THE UNITED STATES AIR FORCE

INSTALLATION RESTORATION PROGRAM

FINAL

FIVE-YEAR ROD REVIEW REPORT

Prepared for:

EIELSON AIR FORCE BASE, ALASKA

JANUARY 2004
(USEPA acceptance letter dated September 29, 2003)

Preface

This document was prepared for the United States Air Force (USAF) by EA Engineering, Science, and Technology (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.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

29 SEP 2003

Reply To
Attn Of: ECL-113

Mr. Michael J. Raabe
Eielson Air Force Base
Chief Environmental Restoration
354 CES/CEVR
2310 Central Ave. Suite 100
Eielson AFB, AK 99702-2299

Re: Second Five-Year Review for Eielson AFB

Dear Mr. Raabe:

EPA has reviewed the Five-Year Review Report for the Eielson Air Force Base and concurs with the Air Force findings that the remedies for all operable units are expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled through institutional controls. The Air Force is appropriately implementing the institutional controls program as outline in the Base General Comprehensive Plan. EPA requests that a summary of the implementation of institutional controls be included in the five-year review documentation.

EPA's project manager, Mary Jane Nearman, conducted the site inspection, in conjunction with the Air Force and State of Alaska project managers, on July 24 and 25, 2003. The remedies have been implemented and are functioning properly. The Applicable or Relevant and Appropriate Requirements (ARARs) identified in the Records of Decision (RODs) were reviewed and the cleanup levels established in the RODs remain protective.

Subsequent to the submittal of the Five-Year Review Report and the site inspection, the Air Force notified EPA and the State of the appearance of additional surface soil contamination at SS35, the Asphalt Mixing and Drum Burial Area located next to Garrison Slough. The Air Force will add further evaluation and remediation of this area under followup actions required under the five-year review recommendations.

We look forward to working with you on finalizing the Five-Year Review documentation now that we have completed the five-year review process. Please contact Mary Jane Nearman at (206) 553-6642 if you have any questions or concerns.

Sincerely,

Michael F. Gearheard, Director
Environmental Cleanup Office

ADEC acceptance letter

USAF acceptance letter

REPORT DOCUMENTATION PAGE

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- *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)*

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TABLE OF CONTENTS

LIST OF FIGURES

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
DRO	Diesel Range (Petroleum Hydrocarbon) Organic Compounds
DDT	dichlorodiphenyltrichloroethane
EA	EA Engineering, Science, and Technology
EAFB	Eielson Air Force Base
FFA	Federal Facility Agreement
FNSB	Fairbanks North Star Borough
FS	Feasibility Study
ft	feet
GRO	Gasoline Range (Petroleum Hydrocarbon) Organic Compounds
HAZMAT	Hazardous Materials
IC	Institutional Control
IRA	Interim Remedial Action
IRP	Installation Restoration Program
km	kilometer
MCLs	Maximum Contaminant Levels

MCLGs	Maximum Contaminant Level Goals
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
m	meter(s)
NAPL	non-aqueous phase liquid
NBW	North Boundary Wells
NFA	No Further Action
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene; also known as perchloroethene
POL	Petroleum, Oil, and Lubricant
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
SVE	Soil Vapor Extraction
SVOC	semivolatile organic compound
SWMP	Sitewide Monitoring Program
TCE	trichloroethene
TI	Technical Impracticability
TRC	Technical Review Committee
USACE	United States Army Corp of Engineers

USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report documents the second Five-Year Review for the Installation Restoration Program at Eielson Air Force Base (EAFB), Alaska. The Installation Restoration Program (IRP) at Eielson Air Force Base 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.

Operable Unit 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 in the interim exposure pathways that could result in 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. Two current issues at OU1 include increased benzene, toluene, ethylbenzene, and xylene (BTEX) compound concentrations at ST48, hydrologically downgradient of the area remediated by the former bioventing system, and the decommissioning of the Blair Lakes Facility, which houses the product recovery system for source areas SS50-SS52. Future groundwater sampling at ST48 will include increased monitoring at downgradient wells. Product recovery efforts at SS50-SS52 will cease operation when the Blair Lakes Facility is decommissioned 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 had limited success, and are not significantly reducing the time to reach remediation goals.

Operable Unit 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 in the interim exposure pathways that could result in 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. Current issues at OU2 include damaged bioventing system components at both ST10/SS14 and ST13/DP26, a possible shifting benzene plume at ST10/SS14 due to altered surface cover, and a new area of fuel contamination identified northeast of ST13/DP26. Damage bioventing system components at ST10/SS14 and ST13/DP26 will be replaced. A plume delineation will further characterize the extent of the benzene plume north of the bioventing system enclosures at ST10/SS14. The bioventing systems may be upgraded during the process of fixing damaged components to remediate areas of high benzene concentrations as characterized by the plume delineation. A further investigation will be conducted to characterize the source of fuel contamination northeast of ST13/DP26.

Operable Units 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 for OUs 3, 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 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. Current issues at OUs 3, 4, and 5 include the continued presence of elevated chlorinated solvent concentrations at WP45/SS57, with possible decreasing anaerobic dechlorination. Anaerobic dechlorination at source area WP45/SS57 is currently under evaluation by a Remedial Process Optimization (RPO) team. The findings and conclusions from the RPO process will determine if further actions are required to enhance the remediation process at this source area.

Operable Unit 6 contains source area WP38, requiring a Five-Year Review. The remedy for OU6 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 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. Groundwater monitoring and the implementation of ICs will continue at the OU6 source area until RAOs are achieved.

The Sitewide OU contains source area SS67 (Garrison Slough), requiring a Five-Year Review. The remedy for the Sitewide OU 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 through ICs. The remedy for the source area, dredging and excavation of polychlorinated biphenyl (PCB) impacted sediment and soil and the implementation of ICs, is still being evaluated. The remaining issue at SS67 includes PCB concentrations exceeding the 0.69 microgram per kilogram (µg/Kg) RAO in fish tissue samples collected both on Base and off Base. ICs are implemented to prevent off-Base migration of fish using fish screens. ICs will be further implemented to ensure that the remedy is protective to human health. If continued fish tissue sampling indicates that soil and sediment cleanup activities have not reduced the PCB concentrations in fish tissue to acceptable concentrations, then additional remedial actions will be evaluated, along with improvements to the current fish barrier.

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 Environmental Excellence contract number F41624-03-D-8596-0003.

Author title:	**Author affiliation:**

Review period: 09/28/1998 to 09/28/2003

Date(s) of site inspection: 07/24/2003

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) **X** 3 (third) 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)*: 09/28/1998

Due date *(five years after triggering action date)*: 09/28/2003

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, Continued

Issues:

For Operable Unit 1:

Source Area ST48:
Benzene, toluene, ethylbenzene, and xylene (BTEX) compound concentrations increased downgradient of the area remediated by the former bioventing system.

Source Area SS50-SS52:
The Blair Lakes Facility, which houses the product recovery system for source area SS50-SS52, is scheduled for decommissioning in 2004.

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

For Operable Unit 2:

Source Area ST10/SS14:
Construction activities and frost heaving damaged bioventing system components. Several bioventing lines and injection points need replacing. The bioventing system is designed with screened sections below the water table, which causes air bypass at the bentonite seals. The benzene plume boundaries at ST10/SS14 possibly shifted since the 1992 plume delineation.

Source Area ST13/DP26:
A new area of fuel contamination was found northeast of ST13/DP26 at the 795 utilidor. The bioventing system is designed with screened sections below the water table, which causes air bypass at the bentonite seals.

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

For Operable Unit 3, 4, and 5:

Source Area WP45/SS57:
The 2001 groundwater probe investigation identified the continued presence of elevated chlorinated solvent concentrations. Site conditions suggest decreasing anaerobic dechlorination.

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

For Operable Unit 6:

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

For the Sitewide Operable Unit:

Polychlorinated Biphenyl (PCB) concentrations in fish tissue samples collected both on base and off base exceed the 0.69 µg/Kg Remedial Action Objective (RAO).

No other 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:

Source Area ST48:
The plume north of source area ST48 will be monitored due to increasing BTEX concentration. Groundwater monitoring events will include sampling for BTEX at monitoring well 48M08, and downgradient monitoring well 18-6.

Source Area SS50-SS52:
Due to impracticability, product recovery efforts at SS50-SS52 will cease operation when the Blair Lakes Facility is decommissioned. Contamination at these source areas causes minimal risks to human health and the environment due to the remote site location and groundwater immobility. Product recovery efforts have had limited success, and are not significantly reducing the product or the time to reach remediation goals.

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:

Source Area ST10/SS14:
A plume delineation will further characterize the benzene plume extent north of the bioventing system enclosures at ST10/SS14. The bioventing systems may be upgraded during the process of fixing damaged components to remediate areas of high benzene concentration as determined by the plume delineation.

Source Area ST13/DP26:
A further investigation will be conducted to characterize the source of fuel contamination northeast of ST13/DP26.

General:
Existing Operable Unit 2 bioventing injection wells will be replaced with screening above the water table. Bioventing will continue at source areas ST10/SS14 and ST13/DP26. 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 Area WP45/SS57:
Anaerobic dechlorination at source area WP45/SS57 is currently under evaluation by a Remedial Process Optimization (RPO) team. The findings and conclusions from the RPO process will determine if further actions are required to enhance the remediation process at this source area.

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

Five-Year Review Summary Form, Continued

For Operable Unit 6:

General:
Groundwater monitoring and the implementation of ICs will continue at the Operable Unit 6 source area until RAOs are achieved.

For the Sitewide Operable Unit:

ICs are implemented to prevent off base migration of fish using fish screens. ICs will be further implemented to ensure that the remedy is protective to human health. If continued fish tissue sampling indicates that soil and sediment cleanup activities have not reduced the PCB concentration in fish tissue to an acceptable concentration, then additional remedial actions will be evaluated, along with improvements to the current fish barrier.

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 for Operable Units 3, 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 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 for Operable Unit 6 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 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.

Five-Year Review Summary Form, Concluded

For the Sitewide Operable Unit:
The remedy for the Sitewide Operable Unit 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 through engineering controls and ICs. The remedy for the source area, dredging and excavation of PCB impacted sediment and soil and the implementation of ICs, is still being evaluated.

Comprehensive Protectiveness Statement:
Based on the results of this report, the remedies selected for all seven operable units at Eielson Air Force Base are expected to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risk are being controlled

Other Comments:

None

1 INTRODUCTION

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Eielson Air Force Base (EAFB) is required to conduct a 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 EAFB 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 allow unlimited use and unrestricted exposure. A Five-Year Review is also required only for sites with a Record of Decision (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 C.F.R 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 a Five-Year Review of the remedial actions implemented at Operable Units (OU)s 1 through 6 and the Sitewide OU at EAFB, 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 a subsequent Five-Year Review. This Five-Year Review covers the period of September 28, 1998 through September 28,

2003. 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 28, 1998 signature date of the first Five-Year Review document.

1.2 Public Involvement at EAFB

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 EAFB 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 the clean-up activity at EAFB. 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 EAFB 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. EAFB RAB meetings were held quarterly until December 1996, and semiannually after. At RAB meetings EAFB has presented technical briefings and RAB members and attendees have had the opportunity to voice their concerns about environmental issues at EAFB.

1.2.3 Community Involvement During Five-Year Review

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

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

- Notice of the May 2003 RAB meeting, which included a discussion of the Five-Year Review, was published in the Fairbanks *Daily News Miner* on July 6 and 13, 2003.

- The Draft Five-Year ROD Review, dated June 2003, was made available to the public in the Administrative Record at EAFB, the North Pole Library, and the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks. The Draft Five-Year ROD Review was made available to allow public comment in the early stage of the Five-Year Review process.

- Upon completion, a notice of availability was published in the *Daily News Miner,* and the Five-Year Review made available to the public in both the Administrative Record at EAFB and in the Information Repository maintained at the Elmer E. Rasmusen Library at the University of Alaska, Fairbanks.

- The results of the Five-Year Review were presented at the December 2003 RAB meeting.

1.3 Facility Location and Description

EAFB is an active military installation that has been used for military operations since its establishment in 1944. The mission of EAFB is to train and equip personnel for close air support of ground troops in an arctic environment. EAFB operations include industrial areas, aircraft maintenance and operations, an active runway and associated facilities, administrative offices, and residential and recreational facilities. EAFB 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 EAFB 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.

EAFB is within the Fairbanks North Star Borough (FNSB), a county-scale local government, located approximately 40 km southeast of Fairbanks, Alaska. The city of Fairbanks is the urban center of FNSB. North Pole and Moose Creek are suburban/rural areas within FNSB. North Pole (population 5,000) is approximately 11 km northwest of EAFB, and Moose Creek (population 510) is approximately 5 km north of EAFB. The Trans-Alaska Pipeline transects the middle of EAFB for a distance of approximately 8 km (Figures 1-1, 1-2).

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

Approximately 5,500 people live on EAFB. Military housing is located in the central portion of the Base, east of Industrial Drive. EAFB 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).

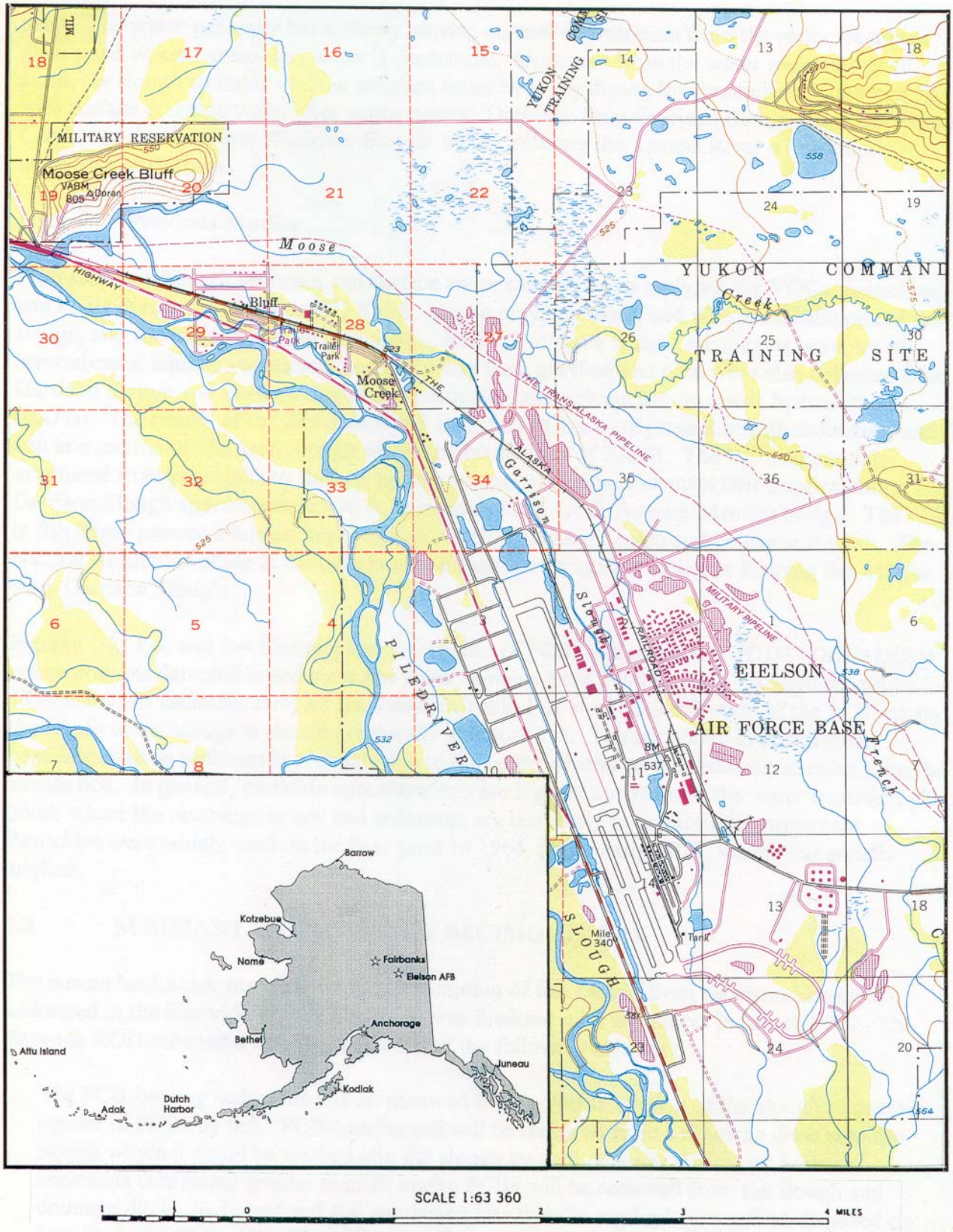


Figure 1-1: Eielson Air Force Base Location

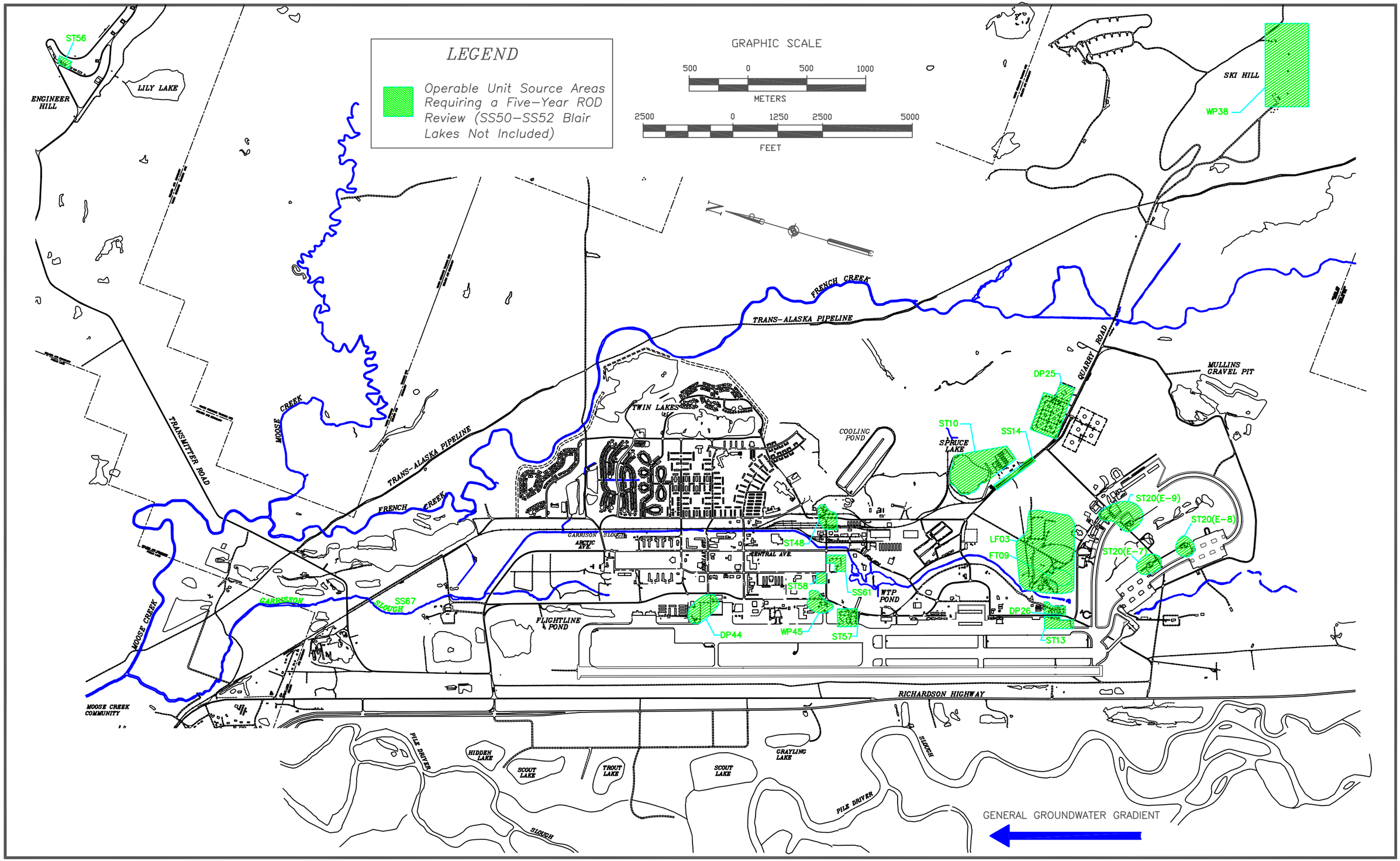


Figure 1-2: Source Area Locations, Eielson AFB, Alaska

Groundwater from Base supply wells is treated to remove iron and sulfate and is used for drinking water at EAFB. This water is also the principal supply for industrial, domestic, agricultural, and fire-fighting uses.

In addition to the Base water supply wells and power plant cooling wells, there are seven small-capacity wells serving remote Base areas in addition to 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 EAFB 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 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 during the Remedial Investigation/Feasibility Studies (RI/FS) process was 50 micrograms per liter (µg/L). The USEPA adopted a new arsenic MCL in 2002 at 10 µg/L. In general, metals are not considered constituents of concern (COCs). Lead values exceeding the regulatory screening limit of 15 µg/L in water were retained as a COC (USAF, 1998d).

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

Average Metals Concentrations in Background Groundwater Samples
(adapted from USAF 1994 SWMPR)

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 EAFB was listed on the NPL of federal Superfund sites by the USEPA. The USAF, USEPA, and the ADEC signed the FFA for EAFB 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 EAFB. 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.

Records of Decisions containing OUs 1 through 6 and the Sitewide OU were signed by the USEPA, ADEC, and the USAF. RODs for OU1, OU2, and OU6 were signed in 1994. Operable Units 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 (ICs).

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 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 EAFB 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 annually for volatile organic compound (VOCs), semivolatile organic compound (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, that 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.

1.5 Roles and Responsibilities

EA has been contracted by the USAF to prepare this Five-Year Review for EAFB 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 20 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 EAFB, and community awareness. Chapters 2 through 6 present the separate OUs with selected remedies and recommendations. Chapter 7 lists references cited in this document.

1.7 Next Five-Year Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

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 are 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	Remedial Action Objective
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, 1994c). 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 Installation Restoration Program (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	U.S. 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, 1998c).
December 2002	Remedial Process Optimization (RPO) Phase II Technical Report completed (USAF, 2002c).

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 EAFB.

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, and conducted semi-annually from 1997 to the present.

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

2.3.1 Background

Source area ST20 is located in the industrial area of EAFB 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 USTs, a 25,000-gallon defueling underground storage tank (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. EAFB 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 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
- Institutional Controls 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, and 2002 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 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 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 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 potentially contaminated groundwater.

2.3.3 Progress Since the last Five-Year Review

Bioventing system operation continued during the current review period. RPO studies were conducted at E-7 and E-9 from May 2001 to August 2002. Groundwater samples were collected under the 2002 SWMP at E-7, E-8, and E-9.

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.

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).

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 in August 2003.

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 xylene at concentrations below MCLs. Hydrologically downgradient 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.

Six groundwater samples were collected in 2002. Benzene was detected in sample 20M07 at a concentration (11 µg/L) exceeding the MCL (5 µg/L). Benzene was detected at concentrations below the MCL in samples 20M01 and 20PP115 (0.7 µg/L and 2.1 µg/L, respectively). Samples 20M01, 20M07, and 20PP115 had detectable toluene, ethylbenzene, and xylene, at concentrations below their MCLs (Figure ST20 (E-9)-1).

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.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at sites E-7 and E-9. During the site visits, the inspection team also discussed the extent of the benzene plumes and shutdowns of the bioventing systems.

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.

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 sites E-7 and E-9, decreasing BTEX concentrations in the local groundwater. The bioventing system at E-7 was shut down in September 2002, and decommissioned in August 2003. Operation of the bioventing system at E-9 continues removing BTEX in the area of elevated concentration. 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. The E-8 site 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.

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

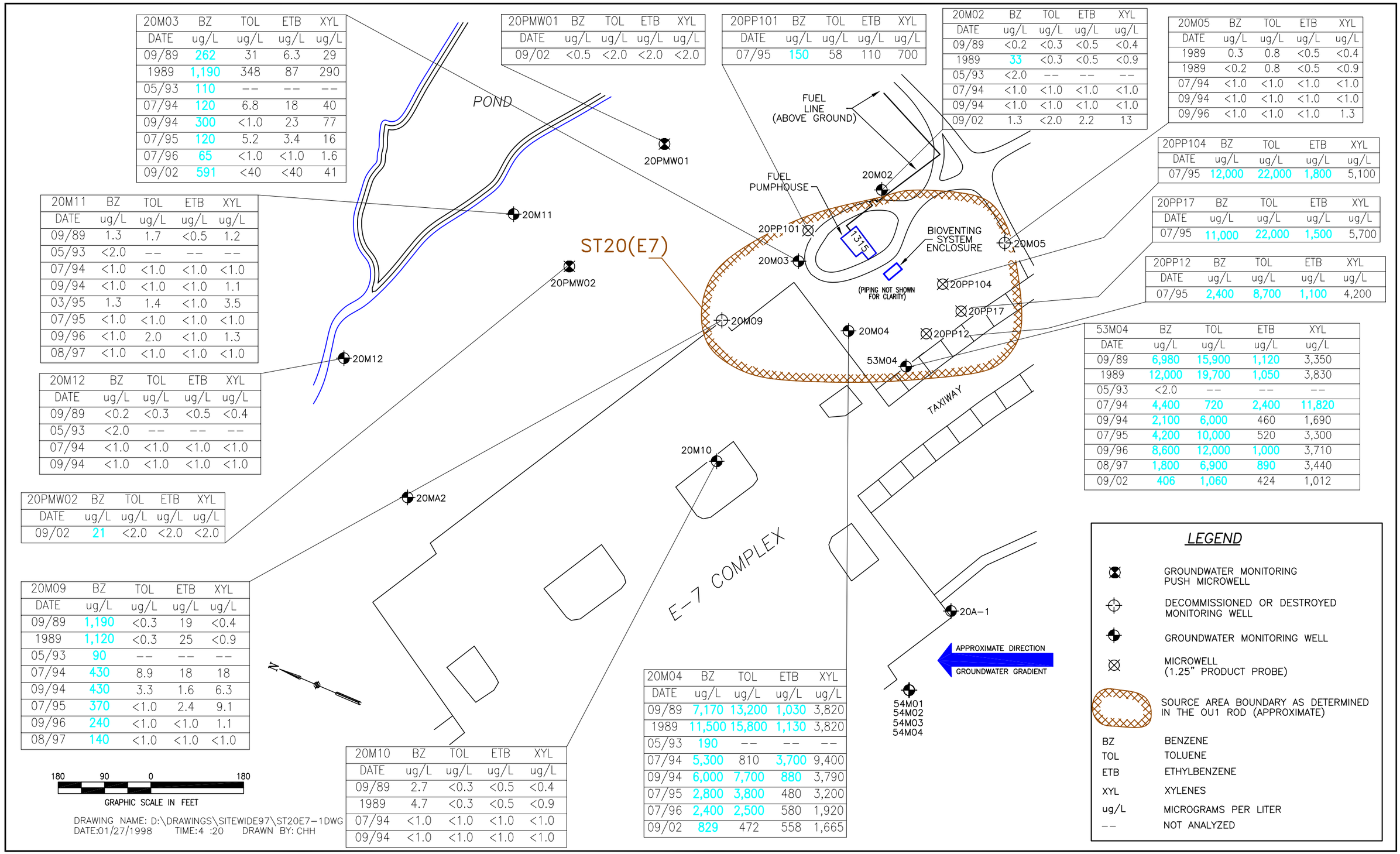
The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST20:

Figure ST20(E-7)-1 ST20(E-7) Site Plan Showing Groundwater Monitoring and 1.25" Well Point Locations, EAFB, Alaska.

Figure ST20(E-8)-1 ST20(E-8) Site Plan Showing Groundwater Monitoring and 1.25" Well Point Locations, EAFB, Alaska.

Figure ST20(E-9)-1 ST20(E-9) Site Plan Showing Groundwater Monitoring and 1.25" Well Point Locations, EAFB, Alaska.



20M03	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	262	31	6.3	29
1989	1,190	348	87	290
05/93	110	--	--	--
07/94	120	6.8	18	40
09/94	300	<1.0	23	77
07/95	120	5.2	3.4	16
07/96	65	<1.0	<1.0	1.6
09/02	591	<40	<40	41

20PMW01	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/02	<0.5	<2.0	<2.0	<2.0

20PP101	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
07/95	150	58	110	700

20M02	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5	<0.4
1989	33	<0.3	<0.5	<0.9
05/93	<2.0	--	--	--
07/94	<1.0	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0	<1.0
09/02	1.3	<2.0	2.2	13

20M05	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
1989	0.3	0.8	<0.5	<0.4
1989	<0.2	0.8	<0.5	<0.9
07/94	<1.0	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0	<1.0
09/96	<1.0	<1.0	<1.0	1.3

20PP104	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
07/95	12,000	22,000	1,800	5,100

20PP17	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
07/95	11,000	22,000	1,500	5,700

20PP12	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
07/95	2,400	8,700	1,100	4,200

53M04	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	6,980	15,900	1,120	3,350
1989	12,000	19,700	1,050	3,830
05/93	<2.0	--	--	--
07/94	4,400	720	2,400	11,820
09/94	2,100	6,000	460	1,690
07/95	4,200	10,000	520	3,300
09/96	8,600	12,000	1,000	3,710
08/97	1,800	6,900	890	3,440
09/02	406	1,060	424	1,012

20M11	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	1.3	1.7	<0.5	1.2
05/93	<2.0	--	--	--
07/94	<1.0	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0	1.1
03/95	1.3	1.4	<1.0	3.5
07/95	<1.0	<1.0	<1.0	<1.0
09/96	<1.0	2.0	<1.0	1.3
08/97	<1.0	<1.0	<1.0	<1.0

20M12	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5	<0.4
05/93	<2.0	--	--	--
07/94	<1.0	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0	<1.0

20PMW02	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/02	21	<2.0	<2.0	<2.0

20M09	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	1,190	<0.3	19	<0.4
1989	1,120	<0.3	25	<0.9
05/93	90	--	--	--
07/94	430	8.9	18	18
09/94	430	3.3	1.6	6.3
07/95	370	<1.0	2.4	9.1
09/96	240	<1.0	<1.0	1.1
08/97	140	<1.0	<1.0	<1.0

20M10	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	2.7	<0.3	<0.5	<0.4
1989	4.7	<0.3	<0.5	<0.9
07/94	<1.0	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0	<1.0

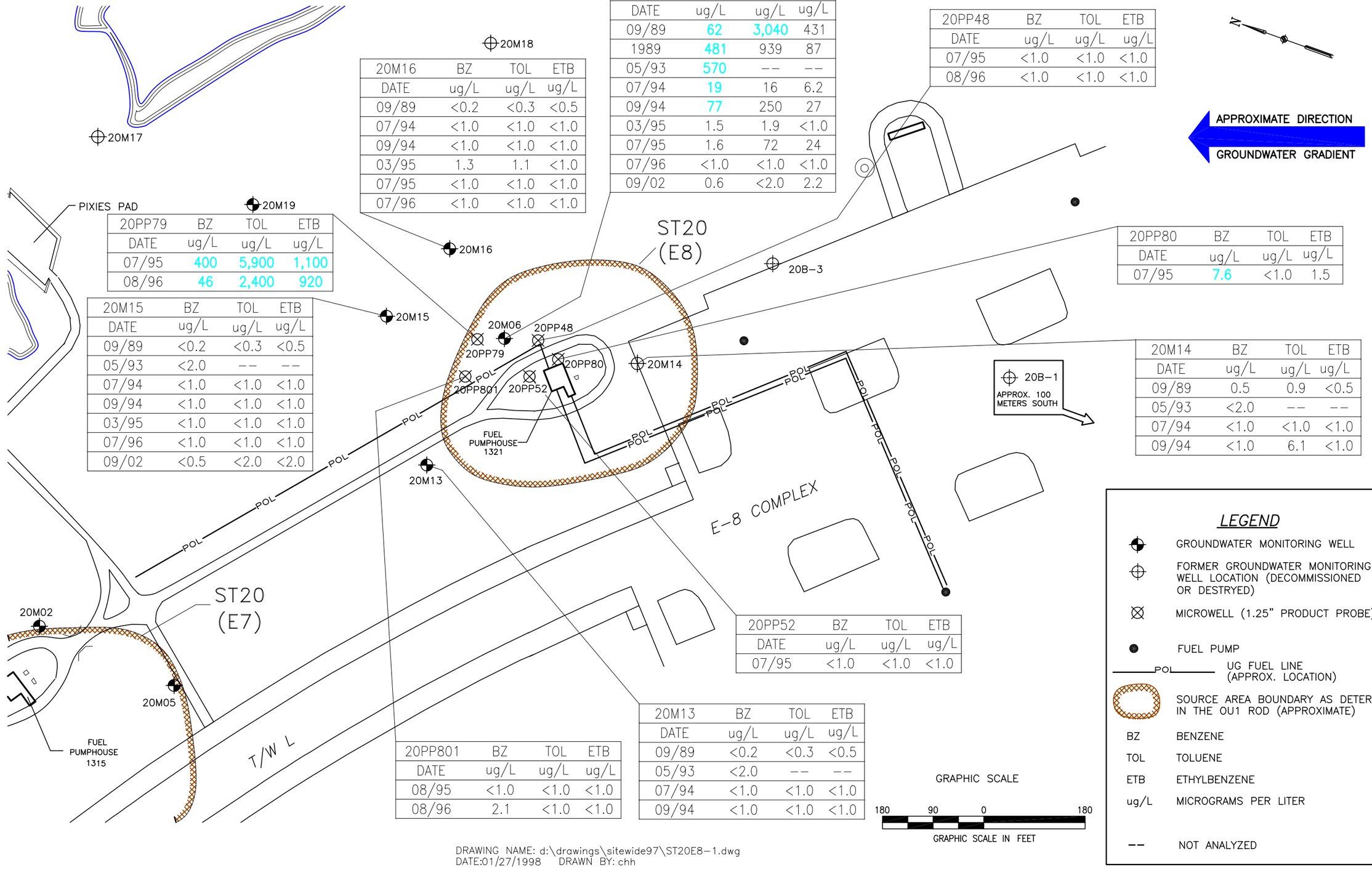
20M04	BZ	TOL	ETB	XYL
DATE	ug/L	ug/L	ug/L	ug/L
09/89	7,170	13,200	1,030	3,820
1989	11,500	15,800	1,130	3,820
05/93	190	--	--	--
07/94	5,300	810	3,700	9,400
09/94	6,000	7,700	880	3,790
07/95	2,800	3,800	480	3,200
07/96	2,400	2,500	580	1,920
09/02	829	472	558	1,665

LEGEND

- GROUNDWATER MONITORING PUSH MICROWELL
- DECOMMISSIONED OR DESTROYED MONITORING WELL
- GROUNDWATER MONITORING WELL
- MICROWELL (1.25" PRODUCT PROBE)
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU1 ROD (APPROXIMATE)

BZ	BENZENE
TOL	TOLUENE
ETB	ETHYLBENZENE
XYL	XYLENES
ug/L	MICROGRAMS PER LITER
--	NOT ANALYZED

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



20M16	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5
07/94	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0
03/95	1.3	1.1	<1.0
07/95	<1.0	<1.0	<1.0
07/96	<1.0	<1.0	<1.0

20M06	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/89	62	3,040	431
1989	481	939	87
05/93	570	--	--
07/94	19	16	6.2
09/94	77	250	27
03/95	1.5	1.9	<1.0
07/95	1.6	72	24
07/96	<1.0	<1.0	<1.0
09/02	0.6	<2.0	2.2

20PP48	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
07/95	<1.0	<1.0	<1.0
08/96	<1.0	<1.0	<1.0

20PP79	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
07/95	400	5,900	1,100
08/96	46	2,400	920

20PP80	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
07/95	7.6	<1.0	1.5

20M15	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5
05/93	<2.0	--	--
07/94	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0
03/95	<1.0	<1.0	<1.0
07/96	<1.0	<1.0	<1.0
09/02	<0.5	<2.0	<2.0

20M14	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/89	0.5	0.9	<0.5
05/93	<2.0	--	--
07/94	<1.0	<1.0	<1.0
09/94	<1.0	6.1	<1.0

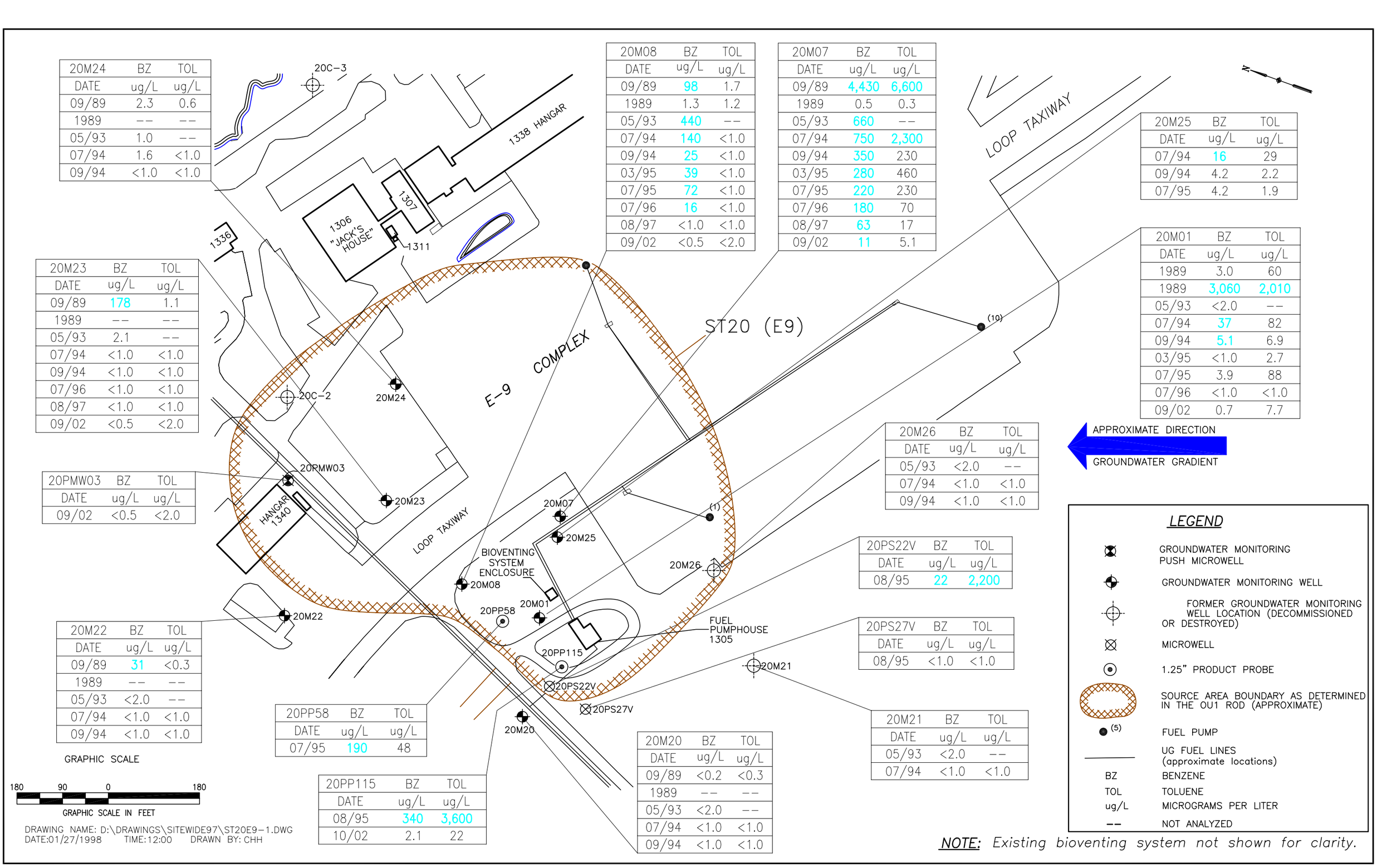
20PP52	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
07/95	<1.0	<1.0	<1.0

20PP801	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
08/95	<1.0	<1.0	<1.0
08/96	2.1	<1.0	<1.0

20M13	BZ	TOL	ETB
DATE	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5
05/93	<2.0	--	--
07/94	<1.0	<1.0	<1.0
09/94	<1.0	<1.0	<1.0

DRAWING NAME: d:\drawings\sitewide97\ST20E8-1.dwg
DATE:01/27/1998 DRAWN BY: chh

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



20M24	BZ	TOL
DATE	ug/L	ug/L
09/89	2.3	0.6
1989	--	--
05/93	1.0	--
07/94	1.6	<1.0
09/94	<1.0	<1.0

20M08	BZ	TOL
DATE	ug/L	ug/L
09/89	98	1.7
1989	1.3	1.2
05/93	440	--
07/94	140	<1.0
09/94	25	<1.0
03/95	39	<1.0
07/95	72	<1.0
07/96	16	<1.0
08/97	<1.0	<1.0
09/02	<0.5	<2.0

20M07	BZ	TOL
DATE	ug/L	ug/L
09/89	4,430	6,600
1989	0.5	0.3
05/93	660	--
07/94	750	2,300
09/94	350	230
03/95	280	460
07/95	220	230
07/96	180	70
08/97	63	17
09/02	11	5.1

20M25	BZ	TOL
DATE	ug/L	ug/L
07/94	16	29
09/94	4.2	2.2
07/95	4.2	1.9

20M01	BZ	TOL
DATE	ug/L	ug/L
1989	3.0	60
1989	3,060	2,010
05/93	<2.0	--
07/94	37	82
09/94	5.1	6.9
03/95	<1.0	2.7
07/95	3.9	88
07/96	<1.0	<1.0
09/02	0.7	7.7

20M23	BZ	TOL
DATE	ug/L	ug/L
09/89	178	1.1
1989	--	--
05/93	2.1	--
07/94	<1.0	<1.0
09/94	<1.0	<1.0
07/96	<1.0	<1.0
08/97	<1.0	<1.0
09/02	<0.5	<2.0

20M26	BZ	TOL
DATE	ug/L	ug/L
05/93	<2.0	--
07/94	<1.0	<1.0
09/94	<1.0	<1.0

20PMW03	BZ	TOL
DATE	ug/L	ug/L
09/02	<0.5	<2.0

20PS22V	BZ	TOL
DATE	ug/L	ug/L
08/95	22	2,200

20PS27V	BZ	TOL
DATE	ug/L	ug/L
08/95	<1.0	<1.0

20M22	BZ	TOL
DATE	ug/L	ug/L
09/89	31	<0.3
1989	--	--
05/93	<2.0	--
07/94	<1.0	<1.0
09/94	<1.0	<1.0

20PP58	BZ	TOL
DATE	ug/L	ug/L
07/95	190	48

20M21	BZ	TOL
DATE	ug/L	ug/L
05/93	<2.0	--
07/94	<1.0	<1.0

20PP115	BZ	TOL
DATE	ug/L	ug/L
08/95	340	3,600
10/02	2.1	22

20M20	BZ	TOL
DATE	ug/L	ug/L
09/89	<0.2	<0.3
1989	--	--
05/93	<2.0	--
07/94	<1.0	<1.0
09/94	<1.0	<1.0

GRAPHIC SCALE

180 90 0 180

GRAPHIC SCALE IN FEET

DRAWING NAME: D:\DRAWINGS\SITEWIDE97\ST20E9-1.DWG
DATE:01/27/1998 TIME:12:00 DRAWN BY: CHH

LEGEND

- GROUNDWATER MONITORING PUSH MICROWELL
- GROUNDWATER MONITORING WELL
- FORMER GROUNDWATER MONITORING WELL LOCATION (DECOMMISSIONED OR DESTROYED)
- MICROWELL
- 1.25" PRODUCT PROBE
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU1 ROD (APPROXIMATE)
- (5) FUEL PUMP
- UG FUEL LINES (approximate locations)
- BZ BENZENE
- TOL TOLUENE
- ug/L MICROGRAMS PER LITER
- -- NOT ANALYZED

NOTE: *Existing bioventing system not shown for clarity.*

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

2.4 ST48 Power Plant Area

2.4.1 Background

Source area ST48 is located in the east-central portion of EAFB, 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
- Institutional Controls 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, and 2002 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

Bioventing system operation continued during the current review period. RPO were conducted at ST48 from May 2001 to August 2002. Groundwater samples were collected under the 2002 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 2002 had benzene concentrations exceeding the MCL in two source area samples (48M08 at 882 µg/L, 53M03 at 25 µg/L). Toluene and ethylbenzene exceeded the MCL in one source area sample (12,500 µg/L and 1,600 µg/L, at 48M08 respectively). All 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.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at ST48. The inspection team also discussed the locations of air injection and SVE wells.

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.

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

Bioventing reduced BTEX concentrations within the zone of influence, however BTEX concentration increased north of Division Street, but still within the original plume boundaries. The plume north of Division Street will be monitored due to increasing BTEX concentration. Groundwater monitoring events will include sampling for BTEX at monitoring well 48M08, and downgradient monitoring well 18-6. No other 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 at ST48 until BTEX concentrations meet the MCLs. Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs. 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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST48:

48M05	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
09/89	29	<0.3	<0.5	--
09/89	3.0	<0.3	<0.5	--
05/93	1.3	--	--	--
07/94	1.3	<1.0	<1.0	<1.0
08/94	<1.0	<1.0	<1.0	<0.5
10/94	<1.0	<1.0	<1.0	<1.0
09/95	2.2	<1.0	<1.0	<1.0
07/96	1.2	<1.0	<1.0	<1.0
09/97	5.0	<1.0	<1.0	<1.0
09/02	<0.5	<1.0	<1.0	<1.0

48M04	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
09/89	<0.1	<0.3	<0.5	--
05/93	0.1	--	--	--
07/94	<1.0	<1.0	<1.0	<1.0
08/94	<1.0	<1.0	<1.0	<0.5
10/94	<1.0	<1.0	<1.0	<1.0
09/95	<1.0	<1.0	<1.0	<1.0
07/96	<1.0	<1.0	<1.0	<1.0
09/97	<1.0	<1.0	<1.0	<1.0
09/02	<0.5	<1.0	<1.0	<1.0

48PP28	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
07/95	64	540	480	<25
07/96	<1.0	150	280	<1.0

53M03	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
10/89	318	230	<0.5	--
10/89	299	53	<0.5	--
09/91	460	53	100	<5.0
05/93	120	--	--	--
07/94	220	44	110	2.3
10/94	460	11	27	1.2
03/95	1.9	2.9	1.6	<1.0
07/95	190	15	27	1.5
09/95	240	25	47	<1.0
07/96	390	26	87	<1.0
09/97	170	21	72	<1.0
09/02	25	4.6	11	<1.0

48PP13	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
07/95	7,200	5,400	370	47
07/96	6,700	3,700	250	61

48PP102	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
07/96	6.2	5.0	160	<1.0

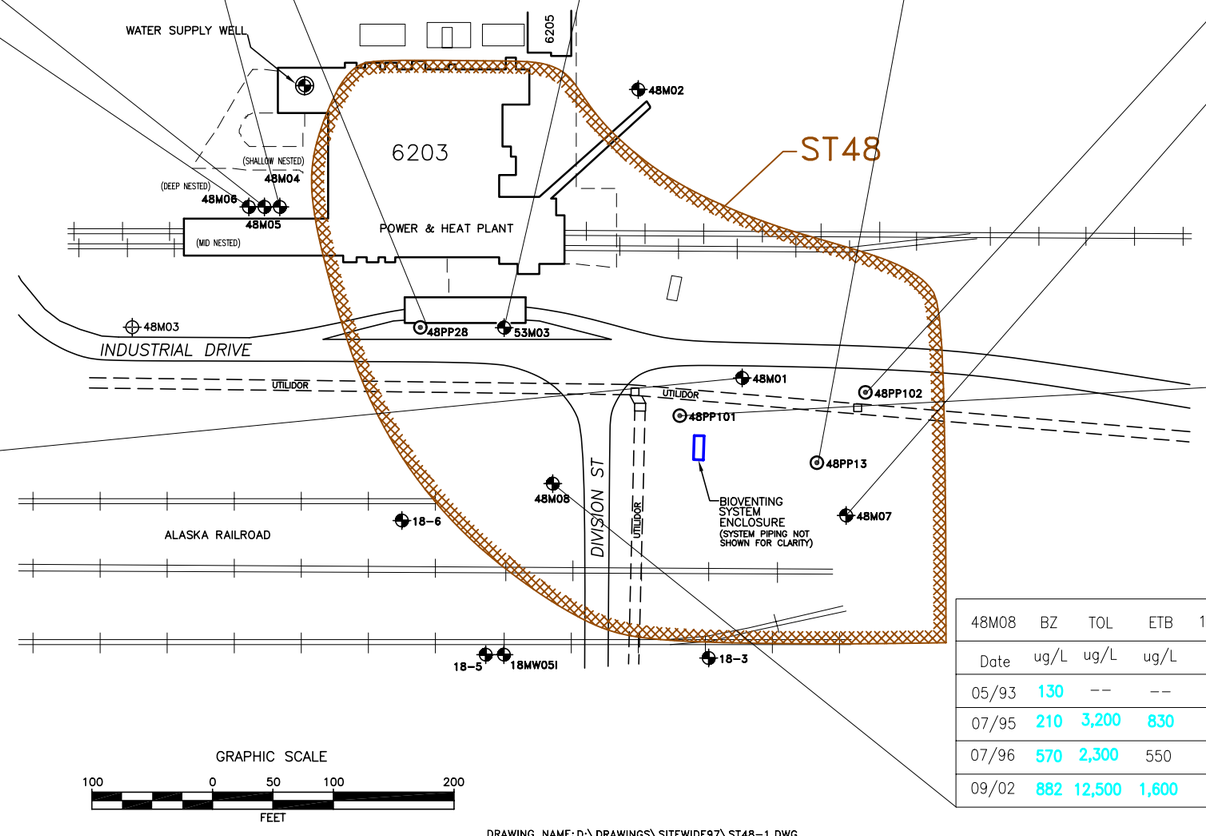
48M07	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
10/89	3.6	<0.3	<0.5	--
05/93	0.4	--	--	--
07/94	<1.0	<1.0	1.1	<1.0
10/94	<1.0	<1.0	<1.0	<1.0
03/95	6.3	15	7.8	<1.0
07/96	<1.0	<1.0	<1.0	<1.0

48M06	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
09/89	<0.2	<0.3	<0.5	--
09/89	<0.2	<0.3	<0.5	--
05/93	<2.0	--	--	--
07/94	<1.0	<1.0	<1.0	<1.0
08/94	<1.0	<1.0	<1.0	<0.5
10/94	<1.0	<1.0	<1.0	<1.0
09/95	<1.0	<1.0	<1.0	<1.0
07/96	<1.0	<1.0	<1.0	<1.0
09/97	<1.0	<1.0	<1.0	<1.0

48M01	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
1989	1,390	49	143	--
05/93	910	--	--	--
07/94	3,900	350	230	36
10/94	3,600	82	170	54
07/95	2,900	200	110	32
09/95	3,300	89	480	<20
07/96	4,600	87	290	14
10/97	3,800	62	220	4

48M08	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
05/93	130	--	--	--
07/95	210	3,200	830	<25
07/96	570	2,300	550	<1.0
09/02	882	12,500	1,600	<1.0

48PP101	BZ	TOL	ETB	1,2DCA
Date	ug/L	ug/L	ug/L	ug/L
07/95	250	11	160	<25



LEGEND

- GROUNDWATER MONITORING WELL
- FORMER GROUNDWATER MONITORING WELL LOCATION (DECOMMISSIONED OR DESTROYED)
- 1.25" PRODUCT PROBE
- WATER SUPPLY WELL
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU1 ROD (APPROXIMATE)
- BZ BENZENE
- TOL TOLUENE
- ETB ETHYLBENZENE
- 1,2DCA 1,2-DICHLOROETHANE
- ug/L MICROGRAMS PER LITER
- -- NOT ANALYZED

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

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 EAFB. 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
- Institutional Controls 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

Groundwater samples were collected as part of the 2002 SWMP. NAPL recovery stopped in 1998, was restarted in 2000 and continues. RPO studies were conducted in August 2002.

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 1050 gallons NAPL was recovered from 1992 to 1997. The system ceased operating from 1998 to 2000 due to mechanical malfunctions. Approximately 70 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 upgradient 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 through regular meetings and teleconferences. Source areas SS50-52 were not visited during the Five-Year ROD Review site inspections due to the remote location and regulator familiarity with the site.

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 results show BTEX concentrations remaining above MCLs. 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. Product recovery attempts had limited success, and are 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

The Blair Lakes facility, which houses the product recovery system, is scheduled for decommissioning in 2004. Free product recovery has been accomplished to the maximum extent practicable, as defined by 18AAC75.990. The product recovery system will cease operation at the time of decommissioning, and will be properly abandoned.

2.5.7 Recommendations and Follow-Up Actions

Elevated benzene concentrations remain at SS50-52 due to the existence of NAPL. Local permafrost and the immobility of the product hinder free product recovery efforts. Modifications or optimization of the recovery system will not significantly increase petroleum product recovery practicability or reduce the time frame to achieve remediation goals. Contamination at this source area presents minimal risks to human health and the environment due to the remote site location and groundwater immobility. The product recovery system will continue operation until the facility is decommissioned. Groundwater monitoring will continue as determined by the RPMs at SS50-52 until BTEX concentrations meet the MCLs. Additional land use restrictions include limitations on excavation and construction activities and the extraction of shallow groundwater.

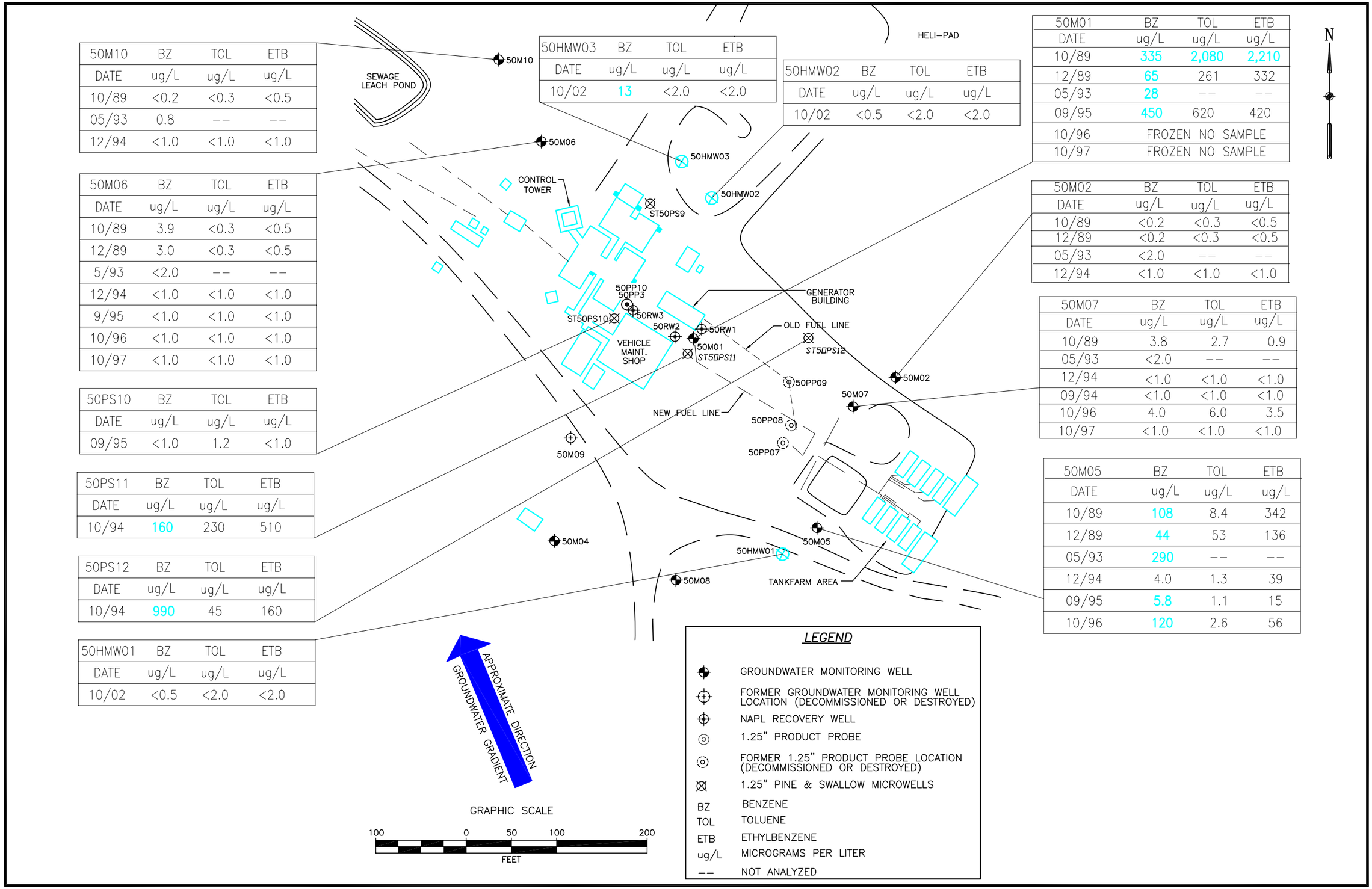
2.5.8 Protectiveness Statement

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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for SS50-SS52:



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

LEGEND

- GROUNDWATER MONITORING WELL
- FORMER GROUNDWATER MONITORING WELL LOCATION (DECOMMISSIONED OR DESTROYED)
- NAPL RECOVERY WELL
- 1.25" PRODUCT PROBE
- FORMER 1.25" PRODUCT PROBE LOCATION (DECOMMISSIONED OR DESTROYED)
- 1.25" PINE & SWALLOW MICROWELLS

BZ BENZENE
TOL TOLUENE
ETB ETHYLBENZENE
ug/L MICROGRAMS PER LITER
-- NOT ANALYZED

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

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 closed 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	**Remedial Action Objective**
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 OU2 Treatment System Report 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, 1994c).
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).

3.2 Community Involvement

The RI/FS and Proposed Plan for OU2 EAFB 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 EAFB 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 ROD Review are included in Appendix B. Additionally, RAB meetings to address community involvement were conducted on a

quarterly basis in 1995 and 1996, and conducted semi-annually from 1997 to the present.

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 EAFB, 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
- Institutional Controls 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 the indoor air quality issues. Groundwater samples were collected under the SWMP. 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

Bioventing and SVE system operations continued during the current review period. Groundwater samples were collected under the 1998, 1999 and 2002 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 1.04 mg/Kg-day in 1997 to 0.55 mg/Kg-day in 2001. Respiration test data were used to estimate that approximately 10,300 gallons of fuel had biodegraded between 1997 and 2003. The decrease in the average biodegradation rate is partly due to damaged bioventing system components.

Groundwater monitoring results from the 1998, 1999, and 2002 sampling events continue exceeding BTEX and lead MCLs within the source area boundaries. BTEX concentrations in samples collected from well 10-1 decreased from 1995 until it was decommissioned in 2002. Benzene concentrations from other sample locations within or near the central source area remain within their historic range. Hydrologically upgradient samples, collected in 2002, were non-detect for BTEX and lead. Benzene concentrations down hydrologic gradient, in well 10MW12, have decreased since 1995 to below the MCL. Concentrations in all other samples collected down hydrologic gradient remain below the MCLs (Figure ST10/SS14-1).

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 2002 in four wells (10RW03, 10VW03B, 10VW04B, and 10VW10A) within the central source area. Product thickness ranged from a sheen (10RW03) to 2.3 ft (10VW04B).

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at ST10/SS14 including the fueling facility layout, nearby Spruce Lake, a fire suppression well location, and monitoring points for a current plume delineation.

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 downgradient of the source area. Respiration tests conducted at the bioventing system locations estimate that approximately 10,300 gallons of fuel have been biodegraded. 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 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 areas, decreasing BTEX concentrations in the local groundwater. Groundwater monitoring indicates contamination levels hydrologically downgradient from the source area were reduced and remain below MCLs. All previous assumptions for the ST10/SS14 source areas are still valid.

3.3.6 Issues

Construction activities and frost heaving damaged bioventing system components. Several bioventing lines and injection points need replacing. The OU2 bioventing system is designed with screened sections below the water table, which causes air bypass at the bentonite seals. Existing bioventing injection wells will be replaced with screening above the water table. A plume delineation will further characterize the plume extent north of the bioventing system enclosures. The bioventing systems may be upgraded during the process of fixing damaged components to remediate areas of high benzene concentration as determined by the plume delineation study.

3.3.7 Recommendations and Follow-Up Actions

Respiration testing and groundwater monitoring indicate the RAOs for ST10/SS14 are being achieved. Groundwater monitoring will continue until BTEX and lead concentrations meet the MCLs. Bioventing will continue remediating the source area, with potential upgrades added to the bioventing system. SVE will continue addressing indoor air quality within Building 6225. Groundwater monitoring will continue as determined by the RPMs at ST10/SS14 until BTEX and lead concentrations meet the MCLs. 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 bioventing, SVE, 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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST10/SS14:

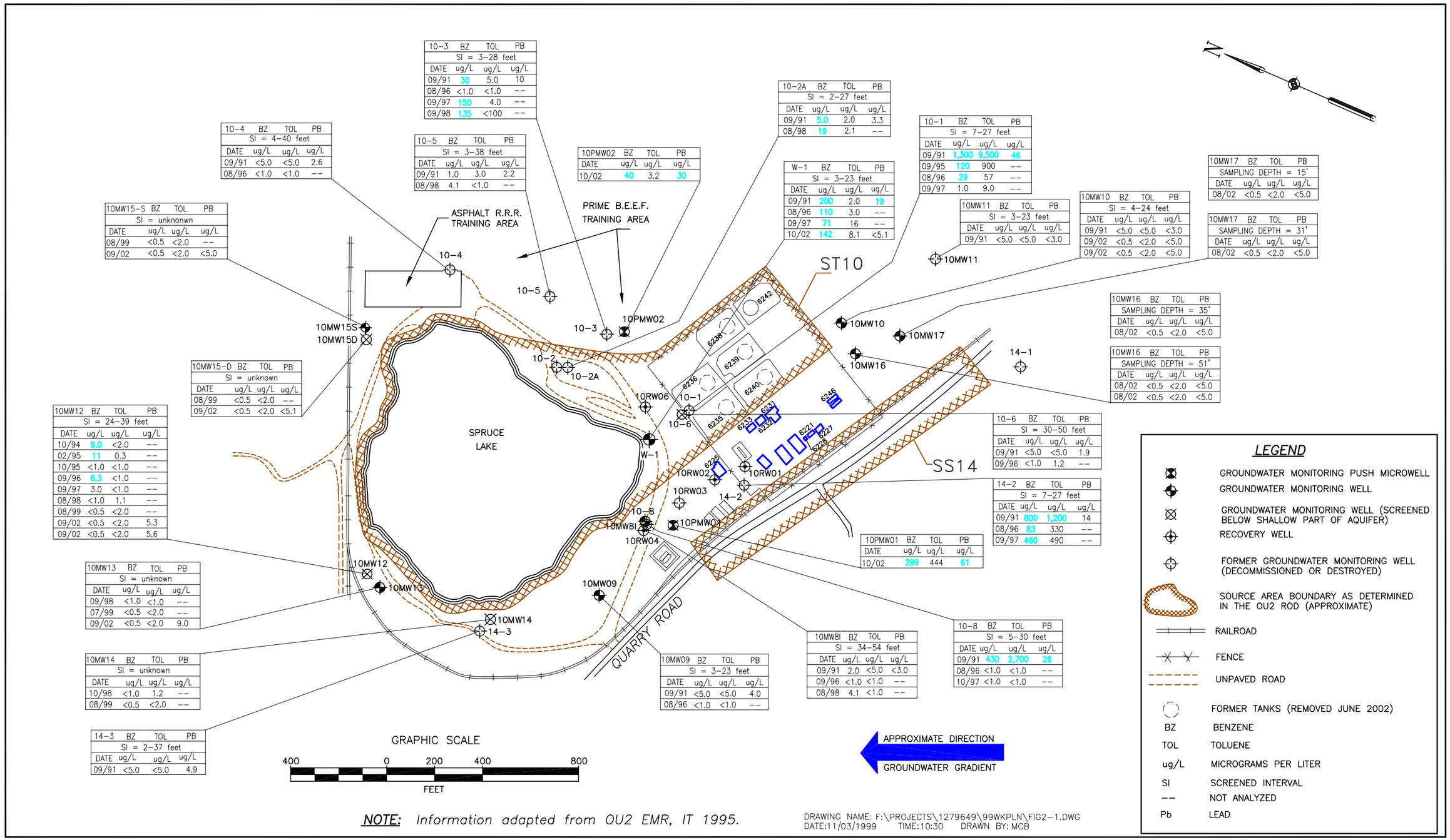


Figure ST10/SS14-1: ST10/SS14, E-2 POL Storage Area/E-2 Railroad JP4 Fuel Spill, Groundwater Monitoring Locations, Eielson AFB, Alaska

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 downgradient 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
- Institutional Controls 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. Groundwater samples were collected under the SWMP. ICs were implemented to prevent human exposure to groundwater contaminated above drinking water standards.

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 HazMat yard
- A line running east and west along the north boundary fence for Tanks 3 and 4, the former location of Tank 300

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

Bioventing and product recovery system operations continued during the current review period. Groundwater samples were collected as part of the 1998, 1999, 2000, and 2002 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 0.96 mg/Kg-day in 2001. Respiration test data were used to estimate that approximately 13,600 gallons fuel had biodegraded between 1996 and 2003.

Groundwater monitoring results from 1994 through 2002 sampling events continue exceeding the benzene, toluene, and lead MCLs. Elevated benzene concentrations, above MCLs, continue to be observed in samples collected within and hydrologically downgradient of the ST13 and DP26 source areas. Lead concentrations in 2002 exceeded the MCL in two wells outside the TI waiver boundaries, wells 26-6 and 37-5. This high lead concentration is likely attributable to the high turbidity of the groundwater samples (Figures ST13/DP26-1, ST13/DP26-2).

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. The utilidor product recovery system removed approximately 150-gallons NAPL, and continues to operate. The 795 utilidor is hydrologically downgradient from ST13/DP26, and was not defined in the OU2 ROD as part of the source area.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at ST13/DP26. The inspection team also discussed the TI waiver boundaries during the site visit.

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 stable or decreasing COC concentrations downgradient of the source area. Respiration tests conducted at the bioventing system locations indicate that approximately 13,600-gallons of fuel have biodegraded. 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 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. Groundwater monitoring indicates contamination levels hydrologically downgradient from the source area were reduced or stabilized. All previous assumptions for the ST13/DP26 source areas are still valid.

3.4.6 Issues

A new area of contamination was found east of DP26 at the 795 Utilidor, and north of NFA source area SS37. Free product recovery is currently operating at the 795 Utilidor. The contamination source is either fuel released from former USTs removed in 1997 at SS37, immediately south of the 795 Utilidor, or contamination migrating from hydrologically upgradient source area ST13/DP26.

The OU2 bioventing system is designed with screened sections below the water table, which causes air bypass at the bentonite seals. The existing bioventing injection wells should be replaced with screening above the water table.

3.4.7 Recommendations and Follow-Up Actions

Respiration testing and groundwater monitoring indicate the RAOs for ST13/DP26 are being achieved. Bioventing and product recovery systems will continue remediating the source area. A further investigation will be conducted at the 795 Utilidor location to characterize the NAPL source. Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs and to ensure that the lead remains immobile. 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 area has been addressed through bioventing, product recovery, 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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST13/DP26:

Figure ST13/DP26-1: Locations of Sampled Monitoring wells, ST13/DP26, EAFB, Alaska.

Figure ST13/DP26-2: ST13/DP26, E-4 Diesel Fuel Spill/E-10 Fuel Tank Sludge Burial Pit, Groundwater Monitoring Locations in TI Waiver Area, EAFB, Alaska.

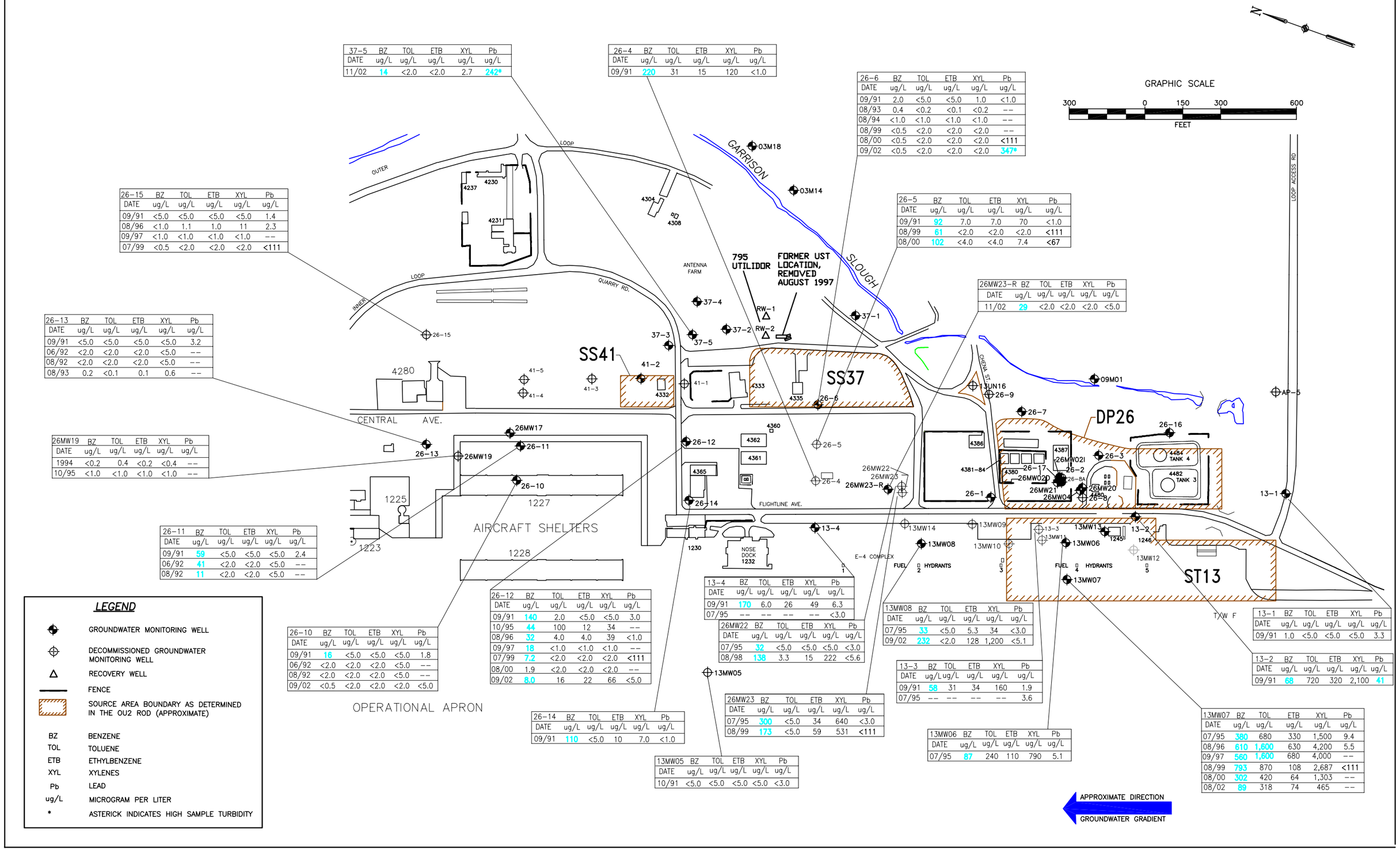
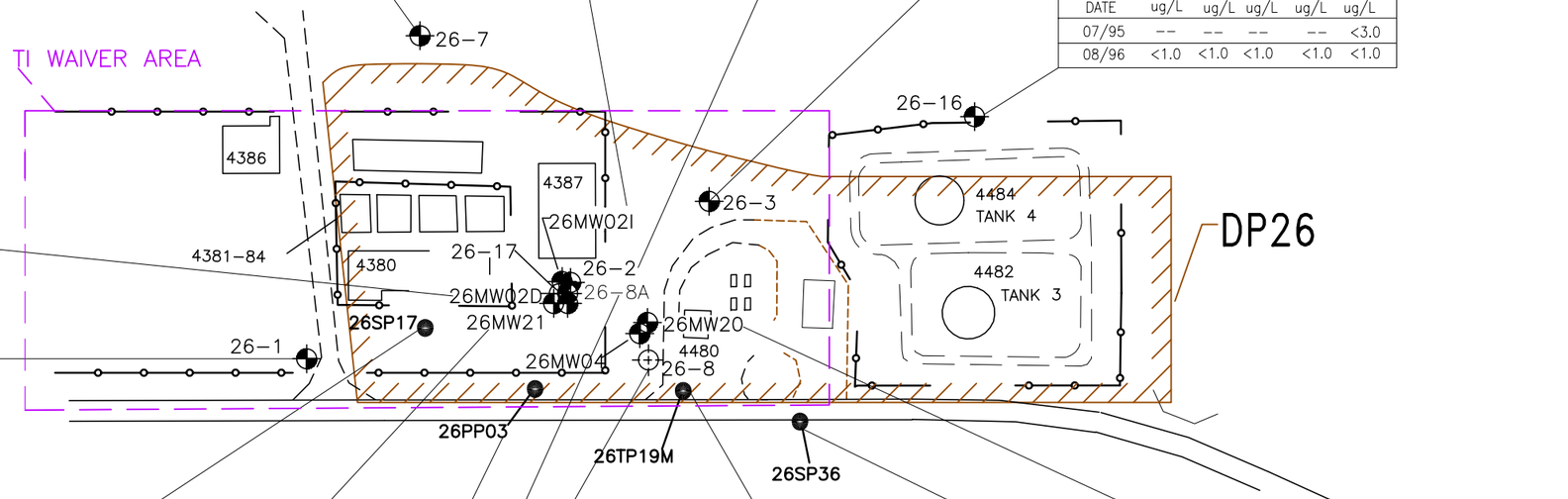


Figure ST13/DP26-1: ST13/DP26, E-4 Diesel Fuel Spill/E-10 Fuel Tank Sludge Burial Pit, Groundwater Monitoring Locations, Eielson AFB, Alaska

LEGEND

- GROUNDWATER MONITORING WELL
- DECOMMISSIONED GROUNDWATER MONITORING WELL
- GROUNDWATER MONITORING POINT
- TI WAIVER AREA
- FENCE
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU2 ROD (APPROXIMATE)

BZ	BENZENE
TOL	TOLUENE
ETB	ETHYLBENZENE
XYL	XYLENES
Pb	LEAD
ug/L	MICROGRAM PER LITER



26MW02I	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
10/91	53	<5.0	11	11	4.0
08/92	14	<2.0	<2.0	<5.0	--
07/95	<5.0	<5.0	<5.0	<5.0	<3.0

26-7	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	<5.0	<5.0	<5.0	<5.0	<1.0
07/95	<5.0	<5.0	<5.0	<5.0	<3.0

26-2	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	140	150	40	230	1.3
08/92	37	37	8.1	53	--

26-3	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	75	<5.0	1.0	5.0	1.4
07/95	--	--	--	--	<3.0

26-16	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
07/95	--	--	--	--	<3.0
08/96	<1.0	<1.0	<1.0	<1.0	<1.0

26MW02D	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/92	<2.0	<2.0	<2.0	<5.0	--
07/95	<5.0	<5.0	<5.0	<5.0	<3.0

26-1	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	510	3,000	1,100	6,300	334
08/93	780	7,000	1,200	9,800	420
07/95	360	2,700	950	6,400	150
10/95	450	3,200	1,200	8,300	--
08/96	360	3,300	1,200	9,500	216
09/97	240	2,600	1,200	7,200	91
08/98	311	3,950	1,410	9,770	141
08/99	218	3,110	1,050	7,130	194
08/00	126	1,830	731	5,070	--
09/02	97	2,530	832	5,860	427
09/02	138	2,650	1,020	6,750	336

26SP17	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/00	18	351	130	1,747	--

26MW21	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
07/95	8.5	<5.0	1.9	6.3	<3.0

26PP03	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/00	31	18	74	425	--

26TP19M	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/11/00	2,670	9,980	2,020	11,770	<14

26-8	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	1,400	4,200	610	5,400	795
08/93	2,700	8,500	990	9,100	690
07/95	3,100	8,200	830	9,800	5,100

26-8A	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/91	280	520	220	2,300	72

26SP36	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
09/00	764	3,960	649	6,810	--

26MW20	BZ	TOL	ETB	XYL	Pb
DATE	ug/L	ug/L	ug/L	ug/L	ug/L
08/96	110	530	170	1,860	6.6
09/98	154	708	289	2,610	<114
09/02	35	27	53	639	<5.0

APPROXIMATE DIRECTION
GROUNDWATER GRADIENT

GRAPHIC SCALE
200 0 100 200 400
FEET

Figure ST13/DP26-2: ST13/DP26, E-4 Diesel Fuel Spill/E-10 Fuel Tank Sludge Burial Pit, Groundwater Monitoring Locations in the TI Waiver Area, Eielson AFB, Alaska

4 OPERABLE UNIT 3

Operable Units 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 Operable Unit 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, 1998d). 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	--
Trichloroethene	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 (FS) 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, 1998c).

September 1995 OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1998d).

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)

4.2 Community Involvement

The RI/FS, BLRA, and the Proposed Plan for OUs 3,4,5 and Other Areas of EAFB 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 EAFB 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, and conducted semi-annually from 1997 to the present.

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 downgradient 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 downgradient 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
- Institutional Controls 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 1996, 1997, and 2002 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 2002 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.

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 downgradient of Hanger 1140 at well 44M07 are non-detect for TCE and below the MCL for cis-1,2 DCE. 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 downgradient 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. Nearby well 44M09, 100 ft directly down hydrologic gradient of 44M05, was sampled in 2002. All BTEX compounds and chlorinated VOCs were non-detect.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visually evaluate conditions at DP44. The inspection team discussed replacing monitoring well 44M04 during the site visit.

4.3.5 Technical Assessment

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

The remedy for source area DP44 is performing as expected. 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

Based on the data review and site inspection, the remedy is functioning as intended by the OU2 ROD and the Amended OU2 ROD. BTEX concentration remains below the MCL within the source area and hydrologically downgradient. Elevated TCE and cis-1,2 DCE concentrations likely remains were previously identified south of Hanger 1140. No groundwater samples have been collected within the chlorinated solvent plume boundaries since 1996. TCE and cis-1,2 DCE remain below MCLs at all other locations within the DP44 source area, and hydrologically downgradient. 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.

4.3.7 Recommendations and Follow-Up Actions

The amended RAOs for DP44 are to ensure that BTEX and chlorinated VOCs are not migrating off site and that their concentrations continue to decrease. Groundwater monitoring indicates the RAOs for DP44 are being achieved. A comparison of 2002 and previous groundwater analytical results indicates that BTEX and chlorinated solvent concentrations remain below MCLs within the DP44 source area, and hydrologically downgradient. However, further groundwater sampling needs to occur south of hanger 1140 to evaluate the TCE and cis-1,2 DCE plume identified by the 1994 microwell investigation and previous sampling from decommissioned monitoring well 44M04. A replacement well will be installed for monitoring well 44M04 and screened at the same interval. Groundwater monitoring will continue as determined by the RPMs at DP44 until BTEX and chlorinated VOC concentrations meet the MCLs. 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 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 of, and inhalation during use of contaminated groundwater.

4.3.9 Next Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for DP44:

Figure DP44-1 DP44 Site Plan Showing Groundwater Monitoring and Pilot Vapor Extraction Well Locations, EAFB, Alaska.

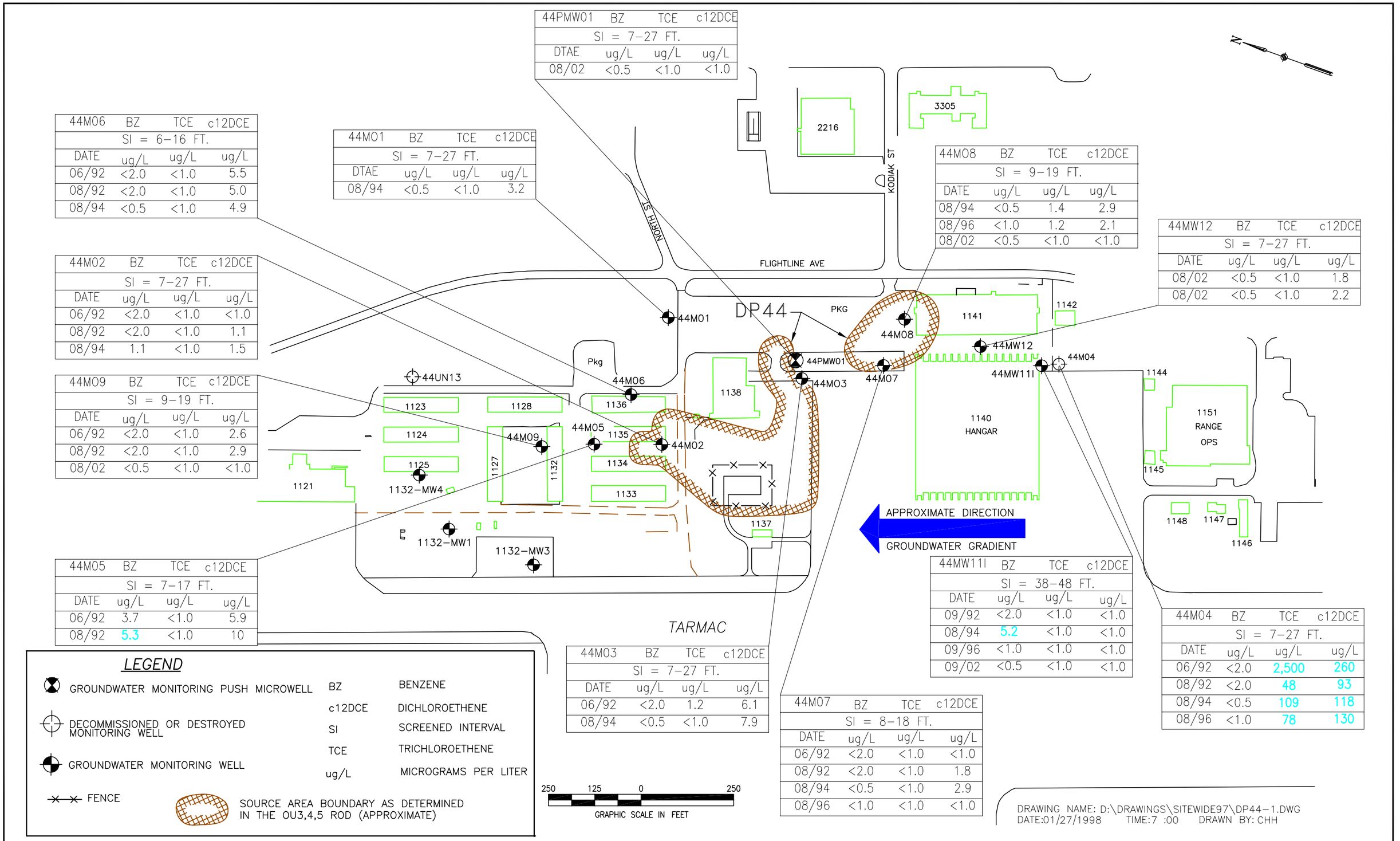


Figure DP44-1: DP44, Battery Shop Leach Field, Groundwater Monitoring Locations, Eielson AFB, Alaska

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 downgradient 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 upgradient 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 upgradient 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
- Institutional Controls 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, and 2002 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 implementing ICs to prevent exposure to contaminated groundwater.

4.4.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2000, 2001, and 2002 SWMPs.

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.

Data Review

Benzene concentrations exceed the MCL in sample 45MW07. Since 1992 benzene concentrations have decreased at 45M08 (9.7 µg/L to 2.1 µg/L). TCE concentrations remain above the MCL in four of the five 2002 sampling locations (45M01, 45M03, 45MW08, and 45MW09). Historical data show decreases in TCE, since 1992, in samples collected from wells 45MW01, 45MW08, and 45MW09. Push probes installed in 2001 identified TCE concentrations up to 61,000 µg/L in the vicinity of monitoring well 45M08 (USAF, 2002c) (Figure WP45/SS57-1).

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 through regular meetings and

teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at WP45/SS57, including the locations of monitoring well 45MW08 and the former Base water supply well.

4.4.5 Technical Assessment

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

The remedy for WP45/SS57 source areas is performing as expected. Groundwater is monitored to identify any changes to the plume configuration until cleanup goals are achieved. ICs continue to be 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 ROD. Groundwater samples indicate stabilized benzene and TCE plumes. TCE concentrations in groundwater samples decreased down hydrologic gradient from the source areas at wells 45MW01 and 45MW09. Benzene and TCE concentrations decreased or stabilized where previously elevated at wells 45MW07 and 45MW08. The 2001 groundwater probe investigation identified TCE concentrations up to 61,000 μg/L in the vicinity of monitoring well 45M08. All previous assumptions for the WP45/SS57 source areas are still valid.

4.4.6 Issues

The 2001 groundwater probe investigation confirmed continued elevated chlorinated solvent concentration near monitoring well 45M08. Recent field measurements collected independent of the IRP brings into question active anaerobic dechlorination. The data includes decreasing BTEX concentration, low oxygen, and lack of depleted sulfate.

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. Anaerobic dechlorination at source areas WP45/SS57 is currently under evaluation by an RPO team. The findings and conclusions from the RPO process will determine if further actions are required to enhance the remediation process at this

source area. Groundwater monitoring will continue as determined by the RPMs at WP45/SS57 until BTEX and 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 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, and inhalation during use of contaminated groundwater.

4.4.9 Next Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for WP45/SS57:

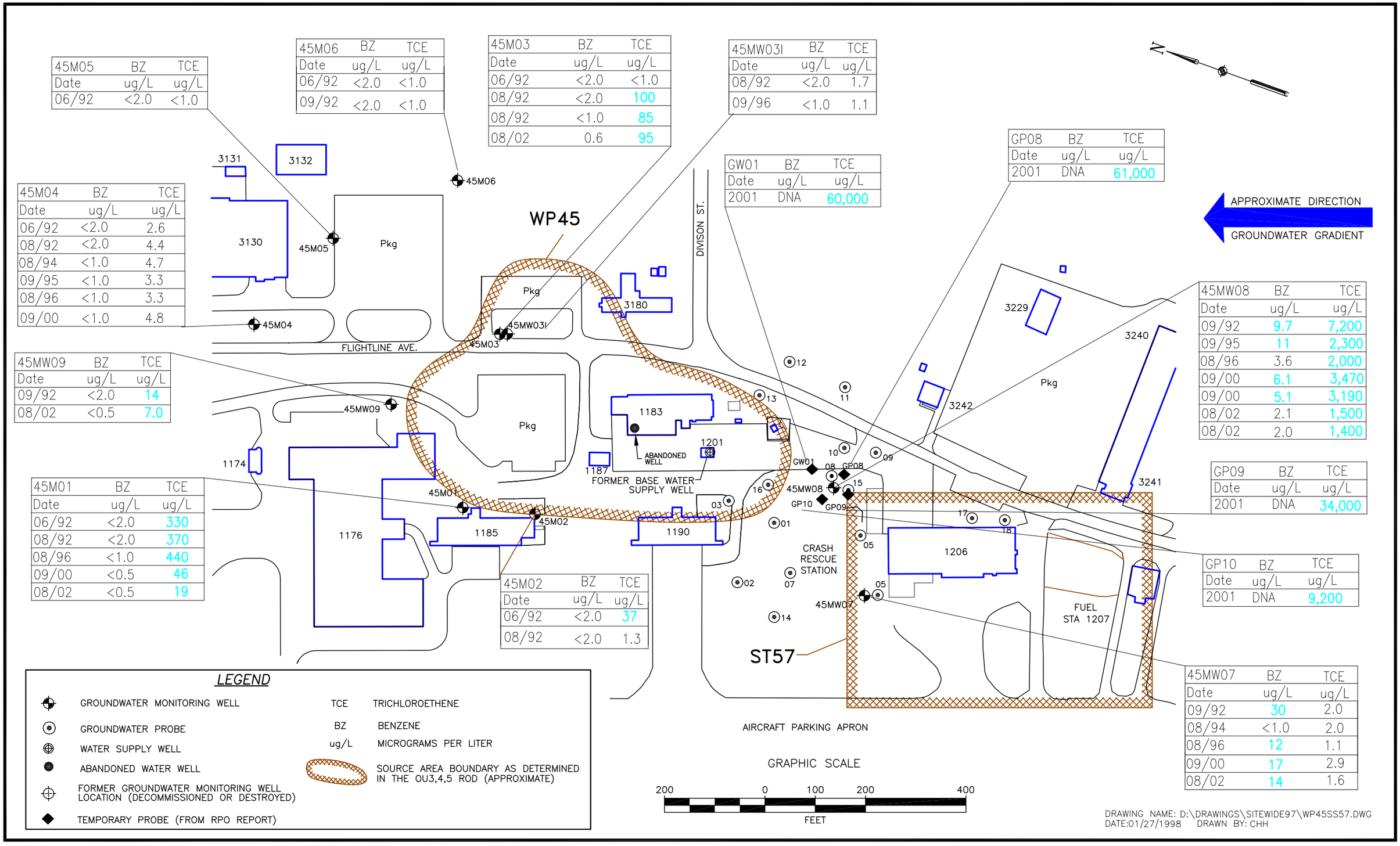


Figure WP45/SS57–1: WP45/SS57, Photo Lab, Building 1183/Fire Station Parking Lot, Groundwater Monitoring Locations, Eielson AFB, Alaska

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, 1998c). 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 m, and conductivity of 0.09 m/day, suggesting extremely slow transport velocity for any contaminant in the deep aquifer (USAF, 1998c).

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.

Drinking water is transported to the facility and stored in holding tanks. Groundwater use is restricted to toilets, sinks, and boilers with warning signs that the water is not potable.

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

- Maintenance of "non-potable water" signs at each water tap, which indicate that the water should not be used for drinking

History of Contamination

The quantity of chlorinated solvent release at ST56 is unknown. The original source of the contamination has not been identified (USAF, 1995e). Activities at ST56 involved

light vehicle and trailer maintenance in Building 6161. A tank of Stoddard™ 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 leachfield 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 leachfield 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 downgradient monitoring wells, COCs were only detected in 56MW03, which is located just downgradient 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
- Institutional Controls 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 leachfield. 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 leachfield. 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, and 2002 SWMP and analyzed for VOCs.

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 2001 and 2002 SWMPs.

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. TCE concentrations have exceeded the MCL in well 56MW03, near the wastewater leachfield. Samples could not be collected from 56MW03 during the last three attempts because the well was dry. 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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at ST56, including the general site layout and locations of the former and current septic tanks/leach fields.

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. 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

Based on the data review and site inspection, the remedy is functioning as intended by the ROD. PCE concentrations in the new supply well continues to exceed the MCL. 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.

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. PCE concentrations continue to exceed the MCL within the source area aquifer. Groundwater monitoring will continue as determined by the RPMs at ST56 until BTEX and chlorinated VOC concentrations meet the MCLs. Land use restrictions will remain in effect until RAOs are achieved.

4.5.8 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, 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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST56:

Figure ST56-1: ST56 Site Plan, Engineer Hill Area, Monitoring Well Locations, EAFB, Alaska.

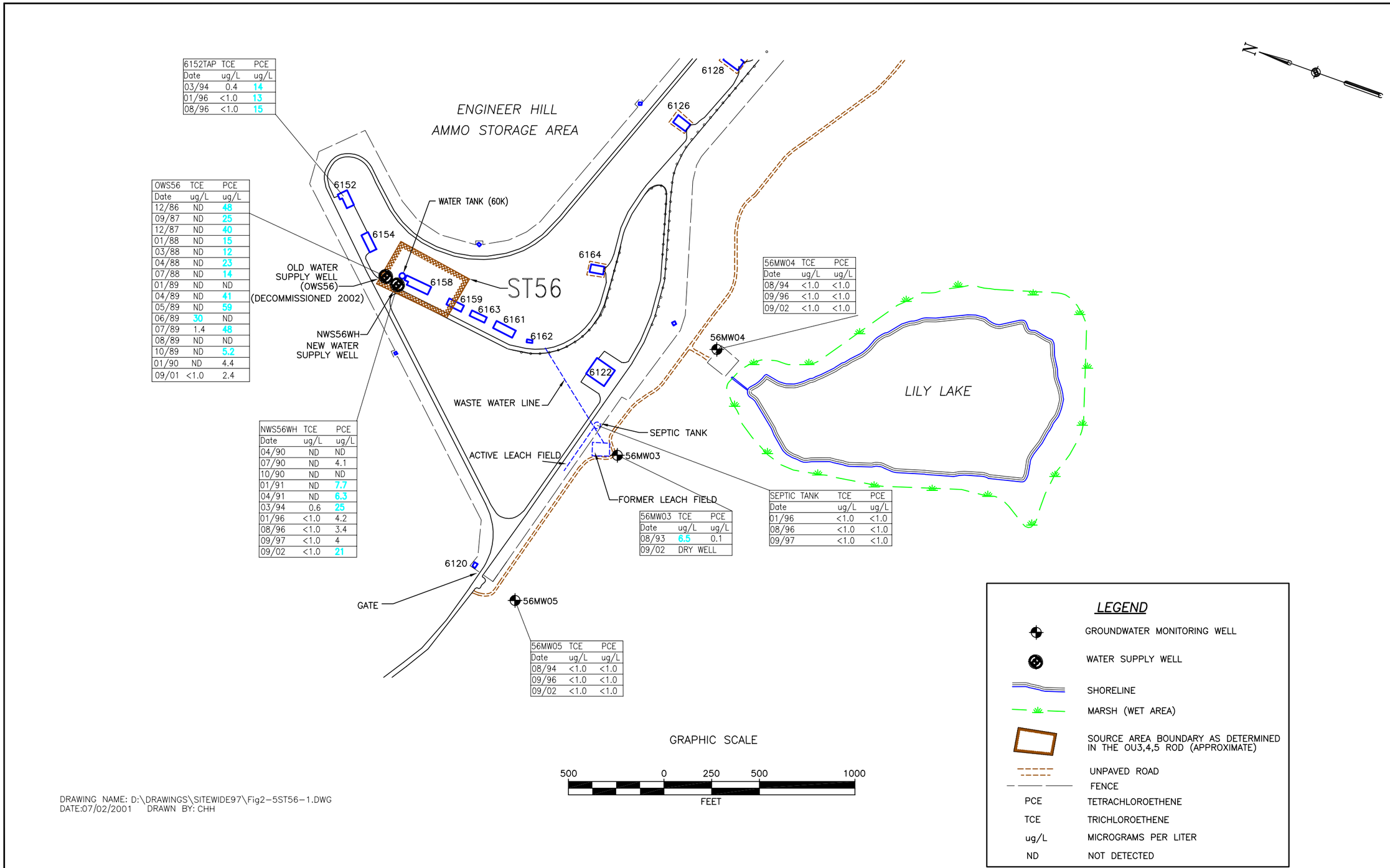


Figure ST56-1: ST56, Engineer Hill Fuel Spill Area, Groundwater Monitoring Locations, Eielson AFB, Alaska

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 downgradient. Soil and groundwater sample results near the eastern drywell (monitoring well 61MW01) and also the downgradient 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
- Institutional Controls 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, 1998, 2001, and 2002 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 1998, 2001, and 2002 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

PCE and TCE continue to exceed MCLs. PCE and TCE concentrations increased in 61MW02. Previous PCE results from 61MW02 ranged from 3.1 µg/L to 3.5 µg/L, below the MCL. PCE results for 2002 were 14.7 µg/L. TCE was detected above the MCL in 61MW02, at 33.2 µg/L. Previous TCE results were also above the MCL in 61MW02. 2002 TCE results are the highest since 1994 (Figure SS64-1).

Cis-1,2-DCE and trans-1,2-DCE were detected in 2002 below MCLs down hydrologic gradient of the source area in 61PMW01. Previous micro well results in the vicinity of 61PMW01 had varying concentrations of cis-1,2-DCE and trans-1,2-DCE. Cis-1,2-DCE was previously detected in 1998 from hydrologically downgradient well 61MW04.

Groundwater monitoring results from well 61MW02 had similar BTEX concentrations compared to previous samples, with concentrations below MCLs. BTEX concentrations remain below detection limits north (down hydrologic gradient) of the source area, in wells 58MW13 and 61PMW01. All VOCs remain below detection limits north of Building 3213 in well 61MW03.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at SS61. The inspection team discussed current monitoring well locations during the site visit.

4.6.5 Technical Assessment

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

The remedy for source area SS61 is performing as expected. Groundwater monitoring evaluates the plume configuration, 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 OU3,4,5 ROD. Chlorinated solvent concentrations remain above MCLs within the source area. COC concentrations from well 61MW03 are below MCLs down hydrologic gradient from the previously identified area of concern north of Building 3213. COC concentrations from hydrologically downgradient well 61PMW01 are below MCLs.

4.6.6 Issues

No issues were identified relating to the protectiveness of the remediation process at source area SS61.

4.6.7 Recommendations and Follow-Up Actions

The RAOs for SS61 include the protection of groundwater, and determining if an additional source of contamination exists north of Building 3123. BTEX concentrations in groundwater remain below the MCLs. Chlorinated solvent contamination exceeds

MCLs within the source area south of Building 3213. Low COC concentrations north of Building 3213 indicates the plume has stabilized. Groundwater monitoring will continue as determined by the RPMs at SS61 until BTEX and chlorinated solvent concentrations meet the MCLs. Land use restrictions remain until RAOs are achieved.

4.6.8 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.

4.6.9 Next Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for SS61:

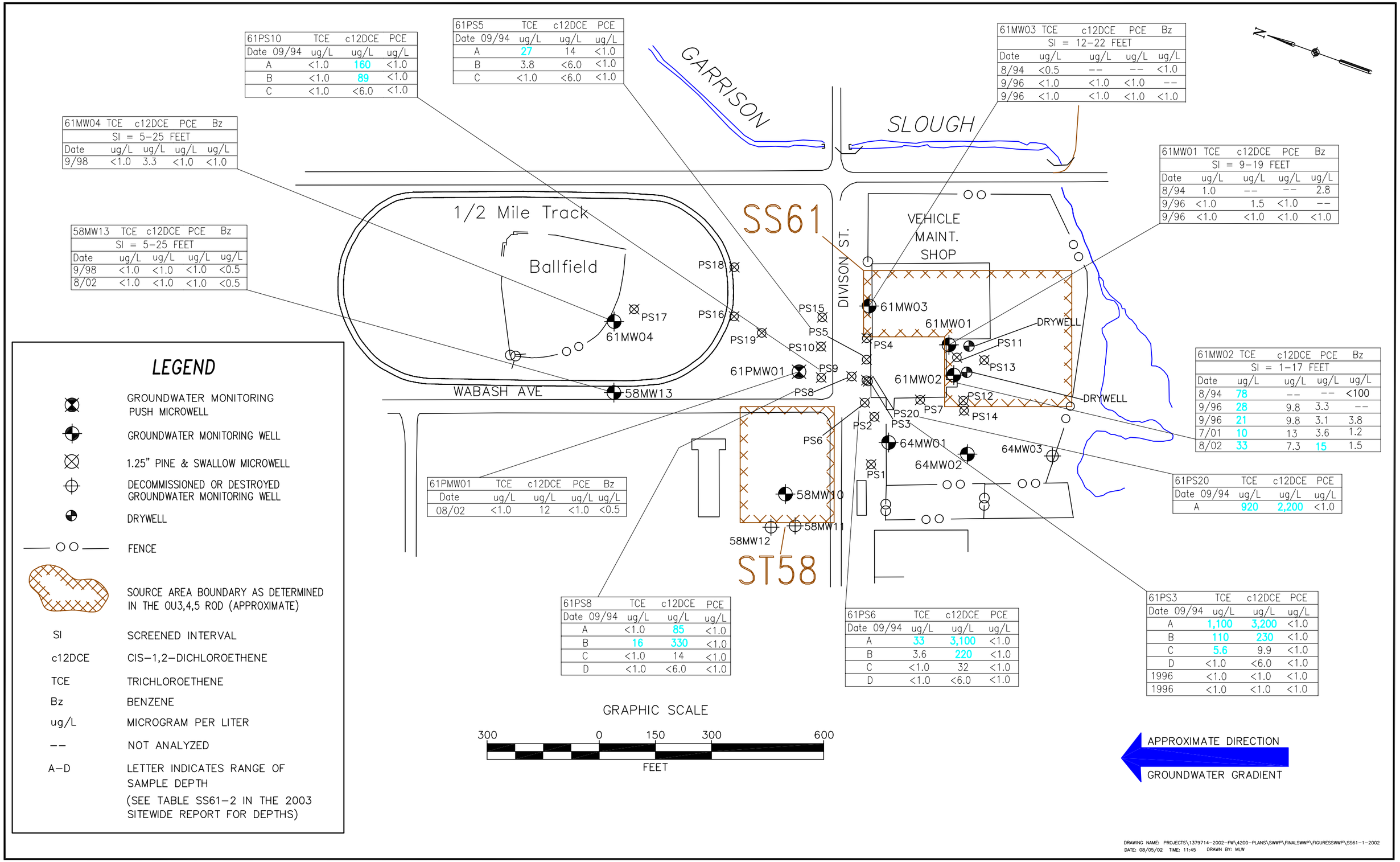


Figure SS61-1: SS61, Vehicle Maintenance Building 3213, Groundwater Monitoring Locations, Eielson AFB, Alaska

5 OPERABLE UNIT 4

Operable Units 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.

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, 1998d). 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	--
Trichloroethene	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 FS 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, 1998c).
September 1995	OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1998d).
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)

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, and conducted semi-annually from 1997 to the present.

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 EAFB 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 downgradient 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 (PRG). 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 0.33 meters 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
- Institutional Controls 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 and 2002 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.

5.3.3 Progress Since the last Five-Year Review

Groundwater samples were collected under the 2002 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 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 (Figure DP25-1).

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at DP25.

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. While 2002 sample results had COCs below MCL, elevated COC concentrations likely remain in the central E-6 complex area, and near tank 6263. All previous assumptions for the DP25 source area are still valid.

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 and lead concentrations meet the MCLs. Land use restrictions will remain in effect until RAOs are achieved.

5.3.8 Protectiveness Statement

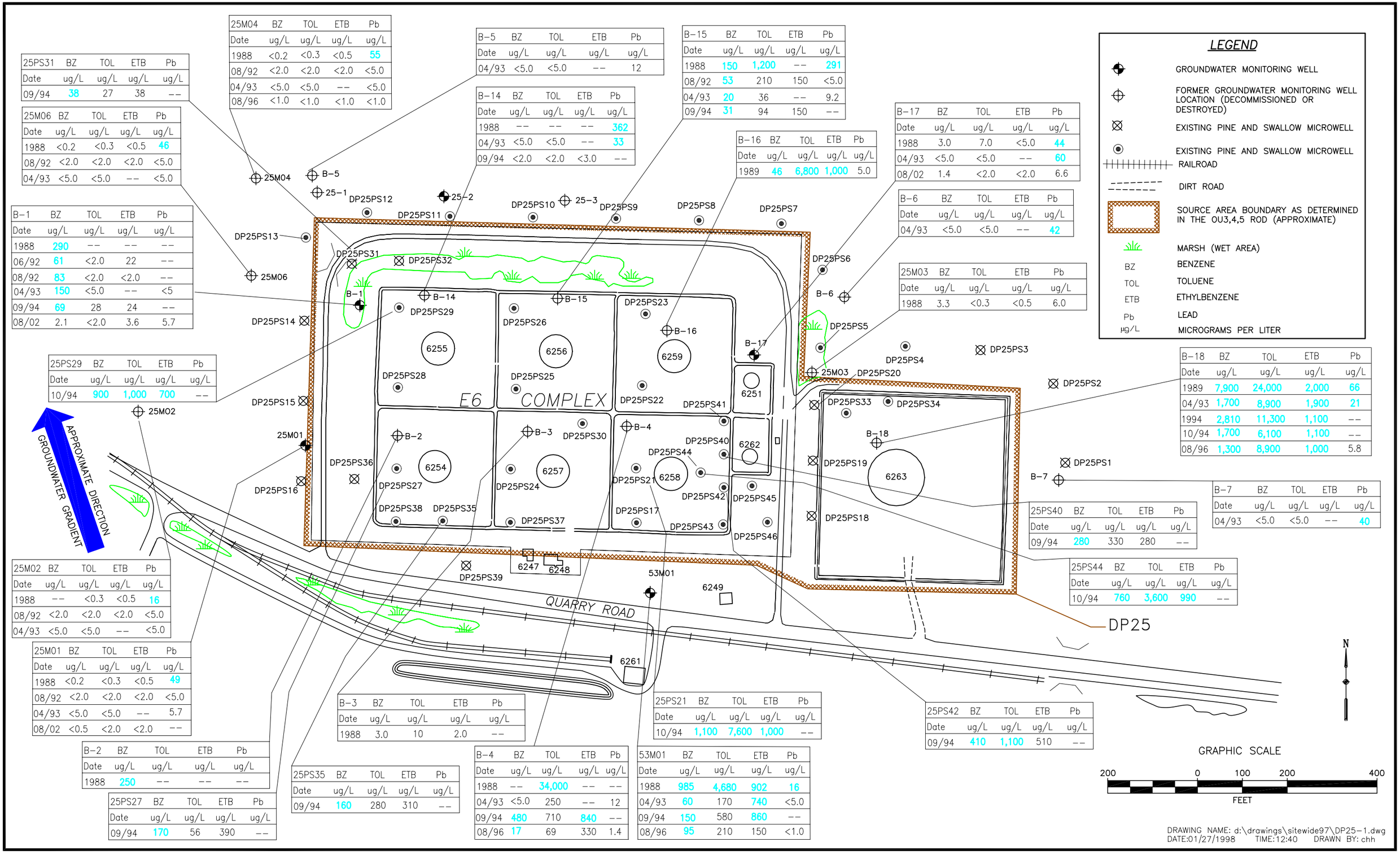
The remedy at OU3, 4, and 5 is expected to be protective of human health and the environment, and in the interim exposure pathways that could result in unacceptable risks are being controlled. The remedy for the source area has been addressed through

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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for DP-25:



25M04	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	<0.2	<0.3	<0.5	55
08/92	<2.0	<2.0	<2.0	<5.0
04/93	<5.0	<5.0	--	<5.0
08/96	<1.0	<1.0	<1.0	<1.0

B-5	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
04/93	<5.0	<5.0	--	12

B-15	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	150	1,200	--	291
08/92	53	210	150	<5.0
04/93	20	36	--	9.2
09/94	31	94	150	--

25PS31	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
09/94	38	27	38	--

B-14	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	--	--	--	362
04/93	<5.0	<5.0	--	33
09/94	<2.0	<2.0	<3.0	--

B-16	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1989	46	6,800	1,000	5.0

B-17	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	3.0	7.0	<5.0	44
04/93	<5.0	<5.0	--	60
08/02	1.4	<2.0	<2.0	6.6

25M06	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	<0.2	<0.3	<0.5	46
08/92	<2.0	<2.0	<2.0	<5.0
04/93	<5.0	<5.0	--	<5.0

B-6	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
04/93	<5.0	<5.0	--	42

B-1	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	290	--	--	--
06/92	61	<2.0	22	--
08/92	83	<2.0	<2.0	--
04/93	150	<5.0	--	<5
09/94	69	28	24	--
08/02	2.1	<2.0	3.6	5.7

25M03	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	3.3	<0.3	<0.5	6.0

B-18	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1989	7,900	24,000	2,000	66
04/93	1,700	8,900	1,900	21
1994	2,810	11,300	1,100	--
10/94	1,700	6,100	1,100	--
08/96	1,300	8,900	1,000	5.8

25PS29	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
10/94	900	1,000	700	--

B-7	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
04/93	<5.0	<5.0	--	40

25PS40	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
09/94	280	330	280	--

25PS44	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
10/94	760	3,600	990	--

25M02	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	--	<0.3	<0.5	16
08/92	<2.0	<2.0	<2.0	<5.0
04/93	<5.0	<5.0	--	<5.0

25M01	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	<0.2	<0.3	<0.5	49
08/92	<2.0	<2.0	<2.0	<5.0
04/93	<5.0	<5.0	--	5.7
08/02	<0.5	<2.0	<2.0	--

B-3	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	3.0	10	2.0	--

25PS21	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
10/94	1,100	7,600	1,000	--

25PS42	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
09/94	410	1,100	510	--

B-2	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	250	--	--	--

25PS35	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
09/94	160	280	310	--

B-4	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	--	34,000	--	--
04/93	<5.0	250	--	12
09/94	480	710	840	--
08/96	17	69	330	1.4

53M01	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
1988	985	4,680	902	16
04/93	60	170	740	<5.0
09/94	150	580	860	--
08/96	95	210	150	<1.0

25PS27	BZ	TOL	ETB	Pb
Date	ug/L	ug/L	ug/L	ug/L
09/94	170	56	390	--

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

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
- Institutional Controls 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, 1998, and 2002 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 2002 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).

TCE was detected in sample ST58PS10 (collected in 1994 and 1996) at concentrations exceeding the MCL. TCE was non-detect in all other samples and is not a COC. The sample ST58PS10 location is hydrologically downgradient from source area SS61, with known chlorinated VOC contamination.

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at ST58.

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. Groundwater monitoring indicates the RAOs for ST58 are being achieved. A comparison of 2002 and previous groundwater analytical results indicate that benzene concentration within and hydrologically downgradient of the source area decreased to levels below the MCLs. Lead concentration in groundwater continues to exceed the MCL within the source area boundaries. Groundwater monitoring will continue as determined by the RPMs until all COC concentrations meet the MCLs. Land use restrictions at ST58 will remain in effect until RAOs are achieved.

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

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for ST58:

Figure ST58-1: ST58, Old Quarter Master Service Station, Groundwater Monitoring Locations, EAFB, Alaska.

Note: *Information adapted from Final RI, USAF 1995.*

58PS4	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--
10/94	<2.0	--

58PS10	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--
09/96	<1.0	1.9

58PS3	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--
09/96	<1.0	13

58MW04	BZ	Pb
Date	ug/L	ug/L
01/92	72	--
04/93	98	63

58PS2	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58MW06	BZ	Pb
Date	ug/L	ug/L
01/92	<0.2	--
04/93	<0.7	44

58PS1	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58PS9	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--
09/96	<1.0	4.3

58MW05	BZ	Pb
Date	ug/L	ug/L
01/92	85	--
04/93	29	40

58MW13	BZ	Pb
Date	ug/L	ug/L
09/98	<1.0	<5.0
08/02	<0.5	--

58MW09	BZ	Pb
Date	ug/L	ug/L
04/93	24	130

58PP101	BZ	Pb
Date	ug/L	ug/L
09/95	<1.0	--
09/96	<1.0	78

58MW07	BZ	Pb
Date	ug/L	ug/L
01/92	<0.2	--
04/93	<0.7	110

58PP104	BZ	Pb
Date	ug/L	ug/L
09/95	<1.0	--

58PS12	BZ	Pb
Date	ug/L	ug/L
10/94	<2.0	--
09/96	<1.0	<1.0

58PP103	BZ	Pb
Date	ug/L	ug/L
09/95	<1.0	--
09/96	<1.0	62

58PMW01	BZ	Pb
Date	ug/L	ug/L
08/02	<0.5	34

58PS14	BZ	Pb
Date	ug/L	ug/L
10/94	<2.0	--

58MW03	BZ	Pb
Date	ug/L	ug/L
01/92	5.4	--
04/93	3.7	41

58MW10	BZ	Pb
Date	ug/L	ug/L
04/93	450	89
09/95	30	--
09/96	<1.0	10
08/98	<1.0	<5.0
08/02	<0.5	<5.0

58MW08	BZ	Pb
Date	ug/L	ug/L
01/92	145	--
04/93	180	51

58MW12	BZ	Pb
Date	ug/L	ug/L
04/93	<0.7	180
09/96	<1.0	6.3

58PS13	BZ	Pb
Date	ug/L	ug/L
10/94	<2.0	--

58MW11	BZ	Pb
Date	ug/L	ug/L
04/93	1.3	170
10/94	<2.0	--
09/96	<1.0	7.2

58PP102	BZ	Pb
Date	ug/L	ug/L
09/95	<1.0	--
09/96	<1.0	30

58PS6	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58MW01	BZ	Pb
Date	ug/L	ug/L
01/92	<0.2	--
04/93	<0.7	35

58PS5	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58PS11	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58MW02	BZ	Pb
Date	ug/L	ug/L
01/92	<0.2	--
04/93	<0.7	39

58PS8	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

58PS7	BZ	Pb
Date	ug/L	ug/L
09/94	<2.0	--

ST58PS10
ST58PS9
ST58PS4
ST58PS3
ST58PS2
ST58PS1
58MW13
ST58PS12
58MW07
58MW04
58MW06
58MW05
58MW09
58PMW01
58PP101
58PP104
58MW03
58PP103
ST58PS14
58MW08
ST58PS13
58PP102
58MW02
58MW01
58MW10
ST58PS11
ST58PS8
SS58
58MW12
58MW11
ST58PS7
ST58PS6
ST58PS5
61MW01
61MW02
64MW01
SS61
SS64
RUNNING TRACK
WABASH AVENUE
MAINTENANCE SHOP 3213
3133
3211
DIVISION STREET
TI WAIVER BOUNDARY (EXTENDS TO FLIGHTLINE AVE)
APPROXIMATE DIRECTION
GROUNDWATER GRADIENT

GRAPHIC SCALE
100 0 50 100 200
FEET

DRAWING NAME: D:\DRAWINGS\SITEWIDE97\ST58-1.DWG
DATE:01/27/1998 TIME:08:55 DRAWN BY: CHH

LEGEND

- GROUNDWATER MONITORING PUSH MICROWELL
- EXISTING GROUNDWATER MONITORING WELL
- FORMER GROUNDWATER MONITORING WELL LOCATION (DECOMMISSIONED OR DESTROYED)
- 1.25" PINE & SWALLOW MICROWELL
- 1.25" PRODUCT MONITORING PROBE
- —X—X— FENCE
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU3,4,5 ROD (APPROXIMATE)
- TI (TECHNICAL IMPRACTICABILITY) WAIVER BOUNDARY
- BZ BENZENE
- Pb LEAD
- ug/L MICROGRAMS PER LITER
- — — NOT ANALYZED

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

6 OPERABLE UNIT 5

Operable Units 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, 1998d). Post-closure care, including maintenance and monitoring, is conducted in accordance with 40 Code of Federal Regulations (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-Dichloroethene	70	--
trans-1,2-Dichloroethene	100	--
Trichloroethene	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 FS 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, 1998c).

September 1995 OU3,4,5 ROD signed by USAF, USEPA, and ADEC (USAF, 1998d).

September 1996 EAFB 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)

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, and conducted semi-annually from 1997 to the present.

6.3 LF03/FT09 Old Base Landfill/Firefighter training Area

6.3.1 Background

LF03/FT09 occupies approximately 100 acres 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 EAFB 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 EAFB 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, 1998d). 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
- Institutional Controls 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 contact with the refuse.

ICs were implemented to control assess to the groundwater and prevent unauthorized dumping. Groundwater samples were collected 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 1998, 1999, 2000, 2001, and 2002 SWMPs.

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 and 09M02, which are hydrologically downgradient 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 exceed action levels in several source are wells. SVOC concentrations in groundwater remain below cleanup levels. PCB concentrations remain non-detect from monitoring well 03M09, hydrologically downgradient from the PCB burial location (Figures LF03/FT09-1, LF03/FT09-2, LF03/FT09-3).

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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at LF03/FT09 including the new building location, standpipes for methane gas venting, monitoring well locations, and soil stockpile locations. The inspection team also discussed ICs for the source area during the site visit.

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, TCE, and metal concentrations exceeding the MCLs within the source area, but stable hydrologically downgradient. PCB concentration remains below the action levels. 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 NCP requires compliance with ARARs at the edge of the waste management area (i.e., the landfill) Groundwater at and adjacent to the landfill will continue to be monitored to verify that contaminant concentrations remain below acceptable regulatory levels. An additional monitoring point will be installed between 03M13 and Garrison Slough. 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 EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for LF03:

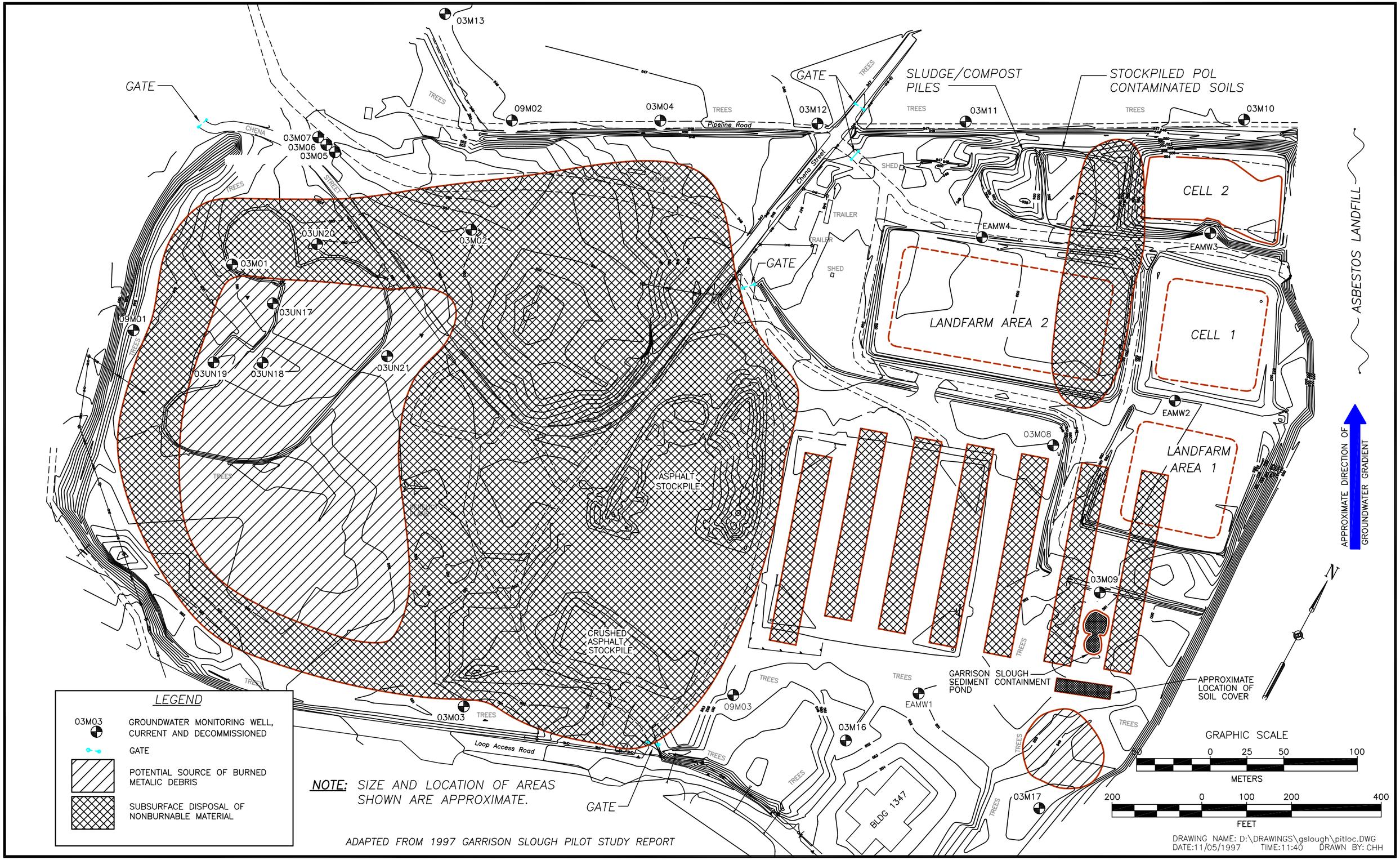
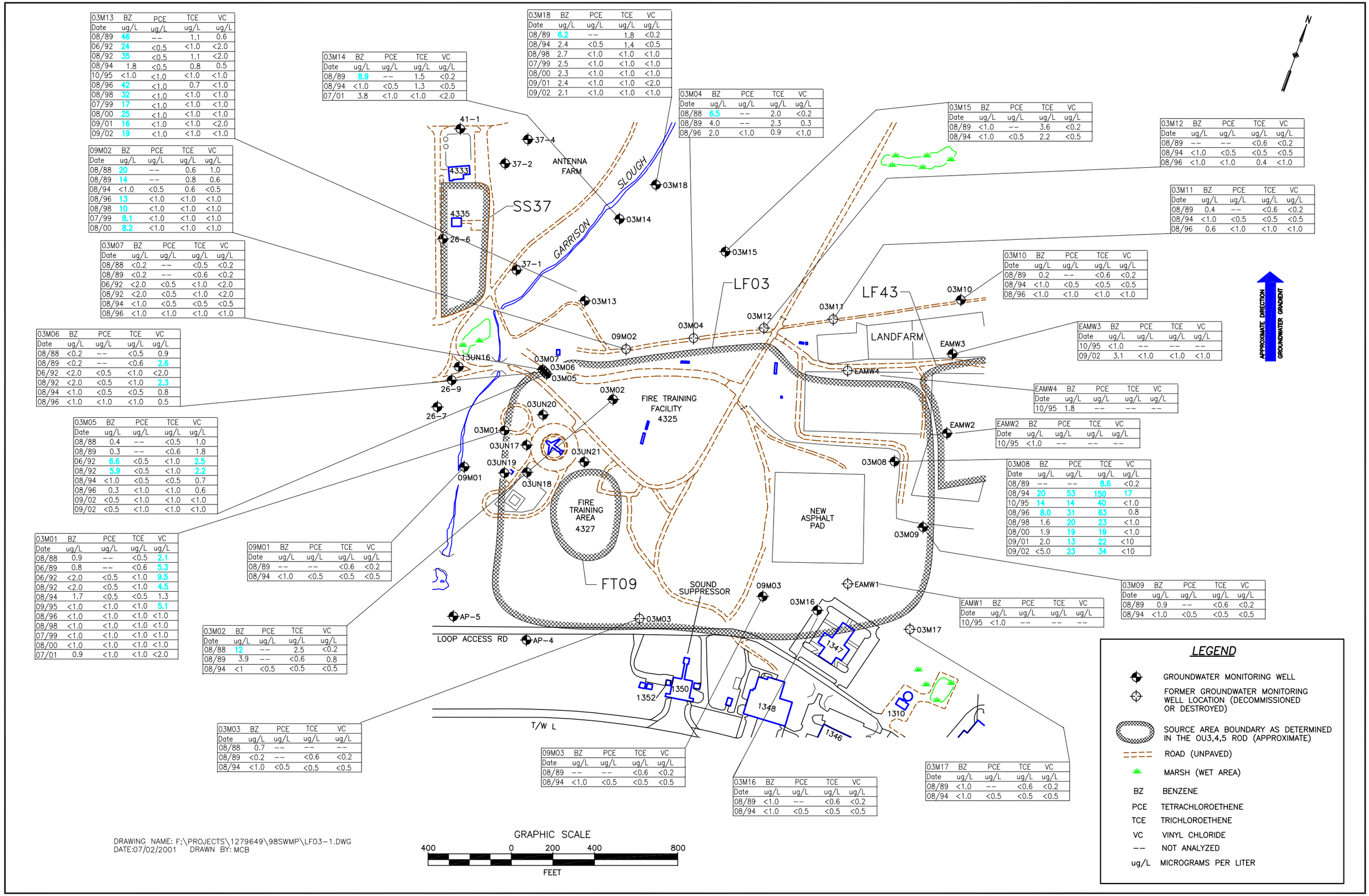


Figure LF03/FT09–1. LF03/FT09 Site Plan Showing Locations of Groundwater Monitor Wells and Subsurface Disposal, Eielson AFB, Alaska



03M13	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	46	--	1.1	0.6
06/92	24	<0.5	<1.0	<2.0
08/92	35	<0.5	1.1	<2.0
08/94	1.8	<0.5	0.8	0.5
10/95	<1.0	<1.0	<1.0	<1.0
08/96	42	<1.0	0.7	<1.0
08/98	32	<1.0	<1.0	<1.0
07/99	17	<1.0	<1.0	<1.0
08/00	25	<1.0	<1.0	<1.0
09/01	16	<1.0	<1.0	<2.0
09/02	19	<1.0	<1.0	<1.0

03M14	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	8.9	--	1.5	<0.2
08/94	<1.0	<0.5	1.3	<0.5
07/01	3.8	<1.0	<1.0	<2.0

03M18	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	6.2	--	1.8	<0.2
08/94	2.4	<0.5	1.4	<0.5
08/98	2.7	<1.0	<1.0	<1.0
07/99	2.5	<1.0	<1.0	<1.0
08/00	2.3	<1.0	<1.0	<1.0
09/01	2.4	<1.0	<1.0	<2.0
09/02	2.1	<1.0	<1.0	<1.0

03M04	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	6.5	--	2.0	<0.2
08/89	4.0	--	2.3	0.3
08/96	2.0	<1.0	0.9	<1.0

03M15	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	<1.0	--	3.6	<0.2
08/94	<1.0	<0.5	2.2	<0.5

03M12	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	--	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5
08/96	<1.0	<1.0	0.4	<1.0

03M11	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	0.4	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5
08/96	0.6	<1.0	<1.0	<1.0

03M10	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	0.2	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5
08/96	<1.0	<1.0	<1.0	<1.0

09M02	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	20	--	0.6	1.0
08/89	14	--	0.8	0.6
08/94	<1.0	<0.5	0.6	<0.5
08/96	13	<1.0	<1.0	<1.0
08/98	10	<1.0	<1.0	<1.0
07/99	8.1	<1.0	<1.0	<1.0
08/00	8.2	<1.0	<1.0	<1.0

03M07	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	<0.2	--	<0.5	<0.2
08/89	<0.2	--	<0.6	<0.2
06/92	<2.0	<0.5	<1.0	<2.0
08/92	<2.0	<0.5	<1.0	<2.0
08/94	<1.0	<0.5	<0.5	<0.5
08/96	<1.0	<1.0	<1.0	<1.0

03M06	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	<0.2	--	<0.5	0.9
08/89	<0.2	--	<0.6	2.6
06/92	<2.0	<0.5	<1.0	<2.0
08/92	<2.0	<0.5	<1.0	2.3
08/94	<1.0	<0.5	<0.5	0.8
08/96	<1.0	<1.0	<1.0	0.5

03M05	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	0.4	--	<0.5	1.0
08/89	0.3	--	<0.6	1.8
06/92	6.6	<0.5	<1.0	2.5
08/92	5.9	<0.5	<1.0	2.2
08/94	<1.0	<0.5	<0.5	0.7
08/96	0.3	<1.0	<1.0	0.6
09/02	<0.5	<1.0	<1.0	<1.0
09/02	<0.5	<1.0	<1.0	<1.0

03M01	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	0.9	--	<0.5	2.1
06/89	0.8	--	<0.6	5.3
06/92	<2.0	<0.5	<1.0	9.5
08/92	<2.0	<0.5	<1.0	4.5
08/94	1.7	<0.5	<0.5	1.3
09/95	<1.0	<1.0	<1.0	5.1
08/96	<1.0	<1.0	<1.0	<1.0
08/98	<1.0	<1.0	<1.0	<1.0
07/99	<1.0	<1.0	<1.0	<1.0
08/00	<1.0	<1.0	<1.0	<1.0
07/01	0.9	<1.0	<1.0	<2.0

09M01	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	--	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

03M02	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	12	--	2.5	<0.2
08/89	3.9	--	<0.6	0.8
08/94	<1	<0.5	<0.5	<0.5

03M03	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/88	0.7	--	--	--
08/89	<0.2	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

09M03	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	--	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

03M16	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	<1.0	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

03M17	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	<1.0	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

EAMW3	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
10/95	<1.0	--	--	--
09/02	3.1	<1.0	<1.0	<1.0

EAMW4	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
10/95	1.8	--	--	--

EAMW2	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
10/95	<1.0	--	--	--

03M08	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	--	--	8.6	<0.2
08/94	20	53	150	17
10/95	14	14	40	<1.0
08/96	8.0	31	63	0.8
08/98	1.6	20	23	<1.0
08/00	1.9	19	19	<1.0
09/01	2.0	13	22	<10
09/02	<5.0	23	34	<10

03M09	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
08/89	0.9	--	<0.6	<0.2
08/94	<1.0	<0.5	<0.5	<0.5

EAMW1	BZ	PCE	TCE	VC
Date	ug/L	ug/L	ug/L	ug/L
10/95	<1.0	--	--	--

LEGEND

- GROUNDWATER MONITORING WELL
- FORMER GROUNDWATER MONITORING WELL LOCATION (DECOMMISSIONED OR DESTROYED)
- SOURCE AREA BOUNDARY AS DETERMINED IN THE OU3,4,5 ROD (APPROXIMATE)
- ROAD (UNPAVED)
- MARSH (WET AREA)
- BZ BENZENE
- PCE TETRACHLOROETHENE
- TCE TRICHLOROETHENE
- VC VINYL CHLORIDE
- -- NOT ANALYZED
- ug/L MICROGRAMS PER LITER

GRAPHIC SCALE
400 0 200 400 800
FEET

DRAWING NAME: F:\PROJECTS\1279649\98SWMP\LF03-1.DWG
DATE:07/02/2001 DRAWN BY: MCB

Figure LF03/FT09-2: LF03/FT09, Landfill 3/Fire Training Area 9, Groundwater Monitoring Locations with VOC Results, Eielson AFB, Alaska

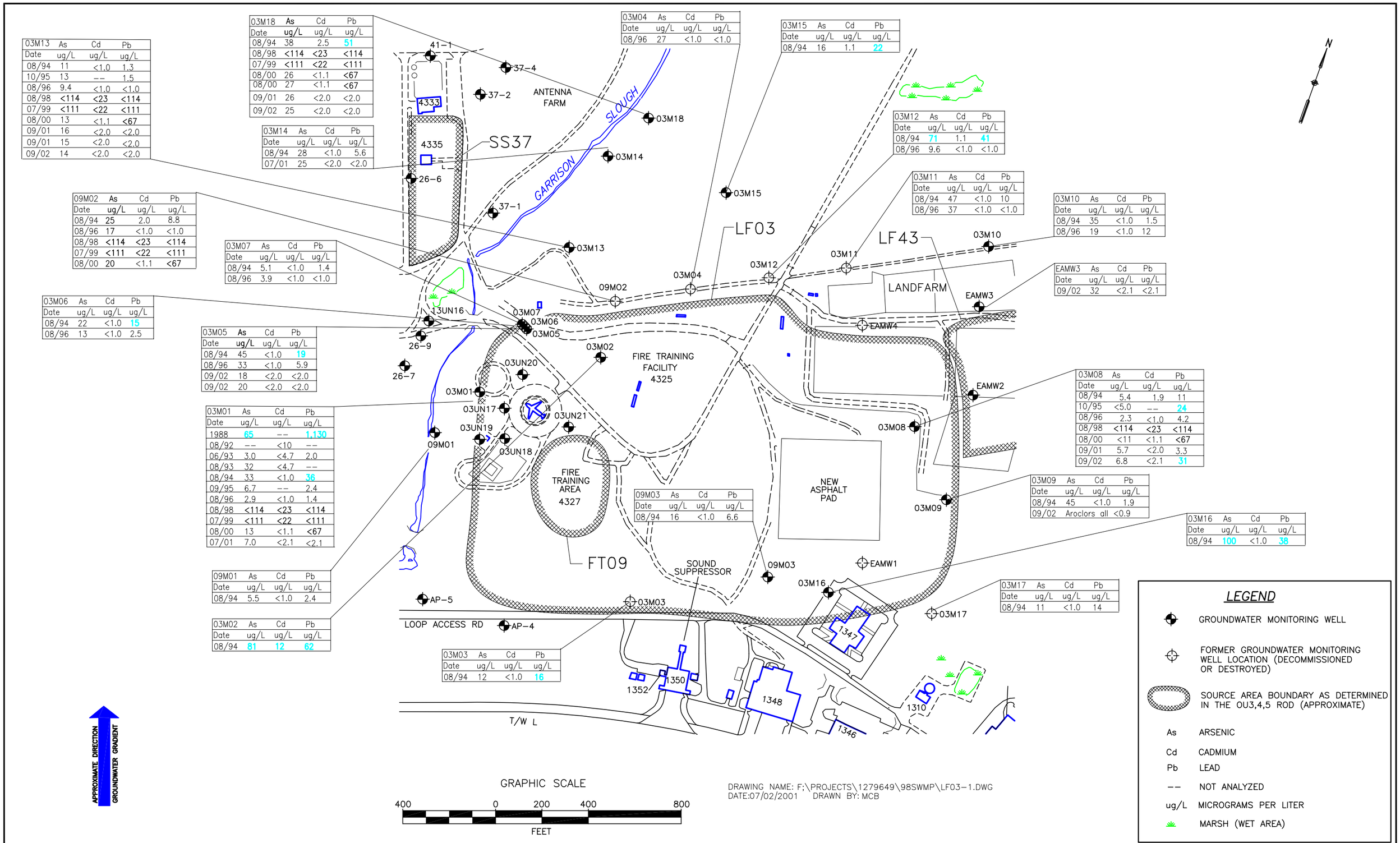


Figure LF03/FT09-3: LF03/FT09, Landfill 3/Fire Training Area 9, Groundwater Monitoring Locations with Metals Results, Eielson AFB, Alaska

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 FS 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-	EAFB 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).

7.2 Community Involvement

The RI/FS documents (USAF 1994a,b, and c) and the Proposed Plan for OU 6 of EAFB 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, and conducted semi-annually from 1997 to the present.

7.3 WP38 Ski Lodge Well Contamination

7.3.1 Background

OU6 (WP38) includes approximately 200 acres of southwest-facing hillside near the EAFB Ski Lodge. Present uses of the area include downhill and cross-country skiing, winter survival training, snowmobiling, 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, that exceeded 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
- Institutional Controls 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, 2001, and 2002 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

In 1997, groundwater samples were collected from 8621, 38M01, 38M02, 38M06, and 38M18 and analyzed in the field using total BTEX immunoassay test kits. In 2001 and 2002 groundwater samples were collected and analyzed for BTEX and metals using an analytical laboratory.

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 downslope 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 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 3000 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 Diesel Range Organic Compounds (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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visually assess the general site layout at source area 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. 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 three 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. 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.

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 downgradient alluvial deposits, and ICs should also protect the alluvium. Groundwater monitoring should include sampling in the

hydrologically downgradient alluvial deposits, if feasible due to local permafrost. Groundwater monitoring will continue as determined by the RPMs until BTEX concentrations meet the MCLs. Land use restrictions remain in affect until RAOs are achieved.

7.3.8 Protectiveness Statement

The remedy at OU6 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 groundwater, inhalation of, and dermal contact with contaminants during groundwater use.

7.3.9 Next Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for WP38:

Figure WP38-1	WP38, Ski Lodge Well Contamination, Groundwater Monitoring Locations, EAFB, Alaska.
Figure WP38-2	WP38, Ski Lodge Well Contamination Showing Topographic Relief, EAFB, Alaska.

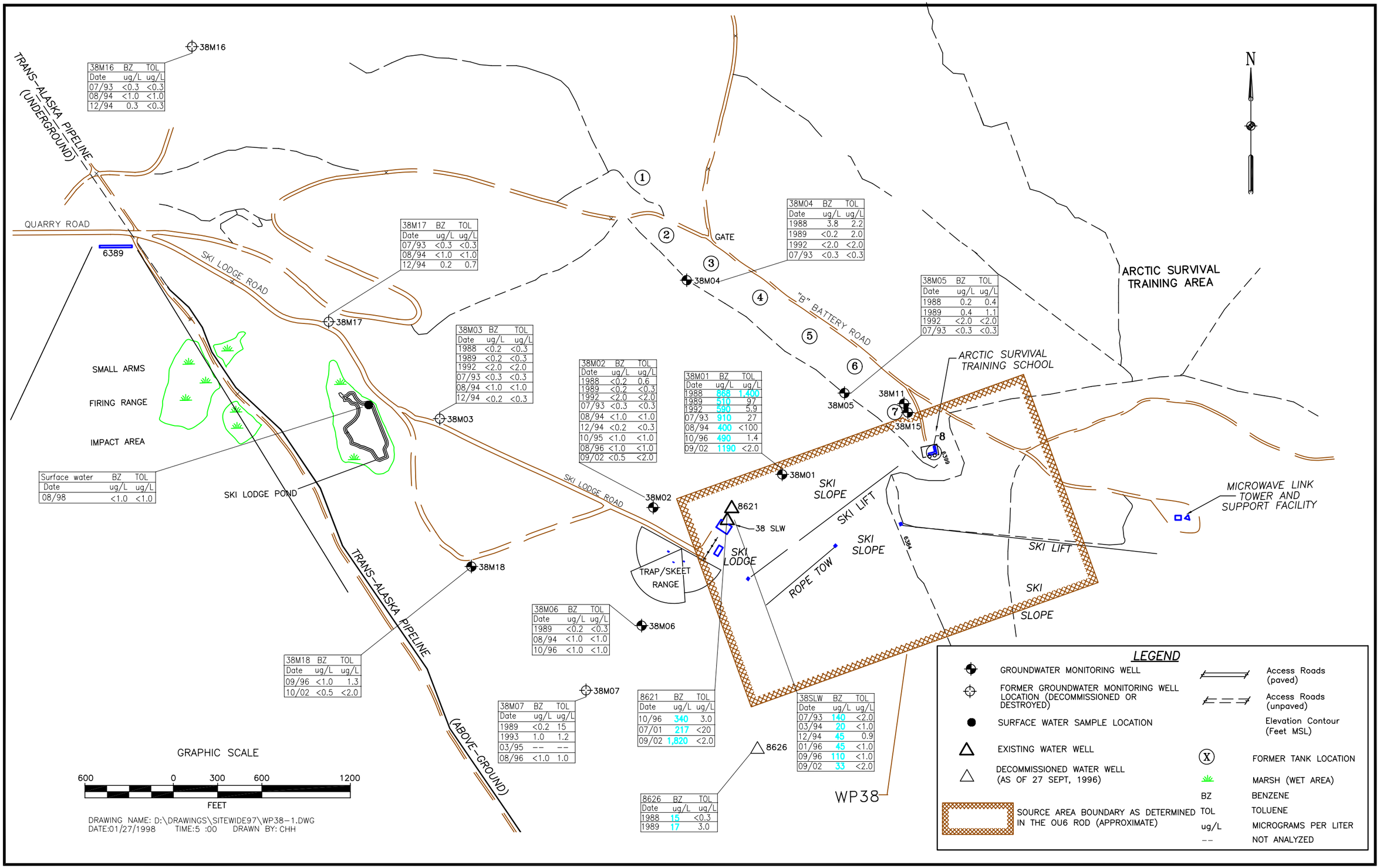


Figure WP38-1: WP38, Ski Lodge Well Contamination, Groundwater Monitoring Locations, Eielson AFB, Alaska

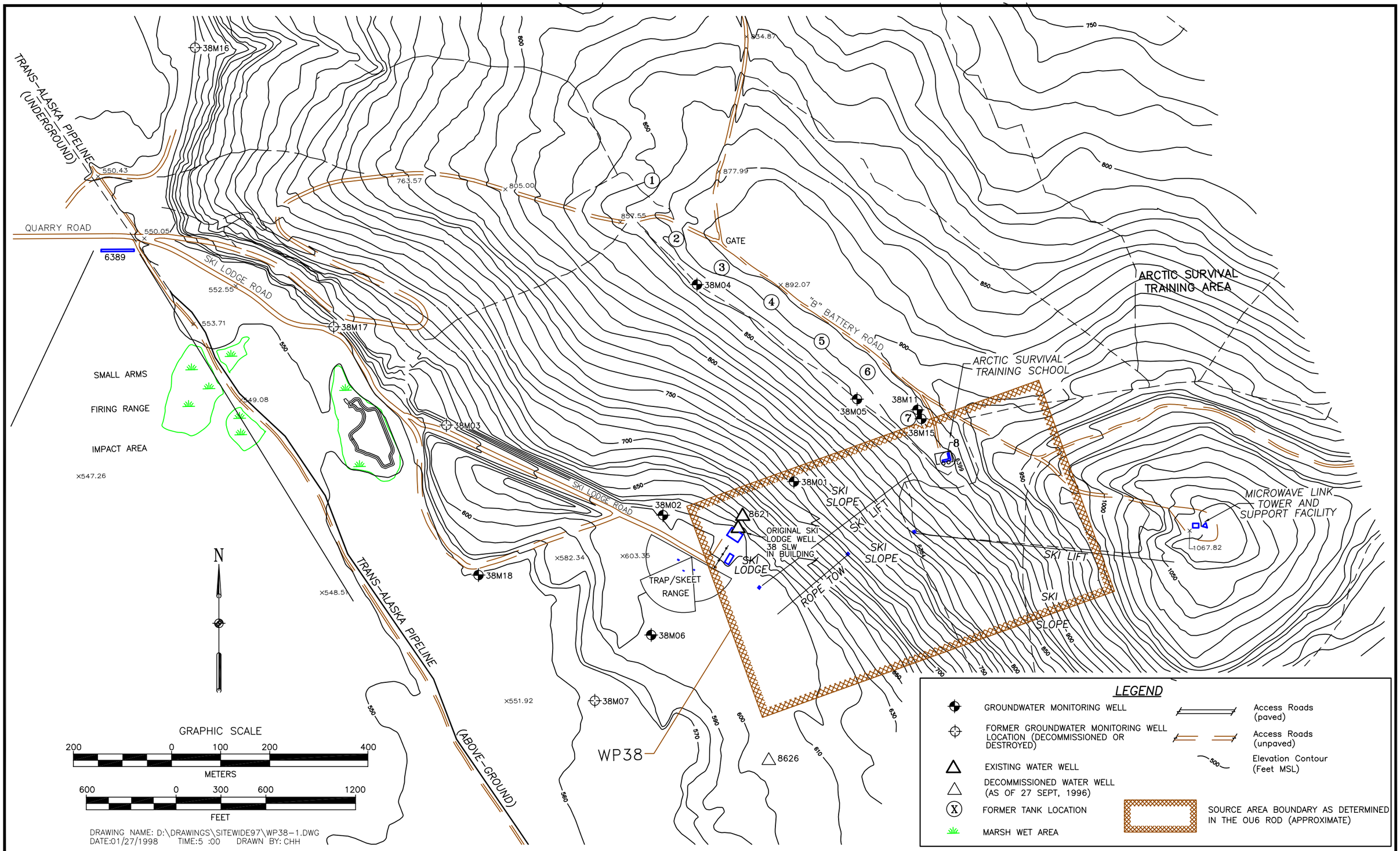


Figure WP38–2: WP38, Ski Lodge Well Contamination Showing Topographic Relief, Eielson AFB, Alaska

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 HI> 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.

Remedial Action Objectives for Garrison Slough				
Medium	**COC**	**Exposure Route**	**Receptor**	**Remediation Goal**
Fish	PCBs (Aroclor 1260)	Ingestion	Human	0.69 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 EAFB 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 EAFB, including Garrison Slough.

1994 Surface Water and Sediment Investigation, Final Report, EAFB, 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 Feasibility Study completed (USAF, 1995a)

August 1995 Sitewide Biological Risk Assessment completed (USAF, 1995b).

August 1995 Sitewide RI completed (USAF, 1995c).

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.

8.2 Community Involvement

The Sitewide RI/FS and Sitewide Proposed Plan for EAFB 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 EAFB 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, and conducted semi-annually from 1997 to the present.

8.3 SS67 Garrison Sough

8.3.1 Background

Garrison Slough begins in a marshy area at the south end of EAFB, near the old Army landfill (LF05). The slough flows north-northwest through the developed portion of EAFB. Garrison Slough passes directly through the developed portion of EAFB, 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, 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 EAFB. 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 EAFB
- 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 EAFB. 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 (UXO) (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 are 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 EAFB. 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 samples were collected on an annual basis. Sediment samples were collected from multiple stations along Garrison Slough in 1998, 1999, 2000, and 2001 to confirm PCB concentration levels. EAFB residents applying for recreational fishing permits on Base are advised not to consume any fish caught from the Slough.

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.

On Base Fish Tissue Sample Results

Year	Average	Total Samples	Minimum	Species	Maximum	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

Off Base Fish Tissue Sample Results

Year	Average	Total Samples	Minimum	Species	Maximum	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

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).

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, 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 through regular meetings and teleconferences. In addition, site inspections were conducted on July 24, 2003 to visual evaluate conditions at SS67 including the fish screens and the general slough layout. The inspection team also discussed ICs for the source area during the site visit.

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. The selected remedy for the Sitewide OU has resulted in a reduction of PCB levels available to human receptors. 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?

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 2.66 µg/Kg, representing a risk value of 10^{-6}.

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 soil and sediment cleanup resulted in an overall decrease in PCBs available to biological and human receptors, though fish sample results still exceed the cleanup goal. Soil and sediment sample results indicate that PCB concentrations still exceed the 10,000 µg/Kg cleanup goal specified by the Sitewide ROD.

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 2.66 µg/Kg.

8.3.6 Issues

ICs are implemented to prevent off-Base migration of fish using fish screens. Fish tissue samples collected off Base exceed the 0.69 µg/Kg RAO. ICs should be further implemented to ensure that the remedy is protective to human health. If continued fish tissue sampling indicates that soil and sediment cleanup activities have not reduced the PCB concentration in fish tissue to an acceptable concentration, then additional remedial actions should be evaluated, along with improvements to the current fish barrier.

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 EPA and ADEC.

8.3.7 Recommendations and Follow-up Actions

The RAOs for Garrison Slough include obtaining PCB concentration in fish tissue that is protective of human health. Sediment samples collected after cleanup activities confirmed that PCB concentration still slightly exceeds the 10,000 µg/Kg PCB concentration as specified by the Sitewide ROD. The sediment removal reduced PCB concentration in fish tissue, however PCB concentration still exceeds the cleanup level both on and off Base. Fish tissue sample collection will continue annually both on and off Base until the PCB cleanup level is achieved. Fish sample collection in 2003 will include multiple samples from pre and post sediment removal age groups to accurately characterize PCB concentration trends. The protectiveness of the remedy will then be reevaluated based the 2003 results. ICs will continue to be implemented. Land use restrictions remain in affect until RAOs are achieved.

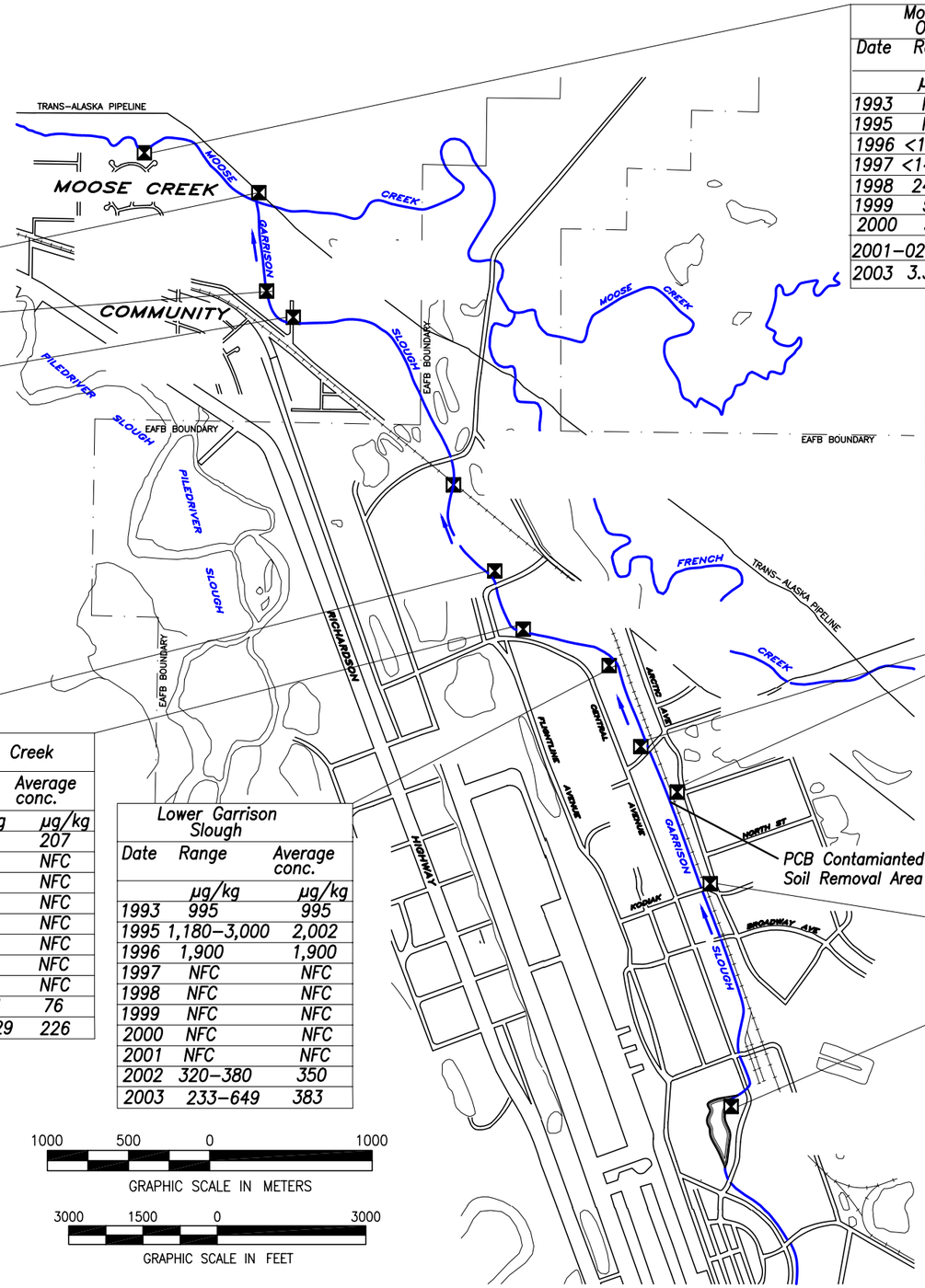
8.3.8 Protectiveness Statement

The remedy for Garrison Slough 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 through ICs. The remedy for the source area has been addressed through dredging and excavation of PCB impacted sediment and soil and the implementation of ICs to prevent the ingestion of PCB contaminated fish. The effectiveness of the remedy is still being evaluated.

8.3.9 Next Review

The next Five-Year Review for EAFB is required to be completed by September 28, 2008, five years from the date of this review. The relative review period would be from September 28, 2003 to September 28, 2008.

List of Figures for Garrison Slough:



Moose Creek/ Garrison Slough Confluence		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	<20–247	88
1996	<14–730	130
1997	NFC	NFC
1998	14–130	60
1999	<14–100	68
2000–02	NFC	NFC
2003	5.6–85	85

Moose Creek Osage St.		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	<15–82	41
1997	<14–60	27
1998	24–99	65
1999	54	54
2000	33	33
2001–02	NFC	NFC
2003	3.3–256	92

Moose Creek Petes Crossing		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	49–140	86
1997	170–1,100	635
1998	NFC	NFC
1999	NFC	NFC
2000	NFC	NFC
2001	48	48
2002	<50	25
2003	140–160	146

Garrison Slough New Station		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	NFC	NFC
1997	<14–110	59
1998	50–55	53
1999	17–38	24
2000	94	94
2001	140	140
2002	120–370	245
2003	55	55

Fish Barrier Downstream		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	NFC	NFC
1997	71–430	234
1998	70–120	95
1999	27	27
2000	25	25
2001	37–1,400	406
2002	160–320	240
2003	105	105

Fish Barrier Upstream		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	NFC	NFC
1997	39–1,200	620
1998	33–490	251
1999	NFC	NFC
2000	520	520
2001	470–540	505
2002	160	160
2003	153–445	266

Arctic Ave Manchu road		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	670–12,000	5,510
1997	67–450	309
1998	480–680	580
1999	62–1,300	550
2000	150–2,000	777
2001	320–2,100	725
2002	<170–480	283
2003	64–351	165

Waste Water Treatment Plant		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	NFC	NFC
1995	NFC	NFC
1996	240–940	565
1997	NFC	NFC
1998	58–160	100
1999	40–230	135
2000	35	35
2001	220–230	225
2002	290	290
2003	19–350	229

Flightline Creek		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	207	207
1995	NFC	NFC
1996	NFC	NFC
1997	NFC	NFC
1998	NFC	NFC
1999	NFC	NFC
2000	NFC	NFC
2001	NFC	NFC
2002	60–91	76
2003	123–329	226

Lower Garrison Slough		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	995	995
1995	1,180–3,000	2,002
1996	1,900	1,900
1997	NFC	NFC
1998	NFC	NFC
1999	NFC	NFC
2000	NFC	NFC
2001	NFC	NFC
2002	320–380	350
2003	233–649	383

Middle Garrison Slough		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	11	11
1995	<20–39.8	27
1996	29–2,300	739
1997	NFC	NFC
1998	30–390	160
1999	NFC	NFC
2000	NFC	NFC
2001	22–34	28
2002	<50	25
2003	125	125

Upper Garrison Slough		
Date	Range	Average conc.
	µg/kg	µg/kg
1993	649	649
1995	<20–126	78
1996	NFC	NFC
1997	NFC	NFC
1998	14	14
1999	67–250	138
2000	24	24
2001	74–200	138
2002	74–110	92
2003	139–401	270

LEGEND

- FISH MONITORING LOCATION
- NFC NO FISH CAUGHT @ STATION
- STREAM FLOW DIRECTION
- < INDICATES A NON–DETECT AT THE INDICATED CONCENTRATION

NOTE:
VALUES LISTED REPRESENT THE RANGE AND AVERAGE AROCLOR–1260 CONCENTRATIONS IN UG/KG FOR EACH STATION.

1000 500 0 1000
GRAPHIC SCALE IN METERS

3000 1500 0 3000
GRAPHIC SCALE IN FEET

DRAWING NAME: D:\DRAWINGS\SITEWIDE97\GS–1.DWG
DATE:07/02/2001 TIME:11:44 DRAWN BY: CHH

Figure SS67–1. Garrison Slough Fish Tissue Collection Sites, Eielson AFB, Alaska

PCB (Aroclor 1260) Concentrations in Sediment and Surface Water

GRAPHIC SCALE

500 0 500 1000

METERS

2500 0 1250 2500 5000

FEET

Notes:

1. *Aroclor 1260 concentration for invertebrate and aquatic vegetation included at Station MGS. All other PCB results for invertebrate and aquatic vegetation were non–detect.*
2. *Station identities are from most recent sampling event. For additional station identities see the Sitewide Remedial Investigation.*

GENERAL GROUNDWATER GRADIENT

N

GS12 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	55,000	NA

GS11 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	<29	NA

GS10 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	<18	NA

FC02 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1993	<3	<0.1.1
1994	<13	<1

FC01 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1993	<3	<0.11
1994	<13	<1

62S03 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	<19	<0.12

GS07 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	7,650	<0.12
1992	<20	NA
1994	3,200	NA

GS05 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	25	<0.12
1993	<3	<0.11
1994	<13	<1

MGS Date	Invertebrate (ug/Kg)	Aquatic Vegetation (ug/Kg)
1994	1,360	20.6

GS08 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	2,100	<1

GS03 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	<19	<0.12
1993	<3	<0.11
1994	<13	<1

62S01 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	<14	<0.12

GS13 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	3,500	NA

FC03 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1993	<3	<0.11

MC01 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1993	<3	<0.11

62S02 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	<84	<0.12

FRENCH CREEK

GARRISSON SLOUGH

MOOSE CREEK

SEDIMENT REMOVAL LOCATION, SEE FIGURE SS67–3

GS06 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	404	<0.12
1992	<20	NA
1993	<3	<0.11
1994	230	<1

62S10 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	226	<0.12

GS–2 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1992	<20	NA

GS09 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1994	130	<1

62S09 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	652	<0.12

GS04 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	57	<0.12
1992	<20	NA
1993	<3	<0.11
1994	<13	<1

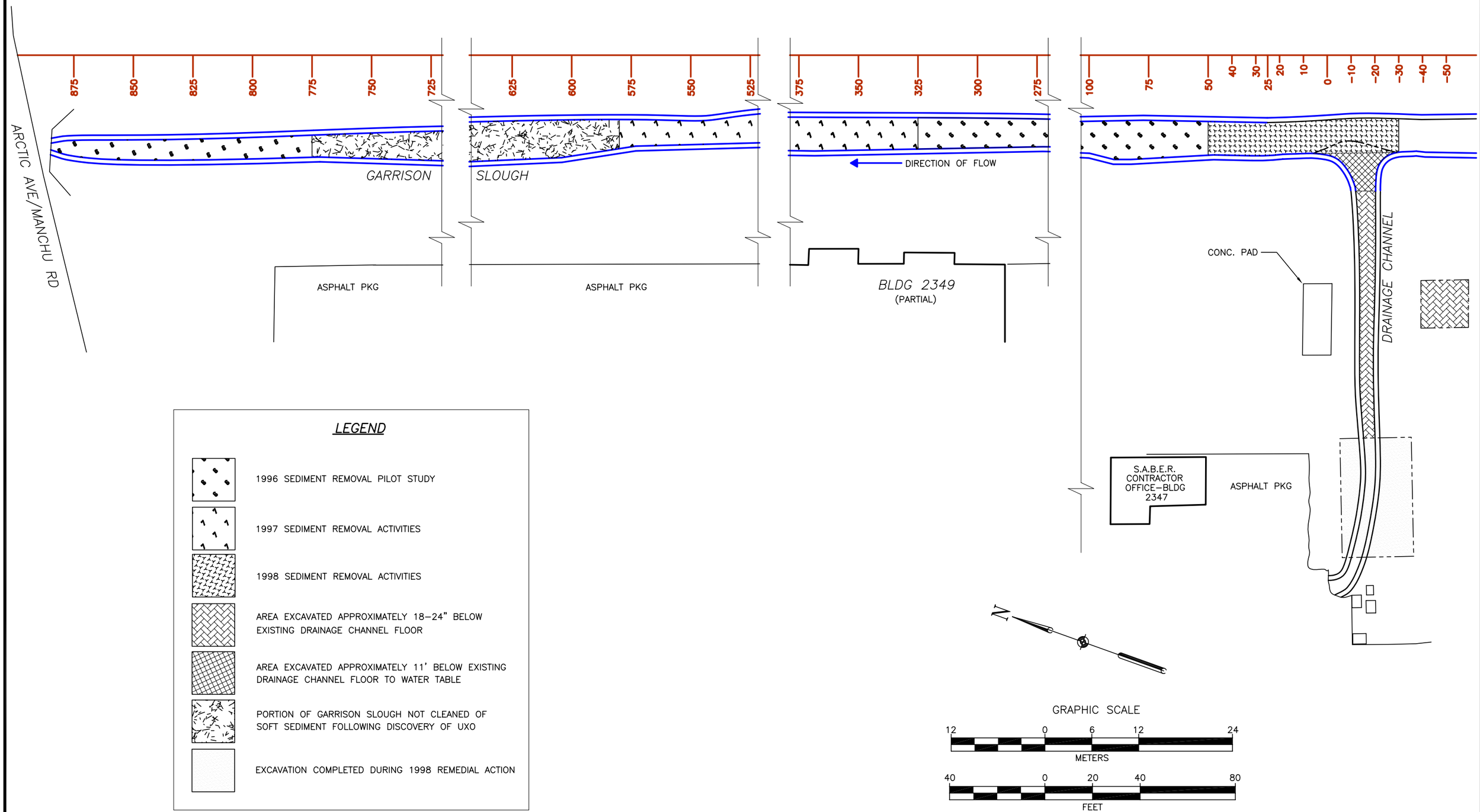
GS02 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1993	<3	<0.11

62S05 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1990	<22	<0.12

GS01 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1992	<20	NA
1993	<3	<0.11
1994	<13	<1

GS00 Date	Sediment (ug/Kg)	Surface H20 (ug/L)
1992	<20	NA
1993	<3	<0.11
1994	<13	<1

Figure SS67–2: Garrison Slough RI Results, Eielson AFB, Alaska

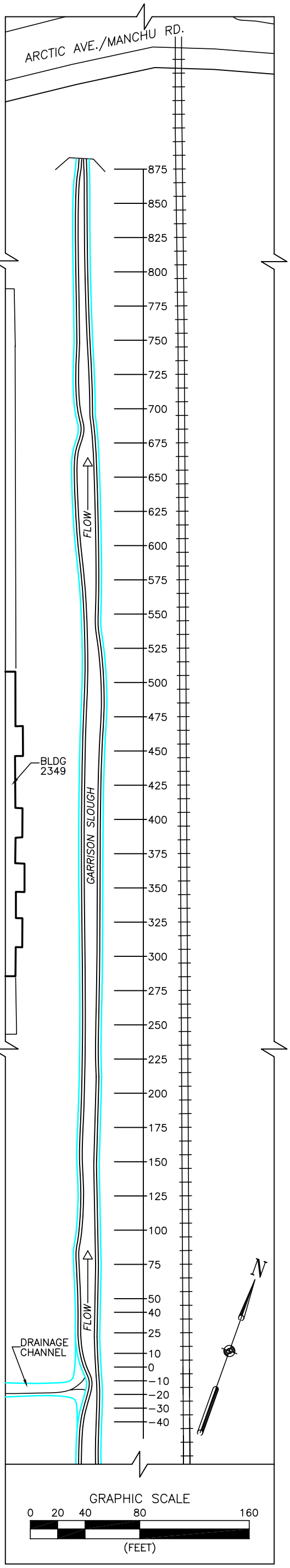


ADAPTED FROM 1997 GARRISON SLOUGH PILOT STUDY REPORT

DRAWING NAME: D:\DRAWINGS\GSLOUGH\FIG-ES-2.DWG
DATE:12/03/1997 DRAWN BY: CHH

Figure SS67-3. Soft Sediment Removal Areas and Excavated Areas, Garrison Slough, Eielson AFB, Alaska

	SAMPLE IDENTIFICATION	SAMPLE DATE	AROCLOR 1260 (mg/kg)
CONFIRMATION SAMPLES COLLECTED FOR 1996 SEDIMENT REMOVAL ACTIVITIES	* 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
SEDIMENT REMOVAL NOT CONDUCTED FOLLOWING DISCOVERY OF UXO	GS 28 (Sitewide RI)-675	PNL 1994	6.5
	GS 29 (Sitewide RI)-625	PNL 1994	9.8
CONFIRMATION SAMPLES COLLECTED FOR 1997 SEDIMENT REMOVAL ACTIVITIES	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
CONFIRMATION SAMPLES COLLECTED FOR 1996 SEDIMENT REMOVAL ACTIVITIES	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
CONFIRMATION SAMPLES COLLECTED FOR 1998 SEDIMENT REMOVAL ACTIVITIES	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



* **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 1N 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

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