Final
3 September 2015

Fourth Five-Year Review

Naval Base Kitsap Bangor
Silverdale, Washington

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

EXECUTIVE SUMMARY

As lead agency for environmental cleanup of Naval Base Kitsap (NBK) Bangor, the U.S. Navy (Navy) has completed the fourth 5-year review of remedial actions conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300). The purpose of this 5-year review is to ensure that the remedial actions selected in the Records of Decision (RODs) for operable units (OUs) at NBK Bangor remain protective of human health and the environment. A 5-year review is required for this site because the remedies allow contaminants to remain in place at concentrations that do not allow unlimited site use and unrestricted exposure. This fourth 5-year review was prepared in accordance with U.S. Department of Defense, Navy, and U.S. Environmental Protection Agency guidance.

Construction is complete for all of the remedies selected in the RODs for NBK Bangor. The Navy has completed implementation of 14 of the 21 recommendations from the third 5-year review and is continuing to work toward completion of the remaining recommendations. The current status of the OUs and the protectiveness statements are included in Table ES-1.

Table ES-1
Summary of OU Status and Protectiveness Determination

OU	Site	Status	Protectiveness Determination[a]	Protectiveness Statement
1	A	Remedy construction complete; ongoing remedy operation, maintenance, and monitoring, groundwater monitoring, and LUC monitoring	Short-term protective	The remedy at OU 1 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the groundwater plume is stable, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: • Prepare a focused feasibility study for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance, including an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways. • Perform a comprehensive evaluation of the pump and treat system maintenance needs and proactively repair and replace equipment if continued long-term operation of the pump and treat system is planned. • Investigate the depression in the southeast corner of the burn area to assess impacts to the leach basin liner and, at a minimum, backfill the hole with clean sand.
2	F	Remedy construction complete; ongoing remedy operation, maintenance, and monitoring, groundwater monitoring, and LUC monitoring	Short-term protective	The remedy at OU 2 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the pump and treat system contains the plume, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: • Continue remedy optimization by performing aerobic and anaerobic biodegradation treatability tests and further modeling. • Continue to evaluate the pump and treat system maintenance needs and proactively repair and replace equipment to minimize future system shutdowns and the potential loss of plume containment. • Tabulate and report data in the body of the long-term monitoring report for 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, because concentrations of these chemicals exceeded the RGs during this 5-year review period.

Table ES-1 (Continued)
Summary of OU Status and Protectiveness Determination

OU	Site	Status	Protectiveness Determination[a]	Protectiveness Statement
				• Following completion of the modeling activities planned for 2015, reevaluate the need for additional groundwater monitoring points to better characterize the potentiometric surface proximate to active infiltration wells and extraction wells in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study. • Remove vegetation observed growing in the asphalt seams and drainage swale of the Site F infiltration barrier, and repair cracks in the asphalt cap, as needed.
3	16/24 and 25	Remedy construction complete; ongoing LUC monitoring at Site 16/24	Protective	The remedy at OU 3 is protective of human health and the environment. The remedy for Site 16/24 soil consisted of a residential land use restriction. The remedy for Site 25 groundwater consisted of groundwater monitoring, which met the requirements of the OU 3 ROD in 1997 and was discontinued at that time. Inspections of the LUCs at Site 16/24 have been conducted regularly, and the current land use remains in accordance with the restrictions defined in the OU 8 ROD (which established the basewide LUCs). Therefore, the selected remedy for OU 3 is functioning as intended by the ROD. No RAO was established in the OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b).
6	D	Remedy construction complete	Protective	The remedy at OU 6 is protective of human health and the environment. The remedy for Site D included excavating soil from the burn trench, screening and composting the excavated soils at an on-base treatment facility, backfilling the treated soils into the excavation area, grading and revegetation, and surface water and groundwater sampling. The remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD, and no IC was required for OU 6. These actions effectively meet the RAOs established in the OU 6 ROD.
7	B, E/11, 10	Remedy construction complete; ongoing remedy maintenance, groundwater monitoring, and LUC monitoring	Protective	The remedy at OU 7 is protective of human health and the environment. The remedy for Site B (Floral Point) included covering areas of contaminated soil, installing shoreline protection and stormwater drainage systems to control erosion, monitoring sediment and clam tissue, and installing signs notifying visitors that the site is to be used for recreational purposes only and approval is required for digging or mowing. The remedy for soil at Site E/11 included disposal of stockpiled soil and metal debris, grading site, and backfilling with clean topsoil. The remedy for Site 10 included ongoing long-term maintenance of the asphalt pavement cover, groundwater monitoring, groundwater use restrictions, and expansion of the area of asphalt

Table ES-1 (Continued)
Summary of OU Status and Protectiveness Determination

OU	Site	Status	Protectiveness Determination[a]	Protectiveness Statement
				cover to include soils contaminated with arsenic, cadmium, lead, and polychlorinated biphenyls. These remedy components functioned as intended by the ROD. LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs at Sites E/11 and 10, LUCs and engineering controls prevent exposure to contaminated soil at Sites B and 10, and groundwater monitoring is performed to assess the extent of contaminated groundwater at Site E/11 (as part of OU 2 Site F groundwater monitoring). The LUCs and groundwater monitoring components of the remedy are functioning as intended by the ROD. These actions effectively meet the RAOs established in the OU 7 ROD.
8	27, 28, and 29	Remedy construction complete; ongoing LNAPL recovery, groundwater monitoring, and LUC monitoring	Short-term protective	The remedy at OU 8 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the extent of the groundwater plume is decreasing, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: • Continue remedy optimization activities specified in recommendations (see Table 8-1). • Perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study. • Review the toluene RG prior to discontinuation of monitoring at the site to assess protectiveness.

[a]The protectiveness determination is based on EPA guidance (USEPA 2001 and 2012a).

Notes:
COC - chemical of concern
EPA - U.S. Environmental Protection Agency
LNAPL - light nonaqueous-phase liquid
LUC - land use control
OU - operable unit
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RAO - remedial action objective
ROD - Record of Decision
RG - remediation goal

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name (from WasteLAN): Naval Base Kitsap Bangor (USNAVY)		
EPA ID (from WasteLAN): 110000771219		
Region: 10	**State:** WA	**City/County:** Kitsap

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Navy
Author name (Federal or State Project Manager): Ellen Brown
Author affiliation: Naval Facilities Engineering Command Northwest
Review period: 10/1/2009 – 4/30/14
Date of site inspection: September 18, 2014
Type of review: Statutory
Review number: 4
Triggering action date: October 2010
Due date *(five years after triggering action date)*: October 2015

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU 3, OU 4, OU 5, OU 6, and OU 7
Issues and Recommendations Identified in the Five-Year Review:

OU(s): General	
	Issue Category: Remedy performance
	Issue: State and federal human health surface water quality criteria are in process of public comment and revision.
	Recommendation: Evaluate state and federal human health surface water quality criteria revisions in the next 5-year review.

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Federal Facility	EPA/State	10/31/20

Five-Year Review Summary Form (Continued)

OU(s): General	**Issue Category:** Remedy performance			
	Issue: EPA human health exposure factors have been revised, but Ecology has not included these revisions in current MTCA Method B values.			
	Recommendation: Evaluate exposure factor changes in next 5-year review.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/20
OU(s): General	**Issue Category:** Remedy performance			
	Issue: Some deficiencies identified in the annual inspection reports were not immediately repaired.			
	Recommendation: Ensure deficiencies that impact protectiveness are repaired within the same year if funding is available, or programmed for the next year if funding is not available in the same year.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/16
OU(s): 1	**Issue Category:** Remedy performance			
	Issue: The Site A groundwater treatment system is not functioning as intended by the ROD, because it has not met the cleanup time frame established in the ROD.			
	Recommendation: Prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies would be evaluated in the FFS. The other treatment technologies to be included in the FFS would be selected using a collaborative process with the stakeholders. The FFS will also include an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways. An MNA treatability study work plan will be developed in conjunction with the EPA and Ecology that would include temporarily deactivating the pump and treat system and implementing an MNA treatability test using EPA protocols.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	7/31/19
OU(s): 1	**Issue Category:** Operations and maintenance			
	Issue: The Site A pump and treat system is over 15 years old and has experienced significant wear and tear which could result in equipment failure and unplanned shutdowns.			
	Recommendation: If continued long-term operation of the pump and treat system is planned, perform a comprehensive evaluation of the pump and treat system maintenance needs and proactively repair and replace equipment. Address corrosion observed on floor braces supporting effluent piping, and replace			

Five-Year Review Summary Form (Continued)

	extraction well vaults with traffic-rated vaults.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/20
OU(s): 1	**Issue Category:** Operations and maintenance			
	Issue: A depression was noted in the southeast corner of the burn area with a pipe visible in the depression, which may indicate a possible impact to the leach basin liner.			
	Recommendation: Investigate the depression in the southeast corner of the burn area to assess impacts to the leach basin liner. At a minimum, backfill the hole with clean sand.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	12/31/17
OU(s): 2	**Issue Category:** Remedy performance			
	Issue: The Site F groundwater treatment system is not functioning as intended by the ROD, because it has not met the cleanup time frame established in the ROD.			
	Recommendation: Perform aerobic and anaerobic degradation treatability test and further modeling to support Site F remedy optimization.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/16
OU(s): 2	**Issue Category:** Operations and maintenance			
	Issue: Lengthy unscheduled pump and treat system shutdowns could impact plume containment.			
	Recommendation: Continue to evaluate the pump and treat system maintenance needs, proactively repair or replace equipment to minimize future system shutdowns and the potential loss of plume containment, and repair the minor water leaks observed during the site inspection.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/20
OU(s): 2	**Issue Category:** Monitoring			
	Issue: Concentrations of 1,3,5-TNB and 1,3-DNB, COCs for Site F groundwater, are not currently being tabulated or reported in the body of the LTM report, and concentrations during this 5-year review period exceeded RGs.			
	Recommendation: Tabulate and report data in the body of the LTM report for 1,3,5-TNB and 1,3-DNB, COCs for Site F groundwater, because concentrations of these chemicals exceeded the RGs during this 5-year review period.			

Five-Year Review Summary Form (Continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Federal Facility	EPA/State	10/31/16
OU(s): 2	**Issue Category:** Monitoring			
	Issue: Limited hydraulic head observation points in the vicinity of extraction well F-EW5 and the infiltration wells adjacent to Trigger Avenue limit the ability to assess plume containment.			
	Recommendation: Following completion of the modeling activities planned for 2015, reevaluate the need for additional groundwater monitoring points to better characterize the potentiometric surface proximate to active infiltration and extraction wells in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/16
OU(s): 2	**Issue Category:** Operations and maintenance			
	Issue: During the inspection of the Site F infiltration barrier, vegetation was observed growing in the seams in the asphalt and in the drainage swale and, if allowed to continue to grow, could impact the functionality of the infiltration barrier.			
	Recommendation: Remove vegetation observed growing in the asphalt seams and drainage swale of the site infiltration barrier, and repair the cracks in the asphalt cap, as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/16
OU(s): 8	**Issue Category:** Remedy performance			
	Issue: The OU 8 remedy is taking longer to meet the remedial action objectives than estimated in the ROD, benzene concentrations are increasing in selected wells, and LNAPL continues to be detected at the site.			
	Recommendation: Perform additional studies to further define the nature and extent of dissolved-phase COCs and LNAPL (including LNAPL mobility tests) to support remedy optimization, perform the benzene pilot test to evaluate air sparge/soil vapor extraction technology, evaluate whether low-temperature thermal treatment could enhance MNA, evaluate active source remediation technologies, reestablish the 1,2-DCA biobarrier after the benzene pilot study has been completed, and monitor 1,2-DCA and indicator parameters in pilot study wells, in addition to the ongoing MNA program.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	12/31/17

Five-Year Review Summary Form (Continued)

OU(s): 8	**Issue Category:** Remedy performance			
	Issue: Because the presence of residual free product could be providing a continued source of contaminants to groundwater and because of potentially increasing concentrations of benzene in groundwater, subslab soil gas concentrations could also increase.			
	Recommendation: Perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/20
OU(s): 8	**Issue Category:** Remedy performance			
	Issue: The toxicity of toluene has increased based on the current EPA reference dose, and the current MTCA Method B cleanup level of 640 µg/L is lower than the ROD RG of 1,000 µg/L, which is based on the federal MCL. Using the current EPA reference dose, the hazard quotient of the MCL of 1,000 µg/L is 2, above the ROD hazard goal of 1, and the maximum concentration of toluene at the site during this 5-year review period was 16,000 µg/L.			
	Recommendation: Review the toluene RG prior to discontinuation of monitoring at the site to assess protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	10/31/20

Protectiveness Statement(s)

Operable Unit: 1	**Protectiveness Determination:** Short-term protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 1 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the groundwater plume is stable, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance, including an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways.
- Perform a comprehensive evaluation of the pump and treat system maintenance needs and proactively repair and replace equipment if continued long-term operation of the pump and treat system is planned.
- Investigate the depression in the southeast corner of the burn area to assess impacts to the leach basin liner and, at a minimum, backfill the hole with clean sand.

Five-Year Review Summary Form (Continued)

Operable Unit: 2	**Protectiveness Determination:** Short-term protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 2 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the pump and treat system contains the plume, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Continue remedy optimization by performing aerobic and anaerobic degradation treatability tests and further modeling.
- Continue to evaluate the pump and treat system maintenance needs and proactively repair and replace equipment to minimize future system shutdowns and the potential loss of plume containment.
- Tabulate and report data in the body of the LTM report for 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, because concentrations of these chemicals exceeded the RGs during this 5-year review period.
- Following completion of the modeling activities planned for 2015, reevaluate the need for additional groundwater monitoring points to better characterize the potentiometric surface proximate to active infiltration wells and extraction wells in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.
- Remove vegetation observed growing in the asphalt seams and drainage swale of the Site F infiltration barrier, and repair cracks in the asphalt cap, as needed.
-

Operable Unit: 3	**Protectiveness Determination:** Protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 3 is protective of human health and the environment. The remedy for Site 16/24 soil consisted of a residential land use restriction. The remedy for Site 25 groundwater consisted of groundwater monitoring, which met the requirements of the OU 3 ROD in 1997 and was discontinued at that time. Inspections of the LUCs at Site 16/24 have been conducted regularly, and the current land use remains in accordance with the restrictions defined in the OU 8 ROD (which established the basewide LUCs). Therefore, the selected remedy for OU 3 is functioning as intended by the ROD. No RAO was established in the OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b).

Operable Unit: 6	**Protectiveness Determination:** Protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 6 currently protects human health and the environment. The remedy for Site D included excavating soil from the burn trench, screening and composting the excavated soils at an on-base treatment facility, backfilling the treated soils into the excavation area, grading and revegetation, and surface water and groundwater sampling. The remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD, and no IC was required for OU 6. These actions effectively meet the RAOs established in the OU 6 ROD.

Operable Unit: 7	**Protectiveness Determination:** Protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 7 is protective of human health and the environment. The remedy for Site B (Floral Point) included covering areas of contaminated soil, installing shoreline protection and stormwater drainage systems to control erosion, monitoring sediment and clam tissue, and installing signs notifying visitors that the site is to be used for recreational purposes only and approval is required for digging or

Five-Year Review Summary Form (Continued)

mowing. The remedy for soil at Site E/11 included disposal of stockpiled soil and metal debris, grading site, and backfilling with clean topsoil. The remedy for Site 10 included ongoing long-term maintenance of the asphalt pavement cover, groundwater monitoring, groundwater use restrictions, and expansion of the area of asphalt cover to include soils contaminated with arsenic, cadmium, lead, and PCBs. These remedy components functioned as intended by the ROD. LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs at Sites E/11 and 10, LUCs and engineering controls prevent exposure to contaminated soil at Sites B and 10, and groundwater monitoring is performed to assess the extent of contaminated groundwater at Site E/11 (as part of OU 2 Site F groundwater monitoring). The LUCs and groundwater monitoring components of the remedy are functioning as intended by the ROD. These actions effectively meet the RAOs established in the OU 7 ROD.

Operable Unit: 8	**Protectiveness Determination:** Short-term protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedy at OU 8 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the extent of the groundwater plume is decreasing, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Continue remedy optimization activities specified in the recommendations table (see Table 8-1).
- Perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study.
- Review the toluene RG prior to discontinuation of monitoring at the site to assess protectiveness.

Sitewide Protectiveness Statement (if applicable)

Protectiveness Determination: Short-term protective	**Addendum Due Date:** Not applicable

Protectiveness Statement:
The remedies at NBK Bangor currently protect human health and the environment because LUCs and/or engineering controls prevent exposure to contaminated media, groundwater plumes are stable and/or contained by pump and treat systems, and groundwater monitoring is performed to assess the extent of groundwater plumes. However, in order for the remedies to be protective in the long term, the actions listed in the protectiveness statements for OUs 1, 2, and 8 need to be taken to ensure protectiveness.

Signature sheet for the Naval Base Kitsap Bangor fourth 5-year review report.

T. Zwolfer
Captain, U.S. Navy
Commanding Officer, Naval Base Kitsap

9/11/2015
Date

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criterion
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
cm	centimeter
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSM	conceptual site model
DCA	dichloroethane
DCE	dichloroethene
DCLP	Determination of Cleanup Level Plan
DCP	dichloropropane
DDT	dichlorodiphenyltrichloroethane
DNB	dinitrobenzene
DNT	dinitrotoluene
DNX	hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
Ecology	Washington State Department of Ecology
EDB	dibromoethane
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
EVO	emulsified vegetable oil
EVS	Environmental Visualization System
FFA	Federal Facilities Agreement
FFS	focused feasibility study
FS	feasibility study
ft	foot
g	gram
GAC	granular activated carbon
g/L	gram per liter
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IC	institutional control
ICMP	Institutional Controls Management Plan
IRA	interim remedial action
IRACR	independent remedial action closure report
IRIS	Integrated Risk Information System
kg	kilogram
LCL	lower confidence limit

ABBREVIATIONS AND ACRONYMS (Continued)

LNAPL	light nonaqueous-phase liquid
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram per day
mg/L	milligram per liter
mg/m^3	milligram per cubic meter
MNA	monitored natural attenuation
MNX	hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
MSL	mean sea level
MTCA	Model Toxics Control Act
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC NW	Naval Facilities Engineering Command Northwest
Navy	U.S. Navy
NBK	Naval Base Kitsap
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
OM&M	operation, maintenance, and monitoring
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PGDN	propylene glycol dinitrate
ppm	part per million
PPRTV	Provisional Peer-Reviewed Toxicity Value
PQL	practical quantitation limit
PRG	preliminary remediation goal
PWIA	Public Works Industrial Area
RAB	Restoration Advisory Board
RAO	remedial action objective
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
redox	oxidation reduction potential
RfD	reference dose
RG	remediation goal
RI	remedial investigation
ROD	Record of Decision

ABBREVIATIONS AND ACRONYMS (Continued)

RSL	Residential Screening Level
SARA	Superfund Amendments and Reauthorization Act
SAP	sampling and analysis plan
SF	slope factor
TCA	trichloroethane
TCRA	time-critical removal action
TNB	trinitrobenzene
TNT	trinitrotoluene
TNX	hexahydro-1,3,5-trinitroso-1,3,5-triazine
TPH	total petroleum hydrocarbons
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This report presents the results of the fourth 5-year review performed for the Naval Base Kitsap (NBK) Bangor National Priorities List (NPL) site, more commonly known simply as NBK Bangor. NBK Bangor is located on the Kitsap peninsula in Kitsap County, Washington, at a location on Hood Canal approximately 10 miles north of Bremerton (Figure 1-1). The purpose of a 5-year review is to evaluate whether the remedies selected for implementation in the Records of Decision (RODs) for a site remain protective of human health and the environment. The methods, findings, and conclusions of 5-year reviews are documented in 5-year review reports, which identify any issues found during the review and provide recommendations to address them. This report was prepared using U.S. Department of Defense, U.S. Navy (Navy), and U.S. Environmental Protection Agency (EPA) guidance (USDoD 2012 and 2014, U.S. Navy 2011a and 2013a, and USEPA 2001, 2012a, and 2014a).

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

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

Naval Facilities Engineering Command Northwest (NAVFAC NW) has conducted this fourth 5-year review of the remedial actions implemented at NBK Bangor. The review was initiated in May 2014 using data generated between October 2009 and April 2014. The triggering action for this review was the third 5-year review, executed by the Navy in October 2010 (U.S. Navy 2010a). The second 5-year review was executed in September 2005 (U.S. Navy 2005a), and the first 5-year was executed in September 2000 (U.S. Navy 2000a). Contaminants have been left at NBK Bangor above levels that allow for unlimited use and unrestricted exposure. CERCLA requires 5-year reviews when hazardous substances, pollutants, or contaminants will remain on site. Because RODs documenting the remedies implemented at NBK Bangor were signed after October 17, 1986 (the effective date of the Superfund Amendments and Reauthorization Act [SARA]), this 5-year review is considered a statutory, rather than a policy, review.

There are eight operable units (OUs) at NBK Bangor (Figure 1-2). The Bangor Ordnance Disposal Site (OU 1) was added to the NPL in July 1987, and Bangor Naval Submarine Base Site (OUs 2, 3, 4, 5, 6, 7, and 8) was added to the NPL in August 1990. Because no further action was recommended for OUs 4 and 5 (U.S. Navy, USEPA, and Ecology 1993 and 1994a), these OUs are not included in the 5-year review. This report covers the remedies selected in the signed RODs for OUs 1, 2, 3, 6, 7, and 8 (U.S. Navy, USEPA, and Ecology 1991a, 1994b, 1994c, 1994d, 1996, and 2000a).

This 5-year review is streamlined to minimize repeating information that has been included in previous 5-year reviews. The intent is to focus on the actions, monitoring, and issues over the last 5 years and recommendations and protectiveness for the next 5 years. To facilitate this, information from the previous 5 years is briefly summarized and a reference is included where the reader may obtain more detailed information. In addition, frequently referenced documents are included in Appendix A on a CD.

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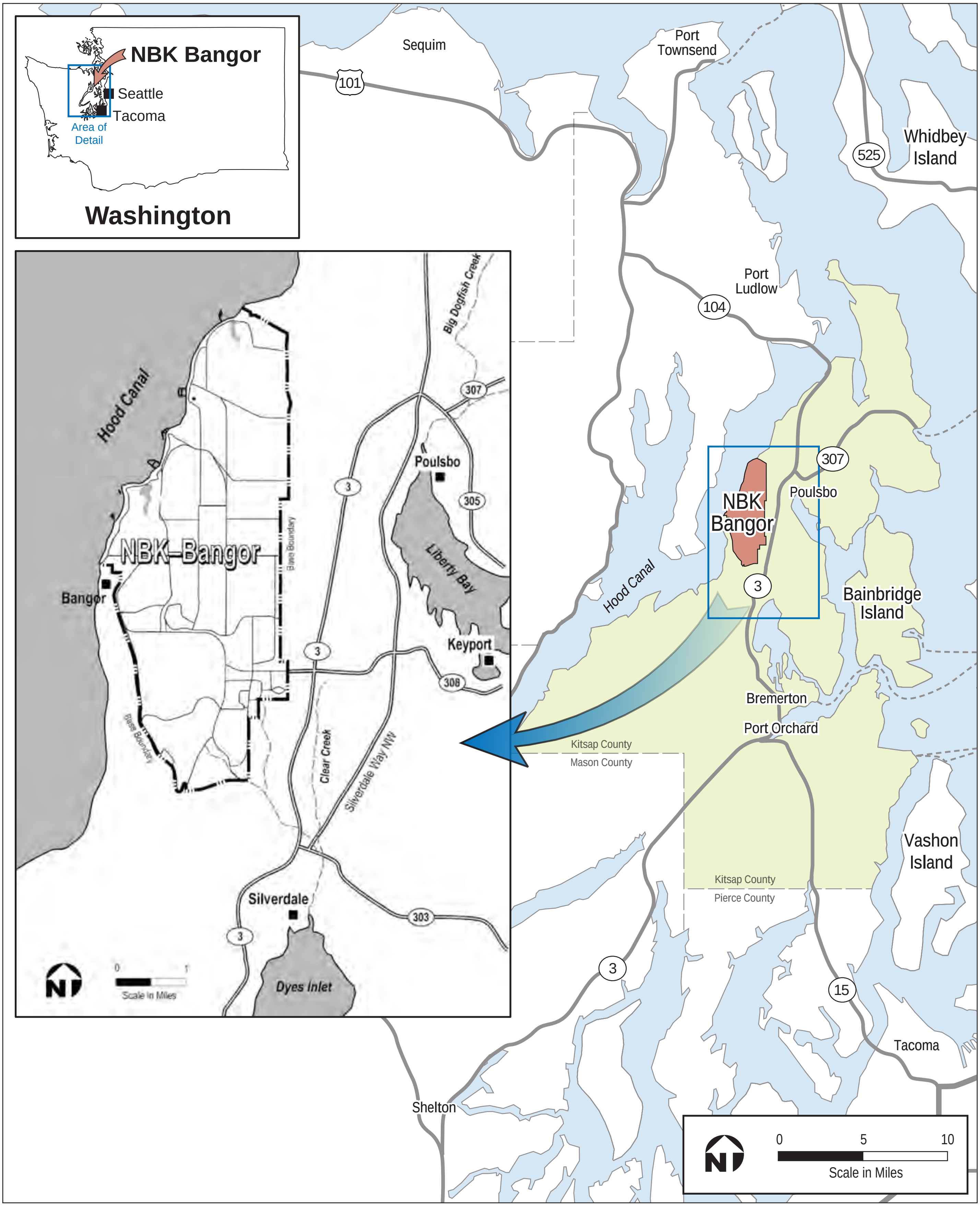

U.S. NAVY

Figure 1-1
NBK Bangor Vicinity Map

NBK Bangor
FOURTH
5-YEAR REVIEW

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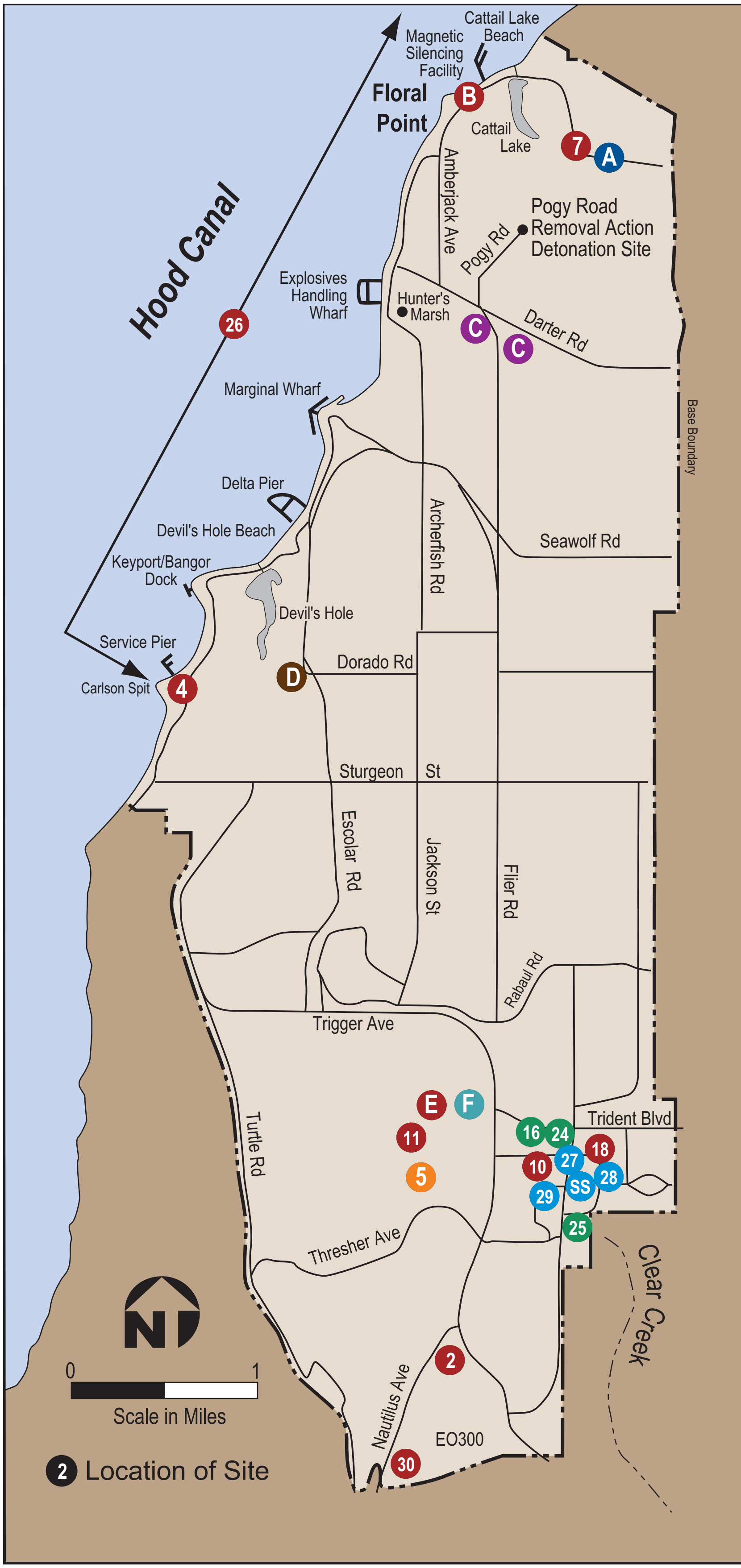

OPERABLE UNIT 1 (OU 1)
Site A Bangor Ordnance Disposal Site

OPERABLE UNIT 2 (OU 2)
Site F Former Wastewater Location

OPERABLE UNIT 3 (OU 3)
Site 16 Drum Storage Area
Site 24 Former Incinerator Site
Site 25 Former Treatment Plant Outfall

OPERABLE UNIT 4 (OU 4 - No Further Action)
Site C-West Bldg 7700 Fill Area
Site C-East Ordnance Wastewater Disposal Area

OPERABLE UNIT 5 (OU 5 - No Further Action)
Site 5 Former Metallurgy Lab Rubble

OPERABLE UNIT 6 (OU 6)
Site D Munitions Burn Area

OPERABLE UNIT 7 (OU 7)
Site B Floral Point
Site E Acid Disposal Pit
Site 2 Classification Yard/ Fleet Deployment Parking
Site 4 Carlson Spit
Site 7 Old Paint Can Disposal Site
Site 10 Pesticide Storage Quonset Huts
Site 11 Pesticide/Herbicide Drum Disposal Area
Site 18 PCB Spill Site
Site 26 Hood Canal Sediments
Site 30 Railroad Tracks

OPERABLE UNIT 8 (OU 8)
Site 27 Steam Cleaning Pit
Site 28 Paint Shop Drainage Ditch
Site 29 Public Works Maintenance Garage
SS Public Works Industrial Area Service Station

EO300 Small Arms Ranges

U.S. NAVY	**Figure 1-2** **NBK Bangor Sites and Operable Units**	NBK Bangor FOURTH 5-YEAR REVIEW

2.0 SITE CHRONOLOGY

This section summarizes dates of major events such as the initial discovery of contamination, NPL listing, decision and enforcement documents, remedial and removal actions, construction completion, and prior 5-year reviews. The chronology of major site events for NBK Bangor is summarized by OU on Figure 2-1. The chronology of major site events up to and including the RODs are discussed in the sections below. Additional information can be obtained by reviewing Section 2 of the first, second, and third 5-year reviews (U.S. Navy 2000a, 2005a, and 2010a), which were completed in 2000, 2005, and 2010, respectively. These documents are included as attachments in Appendix A for easy reference. Information on major site events occurring after the signing of the ROD is provided in subsequent sections of this report.

2.1 SITEWIDE CHRONOLOGY

In 1978, the Navy Assessment and Control of Installation Pollutants (NACIP) program was initiated, and waste disposal sites at NBK Bangor were evaluated under this program. As part of the NACIP program, an initial assessment study was conducted at NBK Bangor (NEESA 1983). The purpose of the initial assessment study was to identify and assess environmental contamination resulting from past hazardous materials storage, transfer, processing, and disposal operations at NBK Bangor. Following completion of the initial assessment study, a current situation report was completed for OU 1 (U.S. Navy 1988), and a combined current situation report was completed for sites included in OUs 2 through 7 (U.S. Navy 1989). As a result of the U.S. Congress enacting SARA, the Navy suspended further NACIP program activities and transitioned into the EPA's remedial investigation/feasibility study (RI/FS) procedures for inactive waste sites.

NBK Bangor is listed twice on EPA's NPL. The Bangor Ordnance Disposal Site (OU 1) was added to the NPL in July 1987 and Bangor Naval Submarine Base Site (OUs 2, 3, 4, 5, 6, 7, and 8) in August 1990. In January 1990, the Navy, EPA, and Washington State Department of Ecology (Ecology) entered into a Federal Facilities Agreement (FFA). Three sites initially investigated as part of OU 7 (Sites 27, 28, and 29) were included in a separate OU (OU 8) following the discovery that volatile organic compounds (VOCs) had been detected in a newly installed, but not yet operational, water supply well in the neighborhood southeast of these sites. OU 8 was added to the FFA in October 1994. In addition to Sites 27, 28, and 29, OU 8 also includes the Public Works Industrial Area (PWIA) service station. In the FFA, the 22 sites at NBK Bangor were divided into 8 OUs for management purposes. Figure 1-2 depicts the locations of the 22 sites and lists the division of the sites into their respective OUs.

2.2 OU 1 CHRONOLOGY

The RI for OU 1 occurred from 1988 through 1989, and the FS was completed in 1991 (U.S. Navy 1991). The ROD for OU 1 was signed in December 1991 (U.S. Navy, USEPA, and Ecology 1991a). The OU 1 ROD has been amended by three Explanations of Significant Differences (ESDs) (U.S. Navy, USEPA, and Ecology 1994e, 1998, 2000b), which documented changes to the OU 1 ROD selected remedy. These ESDs were signed in May 1994, March 1998, and August 2000, respectively.

2.3 OU 2 CHRONOLOGY

Prior to the completion of the RI/FS, a ROD for an interim remedial action (IRA) was signed in September 1991 (U.S. Navy, USEPA, and Ecology 1991b). The RI for OU 2 occurred from 1990 through 1992, and the FS was completed in 1993 (U.S. Navy 1993a). The OU 2 IRA ROD has been amended by one ESD signed in April 1994 (U.S. Navy, USEPA, and Ecology 1994f), which documented changes to the OU 2 IRA selected remedy. The ROD for OU 2 was signed in September 1994 (U.S. Navy, USEPA, and Ecology 1994d).

2.4 OU 3 CHRONOLOGY

The RI for OU 3 occurred from 1991 through 1992, and the FS was completed in 1992 (U.S. Navy 1992a). The ROD for OU 3 was signed in April 1994 (U.S. Navy, USEPA, and Ecology 1994b).

2.5 OU 4 CHRONOLOGY

The RI for OU 4 occurred from 1991 through 1992, and the FS was completed in 1993 (U.S. Navy 1993b). The ROD for OU 4 was signed in July 1994 (U.S. Navy, USEPA, and Ecology 1994a). No further action was the selected remedy for OU 4. Therefore, this OU is not discussed further in this document.

2.6 OU 5 CHRONOLOGY

The RI for OU 5 occurred in 1992, and the FS was completed in 1992 (U.S. Navy 1992b). The ROD for OU 5 was signed in September 1993 (U.S. Navy, USEPA, and Ecology 1993). No further action was the selected remedy for OU 5. Therefore, this OU is not discussed further in this document.

2.7 OU 6 CHRONOLOGY

The RI for OU 6 occurred from 1991 through 1992, and the FS was completed in 1993 (U.S. Navy 1993c). The ROD for OU 6 was signed in September 1994 (U.S. Navy, USEPA, and Ecology 1994c).

2.8 OU 7 CHRONOLOGY

Two removal actions were completed at OU 7 prior to the signing of the ROD and prior to most of the RI/FS activities at the OU. In 1988, a soil, debris, and drum removal action was completed at Site 2. A soil and drum removal action was completed at Site 11 in 1992. The RI for OU 7 occurred from 1991 through 1994, and the FS was completed in 1994 (U.S. Navy 1994a and 1994b). The ROD for OU 7 was signed in April 1996 (U.S. Navy, USEPA, and Ecology 1996).

2.9 OU 8 CHRONOLOGY

The RI for OU 7 included investigation of the sites later transferred to OU 8 and was performed from 1991 through 1994. The RI for OU 8 occurred from 1995 through 1996, and the FS was completed in 2000 (U.S. Navy 1999a and 2000b). The ROD for OU 8 was signed in September 2000 (U.S. Navy, USEPA, and Ecology 2000a). The following removal actions were conducted prior to the signing of the ROD:

- 1986–1998: Free-product removal at the PWIA service station
- 1992–1996: Multiple underground storage tank (UST) removals and closures at the PWIA service station
- 1995–1998: Soil vapor extraction/air sparging system operation at the PWIA service station
- 1995: Time-critical removal action (TCRA) to supply off-base residents with an alternative water supply
- 1997–1999: Non-time-critical removal action to construct and operate a groundwater containment system

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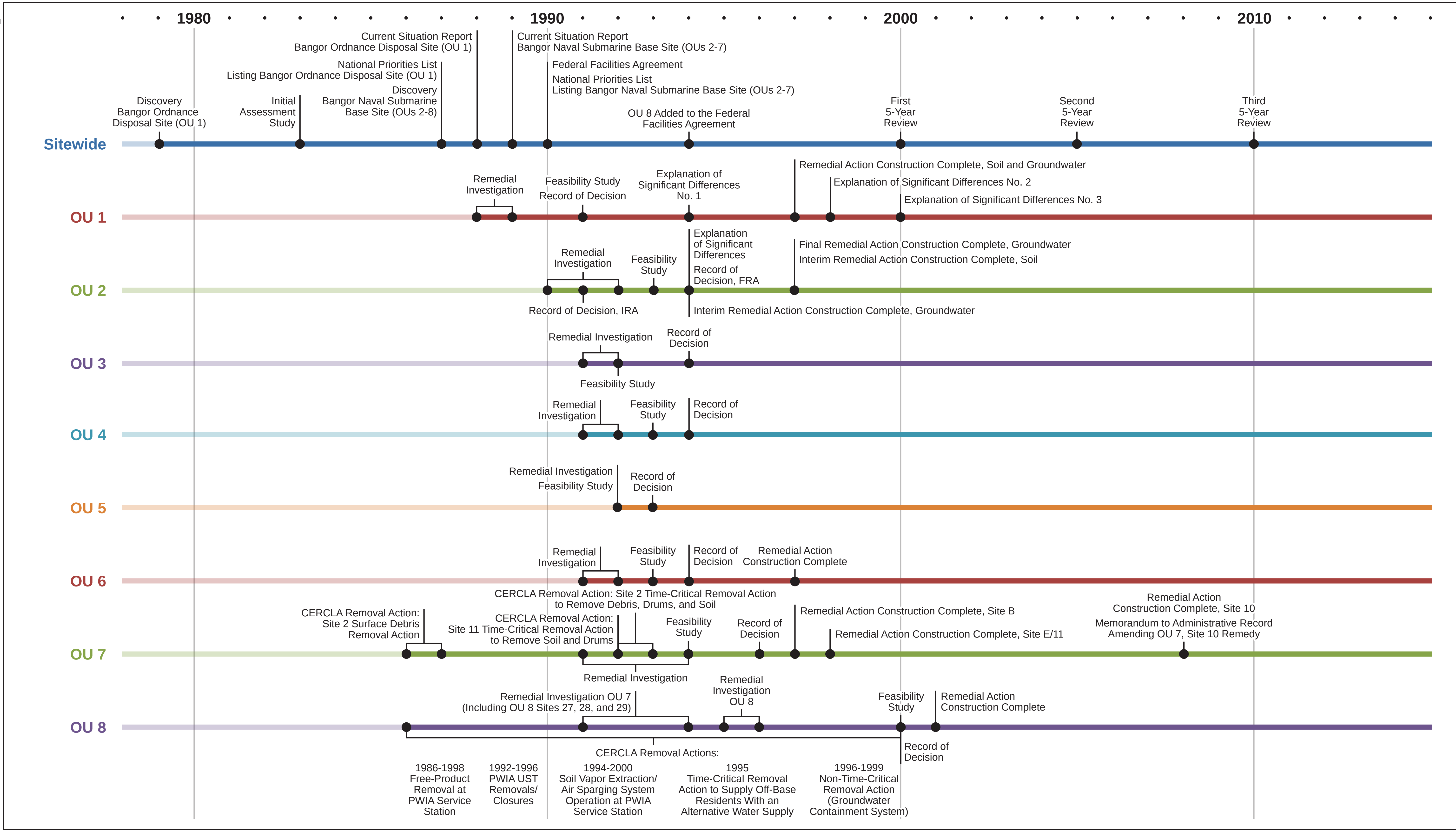

U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 2-1
Chronology of Key Events

3.0 BACKGROUND

NBK Bangor covers 7,201 acres on the Kitsap peninsula in Kitsap County, Washington, at a location on Hood Canal approximately 10 miles north of Bremerton (Figure 1-1). The Kitsap County Comprehensive Plan Land Use Map (Kitsap County 2014), included on the website http://www.kitsapgov.com/dcd/gis/maps_data/standard_maps/regulatory_planning.htm, lists land immediately surrounding NBK Bangor as predominantly rural residential (one dwelling unit per 5 acres). One area immediately southeast of NBK Bangor is identified as urban industrial.

Naval activities began at NBK Bangor in June 1944, when the U.S. Naval Magazine, Bangor was established to provide a deep-water shipment facility for ordnance. From 1944 to the early 1970s, the Navy facility at Bangor was primarily used for transshipment and storage of ordnance and demilitarization of unserviceable and dangerous ammunition. In February 1977, NBK Bangor was commissioned as the West Coast home port for the Trident Submarine Launched Ballistic Missile System. The current mission of the base is to provide administrative and personnel support for submarine force operations and logistical support for other Navy activities.

The following sections describe each of the OUs at NBK Bangor, including their physical characteristics. Table 3-1 summarizes the land and resource use, history of contamination, removal actions performed, and basis for taking remedial action for each OU. Additional information can be obtained by reviewing Section 3 of the first, second, and third 5-year reviews (U.S. Navy 2000a, 2005a, and 2010a), as well as the RODs for each OU (U.S. Navy, USEPA, and Ecology 1991a, 1994b, 1994c, 1994d, 1996, and 2000a). These documents are included as attachments in Appendix A for easy reference.

3.1 OU 1 (SITE A)

The Bangor Ordnance Disposal Site (Site A) is located in the northern portion of NBK Bangor (Figure 1-2). Site A is currently divided into the following areas: burn area, debris areas 1 and 2, and stormwater discharge area (Figure 3-1). The off-base community of Vinland is located approximately 2,000 feet to the north of the site and Cattail Lake is located downhill and to the west of the site. Hood Canal, which borders NBK Bangor, is located to the west of Site A, Vinland, and Cattail Lake. Ground elevations at the site range from 150 to 180 feet above mean sea level (MSL). Surface water runoff from the site flows northerly and westerly and eventually discharges into Hood Canal. Groundwater of interest occurs in two zones at Site A. The first is the perched zone, which occurs within a localized deposit of recessional outwash extending from ground surface to depths of 20 feet. When present seasonally, the perched zone is encountered at depths typically ranging from 10 to 20 feet below grade. The perched water sits upon lower permeability glacial till, which separates the perched zone from the underlying shallow aquifer. The shallow aquifer at Site A is an unconfined aquifer occurring within the stratified sand/silt deposits underlying the till (groundwater surface at depths of 70 to 90 feet below the burn area). Groundwater in the shallow aquifer beneath the former burn area flows toward the west-northwest, with discharge to the Cattail Lake drainage (U.S. Navy 1991). Note that the municipal water supplies for Vinland are obtained from the deeper sea level aquifer, which has not been impacted by activities at Site A (U.S. Navy 1991).

3.2 OU 2 (SITE F)

The wastewater lagoon and overflow ditch (Site F) is located in the south-central portion of NBK Bangor approximately 1.5 miles east of Hood Canal (Figure 1-2). It is located in a clearing surrounded by a large forested area. Local features near Site F include a Navy helipad approximately 700 feet northwest of the site and sidings and a rail line approximately 1,500 feet west (Figure 3-2). The ground elevation near the former disposal lagoon ranges from approximately 300 to 310 feet above MSL and increases to the west until it reaches a plateau at an elevation from 375 to 400 feet MSL. The site is located within a large closed basin with no natural drainages. However, the site does received minor surface water flow during precipitation events from ditches constructed along roads and railroad tracks. Groundwater in the shallow aquifer occurs approximately 50 feet below the ground surface (bgs) in the vicinity of the former lagoon and is from 60 to 100 feet thick below Site F. This shallow aquifer occurs throughout NBK Bangor and flows generally to the northwest, eventually discharging via seeps in the western part of NBK Bangor. These seeps feed an unnamed creek that flows through the town of Old Bangor and into Hood Canal. Beneath the shallow aquifer is an aquitard, which impedes the vertical flow of groundwater from the shallow aquifer to a deeper aquifer. This deeper aquifer, referred to as the sea level aquifer, is encountered 80 to 100 feet beneath the bottom of the shallow aquifer and is confined by the low-permeability aquitard. The sea level aquifer also occurs throughout NBK Bangor. No on-base water supply well is completed in the shallow aquifer, and the shallow aquifer does not extend off base to the west beneath the communities of Olympic View and Old Bangor. Therefore, water supply for these communities is not derived from the shallow aquifer.

3.3 OU 3 (SITES 16/24 AND 25)

OU 3 is located in the southeastern portion of NBK Bangor in the vicinity of the PWIA (Figure 1-2) and consists of Sites 16, 24, and 25. Sites 16 and 24 are the locations of former solid- and liquid-waste incinerators and a drum storage area. Because of their proximity, they are addressed together as Site 16/24 (Figure 3-3). Site 25, downgradient of Site 16/24, is the location of a former sewage treatment plant outfall from the PWIA. The ground elevation at Site 16/24 is approximately 325 feet above MSL, with the surface sloping gently down to the north and steeply to the south. A small drainage swale extends along the western side of the site and drains to the south. The ground elevation at Site 25 is approximately 275 feet MSL. Site 25 currently provides treatment of stormwater prior to its discharge into the central branch of Clear Creek, an ephemeral stream located off base to the southeast of the site. Stormwater treatment includes two earthen stormwater detention/retention ponds, which cover approximately 1.2 acres and an oil/water separator. Clear Creek ultimately discharges into Dyes Inlet of Puget Sound (Figure 1-1). The shallow aquifer in the vicinity of Sites 16/24 and 25 generally flows south.

3.4 OU 6 (SITE D)

Site D is a former ordnance disposal area in the west-central portion of NBK Bangor (Figure 1-2). Hood Canal, which borders NBK Bangor, is located approximately one-half mile to the west of Site D. Ground elevations at the site range from approximately 100 to 180 feet above MSL and the land surface slopes from the vicinity of Escolar Road down to the abandoned railroad grade (Figure 3-4). Much of Site D is seasonally wet, with the lower western portion of the site beneath standing water during the wet season. Surface water enters the site from two ephemeral drainages and one perennial stream, becomes impounded by the abandoned railroad grade, and leaves the site via an ephemeral drainage to Devil's Hole Lake to the northwest (Figure 1-2). Two aquifers were identified during the RI/FS at Site D: the perched groundwater and the shallow aquifer. Groundwater in the perched zone is at or near the ground surface and discharges to the surface in the western part of the site. The perched water sits upon lower permeability glacial till, which separates the perched zone from the underlying shallow aquifer. Groundwater in both the perched zone and the shallow aquifer beneath the former burn area flows toward the west-northwest.

3.5 OU 7 (SITES B, E, 2, 4, 7, 10, 11, 18, 26, AND 30)

OU 7 includes 10 known or suspected waste sites (Sites B, E, 2, 4, 7, 10, 11, 18, 26, and 30) at locations across NBK Bangor (Figure 1-2). Sites 27, 28, and 29 were originally part of OU 7, but were included in OU 8 in 1994 following the investigation of surrounding areas. Although not part of OU 7 as defined in the FFA, three lake or wetland areas (Cattail Lake, Hunter's Marsh, and Devil's Hole [Figure 1-2], collectively termed the Ecological Areas) were included for study with the 10 sites.

The OU 7 risk assessment concluded that conditions at Sites 4, 7, 18, and 30 and the three Ecological Areas pose no unacceptable risks to human health (under an unrestricted use scenario) or the environment. The OU 7 ROD declared that no remedial action (and no institutional control [IC] or monitoring) is required for these sites/areas, and no 5-year review is required. Thus, they are not discussed further here. The third 5-year review (U.S. Navy 2010a) recommended that 5-year reviews of Sites 2 and 26 should be discontinued. Therefore, these two sites are also not discussed further in this 5-year review. Background information for the remaining OU 7 sites is included in the following sections. Sites E and 11 are discussed together because of their proximity.

3.5.1 Site B (Floral Point)

Site B (Floral Point) is located at the northern end of NBK Bangor and covers approximately 5 acres of natural shoreline along Hood Canal (Figure 1-2). Amberjack Avenue provides access to the site, and a gravel road extends through the site in a circle (Figure 3-5). The average ground elevation at Site B is 14 feet above MSL, with the surface sloping gently up from the shoreline toward the center of the site at 25 feet above MSL. Floral Point has no surface water drainages, because of the high permeability of the soils at the site. Groundwater beneath the site is saline (nonpotable) because of tidal mixing.

3.5.2 Site E (Acid Disposal Pit) and Site 11 (Pesticide/Herbicide Drum Disposal Area)

Sites E and 11 are located in the south-central portion of the NBK Bangor one-half mile north of Thresher Avenue (Figure 1-2). Sites E and 11 are contiguous, and there was concern that pesticide/herbicide drums may also have been disposed of at Site E (Figure 3-6). Therefore, the two sites are addressed together (Site E/11) in the OU 7 ROD. The ground elevation at Site E/11 is approximately 325 feet above MSL, and the site slopes gradually down toward the northeast. Site E/11 is located in the upper reaches of the Clear Creek drainage area, but does not drain directly into the creek (Figure 1-1). Perched groundwater does not appear to be present at Site E/11. The shallow aquifer is present and appears to flow toward the northeast at Site E/11.

3.5.3 Site 10 (Pesticide Storage Quonset Huts)

Site 10, the location of two former pesticide storage Quonset huts, is located just west of the PWIA in the southeastern portion of the base (Figure 3-7). The ground elevation at Site 10 is approximately 300 feet above MSL. Perched groundwater does not appear to be present at Site 10. The shallow aquifer is present and appears to flow toward the southeast under a gentle gradient trending roughly parallel to the area topographic gradient.

3.6 OU 8 (SITES 27, 28, and 29)

OU 8 consists of approximately 150 acres of land located in the southeastern corner of NBK Bangor (Figure 1-2). It encompasses the PWIA and off-base residential community along Mountain View Road between Clear Creek Road and the NBK Bangor boundary. OU 8 consists of the following known or suspected former waste sites (Figure 3-8):

- Site 27, Steam Cleaning Pit

- Site 28, Paint Shop Drainage Ditch
- Site 29, Public Works Maintenance Garage

Sites 27, 28, and 29 were also studied during RIs of OU 7. OU 8 also encompasses a plume of groundwater contamination that emanates from the PWIA and extends in a southeast direction toward the Mountain View residential neighborhood. Ground elevations at OU 8 range from approximately 275 to 300 feet above MSL, and the site slopes gradually down toward the southeast. The PWIA is near the headwaters of the central branch of Clear Creek, which flows south to Dyes Inlet. The central branch is an ephemeral stream that is confined to stormwater culverts beneath the paved surfaces in the PWIA. While flowing through the Mountain View residential area, the central branch follows a naturalized drainage swale. Throughout most of OU 8, the Vashon Till is exposed at the surface, and typically varies from 20 to 40 feet thick. Underlying the till at OU 8 is the Vashon Advance Outwash that hosts an unconfined aquifer system referred to as the shallow aquifer. The shallow aquifer is approximately 120 feet thick throughout most of OU 8, and the depth to groundwater ranges from 5 to 65 feet bgs. In the PWIA, the depth to groundwater is approximately 22 feet bgs. The general direction of groundwater flow in the shallow aquifer is to the southeast.

3.7 OTHER CLEANUP ACTIONS

Two cleanup actions have been conducted at NBK Bangor since execution of the OU 8 ROD, one at the Pogy Road site and one at Site EO300. These two cleanup actions are summarized in this section.

3.7.1 Pogy Road Cleanup Action

The Pogy Road site is located in the northern portion of NBK Bangor at the northern terminus of Pogy Road (Figures 1-2 and 3-9). The area was used on January 10, 2001, for emergency treatment of selected ordnance items recovered during a TCRA involving the clearance of munitions and explosives of concern at Jackson Park Housing Complex. Soil was contaminated with ordnance compounds as a result of the emergency detonation of the munitions and explosives of concern, and an independent cleanup action was completed for soil under the Model Toxics Control Act (MTCA) regulations. Based on confirmation sampling results, the closure report concluded that no residual contamination exists at or near the risk-based cleanup levels identified for the cleanup action (U.S. Navy 2005b). Further information on the independent cleanup action can be obtained by reviewing Section 3.7 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

3.7.2 Site EO300 Time-Critical Removal Action

Site EO300 consists of two pistol ranges and a trap range (Figures 1-2 and 3-10). Small arms were fired at these ranges to support military training from the late 1940s until the late 1970s. The former firing points for the ranges are located in a cleared area of the woods. After being closed as a small arms range, the site was used as a recreational archery range. Today, the site is vacant, and the land use is designated as recreational. Hiking trails at the site lead to Trident Lakes and are occasionally used by recreational users.

Initial site investigations were performed from 1996 to 2005. Soil sample results showed that lead concentrations in soil were greater than state screening concentrations, which protect human health. In particular, soils from the berms at the pistol ranges and within the shotfall zone at the trap range were greater than state screening concentrations. Based on the results of these site investigations, a TCRA was completed in 2009 (U.S. Navy 2010b). The TCRA involved removing soil contaminated with lead from the pistol ranges. A concrete target-stand pad along the impact-berm toe and the soil underlying the pad in Pistol Range 1 were removed. In addition, two sheds and a canopy over a firing point in Pistol Range 1 were demolished.

During the RI (U.S. Navy 2011b), soil and groundwater samples were collected in the vicinity of the pistol and trap ranges, and sediment and surface water samples were collected near the banks of Trident Lakes to evaluate if contamination had migrated from the site. The RI identified lead, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and dioxins/furans in surface soil at concentrations exceeding Washington State soil cleanup levels for unrestricted land use. Groundwater concentrations were found to be below drinking water standards, and concentrations of chemicals found in sediment and surface water near the banks of Trident Lakes were less than state cleanup levels.

The Navy completed a human health risk assessment and screening-level ecological risk assessment for Site EO300. The human health risk assessment concluded the following:

- Direct contact exposure to lead in surface soil at the pistol ranges may result in unacceptable cancer risks to future residents (note that this risk was addressed with the removal of soils during the 2009 TCRA).

- Direct contact exposure to cPAHs, lead, and dioxins/furans in surface soil at the trap range may result in unacceptable cancer and noncarcinogenic risks to future residents.

Based on the results of the screening-level ecological risk assessment, potential risks to soil invertebrates (e.g., earthworms), plants, and birds were unacceptable. These risks were from exposure to lead in surface soil at the trap range.

During the FS, remedial action objectives (RAOs) were established, and remedial alternatives were developed and evaluated (U.S. Navy 2011b). The following two RAOs were established for the site:

- Prevent unacceptable risk from exposure to soil with concentrations of cPAHs, lead, and dioxins/furans greater than Washington State cleanup levels for unrestricted land use (i.e., residential cleanup goals).
- Minimize disturbance to the environment during cleanup activities (for example, limit the number of trees that will be cut down).

In the proposed plan, the Navy proposed Alternative 2b as the preferred remedy for Site EO300 (U.S. Navy 2012a), which consists of the following:

- Removal of contaminated soil from selected areas of Site EO300
- Treatment of excavated soil and disposal of the treated soil at an off-site waste landfill

The RI/FS also identified areas of the site that required further delineation prior to completing the remedial action design. These areas include upland forest, where measures to minimize disturbance must be considered. To address these data gaps, a work plan was completed in 2013 (U.S. Navy 2013b).

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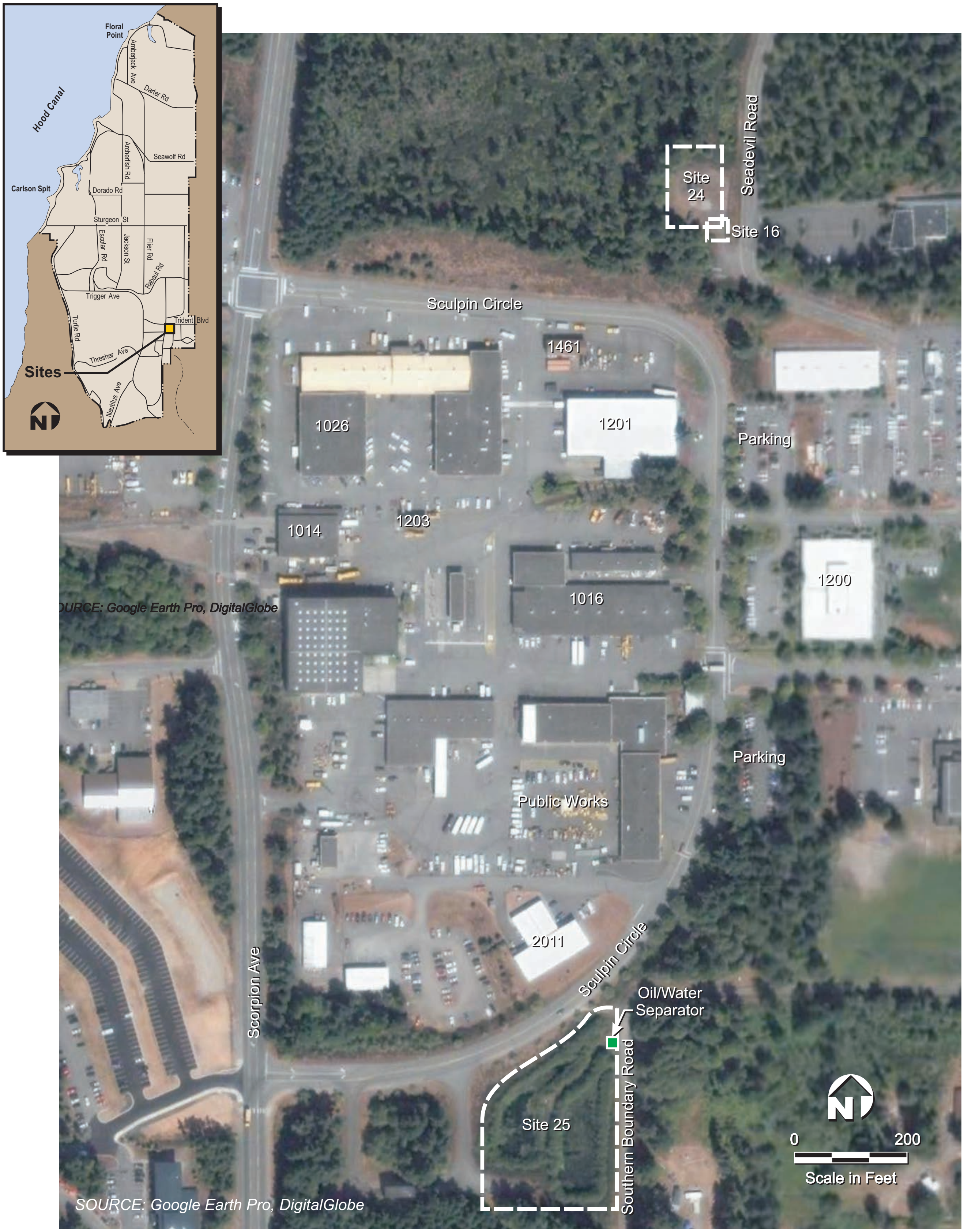
U.S. NAVY	**Figure 3-1** **OU 1, Site A Location Map**	NBK Bangor FOURTH 5-YEAR REVIEW

U.S. NAVY

Figure 3-2
OU 2, Site F Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_07.ai



U.S. NAVY	**Figure 3-3** **OU 3, Sites 16/24 and 25 Location Map**	NBK Bangor FOURTH 5-YEAR REVIEW

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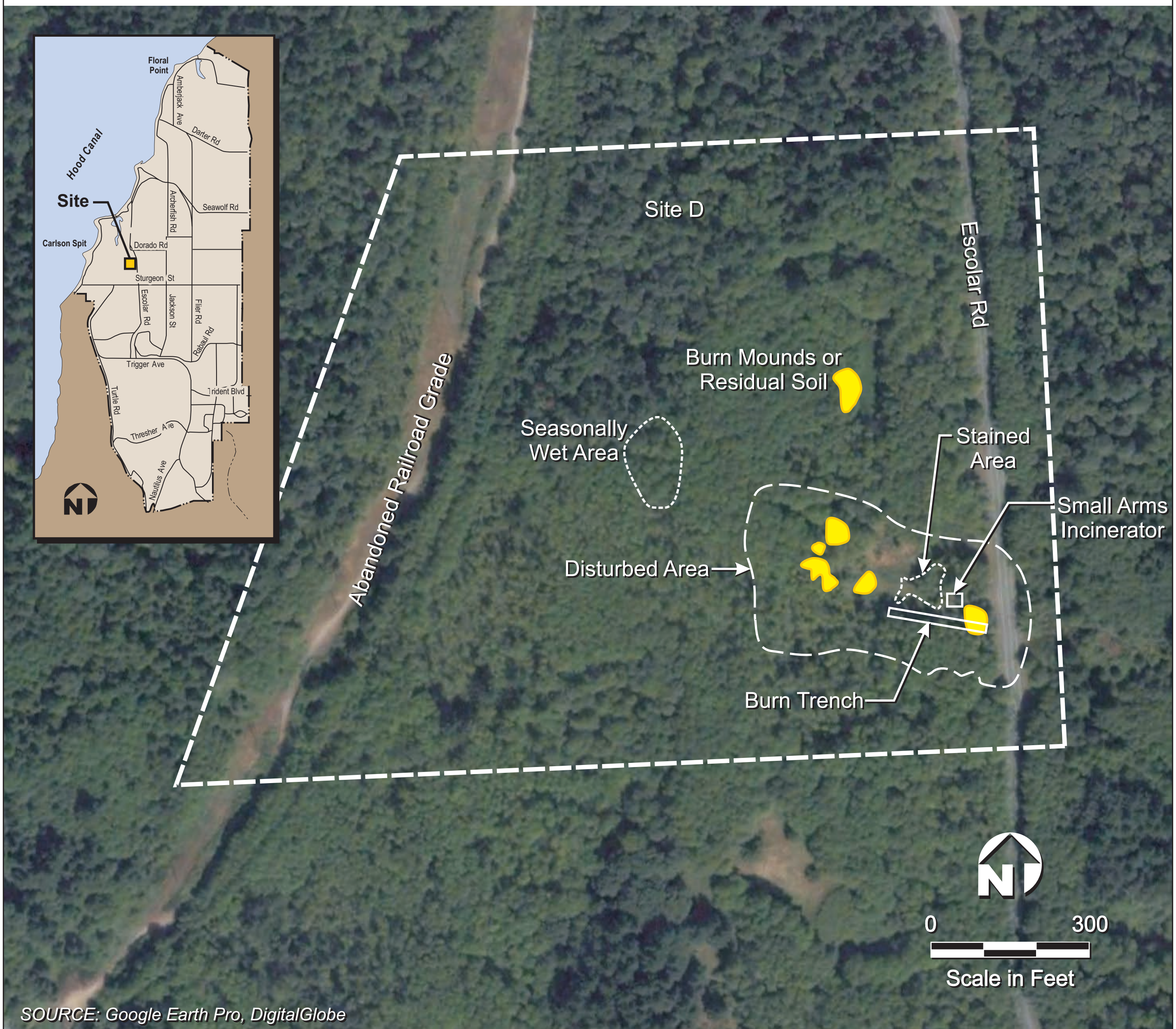

U.S. NAVY

Figure 3-4
OU 6, Site D Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW

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U.S. NAVY

Figure 3-5
OU 7, Site B Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW

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U.S. NAVY

Figure 3-6
OU 7, Site E/11 Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW

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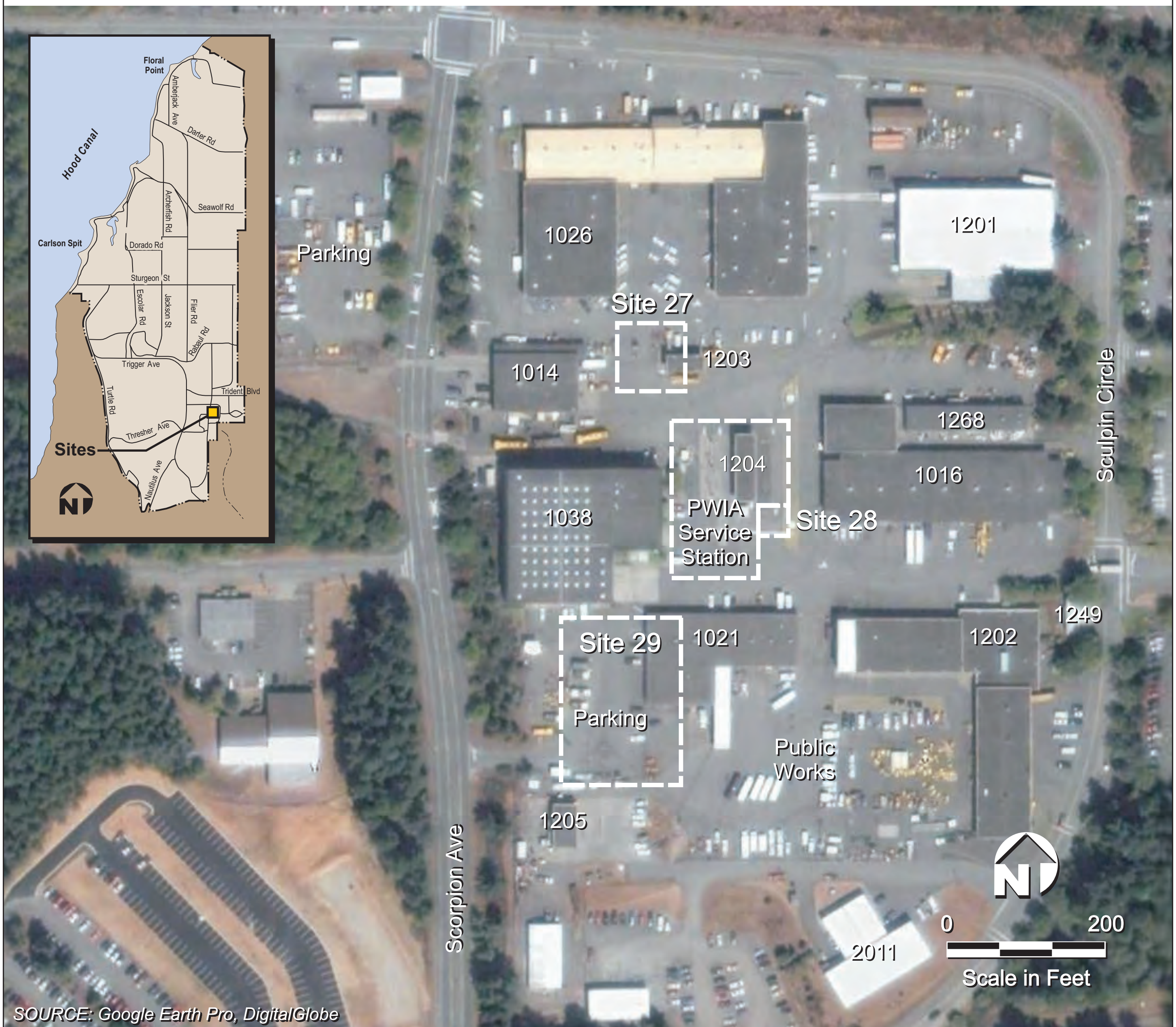
U.S. NAVY

Figure 3-7
OU 7, Site 10 Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW



U.S. NAVY	**Figure 3-8** **OU 8, Sites 27, 28, 29, and** **PWIA Service Station Location Map**	NBK Bangor FOURTH 5-YEAR REVIEW

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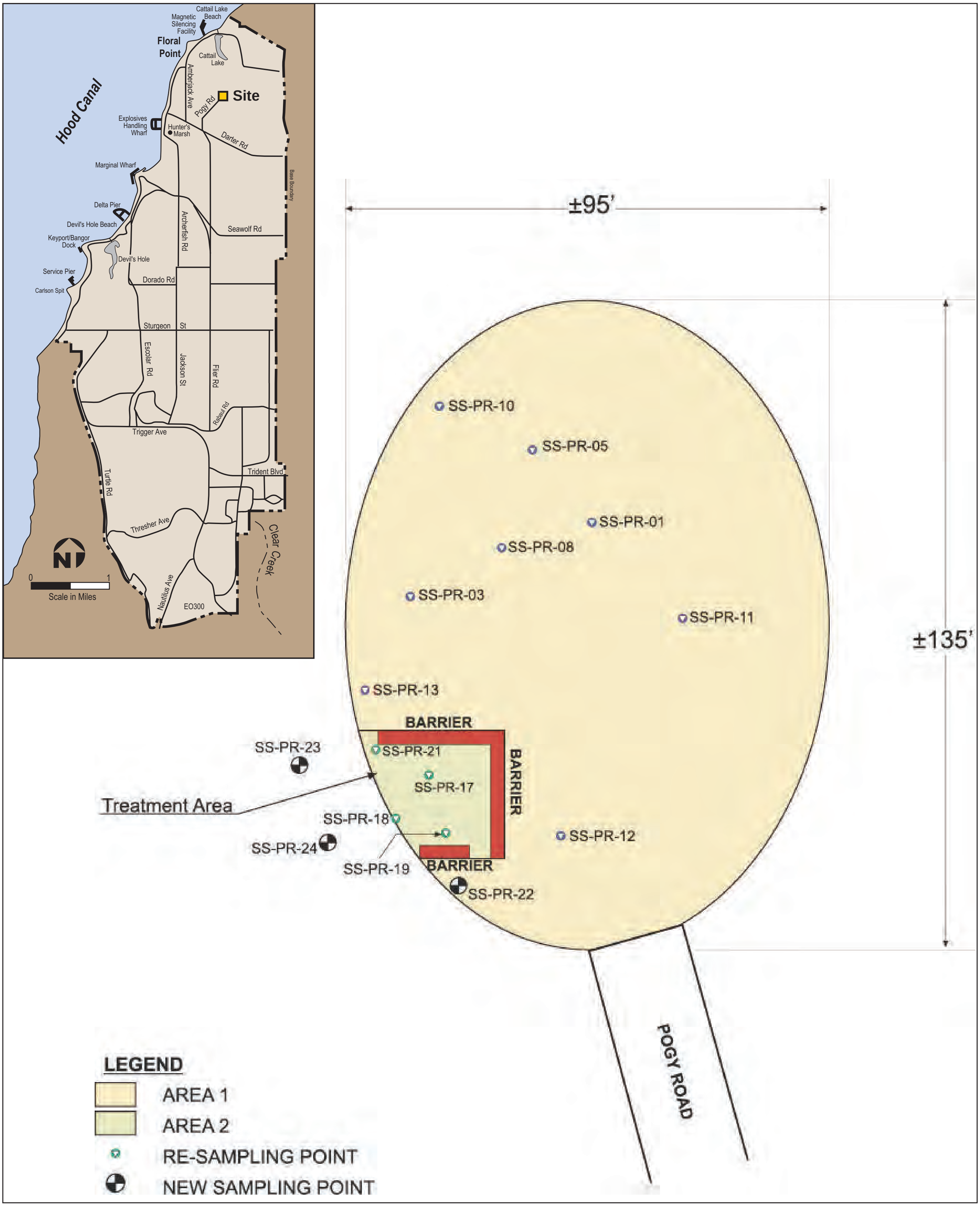

U.S. NAVY

Figure 3-9
Pogy Road Site Map

NBK Bangor
FOURTH
5-YEAR REVIEW

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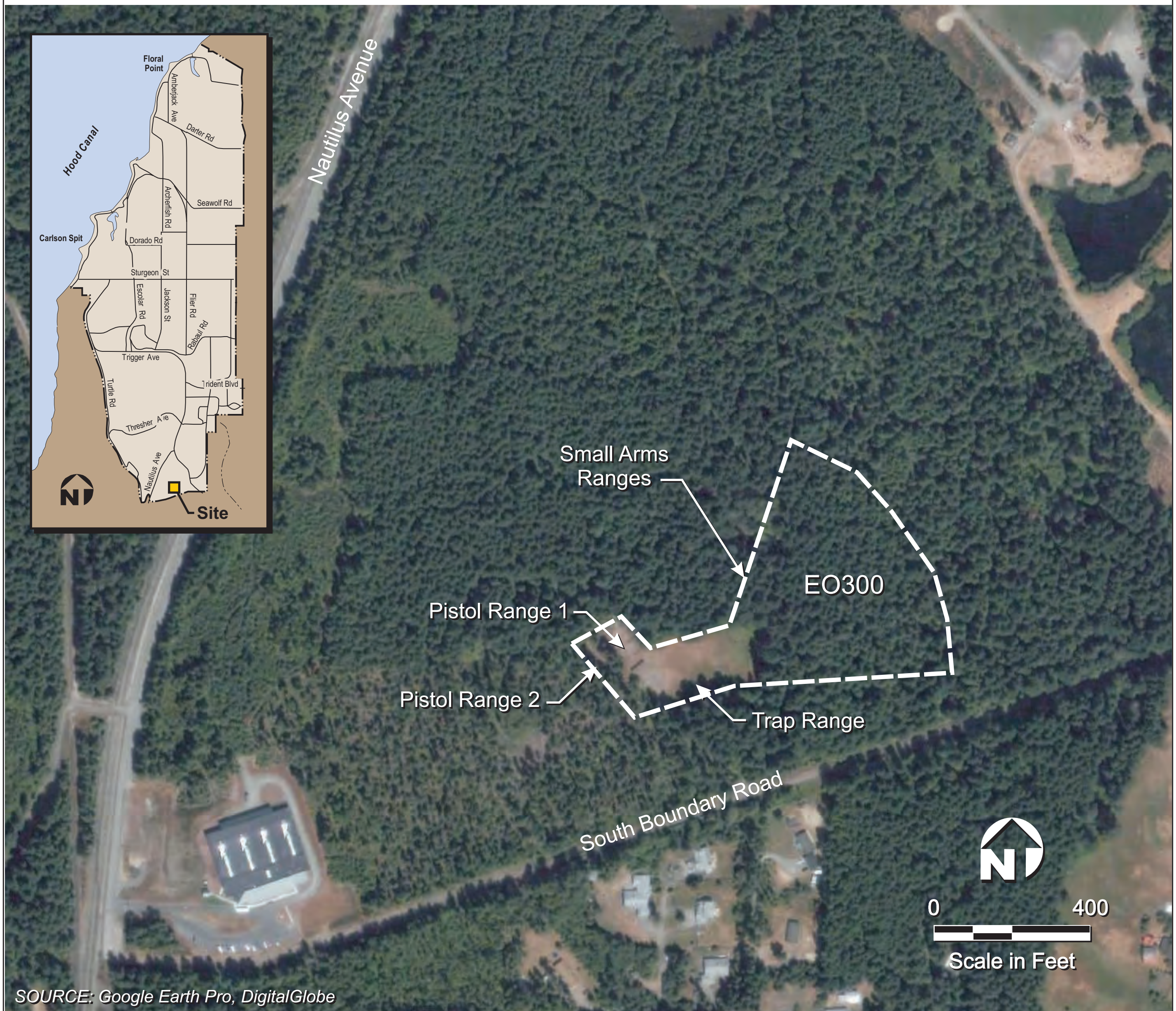


U.S. NAVY

Figure 3-10
Site EO300 Location Map

NBK Bangor
FOURTH
5-YEAR REVIEW

Table 3-1
Background Information Summary for NBK Bangor

OU	Site(s)	Land and Resource Use	History of Contamination	Removal Actions Performed	Basis for Taking Remedial Action as Identified in the ROD
1	A	• The site is currently not being used and is fenced to prevent unauthorized access. • Undeveloped forest land is located immediately adjacent to the site. • Residential development (Vinland) is located approximately 2,000 feet to the north.	• From 1962 to 1975, the Navy used Site A to detonate and incinerate various ordnance materials, and soil, surface water, and shallow groundwater were contaminated as a result of these activities. • The site included burn mounds, facilities for personnel, fire-suppression vehicles and equipment, an incinerator for ammunition, and a blast pit for ordnance detonation. • The groundwater plume in the shallow aquifer, at the time of the ROD, extended approximately 250 feet west from the leach basin.	Although not performed as a removal action under CERCLA, the following activities were performed: • Buildings at the site were demolished and burned on site in 1977. • A stormwater diversion structure was constructed in 1983 to convey surface water discharges from the burn area to Hood Canal to minimize the potential migration of contamination to Vinland.	Burn area: • Potential unacceptable risks to site workers from exposure to soil and groundwater contaminated with ordnance compounds • Potential unacceptable risks to hypothetical future residents from exposure to soil contaminated with ordnance compounds and PCBs and groundwater contaminated with ordnance compounds • Potential unacceptable risk to terrestrial wildlife from exposure to soil contaminated with ordnance compounds Debris area 2: • Potential unacceptable risks to site workers from exposure to soil contaminated with ordnance compounds and PCBs • Potential unacceptable risk to terrestrial wildlife from exposure to soil contaminated with lead No unacceptable risk was identified for debris area 1 or the stormwater discharge area.
2	F	• The paved portion of the former lagoon area is currently used by the recycling facility and for vehicle parking and container storage. • Undeveloped forest land is located immediately adjacent to the site.	• From approximately 1960 to 1972, the Navy used the former wastewater lagoon and overflow ditch for the disposal of wastewater produced during the demilitarization of ordnance items in the adjacent segregation facility building. • Much of the wastewater, which contained high concentrations of ordnance compounds, apparently infiltrated through the unlined bottom of the lagoon and overflow ditch. As a result, both soil and shallow groundwater were contaminated with ordnance compounds. • The groundwater plume in the shallow aquifer, at the time of the ROD, extended 4,900 feet northwest from the former lagoon. • The sea level aquifer has not been impacted by ordnance compounds	Although not performed as a removal action under CERCLA, the following activities were performed: • While the lagoon was in active service, it was periodically allowed to drain, and waste materials at the surface were "burned off" in place or transported to Site A for burning and disposal. • In February 1972, 500 cubic feet of soil were excavated from the top several feet of the former lagoon and taken to Site A for burning. • In 1980, the former lagoon area was backfilled and covered with asphalt.	• Potential unacceptable risks to hypothetical future residents from exposure to soil and groundwater contaminated with ordnance compounds • Potential ecological risks to sensitive aquatic species if ordnance contamination in the shallow aquifer were to reach the aquifer discharge area (seeps near the western base boundary)
3	16/24	• The site is fenced and generally used for vehicle parking and construction-related storage. • Undeveloped forest land is located immediately to the north, south, and west of the site. • The PWIA is located approximately 150 feet to the southwest.	• Between 1973 and 1983, the Navy used the liquid-waste incinerator for burning demilitarization wastewater from Site F, Otto fuel wastewater, and waste solvents. The solid-waste unit burned solid waste, including rags, sawdust, and protective clothing and carbon filters contaminated with Otto fuel. • Surface soil at Site 16/24 was contaminated as a result of these activities.	Although not performed as a removal action under CERCLA, both incinerators at Site 16/24 were deactivated in 1983 and removed from the site in 1987.	Concentrations of metals in soil at Site 16/24 exceeded MTCA cleanup levels.

Table 3-1 (Continued)
Background Information Summary for NBK Bangor

OU	Site(s)	Land and Resource Use	History of Contamination	Removal Actions Performed	Basis for Taking Remedial Action as Identified in the ROD
3	25	• The site is currently being used for stormwater detention and consists of two earthen stormwater detention/retention ponds and an oil/water separator. • The PWIA is located just to the north of the site, a solid waste transfer station is located southwest of the site, and a residential area located outside the base boundary is located to the southeast.	• From 1942 to 1977, the Navy discharged treated sewage from the industrial and barracks areas of NBK Bangor to the central branch of Clear Creek via an outfall at Site 25. • Groundwater at Site 25 was contaminated as a result of this activity.	Although not performed as a removal action under CERCLA Site 25 was regraded during construction of the stormwater detention ponds currently located at the site.	• Concentrations of metals in groundwater at Site 25 exceeded MTCA cleanup levels. • Potential unacceptable ecological risks to aquatic biota from exposure to surface water and sediment in the headwaters of Clear Creek's central branch (adjacent to Site 25), where some chemical concentrations exceeded state water and/or sediment quality criteria
6	D	• The site is currently undeveloped. • Undeveloped forest land is located immediately adjacent to the site.	• From 1946 until 1963, Site D served as the principal area for burning, detonating, and possibly burying ordnance at NBK Bangor. Soil, sediment, surface water, and shallow groundwater were contaminated as a result of these activities. • The site included a small arms incinerator, burn trench, and smaller burn areas or mounds.	None	• Concentrations of volatile organic compounds in groundwater exceeded MTCA cleanup levels. • Concentrations of metals in surface water exceeded MTCA cleanup levels. • Potential unacceptable risks to hypothetical future residents from exposure to soil contaminated with ordnance compounds. • Potential unacceptable risk to terrestrial wildlife from exposure to soil contaminated with ordnance compounds and possibly metals.
7	B	• The site is currently used as a recreational area (boat ramp) by base personnel. • The beach south of Floral Point is used by base personnel for shellfish harvesting every 3 to 5 years, on a rotational basis with other base beaches. • The beach at and to the north of Floral Point is not used for shellfish harvesting because of the lack of suitable sediment substrate. • Undeveloped forest land is located immediately to the east of the site.	• In the 1950s and 1960s, pyrotechnic testing and black powder burning was reportedly performed at Floral Point. • From approximately 1950 to 1968, the Navy used Floral Point for station dumping, including pit disposal, landfilling, and trash burning. • In 1966 to 1967, the site was reportedly used for open burning of RDX and TNT residuals from Site F. • Soil and groundwater were contaminated as a result of these activities.	None	• Potential unacceptable risks to hypothetical future residents from exposure to soil contaminated with polycyclic aromatic hydrocarbons, PCBs, and metals • Potential unacceptable risk to plants, soil invertebrates, and mammals from exposure to soil contaminated with metals
	E/11	• The site is currently not being used and is fenced to prevent unauthorized access. • Undeveloped forest land is located immediately adjacent to the site.	• From 1960 to 1973, the Navy reportedly disposed of electroplating wastes and Otto fuel in an unlined pit at Site E (acid disposal site). • In 1968 or 1969, the Navy used Site 11 as a pesticide/herbicide disposal area, where empty, rinsed pesticide containers were buried between two barricaded railroad siding areas. • Soil and groundwater were contaminated as a result of these activities.	• In 1992, a time-critical removal action was initiated at Site 11, during which 85 containers were removed together with approximately 400 cubic yards of soil containing pesticides. • Excavated soil was stockpiled on site.	• Potential unacceptable risks to site workers and hypothetical residents from exposure to stockpiled soil contaminated with pesticides • Potential unacceptable risks to hypothetical future residents from exposure to groundwater contaminated with petroleum hydrocarbons (Otto fuel) • Potential unacceptable risk to mammals from exposure to stockpiled soil contaminated with pesticides

Table 3-1 (Continued)
Background Information Summary for NBK Bangor

OU	Site(s)	Land and Resource Use	History of Contamination	Removal Actions Performed	Basis for Taking Remedial Action as Identified in the ROD
7	10	• The site is currently a paved parking lot for Buildings 2011 and 2012. • Undeveloped forest land is located immediately north, east, and west of the site. • The PWIA is located approximately 200 feet east of the site, and one of the site buildings and a parking area are located south of the site.	• Prior to 1979, the two former wooden floor Quonset huts were used to store pesticides and herbicides. • Groundwater was found to be contaminated. However, the source of contamination was most likely the PWIA. • In 2008 during a construction project at Site 10, soil in an unpaved area of the site was found to contain chemicals at concentrations above the MTCA Method A soil cleanup level for unrestricted land use.	Although not performed as a removal action under CERCLA, the Quonset huts were demolished in 1983 and reportedly disposed of in the former barricaded railroad siding area.	• Potential unacceptable risks to hypothetical future residents from exposure to groundwater contaminated with petroleum hydrocarbons • Concentrations of metals and PCBs in soil exceeded the MTCA Method A soil cleanup level for unrestricted land use
8	27, 28, and 29	• The site currently includes the PWIA, and land use is industrial. • Residential development (Mountain View neighborhood) is located approximately 100 feet to the southeast of the PWIA.	• Site 27 is the location of a former steam cleaning pit that consisted of an excavated sump filled with gravel used to collect and dispose of steam cleaning condensate generated from locomotive maintenance in Building 1014 and may have been used for the disposal of spent solvents, waste oils, and pesticides. • Site 28 is the location of a former paint shop (located in the vicinity of existing Building 1204) that was used by public works personnel to mix and apply paint and where waste materials from the paint shop were reportedly disposed of in a ditch adjacent to the building and/or dumped behind the building. • Site 28 is also the current location of the PWIA service station, where a gasoline release from a UST was discovered in 1986. • Site 29 is the location of an area historically used to rinse neutralized pesticide containers on the west side of Building 1021 and perform routine service on trucks and other vehicles. • Soil and groundwater were contaminated as a result of site activities. • LNAPL was present beneath the PWIA service station, and the groundwater plume extended approximately 2,000 feet southeast from the gas station into the Mountain View residential neighborhood at the time of the ROD.	Although not performed as a removal action under CERCLA, the following activities were performed: • When the steam cleaning pit at Site 27 was full, the grease and residue were hauled away to an unknown location for disposal. • From 1986 to 1998, LNAPL was recovered from the vicinity of the PWIA service station using a free-product recovery system that consisted of three product-recovery wells equipped with pneumatic pumps, an oil/water separator, and an aboveground holding tank. • From 1992 to 1996, several USTs were removed or abandoned in place to prevent further releases to the subsurface, based on the results of tightness tests performed on USTs in the PWIA. • From 1994 to 2000, a combined soil vapor extraction and bioventing system were used in the vicinity of the gasoline release at the PWIA service station to remediate petroleum-contaminated soil. The following two removal actions were performed under CERCLA: • In 1995, the Navy connected the Mountain View neighborhood, southeast of the base boundary, to a municipal water supply. • From 1996 to 1999, the Navy installed and operated a groundwater containment system to minimize off-base plume migration into the Mountain View residential neighborhood.	Potential unacceptable risks to off-based residents and to hypothetical future on-base residents from exposure to groundwater contaminated with volatile organic compounds (drinking water pathway and crop irrigation only, no vapor intrusion risks)

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
LNAPL - light nonaqueous-phase liquid
MTCA - Model Toxics Control Act
NBK - Naval Base Kitsap
OU - operable unit
PCB - polychlorinated biphenyl
PWIA - Public Works Industrial Area
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
TNT - trinitrotoluene
UST - underground storage tank

4.0 REMEDIAL ACTIONS

The RODs for NBK Bangor required remedial actions for six OUs (1, 2, 3, 6, 7, and 8). This section summarizes the RAOs, remedies, remedy components and implementation, and ongoing operation, maintenance, and monitoring (OM&M) requirements established in the RODs for each of these OUs. Information previously presented in the third 5-year review is not repeated here. Therefore, additional information can be obtained by reviewing Section 4 of the third 5-year (U.S. Navy 2010a) and the RODs and ESDs for each OU, which are included in Appendix A. This 5-year review focuses on remedy implementation activities between October 2009 and April 2014, as well as OM&M information for this same time period.

The operation and maintenance (O&M) costs for each OU are summarized for this 5-year review period in Table 4-1. These costs are as follows:

- The O&M costs for OU 1 ranged between $302,628 and $548,176 with an average cost of $446,526. These costs are fairly uniform and do not appear to be decreasing.
- The O&M costs for OU 2 averaged $1,091,623 per year with little variability. These costs are nearly 10 times the costs estimated in the OU 2 ROD and reflect the increasing maintenance costs associated with this aging treatment system.
- The O&M costs for OU 7 were below $70,000 during 5 of the 6 years presented in Table 4-1. Only during 2011 did the costs exceed this threshold when the Navy expended $277,971 for this OU.
- The O&M costs for OU 8 ranged between $287,247 and $904,875 with an average cost of $602,526. These costs are 3 times the costs estimated in the OU 8 ROD and reflect the pilot study efforts being conducted at this OU.
- Compared to the last 5-year review period, the O&M costs were significantly higher for all of the OUs, except for OU 1.

4.1 OU 1 (SITE A)

4.1.1 Remedy Selection

The reasonably anticipated land use, impacted media, chemicals of concern (COCs), remediation goals (RGs), RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.1 of the third 5-

year review (U.S. Navy 2010a), the OU 1 ROD (U.S. Navy, USEPA, and Ecology 1991a), and the ESDs for OU 1 (U.S. Navy, USEPA, and Ecology 1994e, 1998, and 2000b), which are included in Appendix A.

4.1.2 Remedy Implementation

The remedy for Site A soil was implemented from October 1992 through September 1997. During this time implementation of the soil remedy included the following components:

- Fourteen monitoring wells were abandoned by pressure grouting.
- Ordnance-contaminated surface soils were excavated and stockpiled.
- A lined soil-washing basin was constructed in the resulting excavation.
- Stockpiled soils were amended with sand and calcium chloride to improve permeability.
- Amended stockpiled soils were placed in the soil-washing basin.
- Passive soil leaching was conducted.
- Leachate was collected and treated with granulated activated carbon.
- Upon closure, untreated basin leachate was diverted into the storm water diversion system.

Groundwater remediation began in May 1997 and is ongoing. Implementation of the groundwater remedy included the following components:

- Extracted groundwater is pumped to the soil leachate treatment system for treatment.
- Treated groundwater is currently discharged to the stormwater diversion system.

Further information on remedy implementation can be obtained by reviewing Section 4.1 of the third 5-year review (U.S. Navy 2010a).

4.1.3 Operation, Maintenance, and Monitoring

The OM&M program for Site A, specified by the OU 1 ROD, consists of OM&M of the groundwater treatment system, monitoring groundwater, and managing and maintaining land use controls (LUCs) implemented for the site. LUC management and maintenance are discussed in Section 4.7 for all of the sites where they apply.

Groundwater Treatment System OM&M

Operation of the Site A groundwater treatment system began in December 1994. The objective of the groundwater remediation system at Site A is aquifer restoration and groundwater containment. The process involves pumping groundwater from extraction wells, removing hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in the aboveground treatment system, and returning the treated water to the shallow aquifer via a reintroduction well or directly to surface water via a stormwater drainage ditch.

OM&M requirements for the groundwater treatment system have been established in the annual O&M manuals during this review period (U.S. Navy 2009c, 2010e, 2011d, 2012c, 2013d, and 2014q). OM&M included the following:

- Routine inspection and maintenance of equipment
- Weekly, quarterly, semiannual, and annual equipment and instrument preventive maintenance
- Corrective maintenance of equipment as needed
- Monthly treatment system building inspections
- Compliance and performance monitoring and sampling, including recording operating parameters, sampling water at various stages within the treatment process, and water level monitoring in wells

In addition to the these OM&M activities, extraction well maintenance was performed during this 5-year review period in accordance with the 2009 sampling and analysis plan (SAP) (U.S. Navy 2009b) and the 2012 well maintenance work plan (U.S. Navy 2012e). Extraction well maintenance included removing and cleaning pumps and redeveloping the wells.

Since the third 5-year review, the extraction and treatment system has generally performed as designed, with periodic maintenance and repair completed as necessary. Minimal unscheduled shutdowns occurred in 2009, 2010, and 2013 (less than 2 days total). During 2011 (9 days), 2012 (6 days), and 2014 (4 days), there was a total of 19 days of unscheduled shutdowns from power outages, road closures, site access restrictions, and bad weather (U.S. Navy 2014b). Additional planned shutdowns occurred in order to repair equipment, including 64 days in 2011, 24 days in 2012, and 3 months in 2013 (U.S. Navy 2014b). The results of the groundwater treatment system OM&M are documented in the annual long-term monitoring (LTM) and O&M data reports and discussed in Section 6.

Groundwater Monitoring

Monitoring of groundwater at Site A is conducted to assess contaminant distribution, compliance with RGs, performance of the groundwater extraction and treatment system, and performance of natural attenuation. Monitoring requirements have been established in the SAPs completed during this review period (U.S. Navy 2009b, 2010f, 2011e, 2012d, and 2013e). Performance and compliance monitoring wells include shallow aquifer extraction wells, perched zone monitoring wells, and shallow aquifer monitoring wells, which are shown on Figure 4-1 (U.S. Navy 2013e). The groundwater was analyzed for ordnance compounds (EPA Method 8330) and natural attenuation parameters (methane, nitrate/nitrite, alkalinity, dissolved organic carbon, chloride/sulfate, and manganese) and tested for field parameters.

During this 5-year review period, six new monitoring wells were installed at Site A in accordance with project work plans (U.S. Navy 2009b and 2012e) for the purpose of further characterizing the site as part of remedy optimization (Figure 4-1):

- A-MW56 and A-MW57 in November 2009
- A-MW58, A-MW59, A-MW60, and A-MW61 in August 2013

Well A-MW56 was positioned downgradient of existing A-MW49 to help delimit the extent of RDX in groundwater between A-MW49 and Tinosa Road. Well A-MW57 was positioned along Tinosa Road as a sentinel well between monitoring wells A-MW51 and A-MW52. Both new wells are screened high in the saturated zone to monitor potential migration of contaminants at the top of the shallow aquifer. A-MW58 was positioned adjacent to A-MW21 and upgradient to the site in the perched zone. A-MW59, A-MW60, and A-MW61 were positioned adjacent to the leach basin to evaluate the perched zone conditions and assess the RDX extent near the source area in the perched zone (U.S. Navy 2014b).

Since the third 5-year review, the monitoring frequency for the perched zone and the shallow aquifer monitoring wells varied depending on the well. The extraction well monitoring frequency (annual) remained the same during this review period. The planned and actual sampling program over the 5-year review period is summarized in Table 4-3. The deviations from the sampling plans are as follows:

- In 2010, monitoring well A-MW53 was sampled once, although only planned for water level measurement.
- In 2014, A-MW36, A-MW38, and A-MW60 were not sampled.

Well A-MW53 was sampled in 2010 at the request of the EPA (U.S. Navy 2011f). The 2014 LTM report noted the deviation from the SAP listed above and stated that wells A-MW36, A-MW38, and A-MW60 were dry at the time of sampling. Although three wells were not sampled in 2014, a large set of data was obtained for the site, and these data are distributed sufficiently to provide representative documentation of groundwater conditions over this 5-year review period.

Note that minor inconsistencies were observed in the 2011, 2012, and 2013 Site A SAP planning tables. The general monitoring tables included sampling of a few wells that did not appear on the event-specific monitoring tables. Any deviation or planned delay in sampling should be documented in the applicable SAP tables and the conclusion section of the LTM reports.

Groundwater Modeling

As part of a remedy optimization effort during this 5-year review period, an updated conceptual site model (CSM) was completed for Site A (U.S. Navy 2014i) that included a data collection field effort, groundwater modeling, and a preliminary alternative remedial options analysis. Several models were developed, including a three-dimensional model to visualize subsurface conditions and the RDX plume, vadose zone loading to evaluate contributions to the shallow aquifer, and numeric flow modeling to evaluate transport through groundwater under current and future conditions. The purpose of the modeling investigation was to address issues and recommendations identified in the third 5-year review and support remedy optimization for OU 1 (U.S. Navy 2010a).

The issues identified in the third 5-year review were as follows:

- The potential contaminant contribution to the shallow aquifer from the perched zone and residual soil contamination is unclear, as is the quantity of contaminant mass removed from the shallow aquifer by the pump and treat system as compared to natural attenuation.
- The Site A groundwater treatment system is not functioning as intended by the ROD.

The recommendations stated in the third 5-year review were as follows:

- Update the CSM to portray the latest understanding of contaminant inputs from residual soil and perched zone contamination and contaminant removal from natural attenuation and pump and treat.
- Complete the assessment of an alternative remedy to the current treatment system, and take action based on the results of the assessment.

Results of the groundwater modeling are discussed in Section 6.4.1.

4.2 OU 2 (SITE F)

4.2.1 Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.1 of the third 5-year review (U.S. Navy 2010a), the OU 2 ROD (U.S. Navy, USEPA, and Ecology 1994d), and the ESD for OU 2 (U.S. Navy, USEPA, and Ecology 1994f), which are included in Appendix A.

4.2.2 Remedy Implementation

The remedy for Site F soil was implemented from summer 1996 through August 1997. During this time implementation of the soil remedy included the following components:

- Contaminated soil was excavated and hauled to the on-base treatment facility for screening and composting.
- Composted soils were used as backfill at Sites F and D.
- The Site F excavation was backfilled with a variety of oversized material from the screening and available broken asphalt.
- An infiltration barrier capped with a concrete pad was placed over the fill.
- A recycling facility was constructed at the site on the concrete pad.

Groundwater restoration began in December 1994 and is ongoing. Implementation of the groundwater remedy included the following components:

- Extracted groundwater is pumped to an on-site treatment system for treatment.
- Treated groundwater is reinjected into the shallow aquifer.

Further information on remedy implementation can be obtained by reviewing Section 4.2 of the third 5-year review (U.S. Navy 2010a).

4.2.3 Operation, Maintenance, and Monitoring

The OM&M program for Site F, specified by the OU 2 ROD, consists of OM&M of the groundwater treatment system, monitoring groundwater, and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7.

Groundwater Treatment System OM&M

Operation of the Site F groundwater treatment system began in December 1994. The objective of the groundwater remediation system at Site F is aquifer restoration and groundwater containment. The process involves pumping groundwater from extraction wells, removing ordnance compounds in the aboveground treatment system, and returning the treated water to the shallow aquifer via reintroduction wells.

OM&M requirements for the groundwater treatment system have been established in the annual O&M manuals during this review period (U.S. Navy 2009d, 2010g, 2012f, and 2014d). The results of the groundwater treatment system OM&M are documented in the annual LTM and O&M data reports and discussed in Section 6. OM&M included the following:

- Routine inspection and maintenance of equipment
- Daily, quarterly, semiannual, and annual equipment and instrument preventive maintenance
- Corrective maintenance of equipment as needed
- Monthly treatment system building inspections
- Compliance and performance monitoring and sampling, including recording operating parameters and sampling water at various stages within the treatment process

In addition to the these OM&M activities, extraction and injection well maintenance was performed during this 5-year review period in accordance with the 2011 and 2012 well maintenance work plans (U.S. Navy 2011h and 2012e). Well maintenance included removing and cleaning pumps, replacing selected pumps, and redeveloping the wells.

Since the last 5-year review, the groundwater treatment system has not performed as designed because of operational issues and frequent system shutdowns. However, these system shutdowns and operational issues do not appear to have impacted containment of ordnance-contaminated groundwater (see discussion in Section 6.4.2). Operational issues at the Site F groundwater treatment system, which began in 2009, were the result of low voltages and voltage fluctuations. Low voltage requires equipment to run at high amperage, which causes issues with the electrical and programming systems that run the Site F groundwater treatment system. The operational issues included blown fuses, damaged pump circuits, and undercurrent faults on the influent and effluent variable drives. The voltage fluctuations resulted in occasional electric faults, which shut down the system for short periods of time. Corrective measures were initiated in 2010 and included tracking voltage readings on a weekly basis. In March 2012, the Navy installed a surge protector to prevent future damage from power surges to the electrical system and influent and effluent pumps at the Site F groundwater treatment plant.

Long system shutdowns occurred from January 2013 to March 2014 because of large voltage fluctuations, repairs and upgrades to the system, and the U.S. Army Corps of Engineers (USACE) treatability study (U.S. Navy 2014c). The groundwater treatment system was offline for the majority of January 2013 because of large voltage fluctuations. The system was restarted in February 2013 at reduced extraction rates. The system was shut down again from September to October 2013 for repairs and upgrades to restore full operation of the system. Operations resumed at the end of October 2013, but wells were operated intermittently during the startup phase for the newly installed pumps and piping. The system was shut down again for approximately 3 months from December 2013 to March 2014 for the USACE treatability study, which required the Site F system to be idle. During the planned system shutdown, numerous system improvements were implemented (U.S. Navy 2014c). Regularly scheduled quarterly monitoring in wells F-MW63, F-MW64, F-MW67, F-MW68, F-MW70, and F-MW71 conducted in 2013 during the reduced system operations and in winter 2014 during the system shutdown for USACE testing did not show significant changes in plume containment. RDX monitoring results in northern plume edge wells during the times of limited operations were similar to sampling results prior to the long system shutdowns, indicating that RDX did not migrate beyond containment (U.S. Navy 2014c).

Groundwater Monitoring

Monitoring of groundwater at Site F is conducted to assess contaminant distribution, compliance with RGs, and performance of the groundwater extraction and treatment system. Because Site E/11 lies within the Site F RDX plume, monitoring of Site E/11 is conducted as part of the monitoring at Site F. Monitoring requirements have been established in the SAPs completed during this review period (U.S. Navy 2009e, 2010h, 2011i, 2011q, 2012g, and 2013f). Performance and compliance monitoring wells are shown on Figure 4-2 (U.S. Navy 2013f). The groundwater was analyzed for ordnance compounds (EPA Method 8330) and nitrate/nitrite (EPA Method 353.2) and tested for field parameters. In addition, samples collected from two wells at Site E/11 were also analyzed for propylene glycol dinitrate (the primary constituent of Otto fuel) using the laboratory's standard operating procedure SOC-OTTO.

In February 2011, two new monitoring wells (F-MW70 and F-MW71) were installed at Site F in accordance with the project work plan (U.S. Navy 2011g) (Figure 4-2). The wells were installed downgradient of existing northern plume edge wells F-MW67 and F-MW68 to help define the downgradient extent of RDX in groundwater above the RG of 0.8 µg/L (U.S. Navy 2014c). Monitoring in these wells has been performed quarterly since they were installed in 2011.

The planned and actual sampling program for Sites F and E/11 over the 5-year review period is summarized in Table 4-4. Note that Table 4-4 does not include the monitoring wells where only depth to groundwater measurements were collected. Changes that were made to the monitoring frequency over this 5-year review period are as follows:

- Monitoring frequency was changed from annually to every 5 years for wells EMW-21U and EMW-23U in April 2011, because concentrations of Otto fuel were consistently below the RG.
- Monitoring frequency was changed from quarterly to annually for northern plume edge wells F-MW66 and F-MW69 in April 2012, because concentrations of RDX were consistently below the RG.

The deviations from the sampling plans are as follows:

- In 2013, wells F-EW1, F-EW2, F-EW7, and F-EW10 were sampled more frequently than planned.
- In 2014, wells F-MW32 and F-MW55M were not sampled.

During the spring 2013 sampling event, six of the extraction wells (F-EW3, F-EW4, F-EW5, F-EW6, F-EW8, and F-EW9) were not sampled because the pump motors in these wells had failed as a result of power supply problems. After replacement of the failed pump motors, all 10 extraction wells were sampled in December 2013. As a result, the four extraction wells with functioning motors were sampled twice in 2013. Because of the RDX spiking and frequent sampling conducted as part of a treatability study (which caused a shutdown of the groundwater treatment system for 3 months), wells F-MW32 and F-MW55M were not sampled as planned during the winter 2014 sampling event (U.S. Navy 2014c). Comparison of the planned to actual groundwater sampling conducted indicates that the groundwater monitoring program has been successfully implemented during this 5-year review period at Site F.

Remedy Optimization and Groundwater Modeling Studies

USACE developed and calibrated a numerical groundwater flow model and contaminant transport model for Site F (USACE 2014) to support remedy optimization and help evaluate aerobic and anaerobic biodegradation at the site. The groundwater flow model was developed to address issues and recommendations identified in the third 5-year review and support remedy optimization for OU 2 (U.S. Navy 2010a).

The issues identified in the third 5-year review were the following:

- The concentration trend at well F-MW67, which is beyond the limits of the extraction system containment, is increasing.
- The Site F groundwater treatment system is not functioning as intended by the ROD.

The recommendation stated in the third 5-year review was to complete the ongoing assessment and optimization of the Site F treatment system to address containment issues, downgradient plume extent, and the portion of the plume downgradient of the current capture zone.

Results of the groundwater modeling are discussed in Section 6.4.2.

4.3 OU 3 (SITES 16/24 AND 25)

4.3.1 Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.3 of the third 5-year review (U.S. Navy 2010a) and the OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b), which are included in Appendix A.

4.3.2 Remedy Implementation

The remedy for Site 16/24 soil, which consisted of a residential land use restriction, was implemented in 1993 prior to the completion of the ROD by the Commanding Officer of the Naval Submarine Base, Bangor (see Attachment 2 of the ROD [U.S. Navy, USEPA, and Ecology 1994b]). The Navy prepared an Institutional Controls Management Plan (ICMP) for all of NBK Bangor in 2001 (U.S. Navy 2001). The 2001 ICMP formalized the LUCs for Site 16/24. The ICMP was revised in 2007 and 2010 (U.S. Navy 2007a and 2010c).

The remedy for Site 25 groundwater, which consisted of groundwater monitoring, was performed from March 1994 through September 1997. At that time, the Navy and Ecology agreed that the groundwater monitoring for Site 25 met the requirements of the OU 3 ROD and no additional monitoring was required (U.S. Navy 2000a).

Further information on remedy implementation can be obtained by reviewing Section 4.3 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

4.3.3 Operation, Maintenance and Monitoring

The OM&M program for Sites 16/24 and 25, specified by the OU 3 ROD, consists of fulfilling ROD-mandated monitoring requirements and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7.

No monitoring activities are currently being conducted at Sites 16/24 and 25 (see Section 4.3.2 above).

4.4 OU 6 (SITE D)

4.4.1 Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.4 of the third 5-year review (U.S. Navy 2010a) and the OU 6 ROD (U.S. Navy, USEPA, and Ecology 1994c), which are included in Appendix A.

4.4.2 Remedy Implementation

The remedy for Site D was implemented from December 1995 through June 2000. During this time, implementation of the remedy included the following components:

- Pre-excavation sampling was performed in the three areas of Site D identified in the RI/FS as requiring remediation: Grid G-1, Grid M-12, and the former burn trench.
- Sampling results indicated that soils in Grids G-1 and M-12 met soil cleanup levels and, therefore, did not require remediation (following site reconnaissance and extensive discussions, Ecology declared these grid areas as requiring no further action).
- An unexploded ordnance survey was completed for the trench and none was found.
- Contaminated soil from the burn trench was excavated and hauled to the on-base treatment facility for screening and composting.

- Verification soil samples were collected from the excavation for analyses.
- Composted soils were used to backfill the excavation at Site D.
- The site was graded to match the existing contours to the extent possible and revegetated with native plants.
- Surface water samples were collected from nine locations at Site D in December 1997 and analyzed for target analyte list metals and ordnance compounds.
- Two rounds of groundwater samples were collected for VOC and semivolatile organic compound analysis, one round prior to soil excavation and the second after soil treatment and backfilling were completed.
- Nine groundwater monitoring wells present at the site were decommissioned.

Ordnance compounds were not detected in the nine surface water samples. In addition, no elevated metals concentration was detected in surface water. The second round of groundwater sampling data showed no detection above the groundwater cleanup levels.

Further information on remedy implementation can be obtained by reviewing Section 4.4 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

4.4.3 Operation, Maintenance, and Monitoring

No ongoing OM&M activities are required by the OU 6 ROD. While no formal IC requirement is in place for this site, the site has restrictions in place under wetland regulations, which were determined to provide sufficient protection in the ROD. LUC management and maintenance for these informal ICs is discussed in Section 4.7.

4.5 OU 7 (SITES B, E/11, AND 10)

The selected remedy for OU 7 includes remedial action for Sites B and E/11 and no action with monitoring for Site 10. The selected remedies for these sites are discussed below. As previously discussed, remedial activities and monitoring at Sites 2 and 26 are considered complete and are not discussed in this 5-year review.

4.5.1 Site B

Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.5.1 of the third 5-year review (U.S. Navy 2010a) and the OU 7 ROD (U.S. Navy, USEPA, and Ecology 1996), which are included in Appendix A.

Remedy Implementation

The remedy for Site B was implemented from June through November 1997. During this time, implementation of the remedy included the following components:

- Surficial metal debris was removed from the wetland area.
- Areas of known contaminated soil were covered by 1 foot of clean soil overlain by a mulch layer, then revegetated with native plants.
- A shoreline protection system, consisting of a sand and gravel blend (beach mix) similar to the native beach materials was constructed along the site perimeter to reduce site erosion.
- Control points were established at the top of the shoreline protection berm to monitor future beach movement.
- A stormwater drainage system was installed to control erosion.
- A concrete turnaround was constructed at the top of the boat ramp to prevent erosion from vehicles using the ramp.
- Nine groundwater monitoring wells present at the site were decommissioned.
- Signs were placed at the site notifying visitors that the site is to be used for recreational purposed only and that approval is required for digging or mowing.

Ecology reviewed the final remedial action report and determined that the Site B remedial action had been completed in accordance with the OU 7 ROD (Ecology 1999a). Further information on remedy implementation can be obtained by reviewing Section 4.5.1 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

Operation, Maintenance, and Monitoring

The OM&M program for Site B, specified by the OU 7 ROD, consists of fulfilling ROD-mandated monitoring requirements and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7.

Sediment and clam tissue monitoring was conducted in the area of Floral Point for 14 years (1991 through 2004). Concentration trends in the analytical data were analyzed as the data accumulated. The data trends showed that groundwater discharge from Floral Point into Hood Canal is not adversely affecting sediments or clam tissue. This monitoring component of the Site B remedy has functioned as intended by the ROD and is complete (Ecology 2005). The ROD did not require LTM after it was demonstrated that groundwater discharge was not adversely affecting sediments or clam tissue (U.S. Navy, USEPA, and Ecology 1996).

4.5.2 Site E/11

Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.5.2 of the third 5-year review (U.S. Navy 2010a) and the OU 7 ROD (U.S. Navy, USEPA, and Ecology 1996), which are included in Appendix A.

Remedy Implementation

The remedy for soil at Site E/11 was implemented from July 1997 through May 1998. During this time implementation of the soil remedy included the following components:

- Approximately 830 cubic yards of stockpiled soil were sampled for characterization, transported, and disposed of at a permitted landfill.
- A stockpile of metal debris was also disposed of at an off-site facility.
- Two rounds of conformation soil samples were collected from the location beneath the former soil stockpile.
- The site was graded and backfilled with 6 inches of clean topsoil.

The groundwater use restriction component of the remedy was formally satisfied in 2000, with adoption of the basewide ICMP required by the OU 8 ROD. Further information on remedy implementation can be obtained by reviewing Section 4.5.2 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

Operation, Maintenance, and Monitoring

The OM&M program for Site E/11, specified by the OU 7 ROD, consists of fulfilling ROD-mandated monitoring requirements and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7. Site E/11 groundwater is being monitored in conjunction with Site F monitoring (see Section 4.2.3).

4.5.3 Site 10

Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.5.4 of the third 5-year review (U.S. Navy 2010a) and the OU 7 ROD (U.S. Navy, USEPA, and Ecology 1996), which are included in Appendix A.

Remedy Implementation

The remedy for Site 10 was implemented after the signing of the ROD in 1996. This included the following components:

- Ongoing long-term maintenance of the asphalt pavement cover
- Groundwater monitoring
- Groundwater use restrictions
- Expansion of area of asphalt cover to include soils contaminated with arsenic, cadmium, lead, and polychlorinated biphenyls (PCBs) (U.S. Navy 2008a)

The first 5-year review (U.S. Navy 2000a) found that the original remedy components for Site 10 (first three bullets above) had not been completed and listed this as a deficiency. In response to that finding, the Navy conducted two groundwater sampling events, on November 6, 2000, and July 17, 2001 (U.S. Navy 2002). This sampling event satisfied the groundwater component of the remedy for Site 10 as established in the OU 7 ROD, and no further groundwater sampling has been conducted at Site 10. Ecology concurred with the decision to discontinue groundwater monitoring at Site 10.

The OU 8 ROD amended the Site 10 remedy by stating that it was not necessary for the pavement to remain in place. This amendment was based on a finding that the cancer and noncancer risk for future residents from chemicals in soil at Site 10 were acceptable, based on EPA criteria, and that the concentrations of these chemicals in soil passed the applicable MTCA criteria. The Site 10 remedy was again amended in 2008, through a memorandum to the administrative file (U.S. Navy 2008a). This memorandum established asphalt capping as a component of the remedy for an area of Site 10 soil that was found to contain arsenic, lead, cadmium, and PCBs at concentrations above the MTCA Method A soil cleanup level for unrestricted land use. These contaminants in soil at Site 10 were identified during a construction project to add a new warehouse and parking lot to a previously unpaved portion of Site 10. The expanded asphalt capping component of the remedy was constructed between September 22 and November 7, 2008 (U.S. Navy 2009a). The expansion of the footprint of Site 10, subject to ICs and the inclusion of the asphalt cap maintenance requirement, is part of the 2010 update to the ICMP.

Further information on remedy implementation can be obtained by reviewing Section 4.5.4 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

Operation, Maintenance, and Monitoring

The OM&M program for Site 10, specified by the OU 7 ROD, consists of fulfilling ROD-mandated monitoring requirements and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7. Monitoring activities are not currently being conducted at Site 10 (see Remedy Implementation section above).

4.6 OU 8

4.6.1 Remedy Selection

The reasonably anticipated land use, impacted media, COCs, RGs, RAOs, and description of the remedy components are summarized in Table 4-2. Further information on remedy selection can be obtained by reviewing Section 4.6 of the third 5-year review (U.S. Navy 2010a) and the OU 8 ROD (U.S. Navy, USEPA, and Ecology 2000a), which are included in Appendix A.

In addition to the remedy components for OU 8, the OU 8 ROD formally established ICs for other sites at NBK Bangor to comply with recent EPA guidance regarding ICs (USEPA 2002). The formalization of ICs for other sites was incorporated into the OU 8 ROD in lieu of preparing ESDs for each of the previously signed RODs.

4.6.2 Remedy Implementation

The remedy for OU 8 was initiated in October 2000 and is ongoing. This included the following components:

- Monitored natural attenuation (MNA) of COCs in groundwater is ongoing.

- A passive light nonaqueous-phase liquid (LNAPL) skimming pilot test was conducted over a 16-day period.
- Passive LNAPL recovery of free product was implemented.
- Free-product recovery was monitored.
- Long-term groundwater monitoring is ongoing.
- Deployed oxidation reduction potential (redox) manipulation in groundwater as a phased contingent action.
- Groundwater use restrictions were implemented both on and off base.

Further information on remedy implementation can be obtained by reviewing Section 4.6 of the third 5-year review (U.S. Navy 2010a), which is included in Appendix A.

4.6.3 Operation, Maintenance, and Monitoring

The OM&M program for OU 8, specified by the OU 8 ROD, consists of fulfilling ROD-mandated monitoring requirements, recovering free product, and managing and maintaining LUCs implemented for the site. LUC management and maintenance are discussed for all of the sites where they apply in Section 4.7. Additional investigations (vapor intrusion and pilot studies) and groundwater modeling were performed to evaluate whether additional phased contingent actions are warranted at the site.

Groundwater Monitoring

Monitoring of groundwater at OU 8 is conducted to assess contaminant distribution, including free product, compliance with RGs, and performance of natural attenuation. Monitoring requirements have been established in the SAPs completed during this review period (U.S. Navy 2009e, 2010i, 2011j, 2013g, and 2014e). Performance and compliance monitoring wells are shown on Figure 4-3 (U.S. Navy 2014e). The groundwater was analyzed for VOCs (EPA Method 8260C) and natural attenuation parameters (hydrogen sulfide, ferrous iron, ethane/ethene, methane, nitrate/nitrite, alkalinity, dissolved organic carbon, chloride/sulfate, and manganese) and tested for field parameters. No additional performance and compliance monitoring well was installed at OU 8 for the groundwater monitoring program during this 5-year review period.

Groundwater monitoring for evaluating natural attenuation performance was initially conducted quarterly, with the frequency decreased to semiannually after November 2001. The planned and actual sampling program for OU 8 over this 5-year review period is summarized in Table 4-5. Currently monitoring at OU 8 is conducted as follows:

- Performance monitoring for MNA is conducted semiannually at seven locations.
- Performance and compliance monitoring for MNA and VOCs is conducted semiannually at seven additional locations.
- Performance and compliance monitoring for MNA and VOCs is conducted annually at one location.
- Compliance monitoring for VOCs is conducted semiannually at four locations.
- Field parameters are monitored annually at five locations.
- Free-product thickness is measured semiannually at 10 locations and annually at 5 additional locations.

Five additional monitoring wells at OU 8 were sampled on a one-time basis during this 5-year review period. Two damaged monitoring wells (28MW01 and 8MW28) have been replaced in the monitoring program with two existing, undamaged wells (8MW24 and MW08, respectively). No additional change was made to the monitoring locations or sampling frequency over this 5-year review period.

As shown on Table 4-5, there was only one deviation from the monitoring plans for OU 8. A sample was not collected from 8MW47 in the spring of 2009, because of the presence of free product in the well. However, it should be noted that this deviation is for the previous 5-year review period. Therefore, the MNA performance monitoring plans have been successfully implemented during this 5-year review period at OU 8.

Free-Product Recovery

Free-product recovery at OU 8 was terminated in 2004, because product recovery rates were below the ROD-specified practical recovery endpoint of 0.5 gallon per month for the last 2.5 years of operation. However, during the Round 15 sampling event in October 2006, free product was observed in well 8MW47. As a result, free-product recovery was restarted in August 2009 and has occurred through April of 2014, except in June 2010, July 2010, January 2011, February 2011, and October 2011 through March 2012. Initially, product recovery was only performed in well 8MW47, but activities were later expanded to include 17 wells located within the PWIA. It should be noted that free product was not recovered from all 17 wells. Free-product recovery activities shifted to measurement only in April 2014 to facilitate LNAPL mobility testing, as recommended in the Round 29 monitoring report (U.S. Navy 2014f). LNAPL mobility tests will be conducted to evaluate whether additional effort to reduce free product underlying the PWIA is warranted.

In accordance with the OU 8 SAPs (U.S. Navy 2009e, 2010i, 2011j, and 2013g), recovery of product was conducted for any well where more than 0.10 foot of floating product was detected. For wells where product is detected above this threshold, product was recovered once a week until the thickness remained below 0.10 foot. Product was recovered either by bailer, wicking sock, or peristaltic pump with tubing. Note that dedicated pumps in wells containing free product were not removed in order to avoid contaminating the pump. A summary of the free-product recovery activities conducted at OU 8 is included in Section 6.

Vapor Intrusion Studies

Concentrations of a number of volatile chemicals in groundwater exceed health-protective screening levels for the vapor intrusion pathway within the PWIA area of OU 8 at NBK Bangor.

Although remediation activities have removed contamination from the top 15 feet of the vadose zone, some residual soil contamination may still be present between 15 feet and the water table (30 feet bgs). Residual free product is also present at some locations. Residual deep soil contamination and free product are both serving as sources of vapors to soil gas, in addition to the dissolved constituents in groundwater within the PWIA. Because groundwater is sufficiently shallow and the vadose zone is permeable and contains possible preferential pathways (buried utility corridors), the vapor intrusion pathway was considered potentially complete for the PWIA buildings. As a result, a vapor intrusion assessment, which included the development of a CSM for vapor intrusion, was performed for the PWIA (U.S. Navy 2012h). The report for this initial assessment identified Buildings 1021 and 1202 as the buildings with the greatest potential for vapor intrusion concerns within the PWIA based on their locations over maximum groundwater concentrations and residual free product, as well as their size and occupancy rates. The vapor intrusion assessment report recommended additional sampling to fill data gaps and verify assumptions made in the modeling and analysis.

Based on the recommendation from the first phase of vapor intrusion assessment, a second phase was performed. During this second phase, additional sampling was performed, including subslab vapor and indoor air samples, and the CSM was updated based on these results and the most recent groundwater monitoring results (U.S. Navy 2014n). Results of both phases of the vapor intrusion assessment are presented in Section 6.4.4.

Pilot Studies

To address the slower-than-anticipated remediation progress of the selected remedy, the increasing benzene concentrations observed during the third 5-year review period, and the return of free product in monitoring wells, the Navy implemented pilot testing to evaluate potential additional contingent remedial actions at OU 8. These pilot studies, conducted during this 5-year review period, consist of the following:

- A Phase I field study to augment the MNA remedy for the 1,2-dichloroethane (DCA) plume in shallow groundwater using biostimulation and bioaugmentation in a treatment barrier to reduce concentrations of chlorinated VOCs migrating in groundwater from source areas in the PWIA (U.S. Navy 2011k)

- A laboratory study to evaluate the potential for bioremediation of benzene in the presence of 1,2-DCA under aerobic and anaerobic conditions using soil and groundwater collected from NBK Bangor (Battelle 2011)

- A Phase II field study to gather additional data to further assess the outcome of the Phase I field study, address uncertainties for full-scale implementation of a treatment barrier, and gather contaminant and physical data to address data gaps identified within the source area (U.S. Navy 2013h and 2013n)

- A bioaugmentation longevity field study to provide an updated evaluation of the effectiveness of the treatment barrier for enhancing the biodegradation of 1,2-DCA and other chlorinated VOCs 21 months after completion of the Phase II study (U.S. Navy 2014g)

Results of these pilot studies are discussed in Section 6.4.4. The Navy also intends to perform further investigation of the vapor intrusion pathway within the OU 8 PWIA following completion of the current pilot testing program. Results of the vapor intrusion investigation will be reported in study-specific reports upon completion of the study and evaluated in the next 5-year review report.

Groundwater Modeling

A three-dimensional model was constructed for OU 8 to evaluate plume stability and better understand the nature and extent of the LNAPL source material. The purpose of the modeling investigation was to address issues and recommendations identified in the third 5-year review and support remedy optimization for OU 8 (U.S. Navy 2014h).

The issues identified in the third 5-year review were as follows:

- Benzene concentrations in the core of the plume at OU 8 exhibited an increasing trend from 2005 to 2009, and free product was once again observed in monitoring wells.

- The OU 8 remedy was taking longer to meet the RAOs than anticipated in the ROD.

The recommendations stated in the third 5-year review were as follows:

- Obtain documentation of COC concentrations remaining in soil following removal actions.
- Assess whether residual COC concentrations in soil are protective of groundwater.
- Update the OU 8 CSM accordingly.

Results of the groundwater modeling are discussed in Section 6.4.4.

4.7 LAND USE CONTROL MANAGEMENT AND MAINTENANCE

LUCs, which include ICs and engineering controls, are part of the remedies for Sites A, F, 16/24, B, E/11, and 10 and OU 8. While no formal IC requirement is in place for Site D, this site has restrictions in place under wetland regulations, which were determined to provide sufficient protection by the OU 6 ROD. Media, ICs, and engineering controls are summarized in Table 4-6 for each site where they apply. ICs and engineering controls are currently managed under the ICMP for NBK Bangor that was updated in 2010 (U.S. Navy 2010c). The functions of the ICMP are as follows:

- Describes the LUC requirements for each site
- Notifies planners and other Navy personnel about the environmental conditions of the property that is encumbered by LUCs
- Limits land use to industrial and outdoor recreational uses in designated areas
- Provides a process for inspection and maintenance of ICs and engineering controls
- Provides tracking information to regulators that the land use remains consistent with restrictions placed upon a site by the RODs

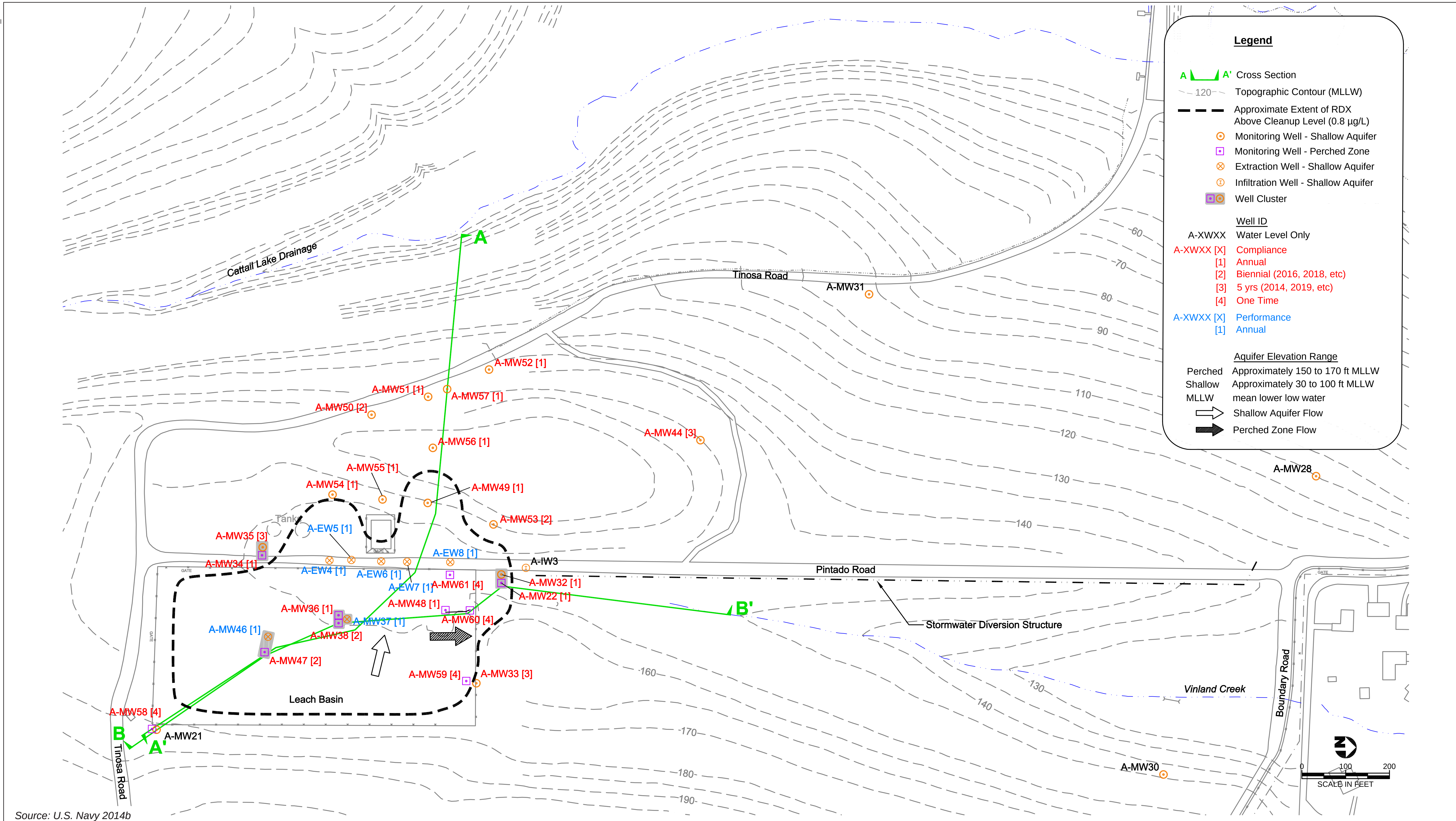
The boundaries of each IC area, as well as the location of engineering controls, are shown on figures in the ICMP. The ICMP established procedures for primary and contingency inspections.

The ICMP also provides a mechanism for updating the ICs as necessary over time, with the concurrence of Ecology and EPA.

The purpose of the annual (primary) inspection is to document site conditions, ensure that the ICs and engineering controls are functioning as intended, and identify potential problems at an early stage, prior to the need for significant repairs. The annual inspection includes visual inspections, review of the excavation permits, and beach profile measurements at Site B. The visual inspection is documented using a checklist provided in the ICMP, field notes, and photographs. The excavation permit review is performed by the NBK Bangor remedial project manager throughout the year and documented in the annual inspection report. The beach profile measurements are performed using methods and procedures specified in the ICMP. Following the primary inspection, any deficiency is noted and corrected through the NBK Bangor work-order process.

Contingency inspections are required in the event that an IC or engineering control might have been compromised either as documented during the annual inspection or as suspected based on the occurrence of a specific event, such as a construction project, natural disaster, or severe weather event. Contingency inspections will occur as recommended in the annual inspection report and will typically occur after required maintenance or repair, or after a construction project, natural disaster, or storm event.

Annual inspections were performed in accordance with the ICMP during October 2009, September 2010, 2011, 2012, and 2013 and reported in annual IC inspection letter reports (U.S. Navy 2010d, 2011c, 2012b, 2013c, and 2014a). Based on the results of the annual inspection, maintenance of engineering controls is conducted on an as-needed basis. Site inspection results are provided in Section 6.



Source: U.S. Navy 2014b

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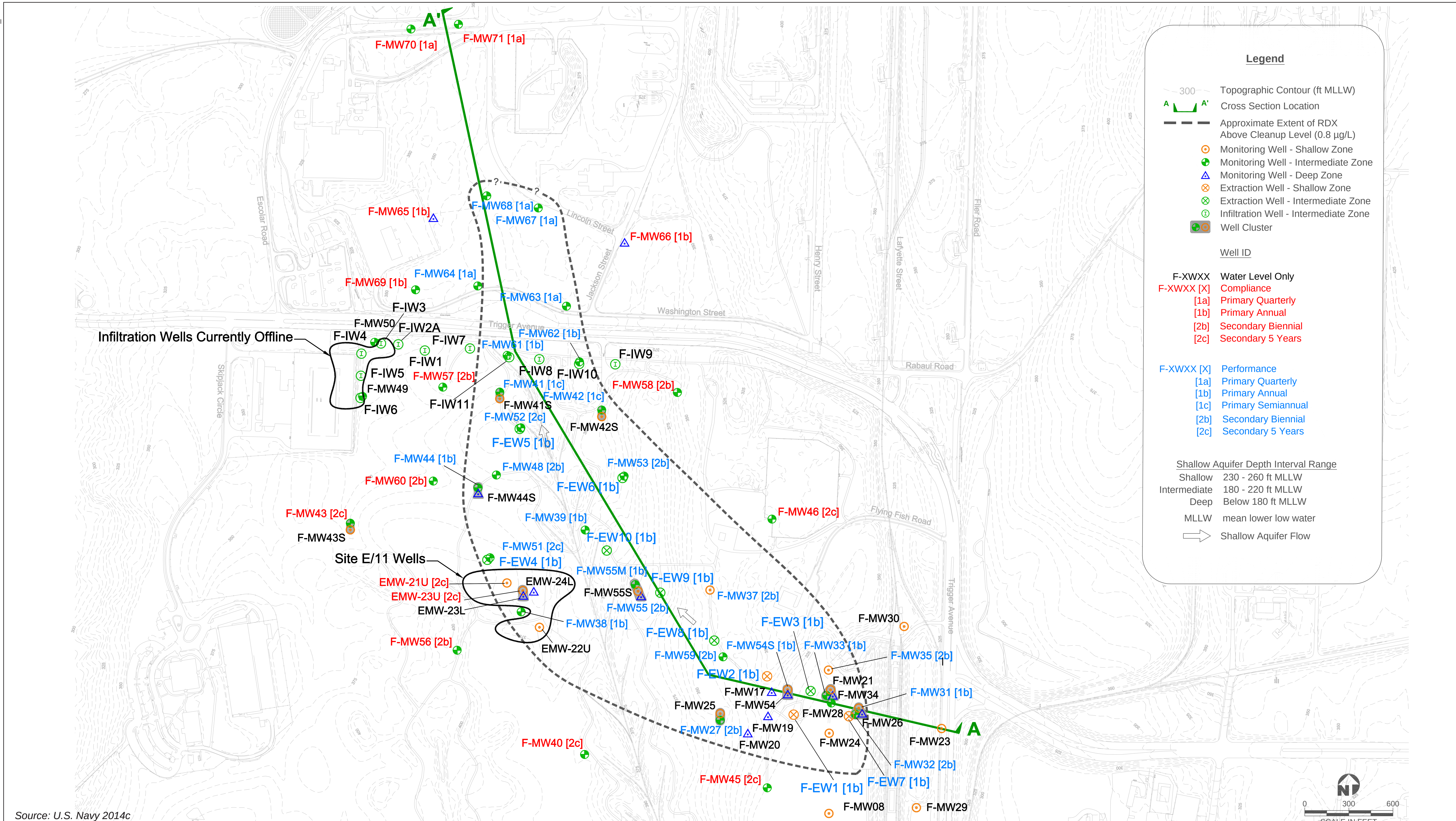
U.S. NAVY	NBK Bangor FOURTH 5-YEAR REVIEW	**Figure 4-1** **Site A Compliance and Performance Monitoring Well Locations**

33762145_01.ai



U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 4-2
OU 2 Site F and OU 7 Site E/11 Compliance and Performance Monitoring Well Locations

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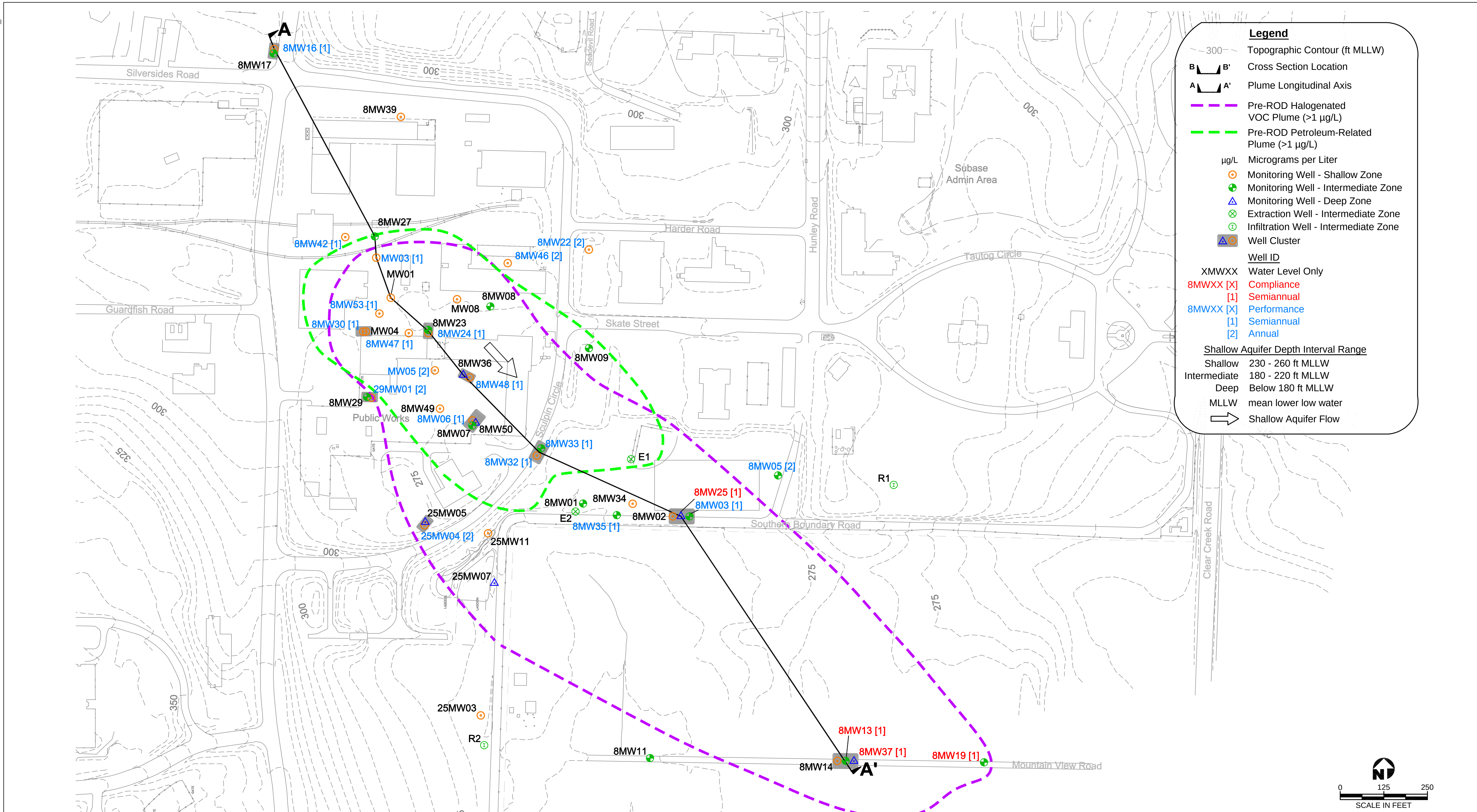


Source: U.S. Navy 2014c

U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 4-3
OU 8 Compliance and Performance Monitoring Well Locations

Table 4-1
Summary of Annual O&M Costs for OUs 1, 2, 3, 6, 7, and 8

Year	OU 1 Site A	OU 2 Site F	OU 3[a] Sites 16/24 and 25	OU 6[b] Site D	OU 7[c] Sites B, E/11, and 10	OU 8 Sites 27, 28, and 29
2009	$548,176	$1,260,242	$0	$0	$69,040	$313,830
2010	$449,291	$866,070	$0	$0	$36,729	$287,247
2011	$302,628	$1,111,789	$0	$0	$277,971	$897,672
2012	$521,070	$1,049,191	$0	$0	$25,346	$904,875
2013	$407,124	$1,122,449	$0	$0	$25,346	$458,796
2014	$450,865	$1,139,994	$0	$0	$65,100	$752,736
Average Annual O&M Cost 2010–2014	$446,526	$1,091,623	$0	$0	$83,255	$602,526
Estimated Annual O&M Cost in ROD	NS	$160,000	NS	$16,500	NS	$196,300

[a]The remedy for Site 16/24 consists of residential land use restrictions. The remedy for Site 25 consists of groundwater monitoring for a 5-year period, which was completed in 1997. Costs associated with the annual institutional controls inspections for this site are included in the costs for OUs 1, 2, 7, and 8.
[b]The remedy for Site D consists of composting of contaminated soil and placement of the remediated material back on the site, followed by short-term monitoring in the shallow aquifer. The remedy was completed in 2000. While no formal IC requirement is in place for this site, restrictions are in place under wetland regulations, and annual institutional controls inspections are conducted at this site. Costs associated with the annual institutional controls inspections for this site are included in the costs for OUs 1, 2, 7, and 8.
[c]O&M costs (long-term monitoring) for Site E/11 is included in the costs for OU 2.

Notes:
NS - not specified in ROD
O&M - operation and maintenance
OU - operable unit
ROD - Record of Decision

Table 4-2
Summary of Remedial Actions at NBK Bangor

OU	Site	Reasonably Anticipated Land Use	Medium	Chemical of Concern	Remediation Goals	Remedial Action Objectives	Remedy Components	Remedy Construction/ Implementation Complete	Ongoing Operation, Maintenance, and Monitoring
1	A	Outdoor recreational	Soil	TNT Total DNT RDX Lead Total phthalates[a] Total PCBs	33 mg/kg 1.5 mg/kg 9.1 mg/kg 250 mg/kg 140 mg/kg 4.3 mg/kg	Reduce the concentrations of contaminants in soil to be protective of human health for an unrestricted site use.	• Excavate soil from the burn area and debris area 2 that exceeds MTCA direct contact cleanup levels for the COCs. • Place soil in a soil washing basin constructed at the Site A burn area. • Place soils exceeding the RG for lead in a separate cell. • Conduct verification monitoring during and/or following the excavation to ensure that all soils exceeding the cleanup levels have been excavated. • Perform soil washing on soils placed in the treatment basin.[b,f] • Treat the leachate with UV oxidation.[c] • Debris area 2 soils that contain lead concentrations above the RG after treatment will be excavated and disposed of at a permitted off-site solid waste facility.[d] • Recycle the treated water back to the leach basin.[e,g] • Abandon the soil washing basin, liner, and soil contents in place by placing a 1-foot soil cover over the treated material, and revegetate to prevent erosion. • Grade site to allow for surface water drainage, including drainage from the abandoned leach basin. • Implement LUCs as specified in the OU 8 ROD.	Yes	• Maintain signs. • Maintain blackberries along the upper portion of the steep ravine containing debris area 2 to restrict access to the ravine. • Maintain excavation permit requirements. • Conduct annual LUC monitoring.
			GW	TNT Total DNT RDX Lead[s] Total phthalates[a] Total PCBs[s]	2.9 µg/L 0.1 µg/L 0.8 µg/L 15 µg/L 4 µg/L 0.1 µg/L	• Reduce concentrations of contaminants in the shallow aquifer groundwater to levels below MTCA groundwater cleanup. • The point of compliance will be throughout the shallow aquifer.	• Immediately abandon all older monitoring wells that may not have competent surface seals. • Concurrent with the soil washing, conduct additional groundwater monitoring and pilot-level treatability studies to support the final design of the groundwater remediation system. • Achieve the groundwater RG for RDX in the most cost-effective manner within a 10-year period of operation.[h] • Treat extracted groundwater using UV oxidation to reduce RDX and reinject into the subsurface to facilitate maximum flushing of the aquifer.[i] • Install an effective effluent polishing process to achieve RGs if the groundwater treatment system proves ineffective. • Monitor and evaluate system effectiveness as a component of operation and maintenance. • Cease system operation when it can be demonstrated that either the cleanup standards have been met, or continued operation is no longer practicable. • Implement LUCs as specified in the OU 8 ROD.	Yes	• Perform regular operation, maintenance, and monitoring of the Site A groundwater treatment system. • Conduct performance and compliance monitoring of groundwater. • Conduct annual LUC monitoring.

Table 4-2 (Continued)
Summary of Remedial Actions at NBK Bangor

OU	Site	Reasonably Anticipated Land Use	Medium	Chemical of Concern	Remediation Goals	Remedial Action Objectives	Remedy Components	Remedy Construction/ Implementation Complete	Ongoing Operation, Maintenance, and Monitoring
			SW	TNT Total DNT RDX Lead[s] Total phthalates[a] Total PCBs[s]	31 µg/L 0.6 µg/L 30 µg/L 1 µg/L 3 µg/L <0.01 µg/L	None	None	NA	None
2	F	• Industrial • Outdoor recreational	Soil	*Direct Contact:* RDX TNT DNT TNB DNB Nitrate Nitrite Manganese *Groundwater Protection:* RDX TNT DNT TNB DNB Nitrate Nitrite Manganese	 9.1 mg/kg 33 mg/kg 1.5 mg/kg 4 mg/kg[p] 8 mg/kg[p] 29,000 mg/kg 8,000 mg/kg 940 mg/kg 1 mg/kg 0.3 mg/kg 0.5 mg/kg 0.25 mg/kg 0.25 mg/kg 1,000 mg/kg 100 mg/kg 940 mg/kg	Eliminate the risk associated with potential direct contact with contaminated soils.	• Excavate contaminated soils to a depth of 15 feet with concentrations above direct contact RGs. • Conduct verification soil sampling during and/or following the excavation to ensure that all soils exceeding the direct contact RGs to a depth of 15 feet have been excavated. • Mix the excavated soils with organic amendment, and place the soil/amendment mixture into a structure designed specifically to house the biological treatment process. • Use the treated soil/amendment mixture to fill and regrade the Site F excavation and overflow ditch to provide a generally flat surface over which to place the infiltration barrier. • Install an infiltration barrier over all soils with concentrations above groundwater protection RGs. • Cover the infiltration barrier with uncontaminated soil both to allow revegetation and provide greater protection against physical and chemical degradation. • Implement LUCs as specified in the OU 8 ROD.	Yes	• Conduct periodic inspection of the infiltration barrier, as needed, to ensure its long-term integrity. • Conduct annual LUC monitoring.
			GW	RDX TNT DNT TNB DNB Nitrate Nitrite Manganese	0.8 µg/L 2.9 µg/L 0.13 µg/L 0.8 µg/L 1.6 µg/L 10,000 µg/L 1,000 µg/L[q] 50 µg/L	Cleanup groundwater contamination in the shallow aquifer to achieve the most cost-effective reduction in overall site risk.	• Abandon groundwater monitoring wells that are no longer of use. • Enhance the Site F interim remedial action groundwater extraction, treatment, and reintroduction system to provide efficient removal of contaminant mass and handle the higher system flow rate. • Treat extracted groundwater by GAC (and ion exchange, if needed for nitrate removal) to meet RGs, and return the treated water to the shallow aquifer via reintroduction wells. • Monitor and evaluate system effectiveness as a component of operation and maintenance. • Initiate formal review of the groundwater system operations after one of the following performance evaluation criteria is met: - Groundwater RGs are achieved for all constituents of concern in the Site F shallow aquifer. - No statistically significant change in constituent concentrations is observed in monitoring wells with concentrations above RGs after reasonable system modifications have been implemented.	Yes	• Perform regular operation, maintenance, and monitoring of the Site F groundwater treatment system. • Conduct performance and compliance monitoring of groundwater. • Conduct annual LUC monitoring.

Table 4-2 (Continued)
Summary of Remedial Actions at NBK Bangor

OU	Site	Reasonably Anticipated Land Use	Medium	Chemical of Concern	Remediation Goals	Remedial Action Objectives	Remedy Components	Remedy Construction/ Implementation Complete	Ongoing Operation, Maintenance, and Monitoring
							- The rates of concentration decline in the Site F shallow aquifer indicate that the cost of continued system operation is substantial and disproportionate relative to the incremental degree of environmental protection being achieved. • Implement LUCs as specified in the OU 8 ROD.		
			SW	RDX TNT DNT TNB DNB Nitrate Nitrite Manganese	260 µg/L 40 µg/L 300 µg/L 80 µg/L NA[r] 10,000 µg/L NA NA[r]	None	None	NA	None
3	16/24	Industrial	Soil	Antimony Arsenic Beryllium	32 mg/kg 20 mg/kg 0.23 mg/kg	None established[o]	• Implement institutional controls to prevent residential use. • Attach deed restrictions to any future property transfer.	Yes	Conduct annual LUC monitoring.
	25	Industrial	GW	Cadmium Manganese	8 µg/L 50 µg/L	None established[o]	Perform 5 years of semiannual groundwater monitoring to verify that concentrations of chemicals in the shallow aquifer are consistent with naturally occurring background concentrations.	Yes	None
6	D	Outdoor recreational	Soil	*MTCA Method B:* TNT DNT *MTCA Method C:* DNT	 33.3 mg/kg 1.47 mg/kg[j] 58.8 mg/kg[k]	Prevent unacceptable current and potential future risks to human health and the environment posed by ingestion and dermal contact with TNT and DNT in Site D soil.	• Excavate and stockpile all soils at Site D containing TNT concentrations above the MTCA Method B residential soil cleanup level. • Outside of the wetland boundary, excavate and stockpile soils containing DNT concentrations above the MTCA Method B residential soil cleanup level. • Within the wetland boundary, excavate and stockpile soils containing DNT concentrations above the MTCA Method C soil cleanup level. • Treat the excavated soils by composting to achieve MTCA Method B residential soil cleanup levels for nine designated ordnance compounds. • Backfill the excavations with the treated soils, covering them with clean soils and revegetating the affected areas with native vegetation. • Return the treatment area and any access roads to natural contours, and revegetate them with native vegetation. • Conduct a review of the soil remediation data to evaluate the effectiveness of the remedy within 5 years of remedy commencement.	Yes	None
			SW	Arsenic Copper Mercury Thallium Zinc	0.0842 µg/L 6.1 µg/L[m] 0.012 µg/L (total) 1.56 µg/L (total) 57 µg/L	Prevent migration of metals from Site D surface water at concentrations that may adversely affect ecological receptors in downstream surface water.	• Conduct surface water sampling to confirm that RGs are not exceeded in downgradient surface water due to transport of contaminants from Site D following soil remediation. • Consider response actions, including active remediation, if monitoring identifies exceedances of RGs in downgradient surface water.	Yes	None

Table 4-2 (Continued)
Summary of Remedial Actions at NBK Bangor

OU	Site	Reasonably Anticipated Land Use	Medium	Chemical of Concern	Remediation Goals	Remedial Action Objectives	Remedy Components	Remedy Construction/ Implementation Complete	Ongoing Operation, Maintenance, and Monitoring
			GW	Acetone Chlorobenzene DBCM Methylene chloride Tetrachloroethene Toluene Xylenes	800 µg/L 100 µg/L 100 µg/L 5.83 µg/L 0.858 µg/L 1,000 µg/L 10,000 µg/L	Prevent potential future human health risks that may be caused by ingestion or inhalation of contaminants in shallow aquifer groundwater.	• Conduct short-term groundwater monitoring for VOCs in the shallow aquifer to verify exceedances of health-based criteria. • Perform further characterization of the shallow aquifer to determine the nature and extent of contamination, if confirmed by the short-term monitoring. • Consider active remediation of the shallow groundwater if exceedances of RGs are confirmed by monitoring. • Conduct a review of the short-term monitoring data to evaluate the effectiveness of the remedy within 5 years of remedy commencement.	Yes	None
7	B	Outdoor recreational	Soil	PAHs PCBs Arsenic	1 ppm (1.0 mg/kg) 1 ppm (1.0 mg/kg) 20 ppm (20 mg/kg)	Prevent dermal contact and ingestion of shallow and subsurface soil containing PAH and PCB concentrations above the state cleanup level of 1 ppm for soil to 15 feet bgs and arsenic concentrations above 20 ppm.	• Cover the site with a soil cover. • Vegetate the soil cover. • Construct swales to control or reduce infiltration of rainwater. • Maintain the soil cover to prevent future contact with the contaminated soil. • Install signs informing visitors of restricted site use. • Implement LUCs as specified in the OU 8 ROD.	Yes	• Maintain soil cover and shoreline stabilization measures as needed. • Conduct annual LUC monitoring.
			GW	None established	None established	Confirm through monitoring of Hood Canal sediments and clam tissue that groundwater discharge from Floral Point into Hood Canal is not negatively affecting the sediments or clam tissues.	Conduct a 5-year monitoring program of marine sediments and clam tissue to be included under Site 26 monitoring.	Yes	None
7	E/11	Outdoor recreational	Soil	DDT	2.94 ppm (2.94 mg/kg)	Prevent direct contact with and ingestion of stockpiled soil and underlying soil down to 15 feet bgs that contains DDT in concentrations above the state cleanup level of 2.94 ppm.	Transport and dispose of approximately 400 cubic yards of contaminated stockpiled soil to a Resource Conservation and Recovery Act-approved landfill.	Yes	None
			GW	PGDN	0.0002 ppm (0.2 µg/L)	Prevent ingestion of groundwater containing Otto fuel concentrations above 0.0002 ppm.[l] PGDN is one of several chemical compounds in Otto fuel and is used as the indicator chemical.	• Groundwater at Site E/11 is currently being treated under OU 2. • Monitor groundwater for ordnance compounds and Otto fuel. • Conduct a 5-year evaluation of the effectiveness of the OU 2 remediation system in removing Otto fuel. • Implement groundwater use restrictions.	Yes	• Conduct groundwater monitoring as part of OU 2 (Site F) monitoring. • Conduct annual LUC monitoring.
7	10	Industrial	GW	TPH	1 ppm (1,000 µg/L)	Prevent ingestion of groundwater containing TPH concentrations above the state cleanup level of 1 ppm throughout the aquifer.	• Perform long-term groundwater monitoring • Implement groundwater use restrictions	Yes	• None
			Soil	Arsenic Cadmium Lead PCBs	20 mg/kg 2 mg/kg 250 mg/kg 1 mg/kg	None established.	• Maintain the existing asphalt pavement to protect human health and the environment. • Establish asphalt capping as an extended remedy for an area of site soil found to contain arsenic, lead, cadmium, and PCBs at concentrations above the stated RGs.[n]	Yes	• Maintain asphalt soil cover. • Conduct annual LUC monitoring.

Table 4-2 (Continued)
Summary of Remedial Actions at NBK Bangor

OU	Site	Reasonably Anticipated Land Use	Medium	Chemical of Concern	Remediation Goals	Remedial Action Objectives	Remedy Components	Remedy Construction/ Implementation Complete	Ongoing Operation, Maintenance, and Monitoring
8		• Industrial on base • Residential off base	GW	Benzene 1,2-DCA 1,1-DCE 1,2-EDB Toluene	5 µg/L 5 µg/L 0.0729 µg/L 0.000515 µg/L 1,000 µg/L	• Minimize the migration of VOCs from LNAPL beneath the PWIA into groundwater at concentrations that would cause adverse noncancer health effects or unacceptable cancer risks. • Minimize human exposure to COCs in sitewide groundwater that would result in adverse noncancer health effects or unacceptable cancer risks.	• Monitor for natural attenuation of COCs in groundwater. • Consider phased contingent actions if MNA is shown to be insufficient, including the possible use of oxidation reduction potential manipulation, pumping and treating groundwater using the existing system, or new technologies. • Remove LNAPL using a free-product recovery system until the recovery rate reaches the practicable endpoint of an average of 0.5 gallon per month for a 1-year period. • Establish institutional controls for OU 8, both on and off base, to prevent the use and consumption of untreated groundwater.	Yes	• Conduct performance and compliance monitoring of groundwater. • Free-product recovery • Conduct annual LUC monitoring.

[a]The cleanup level for total phthalates is based on bis(2-ethylhexyl)phthalate, which is the most toxic of the phthalates detected at OU 1 (Site A). Although phthalates were identified as COCs in the ROD, they were not a risk driver for the site and have not been included in the long-term monitoring at the site.
[b]To improve permeability of the soil in the soil washing basin, ESD No. 1 prescribed the addition of a sand amendment in a 1:1 volume ratio to the soil and calcium chloride up to 40 mg/L to the wash water.
[c]Because of improved permeability of the soil in the soil washing basin, ESD No. 1 prescribed a change from UV oxidation to GAC for the treatment of soil washing leachate to reduce operational costs.
[d]ESD No. 1 prescribed that the limited volume of debris area 2 soil containing lead concentrations above RG after treatment can be left in place, because excavating the soil poses a greater risk to human health and the environment.
[d]To ensure that leachate releases from the treatment basin after basin closure will be protective of human health and the environment, ESD No. 1 prescribed the development and implementation of a leachate management plan for the closed leach basin.
[f]ESD No. 2 prescribed the use of composting to complete remediation of the leach basin soils.
[g]ESD No. 3 prescribed that the leachate from the closed soil washing basin was acceptable for discharge to surface water without treatment.
[h]ESD No. 1 prescribed that treating groundwater begin by July 1, 1996, rather than 1 year after soil treatment is complete.
[i]ESD No. 2 prescribed a change from UV oxidation to GAC for the treatment of extracted groundwater to reduce operational costs.
[j]DNT cleanup level applied to soils located outside the wetlands boundary
[k]DNT cleanup level applied to soils located inside the wetlands boundary
[l]There is no cleanup value for Otto fuel. The calculated preliminary remediation cleanup goal is 0.000038 ppm. However, the method detection limit for Otto fuel is 0.0002 ppm and in accordance with state regulations is used as the cleanup goal.
[m]Based on an average hardness of 55 mg/kg calcium carbonate
[n]The Site 10 remedy was amended in 2008 through a memorandum to the administrative file, which established asphalt capping as a component of the remedy for an area of Site 10 soil that was found to contain arsenic, lead, cadmium, and PCBs at concentrations above the MTCA Method A soil cleanup level for unrestricted land use.
[o]The baseline risk assessment showed that risks at Sites 16/24 and 25 were within EPA's acceptable risk range and that no remedial action was necessary. However, because the exceedances of MTCA cleanup levels in surface soil at Sites 16/24 and groundwater at Site 25, LUCs have been implemented at Sites 16/24 and groundwater monitoring was performed at Site 25.
[p]The ROD presented inconsistent RGs for TNB and DNB. The values presented in this table are from Table 15 of the ROD. A value of 1.1 mg/kg was presented in the text on page 15 of the ROD for TNB and a value of 2.1 mg/kg for DNB.
[q]The ROD presented inconsistent RGs for nitrite. The value presented in this table is from Table 15 of the ROD. A value of 490 µg/L was presented in the text on page 16 of the ROD.
[r]The ROD presented inconsistent RGs for DNB and manganese. The values in this table are from Table 15 of the ROD. A value of 10 µg/L was presented in the text on page 16 of the ROD for DNB and a value of 1,500 µg/L for manganese.
[s]Lead and PCBs were included on the summary of COCs in the ROD. However, they were not risk drivers at the site, and monitoring for these chemicals has not been included in the long-term monitoring at Site A.

Notes:
bgs - below ground surface
COC - chemicals of concern
DCA - dichloroethane
DCE - dichloroethene
DBCM - dibromo(chloro)methane
DDT - dichlorodiphenyltrichloroethane
DNB - 1,3-dinitrobenzene
DNT - 2,4- and 2,6-dinitrotoluene
EDB - dibromoethane

Table 4-2 (Continued)
Summary of Remedial Actions at NBK Bangor

EPA - U.S. Environmental Protection Agency
GAC - granular activated carbon
GW - groundwater
LNAPL - light non-aqueous phase liquid
LUC - land use control
µg/L - microgram per liter
mg/L - milligram per liter
mg/kg - milligrams per kilogram
MNA - monitored natural attenuation
MTCA - Model Toxics Control Act
NA - not applicable
OU - operable unit
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PGDN - propylene glycol dinitrate
ppm - parts per million
PWIA - Public Works Industrial Area
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RG - remediation goal
ROD - record of decision
SW - surface water
TNB - 1,3,5-trinitrobenzene
TNT - trinitrotoluene
TPH - total petroleum hydrocarbon
UV - ultraviolet
VOC - volatile organic compound

Table 4-3
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Site A

Well ID[a]	Planned Sampling Frequency				Planned Analytes		Actual					
	2009 to 2010	8/2010 to 4/2011 and 8/2011 to 4/2012	8/2012 to 4/2013	7/2013 to 4/2014	Natural Attenuation Parameters	Ordnance Compounds	Sampled 2009	Sampled 2010	Sampled 2011	Sampled 2012	Sampled 2013	Sampled 2014
Compliance												
A-MW22[b]	Biennial	Biennial	Annual	Annual	X	X	NS[e]	NP	NS[e]	X	X	X
A-MW32	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-MW34[b,g]	Biennial	Biennial	Annual	Annual	X	X	X	NP	NS[e]	X	X	X
A-MW36[b]	WL only	WL only	WL only	Annual	X	X	WL only	WL only	WL only	X	X	**NS[f]**
A-MW38[b,g]	Biennial	Biennial	Annual	Annual	X	X	NS[e]	NP	X	X	X	**NS[f]**
A-MW44	Biennial	Biennial[j]	Every 5 years	Every 5 years	X	X	X	NP	NP[j]	NP	NP	X
A-MW47[b,g]	Biennial	Biennial	Annual	Annual	X	X	NS[e]	NP	X	X	X	X
A-MW48[b,g]	Biennial	Biennial	Annual	Annual	X	X	X	NP	NS[e]	X	X	X
A-MW49	Annual	Quarterly	Quarterly	Annual	X	X	X	XX[d]	XXXX	XXXX	XXX[i]	X
A-MW50	Biennial	Biennial[k]	Biennial	Biennial	X	X	X	NP	NP[k]	X	NP	X
A-MW51	Annual	Quarterly	Quarterly	Annual	X	X	X	XX[d]	XXXX	XXXX	XX	X
A-MW52	Annual	Annual	Annual	Annual	X	X	X	X	X	X	NP[l]	X
A-MW53	Annual	WL only	Biennial	Biennial	X	X	X	**X[c]**	WL only	X	NP	X
A-MW54	Annual	Annual	Annual	Annual	X	X	X	X	X	X	NP[l]	X
A-MW55	Annual	Annual	Annual	Annual	X	X	X	X	X	X	NP[l]	X
A-MW56	Annual	Quarterly	Quarterly	Annual	X	X	X	XX[d]	XXXX	XXXX	XXX[i]	X
A-MW57	Annual	Quarterly	Quarterly	Annual	X	X	X	XX[d]	XXXX	XXXX	XX	X
A-MW58[b]	NA	NA	NA	One-time	X	X	NA	NA	NA	NA	NA	X
A-MW59[b]	NA	NA	NA	One-time	X	X	NA	NA	NA	NA	NA	X
A-MW60[b]	NA	NA	NA	One-time	X	X	NA	NA	NA	NA	NA	**NS[f]**
A-MW61[b]	NA	NA	NA	One-time	X	X	NA	NA	NA	NA	NA	X
Performance												
A-EW4	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-EW5	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-EW6	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-EW7	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-EW8	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-MW33	Every 5 years	Every 5 years	Every 5 years	Every 5 years	X	X	X	NP	NP	NP	NP	X
A-MW35[h]	Every 5 years	Every 5 years	Every 5 years	Every 5 years	X	X	X	NP	NP	NP	NP	X
A-MW37	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X
A-MW46	Annual	Annual	Annual	Annual	X	X	X	X	X	X	X	X

Table 4-3 (Continued)
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Site A

[a]A-MW21, A-MW28, A-MW30, A-MW31, and A-IW3 planned water level collection only, and are not included on this table.
[b]These wells are screened in the perched zone.
[c]Sampled following U.S. Environmental Protection Agency request
[d]Sampled only twice because of transition from annual to quarterly sampling in August 2010
[e]Only planned to sample a maximum of two perched zone wells based on the presence of water. The sampling was to be conducted in the following order until sampling was completed in two wells: A-MW48, A-MW47, A-MW38, A-MW22, and A-MW34
[f]Well not sampled because of low potentiometric surface in the perched zone, resulting in an inadequate volume of groundwater in the well
[g]Considered a performance monitoring well through 2011
[h]Considered a compliance monitoring well through 2013
[i]An additional round of sampling performed in this well in August 2013 after restart of the treatment system
[j]Sampling frequency changed from biennially to once every 5 years in 2011.
[k]Biennial sampling of A-MW50 delayed until 2012.
[l]Annual sampling changed from summer to spring, with the first annual spring event performed in 2014.

Notes:
Bold entry represents more frequent sampling than planned.
Bold and yellow highlighted entry represents less frequent sampling than planned.
NA - not applicable (wells did not exist until August 2013.)
NP - not planned
NS - not sampled
WL - water level
X - sampled as planned

Table 4-4
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Sites F and E/11

Well ID	Evaluation Function	Planned Sampling Frequency		Planned Analytes			Actual					
		2009-2014	Change and Year	Otto Fuel	Nitrate/ Nitrite	Ordnance Analytes[a]	Sampled 2009	Sampled 2010	Sampled 2011	Sampled 2012	Sampled 2013	Sampled 2014
Site F Compliance												
F-MW40	Compliance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW42[e]	Compliance	Semiannual			X	X	XX	XX	XX	XX	XX	X
F-MW43	Compliance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW45	Compliance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW46	Compliance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW56	Compliance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW57	Compliance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW58	Compliance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW60	Compliance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW65	Compliance	Annual			X	X	X	X	X	X	X	X
F-MW66	Compliance	Quarterly/ annual	Annual 2011		X	X	XXXX	XXXX	XX	X	X	X
F-MW69	Compliance	Quarterly/ annual	Annual 2011		X	X	XXXX	XXXX	XX	X	X	X
F-MW70	Compliance	NP/quarterly	Quarterly 2011		X	X	NP	NP	XXX[b]	XXXX	XXXX	XX[c]
F-MW71	Compliance	NP/quarterly	Quarterly 2011		X	X	NP	NP	XXX[b]	XXXX	XXXX	XX[c]
Site F Performance[g]												
F-MW27	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW31	Performance	Annual			X	X	X	X	X	X	X	X
F-MW32	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW33	Performance	Annual			X	X	X	X	X	X	X	**NS[d]**
F-MW35	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW37	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW38	Performance	Annual			X	X	X	X	X	X	X	X
F-MW39	Performance	Annual			X	X	X	X	X	X	X	X
F-MW41	Performance	Semiannual			X	X	XX	XX	XX	XX	XX	X[c]
F-MW44	Performance	Annual			X	X	X	X	X	X	X	X
F-MW48	Performance	Biennial			X	X	X	NP	X	NP	X	NP

Table 4-4 (Continued)
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Sites F and E/11

		Planned Sampling Frequency		**Planned Analytes**			**Actual**					
Well ID	**Evaluation Function**	**2009-2014**	**Change and Year**	**Otto Fuel**	**Nitrate/ Nitrite**	**Ordnance Analytes[a]**	**Sampled 2009**	**Sampled 2010**	**Sampled 2011**	**Sampled 2012**	**Sampled 2013**	**Sampled 2014**
Site F Performance (continued)												
F-MW51	Performance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW52	Performance	Every 5 years			X	X	X	NP	NP	NP	NP	X
F-MW53	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW54S	Performance	Annual			X	X	X	X	X	X	X	X
F-MW55	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW55M	Performance	Annual			X	X	X	X	X	X	X	**NS[d]**
F-MW59	Performance	Biennial			X	X	X	NP	X	NP	X	NP
F-MW61	Performance	Annual			X	X	X	X	X	X	X	X
F-MW62	Performance	Annual			X	X	X	X	X	X	X	X
F-MW63[f]	Performance	Quarterly			X	X	XXXX	XXXX	XXXX	XXXX	XXXX	XX[c]
F-MW64[f]	Performance	Quarterly			X	X	XXXX	XXXX	XXXX	XXXX	XXXX	XX[c]
F-MW67[f]	Performance	Quarterly			X	X	XXXX	XXXX	XXXX	XXXX	XXXX	XX[c]
F-MW68[f]	Performance	Quarterly			X	X	XXXX	XXXX	XXXX	XXXX	XXXX	XX[c]
F-EW1	Performance (extraction well)	Annual			X	X	X	X	X	X	X**X**	X
F-EW2	Performance (extraction well)	Annual			X	X	X	X	X	X	X**X**	X
F-EW3	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW4	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW5	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW6	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW7	Performance (extraction well)	Annual			X	X	X	X	X	X	X**X**	X

Table 4-4 (Continued)
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Sites F and E/11

Well ID	Evaluation Function	Planned Sampling Frequency		Planned Analytes			Actual					
		2009-2014	Change and Year	Otto Fuel	Nitrate/ Nitrite	Ordnance Analytes[a]	Sampled 2009	Sampled 2010	Sampled 2011	Sampled 2012	Sampled 2013	Sampled 2014
Site F Performance (continued)												
F-EW8	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW9	Performance (extraction well)	Annual			X	X	X	X	X	X	X	X
F-EW10	Performance (extraction well)	Annual			X	X	X	X	X	X	XX	X
Site E/11												
EMW-21U	Compliance	Annual/ 5 years	5 years 2012	X	X		X	X	X	NS	NS	X
EMW-23U	Compliance	Annual/ 5 years	5 years 2012	X	X		X	X	X	NS	NS	X

[a]Ordnance analytes for Site F are as follows: RDX, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-TNB, 1,3-DNB, MNX, DNX, TNX, and nitrobenzene. Note that 1,3,5-TNB and 1,3-DNB together with the results for seven additional ordnance analytes (HMX, tetryl, 2-NT, 3-NT, 4-NT, 2-amino-4,6-DNT, and 4-amino-2,6-DNT) are reported by the laboratory but not included in the monitoring reports.
[b] Initiated monitoring in this well in 2011 after the first quarterly sampling event
[c]This 5-year review only includes sampling through April 2014. Additional sampling is to be performed in 2014 after this cut-off date.
[d]This well was not sampled in April 2014, because the well was used for a treatability study that involved injection of water spiked with RDX at high concentrations.
[e]This well was considered a performance monitoring well through 2012.
[f]This well was considered a compliance monitoring well through 2011.
[g]Wells F-MW08, F-MW17, F-MW19, F-MW20, F-MW21, F-MW23, F-MW24, F-MW25, F-MW26, F-MW28, F-MW29, F-MW30, F-MW34, F-MW41S, F-MW42S, F-MW43S, F-MW44S, F-MW49, F-MW50, F-MW54, F-IW1, F-IW2A, F-IW3, F-IW4, F-IW5, F-IW6, F-IW7, F-IW8, F-IW9, F-IW10, F-IW11, EMW-22U, EMW-23L, and EMW-24L planned water level only and are not included in this table.

Table 4-4 (Continued)
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for Sites F and E/11

Notes:
Bold entry represents more frequent sampling than planned.
Bold and highlighted in yellow entry represents less frequent sampling than planned.
DNB - 1,3-dinitrobenzene
DNT - dinitrotoluene
DNX - hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
HMX - octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
MNX - hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NT - nitrotoluene
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNB -1,3,5-trinitrobenzene
TNT - trinitrotoluene
TNX - hexahydro-1,3,5-trinitroso-1,3,5-triazine
NP - not planned
NS - not sampled
X - sampled as planned; each X represents one sampling event.

Table 4-5
Summary of 2009 to 2014 Planned Groundwater Monitoring Program Versus Actual for OU 8

	Planned Sampling Frequency		Planned Analytes				Actual					
Well ID	2009-2014	Change and Year	Product Thickness	Field Parameters	VOCs[a]	MNA[b]	Sampled 2009	Sampled 2010	Sampled 2011	Sampled 2012	Sampled 2013	Sampled 2014
Performance[j,k]												
8MW16	Semiannual		X	X		X	XX	XX	XX	XX	XX[d]	X
MW03	Semiannual		X	X		X	XX	XX	XX	XX	XX[d]	X
8MW53	Semiannual		X	X		X	XX	XX	XX	XX	XX[d]	X
8MW30	Semiannual		X	X		X	XX	XX	XX	XX	XX[d]	X
28MW01	Semiannual	Obstruction discovered in 2009	X	X		X	X	NP	NP	NP	NP	NP
8MW24	Semiannual	Replaces 28MW01 in fall 2009	X	X		X	X[c]	XX	XX	XX	XX[d]	X
8MW48	Semiannual		X	X		X	XX	XX	XX	XX[e]	XX[d]	X
8MW32	Semiannual		X	X		X	XX	XX	XX	XX[e,f]	XX[d]	X
Performance and Compliance												
MW05	Annual		X	X	X	X	X	X	X	X	X	NP[g]
8MW42	Semiannual		X	X	X	X	XX	XX	XX	XX	XX	X
8MW28	Semiannual	Obstruction discovered in 2010		X	X	X	XX	X	NP	NP	NP	NP
MW08	Semiannual	Replaces 8MW28 in fall 2010		X	X	X	NP	X[h]	XX	XX	XX	X
8MW47	Semiannual		X	X	X	X	**X**[i]	XX	XX	XX	XX	X
8MW06	Semiannual		X	X	X	X	XX	XX	XX	XX	XX	X
8MW33	Semiannual			X	X	X	XX	XX	XX	XX	XX	X
8MW35	Semiannual			X	X	X	XX	XX	XX	XX	XX	X
8MW03	Semiannual			X	X	X	XX	XX	XX	XX	XX	X
Compliance												
8MW25	Semiannual			X	X		XX	XX	XX	XX	XX	X
8MW13	Semiannual			X	X		XX	XX	XX	XX	XX	X
8MW37	Semiannual			X	X		XX	XX	XX	XX	XX	X
8MW19	Semiannual			X	X		XX	XX	XX	XX	XX	X
One Time												
8MW49	One time		X	X	X	X	NP	NP	NP	NP	X[d]	NP
25MW03	One time		X	X	X		NP	NP	NP	NP	X[d]	NP
25MW04	One time		X	X	X		NP	NP	NP	NP	NP	NP
8MW02	One time			X	X		NP	NP	NP	X[f]	NP	NP
8MW14	One time			X	X		NP	NP	NP	X[f]	NP	NP
8MW34	One time			X	X		NP	NP	NP	X[f]	NP	NP

[a]VOCs include benzene, toluene, ethylbenzene, 1,2-dibromoethane , 1,2-dichloroethane, 1,1-dichlorothene, 1,1,2-trichloroethane, and 1,2-dichloropropane.
[b]MNA includes hydrogen sulfide, ferrous iron, ethane/ethane, methane, nitrate/nitrite, alkalinity, dissolved organic carbon, chloride/sulfate, and dissolved manganese.
[c]Well 8MW24 was sampled in lieu of 28MW01 due to an obstruction in the latter well that was observed in October 2009. VOCs were analyzed in the sample collected during the fall 2009 to provide additional plume information.
[d]The Navy elected to sample this location for VOCs to assess the distribution of benzene, toluene, ethylbenzene, and xylenes beyond MNA requirements.
[e]The Navy elected to sample this location for VOCs to provide additional information this year only to support the pilot study and assess the distribution of petroleum VOCs.
[f]The Navy requested a one-time sampling for field parameters and VOCs to assess current conditions for VOCs in the shallow portion of the aquifer downgradient of the source area.
[g]This well is sampled annually. An additional 2014 sampling event is to be conducted in the fall after this 5-year review period.
[h]Well MW08 was sampled in lieu of 8MW28 because of high water temperatures and steam encountered in well 8MW28 during spring 2010 that has caused the well casing to fail, producing an obstruction.
[i]Well 8MW47 was not sampled in the spring because of the presence of free product in the well, and in the fall it was sampled after free product was removed from the well and the sampling crew confirmed no measurable thickness of free product was present.
[j]Five wells considered to be performance monitoring wells are not included on this table (8MW22, 8MW46, 29MW01, 25MW04, and 8MW05). Only field parameters and product thicknesses are measured in these wells on an annual basis, except product thickness is not measured at 8MW05.
[k]Wells 8MW08, 8MW09, 8MW17, 8MW27, 8MW29, 8MW49, 25MW05, 25MW07, and MW04 planned water level only and are not included in this table.

Notes:
Bold and highlighted in yellow entry represents less frequent sampling than planned.
MNA - monitored natural attenuation
NP - not planned
VOC - volatile organic compound
X - Sampled as planned; each X represents one sampling event.

Table 4-6
Summary of Institutional and Engineering Controls by Operable Unit

Site Name (Associated OU)	Media	Institutional Control	Engineering Control
Site A burn area (OU 1)	Groundwater	• Groundwater use prohibition • Land use restrictions (land uses must be consistent with remedy) • Excavation permits and construction project review required	• Leach basin liner • Treatment system protection • Fence
Site A Debris area 2 (OU 1)	Soil	• Land use restrictions (outdoor recreational only) • Excavation permits and construction project review required • Ensure that all disturbed or excavated soils at or from the site are properly categorized and disposed of and that workers are protected during any such disturbance or excavation	• Signs • Thorny vegetation barrier
Site F (OU 2)	Groundwater and soil beneath infiltration barrier	• Groundwater use prohibition • Land use restrictions (land uses must be consistent with remedy) • Excavation permits and construction project review required • Notify Ecology and EPA prior to any development or redevelopment of the site to ensure the integrity of the remedy	• Infiltration barrier • Treatment system protection
Site 16/24 (OU 3)	Soil	• Land use restriction (industrial only) • Excavation permits and construction project review required • Ensure that all disturbed or excavated soils at or from the site are properly categorized and disposed of and that workers are protected during any such disturbance or excavation	None

Table 4-6 (Continued)
Summary of Institutional and Engineering Controls by Operable Unit

Site Name (Associated OU)	Media	Institutional Control	Engineering Control
Site D (OU 6)[a]	Soil/sediment within wetland area	• Excavation permits and construction project review required • Ensure that all applicable permitting for construction in wetland obtained • Ensure that all disturbed or excavated soils at or from the site are properly categorized and disposed of and that workers are protected during any such disturbance or excavation • Notify Ecology, EPA, and the U.S. Army Corps of Engineers prior to any development or redevelopment of the site to ensure wetland regulations are followed	None
Site B (OU 7)	Soil	• Land use restriction (outdoor recreational use only) • Excavation permits and construction project review required • Notify Ecology and EPA prior to any development or redevelopment of the site to ensure the integrity of the remedy	• Vegetative soil cover • Soft bank erosion protection • Signs • Stormwater drainage system
Site E/11 (OU 7)	Groundwater	Covered as part of Site F	Covered as part of Site F
Site 10 (OU 7)	Groundwater and soil	• Groundwater use prohibition • Land use restriction (industrial only) • Excavation permits and construction project review required	• Infiltration barrier • Slope erosion control system

Table 4-6 (Continued)
Summary of Institutional and Engineering Controls by Operable Unit

Site Name (Associated OU)	Media	Institutional Control	Engineering Control
Public Works Industrial Area (OU 8 on base)	Groundwater and soil	• Groundwater use prohibition • Land use restrictions (land uses must be consistent with remedy and land use restrictions below 15 feet to water table to prevent exposure to petroleum-contaminated soil) • Excavation permits and construction project review required	None
Mountain View neighborhood (OU 8 off base)	Groundwater	Groundwater use prohibition	None

[a]No formal institutional control for this OU. However, wetland laws are used to restrict activities within the wetland area, and annual inspections are performed.

Notes:
Ecology - Washington State Department of Ecology
EPA - U.S. Environmental Protection Agency
OU - operable unit

5.0 PROGRESS SINCE LAST 5-YEAR REVIEW

This section summarizes the status of recommendations and follow-up actions from the last 5-year review, the results of implemented actions, including whether they achieved the intended purpose, and the status of any other prior issues (Table 5-1). The Navy has completed most of the actions recommended by the last 5-year review. Outstanding issues include the ongoing evaluation of remedy optimization at Sites A and F and OU 8.

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
OUs 1 and 2			
Update the labeling of valves, treatment equipment, and other components of the Sites A and F treatment systems to reduce the potential for error in system operation.	February 26, 2013	Additional labeling has been added to Site A to provide clarification, including labeling of valves within Site A extraction well monuments for compressed air and water discharge lines.	U.S. Navy 2013i
Site A: If pump and treat will continue in the long term and if it is feasible, consider including individual extraction well line flow totalizers to enhance functionality assessments.	July 23, 2009	Measurements of discharge rates are being conducted by bucket tests on a quarterly basis. At present, this provides sufficient detail for functionality assessments.	U.S. Navy 2010j
Title the annual reports that include both monitoring and treatment system operation data "*year* Operations, Maintenance, and Monitoring Report."	June 23, 2010	Reports have been retitled as "(year) Annual LTM and O&M Data Report for Site A."	U.S. Navy 2010j, 2010l
Monitor EPA's reevaluation of the RDX cancer slope factor and reassess the protectiveness of Sites A and F when the reevaluation is complete.	In progress	This evaluation will likely be completed as part of the future fifth 5-year review (see Section 7). Currently, the RDX toxicological review is in the preliminary draft stage, and the EPA is seeking review and comment. Once the toxicological review is finalized, a new cleanup level can be calculated and compared to existing soil results.	NA
OU 1			
Update the conceptual site model to portray the latest understanding of contaminant inputs from residual soil and perched aquifer contamination and contaminant removal from natural attenuation and pump and treat.	July 3, 2014	The Navy submitted a conceptual site model update for Site A. The EPA has outstanding issues with the Site A conceptual site model update, and the Navy will address these concerns through the completion of an FFS and field verification of aquifer properties.	U.S. Navy 2014i
Complete the assessment of an alternative remedy to the current treatment system, and take action based on the results of the assessment.	July 3, 2014	The evaluation of remedies was considered in the Site A conceptual site model update.	U.S. Navy 2014i

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
	In progress	The approach of evaluating MNA at the site recommended in the Site A CSM update is currently under consideration by the Navy. Recent GW monitoring events have included the collection of water quality parameters (i.e., degradation products of RDX and methane) in support of MNA analysis at the site. In addition, the Navy will prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies would be evaluated in the FFS. The FFS will also include an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways.	U.S. Navy 2011f, 2012i, 2013i, 2014b
Plant additional thorny bushes to discourage access to Debris Area 2, or fence the area.	Completed	The Navy has determined that the steep slope and security measures within the lower base sufficiently discourage access in combination with signs that post no access, and inspections reveal the presence of some thorny bushes in Debris Area 2, such as holly and native blackberries.	Interview with Navy RPM
OU 2			
Complete the ongoing assessment and optimization of the Site F treatment system to address containment issues, downgradient plume extent, and the portion of the plume downgradient of the current capture zone. Include an assessment of the capture and treatment of Otto fuel from Site E/11.	August 1, 2014	The following work has been completed in addressing the ongoing containment issues and downgradient extent: • Installed wells F-MW70 and F-MW71 in 2011 that bounded the extent of the plume • Reported on groundwater containment in all monitoring reports, including at Site E/11	U.S. Navy 2010k, 2010l, 2010m, 2010n, 2010o, 2010p, 2011l, 2011m, 2011n, 2011o, 2011p, 2012j

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
		• Concluded that downgradient RDX values are decreasing with trends consistent with slowly degrading residual values, and the RDX plume is achieving containment (the plume is not expanding) USACE developed and calibrated a numerical groundwater flow model and contaminant transport model for Site F, which is presented in a GW modeling report (USACE 2014). The Site F numerical model was developed to support remedy optimization being conducted by the Navy's contractor. More specifically, this model was developed for use as a comparative and predictive tool to aid in design of pilot tests and full-scale bioremediation.	2012k, 2012l, 2012m, 2013j, 2013k, 2013l, 2013m, 2014b, 2014c, 2014j, 2014k, 20141
	In progress	USACE will conduct a treatability study to evaluate anaerobic biodegradation of RDX. The results will be presented in an optimization report to be finalized in 2015, after this 5-year review period. The Navy's contractor will use the USACE model to perform simulations in support of optimizing the remedy at Site F. This modeling is scheduled to be completed in 2015. Currently, the Navy is reviewing recommendations for additional and expanded pilot studies involving aerobic and/or anaerobic biodegradation.	Interview with Navy RPM

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Expand the IC boundary for Site F to cover the larger area of the groundwater plume.	September 16, 2010	Revised IC boundary included in the latest ICMP.	U.S. Navy 2010c
Review the groundwater analytical program at OU 2, considering the higher cleanup levels that would be calculated today for some compounds, and update the monitoring plan based on the results.	November 5, 2009	The two compounds identified as having higher cleanup levels in the third 5-year review were 1,3,5-TNB and nitrite-N. 1,3,5-TNB has never been reported in the LTM reports, and nitrite-N is analyzed together with nitrate-N. Nitrate (nitrate-N/nitrite-N) concentrations are compared to the higher RG for nitrate-N of 10,000 µg/L. EPA Method 353.2 quantifies nitrate plus nitrite. However, the contribution of nitrite is assumed to be negligible, and, therefore, the result is considered representative of nitrate.	U.S. Navy 2009e
	October 15, 2015	The Navy reviewed current and historical COC concentrations against RGs during this 5-year review to determine if any changes need to be made in GW monitoring and reporting (see Section 6).	NA
Review the analytical results for the six OU 2 COCs not regularly summarized in the LTM reports against their ROD RGs and potential cleanup level changes to evaluate whether the LTM program should continue to analyze groundwater for these chemicals. Revise the OU 2 LTM program based on the conclusions.	October 24, 2014	Nine COCs were identified in the ROD for OU 2, including 2,4,6-TNT, RDX, 2,4-DNT, 2,6-DNT, 1,3,5-TNB, 1,3-DNB, nitrate-N, nitrite-N, and manganese. Three of these chemicals (manganese, 1,3-DNB, and 1,3,5-TNB) were never reported in LTM reports after implementation of the remedy. However, 1,3-DNB and 1,3,5-TNB are still analyzed for and reported electronically in the NIRIS database. Manganese was not analyzed for because it is naturally occurring in site soils (U.S. Navy 1993a). All other chemicals are currently monitored and reported either quarterly or yearly (nitrates) in LTM reports. In addition, monitoring and reporting of four additional chemicals has been added to the	U.S. Navy 2010k, 2010l, 2010m, 2010n, 2010o, 2010p, 2011m, 2011n, 2011o, 2011p, 2012j, 2012k, 2012l, 2012m, 2013j, 2013k, 2013l, 2013m, 2014c 2014j, 2014k, 2014l

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
		monitoring program. These are the RDX reduction intermediates (MNX, DNX, and TNX) and Otto fuel. Monitoring for MNX, DNX, and TNX was added as a line of evidence for in situ RDX degradation. Otto fuel (propylene glycol dinitrate) monitoring was added because it is a contaminant at Site E/11, which is within the Site F plume boundaries. The analytical results for 2,4,6-TNT, RDX, 2-4 DNT, 2-6 DNT, MNX, DNX, TNX, nitrite/nitrate (yearly), and Otto fuel (once yearly and now every 5 years) are listed in the LTM reports, but the historical results (showing concentration trends) are only presented for RDX, 2,4,6-TNT, and total DNT as an appendix.	
	In progress	Although historical concentration (trends) are not presented for the other chemicals monitored in the LTM reports, the Navy reviewed historical and current concentrations of the other COCs during this 5-year review to determine if any other chemicals should be dropped from GW monitoring (see Section 6).	NA
OU 3			
Track EPA's reevaluation of arsenic toxicity, and evaluate the need for changes to ICs for soil at OU 3 if arsenic concentrations in soil are confirmed to be above background levels. Revise the ICMP based on the conclusions.	In progress	This evaluation will likely be completed as part of the future fifth 5-year review (see Section 7). Currently, the arsenic toxicological review is in the draft development stage, and the EPA is seeking review and comment. Once the toxicological review is finalized, a new cleanup level can be calculated and compared to existing soil results.	NA

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Evaluate OU 3 based on current and historical groundwater monitoring data to determine if groundwater ICs can be removed. Revise the ICMP based on the conclusions.	October 15, 2015	Neither the OU 3 ROD nor the OU 8 ROD, where ICs were specified for all of the OUs at NBK Bangor, specified GW use restrictions for OU 3. The OU 3 ROD specified 5 years of semiannual GW monitoring to verify that concentrations of chemicals (cadmium and manganese only) in the shallow aquifer are consistent with naturally occurring background concentrations. This GW monitoring was performed from March 1994 through September 1997. Based on sampling results below OU 3 RGs, the Navy and Ecology agreed that the GW monitoring for Site 25 met the requirements of the OU 3 ROD and that no additional monitoring was required. However, GW use restrictions are in place at OU 3 because of GW contamination originating from OU 8. Removal of the GW use restrictions at this site will be performed in conjunction with OU 8, when OU 8 RGs are met throughout the OU 8 GW use restriction area.	U.S. Navy 2000a
OU 6			
Collect and analyze soil and sediment samples for 2,4-dinitrotoluene to evaluate whether current concentrations meet the Method B level. Based on the results, consider discontinuing 5-year reviews at OU 6.	October 15, 2015	No additional sampling was performed at OU 6. The Navy will maintain land use controls and continue to include this OU in the 5-year review. The remedy remains protective, however if removal of land use restrictions is proposed in the future, soil/sediment would be sampled to evaluate whether current concentrations meet the Method B level.	NA

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
OU 7			
Discontinue 5-year reviews at Sites 2 and 26.	October 15, 2015	Sites 2 and 26 were removed from 5-year review evaluations.	NA
OU 8			
Implement the currently planned pilot testing to evaluate potential additional contingent remedial actions at OU 8 to address the slower-than-anticipated remediation progress of the selected remedy, the increasing benzene concentrations, and the return of free product.	November 3, 2014	The Navy completed a DCA pilot study at OU 8 to evaluate augmentation of the MNA remedy by creating a biobarrier for degrading chlorinated VOCs. Phase I of the pilot study began with the injection of EVO together with halorespiring microbes. In 2011, a review of operations at the PWIA petroleum storage and delivery facilities concluded that no current or recent releases are evident. A Phase II DCA pilot study was begun in spring 2012 and completed in 2013 to improve on the establishment of the biobarrier and complete extensive site characterization of sources, LNAPL extent, and residual contamination. During the Phase II DCA pilot study, an electrical resistivity imaging geophysical survey and soil borings/well installations were completed. Using this information, an updated CSM was presented on April 5, 2013, and a visual three-dimensional model was initiated in 2013 to further support site evaluations and remedy optimization.	U.S. Navy 2010q, 2010r, 2011k 2011r, 2011s, 2011t, 2012n, 2012o, 2012p, 2013h, 2013n,. 2013o, 2013p, 2014f, 2014g, 2014h, 2014m

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
		Additional GW monitoring was completed in March and April 2014 to provide an updated evaluation of the effectiveness of the biobarrier for enhancing the existing biodegradation of DCA and other chlorinated VOCs. The bioaugmentation longevity report describes the results of the GW monitoring and concluded that DCA concentrations met cleanup levels at the boundary. In order to maintain the barrier, reinjections of EVO and microbes every 3 years is recommended together with another round of monitoring of pilot study wells in the spring 2015. However, this recommendation has been deferred until the benzene pilot study has been completed. A technical memorandum was completed by the Navy consultant in May 2014 that presented petroleum forensics data and described the development and outcome of the three-dimensional model of OU 8. The results of the Navy's modeling of site conditions and forensic analyses of free-product samples and soil cores collected from OU 8 indicate that LNAPL is likely residual from old releases. Additional data from upcoming remedial activities at the site will be applied to further evaluate this conclusion. In response to concerns raised by Ecology regarding increasing concentrations of benzene reported by the Navy in the OU 8 source area, the Navy undertook additional sampling for VOCs, including sampling of several wells screened in the shallow portion of the aquifer not included	

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
		in the MNA program. Results confirmed that benzene, toluene, ethylbenzene, and total xylenes do not occur at detectable levels outside the PWIA source area. The Navy also implemented regular LNAPL monitoring, included substantial characterization in the Phase II DCA pilot study, and completed regular product gauging and recovery.	
	In progress	A separate pilot study to address dissolved benzene concentrations and LNAPL in GW in the PWIA source area has been contracted by the Navy. The study will provide limited treatment of the plume through air sparge/soil vapor extraction technology, as well as data to evaluate its effectiveness at this site. Data gaps were identified in the modeling technical memorandum at OU 8. The Navy has acquired technical services to resolve any data gaps (results are expected in 2015).	Interview with Navy RPM
Perform an investigation of the vapor intrusion pathway within the PWIA of OU 8 following completion of the current pilot testing program. If the use of the buildings located above the COC plume in groundwater changes, accelerate the vapor intrusion investigation.	March 31, 2014	A CSM for vapor intrusion was completed March 9, 2012, and the quantitative assessment report was completed March 31, 2014. The 2014 report concluded that subslab soil gas and indoor air concentrations at the PWIA, regardless of source, do not represent health concerns. The Navy will perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study.	U.S. Navy 2012h, 2014m

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

Recommendations/ Follow-up Actions	Completion Date	Notes Regarding Completion	Reference
Obtain documentation of COC concentrations remaining in soil following removal actions, assess whether residual COC concentrations in soil are protective of groundwater, and update the OU 8 CSM accordingly.	April 5, 2013	The implementation report and CSM update of the DCA plume pilot study concluded that residual concentrations in soil are not protective of GW, although they are presumed tightly bound within the fine-grained till.	U.S. Navy 2013h
General			
Revise the ICMP to include updated field checklists and figures and an enhanced shoreline monitoring procedure.	September 16, 2010	Revised in the latest ICMP.	U.S. Navy 2010c
Prepare draft Notice of Intent to Delete for soils at Sites A, D, E, F, 2, 11, and 26.	NA	Will not be carried through to the fourth 5-year review because of EPA's National Priorities List deletion policy, as discussed during the stakeholder kickoff meeting (U.S. Navy 2014p). EPA does not separate soil and groundwater for deletions. The entire site, including both soil and groundwater, is deleted at once.	NA
Evaluate alternative methods for analyzing data trends.	July 30, 2014	Substantial additional statistical analysis has been added to monitoring reports for Sites A and F and OU 8. Trends analysis presented as part of this 5-year review.	U.S. Navy 2010j, 2010q, 2014c

Notes:

Yellow - in progress
Green - completed
COC - chemical of concern
CSM - conceptual site model
DCA - dichloroethane
DNB - dinitrobenzene
DNT - dinitrotoluene
DNX - hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
Ecology - Washington State Department of Ecology

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

EPA - U.S. Environmental Protection Agency
EVO - emulsified vegetable oil
FFS - focused feasibility study
GW - groundwater
IC - institutional control
ICMP - Institutional Controls Management Plan
LNAPL - light nonaqueous phase liquid
LTM - long-term monitoring
µg/L - microgram per liter
MNA - monitored natural attenuation
MNX - hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NA - not applicable
NIRIS - Naval Installation Restoration Information System
OU - operable unit
PWIA - Public Works Industrial Area
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RG - remediation goal
ROD - Record of Decision
RPM - Remedial Project Manager
TNB - trinitrobenzene
TNT - trinitrotoluene
TNX - hexahydro-1,3,5-trinitroso-1,3,5-triazine
USACE - U.S. Army Corps of Engineers
VOC - volatile organic compound

6.0 FIVE-YEAR REVIEW PROCESS

6.1 FIVE-YEAR REVIEW TEAM

The Navy is the lead agency for this 5-year review, which covers the period October 2009 through April 2014. Personnel from NAVFAC NW and NBK Bangor represented the Navy in this 5-year review. Project managers and other staff from the EPA, Ecology, and other stakeholder groups have also participated in the review process. Both the EPA and Ecology are cosignatories of the RODs for NBK Bangor. All team members had the opportunity to provide input to this report. Comments received from EPA and Ecology together with the Navy's responses are included in Appendix G.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

There are specific requirements pursuant to CERCLA Section 117(a), as amended, that require certain reports to be released to the public and the public to be notified of proposed cleanup plans and remedial actions. The community notification and involvement activities are described in the paragraphs below.

The Navy placed a notice of intent in the *Kitsap Week* on November 21, 2014 and in the *Kitsap Sun* on November 23, 2014 informing the public that the site is currently undergoing a 5-year review. This notice also provided information as to when, where, and how the public could receive information and how to provide comments on the protectiveness of the remedy. There has been no public response resulting from the notice. However, one community member was interviewed during this 5-year review (see Section 6.6).

The Navy has maintained an ongoing commitment to community involvement since the time of the first investigations at NBK Bangor. The Navy has written a community relations plan, which was last updated in 2009, that is available for public review (U.S. Navy 2009f). In the past, the community has been informed of progress at the site through fact sheets, published public notices, and public meetings. The proposed plans were circulated for public comment before the RODs were finalized. Key documents have been made available for review at NAVFAC NW and the Central Kitsap Regional Library on Sylvan Way in Bremerton.

A Restoration Advisory Board (RAB) for NBK Bangor was established in 1995 to provide community input to remediation activities at NBK Bangor. The RAB members included representatives of the Navy, regulatory agencies, civic groups, private citizens, tribal governments, local governments, and environmental activist groups. The NBK Bangor RAB was active from 1995 to 2005. It was disbanded in May 2005 since there was no longer sufficient, sustained community interest, and the RAB had achieved the installation's desired end goal.

6.3 DOCUMENT REVIEW

Documents reviewed during this 5-year review were those documents describing the inspection, monitoring, operation, and maintenance of the selected remedies. The documents that were reviewed are listed below:

- The first, second, and third 5-year reviews for NBK Bangor (U.S. Navy 2000a, 2005a, and 2010a)
- The signed RODs (OUs 1, 2, 3, 6, 7, and 8) (U.S. Navy, USEPA, and Ecology 1991a, 1994b, 1994c, 1994d, 1996, and 2000a)
- ESDs for OUs 1 and 2 (U.S. Navy, USEPA, and Ecology 1994e, 1994f, 1998, and 2000b)
- OM&M plans for OUs 1 and 2 (U.S. Navy 2009c, 2009d, 2010e, 2010g, 2011d, 2012c, 2012f, 2013d, and 2014d)
- SAPs for OUs 1, 2, and 8 (U.S. Navy 2009b, 2009e, 2010f, 2010h, 2010i, 2011e, 2011i, 2011j, 2011q, 2012d, 2012g, 2013e, 2013f, 2013g, and 2014e)
- Monitoring reports for OU 1 (U.S. Navy 2010j, 2011f, 2011u, 2011v, 2011w, 2012i, 2012q, 2012r, 2012s, 2013i, 2013q, 2013r, 2013s, 2013t, and 2014b)
- Monitoring reports for OU 2 (U.S. Navy 2010k, 2010l, 2010m, 2010n, 2010o, 2010p, 2011m, 2011n, 2011o, 2011p, 2012j, 2012k, 2012l, 2012m, 2013j, 2013k, 2013l, 2013m, 2014c, 2014j, 2014k, and 2014l)
- Monitoring reports for OU 8 (U.S. Navy 2010q, 2010r, 2011s, 2011t, 2012o, 2012p, 2013o, 2013p, 2014f, and 2014m)
- The ICMPs for NBK Bangor (U.S. Navy 2007 and 2010c)
- Institutional controls inspection letter reports (U.S. Navy 2010d, 2011c, 2012b, 2013c, and 2014a)
- Studies related to optimization of the OU 1 remedy (Annable 2012, USEPA 2013a, and U.S. Navy 2014i)

- Study related to optimization of the OU 2 remedy (USACE 2014)
- Studies related to optimization of the OU 8 remedy (Battelle 2011 and U.S. Navy 2011k, 2011r, 2013h, 2013n, 2014g, and 2014h)
- Vapor intrusion studies for OU 8 (U.S. Navy 2012h and 2014n)
- Treatment system maintenance and well installation and maintenance for OUs 1 and 2 (U.S. Navy 2010s, 2011g, 2011h, 2011l, 2012e, 2012t, 2013u, and 2014o)

The latest monitoring reports for OU 1, OU 2, and OU 8 are included in Appendix A for easy reference.

6.4 DATA REVIEW

This section summarizes data collected through the various monitoring programs at Bangor, with emphasis on data collected since the last 5-year review, which includes the following:

- LTM and O&M data at OU 1 (Section 6.4.1)
- LTM and O&M data at OU 2 (Section 6.4.2)
- LTM data at OU 7 (Section 6.4.3)
- MNA data at OU 8 (Section 6.4.4)
- Annual IC inspection data at Bangor (Section 6.4.5)

In addition to LTM and O&M data collected for OUs 1, 2, and 8, data have been collected and analyzed relative to remedy optimization. These data are also discussed in Sections 6.4.1, 6.4.2, and 6.4.4, respectively.

The required O&M programs are described in Section 4, and the implications of the data for the functionality and protectiveness of the remedies are discussed in Section 7.

6.4.1 OU 1 (Site A)

This section summarizes the results of work performed at OU 1 during this 5-year review period. This includes a review of the LTM results, treatment system O&M data, and a summary of the additional post-ROD investigations and studies conducted for OU 1.

OU 1 LTM

The OU 1 ROD (U.S. Navy, USEPA, and Ecology 1991a) specified that the concentrations of COCs (RDX, 2,4,6-trinitrotoluene [TNT], and 2,4- and 2,6-dinitrotoluene [DNT]) in the compliance wells located in the seasonal perched groundwater zone and throughout the shallow aquifer of the burn area shall comply with the RGs within a 10-year period of treatment system operation. In addition, treatment system performance is to be monitored by sampling performance wells. The main objective at Site A is to restore shallow aquifer waters to support possible future drinking water use (U.S. Navy, USEPA, and Ecology 1991a). To meet ROD requirements, LTM of groundwater has occurred at Site A since 1994. Site A LTM data, as well as treatment system OM&M data (discussed below), over this review period are documented in the annual LTM and O&M data reports (U.S. Navy 2010j, 2011f, 2012i, 2013i, and 2014b) and LTM letter reports (2011u, 2011v, 2011w, 2012q, 2012r, 2012s, 2013q, 2013r, 2013s, and 2013t). Note that the 2014 annual LTM and O&M data report did not include all data for the site in the cumulative data table. This should be corrected in future versions of the annual report.

During this 5-year review period, LTM was performed in 17 compliance monitoring wells and 9 performance wells, including 7 extraction wells, as detailed in Section 4.1.3. Four additional compliance monitoring wells A-MW58, A-MW59, A-MW60, and A-MW61 were installed in August 2013 and sampled in April 2014 to assist with the assessment of RDX extent near the source in the perched groundwater zone (U.S. Navy 2014b). Analytical results for ordnance compounds (RDX, 2,4,6-TNT, 2,4-DNT, and 2,6-DNT) in groundwater samples collected at the site since 1994 are summarized in Table B-1 of Appendix B-1 (U.S. Navy 2014b). In addition, field parameters and natural attenuation analytical results from 2009 to 2014 are summarized in Table B-2 of Appendix B-1 (U.S. Navy 2014b). Starting in 2009, the RDX reduction intermediates hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine (MNX), hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine (DNX), and hexahydro-1,3,5-trinitroso-1,3,5-triazine (TNX) were also reported for the site.

Statistical trend analysis, including linear regression and Mann-Kendall, were conducted on a subset of wells in the 2014 annual groundwater data report (U.S. Navy 2014b). Data from the wells were reviewed to identify wells with RDX, 2,4,6-TNT, 2,4-DNT, and 2,6-DNT results above detection limits in at least 80 percent of the historical results. Wells with data sets containing greater than 20 percent nondetections were eliminated from the analyses because of insufficient data. Data sets for the following monitoring wells were determined to be suitable for statistical evaluation in groundwater:

- Performance wells, including the following extraction wells: A-EW4, A-EW5, A-EW6, A-EW7, A-EW8, A-MW37, and A-MW46
- Compliance wells, including the following shallow aquifer monitoring wells: A-MW32, A-MW49, and A-MW54
- Compliance wells, including the following perched zone monitoring wells: A-MW22, A-MW47, and A-MW48

A summary of the linear regression and Mann-Kendall evaluation is provided in Tables 6-1 and 6-2, which were reproduced from Tables 4-1 and 4-2 of the 2014 annual LTM and O&M data report for Site A (U.S. Navy 2014b). The linear regression and Mann-Kendall evaluations are discussed in the following sections for the performance and compliance monitoring wells.

OU 1 Performance Well LTM Summary

Performance monitoring at Site A was conducted at nine locations and generally included the following:

- Annual sampling of five extraction wells (A-EW4 through A-EW8) and two converted monitoring wells (A-MW37 and A-MW46) located within the burn area (source area)
- Sampling of two shallow aquifer monitoring wells (A-MW33 and A-MW35), located just to the north and the east of the burn area, once every 5-years

RDX was the only COC detected in the performance monitoring wells during this 5-year review period at concentrations greater than site RGs. RDX was detected at concentrations greater than its RG at seven of the nine performance monitoring wells during this 5-year review period, as summarized below (see Appendix B-1 Table B-1):

- At extraction well A-EW4 during all sampling events at concentrations from 80 to 130 μg/L
- At extraction well A-EW5 during all sampling events at concentrations from 0.97 to 34 μg/L
- At A-EW6 during two out of five sampling events that have occurred since the last 5-year review at concentrations of 1.3 and 1.4 μg/L
- At A-EW7 during all sampling events at concentrations from 110 to 300 μg/L
- At A-EW8 above its RG during all sampling events at concentrations from 66 to 220 μg/L
- At A-MW37 during all sampling events at concentrations from 62 to 110 μg/L
- At A-MW46 during all sampling events at concentrations from 59 to 100 μg/L

RDX reduction intermediates MNX, DNX, and/or TNX were detected during this 5-year review period at these seven wells except at A-EW6. The presence of these compounds indicates that RDX breakdown is occurring. No RGs were established in the ROD for these constituents.

Review of the performance monitoring data obtained during this 5-year review period indicates that adequate data are being obtained to measure and document performance of the remedy and that all the data types and frequencies remain necessary. Therefore, no change to the performance monitoring program is recommended at this time.

OU 1 Performance Well Concentration Trends from Latest LTM Report

Statistical trend analysis including linear regression and Mann-Kendall were conducted for RDX in the seven performance monitoring wells where concentrations exceeded the RDX RG. No trend analysis was performed for wells A-EW6, A-MW33, and A-MW35, because the data sets for these wells had greater than 20 percent nondetections. Performance well linear regression trend analysis results for RDX are summarized in Table 6-1 and as follows:

- A-EW4 shows a statistically significant increasing trend.
- A-EW5 shows a statistically nonsignificant increasing trend.
- A-EW7, A-MW37, and A-MW46 show statistically significant decreasing trends.
- A-EW8 shows a statistically nonsignificant decreasing trend.

Performance well Mann-Kendall trend analysis results for RDX are summarized in Table 6-2 and as follows:

- A-EW4 shows an increasing trend at 80 and 90 percent confidence levels.
- A-EW5 shows no trend and stable conditions.
- A-EW6,[1] A-EW7, and A-EW8 show decreasing trends at 80 percent confidence level.
- A-MW37 and A-MW46 show decreasing trends at 80 and 90 percent confidence levels.

[1] Although there were greater than 20 percent nondetections for this well, Mann-Kendall trend analysis was performed. However, linear regression analysis was not performed.

Therefore, only one of the seven performance monitoring wells (A-EW4), where trend analysis was performed, shows a potentially increasing trend of ordnance compounds, and the remaining performance wells show no trends or decreasing concentrations.

RDX concentration trends in groundwater samples collected between 1994 and March 2014 from extraction wells at Site A and from shallow aquifer monitoring well A-MW33 are presented in Figures 6-1 and 6-2, respectively (U.S. Navy 2014b). These figures show the concentration trends using a logarithmic scale. While reductions in ordnance compounds have occurred, Figure 6-1 illustrates that concentrations remain above RGs in all but one extraction well. Figure 6-2 illustrates that the concentration at A-MW33 is currently below the RG.

OU 1 Performance Well Concentration Trends Performed as Part of 5-Year Review

Additional trend analyses were performed as part of this 5-year review and consisted of plotting the log-transformed laboratory data against time using only data from this 5-year review period. Concentration trends were evaluated for a subset of the performance monitoring wells and included those wells with the highest detected concentrations during this 5-year review period, or those with increasing concentrations trends based on the linear regression and Mann-Kendall test performed in the latest LTM report (A-EW4, A-EW5, A-EW7, A-EW8, and A-MW37).

All of the performance monitoring wells selected for inclusion in this analysis are extraction wells. The concentration trend plots and a description of the methodology used for this trends analysis are provided in Appendix B-2 and B-3, respectively. The average concentration, minimum reported concentration, maximum reported concentration, trend of concentration decay rate, 95 percent upper confidence limit (UCL), and 95 percent lower confidence limit (LCL) were calculated for these data on a well by well basis. Table 6-3 presents these calculated values for RDX concentrations reported for the five performance monitoring wells included in this analysis.

The average concentrations over the last 5 years calculated for RDX in the performance monitoring wells included in this analysis ranged from 23 to 210 μg/L. These wells are located adjacent to the burn area at Pintado Road or within the burn area itself (A-MW37). The average concentrations are greater than the established RG of 0.8 μg/L. A negative concentration decay rate was calculated for all wells included in this analysis except for A-EW4, indicating decreasing concentration trends with greater than 50 percent probability but less than 95 percent probability. The concentration trend at A-EW4 produced a slightly positive concentration decay rate of 0.017, suggesting stable to slightly increasing concentrations (see Table 6-3). No estimate of time to achieve the RG for RDX in the performance monitoring wells can be made at this time because of the slightly increasing concentration trend at A-EW4.

OU 1 Compliance Monitoring Well LTM Summary

Compliance monitoring at Site A was conducted at 21 locations and generally included the following:

- Annual sampling of two shallow aquifer wells (A-MW32 and A-MW49) located within the RDX plume
- Annual sampling of three shallow aquifer wells (A-MW54, A-MW55, and A-MW56) located close to the leading edge of the RDX plume
- Annual sampling of three shallow aquifer wells (A-MW51, A-MW52, and A-MW57) and biennial sampling from two shallow aquifer wells (A-MW50 and A-MW53) located downgradient of the existing RDX plume
- Annual sampling of six perched zone wells (A-MW22, A-MW34, A-MW36, A-MW38, A-MW47, and A-MW48) located within or just adjacent to the burn area
- Sampling once every 5-years of one shallow aquifer monitoring well (A-MW44) located downgradient of the existing plume.
- One-time sampling of three newly installed perched zone wells (A-MW59, A-MW60, and A-MW61) located within the burn area (Note that a sample could not be collected from A-MW60 because it was dry at the time of sampling.)
- One-time sampling of one newly installed perched zone well (A-MW58) located just upgradient of the burn area

2,4-DNT was not detected above its RG in any of the compliance monitoring wells during this review period. RDX, 2,4,6-TNT, and/or 2,6-DNT were detected at concentrations greater than their respective RGs at 8 of the 21 compliance monitoring wells (Figure 6-3) during this 5-year review period, as summarized below (see Appendix B-1 Table B-1):

- RDX at shallow aquifer well A-MW32 during all sampling events at concentrations from 5.9 to 9.1 µg/L
- RDX at shallow aquifer well A-MW49 during all sampling events at concentrations from 1 to 240 µg/L
- RDX at perched zone well A-MW22 during all sampling events at concentrations from 31 to 49 µg/L

- RDX at perched zone well A-MW36 during all sampling events at concentrations of 30 and 32 µg/L
- 2,6-DNT at perched zone well A-MW36 during one sampling event at a concentration of 0.31 µg/L
- RDX at perched zone well A-MW38 during all sampling events at concentrations ranging from 13 to 49 µg/L
- 2,4,6-TNT at perched zone well A-MW38 during two sampling events at concentrations of 3.4 and 4 µg/L
- 2,6-DNT at perched zone well A-MW38 during two sampling events at a concentration of 0.2 µg/L
- RDX at perched zone well A-MW47 during all sampling events at concentrations from 6.2 to 43 µg/L
- 2,6-DNT at perched zone well A-MW47 during all sampling events at concentrations from 0.17 to 0.55 µg/L
- RDX at perched zone well A-MW48 during all sampling events at concentrations from 69 to 99 µg/L
- RDX at perched zone well A-MW61 (4.3 µg/L) during the only sampling event conducted at the well

RDX reduction intermediates MNX, DNX, and/or TNX were detected during this 5-year review period at these eight wells. The presence of these compounds indicates that RDX breakdown is occurring. No RGs were established in the ROD for these constituents.

Review of the compliance monitoring data obtained during this 5-year review period indicates that adequate data are being obtained to measure and document progress towards meeting RAOs in groundwater beneath the site and that all the data types and frequencies remain necessary. Therefore, no change to the compliance monitoring program is recommended at this time.

OU 1 Compliance Well Concentration Trends from Latest LTM Report

Statistical trend analysis, including linear regression and Mann-Kendall, were conducted for RDX and 2,4,6-TNT in six of the compliance monitoring wells. Trend analyses were performed for RDX in A-MW22, A-MW32, A-MW47, A-MW48, and A-MW49 and 2,4,6-TNT in A-MW47, because these wells had large enough data sets with less than 20 percent nondetections. Although the concentrations of RDX in A-MW54 did not exceed the RGs during this 5-year review period, trend analysis was performed for this well because the data set had less than 20 percent nondetections, and concentrations exceeded RGs during the last 5-year review period.

Compliance well linear regression trend analysis results for RDX and 2,4,6-TNT are summarized in Table 6-1 and as follows:

- Shallow aquifer well A-MW32 shows a statistically nonsignificant increasing RDX trend.
- Shallow aquifer wells A-MW49 and A-MW54 show statistically significant decreasing RDX trends.
- Perched zone well A-MW22 was not analyzed, because EPA guidance does not recommend performing linear regression analysis on less than eight data points.
- Perched zone wells A-MW47 and A-MW48 show statistically nonsignificant decreasing RDX trends.
- Perched zone well A-MW47 shows a statistically significant decreasing 2,4,6-TNT trend.

Compliance well Mann-Kendall trend analysis results for RDX and 2,4,6-TNT are summarized in Table 6-2 and as follows:

- Shallow aquifer well A-MW32 shows an increasing RDX trend at 80 percent confidence level.
- Shallow aquifer well A-MW49 and perched zone wells A-MW22 and A-MW47 show no RDX trends and stable conditions.
- Shallow aquifer well A-MW54 and perched zone well A-MW48 show decreasing RDX trends at 80 and 90 percent confidence levels.
- Perched zone well A-MW47 shows decreasing 2,4,6-TNT trends at 80 and 90 percent confidence levels.

Therefore, only one of the six compliance monitoring wells (A-MW32) where trends analysis was performed show potentially increasing trends of ordnance compounds, and the remaining compliance wells show stable or decreasing concentrations.

RDX and TNT concentration trends in groundwater samples collected between 1994 and March 2014 from selected compliance monitoring wells at Site A in both the shallow aquifer and the perched zone groundwater are presented in Figures 6-2 and 6-3, respectively (U.S. Navy 2014b). These figures show the concentration trends using a logarithmic scale. While reductions in ordnance compounds have occurred, these figures illustrate that concentrations remain above RGs.

OU 1 Compliance Well Concentration Trends Performed as Part of 5-Year Review

As discussed above, additional trend analyses were performed as part of this 5-year review and consisted of plotting the log-transformed laboratory data against time using only data from this 5-year review period. Concentration trends were evaluated for a subset of the compliance monitoring wells and included those wells with the highest detected concentrations during this 5-year review period, those with increasing concentrations trends based on the linear regression and Mann-Kendall test performed in the latest LTM report, or were located along the leading edge of the plume. The compliance monitoring wells selected for inclusion in this analysis include two perched monitoring wells (A-MW47 and A-MW48) and five shallow aquifer monitoring wells (A-MW32, A-MW49, A-MW54, A-MW56, and A-MW57). The concentration trend plots and a description of the methodology used for this trend analysis are provided in Appendices B-2 and B-3, respectively. Table 6-3 presents these calculated values for RDX concentrations reported for the seven compliance monitoring wells included in this analysis.

The average concentrations over the last 5-years calculated for RDX were 20.8 and 83.75 µg/L in the two perched zone wells. Both of these are located within the burn area (source area). These concentrations are greater than the established RG of 0.8 µg/L. A negative concentration decay rate was calculated for A-MW48, indicating a decreasing concentration trend with a greater than 95 percent probability. The concentration trend at A-MW47 indicated a positive concentration decay rate, indicating an increasing concentration trend.

The average concentrations over the last 5-years calculated for RDX were 6.9 and 65.7 µg/L in the two shallow aquifer wells (A-MW32 and A-MW49) located within the plume boundary and just outside the source area. These concentrations are greater than the established RG of 0.8 µg/L. A negative concentration decay rate was calculated for A-MW49, indicating a decreasing concentration with greater than 50 percent probability, but less than 95 percent probability. The concentration trend at A-MW32 indicated a slightly positive concentration decay rate of 0.079, indicating a slightly increasing concentration trend.

The average concentrations over the last 5 years calculated for RDX in the three shallow aquifer wells (A-MW54, A-MW56, and A-MW57) located near the leading edge of the plume ranged from 0.1 to 0.5 µg/L. The concentrations are less than the established RG of 0.8 µg/L. A negative concentration decay rate was calculated for A-MW57, indicating a decreasing concentration trend with greater than 50 percent probability, but less than 95 percent probability.

The concentration trends at A-MW54 and A-MW56 produced slightly positive concentration decay rates of 0.013 and 0.017, suggesting stable to slightly increasing concentrations (see Table 6-3).

In summary, RDX concentrations at the site remain above the established RG in the area shown on Figure 6-4. The RDX concentrations in half of the wells evaluated located within the plume boundary were decreasing and half were increasing over this 5-year review period. For those wells located near the leading edge of the plume, the RDX concentrations in the two wells nearest to the plume edge were increasing and decreasing in the one well farthest from the plume edge. No estimate of time to achieve the RG for RDX in the compliance monitoring wells can be made at this time, because of the increasing concentrations at some of the site wells.

Ordnance Constituent Distribution in Groundwater at OU 1

The 2009 and 2014 (March/April) distribution of RDX in groundwater is shown on Figure 6-4 (reproduced from Figure 3-3 of U.S. Navy 2010j and Figure 3-4 of U.S. Navy 2014b). The estimated lateral distribution of RDX at concentrations above its RG appears to be relatively stable from 2009 to 2014.

However, the lateral extent of the RDX plume core, which is represented by the 100 µg/L contour, has decreased from 2009 to 2014. In 2009, wells with concentrations exceeding 100 µg/L included A-MW36 (130 µg/L) and A-EW7 (180 µg/L), and the plume core was estimated to extend from the well cluster at A-MW37 to just west (downgradient) of Pintado Road (approximately 300 feet long by 75 feet wide) (Figure 6-4). In 2014, wells with concentrations exceeding 100 µg/L included A-EW7 (110 µg/L) and A-EW8 (120 µg/L), and the plume was roughly circular in the vicinity of these two wells with a diameter of 100 feet (Figure 6-4). It should be noted that the RDX plume core has also decreased when compared to the 2004 analytical results. In 2004, wells with concentrations exceeding 100 µg/L included A-MW46 (160 µg/L), A-MW37 (130 µg/L), and A-MW49 (360 µg/L), and the plume core extended approximately 600 feet.

As previously discussed in Section 4.1.3, six new wells were installed during this 5-year review period to refine the extent of the RDX contamination in both the shallow aquifer and the perched zone. Wells A-MW56 and A-MW57 are both located downgradient of well A-MW49 and are screened in the shallow aquifer. Twelve to 13 rounds of sampling occurred between 2009 and 2014, and results indicate that groundwater samples from these wells contained very low levels (below the RG) of RDX and no detections of 2,4,6-TNT, 2,6-DNT, or 2,4-DNT at concentrations above their respective reporting limits. The results from these wells confirmed that the RDX plume does not extend very far beyond well A-MW49. Wells A-MW58 through A-MW61 were located along the perimeter of the burn area. One sample was collected from each well, except A-MW60, which was dry at the time of sampling. All wells were screened in the perched zone.

RDX was detected above its RG at AMW-61, which is located close to the RDX plume core. RDX and all other ordnance compound analytes were not detected at the other two locations.

Monitoring of two Site A shallow aquifer monitoring wells (A-MW28 and A-MW30) located near the northern base boundary has shown no detectable RDX between years 1994 and 2007. The monitoring data demonstrated that the plume is not approaching the northern base boundary and that drinking water wells in Vinland are not threatened by Site A contaminants. Sampling at these wells was terminated during the last 5-year review period based on these results.

OU 1 Treatment System Performance

Site A OM&M and performance data are documented in the annual LTM and O&M data reports (U.S. Navy 2010j, 2011f, 2012i, 2013i, and 2014b). Monthly samples were submitted for analysis of influent and effluent (between lead and lag granular activated carbon [GAC] vessels) to ensure that treated water meets discharge requirements prior to surface water discharge. Monitoring confirmed that criteria were met over the past 5 years. No carbon change-out has been necessary since the most recent change in April 2008, and no change is anticipated for several years based on the low rate of carbon loading and the previous longevity (U.S. Navy 2014b).

Treatment system repairs and inspections performed between November 2009 and January 2014 included the following (U.S. Navy 2010s and 2013u):

- Updated the labeling of valves, treatment equipment, and other components
- Redeveloped extraction wells A-EW4, A-EW5, A-EW6, A-EW7, and A-EW8, inspected and cleaned pumps in November 2009, and redeveloped the five extraction wells again in October 2012
- Replaced treatment plant sump pump in September 2012
- Observed cracks in condenser unit, air receiver tank, and containment in April 2013
- Removed expired test kits, old pumps and equipment, and polyvinyl chloride pipes and hoses in May/June 2013
- Replaced air compressor and associated components in July and August 2013 and installed new air compressor control panel in September 2013 and air compressor filter regulator in November 2013

- Removed, inspected, repaired, and cleaned extraction well pumps for A-EW6 and A-MW37 in December 2013 and January 2014

Cumulative contaminant mass removal over time for the Site A groundwater treatment system is shown on Figure 6-5 (reproduced from Figure 5-3 of U.S. Navy 2014b). The system has removed approximately 54 pounds of total ordnance since operations began in May 1997. Approximately 30 pounds of the total is RDX and approximately 2 pounds is 2,4,6-TNT. Approximately 4 pounds of RDX has been recovered during this review period (September 2009 to March 2014). From 2009 through 2014, the average cost per pound of RDX removed was approximately $500,000, which is about double the cost per pound reported during the previous 5-year review period, primarily because the weight of RDX removed during this review period is about half of what was removed during the previous 5-year review period. During 2013, the latest full year of operation, the treatment system treated approximately 1.7 million gallons of water, based on 269 days of operation and an average flow rate of 4.4 gallons per minute (U.S. Navy 2014b).

The last 15 years of operational information for the pump and treat system suggest that the shallow aquifer could not be used as a drinking water source because of the low pumping rates and, therefore, does not represent a complete human health pathway at the site. Therefore, remediation levels may be adjusted to ones based on protection of ecological receptors in downgradient water bodies. Based on this, it is recommended that a field verification of aquifer properties be performed and the human health risk pathways reevaluated.

Assessment of Extraction System Containment at OU 1

Assessment of containment was performed as part of routine OM&M and reported annually. These assessments were based on observed hydraulic heads and downgradient chemical monitoring data. Potentiometric surface data show that groundwater extraction does alter the potentiometric heads close to the point of groundwater withdrawal, but cannot accomplish sufficient drawdown in the low-permeability aquifer to achieve containment. This observation is consistent with previous findings (U.S. Navy 2008b). No overall decline in water elevations is evident to date as a result of restoring the Cattail Lake drainage. The potentiometric surface has declined slightly, but is within the normal range of observations (U.S. Navy 2014b).

Chemical monitoring data downgradient of the infiltration wells showed that RDX extends beyond the line of extraction wells, most notably at well A-MW49. Monitoring at wells A-MW56 and A-MW57 continue to confirm that A-MW49 is positioned near the leading edge of the plume, as RDX concentrations were well below the cleanup level at A-MW56 and not detected above the laboratory quantitation limit at A-MW57 (U.S. Navy 2014b).

Natural degradation of ordnance compounds apparently contributes to mass reduction within the plume at Site A (U.S. Navy 2014b). For this reason, the degradation indicator compounds MNX, DNX, and TNX were added to the reporting beginning in 2009, and indicator parameters for natural degradation were added in 2010. The RDX degradation compounds were detected in numerous wells, and their presence provided a strong indication that degradation is active at Site A. Where RDX is detected above approximately 5 µg/L, MNX also occurs consistently at 2 percent of the RDX concentration (U.S. Navy 2014b).

OU 1 Post-ROD Investigations

The third 5-year review (U.S. Navy 2010a) identified the need to update the Site A CSM to portray the latest understanding of contaminant inputs from residual soil and perched zone groundwater contamination, as well as contaminant removal from natural attenuation and groundwater treatment. Issues with the hydrogeologic CSM were identified by EPA, including gaps in understanding of the contaminant mass distribution, contaminant mass flux, water balance, and natural attenuation mechanisms and their relative contributions to plume cleanup (USEPA 2012b).

An initial assessment of the mass discharge (extraction) of RDX for OU 1 Site A was performed in 2012 using LTM data collected through August 2010 (Annable 2012). A mass removal rate of approximately 1.4 g/day was estimated for the seven extraction wells in the shallow aquifer. The total mass of RDX for the shallow aquifer, both sorbed and in solution, was estimated at 6,000 g or 6 kg. Assuming a constant mass extraction rate (zero-order model) of 1.4 g/day from the extraction wells, 13 years would be required to remove all of the RDX. Based on a more realistic first-order decay model, the time to remove 90 percent of the mass would be about 25 years and to remove 99 percent around 50 years. The total mass of RDX for the perched zone was estimated at 300 grams (g). The uncertainty of this number was considered very high because of the limited number of wells and other unknowns. Assuming a water recharge rate from the perched zone to the unconfined aquifer of 10 cm/year, then a mass discharge rate of 60 g/year would result in an estimated removal time of 5 years for the perched zone (Annable 2012).

Based on a review of the previous EPA memorandum (2012b) and Annable's mass discharge memorandum (2012), the EPA provided three strategies for optimizing site cleanup (USEPA 2013a). Option 3, discontinue pump and treat and implement an enhanced in situ bioremediation remedy, was recommended to achieve restoration within a reasonable time frame in order to meet ROD requirements. They also recommended that the Navy conduct comprehensive remedy optimization, including a focused FS (FFS) to screen and evaluate all of these options and any others the Navy may consider reasonable.

The updated CSM report finalized in 2014 (U.S. Navy 2014i) used data collected during the 2013 field season and groundwater modeling to predict future RDX concentrations, vadose zone contributions to groundwater, and flow and transport of both groundwater and dissolved RDX in groundwater. CTech Development Corporation's Environmental Visualization System Pro (EVS Pro) modeling software was used to visually model the RDX plume at different times, including 1997, 2009, and 2013 (Figure 6-6) and determine the center of mass for historical data from 1997 through 2013 (as shown on Figure 6-7). Numerical flow modeling was used to predict future extent of RDX contamination for years 10, 30, 50, and 100, assuming groundwater pumping and no groundwater pumping scenarios (Figure 6-8).

The CSM report (U.S. Navy 2014i) listed the following conclusions based on evaluation of site history, site data (historical and 2013 field investigation), and modeling:

- The initial source of RDX in site soils has been controlled.
- RDX concentrations in site groundwater sampled at wells within both the perched zone and shallow aquifer are generally declining or show erratic values with no clear temporal trend.
- The plume appears to be stable with the center of mass not moving over time (Figure 6-7).
- The plume volume appears to be decreasing with time with a clear and pronounced trend (Figure 6-6).
- The plume mass and concentration are also decreasing, but along less clear and pronounced trends.
- SESOIL modeling, which was used to evaluate RDX contributions from the vadose zone, suggests that vadose zone loading to the shallow aquifer may no longer be significant.
- Groundwater flow and transport modeling suggest that groundwater in the shallow aquifer moves toward the Cattail Lake drainage, but that concentrations reaching that drainage would be lower than 1.0 µg/L (Figure 6-8).
- Monitoring wells downgradient of the source area along the road have not shown detections of RDX above the RG since they were installed.
- Numerical flow modeling, which was used to evaluate flow and transport of both groundwater and dissolved RDX in groundwater, suggests very little difference in plume behavior between the pumping and no pumping scenarios (Figure 6-8).

- The pump and treat system does not appear necessary for containing the plume or making significant progress toward achieving the RGs (Figure 6-8).

- RDX breakdown products have been found in groundwater, suggesting that degradation processes are at work beneath the site.

- The site pump and treat system does not appear to be significantly more effective than natural attenuation for RDX reduction in affected site groundwater.

- Natural processes appear to have contributed to the remedial progress made to date. There are no complete exposure pathways, and the low transmissivity of the shallow aquifer make pump and treat, or other technologies that rely upon aquifer transmissivity, less effective.

Eleven potential remedy optimization options (including no action) were evaluated in the CSM report for effectiveness, implementability, and cost, and the following five options were evaluated in more detail in the report (U.S. Navy 2014i):

- Continued operation of the pump and treat system
- MNA
- In situ alkaline hydrolysis
- In situ chemical oxidation
- Enhanced in situ bioremediation

Of these five alternatives, MNA was recommended, if demonstrated to be viable by deactivation of the pump and treat system, as discussed further below. This alternative was recommended because of the following reasons:

- The RDX plume appears to be shrinking and is not posing a near-term threat to surface water bodies.

- Drinking water wells are not located in the area, an IC is in place to prevent the installation of wells for drinking water, and current conditions do not pose a risk to human health or the environment.

- The value of operating the expensive pump and treat system is not apparent and has been the subject of discussion among the Navy, Ecology, and EPA for the past 15 years.

- Extensive additional studies could be performed to determine the mass of RDX in the system and develop an estimate of the rate of natural attenuation. These studies will be expensive and, because of the complexity of the factors, may not be conclusive.

- It is the least expensive alternative.

The Site A CSM concluded that a more direct way to determine the value of continued operation of the pump and treat system is to deactivate the system and monitor changes in the plume. Because the plume is not near any receptor, temporarily deactivating the system does not pose a risk. If the plume size increases, the pump and treat system can be reactivated and alternative approaches could then be evaluated, such as in situ alkaline hydrolysis, in situ chemical oxidation, and in situ enhanced biological treatment. If the plume continues to shrink, it would be a good indicator that continued system operation is not beneficial. Based on these conclusions, the Navy is recommending that a treatability test of MNA be performed at Site A. This MNA treatability test would be completed using EPA protocols and would include temporarily deactivating the pump and treat system. Prior to the treatability test, the Navy would develop a treatability study work plan in conjunction with EPA and Ecology.

6.4.2 OU 2 (Site F)

This section summarizes the results of work performed at OU 2 during this 5-year review period. This includes a review of the LTM results and treatment system operation and maintenance data and a summary of the additional post-ROD investigations and studies conducted for OU 2.

OU 2 LTM

The OU 2 ROD (U.S. Navy, USEPA, and Ecology 1994d) specified that the concentrations of COCs (RDX, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-trinitrobenzene [TNB], 1,3-dinitrobenzene [DNB], nitrate, nitrite, and manganese) in the compliance wells located throughout the shallow aquifer shall comply with the MTCA groundwater cleanup levels, which is expected to occur within 5 to 10 years of the start of treatment. In addition, treatment system performance is to be monitored by sampling performance wells. The main objective at Site F is to restore shallow aquifer waters to support possible future drinking water use (U.S. Navy, USEPA, and Ecology 1994d). To meet ROD requirements, LTM of groundwater has occurred at Site F since 1994. Site F LTM data, as well as treatment system OM&M data, over this review period are documented in the LTM and O&M data reports (U.S. Navy 2010m, 2010n, 2010o, 2010p, 2011m, 2011n, 2011o, 2011p, 2012j, 2012k, 2012l, 2012m, 2013j, 2013k, 2013l, 2013m, 2014c, 2014j, 2014k, and 2014l).

Over the last 5-year period, LTM was performed in 14 compliance monitoring wells and 34 performance monitoring wells, including 10 extraction wells, as detailed in Section 4.2.3. Two additional compliance monitoring wells, F-MW70 and F-MW71, were installed in February 2011 and have been sampled quarterly since then to help define the downgradient extent of RDX in groundwater above the RG of 0.8 μg/L (U.S. Navy 2014c). Analytical results for ordnance compounds (RDX, 2,4,6-TNT, total DNT) in groundwater samples collected at the site since 1994 are summarized in Tables C-1 through C-3 of Appendix C-1 (U.S. Navy 2014c). Starting in 2010, the RDX reduction intermediates MNX, DNX, and TNX were also reported for the site (see Appendix C-1 Table C-4). Note that the format of the data in Appendix C-1 Tables C-1 through C-4 complicates the review of the data, and it is recommended that the data be presented in a manner similar to Site A. In addition, data for DNT should be reported in these tables separately for 2,4-DNT and 2,6-DNT for consistency with the data tables in the body of the document. Nitrate (nitrate-N/nitrite-N) concentrations are presented in the monitoring reports. However, nitrates have never been presented in the historical summary tables included in Appendix C-1, and it is recommended that nitrate be included in this table.

Results for 1,3,5-TNB and 1,3-DNB (COCs identified in the ROD) and eight additional ordnance analytes being analyzed for at Site F (nitrobenzene, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine, tetryl, 2- nitrotoluene, 3- nitrotoluene, 4- nitrotoluene, 2-amino-4,6-DNT, and 4 amino-2,6-DNT), which were not identified as COCs in the ROD, are not discussed in the monitoring reports, but the data are available in laboratory reports included in the appendices of the monitoring reports. Manganese, a chemical identified as a COC in the ROD, has never been analyzed for during LTM at Site F because it occurs naturally in soils. See Section 7 for further discussion of this chemical.

Statistical trend analysis using the Mann-Kendall test was conducted for the performance and compliance monitoring wells in the 2014 annual groundwater data report (U.S. Navy 2014c). Trend analysis was performed for RDX, 2,4,6-TNT, and total DNT using data from the last 10 sampling events. If the ordnance compound was not detected during the 10 sampling events, the trend analysis was not performed. A summary of the Mann-Kendall evaluation is provided in Table 6-4, which was reproduced from Table 4-1 of the 2014 annual LTM and O&M data report for Site F (U.S. Navy 2014c). The Mann-Kendall evaluation is discussed in the following sections for the performance and compliance monitoring wells.

OU 2 Performance Well LTM Summary

Performance monitoring at Site F was conducted at 34 locations and generally included the following:

- Annual sampling of 10 extraction wells (F-EW1 through F-EW10)
- Biennial sampling of eight shallow aquifer monitoring wells (F-MW27, F-MW32, F-MW35, F-MW37, F-MW48, F-MW53, F-MW55, and F-MW59)
- Annual sampling of nine shallow aquifer monitoring wells (F-MW31, F-MW33, F-MW38, F-MW39, F-MW44, F-MW54S, F-MW55M, F-MW61, and F-MW62)

- Semiannual sampling of one shallow aquifer monitoring well (F-MW41)
- Quarterly sampling of four shallow aquifer monitoring wells (F-MW63, F-MW64, F-MW67, and F-MW68)
- Sampling of two shallow aquifer monitoring wells (F-MW51 and F-MW52) once every 5-years

RDX, 2,4,6-TNT, total DNT, and nitrate/nitrite were detected at concentrations greater than their respective RGs during this 5-year review period in the performance monitoring wells, as follows (see Appendix C-1 Tables C-1 through C-3):

- RDX in all 10 of the extraction wells during all sampling events at concentrations from 4.2 µg/L in well F-EW6 to 91 µg/L in well F-EW4
- 2,4,6-TNT at extraction wells F-EW1, F-EW3, and F-EW7 during all sampling events at concentrations from 17 µg/L in well F-EW1 to 120 µg/L in well F-EW7
- Total DNT at extraction wells F-EW1, F-EW3, and F-EW7 during all sampling events (except not at F-EW1 and not sampled for at F-EW3 in April 2013) at concentrations from 0.28 µg/L in well F-EW7 to 4.99 µg/L also in well F-EW7
- RDX in two northern plume edge performance monitoring wells (F-MW67 and F-MW68) during all of the sampling events, in one (F-MW63) during 18 of the sampling events, and in one (F-MW64) during 9 of the sampling events at concentrations from 0.87 µg/L in well F-MW64 to 4.6 µg/L in well F-MW67
- RDX in the 16 remaining performance monitoring wells (F-MW27, F-MW31, F-MW33, F-MW35, F-MW37, F-MW38, F-MW39, F-MW44, F-MW48, F-MW51, F-MW52, F-MW53, F-MW54S, F-MW-55, F-MW55M, and F-MW59) during all sampling events at concentrations from 2.2 µg/L in well F-MW52 to 2,200 µg/L in well F-MW48
- 2,4,6-TNT at performance monitoring wells F-MW31, F-MW32, F-MW33, and F-MW35 during all sampling events (except below its RG at F-MW32 in April 2011) at concentrations from 5 µg/L in well F-MW32 to 2,200 µg/L in well F-MW31
- Total DNT at performance monitoring wells F-MW31, F-MW33, and F-MW35 during all sampling events that have occurred since the last 5-year review (except it was not detected at F-MW35 in April 2013) at concentrations of from 0.49 µg/L in well F-MW35 to 50.9 µg/L in well F-MW31

- Nitrate and nitrite analyzed as nitrogen in performance monitoring well F-MW31

RDX reduction intermediates MNX, DNX, and/or TNX were detected during this 5-year review period at 8 of the extraction wells and 12 of the other performance monitoring wells (Appendix C-1 Table C-4). The highest concentrations of these three chemicals have consistently been reported at F-MW39. The presence of these compounds indicates that RDX breakdown is occurring. No RGs were established in the ROD for these constituents.

1,3,5-TNB and 1,3-DNB data were downloaded from Naval Installation Restoration Information System (NIRIS), and concentrations were compared to their RGs. It should be noted that not all data were available in the NIRIS database, because the most current laboratory data has not been loaded into the system. In reviewing the data available for the last 5 years, only well F-MW31 had concentrations of 1,3-DNB above the ROD RG of 1.6 μg/L. F-MW31 is located close to the source, and concentrations have doubled from 10 μg/L (in April 2010) to 20 μg/L (in January 2014). Concentrations of 1,3,5-TNB in recent data exceeded the ROD RG of 0.8 μg/L in nine wells: F-EW1, F-EW2, F-EW3, F-EW7, F-MW31, F-MW32, F-MW33, F-MW35, and F-MW54S. All of these wells are located near the source area. Wells F-MW31 and FMW-35 appear to have increasing concentrations for 1,3,5-TNB in the reviewed data. It is recommended that future monitoring reports tabulate and report data for 1,3,5-TNB and 1,3-DNB in the body of the report, since concentrations of these chemicals exceeded the RGs during this 5-year review period.

Review of the performance monitoring data obtained during this 5-year review period indicates that adequate data are being obtained to measure and document progress towards meeting RAOs in groundwater beneath the site and that all the data types and frequencies remain necessary. Therefore, no change to the performance monitoring program is recommended at this time.

OU 2 Performance Well Concentration Trends from Latest LTM Report

Statistical trend analysis using the Mann-Kendall test was conducted for RDX in all of the performance monitoring wells, except F-MW51, F-MW61, and F-MW62. Statistical trend analysis was conducted for 2,4,6-TNT in the following wells: F-EW1, F-EW2, F-EW3, F-EW7, F-MW31, F-MW32, F-MW33, F-MW35, and F-MW54S. Statistical trend analysis was conducted for total DNT in the following wells: F-EW1, F-EW3, F-EW7, F-MW31, F-MW32, and F-MW33. Trend analysis was not performed when there were less than four detections in the last 10 sampling events. Performance well Mann-Kendall trend analysis results for RDX, 2,4,6-TNT, and total DNT are summarized in Table 6-4 and as follows:

- F-MW44 and F-MW48 show increasing RDX trends at 80 and 90 percent confidence levels.

- F-MW35 shows an increasing 2,4,6-TNT trend at 80 and 90 percent confidence levels.
- F-MW35, F-MW37, and F-MW64 show no RDX trends and stable conditions (note that well F-MW64 is a northern plume edge well).
- F-EW7 and F-MW54S show no 2,4,6-TNT trends and stable conditions.
- F-EW1 and F-EW7 show no total DNT trends and stable conditions.
- F-EW7, F-EW9, F-MW31, F-MW55, and F-MW63 show decreasing RDX trends at the 80 percent confidence level.
- F-EW3 shows a decreasing total DNT trend at the 80 percent confidence level.
- F-EW1 through F-EW6, F-EW8, F-EW10, F-MW27, F-MW32, F-MW33, F-MW38, F-MW39, F-MW41, F-MW52, F-MW53, F-MW54S, F-MW55M, F-MW59, F-MW67, and F-MW68 show decreasing RDX trends at 80 and 90 percent confidence levels (note that wells F-MW63, F-MW67, and F-MW68 are northern plume edge wells).
- F-EW1, F-EW2, F-EW3, F-MW31, F-MW32, and F-MW33 show decreasing 2,4,6-TNT trends at 80 and 90 percent confidence levels.
- F-MW31, F-MW32, and F-MW33 show decreasing total DNT trends at 80 and 90 percent confidence levels.

Therefore, only 3 of the 34 performance monitoring wells (F-MW35, F-MW44, and F-MW48) show increasing trends of ordnance compounds, and the remaining performance wells show nondetected, stable, or declining concentrations. None of the wells with increasing trends is located along the northern plume edge. The increasing trends in wells F-MW44 and F-MW48 are most likely the result of the RDX plume core being drawn toward extraction well F-EW5. It is unclear why 2,4,6-TNT concentrations are increasing in well F-MW35.

RDX concentration trends in groundwater samples collected between 1994 and March 2014 from extraction wells located near and downgradient of the source area are presented on Figures 6-9 and 6-10, respectively (U.S. Navy 2014c). Because most 2,4,6-TNT and DNT removal occurs near the source area (principally at wells F-EW1, F-EW3, and F-EW7), Figures 6-11 and 6-12 present the 2,4,6-TNT and DNT concentration trends over time in the wells near the source area only. Figures 6-9 through 6-12 illustrate the decreasing concentrations in extraction wells over time on logarithmic scales. While reductions in ordnance compounds have occurred, Figures 6-9 through 6-12 illustrate that concentrations remain above RGs.

The Mann-Kendall analysis currently being used to evaluate Site F data trends provides a useful analysis of trends. However, additional statistical methods are available for consideration. The Mann-Kendall analysis is being applied to the 10 most recent sample records to identify current trends. The Navy should consider the use of additional statistical tools to provide a more robust analysis on long-term trends for future evaluations in the annual LTM reports. For example, the linear regression analysis used for OUs 1 and 8 could also be applied to OU 2.

OU 2 Performance Well Concentration Trends Performed as Part of 5-Year Review

As discussed for Site A above, additional trend analyses were performed as part of this 5-year review and consisted of plotting the log-transformed laboratory data against time using only data from this 5-year review period. Concentration trends were evaluated for a subset of the performance monitoring wells and included wells along the plume longitudinal axis with five or more detected results over this 5-year review period. The performance wells selected for inclusion in this analysis were locations from the source area (F-MW31, F-MW33, and F-MW54S), the central plume area (F-MW39 and F-MW55M), north containment area (just upgradient of the reinjection wells along Trigger Avenue) (F-MW44), and the northern plume edge area (F-MW68). These concentration trend plots are included in Appendix C-2 of this report, and a description of the methodology used for this trend analysis is provided in Appendix B-3. The average concentration, minimum reported concentration, maximum reported concentration, concentration decay rate trend, and 95 percent UCL and LCL were calculated for these data on a well by well basis. Table 6-5 presents these calculated values for RDX concentrations reported for the seven performance monitoring wells included in this analysis.

The average concentrations over the last 5 years calculated for RDX ranged from 10 to 160 μg/L in three wells located within the source area (F-MW31, F-MW33, and F-MW54S). These concentrations are greater than the established cleanup level of 0.8 μg/L. Negative concentration decay rates were calculated for two of these locations, indicating decreasing concentration trends. The trends are decreasing with greater than 95 percent probability at well F-MW33 and decreasing with greater than 50 percent but less than 95 percent probability at location F-MW54S. The concentration trend at well F-MW31 indicated a positive concentration decay rates indicating an increasing concentration trend.

The average concentrations over the last 5 years calculated for RDX were 463 and 50.8 μg/L in wells F-MW39 and F-MW55M located in the central plume area. These concentrations are greater than the established cleanup level of 0.8 μg/L. Negative concentration decay rates were calculated for both of these locations, indicating decreasing concentration trends. The trends are decreasing with greater than 95 percent probability at well F-MW39 and decreasing with greater than 50 percent but less than 95 percent probability at location F-MW55M.

The average concentration over the last 5 years calculated for RDX was 978 µg/L in well F-MW44 located in the north containment plume area. This concentration is greater than the established cleanup level of 0.8 µg/L. A negative concentration decay rate was calculated for F-MW48, decreasing at a greater than 95 percent probability. The concentration trend at well F-MW31 indicated a positive concentration decay rate, indicating an increasing concentration trend.

The average concentration over the last 5 years calculated for RDX was 3.03 µg/L in well F-MW68 located in the northern plume edge area. This concentration is greater than the established cleanup level of 0.8 µg/L. A negative concentration decay rate was calculated for F-MW68, indicating a decreasing concentration trend with a greater than 95 percent probability.

In summary, RDX concentrations at the site remain above the established RG in the areas shown on Figure 6-13. The RDX concentrations in five of the seven wells evaluated were decreasing, and the remainder was increasing over this 5-year review period. No estimate of time to achieve the RG for RDX in the performance monitoring wells can be made at this time, because of the increasing concentrations at some of the wells.

OU 2 Compliance Well LTM Summary

Current routine sampling of the compliance wells includes biennial sampling of four shallow aquifer monitoring wells (F-MW56, F-MW57, F-MW58, and F-MW60), annual sampling of three shallow aquifer wells (F-MW65, F-MW66, and F-MW69), semiannual sampling of one shallow aquifer monitoring well (F-MW42), quarterly sampling of two shallow aquifer monitoring wells (F-MW70 and F-MW71), and sampling of four shallow aquifer monitoring wells (F-MW40, F-MW43, F-MW45, and F-MW46) once every 5-years. RDX, 2,4,6-TNT, total DNT, and nitrate/nitrite were not detected above their respective RGs in any of the compliance monitoring wells during this 5-year review period. RDX reduction intermediates MNX, DNX, and TNX were not detected during this 5-year review period at any of the compliance monitoring wells.

Review of the compliance monitoring data obtained during this 5-year review period indicates that adequate data are being obtained to measure and document progress towards meeting RAOs in groundwater beneath the site and that all the data types and frequencies remain necessary. Therefore, no change to the compliance monitoring program is recommended at this time.

OU 2 Compliance Well Concentration Trends from Latest LTM Report

Statistical trend analysis using the Mann-Kendall test was conducted for RDX in the following wells: F-MW42, F-MW45, F-MW65, and F-MW69. Trend analyses were not performed when there were less than 4 detections in the last 10 sampling events. Compliance well Mann-Kendall trend analysis results for RDX are summarized in Table 6-4, which was reproduced from

Table 4-1 of the 2014 annual LTM and O&M data report for Site F (U.S. Navy 2014c). All compliance wells where trend analysis was performed showed decreasing RDX concentration at the 80 and 90 percent confidence levels.

OU 2 Compliance Well Concentration Trends Performed as Part of This 5-Year Review

As discussed for Site A above, additional trend analyses were performed as part of this 5-year review and consisted of plotting the log-transformed laboratory data against time using only data from this 5-year review period. Concentration trends were evaluated for one of the compliance monitoring wells located in the northern plume edge area (F-MW64). The concentration trend plot is included in Appendix C-2 of this report, and a description of the methodology used for this trend analysis is provided in Appendix B-3. Table 6-5 presents these calculated concentration values for RDX reported in the one compliance monitoring well included in this analysis. The average concentration over the last 5 years calculated for RDX was 0.91 µg/L. This concentration is greater than the established cleanup level of 0.8 µg/L. A negative concentration decay rate was calculated for well F-MW64, indicating a decreasing concentration trend with a greater than 50 percent but less than 95 percent probability.

In summary, RDX concentrations at the site remain above the established RG in the area shown on Figure 6-13. The RDX concentrations in five of the seven wells evaluated were decreasing and increasing in the remaining two wells over this 5-year review period. No estimate of time to achieve the RG for RDX in the compliance monitoring wells can be made at this time, because of the increasing concentrations at some of the performance monitoring wells at the site.

Ordnance Constituent Distribution in Groundwater at OU 2

The 2009 (August) and 2014 (winter) distribution of RDX in groundwater is shown on Figure 6-13 (reproduced from Figure 3-3 of U.S. Navy 2010l and Figure 3-6 of U.S. Navy 2014c). The estimated lateral distribution of RDX at concentrations above its RG appears to be relatively stable from 2009 to 2014. A discussion of the separate portion of the plume located north of Trigger Avenue (Figure 6-13) is included as part of the discussion of plume containment and post-ROD investigation in the sections below.

However, the lateral extent of the RDX plume core, which is represented by the 1,000 and 100 µg/L contours, has decreased from 2009 to 2014. In 2009, wells with concentrations exceeding 1,000 µg/L included F-MW39 and F-MW48, and wells with concentrations exceeding 100 µg/L included F-MW33, F-MW35, F-MW39, F-MW44, F-MW48, F-MW55, and F-MW55M. The plume core at that time was divided into two pieces, with one smaller area in the vicinity of F-MW33 (with dimensions approximately 500 by 750 feet) in the source area and one larger area south of Trigger Avenue (with dimensions approximately 1,000 by 2,000 feet) (Figure 6-13).

In 2014, the only well with a concentration exceeding both 100 and 1,000 µg/L was F-MW44, although not all wells were sampled during this sampling event. (Note that the highest RDX concentration of this 5-year review period was observed in well F-MW48 at 2,200 µg/L, which lies in relatively close proximity to extraction well F-EW5.) The plume core in 2014 was again divided into two pieces, with one very small area in the vicinity of F-MW54 and a larger area south of Trigger Avenue (with dimensions approximately 750 by 1,000 feet) (Figure 6-13).

As previously discussed in Section 4.2.3, two new wells were installed downgradient of existing northern plume edge wells F-MW67 and F-MW68 to help define the downgradient extent of RDX in groundwater above the RG of 0.8 µg/L (U.S. Navy 2014c). Fourteen rounds of sampling occurred between 2011 and 2014, and RDX was detected only once (below the RG) in well F-MW70 in April 2011. 2,4,6-TNT and total DNT were not detected above their respective reporting limits. The results from these wells confirmed that the RDX plume does not extend very far beyond well F-MW68.

OU 2 Treatment System Performance

Site F OM&M and performance data are documented in the LTM and O&M data reports (U.S. Navy 2010o, 2011o, 2012l, 2013l, and 2014c). Monthly samples of influent water, water between GAC units, and effluent water were analyzed to track concentrations before and after GAC treatment and ensure that treated water meets discharge requirements prior to reinjection. Monitoring confirmed that discharge criteria were met over the past 5 years. Carbon change-outs occurred on the following dates: January 29, 2010; August 10, 2010; April 26, 2011; November 30, 2011; May 9, 2012; and October 23, 2012. No carbon change-out was completed in 2013 because of the low operating flow rates and extended time the treatment system was shut down.

Treatment system repairs and inspections performed between November 2009 and March 2014 included the following (U.S. Navy 2011l, 2012t, 2013u, 2014d, and 2014o):

- Updated the labeling of valves, treatment equipment, and other components
- Replaced a seized butterfly valve on an influent line in January 2010
- Installed a system in September 2010 intended to monitor and record the aquifer and the infiltration well's ability to contain the plume and real time changes in infiltration rates in the reintroduction wells F-IW1, F-IW2A, F-IW7, F-IW8, F-IW9, F-IW10, and F-IW11
- Drilled and installed two new monitoring wells, F-MW70, and F-MW71 in February 2011

- In August and September of 2011, redeveloped reintroduction wells F-IW1, F-IW8, F-IW9 and extraction wells F-EW5 and F-EW10, replaced failed motors at F-EW5 and F-EW10, and cleaned the pumps at F-EW5 and F-EW10

- In February 2012, replaced a motor in well F-EW4 that failed after an unscheduled electrical outage at Site F in November 2011

- Installed a surge protector with a power monitoring device into the motor control center to protect the Site F electrical system from observed persistent externally generated electrical surges and replaced piping and flanges in March 2012

- Cleaned and redeveloped reintroduction wells F-IW7 and F-IW10 and extraction wells F-EW2 and F-EW6 in November 2012

- From September through November 2012, upgraded the electrical system based on an electrical inspection completed in 2004

- Took the Site F treatment plant temporarily offline in January 2013 after an electrical event triggered alarms on a surge protector, tripped thermal overloads and fuses, rendered the programmable logic controller temporarily inoperable, and caused subsequent pump/motor failures in wells F-EW3, F-EW4, F-EW5, F-EW6, F-EW8, and F-EW9

- As a result of the electrical issues listed above, lowered taps in the Site F transformer to reduce incoming voltage to 485 volts and restarted the treatment plant with the remaining four extraction wells operating at full capacity to maintain plume containment

- From April through July 2013, purchased new well locks; conducted lock, casing, and well house maintenance; completed extensive vegetation removal; removed and properly disposed of expired and no longer relevant test kits; removed and recycled old pumps and equipment; and replaced flow transmitter on one of the influent lines

- In August 2013, replaced/installed various valves and vacuum breakers, repaired leaking process piping, and replaced process piping

- From September through November 2013, conducted emergency repairs and upgrades to the Site F treatment plant system, including replaced extraction well pumps P-1, P-2, P-3, P-4, P-5, P-6, P-13, and P-14; reinstalled polyvinyl chloride sounding tubes in each of the 10 extraction wells; replaced all aboveground extraction wellhead piping and equipment; installed new pressure gauges at the wellheads; installed a new flow totalizer at well F-EW10; redeveloped wells F-EW1, F-EW3, F-EW4, F-EW7, F-EW8, and F-EW10 after the pump assemblies and well head piping had been removed; installed a new monitoring well to perform a treatability study to identify and develop a bioaugmentation culture that can degrade RDX at Site F; installed new pump protection units in the motor control panel; and installed an uninterruptible power supply

- From December 2013 to March 2014, conducted a maintenance inspection of the treatment system valves; replaced various valves, check valves, and vacuum breakers; installed a saddle with a manual air release/sample port and pressure gauge on both well field influent lines; installed new pressure gauges on the bag filter units; and replaced all extraction well heat tape with new self-regulating cable

Cumulative contaminant mass removal over time for the Site F groundwater treatment system is shown on Figure 6-14 (reproduced from Figure 5-1 of U.S. Navy 2014c). The system has removed approximately 4 billion gallons of water and approximately 3,500 pounds of total ordnance since operations began in 1996. Over 3,000 pounds of the total is RDX, of which over 400 pounds is 2,4,6-TNT and approximately 30 pounds total DNT. Approximately 400 pounds of RDX has been recovered during this review period (September 2009 to March 2014). From 2009 through 2014, the average cost per pound of RDX removed was approximately $4,000, which is less than the cost per pound reported during the previous 5-year review period. During 2013, the latest full year of operation, the treatment system treated approximately 52 million gallons of water (U.S. Navy 2014c).

Assessment of Extraction System Containment at OU 2

Containment assessment was performed as part of routine OM&M and reported annually. These assessments were based on observed hydraulic heads and downgradient chemical monitoring data. As in the last 5-year review, potentiometric surface data show that extraction from well F-EW5 and reintroduction in the line of infiltration wells has established a strong reversal of gradient, which is supportive of good containment. Considering the configuration of the potentiometric surface, the limited hydraulic head observation points available between the individual infiltration wells limit the ability to determine with certainty that containment is complete. Well F-EW5, the most important extraction well for containment, has operated over the last 7 years at an average annual extraction rate of approximately 200 gallons per minute. Although the annualized rate dropped to 43.5 gallons per minute in 2013, well F-EW5 has been restored to a high rate of extraction and resumed operations at 100 percent capacity (U.S. Navy 2014c).

As discussed in Section 4.2.3, long system shutdowns occurred from January 2013 to March 2014 because of large voltage fluctuations, repairs and upgrades to the system, and the USACE treatability study (U.S. Navy 2014c). These shutdowns presented containment challenges. Monitoring was conducted quarterly in 2013 throughout the reduced operations and then again in winter 2014 to assess whether the reduced operations were impacting groundwater containment. During the system shutdown for USACE testing, there was no significant change of plume containment. Although there were limited operations during 2013, results gave support that RDX did not appear to migrate beyond containment during 2013.

Chemical data for monitoring wells located downgradient of the infiltration wells showed decreasing trends, indicating that containment continued to be effective even with the limited operations of 2013. The majority of wells located downgradient of the infiltration wells showed decreasing RDX trends and/or RDX concentrations below the RG. Wells FMW65, F-MW67, F-MW68, and F-MW69 showed decreasing RDX trends at 80 and 90 percent confidence levels, and well F-MW63 showed a decreasing RDX trends at the 80 percent confidence level, with wells F-MW65 and F-MW69 below the RG. Although well F-MW64 showed no trend, concentrations of RDX were below the RG at 0.76 μg/L in January 2014 and slightly above the RG at 0.87 μg/L in March 2014. Finally, RDX was not detected at well F-MW66.

Under conditions of complete containment, downgradient wells are expected to exhibit decreasing trends that eventually reach RGs. Decreasing trends suggest the system is accomplishing complete or near-complete containment. However, the concentrations of RDX above or near the RDX cleanup level of 0.8 μg/L at wells F-MW63, F-MW64, F-MW67, and F-MW68 could be explained by either incomplete containment, or by the slow tailing of a higher concentration slug whose migration precedes complete containment (U.S. Navy 2014c).

The OU 2 extraction system is also intended to provide containment of Otto fuel constituents in groundwater at Site E/11. Although the containment assessment for Site F does not explicitly discuss Otto fuel at Site E/11, the assessment that was performed for Site F is applicable to Site E/11, because the groundwater plume for Site F overlays the area where Otto fuel contamination is present.

Because the limited hydraulic head observation points available between the individual infiltration wells limit the ability to determine with certainty that containment is complete, the 2014 annual LTM and O&M report for Site F (U.S. Navy 2014c) recommended that new piezometers be installed adjacent to and between infiltration wells to improve characterization of the potentiometric surface and assess the quality of containment. The report also recommended that piezometers be installed adjacent to active extraction wells that currently lack an adjacent observation point to improve the potentiometric surface for passive wells, which are more representative of aquifer conditions. The need for additional groundwater monitoring points to better characterize the potentiometric surface should be reevaluated following completion of the modeling activities to be performed in 2015 (see the following section) in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.

OU 2 Post-ROD Investigations

The third 5-year review (U.S. Navy 2010a) identified the need to complete the ongoing assessment and optimization of the Site F treatment system to address containment issues, downgradient plume extent, and the portion of the plume downgradient of the current capture zone. Based on this recommendation, a numerical groundwater flow model and contaminant transport model was developed and calibrated to support a treatability study to evaluate anaerobic biodegradation of RDX at Site F (USACE 2014).

The groundwater flow and contaminant transport modeling effort consisted of developing a groundwater flow model using MODFLOW and a contaminant transport model using MT3DMS. The local geologic, hydrologic, hydrogeologic, and contaminant conditions and other off-site influences were incorporated to reproduce the site conditions of Site F. The groundwater model objectives were as follows:

- Assimilate relevant site data into a comprehensive hydrogeologic conceptual and mathematical model framework.
- Adequately represent the current site groundwater conditions.
- Quantitatively evaluate up to two alternatives for pilot tests and full-scale bioremediation.
- Provide an updatable and transferable tool (i.e., the model in electronic form) for future site groundwater management.

The contaminant transport model was calibrated using RDX data collected from 1994 (when the pump and treat system began operation) to determine if the model was capable of predicting long-term plume migration. The results of the calibrated contaminant transport model were then compared to observed RDX concentration contours for April 2013 (U.S. Navy 2013l) to verify that the modeled plume migration was representative of site conditions. The model was able to predict the general shape of the plume and migration of the lower concentration RDX lobe towards monitoring wells F-MW70 and F-MW71 (USACE 2014). However, the model underpredicted concentrations near the source area and the injection wells. These areas may have continuing sources that may not be adequately represented in the contaminant transport model.

The groundwater flow model was able to simulate seasonal groundwater fluctuations as well as stresses from extraction and injection, and the contaminant transport model was able to simulate the general pattern of contaminant migration. However, spikes and large increases in RDX concentrations were not replicated, which was likely because of insufficient representation of source terms (USACE 2014). The USACE groundwater flow and contaminant transport modeling will be used in predictive simulations for pilot testing and full-scale bioremediation. Results of predictive simulations together with the anaerobic biodegradation treatability test results will be completed in 2015 and reported in the next 5-year review.

6.4.3 OU 7, Site E/11

The OU 7 ROD (U.S. Navy, USEPA, and Ecology 1996) specified that ingestion of groundwater containing Otto fuel concentrations above its RG will be prevented through the implementation of a groundwater use restriction, and concentrations of Otto fuel (propylene glycol dinitrate is used as the indicator chemical) in site wells shall be monitored. To meet ROD requirements, LTM has occurred at the site since August 1996. Site E/11 groundwater monitoring data over this review period is reported along with the Site F groundwater monitoring results documented in the LTM and O&M data reports (U.S. Navy 2010o, 2011o, and 2014c). In addition, analytical results for Otto fuel in groundwater samples collected at the site since 1994 are summarized in Table C-5 of Appendix C-1 (U.S. Navy 2014c).

Over the last 5-year period, LTM was performed in two site monitoring wells (E-MW21U and E-MW23U), as detailed in Section 4.2.3. In 2011, the sampling frequency was revised to once every 5 years. Otto fuel has been detected during this 5-year review period in wells E-MW21U and E-MW23U below the RG of 0.2 mg/L, with the exception of the 2010 sample for E-MW23U (0.23 µg/L) and the 2014 sample result for E-MW21U (0.27 µg/L). Since April 2010, Otto fuel concentrations have been consistently detected with concentrations ranging from 0.087 (estimated value) to 0.27 µg/L.

Monitoring of Otto Fuel should be continued for Site E/11 wells at the current frequency. Therefore, the next sampling event would occur in the winter of 2019 to provide data for the next 5-year review. Because the hydraulic head elevations for Site E/11 wells are consistently lower than Site F wells in the vicinity, Site E/11 wells should be resurveyed to verify that the apparent head difference is not an artifact of the existing top-of-casing survey data for the monitoring wells.

6.4.4 OU 8

This section summarizes the results of work performed at OU 8 during this 5-year review period. This includes a review of the LTM results, LNAPL recovery data, and summary of the additional post-ROD investigations and studies conducted for OU 8.

OU 8 LTM

The OU 8 ROD (U.S. Navy, USEPA, and Ecology 2000a) specified that the concentrations of COCs (benzene, 1,2-DCA, 1,1-dichloroethene [DCE], 1,2-dibromomethane [EDB], and toluene) in the off-base compliance monitoring wells shall comply with the RGs within a 10-year period of time and the source of groundwater contamination (LNAPL) will be removed until the recovery rate reaches the practicable recovery endpoint. Although the ROD did not specify a time frame for meeting RGs at on-base locations, it did specify that RGs would be met in the on-base compliance monitoring wells. The ROD also specified that MNA performance is to be monitored by sampling performance monitoring wells for MNA parameters.

The main objectives of the remedial action at OU 8 are to minimize the migration of VOCs from LNAPL beneath the PWIA into groundwater at concentrations that would cause unacceptable risks and minimize human exposure to COCs in sitewide groundwater that would result in unacceptable risks (U.S. Navy, USEPA, and Ecology 2000a). To meet ROD requirements, LTM has occurred at OU 8 since 1998. OU 8 groundwater monitoring and LNAPL recovery data over this review period are summarized below and documented in the MNA monitoring reports (U.S. Navy 2010q, 2010r, 2011s, 2011t, 2012o, 2012p, 2013o, 2013p, 2014f, and 2014m).

During this 5-year review period, the Navy periodically monitored conditions in groundwater at 24 monitoring wells and conducted monitoring activities on a one-time basis at 5 additional locations, as detailed in Section 4.6.3. The number of monitoring wells includes five locations where only field parameters and/or product thickness were measured (8MW22, 8MW46, 29MW01, 25MW04, and 8MW05). An additional 13 wells were also monitored for the presence of LNAPL either on a regular or a one-time basis. The performance and compliance monitoring activities conducted are further detailed below.

Performance monitoring for MNA was conducted semiannually at seven locations:

- Well 8MW16 positioned approximately 600 feet upgradient from the source area
- Wells MW03, 8MW53, 8MW30, 8MW24 (which replaced 28MW01 in fall 2009), and 8MW48 positioned within the source area
- Well 8MW32 positioned within the known contaminant plume downgradient from the source area

Performance and compliance monitoring for MNA and VOCs was conducted semiannually (unless otherwise noted below) at nine locations:

- Well 8MW42 positioned approximately at the upgradient edge of the source area

- Wells MW08 (which replaced 8MW28 in fall 2010), 8MW47, MW05 (annually), 8MW49 (one time), and 8MW06 positioned within the source area

- Well 8MW33 positioned within the known contaminant plume downgradient from the source area

- Wells 8MW03 and 8MW35 positioned at the downgradient NBK Bangor installation boundary

Compliance monitoring for VOCs was conducted semiannually (unless otherwise noted below) at eight locations:

- Wells 8MW34, 8MW02, 8MW25, and 25MW03 (all one time) positioned at the downgradient NBK Bangor installation boundary

- Wells 8MW13, 8MW14 (one-time), 8MW19, and 8MW37 positioned approximately 800 feet off site and downgradient of the installation boundary

Historical analytical results for COCs (benzene, 1,2-DCA, 1,1-DCE, 1,2-EDB, and toluene) and 1,1,2-trichloroethane (TCA) in groundwater samples collected from selected wells at the site since 1998 are summarized in Table D-1 of Appendix D-1 (U.S. Navy 2014m). Analytical results for VOCs, including all COCs, and MNA parameters for sampling events conducted during this 5-year review period were copied from the MNA monitoring reports and are included in Appendix D-2 (U.S. Navy 2010q, 2010r, 2011s, 2011t, 2012o, 2012p, 2013o, 2013p, 2014f, and 2014m). To aid in trend analysis, it is recommended that future MNA monitoring reports include historical analytical data for all wells monitored at OU 8 in Appendix D. During this 5-year review period, VOCs were not reported at concentrations above RGs in wells 8MW16, 8MW42, 8MW32, 25MW04, 8MW25, 25MW03, 8MW13, 8MW37, and 8MW19.

1,2-DCA was detected at concentrations greater than its RG during this 5-year review period, as summarized below:

- At source area well MW08 during four of eight sampling events at concentrations from 10 to 46 μg/L

- At source area well 8MW47 during 6 of 10 sampling events at concentrations from 19 to 61 μg/L

- At source area well MW05 during all five sampling events at concentrations from 180 to 820 μg/L

- At source area well 8MW06 during 9 of 10 sampling events at concentrations from 260 to 1,100 μg/L
- At near-source downgradient well 8MW33 during all 11 sampling events at concentrations from 13 to 40 μg/L
- At downgradient installation boundary well 8MW03 during five of nine sampling events at concentrations from 6.5 to 11 μg/L
- At downgradient installation boundary well 8MW35 during 1 of 10 sampling events at a concentration of 5.2 μg/L

Similarly, benzene was detected at concentrations greater than its RG during this 5-year review period, as summarized below:

- At source area well 8MW28 during one of two sampling events at a concentration of 5.6 μg/L
- At source area well 8MW30, which was sampled 10 times, but only 1 sample was analyzed for benzene, at a concentration of 15 μg/L
- At source area well 8MW53, which was sampled 10 times, but only 1 sample was analyzed for benzene, at a concentration of 450 μg/L
- At source area well MW08 during all eight sampling events at concentrations from 1,700 to 12,000 μg/L
- At source area well 8MW47 during all 10 sampling events at concentrations from 1,600 to 12,000 μg/L
- At source area well 8MW24, during all three sampling events that benzene was analyzed for, at concentrations from 620 to 3,500 μg/L
- At source area well 8MW48, during all three sampling events that benzene was analyzed for, at concentrations from 5,000 to 8,000 μg/L
- At source area well MW05 during all five sampling events at concentrations from 10,000 to 20,000 μg/L
- At source area well 8MW49 during a one-time sampling event at a concentration of 6,400 μg/L

- At source area well 8MW06 during all 10 sampling events at concentrations from 11,000 to 19,000 μg/L

Because concentrations of VOCs have been below the RGs for the last 2 years in the off-base wells, the 2014 LTM report recommended that the frequency for compliance monitoring in these wells should be changed to annually. No other change to the monitoring program is recommended at this time.

OU 8 LTM Statistical Trend Analysis Summary

Statistical trend analysis, including linear regression and Mann-Kendall, were conducted on a subset of wells in the 2014 annual LTM and O&M data report for OU 8 (U.S. Navy 2014f). Data from the wells were reviewed to identify wells with benzene, ethylbenzene, toluene, 1,1,2-TCA, 1,2-DCA, 1,1-DCE, 1,2-EDB, 1,2-dichloropropane (DCP), and vinyl chloride results above detection limits in at least 80 percent of the historical results. Wells with data sets containing greater than 20 percent nondetections were eliminated from the analysis because of insufficient data. Locations where data sets contain less than 20 percent nondetections, one-half the detection limit for the nondetected data points was substituted in the data sets for the analysis.

Data sets for the following monitoring wells were determined to be suitable for statistical analysis in groundwater:

- Petroleum COCs in upgradient well 8MW42 (Mann-Kendall only)
- Petroleum COCs in source area wells 8MW06, 8MW47, MW05, and MW08
- Chlorinated VOCs in source area wells 8MW06 and MW05
- Chlorinated VOCs in on-site downgradient wells 8MW03, 8MW33, and 8MW35
- Chlorinated VOCs in off-site downgradient wells 8MW13 and 8MW19

Summaries of the linear regression and Mann-Kendall evaluations are provided in Tables 6-6 and 6-7, which were reproduced from Tables 4-2 and 4-3 of the 2014 annual LTM and O&M data report for OU 8 (U.S. Navy 2014f). The linear regression and Mann-Kendall evaluations are discussed in the following sections for the performance and compliance monitoring wells.

OU 8 LTM Linear Regression Trend Analysis Summary

Linear regression trend analysis results for COCs are summarized in Table 6-6 on a well-specific basis and by COC as follows:

- Benzene:
  - Statistically significant decreasing concentration trends not found
  - A decreasing concentration trend for well MW08 that is not statistically significant
  - An increasing concentration trend for well 8MW47 that is not statistically significant
  - Statistically significant increasing concentration trends in wells 8MW06 and MW05
- Ethylbenzene:
  - Statistically significant decreasing concentration trend in well 8MW47
  - A decreasing concentration trend for well MW08 that is not statistically significant
  - Statistically significant increasing concentration trends in wells 8MW06 and MW05
- Toluene:
  - Statistically significant decreasing concentration trends in wells 8MW47 and MW08
  - An increasing concentration trend for well MW05 that is not statistically significant
  - Statistically significant increasing concentration trend in well 8MW06
- 1,1,2-TCA: Statistically significant decreasing concentration trends in wells 8MW03, 8MW33, and 8MW35
- 1,1-DCE:
  - Statistically significant decreasing concentration trends in wells 8MW03 and 8MW35

  - A decreasing concentration trend for well 8MW33 that is not statistically significant

- 1,2-DCA:
  - Statistically significant decreasing concentration trends in wells 8MW06, 8MW03, 8MW35, 8MW13, and MW19
  - An increasing concentration trend for well MW05 that is not statistically significant
  - Statistically significant increasing concentration trend in well 8MW33

- 1,2-DCP: Statistically significant decreasing concentration trend in well 8MW33

This analysis indicates that concentration trends for petroleum-related COCs are generally increasing in source area wells 8MW06 and MW05, but are decreasing or stable in source area wells 8MW47 and MW08. This analysis also shows that concentration trends for chlorinated VOCs are generally decreasing in groundwater at the site, except for well 8MW33 where 1,2-DCA concentrations have increased and well MW05 where concentrations of 1,2-DCA are stable.

OU 8 LTM Mann-Kendall Trend Analysis Summary

The Mann-Kendall trend analysis results for COCs are summarized in Table 6-7 on a well-specific basis and by COC as follows:

- Benzene:
  - A decreasing concentration trend for the 2009 to 2013 time period in wells 8MW42 and 8MW47 at the 90 percent confidence level
  - No statistically significant concentration trend was found in well MW08 for the 2010 to 2013 time period and well 8MW47 for the 2000 to 2013 time period
  - An increasing concentration trend for the 2000 to 2013 time period in wells 8MW06 and MW05 at the 95 percent confidence level and at the 90 percent confidence level for the 2009 to 2013 time period for well 8MW06 and the 2007 to 2013 time period for MW05

- Ethylbenzene:
  - A decreasing concentration trend for the 2000 to 2013 time period in well 8MW47 at the 95 percent confidence level and at the 90 percent confidence level for the 2009 to 2013 time period
  - No statistically significant concentration trend found in well MW08
  - An increasing concentration trend for the 2000 to 2013 time period in wells 8MW06 and MW05 at the 95 percent confidence level and at the 90 percent confidence level for the 2009 to 2013 time period for well 8MW06 and the 2007 to 2013 time period for well MW05
- Toluene:
  - A decreasing concentration trend for the 2000 to 2013 time period in well 8MW47 at the 95 percent confidence level and at the 90 percent confidence level for the 2009 to 2013 time period
  - A decreasing concentration trend for the 2010 to 2013 time period in well MW08 at the 95 percent confidence level
  - No statistically significant concentration trend found in well 8MW06 for the 2009 to 2013 time period and in well MW05 for either the 2000 to 2013 or the 2007 to 2013 time periods
  - An increasing concentration trend for the 2000 to 2013 time period in well 8MW06 at the 95 percent confidence level
- 1,1,2-TCA:
  - A decreasing concentration trend for the 2000 to 2013 time period in wells 8MW03, 8MW33, and 8MW35 at the 95 percent confidence level
  - A decreasing concentration trend for the 2009 to 2013 time period in well 8MW33 at the 90 percent confidence level
  - No statistically significant concentration trend found for the 2009 to 2013 time period in well 8MW35
  - No statistically significant increasing concentration trends found

- 1,1-DCE:
  - A decreasing concentration trend for the 2000 to 2013 time period in wells 8MW03 and 8MW33 at the 95 percent confidence level
  - A decreasing concentration trend for the 2009 to 2013 time period in well 8MW35 at the 90 percent confidence level
  - No statistically significant concentration trend found for the 2009 to 2013 time period in wells 8MW03 and 8MW33 and for the 2000 to 2013 time period in well 8MW35
  - No statistically significant increasing concentration trends found
- 1,2-DCA:
  - A decreasing concentration trend for the 2000 to 2013 time period in wells 8MW06, 8MW03, 8MW35, and 8MW19 at the 95 percent confidence level
  - A decreasing concentration trend for the 2009 to 2013 time period in well 8MW13 at the 95 percent confidence level
  - A decreasing concentration trend for the 2009 to 2013 time period in wells 8MW06, 8MW03, 8MW33, 8MW35, and 8MW19 at the 90 percent confidence level
  - No statistically significant concentration trend found in well MW05
  - An increasing concentration trend for the 2000 to 2013 time period in well 8MW33 at the 95 percent confidence level
- 1,2-DCP: A decreasing concentration trend for the 2000 to 2013 time period in well 8MW33 at the 95 percent confidence level and at the 90 percent confidence level for the 2009 to 2013 time period

This analysis indicates that concentration trends for petroleum-related COCs are generally increasing in source area wells 8MW06 and MW05, but are decreasing in upgradient well 8MW42 and decreasing or stable in source area wells 8MW47 and MW08. This analysis also shows that concentration trends for chlorinated VOCs are generally decreasing in groundwater at the site, except for well 8MW33, in the period from 2000 to 2013 during which 1,2-DCA concentrations have increased.

Current Distribution of Chlorinated VOCs in Groundwater

The lateral distribution of chlorinated VOCs in groundwater has been typically based on the reported results for 1,2-DCA, and this approach is used in this 5-year review as well. Review of the data for chlorinated VOCs, other than 1,2-DCA, indicates that this approach continues to provide a representative estimate of the distribution of all chlorinated VOCs in groundwater at OU 8. The 2009 and 2013/2014 distributions of 1,2-DCA in groundwater at concentrations greater than the established RG of 5-µg/L are shown on Figure 6-15. For this discussion, the 5-µg/L RG represents the contaminant plume boundary. These results indicate that the downgradient edge of the 1,2-DCA concentration plume retreated away from the NBK Bangor boundary toward the source area during this 5-year review period.

Trend Analyses of 1,2-DCA Concentration Data Performed as Part of 5-Year Review

Concentration trends for 1,2-DCA using only data collected during this 5-year review period were evaluated for each monitoring well where periodic sampling occurred and concentrations were detected above the reporting limit. This subset of wells consists of the following:

- One upgradient well (8MW42)
- Four source area wells (8MW06, 8MW47, MW05, and MW08)
- One near-source downgradient well (8MW33)
- Two downgradient installation boundary wells (8MW03 and 8MW55)
- Two downgradient off-site wells (8MW13 and 8MW19)

These trend analyses consisted of plotting the log-transformed laboratory data against time. The concentration plots are included in Appendix D-3 of this report, and a description of the methodology used to construct them is included in Appendix B-3 of this report. The average concentration, minimum reported concentration, maximum reported concentration, concentration decay rate trend, and 95 percent UCL and LCL were calculated for these data on a well by well basis. Table 6-8 presents these calculated values for 1,2-DCA concentrations reported for the 10 wells that were monitored periodically for VOCs during this review period and had concentrations above the reporting limit.

The average concentration over the last 5 years for 1,2-DCA was calculated at 0.32 µg/L in well 8MW42, located at the upgradient edge of the source area, which is less than the established RG of 5 µg/L. A negative concentration decay rate was calculated for this location, indicating a decreasing concentration trend. The concentration trend is decreasing with greater than 50 percent but less than 95 percent probability.

The average concentrations over the last 5 years calculated for 1,2-DCA ranged from 23.8 to 678 µg/L in four wells located within the source area (8MW06, 8MW47, MW05, and MW08) and in one well located in the dissolved plume downgradient from the source area (8MW33).

These concentrations are greater than the established RG of 5 µg/L. However, negative concentration decay rates were calculated for each of these locations, indicating decreasing concentration trends. The trends are decreasing with greater than 95 percent probability at four (8MW06, 8MW47, MW05, and 8MW33) of these five locations. The concentration trend is decreasing with greater than 50 percent probability but less than 95 percent probability at well MW08.

The average concentration over the last 5 years for 1,2-DCA in well 8MW03 located at the NBK Bangor installation boundary was calculated at 5.68 µg/L, just above the RG. However, a negative concentration decay rate was calculated for this location, indicating a decreasing concentration trend. This concentration trend is decreasing with greater than 50 percent but less than 95 percent probability.

The average concentrations over the last 5-years calculated for 1,2-DCA ranged from 0.22 to 1.86 µg/L in three wells: 8MW35 located at the NBK Bangor installation boundary and 8MW13 and 8MW19 located approximately 800 feet off site and downgradient of the installation boundary. Negative concentration decay rates were calculated for each of these locations, indicating decreasing concentration trends. The trends are decreasing with greater than 95 percent probability at all three of these wells (8MW35, 8MW13, and 8MW19).

In summary, although 1,2-DCA concentrations at the site remain above the established RG in the area shown on Figure 6-15, concentrations across the site appear to be decreasing with better than a 95 percent probability in 7 of the 10 well locations, with detected concentrations and greater than a 50 percent probability at the remaining 3 locations. An estimate of the time to achieve the established RG of 5 µg/L for 1,2-DCA in groundwater was made for the well 8MW06, where the highest average concentration (678 µg/L) was reported. Assuming that concentration trends remain constant into the future, the 1,2-DCA concentration in groundwater from well 8MW06 is estimated to achieve the RG in approximately 20 years.

Current Distribution of Petroleum-Related Chemicals in Groundwater

The current lateral distribution of petroleum-related chemicals in groundwater has typically been based on the reported results for benzene, and this approach is used in this 5-year review as well. Review of the data for petroleum-related chemicals other than benzene indicates that this approach continues to provide a representative estimate of the distribution of all petroleum-related chemicals in groundwater at OU 8. Figure 6-16 shows the estimated extent of benzene in groundwater at concentrations greater than the established RG of 5 µg/L at the beginning and end of this 5-year reporting period. For this discussion, the 5 µg/L RG represents the contaminant plume boundary. These results indicate that the plume boundary has not changed during this 5-year review period, suggesting a steady-state condition for petroleum-related chemicals in groundwater at the site.

Trend Analyses of Benzene Data Performed as Part of 5-Year Review

Concentration trends for benzene using only data collected during this 5-year review period were evaluated for each monitoring well where periodic sampling occurred and concentrations were detected above the reporting limit. This subset of wells consists of the following:

- One upgradient well (8MW42)
- Four source area wells (8MW06, 8MW47, MW05, and MW08)
- Two downgradient installation boundary wells (8MW03 and 8MW35)
- One downgradient off-site well (8MW13)

These trend analyses were performed using the same methodology as was used for the 1,2-DCA data. The concentration plots are included in Appendix D-4 of this report, and Table 6-9 presents the calculated trend values for benzene concentrations reported for the eight wells that were monitored periodically for VOCs during this review period and had concentrations above the reporting limit.

The average concentrations over the last 5 years calculated for benzene in each of four wells located within the source area (8MW06, 8MW47, MW05, and MW08) ranged from 5,738 to 15,200 µg/L. These concentrations are greater than the established RG of 5 µg/L. Negative concentration decay rates were calculated for two of these locations (8MW47 and MW08), with greater than 95 percent probability that the trends are decreasing. The concentration trends at the two remaining locations (MW05 and 8MW06) produced slightly positive concentration decay rates of 0.030 and 0.037, suggesting stable to slightly increasing concentrations (see Table 6-9).

The average concentrations over the last 5 years calculated for benzene in four of the wells (8MW42, 8MW03, 8MW35, and 8MW13) were all below the established RG of 5 µg/L. A negative concentration decay rate was calculated for well 8MW42, with greater than 95 percent probability that the trend is decreasing. Because 9 of the 10 detected values for well 8MW42 were reported as estimated concentrations below the laboratory reporting limit of 0.5 µg/L, there is more uncertainty regarding the decreasing concentration trend in this well. This well is located approximately at the upgradient edge of the source area. Results of trend analysis are not reported for benzene in wells 8MW03 and 8MW35 located at the NBK Bangor installation boundary and well 8MW13 located approximately 800 feet off site and downgradient of the installation boundary, because data from these locations consist of 27 reported nondetections at the 0.5 µg/L laboratory reporting limit and 6 estimated values at concentrations below this reported detection limit. No benzene concentrations at these three locations were above the laboratory reporting limit of 0.5 µg/L. The plots of these data are included as Figures D-16, D-17, and D-18 in Appendix D-4.

In summary, benzene concentrations at the site remain above the established RG in the area shown on Figure 6-16. The benzene data show decreasing concentrations trends in the northern portion of the source area (wells 8MW42, MW08, and 8MW47) during this 5-year review period. Detected benzene concentrations in the southern portion of the source area (wells MW05 and 8MW06) appear to be stable or slightly increasing. Benzene concentrations at the downgradient locations are below reported detection limits. No estimate of the time to achieve the RG for benzene in site groundwater can be made at this time, because of the slightly increasing concentrations at some of the site wells.

LNAPL Recovery

LNAPL was observed in 30 monitoring wells at OU 8 during this 5-year review period. The extent of observed LNAPL based on these observations is shown on Figure 6-16. Where product is observed at a thickness greater than 0.10 foot in a well, product recovery is initiated and repeated weekly until the product thickness drops below 0.10 foot. Gauging for the potential presence of LNAPL was focused on wells in the general vicinity of the PWIA service station. Gauging frequency varied based on the past observations at each well and was adjusted during the year based on new findings (U.S. Navy 2014m).

Table 6-10 shows the 14 locations where LNAPL recovery occurred at OU 8 during this 5-year review period and presents a summary of the quantity recovered. Detailed product recovery information is included in Table D-2 of Appendix D-1, which is reproduced from Table E-1 of the Round 30 MNA report (U.S. Navy 2014m).

Because free product continues to be detected at the site, regular free-product measurements for wells screened across the water table in the PWIA should continue. In addition, LNAPL mobility tests should be performed to evaluate whether additional effort is warranted to reduce free product underlying the PWIA.

OU 8 Post-ROD Investigations

The third 5-year review (U.S. Navy 2010a) recommended the following actions:

- Implement the currently planned pilot testing to evaluate potential additional contingent remedial actions at OU 8 to address the slower-than-anticipated remediation progress of the selected remedy, increasing benzene concentrations, and return of free product.

- Perform an investigation of the vapor intrusion pathway within the PWIA of OU 8 following completion of the current pilot testing program.

- Obtain documentation of COC concentrations remaining in soil following removal actions, assess whether residual COC concentrations in soil are protective of groundwater, and update the OU 8 CSM accordingly.

Based on these recommendations, several investigations and studies were conducted at the OU 8 site during this 5-year review period. These investigations are summarized below.

Laboratory Study Results —Microcosm Study 2011

A microcosm study was conducted in 2011 by the University of Toronto for the Navy using soil and groundwater samples collected from OU 8. The objective of the study was to evaluate the potential for biodegradation of benzene, in the presence of 1,2-DCA, under aerobic and anaerobic conditions for the purpose of implementing MNA or other passive bioremediation alternatives to address the groundwater benzene and DCA plumes at OU 8 (Battelle 2011).

This study concluded the following:

- Significant degradation of benzene was not observed under aerobic conditions with site groundwater and aquifer material.
- In the presence of a culture medium containing trace elements and vitamins, rapid aerobic degradation of benzene was observed.
- Anaerobic biodegradation of benzene was observed in microcosms amended with the Edwards' laboratory anaerobic benzene degrading culture.
- This degradation was enhanced under sulfate-reducing conditions and inhibited in the presence of another electron donor.
- 1,2-DCA was degraded in the presence of an electron donor, lactate, and a dechlorinating culture containing *Dehalococcoides*, KB-1®.
- Anaerobic benzene degradation may be coupled to 1,2-DCA reduction.

Pilot Study Results—Phase I Field Study 2011

In 2011, the Navy conducted a Phase I field pilot study to accomplish the following:

- Evaluate the ability to augment the MNA remedy through injection of an electron donor that stimulates anaerobic degradation of chlorinated VOCs.

- Demonstrate that increasing the degradation rates of chlorinated VOCs in a treatment zone barrier within the shallow aquifer will augment the natural attenuation processes, thereby attaining concentrations below RGs at the base boundary within OU 8.

The Phase I field pilot study included the following:

- Installation of a line of five injection wells (8IW-1, 8IW-2, 8IW-3, 8IW-4, and 8IW-5) to create a treatment zone barrier oriented cross gradient to groundwater flow in the southern portion of the PWIA (Figure 6-17)
- Installation of nine monitoring wells (8PS-A1, 8PS-A3, 8PS-B1, 8PS-B2, 8PS-C1, 8PS-C2, 8PS-C3, 8PS-C4, and 8PS-D1) downgradient from injection wells 8IW-1 and 8IW-2 to evaluate the effectiveness of the treatment zone barrier (Figure 6-17)
- Creation of a treatment zone barrier extending for 35 feet below the water table (approximate depth of 35 to 70 feet bgs)
- Injection of emulsified vegetable oil (EVO) into the wells, followed 9 days later by microbes known to degrade DCA
- Collection of groundwater samples before and after injections from several new and existing OU 8 wells positioned immediately downgradient and screened at different depths to evaluate the treatment zone barrier (U.S. Navy 2011k)

The Navy collected three rounds of groundwater monitoring data every 3 months for 9 months to evaluate results of the Phase I field pilot study. These data were reported in the DCA plume pilot study report (U.S. Navy 2011k). The post-injection groundwater monitoring occurred in August 2010, November 2010, and January and February 2011. Results of these monitoring activities are summarized in Table 6-11. The complete data tables are included in Appendix D-5 of this 5-year review report.

The study concluded that an effective biobarrier was slow to develop, and the monitoring results were inconclusive on the biobarrier's effectiveness. To improve the evaluation of the biobarrier effectiveness and improve the approach for a second phase to the pilot study, a number of recommendations were made, including the following:

- Conduct additional total petroleum hydrocarbon (TPH) and VOC analyses during future soil sampling.

- Install additional injection and monitoring wells.
- Modify the injection procedures to improve distribution throughout the biobarrier.
- Extend the groundwater monitoring program beyond the 9-month period implemented in the study and adjust the analyte list to better evaluate the DCA degradation.

Pilot Study Results—Phase II Field Study 2012

In 2012, the Navy conducted a Phase II field pilot study to accomplish the following:

- Gather additional data to assess the outcome of Phase I EVO injections and bioaugmentation.
- Improve characterization of the OU 8 source area and refine the augmentation approach for the MNA remedy.
- Demonstrate that increasing the degradation rates of chlorinated VOCs in a treatment zone barrier within the shallow aquifer will augment the natural attenuation processes, thereby attaining concentrations below RGs at the base boundary within OU 8.

The Phase II field pilot study included the following:

- Conduct an electrical resistivity imaging survey, as shown on Figure 6-18, to improve understanding of the distributions of gasoline and chlorinated VOCs in the soil and groundwater and provide information for determining the placement of soil borings and monitoring wells.
- Install two additional injection wells (8IW-6 and 8IW-7) that extend the line of existing injections to the west-southwest (Figure 6-19).
- Install three additional monitoring wells (8PS-E1, 8PS-F1, and 8PS-G1) that provide downgradient monitoring points for the expanded treatment area (Figure 6-19).
- Install 10 additional monitoring wells (8CB-MW01, 8CB-MW02, 8CB-MW08, 8CB-MW17, 8CB-MW18, 8CB-MW23, 8CB-MW24, 8CB-MW25, 8CB-MW26, and 8CB-MW28) at locations surrounding and within the source area to provide additional groundwater monitoring locations to better evaluate the effectiveness of the treatment zone barrier (Figure 6-19).

- Clean the five existing injection wells to remove biofouling that was observed in the wells following the Phase I injections.

- Conduct aquifer testing at four injection wells (8IW-1, 8IW-3, 8IW-6, and 8IW-7) using tracer tests.

- Inject EVO and WBC-2™ microbes into wells 8IW-6 and 8IW-7 and KB-1 microbes only into well 8IW-1 using site groundwater extracted from nearby injection well 8IW-3 to push the microbes into the surrounding formation.

- Conduct baseline groundwater monitoring before injections from several new and existing OU 8 wells positioned immediately downgradient and screened at different depths to evaluate the treatment zone barrier (U.S. Navy 2013h).

- Three additional rounds of groundwater monitoring were completed at equally spaced intervals over a 9-month period to support the assessment of injection effectiveness (results are discussed in the "Phase II Field Study 2013" section below).

The data evaluation conducted for this study focused on updating the CSM. The study concluded the following regarding the CSM:

- No other source of gasoline release has been identified other than the documented 1986 release.

- Currently LNAPL is observed in the same areas as it was observed in the 1990s.

- The LNAPL is a gasoline product.

- The return of measurable product thicknesses in wells since 2009 may be related to lower groundwater surface elevations currently than during the 1990s.

- Bioactivity shown by the electrical resistivity imaging survey in the area of the PWIA service station area indicates that gasoline in the vadose zone has been largely degraded.

- LNAPL remains widespread in the vadose zone within the Vashon Till in the southern PWIA area beginning at depths of 17.5 to 22.5 feet and extending below the water table.

- The Vashon Till apparently created an important barrier to petroleum contaminant flow and also trapped significant LNAPL as the water table rose, thereby forcing it to linger for long periods and allowing it to wick into the fine-grained Vashon Till.

- The trapped LNAPL has been in contact with groundwater in the southern PWIA area, and the product currently in the till provides a long-term source for releases to groundwater.

- Whereas residual gasoline in the vadose zone shows degradation of benzene and toluene, submerged or trapped LNAPL has retained relatively high concentrations of benzene and toluene, as demonstrated by dissolved concentrations in adjacent groundwater.

- Dissolved fractions of gasoline are degraded rapidly as groundwater flows from the source area such that RGs are met within a short distance (at Sculpin Circle).

- No DCA detection occurred in the area of the PWIA service station.

- Utility trenches as potential conduits of migration were evaluated, but no associated contamination was identified.

- DCA concentrations decrease with depth, and no evidence for LNAPL in the aquifer exists.

- DCA concentrations are consistently highest in the southern PWIA in the area of the pilot study wells together with wells MW05 and 8MW06.

- Concentrations of DCA decrease steadily downgradient from the source area and are near the RG of 5 µg/L at the base boundary.

- Contaminants are shown to follow the long-established path of transitioning from the shallow depth interval in the source area to the intermediate depth interval of the aquifer downgradient of the source area, then migrating southeast through the area of wells 8MW35 and 8MW03 at the base boundary, and continuing to well 8MW13 at Mountain View Road (U.S. Navy 2013h).

The study concluded the following regarding the injection of EVO and microbes:

- The Phase II field activities showed that clogging extended beyond the well and sandpack such that bacterial growth encouraged by the injections in fact had clogged pore space in the aquifer matrix.

- Experience at other sites shows that this clogging is temporary rather than permanent, and the effective porosity of the aquifer matrix will be restored over time as the bacterial mass is diminished.

- Monitoring during the injections suggests that the distribution was good, and the injection method targeted the zone of highest contamination in the shallow aquifer (U.S. Navy 2013h).

Pilot Study Results—Phase II Field Study 2013

The Navy collected three rounds of groundwater monitoring data every 3 months for 9 months to evaluate results of the Phase II field pilot study conducted in 2012. These data were reported in the DCA pilot study evaluation (U.S. Navy 2013n). The post-injection groundwater monitoring occurred in September and December 2012 and March 2013. Results of these monitoring activities are summarized in Table 6-11, and Figure 6-20 presents these data in a graphical format. The complete data tables are included in Appendix D-5 of this 5-year review report.

The data evaluation conducted for this study focused on establishment of a biobarrier, effectiveness of the biobarrier, and evaluation of the materials injected to accomplish augmentation of degradation. The study concluded the following:

- Site geochemical parameters (dissolved oxygen, oxidation reduction potential, pH, nitrate sulfate, and methane) indicated that anaerobic conditions were achieved and maintained in the biobarrier.

- The biobarrier was effective in Phase II at reducing DCA by 12 to 96 percent in monitoring wells (8PS-A1, 8PS-A3, 8PS-B1, 8PS-B2, 8PS-C1, 8PS-C2, 8PS-C3, 8PS-C4, and 8PS-D1) installed downgradient of Phase I injection wells (highest in the shallowest wells).

- The biobarrier was also effective in Phase II at reducing DCA by 44 to 84 percent in monitoring wells (8PS-E1, 8PS-F1, and 8PS-G1) installed downgradient of the Phase II injection wells.

- Ethene and ethane production was observed, providing evidence of degradation proceeding to its end products.

- The similar reductions of DCA in the Phases I and II portions of the biobarrier revealed that the first-time injection of WBC-2 microbes in the Phase II area engaged more rapidly in augmenting degradation compared to the Phase I area injected with KB-1 microbes.

- The greater quantity of microbes injected for Phase II may also have supported more rapid engagement for both KB-1 and WBC-2 microbes (U.S. Navy 2013n).

The recommended path forward includes the following:

- Injections likely should be repeated every 2 to 3 years, although EVO need not be injected while geochemical parameters and dissolved organic carbon indicate that anaerobic conditions have been maintained.

- A confirmational round of monitoring should be conducted at approximately 18 months after injections to assess the longer term performance of DCA biodegradation in the biobarrier (see "Bioaugmentation Longevity Study 2014" section below).

- The longevity of the biobarrier and need for reinjection of EVO and microbes should be assessed to evaluate the cost of maintaining the biobarrier to reduce source area chlorinated VOC concentrations to ensure that RGs for COCs are achieved at the base boundary (U.S. Navy 2013n).

Vapor Intrusion Studies 2012 and 2013

The Navy conducted vapor intrusion studies to evaluate whether vapor migration from the subsurface to indoor air is a potentially complete exposure pathway warranting further investigation (U.S. Navy 2012h). Based on EVS Pro data depictions (discussed below) and existing contaminant concentration data, it was concluded that the PWIA was the only potential area of concern for the vapor intrusion pathway. Buildings 1021 and 1202 were selected for vapor intrusion analyses based on the concentrations in groundwater beneath the buildings and presence of small offices within the buildings.

Indoor air and subslab soil gas sample pairs were collected from five locations in each building within small office/storage spaces (U.S. Navy 2014n). Two rounds of samples were collected: January and July 2013. These samples were analyzed for benzene, toluene, ethylbenzene, 1,1-DCE, 1,2-DCA, 1,2-dibromomethane, 1,2-dichloropropane, 1,2,3-TCA, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, isopropylbenzene, naphthalene, xylenes, and vinyl chloride. Results of these analyses and associated field measurements are included in Appendix D-6 of this 5-year review report. The vapor intrusion study concluded the following:

- Although selected contaminants were detected in indoor air, the subslab sample data indicate that these detections result from indoor sources and do not result from vapor intrusion from the subsurface.

- High oxygen levels measured in subslab soil gas beneath the buildings supports the conclusion that the vapor intrusion pathway is not significant for these buildings under current conditions, because these high levels are indicative of an environment conducive to biodegradation that results in significant attenuation of the vapor concentrations within the vadose zone.

- The high oxygen levels explain why subslab soil gas concentrations are below levels of concern, even though groundwater beneath the site is significantly impacted by petroleum-related VOCs and the presence of residual free product.

- 1,2-DCA was not detected in subslab soil gas, demonstrating that 1,2-DCA vapors are not migrating from groundwater and the pathway is incomplete (U.S. Navy 2014n).

- Although indoor air and subslab soil gas data indicate that the vapor intrusion pathway is insignificant for workers in the PWIA (under current conditions), the presence of residual free product could be providing a continued source of contaminants to groundwater. In addition, potentially increasing concentrations of benzene in groundwater have also been noted. If groundwater concentrations continue to increase, subslab soil gas concentrations could also increase. Because of these uncertainties, an additional round of vapor intrusion monitoring was recommended. However, subslab soil gas concentrations are unlikely to increase to levels that would result in health concerns.

Pilot Study Results—Bioaugmentation Longevity Study 2014

The Navy conducted additional groundwater monitoring in the March and April 2014 time frame to evaluate the effectiveness of the biobarrier 21 months after injection as recommended by the pilot study evaluation report (U.S. Navy 2013n), as discussed in the Phase II field study 2013 section above. This groundwater monitoring was conducted such that it corresponded with Round 30 of the periodic MNA activities conducted for OU 8 (U.S. Navy 2014g).

Results of monitoring activities conducted during baseline monitoring, 9-month post-injection monitoring, and 21-month post-injection monitoring are summarized in Table 6-11, and Figure 6-20 presents these data in a graphical format. The complete data tables are included in Appendix D-5 of this 5-year review report.

The conclusions presented by the bioaugmentation longevity study focus on data relevant to the effectiveness of the biobarrier and evaluation of the materials injected to accomplish augmentation of biodegradation. Those conclusions are summarized as follows:

- EVO and microbe injections were very successful in establishing the biobarrier.

- The observed longevity of the injected EVO confirmed that scaling back the oil content from 2 to 1 percent in wells 8IW-6 and 8IW-7 and forgoing additional EVO in well 8IW-1 for Phase II injections was appropriate.

- Elevated methane concentrations observed in samples collected throughout the biobarrier during the Phase II 21-month monitoring period indicate that vigorous methanogenesis occurred in the study area.

- Insufficient EVO remains approximately 3 years after injection in the Phase I wells, and EVO concentrations are significantly diminished approximately 2 years after injection in the Phase II wells.

- As the volatile fatty acids near depletion, ongoing degradation in the biobarrier may be slowing as a result.

- The biobarrier was highly effective in Phase II at reducing DCA by 67 to 97 percent in monitoring wells (8PS-A1, 8PS-A3, 8PS-B1, 8PS-B2, 8PS-C1, 8PS-C2, 8PS-C3, 8PS-C4, and 8PS-D1) installed downgradient of Phase I injection wells (highest in the shallowest wells).

- The biobarrier was also highly effective in Phase II at reducing DCA by 84 to 93 percent in monitoring wells (8PS-E1, 8PS-F1, and 8PS-G1) installed downgradient of the Phase II injection wells.

- Ethene and ethane production was observed, providing evidence of degradation proceeding to its end products (U.S. Navy 2014g).

A separate benzene pilot study to decrease LNAPL and dissolved benzene in the PWIA source area has been contracted by the Navy in an effort to reduce benzene concentrations in groundwater. Because redox manipulation by the LNAPL pilot study may raise the aerobic level in the subsurface and interact with the DCA pilot study area, the next step for maintenance of the DCA biobarrier likely should be deferred until the benzene pilot study has been completed. Therefore, the recommended path forward includes the following:

- Periodic monitoring of DCA and indicator parameters in pilot study wells, in addition to the ongoing MNA program, to assist in the assessment of the possible impacts from the benzene pilot study and inform when additional injections of EVO and microbes are appropriate

- Reestablishment of the DCA biobarrier once the benzene pilot study has been completed (U.S. Navy 2014g)

Modeling Results 2014

In 2014 the Navy conducted a study to accomplish the following:

- Further analyze existing soil and groundwater data using the three-dimensional EVS Pro model to estimate the extent of 1,2-DCA and benzene at the site.
- Analyze historical data to determine if the LNAPL plume may be related to a recent source.
- Perform plume stability analyses using historical data to assess LNAPL stability.
- Assess hydrologic conditions at individual wells to evaluate if measured LNAPL thickness is exaggerated.
- Provide conclusions and recommendations to improve understanding of site conditions and optimize the remedy.

The following conclusions were drawn from these analyses:

- The nature of the LNAPL source appears to be multiple historical releases from several of the USTs removed from the PWIA service station in the 1990s.
- The analytical data and tank testing results support the theory that no ongoing release from the existing gasoline and diesel tanks is occurring, and LNAPL appears to be at or near residual saturation.
- Results of the EVS Pro modeling concluded that from the mid-1990s to 2013, the 1,2-DCA and benzene plume footprints have receded, and the centers of mass for both contaminant plumes were localized to the site (see Figures 6-21 and 6-22).
- The increasing concentrations of benzene observed in some wells may be attributable to changes in the water levels at the site or impacts from recent pilot testing.
- Results of the hydrologic assessment suggest the presence of exaggerated LNAPL thickness in the wells at the site and that LNAPL saturations at the site are likely residual (U.S. Navy 2014h).

The recommended path forward includes the following:

- Conduct additional evaluation of the dissolved phase to optimize LTM, identify the need for and location of new monitoring wells, and sample groundwater from more wells in the PWIA area.

- Conduct additional analyses to better define the nature and extent of the LNAPL still present on the site to support remedy optimization.

- Evaluate active source remediation technologies for cost and effectiveness to optimize the remedy, including bioventing, source zone biosparging with soil vapor extraction, in situ groundwater recirculation, and in situ chemical oxidation (U.S. Navy 2014h).

6.4.5 Annual Institutional Control Inspections

Annual inspections are conducted at the sites where LUCs are in place in accordance with the previous and current ICMPs. The Navy prepared an ICMP for all of NBK Bangor in 2001 (U.S. Navy 2001). The ICMP was revised in 2007 and again in 2010. Inspections have been conducted during each of the 5 years that comprise this review period. The inspections performed in 2009 were conducted as established in the ICMP dated April 17, 2007 (U.S. Navy 2007). Subsequent inspections were conducted as established in the ICMP dated September 16, 2010 (U.S. Navy 2010c). IC inspections conducted during this review period, occurred on the following dates:

- October 19 to 26, 2009
- September 27 to October 4, 2010
- September 20 to 29, 2011
- September 23 to October 5, 2012
- September 17 to 30, 2013.

Annual inspections conducted for Sites A, F, 16/24, D, B, E/11, and 10 and OU 8 were reported in annual ICs inspection letter reports (U.S. Navy 2010d, 2011c, 2012b, 2013c, and 2014a). Activities conducted during these inspections and the results are summarized in Table 6-12.

During this 5-year review, ICs at NBK Bangor were found to be maintaining conditions protective of human health and the environment based on the visual inspections conducted. No site had inspection results that require contingency inspections, nor did any of the site ICs require immediate maintenance (U.S. Navy 2010d, 2011c, 2012b, 2013c, and 2014a). However, it should be noted that some deficiencies identified in the annual inspection reports were not immediately repaired. A greater effort should be made to ensure that deficiencies that impact protectiveness be repaired within the same year (before the next annual inspection) if funding is available in the same year, or programmed for the next year if funding is not available in the same year.

6.5 RESULTS OF SITE INSPECTION

The site inspection checklists are included as Appendix E. This section contains a summary of the site inspection findings. The site visit, which occurred on September 18, 2014, was conducted by the following personnel:

- Douglas Guenther, NAVFAC NW Remedial Project Manager
- Steve Skeehan, NAVFAC NW Navy Technical Representative
- Debbie Rodenhizer, URS Project Manager
- Eric Lillywhite, URS Senior Environmental Scientist
- Tom Goodlin, Sealaska Hydrogeologist

The site visit consisted of inspecting all portions of the site covered by ICs or requiring ongoing remedy operation and maintenance.

At OU 1 (Site A), a visual inspection was performed of the treatment plant and the areas where ICs are required. The O&M manual or maintenance logs could not be found in the treatment plant building at the time of the site inspection. Following the site inspection, the O&M contractor clarified that the O&M manual is kept in the field truck so that it is present while workers are on site, and a second copy is kept at the field office. The maintenance logs are kept at the field office instead of at the treatment plant, because it is impractical to keep the logs at Site A where they are not easily accessed because of base security.

The treatment plant was found to be in generally good condition and operational. However, corrosion was observed on floor braces supporting effluent piping in the southeast part of the treatment plant building, and one extraction well vault needs replacement. Furthermore, none of the extraction well vaults is traffic rated and located within the access road to the site. The Site A treatment system is over 15 years old and has experienced significant wear and tear over its operational life. Because of this, equipment failure is possible that could potentially lead to partial or full failure of the system as a whole. If continued long-term operation of this system is planned, the Navy, together with their LTM contractor, should perform a comprehensive evaluation of the pump and treat system maintenance needs and proactively repair or replace equipment to minimize future unscheduled shutdowns.

During the inspection of the burn area, a depression was noted in the southeast corner of the burn area, and a pipe was visible in this depression. This area should be investigated to determine if the leach basin liner may have been compromised, and, at a minimum, the hole should be backfilled with clean sand. In addition, tire ruts in the sand were observed along the perimeter of the burn area, most likely from well drilling activities at the site. These minor ruts do not appear to have impacted the leach basin liner. The O&M contractor noted that there most likely is bentonite in new well A-MW60, because the well does not produce water. This area is adequately covered by other wells, and redrilling of this well is considered unnecessary.

At OU 2 (Site F), a visual inspection was performed of the treatment plant and areas where ICs are required. The treatment plant was found to be generally in good condition and operational, with the O&M manual and records available on site. During the inspection, the roll-up door was partially open for ventilation, most likely because of the minor water leaks from various vessels and pumps observed during the visit. Theoretically, someone could access the building under the door, although the treatment plant is on NBK Bangor and access is controlled.

An electrical failure, caused from poor power quality, occurred in January 2013 during large wind storms that burned out many of the extraction well pumps and caused other damage. The Navy responded and repaired/upgraded the system in a timely fashion, and the long-term protectiveness of the remedy was not affected. The Navy also performed extensive repairs and upgrades from December 2013 to March 2014 while further bioremediation pilot testing was performed at the site. The Navy, together with their LTM contractor, should continue to evaluate pump and treat system maintenance needs and proactively repair and replace equipment. In addition, the minor water leaks observed during the site inspection should be repaired.

During the inspection of the Site F infiltration barrier, vegetation was observed growing in the seams in the asphalt and in the drainage swale. The vegetation in the drainage swale includes small trees. If allowed to continue to grow, this vegetation may impact the functionality of the infiltration barrier. This vegetation should be removed, and the asphalt cap repaired, as needed.

At OU 3 (Sites 16/24 and 25), OU 7 (Sites B, E/11, and 10), and OU 8, visual inspections were performed of the areas where ICs are required. Although no IC is required at Site 25, one monitoring well and protective casing was observed to be compromised, and decommissioning of this well is recommended. At Site B, erosion along the southern shoreline area, fading information signs, and the presence of invasive species in the cap area were observed. The Navy currently monitors beach erosion, and periodically replenishes the beach with fish mix. The presence of invasive species is not expected to compromise the integrity of the cap. However, the signs should be replaced. At Site E/11, fencing is compromised in one location adjacent to one of the gates, and the presence of invasive species was noted. At Site 10, the asphalt cap showed some signs of cracking, and a sinkhole is present adjacent to Building 2011. Based on these observations, the fencing and asphalt cap at Site 10 should be repaired.

6.6 RESULTS OF INTERVIEWS

Interviews were conducted with persons familiar with the CERCLA actions at NBK Bangor. Interviewees were selected from the Navy, Ecology, EPA, Kitsap County Health District, and community. Interview instructions and questions were sent to potential interviewees via e-mail or regular mail, and responses to questions were returned by e-mail. Not all those invited to comment chose to do so. Interview responses are documented in Appendix F. Highlights of the interview responses are summarized in the following sections.

6.6.1 Navy Personnel

Four Navy personnel responded to the interview request. As in the last 5-year review, Navy personnel expressed the opinion that the Site A pump and treat system was meeting the ROD requirements and remained protective, but was not a cost-effective remedy component. Furthermore, because of the low subsurface conductivity of the site, the prospect is low to increase system recovery. The Navy's opinion is that MNA may possibly be an effective replacement for the pump and treat remedy component. Therefore, recent groundwater monitoring events have included water quality parameters in support of the MNA alternative. Because of the very slow movement of groundwater at the site, containment might be achieved at Site A without the treatment system operating. An assessment should be performed on whether the plume would effectively remain contained, in accordance with the requirements of the ROD, if the treatment system were turned off. Alternatives to pump and treat should be reviewed for technical practicality and to determine if the site should be declared technically impracticable to remediate.

The Navy's opinion is that the Site F pump and treat system has been an effective component of the Site F remedy by containing and removing contamination. Although optimization of the current pump and treat system may prove beneficial, bioaugmentation for RDX reduction would best improve the remediation rate (if studies confirm effectiveness). The Navy also believed that OU 8 was meeting the ROD requirements by achieving containment, decreasing the extent of the DCA and benzene plume, and meeting off-base drinking water standards. Furthermore, remediation of benzene and DCA and removal of free product is being optimized through ongoing pilot studies.

The Navy reported that ICs have been effective to date, with no violations. Navy personnel reported no complaints from the public. Navy personnel expressed the opinion that the monitoring data collected and site inspections conducted over this 5-year review period have been adequate for meeting the ROD requirements.

6.6.2 Agency Personnel

Personnel from EPA, Ecology, and the Kitsap County Health Department responded to the interview request.

The EPA respondent stated that the remedies at OUs 1 and 2 were currently protective in the short term because there is no current groundwater exposure. However, the EPA respondent questioned the long-term protectiveness, because the length of time to achieve RAOs is unknown or not well estimated. The EPA respondent felt an estimation of the time frame for current remedies to achieve groundwater RAOs should be performed to assess whether or not changes to the remedies are necessary to achieve RAOs in a reasonable time frame.

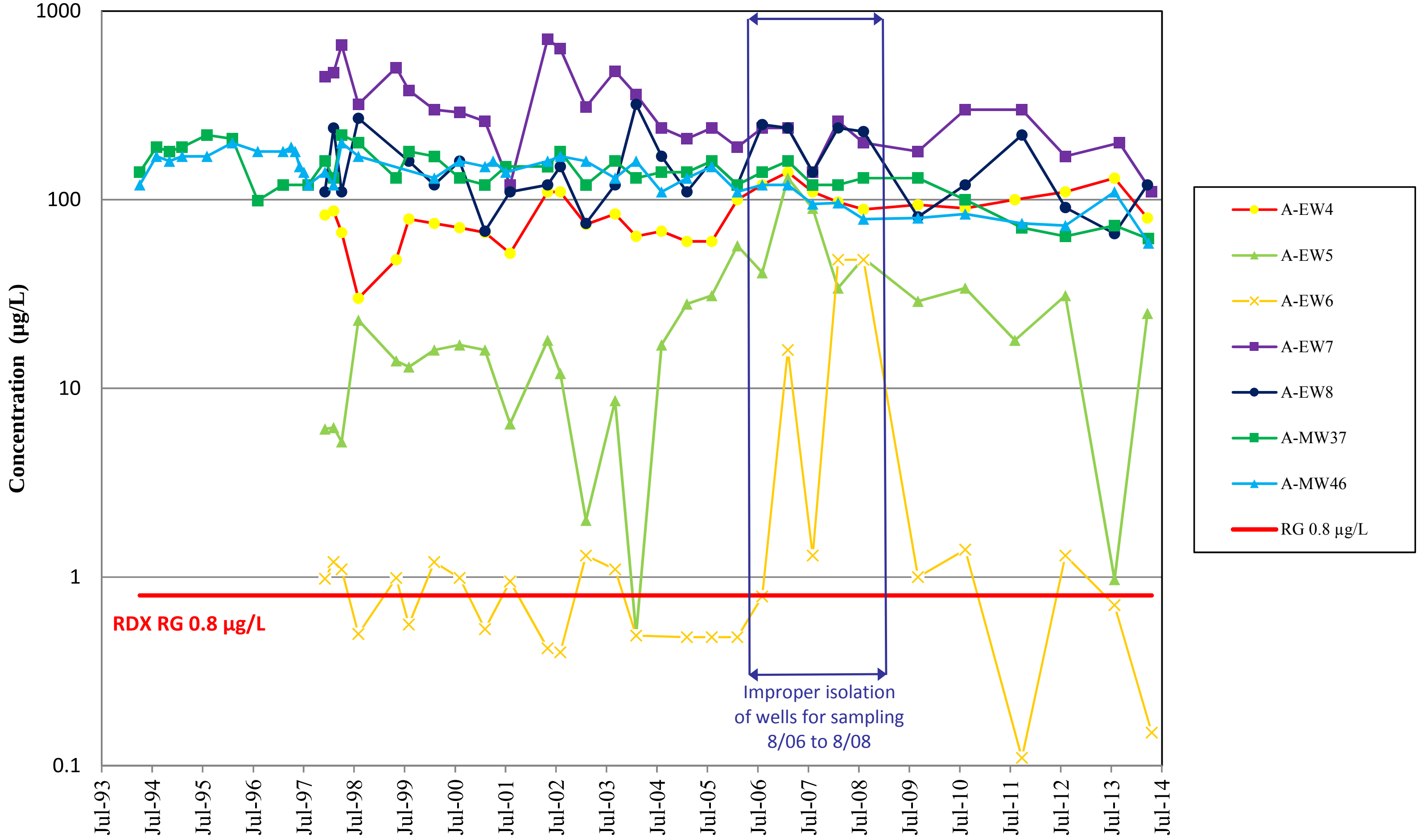
The EPA does not believe the remedy for OU 8 has met or will meet the groundwater RAOs in either the short or long term. The OU 8 monitoring data show that the remedy is inconsistent with the objectives of the EPA's MNA guidance. Therefore, EPA recommended a change in the remedy for OU 8. EPA further recommended that treatability studies and an FFS should be performed to evaluate more effective LNAPL and dissolved-phase benzene groundwater remediation technologies. The EPA respondent felt monitoring was sufficient. However, the remedy for OU 8 was ineffective and additional analysis of monitoring data was needed to assess achievement of RAOs. The EPA respondent also commented that the scientific finding of borderline risks for some VOCs in the vapor intrusion study for OU 8 may call into question the protectiveness of the remedy. If there are future increases in LNAPL or dissolved-phase benzene concentrations in the source area, vapor intrusion risks could increase. The EPA was unaware of any violations or complaints from the public.

Ecology's respondent also stated that the remedies at OU 1 and OU 2 were protective in the short term, but also believed that the remedy at OU 8 appeared to be protective in the short term. However, the respondent did not believe the pilot studies at OU 8 were resulting in progress toward remediating the site. The respondent agreed that the environmental monitoring at NBK Bangor has shown that the ROD goals have been met, but monitoring has also shown that the present passive actions at OU 8 are failing to remediate the site in a reasonable time frame. The respondent further stated that although containment goals have been met, the goal to reduce the level of contamination to less than federal and state standards has not been met, nor will it be met in a reasonable time frame. The respondent believed that an FFS should be performed, followed by more aggressive active remediation in the source area.

As in the last 5-year review, the Kitsap County Health District expressed concern that their agency did not have information regarding the remedies at NBK Bangor and therefore could not adequately comment. The respondents overall impression (pertaining to corrective actions at the Floral Point landfill) was that the remedies were in place and monitoring was ongoing.

6.6.3 Community

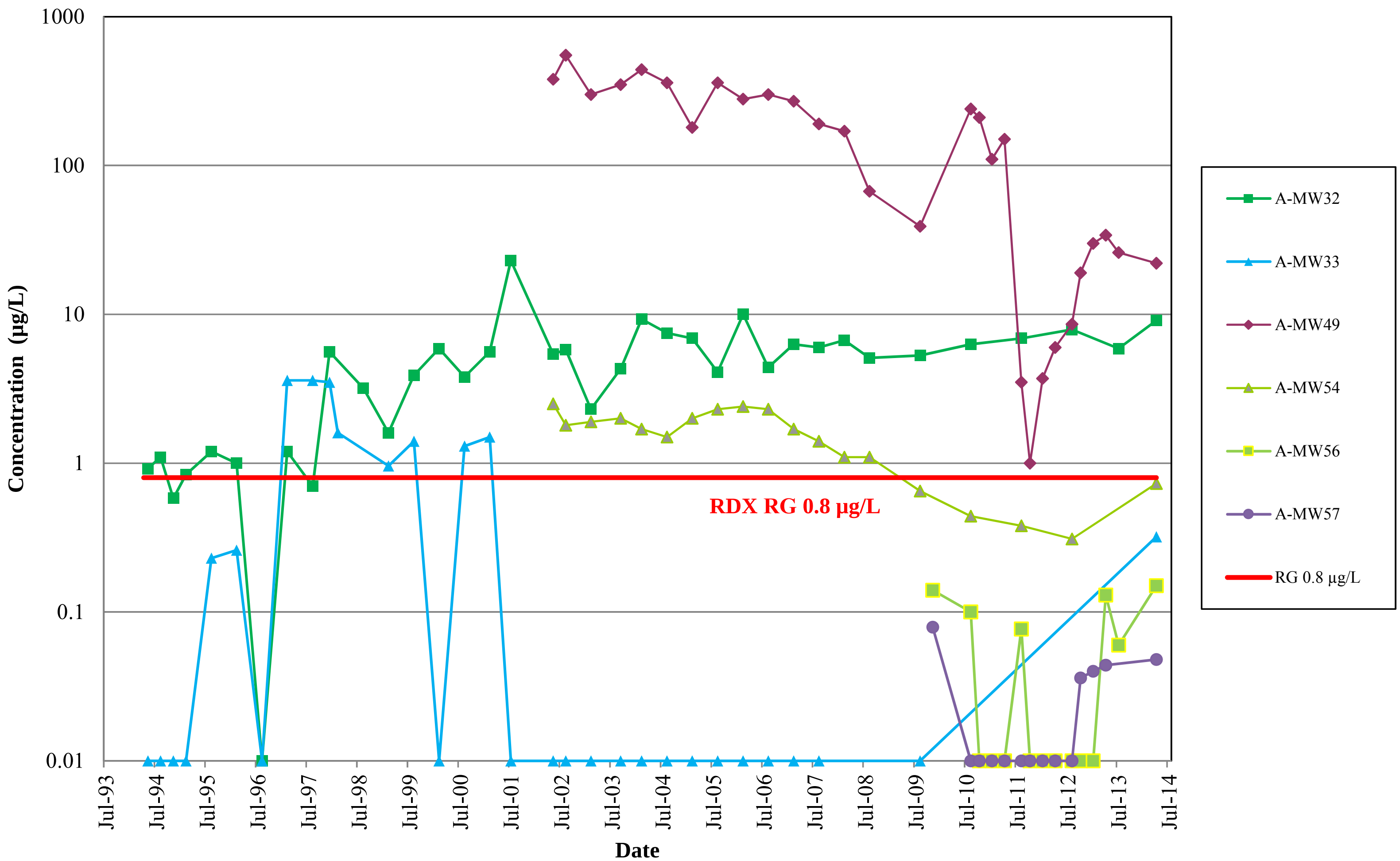
One community member respondent (former RAB member) reported feeling uninformed since dissolution of the RAB. The respondent expressed an explicit desire for an update on the current status of the Bangor sites, especially for Floral Point, as there was concern in the past about implementation and method of remedies for Floral Point. The second community member respondent also felt uninformed, with no further comments. Based on these interview responses and those received form the Kitsap County Health District, additional agency and community outreach activities should be performed.



Source: U.S. Navy 2014b

U.S. NAVY	**Figure 6-1** **Site A RDX Trends in Extraction Wells**	NBK Bangor FOURTH 5-YEAR REVIEW

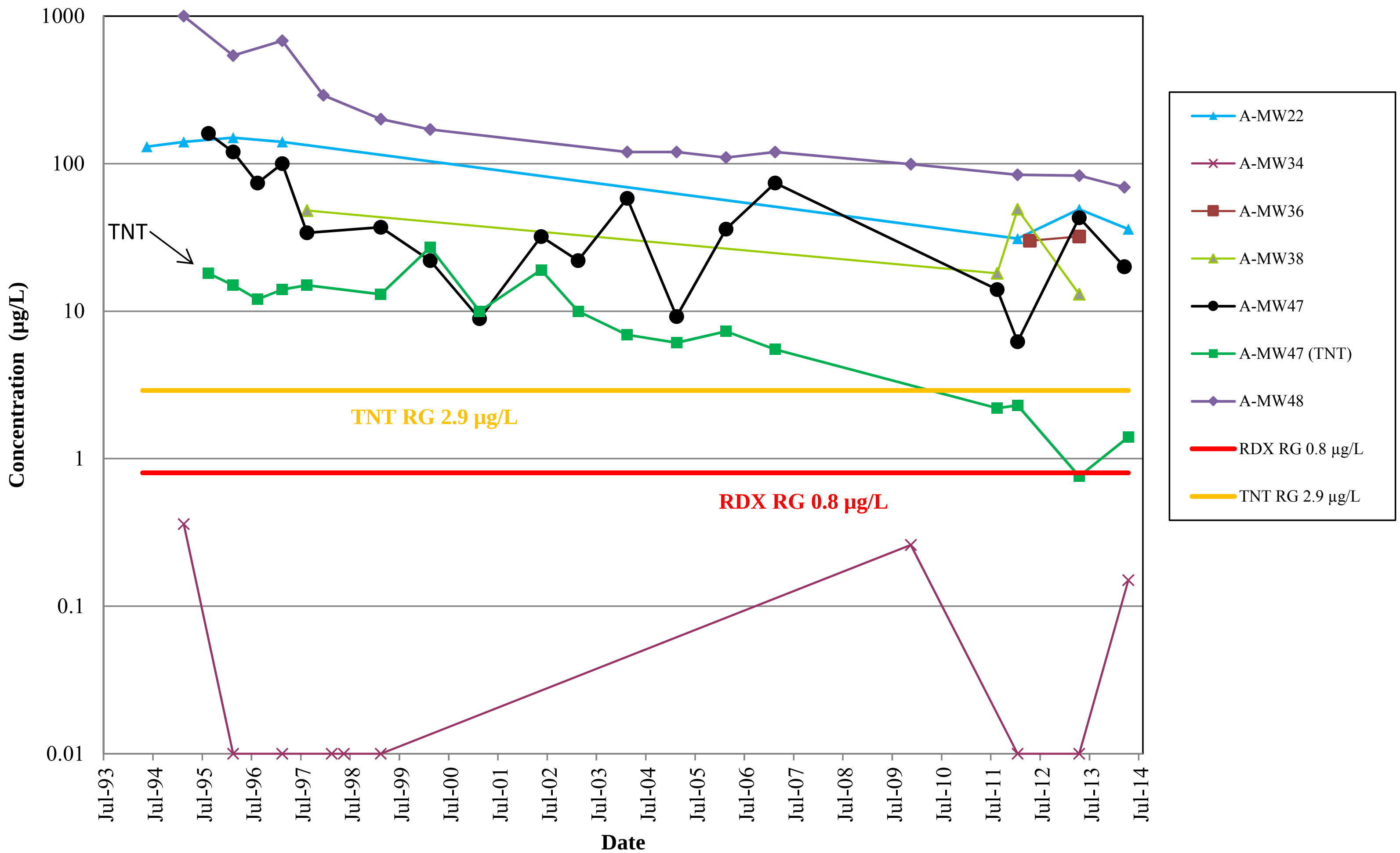
33762145_36.ai



Note: Nondetects plotted arbitrarily as 0.01 (µg/L)

Source: U.S. Navy 2014b

U.S. NAVY	**Figure 6-2** **Site A RDX Trends in Shallow Aquifer Monitoring Wells**	NBK Bangor FOURTH 5-YEAR REVIEW



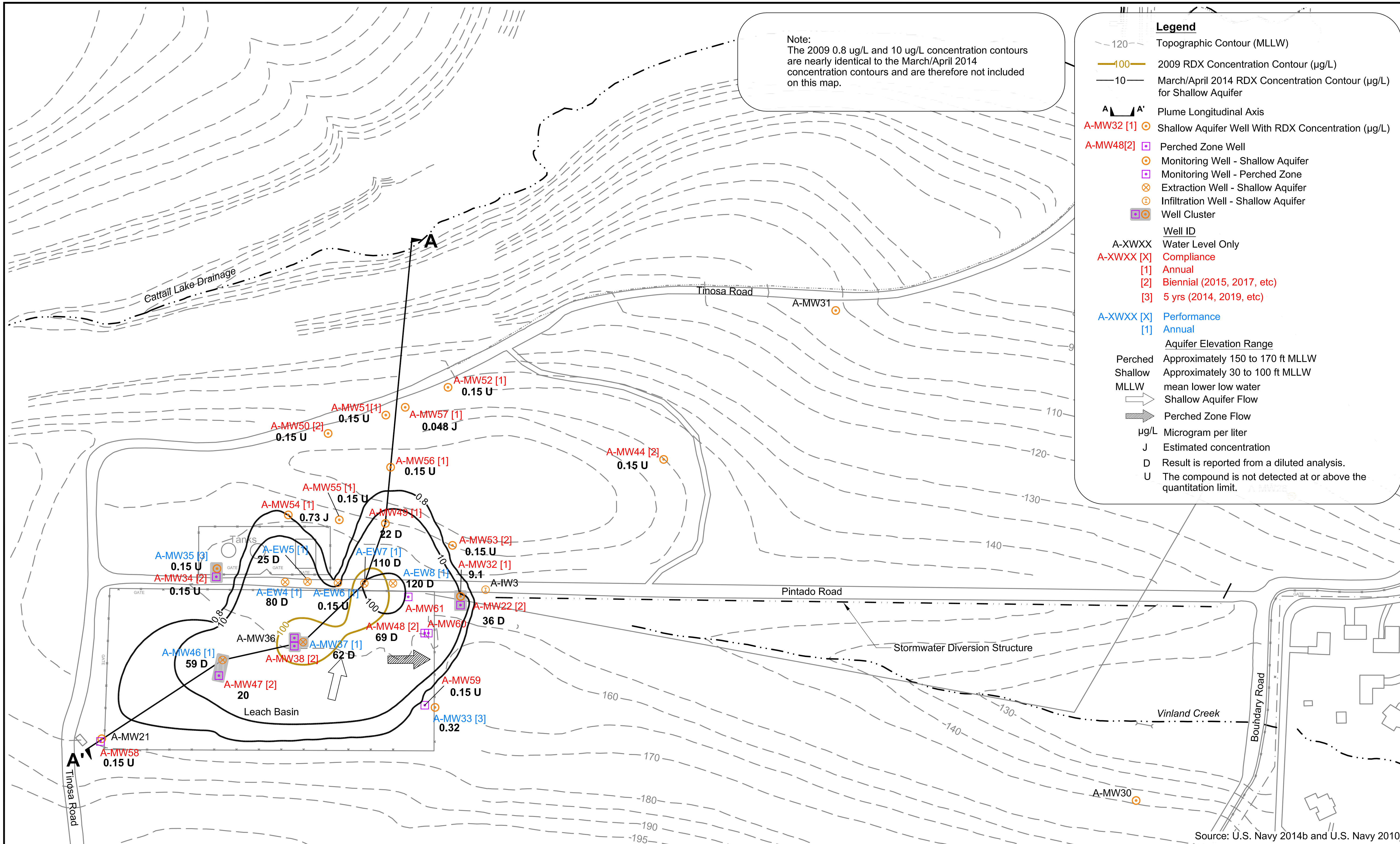
Note: Nondetects plotted arbitrarily as 0.01 (µg/L)

Source: U.S. Navy 2014b

U.S. NAVY

Figure 6-3
Site A RDX and TNT Trends in Perched Zone Monitoring Wells

NBK Bangor
FOURTH
5-YEAR REVIEW



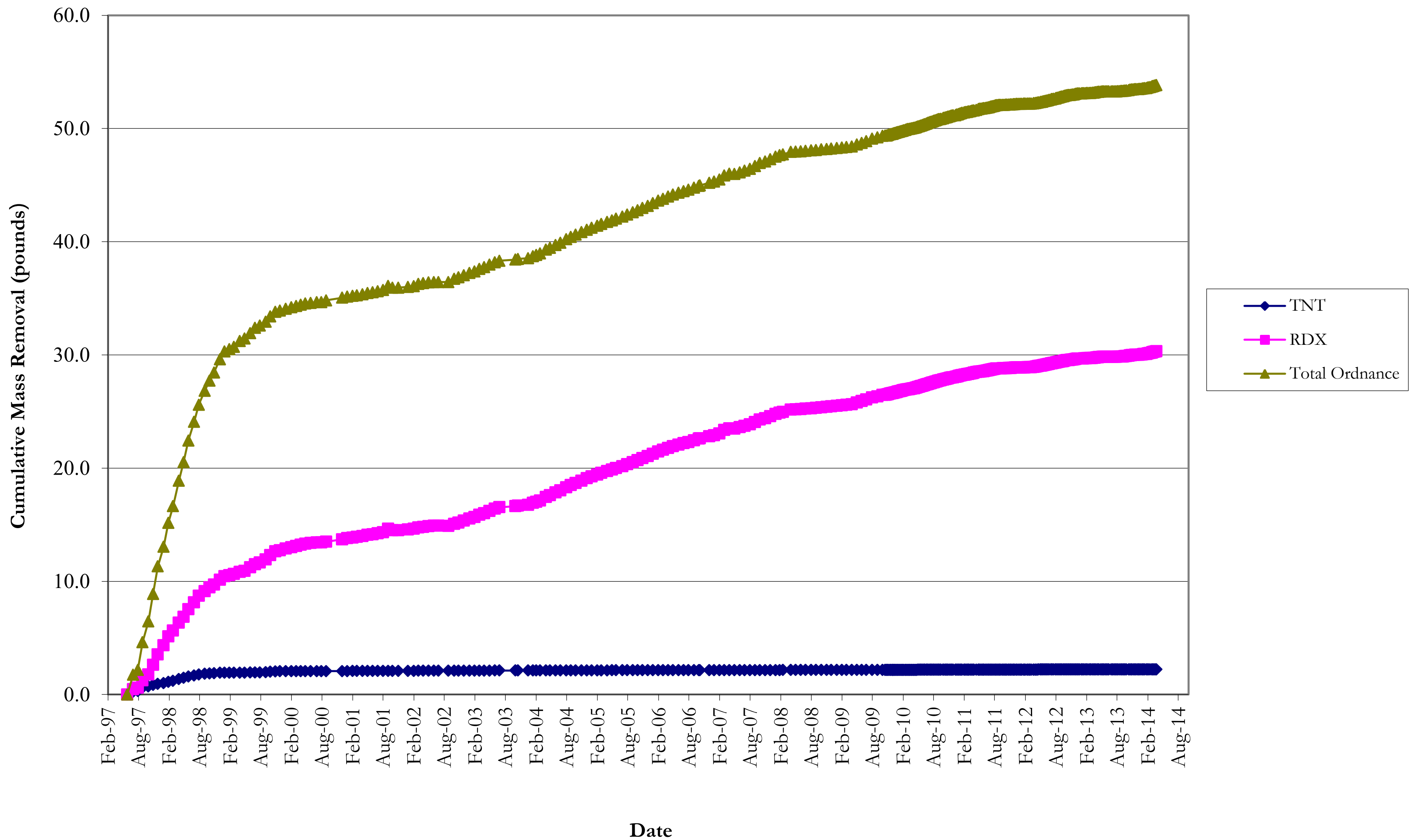
U.S. NAVY

NBK Bangor
FOURTH 5-YEAR REVIEW

Figure 6-4
Extent of RDX in Site A Groundwater During This 5-Year Review Period

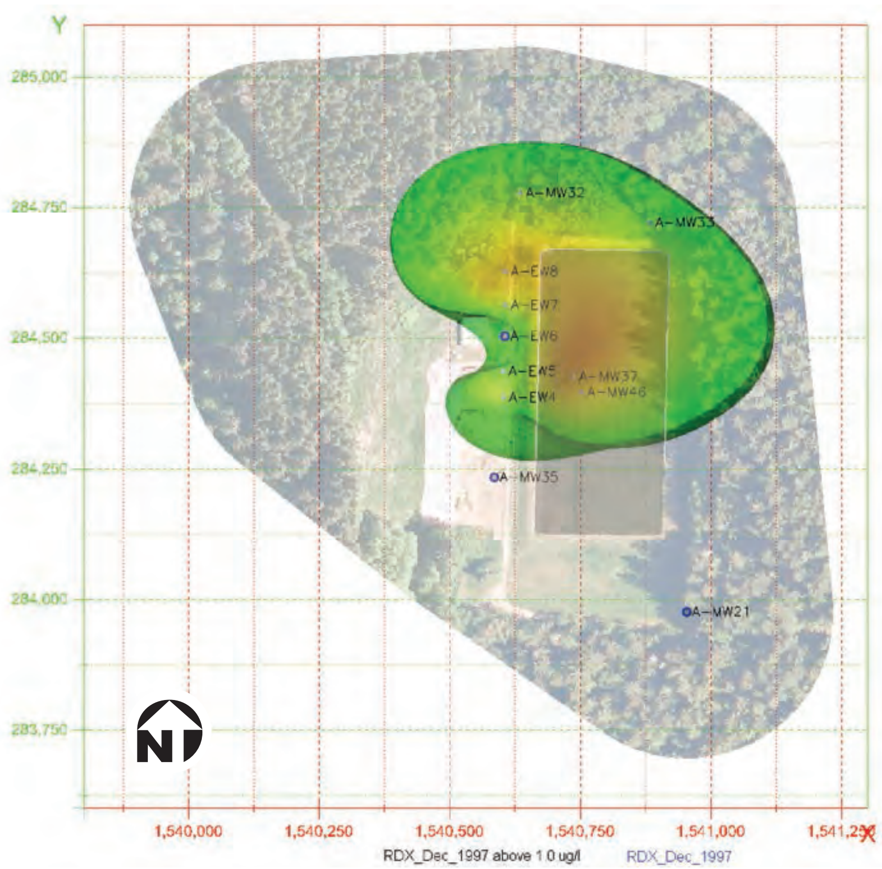
J:\GIS\Projects\NAVY\Bangor\Sub-Tasks\DO 78\4th-5yr\Fig 6-4 RDX Site A.dwg
Mod: 01/21/2015, 09:57 | Plotted: 01/21/2015, 09:57 | john_knobbs

33762145_38.ai

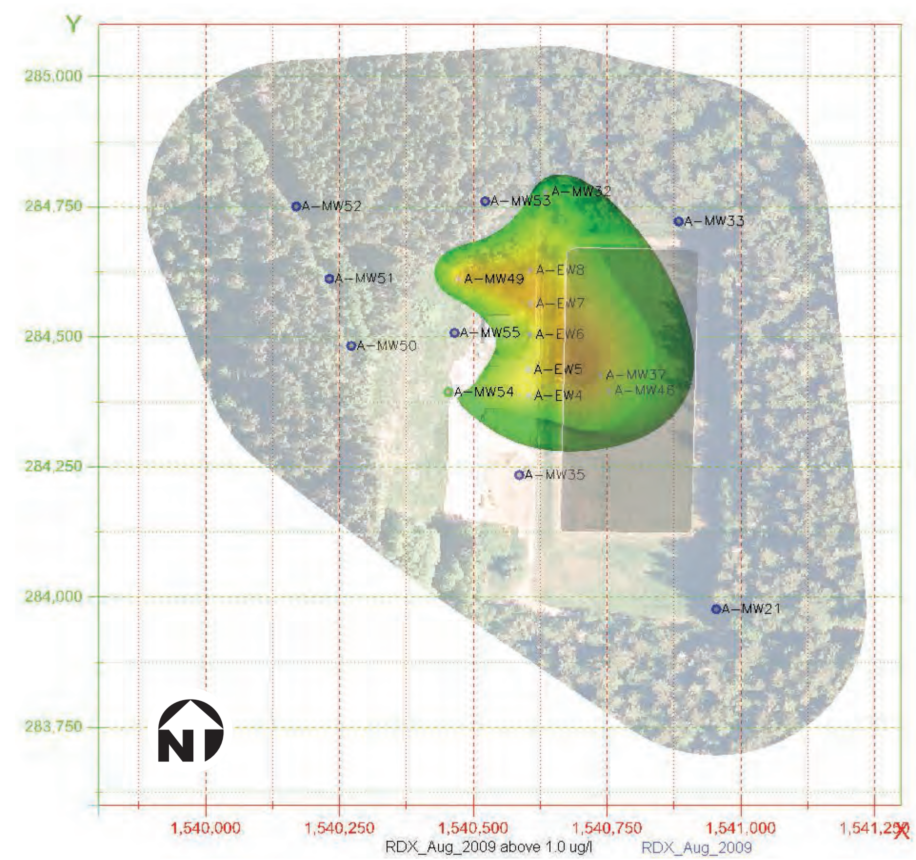


U.S. NAVY	**Figure 6-5** **Site A Pump and Treat System Mass Removal Since 1997**	NBK Bangor FOURTH 5-YEAR REVIEW

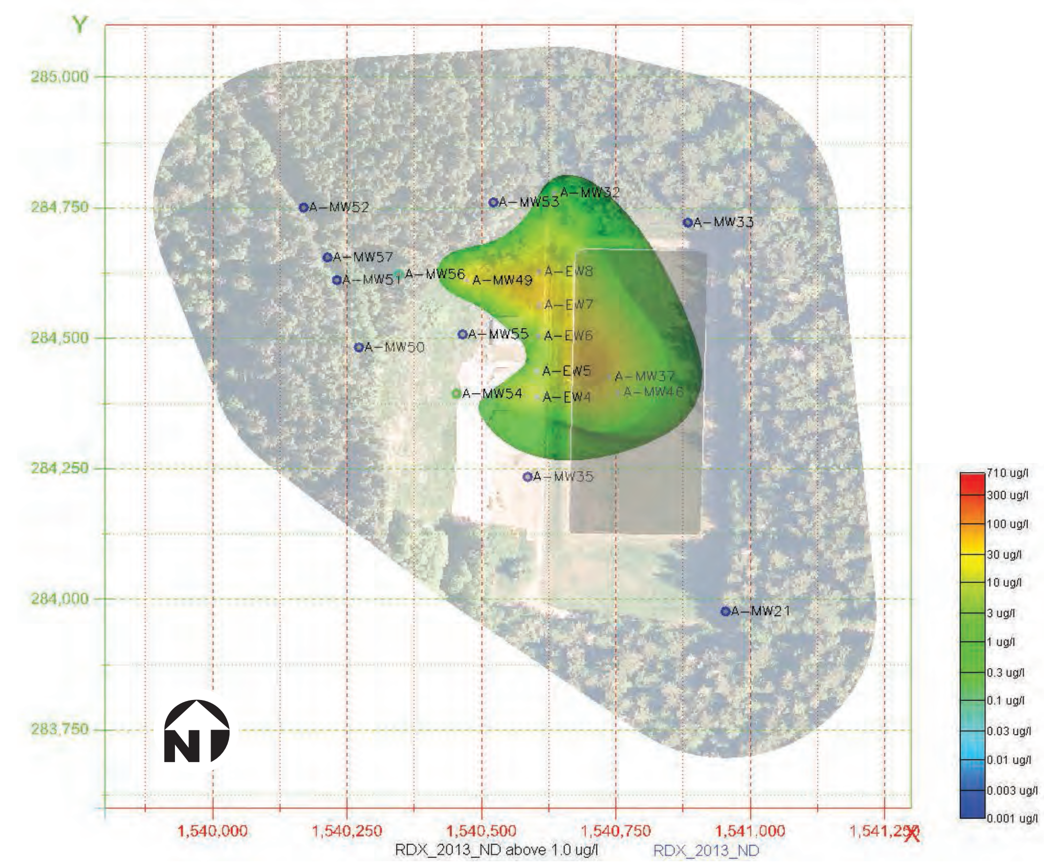
33762145_44.ai



1997 RDX Plume



2009 RDX Plume



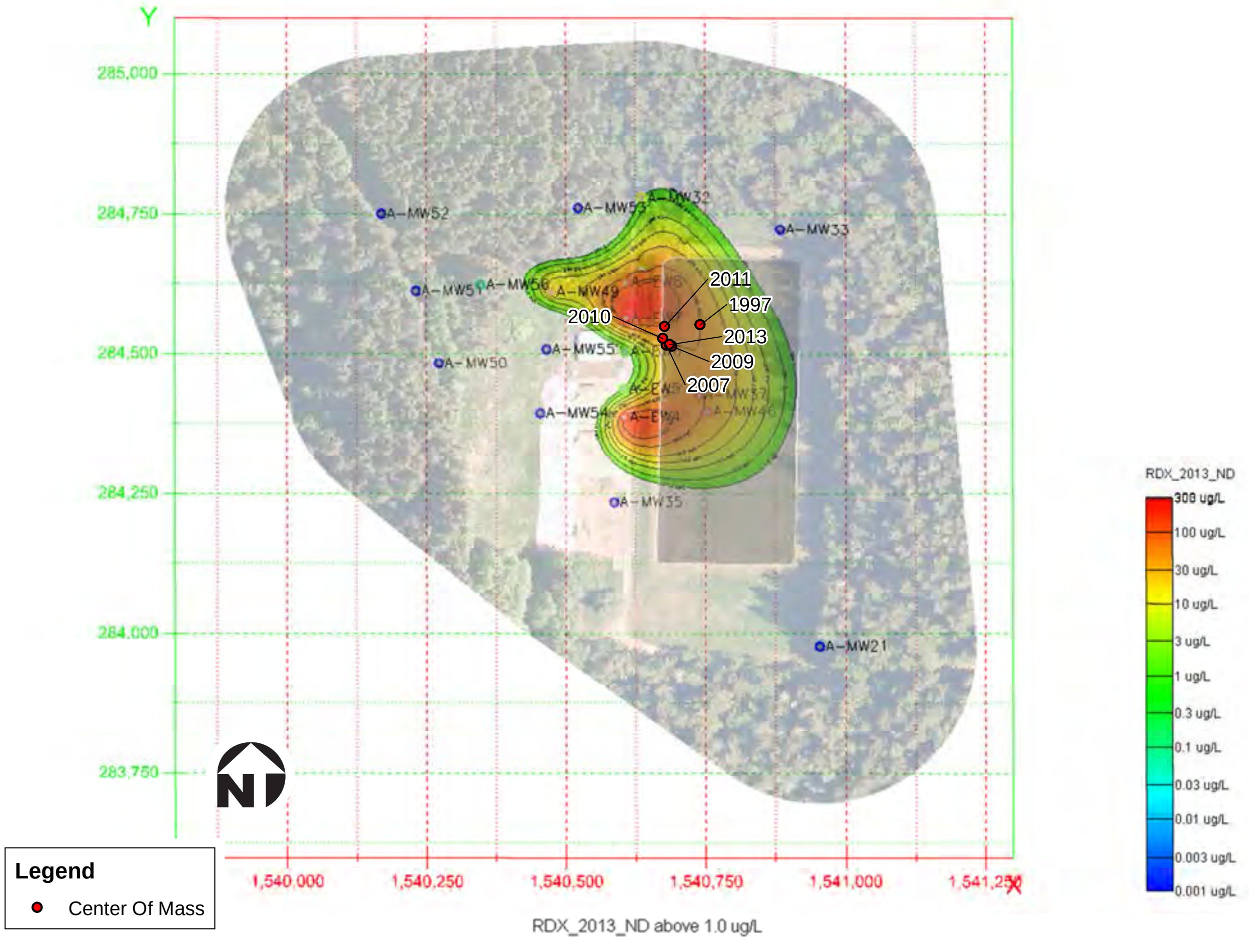
2013 RDX Plume

U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 6-6
EVS Pro Modeling Results for RDX Plume at Site A

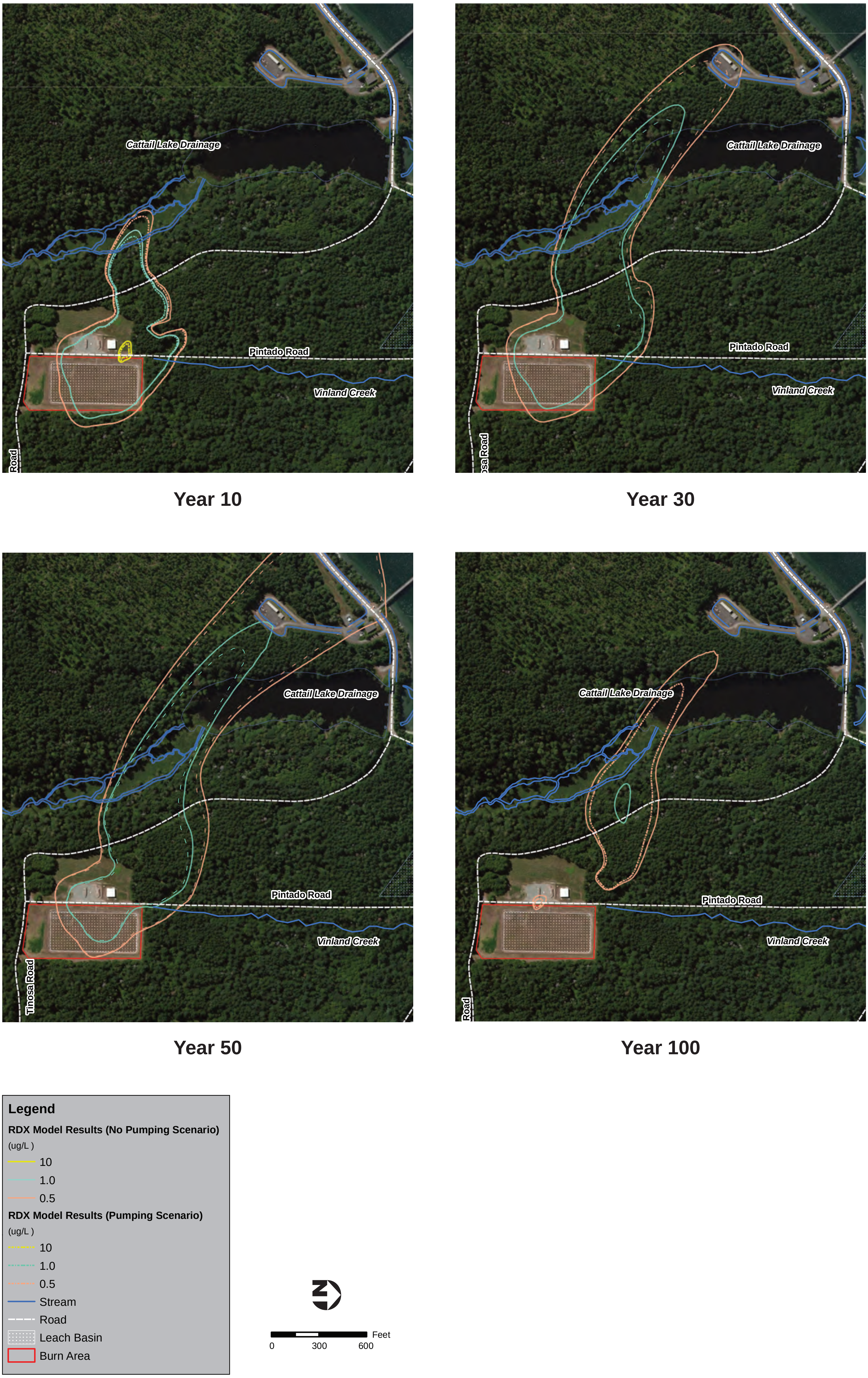
33762145_71.ai



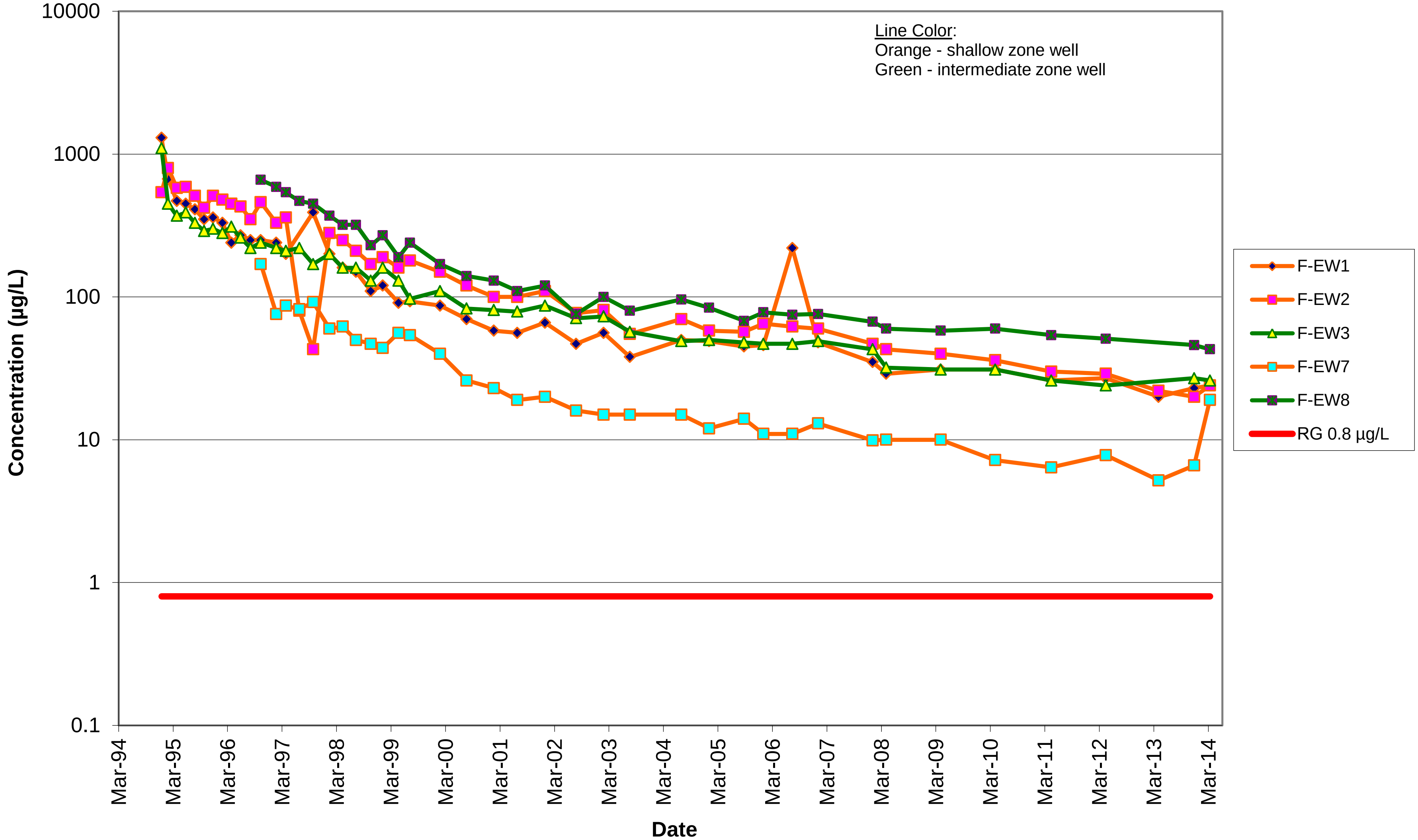
U.S. NAVY

Figure 6-7
EVS Pro Modeling Results for RDX Plume Center of Mass at Site A

NBK Bangor
FOURTH
5-YEAR REVIEW



U.S. NAVY	**Figure 6-8** **Site A Numerical Flow Modeling Results**	NBK Bangor FOURTH 5-YEAR REVIEW



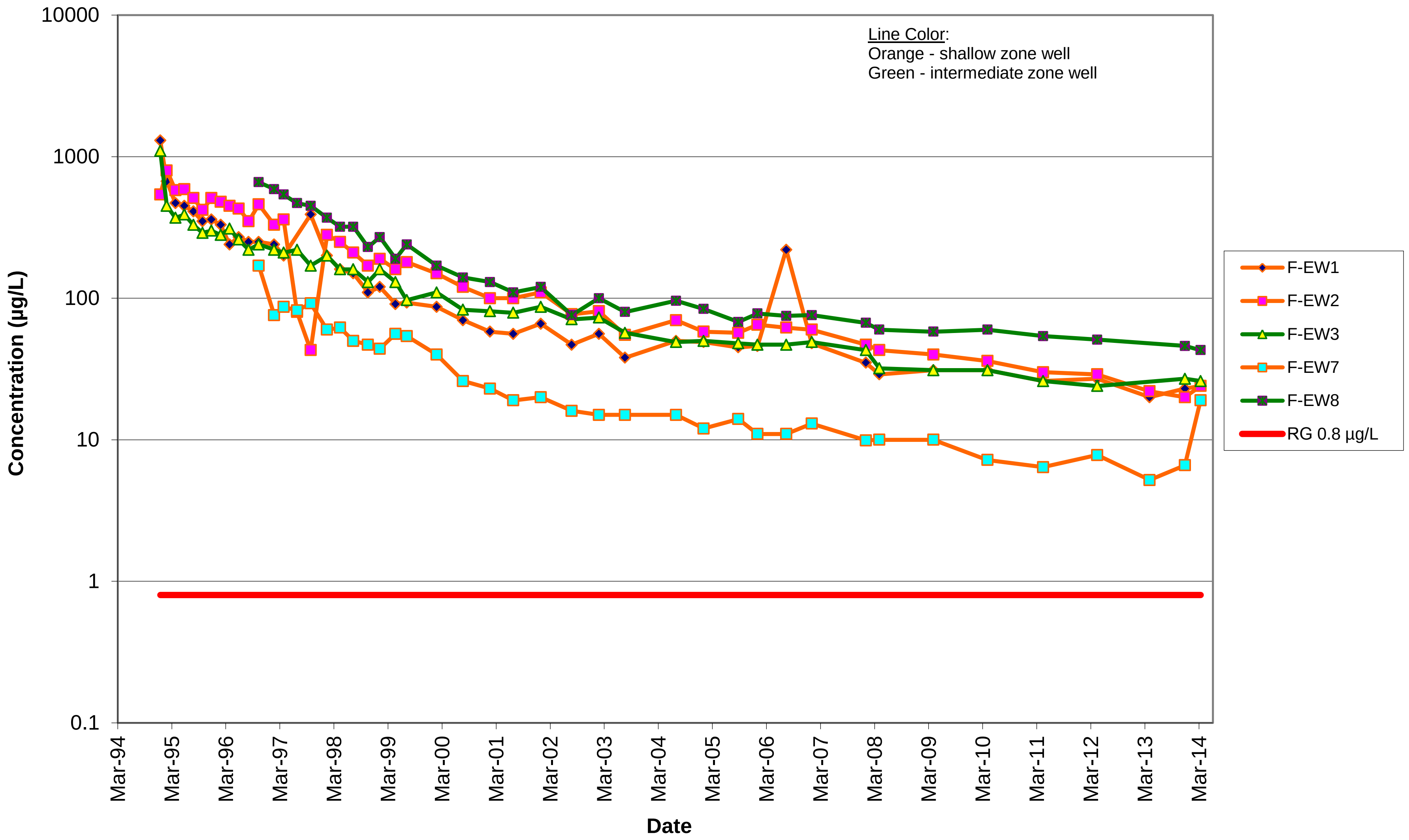
Source: U.S. Navy 2014c

U.S. NAVY

Figure 6-9
RDX Trends in Extraction Wells Located Near the OU 2 Source Area

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_40.ai



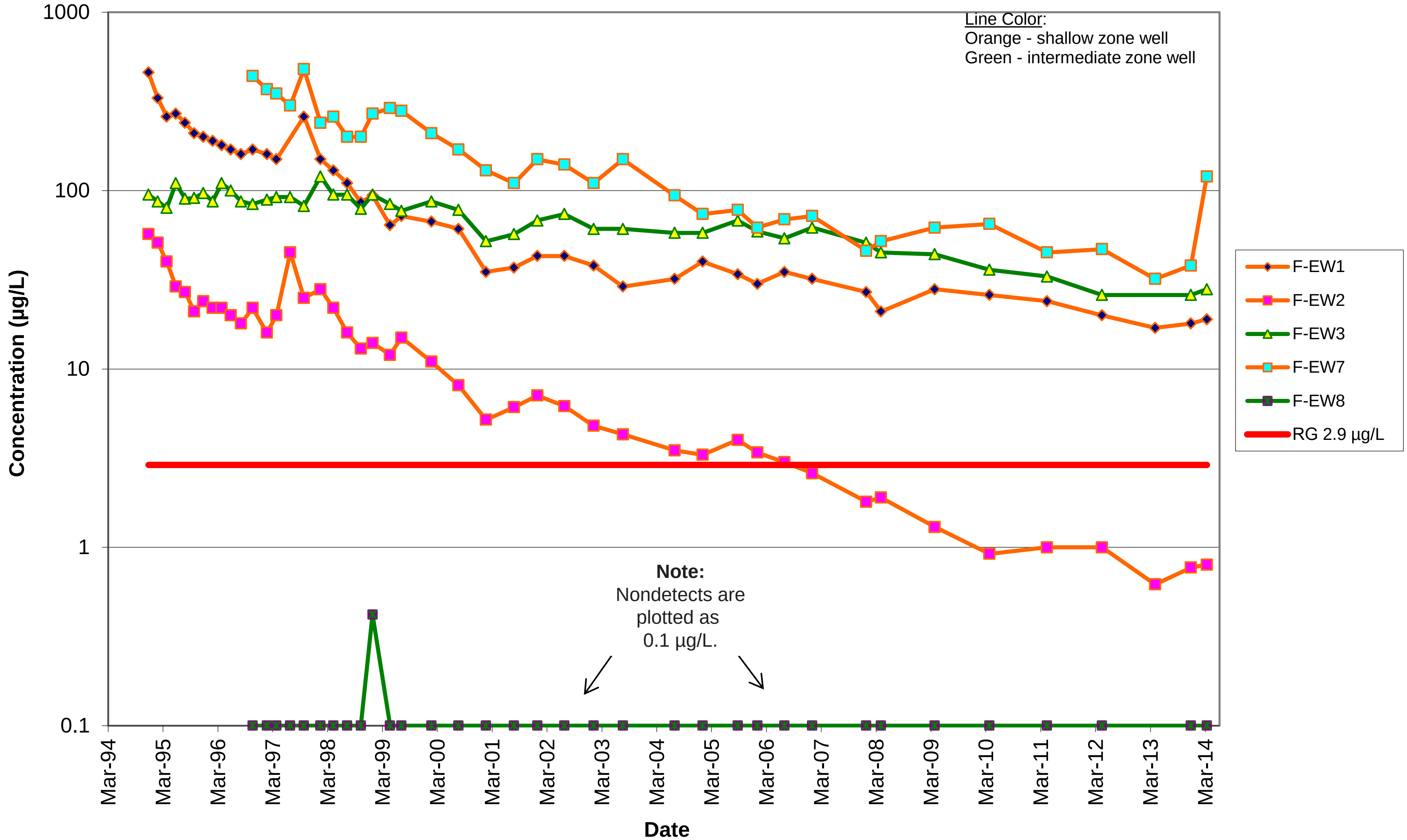
Source: U.S. Navy 2014c

U.S. NAVY

Figure 6-10
RDX Trends in Extraction Wells Located Downgradient of the OU 2 Source Area

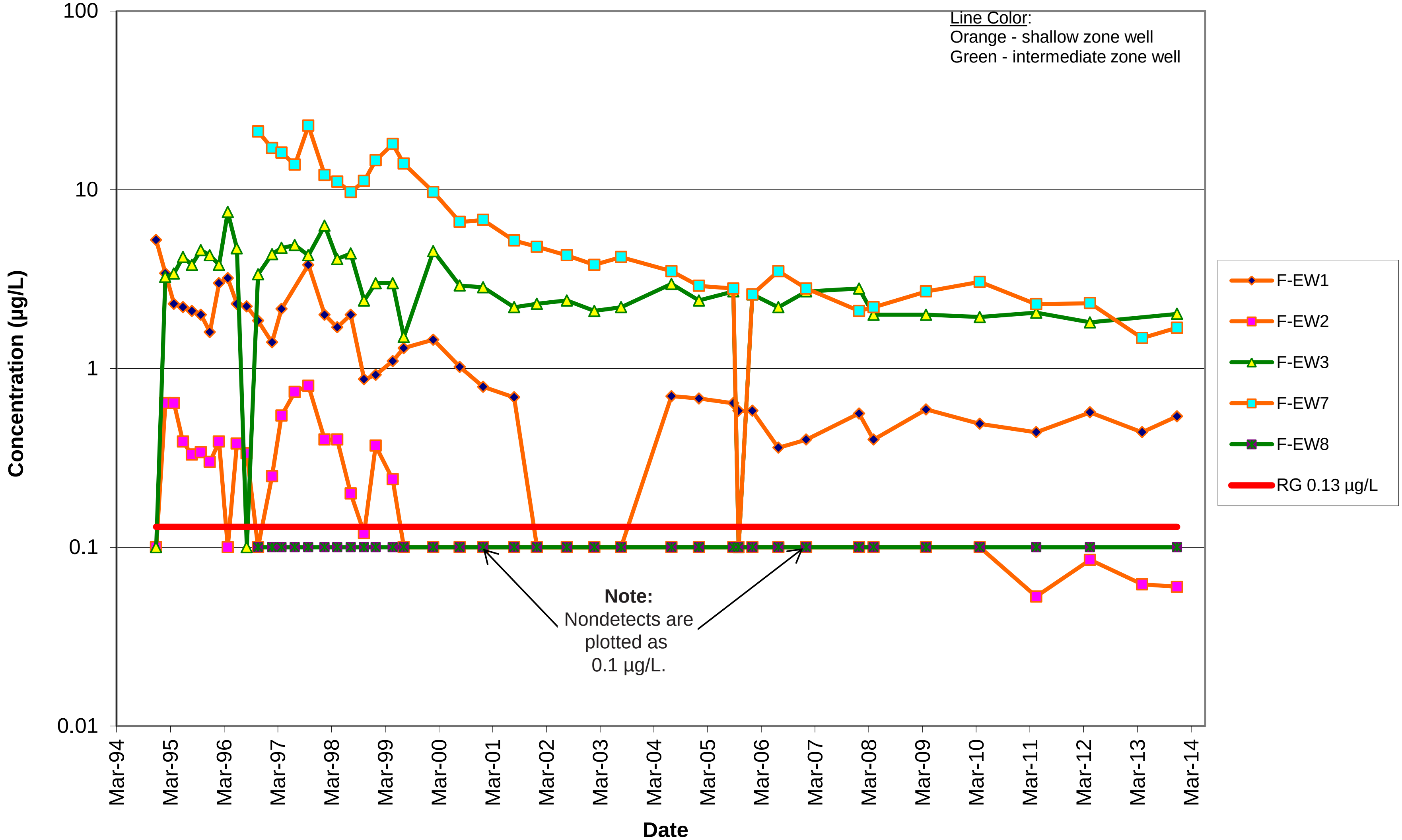
NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_41.ai



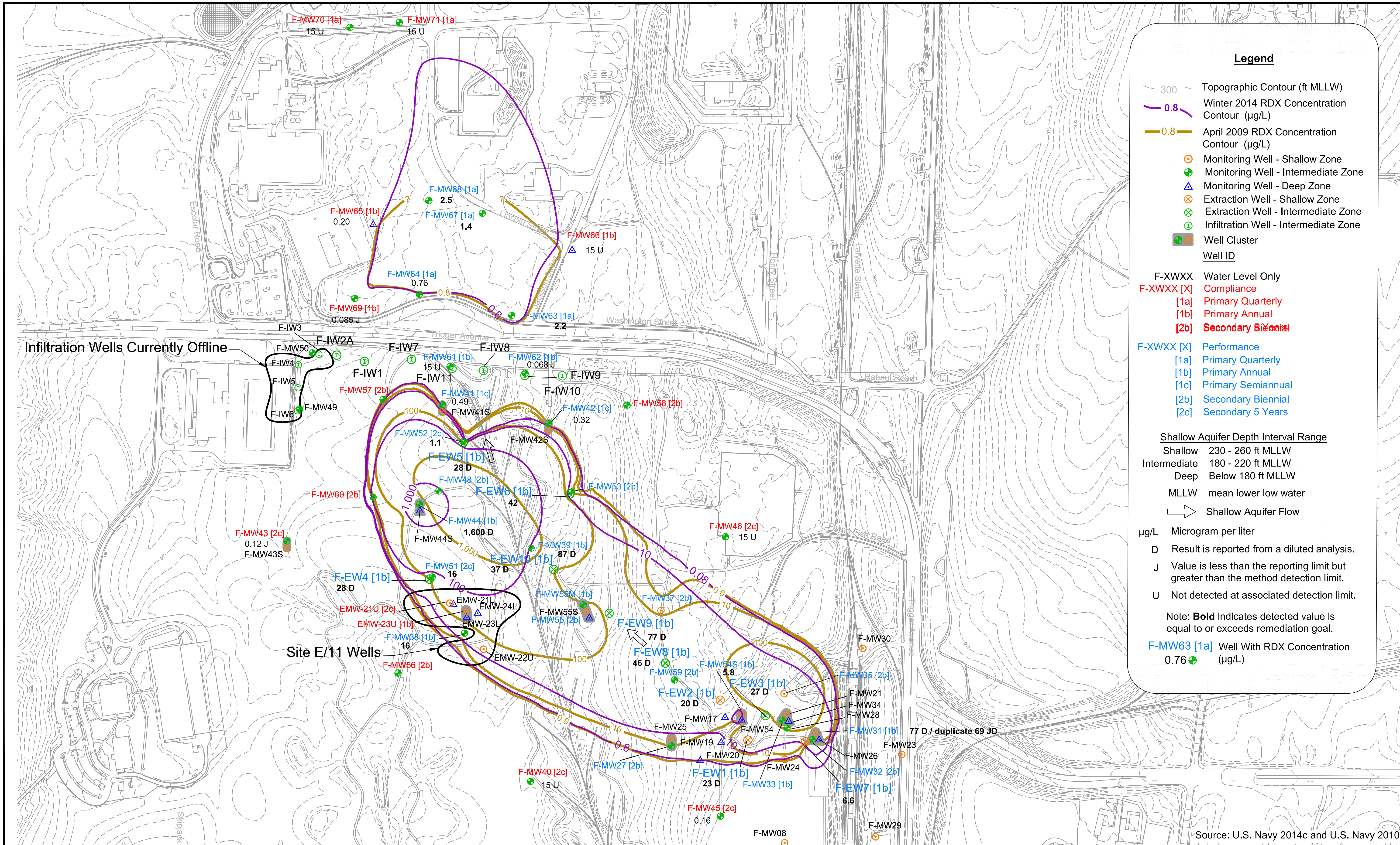
Source: U.S. Navy 2014c

U.S. NAVY	**Figure 6-11** **TNT Trends in Extraction Wells Located Near the OU 2 Source Area**	NBK Bangor FOURTH 5-YEAR REVIEW



Source: U.S. Navy 2014c

U.S. NAVY	**Figure 6-12** **DNT Trends in Extraction Wells Located Near the OU 2 Source Area**	NBK Bangor FOURTH 5-YEAR REVIEW

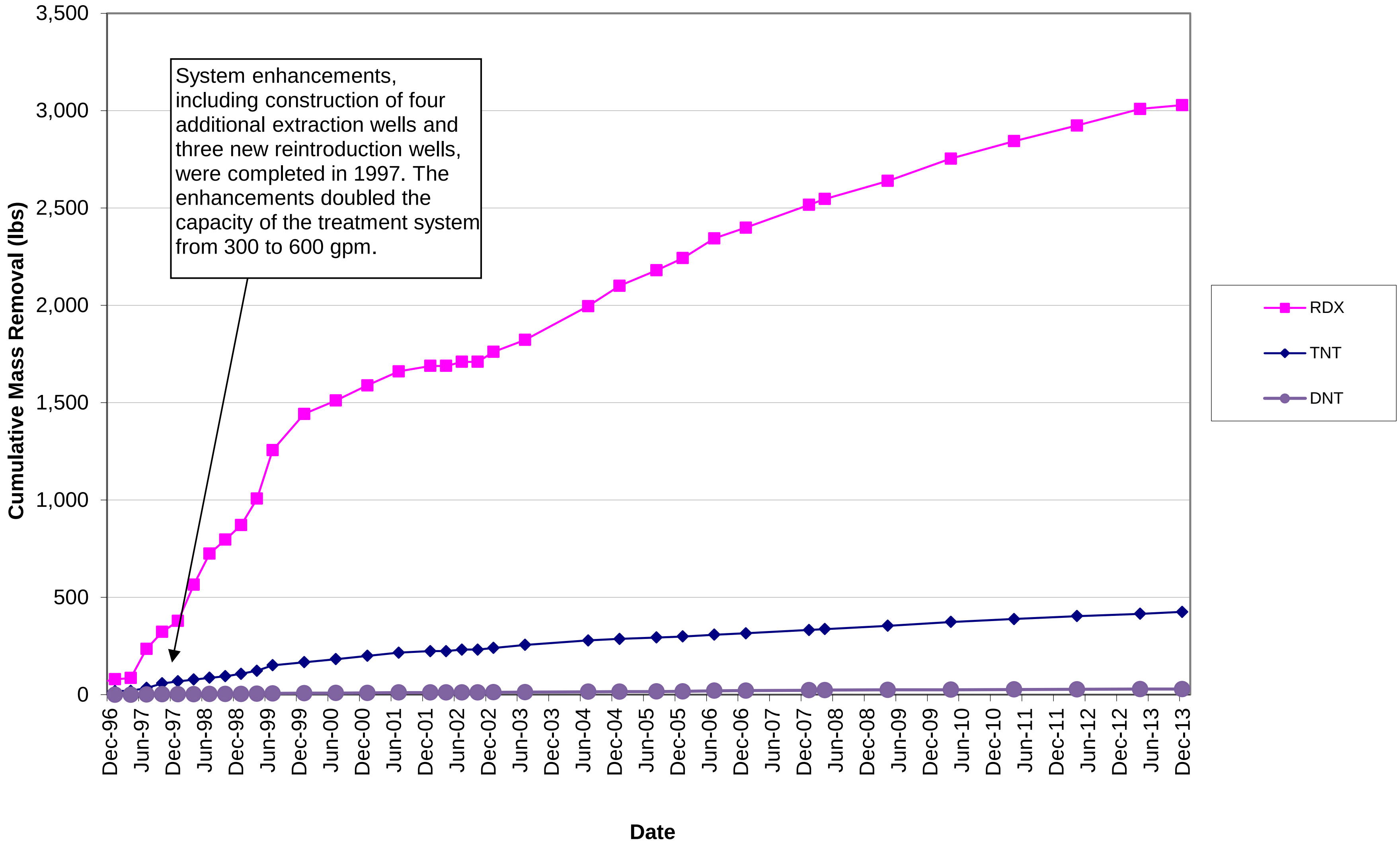


U.S. NAVY

NBK Bangor
FOURTH 5-YEAR REVIEW

Figure 6-13
Extent of RDX in Site F Groundwater During This 5-Year Review Period

J:\GIS\Projects\NAVY\Bangor\Sub-Tasks\DO 78\4th-5yr\FIG 6-13 RDX Site F.dwg
Mod: 01/21/2015, 10:05 | Plotted: 01/21/2015, 10:06 | john_knobbs

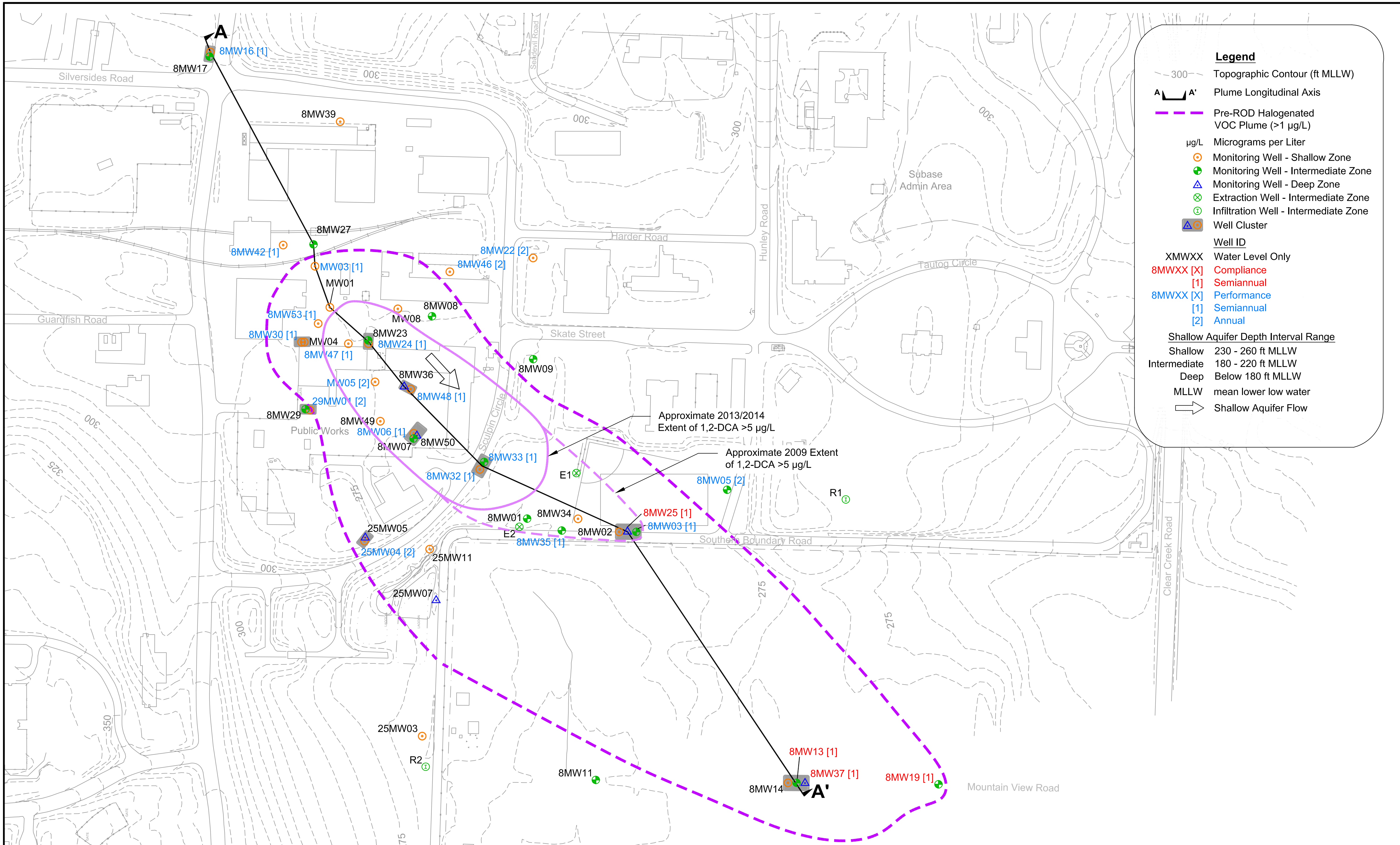


Source: U.S. Navy 2014c

U.S. NAVY

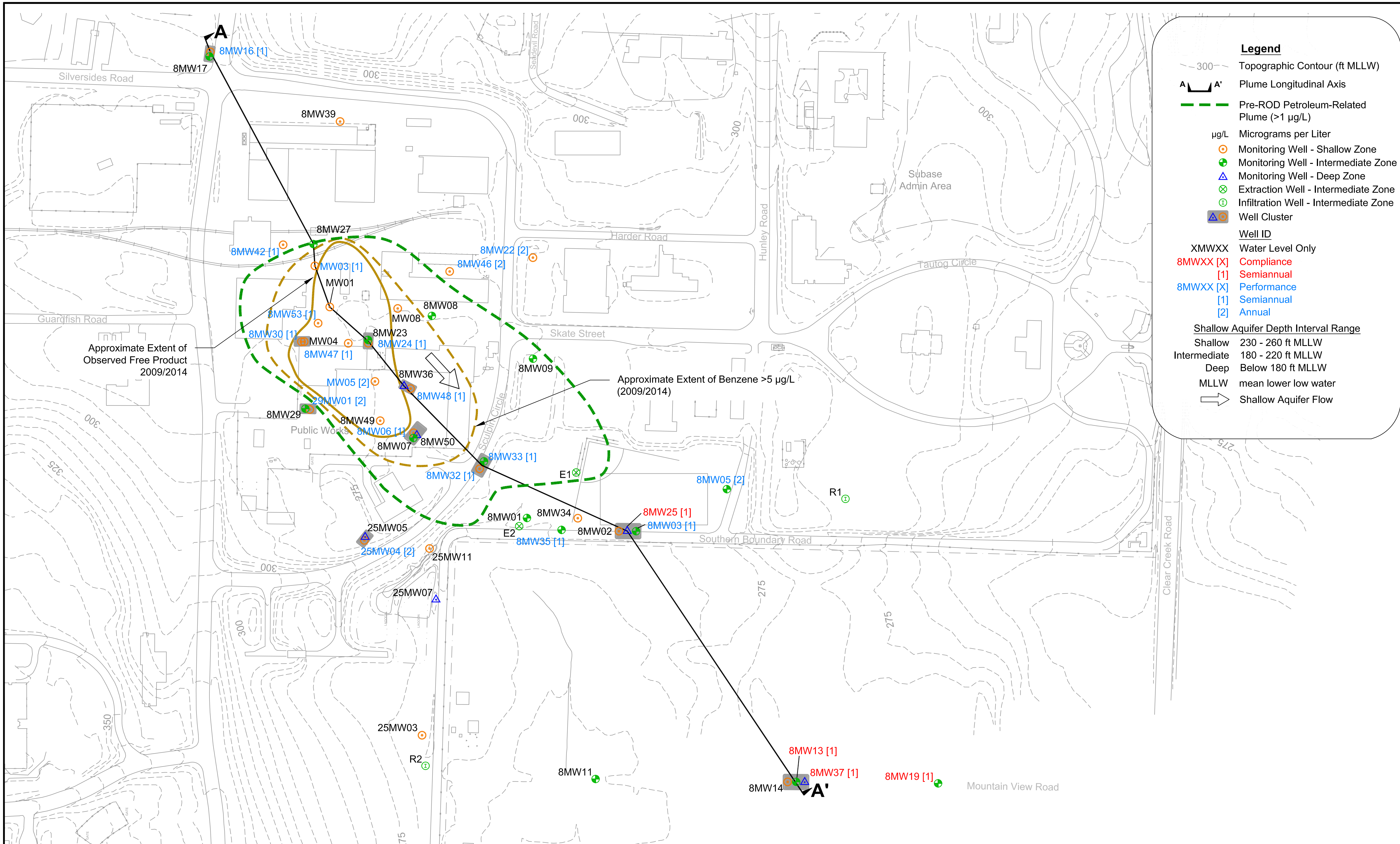
Figure 6-14
Site F Pump and Treat System Contaminant Mass Removal Since 1996

NBK Bangor
FOURTH
5-YEAR REVIEW



U.S. NAVY	NBK Bangor FOURTH 5-YEAR REVIEW	0 125 250 SCALE IN FEET	**Figure 6-15 Extent of 1,2-DCA in OU 8 Groundwater During This 5-Year Review Period**

J:\GIS\Projects\NAVY\Bangor\Sub-Tasks\DO 78\4th-5yr\FIG 6-15 Extent DCA in GW.dwg
Mod: 01/16/2015, 14:46 | Plotted: 01/27/2015, 11:10 | john_knobbs



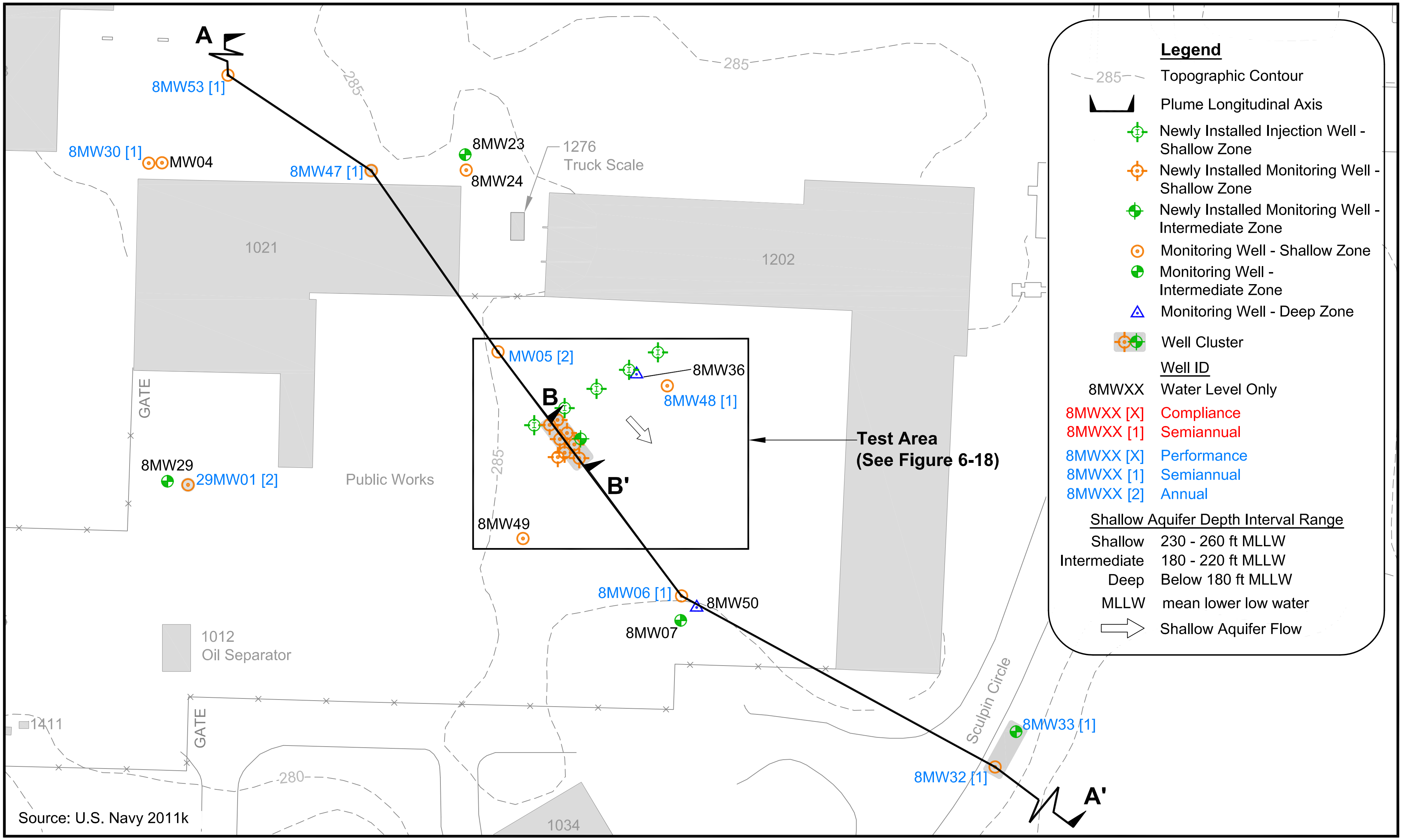
U.S. NAVY

NBK Bangor
FOURTH 5-YEAR REVIEW

0 125 250
SCALE IN FEET

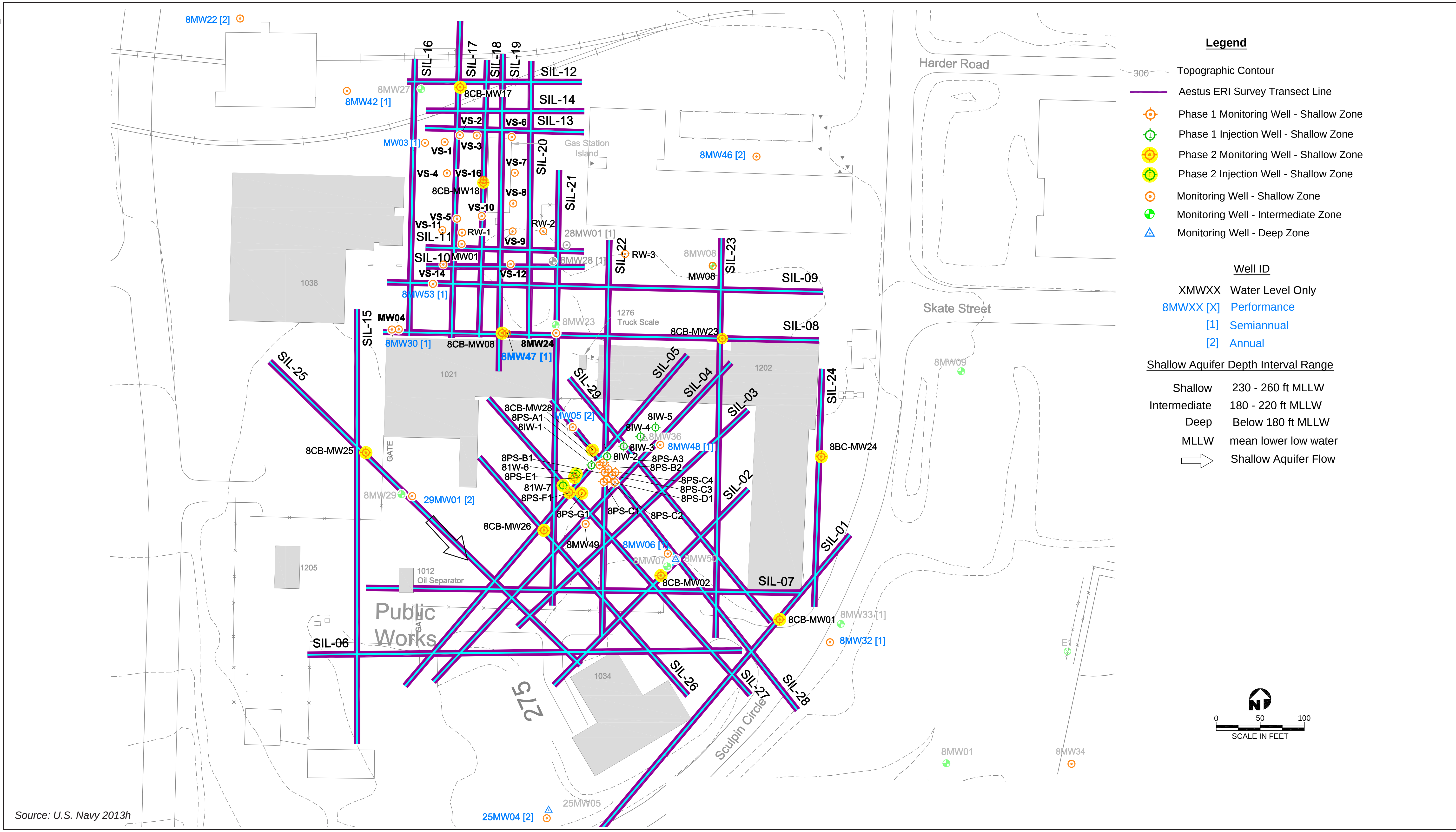
Figure 6-16
Extent of Petroleum-Related Chemicals in OU 8 Groundwater During This 5-Year Review Period

J:\GIS\Projects\NAVY\Bangor\Sub-Tasks\DO 78\4th-5yr\FIG 6-16 Extent Petro in GW.dwg
Mod: 01/27/2015, 11:13 | Plotted: 01/27/2015, 11:13 | john_knobbs



U.S. NAVY		**Figure 6-17** **OU 8 Injection and Monitoring Well Location Map**	NBK Bangor FOURTH 5-YEAR REVIEW

J:\GIS\Projects\NAVY\Bangor\Sub-Tasks\DO 78\4th-5yr\Fig 6-17 WELL MAP.dwg
Mod: 02/03/2015, 15:59 | Plotted: 02/03/2015, 16:00 | john_knobbs

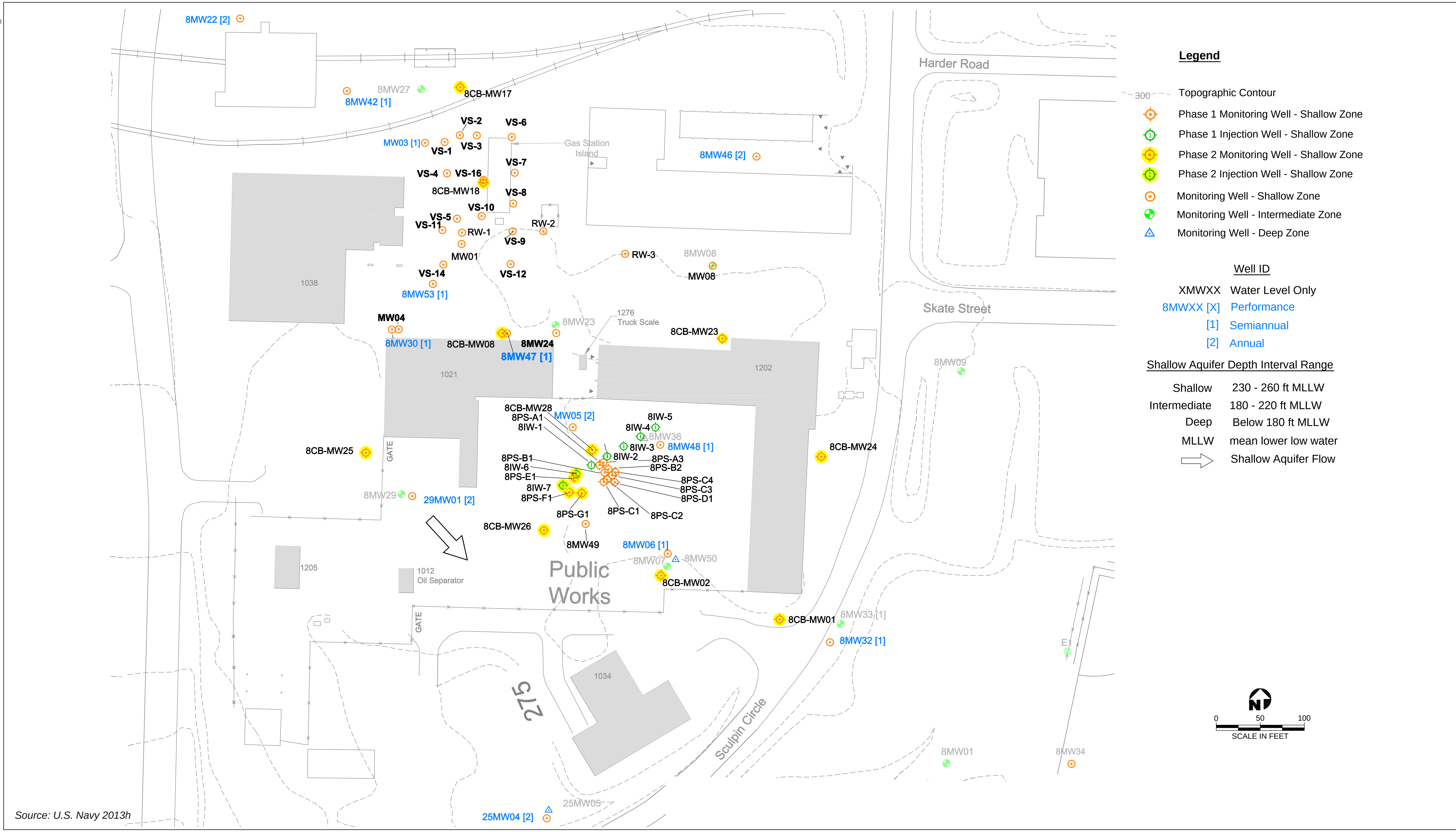


U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 6-18
OU 8 Electrical Resistivity Imaging Transect Lines

33762145_48.ai

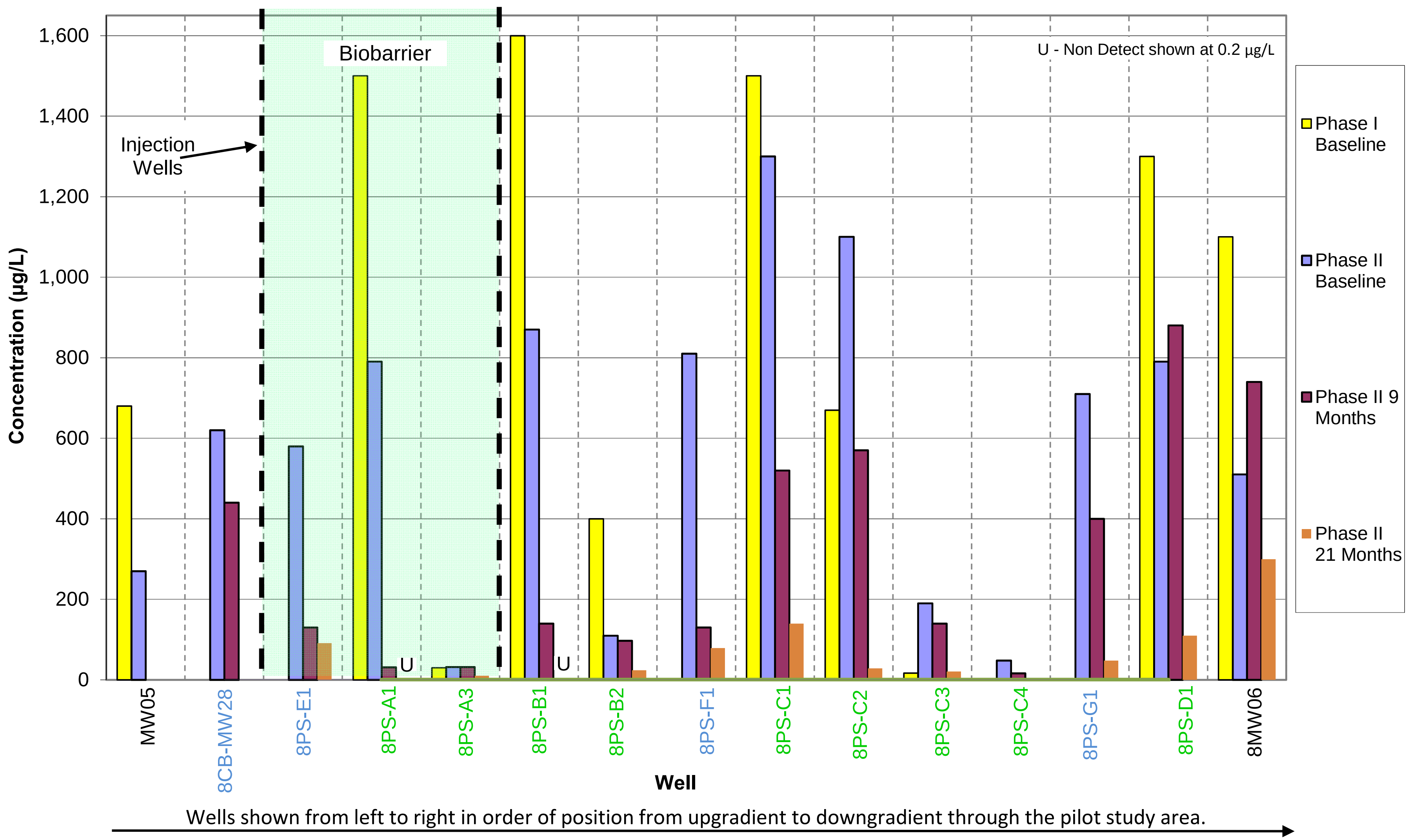


U.S. NAVY

NBK Bangor
FOURTH
5-YEAR REVIEW

Figure 6-19
OU 8 Pilot Study and Existing Well Location Map

33762145_50.ai



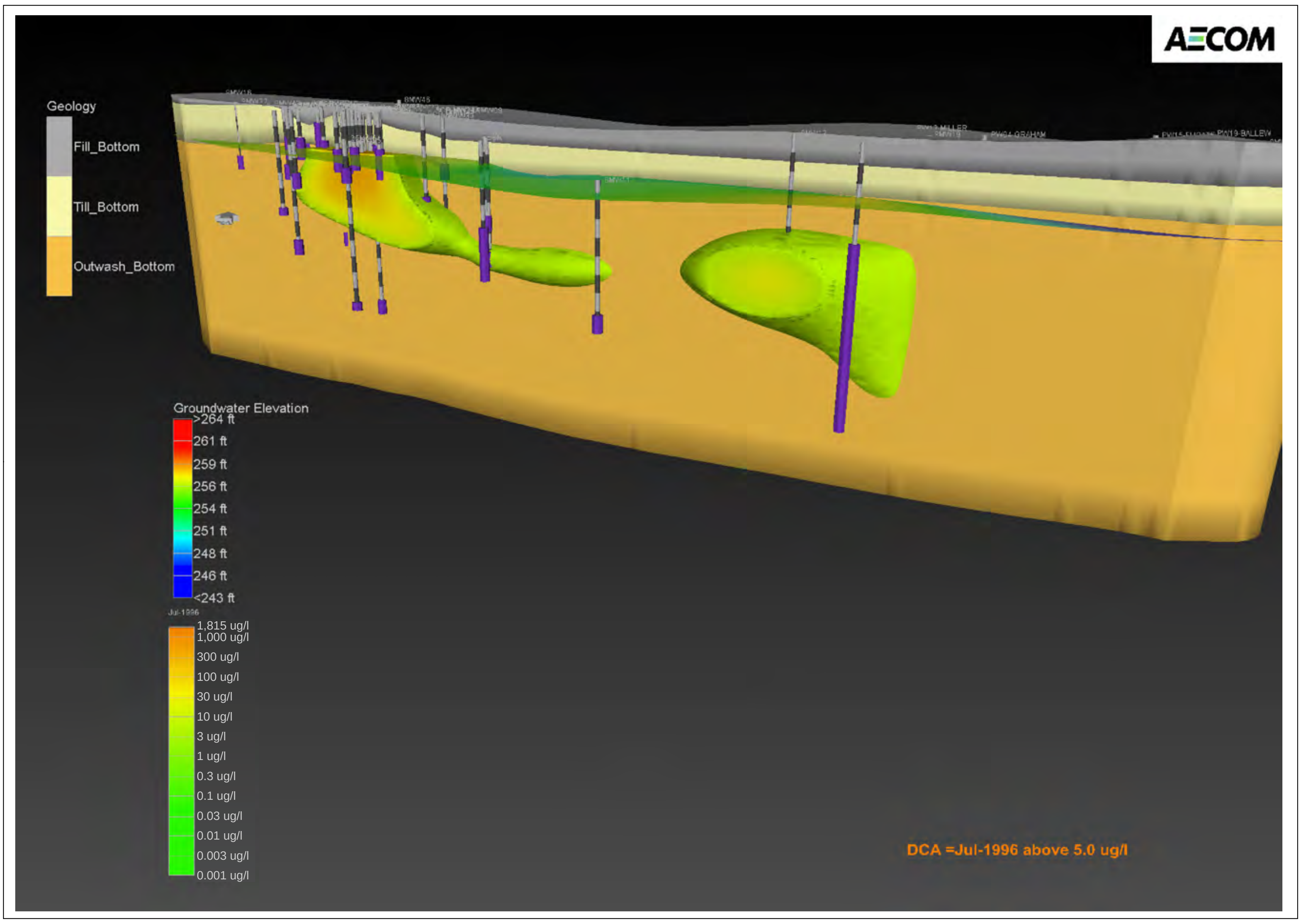
Note: Wells installed during Phase I are labeled in green font, and wells installed during Phase II are labeled in Blue front.

Source: U.S. Navy 2014g

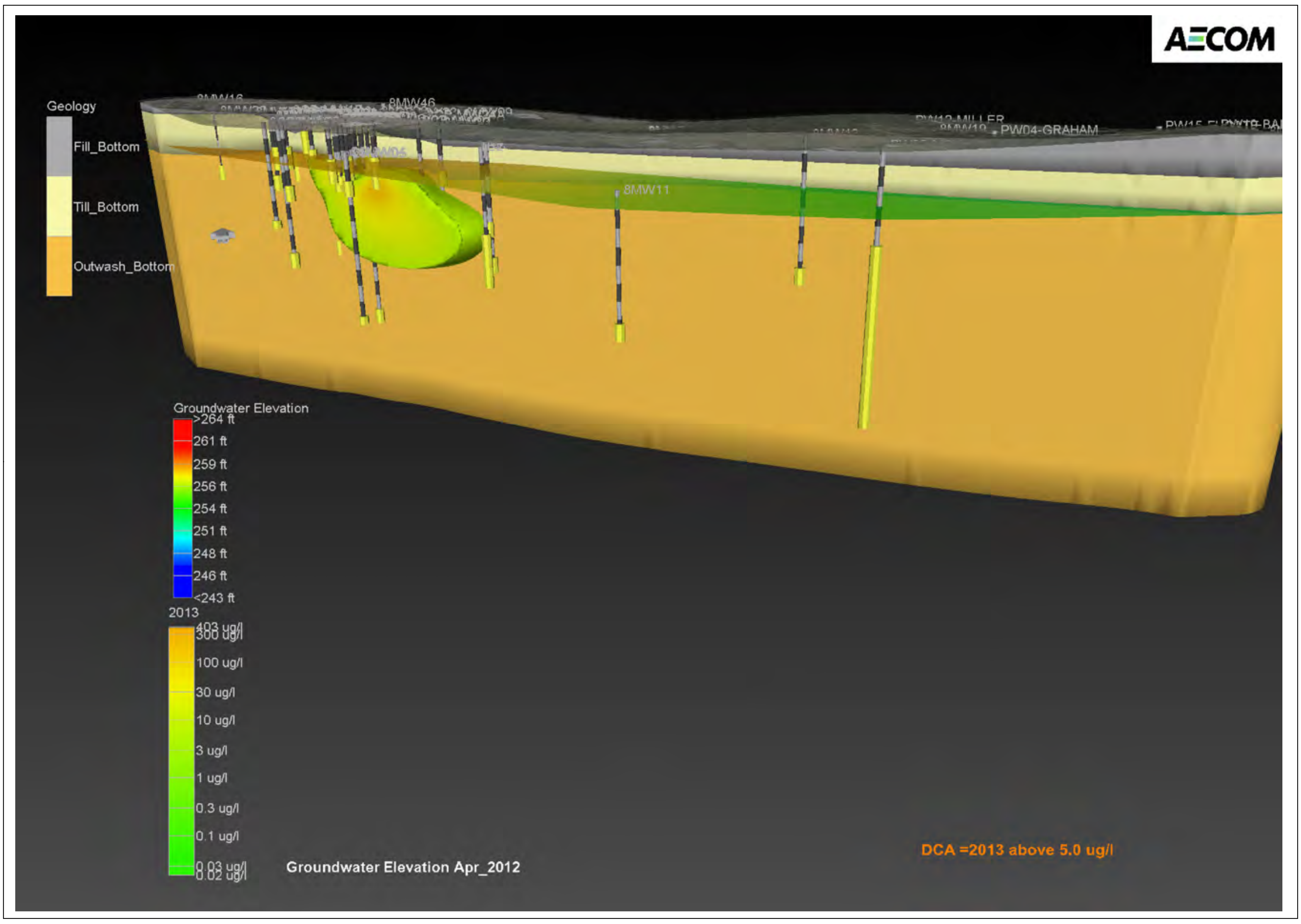
U.S. NAVY

Figure 6-20
Phase II Monitoring Results for DCA Concentrations within and near Biobarrier

NBK Bangor
FOURTH
5-YEAR REVIEW



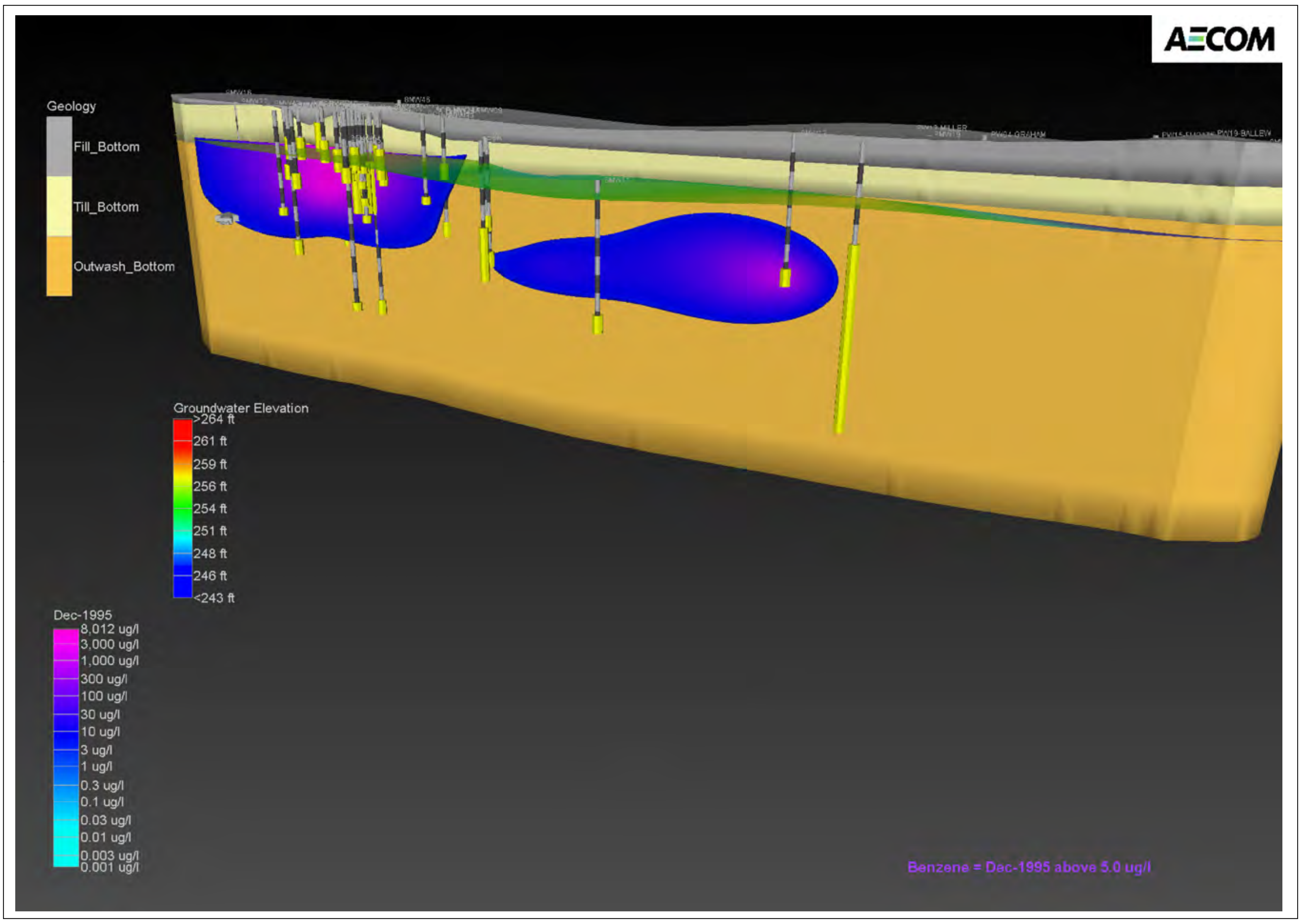
1996



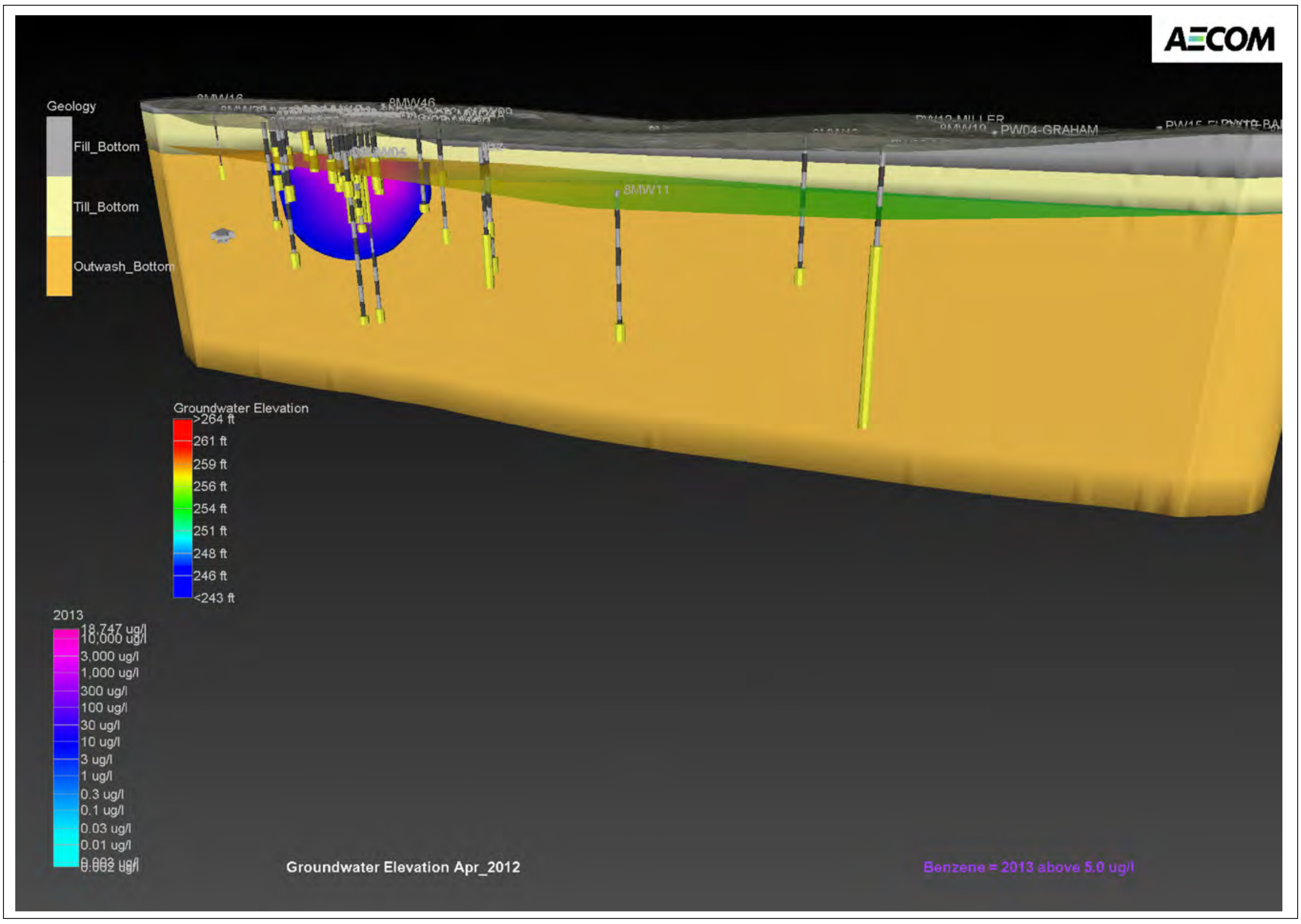
2013

Source: U.S. Navy 2014h

U.S. NAVY	**Figure 6-21** **OU 8 EVS Pro Model Results for 1,2-DCA**	NBK Bangor FOURTH 5-YEAR REVIEW



1995



2013

Source: U.S. Navy 2014h

U.S. NAVY	**Figure 6-22** **OU 8 EVS Pro Model Results for Benzene**	NBK Bangor FOURTH 5-YEAR REVIEW

Table 6-1
Summary of Normality and Linear Regression Analysis Results for OU 1

Well	Analyte	Data Are Normally Distributed (Parametric)[a]	Linear Regression Trend[b]	Perform Mann-Kendall[c]	Notes
Perched Zone Wells					
A-MW22	RDX	No	NA	Yes	EPA guidance does not recommend performing a linear regression on less than eight data points.
A-MW47	RDX	Yes[d]	Downward	Yes	Concentration data required transformation to fit the normal distribution model.
	TNT	Yes	**Downward**	Yes	
A-MW48	RDX	Yes[d]	Downward	Yes	Concentration data required transformation to fit the normal distribution model.
Shallow Aquifer Wells					
A-MW32	RDX	No	Upward	Yes	Even though the data set was considered not normally distributed by the Shapiro-Wilks test, this may be due to one outlier data point. When linear regression was performed for the data set with the outlier removed, it resulted in a valid P-statistic.
A-MW49	RDX	Yes	**Downward**	Yes	
A-MW54	RDX	Yes	**Downward**	Yes	
Extraction Wells					
A-EW4	RDX	Yes	**Upward**	Yes	
A-EW5	RDX	Yes	Upward	Yes	Data do not follow a normal distribution, and therefore linear regression fit is not statistically significant. Trend may be increasing.[e]
A-EW6	RDX	No	NA	Yes	Data set contained greater than 20% nondetections.
A-EW7	RDX	Yes	**Downward**	Yes	
A-EW8	RDX	Yes[d]	Downward	Yes	Concentration data required transformation to fit the normal distribution model, and the linear trend is not significant.
A-MW37	RDX	Yes	**Downward**	Yes	
A-MW46	RDX	Yes	**Downward**	Yes	

[a]As determined by Shapiro-Wilks normality test using Chemstat® statistical analysis software
[b]Trends that appear to be most valid are shown in **bold** text. These are trends that pass the Shapiro-Wilks tests, do not require transformation of the data set, and have P-values indicating the fit line is statistically significant and scatter plots uniform.

Table 6-1 (Continued)
Summary of Normality and Linear Regression Analysis Results for OU 1

[c]Mann-Kendall trend analysis performed on (a) wells with nonparametric data sets, (b) a data set that does not fit criteria for linear regression, or (c) a linear trend that is not statistically significant. See Table 4-2 for results.
[d]Log-transformed data
[e]Information provided in Table F-1 of 2014 LTM report (U.S. Navy 2014b)

Notes:
NA - not applicable
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT - 2,4,6-trinitroltoluene

Table 6-2
Summary of Mann-Kendall Trend Analysis Results for OU 1

Well	RDX	TNT	2,6-DNT	2,4-DNT	Current Frequency	Period Evaluated	Previous Analysis	Trend Changes From Previous Analysis
Perched Zone Wells								
A-MW22[a]	**NT**	>20% ND	>20% ND	>20% ND	Annual	May-1994 to Apr-2014	2012	No change
A-MW47[a]	**NT**	**D-2**	>20% ND	>20% ND	Annual	Feb-2001 to Mar-2014	2012	No change
A-MW48[a]	**D-2**	>20% ND	>20% ND	>20% ND	Annual	Dec-1997 to Mar-2014	2012	No change
Shallow Aquifer Wells								
A-MW32[a]	**1-1**	>20% ND	>20% ND	>20% ND	Annual	Feb-2007 to Apr-2014	2012	RDX NT in 2012 changed to 1-1 in 2014
A-MW49[a]	**NT**	>20% ND	>20% ND	>20% ND	Annual	Oct-2010 to Apr-2014	2012	RDX trend changed from D-2 in 2012 to NT in 2014
A-MW54[a]	**D-2**	>20% ND	>20% ND	>20% ND	Annual	Feb-2006 to Apr-2014	2012	No change
Extraction Wells								
A-EW4	**1-2**	>20% ND	>20% ND	>20% ND	Annual	Aug-2004 to Apr-2014	2012	RDX trend changed from D-1 in 2012 to 1-2 in 2014
A-EW5	**NT**	>20% ND	>20% ND	>20% ND	Annual	Aug-2004 to Apr-2014	2012	RDX trend changed from D-2 in 2012 to NT in 2014
A-EW6	**D-1**	>20% ND	>20% ND	>20% ND	Annual	Aug-2009 to Apr-2014	2012	RDX trend changed from NT in 2012 to D-1 in 2014
A-EW7	**D-1**	>20% ND	>20% ND	>20% ND	Annual	Aug 2004 to Apr-2014	2012	No change
A-EW8	**D-1**	>20% ND	>20% ND	>20% ND	Annual	Aug-2004 to Apr-2014	2012	RDX trend changed from D-2 in 2012 to D-1 in 2014
A-MW37	**D-2**	>20% ND	>20% ND	>20% ND	Annual	Feb-2007 to Mar-2014	2012	No change
A-MW46	**D-2**	>20% ND	>20% ND	>20% ND	Annual	Feb-2007 to Mar-2014	2012	No change

Table 6-2 (Continued)
Summary of Mann-Kendall Trend Analysis Results for OU 1

[a]Compliance monitoring well

Notes:

>20% ND	- Greater than 20% of analytical results were nondetections. Therefore, trend analysis was not conducted.
NT	- No trend
D-1	- Trend at 80% confidence level is decreasing
D-2	- Trend at 80% and 90% confidence level is decreasing
1-1	- Trend at 80% confidence level is increasing
1-2	- Trend at 80% and 90% confidence level is increasing

DNT - dinitrotoluene
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT - 2,4,6-trinitrotoluene

Table 6-3
RDX Concentration Trend Analysis Summary for OU 1 Selected Wells from Spring 2009 to Spring 2014

Well	Number Results	Number Detected	Concentration Greater Than RG	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Concentration Decay Rate of Log Data	95% UCL Trend	95% LCL Trend	Confidence That Concentration Trend Is Decreasing
Perched Zone Wells										
A-MW47[a]	4	4	4	6.2	**20.8**	43	0.401	1.539	-0.736	NA
A-MW48[a]	4	4	4	69	**83.75**	99	-0.074	-0.020	-0.129	>95%
Shallow Aquifer Wells										
A-MW32[a]	6	6	6	5.3	**6.9**	9.1	0.079	0.163	-0.006	NA
A-MW49[a]	13	13	13	1.0	**65.7**	240	-0.450	0.232	-1.133	>50% but <95%
A-MW54[a]	5	5	0	0.31	0.5	0.73	0.013	0.284	-0.258	NA
A-MW56[a]	13	5	0	0.06	0.11	0.15	0.016	0.135	-0.103	NA
A-MW57[a]	12	3	0	0.04	0.1	0.15	-0.127	0.033	-0.287	>50% but <95%
Extraction Wells										
A-EW4	6	6	6	80	**101**	130	0.017	0.118	-0.083	NA
A-EW5	6	6	6	1.0	**23**	34	-0.354	0.383	-1.092	>50% but <95%
A-EW7	6	6	6	110	**210**	300	-0.119	0.069	-0.308	>50% but <95%
A-EW8	6	6	6	66	**116**	220	-0.019	0.234	-0.271	>50% but <95%
A-MW37	6	6	6	62	**86.8**	130	-0.091	0.060	-0.242	>50% but <95%

[a]Compliance monitoring well

Notes:
Bolded text indicates monitoring well locations where the average concentration is above the RG of 0.8 µg/L.
LCL - lower confidence limit
µg/L - microgram per liter
NA - not applicable (Concentrations are increasing.)
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RG - remediation goal
UCL - upper confidence limit

Table 6-4
Summary of Mann-Kendall Trend Analyses for OU 2

Well	Last Sampling Events			Current Sampling Frequency	Period Evaluated	2014 Mann-Kendall Performed	2014 Changes from 2013 Analysis
	RDX	TNT	DNT				
Extraction Wells							
F- EW1	D-2	D-2	NT	Annual	1/07-3/14	Yes	No change
F- EW2	D-2	D-2	<4	Annual	1/07-3/14	Yes	No change
F- EW3	D-2	D-2	D-1	Annual	7/06-3/14	Yes	DNT change from D-2 to D-1
F- EW4	D-2	ND	ND	Annual	7/06-3/14	Yes	No change
F- EW5	D-2	ND	ND	Annual	7/06-3/14	Yes	No change
F- EW6	D-2	ND	ND	Annual	7/06-3/14	Yes	No change
F- EW7	D-1	NT	NT	Annual	1/07-3/14	Yes	RDX change from D-2 to D-1; TNT change from D-2 to NT; DNT change from D-1 to NT
F- EW8	D-2	ND	ND	Annual	7/06-3/14	Yes	No change
F- EW9	D-1	ND	ND	Annual	7/06-3/14	Yes	RDX change from D-2 to D-1
F- EW10	D-2	ND	ND	Annual	1/07-3/14	Yes	No change
Primary Wells							
F-MW31	D-1	D-2	D-2	Annual	7/06-1/14	Yes	RDX change from D-2 to D-1
F-MW33	D-2	D-2	D-2	Annual	1/06-4/13	No	Not sampled in 2014
F-MW38	D-2	ND	ND	Annual	7/06-1/14	Yes	No change
F-MW39	D-2	ND	ND	Annual	7/06-1/14	Yes	No change
F-MW40[a]	<4	ND	ND	5 Year	6/96-1/14	No	Not detected; no change from 2009
F-MW41	D-2	ND	ND	Semiannual	4/09-1/14	Yes	No change
F-MW42[a]	D-2	ND	ND	Semiannual	4/09-1/14	Yes	RDX change from D-1 to D-2
F-MW43[a]	<4	ND	ND	5 Year	6/96-1/14	No	Not detected; no change from 2009
F-MW44	I-2	ND	ND	Annual	7/06-1/14	Yes	No change
F-MW46[a]	<4	ND	ND	5 Year	6/96-1/14	No	Not detected; no change from 2009
F-MW54S	D-2	NT	ND	Annual	7/06-1/14	Yes	No change
F-MW55M	D-2	ND	ND	Annual	1/06-4/13	No	Not sampled in 2014
F-MW56[a]	<4	ND	ND	Biennial	7/03-4/13	No	
F-MW57[a]	ND	ND	ND	Biennial	7/03-4/13	No	

Table 6-4 (Continued)
Summary of Mann-Kendall Trend Analyses for OU 2

Well	Last Sampling Events			Current Sampling Frequency	Period Evaluated	2014 Mann-Kendall Performed	2014 Changes from 2013 Analysis
	RDX	TNT	DNT				
F-MW58[a]	ND	ND	ND	Biennial	7/03-4/13	No	
F-MW59	D-2	ND	ND	Biennial	7/03-4/13	No	
F-MW60[a]	ND	ND	ND	Biennial	7/03-4/13	No	
Secondary Wells							
F-MW27	D-2	ND	ND	Biennial	1/97-4/13	No	
F-MW32	D-2	D-2	D-2	Biennial	1/97-4/13	No	
F-MW35	NT	I-2	<4	Biennial	1/97-4/13	No	
F-MW37	NT	ND	ND	Biennial	1/97-4/13	No	
F-MW45[a]	D-2	ND	ND	5 Year	6/96-1/14	Yes	
F-MW48	I-2	ND	ND	Biennial	1/97-4/13	No	
F-MW51	<4	ND	ND	5 Year	8/96-1/14	No	Not detected; no change from 2009
F-MW52	D-2	ND	ND	5 Year	8/96-1/14	Yes	No change from 2009
F-MW53	D-2	ND	ND	Biennial	1/97-4/13	No	
F-MW55	D-1	ND	ND	Biennial	1/98-4/13	No	
Northern Plume Edge Wells							
F-MW61	ND	ND	ND	Annual	10/06-2/14	No	
F-MW62	<4	ND	ND	Annual	10/06-2/14	No	
F-MW63	D-1	ND	ND	Quarterly	4/11-1/14	Yes	RDX change from D-2 to D-1
F-MW64	NT	ND	ND	Quarterly	4/11-1/14	Yes	No change
F-MW65[a]	D-2	ND	ND	Annual	1/7-2/14	Yes	No change
F-MW66[a]	ND	ND	ND	Annual	8/09-2/14	No	
F-MW67	D-2	ND	ND	Quarterly	4/11-2/14	Yes	No change
F-MW68	D-2	ND	ND	Quarterly	4/11-2/14	Yes	No change
F-MW69[a]	D-2	ND	ND	Annual	10/09-2/14	Yes	RDX change from D-1 to D-2
F-MW70[a]	<4	ND	ND	Quarterly	10/11-2/14	No	
F-MW71[a]	ND	ND	ND	Quarterly	10/11-2/14	No	

[a]Compliance monitoring wells

Table 6-4 (Continued)
Summary of Mann-Kendall Trend Analyses for OU 2

Notes:

<4 - Less than 4 detections in the last 10 sampling events. Does not meet Mann-Kendall input criteria. No Mann-Kendall analysis performed.
ND - No detections in the last 10 sampling events. No Mann-Kendall analysis performed.
NT - No trend
D-1 - Trend at 80% confidence level is decreasing.
D-2 - Trend at 80% and 90% confidence levels are decreasing.
I-1 - Trend at 80% confidence level is increasing.
I-2 - Trend at 80% and 90% confidence levels are increasing.
DNT - dinitrotoluene
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT - 2,4,6,-trinitrotoluene

Table 6-5
RDX Concentration Trend Analyses Summary for OU 2 Selected Wells from Spring 2009 to Spring 2014

Well[a]	Well Depth Interval[b]	Number Results	Number Detected	Concentration Greater Than RG	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Concentration Decay Rate of Log Data	95% UCL Trend	95% LCL Trend	Confidence That Concentration Trend Is Decreasing	Mann-Kendall Trends Analyses[c]
Source Area												
F-MW31	Shallow	**6**	**6**	**6**	**26**	**47.3**	**77**	**0.087**	**0.320**	**-0.146**	**Not applicable**	Decreasing at 80% confidence level
F-MW33	Intermediate	**5**	**5**	**5**	**76**	**121**	**160**	**-0.163**	**-0.065**	**-0.261**	**>95%**	Decreasing at 80% and 90% confidence level
F-MW54S	Shallow	**6**	**6**	**6**	**2.6**	**5.17**	**10**	**-0.126**	**0.109**	**-0.360**	**>50% but <95%**	Decreasing at 80% and 90% confidence level
Central Plume Area												
F-MW39	Intermediate	**6**	**6**	**6**	**87**	**463**	**1,400**	**-0.495**	**-0.286**	**-0.704**	**>95%**	Decreasing at 80% and 90% confidence level
F-MW55M	Intermediate	**5**	**5**	**5**	**22**	**50.8**	**110**	**-0.282**	**0.129**	**-0.692**	**>50% but <95%**	Decreasing at 80% and 90% confidence level
North Containment Area												
F-MW44	Intermediate	**6**	**6**	**6**	**240**	**978**	**1,600**	**0.328**	**0.506**	**0.149**	**NA**	Increasing
Northern Plume Edge Area												
F-MW64	Intermediate	**20**	**20**	**7**	**0.47**	**0.91**	**3.1**	**-0.020**	**0.087**	**-0.128**	**>50% but <95%**	No trend
F-MW68	Intermediate	**20**	**20**	**20**	**2.5**	**3.03**	**3.8**	**-0.068**	**-0.054**	**-0.082**	**>95%**	Decreasing at 80% and 90% confidence level

[a]All wells are performance wells, with the exception of F-MW64, which is a compliance well.
[b]All wells screened within the shallow aquifer. Therefore, the depth interval referenced is within the shallow aquifer.
[c]Mann-Kendall was based on all historical data (not the last 5 years).

Notes:
Bolded text indicates monitoring well locations where the average concentration is above the established cleanup level of 0.8 µg/L.
LCL - lower confidence limit
µg/L - microgram per liter
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RG - remediation goal
UCL - upper confidence limit

Table 6-6
Summary of Normality and Linear Regression Analysis Results for OU 8

Well	Analyte	Data Are Normally Distributed (Parametric)[a]	Linear Regression Trend[b]	Perform Mann-Kendall[c]	Notes
Source Area Wells					
8MW06	Benzene	Yes[d]	**Upward**	Yes	Statistically significant upward trend. Possible seasonable variability.
	Ethyl-benzene	Yes[d]	**Upward**	Yes	Statistically significant upward trend.
	Toluene	Yes[d]	**Upward**	Yes	Statistically significant upward trend. Possible seasonable variability.
	DCA	Yes	**Downward**	Yes	Statistically significant downward trend. Possible seasonable variability.
	DCP	NA	NA	No	Data set contains 52% nondetected data from 2000 to 2013. The data set from 2011 to 2013 contains 20% nondetected data, with the detections all estimated values below the laboratory quantitation limit.
8MW47	Benzene	Yes	Upward	Yes	Statistical significance is questionable. Possible seasonable variability.
	Ethyl-benzene	Yes	**Downward**	Yes	Statistically significant downward trend. Seasonality not indicated.
	Toluene	Yes	**Downward**	Yes	Statistically significant downward trend. Seasonality not indicated.
MW05	Benzene	Yes	**Upward**	Yes	Statistically significant upward trend.
	Ethyl-benzene	Yes	**Upward**	Yes	Statistically significant upward trend.
	Toluene	Yes[d]	Upward	Yes	Possible upward trend. However, linear regression is not statistically significant.
	DCA	Yes	Upward	Yes	Possible upward trend. However, linear regression is not statistically significant.
	DCP	NA	NA	No	Data set contains 47% nondetected data from 2000 to 2013. The data set from 2009 to 2013 contains 14% nondetected data, with the detections all estimated values below the laboratory quantitation limit.
MW08	Benzene	Yes	Downward	Yes	Possible downward trend. However, linear regression is not statistically significant.

Table 6-6 (Continued)
Summary of Normality and Linear Regression Analysis Results for OU 8

Well	Analyte	Data Are Normally Distributed (Parametric)[a]	Linear Regression Trend[b]	Perform Mann-Kendall[c]	Notes
	Ethyl-benzene	Yes	Downward	Yes	Possible downward trend. However, linear regression is not statistically significant.
	Toluene	Yes	**Downward**	Yes	Statistically significant downward trend.
On-Site Downgradient Wells					
8MW03	TCA	Yes[d]	**Downward**	Yes	Statistically significant downward trend.
	DCE	Yes[d]	**Downward**	Yes	Statistically significant downward trend.
	DCA	Yes[d]	**Downward**	Yes	Statistically significant downward trend.
	DCP	NA	NA	No	Data set contains 27% nondetected data from 2000 to 2013. The data set from 2011 to 2013 contains 20% nondetected data, with the detections all estimated values below the laboratory quantitation limit.
8MW33	TCA	Yes	**Downward**	Yes	Statistically significant downward trend.
	DCE	No	Downward	Yes	Possible downward trend.
	DCA	Yes	**Upward**	Yes	Statistically significant upward trend.
	DCP	Yes[d]	**Downward**	Yes	Statistically significant downward trend.
8MW35	TCA	Yes	**Downward**	Yes	Statistically significant downward trend.
	DCE	Yes[d]	**Downward**	Yes	Data from 2000 to 2013 show a downward trend, but not statistically significant. Statistically significant downward trend during recent years 2006 to 2013.
	DCA	Yes[d]	**Downward**	Yes	Data from 2004 to 2013 show a statistically significant downward trend. Data from 2000 to 2013 show a downward trend, but not statistically significant.
Off-Site Downgradient Wells					
8MW13	DCA	Yes	**Downward**	Yes	Statistically significant downward trend for 2009 to 2013 data.
8MW19	DCA	Yes[d]	**Downward**	Yes	Statistically significant downward trend.

[a]As determined by Shapiro-Wilks normality test using Chemstat® statistical analysis software
[b]Trends that appear to be most valid are shown in **bold** text. These are trends that pass the Shapiro-Wilks tests, do not require transformation of the data set, and have P-values indicating the fit line is statistically significant and scatter plots uniform.

Table 6-6 (Continued)
Summary of Normality and Linear Regression Analysis Results for OU 8

[c]Mann-Kendall trend analysis performed on (a) wells with nonparametric data sets, (b) a data set that does not fit criteria for linear regression, or (c) a linear trend that is not statistically significant. See Table 6-7 for results.
[d]Log-transformed data

Notes:
DCA - 1,2-dichloroethane
DCE - 1,1-dichloroethene
DCP - 1,2-dichloropropane
NA - not applicable
TCA - 1,1,2-trichloroethane

Table 6-7
Summary of Mann-Kendall Trend Analysis Results for OU 8

Well	Benzene	Ethyl-benzene	Toluene	TCA	DCE	DCA	DCP	Current Frequency	Period Evaluated	Previous Analysis	Trend Changes From Previous Analysis
Upgradient Wells											
8MW42	**D-1**	>20% ND	>20% ND	>20% ND	>20% ND	>20% ND	>20% ND	Semiannual	2009 to 2013	2012	No trend changed to downward trend for benzene
Source Area Wells											
8MW06	**I-2**	**I-2**	**I-2**	>20% ND	>20% ND	**D-2**	>20% ND	Semiannual	2000 to 2013	2012	No change
	I-1	**I-1**	**NT**	>20% ND	>20% ND	**D-1**	>20% ND	Semiannual	2009 to 2013	2012	No trend changed to downward trend for DCA
8MW47	**NT**	**D-2**	**D-2**	>20% ND	>20% ND	>20% ND	>20% ND	Semiannual	2000 to 2013	2012	Upward trend changed to no trend for benzene
	D-1	**D-1**	**D-1**	>20% ND	>20% ND	>20% ND	>20% ND	Semiannual	2009 to 2013	2012	No trend changed to downward trends for ethylbenzene and toluene. Benzene not evaluated in 2012.
MW05	**I-2**	**I-2**	**NT**	>20% ND	>20% ND	**NT**	>20% ND	Annual	2000 to 2013	2012	No change
	I-1	**I-1**	**NT**	>20% ND	>20% ND	**NT**	>20% ND	Annual	2007 to 2013	2012	No change
MW08	**NT**	**NT**	**D-2**	>20% ND	>20% ND	>20% ND	>20% ND	Semiannual	2010 to 2013	2012	No trend changed to downward trend for toluene
On-Site Downgradient Wells											
8MW03	>20% ND	>20% ND	>20% ND	**D-2**	**D-2**	**D-2**	>20% ND	Semiannual	2000 to 2013	2012	No change

Table 6-7 (Continued)
Summary of Mann-Kendall Trend Analysis Results for OU 8

Well	Benzene	Ethyl-benzene	Toluene	TCA	DCE	DCA	DCP	Current Frequency	Period Evaluated	Previous Analysis	Trend Changes From Previous Analysis
	>20% ND	>20% ND	>20% ND	>20% ND	**NT**	**D-1**	>20% ND	Semiannual	2009 to 2013	2012	Downward trend for TCA changed to not evaluated. Downward trend for DCE changed to not trend.
8MW33	>20% ND	>20% ND	>20% ND	**D-2**	**D-2**	**I-2**	**D-2**	Semiannual	2000 to 2013	2012	Downward trend changed to upward trend for DCA
	>20% ND	>20% ND	>20% ND	**D-1**	**NT**	**D-1**	**D-1**	Semiannual	2009 to 2013	2012	Downward trend changed to no trend for DCA
8MW35	>20% ND	>20% ND	>20% ND	**D-2**	**NT**	**D-2**	>20% ND	Semiannual	2000 to 2013	2012	No trend changed to downward trend for DCA
	>20% ND	>20% ND	>20% ND	**NT**	**D-1**	**D-1**	>20% ND	Semiannual	2009 to 2013	2012	No change
Off-Site Downgradient Wells											
8MW13	>20% ND	>20% ND	>20% ND	>20% ND	>20% ND	**D-2**	>20% ND	Semiannual	2009 to 2013	2012	No trend changed to downward trend for DCA
8MW19	>20% ND	>20% ND	>20% ND	>20% ND	>20% ND	**D-2**	>20% ND	Semiannual	2000 to 2013	2012	No change
	>20% ND	>20% ND	>20% ND	>20% ND	>20% ND	**D-1**	>20% ND	Semiannual	2009 to 2013	2012	No change

Notes:

>20% ND - Greater than 20% of analytical results were nondetections. Therefore, trend analysis was not conducted.

NT - No trend

D-1 - Trend at 90% confidence level is decreasing.

D-2 - Trend at 95% confidence level is decreasing.

I-1 - Trend at 90% confidence level is increasing.

I-2 - Trend at 95% confidence level is increasing.

TCA - 1,1,2-trichloroethane
DCE - 1,1-dichloroethene
DCA - 1,2-dichloroethane
DCP - 1,2-dichloropropane

Table 6-8
1,2-DCA Concentration Trend Analyses Summary for OU 8 from Spring 2009 to Spring 2014

Well	Number Results	Number Detected	Concentration Greater Than RG	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Concentration Decay Rate of Log Data	95% UCL Trend	95% LCL Trend	Confidence That Concentration Trend Is Decreasing
Upgradient Well										
8MW42	11	9	0	0.12	0.32	0.5	-0.074	0.108	-0.257	>50% but <95%
Source Area Wells										
8MW06	**11**	**10**	**11**	**280**	**678**	**1,100**	**-0.202**	**-0.100**	**-0.304**	**>95%**
8MW47	**10**	**6**	**9**	**2.5**	**63.0**	**350**	**-0.477**	**-0.016**	**-0.938**	**>95%**
MW05	**5**	**5**	**5**	**180**	**444**	**820**	**-0.338**	**-0.040**	**-0.636**	**>95%**
MW08	**8**	**5**	**6**	**4.6**	**23.8**	**82**	**-0.333**	**0.260**	**-0.926**	**>50% but <95%**
Near Source Downgradient Well										
8MW33	**11**	**11**	**11**	**21**	**39.6**	**67**	**-0.187**	**-0.128**	**-0.246**	**>95%**
Downgradient Installation Boundary Well										
8MW03	**11**	**10**	**5**	**0.50**	**5.68**	**11**	**-0.123**	**0.180**	**-0.425**	**>50% but <95%**
8MW35	11	11	1	0.62	1.86	5.2	-0.255	-0.039	-0.472	>95%
Downgradient Off-Site Wells										
8MW13	11	11	0	0.71	1.56	2.3	-0.184	-0.103	-0.265	>95%
8MW19	11	10	0	0.11	0.22	0.3	-0.155	-0.094	-0.216	>95%

Notes:
Bolded text indicates monitoring well locations where the average concentration is above the established cleanup level of 5 µg/L.
DCA - dichlorethane
LCL - lower confidence limit
µg/L - microgram per liter
RG - remediation goal
UCL - upper confidence limit

Table 6-9
Benzene Concentration Trend Analyses Summary for OU 8 from Spring 2009 to Spring 2014

Well	Number Results	Number Detected	Concentration Greater Than RG	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Concentration Decay Rate of Log Data	95% UCL Trend	95% LCL Trend	Confidence That Concentration Trend Is Decreasing
Upgradient Well										
8MW42	11	10	0	0.12	0.32	0.51	-0.219	-0.115	-0.324	>95%
Source Area Wells										
8MW06	**11**	**11**	**11**	**11,000**	**14,091**	**19,000**	**0.030**	**0.097**	**-0.038**	**NA**
8MW47	**10**	**10**	**10**	**2,500**	**6,430**	**12,000**	**-0.231**	**-0.057**	**-0.406**	**>95%**
MW05	**5**	**5**	**5**	**10,000**	**15,200**	**20,000**	**0.037**	**0.251**	**-0.177**	**NA**
MW08	**8**	**8**	**8**	**1,700**	**5,738**	**12,000**	**-0.355**	**-0.082**	**-0.628**	**>95%**
Downgradient Installation Boundary Wells										
8MW03	11	4	0	0.22	0.41	0.50	NR	NR	NR	NR
8MW35	11	1	0	0.04	0.46	0.50	NR	NR	NR	NR
Downgradient Off-Site Well										
8MW13	11	1	0	0.05	0.46	0.50	NR	NR	NR	NR

Notes:
Bolded text indicates monitoring well locations where the average concentration is above the established cleanup level of 5 µg/L.
LCL - lower confidence limit
µg/L - microgram per liter
NA - not applicable (Concentrations are increasing.)
NR - not reported (The concentration decay rate, 95% UCL trend, 95% LCL trend, and confidence that concentration trend is decreasing were not reported, because analytical results for these wells consisted of mostly nondetected values, and all detected values were less than the reporting limit of 0.5 µg/L.)
RG - remediation goal
UCL - upper confidence limit

Table 6-10
Summary of October 2009 to 2014 Free-Product Recovery Activities for OU 8

Well ID	Product Recovery					
	2009	2010	2011	2012	2013	2014
8MW47	X	X				
8MW49		X	X			
MW04		X				
VS-2		X				
VS-3		X		X	X	X
VS-4		X				
VS-7			X		X	
VS-10			X		X	
VS-12			X	X	X	
8IW-7				X	X	X
8CB-MW17				X	X	X
8CB-MW18				X	X	X
8CB-MW26				X	X	X
RW-1				X		
Quantity Recovered (gallon)	**0.0008**	**3.75**	**2.30**	**5.81**	**3.43**	**0.87**
Total Quantity Recovered for the Period (gallons)			**16.16**			

Source: U.S. Navy 2014d

Table 6-11
Reductions in DCA for Phases I and II Pilot Studies and Following Longevity Sampling

Well	Phase I				Phase II				Longevity Sampling			Overall Phases I & II Reduction
	Baseline (May 2010) (µg/L)	9 Months (Feb-Apr 2011) (µg/L)	Percent Change	Percent Reduction	Baseline (Apr-Jun 2012) (µg/L)	9 Months (Mar-Apr 2013) (µg/L)	Percent Change	Percent Reduction	21 Months (Mar-Apr 2014) (µg/L)	Percent Change	Percent Reduction	
Upgradient Wells												
MW05[a,b]	410	610	149%	NA	270	210	78%	22%	180	67%	33%	56%
8MW48[c]	33	300	923%	NA	ND (40)	ND (26)	NC	NC	NA	NC	NC	100%[d]
Phase I Wells												
8PS-A1	1,500	1,100	73%	27%	790	31	4%	96%	ND (25)	NC	NC	100%[d]
8PS-A3	30	100	333%	NA	32	32	100%	0%	10	31%	69%	67%
8PS-B1	1,600	1,200	75%	25%	870	140	16%	84%	ND (25)	NC	NC	100%
8PS-B2	400	530	133%	NA	110	97	88%	12%	24	22%	78%	94%
8PS-C1	1,500	1,300	87%	13%	1,300	520	40%	60%	140	11%	89%	91%
8PS-C2	670	690	103%	NA	1,100	570	52%	48%	29	3%	97%	96%
8PS-C3	17	170	1000%	NA	190	140	74%	26%	21	11%	89%	-24%
8PS-C4	0.23	7.3	3174%	NA	48.0	16.0	33%	67%	NA	33%[e]	67%	NA
8PS-D1	1,300	1,000	77%	23%	790	880	111%	NA	110	14%	86%	92%
Phase II Wells												
8PS-E1	NA	NA	NA	NA	580	130	22%	78%	91	16%	84%	NA
8PS-F1	NA	NA	NA	NA	810	130	16%	84%	79	10%	90%	NA
8PS-G1	NA	NA	NA	NA	710	400	56%	44%	48	7%	93%	NA
Downgradient Wells												
8MW06	1,100	620	56%	44%	510	740	145%	NA	300	59%	41%	73%
8MW49	120	62	52%	48%	ND (35)	ND (13)	NC	NC	14	NC	NC	88%
8MW33	49	36	73%	27%	32	21	66%	34%	24	75%	25%	51%
8MW03	7.6	4	53%	47%	6.5	3.2	49%	51%	4.4	68%	32%	42%

Table 6-11 (Continued)
Reductions in DCA for Phases I and Phase II Pilot Studies and Following Longevity Sampling

[a]Reports an average to represent Phase I baseline value; not detected in May 2010 due to elevated detection level and 820 µg/L in November 2010.
[b]October 2012 used for Phase II 9 months, as MW05 sampled annually in the fall.
[c]Reports an average to represent Phase I baseline value; not detected in May 2010 due to elevated detection level and 65 µg/L in November 2010.
[d]A value of 100% overstates the reduction due to concentrations reported below the detection level.
[e]The 21-month data are not available. Phase II 9-month concentration used for calculation.

Notes:
"Change" represents the ending value relative to the beginning, while "reduction" represents the value lost by the ending value relative to the beginning.
Wells installed during Phase I are labeled in **green** font, and wells installed during Phase II are labeled in **blue** font.
DCA - dichloroethane
µg/L - microgram per liter
NA - not applicable (shown when data not available and reductions not calculated for increases)
NC - not calculable
ND - Not detected at or above the laboratory quantitation limit. The quantitation limit is displayed in parenthesis.

Table 6-12
Institutional Controls Inspection and Maintenance Summary

Site	Inspection Activities	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
OU 1 Site A burn area	Photograph the site to document any incremental changes, which, over time could impact the site remedy. Inspect the leach basin for any evidence of impact to the liner or soil erosion. Inspect the stormwater conveyance to confirm that water is able to freely flow through the system and is exiting the system at the outfall. Inspect the groundwater restricted use area to confirm that no unauthorized groundwater use is occurring. Interview the treatment plant operators to obtain any information regarding any impacts to the groundwater treatment system. Inspect that the on-site fencing is secured and exhibits no major damage.	***Observations***				
		No deficiencies observed	One manhole cover was found to be missing from the stormwater system.	Same as previous year plus: Injection well AIW-3 is protected from traffic by a loose metal plate that could slide off the well. Two apparent monitoring wells were discovered near the stormwater outfall.	Same as previous year plus: A second manhole cover was found to be missing from the stormwater system. One sign located on Pintado Road was knocked over and the post broken at the base.	Same as previous year plus: **It appears that one of the manhole covers from the stormwater system was replaced.** **A traffic cone was placed along the shoulder of the road near extraction well AIW-3 to alert drivers.**
		Recommendations				
		None made	Install a replacement manhole cover. Add the inspection of the sign located at the north end of Pintado Road to the IC inspection program.	Same as previous year plus: Install a traffic-rated, flush-mount well cover to protect well AIW-3. Investigate these monitoring points to determine their identification.	Same as previous year plus: Install two replacement manhole covers. Replace the post for the site restriction sign.	Same as previous year
OU 1 Site A debris area 2	Photograph the site to document any incremental changes, which, over time could impact the site remedy. Inspect the site for evidence of site usage other than for recreational purposes. Look for evidence of blackberries or other types of vegetation that restrict access to the ravine. Inspect existing signs for damage or defacement and photograph observed damage.	***Observations***				
		No deficiencies observed	Drums that were identified on the steep slope above debris area 2 were determined to be consistent with other solid waste associated with OU 1.	Same as previous year	Same as previous year	Same as previous year
		Recommendations				
		None made	Extend the boundary of debris area 2 to the top of the steep slope to include these drums within the mapped land use control area.	Same as previous year	Same as previous year	Same as previous year

Table 6-12 (Continued)
Institutional Controls Inspection and Maintenance Summary

Site	Inspection Activities	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
OU 2 Site F	Inspect the asphaltic pavement work surface for cracks to confirm the integrity of the underlying infiltration barrier. Inspect drainage ditches and culverts for debris or sediments that may impede stormwater flow. Inspect the site to ensure that groundwater use restrictions are in place. Interview the groundwater treatment plant operators to obtain any information regarding any impacts to the groundwater treatment system.	***Observations***				
		Minor cracks were reported in the surface asphalt east of the canopy structure.	Same as previous year plus: Additional minor cracks were reported in the surface asphalt working area and in area west of the canopy structure. Vegetation overgrowth was reported in the paved stormwater ditches that may impede or redirect flow. Two large areas of downed trees were reported that impede the visual inspection of the margins of the asphalt.	Same as previous year	Same as previous year plus: Scotch broom and alder trees were reported growing through the asphalt in the paved drainage ditches and are up to 2 inches in diameter in size. Alder trees up to 4 inches in diameter were reported to be present along the entire western edge of the paved area, with roots uplifting the asphalt. All the culvert openings at the site were reported to be 50% blocked by either vegetation or rocks. The canopy was reported to be no longer present. A storm drain was observed to have no sediment sock and was partially blocked with detritus and soil. It was reported that the former canopy area was not swept after removal, and sand material remaining at this location may eventually block the storm drain.	Same as previous year plus: The Scotch broom and alder trees reported growing through the asphalt in the paved drainage ditches are now reported to be up to 4 inches in diameter. The alder trees that are lifting the pavement along the western edge of the paved area are now reported to be up to 6 inches in diameter. Stormwater was observed ponded up to 4 inches deep in a large area around the storm drain near the former canopy area.
		Recommendations				
		Fill the cracks to extend the longevity of the asphalt and limit weed growth. Update the ICMP to correctly reflect the limits of the Site F infiltration barrier and locations of items requiring inspection.	Same as previous year plus: Clear vegetation from these ditches to prevent diversion of stormwater out of the structures that could cause damage by erosion. Add additional structures to the site map in the ICMP to better assist field personnel when locating the barrier boundaries during site inspections.	Same as previous year	Same as previous year plus: Add the additional storm drain and pavement area at the former canopy to the IC inspection. Sweep the former canopy area to prevent the stormwater catch basin from becoming blocked with sand.	Same as previous year plus: Clear vegetation from ditches within the cap area, but leave vegetative growth in the perimeter ditches in place to slow stormwater flow and prevent erosion.
OU 3 Site 16/24	Photograph the site to verify the site use. Inspect that the on-site fencing is secured and exhibits no major damage.	***Observations***				
		No deficiencies observed	No deficiencies observed	No deficiencies observed	No deficiencies observed	No deficiencies observed
		Recommendations				
		None made	None made	None made	None made	None made

Table 6-12 (Continued)
Institutional Controls Inspection and Maintenance Summary

Site	Inspection Activities	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
OU 6 Site D	Inspect the site to ensure that no development occurs within the wetland boundary.	***Observations***				
		The lack of distinctive features on the site map prevented the field team from locating the site limits.	Same as previous year	Same as previous year	Same as previous year	Same as previous year
		Recommendations				
		Add an aerial view site map showing additional site features to the site figure in the ICMP to assist field personnel during site visits.	Same as previous year	Same as previous year	Same as previous year	Same as previous year
OU 7 Site B	Inspect the soil cover to identify areas where erosion problems exist or are likely to develop. Inspect the site for any unauthorized dumping or other unusual activities. Inspect the stormwater drainage system to confirm that water is able to freely flow through the system. Inspect the shoreline noting variations from previous inspection conditions. Inspect existing signs for damage or defacement and photograph observed damage.	***Observations***				
		Minor shoreline erosion was noted using the calculations specified by the ICMP.	The shoreline did not meet design specifications in one small area of the midbeach at Transect B.	**Beach replenishment activities were conducted to address minor shoreline erosion identified in 2009 and 2010. These activities added four vertical polyvinyl chloride markers that will aid in the quick assessment of beach erosion.** Some exposed soil was noted as a result of vegetation removal accomplished during beach replenishment activities. A deficiency may occur if significant erosion takes place. It was reported that two signs will require maintenance or replacement soon.	Same as previous year plus: Transects appear similar to surveys from 2011 after the beach replenishment activities. The berms near hubs are maintaining at similar elevations to those established by the beach replenishment in 2011, and a mound of large shells has been established in the middle portion of the beach slope.	Same as previous year plus: To provide early identification of significant storm damage, informal inspections of the Floral Point beach area were performed during the winter with no significant erosion or flooding reported. It was reported that figures of the ICMP include the site extent, but do not identify the extent of the vegetated cap area within the site.
		Recommendations				
		None made	None made	Consider placing erosion protection (such as jute matting) on bare soil to protect against erosion of exposed soil, or placing a 1-foot-thick soil cap on bare soil for the winter season to hold the soil until native plants can reestablish. Repaint or replace two signs that require maintenance.	Same as previous year	Same as previous year plus: Continue informal winter inspections of the Floral Point beach area. Update the ICMP to identify the extent of the vegetated cap area to better assist the field team during inspection to the cap area.

Table 6-12 (Continued)
Institutional Controls Inspection and Maintenance Summary

Site	Inspection Activities	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
OU 7 Site E/11	Photograph the site to document any incremental changes that over time could impact the site remedy. Inspect that the on-site fencing is secured and exhibits no major damage.	***Observations***				
		The gate in the site fencing was unlocked. The fence is not a specified land use control but is considered an additional site control by the Navy.	Same as previous year	Same as previous year	Same as previous year	Same as previous year
		Recommendations				
		None made	Install a lock and chain on the gate.	Same as previous year	Same as previous year	Same as previous year
OU 7 Site 10	Inspect the site for any evidence of groundwater use beyond that required by the groundwater treatment system. Inspect the asphalt cap for evidence of cracking, pot holes, uplifting, and subsidence. Photograph the site to document any incremental changes that over time could impact the site remedy.	***Observations***				
		No deficiencies observed	Minor pavement deficiencies were observed in the older portion of the paved area, including small potholes and some alligator cracking.	Same as previous year plus: **New pavement was observed in an area that had exhibited sparse vegetation as well as an area of subsiding pavement.**	Same as previous year plus: Excavation activities were observed in an area noted as having subsided and been subsequently repaired in 2011. This excavation was reported to be approximately 100 by 25 feet and up to 4 feet in depth. The Navy contractor confirmed with the NAVFAC NW RPM that the work had been performed with NAVFAC NW knowledge and coordination.	Same as previous year plus: The asphalt repair resulting from the excavation observed in 2012 was inspected during the site visit. The repair appeared in good condition and no new or recurring areas of subsidence were noted.
		Recommendations				
		None made	Inspect the older portions of asphaltic pavement to identify when repair or resurfacing is warranted to prevent cap failure. Plant new vegetation in an unpaved area to prevent erosion.	Inspect the older portions of asphaltic pavement to identify when repair or resurfacing is warranted to prevent cap failure.	Same as previous year	Same as previous year
OU 8	Inspect the site for any evidence of groundwater use beyond that required for environmental cleanup and aquifer restoration under the installation restoration program. Survey the site for nonpermitted wells. Confirm that no water supply wells have been installed by contacting the Bremerton/Kitsap County Health District. Inspect the site for excavations and review any approved excavation permits.	***Observations***				
		No deficiencies observed	No deficiencies observed	It was reported that a broken steam line damaged wells 28MW01 and 8MW28. The repair to the steam line followed the excavation permit process. No contingency inspection was required.	Same as previous year plus: Excavation activities were observed near the fueling station associated with the steam line repair. This work has followed the excavation permit process, and the Navy advised contractors that exposure to petroleum- contaminated soil is possible below a depth of 15 feet. **Monitoring wells 28MW01 and 8MW28 were decommissioned in accordance with Washington State Department of Ecology regulations and guidance (WAC 173-160).**	Same as previous year plus: **The asphalt repair associated with the steam line repair was inspected and appeared to be in good condition.**

Table 6-12 (Continued)
Institutional Controls Inspection and Maintenance Summary

Site	Inspection Activities	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
	Photograph the site to document any incremental changes that over time could impact the site remedy.	***Recommendations***				
		None made	None made	Decommission wells 28MW01 and 8MW28, because nearby wells have been substituted as replacement monitoring locations. Modify the excavation permit to include a section or an attachment that indicates that NAVFAC NW reviewed the chemicals of concern with the contractor or submitted the historical information, including the chemicals of concern tables for the site from Section 2 of the ICMP.	Same as previous year	Same as previous year

Notes:
IC - institutional control
ICMP - Institutional Controls Management Plan
NAVFAC NW - Naval Facilities Engineering Command Northwest
OU - operable unit
RPM - Remedial Project Manager

7.0 TECHNICAL ASSESSMENT

This section presents the details of the functionality of the remedies, the continued validity of ROD assumptions, any new information that has arisen that could affect the protectiveness of the remedy, and a technical assessment summary for the remedies for OU 1 (Site A), OU 2 (Site F), OU 3 (Sites 16/24 and 25), OU 6 (Site D), OU 7 (Sites B, E/11, and 10), and OU 8.

This section answers three questions:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Based on the answers to the questions discussed in this section, a technical assessment of the remedies is summarized in Table 7-1. This table provides a quick reference to these question and the answers by OU and site. A discussion of the answers to these questions and the technical assessment summary are presented in order under each OU and site in the sections below.

In answering Question B, any change to an applicable or relevant and appropriate requirement (ARAR) used to establish RGs in the ROD and to risk assessment assumptions (exposure and toxicity) are reviewed to evaluate the protectiveness of the remedy. In the preamble to the NCP, EPA stated that ARARs are generally “frozen” at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA 2001) indicates that the question of interest in developing the 5-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether this change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old standard and the new standard and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within EPA’s acceptable excess cancer risk range of 10^{-4} to 10^{-6}. If the old standard is not considered protective, a new cleanup standard may need to be adopted after the 5-year review through CERCLA’s processes for modifying a remedy.

RGs were established for soil, groundwater, and surface water in the RODs for NBK Bangor. During the first, second, and third 5-year reviews for NBK Bangor, ARARs were reviewed to assess whether any substantive changes were made to ARARs that would call into question the protectiveness of the remedy and the RGs established in the ROD. For this 5-year review, all the

ARARs identified in the ROD were again reviewed for changes that could affect the assessment of whether the remedy is protective. Based on this review, it was concluded that five of the regulations listed as ARARs have changed, as follows:

- Washington State MTCA regulations
- National primary drinking water regulations (maximum contaminant levels [MCLs])
- EPA's regional screening levels (formerly preliminary remediation goals [PRGs])
- Federal marine ambient water quality criteria (AWQC)
- Washington State marine AWQC

In addition to establishing risk-based cleanup levels, MTCA also allows for use of background or the laboratory practical quantitation limit (PQL) as a cleanup level when the MTCA cleanup level is lower than these values. The 5-year review includes an assessment of current PQLs used for LTM and a comparison of the current ARARs with the RGs based on the PQLs or background.

7.1 OU 1 (SITE A)

7.1.1 Functionality of Remedy for OU 1 (Site A)

Is the remedy functioning as intended by the decision documents? No. Although the remedy for Site A soil is functioning as intended by the ROD and three ESDs, the remedy for Site A groundwater is not functioning as intended, as described below. However, the groundwater remedy is protective of human health and the environment because there is no exposure to groundwater with concentrations of COCs exceeding RGs.

The RAOs established in the OU 1 ROD are the following:

- Reduce the concentrations of contaminants in soil to be protective of human health for an unrestricted site use.
- Reduce concentrations of contaminants in the shallow aquifer groundwater to levels below MTCA groundwater cleanup, and the point of compliance will be throughout the shallow aquifer.

The remedy for Site A soil is functioning as intended by the ROD and the three ESDs (as was also found in the first, second, and third 5-year reviews [U.S. Navy 2000a, 2005a, and 2010a]).

The IC inspection process for soil, as well as groundwater, is generally functioning as intended by the OU 8 ROD (wherein IC inspections were required for all OUs). The remedy for Site A soil was implemented from October 1992 through September 1997 and included excavating and stockpiling soil, constructing a soil-washing basin in the resulting excavation, treating the excavated soils using soil washing and composting, treating leachate from the soil washing and composting operations, and abandoning the soil-washing basin, liner, and soil contents in place by placing a 1-foot soil cover over the treated material and revegetating to prevent erosion. Inspections are performed annually to ensure that required LUCs are maintained.

The groundwater extraction and treatment portion of the remedy for Site A is not functioning as intended by the ROD, even though all of the remedy components listed in Table 4-1 have been implemented, and monitoring and groundwater treatment system optimization have been performed as envisioned (Section 11.1 of the ROD). However, significant progress was made during this 5-year review period towards optimizing the remedy.

Groundwater remediation began in May 1997 and is ongoing. Implementation of the groundwater remedy includes pumping and treating extracted groundwater and discharging the treated groundwater to the stormwater diversion system. The groundwater treatment system has been operating for more than 15 years and has therefore not met the time frame established in the ROD, which specified that RGs would be met within 10 years. Although it has not met the cleanup time frame, the remedy remains protective of human health and the environment because there is no exposure to groundwater with concentrations of COCs exceeding RGs.

Based on the monitoring results, the extent of groundwater exceeding cleanup levels has remained relatively constant since groundwater treatment was initiated. However, the area of highest concentration (see Figure 6-4, denoted by concentrations of RDX greater than 100 μg/L) has decreased significantly since the time of the ROD. Concentration trends analyzed in the latest OU 1 annual LTM report (U.S. Navy 2014b), using all groundwater monitoring data collected since treatment system operation began, indicate stable or decreasing concentration trends in the majority of the performance and compliance monitoring wells. Increasing trends were only noted in extraction well A-EW4, and potentially increasing trends were noted in extraction well A-EW5 and compliance monitoring well A-MW32 located adjacent to Pintado Road on the north side of the burn area. The trend analysis conducted for this 5-year review, performed using only data from the last 5 years, indicated increasing concentration trends in the perched zone wells A-MW47 and A-MW32. However, only four monitoring events have occurred in well A-MW47 in the last 5 years. The trend analysis performed using only data from the last 5 years also indicated stable or slightly increasing trends in extraction well A-EW4 and leading plume edge wells A-MW54 and A-MW56.

Based on the recommendation in the last 5-year review, the Navy completed extensive groundwater modeling, updated the CSM, and evaluated remedy optimization alternatives (U.S. Navy 2014i). The numerical flow modeling results suggest that there is very little difference in plume behavior between the pumping and no pumping scenarios (Figure 6-8), and the site pump and treat system does not appear to be significantly more effective than natural attenuation for RDX reduction in affected site groundwater. Based on analysis of five remedy optimization alternatives, MNA was recommended. The basis for the recommendation includes: the RDX plume is not posing a near-term threat to surface water bodies; drinking water wells are not located in the area, an IC is in place to prevent the installation of wells for drinking water, and current conditions do not pose a risk to human health or the environment; and the value of operating the expensive pump and treat system is not apparent and has been the subject of discussion among the Navy, Ecology, and EPA for the past 15 years. In fact, the cost per pound of RDX has increased to $500,000 during this 5-year review period, and these costs are expected to continue to climb as the aging treatment system requires more repairs and upgrades and the pounds of RDX per year extracted decrease.

During the stakeholder kickoff meeting, EPA stated that they had concerns related to hydraulic conductivity (K) and the Kd values used in the modeling (U.S. Navy 2014p). In a follow up letter, EPA elaborated further on these concerns and suggested that the Navy either perform extensive slug testing in shallow aquifer wells across the site, or redo the groundwater modeling using K values from historical studies (USEPA 2014b). Based on this, it is recommended that a field verification of aquifer properties be performed, which the Navy will perform as part of the MNA treatability study discussed below. In addition, an FFS for OU 1 will be performed in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies will be evaluated in the FFS. The other treatment technologies to be included in the FFS would be selected using a collaborative process with the stakeholders.

As part of the FFS, the following activities would also be performed:

- A treatability study of MNA in accordance with EPA's MNA guidance
- An evaluation of remediation time frames using a mass balance assessment or other technique
- A reevaluation of the human health risk pathways and the RAOs

The Navy is recommending that a treatability test of MNA be performed instead of performing additional modeling, which may not be acceptable to EPA. So far, three separate models with varying amounts of site-specific data have all generally obtained the same results. However, none of these models was accepted by EPA. Therefore, the Navy, in conjunction with EPA and Ecology, would develop a treatability study work plan, which would include temporarily deactivating the pump and treat system and implementing an MNA treatability test using EPA protocols. Deactivating the pump and treat system and monitoring changes in the plume is a more direct method of determining the value of continued operation of the system. This method would definitively demonstrate whether the pump and treat system provides any benefits in terms of plume containment without the inherent uncertainties in performing more modeling and analysis. Because the plume is not near any receptors, temporarily deactivating the system does not pose a risk. Following completion of the MNA treatability study, the pump and treat system would be restarted while the FFS is completed and a new remedy selected for the site in an ESD or ROD Amendment.

Using the results of more than 15 years of site monitoring well data and pump and treat operational data, as well as the results of the field verification of aquifer properties, the human health risk pathways and RAOs will be reevaluated in the FFS. The operational information for the existing pump and treat system suggests that the shallow aquifer could not be used as a drinking water source because of the low pumping rates and, therefore, does not represent a complete human health pathway at the site. Therefore, remediation levels may be adjusted to ones based on protection of ecological receptors in downgradient water bodies.

7.1.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Tables 7-2 through 7-4. The changes to the toxicity risk assumptions are discussed below. There was no change to the exposure risk assessment assumptions. However, as previously stated in Section 6.4.1, the operational information for the existing pump and treat system at Site A suggests that the shallow aquifer could not be used as a drinking water source and, therefore, does not represent a complete human health pathway at the site. Therefore, the human health risk pathways and the RAOs will be reevaluated in the FFS and remediation levels may be adjusted to ones based on protection of ecological receptors in downgradient water bodies.

Review of ARARs

COCs for soil, surface water, and groundwater at Site A included 2,4,6-TNT, total DNT, and RDX. Total phthalates and total PCBs were also included as COCs for soil, surface water, and groundwater, although they were not risk drivers at the site. Furthermore, no phthalate or PCB analysis has been included in the LTM program, and these chemicals were not specifically discussed in the ROD. Therefore, an ARARs analysis was not performed for phthalates or PCBs.

Soil. The ROD selected 2,4,6-TNT, 2,4/2,6-DNT, RDX, and lead as COCs in soil at Site A. Soils have been remediated/removed from the burn area such that remaining COCs in soil are at or below the MTCA Method B values for unrestricted land use. However, lead remains above the MTCA Method A value of 250 mg/kg at debris area 2. The remedy has provided for restricted access (deterrent plantings throughout the area), signage warning against exposure, and ICs. Table 7-2 compares the RGs identified in Sections 8 and 12 of the OU 1 ROD (U.S. Navy, USEPA, and Ecology 1991a) with current cleanup levels. The current MTCA Method B soil value has increased from 1.5 to 2.2 mg/kg for 2,4/2,6-DNT, and because the value is higher, the remedy remains protective. No other change to cleanup levels was noted.

Groundwater and Surface Water. The ROD selected 2,4,6-TNT, 2,4/2,6-DNT, RDX, and lead as COCs in groundwater at Site A. The ordnance compounds (2,4,6-TNT, 2,4/2,6-DNT, and RDX) were identified in burn area wells, and lead was included because it was identified in soil above the MTCA Method A value. Lead was not selected as a COC in water at Site A, based on detections above MTCA Method A, because similar concentrations were observed at locations beyond the influence of Site A potentially representing background. The lead detections in water were not found to correlate with detections in soil media (U.S. Navy, USEPA, and Ecology 1991a). Table 7-3 compares the groundwater RGs presented in the OU 1 ROD with the current MTCA Method B cleanup values (with the exception of lead, which has a Method A value). The MTCA Method B groundwater value for 2,4/2,6-DNT has increased from 0.1 to 0.19 µg/L. Because the value is higher, the remedy remains protective. No other change to cleanup levels was noted.

Table 7-4 compares surface water RGs with current cleanup values (where available). The MTCA Method B groundwater value for 2,4/2,6-DNT increased from 0.6 to 5.5 µg/L. The lead surface water RG was established as 1 µg/L in the ROD. However, the basis is not known. The current federal marine AWQC is higher at 8.1 µg/L. Therefore, there was no value change that would impact the protectiveness of the remedy.

Review of Risk Assessment Assumptions – Toxicity

2,4/2,6-DNT is the only Site A COC with a change in current toxicity criteria, and RDX is likely to change in the future. Because of the changes to the toxicity criteria, 2,4/2,6-DNT are now considered less toxic (i.e., today's current soil, groundwater, and surface water cleanup levels are higher) than at the time of the ROD. MTCA B calculations previously used EPA's Integrated Risk Information System (IRIS) slope factor (SF) of 0.68 $(mg/kg\text{-}day)^{-1}$, and currently MTCA B calculations use EPA's Provisional Peer-Reviewed Toxicity Value (PPRTV) SF of 0.45 $(mg/kg\text{-}day)^{-1}$. The summary of specific toxicity changes for 2,4/2,6-DNT are presented in Table 7-15, and future changes for RDX are discussed below.

RDX's toxicity is currently under review by EPA. The EPA's Residential Screening Level (RSL) and Ecology's MTCA B value currently use the PPRTV SF of 0.11 $(mg/kg\text{-}day)^{-1}$ based on liver, hepatocellular carcinoma, and adenomas tumors in mice (USDoD 1984). While the MTCA Method B value selected as the RG in the ROD has not changed (0.8 mg/kg), the EPA may increase the toxicity of this chemical, thus lowering MTCA B cleanup levels and EPA RSLs.

Currently, the RDX toxicological review is in the preliminary stages, which included a comprehensive literature search and compilation of health effects tables (USEPA 2013b), and the EPA is seeking public review and comment. Toxicity changes and impacts to the protectiveness of the remedy will likely be completed as part of the future fifth 5-year review once the toxicological review is finalized.

7.1.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 1 that could call into question the protectiveness of the remedy.

7.1.4 Technical Assessment Summary

Although the remedy for the soil at OU 1 is functioning as designed, the remedy for groundwater is not functioning as designed because the time frame for remediation has not been met. Although the remedy has not met the cleanup time frame, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs.

The Navy recommends that an FFS be prepared for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies would be evaluated in the FFS. The other treatment technologies to be included in the FFS would be selected using a collaborative process with the stakeholders. The FFS will also include an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways. An MNA treatability study work plan will be developed in conjunction with the EPA and Ecology that would include temporarily deactivating the pump and treat system and implementing an MNA treatability test using EPA protocols (USEPA 1999).

The ARARs, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy at Site A that could call into question the protectiveness of the remedy. Although exposure assumptions are still protective of human health and the environment, they may not be valid. The Site A pump and treat system operational data suggest that the shallow aquifer could not be used as a drinking water source. Therefore, as previously discussed in Sections 7.1.1 and 7.1.2, the human health risk pathways and the RAOs will be reevaluated in the FFS, and remediation levels may be adjusted to ones based on protection of ecological receptors in downgradient water bodies.

7.2 OU 2 (SITE F)

7.2.1 Functionality of Remedy for OU 2 (Site F)

Is the remedy functioning as intended by the decision documents? No. Although the remedy for Site F soil is functioning as intended by the ROD and ESD, the remedy for Site F groundwater is not functioning as intended, as described below. However, the groundwater remedy is protective of human health and the environment because there is no exposure to groundwater with concentrations of COCs exceeding RGs.

The RAOs established in the OU 2 ROD are the following:

- Eliminate the risk associated with potential direct contact with contaminated soils.
- Cleanup groundwater contamination in the shallow aquifer to achieve the most cost-effective reduction in overall site risk.

The remedy for Site F soil is functioning as intended by the ROD and ESD (as was also found in the first, second, and third 5-year reviews [U.S. Navy 2000a, 2005a, and 2010a]). The IC inspection process for soil, as well as groundwater, is generally functioning as intended by the OU 8 ROD (wherein IC inspections were required for all OUs). The remedy for Site F soil was implemented from summer 1996 through August 1997 and included excavating contaminated soil, composting the soil in an on-base treatment facility, backfilling the excavation area with a variety of oversized material from excavated soil screening and available broken asphalt, and capping the excavation area with an infiltration barrier and concrete pad. Inspections are performed annually to ensure that required LUCs are maintained.

The remedy for Site F groundwater is not functioning as intended by the ROD. However, significant progress was made during this 5-year review period towards optimizing the remedy. Groundwater remediation began in December 1994 and is ongoing. Implementation of the groundwater remedy includes pumping and reinjecting treated groundwater into the shallow aquifer. The groundwater treatment system has been operating for approximately 20 years, which is substantially longer than the 5- to 10-year time frame established in the ROD. Although it has not met the cleanup time frame, the remedy remains protective of human health and the environment because there is no exposure to groundwater with concentrations of COCs exceeding RGs.

Based on the monitoring results, the extent of groundwater exceeding cleanup levels has remained relatively constant since groundwater treatment was initiated. However, the area of highest concentration (see Figure 6-13, denoted by concentrations of RDX greater than 100 and 1,000 µg/L) has decreased significantly since the last 5-year review. Concentration trends analyzed in the latest OU 2 annual LTM report (U.S. Navy 2014c), using groundwater monitoring data from the last 10 monitoring events, indicate stable or decreasing concentration trends in the majority of the performance and compliance monitoring wells. Increasing trends were only noted in performance monitoring wells F-MW44 and F-MW48 for RDX and F-MW35 for 2,4,6-TNT. The increasing RDX trends in F-MW44 and F-MW48 are most likely the result of the plume core being drawn toward extraction well F-EW5. The trend analysis conducted for this 5-year review, performed using only data from the last 5 years, indicated increasing concentration trends in performance monitoring wells F-MW44 and F-MW31. Although an increasing trend has been identified in F-MW31 during the last 5 years of monitoring, concentrations in this well are still substantially lower than when monitoring began in 1994. Based on the trend analysis, concentrations appear to be generally stable or declining.

The current potentiometric surface data show that extraction from well F-EW5 and reintroduction in the line of infiltration wells has established a strong reversal of gradient, which is supportive of good containment (U.S. Navy 2014c). However, the limited hydraulic head observation points available between the individual infiltration wells limit the ability to determine with certainty that containment is complete. Because of the limited hydraulic head observation points, the 2014 annual LTM and O&M report for Site F (U.S. Navy 2014c) recommended that new piezometers be installed adjacent to and between infiltration wells to improve characterization of the potentiometric surface and assess the quality of containment. The report also recommended that piezometers be installed adjacent to active extraction wells that currently lack an adjacent observation point to improve the potentiometric surface for passive wells, which are more representative of aquifer conditions. The need for additional groundwater monitoring points to better characterize the potentiometric surface should be reevaluated following completion of the modeling activities to be performed in 2015 in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.

2013 presented some challenges for containment as a result of equipment problems experienced by the pump and treat system. Well F-EW5, the most important extraction well for containment, has operated over the last 7 years at an average annual extraction rate of approximately 200 gallons per minute. Because of the system’s operational problems, the annualized extraction rate dropped to 43.5 gallons per minute in 2013. Well F-EW5 has resumed operations at 100 percent capacity, and monitoring conducted quarterly in 2013 through winter 2014 did not show any change of significance for plume containment (U.S. Navy 2014c). Extensive system repairs and upgrades were undertaken in 2013 and early 2014 in response to the operational problems experienced in 2013. In order to prevent future system shutdowns and the potential loss of plume containment, the Navy, together with the LTM contractor, should continue to evaluate the pump and treat system maintenance needs and proactively repair and replace equipment.

The third 5-year review (U.S. Navy 2010a) identified the need to complete the ongoing assessment and optimization of the Site F treatment system to address containment issues, downgradient plume extent, and the portion of the plume downgradient of the current capture zone. Based on this recommendation, the following activities were completed:

- Installed wells F-MW70 and F-MW71 in 2011 that bounded the extent of the plume

- Reported on groundwater containment in all monitoring reports

- Developed and calibrated a numerical groundwater flow model and contaminant transport model (USACE 2014)

Follow-up work to these studies is in progress at the time of this 5-year review to support Site F remedy optimization.

7.2.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Tables 7-6 and 7-7. The changes to the toxicity risk assumptions are discussed below. There was no change to the exposure risk assessment assumptions.

Review of ARARs

Soil. The risk assessment, based on residential land use, identified 2,4,6-TNT, 2,4-DNT, and RDX as COCs in soil. Based on risks in groundwater, an additional six compounds were included on the soil COC list in the OU 2 ROD (manganese, nitrate, nitrite, 2,6-DNT, 1,3,5-TNB, and 1,3-DNB). Soil exceeding the ROD RGs for the nine COCs was removed down to 15 feet bgs. The ROD RGs are presented in Table 7-6 together with the values that would be selected today for residential land use. Current cleanup levels are either the same or higher. Therefore, the remedy remains protective.

Groundwater and Surface Water. The baseline risk assessment identified nine COCs based on residents drinking the shallow groundwater, including RDX, manganese, nitrate, nitrite, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, 1,3,5-TNB, and 1,3-DNB. The ROD developed RGs for all nine COCs. However, the document also indicated that 2,4,6-TNT, 2,4-DNT, RDX, and nitrate were the chemicals of greatest concern, based on toxicity (2,4,6-TNT and 2,4-DNT[2]) and extent of area above RGs (RDX and nitrate). Table 7-7 lists the ROD RGs for the COCs and the current cleanup levels. Either there is no change, or the current cleanup level would be higher than the level established in the ROD (i.e., 2,4/2-6-DNT, 1,3,5-TNB, and nitrite). Therefore, the remedy remains protective.

[2]The RG for 2,4-DNT was derived using a cancer SF based on the toxicity of 2,4-DNT and 2,6-DNT as a mixture.

Although manganese was a ROD COC, it was not analyzed for in groundwater during the LTM activities, because it is naturally occurring in site soils (U.S. Navy 1993a). Concentrations in groundwater in the RI/FS for dissolved manganese ranged from 2.4 to 312 µg/L, which was compared to a maximum manganese background level of 2.4 µg/L. Manganese concentrations above the ROD RG were detected in only one monitoring well, F-MW31, which is located downgradient of the wastewater lagoon. The detected concentrations in this well were anomalously high, relative to manganese concentrations detected in other monitoring wells. According to the RI, these high concentrations were thought to be attributed to reduced groundwater oxygen concentrations at this location (likely from biodegradation), promoting mineralization of manganese present in natural soils (U.S. Navy 1993a). All other monitoring wells during the RI/FS contained manganese concentrations below the secondary MCL of 50 µg/L.

The ROD RG for manganese is based on the secondary MCL value of 50 µg/L. This secondary MCL value was established based on aesthetic concerns (e.g., laundry staining). Although there is no primary MCL, there is a current MTCA Method B value of 2,240 µg/L, which equates to a risk of 1×10^{-6}. The current MTCA Method B value of 2,240 µg/L is greater than the highest manganese concentration of 312 µg/L in the RI/FS. Therefore, although manganese is not monitored for, historical concentrations are not considered a human health concern. Therefore, monitoring for this chemical is not warranted.

Also included in Table 7-7 are the groundwater RGs protective of surface water in the event that the groundwater plume should ever migrate to surface water. Currently, the groundwater plume has not impacted surface water above RGs based on winter 2014 sampling (U.S. Navy 2014c), and it is not anticipated in the future. Therefore, potential changes to surface water RGs, if established today, were not evaluated as part of this 5-year review. When the removal of groundwater restrictions is proposed, groundwater concentrations for the COCs should be compared to current drinking water and, in the event that groundwater is near a surface water discharge point, to current surface water standards.

Review of Risk Assessment Assumptions - Toxicity

2,4/2,6-DNT, 1,3,5-TNB, and manganese in soil and 2,4/2,6-DNT in groundwater are the Site F COCs with changes in toxicity criteria. Because of the changes to the toxicity criteria, these chemicals are now considered less toxic (i.e., today's current cleanup levels are higher) than at the time of the ROD. Nitrate's MTCA Method B soil and groundwater values have increased. However, the toxicity criterion has not changed since the ROD, and the reason for cleanup level changes cannot be determined. Because all cleanup levels are now higher, the remedy is still protective. The details of the toxicological changes for each chemical are discussed below and summarized in Table 7-15. RDX toxicity criteria are currently under review by EPA, and future changes were previously discussed in Section 7.1.2.

2,4/2,6-DNT. MTCA Method B calculations previously used EPA's IRIS SF of 0.68 $(mg/kg\text{-}day)^{-1}$, and currently MTCA Method B calculations use EPA's PPRTV SF of 0.45 $(mg/kg\text{-}day)^{-1}$.

1,3,5-TNB. MTCA Method B currently uses EPA's IRIS reference dose (RfD) of 0.03 mg/kg-day, and the RG was based on an RfD of 0.00005 mg/kg-day.

Nitrate. The noncancer oral RfD for nitrate of 1.6 mg/kg-day does not appear to have changed since the ROD was signed in 1991. Nitrate was included as a soil COC because it was a COC in groundwater. Thus, the ROD MTCA Method B value chosen as the RG may have been based on the protection of groundwater, rather than direct human contact with soil. In any case, the maximum nitrate concentration detected in soil samples collected from OU 2 was 17 mg/kg, which is several orders of magnitude below both the old and new MTCA Method B cleanup levels. Groundwater concentrations of nitrate are not likely a concern, based on the low soil concentrations at OU 2.

Manganese. The RG was based on a background value for soil and the secondary MCL for groundwater. The current MTCA Method B values for soil and groundwater are much higher than the RGs. MTCA Method B currently uses EPA's IRIS RfD of 0.14 mg/kg-day.

7.2.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 2 that could call into question the protectiveness of the remedy.

7.2.4 Technical Assessment Summary

Although the remedy for the soil at OU 2 is functioning as designed, the remedy for groundwater is not functioning as designed because the time frame for remediation has not been met. Although the remedy has not met the cleanup time frame, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs. The Navy is continuing to evaluate remedy optimization options to address the remediation time frame. This includes performing additional groundwater modeling simulations, conducting a treatability study to evaluate anaerobic biodegradation of RDX, and evaluating the need for additional and expanded pilot studies involving aerobic and/or anaerobic biodegradation. The ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy at Site F that could call into question the protectiveness of the remedy.

7.3 OU 3 (SITES 16/24 AND 25)

7.3.1 Functionality of Remedy for OU 3 (Sites 16/24 and 25)

Is the remedy functioning as intended by the decision documents? Yes.

No RAO was established in the OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b). The remedy for Site 16/24 soil, which consisted of a residential land use restriction, was implemented in 1993 prior to the completion of the ROD and formalized in 2001 upon completion of the ICMP for all of NBK Bangor (U.S. Navy 2001). The remedy for Site 25 groundwater, which consisted of groundwater monitoring, was performed from March 1994 through September 1997. At that time, the Navy and Ecology agreed that the groundwater monitoring for Site 25 met the requirements of the OU 3 ROD and that no additional monitoring was required (U.S. Navy 2000a).

The selected remedy for OU 3 continues to function as intended by the ROD. Inspections of the LUCs at Site 16/24 have been conducted regularly, and the current land use remains in accordance with the restrictions defined in the OU 8 ROD (which established the basewide LUCs).

7.3.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Tables 7-8 and 7-9. The changes to the toxicity risk assumptions are discussed below. There was no change to the exposure risk assessment assumptions.

Review of ARARs

Soil. The OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b) selected a no action alternative that required establishment of ICs for Site 16/24, because antimony and beryllium concentrations in soil exceeded MTCA Method B levels, and arsenic in soil exceeded the MTCA Method A value for unrestricted land use.[3] Assuming a future residential (unrestricted) land use, the risk assessment did not find unacceptable risks from exposures to soil. A comparison of the ROD RG values with current standards is provided in Table 7-8. The beryllium cleanup level has increased, and the antimony and arsenic cleanup levels have remained the same. Based on this ARARs review, the LUCs for soil at this site may be unnecessary for the reasons listed below:

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[3]Although the ROD identifies the arsenic ARAR as originating from Method B, it is a Method A value.

- The cleanup level for beryllium is currently 160 mg/kg, much higher than the ROD RG of 0.2 mg/kg, and the maximum beryllium concentration detected in soil at this site was only 1 mg/kg.

- While the cleanup level for antimony of 32 mg/kg has not changed since the ROD, the maximum antimony concentration detected in soil was only 35.8 mg/kg, less than two times the cleanup level. A statistical analysis of the data indicates that less than 10 percent of sample concentrations exceed the ROD RG, and the 95 percent UCL of the mean is below the cleanup level.[4] The exceedance for antimony was in a surface soil sampling location around the incinerator. There was only one exceedance out of 23 samples in this area, and the exceedance was the only detected antimony concentration.

- Like antimony, arsenic's ROD RG of 20 mg/kg has not changed. However, EPA published a toxicological update in 2010 (which is still under review as of this fourth 5-year review) that will likely result in an increase in the toxicity criteria for arsenic (i.e., the chemical will be considered a more potent carcinogen [see discussion below]). A review of the soil data indicates only one sample exceeded the ROD RG, with a concentration of 82.7 mg/kg. In the RI for the site, this value was coded "NJ" (a tentatively identified estimated value) on some tables and as "J" (estimated value) on others (U.S. Navy 1992a). Therefore, there is some uncertainty as to whether the maximum concentration is actually present on the site. Like antimony, the maximum arsenic concentration was found in surface soil samples collected around the incinerator. All other soil samples in this area (total of 23 samples) were below the ROD RG of 20 mg/kg. The next highest arsenic concentration was 13.9 mg/kg (potentially a concentration representative of local background). A 95 percent UCL calculated for the surface soil data set results in a concentration of 22.7 mg/kg, driven by the single RG exceedance and only marginally above the ROD RG.

While site soils are approximately at RG concentrations around the incinerator as a whole, the necessity of keeping ICs at this site should be reviewed during the fifth 5-year review because of the proposed changes in arsenic toxicity (see discussion below).

Groundwater. Groundwater monitoring was implemented at Site 25 for cadmium and manganese based on exceedances of MTCA Method B groundwater cleanup levels. Although

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[4]According to Washington Administrative Code (WAC) 173-340(7)(e)(i), a site can be considered "clean" if no single sample concentration is greater than two times the soil cleanup level and (ii) less than 10 percent of the sample concentrations exceed the soil cleanup level. Additionally, under MTCA, an exceedance of a cleanup level at one location may not require action if the rest of the data are lower and include a provision (WAC 173-340-740[7][d]) allowing the statistical evaluation of the data. MTCA specifically allows the use of the 95 percent UCL, where the probability of underestimating the true mean is less than 5 percent.

groundwater monitoring has been discontinued because all cleanup levels were met, an ARARs comparison was still conducted. Table 7-9 compares the ROD RGs with current Method B and state MCL values. Because the standards have either remained the same or been raised, the remedy remains protective.

Review of Risk Assessment Assumptions - Toxicity

Beryllium is the only OU 3 COC in soil with a current change in toxicity criteria. However, there is a future possibility that arsenic toxicity criteria may change resulting in a lower cleanup level in soil at Site 16/24. The toxicity changes for both chemicals are discussed below, and the beryllium changes are summarized in Table 7-15.

Beryllium. Because of the changes to the toxicity criteria, beryllium is now considered less toxic (i.e., today's current soil cleanup level is higher) than at the time of the ROD. Therefore, the remedy is still protective. Currently MTCA B calculations use EPA's IRIS RfD of 0.002 mg/kg-day.

Arsenic. Arsenic is a COC at Site 16/24. While the MTCA Method A value selected as an RG in the ROD has not changed (20 mg/kg), the EPA published a draft toxicological review of inorganic arsenic in 2010 (USEPA 2010), which is still under review. The National Research Council offered recommendations on scientific issues in EPA's IRIS assessment in a 2014 interim report (NRC 2014). EPA indicates that this draft does not represent EPA policy until the document is finalized. After the comment period has closed, EPA will begin preparing the final toxicological review and placing new toxicity criteria in EPA's IRIS database. The draft is proposing a significant increase in arsenic's oral cancer SF. The draft review categorizes inorganic arsenic as "carcinogenic to humans," using EPA's new classification system (finalized in 2005). Although the chemical was also considered an "A" carcinogen previously, demonstrated to cause cancer in humans, the classification under the new system indicates that there is now additional information on the biological mechanisms inducing cancer.

The proposed new SF is based on the same Taiwanese study used to develop the original SF (1.75 $[mg/kg\text{-}day]^{-1}$), but is based on tumors in different sites, specifically lung and bladder, rather than skin. The draft toxicological review also continues to use a linear low-dose extrapolation, concluding that information is insufficient to change the linear low-dose default assumption. However, whether there is a threshold for the carcinogenic effects of arsenic is a topic of much scientific debate. The findings of the review recommended an oral SF of 25.7 $(mg/kg\text{-}day)^{-1}$, based on the combined internal (lung plus bladder) cancer incidence for women (the more sensitive population). This is a conservative upper-bound estimate, as cancer potency factors were found to range from 6.7 to 25.7 $(mg/kg\text{-}day)^{-1}$, depending on type and gender (USEPA 2010). The new SF represents a potential increase in cancer potency by a factor of 17 (and a concomitant lowering of risk-based cleanup levels by a factor of 17). If this SF is finalized and placed into EPA's IRIS database, the current MTCA Methods B and C values for arsenic in soil and water would drop significantly, calling the remedy into question at OU 3.

At Site 16/24, no cleanup action was undertaken for soil. However, ICs are in place to prevent residential land use. The original baseline risk assessment estimated that risks based on residential exposures were within EPA's acceptable risk range, but if the proposed SF was finalized and used in revised risk calculations, unacceptable risks might be identified (if arsenic in soil is actually present at concentrations above background). Once the SF has been finalized, risks should be reevaluated to verify that the remedy is still protective. However, the site is currently vacant and fenced, dig permits are required, and an IC prevents use of the site as residential land.

7.3.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 3 that could call into question the protectiveness of the remedy.

7.3.4 Technical Assessment Summary

The remedy at OU 3 is functioning as intended by the decision documents. The ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy that could call into question the protectiveness of the remedy.

7.4 OU 6 (SITE D)

7.4.1 Functionality of Remedy for OU 6 (Site D)

Is the remedy functioning as intended by the decision documents? Yes.

The RAOs established in the OU 6 ROD are the following:

- Prevent unacceptable current and potential future risks to human health and the environment posed by ingestion and dermal contact with TNT and DNT in Site D soil.
- Prevent migration of metals from Site D surface waters at concentrations that may adversely affect ecological receptors in downstream surface waters.
- Prevent potential future human health risks that may be caused by ingestion or inhalation of contaminants in shallow aquifer groundwater.

The remedy for Site D was implemented from December 1995 through June 2000 and included excavating soil from the burn trench, screening and composting the excavated soils at an on-base treatment facility, backfilling the treated soils into the excavation area, grading and revegetation, and surface water and groundwater sampling.

As found during the previous 5-year reviews, the remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD. No ongoing monitoring was required following the first 5-year review, and there is no apparent change in the functionality of the remedy since that time. Monitoring for perchlorate as a new potential contaminant in groundwater did not reveal any contamination. No IC was required for OU 6.

7.4.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Tables 7-10. The changes to the toxicity risk assumptions are discussed below. There was no change to the exposure risk assessment assumptions.

Review of ARARs

Soil. Human (residential land use) and ecological risks were identified for Site D soils and nine chemicals were selected as COCs. Table 7-10 compares OU 6 ROD (U.S. Navy, USEPA, and Ecology 1994c) soil ARARs (MTCA Methods B and C values) with current MTCA standards for the COCs. The cleanup levels have increased for 2,4-DNT (impacting outside and inside wetland values), nitrobenzene, and 1,3,5-TNB. Therefore, the remedy remains protective for these COCs. The MTCA Method B soil cleanup levels for 2,6-DNT, nitrotoluene (all isomers), 1,2-DNB, and 1,4-DNB have decreased, calling into question the protectiveness of the remedy. These chemicals and the changes in toxicity are discussed below.

Groundwater. The baseline risk assessment did not identify any risks from chemicals in surface water or groundwater and no water RG was established in the OU 6 ROD. Short-term groundwater monitoring took place at OU 6 in May 1996 and June 1997. The monitoring wells were decommissioned in June 2000, because no chemical exceeded any ARAR. Surface water monitoring was also conducted post-ROD, and no chemical exceeded AWQC concentrations. Therefore, an ARAR review of the cleanup levels used to evaluate the post-ROD water data was not conducted as part of this 5-year review.

Review of Risk Assessment Assumptions – Toxicity

Because of the changes to the toxicity criteria, 2,4-DNT, 1,3,5-TNB, and nitrobenzene are now considered less toxic (i.e., today's current cleanup levels are higher) than at the time of the ROD, and 2,6-DNT, nitrotoluenes, 1,2-DNB, and 1,4-DNB are more toxic than at the time of the ROD. For those chemicals with higher cleanup levels, the remedy remains protective. The protectiveness of the remedy is discussed below only for those chemicals with currently lower cleanup levels. The details of the toxicological changes for each chemical are summarized below and in Table 7-15.

2,4-DNT. MTCA Method B previously evaluated this chemical as a mixture, using EPA's IRIS SF of 0.68 $(mg/kg\text{-}day)^{-1}$. MTCA Methods B (outside the wetland) and C (inside the wetland) currently use California Environmental Protection Agency's SF of 0.31 $(mg/kg\text{-}day)^{-1}$.

1,3,5-TNB. MTCA Method B currently uses EPA's IRIS RfD of 0.03 mg/kg-day, and the RG was based on an RfD of 0.00005 mg/kg-day.

Nitrobenzene. MTCA Method B currently uses EPA's IRIS RfD of 0.002 mg/kg-day.

2,6-DNT. The oral SF of 1.5 $(mg/kg\ day)^{-1}$, an EPA PPRTV, is used to calculate the current MTCA Method B value. The ROD RG was based on the EPA IRIS value of 0.68 $(mg/kg\ day)^{-1}$. This change in toxicity is reflected in the current regulatory soil cleanup level of 0.67 mg/kg, a decrease from the ROD RG of 1.5 mg/kg. Using this new SF, the cancer risk of the cleanup level of 1.5 mg/kg is 2×10^{-6}, below the ROD cancer risk goal of 1×10^{-5}. Because the ROD cancer risk goal is still being met, the remedy designed to achieve the cleanup level is protective, and no RG change is recommended.

Nitrotoluene (all isomers). There is no SF for the mixture of ortho-, meta-, and para- isomers. The most toxic isomer, ortho-nitrotoluene, has an oral SF of 0.22 $(mg/kg\ day)^{1}$, an EPA PPRTV, that is used to calculate the current MTCA Method B value. The ROD RG was based on inclusion of all isomers, whereas, the current cleanup level is reflective of the most toxic isomer. The current regulatory soil cleanup level of 5 mg/kg is a decrease from the ROD RG of 800 mg/kg. Using the current SF for o-nitrotoluene, the cancer risk of the cleanup level of 800 mg/kg is 2×10^{-4}, above the ROD cancer risk goal of 1×10^{-5}. However, nitrotoluene was not detected in soil at Site D during the RI (U.S. Navy, USEPA, and Ecology 1994c). Therefore, the remedy is still protective.

1,2-DNB (ortho-) and 1,4-DNB (para-). The oral RfD of 0.0001 mg/kg day, an EPA PPRTV, is used to calculate the current MTCA Method B values for both chemicals. The current oral RfDs are the same for all the dinitrobenzene isomers (ortho-, meta-, and para-). During the ROD, the oral RfDs were different for ortho- and para-. The current cleanup level is reflective of the most toxic isomer (1,3-dinitrobenzene [meta-]). The current regulatory soil cleanup level of

8 mg/kg is a decrease from the ROD RG of 32 mg/kg for both ortho- and para- isomers. Using this current RfD, the hazard of the cleanup level of 32 mg/kg is 4, above the ROD hazard risk goal of 1. However, 1,2-DNB (ortho-) and 1,4-DNB (para-) were not detected in soil at Site D during the RI (U.S. Navy, USEPA, and Ecology 1994c). Therefore, the remedy is still protective.

7.4.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 6 that could call into question the protectiveness of the remedy.

7.4.4 Technical Assessment Summary

The remedy at OU 6 is functioning as intended by the decision documents. The ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy that could call into question the protectiveness of the remedy.

7.5 OU 7 (SITES B, E/11, AND 10)

7.5.1 Functionality of Remedy for OU 7 (Sites B, E/11, and 10)

Functionality of Remedy for Site B (Floral Point)

Is the remedy functioning as intended by the decision documents? Yes.

The RAOs established for Site B in the OU 7 ROD are the following:

- Prevent dermal contact and ingestion of shallow and subsurface soil containing polycyclic aromatic hydrocarbon (PAH) and PCB concentrations above the state cleanup level of 1 ppm for soil to 15 feet bgs and arsenic concentrations above 20 ppm.

- Confirm through monitoring of Hood Canal sediments and clam tissue that groundwater discharge from Floral Point into Hood Canal is not negatively affecting the sediments or clam tissues.

The remedy for Site B (Floral Point) was implemented from June through November 1997 and included covering areas of contaminated soil, installing a shoreline protections system and a stormwater drainage system to control erosion, monitoring sediment and clam tissue, and installing signs notifying visitors that the site is to be used for recreational purposes only and approval is required for digging or mowing.

The remedy for Site B (Floral Point) is functioning as intended by the OU 7 ROD. The vegetated soil cover, shoreline protection system, stormwater management structures, and signs are being maintained. LUCs are in place, enforced, and inspected annually. IC inspections identified an issue with erosion along the shoreline, and beach replenishment activities were conducted to address shoreline erosion identified in 2009 and 2010. IC inspections and the site inspection conducted as part of this 5-year review identified fading signs. These fading signs should be repainted or replaced.

This monitoring component of the Site B remedy has functioned as intended by the ROD and is complete. Therefore, the monitoring requirement has been terminated.

Functionality of Remedy for Site E/11

Is the remedy functioning as intended by the decision documents? Yes.

The RAOs established for Site E/11 in the OU 7 ROD are the following:

- Prevent direct contact with and ingestion of stockpiled soil and underlying soil down to 15 feet bgs that contains dichlorodiphenyltrichloroethane (DDT) in concentrations above the state cleanup level of 2.94 ppm.

- Prevent ingestion of groundwater containing Otto fuel concentrations above 0.0002 ppm. Propylene glycol dinitrate (PGDN) is one of several chemical compounds in Otto fuel and is used as the indicator chemical.

The remedy for soil at Site E/11 was implemented from July 1997 through May 1998 and included disposal of stockpiled soil and metal debris, grading site, and backfilling with clean topsoil. The groundwater use restriction component of the remedy was formally satisfied in 2000, with adoption of the basewide ICMP required by the OU 8 ROD.

As found during the previous 5-year reviews, the remedy component for soil removal and disposal at Site E/11 functioned as intended by the ROD. The groundwater use restriction remains in place as part of the basewide ICMP, and this restriction is functioning as intended.

Recovery of groundwater beneath Site E/11 containing Otto fuel continued during this review period as part of the Site F pump and treat system. Monitoring for Otto fuel in Site E/11 wells is conducted concurrently with Site F monitoring. Although groundwater extraction by the Site F system is ongoing, there is no apparent decreasing trend in Otto fuel concentration beneath Site E/11. Based on the stable trend of Otto fuel concentrations in Site E/11 wells, it appears that the remedy is functioning to contain, but not substantially remove, Otto fuel from beneath the site. Containment of groundwater containing Otto fuel, in combination with the groundwater use restriction, functions to meet the RAO of preventing ingestion of groundwater containing Otto fuel at concentrations above the RG.

Functionality of Remedy for Site 10

Is the remedy functioning as intended by the decision documents? Yes.

The RAO established for Site E/11 in the OU 7 ROD is the following: Prevent ingestion of groundwater containing TPH concentrations above the state cleanup level of 1 ppm throughout the aquifer.

The remedy for Site 10 was implemented after the signing of the ROD in 1996 and included ongoing long term maintenance of the asphalt pavement cover, groundwater monitoring, groundwater use restrictions, and expansion of the area of asphalt cover to include soils contaminated with arsenic, cadmium, lead, and PCBs (U.S. Navy 2008a). The remedy for Site 10 is functioning as intended by the ROD. The confirmation groundwater sampling was completed during the second 5-year review period and resulted in a finding that further sampling is not necessary. Groundwater use restrictions are included in the ICMP as part of the restrictions on OU 8 and are being monitored and enforced. Maintenance of the asphalt pavement is also included in the ICMP.

Annual IC inspections identified small potholes, alligator cracking, sparse vegetation, subsiding pavement, and excavation activities in areas of the asphalt cap during this 5-year review period. New pavement was placed and repairs made based on these inspections. The site inspection conducted as part of this 5-year review identified signs of cracking in the asphalt cap and a sinkhole adjacent to Building 2011. The asphalt cap at Site 10 should be repaired.

7.5.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Tables 7-11 and 7-12. There was no change to the risk assessment assumptions (toxicity and exposure).

Review of ARARs

Soil. The baseline risk assessment, assuming residential land use, identified COCs for Sites B, E/11, and 10 as listed in Tables 7-11 and 7-12 for soil and groundwater, respectively. Table 7-11 compares soil RGs from the OU 7 ROD (U.S. Navy, USEPA, and Ecology 1996) with current ARARs. Specifically, the ROD identified MTCA Method A soil values for unrestricted land use for Sites B (Floral Point) and Method B soil values protective of direct contact for unrestricted land use for Site E/11. At Site 10, arsenic, cadmium, lead, and Aroclor 1254 were identified post-ROD (U.S. Navy 2009a) and are also included in Table 7-11. The only soil ARAR that would be lower today is for cPAHs, a soil COC at Site B. The rest of the ARARs remain unchanged. However, EPA published a toxicological update for arsenic in 2010 (which is still under review as of this fourth 5-year review) that will likely result in an increase in the toxicity criteria for arsenic (see Section 7.3.2 for further discussion). Because the remedies at OU 7 Sites B and 10 consist of maintaining clean cover or a cap, the remedy will remain protective even if the proposed SF for arsenic is changed, resulting in a lower MTCA Method B cleanup level.

The MTCA Method A unrestricted cleanup level for cPAHs is now 0.1 mg/kg, compared to 1 mg/kg at the time of the ROD. In addition, under the November 2007 revision of MTCA (WAC 173-340-708[8][e]), determining compliance with cleanup levels for mixtures of cPAH compounds is now done by calculating a benzo(a)pyrene "equivalent" value for each sample. This toxic equivalent concentration is derived by adjusting the concentrations of the seven cPAHs based on their toxicity compared to benzo(a)pyrene. The sum of the adjusted concentrations is then calculated and compared to the 0.1-mg/kg cleanup level. No soil was removed from Site B. The remedy involved placing clean fill over impacted soils and revegetating. Because the cover is being maintained, the remedy for Site B is still protective. If the cover were to be removed, cPAH soil concentrations would require evaluation using current standards and methodology. The estimated health risk of the ROD RG (1 mg/kg) is 1×10^{-5}, which is equal to the health goal. Therefore, the remedy remains protective.

Groundwater. Two chemicals were selected as COCs in groundwater at OU 7 based on the results of the risk assessment and assuming groundwater was used for drinking: TPH at Site 10 and Otto fuel at Site E/11. The MTCA Method A value for TPH of 1,000 µg/L was identified in the OU 7 ROD as the RG for Site 10 (see Table 7-12). Currently, MTCA does not have a generic TPH value, but provides values for various carbon-chain-length ranges of petroleum fuels (e.g., gasoline, diesel). All the MTCA Method A TPH levels are currently lower than 1,000 µg/L. The risk assessment in the RI (U.S. Navy 1994a) assumed that the single TPH sample used to assess health risks was marine diesel. Therefore, the MTCA Method A value of 500 µg/L would currently be applicable. The lowering of this value calls into question the protectiveness of the remedy based on a calculated hazard of 2 for the ROD RG value, which exceeds the ROD hazard goal of 1. However, because diesel and residual-range petroleum compounds were not detected during the last groundwater sampling at Site 10 (in 2000 and 2001), the remedy is still protective at Site 10.

The RG for Otto fuel in groundwater at Site E/11 was the PQL of 0.2 µg/L, because the risk-based value protective of the drinking water pathway of 0.038 µg/L could not be achieved using analytical techniques at the time. The risk-based RG in the ROD was derived for PGDN, the major component of Otto fuel. Currently, EPA does not have a reference dose for PGDN in their IRIS database. However, EPA's regional screening tables list a reference concentration of 2.7 x

10^{-4} mg/m^3, developed by the Agency for Toxic Substances and Disease Registry, as a provisional measure of PGDN toxicity. Thus, the current toxicity assessment indicates that PGDN is less toxic than was understood at the time of the ROD. EPA calculates a tap water regional screening level for PGDN of 0.6 µg/L (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/ index.htm). If a MTCA Method B level were to be calculated using the same current toxicity criteria assumptions as the EPA regional screening tables, the MTCA Method B level would be the same as the EPA value when rounded to one significant figure (i.e., also 0.6 µg/L). Otto fuel detections during this 5-year review period are below the current risk-based level, because the maximum detected concentration was 0.27 µg/L. Based on an increase in the cleanup level ARAR, the remedy remains protective for PGDN.

7.5.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 7 that could call into question the protectiveness of the remedy.

7.5.4 Technical Assessment Summary

The remedy at OU 7 is functioning as intended by the decision documents. The ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy that could call into question the protectiveness of the remedy.

7.6 OU 8

7.6.1 Functionality of Remedy for OU 8

Is the remedy functioning as intended by the decision documents? Yes, the remedy for OU 8 is functioning as intended by the ROD.

The RAOs established for OU 8 in the ROD are the following:

- Minimize the migration of VOCs from LNAPL beneath the PWIA into groundwater at concentrations that would cause adverse noncancer health effects or unacceptable cancer risks.

- Minimize human exposure to COCs in sitewide groundwater that would result in adverse noncancer health effects or unacceptable cancer risks.

The remedy for OU 8 was initiated in October 2000 and is ongoing. It included MNA of COCs (performance monitoring), groundwater compliance monitoring, LNAPL recovery, and groundwater use restrictions both on and off base. In addition, the ROD specified that redox manipulation could be deployed in groundwater as a phased contingent action, if needed. MNA, compliance groundwater monitoring, and LNAPL recovery are ongoing, and inspections are performed annually to ensure that required LUCs are maintained. The remedy for OU 8 is functioning as intended by the OU 8 ROD, because the groundwater plume does not currently extend beyond the base boundary (see Figures 6-15 and 6-16). The ROD only specified a time frame for meeting the remediation goals in the off-base portion of the plume, and this time frame has been met. The ROD does not include a time frame for the source area in the PWIA to meet RAOs.

The extent of the 1,2-DCA plume has decreased substantially relative to pre-ROD conditions (Figure 6-15). The most recent groundwater monitoring results indicate that concentrations of 1,2-DCA have achieved the RG of 5 µg/L at the NBK Bangor installation boundary. Concentration trends analyzed in the Round 29 LTM report (U.S. Navy 2014f), using all groundwater monitoring data collected since 2000, indicate stable or decreasing concentration trends in every monitoring well except 8MW33, where 1,2-DCA concentrations have increased. However, the trend analysis conducted for this 5-year review, performed using only data from the last 5 years, indicated decreasing concentration trends in all monitoring wells with detected concentrations of 1,2-DCA. Based on the monitoring results and the trend analysis, the plume size is decreasing and the concentrations appear to be declining.

The extent of the benzene plume and LNAPL has been relatively stable during this 5-year review period (Figure 6-16). Concentration trends analyzed in the Round 29 LTM report (U.S. Navy 2014f), using all groundwater monitoring data collected since 2000, indicate increasing concentration trends in on-site area monitoring wells 8MW06 and MW05. Concentrations of benzene in these two wells, which are located within the southern portion of the PWIA, also show increasing concentration trends for this 5-year review period. The increasing concentration trends observed for benzene and the return of free product to on-site wells in 2009, suggest that a residual source of petroleum compounds is still present at the site and contributing contaminants into the groundwater. However, this residual source has not resulted in an increase in the lateral extent of the dissolved benzene plume, and the remedy is protective of human health and the environment.

Although all of the remedy components have been implemented as envisioned by the ROD, progress toward meeting the RAOs is slower than estimated by the ROD. Furthermore, the EPA and Ecology have repeatedly expressed their concern that the remediation time frame is not reasonable and more aggressive technologies should be considered, given the high concentrations of benzene and the presence of LNAPL in the source area. For this reason and as recommended in the last 5-year review, additional studies, including pilot tests, were implemented during this 5-year review period to gain a better understanding of site conditions and evaluate technologies that may shorten the time necessary to achieve the RGs for benzene and 1,2-DCA in groundwater.

The studies completed by the Navy included a laboratory study to evaluate the potential for biodegradation of benzene, in the presence of 1,2-DCA, under aerobic and anaerobic conditions, extensive pilot testing of anaerobic degradation of chlorinated VOCs, investigation of the vapor intrusion pathway within the PWIA of OU 8, and additional investigations into the nature and extent of COCs, including LNAPL, at the PWIA, including groundwater modeling and updating the OU 8 CSM. The conclusion of the additional investigations into the nature and extent of COCs are discussed in the new information section below. The results of the remaining studies are summarized here.

Results of the laboratory study and the pilot testing conducted during this 5-year review period have shown that although EVO and microbe injections were very successful in establishing the biobarrier, insufficient EVO remains in the subsurface approximately 3 years after injection, indicating that reinjection every 3 years is necessary to maintain the biobarrier. In addition, the biobarrier was highly effective in reducing 1,2-DCA concentrations in groundwater by about 67 to 97 percent in downgradient monitoring wells. Because a separate benzene pilot study to decrease LNAPL and dissolved benzene in the PWIA source area has been contracted by the Navy and the pilot study may raise the aerobic level in the subsurface, reestablishment of the 1,2-DCA biobarrier should be deferred until the benzene pilot study has been completed. However, periodic monitoring of 1,2-DCA and indicator parameters in pilot study wells, in addition to the ongoing MNA program, is recommended to assist in the assessment of the possible impacts from the benzene pilot study and inform when additional injections of EVO and microbes are appropriate.

The vapor intrusion study concluded that the subslab soil gas and indoor air concentrations at the PWIA, regardless of source, do not represent a health concern. However, because of uncertainties related to the subsurface conditions (i.e., continued presence of free product and increasing benzene concentrations in groundwater) and in response to comments from Ecology and EPA, an additional round of vapor intrusion monitoring was recommended in the vapor intrusion study to ensure that subslab soil gas concentrations are not increasing to levels that represent a vapor intrusion concern (U.S. Navy 2014n). Although the specific sampling protocol has not been established, the recommendations in Appendix H of the vapor intrusion study should be considered in the future sampling plan. Future vapor intrusion monitoring will include collecting samples from existing monitoring locations and analyzing those samples for the same COCs as in the 2014 vapor intrusion study.

7.6.2 Continued Validity of ROD Assumptions

Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? Yes, the ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Table 7-13. The changes to the toxicity risk assumptions are discussed below. There was no change to the exposure risk assessment assumptions.

Review of ARARs

No soil RG was established at OU 8. Nine chemicals were selected as COCs in groundwater, based on the results of the risk assessment, and the ROD developed RGs for five of these chemicals, assuming future use as drinking water[5]. Table 7-13 compares groundwater RGs from the OU 8 ROD (U.S. Navy, USEPA, and Ecology 2000a) with current ARAR values. MCLs were chosen as cleanup levels for benzene, 1,2-DCA, and toluene, rather than MTCA Method B values. Ecology's Toxics Cleanup Program allows the use of MCLs if the MCL is less than or equal to the 10^{-5} risk level, or has a hazard quotient of 1 (Ecology 1993). Currently the MCL is protective for benzene and 1,2-DCA, but not for toluene (calculated as a hazard quotient of 2).

MTCA Method B values were chosen for the two remaining COCs (1,1-DCE and 1,2-EDB). However, the ROD indicated that the MTCA Method B values for these two compounds were below PQL concentrations. Therefore, the ROD stated that PQLs would be used as RGs, but did not provide numeric PQL values. The PQL values that have been used in the LTM reports are 0.8 µg/L for 1,2-EDB and 0.5 µg/L for 1,1-DCE. Changes in toxicity for all COCs are discussed in detail below.

Review of Risk Assessment Assumptions – Toxicity

Because of the changes to the toxicity criteria, 1,1-DCE and 1,2-EDB are now considered less toxic (i.e., today's current cleanup levels are higher) than at the time of the ROD. Therefore, the remedy remains protective for these two chemicals with higher MTCA Method B cleanup levels. For the three chemicals with the RG basis as the MCL, the protectiveness of the remedy is discussed below. The details of the toxicological changes for each chemical are summarized below and in Table 7-5.

1,1-DCE. 1,1-DCE is no longer considered a carcinogen by the EPA. Therefore, the ROD RG of 0.0729 µg/L, based on a carcinogenic endpoint, is not applicable given the current understanding of 1,1-DCE toxicity. The oral RfD of 0.05 mg/kg-day from EPA's IRIS is used to calculate the current MTCA Method B value. The current groundwater cleanup level increased from 0.0729 to 400 µg/L. The use of a PQL of 0.5 µg/L as the RG for this chemical (the risk-based level was not analytically achievable) is no longer necessary to protect health. The maximum detected concentration during this 5-year review period was 4.5 µg/L. Because the current MTCA B value exceeds the MCL, it is recommended the ROD RG be reviewed for applicability of the current federal/state MCL of 7 µg/L (which is two orders of magnitude

[5]The four chemicals for which no RG was established were chemicals where the health risks were due to uses of the groundwater for other than drinking (e.g., watering crops or livestock).

higher than the ROD RG) and the ROD amended, only if changes to the RG could result in discontinuation of monitoring at the site (for example, if no other chemicals at the site exceed their RGs).

1,2-EDB. The cancer oral SF for 1,2-EDB changed in IRIS from the 85 $(mg/kg\text{-}day)^{-1}$ used to calculate the RG in the ROD to 2 $(mg/kg\text{-}day)^{-1}$, a substantial reduction in toxicity. Thus, the current MTCA Method B cleanup level would change the RG from 0.000515 to 0.02 µg/L. This new cleanup level is still below the PQL of 0.8 µg/L.

Benzene. The oral SF for benzene, as reported in EPA's IRIS, changed to 0.055 $(mg/kg\text{-}day)^{-1}$ in 2000. This change in toxicity is reflected in the current MTCA Method B groundwater cleanup level of 0.8 µg/L, which is lower than the ROD RG of 5 µg/L based on the federal MCL. Using this current SF, the cancer risk of the MCL of 5 µg/L is 6×10^{-6}, below the ROD cancer risk goal of 1×10^{-5}. Because the ROD cancer risk goal is still being met, the remedy is protective.

1,2-DCA. The oral SF is 0.091 $(mg/kg\text{-}day)^{-1}$, as reported in EPA's IRIS. This change in toxicity is reflected in the current MTCA Method B groundwater cleanup level of 0.48 µg/L, which is lower than the ROD RG of 5 µg/L based on the federal MCL. Using this current SF, the cancer risk of the MCL of 5 µg/L is 1×10^{-5}, equal to the ROD cancer risk goal of 1×10^{-5}. Because the ROD cancer risk goal is still being met, the remedy is protective.

Toluene. The oral RfD is 0.08 mg/kg-day, as reported in EPA's IRIS database. This change in toxicity is reflected in the MTCA Method B groundwater cleanup level of 640 µg/L, which is lower than the ROD RG of 1,000 µg/L based on the federal MCL. Using this current RfD, the hazard of the MCL of 1,000 µg/L is 2, above the ROD hazard goal of 1. The maximum concentration of toluene at the site during this 5-year review period was 16,000 µg/L. However, ICs are in place that prohibit groundwater use. Therefore, the remedy is still protective.

Review of Risk Assessment Assumptions – Exposure

The third 5-year review recommended the vapor intrusion pathway be evaluated at OU 8 because of volatiles present in groundwater within 100 feet of occupied buildings, groundwater concentrations exceeding MTCA screening levels for vapor intrusion, free product in the vicinity of Building 1021, vadose zone soils being relatively permeable, and historical investigations of subsurface soil gas indicating the presence of VOCs. As discussed in Section 6.4.4, the OU 8 vapor intrusion quantification report was completed in 2013 (U.S. Navy 2014n) and concluded there were no vapor intrusion hazards in PWIA buildings based on indoor air and subslab soil gas sampling at that time. Because of the high concentrations of contaminants in groundwater at the site, vapor intrusion risks may need to be evaluated again in the future if significant increases in volatile concentrations in groundwater are indicated or remedy optimization include options that increase vapor intrusion into buildings.

7.6.3 New Information

Has any other information come to light that could call into question the protectiveness of the remedy? No, there is no new information regarding the remedy at OU 8 that could call into question the protectiveness of the remedy.

New information obtained during the Phase II pilot testing better defined the contact between Vashon Till and the underlying advance outwash unit. This contact was demonstrated to dip below the groundwater surface to the west and south of the petroleum source area. The presence of the Vashon Till extending below the water table would limit the spread of LNAPL wherever the till was submerged, in effect acting as a natural barrier to LNAPL migration. The floating product would spread to its maximum extent during low water table conditions and be trapped beneath the Vashon Till during the subsequent water level rise. The trapped LNAPL remains in contact with the till and adsorbs to the fine-grained fraction of the till where it remains as a long-term source for re-releases into groundwater.

Groundwater modeling was completed for OU 8 in 2014 and provided new insights into the CSM. The study (U.S. Navy 2014h) concluded the following:

- The source of LNAPL appears to be multiple historical releases from the PWIA service station in the 1990s.
- No ongoing release from the existing gasoline and diesel tanks is occurring, and LNAPL appears to be at or near residual saturation.
- From the mid-1990s to 2013, the 1,2-DCA and benzene plume footprints have receded, and the centers of mass for both contaminant plumes were localized to the site (see Figures 6-21 and 6-22).
- The increasing concentrations of benzene observed in some wells may be attributable to changes in the water levels at the site or impacts from recent pilot testing.
- The LNAPL thicknesses are likely exaggerated.

Based on the results of the modeling, the following are recommended: additional studies to further define the nature and extent of dissolved-phase COCs and LNAPL to support remedy optimization and an evaluation of active source remediation technologies such as bioventing, source zone biosparging with soil vapor extraction, in situ groundwater recirculation, and in situ chemical oxidation (U.S. Navy 2014h). The Navy is conducting a separate pilot study to address dissolved benzene concentrations and LNAPL in groundwater in the PWIA source area, and the results of this study will be used in the evaluation of active source remediation technologies.

During the evaluation of the results of the benzene pilot study, the Navy will consider whether low-temperature thermal treatment, where soil temperatures would be raised to between 30 and 50 ºC, could enhance MNA.

7.6.4 Technical Assessment Summary

The remedy at OU 8 is functioning as intended by the decision documents, albeit slower than estimated by the ROD. The ARARs, exposure assumptions, toxicity data, and RAOs are still valid and protective of human health and the environment, and there is no new information regarding the remedy that could call into question the protectiveness of the remedy.

7.7 POGY ROAD

Although no ROD was executed for Pogy Road, an analysis of the validity of the ARARs, the exposure assumptions, and the toxicity data was performed to assess whether the removal action is still protective of human health and the environment. An assessment of the functionality of the remedy was not performed, because no ROD was executed and there is no RAO for this site. Furthermore, there was no new information for this site. Changes to the ARARs used to establish cleanup levels in the ROD are evaluated below and summarized in Table 7-14. The changes to the toxicity risk assumptions are discussed below. There were no changes to the exposure risk assessment assumptions. The ARARs, exposure assumptions, and toxicity data are still valid and protective of human health and the environment.

Review of ARARs

Sixteen chemicals were selected as COCs in soil and cleanup levels are presented in the determination cleanup plan (DCLP) (U.S. Navy 2004a). Soil cleanup levels were based on direct contact with soil, which is the only plausible exposure pathway for the Pogy Road site because site conditions are protective of groundwater and surface water. Table 7-14 compares the soil ARARs (MTCA Methods B and C values) from the DCLP (U.S. Navy 2004a) and EPA PRGs of the independent remedial action closure report (IRACR) (U.S. Navy 2005b) to current ARARs (MTCA Methods B and C values) and EPA RSLs previously known as PRGs. The following chemicals have lower current MTCA B values: 1,3-DNB, tetryl, 2,6-DNT, 2-nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene. The current EPA RSLs for nitroglycerin, 2,6-DNT, and 3-nitrotoluene are lower than the previously established EPA PRGs. None of the 16 chemicals have lower current MTCA C values.

Review of Risk Assessment Assumptions - Toxicity

Because of the changes to the toxicity criteria, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), RDX, 2,4,6-TNT, 4-amino 2,6-DNT, and 2-amino 4,6-DNT are now considered less toxic (i.e., today's current cleanup levels are higher) and 1,3-DNB, tetryl, nitroglycerin, 2,6-DNT, and nitrotoluenes (2-, 3-, and 4-) are now considered more toxic (i.e., today's current cleanup levels are lower) than at the time of the DCLP/IRACR. For those six chemicals with higher cleanup levels, the remedy remains protective. The protectiveness of the remedy is discussed below only for those chemicals with currently lower cleanup levels. The details of the toxicological changes for each chemical are summarized below and in Table 7-15.

The maximum concentrations detected during confirmation sampling from 2003 and 2004 for those COCs with lower cleanup levels are summarized in Table 7-15 (U.S. Navy 2004a).

The maximum site concentration for each COC, except for nitroglycerin, does not exceed the current MTCA Method B or EPA RSL. Therefore, the remedy remains protective for 1,3-DNB, tetryl, 2,6-dinitrotoluene, and nitrotoluenes (2-, 3-, and 4-) because site concentrations are below cleanup levels. The protectiveness of the remedy for nitroglycerin is discussed further below.

HMX. EPA RSL currently uses IRIS RfD of 0.05 mg/kg-day. This change has increased the current RSL.

RDX. EPA RSL currently uses IRIS SF of 0.11 $(mg/kg\text{-}day)^{-1}$. The RDX toxicity is under EPA review and they may increase the toxicity of this chemical; therefore lowering MTCA B cleanup levels and EPA RSLs. As previously stated, toxicity changes and impacts to the protectiveness of the remedy will likely be completed as part of the future fifth 5-year review. Currently, the RDX toxicological review is in the preliminary draft stage and the EPA is seeking review and comment. Once the toxicological review is finalized, a new cleanup level can be calculated and compared to existing soil results.

TNT. MTCA C currently uses IRIS RfD of 0.0005 mg/kg-day and EPA RSL currently uses IRIS SF of 0.03 $(mg/kg\text{-}day)^{-1}$. This change has increased the current RSL.

4-Amino-2,6-DNT and 2-Amino-4,6-DNT. EPA RSL currently uses RfD of 0.002 mg/kg-day for both of these chemicals. This change has increased the current RSLs. The IRIS oral RfD of 0.002 mg/kg-day for 2,4-DNT is used as a surrogate for 2-amino-4,6-DNT and 4-amino-2,6-DNT.

1,3-DNB (meta-). The oral RfD of 0.0001 mg/kg-day, a IRIS value from EPA, is used to calculate the current MTCA B value. The current regulatory soil cleanup level of 8 mg/kg is lower than the cleanup level of 40 mg/kg in the DCLP. Using this current RfD, the hazard of the cleanup level of 40 mg/kg is 5, above the hazard risk goal of 1. However, site concentrations are below the current MTCA Method B value, and therefore, the remedy remains protective.

Tetryl. The oral RfD of 0.002 mg/kg-day, a PPRTV from EPA, is used to calculate the current MTCA Methods B and C values. The current regulatory soil cleanup level of 160 mg/kg is lower than the cleanup level of 800 mg/kg in the DCLP. Using this current RfD, the hazard of the ROD RG of 800 mg/kg is 5, above the hazard risk goal of 1. However, site concentrations are below the current MTCA Method B value, and therefore, the remedy remains protective.

Nitroglycerin. The oral SF of 0.017 $(mg/kg\text{-}day)^{-1}$, a PPRTV from EPA, is used to calculate the current EPA RSL value. There is no MTCA Method B or C value. This change in toxicity is reflected in the current RSL of 6.2 mg/kg, which is lower than the cleanup level of 35 mg/kg in the IRACR. Using this new SF, the cancer risk of the RSL of 35 mg/kg is 6×10^{-6}, below the cancer risk goal of 1×10^{-5}. Because the cancer risk goal is still being met, the remedy remains protective.

2,6-DNT. The oral SF of 1.5 $(mg/kg\ day)^{-1}$, an EPA PPRTV, is used to calculate the current MTCA Method B and EPA RSL values. The cleanup levels were based on the EPA IRIS value of 0.68 $(mg/kg\ day)^{-1}$. This change in toxicity is reflected in the current MTCA Method B soil cleanup level of 0.67 mg/kg, which is lower than the cleanup level of 80 mg/kg in the DCLP and is reflected in the current EPA residential soil RSL of 0.36 mg/kg, which is lower than the cleanup level of 0.72 mg/kg in the IRACR. Using this new SF, the cancer risk of the 80 mg/kg cleanup level is 1×10^{-4}, which exceeds the cancer risk goal of 1×10^{-5}. However, the maximum detected concentration at the site was 0.085 mg/kg, which is well below the current MTCA B value. Using the new SF, the cancer risk of the PRG of 0.72 mg/kg is 2×10^{-6}, which is below the cancer risk goal of 1×10^{-5}. Therefore, the remedy is still protective for this chemical.

2-Nitrotoluene, 3-Nitrotoluene, and 4-Nitrotoluene. It appears that during the DCLP, all three isomers (meta-, ortho- and para-) were evaluated as a mixture having the same MTCA Method B RG value of 800 mg/kg. Currently, the toxicity criteria differs for each isomer, as follows: 2-nitrotoluene has a PPRTV SF of 0.22 $(mg/kg\text{-}day)^{-1}$, 3-nitrotoluene has a PPRTV RfD of 0.0001 mg/kg-day, and 4-nitrotoluene has a PPRTV SF of 0.016 $(mg/kg\text{-}day)^{-1}$. These toxicity criteria are used to calculate the current lower MTCA Method B values of 5 mg/kg for 2-nitrotoluene, 8 mg/kg for 3-nitrotoluene, and 63 mg/kg for 4-nitrotoluene. Using the current toxicity factors and cleanup level of 800 mg/kg, the risk of 2-nitrotoluene is 2×10^{-4} and 4-nitrotoluene is 1×10^{-5}, and the hazard of 3-nitrotoluene is 100. 2-Nitrotoluene and 3-nitrotoluene exceed the risk goal of 1×10^{-5} and hazard goal of 1. 4-Nitrotoluene does not exceed the risk goal. Therefore, the remedy is still protective for 4-nitrotoluene. For 2-nitrotoluene and 3-nitrotoluene, site concentrations are below cleanup levels, and therefore, the remedy remains protective.

7.8 ISSUES

Table 7-16 lists the issues identified as a result of this 5-year review. Issues that do not affect protectiveness, but have been identified during this 5-year review process, are included in a footnote to the table.

Table 7-1
Technical Assessment Summary

Operable Unit	Sites	Question A: Is the remedy functioning as intended by the decision documents?	Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?	Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
1	A	No[a]	Yes	No
2	F	No[a]	Yes	No
3	24/25 and 26	Yes	Yes	No
7	B	Yes	Yes	No
	E/11	Yes	Yes	No
	10	Yes	Yes	No
8	27, 28, and 29	Yes	Yes	No

[a]The soil remedies for Sites A and F are functioning as intended by the ROD and Explanations of Significant Differences. However, the groundwater remedies are not functioning as intended, because they have not met the cleanup time frames established in the RODs. The groundwater remedies are protective of human health and the environment because there is no exposure to groundwater with concentrations of chemicals of concern exceeding remediation goals.

Notes:
RAO - remedial action objective
ROD - Record of Decision

Table 7-2
Soil ARARs for Operable Unit 1

Chemical	ROD Remediation Goal (mg/kg)	Basis of Remediation Goal	Current MTCA Method B[a] (mg/kg)	Change in Cleanup Level If Established Today?
2,4,6-TNT	33	MTCA B	33	No
2,4- and 2,6-DNT	1.5	MTCA B	2.2	Yes, higher
RDX	9.1	MTCA B	9.1	No
Lead	250	MTCA A	250 (MTCA A)	No

[a]MTCA B value unless otherwise specified

Notes:
ARARs - applicable or relevant and appropriate requirements
DNT - dinitrotoluene
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
TNT - trinitrotoluene

Table 7-3
Groundwater ARARs for Operable Unit 1

	Drinking Water Protection					
Chemical	ROD Drinking Water Remediation Goal (µg/L)	Basis of Remediation Goal	Current MTCA Method B[a] (µg/L)	Current Federal MCL (µg/L)	Current State MCL (µg/L)	Change in Cleanup Level If Established Today?
2,4,6-TNT	2.9	MTCA B	2.9	None	None	No
2,4- and 2,6-DNT	0.1	MTCA B	0.19	None	None	Yes, higher
RDX	0.8	MTCA B	0.8	None	None	No
Lead	15	MTCA A	15 (MTCA A)	15	15	No

[a]MTCA B value unless otherwise specified

Notes:
ARARs - applicable or relevant and appropriate requirements
DNT - dinitrotoluene
MCL - maximum contaminant level
µg/L - microgram per liter
MTCA - Model Toxics Control Act
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
TNT - trinitrotoluene

Table 7-4
Surface Water ARARs for Operable Unit 1

	Drinking Water Protection					
Chemical	**ROD SW Remediation Goal (µg/L)**	**Basis of Remediation Goal**	**Current MTCA SW Method B (µg/L)**	**Current Federal AWQC Marine (µg/L)**	**Current State AWQC Marine (µg/L)**	**Change in Cleanup Level If Established Today?**
2,4,6-TNT	31	MTCA B SW	None	None	None	No
2,4- and 2,6-DNT	0.6	MTCA B SW	5.5[a]	3.4 (HH)	None	Yes, higher
RDX	30	MTCA B SW	None	None	None	No
Lead	1	Not listed	None	8.1 (CC)	8.1	Yes, higher
Phthalates	3	MTCA B SW	3.6[b]	2.2 (HH)	None	No

[a]Based on 2,4-DNT, cancer endpoint; no cancer endpoint listed for the 2,4/2,6-DNT mixture
[b]Based on bis(2-ethylhexyl)phthalate

Notes:
ARARs - applicable or relevant and appropriate requirements
AWQC - ambient water quality criteria
CC - chronic marine aquatic life criteria
DNT - dinitrotoluene
HH - human health criteria
µg/L - microgram per liter
MTCA - Model Toxics Control Act
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
SW- surface water
TNT - trinitrotoluene

Table 7-5
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

Chemical	Identified Change	Estimated Health Risk of the RG	Is Remedy Still Protective?	Reason for Change
2,4/2,6-DNT	• MTCA B soil increased from 1.5 to 2.2 mg/kg at OUs 1 and 2. • MTCA B GW increased from 0.1 to 0.19 µg/L at OU 1. • MTCA B GW increased from 0.13 to 0.19 µg/L at OU 2. • MTCA B SW increased from 0.6 to 5.5 µg/L at OU 1.	NA	Yes	Toxicity criteria: MTCA B previously used IRIS EPA SF of 6.8×10^{-1} $(mg/kg\text{-}day)^{-1}$; currently use PPRTV SF of 0.45 $(mg/kg\text{-}day)^{-1}$.
2,4-DNT	• MTCA B soil increased from 1.5 to 3.2 mg/kg at OU 6 (outside wetland). • MTCA C soil increased from 58.8 to 423 mg/kg at OU 6 (inside wetland).	NA	Yes	Toxicity criteria: MTCA B previously evaluated as a mixture using IRIS EPA SF of 6.8×10^{-1} $(mg/kg\text{-}day)^{-1}$; MTCA B and C currently use Cal EPA SF of 0.31 $(mg/kg\text{-}day)^{-1}$.
2,6-DNT	• **MTCA B soil decreased from 1.5 to 0.67 mg/kg at OU 6.** • **MTCA B soil decreased from 80 to 0.67 mg/kg at Pogy Road.** • **EPA soil PRG decreased from 0.72 to 0.36 mg/kg at Pogy Road.**	**2×10^{-6}** **1×10^{-4}** **2×10^{-6}**	Yes[a]	Toxicity criteria: MTCA B previously evaluated as a mixture using IRIS EPA SF of 6.8×10^{-1} $(mg/kg\text{-}day)^{-1}$; MTCA B and EPA RSL currently use PPRTV SF of 1.5 $(mg/kg\text{-}day)^{-1}$.
Lead	Federal/state AWQC SW increased from 1 to 8.1 µg/L at OU 1.	NA	Yes	The basis for the RG of 1 µg/L is not listed; therefore, the reason for the change cannot be determined.

Table 7-5 (Continued)
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

Chemical	Identified Change	Estimated Health Risk of the RG	Is Remedy Still Protective?	Reason for Change
1,3,5-TNB	• MTCA B soil increased from 4 to 2,400 mg/kg at OUs 2 and 6. • MTCA B GW increased from 0.8 to 480 µg/L at OU 2.	NA	Yes	Toxicity criteria: MTCA B currently uses IRIS RfD of 0.03 mg/kg-day (RG was previously based on RfD of 0.00005 mg/kg-day).
Nitrate	MTCA B soil increased from 29,000 to 128,000 mg/kg at OU 2.	NA	Yes	Change cannot be determined. The IRIS RfD of 1.6 mg/kg-day has not changed since the 1991 ROD.
Manganese	RG was background value of 290 mg/kg; MTCA B soil is currently 11,200 mg/kg at OU 2.	NA	Yes	Toxicity criteria: MTCA B currently uses IRIS RfD of 0.14 mg/kg-day.
Nitrite	Federal MCL GW increased from 100 to 1,000 µg/L at OU 2.	NA	Yes	Federal MCL increased table value.
Beryllium	MTCA B soil increased from 0.23 to 160 mg/kg at OU 3.	NA	Yes	Toxicity criteria: MTCA B currently uses IRIS RfD of 0.002 mg/kg-day.
Nitrotoluenes (all isomers)	**MTCA B soil decreased from 800 to 5 mg/kg at OU 6.**	**2×10^{-4}**	Yes[a]	Toxicity criteria: MTCA B may have previously evaluated as an isomer mixture; currently use PPRTV SF of 0.22 $(mg/kg\text{-}day)^{-1}$ based on ortho-nitrotoluene.
1,2-DNB (ortho-)	**MTCA B soil decreased from 32 to 8 mg/kg at OU 6**	**4**	Yes[a]	Toxicity criteria: MTCA B currently uses PPRTV RfD of 0.0001 mg/kg-day.
1,3-DNB (meta-)	• **MTCA B soil decreased from 40 to 8 mg/kg at Pogy Road;** • EPA soil PRG increased from 6.1 to 6.2 mg/kg at Pogy Road	**5** NA	Yes[a]	Toxicity criteria: MTCA B currently uses IRIS RfD of 0.0001 mg/kg-day.
1,4-DNB (para-)	**MTCA B soil decreased from 32 to 8 mg/kg at OU 6.**	**4**	Yes[a]	Toxicity criteria: MTCA B currently uses PPRTV RfD of 0.0001 mg/kg-day.

Table 7-5 (Continued)
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

Chemical	Identified Change	Estimated Health Risk of the RG	Is Remedy Still Protective?	Reason for Change
Nitrobenzene	MTCA B soil increased from 40 to 160 mg/kg at OU 6.	NA	Yes	Toxicity criteria: MTCA B currently uses IRIS RfD of 0.002 mg/kg-day.
Total cPAHs	**MTCA A soil decreased from 1 to 0.1 mg/kg at OU 7.**	**1×10^{-5}**	Yes	MTCA A table value changed based on evaluating all cPAHs relative to the toxicity of benzo(a)pyrene. Current IRIS SF for benzo(a)pyrene is 7.3 $(mg/kg\text{-}day)^{-1}$.
TPH	**MTCA A GW decreased from 1,000 to 500 µg/L at OU 7.**	**2**	Yes	There is no longer a MTCA A value for TPH. Current values are based on gasoline, diesel, and oil ranges, and the lowest MTCA A value is 500 µg/L for diesel, heavy oil, and mineral oil.
Otto fuel (based on PGDN)	ROD RG is based on PQL of 0.2 µg/L; current MTCA B GW value is calculated at 0.6 µg/L at OU 7.	NA	Yes	MTCA B value is not available for PGDN. A MTCA B value was calculated using an ATSDR RfC of 2.7×10^{-4} mg/m^3.
Benzene	ROD RG is based on federal MCL of 5 µg/L at OU 8; current MTCA B GW value is lower at 0.8 µg/L.	6×10^{-6}	Yes	No change to federal MCL. Toxicity criteria: MTCA B currently uses EPA IRIS SF of 0.055 $(mg/kg\text{-}day)^{-1}$.
1,2-DCA	ROD RG is based on federal MCL of 5 µg/L at OU 8; current MTCA B GW value is lower at 0.48 µg/L.	1×10^{-5}	Yes	No change to federal MCL. Toxicity criteria: MTCA B currently uses EPA IRIS SF of 0.091 $(mg/kg\text{-}day)^{-1}$.
Toluene	**ROD RG is based on federal MCL of 1,000 µg/L at OU 8; current MTCA B GW value is lower at 640 µg/L.**	**2**	Yes[b]	No change to federal MCL. Toxicity criteria: MTCA B currently uses EPA IRIS RfD of 0.08 mg/kg-day.
1,1-DCE	MTCA B GW increased from 0.0729 to 400 µg/L at OU 8.	NA	Yes	Toxicity criteria: No longer considered a carcinogen; MTCA B currently uses EPA IRIS RfD of 0.05 mg/kg-day.

Table 7-5 (Continued)
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

Chemical	Identified Change	Estimated Health Risk of the RG	Is Remedy Still Protective?	Reason for Change
1,2-EDB	MTCA B GW increased from 0.000515 to 0.02 µg/L at OU 8.	NA	Yes	MTCA B currently uses EPA IRIS SF of 2 $(mg/kg\text{-}day)^{-1}$. No change recommended based on lowest attainable current PQL of 0.8 µg/L.
HMX	EPA soil PRG increased from 3,100 to 3,800 mg/kg.	NA	Yes	Toxicity criteria: EPA RSL currently uses IRIS RfD of 0.05 mg/kg-day.
RDX	EPA soil PRG increased from 4.4 to 6 mg/kg.	NA	Yes	Toxicity criteria: EPA RSL currently uses IRIS SF of 0.11 $(mg/kg\text{-}day)^{-1}$.
Tetryl	• **MTCA B soil decreased from 800 to 160 mg/kg at Pogy Road.** • MTCA C soil increased from 1,750 to 7,000 mg/kg at Pogy Road.	**5** NA	Yes[a]	Toxicity criteria: MTCA B and C currently use PPRTV RfD of 0.002 mg/kg-day.
Nitroglycerin	**EPA soil PRG decreased from 35 to 6.2 mg/kg at Pogy Road.**	**6×10^{-6}**	Yes	Toxicity criteria: EPA RSL currently uses PPRTV SF of 0.017 $(mg/kg\text{-}day)^{-1}$.
2,4,6-Trinitrotoluene (TNT)	• MTCA C soil increased from 700 to 1,800 mg/kg at Pogy Road. • EPA soil PRG increased from 16 to 21 mg/kg at Pogy Road.	NA	Yes	Toxicity criteria: MTCA C currently uses IRIS RfD of 0.0005 mg/kg-day, and EPA RSL currently uses IRIS SF of 0.03 $(mg/kg\text{-}day)^{-1}$.
4-Amino-2,6-DNT	EPA soil PRG increased from 12 to 150 mg/kg at Pogy Road.	NA	Yes	Toxicity criteria: EPA RSL currently uses 2,4-DNT's RfD of 0.002 mg/kg-day as a surrogate for this chemical.
2-Amino-4,6-DNT	EPA soil PRG increased from 12 to 150 mg/kg at Pogy Road.	NA	Yes	Toxicity criteria: EPA RSL currently uses 2,4-DNT's RfD of 0.002 mg/kg-day as a surrogate for this chemical.

Table 7-5 (Continued)
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

Chemical	Identified Change	Estimated Health Risk of the RG	Is Remedy Still Protective?	Reason for Change
2-Nitrotoluene (ortho-)	• **MTCA B soil decreased from 800 to 5 mg/kg at Pogy Road.** • EPA soil PRG increased from 0.88 to 3.2 mg/kg at Pogy Road.	**2×10^{-4}** NA	Yes[a]	Toxicity criteria: MTCA B may have previously evaluated as an isomer mixture; currently use PPRTV SF of 0.22 $(mg/kg\text{-}day)^{-1}$.
4-Nitrotoluene (para-)	• **MTCA B soil decreased from 800 to 63 mg/kg at Pogy Road.** • EPA soil PRG increased from 12 to 33 mg/kg at Pogy Road.	**1×10^{-5}** NA	Yes	Toxicity criteria: MTCA B may have previously evaluated as an isomer mixture; currently use PPRTV SF of 0.016 $(mg/kg\text{-}day)^{-1}$.
3-Nitrotoluene (meta-)	• **MTCA B soil decreased from 800 to 8 mg/kg at Pogy Road.** • **EPA soil PRG decreased from 730 to 6.2 at Pogy Road.**	**100** **118**	Yes[a]	Toxicity criteria: MTCA B may have previously evaluated as an isomer mixture; currently use PPRTV RfD of 0.0001 mg/kg-day.

[a]Although the estimated health risk of the RG exceeds the health goals of 1 or 1×10^{-5}, the remedy remains protective because site concentrations are below current cleanup levels.
[b]Institutional controls are in place that prohibit groundwater use; therefore, the remedy is still protective.

Notes:
Bold indicates an increase in toxicity and a decrease of the cleanup level.
ATSDR - Agency for Toxic Substances and Disease Registry
AWQC - ambient water quality criterion
Cal EPA - California Environmental Protection Agency
cPAHs - carcinogenic polycyclic aromatic hydrocarbons
DCA - dichloroethane
DCE - dichloroethene
DDT - dichlorodiphenyltrichloroethane
DNB - dinitrobenzene
DNT - dinitrotoluene
DNX - Hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine

Table 7-5 (Continued)
Summary of Current ARAR Changes and Impacts on Protectiveness for NBK Bangor OUs

EDB - dibromoethane
EPA - U.S. Environmental Protection Agency
GW - groundwater
HMX - octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IRIS - Integrated Risk Information System
MCL - maximum contaminant level
µg/L - microgram per liter
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
MTCA - Model Toxics Control Act
NA - not applicable
PGDN - propylene glycol dinitrate
PPRTV - Provisional Peer-Reviewed Toxicity Values from EPA
PQL - practical quantitation limit
PRG - preliminary remediation goal
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RfC - reference concentration
RfD - reference dose
ROD - Record of Decision
RSL - regional screening level
SF - slope factor
SW - surface water
TNB - trinitrobenzene
TPH - total petroleum hydrocarbons

Table 7-6
Soil ARARs for Operable Unit 2

Chemical	ROD Remediation Goal (mg/kg)	Basis of Remediation Goal	Current MTCA Method B (mg/kg)	Change in Cleanup Level If Established Today?
2,4,6,-TNT	33	MTCA B	33	No
RDX	9.1	MTCA B	9.1	No
2,4- and 2,6-DNT	1.5	MTCA B	2.2	Yes, higher
1,3,5-TNB	4.0	MTCA B	2,400	Yes, higher
1,3-DNB	8.0	MTCA B	8.0	No
Nitrate-N	29,000	MTCA B	128,000	Yes, higher
Nitrite-N	8,000	MTCA B	8,000	No
Manganese	940	Background	11,200	Yes, higher

Notes:
ARARs - applicable or relevant and appropriate requirements
DNB - dinitrobenzene
DNT - dinitrotoluene
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
TNB - trinitrobenzene
TNT - trinitrotoluene

Table 7-7
Groundwater ARARs for Operable Unit 2

	Drinking Water Protection					Surface Water Protection		
Chemical	ROD Drinking Water Remediation Goal (µg/L)	Basis of Remediation Goal	Current MTCA Method B (µg/L)	Current Federal MCL (µg/L)	Change in Cleanup Level If Established Today?	ROD Surface Water Cleanup Level (µg/L)	Basis of Cleanup Level	Current MTCA Method B (µg/L)
2,4,6,-TNT	2.9	MTCA B	2.9	None	No	40	Ryon 1987	Not researched – groundwater plume not reaching surface water
RDX	0.8	MTCA B	0.8	None	No	260	See note a	
2,4 and 2,6-DNT	0.13	MTCA B	0.19	None	Yes, higher	300	See note b	
1,3,5-TNB	0.8	MTCA B	480	None	Yes, higher	80	See note c	
1,3-DNB	1.6	MTCA B	1.6	None	No	None		
Nitrate-N	10,000	Federal MCL	25,600	10,000	No	10,000	MCL	
Nitrite-N	100	Federal MCL	1,600	1,000	Yes, higher	None	-	
Manganese	50	State MCL[d]	50 (State MCL)[d] 2,240 (MTCA B)	50[d]	No	None	See note d	

[a]Extrapolated using acute chronic ratio (Stephen et al. 1985 reference not included in remedial investigation/feasibility study reference list [U.S. Navy 1993a])
[b]Extrapolated using acute chronic ratio (Etnier 1987)
[c]No observable effect concentration (Layton et al. 1987)
[d]The source of the manganese remediation goal is a secondary MCL.

Notes:
ARARs - applicable or relevant and appropriate requirements
DNB - dinitrobenzene
DNT - dinitrotoluene
MCL - maximum contaminant level
µg/L - microgram per liter
MTCA - Model Toxics Control Act
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD - Record of Decision
TNB - trinitrobenzene
TNT - trinitrotoluene

Table 7-8
Soil ARARs for Operable Unit 3

Chemical	ROD Remediation Goal (mg/kg)	Basis of Remediation Goal	Current MTCA Method B (mg/kg)	Change in Cleanup Level If Established Today?
Antimony	32	MTCA B	32	No
Arsenic	20	MTCA A	20	No
Beryllium	0.23	MTCA B	160	Yes, higher

Notes:
ARARs - applicable or relevant and appropriate requirements
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
ROD - Record of Decision

Table 7-9
Groundwater ARARs for Operable Unit 3

Chemical	Drinking Water Protection				
	ROD Drinking Water Remediation Goal (µg/L)	Basis of Remediation Goal	Current MTCA Method B (µg/L)	Current State MCL (µg/L)	Change in Cleanup Level If Established Today?
Cadmium	8	MTCA B	8	5	No
Manganese	50	State MCL[a]	2,240	50	No

[a]The source of the manganese remediation goal is not specified in the OU 3 RO. However, it is presumed to have been the State secondary MCL based on other OUs at Bangor.

Notes:
ARARs - applicable or relevant and appropriate requirements
µg/L - microgram per liter
MTCA - Model Toxics Control Act
ROD - Record of Decision

Table 7-10
Soil ARARs for Operable Unit 6

Chemical	ROD Remediation Goal (mg/kg)	Basis of Remediation Goal	Current MTCA Method B (mg/kg)	Change in Cleanup Level If Established Today?
2,4,6-TNT	33.3	MTCA B	33	No
2,4-DNT (outside wetland)	1.5	MTCA B	3.2	Yes, higher
2,4-DNT (inside wetland)	58.8	MTCA C[a]	423[a]	Yes, higher
2,6-DNT	1.5	MTCA B	0.67	Yes, lower
Nitrotoluene (all isomers)	800	MTCA B	5[b]	Yes, lower
1,2-DNB (ortho-)	32	MTCA B	8	Yes, lower
1,3-DNB (meta-)	8	MTCA B	8	No
1,4-DNB (para-)	32	MTCA B	8	Yes, lower
1,3,5-TNB	4	MTCA B	2,400	Yes, higher
Nitrobenzene	40	MTCA B	160	Yes, higher

[a]MTCA Method C cleanup level is used according to the Operable Unit 6 ROD to prevent significant damage to wetlands ecosystem.
[b]The lowest of the three isomers was selected as current MTCA Method B value.

Notes:
ARARs - applicable or relevant and appropriate requirements
DNB - dinitrobenzene
DNT - dinitrotoluene
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
ROD - Record of Decision
TNB - trinitrobenzene
TNT - trinitrotoluene

Table 7-11
Soil ARARs for Operable Unit 7

Chemical	ROD Remediation Goal (mg/kg)	Basis of Remediation Goal	Current MTCA Method A (mg/kg)	Current MTCA Method B (mg/kg)	Change in Cleanup Level If Established Today?
Arsenic (Sites B and 10[a])	20	MTCA A	20	0.67	No
Total cPAHs (Site B)	1	MTCA A	See Note b	See Note c	Yes, lower
Total PCBs (Sites B and 10[a])	1	MTCA A	10 (industrial) 1 (unrestricted)	0.5	No
DDT (Site E/11)	2.94	MTCA B	4 (industrial) 3 (unrestricted)	2.9	No
Cadmium (Site 10[a])	None	NA	2	80	No
Lead (Site 10[a])	None	NA	250	None	No

[a]Four chemicals at Site 10 were identified post-ROD during a parking lot expansion. Remediation goals were not established. However, the chemicals are listed here for completeness.
[b]Method A for benzo(a)pyrene is 2 mg/kg industrial and 0.1 mg/kg unrestricted. There is no specified value for other cPAHs.
[c]Individual compounds were evaluated based on their toxicity to benzo(a)pyrene. The current Method B value is 0.137 mg/kg.

Notes:
ARARs - applicable or relevant and appropriate requirements
cPAHs - carcinogenic polycyclic aromatic hydrocarbons
DDT - dichlorodiphenyltrichloroethane
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
NA - not applicable
PCBs - polychlorinated biphenyls
ROD - Record of Decision

Source: ROD Table 19 (U.S. Navy, USEPA, and Ecology 1996)

Table 7-12
Groundwater ARARs for Operable Unit 7

Chemical	ROD Remediation Goal (µg/L)	Basis of Remediation Goal	Current MTCA Method A (µg/L)	Current MTCA Method B (µg/L)	Change in Cleanup Level If Established Today?
TPH (Site 10)	1,000	MTCA A	500	None	Yes, lower[a]
Otto fuel (Site E/11)	0.2	Practical quantitation limit	None	0.6	Yes, higher[b]

[a]No longer a MTCA Method A for TPH. Method A for diesel-range organics, heavy oils, and mineral oil is 500 µg/L. For gasoline-range organics, if no detectable benzene, Method A is 1,000 µg/L.
[b]A risk-based MTCA Method B level for the major component of Otto fuel (propylene glycol dinitrate) is not currently available in Washington State Department of Ecology's CLARC database. However, if a MTCA Method B level were calculated using U.S. Environmental Protection Agency toxicity assumptions, it would be 0.6 µg/L. See discussion in Section 7.2.2.

Notes:
ARARs - applicable or relevant and appropriate requirements
µg/L - microgram per liter
MTCA - Model Toxics Control Act
ROD - Record of Decision
TPH - total petroleum hydrocarbon

Table 7-13
Groundwater ARARs for Operable Unit 8

Chemical	Drinking Water Protection				
	ROD Drinking Water Remediation Goal (µg/L)	Basis of Remediation Goal	Current MTCA Method B (µg/L)	Current MCL (µg/L)	Change in Cleanup Level If Established Today?
Benzene	5	MCL	0.8	5	No
1,2-DCA	5	MCL	0.48	5	No
1,1-DCE	0.0729[a]	MTCA B	400	7	Yes, higher
1,2-EDB	0.000515[a]	MTCA B	0.02	0.05	Yes, higher
Toluene	1,000	MCL	640	1,000	No

[a]The ROD indicated that these MTCA B levels were below the PQL. Therefore, the PQL would be used as a remediation goal, but specific PQL concentrations were not listed in the ROD. The current achievable PQLs are 0.5 µg/L for 1,1-DCE and 0.8 µg/L for 1,2-EDB.

Notes:
ARARs - applicable or relevant and appropriate requirements
DCA - dichloroethane
DCE - dichloroethene
EDB - dibromoethane
MCL - maximum contaminant level
µg/L - microgram per liter
MTCA - Model Toxics Control Act
PQL - practical quantitation limit
ROD - Record of Decision

Source: ROD Tables 8-1 and D-1 (U.S. Navy, USEPA, and Ecology 2000a)

Table 7-14
Soil ARARs for Pogy Road

Chemical	MTCA Method B from DCLP (mg/kg)	MTCA Method C from DCLP (mg/kg)	EPA PRG from IRACR (mg/kg)	Current MTCA Method B (mg/kg)	Current MTCA Method C (mg/kg)	Current EPA RSL (mg/kg)	Change in Cleanup Level If Established Today?
HMX	4,000	175,000	3,100	4,000	175,000	3,800	Yes, higher
RDX	9.09	1,190	4.4	9.1	1,200	6	Yes, higher
Picric acid (2,4,6-trinitrophenol)	33–5,400[a]	1,800–230,000[a]	NE	NE	NE	NE	NA
1,3-Dinitrobenzene	40	NE	6.1	8	350	6.2	Yes, lower (MTCA B); higher (RSL)
Tetryl (2,4,6-Trinitrophenylmethylnitramine)	800	1,750	NE	160	7,000	120	Yes, lower (MTCA B); higher (MTCA C)
Nitroglycerin	71.4	9,380	35	NE	NE	6.2	Yes, lower (RSL)
2,4,6-Trinitrotoluene (TNT)	33.3	700	16	33	1,800	21	Yes, higher
4-Amino 2,6-Dinitrotoluene	16	700	12	NE	NE	150	Yes, higher
2-Amino 4,6-Dinitrotoluene	16	NE	12	NE	NE	150	Yes, higher
2,6-Dinitrotoluene	80	NE	0.72	0.67	87.5	0.36[b]	Yes, lower (both)
2-Nitrotoluene (ortho-)	800	NE	0.88	5	597	3.2	Yes, lower (MTCA B); higher (RSL)
4-Nitrotoluene (para-)	800	NE	12	63	8,200	33	Yes, lower (MTCA B); higher (RSL)
3-Nitrotoluene (meta-)	800	NE	730	8	350	6.2	Yes, lower (both)
TNX	NDV	NDV	NE	NE	NE	NE	NA
DNX	0.00182–0.0196[a]	0.239–2.57[a]	NE	NE	NE	NE	NA
MNX	0.333–9.9[a]	43.8–1,190[a]	NE	NE	NE	NE	NA

Table 7-14 (Continued)
Soil ARARs for Pogy Road

[a]These calculated soil cleanup levels are subject to greater uncertainty than the other soil cleanup levels developed for the remaining explosives-related compounds. See Section 4 of the DCLP for more details (U.S. Navy 2004).
[b]Current RSL based on the carcinogenicity of a 2,4/2,6-dinitrotoluene mixture.

Notes:
DCLP - determination of cleanup level plan (U.S. Navy 2004)
DNX - hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine
EPA - U.S. Environmental Protection Agency
HMX - octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IRACR - independent remedial action closure report (U.S. Navy 2005b)
mg/kg - milligram per kilogram
MNX - hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NDV - no defensible value
NE - not established
PRG - preliminary remediation goal
RSL - Residential Screening Level
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNX - hexahydro-1,3,5-trinitroso-1,3,5-triazine

Table 7-15
Comparison of Maximum Pogy Road Concentrations to Current ARARs

Chemical	November 2003/June 2004 Maximum Detections (mg/kg)	Current MTCA Method B Soil/ Current EPA Residential Soil Residential Screening Level (mg/kg)
1,3-Dinitrobenzene	0.016 J	8/6.2
Tetryl	0.021 J	160/120
Nitroglycerin	36 J	NE/6.2
2,6-Dinitrotoluene	0.085 J	0.67/0.36
2-Nitrotoluenes	0.047 J	5/3.2
3-Nitrotoluenes	0.060 J	63/33
4-Nitrotoluenes	0.110 J	8/6.2

Notes:
ARARs - applicable or relevant and appropriate requirements
EPA - U.S. Environmental Protection Agency
J - established value
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
NE - not established

Table 7-16
Issues

Item No.	Issue[a]	Affects Protectiveness[b]	
		Current	Future
General			
1	State and federal human health surface water quality criteria are in the process of public comment and revision.	No	Yes
2	EPA human health exposure factors have been revised, but Ecology has not included these revisions in current MTCA Method B values.	No	Yes
3	Some deficiencies identified in the annual inspection reports were not immediately repaired.	No	Yes
OU 1			
4	The Site A groundwater treatment system is not functioning as intended by the ROD, because it has not met the cleanup time frame established in the ROD.	No	Yes
5	The Site A pump and treat system is over 15 years old and has experienced significant wear and tear, which could result in equipment failure and unplanned shutdowns.	No	Yes
6	A depression was noted in the southeast corner of the burn area with a pipe visible in the depression, which may indicate a possible impact to the leach basin liner.	No	Yes
OU 2			
7	The Site F groundwater treatment system is not functioning as intended by the ROD, because it has not met the cleanup time frame established in the ROD.	No	Yes
8	Lengthy unscheduled pump and treat system shutdowns could impact plume containment.	No	Yes
9	Concentrations of 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, COCs for Site F groundwater, are not currently being tabulated or reported in the body of the LTM report, and concentrations during this 5-year review period exceeded RGs.	No	Yes
10	Limited hydraulic head observation points in the vicinity of extraction well F-EW5 and the infiltration wells adjacent to Trigger Avenue limit the ability to assess plume containment.	No	Yes
11	During the inspection of the Site F infiltration barrier, vegetation was observed growing in the seams in the asphalt and in the drainage swale and, if allowed to continue to grow, could impact the functionality of the infiltration barrier.	No	Yes
OU 8			
12	The OU 8 remedy is taking longer to meet the remedial action objectives than estimated in the ROD, benzene concentrations are increasing in selected wells, and light nonaqueous-phase liquid continues to be detected at the site.	No	Yes
13	Because the presence of residual free product could be providing a continued source of contaminants to groundwater and because of potentially increasing concentrations of benzene in groundwater, subslab soil gas concentrations could also increase.	No	Yes

Table 7-16 (Continued)
Issues

Item No.	Issue[a]	Affects Protectiveness[b]	
		Current	Future
14	The toxicity of toluene has increased based on the current EPA reference dose, and the current MTCA Method B cleanup level of 640 µg/L is lower than the ROD RG of 1,000 µg/L, which is based on the federal MCL. Using the current EPA reference dose, the hazard quotient of the MCL of 1,000 µg/L is 2, above the ROD hazard goal of 1, and the maximum concentration of toluene at the site during this 5-year review period was 16,000 µg/L.	No	Yes

[a]The issues listed below have been identified to require follow-up action prior to the next 5-year review, but do not impact protectiveness:

- General:
  - Annual LUC inspections have identified minor issues that have not been addressed.
  - Annual LUC inspections have suggested revisions to the Institutional Controls Management Plan that have not been incorporated into the document.
  - Three respondents to the interview questions felt uninformed regarding ongoing remedy implementation at NBK Bangor.
- OU 1:
  - Minor inconsistencies were observed in the 2011, 2012, and 2013 Site A sampling and analysis planning tables. The general monitoring tables included sampling of a few wells that did not appear on the event-specific monitoring tables.
  - Not all years of data were included in the 2014 cumulative data tables in the appendix of the 2014 LTM report.
- OU 2:
  - Although the Mann-Kendall analysis currently being used to evaluate Site F data trends provides a useful analysis of trends, additional statistical methods that provide a more robust analysis of long-term trends are available for consideration.
  - The format of the historical summary tables (Appendix E of LTM report) complicates the review of the data.
  - Manganese is included as a COC for this site, and the RG is based on the secondary MCL, which is not health based. Historical manganese concentrations are less than the risk-based MTCA Method B cleanup level.
- OU 7:
  - Fading signs and erosion were noted at Site B during the site inspection.
  - The fencing at Site E/11 is compromised at one location adjacent to one of the gates.
  - The hydraulic head elevations for Site E/11 are consistently a couple feet lower than the Site F wells located in the vicinity, suggesting that there is an issue with the surveyed well elevations.
  - At Site 10, cracking in the asphalt and a sinkhole were noted during the site inspection.
- OU 8:
  - The concentrations of volatile organic compounds are less than RGs at off-base locations.
  - 1,1-Dichloroethene is no longer considered a carcinogen by the EPA. Therefore, the ROD RG of 0.07 µg/L, based on a carcinogenic endpoint, is not applicable given the current understanding of its toxicity.
  - The concentration trend plots presented in the LTM reports show nondetected concentrations at 0.1 µg/L regardless of their reported detection limits, which is not noted on the trend plots.
  - Historical analytical results are only presented for selected wells in the natural attenuation monitoring reports.

Table 7-16 (Continued)
Issues

[b]If the issue impacts current protectiveness, the remedy is designated "not protective," and if the issue impacts future protectiveness, the remedy is designated "short-term protective" in Section 9 in accordance with EPA guidance (USEPA 2001 and 2012a). In some cases, not enough information is available, and then the "protectiveness deferred" designation is used.

Notes:
COC - chemical of concern
EPA - U.S. Environmental Protection Agency
LTM - long-term monitoring
LUC - land use control
MCL - maximum contaminant level
μg/L - microgram per liter
MTCA - Model Toxics Control Act
OU - operable unit
RG - remediation goal
ROD - Record of Decision

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This section presents the recommendations and follow-up actions identified as a result of the 5-year review process. The recommended actions necessary to ensure the long-term protectiveness of the remedies are identified in Table 8-1. Recommendations that do not affect protectiveness, but have been identified during this 5-year review process, are included in a footnote to the table.

Table 8-1
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action[a]	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness[b]	
					Current	Future
General						
1	Evaluate State and Federal human health surface water quality criteria revisions in the next 5-year review.	NAVFAC NW	Ecology, EPA	10/31/20	No	Yes
2	Evaluate exposure factor changes in next 5-year review.	NAVFAC NW	Ecology, EPA	10/31/20	No	Yes
3	Ensure deficiencies that impact protectiveness are repaired within the same year if funding is available, or programmed for the next year if funding is not available in the same year.	NAVFAC NW	Ecology, EPA	10/31/16	No	Yes
OU 1						
4	Prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies would be evaluated in the FFS. The other treatment technologies to be included in the FFS would be selected using a collaborative process with the stakeholders. The FFS will also include an evaluation of remediation timeframes using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways. An MNA treatability study work plan will be developed in conjunction with the EPA and Ecology which would include temporarily deactivating the pump and treat system and implementing an MNA treatability test using EPA protocols.	NAVFAC NW	Ecology, EPA	7/31/19	No	Yes
5	If continued long-term operation of the pump and treat system is planned, perform a comprehensive evaluation	NAVFAC NW	Ecology, EPA	10/31/20	No	Yes

Table 8-1 (Continued)
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action[a]	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness[b]	
					Current	Future
	of the pump and treat system maintenance needs and proactively repair or replace equipment. Address corrosion observed on floor braces supporting effluent piping, and replace extraction well vaults with traffic-rated vaults.					
6	Investigate the depression in the southeast corner of the burn area to assess impacts to the leach basin liner. At a minimum, backfill the hole with clean sand.	NAVFAC NW	Ecology, EPA	12/31/17	No	Yes
OU 2						
7	Perform aerobic and anaerobic biodegradation treatability tests and further modeling to support Site F remedy optimization.	NAVFAC NW	Ecology, EPA	10/31/16	No	Yes
8	Continue to evaluate the pump and treat system maintenance needs, proactively repair and replace equipment to minimize future system shutdowns and the potential loss of plume containment, and repair the minor water leaks observed during the site inspection.	NAVFAC NW	Ecology, EPA	10/31/20	No	Yes
9	Tabulate and report data in the body of the LTM report for 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, COCs for Site F groundwater, because concentrations of these chemicals exceeded the RGs during this 5-year review period.	NAVFAC NW	Ecology, EPA	10/31/16	No	Yes
10	Following completion of the modeling activities planned for 2015, reevaluate the need for additional groundwater monitoring points to better characterize the potentiometric surface proximate to active infiltration and extraction wells in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.	NAVFAC NW	Ecology, EPA	10/31/16	No	Yes

Table 8-1 (Continued)
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action[a]	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness[b]	
					Current	Future
11	Remove vegetation observed growing in the asphalt seams and drainage swale of the site infiltration barrier, and repair the cracks in the asphalt cap, as needed.	NAVFAC NW	Ecology, EPA	10/31/16	No	Yes
OU 8						
12	Perform additional studies to further define the nature and extent of dissolved-phase COCs and LNAPL (including LNAPL mobility tests) to support remedy optimization, perform the benzene pilot test to evaluate air sparge/soil vapor extraction technology, evaluate whether low-temperature thermal treatment could enhance MNA, evaluate active source remediation technologies, reestablish the 1,2-DCA biobarrier after the benzene pilot study has been completed, and monitor 1,2-DCA and indicator parameters in pilot study wells, in addition to the ongoing MNA program.	NAVFAC NW	Ecology, EPA	12/31/17	No	Yes
13	Perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study.	NAVFAC NW	Ecology, EPA	10/31/20	No	Yes
14	Review the toluene RG prior to discontinuation of monitoring at the site to assess protectiveness.	NAVFAC NW	EPA, Ecology	10/31/20	No	Yes

[a]The following recommendations that do not impact protectiveness require follow-up action prior to the next 5-year review (see Sections 4, 6, and 7 for details):

- General:
  - Address minor issues identified in the annual land use control inspection reports that have not been addressed.
  - Update the ICMP with the suggested revisions in the annual land use control inspection reports.
  - Perform agency and community outreach activities.
- OU 1:
  - Planning tables in the sampling and analysis plans should be checked for consistency, and any deviation or planned delay in sampling should be documented in the applicable table and conclusion section of the LTM reports.

Table 8-1 (Continued)
Recommendations and Follow-Up Actions

- Include all years of data in the cumulative data tables of the annual monitoring reports.

- OU 2:
  - Consider the use of additional statistical tools to provide a more robust analysis of long-term trends for future evaluations in the annual OU 2 LTM reports, such as the linear regression analysis currently being used for OU 1 and OU 8.
  - Present the historical summary tables (Appendix E of LTM report) in a manner similar to the summary tables for Site A, include nitrate concentrations on these tables, and report DNT data in these tables separately for 2,4-DNT and 2,6-DNT for consistency with the data tables in the body of the document.
  - Prepare a memorandum to the file indicating that historical manganese concentrations are less than the risk-based MTCA Method B cleanup level and that no monitoring is required. Prepare a ROD amendment prior to discontinuing monitoring changing the RG to the risk-based MTCA Method B cleanup level.
- OU 7:
  - At Site B, replace or repaint fading signs, continue to monitor erosion, and place additional fish mix, as needed.
  - At Site E/11, fix the fencing at one location adjacent to one of the gates.
  - Resurvey the Site E/11 monitoring wells.
  - At Site 10, repair cracking and a sinkhole in the asphalt.
- OU 8:
  - Reduce monitoring frequency to annually at off-base locations.
  - Review the ROD RG for 1,1-dichloroethene for potential applicability of the current federal/state maximum contaminant level of 7 µg/L (which is two orders of magnitude higher than the ROD RG), and amend the ROD if changes to the RG could result in discontinuation of monitoring at the site (for example, if no other chemical at the site exceeds its RG).
  - The concentration trend plots presented in the LTM reports should include a note explaining that the undetected values are all shown at an arbitrary value of 0.1 µg/L, regardless of the actual reporting limit, and that the actual reporting limit may be higher than the RG. In addition, all assumptions should be noted on the figure.
  - Include historical analytical data for all wells monitored at OU 8 in Appendix D of the MNA monitoring reports.

[b] Under the "current" column, a “yes” entry indicates impacts to current protectiveness may occur if the recommended action is not implemented, and the remedy is designated “not protective” in Section 9 in accordance with EPA guidance (USEPA 2001 and 2012a). Under the "future" column, a “yes” entry indicates impacts to future protectiveness may occur if the recommended action is not implemented, and the remedy is designated “short-term protective” in Section 9. For NBK Bangor, only issues and recommendations potentially affecting future protectiveness have been identified.

Notes:
COCs - chemicals of concern
DCA - dichloroethane
DNT - dinitrotoluene
Ecology - Washington State Department of Ecology
EPA - U.S. Environmental Protection Agency
ICMP - Institutional Controls Management Plan
LNAPL - light nonqueous-phase liquid
LTM - long-term monitoring
µg - microgram per liter
MNA - monitored natural attenuation
MTCA - Model Toxics Control Act
NAVFAC NW - Naval Facilities Engineering Command Northwest
OU - operable unit
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
RG - remediation goal
ROD - Record of Decision
USACE - U.S. Army Corps of Engineers

9.0 CERTIFICATION OF PROTECTIVENESS

Protectiveness determinations for NBK Bangor were made in accordance with EPA guidance (USEPA 2001 and 2012a). Five protectiveness categories are defined in EPA guidance: protective, short-term protective, will be protective, protectiveness deferred, and not protective. Further information on these designations can be found by reviewing EPA guidance documents (USEPA 2001 and 2012a). For CERCLA sites that require a 5-year review, a separate protectiveness statement is required for each OU where the remedial action is currently underway or remedial construction is complete. If remedial construction is complete, a sitewide protectiveness determination is also required and will generally be the same as the least protective OU at the site. Because remedial construction is complete at NBK Bangor, a certification of protectiveness is provided for the entire site in the paragraph below and for each OU in the following sections.

The remedies at NBK Bangor currently protect human health and the environment because LUCs and/or engineering controls prevent exposure to contaminated media, groundwater plumes are stable and/or contained by pump and treat systems, and groundwater monitoring is performed to assess the extent of groundwater plumes. However, in order for the remedies to be protective in the long term, the actions listed in Table 8-1 and summarized below for OUs 1, 2, and 8 need to be taken to ensure protectiveness.

9.1 OU 1

The remedy at OU 1 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the groundwater plume is stable, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance, including an evaluation of remediation time frames using a mass balance assessment or other technique, a treatability study of MNA, field verification of aquifer properties, and a reevaluation of the human health risk pathways.

- Perform a comprehensive evaluation of the pump and treat system maintenance needs and proactively repair and replace equipment if continued long-term operation of the pump and treat system is planned.

- Investigate the depression in the southeast corner of the burn area to assess impacts to the leach basin liner and, at a minimum, backfill the hole with clean sand.

9.2 OU 2

The remedy at OU 2 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the pump and treat system contains the plume, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Continue remedy optimization by performing aerobic and anaerobic biodegradation treatability tests and further modeling.
- Continue to evaluate the pump and treat system maintenance needs and proactively repair and replace equipment to minimize future system shutdowns and the potential loss of plume containment.
- Tabulate and report data in the body of the LTM report for 1,3,5-TNB and 1,3-DNB, because concentrations of these chemicals exceeded the RGs during this 5-year review period.
- Following completion of the modeling activities planned for 2015, reevaluate the need for additional groundwater monitoring points to better characterize the potentiometric surface proximate to active infiltration wells and extraction wells in support of RDX plume containment objectives and the ongoing USACE bioaugmentation pilot study.
- Remove vegetation observed growing in the asphalt seams and drainage swale of the Site F infiltration barrier, and repair cracks in the asphalt cap, as needed.

9.3 OU 3

The remedy at OU 3 is protective of human health and the environment. The remedy for Site 16/24 soil consisted of a residential land use restriction. The remedy for Site 25 groundwater consisted of groundwater monitoring, which met the requirements of the OU 3 ROD in 1997 and was discontinued at that time. Inspections of the LUCs at Site 16/24 have been conducted regularly, and the current land use remains in accordance with the restrictions defined in the OU 8 ROD (which established the basewide LUCs). Therefore, the selected remedy for OU 3 is functioning as intended by the ROD. No RAO was established in the OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994b).

9.4 OU 6

The remedy at OU 6 is protective of human health and the environment. The remedy for Site D included excavating soil from the burn trench, screening and composting the excavated soils at an on-base treatment facility, backfilling the treated soils into the excavation area, grading and revegetation, and surface water and groundwater sampling. The remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD, and no IC was required for OU 6. These actions effectively meet the RAOs established in the OU 6 ROD listed in Table 4-2.

9.5 OU 7

The remedy at OU 7 is protective of human health and the environment. The remedy for Site B (Floral Point) included covering areas of contaminated soil, installing shoreline protection and stormwater drainage systems to control erosion, monitoring sediment and clam tissue, and installing signs notifying visitors that the site is to be used for recreational purposes only and approval is required for digging or mowing. The remedy for soil at Site E/11 included disposal of stockpiled soil and metal debris, grading site, and backfilling with clean topsoil. The remedy for Site 10 included ongoing long-term maintenance of the asphalt pavement cover, groundwater monitoring, groundwater use restrictions, and expansion of the area of asphalt cover to include soils contaminated with arsenic, cadmium, lead, and PCBs. These remedy components functioned as intended by the ROD. LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs at Sites E/11 and 10, LUCs and engineering controls prevent exposure to contaminated soil at Sites B and 10, and groundwater monitoring is performed to assess the extent of contaminated groundwater at Site E/11 (as part of OU 2 Site F groundwater monitoring). The LUCs and groundwater monitoring components of the remedy are functioning as intended by the ROD. These actions effectively meet the RAOs established in the OU 7 ROD listed in Table 4-2.

9.6 OU 8

The remedy at OU 8 currently protects human health and the environment because LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the extent of the groundwater plume is decreasing, and groundwater monitoring is performed to assess the extent of the plume. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- Continue remedy optimization activities specified in recommendations Table 8-1.
- Perform an additional round of vapor intrusion monitoring following completion of the benzene pilot study.
- Review the toluene RG prior to discontinuation of monitoring at the site to assess protectiveness.

10.0 NEXT REVIEW

The next 5-year review is tentatively scheduled for 2020.

11.0 REFERENCES

Annable, Michael D., Ph.D., P.E. 2012. *Letter Report on Mass Flux and Mass Discharge Assessment for Bangor Site A.* Prepared by the University of Florida, Department of Environmental Engineering Sciences for NAVFAC Northwest, Silverdale, Washington. March 12, 2012.

Battelle Memorial Institute (Battelle). 2011. *Microcosm Study to Evaluate Biodegradation of Benzene and 1,2-DCA in Groundwater*. Prepared by Geosyntec Consultants for Battelle Memorial Institute, Project No. CHR8324. Ann Arbor, Michigan. December 2011.

Etnier, E.L. 1987. "Water Quality Criteria for 2,4-Dinitrotoluene and 2,6-Dinitrotoluene." ORNL-6312. Oak Ridge National Laboratory.

Kitsap County. 2014. Kitsap County Comprehensive Plan Land Use Map. Kitsap County Department of Community Development, GIS Division. Downloaded from http://www.kitsapgov.com/dcd/gis/maps_data/standard_maps/regulatory_planning.htm. Amended January 15, 2014.

Layton, D., B. Mallon, W. Mitchell, L. Hall, R. Fish, L. Perry, G. Snyder, K. Bogen, W. Malloch, C. Ham, and P. Dowd. 1987. *Conventional Weapons Demilitarization, A Health and Environmental Effects Data-Base Assessment.* Lawrence Livermore National Laboratory, University of California Berkeley. Supported by U.S. Army Medical Research and Development Command.

National Research Council. 2014. *Critical Aspects of EPA's IRIS Assessment of Inorganic Arsenic.* Available at http://www.nap.edu/catalog.php?record_id=18594

Naval Energy and Environmental Support Activity (NEESA). 1983. *Initial Assessment Study of Naval Submarine Base Bangor, Bremerton, Washington.* NEESA 13-004. June 1983.

Ryon, M.G. 1987. *Water Quality Criteria for 2,4,6-Trinitrotoluene.* AD-ORNL-6304. Oak Ridge National Laboratory.

U.S. Army Corps of Engineers (USACE). 2014. Groundwater Modeling at Naval Base Kitsap Bangor Site F Report. June 2014.

U.S. Department of Defense (USDoD). 2014. Subject: Five-year Review Procedures – Update to DoD Manual 4715.20, "Defense Environmental Restoration Program (DERP) Management" dated March 9, 2012. June 2, 2014.

———. 2012. Defense Environmental Restoration Program (DERP) Management, Manual No. 4715.20. March 2012.

———. 1984. Available from U.S. Army Medical Research and Development Command. DAMD17-C-9161. Ft. Detrick. Frederick, MD.

U.S. Environmental Protection Agency (USEPA). 2014a. "Streamlining Federal Facility FYRs." Presented at the 23rd Annual NARPM Training Program, May 2014.

———. 2014b. Memorandum: Issues with the 2013 Constant-Rate Pumping Test and Resulting Hydraulic Conductivity Values Measured at Bangor Site A. Prepared by Marcia Knadle, Hydrogeologist, and Kwasi Boateng, Hydrogeologist, for Harry Craig, Remedial Project Manager. Region 10, Seattle, WA. December 22, 2014.

———. 2013a. *Potential Strategies for Optimizing the Site Cleanup at Bangor Site A – Revised.* Prepared by Marcia Knadle, Office of Environmental Assessment (OEA) Hydrogeologist, and Kwasi Boateng, OEA Hydrogeologist, for Harry Craig, Superfund Remedial Project Manager. Region 10, Seattle, WA. April 2013.

———. 2013b. Preliminary Materials for the Integrated Risk Information System (IRIS) Toxicological Review of Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). EPA/635/R-13/140. July 2013.

———. 2012a. Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews. OSWER 9200.2-111. September 2012.

———. 2012b. Memorandum: Issues with the Hydrogeologic Conceptual Model for Bangor Site A, February 9, 2012. Prepared by Marcia Knadle, Hydrogeologist, OEA, to Harry Craig, Superfund Remedial Project Manager. February 9, 2012.

———. 2010. *Toxicological Review of Inorganic Arsenic. In support of Summary Information on the Integrated Risk Information System (IRIS).* Draft – Do not cite or quote. EPA/635/R-10/001. February 2010. Available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=219111>.

———. 2002. *Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities.* Memorandum posted on EPA Region 10 web page. Last update July 26, 2002. Available at <http://yosemite.epa.gov/r10/owcm.nsf/72b5220edcd9cf5b88256500005decf3/ae2ddc387dd5733b8825679f007ab1db?OpenDocument>.

———. 2001. *Comprehensive Five-Year Review Guidance.* Office of Emergency and Remedial Response. EPA 540-R-01-007. OSWER No. 9355.7-03B-P. June 2001.

———. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. April 1999.

U.S. Navy. 2014a. 2013 Institutional Controls Inspection Letter Report, ′13 Bangor Compliance LTM for OU 8, Sites A & F, Naval Base Kitsap, Silverdale, Washington. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0073. Silverdale, Washington. February 2014.

———. 2014b. 2014 Annual LTM and O&M Data Report for Site A, Task Order 73, Long-Term Monitoring/Operations at Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. September 2014.

———. 2014c. 2014 Annual (First Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. July 2014.

———. 2014d. *Operations and Maintenance Manual, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap at Bangor*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0070. May 2014.

———. 2014e. Tier II Sampling and Analysis Plan, Monitored Natural Attenuation for Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0082. July 2014.

———. 2014f. Round 29 (Fall 2013) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0073. May 2014.

———. 2014g. *Draft Bioaugmentation Longevity Report, OU 8 DCA Plume Pilot Study Phase II, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0082. Silverdale, Washington. November 2014.

———. 2014h. *Modeling Technical Memorandum – Naval Base Kitsap at Bangor, OU 8*. Prepared by Resolution Consultants, A Joint Venture of AECOM & EnSafe, for Naval Facilities Engineering Command Northwest under CLEAN Contract No. N62470-11-D-8013, Contract Task Order JP05. Silverdale, Washington. May 2014.

———. 2014i. *Site A Conceptual Site Model Update, Naval Base Kitsap, Bangor, Silverdale, Washington*. Prepared by Resolution Consultants, A Joint Venture of AECOM & EnSafe, for Naval Facilities Engineering Command Northwest under Contract No. N62470-11-D-8013, Contract Task Order JP01. Silverdale, Washington. July 2014.

———. 2014j. Fall 2013 LTM and O&M Letter Report for Site F, Task Order 73, '13 Bangor Compliance LTM for OU 8 and Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. March 7, 2014.

———. 2014k. Spring 2014 LTM and O&M Letter Report for Site F, Task Order 73, '13 Bangor Compliance LTM for OU 8 and Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. September 19, 2014.

———. 2014l. Draft Summer 2014 LTM and O&M Letter Report for Site F, Task Order 82, '14 Bangor Compliance LTM for OU 8 and Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. October 24, 2014.

———. 2014m. Round 30 (Spring 2014) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0073. September 2014.

———. 2014n. *Vapor Intrusion Evaluation, Quantitative Assessment Report, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by URS Group, Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4001, Delivery Order 0060. March 2014.

———. 2014o. Completion Report - System Repairs and Upgrades, Site F Treatment System, Contract No. N44255-09-D-4005, Task Order 80, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. January 2014.

———. 2014p. “DO 78 Bangor Fourth 5-Year Review, Stakeholder Kickoff Meeting.” Meeting notes for October 7, 2014.

———. 2014q. *Draft Site A Operations and Maintenance Manual, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. March 2014.

———. 2013a. *Toolkit for Preparing Five-Year Reviews*. Naval Facilities Engineering Command Northwest. April 2013.

———. 2013b. *Work Plan, Site EO300 Small Arms Ranges PreRemedial Action Design, Naval Base Kitsap, Bangor, Silverdale, Washington*. Prepared by Resolution Consultants for Naval Facilities Engineering Command Northwest under Contract No. N62470-11-D-8013. April 2013.

———. 2013c. 2012 Institutional Controls Inspection Letter Report, 2011 NBK at Bangor Compliance IC Inspections (Land Use Controls) and LTM OU 8, Sites A&F, Silverdale, Washington. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0053. Silverdale, Washington. February 13, 2013.

———. 2013d. *Operations and Maintenance Manual, Site A Groundwater Treatment System, Naval Base Kitsap at Bangor, Silverdale, Washington.* Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. April 2013.

———. 2013e. *Tier II Sampling and Analysis Plan, Long-Term Monitoring for Site A, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. July 2013.

———. 2013f. *Tier II Sampling and Analysis Plan (SAP), LTM for Site F, Naval Base Kitsap, Bangor, Silverdale, Washington*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0073. July 2013.

———. 2013g. Tier II Sampling and Analysis Plan, Monitored Natural Attenuation for Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0073. July 2013.

———. 2013h. Implementation Report and Conceptual Site Model Update, OU 8 DCA Plume Pilot Study Phase II, Naval Base Kitsap, Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0046. Silverdale, Washington. April 2013.

———. 2013i. 2012 Annual LTM and O&M, Data Report for Site A, Long-Term Monitoring/Operations, Naval Base Kitsap, Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0053. Silverdale, Washington. February 2013.

———. 2013j. October 2012 (Fourth Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0053. Silverdale, Washington. April 2013.

———. 2013k. *January 2013 (First Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0053. Silverdale, Washington. June 2013.

———. 2013l. *April 2013 (Second Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0053. Silverdale, Washington. September 2013.

———. 2013m. Summer 2013 LTM and O&M Letter Report for Site F, Task Order 73, '13 Bangor Compliance LTM for OU 8 and Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. December 18, 2013.

———. 2013n. DCA Bioaugmentation Pilot Study Evaluation and Conclusions, OU 8 DCA Plume Pilot Study Phase II, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0046. Silverdale, Washington. August 2013.

———. 2013o. Round 27 (Fall 2012) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap, Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0053. June 2013.

———. 2013p. Round 28 (Spring 2013) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0053. September 2013.

———. 2013q. October 2012 Site A LTM and O&M Letter Report, Task Order 53, '12 NBK Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. March 19, 2013.

———. 2013r. January 2013 Site A LTM and O&M Letter Report, Task Order 53, '12 NBK Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. June 7, 2013.

———. 2013s. Spring 2013 Site A LTM and O&M Letter Report, Task Order 53, '12 NBK Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. August 23, 2013.

———. 2013t. *Summer 2013 Site A LTM and O&M Letter Report, Task Order 73, '13 NBK Bangor LTM OU 8, Sites A & F, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. December 18, 2013.

———. 2013u. *Well Maintenance Report, Long-Term Monitoring at Sites A and F, Naval Base Kitsap, Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. February 2013.

———. 2012a. Proposed Plan, Soil Removal at Site EO 300 - Small Arms Range, Naval Base Kitsap, Bangor, Washington. December 2012.

———. 2012b. 2011 Institutional Controls Inspection Letter Report, 2011 NBK at Bangor Compliance IC Inspections (Land Use Controls) and LTM OU 8, Sites A&F, Silverdale, Washington. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0038. Silverdale, Washington. February 13, 2012.

———. 2012c. *Operation and Maintenance Manual, Site A Groundwater Treatment System, Naval Base Kitsap at Bangor, Silverdale, Washington.* Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. August 2012.

———. 2012d. *Tier II Sampling and Analysis Plan, Long-Term Monitoring for Site A, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. July 2012.

———. 2012e. *Well Maintenance Work Plan, Long-Term Monitoring at Sites A and F, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. October 2012.

———. 2012f. *Operations and Maintenance Manual, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap at Bangor*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0034. August 2012.

———. 2012g. *Tier II Sampling and Analysis Plan (SAP), LTM for Site F, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0053. July 2012.

———. 2012h. *Vapor Intrusion Evaluation: Conceptual Site Model Report, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by URS Group, Inc. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4001, Delivery Order 0036. March 2012.

———. 2012i. 2011 Annual LTM and O&M Data Report for Site A, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0038. February 2012.

———. 2012j. October 2011 (Fourth Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0038. Silverdale, Washington. March 2012.

———. 2012k. *January 2012 (First Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0038. Silverdale, Washington. June 2012.

———. 2012l. *April 2012 (Second Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0038. Silverdale, Washington. September 2012.

———. 2012m. *August 2012 (Third Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0053. Silverdale, Washington. December 2012.

———. 2012n. *Fall 2011 Groundwater Data Report, DCA Plume Pilot Study/Operable Unit 8, Naval Kitsap at Bangor, Silverdale, Washington.* Prepared by Sealaska Environmental

Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0038. Silverdale, Washington. April 2012.

———. 2012o. Round 25 (Fall 2011) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0038. April 2012.

———. 2012p. Round 26 (Spring 2012) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0038. September 2012.

———. 2012q. October 2011 Site A LTM and O&M Letter Report, Task Order 38, '11 Compliance NBK at Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. March 8, 2012.

———. 2012r. January 2012 Site A LTM and O&M Letter Report, Task Order 38, '11 Compliance NBK at Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. June 20, 2012.

———. 2012s. April 2012 Site A LTM and O&M Letter Report, Task Order 38, '11 Compliance NBK at Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. August 28, 2012.

———. 2012t. *Well Maintenance Report, Long-Term Monitoring at Site F, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. February 2012.

———. 2011a. Policy for Conducting Five-Year Reviews. June 7, 2011.

———. 2011b. *Remedial Investigation/Feasibility Study Report for EO300, Small Arms Range, Naval Base Kitsap Bangor, Silverdale, Washington.* Prepared by Tetra Tech NUS, Inc. for Naval Facilities Engineering Command Northwest under Contract No. N62467-04-0055. October 2011.

———. 2011c. 2010 Institutional Controls Inspection Letter Report, 10 Compliance NBK Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A&F, Silverdale, Washington. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. March 24, 2011.

———. 2011d. Operation and Maintenance Manual, Long Term Monitoring/Operations at Site A, Naval Submarine Base Bangor, Silverdale, Washington. Prepared by Sealaska for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. August 2011.

———. 2011e. *Sampling and Analysis Plan, Long-Term Monitoring for Site A, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. July 2011.

———. 2011f. 2010 Annual LTM and O&M Data Report for Site A, Task Order 23, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. April 2011.

———. 2011g. *Well Installation Work Plan, Long-Term Monitoring at Site F, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. January 2011.

———. 2011h. *Well Maintenance Work Plan, Long-Term Monitoring for Site F, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. August 2011.

———. 2011i. Rev. 1, Sampling and Analysis Plan, Long-Term Monitoring for Site F Including Site E/11 and Monitored Natural Attenuation/Operable Unit 8, Naval Base Kitsap Bangor. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. January 2011.

———. 2011j. Sampling and Analysis Plan, Monitored Natural Attenuation for Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0038. Silverdale, Washington. July 2010.

———. 2011k. *Pilot Study Report, DCA Plume Pilot Study/Operable Unit 8, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0010. Silverdale, Washington. June 2011.

———. 2011l. *Well Installation Report for Site F, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. August 2011.

———. 2011m. October 2010 (Fourth Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. March 2011.

———. 2011n. *January 2011 (First Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. June 2011.

———. 2011o. *April 2011 (Second Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. September 2011.

———. 2011p. *July 2011 (Third Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0038. Silverdale, Washington. December 2011.

———. 2011q. *Sampling and Analysis Plan, Long-Term Monitoring for Site F Including Site E/11 Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0038. Silverdale, Washington. July 2011.

———. 2011r. Summer 2011 Injection and Groundwater Data Report, DCA Plume Pilot Study/Operable Unit 8, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. 4255-09-D-4005, Task Order 0038. Silverdale, Washington. December 2011.

———. 2011s. Round 23 (October 2010) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska

Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0023. April 2011.

———. 2011t. Round 24 (April 2011) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0023. September 2011.

———. 2011u. October 2010 Site A LTM and O&M Letter Report, Task Order 23, ‘10 Compliance NBK Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. March 24, 2011.

———. 2011v. January 2011 Site A LTM and O&M Letter Report, Task Order 23, ‘10 Compliance NBK at Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. June 3, 2011.

———. 2011w. April 2011 Site A LTM and O&M Letter Report, Task Order 23, ‘10 Compliance NBK at Bangor Compliance IC Inspections (LUC) and LTM OU 8, Sites A & F, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. September 19, 2011.

———. 2010a. *Third Five-Year Review, Naval Base Kitsap Bangor, Silverdale, Washington*. October 8, 2010. Executed by the Navy on October 12, 2010.

———. 2010b. Time-Critical Removal Action Completion Report Pistol Range Areas, Site EO300, Naval Base Kitsap – Bangor, Silverdale, Washington. Prepared by AGVIQ-CH2M HILL Constructors, Inc. for Naval Facilities Engineering Command, Northwest under Contract No. N62470-08-D-1006. May 2010.

———. 2010c. *Institutional Controls Management Plan, Naval Base Kitsap at Bangor*. Prepared by SES for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. September 2010.

———. 2010d. 2009 Institutional Controls Inspection Letter Report, Compliance Long-Term Monitoring as Sites A, F, and OU 8 at Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by SES for Naval Facilities Engineering Command Northwest under

Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. March 1, 2010.

———. 2010e. Operations and Maintenance Manual, Long-Term Monitoring/Operations at Site A, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. July 2010.

———. 2010f. *Sampling and Analysis Plan, Long-Term Monitoring for Site A, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. August 2010.

———. 2010g. *Operations and Maintenance Manual, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap at Bangor*. Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0001. July 2010.

———. 2010h. *Sampling and Analysis Plan, Long-Term Monitoring for Site F Including Site E/11 Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0023. Silverdale, Washington. July 2010.

———. 2010i. Sampling and Analysis Plan, Monitored Natural Attenuation for Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0023. Silverdale, Washington. August 2010.

———. 2010j. 2009 Annual LTM and O&M, Data Report for Site A, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-04-D-4005, Task Order 0007. Silverdale, Washington. June 2010.

———. 2010k. April 2009 (Second Quarter) Groundwater Sampling Data Report, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap, Bangor. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. April 2010.

———. 2010l. August 2009 (Third Quarter) Groundwater Sampling Data Report, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap, Bangor. Prepared by Sealaska

Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. May 2010.

———. 2010m. October 2009 (Fourth Quarter) Groundwater Sampling Data Report, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap, Bangor. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. May 2010.

———. 2010n. *January 2010 (First Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. June 2010.

———. 2010o. *April 2010 (Second Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. September 2010.

———. 2010p. *July 2010 (Third Quarter) LTM and O&M Data Report for Site F, Long-Term Monitoring/Operations, Naval Base Kitsap Bangor*. Prepared by Sealaska Environmental Services for Naval Facilities Engineering Northwest under Contract No. N44255-09-D-4005, Task Order 0023. Silverdale, Washington. December 2010.

———. 2010q. *Round 21 Monitoring Report, Monitored Natural Attenuation/Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington.* Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0007. June 2010.

———. 2010r. Round 22 (April 2010) Monitoring Report, Monitored Natural Attenuation/ Operable Unit 8, Naval Base Kitsap Bangor, Silverdale, Washington. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0007. September 2010.

———. 2010s. *Well Installation and Maintenance Report for Site A, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by Sealaska Environmental Services, LLC for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0007. June 2010.

———. 2009a. *Closure Report, Capping Parking Area at Site 10, Naval Base Kitsap Bangor, Silverdale, Washington*. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N68711-04-D-1104, Task Order 0036. March 2009.

———. 2009b. *Revision 1, Sampling and Analysis Plan, Long-Term Monitoring for Site A, Naval Base Kitsap Bangor, Silverdale, Washington.* Prepared by Sealaska Environmental Services, LLC. for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005. Silverdale, Washington. November 2009.

———. 2009c. *Operation and Maintenance Manual, Long-Term Monitoring/Operations at Site A, Naval Base Kitsap at Bangor*. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N44255-05-D-5101, Task Order 0045. Silverdale, Washington. June 2009.

———. 2009d. *Operation and Maintenance Manual, Long-Term Monitoring/Operations at Site F, Naval Base Kitsap at Bangor*. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N44255-05-D-5101, Task Order 0045. Silverdale, Washington. June 2009.

———. 2009e. Rev. 1, Sampling and Analysis Plan, Long-Term Monitoring for Site F Including Site E/11 and Monitored Natural Attenuation/Operable Unit 8, Naval Base Kitsap Bangor. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N44255-09-D-4005, Task Order 0007. Silverdale, Washington. November 2009.

———. 2009f. *Community Relations Plan, Naval Base Kitsap Bangor.* Prepared by URS Group, Inc., for Naval Facilities Engineering Command Northwest under Contract No. N44266-05-D-5100, Delivery Order 0035. Silverdale, Washington. January 2009.

———. 2008a. *Capping Contaminated Soil at OU 7, Site 10, Naval Base Kitsap Bangor*. Memorandum to File by Said Seddiki, PE, RPM. July 17, 2008.

———. 2008b. *August 2007 (Dry Season) Groundwater Sampling Data Report Site A, Naval Base Kitsap Bangor, Silverdale Washington*. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N44255-05-D-5101. Silverdale, Washington. January 2008.

———. 2007. *Institutional Controls Management Plan, Naval Base Kitsap at Bangor*. Prepared by SES-Tech for Naval Facilities Engineering Command Northwest under Contract No. N44255-05-D-5101, Task Order 0022. Silverdale, Washington. April 2007.

———. 2005a. *Second Five-Year Review of Record of Decision, Naval Base Kitsap at Bangor, Silverdale, Washington*. Prepared by URS Group Inc., for Naval Facilities Engineering Command Northwest under Contract No. N44255-02-D-2008, Delivery Order 0040. Poulsbo, Washington. September 2005.

———. 2005b. Independent Remedial Action Closure Report, Pogy Road Emergency Treatment Area Soil Sampling and Disposal, Naval Base Kitsap at Bangor, Silverdale, Washington. Prepared by Tetra Tech EC, Inc., for NAVFAC NW under Contract No. N44255-01-D-2000, TO 0044. November 2005.

———. 2004. *Determination of Cleanup Level Plan for Pogy Road Soil Removal at Naval Base Kitsap at Bangor, Silverdale, Washington.* Prepared by Tetra Tech EC, Inc., for NAVFAC NW under Contract No. N44255-01-D-2000, TO 0044. September 2004.

———. 2002. Environmental Services Monitoring, Long-Term Monitoring, Final Monitoring Report, Site 10, Operable Unit 7, Naval Submarine Bangor, Washington. Prepared by The Environmental Company, Inc., for EFA NW under Contract No. N44255-98-D-4416, Contract Task Order 018. June 2002.

———. 2001. *Institutional Controls Management Plan, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by Engineering Field Activity, Northwest, Southwest Division, Naval Facilities Engineering Command Northwest, Poulsbo, Washington. August 2001.

———. 2000a. *Base-Wide Five-Year Review of Records of Decision, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by Hart Crowser for Department of the Navy, Engineering Field Activity, Northwest under Contract No. N44255-98-D-4408, Delivery Order 025. September 2000.

———. 2000b. Feasibility Study Report, Operable Unit 8, Naval Submarine Base Bangor, Kitsap County, Washington. Prepared by EA Engineering, Science, and Technology. April 2000.

———. 1999a. Remediation Investigation Report, Naval Submarine Base Bangor, Kitsap County, Washington. Prepared by EA Engineering, Science and Technology. December 1999.

———. 1994a. *Remedial Investigation Report for Operable Unit 7, SUBASE, Bangor, Bremerton, Washington*. Prepared by URS Consultants, Inc., for EFA NW under CLEAN Contract N62474-89-D-9295, CTO 0058. October 1994.

———. 1994b. *Feasibility Study for Operable Unit 7, SUBASE, Bangor, Bremerton, Washington*. Prepared by URS Consultants, Inc., for EFA NW under CLEAN Contract N62474-89-D-9295, CTO 0058.

———. 1993a. *Remedial Investigation/Feasibility Study Report, Site F, Naval Submarine Base Bangor, Bangor, Washington*. Prepared by Hart Crowser for Engineering Field Activity, Northwest, Naval Facilities Engineering Command. Silverdale, Washington. November 1993.

———. 1993b. *Operable Unit 4, Remedial Investigation/Feasibility Study Report*. Prepared by URS Consultants, Inc. for EFA NW. May 1993.

———. 1993c. Final Remedial Investigation/Feasibility Study, Operable Unit 6, Naval Submarine Base, Bangor, Washington. Prepared by URS Consultants, Inc. for EFA NW. December 1993.

———. 1992a. *Remedial Investigation/Feasibility Report, Operable Unit 3, Sites 16/24 and 25, Naval Submarine Base, Bangor, Washington*. Prepared by the URS Team for Engineering Field Activity, Northwest, under Contract No. 62474-89-D-9295, Task Order 35. Poulsbo, Washington. October 1992.

———. 1992b. *Remedial Investigation/Feasibility Report, Operable Unit 5, SUBASE Bangor, Washington.* Prepared by URS Consultants, Inc. for Naval Facilities Engineering Command. Silverdale, Washington. December 1992.

______. 1991. Remedial Investigation/Feasibility Study Report, Site A, Naval Submarine Base, Bangor, Washington. Prepared by Hart Crowser. August 1991.

______. 1989. Current Situation Report, Sites C, D, E, F, 5, 6, 11, 12, 24, and 25, SUBASE Bangor, Bangor, Washington. Prepared by Hart Crowser. April 1989.

———. 1988. Current Situation Report, Site A, Naval Submarine Base, Bangor, Washington. Prepared by Hart Crowser. April 1988.

U.S. Navy, U.S. Environmental Protection Agency (USEPA), and Washington State Department of Ecology (Ecology). 2000a. *Final Record of Decision, Naval Submarine Base Bangor, Operable Unit 8, Kitsap County, Washington.* September 27, 2000.

———. 2000b. Explanation of Significant Differences (ESD) No. 3 for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington. August 2, 2000.

———. 1998. Explanation of Significant Differences (ESD) No. 2 for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington. March 1998.

———. 1996. *Record of Decision, Operable Unit 7, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by URS Consultants, Inc., for Engineering Field Activity, Northwest, Southwest Division, Naval Facilities Engineering Command Northwest. Poulsbo, Washington. April 16, 1996.

———. 1994a. Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 4, Silverdale, Washington. July 19, 1994.

———. 1994b. Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 3, Bangor, Washington. April 15, 1994.

———. 1994c. Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 6, Silverdale, Washington. September 27, 1994.

———. 1994d. Declaration of the Record of Decision, Decision Summary, and Responsiveness Summary for Final Remedial Action, Naval Submarine Base, Bangor, Site F (Operable Unit 2), Silverdale, Washington. September 28, 1994.

———. 1994e. Explanation of Significant Differences (ESD) for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington. May 1994.

———. 1994f. Site F Explanation of Significant Differences, Department of the Navy, Naval Submarine Base Bangor, Bangor, WA. April 1994.

———. 1993. Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 5, Bangor, Washington. September 30, 1993.

———. 1991a. Declaration of the Record of Decision, Naval Submarine Base, Bangor, Site A (Operable Unit 1), Bangor, Washington. December 10, 1991.

———. 1991b. Declaration of the Record of Decision, Decision Summary, Responsiveness Summary, and Administrative Record Index for Interim Remedial Action, Naval Submarine Base, Bangor, Site F (Operable Unit 2), Bangor, Washington. August 1991 (signed September 1991).

Washington Department of Ecology (Ecology). 2005. Letter from Nnamdi Madakor of Ecology to Said Seddiki of NAVFAC NW, re: Site 26/Floral Point Sediment and Clam Tissue Sampling Results. November 21, 2005.

———. 1999a. Letter from Marian Abbett of Ecology to Delfin Arreola of EFA NW, re: Floral Point/Site B Remedial Action Report. April 14, 1999.

———. 1993. *Implementation Memo No. 1: Guidance on the Use of MCLs as Cleanup Levels.* Memorandum from Carol Krage, Toxics Cleanup Program, Washington State Department of Ecology, to Interested Staff, March 15, 1993. Available at <http://www.ecy.wa.gov/programs/tcp/policies/mcl.html>.

APPENDIX A

Frequently Referenced Documents
(Attached as a Disk Appendix)

APPENDIX B

OU 1, Site A Data

APPENDIX B-1

Table B-1
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
Perched Zone Monitoring Wells								
A-MW22	May-94	**130**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	**140**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**150**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	**140**	1.2 U	2.9 U	1.7 U	NA	NA	NA
	Jan-12	**31 Q**	0.10 U	0.099 U	0.099 U	**2.2**	**0.93**	**3.5**
	Apr-13	**49 D**	0.15 U	0.13 U	0.13 U	**3.3 J**	**1.7**	**5.2 J**
	Apr-14	**36 D**	0.15 U	0.13 U	0.13 U	**2.6**	**1.4 M**	**2.3**
A-MW34	Feb-95	**0.36**	0.05 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	0.58 U	0.65 U	1.5 U	0.86 U	NA	NA	NA
	Feb-98	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	May-98	0.94 U	0.94 U	0.94 U	0.94 U	NA	NA	NA
	Feb-99	0.92 U	0.92 U	0.92 U	0.92 U	NA	NA	NA
	Nov-09	0.26 U	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Jan-12	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	0.50 U	0.50 U
	Apr-13	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U Q
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW36	Apr-12	**30 Q**	**0.92**	**0.31**	0.13 U	2.0 U	0.50 U	0.50 U
	Apr-13	**32**	**0.56 J**	0.13 U	0.13 U	**0.98 J**	0.51 U	**0.10 J**
A-MW38	Aug-97	**48**	0.4 U	0.92 U	0.53 U	NA	NA	NA
	Aug-11	**18**	**1.5**	**0.2**	0.099 U	2.0 U	2.0 U	2.0 U
	Jan-12	**49 Q**	**3.4 J**	**0.2 J**	0.099 U	2.0 U	0.50 U	**0.091 J**
	Apr-13	**13**	**4**	**0.12 J**	0.13 U	**0.29 J**	0.51 U	0.51 U Q
A-MW47	Aug-95	**160**	**18**	**0.97 J**	**1.2 J**	NA	NA	NA
	Feb-96	**120**	**15**	**1.6**	**1.6**	NA	NA	NA
	Aug-96	**74**	**12**	2.2 U	0.6 U	NA	NA	NA
	Feb-97	**100**	**14**	2.3 U	1.3 U	NA	NA	NA
	Aug-97	**34**	**15**	**0.86 J**	**0.5 J**	NA	NA	NA
	Feb-99	**37**	**13**	1.1 U	1.1 U	NA	NA	NA
	Feb-00	**22**	**27**	0.83 U	0.83 U	NA	NA	NA
	Feb-01	**8.9**	**10**	0.51 U	0.51 U	NA	NA	NA
	May-02	**32**	**19**	1 U	1 U	NA	NA	NA
	Feb-03	**22**	**10**	0.44 U	0.44 U	NA	NA	NA
	Feb-04	**58**	**6.9**	**0.88**	0.49 U	NA	NA	NA
	Feb-05	**9.2**	**6.1**	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**36**	**7.3**	**0.6**	0.49 U	NA	NA	NA
	Feb-07	**74 D**	**5.5**	**1**	**0.17 J**	NA	NA	NA
	Aug-11	**14 J**	**2.2 J**	**0.37 J**	**0.087 J**	**0.59 J**	2.0 U	2.0 U
	Jan-12	**6.2**	**2.3**	**0.17**	**0.075 J**	2 U	0.5 U	0.5 U
	Apr-13	**43 D**	**0.76 M,J**	**0.55 J**	0.13 U	**1.5 J**	0.5 U	**0.29 J**
	Mar-14	**20**	**1.4**	**0.38**	**0.088 J**	**0.7**	**1.20 J**	0.51 U

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW48	Feb-95	**1000**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**540**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	**680**	0.74 U	1.7 U	0.98 U	NA	NA	NA
	Dec-97	**290 J**	0.94 UJ	2.2 UJ	1.2 UJ	NA	NA	NA
	Feb-99	**200**	0.38 U	0.38 U	0.38 U	NA	NA	NA
	Feb-00	**170**	0.35 U	0.35 U	0.35 U	NA	NA	NA
	Feb-04	**120**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**120**	0.57 U	0.57 U	0.57 U	NA	NA	NA
	Feb-06	**110**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	**120 D**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Nov-09	**99 D**	0.15 U	0.15 U	0.15 U	1.9 U	**0.34 J**	**0.37 J**
	Jan-12	**84**	0.10 U	0.10 U	0.10 U	**4.7**	0.50 U	**1.4**
	Apr-13	**83 D**	0.15 U	0.13 U	0.13 U	**3.8 J**	0.50 U	**2.7 J**
	Mar-14	**69 D**	0.15 U	0.13 U	0.13 U	**3.7**	0.5 U	**0.56**
A-MW58	Mar-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW59	Mar-14	0.15 U	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
A-MW61	Mar-14	**4.3 M**	0.15 U	0.13 U	**0.094 J**	**0.32 J**	**0.49 J**	**0.45 J**
Shallow Aquifer Monitoring Wells								
A-MW21	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	1.2 U	1.3 U	3.1 U	1.8 U	NA	NA	NA
	Dec-97	0.62 UJ	0.7 U	1.6 U	0.9 U	NA	NA	NA
A-MW28	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	0.77 U	0.86 U	2 U	1.2 U	NA	NA	NA
	Dec-97	0.46 UJ	0.52 U	1.2 U	0.7 U	NA	NA	NA
	Feb-99	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA
	Feb-00	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Feb-01	0.46 U	0.46 U	0.46 U	0.46 U	NA	NA	NA
	May-02	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Feb-03	0.44 U	0.44 U	0.44 U	0.44 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	0.52 U	0.52 U	0.52 U	0.52 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW30	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-97	0.82 U	0.92 U	2.1 U	1.2 U	NA	NA	NA
	Dec-97	0.58 UJ	0.65 U	1.5 U	0.9 U	NA	NA	NA
	Feb-99	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-00	0.99 U	0.99 U	0.99 U	0.99 U	NA	NA	NA
	Feb-01	0.46 U	0.46 U	0.46 U	0.46 U	NA	NA	NA
	May-02	0.81 U	0.81 U	0.81 U	0.81 U	NA	NA	NA
	Feb-03	1.4 U	1.4 U	1.4 U	1.4 U	NA	NA	NA
	Feb-06	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-07	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
A-MW32	May-94	**0.92**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	**1.1**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	**0.58**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	**0.84**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	**1.2**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**1**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	0.67 U	0.76 U	1.8 U	1 U	NA	NA	NA
	Feb-97	**1.2**	0.94 U	2.2 U	1.2 U	NA	NA	NA
	Aug-97	**0.7**	0.31 U	0.71 U	0.41 U	NA	NA	NA
	Dec-97	**5.6 J**	2.9 U	6.7 U	3.8 U	NA	NA	NA
	Aug-98	**3.2**	0.68 U	1.6 U	0.91 U	NA	NA	NA
	Feb-99	**1.6**	0.69 U	0.69 U	0.69 U	NA	NA	NA
	Aug-99	**3.9**	0.57 U	0.57 U	0.57 U	NA	NA	NA
	Feb-00	**5.9**	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Aug-00	**3.8**	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Feb-01	**5.6**	0.35 U	0.35 U	0.35 U	NA	NA	NA
	Jul-01	**23**	0.44 U	0.44 U	0.44 U	NA	NA	NA
	May-02	**5.4**	0.64 U	0.64 U	0.64 U	NA	NA	NA
	Aug-02	**5.8**	0.6 U	0.6 U	0.6 U	NA	NA	NA
	Feb-03	**2.3**	1.5 U	1.5 U	1.5 U	NA	NA	NA
	Sep-03	**4.3**	0.18 U	0.18 U	0.18 U	NA	NA	NA
	Feb-04	**9.3**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	**7.5**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	**6.9**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-05	**4.1**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-06	**10**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**4.4**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	**6.3**	0.5 U	0.5 U	0.5 U	NA	NA	NA

**Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and
Performance Data Through April 2014**

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW32 (continued)	Aug-07	**6**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**6.7**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-08	**5.1**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**5.3**	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Aug-10	**6.3**	0.096 U	0.096 U	0.096 U	1.9 U	1.9 U	1.9 U
	Aug-11	**6.9**	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-12	**7.9**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Jul-13	**5.9**	0.15 U	0.13 U	0.13 U	**0.1 J**	0.5 U	0.5 U
	Apr-14	**9.1**	0.15 U	0.13 U	0.13 U	**0.2 J**	0.5 U	0.5 U
A-MW33	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	**0.23**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**0.26**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	0.72 U	0.81 U	1.9 U	1.1 U	NA	NA	NA
	Feb-97	**3.6**	0.79 U	1.8 U	1.1 U	NA	NA	NA
	Aug-97	**3.6**	0.63 U	1.5 U	0.84 U	NA	NA	NA
	Dec-97	**3.5 J**	0.43 U	1 U	0.58 U	NA	NA	NA
	Aug-98	**1.6**	0.45 U	1.1 U	0.6 U	NA	NA	NA
	Feb-99	**0.96**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-99	**1.4**	0.4 U	0.4 U	0.4 U	NA	NA	NA
	Feb-00	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA
	Aug-00	**1.3**	0.61 U	0.61 U	0.61 U	NA	NA	NA
	Feb-01	**1.5**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Jul-01	0.36 U	0.36 U	0.36 U	0.36 U	NA	NA	NA
	May-02	0.94 U	0.94 U	0.94 U	0.94 U	NA	NA	NA
	Aug-02	0.17 U	0.17 U	0.17 U	0.17 U	NA	NA	NA
	Feb-03	0.96 U	0.96 U	0.96 U	0.96 U	NA	NA	NA
	Sep-03	0.66 U	0.66 U	0.66 U	0.66 U	NA	NA	NA
	Feb-04	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-04	0.53 U	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Feb-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-07	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	0.25 U	0.15 U	0.15 U	0.15 U	2 U	2 U	2 U
	Apr-14	**0.32**	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW35	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	0.74 U	0.83 U	1.9 U	1.1 U	NA	NA	NA
	Feb-97	0.85 U	0.95 U	2.2 U	1.3 U	NA	NA	NA
	Aug-97	0.62 U	0.7 U	1.6 U	0.9 U	NA	NA	NA
	Dec-97	0.35 UJ	0.4 UJ	0.9 UJ	0.5 UJ	NA	NA	NA
	Aug-98	1 U	1.2 U	2.7 U	1.6 U	NA	NA	NA
	Feb-99	0.91 U	0.91 U	0.91 U	0.91 U	NA	NA	NA
	Aug-99	0.92 U	0.92 U	0.92 U	0.92 U	NA	NA	NA
	Feb-00	1.4 U	1.4 U	1.4 U	1.4 U	NA	NA	NA
	Aug-00	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA
	Feb-01	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Jul-01	0.42 U	0.42 U	0.42 U	0.42 U	NA	NA	NA
	May-02	1.6 U	1.6 U	1.6 U	1.6 U	NA	NA	NA
	Aug-02	0.31 U	0.31 U	0.31 U	0.31 U	NA	NA	NA
	Feb-03	1 U	1 U	1 U	1 U	NA	NA	NA
	Sep-03	1.4 U	1.4 U	1.4 U	1.4 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-07	0.53 U	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Aug-07	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	0.24 U	0.15 U	0.15 U	0.15 U	2 U	2 U	2 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
A-MW44	May-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	0.19 U	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	**0.27 J**	0.23 UJ	0.55 UJ	0.31 UJ	NA	NA	NA
	Feb-97	0.74 U	0.83 U	1.9 U	1.1 U	NA	NA	NA
	Aug-97	0.58 U	0.65 U	1.5 U	0.86 U	NA	NA	NA
	Dec-97	0.83 UJ	0.94 U	2.2 U	1.2 U	NA	NA	NA
	Aug-98	1.1 U	1.2 U	2.9 U	1.7 U	NA	NA	NA
	Feb-99	0.81 U	0.81 U	0.81 U	0.81 U	NA	NA	NA
	Aug-99	0.57 U	0.57 U	0.57 U	0.57 U	NA	NA	NA
	Feb-00	0.29 U	0.29 U	0.29 U	0.29 U	NA	NA	NA
	Aug-00	0.79 U	0.79 U	0.79 U	0.79 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW44 (continued)	Feb-01	0.66 U	0.66 U	0.66 U	0.66 U	NA	NA	NA
	Jul-01	0.3 U	0.3 U	0.3 U	0.3 U	NA	NA	NA
	Aug-02	0.34 U	0.34 U	0.34 U	0.34 U	NA	NA	NA
	Feb-03	1 U	1 U	1 U	1 U	NA	NA	NA
	Sep-03	0.53 U	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-05	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-06	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	0.52 U	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	0.25 U	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW49	May-02	**380**	0.7 U	0.7 U	0.7 U	NA	NA	NA
	Aug-02	**550**	0.4 U	0.4 U	0.4 U	NA	NA	NA
	Feb-03	**300**	1 U	1 U	1 U	NA	NA	NA
	Sep-03	**350**	0.69 U	0.69 U	0.69 U	NA	NA	NA
	Feb-04	**440**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	**360**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**180**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-05	**360**	**0.73**	0.49 U	0.49 U	NA	NA	NA
	Feb-06	**280**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**300**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Feb-07	**270 D**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Aug-07	**190 D**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**170 D**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	**67 D**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**39 D**	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Aug-10	**240**	0.097 U	0.097 U	0.097 U	**1.33 J**	**0.068 J**	1.9 U
	Oct-10	**210**	0.1 U	0.1 U	0.1 U	2 U	2 U	2 U
	Jan-11	**110**	0.1 U	0.1 U	0.1 U	2 U	**0.06 J**	**0.15 J**
	Apr-11	**150**	0.1 U	0.1 U	0.1 U	1.9 U	1.9 U	1.9 U
	Aug-11	**3.5**	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Oct-11	**1**	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Jan-12	**3.7**	0.10 U	0.10 U	0.10 U	2.0 U	0.51 U	0.51 U
	Apr-12	**6**	0.15 U	0.13 U	0.13 U	2.0 U	0.49 U	0.49 U
	Aug-12	**8.6**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Oct-12	**19**	0.15 U	0.13 U	0.13 U	**0.1 J**	0.51 U	0.51 U
	Jan-13	**30**	0.15 U	0.13 U	0.13 U	**0.13 J**	0.51 U	0.51 U
	Apr-13	**34**	0.15 U	0.13 U	0.13 U	**0.17 J**	0.51 U	0.51 U Q
	Jul-13	**26**	0.15 U	0.13 U	0.13 U	**0.2 J**	0.5 U	0.5 U
	Apr-14	**22 D**	0.15 U	0.13 U	0.13 U	**0.2 J**	0.5 U	0.5 U

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		0.8	2.9	0.13	0.13	NS	NS	NS
A-MW50	May-02	1.2 U	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Aug-02	0.62 U	0.62 U	0.62 U	0.62 U	NA	NA	NA
	Feb-03	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Sep-03	1.9 U	1.9 U	1.9 U	1.9 U	NA	NA	NA
	Feb-04	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-04	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-06	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-07	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	0.24 U	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Aug-12	0.15 U	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW51	May-02	0.77 U	0.77 U	0.77 U	0.77 U	NA	NA	NA
	Aug-02	0.4 U	0.4 U	0.4 U	0.4 U	NA	NA	NA
	Feb-03	0.26 U	0.26 U	0.26 U	0.26 U	NA	NA	NA
	Sep-03	0.4 U	0.4 U	0.4 U	0.4 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	5 UJ	5 UJ	5 UJ	5 UJ	NA	NA	NA
	Aug-06	0.56 U	0.56 U	0.56 U	0.56 U	NA	NA	NA
	Feb-07	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-07	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-08	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	0.24 U	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Aug-10	0.096 U	0.096 U	0.096 U	0.096 U	1.9 U	1.9 U	1.9 U
	Oct-10	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Jan-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Apr-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Oct-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Jan-12	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	0.50 U	0.50 U
	Apr-12	0.15 U	0.15 U	0.13 U	0.13 U	2.0 U	0.50 U	0.50 U
	Jul-12	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
	Oct-12	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Jan-13	0.15 U	0.15 U	0.13 U	0.13 U	0.49 U	0.49 U	0.49 U
	Apr-13	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U Q
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW52	May-02	1.10 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Aug-02	0.21 U	0.21 U	0.21 U	0.21 U	NA	NA	NA
	Feb-03	0.99 U	0.99 U	0.99 U	0.99 U	NA	NA	NA
	Sep-03	1.5 U	1.4 U	1.4 U	1.4 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	0.53 U	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Aug-07	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-08	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	0.24 U	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Aug-10	0.096 U	0.096 U	0.096 U	0.096 U	1.9 U	1.9 U	1.9 U
	Aug-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Jul-12	0.15 U	0.15 U	0.13 U	0.13 U	0.52 U	0.52 U	0.52 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW53	May-02	0.87 U	0.87 U	0.87 U	0.87 U	NA	NA	NA
	Aug-02	0.27 U	0.27 U	0.27 U	0.27 U	NA	NA	NA
	Feb-03	0.71 U	0.71 U	0.71 U	0.71 U	NA	NA	NA
	Sep-03	0.83 U	0.83 U	0.83 U	0.83 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-05	0.51 U	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-06	0.54 U	0.54 U	0.54 U	0.54 U	NA	NA	NA
	Aug-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	0.52 U	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-08	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	0.25 U	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Aug-10	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-12	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
A-MW54	May-02	**2.5**	1 U	1 U	1 U	NA	NA	NA
	Aug-02	**1.8**	0.2 U	0.2 U	0.2 U	NA	NA	NA
	Feb-03	**1.9**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Sep-03	**2**	1 U	1 U	1 U	NA	NA	NA
	Feb-04	**1.7**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-04	**1.5**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-05	**2**	0.49 U	0.49 U	0.49 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW54 (continued)	Aug-05	**2.3**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**2.4**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**2.3**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	**1.7**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	**1.4**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**1.1**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	**1.1**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	**0.65**	0.15 U	0.15 U	0.15 U	2 U	2 U	2 U
	Aug-10	**0.44**	0.10 U	0.10 U	0.10 U	1.9 U	1.9 U	1.9 U
	Aug-11	**0.38**	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-12	**0.31**	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Apr-14	**0.73 J**	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW55	May-02	0.88 U	0.88 U	0.88 U	0.88 U	NA	NA	NA
	Aug-02	0.3 U	0.3 U	0.3 U	0.3 U	NA	NA	NA
	Feb-03	0.88 U	0.88 U	0.88 U	0.88 U	NA	NA	NA
	Sep-03	0.95 U	0.95 U	0.95 U	0.95 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-06	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	0.52 U	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-08	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	0.24 U	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Aug-10	0.097 U	0.10 U	0.10 U	0.10 U	1.9 U	1.9 U	1.9 U
	Aug-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-12	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
A-MW56	Nov-09	**0.14 J**	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Aug-10	**0.1**	0.098 U	0.098 U	0.098 U	2.0 U	2.0 U	2.0 U
	Oct-10	0.1 U	0.1 U	0.1 U	0.1 U	1.9 U	1.9 U	1.9 U
	Jan-11	0.1 U	0.1 U	0.1 U	0.1 U	2.0 U	2.0 U	2.0 U
	Apr-11	0.1 U	0.1 U	0.1 U	0.1 U	2.0 U	2.0 U	2.0 U
	Aug-11	**0.077 J**	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Oct-11	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Jan-12	0.10 U	0.10 U	0.10 U	0.10 U	2.0 U	0.50 U	0.50 U
	Apr-12	0.15 U	0.15 U	0.13 U	0.13 U	2.0 U	0.50 U	0.50 U
	Aug-12	0.15 U	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Oct-12	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
	Jan-13	0.15 U	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
	Apr-13	**0.13 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U Q

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW56 (continued)	Jul-13	**0.060 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
A-MW57	Nov-09	**0.079 J**	0.15 U	0.15 U	0.15 U	1.9 U	1.9 U	1.9 U
	Aug-10	0.097 U	0.097 U	0.097 U	0.097 U	1.9 U	1.9 U	1.9 U
	Oct-10	0.097 U	0.097 U	0.097 U	0.097 U	1.9 U	1.9 U	1.9 U
	Jan-11	0.1 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Apr-11	0.1 U	0.10 U	0.10 U	0.10 U	2.0 U	2.0 U	2.0 U
	Aug-11	0.1 U	0.10 U	0.10 U	0.1 U	2.0 U	2.0 U	2.0 U
	Oct-11	0.1 U	0.1 U	0.1 U	0.1 U	2 U	2 U	2 U
	Jan-12	0.099 U	0.099 U	0.099 U	0.099 U	2.0 U	0.5 U	0.5 U
	Apr-12	0.15 U	0.15 U	0.13 U	0.13 U	2.0 U	0.5 U	0.5 U
	Jul-12	0.15 U	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Oct-12	**0.036 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Jan-13	**0.04 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
	Apr-13	**0.044 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U Q
	Apr-14	**0.048 J**	0.15 U	0.13 U	0.13 U	0.5 U	0.5 U	0.5 U
Extraction Wells (Shallow Aquifer)								
A-EW4	Dec-97	**83 J**	2.2 U	5 U	2.9 U	NA	NA	NA
	Feb-98	**87 J**	1.9 UJ	4.4 UJ	2.5 UJ	NA	NA	NA
	Apr-98	**67 J**	1.7 U	3.9 U	2.3 U	NA	NA	NA
	Aug-98	**30**	1.8 U	4.1 U	2.4 U	NA	NA	NA
	May-99	**48**	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Aug-99	**79**	0.78 U	0.78 U	0.78 U	NA	NA	NA
	Feb-00	**75**	0.91 U	0.91 U	0.91 U	NA	NA	NA
	Aug-00	**71**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Feb-01	**67**	0.58 U	0.58 U	0.58 U	NA	NA	NA
	Aug-01	**52**	0.39 U	0.39 U	0.39 U	NA	NA	NA
	May-02	**110**	0.91 U	0.91 U	0.91 U	NA	NA	NA
	Aug-02	**110**	0.6 U	0.6 U	0.6 U	NA	NA	NA
	Feb-03	**74**	0.82 U	0.82 U	0.82 U	NA	NA	NA
	Sep-03	**84**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Feb-04	**64**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-04	**68**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**60**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	**60**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**100**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Aug-06	**120 C**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Feb-07	**140 DC**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	**110 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	**97 DC**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-08	**89 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**94 D**	0.15 U	0.15 U	0.15 U	**2.1**	**0.16 J**	**0.13 J**
	Aug-10	**90**	0.1 U	0.1 U	0.1 U	1.9 U	**0.16 J**	1.9 U
	Sep-11	**100**	0.10 U	0.10 U	0.10 U	**3.2**	**0.30 J**	**0.26 J**

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-EW4 (continued)	Aug-12	**110 Q**	0.15 U	0.13 U	0.13 U	0.5 U	**0.19 J**	**0.16 J**
	Jul-13	**130 D**	0.15 U	0.13 U	0.13 U	**3.7**	**0.34 J**	**0.15 J M**
	Mar-14	**80 D**	0.15 U	0.13 U	0.13 U	**2.0**	**0.16 J**	**0.083 J M**
A-EW5	Dec-97	**6.1 J**	0.47 U	1.1 U	0.62 U	NA	NA	NA
	Feb-98	**6.2 J**	1.6 UJ	3.8 UJ	2.2 UJ	NA	NA	NA
	Apr-98	**5.2 J**	0.56 U	1.3 U	0.74 U	NA	NA	NA
	Aug-98	**23**	1.1 U	2.5 U	1.4 U	NA	NA	NA
	May-99	**14**	0.87 U	0.87 U	0.87 U	NA	NA	NA
	Aug-99	**13**	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Feb-00	**16**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Aug-00	**17**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-01	**16**	0.78 U	0.78 U	0.78 U	NA	NA	NA
	Aug-01	**6.5**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	May-02	**18**	0.3 U	0.3 U	0.3 U	NA	NA	NA
	Aug-02	**12**	0.13 U	0.13 U	0.13 U	NA	NA	NA
	Feb-03	**2**	0.7 U	0.7 U	0.7 U	NA	NA	NA
	Sep-03	**8.6**	0.42 U	0.42 U	0.42 U	NA	NA	NA
	Feb-04	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-04	**17**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**28**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	**31**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-06	**57**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**41 C**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-07	**130 DC**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-07	**90 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**34 C**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-08	**49 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**29 D**	0.15 U	0.15 U	0.15 U	**0.59 J**	2.0 U	2.0 U
	Aug-10	**34 Q**	0.1 U	0.1 U	R	**0.77 J**	**0.066 J**	1.9 U
	Sep-11	**18**	0.10 U	0.10 U	0.10 U	**0.59 J**	2.0 U	2.0 U
	Aug-12	**31 Q**	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Jul-13	**0.97**	0.15 U	0.13 U	0.13 U	**0.06 J**	0.50 U	0.50 U
	Mar-14	**25 D**	0.15 U	0.13 U	0.13 U	**0.59**	0.51 U	0.51 U
A-EW6	Dec-97	0.98 UJ	1.1 U	2.6 U	1.5 U	NA	NA	NA
	Feb-98	1.2 UJ	1.4 UJ	3.2 UJ	1.8 UJ	NA	NA	NA
	Apr-98	1.1 UJ	1.3 U	2.9 U	1.7 U	NA	NA	NA
	Aug-98	**0.5 J**	0.47 U	1.1 U	0.62 U	NA	NA	NA
	May-99	0.99 U	0.99 U	0.99 U	0.99 U	NA	NA	NA
	Aug-99	0.56 U	0.56 U	0.56 U	0.56 U	NA	NA	NA
	Feb-00	1.2 U	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Aug-00	**0.99**	0.46 U	0.46 U	0.46 U	NA	NA	NA
	Feb-01	**0.53**	0.44 U	0.44 U	0.44 U	NA	NA	NA
	Aug-01	**0.95**	0.57 U	0.57 U	0.57 U	NA	NA	NA
	May-02	0.42 U	0.42 U	0.42 U	0.42 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-EW6 (continued)	Aug-02	0.4 U	0.4 U	0.4 U	0.4 U	NA	NA	NA
	Feb-03	1.3 U	1.3 U	1.3 U	1.3 U	NA	NA	NA
	Sep-03	1.1 U	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-05	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	0.48 U	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-06	**0.79 C**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-07	**16 C**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	**1.3 C**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	**48 C**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	**48 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**1 PG**	0.15 U	0.15 U	0.15 U	2.0 U	2.0 U	2.0 U
	Aug-10	**1.4 PG**	0.098 U	0.098 U	0.098 U	2.0 U	2.0 U	2.0 U
	Sep-11	**0.11**	0.099 U	0.099 U	0.099 U	2.0 U	2.0 U	2.0 U
	Aug-12	**1.3 PG**	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
	Jul-13	**0.71 J**	0.15 U	0.13 U	0.13 U	0.51 U	0.51 U	0.51 U
	Apr-14	0.15 U	0.15 U	0.13 U	0.13 U	0.50 U	0.50 U	0.50 U
A-EW7	Dec-97	**450 J**	1.5 U	3.4 U	1.9 U	NA	NA	NA
	Feb-98	**470 J**	1.1 UJ	2.6 UJ	1.5 UJ	NA	NA	NA
	Apr-98	**660 J**	1.3 U	2.9 U	1.7 U	NA	NA	NA
	Aug-98	**320**	0.4 U	0.92 U	0.53 U	NA	NA	NA
	May-99	**500**	3.3 U	3.3 U	3.3 U	NA	NA	NA
	Aug-99	**380**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Feb-00	**300**	1.6 U	1.6 U	1.6 U	NA	NA	NA
	Aug-00	**290**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Feb-01	**260**	0.47 U	0.47 U	0.47 U	NA	NA	NA
	Aug-01	**120**	0.55 U	0.55 U	0.55 U	NA	NA	NA
	May-02	**710**	0.92 U	0.92 U	0.92 U	NA	NA	NA
	Aug-02	**630**	0.47 U	0.47 U	0.47 U	NA	NA	NA
	Feb-03	**310**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Sep-03	**480**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-04	**360**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	**240**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	**210**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-05	**240**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**190**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**240 C**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-07	**240 DC**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-07	**140 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**260 DC**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-08	**200 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-09	**180 D**	0.15 U	0.15 U	0.15 U	**3.5**	**0.29 J**	**0.21 J**

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-EW7 (continued)	Aug-10	**300**	0.098 U	0.098 U	0.098 U	**5**	**0.47**	2.0 U
	Sep-11	**300**	0.10 U	0.10 U	0.10 U	**6.90**	**0.56 J**	**0.40 J**
	Aug-12	**170**	0.15 U	0.13 U	0.13 U	0.49 U	**0.32 J**	**0.28 J**
	Aug-13	**200 D**	0.16 U	0.13 U	0.13 U	**4.40**	0.52 U	**0.25 J**
	Apr-14	**110 D**	0.15 U	0.13 U	0.13 U	**2.40**	0.51 U	**0.19 J**
A-EW8	Dec-97	**110 J**	0.59 U	1.4 U	0.79 U	NA	NA	NA
	Feb-98	**240 J**	1.6 UJ	3.8 UJ	2.2 UJ	NA	NA	NA
	Apr-98	**110 J**	1.2 U	2.8 U	1.6 U	NA	NA	NA
	Aug-98	**270**	0.86 U	2 U	1.2 U	NA	NA	NA
	Aug-99	**160**	1.7 U	1.7 U	1.7 U	NA	NA	NA
	Feb-00	**120**	1.1 U	1.1 U	1.1 U	NA	NA	NA
	Aug-00	**160**	0.73 U	0.73 U	0.73 U	NA	NA	NA
	Feb-01	**68**	0.34 U	0.34 U	0.34 U	NA	NA	NA
	Aug-01	**110**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	May-02	**120**	1.3 U	1.3 U	1.3 U	NA	NA	NA
	Aug-02	**150**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Feb-03	**75**	1 U	1 U	1 U	NA	NA	NA
	Sep-03	**120**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Feb-04	**320**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	**170**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**110**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-05	**160**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**120**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-06	**250 C**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-07	**240 DC**	0.52 U	0.52 U	0.52 U	NA	NA	NA
	Aug-07	**140 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	**240 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	**230 DC**	**0.17 J**	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**81 D**	0.15 U	0.15 U	0.15 U	**1.6 J**	**0.12 J**	**0.073 J**
	Aug-10	**120**	**0.097**	**0.097**	**0.097**	**2.7**	**0.22 J**	1.9 U
	Sep-11	**220**	0.10 U	0.10 U	0.10 U	**5.3**	**0.44 J**	**0.33 J**
	Aug-12	**91 Q**	0.15 U	0.13 U	0.13 U	0.50 U	**0.14 J**	**0.10 J**
	Jul-13	**66 D**	0.15 U	0.13 U	0.13 U	**1.40**	0.5 U	0.50 U
	Mar-14	**120 D**	0.15 U	0.13 U	0.13 U	**2.70**	**0.73 J**	**0.10 J**
A-MW37	Apr-94	**140**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	**190**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	**180**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	**190**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	**220**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**210**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	**99 J**	0.34 UJ	0.8 UJ	0.46 UJ	NA	NA	NA
	Feb-97	**120**	1.4 U	3.3 U	1.9 U	NA	NA	NA
	Aug-97	**120**	1.1 U	2.6 U	1.5 U	NA	NA	NA
	Dec-97	**160 J**	2.2 U	5 U	2.9 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW37 (continued)	Feb-98	**130 J**	1.7 UJ	3.9 UJ	2.3 UJ	NA	NA	NA
	Apr-98	**220 J**	0.81 U	1.9 U	1.1 U	NA	NA	NA
	Aug-98	**200**	1.7 U	3.9 U	2.2 U	NA	NA	NA
	May-99	**130**	1.4 U	1.4 U	1.4 U	NA	NA	NA
	Aug-99	**180**	0.64 U	0.64 U	0.64 U	NA	NA	NA
	Feb-00	**170**	1.2 U	1.2 U	1.2 U	NA	NA	NA
	Aug-00	**130**	0.92 U	0.92 U	0.92 U	NA	NA	NA
	Feb-01	**120**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Jul-01	**150**	0.79 U	0.79 U	0.79 U	NA	NA	NA
	May-02	**150**	1.3 U	1.3 U	1.3 U	NA	NA	NA
	Aug-02	**180**	0.25 U	0.25 U	0.25 U	NA	NA	NA
	Feb-03	**120**	**2.2**	1.3 U	1.3 U	NA	NA	NA
	Sep-03	**160**	1.9 U	1.9 U	1.9 U	NA	NA	NA
	Feb-04	**130**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-04	**140**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-05	**140**	**0.81**	0.49 U	0.49 U	NA	NA	NA
	Aug-05	**160**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**120**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**140 C**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-07	**160 DC**	0.53 U	0.53 U	0.53 U	NA	NA	NA
	Aug-07	**120 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-08	**120 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Aug-08	**130 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-09	**130 D**	0.15 U	0.15 U	0.15 U	**0.17 J**	**0.1 J**	**0.094 J**
	Aug-10	**84**	0.1 U	0.1 U	0.1 U	**1.2 J**	**0.11 J**	2.0 U
	Sep-11	**71**	0.1 U	0.1 U	0.1 U	**1 J**	**0.74 J**	2.0 U
	Aug-12	**64**	0.15 U	0.13 U	0.13 U	**0.99**	0.50 U	**0.12 J PG**
	Jul-13	**110 D**	**0.12 J**	0.13 U	0.13 U	**2.1**	**0.42 J M**	**0.31 J**
	Mar-14	**62 D**	**0.19**	0.13 U	0.13 U	**1.1**	**1.00 J**	0.52 U
A-MW46	Apr-94	**120**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-94	**170**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Nov-94	**160**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-95	**170**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-95	**170**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Feb-96	**200**	0.65 U	0.05 U	0.05 U	NA	NA	NA
	Aug-96	**180**	0.56 U	1.3 U	0.74 U	NA	NA	NA
	Feb-97	**180**	1.3 U	3 U	1.7 U	NA	NA	NA
	Apr-97	**190**	1.3 U	3.1 U	1.8 U	NA	NA	NA
	May-97	**180**	1.3 U	3.1 U	1.8 U	NA	NA	NA
	May-97	**140**	0.74 U	1.7 U	0.98 U	NA	NA	NA
	May-97	**150**	0.92 U	2.1 U	1.2 U	NA	NA	NA
	Jun-97	**150**	1.1 U	2.6 U	1.5 U	NA	NA	NA
	Jul-97	**140**	0.74 U	1.7 U	0.98 U	NA	NA	NA
	Jul-97	**140**	0.77 U	1.8 U	1 U	NA	NA	NA

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

Well No.	Date	RDX (µg/L)	TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)	MNX (µg/L)	DNX (µg/L)	TNX (µg/L)
Groundwater Cleanup		**0.8**	**2.9**	**0.13**	**0.13**	**NS**	**NS**	**NS**
A-MW46 (continued)	Aug-97	**120**	0.94 U	2.2 U	1.2 U	NA	NA	NA
	Aug-97	**120**	0.83 U	2.1 U	1.2 U	NA	NA	NA
	Dec-97	**140 J**	2.5 U	5.9 U	3.4 U	NA	NA	NA
	Feb-98	**120 J**	1.9 UJ	4.4 UJ	2.5 UJ	NA	NA	NA
	Apr-98	**200 J**	1.3 U	3.1 U	1.8 U	NA	NA	NA
	Aug-98	**170**	0.52 U	1.2 U	0.7 U	NA	NA	NA
	Feb-00	**130**	1 U	1 U	1 U	NA	NA	NA
	Aug-00	**160**	0.7 U	0.7 U	0.7 U	NA	NA	NA
	Feb-01	**150**	0.75 U	0.75 U	0.75 U	NA	NA	NA
	Apr-01	**160**	2.5 U	2.5 U	2.5 U	NA	NA	NA
	Jul-01	**140**	0.6 U	0.6 U	0.6 U	NA	NA	NA
	May-02	**160**	0.4 U	0.4 U	0.4 U	NA	NA	NA
	May-02	**180**	0.81 U	0.81 U	0.81 U	NA	NA	NA
	Aug-02	**170**	0.27 U	0.27 U	0.27 U	NA	NA	NA
	Feb-03	**160**	0.27 U	0.27 U	0.27 U	NA	NA	NA
	Sep-03	**130**	1.3 U	1.3 U	1.3 U	NA	NA	NA
	Feb-04	**160**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-04	**110**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Feb-05	**130**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-05	**150**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Feb-06	**110**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-06	**120 C**	0.49 U	**0.4 J**	0.49 U	NA	NA	NA
	Feb-07	**120 DC**	0.51 U	0.51 U	0.51 U	NA	NA	NA
	Aug-07	**95 DC**	0.5 U	0.5 U	0.5 U	NA	NA	NA
	Feb-08	**96 DC**	0.49 U	0.49 U	0.49 U	NA	NA	NA
	Aug-08	**79 DC**	0.48 U	0.48 U	0.48 U	NA	NA	NA
	Aug-09	**80 D**	0.15 U	0.15 U	0.15 U	**1.1 J**	**0.072 J**	**0.097 J**
	Aug-10	**100**	0.10 U	0.097 U	0.097 U	**1.4 J**	**0.12 J**	**0.11 J**
	Sep-11	**75**	0.10 U	0.10 U	0.10 U	**1.3 J**	**0.12 J**	**0.073 J PG**
	Aug-12	**73**	0.15 U	0.13 U	0.13 U	**1.4**	**0.17 J**	**0.21 J PG**
	Jul-13	**73 D**	0.15 U	0.13 U	0.13 U	**1.4**	0.50 U	**0.16 J**
	Mar-14	**59 D**	0.15 U	0.13 U	0.13 U	**0.9**	**0.57 J**	**0.09 J M**

Notes:
Shallow aquifer monitoring wells A-MW37 and A-MW46 are currently used as extraction wells.
µg/L - micrograms per liter
C - Composite sample; August 2006 through August 2008 did not properly isolate the wells for sample collection, resulting in skewed data. Without proper isolation, the extraction well data represented a partial blending from adjacent wells using the same discharge line.
D - Sample was diluted and reanalyzed.
DNT - dinitrotoluene
DNX - hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine

Table B-1 (Continued)
OU 1 Site A, Summary of Groundwater Compliance and Performance Data Through April 2014

E - The reporting value is estimated because of the interference. The serial dilution was not within control limits. J - estimated value
M - A manual integration was performed on the chromatographic peak. MNX - hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine
NA - Not Analyzed
NS - no cleanup standard available
PG - The percent difference between the original and confirmation analyses was greater than 40 percent
R - The result was rejected
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT - 2,4,6-trinitrotoluene
TNX - hexahydro-1,3,5-trinitroso-1,3,5-triazine
Q - The quantitative limit is elevated due to high analyte values.
U - The compound is not detected at or above the quantitation limit.
UJ - The compound is not detected at or above the estimated quantitation limit.
Highlighted data are for current 5-year review period
Bolded values are detected values
Yellow highlighted values exceed RG in last 5-year period

Table B-2
Summary of Field Parameters and Natural Attenuation Parameters by Well

Well ID	Well Type/Aquifer Depth Interval		Sample ID	Sample Date	Field Parameters						Natural Attenuation Parameters [3/]								
					pH	Dissolved Oxygen - Meter (mg/L) [1/]	Dissolved Oxygen - Test Kit (mg/L) [2/]	ORP (mV)	Ferrous Iron (mg/L)	Hydrogen Sulfide (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Nitrate-Nitrite (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	DOC (mg/L)	Dissolved Manganese (µg/L)
A-MW46	Extraction		SITE-A-09-306	8/5/2009	7.04	4.55	NA	243	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-300	8/11/2010	7.11	10.24[4/]	NA	263	0.00	0.00	0.32 J	0.60 U	1.0 U	0.81 J	91.2	2.59	6.06	0.54	5.0 U
			SITE-A-11-300	8/3/2011	6.10	12.55[4/]	NA	291	0.32[5/]	0.10[5/]	1.3 U	NA	NA	0.881	104	2.49	4.5	1.06	7.6 UJ
			SITE-A-12-300	8/7/2012	6.67	6.12	NA	145	0.00	0.01	1.3 U	NA	NA	0.69 J	107	2.06	4.40	0.60	5.0 UJ
			SITE-A-13-300	7/24/2013	7.61	13.89[3/]	NA	176	0.00	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-200	3/26/2014	7.48	6.27	NA	281	0.00	0.00	1.3 U	NA	NA	0.50	99	2.69	5.77	0.56	0.50 J
A-MW47	Mon-Perched		SITE-A-11-301	8/3/2011	5.23	7.4	NA	169	0.03[5/]	0.00[5/]	1.50	NA	NA	0.781	40.4	2.49	4.85	1.11	5.0 UJ
			SITE-A-12-100	1/26/2012	7.27	6.57	NA	167	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-204	4/10/2013	5.78	1.49	NA	386	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-201	3/26/2014	5.86	5.05	NA	315	0	0.00	1.3 U	NA	NA	0.81	64	2.57	5.06	0.79	1.60
A-MW34	Mon-Perched		SITE-A-09-406	11/30/2009	5.48	7.28	NA	236	0	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-101	1/27/2012	6.95	7.01	NA	257	0	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-201	4/9/2013	6.62	7.12	NA	404	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-203	4/3/2014	5.52	8.37	NA	367	0	0	NA	NA	NA	4.6 D	29 UJ	0.66	0.69	0.49 J	0.8 J
A-MW35	Mon-Saturated		SITE-A-09-310	8/4/2009	7.28	2.69	NA	252	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-202	4/3/2014	7.50	11.39	NA	60	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW36 [9/]	Mon-Perched		SITE-A-12-205	4/10/2012	6.39	5.66	NA	177	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-202	4/10/2013	5.85	2.92	NA	408	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW37	Extraction		SITE-A-09-305	8/6/2009	7.45	2.41	NA	276	0.08	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-301	8/11/2010	7.17	16.6[4/]	NA	269	0.00	0.00	0.42 J	0.60 U	1.0 U	0.72 J	112	2.80	5.23	1.90	5.0 U
			SITE-A-11-303	8/3/2011	6.01	7.73	NA	223	0.00	0.00	1.3 U	NA	NA	0.65	140	2.69	5.45	0.62 UJ	5.0 UJ
			SITE-A-12-301	8/6/2012	6.19	9.32 [4/]	NA	154	0.00	0.01	1.3 U	NA	NA	0.57 J	124	2.32	5.37	0.35 J	8.0
			SITE-A-13-301	7/24/2013	7.40	12.16 [3/]	NA	184	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-205	3/26/2014	6.42	15.40	NA	386	0.00	0.01	1.3 U	NA	NA	0.57	151	2.59	5.45	0.56	0.30 J
A-MW38	Mon-Perched		SITE-A-11-319	8/3/2011	5.10	3.13	NA	317	0.61[5/]	0.45[5/]	1.3 U	NA	NA	1.02	40	2.32	3.10	0.73	5.0 UJ
			SITE-A-12-103	1/26/2012	6.85	4.04	NA	228	0.14[8/]	0.13[8/]	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-203	4/10/2013	5.63	1.86	NA	430	0.14	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-EW4	Extraction		SITE-A-09-300	8/5/2009	6.92	4.84	NA	276	0.03	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-302	8/10/2010	7.39	8.1[4/]	NA	182	0.01	0.01	0.30 J	0.60 U	1.0 U	0.75 J	161	2.63	5.38	0.66	3.3 J
			SITE-A-11-304	8/2/2011	5.93	8.01[4/]	NA	325	0.00	0.01	1.3 U	NA	NA	0.655	131	2.62	5.69	0.62 UJ	5.0 U
			SITE-A-11-304b[6/]	9/22/2011	6.51	7.62	NA	174	0.00	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-302	8/3/2012	6.06	5.97	NA	16.6	0.00	0.00	1.3 U	NA	NA	0.52 J	147	2.06	5.75	0.97	4.2 J
			SITE-A-13-302	7/24/2013	6.57	5.66	NA	242	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-207	3/19/2014	6.20	8.56	NA	355	0.00	0.01	1.3 U	NA	NA	0.56	183	2.48	7.54	0.39 J	23.1
		(Dup)	SITE-A-14-208	3/19/2014	6.20	8.56	NA	355	0.00	0.01	1.3 U	NA	NA	0.58	189	2.43	7.40	0.43 J	14.7
A-EW5	Extraction		SITE-A-09-301	8/5/2009	6.69	5.62	NA	242	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-303	8/10/2010	7.27	4.8	NA	131	0.00	0.04	0.31 J	0.60 U	1.0 U	0.078 J	174	2.61	13.20	0.65	40.4
			SITE-A-11-305	8/2/2011	6.33	7.08	NA	320	0.00	0.01	0.34 J	NA	NA	0.671	121	2.68	5.57	1.09	5.0 U
			SITE-A-11-305b[6/]	9/22/2011	5.82	4.06	NA	158	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-303	8/3/2012	6.34	7.27	NA	182	0.00	0.01	1.3 U	NA	NA	0.066 J	189	2.39	8.80	0.63	17.5
			SITE-A-13-303	7/24/2013	6.90	4.64	NA	219	0.00	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-209	3/19/2014	7.42	9.67	NA	255	0.00	0.00	1.3 U	NA	NA	0.085	199	2.62	9.23	0.33 J	31.0

Table B-2 (Continued)
Summary of Field Parameters and Natural Attenuation Parameters by Well

				Field Parameters						Natural Attenuation Parameters [3/]								
Well ID	Well Type/Aquifer Depth Interval	Sample ID	Sample Date	pH	Dissolved Oxygen - Meter (mg/L) [1/]	Dissolved Oxygen - Test Kit (mg/L) [2/]	ORP (mV)	Ferrous Iron (mg/L)	Hydrogen Sulfide (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Nitrate-Nitrite (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	DOC (mg/L)	Dissolved Manganese (µg/L)
A-EW6	Extraction	SITE-A-09-302	8/5/2009	7.21	3.79	NA	245	0.04	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-304	8/10/2010	7.71	3.4	NA	224	0.00	0.01	1.3 U	0.60 U	1.0 U	0.05 UJ	152	2.49	11.90	0.63	54.3
		SITE-A-11-306	8/2/2011	6.38	9.01[4/]	NA	323	0.00	0.00	1.3 U	NA	NA	0.731	130	2.64	5.68	1.18	113
		SITE-A-11-306b[6/]	9/22/2011	6.92	1.94	NA	96	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-304	8/3/2012	6.78	0.50	0.895	175	0.00	0.00	1.3 U	NA	NA	0.050 UJ	149	2.05	9.78	0.32 J	114
		(Dup) SITE-A-12-305	8/3/2012	6.78	0.50	0.895	175	0.00	0.00	1.3 U	NA	NA	0.0073 J	171	2.05	9.72	0.33 J	112
		SITE-A-13-304	7/24/2013	6.98	4.24	NA	220	0.00	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-210	4/17/2014	6.61	6.61	NA	201	0.17	0.00	1.3 U	NA	NA	0.071 UJ	132	1.84	11.6	0.73	1.40
A-EW7	Extraction	SITE-A-09-303	8/4/2009	7.62	5.88	NA	290	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-305	8/11/2010	6.74	8.8[4/]	NA	321	0.00	0.04	1.3 U	0.60 U	1.0 U	0.27 J	156	2.29	7.47	0.97	5.0 UJ
		SITE-A-11-307	8/2/2011	6.51	12.21[4/]	NA	310	0.00	0.02	0.56 J	NA	NA	0.407	157	2.52	8.3	0.65 UJ	5.1 UJ
		SITE-A-11-307b[6/]	9/22/2011	6.26	7.47	NA	172	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-306	8/1/2012	7.42	6.08	NA	175	0.00	0.01	1.3 U	NA	NA	0.069 J	148	1.60	7.95	0.27 J	1.1 J
		SITE-A-13-305	8/27/2013	6.81	7.58	NA	302	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-211	4/17/2014	6.66	7.40	NA	251	0.01	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-EW8	Extraction	SITE-A-09-304	8/4/2009	7.77	5.39	NA	261	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-306	8/10/2010	7.61	3.7	NA	204	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-308	8/2/2011	6.44	7.21	NA	290	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-308b[6/]	9/22/2011	6.33	6.96	NA	178	0.00	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-307	8/1/2012	7.57	4.04	NA	172	0.00	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-307	7/24/2013	7.19	4.22	NA	201	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-212	3/19/2014	7.89	5.00	NA	309	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW33	Mon-Saturated	SITE-A-09-308	8/4/2009	7.68	4.77	NA	320	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-213	4/8/2014	7.40	7.82	NA	324	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW48	Mon-Perched	SITE-A-09-403	11/30/2009	5.97	7.61	NA	358	0.00	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-104	1/26/2012	6.65	7.31	NA	230	0	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-205	4/9/2013	6.24	7.85	NA	388	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-214	3/24/2014	5.67	8.29	NA	410	0.13	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW54	Mon-Saturated	SITE-A-09-317	8/3/2009	7.45	5.77	NA	299	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-307	8/9/2010	7.27	6.7	NA	242	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-309	8/1/2011	7.11	6.63	NA	306	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-308	8/6/2012	7.20	3.74	NA	172	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-215	4/17/2014	7.55	4.83	NA	311	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW55	Mon-Saturated	SITE-A-09-318	8/3/2009	8.04	3.62	NA	284	0.06	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-308	8/9/2010	7.00	6.3	NA	213	0.02	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-310	8/1/2011	7.49	6.9	NA	298	0.00	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-309	8/6/2012	7.45	3.27	NA	158	0.20	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-216	4/17/2014	8.26	5.07	NA	273	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B-2 (Continued)
Summary of Field Parameters and Natural Attenuation Parameters by Well

Well ID	Well Type/Aquifer Depth Interval		Sample ID	Sample Date	Field Parameters						Natural Attenuation Parameters [3/]								
					pH	Dissolved Oxygen - Meter (mg/L) [1/]	Dissolved Oxygen - Test Kit (mg/L) [2/]	ORP (mV)	Ferrous Iron (mg/L)	Hydrogen Sulfide (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Nitrate-Nitrite (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	DOC (mg/L)	Dissolved Manganese (µg/L)
A-MW49	Mon-Saturated		SITE-A-09-312	8/3/2009	7.63	4.46	NA	286	0.03	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-309	8/9/2010	6.97	4.5	NA	126	0.00	0.00	1.3 U	0.60 U	1.0 U	3.0 J	102	2.06	2.33	0.40 J	5.0 U
		(Dup)	SITE-A-10-310	8/9/2010	6.97	4.5	NA	126	0.00	0.00	1.3 UJ	0.60 U	1.0 U	2.9 J	103	2.05	2.35	0.47 J	5.0 U
			SITE-A-10-400	10/27/2010	7.45	4.26	NA	329	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup)	SITE-A-10-401	10/27/2010	7.45	4.26	NA	329	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-104	1/19/2011	7.34	3.58	NA	218	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-203	4/25/2011	7.39	3.52	NA	187	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup)	SITE-A-11-204	4/25/2011	7.39	3.52	NA	187	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-311	8/3/2011	7.00	7.42	NA	189	0.04	0.01	1.3 U	NA	NA	1.54	112	2.48	2.93	0.56	5.0 U
		(Dup)	SITE-A-11-312	8/3/2011	7.00	7.42	NA	189	0.04	0.01	1.3 U	NA	NA	1.54	122	2.45	2.94	0.41 J	5.0 U
			SITE-A-11-400	10/27/2011	7.13	7.07	NA	188	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-401	10/27/2011	7.13	7.07	NA	188	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-106	1/30/2012	7.10	6.57	NA	182	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-200	4/10/2012	7.02	7.22	NA	261	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-310	8/1/2012	6.79	7.33	NA	168	0.00	0.02	1.3 U	NA	NA	0.93 J	138	1.71	3.75	0.32 J	5.0 U
			SITE-A-12-400	10/29/2012	7.37	6.11	NA	153	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-100	1/29/2013	7.24	5.5	NA	141	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-308	7/24/2013	7.67	7.61	NA	180	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-306	7/24/2013	7.67	7.61	NA	180	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-217	4/8/2014	7.95	7.09	NA	301	0.00	0.00	1.3 U	NA	NA	0.85	141	2.05	4.38	0.46 J	1.00 U
A-MW56	Mon-Saturated		SITE-A-09-400	11/30/2009	8.07	1.72	NA	209	0.00	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-10-311	8/10/2010	7.10	3.7	NA	272	0.00	0.00	1.3 U	0.60 U	1.0 U	0.17 J	118	1.44	14.40	0.50 J	5.0 U
			SITE-A-10-402	10/27/2010	7.50	1.91	NA	330	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-100	1/19/2011	6.92	3.92	NA	332	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup)	SITE-A-11-101	1/19/2011	6.92	3.92	NA	332	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-200	4/25/2011	7.19	3.09	NA	225	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-11-314	8/3/2011	7.41	4.54	NA	155	0.00	0.00	0.32 J	NA	NA	0.142	132	1.31	13.9	1.22	5.0 UJ
			SITE-A-11-403	10/27/2011	7.35	3.74	NA	132	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-108	1/30/2012	6.95	3.33	NA	165	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-202	4/10/2012	7.40	4.68	NA	271	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-12-314	8/1/2012	7.65	0	1.1 [4/]	180	0.13	0.00	1.3 U	NA	NA	0.16 J	132	1.41	15.0	0.26 J	5.0 U
			SITE-A-12-401	10/29/2012	7.41	1.6	NA	159	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-101	1/29/2013	7.15	2.37	NA	131	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup)	SITE-A-13-102	1/29/2013	7.15	2.37	NA	131	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-209	4/9/2013	7.78	2.85	NA	323	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-310	7/24/2013	7.90	2.94	NA	191	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-221	4/8/2014	7.79	2.36	NA	309	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW22	Mon-Perched		SITE-A-12-107	1/27/2012	6.27	7.09	NA	252	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			UW	7/31/2012	6.50	5.72	NA	253	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-13-200	4/10/2013	5.98	5.79	NA	444	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup)	SITE-A-13-206	4/10/2013	5.98	5.79	NA	444	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
			SITE-A-14-218	4/7/2014	5.43	8.13	NA	389	0.00	0.00	1.3 U	NA	NA	2.3	42	1.88	3.43	0.69	0.30 J

Table B-2 (Continued)
Summary of Field Parameters and Natural Attenuation Parameters by Well

Well ID	Well Type/Aquifer Depth Interval	Sample ID	Sample Date	Field Parameters: pH	Field Parameters: Dissolved Oxygen - Meter (mg/L) [1/]	Field Parameters: Dissolved Oxygen - Test Kit (mg/L) [2/]	Field Parameters: ORP (mV)	Field Parameters: Ferrous Iron (mg/L)	Field Parameters: Hydrogen Sulfide (mg/L)	Natural Attenuation Parameters [3/]: Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Nitrate-Nitrite (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	DOC (mg/L)	Dissolved Manganese (µg/L)
A-MW32	Mon-Saturated	SITE-A-09-307	8/4/2009	8.24	0.81	0.59	250	0.07	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-315	8/10/2010	8.00	0.98	1.010	239	0.00	0.00	1.3 U	0.60 U	1.0 U	0.066 J	98.3	3.78	14.90	0.71	9.2
		SITE-A-11-313	8/3/2011	7.62	1.3	NA	98	0.00	0.00	1.3 U	NA	NA	0.038 J	101	3.52	14.20	0.62 UJ	8.0 UJ
		SITE-A-12-311	8/3/2012	7.69	0	1.1 [7/]	173	0.00	0.01	1.3 U	NA	NA	0.069 J	100	3.09	13.6	0.70	6.9
		SITE-A-13-309	7/24/2013	8.24	0.00	0.58	172	0.01	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-219	4/3/2014	8.47	0.46	1100	128	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-220	4/3/2014	8.47	0.46	1100	128	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW53	Mon-Saturated	SITE-A-09-316	8/3/2009	8.13	3.68	NA	257	0.01	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-324	8/12/2010	7.76	0.78	986	-61	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-312	8/6/2012	7.96	0	0.944	-64	0.14	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-227	4/7/2014	8.49	0.24	1.1	18	0.02	0.00	NA	NA	NA	0.05 UJ	98	2.94	10.7	0.57	6.0
A-MW50	Mon-Saturated	SITE-A-09-313	8/3/2009	8.01	1.71	NA	266	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-313	8/1/2012	7.74	0	0.836	180	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-226	4/17/2014	7.17	2.47	NA	92	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW51	Mon-Saturated	SITE-A-09-314	8/3/2009	7.78	1.38	NA	257	0.08	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-312	8/9/2010	7.67	3.6	NA	240	0.04	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-403	10/27/2010	7.63	7.48	NA	370	0.03	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-102	1/19/2011	7.67	3.22	NA	216	0.00	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-201	4/25/2011	7.40	2.88	NA	204	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-315	8/1/2011	7.41	4.87	NA	332	0.01	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Site-A-11-402	10/27/2011	7.17	4.61	NA	233	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-109	1/26/2012	7.11	4.14	NA	182	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-203	4/10/2012	7.67	2.49	NA	231	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-315	7/31/2012	7.80	0	1.1 [7/]	188	0.04	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-402	10/29/2012	7.16	0.2	NA	200	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup) SITE-A-12-403	10/29/2012	7.16	0.2	NA	200	0.00	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-103	1/29/2013	7.06	1.12	NA	130	0.00	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-208	4/9/2013	7.69	0	NA	327	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-222	4/17/2014	8.14	3.11	NA	276	0.55	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW57	Mon-Saturated	SITE-A-09-401	11/30/2009	7.97	8.79	NA	217	0	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		(Dup) SITE-A-09-402	11/30/2009	7.97	8.79	NA	217	0	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-313	8/9/2010	7.65	7.5	NA	245	0.84 [5/]	0.49 [5/]	1.3 U	0.60 U	1.0 U	0.30 J	84	1.52	9.22	0.55	5.0 UJ
		SITE-A-10-404	10/27/2010	7.12	7.63	NA	357	0.03	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-103	1/19/2011	7.31	5.67	NA	227	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-202	4/25/2011	7.15	5.87	NA	177	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-11-316	8/1/2011	7.01	8.94 [4/]	NA	363	0.00	0.00	1.3 U	NA	NA	1.87	85.3	1.46	4.93	0.69	5.0 U
		SITE-A-11-404	10/27/2011	7.09	8.31	NA	285	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-110	1/26/2012	6.87	7.51	NA	199	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-204	4/11/2012	7.57	7.79	NA	260	0.22 [10/]	0.15 [10/]	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-12-317	7/31/2012	7.33	9.12 [4/]	NA	198	0.28	0.03	0.31 J	NA	NA	0.011 BJ	103	1.23	7.33	0.13 J	2.3 J
		SITE-A-12-404	10/29/2012	6.34	6.95	NA	185	0.07	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-104	1/29/2013	6.85	6.17	NA	130	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-13-210	4/9/2013	6.79	7.63	NA	374	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-223	4/17/2014	8.19	7.79	NA	278	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B-2 (Continued)
Summary of Field Parameters and Natural Attenuation Parameters by Well

Well ID	Well Type/Aquifer Depth Interval	Sample ID	Sample Date	Field Parameters							Natural Attenuation Parameters [3/]								
				pH	Dissolved Oxygen - Meter (mg/L) [1/]	Dissolved Oxygen - Test Kit (mg/L) [2/]	ORP (mV)	Ferrous Iron (mg/L)	Hydrogen Sulfide (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Nitrate-Nitrite (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	DOC (mg/L)	Dissolved Manganese (µg/L)
A-MW52	Mon-Saturated	SITE-A-09-315	8/3/2009	7.22	0.62	1.1 [7/]	262	0.06	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-10-314	8/9/2010	6.98	2.4	NA	274	0.00	0.01	1.3 UJ	0.60 U	1.0 U	0.76 J	92.9	10.4	15.30	0.61	5.0 U
		SITE-A-11-317	8/1/2011	6.81	4.45	NA	340	0.00	0.00	1.3 U	NA	NA	0.266	90.4	14.5	21.00	1.06	5.0 U
		SITE-A-12-316	7/31/2012	6.68	0.58	1.1 [7/]	192	0.00	0.01	1.3 U	NA	NA	0.6 J	89.4	8.2	14.2	0.33 J	5.0 U
		SITE-A-14-224	4/3/2014	7.46	3.31	NA	301	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW44	Mon-Saturated	SITE-A-09-311	8/4/2009	7.69	0.94	1.1 [7/]	270	0.07	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
		SITE-A-14-225	4/8/2014	7.49	0.00	918	330	0.08	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
A-MW58	Mon-Perched	SITE-A-14-228	3/26/2014	5.86	8.96	NA	428	0.00	0.03	1.3 U	NA	NA	0.061	37	2.75	4.60	0.79	31.1
A-MW59	Mon-Perched	SITE-A-14-229	3/24/2014	5.63	9.73	NA	414	0.04	0.14	1.3 U	NA	NA	0.25	24 UJ	1.73	3.02	0.62	5.10
A-MW60	Mon-Perched																	
A-MW61	Mon-Perched	SITE-A-14-231	3/24/2014	6.48	5.87	NA	275	0	0.04	1.3 U	NA	NA	0.40	115	2.15	9.87	0.73	101

Notes:

DOC - Dissoved Organic Carbon

Dup - Indicates sample is a duplicate collected and analyzed concurrently with the associated project sample.

Eh - oxygen reduction potential

mg/L - milligrams per liter

Mon-Perched - Monitoring of perched zone; Mon-Saturated - Monitoring of shallow aquifer

mV - millivolt

NA - Parameter not measured

pH - acidity based on hydrogen ion potential

µg/L - micrograms per liter

[1/] DO measured in the field using the Horiba; extraction pumps can entrain air resulting in elevated oxygen values.

[2/] DO measured in the field using the Hach DR-850 colorimeter method when the Horiba reading was < 1mg/L.

[3/] Natural attenuation parameters only collected during Annual sampling events beginning in August 2010 per the TO 23, and TO 38 Sampling and Analysis Plans.

[4/] DO values above 8 mg/L are considered out of range for typical well conditions and may indicate a problem with the probe or the introduction of air by extraction well pumps.

[5/] Test kit samples did not change to their indicator colors and therefore the high turbidity of the sample likley led to elevated readings.

[6/] Results for the August 2011 samples from A-EW4 through A-EW8 indicated improper well isolation (results reported in gray); wells were resampled in September 2011 to confirm values (results reported in black).

[7/] Value exceeded the test kit measurable limit of 1.1 mg/L.

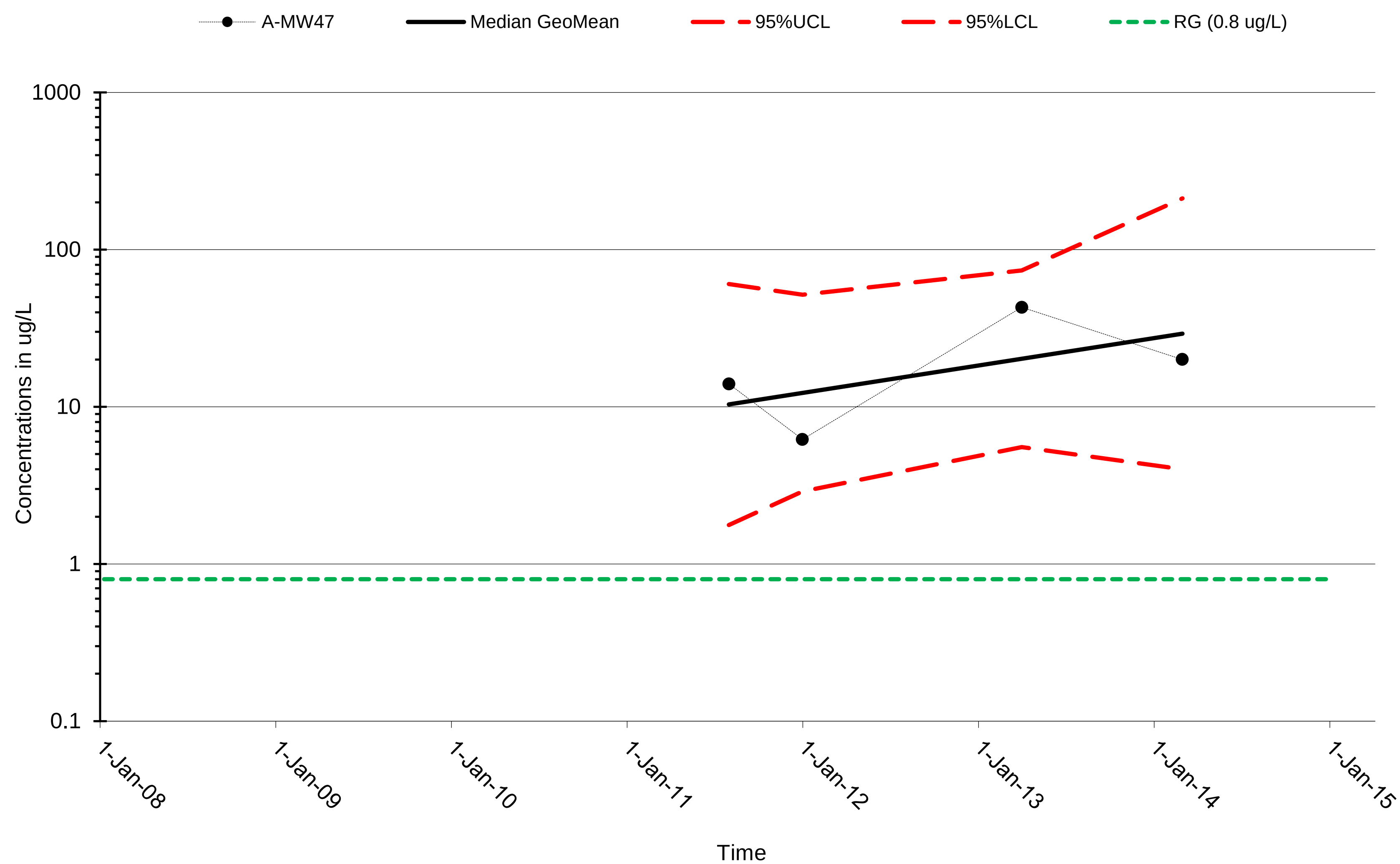
[8/] Water in well A-MW38 was slightly cloudy during the January 2012 sampling event which may have affected the ferrous iron and hydrogen sulfide test kit results.

[9/] Only one set of groundwater parameters was collected from well A-MW36 in April 2012. This was done in order to ensure enough water to collect a sample in April 2012 and was based on the small amount of water in well in April 2012 and its history of running dry during sampling.

[10/] Water in well A-MW57 was slightly cloudy during the April 2012 sampling event, which may have affected the ferrous iron and hydrogen sulfide test kit results.

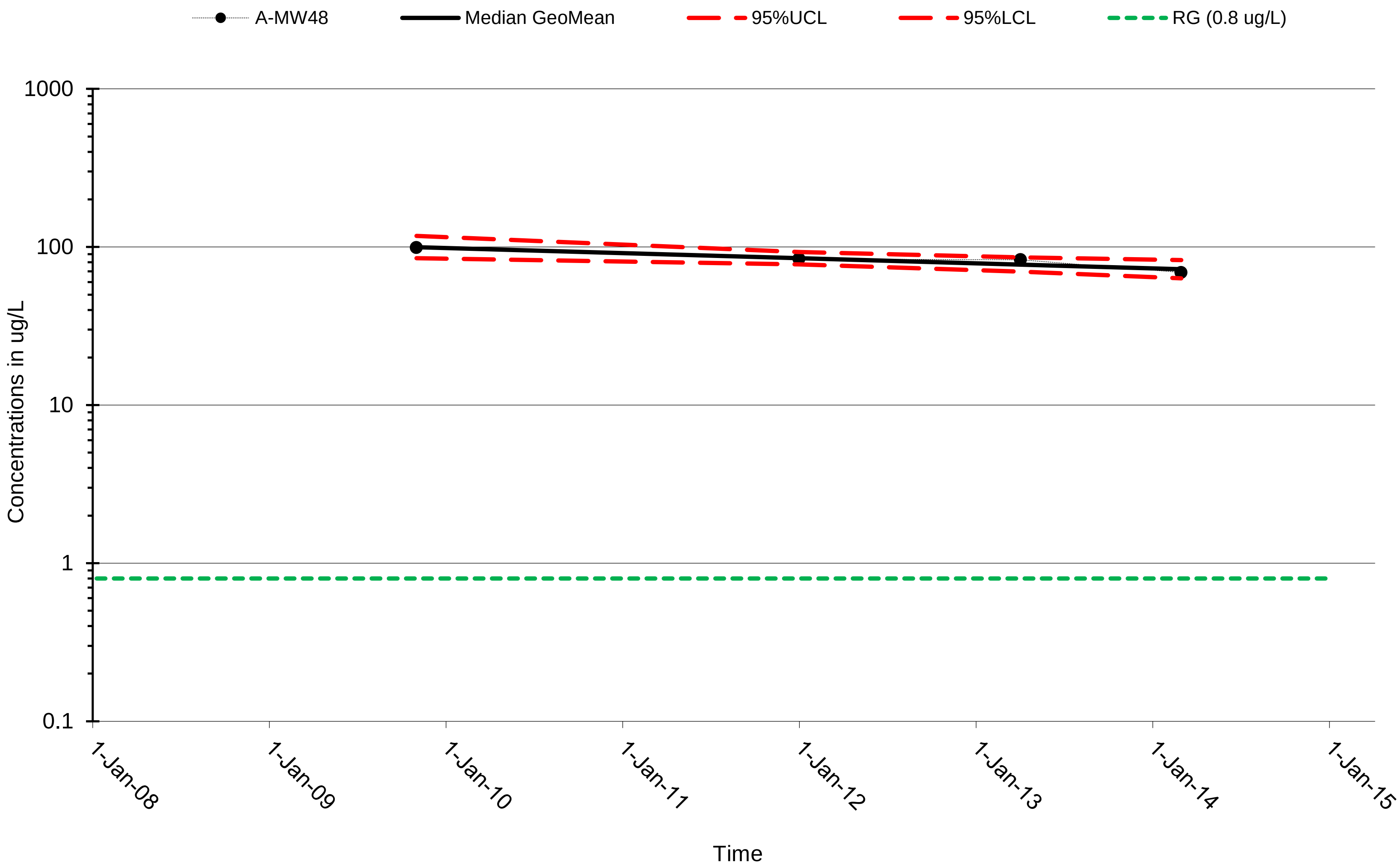
Gray highlight indicates plume centerline wells

APPENDIX B-2



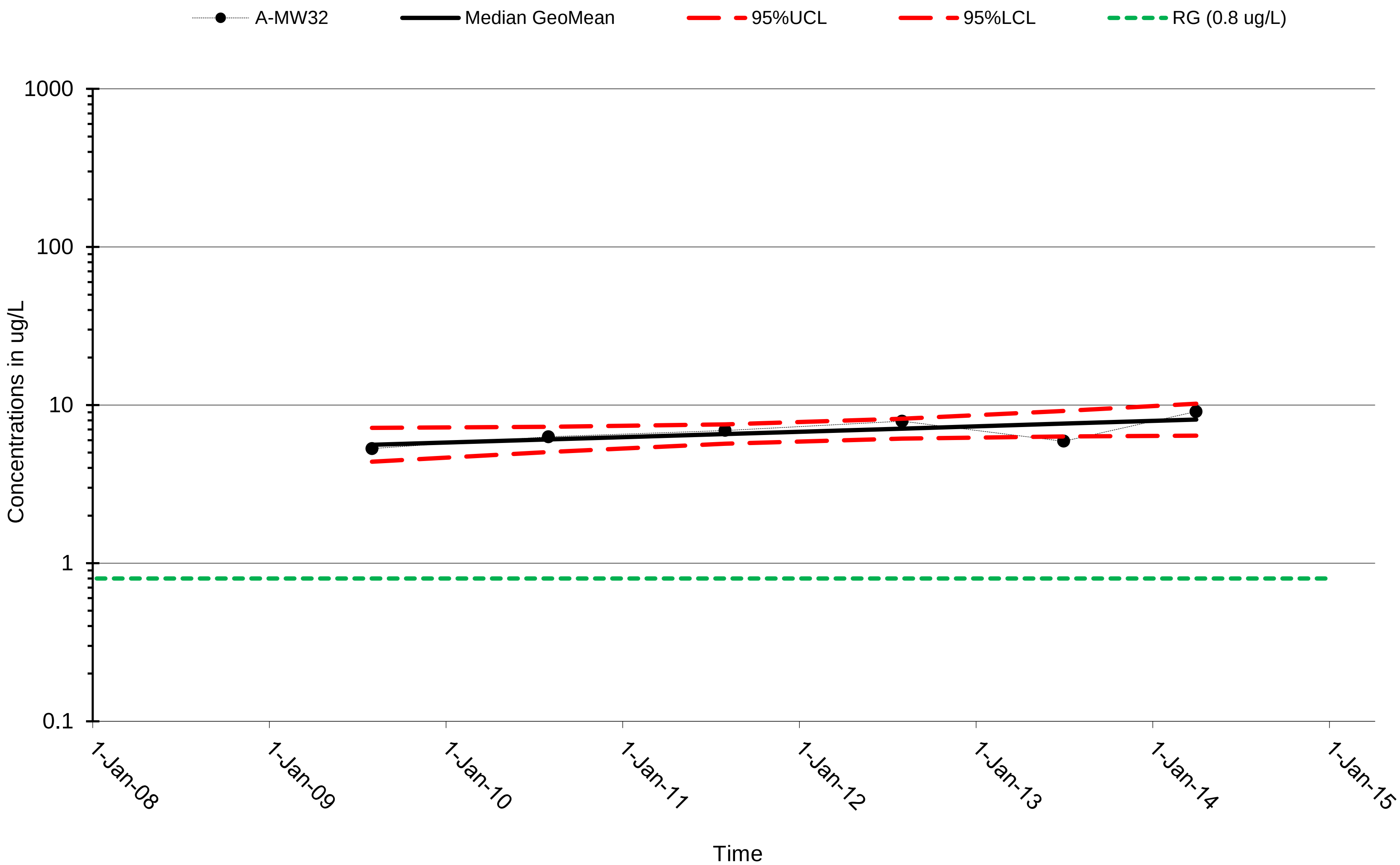
U.S. NAVY	**Figure B-1** **RDX in Source Perched Zone Well A-MW47**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_52.ai



U.S. NAVY	**Figure B-2** **RDX in Near Source Perched Zone Well A-MW48**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_53.ai

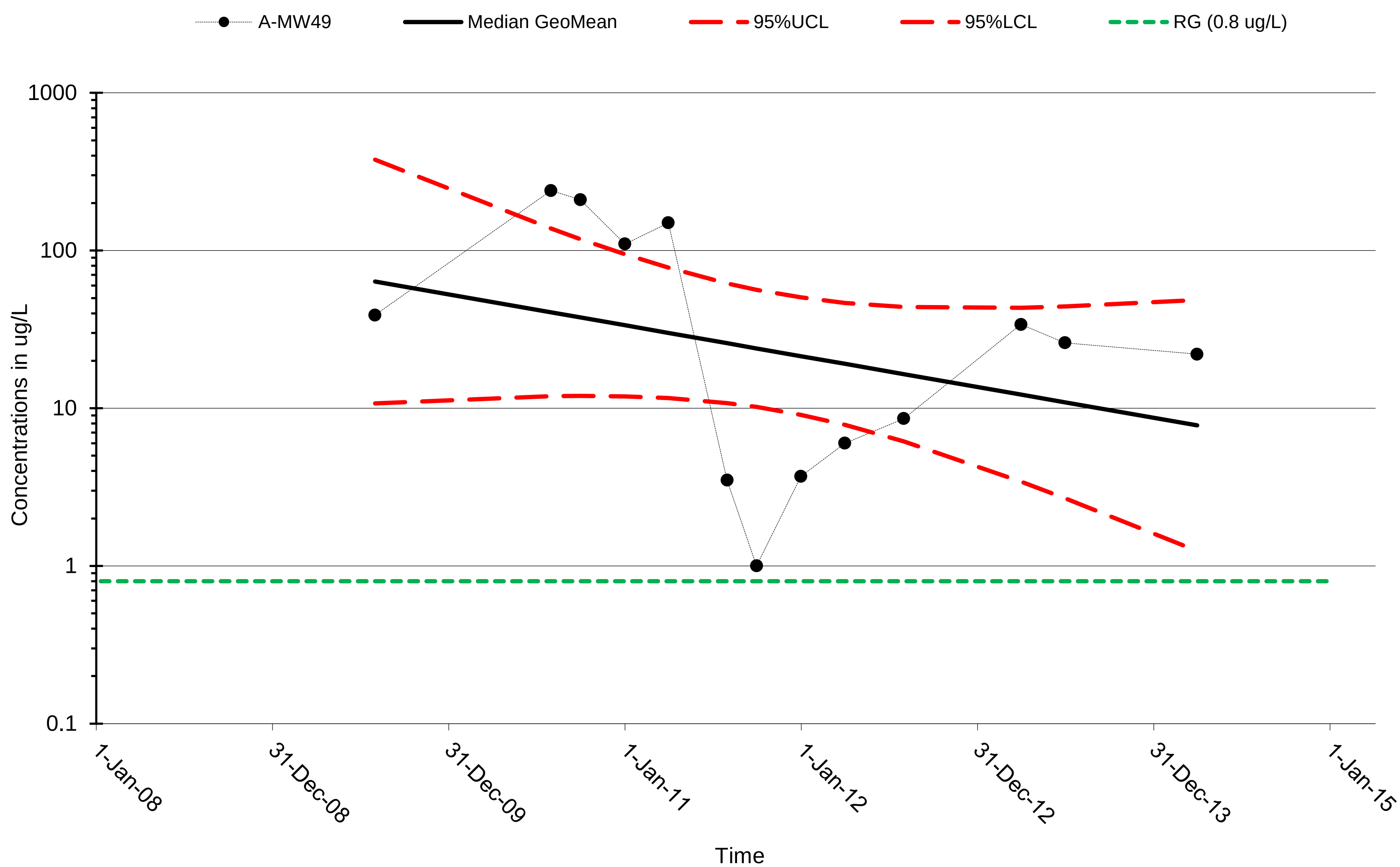


U.S. NAVY

Figure B-3
RDX in Near Source Shallow Aquifer Well A-MW32

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_54.ai

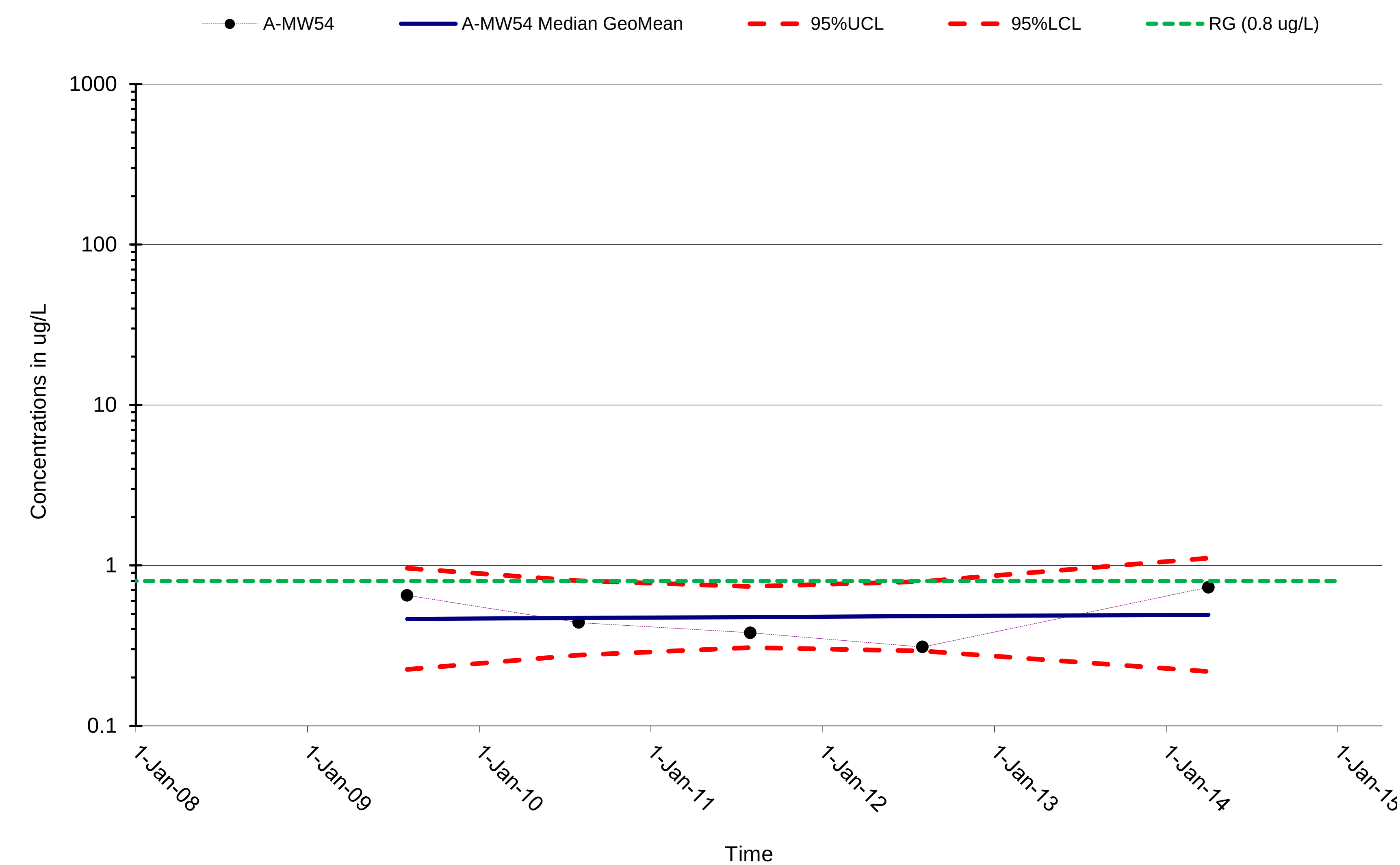


U.S. NAVY

Figure B-4
RDX in Downgradient Shallow Aquifer Well A-MW49

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_55.ai

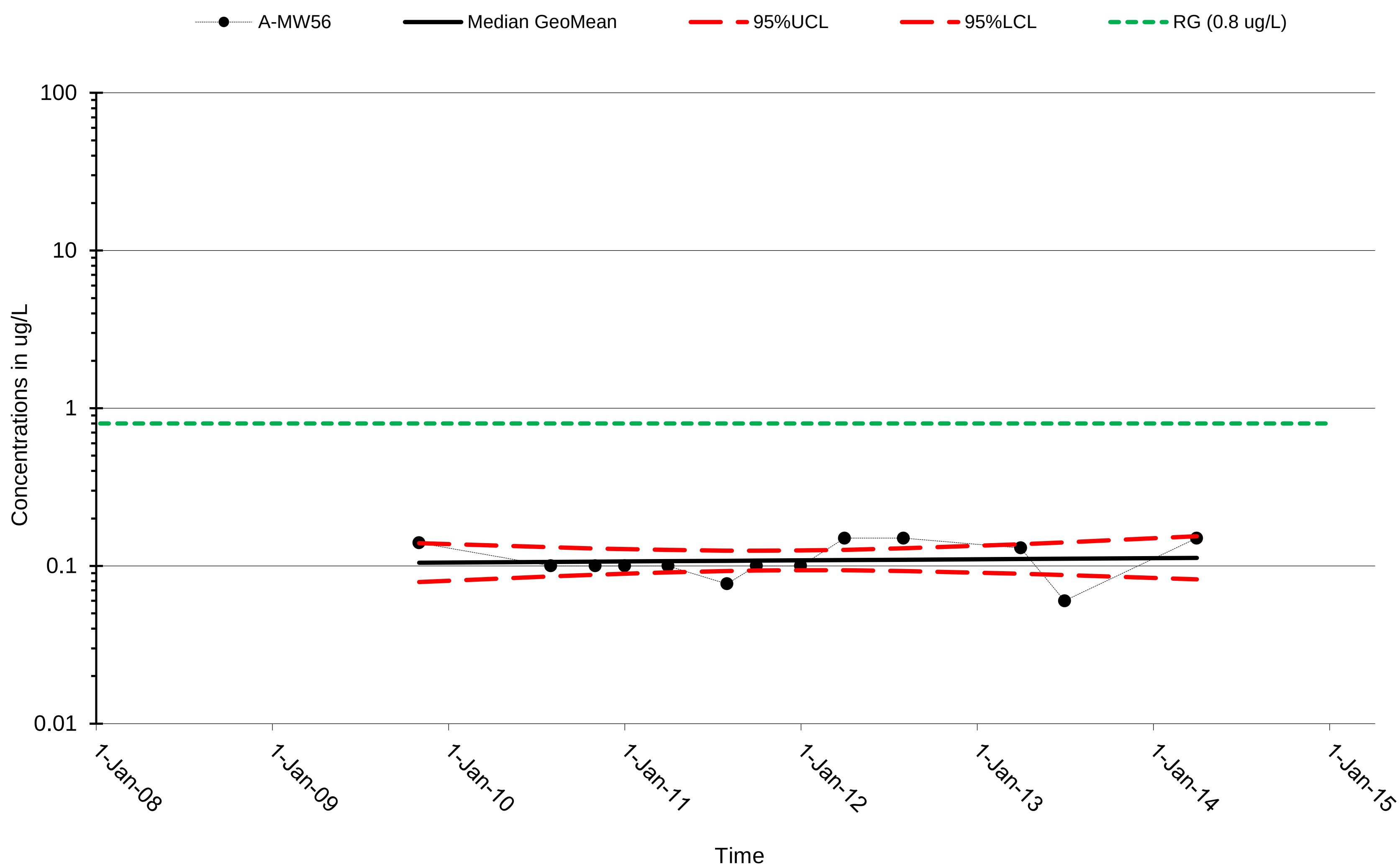


U.S. NAVY

Figure B-5
RDX in Downgradient Shallow Aquifer Well A-MW54

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_56.ai

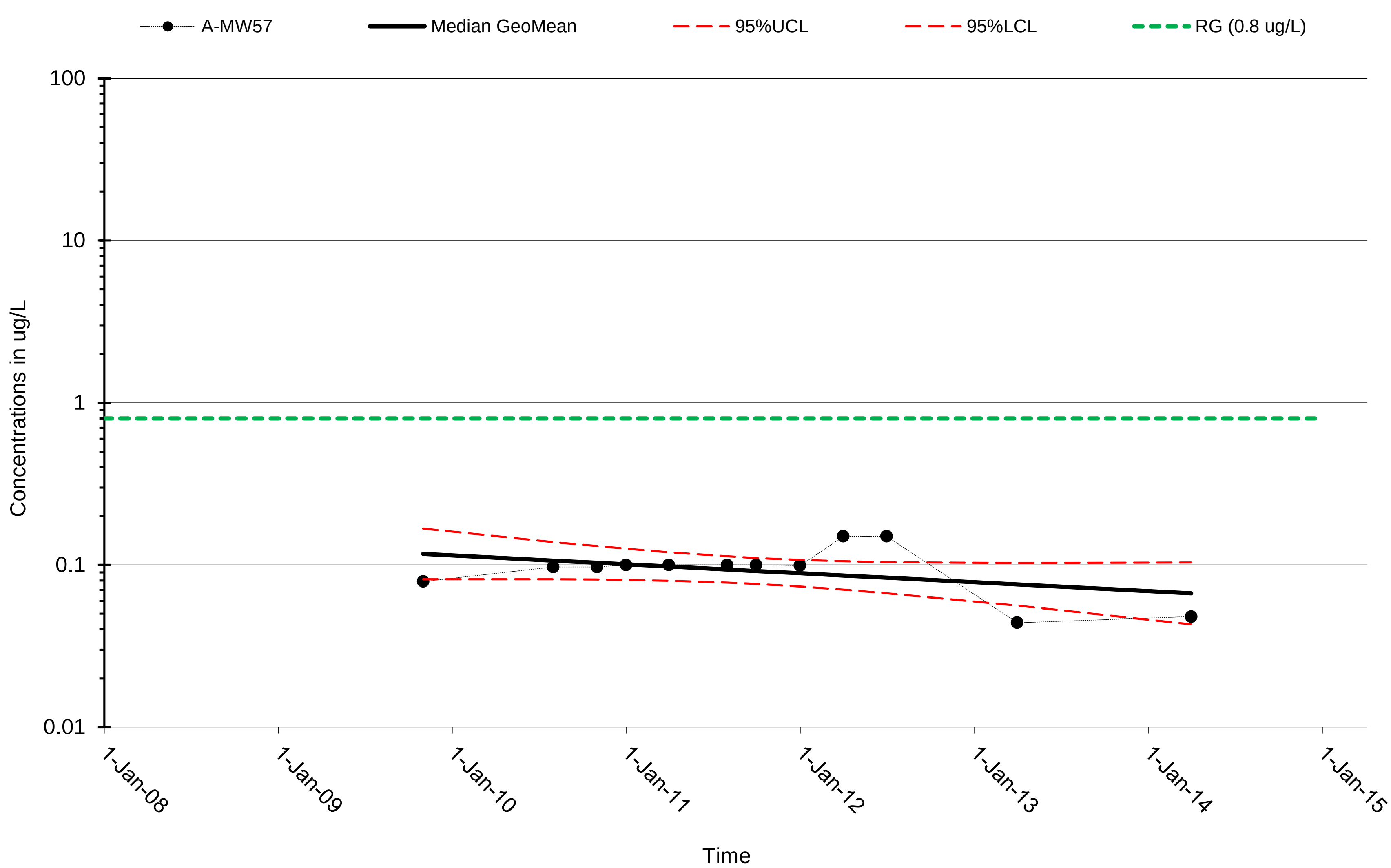


U.S. NAVY

Figure B-6
RDX in Downgradient Shallow Aquifer Well A-MW56

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_57.ai

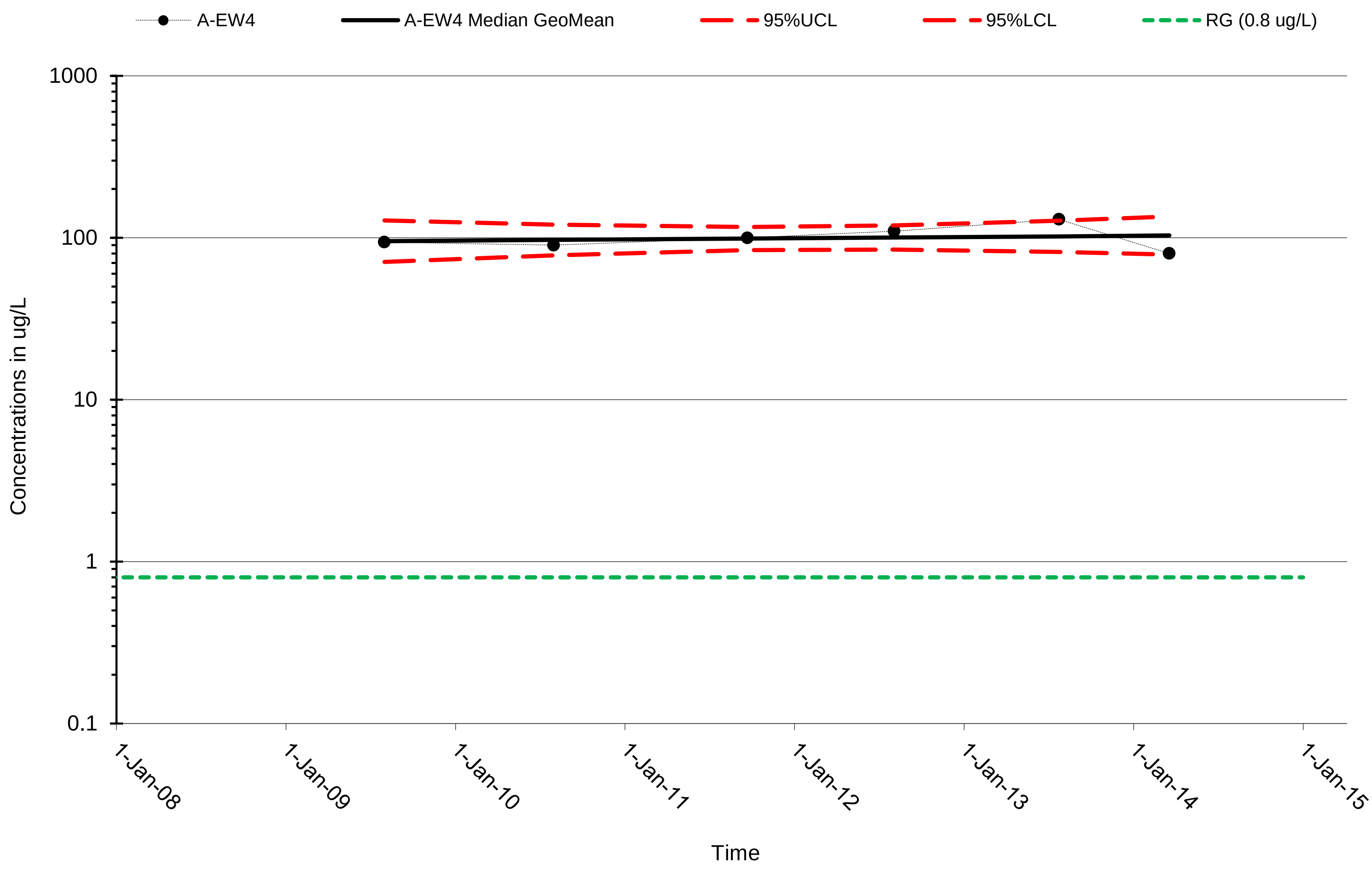


U.S. NAVY

Figure B-7
RDX in DowngradientShallow Aquifer Well A-MW57

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_58.ai

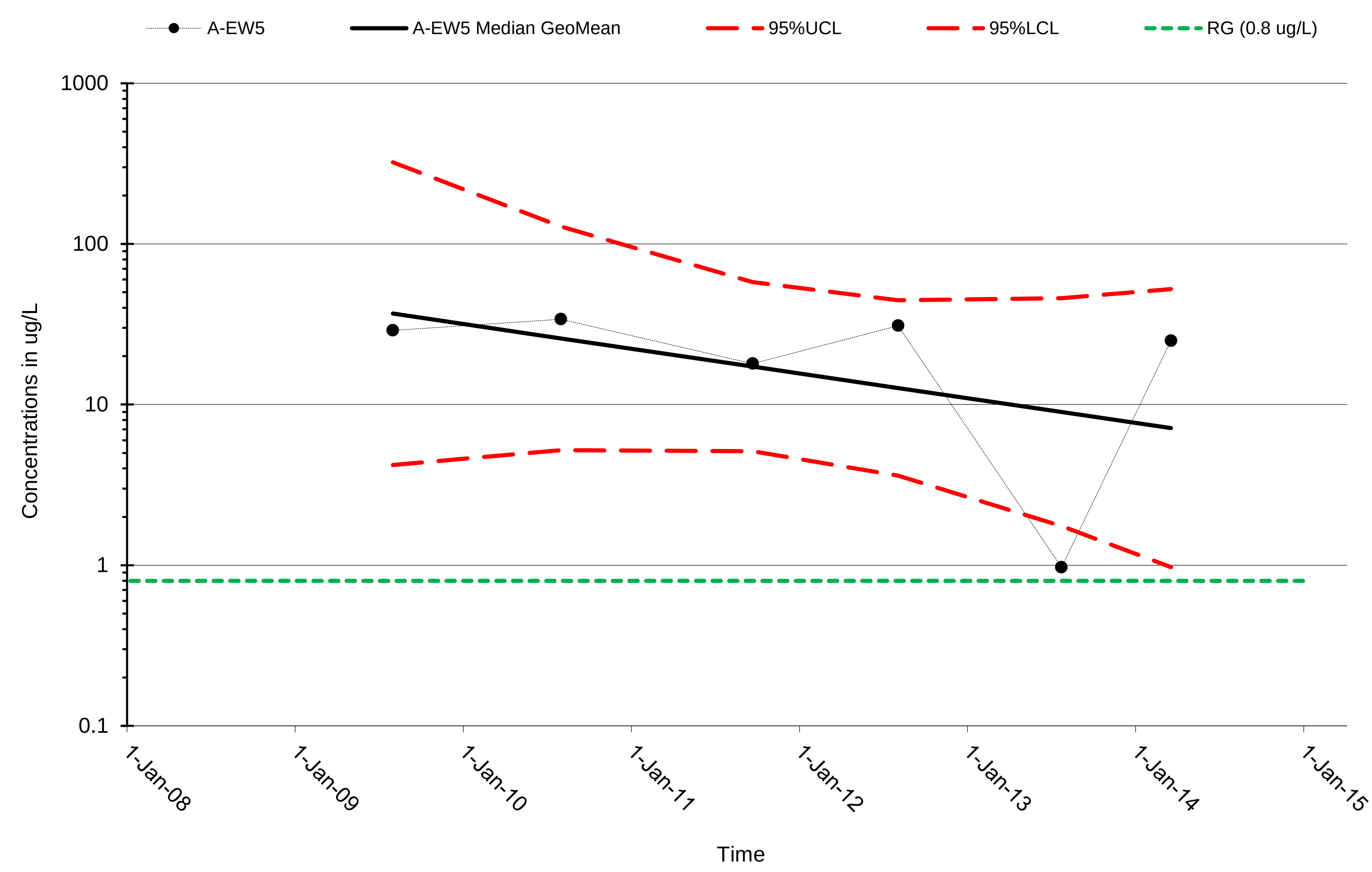


U.S. NAVY

Figure B-8
RDX in Extraction Well A-EW4

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_59.ai

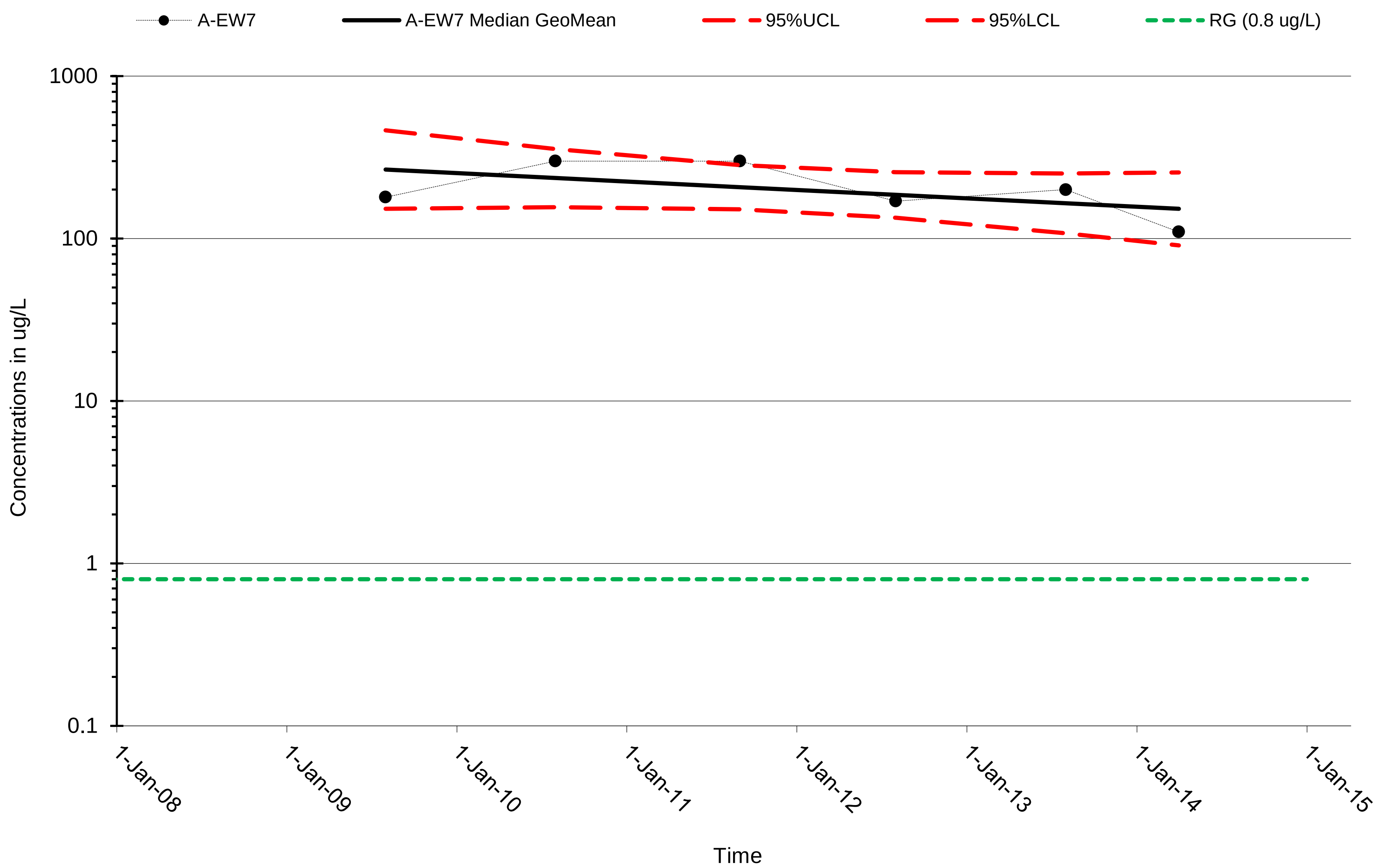


U.S. NAVY

Figure B-9
RDX in Extraction Well A-EW5

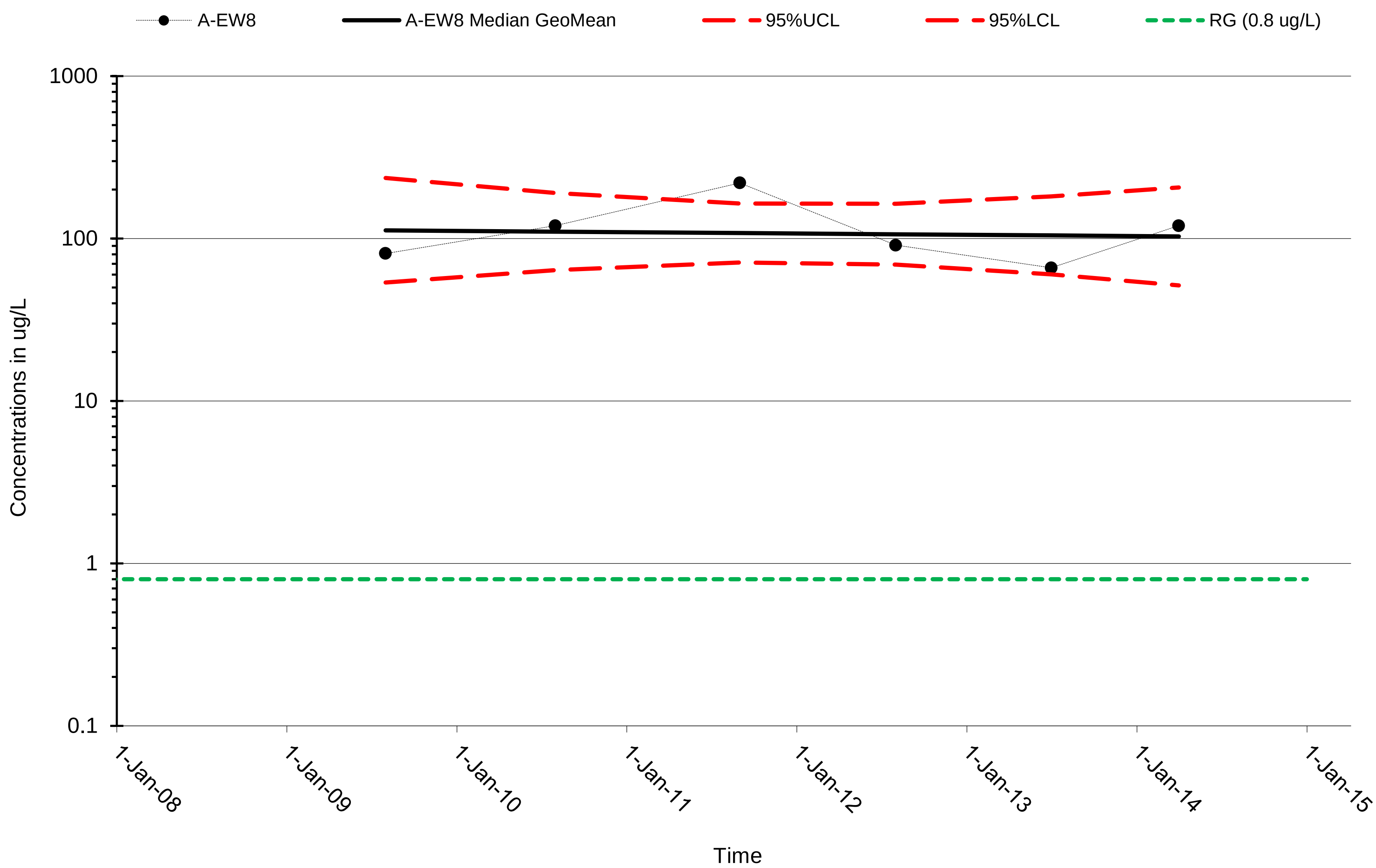
NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_60.ai



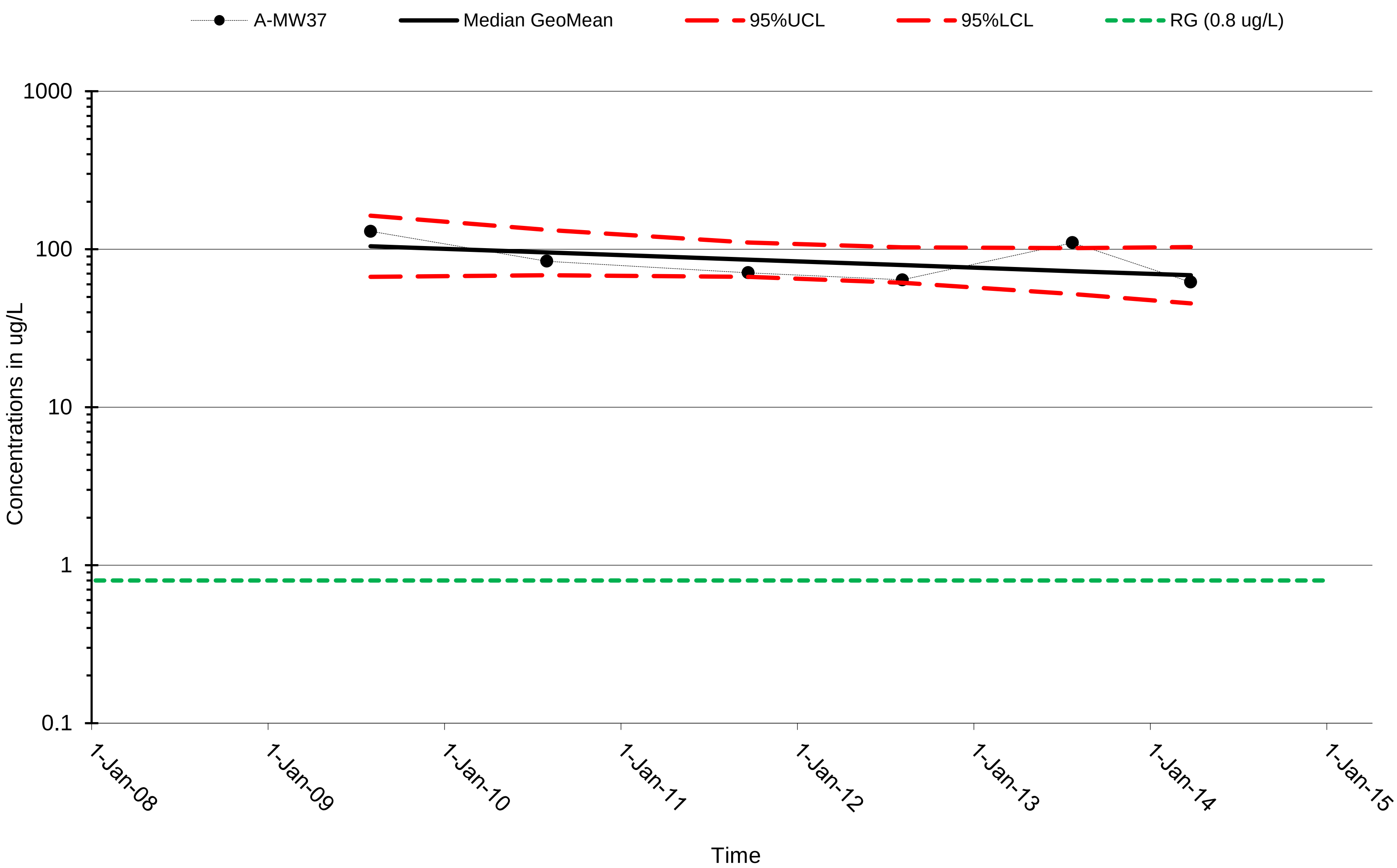
U.S. NAVY	**Figure B-10** **RDX in Extraction Well A-EW7**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_61.ai



U.S. NAVY	**Figure B-11** **RDX in Extraction Well A-EW8**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_62.ai



U.S. NAVY

Figure B-12
RDX in Source Shallow Aquifer Well A-MW37

NBK Bangor
FOURTH
5-YEAR REVIEW

APPENDIX B-3

Data Reduction

Analytical data used for these trend analyses were obtained for individual wells from available concentration data for samples collected between April 2009 and May 2014. Available data were evaluated for duplicate results and reduced according to standard data reduction procedures. Rejected results were removed in favor of nonrejected results. If both results were flagged not detected, the smaller of the two values was retained. If both results were detected concentrations, the larger of the two values was retained. If one value was not detected and one value was detected, the detected value was retained.

Methodology

The methodology used to estimate the concentration trend is summarized as follows:

- Log-transform the concentration data for a designated chemical of concern and well
- Transform time into the decimal equivalent in years, with zero set at the earliest sample date for a given well and 1 equal to one calendar year
- Plot the log-transformed concentration data against time
- Compute the concentration decay rate as the slope of the log-transformed concentration data against time.
- Calculate the 95 percent upper confidence limit on the concentration decay rate of the log-transformed concentration data as a function of time.
- Calculate the 95 percent lower confidence limit on the concentration decay rate of the log-transformed concentration data as a function of time.

The slope of the decay rate and confidence limits are then used to determine the confidence in the null hypothesis that the log-transformed concentration data possess a negative decay rate (concentrations are decreasing with time). The rationale for this determination is summarized in Table B-3.

These analyses can also estimate the time until the target analyte concentration reaches the RG by estimating the concentration at one-year intervals into the future based on the concentration decay rate calculated using data from this 5-year review period.

Table B-3
Rationale for Determination That Concentrations Are Decreasing With Time

Slope of 95% UCL	Slope of Decay Rate	Slope of 95% LCL	Confidence That Trend Is Downward	Interpretation of Results
Negative	Negative	Negative	>95%	Decreasing Trend
Positive	Negative	Negative	<95% but >50%	Flat to Decreasing
Positive	Positive	Negative	<50% but >5%	Flat to Increasing
Positive	Positive	Positive	<5%	Increasing Trend

Notes:
UCL - upper confidence limit
LCL - lower confidence limit

APPENDIX C

OU 2 Site F Data

APPENDIX C-1

Table C-1 - RDX Analytical Results Compilation for the Shallow Aquifer at Site F

RDX in µg/L																											
Well No.	Dec-94	Feb-95	Apr-95	Jun-95	Aug-95	Oct-95	Dec-95	Feb-96	Apr-96	Jun-96	Aug-96	Oct-96	Jan-97	Apr-97	Jun-97	Jul-97	Aug-97	Sep-97	Oct-97	Nov-97	Dec-97	Jan-98	Feb-98	Mar-98	Apr-98	May-98	Jun-98
Monitoring Wells																											
F-MW21	150						120																				
F-MW24	Dry						720																				
F-MW27	280	240	210	170	140	140	150	150	140	160	150		130									69					
F-MW31	480 J	370	230	190	230	300	350	360	210	190	250	180	380	280		160			180 J			370			320		
F-MW32	54						53						9.1									3.5					
F-MW33	870	820	660	620	930	1,200	1,100	1,100	770	840	1,100	880	580	420		400			420			350			320		
F-MW35	33						7.6						110									32					
F-MW36	240	240	310	350	420	390	340	350	520	620	600	610		550		430			380								
F-MW37	3.0						2.4						3.0									2.4					
F-MW38	880	1,800	1,100	1,100	1,100	1,200	1,000	1,100	3,100	1,100	1,200	1,200	1,200	1,100		1,300			1,100			1,000			710		
F-MW39	860	910	1,100	1,200	1,200	1,300	940	1,100	2,700	1,100	1,200	1,300	1,200	1,000		1,400			1,100			1,700			1,200		
F-MW40	0.95 U			0.95 U			0.95 U			0.95 U			0.95 U									0.27 J					
F-MW41	0.95 U	2.0	2.9	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.2 J			0.35 J		
F-MW42	1.6	6.9	22	50	68	100	110	150	90	120	97	90	60	32		25			13			6.2			3.6		
F-MW43	0.95 U			2.4 U			0.95 U			0.95 U			0.95 U									0.22 J					
F-MW44	1.0 J	0.95 U	0.95 U	2.4 U	1.0	0.95 U	0.95 U	0.95 U	0.93 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.95 U			0.95 U		
F-MW45	1.6						1.8			1.9			1.4									0.66 J					
F-MW46	0.95 U			0.95 U			0.95 U			0.95 U			0.95 U									0.95 U					
F-MW48	22						29						300									280					
F-MW51	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	2.9 U	0.95 U	0.95 U		250									0.28 J					
F-MW52	72	0.95 U	0.95 U	0.95 U	0.21 J	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U	47		670									5.4					
F-MW53	990	1,100	700	430	420	370	300	290	160	250	210		1,000									320					
F-MW54	0.95 U						0.95 U																				
F-MW54S	1,100	1,100	780	820	790	780	590	290	98	100	120	270	200	95		600			630			120			69		
F-MW55	7.8	4.1	5.5	4.5	3.6	6.1	7.4	3.1	5.8	5.5	5.7		7.7									180			910		
F-MW55M												1,000	760	460		1,100			1,000			1,300					
F-MW56	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	2.3 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.95 U			0.95 U		
F-MW57	0.95 U	0.95 U	0.95 U	0.95 U	0.31 J	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.95 U			0.95 U		
F-MW58	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.1 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.95 U			0.95 U		
F-MW59												660	230	520		770			850			700			590		
F-MW60												0.95 U	0.95 U	0.95 U		0.95 U			0.95 U			0.95 U			0.95 U		
F-MW61												0.95 U	0.95 U	11	23	75	130		70	64	52	45	44	36	30	25	21
F-MW62												520	540	280		170	70		100	71	74	57	54	31	35	32	27
F-MW63															0.95 U			0.95 U	0.95 U	0.22 J	1.8	1.3	11	14	15	31	34
F-MW64																		6.5	8.8	8.4	7.6	7.3	7.9	7.9	4.7	4.2	3.8
F-MW65																										0.95 U	0.95 U
F-MW66																											
F-MW67																											
F-MW68																											
F-MW69																											
F-MW70																											
F-MW71																											
Extraction Wells																											
F-EW1	1,300	670	470	450	410	350	360	330	240	270	250	250	240	200					390			200			160		
F-EW2	540	800	580	590	510	420	510	480	450	430	350	460	330	360		80			43			280			250		
F-EW3	1,100	450	370	390	330	290	300	280	310	260	220	240	220	210		220			170			200			160		
F-EW4	9.5	8.8	15	22	38	81	110	110	160	180	190		300	290		280			260			250			250		
F-EW5	320	64	60	65	77	72	82	91	98	110	120		400	190		160			140			140			120		
F-EW6	1,100	850	620	680	660	590	570	640	520	530	450		1,100	480		400			310			270			200		
F-EW7												170	76	87		82			92			60			62		
F-EW8												660	590	540		470			450			370			320		
F-EW9													1,100			630			590			520			450		
F-EW10													1,200	970		670			730			580			620		

Notes:

Switched results to correct-TCG

RDX groundwater cleanup level is 0.8 ug/L.
Blank spaces indicate sample not collected on that date.
U – Not detected at associated detection limit.
D – The reported value is from a diluted reanalysis.
P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported
J – Detected below routine reporting limit. This value should be considered an estimate
PG - The % difference between the original and confirmation analyses is greater than 40%

Table C-1 - RDX Analytical Results Compilation for the Shallow Aquifer at Site F

RDX in µg/L																												
Well No.	Jul-98	Aug-98	Oct-98	Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Oct-99	Jan-00	Apr-00	Jul-00	Oct-00	Jan-01	Apr-01	Jul-01	Oct-01	Jan-02	Apr-02	Jul-02	Oct-02	Jan-03
Monitoring Wells																												
F-MW21																												
F-MW24																												
F-MW27							54													35								26 J
F-MW31	8.4			290			270			330			260			260		290		51		60 J		56		170		68 R
F-MW32							3.8													8.6								7.6 UJ
F-MW33	350			310			550			200			290			230		170		210		220		250		170		290 J
F-MW35							690													790								420
F-MW36																												
F-MW37							2.6													4.5								4.9
F-MW38	620			89			280			280			280			200		120		120		28		86		57		59 J
F-MW39	1,000			1,000			1,300			1,400			2,700			1,900		980		1,500		2200		3800		1200		2600
F-MW40							0.95 U													0.35 U								0.81 U
F-MW41	0.95 U			130			1.1			12			1.9 U			10		9.2		8.3		6.7		6.8		3.9		6.0 J
F-MW42	2.7			2.4			2.5			2.2			2.3			2.0		1.6		1.3		0.97		0.81		1.0		1.2 UJ
F-MW43							0.95 U													0.82 U								0.87 UJ
F-MW44	0.95 U			0.95 U			0.95 U			0.95 U			0.84 U			1.0 U		1.6 U		0.47 U		1 U		0.55 U		0.56 U		4.4 J
F-MW45							0.61 J													0.83 U								0.61 U
F-MW46							0.95 U													0.60 U								0.52 UJ
F-MW48							280													200								410
F-MW51							0.95 U													0.55 U								1.1 UJ
F-MW52							8.4													1.9								1.0 UJ
F-MW53							100													23								11 J
F-MW54																												
F-MW54S	160			140			60			25			66			31		21		37		35		28		21		18 J
F-MW55							42													240								730 J
F-MW55M	1,100			1,400			1,100			1,100			1,300			1,300		210		880		820				950		320
F-MW56	0.95 U			0.95 U			0.95 U			0.95 U			1.1 U			1.6 U		0.79 U		0.99 U		0.46 U		0.95 U		0.87 U		1.2 UJ
F-MW57	0.95 U			0.95 U			0.95 U			0.95 U			0.84 U			0.86 U		0.64 U		0.77 U		0.47 U		0.99 U		0.52 U		0.65 UJ
F-MW58	0.95 U			0.95 U			0.95 U			0.95 U			0.62 U			1.2 U		0.77 U		0.49 U		0.53 U		0.74 U		0.68 U		0.78 UJ
F-MW59	500			380			400			360			340			220		180		130		100		120		130		100
F-MW60	0.95 U			0.95 U			0.95 U			0.95 U			1.1 U			1.2 U		0.29 U		0.34 U		0.49 U		0.52 U		0.83 U		1.2 UJ
F-MW61	19	17		14	13	11	11	10	0.95 U	7.6	6.4	5.7	5.6	4.9	4.1	3.4	4.4	2.5	3.1	2.3	2.8	1.8	2.1	4.1	4.6	2.8	3.0	2.7 J
F-MW62	26	26		22	22	20	18	15	16	13	13	12	12	14	12	11	9.3	7.3	8.1	6.9	6.9	5.4	6.2	5.6	5.9	4.2	6.5	6.2
F-MW63	54	63	0.95 U	350	100	110	120	110	150	100	95	93	96	110	98	91	77	60	41	51	47	43	41	32	35	23	32	28 J
F-MW64	3.0	3.7	0.95 U	2.5	100	2.6	2.5	2.3	2.7	2.5	2.4	1.6	1.7	1.2	0.93	1.2 U	0.57 U	1.3 U	0.84 U	0.94 U	1.0 U	0.53 U	0.58 U	1.1 U	0.94 U	0.83 U	0.59 U	0.98 J
F-MW65	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.4 U	0.42 U	0.61 U	1.3 U	0.65 U	0.52 U	0.75 U	0.61 U	0.82 U	0.58 U	0.4 U	0.7 U	0.97 U	0.83 U	0.43 U	0.12 U	0.96 UJ
F-MW66																												
F-MW67																												
F-MW68																												
F-MW69																												
F-MW70																												
F-MW71																												
Extraction Wells																												
F-EW1	150			110			120			91			93			87		70		58		56		66		47		56
F-EW2	210			170			190			160			180			150		120		100		100		110		77		81
F-EW3	160			130			160			130			97			110 J		83		81		79		87		71		73
F-EW4	240			210			140			260			250			250		190		220		150		170		160		150
F-EW5	170			130			110			140			110			120		87		84		86		77		62		65
F-EW6	140						110			91			84			60		56		43		36		33		22		23
F-EW7	50			47			44 J			56			54			40		26		23		19		20		16		15 J
F-EW8	320			230			270			190			240			170		140		130		110		120		76		100
F-EW9	460			340						340			320			230		200		180		150		180		140		140
F-EW10	600			510			530			520			510			420		350		360		310		320		360		220

Notes:

RDX groundwater cleanup level is 0.8 ug/L.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported

J – Detected below routine reporting limit. This value should be considered an estimate.

PG - The % difference between the original and confirmation analyses is greater than 40%.

Table C-1 - RDX Analytical Results Compilation for the Shallow Aquifer at Site F

RDX in µg/L																														
Well No.	Apr-03	Jul-03	Oct-03	Jan-04	Feb-04	Apr-04	Jul-04	Oct-04	Jan-05	Apr-05	Aug-05	Oct-05	Jan-06	Apr-06	Jul-06	Oct-06	Jan-07	Apr-07	Jun-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	Aug-09	Oct-09	Jan-10	Apr-10
Monitoring Wells																														
F-MW21																														
F-MW24																														
F-MW27									20								19									11				
F-MW31		120 UJ					130.0		140 J		140 J		84 J		90 J		67 D				120	37				57 DP				26 JD
F-MW32									1.5								0.51 U									0.5 U				
F-MW33		180					200.0		170		200		180 J		140 J		220 D				130	74				160 D				140 D
F-MW35									140								220 D									590 D				
F-MW36																														
F-MW37									4.9								0.52 U									3.7				
F-MW38		46					46.0		36		36		32		38		23				16	20				18				16
F-MW39		2000					820.0		1800		2500		1000 J		1300 J		570 D				630	740 D				1400 D				520 D
F-MW40									0.5 U								0.50 U									0.49 U				
F-MW41		3.8					3.9		3.6		2.9		2.6		1.7 J		2.1		1.0		1.5	1.7		1.2		0.93		0.56		0.57
F-MW42		0.65 J					0.9		1.1		0.97		1.0		1.2		1.1		0.91		0.86	0.63		0.69		0.75		0.77		0.42
F-MW43									0.48 U								0.52 U									0.49 U				
F-MW44		6.9					28.0		50		52		49		42		63 D				96	160 D				240 D				830 D
F-MW45									0.51 U								0.53 U									0.49 U				
F-MW46									0.49 U								0.53 U									0.49 U				
F-MW48									830								990 D									2,900 D				
F-MW51									0.54 U								0.51 U									0.49 U				
F-MW52									0.49 U								0.53 U									0.49 U				
F-MW53									4.7								4.9									3.1				
F-MW54																														
F-MW54S		6.4					12.0		9.9		9.4		9.2		6.1		7.7				5.7	11				9.7				4.9
F-MW55									470								400 D									220 D				
F-MW55M		240					150.0		110		96		150 J		25 J		120 D				70	60 D				110 D				39
F-MW56		1.4 UJ					0.5 U		0.49 U		0.48 U		0.53 U		0.49 U		0.54 U									0.49 U				
F-MW57		0.57 UJ					0.6 U		0.48 U		0.49 U		0.50 U		0.48 U		0.53 U									0.48 U				
F-MW58		0.79 UJ					0.53 U		0.49 U		0.48 U		0.49 U		0.49 U		0.54 U									0.51 U				
F-MW59		99					110		95		90		89 J		89 J		85 D									61				
F-MW60		1.3 UJ					0.5 U		0.49 U		0.49 U		0.49 U		0.48 U		0.52 U									0.49 U				
F-MW61	1.8	1.7 J	1.5			0.49 U	0.5 U	0.49 U	0.48 U	0.5 U	0.50 U	0.49 U	0.52 U	0.49 U	0.48 UJ	0.48 U	0.52 U				0.49 U	0.53 U				0.48 U				0.24 U
F-MW62	4.9	4.0	3.6			0.66	0.6	0.52 U	0.48 U	0.5 U	0.52 U	0.48 U	0.51 U	0.51 U	0.48 U	0.49 U	0.53 U				0.51 U	0.53 U				0.49 U				0.15 J
F-MW63	21	18	15			19	17	16	16	13	15	15	13	12	9.9	8.7	8.8	7.1	5.7	6.5	5.6	5.2	5.0	5	4.3	4.9	4.6 PG	3.8	3.8	3.6
F-MW64	0.95	0.98	0.63			1.0	1.40	0.9	0.89	0.93	1.8	1.5	0.93	1.1	0.93	0.93	1.0	1.2	1.0	1.0	0.98	0.61	0.59	0.56	0.66	0.72	0.76	0.8	0.69	0.75
F-MW65	0.53U	0.92 UJ	0.62 U			0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.48 U	0.5 U	0.48 UJ	0.50 U	0.50 U				0.49 U	0.54 U	0.50 U			0.48 U				0.18 J
F-MW66					0.49 U						0.49 U	0.50 U	0.48 U	0.5 U	0.49 U	0.50 U	0.50 U	0.50 U	0.50 U	0.48 U	0.49 U	0.53 U	0.50 U	0.5 U	0.49 U	0.48 U	0.25 U	0.24 U	0.25 U	0.25 U
F-MW67					3.9				3.5	2.6	3.1	3.1	3.6	2.4	3.1	3.7	4.0	2.8	2.4	3.5	3.8	2.9	3.3	4.8	4.5	4.6	4.7	4.1	4.6	3.7
F-MW68					3.9				4.5	4.3	5.6	5.1	5.4	5	7.3 PJ	4.9	6.0	5.8	4.7	4.5	3.8	2.9	3.4	3.6	3.5	3.5	3.5 PG	3.8	3.2	3.1
F-MW69					0.49 U						0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.51 U	0.50 U	0.49 U	0.49 U	0.48 U	0.53 U	0.19 U	0.26 J	0.34 J	0.49 U	0.23 J	0.2 J	0.18 J	0.16 J
F-MW70																														
F-MW71																														
Extraction Wells																														
F-EW1		38					50		49		45		46		220 ENJ		48				35	29				31				31
F-EW2		55					70		58		57		65 J		62 EJ		60 D				47	43				40				36
F-EW3		57					49		50		48		47		47		49				43	32				31				31
F-EW4		130					140		140		120		120 J		130 EJ		120 D				91	91 D				86 D				91
F-EW5		56					61		56		53		55		74 EJ		58 D				45	46				43				42
F-EW6		19					18		20		18		15		12		12				9.5	9.3				8.4				6.1
F-EW7		15					15		12		14		11		11		13				9.9	10				10				7.2
F-EW8		80					96		84		68		78 J		75 EJ		76 D				67	60 D				58 D				60
F-EW9		130					80		88		76		73 J		76 EJ		72 D				53	65 D				54 D				60
F-EW10		180					190		160		150		150 J		120 EJ		120 D				75	87 D				77 D				70

Notes:

RDX groundwater cleanup level is 0.8 ug/L.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported

J – Detected below routine reporting limit. This value should be considered an estimate.

PG - The % difference between the original and confirmation analyses is greater than 40%.

Table C-1 - RDX Analytical Results Compilation for the Shallow Aquifer at Site F

RDX in µg/L																		
Well No.	Jul-10	Oct-10	Jan-11	Mar-11	Apr-11	Jul-11	Oct-11	Jan-12	Apr-12	Aug-12	Oct-12	Jan-13	Apr-13	Jul-13	Nov-13	Dec-13	Jan-14/Feb-14	Mar-14	Mar-14
Monitoring Wells																			
F-MW21																			
F-MW24																			
F-MW27					9.2								8.6						
F-MW31					30				58 Q				36 D,M				77 D		
F-MW32					0.32								0.62						
F-MW33					110				120 Q				76 D						
F-MW35					59								160 D						
F-MW36																			
F-MW37					2.9								2.2						
F-MW38					16				19				16				16		
F-MW39					230				380 Q				160 D				87 D		
F-MW40																	0.15 U		
F-MW41		0.56			0.49		0.47		0.47		0.15 U		0.39	0.43			0.49		
F-MW42		0.45			0.42		0.48		0.64		0.35		0.52	0.54			0.32		
F-MW43																	0.12 J		
F-MW44					880				920 Q				1,400 D				1600 D		
F-MW45																	0.16		
F-MW46																	0.15 U		
F-MW48						2,200							610 D						
F-MW51																	16		
F-MW52																	1.1		
F-MW53					2.9								2.6						
F-MW54																			
F-MW54S					3.2				4.8				2.6				5.8		
F-MW55					160								120 D						
F-MW55M					25				58 Q				22 D						
F-MW56					0.10 U								0.15 U						
F-MW57					0.10 U								0.052 J						
F-MW58					0.10 U								0.15 U						
F-MW59					59								55 D						
F-MW60					0.10 U								0.15 U						
F-MW61					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW62					0.10 U				0.11 J				0.057 J				0.068 J		
F-MW63	3.1	3.2	2.8		0.10 U	2.7	2.6	2.5	2.5	3.1	2.1	1.7	1.7	2.4	1.7		2.2		1.5
F-MW64	3.1	0.61	0.52		0.72	1.2	0.99	0.78	0.88	1.0	0.74	0.47	0.98	1.1	0.56		0.76		0.87
F-MW65					0.19				0.17				0.18				0.20		
F-MW66	0.10 U	0.10 U	0.10 U		0.10 U				0.15 U				0.15 U				0.15 U		
F-MW67	3.5	3.3	3.3		2.4	2.2	2.4	2.8	2.6	2.2	2.1	1.9	1.6	1.5	1.5		1.4		1.2
F-MW68	3.3	3.1	3.0		3.1	3.2	2.9	3.2	2.8	2.8	3.0	2.8	2.5	2.8	2.5		2.5		2.4
F-MW69	0.17	0.15	0.14		0.14				0.11 J				0.088 J				0.085 J		
F-MW70				0.1 U	0.065 J	0.1 U	0.1 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U	0.15 U		0.15 U		0.15 U
F-MW71				0.1 U	0.1 U	0.1 U	0.1 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U	0.15 U		0.15 U		0.15 U
Extraction Wells																			
F-EW1					26				27 Q				20 D			23 D		24 D	
F-EW2					30				29 Q				22			20 D		24	
F-EW3					26				24 Q							27 D		26	
F-EW4					77				65 Q							45 D		38	
F-EW5					35				38 Q							28 D		26	
F-EW6					6.7				5.3							4.2		5	
F-EW7					6.4				7.8				5.2			6.6		19 J	
F-EW8					54				51 Q							46 D		43	
F-EW9					52				48 Q							77 D		54	
F-EW10					54				63 Q				37 D			37 D		57	

Notes:

RDX groundwater cleanup level is 0.8 ug/L.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported

J – Detected below routine reporting limit. This value should be considered an estimate.

PG - The % difference between the original and confirmation analyses is greater than 40%.

Q = The reporting limit is elevated due to high analyte values.

Table C-2 - TNT Analytical Results Compilation for the Shallow Aquifer at Site F

TNT in µg/L

Well No.	Dec-94	Feb-95	Apr-95	Jun-95	Aug-95	Oct-95	Dec-95	Feb-96	Apr-96	Jun-96	Aug-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Jan-00	Jul-00	Jan-01	Apr-01	Jul-01
Monitoring Wells																												
F-MW21	2,200						2,100																					
F-MW24	Dry						540																					
F-MW27	700	0.65 U	0.65 U	0.65 U	0.33 J	0.65 U	0.65 U	0.65 U	2.6 U	0.65 U	0.65 U		0.65 U				0.65 U				0.65 U					0.88 U		
F-MW31	8,900	4,700	3,800	3,900	3,700	5,400	7,000	8,600	4,000	3,800	5,600	4,300	5,300	4,800	3,800	3,600	4,000	4,100	64	4,600	5,800	4,500	5,100	5,800	5,400	2,800		2900
F-MW32	51						100						32				10				7.6					78		
F-MW33	2,200 J	2,000	2,400	2,000	1,800	1,600	1,300	890	1,400	1,500	1,200	1,800	1,200	2,400	2,000	2,400 J	1,700	2,000	1,700	1,300	1,200	1,400	1,700	1,200	900	610		650
F-MW35	6.5 U						0.17 J						0.65 U				0.65 U				0.13 J					0.55 U		
F-MW36	32 U	0.38 J	0.42 J	0.65 U	0.86	0.65 U	0.65 U	0.65 U	3.5 U	0.65 U	0.65 U	0.65 U		0.65 U	0.65 U	0.65 U												
F-MW37	0.65 U						0.65 U						0.65 U				0.65 U				0.65 U					0.66 U		
F-MW38	0.65 U	0.65 U	0.16 J	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	2.30 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2 U	1.1 U	0.34 U	0.68 U		0.18 UJ
F-MW39	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.80 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.73 U	1.1 U	0.34 U	0.47 U		0.94 UJ
F-MW40	0.65 U			0.19 J			0.65 U			0.65 U			0.65 U				0.65 U				0.65 U					0.35 U		
F-MW41	0.65 U	0.7 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.4 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.9 U	1.1 U	1.0 U	0.48 U		1 UJ
F-MW42	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.44 U	0.52 U	1.4 U	0.84 U		0.57 UJ
F-MW43	0.65 U			1.6 U			0.65 U			0.65 U			0.65 U				0.65 U				0.65 U					0.82 U		
F-MW44	0.65 U	0.65 U	0.65 U	1.6 U	0.58 J	0.65 U	0.65 U	0.65 U	1 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.84 U	1.0 U	1.6 U	0.47 U		1 UJ
F-MW45	0.65 U						0.65 U			0.65 U			0.65 U				0.65 U				0.65 U					0.83 U		
F-MW46	0.65 U			0.65 U			0.65 U			0.65 U			0.65 U				0.49 J				0.65 U					0.60 U		
F-MW48	0.65 U						0.65 U						0.65 U				0.65 U				0.65 U					0.20 U		
F-MW51	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	3.2 U	0.65 U	0.65 U		0.65 U				0.65 U				0.65 U					0.55 U		
F-MW52	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	2.3 U	0.65 U	0.65 U		0.65 U				0.65 U				0.38 J					0.23 U		
F-MW53	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	1.4 U	0.65 U	0.65 U		0.65 U				0.65 U				0.65 U					0.60 U		
F-MW54	0.41 J						0.65 U																					
F-MW54S	250	120 J	110	140	140	160	93	60 J	22	18	7.2	17	24 J	4.9	42	51	12	6.9	19 J	19	10	4.4	10	4.6	3.3	3.6		2.6
F-MW55	0.65 U	0.65 U	3.2 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U	0.65 U				0.65 U	0.65 U			0.65 U					0.40 U		
F-MW55M													0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.36 U	0.70 U	0.68 U	0.88 U		0.86 U
F-MW56	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	2.6 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.1 U	1.6 U	0.79 U	0.99 U		0.46 UJ
F-MW57	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.4 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.84 U	0.86 U	0.64 U	0.77 U		0.47 UJ
F-MW58	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.62 U	1.2 U	0.77 U	0.49 U		0.53 U
F-MW59												0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2 U	0.47 U	0.74 U	0.74 U		0.77 U
F-MW60												0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.1 U	1.2 U	0.29 U	0.34 U		0.49 UJ
F-MW61												0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.47 U	1.2 U	0.60 U	0.35 U	1.4 U	0.56 U
F-MW62												0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.96 U	0.94 U	1.1 U	0.44 U	0.77 U	0.39 U
F-MW63																0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.42 U	1.6 U	0.90 U	1.30 U	0.70 U	0.62 U
F-MW64																0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.52 U	1.2 U	1.3 U	0.94 U	1.0 U	0.53 U
F-MW65																			0.65 U	0.65 U	0.65 U	0.65 U	0.42 U	0.65 U	0.75 U	0.82 U	0.58 U	0.4 U
F-MW66																												
F-MW67																												
F-MW68																												
F-MW69																												
F-MW70																												
F-MW71																												
Extraction Wells																												
F-EW1	460	330	260	270	240	210	200	190	180	170	160	170	160	150		260	150	130	110	86	94	64	72	67	61	35		37
F-EW2	57 J	51 J	40	29	27	21 J	24 J	22 J	22	20	18	22 J	16	20	45	25	28 J	22	16	13	14	12	15	11	8.1	5.2		6.1
F-EW3	95	87	80	110	90	91	97	87	110	100	87	84	89	92	92	82	120	95	95	79	95	84	77	87	78	52		57
F-EW4	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2	0.65 U	2.7 U	0.65 U	0.65 U		0.65 U	0.65 U	0.23 J	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.20 U	0.75 U	0.52 U	0.91 U		0.46 U
F-EW5	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	8	0.65 U	2.2 U	0.65 U	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.21 U	0.64 U	0.52 U	0.38 U		1.6 U
F-EW6	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.39 J	0.65 U	1.4 U	0.65 U	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.65 U	0.75 U	0.82 U	0.81 U	0.3 U		0.33 U
F-EW7												440	370	350	300	480	240	260	200	200	270	290	280	210	170	130		110
F-EW8												0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.42 J	0.65 U	0.75 U	0.65 U	0.88 U	1.1 U		0.66 U
F-EW9													0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.43 U	0.31 U	0.96 U	0.55 U		0.38 U
F-EW10													0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.49 U	0.56 U	0.44 U	0.82 U		0.51 U

Notes:

Switched results to correct-TCG

TNT groundwater cleanup level is 2.9 ug/L.

TNT remains non-detect in all samples from wells F-MW61 through F-MW65. TNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported.

J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-2 - TNT Analytical Results Compilation for the Shallow Aquifer at Site F

TNT in µg/L																											
Well No.	Jan-02	Apr-02	Jul-02	Oct-02	Jan-03	Apr-03	Jul-03	Oct-03	Jan-04	Apr-04	Jul-04	Oct-04	Jan-05	Apr-05	Aug-05	Oct-05	Jan-06	Apr-06	Jul-06	Oct-06	Jan-07	Apr-07	Jun-07	Oct-07	Jan-08	Apr-08	Jul-08
Monitoring Wells																											
F-MW21																											
F-MW24																											
F-MW27					1.6 UJ								0.48 U								0.53 U						
F-MW31	2500		3,300		1,900 J		2,000 J				2,200		2,200		3,200		1800 J		2500 J		2600 D				1,900	2,200 D	
F-MW32					110								0.49 U								0.51 U						
F-MW33	660		960		500 J		490				490		430		540		450 J		390 J		440 D				380	250 D	
F-MW35					10								42								36						
F-MW36																											
F-MW37					0.46 U								0.49 U								0.52 U						
F-MW38	0.56 U		0.61 U		0.77 U		0.56 U				0.49 U		0.48 U		0.48 U		0.50 U		0.49 U		0.56 U				0.52 U	0.54 U	
F-MW39	0.7 U		0.52 U		0.90 UJ		1.1 U				0.49 U		0.5 U		0.49 U		0.49 U		0.5 U		0.53 U				0.49 U	0.54 U	
F-MW40					0.81 UJ								0.5 U								0.50 U				0.5 U	0.54 U	
F-MW41	1.4 U		0.26 U		1.4 UJ		0.57 U				0.54 U		0.5 U		0.49 U		0.48 U		0.49 UJ		0.52 U		0.50 U				
F-MW42	0.47 U		0.51 U		1.2 UJ		0.38 UJ				0.52 U		0.51 U		0.48 U		0.48 U		0.49 U		0.52 U		0.49 U		0.5 U	0.54 U	
F-MW43					0.87 UJ								0.48 U								0.52 U						
F-MW44	0.55 U		0.56 U		1.3 UJ		0.88 U				0.49 U		0.48 U		0.49 U		0.51 U		0.49 U		0.51 U				0.5 U	0.54 U	
F-MW45					0.61 U								0.51 U								0.53 U						
F-MW46					0.52 U								0.49 U								0.53 U						
F-MW48					1.0 UJ								0.5 U								0.52 U						
F-MW51					1.1 UJ								0.54 U								0.51 U						
F-MW52					1.0 UJ								0.49 U								0.53 U						
F-MW53					1.2 UJ								0.53 U								0.52 U						
F-MW54																											
F-MW54S	1.4 U		2.4		1.8 J		0.68				0.48 U		0.5		0.49 U		0.58		0.49 U		0.53 U				0.49 U	0.8	
F-MW55					0.73 U								0.48 U								0.52 U				0.5 U	0.53 U	
F-MW55M			0.86 U		1.3 UJ		0.96 UJ				0.49 U		0.48 U		0.48 U		0.52 U		0.49 U		0.53 U						
F-MW56	0.95 U		0.87 U		1.2 UJ		1.4 UJ				0.5 U		0.49 U		0.48 U		0.53 U		0.49 U		0.54 U						
F-MW57	0.99 U		0.52 U		0.65 UJ		0.57 U				0.61 U		0.48 U		0.49 U		0.50 U		0.48 U		0.53 U						
F-MW58	0.74 U		0.68 U		0.78 UJ		0.79 U				0.53 U		0.49 U		0.48 U		0.49 U		0.49 U		0.54 U						
F-MW59	0.51 U		1.0 U		0.30 U		0.73 U				0.49 U		0.48 U		0.48 U		0.48 U		0.48 U		0.54 U						
F-MW60	0.52 U		0.83 U		1.2 UJ		1.3 UJ				0.49 U		0.49 U		0.49 U		0.49 U		0.48 U		0.52 U						
F-MW61	1.1 U	0.96 U	0.53 U	0.6 U	0.94 UJ	0.56 UJ	0.38 UJ	0.42 U		0.49 U	0.49 U	0.49 U	0.48 U	0.5 U	0.50 U	0.49 U	0.52 U	0.49 U	0.48 U	0.48 U	0.52 U				0.49 U	0.53 U	
F-MW62	0.82 U	0.62 U	0.7 U	0.61 U	1.2 UJ	0.83 UJ	0.43 U	0.74 U		0.48 U	0.52 U	0.52 U	0.48 U	0.5 U	0.52 U	0.48 U	0.51 U	0.51 U	0.48 U	0.49 U	0.53 U				0.51 U	0.53 U	
F-MW63	0.48 U	1.1 U	0.53 U	0.49 U	0.81 UJ	0.64 UJ	0.30 U	0.21 U		0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.49 U	2.6	0.49 U	0.49 U	0.50 U	0.50 U	0.49 U	0.48 U	0.48 U	0.54 U	0.49 U
F-MW64	1.1 U	0.94 U	0.83 U	0.59 U	0.79 UJ	0.64 UJ	0.64 U	0.21 U		0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.49 U	0.51 U	0.48 U	0.50 U	0.49 U	0.49 U	0.49 U	0.48 U	0.49 U	0.53 U	0.50 U
F-MW65	0.97 U	0.83 U	0.43 U	0.12 U	0.96 UJ	0.53 UJ	0.92 U	0.62 U		0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.48 U	0.5 U	0.48 UJ	0.50 U	0.50 U				0.49 U	0.54 U	0.50 U
F-MW66								0.49 U							0.49 U	0.50 U	0.48 U	0.5 U	0.49 U	0.50 U	0.50 U	0.50 U	0.50 U	U	0.49 U	0.53 U	0.50 U
F-MW67								0.49 U					0.48 U	0.51 U	0.48 U	0.49 U	0.50 U	0.5 U	0.50 U	0.48 U	0.53 U	0.50 U	0.49 U	0.49 U	0.49 U	0.54 U	0.48 U
F-MW68								0.49 U					0.5 U	0.5 U	0.48 U	0.50 U	0.49 U	0.5 U	0.48 UJ	0.48 U	0.51 U	0.50 U	0.49 U	0.48 U	0.49 U	0.53 U	0.48 U
F-MW69								0.49 U							0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.51 U	0.50 U	0.49 U	0.49 U	0.48 U	0.53 U	0.49 U
F-MW70																											
F-MW71																											
Extraction Wells																											
F-EW1	43		43		38		29				32		40		34		30		35		32				27	21	
F-EW2	7.1		6.2		4.8		4.3				3.5		3.3		4.0		3.4		3.0		2.6				1.8	1.9	
F-EW3	68		74		61		61				58		58		68		59 J		54 EJ		62 D				51	45	
F-EW4	0.42 U		0.33 U		0.40 U		0.7 U				0.49 U		0.49 U		0.48 U		0.48 U		0.48 U		0.51 U				0.49 U	0.54 U	
F-EW5	1.2 U		0.79 U		0.90 UJ		0.96 U				0.49 U		0.49 U		0.48 U		0.51 U		0.48 U		0.51 U				0.49 U	0.53 U	
F-EW6	0.49 U		0.74 U		0.56 U		1.2 U				0.49 U		0.49 U		0.49 U		0.49 U		0.48 U		0.45 U				0.49 U	0.53 U	
F-EW7	150		140		110 J		150				94		74		78		62 J		69 EJ		72 D				46	52	
F-EW8	0.84 U		0.79 U		1.1 UJ		0.68 U				0.5 U		0.49 U		0.48 U		0.48 U		0.48 U		0.50 U				0.5 U	0.53 U	
F-EW9	0.84 U		0.77 U		1.2 UJ		1.7 U				0.49 U		0.48 U		0.50 U		0.48 U		0.48 U		0.51 U				0.49 U	0.54 U	
F-EW10	0.75 U		0.65 U		0.40 U		0.43 U				0.49 U		0.49 U		0.48 U		0.48 U		0.48 U		0.50 U				0.49 U	0.53 U	

Notes:

TNT groundwater cleanup level is 2.9 ug/L.

TNT remains non-detect in all samples from wells F-MW61 through F-MW65. TNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported.

J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-2 - TNT Analytical Results Compilation for the Shallow Aquifer at Site F

TNT in µg/L																										
Well No.	Oct-08	Jan-09	Apr-09	Aug-09	Oct-09	Jan-10	Apr-10	Jul-10	Oct-10	Jan-11	Mar-11	Apr-11	Jul-11	Oct-11	Jan-12	Apr-12	Aug-12	Oct-12	Jan-13	Apr-13	Jul-13	Nov-13	Dec-13	Jan-14/Feb-14	Mar-14	Mar-14
Monitoring Wells																										
F-MW21																										
F-MW24																										
F-MW27			0.5 U									0.10 U								0.15 U						
F-MW31			1,900 D				2,200 D					2,000				1,700				1,300 D				1,900 D		
F-MW32			0.5 U									0.19								5.0						
F-MW33			370 D				330 D					250				180				180 D,M						
F-MW35			57 D									50								21 D						
F-MW36																										
F-MW37			0.49 U									0.10 U								0.15 U						
F-MW38			0.49 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW39			0.50 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW40			0.49 U																					0.15 U		
F-MW41	0.25 J		0.49 U		0.15 U		0.15 U					0.10 U		0.10 U		0.15 U		0.15 U		0.15 U	0.15 U			0.15 U		
F-MW42	0.49 U		0.51 U		0.15 U		0.15 U					0.10 U		0.10 U		0.15 U		0.15 U		0.15 U	0.15 U			0.15 U		
F-MW43			0.49 U																					0.15 U		
F-MW44			0.49 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW45			0.49 U																					0.15 U		
F-MW46			0.49 U																					0.15 U		
F-MW48			0.49 U										0.10 U							0.15 U						
F-MW51			0.49 U																					0.15 U		
F-MW52			0.49 U																					0.15 U		
F-MW53			0.49 U									0.10 U								0.15 U						
F-MW54																										
F-MW54S			0.62				0.15 U					0.2				0.18				0.13 J				0.62		
F-MW55			0.48 U									0.10 U								0.15 U						
F-MW55M			0.49 U				0.15 U					0.10 U				0.15 U				0.16 U						
F-MW56			0.49 U									0.10 U								0.15 U						
F-MW57			0.48 U									0.10 U								0.15 U						
F-MW58			0.51 U									0.10 U								0.15 U						
F-MW59			0.5 U									0.10 U								0.15 U						
F-MW60			0.49 U									0.10 U								0.15 U						
F-MW61			0.48 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW62			0.49 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW63	0.49 U	0.49 U	0.48 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U		0.15 U		0.15 U
F-MW64	0.50 U	0.50 U	0.49 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U		0.15 U		0.15 U
F-MW65			0.48 U				0.15 U					0.10 U				0.15 U				0.15 U				0.15 U		
F-MW66	0.50 U	0.49 U	0.48 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U				0.15 U				0.15 U				0.15 U		
F-MW67	0.49 U	0.49 U	0.50 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U		0.16 U		0.15 U
F-MW68	0.50 U	0.49 U	0.50 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U		0.15 U		0.15 U
F-MW69	0.49 U	0.50 U	0.49 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U		0.10 U				0.15 U				0.15 U				0.15 U		
F-MW70											0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U	0.15 U		0.15 U		0.15 U
F-MW71											0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.15 U	0.15 U	0.15 U	0.15 U	0.16 U	0.15 U	0.15 U		0.15 U		0.15 U
Extraction Wells																										
F-EW1			28				26					24				20				17			18		19	
F-EW2			1.30				0.92					1				1.0				0.62			0.77		0.8	
F-EW3			44				36					33				26							26 D		28	
F-EW4			0.49 U				0.15 U					0.10 U				0.15 U							0.15 U		0.15 U	
F-EW5			0.49 U				0.15 U					0.10 U				0.15 U							0.15 U		0.15 U	
F-EW6			0.49 U				0.15 U					0.10 U				0.15 U							0.15 U		0.15 U	
F-EW7			62 D				65					45				47				32 D			38 D		120 D	
F-EW8			0.49 U				0.15 U					0.10 U				0.15 U							0.15 U		0.15 U	
F-EW9			0.48 U				0.15 U					0.10 U				0.15 U							0.15 U		0.15 U	
F-EW10			0.49 U				0.15 U					0.10 U				0.15 U				0.15 U			0.15 U		0.15 U	

Notes:

TNT groundwater cleanup level is 2.9 ug/L.

TNT remains non-detect in all samples from wells F-MW61 through F-MW65. TNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.

Blank spaces indicate sample not collected on that date.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported.

J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-3 - DNT Analytical Results Compilation for the Shallow Aquifer at Site F

Total DNT in µg/L																								
Well No.	Dec-94	Feb-95	Apr-95	Jun-95	Aug-95	Oct-95	Dec-95	Feb-96	Apr-96	Jun-96	Aug-96	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Jan-00
Monitoring Wells																								
F-MW21	166 J						189																	
F-MW24	Dry						5.2																	
F-MW27	85 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	4.8 U	0.25 U	0.25 U		0.25 U				0.25 U				0.25 U			
F-MW31	450 J	300	240	230	270	320	354	380	274	240	310	250	410	290	194	240 J	264	230	2.4 J	290	358	236	278	366
F-MW32	2.19 J						4.6						0.43				0.25 J				0.24 J			
F-MW33	240 J	180	180	150	140	110	97	59	103	100	64	140	74	190	183	196 J	138	150	140	105	94	121	157	119
F-MW35	2.5 U						0.25 U						0.25 U				0.25 U				0.25 U			
F-MW36	12 U	0.25 U	0.25 U	0.1 U	0.14 J	0.25 U	0.25 U	0.25 U	6.5 U	0.25 U	0.25 U	1.07		0.25 U	0.25 U	0.25 U								
F-MW37	0.3 U						0.25 U						0.25 U				0.25 U				0.25 U			
F-MW38	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	4.3 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	1.2 U	1.1 U
F-MW39	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	3.3 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.73 U	1.1 U
F-MW40	1.1 U			0.25 U			0.25 U			0.25 U			0.25 U				0.25 U				0.25 U			
F-MW41	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.6 U	0.25 U	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	1.9 U	1.1 U
F-MW42	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.4 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.44 U	0.5 U
F-MW43	0.25 U			0.25 U			0.25 U			0.25 U			0.25 U				0.25 U				0.25 U			
F-MW44	0.3 U	0.25 U	0.25 U	0.25 U	0.11 J	0.25 U	0.25 U	0.25 U	1.9 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.84 U	1.0 U
F-MW45	0.25 U						0.25 U			0.25 U			0.25 U				0.25 U				0.25 U			
F-MW46	0.25 U			0.25 U			0.25 U			0.25 U			0.25 U				0.25 U				0.25 U			
F-MW48	0.19 J						0.25 U						0.25 U				0.25 U				0.25 U			
F-MW51	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	6 U	0.25 U	0.25 U		0.25 U				0.25 U				0.25 U			
F-MW52	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	4.3 U	0.25 U	0.25 U		0.25 U				0.25 U				0.25 U			
F-MW53	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.7 U	0.25 U	0.25 U		0.25 U				0.25 U				0.25 U			
F-MW54	0.25 U						0.25 U			0.25 U														
F-MW54S	9 JP	0.88	0.28	0.65	0.78	0.8	0.44	0.42 J	3.7 U	0.28 J	0.25 U	0.25 U	0.49	0.25 U	1.05 J	1.3 J	0.3 J	0.2 J	0.30 J	0.26 J	0.28 J	0.25 U	0.56 U	0.52 U
F-MW55	0.25 U	0.25 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.5 U	0.25 U	0.25 U		0.25 U				0.25 U	0.25 U			0.25 U			
F-MW55M												0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U	0.26	0.25 U	0.25 U	0.36 U	0.70 U
F-MW56	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	4.7 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	1.1 U	1.6 U
F-MW57	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.7 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.84 U	0.86 U
F-MW58	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.3 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.62 U	1.2 U
F-MW59												0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	1.2 U	0.47 U
F-MW60												0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	1.1 U	1.2 U
F-MW61												0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.47 U	1.2 U
F-MW62												0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.96 U	0.94 U
F-MW63																0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.42 U	1.6 U
F-MW64																0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.52 U	1.2 U
F-MW65																			0.25 U	0.25 U	0.25 U	0.25 U	0.42 U	0.65 U
F-MW66																								
F-MW67																								
F-MW68																								
F-MW69																								
F-MW70																								
F-MW71																								
Extraction Wells																								
F-EW1	5.2	3.4	2.3	2.2	2.1	2.0	1.6	3.0	3.2 U	2.3	2.2	1.9	1.4	2.2		3.8	2.0	1.7	2.0	0.87	0.92	1.1	1.3	1.5
F-EW2	25 U	0.64	0.64	0.39	0.33	0.34	0.30	0.39	4.3 U	0.38	0.34	0.53 U	0.25	0.55	0.74	0.8 J	0.4	0.4 J	0.2 J	0.12 J	0.37 J	0.24	0.83 U	1.1 U
F-EW3	12 U	3.3	3.4	4.2	3.8	4.6	4.3	3.8	7.5 J	4.7	3.7	3.4	4.4	4.7	4.9	4.3 J	6.3	4.1	4.4	2.4	3.0	3.0	1.5	4.5
F-EW4	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.14 J	0.25 U	5.0 U	0.25 U	0.5 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.20 U	0.75 U
F-EW5	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.59	0.25 U	4.0 U	0.25 U	0.5 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.21 U	0.64 U
F-EW6	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.7 U	0.25 U	0.5 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U	0.25 U	0.75 U	0.82 U
F-EW7												21.2	17.1	16.1	13.8	22.8	12.1	11.1	9.7	11.2	14.6	18 J	14	9.7
F-EW8												0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.65 U
F-EW9													0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U	0.43 U	0.31 U
F-EW10													0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.49 U	0.56 U

Switched results to correct-TCG

Notes:

DNT groundwater cleanup level is 0.13 ug/L.

Blank spaces indicate sample not collected on that date.

DNT remains non-detect in all samples from wells F-MW61 through F-MW65. DNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported

J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-3 - DNT Analytical Results Compilation for the Shallow Aquifer at Site F

Total DNT in µg/L																						
Well No.	Jul-00	Jan-01	Jul-01	Jan-02	Apr-02	Jul-02	Oct-02	Jan-03	Apr-03	Jul-03	Oct-03	Jan-04	Apr-04	Jul-04	Oct-04	Jan-05	Apr-05	Aug-05	Oct-05	Jan-06	Apr-06	Jul-06
Monitoring Wells																						
F-MW21																						
F-MW24																						
F-MW27		0.88 U						1.6 UJ								0.48 U						
F-MW31	296	222	207	150		190		120 J		120 UJ				123.8 J		130		185		58 J		110 J
F-MW32		6.4						2.3 R								0.49 U						
F-MW33	67.9	61	12 U	44		67		36 J		38				41.5 J		37		40		36		28
F-MW35		0.55 U						0.79 UJ								0.49 U						
F-MW36																						
F-MW37		0.66 U						0.46 U								0.49 U						
F-MW38	0.34 U	0.68 U	0.18 UJ	0.56 U		0.61 U		0.77 UJ		0.6 UJ				0.49 U		0.48 U		0.48 U		0.50 U		0.49 U
F-MW39	0.34 U	0.47 U	0.94 U	0.7 U		0.94 U		0.90 UJ		1.1 UJ				0.49 U		0.49 U		0.49 U		0.49 U		0.5 U
F-MW40		0.35 U						0.81 UJ								0.5 U						
F-MW41	1.0 U	0.48 U	1 UJ	1.4 U		0.26 U		1.4 UJ		0.6 UJ				0.54 U		0.5 U		0.49 U		0.48 U		0.49 UJ
F-MW42	1.4 U	0.84 U	0.57 U	0.47 U		0.51 U		1.2 UJ		0.4 UJ				0.52 U		0.51 U		0.48 U		0.48 U		0.49 U
F-MW43		0.82 U						0.87 UJ								0.48 U						
F-MW44	1.6 U	0.47 U	1 UJ	0.55 U		0.56 U		1.3 UJ		0.9 UJ				0.49 U		0.48 U		0.49 U		0.51 U		0.49 U
F-MW45		0.83 U						0.61 U								0.51 U						
F-MW46		0.60 U						0.52 UJ								0.49 U						
F-MW48		0.20 U						1.0 UJ								0.5 U						
F-MW51		0.55 U						1.1 UJ								0.54 U						
F-MW52		0.23 U						1.0 UJ								0.49 U						
F-MW53		0.60 U						1.2 UJ								0.53 U						
F-MW54																						
F-MW54S	0.92 U	0.47 U	0.39 U	1.4 U		0.38 U		0.38 UJ		0.16 UJ				0.48 U		0.48 U		0.49 U		0.49 U		0.49 U
F-MW55		0.40 U						0.73 UJ								0.48 U						
F-MW55M	0.68 U	0.88 U	0.86 U			0.86 U		1.3 UJ		0.96 UJ				0.49 U		0.48 U		0.48 U		0.52 U		0.49 U
F-MW56	0.79 U	0.99 U	0.46 UJ	0.95 U		0.87 U		1.2 UJ		1.4 UJ				0.5 U		0.49 U		0.48 U		0.53 U		0.49 U
F-MW57	0.64 U	0.77 U	0.47 UJ	0.99 U		0.52 U		0.65 UJ		0.57 UJ				0.61 U		0.48 U		0.49 U		0.50 U		0.48 U
F-MW58	0.77 U	0.49 U	0.53 U	0.74 U		0.68 U		0.78 UJ		0.49 UJ				0.53 U		0.49 U		0.48 U		0.49 U		0.49 U
F-MW59	0.74 U	0.74 U	0.77 U	0.51 U		1 U		0.30 U		0.73 UJ				0.49 U		0.48 U		0.48 U		0.48 U		0.48 U
F-MW60	0.29 U	0.34 U	0.49 UJ	0.52 U		0.83 U		1.2 UJ		1.3 UJ				0.49 U		0.49 U		0.49 U		0.49 U		0.48 U
F-MW61	0.60 U	0.35 U	0.56 U	1.1 U	0.96 U	0.53 U	0.6 U	0.94 UJ	0.56 UJ	0.38 UJ	0.42 UJ		0.49 U	0.49 U	0.49 U	0.48 U	0.5 U	0.50 U	0.49 U	0.52 U	0.49 U	0.48 U
F-MW62	1.1 U	0.44 U	0.39 U	0.82 U	0.62 U	0.7 U	0.61 U	1.2 UJ	0.83 UJ	0.43 UJ	0.35 UJ		0.48 U	0.52 U	0.52 U	0.48 U	0.5 U	0.52 U	0.48 U	0.51 U	0.51 U	0.48 U
F-MW63	0.90 U	1.30 U	0.62 UJ	0.48 U	1.1 U	0.53 U	0.49 U	0.81 UJ	0.64 UJ	0.30 UJ	0.21 UJ		0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.49 U	1.5	0.49 UJ
F-MW64	1.3 U	0.94 U	0.53 UJ	1.1 U	0.94 U	0.83 U	0.59 U	0.79 U	0.64 UJ	0.64 UJ	0.21 UJ		0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.49 U	0.51 U	0.48 U
F-MW65	0.75 U	0.82 U	0.4 UJ	0.97 U	0.83 U	0.43 U	0.12 U	0.96 UJ	0.53 UJ	0.92 UJ	0.62 UJ		0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.48 U	0.48 U	0.48 U	0.5 U	0.48 UJ
F-MW66											0.49 U							0.49 U	0.50 U	0.48 U	0.5 U	0.49 UJ
F-MW67											0.49 U					0.48 U	0.51 U	0.48 U	0.49 U	0.50 U	0.5 U	0.5 U
F-MW68											0.49 U					0.5 U	0.5 U	0.48 U	0.50 U	0.49 U	0.5 U	0.48 UJ
F-MW69											0.49 U							0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
F-MW70																						
F-MW71																						
Extraction Wells																						
F-EW1	1.0	0.79	0.69	0.74 U		0.23 U		0.99 UJ		0.2 UJ				0.7		0.68		0.64		0.58		36 PJ
F-EW2	0.87 U	1.3 U	1.3 U	0.66 U		0.58 U		0.43 U		0.27 UJ				0.49 U		0.49 U		0.48 U		0.50 U		0.48 U
F-EW3	2.9	2.85	2.2	2.3		2.4		2.1 J		2.2				2.97		2.4		2.7		2.6		2.2
F-EW4	0.52 U	0.91 U	0.46 U	0.42 U		0.33 U		0.4 U		0.7 UJ				0.49 U		0.49 U		0.48 U		0.48 U		0.48 U
F-EW5	0.52 U	0.38 U	1.6 U	1.2 U		0.79 U		0.9 UJ		0.96 UJ				0.49 U		0.49 U		0.48 U		0.51 U		0.48 U
F-EW6	0.81 U	0.3 U	0.33 U	0.49 U		0.74 U		0.56 U		1.2 UJ				0.49 U		0.49 U		0.49 U		0.49 U		0.48 U
F-EW7	6.6	6.78	5.2	4.8		4.3		3.8 R		4.2				3.5		2.9		2.8		2.6		3.5
F-EW8	0.88 U	1.1 U	0.66 U	0.84 U		0.79 U		1.1 UJ		0.68 UJ				0.5 U		0.49 U		0.48 U		0.48 U		0.48 U
F-EW9	0.96 U	0.55 U	0.38 U	0.84 U		0.77 U		1.2 UJ		1.7 UJ				0.49 U		0.48 U		0.50 U		0.48 U		0.48 U
F-EW10	0.44 U	0.82 U	0.51 U	0.75 U		0.65 U		0.4 U		0.43 UJ				0.5 U		0.48 U		0.48 U		0.48 U		0.48 U

Notes:
DNT groundwater cleanup level is 0.13 ug/L.
Blank spaces indicate sample not collected on that date.
DNT remains non-detect in all samples from wells F-MW61 through F-MW65. DNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.
U – Not detected at associated detection limit.
D – The reported value is from a diluted reanalysis.
P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported
J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-3 - DNT Analytical Results Compilation for the Shallow Aquifer at Site F

Total DNT in µg/L																			
Well No.	Oct-06	Jan-07	Apr-07	Jun-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	Aug-09	Oct-09	Jan-10	Apr-10	Jul-10	Oct-10	Jan-11	Mar-11
Monitoring Wells																			
F-MW21																			
F-MW24																			
F-MW27		0.53 U									0.5 U								
F-MW31		110 D				96	91				97 D				24.1				
F-MW32		0.51 U									0.5 U								
F-MW33		30				34.8	23				30.6 P				35.8				
F-MW35		0.51 U									0.5 PU								
F-MW36																			
F-MW37		0.52 U									0.49 U								
F-MW38		0.56 U				0.52 U	0.54 U				0.49 U				0.15 U				
F-MW39		0.53 U				0.49 U	0.54 U				0.5 U				0.15 U				
F-MW40		0.5 U									0.49 U								
F-MW41		0.52 U		0.5 U		0.5 U	0.54 U		0.49 U		0.49 U		0.15 U		0.15 U				
F-MW42		0.52 U		0.49 U		0.5 U	0.54 U		0.49 U		0.51 U		0.15 U		0.15 U				
F-MW43		0.52 U									0.49 U								
F-MW44		0.51 U				0.5 U	0.54 U				0.49 U				0.15 U				
F-MW45		0.53 U									0.49 U								
F-MW46		0.53 U									0.49 U								
F-MW48		0.52 U									0.49 U								
F-MW51		0.51 U									0.49 U								
F-MW52		0.53 U									0.49 U								
F-MW53		0.52 U									0.49 U								
F-MW54																			
F-MW54S		0.53 U				0.49 U	0.53 U				0.49 U				0.15 U				
F-MW55		0.52 U									0.48 U								
F-MW55M		0.53 U				0.5 U	0.53 U				0.49 U				0.15 U				
F-MW56		0.54 U									0.49 U								
F-MW57		0.53 U									0.48 U								
F-MW58		0.54 U									0.51 U								
F-MW59		0.54 U									0.5 U								
F-MW60		0.52 U									0.49 U								
F-MW61	0.48 U	0.52 U				0.49 U	0.53 U				0.48 U				0.15 U				
F-MW62	0.49 U	0.53 U				0.51 U	0.53 U				0.49 U				0.15 U				
F-MW63	0.49 U	0.5 U	0.5 U	0.49 U	0.48 U	0.48 U	0.54 U	0.49 U	0.49 U	0.49 U	0.48 U	0.15 U	0.15 U	0.15 U	0.15 U	0.099 U	0.10 U	0.10 U	
F-MW64	0.5 U	0.49 U	0.49 U	0.49 U	0.48 U	0.49 U	0.53 U	0.5 U	0.5 U	0.5 U	0.49 U	0.15 U	0.15 U	0.15 U	0.15 U	0.10 U	0.10 U	0.10 U	
F-MW65	0.5 U	0.5 U				0.49 U	0.54 U	0.5 U			0.48 U				0.15 U				
F-MW66	0.5 U	0.5 U	0.5 U	0.5 U	U	0.49 U	0.53 U	0.5 U	0.5 U	0.49 U	0.48 U	0.15 U	0.15 U	0.15 U	0.15 U	0.098 U	0.10 U	0.10 U	
F-MW67	0.48 U	0.53 U	0.5 U	0.49 U	0.49 U	0.49 U	0.54 U	0.48 U	0.49 U	0.49 U	0.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.098 U	0.10 U	0.10 U	
F-MW68	0.48 U	0.51 U	0.5 U	0.49 U	0.48 U	0.49 U	0.53 U	0.48 U	0.5 U	0.49 U	0.5 U	0.15 U	0.15 U	0.15 U	0.15 U	0.099 U	0.10 U	0.10 U	
F-MW69	0.48 U	0.51 U	0.5 U	0.49 U	0.49 U	0.48 U	0.53 U	0.49 U	0.49 U	0.5 U	0.49 U	0.15 U	0.15 U	0.15 U	0.15 U	0.098 U	0.10 U	0.10 U	
F-MW70																			0.1 U
F-MW71																			0.1 U
Extraction Wells																			
F-EW1		0.4 J				0.56	0.4 J				0.59				0.49				
F-EW2		0.51 U				0.49 U	0.54 U				0.5 U				0.15 U				
F-EW3		2.7				2.8	2				2.2 PJ				1.9				
F-EW4		0.51 U				0.49 U	0.54 U				0.49 U				0.15 U				
F-EW5		0.51 U				0.49 U	0.53 U				0.49 U				0.15 U				
F-EW6		0.45 U				0.49 U	0.54 U				0.49 U				0.15 U				
F-EW7		2.8				2.1	2.2				3.1 PJ				3.1				
F-EW8		0.5 U				0.5 U	0.53 U				0.49 U				0.15 U				
F-EW9		0.51 U				0.49 U	0.54 U				0.48 U				0.15 U				
F-EW10		0.5 U				0.49 U	0.53 U				0.49 U				0.15 U				

Notes:
DNT groundwater cleanup level is 0.13 ug/L.
Blank spaces indicate sample not collected on that date.
DNT remains non-detect in all samples from wells F-MW61 through F-MW65. DNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.
U – Not detected at associated detection limit.
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J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-3 - DNT Analytical Results Compilation for the Shallow Aquifer at Site F

Total DNT in µg/L															
Well No.	Apr-11	Jul-11	Oct-11	Jan-12	Apr-12	Aug-12	Oct-12	Jan-13	Apr-13	Jul-13	Nov-13	Dec-13	Jan-14/Feb-14	Mar-14	Mar-14
Monitoring Wells															
F-MW21															
F-MW24															
F-MW27	0.10 U								0.13 U						
F-MW31	33 PG				43.5 J				38.7 J,D				50.9 J		
F-MW32	0.10 U								0.13 U						
F-MW33	26.7 PGJ				21 J				20.9 J						
F-MW35	0.49 PG								0.13 U						
F-MW36															
F-MW37	0.10 U								0.13 U						
F-MW38	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW39	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW40													0.13 U		
F-MW41	0.10 U		0.10 U		0.13 U		0.13 U		0.13 U	0.13 U			0.13 U		
F-MW42	0.10 U		0.10 U		0.13 U		0.13 U		0.13 U	0.13 U			0.13 U		
F-MW43													0.13 U		
F-MW44	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW45													0.13 U		
F-MW46													0.13 U		
F-MW48		0.10 U							0.13 U						
F-MW51													0.13 U		
F-MW52													0.13 U		
F-MW53	0.10 U								0.13 U						
F-MW54															
F-MW54S	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW55	0.10 U								0.13 U						
F-MW55M	0.10 U				0.13 U				0.13 U						
F-MW56	0.10 U								0.13 U						
F-MW57	0.10 U								0.13 U						
F-MW58	0.10 U								0.13 U						
F-MW59	0.10 U								0.13 U						
F-MW60	0.10 U								0.13 U						
F-MW61	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW62	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW63	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U		0.13 U		0.13 U
F-MW64	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U		0.13 U		0.13 U
F-MW65	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW66	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW67	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U		0.13 U		0.13 U
F-MW68	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.14 U		0.13 U		0.13 U
F-MW69	0.10 U				0.13 U				0.13 U				0.13 U		
F-MW70	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U		0.13 U		0.13 U
F-MW71	0.10 U	0.10 U	0.10 U	0.10 U	0.13 U	0.13 U	0.13 U	0.13 U	0.14 U	0.13 U	0.13 U		0.13 U		0.13 U
Extraction Wells															
F-EW1	0.44 PG				0.568 J PG				0.13 U			0.54 J		0.47	
F-EW2	0.10 U				0.085 J				0.062 U			0.06 J		0.062 J	
F-EW3	2.05 PG				1.81							2.02		2.13	
F-EW4	0.10 U				0.13 U							0.13 U		0.13 U	
F-EW5	0.10 U				0.13 U							0.13 U		0.13 U	
F-EW6	0.10 U				0.13 U							0.13 U		0.13 U	
F-EW7	2.29 PG				2.32				0.28			1.69		4.99 J	
F-EW8	0.10 U				0.13 U							0.13 U		0.13 U	
F-EW9	0.10 U				0.13 U							0.13 U		0.13 U	
F-EW10	0.10 U				0.13 U				0.13 U			0.13 U		0.13 U	

Notes:

DNT groundwater cleanup level is 0.13 ug/L.

Blank spaces indicate sample not collected on that date.

DNT remains non-detect in all samples from wells F-MW61 through F-MW65. DNT results from more frequent monitoring of these 5 wells since June 1997 (monthly, and then quarterly) are not presented here.

U – Not detected at associated detection limit.

D – The reported value is from a diluted reanalysis.

P – When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, the higher value is reported

J – Detected below routine reporting limit. This value should be considered an estimate.

Table C-4 - MNX, DNX, and TNX Analytical Results Compilation for the Shallow Aquifer at Site F

	MNX, DNX and TNX in µg/L																										
Well No.	**Jul-10**			**Oct-10**			**Mar-11**			**Apr-11**			**Jul-11**			**Oct-11**			**Jan-12**			**Apr-12**			**Aug-12**		
	MNX	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**
Monitoring Wells																											
F-MW21																											
F-MW24																											
F-MW27										2.0 U	2.0 U	2.0 U															
F-MW31										2.0 U	2.0 U	2.0 U										2.0 U	0.5 U	0.5 U			
F-MW32										2.0 U	2.0 U	2.0 U															
F-MW33										2.0 U	2.0 U	2.0 U										2.0 U	0.5 U	0.5 U			
F-MW35										2.0 U	2.0 U	2.0 U															
F-MW36																											
F-MW37										1.9 U	1.9 U	1.9 U															
F-MW38										2.0 U	2.0 U	2.0 U										2.0 U	0.5 U	0.5 U			
F-MW39										1.9 J	0.7 J	1.0 J										2.7	0.89	1.4			
F-MW40																											
F-MW41				1.9 U	1.9 U	1.9 U				2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U				2.0 U	0.50 U	0.50 U			
F-MW42				2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	1.9 U				2.0 U	0.50 U	0.50 U			
F-MW43																											
F-MW44										0.9 J	2.0 U	2.0 U										1.0 J	0.50 U	0.50 U			
F-MW45																											
F-MW46																											
F-MW48													2.70	1.9 U	1.9 U												
F-MW51																											
F-MW52																											
F-MW53										2.0 U	2.0 U	2.0 U															
F-MW54																											
F-MW54S										1.9 U	1.9 U	1.9 U										2.0 U	0.50 U	0.50 U			
F-MW55										2.0 U	2.0 U	2.0 U															
F-MW55M										2.0 U	0.3 J	2.0										2.0 U	0.50 U	0.50 U			
F-MW56										1.9 U	1.9 U	1.9 U															
F-MW57										2.0 U	2.0 U	2.0 U															
F-MW58										2.0 U	2.0 U	2.0 U															
F-MW59										2.0 U	2.0 U	2.0 U															
F-MW60										2.0 U	2.0 U	2.0 U															
F-MW61										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-MW62										2.0 U	2.0 U	2.0 U										2.0 U	0.51 U	0.51 U			
F-MW63	2.0 UJ, CV	2.0 U, CV	2.0 U	2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
F-MW64	2.1 UJ, CV	2.1 U, CV	2.1 U	2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U	0.52 U	0.52 U	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
F-MW65										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-MW66	2.0 UJ, CV	2.0 U, CV	2.0 U	2 U	2.0 U	2.0 U				1.9 U	1.9 U	1.9 U										2.0 U	0.51 U	0.51 U			
F-MW67	2.0 UJ, CV	2.0 U, CV	2.0 U	2 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	0.49 U	0.49 U	0.49 U
F-MW68	2.0 UJ, CV	2.0 U, CV	2.0 U	1.9 U	1.9 U	1.9 U				2.0 U	2.0 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
F-MW69	2.0 UJ, CV	2.0 U, CV	2.0 U	2.0 U	2.0 U	2.0 U				2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-MW70							2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
F-MW71							2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.51 U	0.51 U	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Extraction Wells																											
F-EW1										2.0 U	2.0 U	2.0 U										0.50 U	0.50 U	0.50 U			
F-EW2										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW3										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW4										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW5										1.9 U	1.9 U	1.9 U										2.0 U	0.50 U	0.50 U			
F-EW6										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW7										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW8										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			
F-EW9										1.9 U	1.9 U	1.9 U										2.0 U	0.50 U	0.50 U			
F-EW10										2.0 U	2.0 U	2.0 U										2.0 U	0.50 U	0.50 U			

Table C-4 - MNX, DNX, and TNX Analytical Results Compilation for the Shallow Aquifer at Site F

	MNX, DNX and TNX in µg/L																										
Well No.	**Oct-12**			**Jan-13**			**Apr-13**			**Jul-13**			**Nov-13**			**Dec-13**			**Jan-14/Feb-14**			**3/18/2014**			**3/25/2014**		
	MNX	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**	**MNX**	**DNX**	**TNX**
Monitoring Wells																											
F-MW21																											
F-MW24																											
F-MW27							0.038 J	0.51 U	0.51 U																		
F-MW31							0.39 J	0.51 U	0.51 U,Q										0.51 U	0.51 U	0.51 U						
F-MW32							0.51 U	0.51 U	0.51 U,Q																		
F-MW33							0.27 J	0.51 U	0.51 U,Q																		
F-MW35							0.73 J	0.51 U	0.51 U,Q																		
F-MW36																											
F-MW37							0.51 U	0.51 U	0.51 U																		
F-MW38							0.050 J	0.50 U	0.50 U,Q										0.500 U	0.50 U	0.50 U						
F-MW39							4.6	4.5	37 D,Q,J										2.6	3.0	21 D						
F-MW40																			0.51 U	0.51 U	0.51 U						
F-MW41	0.51 U	0.51 U	0.51 U				0.50 U	0.50 U	0.50 U,Q	0.50 U	0.50 U	0.50 U							0.51 U	0.51 U	0.51 U						
F-MW42	0.50 U	0.50 U	0.50 U				0.51 U	0.51 U	0.51 U,Q	0.50 U	0.50 U	0.50 U							0.51 U	0.51 U	0.51 U						
F-MW43																			0.51 U	0.51 U	0.51 U						
F-MW44							1.5	0.51 U	0.51 U,Q										1.7	0.5 U	0.5 U						
F-MW45																			0.51 U	0.51 U	0.51 U						
F-MW46																			0.51 U	0.51 U	0.51 U						
F-MW48							0.73 J	0.50 U	0.50 U,Q																		
F-MW51																			0.066 J	0.51 U	0.51 U						
F-MW52																			0.51 U	0.51 U	0.51 U						
F-MW53							0.51 U	0.51 U	0.51 U,Q																		
F-MW54																											
F-MW54S							0.50 U	0.50 U	0.50 U,Q										0.51 U	0.51 U	0.51 U						
F-MW55							0.27 J	0.51 U	0.51 U,Q																		
F-MW55M							0.17 J	0.52 U	0.52 U,Q																		
F-MW56							0.51 U	0.51 U	0.51 U,Q																		
F-MW57							0.51 U	0.51 U	0.51 U,Q																		
F-MW58							0.51 U	0.51 U	0.51 U,Q																		
F-MW59							0.20 J	0.51 U	0.51 U																		
F-MW60							0.50 U	0.50 U	0.50 U,Q																		
F-MW61							0.51 U	0.51 U	0.51 U,Q										0.52 U	0.52 U	0.52 U						
F-MW62							0.51 U	0.51 U	0.51 U,Q										0.51 U	0.51 U	0.51 U						
F-MW63	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U
F-MW64	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U
F-MW65							0.51 U	0.51 U	0.51 U																		
F-MW66							0.51 U	0.51 U	0.51 U																		
F-MW67	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.52 U	0.52 U	0.52 U				0.52 U	0.52 U	0.52 U				0.51 U	0.51 U	0.51 U
F-MW68	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U	0.52 U	0.52 U	0.52 U				0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U
F-MW69							0.51 U	0.51 U	0.51 U										0.51 U	0.51 U	0.51 U						
F-MW70	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U	0.52 U	0.52 U	0.52 U	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U				0.52 U	0.52 U	0.52 U
F-MW71	0.50 U	0.50 U	0.50 U	0.51 U	0.51 U	0.51 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51 U				0.5 U	0.5 U	0.5 U				0.50 U	0.50 U	0.50 U
Extraction Wells																											
F-EW1							0.14 J	0.50 U	0.50 U,Q							0.50 U	0.50 U	0.50 U				0.51 U	0.51 U	0.51 U			
F-EW2							0.099 J	0.52 U	0.52 U							0.51 U	0.51 U	0.51 U				0.52 U	0.52 U	0.52 U			
F-EW3																0.50 U	0.50 U	0.50 U				0.51 U	0.51 U	0.51 U			
F-EW4																0.15 J	0.50 U	0.50 U				0.14 J	0.50 U	0.50 U			
F-EW5																0.099 J	0.51 U	0.51 U				0.099 J	0.51 U	0.51 U			
F-EW6																0.51 U	0.51 U	0.51 U				0.51 U	0.51 U	0.51 U			
F-EW7							0.51 U	0.51 U	0.14 J,Q							0.50 U	0.50 U	0.50 U				0.51 U	0.83 J	0.51 U			
F-EW8																0.15 J	0.50 U	0.50 U				0.15 J	0.16	0.50 U			
F-EW9																0.19 J	0.50 U	0.50 U				0.50 U	0.50 U	0.50 U			
F-EW10							0.085 J	0.51 U	0.51 U,Q							0.088 J	0.51 U	0.51 U				0.14 J	0.51 U	0.51 U			

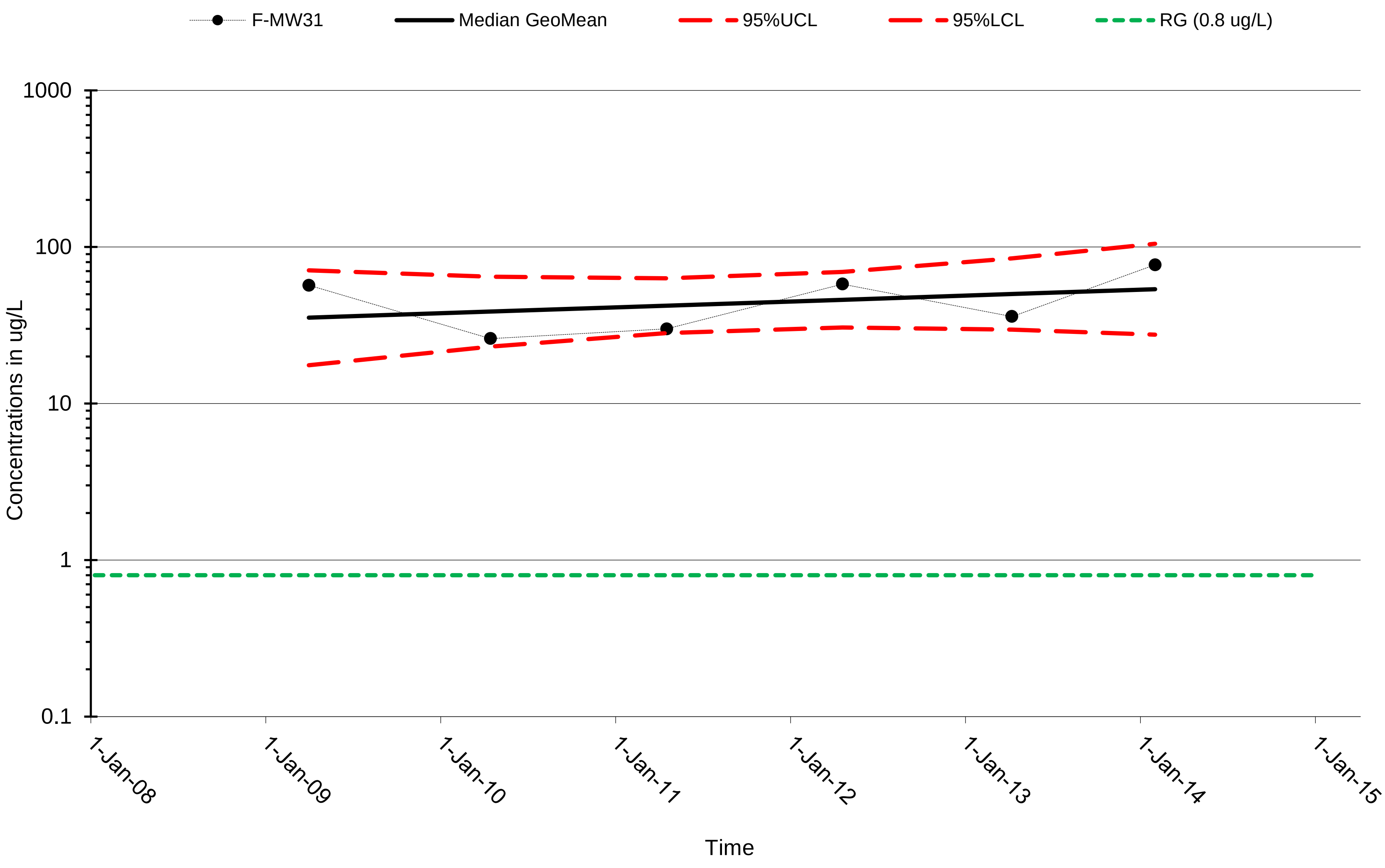
Table C-5 – Otto Fuel Analytical Results Compilation for the Shallow Aquifer at Site E/11

	Otto Fuel Concentration in µg/L																				
Well ID	Aug-96	Jan-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Apr-99	Jan-00	Jan-01	Jan-02	Jan-03	Jan-05	Jan-06	Jan-07	Jan-08	Apr-08	Apr-09	Apr-10	Apr-11	Feb-14
Site F Wells																					
F-EW4		0.10 U	0.10	0.12	0.10 U	0.10 U	0.10 U	0.10 U													
Site E/11 Wells																					
E-MW21L	0.25 U	0.10 U																			
E-MW21U	0.36	0.47	0.57	0.69	0.51	0.63	0.65	1.0	0.10 U	0.77	0.87	0.67	1.4 UJ	0.10 U	0.42 U	0.89	0.32	0.42	0.14	0 .16 J	0.27
E-MW22L	0.25 U	0.10 U																			
E-MW22U	0.25 U	0.10 U																			
E-MW23L	0.25 U	0.10 U																			
E-MW23U	0.25 U	0.21		0.34	0.25	0.33	0.62	0.57	0.10 U	0.50	0.51	0.4	1.1 UJ	0.10 U	0.49 U	0.74	0.31	0.42	0.23	0.087 J	0.17

Notes:
The Otto Fuel groundwater cleanup level is 0.2 ug/L.
The "L" and "U" designations associated with well ID refer to lower (deeper) and upper (shallower) wells, respectively, within a well cluster.
Blank spaces indicate sample not collected on that date.
U: Not detected at associated detection limit.

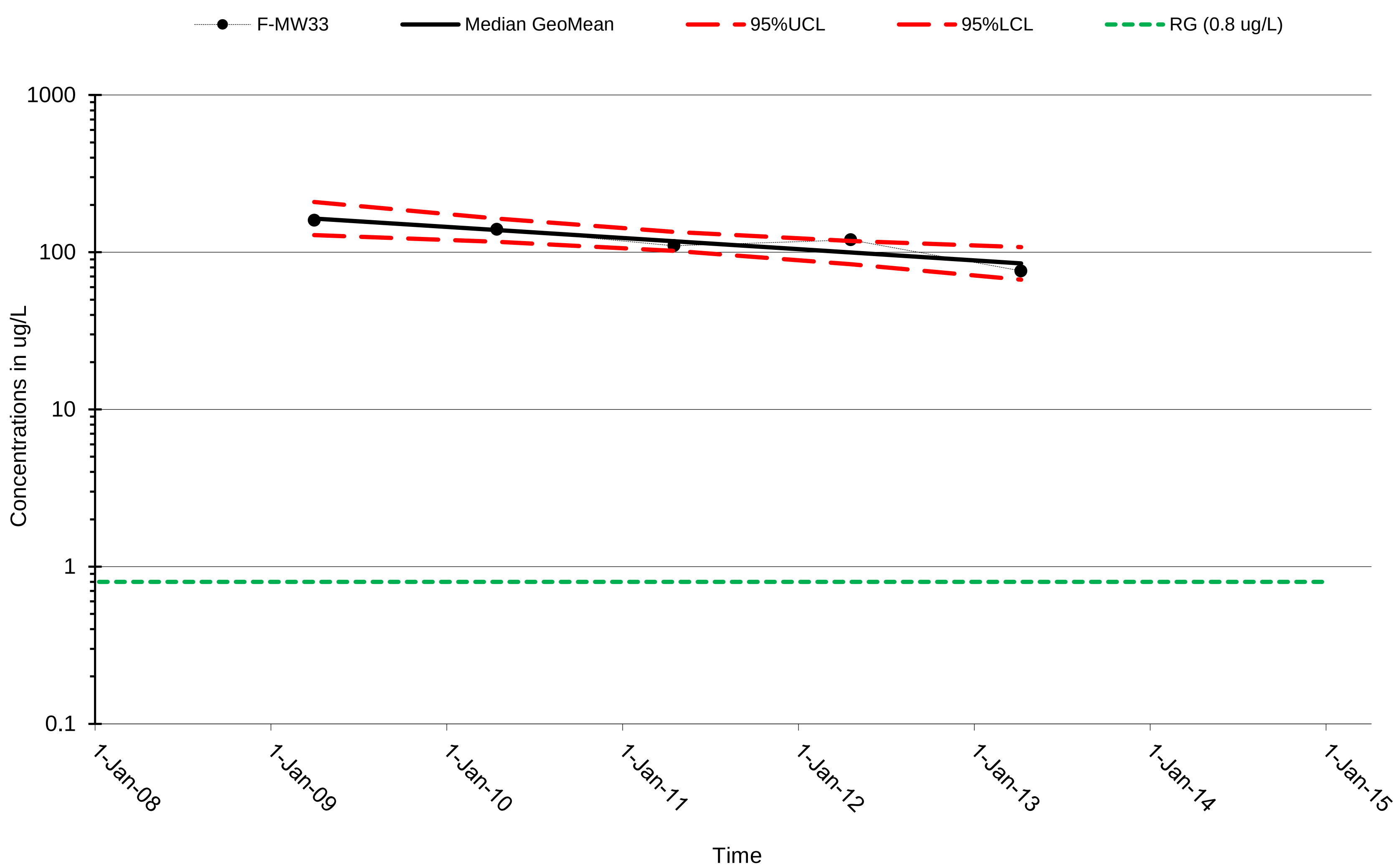
APPENDIX C-2

33762145_63.ai



U.S. NAVY	**Figure C-1** **RDX in Well F-MW31**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_64.ai

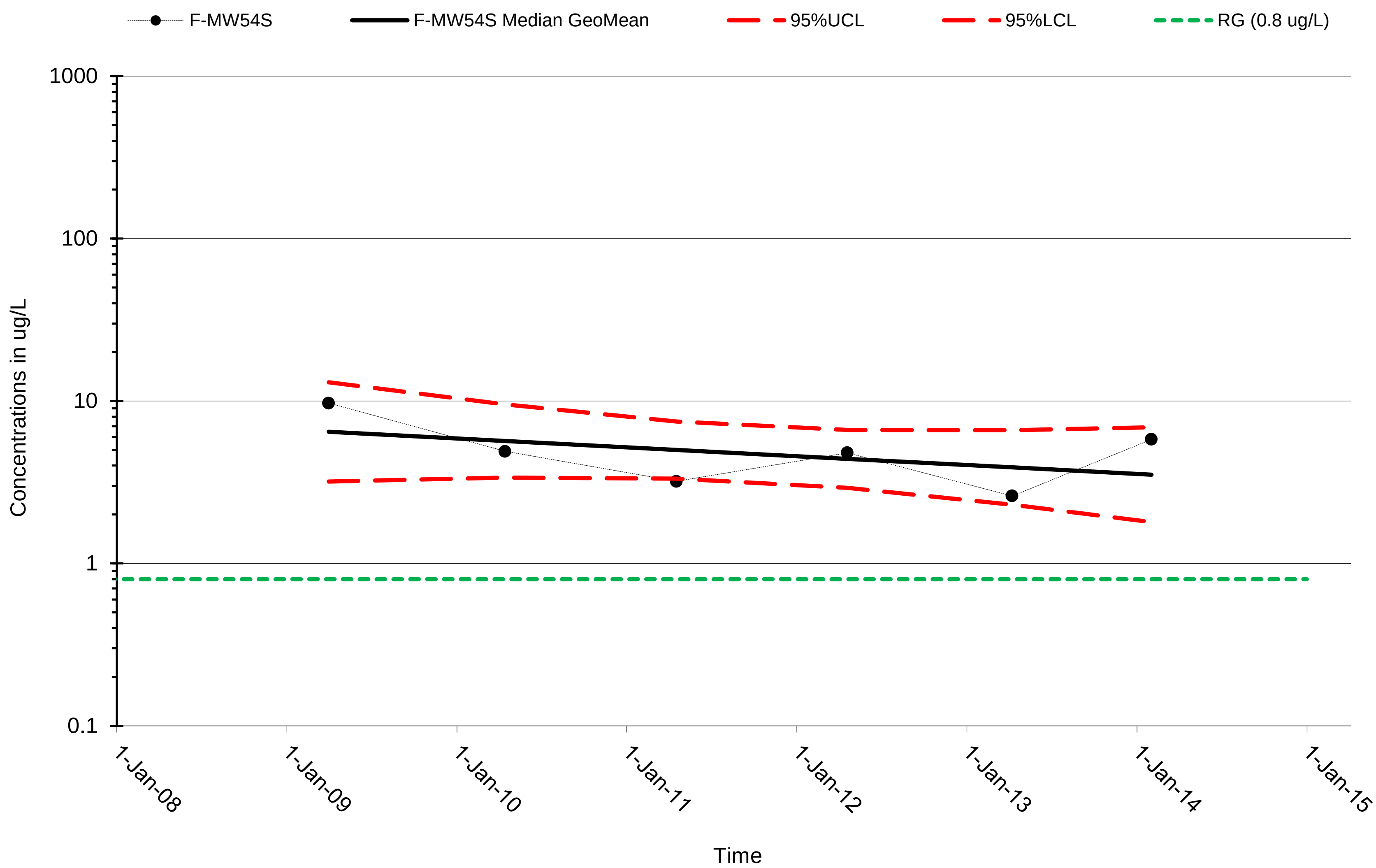


U.S. NAVY

Figure C-2
RDX in Well F-MW33

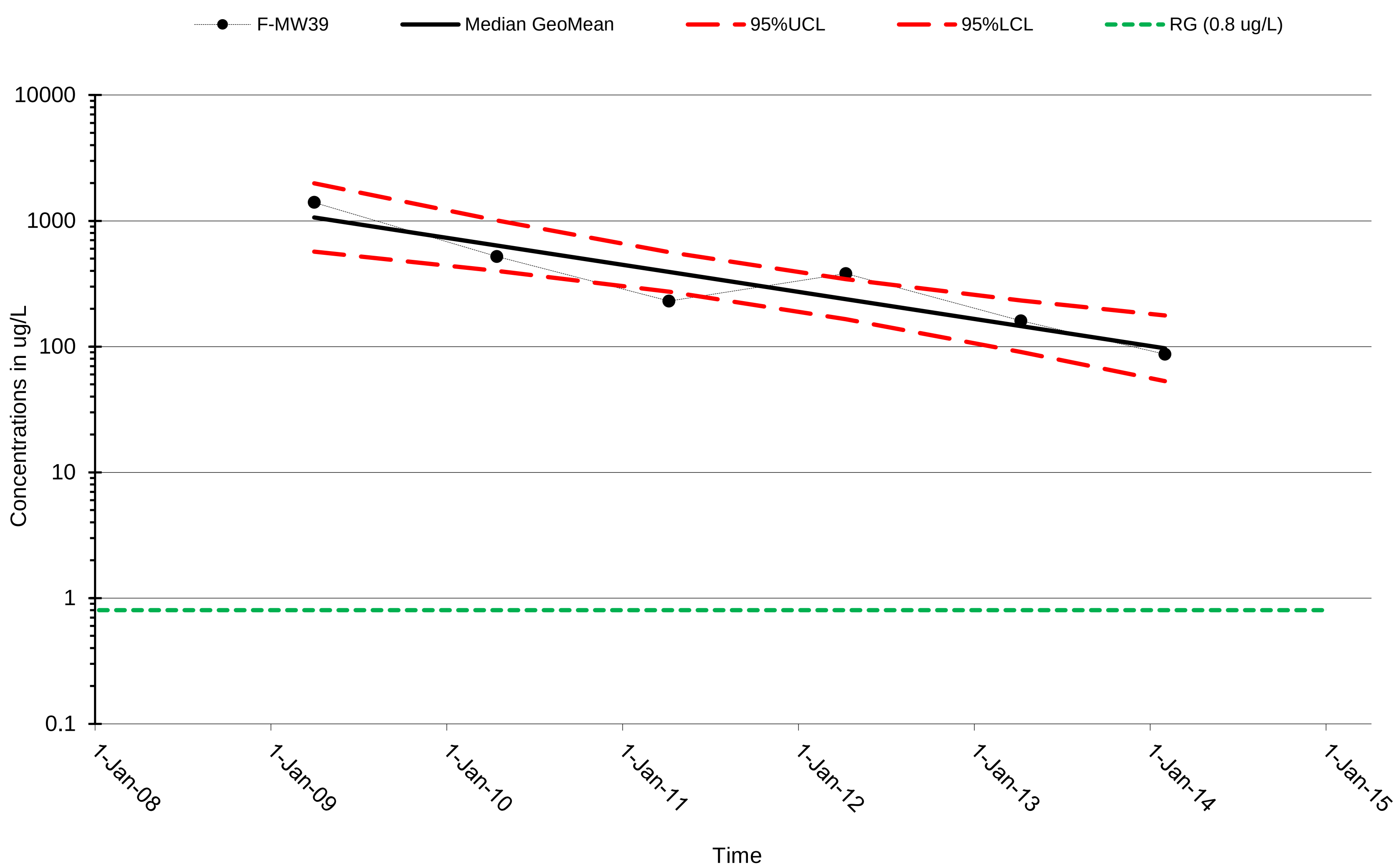
NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_65.ai



U.S. NAVY	**Figure C-3** **RDX in Well F-MW54S**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_66.ai

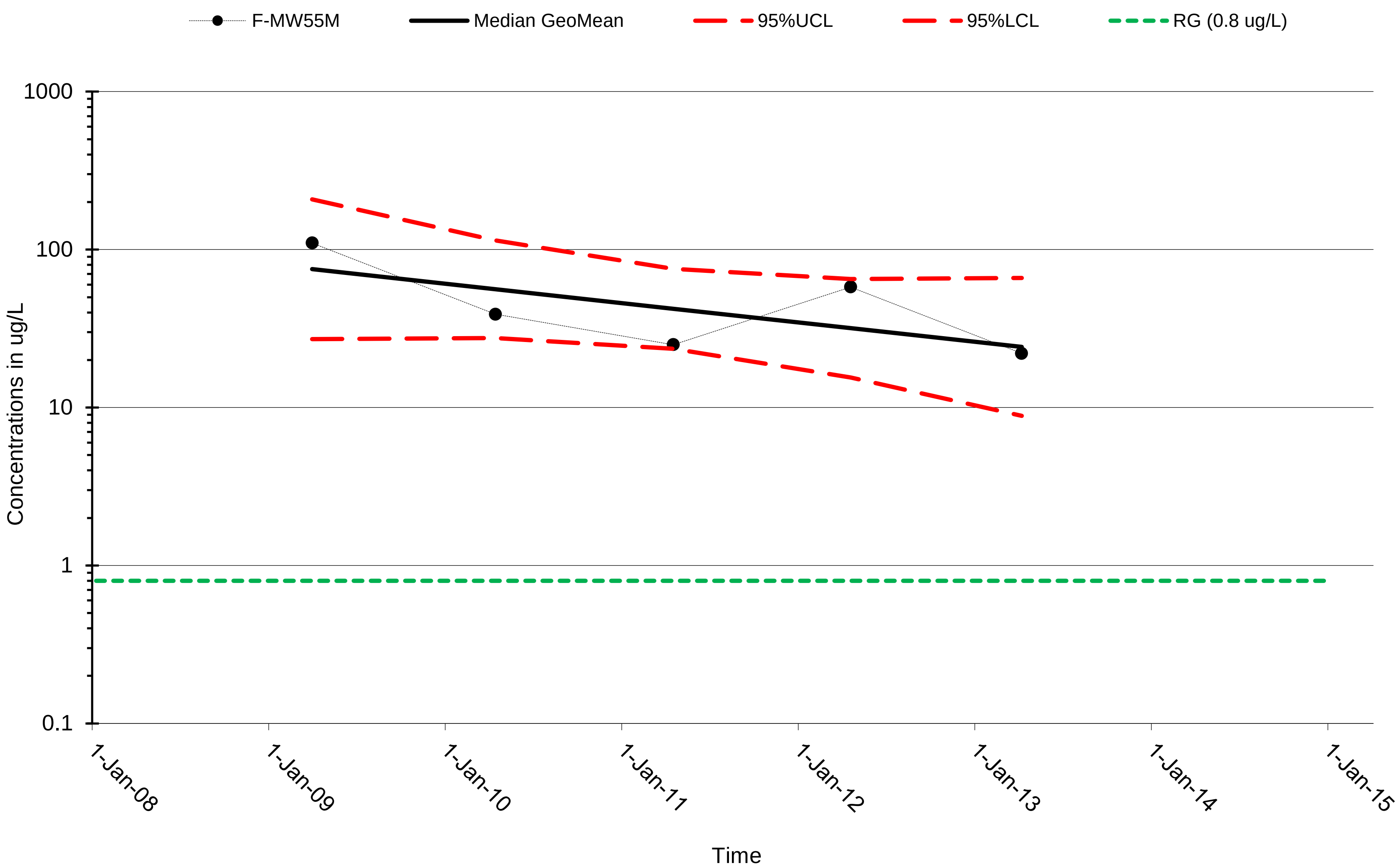


U.S. NAVY

Figure C-4
RDX in Well F-MW39

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_67.ai

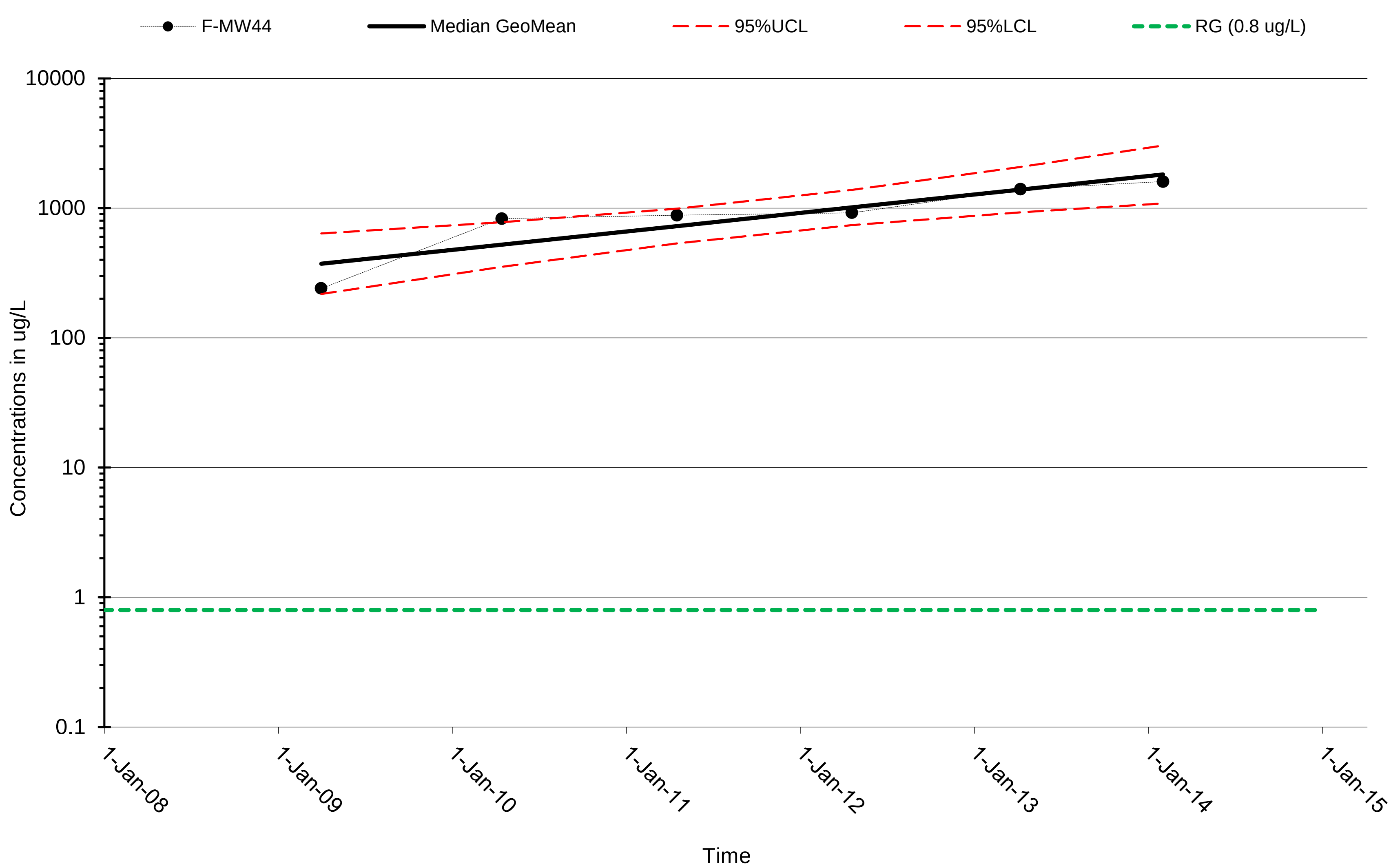


U.S. NAVY

Figure C-5
RDX in Well F-MW55M

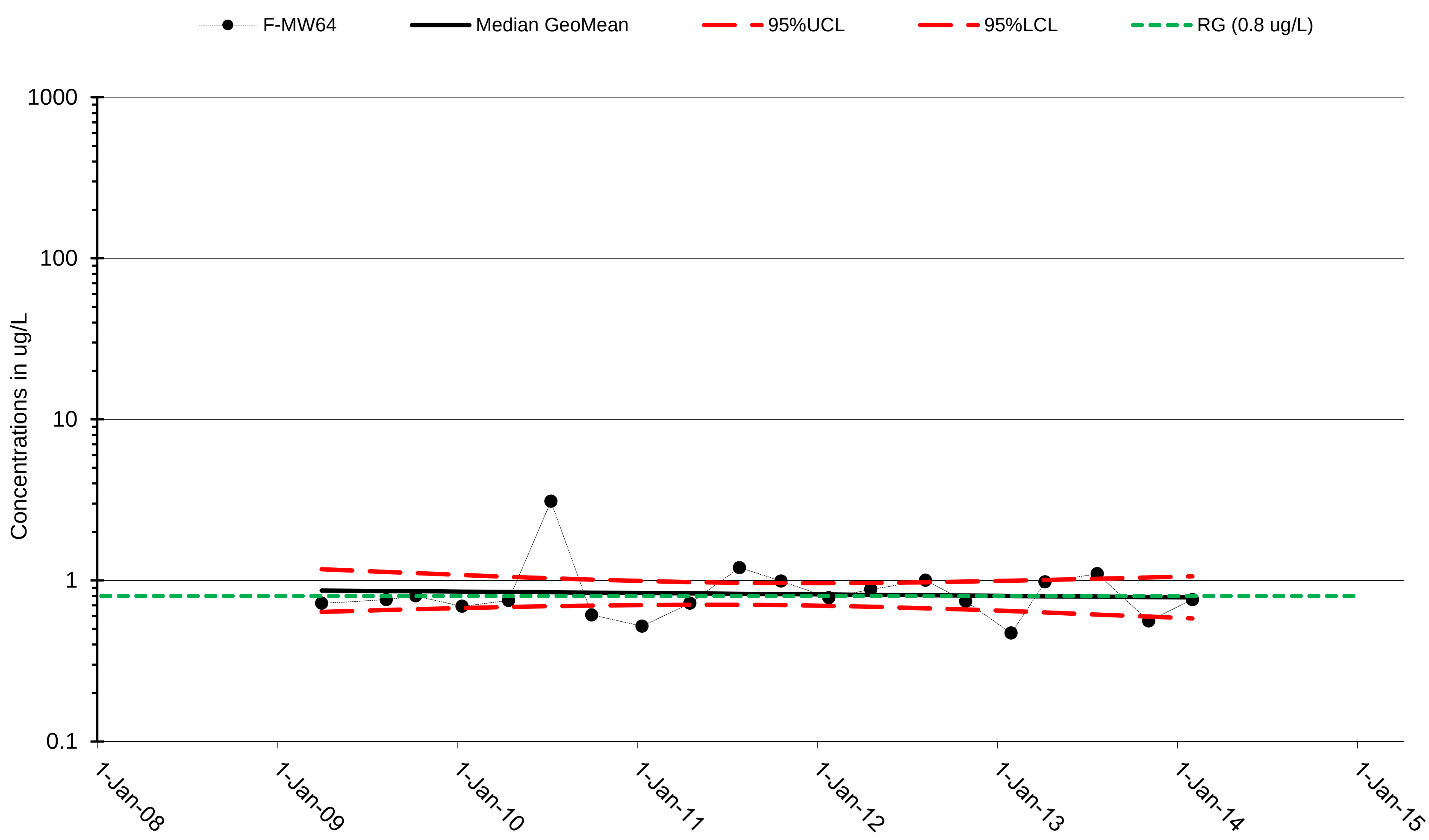
NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_68.ai



U.S. NAVY	**Figure C-6** **RDX in Well F-MW44**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_69.ai

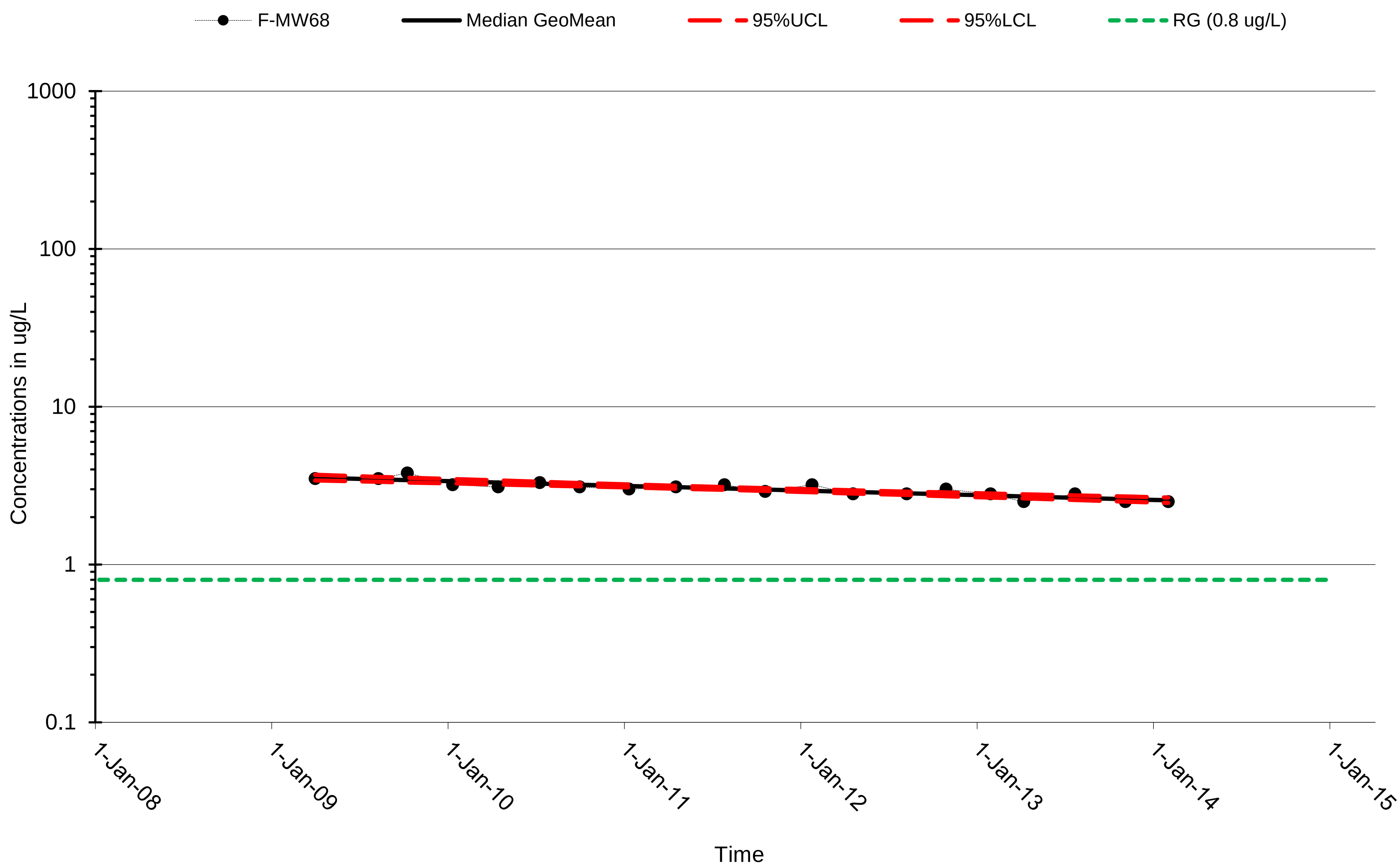


U.S. NAVY

Figure C-7
RDX in Well F-MW64

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_70.ai



U.S. NAVY

Figure C-8
RDX in Well F-MW68

NBK Bangor
FOURTH
5-YEAR REVIEW

APPENDIX D

OU 8 Data

APPENDIX D-1

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		Benzene (5.0 µg/L)	DCA (5.0 µg/L)	TCA (5.0 µg/L)	DCE (0.5 µg/L)	EDB (0.8 µg/L)	Toluene (1,000 µg/L)
8MW47	3/16/1998	7,800	700 J	50 U	50 U	16 J	7,800 J
	6/23/1998	2,900 J	140	50 U	50 U	13 J	16,000 J
	9/28/1998	5,900	250	100 U	100 U	100 U	11,000
	3/30/1999	11,000 J	640 U	50 U	50 U	50 U	2,500 J
	9/27/1999	3,800 J	50 U	50 U	50 U	50 U	12,000 J
	3/27/2000	2,000	100 U	100 U	100 U	100 U	5,600 J
	6/22/2000	2,600 J	100 U	100 U	100 U	100 U	14,000 J
	11/1/2000	3,200	100 U	100 U	100 U	400 U	22,000
	1/17/2001	3,800	50 U	50 U	50 U	20 J	20,000
	4/17/2001	4,400 D	30 U	20 U	30 U	20 U	19,000 D
	7/18/2001	4,600 D	23 U	20 U	24 U	15 U	20,000 D
	10/24/2001	7,500 D	290 D	10 UD	12 UD	37 JD	21,000 D
	5/30/2002	3,600	12 U	10 U	12 U	10 J	18,000
	10/30/2002	7,800	12 U	10 U	12 U	24 J	18,000
	4/9/2003	7,300	5.7 U	5 U	6 U	9.5 J	12,000 J
	10/9/2003	8,900	160	2.5 U	3 U	33	11,000
	4/15/2004	4,000 D	25 JD	10 U	12 U	7.3 U	19,000 D
	10/12/2004	11,000	140	1.7 J	0.6 U	21	11,000
	4/7/2005	6,900	120 U	0.69 U	0.61 U	19	15,000
	10/11/2005	12,000	190 J	18	0.5 U	19	12,000
	5/1/2006	3,700 D	4	110	0.5 U	25	11,000 D
	10/1/2006	12,000 D	200 J	170 J	1 U	10 J	8,100 D
	4/1/2007	2,100	0.5 U	0.5 U	0.5 U	0.5 U	11,000
	10/1/2007	NS	NS	NS	NS	NS	NS
	4/1/2008	NS	NS	NS	NS	NS	NS
	10/8/2008	NS	NS	NS	NS	NS	NS
	4/8/2009	NS	NS	NS	NS	NS	NS
	10/8/2009	12,000 D	61 D	25 U	25 U	13 JD	6,700 D
	4/21/2010	8,700 D	350 U	0.5	13 U	6.5 JD	8,200 D
	10/6/2010	9,100 JD	33 D	25 U	25 U	8.5 JD	12,000 JD
	4/12/2011	7,400 D	31 D	10 U	10 U	2.2 JD	6,600 D
	10/3/2011	5,300 D	19 D	13 U	13 U	3.0 JD	11,000 D
	4/19/2012	2,500 D	11 Ui	1.0 U	1.0 U	1.0 U	7,200 D
	10/16/2012	6,400 D	21 D	10 U	10 U	10 U	5,300 D
	4/19/2013	1,600 D	73 U	5 U	5 U	5 U	3,000 D
	10/22/2013	3,900 D	2.5 U	2.5 U	2.5 U	2.5 U	1,700 D
	4/2/2014	6,000 D	28.0 D	10.0 U	10.0 U	10.0 U	300 D

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations (Continued)

Monitoring Location	Date Sampled	Analyte (Cleanup Level) Benzene (5.0 µg/L)	DCA (5.0 µg/L)	TCA (5.0 µg/L)	DCE (0.5 µg/L)	EDB (0.8 µg/L)	Toluene (1,000 µg/L)
MW05	3/28/2000	1,800 D	220 D	100 U	100 U	18 J	2,100 D
	6/22/2000	4,000 J	340 D	100 U	100 U	25 J	2,500 U
	10/31/2006	9,000 D	500 D	99 J	1 UJ	1 UJ	2,900 D
	4/16/2007	4,700 D	260 D	0.5 U	0.5 U	0.5 U	1,700 D
	10/29/2007	7,600 N	430 N	0.5 U	0.5 U	0.5 U	2,200 N
	10/9/2008	6,700 D	500 D	0.5 U	0.5 U	0.5 U	1,400 D
	10/13/2009	10,000 J	500 J	25 U	25 U	25 U	810 D
	5/4/2010	8,400 J	680 U	13 U	13 U	13 U	790 J
	10/5/2010	20,000 D	820 D	25 U	25 U	25 U	15,000 JD
	2/3/2011	15,000 J	610 J	25 U	25 U	25 U	11,000 J
	10/3/2011	17,000 D	510 J	25 U	25 U	25 U	16,000 D
	10/16/2012	14,000 D	210 D	25 U	25 U	25 U	11,000 D
	10/23/2013	14,000 D	180 D	25 U	25 U	25 U	6,000 D

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations (Continued)

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		Benzene (5.0 µg/L)	**DCA (5.0 µg/L)**	**TCA (5.0 µg/L)**	**DCE (0.5 µg/L)**	**EDB (0.8 µg/L)**	**Toluene (1,000 µg/L)**
8MW06	3/13/1998	73	1,100 J	20 U	20 U	20 U	4.4 J
	6/19/1998	250	1,500 J	50 U	50 U	50 U	18 J
	9/28/1998	110	1,200	50 U	50 U	50 U	6.5 J
	3/29/1999	53	1,000 J	20 U	20 U	20 U	3 J
	9/27/1999	130	1,100	50 U	50 U	50 U	20 J
	3/24/2000	170	1,600 J	50 U	50 U	50 U	11 J
	6/21/2000	470 J	1,200 D	1 U	1 U	1 U	82 D
	10/31/2000	370	1,200	0.5 U	0.5 U	0.4 J	61
	1/18/2001	950	1,200	1 U	1 U	3 J	340
	4/17/2001	860 D	1,200 D	2 U	3 U	2 U	200 D
	7/18/2001	850 D	1,200 D	2.5 U	3 U	1.9 U	91 D
	10/23/2001	830 D	1,400 D	0.5 U	0.6 U	1.8 JD	180 D
	5/30/2002	1,100	1,700	1 U	1.2 U	1.6 J	140
	10/30/2002	1,400	1,500	1 U	1.2 U	2.5 J	180 J
	4/9/2003	910	1,100	0.5 U	0.6 U	0.37 U	27
	10/7/2003	580	940	0.5 U	0.6 U	0.37 U	57
	4/14/2004	1,900 D	1,100 D	0.5 U	0.6 U	1.6 JD	69 D
	10/8/2004	1,700	1,300 J	0.5 U	0.6 U	1.5 J	110
	4/7/2005	3,000	980	0.69 U	0.61 U	1.4 J	57
	10/11/2005	6,300	2,400	0.5 U	0.5 U	1.2	76 J
	4/26/2006	3,600 D	820 D	0.5 U	0.5 U	1.1	110
	10/1/2006	1,300 D	660 D	1 U	1 U	1 U	23 J
	4/1/2007	4,800	740	0.5 U	0.5 U	0.5 U	100
	10/1/2007	4,700 D	690 D	0.5 U	0.5 U	1.3	170 D
	4/1/2008	7,200	800	0.5 U	0.5 U	0.5 U	160
	10/9/2008	4,400 D	640 D	0.5 U	0.5 U	0.5 U	200 D
	4/8/2009	11,000 D	940 D	0.5 U	0.5 U	0.5 U	300 D
	10/6/2009	13,000 J	810 D	25 U	25 U	25 U	590 D
	4/19/2010	13,000 D	1,100 D	25 U	25 U	25 U	430 D
	10/5/2010	12,000 D	740 D	25 U	25 U	25 U	630 D
	4/12/2011	18,000 D	620 D	25 U	25 U	25 U	290 D
	10/3/2011	13,000 D	610 D	13 U	13 U	13 U	480
	4/19/2012	19,000 D	510 D	1.5 DJ	1.0 U	1.0 U	180 D
	10/17/2012	13,000 D	810 DJ	13 U	13 U	13 U	350 D
	4/19/2013	17,000 D	740 U	25 U	25 U	25 U	210 D
	10/23/2013	15,000 D	280 D	25 U	25 U	25 U	460 D
	4/2/2014	11,000 D	300 D	25 U	25 U	25 U	71 D

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations (Continued)

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		Benzene (5.0 µg/L)	DCA (5.0 µg/L)	TCA (5.0 µg/L)	DCE (0.5 µg/L)	EDB (0.8 µg/L)	Toluene (1,000 µg/L)
8MW33	3/13/1998	0.73 J	270	20	9.2	1 U	1 U
	8/5/1998	0.4 J	51	31	16	1 U	0.12 J
	9/25/1998	0.44 J	35	34 J	15	1 U	1 U
	3/24/1999	1 U	1 U	1 U	1 U	1 U	1 U
	6/24/1999	0.32 J	26 J	37 J	18 J	1 U	1 U
	9/22/1999	0.3 J	18 J	28 J	18	1 U	1 U
	12/15/1999	0.24 J	26 J	31 J	17	2 U	2 U
	3/23/2000	0.23 J	20 J	27 J	18	1 U	1 U
	6/20/2000	0.26 J	16	31 J	21	1 U	1 U
	10/31/2000	0.2 J	15	31	20	2 U	0.1 J
	1/18/2001	0.3 J	14	25	14	2 U	0.5 U
	4/17/2001	0.2 J	16	25	14	0.08 U	0.4 J
	7/20/2001	0.5 U	14	24	13	0.073 U	0.5 U
	10/24/2001	0.18 J	14	24	15	0.073 U	0.26 U
	5/30/2002	0.28 J	17	23	17	0.073 U	0.098 U
	10/30/2002	0.11 U	13	25	16	0.073 U	0.098 U
	4/10/2003	0.25 J	16	19	15	0.073 U	0.098 U
	10/8/2003	0.14 J	12	19	18	0.073 U	0.098 U
	4/14/2004	0.18 J	35	18	14	0.073 U	0.098 U
	10/8/2004	0.13 J	27 J	19	16	0.073 U	0.098 U
	4/5/2005	0.15 J	38	14	10	0.099 U	0.5 U
	10/10/2005	0.5 U	30	13	10	0.5 U	0.5 U
	4/22/2006	0.5 U	58	12	9.9	0.5 U	0.5 U
	10/1/2006	1 U	54	12	10	1 U	1 U
	4/1/2007	0.5 U	49	9.9	5.3	0.5 U	0.5 U
	10/1/2007	0.5 U	72	9.4	6.4	0.5 U	0.5 U
	4/1/2008	0.5 U	57	6.8	5.1	0.5 U	0.5 U
	10/7/2008	0.5 U	64	7.8	6.3	0.5 U	0.5 U
	4/6/2009	0.5 U	51	5.4	3.5	0.5 U	0.5 U
	10/5/2009	0.5 U	67	7.7	4.5	0.5 U	0.06 J
	4/20/2010	0.5 U	49	5.7	3.5	0.5 U	0.5 U
	10/5/2010	0.5 U	49	5.8	3.6	0.5 U	0.5 U
	4/11/2011	0.5 U	36	4.4	3.4	0.5 U	0.5 U
	9/27/2011	0.5 U	39	5.8	3.7	0.5 U	0.5 U
	4/25/2012	0.5 U	32 J	4.1	2.5	0.5 U	0.5 U
	10/17/2012	0.5 U	40	5.5	3.8	0.5 U	0.5 U
	4/19/2013	0.5 U	21	2.4	1.6	0.5 U	0.25 J
	10/24/2013	0.5 U	28	4.5	3.1	0.5 U	0.5 U
	3/31/2014	0.5 U	24	2.8	2.0	0.5 U	0.5 U

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations (Continued)

Monitoring Location	Date Sampled	Analyte (Cleanup Level) Benzene (5.0 µg/L)	DCA (5.0 µg/L)	TCA (5.0 µg/L)	DCE (0.5 µg/L)	EDB (0.8 µg/L)	Toluene (1,000 µg/L)
8MW03	3/9/1998	29	150	5.4 J	2.1 J	1 U	1 U
	9/24/1998	6.6	110	5	2	1 U	1 U
	3/24/1999	1 U	1 U	1 U	1 U	1 U	1 U
	6/23/1999	4.8	90 J	6 J	2.7 J	1 U	1 U
	9/21/1999	1.5	70 J	4.7	2.4	1 U	1 U
	3/21/2000	0.83 J	69 J	4.2	2.4	1 U	1 U
	10/30/2000	0.54	80	5.5	3.4	2 U	0.3 J
	1/16/2001	0.53	61	4.9	3	0.8 U	0.5 U
	4/16/2001	0.99	56	4.5	2.7	0.08 U	0.2 J
	7/18/2001	0.11 U	49	3.6	2.9	0.073 U	0.5 U
	10/22/2001	1.2	46	3.4	2.7	0.073 U	0.13 U
	5/30/2002	2.3	47	3.7	2.7	0.073 U	0.16 J
	10/29/2002	1.3	28	3	1.8	0.073 U	0.098 U
	4/7/2003	0.28 J	18	1.7	1.6	0.073 U	0.098 U
	10/6/2003	0.37 J	20	1.9	2	0.073 U	0.098 U
	4/12/2004	0.11 U	11	0.87	0.68	0.073 U	0.15 J
	10/6/2004	0.2 J	19	1.3	1.4	0.073 U	0.098 U
	4/6/2005	0.14 U	12	1	0.93	0.099 U	0.34 J
	10/13/2005	0.5 U	14	1	1.1	0.5 U	0.5 U
	4/27/2006	0.5 U	14	0.8	0.9	0.5 U	0.5 U
	10/1/2006	1 U	16	0.72 J	0.98 J	1 U	1 U
	4/1/2007	0.5 U	11	0.5 U	0.47 J	0.5 U	0.5 U
	10/1/2007	0.22 J	16	0.63	0.83	0.5 U	0.5 U
	4/1/2008	0.23 J	11	0.52	0.76	0.5 U	0.5 U
	10/6/2008	0.23 J	13	0.61	0.84	0.5 U	0.5 U
	4/6/2009	0.28 J	10	0.68	0.82	0.5 U	0.5 U
	10/5/2009	0.24 J	11	0.6	0.77	0.5 U	0.5 U
	4/19/2010	0.5 U	7.6	0.5 U	0.44 J	0.5 U	0.5 U
	10/6/2010	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/11/2011	0.5 U	4	0.5 U	0.22 J	0.5 U	0.5 U
	9/27/2011	0.22 J	7.8	0.52	0.75	0.5 U	0.5 U
	4/19/2012	0.22 J	6.5	0.39 J	0.60	0.5 U	0.5 U
	10/18/2012	0.5 U	4.2	0.22 J	0.37	0.5 U	0.5 U
	4/19/2013	0.5 U	3.2	0.5 U	0.27 J	0.5 U	0.5 U
	10/24/2013	0.5 U	3.3	0.5 U	0.39 J	0.5 U	0.5 U
	3/31/2014	0.5 U	4.4	0.5 U	0.26 J	0.5 U	0.5 U

Appendix D. Historical MNA Sample Results Supporting Temporal Variation Evaluations (Continued)

Monitoring Location	Date Sampled	Analyte (Cleanup Level) Benzene (5.0 µg/L)	DCA (5.0 µg/L)	TCA (5.0 µg/L)	DCE (0.5 µg/L)	EDB (0.8 µg/L)	Toluene (1,000 µg/L)
8MW13	3/11/1998	2.6	70	3.3	1.1	1 U	1 U
	6/17/1998	2.3	37	2.1	0.55 J	1 U	0.38 J
	9/23/1998	2.4	24	1.5	0.45 J	1 U	1 U
	12/14/1998	2.4	21	1.5	0.39 J	1 U	1 U
	3/25/1999	0.3 J	7.3	0.95 J	1 U	1 U	1 U
	6/24/1999	1 U	4.3	0.73 J	1 U	1 U	1 U
	9/20/1999	0.29 J	3.4	0.86 J	1 U	1 U	1 U
	12/13/1999	0.43 J	3.5	0.72 J	1 U	1 U	1 U
	3/23/2000	0.3 J	2.7	0.59 J	1 U	1 U	1 U
	6/19/2000	0.13 J	2.2	0.53 J	1 U	1 U	1 U
	11/2/2000	0.5 U	2.9	0.52	0.5 U	2 U	0.5 U
	1/15/2001	0.5 U	3.2	0.53	0.5 U	0.8 U	0.5 U
	4/19/2001	0.2 U	2.9	0.1 U	0.2 U	0.08 U	0.1 U
	7/19/2001	0.11 U	2.9	0.44 J	0.12 U	0.073 U	0.5 U
	10/25/2001	0.11 U	2	0.41 J	0.12 U	0.073 U	0.18 U
	5/30/2002	0.11 U	1.4	0.28 J	0.12 U	0.073 U	0.098 U
	10/29/2002	0.11 U	1.6	0.04 J	0.12 U	0.073 U	0.098 U
	4/8/2003	0.11 U	0.85	0.25 J	0.12 U	0.073 U	0.098 U
	10/6/2003	0.11 U	0.76	0.23 J	0.12 U	0.073 U	0.098 U
	4/13/2004	0.11 U	0.7	0.21 J	0.12 U	0.073 U	0.098 U
	10/7/2004	0.11 U	0.82 J	0.23 J	0.12 U	0.073 U	0.098 U
	4/4/2005	0.14 U	0.84	0.18 J	0.13 U	0.099 U	0.5 U
	10/6/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	5/2/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	10/1/2006	1 U	1 U	1 U	1 U	1 U	1 U
	4/1/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	10/1/2007	0.5 U	0.38 J	0.5 U	0.5 U	0.5 U	0.5 U
	4/1/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	10/3/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
	4/9/2009	0.5 U	1.7	0.5 U	0.5 U	0.5 U	0.5 U
	10/13/2009	0.5 U	2.1	0.5 U	0.5 U	0.5 U	0.14 J
	4/22/2010	0.5 U	2.3	0.5 U	0.5 U	0.5 U	0.05 J
	10/7/2010	0.5 U	2.2	0.5 U	0.5 U	0.5 U	0.5 U
	4/15/2011	0.5 U	1.8	0.5 U	0.5 U	0.5 U	0.5 U
	9/30/2011	0.5 U	1.2	0.5 U	0.5 U	0.5 U	0.5 U
	4/20/2012	0.5 U	1.8	0.5 U	0.5 U	0.5 U	0.5 U
	10/22/2012	0.5 U	1.1	0.5 U	0.5 U	0.5 U	0.5 U
	4/19/2013	0.5 U	1.1	0.5 U	0.5 U	0.5 U	0.5 U
	10/24/2013	0.5 U	0.71	0.5 U	0.5 U	0.5 U	0.5 U
	3/27/2014	0.5 U	0.16 J	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
D = The result is reported from a diluted analysis.
DCA = 1,2-dichloroethane
DCE = 1,1-dichloroethene
EDB = 1,2-dibromoethane
J = The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
µg/L = micrograms per liter
TCA = 1,1,2-Trichloroethane
U = The compound was analyzed for but was not detected (non-detect) at or above the MRL/MDL.

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW01	10/5/2010	NA		30.07	34.10	NP					
MW01	11/10/2010	NA		30.19	34.10	NP					
MW01	1/5/2011	NA		29.80	34.10	NP					
MW01	2/9/2011	NA		28.48	34.10	NP					Sheen
MW01	3/16/2011	0.0		27.49	34.10	NP					
MW01	3/24/2011	NA		25.65	34.10	NP					
MW01	3/29/2011	0.0		26.73	34.10	NP					
MW01	4/13/2011	0.0		26.08	34.10	NP					
MW01	5/18/2011	NA		25.91	34.10	NP					
MW01	6/23/2011	NA		26.52	34.10	NP					
MW01	7/27/2011	NA		26.75	34.10	NP					
MW01	8/27/2011	NA		27.31	34.10	NP					
MW01	9/28/2011	NA		27.49	34.10	NP					
MW01	4/18/2012	NA		26.55	34.10	NP					
MW01	5/3/2012	NA		19.04	34.10	NP					Water level checked.
MW01	6/8/2012	NA		26.15	34.10	NP					
MW01	7/3/2012	NA		25.03	34.10	NP					
MW01	8/6/2012	NA		28.31	34.10	NP					
MW01	9/11/2012	NA		28.32	34.10	NP					
MW01	10/18/2012	NA	trace	29.35	34.1	NP					
MW01	11/15/2012	NA		28.84	34.10	NP					
MW01	12/13/2012	NA		27.42	34.10	NP					
MW01	1/17/2013	NA	trace	26.32	34.10	NP					
MW01	2/14/2013	NA	trace	25.32	34.10	NP					
MW01	3/12/2013	NA		26.29	34.10	NP					
MW01	4/12/2013	NA		26.22	34.10	NP					
MW01	5/16/2013	NA		27.05	34.10	NP					
MW01	6/13/2013	NA	trace	27.45	34.10	trace					
MW01	7/11/2013	NA		27.83	34.10	NP					
MW01	8/15/2013	NA		27.14	34.10	NP					
MW01	9/5/2013	NA		28.33	34.10	NP					
MW01	10/7/2013	NA	trace	28.77	34.10	NP					
MW01	11/13/2013	NA		29.97	34.10	NP					
MW01	12/13/2013	NA		29.56	34.10	NP					
MW01	1/10/2014	NA		29.3	34.10	NP					
MW01	2/13/2014	NA		29.19	34.10	NP					
MW01	3/13/2014	NA		28.86	34.10	NP					
MW01	4/3/2014	NA		28.15	34.10	NP					
MW01	4/24/2014	0.1		27.45	34.10	NP					
MW01	5/5/2014	NA		27.82	34.10	NP					
MW01	5/20/2014	NA		27.89	34.10	NP					
							MW01 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW03	10/5/2010	NA		29.84	35.90	NP					
MW03	11/10/2010	NA		29.94	35.90	NP					
MW03	12/8/2010	NA		29.87	35.90	NP					
MW03	1/5/2011	NA		29.80	35.90	NP					
MW03	2/9/2011	NA		29.09	35.90	NP					
MW03	3/24/2011	NA		26.55	35.90	NP					
MW03	4/6/2011	NA		29.17	35.90	NP					
MW03	5/18/2011	NA		25.89	35.90	NP					
MW03	6/23/2011	NA		26.24	35.90	NP					
MW03	7/27/2011	NA		27.68	35.90	NP					
MW03	8/27/2011	NA		26.98	35.90	NP					
MW03	9/28/2011	NA		27.62	35.90	NP					
MW03	4/18/2012	NA		26.69	35.90	NP					
MW03	5/3/2012	NA		26.58	35.90	NP					
MW03	6/8/2012	NA		27.11	35.90	NP					
MW03	7/3/2012	NA		27.45	35.90	NP					
MW03	8/6/2012	NA		27.85	35.90	NP					
MW03	9/11/2012	NA		28.40	35.90	NP					
MW03	10/18/2012	NA		29.23	35.90	NP					
MW03	11/15/2012	NA		29.11	35.90	NP					
MW03	12/13/2012	NA		27.77	35.90	NP					White bugs on the probe
MW03	1/17/2013	NA		26.09	35.90	NP					White bugs on the probe
MW03	2/14/2013	NA		26.08	35.90	NP					White bugs on the probe
MW03	3/12/2013	NA		26.15	35.90	NP					White bugs on the probe
MW03	4/12/2013	NA		26.26	35.90	NP					White bugs on the probe
MW03	5/16/2013	NA		26.90	35.90	NP					White bugs on the probe
MW03	6/13/2013	NA		26.98	35.90	NP					White bugs on the probe
MW03	7/11/2013	NA		27.31	35.90	NP					White bugs on the probe
MW03	8/15/2013	NA		27.80	35.90	NP					White bugs on the probe
MW03	9/5/2013	NA		28.00	35.90	NP					White bugs on the probe
MW03	10/7/2013	NA		28.00	35.90	NP					White bugs on the probe
MW03	11/13/2013	NA		28.75	35.90	NP					White bugs on the probe
MW03	12/13/2013	NA		29.00	35.90	NP					White bugs on the probe
MW03	1/10/2014	NA		29.58	35.90	NP					White bugs on the probe
MW03	2/13/2014	NA		28.45	35.90	NP					
MW03	3/13/2014	NA		28.44	35.90	NP					
MW03	4/3/2014	NA		27.55	35.90	NP					
MW03	4/25/2014	0.0		27.43	35.90	NP					PID wellhead peak 0.8 ppm
							MW03 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW04	12/3/2009	0.0	NA	NA	30.96	NP					Seal and bolts good, 4" butterfly cap, light smell of petro. On probe
MW04	1/12/2010	0.1	NA	30.26	30.96	NP					Black sediment, smell of petroleum on probe
MW04	2/9/2010	0.2	28.73	30.25	20.96	1.52	4,066	2,038	4,066	1.07	bailing DTP 30.63 DTW 30.83 ft, product seems to be flowing into well
MW04	3/3/2010	NA	27.93	28.73	30.96	0.80					Measured product and water in well with probe
MW04	3/4/2010	NA	27.96	28.79	30.96	0.77					Measured product and water in well with probe
MW04	3/5/2010	NA	27.98	28.80	30.96	0.79					Measured product and water in well with probe
MW04	3/8/2010	NA	28.18	28.84	30.96	0.66					Measured product and water in well with probe
MW04	3/9/2010	NA	28.14	28.81	30.96	0.67					Measured product and water in well with probe
MW04	3/10/2010	NA	28.20	28.88	30.96	0.68					Measured product and water in well with probe
MW04	3/11/2010	NA	28.12	28.80	30.96	0.68					Measured product and water in well with probe
MW04	3/12/2010	NA	28.00	28.70	30.96	0.70					Measured product and water in well with probe
MW04	3/15/2010	NA	28.11	28.82	30.96	0.71					Measured product and water in well with probe
MW04	3/29/2010	NA	27.95	28.62	30.96	0.67					Bailed until rechage of well was greater than bailing rate
MW04	3/29/2010	NA	30.22	30.62	30.96	0.40	540	5,430	4,606	1.22	Measured product and water removed during bailing
MW04	3/30/2010	NA	27.84	28.38	30.96	0.54					
MW04	3/30/2010	NA	29.91	30.20	30.96	0.29					
MW04	3/30/2010	NA	30.31	30.47	30.96	0.16	435	5,685	5,041	1.33	Measured product and water removed during bailing
MW04	3/31/2010	NA	27.92	28.15	30.96	0.23					
MW04	3/31/2010	NA	29.90	30.03	30.96	0.13					
MW04	3/31/2010	NA	29.98	30.00	30.96	0.02					
MW04	3/31/2010	NA	30.39	30.39	30.96	NP	220	5,880	5,261	1.39	Measured product and water removed during bailing
MW04	4/1/2010	NA	27.93	27.98	30.96	0.05					Bailed until rechage of well was greater then bailing rate
MW04	4/1/2010	NA	30.09	30.11	30.96	0.02					Used a absorbant sock to pull remaining product in well
MW04	4/1/2010	NA	30.03	30.03	30.96	NP					Bailed until rechage of well was greater than bailing rate
MW04	4/1/2010	NA	30.57	30.57	30.96	NP	15	6,285	5,276	1.39	Measured product and water in well with probe
MW04	4/2/2010	NA	27.65	27.68	30.96	0.03					Measured product and water in well with probe
MW04	4/5/2010	NA	27.87	27.90	30.96	0.03					Measured product and water in well with probe
MW04	4/6/2010	NA	27.98	28.02	30.96	0.04					Measured product and water in well with probe
MW04	5/5/2010	0.1		28.19	30.96	NA	30	50	5,306	1.40	Recovered 30ml of product. Bailed until recharge of well was greater than bailing rate
MW04	5/10/2010	NA		28.15	30.96	NP					
MW04	8/3/2010	NA		29.27	35.00	NP					
MW04	8/11/2010	NA		29.48	35.00	NP					
MW04	8/20/2010	NA	29.61	29.62	35.00	0.01					Sheen
MW04	8/25/2010	NA	29.95	30.08	35.00	0.13	275	NA	5,581	1.47	Product recovery with sock
MW04	9/1/2010	NA	29.75	29.75	35.00	NP					
MW04	9/10/2010	NA	29.77	29.77	35.00	NP					
MW04	9/15/2010	NA	29.62	29.62	35.00	NP					
MW04	9/24/2010	NA	29.84	29.84	35.00	NP					
MW04	9/29/2010	NA	29.86	29.86	35.00	NP					
MW04	10/5/2010	NA	29.87	29.87	35.00	NP					
MW04	10/13/2010	NA	29.92	29.92	35.00	NP					
MW04	10/19/2010	NA	29.98	29.98	35.00	NP					
MW04	10/27/2010	NA	30.04	30.04	35.00	NP					
MW04	11/3/2010	NA	30.09	30.09	35.00	NP					
MW04	11/10/2010	NA	30.14	30.14	35.00	NP					
MW04	11/17/2010	0.00	30.11	30.11	35.00	NP					
MW04	11/24/2010	NA		30.07	35.00	NP					
MW04	12/1/2010	NA		30.13	35.00	NP					
MW04	12/8/2010	NA	30.26	30.27	35.00	0.01					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW04	12/15/2010	NA	29.85	29.86	35.00	0.01					
MW04	12/22/2010	NA		29.52	35.00	NP					
MW04	12/30/2010	NA		28.89	35.00	NP					
MW04	1/5/2011	NA		30.16	35.00	NP					
MW04	1/14/2011	NA		28.56	35.00	NP					
MW04	1/19/2011	NA		28.24	35.00	NP					
MW04	1/26/2011	NA		28.19	35.00	NP					
MW04	2/2/2011	NA		28.15	35.00	NP					
MW04	2/9/2011	NA		28.10	35.00	NP					
MW04	2/17/2011	NA		27.94	35.00	NP					
MW04	2/28/2011	NA		27.89	35.00	NP					
MW04	3/16/2011	NA		27.73	35.00	NP					
MW04	3/24/2011	NA		26.51	35.00	NP					
MW04	3/29/2011	NA		26.14	35.00	NP					
MW04	4/6/2011	NA		29.01	35.00	NP					
MW04	5/18/2011	NA		25.75	35.00	NP					
MW04	6/23/2011	NA		26.48	35.00	NP					
MW04	7/27/2011	NA		26.86	35.00	NP					
MW04	8/27/2011	NA		27.23	35.00	NP					
MW04	9/28/2011	NA		28.01	35.00	NP					
MW04	4/18/2012	NA		25.91	35.00	NP					
MW04	5/3/2012	NA		25.81	35.00	NP					
MW04	6/8/2012	NA		NA	35.00						
MW04	6/13/2012	NA		21.03	35.00	NP					
MW04	7/3/2012	NA		27.46	35.00	NP					
MW04	8/6/2012	NA		27.98	35.00	NP					
MW04	9/11/2012	NA		28.70	35.00	NP					
MW04	11/15/2012	NA		29.63	35.00	NP					Removed absorbent sock in well
MW04	12/13/2012	NA		26.85	35.00	NP					
MW04	1/17/2013	NA		25.28	35.00	NP					
MW04	2/14/2013	NA	trace	25.37	35.00	NP					
MW04	3/12/2013	NA		25.40	35.00	NP					
MW04	4/12/2013	NA		25.53	35.00	NP					
MW04	5/16/2013	NA		26.21	35.00	NP					
MW04	6/13/2013	NA		28.80	35.00	NP					
MW04	7/11/2013	NA		27.50	35.00	NP					
MW04	8/15/2013	NA		28.10	35.00	NP					
MW04	9/5/2013	NA		28.38	35.00	NP					
MW04	10/7/2013	NA		28.43	35.00	NP					
MW04	11/13/2013	NA		28.94	35.00	NP					
MW04	12/13/2013	NA		29.11	35.00	NP					
MW04	1/10/2014	NA		29.50	35.00	NP					
MW04	2/13/2014	NA		29.50	35.00	NP					
MW04	3/13/2014	NA		28.19	35.00	NP					
MW04	4/3/2014	NA		27.19	35.00	NP					
MW04	4/25/2014	7.9		27.29	35.00	NP					PID wellhead peak 193.9 ppm
							MW04 CUMULATIVE		5,581	1.47	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW05	10/5/2010	NA		30.05	40.50	NP					
MW05	11/10/2010	NA		30.08	40.50	NP					
MW05	12/8/2010	NA		29.98	40.50	NP					
MW05	1/5/2011	NA		30.01	40.50	NP					
MW05	2/9/2011	NA	28.26	28.28	40.50	0.02					
MW05	3/16/2011	NA		27.06	40.50	NP					
MW05	3/24/2011	NA		26.42	40.50	NP					
MW05	3/29/2011	NA		26.32	40.50	NP					
MW05	4/6/2011	NA		28.95	40.50	NP					
MW05	4/13/2011	NA		25.96	40.50	NP					
MW05	5/4/2011	NA	26.59	26.61	40.50	0.02					
MW05	5/11/2011	NA		26.17	40.50	NP					
MW05	5/18/2011	NA		26.17	40.50	NP					
MW05	6/23/2011	NA		26.64	40.50	NP					
MW05	7/27/2011	NA		27.70	40.50	NP					
MW05	8/27/2011	NA		27.44	40.50	NP					
MW05	9/28/2011	NA		28.08	40.50	NP					
MW05	4/18/2012	NA		26.62	40.50	NP					
MW05	5/3/2012	NA		26.93	40.50	NP					
MW05	6/8/2012	NA		27.45	40.50	NP					
MW05	7/3/2012	NA		27.79	40.50	NP					
MW05	8/6/2012	NA		28.21	40.50	NP					
MW05	9/11/2012	NA		28.74	40.50	NP					
MW05	10/18/2012	NA		29.26	40.50	NP					
MW05	11/15/2012	NA		29.22	40.50	NP					
MW05	12/13/2012	NA		27.69	40.50	NP					
MW05	1/17/2013	NA	trace	26.23	40.50	trace					
MW05	2/14/2013	NA		26.32	40.50	NP					
MW05	3/12/2013	NA	trace	26.43	40.50	trace					
MW05	4/12/2013	NA		26.45	40.50						Petroleum odor
MW05	5/16/2013	NA		27.02	40.50						
MW05	6/13/2013	NA		27.35	40.50	NP					
MW05	7/11/2013	NA	NP	27.73	40.50	NP					
MW05	8/15/2013	NA	NP	28.28	40.50	NP					
MW05	9/5/2013	NA	NP	28.52	40.50	NP					
MW05	10/7/2013	NA	NP	28.53	40.50	NP					
MW05	11/13/2013	NA	NP	29.06	40.50	NP					
MW05	12/13/2013	NA	NP	29.34	40.50	NP					
MW05	1/10/2014	NA	NP	29.85	40.50	NP					
MW05	2/13/2014	NA	NP	29.71	40.50	NP					
MW05	3/13/2014	NA	trace	28.31	40.50	NP					
MW05	4/3/2014	NA	trace	27.60	40.50	NP					
MW05	4/25/2014	0.20	NP	27.70	40.50	NP					PID wellhead peak 89.5 ppm
							MW05 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
MW08	10/5/2010	NA		30.26	39.39	NP					
MW08	11/10/2010	NA		30.38	39.39	NP					
MW08	12/8/2010	NA		30.33	39.39	NP					
MW08	1/5/2011	NA		30.25	39.39	NP					
MW08	2/9/2011	NA		28.59	39.39	NP					
MW08	3/24/2011	NA		26.97	39.39	NP					
MW08	5/18/2011	NA		26.44	39.39	NP					
MW08	6/23/2011	NA		26.85	39.39	NP					
MW08	7/27/2011	NA		27.28	39.39	NP					
MW08	8/27/2011	NA		27.59	39.39	NP					
MW08	9/28/2011	NA		28.22	39.39	NP					
MW08	4/18/2012	NA		27.16	39.39	NP					
MW08	5/3/2012	NA		27.20	39.39	NP					
MW08	6/8/2012	NA		27.70	39.39	NP					
MW08	7/3/2012	NA		27.95	39.39	NP					
MW08	8/6/2012	NA		28.36	39.39	NP					
MW08	9/11/2012	NA		28.93	39.39	NP					
MW08	10/18/2012	NA	trace	29.35	39.39	trace					
MW08	11/15/2012	NA		29.44	39.39	NP					
MW08	12/13/2012	NA		28.11	39.39	NP					
MW08	1/17/2013	NA		26.63	39.39	NP					
MW08	2/14/2013	NA	trace	26.60	39.39	trace					Oily residue on probe, fuel odor
MW08	3/12/2013	NA	NP	26.85	39.39	NP					Probe was warm to the touch
MW08	4/12/2013	NA	NP	26.75	39.39	NP					
MW08	5/16/2013	NA	NP	27.22	39.39	NP					
MW08	6/13/2013	NA	trace	27.53	39.39	trace					
MW08	7/11/2013	NA	NP	27.91	39.39	NP					
MW08	8/15/2013	NA	NP	28.40	39.39	NP					
MW08	9/5/2013	NA	NP	28.65	39.39	NP					
MW08	10/7/2013	NA	NP	28.71	39.39	NP					
MW08	11/13/2013	NA	NP	29.26	39.39	NP					
MW08	12/13/2013	NA	NP	29.50	39.39	NP					
MW08	1/10/2014	NA	NP	29.75	39.39	NP					
MW08	2/13/2014	NA	NP	29.90	39.39	NP					
MW08	3/13/2014	NA	NP	28.80	39.39	NP					
MW08	4/3/2014	NA	NP	28.02	39.39	NP					Probe was warm to the touch
MW08	4/25/2014	9.2	NP	28.00	39.39	NP					PID wellhead peak 941.6 ppm
							MW08 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
RW-1	10/5/2010	NA		30.50	NA	NP					
RW-1	11/10/2010	NA		NA	NA	NP					Steaming well not sampled
RW-1	12/8/2010	NA		29.44	NA	NP					Steaming well not sampled
RW-1	1/5/2011	NA		29.25	NA	NP					
RW-1	2/9/2011	NA		27.65	NA	NP					
RW-1	3/24/2011	NA		26.03	NA	NP					
RW-1	4/6/2011	NA		28.53	NA	NP					
RW-1	4/18/2012	NA		26.73	NA	NP					
RW-1	5/3/2012	NA		26.62	NA	NP					
RW-1	6/8/2012	NA		27.20	NA	NP					
RW-1	7/3/2012	NA		27.56	NA	NP					
RW-1	8/6/2012	NA		27.94	NA	NP					
RW-1	9/11/2012	NA	Trace	28.47	NA	Trace					
RW-1	9/20/2012	NA		28.59	NA	NP					
RW-1	9/27/2012	NA		28.70	NA	NP					
RW-1	10/5/2012	NA		28.81	NA	NP					
RW-1	10/12/2012	NA	NP	28.84	NA	NP					
RW-1	10/18/2012	NA	NP	28.92	NA	NP					
RW-1	11/15/2012	NA	trace	29.02	NA	trace					
RW-1	12/13/2012	NA		27.65	NA	NP					
RW-1	1/17/2013	NA		26.12	NA	NP					
RW-1	2/14/2013	NA		26.18	NA	NP					
RW-1	3/12/2013	NA		26.22	NA	NP					
RW-1	4/12/2013	NA	trace	26.3	NA	trace					
RW-1	5/16/2013	NA		26.75	44.35	NP					DTB to well monument 44.35 ft
RW-1	6/13/2013	NA	NP	27.09	44.35	NP					Rust colored flakes on the probe
RW-1	7/11/2013	NA	NP	27.45	44.35	NP					Rust colored flakes on the probe
RW-1	8/15/2013	NA	NP	27.95	44.35	NP					Rust colored flakes on the probe
RW-1	9/5/2013	NA	NP	28.2	44.35	NP					Rust colored flakes on the probe
RW-1	10/7/2013	NA	NP	28.3	44.35	NP					
RW-1	11/13/2013	NA	NP	28.8	44.35	NP					
RW-1	12/13/2013	NA	NP	29.09	44.35	NP					
RW-1	1/10/2014	NA	NP	28.89	44.35	NP					
RW-1	2/13/2014	NA	NP	29.44	44.35	NP					
RW-1	3/13/2014	NA	NP	28.31	44.35	NP					
RW-1	4/3/2014	NA	NP	27.53	44.35	NP					
RW-1	4/25/2014	0	NP	27.53	44.35	NP					PID wellhead peak 0.4 ppm
							RW-1 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
RW-2	10/5/2010	NA		30.50	NA	NP					
RW-2	12/8/2010	NA		29.44	NA	NP					Steaming well not sampled
RW-2	1/5/2011	NA		29.25	NA	NP					
RW-2	2/9/2011	NA		27.65	NA	NP					
RW-2	3/24/2011	NA		26.03	NA	NP					
RW-2	4/6/2011	NA		28.53	NA	NP					
RW-2	10/5/2010	NA		30.50	NA	NP					
RW-2	12/8/2010	NA		29.44	NA	NP					Steaming well not sampled
RW-2	1/5/2011	NA		29.25	NA	NP					
RW-2	2/9/2011	NA		27.65	NA	NP					
RW-2	3/24/2011	NA		26.03	NA	NP					
RW-2	4/6/2011	NA		28.53	NA	NP					
RW-2	4/6/2011	NA		28.53	NA	NP					
RW-2	4/18/2012	NA		26.37		NP					Located well in area labeled ECW-2. J-plug brittle/broken. A.Lewis to replace.
RW-2	5/3/2012	NA		26.10		NP					
RW-2	6/8/2012	NA		20.80		NP					
RW-2	6/13/2012	NA		26.85		NP					
RW-2	6/29/2012	NA		27.02		NP					
RW-2	7/3/2012	NA		27.08		NP					
RW-2	8/6/2012	NA		27.50		NP					
RW-2	9/11/2012	NA		28.05		NP					
RW-2	11/15/2012	NA	trace	28.63		trace					
RW-2	12/13/2012	NA		27.28		NP					
RW-2	1/17/2013	NA		25.75		NP					
RW-2	2/14/2013	NA		25.73		NP					
RW-2	3/12/2013	NA	trace	25.83		trace					
RW-2	4/12/2013	NA		NP		NP					
RW-2	5/16/2013	NA	NP	26.36	48.35	NP					DTB to well monument 48.35 ft
RW-2	6/13/2013	NA	NP	27.70	48.35	NP					
RW-2	7/11/2013	NA	NP	27.06	48.35	NP					
RW-2	8/15/2013	NA	NP	27.58	48.35	NP					
RW-2	9/5/2013	NA	NP	27.83	44.00	NP					
RW-2	10/7/2013	NA	NP	27.90	44.00	NP					
RW-2	11/13/2013	NA	NP	28.46	44.00	NP					
RW-2	12/13/2013	NA	NP	28.70	44.00	NP					
RW-2	1/10/2014	NA	NP	28.96	44.00	NP					
RW-2	2/13/2014	NA	NP	29.06	44.00	NP					
RW-2	3/13/2014	NA	NP	28.01	44.00	NP					
RW-2	4/3/2014	NA	NP	27.21	44.00	NP					
RW-2	4/25/2014	0.0	NP	27.21	44.00	NP					PID wellhead peak 0.2 ppm
							RW-2 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
RW-3	10/5/2010	NA		29.50	NA	NP					
RW-3	11/10/2010	NA		29.89	NA	NP					
RW-3	12/8/2010	NA		30.03	NA	NP					
RW-3	1/5/2011	NA		30.10	NA	NP					
RW-3	2/9/2011	NA		28.21	NA	NP					
RW-3	3/24/2011	NA		27.01	NA	NP					
RW-3	7/27/2011	NA		NA	NA						Steam
RW-3	8/27/2011	NA		26.88	NA	NP					
RW-3	9/28/2011	NA		NA	NA						Covered by vehicle
RW-3	4/18/2012	NA		26.45	NA	NP					
RW-3	5/3/2012	NA		26.44	NA	NP					
RW-3	4/18/2012	NA		26.45	NA	NP					
RW-3	5/3/2012	NA		26.44	NA	NP					
RW-3	6/8/2012	NA		NA	NA						
RW-3	6/13/2012	NA		21.05	NA	NP					
RW-3	7/3/2012	NA		NA	NA	NP					
RW-3	7/13/2012	NA		NA	NA	NP					
RW-3	7/20/2012	NA		NA	NA	NP					
RW-3	8/6/2012	NA		NA	NA	NP					
RW-3	9/11/2012	NA		28.22	NA	NP					
RW-3	10/18/2012	NA		NA	NA						
RW-3	11/15/2012	NA		28.79	NA	NP					Monthly water levels
RW-3	12/13/2012	NA									Car parked on this well, unable to measure
RW-3	1/17/2013	NA		29.90	NA	NP					Monthly water levels
RW-3	2/14/2013	NA									Truck parked on this well, unable to measure
RW-3	2/19/2013	NA									Truck parked on this well, unable to measure
RW-3	2/28/2013	NA									Truck parked on this well, unable to measure
RW-3	3/7/2013	NA		26.00	NA	NP					Monthly water level, rust colored residue on the probe
RW-3	3/12/2013	NA			NA						Truck parked on this well, unable to measure
RW-3	4/12/2013	NA		26.28	NA	NP					
RW-3	5/16/2013	NA		27.49	44.44	NP					DTP to well monument 44.44ft
RW-3	6/13/2013	NA									Truck parked on this well, unable to measure
RW-3	6/27/2013	NA									Truck parked on this well, unable to measure
RW-3	7/11/2013	NA		27.19	44.44	NP					No product recovered
RW-3	8/15/2013	NA		27.72							
RW-3	9/5/2013	NA		27.99	44.44	NP					
RW-3	10/7/2013	NA									No measurement--Vehicle parked on top of well
RW-3	11/13/2013	NA									No measurement--Vehicle parked on top of well
RW-3	12/13/2013	NA									No measurement--Vehicle parked on top of well
RW-3	12/20/2013	NA		28.76							
RW-3	1/10/2014	NA									No measurement--Vehicle parked on top of well
RW-3	2/13/2014	NA									No measurement--Vehicle parked on top of well
RW-3	3/13/2014	NA									No measurement--Vehicle parked on top of well
RW-3	4/3/2014	NA									No measurement--Vehicle parked on top of well
RW-3	4/25/2014	22.9	NP	27.30							PID wellhead peak 333.1 ppm
							RW-3 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-1A	12/3/2009	0.0		31.85	32.29	NP					Seal and bolts good, 2" butterfly cap, hard bottom
VS-1A	1/12/2010	0.0		31.86	32.29	NP					Smell of petroleum on probe
VS-1A	2/9/2010	0.0		30.53	32.29	NP					
VS-1A	4/18/2012	NA		27.73	32.29	NP					
VS-1A	5/3/2012	NA		27.64	32.29	NP					
VS-1A	6/8/2012	NA		28.12	32.29	NP					
VS-1A	7/3/2012	NA		28.45	32.29	NP					
VS-1A	8/6/2012	NA		28.82	32.29	NP					
VS-1A	9/11/2012	NA		29.35	32.29	NP					
VS-1A	10/18/2012	NA		29.78	32.29	NP					
VS-1A	11/15/2012	NA		29.91	32.29	NP					White bugs on probe
VS-1A	12/13/2012	NA		28.78	32.29	NP					White bugs on probe
VS-1A	1/17/2013	NA		27.15	32.29	NP					White bugs on probe
VS-1A	2/14/2013	NA		27.09	32.29	NP					White bugs on probe
VS-1A	3/12/2013	NA		27.15	32.29	NP					White bugs on probe
VS-1A	4/12/2013	NA		27.24	32.29	NP					White bugs on probe
VS-1A	5/16/2013	NA	27.63	27.64	32.29	0.01					White bugs on probe
VS-1A	6/13/2013	NA	NP	27.96	32.29	NP					White bugs on probe
VS-1A	7/11/2013	NA	NP	28.31	32.29	NP					White bugs on probe
VS-1A	8/15/2013	NA	NP	28.78	32.29	NP					White bugs on probe
VS-1A	9/5/2013	NA	NP	29.04	32.29	NP					White bugs on probe
VS-1A	10/7/2013	NA	NP	29.20	32.29	NP					White bugs on probe
VS-1A	11/13/2013	NA	NP	29.67	32.29	NP					White bugs on probe
VS-1A	12/13/2013	NA	NP	29.89	32.29	NP					White bugs on probe
VS-1A	1/10/2014	NA	NP	30.17	32.29	NP					
VS-1A	2/13/2014	NA	NP	30.31	32.29	NP					
VS-1A	3/13/2014	NA	NP	29.40	32.29	NP					
VS-1A	4/3/2014	NA	NP	28.56	32.29	NP					
VS-1A	4/24/2014	0.0	NP	28.45	32.29	NP					PID wellhead peak 2.3 ppm, White bugs on probe
							VS-1A CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-1	8/3/2010	NA		30.01	32.00	NP					
VS-1	8/11/2010	NA		30.12	32.00	NP					
VS-1	8/20/2010	NA		30.21	32.00	NP					
VS-1	8/25/2010	NA		30.36	32.00	NP					
VS-1	9/1/2010	NA		30.44	32.00	NP					
VS-1	9/10/2010	NA		30.51	32.00	NP					
VS-1	9/15/2010	NA		30.50	32.00	NP					
VS-1	9/24/2010	NA	30.62	30.63	32.00	0.01					Sheen
VS-1	9/29/2010	NA		30.69	32.00	NP					
VS-1	10/5/2010	NA		30.75	32.00	NP					
VS-1	10/13/2010	NA		30.80	32.00	NP					
VS-1	10/19/2010	NA		30.84	32.00	NP					
VS-1	10/27/2010	NA		30.89	32.00	NP					
VS-1	11/3/2010	NA		30.92	32.00	NP					
VS-1	11/10/2010	NA		30.95	32.00	NP					
VS-1	11/17/2010	0.0		30.97	32.00	NP					
VS-1	11/24/2010	NA		30.94	32.00	NP					
VS-1	12/1/2010	NA		30.91	32.00	NP					
VS-1	12/8/2010	NA		30.90	32.00	NP					
VS-1	12/15/2010	NA		30.65	32.00	NP					
VS-1	12/22/2010	NA		30.30	32.00	NP					
VS-1	12/30/2010	NA		29.96	32.00	NP					
VS-1	1/5/2011	NA		30.91	32.00	NP					
VS-1	1/14/2011	NA		29.48	32.00	NP					
VS-1	1/19/2011	NA		29.37	32.00	NP					
VS-1	1/26/2011	NA		29.28	32.00	NP					
VS-1	2/2/2011	NA		29.21	32.00	NP					
VS-1	2/9/2011	NA		29.11	32.00	NP					
VS-1	2/17/2011	NA		28.92	32.00	NP					
VS-1	2/28/2011	NA		28.79	32.00	NP					
VS-1	3/16/2011	NA		28.29	32.00	NP					
VS-1	3/24/2011	NA		27.63	32.00	NP					
VS-1	3/29/2011	NA		26.43	32.00	NP					
VS-1	3/16/2011	NA		28.49	32.00	NP					
VS-1	3/24/2011	NA		27.63	32.00	NP					
VS-1	3/29/2011	NA		28.66	32.00	NP					
VS-1	4/6/2011	NA		28.52	32.00	NP					
VS-1	5/18/2011	NA		27.00	32.00	NP					
VS-1	6/23/2011	NA		27.31	32.00	NP					
VS-1	7/27/2011	NA		27.70	32.00	NP					
VS-1	8/18/2011	NA		28.15	32.00	NP					
VS-1	8/27/2011	NA		27.97	32.00	NP					
VS-1	9/28/2011	NA		28.60	32.00	NP					
							VS-1 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-2	12/3/2009	0.0		31.98	32.02	NP					Bolts and seal good, 2" PVC cap, light sediment in
VS-2	1/12/2010	0.0		31.99	32.02	NP					Smell of petroleum on probe
VS-2	2/9/2010	0.1	30.74	30.75	32.02	0.01	1	19	1	0.0003	Recovered, DTW 30.75 afterwards
VS-2	8/3/2010	NA	30.20	30.21	32.00	0.01					
VS-2	8/11/2010	NA	30.32	30.34	32.00	0.02					
VS-2	8/20/2010	NA	30.39	``	32.00	0.02					
VS-2	8/25/2010	NA	30.48	30.50	32.00	0.02					
VS-2	9/1/2010	NA	30.56	30.58	32.00	0.02					
VS-2	9/10/2010	NA	30.68	30.70	32.00	0.02					
VS-2	9/15/2010	NA	30.69	30.71	32.00	0.02					
VS-2	9/24/2010	NA	30.78	30.81	32.00	0.03					
VS-2	9/29/2010	NA	30.84	30.87	32.00	0.03					
VS-2	10/5/2010	NA	30.93	30.96	32.00	0.03					
VS-2	10/13/2010	NA	30.97	31.00	32.00	0.03					
VS-2	10/19/2010	NA	31.03	31.06	32.00	0.03					
VS-2	10/27/2010	NA	31.06	31.10	32.00	0.04					
VS-2	11/3/2010	NA	31.09	31.12	32.00	0.03					
VS-2	11/10/2010	NA	31.12	31.13	32.00	0.01					
VS-2	11/17/2010	NA		30.95	32.00	NP					
VS-2	11/24/2010	NA		31.01	32.00	NP					
VS-2	12/1/2010	NA		31.05	32.00	NP					
VS-2	12/8/2010	NA		31.08	32.00	NP					
VS-2	12/15/2010	NA		30.83	32.00	NP					
VS-2	12/22/2010	NA		30.49	32.00	NP					
VS-2	12/30/2010	NA		30.16	32.00	NP					
VS-2	1/5/2011	NA		31.10	32.00	NP					
VS-2	1/14/2011	NA		29.69	32.00	NP					
VS-2	1/19/2011	NA		29.59	32.00	NP					
VS-2	1/26/2011	NA		29.54	32.00	NP					
VS-2	2/2/2011	NA		29.45	32.00	NP					
VS-2	2/9/2011	NA		29.31	32.00	NP					
VS-2	2/17/2011	NA		29.13	32.00	NP					
VS-2	2/28/2011	NA		29.00	32.00	NP					
VS-2	3/16/2011	NA		28.49	32.00	NP					
VS-2	3/24/2011	NA		27.85	32.00	NP					
VS-2	3/29/2011	NA		26.66	32.00	NP					
VS-2	4/6/2011	NA		28.52	32.00	NP					
VS-2	5/18/2011	NA		27.19	32.00	NP					
VS-2	6/23/2011	NA		27.50	32.00	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-2	7/27/2011	NA		27.32	32.00	NP					
VS-2	8/27/2011	NA		28.15	32.00	NP					
VS-2	9/28/2011	NA		28.78	32.00	NP					
VS-2	4/18/2012	NA		27.94	32.00	NP					Trace found, not measurable.
VS-2	5/3/2012	NA		27.84	32.00	NP					
VS-2	6/8/2012	NA		28.33	32.00	NP					
VS-2	7/3/2012	NA		28.63	32.00	NP					
VS-2	8/6/2012	NA		29.00	32.00	NP					
VS-2	9/11/2012	NA		29.52	32.00	NP					
VS-2	10/18/2012	NA	29.92	29.93	32.00	0.01					
VS-2	11/15/2012	NA		30.09	32.00	NP					White bugs on probe
VS-2	12/13/2012	NA		28.95	32.00	NP					White bugs on probe
VS-2	1/17/2013	NA		27.38	32.00	NP					Fuel odor
VS-2	2/14/2013	NA		27.29	32.00	NP					
VS-2	3/12/2013	NA		27.36	32.00	NP					
VS-2	4/12/2013	NA		27.45	32.00	NP					
VS-2	5/16/2013	NA		27.82	32.00	NP					White bugs on probe
VS-2	6/13/2013	NA		28.14	32.00	NP					White bugs on probe
VS-2	7/11/2013	NA		28.50	32.00	NP					White bugs on probe
VS-2	8/15/2013	NA		28.93	32.00	NP					White bugs on probe
VS-2	9/5/2013	NA	Trace	29.22	32.00						White bugs on probe
VS-2	10/7/2013	NA		29.38	32.00	NP					
VS-2	11/13/2013	NA		29.84	32.00	NP					White bugs on probe
VS-2	12/13/2013	NA		30.07	32.00	NP					White bugs on probe
VS-2	1/10/2014	NA	Trace	30.34	32.00	NP					
VS-2	2/13/2014	NA		30.51	32.00	NP					
VS-2	3/13/2014	NA	NP	29.60	32.00	NP					
VS-2	4/3/2014	NA	NP	28.79	32.00	NP					
VS-2	4/25/2014	0.0	NP	28.64	32.00	NP					PID wellhead peak 15.1 ppm, White bugs on probe
							VS-2 CUMULATIVE		1	0.0003	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-3	12/3/2009	0.3		NA	31.59	NP					Allowed to breathe, seal and bolts good, 2" butterfly cap
VS-3	1/12/2010	0.1		31.55	31.60	NP					Gray clay bottom, light smell of petroleum on probe
VS-3	2/9/2010	0.2	30.73	30.77	31.60	0.04	3	120	3	0.0008	Gray clay bottom, light smell of petroleum on probe, DTW 31.36 afterwards
VS-3	8/3/2010	NM	30.00	30.44	32.00	0.44					
VS-3	8/11/2010	NA	30.07	30.56	32.00	0.49					
VS-3	8/20/2010	NA	30.18	30.74	32.00	0.56					
VS-3	8/23/2010	NA	30.23	30.86	32.00	0.63	950	NA	953	0.25	Product recovery with sock
VS-3	8/25/2010	NA	31.01	31.01	32.00	NP					
VS-3	9/1/2010	NA	30.77	30.77	32.00	NP					
VS-3	9/10/2010	NA	30.43	30.43	32.00	NP					
VS-3	9/15/2010	NA	30.46	31.04	32.00	0.58					
VS-3	9/17/2010	NA	30.47	31.09	32.00	0.62	1,300	NA	2,253	0.60	
VS-3	9/24/2010	NA	30.62	30.91	32.00	0.29	260	NA	2,513	0.66	
VS-3	9/29/2010	NA	30.69	31.14	32.00	0.45					
VS-3	10/5/2010	NA	30.94	31.23	32.00	0.29	925	NA	3,438	0.91	
VS-3	10/13/2010	NA	30.74	30.88	32.00	0.14					
VS-3	10/19/2010	NA	30.78	30.97	32.00	0.19					
VS-3	10/22/2010	NA	30.80	31.39	32.00	0.59	1,180	NA	4,618	1.22	Product recovery with sock
VS-3	10/27/2010	NA	30.90	31.10	32.00	0.20					
VS-3	11/3/2010	NA	30.96	31.22	32.00	0.26					
VS-3	11/10/2010	NA	30.94	31.23	32.00	0.29					
VS-3	11/17/2010	NA	30.81	31.18	32.00	0.37	810		5,428	1.43	Product recovery with sock
VS-3	11/24/2010	NA	30.74	30.97	32.00	0.23	470		5,898	1.56	Product recovery with sock
VS-3	12/1/2010	NA	30.86	31.04	32.00	0.18	75		5,973	1.58	Product recovery with sock
VS-3	12/8/2010	NA	30.92	31.16	32.00	0.24	100		6,073	1.60	Product recovery with sock
VS-3	12/15/2010	NA	30.75	30.86	32.00	0.11	50		6,123	1.62	Product recovery with sock
VS-3	12/22/2010	NA		30.44	32.00	NP					
VS-3	12/30/2010	NA		30.14	32.00	NP					
VS-3	1/5/2011	NA	30.86	30.92	32.00	0.06					
VS-3	1/14/2011	NA		29.67	32.00	NP					
VS-3	1/19/2011	NA		29.56	32.00	NP					
VS-3	1/26/2011	NA		29.48	32.00	NP					
VS-3	2/2/2011	NA		29.34	32.00	NP					
VS-3	2/9/2011	NA	29.21	29.22	32.00	0.01					
VS-3	2/17/2011	NA		29.07	32.00	NP					
VS-3	2/28/2011	NA		28.92	32.00	NP					
VS-3	3/24/2011	NA		27.85	32.00	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-3	3/29/2011	NA		26.67	32.00	NP					
VS-3	3/16/2011	NA		28.50	32.00	NP					
VS-3	4/6/2011	NA		28.45	32.00	NP					
VS-3	4/13/2011	NA		27.09	32.00	NP					
VS-3	4/21/2011	NA	26.99	27.00	32.00	0.01					
VS-3	4/27/2011	NA	26.92	26.93	32.00	0.01					
VS-3	5/4/2011	NA		27.01	32.00	NP					
VS-3	5/11/2011	NA		26.94	32.00	NP					
VS-3	5/18/2011	NA	26.93	26.94	32.00	0.01					
VS-3	6/8/2011	NA	27.10	27.11	32.00	0.01					
VS-3	6/23/2011	NA	27.37	27.45	32.00	0.08					
VS-3	6/28/2011	NA	27.31	27.33	32.00	0.02					
VS-3	7/8/2011	NA	27.55	27.63	32.00	0.08					
VS-3	7/20/2011	NA	27.68	27.75	32.00	0.07					
VS-3	7/27/2011	NA	27.75	27.83	32.00	0.08					
VS-3	8/4/2011	NA	27.81	27.84	32.00	0.03					
VS-3	8/18/2011	NA	28.00	28.06	32.00	0.06					
VS-3	8/24/2011	NA	28.10	28.12	32.00	0.02					
VS-3	8/27/2011	NA	28.00	28.08	32.00	0.08					
VS-3	8/31/2011	NA	28.22	28.25	32.00	0.03					
VS-3	9/16/2011	NA		28.44	32.00	NP					
VS-3	9/21/2011	NA		28.46	32.00	NP					
VS-3	9/28/2011	NA		28.66	32.00	NP					
VS-3	4/18/2012	NA		27.90	32.00	NP					
VS-3	5/3/2012	NA		27.77	32.00	NP					
VS-3	6/8/2012	NA		28.21	32.00	NP					
VS-3	7/3/2012	NA		28.49	32.00	NP					
VS-3	8/6/2012	NA	28.73	28.89	32.00	0.16					
VS-3	8/10/2012	NA		28.90	32.00	NP					
VS-3	8/16/2012	NA	28.94	28.95	32.00	0.01					
VS-3	8/31/2012	NA	29.22	29.24	32.00	0.02					
VS-3	9/5/2012	NA	28.23	28.3	32.00	0.07					
VS-3	9/11/2012	NA	29.37	29.5	32.00	0.13	160	1,280	6,283	1.66	
VS-3	9/20/2012	0.2	29.45	29.55	32.00	0.1	65	935	6,348	1.68	
VS-3	9/27/2012	NA	29.55	29.63	32.00	0.08					
VS-3	10/5/2012	NA	29.69	29.81	32.00	0.12	80	920	6,428	1.70	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-3	10/12/2012	NA	29.73	29.79	32.00	0.06					
VS-3	10/18/2012	NA	29.81	29.9	32.00	0.09					
VS-3	10/25/2012	NA	29.91	30.05	32.00	0.14	100	290	6,528	1.72	
VS-3	10/30/2012	NA	29.93	29.96	32.00	0.03					
VS-3	11/15/2012	NA	29.97	30.06	32.00	0.09					No product recovered
VS-3	12/13/2012	NA		28.93	32.00	NP					No product recovered
VS-3	1/17/2013	NA	27.32	27.33	32.00	0.01					No product recovered
VS-3	2/14/2013	NA	27.16	27.17	32.00	0.01					No product recovered
VS-3	3/12/2013	NA	27.25	27.26	32.00	0.01					No product recovered
VS-3	4/12/2013	NA	NP	27.36	32.00	NP					No product recovered
VS-3	5/16/2013	NA	27.71	27.75	32.00	0.04					No product recovered
VS-3	6/13/2013	NA	28.01	28.05	32.00	0.04					No product recovered
VS-3	7/11/2013	NA	28.36	28.4	32.00	0.04					No product recovered
VS-3	8/15/2013	NA		28.84	34.00						No product recovered
VS-3	9/5/2013	NA	NP	29.17	34.00						
VS-3	10/7/2013	NA	29.25	29.34	32.00	0.09	110	210	6,638	1.75	Collected samples for AECOM
VS-3	10/14/2013	NA	29.4	29.55	32.00	0.15	80	110	6,718	1.77	Product recovered
VS-3	10/21/2013	NA	29.42	29.5	32.00	0.08	0	0			No product recovered
VS-3	11/13/2013	NA	NP	29.7	32.00	0					
VS-3	12/13/2013	NA	29.85	30.08	32.00	0.23	200	250	6,918	1.83	Product recovered
VS-3	12/20/2013	NA	29.92	29.95	32.00	0.03					No product recovered
VS-3	1/10/2014	NA	30.17	30.34	32.00	0.17	110	160	7,028	1.86	Product recovered
VS-3	1/17/2014	NA	30.2	30.22	32.00	0.02					No product recovered
VS-3	2/13/2014	NA	30.35	30.44	32.00	0.09	50	50	7,078	1.87	Product recovered
VS-3	2/21/2014	NA	30.25	30.29	32.00	0.04					
VS-3	3/13/2014	NA	NP	29.61	32.00						
VS-3	4/3/2014	NA	NP	28.8	32.00						
VS-3	4/25/2014	0.2	NP	28.6	32.00						PID wellhead peak 23.2 ppm
							VS-3 CUMULATIVE		7,078	1.87	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-4	12/3/2009	0.0		NA	31.35	NP					Seal and bolts good, 2" butterfly cap, muddy bottom
VS-4	1/12/2010	0.0		NA	31.35	NP					
VS-4	2/9/2010	0.1	30.32	30.56	31.35	0.24	593	142	593	0.16	Heavy smell of petroleum on probe , DTW 30.40 w/ light sheen afterwards
VS-4	8/3/2010	NA	29.90	29.93	32.00	0.03					
VS-4	8/11/2010	NA	29.98	29.99	32.00	0.01					
VS-4	8/20/2010	NA	30.11	30.11	32.00	0.00					
VS-4	8/25/2010	NA	30.19	30.22	32.00	0.03	275	NA	868	0.23	
VS-4	9/1/2010	NA	30.32	30.34	32.00	0.02					
VS-4	9/10/2010	NA	30.38	30.41	32.00	0.03					
VS-4	9/15/2010	NA	30.40	30.43	32.00	0.03					
VS-4	9/24/2010	NA	30.51	30.55	32.00	0.04					
VS-4	9/29/2010	NA	30.57	30.59	32.00	0.02					
VS-4	10/5/2010	NA	30.64	30.66	32.00	0.02					
VS-4	10/13/2010	NA	30.70	30.72	32.00	0.02					
VS-4	10/19/2010	NA	30.74	30.77	32.00	0.03					
VS-4	10/27/2010	NA	30.77	30.83	32.00	0.06					
VS-4	11/3/2010	NA	30.79	30.81	32.00	0.02					
VS-4	11/10/2010	NA	30.78	30.80	32.00	0.02					
VS-4	11/17/2010	0.0	30.81	30.82	32.00	0.01					
VS-4	11/24/2010	NA		30.78	32.00	0.01					
VS-4	12/1/2010	NA		30.89	32.00	NP					
VS-4	12/8/2010	NA		30.77	32.00	NP					
VS-4	12/15/2010	NA		30.52	32.00	NP					
VS-4	12/22/2010	NA		30.15	32.00	NP					
VS-4	12/30/2010	NA		29.13	32.00	NP					
VS-4	1/5/2011	NA		30.56	32.00	NP					
VS-4	1/14/2011	NA		29.29	32.00	NP					
VS-4	1/19/2011	NA		29.20	32.00	NP					
VS-4	1/26/2011	NA		29.12	32.00	NP					
VS-4	2/2/2011	NA		29.06	32.00	NP					
VS-4	2/9/2011	NA		28.99	32.00	NP					
VS-4	2/17/2011	NA		28.79	32.00	NP					
VS-4	2/28/2011	NA		28.67	32.00	NP					
VS-4	3/16/2011	NA		28.10	32.00	NP					
VS-4	3/29/2011	NA		27.24	32.00	NP					
VS-4	4/6/2011	NA		28.10	32.00	NP					
VS-4	5/18/2011	NA		26.88	32.00	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-4	6/23/2011	NA		27.20	32.00	NP					
VS-4	7/27/2011	NA		27.62	32.00	NP					
VS-4	8/27/2011	NA		27.88	32.00	NP					
VS-4	9/28/2011	NA		28.51	32.00	NP					
VS-4	4/18/2012	NA		27.55	32.00	NP					
VS-4	5/3/2012	NA		27.39	32.00	NP					
VS-4	6/8/2012	NA		28.03	32.00	NP					
VS-4	7/3/2012	NA	28.34	28.39	32.00	0.05					
VS-4	7/13/2012	NA	28.37	28.40	32.00	0.03					
VS-4	7/20/2012	NA	28.53	28.60	32.00	0.07					
VS-4	7/27/2012	NA	28.60	28.64	32.00	0.07					
VS-4	8/6/2012	NA		28.75	32.00	NP					
VS-4	9/11/2012	NA		29.27	32.00	NP					
VS-4	10/18/2012	NA		29.67	32.00	NP					
VS-4	11/15/2012	NA	trace	28.80	32.00	trace					
VS-4	12/13/2012	NA	trace	28.50	32.00	trace					
VS-4	1/17/2013	NA	trace	26.95	32.00	trace					
VS-4	2/14/2013	NA		26.96	32.00	trace					
VS-4	3/12/2013	NA	NP	27.03	32.00	NP					
VS-4	4/12/2013	NA	NP	27.11	32.00	NP					
VS-4	5/16/2013	NA	NP	27.52	32.00	NP					
VS-4	6/13/2013	NA	27.87	27.88	32.00	0.01					No product recovered
VS-4	7/11/2013	NA	NP	28.23	32.00	NP					
VS-4	8/15/2013	NA	28.70	28.72	32.00	NP					
VS-4	9/5/2013	NA	NP	29.93	32.00	NP					
VS-4	10/7/2013	NA	NP	29.09	32.00	NP					No product recovered
VS-4	11/13/2013	NA	NP	29.57	32.00	NP					
VS-4	12/13/2013	NA	NP	29.81	32.00	NP					
VS-4	1/10/2014	NA	Trace	30.06	32.00	NP					
VS-4	2/13/2014	NA		30.22	32.00	NP					
VS-4	3/13/2014	NA		29.25	32.00	NP					
VS-4	4/3/2014	NA		28.37	32.00	NP					
VS-4	4/25/2014	0.1	trace	28.30	32.00	NP					PID wellhead peak 122.4 ppm
							VS-4 CUMULATIVE		868	0.23	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-5	12/3/2009	0.0		29.52	29.96	NP					Two good bolts, broken seal, 2" butterfly cap, hard
VS-5	1/12/2010	0.0		29.54	29.96	NP					White particulate on probe, appeared to be small insects
VS-5	2/9/2010	0.0		29.54	29.96	NP					White particulate on probe, appeared to be small insects
VS-5	10/5/2010	NA		29.19	29.96	NP					
VS-5	11/10/2010	NA		29.51	29.96	NP					
VS-5	12/8/2010	NA		29.53	29.96	NP					
VS-5	1/5/2011	NA		29.63	29.96	NP					
VS-5	2/9/2011	NA		29.14	29.96	NP					
VS-5	3/24/2011	NA		27.61	29.96	NP					
VS-5	4/6/2011	NA		28.34	29.96	NP					
VS-5	5/18/2011	NA		26.92	29.96	NP					
VS-5	6/23/2011	NA		27.28	29.96	NP					
VS-5	7/27/2011	NA		27.74	29.96	NP					
VS-5	8/27/2011	NA		28.06	29.96	NP					
VS-5	9/28/2011	NA		28.72	29.96	NP					
VS-5	4/18/2012	NA		27.64	29.96	NP					
VS-5	5/3/2012	NA		27.55	29.96	NP					
VS-5	6/8/2012	NA		28.17	29.96	NP					
VS-5	7/3/2012	NA		28.46	29.96	NP					
VS-5	8/6/2012	NA		28.88	29.96	NP					
VS-5	9/11/2012	NA		29.45	29.96	NP					
VS-5	10/18/2012	NA		29.51	29.96	NP					
VS-5	11/15/2012	NA		29.52	29.96	NP					
VS-5	12/13/2012	NA		28.81	29.96	NP					
VS-5	1/17/2013	NA		26.89	29.96	NP					
VS-5	2/14/2013	NA		26.96	29.96	NP					
VS-5	3/12/2013	NA	trace	27.12	29.96	trace					
VS-5	4/12/2013	NA		27.29	29.96	NP					
VS-5	5/16/2013	NA	NP	27.67	29.96	NP					
VS-5	6/13/2013	NA	NP	28.02	29.96	NP					
VS-5	7/11/2013	NA	NP	28.39	29.96	NP					
VS-5	8/15/2013	NA	NP	28.89	29.96	NP					
VS-5	9/5/2013	NA	NP	29.20.	29.96	NP					
VS-5	10/7/2013	NA	NP	29.33	29.96	NP					
VS-5	11/13/2013	NA	NP	29.54	29.96	NP					
VS-5	12/13/2013	NA	NP	29.53	29.96	NP					
VS-5	1/10/2014	NA	NP	29.53	29.96	NP					
VS-5	2/13/2014	NA	NP	29.53	29.96	NP					
VS-5	3/13/2014	NA	NP	29.54	29.96	NP					
VS-5	4/3/2014	NA	NP	29.96	29.96	NP					
VS-5	4/25/2014	0.1	NP	28.48	29.96	NP					PID wellhead peak 3.9 ppm
							VS-5 CUMULATIVE		0	0.0	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-6	12/3/2009	0.0		29.21	29.65	NP					Bolts and seal good, 2" butterfly cap
VS-6	1/12/2010	0.0		29.23	29.65	NP					Black sediment, heavy smell of petroleum on probe
VS-6	2/9/2010	0.0		29.23	29.65	NP					Black sediment, heavy smell of petroleum on probe
VS-6	10/5/2010	NA		29.18	29.96	NP					
VS-6	11/10/2010	NA		29.28	29.96	NP					
VS-6	12/8/2010	NA		29.19	29.96	NP					
VS-6	1/5/2011	NA		29.18	29.96	NP					
VS-6	2/9/2011	NA		29.07	29.96	NP					
VS-6	3/24/2011	NA		27.74	29.96	NP					
VS-6	4/6/2011	NA		28.11	29.96	NP					
VS-6	5/18/2011	NA		26.95	29.96	NP					
VS-6	6/23/2011	NA		27.26	29.96	NP					
VS-6	7/27/2011	NA		27.65	29.96	NP					
VS-6	8/27/2011	NA		27.92	29.96	NP					
VS-6	9/28/2011	NA		28.54	29.96	NP					
VS-6	4/18/2012	NA		27.77	29.96	>0.01					Trace, not measurable.
VS-6	5/3/2012	NA		27.64	29.96	>0.01					
VS-6	6/8/2012	NA		28.17	29.96	NP					
VS-6	7/3/2012	NA		28.38	29.96	NP					
VS-6	8/6/2012	NA		28.75	29.96	NP					
VS-6	9/11/2012	NA		29.21	29.96	NP					
VS-6	10/18/2012	NA	29.21	29.22	29.96	0.01					
VS-6	11/15/2012	NA	NP	29.22	29.96	NP					No product recovered
VS-6	12/13/2012	NA	trace	28.79	29.96	trace					
VS-6	1/17/2013	NA		27.22	29.96						
VS-6	2/14/2013	NA		27.06	29.96						
VS-6	3/12/2013	NA	trace	27.15	29.96	trace					
VS-6	4/12/2013	NA	trace	27.25	29.96	trace					No product recovered
VS-6	5/16/2013	NA	NP	27.60	29.96	NP					
VS-6	6/13/2013	NA	NP	27.92	29.96	NP					
VS-6	7/11/2013	NA	trace	28.25	29.96	NP					
VS-6	8/15/2013	NA	NP	28.74	29.96	NP					
VS-6	9/5/2013	NA	NP	28.99	29.96	NP					
VS-6	10/7/2013	NA	NP	29.15	29.96	NP					
VS-6	11/13/2013	NA	NP	29.24	29.96	NP					
VS-6	12/13/2013	NA	NP	29.21	29.96	NP					
VS-6	1/10/2014	NA	NP	29.22	29.96	NP					
VS-6	2/13/2014	NA	NP	29.21	29.96	NP					
VS-6	3/13/2014	NA	NP	29.23	29.96	NP					
VS-6	4/3/2014	NA	NP	28.61	29.96	NP					
VS-6	4/25/2014	0.1	NP	28.45	29.96	NP					PID wellhead peak 80.4 ppm
							VS-6 CUMULATIVE		0	0.0	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-7	12/3/2009	0.3		NA	28.30	NP					Initial PID reading of 10.0, Let breathe 10 minutes
VS-7	1/12/2010	0.0		NA	28.20	NP					Sandy bottom, light smell of petroleum on probe
VS-7	2/9/2010	0.0		NA	28.30	NP					Sandy bottom, light smell of petroleum on probe
VS-7	3/24/2011	NA		27.52	28.30	NP					
VS-7	4/6/2011	NA		28.50	28.30	NP					
VS-7	5/18/2011	NA	26.77	26.80	28.30	0.03					
VS-7	6/23/2011	NA	27.07	27.09	28.30	0.02					
VS-7	6/28/2011	NA	27.00	27.00	28.30	0.00					
VS-7	7/8/2011	NA	27.24	27.25	28.30	0.01					
VS-7	7/13/2011	NA	27.26	27.26	28.30	0.00					
VS-7	7/20/2011	NA	27.39	27.41	28.30	0.02					
VS-7	7/27/2011	NA	27.45	27.51	28.30	0.06					
VS-7	8/4/2011	NA	27.51	27.52	28.30	0.01					
VS-7	8/18/2011	NA	27.72	27.87	28.30	0.15	50	NA	50	0.01	Product recovery with sock
VS-7	8/24/2011	NA	27.81	27.97	28.30	0.16	70	50	120	0.03	
VS-7	8/31/2011	NA	27.93	28.08	28.30	0.15	60	50	180	0.05	
VS-7	9/21/2011	NA	28.21	28.30	28.30	0.09	70	50	250	0.07	
VS-7	9/28/2011	NA		28.30	28.30	NP					DTB Dry
VS-7	4/18/2012	NA		27.56	28.30	NP					
VS-7	5/3/2012	NA		27.43	28.30	NP					
VS-7	6/8/2012	NA	27.91	27.95	28.30	NP					
VS-7	6/13/2012	NA	28.01	28.03	28.30	0.02					
VS-7	6/20/2012	NA	28.00	28.01	28.30	0.01					
VS-7	6/29/2012	NA	28.14	28.16	28.30	0.02					
VS-7	7/3/2012	NA		28.23	28.30	NP					
VS-7	7/13/2012	NA		28.31	28.30	NP					
VS-7	7/20/2012	NA			28.30	NP					
VS-7	7/27/2012	NA			28.30	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-7	8/6/2012	NA			28.30	NP					
VS-7	9/11/2012	NA		28.30	28.30	NP					
VS-7	10/18/2012	NA		28.30	28.30	NP					
VS-7	11/15/2012	NA		28.30	28.30	DRY					
VS-7	12/13/2012	NA		28.30	28.30	DRY					
VS-7	1/17/2013	NA		27.03	28.03						
VS-7	2/14/2013	NA		26.89	28.03						
VS-7	3/12/2013	NA		26.96	28.03						
VS-7	4/12/2013	NA		27.06	28.03	NP					
VS-7	5/16/2013	NA		27.46	27.47	0.01					No product recovered
VS-7	6/13/2013	NA		27.75	27.88	0.13	210	590	460	0.12	Product recovered. Thicker darker products.
VS-7	6/20/2013	NA		26.80	26.89	0.09	70	100	530	0.14	Product recovered.
VS-7	6/27/2013	NA		27.93	28.01	0.08					No product recovered
VS-7	7/11/2013	NA		28.09	28.18	0.09					No product recovered
VS-7	8/15/2013	NA		28.32	28.30	DRY					White bugs on probe
VS-7	9/5/2013	NA		28.32	28.30	DRY					White bugs on probe
VS-7	10/7/2013	NA		28.32	28.32	DRY					
VS-7	11/13/2013	NA		28.32	28.32	DRY					
VS-7	12/13/2013	NA		28.32	28.32	DRY					
VS-7	1/10/2014	NA		28.32	28.32						
VS-7	2/13/2014	NA		28.32	28.32						
VS-7	3/13/2014	NA		28.32	28.32						
VS-7	4/3/2014	NA		28.32	28.32						
VS-7	4/25/2014	0.1	NP	28.27	28.32						PID wellhead peak 31.3 ppm
							VS-7 CUMULATIVE		530	0.14	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-8	12/3/2009	0.0		29.60	29.65	NP					Seal and Bolts good, 2" butterfly cap, Hard bottom
VS-8	1/12/2010	0.0		29.60	29.65	NP					Light smell of petroleum on probe
VS-8	2/9/2010	0.0		29.60	29.65	NP					
VS-8	10/5/2010	NA		29.59	29.65	NP					
VS-8	11/10/2010	NA		29.58	29.65	NP					
VS-8	12/8/2010	NA		29.59	29.65	NP					
VS-8	1/5/2011	NA		29.51	29.65	NP					
VS-8	2/9/2011	NA		29.23	29.65	NP					
VS-8	3/24/2011	NA		27.75	29.65	NP					
VS-8	4/6/2011	NA		28.70	29.65	NP					
VS-8	5/18/2011	NA		27.13	29.65	NP					
VS-8	6/23/2011	NA		27.44	29.65	NP					
VS-8	7/27/2011	NA		27.84	29.65	NP					
VS-8	8/27/2011	NA		21.14	29.65	NP					
VS-8	9/28/2011	NA		28.81	29.65	NP					Light smell of petroleum on probe
VS-8	4/18/2012	NA		27.88	29.65	NP					Light smell of petroleum on probe
VS-8	5/3/2012	NA		27.76	29.65	NP					
VS-8	6/8/2012	NA		28.23	29.65	NP					
VS-8	7/3/2012	NA		28.64	29.65	NP					
VS-8	8/6/2012	NA		29.01	29.65	NP					
VS-8	9/11/2012	NA		29.54	29.65	NP					
VS-8	10/18/2012	NA	29.58	29.59	29.65	0.01					
VS-8	11/15/2012	NA		29.59	29.65	NP					Worms around well cover
VS-8	12/13/2012	NA		28.85	29.65	NP					Worms around well cover
VS-8	1/17/2013	NA		27.31	29.65	NP					Worms around well cover
VS-8	2/14/2013	NA		27.27	29.65	NP					Worms around well cover
VS-8	3/12/2013	NA		27.33	29.65	NP					Worms around well cover, Probe warm to the touch
VS-8	4/12/2013	NA		27.40	29.65	NP					Worms around well cover. Probe warm to the touch
VS-8	5/16/2013	NA		27.85	29.65	NP					Worms around well cover
VS-8	6/13/2013	NA		28.16	29.65	NP					Worms around well cover
VS-8	7/11/2013	NA		28.52	29.65	NP					White bugs on probe
VS-8	8/15/2013	NA		29.08	29.65	NP					White bugs on probe
VS-8	9/5/2013	NA		29.25	29.65	NP					White bugs on probe
VS-8	10/7/2013	NA		29.40	29.65	NP					
VS-8	11/13/2013	NA		29.61	29.65	NP					
VS-8	12/13/2013	NA		29.60	29.65	NP					
VS-8	1/10/2014	NA		29.60	29.65	NP					
VS-8	2/13/2014	NA		29.60	29.65	NP					
VS-8	3/13/2014	NA		29.56	29.65	NP					
VS-8	4/3/2014	NA		28.75	29.65	NP					
VS-8	4/25/2014	0.2		28.65	29.65	NP					PID wellhead peak 0.2 ppm
							VS-8 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-9	12/3/2009	0.1		31.33	45.04	NP					Seal and bolts good
VS-9	1/12/2010	0.0		29.59	29.95	NP					Gray clay bottom, light petroleum smell on probe
VS-9	2/9/2010	0.0		29.60	29.95	NP					Gray clay bottom, light petroleum smell on probe
VS-9	10/5/2010	NA		29.58	29.65	NP					Light smell of petroleum on probe
VS-9	11/10/2010	NA		29.95	29.65	NP					Light smell of petroleum on probe
VS-9	12/8/2010	NA		29.60	29.65	NP					
VS-9	1/5/2011	NA		29.55	29.65	NP					
VS-9	2/9/2011	NA		28.43	29.65	NP					
VS-9	3/24/2011	NA		26.86	29.65	NP					
VS-9	4/6/2011	NA		28.63	29.65	NP					
VS-9	5/18/2011	NA		25.17	29.65	NP					
VS-9	6/23/2011	NA		24.63	29.65	NP					
VS-9	7/27/2011	NA		NA	29.65	NP					Well hot
VS-9	8/27/2011	NA		NA	29.65	NP					Well hot
VS-9	9/28/2011	NA	28.05	28.06	29.65	0.01					
VS-9	4/18/2012	NA		26.96	29.65	NP					
VS-9	5/3/2012	NA		26.18	29.65	NP					
VS-9	6/8/2012	NA		27.31	29.65	NP					
VS-9	7/3/2012	NA		27.77	29.65	NP					
VS-9	8/6/2012	NA		28.22	29.65	NP					
VS-9	9/11/2012	NA		28.78	29.65	NP					
VS-9	10/18/2012	NA	trace	29.23	29.65	Trace					
VS-9	11/15/2012	NA	29.3	29.33	29.65	0.03					Yellow residue on probe, fuel odor and probe was warm
VS-9	12/13/2012	NA		28.00	29.65						
VS-9	1/17/2013	NA	trace	26.40	29.65	trace					
VS-9	2/14/2013	NA		26.35	29.65						
VS-9	3/12/2013	NA		26.50	29.65						
VS-9	4/12/2013	NA		26.62	29.65						
VS-9	5/16/2013	NA		27.04	29.65						
VS-9	6/13/2013	NA		27.38	29.65						
VS-9	7/11/2013	NA		27.75	29.65						
VS-9	8/15/2013	NA		28.25	29.65						
VS-9	9/5/2013	NA		28.53	29.65						
VS-9	10/7/2013	NA		28.60	29.65						
VS-9	11/13/2013	NA		29.14	29.65						
VS-9	12/13/2013	NA		29.34	29.65						
VS-9	1/10/2014	NA		29.53	29.65						
VS-9	2/13/2014	NA		29.53	29.65						
VS-9	3/13/2014	NA		28.75	29.65						
VS-9	4/3/2014	NA		27.94	29.65						
VS-9	4/25/2014	0.0	NP	27.86	29.65						PID wellhead peak 34.2 ppm
							VS-9 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-10	12/3/2009	0.0		29.79	29.86	NP					Bolts and seal good, 2" butterfly cap, hard bottom
VS-10	1/12/2010	0.0		29.79	29.91	NP					Light smell of petroleum on probe
VS-10	2/9/2010	0.0		29.79	29.91	NP					Light smell of petroleum on probe
VS-10	10/5/2010	NA		29.78	29.91	NP					
VS-10	11/10/2010	NA		29.79	29.91	NP					
VS-10	12/8/2010	NA		29.79	29.91	NP					
VS-10	1/5/2011	NA		29.71	29.91	NP					
VS-10	2/9/2011	NA		29.32	29.91	NP					
VS-10	3/24/2011	NA		27.76	29.91	NP					
VS-10	4/6/2011	NA		28.88	29.91	NP					
VS-10	5/18/2011	0.0	27.23	27.27	29.91	0.04	200	60	200	0.1	Product recovery with sock
VS-10	5/25/2011	NA	27.29	27.36	29.91	0.07	75	50	275	0.07	Product recovery with sock
VS-10	6/1/2011	NA	27.29	27.36	29.91	0.07	90	50	365	0.10	Product recovery with sock
VS-10	6/8/2011	NA	27.37	27.48	29.91	0.11	150	50	515	0.14	Product recovery with sock
VS-10	6/15/2011	NA	27.45	27.56	29.91	0.11	125	50	640	0.17	Product recovery with sock
VS-10	6/23/2011	NA	27.49	27.69	29.91	0.20	100	50	740	0.20	Product recovery with sock
VS-10	6/28/2011	NA	27.44	27.53	29.91	0.09	200	50	940	0.25	Product recovery with sock
VS-10	7/8/2011	NA	27.68	27.88	29.91	0.20	40	50	980	0.26	Product recovery with sock
VS-10	7/20/2011	NA	27.82	27.99	29.91	0.17	75	50	1,055	0.28	Product recovery with sock
VS-10	7/27/2011	NA	27.68	27.88	29.91	0.20	75	50	1,130	0.30	Product recovery with sock
VS-10	8/4/2011	NA	27.94	28.11	29.91	0.17	50	50	1,180	0.31	Product recovery with sock
VS-10	8/18/2011	NA	28.23	28.41	29.91	0.18	50	50	1,230	0.32	Product recovery with sock
VS-10	8/24/2011	NA	28.32	28.39	29.91	0.07	5	50	1,235	0.33	Product recovery with sock
VS-10	8/27/2011	NA	28.23	28.41	29.91	0.18					
VS-10	9/27/2011	NA		28.91	29.91	NP					
VS-10	4/18/2012	NA		27.94	29.91	NP					
VS-10	5/3/2012	NA		27.88	29.91	NP					
VS-10	6/8/2012	NA		28.40	29.91	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-10	7/3/2012	NA		28.72	29.91	NP					
VS-10	8/6/2012	NA		29.12	29.91	NP					
VS-10	9/11/2012	NA		29.65	29.91	NP					
VS-10	10/18/2012	NA		29.78	29.91	NP					
VS-10	11/15/2012	NA	trace	29.80	29.91	NP					Fuel odor
VS-10	12/13/2012	NA		28.88	29.91	NP					
VS-10	1/17/2013	NA	trace	27.35	29.91	NP					
VS-10	2/14/2013	NA	27.33	27.34	29.91	0.01					No product recovered
VS-10	3/12/2013	NA	trace	27.40	29.91	trace					
VS-10	4/12/2013	NA	27.46	27.50	29.91	0.04					No product recovered
VS-10	5/16/2013	NA	NP	27.90	29.91	NP					
VS-10	6/13/2013	NA	28.21	28.45	29.91	0.24	180	200	1,415	0.37	Product recovered. Strong hydrocarbon musty odor and thicker product.
VS-10	6/20/2013	NA	28.30	28.33	29.91	0.03					No product recovered
VS-10	6/27/2013	NA	28.44	28.50	29.91	0.06					No product recovered
VS-10	7/11/2013	NA	28.60	28.65	29.91	0.05					No product recovered
VS-10	8/15/2013	NA	NP	29.10	29.91	NP					No product recovered
VS-10	9/5/2013	NA	NP	29.34	29.91	NP					No product recovered
VS-10	10/7/2013	NA	NP	29.46	29.91	NP					
VS-10	11/13/2013	NA	NP	29.81	29.91	NP					
VS-10	12/13/2013	NA	NP	29.80	29.91	NP					
VS-10	1/10/2014	NA	NP	29.78	29.91	NP					
VS-10	2/13/2014	NA	NP	29.78	29.91	NP					
VS-10	3/13/2014	NA	NP	29.59	29.91	NP					
VS-10	4/3/2014	NA	DRY	29.88	29.91	NP					
VS-10	4/25/2014	0.1	NP	28.75	29.91	NP					PID wellhead peak 0.2 ppm
							VS-10 CUMULATIVE		1,415	0.37	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-11	12/3/2009	0.0		29.24	29.63	NP					3 stripped bolts, good seal, PVC cap without lock,, hard
VS-11	1/12/2010	0.0		29.23	29.65	NP					
VS-11	2/9/2010	0.1	>29.23	29.24	29.65	Sheen					
VS-11	10/5/2010	NA		29.20	29.65	NP					
VS-11	11/10/2010	NA		29.26	29.65	NP					
VS-11	12/8/2010	NA		29.23	29.65	NP					
VS-11	1/5/2011	NA		29.31	29.65	NP					
VS-11	2/9/2011	NA		28.72	29.65	NP					
VS-11	3/24/2011	NA		27.16	29.65	NP					
VS-11	4/6/2011	NA		28.56	29.65	NP					
VS-11	5/18/2011	NA		26.26	29.65	NP					
VS-11	6/23/2011	NA		26.66	29.65	NP					
VS-11	7/27/2011	NA		27.12	29.65	NP					
VS-11	8/27/2011	NA		27.42	29.65	NP					
VS-11	9/28/2011	NA		28.19	29.65	NP					
VS-11	4/18/2012	NA		26.94	29.65	NP					
VS-11	5/3/2012	NA		26.80	29.65	NP					
VS-11	6/8/2012	NA		27.41	29.65	NP					
VS-11	7/3/2012	NA		27.73	29.65	NP					
VS-11	8/6/2012	NA		28.33	29.65	NP					
VS-11	9/11/2012	NA		29.06	29.65	NP					
VS-11	10/18/2012	NA		29.19	29.65	NP					
VS-11	11/15/2012	NA	trace	29.21	29.65	trace					
VS-11	12/13/2012	NA		28.55	29.65	NP					
VS-11	1/17/2013	NA	trace	25.94	29.65	trace					
VS-11	2/14/2013	NA		26.26	29.65	NP					
VS-11	3/12/2013	NA		26.53	29.65	NP					
VS-11	4/12/2013	NA		26.78	29.65	NP					
VS-11	5/16/2013	NA	NP	27.12	29.65	NP					
VS-11	6/13/2013	NA	NP	27.45	29.65	NP					
VS-11	7/11/2013	NA	NP	27.80	29.65	NP					
VS-11	8/15/2013	NA	trace	28.42	29.65						
VS-11	9/5/2013	NA	NP	28.80	29.65	NP					
VS-11	10/7/2013	NA	NP	29.04	29.65	NP					
VS-11	11/13/2013	NA	NP	29.24	29.65	NP					
VS-11	12/13/2013	NA	NP	29.23	29.65	NP					
VS-11	1/10/2014	NA	NP	29.24	29.65						
VS-11	2/13/2014	NA	NP	29.24	29.65						
VS-11	3/13/2014	NA	NP	29.24	29.65						
VS-11	4/3/2014	NA	NP	28.32	29.65						
VS-11	4/25/2014	0.5	NP	27.84	29.65						PID wellhead peak 165.5 ppm
							VS-11 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-12	12/3/2009	0.0		28.78	29.13	NP					Seal and bolts good, No lock, 2" butterfly cap
VS-12	1/12/2010	0.0		28.98	29.13	NP					Smell of petroleum on probe
VS-12	2/9/2010	0.0		28.99	29.13	NP					Moderate smell of petroleum on probe
VS-12	10/5/2010	NA		28.98	29.13	NP					
VS-12	11/10/2010	NA		28.97	29.13	NP					
VS-12	12/8/2010	NA		28.98	29.13	NP					
VS-12	1/5/2011	NA		29.76	29.13	NP					
VS-12	2/9/2011	NA	28.77	28.97	29.13	0.20					
VS-12	3/16/2011	NA	28.01	28.15	29.13	0.14	235	0	235	0.06	Product recovery with sock
VS-12	3/24/2011	NA	27.33	27.53	29.13	0.20	460	0	695	0.18	Product recovery with sock
VS-12	3/29/2011	NA	27.22	27.31	29.13						
VS-12	4/6/2011	NA	28.91	28.95	29.13						
VS-12	4/13/2011	NA	26.53	26.97	29.13	0.44	850	0	1,545	0.41	Product recovery with sock
VS-12	4/21/2011	NA	26.46	26.85	29.13	0.39	650	0	2,195	0.58	Product recovery with sock
VS-12	4/27/2011	NA	26.49	26.65	29.13	0.16	200	0	2,395	0.63	Product recovery with sock
VS-12	5/4/2011	NA	26.65	26.71	29.13						
VS-12	5/11/2011	NA	26.68	26.81	29.13	0.13	200	0	2,595	0.69	Product recovery with sock
VS-12	5/18/2011	NA	26.42	26.60	29.13	0.18	200	50	2,795	0.74	Product recovery with sock
VS-12	6/23/2011	NA		26.64	29.13						
VS-12	7/27/2011	NA	26.77	27.27	29.13	0.05	600	50	3,395	0.90	Product recovery with sock
VS-12	8/4/2011	NA	26.93	27.47	29.13	0.54	650	50	4,045	1.07	Product recovery with sock
VS-12	8/18/2011	NA	27.56	27.79	29.13	0.23	100	50	4,145	1.09	Product recovery with sock
VS-12	8/24/2011	NA	27.75	27.90	29.13	0.15	30	50	4,175	1.10	Product recovery with sock
VS-12	8/27/2011	NA	27.56	27.77	29.13	0.21					
VS-12	9/16/2011	NA		27.84	29.13	NP	15		4,190	1.10	Product recovery with sock
VS-12	9/28/2011	NA	28.56	28.60	29.13	0.04					
VS-12	4/18/2012	NA	27.45	27.54	29.13	0.09	50	30	4,240	1.10	Product recovery with sock
VS-12	4/27/2012	NA	27.40	27.56	29.13	0.16					Product recovery with sock
VS-12	5/3/2012	NA	27.14	27.25	29.13	0.11					
VS-12	5/4/2012	NA	27.45	27.29	29.13	0.16	70		4,310	1.10	Product recovery with sock
VS-12	5/11/2012	NA	27.22	27.32	29.13	0.10	50		4,360	1.10	Product recovery with sock
VS-12	5/16/2012	NA	27.20	27.30	29.13	0.10	30		4,390	1.10	Product recovery with sock
VS-12	5/25/2012	NA	27.36	27.26	29.13	0.10	40	30	4,430	1.17	
VS-12	5/29/2012	NA	27.44	27.59	29.13	0.15	95	345	4,525	1.19	
VS-12	6/8/2012	NA	27.69	27.72	29.13	0.03					
VS-12	6/13/2012	NA	27.81	27.85	29.13	0.04					
VS-12	6/20/2012	NA	27.93	27.97	29.13	0.04	2	40	4,527	1.19	
VS-12	6/29/2012	NA	28.10	28.11	29.13	0.01					
VS-12	7/3/2012	NA	28.16	28.20	29.13	0.04					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-12	7/13/2012	NA	28.33	28.36	29.13	0.03					
VS-12	7/20/2012	NA			29.13						
VS-12	7/27/2012	NA	28.56	28.59	29.13	0.03					
VS-12	8/6/2012	NA	28.70	28.74	29.13	0.04					
VS-12	8/10/2012	NA	28.75	28.79	29.13	0.04					
VS-12	8/16/2012	NA	28.85	28.86	29.13	0.01					
VS-12	8/31/2012	NA	NA	29.00	29.13	0.00					
VS-12	9/5/2012	NA	NA	28.98	29.13	0.00					
VS-12	9/11/2012	NA	NA	28.98	29.13	0.00					
VS-12	10/18/2012	NA	NA	29.00	29.13						
VS-12	11/15/2012	NA	trace	28.97	29.13	0.00					Mothly wather levels, white worms
VS-12	12/13/2012	NA		28.56	29.13						Monthly water levels moderate petrolium odor
VS-12	1/17/2013	NA	26.85	26.95	29.13	0.10	400	230	4,927	1.30	Monthly water levels, product recovered
VS-12	1/24/2013	NA	26.79	26.92	29.13	0.13	150	320	5,077	1.34	Product recovered, Probe warm to the touch
VS-12	1/31/2013	NA	26.75	26.83	29.13	0.08					No product recovered
VS-12	2/14/2013	NA	26.85	26.97	29.13	0.12	160	220	5,237	1.38	Product recovered, Probe warm to the touch
VS-12	2/19/2013	NA	26.73	26.81	29.13	0.08					No product recovered
VS-12	3/12/2013	NA	27.00	27.05	29.13	0.05					No product recovered
VS-12	4/12/2013	NA	27.13	27.20	29.13	0.07					No product recovered
VS-12	5/16/2013	NA	27.50	27.69	29.13	0.19	190	210	5,427	1.43	
VS-12	5/23/2013	NA	27.60	27.70	29.13	0.10	40	170	5,467	1.44	
VS-12	5/29/2013	NA	27.65	27.69	29.13	0.04					
VS-12	6/13/2013	NA	27.85	27.91	29.13	0.06					
VS-12	7/11/2013	NA	28.22	28.30	29.13	0.08					
VS-12	8/15/2013	NA	NP	28.82	29.13	NP					
VS-12	9/5/2013	NA	NP	29.00	29.13	NP					
VS-12	10/7/2013	NA	NP	29.00	29.13	NP					
VS-12	11/13/2013	NA	NP	29.05	29.13	NP					
VS-12	12/13/2013	NA	NP	29.00	29.13	NP					
VS-12	1/10/2014	NA	NP	29.00	29.13						
VS-12	2/13/2014	NA	NP	29.00	29.13						
VS-12	3/13/2014	NA	NP	29.00	29.13						
VS-12	4/3/2014	NA	NP	29.13	29.13						
VS-12	4/25/2014	0.1	28.39	28.41	29.13	0.02					PID wellhead peak 44.5 ppm
							VS-12 CUMULATIVE		5,467	1.44	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-13	12/3/2009	0.0	NA	NA	29.22	NP					Seal and bolts good, 2" butterfly cap, Muddy bottom, light smell of petroleum on probe
VS-13	1/12/2010	0.2	NA	NA	29.25	NP					Probe warm to touch, light smell of petroleum
VS-13	2/9/2010	0.2	>29.23	29.24	29.25	Sheen					
VS-13	10/5/2010			28.96	29.25	NP					Let well breathe, moderate petro smell, probe warm to
VS-13	4/18/2012	NA		24.32	29.25	NP					
VS-13	10/18/2012	NA		28.94	29.25	NP					
VS-13	11/15/2012	NA	28.73	28.74	29.25	0.01					
VS-13	12/13/2012	NA		27.35	29.25						
VS-13	1/17/2013	NA		29.25	29.25	Dry					
VS-13	2/14/2013	NA		25.79	29.25						
VS-13	3/12/2013	NA		25.92	29.25						
VS-13	4/12/2013	NA		26.04	29.25						Cracked well cap
VS-13	5/16/2013	NA		29.25	29.25	Dry					Cracked well cap
VS-13	6/13/2013	NA		26.84	29.25						Cracked well cap
VS-13	7/11/2013	NA		27.23	29.25						Cracked well cap
VS-13	8/15/2013	NA		27.72	29.25						
VS-13	9/5/2013	NA		28.01	29.25						
VS-13	10/7/2013	NA		28.06	29.25						
VS-13	11/13/2013	NA		28.61	29.25						
VS-13	12/13/2013	NA		28.81	29.25						
VS-13	1/10/2014	NA		29.10	29.25						Black sediment on probe
VS-13	2/13/2014	NA		29.14	29.25						
VS-13	3/13/2014	NA		28.13	29.25						
VS-13	4/3/2014	NA		27.36	29.25						
VS-13	4/25/2014	0.0		27.33	29.25						PID wellhead peak 20.1 ppm
							VS-13 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-14	12/3/2009	0.1		NA	17.19	NP					Heavy smell of petroleum on probe and in mud, muddy bottom, fitted PVC cap without lock, seal and bolts good
VS-14	1/12/2010	0.0		NA	17.19	NP					Probe warm to touch, light smell of petroleum
VS-14	2/9/2010	0.0		NA	17.19	NP					Probe warm to touch, light smell of petroleum
VS-14	10/5/2010	NA		17.17	17.19	NP					Well dry
VS-14	11/10/2010	NA		17.17	17.19	NP					Well dry
VS-14	12/8/2010	NA		17.25	17.19	NP					
VS-14	1/5/2011	NA		17.55	17.19	NP					
VS-14	2/9/2011	NA		17.50	17.19	NP					
VS-14	3/24/2011	NA		17.18	17.19	NP					Well dry
VS-14	4/6/2011	NA		16.90	17.19	NP					
VS-14	5/18/2011	NA		17.18	17.19	NP					Well dry
VS-14	6/23/2011	NA		17.18	17.19	NP					Well dry
VS-14	7/27/2011	NA		NA	17.19	NP					Well hot
VS-14	8/27/2011	NA		17.18	17.19	NP					Well dry
VS-14	9/28/2011	NA		17.18	17.19	NP					Well dry
VS-14	4/18/2012	NA		17.26	17.19	NP					Well dry @ 17.26 - also hot and steam emiting out of casing. Tape is very warm.
VS-14	5/3/2012	NA		17.24	17.19	NP					Well dry
VS-14	6/8/2012	NA		17.27	17.19	NP					
VS-14	7/3/2012	NA		17.27	17.19	NP					
VS-14	8/6/2012	NA		17.25	17.19	NP					
VS-14	9/11/2012	NA		17.25	17.19	NP					
							VS-14 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
VS-16	12/3/2009	0.0		26.59	26.96	NP					Missing 2 bolts, two enlarged sockets, 2" butterfly cap, good seal, hard bottom
VS-16	1/12/2010	0.0		26.60	26.90	NP					
VS-16	2/9/2010	0.0		26.60	26.96	NP					
VS-16	10/5/2010	NA		26.62	26.96	NP					
VS-16	11/10/2010	NA		26.64	26.96	NP					
VS-16	12/8/2010	NA		26.63	26.96	NP					
VS-16	1/5/2011	NA		26.60	26.96	NP					
VS-16	2/9/2011	NA		26.62	26.96	NP					
VS-16	3/24/2011	NA		26.62	26.96	NP					
VS-16	4/6/2011	NA		25.48	26.96	NP					
VS-16	5/18/2011	NA		26.41	26.96	NP					
VS-16	6/23/2011	NA		26.53	26.96	NP					
VS-16	7/27/2011	NA		26.54	26.96	NP					
VS-16	8/27/2011	NA		26.55	26.96	NP					
VS-16	9/28/2011	NA		26.55	26.96	NP					
VS-16	4/18/2012	NA		26.59	26.96	NP					
VS-16	5/3/2012	NA		26.56	26.96	NP					
VS-16	6/8/2012	NA		26.55	26.96	NP					
VS-16	7/3/2012	NA		26.58	26.96	NP					
VS-16	8/6/2012	NA		26.55	26.96	NP					
VS-16	9/11/2012	NA		26.58	26.96	NP					
VS-16	10/18/2012	NA		26.60	26.96	NP					
VS-16	11/15/2012	NA		26.59	26.96	NP					
VS-16	12/13/2012	NA		26.60	26.96	NP					
VS-16	1/17/2013	NA		26.53	26.96	NP					
VS-16	2/14/2013	NA		26.52	26.96	NP					
VS-16	3/12/2013	NA		26.52	26.96	NP					
VS-16	4/12/2013	NA	trace	26.54	26.96	trace					
VS-16	5/16/2013	NA		26.55	26.96	NP					
VS-16	6/13/2013	NA		26.55	26.96	NP					Brown residue on the probe
VS-16	7/11/2013	NA		26.58	26.96	NP					Brown residue on the probe
VS-16	8/15/2013	NA		26.58	26.96	NP					White bugs on probe
VS-16	9/5/2013	NA		26.59	26.96	NP					White bugs on probe
VS-16	10/7/2013	NA		26.60	26.96	NP					
VS-16	11/13/2013	NA		26.60	26.96	NP					
VS-16	12/13/2013	NA		26.60	26.96	NP					
							VS-16 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW24	12/3/2009	0.0		31.93	45.04	NP					
8MW24	1/12/2010	0.0		31.33	45.04	NP					
8MW24	2/9/2010	0.0		30.04	45.04	NP					
8MW24	10/5/2010	NA		30.55	45.04	NP					
8MW24	11/10/2010	NA		30.63	45.04	NP					
8MW24	12/8/2010	NA		30.55	45.04	NP					
8MW24	1/5/2011	NA		30.48	45.04	NP					
8MW24	2/9/2011	NA		28.85	45.04	NP					
8MW24	3/24/2011	NA		27.11	45.04	NP					
8MW24	4/6/2011	NA		29.61	45.04	NP					
8MW24	5/18/2011	NA		26.70	45.04	NP					
8MW24	6/23/2011	NA		27.14	45.04	NP					
8MW24	7/27/2011	NA		27.57	45.04	NP					
8MW24	8/27/2011	NA		27.88	45.04	NP					
8MW24	9/28/2011	NA		28.53	45.04	NP					
8MW24	4/18/2012	NA		27.37	45.04	NP					
8MW24	5/3/2012	NA		27.41	45.04	NP					
8MW24	6/8/2012	NA		27.95	45.04	NP					
8MW24	7/3/2012	NA		28.23	45.04	NP					
8MW24	8/6/2012	NA		28.65	45.04	NP					
8MW24	9/11/2012	NA		29.19	45.04	NP					
							8MW24 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW47	8/29/2009	0.0	32.85	32.88	NM	0.03	1	1	1	0.000	
8MW47	9/24/2009	0.0	33.10	33.11	NM	0.01	2	3	3	0.001	
8MW47	10/6/2009	0.0	>33.20	33.21	38.30	>0.01					Minor sheen detected, but not measureable
8MW47	12/3/2009	0.0	NA	32.10	38.25	NP					Moderate smell of petroleum on probe, 1 missing bolt, 1 stripped bolt, 1 broken socket tab, 4" butterfly cap
8MW47	1/13/2010	0.0	31.51	31.54	NM	0.03	52	12	55	0.015	Recovered 52ml of product leaving a light sheen
8MW47	2/9/2010	0.0		30.24	NM	NP					Moderate smell of petroleum on probe
8MW47	8/3/2010	NA		30.04	40.50	NP					
8MW47	8/11/2010	NA		30.09	40.50	NP					
8MW47	8/20/2010	NA		30.19	40.50	NP					
8MW47	8/25/2010	NA		30.33	40.50	NP					
8MW47	9/1/2010	NA		30.41	40.50	NP					
8MW47	9/10/2010	NA		30.55	40.50	NP					
8MW47	9/15/2010	NA		30.56	40.50	NP					
8MW47	9/24/2010	NA		30.65	40.50	NP					
8MW47	9/29/2010	NA		30.68	40.50	NP					
8MW47	10/5/2010	NA		30.77	40.50	NP					
8MW47	10/13/2010	NA		30.84	40.50	NP					
8MW47	10/19/2010	NA		30.88	40.50	NP					
8MW47	10/27/2010	NA		30.91	40.50	NP					
8MW47	11/3/2010	NA		30.89	40.50	NP					
8MW47	11/10/2010	NA		30.87	40.50	NP					
8MW47	11/17/2010	0.00		30.88	40.50	NP					
8MW47	11/24/2010	0.00		30.92	40.50	NP					
8MW47	12/1/2010	NA		30.88	40.50	NP					
8MW47	12/8/2010	NA		30.85	40.50	NP					
8MW47	12/15/2010	NA		30.47	40.50	NP					
8MW47	12/22/2010	NA		30.08	40.50	NP					
8MW47	12/30/2010	NA		29.70	40.50	NP					
8MW47	1/5/2011	NA		30.89	40.50	NP					
8MW47	1/14/2011	NA		29.33	40.50	NP					
8MW47	1/19/2011	NA		29.20	40.50	NP					
8MW47	1/26/2011	NA		29.17	40.50	NP					
8MW47	2/2/2011	NA		29.13	40.50	NP					
8MW47	2/9/2011	NA		29.06	40.50	NP					
8MW47	2/17/2011	NA		28.85	40.50	NP					
8MW47	2/28/2011	NA		28.69	40.50	NP					
8MW47	3/16/2011	NA		27.97	40.50	NP					
8MW47	3/24/2011	NA		27.36	40.50	NP					
8MW47	3/29/2011	NA		26.14	40.50	NP					

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW47	4/6/2011	NA		29.94	40.50	NP					
8MW47	5/18/2011	NA		26.90	40.50	NP					
8MW47	6/23/2011	NA		27.32	40.50	NP					
8MW47	7/27/2011	NA		27.63	40.50	NP					
8MW47	8/27/2011	NA		28.06	40.50	NP					
8MW47	9/28/2011	NA		28.70	40.50	NP					
8MW47	4/18/2012	NA		27.52	40.50	NP					
8MW47	5/3/2012	NA		27.63	40.50	NP					
8MW47	6/8/2012	NA		28.14	40.50	Trace					
8MW47	6/13/2012	NA		28.21	40.50	NP					
8MW47	6/20/2012	NA		28.10	40.50	NP					
8MW47	6/29/2012	NA		28.39	40.50	NP					
8MW47	7/3/2012	NA		28.45	40.50	NP					
8MW47	8/6/2012	NA		28.87	40.50	NP					
8MW47	9/11/2012	NA		29.42	40.50	NP					
8MW47	10/18/2012	NA		29.91	40.50	NP					
8MW47	11/15/2012	NA	trace	29.89	40.50	trace					
8MW47	12/13/2012	NA		28.49	40.50	NP					
8MW47	1/17/2013	NA	trace	27.00	40.50	trace					
8MW47	2/14/2013	NA		26.98	40.50	NP					
8MW47	3/12/2013	NA		27.14	40.50	NP					
8MW47	4/15/2013	NA		27.28	40.50	NP					Measured during LTM sampling
8MW47	5/16/2013	NA		27.69	40.50	NP					
8MW47	6/13/2013	NA	trace	28.01	40.50	NP					
8MW47	7/11/2013	NA	NP	28.40	40.50	NP					
8MW47	8/15/2013	NA	NP	28.90	40.50	NP					
8MW47	9/5/2013	NA	NP	29.14	40.50	NP					
8MW47	10/7/2013	NA	NP	29.20	40.50	NP					
8MW47	11/13/2013	NA	NP	29.76	40.50	NP					
8MW47	12/13/2013	NA	NP	29.98	40.50	NP					
8MW47	1/10/2014	NA	NP	30.25	40.50	NP					
8MW47	2/13/2014	NA	NP	30.38	40.50	NP					
8MW47	3/13/2014	NA	NP	29.16	40.50	NP					
8MW47	4/3/2014	NA	NP	28.06	40.50	NP					
8MW47	4/25/2014	1.20	NP	28.43	40.50	NP					Wellhead peak 434.1 ppm
							8MW47 CUMULATIVE		55	0.015	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW49	5/4/2010	NA	28.67	30.66	40.00	1.99					Measured product and water in well with probe
8MW49	5/5/2010	3.0	29.16	29.21	40.00	0.05	340		340	0.09	Recovered 340ml of product leaving <0.01 ft of product
8MW49	5/10/2010	NA	29.11	29.15	40.00	0.04	200	80	540	0.14	Recovered 200ml of product.
8MW49	8/3/2010	NA	29.83	30.09	40.00	0.26					
8MW49	8/11/2010	NA	30.36	30.71	40.00	0.35					
8MW49	8/20/2010	NA	30.03	30.35	40.00	0.32					
8MW49	8/23/2010	NA	30.15	30.35	40.00	0.20					
8MW49	8/25/2010	NA	30.23	30.58	40.00	0.35					
8MW49	9/1/2010	NA	30.30	30.63	40.00	0.33					
8MW49	9/10/2010	NA	30.34	30.67	40.00	0.33					
8MW49	9/15/2010	NA	30.36	30.71	40.00	0.35					
8MW49	9/16/2010	NA	30.40	30.75	40.00	0.35	700	NA	1,240	0.33	
8MW49	9/24/2010	NA	30.43	30.47	40.00	0.04					
8MW49	9/29/2010	NA	30.48	30.54	40.00	0.06					
8MW49	10/5/2010	NA	30.55	30.63	40.00	0.08					
8MW49	10/13/2010	NA	30.61	30.69	40.00	0.08					
8MW49	10/19/2010	NA	30.64	30.70	40.00	0.06					
8MW49	10/27/2010	NA	30.69	30.74	40.00	0.05					
8MW49	11/3/2010	NA	30.67	30.69	40.00	0.02					
8MW49	11/10/2010	NA		30.65	40.00	NP					
8MW49	11/17/2010	0.00		30.63	40.00	NP					
8MW49	11/24/2010	NA		30.60	40.00	NP					
8MW49	12/1/2010	NA	30.57	30.59	40.00	0.02					
8MW49	12/8/2010	NA	30.52	30.64	40.00	0.12	240	0	1,480	0.39	Product recovery with sock
8MW49	12/15/2010	NA	29.90	29.92	40.00	0.02	10	0	1,490	0.39	Product recovery with sock
8MW49	12/22/2010	NA	29.57	29.58	40.00	0.01					
8MW49	12/30/2010	NA		29.13	40.00	NP					
8MW49	1/5/2011	NA		30.63	40.00	NP					
8MW49	1/14/2011	NA		28.89	40.00	NP					
8MW49	1/19/2011	NA		29.20	40.00	NP					
8MW49	1/26/2011	NA		29.07	40.00	NP					
8MW49	2/2/2011	NA		28.93	40.00	NP					
8MW49	2/9/2011	NA		28.78	40.00	NP					
8MW49	2/17/2011	NA		28.50	40.00	NP					
8MW49	2/28/2011	NA		28.42	40.00	NP					
8MW49	3/16/2011	NA		27.37	40.00	NP					
8MW49	3/24/2011	NA		26.90	40.00	NP					
8MW49	3/29/2011	NA		26.72	40.00	NP					
8MW49	4/6/2011	NA		29.68	40.00	0.29	700	70	2,190	0.58	Product recovery with sock
8MW49	4/21/2011	NA	26.38	26.67	40.00	0.29	700	70	2,890	0.76	Product recovery with sock
8MW49	4/27/2011	NA	26.50	26.60	40.00	0.10	220	80	3,110	0.82	Product recovery with sock

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW49	5/11/2011	NA	26.68	26.81	40.00	0.13	290	0	3,400	0.90	Product recovery with sock
8MW49	5/18/2011	NA	26.68	26.81	40.00	0.13	290	0	3,690	0.97	Product recovery with sock
8MW49	6/23/2011	NA	27.18	27.35	40.00	0.17	200	0	3,890	1.03	Product recovery with sock
8MW49	6/28/2011	NA	27.16	27.32	40.00	0.16	280	0	4,170	1.10	Product recovery with sock
8MW49	7/8/2011	NA	27.41	27.50	40.00	0.09	100	0	4,270	1.13	Product recovery with sock
8MW49	7/27/2011	NA	27.50	27.71	40.00	0.21	220	0	4,490	1.19	Product recovery with sock
8MW49	8/24/2011	NA	28.06	28.10	40.00	0.04	20	0	4,510	1.19	Product recovery with sock
8MW49	8/27/2011	NA	27.98	28.01	40.00	0.03	20	0	4,530	1.20	Product recovery with sock
8MW49	8/31/2011	NA	28.21	28.25	40.00	0.04	30	0	4,560	1.20	Product recovery with sock
8MW49	9/16/2011	NA	28.45	28.45	40.00	NP					
8MW49	9/28/2011	NA	28.70	28.70	40.00	NP					
8MW49	4/18/2012	NA		27.22	40.00	NP					
8MW49	5/3/2012	NA		27.44	40.00	NP					
8MW49	6/8/2012	NA		28.01	40.00	NP					
8MW49	7/3/2012	NA		28.31	40.00	NP					
8MW49	8/6/2012	NA		28.78	40.00	NP					
8MW49	9/11/2012	NA	29.31	29.32	40.00	0.01					
8MW49	9/20/2012	0.00	29.46	29.49	40.00	0.03					
8MW49	9/27/2012	NA	29.55	29.60	40.00	0.05					
8MW49	10/5/2012	NA	29.65	29.72	40.00	0.07					
8MW49	10/12/2012	NA	29.72	29.80	40.00	0.08					
8MW49	10/18/2012	NA	29.76	29.82	40.00	0.06					
8MW49	11/15/2012	NA	29.68	29.70	40.00	0.02					
8MW49	12/13/2012	NA		28.04	40.00	NP					
8MW49	1/17/2013	NA		26.64	40.00	NP					
8MW49	2/14/2013	NA		26.80	40.00	NP					
8MW49	3/12/2013	NA		26.95	40.00	NP					
8MW49	4/12/2013	NA	trace	27.93	40.00	NP					
8MW49	5/16/2013	NA		27.60	40.00	NP					
8MW49	6/13/2013	NA	NP	27.90	40.00	NP					
8MW49	7/11/2013	NA	NP	28.30	40.00	NP					
8MW49	8/15/2013	NA	NP	28.85	40.00						
8MW49	9/5/2013	NA	NP	29.07	40.00	NP					
8MW49	10/7/2013	NA	NP	29.00	40.00	NP					
8MW49	11/13/2013	NA	NP	29.63	40.00	NP					
8MW49	12/13/2013	NA	29.90	29.91	40.00	0.01					No product recovered
8MW49	1/10/2014	NA	30.16	30.23	40.00	0.07					No product recovered
8MW49	2/13/2014	NA	30.20	30.23	40.00	0.03					No product recovered
8MW49	3/13/2014	trace	28.61	30.23	40.00						
8MW49	4/3/2014	NA	28.00	30.23	40.00						
8MW49	4/25/2014	0.50	NP	28.15	40.00						PID wellhead peak 38.0 ppm
							8MW49 CUMULATIVE		4,560	1.20	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8MW53	10/5/2010	NA		30.28	46.00	NP					
8MW53	11/10/2010	NA		30.41	46.00	NP					
8MW53	12/8/2010	NA		30.31	46.00	NP					
8MW53	1/5/2011	NA		30.11	46.00	NP					
8MW53	2/9/2011	NA		28.57	46.00	NP					
8MW53	3/24/2011	NA		26.83	46.00	NP					
8MW53	4/6/2011	NA		29.77	46.00	NP					
8MW53	5/18/2011	NA		26.47	46.00	NP					
8MW53	6/23/2011	NA		26.79	46.00	NP					
8MW53	7/27/2011	NA		27.24	46.00	NP					
8MW53	8/27/2011	NA		27.51	46.00	NP					
8MW53	9/28/2011	NA		28.16	46.00	NP					
8MW53	4/18/2012	NA		27.10	46.00	NP					
8MW53	5/3/2012	NA		27.07	46.00	NP					
8MW53	6/8/2012	NA		27.64	46.00	NP					
8MW53	7/3/2012	NA		27.94	46.00	NP					
8MW53	7/13/2012	NA		28.04	46.00	NP					
8MW53	7/20/2012	NA		28.16	46.00	NP					
8MW53	7/27/2012	NA		28.23	46.00	NP					
8MW53	8/6/2012	NA		28.34	46.00	NP					
8MW53	9/11/2012	NA		28.89	46.00	NP					
8MW53	10/18/2012	NA		29.31	46.00	NP					
8MW53	11/15/2012	NA		29.40	46.00	NP					
8MW53	12/13/2012	NA		28.01	46.00	NP					
8MW53	1/17/2013	NA		26.49	46.00	NP					
8MW53	2/14/2013	NA		26.54	46.00	NP					
8MW53	3/12/2013	NA		26.65	46.00	NP					
8MW53	4/12/2013	NA		26.72	46.00	NP					
8MW53	5/16/2013	NA		27.19	46.00	NP					
8MW53	6/13/2013	NA		27.52	46.00	NP					
8MW53	7/11/2013	NA		27.88	46.00	NP					
8MW53	8/15/2013	NA		28.36	46.00	NP					
8MW53	9/5/2013	NA		28.60	46.00	NP					
8MW53	10/7/2013	NA		28.66	46.00	NP					
8MW53	11/13/2013	NA		29.21	46.00	NP					
8MW53	12/13/2013	NA		29.45	46.00	NP					
8MW53	1/10/2014	NA		29.73	46.00	NP					
8MW53	2/13/2014	NA		29.35	46.00	NP					
8MW53	3/13/2014	NA		28.69	46.00	NP					
8MW53	4/3/2014	NA									TO 82 no longer measured
							8MW53 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW23	10/18/2012	NA	NP	29.58							
8CB-MW23	11/15/2012	NA	trace	29.59		trace					
8CB-MW23	12/13/2012	NA		28.10		NP					
8CB-MW23	1/17/2013	NA	trace	26.67		trace					
8CB-MW23	2/14/2013	NA									Unable to measure, truck over well for monthly water levels
8CB-MW23	2/19/2013	NA									Unable to measure, truck over well for monthly water levels
8CB-MW23	2/28/2013	NA		26.85		NP					
8CB-MW23	3/12/2013	NA		26.84		NP					
8CB-MW23	4/12/2013	NA		26.84		NP					Bailed surface water from well casing
8CB-MW23	5/16/2013	NA		27.40		NP					Bailed surface water from well casing
8CB-MW23	6/13/2013	NA									Unable to measure, truck over well for monthly water levels
8CB-MW23	6/27/2013	NA									Unable to measure, truck over well for monthly water levels
8CB-MW23	7/11/2013	NA		28.10		NP					
8CB-MW23	8/15/2013	NA		28.62		NP					
8CB-MW23	9/5/2013	NA		28.88		NP					
8CB-MW23	10/7/2013	NA		28.90		NP					
8CB-MW23	11/13/2013	NA		29.46		NP					
8CB-MW23	12/13/2013	NA		29.71		NP					
8CB-MW23	1/10/2014	NA		30.00		NP					Bailed monument
8CB-MW23	2/13/2014	NA		30.09		NP					Bailed monument
8CB-MW23	3/13/2014	NA		28.79		NP					Bailed monument
8CB-MW23	4/3/2014	NA		27.92		NP					Bailed monument
8CB-MW23	4/25/2014	0.2		28.11		NP					PID wellhead peak 3.3 ppm
						8CB-MW23 CUMULATIVE			0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW26	5/29/2012	NA	25.85	26.31		0.46	275	725	275	0.07	Product recovery with peristaltic pump
8CB-MW26	6/8/2012	NA		25.99		NP			275	0.07	
8CB-MW26	7/3/2012	NA	26.38	26.73		0.35			275	0.07	Sock supended in well.
8CB-MW26	7/13/2012	NA	26.51	26.80		0.39	110		385	0.10	Recovered with suspended sock
8CB-MW26	7/20/2012	NA	26.60	27.00		0.40	340	220	725	0.19	26.82
8CB-MW26	7/27/2012	NA	26.72	26.96		0.24	120	110	845	0.22	26.82
8CB-MW26	8/6/2012	NA	27.18	27.22		0.04					
8CB-MW26	8/10/2012	NA	26.92	27.25		0.33	160	180	1,005	0.27	27.10
8CB-MW26	8/16/2012	NA	27.03	27.27		0.24	110	130	1,115	0.29	
8CB-MW26	8/31/2012	NA	27.46	27.55		0.09					No product recovered
8CB-MW26	9/5/2012	NA	27.39	27.65		0.26	160	100	1,275	0.34	
8CB-MW26	9/11/2012	NA	27.59	27.73		0.14	70	930	1,345	0.36	Product recovery with peristaltic pump
8CB-MW26	9/20/2012	0.00	27.77	27.92		0.15	80	100	1,425	0.38	Product recovery with peristaltic pump only sheen left
8CB-MW26	9/27/2012	NA	27.89	27.97		0.08					No product recovered
8CB-MW26	10/5/2012	NA	27.95	28.15		0.20	120	500	1,545	0.41	Product recovery with peristaltic pump only sheen left
8CB-MW26	10/12/2012	NA	28.07	28.09		0.02					No product recovered
8CB-MW26	10/18/2012	NA	28.06	28.32		0.26					Monthly water levels, no product recovered
8CB-MW26	10/25/2012	NA	28.22	28.61		0.39	190	460	1,735	0.46	Product recovery with peristaltic pump
8CB-MW26	10/30/2012	NA	28.20	28.32		0.12	60	190	1,795	0.47	Product recovery with peristaltic pump, water recovered was milky in color
8CB-MW26	11/8/2012	NA	28.08	28.14		0.06					No product recovered
8CB-MW26	11/15/2012	NA	28.12	28.30		0.18	80	410	1,875	0.50	peristaltic pump
8CB-MW26	11/21/2012	NA	27.97	28.02		0.05					No product recovered
8CB-MW26	12/13/2012	NA	0.00	26.64							
8CB-MW26	1/17/2013	NA		24.99		NP					
8CB-MW26	2/14/2013	NA	25.00	25.01		0.01					No product recovered
8CB-MW26	3/7/2013	NA		25.26		0.11	68		1,943	0.51	Groundwater sampling, thickness of 0.11 ft removed before sampling

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW26	3/12/2013	NA		25.26							
8CB-MW26	3/21/2013	NA	25.40	25.42		0.02					No product recovered
8CB-MW26	4/12/2013	NA	NP	25.24		NP					No product recovered
8CB-MW26	5/16/2013	NA	25.71	25.93		0.22	90	210	2,033	0.54	Product recovered
8CB-MW26	5/23/2013	NA	25.88	26.00		0.12	70	150	2,103	0.56	Product recovered
8CB-MW26	5/29/2013	NA	25.91	26.00		0.09	50	200	2,153	0.57	Product recovered
8CB-MW26	6/6/2013	NA	25.96	26.03		0.07					No product recovered
8CB-MW26	6/13/2013	NA	26.09	26.15		0.06					No product recovered
8CB-MW26	7/11/2013	NA	26.46	26.86		0.40	240	610	2,393	0.63	Product recovered
8CB-MW26	7/17/2013	NA	26.65	26.82		0.17	50	770	2,443	0.64	Product recovered
8CB-MW26	7/26/2013	NA	26.80	26.91		0.11	80	120	2,523	0.67	Product recovered
8CB-MW26	8/1/2013	NA	26.91	26.95		0.04					No product recovered
8CB-MW26	8/15/2013	NA	27.19	27.30		0.11	70	410	2,593	0.68	Product recovered
8CB-MW26	8/22/2013	NA	27.23	27.27		0.04					No product recovered
8CB-MW26	9/5/2013	NA	27.28	27.31		0.03					No product recovered
8CB-MW26	9/13/2013	NA	27.50	27.62		0.12	50	60	2,643	0.68	Product recovered
8CB-MW26	9/20/2013	NA	27.55	27.58		0.03					No product recovered
8CB-MW26	10/7/2013	NA	27.50	27.52		0.02					No product recovered
8CB-MW26	11/13/2013	NA	28.02	28.13		0.11	85	130	2,728	0.72	Product recovered
8CB-MW26	11/22/2013	NA	28.09	28.24		0.15	110	90	2,838	0.75	Product recovered
8CB-MW26	11/27/2013	NA	28.02	28.03		0.01					No product recovered
8CB-MW26	12/13/2013	NA	29.31	29.46		0.15	80	120	2,918	0.77	Product recovered
8CB-MW26	12/20/2013	NA	28.26	28.35		0.09					No product recovered
8CB-MW26	1/10/2014	NA	28.61	28.86		0.25	160	200	3,078	0.81	Product recovered
8CB-MW26	1/17/2014	NA	28.50	28.52		0.02					No product recovered
8CB-MW26	2/13/2014	NA	28.76	28.83		0.07					
8CB-MW26	3/13/2014	NA	NP	27.40		0.00					
8CB-MW26	4/3/2014	NA	NP	26.56		0.00					Bailed monument
8CB-MW26	4/25/2014	0.40	NP	26.50		0.00					PID wellhead peak 714.0 ppm
						8CB-MW26 CUMULATIVE			3,078	0.81	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW28	5/29/2012	NA		28.31		Trace					
8CB-MW28	6/8/2012	NA		28.04		NP					
8CB-MW28	7/3/2012	NA		28.30		NP					
8CB-MW28	8/6/2012	NA		28.77		NP					
8CB-MW28	9/11/2012	NA		29.32		NP					
8CB-MW28	10/18/2012	NA		29.75		NP					
8CB-MW28	11/15/2012	NA		29.72		NP					
8CB-MW28	12/13/2012	NA		28.16		NP					
8CB-MW28	1/17/2013	NA		26.73		NP					
8CB-MW28	2/14/2013	NA		26.84		NP					
8CB-MW28	3/12/2013	NA		27.16		NP					
8CB-MW28	4/12/2013	NA		NA							Vehicle parked over the well
8CB-MW28	5/16/2013	NA		27.59		NP					
8CB-MW28	6/13/2013	NA		27.89		NP					
8CB-MW28	7/11/2013	NA		28.29		NP					
8CB-MW28	8/15/2013	NA		28.82		NP					
8CB-MW28	9/5/2013	NA		29.03		NP					
8CB-MW28	10/7/2013	NA	NP	29.06		NP					
8CB-MW28	11/13/2013	NA	NP	29.61		NP					
8CB-MW28	12/13/2013	NA	NP	28.89		NP					
8CB-MW28	1/10/2014	NA		30.15		NP					
8CB-MW28	2/13/2014	NA		30.25		NP					
8CB-MW28	3/13/2014	NA		28.81		NP					
8CB-MW28	4/3/2014	NA									TO 82 no longer measured
						8CB-MW28 CUMULATIVE			0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW02	5/29/2012	NA		27.61		NP					
8CB-MW02	6/8/2012	NA		27.60		NP					
8CB-MW02	7/3/2012	NA		27.88		NP					
8CB-MW02	8/6/2012	NA		28.36		NP					
8CB-MW02	9/11/2012	NA		28.97		NP					
8CB-MW02	10/18/2012	NA		29.40		NP					
8CB-MW02	11/15/2012	NA	trace	29.24		trace					
8CB-MW02	12/13/2012	NA		27.50		NP					
8CB-MW02	1/17/2013	NA		26.14		NP					
8CB-MW02	2/14/2013	NA	trace	26.34		trace					
8CB-MW02	3/12/2013	NA	trace	26.55		trace					
8CB-MW02	4/12/2013	NA		26.45		NP					
8CB-MW02	5/16/2013	NA	NP	27.20		NP					
8CB-MW02	6/13/2013	NA	NP	27.50		NP					
8CB-MW02	7/11/2013	NA	NP	27.91		NP					
8CB-MW02	8/15/2013	NA	NP	28.49		NP					
8CB-MW02	9/5/2013	NA	NP	28.70		NP					
8CB-MW02	10/7/2013	NA	NP	28.60		NP					
8CB-MW02	11/13/2013	NA	NP	29.25		NP					
8CB-MW02	12/13/2013	NA	NP	29.52		NP					
8CB-MW02	1/10/2014	NA	NP	29.80		NP					
8CB-MW02	2/13/2014	NA	NP	29.79		NP					
8CB-MW02	3/13/2014	NA	NP	28.02		NP					
8CB-MW02	4/3/2014	NA	NP	27.50		NP					
8CB-MW02	4/25/2014	0.2	NP	27.70		NP					PID wellhead peak 167.2 ppm
						8CB-MW02 CUMULATIVE			0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW17	5/29/2012	NA		27.58		Trace					
8CB-MW17	6/8/2012	NA		27.65		NP					
8CB-MW17	7/3/2012	NA	27.90	28.08		0.18					
8CB-MW17	7/13/2012	NA	27.92	28.15		0.23					
8CB-MW17	7/20/2012	NA	28.08	28.39		0.31	220	110	220	0.06	
8CB-MW17	7/27/2012	NA	28.17	28.29		0.12	40	160	260	0.07	
8CB-MW17	8/6/2012	NA	28.28	28.44		0.16					
8CB-MW17	8/10/2012	NA	28.30	28.53		0.23	110	440	370	0.10	
8CB-MW17	8/16/2012	NA	28.39	28.48		0.09					
8CB-MW17	8/31/2012	NA	28.60	28.63		0.03					
8CB-MW17	9/5/2012	NA	28.63	28.80		0.17	70	260	440	0.12	
8CB-MW17	9/11/2012	NA		28.79		NP					
8CB-MW17	10/18.2012	NA	29.16	29.61		0.45					
8CB-MW17	10/25/2012	NA	29.30	29.80		0.50	260	290	700	0.18	
8CB-MW17	10/30/2012	NA	29.34	29.43		0.09					
8CB-MW17	11/8/2012	NA	29.25	29.41		0.16	80	420	780	0.21	Product recovery with peristaltic pump
8CB-MW17	11/15/2012	NA				0.00					Ambulance parked over well
8CB-MW17	11/21/2012	NA	29.29	29.38		0.09					No product recovered
8CB-MW17	12/13/2012	NA	28.23	28.24		0.01					
8CB-MW17	1/17/2013	NA	trace	26.71		NP					No product recovered
8CB-MW17	2/14/2013	NA	26.62	26.66		0.04					No product recovered
8CB-MW17	3/7/2013					0.03					Groundwater sampling, thickness of 0.03 ft removed before sampling

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW17	3/12/2013	NA	26.66	26.72		0.06					Follows 0.03 ft product thickness removed the prior week for sampling
8CB-MW17	4/12/2013	NA	26.73	26.90		0.17					No product recovered
8CB-MW17	4/17/2013	NA	26.92	27.01		0.09	50	280	830	0.22	water.
8CB-MW17	4/25/2013	NA	26.82	26.92		0.10	50	260	880	0.23	Product recovery with peristaltic pump.
8CB-MW17	5/2/2013	NA	27.04	27.06		0.02					
8CB-MW17	5/16/2013	NA	27.12	27.15		0.03					
8CB-MW17	6/13/2013	NA	27.45	27.52		0.07					
8CB-MW17	7/11/2013	NA	27.76	27.92		0.16	80	90	960	0.25	water
8CB-MW17	7/17/2013	NA	27.88	27.91		0.03					No product recovered
8CB-MW17	8/15/2013	NA	28.25	28.33		0.08					No product recovered
8CB-MW17	8/22/2013	NA	28.25	28.33		0.08	20	200	980	0.26	Product recovered with disposable bailer.
8CB-MW17	9/5/2013	NA	NA	27.60							No product recovered, Interface meter issues prevented DTP - 9/6 well covered by large tow truck.
8CB-MW17	9/13/2013	NA	28.59	28.61		0.02	60	200	1,040	0.27	Product recovery with peristaltic pump. Bailed casing
8CB-MW17	9/20/2013	NA	28.60	28.63		0.03					No product recovered
8CB-MW17	10/7/2013	NA	28.65	28.68		0.03	2	100	1,042	0.28	Product recovered for AECOM
8CB-MW17	11/13/2013	NA	29.09	29.21		0.12	70	130	1,112	0.29	water.
8CB-MW17	11/22/2013	NA	29.21	29.23		0.02					No product recovered
8CB-MW17	12/13/2013	NA	29.35	29.41		0.06					No product recovered
8CB-MW17	1/10/2014	NA	29.61	29.70		0.09	50	120	1,162	0.31	Product recovery with peristaltic pump.
8CB-MW17	1/17/2014	NA	29.58	29.59		0.01					No product recovered
8CB-MW17	2/13/2014	NA	29.79	29.82		0.03					No product recovered
8CB-MW17	3/13/2014	NA	trace	28.88		0.00					
8CB-MW17	4/3/2014	NA	NP	28.05		0.00					
8CB-MW17	4/25/2014	0.0	NP	27.99		0.00					PID wellhead peak 123.0 ppm
						8CB-MW17 CUMULATIVE			1,162	0.31	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW18	5/29/2012	NA		28.07		Trace					
8CB-MW18	6/8/2012	NA		28.13		Trace					
8CB-MW18	6/13/2012	NA		28.25		NP					
8CB-MW18	6/29/2012	NA	28.33	28.63		0.30	178	58	178	0.05	
8CB-MW18	7/3/2012	NA		28.45		NP			178	0.05	
8CB-MW18	8/6/2012	NA							178	0.05	
8CB-MW18	9/11/2012	NA	29.32	29.74		0.42	310	1,680	488	0.13	
8CB-MW18	9/20/2012	0.0	29.45	29.63		0.18	80	910	568	0.15	
8CB-MW18	9/27/2012	NA	29.55	29.62		0.07			568	0.15	
8CB-MW18	10/5/2012	NA	29.65	29.82		0.17	80	420	648	0.17	
8CB-MW18	10/12/2012	NA	29.71	29.78		0.07			648	0.17	
8CB-MW18	10/18/2012	NA	29.76	29.90		0.14			648	0.17	
8CB-MW18	10/25/2012	NA	29.93	30.16		0.23	130	120	778	0.21	
8CB-MW18	10/30/2012	NA	29.89	29.95		0.06					
8CB-MW18	11/15/2012	NA	trace	30.05							No product recovered
8CB-MW18	12/13/2012	NA	28.60	28.80		0.20	110		888	0.23	Product recovery with peristaltic pump
8CB-MW18	12/20/2012	NA	28.34	28.35		0.01					No product recovered
8CB-MW18	1/17/2013	NA	trace	27.12							No product recovered
8CB-MW18	2/14/2013	NA	27.10	27.15		0.05					No product recovered
8CB-MW18	3/7/2013	NA				0.11	68		956	0.25	Groundwater sampling, thickness of 0.11 ft removed before sampling
8CB-MW18	3/12/2013	NA		27.24							
8CB-MW18	3/21/2013	NA	27.35	27.42		0.07					No product recovered
8CB-MW18	4/12/2013	NA	27.20	27.41		0.21					Monthly water levels, no product recovered, sheen red surface water
8CB-MW18	4/17/2013	NA	27.39	27.84		0.45	110	600	1,066	0.28	pump
8CB-MW18	4/25/2013	NA	27.35	27.49		0.14	60	360	1,126	0.30	Monthly water levels, Product recovery with peristaltic pump. Water opaque in appearance.

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8CB-MW18	5/2/2013	NA	27.54	27.62		0.08					No product recovered
8CB-MW18	5/16/2013	NA		27.62							No product recovered
8CB-MW18	6/13/2013	NA	27.92	28.28		0.36	200	360	1,326	0.35	Product recovery with peristaltic pump, strong hydrocarbon odor and the water is milky colored
8CB-MW18	6/20/2013	NA	28.01	28.11		0.10	50	240	1,376	0.36	Product recovery with peristaltic pump, strong hydrocarbon odor and the water is milky colored
8CB-MW18	6/27/2013	NA	28.06	28.12		0.06					No product recovered
8CB-MW18	7/11/2013	NA	28.30	28.56		0.26	140	170	1,516	0.40	Product recovery with peristaltic pump, strong hydrocarbon odor and the water is milky colored
8CB-MW18	7/17/2013	NA	28.43	28.50		0.07					No product recovered
8CB-MW18	8/15/2013	NA		29.06							
8CB-MW18	9/6/2013	NA	29.03	29.39		0.36	220	240	1,736	0.46	Product recovery with peristaltic pump, and the water is milky colored
8CB-MW18	9/13/2013	NA		27.80							No product recovered
8CB-MW18	9/20/2013	NA	29.14	29.22		0.08					No product recovered
8CB-MW18	10/7/2013	NA	29.15	29.30		0.15	80	180	1,816	0.48	Product recovery with peristaltic pump, Sample taken for AECOM
8CB-MW18	10/14/2013	NA	29.38	29.40		0.02					No product recovered
8CB-MW18	11/13/2013	NA		29.66							No product recovered
8CB-MW18	12/13/2013	NA	29.90	30.08		0.18	100	270	1,916	0.51	Product recovered
8CB-MW18	12/20/2013	NA	29.81	29.89		0.08					No product recovered
8CB-MW18	1/10/2014	NA	30.15	30.30		0.15	80	360	1,996	0.53	Product recovered
8CB-MW18	1/17/2014	NA	30.10	30.13		0.03					No product recovered
8CB-MW18	2/13/2014	NA	30.31	30.39		0.08					No product recovered
8CB-MW18	3/13/2014	NA	29.30	29.38		0.08					No product recovered
8CB-MW18	4/3/2014	NA	28.50	28.53		0.03					
8CB-MW18	4/25/2014	0.1	28.44	28.46		0.02					PID wellhead peak 246.4 ppm
						8CB-MW18 CUMULATIVE			1,996	0.53	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8IW-6	10/18/2012	NA	NP	29.49							
8IW-6	11/15/2012	NA	NP	29.41							
8IW-6	12/13/2012	NA	NP	27.75							
8IW-6	1/17/2013	NA	NP	26.35							
8IW-6	2/14/2013	NA	NP	26.52							
8IW-6	3/12/2013	NA	NP	26.74							
8IW-6	4/12/2013	NA	NP	26.70							
8IW-6	5/16/2013	NA	NP	27.35							
8IW-6	6/13/2013	NA	NP	27.60							
8IW-6	7/11/2013	NA	NP	27.93							
8IW-6	8/15/2013	NA	NP	28.50							
8IW-6	9/5/2013	NA	NP	28.73							
8IW-6	10/7/2013	NA	NP	28.71							
8IW-6	11/13/2013	NA	NP	29.46							
8IW-6	12/13/2013	NA	NP	29.57							
8IW-6	1/10/2014	NA	NP	29.90							
8IW-6	2/13/2014	NA	Trace	29.91							
8IW-6	3/13/2014	NA	NP	28.54							
8IW-6	4/3/2014	NA	Trace	27.83							
8IW-6	4/25/2014	0.10	NP	28.06							PID Well head peak 23.2 ppm. Well no longer measured.
							8IW-6 CUMULATIVE		0	0.00	

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8IW-7	5/31/2012	NA	25.71	29.41		3.70	9,970		9,970	2.63	
8IW-7	6/4/2012	NA	26.43	27.50		1.07	2,650		12,620	3.33	
8IW-7	6/8/2012	NA		26.52		NP					
8IW-7	6/13/2012	NA		26.27		NP					
8IW-7	6/20/2012	NA		26.79		NP					
8IW-7	6/29/2012	NA		27.03		NP					
8IW-7	7/3/2012	NA		27.20		NP					
8IW-7	8/6/2012	NA		28.29		NP					
8IW-7	9/11/2012	NA	27.85	28.46		0.61	1,130	1,620	13,750	3.63	
8IW-7	9/20/2012	0.0	28.05	28.50		0.45	840	160	14,590	3.85	
8IW-7	9/27/2012	NA	28.35	28.63		0.28	460	240	15,050	3.97	
8IW-7	10/5/2012	NA	28.65	28.71		0.06					
8IW-7	10/12/2012	NA	28.27	28.93		0.66	1,600	100	16,650	4.40	
8IW-7	10/18/2012	NA	29.41	29.57		0.16					
8IW-7	10/25/2012	NA	28.72	28.79		0.07					
8IW-7	11/15/2012	NA	28.28	29.73		1.45	1,080	120	17,730	4.68	pump
8IW-7	11/21/2012	NA	28.07	28.09		0.02					No product recovered
8IW-7	12/13/2012	NA	27.76	27.77		0.01					
8IW-7	1/17/2013	NA	NP	25.40							pressure build up in well housing.
8IW-7	2/14/2013	NA	25.55	25.66		0.11	160	380	17,890	4.72	Product recovered using peristaltic pump
8IW-7	2/19/2013	NA	25.60	25.78		0.18	530	350	18,420	4.86	Product recovered using peristaltic pump
8IW-7	2/28/2013	NA	25.70	26.30		0.60	1,460	30	19,880	5.25	Product recovered using peristaltic pump
8IW-7	2/7/2013	NA	25.72	25.76		0.04					No product recovered
8IW-7	3/12/2013	NA	25.70	25.72		0.02					No product recovered
8IW-7	4/12/2013	NA	25.88	26.05		0.17					
8IW-7	4/17/2013	NA	25.75	26.05		0.30	720	280	20,600	5.44	Product recovered using peristaltic pump

Table D-2 Summary of OU 8 Product Measurement and Recovery

Well ID	Date	PID Reading (PPM)	Depth To Product (ft)	Depth to Water (ft)	Depth to Bottom (ft)	Product Thickness (ft)	Volume of Product Recovered (ml)	Volume of Water Recovered (ml)	Cumulative Product Recovered (ml)	Cumulative Product Recovered (gal)	Comments
8IW-7	4/25/2013	NA	25.95	25.97		0.02					
8IW-7	5/16/2013	NA	26.16	26.54		0.38	910	200	21,510	5.68	Product recovered using peristaltic pump
8IW-7	5/23/2013	NA	26.25	26.70		0.45	970	50	22,480	5.93	Product recovered using peristaltic pump
8IW-7	5/29/2013	NA	26.38	26.39		0.01					
8IW-7	6/13/2013	NA	26.56	26.57		0.01					
8IW-7	7/11/2013	NA	26.97	27.01		0.04					
8IW-7	8/15/2013	NA	27.50	27.83		0.33	710	150	23,190	6.12	Product recovered using peristaltic pump
8IW-7	8/22/2013	NA	27.51	27.70		0.19	480	450	23,670	6.25	Product recovered using peristaltic pump
8IW-7	9/5/2013	NA	27.50	27.60		0.10					No product recovered
8IW-7	9/6/2013	NA	27.50	27.60		0.10	260	440	23,930	6.32	Product recovered using peristaltic pump
8IW-7	10/7/2013	NA	27.73	28.20		0.47	1,030	460	24,960	6.59	Product recovered using peristaltic pump, Bailed 2.5 gal, Samples taken for AECOM
8IW-7	10/14/2013	NA	27.95	27.96		0.01					No product recovered, took picture of water and rusty film around well housing.
8IW-7	11/13/2013	NA	28.31	28.71		0.40	980	60	25,940	6.85	Product removed using peristaltic pump.
8IW-7	11/22/2013	NA	28.35	28.59		0.24	525	475	26,465	6.99	Product removed using peristaltic pump.
8IW-7	11/27/2013	NA		28.22							No product recovered
8IW-7	12/12/2013	NA		28.70							No product recovered
8IW-7	1/10/2014	NA	28.88	29.10		0.22	380	470	26,845	7.09	Product removed using peristaltic pump.
8IW-7	1/17/2014	NA	28.69	28.73		0.04					No product recovered
8IW-7	2/13/2014	NA	28.80	29.79		0.99	2,440	30	29,285	7.73	monument
8IW-7	2/21/2014	NA	30.58	30.59		0.01					Bailed monument
8IW-7	3/13/2014	NA	27.34	27.35		0.01					Bailed monument
8IW-7	4/3/2014	NA	26.70	26.72		0.02					Bailed monument
8IW-7	4/25/2014	0.1	NP	26.84		0.00					PID wellhead peak 104.6 ppm
							8IW-7 CUMULATIVE		29,285	7.73	
							TOTAL:		61,075	16.13	

Notes:
NM - Not Measured NA - Not Available NP - No Product

APPENDIX D-2

Table D-2. Summary of Laboratory Analytical Results for April 2009

Analyte	CAS #	Units	Monitoring Location: / Sample ID (OU8-09-XXX): / Cleanup Level	8MW16	8MW42	MW03	8MW53	8MW30	28MW01	8MW28	8MW47	8MW48	8MW06	8MW32	8MW33	8MW35	8MW35	8MW25	8MW03	8MW13	8MW37	8MW19
				201	202	203	204	205	206	209	207	208	210	211	212	213	214	216	215	217	219	218
Volatile Organic Compounds																						
Benzene	71-43-2	µg/l	5		ND (0.50)					ND (0.50)	FP		**11000 D**		ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	0.28 J	ND (0.50)	ND (0.50)	ND (0.50)
1,2-Dichloroethane	107-06-2	µg/l	5		ND (0.50)					ND (0.50)	FP		**940 D**		**51**	4.6	4.2	ND (0.50)	**10**	1.7	ND (0.50)	0.28 J
1,1-Dichloroethene	75-35-4	µg/l	0.5		ND (0.50)					ND (0.50)	FP		ND (0.50)		**3.5**	0.44 J	0.44 J	ND (0.50)	**0.82**	ND (0.50)	ND (0.50)	ND (0.50)
1,2-Dichloropropane	78-87-5	µg/l	5		ND (0.50)					ND (0.50)	FP		ND (0.50)		1.3	ND (0.50)	0.21 J	ND (0.50)	0.20 J	ND (0.50)	ND (0.50)	ND (0.50)
1,2-Dibromoethane	106-93-4	µg/l	0.8		ND (0.50)					ND (0.50)	FP		ND (0.50)		ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Ethylbenzene	100-41-4	µg/l	700		ND (0.50)					ND (0.50)	FP		420 D		ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
1,1,2-Trichloroethane	79-00-5	µg/l	5		ND (0.50)					ND (0.50)	FP		ND (0.50)		**5.4**	0.29 J	0.54	ND (0.50)	0.68	ND (0.50)	ND (0.50)	ND (0.50)
Toluene	108-88-3	µg/l	1,000		ND (0.50)					ND (0.50)	FP		300 D		ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Vinyl chloride	75-01-4	µg/l	0.5		ND (0.50)					ND (0.50)	FP		ND (0.50)		ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Ethane	78-84-0	µg/l		ND (0.61)	ND (0.61)	ND (0.61)	ND (0.61)	2.9	ND (0.61)	ND (0.61)	FP	4	4.4	ND (0.61)	0.90	ND (0.61)	ND (0.61)		ND (0.61)			
Ethene	74-85-1	µg/l		ND (0.76)	ND (0.76)	ND (0.76)	0.85	0.66 J	2.2	ND (0.76)	FP	4.9	2.5	ND (0.76)	ND (0.76)	ND (0.76)	ND (0.76)		ND (0.76)			
Methane	74-82-8	µg/l		ND (0.31)	ND (0.31)	4000 D	2800 D	110	2700 D	1.7	FP	7.1	16	11	11	3.1	4.7		0.45			
Other Organic Compounds																						
Carbon, dissolved organic	NA	mg/l		ND (1.0)	7.1	47	4.8	6.2	3.3	ND (1.0)	FP	12	11	1.4	1.1	ND (1.0)	ND (1.0)		ND (1.0)			
Inorganic Parameters																						
Chloride	16887-00-6	mg/l		1.4	9.1	14	9.8	4.6	9.4	1.7	FP	10	20	5.5	7.8	4.3	4.1		3.2			
Nitrate as Nitrogen	NA	mg/l		0.98	1.2	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	FP	ND (0.20)	ND (0.20)	1.6	ND (0.20)	0.39	0.38		ND (0.20)			
Nitrite as Nitrogen	NA	mg/l		ND (0.10)	ND (0.10)	0.56	0.25	ND (0.10)	ND (0.10)	ND (0.10)	FP	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)		ND (0.10)			
Sulfate	NA	mg/l		3.8	59	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	9.5	FP	ND (1.0)	ND (1.0)	9.7	6.7	4.0	3.9		4.7			
Manganese, Dissolved	7439-96-5	µg/l		ND (15.0)	ND (15.0)	6080	1890 N	2720 N	8080 N	ND (15.0)	FP	8960 N	3070 N	15.0 N	1130 N	933 N	929 N		433 N			
Parameters																						
Alkalinity	NA	mg/l		150	290	380	350	340	720	200	FP	510	560	120	340	52	45		67			

Notes:
Values shown in **bold** text exceed analyte-specific cleanup levels.
D – The result is reported from a diluted analysis.
J – The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
Gray highlight indicates plume centerline wells

mg/L – micrograms per liter
N – The associated spiked sample recovery was not within control limits for this metal.
ND – The result is not detected at a concentration that is greater than or equal to the reporting limit, which is shown in parentheses.
FP – Not sampled due to the presence of free product.

Table D-2. Summary of Laboratory Analytical Results for October 2009

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	8MW28	8MW47	8MW24	MW05	8MW48	8MW06	8MW32	8MW33	8MW35	8MW03	8MW25	8MW13	8MW19	8MW37
			Sample ID (OU8-09-XXX):	301	303	306	307	308	315	310	309	311	314	318	319	320	322	328	329	330	331	332
Analyte	**CAS #**	**Units**	**Cleanup Level**																			
Volatile Organic Compounds																						
Benzene	71-43-2	µg/l	5		0.40 J				3	**12,000 D**	**3,500 D**	**10,000 J**		**13,000 J**		0.5 U	0.04 J	0.24 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	107-06-2	µg/l	5		0.23 J				0.5 U	**61 D**	**31 D**	**500 D**		**810 D**		**67**	**5.2**	**11**	0.5 U	2.1	0.25 J	0.5 U
1,1-Dichloroethene	75-35-4	µg/l	0.5		0.50 U				0.5 U	25 U	10 U	25 U		25 U		**4.5**	0.47 J	**0.77**	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	78-87-5	µg/l	5		0.50 U				0.5 U	25 U	10 U	**7 JD**		**12 JD**		1.9	0.21 J	0.22 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	106-93-4	µg/l	0.8		0.50 U				0.5 U	**13 JD**	10 U	25 U		25 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	100-41-4	µg/l	700		0.50 U				0.69	**1,300 D**	**1,500 D**	630 D		590 D		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	79-00-5	µg/l	5		0.50 U				0.5 U	25 U	10 U	25 U		25 U		**7.7**	0.62	0.6	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	108-88-3	µg/l	1,000		0.50 U				1.2	**6,700 D**	990 D	810 D		590 D		0.06 J	0.5 U	0.5 U	0.5 U	0.14 J	0.5 U	0.28 J
Vinyl chloride	75-01-4	µg/l	0.5		0.50 U				0.12 J	25 U	10 U	25 U		25 U		0.5 U	0.08 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethane	78-84-0	µg/l		0.60 U	0.20 J	0.16 J	2.0	2.8	0.6 U	5.6	5.9	1.8	4.2	4.6	0.21 J	0.9	0.6 U	0.6 U				
Ethene	74-85-1	µg/l		1.0 U	0.12 J	0.15 J	1.6	5	0.47 J	7.8	4.8	9.1	9.4	5.4	1 U	0.093 J	1 U	1 U				
Methane	74-82-8	µg/l		1.3 U	6.8	680	3,800	170	38	16	1,200	2,300	14	29	57	15	2	0.89 J				
Other Organic Compounds																						
Carbon, dissolved organic	NA	mg/l		0.61	11.8	64	1.24	6.3	1.26	17	8.2	17.7	14	11.7	2.49	1.58	0.81	0.63				
Inorganic Parameters																						
Chloride	16887-00-6	mg/l		1.25	10.8	13.8	12.2	3.85	1.22	25.3	8.24	12.2	9.09	1.27	7.49	6.93	3.32	2.58				
Nitrate as Nitrogen	NA	mg/l		0.50	0.62	0.1 U	0.1 U	0.1U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.35	0.1 U	0.31	0.17				
Nitrite as Nitrogen	NA	mg/l		0.10 U	0.2	0.1 U	0.1 U	0.1U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.006 J	0.015 J				
Sulfate	NA	mg/l		2.52	21.3	0.08 J	0.04 J	0.05 J	2.51	0.07 J	0.06 J	0.11 J	0.1 J	2.51	13.6	5.01	3.5	4.21				
Manganese, Dissolved	7439-96-5	µg/l		5.0 U	2,880	5,930	2,190	2,540	64	2,940	5,320	6,730	8,790	8,680	48.9	834	744	398				
Parameters																						
Alkalinity	NA	mg/l		129	443	433	348	324	48.6	484	404	389	472	507	188	360	42.4	61.3				

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
D – The result is reported from a diluted analysis.
J – The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L – milligrams per liter
mg/L – micrograms per liter
N – The associated spiked sample recovery was not within control limits for this metal.
U – The result is not detected at a concentration that is greater than or equal to the reporting limit.

Table D-2. Summary of Laboratory Analytical Results for April 2010

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	8MW47	8MW24	8MW48	8MW28	8MW06	8MW32	8MW33	8MW33 (DUP)	8MW35	8MW03	8MW25	8MW13	8MW19	8MW37
			Sample ID (OU8-10-XXX):	201	202	203	204	205	207	206	208	209	210	211	212	213	214	215	216	217	218	219
Analyte	**CAS #**	**Units**	**Cleanup Level**																			
Volatile Organic Compounds																						
Benzene	71-43-2	µg/L	5		0.51				**8,700 D**			**5.6**	**13,000 D**		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.05 J	0.5 U	0.5 U
1,2-Dichloroethane	107-06-2	µg/L	5		0.48 J				350 U			0.5 U	**1,100 D**		**49**	**50**	0.62	**7.6**	0.5 U	2.3	0.23 J	0.5 U
1,1-Dichloroethene	75-35-4	µg/L	0.5		0.15 J				13 U			0.5 U	25 U		**3.5**	**3.7**	0.5 U	0.44 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	78-87-5	µg/L	5		0.21 J				13 U			0.5 U	**12 JD**		1.6	1.6	0.5 U	0.12 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	106-93-4	µg/L	0.8		0.5 U				**6.5 JD**			0.5 U	25 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	100-41-4	µg/L	700		0.5 U				**1,200 D**			35	**820 D**		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	79-00-5	µg/L	5		0.5				13 U			0.5 U	25 U		**5.7**	**5.6**	0.5 U	0.31 J	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	108-88-3	µg/L	1,000		0.5 U				**8,200 D**			38	430 D		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	75-01-4	µg/L	0.5		0.12 J				13 U			0.5 U	25 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.43 J	0.5 U	0.5 U
Ethane	78-84-0	µg/L		0.6 U	0.14 J	0.4 J	1.7	1.6	2.3	5.5	3.7	0.6 U	4	0.6 U	0.15 J	0.15 J	0.6 U	0.6 U				
Ethene	74-85-1	µg/L		1 U	0.1 J	0.23 J	0.93 J	0.81 J	4.2	6.9	7.7	1 U	6	1 U	1 U	1 U	1 U	1 U				
Methane	74-82-8	µg/L		1.3 U	5.4	3,100	3,800	77	33	110	18	5.1	49	1.3 U	2.1	1.7	0.84 J	1.3 U				
Other Organic Compounds																						
Carbon, dissolved organic	NA	mg/L		1.95	10	126	15.5	5.66	25.2	9.5	12.5	0.75	13.8	1.87	1.01	1.28	1.24	0.81				
Chloride	16887-00-6	mg/L		5	11.2	14.7	14.1	3.1 J	15.3	7.8 J	7	1.25	22.4	1.65	2.51	2.54	2.17	2.68				
Nitrate as Nitrogen	NA	mg/L		2.82	3.32	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.09 J	0.1 U	0.1 U	0.4	0.28				
Nitrite as Nitrogen	NA	mg/L		0.1 U	0.12	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U				
Sulfate	NA	mg/L		6.86	25	0.09 J	0.04 J	0.09 J	0.07 J	0.06 J	0.34	6.99	0.17 J	4.61	4.36	4.38	2.95	3.9				
Manganese, Dissolved	7439-96-5	µg/L		5 U	2,800	5,940	2,180	2,480	3,770	4,790	8,220	31	9,740	5 U	404	401	561	348				
Parameters																						
Alkalinity	NA	mg/L		158	408	368	460	304	498	365	478	185	536	25.2	124	122	38.2	48.2				

Notes:

Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L - milligrams per liter
µg/L - micrograms per liter
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.

Table D-2. Summary of Laboratory Analytical Results for October 2010

Analyte	CAS #	Units	Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	8MW47	8MW47 (DUP)	8MW24	MW05	8MW48	8MW06	8MW32	8MW33	8MW35 (MS/MSD)	8MW25	8MW03	8MW13	8MW37	8MW19
			Sample ID (OU8-10-XXX):	301	303	305	306	307	309	310	311	312	316	320	321	323	324	328	329	330	332	333	334
			Cleanup Level																				
Volatile Organic Compounds																							
Benzene	71-43-2	μg/L	5	0.50 U	0.29 J				**4,600 D**	**9,100 JD**	**9,200 D**		**20,000 D**		**12,000 D**		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	107-06-2	μg/L	5	0.50 U	0.24 J				**13 D**	**33 D**	**33 D**		**820 D**		**740 D**		**49**	1.9	0.50 U	0.50 U	2.2	0.50 U	0.30 J
1,1-Dichloroethene	75-35-4	μg/L	0.5	0.50 U	0.090 J				10 U	25 U	25 U		25 U		25 U		**3.6**	0.21 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	78-87-5	μg/L	5	0.50 U	0.50 U				10 U	25 U	25 U		**8.5 JD**		**11 JD**		1.6	0.10 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	106-93-4	μg/L	0.8	0.50 U	0.50 U				10 U	**8.5 JD**	**9.0 JD**		25 U		25 U		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	μg/L	700	0.50 U	0.50 U				**1,400 D**	**1,500 D**	**1,500 D**		**1,300 D**		480 D		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	μg/L	5	0.50 U	0.14 J				10 U	25 U	25 U		25 U		25 U		**5.8**	0.36 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	108-88-3	μg/L	1,000	0.060 J	0.89				280 D	**12,000 JD**	**12,000 JD**		**15,000 JD**		630 D		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	μg/L	0.5	0.50 U	0.080 J				10 U	25 U	25 U		25 U		25 U		0.50 U	0.50 U	0.50 U	0.50 U	0.18 J	0.50 U	0.50 U
Ethane	78-84-0	μg/L		0.60 U	0.10 U	1.1	2.0	2.2	3.2	2.7	2.7	7.3	2.1	1.9	4.3	0.60 U	0.14 J	0.60 U		0.60 U			
Ethene	74-85-1	μg/L		1.0 U	1.0 U	0.86 J	0.78 J	0.72 J	4.5	4.0	3.1	3.3	17	4.0	6.4	1.0 U	1.0 U	1.0 U		1.0 U			
Methane	74-82-8	μg/L		1.3 U	2.9 B	5,300 B	4,800 B	120 B	6,600 B	21 B	22 B	210 B	61 B	24 B	33 B	1.3 U	3.2 B	1.5 B		3.0 B			
Inorganic Parameters																							
Carbon, dissolved organic	NA	mg/L		0.72	14.7	114	13.6	7.9	23.3	30.5	29.8	18.7	37.1	35.8	24.6	2.05	1.37	1.23		1.8			
Chloride	16887-00-6	mg/L		4.95	10.3	2.92	12.1	2.20	12.0	11.3	12.3	8.60	9.31	8.17	22.0	2.62	2.63	2.46		1.84			
Nitrate as Nitrogen	NA	mg/L		1.72	2.54	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	1.43	0.20 U	0.45		0.20 U			
Nitrite as Nitrogen	NA	mg/L		0.20 U	0.20 U	0.20 U	0.21	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U		0.20 U			
Sulfate	NA	mg/L		7.25	41.5	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.23 J	0.38 J	0.41	0.40 U	0.44	5.88	5.32	3.18		39.9			
Manganese, Dissolved	7439-96-5	μg/L		5.0 U	1,850	7,030	2,240	1,980	7,390	3,650	3,660	5,510	6,230	9,290	9,620	5.0	406	899		142			
Parameters																							
Alkalinity	NA	mg/L		122	361	451	441	281	541	501	511	435	389	570	550	52.7	148	46.8		64.8			

Notes:
Plume centerline wells are highlighted.
Values shown in **bold** text exceed analyte-specific cleanup levels.
B - The associated method blank contained the target analyte at trace concentration.
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L - milligrams per liter
μg/L - micrograms per liter
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.

Table D-2. Summary of Laboratory Analytical Results for April 2011

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	8MW47	8MW24	8MW48	MW08	8MW06	8MW06 (DUP)	8MW32	8MW33	8MW35	8MW03	8MW25	8MW13	8MW19	8MW37
			Sample ID (OU8-11-XXX):	200	201	202	203	204	206	205	207	208	209	210	211	212	213	214	215	216	217	218
Analyte	**CAS #**	**Units**	**Cleanup Level**																			
Volatile Organic Compounds																						
Benzene	71-43-2	µg/L	5		0.44 J				**7,400 D**			**12,000** D	**18,000 D**	**18,000 D**		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-dichloroethane	107-06-2	µg/L	5		0.48 J				**31 D**			**46 D**	**620 D**	**690 D**		**36**	0.62	4.0	0.50 U	1.8	0.25 J	0.50 U
1,1-dichloroethene	75-35-4	µg/L	0.5		0.28 J				10 U			13 U	25 U	25 U		**3.4**	0.50 U	0.22 J	0.50 U	0.50 U	0.50 U	0.50 U
1,2-dichloropropane	78-87-5	µg/L	5		0.37 J				10 U			13 U	25 U	25 U		1.4	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-dibromoethane	106-93-4	µg/L	0.8		0.50 U				**2.2 JD**			13 U	25 U	25 U		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700		0.50 U				**760 D**			**1,300** D	670 D	**770 D**		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-trichloroethane	79-00-5	µg/L	5		0.85				10 U			13 U	25 U	25 U		4.4	0.15 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	108-88-3	µg/L	1,000		0.50 U				**6,600 D**			170 D	290 D	320 D		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5		0.50 U				10 U			13 U	25 U	25 U		0.50 U	0.50 U	0.50 U	0.50 U	0.12 J	0.50 U	0.50 U
Ethane	78-84-0	µg/L		0.6 U	0.070 J	0.68	6.7	3.6	3.3	15	5.1	11	6.7	5.3	0.60 U	0.60 U	0.60 U	0.60 U				
Ethene	74-85-1	µg/L		1.0 U	1.0 U	0.32 J	13	4.7	6.5	47	15	19	14	8.6	1.0 U	1.0 U	1.0 U	1.0 U				
Methane	74-82-8	µg/L		1.3 U	1.3 U	7,500	6,400	120	140	620	360	8,200	83	67	1.3 U	1.3 J	0.80 J	0.37 J				
Other Organic Compounds																						
Carbon, dissolved organic	NA	mg/L		0.5 U	9.82	88	9.4	4.79	48.9	8.6	17.2	9.4	23.2	23.7	0.93	0.65	0.50 U	0.50 U				
Chloride	16887-00-6	mg/L		9.07	12.9	13.6	30.4	1.87	13.4	8.85	9.38	6.80	29.5	29.5	2.21	2.25	3.49	2.36				
Nitrate as Nitrogen	NA	mg/L		2.94	6.36	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.05 J	0.10 U	0.47	0.50				
Nitrite as Nitrogen	NA	mg/L		0.10 U	0.08 J	0.1 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.01 J				
Sulfate	NA	mg/L		8.11	19.6	0.84	0.66	0.45	0.78	0.64	0.18 J	0.82	0.90	0.85	3.45	4.19	2.62	3.38				
Manganese, Dissolved	7439-96-5	µg/L		5 UJ	1,910	5,720	2,080	1,870	3,910	4,740	8,710	6,980	10,300	10,300	0.4 J	252	403	435				
Parameters																						
Alkalinity	NA	mg/L		127	386	454	428	252	538	393	408	564	545	560	38.5	82.0	53.2	49.9				

Notes:

Plume centerline wells are highlighted

Values shown in **bold** text exceed analyte-specific cleanup levels.

D - The result is reported from a diluted analysis.

J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).

mg/L - milligrams per liter

µg/L - micrograms per liter

U - The result is not detected at a concentration that is greater than or equal to the reporting limit.

Table D-2. Summary of Laboratory Analytical Results for September-October 2011

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	8MW47	8MW47 (DUP)	8MW24	8MW48	MW05	8MW06	8MW32	8MW33	8MW35	8MW03	8MW25	8MW13	8MW37	8MW19
			Sample ID (OU8-11-XXX):	301	303	305	306	307	309	310	311	312	320	316	321	323	324	328	330	329	332	333	334
Analyte	**CAS #**	**Units**	**Cleanup Level**																				
Volatile Organic Compounds																							
Benzene	71-43-2	µg/L	5		0.24 J				**7,500 D**	**5,300 D**	**5,300 D**			**17,000 D**	**13,000 D**		0.50 U	0.50 U	0.22 J	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	107-06-2	µg/L	5		0.22 J				**19 D**	**19 D**	**20 D**			**510 D**	**610 D**		**39**	2.1	**7.8**	0.50 U	1.2	0.50 U	0.26 J
1,1-Dichloroethene	75-35-4	µg/L	0.5		0.50 U				13 U	13 U	13 U			25 U	13 U		**3.7**	0.30 J	**0.75**	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	78-87-5	µg/L	5		0.50 U				13 U	2.5 JD	13 U			**9.5 JD**	**8.3 JD**		1.6	0.19 J	0.22 J	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	106-93-4	µg/L	0.8		0.50 U				13 U	**3.0 JD**	**3.0 JD**			25 U	13 U		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700		0.50 U				**1,500 D**	**1,200 D**	**1,100 D**			**1,200 D**	470		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	µg/L	5		0.19 J				13 U	13 U	13 U			25 U	13 U		**5.8**	0.46 J	0.52	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	108-88-3	µg/L	1,000		0.50 U				160 D	**11,000 D**	**11,000 D**			**16,000 D**	480		0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5		0.50 U				13 U	13 U	13 U			25 U	13 U		0.50 U	0.08 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethane	78-84-0	µg/L		0.60 U	0.60 U	0.31 J	1.9	2.9	2.4	2.3	2.4	9.3	2.3	2.4	4.1	0.60 U	0.15 J	0.60 U	0.60 U				
Ethene	74-85-1	µg/L		1.0 U	1.0 U	0.19 J	1.1	2.7	1.9	2.7	2.3	1.6	3.5	21	3.4	1.0 U	1.0 U	1.0 U	1.0 U				
Methane	74-82-8	µg/L		1.3 U	1.9	5,000	3,800	150	6,000	250	260	430	960	390	29	0.36 J	4.4	1.20 J	0.54 J				
Other Organic Compounds																							
Carbon, dissolved organic	NA	mg/L		1.40	9.06	40.1	9.93	6.42	15.4	17.1	17.4	11.1	33.7	26.1	17.3	1.36 UJ	0.87 UJ	0.72 UJ	0.75 UJ				
Chloride	16887-00-6	mg/L		18.0	11.5	7.69	21.5	1.37	32.7	12.8	12.9	10.2	5.94	11.7	22.1	2.54	2.45	2.59	2.49				
Nitrate as Nitrogen	NA	mg/L		0.71	2.13	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.38	0.10 U	0.36	0.33				
Nitrite as Nitrogen	NA	mg/L		0.10 U	0.14	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U				
Sulfate	NA	mg/L		6.56	32.9	0.22 J	0.10 J	0.10 J	0.13 J	0.12 J	0.14 J	0.12 J	0.20 J	0.13 J	0.71	4.58	5.15	3.00	3.48				
Manganese, Dissolved	7439-96-5	µg/L		5.0 UJ	1,530	6,600	2,710	1,520	7,020	3,810	3,820	5,440	10,400	6,080	9,580	5.0 UJ	419	822	415				
Parameters																							
Alkalinity	NA	mg/L		124	332	520	410	224	470	465	466	424	592	364	537	47.4	124	66.0	53.5				

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L - milligrams per liter
µg/L - micrograms per liter
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.

Table D-2. Summary of Laboratory Analytical Results for April 2012

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	MW08 (DUP)	8MW47	8MW24	8MW48	8MW06	8MW32	8MW33	8MW35	8MW34	8MW02	8MW03
			Sample ID (OU8-12-XXX):	200	201	202	203	204	205	206	207	208	209	210	211	212	213	220	222	215
Analyte	**CAS #**	**Units**	**Cleanup Level**																	
Volatile Organic Compounds																				
Benzene	71-43-2	µg/L	5		0.38 J				**7,600** D	**6,400** D	**2,500 D**			**19,000 D**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.22 J
1,2-Dichloroethane	107-06-2	µg/L	5		0.29 J				12 Ui	11 Ui	11 Ui			**510 D**	0.50 U	**32 J**	1.3	0.50 U	0.50 U	**6.5**
1,1-Dichloroethene	75-35-4	µg/L	0.5		0.10 J				10 U	10 U	1.0 U			1.0 U	0.50 U	**2.5**	0.17 J	0.50 U	0.50 U	**0.60**
1,2-Dichloropropane	78-87-5	µg/L	5		0.17 J				10 U	10 Ui	1.0 U			**9.9 DJ**	0.50 U	1.2	0.10 J	0.50 U	0.50 U	0.19 J
1,2-Dibromoethane	106-93-4	µg/L	0.8		0.50 U				10 U	10 U	1.0 U			1.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700		0.50 U				**1,500 D**	**1,300 D**	590 D			430 D	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	µg/L	5		0.37 J				10 U	10 U	1.0 U			1.5 DJ	0.50 U	4.1	0.30 J	0.50 U	0.50 U	0.39 J
Toluene	108-88-3	µg/L	1,000		0.50 U				140 D	150 D	**7,200 D**			180 D	0.50 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5		0.50 U				10 U	10 U	1.0 U			1.0 Ui	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethane	78-84-0	µg/L		0.60 U	0.094 J	0.3 J	2.5	1.6	2.1	2.1	1.7	6.7	3.0	3.9	0.60 U	0.60 U	0.60 U			0.60 U
Ethene	74-85-1	µg/L		1.0 U	1.0 U	0.11 J	0.43 J	0.51 J	1.3	1.3	3.3	1.1	4.6	3.3	1.0 U	1.0 U	1.0 U			1.0 U
Methane	74-82-8	µg/L		1.3 U	1.3 U	5,100 B	3,000 B	64 B	4,800 B	4,800 B	1,700	380 B	2,000	39	1.3 U	5.6	0.60 J			0.36 J
Other Organic Compounds																				
Carbon, dissolved organic	NA	mg/L		1.94	8.01	46.2	14.3	4.76	14.7	14.9	37.0	13.4	35.5	21.7	1.94	0.84	1.26 UJ			2.00
Chloride	16887-00-6	mg/L		12.1 J	45.1	4.56	21.3	1.44	7.71	8.28	10.9	9.76	5.24	29.9	5.81 J	2.22	2.83			2.88
Nitrate as Nitrogen	NA	mg/L		1.01 J	0.90 J	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 U	0.10 UJ	0.10 U	0.10 U	0.22 J	0.10 UJ	0.57			0.35
Nitrite as Nitrogen	NA	mg/L		0.10 U	0.06 J	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U			0.10 U
Sulfate	NA	mg/L		5.6	23.1	0.17 J	0.15 J	0.16 J	0.20 J	0.23 J	0.23 J	0.14 J	0.24 J	0.42	4.67	3.79	2.79			3.34
Manganese, Dissolved	7439-96-5	µg/L		0.5 UJ	1,270	4,790	1,770	1,300	4,970	5,070	4,170	4,510	8,980	9,720	1.0 UJ	310	353			467
Parameters																				
Alkalinity	NA	mg/L		130	331	404	404	204	401	395	491	372	576	553	51.8	105	60.3			60.9

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
B - Methane was detected in an associated method blank.
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L - milligrams per liter
µg/L - micrograms per liter
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.
Ui - The MDL or Practical Quantitation Limit (PQL) is elevated due to a chromatographic interference.

Table D-2. Summary of Laboratory Analytical Results for April 2012 (continued)

Analyte	CAS #	Units	Monitoring Location:	8MW25		8MW14		8MW13		8MW37		8MW19	
			Sample ID (OU8-12-XXX):	214		221		216		217		218	
			Cleanup Level										
Volatile Organic Compounds													
Benzene	71-43-2	µg/L	5	0.50	U	2.6		0.50	U	0.50	U	0.50	U
1,2-Dichloroethane	107-06-2	µg/L	5	0.50	U	0.50	U	1.8		0.50	U	0.21	J
1,1-Dichloroethene	75-35-4	µg/L	0.5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dichloropropane	78-87-5	µg/L	5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dibromoethane	106-93-4	µg/L	0.8	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Ethylbenzene	100-41-4	µg/L	700	0.50	U	1.1		0.50	U	0.50	U	0.50	U
1,1,2-Trichloroethane	79-00-5	µg/L	5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	µg/L	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Vinyl chloride	75-01-4	µg/L	0.5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Ethane	78-84-0	µg/L											
Ethene	74-85-1	µg/L											
Methane	74-82-8	µg/L											
Other Organic Compounds													
Carbon, dissolved organic	NA	mg/L											
Chloride	16887-00-6	mg/L											
Nitrate as Nitrogen	NA	mg/L											
Nitrite as Nitrogen	NA	mg/L											
Sulfate	NA	mg/L											
Manganese, Dissolved	7439-96-5	µg/L											
Parameters													
Alkalinity	NA	mg/L											

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
B - Methane was detected in an associated method blank.
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
mg/L - milligrams per liter
µg/L - micrograms per liter
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.
Ui - The MDL or Practical Quantitation Limit (PQL) is elevated due to a chromatographic interference.

Table D-2. Summary of Laboratory Analytical Results for October 2012

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	8MW47	8MW24	MW05	MW05 (DUP)	8MW48	8MW06	8MW32	8MW33	8MW35
			Sample ID (OU8-12-XXX):	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414
Analyte	**CAS #**	**Units**	**Cleanup Level**															
Volatile Organic Compounds																		
Benzene	71-43-2	µg/L	5	NA	0.22 J	NA	NA	NA	**5,100** D	**6,400 D**	NA	**14,000 D**	**15,000 D**	**6,300 D**	**13,000 D**	0.15 J	0.50 U	0.50 U
1,2-Dichloroethane	107-06-2	µg/L	5	NA	0.12 J	NA	NA	NA	**10 D**	**21 D**	NA	**210 D**	**230 D**	10 U	**810 DJ**	2.0 J	**40**	1.3
1,1-Dichloroethene	75-35-4	µg/L	0.5	NA	0.50 U	NA	NA	NA	10 U	10 U	NA	25 U	25 U	10 U	13 U	0.50 U	**3.8**	0.24 J
1,2-Dichloropropane	78-87-5	µg/L	5	NA	0.50 U	NA	NA	NA	10 U	10 U	NA	**5.5 U**	**6 JD**	10 U	**9.3 JD**	0.50 U	1.6	0.13 J
1,2-Dibromoethane	106-93-4	µg/L	0.8	NA	0.50 U	NA	NA	NA	10 U	10 U	NA	25 U	25 U	10 U	13 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700	NA	0.50 U	NA	NA	NA	**1,400 D**	**1,200 D**	NA	**1,000 D**	**1,100 D**	**1,700** D	**710 D**	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	µg/L	5	NA	0.50 U	NA	NA	NA	10 U	10 U	NA	25 U	25 U	10 U	13 U	0.50 U	**5.5**	0.32 J
Toluene	108-88-3	µg/L	1,000	NA	0.50 U	NA	NA	NA	170 D	**5,300 D**	NA	**11,000 D**	**12,000 D**	**7,900 D**	350 D	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5	NA	0.50 U	NA	NA	NA	10 U	10 U	NA	25 U	25 U	10 U	13 U	0.50 U	0.50 U	0.50 U
Ethane	78-84-0	µg/L		0.60 U	0.60 U	1.6	6.2	13	2.9	7.8	25	3.8	3.1	3.8	8.6	0.60 U	0.18 J	0.60 U
Ethene	74-85-1	µg/L		1.0 U	1.0 U	1.20	11	63	1.4	26	77	27	23	6.7	22	1.0 U	1.0 U	1.0 U
Methane	74-82-8	µg/L		1.3 U	1.2 J	7,300	5,300	180	7,400	2,100	1,500	1,500	1,400	7,200	51	1.3 U	6.0	3.4
Other Organic Compounds																		
Carbon, dissolved organic	NA	mg/L		0.64	6.2	22.7	8	5.3	6.1	11.8	10.6	19	18.8	25.2	13.4	1.65	1.08	0.64
Chloride	16887-00-6	mg/L		17.8 J	14.5 J	3.99	19.4 J	1.74 J	35.2	12.4 J	6.72	11.9 J	11.8 J	4.43	19.7	3.20	2.88	2.71
Nitrate as Nitrogen	NA	mg/L		0.36	1.91	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 J	0.10 U	0.10 U	0.53	0.10 U	0.35
Nitrite as Nitrogen	NA	mg/L		0.10 U	0.12	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 J	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Sulfate	NA	mg/L		4.02	25.3	0.51	0.32	0.20 J	0.20 U	0.34	0.29	0.37	0.38	0.40	0.49	11.8	4.89	3.21
Manganese, Dissolved	7439-96-5	µg/L		5.0 U	1,990	5,970	2,450	1,230	6,360	3,340	3,930	5,720	5,730	8,790	7,840	1.1 J	403	138
Parameters																		
Alkalinity	NA	mg/L		123	341	500	399	193	441	475	311	349	350	566	495	73.1	156	61.5

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
DUP - Duplicate sample
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.
mg/L - milligrams per liter
µg/L - micrograms per liter

Table D-2. Summary of Laboratory Analytical Results for October 2012 (continued)

			Monitoring Location:	8MW25		8MW03		8MW13		8MW37		8MW19	
			Sample ID (OU8-12-XXX):	416		415		417		418		419	
Analyte	**CAS #**	**Units**	**Cleanup Level**										
Volatile Organic Compounds													
Benzene	71-43-2	µg/L	5			0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dichloroethane	107-06-2	µg/L	5	0.50	U	4.2		1.1		0.50	U	0.17	J
1,1-Dichloroethene	75-35-4	µg/L	0.5	0.50	U	0.37		0.50	U	0.50	U	0.50	U
1,2-Dichloropropane	78-87-5	µg/L	5	0.50	U	0.10	J	0.50	U	0.50	U	0.50	U
1,2-Dibromoethane	106-93-4	µg/L	0.8	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Ethylbenzene	100-41-4	µg/L	700	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
1,1,2-Trichloroethane	79-00-5	µg/L	5	0.50	U	0.22	J	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	µg/L	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Vinyl chloride	75-01-4	µg/L	0.5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Ethane	78-84-0	µg/L		0.50	U	0.60	U	NA		NA		NA	
Ethene	74-85-1	µg/L		NA		1.0	U	NA		NA		NA	
Methane	74-82-8	µg/L		NA		2.9		NA		NA		NA	
Other Organic Compounds						NA							
Carbon, dissolved organic	NA	mg/L				0.34	J	NA		NA		NA	
Chloride	16887-00-6	mg/L		NA		4.78		NA		NA		NA	
Nitrate as Nitrogen	NA	mg/L		NA		0.40		NA		NA		NA	
Nitrite as Nitrogen	NA	mg/L		NA		0.10	U	NA		NA		NA	
Sulfate	NA	mg/L		NA		3.04		NA		NA		NA	
Manganese, Dissolved	7439-96-5	µg/L		NA		571		NA		NA		NA	
Parameters				NA									
Alkalinity	NA	mg/L				56.0		NA		NA		NA	

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
DUP - Duplicate sample
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
U - The result is not detected at a concentration that is greater than or equal to the reporting limit.
mg/L - milligrams per liter
µg/L - micrograms per liter

Table D-2. Summary of Laboratory Analytical Results for April 2013

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	8MW47	8MW47 (DUP)	8MW24	8MW48	8MW06	8MW32	8MW33	8MW35	8MW25	8MW03	8MW13	8MW37	8MW19
			Sample ID (OU8-13-XXX):	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218
Analyte	**CAS #**	**Units**	**Cleanup Level**																			
Volatile Organic Compounds																						
Benzene	71-43-2	µg/L	5	NA	0.12 J	NA	NA	NA	**2,900 D**	**1,600 D**	**2,500 D**	**970 D**	**8,000 D**	**17,000 D**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	107-06-2	µg/L	5	NA	0.14 J	NA	NA	NA	82 U,i	73 U,i	75 U,i	29 U,i	220 U,i	740 U,i	0.50	**21**	1.1	0.50 U	3.2	1.1	0.50 U	0.16 J
1,1-Dichloroethene	75-35-4	µg/L	0.5	NA	0.50 U	NA	NA	NA	5.0 U	5.0 U	10 U	2.5 U	10 U	25 U	0.50 U	**1.6**	0.14 J	0.50 U	0.27 J	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	78-87-5	µg/L	5	NA	0.50 U	NA	NA	NA	5.0 U,i	2.7 JD	10 U	2.6 U,i	10 U,i	25 U,i	0.50 U	0.72	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	106-93-4	µg/L	0.8	NA	0.50 U	NA	NA	NA	5.0 U	5.0 U	10 U	2.5 U	10 U	25 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700	NA	0.50 U	NA	NA	NA	**1,100 D**	680 D	670 D	**2,300 D**	**1,800 D**	**740 D**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	µg/L	5	NA	0.14 J	NA	NA	NA	5.0 U	5.0 U	10 U	2.5 U	10 U	25 U	0.50 U	2.4	0.27 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	108-88-3	µg/L	1,000	NA	0.23 J	NA	NA	NA	110 D	**3,000 D**	**4,300 D**	660 D	**6,700 D**	210 D	0.30 J	0.25 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5	NA	0.50 U	NA	NA	NA	5.0 U	5.0 U	10 U	2.5 U	10 U	25 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethane	78-84-0	µg/L		0.60 U	0.075 J	1.8	3.5	3.1	5.9	2.4	2.0	9.9	2.9	6.4	0.60 U	0.60 U	0.60 U	NA	0.60 U	0.60 U	0.60 U	0.60 U
Ethene	74-85-1	µg/L		1.0 U	0.089 J	1.5	2.8	7.4	5.7	5.0	3.7	5.4	4.0	20	1.0 U	1.0 U	1.0 U	NA	1.0 U	1.0 U	1.0 U	1.0 U
Methane	74-82-8	µg/L		1.3 U	0.65 J	5,700	4,700	57	6,400	3,300	3,600	570	8,400	63	1.3 U	1.3 U	8.4	NA	3.1	1.3 U	10	1.6
Other Organic Compounds																						
Carbon, dissolved organic	NA	mg/L		0.46 J	6.76	40.3	6.42	4.69	8.44	14.0	14.1	9.76	15.1	21.1	1.23	1.25	1.39		0.71	0.57	0.45 J	0.86
Chloride	16887-00-6	mg/L		13.3	23.4	2.97	23.8	2.12	12.0	10.6	10.7	7.43	4.57	33.7	2.53	1.65	1.94		2.71	1.96	1.04	3.61
Nitrate as Nitrogen	NA	mg/L		0.87	2.51	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.39	0.10 U	0.40 J		0.52	0.37	0.10 U	0.23
Nitrite as Nitrogen	NA	mg/L		0.10 U	0.03 J	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U		0.03 J	0.10 U	0.10 U	0.10 U
Sulfate	NA	mg/L		4.80	26.9	0.42	0.25	0.15 J	0.40	0.38	0.33	0.26	0.43	0.47	4.17 J	3.89 J	2.43 J		3.14	2.89	3.23	9.36
Manganese, Dissolved	7439-96-5	µg/L		2.0 UJ	650	5,600	1,870	1,200	4,900	3,970	4,040	3,990	9,920	10,300	2.2	126	642		590	107	11.7	2.0
Parameters																						
Alkalinity	NA	mg/L		123	307	441	309	187	359	428	433	331	554	499	50.5	74.8	53.8		54.5	58.0	64.2	133

Notes:

Plume centerline wells are highlighted

Values shown in **bold** text exceed analyte-specific cleanup levels.

DUP - Duplicate sample

D - The result is reported from a diluted analysis.

J - The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).

U - The result is not detected at a concentration that is greater than or equal to the reporting limit.

U,i - The MDL, LOD, or LOQ is elevated due to a chromatographic interference.

mg/L - milligrams per liter

NA - Not Analyzed

µg/L - micrograms per liter

Table D-2. Summary of Laboratory Analytical Results for October 2013

			Monitoring Location:	8MW16	8MW42	MW03	8MW53	8MW30	MW08	8MW47	8MW24	MW05	8MW48	8MW49	8MW06	8MW06 (DUP)	8MW32	8MW33
			Sample ID (OU8-13-XXX):	400	401	402	403	404	405	406	407	408	410	409	411	412	413	414
Analyte	**CAS #**	**Units**	**Cleanup Level**															
Volatile Organic Compounds																		
Benzene	71-43-2	µg/L	5	0.50 U	0.18 J	**16 J**	**450 D**	**15 DJ**	**4,500 D**	**3,900 D**	**620 D**	**14,000 D**	**5,000 D**	**6,400 D**	**15,000 D**	**15,000 D**	0.22 J	0.50 U
1,2-Dichloroethane	107-06-2	µg/L	5	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	5.0 U	2.5 U	2.5 U	**180 D**	13 U	13 U	**280 D**	**260 D**	2.1	**28**
1,1-Dichloroethene	75-35-4	µg/L	0.5	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	5.0 U	2.5 U	2.5 U	25 U	13 U	13 U	25 U	25 U	0.50 U	**3.1**
1,2-Dichloropropane	78-87-5	µg/L	5	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	1.6 JD	2.5 U	2.5 U	5.0 JD	3.3 JD	13 U	**7.5 JD**	**7.5 JD**	0.50 U	1.3
1,2-Dibromoethane	106-93-4	µg/L	0.8	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	5.0 U	2.5 U	2.5 U	25 U	13 U	13 U	25 U	25 U	0.50 U	0.50 U
Ethylbenzene	100-41-4	µg/L	700	0.50 U	0.50 U	13 J	**1,100 D**	**1,300 D**	**1,300 D**	**1,100 D**	**1,300 D**	**1,100 D**	**1,400 D**	**1,300 D**	**880 D**	**830 D**	0.50 U	0.50 U
1,1,2-Trichloroethane	79-00-5	µg/L	5	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	5.0 U	2.5 U	2.5 U	25 U	13 U	13 U	25 U	25 U	0.50 U	4.5
Toluene	108-88-3	µg/L	1,000	0.50 U	0.50 U	15 J	110 D	640 D	100 D	**1,700 D**	210 JD	**6,000 D**	**4,200 D**	**6,900 D**	460 D	410 D	0.50 U	0.50 U
m,p-Xylenes	108-38-3/ 106-42-3	µg/L	NS	0.50 U	0.50 U	28 J	900 D	2,000 D	550 D	4,900 D	790 JD	5,000 D	3,500 D	6,700 D	1,100 D	1,100 D	0.50 U	0.50 U
o-Xylene	95-47-6	µg/L	NS	0.50 U	0.50 U	11 J	53 D	2,200 D	22 D	960 D	130 JD	2,400 D	2,300 D	3,000 D	360 D	330 D	0.50 U	0.50 U
Vinyl chloride	75-01-4	µg/L	0.5	0.50 U	0.50 U	0.50 U	2.5 U	2.5 U	5.0 UJ	2.5 U	2.5 U	25 U	13 U	13 U	25 U	25 U	0.50 UJ	0.50 UJ
Ethane	78-84-0	µg/L		0.60 U	0.60 U	0.66	2.7	2.1	3.4	1.9	8.2	11	3.6	2.7	8.8	9.6	0.60 U	0.13 J
Ethene	74-85-1	µg/L		1.0 U	1.0 U	0.071 J	0.67 J	0.36 J	0.96 J	1.6	0.48 J	48	5.5	10	34	39	1.0 U	1.0 U
Methane	74-82-8	µg/L		1.3 U	0.74 J	6,100	6,800	72	7,300	4,600	830	4,700	10,000	670	160	160	0.42 J	3.6
Other Organic Compounds																		
Carbon, dissolved organic	N/A	mg/L		0.80	8.4	25.9	6.6	3.97	11.2	10.1	9.4	17.0	10.5	16.4	16.2	16.1	1.83	1.74
Chloride	16887-00-6	mg/L		10.6 J	18.8	3.57	23.2	2.80	39.9	12.4	6.94	10.7 J	4.29 J	7.71 J	21.8 J	21.1 J	5.09	2.73
Nitrate as Nitrogen	N/A	mg/L		0.49	2.95	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.49	0.10 U
Nitrite as Nitrogen	N/A	mg/L		0.10 U	0.11	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Sulfate	N/A	mg/L		3.71	24.9	0.25	0.14 J	0.09 J	0.15 J	0.18 J	0.14 J	0.19 J	0.12 J	0.10 J	0.23	0.20	16.9	5.65
Manganese, Dissolved	7439-96-5	µg/L		2.0 UJ	2,030	6,580	2,290	1,140	5,400	3,590	3,810	5,790	9,460	7,290	9,020	8,820	2.80	335
Parameters																		
Alkalinity	N/A	mg/L		132	362	543	375	197	419	497	341	362	555	NA	506	492	99.4	144

Table D-2. Summary of Laboratory Analytical Results for October 2013 (continued)

Analyte	CAS #	Units	Cleanup Level	25MW04		8MW35		8MW25		8MW03		25MW03		8MW13		8MW37		8MW19	
			Sample ID (OU8-13-XXX):	418		415		416		417		419		420		421		422	
Volatile Organic Compounds																			
Benzene	71-43-2	µg/L	5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dichloroethane	107-06-2	µg/L	5	0.50	U	0.84		0.50	U	3.3		0.50	U	0.71		0.50	U	0.11	J
1,1-Dichloroethene	75-35-4	µg/L	0.5	0.50	U	0.18	J	0.50	U	0.39	J	0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dichloropropane	78-87-5	µg/L	5	0.50	U	0.10	J	0.50	U	0.10	J	0.50	U	0.50	U	0.50	U	0.50	U
1,2-Dibromoethane	106-93-4	µg/L	0.8	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Ethylbenzene	100-41-4	µg/L	700	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
1,1,2-Trichloroethane	79-00-5	µg/L	5	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	µg/L	1,000	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.060	J	0.50	U
m,p-Xylenes	108-38-3/ 106-42-3	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
o-Xylene	95-47-6	µg/L	NS	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Vinyl chloride	75-01-4	µg/L	0.5	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ
Ethane	78-84-0	µg/L		NA		0.60	U	NA		0.60	U	NA		NA		NA		NA	
Ethene	74-85-1	µg/L		NA		1.0	U	NA		1.0	U	NA		NA		NA		NA	
Methane	74-82-8	µg/L		NA		7.5		NA		22		NA		NA		NA		NA	
Other Organic Compounds																			
Carbon, dissolved organic	N/A	mg/L		NA		1.34		NA		3.09		NA		NA		NA		NA	
Chloride	16887-00-6	mg/L		NA		7.24		NA		3.13		NA		NA		NA		NA	
Nitrate as Nitrogen	N/A	mg/L		NA		0.54		NA		0.60		NA		NA		NA		NA	
Nitrite as Nitrogen	N/A	mg/L		NA		0.10	U	NA		0.10	U	NA		NA		NA		NA	
Sulfate	N/A	mg/L		NA		2.38		NA		3.48		NA		NA		NA		NA	
Manganese, Dissolved	7439-96-5	µg/L		NA		1400		NA		575		NA		NA		NA		NA	
Parameters																			
Alkalinity	N/A	mg/L		NA		58.4		NA		64.2		NA		NA		NA		NA	

Notes:

Plume centerline wells are highlighted.

Values shown in **bold** text exceed analyte-specific cleanup levels.

DUP – Field duplicate sample

Beginning with Round 29, xylenes are being reporting for VOC analytical results in support of characterizing gasoline through its common dissolved constituents. For Round 29 only, the Navy elected to conduct VOC monitoring at wells 8MW16, MW03, 8MW53, 8MW30, 8MW24, 8MW48, 8MW49, 8MW32, 25MW04, and 25MW03 to assess the distribution of benzene, toluene, ethylbenzene, and xylenes beyond MNA requirements.

D – The result is reported from a diluted analysis.
J – The result is an estimated concentration that is less than the reporting limit but greater than or equal to the method detection limit (MDL).
U – The result is not detected at a concentration that is greater than or equal to the reporting limit.
UJ – The result was qualified as not detected at the indicated, estimated detection limit during data validation.
NA – Not Analyzed
N/A – Not Available
NS – A cleanup level for this analyte is not specified
mg/L – milligrams per liter
µg/L – micrograms per liter

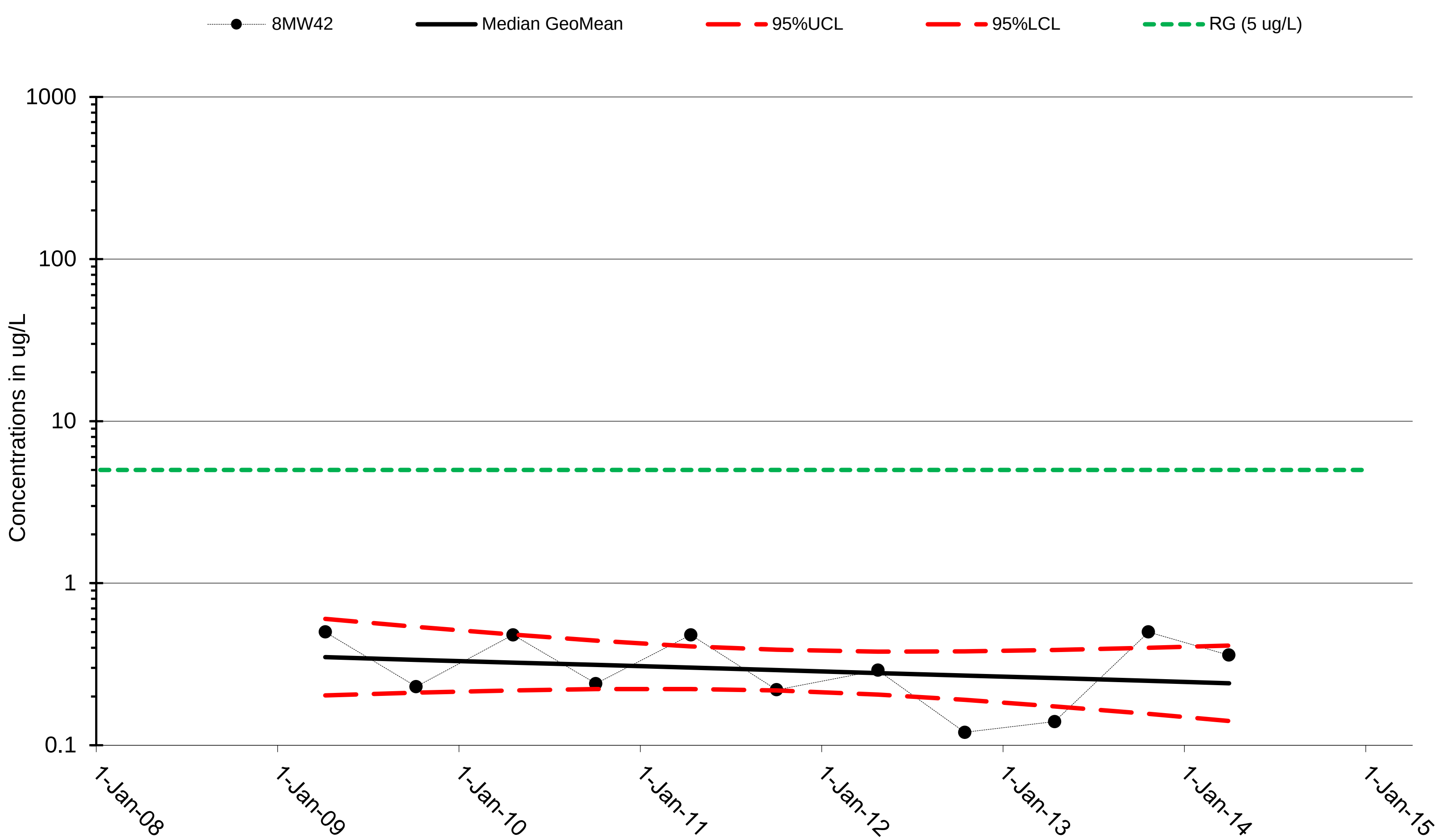
Table D-2. Summary of Laboratory Analytical Results for Spring 2014

Monitoring Location	Sample ID (OU8-14-)	Sample Date		Volatile Organic Compounds														Other Compounds and Parameters						
			Analyte	Benzene	DCA	DCE	DCP	EDB	Ethyl-benzene	TCA	Toluene	m,p-Xylenes	o- Xylene	Vinyl chloride	Ethane	Ethene	Methane	Carbon, dissolved organic	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Manganese, Dissolved	Alkalinity
			CAS #	71-43-2	107-06-2	75-35-4	78-87-5	106-93-4	100-41-4	79-00-5	108-88-3	108-38-3/ 106-42-3	95-47-6	75-01-4	78-84-0	74-85-1	74-82-8	N/A	16887-00-6	N/A	N/A	N/A	7439-96-5	N/A
			Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
			Cleanup Level	5	5	0.5	5	0.8	700	5	1,000	NS	NS	0.5										
8MW16	200	3/31/2014													0.60 U	1.0 U	1.3 U	0.34 J	13.2	1.80	0.10 U	6.31	0.30 J	141
8MW42	201	4/1/2014		0.23 J	0.36 J	0.23 J	0.28 J	0.50 U	0.50 U	0.71	0.50 U	0.50 U	0.50 U	0.50 U	0.60 U	1.0 U	1.3 U	5.76	10.7	2.80	0.07 J	22.6	1,980	335
MW03	202	4/1/2014													0.84	0.14 J	5,700	40	5.04	0.10 U	0.10 U	0.26	6,680	528
8MW53	203	4/1/2014													2.0	0.44 J	5,100	5.92	33.6	0.10 U	0.10 U	0.09 J	1,770	336
8MW30	204	4/2/2014													2.1	0.38 J	60	2.85	2.60	0.10 U	0.10 U	0.11 J	1140	199
MW08	205	4/2/2014		**1,700 D**	4.6 D	2.5 U	2.5 U	2.5 U	390 D	2.5 U	40 D	240 D	9.5 D	2.5 U	3.8	0.29 J	4,200	8.55	17.4	0.10 U	0.10 U	0.22	5,590	429
8MW47	206	4/2/2014		**6,000 D**	**28 D**	10 U	10 U	10 U	680 D	10 U	300 D	2,300 D	460 D	10 U	2.5	1.7	3,500	10.5	17.3	0.10 U	0.10 U	0.17 J	3,810	557
8MW47 (DUP)	207	4/2/2014		**6,400 D**	**30 D**	10 U	10 U	10 U	**770 D**	10 U	330 D	2,500 D	500 D	10 U	2.5	1.8	3,700	10.6	17.4	0.10 U	0.10 U	0.15 J	3,750	564
8MW24	208	4/1/2014													1.6	0.23 J	580	3.04	3.50	0.10 U	0.10 U	1.99	3,060	276
8MW48	209	4/2/2014													0.31 J	0.22 J	9,900	7.23	5.13	0.10 U	0.10 U	0.20 UJ	10,500	573
8MW06	210	4/2/2014		**11,000 D**	**300 D**	25 U	25 U	25 U	520 D	25 U	71 D	180 D	42 D	25 U	2.8	3.0	150	13.4	21.9	0.10 U	0.10 U	0.20 UJ	9,390	477
8MW32	211	3/31/2014													0.60 U	1.0 U	1.3 U	0.90	2.00	0.12	0.10 U	4.55	1.00	69
8MW33	212	3/31/2014		0.50 U	**24**	**2.0**	0.50 U	0.50 U	0.50 U	2.8	0.50 U	0.50 U	0.50 U	0.50 U	0.075 J	1.0 U	2.6 UJ	0.73	2.15	0.10 U	0.10 U	5.73	391	137
8MW35	213	3/31/2014		0.50 U	0.86	0.18 J	0.13 J	0.50 U	0.50 U	0.22 J	0.50 U	0.50 U	0.50 U	0.080 J	0.60 U	1.0 U	1.7 UJ	0.61	6.18	0.29	0.10 U	2.45	524	68
8MW25	215	4/2/2014		0.50 UJ	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U										
8MW03	214	3/31/2014		0.50 U	4.4	0.47 J	0.12 J	0.50 U	0.50 U	0.26 J	0.50 U	0.50 U	0.50 U	0.50 U	0.60 U	1.0 U	1.4 UJ	0.57	2.56	0.39	0.10 U	3.41	563	70
8MW13	216	3/27/2014		0.50 U	1.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U										
8MW37	217	3/27/2014		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U										
8MW19	218	3/27/2014		0.50 U	0.16 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U										

Notes:
Plume centerline wells are highlighted
Values shown in **bold** text exceed analyte-specific cleanup levels.
DCA - 1,2-Dichloroethane
DCE - 1,1-Dichloroethene
DCP - 1,2-Dichloropropane
EDB - 1,2-Dibromoethane
TCA - 1,1,2-Trichloroethane
DUP - Field duplicate sample
D - The result is reported from a diluted analysis.
J - The result is an estimated concentration that is less than the quantitation limit but greater than the method detection limit or due to a quality control outlier.
U - The compound is not detected at or above the laboratory quantitation limit.
UJ - The compound is not detected at or above the estimated quantitation limit.
NS - A cleanup level for this analyte is not specified
mg/L - milligrams per liter
µg/L - micrograms per liter

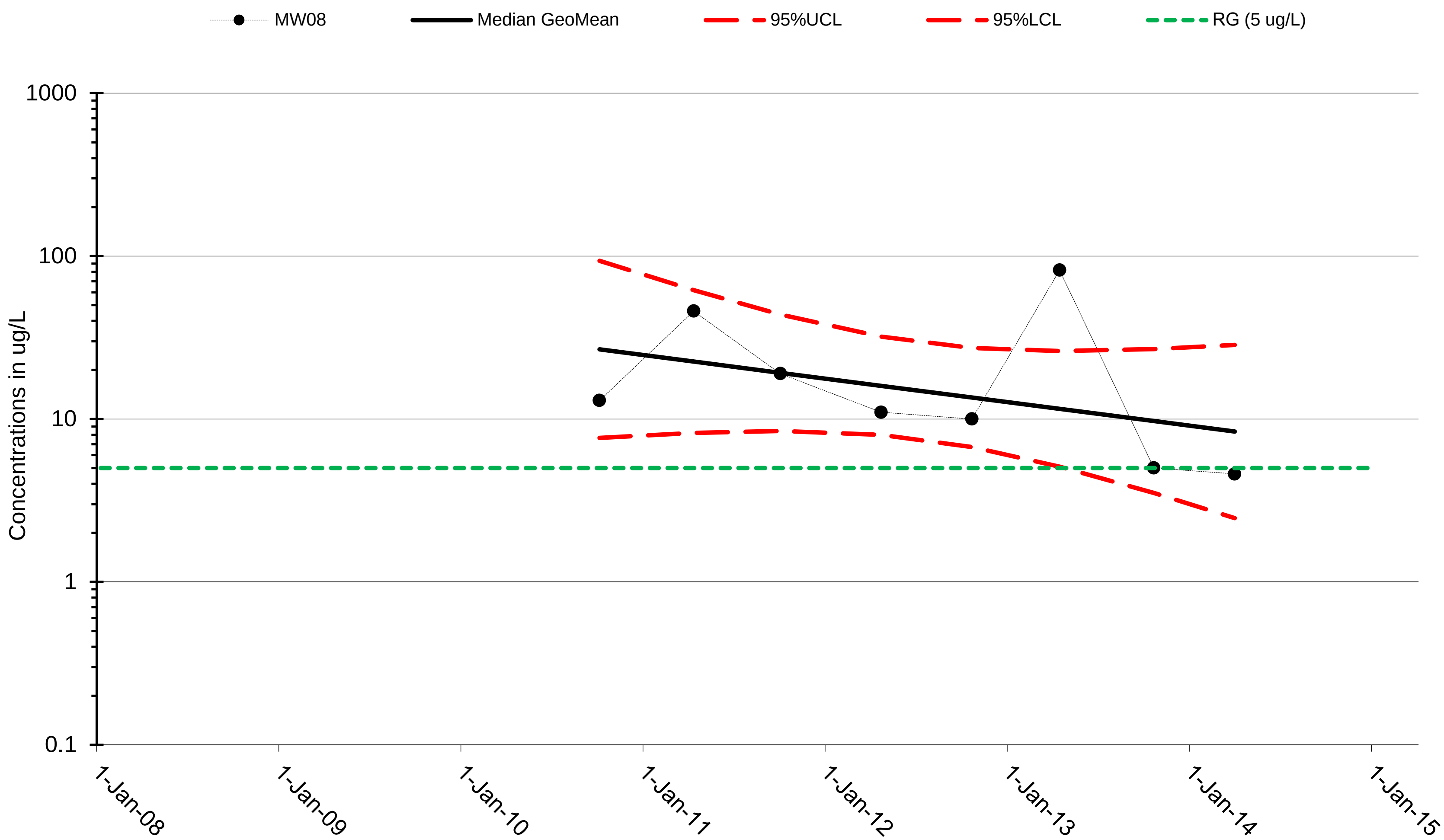
APPENDIX D-3

33762145_17.ai



U.S. NAVY	**Figure D-1** **1,2-DCA in Shallow Upgradient Well 8MW42**	NBK Bangor FOURTH 5-YEAR REVIEW

33762145_18.ai

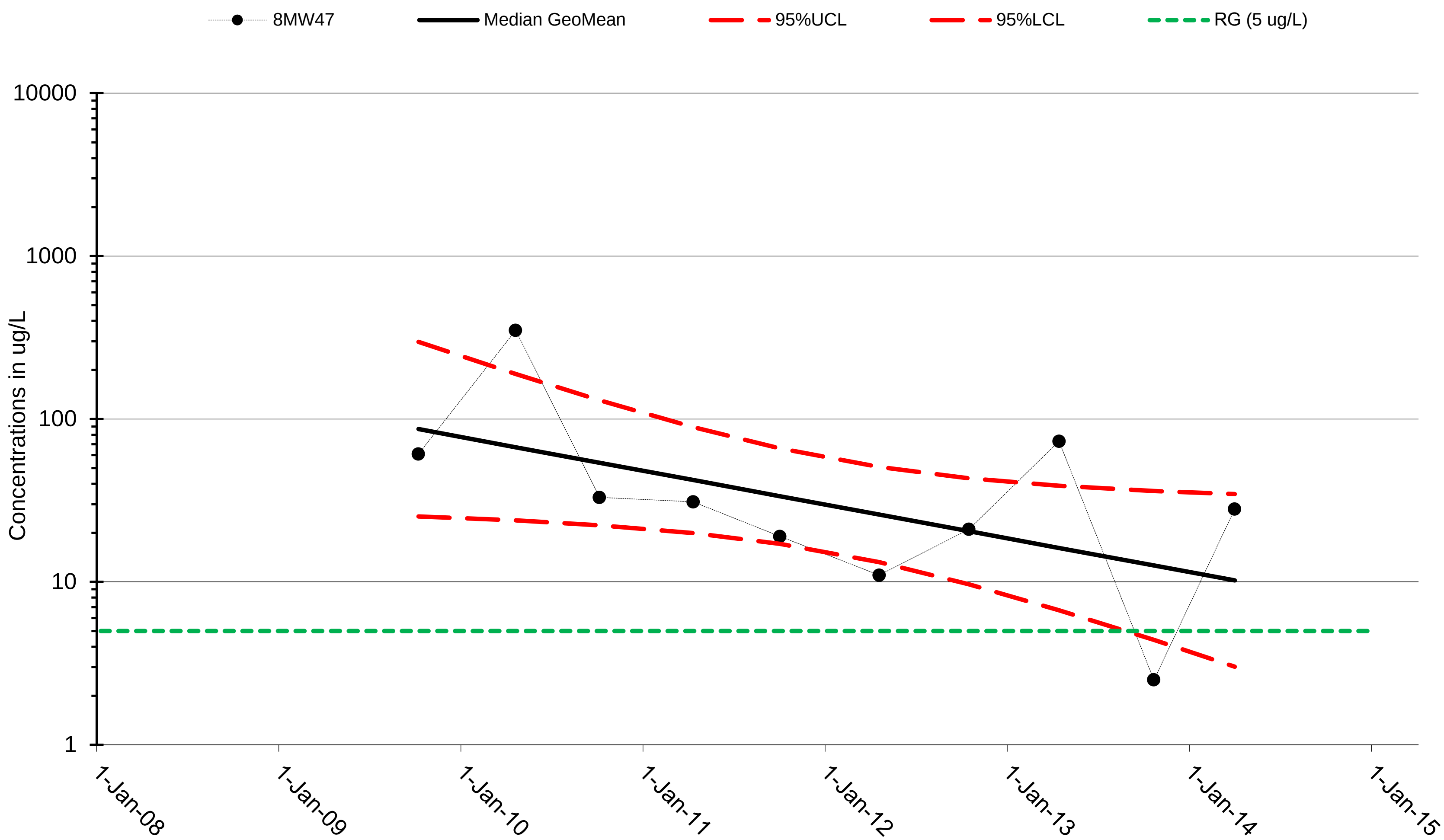


U.S. NAVY

Figure D-2
1,2-DCA in Shallow Source Area Well MW8

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_19.ai

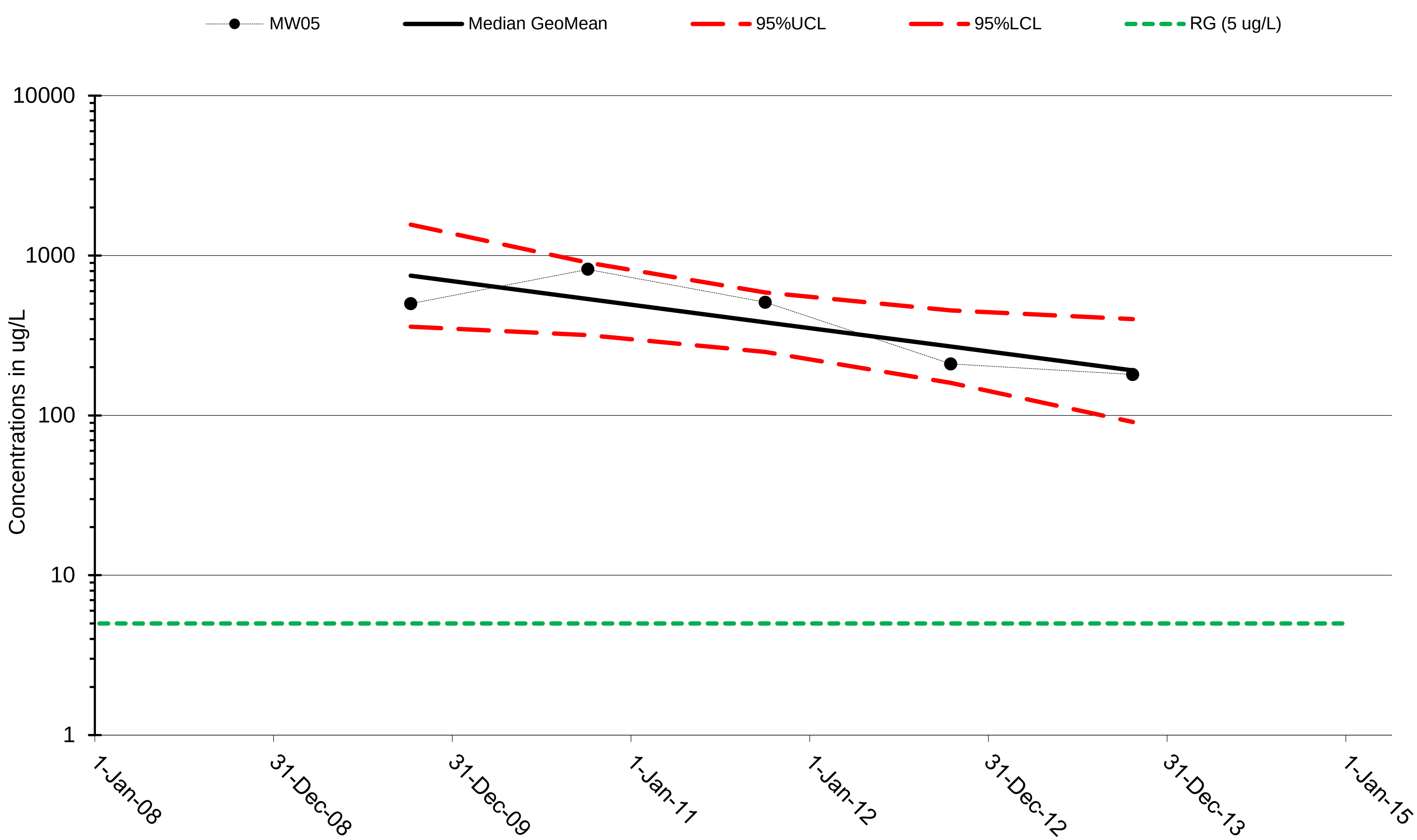


U.S. NAVY

Figure D-3
1,2-DCA in Shallow Source Area Well 8MW47

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_20.ai

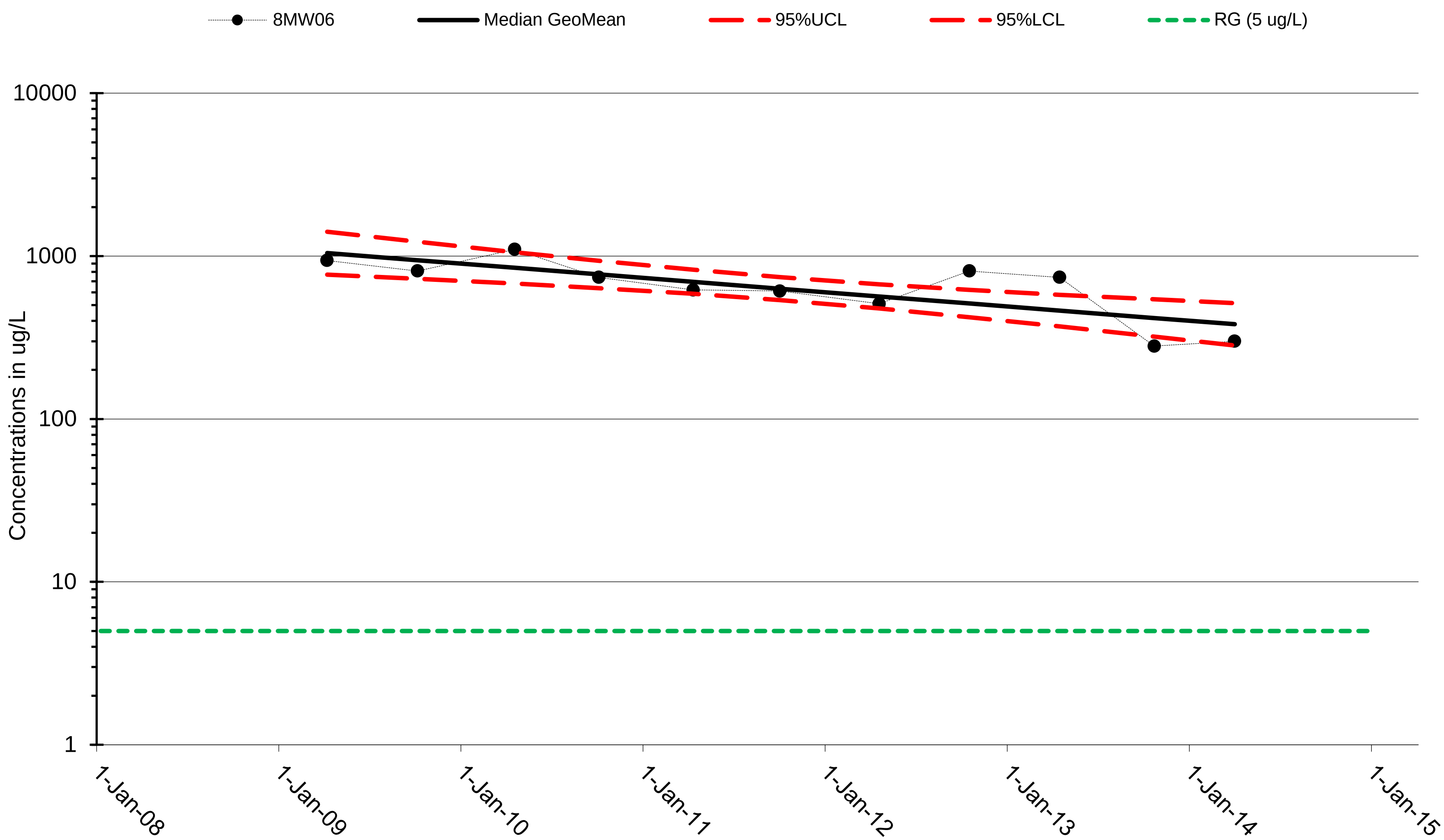


U.S. NAVY

Figure D-4
1,2-DCA in Shallow Source Area Well MW05

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_21.ai

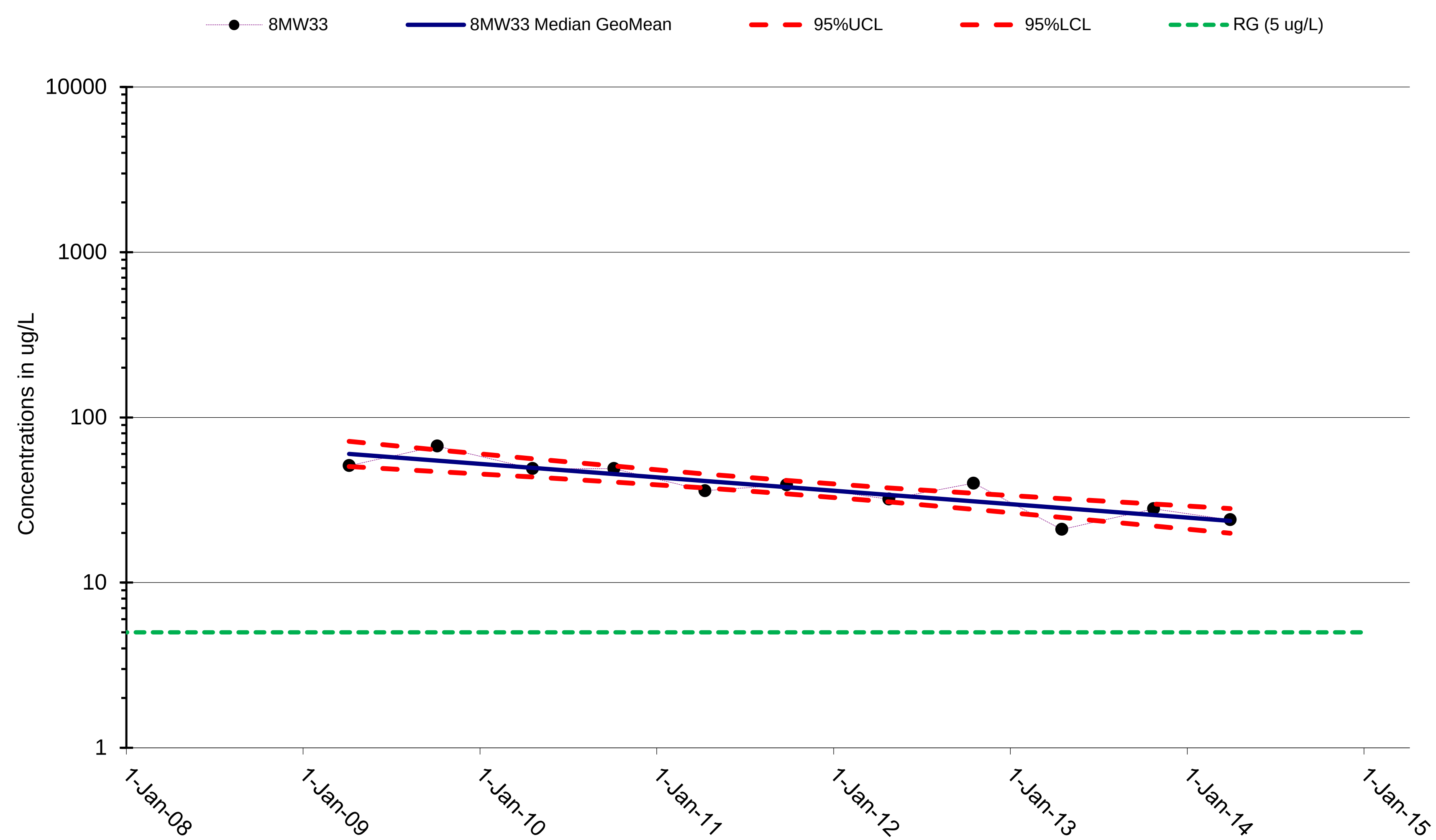


U.S. NAVY

Figure D-5
1,2-DCA in Shallow Source Area Well 8MW06

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_22.ai



U.S. NAVY	**Figure D-6** **1,2-DCA in Intermediate Downgradient Well 8MW33**	NBK Bangor FOURTH 5-YEAR REVIEW

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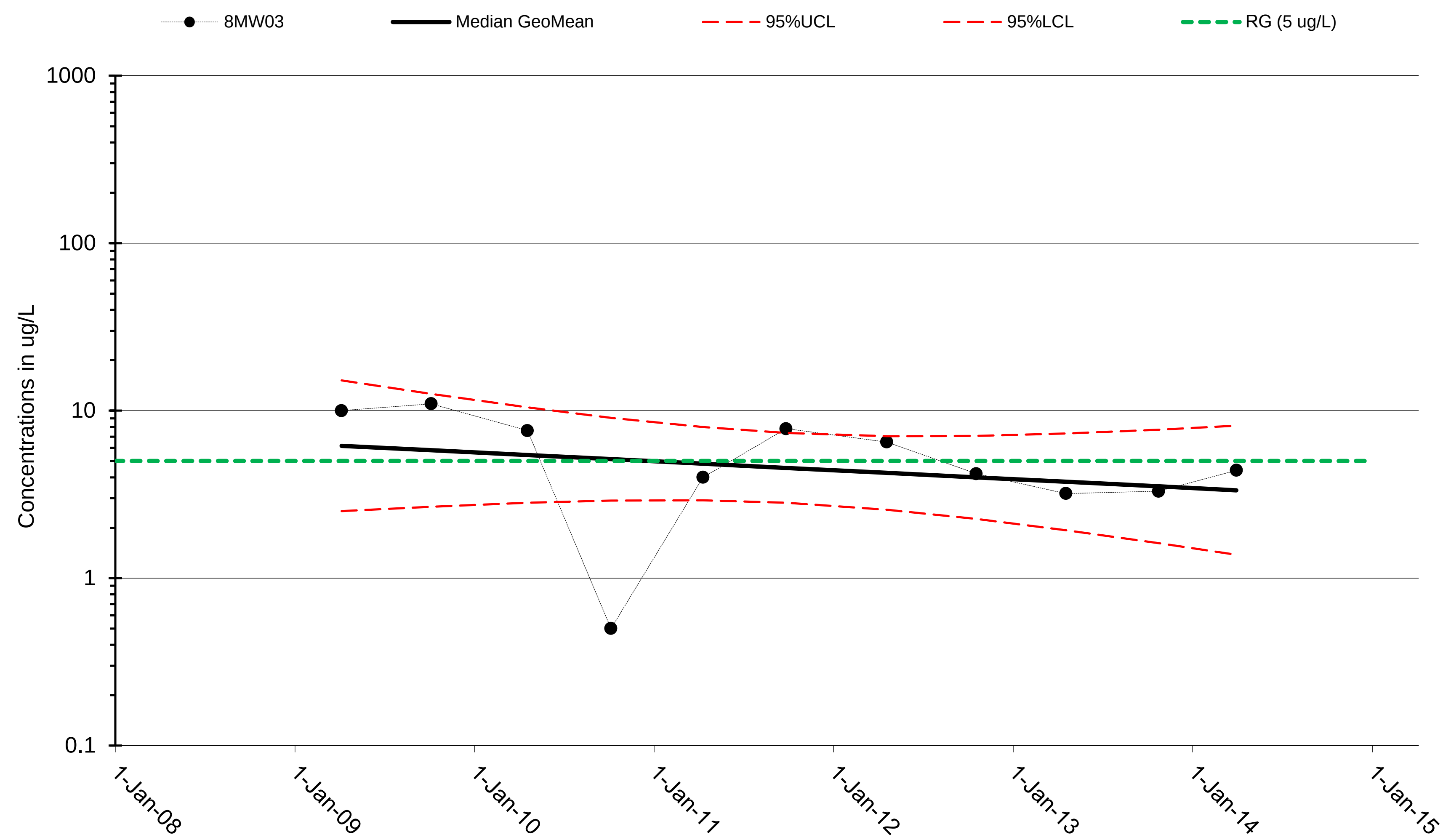
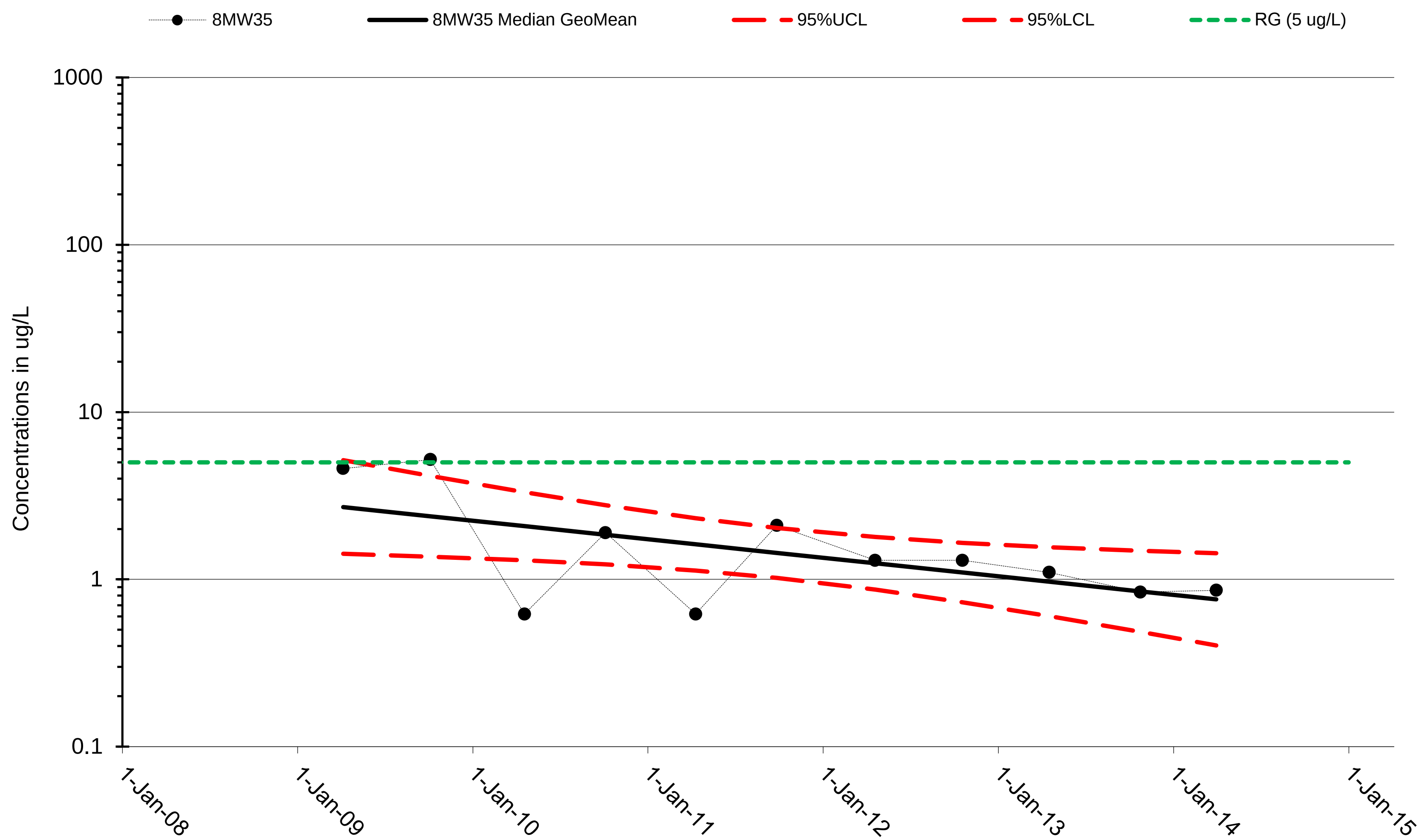


U.S. NAVY

Figure D-7
1,2-DCA in Intermediate Site Boundry Well 8MW03

NBK Bangor
FOURTH
5-YEAR REVIEW

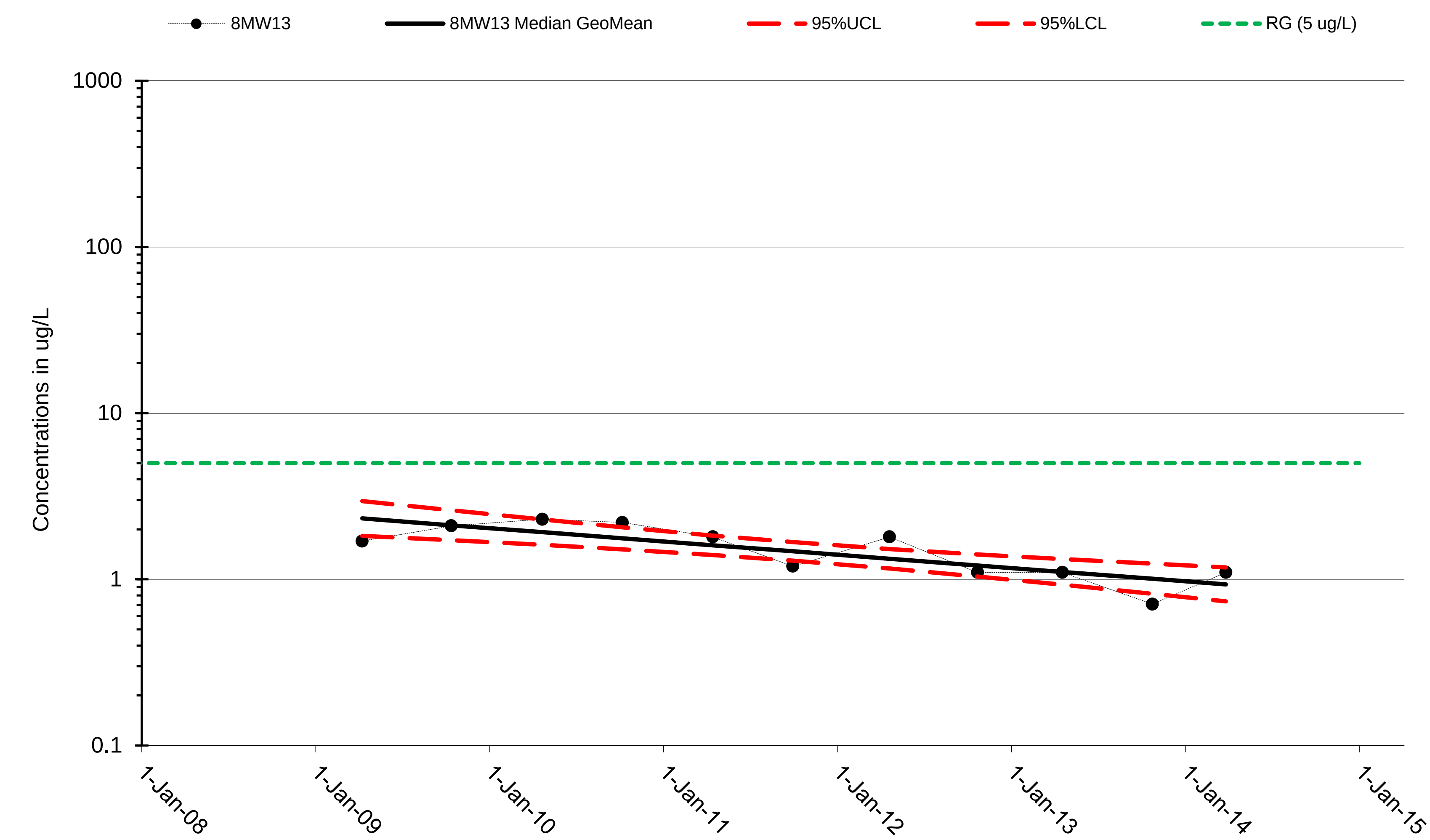


U.S. NAVY

Figure D-8
1,2-DCA in Shallow Site Boundary Well 8MW35

NBK Bangor
FOURTH
5-YEAR REVIEW

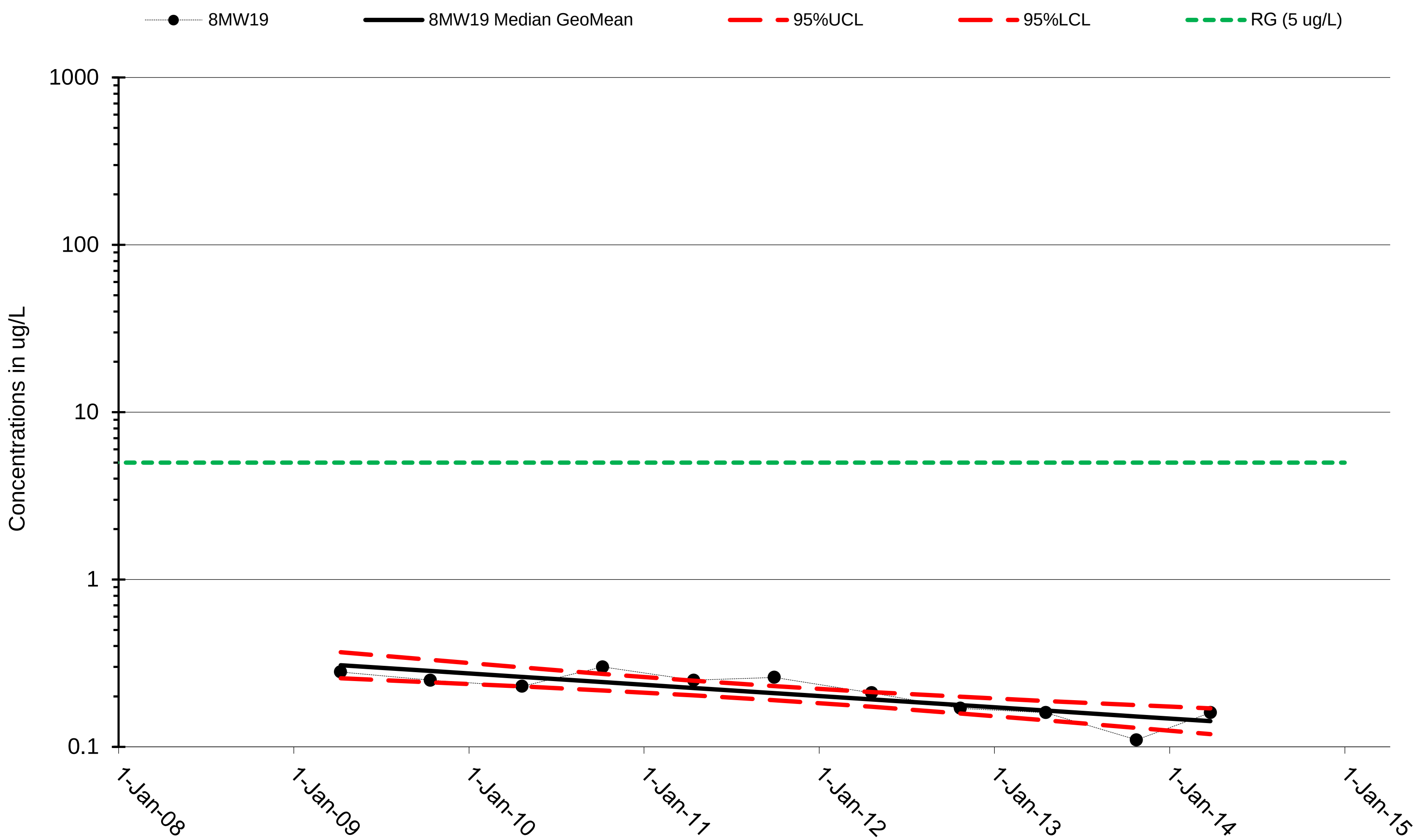
33762145_25.ai



U.S. NAVY

Figure D-9
1,2-DCA in Intermediate Off-Site Compliance Well 8MW13

NBK Bangor
FOURTH
5-YEAR REVIEW



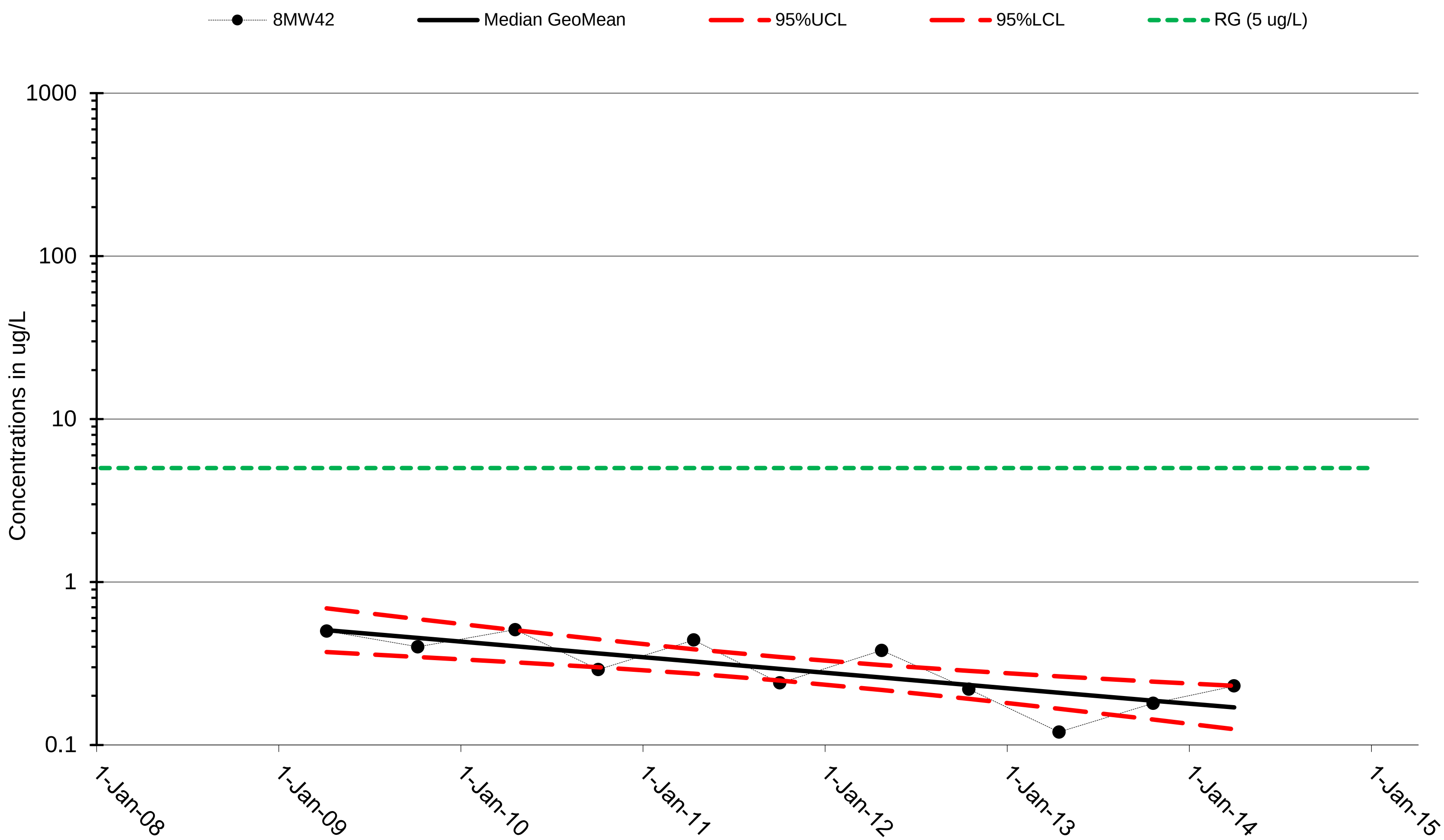
U.S. NAVY

Figure D-10
1,2-DCA in Intermediate Off-Site Compliance Well 8MW19

NBK Bangor
FOURTH
5-YEAR REVIEW

APPENDIX D-4

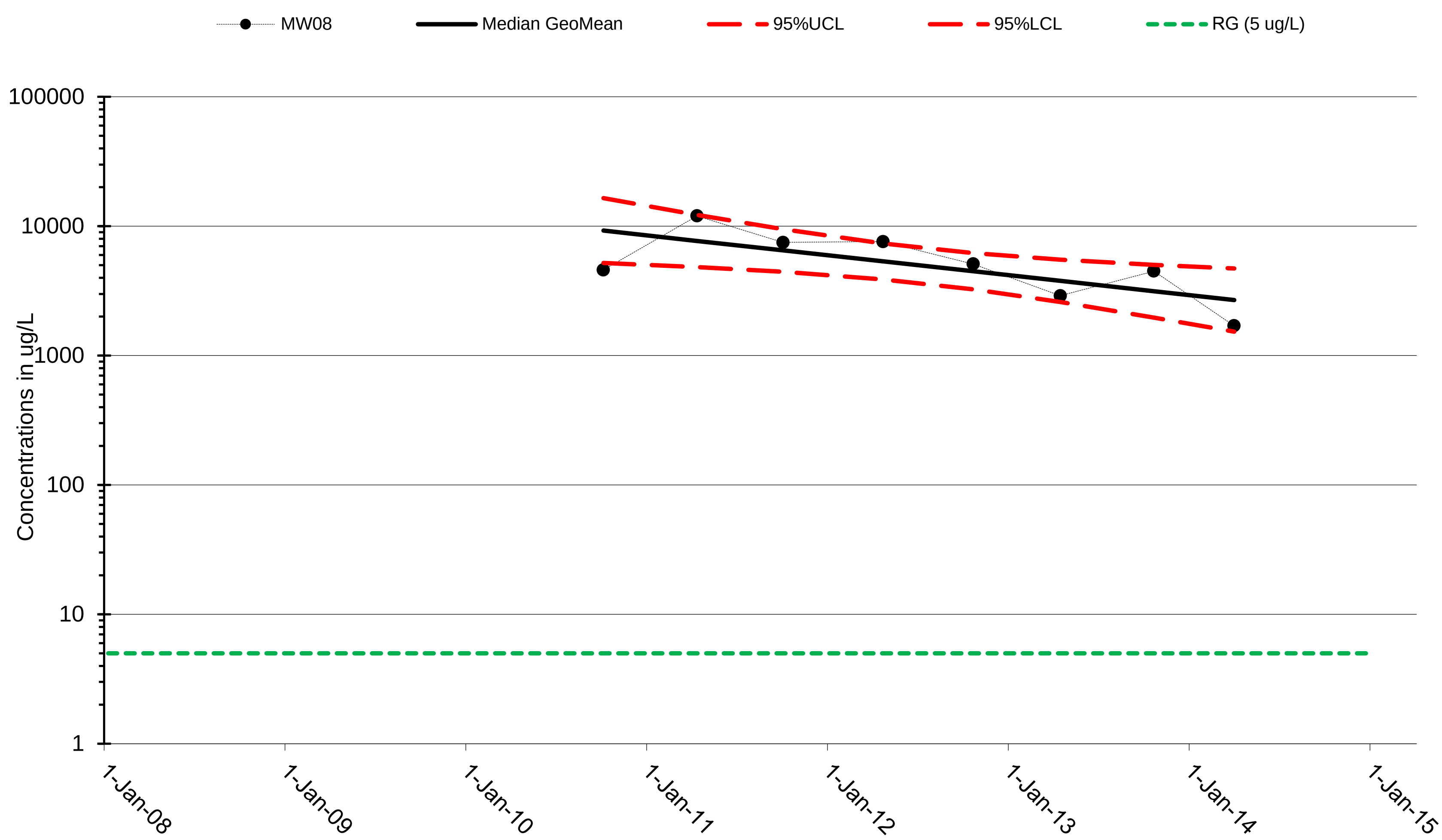
33762145_27.ai



U.S. NAVY

Figure D-11
Benzene in Shallow Upgradient Well 8MW42

NBK Bangor
FOURTH
5-YEAR REVIEW

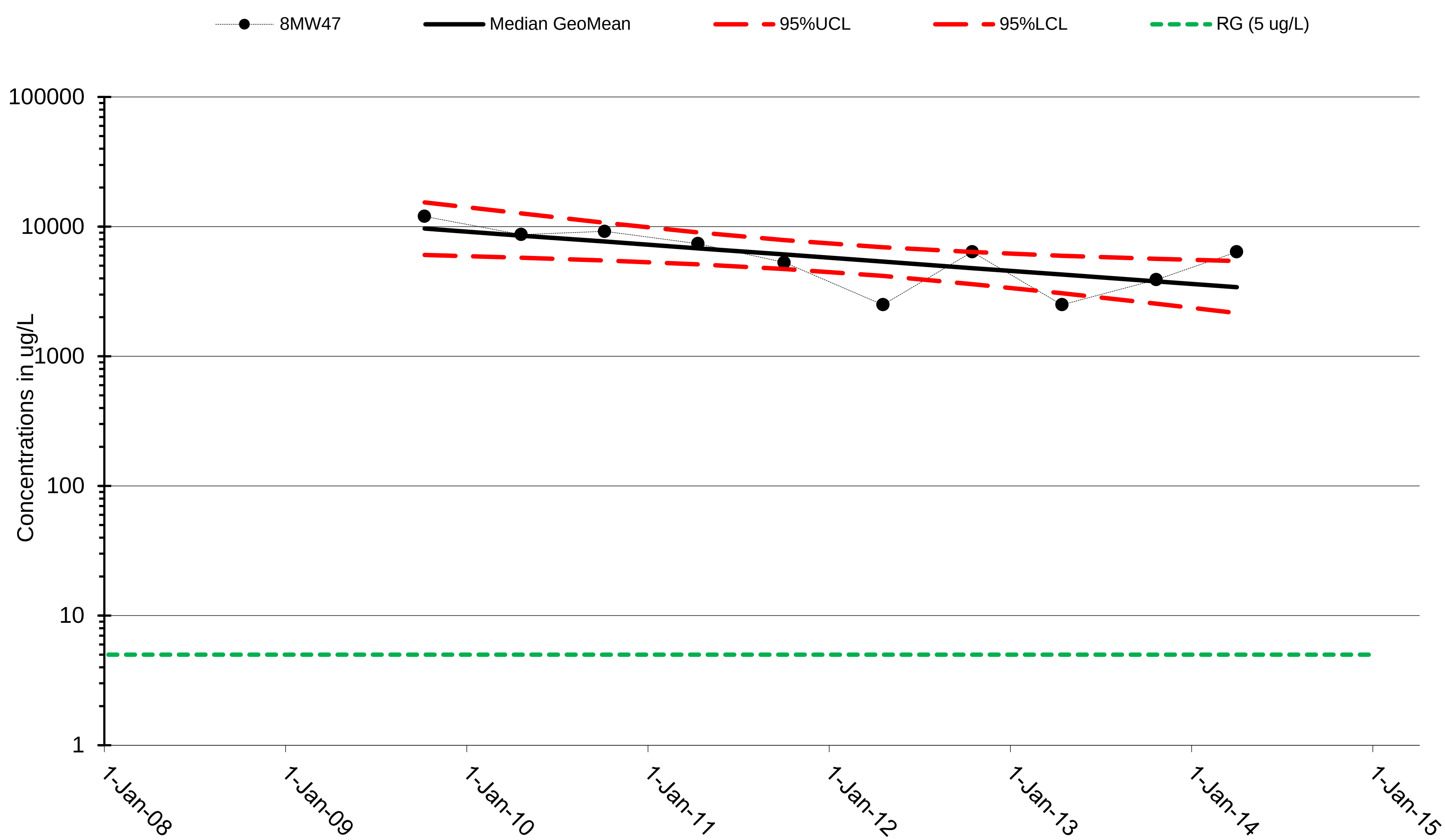


U.S. NAVY

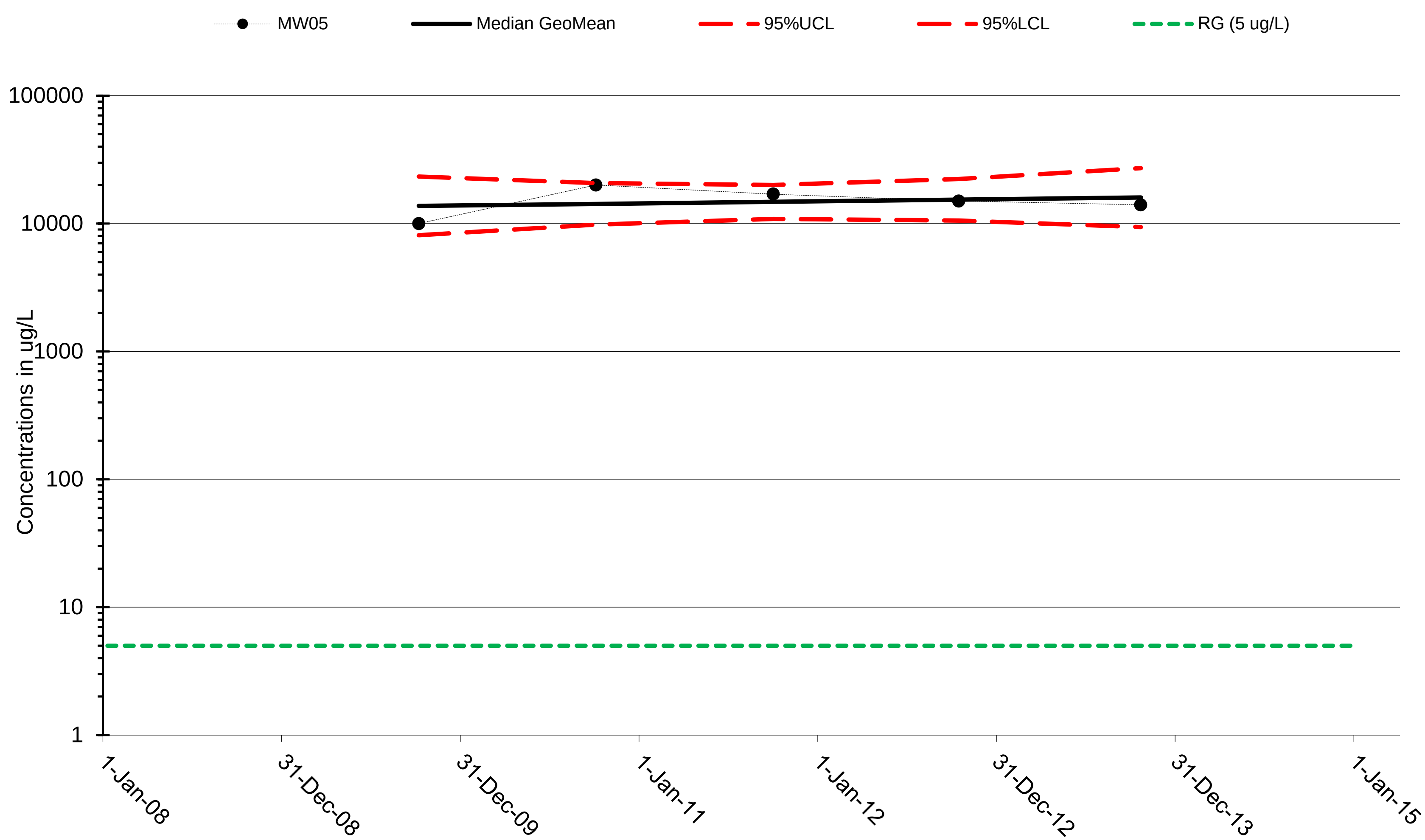
Figure D-12
Benzene in Shallow Source Area Well MW8

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_29.ai



U.S. NAVY	**Figure D-13** **Benzene in Shallow Source Area Well 8MW47**	NBK Bangor FOURTH 5-YEAR REVIEW

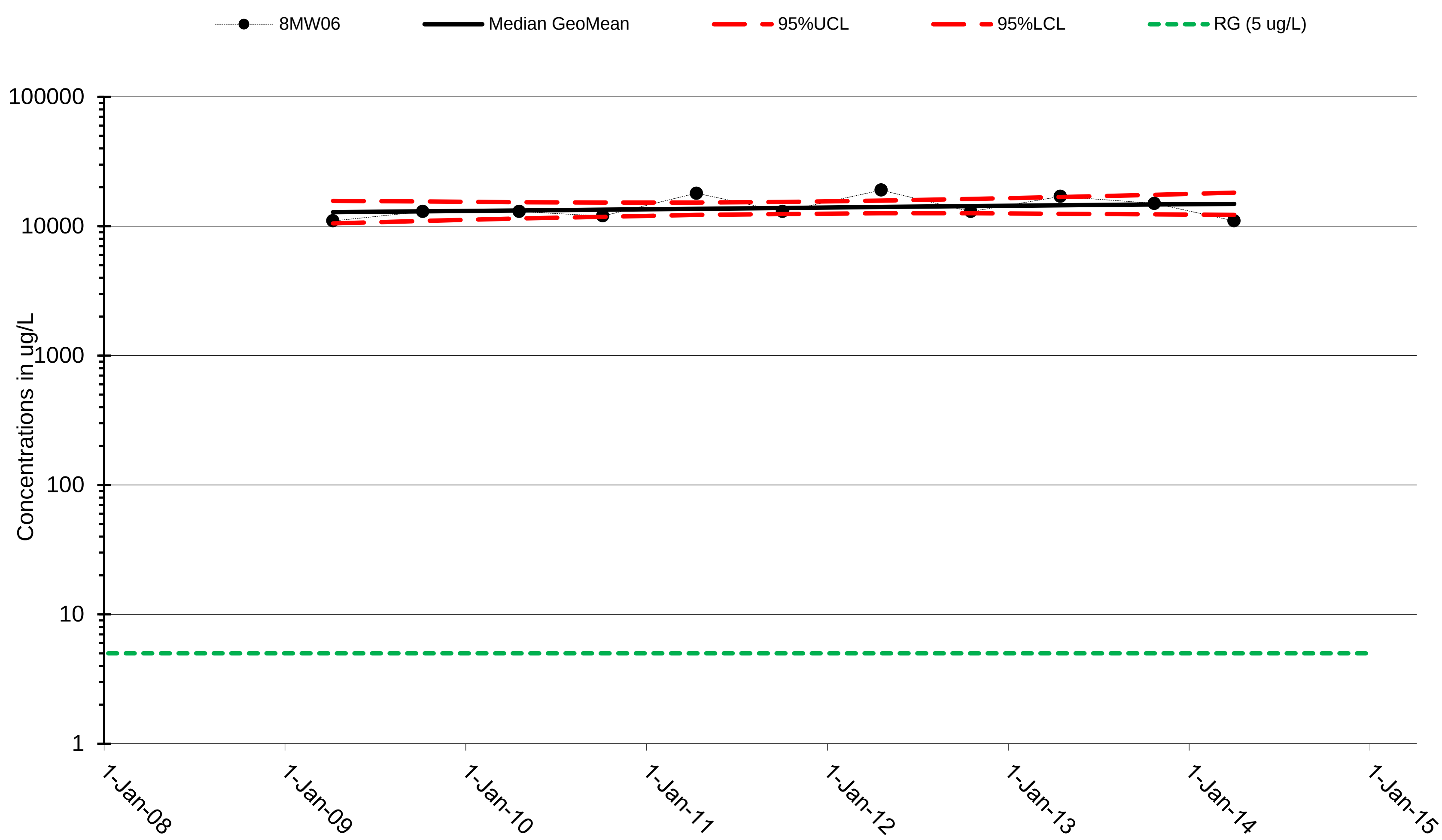


U.S. NAVY

Figure D-14
Benzene in Shallow Source Area Well MW05

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_31.ai

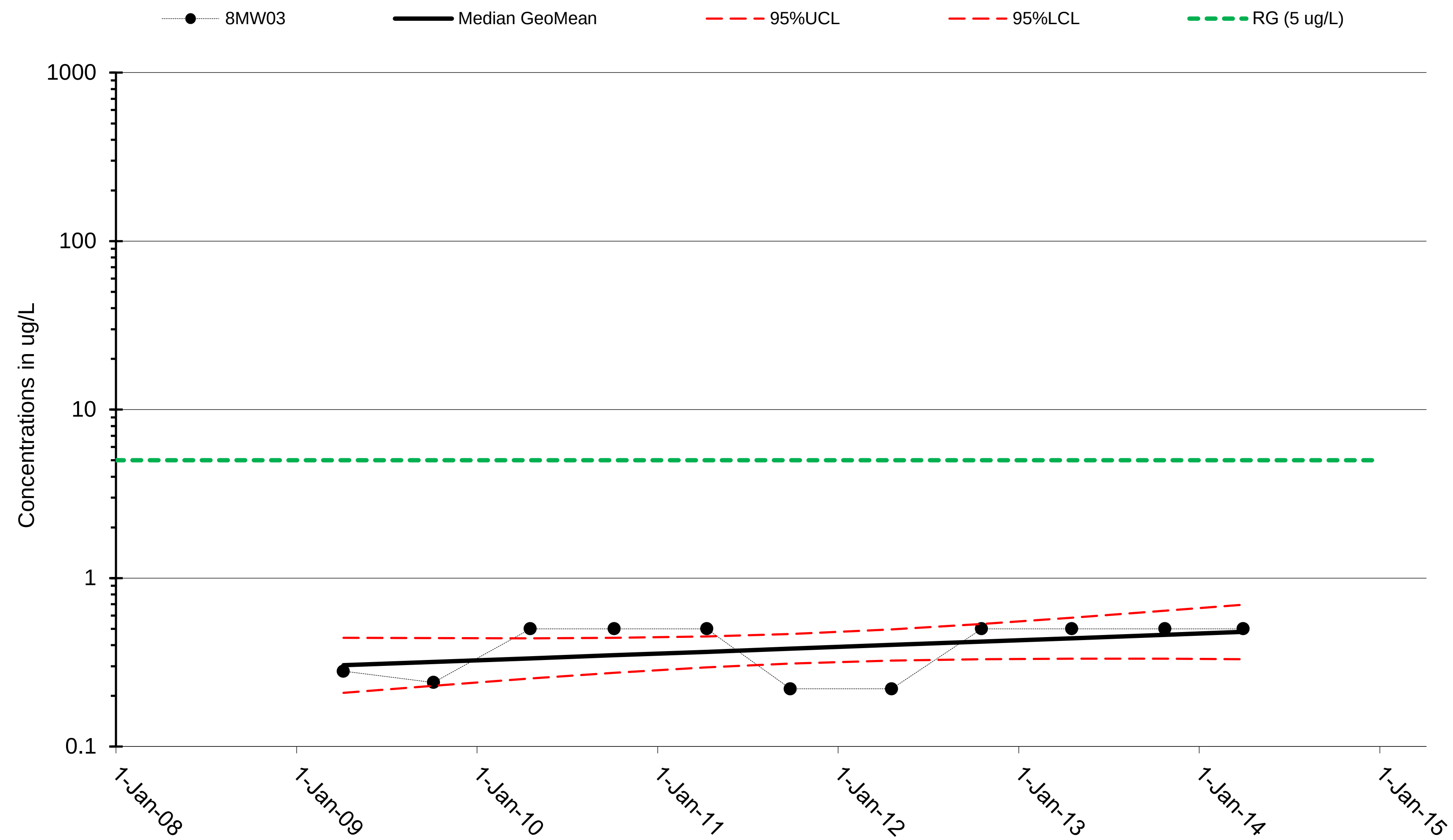


U.S. NAVY

Figure D-15
Benzene in Shallow Source Area Well 8MW06

NBK Bangor
FOURTH
5-YEAR REVIEW

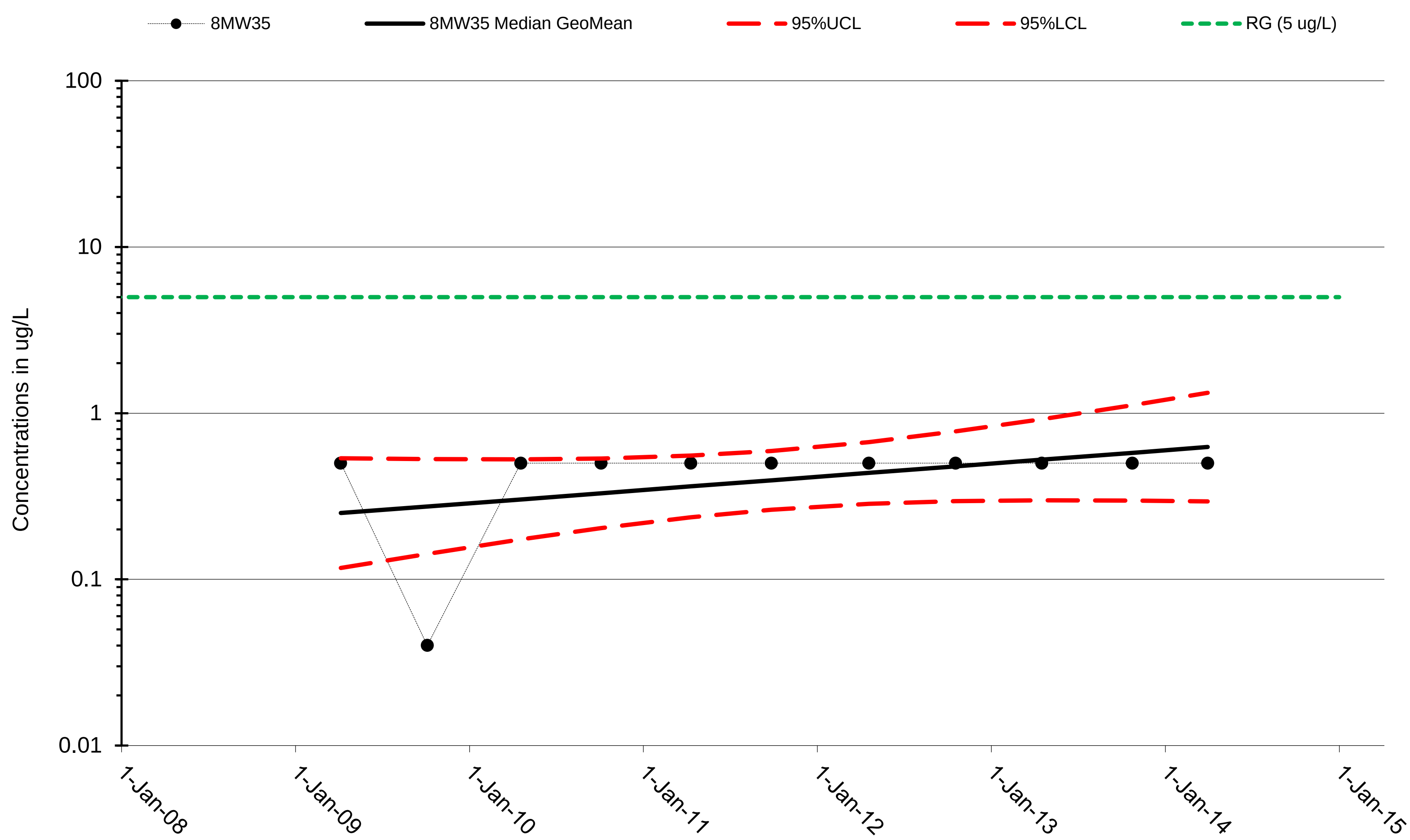
33762145_32.ai



U.S. NAVY

Figure D-16
Benzene in Intermediate Site Boundry Well 8MW03

NBK Bangor
FOURTH
5-YEAR REVIEW

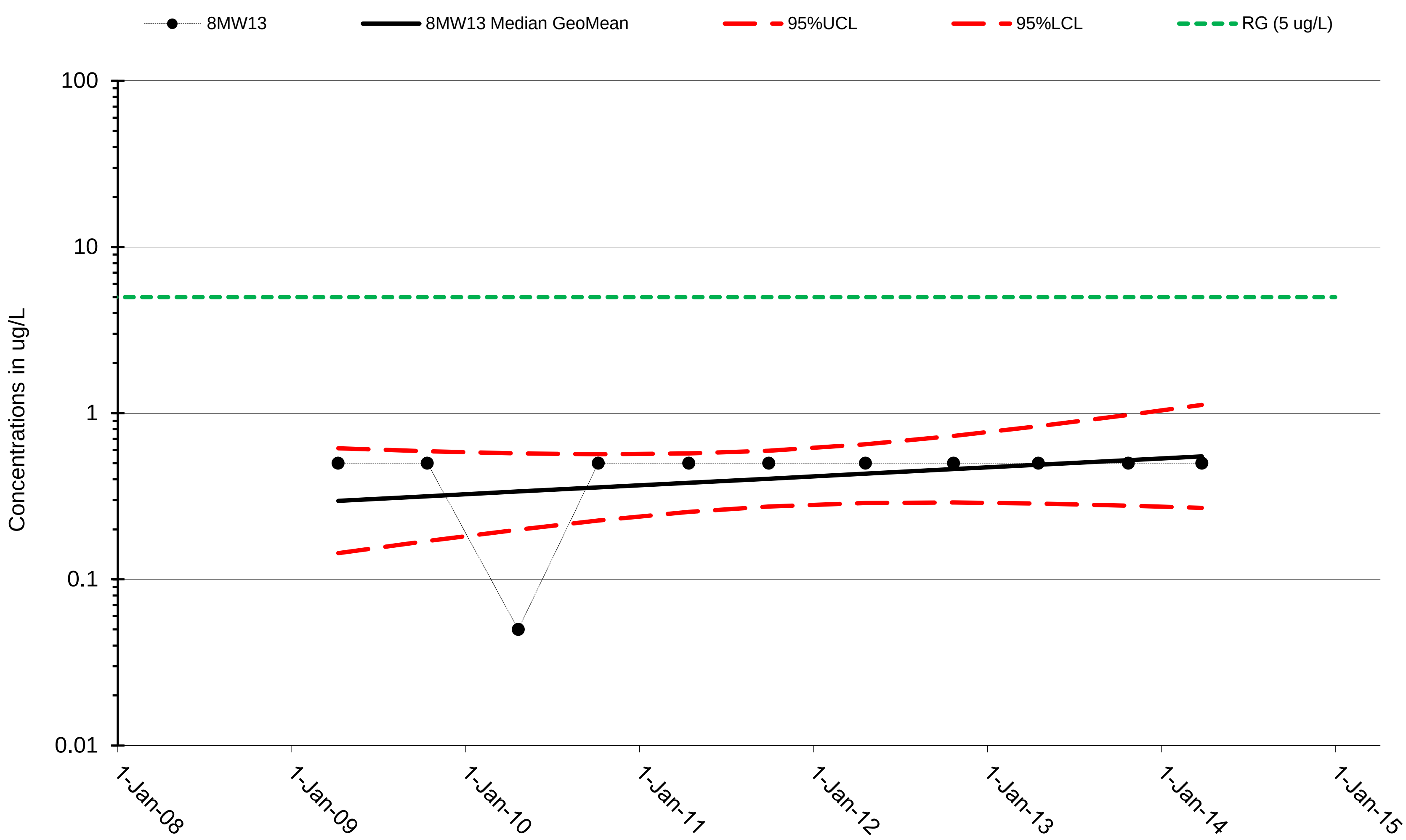


U.S. NAVY

Figure D-17
Benzene in Shallow site Boundary Well 8MW35

NBK Bangor
FOURTH
5-YEAR REVIEW

33762145_34.ai



U.S. NAVY	**Figure D-18** **Benzene in Intermediate Off-Site Compliance Well 8MW13**	NBK Bangor FOURTH 5-YEAR REVIEW

APPENDIX D-5

Table 7-1. Summary of Baseline Field Parameters for OU 8 Pilot Study Phase II Baseline

Monitoring Location	Area[1/]	Sample Date[2/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen[/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	Eh (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
8MW27	PWIA	5/31/12	16.5	6.92	0.361	0	1.07	NA	182	0.00	0.01	26.66
8CB-MW17	PWIA	6/6/12	18.6	6.83	0.502	3.9	1.23	NA	-22	0.00	0.02	27.68
8CB-MW18	PWIA	6/6/12	19.7	6.53	1.150	10.2	1.32	NA	-51	0.59	0.11	28.17
8MW53	PWIA	5/30/12	28.8	6.67	0.735	8	1.21	NA	-97	0.65	0.02	27.59
8CB-MW08	PWIA	8/20/12	23.5	6.64	0.509	19.5	0.00	0.383	-374	0.00	0.03	28.98
8CB-MW08 Temp at 50'	PWIA	8/14/12	25.4	6.56	0.93	>1000	0.00	0.583	-104	0.55	0.61	31.70
8MW24	PWIA	5/30/12	20.9	6.57	0.704	10	1.49	NA	-47	1.02	0.02	27.92
8CB-MW25	PWIA	8/20/12	17.0	6.57	0.821	19.3	0.00	0.486	-401	0.00	0.03	27.95
29MW01	PWIA	8/20/12	17.6	6.02	0.400	27.3	0.00	0.685	176	0.00	0.04	27.05
8MW29	PWIA	8/20/12	16.4	6.59	0.629	28.7	0.00	0.79	56	0.00	0.02	26.96
8CB-MW23	PWIA	5/30/12	20.6	6.18	0.501	10	1.32	NA	-121	0.06	0.01	27.81
8CB-MW23 Temp at 45'	PWIA	5/21/12	20.1	8.17	0.260	261	4.90	0.442	51	0.00	0.09	27.88
8CB-MW24	PWIA	6/5/12	21.3	5.91	0.423	19.9	1.54	NA	-210	0.00	0.03	27.95
8CB-MW24 Temp at 44'	PWIA	5/22/12	18.2	7.84	0.200	854	6.19	>1.1[7/]	84	0.01	>0.80[6/]	28.12
MW05	PWIA	5/31/12	15.5	6.18	0.759	0	0.83	0.443	-68	>3.30[5/]	0.01	27.54
8MW48	PWIA	4/26/2012	14.5	6.44	1.14	0.5	0.00	0.406	-72	>3.30[5/]	0.02	26.90
8CB-MW28	PWIA	6/4/12	17.3	6.35	0.858	6	1.33	NA	-137	0.26	0.07	27.93
8IW-1	PWIA	4/26/2012	15.72	5.20	0.865	23.2	0.88	0.669	70	>3.30[5/]	0.05	27.42
8IW-2	PWIA	4/26/2012	16.75	5.39	1.26	25.5	0.82	0.599	87	>3.30[5/]	0.01	27.28
8IW-3	PWIA	4/26/2012	17.93	5.92	0.915	42	7.68	NM	-26	>3.30[5/]	0.05	26.68
8IW-6	PWIA	4/26/2012	16.2	7.84	0.105	19	6.51	NM	31	0.07	0.00	27.14
8IW-7	PWIA	4/26/2012	15.8	7.76	0.114	0	3.39	NM	36	0.01	0.01	26.20
8PS-A1	PWIA	4/30/2012	16.15	6.34	1.19	44.7	1.02	NM	5	>3.30[5/]	0.02	27.25
8PS-A3	PWIA	4/30/2012	15.5	7.63	0.156	41	1.97	NM	-81	>3.30[5/]	0.04	27.22
8PS-B1	PWIA	4/30/2012	15.67	6.54	1.73	30.2	1.00	NM	-14	>3.30[5/]	0.00	27.30
8PS-B2	PWIA	4/30/2012	15.7	7.47	0.190	28	2.14	NM	-57	>3.30[5/]	0.02	27.29
8PS-C1	PWIA	5/1/2012	16.1	7.59	0.128	4	2.41	NM	-52	1.77	0.01	27.72
8PS-C3	PWIA	5/1/2012	15.1	6.53	2.00	9.3	0.00	0.645	-56	2.62	0.03	27.42
8PS-C2	PWIA	5/1/2012	16.8	7.93	0.147	0	1.07	NM	-94	1.83	0.00	27.39
8PS-C4	PWIA	5/1/2012	15.1	6.50	1.09	78.6	0.00	0.325	-57	1.99	0.03	27.14

Table 7-1. Summary of Baseline Field Parameters for OU 8 Pilot Study Phase II Baseline (continued)

Monitoring Location	Area[1/]	Sample Date[2/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen[3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	Eh (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
8PS-D1	PWIA	4/30/2012	17.4	6.54	1.11	0	0.00	0.767	-98	2.09	0.04	27.20
8PS-E1	PWIA	4/30/2012	16.7	6.56	1.14	2.9	0.00	1.068	-26	0.25	0.06	26.85
8PS-F1	PWIA	4/30/2012	16.8	6.70	1.22	5.1	0.00	0.282	-452	0.13	0.01	26.51
8PS-G1	PWIA	4/26/2012	17.3	6.56	1.37	27.9	0.00	0.612	-33	0.05	0.01	27.30
8MW49	PWIA	4/26/2012	16.1	6.46	1.07	46.3	0.00	0.572	-40	2.75	0.17	27.45
8CB-MW26	PWIA	6/5/12	17.2	6.32	0.527	4.5	2.18	NA	-9	0.00	0.04	25.94
8MW06	PWIA	6/5/12	15.6	6.40	1.02	0	2.05	NA	-179	>3.30[5/]	0.06	27.95
8CB-MW02	PWIA	6/4/12	17.9	6.09	0.853	10.7	1.44	NA	-151	0.58	0.03	27.56
8CB-MW01	PWIA	8/20/12	17.8	6.87	0.386	29.9	0.00	0.451	-339	0.00	0.03	27.93

Notes:
[1/] PWIA – Public Works industrial Area, SBB – Southern Base Boundary, MVR – Mountain View Road
[2/] Well installation and subsequent baseline monitoring occurred over several months.
[3/] DO measured in the field using the Horiba.
[4/] DO measured in the field using the Hach DR-850 colorimeter method when the Horiba reading was ≤ 1mg/L.
[5/] Result exceeded the maximum value of 3.3 mg/L for the Hach DR850/8146 test kit.
[6/] Result exceeded the maximum value of 0.8 mg/L. Emulsified vegetable oil visible in well at time of sampling. Test kit did not change to indicator color. Sample water was white.
[7/] Result exceeded the test kit maximum value of 1.1 mg/L.
Temp - Samples collected from temporary wells installed during well drilling and prior to installation of permanent wells.
mg/L – milligrams per liter
mS/cm – milliSiemens per centimeter
mV – millivolt
N/A – Not Analyzed
NTU – nephelometric turbidity unit
NM – Not Measured
pH – acidity based on hydrogen ion activity
Eh – redox potential

Table 7-2. Summary of VOC Results for OU 8 Pilot Study Phase II Baseline

Round	Well	Sample ID (OU8-Pilot-)	Volatile Organic Compounds: Benzene	DCA	DCE	DCP	EDB	Ethylbenzene	TCA	Toluene	Vinyl Chloride	Ethane	Ethene	Methane
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
			OU 8 Groundwater Cleanup Level (CUL)											
			5	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*	*NA*	*NA*	*NA*
April - May 2012	8MW27	12-145	0.11 J	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U	0.54 UJ	0.50 U			
	MW03	12-202										0.3 J	0.11 J	5,100 B
	8MW53	12-101	**320 JD**	2.5 UiJ	2.5 U	2.5 U	2.5 U	**1,000 D**	2.5 U	280 D	2.5 U	2.5	0.43 J	3,000 B
	8MW47	12-207	**2,500 D**	11 Ui	1.0 U	1.0 U	1.0 U	590 D	1.0 U	**7,200 D**	1.0 U	1.7	3.3	1,700
	8MW24	12-102	**1,000 D**	12 UiJ	2.5 U	2.5 U	2.5 U	**1,900 D**	2.5 U	**2,400 D**	2.5 U	6.7	1.1	380 B
	MW05	12-103	**16,000 JD**	**270 JD**	25 U	**7 JD**	25 U	870 D	25 U	**13,000 D**	25 U			
	8CB-MW23	12-129	27 J	1.3 UJ	0.50 UJ	0.50 UJ	0.50 UJ	190 D	0.50 UJ	68 D	0.50 UJ	0.52 J	0.47 J	190
	8CB-MW23 (temp)	12-130	0.95	2.1 J	0.50 U	0.50 UJ	0.50 U	1.9	0.50 U	0.93	0.50 U	0.60	0.22 J	150
	8CB-MW24	12-137	1.2	2.7 J	0.50 U	0.50 U	0.50 U	0.58	0.50 U	4.4	0.50 U			
	8CB-MW24 (temp)	12-138	0.070 J	2.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U			
	8CB-MW28	12-127	**25,000 J**	**620 D**	25 UJ	**10 JD**	**110 D**	**1,600 D**	25 U	**22,000 JD**	25 U	3.6	13	5,300
	8CB-MW28 (Dup)	*12-128*												
	8MW48	12-134	**10,000 D**	40 Ui	10 U	3.2 JD	10 U	**1,600 D**	10 U	**9,400 D**	10 U	3.0	4.6	2,000
	8MW49	12-135	**5,700 D**	35 Ui	10 U	10 Ui	10 U	**910 D**	10 U	**7,600 D**	10 U	0.79	3.3	110
	8IW-1	12-104												
	8IW-2	12-105												
	8IW-3	12-106												
	8IW-6	12-109												
	8IW-7	12-110												
	8PS-A1	12-111	**25,000 D**	**790 D**	25 U	**10 JD**	25 U	**1,900 D**	25 U	**21,000 D**	25 U	2.7	11	13,000
	8PS-A3	12-112	**930 D**	**32**	0.50 U	0.50 U	0.50 U	5.3	0.50 U	120 D	0.50 U	0.93	0.17 J	20,000
	8PS-B1	12-113	**23,000 D**	**870 D**	25 U	**8.5 JD**	25 U	**1,100 D**	25 U	**11,000 D**	25 U	4.4	19	8,100
	8PS-B1 (Dup)	*12-114*	***23,000 D***	***880 D***	*25 U*	***9.0 JD***	*25 U*	***1,000 D***	*25 U*	***11,000 D***	*25 U*	*4.4*	*19*	*8,200*
	8PS-B2	12-115	**430 D**	**110 D**	0.50 U	0.50 Ui	0.50 U	9.6	0.50 U	120 D	0.50 U	0.78	0.40 J	16,000
	8PS-C1	12-116	**20,000 D**	**1,300 D**	25 U	**10 JD**	25 U	**1,400 D**	25 U	**1,100 D**	25 U	5.0	25	9,800
	8PS-C2	12-117	**3,000 D**	**1,100 D**	5.0 U	**6.0 D**	5.0 U	200 D	5.0 U	420 D	5.0 U	6.7	5.4	6,400
	8PS-C3	12-118	**250 D**	**190 D**	0.50 U	0.49 J	0.50 U	2.5	0.50 U	58	0.50 U	1.8	0.80 J	19,000
	8PS-C4	12-119	**250 D**	**48**	0.080 J	0.27 J	0.50 U	0.97	0.50 U	36	0.50 U	1.5 J	0.57 J	25,000
	8PS-D1	12-120	**23,000 D**	**790 D**	25 U	**8.5 JD**	**38 D**	**1,400 D**	25 U	**6,100 D**	25 U	7.2	32	300
	8PS-E1	12-123	**12,000 D**	**580 D**	13 U	**6.8 JD**	**2.5 JD**	**1,300 D**	13 U	**4,300 D**	13 U	4.9	10	1,300
	8PS-F1	12-124	**11,000 D**	**810 D**	13 U	**7.5 JD**	**25 D**	**1,100 D**	13 U	**2,100 D**	13 U	8.5	22	26
	8PS-G1	12-125	**4,800 D**	**710 D**	5.0 U	**7.3 D**	**7.4 D**	**580 D**	5.0 U	**1,200 D**	5.0 U	4.3	8.3	31
	8CB-MW26	12-126	**3,400 JD**	25 U	25 U	25 U	**13 JD**	**1,600 D**	25 U	**17,000 D**	25 U	1.1	6.6	11
	8CB-MW02	12-131	**14,000 D**	**91 Ui**	25 UJ	25 Ui	**13 JD**	**1,600 D**	25 U	**11,000 D**	25 U			
	8CB-MW17	12-132	**1,000 D**	10 Ui	10 UJ	10 U	10 U	**1,500 D**	10 U	**8,400 D**	10 U			
	8CB-MW18	12-133	**21,000 D**	25 Ui	25 UJ	25 U	25 U	**1,400 D**	25 U	**9,700 D**	25 U			
	8MW06	12-136	**19,000 D**	**510 D**	1.0 U	**9.9 DJ**	1.0 U	430 D	1.5 DJ	180 D	1.0 Ui	3.9	3.3	39
	8MW33	12-212	0.50 U	**32 J**	**2.5**	1.2	0.50 U	0.50 U	4.1	0.50 U	0.50 U	0.60 U	1.0 U	5.6
	8MW03	12-215	0.22 J	**6.5**	**0.60**	0.19 J	0.50 U	0.50 U	0.39 J	0.50 U	0.50 U	0.60 U	1.0 U	0.36 J

Expanded Volatile Organic Compounds List (Detected or Estimated Only): 1,1-Dichloroethane	cis-1,2-Dichloroethene	2-Butanone (MEK)	Chloroform	1,1,1-Trichloroethane	m,p-Xylenes	o-Xylene	Isopropylbenzene	n-Propylbenzene	1,3,5-Trimethylbenzene	tert-butylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	4-Isopropyltoluene
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table 7-2. Summary of VOC Results for OU 8 Pilot Study Phase II Baseline (continued)

Round	Well	Sample ID (OU8-Pilot-)	Benzene	DCA	DCE	DCP	EDB	Ethylbenzene	TCA	Toluene	Vinyl Chloride	Ethane	Ethene	Methane
			Volatile Organic Compounds											
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
			Groundwater Cleanup Level (CUL)											
			5	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*	*NA*	*NA*	*NA*
August 2012	8CB-MW01	12-139	0.19 J	**40**	**0.58**	0.50 U	0.50 U	0.050 J	0.74	0.43 J	0.50 U			
August 2012	8CB-MW08	12-140	**6.8**	0.47 J	0.14 J	0.22 J	0.50 U	1.9	0.46 J	17	0.50 U			
August 2012	8CB-MW08 (temp)	12-141	**240 JD**	**25**	0.50 U	1.4	0.50 U	21	0.50 U	100 D	0.50 U			
August 2012	8CB-MW25	12-142	0.080 J	**7.8**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.50 U			
August 2012	*8CB-MW25 (Dup)*	*12-143*	*0.080 J*	***7.8***	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.15 J*	*0.50 U*			
August 2012	29MW01	12-146	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 J	0.50 U			
August 2012	8MW29	12-147	0.23 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.26 J	0.50 U			

Well	Sample ID (OU8-Pilot-)	1,1-Dichloroethane	cis-1,2-Dichloroethene	2-Butanone (MEK)	Chloroform	1,1,1-Trichloroethane	m,p-Xylenes	o-Xylene	Isopropylbenzene	n-Propylbenzene	1,3,5-Trimethylbenzene	tert-butylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	4-Isopropyltoluene
		Expanded Volatile Organic Compounds List (Detected or Estimated Only)													
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
8CB-MW01	12-139	0.080 J	0.50 U	20 U	0.50 U	0.50 U	0.21 J	0.080 J	2.0 U	2.0 U	2.0 U	2.0 U	0.070 J	2.0 U	2.0 U
8CB-MW08	12-140	0.50 U	0.50 U	20 U	0.13 J	0.50 U	8.5	3.2	0.090 J	0.33 J	0.89 J	2.0 U	3.4	2.0 U	2.0 U
8CB-MW08 (temp)	12-141	0.50 U	0.015 J	7.7 J	0.14 J	0.50 U	32	14	1.3 J	2.4	2.6	0.20 J	8.8	0.38 J	0.080 J
8CB-MW25	12-142	6.1	0.14 J	20 U	0.50 U	0.50 U	0.12 J	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.070 J	2.0 U	2.0 U
8CB-MW25 (Dup)	*12-143*	*6.1*	*0.12 J*	*20 U*	*0.50 U*	*0.50 U*	*0.13 J*	*0.50 U*	*2.0 U*	*2.0 U*	*2.0 U*	*2.0 U*	*0.070 J*	*2.0 U*	*2.0 U*
29MW01	12-146	0.10 J	0.50 U	20 U	0.50 U	0.10 J	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
8MW29	12-147	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.14 J	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
Olive green highlighted cells indicate sample results from OU 8 Round 26 monitoring in April 2012. Sample ID prefix used was "OU8-12-".
1/ = For this analyte (CAS Registry No. 5103-74-2), USEPA has corrected the name to be beta-Chlordane, also known as trans-Chlordane.
B - The associated method blank contained the target analyte at trace concentration.
D - The result is reported from a diluted analysis.
i - The level of detection is elevated due to a matrix interference.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable
Bold - The detected value exceeds the cleanup level.

Abbreviations	Sampling Round	Dates
DCA - 1,2-Dichloroethane	April 2012 (Phase II Baseline)	April 26-30, 2012
DCE - 1,1-Dichloroethene	May 2012 (Phase II Baseline)	May 21-31, 2012
DCP - 1,2-Dichloropropane	Round 26	April 19-25, 2012
EDB - 1,2-Dibromoethane	August 2012 (Phase II Baseline)	August 14-20, 2012
TCA - 1,1,2-Trichloroethane		
MEK - methyl ethyl ketone		

Table 7-3. Summary of Inorganic Parameter Results for OU 8 Pilot Study Phase II Baseline

Round	Well	Sample ID (OU8-Pilot-)	Inorganic Parameters: Cations (Dissolved): Calcium µg/L	Manganese µg/L	Magnesium µg/L	Potassium µg/L	Sodium µg/L	Anions: Bicarbonate as $CaCO_3$ mg/L	Carbonate as $CaCO_3$ mg/L	Chloride mg/L	Nitrate as Nitrogen mg/L	Nitrite as Nitrogen mg/L	Sulfate mg/L	Alkalinity mg/L	Other: Carbon, organic (dissolved) mg/L
			NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
April - May 2012	8MW27	12-145													
	MW03	12-202		4,790						4.56	0.10 UJ	0.10 U	0.17 J	404	46.2
	8MW53	12-101		1,770						21.3	0.10 UJ	0.10 U	0.15 J	404	14.3
	8MW47	12-207		4,170						10.9	0.10 U	0.10 U	0.23 J	491	37.0
	8MW24	12-102		4,510						9.76	0.10 UJ	0.10 U	0.14 J	372	13.4
	MW05	12-103													
	8CB-MW23	12-129	51,600	5,640	22,500	1,960	13,300	248	9.0 U	6.58	0.44		2.88		2.32
	8CB-MW23 (temp)	12-130	77,100	3,330	42,400	2,170	13,200	379	2 U	3.79	0.10 U		3.39		2.26
	8CB-MW24	12-137	46,800	1,640	13,500	1,640	13,300	193	2.0 U	8.53	0.12		5.56		
	8CB-MW24 (temp)	12-138	58,200	1,620	20,500	1,320	9,810	238	9.0 U	3.10	0.10 UJ		7.13 J		
	8CB-MW28	12-127	99,700	6,110	43,200	1,900	13,000	423	9.0 U	8.31	0.10 UJ		4.34		13.7
	8CB-MW28 (Dup)	*12-128*	*101,000*	*6,280*	*42,700*	*1,900*	*12,900*	*427*	*9.0 U*	*8.32*	*0.10 UJ*		*4.3*		*13.5*
	8MW48	12-134		8,980						5.24	0.10 U	0.10 U	0.24 J	576	35.5
	8MW49	12-135		7,850						10.3	0.10 U		0.29 J		27.7
	8IW-1	12-104													159
	8IW-2	12-105													474
	8IW-3	12-106													196
	8IW-6	12-109													20.5
	8IW-7	12-110													6.9
	8PS-A1	12-111		11,100						9.91	0.10 UJ		0.24 J		97.5
	8PS-A3	12-112		18,200						9.50	0.10 UJ		0.32 J		125
	8PS-B1	12-113		12,200						11.3	0.10 UJ		0.20 J		126
	8PS-B1 (Dup)	*12-114*		*12,500*						*11.3*	*0.10 UJ*		*0.2 J*		*126*
	8PS-B2	12-115		18,100						7.8	0.10 UJ		0.28 J		46.4
	8PS-C1	12-116		8,810						45.0	0.10 UJ		3.8		29.0
	8PS-C2	12-117		7,110						13.7	0.10 UJ		1.85		34.2
	8PS-C3	12-118		17,900						9.14	0.10 UJ		0.42		90.4
	8PS-C4	12-119		8,160						13.7	0.10 UJ		0.69		9.7
	8PS-D1	12-120		9,400						34.5	0.10 UJ		0.91		32.4
	8PS-E1	12-123		6,620						26.2	0.10 UJ		7.5		21.1
	8PS-F1	12-124		6,470						24.8	0.10 UJ		13.8		12.3
	8PS-G1	12-125		9,520						49.5	0.10 U		11.8		14.8
	8CB-MW26	12-126	52,000	3,740	21,200	1,540	15,400	236	2.0 U	9.32	0.10 U		16.2		3.2
	8CB-MW02	12-131	98,700	10,600	37,300	1,950	15,300	409	9.0 U	16.1	0.10 UJ		1.26		
	8CB-MW17	12-132	45,500	2,610	29,500	1,630	8,830	232	2.0 U	8.77	0.10 U		4.01		
	8CB-MW18	12-133	117,000	7,190	66,300	2,420	29,500	598	2.0 U	14.1	0.10 U		0.37 J		
	8MW06	12-136		9,720						29.9	0.10 U	0.10 U	0.42	553	21.7
	8MW33	12-212		310						2.22	0.10 UJ	0.10 U	3.79	105	0.84
	8MW03	12-215		467						2.88	0.35	0.10 U	3.34	60.9	2.00

Table 7-3. Summary of Inorganic Parameter Results for OU 8 Pilot Study Phase II Baseline (continued)

Round	Well	Sample ID	Inorganic Parameters												Other
			Cations (Dissolved)					Anions							
			Calcium	Manganese	Magnesium	Potassium	Sodium	Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Carbon, organic (dissolved)
		Sample ID	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
August 2012	8CB-MW01	12-139	31,000	1,100	16,500	1,250	7,090	168	168	1.95	0.10 U		9.04		
	8CB-MW08	12-140	41,600	523	24,400	16,400	8,670	217	217	4.08	0.10 U		5.06		
	8CB-MW08 (temp)	12-141													
	8CB-MW25	12-142	56,200	675	41,500	2,020	34,200	379	379	13.1	0.09 J		8.85		
	8CB-MW25 (Dup)	*12-143*													
	29MW01	12-146													
	8MW29	12-147													

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
Olive green highlighted cells indicate sample results from OU 8 Round 26 monitoring in April 2012. Sample ID prefix used was "OU8-12-".
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable
Bold - The detected value exceeds the cleanup level.

Sampling Round	Dates
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012

Table 7-4. Summary of MBT and VFA Results for OU 8 Pilot Study by Round

Round	Well	Sample ID	Molecular Biological Tools				Volatile Fatty Acids									
			DHC		DHB		Lactate		Acetate	Propionate		Formate	Butyrate		Pyruvate	
		Sample ID	cells/mL		cells/mL		mg/L		mg/L	mg/L		mg/L	mg/L		mg/L	
	Well	(OU8-Pilot-)	*NA*		*NA*		*NA*		*NA*	*NA*		*NA*	*NA*		*NA*	
April - May 2012	8MW27	12-145														
	MW03	12-202														
	8MW53	12-101														
	8MW47	12-207														
	8MW24	12-102	3.00E-01	J	3.28E+03											
	MW05	12-103														
	8CB-MW23	12-129	5.00E-01	U	3.00E+00	U										
	8CB-MW23 (temp)	12-130														
	8CB-MW24	12-137														
	8CB-MW24 (temp)	12-138														
	8CB-MW28	12-127	6.00E-01	U	8.10E+00											
	8CB-MW28 (Dup)	*12-128*														
	8MW48	12-134	6.70E+01		3.90E+03											
	8MW49	12-135	2.26E+03		7.90E+03											
	8IW-1	12-104					0.39	U	287	37		1.3	25		2.2	
	8IW-2	12-105					0.39	U	437	175		0.76	89		7.6	
	8IW-3	12-106					0.39	U	334	21		0.96	38		2.6	
	8IW-6	12-109					0.39	U	12	0.31	U	1.8	0.41	U	0.69	U
	8IW-7	12-110					0.39	U	3.1	0.31	U	1.9	0.41	U	0.69	U
	8PS-A1	12-111	7.43E+01		1.23E+03		0.39	U	209	3.2		1.1	5.7		0.69	U
	8PS-A3	12-112	2.03E+01		2.61E+03		0.39	U	147	51		1.9	6.9		0.69	U
	8PS-B1	12-113	2.35E+02		9.27E+03		0.39	U	232	41		1.2	1.7		1.7	
	8PS-B1 (Dup)	*12-114*	*1.07E+02*		*5.70E+03*		*0.39*	*U*	*242*	*43*		*1.3*	*1.9*		*1.7*	
	8PS-B2	12-115	9.60E+00		8.38E+02		0.39	U	80	19		1.4	2.1		2.2	
	8PS-C1	12-116	1.11E+03		3.24E+03		0.78		15	0.31	U	2.2	0.57		0.69	U
	8PS-C2	12-117	1.99E+01		4.14E+03		0.39	U	84	0.98		1.8	0.41	U	0.69	U
	8PS-C3	12-118	1.28E+01		1.06E+04		0.39	U	208	20		1.0	3.1		0.69	U
	8PS-C4	12-119	1.76E+01		2.05E+03		0.39	U	10	0.41		1.9	0.41	U	0.69	U
	8PS-D1	12-120	6.05E+01		4.89E+03		0.52		13	26		1.6	0.41	U	0.69	U
	8PS-E1	12-123	1.07E+01		1.41E+01		0.39	U	3.4	0.31	U	1.9	0.41	U	0.69	U

Table 7-4. Summary of MBT and VFA Results for OU 8 Pilot Study by Round (continued)

Round	Well	Sample ID	Molecular Biological Tools		Volatile Fatty Acids					
			DHC	DHB	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
		Sample ID	cells/mL	cells/mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
April - May 2012	8PS-F1	12-124	2.00E-01 J	4.00E-01 J	0.39 U	3.5	0.31 U	2.2	0.42	0.69 U
	8PS-G1	12-125	1.28E+03	1.45E+03	0.40	2.9	0.78	1.7	0.41 U	0.69 U
	8CB-MW26	12-126								
	8CB-MW02	12-131								
	8CB-MW17	12-132	1.30E+00	3.11E+02						
	8CB-MW18	12-133	6.90E+00	7.31E+01						
	8MW06	12-136	2.80E+00	1.16E+03						
	8MW33	12-212								
	8MW03	12-215								
August 2012	8CB-MW01	12-139								
	8CB-MW08	12-140								
	8CB-MW08 (temp)	12-141								
	8CB-MW25	12-142								
	8CB-MW25 (Dup)	*12-143*								
	29MW01	12-146								
	8MW29	12-147								

Notes:
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
(Dup) - Indicates field duplicate sample
DHB - Dehalobacter spp.
DHC - Dehalococcoides spp.
NA - Not applicable

Sampling Round	
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012

Table 7-5. Summary of Pesticide Results for OU 8 Pilot Study Phase II Baseline

Round	Well	Sample ID (OU8-Pilot-)	alpha-BHC	beta-BHC	gamma-BHC (Lindane)	delta-BHC	Heptachlor	Aldrin	Heptachlor Epoxide	gamma- Chlordane [1/]	Endosulfan I	alpha- Chlordane	Dieldrin	4,4'-DDE	Endrin	Endosulfan II	4,4'-DDD	Endrin Aldehyde	Endosulfan Sulfate	4,4'-DDT	Endrin Ketone	Methoxychlor	Toxaphene	2,4'-DDE	2,4'-DDD	2,4'-DDT
			Pesticides																							
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
			NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
August 2012	8CB-MW01	12-139																								
	8CB-MW08	12-140	0.99 Ui	1.0 U	0.51 J	0.99 Ui	0.99 Ui	0.99 U	1.0 U	0.99 U	0.99 U	0.99 U	0.99 U	0.99 U	0.99 U	1.2 U	0.99 U	0.99 U	1.0 U	0.99 U	0.64 JP	0.99 U	64 Ui	1.4 Ui	0.99 U	0.99 U
	8CB-MW08 (temp)	12-141																								
	8CB-MW25	12-142	1.0 Ui	1.0 Ui	1.0 Ui	1.0 Ui	1.0 U	1.7 Ui	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 Ui	1.0 U	1.0 Ui	1.0 U	1.0 U	73 Ui	1.0 Ui	1.0 U	1.0 U
	8CB-MW25 (Dup)	*12-143*	*1.0 Ui*	*1.1 Ui*	*1.0 Ui*	*1.0 U*	*1.0 U*	*1.6 Ui*	*1.0 U*	*1.0 U*	*1.0 U*	*1.0 U*	*1.0 U*	*1.0 U*	*1.0 U*	*1.0 Ui*	*1.0 U*	*1.0 Ui*	*1.0 U*	*1.0 Ui*	*1.0 Ui*	*1.0 U*	*54 Ui*	*1.0 Ui*	*1.0 U*	*1.0 U*
	29MW01	12-146	0.32 J	1.0 U	1.0 Ui	1.0 Ui	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 Ui	1.0 Ui	1.0 Ui	1.0 U	1.0 Ui	1.0 U	1.0 U	1.0 U	1.0 U	69 Ui	1.0 U	1.0 U	1.0 U
	8MW29	12-147	1.0 U	1.0 U	1.0 Ui	1.0 Ui	1.0 Ui	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 Ui	1.0 U	1.0 U	1.0 U	1.0 U	83 Ui	3.5 Ui	1.0 U	1.0 U

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
1/ = For this analyte (CAS Registry No. 5103-74-2), USEPA has corrected the name to be beta-Chlordane, also known as trans-Chlordane.
i - The level of detection is elevated due to a matrix interference.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable
Bold - The detected value exceeds the cleanup level.

Sampling Round	Dates
August 2012	August 14-20, 2012

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round

Round	Monitoring Location	Sample Date[1/]	Area[2/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen[3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	Eh (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
April - August 2012	8MW47	4/19/2012	PWIA	19.4	6.54	0.995	16.4	0.0	0.939	-74	>3.30[5/]	0.15	27.85
	8MW48	4/19/2012	PWIA	14.9	6.24	1.17	0.0	0.0	0.564	-58	>3.30[5/]	0.04	27.18
	8MW27	5/31/12	PWIA	16.5	6.92	0.361	0	1.07	NA	182	0.00	0.01	26.66
	8CB-MW17	6/6/12	PWIA	18.6	6.83	0.502	3.9	1.23	NA	-22	0.00	0.02	27.68
	8CB-MW18	6/6/12	PWIA	19.7	6.53	1.150	10.2	1.32	NA	-51	0.59	0.11	28.17
	8MW53	5/30/12	PWIA	28.8	6.67	0.735	8	1.21	NA	-97	0.65	0.02	27.59
	8CB-MW08	8/20/12	PWIA	23.5	6.64	0.509	19.5	0.00	0.383	-374	0.00	0.03	28.98
	8CB-MW08 Temp at 50'	8/14/12	PWIA	25.4	6.56	0.93	>1000	0.00	0.583	-104	0.55	0.61	31.70
	8MW24	5/30/12	PWIA	20.9	6.57	0.704	10	1.49	NA	-47	1.02	0.02	27.92
	8CB-MW25	8/20/12	PWIA	17.0	6.57	0.821	19.3	0.00	0.486	-401	0.00	0.03	27.95
	29MW01	8/20/12	PWIA	17.6	6.02	0.400	27.3	0.00	0.685	176	0.00	0.04	27.05
	8MW29	8/20/12	PWIA	16.4	6.59	0.629	28.7	0.00	0.79	56	0.00	0.02	26.96
	8CB-MW23	5/30/12	PWIA	20.6	6.18	0.501	10	1.32	NA	-121	0.06	0.01	27.81
	8CB-MW23 Temp at 45'	5/21/12	PWIA	20.1	8.17	0.260	261	4.90	0.442	51	0.00	0.09	27.88
	8CB-MW24	6/5/12	PWIA	21.3	5.91	0.423	19.9	1.54	NA	-210	0.00	0.03	27.95
	8CB-MW24 Temp at 44'	5/22/12	PWIA	18.2	7.84	0.200	854	6.19	>1.1[7/]	84	0.01	>0.80[6/]	28.12
	MW05	5/31/12	PWIA	15.5	6.18	0.759	0	0.83	0.443	-68	>3.30[5/]	0.01	27.54
	8MW48	4/26/12	PWIA	14.5	6.44	1.14	0.5	0.00	0.406	-72	>3.30[5/]	0.02	26.90
	8CB-MW28	6/4/12	PWIA	17.3	6.35	0.858	6	1.33	NA	-137	0.26	0.07	27.93
	8IW-1	4/26/12	PWIA	15.72	5.20	0.865	23.2	0.88	0.669	70	>3.30[5/]	0.05	27.42
	8IW-2	4/26/12	PWIA	16.75	5.39	1.26	25.5	0.82	0.599	87	>3.30[5/]	0.01	27.28
	8IW-3	4/26/12	PWIA	17.93	5.92	0.915	42	7.68	NM	-26	>3.30[5/]	0.05	26.68
	8IW-6	4/26/12	PWIA	16.2	7.84	0.105	19	6.51	NM	31	0.07	0.00	27.14
	8IW-7	4/26/12	PWIA	15.8	7.76	0.114	0	3.39	NM	36	0.01	0.01	26.20
	8PS-A1	4/30/12	PWIA	16.15	6.34	1.19	44.7	1.02	NM	5	>3.30[5/]	0.02	27.25
	8PS-A3	4/30/12	PWIA	15.5	7.63	0.156	41	1.97	NM	-81	>3.30[5/]	0.04	27.22
	8PS-B1	4/30/12	PWIA	15.67	6.54	1.73	30.2	1.00	NM	-14	>3.30[5/]	0.00	27.30
	8PS-B2	4/30/12	PWIA	15.7	7.47	0.190	28	2.14	NM	-57	>3.30[5/]	0.02	27.29
	8PS-C1	5/1/12	PWIA	16.1	7.59	0.128	4	2.41	NM	-52	1.77	0.01	27.72
	8PS-C3	5/1/12	PWIA	15.1	6.53	2.00	9.3	0.00	0.645	-56	2.62	0.03	27.42
	8PS-C2	5/1/12	PWIA	16.8	7.93	0.147	0	1.07	NM	-94	1.83	0.00	27.39
	8PS-C4	5/1/12	PWIA	15.1	6.50	1.09	78.6	0.00	0.325	-57	1.99	0.03	27.14
	8PS-D1	4/30/12	PWIA	17.4	6.54	1.11	0	0.00	0.767	-98	2.09	0.04	27.20
	8PS-E1	4/30/12	PWIA	16.7	6.56	1.14	2.9	0.00	1.068	-26	0.25	0.06	26.85
	8PS-F1	4/30/12	PWIA	16.8	6.70	1.22	5.1	0.00	0.282	-452	0.13	0.01	26.51
	8PS-G1	4/26/12	PWIA	17.3	6.56	1.37	27.9	0.00	0.612	-33	0.05	0.01	27.30
	8MW49	4/26/12	PWIA	16.1	6.46	1.07	46.3	0.00	0.572	-40	2.75	0.17	27.45
	8CB-MW26	6/5/12	PWIA	17.2	6.32	0.527	4.5	2.18	NM	-9	0.00	0.04	25.94
	8MW33	4/25/2012	PWIA	11.5	6.81	0.237	5.5	0.0	0.37	-17	0.00	0.00	25.29
	8MW06	4/19/2012	PWIA	13.8	6.02	1.17	0.0	0.0	0.797	-87	>3.30[5/]	0.01	27.43
	8MW06	6/5/12	PWIA	15.6	6.40	1.02	0	2.05	NM	-179	>3.30[5/]	0.06	27.95
	8CB-MW02	6/4/12	PWIA	17.9	6.09	0.853	10.7	1.44	NM	-151	0.58	0.03	27.56
	8CB-MW01	8/20/12	PWIA	17.8	6.87	0.386	29.9	0.00	0.451	-339	0.00	0.03	27.93
	8MW03	4/19/2012	SBB	9.7	6.85	0.151	0.0	0.0	0.300	67	0.00	0.00	13.00

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round

Round	Monitoring Location	Sample Date[1/]	Area[2/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen[3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	Eh (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
September/October 2012	8MW47	10/16/2012	PWIA	22.11	6.70	1.01	0.00	0.36	0.631	-113	3.23	0.06	29.91
	MW05	10/16/2012	PWIA	16.94	6.55	0.789	8	0.15	0.496	-82	3.30 [5/]	0.01	29.26
	8MW48	10/17/2012	PWIA	15.69	6.76	1.22	0.00	0.00	0.327	-91	3.30 [5/]	0.02	29.32
	8PS-A1	9/6/12	PWIA	19.0	6.05	1.15	7.8	0.00	0.323	-50	>3.30[5/]	0.02	29.11
	8PS-A3	9/6/12	PWIA	16.9	6.12	1.33	8.4	0.00	0.490	-75	>3.30[5/]	0.06	29.08
	8PS-B1	9/5/12	PWIA	19.0	6.51	1.55	15.2	0.00	0.474	-76	>3.30[5/]	0.00	29.09
	8PS-B2	9/5/12	PWIA	17.0	6.33	1.62	7.6	0.00	0.559	-61	2.83	0.00	29.09
	8PS-C1	9/5/12	PWIA	17.4	6.56	1.35	25.1	0.00	0.551	-76	1.94	0.01	29.09
	8PS-C2	9/5/12	PWIA	19.2	6.71	1.42	1.0	0.00	0.968	-152	1.87	0.16	29.14
	8PS-C3	9/4/12	PWIA	20.0	6.71	1.98	0	0.00	0.462	-79	>3.30[5/]	0.01	29.10
	8PS-D1	9/4/12	PWIA	18.8	6.75	1.34	0	0.00	0.393	-137	2.76	0.01	29.01
	8PS-E1	9/6/12	PWIA	17.9	5.27	2.14	>1000	0.00	0.239	-18	>3.30[5/]	0.80	28.67
	8PS-F1	9/4/12	PWIA	19.3	6.80	1.73	14.3	0.00	0.939	-182	3.10	0.08	29.34
	8PS-G1	9/4/12	PWIA	18.9	6.63	1.52	0.7	0.00	0.811	-161	1.97	0.02	29.02
	8MW06	10/17/2012	PWIA	14.80	6.57	1.13	0.00	0.00	0.477	-74	2.40	0.00	29.79
	8MW33	10/17/2012	PWIA	12.55	7.12	0.368	0.00	0.00	0.376	-8	0.00	0.00	27.89
	8MW03	10/18/2012	SBB	11.13	6.87	0.160	0.00	0.00	0.374	-10	0.00	0.01	15.73
December 2012	8PS-A1	12/5/12	PWIA	17.7	6.41	1.31	50.5	1.98	NM	-47	>3.30[5/]	0.07	28.32
	8PS-A3	12/3/12	PWIA	15.5	6.56	1.40	9.5	0.89	0.161	-64	>3.30[5/]	0.01	28.50
	8PS-B1	12/5/12	PWIA	18.0	6.72	1.47	52	2.25	NM	-74	>3.30[5/]	0.02	28.35
	8PS-B2	12/3/12	PWIA	16.7	6.76	1.54	0	0.74	0.342	-59	>3.30[5/]	0.01	28.55
	8PS-C1	12/5/12	PWIA	15.8	6.71	1.39	10.4	1.55	NM	-67	2.89	0.06	28.36
	8PS-C2	12/4/12	PWIA	16.7	6.84	1.42	1.1	1.34	0.286	-102	2.98	0.11	28.36
	8PS-C3	12/3/12	PWIA	15.9	6.84	1.70	0	0.17	0.140	-73	>3.30[5/]	0.01	28.57
	8PS-D1	12/5/12	PWIA	16.1	6.79	1.25	9.7	2.43	NM	-68	2.80	0.04	28.23
	8PS-E1	12/4/12	PWIA	17.4	5.54	1.93	242	1.94	0.142	22	>3.30[5/]	0.07	27.94
	8PS-F1	12/4/12	PWIA	18.0	6.88	1.78	152	1.70	0.607	-119	>3.30[5/]	0.15	27.58
	8PS-G1	12/4/12	PWIA	17.0	6.75	1.56	242	1.39	0.370	-90	>3.30[5/]	0.01	28.12
March/April 2013	8MW47	4/15/2013	PWIA	21.84	7.01	0.96	0.40	0	0.450	-118	>3.30[5/]	0.14	27.28
	8MW48	4/16/2013	PWIA	15.45	7.05	1.24	3.30	0.00	0.356	-95	>3.30[5/]	0.08	26.60
	8CB-MW17	3/7/13	PWIA	18.6	7.12	0.566	14	1.40	0.487	-32	0.55	0.10	26.71
	8CB-MW18	3/11/13	PWIA	17.83	6.44	1.14	0	2.29	0.380	-86	2.55	0.01	27.29
	8CB-MW23	3/7/13	PWIA	19.7	6.54	0.606	20	3.41	0.719	1.54	1.30	0.03	26.84
	8CB-MW24	3/7/13	PWIA	18.1	6.40	0.489	27	2.33	0.563	-72	0.00	0.03	26.89
	8MW48	3/8/13	PWIA	14.56	6.21	1.16	9	2.09	0.499	-93	>3.30[5/]	0.05	26.51
	8CB-MW28	3/11/13	PWIA	16.49	6.35	0.906	0	1.64	0.365	-118	2.06	0.10	27.16
	8PS-A1	3/12/13	PWIA	15.5	6.30	1.27	42	1.75	0.343	-45	>3.30[5/]	0.01	26.87
	8PS-A3	3/8/13	PWIA	15.1	6.37	1.31	25	1.08	0.238	-18	>3.30[5/]	0.02	27.05
	8PS-B1	3/12/13	PWIA	15.6	6.49	1.36	44	1.45	0.441	-125	>3.30[5/]	0.08	26.89
	8PS-B2	3/6/13	PWIA	16.3	6.69	1.46	85	4.12	0.398	32	>3.30[5/]	0.03	26.78
	8PS-C1	3/8/13	PWIA	15.2	6.66	1.35	10	1.15	0.477	-17	2.41	0.01	26.92
	8PS-C2	3/6/13	PWIA	16.0	6.94	1.23	6	2.14	0.309	19	1.71	0.09	26.81
	8PS-C3	3/6/13	PWIA	15.5	6.74	1.29	20	3.71	0.353	88	>3.30[5/]	0.03	26.75

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round

Round	Monitoring Location	Sample Date[1/]	Area[2/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen[3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	Eh (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
March/April 2013 (Cont.)	8PS-C4	3/8/13	PWIA	15.2	6.62	0.912	32	0.88	0.970	-117	3.08	0.07	26.62
	8PS-D1	3/12/13	PWIA	16.47	6.24	1.19	2	1.70	0.838	-109	2.81	0.15	26.79
	8PS-E1	3/11/13	PWIA	15.6	5.53	1.88	15	1.69	0.383	13	>3.30[5/]	0.05	26.86
	8PS-F1	3/11/13	PWIA	15.4	6.60	1.71	31	1.65	0.354	-115	>3.30[5/]	0.06	26.18
	8PS-G1	3/8/13	PWIA	14.8	6.64	1.58	15	1.21	0.597	-95	>3.30[5/]	0.01	26.84
	8MW49	3/12/13	PWIA	16.27	6.04	1.09	0	2.00	0.385	-90	2.53	0.12	26.95
	8CB-MW26	3/11/13	PWIA	17.59	5.99	0.694	18	1.89	0.521	-44	0.12	0.11	25.26
	8MW06	3/8/13	PWIA	14.21	6.26	1.17	40	1.70	0.712	-89	2.34	0.00	26.91
	8MW06	4/17/2013	PWIA	11.39	7.25	0.20	2.50	0.00	0.760	6	0.00	0.01	24.94
	8MW33	4/16/2013	PWIA	14.63	6.90	1.260	9.10	0.00	0.666	-74	3.25	0.01	26.96
	8CB-MW02	3/7/13	PWIA	16.5	6.56	0.814	42	1.78	0.534	-80	1.20	0.07	26.56
	8MW03	4/18/2013	BB	9.89	6.74	0.167	7.90	0.00	0.937	78	0.00	0.00	12.82

Notes:

[1/] Well installation and subsequent baseline monitoring occurred over several months

[2/] PWIA – Public Works industrial Area, SBB – Southern Base Boundary, MVR – Mountain View Road.

[3/] DO measured in the field using the Horiba. The meter values suggest results may not have been accurate under site conditions, so all wells in March 2013 had DO measured by Hach test kits.

[4/] DO measured in the field using the Hach DR-850 colorimeter method typically applied when the Horiba reading was ≤ 1mg/L. However, the test kits were used for all wells and considered more accurate for site conditions.

[5/] Result exceeded the maximum value of 3.3 mg/L for the Hach DR850/8146 test kit.

[6/] Result exceeded the maximum value of 0.8 mg/L. Emulsified vegetable oil visible in well at time of sampling. Test kit did not change to indicator color. Sample water was white.

[7/] Result exceeded the test kit maximum value of 1.1 mg/L.

Olive green highlighted cells indicate sample results from OU 8 MNA Rounds 26, 27, and 28.

Temp - Samples collected from temporary wells installed during well drilling and prior to installation of permanent wells.

mg/L – milligrams per liter
mS/cm – milliSiemens per centimeter
mV – millivolt
NA – Not Analyzed
NTU – nephelometric turbidity unit
NM – Not Measured
pH – acidity based on hydrogen ion activity
Eh – redox potential

Sampling Round	Dates
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012
September 2012	September 4-6, 2012
Round 27	October 16-23, 2012
December 2012	December 3-5, 2012
March 2013	March 6-12, 2013
Round 28	April 15-18, 2013

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID (OU8-Pilot-)	Volatile Organic Compounds[1/]											
			Benzene	DCA	DCE	DCP	EDB	Ethylbenzene	TCA	Toluene	Vinyl Chloride	Ethane	Ethene	Methane
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
			Groundwater Cleanup Level (CUL)											
			5	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*	*NA*	*NA*	*NA*
April - August 2012 (Phase II Baseline)	8MW27	12-145	0.11 J	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U	0.54 UJ	0.50 U			
	MW03	12-202										0.3 J	0.11 J	5,100 B
	8MW53	12-101	**320 JD**	2.5 Ui,J	2.5 U	2.5 U	2.5 U	**1,000 D**	2.5 U	280 D	2.5 U	2.5	0.43 J	3,000 B
	8MW47	12-207	**2,500 D**	11 Ui	1.0 U	1.0 U	1.0 U	590 D	1.0 U	**7,200 D**	1.0 U	1.7	3.3	1,700
	8MW24	12-102	**1,000 D**	12 Ui,J	2.5 U	2.5 U	2.5 U	**1,900 D**	2.5 U	**2,400 D**	2.5 U	6.7	1.1	380 B
	MW05	12-103	**16,000 JD**	**270 JD**	25 U	**7 JD**	25 U	870 D	25 U	**13,000 D**	25 U			
	8CB-MW23	12-129	27 J	1.3 UJ	0.50 UJ	0.50 UJ	0.50 UJ	190 D	0.50 UJ	68 D	0.50 UJ	0.52 J	0.47 J	190
	8CB-MW23 (temp)	12-130	0.95	2.1 J	0.50 U	0.50 UJ	0.50 U	1.9	0.50 U	0.93	0.50 U	0.60	0.22 J	150
	8CB-MW24	12-137	1.2	2.7 J	0.50 U	0.50 U	0.50 U	0.58	0.50 U	4.4	0.50 U			
	8CB-MW24 (temp)	12-138	0.070 J	2.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U			
	8CB-MW28	12-127	**25,000 J**	**620 D**	25 UJ	**10 JD**	**110 D**	**1,600 D**	25 U	**22,000 JD**	25 U	3.6	13	5,300
	8CB-MW28 (Dup)	*12-128*												
	8MW48	12-134	**10,000 D**	40 Ui	10 U	3.2 JD	10 U	**1,600 D**	10 U	**9,400 D**	10 U	3.0	4.6	2,000
	8MW49	12-135	**5,700 D**	35 Ui	10 U	10 Ui	10 U	**910 D**	10 U	**7,600 D**	10 U	0.79	3.3	110
	8IW-1	12-104												
	8IW-2	12-105												
	8IW-3	12-106												
	8IW-6	12-109												
	8IW-7	12-110												
	8PS-A1	12-111	**25,000 D**	**790 D**	25 U	**10 JD**	25 U	**1,900 D**	25 U	**21,000 D**	25 U	2.7	11	13,000
	8PS-A3	12-112	**930 D**	**32**	0.50 U	0.50 U	0.50 U	5.3	0.50 U	120 D	0.50 U	0.93	0.17 J	20,000
	8PS-B1	12-113	**23,000 D**	**870 D**	25 U	**8.5 JD**	25 U	**1,100 D**	25 U	**11,000 D**	25 U	4.4	19	8,100
	8PS-B1 (Dup)	*12-114*	***23,000 D***	***880 D***	*25 U*	***9.0 JD***	*25 U*	***1,000 D***	*25 U*	***11,000 D***	*25 U*	*4.4*	*19*	*8,200*
	8PS-B2	12-115	**430 D**	**110 D**	0.50 U	0.50 Ui	0.50 U	9.6	0.50 U	120 D	0.50 U	0.78	0.40 J	16,000
	8PS-C1	12-116	**20,000 D**	**1,300 D**	25 U	**10 JD**	25 U	**1,400 D**	25 U	**1,100 D**	25 U	5.0	25	9,800
	8PS-C2	12-117	**3,000 D**	**1,100 D**	5.0 U	**6.0 D**	5.0 U	200 D	5.0 U	420 D	5.0 U	6.7	5.4	6,400
	8PS-C3	12-118	**250 D**	**190 D**	0.50 U	0.49 J	0.50 U	2.5	0.50 U	58	0.50 U	1.8	0.80 J	19,000
	8PS-C4	12-119	**250 D**	**48**	0.080 J	0.27 J	0.50 U	0.97	0.50 U	36	0.50 U	1.5 J	0.57 J	25,000
	8PS-D1	12-120	**23,000 D**	**790 D**	25 U	**8.5 JD**	**38 D**	**1,400 D**	25 U	**6,100 D**	25 U	7.2	32	300
	8PS-E1	12-123	**12,000 D**	**580 D**	13 U	**6.8 JD**	**2.5 JD**	**1,300 D**	13 U	**4,300 D**	13 U	4.9	10	1,300
	8PS-F1	12-124	**11,000 D**	**810 D**	13 U	**7.5 JD**	**25 D**	**1,100 D**	13 U	**2,100 D**	13 U	8.5	22	26
	8PS-G1	12-125	**4,800 D**	**710 D**	5.0 U	**7.3 D**	**7.4 D**	580 D	5.0 U	**1,200 D**	5.0 U	4.3	8.3	31
	8CB-MW26	12-126	**3,400 JD**	25 U	25 U	25 U	**13 JD**	**1,600 D**	25 U	**17,000 D**	25 U	1.1	6.6	11
	8CB-MW02	12-131	**14,000 D**	**91 Ui**	25 UJ	25 Ui	**13 JD**	**1,600 D**	25 U	**11,000 D**	25 U			
	8CB-MW17	12-132	**1,000 D**	10 Ui	10 UJ	10 U	10 U	**1,500 D**	10 U	**8,400 D**	10 U			
	8CB-MW18	12-133	**21,000 D**	25 Ui	25 UJ	25 U	25 U	**1,400 D**	25 U	**9,700 D**	25 U			
	8MW06	12-136	**19,000 D**	**510 D**	1.0 U	**9.9 DJ**	1.0 U	430 D	1.5 DJ	180 D	1.0 Ui	3.9	3.3	39
	8MW33	12-212	0.50 U	**32 J**	**2.5**	1.2	0.50 U	0.50 U	4.1	0.50 U	0.50 U	0.60 U	1.0 U	5.6
	8MW03	12-215	0.22 J	**6.5**	**0.60**	0.19 J	0.50 U	0.50 U	0.39 J	0.50 U	0.50 U	0.60 U	1.0 U	0.36 J
	8CB-MW01	12-139	0.19 J	**40**	**0.58**	0.50 U	0.50 U	0.050 J	0.74	0.43 J	0.50 U			
	8CB-MW08	12-140	**6.8**	0.47 J	0.14 J	0.22 J	0.50 U	1.9	0.46 J	17	0.50 U			
	8CB-MW08 (temp)	12-141	**240 JD**	**25**	0.50 U	1.4	0.50 U	21	0.50 U	100 D	0.50 U			

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID (OU8-Pilot-)	Benzene μg/L	DCA μg/L	DCE μg/L	DCP μg/L	EDB μg/L	Ethylbenzene μg/L	TCA μg/L	Toluene μg/L	Vinyl Chloride μg/L	Ethane μg/L	Ethene μg/L	Methane μg/L
		Groundwater Cleanup Level (CUL)	*5*	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*	*NA*	*NA*	*NA*
	8CB-MW25	12-142	0.080 J	**7.8**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.50 U			
	8CB-MW25 (Dup)	*12-143*	*0.080 J*	***7.8***	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.15 J*	*0.50 U*			
	29MW01	12-146	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 J	0.50 U			
	8MW29	12-147	0.23 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.26 J	0.50 U			
September 2012	8PS-A1	12-201	**12,000 D**	**530 D**	25 U	25 U	25 U	**890 D**	25 U	**9,700 D**	25 U	1.8	12 B,L	16,000 B
September 2012	*8PS-A1 (Dup)*	*12-202*	***11,000 D***	***520 D***	*25 U*	*25 U*	*25 U*	***860 D***	*25 U*	***8,600 D***	*25 U*	*1.9*	*11 B,L*	*17,000 B*
September 2012	8PS-A3	12-203	**490 D**	**46 D**	1.3 U	1.3 U	1.3 U	13 D	1.3 U	95 D	1.3 U	0.98	1.0 U	18,000 B
September 2012	8PS-B1	12-204	**16,000 D**	**440 D**	25 U	5.0 JD	25 U	**730 D**	25 U	**8,900 D**	25 U	5.4	16 B,L	13,000 B
September 2012	8PS-B2	12-205	**1,100 D**	**120 D**	2.5 U	2.5 U	2.5 U	29 D	2.5 U	120 D	2.5 U	1.5	0.93 J,B,L	15,000 B
September 2012	8PS-C1	12-206	**17,000 D**	**560 D**	25 U	**6.5 JD**	25 U	**1,100 D**	25 U	**6,100 D**	25 U	4.2	18 B,L	10,000 B
September 2012	8PS-C2	12-207	**1,100 D**	**370 D**	2.5 U	**2.0 JD**	2.5 U	62 D	2.5 U	220 D	2.5 U	2.6	2.2 B,L	7,800 B
September 2012	8PS-C3	12-208	**370 D**	**84 D**	0.50 U	0.11 J	0.50 U	5.0	0.50 U	75 D	0.50 U	0.60 J	1.0 UJ	16,000 B
September 2012	8PS-D1	12-209	**16,000 D**	**650 D**	25 U	**7.0 JD**	**9.5 JD**	**960 D**	25 U	**3,100 D**	25 U	6.5	25 B,L	4,300 B
September 2012	8PS-E1	12-210	**640 D**	**150 D**	1.3 U	1.0 JD	1.3 U	20 D	1.3 U	360 D	1.3 U	5.3	4.7 B,L	12,000 B
September 2012	8PS-F1	12-211	**7,800 D**	**310 D**	13 U	3.8 JD	**3.5 JD**	**740 D**	13 U	**2,600 D**	13 U	8.9	28 B,L	4,300 B
September 2012	8PS-G1	12-212	**11,000 D**	**340 D**	25 U	**5.5 JD**	**22 JD**	**940 D**	25 U	**5,100 D**	25 U	4.4	17 B,L	1,100 B
September 2012	8MW47	12-406	**6,400 D**	**21 D**	10 U	10 U	10 U	**1,200 D**	10 U	**5,300 D**	10 U	7.8	26	2,100
September 2012	MW05	12-408	**14,000 D**	**210 D**	25 U	**5.5 U**	25 U	**1,000 D**	25 U	**11,000 D**	25 U	3.8	27	1,500
September 2012	*MW05 (Dup)*	*12-409*	**15,000 D**	**230 D**	25 U	**6 JD**	25 U	**1,100 D**	25 U	**12,000 D**	25 U	3.1	23	1,400
September 2012	8MW48	12-410	**6,300 D**	10 U	10 U	10 U	10 U	**1,700** D	10 U	**7,900 D**	10 U	3.8	6.7	7,200
September 2012	8MW06	12-411	**13,000 D**	**810 DJ**	13 U	**9.3 JD**	13 U	**710 D**	13 U	350 D	13 U	8.6	22	51
September 2012	8MW33	12-413	0.50 U	**40**	**3.8**	1.6	0.50 U	0.50 U	**5.5**	0.50 U	0.50 U	0.18 J	1.0 U	6.0
September 2012	8MW03	12-415	0.50 U	4.2	0.37	0.10 J	0.50 U	0.50 U	0.22 J	0.50 U	0.50 U	0.60 U	1.0 U	2.9
December 2012	8PS-A1	12-301	**10,000 D**	**32 D**	25 U	25 U	25 U	**890 D**	25 U	**9,100 D**	25 U	0.64	13	16,000
December 2012	8PS-A3	12-302	**16,000 JD**	**30 D**	1.3 U	1.3 U	1.3 U	10 D	1.3 U	64 D	1.3 U	0.83 J	0.31 J	17,000
December 2012	8PS-B1	12-303	**13,000 D**	**140 D**	25 U	25 U	25 U	**730 D**	25 U	**8,600 D**	25 U	2.4	65	16,000
December 2012	8PS-B2	12-304	**890 D**	**110 D**	2.5 U	2.5 U	2.5 U	30 D	2.5 U	130 D	2.5 U	1.3	0.80 J	15,000
December 2012	8PS-C1	12-305	**16,000 D**	**640 D**	25 U	**6.0 JD**	25 U	**1,300 D**	25 U	**5,100 D**	25 U	4.3	28	13,000
December 2012	8PS-C2	12-306	**1,200 D**	**140 D**	2.5 U	2.5 U	2.5 U	64 D	2.5 U	200 D	2.5 U	3.2	76	12,000
December 2012	8PS-C3	12-307	**270 D**	**66**	0.50 U	0.50 U	0.50 U	3.9	0.50 U	78	0.50 U	0.75	0.40 J	18,000
December 2012	8PS-D1	12-308	**19,000 D**	**800 D**	25 U	**7.5 JD**	25 U	**1,200 D**	25 U	**6,000 D**	25 U	7.0	37	4,500
December 2012	8PS-E1	12-309	**790 D**	**120 D**	1.3 U	0.85 JD	1.3 U	14 D	1.3 U	310 D	1.3 U	4.1	5.4	13,000
December 2012	8PS-F1	12-310	**7,300 D**	**400 D**	13 U	13 U	13 U	**760 D**	13 U	**2,800 D**	13 U	5.9	18	10,000
December 2012	*8PS-F1 (Dup)*	*12-311*	***7,300 D***	***380 D***	*13 U*	*2.5 JD*	*13 U*	***770 D***	*13 U*	***2,800 D***	*13 U*	*7.7*	*23*	*10,000*
December 2012	8PS-G1	12-312	**10,000 D**	**390 D**	25 U	25 U	25 U	**1100 D**	25 U	**5,800 D**	25 U	4.8	19	6,900
March 2013	8PS-A1	13-101	**14,000 D**	**31 D**	25 U	25 U	25 U	**990 D**	25 U	**12,000 D**	25 U	0.71	8.6	15,000
March 2013	*8PS-A1 (Dup)*	*13-125*												
March 2013	8PS-A3	13-102	**840 D**	**32 D**	1.0 U	1.0 U	1.0 U	15 D	1.0 U	50 D	1.0 U	0.98	1.9	18,000
March 2013	8PS-B1	13-103	**15,000 DJ**	**140 D**	25 U	25 U	25 U	**830 D**	25 U	**10,000 D**	25 U	2.5	71	14,000
March 2013	8PS-B2	13-104	**1,300 D**	**97 D**	2.5 U	2.5 U	2.5 U	37 D	2.5 U	130 D	2.5 U	1.5	16	16,000
March 2013	8PS-C1	13-105	**16,000 D**	**520 D**	25 U	**6.5 JD**	25 U	**1,300 D**	25 U	**2,800 D**	25 U	2.7	51	12,000
March 2013	8PS-C2	13-106	**1,900 D**	**570 D**	5.0 U	3.4 JD	5.0 U	97 D	5.0 U	330 D	5.0 U	3.9	88	14,000
March 2013	8PS-C3	13-107	**510 DJ**	**140 DJ**	0.50 U	0.37 J	0.50 U	6.3	0.50 U	71	0.50 U	1.2	8.2	19,000

Volatile Organic Compounds[1/]

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID (OU8-Pilot-)	Benzene µg/L	DCA µg/L	DCE µg/L	DCP µg/L	EDB µg/L	Ethylbenzene µg/L	TCA µg/L	Toluene µg/L	Vinyl Chloride µg/L	Ethane µg/L	Ethene µg/L	Methane µg/L
		Groundwater Cleanup Level (CUL)	*5*	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*	*NA*	*NA*	*NA*
March 2013	8PS-C4	13-108	**68 D**	**16**	0.50 U	0.27 J	0.50 U	0.55	0.50 U	0.58	0.50 U	1.3	0.22 J	8,300
	8PS-D1	13-109	**21,000 D**	**880 D**	50 U	**10 JD**	50 U	**1,500 D**	50 U	**9,900 D**	50 U	9.0	46	3,600
	8PS-D1 (Dup)	*13-112*	**20,000 D**	**880 D**	50 U	**10 JD**	50 U	**1,400 D**	50 U	**9,500 D**	50 U	7.4	39	3,500
	8PS-E1	13-110	**790 JD**	**130 D**	2.5 U	1.1 JD	2.5 U	12 D	2.5 U	370 D	2.5 U	2.4	4.8	12,000
	8PS-F1	*13-111*	**8,100 D**	**130 D**	10 U	10 U	10 U	**800 D**	10 U	**2,700 D**	10 U	6.3	63	12,000
	8PS-G1	13-113	**10,000 JD**	**400 D**	25 U	25 U	25 U	**1,400 D**	25 U	**4,200 D**	25 U	3.7 J	24	7,100
	8MW48	13-122	**8,500 D**	26 Ui	10 U	10 U	10 U	**1,800 D**	10 U	**7,100 D**	10 U			
	8MW48	13-209	**8,000 D**	220 Ui	10 U	10 Ui	10 U	**1,800 D**	10 U	**6,700 D**	10 U	2.9	4.0	8,400
	8MW49	13-123	**3,300 D**	13 Ui	10 U	10 U	10 U	510 D	10 U	**5,000 D**	10 U	0.91	3.3	960
	8CB-MW26	13-114	**950 D**	25 U	25 U	25 U	25 U	**1,500 D**	25 U	**9,100 D**	25 U			
	8CB-MW26 (Dup)	*13-115*	**860 D**	25 U	25 U	25 U	25 U	**1,400 D**	25 U	**9,300 D**	25 U			
	8CB-MW28	13-116	**19,000 D**	**440 D**	50 U	50 U	50 U	**1,600 D**	50 U	**22,000 D**	50 U			
	8CB-MW23	13-117	**78 J**	4.4	0.50 U	2.3	0.50 U	260 D	0.50 U	110 D	0.50 U			
	8CB-MW02	13-118	**12,000 D**	66 Ui	10 U	10 U	**12 D**	**2,100 D**	10 U	**13,000 D**	10 U			
	8CB-MW17	13-119	**850 D**	5.0 U	5.0 U	5.0 U	5.0 U	**1,400 D**	5.0 U	**4,700 D**	5.0 U			
	8CB-MW18	13-120	**16,000 D**	25 U	25 U	25 U	25 U	**1,400 D**	25 U	**11,000 D**	25 U			
	8CB-MW24	13-121	0.40 J	2.2	0.50 U	0.50 U	0.50 U	1 U	0.50 U	0.32 J	0.50 U			
	8MW47	13-206	**1,600 D**	73 Ui	5.0 U	2.7 JD	5.0 U	680 D	5.0 U	**3,000 D**	5.0 U	2.4	5.0	3,300
	8MW47 (Dup)	*13-207*	***2,500 D***	*75 Ui*	*10.0 U*	*10 U*	*10.0 U*	*670 D*	*10.0 U*	***4,300 D***	*10.0 U*	*2*	*3.7*	*3,600*
	8MW06	13-210	**17,000 D**	740 Ui	25 U	25 Ui	25 U	**740 D**	25 U	210 D	25 U	6.4	20	63
	8MW33	13-212	0.50 U	**21**	**1.6**	0.72	0.50 U	0.50 U	2.4	0.25 J	0.50 U	0.60 U	1.0 U	1.3 U
	8MW03	13-215	0.50 U	3.2	0.27 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.60 U	1.0 U	3.1

Volatile Organic Compounds[1/]

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at 8IW-2 during the September 2011 sampling event.
Olive green highlighted cells indicate sample results from OU 8 MNA Rounds 26, 27, and 28.
1/ = The following wells sampled in the Baseline round had an expanded analyte list, as shown in Table 7-2 of Sealaska (2013b): 8CB-MW01, 8CB-MW08, 8CB-MW08 (temp), 8CB-MW25, 8CB-MW25 (Dup), 29MW01, and 8MW29.
B - The associated method blank contained the target analyte at trace concentration.
D - The result is reported from a diluted analysis.
i - The level of detection is elevated due to a matrix interference.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
L - As applicable to RSK-175 analysis, the recovery for the laboratory control sample was outside laboratory control limits and the result may be biased low.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable
Bold - The detected value exceeds the cleanup level

Sampling Round	Dates	Abbreviations
April 2012 (Phase II Baseline)	April 26-30, 2012	DCA - 1,2-Dichloroethane
May 2012 (Phase II Baseline)	May 21-31, 2012	DCE - 1,1-Dichloroethene
Round 26	April 19-25, 2012	DCP - 1,2-Dichloropropane
August 2012 (Phase II Baseline)	August 14-20, 2012	EDB - 1,2-Dibromoethane
September 2012	September 4-6, 2012	TCA - 1,1,2-Trichloroethane
Round 27	October 16-23, 2012	DHB - *Dehalobacter* spp.
December 2012	December 3-5, 2012	DHC - *Dehalococcoides* spp.
March 2013	March 6-12, 2013	
Round 28	April 15-18, 2013	

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID (OU8-Pilot-)	Inorganic Parameters: Cations (Dissolved): Calcium (µg/L)	Manganese (µg/L)	Magnesium (µg/L)	Potassium (µg/L)	Sodium (µg/L)	Anions: Bicarbonate as $CaCO_3$ (mg/L)	Carbonate as $CaCO_3$ (mg/L)	Chloride (mg/L)	Nitrate as Nitrogen (mg/L)	Nitrite as Nitrogen (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Other: Carbon, organic (dissolved) (mg/L)
			NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
April - August 2012 (Phase II Baseline)	8MW27	12-145													
	MW03	12-202		4,790						4.56	0.10 UJ	0.10 U	0.17 J	404	46.2
	8MW53	12-101		1,770						21.3	0.10 UJ	0.10 U	0.15 J	404	14.3
	8MW47	12-207		4,170						10.9	0.10 U	0.10 U	0.23 J	491	37.0
	8MW24	12-102		4,510						9.76	0.10 UJ	0.10 U	0.14 J	372	13.4
	MW05	12-103													
	8CB-MW23	12-129	51,600	5,640	22,500	1,960	13,300	248	9.0 U	6.58	0.44		2.88		2.32
	8CB-MW23 (temp)	12-130	77,100	3,330	42,400	2,170	13,200	379	2 U	3.79	0.10 U		3.39		2.26
	8CB-MW24	12-137	46,800	1,640	13,500	1,640	13,300	193	2.0 U	8.53	0.12		5.56		
	8CB-MW24 (temp)	12-138	58,200	1,620	20,500	1,320	9,810	238	9.0 U	3.10	0.10 UJ		7.13 J		
	8CB-MW28	12-127	99,700	6,110	43,200	1,900	13,000	423	9.0 U	8.31	0.10 UJ		4.34		13.7
	8CB-MW28 (Dup)	*12-128*	*101,000*	*6,280*	*42,700*	*1,900*	*12,900*	*427*	*9.0 U*	*8.32*	*0.10 UJ*		*4.25*		*13.5*
	8MW48	12-134		8,980						5.24	0.10 U	0.10 U	0.24 J	576	35.5
	8MW49	12-135		7,850						10.3	0.10 U		0.29 J		27.7
	8IW-1	12-104													159
	8IW-2	12-105													474
	8IW-3	12-106													196
	8IW-6	12-109													20.5
	8IW-7	12-110													6.9
	8PS-A1	12-111		11,100						9.91	0.10 UJ		0.24 J		97.5
	8PS-A3	12-112		18,200						9.50	0.10 UJ		0.32 J		125
	8PS-B1	12-113		12,200						11.3	0.10 UJ		0.20 J		126
	8PS-B1 (Dup)	*12-114*		*12,500*						*11.3*	*0.10 UJ*		*0.19 J*		*126*
	8PS-B2	12-115		18,100						7.8	0.10 UJ		0.28 J		46.4
	8PS-C1	12-116		8,810						45.0	0.10 UJ		3.8		29.0
	8PS-C2	12-117		7,110						13.7	0.10 UJ		1.85		34.2
	8PS-C3	12-118		17,900						9.14	0.10 UJ		0.42		90.4
	8PS-C4	12-119		8,160						13.7	0.10 UJ		0.69		9.7
	8PS-D1	12-120		9,400						34.5	0.10 UJ		0.91		32.4
	8PS-E1	12-123		6,620						26.2	0.10 UJ		7.5		21.1
	8PS-F1	12-124		6,470						24.8	0.10 UJ		13.8		12.3
	8PS-G1	12-125		9,520						49.5	0.10 U		11.8		14.8
	8CB-MW26	12-126	52,000	3,740	21,200	1,540	15,400	236	2.0 U	9.32	0.10 U		16.2		3.2
	8CB-MW02	12-131	98,700	10,600	37,300	1,950	15,300	409	9.0 U	16.1	0.10 UJ		1.26		
	8CB-MW17	12-132	45,500	2,610	29,500	1,630	8,830	232	2.0 U	8.77	0.10 U		4.01		
	8CB-MW18	12-133	117,000	7,190	66,300	2,420	29,500	598	2.0 U	14.1	0.10 U		0.37 J		
	8MW06	12-136		9,720						29.9	0.10 U	0.10 U	0.42	553	21.7
	8MW33	12-212		310						2.22	0.10 UJ	0.10 U	3.79	105	0.84
	8MW03	12-215		467						2.88	0.35	0.10 U	3.34	60.9	2.00
	8CB-MW01	12-139	31,000	1,100	16,500	1,250	7,090	168	168	1.95	0.10 U		9.04		
	8CB-MW08	12-140	41,600	523	24,400	16,400	8,670	217	217	4.08	0.10 U		5.06		
	8CB-MW08 (temp)	12-141													

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Inorganic Parameters												Other
			Cations (Dissolved)					Anions							
			Calcium	Manganese	Magnesium	Potassium	Sodium	Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Carbon, organic (dissolved)
		Sample ID	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	8CB-MW25	12-142	56,200	675	41,500	2,020	34,200	379	379	13.1	0.09 J		8.85		
	8CB-MW25 (Dup)	*12-143*													
	29MW01	12-146													
	8MW29	12-147													
September/October 2012	8PS-A1	12-201								8.2			0.62		122
	8PS-A1 (Dup)	*12-202*								9.08			0.29		127
	8PS-A3	12-203								8.8			0.37		24.7
	8PS-B1	12-204								22.9			0.33		128
	8PS-B2	12-205								8.49			0.43		10.1
	8PS-C1	12-206								79.9			0.59		23.8
	8PS-C2	12-207								10.2			2.59		30.2
	8PS-C3	12-208								7.99			0.33		21.1
	8PS-D1	12-209								38.1			0.88		24.8
	8PS-E1	12-210								9.4			0.55		1080
	8PS-F1	12-211								23.5			1.9		0.55
	8PS-G1	12-212								70			3.41		41.8
	8MW47	12-406		3,340						12.4 J	0.10 U	0.10 U	0.34	475	11.8
	MW05	12-408		5,720						11.9 J	0.10 U	0.10 U	0.37	349	19
	MW05 (Dup)	*12-409*		5,730						11.8 J	0.10 J	0.10 J	0.38	350	18.8
	8MW48	12-410		8,790						4.43	0.10 U	0.10 U	0.40	566	25.2
	8MW06	12-411		7,840						19.7	0.10 U	0.10 U	0.49	495	13.4
	8MW33	12-413		403						2.88	0.10 U	0.10 U	4.89	156	1.08
	8MW03	12-415		571						4.78	0.40	0.10 U	3.04	56.0	0.34 J
December 2012	8PS-A1	12-301								12.3			0.38		89.8
	8PS-A3	12-302								8.74			0.49		21.1
	8PS-B1	12-303								18.5			0.4		93.8
	8PS-B2	12-304								7.77			0.42		8.57
	8PS-C1	12-305								80.1			0.39		31.9
	8PS-C2	12-306								11			0.8		18.9
	8PS-C3	12-307								9.05			0.4		8.91
	8PS-D1	12-308								34.3			0.38		17
	8PS-E1	12-309								17.2			0.53		848
	8PS-F1	12-310								23.6			0.41		144
	8PS-F1 (Dup)	*12-311*								23.4			0.42		145
	8PS-G1	12-312								79.5			0.48		33.6
March/April 2013	8PS-A1	13-101		15,000						11.4	0.10 U		0.34		99.0
	8PS-A1 (Dup)	*13-125*													
	8PS-A3	13-102		15,400						7.77	0.10 UJ		0.39		20.7
	8PS-B1	13-103		11,800						20.0	0.10 U		0.72		68.5
	8PS-B2	13-104		13,800						7.30	0.10 U		0.32		9.7
	8PS-C1	13-105		11,800						73.4	0.10 UJ		0.44		28.4

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID (OU8-Pilot-)	Inorganic Parameters: Cations (Dissolved) Calcium	Manganese	Magnesium	Potassium	Sodium	Anions: Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Other: Carbon, organic (dissolved)
			µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
March/April 2013	8PS-C2	13-106		8,870						15.0	0.10 U		0.61		28.2
March/April 2013	8PS-C3	13-107		12,000						8.02	0.10 U		0.45		8.36
March/April 2013	8PS-C4	13-108		7,270						8.25	0.10 UJ		4.69		7.67
March/April 2013	8PS-D1	13-109		9,620						50.7	0.10 U		0.52		26.4
March/April 2013	*8PS-D1 (Dup)*	*13-112*		*9,820*						*51.1*	*0.10 U*		*0.53*		*27.3*
March/April 2013	8PS-E1	13-110		22,600						17.6	0.10 U		0.53		783
March/April 2013	8PS-F1	13-111		11,900						22.9	0.10 U		0.44		108
March/April 2013	8PS-G1	13-113		13,000						77.5	0.10 UJ		0.67		20.9
March/April 2013	8MW48	13-122													
March/April 2013	8MW48	13-209		9,920						4.57	0.10 U	0.10 U	0.43	554	15.1
March/April 2013	8MW49	13-123		7,650						9.69	0.10 U		1.98		24.6
March/April 2013	8CB-MW26	13-114													
March/April 2013	*8CB-MW26 (Dup)*	*13-115*													
March/April 2013	8CB-MW28	13-116													
March/April 2013	8CB-MW23	13-117													
March/April 2013	8CB-MW02	13-118													
March/April 2013	8CB-MW17	13-119													
March/April 2013	8CB-MW18	13-120													
March/April 2013	8CB-MW24	13-121													
March/April 2013	8MW47	13-206		3,970						10.6	0.10 U	0.10 U	0.38	428	14
March/April 2013	*8MW47 (Dup)*	*13-207*		*4,040*						*10.7*	*0.10 U*	*0.10 U*	*0.33*	*433*	*14.1*
March/April 2013	8MW06	13-210		10,300						33.7	0.10 U	0.10 U	0.47	499	21.1
March/April 2013	8MW33	13-212		126						1.65	0.10 U	0.10 U	3.89 J	74.8	1.25
March/April 2013	8MW03	13-215		590						2.71	0.52	0.030 J	3.14	54.5	0.71

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at 8IW-2 during the September 2011 sampling event.
Olive green highlighted cells indicate sample results from OU 8 MNA Rounds 26, 27, and 28.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable

Sampling Round	Dates
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012
September 2012	September 4-6, 2012
Round 27	October 16-23, 2012
December 2012	December 3-5, 2012
March 2013	March 6-12, 2013
Round 28	April 15-18, 2013

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID	Molecular Biological Tools						Volatile Fatty Acids					
			Microbial Insights		SiREM Sample Split Analysis									
			DHC	DHB	vcrA	% vcrA	Dhc 16S rRNA	% DHC	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
		Sample ID	cells/mL	cells/mL	Gene Copies/mL	%	Gene Copies/mL	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
April - August 2012 (Phase II Baseline)	8MW27	12-145												
	MW03	12-202												
	8MW53	12-101												
	8MW47	12-207												
	8MW24	12-102	3.00E-01 J	3.28E+03										
	MW05	12-103												
	8CB-MW23	12-129	5.00E-01 U	3.00E+00 U										
	8CB-MW23 (temp)	12-130												
	8CB-MW24	12-137												
	8CB-MW24 (temp)	12-138												
	8CB-MW28	12-127	6.00E-01 U	8.10E+00										
	8CB-MW28 (Dup)	*12-128*												
	8MW48	12-134	6.70E+01	3.90E+03										
	8MW49	12-135	2.26E+03	7.90E+03										
	8IW-1	12-104							0.39 U	287	37	1.3	25	2.2
	8IW-2	12-105							0.39 U	437	175	0.76	89	7.6
	8IW-3	12-106							0.39 U	334	21	0.96	38	2.6
	8IW-6	12-109							0.39 U	12	0.31 U	1.8	0.41 U	0.69 U
	8IW-7	12-110							0.39 U	3.1	0.31 U	1.9	0.41 U	0.69 U
	8PS-A1	12-111	7.43E+01	1.23E+03					0.39 U	209	3.2	1.1	5.7	0.69 U
	8PS-A3	12-112	2.03E+01	2.61E+03					0.39 U	147	51	1.9	6.9	0.69 U
	8PS-B1	12-113	2.35E+02	9.27E+03					0.39 U	232	41	1.2	1.7	1.7
	8PS-B1 (Dup)	*12-114*	*1.07E+02*	*5.70E+03*					*0.39 U*	*242*	*43*	*1.3*	*1.9*	*1.7*
	8PS-B2	12-115	9.60E+00	8.38E+02					0.39 U	80	19	1.4	2.1	2.2
	8PS-C1	12-116	1.11E+03	3.24E+03					0.78	15	0.31 U	2.2	0.57	0.69 U
	8PS-C2	12-117	1.99E+01	4.14E+03					0.39 U	84	0.98	1.8	0.41 U	0.69 U
	8PS-C3	12-118	1.28E+01	1.06E+04					0.39 U	208	20	1.0	3.1	0.69 U
	8PS-C4	12-119	1.76E+01	2.05E+03					0.39 U	10	0.41	1.9	0.41 U	0.69 U
	8PS-D1	12-120	6.05E+01	4.89E+03					0.52	13	26	1.6	0.41 U	0.69 U
	8PS-E1	12-123	1.07E+01	1.41E+01					0.39 U	3.4	0.31 U	1.9	0.41 U	0.69 U
	8PS-F1	12-124	2.00E-01 J	4.00E-01 J					0.39 U	3.5	0.31 U	2.2	0.42	0.69 U
	8PS-G1	12-125	1.28E+03	1.45E+03					0.40	2.9	0.78	1.7	0.41 U	0.69 U
	8CB-MW26	12-126												
	8CB-MW02	12-131												
	8CB-MW17	12-132	1.30E+00	3.11E+02										
	8CB-MW18	12-133	6.90E+00	7.31E+01										
	8MW06	12-136	2.80E+00	1.16E+03										
	8MW33	12-212												
	8MW03	12-215												
	8CB-MW01	12-139												
	8CB-MW08	12-140												
	8CB-MW08 (temp)	12-141												

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Molecular Biological Tools						Volatile Fatty Acids					
			Microbial Insights		SiREM Sample Split Analysis									
			DHC	DHB	vcrA	% vcrA	Dhc 16S rRNA	% DHC	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
		Sample ID	cells/mL	cells/mL	Gene Copies/mL	%	Gene Copies/mL	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	8CB-MW25	12-142												
	8CB-MW25 (Dup)	*12-143*												
	29MW01	12-146												
	8MW29	12-147												
September 2012	8PS-A1	12-201	5.10E+00	1.66E+03					0.39 U	249	14	1.8	11	1.3
	8PS-A1 (Dup)	*12-202*	*1.21E+01*	*1.93E+04*					*0.57*	*260*	*12*	*2.1*	*12*	*1.2*
	8PS-A3	12-203							0.39 U	6.6	0.31 U	2.8	0.41 U	0.69
	8PS-B1	12-204												
	8PS-B2	12-205												
	8PS-C1	12-206												
	8PS-C2	12-207												
	8PS-C3	12-208												
	8PS-D1	12-209												
	8PS-E1	12-210	9.74E+01	1.89E+02					0.39 U	445	873	1.7	81	2.4
	8PS-F1	12-211												
	8PS-G1	12-212												
December 2012	8PS-A1	12-301	1.38E+03	1.30E+00					0.39 U	182	1.8	0.22 U	0.46	0.69 U
	8PS-A3	12-302	5.00E-01 U	2.63E+02					0.51 U	0.54 U	0.31	0.72	0.41 U	0.69 U
	8PS-B1	12-303	2.20E+00	1.16E+02					0.39 U	212	1.9	0.22 U	0.41 U	0.69 U
	8PS-B2	12-304	5.00E-01 U	1.70E+02					0.39 U	0.54 U	0.31 U	0.22 U	0.41 U	0.69 U
	8PS-C1	12-305	7.00E-01	9.35E+02										
	8PS-C2	12-306	5.00E-01 U	2.11E+03										
	8PS-C3	12-307	4.00E-01 J	2.94E+02										
	8PS-D1	12-308												
	8PS-E1	12-309	2.60E+00	1.34E+01					0.39 U	416	692	0.22 U	79	14
	8PS-F1	12-310	2.20E+01	1.34E+03					0.39 U	150	144	0.22 U	7.2	3.0
	8PS-F1 (Dup)	*12-311*	*1.06E+01*	*5.34E+02*					*0.39 U*	*141*	*139*	*0.22 U*	*6.2*	*2.8*
	8PS-G1	12-312	1.80E+00	7.02E+02					0.39 U	8.3	39	0.22 U	0.41 U	0.69 U
March 2013	8PS-A1	13-101	2.00E-01 J	5.77E+02	4.00E+00 B	0.0003 - 0.0008			0.39 U	211	2.4	0.22 U	7.9	0.69 U
	8PS-A1 (Dup)	*13-125*							0.39 U	204	2.1	0.22 U	7.7	0.69 U
	8PS-A3	13-102	5.00E-01 U	8.50E+02					0.39 U	3.4	0.31 U	2.1	0.41 U	0.69 U
	8PS-B1	13-103	6.00E-01 J	5.61E+03	3.00E+00 B	0.0002 - 0.0005			0.39 U	156	0.31 U	0.22 U	0.41 U	0.69 U
	8PS-B2	13-104	5.00E-01 U	8.51E+02					0.39 U	0.71	0.31 U	1.4	0.41 U	0.69 U
	8PS-C1	13-105	5.00E-01 U	8.02E+03					0.40 U	25	0.31 U	1.7	0.41 U	0.69 U
	8PS-C2	13-106	5.00E-01 U	3.00E+00 U					0.39 U	80	0.31 U	1.5	0.41 U	0.69 U
	8PS-C3	13-107	5.00E-01 U	2.14E+03					0.39 U	0.59	0.31 U	1.7	0.41 U	0.69 U
	8PS-C4	13-108	5.00E-01 U	7.80E+02										
	8PS-D1	13-109	5.00E-01 U	1.85E+03										
	8PS-D1 (Dup)	*13-112*	*5.00E-01 U*	*3.03E+03*										
	8PS-E1	13-110	5.00E-01 U	9.10E+00			1.00E+00 U	NA	0.78 U	485	895	4.6	70	36
	8PS-F1	13-111	5.00E-01 U	1.58E+03			1.00E+00 J	0.006 - 0.01	0.39 U	158	67	1.4	2.9	0.70
	8PS-G1	13-113	5.00E-01 U	3.59E+03					0.39 U	4.6	15	1.3	0.41 U	0.69 U

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Molecular Biological Tools						Volatile Fatty Acids					
			Microbial Insights		SiREM Sample Split Analysis									
			DHC	DHB	vcrA	% vcrA	Dhc 16S rRNA	% DHC	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
		Sample ID	cells/mL	cells/mL	Gene Copies/mL	%	Gene Copies/mL	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
March/ 2013	8MW48	13-122	5.00E-01 U	7.12E+02										
	8MW49	13-123	5.00E-01 J	7.84E+02										
	8CB-MW26	13-114												
	8CB-MW26 (Dup)	*13-115*												
	8CB-MW28	13-116												
	8CB-MW23	13-117												
	8CB-MW02	13-118												
	8CB-MW17	13-119												
	8CB-MW18	13-120												
	8CB-MW24	13-121												
	8MW06	13-124	5.00E-01 U	1.77E+02										

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at 8IW-2 during the September 2011 sampling event.
B - Analyte was also detected in the method blank.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable

Sampling Round	Dates	Abbreviations
April 2012 (Phase II Baseline)	April 26-30, 2012	DHB - *Dehalobacter* spp.
May 2012 (Phase II Baseline)	May 21-31, 2012	DHC - *Dehalococcoides* spp.
Round 26	April 19-25, 2012	rRNA - 16S ribosomal ribonucleic acid gene
August 2012 (Phase II Baseline)	August 14-20, 2012	vcrA - vinyl chloride reductase A gene
September 2012	September 4-6, 2012	
December 2012	December 3-5, 2012	
March 2013	March 6-12, 2013	

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round

Round	Monitoring Location	Sample Date[2/]	Area[1/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	ORP (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
April - August 2012	8MW47	4/19/2012	PWIA	19.4	6.54	0.995	16.4	0.0	0.939	-74	>3.30[5/]	0.15	27.85
	8MW48	4/19/2012	PWIA	14.9	6.24	1.17	0.0	0.0	0.564	-58	>3.30[5/]	0.04	27.18
	8MW27	5/31/2012	PWIA	16.5	6.92	0.361	0	1.07	NA	182	0.00	0.01	26.66
	8CB-MW17	6/6/2012	PWIA	18.6	6.83	0.502	3.9	1.23	NA	-22	0.00	0.02	27.68
	8CB-MW18	6/6/2012	PWIA	19.7	6.53	1.150	10.2	1.32	NA	-51	0.59	0.11	28.17
	8MW53	5/30/2012	PWIA	28.8	6.67	0.735	8	1.21	NA	-97	0.65	0.02	27.59
	8CB-MW08	8/20/2012	PWIA	23.5	6.64	0.509	19.5	0.00	0.383	-374	0.00	0.03	28.98
	8CB-MW08 Temp at 50'	8/14/2012	PWIA	25.4	6.56	0.93	>1000	0.00	0.583	-104	0.55	0.61	31.70
	8MW24	5/30/2012	PWIA	20.9	6.57	0.704	10	1.49	NA	-47	1.02	0.02	27.92
	8CB-MW25	8/20/2012	PWIA	17.0	6.57	0.821	19.3	0.00	0.486	-401	0.00	0.03	27.95
	29MW01	8/20/2012	PWIA	17.6	6.02	0.400	27.3	0.00	0.685	176	0.00	0.04	27.05
	8MW29	8/20/2012	PWIA	16.4	6.59	0.629	28.7	0.00	0.79	56	0.00	0.02	26.96
	8CB-MW23	5/30/2012	PWIA	20.6	6.18	0.501	10	1.32	NA	-121	0.06	0.01	27.81
	8CB-MW23 Temp at 45'	5/21/2012	PWIA	20.1	8.17	0.260	261	4.90	0.442	51	0.00	0.09	27.88
	8CB-MW24	6/5/2012	PWIA	21.3	5.91	0.423	19.9	1.54	NA	-210	0.00	0.03	27.95
	8CB-MW24 Temp at 44'	5/22/2012	PWIA	18.2	7.84	0.200	854	6.19	>1.1[7/]	84	0.01	>0.80[6/]	28.12
	MW05	5/31/2012	PWIA	15.5	6.18	0.759	0	0.83	0.443	-68	>3.30[5/]	0.01	27.54
	8MW48	4/26/2012	PWIA	14.5	6.44	1.14	0.5	0.00	0.406	-72	>3.30[5/]	0.02	26.90
	8CB-MW28	6/4/2012	PWIA	17.3	6.35	0.858	6	1.33	NA	-137	0.26	0.07	27.93
	8IW-1	4/26/2012	PWIA	15.72	5.20	0.865	23.2	0.88	0.669	70	>3.30[5/]	0.05	27.42
	8IW-2	4/26/2012	PWIA	16.75	5.39	1.26	25.5	0.82	0.599	87	>3.30[5/]	0.01	27.28
	8IW-3	4/26/2012	PWIA	17.93	5.92	0.915	42	7.68	NM	-26	>3.30[5/]	0.05	26.68
	8IW-6	4/26/2012	PWIA	16.2	7.84	0.105	19	6.51	NM	31	0.07	0.00	27.14
	8IW-7	4/26/2012	PWIA	15.8	7.76	0.114	0	3.39	NM	36	0.01	0.01	26.20
	8PS-A1	4/30/2012	PWIA	16.15	6.34	1.19	44.7	1.02	NM	5	>3.30[5/]	0.02	27.25
	8PS-A3	4/30/2012	PWIA	15.5	7.63	0.156	41	1.97	NM	-81	>3.30[5/]	0.04	27.22
	8PS-B1	4/30/2012	PWIA	15.67	6.54	1.73	30.2	1.00	NM	-14	>3.30[5/]	0.00	27.30
	8PS-B2	4/30/2012	PWIA	15.7	7.47	0.190	28	2.14	NM	-57	>3.30[5/]	0.02	27.29
	8PS-C1	5/1/2012	PWIA	16.1	7.59	0.128	4	2.41	NM	-52	1.77	0.01	27.72
	8PS-C3	5/1/2012	PWIA	15.1	6.53	2.00	9.3	0.00	0.645	-56	2.62	0.03	27.42
	8PS-C2	5/1/2012	PWIA	16.8	7.93	0.147	0	1.07	NM	-94	1.83	0.00	27.39
	8PS-C4	5/1/2012	PWIA	15.1	6.50	1.09	78.6	0.00	0.325	-57	1.99	0.03	27.14
	8PS-D1	4/30/2012	PWIA	17.4	6.54	1.11	0	0.00	0.767	-98	2.09	0.04	27.20
	8PS-E1	4/30/2012	PWIA	16.7	6.56	1.14	2.9	0.00	1.068	-26	0.25	0.06	26.85
	8PS-F1	4/30/2012	PWIA	16.8	6.70	1.22	5.1	0.00	0.282	-452	0.13	0.01	26.51
	8PS-G1	4/26/2012	PWIA	17.3	6.56	1.37	27.9	0.00	0.612	-33	0.05	0.01	27.30
	8MW49	4/26/2012	PWIA	16.1	6.46	1.07	46.3	0.00	0.572	-40	2.75	0.17	27.45
	8CB-MW26	6/5/2012	PWIA	17.2	6.32	0.527	4.5	2.18	NM	-9	0.00	0.04	25.94
	8MW33	4/25/2012	PWIA	11.5	6.81	0.237	5.5	0.0	0.37	-17	0.00	0.00	25.29
	8MW06	4/19/2012	PWIA	13.8	6.02	1.17	0.0	0.0	0.797	-87	>3.30[5/]	0.01	27.43

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round (continued)

Round	Monitoring Location	Sample Date[2/]	Area[1/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen [3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	ORP (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
(Cont.)	8MW06	6/5/2012	PWIA	15.6	6.40	1.02	0	2.05	NM	-179	>3.30[5/]	0.06	27.95
	8CB-MW02	6/4/2012	PWIA	17.9	6.09	0.853	10.7	1.44	NM	-151	0.58	0.03	27.56
	8CB-MW01	8/20/2012	PWIA	17.8	6.87	0.386	29.9	0.00	0.451	-339	0.00	0.03	27.93
	8MW03	4/19/2012	SBB	9.7	6.85	0.151	0.0	0.0	0.300	67	0.00	0.00	13.00
December 2012	8PS-A1	12/5/2012	PWIA	17.7	6.41	1.31	50.5	1.98	NM	-47	>3.30[5/]	0.07	28.32
	8PS-A3	12/3/2012	PWIA	15.5	6.56	1.40	9.5	0.89	0.161	-64	>3.30[5/]	0.01	28.50
	8PS-B1	12/5/2012	PWIA	18.0	6.72	1.47	52	2.25	NM	-74	>3.30[5/]	0.02	28.35
	8PS-B2	12/3/2012	PWIA	16.7	6.76	1.54	0	0.74	0.342	-59	>3.30[5/]	0.01	28.55
	8PS-C1	12/5/2012	PWIA	15.8	6.71	1.39	10.4	1.55	NM	-67	2.89	0.06	28.36
	8PS-C2	12/4/2012	PWIA	16.7	6.84	1.42	1.1	1.34	0.286	-102	2.98	0.11	28.36
	8PS-C3	12/3/2012	PWIA	15.9	6.84	1.70	0	0.17	0.140	-73	>3.30[5/]	0.01	28.57
	8PS-D1	12/5/2012	PWIA	16.1	6.79	1.25	9.7	2.43	NM	-68	2.80	0.04	28.23
	8PS-E1	12/4/2012	PWIA	17.4	5.54	1.93	242	1.94	0.142	22	>3.30[5/]	0.07	27.94
	8PS-F1	12/4/2012	PWIA	18.0	6.88	1.78	152	1.70	0.607	-119	>3.30[5/]	0.15	27.58
	8PS-G1	12/4/2012	PWIA	17.0	6.75	1.56	242	1.39	0.370	-90	>3.30[5/]	0.01	28.12
March - April 2013	8MW47	4/15/2013	PWIA	21.84	7.01	0.96	0.40	0	0.450	-118	>3.30[5/]	0.14	27.28
	8MW48	4/16/2013	PWIA	15.45	7.05	1.24	3.30	0.00	0.356	-95	>3.30[5/]	0.08	26.60
	8CB-MW17	3/7/2013	PWIA	18.6	7.12	0.566	14	1.40	0.487	-32	0.55	0.10	26.71
	8CB-MW18	3/11/2013	PWIA	17.83	6.44	1.14	0	2.29	0.380	-86	2.55	0.01	27.29
	8CB-MW23	3/7/2013	PWIA	19.7	6.54	0.606	20	3.41	0.719	1.54	1.30	0.03	26.84
	8CB-MW24	3/7/2013	PWIA	18.1	6.40	0.489	27	2.33	0.563	-72	0.00	0.03	26.89
	8MW48	3/8/2013	PWIA	14.56	6.21	1.16	9	2.09	0.499	-93	>3.30[5/]	0.05	26.51
	8CB-MW28	3/11/2013	PWIA	16.49	6.35	0.906	0	1.64	0.365	-118	2.06	0.10	27.16
	8PS-A1	3/12/2013	PWIA	15.5	6.30	1.27	42	1.75	0.343	-45	>3.30[5/]	0.01	26.87
	8PS-A3	3/8/2013	PWIA	15.1	6.37	1.31	25	1.08	0.238	-18	>3.30[5/]	0.02	27.05
	8PS-B1	3/12/2013	PWIA	15.6	6.49	1.36	44	1.45	0.441	-125	>3.30[5/]	0.08	26.89
	8PS-B2	3/6/2013	PWIA	16.3	6.69	1.46	85	4.12	0.398	32	>3.30[5/]	0.03	26.78
	8PS-C1	3/8/2013	PWIA	15.2	6.66	1.35	10	1.15	0.477	-17	2.41	0.01	26.92
	8PS-C2	3/6/2013	PWIA	16.0	6.94	1.23	6	2.14	0.309	19	1.71	0.09	26.81
	8PS-C3	3/6/2013	PWIA	15.5	6.74	1.29	20	3.71	0.353	88	>3.30[5/]	0.03	26.75
	8PS-C4	3/8/2013	PWIA	15.2	6.62	0.912	32	0.88	0.970	-117	3.08	0.07	26.62
	8PS-D1	3/12/2013	PWIA	16.47	6.24	1.19	2	1.70	0.838	-109	2.81	0.15	26.79
	8PS-E1	3/11/2013	PWIA	15.6	5.53	1.88	15	1.69	0.383	13	>3.30[5/]	0.05	26.86
	8PS-F1	3/11/2013	PWIA	15.4	6.60	1.71	31	1.65	0.354	-115	>3.30[5/]	0.06	26.18
	8PS-G1	3/8/2013	PWIA	14.8	6.64	1.58	15	1.21	0.597	-95	>3.30[5/]	0.01	26.84
	8MW49	3/12/2013	PWIA	16.27	6.04	1.09	0	2.00	0.385	-90	2.53	0.12	26.95
	8CB-MW26	3/11/2013	PWIA	17.59	5.99	0.694	18	1.89	0.521	-44	0.12	0.11	25.26
	8MW06	3/8/2013	PWIA	14.21	6.26	1.17	40	1.70	0.712	-89	2.34	0.00	26.91

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round (continued)

Round	Monitoring Location	Sample Date[2/]	Area[1/]	Temperature (Celsius)	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen [3/] (mg/L)	Test Kit Dissolved Oxygen[4/] (mg/L)	ORP (mV)	Ferrous Iron (filtered) (mg/L)	Sulfide (filtered) (mg/L)	Depth to Water (ft btoc)
(Cont.)	8MW06	4/17/2013	PWIA	11.39	7.25	0.20	2.50	0.00	0.760	6	0.00	0.01	24.94
	8MW33	4/16/2013	PWIA	14.63	6.90	1.260	9.10	0.00	0.666	-74	3.25	0.01	26.96
	8CB-MW02	3/7/2013	PWIA	16.5	6.56	0.814	42	1.78	0.534	-80	1.20	0.07	26.56
	8MW03	4/18/2013	SBB	9.89	6.74	0.167	7.90	0.00	0.937	78	0.00	0.00	12.82
October 2013	8MW47	10/22/2013	PWIA	19.15	10.54	0.933	2.8	NA	0.597	-103	>3.30[5/]	0.07	29.47
	MW05	10/23/2013	PWIA	15.02	9.87	0.790	8.6	0	0.327	-82	>3.30[5/]	0.01	28.79
	8MW48	10/23/2013	PWIA	16.22	7.58	1.09	16.2	0	0.402	-87	>3.30[5/]	0.04	28.86
	8MW49	10/23/2013	PWIA	19.40	10.67	1.07	1.8	0	0.430	-87	>3.30[5/]	0.05	29.34
	8MW06	10/23/2013	PWIA	15.53	7.04	1.07	14.7	0	0.307	-71	2.48	0.02	29.29
	8MW33	10/24/2013	PWIA	12.49	8.36	0.313	0.0	0	0.475	53	0.01	0.00	27.53
	8MW03	10/24/2013	SBB	10.94	7.09	0.146	10.9	0	0.400	66	0.01	0.00	15.46
March - April 2014	8PS-A1	4/15/2014	PWIA	16.1	6.41	1.17	15	2.17	NM	1	>3.30[5/]	0.09	28.18
	8PS-A3	4/15/2014	PWIA	16.0	6.34	1.07	39	2.18	NM	-9	>3.30[5/]	0.01	28.15
	8PS-B1	4/15/2014	PWIA	16.30	6.62	1.61	38	2.30	NM	-9	>3.30[5/]	0.03	28.48
	8PS-B2	4/15/2014	PWIA	17.09	6.54	1.58	3.3	0	0.697	-37	>3.30[5/]	0.01	28.18
	8PS-C1	4/15/2014	PWIA	18.35	6.64	1.73	1.5	0	0.501	-36	>3.30[5/]	0.01	28.19
	8PS-C2	4/14/2014	PWIA	19.19	6.58	1.83	30	0	0.318	-46	>3.30[5/]	0.01	28.09
	8PS-C3	4/15/2014	PWIA	16.45	6.65	1.80	0	0	0.396	-39	>3.30[5/]	0.00	28.15
	8PS-D1	4/15/2014	PWIA	18.76	6.70	1.46	3.7	0	0.655	-36	>3.30[5/]	0.00	28.03
	8PS-E1	4/15/2014	PWIA	15.90	5.83	1.32	15	2.7	NM	57	>3.30[5/]	0.03	28.48
	8PS-F1	4/14/2014	PWIA	16.73	6.77	2.41	28.7	0.00	0.288	-76	>3.30[5/]	0.04	27.31
	8PS-G1	4/14/2014	PWIA	19.03	6.68	2.03	39.8	0.13	1.025	-54	>3.30[5/]	0.01	28.01
	8MW49	4/14/2014	PWIA	17.21	6.71	1.22	14.1	0.00	0.564	-44	3.01	0.07	28.11
	8MW47	4/2/2014	PWIA	17.93	6.94	1.32	8.6	0.76	0.356	-79	3.12	0.11	28.48
	8MW48	4/2/2014	PWIA	14.41	6.74	1.32	5.2	0.46	0.320	-57	3.30[7/]	0.06	27.63
	8MW06	4/2/2014	PWIA	14.14	6.70	1.22	2.9	0.83	0.471	-42	2.93	0.01	27.88
	8MW33	3/31/2014	PWIA	12.59	7.33	0.379	5.7	0.98	1.1[6/]	40	0.00	0.00	25.65
	8MW03	3/31/2014	SBB	9.86	6.85	0.203	5.9	0.24	0.429	268	0.00	0.00	13.53

Table 3-1. Groundwater Field Parameters for OU 8 Phase II Pilot Study by Round (continued)

Notes:

1/ PWIA – Public Works industrial Area, SBB – Southern Base Boundary

2/ Well installation and subsequent baseline monitoring occurred over several months.

3/ DO measured in the field using the Horiba.

4/ DO measured in the field using the Hach DR-850 colorimeter method when the Horiba reading was ≤ 1mg/L.

5/ Result exceeded the maximum value of 3.3 mg/L for the Hach DR850/8146 test kit.

6/ Result exceeded the maximum value of 0.8 mg/L. Emulsified vegetable oil visible in well at time of sampling. Test kit did not change to indicator color. Sample water was white.

7/ Result exceeded the test kit maximum value of 1.1 mg/L.

Olive green highlighted cells indicate sample results from OU 8 Rounds 26, 27, 28, 29, and 30 monitoring.

Temp - Samples collected from temporary wells installed during well drilling and prior to installation of permanent wells.

	Sampling Round	Dates
mg/L - milligrams per liter		
mS/cm - milliSiemens per centimeter	April 2012 (Phase II Baseline)	April 26-30, 2012
mV - millivolt	May 2012 (Phase II Baseline)	May 21-31, 2012
NA - Not Analyzed	Round 26	April 19-25, 2012
NTU - nephelometric turbidity unit	August 2012 (Phase II Baseline)	August 14-20, 2012
NM - Not Measured	September 2012	September 4-6, 2012
pH - acidity based on hydrogen ion activity	Round 27	October 16-23, 2012
ORP - oxidation redox potential	December 2012	December 3-5, 2012
	March 2013	March 6-12, 2013
	Round 28	April 15-18, 2013
	Round 29	October 21-30, 2013
	Round 30	March 27-April 9, 2014
	April 2014	April 14-15, 2014

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID	Volatile Organic Compounds[1/]													
			Benzene	DCA	DCE	DCP	EDB	Ethylbenzene	TCA	Toluene	Vinyl Chloride	m,p-Xylenes	o- Xylene	Ethane	Ethene	Methane
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Sample ID	*Groundwater Cleanup Level (CUL)*													
	Well	(OU8-Pilot-)	*5*	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*			*NA*	*NA*	*NA*
April - August 2012 (Phase II Baseline)	8MW27	12-145	0.11 J	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.50 U	0.54 UJ	0.50 U					
	MW03	12-202												0.3 J	0.11 J	5,100 B
	8MW53	12-101	**320 JD**	2.5 Ui,J	2.5 U	2.5 U	2.5 U	**1,000 D**	2.5 U	280 D	2.5 U			2.5	0.43 J	3,000 B
	8MW47	12-207	**2,500 D**	11 Ui	1.0 U	1.0 U	1.0 U	590 D	1.0 U	**7,200 D**	1.0 U			1.7	3.3	1,700
	8MW24	12-102	**1,000 D**	12 Ui,J	2.5 U	2.5 U	2.5 U	**1,900 D**	2.5 U	**2,400 D**	2.5 U			6.7	1.1	380 B
	MW05	12-103	**16,000 JD**	**270 JD**	25 U	**7 JD**	25 U	870 D	25 U	**13,000 D**	25 U					
	8CB-MW23	12-129	27 J	1.3 UJ	0.50 UJ	0.50 UJ	0.50 UJ	190 D	0.50 UJ	68 D	0.50 UJ			0.52 J	0.47 J	190
	8CB-MW23 (temp)	12-130	0.95	2.1 J	0.50 U	0.50 UJ	0.50 U	1.9	0.50 U	0.93	0.50 U			0.60	0.22 J	150
	8CB-MW24	12-137	1.2	2.7 J	0.50 U	0.50 U	0.50 U	0.58	0.50 U	4.4	0.50 U					
	8CB-MW24 (temp)	12-138	0.070 J	2.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U					
	8CB-MW28	12-127	**25,000 J**	**620 D**	25 UJ	**10 JD**	**110 D**	**1,600 D**	25 U	**22,000 JD**	25 U			3.6	13	5,300
	8MW48	12-134	**10,000 D**	40 Ui	10 U	3.2 JD	10 U	**1,600 D**	10 U	**9,400 D**	10 U			3.0	4.6	2,000
	8MW49	12-135	**5,700 D**	35 Ui	10 U	10 Ui	10 U	**910 D**	10 U	**7,600 D**	10 U			0.79	3.3	110
	8PS-A1	12-111	**25,000 D**	**790 D**	25 U	**10 JD**	25 U	**1,900 D**	25 U	**21,000 D**	25 U			2.7	11	13,000
	8PS-A3	12-112	**930 D**	**32**	0.50 U	0.50 U	0.50 U	5.3	0.50 U	120 D	0.50 U			0.93	0.17 J	20,000
	8PS-B1	12-113	**23,000 D**	**870 D**	25 U	**8.5 JD**	25 U	**1,100 D**	25 U	**11,000 D**	25 U			4.4	19	8,100
	8PS-B1 (Dup)	*12-114*	***23,000 D***	***880 D***	*25 U*	***9.0 JD***	*25 U*	***1,000 D***	*25 U*	***11,000 D***	*25 U*			*4.4*	*19*	*8,200*
	8PS-B2	12-115	**430 D**	**110 D**	0.50 U	0.50 Ui	0.50 U	9.6	0.50 U	120 D	0.50 U			0.78	0.40 J	16,000
	8PS-C1	12-116	**20,000 D**	**1,300 D**	25 U	**10 JD**	25 U	**1,400 D**	25 U	**1,100 D**	25 U			5.0	25	9,800
	8PS-C2	12-117	**3,000 D**	**1,100 D**	5.0 U	**6.0 D**	5.0 U	200 D	5.0 U	420 D	5.0 U			6.7	5.4	6,400
	8PS-C3	12-118	**250 D**	**190 D**	0.50 U	0.49 J	0.50 U	2.5	0.50 U	58	0.50 U			1.8	0.80 J	19,000
	8PS-C4	12-119	**250 D**	**48**	0.080 J	0.27 J	0.50 U	0.97	0.50 U	36	0.50 U			1.5 J	0.57 J	25,000
	8PS-D1	12-120	**23,000 D**	**790 D**	25 U	**8.5 JD**	**38 D**	**1,400 D**	25 U	**6,100 D**	25 U			7.2	32	300
	8PS-E1	12-123	**12,000 D**	**580 D**	13 U	**6.8 JD**	**2.5 JD**	**1,300 D**	13 U	**4,300 D**	13 U			4.9	10	1,300
	8PS-F1	12-124	**11,000 D**	**810 D**	13 U	**7.5 JD**	**25 D**	**1,100 D**	13 U	**2,100 D**	13 U			8.5	22	26
	8PS-G1	12-125	**4,800 D**	**710 D**	5.0 U	**7.3 D**	**7.4 D**	580 D	5.0 U	**1,200 D**	5.0 U			4.3	8.3	31
	8CB-MW26	12-126	**3,400 JD**	25 U	25 U	25 U	**13 JD**	**1,600 D**	25 U	**17,000 D**	25 U			1.1	6.6	11
	8CB-MW02	12-131	**14,000 D**	**91 Ui**	25 UJ	25 Ui	**13 JD**	**1,600 D**	25 U	**11,000 D**	25 U					
	8CB-MW17	12-132	**1,000 D**	10 Ui	10 UJ	10 U	10 U	**1,500 D**	10 U	**8,400 D**	10 U					
	8CB-MW18	12-133	**21,000 D**	25 Ui	25 UJ	25 U	25 U	**1,400 D**	25 U	**9,700 D**	25 U					
	8MW06	12-136	**19,000 D**	**510 D**	1.0 U	**9.9 DJ**	1.0 U	430 D	1.5 DJ	180 D	1.0 Ui			3.9	3.3	39
	8MW33	12-212	0.50 U	**32 J**	**2.5**	1.2	0.50 U	0.50 U	4.1	0.50 U	0.50 U			0.60 U	1.0 U	5.6
	8MW03	12-215	0.22 J	**6.5**	**0.60**	0.19 J	0.50 U	0.50 U	0.39 J	0.50 U	0.50 U			0.60 U	1.0 U	0.36 J
	8CB-MW01	12-139	0.19 J	**40**	**0.58**	0.50 U	0.50 U	0.050 J	0.74	0.43 J	0.50 U					
	8CB-MW08	12-140	**6.8**	0.47 J	0.14 J	0.22 J	0.50 U	1.9	0.46 J	17	0.50 U					
	8CB-MW08 (temp)	12-141	**240 JD**	**25**	0.50 U	1.4	0.50 U	21	0.50 U	100 D	0.50 U					
	8CB-MW25	12-142	0.080 J	**7.8**	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.50 U					
	8CB-MW25 (Dup)	*12-143*	*0.080 J*	***7.8***	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.50 U*	*0.15 J*	*0.50 U*					
	29MW01	12-146	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 J	0.50 U					
	8MW29	12-147	0.23 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.26 J	0.50 U					

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Volatile Organic Compounds[1/]																												
			Benzene		**DCA**		**DCE**		**DCP**		**EDB**		**Ethylbenzene**		**TCA**		**Toluene**		**Vinyl Chloride**		**m,p-Xylenes**		**o- Xylene**		**Ethane**		**Ethene**		**Methane**	
			µg/L		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**	
		Sample ID	*Groundwater Cleanup Level (CUL)*																												
Round	**Well**	(OU8-Pilot)	*5*		*5*		*0.5*		*5*		*0.8*		*700*		*5*		*1,000*		*0.5*						*NA*		*NA*		*NA*	
September 2012	8PS-A1	12-201	**12,000**	**D**	**530**	**D**	25	U	25	U	25	U	**890**	**D**	25	U	**9,700**	**D**	25	U					1.8		12	B,L	16,000	B
	8PS-A1 (Dup)	*12-202*	***11,000***	***D***	***520***	***D***	*25*	*U*	*25*	*U*	*25*	*U*	***860***	***D***	*25*	*U*	***8,600***	***D***	*25*	*U*					*1.9*		*11*	*B,L*	*17,000*	*B*
	8PS-A3	12-203	**490**	**D**	**46**	**D**	1.3	U	1.3	U	1.3	U	13	D	1.3	U	95	D	1.3	U					0.98		1.0	U	18,000	B
	8PS-B1	12-204	**16,000**	**D**	**440**	**D**	25	U	5.0	JD	25	U	**730**	**D**	25	U	**8,900**	**D**	25	U					5.4		16	B,L	13,000	B
	8PS-B2	12-205	**1,100**	**D**	**120**	**D**	2.5	U	2.5	U	2.5	U	29	D	2.5	U	120	D	2.5	U					1.5		0.93	J,B,L	15,000	B
	8PS-C1	12-206	**17,000**	**D**	**560**	**D**	25	U	**6.5**	**JD**	25	U	**1,100**	**D**	25	U	**6,100**	**D**	25	U					4.2		18	B,L	10,000	B
	8PS-C2	12-207	**1,100**	**D**	**370**	**D**	2.5	U	**2.0**	**JD**	2.5	U	62	D	2.5	U	220	D	2.5	U					2.6		2.2	B,L	7,800	B
	8PS-C3	12-208	**370**	**D**	**84**	**D**	0.50	U	0.11	J	0.50	U	5.0		0.50	U	75	D	0.50	U					0.60	J	1.0	UJ	16,000	B
	8PS-D1	12-209	**16,000**	**D**	**650**	**D**	25	U	**7.0**	**JD**	**9.5**	**JD**	**960**	**D**	25	U	**3,100**	**D**	25	U					6.5		25	B,L	4,300	B
	8PS-E1	12-210	**640**	**D**	**150**	**D**	1.3	U	1.0	JD	1.3	U	20	D	1.3	U	360	D	1.3	U					5.3		4.7	B,L	12,000	B
	8PS-F1	12-211	**7,800**	**D**	**310**	**D**	13	U	3.8	JD	**3.5**	**JD**	**740**	**D**	13	U	**2,600**	**D**	13	U					8.9		28	B,L	4,300	B
	8PS-G1	12-212	**11,000**	**D**	**340**	**D**	25	U	**5.5**	**JD**	**22**	**JD**	**940**	**D**	25	U	**5,100**	**D**	25	U					4.4		17	B,L	1,100	B
	8MW47	12-406	**6,400**	**D**	**21**	**D**	10	U	10	U	10	U	**1,200**	**D**	10	U	**5,300**	**D**	10	U					7.8		26		2,100	
	MW05	12-408	**14,000**	**D**	**210**	**D**	25	U	**5.5**	**U**	25	U	**1,000**	**D**	25	U	**11,000**	**D**	25	U					3.8		27		1,500	
	MW05 (Dup)	*12-409*	**15,000**	**D**	**230**	**D**	25	U	**6**	**JD**	25	U	**1,100**	**D**	25	U	**12,000**	**D**	25	U					3.1		23		1,400	
	8MW48	12-410	**6,300**	**D**	10	U	10	U	10	U	10	U	**1,700**	D	10	U	**7,900**	**D**	10	U					3.8		6.7		7,200	
	8MW06	12-411	**13,000**	**D**	**810**	**DJ**	13	U	**9.3**	**JD**	13	U	**710**	**D**	13	U	350	D	13	U					8.6		22		51	
	8MW33	12-413	0.50	U	**40**		**3.8**		1.6		0.50	U	0.50	U	**5.5**		0.50	U	0.50	U					0.18	J	1.0	U	6.0	
	8MW03	12-415	0.50	U	4.2		0.37		0.10	J	0.50	U	0.50	U	0.22	J	0.50	U	0.50	U					0.60	U	1.0	U	2.9	
December 2012	8PS-A1	12-301	**10,000**	**D**	**32**	**D**	25	U	25	U	25	U	**890**	**D**	25	U	**9,100**	**D**	25	U					0.64		13		16,000	
	8PS-A3	12-302	**16,000**	**JD**	**30**	**D**	1.3	U	1.3	U	1.3	U	10	D	1.3	U	64	D	1.3	U					0.83	J	0.31	J	17,000	
	8PS-B1	12-303	**13,000**	**D**	**140**	**D**	25	U	25	U	25	U	**730**	**D**	25	U	**8,600**	**D**	25	U					2.4		65		16,000	
	8PS-B2	12-304	**890**	**D**	**110**	**D**	2.5	U	2.5	U	2.5	U	30	D	2.5	U	130	D	2.5	U					1.3		0.80	J	15,000	
	8PS-C1	12-305	**16,000**	**D**	**640**	**D**	25	U	**6.0**	**JD**	25	U	**1,300**	**D**	25	U	**5,100**	**D**	25	U					4.3		28		13,000	
	8PS-C2	12-306	**1,200**	**D**	**140**	**D**	2.5	U	2.5	U	2.5	U	64	D	2.5	U	200	D	2.5	U					3.2		76		12,000	
	8PS-C3	12-307	**270**	**D**	**66**		0.50	U	0.50	U	0.50	U	3.9		0.50	U	78		0.50	U					0.75		0.40	J	18,000	
	8PS-D1	12-308	**19,000**	**D**	**800**	**D**	25	U	**7.5**	**JD**	25	U	**1,200**	**D**	25	U	**6,000**	**D**	25	U					7.0		37		4,500	
	8PS-E1	12-309	**790**	**D**	**120**	**D**	1.3	U	0.85	JD	1.3	U	14	D	1.3	U	310	D	1.3	U					4.1		5.4		13,000	
	8PS-F1	12-310	**7,300**	**D**	**400**	**D**	13	U	13	U	13	U	**760**	**D**	13	U	**2,800**	**D**	13	U					5.9		18		10,000	
	8PS-F1 (Dup)	*12-311*	***7,300***	***D***	***380***	***D***	*13*	*U*	*2.5*	*JD*	*13*	*U*	***770***	***D***	*13*	*U*	***2,800***	***D***	*13*	*U*					*7.7*		*23*		*10,000*	
	8PS-G1	12-312	**10,000**	**D**	**390**	**D**	25	U	25	U	25	U	**1100**	**D**	25	U	**5,800**	**D**	25	U					4.8		19		6,900	
March 2013	8PS-A1	13-101	**14,000**	**D**	**31**	**D**	25	U	25	U	25	U	**990**	**D**	25	U	**12,000**	**D**	25	U					0.71		8.6		15,000	
	8PS-A3	13-102	**840**	**D**	**32**	**D**	1.0	U	1.0	U	1.0	U	15	D	1.0	U	50	D	1.0	U					0.98		1.9		18,000	
	8PS-B1	13-103	**15,000**	**DJ**	**140**	**D**	25	U	25	U	25	U	**830**	**D**	25	U	**10,000**	**D**	25	U					2.5		71		14,000	
	8PS-B2	13-104	**1,300**	**D**	**97**	**D**	2.5	U	2.5	U	2.5	U	37	D	2.5	U	130	D	2.5	U					1.5		16		16,000	
	8PS-C1	13-105	**16,000**	**D**	**520**	**D**	25	U	**6.5**	**JD**	25	U	**1,300**	**D**	25	U	**2,800**	**D**	25	U					2.7		51		12,000	
	8PS-C2	13-106	**1,900**	**D**	**570**	**D**	5.0	U	3.4	JD	5.0	U	97	D	5.0	U	330	D	5.0	U					3.9		88		14,000	
	8PS-C3	13-107	**510**	**DJ**	**140**	**DJ**	0.50	U	0.37	J	0.50	U	6.3		0.50	U	71		0.50	U					1.2		8.2		19,000	
	8PS-C4	13-108	**68**	**D**	**16**		0.50	U	0.27	J	0.50	U	0.55		0.50	U	0.58		0.50	U					1.3		0.22	J	8,300	
	8PS-D1	13-109	**21,000**	**D**	**880**	**D**	50	U	**10**	**JD**	50	U	**1,500**	**D**	50	U	**9,900**	**D**	50	U					9.0		46		3,600	
	8PS-D1 (Dup)	*13-112*	**20,000**	**D**	**880**	**D**	50	U	**10**	**JD**	50	U	**1,400**	**D**	50	U	**9,500**	**D**	50	U					7.4		39		3,500	
	8PS-E1	13-110	**790**	**JD**	**130**	**D**	2.5	U	1.1	JD	2.5	U	12	D	2.5	U	370	D	2.5	U					2.4		4.8		12,000	

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID (OU8-Pilot)	Benzene µg/L	DCA µg/L	DCE µg/L	DCP µg/L	EDB µg/L	Ethylbenzene µg/L	TCA µg/L	Toluene µg/L	Vinyl Chloride µg/L	m,p-Xylenes µg/L	o- Xylene µg/L	Ethane µg/L	Ethene µg/L	Methane µg/L
		Groundwater Cleanup Level (CUL)	*5*	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*			*NA*	*NA*	*NA*
March 2013 (Cont.)	*8PS-F1*	*13-111*	**8,100** D	**130** D	10 U	10 U	10 U	**800** D	10 U	**2,700** D	10 U			6.3	63	12,000
	8PS-G1	13-113	**10,000** JD	**400** D	25 U	25 U	25 U	**1,400** D	25 U	**4,200** D	25 U			3.7 J	24	7,100
	8MW48	13-122	**8,500** D	26 Ui	10 U	10 U	10 U	**1,800** D	10 U	**7,100** D	10 U					
	8MW48	13-209	**8,000** D	220 Ui	10 U	10 Ui	10 U	**1,800** D	10 U	**6,700** D	10 U			2.9	4.0	8,400
	8MW49	13-123	**3,300** D	13 Ui	10 U	10 U	10 U	510 D	10 U	**5,000** D	10 U			0.91	3.3	960
	8CB-MW26	13-114	**950** D	25 U	25 U	25 U	25 U	**1,500** D	25 U	**9,100** D	25 U					
	8CB-MW26 (Dup)	*13-115*	**860** D	25 U	25 U	25 U	25 U	**1,400** D	25 U	**9,300** D	25 U					
	8CB-MW28	13-116	**19,000** D	**440** D	50 U	50 U	50 U	**1,600** D	50 U	**22,000** D	50 U					
	8CB-MW23	13-117	**78** J	4.4	0.50 U	2.3	0.50 U	260 D	0.50 U	110 D	0.50 U					
	8CB-MW02	13-118	**12,000** D	66 Ui	10 U	10 U	**12** D	**2,100** D	10 U	**13,000** D	10 U					
	8CB-MW17	13-119	**850** D	5.0 U	5.0 U	5.0 U	5.0 U	**1,400** D	5.0 U	**4,700** D	5.0 U					
	8CB-MW18	13-120	**16,000** D	25 U	25 U	25 U	25 U	**1,400** D	25 U	**11,000** D	25 U					
	8CB-MW24	13-121	0.40 J	2.2	0.50 U	0.50 U	0.50 U	1 U	0.50 U	0.32 J	0.50 U					
	8MW47	13-206	**1,600** D	73 Ui	5.0 U	2.7 JD	5.0 U	680 D	5.0 U	**3,000** D	5.0 U			2.4	5.0	3,300
	8MW47 (Dup)	*13-207*	***2,500*** *D*	*75 Ui*	*10.0 U*	*10 U*	*10.0 U*	*670 D*	*10.0 U*	***4,300*** *D*	*10.0 U*			*2*	*3.7*	*3,600*
	8MW06	13-210	**17,000** D	740 Ui	25 U	25 Ui	25 U	**740** D	25 U	210 D	25 U			6.4	20	63
	8MW33	13-212	0.50 U	**21**	**1.6**	0.72	0.50 U	0.50 U	2.4	0.25 J	0.50 U			0.60 U	1.0 U	1.3 U
	8MW03	13-215	0.50 U	3.2	0.27 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U			0.60 U	1.0 U	3.1
October 2013	8MW47	13-406	**3,900** D	2.5 U	2.5 U	2.5 U	2.5 U	**1,100** D	2.5 U	**1,700** D	2.5 U	4,900 D	960 D	1.9	1.6	4,600
	MW05	13-408	**14,000** D	**180** D	25 U	5.0 JD	25 U	**1,100** D	25 U	**6,000** D	25 U	5,000 D	2,400 D	11	48	4,700
	8MW48	13-410	**5,000** D	13 U	13 U	3.3 JD	13 U	**1,400** D	13 U	**4,200** D	13 U	3,500 D	2,300 D	3.6	5.5	10,000
	8MW49	13-409	**6,400** D	13 U	13 U	13 U	13 U	**1,300** D	13 U	**6,900** D	13 U	6,700 D	3,000 D	2.7	10	670
	8MW06	13-411	**15,000** D	**280** D	25 U	**7.5** JD	25 U	**880** D	25 U	460 D	25 U	1,100 D	360 D	8.8	34	160
	8MW06 (Dup)	13-412	**15,000** D	**260** D	25 U	**7.5** JD	25 U	**830** D	25 U	410 D	25 U	1,100 D	330 D	9.6	39	160
	8MW33	13-414	0.50 U	**28**	**3.1**	1.3	0.50 U	0.50 U	4.5	0.50 U	0.50 UJ	0.50 U	0.50 U	0.13 J	1.0 U	3.6
	8MW03	13-417	0.50 U	3.3	0.39 J	0.10 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U	0.50 U	0.60 U	1.0 U	22
March - April 2014	8PS-A1	14-101	**16,000** D	25 U	25 U	25 U	25 U	**980** D	25 U	**12,000** D	25 U	2,500 D	1,900 D	0.64	4.0	11,000
	8PS-A3	14-102	**230** D	10	0.50 U	0.50 U	0.50 U	4.6	0.50 U	16	0.50 UJ	6.3	5.1	0.91	2.2	17,000
	8PS-B1	14-103	**12,000** D	25 U	25 U	25 U	25 U	610 D	25 U	**7,400** D	25 U	1,200 D	1,100 D	0.30 J	7.1	10,000
	8PS-B2	14-104	**690** D	**24** D	2.5 U	2.5 U	2.5 U	11 D	2.5 U	18 D	2.5 U	6.5 D	8.1 D	0.96	11	11,000
	8PS-C1	14-105	**14,000** D	**140** D	25 U	25 U	25 U	**810** D	25 U	**1,900** D	25 U	900 D	480 D	0.84	53	10,000
	8PS-C2	14-106	**820** D	**29** D	1.3 U	1.3 U	1.3 U	40 D	1.3 U	96 D	1.3 U	19 D	15 D	1.1	17	13,000
	8PS-C3	14-107	**62** J	**21**	0.50 U	0.50 U	0.50 U	1.9	0.50 U	6.0	0.50 U	3.4	3.8 J	0.68	2.5	14,000
	8PS-D1	14-108	**19,000** D	**110** D	50 U	50 U	50 U	**1,200** D	50 U	**8,200** D	50 UJ	2,400 D	1,100 D	2.4	81	4,900
	8PS-E1	14-109	**1,100** D	**91** D	2.5 U	0.50 DJ	2.5 U	25 D	2.5 U	650 D	2.5 U	43 D	33 D	0.49 J	2.4	8,200
	8PS-F1	14-110	**8,200** D	**79** D	13 U	13 U	13 U	600 D	13 U	**2,600** D	13 U	600 D	450 D	5.0	14	9,700
	8PS-F1	*14-111*	**8,700** DJ	**42** D	13 U	13 U	13 U	**730** D	13 U	**2,800** DJ	13 U	700 D	570 DJ	4.7	14	9,400
	8PS-G1	14-112	**9,800** D	**48** D	13 U	13 U	13 U	**750** D	13 U	**2,700** D	13 U	740 D	430 D	1.3	45	8,600
	8MW49	14-113	**4,400** D	**14** D	10 U	2.0 DJ	10 U	**890** D	10 U	**4,700** D	10 U	6,600 D	3,400 D	0.91	1.8	670
	8MW47	14-206	**6,000** D	**28** D	10 U	10 U	10 U	680 D	10 U	300 D	10 U	2,300 D	460 D	2.5	1.7	3,500
	8MW47 (Dup)	*14-207*	**6,400** D	**30** D	10 U	10 U	10 U	**770** D	10 U	330 D	10 U	2,500 D	500 D	2.5	1.8	3,700

Volatile Organic Compounds[1/]

Table 3-2. VOCs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID (OU8-Pilot)	Benzene µg/L	DCA µg/L	DCE µg/L	DCP µg/L	EDB µg/L	Ethylbenzene µg/L	TCA µg/L	Toluene µg/L	Vinyl Chloride µg/L	m,p-Xylenes µg/L	o- Xylene µg/L	Ethane µg/L	Ethene µg/L	Methane µg/L
		Groundwater Cleanup Level (CUL)	*5*	*5*	*0.5*	*5*	*0.8*	*700*	*5*	*1,000*	*0.5*			*NA*	*NA*	*NA*
(Cont.)	8MW48	14-209												0.31 J	0.22 J	9,900
(Cont.)	8MW06	14-210	**11,000 D**	**300 D**	25 U	25 U	25 U	520 D	25 U	71 D	25 U	180 D	42 D	2.8	3.0	150
(Cont.)	8MW33	14-212	0.50 U	**24**	**2.0**	0.50 U	0.50 U	0.50 U	2.8	0.50 U	0.50 U	0.50 U	0.50 U	0.075 J	1.0 U	2.6 UJ
(Cont.)	8MW03	14-214	0.50 U	4.4	0.47 J	0.12 J	0.50 U	0.50 U	0.26 J	0.50 U	0.50 U	0.50 U	0.50 U	0.60 U	1.0 U	1.4 UJ

Volatile Organic Compounds[1/]

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at well 8IW-2 during the September 2011 sampling event.
Olive green highlighted cells indicate sample results from OU 8 Rounds 26, 27, 28, 29, and 30. Sample ID prefix used was "OU8-12-2XX" (Round 26), "OU8-12-4XX" (Round 27), "OU8-13-XX" (Round 28), "OU8-13-XX" (Round 29), and "OU8-14-XX" (Round 30)
1/ The following wells sampled in the Baseline round had an expanded analyte list: 8CB-MW01, 8CB-MW08, 8CB-MW08 (temp), 8CB-MW25, 8CB-MW25 (Dup), 29MW01, and 8MW29.
B - The associated method blank contained the target analyte at trace concentration.
D - The result is reported from a diluted analysis.
i - The level of detection is elevated due to a matrix interference.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
L - As applicable to RSK-175 analysis, the recovery for the laboratory control sample was outside laboratory control limits and the result may be biased low.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable
Bold - The detected value exceeds the cleanup level

Sampling Round	Dates
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012
September 2012	September 4-6, 2012
Round 27	October 16-23, 2012
December 2012	December 3-5, 2012
March 2013	March 6-12, 2013
Round 28	April 15-18, 2013
Round 29	October 21-30, 2013
Round 30	March 27 - April 9, 2014
April 2014	April 14-15, 2014

Abbreviations
DCA - 1,2-Dichloroethane
DCE - 1,1-Dichloroethene
DCP - 1,2-Dichloropropane
EDB - 1,2-Dibromoethane
TCA - 1,1,2-Trichloroethane

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID	Calcium	Manganese	Magnesium	Potassium	Sodium	Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Carbon, Organic (Dissolved)
			Inorganic Parameters												Other
			Cations (Dissolved)					Anions							
		Sample ID	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	MW03	12-202		4,790						4.56	0.10 UJ	0.10 U	0.17 J	404	46.2
	8MW53	12-101		1,770						21.3	0.10 UJ	0.10 U	0.15 J	404	14.3
	8MW47	12-207		4,170						10.9	0.10 U	0.10 U	0.23 J	491	37.0
	8MW24	12-102		4,510						9.76	0.10 UJ	0.10 U	0.14 J	372	13.4
	8CB-MW23	12-129	51,600	5,640	22,500	1,960	13,300	248	9.0 U	6.58	0.44		2.88		2.32
	8CB-MW23 (temp)	12-130	77,100	3,330	42,400	2,170	13,200	379	2 U	3.79	0.10 U		3.39		2.26
	8CB-MW24	12-137	46,800	1,640	13,500	1,640	13,300	193	2.0 U	8.53	0.12		5.56		
	8CB-MW24 (temp)	12-138	58,200	1,620	20,500	1,320	9,810	238	9.0 U	3.10	0.10 UJ		7.13 J		
	8CB-MW28	12-127	99,700	6,110	43,200	1,900	13,000	423	9.0 U	8.31	0.10 UJ		4.34		13.7
	8CB-MW28 (Dup)	*12-128*	*101,000*	*6,280*	*42,700*	*1,900*	*12,900*	*427*	*9.0 U*	*8.32*	*0.10 UJ*		*4.25*		*13.5*
	8MW48	12-134		8,980						5.24	0.10 U	0.10 U	0.24 J	576	35.5
	8MW49	12-135		7,850						10.3	0.10 U		0.29 J		27.7
	8IW-1	12-104													159
	8IW-2	12-105													474
	8IW-3	12-106													196
	8IW-6	12-109													20.5
	8IW-7	12-110													6.9
	8PS-A1	12-111		11,100						9.91	0.10 UJ		0.24 J		97.5
	8PS-A3	12-112		18,200						9.50	0.10 UJ		0.32 J		125
	8PS-B1	12-113		12,200						11.3	0.10 UJ		0.20 J		126
	8PS-B1 (Dup)	*12-114*		*12,500*						*11.3*	*0.10 UJ*		*0.19 J*		*126*
	8PS-B2	12-115		18,100						7.8	0.10 UJ		0.28 J		46.4
	8PS-C1	12-116		8,810						45.0	0.10 UJ		3.8		29.0
	8PS-C2	12-117		7,110						13.7	0.10 UJ		1.85		34.2
	8PS-C3	12-118		17,900						9.14	0.10 UJ		0.42		90.4
	8PS-C4	12-119		8,160						13.7	0.10 UJ		0.69		9.7
	8PS-D1	12-120		9,400						34.5	0.10 UJ		0.91		32.4
	8PS-E1	12-123		6,620						26.2	0.10 UJ		7.5		21.1
	8PS-F1	12-124		6,470						24.8	0.10 UJ		13.8		12.3
	8PS-G1	12-125		9,520						49.5	0.10 U		11.8		14.8
	8CB-MW26	12-126	52,000	3,740	21,200	1,540	15,400	236	2.0 U	9.32	0.10 U		16.2		3.2
	8CB-MW02	12-131	98,700	10,600	37,300	1,950	15,300	409	9.0 U	16.1	0.10 UJ		1.26		
	8CB-MW17	12-132	45,500	2,610	29,500	1,630	8,830	232	2.0 U	8.77	0.10 U		4.01		
	8CB-MW18	12-133	117,000	7,190	66,300	2,420	29,500	598	2.0 U	14.1	0.10 U		0.37 J		
	8MW06	12-136		9,720						29.9	0.10 U	0.10 U	0.42	553	21.7
	8MW33	12-212		310						2.22	0.10 UJ	0.10 U	3.79	105	0.84
	8MW03	12-215		467						2.88	0.35	0.10 U	3.34	60.9	2.00
	8CB-MW01	12-139	31,000	1,100	16,500	1,250	7,090	168	168	1.95	0.10 U		9.04		
	8CB-MW08	12-140	41,600	523	24,400	16,400	8,670	217	217	4.08	0.10 U		5.06		
	8CB-MW25	12-142	56,200	675	41,500	2,020	34,200	379	379	13.1	0.09 J		8.85		

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Calcium	Manganese	Magnesium	Potassium	Sodium	Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Carbon, Organic (Dissolved)
			Inorganic Parameters: Cations (Dissolved)					Inorganic Parameters: Anions						Inorganic Parameters	Other
		Sample ID	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
September 2012	8PS-A1	12-201								8.2			0.62		122
	8PS-A1 (Dup)	*12-202*								9.08			0.29		127
	8PS-A3	12-203								8.8			0.37		24.7
	8PS-B1	12-204								22.9			0.33		128
	8PS-B2	12-205								8.49			0.43		10.1
	8PS-C1	12-206								79.9			0.59		23.8
	8PS-C2	12-207								10.2			2.59		30.2
	8PS-C3	12-208								7.99			0.33		21.1
	8PS-D1	12-209								38.1			0.88		24.8
	8PS-E1	12-210								9.4			0.55		1080
	8PS-F1	12-211								23.5			1.9		0.55
	8PS-G1	12-212								70			3.41		41.8
	8MW47	12-406		3,340						12.4 J	0.10 U	0.10 U	0.34	475	11.8
	MW05	12-408		5,720						11.9 J	0.10 U	0.10 U	0.37	349	19
	MW05 (Dup)	*12-409*		5,730						11.8 J	0.10 J	0.10 J	0.38	350	18.8
	8MW48	12-410		8,790						4.43	0.10 U	0.10 U	0.40	566	25.2
	8MW06	12-411		7,840						19.7	0.10 U	0.10 U	0.49	495	13.4
	8MW33	12-413		403						2.88	0.10 U	0.10 U	4.89	156	1.08
	8MW03	12-415		571						4.78	0.40	0.10 U	3.04	56.0	0.34 J
December 2012	8PS-A1	12-301								12.3			0.38		89.8
	8PS-A3	12-302								8.74			0.49		21.1
	8PS-B1	12-303								18.5			0.4		93.8
	8PS-B2	12-304								7.77			0.42		8.57
	8PS-C1	12-305								80.1			0.39		31.9
	8PS-C2	12-306								11			0.8		18.9
	8PS-C3	12-307								9.05			0.4		8.91
	8PS-D1	12-308								34.3			0.38		17
	8PS-E1	12-309								17.2			0.53		848
	8PS-F1	12-310								23.6			0.41		144
	8PS-F1 (Dup)	*12-311*								23.4			0.42		145
	8PS-G1	12-312								79.5			0.48		33.6
March 2013	8PS-A1	13-101		15,000							0.10 U		0.34		99.0
	8PS-A3	13-102		15,400							0.10 UJ		0.39		20.7
	8PS-B1	13-103		11,800							0.10 U		0.72		68.5
	8PS-B2	13-104		13,800							0.10 U		0.32		9.7
	8PS-C1	13-105		11,800							0.10 UJ		0.44		28.4
	8PS-C2	13-106		8,870							0.10 U		0.61		28.2
	8PS-C3	13-107		12,000							0.10 U		0.45		8.36
	8PS-C4	13-108		7,270							0.10 UJ		4.69		7.67
	8PS-D1	13-109		9,620							0.10 U		0.52		26.4
	8PS-D1 (Dup)	*13-112*		9,820							0.10 U		0.53		27.3
	8PS-E1	13-110		22,600							0.10 U		0.53		783

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Round	Well	Sample ID	Calcium	Manganese	Magnesium	Potassium	Sodium	Bicarbonate as $CaCO_3$	Carbonate as $CaCO_3$	Chloride	Nitrate as Nitrogen	Nitrite as Nitrogen	Sulfate	Alkalinity	Carbon, Organic (Dissolved)
			Inorganic Parameters												**Other**
			Cations (Dissolved)					**Anions**							
			µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
March 2013 (Cont.)	*8PS-F1*	*13-111*		11,900							0.10 U		0.44		108
	8PS-G1	13-113		13,000							0.10 UJ		0.67		20.9
	8MW48	13-209		9,920						4.57	0.10 U	0.10 U	0.43	554	15.1
	8MW49	13-123		7,650							0.10 U		1.98		24.6
	8MW47	13-206		3,970						10.6	0.10 U	0.10 U	0.38	428	14
	8MW47 (Dup)	*13-207*		*4,040*						*10.7*	*0.10 U*	*0.10 U*	*0.33*	*433*	*14.1*
	8MW06	13-210		10,300						33.7	0.10 U	0.10 U	0.47	499	21.1
	8MW33	13-212		126						1.65	0.10 U	0.10 U	3.89 J	74.8	1.25
	8MW03	13-215		590						2.71	0.52	0.030 J	3.14	54.5	0.71
October 2013	8MW47	13-406		3,590						12.4	0.10 U	0.10 U	0.18 J	497	10.1
	MW05	13-408		5,790						10.7 J	0.10 U	0.10 U	0.19 J	362	17.0
	8MW48	13-410		9,460						4.29 J	0.10 U	0.10 U	0.12 J	555	10.5
	8MW49	13-409		7,290						7.71 J	0.10 U	0.10 U	0.10 J	NA	16.4
	8MW06	13-411		9,020						21.8 J	0.10 U	0.10 U	0.23	506	16.2
	8MW06 (Dup)	13-412		8,820						21.1 J	0.10 U	0.10 U	0.20	492	16.1
	8MW33	13-414		335						2.73	0.10 U	0.10 U	5.65	144	1.74
	8MW03	13-417		575						3.13	0.60	0.10 U	3.48	64.2	3.09
March - April 2014	8PS-A1	14-101		14,700						16.3 J	0.10 U	0.10 U	0.17 J		23.2
	8PS-A3	14-102		12,000						9.30 J	0.10 U	0.10 U	0.36		13.6
	8PS-B1	14-103		18,000						14.6 J	0.10 U	0.10 U	0.17 J		101
	8PS-B2	14-104		13,100						6.82 J	0.10 U	0.10 U	0.15 J		6.57
	8PS-C1	14-105		12,500						80.3 J	0.10 U	0.10 U	0.14 J		17.8
	8PS-C2	14-106		11,500						9.38	0.10 UJ	0.10 U	0.25		6.12
	8PS-C3	14-107		14,100						8.08 J	0.10 U	0.10 U	0.18 J		9.38
	8PS-D1	14-108		10,900						23.6 J	0.10 U	0.10 U	0.38		17.2
	8PS-E1	14-109		15,100						22.0 J	0.10 U	0.10 U	0.40		408
	8PS-F1	14-110		15,000						30.7	0.10 UJ	0.10 U	0.24		33.5
	8PS-F1	*14-111*		15,100						30.9	0.10 UJ	0.10 U	0.17 J		33.7
	8PS-G1	14-112		14,500						108	0.10 UJ	0.10 U	0.34		12.1
	8MW49	14-113		7,150						5.95	0.10 UJ	0.10 U	0.12 J		26.5
	8MW47	14-206		3,810						17.3	0.10 U	0.10 U	0.17 J	557	10.5
	8MW47 (Dup)	*14-207*		3,750						17.4	0.10 U	0.10 U	0.15 J	564	10.6
	8MW48	14-209		10,500						5.13	0.10 U	0.10 U	0.20 UJ	573	7.23
	8MW06	14-210		9,390						21.9	0.10 U	0.10 U	0.20 UJ	477	13.4
	8MW33	14-212		391						2.15	0.10 U	0.10 U	5.73	137	0.73
	8MW03	14-214		563						2.56	0.39	0.10 U	3.41	70	0.57

Table 3-3. Inorganics in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at well 8IW-2 during the September 2011 sampling event.
Olive green highlighted cells indicate sample results from OU 8 Rounds 26, 27, 28, 29, and 30 monitoring. Sample ID prefix used was "OU8-12-2XX" (Round 26), "OU8-12-4XX" (Round 27), "OU8-13-XX" (Round 28), "OU8-13-XX" (Round 29), and "OU8-14-XX" (Round 30)
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable

Sampling Round	Dates
April 2012 (Phase II Baseline)	April 26-30, 2012
May 2012 (Phase II Baseline)	May 21-31, 2012
Round 26	April 19-25, 2012
August 2012 (Phase II Baseline)	August 14-20, 2012
September 2012	September 4-6, 2012
Round 27	October 16-23, 2012
December 2012	December 3-5, 2012
March 2013	March 6-12, 2013
Round 28	April 15-18, 2013
Round 29	October 21-30, 2013
Round 30	March 27 - April 9, 2014
April 2014	April 14-15, 2014

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round

Round	Well	Sample ID	Molecular Biological Tools: Microbial Insights		SiREM Sample Split Analysis				Volatile Fatty Acids					
			DHC	DHB	vcrA	% vcrA	Dhc 16S rRNA	% DHC	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
		Sample ID	cells/mL	cells/mL	Gene Copies/mL	%	Gene Copies/mL	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Well	(OU8-Pilot-)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	8MW24	12-102	3.00E-01 J	3.28E+03										
	8CB-MW23	12-129	5.00E-01 U	3.00E+00 U										
	8CB-MW28	12-127	6.00E-01 U	8.10E+00										
	8MW48	12-134	6.70E+01	3.90E+03										
	8MW49	12-135	2.26E+03	7.90E+03										
	8IW-1	12-104							0.39 U	287	37	1.3	25	2.2
	8IW-2	12-105							0.39 U	437	175	0.76	89	7.6
	8IW-3	12-106							0.39 U	334	21	0.96	38	2.6
	8IW-6	12-109							0.39 U	12	0.31 U	1.8	0.41 U	0.69 U
	8IW-7	12-110							0.39 U	3.1	0.31 U	1.9	0.41 U	0.69 U
	8PS-A1	12-111	7.43E+01	1.23E+03					0.39 U	209	3.2	1.1	5.7	0.69 U
	8PS-A3	12-112	2.03E+01	2.61E+03					0.39 U	147	51	1.9	6.9	0.69 U
	8PS-B1	12-113	2.35E+02	9.27E+03					0.39 U	232	41	1.2	1.7	1.7
	8PS-B1 (Dup)	*12-114*	*1.07E+02*	*5.70E+03*					*0.39 U*	*242*	*43*	*1.3*	*1.9*	*1.7*
	8PS-B2	12-115	9.60E+00	8.38E+02					0.39 U	80	19	1.4	2.1	2.2
	8PS-C1	12-116	1.11E+03	3.24E+03					0.78	15	0.31 U	2.2	0.57	0.69 U
	8PS-C2	12-117	1.99E+01	4.14E+03					0.39 U	84	0.98	1.8	0.41 U	0.69 U
	8PS-C3	12-118	1.28E+01	1.06E+04					0.39 U	208	20	1.0	3.1	0.69 U
	8PS-C4	12-119	1.76E+01	2.05E+03					0.39 U	10	0.41	1.9	0.41 U	0.69 U
	8PS-D1	12-120	6.05E+01	4.89E+03					0.52	13	26	1.6	0.41 U	0.69 U
	8PS-E1	12-123	1.07E+01	1.41E+01					0.39 U	3.4	0.31 U	1.9	0.41 U	0.69 U
	8PS-F1	12-124	2.00E-01 J	4.00E-01 J					0.39 U	3.5	0.31 U	2.2	0.42	0.69 U
	8PS-G1	12-125	1.28E+03	1.45E+03					0.40	2.9	0.78	1.7	0.41 U	0.69 U
	8CB-MW17	12-132	1.30E+00	3.11E+02										
	8CB-MW18	12-133	6.90E+00	7.31E+01										
	8MW06	12-136	2.80E+00	1.16E+03										
Sept 2012	8PS-A1	12-201	5.10E+00	1.66E+03					0.39 U	249	14	1.8	11	1.3
Sept 2012	*8PS-A1 (Dup)*	*12-202*	*1.21E+01*	*1.93E+04*					*0.57*	*260*	*12*	*2.1*	*12*	*1.2*
Sept 2012	8PS-A3	12-203							0.39 U	6.6	0.31 U	2.8	0.41 U	0.69
Sept 2012	8PS-E1	12-210	9.74E+01	1.89E+02					0.39 U	445	873	1.7	81	2.4
December 2012	8PS-A1	12-301	1.38E+03	1.30E+00					0.39 U	182	1.8	0.22 U	0.46	0.69 U
December 2012	8PS-A3	12-302	5.00E-01 U	2.63E+02					0.51 U	0.54 U	0.31	0.72	0.41 U	0.69 U
December 2012	8PS-B1	12-303	2.20E+00	1.16E+02					0.39 U	212	1.9	0.22 U	0.41 U	0.69 U
December 2012	8PS-B2	12-304	5.00E-01 U	1.70E+02					0.39 U	0.54 U	0.31 U	0.22 U	0.41 U	0.69 U
December 2012	8PS-C1	12-305	7.00E-01	9.35E+02										
December 2012	8PS-C2	12-306	5.00E-01 U	2.11E+03										
December 2012	8PS-C3	12-307	4.00E-01 J	2.94E+02										
December 2012	8PS-E1	12-309	2.60E+00	1.34E+01					0.39 U	416	692	0.22 U	79	14
December 2012	8PS-F1	12-310	2.20E+01	1.34E+03					0.39 U	150	144	0.22 U	7.2	3.0
December 2012	*8PS-F1 (Dup)*	*12-311*	*1.06E+01*	*5.34E+02*					*0.39 U*	*141*	*139*	*0.22 U*	*6.2*	*2.8*
December 2012	8PS-G1	12-312	1.80E+00	7.02E+02					0.39 U	8.3	39	0.22 U	0.41 U	0.69 U

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

			Molecular Biological Tools										Volatile Fatty Acids										
			Microbial Insights				SiREM Sample Split Analysis																
			DHC		DHB		vcrA		% vcrA	Dhc 16S rRNA		% DHC	Lactate		Acetate	Propionate		Formate		Butyrate		Pyruvate	
		Sample ID	cells/mL		cells/mL		Gene Copies/mL		%	Gene Copies/mL		%	mg/L		mg/L	mg/L		mg/L		mg/L		mg/L	
Round	Well	(OU8-Pilot-)	*NA*		*NA*		*NA*		*NA*	*NA*		*NA*	*NA*		*NA*	*NA*		*NA*		*NA*		*NA*	
March 2013	8PS-A1	13-101	2.00E-01	J	5.77E+02		4.00E+00	B	0.0003 - 0.0008				0.39	U	211	2.4		0.22	U	7.9		0.69	U
	8PS-A1 (Dup)	*13-125*											0.39	U	204	2.1		0.22	U	7.7		0.69	U
	8PS-A3	13-102	5.00E-01	U	8.50E+02								0.39	U	3.4	0.31	U	2.1		0.41	U	0.69	U
	8PS-B1	13-103	6.00E-01	J	5.61E+03		3.00E+00	B	0.0002 - 0.0005				0.39	U	156	0.31	U	0.22	U	0.41	U	0.69	U
	8PS-B2	13-104	5.00E-01	U	8.51E+02								0.39	U	0.71	0.31	U	1.4		0.41	U	0.69	U
	8PS-C1	13-105	5.00E-01	U	8.02E+03								0.40	U	25	0.31	U	1.7		0.41	U	0.69	U
	8PS-C2	13-106	5.00E-01	U	3.00E+00	U							0.39	U	80	0.31	U	1.5		0.41	U	0.69	U
	8PS-C3	13-107	5.00E-01	U	2.14E+03								0.39	U	0.59	0.31	U	1.7		0.41	U	0.69	U
	8PS-C4	13-108	5.00E-01	U	7.80E+02																		
	8PS-D1	13-109	5.00E-01	U	1.85E+03																		
	8PS-D1 (Dup)	*13-112*	5.00E-01	U	3.03E+03																		
	8PS-E1	13-110	5.00E-01	U	9.10E+00					1.00E+00	U	NA	0.78	U	485	895		4.6		70		36	
	8PS-F1	13-111	5.00E-01	U	1.58E+03					1.00E+00	J	0.006 - 0.01	0.39	U	158	67		1.4		2.9		0.70	
	8PS-G1	13-113	5.00E-01	U	3.59E+03								0.39	U	4.6	15		1.3		0.41	U	0.69	U
	8MW48	13-122	5.00E-01	U	7.12E+02																		
	8MW49	13-123	5.00E-01	J	7.84E+02																		
	8MW06	13-124	5.00E-01	U	1.77E+02																		
March - April 2014	8PS-A1	14-101											0.39	U	52	0.85		0.28		0.69	U	0.74	
	8PS-A3	14-102											0.39	U	1.8	0.31	U	0.50		0.69	U	0.41	U
	8PS-B1	14-103											0.39	U	242	1.6		0.22	U	0.69	U	1.7	
	8PS-B2	14-104											0.69		0.96	0.31	U	0.51		0.69	U	0.41	U
	8PS-C1	14-105											0.39	U	11	0.31	U	0.28		0.69	U	0.41	U
	8PS-C2	14-106											0.39	U	1.0	0.31	U	0.56		0.69	U	0.41	U
	8PS-C3	14-107											0.39	U	1.6	0.31	U	0.54		0.69	U	0.41	U
	8PS-D1	14-108											0.39	U	4.7	0.31	U	0.42		0.69	U	0.41	U
	8PS-E1	14-109											0.39	U	235	312		3.3		52		48	
	8PS-F1	14-110											0.39	U	73	6.0		0.27		0.69	U	0.41	U
	8PS-F1	*14-111*											0.39	U	74	6.3		0.41		0.69	U	0.41	U
	8PS-G1	14-112											0.39	U	1.9	0.31	U	0.37		0.69	U	0.41	U
	8MW49	14-113											0.39	U	21	0.62		0.27		0.69	U	0.41	U

Table 3-4. MBTs and VFAs in Groundwater for OU 8 Phase II Pilot Study by Round (continued)

Notes:
(Dup) - Indicates field duplicate sample
(temp) - Collected from temporary well installed prior to permanent well installation. Temporary wells were screened at different elevations than temporary wells.
[38.5'] - Samples were collected from two depths (38.5 ft and 49.5 ft) at well 8IW-2 during the September 2011 sampling event.
B - Analyte was also detected in the method blank.
J - The result is qualified as estimated because it is outside of the quantitation range, or the data validator qualified the value as estimated due to a QC outlier.
U - The analyte is not detected at the indicated level of detection, or the data validator qualified the value as not detected at the reporting limit due to trace contamination in an associated blank.
NA - Not applicable

Sampling Round	Dates	Abbreviations
April 2012 (Phase II Baseline)	April 26-30, 2012	DHB - Dehalobacter spp.
May 2012 (Phase II Baseline)	May 21-31, 2012	DHC - Dehalococcoides spp.
Round 26	April 19-25, 2012	rRNA - 16S ribosomal ribonucleic acid gene
August 2012 (Phase II Baseline)	August 14-20, 2012	vcrA - vinyl chloride reductase A gene
September 2012	September 4-6, 2012	
December 2012	December 3-5, 2012	
March 2013	March 6-12, 2013	
Round 28	April 15-18, 2013	
April 2014	April 14-15, 2014	

APPENDIX D-6

Table 2-9
2013 Air Sampling Results Bangor VI (Includes Sub-Slab Soil Gas and Indoor Air)

Chemical	Vinyl Chloride		1,1-Dichloroethene (DCE)		1,2-Dichloroethane (DCA)		Benzene		1,2-Dichloropropane		1,1,2-Trichloroethane (TCA)		Toluene	
EPA's Industrial Air RSL (µg/m^3)	**2.8**		**880**		**0.47**		**1.6**		**1.2**		**0.77**		**22,000**	
Ecology's MTCA C Indoor Air (µg/m^3)	**2.8**		**200**		**0.96**		**3.2**		**4.0**		**1.6**		**5,000**	
Sub-slab Screening Level based on EPA's Industrial Air RSL (µg/m^3)	**28.0**		**8800**		**4.70**		**16.0**		**12.0**		**7.7**		**220,000**	
Sub-slab Screening Level Based on Ecology's MTCA C Indoor Air (µg/m^3)	**28.0**		**2000**		**9.60**		**32.0**		**40.0**		**16**		**50,000**	
Sampling Date	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**
Unit	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**
Building 1021 (Sample No.)														
Bathroom:														
Sub-slab (1021-6)	4.5 U	0.44 U	4.9 U	0.48 U	4.8 U	0.47 U	4.9 U	0.48 U	4.6 U	0.45 U	4.6 U	0.45 U	8.9	1.8
Indoor air (1021-1)	0.51 U	0.49 U	0.56 U	0.53 U	0.54 U	0.52 U	1.4	0.54 J	0.52 U	0.5 U	0.52 U	0.5 U	4.7	2.3
Western Portion:														
Sub-slab (1021-7/1021-12 DUP)	9.4 U	4.3 U	10 U	7.1 J	10 U	4.6 U	10 U	4.7 U	9.7 U	4.4 U	9.7 U	4.4 U	10 U	4.6 U
Indoor air (1021-2/1201-11 DUP)	0.48 U	0.48 U	0.53 U	0.52 U	0.51 U	0.51 U	**2.4**	0.56 J	0.5 U	0.49 U	0.5 U	0.49 U	12	2.6
Smallest Office:														
Sub-slab (1021-8)	1.6 U	0.46 U	1.7 U	0.5 U	1.7 U	0.49 U	1.7 J	0.5 U	1.6 U	0.47 U	1.6 U	0.47 U	71	2.3
Indoor air (1021-3)	0.46 U	0.5 U	0.5 U	0.54 U	**0.88**	0.53 U	**2.1**	0.34 J	0.47 U	0.51 U	0.47 U	0.51 U	8.9	8.1
Large Office:														
Sub-slab (1021-9)	0.47 U	0.46 U	0.51 U	0.5 U	0.5 U	0.49 U	0.46 J	0.4 J	0.48 U	0.47 U	0.48 U	0.47 U	2.4	2.5
Indoor air (1021-4)	0.46 U	0.5 U	0.51 U	0.55 U	0.31 J	0.53 U	**2.3**	0.76 J	0.48 U	0.52 U	0.48 U	0.52 U	21	4.8
Eastern portion:														
Sub-slab (1021-10)	0.46 U	0.47 U	0.50 U	0.51 U	0.49 U	0.5 U	0.38 J	0.28 J	0.47 U	0.48 U	0.47 U	0.48 U	3	2.7
Indoor air (1021-5)	0.47 U	0.48 U	0.51 U	0.53 U	0.5 U	0.52 U	**1.8**	0.74 J	0.48 U	0.5 U	0.48 U	0.5 U	9.1	4.5
Ambient outdoor air (NW Corner) (1021-AA1)	0.49 U	0.43 U	0.53 U	0.47 U	0.52 U	0.46 U	1.1	0.37 J	0.5 U	0.44 U	0.5 U	0.44 U	3.1	0.97
Building 1202 (Sample No.)														
Northeast corner:														
Sub-slab (1202-6/1202-12 DUP)	0.48 U	0.5 U	0.52 U	0.55 U	0.51 U	0.53 U	0.76 J	0.55 U	0.49 U	0.51 U	0.49 U	0.51 U	3.6	2.6
Indoor air (1202-1/1202-11 DUP)	0.44 U	0.4 U	0.48 U	0.44 U	0.37 J	0.42 U	1.6	0.29 J	0.45 U	0.41 U	0.45 U	0.41 U	23	7.1
Northwest corner:														
Sub-slab (1202-7)	0.48 U	0.41 U	0.53 U	0.46 U	0.52 U	0.44 U	0.43 J	0.23 J	0.5 U	0.43 U	0.5 U	0.43 U	4.7	4.6
Indoor air (1202-2)	0.49 U	0.51 U	0.53 U	0.56 U	0.52 U	0.54 U	1	0.29 J	0.5 U	0.52 U	0.5 U	0.52 U	12	7.2
Central portion bathroom														
Sub-slab (1202-8)	0.74 U	0.48 U	0.81 U	0.52 U	0.79 U	0.51 U	0.65 J	0.29 J	0.76 U	0.49 U	0.76 U	0.49 U	6.4	5.3
Indoor air (1202-3)	0.5 U	0.5 U	0.54 U	0.54 U	0.53 U	0.53 U	1.3	0.34 J	0.51 U	0.51 U	0.51 U	0.51 U	13	8.1
Central portion hallway														
Sub-slab (1202-9)	0.53 U	0.44 U	0.59 U	0.48 U	0.57 U	0.46 U	0.59 J	0.48 U	0.55 U	0.45 U	0.55 U	0.45 U	4.6	3.1
Indoor air (1202-4)	0.57 U	0.54 U	0.62 U	0.59 U	0.6 U	0.58 U	1.1	0.31 J	0.59 U	0.56 U	0.59 U	0.56 U	12	9.5
South Central Reception:														
Sub-slab (1202-10)	0.62 U	0.47 U	0.68 U	0.52 U	0.66 U	0.5 U	0.57 J	0.52 U	0.64 U	0.49 U	0.64 U	0.49 U	5.2	2.5
Indoor air (1202-5)	0.46 U	0.53 U	0.5 U	0.58 U	0.49 U	0.56 U	1.1	0.33 J	0.47 U	0.54 U	0.47 U	0.54 U	14	8.8
Ambient outdoor air (NE corner) (1202-AA1)	0.46 U	0.47 U	0.5 U	0.51 U	0.49 U	0.5 U	0.88	0.51 U	0.47 U	0.48 U	0.47 U	0.48 U	1.5	0.94

Chemical	1,2-Dibromoethane		Ethylbenzene		M- and P-Xylene		O-Xylene		Isopropylbenzene (Cumene)		1,3,5-Trimethylbenzene		1,2,4-Trimethylbenzene		Naphthalene	
EPA's Industrial Air RSL (µg/m^3)	**0.02**		**4.9**		**440**		**440**		**1,800**		**31**		**31**		**0.36**	
Ecology's MTCA C Indoor Air (µg/m^3)	**0.04**		**1,000**		**100**		**100**		**400**		**7**		**7**		**3**	
Sub-slab Screening Level based on EPA's Industrial Air RSL (µg/m^3)	**0.20**		**49.0**		**4400**		**4400**		**18,000**		**310**		**310**		**3.60**	
Sub-slab Screening Level Based on Ecology's MTCA C Indoor Air (µg/m^3)	**0.40**		**10,000**		**1000**		**1000**		**4,000**		**70**		**70**		**30**	
Sampling Date	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**	**Jan-13**	**Jul-13**
Unit	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**
Building 1021 (Sample No.)																
Bathroom:																
Sub-slab (1021-6)	4.8 U	0.47 U	4.6 U	0.52 J	9.1 U	1.7	4.5 U	0.78	4.5 U	0.44 U	4.8 U	0.41 J	4.8 U	1.4	4.3 U	0.38 J
Indoor air (1021-1)	0.54 U	0.52 U	0.87	0.4 J	2.9	1.3 J	1.1	0.58 J	0.51 U	0.49 U	0.31 J	0.52 U	0.99	0.39 J	0.49 U	0.47 U
Western Portion:																
Sub-slab (1021-7/1021-12 DUP)	10 U	4.6 U	9.7 U	4.4 U	19 U	8.7 U	9.4 U	4.3 U	9.4 U	4.3 U	10 U	4.6 U	10 U	4.6 U	9 U	4.1 U
Indoor air (1021-2/1201-11 DUP)	0.51 U	0.51 U	2	0.43 J	6.9	1.3 J	2.4	0.49 J	0.48 U	0.48 U	0.73 J	0.51 U	2.4	0.57 J	0.35 J	0.46 U
Smallest Office:																
Sub-slab (1021-8)	1.7 U	0.49 U	2 J	0.66 J	4.1 J	2.1	1.9 J	0.97	3.9	0.46 U	1.7 U	0.49 J	2 J	1.6	1.5 U	0.43 J
Indoor air (1021-3)	0.49 U	0.53 U	**7.3**	0.69 J	33	2.2	12	0.81 J	0.46 U	0.5 U	0.51 J	0.53 U	1.7	0.41 J	**0.64 J**	0.48 U
Large Office:																
Sub-slab (1021-9)	0.5 U	0.49 U	0.48 J	0.73 J	1.9	2.4	0.77 J	1.1	0.28 J	0.46 U	0.85	0.5 J	1.7	1.6	**21**	0.55 J
Indoor air (1021-4)	0.49 U	0.53 U	1.7	0.76 J	5.9	2.6	2.1	0.88	0.46 U	0.5 U	0.59 J	0.53 U	1.9	0.8 J	**0.5 J**	0.33 J
Eastern portion:																
Sub-slab (1021-10)	0.49 U	0.5 U	0.62 J	0.67 J	2.3	2.1	0.85	0.95	0.46 U	0.47 U	0.36 J	0.48 J	1.3	1.6	0.34 J	0.39 J
Indoor air (1021-5)	0.5 U	0.52 U	1.8	0.83	6.4	2.8	2.2	1	0.47 U	0.48 U	0.54 J	0.52 U	1.9	0.81	**0.72 J**	**0.44 J**
Ambient outdoor air (NW Corner) (1021-AA1)	0.52 U	0.46 U	0.56 J	0.44 U	1.9	0.45 J	0.68 J	0.43 U	0.49 U	0.43 U	0.52 U	0.46 U	0.59 J	0.46 U	0.47 U	0.41 U
Building 1202 (Sample No.)																
Northeast corner:																
Sub-slab (1202-6/1202-12 DUP)	0.51 U	0.53 U	16	3.5	52	8.9	16	2.9	0.38 J	0.5 U	0.51 U	0.41 J	0.88	1.6	1.7	0.53 J
Indoor air (1202-1/1202-11 DUP)	0.46 U	0.42 U	1.5	0.51 J	4.6	1.7	1.5	0.53 J	0.44 U	0.4 U	0.76	0.42 U	3.3	0.28 J	**3.3**	0.38 U
Northwest corner:																
Sub-slab (1202-7)	0.52 U	0.44 U	0.73 J	0.45 J	3	1.4	1.2	0.54 J	0.48 U	0.41 U	0.41 J	0.44 U	1.4	0.69 J	0.37 J	0.4 U
Indoor air (1202-2)	0.52 U	0.54 U	1.1	0.45 J	3.6	1.5 J	1.1	0.49 J	0.49 U	0.51 U	0.27 J	0.54 U	0.88	0.32 J	0.47 U	0.49 U
Central portion bathroom																
Sub-slab (1202-8)	0.79 U	0.51 U	13	4.3	36	11	9.4	3.1	0.74 U	0.48 U	0.46 J	0.42 J	1.5	1.6	0.71 U	0.3 J
Indoor air (1202-3)	0.53 U	0.53 U	1.1	0.69 J	3.7	2.2	1.2	0.81 J	0.5 U	0.5 U	0.26 J	0.53 U	0.9	0.41 J	0.48 U	0.48 U
Central portion hallway																
Sub-slab (1202-9)	0.57 U	0.46 U	0.78 J	0.58 J	3.3	1.8	1.3	0.77	0.53 U	0.44 U	0.68 J	0.36 J	2.4	1.5	1.7	0.66 J
Indoor air (1202-4)	0.6 U	0.58 U	1	0.49 J	3.6	1.7 J	1.1	0.53 J	0.57 U	0.54 U	0.6 U	0.58 U	0.92 J	0.3 J	0.55 U	0.52 U
South Central Reception:																
Sub-slab (1202-10)	0.66 U	0.5 U	0.78 J	0.49 J	3.2	1.5 J	1.2	0.69 J	0.62 U	0.47 U	0.46 J	0.37 J	1.5	1.4	0.6 U	1.2
Indoor air (1202-5)	0.49 U	0.56 U	1.2	0.58 J	4.1	2.1	1.2	0.87 J	0.46 U	0.53 U	0.33 J	0.56 U	1	0.35 J	0.44 U	0.51 U
Ambient outdoor air (NE corner) (1202-AA1)	0.49 U	0.5 U	0.28 J	0.48 U	0.89 J	0.95 U	0.31 J	0.47 U	0.46 U	0.47 U	0.49 U	0.5 U	0.29 J	0.5 U	0.44 U	0.45 U

Notes:
1. Where duplicates were collected, the lowest non-detect and highest detected value was reported in the table.
2. An indoor air screening value is not available for 1,3,5-trimethylbenzene; therefore, 1,2,4-trimethylene's screening value was used as a surrogate.

Bold value exceeds screening value based on RSL or MTCA C value.
Ecology - Washington State Department of Ecology
EPA - U.S. Environmental Protection Agency
J - Concentration is estimated. Chemical was detected below the method reporting limit.
µg/m^3 - microgram per cubic meter
MTCA - Model Toxics Control Act
RSL - EPA's regional screening level (November 2012)
U - Chemical was not detected. Value is the method reporting limit.

Table 2-11
Round 1 and Round 2 Field Measurements

Sample Location	PID Reading (ppm)	Oxygen (%)	Carbon Dioxide (%)	Methane (% of LEL)
Round 1 (January 2013)				
1021-6	0.2	19.6	1.1	0
1021-7	0	19	3	0
1021-8	0	19	1.7	0
1021-9	1.7	16.5	3.6	0.1
1021-10	0.4	16.2	4.2	0.1
1202-6	0	20.6	0.2	8.8
1202-7	0	20.6	0.5	1.3
1202-8	0	20.2	0.6	0
1202-9	0	18.6	2.5	0
1202-10	0	18.9	2.2	1.1
Round 2 (July 2013)				
1021-6	2.3	21.2	0	0.2
1021-7	0.8	21	0	0
1021-8	3.4	21.1	0	0
1021-9	3.9	21.2	0	0
1021-10	3.1	21.2	0	0
1202-6	2.7	21.2	0	0
1202-7	3.3	21.2	0	0
1202-8	1.5	20.9	0	0
1202-9	3.0	21.2	0	0
1202-10	2.8	21.2	0	0

Notes:
LEL - lower explosive limit
PID - photoionization detector
ppm - part per million
% - percent

APPENDIX E

Site Inspection Forms

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK Bangor, OU 1 (Site A)*	**Date of inspection:** *09/18/2014*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Overcast/Showers 60-65°*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other *Soil excavation and on-site treatment; leach basin closure; well abandonment*
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact	Name	Title	Date	Phone no.
Contact	Douglas Guenther	NAVFAC NW RPM	11/13/14	(360) 396-0944

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact	Name	Title	Date	Phone no.
Contact	Ellen Brown	Former NAVFAC NW RPM	11/13/14	(360) 396-0070

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact	Name	Title	Date	Phone no.
Contact	Leslie Yuenger	NAVFAC NW PAO	11/13/14	(360) 396-6387

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact	Name	Title	Date	Phone no.
Contact	Silvia Klatman	NBK Kitsap PAO	11/13/14	(360) 627-4031

Problems; suggestions; ☒ Report attached *See Appendix F*

2. **O&M Contractor** Tom Goodlin (Name) Hydrogeologist (Title) 09/18/14 (Date)

Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________

Problems, suggestions; ☐ Report attached ________________________________

3. **LTM Contractor** Tom Goodlin (Name) Hydrogeologist (Title) 09/18/14 (Date)

Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________

Problems, suggestions; ☐ Report attached ________________________________

4.	**Regulatory authorities and response agencies** Agency U.S. Environmental Protection Agency Contact Harry Craig — Senior Remedial Project Manager — 11/13/14 — (503) 326-3689 (Name / Title / Date / Phone no.) Problems; suggestions; ☒ Report attached *See Appendix F* Agency Washington State Department of Ecology Contact Chris Maurer (Name / Title / Date / Phone no.) Problems; suggestions; ☐ Report attached *Chose not to respond* Agency Kitsap Public Health District, Solid & Hazardous Waste Program Contact Grant Holdcroft — Environmental Health Specialist — 12/22/14 — (503) 326-3689 (Name / Title / Date / Phone no.) Problems; suggestions; ☒ Report attached *See Appendix F*
5.	**Members of the public** Contact Sue Edwards — 11/13/14 — (306) 598-4850 (Name / Date / Phone no.) Problems; suggestions; ☒ Report attached *See Appendix F* Contact Peggy Adkins — 11/13/14 — (306) 275-5633 (Name / Date / Phone no.) Problems; suggestions; ☒ Report attached *See Appendix F*

III. DOCUMENTS & RECORDS

1.	**O&M Records**			
	☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
	☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A
	Remarks *No O&M manual or maintenance logs at the site, but available electronically from the Navy.*			
2.	**Leach basin closure records**	☒ Readily available	☒Up to date	
	Remarks *Documented in first 5-year review, with citations to record documents.*			
3.	**Soil excavation and treatment records**	☒ Readily available	☒ Up to date	
	Remarks *Documented in first 5-year review, with citations to record documents.*			
4.	**Well Abandonment Records**	☒ Readily available	☒ Up to date	
	Remarks *On-going Navy policy to abandon unused wells. Wells abandoned with regulatory concurrence.*			
5.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	
	Remarks *See narrative of 5-year review report.*			
6.	**Institutional Controls Inspection Records**	☒ Readily available	☒ Up to date	
	Remarks *See narrative of 5-year review report.*			

IV. O&M COSTS	
1.	**O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other
2.	**O&M Cost Records** **See Table 4-1 in narrative of 5-year review report** ☒ Readily available ☒ Up to date ☒ Funding mechanism/agreement in place
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: *See narrative in Section 4 of the 5-year review.*
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Site A Burn Area	
1.	**Treatment system secure?** ☒ Yes ☐ No Remarks *The garage door to the treatment plant was partially open for ventilation. A fence around the building limits the access.*
2.	**Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No Remarks *Protection of surface water conveyance pipe that collects treated water for discharge. Land use must be protective of the leach basin liner and must not interfere with monitoring, extraction or reinjection wells. Groundwater use is prohibited. Excavation permits and construction project review are required prior to any intrusive activities.*
3.	**Any wells installed except for environmental cleanup?** ☐ Yes ☒ No Remarks
4.	**Any indication of damage to leach basin liner?** ☐ Yes ☒ No Remarks *Potential damage to the leach basin liner in SE corner associated with a depression where a pipe is visible. Tire ruts in sand along the perimeter basin. Gate damaged at the NW corner of the leach basin.*
5.	**Any evidence of excavation?** ☒ Yes ☐ No Remarks *Excavation (drilling) associated with new monitoring well installation.*
B. Site A Debris Area 2	
1.	**Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No Remarks *Land use is outdoor/recreational.*
2.	**Are signs and posts present, in good condition, and legible?** ☒ Yes ☐ No Remarks *Signs are present along Tinosa Road*.
3.	**Is deterrent vegetation intact with no penetrating trails?** ☒ Yes ☐ No Remarks *There is no vegetation such as blackberry to restrict access. A primitive trail leads through the native vegetation, which is not an inviting trail to walk on.*
4.	**Any evidence of excavation?** ☐ Yes ☒ No Remarks *Excavation permits and construction project review are required prior to any intrusive activities.*

C. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**

Site conditions imply ICs properly implemented ☒ Yes ☐ No
Site conditions imply ICs being fully enforced ☒ Yes ☐ No

Type of monitoring (*e.g.*, self-reporting, drive by) *Site visit*
Frequency *Annual*
Responsible party *Sealaska under contract to NAVFAC NW*
Contact Douglas Guenther (Name) — NAVFAC NW RPM (Title) — 09/18/14 (Date) — (360) 396-0944 (Phone no.)

Reporting is up-to-date ☒ Yes ☐ No

Specific requirements in decision documents have been met ☒ Yes ☐ No
Violations have been reported ☐ Yes ☐ No ☒ None
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater treatment system components

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☒ Carbon adsorbers
☒ Filters_____
☐ Additive (*e.g.*, chelation agent, flocculent)_____
☐ Others_____
☐Good condition ☒ Needs Maintenance
☒ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually *See Section 6 of 5-year review report*
☐ Quantity of surface water treated annually_____
Remarks *Sampling and maintenance logs are not available at the treatment plant.*

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☒Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☒Needs repair
☒ Chemicals and equipment properly stored
Remarks *Corrosion on floor braces for supports holding effluent piping, SE corner of the building.*

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☒ Needs Maintenance ☐ N/A

Remarks *One vault for an extraction well needs replacement. Not traffic rated. All vaults should be traffic rated to ensure any cars or trucks do no damage wells/piping. According to Tom Goodlin, A-MW60 has bentonite in the well and does not produce water.*

B. Monitoring Data

1. Monitoring Data

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

C. Other Remedy Components

1.	**Soil excavation**	☒ Completed	☐ Not Completed
2.	**Leach basin closure**	☒ Completed	☐ Not Completed
3.	**Well abandonment**	☒ Completed	☐ Not Completed

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

See narrative of 5-year review.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

See narrative of 5-year review.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

See narrative of 5-year review.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

See narrative of 5-year review.

Fencing around Site A treatment system building

Corrosion observed inside Site A treatment system building

Damaged well vault cover at Site A

Tire ruts observed in the burn area

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK Bangor, OU 2 (Site F)*	**Date of inspection:** *September 18, 2014*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Overcast/Showers 60-65°*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☒ Access controls
☒ Institutional controls
☒ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other *Soil excavation and on-base treatment; infiltration barrier*
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact Douglas Guenther (Name) — NAVFAC NW RPM (Title) — 11/13/14 (Date) — (360) 396-0944 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Ellen Brown (Name) — Former NAVFAC NW RPM (Title) — 11/13/14 (Date) — (360) 396-0070 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Leslie Yuenger (Name) — NAVFAC NW PAO (Title) — 11/13/14 (Date) — (360) 396-6387 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Silvia Klatman (Name) — NBK Kitsap PAO (Title) — 11/13/14 (Date) — (360) 627-4031 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

2. **O&M Contractor** Tom Goodlin (Name) — Hydrogeologist (Title) — 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ____

3. **LTM Contractor** Tom Goodlin (Name) — Hydrogeologist (Title) — 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ____

4.	**Regulatory authorities and response agencies** Agency U.S. Environmental Protection Agency Contact Harry Craig — Senior Remedial Project Manager — 11/13/14 — (503) 326-3689 Name — Title — Date — Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Agency Washington State Department of Ecology Contact Chris Maurer ___ ___ ___ Name — Title — Date — Phone no. Problems; suggestions; ☐ Report attached *Chose not to respond* Agency Kitsap Public Health District, Solid & Hazardous Waste Program Contact Grant Holdcroft — Environmental Health Specialist — 12/22/14 — (503) 326-3689 Name — Title — Date — Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*
5.	**Members of the public** Contact Sue Edwards — 11/13/14 — (306) 598-4850 Name — Date — Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Contact Peggy Adkins — 11/13/14 — (306) 275-5633 Name — Date — Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*

III. DOCUMENTS & RECORDS

1. **O&M Records**				
☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A	
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A	
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A	
☒ Health and Safety Plan	☒ Readily available	☒ Up to date	☐ N/A	
☐ Access logs	☐ Readily available	☐ Up to date	☐ N/A	
Remarks *Records and documents stored in the treatment building. Records also readily available from the Navy electronically.*				
2. **Soil excavation and treatment records**	☒ Readily available	☒ Up to date		
Remarks *Documented in first 5-year review, with citations to record documents.*				
3. **Infiltration barrier as-built records**	☒ Readily available	☒ Up to date		
Remarks *Documented in first 5-year review, with citations to record documents.*				
4. **Groundwater Monitoring Records**	☒ Readily available	☒ Up to date		
Remarks_ *See narrative of 5-year review report.*				
5. **Institutional Controls Inspection Records**	☒ Readily available	☒ Up to date		
Remarks_ *See narrative of 5-year review report.*				

IV. O&M COSTS	
1.	**O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other
2.	**O&M Cost Records** **See Table 4-1 in narrative of 5-year review report** ☒ Readily available ☒ Up to date ☒ Funding mechanism/agreement in place
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: *See narrative in Section 4 of the 5-year review.*
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Site F	
1.	**Treatment system secure?** ☐ Yes ☒ No Remarks *The roll up door is partially open for ventilation. Theoretically someone could access the building under the door.*
2.	**Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No Remarks *Land use is not restricted except for areas covered by engineering controls (infiltration barrier) Groundwater use is prohibited. Excavation permits and construction project review are required prior to any intrusive activities.*
3.	**Any wells installed except for environmental cleanup?** ☐ Yes ☒ No Remarks
4.	**Any indication of damage to infiltration barrier or cracked asphalt?** ☒ Yes ☐ No Remarks *There is minor cracking of asphalt. These cracks are unlikely to allow significant infiltration. However, vegetation is growing in the seams in the asphalt and in the drainage swale, which may be impacting the infiltration barrier.*
5.	**Any evidence of excavation?** ☐ Yes ☒No Remarks
B. Overall Institutional Controls Evaluation	
1.	**Implementation and enforcement** Site conditions imply ICs properly implemented ☒ Yes ☐ No Site conditions imply ICs being fully enforced ☒ Yes ☐ No Type of monitoring (*e.g.*, self-reporting, drive by) *Site visit* Frequency *Annual* Responsible party *Sealaska under contract to NAVFAC NW* Contact Douglas Guenther (Name) NAVFAC NW RPM (Title) 09/18/14 (Date) (360) 396-0944 (Phone no.) Reporting is up-to-date ☒ Yes ☐ No Specific requirements in decision documents have been met ☒ Yes ☐ No Violations have been reported ☐ Yes ☐ No ☒ None Other problems or suggestions: ☐ Report attached
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks Although ICs are currently adequate, vegetation growing in the infiltration barrier needs to be addressed to maintain protectiveness of the remedy.

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A
A. Groundwater treatment system components
1. **Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☒ Carbon adsorbers ☒ Filters__________ ☐ Additive (*e.g.*, chelation agent, flocculent)__________ ☐ Others__________ ☐Good condition ☒ Needs Maintenance ☒ Sampling ports properly marked and functional ☒ Sampling/maintenance log displayed and up to date ☒ Equipment properly identified ☒ Quantity of groundwater treated annually *See Section 6 of 5-year review report* ☐ Quantity of surface water treated annually__________ Remarks__________
2. **Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks *The electrical system had major issues in January 2013. The system was upgraded.*
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☒ Proper secondary containment ☒ Needs Maintenance Remarks *Minor water leaks from various vessels and pumps.*
4. **Discharge Structure and Appurtenances** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks
5. **Treatment Building(s)** ☐ N/A ☒ Good condition (esp. roof and doorways) ☒ Needs repair ☒ Chemicals and equipment properly stored Remarks *Insulation needs repair.*
6. **Monitoring Wells** (pump and treatment remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks
B. Monitoring Data
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
C. Other Remedy Components
1. Soil excavation ☒ Completed ☐ Not Completed **2. Infiltration barrier** ☒ Completed ☐ Not Completed
VII. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *See narrative of 5-year review.*

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See narrative of 5-year review*.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. *See narrative of 5-year review*.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See narrative of 5-year review*.

Equipment inside Site F treatment system building

Vegetation observed growing in the drainage swale above the Site F infiltration barrier

Vegetation growing in asphalt above Site F infiltration barrier

Vegetation growing in asphalt above Site F infiltration barrier

Site Inspection Checklist

I. SITE INFORMATION

Site name: *NBK Bangor, OU 3 (Sites 16/24 and 25)*

Date of inspection: *September 18, 2014*

Location: *Kitsap, WA*

EPA ID: *110000771219*

Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*

Weather/temperature: *Overcast/Showers 60-65°*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other *Verification monitoring of groundwater.*
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. *No OU-specific interviews were conducted, as all actions at OU 3 are complete except annual IC inspections. Interviews for other OUs included general sitewide questions that pertain to this OU.*

III. DOCUMENTS & RECORDS

1. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first 5-year review, with citations to record documents.*

2. **Institutional Controls Inspection Records** ☒ Readily available ☒ Up to date
   Remarks *See narrative of 5-year review report.*

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☒ Contractor for Federal Facility

2. **Remedy Cost Records** *Costs associated with the annual institutional controls inspections for this site are included in the costs for OU 1, OU 2, OU 7, and OU 8.*

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: *NA*

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Site 16/24

1. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
   Remarks: *Area is fenced or surrounded by thick brush preventing access.*

2. **Any evidence of excavation?** ☐ Yes ☒ No
   Remarks

B. Site 25

1. No ICs Required or Established

C. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**

Site conditions imply ICs properly implemented ☒ Yes ☐ No
Site conditions imply ICs being fully enforced ☒ Yes ☐ No

Type of monitoring (*e.g.*, self-reporting, drive by) *Site visit*
Frequency *Annual*
Responsible party *Sealaska under contract to NAVFAC NW*

Contact	Douglas Guenther	NAVFAC NW RPM	09/18/14	(360) 396-0944
	Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No

Specific requirements in decision documents have been met ☒ Yes ☐ No
Violations have been reported ☐ Yes ☐ No ☒ None
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater Monitoring

2. **Verification Monitoring Completed?** ☒ Yes ☐ No
Remarks *The Navy and regulatory agencies have concluded that monitoring is no longer required. Metals concentrations in groundwater do not exceed background. One monitoring well and protective casing have been compromised at Site 25. Decommissioning of this well is recommended.*

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See narrative of 5-year review.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
See narrative of 5-year review.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
See narrative of 5-year review.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
See narrative of 5-year review.

Thick brush preventing access to Site 16/24

Damaged monitoring well protective casing at Site 25

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK Bangor, OU 6 (Site D)*	**Date of inspection:** *September 18, 2014*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Overcast/Showers 60-65°*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☒ Other *Soil excavation and on-base treatment; short-term groundwater monitoring; surface water confirmation monitoring*

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact (Name)	Title	Date	Phone no.
Douglas Guenther	NAVFAC NW RPM	11/13/14	(360) 396-0944

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact (Name)	Title	Date	Phone no.
Ellen Brown	Former NAVFAC NW RPM	11/13/14	(360) 396-0070

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact (Name)	Title	Date	Phone no.
Leslie Yuenger	NAVFAC NW PAO	11/13/14	(360) 396-6387

Problems; suggestions; ☒ Report attached *See Appendix F*

Contact (Name)	Title	Date	Phone no.
Silvia Klatman	NBK Kitsap PAO	11/13/14	(360) 627-4031

Problems; suggestions; ☒ Report attached *See Appendix F*

2. **O&M Contractor** Tom Goodlin (Name) Hydrogeologist (Title) 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

3. **LTM Contractor** Tom Goodlin (Name) Hydrogeologist (Title) 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

4. **Regulatory authorities and response agencies**

Agency U.S. Environmental Protection Agency
Contact Harry Craig — Senior Remedial Project Manager — 11/13/14 — (503) 326-3689
(Name / Title / Date / Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Agency Washington State Department of Ecology
Contact Chris Maurer — ______ — ______ — ______
(Name / Title / Date / Phone no.)
Problems; suggestions; ☐ Report attached
Chose not to respond

Agency Kitsap Public Health District, Solid & Hazardous Waste Program
Contact Grant Holdcroft — Environmental Health Specialist — 12/22/14 — (503) 326-3689
(Name / Title / Date / Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

5. **Members of the public**

Contact Sue Edwards — 11/13/14 — (306) 598-4850
(Name / Date / Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Peggy Adkins — 11/13/14 — (306) 275-5633
(Name / Date / Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

III. DOCUMENTS & RECORDS

1. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
Remarks *Documented in first five-year review, with citations to record documents*.

2. **Soil Treatment Records** ☒ Readily available ☒ Up to date
Remarks *Documented in first 5-year review, with citations to record documents*.

IV. REMEDY COSTS

1. **Implementing Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other

2. **Remedy Cost Records** *Costs associated with the annual institutional controls inspections for this site are included in the costs for OU 1, OU 2, OU 7, and OU 8*.

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: *NA*

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Surface Water and Groundwater Monitoring

1. Verification Monitoring Completed? ☒ Yes ☐ No
Remarks *See narrative of 5-year review report*.

B. Other Remedy Components	
1. Soil excavation and treatment ☒ Completed ☐ Not Completed	
VII. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *There are no formal ICs for Site D. Land use remains as a wetland within a larger wetland ecosystem. The excavation permitting and the construction project review system are used. There were no signs of excavation during the site visit.*
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See narrative of 5-year review.*
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. *See narrative of 5-year review.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See narrative of 5-year review.*

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK Bangor, OU 7 (Sites B, E/11, 10)*	**Date of inspection:** *September 18, 2014*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Overcast/Showers 60-65°*

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment (as part of Site F system)
- ☐ Surface water collection and treatment
- ☒ Other *Surface water control; off-site soil and debris disposal; verification monitoring of groundwater, sediment, and clam tissue*
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

	Name	Title	Date	Phone no.
Contact	Douglas Guenther	NAVFAC NW RPM	11/13/14	(360) 396-0944

Problems; suggestions; ☒ Report attached *See Appendix F*

	Name	Title	Date	Phone no.
Contact	Ellen Brown	Former NAVFAC NW RPM	11/13/14	(360) 396-0070

Problems; suggestions; ☒ Report attached *See Appendix F*

	Name	Title	Date	Phone no.
Contact	Leslie Yuenger	NAVFAC NW PAO	11/13/14	(360) 396-6387

Problems; suggestions; ☒ Report attached *See Appendix F*

	Name	Title	Date	Phone no.
Contact	Silvia Klatman	NBK Kitsap PAO	11/13/14	(360) 627-4031

Problems; suggestions; ☒ Report attached *See Appendix F*

2. **O&M Contractor** Tom Goodlin (Name) Hydrogeologist (Title) 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

3. **LTM Contractor** NA (Name) ____________ (Title) ________ (Date)
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

4.	**Regulatory authorities and response agencies** Agency U.S. Environmental Protection Agency Contact Harry Craig — Senior Remedial Project Manager — 11/13/14 — (503) 326-3689 Name / Title / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Agency Washington State Department of Ecology Contact Chris Maurer Name / Title / Date / Phone no. Problems; suggestions; ☐ Report attached *Chose not to respond* Agency Kitsap Public Health District, Solid & Hazardous Waste Program Contact Grant Holdcroft — Environmental Health Specialist — 12/22/14 — (503) 326-3689 Name / Title / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*
5.	**Members of the public** Contact Sue Edwards — 11/13/14 — (306) 598-4850 Name / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Contact Peggy Adkins — 11/13/14 — (306) 275-5633 Name / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*
	III. DOCUMENTS & RECORDS
1.	**Otto fuel monitoring of Site F system for Site E/11** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report.*
2.	**Soil and debris disposal records (Sites B and E/11)** ☒ Readily available ☒ Up to date Remarks *Documented in first 5-year review, with citations to record documents*.
3.	**Soil cover and storm water control as-built records (Site B)** ☒ Readily available ☒Up to date Remarks *Documented in first 5-year review, with citations to record documents*.
4.	**Soil cover inspection and maintenance records (Site B)** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report*.
5.	**Groundwater monitoring records (Site 10)** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report*.
6.	**Institutional controls inspection records (Sites B, E/11, 10)** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report*.

IV. O&M COSTS	
1.	**O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other
2.	**O&M Cost Records** **See Table 4-1 in narrative of 5-year review report** ☒ Readily available ☒ Up to date ☒ Funding mechanism/agreement in place
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: *NA*
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Site B – Floral Point (checklist items from ICMP)	
1.	**Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No Remarks *Site B is for outdoor recreational use only. Any construction requires an excavation permit and construction project review. Presently, enhanced security measures limit visitations to the lower base area of Bangor, greatly reducing the number of potential recreational users. Dumping of minor amounts of debris and vehicle parts was observed.*
2.	**Any erosion along shoreline or on the vegetated cover?** ☒ Yes ☐ No Remarks *Yes, along the southern shoreline area, erosion marker shows approximately 1 foot of erosion.*
3.	**Appropriate vegetation on cover?** ☒ Yes ☐ No Remarks Invasive plants present.
4.	**Sufficient remaining gravel thickness on cap?** ☒ Yes ☐ No Remarks *Yes, continue monitoring erosion to ensure a proper cap is present.*
B. Sites E/11 and 10 covered by ICs at Sites F and OU 8, respectively. Remarks *Fencing at Site E/11 was compromised in one location adjacent to one of the gates. The asphalt cap at Site 10 showed some signs of cracking, and a sinkhole is present adjacent to Building 2011.*	
C. Overall Institutional Controls Evaluation	
1.	**Implementation and enforcement** Site conditions imply ICs properly implemented ☒ Yes ☐ No Site conditions imply ICs being fully enforced ☒ Yes ☐ No Type of monitoring (*e.g.*, self-reporting, drive by) *Site visit* Frequency *Annual* Responsible party *Sealaska under contract to NAVFAC NW* Contact Douglas Guenther (Name) NAVFAC NW RPM (Title) 09/18/14 (Date) (360) 396-0944 (Phone no.) Reporting is up-to-date ☒ Yes ☐ No Specific requirements in decision documents have been met ☒ Yes ☐ No Violations have been reported ☐ Yes ☐ No ☒ None Other problems or suggestions: ☐ Report attached
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater treatment system components – USING SITE F SYSTEM.

B. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
☒ Sediments and clams are not being affected by COCs at Floral Point
Remarks

C. Floral Point Cover

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent_______________ Depth_____________
Remarks

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths_____________ Widths____________ Depths___________
Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_______________ Depth_____________
Remarks *Area is monitored for erosion annually. Additional cover is added to the beach as needed. Minor erosion in at the southern area was noted.*

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent_______________ Depth_____________
Remarks

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks *Several large native trees in the center of the site. Significant intrusion of invasive species evident.*

6. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent_______________ Height_____________
Remarks

7. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_______________
☐ Ponding ☐ Location shown on site map Areal extent_______________
☐ Seeps ☐ Location shown on site map Areal extent_______________
☐ Soft subgrade ☐ Location shown on site map Areal extent_______________
Remarks

8. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_______________
Remarks

D. Surface water control swales

1. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_______________ Depth_____________
Remarks

2. **Obstructions** Type______________________ ☒ No obstructions
☐ Location shown on site map Areal extent_______________
Size_____________
Remarks

3.	**Excessive Vegetative Growth** Type ☐ No evidence of excessive growth ☒ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent______________ Remarks
E. Cover Penetrations ☒ Applicable ☐ N/A	
1.	**Monitoring Wells** (within surface area of landfill) ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
2.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks None located
F. Other Remedy Components	
1. Soil and debris disposal ☒ Completed ☐ Not Completed	
VII. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *At Site 10, land use is restricted to industrial purposes. Groundwater use is prohibited and the excavation permitting and the construction project review system are used. The slope erosion system (quarry spalls) is functioning as designed. The infiltration barrier (asphalt cap) is in relatively good condition. A patch in the asphalt is located in an area identified during an IC inspection indicating the IC system is effective for Site 10. Some minor cracks and a small sinkhole were identified and should be monitored. At Site B (Floral Point) the ICs appear to be functioning as intended. The information signs are fading. One inspector noted evidence of a significant increase in intertidal organism activity since a previous visit following remedial activities. At Sites E/11, land use is restricted to nonresidential. Groundwater use is prohibited and the excavation permitting and the construction project review system are used. A fence surrounds the site. Significant stands of invasive plant species are located at the site.*
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See narrative of 5-year review*.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. *See narrative of 5-year review*.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See narrative of 5-year review*.

Metal debris observed at Site B

Shoreline area of Site B

Site 10 slope erosion control system

Cracked pavement observed at Site 10

Site E/11 fencing

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK Bangor, OU 8 (Sites 27, 28, 29 and off-site plume)*	**Date of inspection:** *September 18, 2014*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Overcast/Showers 60-65°*
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Access controls ☒ Institutional controls ☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☒ Other *LNAPL removal*	☒ Monitored natural attenuation ☐ Groundwater containment ☐ Vertical barrier walls
Attachments: ☐ Inspection team roster attached	☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact Douglas Guenther (Name) — NAVFAC NW RPM (Title) — 11/13/14 (Date) — (360) 396-0944 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Ellen Brown (Name) — Former NAVFAC NW RPM (Title) — 11/13/14 (Date) — (360) 396-0070 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Leslie Yuenger (Name) — NAVFAC NW PAO (Title) — 11/13/14 (Date) — (360) 396-6387 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

Contact Silvia Klatman (Name) — NBK Kitsap PAO (Title) — 11/13/14 (Date) — (360) 627-4031 (Phone no.)
Problems; suggestions; ☒ Report attached *See Appendix F*

2. **O&M Contractor** Tom Goodlin (Name) — Hydrogeologist (Title) — 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

3. **LTM Contractor** Tom Goodlin (Name) — Hydrogeologist (Title) — 09/18/14 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. ______________
Problems, suggestions; ☐ Report attached ______________________________

4.	**Regulatory authorities and response agencies** Agency U.S. Environmental Protection Agency Contact Harry Craig — Senior Remedial Project Manager — 11/13/14 — (503) 326-3689 Name / Title / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Agency Washington State Department of Ecology Contact Chris Maurer Name / Title / Date / Phone no. Problems; suggestions; ☐ Report attached *Chose not to respond* Agency Kitsap Public Health District, Solid & Hazardous Waste Program Contact Grant Holdcroft — Environmental Health Specialist — 12/22/14 — (503) 326-3689 Name / Title / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*
5.	**Members of the public** Contact Sue Edwards — 11/13/14 — (306) 598-4850 Name / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F* Contact Peggy Adkins — 11/13/14 — (306) 275-5633 Name / Date / Phone no. Problems; suggestions; ☒ Report attached *See Appendix F*
	III. DOCUMENTS & RECORDS
1.	**LNAPL recovery system installation records** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report.*
2.	**Groundwater monitoring records** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report.*
6.	**Institutional controls inspection records** ☒ Readily available ☒ Up to date Remarks *See narrative of 5-year review report.*
	IV. O&M COSTS
1.	**O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☒ Contractor for Federal Facility ☐ Other
2.	**O&M Cost Records** **See Table 4-1 in narrative of 5-year review report** ☒ Readily available ☒ Up to date ☒ Funding mechanism/agreement in place
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: *See narrative in Section 4 of the 5-year review report.*

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. OU 8 (All Sites)	
1.	**Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No Remarks *Groundwater use is prohibited at OU8. Land use is restricted. Excavation permitting and construction design review is required.*
2.	**Have any wells been installed except for environmental cleanup?** ☐ Yes ☒ No Remarks
3.	**Monitoring reports supplied to Health Department?** ☒ Yes ☐ No Remarks
4.	**Any wells allowed by Health Department in restricted area?** ☒ Yes ☐ No Remarks
B. Overall Institutional Controls Evaluation	
1.	**Implementation and enforcement** Site conditions imply ICs properly implemented ☒ Yes ☐ No Site conditions imply ICs being fully enforced ☒ Yes ☐ No Type of monitoring (*e.g.*, self-reporting, drive by) *Site visit* Frequency *Annual* Responsible party *Sealaska under contract to NAVFAC NW* Contact Douglas Guenther (Name) NAVFAC NW RPM (Title) 09/18/14 (Date) (360) 396-0944 (Phone no.) Reporting is up-to-date ☒ Yes ☐ No Specific requirements in decision documents have been met ☒ Yes ☐ No Violations have been reported ☐ Yes ☐ No ☒ None Other problems or suggestions: ☐ Report attached
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks
VI. TREATMENT COMPONENTS ☐ Applicable ☐ N/A	
A. LNAPL and MNA Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ LNAPL is being removed ☐ Contaminant concentrations are declining ☒ MNA is effective Remarks
B. Monitored Natural Attenuation Infrastructure	
1.	**Monitoring Wells** (natural attenuation portion of remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks

VII. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *See narrative of 5-year review*.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See narrative of 5-year review*.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. *See narrative of 5-year review*.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See narrative of 5-year review*.

APPENDIX F

Interview Responses

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 1 Interview – Navy Personnel
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted:	Ellen Brown
Title:	Remedial Project Manager
Organization:	NAVFAC NW
Telephone:	(360) 396-0070
E-mail:	ellen.brown1@navy.mil
Address:	NAVFAC NW 1101 Tautog Circle, Silverdale, WA 98315
Contact made by:	Nicole Rangel
Response type:	e-mail
Date:	November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

    Response: I was the lead RPM for Bangor from 1996 through 2001. I was involved with the remedial actions at OUs 1, 2, 3, 6, and 7, and with the Removal Actions at OU8. I worked on the RI/FS for OU8. In July and August of 2014, I acted as RPM for the Bangor sites.

2. What is your overall impression of the on-going effectiveness of the remedies, including the institutional controls components, at NBK Bangor?

    Response: The institutional controls are in place and functioning appropriately. The operating treatment systems at Sites A & F are functioning adequately to comply with the ROD requirements. Site A is slow to remediate, but does have containment. Due to the very slow movement of groundwater at this site, it is possible that Site A would have containment even without the treatment system operating. An assessment should be performed on whether the plume would effectively remain contained in accordance with the requirements of the ROD if the treatment system were

turned off, and to determine if the site should be declared technically impracticable to remediate. Site F has containment and removal of contamination using its current treatment system, but may experience faster removal by applying the optimization currently being considered, bioaugmentation. OU8 does not currently have a treatment system in operation, but has containment as shown by monitoring results. Remediation of Benzene, DCA, and removal of free product is being optimized through studies of improvements such as air sparging and bioaugmentation.

3. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedies (e.g., unauthorized excavation, unauthorized use of groundwater)?

   Response: During my watch this summer there were no known violations of institutional controls.

4. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

   Response: Yes. The contractor who performs monitoring and operations at Sites A and F, and OU8, performs inspections for the institutional controls. The Navy implements the recommendations that come out of those inspections.

5. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

   Response: None.

6. To the best of your knowledge, are the leach basin barrier at Site A, the infiltration barrier at Site F, the vegetative cap at Site B, and the infiltration barrier at Site 10 intact?

   Response: Yes.

7. What progress has been made in optimizing the pump and treat systems, and/or implementing alternatives to the pump and treat systems at OU 1 (Site A) and OU 2 (Site F)?

   Response: Considerable work has been done on this since 2009. I will defer to Doug Guenther, the current RPM to fully explain this.

8. What is the status of the recommended pilot testing at OU 8, and what progress has been made at implementing the additional contingent remedial actions at OU 8?

Response: Defer to current RPM.

9. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since May 2009 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

    Response: Yes. The monitoring has been performed as required to meet the goals of the respective RODs. The data has been thoroughly reviewed by the Navy and stakeholders, whose comments have been responded to and, as appropriate, acted upon. I finalized SAPS for the coming year of monitoring in July and August.

10. To the best of your knowledge, have the recommendations of the previous (i.e., third) five-year review been implemented, specifically for the sites with remedies not functioning as intended by the decision document?

    Response: Yes. All of the recommendations have been acted upon.

11. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

    Response: None that I know of.

12. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK Bangor?

    Response: I have no concerns about the effectiveness of the remedies in protecting human health and the environment at NAVBASE Kitsap Bangor, but I am concerned that we are continuing to operate a treatment system at Site A that provides little benefit in this regard and takes up resources that could likely do more good for the environment applied elsewhere.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 1 Interview – Navy Personnel
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Douglas Guenther, L.G.
Title: Remedial Project Manager
Organization: NAVFAC NW
Telephone: (360) 396-0944
E-mail: douglas.guenther@navy.mil
Address: NAVFAC NW
1101 Tautog Circle,
Silverdale, WA 98315

Contact made by: Nicole Rangel
Response type: e-mail
Date: November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: I began work at NAVFAC Northwest on August 25, 2014 and officially took over as RPM for NBK Bangor sites on September 25, 2014. I participated in the Five-Year Review site visits/inspections at OUs 1, 2, 3, 6, 7, and 8 conducted in September 2014. I am familiarizing myself with all aspects of these sites.

2. What is your overall impression of the on-going effectiveness of the remedies, including the institutional controls components, at NBK Bangor?

   Response: The treatment systems at Sites A & F are operational and plume control is indicated, however, as mechanical systems age and decline, additional costs will be incurred for repair/replacement. Cleanup times are long at both Site A and F. Site A demonstrates extremely low groundwater flow rates and alternatives should be reviewed for technical practicality as the pump and treat system may not be necessary for hydraulic control. Site F optimization through system enhancement may be slightly beneficial but

more likely, bioaugmentation for RDX reduction would best improve the remediation rate if current and future studies confirm effectiveness.

The OU8 monitoring results indicate active natural attenuation has decreased the horizontal extent of the DCA and benzene plume and has met the off-base groundwater meets drinking water standards per timeline established in the ROD. In addition, the remediation rate of DCA has being optimized through bioaugmentation and planned air sparging/sve pilot study is expected to affect the occurrence of benzene concentrations.

The institutional controls are in place and effective and are routinely assessed.

3. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedies (e.g., unauthorized excavation, unauthorized use of groundwater)?

    Response: Since my job start date August 25, 2014, there were no known violations of institutional controls. Minor maintenance issues cited in the last inspection report are being addressed by in-house resources this fiscal year. The environmental review and dig permit processes for new projects at Bangor protect IC protectiveness.

4. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

    Response: Yes. The contractor who performs monitoring and operations at Sites A and F, and OU8, performs inspections for the institutional controls. The Navy implements the recommendations that come out of those inspections.

5. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

    Response: None.

6. To the best of your knowledge, are the leach basin barrier at Site A, the infiltration barrier at Site F, the vegetative cap at Site B, and the infiltration barrier at Site 10 intact?

    Response: Yes. Documented in the reports for the annual IC inspections.

7. What progress has been made in optimizing the pump and treat systems, and/or implementing alternatives to the pump and treat systems at OU 1 (Site A) and OU 2 (Site F)?

Response: Additional monitoring wells were installed at Site A and the Navy submitted a conceptual site model update in July 2014. Due to extremely low conductivity at the site, the prospect to increase system recovery is minimal. Recent GW monitoring events have included the collection of water quality parameters (i.e. degradation products of RDX, methane) in support of an MNA alternative which is currently under consideration by the Navy.

Additional monitoring wells were installed at Site F to support plume definition in the downgradient direction. A conceptual site model update is underway to be completed in 2015 in support of optimizing the remedy. Trends consistent with slowly-degrading residual values indicate the RDX plume is not expanding.

Recent work completed at Site F includes the U.S. Army Corps of Engineers (USACE) performance of a pilot study for in situ push pull tests to evaluate anaerobic biodegradation of RDX. A numerical groundwater flow model and contaminant transport model was prepared to support the study. Some results are still pending. A second phase bioaugmentation pilot study to further evaluate aerobic and anaerobic biodegradation at the site is expected in 2015 pending available funds.

The replacement of the pump and treat system's programmable logic controller is underway to optimize pump regulation which will add to plume control effectiveness and efficiency.

8. What is the status of the recommended pilot testing at OU 8, and what progress has been made at implementing the additional contingent remedial actions at OU 8?

Response: The Navy completed a phase II DCA pilot study in 2013 to improve on the establishment of the biobarrier and to complete extensive site characterization of sources, LNAPL extent, and residual contamination. Results of the groundwater monitoring concluded that DCA concentrations met cleanup levels at the boundary. In order to maintain the barrier, reinjections of EVO and microbes every 3 years is recommended and is expected to occur begin in 2016 pending funding.

A pilot study to address dissolved benzene concentrations and LNAPL in groundwater in the PWIA source is currently underway. The study will provide limited treatment of the plume through air sparge/SVE technology as well as data to evaluate its effectiveness at this site in 2015.

9. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since May 2009 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

Response: Yes. Monitoring has been performed per requirements set forth in approved Sample and Analysis Plans to meet the goals of the respective RODs. The data has been reviewed by the Navy and stakeholders, whose comments have been responded to and implemented as necessary.

10. To the best of your knowledge, have the recommendations of the previous (i.e., third) five-year review been implemented, specifically for the sites with remedies not functioning as intended by the decision document?

    Response: Yes. Most of the recommendations have been completed or are underway. Additional studies currently underway are expected to yield necessary data for optimization at applicable sites.

11. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

    Response: A notice of the 5-year review was published recently in local papers. I have not been contacted nor am I aware of any community concerns.

12. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK Bangor?

    Response: The remedies are sufficient in protecting human health and the environment at NAVBASE Kitsap Bangor. Costs associated with running the system at Site A do not appear to be an effective use of tax dollars. The Navy has indicated that improvement of cleanup rates is a goal in consideration with protectiveness, health and safety, and cost effectiveness.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 1 Interview – Navy Personnel
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Silvia Klatman
Title: Naval Base Kitsap PAO
Organization: Naval Base Kitsap Public Affairs
Telephone: (360) 627-4031
E-mail: silvia.klatman@navy.mil
Address:

Contact made by: Nicole Rangel
Response type: e-mail
Date: November 13, 2014

Please note: I was not employed as NBK PAO during the period in question, which is reflected in my answers.

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: Unfamiliar. Not involved during that time frame.

2. What is your overall impression of the on-going effectiveness of the remedies, including the institutional controls components, at NBK Bangor?

   Response: Unknown.

3. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedies (e.g., unauthorized excavation, unauthorized use of groundwater)?

   Response: Unknown.

4. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

Response: Assumption is yes, however, unknown.

5. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

   Response: Unknown.

6. To the best of your knowledge, are the leach basin barrier at Site A, the infiltration barrier at Site F, the vegetative cap at Site B, and the infiltration barrier at Site 10 intact?

   Response: Unknown.

7. What progress has been made in optimizing the pump and treat systems, and/or implementing alternatives to the pump and treat systems at OU 1 (Site A) and OU 2 (Site F)?

   Response: Unknown.

8. What is the status of the recommended pilot testing at OU 8, and what progress has been made at implementing the additional contingent remedial actions at OU 8?

   Response: Unknown.

9. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since May 2009 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

   Response: Unknown.

10. To the best of your knowledge, have the recommendations of the previous (i.e., third) five-year review been implemented, specifically for the sites with remedies not functioning as intended by the decision document?

    Response: Unknown.

11. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

    Response: Have not heard of any during my time here but unknown if any were received during the time frame in question.

12. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK Bangor?

    Response: N/A

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 1 Interview – Navy Personnel
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted:	Leslie Yuenger
Title:	Public Affairs Officer
Organization:	NAVFAC NW
Telephone:	(360) 396-6387
E-mail:	leslie.yuenger@navy.mil
Address:	NAVFAC NW 1101 Tautog Circle, Silverdale, WA 98315
Contact made by:	Nicole Rangel
Response type:	e-mail
Date:	November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: I read and approved documents that are prepared for public release.

2. What is your overall impression of the on-going effectiveness of the remedies, including the institutional controls components, at NBK Bangor?

   Response: That the remedies, including the institutional controls are performing as expected.

3. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedies (e.g., unauthorized excavation, unauthorized use of groundwater)?

   Response: I am not aware of any violations of the institutional control requirements that could negatively impact the protectiveness of this component of the remedies.

4. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

    Response: To the best of my knowledge, regular inspections of the institutional controls remedy components are being conducted and documented.

5. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

    Response: I am not aware of any new scientific findings related to potential site risks that might call into questions the protectiveness of the remedies.

6. To the best of your knowledge, are the leach basin barrier at Site A, the infiltration barrier at Site F, the vegetative cap at Site B, and the infiltration barrier at Site 10 intact?

    Response: To the best of my knowledge, the leach basin barrier at Site A, the infiltration barrier at Site F, the vegetative cap at Site B, and the infiltration barrier at Site 10 are intact.

7. What progress has been made in optimizing the pump and treat systems, and/or implementing alternatives to the pump and treat systems at OU 1 (Site A) and OU 2 (Site F)?

    Response: I am unaware of progress made in optimizing the pump and treat systems and/or implementing alternatives to the pump and treat systems at OU-1 and OU-2.

8. What is the status of the recommended pilot testing at OU 8, and what progress has been made at implementing the additional contingent remedial actions at OU 8?

    Response: I am unaware of the status of the recommended pilot testing at OU8 and of any progress made at implementing the additional contingent remedial actions at OU 8.

9. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since May 2009 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

    Response: To the best of my knowledge, the ongoing environmental monitoring performed at many of the OUs since May 2009 have been sufficiently thorough and frequent to meet the goals of the RODs. I am unaware if the monitoring data has been timely and of acceptable quality.

10. To the best of your knowledge, have the recommendations of the previous (i.e., third) five-year review been implemented, specifically for the sites with remedies not functioning as intended by the decision document?

    Response: I am unaware if the recommendations from the previous (third) five-year review have been implemented, specifically for the sites with remedies not functioning as intended by the decision document.

11. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

    Response: I am not aware of any community concerns regarding implementation of the remedies at any of the OU's. I have not been contacted by members of any community regarding implementation of the remedies at any of the OUs.

12. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK Bangor?

    Response: I have no overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK Bangor.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 2 Interview – Regulatory Agency
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Harry Craig
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Address: U.S. EPA Region 10
Oregon Operations Office
805 SW Broadway, Suite 500
Portland, Oregon 97205

Contact made by: Nicole Rangel
Response type: e-mail
Date: November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: I am familiar with all the Bangor RODs. Since 2009 EPA has had the primary technical lead on Bangor Site A (OU-1), and provided technical support to the Washington Department of Ecology on the remaining Operable Units (2 through 8) at Bangor. In addition EPA reviews the site wide Bangor Five Year Reviews to evaluate protectiveness of the remedies, as required by the NCP.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK Bangor?

   Response: Most of the remaining actions at Bangor relate to groundwater remediation at Site A (OU-1), Site F (OU-2), and OU-8. In the short term, these remedies are protective due to no current groundwater exposure. However in the long term, the length of time necessary for each of these remedies to achieve risk based Remedial Action Objectives (RAO) is

unknown or is not well estimated. The upcoming Five Year Review needs to focus on evaluation of the current remedies and the estimated timeframe for these remedies to achieve groundwater RAOs, and whether any changes to the remedies are necessary or recommended.

EPA's review of Ecology's analysis of the OU-8 remedy in 2013 concurs that this is a failed remedy that substantially will not meet the groundwater RAOs in either the short term or the long term, and the OU-8 groundwater monitoring data shows the remedy is inconsistent with the objectives of EPA's 1999 MNA Guidance. As such a change in remedy for OU-8 is necessary, including treatability studies and a Focused Feasibility Study (FFS) to evaluate more effective LNAPL and dissolved phase benzene groundwater remediation technologies.

3. Do you feel well informed about the remediation activities and progress at NBK Bangor? Please elaborate.

 Response: Yes.

4. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

 Response: The Vapor Intrusion Study for OU-8 source area showed borderline risks for some VOCs. Any future increases in LNAPL or dissolved phase benzene in the source area could potentially increase vapor intrusion risks.

5. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

 Response: Overall institutional controls appear to be effective at preventing exposures, but groundwater RAOs have not been achieved yet at any of the three groundwater OUs.

6. In your opinion, have the evaluations and analysis performed (CSM Model Update) at OU 1 (Site A) been effective tools in attaining remediation progress since May 2009?

 Response: The CSM Model Update document for OU-1 does not in itself change the remediation progress for the current operational Pump & Treat system at Site A. The document also does not assess remediation timeframes as discussed in Question #2 above. In addition, EPA has outstanding issues with the modeling input parameters for Kd and hydraulic conductivity in the modeling conducted in that document, which calls into question the accuracy

of the groundwater modeling conclusions. A Focused Feasibility Study (FFS) and treatability studies would be required to assess alternative treatment technologies for Site A groundwater.

7. In your opinion, have the assessments performed (Optimization Study) at OU 2 (Site F) been effective tools in attaining remediation progress since May 2009?

   Response: The groundwater modeling conducted by the Army Corps of Engineers to date for Site F appear to be based on good hydrogeological practices. The results of the push-pull bioremediation treatability studies for Site F conducted by the Army Corps of Engineers has not been provided to EPA or Ecology for review, so we cannot comment on the effectiveness of those tests. A FFS would be required to assess performance and costs effectiveness of alternative treatment technologies as compared to the current operational Pump & Treat system for Site F, and serve as a basis for any change in the remedy.

8. In your opinion, have the assessments performed (Pilot Studies) at OU 8 been effective tools in attaining remediation progress since May 2009?

   Response: No. The primary outstanding issue for OU-8 is dissolved phase benzene concentrations and an increase in amount of LNAPL, which the DCA pilot studies did not address.

9. Since May 2009, have there been any complaints, violations, or other incidents related to NBK Bangor installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: Not that we are aware of.

10. To the best of your knowledge, has the on-going program of environmental monitoring at NBK Bangor been sufficiently thorough and frequent to meet the goals of the RODs?

    Response: The monitoring frequency appears to be sufficient, but the remedy for OU-8 is ineffective, and needs to be changed. For OU-1 and OU-2, additional analysis of the monitoring data is necessary to estimate remediation timeframes to achieve groundwater RAOs, as discussed in Question #2 above.

11. Are you aware of any community concerns regarding implementation of the remedies at NBK Bangor? If so, please give details.

    Response: None we are aware of.

12. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NBK Bangor?

Response: One of the primary objectives of Five Year Reviews is to assess on-going groundwater remediation system performance. The evaluation should be consistent with current EPA (2011, 2014) groundwater guidance and should assess the following:

a) Evaluation of the remedy performance metrics and monitoring data should indicate whether it is likely that the RAOs and cleanup levels will be achieved in a reasonable timeframe with the existing system.

b) If monitoring data and analyses suggest that the remedy is not achieving sufficient progress toward achieving remedial objectives, then the remedy may need to be revisited. It is recommended that the project team evaluate whether:

1) The remedial action may achieve RAOs and cleanup levels with modification to the selected remedy;
2) The remedy is not likely to achieve RAOs and associated cleanup levels in the timeframe envisioned in the ROD;
3) The remedy is not likely to achieve RAOs and associated cleanup levels in the timeframe envisioned in the ROD, but a new projected timeframe is still deemed reasonable; or
4) The remedy is not likely to achieve RAOs and cleanup levels in any reasonable timeframe.

http://www.epa.gov/superfund/health/conmedia/gwdocs/pdfs/gwroadmapfinal.pdf

http://www.epa.gov/superfund/health/conmedia/gwdocs/pdfs/EPA_Groundwater_Remedy_Completion.pdf

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 2 Interview – Regulatory Agency
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted:	Chris Maurer
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Contact made by:	Nicole Rangel
Response type:	e-mail
Date:	November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: I have been the Ecology project manager for OU-1, 2, and 8 since February of 2013. I have no knowledge of OU-3 or 6.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK Bangor?

   Response: The remedies at OU-1, 2, and 8 appear protective in the short term.

3. Do you feel well informed about the remediation activities and progress at NBK Bangor? Please elaborate.

   Response: Yes

4. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

   Response: No

5. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

   Response: The institutional controls appear effective.

6. In your opinion, have the evaluations and analysis performed (CSM Model Update) at OU 1 (Site A) been effective tools in attaining remediation progress since May 2009?

   Response: None

7. In your opinion, have the assessments performed (Optimization Study) at OU 2 (Site F) been effective tools in attaining remediation progress since May 2009?

   Response: None

8. In your opinion, have the assessments performed (Pilot Studies) at OU 8 been effective tools in attaining remediation progress since May 2009?

   Response: The pilot studies are effective tools but not in attaining progress in cleaning up the site.

9. Since May 2009, have there been any complaints, violations, or other incidents related to NBK Bangor installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: No

10. To the best of your knowledge, has the on-going program of environmental monitoring at NBK Bangor been sufficiently thorough and frequent to meet the goals of the RODs?

    Response: The environmental monitoring shows that the goals of the ROD have been met. The monitoring also shows that the present actions are failing to remediate OU-8.

11. Are you aware of any community concerns regarding implementation of the remedies at NBK Bangor? If so, please give details.

Response: No

12. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NBK Bangor?

    Response: The present passive actions at OU-8 are failing to remediate the site in a reasonable time frame. While the goals of the ROD have been met, these goals are containment goals, focused on limiting the site contamination to within the base. The goal that should be overriding, to reduce the level of contamination to less than Federal and State standards, is not being met and will not be met in a reasonable time frame. Given the small size of the Public Works Industrial Area, an aggressive active remediation of the source should be performed. The process should begin with a focused feasibility study, followed promptly by the selected aggressive active remedial measures

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 2 Interview – Regulatory Agency
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Grant Holdcroft
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Bremerton, WA 98337-1866

Contact made by: Nicole Rangel
Response type: e-mail
Date: December 22, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: I have read the RODs in the past. My focus was on the landfill at Floral Point, as the Health District has regulatory responsibilities associated with landfills. I have conducted an inspection at the Floral Point landfill with representatives of the Navy from EFA/NW. Monitoring and maintenance activities at the landfill are ongoing and appear to be thorough.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK Bangor?

   Response: My overall impression of the remedies is good as it pertains to corrective actions at the landfill. The remedies are in place and monitoring is on-going.

3. Do you feel well informed about the remediation activities and progress at NBK Bangor? Please elaborate.

Response: No, unfortunately not. The Kitsap Public Health District has not been receiving information on the site. We would like to be included in the future.

4. To the best of your knowledge, since May 2009, have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

   Response: Since the Health District has not been included in reports related to Bangor for some time, we have no knowledge of any new scientific findings.

5. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

   Response: It appears that the institutional controls are effective. The Health District's Drinking Water program is very aware of the restrictions in groundwater use. However, my source of information is the current 5 year review and not much else.

6. In your opinion, have the evaluations and analysis performed (CSM Model Update) at OU 1 (Site A) been effective tools in attaining remediation progress since May 2009?

   Response: I don't know enough to have an opinion on this. The Kitsap Public Health District has not been receiving information on the progress at the various sites.

7. In your opinion, have the assessments performed (Optimization Study) at OU 2 (Site F) been effective tools in attaining remediation progress since May 2009?

   Response: See answer to 6 above.

8. In your opinion, have the assessments performed (Pilot Studies) at OU 8 been effective tools in attaining remediation progress since May 2009?

   Response: See answer to 6 above.

9. Since May 2009, have there been any complaints, violations, or other incidents related to NBK Bangor installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: Not to my knowledge.

10. To the best of your knowledge, has the on-going program of environmental monitoring at NBK Bangor been sufficiently thorough and frequent to meet the goals of the RODs?

    Response: See answer to 6 above.

11. Are you aware of any community concerns regarding implementation of the remedies at NBK Bangor? If so, please give details.

    Response: Not beyond the concerns of the Mountain View neighborhood.

12. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NBK Bangor?

    Response: No.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 3 Interview – Community Member
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Peggy Adkins
Title: Community CoChair ~~Point No Point Treaty~~
Organization: Community ~~North~~ South
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Bremerton, WA 98312

Contact made by: Nicole Rangel
Response type: mailed 11/26/14
Date: November 25, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: None

2. What is your overall impression of the on-going protectiveness of the remedies at NBK Bangor?

   Response: ??

3. Do you feel well informed about the remediation activities and progress at NBK Bangor? Please elaborate.

   Response: No I have not heard any thing in years

4. What effects on the community have you observed as a result of on-going remedy implementation?

   Response: None

5. Are you aware of any community concerns regarding implementation of the remedies? If so, please give details.

   Response: no

6. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NBK Bangor?

   Response: None

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
May 2009 through April 2014
Type 3 Interview – Community Member
Naval Base Kitsap Bangor
Kitsap, WA

Individual Contacted: Sue Edwards
Title: community member
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E-mail: Suebedwards@home.com, suebedwards@comcast.net
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Poulsbo, WA 98370

Contact made by: Nicole Rangel
Response type: e-mail
Date: November 13, 2014

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with Naval Base Kitsap (NBK) Bangor, the Records of Decision (RODs) for Operable Units (OUs) 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OUs, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since May 2009.

   Response: Became familiar while on the Restoration Advisory Board but have had no involvement as the Board was disbanded.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK Bangor?

   Response: Difficult to tell because I have had little updating.

3. Do you feel well informed about the remediation activities and progress at NBK Bangor? Please elaborate.

   Response: Not at this point – would like to have more updating, particularly at Floral Point since the remedy selected there was "natural attenuation"

4. What effects on the community have you observed as a result of on-going remedy implementation?

Response: I don't know about on-going but I think the initial decisions had a positive effect on the community.

5. Are you aware of any community concerns regarding implementation of the remedies? If so, please give details.

   Response: There was some concern about implementation and method of remedies for Floral Point at the time - that it might not have been proactive enough. A couple of people have asked me since if I have received any update.

6. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NBK Bangor?

   Response: I would like to receive further updates on the effectiveness of the cleanup measures and if there have been any more sites discovered since the Board has not met. There was also a site (can't remember which one) that seemed to have further detects of benzene migration but as I recall the levels found were not of significance in terms of ppm, but I would be interested to know what sort of follow-up was done on that.

APPENDIX G

Agency Comments and Responses to Comments

Technical Review and Comments
Draft Fourth 5-Year Review
Naval Base Kitsap Bangor, Silverdale, Washington
Document Date: April 6, 2015
Commenter: EPA

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
GENERAL COMMENTS			
1	Draft Fourth 5-Year Review	**Comment:** EPA's review of the 4th Five Year Review focused primarily on the operating groundwater treatment systems for OU-1, OU-2, and OU-8, and whether they would be protective over both the short and long term. Although they would generally be protective over the short term, there are a number of outstanding issues regarding long term effectiveness and efficiency for these treatment systems.	**Response:** The Navy agrees and has therefore given OU 1, OU 2, and OU 8 a protectiveness determination of "Short-Term Protective".
2	Draft Fourth 5-Year Review	**Comment:** In general even though these three groundwater remediation systems have operated over a number of years, the 4th draft FYR lacks any analysis of the remediation timeframes necessary to achieve the respective ROD Remedial Action Objectives (RAOs) in groundwater for each Operable Unit (OU). For OU-1 and OU-2, each of these remedies exceeds the ROD estimated remediation timeframes, yet no estimate is provided for the length of time necessary for the current operating Pump & Treat systems to achieve ROD RAOs for RDX (0.8 ug/L) and TNT (2.9 ug/L) in groundwater. For OU-8, based on the presence of free product (LNAPL) and increasing benzene concentrations in groundwater, a remediation timeframe cannot be estimated and it is doubtful that this remedy could ever meet the groundwater RAO of 5 ug/L for benzene in any reasonable timeframe.	**Response:** Additional trend analyses were performed for OUs 1, 2, and 8 as part of this 5-year review and consisted of plotting the log-transformed laboratory data against time using only data from this 5-year review period. The purpose of this trend analysis was to assess the concentrations trends over the last 5 years, and, if possible, estimate the remediation timeframes necessary to achieve the remediation goals. Because concentration trends were increasing in at least one well, remediation timeframes could not be estimated for OU 1 or OU 2 using this method (see Section 6.4.1 pages 6-7 and 6-12 and Section 6.4.2 page 6-24). For OU 8, a remediation timeframe was estimated for 1,2-DCA. Assuming that concentration trends remain constant into the future, the 1,2-DCA concentration in groundwater from well 8MW06 is estimated to achieve the RG in approximately 20 years (see Section 6.4.4 page 6-42). The remediation timeframe could not be estimated for benzene at OU 8, because of the slightly increasing concentration trends at some of the site wells (see Section 6.4.4 page 6-44).

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
			For OU 1, remediation timeframes were estimated in two reports during this 5-year review period. The report titled "Letter Report on Mass Flux and Mass Discharge Assessment for Bangor Site A" by Michael Annable of the University of Florida estimated that "the time required to remove 90% of the mass would be about 25 years and for 99% around 50 years" utilizing a mass balance assessment and assuming first-order decay. Furthermore, in the report titled "Site A Conceptual Site Model Update", the pump-and-treat system was estimated to take 120 years to reach remediation goals, if the current pumping rate was increased by three times (see Table 8-1 and Section 8.3.2.1 of that report). No remediation timeframes were estimated for OU 2 during this 5-year review period, and OU 8 has met the remediation timeframe specified in the ROD. Cleanup timeframes for groundwater are very difficult to predict, and were frequently underestimated in feasibility studies and RODs prepared early in the CERCLA program (late 1980s and 1990s), such as these. In a meeting on September 19, 2013 with EPA and Ecology, EPA indicated that groundwater cleanup timeframes of 30 to 45 years is common, but can be as high as 150 years in some cases. The treatment systems at OU 1 and OU 2, and MNA at OU 8 have been operating for about 15 to 20 years. Although cleanup levels have not been met at these sites, this is still well within the reasonable timeframe for groundwater remediation.

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
			Remediation timeframes, using a mass balance assessment or other technique, will be estimated for OU 1 as part of the completion of an FFS for this OU (see response to General Comment No. 4). Depending on the results of the remedy optimization and modeling activities currently underway for OU 2, additional remedial technologies may be considered for this OU. If additional remedial technologies are recommended for use at OU 2, then the Navy will consider performing a mass balance assessment and estimating remediation timeframes for that OU.
3	Draft Fourth 5-Year Review	**Comment:** Any changes to the selected remedies for OU-1, OU-2, and OU-8 would have to be based on a ROD Amendment or ESD for each of these OUs. FYR recommendations alone do not constitute sufficient administrative or legal basis under CERCLA for remedy changes for these OUs, which would have to be completed based on a CERCLA Nine Criteria analysis, as well as treatability study data for technologies that lack site-specific performance or cost data. The Focused Feasibility Study (FFS) evaluation process provides the basis for a CERCLA Nine Criteria analysis, and the comparison of the current and alternative treatment technologies for groundwater remediation.	**Response:** The RODs for OU 1 and OU 2 do not specify a contingent remedy. Therefore, a ROD amendment or ESD would be required to change the selected remedy for these sites. The ROD for OU 8 includes contingent actions which would be used in the event that MNA does not appear to be meeting cleanup goals. The contingent actions include Redox Manipulation (RM) and re-start of the existing containment (pump & treat) system. If air sparge/soil vapor extraction were implemented at the site to increase oxygen concentrations in the groundwater, which is considered to be RM, a ROD Amendment or ESD would not be necessary. Likewise, implementation of a biobarrier (injection of EVO together with halorespiring microbes) is also considered to be RM and would not require ROD Amendment or ESD.

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
4	Draft Fourth 5-Year Review	**Comment:** For OU-1, EPA does not concur with the Navy's FYR recommendation that the treatment system be turned off and MNA be evaluated. This recommendation is substantially inconsistent with the current OU-1 ROD selected remedy. The FYR lacks any substantive analysis of MNA based on EPA's MNA Guidance, and MNA needs to be evaluated before being selected as a remedy based on the EPA MNA Guidance evaluation criteria, as well as a CERCLA Nine Criteria Analysis. EPA also does not concur on the Navy's suggestion of technical impracticability waiver for OU-1, as this issue was not evaluated in accordance with EPA's Technical Impracticability Guidance.	**Response:** It seems prudent to evaluate MNA at this time, since much, perhaps nearly all, of the remediation appears to be due to these processes, and MNA was not available for consideration as a remedy when this early ROD was signed. The Navy is not recommending selection of MNA for OU 1 at this time, nor is it seeking the technical impracticability waiver at this time. The Navy will prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies selected for consideration during a meeting with the stakeholders would be evaluated in the FFS. In addition, as part of the FFS the following activities would be performed: • A treatability study of MNA • A field verification of aquifer properties • A re-evaluation of the human health risk pathway The Navy is recommending that a treatability test of MNA be performed instead of performing additional modeling, which may not be acceptable to EPA. So far, three separate models with varying amounts of site-specific data, have all generally obtained the same results. However, none of these models were accepted by EPA. Therefore, the Navy, in conjunction with EPA and Ecology, would develop a treatability study work plan, which would include **temporarily** deactivating the pump and treat system and implementing an MNA treatability test using EPA protocols, as

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
			currently recommended in Recommendation 4 of Table 8-1. As part of the MNA treatability study, the Navy will also perform field verification of aquifer properties. Using the results of more than 15 years of site monitoring well data and pump and treat operational data, as well as the results of the field verification of aquifer properties, the human health risk pathways will be re-evaluated in the FFS. The operational information for the existing pump and treat system suggests that the shallow aquifer could not be used as a drinking water source because of the low pumping rates, and therefore is not a human health pathway at the site. Therefore, remediation levels may be adjusted to ones based on protection of ecological receptors in downgradient water bodies. Based on the results of the FFS, an ESD or ROD amendment will be completed, including a technical impracticability demonstration. Text in the 5-year review will be revised to include the information provided in this response to comments. In addition, the recommendations for OU 1 in the 5-year review will be modified to include completion of an FFS, a field verification of aquifer properties, and a re-evaluation of the human health risk pathways.

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
5	Draft Fourth 5-Year Review	**Comment:** For OU-2, EPA supports the evaluation of potential alternative groundwater remediation technologies, such as those initially tested by the Corps of Engineers (COE). EPA however identified a number of outstanding issues regarding the in-situ bioremediation tests conducted by the COE which would need to be resolved before these technologies could be selected as an alternative remedy for OU-2. The technical issues identified on the COE treatability study evaluation are addressed in the attached hydrogeologist review comments for OU-2.	**Response:** See responses to EPA Hydrogeology Review Comments and Recommendations below.
6	Draft Fourth 5-Year Review	**Comment:** For OU-8, EPA's conclusion is that it constitutes a failed remedy at this point in time, and that a more active remediation is necessary for this OU. The presence of LNAPL indicates that source control is not complete, and the increase in dissolved phase benzene concentrations indicated that it is substantially inconsistent with EPA's MNA Guidance, which requires a clear and meaningful downward trend in contaminant concentrations to demonstrate that MNA is effective. Due to the current site conditions at OU-8, it doubtful that any remediation timeframe could be estimated and whether the current MNA remedy could ever meet the benzene RAO of 5 ug/L is also highly doubtful. EPA would expect that the Navy provides FYR recommendations that address the lack of effective performance for the OU-8 remedy through more active remediation measures.	**Response:** The Navy does not agree that the remedy for OU 8 has failed. The remedy for OU 8 is functioning as intended by the OU 8 ROD, because the groundwater plume does not currently extend beyond the base boundary. Furthermore, the ROD only specified a time frame for meeting the remediation goals in the off-base portion of the plume, and this time frame has been met. The ROD does not include a time frame for the source area in the PWIA to meet RAOs. The OU 8 ROD acknowledged that LNAPL recovery is expected to only remove approximately half of the LNAPL on the site (See Section 11.6 of the ROD). Therefore, the presence of free product on the site is expected. Just because free product was found in new wells installed within the source area, does not imply that conditions are worsening. Furthermore, as concluded in the Modeling Technical Memorandum – Naval Base Kitsap at Bangor, OU 8, the analytical data and tank testing results support the theory that no ongoing release from the existing gasoline and diesel tanks is occurring, and LNAPL appears to be at or near residual saturation. However, because of the increasing benzene

Comment No.	Document/ Page &Line	Comment/Recommendation	Response
			concentration trends observed in two site wells and the presence of LNAPL in the newly installed wells, the Navy recommended in the 5-year review (see Recommendation 13 of Table 8-1) that: • Additional studies to further define the nature and extent of dissolved-phase COCs and LNAPL (including LNAPL mobility tests) be performed to support remedy optimization • Benzene pilot test be performed to evaluate air sparge/soil vapor extraction technology • Active source remediation technologies be evaluated • The 1,2-DCA biobarrier be reestablished after the benzene pilot study has been completed • 1,2-DCA and indicator parameters be monitored in pilot study wells in addition to the ongoing MNA program.
SPECIFIC COMMENTS			
7	Draft Fourth 5-Year Review	**Comment:** Specific Comments are addressed in the attached hydrogeology review comments for OU-1, OU-2, and OU-8.	**Response:** See responses to EPA Hydrogeology Review Comments and Recommendations below.

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EPA HYDROGEOLOGY REVIEW COMMENTS AND RECOMMENDATIONS			
8	OU 1 (Site A)	**Comment:** The updated conceptual site model (CSM) does not add much value to our understanding of the hydrogeologic conditions at the site. Evidently, there are data gaps and inconsistencies between modeling results and monitoring results for this site. Recommendations based on modeling results alone would not take precedence over results from actual field data, particularly when there are significant discrepancies between the monitoring data and the modeling results. Perhaps, the most important data gap is that after more than 15 years of system operation we do not know the thickness of the Shallow Aquifer. Specifically, the bottom of the plume is not defined, and we now know that the aquifer extends far beyond where the monitoring wells are screened. This data gap must be addressed before making decision about any of the remedy options. This could be addressed in a Focused Feasibility Study (FFS) (EPA 2014a).	**Response:** This comment is on the Site A CSM report, not the 5-year review. Responses to EPA comments on the Draft Site A CSM report were previously provided to EPA in June 2014. The Navy did not receive a response from the EPA on the comments responses until August 8, 2014 after the document had been finalized in July 2014. The Navy acknowledges that EPA has outstanding issues with the Site A CSM report, and will address these concerns through the proposed FFS process and the field verification of aquifer properties (see response to General Comment No. 4).
9	OU 1 (Site A)	**Comment:** The CSM did not include a mass balance of the a) original mass in place, b) mass removed by the ground water treatment system operation and c) current mass remaining in place. The CSM also does not address other techniques such as regression analysis that can be used to assess restoration time frames. Without this analysis, we would not know how long the current treatment would need to operate to meet the RAO for RDX of 0.8 ug/L in groundwater (EPA 2011, 2014a,b).	**Response:** See response to Specific Comment No. 8 and General Comment No. 2.
10	OU 1 (Site A)	**Comment:** In addition, there remains a data gap for RDX concentrations in vadose zone soils beneath the Leach Basin, which would be a remaining source to groundwater if the liner is removed or becomes compromised over time.	**Response:** See response to Specific Comment No. 8.

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11	OU 1 (Site A)	**Comment:** The ground water modeling does not address how long the current ground water treatment system would need to operate to achieve RAO of 0.8 u/L for RDX throughout the plume. Any change in remedy would need to address this in a FFS analysis.	**Response:** See response to Specific Comment No. 8 and General Comment Nos. 2 and 4. RAOs for OU 1 will be re-evaluated based on more than 15 years of site monitoring well data and operational data from the existing pump-and-treat system, as well as the aquifer properties field verification data.
12	OU 1 (Site A)	**Comment:** The constant –rate pumping test conducted as part of the CSM update to predict flow and transport of both groundwater and dissolved RDX in ground water is not the appropriate method to determine aquifer characteristics in low –permeability aquifers. Driscoll (1986) states that "other types of tests can be used" when the aquifer has a low hydraulic conductivity which limits the yield from virtually nothing to 1 to 2 gpm. The pumping well could sustain only 0.75 gpm, with 9 out 12 observation wells not responding. The report of the aquifer test showed hydraulic conductivity ranging from 1.1 feet/day to 10.9 feet/day with an average of 3.7 feet/day (1.3 x 10-3 cm/sec). We believe that K inferred from this test is too high and that the extraction wells should be able to pump more water than they do if the hydraulic conductivity inferred from this test were correct. The implication is that ground water fate and transport models are very sensitive to hydraulic conductivity. For example, the 10-year projection plume extent shown on Figures 7-7 and 7-11 is far more than what actually occurred between 2002 and 2012. Other inputs such as partition coefficient (Kd) may also contribute to this.	**Response:** See response to Specific Comment No. 8.
13	OU 1 (Site A)	**Comment:** EPA's judgment is that the analytical method and the interpretation of the pumping test data is not valid, and do not reflect the actual field data. We feel strongly that the aquifer characteristics are too different from the general pumping test assumptions listed in Driscoll and for the various analytical tests (Navy, 2014; page 37-38). For example, Driscoll (1986) assumes "typical" transmissivity of over 4,000 ft2/day; the Navy's consultant reported one of 117 ft2/day. Transmissivity (T) is K multiplied by aquifer thickness, the Navy's consultant used 31 ft. (the screen length) in EW-7, the pumping well, as the aquifer thickness; however, we know from the new well (A-MW-58) that the shallow aquifer is at least three times that thickness.	**Response:** See response to Specific Comment No. 8.

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14	OU 1 (Site A)	**Comment:** The updated CSM states that the K determined at Site A is consistent with K reported in USGS (2002) Bangor general area studies. The cited report addresses ground water flow system at NBK Bangor in general and does not address or evaluate lithologic or hydrogeologic conditions at Site A, which is substantially more fine grained and heterogeneous than other locations at the Base. The comparison is rather meaningless since no K data is associated with USGS study.	**Response:** See response to Specific Comment No. 8.
15	OU 1 (Site A)	**Comment:** The analysis of alternative remedial technologies in this updated CSM is rather cursory and does not reflect the true state of development and use of these technologies specifically for RDX. For example, there is no pilot or full scale treatability data on evaluation of in-situ chemical oxidation of RDX in ground water and there is no data specifically on in-situ alkaline hydrolysis of RDX in ground water. Other alternatives such as in-situ bioremediation where there is no demonstrated site specific performance data would also need to be evaluated in pilot and bench scale treatability studies. All of these remedial alternatives would require a change in the selected remedy via a ROD Amendment.	**Response:** See response to Specific Comment No. 8 and General Comment No. 4.
16	OU 1 (Site A)	**Comment:** EPA does not agree with conclusions and recommendations with regard to MNA at this site. The analysis of MNA is not consistent with the EPA MNA Guidance (1999, 2011) with regard to establishing a clear and meaningful downward trend based on ground water monitoring data, and achieving restoration timeframes to ROD RAOs comparable to other remedial alternatives based on a FFS analysis. In addition, the rate of RDX and intermediates degradation in ground water has not been determined, or the time necessary to achieve the RAO of 0.8 ug/l RDX throughout the plume.	**Response:** See response to Specific Comment No. 8 and General Comment No. 4.
17	OU 1 (Site A)	**Recommendation:** There remain significant data gaps that need to be addressed before making a decision about any remedy options. These data gaps could be addressed during the focused feasibility studies.	**Response:** See response to General Comment No. 4.
18	OU 1 (Site A)	**Recommendation:** The major objective of the FFS is to evaluate all remedy options listed in the CSM for restoration timeframe, costs, and effectiveness in a side-by-side Nine Criteria analysis. Some of the options such as in-situ bioremediation would require bench and pilot scale treatability studies to evaluate their potential effectiveness.	**Response:** This is a 5-year review, not an FFS. See response to General Comment No. 4.

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19	OU 1 (Site A)	**Recommendation:** If MNA is included as a remedy option, the analysis should be consistent with the EPA MNA Guidance (1999, 2011) with regard to establishing a clear and meaningful downward trend based on ground water monitoring data. In addition, the rate of RDX and intermediates degradation in ground water must be determined, and the time necessary to achieve the ROD Remedial Action Objective of 0.8 ug/l RDX throughout the plume.	**Response:** See response to Specific Comment No. 11 and General Comment No. 4.
20	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** Although the bioremediation push-pull test conducted by the COE shows the potential for use of bioremediation at Site F, the tests did not conclusively demonstrate that in-situ bioremediation could treat below the ROD RAO of 0.8 ug/L for RDX. Further treatability studies would need to clearly demonstrate that the RDX RAO could be met based on pilot scale studies.	**Response:** Any information included in the draft 5-year review report summarizing the USACE report titled "Optimization of an Explosives-Contaminated Groundwater Pump & Treat Remedy Using Bioremediation, Naval Base Kitsap, Bangor Site F" will be deleted from the text. The draft report, which is dated August 2014, was published after the 5-year review period (data October 2009 through April 2014 and reported through July 2014). Therefore, comments related to this report will be addressed through the standard agency review procedures for that report.
21	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** Although "transient" intermediates from RDX biodegradation (i.e. MNX, DNX, TNX) would be expected to occur, these push-pull tests showed increases in intermediates without subsequent degradation. Further pilot scale tests would clearly need to demonstrate that in-situ bioremediation could degrade RDX intermediates as well as RDX to be used as a full scale technology.	**Response:** See response to Specific Comment No. 20.
22	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** The COE tests did not evaluate TNT degradation in groundwater, which would also need to be demonstrated in further pilot scale testing as well.	**Response:** See response to Specific Comment No. 20.
23	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** The preliminary evaluation of remedial alternatives used an assumed remediation timeframe of 20 years. Based on the modeling results, none of remedial alternatives evaluated met the ROD RAO of 0.8 ug/L for RDX at 20 years, therefore the costs estimates for all the remedial alternatives evaluated are invalid.	**Response:** See response to Specific Comment No. 20.

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24	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** The bioremediation alternatives assumed 15 of 20 years would be based on Monitored Natural Attenuation (MNA). There is no technical basis or analysis for the assumption that MNA would effective over this 15 year time period, therefore the cost estimates for the bioremediation alternatives would be invalid. Any bioremediation alternative would need to be analyzed based on continuation of in-situ bioremediation until the ROD RAOs for RDX and TNT are met.	**Response:** See response to Specific Comment No. 20.
25	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** Any changes to the remedy for Site F would require a side-by-side analysis of remedial alternatives based on a FFS Nine Criteria analysis, which serves as the basis for selection of remedies under CERCLA. Changes to the current Pump and Treat system would require a ROD Amendment, based on appropriate demonstrated pilot scale treatability study data.	**Response:** See response to Specific Comment No. 20.
26	OU 2 (Site F) - Corps of Engineers Optimization Report	**Comment:** This remedy optimization assessment has major limitation that need to be addressed. Remedy scenarios were simulated over a 20 year period to eliminate high concentration RDX to allow MNA to eliminate the lower concentration areas. Active remedy is designed to predict when contaminant cleanup levels would be achieved and not when high concentration areas of the plume would be eliminated. MNA is a passive remedy and should be selected only when it would meet site remedy objectives within a reasonable timeframe as compared to that offered by other methods (EPA MNA Guidance, 1999.) This would require a detailed site specific data to demonstrate that MNA cleanup timeframe at Site F would be comparable to that which could be achieved through an enhanced P&T and phased bioremediation. Since remedy scenarios were not designed to achieve the current ROD RAO cleanup levels, the cost breakdown of remedy options is rather meaningless. TNT is identified as one of the contaminants of concern and yet it was not included in the contaminant transport modeling. Just because TNT plume is much smaller than RDX plume and is present near the original source area does not mean it should be ignored.	**Response:** See response to Specific Comment No. 20.
27	OU 2 (Site F)	**Recommendation:** TNT is a contaminant of concern and should be included in any future (prior to full scale remedy design) contaminant transport model development. Remedy optimization scenarios should be simulated over a longer period in order to predict cleanup levels of both RDX (0.8ug/L) and TNT (2.9 ug/L).	**Response:** See response to Specific Comment No. 20.

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28	OU 8	**Comment:** A 20,000 gallons of residual gasoline from a 1986 release has seeped through a surface till unit. MNA is the selected remedy for the site. After 30 years of cleanup and monitoring, the source area remains well above cleanup levels by 4 orders of magnitude. Free product has been detected north of the source area. The current volume of the residual gasoline mass is estimated at 14,000 gallons which is approximately 70 % of the original 20,000 gallon release 30 years ago.	**Response:** This comment references information included in the Ecology report titled Bangor OU 8 Monitored Natural Attenuation (MNA) Assessment. During the meeting with EPA and Ecology on September 19, 2013, this modeling report was thoroughly discussed and issues were resolved at that time. The project team has moved beyond this modeling effort, and the activities currently under way are described in Table 5-1 of the 5-year review.
29	OU 8	**Comment:** Plume stability assessment (concentration, mass and area) over the entire gasoline footprint shows that average benzene concentrations have increased from 193 to 2,201 ug/L over 17 years. During this same period, the average benzene mass increased by a factor of about five (0.25 to 1.3kg). The increase in benzene mass and concentration over time is evidence of undetected leaks from site USTs. This confirms that the source area is not controlled.	**Response:** See response to Specific Comment No. 28 and General Comment No. 6.
30	OU 8	**Comment:** The source area mass discharge is estimated at about 1.3 gallons of gasoline per day (470 gallon per year). At that rate, and assuming no biodegradation and no undetected leaks, it will take about 30 years to dissipate the 14,000 gallons of remaining gasoline.	**Response:** See response to Specific Comment No. 28.
31	OU 8	**Recommendation:** After 30 years of MNA, gasoline mass and concentrations have increased over time and the source is not controlled.	**Response:** This is not a recommendation. See response to General Comment No. 6.
32	OU 8	**Recommendation:** Based on review of available site data, EPA believes that the remedy for OU 8 has failed.	**Response:** This is a statement of opinion, not a recommendation. See response to General Comment No. 6 above.

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SPECIFIC COMMENTS			
1	Figure 1-1	**Editorial Comment:** The most detailed of the three figures lacks a key to the alphanumeric site locations. Given that the following figure, Figure 1-2, has such a key, the most detailed figure in Figure 1-1 is redundant and could be eliminated for clarity.	**Response:** The redundant detailed part of Figure 1-1 will be replaced with an intermediate map showing the location of Bangor in relation to Kitsap County and Hood Canal.
2	Table 4-2, OU-7, Sites E and 11	**Editorial Comment:** The remediation goal is in ug/L and the remedial action objective is in ppm. Consistent units should be used.	**Response:** The remediation goal will be changed to ppm for consistency with the remedial action objective. The remediation goal will also be provided in ug/L in parenthesis.
3	Page 6-15, Paragraph 2	**Editorial Comment:** "300 (what?)"	**Response:** The units will be added.
4	Page 6-19, Paragraph 3	**Editorial Comment:** "Site A" may be intended to read "Site F."	**Response:** Site A will be changed to Site F.
5	Page 6-31, Paragraph 3	**Comment:** If the enhanced pump and treat/phased bioremediation will not remediate the groundwater within 20 years, the timeframe for active remediation should be increased from the proposed 5 years to a significantly longer period, say 10 - 15 years or more.	**Response:** Any information included in the draft 5-year review report summarizing the USACE report titled "Optimization of an Explosives-Contaminated Groundwater Pump & Treat Remedy Using Bioremediation, Naval Base Kitsap, Bangor Site F" will be deleted from the text. The draft report, which is dated August 2014, was published after the 5-year review period (data October 2009 through April 2014 and reported through July 2014). Therefore, comments related to this report will be addressed through the standard agency review procedures for that report.

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6	Page 6-54, First Bullet	**Editorial Comment:** "the DCA (what?)"	**Response:** The word "biobarrier" will be added after DCA.
7	Page 6-55, FINAL FOURTH FIVE-YEAR REVIEW Bullet	**Comment:** The use of low-temperature or high-temperature in-situ thermal remediation should be included among the active source remediation technologies evaluated. The Corps of Engineers has had significant success with these techniques at the South Tacoma Channel - 12-A site, involving a small confined area, similar to the Public Works Industrial Area, in an urban setting.	**Response:** The purpose of the referenced text is to summarize the results of modeling performed for OU 8. In the modeling document, in situ thermal remediation was not included in the list of recommended active remediation technologies to be evaluated. See response to Comment No. 12.
8	Page 6-59, Section 6.6.2	**Comment:** Ecology's responses to the survey were sent to Ms. Nicole Rangel by e-mail December 12, 2014. They should be summarized here and included in Appendix F.	**Response:** We apologize that Ecology's interview responses were inadvertently not included in the document. Ecology's interview responses will be summarized in this section and included in the Appendix.
9	Figure 6-6	**Editorial Comment:** Two of the three figures have a dashed box, which varies in location, in the figure. A key or footnote should be supplied explaining the purpose of the box and the reason for its omission from the third figure.	**Response:** The dashed box will be removed from the figure.
10	Table 6-12	**Comment:** Ecology is seriously concerned that the same deficiencies are found in the annual inspections year after year. The Navy must promptly repair any deficiencies found in annual inspections. Such repairs should occur before the next annual inspection. It is especially important that monitoring, injection, and extraction wells be fully protected from traffic damage (AIW-3). Potential damage to a well must be immediately repaired.	**Response:** The Navy repairs deficiencies that impact protectiveness as quickly as possible, given the constraints of obtaining funding for these activities. If the deficiency does not impact the protectiveness of the remedy, these repairs may be deferred until a later date in order to fund repairs that do impact protectiveness. Some deficiencies reappear because they reoccur, rather than because they are lingering from the last year. However, a greater effort will be made to ensure that deficiencies that impact protectiveness will be repaired within the same year if funding is available or programmed for the next year if funding is not available in the same year. This issue will be identified in the 5-year review and the recommendation noted above will be added to the 5-year review.

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11	Page 7-26, Toluene	**Comment:** Even though the remedy is considered protective, in view of the very high risk level (32 times that acceptable) that concentrations observed during the past five years represent, more active remediation actions should be undertaken to reduce the concentration of toluene so that the protectiveness of the remediation does not only rest on an institutional control.	**Response:** As summarized in Table 5-1, a separate pilot study to address dissolved benzene concentrations and LNAPL in GW in the PWIA source area has been contracted by the Navy. The study will provide limited treatment of the plume through air sparge/soil vapor extraction technology, as well as data to evaluate its effectiveness at this site. Air sparge/soil vapor extraction is also effective for treatment of toluene. Furthermore, Recommendation 13 in Table 8-1 states the following "Perform additional studies to further define the nature and extent of dissolved-phase COCs and LNAPL (including LNAPL mobility tests) to support remedy optimization, perform the benzene pilot test to evaluate air sparge/soil vapor extraction technology, evaluate active source remediation technologies, reestablish the 1,2-DCA biobarrier after the benzene pilot study has been completed, and monitor 1,2-DCA and indicator parameters in pilot study wells, in addition to the ongoing MNA program." Changes to the text are not recommended based on this comment.
12	Page 7-27, Last Paragraph	**Comment:** The use of low-temperature or high-temperature in-situ thermal remediation should be included here among the active source remediation technologies to be evaluated. The Corps of Engineers has had significant success with these techniques at the South Tacoma Channel - 12-A site, involving a small confined area in an urban setting.	**Response**: As discussed in the comment response above, a separate pilot study to address dissolved benzene concentrations and LNAPL in GW in the PWIA source area has been contracted by the Navy. The study will provide limited treatment of the plume through air sparge/soil vapor extraction technology, as well as data to evaluate its effectiveness at this site. The ROD for OU 8 includes contingent actions which would be used in the event that MNA does not appear to be meeting cleanup goals. The contingent actions include Redox Manipulation (RM) and re-start of the existing containment (pump & treat) system. Air sparge/soil vapor extraction is considered RM. Therefore, this technology could be implemented without an ESD or a ROD amendment. In a meeting on September 19, 2013 with EPA and Ecology, EPA expressed their preference to avoid an ESD or ROD amendment, if possible, because they would rather have the Navy performing active work towards cleaning up the site rather than expending effort on procedural requirements. Furthermore, air sparge/soil vapor extraction was successfully employed at the PWIA gas station, and should be successful in the source area at OU 8. In the course of evaluating the results of the benzene pilot study, the Navy will consider whether low-temperature thermal treatment, where soil temperatures would be raised to between 30 and 50 ºC, could enhance

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			MNA.
13	Section 7.7, First Paragraph	**Editorial Comment:** The second sentence states that there are no remedial action objectives for the site. The seventh sentence states that remedial action objectives for the site remain valid. The paragraph should be revised for consistency.	**Response:** RAO will be deleted from the last sentence.

Meeting Notes
DO 78 Bangor Fourth 5-Year Review
Stakeholder Meeting Regarding Agency Comments and Navy's Response to Comments on the Draft Fourth 5-Year Review
Date: May 27, 2015

Attendees:

Kwasi Boateng – EPA
Ellen Brown – NAVFAC NW
Harry Craig – EPA
Thomas Goodlin – Sealaska (by phone)
Jill Johnston – Resolution Consultants (by phone)
Chris Maurer – Ecology
Nicole Rangel – AECOM
Debbie Rodenhizer – AECOM

Location: Ecology Headquarters, 300 Desmond Drive SE, Lacey, WA 98503, Conference Room R3C-08

Purpose: The purpose of the meeting was to review and discuss the Ecology and EPA comments regarding the Draft Fourth 5-Year Review Naval Base Kitsap Bangor report and the Navy's responses to their comments.

Ecology's comments and the Navy's responses to their comments were discussed first. Kwasi Boateng of the EPA was delayed and arrived midway into the meeting.

Ecology Comments

Ecology Comment No. 5: It was agreed that any information included in the draft 5-year review report summarizing the USACE report titled "Optimization of an Explosives-Contaminated Groundwater Pump & Treat Remedy Using Bioremediation, Naval Base Kitsap, Bangor Site F" will be deleted from the text, because the report was published after the 5-year review period. It was understood that comments related to this report would be addressed through the standard agency review process for the actual study report and not addressed in the fourth 5-year review.

Ecology Comment Nos. 7 and 12: Chris Maurer clarified his comment stating that his intent was for the Navy to consider in situ thermal treatment as an enhancement to vapor extraction and MNA, not as an alternative treatment. He explained that there are three different levels of in situ thermal remediation: high, medium, and low. The high level is where soil is heated to a high enough temperature to vitrify the soils into a glass-like substance, which he does not consider appropriate for the site. The medium level is where soil is heated to 90 to 100 ºC to enhance soil vapor extraction, and the low level is where soil is heated to 30 to 50 ºC to enhance MNA.

Chris stated that the Corp of Engineers successfully used in situ thermal treatment to enhance soil vapor extraction at South Tacoma 12A site, which is similar to the PWIA site. It was also noted by Chris that he believed that the in situ thermal remediation process at Well 12A was a relatively short process, only taking approximately one year. Debbie Rodenhizer expressed concern that there could be issues with implementation of in situ thermal remediation at the PWIA because of the presence of utilities. This would add cost and complicate implementation. Chris Maurer said that the Well 12A project site also had utilities, and suggested that the Navy contact EPA (Harry Craig) for any information that would help with the consideration of in situ thermal remediation. Debbie Rodenhizer asked what type of paperwork was involved with the implementation of in situ thermal treatment at the Well 12 A site. Chris Maurer said no paperwork was involved because the second amendment of the ROD covered the technology. He also indicated that the low level thermal remediation could be considered an enhancement to MNA. Therefore, an ESD or ROD amendment may not be necessary, since MNA was selected in the OU 8 ROD.

Harry Craig stated that if technology is not covered in the ROD, then an ESD or ROD amendment is needed. An ESD is appropriate where only one technology is potentially applicable, and a ROD amendment is appropriate where more than one technology is potentially applicable. Harry stated that thermal treatment is not redox manipulation, which is one of the two contingent remedies in the OU 8 ROD. Therefore, it would not be covered by the ROD. Chris Maurer asked if using thermal treatment to enhance MNA would be covered by the existing OU 8 ROD, because MNA is included in the ROD. Harry Craig said no because MNA requires no intervention. Harry Craig also indicated that he did not believe that soil vapor extraction and air sparging could be considered redox manipulation, and that only the injection of EVO could be considered redox manipulation. Ellen Brown disagreed with Harry's narrow definition of redox manipulation.

Ecology Comment No. 10: Chris Maurer expressed his concern over the repeated reporting of the same deficiencies in the annual inspections year after year without more immediate action, with some of the simpler problems taking 3 to 4 years to resolve (specifically well lids). Ellen Brown acknowledged the concern and agreed to check on the status of repairs.

Action Item: Ellen Brown will check on the status of repairs (specifically well lids) and possibly revise the 5-year to acknowledge the need to respond in a more timely fashion to recommended maintenance and repairs identified through institutional control inspections.

EPA Comments

EPA Comment No. 3: Harry Craig commented that we need to look at life cycle costs. Chris Maurer asked if the Navy had to do a ROD Amendment or ESD, how long would it take? Harry Craig said it depended on how many different technologies would need to be evaluated. Ellen Brown felt it would take at least 2 years, but then added that further time would be needed if a pilot study or FFS was performed. In that case, it would most likely take 3 years for an agreement (ESD or ROD amendment) to be reached, and at that point system design could be initiated. Ellen Brown also emphasized the Navy is able to make faster progress towards site remediation through the optimization of existing remedial actions rather than through completing the paperwork required by an ESD or ROD amendment. The Navy pointed to the September 19, 2013, meeting with EPA and Ecology on OU 8 in which EPA indicated they would broadly interpret what falls within redox manipulation allowed under the ROD and stated a desire to apply efforts toward active work in favor of expenditure on process to complete an ESD or ROD amendment. Ellen Brown also indicated that the Navy prefers not to waste money on studies when action can be taken directly.

Harry Craig said the Navy should evaluate three technologies for OU 8: in situ thermal with vapor extraction, soil vapor extraction, and reevaluation of pump and treat. He also said there was no need to amend the ROD for a treatability study. The EPA fully supports completion of treatability studies. The ROD only needs to be amended for a change to the remedy.

EPA Comment No. 6: Ellen Brown felt the remedy at OU 8 is working slowly at the source, and although the source is significant, the source was identified in the ROD. Harry Craig disagreed by saying there was no source control, nor has the source been fully delineated. He believes benzene concentrations are increasing. However, Ellen Brown disagreed saying there was no real trend. Ellen Brown emphasized that as long as LNAPL is present on site, benzene will be present.

Tom Goodlin then provided a general summary of LNAPL recovery and trends and benzene concentrations on the site. The ROD acknowledged the presence of LNAPL at the site, and that only a portion of the LNAPL would be recovered by the LNAPL recovery system. Operation of the passive LNAPL recovery system continued until well after achieving the LNAPL recovery endpoint specified in the OU 8 ROD. Since the shutdown of the LNAPL recovery system, additional LNAPL recovery (using passive recovery) has been performed in wells where LNAPL has been measured. Generally, this additional LNAPL recovery was performed in new wells that did not exist at the time of the original LNAPL recovery system operation. Furthermore, LNAPL thicknesses generally declined with the additional recovery efforts. Tom Goodlin explained that the extent of LNAPL has not expanded over time, and exists in the same area where it was found in the 1990s, except in one area at the northern extent of LNAPL. However, he believes this is only because wells did not exist in that area in the 1990s. Based on AECOM's investigation work identifying the fuel type at the site, the LNAPL consists of gasoline, leaded gasoline, and diesel. AECOM's investigation work also indicated that multiple releases had probably occurred at the site, but no releases appear to have occurred after the 1980s. The LNAPL also appears to be trapped by the base of a till layer at the site.

Harry Craig asked what Tom meant by passive recovery and how passive recovery has affected dissolved-phase benzene concentrations. Chris Maurer asked what equipment was used for passive recovery. Tom explained that single-phase recovery (LNAPL only) was performed using skimmer pumps and absorbent socks without extracting groundwater to depress the water table. With respect to benzene concentrations, Tom Goodlin explained that as long as LNAPL is in contact with water, high benzene concentrations would continue to be present at the site. He added that there is a direct correlation between the presence of LNAPL and high benzene concentrations. However, outside the area where LNAPL is present, the concentrations of benzene rapidly decline (within about 200 feet downgradient) because of the favorable conditions for benzene degradation. The benzene plume that once extended beyond Mountain View Road in the 1990s now does not extend out of the PWIA and benzene is below detection at Sculpin Circle on base.

Harry Craig asked what would be the estimated timeframe for benzene concentrations to decrease to below the ROD RAO of 5 µg/L given that LNAPL is the source. Tom Goodlin responded that it could take decades, although the actual timeframe is currently unknown. He stated that the ROD only specified a remediation timeframe for the base boundary, and that cleanup levels at the base boundary have been met. The ROD also acknowledges that LNAPL will remain after LNAPL recovery, and that MNA will take time to remediate the site. He then emphasized that the LNAPL plume has been contained, and there is no evidence of new releases. Chris Maurer agreed that there are no new sources. However, Harry Craig disagreed that the source is controlled, and indicated that the use of MNA infers the source is controlled. Tom Goodlin stated that the ROD is clear that substantial LNAPL will remain after product recovery is complete, and one can infer that the ROD recognized the amount to remain at more than 6,000 gallons. Ellen Brown said that they know that concentrations are decreasing to less than the RAOs upgradient of the base boundary. Therefore, reductions are happening, and there is no timeframe in the ROD for the on-base portion of the plume.

Chris Maurer also asked if the rate of degradation is sufficiently high that it complies with EPA MNA guidance, or is the rate so slow that by the time it complies, the timeframe will be considered unreasonable. Chris added that the State asks that remediation be done in a reasonable timeframe, which is left to interpretation. He agreed that benzene is declining; however, he asked is the amount of time to decrease concentrations reasonable or not – will it require 6 months, 6 years, or 60 years? Harry Craig had stated that the source control did not meet MNA guidance, to which Tom Goodlin noted that MNA guidance was available prior to completion of the OU 8 ROD, and the ROD openly recognized that substantial LNAPL would remain after completing source recovery. Ellen responded that 45 years is not uncommon and Debbie Rodenhizer responded that during the September 19, 2013, meeting EPA indicated it could take up to 150 years to achieve RAOs in groundwater at some sites. Harry Craig once again stated he did not believe that source control has been achieved at the site, nor that concentration trends were declining such that reasonable timeframe could be achieved. Ellen Brown emphasized again that the Navy is in compliance with the ROD.

EPA Comment No. 2: Harry Craig stated that restoration timeframes also need to be addressed for OU 1 and OU 2, and the Navy should consider estimating restoration timeframes using a mass balance approach including estimating the mass in place at the start of remediation and mass removed by the pump and treat systems (see EPA Comment No. 9). In addition, the Navy also needs to assess overall site remediation performance. Mann Kendall trends address individual wells but does not work well for the overall site. Ellen Brown said that the Site A CSM report was an attempt at this assessment. Harry Craig believed there were problems with the report; specifically, that the modeled Site A plume did not match the actual plume. Kwasi

Boateng agreed and added that there were big issues with hydraulic conductivity used in the model.

EPA Comment No. 4: Harry Craig stated that he does not concur with turning off the OU 1 pump and treat system, as that would be contrary to the selected remedy of the ROD. Ellen Brown indicated that EPA and Ecology have not been comfortable with the modeling efforts performed to date, so the Navy is considering this new approach. Ellen Brown clarified that the shutdown would be temporary and would allow the completion of an MNA study. The Navy feels secure in a shutdown of the system because there are no immediate risks and no immediate receptors on the site. Kwasi Boateng felt that more site characterization must be performed, and an FFS was needed before MNA could be implemented.

Harry Craig added that the perched aquifer was not cleaning up at the rate the ROD suggested so it's an ongoing source to the shallow aquifer, there are data gaps in the extent of contamination in the vadose zone soils between the leach basin and the shallow aquifer (see EPA Comment No. 10), and the depths of shallow aquifer contamination are not defined. Harry Craig also did not believe that the multiple lines of evidence show that RDX degradation is occurring. MNA guidance would need to be followed to assess the lines of evidence to show natural attenuation is occurring. In Harry's opinion, the following information is needed for OU 1 to support the selection of a remedy: accurate hydraulic conductivity, accurate Kd values, and microbe studies. He stated that a USGS study showed no degradation of RDX under aerobic conditions. Ellen Brown felt a pilot scale test would work best to address EPA's concerns.

EPA Comment No. 9: Harry Craig said the Navy needed to look at all technologies and compare timeframes. Ellen Brown stated that timeframe comparisons/assessments would be done only if evaluating other technologies, but this is not needed for the 5-year review. Harry Craig suggested that a recommendation be added in the fourth five year review to assess restoration timeframes for any new technologies. He said it was a data gap that needs to be addressed; however, this issue does not need to be resolved in the 5-year review. He also suggested that we review the groundwater guidance which was included in his reference list attached to the EPA comments.

Action Item: Ellen Brown to consider Harry Craig's recommendation above.

EPA Comment No. 8: Kwasi Boateng had many comments on the updated Site A CSM report. He felt there were many issues with the report (hydraulic conductivity and Kd values), and believed all his comments were ignored. Ellen Brown asked how the Navy could establish accurate hydraulic conductivity and Kd values that the EPA would approve. Harry Craig replied that we should use slug tests and commented that some of the Kd values were unrealistically low. Jill Johnston addressed his comment by stating that there was a site specific Kd but because of the model limitations, the modeler used the literature value to get more accurate model results. Around 300 to 400 different model runs were performed to test the best input data. She believed the 10-year model projection on Figure 7-11 in the Site A CSM report matched the site data relatively well (contours matched well).

Harry Craig compared Figure 6-6 (EVS modeling results of RDX plume, pumping over 10 year interval) and Figure 6-8 (numerical flow modeling scenario for 10, 30, 50 and 100 years) of the fourth 5-year review and believed that the modeling results did not match actual results. Jill Johnston was concerned that figures being viewed were not the correct figures to look at and not sure the comments should be addressed in the 5-year review. Chris Maurer asked why the literature Kd values were considered more accurate compared to the site specific Kd value used in the model? Jill Johnston replied that she would have to get an answer from the modeler. Harry Craig concluded the discussion by saying that there are outstanding issues of modeling results versus monitoring data. Ellen Brown recommended scheduling another meeting to address the Site A CSM model report issues outside of the 5-year review process.

Ellen Brown asked if the Navy could just capture the lack of satisfaction with the Site A CSM report in the fourth 5-year report and address those concerns in the future. Harry Craig and Kwasi Boateng reiterated that an FFS is needed to compare alternative technologies for OU 1, and that this FFS should include estimates of remediation timeframes and address the data gaps in the modeling. MNA should not be looked at in isolation. Ellen concluded that there is still debate between a pilot/treatability study for MNA, which the Navy supports, and an FFS, which the EPA supports. Chris Maurer added that the pilot study would be more flexible. Harry Craig would like work plans for the treatability study sent to agencies for review, and would like to see this added as a recommendation in the fourth 5-year review. Ellen Brown said she would like to keep the MNA pilot study as a Navy recommendation and have the EPA concur with 5-year review but not on that recommendation. Harry Craig stated that the EPA will probably not concur with turning off the pump and treat system.

Action Item: Chris Maurer to host another meeting to address modeling issues at Site A.

Action Item: Ellen Brown to acknowledge outstanding issues on the Site A CSM report. State that the EPA has unresolved concerns and put a recommendation in the report to address those concerns.

Action Item: Add a recommendation in the fourth 5-year review to send agencies a copy of the treatability study work plan.

EPA Comment No. 20: It was agreed that the review process for the USACE report has not been completed and would not be addressed in the 5-year review (see Ecology Comment No. 5).

Harry Craig also added that the Navy still needs to estimate a remediation timeframe to meet RAOs for OU 2, and requested it be added as a recommendation in the 5-year review.

Additional EPA Comments:

Harry Craig commented that there are outstanding toxicity issues for arsenic and RDX (noncancer and cancer).

Action Item: Debbie Rodenhizer stated she would check on the toxicologic status of these chemicals, but believes the issues were adequately addressed in the report.

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Draft Fourth 5-Year Review
Naval Base Kitsap Bangor, Silverdale, Washington
Document Date April 6, 2015
Commenter: EPA
Comments Received: June 8, 2015

EPA still has outstanding issues on the responses to General Comments No. 2, 3, and 4, and Specific Comment No. 8.

1) General Comment No. 2 - The response still did not address the issue of how long operation of the current systems for OU-1, OU-2, and OU-8 would take to achieve the ROD RAOs. The Annable Memo addressed a mass removal of 90% and 99% not specifically tied to achieving ROD RAOs for OU-1. The CSM Update document estimated restoration timeframe of 120 years for OU-1 was based on modeling at three times the current pumping rate, which may not even be feasible. In addition to trend analysis on individual wells, the evaluation of mass in place and mass removed for each of these three systems was not completed to show overall performance of the treatment system. This is one of the methods developed to address restoration timeframes (EPA, Methods for Monitoring Pump-and-Treat Performance, EPA/600/R-94/123, 1994) that were not evaluated.

Navy Response: As explained in the response to General Comment No. 2, remediation timeframes will be estimated for the treatment alternatives selected for consideration at OU 1 as part of the recommended FFS. The estimated timeframes will be calculated using a mass balance assessment or other technique determined to be applicable to the treatment alternatives being evaluated. The results of the recommended MNA treatability test will also be used in the estimation of restoration timeframes. Further effort on estimating the treatment timeframe for the existing pump and treat system at OU 1 is not warranted for the 5-year review, because it is already known that the existing system has not met the cleanup timeframe established in the ROD and this forms the basis for completing the recommended FFS. Although the treatment timeframes have not been met, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs.

The remedy for OU 2 is undergoing intensive optimization and modeling efforts at this time. Until these optimization and modeling efforts are completed and a strategy for modifying the remedy is established, estimation of the remediation timeframe is premature. Furthermore, efforts toward estimating the treatment timeframe for the existing pump and treat system at OU 2 is not warranted for the 5-year review, because it is already known that the existing system has not met the cleanup timeframe established in the ROD and this forms the basis for completing the optimization and modeling activities. Although the treatment timeframes have not been met, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs.

The Navy has performed and is continuing to perform additional studies and pilot tests at OU 8 to address the LNAPL and high concentrations of benzene in the source area. The remedy for OU 8 is protective of human health and the environment and is functioning as intended by the

OU 8 ROD, because the groundwater plume does not currently extend beyond the base boundary. The ROD only specified a time frame for meeting the remediation goals in the off-base portion of the plume, and this time frame has been met. The ROD does not include a time frame for the source area in the PWIA to meet RAOs. Therefore, estimation of remediation timeframes is not necessary for OU 8 for the on-base portion of the site.

2) General Comment No. 3 - Please explain how air sparging and soil vapor extraction (SVE) are Redox Manipulation.

Navy Response: Although the main goal of air sparging and soil vapor extraction is not redox manipulation, these technologies provide oxygen to the subsurface thereby changing the redox potential of the subsurface. EPA has encouraged the use of a broad definition of redox manipulation in the past (see page 3, 2nd paragraph of the attached OU 8 Status Update Meeting Notes dated September 19, 2013). Specifically, "EPA considers oxidation part of redox manipulation."

3) General Comment No. 4- EPA still does not concur with the recommendation of turning off the groundwater treatment system for OU-1, as it is inconsistent with the ROD selected remedy of pump and treat with GAC for OU-1. There is no biological or geochemical evidence of RDX degradation under aerobic conditions at Site A groundwater (Appendix B, Table B-2). The Bradley and Dinicola (2005) study (attached) showed no RDX degradation under aerobic conditions based on a bench scale treatability study of Site A aquifer sediments, therefore there is no basis to conclude RDX would degrade at pilot scale. The biochemical and geochemical basis for RDX degradation at bench scale, two of lines of evidence in the EPA (1999) MNA Guidance, would need to be demonstrated before EPA would support a pilot scale study. The other site characterization data gaps that still exist for Site A are a) the vertical extent of RDX contamination has not be determined, and b) an accurate hydraulic conductivity has not be determined. The statement in the response of "It seems prudent to evaluate MNA at this time, since much, perhaps nearly all, of the remediation appears to be due these processes..." is not supported by any data analysis, including the mass balance approach discussed in General Comment No. 1 above.

Navy Response: As explained in the response to General Comment No. 4, the Navy is not recommending that the pump and treat system be permanently turned off. The Navy is recommending that an FFS be prepared for OU 1, and as part of completing the FFS, the Navy is recommending that an MNA treatability test be performed. During the scoping of the MNA treatability study, the project team will evaluate existing information on RDX bioremediation, including the study by Bradley and Dinicola, to determine whether sufficient information is available to support performing the pilot-scale treatability test. The pilot-scale treatability test would only include turning off the pump and treat system for a planned period of time. If the existing information is not sufficient for a pilot-scale treatability test, then completion of a bench-scale treatability test would be considered prior to the pilot-scale treatability test. Because there are no potential exposure pathways at the site, temporarily deactivating the pump and treat system will not impact human health and the environment.

During the scoping of the FFS, data gaps will be evaluated by the project team. At a minimum, as described in the response to General Comment No. 4, field verification of aquifer properties will be performed. Hydraulic conductivity, as well as other aquifer properties, would be measured in accordance with procedures that will be outlined in the MNA treatability study work plan which would be developed in conjunction with EPA and Ecology.

The RDX degradation compounds were detected or estimated in numerous wells, and their presence provides a strong indication that degradation is active at Site A. In 2014, where RDX is detected above approximately 5 µg/L, MNX also occurs consistently at 2 percent of the RDX concentration. Although the groundwater at the site is aerobic, the presence of low concentrations of MNX, DNX and TNX in groundwater at the site indicates the possibility of microenvironments in soil that are anaerobic, especially under saturated conditions. This permits the activity of bacterial nitroreductases in breaking down RDX into its nitroso derivatives in these niches. Furthermore, although the study by Bradley and Dinicola did not demonstrate RDX bioremediation in aerobic conditions, aerobic degradation of RDX by bacteria (e.g., Rhodococcus sp.) that utilize RDX as the sole nitrogen source through denitration and mineralization has been documented by other researchers. Intermediate compounds of aerobic pathways are methylene dinitramine, 4-nitro-2,4-diazabutanal, and smaller carbon and nitrogen containing compounds. However, these compounds were not analyzed for at the site.

Specific Comment No. 8 - Please provide a reference to EPA's comments of August 8, 2014, as we can find no correspondence of that date.

Navy Response: The Navy provided the requested correspondence in an e-mail on June 9, 2015.

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Draft Final Fourth 5-Year Review
Naval Base Kitsap Bangor, Silverdale, Washington
Document Date: June 17, 2015
Commenter: EPA

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GENERAL COMMENTS			
1	Draft Final Fourth 5-Year Review	EPA Region 10 has reviewed the draft final Five Year Review (FYR) for Naval Base Kitsap Bangor, and have concluded that of *protectiveness is deferred* for OU-1 (Site A), and that OU-2 (Site F) and OU-8 have *short term protectiveness*. However, for the OU-2 and OU-8 remedies to be considered protective in the long term, more analysis is needed to evaluate the restoration timeframes to achieve groundwater Remedial Action Objectives (RAOs) for these Operable Units. Each of these three OUs exceeds the restoration timeframes estimated in the respective RODs, yet none of these remedies have updated current groundwater restoration timeframe estimates based on 15 to 20 years of groundwater system operations. Techniques such as mass balance (EPA 1994) and capture zone analysis (EPA 2008) have not been used to evaluate restoration timeframes. The progress of remedial systems in achieving RAOs and associated cleanup levels should also be evaluated to determine if actual progress is consistent with progress predicted at the time of remedy decision (EPA 2011).	The Navy agrees with this EPA comment as it was consistent with the protectiveness determination that had been made in the report. The operating groundwater treatment systems for OU-1, OU-2, and OU-8, would be protective over the short term. However, there are a number of outstanding issues regarding long term effectiveness and efficiency for these treatment systems. The Navy does not agree with EPA's change of opinion in the draft final version of the report to "Protectiveness is Deferred" for OU 1. The remedy for OU 1 remains protective because there are no complete exposure pathways at the site. LUCs prevent exposure to groundwater with concentrations of COCs exceeding RGs, the groundwater plume is stable, and groundwater monitoring is performed to assess the extent of the plume. The Navy continues to agree with EPA in the protectiveness determinations for OU 2 and OU 8. The Navy agrees that the restoration timeframes for OU 1 and OU 2 exceed the restoration timeframes estimated in the RODs for these two OUs. However, the Navy does not agree that the restoration timeframe established in the OU 8 ROD has been exceeded. The OU 8 ROD only specified a time frame for meeting the remediation goals in the off-base portion of the plume, and this time frame has been met. The ROD does not include a time frame for the source area in the PWIA to meet RAOs. The Navy has agreed to estimating remediation timeframes for OU 1 as part of completing an FFS (see our response to EPA General Comment No. 2).
2	Draft Final Fourth 5-Year Review	The predicted time frame for operation and completion of the groundwater remedial action is critical to monitoring plan development because it identifies and provides parameters for the monitoring objectives and subsequent monitoring studies, and identifies long term costs for capital equipment replacement and O&M. EPA requires a FYR Recommendation of restoration timeframe estimates based on a technical analysis for OU-1, OU-2 and OU-8 to be	Remediation timeframes will be estimated for the treatment alternatives selected for consideration at OU 1 as part of the recommended FFS. The estimated timeframes will be calculated using a mass balance assessment or other technique determined to be applicable to the treatment alternatives being evaluated. The results of the recommended MNA treatability test will also be used in the estimation of restoration timeframes. Further effort on estimating the treatment timeframe for the existing pump and treat system at OU 1 is not warranted for the 5-year

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		completed before the next FYR.	review, because it is known that the existing system has not met the cleanup timeframe established in the ROD and this forms the basis for completing the recommended FFS. Although the treatment timeframes have not been met, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs. The remedy for OU 2 is undergoing intensive optimization and modeling efforts at this time. Until these optimization and modeling efforts are completed and a strategy for modifying the remedy is established, estimation of the remediation timeframe is premature. Furthermore, efforts toward estimating the treatment timeframe for the existing pump and treat system at OU 2 is not warranted for the 5-year review, because it is known that the existing system has not met the cleanup timeframe established in the ROD and this forms the basis for completing the optimization and modeling activities. Although the treatment timeframes have not been met, the remedy remains protective of human health and the environment, as there is no exposure to groundwater with concentrations of COCs exceeding RGs. The Navy has performed and is continuing studies and pilot tests at OU 8 to address the LNAPL and high concentrations of benzene in the source area. The remedy for OU 8 is protective of human health and the environment and is functioning as intended by the OU 8 ROD, because the groundwater plume does not currently extend beyond the base boundary. The ROD specified a time frame for meeting the remediation goals in the off-base portion of the plume, and that time frame has been met. The ROD did not include a time frame for the source area in the PWIA to meet RAOs. However, the ongoing optimization efforts will produce information that will allow estimation of a cleanup timeframe.
3	Draft Final Fourth 5-Year Review	The OU-1 Site A groundwater remedy continues to have significant site characterization data gaps after 15 years of system operation, including defining the vertical extent of contamination and an accurate field measurement of hydraulic conductivity and transmissivity for the site. Until these data gaps in the OU-1 Conceptual Site Model (CSM) can be adequately addressed, then further evaluation of the operation of the current remedy and any alternative remediation	The Navy has agreed to field verify the aquifer properties as part of the FFS for OU 1 (see the response to EPA General Comment No. 4 on the Draft Fourth 5-Year Review and the responses to additional comments on the Draft Fourth 5-Year Review received on June 8, 2015 after the comment resolution meeting [response to Comment No. 3 in the additional comments]). Since there is no new information which calls into question the previous site characterization the Navy believes that additional characterization of the extent of the groundwater plume is not

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		technologies would be ineffective (EPA 2015). EPA requires a FYR Recommendation for a Site A Characterization Workplan schedule that will address the a) vertical extent of Shallow Aquifer contamination and b) accurate field measured hydraulic conductivity data gaps to be completed before the next FYR.	necessary.
4	Draft Final Fourth 5-Year Review	There are numerous references to Monitored Natural Attenuation (MNA) for RDX at Site A in this document without any substantive monitoring data to demonstrate that significant RDX degradation is occurring. There is no scientific basis to conclude that RDX degrades under aerobic conditions at Site A. Two bench scale treatability studies conducted specifically with Site A aquifer sediments by Bradley and Dinicola (2005) and Strand and Dulla (2013) that showed no RDX degradation under aerobic conditions. This is consistent with the current scientific understanding of the geochemical and microbial conditions necessary for RDX degradation (Hatzinger and Fuller 2014).	Groundwater at OU 1 has been monitored for the RDX degradation MNX, DNX, and TNX products since 2009 (see Table B-1 of the Draft Final Fourth 5-Year Review). The RDX degradation compounds were detected or estimated in numerous wells, and their presence provides a strong indication that degradation is active at Site A. In 2014, where RDX is detected above approximately 5 µg/L, MNX also occurs consistently at 2 percent of the RDX concentration. Although the groundwater at the site is aerobic, the presence of low concentrations of MNX, DNX and TNX in groundwater at the site indicates the possibility of microenvironments in soil that are anaerobic, especially under saturated conditions. This permits the activity of bacterial nitroreductases in breaking down RDX into its nitroso derivatives in these niches. As part of completing the recommended FFS, the Navy is recommending that an MNA treatability test be performed. During the scoping of the MNA treatability study, the project team will evaluate existing information on RDX bioremediation, including the study by Bradley and Dinicola, to determine whether sufficient information is available to support performing the pilot-scale treatability test. If the existing information is not sufficient for a pilot-scale treatability test, then completion of a bench-scale treatability test would be considered prior to the pilot-scale treatability test.
5	Draft Final Fourth 5-Year Review	With negative results on two bench scale studies, there is no basis to conclude that RDX degradation would occur at pilot scale at Site A. Until the microbial and geochemical conditions necessary to achieve RDX degradation have been demonstrated at bench scale, a pilot scale study is not justified. Microbial and geochemical evidence of degradation are two of the lines of evidence in the EPA MNA Protocol (EPA 1999). In addition, aerobic intermediate transformation products of RDX, such as NDAB have not been measured	Although the study by Bradley and Dinicola did not demonstrate RDX bioremediation in aerobic conditions, aerobic degradation of RDX by bacteria (e.g., Rhodococcus sp.) that utilize RDX as the sole nitrogen source through denitration and mineralization has been documented by other researchers. Intermediate compounds of aerobic pathways are methylene dinitramine, 4-nitro-2,4-diazabutanal, and smaller carbon and nitrogen containing compounds. The Navy is recommending that a treatability test of MNA be performed Prior to completion of the recommended treatability study, the following

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		(Hatzinger and Fuller 2014).	activities would be performed: • The project team will evaluate existing information on RDX bioremediation, including the studies cited by the EPA, to determine whether sufficient information is available to support performing the pilot-scale treatability test • If the existing information is not sufficient for a pilot-scale treatability test, then completion of a bench-scale treatability test would be considered prior to the pilot-scale treatability test • The Navy, in conjunction with the EPA and Ecology, would develop a treatability study work plan utilizing the existing information and EPA protocols, as currently recommended in Recommendation 4 on Table 8-1 of the Draft Final 5-Year Review
6	Draft Final Fourth 5-Year Review	If changes to the remedy are contemplated and are outside the scope of the current remedies, then a ROD Amendment or ESD would be required for modification of these remedies. Recommended changes to the remedy should be based on adequate bench and pilot scale testing for technologies that lack adequate cost and performance data, and be evaluated based on a CERLCA Nine Criteria analysis in a Focused Feasibility Study (FFS).	Navy agrees that if a remedy change is outside the scope of the current ROD, an ESD or ROD amendment would be required.
SPECIFIC COMMENTS			
1	Page ii, Executive Summary, OU-1	All relevant technologies should be evaluated in the FFS, including in-situ bioremediation. See also General Comments No. 3 - 6.	Recommendation No. 4 in Table 8-1 of the Draft Final 5-Year Review states: "Prepare an FFS for OU 1 in accordance with EPA's MNA guidance and the technical impracticability guidance. The existing pump and treat system, MNA, and possibly other treatment technologies would be evaluated in the FFS. The other treatment technologies to be included in the FFS would be selected using a collaborative process with the stakeholders." The FFS will include those technologies which are technically implementable at the site. In-situ bioremediation will only be considered if the aquifer properties, which will be field verified during the FFS, are conducive to in-situ bioremediation.

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2	FYR Summary Form, page vi, OU-1	EPA does not concur with deactivation of the current pump and treat system, there is no evidence of RDX degradation under aerobic conditions at Site A, see General Comments No. 4 and 5. Pump and Treat is the selected remedy for OU-1 until an alternative remedy is selected via a ROD Amendment or ESD.	The Navy is not recommending that the pump and treat system be permanently turned off. The Navy is recommending that an FFS be prepared for OU 1, and as part of completing the FFS, the Navy is recommending that an MNA treatability test be performed. A pilot-scale treatability test would include turning off the pump and treat system for a planned period of time. The pilot scale treatability study will not commence until a work plan is approved with the stakeholders. See also responses to EPA General Comment Nos. 4 and 5 above.
3	FYR Summary Form, page vii, OU-2	No current restoration timeframe is provided for OU-2, see General Comment No. 1.	See response to EPA General Comment No. 1 above.
4	FYR Summary Form, page ix, OU-1	Site A still lacks adequate groundwater site characterization in the vertical dimension and accurate field measurements of hydraulic conductivity and transmissivity. Adequate site characterization is necessary to evaluate any remedies, see General Comments No. 3 and 6. A FFS evaluation needs to be conducted in accordance with the EPA Feasibility Study guidance.	See response to EPA General Comment No. 3 above. Completing an FFS for OU 1 was also included in Recommendation No. 4 in Table 8-1 of the Draft Final Fourth 5-Year Review.
5	Page 6-14, 2nd full paragraph	"The last 15 years of operational information for the pump and treat system suggest that the shallow aquifer could not be used as a drinking water source because of the low pumping rates…" – EPA does not concur with this suggestion, as it is inconsistent with the Site A ROD and with EPA Groundwater Guidance to restore groundwaters to beneficial reuse (EPA 2009).	The Navy is recommending that an FFS be performed at OU 1, which will include field verification of aquifer properties and reevaluation of the human health risk pathways (see Recommendation No.4 on Table 8-1 of the Draft Final Fourth 5-Year Review). Based on this, the ROD will be amended or an ESD will be prepared, as warranted. Furthermore, the referenced statement in the Draft Final 5-Year Review is consistent with the cited EPA OSWER directive and Washington State regulations. In the FFS to be performed for OU 1, the pumping data from the existing site wells, in conjunction with aquifer property data to be collected during the FFS, will be used to demonstrate whether or not the shallow aquifer could be used as drinking water source in accordance with these regulations.
6	Page 6-15 1st paragraph	"Natural degradation of ordnance compounds apparently contributes to mass reduction within the plume at Site A" – EPA does not concur with this statement, what is the monitoring evidence of RDX "natural degradation" mass reduction within the plume? In addition, MNX, DNX, and TNX, are primarily anaerobic transformation products of	The language referenced in this comment is from the *2014 Annual LTM and O&M Data Report for Site A, Task Order 73, Long-Term Monitoring/Operations at Naval Base Kitsap Bangor, Silverdale, Washington* which was finalized in September 2014. This section of the 5-year review provides a summary of this report, including the conclusions. In addition, see responses to EPA General Comment Nos. 3,

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		RDX. NDAB is the primary aerobic degradation product of RDX (Hatzinger and Fuller 2014), which was not measured. No mass balance has been conducted to evaluate in-situ mass vs. mass removed by the pump and treat GAC system (EPA 1994). See General Comments No. 3 - 6.	4, and 5 above.
7	Page 6-16 and 6-17	EPA has numerous outstanding issues on the CSM Update report referenced (Navy 2014i), including inconsistencies between model assumptions and outputs and actual site monitoring data for Site A. Evaluation of remedial alternatives needs to be evaluated base on a CERCLA Nine Criteria analysis in a FFS, including cost and performance data (EPA 2000). See General Comments No. 6.	The referenced section summarized the results of the CSM report, which was finalized during this 5-year review period. The Navy has agreed to conduct an FFS for OU 1. Completing an FFS for OU 1 was also included in Recommendation No. 4 in Table 8-1 of the Draft Final Fourth 5-Year Review.
8	Figures 6-4, 6-6, 6-7, and 6-8	These figures lack vertical characterization of the RDX groundwater plume. See General Comment No. 3.	See response to General Comment No. 3.
9	Page 7-7, Section 7.1.4, 1st paragraph	No updated restoration timeframe has been developed, see General Comment No. 1.	See response to General Comment No. 1.
10	Page 7-7, Section 7.1.4, 2nd paragraph	The Pennington et al. (1999) reference does not reflect the current scientific understanding of RDX degradation in groundwater, particularly as it relates the microbial and geochemical conditions necessary to demonstrate in-situ RDX degradation (Hatzinger and Fuller 2014).	The reference to Pennington et al will be deleted from the document. The Hatzinger and Fuller reference cited in the comment will not be added to the document, because it was published after the 5-year review period. The Navy will develop the MNA treatability study work plan in conjunction with EPA and Ecology, and all relevant references will be consulted during the development of the work plan. The development of the work plan is currently included in Recommendation 4 on Table 8-1 of the 5-Year Review.
11	Page 7-8, Section 7.2.1	No updated restoration timeframe has been developed, see General Comment No. 1.	See response to EPA General Comment No. 1 above.

Response to Comment
Draft Final Fourth 5-Year Review
Naval Base Kitsap Bangor, Silverdale, Washington
Document Date: June 17, 2015
Commenter: Ecology

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GENERAL COMMENT			
1	Draft Final Fourth 5-Year Review	In 2013 the Sediment Management Standards (WAC 173-204) were updated, and contain new criteria for evaluating risks to human and ecological health from contaminated sediments. The Navy and EPA should determine the applicability of these revised standards at this site. Ecology would want to be involved in a discussion and/or meeting with the Navy about this topic. If an ARAR listed in a ROD is updated, and calls into question the protectiveness of a remedy (i.e. the standard becomes more stringent), then risk calculations based upon with the new standard should be performed and evaluated against the acceptable risk range. Depending on what the updated risk calculations show, the remedy may need to be re-evaluated. This process is outlined in EPA's Comprehensive Five-Year Review Guidance. Ecology's interpretation is that the decision to discontinue monitoring at Site 26 was based on comparison of Site 26 sediments against the Sediment Management Standards promulgated in 1991 and amended in 1995. For certain chemicals, the new criteria within the updated Sediment Management Standards often result in lower acceptable sediment chemical concentrations than would be set using the earlier version of the rule. It is Ecology's opinion that EPA Guidelines for evaluating updated ARARs be incorporated into the current Draft Final 5-year review for completion during the next 5-yr review cycle.	The Navy reviewed both the 2013 Sediment Management Standards (WAC 173-204) (Ecology 2013) and the Sediment Cleanup Users Manual II (Ecology 2015) to evaluate whether any of the sediment standards (ARARs) have changed since the decision was made to discontinue monitoring and 5-year reviews at Site 26. The marine sediment criteria in the Sediment Management Standards (WAC 173-204) were identified as the ARAR for Site 26 in the Operable Unit 7 ROD. The marine sediment criteria, including the SQS and CSL values, which were used for comparison against sediment monitoring results, were not changed in the 2013 revision of the Sediment Management Standards (Ecology 2013). In the 2013 Sediment Management Standards, freshwater sediment criteria were added. However, these criteria do not apply to Site 26. Therefore, the remedy at Site 26 is still protective of human health and the environment. References: Washington State Department of Ecology (Ecology) 2015. Sediment Cleanup Users Manual II. Guidance for Implementing the Cleanup Provisions for Sediment for Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. March 2015. Ecology 2013. Sediment Management Standards 173-204 WAC Benthic Criteria. http://www.ecy.wa.gov/programs/tcp/smu/SMS%20Benthic%20Criteria%20(3).pdf. Accessed July 2015.