soil at the unpaved drainage channel that empties into Garrison Slough. The drainage channel is located approximately 900 ft upstream of the Arctic Avenue/Manchu Road Bridge (Figure SS67-3).

Initial Response

Surface water, sediment, vegetation, and fish tissue samples were collected during the Sitewide RI/FS. Surface water and sediment contamination appeared largely confined to Garrison Slough. Low levels of petroleum constituents (TPH), chlorinated VOCs, pesticides, and metals were detected in sediment samples along the length of the slough. Fuel-related chemicals and solvents probably originated from adjacent source areas. Pesticides were found throughout Garrison Slough, with highest concentrations near SS35. Metal concentrations did not exceed background levels (USAF, 1995a).

PCBs (Aroclor 1260) were detected from sediment samples collected between Transmitter Rd to upstream of Arctic Ave. High PCB levels appeared concentrated to a shallow drainage ditch running perpendicular to Garrison Slough approximately 900 ft upstream from Arctic Ave. PCB concentrations significantly decreased in Garrison

Slough immediately upstream and downstream of the drainage ditch. Further investigation revealed that PCB contamination was mostly limited to the drainage ditch, indicating a release location.

PCBs, polycyclic aromatic hydrocarbon (PAHs), and pesticides were detected in fish tissue samples collected during the RI. Highest PCBs, PAHs, and pesticides in fish tissue were found in the lower to middle Garrison Slough. PCBs were only detected in aquatic invertebrates and vegetation at one middle Garrison Slough location. PCBs were not detected in the Garrison Slough surface water (Figure SS67-2).

Dichlorodiphenyltrichloroethane (DDT), 2,2-bis(para-chlorophenyl)-1,1-dichloroethane (DDD), and 1,1-dichloro-2,2-bis(para-chlorophenyl)-ethylene (DDE) were detected in surface water samples collected from Garrison Slough, with concentrations ranging non-detect to 0.074 µg/L, highest at SS35. A surface water result from a sample upstream of SS35 was 0.034 µg/L. Garrison Slough sediment samples results for total DDT ranged non-detect to 6,980 µg/Kg downstream from SS35, 300 to 123,050 µg/Kg at SS35, and non-detect upstream.

DDD and DDE were detected in French Creek surface water samples, with concentrations ranging from non-detect to 0.001 µg/L. DDD and DDE were also detected in French Creek sediment samples. The highest concentration was DDD at 32 µg/Kg. Pesticides and PCBs were not detected in surface water and sediment samples collected from Moose Creek or Piledriver Slough

Basis for Taking Action

The results of the Sitewide RI/FS and BLRA indicated PCBs were present in soil, sediments, and fish tissue in a section of Garrison Slough that is within the boundaries of Eielson AFB. Fish tissue and sediment samples collected at Garrison Slough had Aroclor-1260 concentrations that pose a potential risk (USAF, 1995f). PCBs primarily drove risk, although pesticides were also detected in surface water, sediment, and biota samples. The pathway of potential concern is human ingestion of fish tissue.

8.3.2 Remedial Actions

The COCs at SS67 are PCBs (Aroclor 1260). The Sitewide ROD, signed in March 1997, presented the selected remedy for SS67- Garrison Slough. The 1995 Sitewide ROD specified a cleanup level for fish tissue at 0.69 µg/Kg. A soil and sediment cleanup level of 10,000 µg/Kg for PCBs was chosen based on back calculation from allowable fish tissue concentration. The remedy selected in the Sitewide ROD included the following:

- Fishing restrictions in Garrison Slough
- Fish control devise near the downstream edge of Eielson AFB
- Excavation of contaminated soils and sediments with concentrations greater than 10,000 µg/Kg
- Onsite disposal of material with PCB concentrations greater than 10,000 µg/Kg
- Offsite disposal or treatment of materials with PCB concentration greater than 50,000 µg/Kg
- Environmental monitoring of soils, sediments, surface water, fish, and groundwater

The RAOs for SS67 include the following:

- Prevent ingestion of soils in excess of the acceptable carcinogenic risk range as defined by CERCLA
- Prevent additional loading to Garrison Slough via surface water runoff
- Reduce the potential risk to human health from the consumption of PCB-contaminated fish by (1) preventing ingestion of contaminated fish from lower Garrison Slough and (2) reducing the mass of PCBs available for uptake by water column organisms, including fish, so that concentrations of PCBs in fish tissue will eventually achieve acceptable levels

Remedy Implementation

In 1996 to 1998 PCB-contaminated soils and sediment were removed from Garrison Slough to fulfill requirements stipulated in the Sitewide ROD. Vacuum dredging was employed to remove PCB impacted slough sediments. The upper 18-24 inches of soil in the drainage ditch leading into Garrison Slough was excavated. Sediments and soils containing levels of PCBs greater than 50,000 µg/Kg were taken to an off-site treatment facility. Sediments and soil with PCBs ranging 10,000 µg/Kg-50,000 µg/Kg were taken to a containment cell in Landfill-03 on Eielson AFB. Excavation in the drainage ditch extended downward until either groundwater was encountered or when consecutive field screening results indicated PCB concentrations were <10,000 µg/Kg. A 180-foot section of Garrison Slough was not excavated to the 10,000 µg/Kg sediment cleanup level. Excavation stopped after discovering an unexploded ordinance (Figures SS67-3 & SS67-4). Fish barriers were installed near the intersection of Arctic Ave. and Transmitter Rd. to prevent off-Base fish migration. Fish tissue samples were collected from multiple stations (both on and off Base) along Garrison Slough to characterize PCB concentration. A Base fishing license and briefing are required to fish on Eielson AFB. An advisory concerning the PCB contamination is given at the briefing.

System Operation/O&M

O&M includes fish screen maintenance and implementing Base fishing restrictions.

8.3.3 Progress Since the last Five-Year Review

Fish tissue sampling or fish removal occurred on an annual basis under the SWMP. Signs were installed along the banks of Garrison Slough in 2003 indicating potential contamination and the requirement to contact Eielson Natural Resources regarding fishing restrictions. Eielson AFB residents applying for recreational fishing permits on Base are advised not to consume any fish caught from the Slough. In addition, a geophysical survey was conducted in Garrison Slough within the PCB cleanup area to identify and remove potential munitions and explosives of concern (MEC).

8.3.4 Five-Year Review Process

Document Review

Documents reviewed are referenced in Section 8.1 and the citations are included in the List of References. Additional documents referenced include the annual SWMP reports.

Data Review

Fish tissue sample collection in Garrison Slough began on Base in 1993, and off Base in 1995. The following tables display average PCB concentration in fish samples for individual years, along with minimum and maximum sample concentrations.

Cumulative On-Base Fish Tissue Sample Results (No fish tissue samples were submitted for laboratory analysis in 2005 and 2006.)

Year	Average Conc.	Total Samples	Minimum Conc.	Species	Maximum Conc.	Species
1993	466 µg/Kg	4	11 µg/Kg	Grayling	995 µg/Kg	Grayling
1995	631 µg/Kg	17	<20 µg/Kg	Pike	3,000 µg/Kg	Grayling
1996	3,186 µg/Kg	14	29 µg/Kg	Grayling	12,000 µg/Kg	Grayling
1997	535 µg/Kg	9	39 µg/Kg	Pike	1,200 µg/Kg	Grayling
1998	223 µg/Kg	13	14 µg/Kg	Pike	680 µg/Kg	Grayling
1999	372 µg/Kg	12	27 µg/Kg	Trout	1,300 µg/Kg	Trout
2000	419 µg/Kg	7	24 µg/Kg	Trout	2,000 µg/Kg	Grayling
2001	407 µg/Kg	24	<22 µg/Kg	Trout	2,100 µg/Kg	Trout
2002	205 µg/Kg	14	<50 µg/Kg	Grayling	480 µg/Kg	Grayling
2003	237 µg/Kg	22	19 µg/Kg	Grayling	649 µg/Kg	Grayling
2004	162 µg/Kg	16	<0.63 µg/Kg	Grayling	790 µg/Kg	Grayling
2004	108 µg/Kg	7	34 µg/Kg	LNS	220 µg/Kg	LNS
2007	278 µg/Kg	4	240 µg/Kg	Grayling	310 µg/Kg	Grayling

Cumulative Off-Base Fish Tissue Sample Results

Year	Average Conc.	Total Samples	Minimum Conc.	Species	Maximum Conc.	Species
1995	91 µg/Kg	6	<20 µg/Kg	Grayling	247 µg/Kg	Grayling
1996	100 µg/Kg	21	<14 µg/Kg	Trout/Grayling	730 µg/Kg	Grayling
1997	158 µg/Kg	10	<14 µg/Kg	Trout/Grayling	1,100 µg/Kg	Trout
1998	61 µg/Kg	14	14 µg/Kg	Trout	130 µg/Kg	Grayling
1999	46 µg/Kg	8	<14 µg/Kg	Grayling	100 µg/Kg	Grayling
2000	64 µg/Kg	2	33 µg/Kg	Grayling	94 µg/Kg	Trout
2001	94 µg/Kg	2	48 µg/Kg	Trout	140 µg/Kg	Trout
2002	250 µg/Kg	8	<50 µg/Kg	Trout	500 µg/Kg	Grayling
2003	95 µg/Kg	11	3.3 µg/Kg	Grayling	256 µg/Kg	Grayling
2004	0 µg/Kg	0	0	Grayling	0	Grayling
2004	69 µg/Kg	3	69 µg/Kg	LNS	69 µg/Kg	LNS
2007	59 µg/Kg	16	10 µg/Kg	Grayling	150 µg/Kg	Grayling

2007 Off-Base Fish Tissue Sample Results per Station (Garrison Slough New Station is closest to Eielson AFB. Distance increases to Garrison Slough Osage Street, furthest from Eielson AFB.)

Sample Location	Average Conc.	Total Samples	Minimum Conc.	Species	Maximum Conc.
Garrison Slough New Station	98 µg/Kg	4	62 µg/Kg	Grayling	150 µg/Kg
Garrison Slough Pete's Crossing	69 µg/Kg	4	56 µg/Kg	Grayling	87 µg/Kg
Moose Creek Garrison Slough Confluence	45 µg/Kg	4	28 µg/Kg	Grayling	84 µg/Kg
Garrison Slough Osage Street	26 µg/Kg	4	10 µg/Kg	Grayling	58 µg/Kg

Fish tissue samples collected from 1993 to 2001 were random. Fish tissue samples collected in 2002 targeted younger fish to evaluate PCB concentrations in fish born after Garrison Slough cleanup activities. 2002 sample results indicate lower than previous year concentration on Base, but higher than previous year concentration off Base (Figure SS67-1).

Fish tissue samples collected in 2003, 2004, and 2007 were random. Laboratory results indicate that PCB concentrations continue to exceed the 2.69 µg/Kg MCL for Aroclor-1260. From 2003 through 2007 fish removal was conducted on Base using a boat-mounted electro shocker. A total of 916 fish were removed on Base from Garrison Slough during this five year period. The majority of these fish were removed through 2005. Despite several attempts only three fish were removed on Base during 2006, and 33 fish in 2007.

Off-Base sampling to determine Aroclor 1260 concentration in fish downstream of Eielson AFB was the focus during 2007. Ten fish each were collected at four off-Base stations. Laboratory results indicate Aroclor 1260 concentration decreasing with distance from Eielson. Aroclor 1260 concentrations averaged 26 µg/Kg from the furthest downstream sampling station, located approximately 1.5 miles from the fish barriers.

Confirmation sediment sampling was performed from 1998 through 2001 at several previous sediment sampling locations throughout Garrison Slough that had historically high levels of Aroclor 1260. In 2001 a duplicate sample taken from the Arctic Ave./Manchu Rd. location confirmed PCB concentrations (16,000 µg/Kg and 17,000 µg/Kg) were slightly above the RAO (10,000 µg/Kg) for sediments. Sediment samples collected at four other locations along Garrison Slough had PCB concentrations (<93 µg/Kg-2670 µg/Kg) well below the RAO (10,000 µg/Kg). The 3-year requirement for sediment sample collection was completed in 2001 (USAF, 2003c).

Site Inspections

The inspection team for this Five-Year ROD Review consisted of USAF, USEPA, and ADEC representatives. This Five-Year ROD Review consisted primarily of document/data review by members of the inspection team. ADEC requested that Eielson AFB coordinate with Alaska Natural Resources if they remove the fish barriers. ADEC and the USEPA do not want to remove fish barriers. If long term IC are required for Garrison Slough, Eielson proposes recommending future cleanup effort to obtain residential cleanup standards. Vapor intrusion does not pertain to the COC at SS67.

8.3.5 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The rationale for the selected remedy concluded that the removal of soil and sediment contaminated with PCB concentrations exceeding 10,000 µg/Kg would greatly reduce the overall mass available for uptake by aquatic organisms. Implementation of the selected remedy for the Sitewide OU has resulted in a reduction of PCB concentrations in sediments and levels available to human receptors, but did not fully achieve the cleanup goal of 10,000 ug/Kg and has not yet resulted in fish tissue concentrations achieving the RAOs. Engineering and ICs are still being implemented to prevent exposure to Aroclor 1260 contamination.

Question B: Are the exposure assumptions, toxicity data, cleanup values, and RAOs used at the time of the remedy selection still valid?

A review of the Toxicity Values used in the BLRA, presented in the ROD indicates that the oral cancer slope factor used for Aroclor 1260 is no longer valid. The oral cancer slope factor utilized was 7.7 $(mg/Kg\text{-}day)^{-1}$. The oral cancer slope factor currently published by USEPA, and posted on USEPA's Integrated Risk Information System, is 2.0 $(mg/Kg\text{-}day)^{-1}$. Therefore, risks calculated for ingestion of fish from Garrison Slough are overestimated by a factor of 3.8. In order to revise the cleanup value to represent a 10^{-6} risk level, it is necessary to multiply the cleanup value proposed in the ROD of 0.69 µg/Kg, by 3.8, which would result in a revised cleanup value of 2.69 µg/Kg, representing a risk value of 10^{-6}. The 2.69 µg/Kg cleanup value was adopted during the 2003 Five-Year ROD Review.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There are no new ecological risks and there is no new information that questions the protectiveness of the remedy.

Technical Assessment Summary

Remediation goals for sediment and soil are based on calculations for reduced contaminant loading to Garrison Slough that would achieve the fish remediation goal. The soil cleanup level is also based upon acceptable exposure for an industrial land use scenario.

The soil and sediment cleanup resulted in an overall decrease in PCBs concentrations in sediments and levels available to biological and human receptors, but did not fully achieve the cleanup goal of 10,000 ug/Kg. Fish tissue concentrations also did not meet the RAOs.

A toxicity value review indicates that the oral slope cancer value used in calculating the PCB cleanup concentration in fish tissue changed. Updating the oral cancer slope value results in a calculated PCB cleanup value of 2.69 µg/Kg.

8.3.6 Issues

Fish tissue samples collected both on and off Base exceed the 2.69 µg/Kg RAO for Aroclor 1260. The reduction in PCB contaminated soil and sediment did not fully achieve the cleanup goal of 10,000 ug/Kg. Fish tissue concentrations also did not meet the RAOs. Evaluation of additional cleanup action is warranted to reduce PCB concentration in Garrison Slough sediment, with the final objective of meeting RAOs in fish tissue concentration. Issues that affect the protectiveness of the remedy included the following:

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Did not fully achieve the cleanup goal of 10,000 ug/Kg for aroclor 1260, fish tissue concentrations also not achieving the RAOs	Uncertain	Uncertain

In November 2002, the Federal Water Quality Criteria for DDT and its metabolites were revised. One location in Garrison Slough surface water near SS35 exceeds the new levels. The application of these new regulations and the impact on protectiveness will be evaluated by the Air Force, in conjunction with the USEPA and ADEC.

8.3.7 Recommendations and Follow-up Actions

The selected remedy included removal of all sediments in excess of 10,000 ug/Kg and RAOs for Garrison Slough include obtaining PCB concentration in fish tissue that is protective of human health. The sediment removal reduced PCB concentration in fish tissue, however PCB concentration still exceeds the cleanup level both on and off Base. The following list provides recommendations with associated milestone dates:

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N) Current	Affects Protectiveness? (Y/N) Future
Implementation of the selected remedy for the Sitewide OU has resulted in a reduction of PCB concentrations in sediments and levels available to human receptors, but did not fully achieve the cleanup goal of 10,000 ug/Kg and has not yet resulted in fish tissue concentrations achieving the RAOs	Additional information and evaluations that need to be done include: re-evaluation of the risk assessment exposure assumptions, investigation of the possibility of other sources of PCB contamination in fish tissue, and evaluation of the feasibility of additional remedial action that could reduce PCB concentration in Garrison Slough sediment with the final objective of meeting RAOs in fish tissue concentration.	USAF	USEPA, ADEC	1/31/2010	Uncertain	Uncertain

No additional fish tissue samples or sediment samples will be collected until further remedial action. Additional information and evaluations that need to be done include: re-evaluation of the risk assessment exposure assumptions, investigation of the possibility of other sources of PCB contamination in fish tissue, and evaluation of the feasibility of additional remedial action is warranted that could to reduce PCB concentration in Garrison Slough sediment with the final objective of meeting RAOs in fish tissue concentration. The fish barriers will remain in place, however no additional fish tissue samples or sediment samples will be collected until further remedial action. ICs will continue to be implemented. Land use restrictions remain in affect until RAOs are achieved.

8.3.8 Protectiveness Statement

A protectiveness determination of the remedy for the Sitewide OU, which contains source area SS67 (Garrison Slough), cannot be made until further information is obtained. Further information will be obtained by taking the following actions: re-evaluate the risk assessment exposure assumptions, investigate the possibility of other sources of PCB contamination in fish tissue, and evaluate the feasibility of additional remedial actions to further reduce PCB concentrations in Garrison Slough sediments. It is expected that these actions will take approximately 16 months to complete, at which time a protectiveness determination will be made.

8.3.9 Next Review

The next Five-Year Review for Eielson AFB is required to be completed by September 28, 2013, five years from the date of this review. The relative review period would be from September 28, 2008 to September 28, 2013.

List of Figures for SS67:

List of Tables for SS67:

This page intentionally left blank

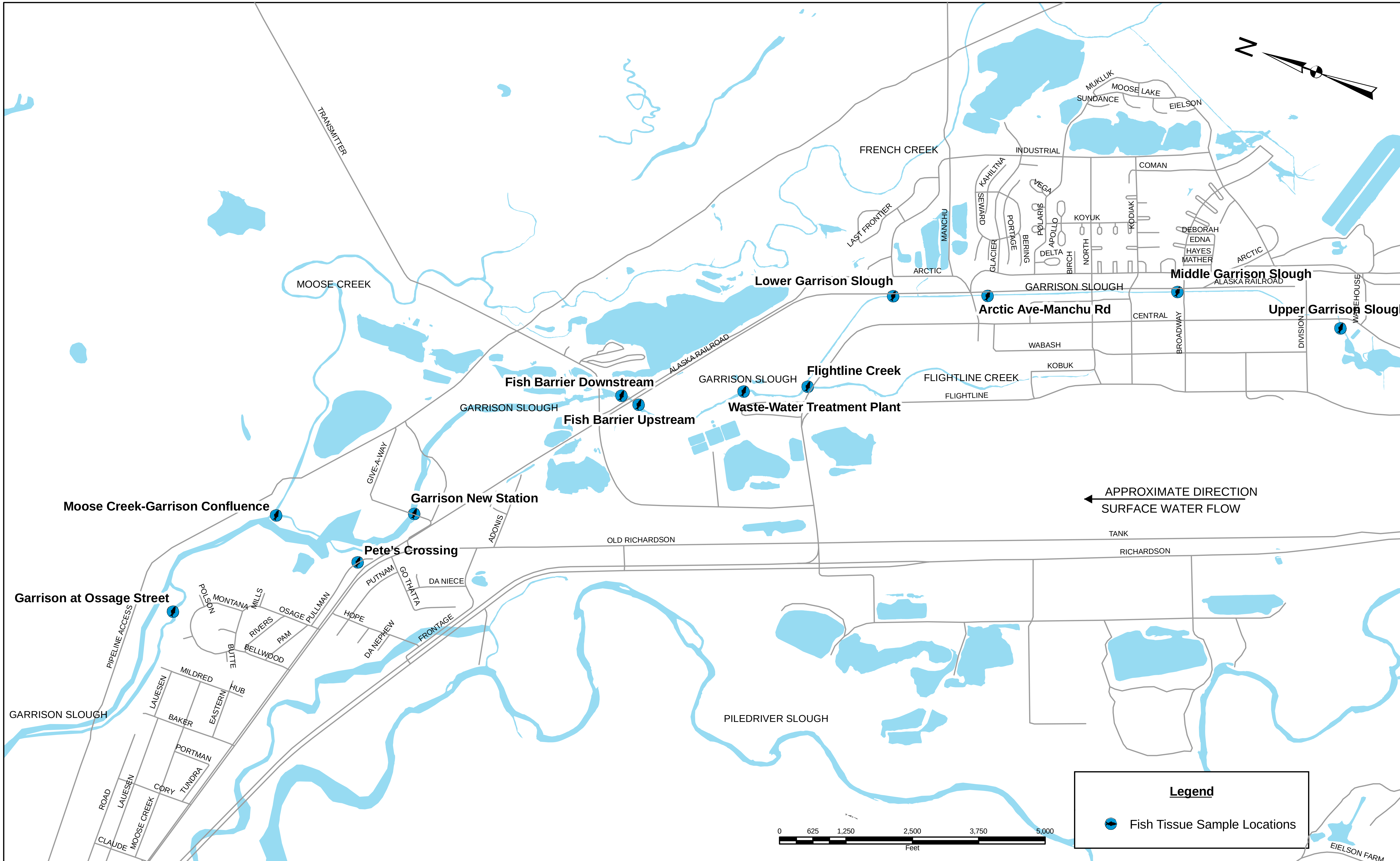


Figure SS67-1: Garrison Slough Fish Tissue Collection Sites, Eielson AFB, Alaska

This page intentionally left blank

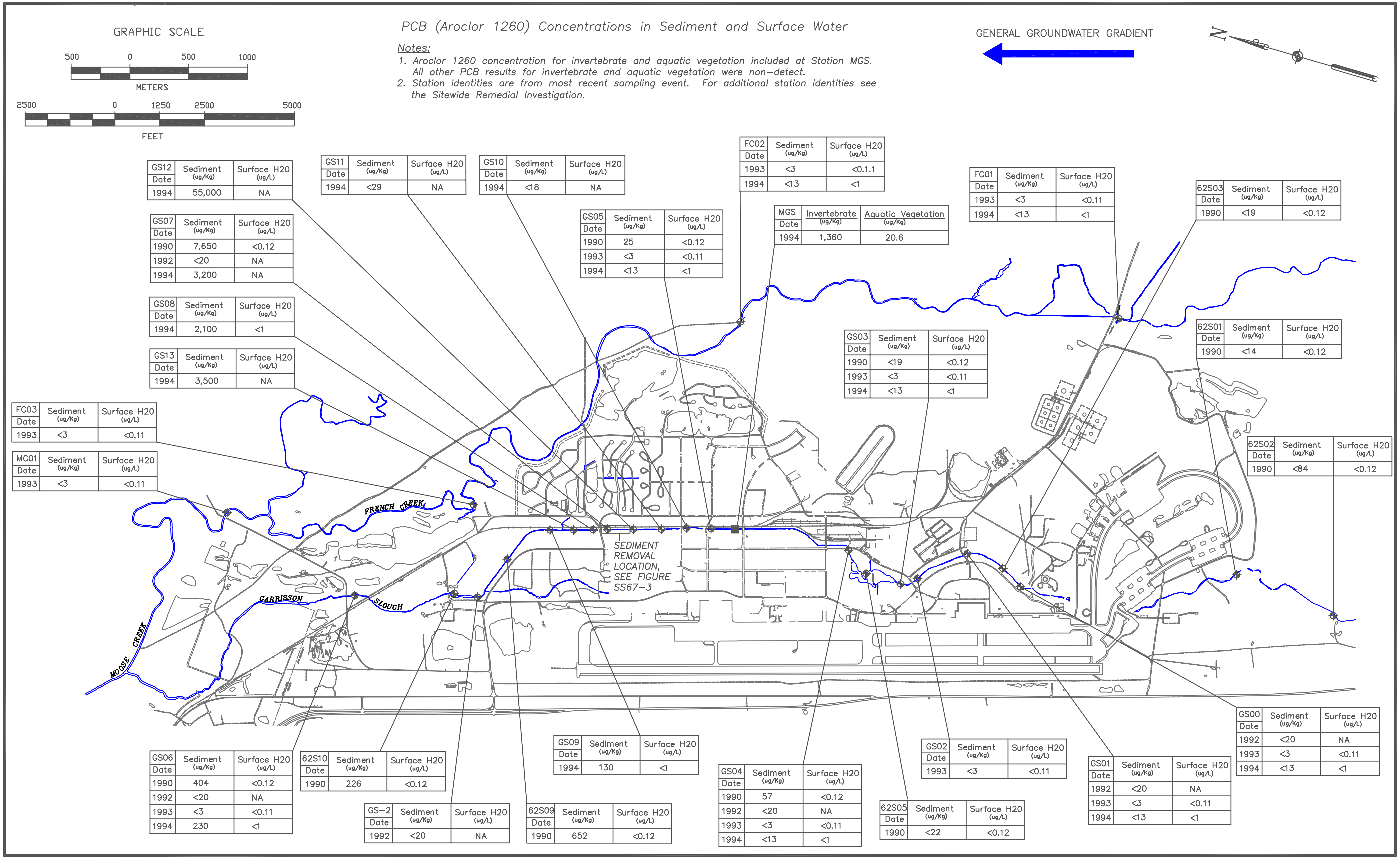


Figure SS67–2: Garrison Slough RI Results, Eielson AFB, Alaska

This page intentionally left blank

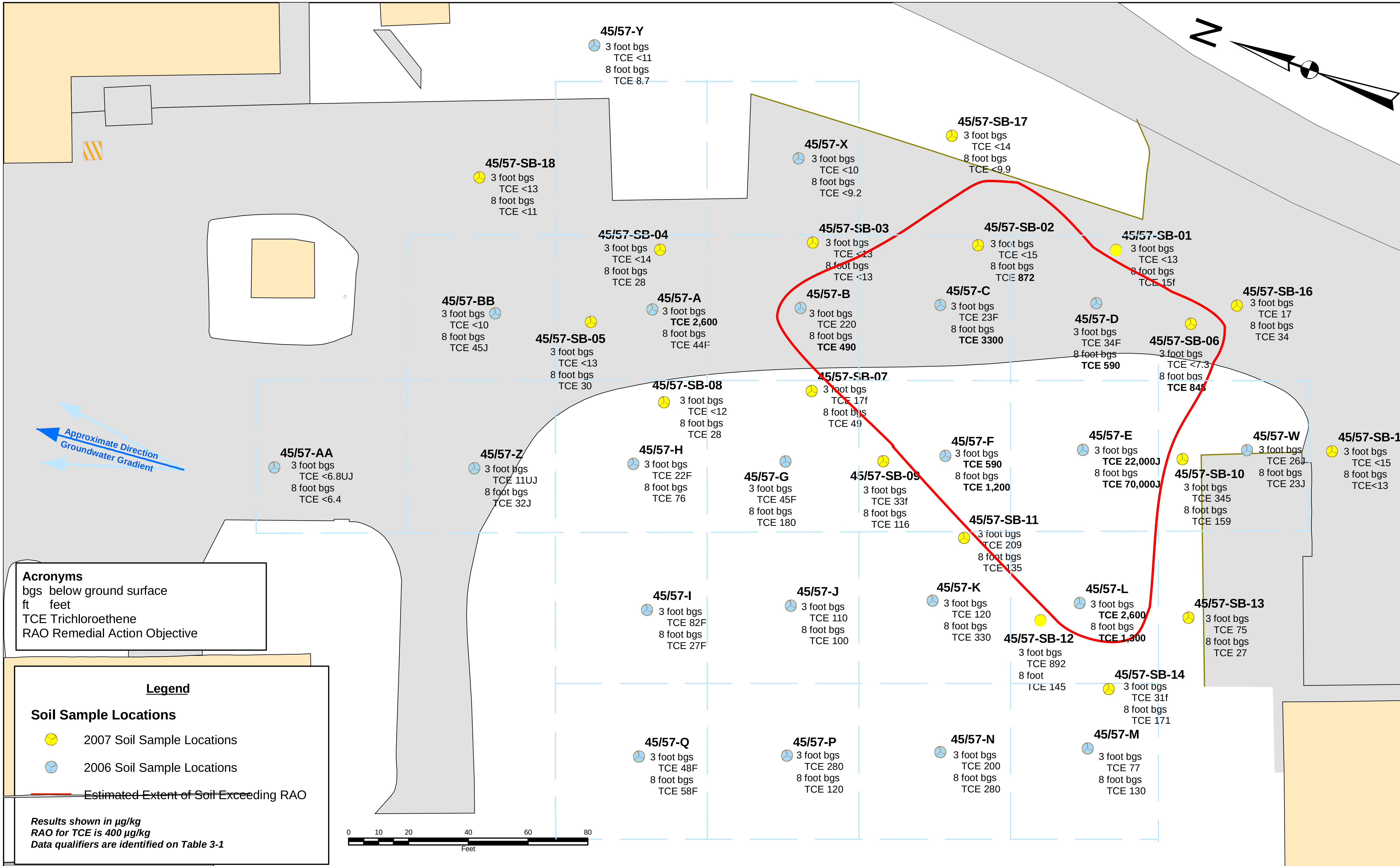


Figure WP45/SS57-3: WP45/SS57, Estimated Extent of Soil with TCE Concentrations Exceeding RAO at 8 feet bgs, Eielson AFB, Alaska

This page intentionally left blank

SAMPLE IDENTIFICATION	SAMPLE DATE	AROCLOR 1260 (mg/kg)
* GS-HB-16-1 (@850-870)	4/25/96	0.044
GS-HB-16-2 (@850-870)	4/25/96	0.039
GS-HB-16-3 (@850-870)	4/25/96	0.57
GS-HB-16-4 (@850-870)	4/25/96	0.39
GS-SC-800	9/23/96	1
GS-SC-775	9/23/96	0.85
GS 28 (Sitewide RI)-675	PNL 1994	6.5
GS 29 (Sitewide RI)-625	PNL 1994	9.8
GS-97-SC-580	7/21/97	1.83
GS-97-SC-575	7/21/97	0.930
GS-97-SC-550	7/21/97	1.95
GS-97-SC-525	7/21/97	0.809
GS-97-SC-525(dup)	7/21/97	2.59
GS-97-SC-500	7/21/97	12.8
GS-97-SC-475	7/21/97	3.13
GS-97-SC-450	7/21/97	4.15
GS-97-SC-425	7/21/97	0.395
GS-97-SC-400	7/21/97	0.320
GS-97-SC-375	7/21/97	2.99
GS-97-SC-350	7/21/97	4.77
GS-97-SC-325	7/21/97	0.697
GS-SC-325	9/23/96	0.55
GS-SC-300	9/23/96	0.76
GS-SC-275	9/23/96	0.84
GS-SC-250	9/23/96	0.23
GS-SC-225	9/23/96	0.37
GS-SC-200	9/23/96	1
GS-SC-175	9/23/96	0.98
GS-SC-150	8/23/96	1
GS-SC-125	8/23/96	11
GS-SC-100	8/23/96	1.3
GS-SC-75	8/23/96	2
GS-98-SC-40	5/21/98	0.6
GS-98-SC-10	5/21/98	8.6
GS-98-SC-OW	5/21/98	0.3

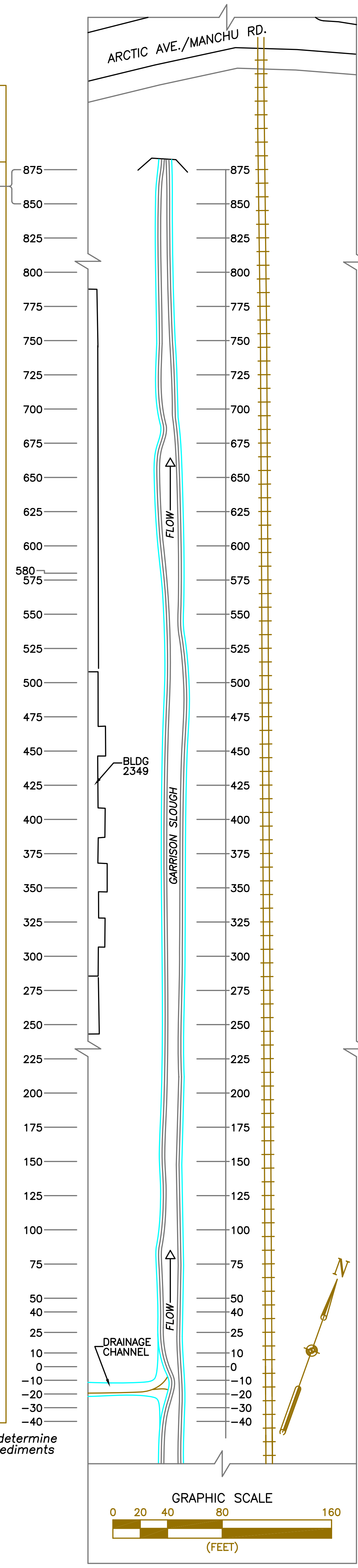
CONFIRMATION SAMPLES COLLECTED FOR 1996 SEDIMENT REMOVAL ACTIVITIES (GS-HB-16-1 through GS-SC-775)

SEDIMENT REMOVAL NOT CONDUCTED FOLLOWING DISCOVERY OF UXO (GS 28 and GS 29)

CONFIRMATION SAMPLES COLLECTED FOR 1997 SEDIMENT REMOVAL ACTIVITIES (GS-97-SC-580 through GS-97-SC-325)

CONFIRMATION SAMPLES COLLECTED FOR 1996 SEDIMENT REMOVAL ACTIVITIES (GS-SC-325 through GS-SC-75)

CONFIRMATION SAMPLES COLLECTED FOR 1998 SEDIMENT REMOVAL ACTIVITIES (GS-98-SC-40 through GS-98-SC-OW)



*NOTE: These samples were collected during initial steps of sediment removal pilot study to determine if removal of sediments adequately reduced PCB content of underlying hard bottom sediments in the 850-870 interval of Garrison Slough.

SAMPLE KEY

GS-97-SC-350

- GS — GARRISON SLOUGH
- 97 — DENOTES SAMPLE COLLECTED IN 1997 (IF NOT SHOWN, SAMPLE COLLECTED IN 1996)
- SC — SEDIMENT CONFIRMATION SAMPLE
- 350 — DISTANCE DOWNSTREAM RELATIVE TO STATION "0" ESTABLISHED NEAR DELTA IN 1996

ADAPTED FROM 1997 GARRISON SLOUGH PILOT STUDY REPORT

DRAWING NAME: D:\DRAWINGS\GSLOUGH\FIG-3-4.DWG
DATE:11/13/1997 DRAWN BY: CHH

Figures SS67-4. Sediment Confirmation Samples Collected In 1996 & 1997 Following Removal of PCB Impacted Soft Sediments, Garrison Slough, Eielson AFB, Alaska

This page intentionally left blank

TABLE SS67-1: GARRISON SLOUGH, PCB (Aroclor-1260) CONCENTRATIONS (µg/kg) IN FISH TISSUE SAMPLES COLLECTED FROM 1993 THROUGH 2007, EIELSON AFB, ALASKA

Sample Location	Sample ID	Date	Fish Weight grams	Species	Aroclor-1260 µg/kg	Age Data	Notes
RAO					**2.69 µg/kg**	**yrs.**	
Upper Garrison Slough (UGS)	B07DE8	09/93	not reported	No. Pike	649		Fillet plus organs
	Fish 1	06/16/95	not reported	No. Pike	104		
	Fish 2	06/16/95	not reported	No. Pike	< 20		
	Fish 3	06/16/95	not reported	No. Pike	< 20		
	Fish 4	06/16/95	not reported	No. Pike	71		
		1996-1997-No Fish Caught/analyzed					
	UGS-FS98-01	08/26/98	140	No. Pike	14		
	UGS-FS99-01	07/08/99	436	Grayling	67		
	UGS-FS99-02	07/08/99	308	Grayling	250		
	UGS-FS-00-01	08/02/00	384	Trout	24		
	UGS-FS-01-01	06/25/01	536	Grayling	110		
	UGS-FS-01-01	06/25/01	536	Grayling	74		
	UGS-FS-01-02	06/25/01	300	Trout	170		
	UGS-FS-01-03	06/25/01	248	Trout	190		
	UGS-FS-01-04	07/24/01	312	Grayling	84		
	UGS-FS-01-05	07/24/01	464	Trout	200		
	UGS-GR-14	07/17/02	241	Grayling	110		
	UGS-GR-6	07/17/02	184	Grayling	74		
	UGS-NP-2	06/03/03	2.5kg	No. Pike	400	9	a,b
	UGS-NP-3	06/10/03	2.9kg	No. Pike	140	10	a,b
	UGS-GR-1	05/25/04	84	Grayling	<0.63	3	a,b,d
	UGS-GR-4	05/25/04	260	Grayling	67	7	a,b
	UGS-GR-5	05/25/04	241	Grayling	41	6	a,b
	UGS-GR-10	05/25/04	99	Grayling	5.4	4	a,b
	UGS-GR-11	05/25/04	244	Grayling	13	5	a,b
	UGS-GR-12	05/25/04	264	Grayling	31	5	a,b
	UGS-GR-14	05/25/04	248	Grayling	240	4	a,b
		2005-2007-No Fish Caught/analyzed					
Middle Garrison Slough (MGS)	B07DB4	09/93	not reported	Grayling	11		Fillet plus organs
	Fish 1	06/16/95	not reported	Grayling	< 20		
	Fish 2	06/16/95	not reported	Grayling	22		
	Fish 3	06/16/95	not reported	Grayling	30		
	Fish 4	06/16/95	not reported	Grayling	33		
	MGS-08	08/05/96	490	Grayling	2,300		
	MGS-09	08/05/96	228	Grayling	29		
	MGS-10	08/05/96	224	Grayling	540		
	MGS-11	08/05/96	134	Grayling	86		
		No Fish Caught During the FY 1997 Field Season					
	MGS-FS98-01	09/10/98	264	Trout	61		
	MGS-FS98-02	09/10/98	204	Trout	390		
	MGS-FS98-03	09/10/98	248	Trout	30		
		1999-2000 No Fish Caught/Analyzed					
	MGS-FS01-01	06/25/01	140	Trout	22 J		
	MGS-FS01-02	06/25/01	224	Grayling	34 J		
	MGS-GR-8	08/07/02	120	Grayling	<50		
	MGS-GR-21	08/07/02	60	Grayling	<50		
	MGS-GR-1	6/6/2003	422	Grayling	100	7	a,b
	MGS-GR-4	05/25/04	139	Grayling	8.9	22	a,b
	MGS-LNS-5	05/25/04	722	LNS	59	~14[1]	a,b
	MGS-LNS-7	05/25/04	353	LNS	10	15-17[1]	a,b
	MGS-LNS-10	05/25/04	444	LNS	34	[2]	a,b
		2005-2007-No Fish Caught/analyzed					
Arctic Ave./Manchu Rd. (AAMR)	AA-MR-02	08/04/96	444	Grayling	12,000		
	AA-MR-03	08/04/96	476	Grayling	2,600		
	AA-MR-04	08/04/96	440	Grayling	6,300		
	AA-MR-05	08/04/96	230	Grayling	7,600		
	AA-MR-06	08/04/96	186	Grayling	670		
	AA-MR-97-01	09/04/97	349	Grayling	430		
	AA-MR-97-02	09/04/97	602	Grayling	290		
	AA-MR-97-03	09/04/97	250	No. Pike	67		
	AA/MR-FS98-01	09/08/98	496	Grayling	480		
	AA/MR-FS98-02	09/08/98	321	Grayling	680		

TABLE SS67-1: GARRISON SLOUGH, PCB (Aroclor-1260) CONCENTRATIONS (µg/kg) IN FISH TISSUE SAMPLES COLLECTED FROM 1993 THROUGH 2007, EIELSON AFB, ALASKA

Sample Location	Sample ID	Date	Fish Weight grams	Species	Aroclor-1260 µg/kg	Age Data	Notes
RAO					**2.69 µg/kg**	**yrs.**	
Arctic Ave./Manchu Rd. (AAMR) cont.	AAMR-FS99-01	07/09/99	156	Trout	470		
	AAMR-FS99-02	07/09/99	116	Trout	62		
	AAMR-FS99-03	07/09/99	146	Trout	89		
	AAMR-FS99-04	07/09/99	284	Trout	1,200		
	AAMR-FS99-05	07/09/99	122	Trout	66		
	AAMR-FS99-06	07/09/99	250	Grayling	660		
	AAMR-FS00-01	08/23/00	412	Grayling	2,000		
	AAMR-FS00-02	08/23/00	268	Trout	180		
	AAMR-FS00-03	08/23/00	182	Trout	150		a, b
	AAMR-FS01-01	05/10/01	288	Trout	2,100		
	AAMR-FS01-02	05/10/01	200	Grayling	280		
	AAMR-FS01-03	07/03/01	200	Grayling	660		
	AAMR-FS01-04	07/10/01	470	Grayling	540		
	AAMR-FS01-04	07/10/01	470	Grayling	550		
	AAMR-FS01-05	07/10/01	300	Trout	740		
	AAMR-FS01-06	07/23/01	88	Grayling	610		
	AAMR-FS01-07	07/23/01	134	Grayling	320		
	AAMR-GR-2-2	07/12/02	184	Grayling	480	3	
	AAMR-GR-2-3	07/12/02	85	Grayling	<170	3	
	AAMR-GR-8	06/03/03	40	Grayling	130	2	a,age estimated with scale
	AAMR-GR-15	06/03/03	112	Grayling	140	4	a,b
	AAMR-GR-16	06/03/03	360	Grayling	350	8	a,b
	AAMR-GR-18	06/03/03	120	Grayling	64	5	a,b
	AAMR-GR-2	05/26/04	206	Grayling	130	6	a,b
	AAMR-GR-6	05/24/04	160	Grayling	220	5	a,b
	AAMR-GR-9	05/28/04	415	Grayling	220	9	a,b
	AAMR-GR-10	05/28/04	196	Grayling	190	4	a,b
	AARR-GR-11	06/02/04	376	Grayling	200	8	a,b
	AAMR-GR-12	06/02/04	395	Grayling	370	7	a,b
	AAMR-GR-13	06/02/04	258	Grayling	790	5	a,b
	AAMR-GR-15	06/02/04	300	Grayling	22	7	a,b
	AAMR-GR-15	06/02/04	300	Grayling	46	7	*
	AAMR-LNS-1	05/26/04	1400	LNS	170	16-18[1]	a,b
	AAMR-LNS-1	05/26/04	1400	LNS	220	16-18[1]	*
	AAMR-LNS-4	05/26/04	1300	LNS	15	11-13[1]	a,b
	AAMR-LNS-20	06/02/04	290	LNS	110	2+ [1]	a,b
		2005-2007-No Fish Caught/analyzed					
Lower Garrison Slough (LGS)	B07DB3	9/93	not reported	Grayling	995		Fillet plus organs
	Fish 1	06/16/95	not reported	Grayling	1,180		
	Fish 2	06/16/95	not reported	Grayling	3,000		
	Fish 3	06/16/95	not reported	Grayling	2,240		
	Fish 4	06/16/95	not reported	Grayling	1,500		
	Fish 4 DUP	06/16/95	not reported	Grayling	2,090		
	LGS-07	08/05/96	488	Grayling	1,900		
		1997-2001 No Fish Caught/Analyzed					
	LGS-GR-3	07/31/02	85	Grayling	320	2+	19 cm
	LGS-GR-15	07/15/02	184	Grayling	380	3+	24.5 cm
	LGS-GR-3	06/09/03	104	Grayling	200	4	a,b
	LGS-GR-5	06/09/03	58	Grayling	650	3	a, b, otolith was in poor cond.
	LGS-GR-9	06/09/03	92	Grayling	270	3	a, b
Composited Samples	*LGS-GR-11*	05/27/04	*6*	*Grayling*		1+	a,b,d
	LGS-GR-12	05/27/04	*4*	*Grayling*	*92*	1*	[2],d
	LGS-GR-13	05/27/04	*6*	*Grayling*		1+	a,b,d
	G-42	07/17/07	*255*	*Grayling*	*280*	*4*	a,b
	G-43	07/17/07	*340*	*Grayling*	*310*	*5*	a,b
	G-44	07/24/07	*345*	*Grayling*	*280*	*5*	a,b
Heritage Park (HP)	HP-GR-28	06/13/02	140	Grayling	190	3	
	HP-GR-29	06/13/02	120	Grayling	450	3	
		1996-2001 and 2003-2007No Fish Caught/Analyzed					

TABLE SS67-1: GARRISON SLOUGH, PCB (Aroclor-1260) CONCENTRATIONS (µg/kg) IN FISH TISSUE SAMPLES COLLECTED FROM 1993 THROUGH 2007, EIELSON AFB, ALASKA

Sample Location	Sample ID	Date	Fish Weight grams	Species	Aroclor-1260 µg/kg	Age Data	Notes
RAO					**2.69 µg/kg**	**yrs.**	
(FLCR)	FLCR-GR-16	07/16/02	85	Grayling	60	2	
	FLCR-GR-16	07/16/02	241	Grayling	91	4	
	FLCR-GR-8	06/05/03	140	Grayling	120	5	a, b
	FLCR-GR-9	06/05/03	98	Grayling	330	4 or 5	a, b, age is estimated
	FCGS-GR-50	06/03/04	31	Grayling	10	2+	a,b,d
	1996-2001 and 2005-2007 No Fish Caught/Analyzed						
Waste Water Treatment Plant	STP-12A	08/06/96	612	Grayling	940		Field duplicates: 12A & 12B
(WWTP)	STP-12B	08/06/96	612	Grayling	240		
	No Fish Caught During the FY 1997 Field Season						
	WWT-FS98-01	09/08/98	65	Trout	58		
	WWT-FS98-02	09/08/98	276	Trout	160		
	WWT-FS98-03	09/08/98	404	Grayling	83		
	WWT-FS99-01	07/12/99	118	Trout	40		
	WWT-FS99-02	07/12/99	298	Grayling	230		
	WWT-FS00-01	08/18/00	284	Grayling	35		
	WWT-FS01-01	05/10/01	204	Trout	220		
	WWT-FS01-02	06/28/01	244	Grayling	230		
	WWT-GR-17	08/08/02	61	Grayling	290	3	
	WWT-GS-GR-2	06/06/03	82	Grayling	18	4	a,b
	WWT-GS-GR-6	06/06/03	50	Grayling	226	3	a,b
	WWT-GS-GR-6	06/06/03	50	Grayling	230	3	*
	WWT-GS-GR-9	06/06/03	112	Grayling	322	4	a,c
	WWT-GS-GR-9	06/06/03	112	Grayling	350	4	*
	WWT-GR-4	05/28/04	79	Grayling	29	3	a,b,d
	WWT-GR-6	05/28/04	24	Grayling	9.9	3	a,b,d
	G-41	10/16/07	380	Grayling	240	6	a,b
Fish Barrier Upstream	*No Fish Caught During the 1996 Field Season*						
(FBUS)	GS-FS-US-97-03	09/04/97	585	No. Pike	39		
	GS-FS-US-97-04	09/17/97	610	Trout	1200		
	GSFB-US-FS98-05	08/27/98	348	Trout	490		
	GSFB-US-FS98-01	09/08/98	84	Trout	33		
	GSFB-US-FS98-02	09/08/98	526	Trout	230		
	RCFB-FS99-01	07/12/99	94	Trout	27		
	GSFB-US-FS00-01	08/02/00	450	Grayling	520		
	RCFB-US-FS01-05	06/06/01	344	Grayling	470		
	RCFB-US-FS01-05	06/06/01	344	Grayling	540		
	GSFB-US-WH-6	10/03/02	39	Whitefish	160	1+	long, taken
	GS-FB-US-GR-1	06/02/03	98	Grayling	160	5	a,b
	GS-FB-US-GR-6	06/02/03	290	Grayling	180	6	a,b
	GS-FB-US-GR-7	06/04/03	19	Grayling	150	2	a,b
	GS-FB-US-GR-14	06/04/03	78	Grayling	360	5	a,b
	GS-FB-US-GR-20	06/09/03	280	Grayling	450	6	a,b
	GS-FB-US-GR-21	06/09/03	118	Grayling	300	5	a,b
	FBUS-LNS-1	05/26/04	830	LNS	56	12-14	a,b
	2005-2007 No Fish Caught/Analyzed						
Fish Barrier Downstream	GS-FS-DS-97-01	09/04/97	430	Grayling	200		
(FBDS)	GS-FS-DS-97-02	09/04/97	610	Grayling	71		
	GS-FS-DS-97-05	09/02/97	580	Grayling	430		
	GSFB-DS-FS98-04	08/27/98	172	Trout	70		
	GSFB-DS-FS98-03	09/08/98	81	Trout	120		
	GSFB-DS-FS00-01	08/23/00	84	Trout	25		
	RCFB-DS-FS01-01	05/10/01	140	Grayling	1,400		
	RCFB-DS-FS01-02	05/10/01	100	Grayling	120		
	RCFB-DS-FS01-03	05/10/01	100	Grayling	65		
	RCFB-DS-FS01-04	05/10/01	88	Grayling	37 J		
	13-DFS-GR	07/15/02	255.1	Grayling	320	3+	
	25-DFS-GR	07/31/02	65	Grayling	160	2	
	GS-FB-DS-GR-1	6/2/2003	120	Grayling	100	5	a,b

TABLE SS67-1: GARRISON SLOUGH, PCB (Aroclor-1260) CONCENTRATIONS (µg/kg) IN FISH TISSUE SAMPLES COLLECTED FROM 1993 THROUGH 2007, EIELSON AFB, ALASKA

Sample Location	Sample ID	Date	Fish Weight grams	Species	Aroclor-1260 µg/kg	Age Data	Notes
RAO					**2.69 µg/kg**	**yrs.**	
(GSNS)	GS-NS-97-02	09/17/97	70	Trout	<14		
	GS-NS-FS98-01	08/26/98	212	Trout	55		
	GS-NS-FS98-02	08/26/98	192	Trout	50		
	GSNS-FS99-01	07/13/99	122	Trout	38		
	GSNS-FS99-02	07/13/99	98	Trout	17		
	GSNS-FS99-03	08/16/99	118	Trout	17		
	GSNS-FS99-04	08/16/99	244	Grayling	25		
	GSNS-FS00-01	08/14/00	126	Trout	94		
	GSNS-FS01-01	07/06/01	140	Trout	140		
	GS-NS-GR-2-1	09/04/02	153	Grayling	120	3	
	GS-NS-GR-2-5	09/04/02	203	Grayling	370	3	
	GS-NS-GR-4	6/5/2003	24	Grayling	55	7	a,b
	G-12	07/12/07	100	Grayling	150	2	a,b
	G-13	07/12/07	90	Grayling	84	2	a,b
	G-15	07/12/07	290	Grayling	96	6	a,b
	G-17	07/12/07	80	Grayling	62	2	a,b
		2004-2006 No Fish Caught/Analyzed					
Moose Creek -Osage Street	MC-05-15	08/08/96	112	Grayling	< 15		
(MC-OS)	MC-05-16	08/08/96	129	Grayling	50		
	MC-05-17	08/08/96	232	Grayling	25		
	MC-05-18	08/08/96	94	Grayling	82		
	MC-OS-97-01	09/03/97	129	Grayling	<14		
	MC-OS-97-02	09/03/97	95	Trout	<14		
	MC-OS-97-03	09/03/97	219	Grayling	60		
	MS-OS-97-03DUP	09/03/97	219	Grayling	59		
	MC-OS-97-04	09/03/97	160	Grayling	<14		
	MC-OS-97-05	09/03/97	145	Grayling	22		
	MC-OS-FS98-04	08/27/98	129	Grayling	94		
	MC-OS-FS98-05	08/27/98	283	Grayling	54		
	MC-OS-FS98-06	08/27/98	152	Grayling	24		
	MC-OS-FS98-07	08/27/98	138	Grayling	79		
	MC-OS-FS98-01	08/29/98	236	Trout	38		
	MC-OS-FS98-02	08/29/98	324	Grayling	99		
	MCOS-FS99-01	08/17/99	96	Grayling	54		
	MS-OS-FS00-01	09/20/00	80	Grayling	33		
		2002-2002 No Fish Caught/Analyzed					
	MC-OS-GR-1	06/10/03	332	Grayling	27	8	a,b
	MC-OS-GR-1	06/10/03	332	Grayling	14	8	a,b, *
	MC-OS-GR-2	06/10/03	110	Grayling	256	4	a, b
	MC-OS-GR-2	06/10/03	110	Grayling	260	4	a,b,*
	MC-OS-GR-3	06/10/03	100	Grayling	144	4 or 5	a, b, age is estimated
	MC-OS-GR-3	06/10/03	100	Grayling	140	4 or 5	*
	MC-OS-GR-4	06/10/03	124	Grayling	32	6	a,b
	MC-OS-GR-4	06/10/03	124	Grayling	13	6	a,b,*
	MC-OS-GR-6	06/10/03	183	Grayling	3.3	7	a,b
	G-02	07/12/07	310	Grayling	58	7	a,b
	G-05	07/12/07	270	Grayling	16	5	a,b
	G-07	07/12/07	360	Grayling	10	7	a,b
	G-10	07/12/07	220	Grayling	20	6	a,b
		2004-2006 No Fish Caught/Analyzed					
Moose Creek/Garrison Slough	Fish 1	06/16/95	not reported	Grayling	216		
(MC-GS)	Fish 2	06/16/95	not reported	Grayling	< 20		
	Fish 3	06/16/95	not reported	Grayling	< 20		
	Fish 4	06/16/95	not reported	Grayling	21		
	MC-GS-31	08/08/96	290	Grayling	40		
	MC-GS-32	08/08/96	290	Whitefish	170		
	MC-GS-33	08/08/96	236	Grayling	36		
	MC-GS-34A	08/08/96	392	Grayling	730		
	MC-GS-34B	08/08/96	392	Grayling	170		
	MC-GS-35	08/08/96	230	Grayling	< 14		
	MC-GS-36	08/08/96	140	Whitefish	81		
	MC-GS-37	08/08/96	245	Grayling	45		

TABLE SS67-1: GARRISON SLOUGH, PCB (Aroclor-1260) CONCENTRATIONS (µg/kg) IN FISH TISSUE SAMPLES COLLECTED FROM 1993 THROUGH 2007, EIELSON AFB, ALASKA

Sample Location	Sample ID	Date	Fish Weight grams	Species	Aroclor-1260 µg/kg	Age Data	Notes
RAO					**2.69 µg/kg**	**yrs.**	
Moose Creek/Garrison Slough (MC-GS) Continued	MC-GS-38	08/08/96	200	Trout	22		
	MC-GS-39	08/08/96	140	Trout	< 14		
	MC-GS-39	08/08/96	140	Trout	< 14		
	No Fish Caught during the FY 1997 Field Season						
	MC/GSC-FS98-03	08/26/98	208	Grayling	34		
	MC/GSC-FS98-04	08/26/98	258	Grayling	130		
	MC/GSC-FS98-05	08/27/98	288	Trout	34		
	MC/GSC-FS98-06	08/29/98	224	Grayling	30		
	MC/GSC-FS98-07	08/29/98	84	Trout	14		
	MC/GSC-FS98-01	09/09/98	310	Grayling	120		
	MCGSC-FS99-01	08/16/99	190	Grayling	<14		
	MCGSC-FS99-02	08/16/99	328	Grayling	99		
	2000-2002 No Fish Caught/Analyzed						
	MC-GS-GR-1	06/09/03	124	Grayling	5.6	5	a,b
	MC-GS-GR-3	06/09/03	310	Grayling	85	10	a,b
	G-23	07/12/07	190	Grayling	28	4	
	G-24	07/12/07	280	Grayling	84	6	
	G-28	07/12/07	295	Grayling	37	7	
	G-29	07/12/07	215	Grayling	29	4	
	2004-2006 No Fish Caught/Analyzed						
Moose Creek/Pete's Crossing (MCPC)	MC-PC-19	08/08/96	238	Trout	79		
	MC-PC-19	08/08/96	126	Trout	59		
	MC-PC-19	08/08/96	142	Trout	140		
	MC-PC-19	08/08/96	52	Grayling	49		
	MC-PC-19	08/08/96	44	Grayling	100		
	MC-PC-19	08/08/96	61	Grayling	120		
	MC-PC-19	08/08/96	212	Burbot	57		
	MC-PC-97-01	09/02/97	259	Trout	1,100		
	MC-PC-97-02	09/04/97	120	Trout	170		
	1998-2000 No Fish Caught/Analyzed						
	MCPC-FS01-01	06/25/01	72	Trout	48 J		
	R-3-MCPC-TR	09/10/02	149	Trout	<50		
	R-4-MCPC-TR	09/10/02	165	Trout	<50		
	MC-PC-GR-3	06/04/03	42	Grayling	140	3	a,b
	MC-PC-GR-5	06/04/03	58	Grayling	140	4	a,b
	MC-PC-GR-6	06/04/03	22	Grayling	160	3 or 4	a,b, age is estimated
Composited Sample	*MC-PC-LNS-1*	*07/27/04*	*<1*	*Sucker*		*<1*	*Composited Sample*
	MC-PC-LNS-2	*07/27/04*	*<1*	*Sucker*	*69*	*<1*	
	MC-PC-LNS-3	*07/27/04*	*<1*	*Sucker*		*<1*	
	G-32	07/13/07	80	Grayling	69	2	
	G-33	07/13/07	70	Grayling	62	2	
	G-37	07/13/07	165	Grayling	56	4	
	G-39	07/13/07	90	Grayling	87	2	
	2005-2006 No Fish Caught/Analyzed						

Notes:	*	Duplicate sample
	+	Plus sign indicates beginning of current years growth visible during aging
	1	Ages for Longnose suckers (Catostomis catostomis) are estimates
	2	Age not available; otolith in poor condition or not available
	a	All tissue samples are skin-on fillet unless otherwise noted
	b	All ages were determined using otolith analyses unless otherwise noted
	c	Age determined using scale method
	d	Surrogate recovery low, below lower confidence limit
	J	Indicates that the analyte was positively identified; however the quantitation is estimated.
	µg/kg	micrograms per kilogram
	GR	Grayling (*Thymallus arcticus*)
	No. Pike	Northern Pike (*Esox lucious*)
	LNS	Longnose Sucker (*Catostomis catostomis*)
Analytical Method:	1. 8082	

TABLE SS67-2: GARRISON SLOUGH, PCB (Aroclor) CONCENTRATIONS (µg/kg) IN SEDIMENT SAMPLES COLLECTED FROM 1998 THROUGH 2001, EIELSON AFB, ALASKA

Station Location	Date	PCB Result (µg/kg)	Comment	Reference
RAO		**10,000**		**18 AAC 75.341**
			See results in SS35 section	
			See results in SS35 section	
Upper Garrison Slough	08/11/00	<254	Aroclor-1260	USAF 2000 SWMPR
	09/10/01	<83	Aroclor-1260	USAF 2001 SWMPR
Middle Garrison Slough	08/18/98	<4,780	Aroclor-1260	USAF 1998 SWMPR
	08/12/99	<42	Aroclor-1260	USAF 1999 SWMPR
	08/11/00	<174	Aroclor-1260	USAF 2000 SWMPR
	09/10/01	<40	Aroclor-1260	USAF 2001 SWMPR
Arctic Ave./Manchu Rd.	08/19/98	**178,000**	Aroclor-1260	USAF 1998 SWMPR
	08/12/99	924	Aroclor-1260	USAF 1999 SWMPR
	08/11/00	1,380	Aroclor-1260	USAF 2000 SWMPR
(duplicate)	08/11/00	801	Aroclor-1260	USAF 2000 SWMPR
	09/10/01	**16,000**	Aroclor-1260	USAF 2001 SWMPR
(duplicate)	09/10/01	**17,100**	Aroclor-1260	USAF 2001 SWMPR
Lower Garrison Slough	08/19/98	137	Aroclor-1260	USAF 1998 SWMPR
(duplicate)	08/19/98	105	Aroclor-1260	USAF 1998 SWMPR
	08/12/99	490	Aroclor-1260	USAF 1999 SWMPR
	08/11/00	2,180	Aroclor-1260	USAF 2000 SWMPR
	09/10/01	2,670	Aroclor-1260	USAF 2001 SWMPR
Railroad crossing	08/18/98	<139	Aroclor-1260	USAF 1998 SWMPR
(fish barriers)	08/12/99	<40	Aroclor-1260	USAF 1999 SWMPR
(duplicate)	08/12/99	<36	Aroclor-1260	USAF 1999 SWMPR
	08/11/00	1,130	Aroclor-1260	USAF 2000 SWMPR
	09/10/01	<93	Aroclor-1260	USAF 2001 SWMPR

Notes:

AAC Alaska Administrative Code
PCB Polychlorinated biphenyl
RAO Remedial Action Objective

Complete references are provided in Appendix B.

9 REFERENCES

18 AAC 60. Solid Waste Management. 2002. Alaska Administrative Code. September.

18 AAC 70. Water Quality Standards. 1999. Alaska Administrative Code. May.

18 AAC 75. Oil and Other Hazardous Substances Pollution Control. 2000. Alaska Administrative Code. October.

18 AAC 78. Underground Storage Tanks. 2000. Alaska Administrative Code. August.

18 AAC 80. Drinking Water. 2001. Alaska Administrative Code. September.

40 CFR 141. National Primary Drinking Water Regulations. Code of Federal Regulations.

40 CFR 258. USEPA Criteria for Solid Waste Landfills. Code of Federal Regulations.

40 CFR 264. USEPA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities. Code of Federal Regulations.

40 CFR 300. National Oil and Hazardous Substances Pollution Contingency Plan. Code of Federal Regulations.

AFCEE (Air Force Center for Environmental Excellence). 1993. Handbook for the Installation Restoration Program Remedial Investigations and Feasibility Studies, September. Environmental Services Directorate, Brooks AFB, Texas.

Battelle Environmental Management Operations. 1991. Source Evaluation Report, Eielson AFB, Alaska. Prepared by CH2M Hill for Battelle Environmental Management Operations, Richland, Washington.

Battelle Environmental Management Operations. 1993. Interim Report for Bioventing Field Initiative, Eielson AFB, Alaska. March. Battelle, Columbus, Ohio.

Battelle Environmental Management Operations. 1995a. Final Report Environics TOC Task 3 Bioventing Feasibility Study, Eielson AFB, Alaska. March. Battelle, Columbus, Ohio.

Battelle Environmental Management Operations. 1995b. Field Investigation, Source Area ST58, Eielson AFB, Alaska. May. Pacific Northwest Laboratory, Richland, Washington

Beikman, H.M. 1980. Geologic Map of Alaska. U.S. Geological Survey 1:2,500,000, Anchorage, Alaska.

REFERENCES (Continued)

CRREL (U.S. Army Cold Regions Research and Engineering Laboratory). 1994. Final Report on Microwell Investigations of Operable Units 3, 4, and 5 at Eielson AFB, Alaska. Prepared by CRREL, Hanover, New Hampshire.

CRREL (U.S. Army Cold Regions Research and Engineering Laboratory). 1995a. Draft Final Report on Micro well Investigations of USTs and the Cargain Road Spill at Eielson AFB, Alaska. Prepared by the University of New Hampshire for CRREL.

CRREL (U.S. Army Cold Regions Research and Engineering Laboratory). 1995b. Field Reports for Activities Associated with the Investigations of Contaminant Transport at Eielson AFB Site. ST48. Prepared by University of New Hampshire for CRREL.

De Boer, J., F.V. Valk, M. A. T. Kerkhoff, P. Hage, U. A. T. Brinkman. 1994. “8-Year Study of the Elimination of PCBs and Other Organochlorine Compounds from Eel (Anguilla anguilla) Under Natural Conditions.” In *Environmental Science and Technology;* Vol. 28, No. 13, p. 2242-2248.

EA (EA Engineering Science, and Technology). 1995a. Final Operable Unit 1 Remedial Action Workplan, Eielson AFB, Alaska. November, Fairbanks, Alaska.

EA (EA Engineering Science, and Technology). 1995b. Final Operable Unit 1 Remedial Design, Eielson AFB, Alaska. November, Fairbanks, Alaska.

Food and Drug Administration, Code of Federal Regulations, Title 21, Vol 2, Cite: 21CFR109.30, Revised 2002

Geick, R.E., and D.L. Kane. 1986. Hydrology of Two Sub-Arctic Watersheds, in Cold Regions. Hydrology Symposium, American Water Resources Association.

HLA (Harding Lawson Associates). 1991. Installation Restoration Program Remedial Investigation/Feasibility Study, Stage 4. Draft Report for Eielson AFB, Alaska. Volume IV. Prepared by HLA for the Alaskan Air Command, Elmendorf AFB, Alaska. (As cited in USAF 1995a.)

IT (International Technology Corporation). 1995a. Eielson OU2 Source Areas ST13/26 Treatability Study Informal Technical Information Report, Draft. September. Prepared for AFCEE, Brooks AFB, TX.

MacDonald D.D., Ingersoll C.G., Berger T.A. (2000) Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environmental Contamination and Toxicology*, 39, 20-31.

Nelson, Gordon L.1978. Hydrologic Information for Land-Use Planning, Fairbanks Vicinity, Alaska. U.S. Geological Survey Open-File Report 78-959.

REFERENCES (Continued)

Pewe, T.L. 1982. Geologic Hazards of the Fairbanks Area. Alaska Division of Geological and Geophysical Surveys Special Report 15, Fairbanks, Alaska. (As cited in USAF 1995a.).

USACE (Unites States Army Corps of Engineers). 1998a. Sitewide Remedial Action Summary Report, Eielson AFB, Alaska. August. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USACE (Unites States Army Corps of Engineers). 1998b. OU3, OU4, and OU5 Remedial Action Summary Report, Eielson AFB, Alaska. August. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USACE (Unites States Army Corps of Engineers). 1999. Site Characterization Report, Chena River Research Site, Eielson AFB, Alaska. October. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USACE (Unites States Army Corps of Engineers). 2000. Release Investigation Report, Chena River Research Site, Eielson AFB, Alaska. December. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USACE (Unites States Army Corps of Engineers). 2001. Summary of Groundwater Flow Direction and Gradient, June 2000 through December 2000, Chena Annex. Eielson AFB, Alaska. April. Prepared by AMEC Earth and Environmental, Inc., Fairbanks, Alaska.

USAEHA (United States Army Environmental Hygiene Agency). 1990. Environmental Baseline Study No. 38-26-7230-91, Chena River Research Site, Eielson AFB, Alaska. Department of the Army, Aberdeen Proving Ground, Maryland. August.

United States Air Force (USAF). 1992. Interim Remedial Action Record of Decision, Eielson AFB, Operable Unit 1B. September. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1993a. Source Evaluation Report Phase 1. October. Prepared by Pacific Northwest Laboratory, Richland, Washington.

USAF. 1993b. 1993 Site-Wide Ground-Water Monitoring Program Draft Workplan, Eielson AFB, Alaska. Prepared by Pacific Northwest Laboratory, Environmental Management Operations, Richland, Washington.

USAF. 1993c. Eielson AFB, Alaska, Remedial Investigation/Feasibility Study Operable Unit 2: Remedial Investigation Report, Final. October. USAF Environmental Restoration Program.

REFERENCES (Continued)

USAF. 1994a. Source Evaluation Report, Phase 2 Investigation, Limited Field Investigation. October. Prepared by Pacific Northwest Laboratory, Richland, Washington.

USAF. 1994b. Eielson AFB, Alaska, Remedial Investigation/Feasibility Study Operable Unit 1 Remedial Investigation Report, Final. May. USAF Environmental Restoration Program.

USAF. 1994c. Eielson AFB, Alaska, Remedial Investigation/Feasibility Study Operable Unit 6 Remedial Investigation Report, Final. USAF Environmental Restoration Program.

USAF. 1994d. Surface Water and Sediment Investigation. May. USAF Environmental Restoration Program.

USAF. 1994e. Final Eielson AFB Operable Unit 6 Record of Decision. July. Prepared for Eielson AFB through Armstrong Laboratory, Brooks AFB, San Antonio, Texas.

USAF. 1994f. Eielson AFB Operable Unit 1 Declaration of the Record of Decision. September.

USAF. 1994g. Eielson AFB Operable Unit 2 and Other Areas Declaration of the Record of Decision. September.

USAF. 1995a. Sitewide Remedial Investigation/Feasibility Study, Eielson AFB, Alaska. Volume I, Remedial Investigation. USAF, Environmental Restoration Program.

USAF. 1995b. Sitewide Remedial Investigation, Eielson AFB, Alaska. Volume IV, Biological Risk Assessment. Prepared by Pacific Northwest Laboratories, Richland, Washington. (As cited in USAF 1995a.)

USAF. 1995c. Operable Unit 3, 4, 5 Remedial Investigation Report, Final. May. Prepared by Pacific Northwest Laboratory, Environmental Management Operations, for the U.S. Air Force, Eielson AFB, Alaska.

USAF. 1995d. Operable Unit 3, 4, 5 Record of Decision. Eielson AFB, Alaska, Final. September. USAF Environmental Restoration Program.

USAF. 1995e. Sitewide Groundwater Monitoring Program 1994 Report, Eielson AFB, Alaska. January. Prepared by Pacific Northwest Laboratory, Environmental Management Operations, Richland, Washington.

USAF. 1995f. Sitewide Remedial Investigation Final Report, Eielson AFB, Alaska. August. Prepared by Pacific Northwest Laboratory, Environmental Management Operations, Richland, Washington.

REFERENCES (Continued)

USAF. 1995g. Eielson AFB Proposed Plan for Operable Unit 3, 4, 5 and Other Areas. May.

USAF. 1995h. Sitewide Monitoring 1995 Workplan, Eielson AFB, Alaska. November. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1995i. Remedial Action Workplan, Remedial Design Operable Unit 2. November. Prepared by AGRA earth & Environmental Inc, Fairbanks, Alaska.

USAF. 1996a. Closure Plan for the OB/OD Area, Eielson AFB, Alaska. February. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1996b. 1995 Sitewide Groundwater Monitoring Report, Eielson AFB, Alaska. February. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1996c. Treatability Study Informal Technical Information Report, Eielson AFB, Alaska. February. Prepared by IT Corporation, Richland, Washington.

USAF. 1996d. Eielson AFB Proposed Record of Decision Amendments for Operable Unit 2 and Operable Unit 3, 4, 5. May.

USAF. 1996e. 1996 Sitewide Monitoring Program Workplan, Eielson AFB, Alaska. June. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1996f. Sitewide Record of Decision, Eielson AFB, Alaska. September.

USAF. 1996g. Technical Memorandum Initial Sampling Activities, Eielson AFB, Alaska. November. Prepared by Jacobs Engineering Group Inc., Anchorage, Alaska.

USAF. 1996f. Final On-Scene Coordinator Report and Investigative Report for Landfill 4 Drum Removal Action. Eielson AFB, Alaska. November. Prepared by Parsons Engineering Science, Inc., Denver, Colorado.

USAF. 1997a. 1996 Sitewide Groundwater Monitoring Report, Eielson AFB, Alaska. May. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1997b. 1997 Sitewide Monitoring Program Workplan Addendum, Eielson AFB, Alaska. July. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

REFERENCES (Continued)

USAF. 1997c. Operable Units 3, 4, and 5, Remedial Design, Eielson AFB, Alaska. August. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1998a. Final Treatment System Report Operable Unit 2, Eielson AFB, Alaska. June. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USAF. 1998b. 1998 Sitewide Monitoring Program Workplan Addendum 2, Eielson AFB, Alaska.. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1998c. Operable Unit 2 Declaration of Amended Record of Decision, Eielson AFB, Alaska. Operable Unit 3,4,5 Declaration of Amended Record of Decision, Eielson AFB, Alaska.

USAF. 1998d. 1997 Sitewide Monitoring Report, Eielson AFB, Alaska. August. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1998e. Remedial Action Summary Reports completed, Eielson AFB, Alaska. August. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USAF. 1998f. Eielson AFB Alaska, Environmental Restoration, Five-Year ROD Review. September.

USAF. 1998g. Utilidor Investigation/Treatability report Utilidor Investigation/Diesel Plume Delineation Study, Eielson AFB, Alaska. November. Prepared by AGRA Earth & Environmental, Inc., Fairbanks, Alaska.

USAF. 1998h. Remedial Actions at Garrison Slough Drainage Ditch Final Report. December. Prepared by Arctic Slope Construction, Inc. Anchorage, Alaska.

USAF. 1999a. 1998 Sitewide Monitoring Report, Eielson AFB, Alaska. April. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1999b. 1999 Sitewide Monitoring Program Workplan Addendum, Eielson AFB, Alaska. July. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 1999c. 1999 Sitewide Monitoring Report, Eielson AFB, Alaska. December. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

REFERENCES (Continued)

USAF. 2000. 2000 Sitewide Monitoring Program Workplan Addendum, Eielson AFB, Alaska. October. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2001a. 2000 Sitewide Monitoring Report, Eielson AFB, Alaska. March. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2001b. 2001 Sitewide Monitoring Workplan Addendum 5 to Fiscal Year 2001 Sitewide Monitoring Program, Eielson AFB, Alaska. July. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2002a. 2001 Sitewide Monitoring Report, Eielson AFB, Alaska. March. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2002b. 2002 Sitewide Monitoring Program Workplan Addendum 6, Eielson AFB, Alaska. August. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2002c. 2002 RPO Phase II Technical Report. December. Prepared by Earth Tech Inc.

USAF. 2003a. 2002 Sitewide Monitoring Report, Eielson AFB, Alaska. June. Prepared by EA Engineering, Science, and Technology, Fairbanks, Alaska.

USAF. 2003b. 2003 Sitewide Monitoring Program Work Plan, Eielson AFB, Alaska, August. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2003c. 2003 Five-Year ROD Review, Eielson AFB, Alaska. September. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2004a. 2003 Sitewide Monitoring Program Report, Eielson AFB, Alaska, April. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2004b. 2004 Sitewide Monitoring Program Work Plan, Eielson AFB, Alaska, August. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2005a. 2004 Sitewide Monitoring Program Report, Eielson AFB, Alaska, March. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2005b. 2005 Sitewide Monitoring Program Work Plan, Eielson AFB, Alaska, August. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2006a. 2005 Sitewide Monitoring Program Report, Eielson AFB, Alaska, March. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

REFERENCES (Concluded)

USAF. 2006b. 2006 Sitewide Monitoring Program Work Plan, Eielson AFB, Alaska, August. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2006c. Remedial Action Operations Report for OU3, Eielson AFB, Alaska, December. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2007a. 2006 Sitewide Monitoring Program Report, Eielson AFB, Alaska, March. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2007b. 2007 Sitewide Monitoring Program Work Plan, Eielson AFB, Alaska, August. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2007c. 2007 Garrison Slough Geophysical Survey Report, Eielson AFB, Alaska, September. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USAF. 2007d. Remedial Action Operations Report for OU3, Eielson AFB, Alaska, December. Prepared by EA Engineering, Science and Technology, Inc., Fairbanks, Alaska.

USEPA, 2002. Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies, November.

USU/UWRL (Utah State University/Utah Water Research Laboratory). 1995. Intrinsic Remediation Engineering Evaluation/Cost Analysis, for Site 45/57. Final Report. December. Prepared for Air Force Center for Environmental Excellence, Brooks AFB, San Antonio, Texas.

USU/UWRL (Utah State University/Utah Water Research Laboratory). 1997. Intrinsic Remediation Engineering Evaluation/Cost Analysis for Site 13/26, Final Report. January. Prepared for Air Force Center for Environmental Excellence, Brooks AFB, San Antonio, Texas.

Weber, F.R., H.L. Foster, T.E.C. Keith and C. Dusel-Bacon. 1978. Preliminary Geologic Map of the Big Delta Quadrangle, Alaska. U.S. Geological Survey Open File Report 78-529-A. 1:250,000. (As cited in USAF 1995a.)

APPENDIX A

SITE INSPECTION PHOTO LOG

This page intentionally left blank

APPENDIX B

FIVE-YEAR ROD REVIEW INTERVIEWS

This page intentionally left blank

INTERVIEW RECORD

Site Name: Eielson Air Force Base		**EPA ID No.:**
Subject: Third Five-Year ROD Review Interview	**Time:** --	**Date:** 09/19/08
Type: Telephone Visit Other **Location of Visit:** Telephone conversation to Mark Wilkinson at EA Engineering, Science, and Technology, Inc.	Incoming Outgoing	

Contact Made By:

Name: Mark Wilkinson	**Title:** Alaska Operations Manager	**Organization:** EA

Individual Contacted:

Name: Dick Tomany	**Title:** RAB Co Chair	**Organization:** RAB
Telephone No: 907- 488-8815 **Fax No:** 907-488-8815 **E-Mail Address:** tomany@misquoitonet.com	**Street Address:** 2191 Nelsen Road **City, State, Zip:** North Pole, AK 99705	

Summary Of Conversation

Questions:

1. What is your overall impression of the project? (general sentiment)

Excellent what they are doing, cleaning up the water.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Have gone to every public meeting. I keep the local public informed on what they are doing.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

No, there have been none.

4. Do you feel well informed about the site's activities and progress?

Yes, I sure do. I am not involved in the site cleanup, but am aware of what they are doing.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No, not really. They keep me informed on what is going on. Eielson has all of their information available in the public record.

This page intentionally left blank

INTERVIEW RECORD

Site Name: Eielson Air Force Base	**EPA ID No.:**	
Subject: Third Five-Year ROD Review Interview	**Time:** --	**Date:** 09/18/08
Type: <u>Telephone</u> Visit Other **Location of Visit:** Telephone conversation to Mark Wilkinson at EA Engineering, Science, and Technology, Inc.	Incoming Outgoing	

Contact Made By:

Name: Mark Wilkinson	**Title:** Alaska Operations Manager	**Organization:** EA

Individual Contacted:

Name: Terry Huisman	**Title:** RAB Co Chair	**Organization:** RAB
Telephone No: 907- 361-4763 **Fax No:** 907-361-4774 **E-Mail Address:** Terry.Huisman@us.army.mil	**Street Address:** 4700 Rivers Street **City, State, Zip:** North Pole, AK 99705	

Summary Of Conversation

Questions:

<u>1. What is your overall impression of the project? (general sentiment)</u>

We have come leaps and bounds. They have partnered well with the community. A step in the right direction to clean it up the way they did. When sites needed cleaned Eielson cleaned the sites with the community involved.

<u>2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.</u>

We started out with monthly meetings. Weathered permitting went on site visits. Visited bioventing sites. Eielson performed sites tours showing community members technology applied for site cleanup. RAB meeting frequency was reduced, but the lines of communication are still open.

<u>3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.</u>

If we have had any inquiries Eielson was helpful with concerns. Eielson will also helpful providing information on sites that do not belong to the USAF. Eielson directed people to the proper agency.

<u>4. Do you feel well informed about the site's activities and progress?</u>

Yes. Sure do. Not only do we get emails, but also news letters and slides at meetings.

<u>5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?</u>

Caution them in a trend across DOD to close RAB programs. We have learned to work in partnership, solving issues before they become a problem. It is important for the USAF to keep the lines of communication open by having local USAF staff to call when concerns occur.

This page intentionally left blank

APPENDIX C

DATA QUALITY OBJECTIVE MONITORING PROJECTIONS

This page intentionally left blank

DATA QUALITY MONITORING PROJECTIONS

Eielson AFB calculated the rate constant at 35 on-Base wells with sufficient groundwater monitoring data. The 35 wells are located on 12 IRP Source Areas. The average calculated rate constant for the 35 wells is 0.36 µg/L/yr. Site conditions are consistent where rate constant is applied.

So, for all equations divide the slope by the 0.36 µg/L/yr rate constant.

Calculate the time to reach 5 µg/L (natural log 1.61) benzene remediation goal.

OU1

ST20 E-7
The highest remaining concentration is 829 µg/L (natural log 6.72) at monitoring well 20M04, sampled in 2002.

$$\frac{6.72-1.61}{0.36}=14 years$$

Projected date to reach remediation goal: 2002+14 = <u>2016</u>

ST20 E-9
The highest remaining concentration is 8.7 µg/L (natural log 2.16) at monitoring well 20PP58B, sampled in 2007.

$$\frac{2.16-1.61}{0.36}=2 years$$

Projected date to reach remediation goal: 2007+2 = <u>2009</u>

ST48
The highest remaining concentration is 6,700 µg/L (natural log 8.81) at monitoring well 48PP13, sampled in 1996.

$$\frac{8.81-1.61}{0.36}=20 years$$

Projected date to reach remediation goal: 1996+20 = <u>2016</u>

SS50-52
The highest remaining concentration is 990 µg/L (natural log 6.90) at monitoring well 50PS12, sampled in 1994.

$$\frac{6.90-1.61}{0.36}=15 years$$

Projected date to reach remediation goal: 1994+15 = <u>2009</u>

OU2

ST10/SS14

The highest remaining concentration is 7,270 µg/L (natural log 8.89) at monitoring well 10PMW04, sampled in 2005.

$$\frac{8.89-1.61}{0.36}=20\,years$$

Projected date to reach remediation goal: 2005+20 = <u>2025</u>

ST13/DP26

The highest remaining concentration is 2,670 µg/L (natural log 7.89) at monitoring well 26TP19M, sampled in 2000.

$$\frac{7.89-1.61}{0.36}=17\,years$$

Projected date to reach remediation goal: 2000+17 = <u>2017</u>

OU3

There are no projected dates to reach the MCLs as chlorinated VOC degradation trends have not been established on Eielson AFB.

OU4

DP25

The highest remaining concentration is 990 µg/L (natural log 4.94) at monitoring well 25M07, sampled in 2006.

$$\frac{4.94-1.61}{0.36}=9\,years$$

Projected date to reach remediation goal: 2006+9 = <u>2015</u>

ST58

Groundwater monitoring should discontinue at Source Area ST58 as RAO are achieved.

OU5

There are no projected dates to reach the MCLs as chlorinated VOC degradation trends have not been established on Eielson AFB.

OU6

WP38
The complex geology of the bedrock aquifer disallows accurate prediction for COCs to meet MCLs. Basewide degradation trends indicate that benzene will reach the MCL in approximately 2018. Further degradation trend evaluation is required at this source area.

The highest remaining concentration is 1,820 µg/L (natural log 7.51) at former supply well 8621, sampled in 2002.

$$\frac{7.51-1.61}{0.36}=16\,years$$

Projected date to reach remediation goal: 2002+16 = <u>2018</u>
<u>This projection is likely not accurate.</u>

Sitewide OU

No degradation trends are established for PCB (Aroclor 1260) on Eielson AFB.

This page intentionally left blank

APPENDIX D

LAND USE CONTROLS MANAGEMENT PLAN

This page intentionally left blank

LAND USE CONTROLS MANAGEMENT PLAN

Prepared for:

EIELSON AIR FORCE BASE, ALASKA

SEPTEMBER 2008

This page left intentionally blank.

SECTION 01: SITE HISTORY AND DESCRIPTION OF INSTALLATION RESTORATION PROGRAM.

Eielson AFB was established in 1944, and military operations have continued to the present. The mission of Eielson AFB is to train and equip personnel for close air support of ground troops in an arctic environment. Eielson AFB operations include industrial areas, aircraft maintenance and operations, an active runway and associated facilities, administrative offices, and residential and recreational facilities.

In carrying out its defense mission, the soils and groundwater at the base have been contaminated from the storage and handling of fuels and solvents plus the operation of landfills. Initially, this contamination was evaluated under the U.S. Air Force Installation Restoration Program (IRP). The four-phase IRP was initiated in 1982 with a Phase 1 records search to identify past disposal sites containing contaminants that may pose a hazard to human health or the environment. Under the IRP, the U.S. Air Force identified potential areas of contamination at Eielson AFB. Potential source areas included old landfills, storage and disposal areas, fueling system leaks, and spill areas.

Eielson AFB was listed on the National Priorities List (NPL) on November 21, 1989, by the U.S. Environmental Protection Agency (USEPA). This listing designated the facility as a federal Superfund site subject to the remedial response requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

In May 1991, the U.S. Air Force, the State of Alaska, and USEPA entered into the Federal Facility Agreement (FFA), under CERCLA Section 120, which established the procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions. An additional goal of the FFA was to integrate the U.S. Air Force's CERCLA response obligations and Resource Conservation and Recovery Act (RCRA) corrective action obligations. Under the FFA, potential source areas were placed in one of six operable units (OU), based on similar contaminant and environmental characteristics, or were included for evaluation under a source evaluation report (SER).

The objectives of the environmental restoration program at Eielson AFB are as follows:

- Protect human health and the environment.

- Comply with USEPA and Alaska Department of Environmental Conservation (ADEC) enforcement of existing federal and state statutes and regulations.

- Conduct all IRP activities in a manner consistent with Section 120 of CERCLA, as amended by SARA.

- Meet FFA requirements, including implementation of institutional controls per record of decision documents.

- Establish priorities for environmental restoration activities so that property disposal and reuse goals can be met. The Eielson Real Property section is contacted whenever a remedial action alters a property in such a way that its value may be affected in the event of a sale.

- Initiate selected removal actions to control, eliminate, or reduce risks to manageable levels. Garrison Slough (SS67) is an example of such an action as PCB-contaminated soil and sediment were removed to reduce a human health risk.

- Shape our program to accommodate community concerns as they are made known to us at the Restoration Advisory Board (RAB) and other public meetings. As an example, a lake with drums was reported to the RAB. The site was assumed to be a former Air Force property. A search of our records indicated the property was never owned by the Air Force. The issue was properly addressed at the next RAB meeting by presenting the result of our records search.

SECTION 02: IC LANGUAGE - PURPOSE, PROCEDURE, LEGAL STATEMENT

(a) Purpose of institutional controls. Typically, institutional controls are selected to prevent unacceptable risks to human health and the environment associated with residual contamination remaining at a site (e.g. land-use restrictions or groundwater use restrictions); or they are selected to maintain the effectiveness of the remedy (e.g. restrictions to maintain integrity of the sitewide groundwater monitoring program, bioventing system, etc.). At Eielson AFB, institutional controls also fulfill a legal requirement to comply with records of decisions and a FFA between Eielson AFB, USEPA, and ADEC.

(b) Legal enforceability. The designated official at Eielson AFB responsible for implementing, monitoring, maintaining and enforcing the institutional controls is the Base Civil Engineer.

Section 310 of CERCLA authorizes states and citizens to sue the federal government, i.e. Secretary of the Air Force, where there is alleged failure of the Air Force to comply with the terms of a FFA, or a failure to comply with the statutory requirements of section 120, generally. This section allows states and citizens to monitor compliance with state and federal environmental cleanup requirements at federal facilities and sue the federal agencies to comply with substantive provisions of section 120 and to impose civil penalties for any violation of a FFA. Failure to implement institutional controls or to enforce such controls contained in the ROD would be a violation of section 120.

The Eielson AFB FFA contains, as part of the enforceability provisions, the following model language: "All terms and conditions of this agreement that relate to interim or final remedial actions, including corresponding schedules and deadlines, and all work associated with the interim or final remedial actions, shall be enforceable by any person pursuant to Section 310 (c) of CERCLA, 42 U.S.C. § 9659 (c), and any violation of such terms or conditions will be subject to civil penalties under Sections 109 and 310 (c) of CERCLA, 42 U.S.C. §§ 9609 and 9659 (c)."

(c) Eielson AFB procedure for insuring compliance with institutional controls. The following is an outline of local procedures for insuring institutional controls are considered in the planning and execution of construction projects.

1. Operations Flight has work order review meetings for proposed projects. A person from Environmental Planning attends these meetings and notes which projects may present environmental concerns.

2. All projects must be executed per the "Engineer's Guide", a local document written and used by Contract Engineering Flight. The project engineer in Contract Engineering Flight is responsible for working the projects in accordance with the Engineer's Guide.

3. In the conceptual phase of a project, a checklist per the Engineer's Guide is used to insure mandatory steps are taken before proceeding with the project. The project engineer is responsible for seeing that all steps on the checklist are completed. Additionally, two Engineering Contract Flight employees, serve as a "choke point" as no project may proceed unless either of the two employees agree that the checklist has been either been completed, or outstanding issues are properly flagged and awaiting timely resolution. Consultation with Environmental Planning section is required for completing the checklist; and the project may not proceed unless the pertinent part of the checklist is signed off by Environmental Planning. The Commander of Contract Engineering Flight is responsible for maintaining procedures that insure proper consultation with Environmental Planning.

4. Once a checklist reaches Environmental Planning, Environmental Restoration concerns are addressed. Planning signs off for a project only after Restoration reviews such aspects as project location and the type of work to be performed. Planning maintains a sign-off sheet as documentation that each project has been properly coordinated within Environmental Flight. The Chief of Environmental Planning is responsible for maintaining procedures that insure coordination with Restoration..

5. Restoration determines whether institutional controls apply to the project site.

   (i) If no institutional controls are applicable, the project is signed off by Restoration and Planning; and it may proceed.

   (ii) If institutional controls apply, Restoration provides a written statement specifying the applicable institutional control*. The environmental sign-off sheet is signed with a notation indicating attached comments. The attachment may include a map showing the nearest Restoration site relative to the proposed project site. The project either proceeds with the institutional controls limitation, or the environmental concerns are debated among Restoration, Planning, and Contract Engineering; and a written conclusion is reached before the project proceeds.

The Chief of Environmental Restoration is responsible for maintaining procedures that insure that Restoration concerns are addressed and presented in a prompt and efficient way when Restoration coordination is sought.

SECTION 03: NO FURTHER ACTION SITES

No further action sites. "No further action" is a CERCLA term. In the "feasibility study" CERCLA stage of a restoration site's development, "no further action" is a considered remedy in addition to other actions (e.g. soil removal, bioventing, etc.). It is often that a site has contamination exceeding cleanup levels, but the selected remedy is "no further action" because that option is the most feasible option. "No further action" does not necessarily mean that a site does not have contamination. It just means that "no further action" was the best cleanup action, and the contaminants may degrade over a number of years.

Even though contamination may exist at a NFA site, there is no exposure pathway, in the site's present condition, for the contaminants to be considered a threat to human health or the environment. However, digging, de-watering, or other construction activities might alter the site in such a way as to create an exposure pathway. Those people doing work on the site need to be aware that contaminants may be present and there may be applicable institutional controls.*

SECTION 04: CLOSED SITES

Closed sites have no institutional controls and no land-use restrictions. Currently, no sites have regulatory concurrence for official closure. However, it is expected that several sites will reach this phase following the 5-Year ROD Review.

SECTION 05: INSTITUTIONAL CONTROLS

General institutional controls:

The ICs outlined below prevent human exposure to contaminants existing at concentrations above federal and state standards, by restricting activities at the sites. ICs for each source area consist of one or more of the following components.

- A prohibition on the installation or use of drinking water wells.

- A requirement that all monitoring wells are secured with locks to prevent unauthorized access to groundwater.

- A requirement for fishing restrictions in Garrison Slough. Base fishing licenses require a briefing advising against consuming fish caught in Garrison Slough.

- Any activity that may result in access to contaminated groundwater or affect the movement of contaminated groundwater requires approval by Environmental Flight (CES/CEV).

- Any activity that may result in the disturbance of any remedial action requires approval by Environmental Flight (CES/CEV).

- Any activity that may result in exposure to or removal of contaminated soil requires approval by Environmental Flight (CES/CEV).

- In the event that contaminated soil or groundwater is removed from the source area it will be disposed of or treated in accordance with applicable state and federal regulations.

- A requirement of notice to and approval by ADEC and USEPA of any proposal to add to or alter land use controls.

- A requirement to notify ADEC and USEPA of any proposal to change the existing land use.

- Groundwater monitoring is conducted under the SWMP to maintain an accurate definition of the area of contamination.

The Sitewide Sampling Schedule is given in Table 1. The purpose of including this table is to indicate which sites have monitoring wells that are still being sampled under the Sitewide Monitoring Program. These wells will not be decommissioned unless damaged.

This page left intentionally blank

Table 1: Sitewide Monitoring Program Sampling Schedule

Source ID	Grouping	ROD Action/Decision	2008 ROD Review Notes/Action	2008	2009	2010	2011	2012
NBW	Sentry Wells	Down gradient sentry wells; sample annually.	Sample prior to Five-Year ROD Review	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	5 GW samples for VOCs, SVOCs, & metals.
LF03	OU5	Amended ROD; Soil Cover, ICs & LTM. Manage under relevant Subtitle C regs (264.117/228b).	Sample prior to Five-Year ROD Review	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	5 GW samples VOCs, SVOCs, & metals.
FT09	OU5	On top of LF03. ICs & LTM.	Sample prior to Five-Year ROD Review	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	Monitor as part of LF03.
ST10	OU2	Active bioventing/product recovery.	Data Quality Objective Monitoring	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
SS14	OU2	Monitor together with ST10.	Monitor together with ST10.	Monitor in conjunction with	Monitor with ST10.	Monitor with ST10.	Monitor with ST10.	Monitor with ST10.
ST13	OU2	Active bioventing/product recovery. TI waver for gw lead ARAR per: OU2 ROD Amendment (Tank 300 upgrade, UST removals, hydrant upgrade, all under EC & state regs).	Data Quality Objective Monitoring	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
DP26	OU2	Active bioventing/product recovery. TI waiver for gw lead ARAR per: OU2 ROD Amendment.	Monitor in conjunction with ST13.	Monitor in conjunction with ST13.	Monitor with ST13.	Monitor with ST13.	Monitor with ST13.	Monitor with ST13.
ST20 E-7	E-7	Active bioventing/product recovery.	Data Quality Objective Monitoring	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
ST20 E-9	E-9	Active bioventing/product recovery.	Data Quality Objective Monitoring	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	Data Quality Objective Monitoring.
DP25	OU4	ICs & LTM.	Data Quality Objective Monitoring	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
SS37	OU4	NFA; Non-UST tanks removed as debris & residual asphalt	NFA.	Monitor with ST13/DP26.	Monitor with ST13/DP26.	Monitor with ST13/DP26.	Monitor with ST13/DP26.	Monitor with ST13/DP26.
WP38	OU6	ICs & LTM.	Evaluate new and emerging technologies and potential TI waiver	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.

Table 1: Sitewide Monitoring Program Sampling Schedule

Source ID	Grouping	ROD Action/Decision	2008 ROD Review Notes/Action	2008	2009	2010	2011	2012
DP44	OU3	ICs & LTM.	Evaluate new and emerging technologies. Sample prior to next Five-Year ROD Review	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	5 GW samples VOCs.
WP45	OU3	ICs & LTM.	Continue ICs & LTM; vertical and horizontal char. of TCE; perform injection using a carbon donar.	Perform pilot study, horizontal char., and carbon injection gw monitoring	Vertical char., full scale injection, and carbon injection gw monitoring.	Groundwater monitoring to evaluate carbon injection results	Groundwater monitoring to evaluate carbon injection results	Groundwater monitoring to evaluate carbon injection results
SS57	OU3	ICs & LTM.	Remedy & monitoring tied to WP45.	Monitor with WP45.	Monitor with WP45.	Monitor with WP45.	Monitor with WP45.	Monitor with WP45.
ST48	OU1	Active bioventing/product recovery.	Data Quality Objective Monitoring	Sample cluster wells 48MW04, 48MW05, 48MW06	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
ST56	OU3	ICs & LTM.	Evaluate new and emerging technologies and potential TI waiver	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.
SS61	OU3	ICs & LTM.	Evaluate new and emerging technologies. Sample prior to next Five-Year ROD Review	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	3 GW samples VOCs.
SS67	Sitewide	PCB soil/sediment removal. IC=fishing restrictions.	Evaluate risk assessment exposure assumptions, the possibility of other sources of PCB contamination in fish tissue, and feasibility of additional remedial action with the final objective of meeting RAOs in fish tissue concentration	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.	No monitoring activity.

Notes:

char. characterization
invert. invertebrates
sed. sediment
surf. surface
regs. regulations

mon. monitoring
gw. groundwtaer

For definitions of additional acronyms and abbreviations included in this table see the LIST OF ACRONYMS AND ABBREVIATIONS, in the beginning of this report.

Figure 1: Eielson AFB LUC MP

Civil Engineering Planning Staff

General Plan

103 Dig permits,
332 Work Order Request
Project scoping

Base GIS – Geobase
- Environmental Condition of Property Map
- Site Footprint
- Environmental Layer
  - Plume extent
    Analytical data
  - Key documents
  - *LUC/IC Table*

Perform project consistent with LUC requirements

Environmental Restoration Program Staff

LUC/IC IP

Environmental Check-off on 103 and 332s
Participate in Design Charrette

Perform analysis of environmental condition – report to LUC/IC requirements to construction PM

*Sitewide Monitoring Program Report**
(Submitted to ADEC annually)
- *Exec. Summary of LUC/IC impacts*
- *Project list with LUC/IC impact*
- *Updated LUC/IC Inspection Checklists*
- *Annually Update LUC/IC Table*

Maintain Site Exit Strategy and ultimately close sites

Note: Red text items are scheduled for implementation in the LUC MP

This page left intentionally blank