



FINAL

16 September 2005

Second Five-Year Review of Record of Decision

Naval Base Kitsap at Bangor

Silverdale, Washington

Department of the Navy

Naval Facilities Engineering Command Northwest

19917 Seventh Avenue NE

Poulsbo, WA 98370-7570



EXECUTIVE SUMMARY

As lead agency for environmental cleanup of Naval Base Kitsap (NBK) at Bangor, the U.S. Navy has completed the second 5-year review of remedial actions, conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 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 at 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 second 5-year review was prepared in accordance with *Navy/Marine Corps Policy for Conducting Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews*, November 2001 (Revised May 2004), and the U.S. Environmental Protection Agency's *Comprehensive Five-Year Review Guidance* (OSWER 9355.7-03B-P, June 2001).

The remedies implemented for NBK at Bangor remain protective of human health and the environment in the short term. In order for the remedies at OU 2 and OU 7 (Site B) to remain protective in the long term, follow-through on several recommendations identified during the 5-year review is needed, as listed on the Five-Year Review Summary Form.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Bangor Naval Submarine Base

EPA ID (from WasteLAN): 110000771219

Region: 10

State: WA

City/County: Kitsap

SITE STATUS

NPL status: Final ☒ Deleted ☐ Other (specify) _____

Remediation status (choose all that apply): Under Construction ☐ Operating ☒ Complete ☒

Multiple OUs?* YES ☒ NO ☐

Construction completion date: September 1997 (OU 1)

Has site been put into reuse? YES ☐ NO ☒

REVIEW STATUS

Lead agency: EPA ☐ State ☐ Tribe ☐ Other Federal Agency: Navy

Author name: Said Seddiki

Author title: Remedial Project Manager

Author affiliation: NAVFAC NW

Review period:** June 2004 to September 2005

Date(s) of site inspection: September 23, 2004

Type of review:

Post-SARA

Pre-SARA

NPL-Removal only

Non-NPL Remedial Action Site

NPL State/Tribe-lead

Regional Discretion

Review number: 1 (first) ☒ 2 (second) ☒ 3 (third) ☐ Other (specify) _____

Triggering action:

Actual RA Onsite Construction at OU# _____

Construction Completion

Other (specify): _____

Actual RA Start at OU

Previous Five-Year Review Report

Triggering action date (from WasteLAN): September 2000

Due date (five years after triggering action date): 9/30/2005

*["OU" refers to operable unit.]

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

Five-Year Review Summary Form (Cont'd)

Issues:

- Site A groundwater treatment system is not functioning as intended by the ROD.
- Site F groundwater treatment system is not functioning as intended by the ROD.
- Otto fuel is not being substantially removed from the groundwater at Site E/11 by the Site F groundwater extraction and treatment system and was not sampled for in 2004.
- Invasive plant species have become more widespread at Site B (Floral Point).
- Wave erosion of shoreline may be threatening landfill at Site B (Floral Point).
- Benzene concentrations in the core of the plume at OU 8 exhibit an increasing trend over at least the last 4 years.
- Institutional control (IC) monitoring records are not complete.
- Site F groundwater plume has expanded beyond the area of ICs.

Recommendations and Follow-up Actions:

- Finalize optimization recommendations for treatment systems at Sites A and F.
- During plume containment evaluations for Site F, include analysis of Otto fuel containment and ensure annual sampling.
- Perform engineering evaluation of shoreline erosion at Site B (Floral Point) landfill and assess invasive plant species.
- Discontinue sediment and clam tissue sampling at Site 26/Floral Point because remedial action objectives have been met. Ecology may require monitoring to be restarted if shoreline erosion is not controlled.
- Continue monitoring focus on benzene concentration trends in the plume core at OU 8. Evaluate in future monitoring reports whether no new exposure pathways have been created at the site and whether benzene concentrations do not exceed those evaluated in the original risk assessment.
- Maintain copies of annual IC inspection reports at both NBK at Bangor and NAVFAC NW to ensure complete records.
- Expand the IC boundary for Site F to cover the larger area of the groundwater plume.
- The U.S. Environmental Protection Agency believes that perchlorate could be a new chemical of interest at NBK at Bangor and recommends sampling to assess the presence or absence of this chemical in groundwater.

Protectiveness Statement(s):

The remedies implemented for NBK at Bangor remain protective of human health and the environment in the short term. At many of the sites and OUs at NBK at Bangor, remedial actions have resulted in chemicals of concern concentrations below the remediation goals (RGs) for specific media. Where RGs have not been met, active remediation systems, operation, maintenance, and monitoring programs, and institutional controls serve to make progress toward meeting RGs and to control exposure pathways in the interim.

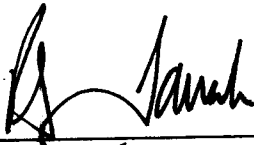
For the remedy at OU 2, Site F, to remain protective in the long term, the treatment system should be optimized in accordance with the recent optimization review. For the remedy at OU 7, Site B (Floral Point), to remain protective in the long term, the current erosion conditions at the landfill should be evaluated.

Other Comments: None.

SECOND FIVE-YEAR REVIEW OF RODs
NAVAL BASE KITSAP AT BANGOR
Naval Facilities Engineering Command Northwest
Contract No. N44255-02-D-2008
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Signature sheet for the Naval Base Kitsap at Bangor, Second Five-Year Review of Records of
Decision report.



R. S. Tanaka
Captain, U.S. Navy
Commanding Officer, Naval Base Kitsap

10/28/05

Date

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ABBREVIATIONS AND ACRONYMS

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
BSV	background screening value
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
C	carbon
CO ₂	carbon dioxide
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CPMP	compliance and performance monitoring plan
CSL	cleanup screening level
DCA	dichloroethane
DCE	dichloroethene
demil	demilitarization
DGPS	differential global positioning system
DNB	dinitrobenzene
DNT	dinitrotoluene
DO	delivery order
Ecology	Washington State Department of Ecology
EDB	dibromomethane
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FFA	Federal Facilities Agreement
FS	feasibility study
GAC	granular activated carbon
GCL	geosynthetic clay liner
gpm	gallon per minute
HPA	Hydraulic Project Approval
H:V	ratio of horizontal to vertical
IAS	initial assessment study
IC	institutional control
ICMP	institutional controls management plan
I&M	inspection and maintenance
IR	Installation Restoration

ABBREVIATIONS AND ACRONYMS (Continued)

IRA	interim remedial action
IRIS	Integrated Risk Information System
K/B	Keyport/Bangor
LNAPL	light nonaqueous-phase liquid
MCL	maximum contaminant level
µg/kg	microgram per kilogram
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram per day
mg/kgoc	milligram per kilogram corrected for organic carbon content
Mn	manganese
MNA	monitored natural attenuation
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
NO ₃	nitrate
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
O&M	operation and maintenance
O&MM	operation, maintenance, and monitoring
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
PSEP	Puget Sound Estuary Program
PWIA	Public Works Industrial Area
QAPP	quality assurance project plan
RA	remedial action
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
redox	oxidation reduction potential

ABBREVIATIONS AND ACRONYMS (Continued)

RG	remediation goal
RI	remedial investigation
ROD	Record of Decision
RPD	relative percent difference
SMS	sediment management standards
SQS	sediment quality standards
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TAL	target analyte list
TEC	The Environmental Company
TPH	total petroleum hydrocarbons
TNB	trinitrobenzene
TNT	trinitrotoluene
2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
USGS	U.S. Geologic Survey
UST	underground storage tank
UV/Ox	ultraviolet/oxidation
UXO	unexploded ordnance
VOC	volatile organic compound
WAC	Washington Administrative Code
WET	whole effluent toxicity

1.0 INTRODUCTION

This report presents the results of the second 5-year review performed for the Naval Base Kitsap (NBK) at Bangor National Priorities List (NPL) site, more commonly known simply as NBK at Bangor. The purpose of 5-year reviews is to determine whether the remedies selected for implementation in the Records of Decision (RODs) for a site are protective of human health and the environment. The methods, findings, and conclusions of 5-year reviews are documented in 5-year review reports, which identify any issues found during the review and recommendations to address them. This report was prepared using Navy and EPA guidance (U.S. Navy 2004a, USEPA 2001a).

The U.S. Navy, the lead agency for NBK at Bangor, is preparing this 5-year review report pursuant to CERCLA Section 121 and the National Contingency Plan (NCP, 40 CFR Part 300). The RODs documenting the remedies implemented at NPK at Bangor were signed after October 17, 1986. Therefore, this is considered a statutory, rather than a policy, review. CERCLA Section 121 states:

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.

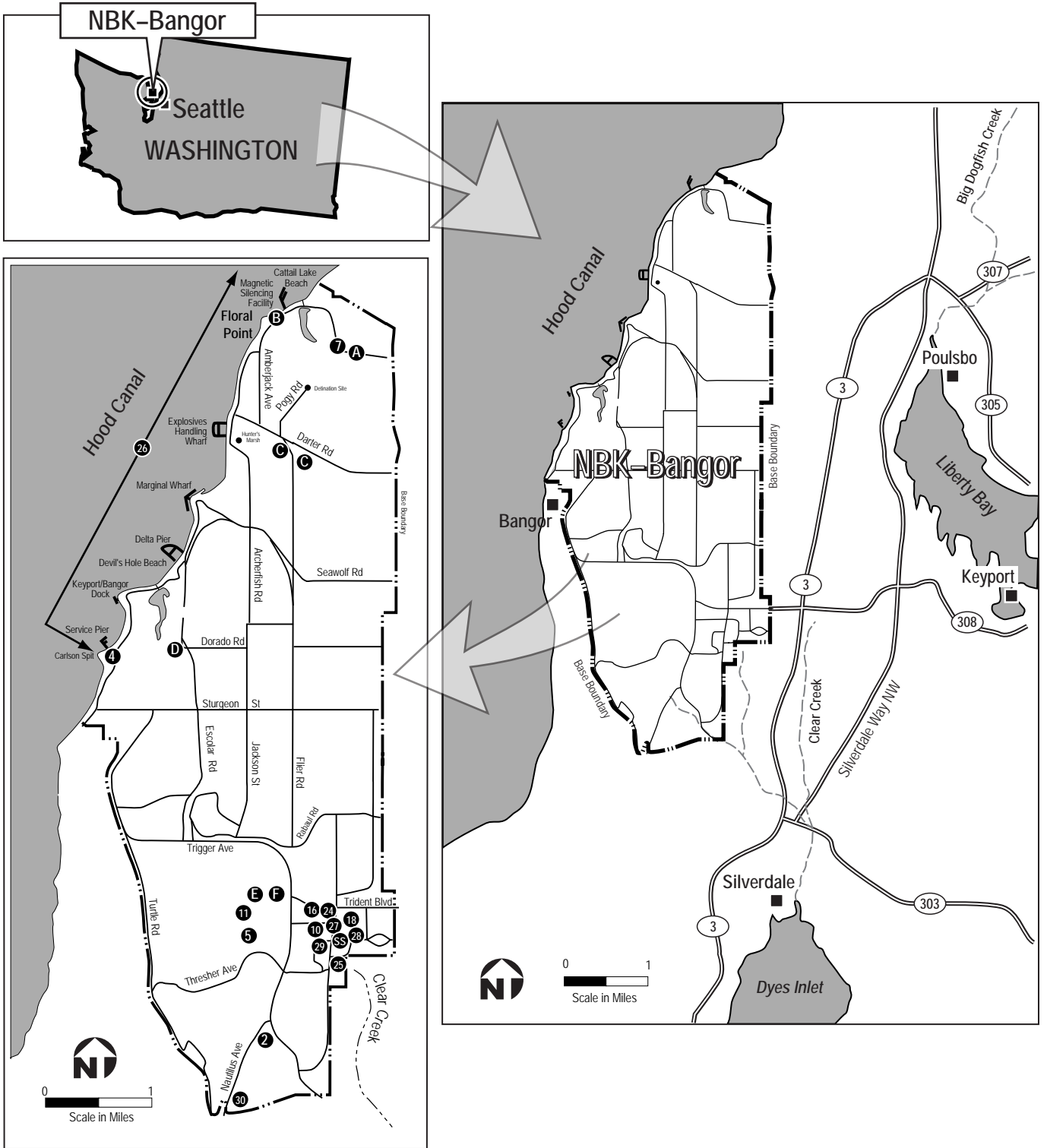
The U.S. Navy's Naval Facilities Engineering Command Northwest (NAVFAC NW) has conducted this 5-year review of the remedial actions implemented at NBK at Bangor. This review was conducted from June 2004 through September 2005. This report documents the results of the review.

There are eight operable units (OUs) at NBK at Bangor (Figures 1-1 and 1-2). 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, 1994a, 1994d, 1996, 2000a). No Further Action was recommended at OUs 4 and 5 (U.S. Navy, USEPA, and Ecology 1993, 1994b), and these OUs are therefore not addressed further in this report.

SECOND FIVE-YEAR REVIEW OF RODs
NAVAL BASE KITSAP AT BANGOR
Naval Facilities Engineering Command Northwest
Contract No. N44255-02-D-2008
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This is the second 5-year review for NBK at Bangor. The triggering action for this review was the completion of the first 5-year review in September 2000 (U.S. Navy 2000a). Contaminants have been left at NBK at Bangor above levels that allow for unlimited use and unrestricted exposure.



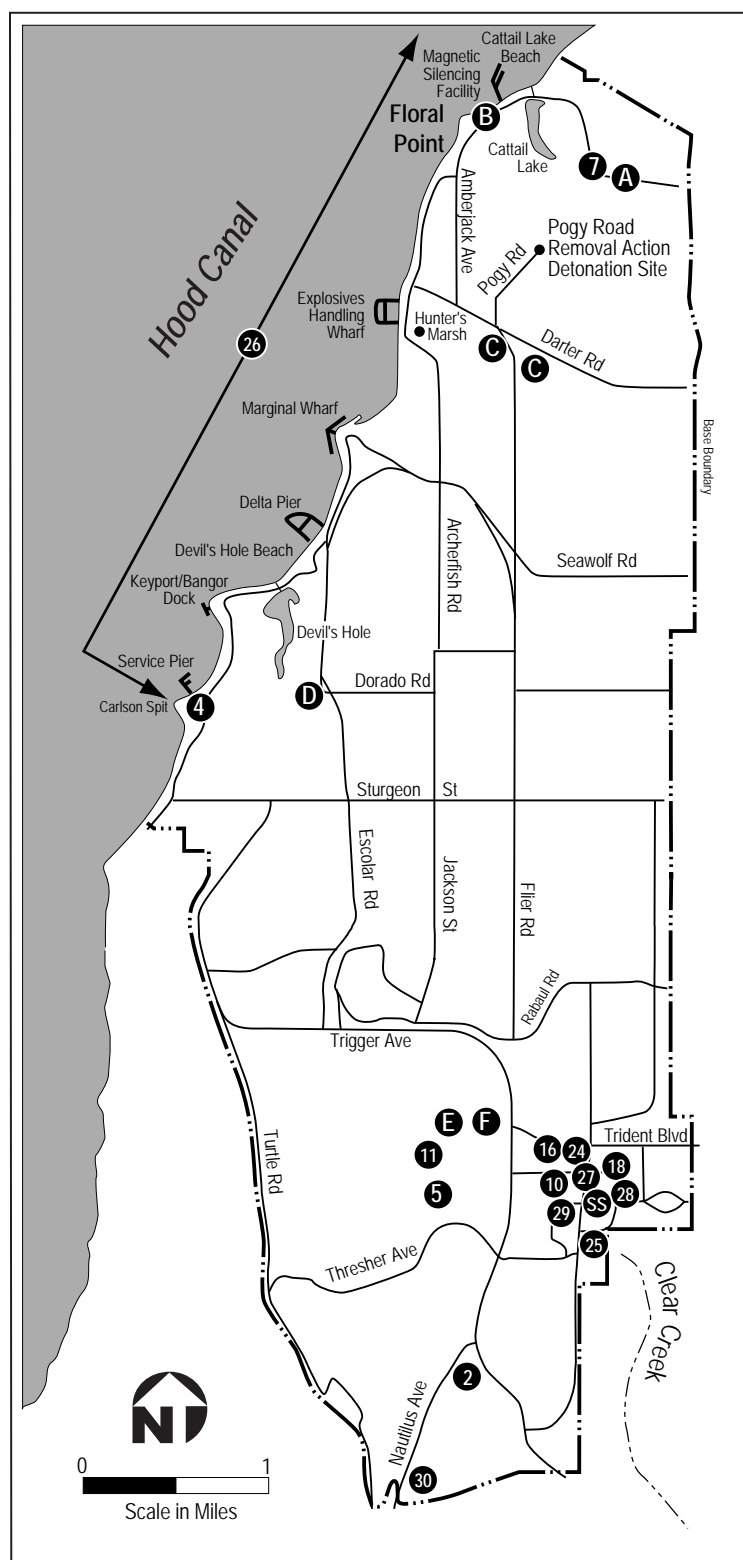
Legend:

- ② Location of Site

U.S.NAVY

Figure 1-1
NBK-Bangor Vicinity Map

DO 0040
NBK-Bangor
Second 5-Year
Review



Legend:

② Location of Site

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)

Site C-West Bldg 7700 Fill Area

Site C-East Ordnance Wastewater Disposal Area

OPERABLE UNIT 5 (OU 5)

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 Old Acid Pit

Site 2 Classification Yard

Site 4 Carlson Spit

Site 7 Old Paint Can Site

Site 10 Pesticide Storage Quonset Hut

Site 11 Pesticide Drum Disposal Area

Site 18 PCB Spill Site

Site 26 Hood Canal Sediments

Site 30 Railroad Tracks

OPERABLE UNIT 8 (OU 8)

Site 27 Bldg 1014 Stream Cleaning Pit

Site 28 Bldg 1032 Drainage Ditch

Site 29 Public Works Maintenance Garage

SS Public Works Industrial Area Service Station

U.S.NAVY

Figure 1-2
NBK-Bangor Sites and Operable Units

DO 0040
NBK-Bangor
Second 5-Year
Review

2.0 SITE CHRONOLOGY

Table 2-1 lists the substantive events in the chronology of NBK at Bangor related to site discovery, investigation, and remediation.

Naval activities began at NBK at Bangor in June 1944, when the U.S. Naval Magazine, Bangor was established. From 1944 to the early 1970s, the Navy facility at Bangor was primarily used as a transshipment and storage point for ordnance. Ordnance arrived by train and by ship to support U.S. military efforts. In February 1977, NBK at Bangor was commissioned as the West Coast home port for the Trident Submarine Launched Ballistic Missile System. In 1978, the Navy Assessment and Control of Installation Pollutants (NACIP) program was initiated to evaluate waste disposal sites at NBK at Bangor.

Additional investigation was completed as part of the initial assessment study (IAS) (NEESA 1983) and characterization study (Hart Crowser 1988, 1989). In all, 42 areas were identified for investigation of possible hazardous substance in various environmental media. Of those 42 areas, 20 were subsequently determined to present no concern. The remaining 22 were carried forward for further investigation. These 22 sites are variously designated by either letter designations (e.g., "Site A"), or numerical designations between 2 and 30 (e.g., "Site 25").

NBK at Bangor is listed twice on the U.S. Environmental Protection Agency's (EPA) National Priorities List (NPL) for investigation and, if necessary, cleanup of past waste disposal sites. Site A (OU 1) was listed to the NPL in July 1987, and the rest of NBK at Bangor was listed in August 1990. In January 1990, the Navy, EPA, and Washington State Department of Ecology (Ecology) entered into a Federal Facilities Agreement (FFA) to ensure that environmental impacts associated with past practices at the base are investigated and remedial actions are completed as needed to protect human health and the environment. In the FFA, the 22 sites at NBK at Bangor were divided into eight operable units (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. In October 1994, OU 8 was added to the FFA to include Sites 27, 28, and 29, which were originally investigated as part of OUs 3 and 7, and the Public Works Industrial Area (PWIA) service station.

The dates that the RODs for the NBK at Bangor OUs were signed are as follow:

- OU 1: December 1991 (U.S. Navy, USEPA, and Ecology 1991a)
- OU 2: September 1994 (U.S. Navy, USEPA, and Ecology 1994d)
- OU 3: April 1994 (U.S. Navy, USEPA, and Ecology 1994a)
- OU 4: July 1994 (U.S. Navy, USEPA, and Ecology 1994b)

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OU 5: September 1993 (U.S. Navy, USEPA, and Ecology 1993)
OU 6: September 1994 (U.S. Navy, USEPA, and Ecology 1994c)
OU 7: April 1996 (U.S. Navy, USEPA, and Ecology 1996)
OU 8: September 2000a (U.S. Navy, USEPA, and Ecology 2000a)

Table 2-1
Chronology of Key Events—Operable Units 1 Through 8

Event	Completion Dates by Operable Unit (OU)							
	OU 1	OU 2	OU 3	OU 4	OU 5	OU 6	OU 7	OU 8
Discovery	Aug-79	Dec-87	Dec-87	Dec-87	Dec-87	Dec-87	Dec-87	Dec-87
Preliminary Assessment	Sept-84	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88
Site Inspection	Sept-84	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88	Nov-88
Hazard Ranking System Package	Sept-84	Jun-89	Jun-89	Jun-89	Jun-89	Jun-89	Jun-89	Jun-89
National Priorities List (NPL) Listing	Jul-87	Aug-90	Aug-90	Aug-90	Aug-90	Aug-90	Aug-90	Aug-90 ^b
Remedial Investigation/Feasibility Study	Aug-91	Nov-93	Apr-93	May-93	Dec-92	Dec-93	Oct-94	Apr-00
Record of Decision	Dec-91	IRA: Sept-91 FRA: Sept-94	Apr-94	Jul-94	Sept-93	Sept-94	Apr-96	Sept-00
Explanation of Significant Differences	No. 1: Jul-94 No. 2: Mar-98 No. 3: Jul-00	Jul-94 ^a	None	None	None	None	None	None
Remedial Action (RA) Construction	Soil: Sept-97 GW: Nov-97	IRA: Dec-94 Soil: Dec-97 GW(FRA): Jan-97	None	None	None	Dec-97	Site B: Nov-97 Site E/11: Aug-97 Site 2: Dec-95	Apr 2001
RA Operations and Monitoring	Soil: Nov-99 GW: ongoing	Soil: Oct-98 GW: ongoing	Site 16/24 ICs: ongoing Site 25 GW: Sept-99	None	None	Dec-97	Site B inspections: ongoing Site E/11 GW: ongoing Site 2 ICs: ongoing Site 10 GW: Mar-95 Site 26 seds: ongoing	MNA: Oct 2000 to present LNAPL recovery: Jan 2001 to June 2004

^aFor interim remedial action ROD

^bAlthough the sites comprising OU 8 were listed to the NPL in August 1990, OU 8 was added to the Federal Facilities Agreement in October 1994.

Notes:

FRA - final remedial action

GW - groundwater

ICs - institutional controls

IRA - interim remedial action

LNAPL - light nonaqueous-phase liquid

MNA - monitored natural attenuation

seds - sediments

3.0 BACKGROUND

NBK at Bangor, covering approximately 7,000 acres, is located in Kitsap County, Washington, approximately 10 miles north of Bremerton. Land surrounding NBK at Bangor is generally undeveloped or supports limited residential uses. The following sections describe each of the OUs at NBK at Bangor, including physical characteristics, land and resource use, the history of contamination, removal actions performed, and the basis for taking remedial action.

3.1 OU 1 (SITE A)

The 12-acre Bangor Ordnance Disposal site (Site A) is located in the northern portion of NBK at Bangor. Land use immediately adjacent to the site is undeveloped forest land, with Cattail Lake downhill to the west and the off-base community of Vinland located approximately 2,000 feet to the north. Hood Canal, which borders NBK at Bangor, is located to the west of Site A, Vinland, and Cattail Lake (Figure 1-2 and Figure 3-2 of Appendix A).

From 1962 to 1975, the Navy used Site A to detonate and incinerate various ordnance materials. Soil, surface water, and shallow groundwater were contaminated as a result of these activities. Municipal water supplies for Vinland are obtained from the deeper sea level aquifer, which has not been impacted by activities at Site A.

Site A consisted of a burn area, Debris Areas 1 and 2, and a stormwater discharge area. The site originally consisted of burn mounds, facilities for personnel, fire suppression vehicles and equipment, an incinerator for ammunition, and a blast pit for ordnance detonation. Buildings at the site were demolished and burned on site in 1977. Grading and redistribution of soil at the Site A burn area continued through 1984. In 1983, the Navy constructed a stormwater diversion structure to convey surface water discharges from the Site A burn area to Hood Canal, to minimize the potential of contamination to Vinland.

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 (water table) aquifer occurring within the stratified sand/silt deposits underlying the till (water table 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.

The remedial investigation (RI) included the collection and chemical analysis of surface and subsurface soil, groundwater, surface water, marine sediment, and fish and shellfish tissue to characterize the nature and extent of contamination at the site. The risk assessment concluded that contaminants in groundwater in the shallow aquifer beneath the burn area, and in soil in the burn area and Debris Area 2, pose an unacceptable risk to human health, assuming residential site use. The primary contaminants of concern (COCs) driving estimated human health risks are 2,4,6-trinitrotoluene (2,4,6-TNT), 2,6-dinitrotoluene (2,6-DNT), and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in the soil and RDX in the groundwater. In addition, lead concentrations in Debris Area 2 soils pose a possible ecological concern to sensitive species. No unacceptable risks were identified for Debris Area 1 or the stormwater discharge area.

3.2 OU 2 (SITE F)

Site F, which represents a former wastewater lagoon and overflow ditch, was used between approximately 1960 and 1970 for the disposal of wastewater produced during the demilitarization (demil) of ordnance items in the adjacent segregation facility building. Between approximately 1957 and 1978, the segregation facility's primary function was demil of ordnance items using steam cleaning and/or steam melt-out procedures. Prior to 1972, wastewater from the demil process was discharged into an unlined wastewater lagoon. The wastewater contained relatively high concentrations of TNT and RDX and lower concentrations of other explosives compounds. Much of the wastewater apparently infiltrated through the lagoon bottom. During periods of heavy discharge, wastewater overflowed the lagoon to a narrow ditch south of the lagoon. Periodically, the wastewater lagoon was allowed to drain and waste materials at the surface of the lagoon were "burned off" in place or transported to Site A for burning and disposal. Beginning in 1972–1973, the lagoon was taken out of service and the wastewater was collected into barrels and delivered to the base liquid-waste incinerator (Site 16/24).

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. The former lagoon area was backfilled and covered with asphalt in 1980. Also in 1980, demil operations at the Bangor segregation facility were transferred to the Indian Island Annex. The buildings were subsequently decontaminated and converted to storage.

Ordnance contamination in soil was limited to the area of the former wastewater lagoon and overflow ditch; beneath the former lagoon, the soil contamination extends to the water table approximately 50 feet below grade. Within the shallow aquifer, RDX extends approximately 4,900 feet downgradient from the former lagoon, whereas TNT and DNT are limited to within approximately 1,000 feet downgradient of the lagoon. The shallow aquifer is not used as a drinking water source for NBK at Bangor. Ordnance contamination from Site F has not

impacted the deeper sea level aquifer, which is a drinking water supply source on and off base. Periodic sampling of the drinking water supply wells shows no impact to the sea level aquifer.

Based on the risk assessment, contaminants in groundwater in the shallow aquifer, and in soil beneath portions of the former wastewater lagoon and overflow ditch, pose an unacceptable risk to human health, assuming residential (unrestricted) site use. The primary contaminants of concern driving site risks are TNT, RDX, and dinitrotoluene (DNT) in soil and TNT, RDX, DNT, and 1,3,5-trinitrobenzene (1,3,5-TNB) in groundwater. In addition, potential ecological risks to sensitive aquatic species were predicted at the discharge area for the shallow aquifer (seeps near the western base boundary) should ordnance contamination in shallow aquifer groundwater arrive there unremediated in the future.

3.3 OU 3 (SITES 16/24 AND 25)

OU 3, located in the southeastern portion of the base, consists of Sites 16, 24, and 25 (Figure 1-2). 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. Between 1973 and 1983, the liquid-waste incinerator reportedly burned demil 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. Both incinerators were deactivated and removed in 1983. Site 25, downgradient of Site 16/24, is the location of a former sewage treatment plant outfall from the base's industrial area. Site 25 has since been regraded and currently consists of two stormwater detention ponds that discharge to Clear Creek.

The OU 3 risk assessment concluded that excess cancer and noncancer risks for Site 16/24 and Site 25, assuming residential use, are within EPA's acceptable risk range. However, chemical concentrations in Site 16/24 surface soil, and in Site 25 groundwater, exceeded Washington State (Model Toxics Control Act [MTCA] cleanup levels. The assessment also concluded that potential ecological risks posed by the sites are negligible, with the possible exception of the headwaters of Clear Creek's central branch (adjacent to Site 25), where some chemical concentrations exceeded state water and/or sediment quality criteria. Concentrations detected in water and sediment further downstream were below respective criteria or were comparable to background concentrations.

3.4 OU 6 (SITE D)

Site D is a former ordnance disposal area in the west-central portion of the base (Figure 1-2). Site D served as the principal area for burning, detonation, and possible burial of ordnance at NBK at Bangor from 1946 until 1963, when these activities were transferred to Site A. Site D was used sporadically for ordnance disposal until approximately 1965. Waste disposal areas at Site D included a small arms incinerator, a burn trench, and smaller burn areas or mounds. Ordnance materials reportedly disposed of at Site D included explosive D (ammonium picrate) sludge, photo flash bombs and ammonium nitrate blocks, smokeless powder, black powder, rocket propellant, white phosphorus shells, compound B (TNT and RDX), Amatol, and propulsion missile grains.

Much of Site D is seasonally wet, with the lower 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 a railroad grade, and leaves the site via an ephemeral drainage to Devil's Hole Lake to the northwest. Groundwater from a perched zone also discharges to the site.

During the RI, samples of soil, freshwater sediment, groundwater, and surface water were collected for chemical analysis. Based on the chemical data, the risk assessment concluded that TNT and DNT in surface soils are the primary COCs contributing to unacceptable estimated human cancer and noncancer risks. Infrequent detections of bis(2-ethylhexyl)phthalate (BEHP) and the pesticide heptachlor in groundwater and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in freshwater sediment resulted in lower estimated cancer risks. TNT and DNT in site soils also pose a risk to sensitive ecological receptors.

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

OU 7 comprises 10 known or suspected waste sites (Sites B, E, 2, 4, 7, 10, 11, 18, 26, and 30) at locations across NBK at Bangor. Figure 1-2 lists the names of the 10 sites and shows their locations. Sites 27, 28, and 29 were originally part of OU 7 but were included within OU 8 in 1994 following 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, 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 controls [ICs] or monitoring) is required for these sites/areas, and no 5-year review is required. Thus, they are not discussed further here.

The OU 7 ROD declared that four sites (B, E, 2, and 11) require remedial action and two sites (10 and 26) require no remedial action with monitoring, as described in the subsections that follow. Sites E and 11 are addressed together as Site E/11.

3.5.1 Site B (Floral Point)

Site B (Floral Point) covers approximately 5 acres of natural shoreline along Hood Canal (Figure 1-2). Pyrotechnic testing was reportedly completed at Floral Point in the 1950s and 1960s. Black powder was also reportedly burned. Floral Point was also used for station dumping, including pit disposal, landfilling, and trash burning, from approximately 1950 to 1968. In 1966–1967, the site was also reportedly used for open burning of RDX and TNT residuals from Site F.

Floral Point has no surface water drainages, and groundwater beneath the shoreline site is saline (nonpotable) due to tidal mixing. The beach south of Floral Point is currently used by base personnel for shellfish harvesting and fishing every 3 to 5 years, on a rotational basis with other base beaches. The beach at and north of Floral Point is not used for shellfishing because suitable sediment substrate is lacking.

The OU 7 risk assessment concluded that PAHs and PCBs in Site B soil pose an unacceptable cancer risk for an assumed future residential use and metals pose a marginal hazard to sensitive ecological receptors.

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 base (Figure 1-2). Site E was reportedly used as an acid disposal site for electroplating wastes and Otto fuel from 1960 to 1973. The materials were disposed of in an unlined pit. Site 11 is a pesticide/herbicide disposal area where, in 1968 or 1969, empty pesticide containers were buried between two barricaded railroad siding areas. The containers, which reportedly contained 2,4-dichlorophenoxyacetic acid (2,4-D), DDT, and Tordon, were triple rinsed and dried prior to burial. In 1992, a time-critical removal action was initiated at Site 11, during which 85 containers were removed along with approximately 400 cubic yards of soil containing pesticides. Soil excavated during this action was stockpiled on site. Sites E and 11 are contiguous, and there was concern that pesticide/herbicide drums may also have been disposed of at Site E. Therefore, the two sites are addressed together (Site E/11) in the OU 7 ROD.

Due to the presence of DDT, cancer risks of approximately 2 in 100,000 and 2 in 1,000,000 were estimated for the ingestion of stockpiled soil by assumed residents and industrial workers, respectively. The DDT in stockpiled soils also poses a marginal hazard to sensitive ecological receptors. Assuming site groundwater is used as a drinking water source, Otto fuel poses unacceptable cancer and noncancer risks to assumed future residents. RDX detected in the lower portion of the shallow aquifer at Sites E/11 also contributes to the estimated drinking water risk, but is part of the Site F plume. Site soils (in-place) pose no unacceptable risk under unrestricted site use.

3.5.3 Site 2 (Classification Yard/Fleet Deployment Parking)

Site 2 (Classification Yard/Fleet Deployment Parking) is located in a north-south-trending ravine between Nautilus and Trigger Avenues (Figure 1-2). Surface water from Site 2 flows through an artificial channel into Trident Lakes. Site 2 was divided into two subareas designated Sites 2A and 2B. Site 2A was a disposal area for small-caliber projectiles. Site 2B was an unauthorized disposal area, with wastes including paint sludge, waste oil, and drums. A cleanup of surface debris at Site 2A was completed in 1986 and 1987. A removal action for debris and drums from Site 2B was completed in 1993. Soils excavated during this action were placed in two stockpiles on site, referred to as Containment Cell Nos. 1 and 2.

Polychlorinated biphenyls (PCBs) detected in stockpiled site soils result in an estimated cancer risk of approximately 1 in 100,000 for assumed future residents of the site. Site soils (in-place) and site groundwater pose no unacceptable risk under unrestricted site use.

3.5.4 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 1-2). The two former wooden floor Quonset huts were used prior to 1979 to store pesticides and herbicides. The site is currently the paved parking area for Buildings 2011 and 2012. Chemicals known to have been stored in the huts include Hyvar X, bromacil, 2,4-D, and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).

Based on a detection of total petroleum hydrocarbons (TPH) in one groundwater sample, an unacceptable noncancer risk was estimated for groundwater ingestion by an assumed future site resident. Site soils did not pose an unacceptable risk for unrestricted site use.

3.5.5 Site 26 (Hood Canal Sediments)

Site 26 (Hood Canal sediments) consists of eight areas along the western shore of the base where the base service piers are located. These eight areas are known as Cattail Lake Beach/Magnetic

Silencing Facility, Floral Point, Explosives Handling Wharf, Marginal Wharf, Delta Pier, Devil's Hole Beach, Keyport/Bangor Dock, and Service Pier (Figure 1-2). The wharf/dock/pier structures along the shoreline serve to limit the potential for erosion and result in local trapping of sediments transported from other areas.

Of the eight Site 26 subareas evaluated, possible ecological risks to marine receptors were identified for four (Marginal Wharf, Devil's Hole Beach, Keyport/Bangor Dock, and Service Pier). Chemicals driving the estimated ecological risks were polycyclic aromatic hydrocarbons (PAHs), pesticides, and BEHP at Marginal Wharf; pesticides at Devil's Hole Beach; mercury and PAHs at Keyport/Bangor Dock; and PAHs, pesticides, and dibenzofuran at Service Pier.

Ecological risk was also assessed under Washington State's sediment management standards (SMS). Under this evaluation, BEHP concentrations at Marginal Wharf exceeded the SMS cleanup screening level (CSL) for minor adverse effects; however, bioassay tests were below the SMS sediment quality standards (SQS) for no adverse effects. For Service Pier, detected sediment concentrations were below the respective CSLs, but two bioassay test results exceeded the CSL. No unacceptable human health risks were identified for Site 26 (based on recreational exposure to sediments and ingestion of clams).

3.6 OU 8

OU 8 consists of approximately 150 acres of land and is located in the southeastern corner of NBK at Bangor (Figure 1-2). It encompasses the Public Works Industrial Area (PWIA) and off-base residential community along Mountain View Road between Clear Creek Road and the NBK at Bangor boundary (Figure 4-1 in Appendix A). OU 8 was added to the FFA in October 1994 and consists of the following known or suspected former waste sites, for which investigations began in 1991:

- Site 27, Steam Cleaning Pit
- Site 28, Paint Shop Drainage Ditch
- Site 29, Public Works Maintenance Garage

Sites 27, 28, and 29 are located within the PWIA and were also studied during remedial investigations of OU 7. Sites 10, 18, and 25 are also located within the PWIA; however, these sites were investigated under different OUs. Sites 10 and 18 were investigated under OU 7, and Site 25 was investigated under OU 3.

The Navy has completed two voluntary time-critical removal actions at OU 8. In 1995, the Navy connected the Mountain View neighborhood, southeast of the base boundary, to a municipal water supply. In 1996, the Navy installed a groundwater containment system to minimize off-base plume migration.

In addition to these two removal actions, a variety of removal and remedial actions were conducted under the NBK at Bangor underground storage tank (UST) program within and around the PWIA from 1986 through 2000. Tightness tests were performed on USTs in the PWIA to identify potential leaks from tanks and associated piping systems. This program documented releases from several tanks and associated piping, and several USTs were removed or abandoned in place to prevent further releases to the subsurface.

In August 1986, a free-product recovery system was installed in the PWIA service station area. The recovery system consisted of three product-recovery wells equipped with pneumatic pumps (RW1, RW2, and RW3) located in the area of known free product. Groundwater mixed with free product was pumped to an oil/water separator. Petroleum from the oil/water separator was pumped into an aboveground holding tank, whereas the wastewater was discharged into the sanitary sewer. The system was shut down in November 1998 after recovering approximately 6,000 gallons of light nonaqueous-phase liquid (LNAPL) from an estimated 20,000 gallons released.

In 1994, a combined soil vapor extraction (SVE) and bioventing system was installed in the vicinity of the gasoline release at the PWIA service station to remediate petroleum-contaminated soil. The system consisted of a combination of 15 SVE wells, four air sparging wells, and one vent well. The SVE wells were manifolded into a blower, whereas the sparging wells were connected to a compressor. Extracted soil vapor was piped to a regenerative thermal oxidation unit for treatment. In March 1996, the aboveground components of the system were dismantled, but the vapor wells and underground piping were left in place.

The SVE system was restarted in January 1997 using the original in-ground components of the system. New aboveground system components were added, including a moisture knockout tank, a blower, a catalytic oxidizer, and a control unit. This second phase of SVE operation lasted from December 1997 through March 2000, and approximately 35,000 pounds of petroleum hydrocarbon vapors were recovered (equivalent to approximately 5,300 gallons of gasoline (U.S. Navy 2001c). In December 1999, confirmatory soil samples were collected beneath the PWIA to a depth of 15 feet below ground surface (bgs). The results indicated that the soil had been remediated to meet Ecology's cleanup levels. In February 2000, Ecology notified NBK at Bangor that no further action is necessary to clean up the soil beneath the PWIA to a depth of 15 feet bgs.

OU 8, as defined in the ROD (U.S. Navy, USEPA, and Ecology 2000a), includes contaminated groundwater on base that migrates off base from the PWIA and extends in a southeasterly direction toward the Mountain View residential neighborhood, as well as contaminated soil that extends from a depth of 15 feet bgs to the water table. The contaminated soil was limited to the central portion of the PWIA, beneath the gasoline service station, where a gasoline release from UST was discovered in 1986. LNAPL was present on the groundwater surface in this area at the time the ROD was signed in 2000.

The OU 8 risk assessment estimated unacceptable cancer and noncancer risks for assumed future site residents drinking on-base groundwater. Unacceptable noncancer risks to future off-base residents were predicted from the combination of residents drinking off-base groundwater and irrigating their crops with it. Ecological risks are not anticipated. The compounds 1,2-dichloroethane (1,2-DCA) and benzene are the primary volatile organic compounds (VOCs) present in OU 8 groundwater and are the risk drivers. No current unacceptable risks from benzene through inhalation pathways were found at the time of the ROD (see Table 5-9 of the ROD).

4.0 REMEDIAL ACTIONS

Previous Navy investigations identified eight OUs at NBK at Bangor that warranted inclusion in the CERCLA remedial investigation/feasibility study (RI/FS) and ROD process. For six of these OUs, some remedial action was required. This section provides a brief description of remedy selection and implementation at each of these six OUs (1, 2, 3, 6, 7, and 8).

4.1 OU 1 (SITE A)

4.1.1 Remedy Selection

The overall remedial action objectives (RAOs) for OU 1 were to:

- 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 standards.

To achieve these objectives, the following remedial action components were specified in the OU 1 ROD (U.S. Navy, USEPA, and Ecology 1991a) (as summarized in the first 5-year review):

- Abandon older site monitoring wells that may not have competent surface seals.
- Excavate burn area and Debris Area 2 surface soils containing ordnance and/or lead concentrations above MTCA residential soil cleanup levels.
- Place excavated soils in a lined soil washing basin (Debris Area 2 soils containing lead to be isolated in special cell in basin).
- Treat the leach basin soils using passive soil washing with ultraviolet/oxidation (UV/Ox) treatment of the basin leachate (and recirculation to the basin), and monitor the treatment, until the soils meet the soil cleanup levels and leachate meets drinking water cleanup levels established in the ROD.
- After treatment of ordnance compounds, abandon the leach basin in place and dispose of any Debris Area 2 soils with lead concentrations above cleanup levels at a permitted off-site landfill.

- Once soil treatment is complete, monitor the perched groundwater zone for compliance with drinking water cleanup levels (to assess protection of the underlying shallow aquifer). If these levels are not met within 5 years after commencement of the remedial action, modifications to the groundwater remediation system will be considered.
- Extract groundwater from the shallow aquifer containing ordnance concentrations above drinking water cleanup levels, treat it to drinking water cleanup levels using UV/Ox technology, and return the treated water to the shallow aquifer via reintroduction wells (for an estimated period of 10 years).
- Monitor the effectiveness of the groundwater restoration, and adjust system performance as warranted by the monitoring data.
- If compliance with state groundwater protection criteria has not been achieved within 5 years from commencement of this action, modifications to the groundwater remediation system will be considered. Modifications may include changing the pumping or reintroduction well configuration, or altering the pumping schedule.

The OU 1 ROD has been amended by three Explanations of Significant Differences (ESDs). ESD No. 1 (U.S. Navy, USEPA, and Ecology 1994e) documented the following changes to the OU 1 ROD selected remedy:

- Add sand amendment to leach basin soil and calcium chloride to wash water to improve permeability (calcium chloride reduces swelling of clays in the fine-grained soil).
- Treat leachate using granular activated carbon (GAC) instead of UV/Ox.
- Leave the limited volume of lead-contaminated soil in Debris Area 2 (excavating the soil poses greater risk to human health and the environment than leaving the soil in place), and implement institutional controls to restrict access to the area.
- Develop and implement a leachate management plan for the closed leach basin to ensure that leachate releases from the treatment basin will be protective of human health and the environment after basin closure.
- Begin treating groundwater by July 1, 1996, rather than 1 year after soil treatment is complete (a 1-year extension of the deadline was subsequently approved).

ESD No. 2 (U.S. Navy, USEPA, and Ecology 1998) documented the following changes to the OU 1 ROD selected remedy:

- Use composting to complete remediation of the leach basin soil (soils from the former Site A “burn mounds” and three localized “hot spots”).
- Treat extracted groundwater using GAC instead of UV/Ox.

ESD No. 3 (U.S. Navy, USEPA, and Ecology 2000b) documented the following changes to the OU 1 ROD selected remedy:

- The leach basin leachate was acceptable for discharge to surface water without treatment (based on whole effluent toxicity [WET] testing).
- The remediation cost to date was more than three times greater than that estimated in the ROD.

4.1.2 Remedy Implementation

Abandonment of Older Monitoring Wells

Since the signing of the OU 1 ROD, the Navy has maintained an ongoing policy to evaluate older wells during regular monitoring events. Wells are upgraded or abandoned as needed.

All well abandonments have been conducted with the concurrence of Ecology.

Soil Remediation

Excavation and stockpiling of the ordnance-contaminated burn area surface soils, construction of the lined soil washing leach basin, amendment of the stockpiled soils with sand, and placement of the amended soils (approximately 13,000 cubic yards) in the leach basin were completed from April through September 1993. The leach basin was constructed over the burn area following soil excavation.

The passive soil leaching system began operation in December 1994, treating approximately 13,000 cubic yards of Site A soils containing ordnance compounds, primarily TNT and RDX. Leachate was collected and treated using GAC, and the treated water was recirculated to the basin. Composting technology was used to treat some soil for which the remediation goals (RGs) were not initially achieved through leaching. With the addition of composting technology, the RGs for burn area soils were achieved by September 1997, and the treated soils were returned to Site A and placed just south of the leach basin, inside the fenced area.

Following the soil washing and composting, soils in the basin met the RGs, but the untreated basin leachate contained RDX above the 30 mg/L surface water RG. A comprehensive WET testing program was completed in December 1998, demonstrating that the untreated leachate is not toxic to aquatic organisms and is acceptable for discharge to surface water (as documented in ESD No. 3). Consequently, the leach basin piping was modified such that basin leachate discharges by gravity flow from the leachate collection sump to Hood Canal via an existing stormwater diversion system. Unused components of the existing system were subsequently decommissioned. The treatment facility continues operation for the purpose of groundwater remediation, as discussed under *Groundwater Remediation*.

Debris Area 2 Institutional Controls

In 1995, an extensive stand of blackberries was planted along the upper portion of the steep ravine containing Debris Area 2 to restrict access to the ravine. Warning signs were also installed along the top of the ravine as an additional means of restricting access to Debris Area 2 (in accordance with ESD No. 1 for Site A).

Groundwater Remediation

Groundwater restoration at OU 1 began in May 1997 with continuous groundwater extraction from monitoring well A-MW46, located within the leach basin footprint and screened in a portion of the shallow aquifer with high COC concentrations. The extracted groundwater was treated in the Site A leachate treatment system. The leachate treatment system was subsequently expanded when the more comprehensive system became fully operational in early November 1997.

The current Site A groundwater extraction system consists of five extraction wells (A-EW4 through A-EW8) spaced at 60- to 70-foot intervals along the downgradient edge of the former burn area and two retrofitted monitoring wells (A-MW37 and A-MW46) located inside the leach basin. Each extraction well is equipped with a submersible pneumatic pump operated by compressed air. Extraction from these wells removes ordnance-contaminated groundwater from the shallow aquifer, which is then pumped to the treatment facility for treatment using a solids filtration system followed by two 20,000-pound GAC vessels. The pumping rates for extraction wells A-EW4 through A-EW8 typically range from 1.0 to 2.0 gallons per minute (gpm), whereas the pumping rates for monitoring wells A-MW37 and A-MW46 typically range from 0.5 to 0.8 gpm, for a total extraction flow rate of approximately 10 gpm (U.S. Navy 2004d). The extraction and treatment system is automated for continuous 24-hour-per-day, 7-day-per-week operation through the use of a programmable logic controller.

Treated water was initially reintroduced to the aquifer through well A-IW3, with excess water routed to the stormwater discharge area. Over time, injection of treated water became impractical, because well A-IW3 required substantial maintenance and the required injection pressure became very high. All treated water is currently routed to a drainage ditch located along the west side of the leach basin. Water in this ditch flows northward, enters a culvert at the northwest corner of the leach basin, and terminates at the stormwater discharge area.

4.1.3 Operation, Maintenance, and Monitoring

Navy contractors have continued regular operation, maintenance, and monitoring (OM&M) of the Site A remediation system and overall groundwater conditions since the last 5-year review in 2000. OM&M of the groundwater extraction and treatment system is performed in accordance with the Site A operations and maintenance manual addendum (U.S. Navy 2000c). Long-term groundwater monitoring is currently performed in accordance with the project management plan for Site A groundwater monitoring (U.S. Navy 2003a).

Treatment system OM&M includes the following (U.S. Navy 2000c):

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

Treatment system operation has been interrupted periodically over the last 5 years. The system has been shut down for up to 4 months at a time because of equipment failures or because of the need for groundwater levels to stabilize for the U.S. Geological Survey (USGS) to conduct natural attenuation studies (U.S. Navy 2004e).

Monitoring and extraction wells in the shallow aquifer and perched groundwater zone at Site A have been monitored periodically since spring 1994 to assess contaminant distribution, compliance with RGs, and performance of the groundwater extraction and treatment system. Sampling has typically occurred semiannually, with one event in the wet season and one event in the dry season of each year. Seven new shallow aquifer monitoring wells (A-MW49 through

A-55) were installed at Site A in April 2002 to further evaluate the RDX contaminant plume migration to the west and northwest of the site and to provide an early warning system for possible impacts to Cattail Lake (U.S. Navy 2003a). The number of wells sampled during each event has varied over the last 5 years. Under the 2003 project management plan (U.S. Navy 2003a), the February 2004 (wet season) sampling event was to include 22 wells, consisting of 7 extraction wells, 13 shallow aquifer monitoring wells, and 2 perched groundwater zone wells. The August 2004 (dry season) sampling event was to include 18 wells, consisting of 7 extraction wells and 11 shallow aquifer monitoring wells.

In addition to the monitoring required by the remedy selected in the ROD, the USGS conducted studies of ordnance degradation and groundwater geochemistry in March 2000 and May 2002 (U.S. Navy 2003c).

All updates and modifications to treatment system OM&M have been conducted with the concurrence of Ecology.

4.2 OU 2 (SITE F)

4.2.1 Remedy Selection

Prior to 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), with the goal of limiting further migration of the highest concentrations of ordnance in groundwater at Site F (i.e., containment of groundwater containing 80 mg/L RDX through pump and treat). The IRA ROD was amended in an ESD (U.S. Navy, USEPA, and Ecology 1994e), selecting GAC instead of UV/Ox for groundwater treatment.

Two primary RAOs were defined in the ROD for final action at OU 2:

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

To achieve these objectives, the following remedial action components were specified in the OU 2 ROD:

- Excavate to a depth of 15 feet those soils with ordnance concentrations above residential soil cleanup levels, and treat them by composting.

- Following monitoring to verify that soil treatment is complete, use the treated soils to fill the Site F excavation and overflow ditch.
- Install an infiltration barrier over all soils with concentrations above soil cleanup levels for groundwater protection, and periodically inspect the barrier to ensure its integrity.
- Modify the site IRA groundwater remediation system by adding extraction wells to enhance, to the maximum extent practicable, removal of ordnance contaminants from the shallow aquifer at Site F.
- Treat extracted groundwater by GAC (and ion exchange, if needed for nitrate removal) to meet groundwater cleanup levels, and return the treated water to the shallow aquifer via reintroduction wells.
- Thermally regenerate the ordnance-loaded GAC to provide permanent destruction of the ordnance compounds.
- Monitor the effectiveness of the groundwater remediation, and make operational adjustments to optimize, to the extent practical, removal of contaminant mass from the shallow aquifer at Site F.
- Initiate formal review of the groundwater system operations after one of the following performance evaluation criteria is met:
 1. Groundwater cleanup levels are achieved for all constituents of concern in the Site F shallow aquifer.
 2. No statistically significant change in constituent concentrations is observed in monitoring wells with concentrations above cleanup levels, after reasonable system modifications have been implemented.
 3. 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.

Based on this review, the Navy and EPA, in consultation with Ecology, will determine whether system shutdown, continued operation, or other remedial response is warranted.

- If the Navy and EPA, in consultation with Ecology, determine that continued operation of the Site F groundwater system is technically infeasible or impracticable, institutional controls and water quality monitoring of the shallow aquifer will be implemented as required by EPA and Ecology to protect human health and the environment until groundwater cleanup levels are achieved.

4.2.2 Remedy Implementation

Soil Remediation

Site F contaminated soils were excavated in summer 1996. The total volume of contaminated soil excavated was approximately 2,300 cubic yards, several times greater than the original estimate of 660 cubic yards. All excavated contaminated soil was hauled to the on-base treatment facility for screening and composting.

The on-base treatment facility was constructed in spring 1996. It consisted of a composting building and a stockpile/staging area with surface water controls. Soil screening to remove 1.5-inch-plus material was performed in the stockpile/staging area. Screening was necessary to prevent damage to the windrow tiller during the composting process. Approximately 300 cubic yards of oversize material were screened out. This material was rescreened to remove as much soil as possible, then sampled for ordnance contamination. Sampling results indicated that the oversize material exceeded cleanup criteria. Therefore, the rocks were pressure washed, stockpiled, and ultimately backfilled into the Site F excavation.

The screened soil was composted by combining it with four amendments to produce a mix that was approximately 25 percent (by volume) soil and 75 percent amendments. Composting was conducted by forming 6-foot-high by 14-foot-wide by 250-foot-long windrows, four of which could be accommodated in the composting building at the same time. Fifteen windrows were required to process the Site F soils. Windrows were monitored for temperature, oxygen, moisture, pH, and thermophilic bacteria and were tilled as needed based on monitoring results. They were also sampled regularly for TNT determination using field test kits, with less frequent off-site laboratory analysis for ordnance. Composting of each individual windrow continued until cleanup levels for residential (unrestricted) use were achieved. The average time for a windrow to reach the cleanup criteria was 30 days.

The OU 2 ROD specified that the composted soil be placed back in the Site F excavation (covered by the infiltration barrier). However, NBK at Bangor requested that the infiltration barrier area be paved over and a concrete-floored recycling facility installed to provide a long-term storage site. Due to the physical nature of the composted material, it was not feasible to place it beneath the pavement without severely weakening the pavement by settlement.

Therefore, some of the composted soil was used at Site F to backfill areas outside the footprint of the pavement, and some was hauled to Site D and used as part of the restoration material at that site. This change was approved by Ecology. The Site F excavation was backfilled with a variety of materials, including oversize material from the screening of excavated Site D and Site F soils, and the existing asphalt pad at Site F, which was broken up into small pieces.

The infiltration barrier covers an area of approximately 1.4 acres. Elements of construction included drainage installation, 12 inches of grading fill, a high-strength woven geotextile fabric, a geosynthetic clay liner (GCL), a 12-inch soil cushion layer, 6 inches of base course, and the asphalt paving. Construction of the infiltration barrier began in August 1996, with final paving and construction of the recycling facility completed in December 1997.

Groundwater Remediation

The Site F IRA containment system, consisting of six extraction wells (F-EW1 through F-EW6), six reintroduction wells (F-IW1 through F-IW6), a GAC water treatment system with 300 gpm capacity, and associated conveyance piping, began operation in December 1994. Figure 2-1 in Appendix A depicts the Site F well network and the location of the treatment system building. The IRA system was shut down in September 1996 for construction of enhancements to the system, in accordance with the requirements of the OU 2 ROD for final remedial action.

The final action enhancements to the groundwater remediation system included construction of four new extraction wells (F-EW7, F-EW8, F-EW9, and F-EW10), three new reintroduction wells (F-IW7, F-IW8, and F-IW9), treatment plant expansion from 300 to 600 gpm capacity, new conveyance system piping to integrate the new extraction and reintroduction wells into the existing system while increasing conveyance system capacity to 600 gpm, and additional monitoring wells. The enhanced system began operation in January 1997.

The groundwater monitoring results from the second quarter of 2003 indicated that the RDX plume had migrated beyond its historical boundary and toward wells F-MW44 and F-MW64. Attempts to contain the plume by increasing pumping at extraction wells F-EW4, F-EW5, and F-EW6 were unsuccessful because of equipment limitations. As a result, several alternative steps were taken to improve the system performance. Among these were the rehabilitation of the 10 extraction wells, replacement of reintroduction well F-IW2 by F-IW2A, and the addition of two reintroduction wells (F-IW10 and F-IW11) and four monitoring wells (F-MW66 through F-MW69). In addition, numerical modeling was performed to evaluate groundwater flow patterns at Site F (U.S. Navy 2004f).

Currently the system includes 10 extraction wells (F-EW1 through F-EW10) from which ordnance-contaminated groundwater is pumped for treatment using a solids filtration system followed by two 20,000-pound GAC vessels. The current system also includes 11 reintroduction wells (F-IW1 and F-IW2A through F-IW11) that return treated water to the aquifer. These reintroduction wells were designed to cause groundwater mounding downgradient of the plume, serving to help contain the plume. Currently only wells F-IW1, F-IW2A, and F-IW7 through F-IW11 are actively being used for reintroduction. The design flow rate of the system is 700 gpm (U.S. Navy 2004e).

4.2.3 Operation, Maintenance, and Monitoring

The Navy has continued regular OM&M of the Site F remediation system and periodic performance and compliance monitoring since the last 5-year review in 2000. OM&M of the groundwater extraction and treatment system is performed in accordance with the Site F operations and maintenance manual addendum 2 (U.S. Navy 2000d). Groundwater monitoring is currently performed in accordance with the compliance and performance monitoring plan for Site F (U.S. Navy 1999a).

Performance monitoring is conducted to evaluate the effectiveness of the treatment process. Performance monitoring results are used to (U.S. Navy 2000d):

- Track GAC loading and detect breakthrough
- Track total ordnance mass removal
- Document concentration trends in groundwater over time to demonstrate remediation progress
- Evaluate the need for operational adjustments to the treatment system

Compliance monitoring results are used to verify that:

- The system is limiting the migration of ordnance compounds
- Ordnance compound concentrations in the shallow aquifer are being reduced to the RGs
- Treated water meets water quality criteria required for reintroduction

Treatment system OM&M includes the following (U.S. Navy 2000d):

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

Some routine OM&M tasks are performed on a daily basis (U.S. Navy 2000d). Since the last 5-year review in 2000, the extraction and treatment system has generally performed as designed, with periodic maintenance and repair completed as necessary (U.S. Navy 2004e). Technical progress reports are prepared monthly to document O&M activities, monitoring results, and remediation progress.

Monitoring and extraction wells at Site F have been monitored periodically since December 1994 to assess contaminant distribution, compliance with RGs, and performance of the groundwater extraction and treatment system. Since 2000, five monitoring wells (F-MW61 through F-MW65) have been monitored quarterly (except for January 2004). Up to 27 additional monitoring wells, and the 10 extraction wells, have also been sampled on a semiannual basis (U.S. Navy 2004f). Monitoring of Site F wells includes monitoring of wells associated with Site E/11. The samples from Site E/11 wells are analyzed for Otto fuel only (U.S. Navy 2003b).

All updates and modifications to treatment system OM&M have been conducted with the concurrence of Ecology.

4.3 OU 3 (SITES 16/24 AND 25)

4.3.1 Remedy Selection

The OU 3 ROD declared that risks at Sites 16/24 and 25 are within EPA's acceptable risk range and no remedial action is necessary. However, Site 16/24 surface soils had concentrations of some metals above MTCA residential soil cleanup levels, and Site 25 groundwater had concentrations of some metals and BEHP above MTCA groundwater cleanup levels.

Institutional controls restricting residential use of Site 16/24 were in place at the time the ROD was signed (included as Attachment 2 to the ROD). Property transfers for Site 16/24 will require a deed restriction to be attached and will have to meet the requirements of CERCLA Section 120(h) and WAC 173-340-440.

The ROD required 5 years of semiannual groundwater monitoring at Site 25 to verify that metals concentrations detected in the shallow aquifer are consistent with natural background concentrations. The Navy, EPA, and Ecology were to compare the monitoring data against federal drinking maximum contaminant levels (MCLs), MTCA Method B groundwater cleanup levels, and representative background concentrations to determine whether additional monitoring or other actions are necessary. The need for residential use restrictions at Site 16/24 and continued groundwater monitoring at Site 25 was to be reevaluated as part of the 5-year review process.

4.3.2 Remedy Implementation

The residential use restrictions for Site 16/24 remain in place. The Navy prepared an institutional controls management plan (ICMP) for all of NBK at Bangor in 2001 (U.S. Navy 2001a), as discussed in Section 4.6.2. The ICMP formalized the land use restrictions for Site 16/24.

Eight post-ROD semiannual groundwater monitoring rounds (March 1994 through September 1997) were completed at Site 25. The initial sampling rounds included analysis for metals, VOCs, semivolatile organic compounds (SVOCs), ordnance, pesticides, and PCBs. Based on the results of the initial monitoring, all analytes except metals were dropped from the sampling program after the second post-ROD sampling event.

Starting in Round 5, the sampling methodology changed from bailers to low-flow sampling with pumps. With this change, detected total metals concentrations decreased, indicating turbidity bias in the initial results for total metals. Following the fifth round, there were no exceedances for dissolved or total metals in any of the Site 25 groundwater samples, excluding a minor exceedance of thallium in one well during the fifth round (U.S. Navy 1999b). In addition, detected metals concentrations in the later sampling rounds were generally below background metals concentrations established for the shallow aquifer (U.S. Navy 1994).

Based on these analytical results, the Navy recommended discontinuation of the groundwater monitoring program for Site 25. Following review of the eight rounds of data and discussions between the Navy and Ecology, Ecology concurred with this recommendation. The Navy and Ecology agreed that the groundwater monitoring completed for Site 25 meets the requirements of the OU 3 ROD and that no additional monitoring is required (U.S. Navy 2000a).

The only monitoring or maintenance activity conducted at OU 3 since the last 5-year review has been the regular IC inspections.

4.4 OU 6 (SITE D)

4.4.1 Remedy Selection

The RAOs for OU 6 were to:

- Prevent unacceptable risks posed by ingestion and dermal contact with TNT and DNT in Site D soils
- Prevent migration of metals from Site D surface waters at concentrations that may adversely affect ecological receptors in downstream surface waters
- Prevent potential future risks that may be posed by human ingestion or inhalation of contaminants in shallow aquifer groundwater

To achieve these objectives, the following remedial action components were specified in the OU 6 ROD:

- Excavate and stockpile all soils at Site D containing TNT concentrations above the MTCA Method B residential soil cleanup level (33 mg/kg).
- Outside the wetland boundary, excavate and stockpile soils containing DNT concentrations above the MTCA Method B residential soil cleanup level (1.5 mg/kg).
- Within the wetland boundary, excavate and stockpile soils containing DNT concentrations above the MTCA Method C soil cleanup level (59 mg/kg). (Cleanup to Method B cleanup levels would result in significant damage to the wetlands.)
- Treat the excavated soils by composting at NBK at Bangor 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 one round of confirmation sampling and analysis (for metals and ordnance) following soil remediation. Consider response actions including active remediation if contaminants transported from Site D cause exceedances in downgradient surface waters.

The OU 6 ROD declared that active surface water remediation to address exceedances of MTCA Method B surface water cleanup levels was not practicable since the metals do not pose significant risks, are not being transported, and will attenuate naturally in the wetlands and because active remediation would create greater environmental risks than the baseline risks.

- Conduct short-term (one round) monitoring for VOCs in the shallow aquifer, using existing monitoring wells, to confirm exceedances of health-based criteria. If exceedances are confirmed, further characterization of the source and extent of VOCs in the shallow aquifer will be conducted. Once characterized, response action, including active remediation, will be considered.
- Complete a 5-year review to determine whether additional action or monitoring is required.

4.4.2 Remedy Implementation

Field activities for the OU 6 remedial action began in December 1995. Following construction of the on-base composting treatment facility (also used for OU 2 soils, described in Section 4.2.2), contaminated Site D soils were excavated and hauled to the treatment facility for screening and composting. Three areas of Site D soils had been identified in the RI/FS to require remediation: grids G-1 and M-12 and the former burn trench. To expedite remediation, the two grids were sampled to confirm their locations in the field. The sampling indicated that soils in grid G-1 met soil cleanup levels for the wetland (MTCA Method C) and soils in grid M-12 met MTCA Method B soil cleanup levels. Following site reconnaissance and extensive discussions, Ecology declared these grid areas as requiring no further action.

The burn trench area, approximately 60 by 125 feet in area by 3 feet deep, was not sampled because data from the previous treatability study confirmed constituent concentrations above cleanup levels. Prior to excavation, an unexploded ordnance (UXO) survey was completed for the trench and no UXO was found. During excavation, TNT field test kits were used to delineate the extent of contamination on all boundaries of the excavation. Once the field test kits indicated

that contaminated soils had been removed, verification soil samples were collected from the excavation for off-site laboratory analysis for ordnance using EPA Method 8330.

The Site D soils were composted using seven 250-foot-long windrows, which treated a total of approximately 880 cubic yards of contaminated soil. The soil was treated between July and October 1996, with an average of 53 days per windrow to treat the soils to meet the direct contact soil cleanup levels specified in the ROD. The composting process was essentially the same as that described in Section 4.2.2 for OU 2 soils. The treated soils were returned to the excavation area at Site D between November 1996 and April 1997. In May 1997, the gravel road installed in the wetland during the RI/FS was breached and covered with compost to promote revegetation, and the site was graded to match the existing contours to the extent possible. In December 1997, wetland plants were planted over the former gravel road. In addition, nine monitoring wells were decommissioned as part of the remediation (five before excavation and four after site restoration).

4.4.3 Operation, Maintenance, and Monitoring

No operations, maintenance, or monitoring activities occurred at OU 6 during this review period, because none were required.

4.5 OU 7 (SITES B, E/11, 2, 10, AND 26)

The selected remedy for OU 7 includes remedial action for Sites B (Floral Point), 2, and E/11, and no action with monitoring for Sites 10 and 26. The selected remedies for the remedial action sites are discussed below, followed by the monitoring-only sites.

4.5.1 Site B (Floral Point)

Remedy Selection

The RAOs for Site B were to:

- Prevent direct contact with and ingestion of soils containing PAH and PCB concentrations above MTCA Method A residential soil cleanup levels
- Confirm through monitoring of the Hood Canal sediments and tissue that groundwater discharge from Floral Point into Hood Canal is not adversely affecting sediments or clam tissue

To achieve these objectives, the following remedial action components were specified for Site B in the OU 7 ROD:

- Cover the site with a soil cover and vegetate the soil cover.
- Construct swales to control or reduce rainwater infiltration through the cover.
- Maintain the vegetated soil cover to prevent future contact with underlying soils.
- For Site B groundwater, conduct a 5-year monitoring of marine sediments and clam tissue. This monitoring is included as part of Site 26 (discussed in Section 4.5.5).

Remedy Implementation

Remedial action at Site B was completed between June and November 1997. The remedial activities included removal of surficial metal debris from the wetland area and decommissioning of nine monitoring wells used to evaluate site groundwater quality during the OU 7 RI/FS. The wells were decommissioned because they were not needed for future monitoring and because they would have interfered with the vegetated soil cover. Contaminated soils areas were covered by 1 foot of soil overlain by a mulch layer. The soil cover was planted with native grasses and a variety of native plants species. The plants provide protection from soil erosion, improve habitat, and reduce infiltration at the site through increased evapotranspiration. 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. At time of placement, the slope of the beach mix ranged from 5:1 to 7:1 (horizontal:vertical), further enhancing site habitat quality. Control points were established at the top of the shoreline protection berm to monitor future beach movement. A stormwater drainage system was installed, including erosion controls (gravel in ditches and riprap below outfalls). Finally, a concrete turnaround was constructed at the top of the boat ramp to prevent erosion from vehicles using the ramp. Ecology reviewed the final remedial action report and determined the Site B remedial action had been completed in accordance with the OU 7 ROD (Ecology 1999a).

Operation, Maintenance, and Monitoring

An inspection and maintenance (I&M) plan for Site B (U.S. Navy 2000e) detailed the inspection procedures for the upland and shoreline components of the remedy and provided general guidance regarding preventive maintenance and repair. The I&M plan included an inspection and maintenance schedule for the soil cover, soil cover vegetation, removal of invasive plant species, shoreline protection system, perimeter road/parking area, stormwater drainage system,

boat ramp/turnaround, and the water supply line. Monitoring of the shoreline protection system involved measurement from 10 monuments (hubs) on top of the gravel berm to the edge of the placed beach gravel.

The type and frequency of inspections required by the I&M plan was superseded by the ICMP published in 2001 (U.S. Navy 2001a). The ICMP requires an annual inspection that includes a systematic site walk with visual observation of the condition of the soil cap and vegetative cover. A form is included to record erosion measurements around the hubs.

The NBK at Bangor Installation Restoration Program Coordinator has been completing and maintaining records of the site inspections, although documentation in the record is not 100 percent complete.

The sediment and tissue monitoring for Floral Point is discussed as part of Site 26 in Section 4.5.5.

4.5.2 Site E/11

Remedy Selection

The RAOs for Site E/11 were to:

- Prevent direct contact with and ingestion of stockpiled soil, and underlying soil to a depth of 15 feet, containing PCB concentrations above the MTCA Method A residential soil cleanup level
- Prevent ingestion of groundwater with Otto fuel concentrations above 0.2 µg/L (which is the practical quantitation limit [PQL])

To achieve these objectives, the following remedial action components were specified for Site E/11 in the OU 7 ROD:

- Transport and dispose of approximately 400 cubic yards of contaminated stockpiled soil at a Resource Conservation and Recovery Act (RCRA) approved landfill.
- Because Site E/11 groundwater is being treated by the OU 2 (Site F) groundwater remediation system, monitor shallow aquifer groundwater at Site E/11 for Otto fuel and evaluate the effectiveness of removing the Otto fuel after 5 years. A groundwater use restriction will be put in NBK at Bangor's master plan.

Remedy Implementation

In July and August 1997, approximately 830 cubic yards of stockpiled soils at Site E/11 were sampled for characterization, transported, and disposed of at a permitted landfill. A stockpile of metal debris (compacted drums and banding) was also disposed of at that time. Following disposal of the stockpiled soils, and prior to site restoration, two rounds of confirmation soil samples were collected from beneath the liner on which the soil stockpile was stored. The soil quality data demonstrated soil concentrations below MTCA residential soil cleanup levels. The site was graded and restored as directed by NBK at Bangor (Foster Wheeler 1998).

The groundwater use restriction component of the remedy was formally satisfied in 2000, with adoption of the base-wide ICMP required by the OU 8 ROD.

Operation, Maintenance, and Monitoring

Monitoring of Site E/11 groundwater is addressed under the compliance and performance monitoring plan (CPMP) for the Site F groundwater remediation system (U.S. Navy 1999a). Groundwater samples were initially collected from six Site E/11 monitoring wells in August 1996 and January 1997 (dry and wet seasons, respectively). Because Otto fuel was detected (0.2 to 0.5 mg/L) in only two monitoring wells (E-MW21U and E-MW23U; Figure 2-1 in Appendix A), monitoring for Otto fuel continued for these two wells only. Because Site F extraction well F-EW4 is downgradient of Site E/11, it was also sampled until 1999 for Otto fuel to determine whether the low concentrations detected in the Site E/11 wells would be measurable in the extraction well.

Since the first 5-year review in 2000, the Site E/11 monitoring wells E-MW21U and E-MW23U were sampled annually each year except for 2004 (January 2000, January 2001, January 2002, and March 2003).

IC enforcement and inspections for Site E/11 have been performed along with site-wide enforcement and inspections required under the ICMP.

All changes to monitoring at Site E/11 have been approved by Ecology.

4.5.3 Site 2

Remedy Selection

The RAO for Site 2 was to prevent direct contact with and ingestion of stockpiled soil, and underlying soil to a depth of 15 feet, containing PCB concentrations above the MTCA Method A residential soil cleanup level.

To achieve this objective, the following remedial action components were specified for Site 2 in the OU 7 ROD:

- Screen approximately 5,000 cubic yards of stockpiled soil for metallic debris, with waste characterization of the metallic debris and screened soil.
- Dispose of the metallic debris (landfill disposal or metal recycling, depending on waste characterization results).
- Dispose of the screened soil (landfill disposal or use as backfill for the disturbed area at Site 2, depending on waste characterization results).

Remedy Implementation

The first action taken at Site 2 was decommissioning of six monitoring wells in August 1995 because they were no longer needed. In fall 1997, the stockpiled materials from Containment Cell Nos. 1 and 2 (both approximately 2,500 cubic yards) were loaded into a screen plant hopper to mechanically segregate the metallic debris from the soil. The screened soils from the two containment cells were stockpiled separately pending analytical results.

During the screening of Cell No. 2, metal objects were observed that appeared to be potential UXO items. One item was confirmed to be a potential UXO object and was turned over to the Explosive Ordnance Disposal Unit. A UXO specialist was on site to oversee the screening of the remaining stockpiled materials. No live ordnance was discovered during the remaining screening.

In addition, confirmed asbestos-containing material (ACM) was discovered (in bags) during the screening of Cell No. 1 materials. Inspection of the screened material revealed small pieces of ACM mixed with the soil placed at the lower end of the site. The ACM-containing soil was rescreened and the ACM pieces removed by hand. Analysis of the screened soil did not indicate the presence of asbestos fibers. The ACM was drummed and disposed of by NBK at Bangor.

Following stockpile segregation, samples of the screened soils from Cell Nos. 1 and 2 were sampled and analyzed for PCBs for disposal characterization. Remediation was completed in December 1995, and the screened soils and metal debris were properly disposed of by NBK at Bangor at a permitted landfill. Ecology reviewed the final closeout report and determined that the Site 2 remedial action had been completed in accordance with the OU 7 ROD (Ecology 1998).

4.5.4 Site 10

Remedy Selection

The RAO for Site 10 was to prevent ingestion of groundwater containing TPH concentrations above the MTCA Method A groundwater cleanup level of 1 mg/L throughout the aquifer.

To achieve this objective, the following remedial action components were specified for Site 10 in the OU 7 ROD:

- Conduct confirmatory groundwater monitoring.
- Establish institutional controls to restrict groundwater use.

If TPH contamination in Site 10 groundwater was confirmed, further investigation would be undertaken.

Remedy Implementation

The first 5-year review (U.S. Navy 2000a) found that the two remedy components for Site 10 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). Groundwater samples were collected from well 10MW01 and analyzed for diesel- and oil-range (residual-range) petroleum hydrocarbons using method NWTPH-Dx. Petroleum hydrocarbons were not detected in the groundwater samples collected on either date at concentrations above the MTCA Method A groundwater cleanup level of 1.0 mg/L (U.S. Navy 2002). This sampling event satisfied the first component of the remedy for Site 10 as established in the OU 7 ROD, and no further sampling has been conducted at Site 10. Ecology concurred with the decision to not continue monitoring at Site 10.

The ICMP for NBK at Bangor was finalized on August 28, 2001, and includes ICs for Site 10. Because of the proximity of Site 10 to OU 8, Site 10 is included in the area covered by the ICs for OU 8. The ICs for OU 8 and Site 10 meet the requirements of this component of the remedy for Site 10 as established in the OU 7 ROD.

Operation, Maintenance, and Monitoring

After completion of the final groundwater sampling round in July 2001, no further active operation, maintenance, or monitoring has been required beyond periodic IC inspections and reporting. IC inspections that included the area of Site 10 have been conducted since adoption of

the ICMP in 2001. The available records imply annual inspections and reporting, although a complete set of annual inspection reports is not available in the record.

4.5.5 Site 26

Remedy Selection

The RAO for Site 26 was to confirm that chemical concentrations in the biologically active zone of the Hood Canal sediments are not increasing.

To achieve this objective, the following remedial action components were specified for Site 26 in the OU 7 ROD:

- Complete at least two sediment sampling and analysis events over a 5-year period at Service Pier, Keyport/Bangor (K/B) Dock, and Marginal Wharf. In addition, sediment and clam tissue monitoring will be completed at Floral Point to confirm that chemicals in groundwater from Site B are not adversely affecting the marine environment
- Evaluate trends in detected chemical concentrations. If contamination is observed to increase in concentration and/or areal extent, the need for additional source control activities, additional sediment sampling, and/or implementation of engineered sediment controls will be assessed. The sediment quality sampling and data review will be conducted in accordance with the Washington State SMS.

Remedy Implementation

The original Site 26 sediment and tissue monitoring program (U.S. Navy 1996a) was developed based on review of the RI data (1991–1992) and discussions at a March 1996 meeting of interested parties.

The overall monitoring program for Site 26 has been modified as portions of the site have met the RAOs in the OU 7 ROD. During the RI/FS phase, Site 26 consisted of eight marine areas, including the area offshore of Floral Point (Figure 1-2). The OU 7 ROD required future sampling at four of these areas: Floral Point, Marginal Wharf, K/B Dock, and Service Pier. In 1996, sediment samples were obtained from multiple stations at each of these four marine areas (U.S. Navy 1996a). At Floral Point, clam tissue samples were collected in addition to the sediment samples.

For the 1998 sampling effort, sampling at some marine areas was eliminated entirely and the number of sampling stations at other marine areas was reduced based on the results from the 1996 analysis. The eliminated stations and/or marine areas were those where COCs were not detected at concentrations exceeding the SQS. The modifications to the Site 26 sampling program were made by the Navy with the concurrence of Ecology. Completion of the 1998 monitoring event fulfilled the OU 7 ROD requirement for monitoring at Site 26. However, Ecology requested continued monitoring at some marine areas (including Floral Point) as part of the 5-year review process, finding that (Ecology 1999b):

- No further monitoring is required for Service Pier and Marginal Wharf to satisfy the OU 7 ROD requirements
- An additional surface sediment sample should be collected at MS70 near K/B Dock to confirm the 1998 BEHP detection (108 mg/kgoc). If BEHP in the additional sample exceeds the cleanup screening level (CSL), additional source control, additional sampling, and/or engineered sediment controls will be assessed, in accordance with the OU 7 ROD.
- Because hazardous substances have been left in place at Floral Point, long-term monitoring of sediment and clam tissue near Floral Point is required (once every 5 years for the 5-year review) and should be included as a component of the Final O&M Plan for Floral Point.

To fulfill Ecology's request, samples were collected from Floral Point and K/B Dock in October 2000 in support of the first 5-year review (U.S. Navy 2001b). Following this sampling event, future sampling was required only for Floral Point (U.S. Navy 2001b).

During these modifications to the overall Site 26 monitoring program, the number of sediment and clam tissue sampling locations for Floral Point was unchanged (U.S. Navy 2001b). A fourth sampling event was conducted in October 2004 at Floral Point in support of this second 5-year review. This sampling event is discussed below in the subsection *Operation, Maintenance, and Monitoring*.

Operation, Maintenance, and Monitoring

The only operation, maintenance, or monitoring tasks conducted at Site 26 since the first 5-year review in 2000 consist of sediment and clam tissue sampling at Floral Point. One sampling event was conducted in fall 2004 in support of this second 5-year review. This 2004 sampling event is described here, with the results discussed in Section 6.4.

Floral Point Monitoring Objective and Rationale. The monitoring objective for Floral Point was to assess whether site groundwater discharge is impacting the marine environment. To satisfy this objective, the 2004 sampling event included collection and chemical analysis of sediment and clam tissue at previously sampled locations at the beach and subtidal areas of Floral Point.

The OU 7 ROD identified five metals (cadmium, copper, lead, nickel, and zinc) and three pesticides (endrin, heptachlor, and gamma-chlordane) as present in Site B groundwater above marine water quality standards. Based on these findings, sediment and clam tissue samples collected during the 2004 monitoring event were analyzed for metals, pesticides, and PCBs. To allow comparison with previous sampling events, sediment samples were also analyzed for various physical parameters, such as total organic carbon, total solids, and grain size distribution, and clam tissue was analyzed for percent lipids.

Floral Point Sampling Stations. There are five sampling stations in the intertidal and subtidal marine areas off Floral Point: MS07, MS08, MS83, MS107, and MS109 (Figure 4-1). The sampling stations were selected during previous sampling events to monitor the potential adverse impacts of groundwater containing COCs on the marine sediments and biologically active zone. Four of the stations are shown in historical records as being located above or near the estimated low water line (Figure 4-1), whereas one station (MS07) is shown located in approximately 18 feet of water. The stations above or near the low water line are considered intertidal stations; MS07 is considered a subtidal station. Because MS08 is very near the low water line, previous sampling plans have designated this station variously as subtidal or intertidal. For consistency with the original designation in the RI, the 2004 sampling event considered MS08 to be an intertidal station.

Field Activities During 2004 Sampling. Sediment and clam tissue sampling was conducted on October 20, 2004, and October 27–28, 2004. Either sediment or clam tissue, or both, was collected from each of the five sampling stations (Figure 4-1). Sediment samples were collected at stations MS07, MS08, MS83, and MS109. Clam tissue sampling was attempted at stations MS107 and MS109, where clams had been previously sampled. Because the substrate habitat in the area of MS107 has changed (gravel content has increased) since the previous sampling event, no clams were found at this station.

Samples were collected as near as possible to the historical sampling locations. Historical records of past sampling events did not always agree with regard to the exact location of sampling stations, however. The field crew reviewed sampling station coordinates available in the Navy's Technical Data Management System and reviewed published reports of previous sampling to identify sampling stations. The field crew then used best judgment in the field to

locate stations. Sampling station locations used in 2004 were recorded using a differential global positioning system (DGPS). Sampling records are included in Appendix B.

The sediment sample from subtidal station MS07 was hand-collected by a Navy diver on October 20, 2004. Station MS07, when reoccupied using past DGPS readings, was found to be in approximately 70 feet of water, as opposed to 18 feet of water as documented during past sampling. Before accepting the 2004 DGPS location, the field team visually compared the vessel location to past sampling station maps and found the location to be correct within the limits of visual estimation.

Sediment and clam tissue samples from intertidal stations were planned to be collected on October 21, 2004. However, the DGPS instrument failed (because of a faulty power switch) at the beginning of sampling, and the sampling event was rescheduled for October 27–28, 2004. Sampling was conducted at a near zero tide, which occurred near midnight on October 27. Station MS08 was historically reported to be located at the low water line (U.S. Navy 1994) and was reported to be in 1.5 feet of water during 7-foot tide conditions in 2000 (U.S. Navy 2001b). During the 2004 sampling event, however, the MS08 station location was found to be in more than 2 feet of water at a zero tide and was not accessible by foot. The nearest accessible beach location was sampled, within approximately 85 feet of the original 1991 sampling location (U.S. Navy 1994). Stations MS109, MS107, and MS83 were located by measuring from remaining landmarks identified in the 2000 sampling report (U.S. Navy 2001b). The DGPS measurements for these locations were then recorded.

Deviations From Sampling Plan. Sampling was conducted in accordance with the procedures and protocols detailed in the sampling and analysis plan and quality assurance plan (U.S. Navy 2004g). The substantive variances from the plans were as follows:

- The sediment core device exhibited poor sample recovery under the site-specific conditions at subtidal station MS07, so the diver collected the sample directly with a stainless steel spoon. This sample collection method was the same as that used historically and in 2004 for intertidal sediment (beach) sampling.
- The historical DGPS coordinates for station MS08 placed the station in water too deep to be accessible by foot (which did not match the historically reported water depths), so the nearest accessible location was sampled.
- No clams were found at station MS107, so multiple clam samples from station MS109 were analyzed. As noted in the report for sampling in 2000 (U.S. Navy 2001b), this is most likely the result of beach habitat changes since the time of the initial sampling events.

Sample Analysis. Sediment samples were analyzed for the following:

- TAL metals (23 metals including mercury) (EPA Methods 6010B, 6020, and 7471A)
- Pesticides/PCBs (EPA Methods 8081A and 8082)
- Total solids (EPA Method 160.3 Modified)
- Total volatile solids (EPA Method 160.4 Modified)
- N-ammonia (EPA Method 350.3 Modified)
- Sulfide (EPA Method 376.2 Modified)
- Total organic carbon (EPA Method 9060 Modified for Puget Sound Estuary Program [PSEP])
- Grain size distribution (sieve and hydrometer—Method PSEP)

These analytical methods were selected to match the methods used during past sampling events, except that analysis for preserved total solids was not performed. Analysis of preserved total solids was not necessary because preservative was not used in the sample container for sulfide analysis.

The clam tissue samples were analyzed for the following:

- TAL metals (23 metals including mercury) (EPA Methods 6010B, 6020, and 7471A)
- Pesticides/PCBs (EPA Methods 8081A and 8082)
- Percent lipids (EPA 3540/NOAA)

The results of the 2004 sampling event are discussed and compared to the results of previous sampling at Floral Point in Section 6.4.

4.6 OU 8

4.6.1 Remedy Selection

The following RAOs were established in the OU 8 ROD:

- 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 site-wide groundwater that would result in adverse noncancer health effects or unacceptable cancer risks.

The following remedial action components were selected to meet these RAOs:

- Monitor natural attenuation of COCs in groundwater.
- Consider phased contingent actions if monitored natural attenuation (MNA) is shown to be insufficient, including the possible use of oxidation reduction potential (redox) 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 0.5 gallon per month for a 1-year period.
- Establish ICs for OU 8, both on and off base.

In addition to these remedy components for OU 8, the OU 8 ROD formally established ICs for other sites at NBK at 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 Navy developed “general requirements and procedures to implement two of the selected remedies specified in the Final OU 8 Record of Decision” in January 2001 (U.S. Navy 2001d). The two components of the remedy addressed were MNA and passive LNAPL recovery. Detailed project plans for conducting MNA were also prepared in late 2000 and early 2001 and

amended in 2002 (U.S. Navy 2004b, page 1-1). The MNA component of the remedy was initiated in October 2000.

Phased contingent actions were included as part of the selected remedy for OU 8 and were to be implemented only if MNA was shown to not be meeting cleanup goals. No phased contingent actions have been implemented since signing of the OU 8 ROD. The Navy has continued to inspect and maintain the groundwater extraction and treatment system previously installed as a removal action, so this system could be restarted as a contingent action if necessary (U.S. Navy 2000b).

The Navy began the LNAPL removal component of the OU 8 remedy in January–February 2001, when a passive LNAPL skimming pilot test was conducted. Passive skimmers were installed in wells VS2, VS7, VS8, VS10, VS12, MW05, and 8MW49 and serviced at 1- to 3-day intervals over a 16-day period. LNAPL was also bailed from the wells with the greatest LNAPL thickness (including VS4, in which a skimmer could not be installed because of a constriction near the top of the well casing). Nearly 15 gallons of LNAPL were recovered during the pilot test, 9 by bailing and 6 by skimming (U.S. Navy 2001c).

Based on the success of the pilot test, the Navy began continuous operation of the eight passive skimmers on April 24, 2001 (Foster Wheeler 2003) and implemented an operation and maintenance plan for the skimming system (U.S. Navy 2001c).

The Navy prepared an ICMP for all of NBK at Bangor in 2001 (U.S. Navy 2001a). The ICMP satisfied the IC remedy component for OU 8, as well as addressing ICs for other OUs where ICs were not originally included in the RODs. The site names, OU designations, and media for which ICs were established in the ICMP are listed in Table 4-1.

Under the ICMP, the Navy established ICs as part of the Navy Installation Restoration Program. The procedures in the ICMP require the following:

- Notifying planners and other Navy personnel about the environmental conditions of the property that is encumbered by ICs
- Limiting land use to nonresidential and outdoor recreational uses in designated areas
- Providing a process for inspection and maintenance of ICs and engineering controls

- Providing tracking information to regulators that the land use remains consistent with restrictions placed upon them by selected ICs

The ICs for each area covered under the ICMP are described in detail in the ICMP and the boundaries of each area are shown on figures in the ICMP. The ICMP established procedures for annually inspecting each area subject to ICs and documenting the inspections using a checklist provided in the ICMP, field notes, and photographs. Contingency inspections were also required in the event that information indicated that an IC might have been compromised at an IC area. Any deficiencies (such as damaged signs) were to be noted and corrected through the NBK at Bangor work-order process. The ICMP provided for updates to the ICs as necessary over time, with the concurrence of Ecology and EPA.

4.6.3 Operation, Maintenance, and Monitoring

MNA monitoring was initially conducted quarterly, with the frequency decreased to semiannually after November 2001. Detailed reports of monitoring results have been prepared for each monitoring round (e.g., U.S. Navy 2004b), with annual MNA evaluation reports also prepared for 2001 and 2002 (TEC 2003).

The operation and maintenance (O&M) manual for the passive LNAPL recovery system (U.S. Navy 2001c) calls for periodic maintenance and monitoring with frequency such “that the collection chambers are not completely filled at the time of servicing.” Performance monitoring results are to be reported on a monthly basis. Some monthly reports are readily available in Navy files, with the most recent on file being January 2003 (Foster Wheeler 2003).

In September 2004, the Navy reviewed the overall performance of the LNAPL recovery system and concluded that the ROD goals for LNAPL recovery had been met. The September 2004 point paper (U.S. Navy 2004c) also notes that “Optimization of product recovery was routinely conducted on a well-specific and site-wide basis in efforts to maximize the rate at which LNAPL is removed from the subsurface.” The Navy ceased LNAPL recovery efforts in June 2004 but continued LNAPL thickness measurements (U.S. Navy 2004c). Ecology concurred with the conclusion that the endpoint criteria had been reached in a letter dated November 2, 2004.

The Navy has conducted annual inspections of the ICs in accordance with the ICMP. Documentation of the inspections is kept by NBK at Bangor and was available for review during this 5-year review.

The inspection checklist from August 4, 2004, reports the following conditions:

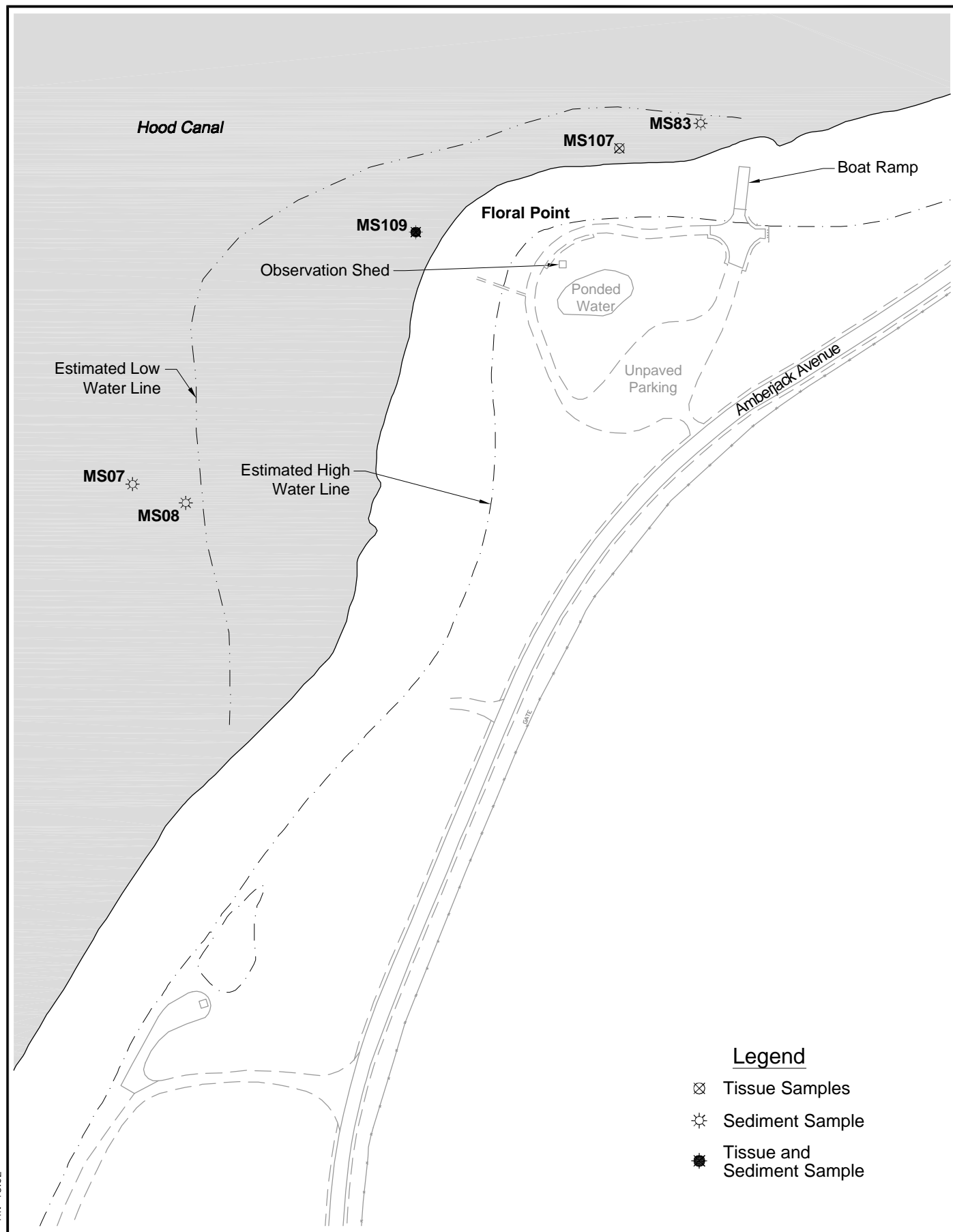
- A review of the ICMP and records for the past year was conducted prior to the field inspection.
- No contingency inspections were required during the year.
- The land uses at the Site A burn area and the Site A Debris Area 2 were consistent with the ICMP requirements.
- No wells had been installed at the Site A burn area for any purpose other than cleanup activities.
- There was no indication of damage to the leach basin liner and no evidence of excavation at the Site A burn area or the Site A Debris Area 2.
- The signage and vegetation at the Site A Debris Area 2 were in good condition.
- The land use at Site F was consistent with the requirements of the ICMP.
- No wells had been installed at Site F for any purpose other than cleanup activities.
- No cracking of the asphalt cap at Site F was observed.
- No weeds were observed growing through the asphalt cap at Site F.
- There was no residential construction at Site 16/24, and no evidence of excavation activities.
- The land use at Site B was consistent with the requirements of the ICMP.
- No erosion was occurring on the Site B vegetated soil cover.
- Some shoreline erosion at Site B was implied by the measurements made during the inspection.
- The gravel cover thickness on the Site B landfill surface remained sufficient.
- The land use at OU 8 was consistent with the requirements of the ICMP.

- No wells had been installed at OU 8 for any purpose other than cleanup activities.
- The Bremerton/Kitsap County Health District has been receiving OU 8 monitoring reports.
- The Bremerton/Kitsap County Health District has not approved potable water well drilling within the OU 8 restricted area.

The IC requirement for controlling land use at OU 8 results in control over potential new inhalation exposure pathways by controlling the type and use of structures in the area of the benzene plume.

The ICMP did not require reporting of the annual IC inspections to regulatory agencies, but stated that the IC inspection files were open for agency review (U.S. Navy 2001a).

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Legend

- ⊗ Tissue Samples
- ☼ Sediment Sample
- ★ Tissue and Sediment Sample

U.S. NAVY

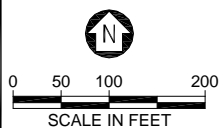


Figure 4-1
Floral Point Marine Sediment and
Tissue Sampling Locations

DO 0040
NBK at Bangor
SECOND 5-YEAR
REVIEW

Table 4-1
Summary of Areas and Media Subject to Institutional Controls

Site Name and Operable Unit	Media for Which ICs Are Established
Site A burn area (OU 1)	Groundwater and leach basin liner
Site A Debris Area 2 (OU 1)	Soil
Site F (OU 2)	Groundwater and protection of infiltration barrier
Site 16/24 (OU 3)	Soil
Site B (OU 7)	Soil
Site E/11 (OU 7)	Groundwater
Public Works Industrial Area (OU 8 on base)	Groundwater
Mountain View neighborhood (OU 8 off base)	Groundwater

Source: U.S. Navy 2001a

Notes:

ICs - institutional controls

OU - operable unit

5.0 PROGRESS SINCE LAST 5-YEAR REVIEW

Since the first 5-year review in 2000, the Navy has completed OU 8 remedy installation and implemented the required monitoring programs. The Navy has also prepared and implemented the site-wide ICMP required in the OU 8 ROD. Implementation of the ICMP addressed one of the two issues identified by the first 5-year review—the lack of formal groundwater use restrictions for Sites 10 and E/11. The Navy also addressed the second issue by completing sampling and analysis for petroleum hydrocarbons in groundwater samples from Site 10. Table 5-1 summarizes the progress toward resolving the two issues.

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

Issues from Previous Review	Recommendations/ Follow-up Actions	Milestone Date	Actions Taken and Outcome	Date of Action
Lack of formal groundwater use restrictions for Sites 10 and E/11	Include groundwater use restrictions in base-wide ICMP. Restrictions should include Sites 10, E/11, A, F, and 25. The ICMP should also include ICs that protect the Site F infiltration barrier and the Site B soil cover.	12 months from signing of OU 8 ROD	ICMP finalized and implemented. Inspections are ongoing and being documented.	August 28, 2001
Lack of analysis for TPH in Site 10 groundwater samples	Collect two rounds of groundwater samples from Site 10 well 10MW01 and analyze for TPH.	First round by end of 2000	Conducted two rounds of groundwater sampling and analysis at Site 10, with no petroleum contamination detected above MTCA Method A cleanup levels.	November 6, 2000, and July 17, 2001

Notes:

ICs - institutional controls
 ICMP - institutional controls management plan
 MTCA - Model Toxics Control Act
 OU - operable unit
 ROD - Record of Decision
 TPH - total petroleum hydrocarbons

6.0 FIVE-YEAR REVIEW PROCESS

6.1 FIVE-YEAR REVIEW TEAM

The Navy is the lead agency for this 5-year review. Personnel from NAVFAC NW and NBK at Bangor represented the Navy in this 5-year review. Project managers and other staff from the EPA and Ecology, the other 5-year review team members, have participated in the review process. Both the EPA and Ecology are cosignatories of the RODs for NBK at Bangor. All team members had the opportunity to provide input to this report.

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 that the public be notified of proposed cleanup plans and remedial actions. The community notification and involvement activities are described in the subsections below.

6.2.1 History of Community Involvement

The Navy has maintained an ongoing commitment to community involvement since the time of the first investigations at NBK at Bangor. The Navy has a written community relations plan that is available for public review and is updated periodically. 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 at Bangor was established in 1995 to provide community input to remediation activities at NBK at Bangor. The RAB members include representatives of the Navy, regulatory agencies, civic groups, private citizens, tribal governments, local governments, and environmental activist groups.

6.2.2 Community Involvement During Second 5-Year Review

A notice was published by the Navy on October 11, 2004, in the *Kitsap Sun* and on October 15, 2004, in the *Northwest Navigator* informing the public that the site is currently undergoing a 5-year review; when, where, and how they could receive information; and how to provide comments on the protectiveness of the remedy. Also, interested community members selected from the RAB were interviewed as part of the site interview process described in Section 6.6.

Other than interview responses (Appendix E), the Navy received no comments or inquires as a result of the public notification.

6.3 DOCUMENT REVIEW

Documents reviewed during this 5-year review were those describing the construction and monitoring of the selected remedies, the RODs describing the selected remedies, and the ICMP for NBK at Bangor.

The primary documents that were reviewed are listed below.

- The signed RODs (OUs 1, 2, 3, 6, 7, and 8) (U.S. Navy, USEPA, and Ecology 1991a, 1994d, 1994a, 1994c, 1996, 2000a)
- The first 5-year review for NBK at Bangor (U.S. Navy 2000a).
- Various reports showing completion of remedial action components for OU 8 (U.S. Navy 2000b, 2001d, 2001a)
- O&M and monitoring reports for OUs 1, 2, 7, and 8 (U.S. Navy 2004b, 2004c, 2004d, 2004f, 2002, 2001b, 1999b)
- IC implementation/monitoring documentation provided by NBK at Bangor environmental department (unpublished)
- The USGS report on biodegradation of RDX (USGS undated)
- The report on treatment plant optimization (U.S. Navy 2004e)
- Updated cost data documented in the NAVFAC NW cost database (unpublished)

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

6.4 DATA REVIEW

This section summarizes trends in data collected through the various monitoring programs at NBK at Bangor, with emphasis on data collected since the last 5-year review. The monitoring

programs are described in Section 4, and the implications of the data on the functionality and protectiveness of the remedies are discussed in Section 7.

The data trends are discussed in the subsections that follow by OU, area, and medium.

6.4.1 Groundwater Contaminant Trends at OU 1 (Site A)

Concentrations of RDX, 2,4,6-TNT, 2,6-DNT, and 2,4-DNT measured in groundwater samples collected from Site A monitoring and extraction wells from May 1994 through August 2004 are summarized in Table 6-1. Well locations are shown on Figure 3-2 of Appendix A. Ordnance-related compound concentrations in the core of the groundwater plume (wells A-MW46, A-MW37, A-EW7, A-EW8, and A-MW49) have not exhibited any strong increasing or decreasing trends over the last 5 years. RDX concentrations in the core of the plume have remained in the range of 120 to 710 $\mu\text{g/L}$ between February 2000 and August 2004. The RG for RDX at Site A is 0.8 $\mu\text{g/L}$. The lateral extent of the plume core has also been consistent over the last 5 years (U.S. Navy 2004h). RDX, TNT, and DNT have all been detected historically (and are still detected) in perched groundwater beneath the site; however, only RDX has been detected in shallow groundwater below the perched groundwater.

New wells A-MW49 through A-MW55 were installed in April 2002 to help assess the lateral extent of ordnance-related compounds in shallow groundwater and possible alternative remediation strategies. RDX has been consistently detected in two of the new wells installed downgradient of the north-south line of extraction wells (A-MW49 and A-MW54). RDX concentrations at A-MW54 have been consistently low (1.5 to 2.5 $\mu\text{g/L}$), whereas concentrations at A-MW49 have been the highest measured at the site over the last 5 years (350 to 500 $\mu\text{g/L}$).

Over the past decade, monitoring of two Site A shallow aquifer monitoring wells (A-MW28 and A-MW30) located near the northern base boundary has showed no detectable RDX. The monitoring data demonstrate that the plume is not approaching the northern base boundary, and that drinking water wells in Vinland are not threatened by Site A contaminants.

RDX has not been detected in new wells A-MW50 through A-MW52, located along Tinosa Road approximately 350 to 500 feet downgradient of the leach basin (Figure 3-2 in Appendix A). These new wells, in combination with older wells at the site, delimit the maximum downgradient extent of ordnance compounds in shallow groundwater. No substantive change in the overall plume boundaries has been observed since the new wells were installed in 2002.

Monitoring of the treatment system indicates that through December 2003, approximately 29 pounds of RDX have been removed (since 1997). Between November 1999 and July 2004 the average cost per pound at RDX removed was \$250,000 (U.S. Navy 2004e). The treatment system treated approximately 1.4 million gallons of water in 2003 (U.S. Navy 2004d).

The RDX degradation studies conducted by the USGS over the last 5 years indicate that in situ biodegradation may contribute substantially to natural attenuation of RDX within Mn(IV)-reducing portions of the shallow aquifer at Site A (U.S. Navy 2004d). The USGS investigations included both laboratory-microcosm experiments on the potential for RDX biodegradation under different redox conditions using radio-labeled RDX and Site A aquifer sediments (Bradley and Dinicola, in press) and field sampling of geochemicals at Site A wells to determine groundwater redox conditions (U.S. Navy 2004d). General findings of the 2002 microcosm study performed by USGS include the following:

- The experiments clearly demonstrated the potential for effective RDX biodegradation in predominantly metals-reducing aquifer sediments, and the manganese-reducing redox conditions inferred from the field data collected from some wells at Site A suggest that in situ biodegradation of RDX may contribute substantially to natural attenuation of RDX.
- Biodegradation is not expected to significantly degrade RDX in the oxic portions of the shallow aquifer at NBK at Bangor.

General findings of the field investigation of redox conditions include the following:

- Anaerobic (Mn[IV]-reducing) conditions favorable to biodegradation of RDX were identified in wells located hydraulically downgradient of the RDX plume.
- The apparent lack of accumulation of the characteristic RDX-reduction products (MNX, DNX, and TNX) in both the microcosm experiments and the field data, and the near complete mineralization of ^{14}C -RDX in the experiments to a nondiagnostic product, $^{14}\text{CO}_2$, indicate that a reliance on the accumulation of diagnostic intermediates as an indicator of in situ RDX biodegradation is problematic under in situ conditions at NBK at Bangor.
- Multiple lines of evidence would be needed during monitoring to demonstrate biodegradation of RDX.

6.4.2 Groundwater Contaminant Trends at OU 2 (Site F)

Tables 6-2, 6-3, and 6-4 present the RDX, TNT, and DNT concentrations in groundwater beneath Site F from December 1994 (startup of the extraction and treatment system) through July 2004. Figure 2-1 in Appendix A depicts the approximate extent of RDX in the shallow aquifer, based on the data from July 2004.

Ordnance-related compound concentrations measured in Site F extraction wells have exhibited an overall declining trend since the first 5-year review (U.S. Navy 2004i). This continues a declining concentration trend that began with startup of the groundwater extraction and treatment system. RDX concentrations in extraction wells ranged from 15 to 420 $\mu\text{g/L}$ between January 2000 and July 2004, compared to an RG of 0.8 $\mu\text{g/L}$. TNT and DNT concentrations ranged from not detected to 210 $\mu\text{g/L}$ and not detected to 9.7 $\mu\text{g/L}$, respectively, during the same time period, compared to RGs of 2.9 $\mu\text{g/L}$ and 0.13 $\mu\text{g/L}$, respectively. Although ordnance-related compound concentrations in extraction wells have declined since system startup, and continue to decline, concentrations remain above the RGs and are exhibiting an asymptotic trend in recent years (U.S. Navy 2004e).

Ordnance-related compound concentrations measured in Site F monitoring wells nearer the source have exhibited an overall declining trend since the first 5-year review, whereas select wells analyzed further from the source near the midline of the plume (F-MW39, F-MW48) exhibit a statistically slight upward trend (U.S. Navy 2004e). The last three monitoring events also imply a slight upward trend in RDX concentrations at F-MW44, located near the western boundary of the plume. RDX concentrations in monitoring wells have ranged from not detected to 3,800 $\mu\text{g/L}$ between January 2000 and July 2004. TNT and DNT concentrations ranged from not detected to 5,800 $\mu\text{g/L}$ (TNT) and 366 $\mu\text{g/L}$ (DNT) over this same period.

RDX concentrations exceeding the RG were detected during the first sampling event (October 2003) of new wells F-MW67 and F-MW68, located approximately 1,200 feet beyond the hydraulic barrier created by the reintroduction wells ("F-IW" wells on Figure 2-1 in Appendix A). The detection of RDX in this location, in combination with the slightly upward RDX concentration trends in some monitoring wells, implies that the plume may be migrating in spite of continuing operation of the treatment system. Comparison of contaminant distribution maps from 1992 and 2004 also supports this conclusion (U.S. Navy 2004e).

Monitoring of the treatment system indicates that between October 1994 and March 2004, approximately 4,100 pounds of RDX have been removed. The cost per pound of RDX removed has increased by approximately 25 percent in the past 3 years to \$1,250 per pound (U.S. Navy 2004e). The treatment system has treated approximately 2.7 billion gallons of water from system startup through August 30, 2004 (U.S. Navy 2004j).

6.4.3 Contaminant Trends at OU 7 (Sites E/11, 10, and 26)

Site E/11

Except for the January 2000 sampling event, Otto fuel has been consistently detected in wells E-MW21U and E-MW23U at concentrations up to 1.0 mg/L, marginally above the 0.2 mg/L RG (Table 6-5). In January 2000 Otto fuel was not detected in either well above 0.10 µg/L. Since the first 5-year review in 2000, Otto fuel concentrations have ranged from 0.40 to 0.87 µg/L. Although the March 2003 Otto fuel concentrations are the lowest measured since January 2000, no strong decreasing or increasing trend in Otto fuel concentrations is evident.

Site 10

As discussed in Section 4.5.4, groundwater samples were collected from well 10MW01 on November 6, 2000, and July 17, 2001 and analyzed for diesel- and oil-range (residual-range) petroleum hydrocarbons using method NWTPH-Dx. Petroleum hydrocarbons were not detected in the groundwater samples collected on either date at concentrations above the MTCA Method A groundwater cleanup level of 1.0 mg/L (U.S. Navy 2002). This sampling event satisfied the first component of the remedy for Site 10 as established in the OU 7 ROD, and no further sampling has been conducted at Site 10.

Site 26

Analytical data from the October 2004 sampling event at Site 26 in the area of Floral Point (Site B) are presented in Appendix C. The data are also summarized and compared to historical results in Tables 6-6 through 6-9.

Results for Sediment Samples. The analytical results for sediment samples from the intertidal and subtidal areas of Floral Point are consistent with those reported for sampling in this area since 1991. None of the metals concentrations exceeded the relevant SMS values. As has been the case since sampling began, many of the metals concentrations reported for the October 2004 sampling event exceeded the background screening values (BSVs) established in the RI. For the five metals of particular interest (cadmium, copper, lead, nickel, and zinc, as discussed in Section 4.5.5), only cadmium at location MS07 exceeded the BSV by more than three times (cadmium was reported at 0.311 mg/kg as compared to a BSV of 0.05 mg/kg). The cadmium concentration remains an order of magnitude below the SMS values, and October 2004 concentrations of the other four metals of interest were one to two orders of magnitude below the SMS values. Metals concentrations at MS07 showed the largest variation from past sampling results. As discussed in Section 4.5.5 and below under *Results of Physical Parameter Analysis*, the sampling location for MS07 may be slightly different than it was in the past. Variations in

metals content compared to past sampling results may therefore reflect spatial variation as opposed to a temporal variation. For all metals analyzed at all locations, no strong increasing or decreasing concentration trends are apparent. If groundwater transport of metals was affecting sediment in the area, an increasing concentration trend of one or more metals should be apparent.

In the October 2004 sediment sample analysis, low estimated concentrations of some pesticides were reported. In all cases, these reported concentrations were below the historical detection limits (Table 6-7). The reported detections of pesticides at locations where pesticides were not detected historically appears to be indicative only of a change in achievable detection limits and not an increase in pesticide concentrations over time. Of the three pesticides of interest (endrin, heptachlor, and gamma-chlordane), only heptachlor was detected during the October 2004 sampling event—at station MS08 at a concentration of 0.53J $\mu\text{g/kg}$ (“J” denotes an estimated concentration). Heptachlor was also identified in a sample from this station in November 1991, at a concentration of 0.42NJ $\mu\text{g/kg}$ (“NJ” denotes the analyte was tentatively identified at the estimated concentration shown). Heptachlor was not detected in samples from this station in 1996, 1998, or 2000, with detection limits ranging from 0.92 to 0.95 $\mu\text{g/kg}$. No increasing concentration trend is evident in the pesticide data. If groundwater transport of pesticides was affecting sediment in the area, an increasing concentration trend of one or more pesticides should be apparent.

As was the case for the historical sampling events, PCBs were not detected in the sediment samples during the October 2004 sampling event.

Results for Tissue Samples. Similar to the sediment sample results, the analytical results for clam tissue at Floral Point are similar to those reported for sampling in this area since 1992. The concentrations of most metals were within or very near the range historically reported. The concentrations of four metals were the highest reported to date, by very low margins (generally in the range of 0.001 mg/kg). The reported cadmium concentration was the highest reported to date by the widest margin. The October 2004 concentration was 0.315 mg/kg in littleneck clam tissue from location MS109, compared to historical results of 0.29 mg/kg in 1996 and 2000. As has been the case since sampling began, many of the metals concentrations reported for the October 2004 sampling event exceeded the BSVs established in the RI. The October 2004 metals concentrations did not exceed 3 times the BSV for any metal. For all metals analyzed, no strong increasing or decreasing concentration trends are apparent. If groundwater transport of metals was affecting clam tissue in the area, an increasing concentration trend of one or more metals should be apparent.

Similar to the sediment results, low estimated concentrations of some pesticides were reported in the October 2004 clam tissue samples. These reported concentrations were below the historical detection limits (Table 6-9). The reported detections of pesticides at locations where pesticides

were not detected historically appears to be indicative only of a change in achievable detection limits and not an increase in pesticide concentrations over time. None of the pesticides of interest (endrin, heptachlor, and gamma-chlordane) were detected during the October 2004 sampling. No increasing concentration trend is evident in the pesticide data. If groundwater transport of pesticides was affecting clam tissue in the area, an increasing concentration trend of one or more pesticides should be apparent.

As was the case for the historical sampling events, PCBs were not detected in the clam tissue samples during the October 2004 sampling event.

Results of Physical Parameter Analyses. The results of the physical parameters measured during the October 2004 sampling event (lipid content of clam tissue, nitrogen as ammonia, grain size distribution, total organic carbon content, total solids, total volatile solids, and total sulfides) were generally similar to the results from previous sampling events (Appendix C). This similarity indicates that the samples collected in 2004 are comparable to those collected historically.

The most notable difference between the 2004 physical parameter results and past results is the grain size distribution at location MS07. At this location, the sediment was found to be substantially more silty than reported in 2000 (a silty sand versus a well-graded sand). This sampling station was also found to be in deeper water than previously reported (as discussed in Section 4.5.5, which comports with the finding of siltier sediment). It is likely that the sediment sample from this station was collected from a slightly different location than in past sampling events. The sample nonetheless appears to be representative of near-shore subtidal conditions off Floral Point.

The grain size distributions of the other three sediment samples were similar to past sampling results, with a poorly graded sand found at MS08, a poorly to well-graded gravel at MS109, and a well-graded gravel at MS83.

Data Quality and Usability. The laboratory and field-generated data collected in 2004 were validated in accordance with Section 5.0 of the quality assurance project plan (QAPP) (U.S. Navy 2004g, Appendix A). Laboratory data were validated by an independent, third-party validator and the validation reports are included in Appendix C. As a result of the validation review, the validator assigned qualifiers to some analytical results. No results were rejected by the validator. Some results were qualified as estimated (indicated by the “J” qualifier), most often because of individual exceedances of accuracy criteria, such as out-of-range surrogate recoveries, out-of-range continuing calibration verification standards, or detection of an analyte in the method blank. The qualification of some of the data values as “estimated” results in a negligible effect on the usability of the data set for this project.

The laboratory reporting limits for many of the sediment organic analytes were slightly higher than specified in the QAPP. However, the laboratory reported analytes detected between the laboratory reporting limit and the method detection limit and qualified the result as an estimated value ("J" qualifier). For PCB and pesticide analytes, the reporting limits achieved in 2004 are very similar to those achieved historically. Metals were generally reported as detected. Reporting limits were below screening levels or historical limits if reported as not detected.

For tissue samples, only the reporting limit for Aroclor 1221 was higher than that specified in the QAPP (20 µg/kg versus 10 µg/kg). Overall, the reporting limits for the sediment and tissue analyses are similar to the historical reporting limits and do not affect the usability of the data for the project objectives.

Relative percent difference (RPD) values were calculated for paired environmental samples and field duplicate samples to evaluate the precision of the field sampling program. RPDs were calculated only for those analytes detected above the reporting limit. The RPD report is included in Appendix C. For the majority of the analytes the RPD is well within the acceptable range specified in the QAPP (≤30 percent for metals, ≤40 percent for pesticides and PCBs, and ≤20 percent for most physical parameters). The exceptions were RPDs of 31 percent and 35 percent for barium and calcium, respectively, in the sediment sample pair from MS109, and an RPD of 51 percent for arsenic in the tissue sample pair from MS109. The results for these analytes were within the range historically found at the site, and the out-of-range RPD results do not affect the usability of the data for the project objectives. The grain size RPD exceeded the QAPP goal of ≤20 percent for most grain sizes, with RPDs up to 48 percent. These RPD goal exceedances reflect the inherent spatial variability of sediment grain size in the field and do not affect the usability of the data for the project objectives.

Equipment rinsate samples were taken both of the field sampling equipment and the laboratory equipment used during preparation of the clam tissue. Low concentrations of metals were detected in both rinsate blanks, and endrin aldehyde was detected in the laboratory rinsate blank. The analytes detected in the rinsate blanks were not detected in associated samples or were below the concentrations found in the samples. The analyte detections in the rinsate samples do not affect the usability of the data for the project objectives.

6.4.4 MNA and LNAPL Recovery Trends at OU 8

MNA Trends

Historical COC concentrations in groundwater samples from select wells at OU 8 are summarized in Table 6-10. Select sampling locations are shown on Figure 4-1 of Appendix A. Monitoring results since implementation of the remedy in 2000 indicate that the lateral and

vertical boundaries of the petroleum and chlorinated solvent plumes are stable (U.S. Navy 2004k).

The petroleum plume is generally confined to the shallow aquifer in the vicinity of the PWIA (U.S. Navy 2004b). The concentrations of benzene and toluene reported in the groundwater sample from well 8MW33 in April 2004 (Table 6-10) indicate that the leading edge of the petroleum plume (the plume boundary is defined as concentrations greater than 1 µg/L) has retreated approximately 100 feet upgradient since the time the ROD was signed (U.S. Navy 2004k). However, the benzene concentrations in wells 8MW06 and 8MW47, located in the core of the petroleum plume, have exhibited an increasing trend since at least March 2000, when operation of the SVE system ceased (Table 6-10).

The chlorinated solvent plume has a larger lateral and vertical extent than the petroleum plume (Figure 4-1 of Appendix A) and extends vertically into the intermediate aquifer (U.S. Navy 2004b). Monitoring since implementation of the remedy indicates that the plume is stable, not having migrated beyond its pre-ROD boundaries (U.S. Navy 2004b). Monitoring of natural biodegradation indicator parameters, such as dissolved oxygen content in groundwater, indicates the continued presence of conditions favorable to biodegradation of both petroleum and chlorinated solvents. Ratios of daughter products to primary chlorinated solvents also indicate ongoing biodegradation. The only substantive trend in natural biodegradation indicator parameter concentrations is the increase in dissolved oxygen concentrations in the core of the plumes. High dissolved oxygen concentrations inhibit reductive dechlorination of chlorinated solvents. To date no decreased biodegradation is discernible as a result of the increasing dissolved oxygen concentration (U.S. Navy 2004b).

COC concentrations continue to exceed the RGs in groundwater beneath OU 8. However, only the concentrations of DCA and dichloroethene (DCE) exceed the RGs at the property boundary of NBK at Bangor. No COC concentrations exceed the RGs in the Mountain View Road area (U.S. Navy 2004b).

The estimated biodegradation rate has remained relatively consistent since implementation of the remedy. The RI/FS included an estimate (based on the estimated degradation rate and mathematical modeling) that by 2008 COC concentrations in wells at the base boundary would be below MCLs (U.S. Navy 2004b).

LNAPL Recovery Trends

The post-ROD LNAPL recovery data for the PWIA are summarized in Table 6-11. As shown in this table, the recovery rates for 2002, 2003, and 2004 are all below the 0.5-gallon-per-month average specified in the ROD as the endpoint for this remedy component. Seasonal trends are

evident in the data, with greater product recovery typically observed in the spring. These trends appear to be associated with variations in groundwater elevation that influence the effectiveness of the skimmers (Foster Wheeler 2003). The total LNAPL recovered in the post-ROD period was 39.5 gallons (U.S. Navy 2004c).

6.5 RESULTS OF SITE INSPECTION

The site inspection checklists are included as Appendix D. This section contains a summary of the site inspection findings. The site visit occurred on September 23, 2004, and was conducted by the following personnel:

- Barbara Chafin-Tissier, NBK Installation Restoration (IR) Program Coordinator
- Daniel Gravning, NAVFAC NW Technical Representative
- Michael Meyer, URS Project Manager

The site visit included verifying that remedial actions were complete and operational (for those items that could be visually inspected) and inspecting all portions of the site covered by ICs.

At OU 1 (Site A), a visual inspection of the treatment plant was made, and the areas where ICs are required were visited. The treatment plant was found to be in good order and operational, with the O&M manual and records available on site. Documentation of O&M activities is performed through monthly technical progress reports. Visual evidence indicated that the IC requirements are generally being met. The “extensive stand of blackberries” that was reportedly planted in Debris Area 2 in 1995 (U.S. Navy 2000a) has apparently not survived. However, the area is now densely vegetated with a variety of plant species that discourage access. Warning signs were observed to be present and in good repair.

Similarly for OU 2 (Site F), a visual inspection of the treatment plant was made, and the areas where ICs are required were visited. The treatment plant was found to be in good order and operational, with the O&M manual and records available on site. Documentation of O&M activities is performed through monthly technical progress reports. Visual and record evidence indicated that the IC requirements are being met.

At OU 3 (Sites 16/24 and 25), the one site where ICs are required (Site 16/24) was visited and visually inspected. The land use observed was generally consistent with the ROD (parking and general storage), and there was no overt evidence of excavation activities. The site was fenced and locked. Two empty, properly labeled drums were observed on site during the inspection. These drums were subsequently removed.

No physical inspection was necessary at OU 6 because all remedy components are complete and ICs are not required.

At OU 7, the landfill cap at Floral Point was visually inspected, and records of Otto fuel sampling at Site E/11 were reviewed. Sediment and clam tissue sampling at Site 26/Floral Point was conducted separately from the site inspection (Section 4.5.5). Records of the landfill cap and IC inspections have been documented and were available for this review. The landfill cap appears to be in generally good condition although Scots Broom, an invasive plant species, was pervasive at the site. In addition to the invasive plants at the site, wave-cut scarps along the beach implied that some erosion was occurring. This observation led to further records review. Measurements by the Navy between October 2000 and July 2004 imply that wave action has caused an erosional scarp to encroach on the landfill over the last 4 years. The scarp location over time, based on measurements by the Navy, is shown on Figure 6-1.

Monitoring of Otto fuel concentrations in groundwater at Site E/11 has been conducted annually, except for 2004. Records imply that the 2004 sampling event for Otto fuels was not conducted.

The remedy for OU 8 was the only remedy implemented during this 5-year review period. Most of the remedy consists of monitoring, for which no physical inspection is required. The mothballed pump and treat system was visually inspected and observed to be in good condition.

Overall, the IC requirements are being met. As discussed in Section 4.6.3, IC inspections are being performed and documented yearly, and checklist documentation is available.

6.6 RESULTS OF INTERVIEWS

Interviews were conducted with persons familiar with the CERCLA actions at NBK at Bangor. Interviewees were selected from the Navy (both NAVFAC NW and NBK at Bangor), Navy contractors working at NBK at Bangor, the EPA, Ecology, Bremerton/Kitsap County Department of Health, and the community. Interview instructions and questions were sent to potential interviewees via e-mail; responses to questions were returned either by e-mail or telephone (at the discretion of the interviewee). Not all those invited to comment chose to do so. Interview responses are documented in Appendix E. Highlights of the interview responses are summarized in the following subsections.

6.6.1 Navy Personnel

In general, Navy personnel expressed the belief that the remedies, including ICs, were meeting the intent of the RODs and were protective of human health and the environment. Navy

personnel reported that the deficiency from the first 5-year review (monitoring at Site 10) had been resolved, that LNAPL recovery at OU 8 had reached the endpoint defined in the ROD and had been discontinued, and that IC inspections were conducted regularly. Navy personnel reported no complaints from the public. Navy personnel also reported that the treatment systems at Site A and Site F are aging. Mass removal at Site F is decreasing, and the Site A system is exhibiting poor mass removal effectiveness and poor cost efficiency. The Navy personnel opined that the Site A treatment system should be replaced with an alternative remedy consisting of land use controls and MNA.

6.6.2 Navy Contractors

Navy contractors reported on the scope and role of their work at NBK at Bangor, as well as the status of the monitoring and O&M for which they are responsible. Contractors involved with O&M of the Site F and Site A treatment systems reported increased maintenance requirements as the systems age. The contractors reported optimizing the two systems to the extent practicable and believe it is unlikely that Site A groundwater will be remediated using the existing system.

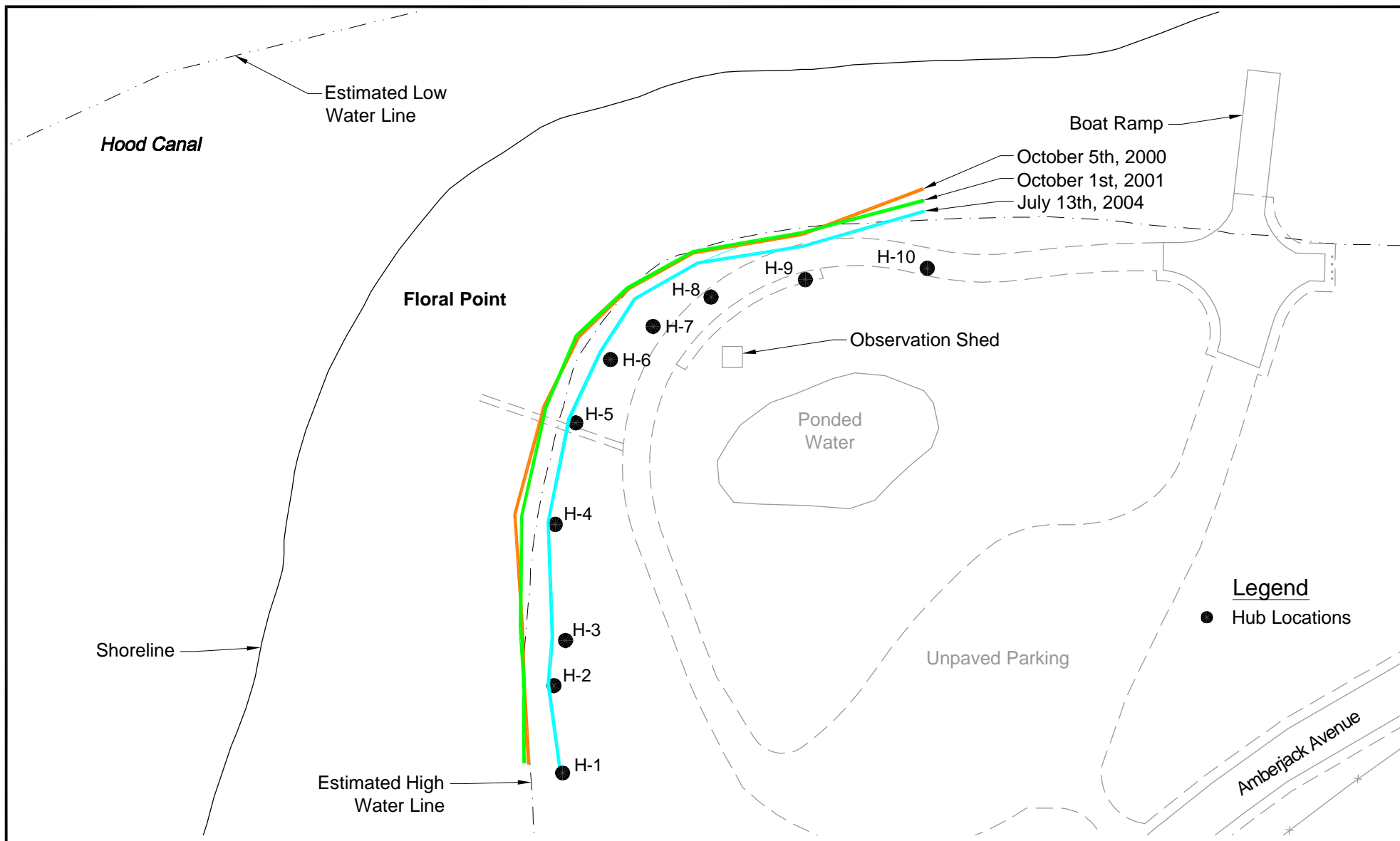
6.6.3 Agency Personnel

The respondent from Ecology stated that monitoring data show the remedies in place, including ICs, to be protective of human health and the environment. The Ecology respondent felt well informed regarding remediation activities at NBK at Bangor, and reported no complaints, violations, or other incidents related to the site. The respondent opined that the pump and treat systems at Sites A and F were effective but that further optimization of the Site F system was warranted.

In comments on the draft treatment system optimization report (U.S. Navy 2004e), Ecology stated a strong preference for continued optimization of the Site A treatment system as opposed to implementation of an alternative remedy.

6.6.4 Community

The two community member respondents expressed satisfaction with the degree of community outreach undertaken by the Navy and reported feeling well informed regarding remediation efforts at NBK at Bangor. The community members reported an overall impression that the remedies have been protective, effective, and innovative. One respondent stressed that the cleanup process was too expensive and required too much administrative effort.



U.S. NAVY

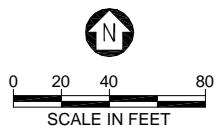


Figure 6-1
Floral Point Erosion Line Locations Over Time

DO 0040
NBK at Bangor
SECOND FIVE-YEAR
REVIEW

Table 6-1
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Perched Zone Monitoring Wells					
A-MW22	May-94	130	0.65 U	0.050 U	0.050 U
	Feb-95	140	0.65 U	0.050 U	0.050 U
	Feb-96	150	0.65 U	0.050 U	0.050 U
	Feb-97	140	1.2 U	2.9 U	1.7 U
A-MW34	Feb-95	0.36	0.050 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-97	0.58 U	0.65 U	1.50 U	0.86 U
	Feb-01	1.1 U	1.1 U	1.1 U	1.1 U
	May-02	0.94 U	0.94 U	0.94 U	0.94 U
	Feb-03	0.92 U	0.92 U	0.92 U	0.92 U
A-MW38	Aug-97	48	0.4 U	0.92 U	0.53 U
A-MW47	Aug-95	160	18	0.97 J	1.2 J
	Feb-96	120	15	1.6	1.6
	Aug-96	74	12	2.2 U	0.6 U
	Feb-97	100	14	2.3 U	1.3 U
	Aug-97	34	15	0.86 J	0.5 J
	Feb-99	37	13	1.1 U	1.1 U
	Feb-00	22	27	0.83 U	0.83 U
	Feb-01	8.9	10	0.51 U	0.51 U
	May-02	32	19	1 U	1 U
	Feb-03	22	10	0.44 U	0.44 U
	Feb-04	58	6.9	0.88	0.49 U
A-MW48	Feb-95	1000	0.65 U	0.050 U	0.050 U
	Feb-96	540	0.65 U	0.050 U	0.050 U
	Feb-97	680	0.74 U	1.7 U	0.98 U
	Dec-97	290 J	0.94 UJ	2.2 UJ	1.2 UJ
	Feb-99	200	0.38 U	0.38 U	0.38 U
	Feb-00	170	0.35 U	0.35 U	0.35 U
	Feb-04	120	0.49 U	0.49 U	0.49 U
Shallow Aquifer Monitoring Wells					
A-MW21	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-95	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-97	1.2 U	1.3 U	3.1 U	1.8 U
	Dec-97	0.62 UJ	0.7 U	1.6 U	0.9 U
A-MW28	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-95	0.19 U	0.65 U	0.050 U	0.050 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells					
A-MW28 (cont.)	Aug-95	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-97	0.77 U	0.86 U	2.0 U	1.2 U
	Dec-97	0.46 UJ	0.52 U	1.2 U	0.7 U
	Feb-99	1.5 U	1.5 U	1.5 U	1.5 U
	Feb-00	1.1 U	1.1 U	1.1 U	1.1 U
	Feb-01	0.46 U	0.46 U	0.46 U	0.46 U
	May-02	1.1 U	1.1 U	1.1 U	1.1 U
	Feb-03	0.44 U	0.44 U	0.44 U	0.44 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
A-MW30	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-95	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-97	0.82 U	0.92 U	2.1 U	1.2 U
	Dec-97	0.58 UJ	0.65 U	1.5 U	0.9 U
	Feb-99	0.51 U	0.51 U	0.51 U	0.51 U
	Feb-00	0.99 U	0.99 U	0.99 U	0.99 U
	Feb-01	0.46 U	0.46 U	0.46 U	0.46 U
	May-02	0.81 U	0.81 U	0.81 U	0.81 U
	Feb-03	1.40 U	1.40 U	1.40 U	1.40 U
	Feb-04	0.51 U	0.51 U	0.51 U	0.51 U
A-MW32	May-94	0.92	0.65 U	0.050 U	0.050 U
	Aug-94	1.1	0.65 U	0.050 U	0.050 U
	Nov-94	0.58	0.65 U	0.050 U	0.050 U
	Feb-95	0.84	0.65 U	0.050 U	0.050 U
	Aug-95	1.2	0.65 U	0.050 U	0.050 U
	Feb-96	1.0	0.65 U	0.050 U	0.050 U
	Aug-96	0.67 U	0.76 U	1.8 U	1.0 U
	Feb-97	1.2	0.94 U	2.2 U	1.2 U
	Aug-97	0.7	0.31 U	0.71 U	0.41 U
	Feb-96	1.0	0.65 U	0.050 U	0.050 U
	Aug-96	0.67 U	0.76 U	1.8 U	1.0 U
	Feb-97	1.2	0.94 U	2.2 U	1.2 U
	Aug-97	0.7	0.31 U	0.71 U	0.41 U
	Dec-97	5.6 J	2.9 U	6.7 U	3.8 U
	Aug-98	3.2	0.68 U	1.6 U	0.91 U
	Feb-99	1.6	0.69 U	0.69 U	0.69 U
	Aug-99	3.9	0.57 U	0.57 U	0.57 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells (cont.)					
A-MW32 (cont.)	Feb-00	5.9	1.1 U	1.1 U	1.1 U
	Aug-00	3.8	1.1 U	1.1 U	1.1 U
	Feb-01	5.6	0.35 U	0.35 U	0.35 U
	Jul-01	23	0.44 U	0.44 U	0.44 U
	May-02	5.4	0.64 U	0.64 U	0.64 U
	Aug-02	5.8	0.60 U	0.60 U	0.60 U
	Feb-03	2.3	1.50 U	1.50 U	1.50 U
	Sep-03	4.3	0.18 U	0.18 U	0.18 U
	Feb-04	9.30	0.49 U	0.49 U	0.49 U
	Aug-04	7.5	0.5 U	0.5 U	0.5 U
A-MW33	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-95	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-95	0.23	0.65 U	0.050 U	0.050 U
	Feb-96	0.26	0.65 U	0.050 U	0.050 U
	Aug-96	0.72 U	0.81 U	1.9 U	1.1 U
	Feb-97	3.6	0.79 U	1.8 U	1.1 U
	Aug-97	3.6	0.63 U	1.5 U	0.84 U
	Dec-97	3.5 J	0.43 U	1.0 U	0.58 U
	Aug-98	1.6	0.45 U	1.1 U	0.60 U
	Feb-99	0.96	0.48 U	0.48 U	0.48 U
	Aug-99	1.4	0.40 U	0.40 U	0.40 U
	Feb-00	1.5 U	1.5 U	1.5 U	1.5 U
	Aug-00	1.3	0.61 U	0.61 U	0.61 U
	Feb-01	1.5	1.2 U	1.2 U	1.2 U
	Jul-01	0.36 U	0.36 U	0.36 U	0.36 U
	May-02	0.94 U	0.94 U	0.94 U	0.94 U
	Aug-02	0.17 U	0.17 U	0.17 U	0.17 U
	Feb-03	0.96 U	0.96 U	0.96 U	0.96 U
	Sep-03	0.66 U	0.66 U	0.66 U	0.66 U
	Sep-03	0.66 U	0.66 U	0.66 U	0.66 U
	Feb-04	0.51 U	0.51 U	0.51 U	0.51 U
	Aug-04	0.53 U	0.53 U	0.53 U	0.53 U
A-MW35	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-95	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-96	0.74 U	0.83 U	1.9 U	1.1 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells (cont.)					
A-MW35 (cont.)	Feb-97	0.85 U	0.95 U	2.2 U	1.3 U
	Aug-97	0.62 U	0.70 U	1.6 U	0.9 U
	Dec-97	0.35 UJ	0.40 UJ	0.9 UJ	0.5 UJ
	Aug-98	1.0 U	1.2 U	2.7 U	1.6 U
	Feb-99	0.91 U	0.91 U	0.91 U	0.91 U
	Aug-99	0.92 U	0.92 U	0.92 U	0.92 U
	Feb-00	1.4 U	1.4 U	1.4 U	1.4 U
	Aug-00	1.5 U	1.5 U	1.5 U	1.5 U
	Feb-01	1.1 U	1.1 U	1.1 U	1.1 U
	Jul-01	0.42 U	0.42 U	0.42 U	0.42 U
	May-02	1.60 U	1.60 U	1.60 U	1.60 U
	Aug-02	0.31 U	0.31 U	0.31 U	0.31 U
	Feb-03	1.00 U	1.00 U	1.00 U	1.00 U
	Sep-03	1.40 U	1.40 U	1.40 U	1.40 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.5 U	0.5 U	0.5 U	0.5 U
A-MW37	Apr-94	140	0.65 U	0.050 U	0.050 U
	Aug-94	190	0.65 U	0.050 U	0.050 U
	Nov-94	180	0.65 U	0.050 U	0.050 U
	Feb-95	190	0.65 U	0.050 U	0.050 U
	Aug-95	220	0.65 U	0.050 U	0.050 U
	Feb-96	210	0.65 U	0.050 U	0.050 U
	Aug-96	99 J	0.34 UJ	0.80 UJ	0.46 UJ
	Feb-97	120	1.4 U	3.3 U	1.9 U
	Aug-97	120	1.1 U	2.6 U	1.5 U
	Dec-97	160 J	2.2 U	5.0 U	2.9 U
	Feb-98	130 J	1.7 UJ	3.9 UJ	2.3 UJ
	Apr-98	220 J	0.81 U	1.9 U	1.1 U
	Aug-98	200	1.7 U	3.9 U	2.2 U
	May-99	130	1.4 U	1.4 U	1.4 U
	Aug-99	180	0.64 U	0.64 U	0.64 U
	Feb-00	170	1.2 U	1.2 U	1.2 U
	Aug-00	130	0.92 U	0.92 U	0.92 U
	Feb-01	120	0.51 U	0.51 U	0.51 U
	Jul-01	150	0.79 U	0.79 U	0.79 U
	May-02	150	1.30 U	1.30 U	1.30 U
	Aug-02	180	0.25 U	0.25 U	0.25 U
	Feb-03	120	2.20	1.30 U	1.30 U
	Sep-03	160	1.9 U	1.9 U	1.9 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells (cont.)					
A-MW37 (cont.)	Feb-04	130	0.48 U	0.48 U	0.48 U
	Aug-04	140	0.5 U	0.5 U	0.5 U
A-MW44	May-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-94	0.19 U	0.65 U	0.050 U	0.050 U
	Nov-94	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-95	0.19 U	0.65 U	0.050 U	0.050 U
	Feb-96	0.19 U	0.65 U	0.050 U	0.050 U
	Aug-96	0.27 J	0.23 UJ	0.550 UJ	0.310 UJ
	Feb-97	0.74 U	0.83 U	1.9 U	1.1 U
	Aug-97	0.58 U	0.65 U	1.5 U	0.86 U
	Dec-97	0.83 UJ	0.94 U	2.2 U	1.2 U
	Aug-98	1.1 U	1.2 U	2.9 U	1.7 U
	Feb-99	0.81 U	0.81 U	0.81 U	0.81 U
	Aug-99	0.57 U	0.57 U	0.57 U	0.57 U
	Feb-00	0.29 U	0.29 U	0.29 U	0.29 U
	Aug-00	0.79 U	0.79 U	0.79 U	0.79 U
	Feb-01	0.66 U	0.66 U	0.66 U	0.66 U
	Jul-01	0.30 U	0.30 U	0.30 U	0.30 U
	Aug-02	0.34 U	0.34 U	0.34 U	0.34 U
	Feb-03	1.00 U	1.00 U	1.00 U	1.00 U
	Sep-03	0.53 U	0.53 U	0.53 U	0.53 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U
A-MW46	Apr-94	120	0.65 U	0.050 U	0.050 U
	Aug-94	170	0.65 U	0.050 U	0.050 U
	Nov-94	160	0.65 U	0.050 U	0.050 U
	Feb-95	170	0.65 U	0.050 U	0.050 U
	Aug-95	170	0.65 U	0.050 U	0.050 U
	Feb-96	200	0.65 U	0.050 U	0.050 U
	Aug-96	180	0.56 U	1.30 U	0.74 U
	Feb-97	180	1.3 U	3.0 U	1.7 U
	26-Apr-97	190	1.3 U	3.1 U	1.8 U
	4-May-97	180	1.3 U	3.1 U	1.8 U
	21-May-97	140	0.74 U	1.7 U	0.98 U
	31-May-97	150	0.92 U	2.1 U	1.2 U
	18-Jun-97	150	1.1 U	2.6 U	1.5 U
	2-Jul-97	140	0.74 U	1.7 U	0.98 U
	16-Jul-97	140	0.77 U	1.8 U	1.0 U
	7-Aug-97	120	0.94 U	2.2 U	1.2 U
	Aug-97	120	0.83 U	2.1 U	1.2 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells (cont.)					
A-MW46 (cont.)	Dec-97	140 J	2.5 U	5.9 U	3.4 U
	Feb-98	120 J	1.9 UJ	4.4 UJ	2.5 UJ
	Apr-98	200 J	1.3 U	3.1 U	1.8 U
	Aug-98	170	0.52 U	1.2 U	0.70 U
	Feb-00	130	1.0 U	1.0 U	1.00 U
	Aug-00	160	0.70 U	0.70 U	0.70 U
	Feb-01	150	0.75 U	0.75 U	0.75 U
	Apr-01	160	2.5 U	2.5 U	2.5 U
	Jul-01	140	0.6 U	0.6 U	0.6 U
	May-02	160	0.4 U	0.4 U	0.4 U
	May-02	180	0.81 U	0.81 U	0.81 U
	Aug-02	170	0.27 U	0.27 U	0.27 U
	Feb-03	160	0.27 U	0.27 U	0.27 U
	Sep-03	130	1.3 U	1.3 U	1.3 U
	Feb-04	160	0.49 U	0.49 U	0.49 U
	Aug-04	110	0.49 U	0.49 U	0.49 U
A-MW49	May-02	380	0.7 U	0.7 U	0.7 U
	Aug-02	550	0.4 U	0.4 U	0.4 U
	Feb-03	300	1.0 U	1.0 U	1.0 U
	Sep-03	350	0.69 U	0.69 U	0.69 U
	Feb-04	440	0.49 U	0.49 U	0.49 U
	Aug-04	360	0.49 U	0.49 U	0.49 U
A-MW50	May-02	1.2 U	1.2 U	1.2 U	1.2 U
	Aug-02	0.62 U	0.62 U	0.62 U	0.62 U
	Feb-03	1.1 U	1.1 U	1.1 U	1.1 U
	Sep-03	1.9 U	1.9 U	1.9 U	1.9 U
	Feb-04	0.5 U	0.5 U	0.5 U	0.5 U
	Aug-04	0.5 U	0.5 U	0.5 U	0.5 U
A-MW51	May-02	0.77 U	0.77 U	0.77 U	0.77 U
	Aug-02	0.4 U	0.4 U	0.4 U	0.4 U
	Feb-03	0.26 U	0.26 U	0.26 U	0.26 U
	Sep-03	0.4 U	0.4 U	0.4 U	0.4 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U
A-MW52	May-02	1.1 U	1.1 U	1.1 U	1.1 U
	Aug-02	0.21 U	0.21 U	0.21 U	0.21 U
	Feb-03	0.99 U	0.99 U	0.99 U	0.99 U
	Sep-03	1.5 U	1.4 U	1.4 U	1.4 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.48 U	0.48 U	0.48 U	0.48 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Shallow Aquifer Monitoring Wells (cont.)					
A-MW53	May-02	0.87 U	0.87 U	0.87 U	0.87 U
	Aug-02	0.27 U	0.27 U	0.27 U	0.27 U
	Feb-03	0.71 U	0.71 U	0.71 U	0.71 U
	Sep-03	0.83 U	0.83 U	0.83 U	0.83 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.49 U	0.49 U	0.49 U	0.49 U
A-MW54	May-02	2.5	1.0 U	1.0 U	1.0 U
	Aug-02	1.8	0.2 U	0.2 U	0.2 U
	Feb-03	1.9	1.2 U	1.2 U	1.2 U
	Sep-03	2	1.0 U	1.0 U	1.0 U
	Feb-04	1.7	0.5 U	0.5 U	0.5 U
	Aug-04	1.5	0.48 U	0.48 U	0.48 U
A-MW55	May-02	0.88 U	0.88 U	0.88 U	0.88 U
	Aug-02	0.3 U	0.3 U	0.3 U	0.3 U
	Feb-03	0.88 U	0.88 U	0.88 U	0.88 U
	Sep-03	0.95 U	0.95 U	0.95 U	0.95 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
	Aug-04	0.5 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
	Feb-98	87 J	1.9 UJ	4.4 UJ	2.5 UJ
	Apr-98	67 J	1.7 U	3.9 U	2.3 U
	Aug-98	30	1.8 U	4.1 U	2.4 U
	May-99	48	1.1 U	1.1 U	1.1 U
	Aug-99	79	0.78 U	0.78 U	0.78 U
	Feb-00	75	0.91 U	0.91 U	0.91 U
	Aug-00	71	1.2 U	1.2 U	1.2 U
	Feb-01	67	0.58 U	0.58 U	0.58 U
	Aug-01	52	0.39 U	0.39 U	0.39 U
	May-02	110	0.91 U	0.91 U	0.91 U
	Aug-02	110	0.60 U	0.60 U	0.60 U
	Feb-03	74	0.82 U	0.82 U	0.82 U
	Sep-03	84	0.53 U	0.53 U	0.53 U
	Feb-04	64	0.48 U	0.48 U	0.48 U
	Aug-04	68	0.49 U	0.49 U	0.49 U
A-EW5	Dec-97	6.1 J	0.47 U	1.1 U	0.62 U
	Feb-98	6.2 J	1.6 UJ	3.8 UJ	2.2 UJ
	Apr-98	5.2 J	0.56 U	1.3 U	0.74 U
	Aug-98	23	1.1 U	2.5 U	1.4 U
	May-99	14	0.87 U	0.87 U	0.87 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Extraction Wells (Shallow Aquifer) (cont.)					
A-EW5 (cont.)	Aug-99	13	1.1 U	1.1 U	1.1 U
	Feb-00	16	1.2 U	1.2 U	1.2 U
	Aug-00	17	0.51 U	0.51 U	0.51 U
	Feb-01	16	0.78 U	0.78 U	0.78 U
	Aug-01	6.5	0.49 U	0.49 U	0.49 U
	May-02	18	0.30 U	0.30 U	0.30 U
	Aug-02	12	0.13 U	0.13 U	0.13 U
	Feb-03	2	0.70 U	0.70 U	0.70 U
	Sep-03	8.6	0.42 U	0.42 U	0.42 U
	Feb-04	0.5 U	0.5 U	0.5 U	0.5 U
	Aug-04	17	0.49 U	0.49 U	0.49 U
A-EW6	Dec-97	0.98 UJ	1.1 U	2.6 U	1.5 U
	Feb-98	1.2 UJ	1.4 UJ	3.2 UJ	1.8 UJ
	Apr-98	1.1 UJ	1.3 U	2.9 U	1.7 U
	Aug-98	0.50 J	0.47 U	1.1 U	0.62 U
	May-99	0.99 U	0.99 U	0.99 U	0.99 U
	Aug-99	0.56 U	0.56 U	0.56 U	0.56 U
	Feb-00	1.2 U	1.2 U	1.2 U	1.2 U
	Aug-00	0.99	0.46 U	0.46 U	0.46 U
	Feb-01	0.53	0.44 U	0.44 U	0.44 U
	Aug-01	0.95	0.57 U	0.57 U	0.57 U
	May-02	0.42 U	0.42 U	0.42 U	0.42 U
	Aug-02	0.4 U	0.4 U	0.4 U	0.4 U
	Feb-03	1.3 U	1.3 U	1.3 U	1.3 U
	Sep-03	1.1 U	1.1 U	1.1 U	1.1 U
	Feb-04	0.49 U	0.49 U	0.49 U	0.49 U
A-EW7	Dec-97	450 J	1.5 U	3.4 U	1.9 U
	Feb-98	470 J	1.1 UJ	2.6 UJ	1.5 UJ
	Apr-98	660 J	1.3 U	2.9 U	1.7 U
	Aug-98	320	0.40 U	0.92 U	0.53 U
	May-99	500	3.3 U	3.3 U	3.3 U
	Aug-99	380	1.2 U	1.2 U	1.2 U
	Feb-00	300	1.6 U	1.6 U	1.6 U
	Aug-00	290	1.2 U	1.2 U	1.2 U
	Feb-01	260	0.47 U	0.47 U	0.47 U
	Aug-01	120	0.55 U	0.55 U	0.55 U
	May-02	710	0.92 U	0.92 U	0.92 U
	Aug-02	630	0.47 U	0.47 U	0.47 U
	Feb-03	310	0.49 U	0.49 U	0.49 U
	Sep-03	480	0.51 U	0.51 U	0.51 U

Table 6-1 (Continued)
Summary of Groundwater Quality Data for Site A Through February 2004

Well No.	Sample Date	RDX (µg/L)	2,4,6-TNT (µg/L)	2,6-DNT (µg/L)	2,4-DNT (µg/L)
Groundwater Cleanup Levels		0.8	2.9	0.13	0.13
Extraction Wells (Shallow Aquifer) (cont.)					
A-EW7 (cont.)	Feb-04	360	0.49 U	0.49 U	0.49 U
	Aug-04	240	0.5 U	0.5 U	0.5 U
A-EW8	Dec-97	110 J	0.59 U	1.4 U	0.79 U
	Feb-98	240 J	1.6 UJ	3.8 UJ	2.2 UJ
	Apr-98	110 J	1.2 U	2.8 U	1.6 U
	Aug-98	270	0.86 U	2.0 U	1.2 U
	Aug-99	160	1.7 U	1.7 U	1.7 U
	Feb-00	120	1.1 U	1.1 U	1.1 U
	Aug-00	160	0.73 U	0.73 U	0.73 U
	Feb-01	68	0.34 U	0.34 U	0.34 U
	Aug-01	110	0.53 U	0.53 U	0.53 U
	May-02	120	1.30 U	1.30 U	1.30 U
	Aug-02	150	0.53 U	0.53 U	0.53 U
	Feb-03	75	1.00 U	1.00 U	1.00 U
	Sep-03	120	0.51 U	0.51 U	0.51 U
	Feb-04	320	0.49 U	0.49 U	0.49 U
	Aug-04	170	0.49 U	0.49 U	0.49 U

Note: Shallow aquifer monitoring wells A-MW37 and A-MW46 currently used as extraction wells.

Notes:

DNT - dinitrotoluene

J - estimated concentration

ug/L - microgram per liter

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

TNT - trinitrotoluene

U - not detected at associated detection limit

RDX Analytical Results for the Shallow Aquifer at Site F Through July 2004

[illegible]

Table 6-2 (Continued)

[illegible]

Table 6-2 (Continued)[illegible]

Table 6-2 (Continued)

[illegible]

Table 6-2 (Continued)

[illegible]

Table 6-2 (Continued)
RDX Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	RDX (µg/L)										
	Jan-02	Apr-02	Jul-02	Oct-02	Jan-03	Apr-03	Jul-03	Oct-03	Jan-04	Apr-04	Jul-04
Monitoring Wells											
F-MW21											
F-MW24											
F-MW27					26 J						
F-MW31	56		170		68 R		120 UJ				130
F-MW32					7.6 UJ						
F-MW33	250		170		290 J		180				200
F-MW35					420						
F-MW36											
F-MW37					4.9						
F-MW38	86		57		59 J		46				46
F-MW39	3800		1200		2600		2000				820
F-MW40					0.81 U						
F-MW41	6.8		3.9		6.0 J		3.8				3.9
F-MW42	0.81		1.0		1.2 UJ		0.65 J				0.9
F-MW43					0.87 UJ						
F-MW44	0.55 U		0.56 U		4.4 J		6.9				28.0
F-MW45					0.61 U						
F-MW46					0.52 UJ						
F-MW48					410						
F-MW51					1.1 UJ						
F-MW52					1.0 UJ						
F-MW53					11 J						
F-MW54											
F-MW54S	28		21		18 J		6.4				12
F-MW55					730 J						
F-MW55M			950		320		240				150
F-MW56	0.95 U		0.87 U		1.2 UJ		1.4 UJ				0.5 U
F-MW57	0.99 U		0.52 U		0.65 UJ		0.57 UJ				0.61 U
F-MW58	0.74 U		0.68 U		0.78 UJ		0.79 UJ				0.53 U
F-MW59	120		130		100		99				110
F-MW60	0.52 U		0.83 U		1.2 UJ		1.3 UJ				0.49 U
F-MW61	4.1	4.6	2.8	3.0	2.7 J	1.8	1.7 J	1.5		0.49 U	0.49 U
F-MW62	5.6	5.9	4.2	6.5	6.2	4.9	4.0	3.6		0.66	0.6
F-MW63	32	35	23	32	28 J	21	18	15		19	17
F-MW64	1.1 U	0.94 U	0.83 U	0.59 U	0.98 J	0.95	0.98	0.63		1.0	1.4
F-MW65	0.97 U	0.83 U	0.43 U	0.12 U	0.96 UJ	0.53U	0.92 UJ	0.62 U		0.49 U	0.49 U
F-MW66								0.49 U			
F-MW67								3.9			
F-MW68								3.9			

Table 6-2 (Continued)
RDX Analytical Results for the Shallow Aquifer at Site F Through July 2004

^aData value is suspect based on variation from earlier and later values. Data value should be considered an "outlier" for trend analysis purposes.

Notes:

RDX groundwater cleanup level is 0.8 µg/L.

Blank spaces indicate sample not collected on that date.

J - estimated concentration

µg/L - microgram per liter

R - rejected

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

U - not detected at associated detection limit

Table 6-3

[illegible]

Table 6-3 (Continued)[illegible]

Table 6-3 (Continued)[illegible]

Table 6-3 (Continued)
TNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	TNT (µg/L)				
	Jul-03	Oct-03	Jan-04	Apr-04	Jul-04
Monitoring Wells					
F-MW21					
F-MW24					
F-MW27					
F-MW31	2,000 J				2,200
F-MW32					
F-MW33	490				490
F-MW35					
F-MW36					
F-MW37					
F-MW38	0.56 U				0.49 U
F-MW39	1.1 U				0.49 U
F-MW40					
F-MW41	0.57 U				0.54 U
F-MW42	0.38 UJ				0.52 U
F-MW43					
F-MW44	0.88 U				0.49 U
F-MW45					
F-MW46					
F-MW48					
F-MW51					
F-MW52					
F-MW53					
F-MW54					
F-MW54S	0.68				0.48 U
F-MW55					
F-MW55M	0.96 UJ				0.49 U
F-MW56	1.4 UJ				0.5 U
F-MW57	0.57 U				0.61 U
F-MW58	0.79 U				0.53 U
F-MW59	0.73 U				0.49 U
F-MW60	1.3 UJ				0.49 U
F-MW61	0.38 UJ	0.42 U		0.49 U	0.49 U
F-MW62	0.43 U	0.74 U		0.48 U	0.52 U
F-MW63	0.30 U	0.21 U		0.49 U	0.49 U
F-MW64	0.64 U	0.21 U		0.49 U	0.49 U
F-MW65	0.92 U	0.62 U		0.49 U	0.49 U
F-MW66		0.49 U			

Notes:

TNT groundwater cleanup level is 2.9 µg/L.
 Blank spaces indicate sample not collected on that date.
 TNT remains nondetect 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.

J - estimated concentration

µg/L - microgram per liter

TNT - trinitrotoluene

U - not detected at associated detection limit

Table 6-4

	Total DNT (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
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
F-MW31	450 J	300	240	230	270	320	354	380	274	240	310
F-MW32	2.19 J						4.6				
F-MW33	240 J	180	180	150	140	110	97	59	103	100	64
F-MW35	2.5 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
F-MW37	0.3 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
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
F-MW40	1.1 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
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
F-MW43	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
F-MW45	0.25 U						0.25 U			0.25 U	
F-MW46	0.25 U			0.25 U			0.25 U			0.25 U	
F-MW48	0.19 J						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
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
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
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
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
F-MW55M											
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
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
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
F-MW59											
F-MW60											
F-MW61											
F-MW62											
F-MW63											
F-MW64											
F-MW65											
F-MW66											
F-MW67											
F-MW68											
F-MW69											
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
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
F-EW3	12 U	3.3	3.4	4.2	3.8	4.6	4.3	3.8	7.5 J	4.7	0.5 U
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	3.7
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
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
F-EW7											
F-EW8											
F-EW9											
F-EW10											

Table 6-4 (Continued)

	Total DNT (µg/L)										
Well No.	Oct-96	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99
Monitoring Wells											
F-MW21											
F-MW24											
F-MW27		0.25 U				0.25 U				0.25 U	
F-MW31	250	410	290	194	240 J	264	230	2.4 J	290	358	236
F-MW32		0.43				0.25 J				0.24 J	
F-MW33	140	74	190	183	196 J	138	150	140	105	94	121
F-MW35		0.25 U				0.25 U				0.25 U	
F-MW36	1.07		0.25 U	0.25 U	0.25 U						
F-MW37		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	0.25 U	0.25 U	0.25 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	0.25 U	0.25 U	0.25 U
F-MW40		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	0.25 U	0.25 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	0.25 U	0.25 U	0.25 U
F-MW43		0.25 U				0.25 U				0.25 U	
F-MW44	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
F-MW45		0.25 U				0.25 U				0.25 U	
F-MW46		0.25 U				0.25 U				0.25 U	
F-MW48		0.25 U				0.25 U				0.25 U	
F-MW51		0.25 U				0.25 U				0.25 U	
F-MW52		0.25 U				0.25 U				0.25 U	
F-MW53		0.25 U				0.25 U				0.25 U	
F-MW54											
F-MW54S	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
F-MW55		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
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	0.25 U	0.25 U	0.25 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	0.25 U	0.25 U	0.25 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	0.25 U	0.25 U	0.25 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
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
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
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
F-MW63					0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
F-MW64					0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
F-MW65								0.25 U	0.25 U	0.25 U	0.25 U
F-MW66											
F-MW67											
F-MW68											
F-MW69											
Extraction Wells											
F-EW1	1.9	1.4	2.2		3.8	2.0	1.7	2.0	0.87	0.92	1.1
F-EW2	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
F-EW3	3.4	4.4	4.7	4.9	4.3 J	6.3	4.1	4.4	2.4	3.0	3.0
F-EW4		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
F-EW5		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
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	0.25 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
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
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
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

Table 6-4 (Continued)
DNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	Total DNT (µg/L)										
	Jul-99	Jan-00	Jul-00	Jan-01	Jul-01	Jan-02	Apr-02	Jul-02	Oct-02	Jan-03	Apr-03
Monitoring Wells											
F-MW21											
F-MW24											
F-MW27				0.88 U						1.6 UJ	
F-MW31	278	366	296	222	207	150		190		120 J	
F-MW32				6.4						2.3 R	
F-MW33	157	119	67.9	61	12 U	44		67		36 J	
F-MW35				0.55 U						0.79 UJ	
F-MW36											
F-MW37				0.66 U						0.46 U	
F-MW38	1.2 U	1.1 U	0.34 U	0.68 U	0.18 UJ	0.56 U		0.61 U		0.77 UJ	
F-MW39	0.73 U	1.1 U	0.34 U	0.47 U	0.94 U	0.7 U		0.94 U		0.90 UJ	
F-MW40				0.35 U						0.81 UJ	
F-MW41	1.9 U	1.1 U	1.0 U	0.48 U	1 UJ	1.4 U		0.26 U		1.4 UJ	
F-MW42	0.44 U	0.5 U	1.4 U	0.84 U	0.57 U	0.47 U		0.51 U		1.2 UJ	
F-MW43				0.82 U						0.87 UJ	
F-MW44	0.84 U	1.0 U	1.6 U	0.47 U	1 UJ	0.55 U		0.56 U		1.3 UJ	
F-MW45				0.83 U						0.61 U	
F-MW46				0.60 U						0.52 UJ	
F-MW48				0.20 U						1.0 UJ	
F-MW51				0.55 U						1.1 UJ	
F-MW52				0.23 U						1.0 UJ	
F-MW53				0.60 U						1.2 UJ	
F-MW54											
F-MW54S	0.56 U	0.52 U	0.92 U	0.47 U	0.39 U	1.4 U		0.38 U		0.38 UJ	
F-MW55				0.40 U						0.73 UJ	
F-MW55M	0.36 U	0.70 U	0.68 U	0.88 U	0.86 U			0.86 U		1.3 UJ	
F-MW56	1.1 U	1.6 U	0.79 U	0.99 U	0.46 UJ	0.95 U		0.87 U		1.2 UJ	
F-MW57	0.84 U	0.86 U	0.64 U	0.77 U	0.47 UJ	0.99 U		0.52 U		0.65 UJ	
F-MW58	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	1.2 U	0.47 U	0.74 U	0.74 U	0.77 U	0.51 U		1 U		0.30 U	
F-MW60	1.1 U	1.2 U	0.29 U	0.34 U	0.49 UJ	0.52 U		0.83 U		1.2 UJ	
F-MW61	0.47 U	1.2 U	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
F-MW62	0.96 U	0.94 U	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
F-MW63	0.42 U	1.6 U	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
F-MW64	0.52 U	1.2 U	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
F-MW65	0.42 U	0.65 U	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
F-MW66											
F-MW67											
F-MW68											
F-MW69											
Extraction Wells											
F-EW1	1.3	1.5	1.0	0.79	0.69	0.74 U		0.23 U		0.99 UJ	
F-EW2	0.83 U	1.1 U	0.87 U	1.3 U	1.3 U	0.66 U		0.58 U		0.43 U	
F-EW3	1.5	4.5	2.9	2.85	2.2	2.3		2.4		2.1 J	
F-EW4	0.20 U	0.75 U	0.52 U	0.91 U	0.46 U	0.42 U		0.33 U		0.4 U	
F-EW5	0.21 U	0.64 U	0.52 U	0.38 U	1.6 U	1.2 U		0.79 U		0.9 UJ	
F-EW6	0.75 U	0.82 U	0.81 U	0.3 U	0.33 U	0.49 U		0.74 U		0.56 U	
F-EW7	14	9.7	6.6	6.78	5.2	4.8		4.3		3.8 R	
F-EW8	0.75 U	0.65 U	0.88 U	1.1 U	0.66 U	0.84 U		0.79 U		1.1 UJ	
F-EW9	0.43 U	0.31 U	0.96 U	0.55 U	0.38 U	0.84 U		0.77 U		1.2 UJ	
F-EW10	0.49 U	0.56 U	0.44 U	0.82 U	0.51 U	0.75 U		0.65 U		0.4 U	

Table 6-4 (Continued)
DNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	Total DNT (µg/L)				
	Jul-03	Oct-03	Jan-04	Apr-04	Jul-04
Monitoring Wells					
F-MW21					
F-MW24					
F-MW27					
F-MW31	120 UJ				123.8 J
F-MW32					
F-MW33	38				41.5 J
F-MW35					
F-MW36					
F-MW37					
F-MW38	0.6 UJ				0.49 U
F-MW39	1.1 UJ				0.49 U
F-MW40					
F-MW41	0.6 UJ				0.54 U
F-MW42	0.4 UJ				0.52 U
F-MW43					
F-MW44	0.9 UJ				0.49 U
F-MW45					
F-MW46					
F-MW48					
F-MW51					
F-MW52					
F-MW53					
F-MW54					
F-MW54S	0.16 UJ				0.48 U
F-MW55					
F-MW55M	0.96 UJ				0.49 U
F-MW56	1.4 UJ				0.5 U
F-MW57	0.57 UJ				0.61 U
F-MW58	0.49 UJ				0.53 U
F-MW59	0.73 UJ				0.49 U
F-MW60	1.3 UJ				0.49 U
F-MW61	0.38 UJ	0.42 UJ		0.49 U	0.49 U
F-MW62	0.43 UJ	0.35 UJ		0.48 U	0.52 U
F-MW63	0.30 UJ	0.21 UJ		0.49 U	0.49 U
F-MW64	0.64 UJ	0.21 UJ		0.49 U	0.49 U
F-MW65	0.92 UJ	0.62 UJ		0.49 U	0.49 U
F-MW66		0.49 U			
F-MW67		0.49 U			
F-MW68		0.49 U			
F-MW69		0.49 U			
Extraction Wells					
F-EW1	0.2 UJ				0.7
F-EW2	0.27 UJ				0.49 U
F-EW3	2.2				2.97
F-EW4	0.7 UJ				0.49 U
F-EW5	0.96 UJ				0.49 U
F-EW6	1.2 UJ				0.49 U
F-EW7	4.2				3.5
F-EW8	0.68 UJ				0.5 U
F-EW9	1.7 UJ				0.49 U
F-EW10	0.43 UJ				0.5 U

Notes:

DNT groundwater cleanup level is 0.13 µg/L.
 Blank cells 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.

J - estimated concentration
 µg/L - microgram per liter
 DNT - dinitrotoluene
 P - confirmation criteria exceeded
 U - not detected at associated detection limit

Table 6-5
Otto Fuel Analytical Results for Sites E/11 and F Wells Through March 2003

Well ID	Otto Fuel Concentration (µg/L)											
	Aug-96	Jan-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Apr-99	Jan-00	Jan-01	Jan-02	Mar-03
Site F Well												
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
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	0.40

Notes:

The Otto fuel groundwater cleanup level is 0.2 µg/L.

The "L" and "U" designations associated with well ID refer to lower (deeper) and upper (shallower) wells, respectively, within a well cluster.

Blank cells indicate sample not collected on that date.

U - not detected at associated detection limit.

Table 6-6
Results of Sediment Chemical Analysis for Floral Point Compared to SMS and BSV for Metals

Metal	SMS		BSV	MS07					MS08					MS109				MS83			
	SQS	CSL		Nov-91	Sep-96	Sep-98	Oct-00	Oct-04	Nov-91	Sep-96	Sep-98	Oct-00	Oct-04	Oct-96	Oct-98	Oct-00	Oct-04	Oct-96	Oct-98	Oct-00	Oct-04
Aluminum			7079	8490	16400	15800	13100	11000	7110	13900	13100	12000	8480	13400	14600	13600	9060	15300	17400	14600	11400
Antimony			0.09 U	4 UJ	6 U	3 U	3 U	0.08 UJ	4 UJ	7	3 U	4	0.03 UJ	7	4	3	0.05 UJ	6 U	5	6 U	0.06 UJ
Arsenic	57	93	4.9	1.6 J	2.1	2	1.9	3.5	1.7 J	2	2.8	2.2	1.7	1.8	1.7	1.6	1.66	0.1 U	2.1	1.7	1.82
Barium			14.8	9.5 J	15.5	15	12.1	25.5	9.8 J	16.6	17.1	12.2	11.1	19.7	15.3	12.7	13.6	24.1	11.7	11.5	14.7
Beryllium			0.15	0.27 J	0.2	0.21	0.22	0.201	0.22 J	0.2	0.19	0.19	0.113	0.2	0.18	0.19	0.111	0.2	0.21	0.2	0.138
Cadmium	5.1	6.7	0.05	0.2 UJ	0.05	0.06	0.04	0.311	0.2 UJ	0.11	0.15	0.14	0.134	0.11	0.08	0.08	0.15	0.07	0.09	0.08	0.091 U
Calcium			4470	4780	12500	12400	9020	4710	3060	14500	9860	8120	5500	26000	20900	15800	30200	17200	20000	15300	16400
Chromium	260	270	18	20.2	29.1	30.1	29.4	24.8	20.5	26.7	27	24	20.8	27.2	24.8	26	22.5	28.3	30.7	33.9	21.4
Cobalt			4.7	5.8 J	8.7	8.6	7.3	6.08 J	4.7 J	7.4	6.6	6.3	5.15 J	7.6	7.7	10.4	5.21 J	9.2	11.1	10.3	8.42 J
Copper	390	390	8	16.7	19.7	18.3	14.8	13.3 J	12	15.7	13.9	13.2	11.2	25.9	22.8	26.8	14.9	45.1	39.7	30.6	25.1
Iron			15841	16500	22600	23100	19600	18200	13000	19100	17900	17300	13700	20400	18900	22400	15300	23900	26200	24500	20200
Lead	450	530	5.1	2.2	2.7	3	3	5.66	2.1	3.1	3.8	3.2	2.86	6.5	6.1	5	3.03	9.4	10.2	6.9	3.96
Magnesium			5421	5900	8210	8740	7560	7710	5280	7490	7260	6760	5990	7920	8150	9120	6570	8240	10400	8990	7280
Manganese			181	197	343	317	265	185	167	269	234	217	179	266	296	369	202	297	320	287	272
Mercury	0.41	0.59	0.03 U	0.1 U	0.007	0.01 U	0.01 U	0.021	0.11 U	0.01	0.01 U	0.02	0.013	0.014	0.01 U	0.01	0.014 J	0.012	0.01 U	0.01	0.018 J
Nickel			21	22.7	29	29.3	25.6	23.5 J	21.7	26	26	24.4	21.6 J	32	31.4	35	23.2 J	30	35.7	37	30.5 J
Potassium			1791	590 J	910	990	810	2000	616 J	980	1080	940	715	1220	800	780	1000	890	830	860	739
Selenium			0.44 J	0.21 U	0.1 U	0.3 U	0.1 U	1.6	0.26 U	0.1 U	0.1 U	0.1 U	0.39 J	0.6 U	0.3 U	0.1	0.42 J	0.6 U	0.3 U	0.1 U	0.16 J
Silver	6.1	6.1	0.03 U	0.6 U	0.06	0.01	0.01 U	0.091 J	0.6 U	0.03 U	0.02	0.01 U	0.038	0.1	0.08	0.46	0.093	0.05	0.04	0.06	0.035
Sodium			4135	2570 J	2530	3220	2830	13400	2930 J	3470	4620	4120	3440	3730	2920	3360	3720	3660	2700	2920	1870
Thallium			0.34	0.26 J	0.1 U	0.3 U	0.07	0.257 J	0.26 U	0.2	0.3 U	0.4	0.076	0.9	0.3 U	0.06 U	0.05	0.6 U	0.3 U	0.06	0.02 U
Vanadium			25.8	35.5 J	60.5	55	49.8	37.6	25.7 J	53.8	44	42.8	33.7	50.2	41.2	47.3	37.4	63.6	58.7	65.3	42.8
Zinc	410	960	31.4	28.6	40.3	41.9	35.3	37.3 J	28.6	36.8	35.9	32.6	31.9	70.8	46.5	58.9	38.6	53	52.3	49.2	44.8

Notes:

All values in milligrams per kilogram (mg/kg) on a dry weight basis

Blank cells indicate that no value is established in the SMS.

Results presented are the "best value" for each analyte at each location on each date. This means that where results from both a primary and field duplicate sample are available, data reduction protocols have been used to establish the most representative result. For sampling in 2004, field duplicate and primary sample results are compared in Appendix C.

BSV - background screening value

CSL - cleanup screening level

J - estimated value

SMS - sediment management standard

SQS - sediment quality standards criteria

U - compound undetected at the listed concentration

Table 6-7
Results of Sediment Chemical Analysis for Floral Point Compared to AET and SMS for Pesticides/PCBs

Compound	AET				SMS		MS07				MS08				MS109				MS83					
	Benthic	Amphipod	Oyster	Microtox	SQS	CSL	Sep-96	Sep-98	Oct-00	Oct-04	Nov-91	Sep-96	Sep-98	Oct-00	Oct-04	Oct-96	Oct-98	Oct-00	Oct-04	Oct-92	Oct-96	Oct-98	Oct-00	Oct-04
Aroclor 1016							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
Aroclor 1221							40 U	39 U	34 U	56 U	6.7 UJ	38 U	38 U	37 U	33 U	39 U	37 U	38 U	32 U	5.8 UJ	37 U	38 U	38 U	30 U
Aroclor 1232							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
Aroclor 1242							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
Aroclor 1248							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
Aroclor 1254							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
Aroclor 1260							20 U	20 U	17 U	28 U	3.3 UJ	19 U	19 U	18 U	17 U	19 U	18 U	19 U	16 U	2.9 UJ	19 U	19 U	19 U	15 U
PCB (Total)	1000	3100	1100	130			40 U	39 U	34 U	56 U	6.7 U	38 U	38 U	37 U	33 U	39 U	37 U	38 U	32 U	5.8 U	37 U	38 U	38 U	30 U
PCB (Total-OC) (mg/kg)					12	65	4.8 U	6.5 U	6.5 U	5.9 U		4.18 U	42.2 U ^a	42.2 U ^a	7.9 U ^a	7.65 U	5.13 U	5.13 U	8.4 U ^a	41 U	6.27 U	6.44 U	4.6 U	37.5 U ^a
4,4-DDD	16	43					2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	1.7 UJ	1.9 U	1.8 U	1.9 U	1.6 UJ	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 UJ
4,4-DDE	9	15					2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	1.7 UJ	1.9 U	1.8 U	1.9 U	1.6 UJ	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 UJ
4,4-DDT	34	>270	>6				2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	0.28 J	1.9 U	1.8 U	1.9 U	1.6 UJ	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 UJ
Aldrin							0.99 U	0.98 U	0.85 U	2.7 UJ	0.034 UJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
Chlordane							0.99 U		0.85 U			0.94 U		0.92 U				0.95 U					0.94 U	
Chlordane (total)							0.99 U	0.98 U			0.034 U	0.94 U	0.95 U			0.97 U	0.92 U			0.15 U	0.93 U	0.94 U		
DDT (total)							2 U	2 U			0.068 U	1.9 U	1.9 U			1.9 U	1.8 U			0.3 U	1.9 U	1.9 U		
Dieldrin										2.7 UJ	0.068 UJ				1.7 UJ				0.5 J	0.3 UJ				1.5 UJ
Endosulfan (total)							2 U	2 U			0.068 U	1.9 U	1.9 U			1.9 U	1.8 U			0.3 U	1.9 U	1.9 U		
Endosulfan I										2.7 U	0.034 UJ				1.7 U				1.6 U	0.15 UJ				1.5 U
Endosulfan II							2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	1.7 UJ	1.9 U	1.8 U	1.9 U	1.6 UJ	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 UJ
Endosulfan sulfate										2.7 U	0.068 UJ				1.7 U				1.6 U	0.3 UJ				1.5 U
Endrin							2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	1.7 U	1.9 U	1.8 U	1.9 U	1.6 U	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 U
Endrin aldehyde							2 U	2 U	1.7 U	2.7 UJ	0.068 UJ	1.9 U	1.9 U	1.8 U	1.7 UJ	1.9 U	1.8 U	1.9 U	1.6 UJ	0.3 UJ	1.9 U	1.9 U	1.9 U	1.5 UJ
Endrin ketone									1.7 U	2.7 UJ	0.068 UJ			1.8 U	1.7 UJ			1.9 U	1.6 UJ	0.3 UJ			1.9 U	1.5 UJ
Heptachlor							0.99 U	0.98 U	0.85 U	2.7 UJ	0.42 NJ	0.94 U	0.95 U	0.92 U	0.53 J	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
Heptachlor epoxide							0.99 U	0.98 U	0.85 U	2.7 UJ	0.034 UJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
Lindane							0.99 U	0.98 U	0.85 U	2.7 UJ	0.034 UJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
Methoxychlor							9.9 U	9.8 U	8.5 U	2.7 UJ	0.34 UJ	9.4 U	9.5 U	9.2 U	1.7 U	9.7 U	9.2 U	9.5 U	0.47 J	1.5 UJ	9.3 U	9.4 U	9.4 U	1.5 U
Toxaphene							99 U	98 U	85 U	140 U	17 UJ	94 U	95 U	92 U	82 U	97 U	92 U	95 U	79 U	15 UJ	93 U	94 U	94 U	74 U
alpha-BHC							0.99 U	0.98 U	0.85 U	2.7 UJ	0.14 NJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
alpha-Chlordane							0.99 U	0.98 U	0.85 U	2.7 UJ	0.034 UJ	0.94 U	0.95 U	0.92 U	0.63 J	0.97 U	0.92 U	0.95 U	0.64 J	0.15 UJ	0.93 U	0.94 U	0.94 U	0.59 J
beta-BHC							0.99 U	0.98 U	0.85 U	2.7 UJ	0.034 UJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
delta-BHC							0.99 U	0.98 U	0.85 U	2.7 UJ	0.79 NJ	0.94 U	0.95 U	0.92 U	1.7 UJ	0.97 U	0.92 U	0.95 U	1.6 UJ	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 UJ
gamma-Chlordane								0.98 U	0.85 U	2.7 UJ	0.034 UJ		0.95 U	0.92 U	1.7 U	0.97 U	0.92 U	0.95 U	1.6 U	0.15 UJ	0.93 U	0.94 U	0.94 U	1.5 U

^aWhen the total organic carbon is less than 0.5 percent, as for these samples, the organic carbon correction is not considered accurate.

Notes:

All values in micrograms per kilogram (µg/kg) on a dry weight basis except total PCB-OC as noted

Blank cells indicate that the analyte was not part of the analysis for that sample on that date, or, for screening values, that no value is established.

Results presented are the "best value" for each analyte at each location on each date. This means that where results from both a primary and field duplicate sample are available, data reduction protocols have been used to establish the most representative result. For sampling in 2004, field duplicate and primary sample results are compared in Appendix

AET - apparent effects threshold

BHC - benzenehexachloride

CSL - cleanup screening level

DDD - dichlorodiphenyldichloroethane

DDE - dichlorodiphenyldichloroethene

DDT - dichlorodiphenyltrichloroethane

J - estimated value

OC - corrected for organic carbon content

PCB - polychlorinated biphenyl

SMS - sediment management standard

SQS - sediment quality standards criteria

U - compound undetected at the listed concentration

Table 6-8
Results of Tissue Chemical Analysis for Floral Point Compared to BSVs for Metals

Metal	BSV	MS107					MS109				
		Oct-92	Oct-96	Oct-98	Oct-00	Oct-00	Oct-96	Oct-98	Oct-00	Oct-04	Oct-04
			Littleneck Clam	Littleneck Clam	Butter Clam	Littleneck Clam	Littleneck Clam	Littleneck Clam	Butter Clam	Butter Clam	Littleneck Clam
Aluminum	4.2	3.8	3.9	12.6	24.6	16.8	20.4	25.1	55.5	13.9	11.1
Antimony	0.01 UJ	0.01 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.0029 U	0.0035 U
Arsenic	1.5	2.2	2.1	1.16	1.6	1.44	1.61	1.29	2.2	2.75	1.78
Barium	0.32 J	0.31 J	0.42	0.42	0.08	0.31	0.34	0.45	0.14	0.0791	0.316
Beryllium	0.003 U	0.003 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.001 U	0.001 J
Cadmium	0.24	0.15	0.24	0.21	0.066	0.31	0.29	0.19	0.29	0.0626	0.315
Calcium	1930 J	612 J	1470	1810	1450	2580	1380	3140	2740	342	959
Chromium	0.14	0.13	0.1 U	1.79	0.28	0.17	0.16	2.52	0.42	0.32	0.54
Cobalt	0.11 J	0.1 J	0.12	0.11	0.17	0.1	0.12	0.15	0.17	0.115	0.102
Copper	0.9	0.99	1.43	1	1.63	1.34	1.54	1.31	3.14	2.2	1.21
Iron	12	12	17.7	30.7	56.6	56.6	44.9	52.4	101	28	27.6
Lead	0.02 UJ	0.03 UJ	0.02 U	0.02 U	0.04	0.05	0.02 U	0.04	0.16	0.053	0.021
Magnesium	692 J	699 J	706	822	668	779	695	802	720	757	666
Manganese	0.81	0.62	0.96	1.05	1.74	1.85	1.5	1.4	2.34	0.95	0.788
Mercury	0.005 UJ	0.005 J	0.01 U	0.009 U	0.01 U	0.01 U	0.009 U	0.01 U	0.01 U	0.004	0.005
Molybdenum		0.04 U									
Nickel	0.33 J	0.34 J	0.3	1.3	1.3	0.4	0.5	2.2	1.2	0.794	0.3
Potassium	1810	1560	2510	1870	3320	2490	2410	1950	2960	1980	1810
Selenium	0.53 J	0.56 J	0.4	0.3	0.4	0.9	0.4	0.25	0.7	0.22	0.46
Silver	0.1 J	0.12	0.2	0.1	0.25	0.18	0.75	0.42	9.5	0.468 J	0.462 J
Sodium	4830 J	4850 J	4410	5690	3070	5570	4330	5330	3660	4390	4390
Thallium	0.93 U	0.89 U	0.1 U	0.1 U	0.04 U	0.04 U	0.1 U	0.1 U	0.04 U	0.0006 J	0.0009 J
Vanadium	0.03 UJ	0.03 UJ	0.06	0.07	0.11	0.09	0.11	0.08	0.23	0.1 U	0.1 U
Zinc	8.6 J	10 J	13.1	13	24.8	13.6	12.8	14.1	23.8	14.9	9.14

Notes:

All values in milligrams per kilogram (mg/kg) on a wet weight basis

Blank cells indicate that this metal was not analyzed on this date and that no BSV has been established.

Results presented are the "best value" for each analyte at each location on each date. This means that,

where results from both a primary and field duplicate sample are available, data reduction protocols have been used to establish the most representative result. For sampling in 2004, field duplicate and primary sample results are compared in Appendix C.

BSV - background screening value

CSL - cleanup screening level

J - estimated value

SMS - sediment management standard

SQS - sediment quality standards criteria

U - compound undetected at the listed concentration

Table 6-9
Results of Tissue Chemical Analysis for Floral Point for Pesticides/PCBs

Compound	MS107					MS109				
	Oct-92	Oct-96	Oct-98	Oct-00	Oct-00	Oct-96	Oct-98	Oct-00	Oct-04	Oct-04
		Littleneck Clam	Littleneck Clam	Clam	Littleneck Clam	Littleneck Clam	Littleneck Clam	Clam	Clam	Littleneck Clam
4,4-DDD	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 U	1 U
4,4-DDE	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 U	1 U
4,4-DDT	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 U	1 U
Aldrin	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	0.27 J
Aroclor 1016	17 UJ	10 U		50 U	50 U	9.5 U		50 U	10 U	10 U
Aroclor 1221	35 UJ	20 U		100 U	100 U	19 U		100 U	20 U	20 U
Aroclor 1232	17 UJ	10 U		50 U	50 U	22		50 U	10 U	10 U
Aroclor 1242	17 UJ	10 U		50 U	50 U	9.5 U		50 U	10 U	10 U
Aroclor 1248	17 UJ	10 U		50 U	50 U	9.5 U		50 U	10 U	10 U
Aroclor 1254	17 UJ	10 U		50 U	50 U	9.5 U		50 U	10 U	10 U
Aroclor 1260	17 UJ	10 U		50 U	50 U	9.5 U		50 U	10 U	10 U
PCB (Total)	35 U	20 U				22				
Chlordane				2.5 U	2.5 U			2.5 U		
Chlordane (total)	0.91 U	0.5 U	2.5 U			0.48 U	2.5 U			
DDT (total)	1.8 U	1 U	5 U			0.95 U	5 U			
Dieldrin	1.8 UJ								0.54 J	1 U
Endosulfan (total)	1.8 U	1 U	5 U			0.95 U	5 U			
Endosulfan I	0.89 UJ								1 U	1 U
Endosulfan II	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 U	1 U
Endosulfan sulfate	1.8 UJ								1 U	1 U
Endrin	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 UJ	1 UJ
Endrin Aldehyde	1.8 UJ	1 U	5 U	5 U	5 U	0.95 U	5 U	5 U	1 U	1 U
Endrin ketone	1.8 UJ			5 U	5 U			5 U	1 U	1 U
Heptachlor	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U
Heptachlor epoxide	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	0.27 J
Lindane	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U
Methoxychlor	8.9 UJ	5 U	25 U	25 U	25 U	4.8 U	25 U	25 U	1 U	1 U
Toxaphene	89 UJ	50 U	250 U	250 U	250 U	48 U	250 U	250 U	50 U	50 U
alpha-BHC	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U
alpha-Chlordane	0.91 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U
beta-BHC	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	2 U	1.5 J
delta-BHC	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U
gamma-Chlordane	0.89 UJ	0.5 U	2.5 U	2.5 U	2.5 U	0.48 U	2.5 U	2.5 U	1 U	1 U

Table 6-9 (Continued)
Results of Tissue Chemical Analysis for Floral Point for Pesticides/PCBs

Notes:

All values in micrograms per kilogram ($\mu\text{g}/\text{kg}$) on a wet weight basis

Blank cells denote that this analyte was not included in the analyte list on this date.

Results presented are the "best value" for each analyte at each location on each date. This means that where results from both a primary and field duplicate sample are available, data reduction protocols have been used to establish the most representative result. For sampling in 2004, field duplicate and primary sample results are compared in Appendix C.

BHC - benzenehexachloride

DDD - dichlorodiphenyldichloroethane

DDE - dichlorodiphenyldichloroethene

DDT - dichlorodiphenyltrichloroethane

J - estimated value

PCB - polychlorinated biphenyl

U - compound undetected at the listed concentration

Table 6-10
Historical Groundwater Sample Results for Select Monitoring Wells at OU 8

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		1,1,2-Trichloroethane (TCA) (5.0 µg/L)	1,1-Dichloroethene (DCE) (0.5 µg/L)	1,2-Dibromoethane (EDB) (0.8 µg/L)	1,2-Dichloroethane (DCA) (5.0 µg/L)	Benzene (5.0 µg/L)	Toluene (1,000 µg/L)
8MW47	3/16/1998	50 U	50 U	16 J	700 J	7800	7800 J
	6/23/1998	50 U	50 U	13 J	140	2900 J	16000 J
	9/28/1998	100 U	100 U	100 U	250	5900	11000
	3/30/1999	50 U	50 U	50 U	640 U	11000 J	2500 J
	9/27/1999	50 U	50 U	50 U	50 U	3800 J	12000 J
	3/27/2000	100 U	100 U	100 U	100 U	2000	5600 J
	6/22/2000	100 U	100 U	100 U	100 U	2600 J	14000 J
	11/1/2000	100 U	100 U	400 U	100 U	3200	22000
	1/17/2001	50 U	50 U	20 J	50 U	3800	20000
	4/17/2001	20 U	30 U	20 U	30 U	4400 D	19000 D
	7/18/2001	20 U	24 U	15 U	23 U	4600 D	20000 D
	10/24/2001	10 UD	12 UD	37 JD	290 D	7500 D	21000 D
	5/30/2002	10 U	12 U	10 J	12 U	3600	18000
	10/30/2002	10 U	12 U	24 J	12 U	7800	18000
	4/9/2003	5 U	6 U	9.5 J	5.7 U	7300	12000 J
	10/9/2003	2.5 U	3 U	33	160	8900	11000
	4/15/2004	10 U	12 U	7.3 U	25 JD	4000 D	19000 D
8MW06	3/13/1998	20 U	20 U	20 U	1100 J	73	4.4 J
	6/19/1998	50 U	50 U	50 U	1500 J	250	18 J
	9/28/1998	50 U	50 U	50 U	1200	110	6.5 J
	3/29/1999	20 U	20 U	20 U	1000 J	53	3 J
	9/27/1999	50 U	50 U	50 U	1100	130	20 J
	3/24/2000	50 U	50 U	50 U	1600 J	170	11 J
	6/21/2000	1 U	1 U	1 U	1200 D	470 J	82 D
	10/31/2000	0.5 U	0.5 U	0.4 J	1200	370	61

Table 6-10 (Continued)
Historical Groundwater Sample Results for Select Monitoring Wells at OU 8

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		1,1,2-Trichloroethane (TCA) (5.0 µg/L)	1,1-Dichloroethene (DCE) (0.5 µg/L)	1,2-Dibromoethane (EDB) (0.8 µg/L)	1,2-Dichloroethane (DCA) (5.0 µg/L)	Benzene (5.0 µg/L)	Toluene (1,000 µg/L)
8MW06 (Continued)	1/18/2001	1 U	1 U	3 J	1200	950	340
	4/17/2001	2 U	3 U	2 U	1200 D	860 D	200 D
	7/18/2001	2.5 U	3 U	1.9 U	1200 D	850 D	91 D
	10/23/2001	0.5 U	0.6 U	1.8 JD	1400 D	830 D	180 D
	5/30/2002	1 U	1.2 U	1.6 J	1700	1100	140
	10/30/2002	1 U	1.2 U	2.5 J	1500	1400	180 J
	4/9/2003	0.5 U	0.6 U	0.37 U	1100	910	27
	10/7/2003	0.5 U	0.6 U	0.37 U	940	580	57
	4/14/2004	0.5 U	0.6 U	1.6 JD	1100 D	1900 D	69 D
8MW33	3/13/1998	20	9.2	1 U	270	0.73 J	1 U
	8/5/1998	31	16	1 U	51	0.4 J	0.12 J
	9/25/1998	34 J	15	1 U	35	0.44 J	1 U
	6/24/1999	37 J	18 J	1 U	26 J	0.32 J	1 U
	9/22/1999	28 J	18	1 U	18 J	0.3 J	1 U
	12/15/1999	31 J	17	2 U	26 J	0.24 J	2 U
	3/23/2000	27 J	18	1 U	20 J	0.23 J	1 U
	6/20/2000	31 J	21	1 U	16	0.26 J	1 U
	10/31/2000	31	20	2 U	15	0.2 J	0.1 J
	1/18/2001	25	14	2 U	14	0.3 J	0.5 U
	4/17/2001	25	14	0.08 U	16	0.2 J	0.4 J
	7/20/2001	24	13	0.073 U	14	0.5 U	0.5 U
	10/24/2001	24	15	0.073 U	14	0.18 J	0.26 U
	5/30/2002	23	17	0.073 U	17	0.28 J	0.098 U
	10/30/2002	25	16	0.073 U	13	0.11 U	0.098 U

Table 6-10 (Continued)
Historical Groundwater Sample Results for Select Monitoring Wells at OU 8

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		1,1,2-Trichloroethane (TCA) (5.0 µg/L)	1,1-Dichloroethene (DCE) (0.5 µg/L)	1,2-Dibromoethane (EDB) (0.8 µg/L)	1,2-Dichloroethane (DCA) (5.0 µg/L)	Benzene (5.0 µg/L)	Toluene (1,000 µg/L)
8MW33 (Continued)	4/10/2003	19	15	0.073 U	16	0.25 J	0.098 U
	10/8/2003	19	18	0.073 U	12	0.14 J	0.098 U
	4/14/2004	18	14	0.073 U	35	0.18 J	0.098 U
8MW03	3/9/1998	5.4 J	2.1 J	1 U	150	29	1 U
	9/24/1998	5	2	1 U	110	6.6	1 U
	6/23/1999	6 J	2.7 J	1 U	90 J	4.8	1 U
	9/21/1999	4.7	2.4	1 U	70 J	1.5	1 U
	3/21/2000	4.2	2.4	1 U	69 J	0.83 J	1 U
	10/30/2000	5.5	3.4	2 U	80	0.54	0.3 J
	1/16/2001	4.9	3	0.8 U	61	0.53	0.5 U
	4/16/2001	4.5	2.7	0.08 U	56	0.99	0.2 J
	7/18/2001	3.6	2.9	0.073 U	49	0.11 U	0.5 U
	10/22/2001	3.4	2.7	0.073 U	46	1.2	0.13 U
	5/30/2002	3.7	2.7	0.073 U	47	2.3	0.16 J
	10/29/2002	3	1.8	0.073 U	28	1.3	0.098 U
	4/7/2003	1.7	1.6	0.073 U	18	0.28 J	0.098 U
	10/6/2003	1.9	2	0.073 U	20	0.37 J	0.098 U
	4/12/2004	0.87	0.68	0.073 U	11	0.11 U	0.15 J
8MW13	3/11/1998	3.3	1.1	1 U	70	2.6	1 U
	6/17/1998	2.1			32 J	2.3	
	9/23/1998	1.5	0.45 J	1 U	24	2.4	1 U
	12/14/1998	1.5	0.39 J	1 U	21	2.4	1 U
	3/25/1999	0.95 J	1 U	1 U	7.3	0.3 J	1 U
	6/24/1999	0.73 J	1 U	1 U	4.3	1 U	1 U

Table 6-10 (Continued)
Historical Groundwater Sample Results for Select Monitoring Wells at OU 8

Monitoring Location	Date Sampled	Analyte (Cleanup Level)					
		1,1,2-Trichloroethane (TCA) (5.0 µg/L)	1,1-Dichloroethene (DCE) (0.5 µg/L)	1,2-Dibromoethane (EDB) (0.8 µg/L)	1,2-Dichloroethane (DCA) (5.0 µg/L)	Benzene (5.0 µg/L)	Toluene (1,000 µg/L)
8MW13 (Continued)	9/20/1999	0.86 J	1 U	1 U	3.4	0.29 J	1 U
	12/13/1999	0.72 J	1 U	1 U	3.5	0.43 J	1 U
	3/23/2000	0.58 J	1 U	1 U	2.7	0.3 J	1 U
	6/19/2000	0.53 J	1 U	1 U	2.2	0.13 J	1 U
	11/2/2000	0.52	0.5 U	2 U	2.9	0.5 U	0.5 U
	1/15/2001	0.53	0.5 U	0.8 U	3.2	0.5 U	0.5 U
	4/19/2001	0.1 U	0.2 U	0.08 U	2.9	0.2 U	0.1 U
	7/19/2001	0.44 J	0.12 U	0.073 U	2.9	0.11 U	0.5 U
	10/25/2001	0.41 J	0.12 U	0.073 U	2	0.11 U	0.18 U
	5/30/2002	0.28 J	0.12 U	0.073 U	1.4	0.11 U	0.098 U
	10/29/2002	0.04 J	0.12 U	0.073 U	1.6	0.11 U	0.098 U
	4/8/2003	0.25 J	0.12 U	0.073 U	0.85	0.11 U	0.098 U
	10/6/2003	0.23 J	0.12 U	0.073 U	0.76	0.11 U	0.098 U
	4/13/2004	0.21 J	0.12 U	0.073 U	0.70	0.11 U	0.098 U

Notes:

D - reported result is from a dilution

J - estimated concentration

µg/L - microgram per liter

OU - operable unit

U - not detected at associated detection limit

Table 6-11
Public Works Industrial Area Product Recovery Summary

2001				2002				2003				2004			
Dates of Operation	Days of Operation	Product Removed (Gallons)	Rate of Recovery (gal/day)	Dates of Operation	Days of Operation	Product Removed (Gallons)	Rate of Recovery (gal/day)	Dates of Operation	Days of Operation	Product Removed (Gallons)	Rate of Recovery (gal/day)	Dates of Operation	Days of Operation	Product Removed (Gallons)	Rate of Recovery (gal/day)
1/18/01 to 2/2/01	15	14.82	0.988	1/29/02 to 2/27/02	29	0.77	0.027	1/27/03 to 2/28/03	33	0.00	0.000	1/5/04 to 2/4/04	30	0.19	0.006
4/24/01 to 4/30/01	6	3.27	0.544	2/27/02 to 3/29/02	30	0.91	0.030	2/28/03 to 3/28/03	29	0.13	0.020	2/4/04 to 3/2/04	27	0.09	0.003
4/30/01 to 5/25/01	25	1.48	0.059	3/29/02 to 4/25/02	27	0.69	0.026	3/28/03 to 4/30/03	33	0.29	0.009	3/2/04 to 3/29/04	27	0.31	0.012
5/25/01 to 6/28/01	34	0.77	0.023	4/25/02 to 5/30/02	35	0.86	0.025	4/30/03 to 5/31/03	31	0.57	0.018	3/29/04 to 4/30/04	32	0.84	0.026
6/28/01 to 7/27/01	29	0.14	0.005	5/30/02 to 6/27/02	28	0.29	0.010	5/31/03 to 6/30/03	30	0.93	0.031	4/30/04 to 6/1/04	32	0.65	0.077
7/27/01 to 8/17/01	21	0.21	0.010	6/27/02 to 7/29/02	32	0.30	0.009	6/30/03 to 7/31/03	31	0.75	0.024	6/1/04 to 7/1/04	30	0.66	0.084
8/17/01 to 9/25/01	39	0.05	0.001	7/29/02 to 8/30/02	32	0.48	0.015	7/31/03 to 8/29/03	29	0.24	0.008				
9/25/01 to 10/30/01	35	3.12	0.089	8/30/02 to 9/30/02	31	0.13	0.004	8/29/03 to 9/30/03	32	0.09	0.003				
10/30/01 to 11/30/01	31	3.67	0.119	9/30/02 to 10/30/02	30	0.26	0.009	9/30/03 to 10/31/03	31	0.30	0.010				
11/30/01 to 12/26/01	26	0.15	0.006	10/30/02 to 11/22/02	23	0.05	0.002	10/31/03 to 12/9/03	39	0.22	0.006				
12/26/01 to 1/29/02	34	0.22	0.007	11/22/02 to 12/26/02	34	0.03	0.001	12/9/03 to 1/5/04	27	0.08	0.003				
				12/26/02 to 1/27/03	32	0.50	0.016								
12-Month Total	295	27.90	0.095	12-Month Total	363	5.30	0.015	12-Month Total	345	3.61	0.010	12-Month Total	178	2.74	0.015
Monthly Average ^a		2.54	2.837	Monthly Average ^a		0.44	0.438	Monthly Average ^a		0.33	0.314	Monthly Average ^a		0.46	0.463

^a Monthly product average calculated using daily average for last 12 months multiplied by 30 days

Note:
ROD-specified product recovery end point = 0.5 gallon/month over a 1-year period

7.0 TECHNICAL ASSESSMENT

7.1 FUNCTIONALITY OF REMEDY

This section answers the question, “Is the remedy functioning as intended by the decision documents?” Each component of the remedy for each OU is discussed in the sections that follow.

7.1.1 Functionality of Remedy for OU 1 (Site A)

The groundwater extraction and treatment portion of the remedy for Site A is not functioning as intended by the ROD. All of the remedy components listed in Section 4.1.1 have been implemented, and monitoring and adjustment (optimization) of the groundwater remediation system has been performed as envisioned (Section 11.1 of the ROD). In spite of these efforts, the opinion of multiple technical reviewers (U.S. Navy 2004e, U.S. Navy 2000e, U.S. Navy 2004d) and interview responses is that the remediation system will not meet the intended ROD goal of “achiev[ing] the MTCA groundwater cleanup level for RDX of 0.8 µg/L in the most cost-effective manner within a 10-year period of operation” (U.S. Navy, USEPA, and Ecology 1991a). Available monitoring data indicate that the RDX concentrations in groundwater beneath Site A in 2007 will be similar to those found at system startup in 1997. A low aquifer transmissivity severely limits the pumping rate of the extraction wells and results in small capture zones and low aquifer flushing rates. However, comparison of contamination distribution maps from 1990 and 2004 suggests that there has been no change in the shape and size of the RDX plume, other than minor variations attributable to an expanded monitoring network (U.S. Navy 2004a). The Navy believes that the remediation system is also not cost efficient, with each pound of RDX removed from the aquifer between November 1999 and July 2004 costing an average of \$250,000 (U.S. Navy 2004e).

As stated in Section 11.1 of the ROD (U.S. Navy, USEPA, and Ecology 1991a), this 5-year review is an opportunity for “consideration of other remedial approaches or revision of the cleanup standards.” Revision of the remedial approach for Site A is recommended in Section 8.0 of this 5-year review report.

Except for the groundwater remediation component of the remedy, the other components of the remedy for Site A are generally functioning as intended by the ROD and the three ESDs (as was also found in the first 5-year review [U.S. Navy 2000a]). The IC inspection process is generally functioning as intended by the OU 8 ROD (wherein IC inspections were required for all OUs).

7.1.2 Functionality of Remedy for OU 2 (Site F)

As found in the first 5-year review (U.S. Navy 2000a), the remedy components for soil at Site F functioned as intended by the ROD. The IC inspection process is also generally functioning as intended by the OU 8 ROD (wherein IC inspections were required for all OUs), although it is not clear that the IC reports required by the ICMP are being prepared.

The groundwater extraction system is not functioning as intended by the ROD because the system does not appear to be consistently achieving hydraulic containment. The treatment system is performing as designed and has been monitored and upgraded throughout its life. However, an optimization review performed in 2004 (U.S. Navy 2004e) concluded that “plume migration may have occurred and ...hydraulic containment of the plume has not been consistently maintained.” The review further concluded that “The extraction wells are generally pumping at their design rates, but do not appear to have established an adequate capture zone.”

In addition, the system exhibits a decreasing efficiency, with O&M costs increasing and the rate of mass removal decreasing. The cost per pound of contaminant mass removed has increased by approximately 25 percent in the past 3 years to \$1,250 per pound (U.S. Navy 2004e). In terms of overall performance, the optimization review found that the system is still effective at removing contaminant mass but will eventually reach an asymptotic recovery rate, with COC concentrations in groundwater remaining above RGs. The optimization review listed five specific recommendations for system optimization and future monitoring (U.S. Navy 2004e). These recommendations focused on achieving and documenting hydraulic containment and maximizing contaminant mass removal.

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

The selected remedy for OU 3 continues to function as intended by the ROD. During this review period, NBK at Bangor implemented a base-wide IC plan that formalized the land use controls at Site 16/24. Inspections of the land use controls at this site have been conducted regularly, and the current land use remains in accordance with the restrictions defined in the OU 8 ROD (which established the base-wide land use controls).

7.1.4 Functionality of Remedy for OU 6 (Site D)

As found during the first 5-year review, the remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD. No additional monitoring was required following the first 5-year review, and there is no apparent change in the functionality of the remedy since that time. No ICs were required for OU 6.

7.1.5 Functionality of Remedy for OU 7 (Sites B, E/11, 2, 10, and 26)

Functionality of Remedy for Site B (Floral Point)

The remedy for Site B (Floral Point) is functioning as intended by the OU 7 ROD. The vegetated soil cover and stormwater management structures have been constructed and maintained. Land use controls are in place, are enforced, and are inspected periodically.

Sediment and clam tissue monitoring has been conducted in the area of Floral Point for 14 years (1991 through 2004), and trends in this analytical data set have been analyzed as the data have accumulated. As discussed in Section 6.4.3, the data trends show 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. The ROD did not require long-term monitoring after it was demonstrated that groundwater discharge was not adversely affecting sediments or clam tissue.

Functionality of Remedy for Site E/11

As found during the first 5-year review, 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 base-wide institutional controls plan, and this restriction is functioning as intended.

Recovery of groundwater beneath Site E/11 containing Otto fuel continued during this review period. Recovery is achieved by the Site F groundwater extraction and treatment system, and 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.

The OU 7 ROD requires that the effectiveness of Otto fuel removal be assessed during each 5-year review. 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. Containment of groundwater containing Otto fuel concentrations above the RG should be included in future capture zone analyses for the Site F extraction and treatment system.

Functionality of Remedy for Site 2

As found in the first 5-year review, the soil and debris removal and disposal conducted at Site 2 met the RAOs for this site, and the remedy remains functional.

Functionality of Remedy for Site 10

The remedy for Site 10 is functioning as intended by the ROD. The confirmation groundwater sampling was completed during this review period and resulted in a finding that further sampling is not necessary. Groundwater use restrictions for Site 10 are included in the ICMP as part of the restrictions on OU 8 and are being monitored and enforced.

Functionality of Remedy for Site 26

The remedy for Site 26 is functioning as intended by the ROD. Periodic sampling has been conducted throughout Site 26, with reductions in sampling requirements (with Ecology's concurrence) as warranted by the data. The only remaining sampling at Site 26 was conducted in 2004 as part of the remedy for Site B, as discussed above. This monitoring component of the Site B/Site 26 remedy has functioned as intended by the ROD and is complete, fulfilling all required monitoring at Site 26.

7.1.6 Functionality of Remedy for OU 8

The remedy for OU 8 is functioning as intended by the ROD; however, the progress toward meeting the RAOs is slower than anticipated. All of the remedy components have been implemented as envisioned by the ROD, including the LNAPL recovery system and the monitoring of groundwater for MNA performance and compliance with RGs. Base-wide IC inspections and management are also being performed and documented in accordance with the ICMP adopted after the OU 8 ROD was signed.

Passive LNAPL recovery has been discontinued because the recovery endpoint specified in the ROD has been reached. This implies that the recoverable LNAPL has been removed and only residual LNAPL remains. The residual LNAPL still results in a measurable product thickness on the groundwater surface in several wells. The recent increasing concentration trend observed for benzene in wells located in the core of the petroleum plume indicates that residual LNAPL remains a source of benzene in groundwater.

The extent of the petroleum plume has decreased when the recent monitoring data are compared with the pre-ROD data (U.S. Navy 2004k). This decrease is likely the result of the LNAPL recovery actions taken since the first LNAPL recovery system was installed in 1986 (U.S. Navy

2004c) and natural degradation. The recent increase in benzene concentrations in the core of the plume may be indicative of a pending increase in petroleum plume extent following cessation of all residual source recovery efforts. The benzene trends are being monitored by the Navy (U.S. Navy 2004k).

The ROD anticipated that additional remedial actions (termed “contingent actions” in the ROD) might be necessary. The ROD stated that if LNAPL recovery and MNA did not appear to be making sufficient progress toward meeting remedial goals, then the following contingent remedial actions would be considered:

- Redox manipulation at the base boundary to enhance biologic activity in groundwater
- Restarting of the groundwater pump and treat system to contain or minimize migration of the off-base plume

The Navy will implement one of these contingent actions if the selected remedy does not restore off-base groundwater to drinking water standards within 10 years.

In accordance with the “contingency remedy” component of the selected remedy for OU 8 (Section 11.5 of the OU 8 ROD), the Navy will consider the availability and long-term effectiveness of possible new technologies if the contingency remedy is implemented and found to be ineffective.

7.2 CONTINUED VALIDITY OF ROD ASSUMPTIONS

This section answers the question, “Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?” Therefore, this section reviews any changes to applicable or relevant and appropriate requirements (ARARs) used to establish RGs in the RODs, as well as any changes to risk assessment assumptions (exposure and toxicity) to evaluate the protectiveness of the remedy. This section concludes that there are no changes to ARARs or risk assessment assumptions that adversely affect the protectiveness of the remedies at NBK at Bangor.

7.2.1 Review of Applicable or Relevant and Appropriate Requirements

In the preamble to the NCP, EPA states that ARARs are generally “frozen” at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA 2001) indicates that the question of

interest in developing the 5-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether this change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old and the new standards and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still 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.

During the first 5-year review for NBK at Bangor, no substantive changes were found to ARARs that would call into question the protectiveness of the remedy. For this 5-year review, all of the ARARs identified in the RODs for OUs 1, 2, 3, 6, 7, and 8, as well as any changes as a result of ESD documents approved by the Navy, EPA, and Ecology subsequent to the RODs, were again reviewed for changes that could affect the assessment of whether the remedy is protective. This section of the 5-year review shows that the protectiveness of the remedies chosen for the NBK at Bangor OUs has not been adversely affected by changes in ARARs since the RODs were signed.

OU 1 (Site A)

Soil. Soil cleanup ARARs identified in the ROD were evaluated against current standards to make sure that the soil remedy remains protective at OU 1. Table 7-1 compares the soil ARARs identified in Sections 8 and 12 of the OU 1 ROD (U.S. Navy, USEPA, and Ecology 1991a) (MTCA Method B cleanup level for direct contact with unrestricted land use) with the MTCA Method B cleanup levels current as of January 2005. There are no changes.

Groundwater and Surface Water. Table 7-2 compares the groundwater ARARs (MTCA Method B cleanup levels) 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). There are no changes.

Although the original ROD identifies numeric surface water ARARs for the leachate from the leach-basin system, they are not provided here because ESD No. 3 (U.S. Navy, USEPA, and Ecology 2000b) states that untreated leachate from the basin may be discharged directly to surface water, even though it exceeds the surface water quality standards identified in the ROD. This is because WET testing on freshwater and saltwater organisms in six tests using the untreated leachate resulted in no acute or chronic toxicity.

OU 2 (Site F)

Soil. Table 7-3 compare the soil ARARs presented in Sections 8 and 12 of the OU 2 ROD (U.S. Navy, USEPA, and Ecology 1994d). Soil ARARs are the MTCA Method B soil cleanup levels

for direct contact with soil (unrestricted land use), with the exception of manganese (where a background value was used). These soil ARARs have not changed for any of the COCs, with the exception of 1,3,5-trinitrobenzene (1,3,5-TNB) and nitrate. The MTCA Method B direct-contact cleanup level for 1,3,5-TNB increased from 4 to 2,400 mg/kg (due to a revision of the “reference dose,” a toxicity measure used in the MTCA Method B formula). The MTCA Method B direct-contact cleanup level for nitrate decreased from 29,000 to 8,000 mg/kg. This lowering of the MTCA Method B value does not affect the protectiveness of the remedy because the highest nitrate concentration detected in OU 2 soil samples was 17 mg/kg, orders of magnitude below the current MTCA Method B cleanup level of 8,000 mg/kg.

Groundwater. Two ARARs are provided in the 1994 ROD for groundwater: MTCA Method B and maximum contaminant levels (MCLs). Table 7-4 compares these cleanup levels presented in the ROD with the current standards. The groundwater ARARs selected in the ROD for OU 2 have not changed for any of the COCs identified in groundwater, with the exception of 1,3,5-TNB. The MTCA Method B groundwater cleanup level for 1,3,5-TNB has increased from 0.8 to 480 µg/L since the ROD was signed (due to a three order-of-magnitude increase in the reference dose).

OU 3 (Sites 16/24 and 25)

Soil. The OU 3 ROD (U.S. Navy, USEPA, and Ecology 1994a) selected a No Action alternative that required establishment of institutional controls for Site 16/24 because soil at this site exceeded antimony and beryllium MTCA Method B concentrations for unrestricted land use and exceeded the arsenic MTCA Method A concentration for unrestricted land use. (Note that although the ROD identifies the arsenic ARAR as originating from Method B, it is instead a Method A value.) A comparison of the ROD values with current standards is provided in Table 7-5. The beryllium cleanup level has increased and the antimony and arsenic cleanup levels have remained the same; therefore the remedy remains protective.

Groundwater. Groundwater monitoring was implemented at Site 25 because metals concentrations in groundwater exceeded MTCA Method B groundwater cleanup levels for cadmium and manganese. Table 7-6 compares the ROD cleanup levels with current Method B values. The remedy selected is still protective because the standards have either remained the same or been raised (the MTCA Method B groundwater cleanup level for manganese has increased from 50 to 2,240 µg/L).

OU 6 (Site D)

Table 7-7 compares OU 6 ROD (U.S. Navy, USEPA, and Ecology 1994c) soil ARARs (Method B direct-contact values for unrestricted land use) with current Method B standards. The cleanup

levels have not changed for any of the COCs except trinitrobenzene, which was raised from 4 to 2,400 mg/kg; therefore, the ROD cleanup value is more protective than the new Method B value.

Short-term groundwater monitoring took place at OU 6 in May 1996 and June 1997; the monitoring wells were decommissioned in June 2000.

OU 7 (Sites B, E/11, 2, 10, and 26)

Soil. Table 7-8 compares soil and groundwater ARARs 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 and 2 and Method B soil values protective of direct contact for unrestricted land use for Sites E and 11. None of the values has changed, so the remedy is still protective.

Groundwater. The MTCA Method A value for TPH was identified in the OU 7 ROD as an ARAR for Site 10 (see Table 7-8); because it has not changed, the remedy is still protective.

OU 8

Table 7-9 compares groundwater ARARs from the OU 8 ROD (U.S. Navy, USEPA, and Ecology 2000a) with current ARAR values. The ARARs values are derived from two sources: MTCA Method B cleanup levels for drinking water protection and federal drinking water MCLs. MCLs were chosen as cleanup levels for benzene, 1,2-DCA, and toluene, rather than Method B values. This is because Ecology's Toxics Cleanup Program has determined that MCLs that are less than or equal to the 10^{-5} risk level, or a hazard quotient of 1.0, are considered sufficiently protective as cleanup standards (Ecology 1993). MTCA Method B values were chosen for the remaining chemicals of concern (1,1-DCE and 1,2-EDB). For all COCs, the RG is either as protective or is more protective than the current ARAR.

7.2.2 Review of Risk Assessment Assumptions

Risk assessment assumptions were also reviewed as part of the requirement to assess protectiveness of the remedy. Minor exposure parameter changes (e.g., adherence factor for soil, dermal evaluation guidance) have occurred since the RODs were issued; however these changes do not affect the protectiveness of the remedy. Toxicity values in EPA's Integrated Risk Information System (IRIS) for some chemicals have also changed since the RODs were signed. Toxicity criteria values have not changed for RG chemicals at OU 1 and OU 7; therefore, these sites are not discussed. How these toxicity value changes might affect the protectiveness of the remedy is discussed below. The focus of this discussion is the groundwater and soil RGs since the RGs for these media are MTCA Method B risk-based values. Legally, MTCA Method B is a

formula that is calculated to arrive at an RG. Because MTCA Method B values are recalculated every time they are used, they would be affected by changes in toxicity measures.

For OU 2, the RGs selected for groundwater and soil were based on risk assessment values: MTCA Method B values protective of groundwater used as drinking water (with the exception of nitrate and nitrite [MCLs] and manganese [secondary MCL]) and MTCA Method B soil values protective of direct contact under unrestricted land use scenarios (with the exception of manganese [background data]). None of the toxicity criteria for the COCs identified for groundwater and soil have changed since the signing of the ROD in 1994, with the exception of nitrate and 1,3,5-TNB. The noncancer oral reference dose for nitrate decreased from 1.6 to 0.1 mg/kg-day as reported on Ecology's CLARC III tables, which Ecology provides for informational purposes only; IRIS reports a reference dose of 1.6 mg/kg-day. However, the groundwater RG for nitrate is the federal MCL, which has not changed since the ROD was signed. In addition, the high nitrate concentration detected in soil samples collected from OU 2 was 17 mg/kg, which is orders of magnitude below both the old MTCA Method B cleanup level of 29,000 mg/kg and the revised MTCA Method B cleanup level of 8,000 mg/kg. Therefore, the RG selected for nitrate is still protective. The noncancer oral reference dose for 1,3,5-TNB has changed from 0.00005 when the RG was originally calculated to its current value in EPA's IRIS database of 0.03 mg/kg-day (USEPA 2005). This change to the reference dose does not affect the ROD cleanup levels of 4 mg/kg and 0.8 µg/L for soil and groundwater, respectively, because they are more protective than the revised MTCA Method B cleanup levels of 2,400 mg/kg and 480 µg/L. See Tables 7-3 and 7-4 for a comparison of ROD ARARs and current standards.

For OU 3, no RGs were selected for soil or groundwater at either Site 16/24 or Site 25. Calculated risks and hazards were within EPA's target risk goals for both sites. Although slight changes in toxicity assumptions and risk assessment assumptions have occurred since the ROD was signed in 1994, the assumptions have not changed substantively enough to affect protectiveness of the chosen remedies: residential land use restrictions at Site 16/24 and groundwater monitoring at Site 25. If the risk assessment for Site 16/24 were conducted using more recent risk assessment guidance, risks and hazards to future residential populations could exceed target health goals. However, as long as the residential land use restrictions remain in place for Site 16/24, the RGs are protective. See Tables 7-5 and 7-6 for a comparison of ROD ARARs and current standards.

For OU 6, the RGs selected for soil were the risk-based MTCA Method B soil values protective of direct contact under unrestricted land use scenarios. The toxicity criteria for the COCs identified for soil have not changed, except for trinitrobenzene, since the signing of the ROD in 1994. The oral reference dose for 1,3,5-TNB changed from 0.00005 to 0.03 mg/kg-day (USEPA 2005), which increases the MTCA Method B cleanup level, if it were calculated today, from 4 to 2,400 mg/kg. This change does not affect the ROD cleanup value of 4 mg/kg because it is more

protective than a revised Method B value. Therefore, all the RGs selected for OU 6 are still protective. See Table 7-7 for a comparison of ROD ARARs and current standards.

For OU 8, the RGs selected for groundwater were the risk-based MTCA Method B cleanup levels for drinking water protection and federal drinking water MCLs. The toxicity criteria for the COCs identified for groundwater have all changed, except for 1,2-DCA and toluene, since the signing of the ROD in 2000. The cancer oral slope factor for benzene changed in IRIS from 0.029 to 0.055 (mg/kg-day)⁻¹, thus a MTCA Method B cleanup level calculated today would change the RG from 1.51 to 0.795 µg/L. Also, the cancer oral slope factor for 1,2-dibromomethane (1,2-EDB) changed in IRIS from 85 to 2 (mg/kg-day)⁻¹, thus a MTCA Method B cleanup level calculated today would change the RG from 0.000515 to 0.022 µg/L. The cancer oral slope factor for 1,1-DCE has been withdrawn from IRIS because the EPA no longer considers 1,1-DCE a carcinogen; therefore, the current MTCA value of 400 µg/L is based on a noncancer oral reference dose. If the noncancer risk-based value of 400 µg/L was used as the cleanup value instead of the cancer risk-based cleanup value of 0.0729 µg/L, the RG for 1,1-DCE would not be exceeded at any of the sampling locations. These changes do not affect the ROD cleanup value because the RG is either more protective than the new Method B value (e.g., 1,2-EDB and 1,1-DCE) or the RG is based on the federal MCL value that has not changed (e.g., benzene). Therefore, all the RGs selected for OU 8 are still protective. See Table 7-9 for a comparison of ROD ARARs and current standards.

7.3 NEW INFORMATION

This section responds to the question “Has any other information come to light that could call into question the protectiveness of the remedy?” Since the last 5-year review, regulators and stakeholders nationwide have become aware that releases of perchlorate could have occurred at sites where munitions treatment has been performed. Because munitions treatment was performed at Sites A and F at NBK at Bangor, the possibility exists that perchlorate was released in the past. To this effect, the Navy agrees to sample for perchlorate in the next sampling event scheduled for fall 2005. After the sampling event, the Navy, EPA and Ecology will review the result and determine the next course of action as appropriate to ensure the continued protection of the human health and the environment at this site. No other information reviewed during this 5-year review, apart from what is included previously in this document, affects the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

The groundwater extraction and treatment systems at OU 1 (Site A) and OU 2 (Site F) are not functioning as intended by the respective RODs. The Site A system is not effectively reducing RDX concentrations in groundwater. Plume migration at Site F may have occurred, and hydraulic-containment may not have been consistently maintained. The contaminant plume at Site A may not be contained by the pump-and-treat system, but the plume does not appear to be expanding, possibly as a result of the hydrogeologic characteristics of the subsurface. The other components of the OU 1 and OU 2 remedies are generally functioning as intended by the RODs.

The remedies for OU 3 and OU 6 continue to function as intended by the RODs.

The remedies for OU 7 (Sites B, E/11, 2, 10, and 26) are generally functioning as intended by the ROD. The long-term monitoring RAO for sediment and clam tissue at Sites B and 26 has been met, and the monitoring requirement at Site 10 have been met. The landfill protection elements, however, may be eroding. The Site F groundwater extraction system is functioning to contain Otto fuel in groundwater at Site E/11 but is not appreciably reducing Otto fuel concentrations.

The remedy for OU 8 is functioning as intended by the ROD; however progress toward meeting the RAOs is slower than anticipated.

There are no changes to ARARs or risk assessment assumptions that adversely affect the protectiveness of the remedies at NBK at Bangor.

7.5 ISSUES

Table 7-10 lists the issues identified as a result of this 5-year review that appear to have the potential to affect the protectiveness of the remedies at NBK at Bangor.

Table 7-1
Comparison of Soil ARARs for OU 1 With Current Standards
(Unrestricted Land Use)

Chemical	ROD ARAR: MTCA Method B Formula Value for Direct Contact (mg/kg)	Current MTCA Method B Formula Value for Direct Contact (mg/kg)
TNT	33	33
DNT	1.5	1.5
RDX	9.1	9.1
Lead	250	250

Notes:

ARAR - applicable or relevant and appropriate requirement

DNT - dinitrotoluene

mg/kg - milligram per kilogram

MTCA - Model Toxics Control Act

OU - operable unit

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

ROD - Record of Decision

TNT - trinitrotoluene

Table 7-2
Comparison of Groundwater ARARs for OU 1 With Current Standards

Chemical	ROD ARAR: MTCA Method B Formula Value (except where noted) (µg/L)	Current MTCA Method B Formula Value (except where noted) (µg/L)
TNT	2.9	2.9
DNT	0.1	0.1
RDX	0.8	0.8
Lead	15 ^a	15 ^a

^aMethod A value

Notes:

ARAR - applicable or relevant and appropriate requirement

DNT - dinitrotoluene

µg/L - microgram per liter

MTCA - Model Toxics Control Act

OU - operable unit

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

ROD - Record of Decision

TNT - trinitrotoluene

Table 7-3
Comparison of ROD Soil ARARs for OU 2 with Current Standards
(Unrestricted Land Use)

Chemical	ROD ARAR: MTCA Method B Formula Value for Direct Contact (mg/kg)	Current MTCA Method B Formula Value for Direct Contact (mg/kg)
2,4,6-TNT	33	33
RDX	9.1	9.1
2,4- and 2,6-DNT	1.5	1.5
1,3,5-TNB	4.0	2,400
1,3-DNB	8.0	8.0
Nitrate-N	29,000	8,000
Nitrite-N	8,000	8,000
Manganese	940	11,000

Notes:

ARAR - applicable or relevant and appropriate requirement

DNB - dinitrobenzene

DNT - dinitrotoluene

mg/kg - milligram per kilogram

MTCA - Model Toxics Control Act

OU - operable unit

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

ROD - Record of Decision

TNB - trinitrobenzene

TNT - trinitrotoluene

Table 7-4
Comparison of Groundwater ARARs for OU 2 with Current Standards

Chemical	ROD ARAR: MTCA Method B Formula Value (µg/L)	Current MTCA Method B Formula Value (µg/L)	ROD ARAR: Federal MCL (µg/L)	Current Federal MCL (µg/L)
2,4,6-TNT	2.9	2.9	None	None
RDX	0.8	0.8	None	None
2,4- and 2,6-DNT	0.13	0.1	None	None
1,3,5-TNB	0.8	480	None	None
1,3-DNB	1.6	1.6	None	None
Nitrate-N	a	1,600	10,000	10,000
Nitrite-N	a	1,600	1,000	1,000
Manganese	50 ^b	2,200	c	c

^aNot provided in ROD

^bBased on background

^cThere is no primary MCL for manganese

Notes:

ARAR - applicable or relevant and appropriate requirement

DNB - dinitrobenzene

DNT - dinitrotoluene

µg/L - microgram per liter

MCL - maximum contaminant level

MTCA - Model Toxics Control Act

OU - operable unit

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine

ROD - Record of Decision

TNB - trinitrobenzene

TNT - trinitrotoluene

Table 7-5
Comparison of Soil ARARs for OU 3, Site 16/24, With Current Standards

Chemical	ROD ARAR: MTCA Method B Formula Value for Direct Contact^a (mg/kg)	Current MTCA Method B Formula Value for Direct Contact (mg/kg)
Antimony	32	32
Arsenic	20	20
Beryllium	0.23	160

^aMTCA Method B soil cleanup levels for unrestricted land use.

Notes:

ARAR - applicable or relevant and appropriate requirement

mg/kg - milligram per kilogram

MTCA - Model Toxics Control Act

OU - operable unit

ROD - Record of Decision

Table 7-6
Comparison of ROD Groundwater ARARs for OU 3, Site 25, With Current Standards

Chemical	ROD ARAR: MTCA Method B Formula Value (µg/L)	Current MTCA Method B Formula Value (µg/L)
Cadmium	8	8
Manganese	50	2,240

Notes:

ARAR - applicable or relevant and appropriate requirement

µg/L - microgram per liter

MTCA - Model Toxics Control Act

OU - operable unit

ROD - Record of Decision

Table 7-7
Comparison of Soil ARARs for OU 6 With Current Standards
(Unrestricted Land Use)

Chemical	ROD ARAR: MTCA Method B Formula Value for Direct Contact (except where noted (mg/kg)	Current MTCA Method B Formula Value (except where noted) (mg/kg)
2,4,6-Trinitrotoluene	33.3	33.3
2,4-Dinitrotoluene ^a	1.5	1.5
2,4-Dinitrotoluene ^b	58.8 ^c	7,000 ^c
2,6-Dinitrotoluene	1.5	1.5
Nitrotoluene	800	800
1,2-Dinitrobenzene (ortho-)	32	32
1,3-Dinitrobenzene (meta-)	8	8
1,4-Dinitrobenzene (para-)	32	32
Trinitrobenzene	4	2,400
Nitrobenzene	40	40

^aOutside the wetlands boundary

^bInside the wetlands boundary

^cMTCA Method C cleanup level is used per OU 6 ROD to prevent significant damage to wetlands ecosystem.

Notes:

ARAR - applicable or relevant and appropriate requirement

mg/kg - milligram per kilogram

MTCA - Model Toxics Control Act

OU - operable unit

ROD - Record of Decision

Table 7-8
Comparison of ROD Soil and Groundwater ARARs for OU 7 With Current Standards

Chemical	Soil				Groundwater		
	ROD ARAR: MTCA Method A Value (mg/kg)	Current MTCA Method A Value (mg/kg)	ROD ARAR: MTCA Method B Formula Value (mg/kg)	Current MTCA Method B Value (mg/kg)	ROD ARAR: MTCA Method A Value (µg/L)	Current MTCA Method A Value (µg/L)	Current PQL as Applicable (µg/L)
Arsenic (Site B)	20	20	NA	NA	NA	NA	NA
Total cPAHs (Site B)	1	1	NA	NA	NA	NA	NA
Total PCBs (Sites B, 2)	1	1	NA	NA	NA	NA	NA
Total petroleum hydrocarbons (Site 10)	NA	NA	NA	NA	1,000	1,000	NA
DDT (Sites E/11)	NA	NA	2.94	2.94	NA	NA	NA
Otto fuel (Sites E/11)	NA	NA	NA	NA	NA	NA	0.0002

Source: ROD Table 19 (U.S. Navy, USEPA, and Ecology 1996)

Notes:

ARAR - applicable or relevant and appropriate requirement

cPAHs - carcinogenic polyaromatic hydrocarbons

DDT - 4,4'-dichlorodiphenyltrichloroethane

mg/kg - milligram per kilogram

µg/L - microgram per liter

MTCA - Model Toxics Control Act

NA - not applicable

OU - operable unit

PCBs - polycyclic biphenyls

PQL - practical quantitation limit

ROD - Record of Decision

Table 7-9
Comparison of ROD Groundwater ARARs for OU 8 With Current Standards

Chemical	ROD ARAR: MTCA Method B Formula Value (µg/L)	Current MTCA Method B Formula Value (µg/L)	ROD ARAR: Federal MCL (µg/L)	Current Federal MCL (µg/L)
Benzene	1.51	0.795	5	5
1,2-DCA	0.481	0.481	5	5
1,1-DCE	0.0729	400	7	7
1,2-EDB	0.000515	0.022	0.05	0.05
Toluene	160	1600	1,000	1,000

Source: ROD Tables 8-1 and D-1 (U.S. Navy, USEPA, and Ecology 2000)

Notes:

ARAR - applicable or relevant and appropriate requirement

DCA - dichloroethane

DCE - dichloroethene

EDB - dibromoethane

MCL - maximum contaminant level

µg/L - microgram per liter

MTCA - Model Toxics Control Act

OU - operable unit

ROD - Record of Decision

Table 7-10
Issues

Issue	Affects Protectiveness	
	Current	Future
Site A groundwater treatment system is not functioning as intended by the ROD.	No	No
Site F groundwater treatment system is not functioning as intended by the ROD.	No	Yes
Otto fuel is not being substantially removed from the groundwater at Site E/11 by the Site F groundwater extraction and treatment system and was not sampled for in 2004.	No	No
Invasive plant species have become more widespread at Site B (Floral Point)	No	No
Wave erosion of shoreline may be threatening landfill at Site B (Floral Point).	No	Yes
Benzene concentrations in the core of the plume at OU 8 exhibit an increasing trend over at least the last 4 years.	No	No
IC monitoring records are not complete.	No	No
Site F groundwater plume has expanded beyond the area of ICs.	No	Yes

Notes:

IC - institutional control
 OU - operable unit
 ROD - Record of Decision

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 8-1 summarizes the recommendations and follow-up actions identified as a result of the 5-year review process. Some recommended actions are necessary to ensure the long-term protectiveness of certain remedy components. Other actions do not affect protectiveness, but are necessary to achieve or maintain compliance with the RODs or subsequent approved implementation plans. Still other actions are recommended because RAOs have been met (such as discontinuing sediment and shellfish monitoring at Site B [Floral Point] and Site 26). And finally, some actions are recommended because a remedial component, although protective, is not effective for reducing COCs (Site A).

Table 8-1
Recommendations and Follow-Up Actions

Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness	
				Current	Future
Finalize optimization recommendations for treatment systems at Sites A and F.	NAVFAC NW	Ecology	September 2006	No	No (Site A) Yes (Site F)
During plume containment evaluations for Site F, include analysis of Otto fuel containment and ensure annual sampling.	NAVFAC NW	Ecology	September 2006	No	No
Perform engineering evaluation of shoreline erosion at Site B (Floral Point) landfill and assess invasive plant species.	NAVFAC NW	Ecology	June 2006	No	Yes
Discontinue sediment and clam tissue sampling at Site 26/Floral Point because remedial action objectives have been met. Ecology may require monitoring to be restarted if shoreline erosion is not controlled.	NAVFAC NW	Ecology	Upon signing of this document	No	No
Continue monitoring focus on benzene concentration trends in the plume core at OU 8. Evaluate in future monitoring reports whether no new exposure pathways have been created at the site and whether benzene concentrations do not exceed those evaluated in the original risk assessment.	NAVFAC NW	Ecology	Ongoing	No	No
Maintain copies of annual IC inspection reports at both NBK at Bangor and NAVFAC NW to ensure complete records.	NAVFAC NW	Ecology	Ongoing	No	No
Expand the IC boundary for Site F to cover the larger area of the groundwater plume.	NAVFAC NW	Ecology	September 2006	No	Yes
EPA believes that perchlorate could be a new chemical of interest at NBK at Bangor and recommends sampling to assess the presence or absence of this chemical in groundwater.	NAVFAC NW	Ecology and EPA	December 2005	No	No

Notes:

Ecology - Washington State Department of Ecology
 EPA - U.S. Environmental Protection Agency
 NAVFAC NW - Naval Facilities Engineering Command Northwest
 IC - institutional control
 NBK - Naval Base Kitsap
 OU - operable unit

9.0 CERTIFICATION OF PROTECTIVENESS

The remedies implemented for NBK at Bangor remain protective of human health and the environment in the short term. At many of the sites and OUs at NBK at Bangor, remedial actions have resulted in COC concentrations below the RGs for specific media. Where RGs have not been met, active remediation systems, O&M and monitoring programs, and ICs serve to make progress toward meeting RGs and to control exposure pathways in the interim.

For the remedy at OU 2, Site F, to remain protective in the long term, the treatment system should be optimized in accordance with the recent optimization review. For the remedy at OU 7, Site B (Floral Point), to remain protective in the long term, the current erosion conditions at the landfill should be evaluated.

SECOND FIVE-YEAR REVIEW OF RODs
NAVAL BASE KITSAP AT BANGOR
Naval Facilities Engineering Command Northwest
Contract No. N44255-02-D-2008
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10.0 NEXT REVIEW

The next 5-year review is tentatively scheduled for 2010.

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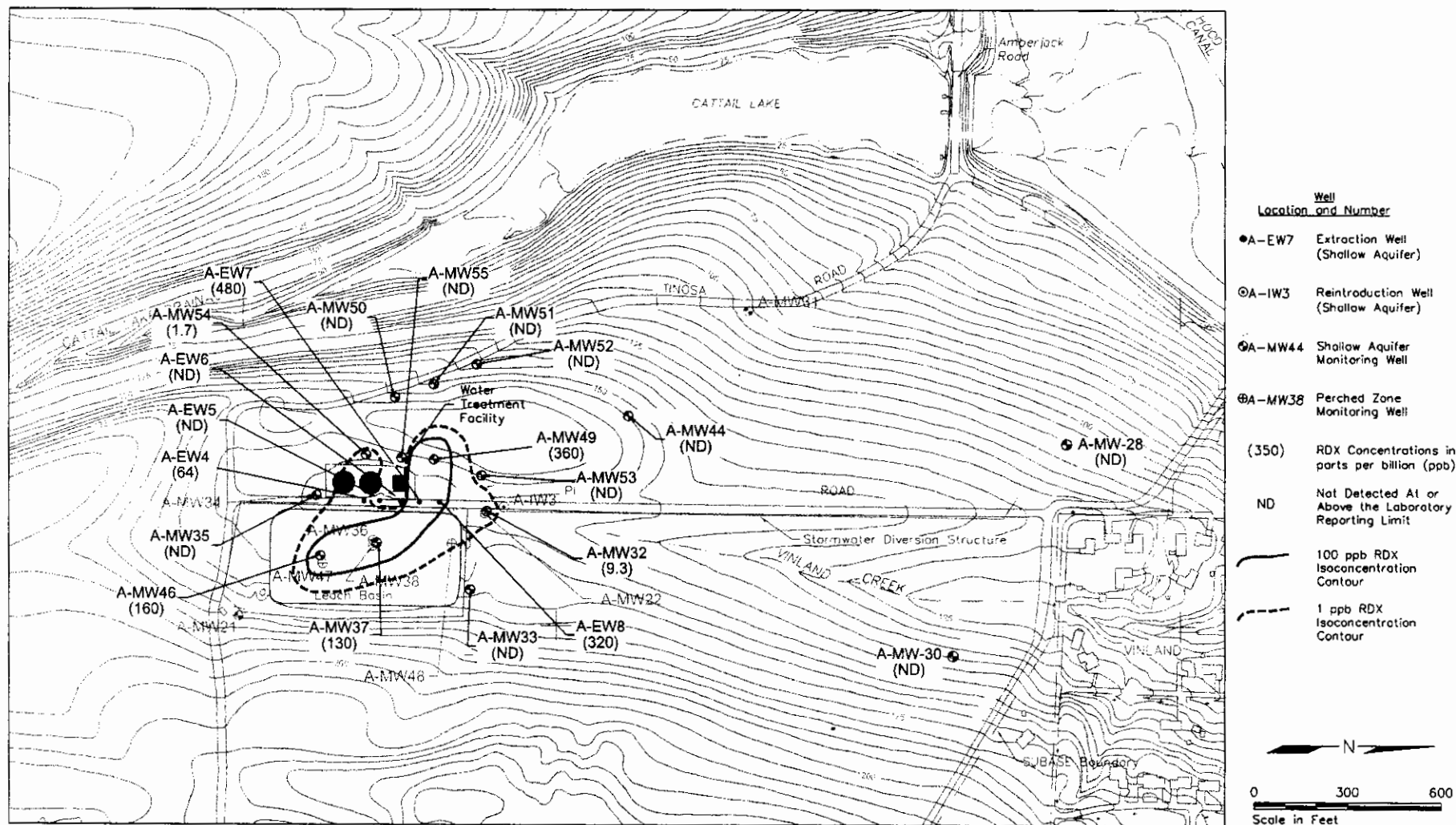
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 - . 1991a. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Site A (Operable Unit 1), Bangor, Washington.* December 10, 1991.
 - . 1991b. *Declaration of the Record of Decision, Decision Summary, Responsiveness Summary, and Administrative Record Index for Interim Remedial Action, Naval Submarine Base Bangor Site F (Operable Unit 2), Bangor, Washington.* August 1991 (signed September 1991).
- Washington State Department of Ecology (Ecology). 1999a. Letter from Marian Abbett of Ecology to Delfin Arreola of EFA NW regarding Floral Point/Site B Remedial Action Report. April 14, 1999.
- . 1999b. Letter from Marian Abbett of Ecology to Ken Patterson of EFA NW regarding Site 26 Hood Canal sediment monitoring at Naval Submarine Base Bangor, Final Technical Memorandum No. 2. September 7, 1999.
 - . 1998. Letter from Marian Abbett of Ecology to Bill Clarno of EFA NW regarding Site 2 Closeout Report (Foster Wheeler) and Site 2 Final As-Built Construction Report (IT Corporation). July 23, 1998.
 - . 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

Figures Showing Recent Monitoring Data

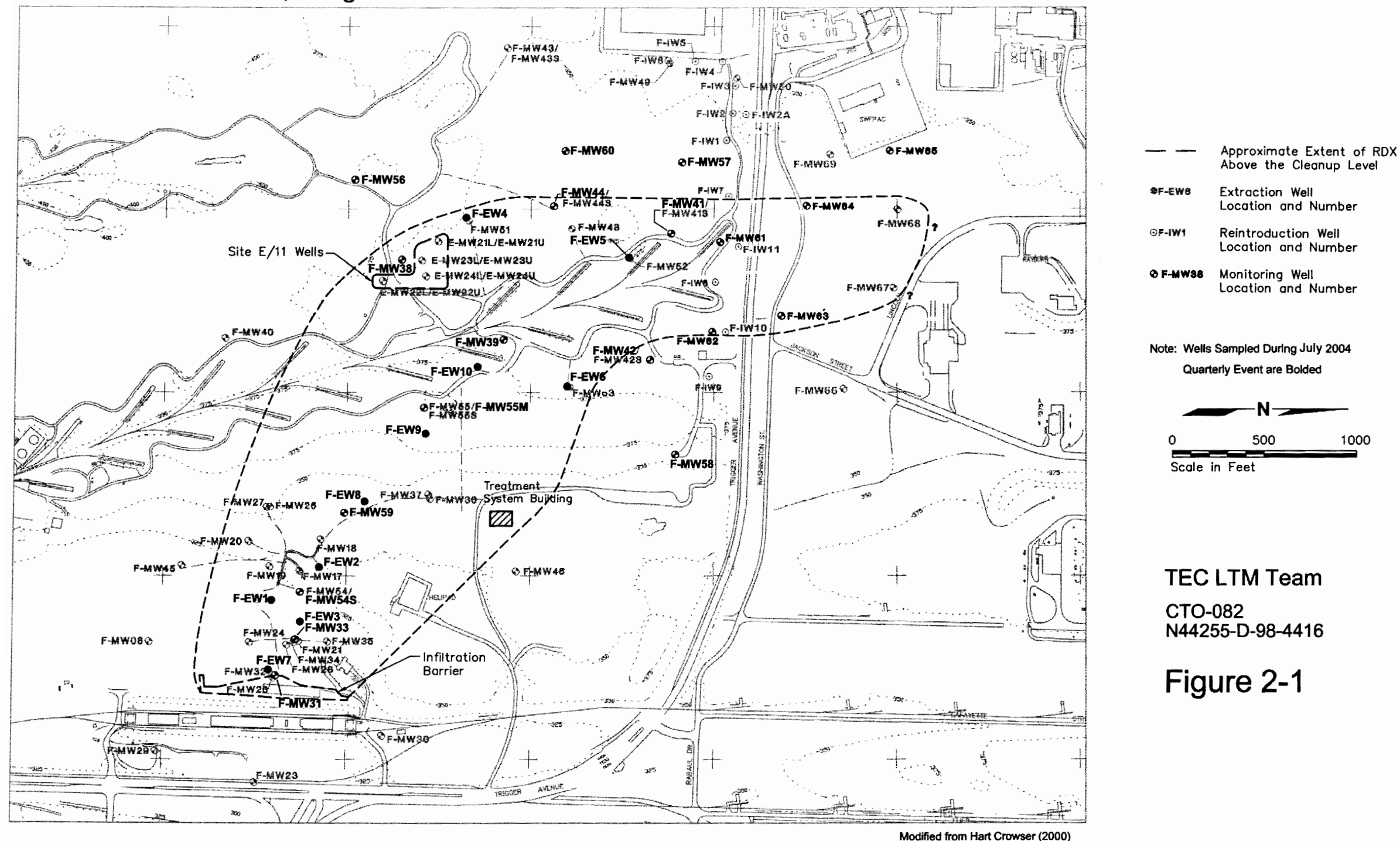
**Appendix A Figures
(From TEC Reports)**

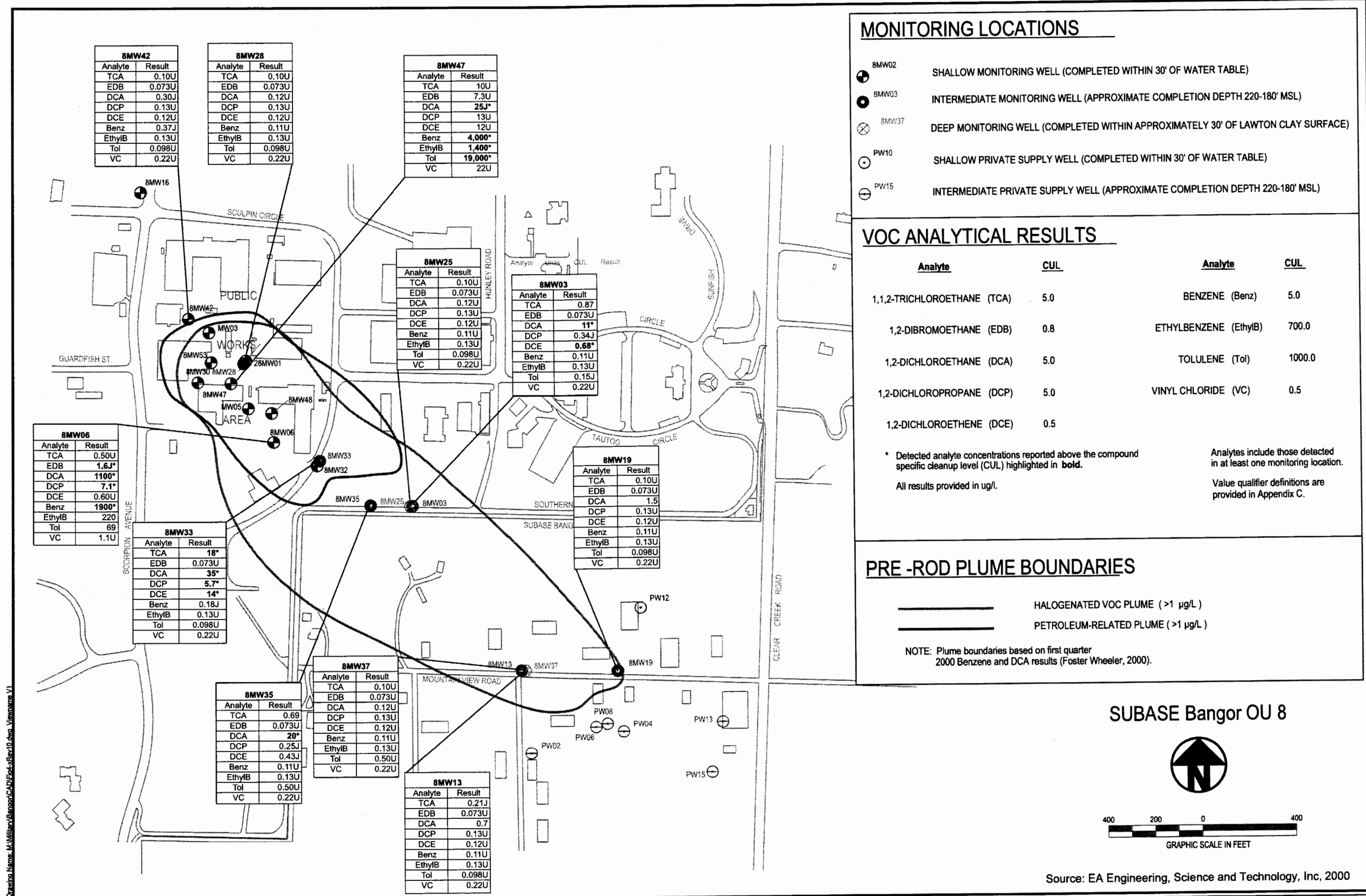
- 3-2 Site A RDX Concentrations During February 2004 Monitoring Event
- 2-1 Site F Compliance and Performance Well Network, July 2004, Naval Submarine Base, Bangor
- 4-1 Summary of Volatile Organic Compound Analytical Results (April 2004), Round 10 MNA Sampling Event, OU B SUBASE Bangor



Site F Compliance and Performance Well Network

July 2004
Naval Submarine Base, Bangor





Drawings Name: M:\Willamette\Bangor\OU8\OU8-Rev10.dwg, Viewname: V1



Figure 4-1
Summary of Volatile Organic Compound Analytical Results
Round 10 Round 8 MNA Sampling Event
OU 8 SUBASE Bangor

Data from April 2004

APPENDIX B

Site 26/Floral Point Sampling Records



TIDAL LEVEL: -0.1 @ 1135 (10/27/01)

[illegible]

ⁱ A = Winnowing, B = Leaking, C = Disturbance, D = Penetration depth.

Comments:

N 285933.039
E 1537790.642
NAD 1927



SEDIMENT CHARACTERISTICS FORM

PROJECT: Bongor 5-Year Review

SITE: Floral Point

DATE: 10/28/04

STATION NUMBER: MS-83

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229088

WATER DEPTH: 0

SAMPLING EQUIPMENT: SS Spoon

TIDAL LEVEL: -0.1 @ 1135 (10/27/04)

Sediment Characteristics:

Texture: Sandy Gravels

Color: Medium - Dark Gray

Odor: none

Oily Sheen: Yes ☐ No ☒

Debris (e.g., shells, wood, etc.): shells

Biological Activity: none

Density/

Consistency: V. Soft ☐ Soft ☒ Firm ☒ Hard ☐ V. Hard ☐

Moisture: Dry ☐ Moist ☐ Wet ☒

Grain Size: Clay ☐ Silt ☐ Fine Sand 10% Med. Sand 60%

Coarse Sand 20% Gravel 60% Other ☐

Comments:



TIDAL LEVEL: -0.1 @ 435

[illegible]

¹ A = Winnowing, B = Leaking, C = Disturbance, D = Penetration depth.

Comments:

NAD 1927



SEDIMENT CHARACTERISTICS FORM

PROJECT: Bungar 5-Year Review

SITE: Floral Point

DATE: 10/27/04

STATION NUMBER: MS 109

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229086, 229087 (FD)

WATER DEPTH: 0

SAMPLING EQUIPMENT: SS Spoon

TIDAL LEVEL: -0.1 @ 1135

Sediment Characteristics:

Texture: Sand and Gravel

Color: Medium Gray

Odor: None

Oily Sheen: Yes ☐ No ☒

Debris (e.g., shells, wood, etc.): shells

Biological Activity: Next to eelgrass bed

Density/

Consistency: V. Soft ☐ Soft ☐ Firm ☒ Hard ☐ V. Hard ☐

Moisture: Dry ☐ Moist ☐ Wet ☒

Grain Size: Clay ☐ Silt ☐ Fine Sand 20% Med. Sand 20%

Coarse Sand 20% Gravel 40% Other ☐

Comments:



TIDAL LEVEL: -0.1 @ 1135

[illegible]

¹ A = Winnowing, B = Leaking, C = Disturbance, D = Penetration depth.

Comments:

N 285418.307
E 1537433.052
NAD 1927



SEDIMENT CHARACTERISTICS FORM

PROJECT: Bingor 5-Tar Review

SITE: Floral Point

DATE: 10/27/04

STATION NUMBER: MS 08

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229085

WATER DEPTH: 6

SAMPLING EQUIPMENT: SS spoon

TIDAL LEVEL: -0.1 @ 1135

Sediment Characteristics:

Texture: Fine Sand

Color: Medium Gray

Odor: None

Oily Sheen: Yes ☐ No ☒

Debris (e.g., shells, wood, etc.): shells, eelgrass

Biological Activity: in eelgrass bed

Density/

Consistency: V. Soft ☐ Soft ☒ Firm ☒ Hard ☐ V. Hard ☐

Moisture: Dry ☐ Moist ☐ Wet ☒

Grain Size: Clay ☐ Silt 10% Fine Sand 90% Med. Sand ☐

Coarse Sand ☐ Gravel ☐ Other ☐

Comments:

Approximately 26 meters from 1991 sample site
and 130 meters from 2000 sample site



TIDAL LEVEL:

[illegible]

¹ A = Winnowing, B = Leaking, C = Disturbance, D = Penetration depth.

Comments:

Core Sampler not successful, Direct Fill Containers



SEDIMENT CHARACTERISTICS FORM

PROJECT: Banyar 5-Year Review

SITE: Floral Point

DATE: 10/20/09

STATION NUMBER: MS 07

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229084

WATER DEPTH: 75

SAMPLING EQUIPMENT: Direct Fill

TIDAL LEVEL: _____

Sediment Characteristics:

Texture: Silt

Color: Gray

Odor: None

Oily Sheen: Yes _____ No ☒

Debris (e.g., shells, wood, etc.): shells

Biological Activity: Worms

Density/

Consistency: V. Soft _____ Soft ☒ Firm _____ Hard _____ V. Hard _____

Moisture: Dry _____ Moist _____ Wet ☒

Grain Size: Clay _____ Silt 80% Fine Sand 20% Med. Sand _____

Coarse Sand _____ Gravel _____ Other _____

Comments:

CLAM SUMMARY FORM

PROJECT: Bunker 5-Year Review
 SITE: Federal Point DATE: 10/27/04
 STATION NUMBER: M5-109 SAMPLES COLLECTED BY: EL, ABH
 SAMPLE NUMBER: 229089, 229090, 229091 WATER DEPTH: 0
 SAMPLING EQUIPMENT: Shovel TIDAL LEVEL: -0.1 @ 1135
 TIME: 2302 LOCATION COORDINATES: N 285696.440
NAD 1927 E 1537476.260

Species	Number of Clams	Total Wet Weight	Comments
<u>Butter clams</u>	<u>10</u>	<u>1,926</u>	
<u>Butter clams</u>	<u>8</u>	<u>1,242</u>	
<u>Little neck clams</u>	<u>11</u>	<u>758</u>	

Sediment Characteristics:

Texture: Silty Sandy Gravel, increasing silt and fine sand with depth

Color: Medium Gray Odor: None

Oily Sheen: Yes ☐ No ☒

Debris (e.g., shells, wood, etc.): shells

Biological Activity: Worms, next to eelgrass bed

Density/
 Consistency: V. Soft ☐ Soft ☐ Firm ☒ Hard ☐ V. Hard ☐

Moisture: Dry ☐ Moist ☐ Wet ☒

Grain Size: Clay ☐ Silt ☐ Fine Sand 20% Med. Sand 20%
 Coarse Sand 20% Gravel 40% Other ☐

Comments: Increasing silt and fine sand with depth by visual only, no grain size sample

CLAM MEASURING FORM

PROJECT: Bangor 5-Year Review

SITE: Floral Point

DATE: 10/27/04

SAMPLES COLLECTED BY: EL ABH

STATION NUMBER: MS-109

SAMPLE NUMBER: 229089, 229090, 229091

SAMPLING EQUIPMENT: Shovel

TIME: 2302

229089 (ms/msd)				229090 (FD)				229091			
#	Species	Length (mm)	Weight (g)	#	Species	Length (mm)	Weight (g)	#	Species	Length (mm)	Weight (g)
1	Butter	95	235	1	Butter	69	86	1	L. Nalk	56	59
2		96	293	2		96	245	2		59	63
3		91	183	3		82	170	3		55	50
4		87	192	4		71	99	4		62	89
5		91	210	5		69	76	5		61	82
6		79	126	6		97	261	6		63	89
7		76	125	7		83	151	7		50	99
8		85	175	8		79	154	8		61	75
9		89	254	9				9		59	71
10		76	133	10				10		58	72
11				11				11		62	59
12				12				12			
13				13				13			
14				14				14			
15				15				15			
16				16				16			
17				17				17			
18				18				18			
Total Weight (g)			1926	Total Weight (g)			1242	Total Weight (g)			758

Comments:

APPENDIX C

Site 26/Floral Point Analytical Data

Luce and Associates

Environmental Consulting Quality Assurance Data Validation

December 18, 2004

Page 1 of 3

Analytical Support Activities
URS Corporation
Century Square
1501 4th Avenue
Suite 1400
Seattle, WA 98101-1616

DATA VALIDATION COVER LETTER

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229084

Sample Numbers and Analyses Validated:

Client Sample	Matrix	Pesticides (Method 8081)
229084	Sediment	X
229084MS	Sediment	X
229084MSD	Sediment	X
229092	Water	X
LCS	Water	X
LCSD	Water	X

Client Sample	Matrix	PCB (Method 8082)
229084	Sediment	X
229084MS	Sediment	X
229084MSD	Sediment	X
229092	Water	X
LCS	Water	X
LCSD	Water	X

<u>Client Sample</u>	<u>Matrix</u>	<u>Metals (Method 6010/6020)</u>	<u>Mercury (Method 7471)</u>
229084	Sediment	X*	X
229084S	Sediment	X*	X
229084D	Sediment	X*	X
229092	Water	X	X
229092S	Water	X	
229092D	Water	X	
Batch QCS	Water		X
Batch QCD	Water		X

* This sample was to be analyzed for the 22 non-mercury TAL metals, but no data were reported for manganese. At the request of the client, the validation was completed without waiting for the laboratory to resubmit manganese data.

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Solids (Method 160.3M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Volatile Solids (Method 160.4M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Organic Carbon (Method 9060M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X
229084MS	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Ammonia (Method 350.3M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084MS	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Sulfide (Method 376.2M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X
229084MS	Sediment	X

Method Reference: Methods referenced above

Validation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methods

Validation Conducted By: R. Luce

Validation Level: 3

Date Received For Validation: 12/11/04

Validation Completion Date: 12/18/04

OVERALL ASSESSMENT OF THE DATA

- ☐ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.
- ☒ The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).
- ☐ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

The conclusions presented in the attached narrative(s) and worksheet(s) were drawn based on the reviewer's professional judgement. The qualifiers assigned to the accompanying data (if any) were assigned based on the validation criteria referenced above and the reviewer's professional judgement. The signature below authorizes the release of the attached materials.

Authorization For Release


Raymond E. Luce II

12/18/04
Date

DATA VALIDATION NARRATIVE COVERSHEET

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229084

Sample Numbers and Analyses Validated:

Client Sample	Matrix	Pesticides (Method 8081)
229084	Sediment	X
229084MS	Sediment	X
229084MSD	Sediment	X
229092	Water	X
LCS	Water	X
LCSD	Water	X

Client Sample	Matrix	PCB (Method 8082)
229084	Sediment	X
229084MS	Sediment	X
229084MSD	Sediment	X
229092	Water	X
LCS	Water	X
LCSD	Water	X

Client Sample	Matrix	Metals (Method 6010/6020)	Mercury (Method 7471)
229084	Sediment	X*	X
229084S	Sediment	X*	X
229084D	Sediment	X*	X
229092	Water	X	X
229092S	Water	X	
229092D	Water	X	
Batch QCS	Water		X
Batch QCD	Water		X

* This sample was to be analyzed for the 22 non-mercury TAL metals, but no data were reported for manganese. At the request of the client, the validation was completed without waiting for the laboratory to resubmit manganese data.

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Solids (Method 160.3M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Volatile Solids (Method 160.4M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Organic Carbon (Method 9060M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X
229084MS	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Ammonia (Method 350.3M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084MS	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Sulfide (Method 376.2M)</u>
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X
229084MS	Sediment	X

Method Reference: Methods referenced above

Validation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methods

Validation Conducted By: Name omitted at client request Validation Level: 3

Date Received For Validation: 12/11/04 Validation Completion Date: 12/18/04

OVERALL ASSESSMENT OF THE DATA

- _____ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.
- X The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).
- _____ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

Authorization For Release Signature omitted at client request

NARRATIVE - PESTICIDES (METHOD 8081)

I. HOLDING TIMES

Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Pest. Extraction</u>	<u>Pest. Analysis</u>
229084	Sediment	10/20/04	11/01/04	11/14/04
229092	Water	10/20/04	10/27/04	10/29/04

The holding times specified in the method were met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction.

II. INITIAL CALIBRATION

Initial calibrations for the required pesticide analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$). DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

III. CONTINUING CALIBRATIONS

Pesticide continuing calibration verification (CCV) standards were analyzed as required.. Listed below are the sample data affected by CC standards that did not meet specified control limit ($\leq 15\%$) for percent difference between the initial calibration and the continuing calibration. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>CCV Standard</u>	<u>GC Column</u>	<u>Analyte</u>	<u>%D</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
11/14/04 14:10	DB-XLB	alpha-BHC	17	229084	UJ
11/14/04 14:10	DB-35MS	beta-BHC	19	229084	UJ
11/14/04 20:51	Both	alpha-BHC	19/17	229084	UJ
11/14/04 20:51	Both	gamma-BHC	16/16	229084	UJ
11/14/04 20:51	DB-XLB	delta-BHC	17	229084	UJ
11/14/04 20:51	DB-XLB	Heptachlor	18	229084	UJ
11/14/04 20:51	DB-XLB	Heptachlor epoxide	17	229084	UJ
11/14/04 20:51	DB-XLB	Dieldrin	16	229084	UJ
11/14/04 20:51	Both	4,4'-DDE	16/16	229084	UJ
11/14/04 20:51	DB-XLB	Endosulfan II	16	229084	UJ
11/14/04 20:51	DB-XLB	4,4'-DDD	16	229084	UJ
11/14/04 20:51	Both	Endrin Ketone	16/16	229084	UJ
11/14/04 20:51	DB-35MS	beta-BHC	20	229084	UJ
11/14/04 20:51	DB-35MS	Aldrin	19	229084	UJ
11/14/04 20:51	DB-35MS	Endrin aldehyde	16	229084	UJ
11/14/04 20:51	DB-35MS	4,4'-DDT	17	229084	UJ

DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

IV. BLANKS

Method blanks were analyzed as required and were free of target analytes. Sample 229092 was identified as an equipment rinsate and was free of target analytes at the reported detection limits.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required, and the results met the client-specified control limits for recovery.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for soil/sediment samples was performed as required, and the results met the client-specified control limits for analyte recovery and precision.

No evidence was found of MS/MSD analyses associated with the water sample, presumably because the water sample was an equipment rinsate. No data were qualified on the basis of this lack of water MS/MSD results.

As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

As an additional quality control measure, water blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

Analyte identification is not evaluated in the level of QC review requested by the client.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested reporting limits (RL) in the water sample were met.

The client-requested reporting limits (RL) in the sediment sample were $50 \mu\text{g/Kg}$ for toxaphene and $1 \mu\text{g/Kg}$ for all other pesticides, reported on a dry weight basis. The reported detection limits for the sediment sample were $63 \mu\text{g/Kg}$ for toxaphene and $1.3 \mu\text{g/Kg}$ for all other pesticides, before adjustments for dilutions, splits, clean-ups, and dry weight factors. No data were qualified on the basis of reporting limits.

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - PCB (METHOD 8082)

I. HOLDING TIMES

Holding times were calculated using the dates presented in the table below.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>PCB Extraction</u>	<u>PCB Analysis</u>
229084	Sediment	10/20/04	11/01/04	11/09/04
229092	Water	10/20/04	10/27/04	10/28/04

The holding times specified in the method were met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction.

II. INITIAL CALIBRATION

Initial calibrations for the required PCB analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$).

III. CONTINUING CALIBRATION

PCB continuing calibration standards were analyzed as required, and the percent difference (%D) between the initial calibration and the continuing calibration was within the specified control limits for each analyte ($\leq 15\%$).

IV. BLANKS

Method blanks were analyzed as required and were free of target analytes. Sample 229092 was identified as an equipment rinsate and was free of target analytes.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required, and the results met the specified control limits for recovery.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for soil/sediment samples was performed as required, and the results met the client-specified control limits for analyte recovery and precision.

No evidence was found of MS/MSD analyses associated with the water sample, presumably because the water sample was an equipment rinsate. No data were qualified on the basis of this lack of water MS/MSD results.

As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

As an additional quality control measure, water blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

Analyte identification is not evaluated in the level of QC review requested by the client.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested reporting limits (RL) in the water sample were met.

The client-requested reporting limits (RL) in the sediment sample were not met. The client-requested reporting limit (RL) was 10 µg/Kg for all Aroclors, reported on a dry weight basis. The reported detection limits were 25 µg/Kg for Aroclor 1221 and 13 µg/Kg for all other Aroclors, before adjustments for dilutions, splits, clean-ups, and dry weight factors. No data were qualified on the basis of reporting limits.

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - METALS (METHODS 6010/6020/7471)

I. HOLDING TIMES

The holding times specified in the method were met. Holding times were calculated using the dates presented in the table below. The analysis of mercury must be performed within 28 days of sample collection. All other metals must be analyzed within six months of sample collection.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>ICP Analysis</u>	<u>Mercury Analysis</u>
229084	Sediment	10/20/04	by 11/29/04	11/02/04
229092	Sediment	10/20/04	by 11/29/04	11/02/04

II. CALIBRATION

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed as required and had recoveries within specified control limits.

III. BLANKS

In the analytical sequence on the ICP instrument on 11/17/04, the final two continuing calibration blanks (CCB) contained sodium at concentrations greater than the instrument detection limit, but less than the reporting limit. No data were affected because the concentration of sodium in the associated sediment sample was much greater than the concentrations found in these CCB.

In the analytical sequence on the ICP-MS instrument on 11/16/04, one or more CCB contained cadmium and thallium at concentrations greater than the instrument detection limit, but less than the reporting limit. No data were affected because the concentrations of these analytes in the associated sediment sample were much greater than the concentrations found in these CCB.

In the analytical sequence on the ICP-MS instrument on 11/29/04, one or more CCB contained cadmium and manganese at concentrations greater than the instrument detection limit, but less than the reporting limit. No data were affected because these analytes were not detected in the associated water sample.

Listed below are the sample data affected by calibration blanks that contained analytes at concentrations with absolute values equal to or greater than the IDL. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*. Note that in the table below, the values in the column labeled "Blank Result" are in units of µg/L, and reflect the raw data taken from the instrument. The results in the column labeled "Reported Sample Results" are in the reporting units appropriate to the sample matrix. The calculations necessary to directly compare blank results with sample results were performed by the reviewer before any qualifiers were assigned.

<u>Sample</u>	<u>Analyte</u>	<u>Time of Blank Analysis</u>	<u>Blank Result</u>	<u>Reported Sample Result</u>	<u>Action Taken</u>
229084	Antimony	11/16/04 11:50	0.07 µg/L	0.08 mg/Kg	0.08 U
229092	Thallium	11/29/04 12:19	0.018 µg/L	0.004 µg/L	0.02 U

Preparation blanks were analyzed as required, and were free of analytes at concentrations with absolute values equal to or greater than the reporting limit. Sample 229092 was identified as an equipment rinsate and contained chromium (0.05 µg/L), magnesium (17.9 µg/L), thallium (0.004 µg/L), and vanadium (0.04 µg/L) at concentrations greater than the IDL. At the request of the client, no data were qualified based on equipment rinsate results.

IV. ICP INTERFERENCE CHECK SAMPLES (ICS)

The ICP ICS was analyzed for the required analytes and at the required frequency. The percentage recoveries for the ICS analytes fell within specified control limits. A review of the raw data suggests that no sample data were affected by potential interferences.

V. LABORATORY CONTROL SAMPLE (LCS)

The LCS was analyzed as required. The recoveries for the LCS analytes fell within manufacturer-specified control limits.

VI. MATRIX SPIKE SAMPLE ANALYSIS

Matrix (pre-digestion) spikes for soil/sediment samples were analyzed as required. The recoveries of aluminum and iron in the matrix spike fell outside the client-specified control limits, but the concentrations of these analytes in the parent sample were greater than four times the amount spiked, so control limits do not apply. Listed below are the sample data affected by matrix spike recoveries that did not meet client-specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Spike Sample</u>	<u>Matrix</u>	<u>Analyte</u>	<u>Percent Recovery</u>	<u>Control Limits (%)</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
229084S	Soil	Antimony	33	70-130	229084	J

Matrix (pre-digestion) spikes for water samples were analyzed as required, and percent recoveries of the matrix spike analytes fell within client-specified control limits.

VII. DUPLICATE SAMPLE ANALYSIS

Laboratory duplicates were analyzed as required. The RPD value between antimony concentrations in sample 229084 and its lab duplicate was 73%, and fell outside the client specified control limit of ≤30%. However, the concentration of antimony in the original analysis was less than five times the reporting limit for the sample, so the control limit used to evaluate the agreement between duplicate mercury results was two times the reporting limit ($2 \times 0.05 \text{ mg/Kg} = 0.10 \text{ mg/Kg}$). The antimony results in the duplicate of sample 229084 fell within this control limit.

Listed below are the sample data affected by results of laboratory duplicate sample analyses that did not meet specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Duplicate Sample</u>	<u>Matrix</u>	<u>Analyte</u>	<u>RPD</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
229084D	Sediment	Silver	77	229084	J

VIII. ICP SERIAL DILUTION

Serial dilutions were analyzed at the frequency required. Listed below are the sample data affected by results from serial dilutions that did not meet the specified control limit. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Analyte</u>	<u>Original Sample (229084) Result (µg/L)</u>	<u>Diluted Sample (229084L) Result (µg/L)</u>	<u>Percent Difference</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
Cobalt	12.2	13.7	11	229084	J
Copper	26.7	31.9	19	229084	J
Nickel	47.2	55.2	17	229084	J
Thallium	0.516	0.786	52	229084	J
Zinc	74.8	102	36	229084	J

IX. SAMPLE RESULT VERIFICATION

Analyte quantitation is not evaluated in the level of QC review requested by the client. The client-requested reporting limits (RL) were met. Reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

X. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

XI. ICP/MS QUALITY CONTROL

ICP/MS instrument quality control parameters are not evaluated in the level of QC review requested by the client.

XII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - TOTAL SOLIDS (METHOD 160.3M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for total solids. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Total Solids Analysis Date</u>
229084	Sediment	10/20/04	11/03/04

II. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

III. ANALYTE QUANTITATION

Analyte quantitation is not evaluated in the level of QC review requested by the client.

IV. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - TOTAL VOLATILE SOLIDS (METHOD 160.4M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for total volatile solids. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Total Volatile Analysis Date</u>
229084	Sediment	10/20/04	11/01/04

II. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$).

III. ANALYTE QUANTITATION

Analyte quantitation is not evaluated in the level of QC review requested by the client.

IV. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - TOTAL ORGANIC CARBON (METHOD 9060M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229084	Sediment	10/20/04	11/06/04

II. CALIBRATION

No evidence of an initial calibration was found. The data review checklist on page 59 of the package suggests that an initial calibration was not applicable. No data were qualified on the basis of this lack of an initial calibration.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (85-115%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (85-115%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested detection limit was met for each target analyte. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - AMMONIA (METHOD 350.3M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229084	Sediment	10/20/04	11/01/04
229086	Sediment	10/27/04	11/01/04
229087	Sediment	10/27/04	11/01/04
229088	Sediment	10/28/04	11/01/04

II. CALIBRATION

An initial calibration was performed. Although the method gives no specific criteria for evaluating initial calibrations, in the opinion of the reviewer the initial calibration was acceptable, and no data were qualified.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$).

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (85-115%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (85-115%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested detection limit (0.2 mg/Kg) was not met. The reported detection limit for the sample was 0.6 mg/Kg. No data were qualified on the basis of reported detection limits. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - SULFIDES (METHOD 376.2M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229084	Sediment	10/20/04	10/26/04

II. CALIBRATION

An initial calibration was performed. Although the method gives no specific criteria for evaluating initial calibrations, in the opinion of the reviewer the initial calibration was acceptable, and no data were qualified.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

The laboratory analyzed a duplicate and a triplicate. Although the relative standard deviation for the triplicate results was within the client-specified control limit ($\leq 20\%$), the relative percent difference between duplicate results was not. Listed below are the sample data affected by results of laboratory duplicate sample analyses that did not meet the client-specified control limit ($RPD \leq 20\%$). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Duplicate Sample</u>	<u>Matrix</u>	<u>Analyte</u>	<u>RPD</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
229084DUP	Sediment	Sulfide	21	229084	J

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (60-130%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (60-130%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested detection limit was not met. The client-requested detection limit was 0.1 mg/Kg, and the reported detection limit for the sample was 1.1 mg/Kg. No data were qualified on the basis of detection limits. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

Luce and Associates

Environmental Consulting Quality Assurance Data Validation

December 17, 2004

Page 1 of 3

Analytical Support Activities
URS Corporation
Century Square
1501 4th Avenue
Suite 1400
Seattle, WA 98101-1616

DATA VALIDATION COVER LETTER

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229085

Sample Numbers and Analyses Validated:

<u>Client Sample</u>	<u>Matrix</u>	<u>Pesticides (Method 8081)</u>
229085	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X
Batch QCMS	Sediment	X
Batch QCMSD	Sediment	X

<u>Client Sample</u>	<u>Matrix</u>	<u>PCB (Method 8082)</u>
229085	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X
Batch QCMS	Sediment	X
Batch QCMSD	Sediment	X

<u>Client Sample</u>	<u>Matrix</u>	<u>Metals (Method 6010/6020)</u>	<u>Mercury (Method 7471)</u>
229085	Sediment	X	X
229086	Sediment	X	X
229087	Sediment	X	X

<u>Client</u> <u>Sample</u>	<u>Matrix</u>	<u>Metals</u> <u>(Method 6010/6020)</u>	<u>Mercury</u> <u>(Method 7471)</u>
229088	Sediment	X	X
229085S	Sediment	X	X
229085D	Sediment	X	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Solids</u> <u>(Method 160.3M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Volatile Solids</u> <u>(Method 160.4M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Organic Carbon</u> <u>(Method 9060M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Ammonia</u> <u>(Method 350.3M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
		Ammonia

Sample ID Matrix (Method 350.3M)

229087	Sediment	X
229088	Sediment	X

Sample ID Matrix Sulfide
(Method 376.2M)

229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

Method Reference: Methods referenced aboveValidation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methodsValidation Conducted By: R. LuceValidation Level: 4Date Received For Validation: 12/11/04Validation Completion Date: 12/17/04**OVERALL ASSESSMENT OF THE DATA**

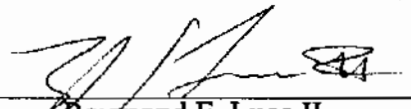
_____ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.

X The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

_____ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

The conclusions presented in the attached narrative(s) and worksheet(s) were drawn based on the reviewer's professional judgement. The qualifiers assigned to the accompanying data (if any) were assigned based on the validation criteria referenced above and the reviewer's professional judgement. The signature below authorizes the release of the attached materials.

Authorization For Release


Raymond E. Luce II12/17/04
Date

DATA VALIDATION NARRATIVE COVERSHEET

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229085

Sample Numbers and Analyses Validated:

<u>Client Sample</u>	<u>Matrix</u>	<u>Pesticides (Method 8081)</u>
229085	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X
Batch QCMS	Sediment	X
Batch QCMSD	Sediment	X

<u>Client Sample</u>	<u>Matrix</u>	<u>PCB (Method 8082)</u>
229085	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X
Batch QCMS	Sediment	X
Batch QCMSD	Sediment	X

<u>Client Sample</u>	<u>Matrix</u>	<u>Metals (Method 6010/6020)</u>	<u>Mercury (Method 7471)</u>
229085	Sediment	X	X
229086	Sediment	X	X
229087	Sediment	X	X
229088	Sediment	X	X
229085S	Sediment	X	X
229085D	Sediment	X	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Solids (Method 160.3M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Volatile Solids (Method 160.4M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Total Organic Carbon (Method 9060M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Ammonia (Method 350.3M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

<u>Sample ID</u>	<u>Matrix</u>	<u>Sulfide (Method 376.2M)</u>
229085	Sediment	X
229085DUP	Sediment	X
229085TRI	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
229087	Sediment	X
229088	Sediment	X

Method Reference: Methods referenced above

Validation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methods

Validation Conducted By: Name omitted at client request

Validation Level: 4

Date Received For Validation: 12/11/04

Validation Completion Date: 12/17/04

OVERALL ASSESSMENT OF THE DATA

- ☐ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.
- ☒ The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).
- ☐ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

Authorization For Release Signature omitted at client request

NARRATIVE - PESTICIDES (METHOD 8081)

I. HOLDING TIMES

Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Pest. Extraction</u>	<u>Pest. Analysis</u>
229085	Sediment	10/27/04	11/01/04	11/14/04
229086	Sediment	10/27/04	11/01/04	11/14/04
229087	Sediment	10/27/04	11/01/04	11/14/04
229088	Sediment	10/28/04	11/01/04	11/14/04

The holding times specified in the method were met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction.

II. INITIAL CALIBRATION

Initial calibrations for the required pesticide analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$). DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

III. CONTINUING CALIBRATIONS

Pesticide continuing calibration verification (CCV) standards were analyzed as required. Listed below are the sample data affected by CC standards that did not meet specified control limits for percent difference between the initial calibration and the continuing calibration. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>CCV Standard</u>	<u>GC Column</u>	<u>Analyte</u>	<u>%D</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
11/14/04 14:10	DB-XLB	alpha-BHC	17	229085	UJ
11/14/04 14:10	DB-XLB	alpha-BHC	17	229086	UJ
11/14/04 14:10	DB-XLB	alpha-BHC	17	229087	UJ
11/14/04 14:10	DB-XLB	alpha-BHC	17	229088	UJ
11/14/04 14:10	DB-35MS	beta-BHC	19	229085	UJ
11/14/04 14:10	DB-35MS	beta-BHC	19	229086	UJ
11/14/04 14:10	DB-35MS	beta-BHC	19	229087	UJ
11/14/04 14:10	DB-35MS	beta-BHC	19	229088	UJ
11/14/04 20:51	Both	alpha-BHC	19/17	229085	UJ
11/14/04 20:51	Both	alpha-BHC	19/17	229086	UJ
11/14/04 20:51	Both	alpha-BHC	19/17	229087	UJ
11/14/04 20:51	Both	alpha-BHC	19/17	229088	UJ
11/14/04 20:51	Both	gamma-BHC	16/16	229085	UJ
11/14/04 20:51	Both	gamma-BHC	16/16	229086	UJ
11/14/04 20:51	Both	gamma-BHC	16/16	229087	UJ
11/14/04 20:51	Both	gamma-BHC	16/16	229088	UJ

<u>CCV Standard</u>	<u>GC Column</u>	<u>Analyte</u>	<u>%D</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
11/14/04 20:51	DB-XLB	delta-BHC	17	229085	UJ
11/14/04 20:51	DB-XLB	delta-BHC	17	229086	UJ
11/14/04 20:51	DB-XLB	delta-BHC	17	229087	UJ
11/14/04 20:51	DB-XLB	delta-BHC	17	229088	UJ
11/14/04 20:51	DB-XLB	Heptachlor	18	229085	J
11/14/04 20:51	DB-XLB	Heptachlor	18	229086	UJ
11/14/04 20:51	DB-XLB	Heptachlor	18	229087	UJ
11/14/04 20:51	DB-XLB	Heptachlor	18	229088	UJ
11/14/04 20:51	DB-XLB	Heptachlor epoxide	17	229085	UJ
11/14/04 20:51	DB-XLB	Heptachlor epoxide	17	229086	UJ
11/14/04 20:51	DB-XLB	Heptachlor epoxide	17	229087	UJ
11/14/04 20:51	DB-XLB	Heptachlor epoxide	17	229088	UJ
11/14/04 20:51	DB-XLB	Dieldrin	16	229085	UJ
11/14/04 20:51	DB-XLB	Dieldrin	16	229086	UJ
11/14/04 20:51	DB-XLB	Dieldrin	16	229087	J
11/14/04 20:51	DB-XLB	Dieldrin	16	229088	UJ
11/14/04 20:51	Both	4,4'-DDE	16/16	229085	UJ
11/14/04 20:51	Both	4,4'-DDE	16/16	229086	UJ
11/14/04 20:51	Both	4,4'-DDE	16/16	229087	UJ
11/14/04 20:51	Both	4,4'-DDE	16/16	229088	UJ
11/14/04 20:51	DB-XLB	Endosulfan II	16	229085	UJ
11/14/04 20:51	DB-XLB	Endosulfan II	16	229086	UJ
11/14/04 20:51	DB-XLB	Endosulfan II	16	229087	UJ
11/14/04 20:51	DB-XLB	Endosulfan II	16	229088	UJ
11/14/04 20:51	DB-XLB	4,4'-DDD	16	229085	UJ
11/14/04 20:51	DB-XLB	4,4'-DDD	16	229086	UJ
11/14/04 20:51	DB-XLB	4,4'-DDD	16	229087	UJ
11/14/04 20:51	DB-XLB	4,4'-DDD	16	229088	UJ
11/14/04 20:51	Both	Endrin Ketone	16/16	229085	UJ
11/14/04 20:51	Both	Endrin Ketone	16/16	229086	UJ
11/14/04 20:51	Both	Endrin Ketone	16/16	229087	UJ
11/14/04 20:51	Both	Endrin Ketone	16/16	229088	UJ
11/14/04 20:51	DB-35MS	beta-BHC	20	229085	UJ
11/14/04 20:51	DB-35MS	beta-BHC	20	229086	UJ
11/14/04 20:51	DB-35MS	beta-BHC	20	229087	UJ
11/14/04 20:51	DB-35MS	beta-BHC	20	229088	UJ
11/14/04 20:51	DB-35MS	Aldrin	19	229085	UJ
11/14/04 20:51	DB-35MS	Aldrin	19	229086	UJ
11/14/04 20:51	DB-35MS	Aldrin	19	229087	UJ
11/14/04 20:51	DB-35MS	Aldrin	19	229088	UJ
11/14/04 20:51	DB-35MS	Endrin aldehyde	16	229085	UJ
11/14/04 20:51	DB-35MS	Endrin aldehyde	16	229086	UJ
11/14/04 20:51	DB-35MS	Endrin aldehyde	16	229087	UJ
11/14/04 20:51	DB-35MS	Endrin aldehyde	16	229088	UJ
11/14/04 20:51	DB-35MS	4,4'-DDT	17	229085	J
11/14/04 20:51	DB-35MS	4,4'-DDT	17	229086	UJ
11/14/04 20:51	DB-35MS	4,4'-DDT	17	229087	UJ
11/14/04 20:51	DB-35MS	4,4'-DDT	17	229088	UJ

DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

IV. BLANKS

Method blanks were analyzed as required and were free of target analytes. Results for the rinsate blank (sample 229092) associated with these samples were reported with another SDG (229084) and are discussed in the validation report for that SDG.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required, and the results met the specified control limits for recovery.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for soil/sediment samples was performed as required, and the results met the client-specified control limits for analyte recovery and precision. As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

Review of the raw data suggests that all target analytes were identified correctly. No signs of false positives or false negatives were observed by the reviewer.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Calculations were verified for ten percent of the target analyte concentrations found in each sample. All were correct. All of the others were therefore assumed to be correct.

At the request of the client, qualifiers were assigned to all results that were flagged with a "P" qualifier by the lab. (The laboratory-assigned P qualifier signifies a percent difference of greater than 40% between the concentrations calculated for a target analyte on the two GC columns.) Results for target analytes with a percent difference of 40% to 100% received J qualifiers. Results for target analytes with a percent difference of $>100\%$ received NJ qualifiers.

The client-requested reporting limits (RL) were not met. The client-requested reporting limits (RL) were 50 $\mu\text{g/Kg}$ for toxaphene and 1 $\mu\text{g/Kg}$ for all other pesticides, reported on a dry weight basis. The reported detection limits were 63 $\mu\text{g/Kg}$ for toxaphene and 1.3 $\mu\text{g/Kg}$ for all other pesticides, before adjustments for dilutions, splits, clean-ups, and dry weight factors. No data were qualified on the basis of reporting limits.

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - PCB (METHOD 8082)

Holding times were calculated using the dates presented in the table below.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>PCB Extraction</u>	<u>PCB Analysis</u>
229085	Sediment	10/27/04	11/01/04	11/09/04
229086	Sediment	10/27/04	11/01/04	11/09/04
229087	Sediment	10/27/04	11/01/04	11/10/04
229088	Sediment	10/28/04	11/01/04	11/10/04

The holding times specified in the method were met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction.

II. INITIAL CALIBRATION

Initial calibrations for the required PCB analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$).

III. CONTINUING CALIBRATION

PCB continuing calibration standards were analyzed as required, and the percent difference (%D) between the initial calibration and the continuing calibration was within the specified control limits for each analyte ($\leq 15\%$).

IV. BLANKS

Method blanks were analyzed as required and were free of target analytes. Results for the rinsate blank (sample 229092) associated with these samples were reported with another SDG (229084) and are discussed in the validation report for that SDG.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required, and the results met the specified control limits for recovery.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for soil/sediment samples was performed as required, and the results met the client-specified control limits for analyte recovery and precision. As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

No target analytes were found in the samples. No signs of false negatives were observed by the reviewer.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

No target analytes were found in the samples.

The client-requested detection limits were not met. The client-requested reporting limit (RL) was 10 µg/Kg for all analytes, reported on a dry weight basis. The reported detection limits were 25 µg/Kg for Aroclor 1221 and 13 µg/Kg for all other Aroclors, before adjustments for dilutions, splits, clean-ups, and dry weight factors. No data were qualified on the basis of reporting limits.

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - METALS (METHODS 6010/6020/7471)

I. HOLDING TIMES

The holding times specified in the method were met. Holding times were calculated using the dates presented in the table below. The analysis of mercury must be performed within 28 days of sample collection. All other metals must be analyzed within six months of sample collection.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>ICP Analysis</u>	<u>Mercury Analysis</u>
229085	Sediment	10/27/04	by 11/29/04	11/09/04
229086	Sediment	10/27/04	by 11/29/04	11/09/04
229087	Sediment	10/27/04	by 11/29/04	11/09/04
229088	Sediment	10/28/04	by 11/29/04	11/09/04

II. CALIBRATION

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed as required and had recoveries within specified control limits.

III. BLANKS

In the analytical sequence on the ICP instrument on 11/25/04, one or more continuing calibration blanks (CCB) contained magnesium and/or sodium at concentrations greater than the instrument detection limit, but less than the reporting limit. No data were affected because the concentrations of these analytes in the associated sediment samples were much greater than the concentrations found in these CCB.

Listed below are the sample data affected by calibration blanks that contained analytes at concentrations with absolute values equal to or greater than the IDL. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*. Note that in the table below, the values in the column labeled "Blank Result" are in units of µg/L, and reflect the raw data taken from the instrument. The results in the column labeled "Reported Sample Results" are in the reporting units appropriate to the sample matrix. The calculations necessary to directly compare blank results with sample results were performed by the reviewer before any qualifiers were assigned.

<u>Sample</u>	<u>Analyte</u>	<u>Time of Blank Analysis</u>	<u>Blank Result</u>	<u>Reported Sample Result</u>	<u>Action Taken</u>
229085	Antimony	11/29/04 14:48	0.06 µg/L	0.03 mg/Kg	0.03 U
229086	Antimony	11/29/04 14:48	0.06 µg/L	0.06 mg/Kg	0.06 U
229087	Antimony	11/29/04 14:48	0.06 µg/L	0.05 mg/Kg	0.05 U
229088	Antimony	11/29/04 14:48	0.06 µg/L	0.06 mg/Kg	0.06 U
229088	Cadmium	11/29/04 14:02	0.03 µg/L	0.091 mg/Kg	0.091 U
229088	Thallium	11/29/04 14:48	0.004 µg/L	0.019 mg/Kg	0.02 U

Preparation blanks were analyzed as required, and were free of analytes at concentrations with absolute values equal to or greater than the reporting limit. Results for the rinsate blank (sample 229092)

associated with these samples were reported with another SDG (229084) and are discussed in the validation report for that SDG.

IV. ICP INTERFERENCE CHECK SAMPLES (ICS)

The ICP ICS was analyzed for the required analytes and at the required frequency. The percentage recoveries for the ICS analytes fell within specified control limits. A review of the raw data suggests that no sample data were affected by potential interferences.

V. LABORATORY CONTROL SAMPLE (LCS)

The LCS was analyzed as required. Listed below are the sample data affected by LCS recoveries that did not meet specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>LCS ID</u>	<u>Analyte</u>	<u>Result (mg/Kg)</u>	<u>Control Limits (mg/Kg)</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
LCSS	Selenium	200	114-194	229085	J
LCSS	Selenium	200	114-194	229086	J
LCSS	Selenium	200	114-194	229087	J
LCSS	Selenium	200	114-194	229088	J

VI. MATRIX SPIKE SAMPLE ANALYSIS

Matrix (pre-digestion) spikes for soil/sediment samples were analyzed as required. The recoveries of aluminum and iron in the matrix spike fell outside the client-specified control limits, but the concentrations of these analytes in the parent sample were greater than four times the amount spiked, so control limits do not apply. Listed below are the sample data affected by matrix spike recoveries that did not meet client-specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Spike Sample</u>	<u>Matrix</u>	<u>Analyte</u>	<u>Percent Recovery</u>	<u>Control Limits (%)</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
229085S	Soil	Antimony	28	70-130	229085	J
229085S	Soil	Antimony	28	70-130	229086	J
229085S	Soil	Antimony	28	70-130	229087	J
229085S	Soil	Antimony	28	70-130	229088	J

VII. DUPLICATE SAMPLE ANALYSIS

Laboratory duplicates were analyzed as required. The RPD value between mercury results in sample 229085 and its lab duplicate was 44%, and fell outside the client specified control limit of $\leq 30\%$. However, the concentration of mercury in the original analysis was less than five times the reporting limit for the sample, so the control limit used to evaluate the agreement between duplicate mercury results was two times the reporting limit ($2 \times 0.013 \text{ mg/Kg} = 0.026 \text{ mg/Kg}$). The mercury results in the duplicate of sample 229085 fell within this control limit. No data were qualified on the basis of duplicate results.

VIII. ICP SERIAL DILUTION

Serial dilutions were analyzed at the frequency required. Listed below are the sample data affected by results from serial dilutions that did not meet the specified control limit. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Analyte</u>	<u>Original Sample (229085) Result (µg/L)</u>	<u>Diluted Sample (229085L) Result (µg/L)</u>	<u>Percent Difference</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
Cobalt	17.3	20.3	17	229085	J
Cobalt	17.3	20.3	17	229086	J
Cobalt	17.3	20.3	17	229087	J
Cobalt	17.3	20.3	17	229088	J
Nickel	72.5	86.7	20	229085	J
Nickel	72.5	86.7	20	229086	J
Nickel	72.5	86.7	20	229087	J
Nickel	72.5	86.7	20	229088	J

IX. SAMPLE RESULT VERIFICATION

Concentration calculations were verified for ten percent of the analytes in each sample. All were found to be correct. All of the others were therefore assumed to be correct. All sample results were within the linear range of the ICP or within the calibrated range of the instrument being used.

The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors. With the following exceptions, the client-specified detection limits were met:

<u>Analyte</u>	<u>Client-Requested Detection Limit (mg/Kg)</u>	<u>Reported Detection Limit (mg/Kg)</u>
Chromium	0.2	0.5
Copper	0.1	1.0
Manganese	0.05	0.5
Zinc	0.05	1.0

No data were qualified based on reported detection limits.

X. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

XI. ICP/MS QUALITY CONTROL

Mass calibration of the MS was within 0.1 atomic mass units (amu) of true value. MS resolution was less than 0.9 amu full width at 10% peak height. The intensity of the ICP/MS internal standards in the

calibration blank and the interference check standard fell within the control limits specified in the method (80-120%). The intensity of the ICP/MS internal standards fell within the control limits specified in the method (30-120%) for all samples.

XII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - TOTAL SOLIDS (METHOD 160.3M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for total solids. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Total Solids Analysis Date</u>
229085	Sediment	10/27/04	11/02/04
229086	Sediment	10/27/04	11/02/04
229087	Sediment	10/27/04	11/02/04
229088	Sediment	10/28/04	11/02/04

II. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

III. ANALYTE QUANTITATION

Calculations were verified for all of the samples. All were correct. Ten percent of the calculations related to the parameters discussed in Sections I and II above were verified. All were found to be correct. All others were therefore assumed to be correct. No transcription errors or data reduction errors were found in the data package.

IV. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - TOTAL VOLATILE SOLIDS (METHOD 160.4M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for total volatile solids. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Total Volatile Analysis Date</u>
229085	Sediment	10/27/04	11/09/04
229086	Sediment	10/27/04	11/09/04
229087	Sediment	10/27/04	11/09/04
229088	Sediment	10/28/04	11/09/04

II. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

III. ANALYTE QUANTITATION

Calculations were verified for all of the samples. All were correct. Ten percent of the calculations related to the parameters discussed in Sections I and II above were verified. All were found to be correct. All others were therefore assumed to be correct. No transcription errors or data reduction errors were found in the data package.

IV. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - TOTAL ORGANIC CARBON (METHOD 9060M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229085	Sediment	10/27/04	11/10/04
229086	Sediment	10/27/04	11/10/04
229087	Sediment	10/27/04	11/10/04
229088	Sediment	10/28/04	11/10/04

II. CALIBRATION

No evidence of an initial calibration was found. The data review checklist on page 61 of the package suggests that an initial calibration was not applicable. No data were qualified on the basis of this lack of an initial calibration.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (85-115%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (85-115%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Calculations were verified for all of the target analyte concentrations found in each sample. All were correct.

The client-requested detection limit was met for each target analyte. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

Ten percent of the calculations related to the parameters discussed in Sections II through V above were verified. All were found to be correct. All others were therefore assumed to be correct. No transcription errors or data reduction errors were found in the data package.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - AMMONIA (METHOD 350.3M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229085	Sediment	10/27/04	11/01/04
229086	Sediment	10/27/04	11/01/04
229087	Sediment	10/27/04	11/01/04
229088	Sediment	10/28/04	11/01/04

II. CALIBRATION

An initial calibration was performed. Although the method gives no specific criteria for evaluating initial calibrations, in the opinion of the reviewer the initial calibration was acceptable, and no data were qualified.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$).

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (85-115%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (85-115%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Calculations were verified for all of the target analyte concentrations found in each sample. All were correct.

The client-requested detection limit was met for each target analyte. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

Ten percent of the calculations related to the parameters discussed in Sections II through V above were verified. All were found to be correct. All others were therefore assumed to be correct. No transcription errors or data reduction errors were found in the data package.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

NARRATIVE - SULFIDES (METHOD 376.2M)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for water or soil samples. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Analysis Date</u>
229085	Sediment	10/27/04	11/01/04
229086	Sediment	10/27/04	11/01/04
229087	Sediment	10/27/04	11/01/04
229088	Sediment	10/28/04	11/01/04

II. CALIBRATION

An initial calibration was performed. Although the method gives no specific criteria for evaluating initial calibrations, in the opinion of the reviewer the initial calibration was acceptable, and no data were qualified.

Continuing calibration verification (CCV) standards were analyzed at regular intervals. Although the method gives no specific criteria for evaluating continuing calibrations, in the opinion of the reviewer the recoveries for the CCV standards were acceptable (90-110%), and no data were qualified.

III. BLANKS

The method blanks and/or instrument blanks associated with the samples were free of analyte at a concentration equal to or greater than the sample detection limit. No evidence of trip blanks, field blanks, or equipment blanks was found.

IV. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 20\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 20\%$, as was the relative standard deviation between the triplicate results.

V. MATRIX SPIKE SAMPLE ANALYSIS

Analysis of MS/MSD for soil/sediment samples was performed, and the results met the client-specified control limits (60-130%). As an additional quality control measure, soil/sediment blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits (60-130%).

VI. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VII. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Calculations were verified for all of the target analyte concentrations found in each sample. All were correct.

The client-requested detection limit was not met. The client-requested detection limit was 0.1 mg/Kg, and the reported detection limit was 0.7 mg/Kg. No data were qualified on the basis of detection limits. The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors.

Ten percent of the calculations related to the parameters discussed in Sections II through V above were verified. All were found to be correct. All others were therefore assumed to be correct. No transcription errors or data reduction errors were found in the data package.

VIII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.



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To:	Michael Meyer, Project Manager	Info:	Data Report - Permanent File Ray Luce, Luce & Associates
From:	Karen Mixon, Senior Chemist <i>KM</i>	Date:	December 30, 2004
	Supplemental Data Quality Review Tissue Samples		
SUBJECT:	Bangor - Floral Point, Delivery Order #40 Contract #N445255-02-D-2008 Columbia Analytical-Kelso, SDG#229089		

Three tissue samples were submitted to Columbia Analytical Services (CAS) located in Kelso, Washington for multiple analyses as dictated in the project plan *Sampling and Analysis Plan, Site 26/Floral Point Sediment and Clam Tissue Sampling for Naval Base Kitsap - Bangor, Silverdale, Washington* (SAP) dated September 24, 2004. CAS received the samples on October 29, 2004 and logged them under SDG#229089 (Work Order #K2408628). The data deliverables were provided to URS Corporation (URS) on December 6, 2004. URS submitted the data package to Luce & Associates (Luce) for summary validation. The data validation report was received from Luce on December 18, 2004.

The data validator qualified all pesticide and PCB data as estimated based on a hold time exceedance. URS contacted CAS and requested that the case narrative be revised to detail how the samples were stored upon arrival at the laboratory and prior to and after preparation for analysis. The information provided by CAS indicated that samples had been frozen upon receipt and maintained as frozen prior to general preparation (clam shucking) and analytical preparation. Based on this, URS removed the data qualifiers assigned by Luce based on holding time. The edits by the URS chemist are written on the data pages from Luce and initialed and dated for the record.

The metals results were originally reported on a dry weight basis. As tissue results are generally evaluated based on an *as received* basis, URS requested that CAS submit revised summary pages with the metals data reported on an *as received* basis. CAS provided the revised pages via PDF files on December 21, 2004. The revised metals data (*as received* pages) were reviewed for accuracy by a URS chemist. The *as received* data were inserted into the CAS analytical report and the data review report from Luce. The dry weight corrected data were maintained in both reports in the event there is a future need for this data. The transition from dry weight to *as received* was done correctly. The data qualifiers originally assigned to the metals data by the validator were transferred to the *as received* data.

Luce and Associates

Environmental Consulting

Quality Assurance

Data Validation

December 19, 2004

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Analytical Support Activities

URS Corporation

Century Square

1501 4th Avenue

Suite 1400

Seattle, WA 98101-1616

DATA VALIDATION COVER LETTER

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229089

Sample Numbers and Analyses Validated:

<u>Client Sample</u>	<u>Matrix</u>	<u>Pesticides (Method 8081)</u>
229089	Tissue	X
229090	Tissue	X
229091	Tissue	X
229089MS	Tissue	X
229089MSD	Tissue	X
229093	Water	X
LCS	Water	X
LCSD	Water	X

<u>Client Sample</u>	<u>Matrix</u>	<u>PCB (Method 8082)</u>
229089	Tissue	X
229090	Tissue	X
229091	Tissue	X
229089MS	Tissue	X
229089MSD	Tissue	X
229093	Water	X
LCS	Water	X
LCSD	Water	X

<u>Client Sample</u>	<u>Matrix</u>	<u>Metals (Method 6000/7000)</u>	<u>Mercury (Method 7471)</u>
229089	Sediment	X	X
229090	Sediment	X	X
229091	Sediment	X	X
229089S	Sediment	X	X
229089D	Sediment	X	X
229093	Water	X	X
229093S	Water	X	
229093D	Water	X	
Batch QCS	Water		X
Batch QCD	Water		X

<u>Sample ID</u>	<u>Matrix</u>	<u>Lipids (Bligh/Dyer)</u>
229089	Sediment	X
229089DUP	Sediment	X
229089TRI	Sediment	X

Method Reference: Methods referenced above

Validation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methods

Validation Conducted By: R. Luce

Validation Level: 3

Date Received For Validation: 12/11/04

Validation Completion Date: 12/19/04

OVERALL ASSESSMENT OF THE DATA

- ☐ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.
- ☒ The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).
- ☐ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

December 19, 2004

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The conclusions presented in the attached narrative(s) and worksheet(s) were drawn based on the reviewer's professional judgement. The qualifiers assigned to the accompanying data (if any) were assigned based on the validation criteria referenced above and the reviewer's professional judgement. The signature below authorizes the release of the attached materials.

Authorization For Release


Raymond E. Luce II

12/19/04
Date

DATA VALIDATION NARRATIVE COVERSHEET

Client Project Number: 33755540.02000

Validator Project Number: 121104-01

Client Project Name: Bangor - Floral Point

Client P.O.: 90694-US

Laboratory: Columbia Analytical - Kelso

Sample Delivery Group: 229089

Sample Numbers and Analyses Validated:

<u>Client Sample</u>	<u>Matrix</u>	<u>Pesticides (Method 8081)</u>
229089	Tissue	X
229090	Tissue	X
229091	Tissue	X
229089MS	Tissue	X
229089MSD	Tissue	X
229093	Water	X
LCS	Water	X
LCSD	Water	X

<u>Client Sample</u>	<u>Matrix</u>	<u>PCB (Method 8082)</u>
229089	Tissue	X
229090	Tissue	X
229091	Tissue	X
229089MS	Tissue	X
229089MSD	Tissue	X
229093	Water	X
LCS	Water	X
LCSD	Water	X

<u>Client Sample</u>	<u>Matrix</u>	<u>Metals (Method 6000/7000)</u>	<u>Mercury (Method 7471)</u>
229089	Sediment	X	X
229090	Sediment	X	X
229091	Sediment	X	X
229089S	Sediment	X	X
229089D	Sediment	X	X
229093	Water	X	X
229093S	Water	X	
229093D	Water	X	
Batch QCS	Water		X
Batch QCD	Water		X

<u>Sample ID</u>	<u>Matrix</u>	<u>Lipids (Bligh/Dyer)</u>
229089	Sediment	X
229089DUP	Sediment	X
229089TRI	Sediment	X

Method Reference: Methods referenced above

Validation Criteria: Functional Guidelines For Evaluating Organic Analyses (10/99), Functional Guidelines For Evaluating Inorganic Analyses (7/02), and the methods

Validation Conducted By: Name omitted at client request Validation Level: 3

Date Received For Validation: 12/11/04 Validation Completion Date: 12/19/04

OVERALL ASSESSMENT OF THE DATA

- _____ The data are **acceptable** according to the criteria referenced above, with no qualifiers assigned by the reviewer.
- X** The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).
- _____ The data are **unacceptable** according to the criteria referenced above, and have been rejected by the reviewer.

Authorization For Release Signature omitted at client request

NARRATIVE - PESTICIDES (METHOD 8081)

I. HOLDING TIMES

Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Pest. Extraction</u>	<u>Pest. Analysis</u>
229089	Tissue	10/27/04	*11/19/04*	11/30/04
229090	Tissue	10/27/04	*11/19/04*	11/30/04
229091	Tissue	10/27/04	*11/19/04*	11/30/04
229093	Water	11/03/04	*11/15/04*	11/18/04

The holding times specified in the method were not met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction. For the purposes of this validation, the soil holding times were used to evaluate the tissue samples. Sample 229093 was an equipment rinsate created at the laboratory by rinsing the grinder used to prepare the tissue samples. The sampling date for this sample in the table above was taken from the Form I, because no sampling date was given on the chain-of-custody form.

Listed below are the data affected because analyses were not performed within holding times. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Sample</u>	<u>Action Taken</u>
229089	Positive results received J qualifiers; negative results received UJ qualifiers.
229090	Positive results received J qualifiers; negative results received UJ qualifiers.
229091	Positive results received J qualifiers; negative results received UJ qualifiers.
229093	Positive results received J qualifiers; negative results received UJ qualifiers.

II. INITIAL CALIBRATION

Initial calibrations for the required pesticide analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$). DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

III. CONTINUING CALIBRATIONS

Pesticide continuing calibration verification (CCV) standards were analyzed as required. Listed below are the sample data affected by CC standards that did not meet specified control limits for percent difference between the initial calibration and the continuing calibration ($\leq 15\%$). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>CCV Standard</u>	<u>GC Column</u>	<u>Analyte</u>	<u>%D</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
11/30/04 22:16	DB-35MS	Endrin	18	229089	UJ
11/30/04 22:16	DB-35MS	Endrin	18	229090	UJ
11/30/04 22:16	DB-35MS	Endrin	18	229091	UJ

DDT degradation and endrin degradation were within specified control limits ($\leq 20\%$ individually, $\leq 30\%$ combined).

IV. BLANKS

Method blanks were analyzed as required. The method blank associated with the water sample contained 4,4'-DDD (0.0022 $\mu\text{g/L}$). This analyte was not found in the associated sample, so no data were affected or qualified based on this method blank result.

Sample 229093 was an equipment rinsate created by the laboratory by rinsing the grinder used to prepare the tissue samples. Sample 229093 contained endrin aldehyde (0.0026 $\mu\text{g/L}$). This analyte was not found in any of the associated tissue samples, so no data were affected or qualified based on this equipment rinsate result.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required. Listed below are the sample data affected by surrogate recoveries that fell outside the client-specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations found in *Functional Guidelines*.

<u>Sample</u>	<u>Surrogate</u>	<u>Percent Recovery</u>	<u>Control Limits (%)</u>	<u>Action Taken</u>
229093	DCB	144	10-136	Positive results received J qualifiers; negative results were left unqualified.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for tissue samples was performed as required. The relative percent difference between MS and MSD recoveries of endrin aldehyde (50%) fell outside the client-specified control limit of $\leq 40\%$. The spike recoveries themselves were within control limits. No data were qualified based on MS/MSD results.

No evidence was found of MS/MSD analyses associated with the water sample, presumably because the water sample was an equipment rinsate. No data were qualified on the basis of this lack of water MS/MSD results.

As an additional quality control measure, tissue laboratory control samples (LCS) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

As an additional quality control measure, water blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

Analyte identification is not evaluated in the level of QC review requested by the client.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client. At the request of the client, qualifiers were assigned to all results that were flagged with a "P" qualifier by the lab. (The laboratory-assigned P qualifier signifies a percent difference of greater than 40% between the concentrations calculated for a target analyte on the two GC columns.) Results for target analytes with a percent difference of 40% to 100% received J qualifiers.

The client-requested reporting limits (RL) in the water sample were met. With the following exceptions, the client-specified reporting limits in the tissue samples were met:

Sample	Analyte	Client-Requested Reporting Limit ($\mu\text{g/Kg}$)	Reported Reporting Limit ($\mu\text{g/Kg}$)
229089	beta-BHC	1.0	2.0
229090	beta-BHC	1.0	2.2
229090	Heptachlor epoxide	1.0	1.1

The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, and clean-ups. No data were qualified based on reported detection limits. Sample results for the tissue samples were reported on a wet-weight basis (i.e., uncorrected for moisture content).

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - PCB (METHOD 8082)

I. HOLDING TIMES

Holding times were calculated using the dates presented in the table below.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>PCB Extraction</u>	<u>PCB Analysis</u>
229089	Tissue	10/27/04	*11/19/04*	12/01/04
229090	Tissuc	10/27/04	*11/19/04*	12/01/04
229091	Tissue	10/27/04	*11/19/04*	12/01/04
229093	Water	11/03/04	*11/15/04*	11/21/04

The holding times specified in the method were not met. Water samples must be extracted within 7 days of collection, and analyzed within 40 days of extraction. Soil samples must be extracted within 14 days of collection and analyzed within 40 days of extraction. For the purposes of this validation, the soil holding times were used to evaluate the tissue samples. Sample 229093 was an equipment rinsate created at the laboratory by rinsing the grinder used to prepare the tissue samples. The sampling date for this sample in the table above was taken from the Form I, because no sampling date was given on the chain-of-custody form.

Listed below are the data affected because analyses were not performed within holding times. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Sample</u>	<u>Action Taken</u>
229089	Results were negative and received UJ qualifiers.
229090	Results were negative and received UJ qualifiers.
229091	Results were negative and received UJ qualifiers.
229093	Results were negative and received UJ qualifiers.

II. INITIAL CALIBRATION

Initial calibrations for the required PCB analytes were performed as required, and the %RSD for each analyte was within specified control limits ($\leq 20\%$).

III. CONTINUING CALIBRATION

PCB continuing calibration standards were analyzed as required. Yes ☐ No ☒

Comments: Listed below are the sample data affected by CC standards that did not meet specified control limits for percent difference (%D) between the initial calibration and the continuing calibration ($\leq 15\%$). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>CCV Standard</u>	<u>GC Column</u>	<u>Analyte</u>	<u>%D</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
11/21/04 03:44	Both	Aroclor 1016	16/28	229093	UJ
11/21/04 03:44	Both	Aroclor 1260	16/19	229093	UJ
11/21/04 11:04	Both	Aroclor 1016	18/25	229093	UJ
11/21/04 11:04	DB-XLB	Aroclor 1260	22	229093	UJ

IV. BLANKS

Method blanks were analyzed as required and were free of target analytes. Sample 229093 was an equipment rinsate created by the laboratory by rinsing the grinder used to prepare the tissue samples, and was free of target analytes.

V. SURROGATE RECOVERY

Analysis of surrogate compounds was performed as required, and the results met the specified control limits for recovery.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

Analysis of MS/MSD for tissue samples was performed as required, and the results met the client-specified control limits for analyte recovery and precision.

No evidence was found of MS/MSD analyses associated with the water sample, presumably because the water sample was an equipment rinsate. No data were qualified on the basis of this lack of water MS/MSD results.

As an additional quality control measure, tissue laboratory control samples (LCS) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

As an additional quality control measure, water blank spike sample(s) were analyzed by the laboratory, and the results met the client-specified control limits for analyte recovery and precision.

VII. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

VIII. TCL ANALYTE IDENTIFICATION

Analyte identification is not evaluated in the level of QC review requested by the client.

IX. ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

Analyte quantitation is not evaluated in the level of QC review requested by the client.

The client-requested reporting limits (RL) in the water sample were met. With the following exceptions, the client-specified reporting limits in the tissue samples were met:

<u>Sample</u>	<u>Analyte</u>	Client-Requested Reporting Limit (<u>µg/Kg</u>)	Reported Reporting Limit (<u>µg/Kg</u>)
229089	Aroclor 1221	10	20
229090	Aroclor 1221	10	20
229091	Aroclor 1221	10	20

The reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, and clean-ups. No data were qualified based on reported detection limits. Results for the tissue samples were reported on a wet-weight basis (i.e., uncorrected for moisture content).

X. SYSTEM PERFORMANCE

The performance of the analytical system was acceptable. No signs of anomalous instrument response, instrument malfunction, chromatographic problems, or degraded analytical performance were observed by the reviewer.

XI. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - METALS (METHODS 6010/6020/7471)

I. HOLDING TIMES

The holding times specified in the method were met. Holding times were calculated using the dates presented in the table below. The analysis of mercury must be performed within 28 days of sample collection. All other metals must be analyzed within six months of sample collection. For the purposes of this validation, the soil holding times were used to evaluate the tissue samples.

<u>Sample</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>ICP Analysis</u>	<u>Mercury Analysis</u>
229089	Sediment	10/27/04	by 11/23/04	11/19/04
229090	Sediment	10/27/04	by 11/23/04	11/19/04
229091	Sediment	10/27/04	by 11/23/04	11/19/04
229093	Water	11/03/04	by 11/23/04	11/12/04

Sample 229093 was an equipment rinsate created at the laboratory by rinsing the grinder used to prepare the tissue samples. The sampling date for this sample in the table above was taken from the Form I used to report the pesticide results, because no sampling date was given on the chain-of-custody form for this sample.

II. CALIBRATION

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed as required and had recoveries within specified control limits.

III. BLANKS

Listed below are the sample data affected by calibration blanks that contained analytes at concentrations with absolute values equal to or greater than the IDL. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*. Note that in the table below, the values in the column labeled "Blank Result" are in units of $\mu\text{g/L}$, and reflect the raw data taken from the instrument. The results in the column labeled "Reported Sample Results" are in the reporting units appropriate to the sample matrix. The calculations necessary to directly compare blank results with sample results were performed by the reviewer before any qualifiers were assigned.

<u>Sample</u>	<u>Analyte</u>	<u>Time of Blank Analysis</u>	<u>Blank Result</u>	<u>Reported Sample Result</u>	<u>Action Taken</u>
229089	Antimony	11/17/04 09:34	0.06 $\mu\text{g/L}$	0.018 mg/Kg	0.05 U
229090	Antimony	11/17/04 09:34	0.06 $\mu\text{g/L}$	0.016 mg/Kg	0.05 U
229091	Antimony	11/17/04 09:34	0.06 $\mu\text{g/L}$	0.021 mg/Kg	0.05 U
229093	Antimony	11/23/04 08:59	0.034 $\mu\text{g/L}$	0.007 $\mu\text{g/L}$	0.05 U

Preparation blanks were analyzed as required, and were free of analytes at concentrations with absolute values equal to or greater than the reporting limit.

Sample 229093 was an equipment rinsate created at the laboratory by rinsing the grinder used to prepare the tissue samples, and contained aluminum (5.3 µg/L), copper (2.5 µg/L), iron (24.7 µg/L), lead (0.037 µg/L), magnesium (12.9 µg/L), manganese (0.05 µg/L), nickel (0.38 µg/L), sodium (46.7 µg/L), and zinc (0.9 µg/L) at concentrations greater than the IDL. At the request of the client, no data were qualified based on equipment rinsate results.

IV. ICP INTERFERENCE CHECK SAMPLES (ICS)

The ICP ICS was analyzed for the required analytes and at the required frequency. The percentage recoveries for the ICS analytes fell within specified control limits. A review of the raw data suggests that no sample data were affected by potential interferences.

V. LABORATORY CONTROL SAMPLE (LCS)

The LCS was analyzed as required. The recoveries for the LCS analytes fell within manufacturer-specified control limits.

VI. MATRIX SPIKE SAMPLE ANALYSIS

Matrix (pre-digestion) spikes for tissue samples were analyzed as required. Listed below are the sample data affected by matrix spike recoveries that did not meet client-specified control limits. The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

<u>Spike Sample</u>	<u>Matrix</u>	<u>Analyte</u>	<u>Percent Recovery</u>	<u>Control Limits (%)</u>	<u>Samples Affected</u>	<u>Qualifier Assigned</u>
229089S	Tissue	Silver	2	70-130	229089	J
229089S	Tissue	Silver	2	70-130	229090	J
229089S	Tissue	Silver	2	70-130	229091	J

Matrix (pre-digestion) spikes for water samples were analyzed as required, and percent recoveries of the matrix spike analytes fell within client-specified control limits.

VII. DUPLICATE SAMPLE ANALYSIS

Laboratory duplicates were analyzed as required. The RPD value between aluminum concentrations in sample 229093 and its lab duplicate was 68%, and fell outside the client specified control limit of ≤30%. The RPD value between iron concentrations in sample 229093 and its lab duplicate was 200%, and fell outside the client specified control limit of ≤30%. However, the concentration of these analytes in the original analysis was less than five times the reporting limit for the sample, so the control limit used to evaluate the agreement between duplicate results was the reporting limit. Results for the duplicate analysis of aluminum and iron in sample 229093 fell within this control limit. No data were qualified on the basis of duplicate results.

VIII. ICP SERIAL DILUTION

Serial dilutions were analyzed at the frequency required. For analytes with sufficiently high concentrations (minimally a factor of 50 times the IDL for ICP, and 100 times the IDL for ICP-MS), the results of the serial dilution fell within the specified control limits.

IX. SAMPLE RESULT VERIFICATION

Analyte quantitation is not evaluated in the level of QC review requested by the client.

Results for the tissue samples were reported on a dry weight basis (i.e., corrected for moisture content). This is contrary to the client's request, which was for the results to be reported on a wet weight basis. For the tissue samples, the reported detection limits were adjusted correctly for all applicable sample dilutions, concentrations, splits, clean-ups, and dry weight factors. With the following exceptions, the client-specified detection limits were met:

<u>Analyte</u>	<u>Client-Requested Detection Limit (mg/Kg)</u>	<u>Reported Detection Limit (mg/Kg)</u>
Aluminum	0.4	5.0
Manganese	0.01	0.5
Mercury	0.004	0.02
Vanadium	0.2	1.0
Zinc	0.1	1.0

For the water sample, client-specified detection limits were met, with the following exceptions:

<u>Analyte</u>	<u>Client-Requested Detection Limit (µg/L)</u>	<u>Reported Detection Limit (µg/L)</u>
Aluminum	2.0	3.0
Chromium	0.2	5.0
Vanadium	0.2	10

No data were qualified based on reported detection limits.

X. FIELD DUPLICATES

Field duplicate samples were not identifiable from documentation in the data package.

XI. ICP/MS QUALITY CONTROL

ICP/MS instrument quality control parameters are not evaluated in the level of QC review requested by the client.

XII. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable with the qualifications noted and appended** to the data by the reviewer. These qualifiers modify the usefulness of the individual values to which they are assigned. (For definitions of the qualifiers used, see the end of the data validation worksheet).

NARRATIVE - LIPIDS (BLIGH/DYER)

I. HOLDING TIMES

The holding times for the samples were reasonable. The method does not specify holding time limits for lipids. Holding times were calculated using the dates presented in the table below.

<u>Sample Number</u>	<u>Matrix</u>	<u>Sampling Date</u>	<u>Preparation Date</u>	<u>Analysis Date</u>
229089	Sediment	10/27/04	11/19/04	12/01/04

II. DUPLICATE SAMPLE ANALYSIS

Results from the analysis of duplicate samples met the client-specified control limit ($\leq 30\%$). The laboratory analyzed a duplicate and a triplicate. The relative percent difference between duplicate results was $< 30\%$, as was the relative standard deviation between the triplicate results.

III. ANALYTE QUANTITATION

Analyte quantitation is not evaluated in the level of QC review requested by the client.

IV. OVERALL ASSESSMENT OF THE DATA

The data are **acceptable** according to the criteria referenced on the cover page of this document, with no qualifiers assigned by the reviewer.

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Sediment Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
8	MS07	ST	0 - 2	20-OCT-04	COLUMBWA	8081	4,4-DDD	.0027	UJ	mg/kg
						8081	4,4-DDE	.0027	UJ	mg/kg
						8081	4,4-DDT	.0027	UJ	mg/kg
						8081	Aldrin	.0027	UJ	mg/kg
						8081	Dieldrin	.0027	UJ	mg/kg
						8081	Endosulfan I	.0027	U	mg/kg
						8081	Endosulfan II	.0027	UJ	mg/kg
						8081	Endosulfan sulfate	.0027	U	mg/kg
						8081	Endrin	.0027	U	mg/kg
						8081	Endrin Aldehyde	.0027	UJ	mg/kg
						8081	Endrin ketone	.0027	UJ	mg/kg
						8081	Heptachlor	.0027	UJ	mg/kg
						8081	Heptachlor epoxide	.0027	UJ	mg/kg
						8081	Lindane	.0027	UJ	mg/kg
						8081	Methoxychlor	.0027	U	mg/kg
						8081	Toxaphene	.14	U	mg/kg
						8081	alpha-BHC	.0027	UJ	mg/kg
						8081	alpha-Chlordane	.0027	U	mg/kg
						8081	beta-BHC	.0027	UJ	mg/kg
						8081	delta-BHC	.0027	UJ	mg/kg
						8081	gamma-Chlordane	.0027	U	mg/kg
						8082	Aroclor 1016	.028	U	mg/kg
						8082	Aroclor 1221	.056	U	mg/kg
						8082	Aroclor 1232	.028	U	mg/kg
						8082	Aroclor 1242	.028	U	mg/kg
						8082	Aroclor 1248	.028	U	mg/kg
						8082	Aroclor 1254	.028	U	mg/kg
						8082	Aroclor 1260	.028	U	mg/kg
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	8081	4,4-DDD	.0017	UJ	mg/kg
						8081	4,4-DDE	.0017	UJ	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Sediment Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	8081	4,4-DDT	.00028	J	mg/kg
						8081	Aldrin	.0017	UJ	mg/kg
						8081	Dieldrin	.0017	UJ	mg/kg
						8081	Endosulfan I	.0017	U	mg/kg
						8081	Endosulfan II	.0017	UJ	mg/kg
						8081	Endosulfan sulfate	.0017	U	mg/kg
						8081	Endrin	.0017	U	mg/kg
						8081	Endrin Aldehyde	.0017	UJ	mg/kg
						8081	Endrin ketone	.0017	UJ	mg/kg
						8081	Heptachlor	.00053	J	mg/kg
						8081	Heptachlor epoxide	.0017	UJ	mg/kg
						8081	Lindane	.0017	UJ	mg/kg
						8081	Methoxychlor	.0017	U	mg/kg
						8081	Toxaphene	.082	U	mg/kg
						8081	alpha-BHC	.0017	UJ	mg/kg
						8081	alpha-Chlordane	.00063	J	mg/kg
						8081	beta-BHC	.0017	UJ	mg/kg
						8081	delta-BHC	.0017	UJ	mg/kg
						8081	gamma-Chlordane	.0017	U	mg/kg
						8082	Aroclor 1016	.017	U	mg/kg
						8082	Aroclor 1221	.033	U	mg/kg
						8082	Aroclor 1232	.017	U	mg/kg
						8082	Aroclor 1242	.017	U	mg/kg
						8082	Aroclor 1248	.017	U	mg/kg
						8082	Aroclor 1254	.017	U	mg/kg
						8082	Aroclor 1260	.017	U	mg/kg
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	8081	4,4-DDD	.0015	UJ	mg/kg
						8081	4,4-DDE	.0015	UJ	mg/kg
						8081	4,4-DDT	.0015	UJ	mg/kg
						8081	Aldrin	.0015	UJ	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Sediment Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	8081	Dieldrin	.0015	UJ	mg/kg
						8081	Endosulfan I	.0015	U	mg/kg
						8081	Endosulfan II	.0015	UJ	mg/kg
						8081	Endosulfan sulfate	.0015	U	mg/kg
						8081	Endrin	.0015	U	mg/kg
						8081	Endrin Aldehyde	.0015	UJ	mg/kg
						8081	Endrin ketone	.0015	UJ	mg/kg
						8081	Heptachlor	.0015	UJ	mg/kg
						8081	Heptachlor epoxide	.0015	UJ	mg/kg
						8081	Lindane	.0015	UJ	mg/kg
						8081	Methoxychlor	.0015	U	mg/kg
						8081	Toxaphene	.074	U	mg/kg
						8081	alpha-BHC	.0015	UJ	mg/kg
						8081	alpha-Chlordane	.00059	J	mg/kg
						8081	beta-BHC	.0015	UJ	mg/kg
						8081	delta-BHC	.0015	UJ	mg/kg
						8081	gamma-Chlordane	.0015	U	mg/kg
						8082	Aroclor 1016	.015	U	mg/kg
						8082	Aroclor 1221	.03	U	mg/kg
						8082	Aroclor 1232	.015	U	mg/kg
						8082	Aroclor 1242	.015	U	mg/kg
						8082	Aroclor 1248	.015	U	mg/kg
						8082	Aroclor 1254	.015	U	mg/kg
						8082	Aroclor 1260	.015	U	mg/kg
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	8081	4,4-DDD	.0016	UJ	mg/kg
						8081	4,4-DDE	.0016	UJ	mg/kg
						8081	4,4-DDT	.0016	UJ	mg/kg
						8081	Aldrin	.0016	UJ	mg/kg
						8081	Dieldrin	.0005	J	mg/kg
						8081	Endosulfan I	.0016	U	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Sediment Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	8081	Endosulfan II	.0016	UJ	mg/kg
						8081	Endosulfan sulfate	.0016	U	mg/kg
						8081	Endrin	.0016	U	mg/kg
						8081	Endrin Aldehyde	.0016	UJ	mg/kg
						8081	Endrin ketone	.0016	UJ	mg/kg
						8081	Heptachlor	.0016	UJ	mg/kg
						8081	Heptachlor epoxide	.0016	UJ	mg/kg
						8081	Lindane	.0016	UJ	mg/kg
						8081	Methoxychlor	.00047	J	mg/kg
						8081	Toxaphene	.079	U	mg/kg
						8081	alpha-BHC	.0016	UJ	mg/kg
						8081	alpha-Chlordane	.00064	J	mg/kg
						8081	beta-BHC	.0016	UJ	mg/kg
						8081	delta-BHC	.0016	UJ	mg/kg
						8081	gamma-Chlordane	.0016	U	mg/kg
						8082	Aroclor 1016	.016	U	mg/kg
						8082	Aroclor 1221	.032	U	mg/kg
						8082	Aroclor 1232	.016	U	mg/kg
						8082	Aroclor 1242	.016	U	mg/kg
						8082	Aroclor 1248	.016	U	mg/kg
						8082	Aroclor 1254	.016	U	mg/kg
						8082	Aroclor 1260	.016	U	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
8	MS07	ST	0 - 2	20-OCT-04	COLUMBWA	6010	Aluminum	11000		mg/kg
						6010	Calcium	4710		mg/kg
						6010	Iron	18200		mg/kg
						6010	Magnesium	7710		mg/kg
						6010	Manganese	185		mg/kg
						6010	Potassium	2000		mg/kg
						6010	Sodium	13400		mg/kg
						6010	Vanadium	37.6		mg/kg
						6020	Antimony	.08	UJ	mg/kg
						6020	Arsenic	3.5		mg/kg
						6020	Barium	25.5		mg/kg
						6020	Beryllium	.201		mg/kg
						6020	Cadmium	.311		mg/kg
						6020	Chromium	24.8		mg/kg
						6020	Cobalt	6.08	J	mg/kg
						6020	Copper	13.3	J	mg/kg
						6020	Lead	5.66		mg/kg
						6020	Nickel	23.5	J	mg/kg
						6020	Selenium	1.6		mg/kg
						6020	Silver	.091	J	mg/kg
						6020	Thallium	.257	J	mg/kg
						6020	Zinc	37.3	J	mg/kg
						7471	Mercury	.021		mg/kg
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	6010	Aluminum	8480		mg/kg
						6010	Calcium	5500		mg/kg
						6010	Chromium	20.8		mg/kg
						6010	Copper	11.2		mg/kg
						6010	Iron	13700		mg/kg
						6010	Magnesium	5990		mg/kg
						6010	Manganese	179		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	6010	Potassium	715		mg/kg
						6010	Sodium	3440		mg/kg
						6010	Vanadium	33.7		mg/kg
						6010	Zinc	31.9		mg/kg
						6020	Antimony	.03	UJ	mg/kg
						6020	Arsenic	1.7		mg/kg
						6020	Barium	11.1		mg/kg
						6020	Beryllium	.113		mg/kg
						6020	Cadmium	.134		mg/kg
						6020	Cobalt	5.15	J	mg/kg
						6020	Lead	2.86		mg/kg
						6020	Nickel	21.6	J	mg/kg
						6020	Selenium	.39	J	mg/kg
						6020	Silver	.038		mg/kg
						6020	Thallium	.076		mg/kg
						7471	Mercury	.013		mg/kg
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	6010	Aluminum	11400		mg/kg
						6010	Calcium	16400		mg/kg
						6010	Chromium	21.4		mg/kg
						6010	Copper	25.1		mg/kg
						6010	Iron	20200		mg/kg
						6010	Magnesium	7280		mg/kg
						6010	Manganese	272		mg/kg
						6010	Potassium	739		mg/kg
						6010	Sodium	1870		mg/kg
						6010	Vanadium	42.8		mg/kg
						6010	Zinc	44.8		mg/kg
						6020	Antimony	.06	UJ	mg/kg
						6020	Arsenic	1.82		mg/kg
						6020	Barium	14.7		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	6020	Beryllium	.138		mg/kg
						6020	Cadmium	.091	U	mg/kg
						6020	Cobalt	8.42	J	mg/kg
						6020	Lead	3.96		mg/kg
						6020	Nickel	30.5	J	mg/kg
						6020	Selenium	.16	J	mg/kg
						6020	Silver	.035		mg/kg
						6020	Thallium	.02	U	mg/kg
						7471	Mercury	.018	J	mg/kg
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	6010	Aluminum	9060		mg/kg
						6010	Calcium	30200		mg/kg
						6010	Chromium	22.5		mg/kg
						6010	Copper	14.9		mg/kg
						6010	Iron	15300		mg/kg
						6010	Magnesium	6570		mg/kg
						6010	Manganese	202		mg/kg
						6010	Potassium	1000		mg/kg
						6010	Sodium	3720		mg/kg
						6010	Vanadium	37.4		mg/kg
						6010	Zinc	38.6		mg/kg
						6020	Antimony	.05	UJ	mg/kg
						6020	Arsenic	1.66		mg/kg
						6020	Barium	13.6		mg/kg
						6020	Beryllium	.111		mg/kg
						6020	Cadmium	.15		mg/kg
						6020	Cobalt	5.21	J	mg/kg
						6020	Lead	3.03		mg/kg
						6020	Nickel	23.2	J	mg/kg
						6020	Selenium	.42	J	mg/kg
						6020	Silver	.093		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	6020	Thallium	.05		mg/kg
						7471	Mercury	.014	J	mg/kg

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Water Quality

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
8	MS07	ST	0 - 2	20-OCT-04	COLUMBWA	160.4	Total Volatile Solids	5.22		%
						350.1	Nitrogen, Ammonia	6.4		mg/kg
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	160.4	Total Volatile Solids	1.42		%
						350.1	Nitrogen, Ammonia	17.2		mg/kg
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	160.4	Total Volatile Solids	1.05		%
						350.1	Nitrogen, Ammonia	2.2		mg/kg
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	160.4	Total Volatile Solids	1.7		%
						350.1	Nitrogen, Ammonia	14.4		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Marine

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
8	MS07	ST	0 - 2	20-OCT-04	COLUMBWA	PS-PSEP	Percent Clay	8.54		%
						PS-PSEP	Percent Gravel	.15		%
						PS-PSEP	Percent Sand, Coarse	.85		%
						PS-PSEP	Percent Sand, Fine	31.2		%
						PS-PSEP	Percent Sand, Medium	5.27		%
						PS-PSEP	Percent Sand, Very Coarse	.48		%
						PS-PSEP	Percent Sand, Very Fine	27.7		%
						PS-PSEP	Percent Silt	27.8		%
						TOC-PSEP	Total Organic Carbon	.95		%
						TS-PSEP	Total Solids	44.8		%
						TS2-PSEP	Total Sulfides	6.3	J	mg/kg
9	MS08	IT	0 - 2	27-OCT-04	COLUMBWA	PS-PSEP	Percent Clay	2.11		%
						PS-PSEP	Percent Gravel	7.19		%
						PS-PSEP	Percent Sand, Coarse	13.2		%
						PS-PSEP	Percent Sand, Fine	20.2		%
						PS-PSEP	Percent Sand, Medium	28.1		%
						PS-PSEP	Percent Sand, Very Coarse	7.57		%
						PS-PSEP	Percent Sand, Very Fine	15.6		%
						PS-PSEP	Percent Silt	5.37		%
						TOC-PSEP	Total Organic Carbon	.42		%
						TS-PSEP	Total Solids	76.4		%
						TS2-PSEP	Total Sulfides	10.4		mg/kg
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	PS-PSEP	Percent Clay	.45		%
						PS-PSEP	Percent Gravel	57.4		%
						PS-PSEP	Percent Sand, Coarse	12.8		%
						PS-PSEP	Percent Sand, Fine	.3		%
						PS-PSEP	Percent Sand, Medium	2.9		%
						PS-PSEP	Percent Sand, Very Coarse	25.4		%
						PS-PSEP	Percent Sand, Very Fine	.22		%
						PS-PSEP	Percent Silt	.27		%

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Sediment Tissue Type: Method Class: Marine

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
84	MS83	IT	0 - 2	28-OCT-04	COLUMBWA	TOC-PSEP	Total Organic Carbon	.08		%
						TS-PSEP	Total Solids	85		%
						TS2-PSEP	Total Sulfides	.4	J	mg/kg
109	MS109	IT	0 - 2	27-OCT-04	COLUMBWA	PS-PSEP	Percent Clay	1.45		%
						PS-PSEP	Percent Gravel	53.6		%
						PS-PSEP	Percent Sand, Coarse	13.7		%
						PS-PSEP	Percent Sand, Fine	9.41		%
						PS-PSEP	Percent Sand, Medium	18		%
						PS-PSEP	Percent Sand, Very Coarse	8.62		%
						PS-PSEP	Percent Sand, Very Fine	7.55		%
						PS-PSEP	Percent Silt	3.47		%
						TOC-PSEP	Total Organic Carbon	.38		%
						TS-PSEP	Total Solids	79.2		%
						TS2-PSEP	Total Sulfides	5.1		mg/kg

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: BCLAM Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	8081	4,4-DDD	.001	U	mg/kg
						8081	4,4-DDE	.001	U	mg/kg
						8081	4,4-DDT	.001	U	mg/kg
						8081	Aldrin	.001	U	mg/kg
						8081	Dieldrin	.00054	J	mg/kg
						8081	Endosulfan I	.001	U	mg/kg
						8081	Endosulfan II	.001	U	mg/kg
						8081	Endosulfan sulfate	.001	U	mg/kg
						8081	Endrin	.001	UJ	mg/kg
						8081	Endrin Aldehyde	.001	U	mg/kg
						8081	Endrin ketone	.001	U	mg/kg
						8081	Heptachlor	.001	U	mg/kg
						8081	Heptachlor epoxide	.001	U	mg/kg
						8081	Lindane	.001	U	mg/kg
						8081	Methoxychlor	.001	U	mg/kg
						8081	Toxaphene	.05	U	mg/kg
						8081	alpha-BHC	.001	U	mg/kg
						8081	alpha-Chlordane	.001	U	mg/kg
						8081	beta-BHC	.002	U	mg/kg
						8081	delta-BHC	.001	U	mg/kg
						8081	gamma-Chlordane	.001	U	mg/kg
						8082	Aroclor 1016	.01	U	mg/kg
						8082	Aroclor 1221	.02	U	mg/kg
						8082	Aroclor 1232	.01	U	mg/kg
						8082	Aroclor 1242	.01	U	mg/kg
						8082	Aroclor 1248	.01	U	mg/kg
						8082	Aroclor 1254	.01	U	mg/kg
						8082	Aroclor 1260	.01	U	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: LCLAM Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	8081	4,4-DDD	.001	U	mg/kg
						8081	4,4-DDE	.001	U	mg/kg
						8081	4,4-DDT	.001	U	mg/kg
						8081	Aldrin	.00027	J	mg/kg
						8081	Dieldrin	.001	U	mg/kg
						8081	Endosulfan I	.001	U	mg/kg
						8081	Endosulfan II	.001	U	mg/kg
						8081	Endosulfan sulfate	.001	U	mg/kg
						8081	Endrin	.001	UJ	mg/kg
						8081	Endrin Aldehyde	.001	U	mg/kg
						8081	Endrin ketone	.001	U	mg/kg
						8081	Heptachlor	.001	U	mg/kg
						8081	Heptachlor epoxide	.00027	J	mg/kg
						8081	Lindane	.001	U	mg/kg
						8081	Methoxychlor	.001	U	mg/kg
						8081	Toxaphene	.05	U	mg/kg
						8081	alpha-BHC	.001	U	mg/kg
						8081	alpha-Chlordane	.001	U	mg/kg
						8081	beta-BHC	.0015	J	mg/kg
						8081	delta-BHC	.001	U	mg/kg
						8081	gamma-Chlordane	.001	U	mg/kg
						8082	Aroclor 1016	.01	U	mg/kg
						8082	Aroclor 1221	.02	U	mg/kg
						8082	Aroclor 1232	.01	U	mg/kg
						8082	Aroclor 1242	.01	U	mg/kg
						8082	Aroclor 1248	.01	U	mg/kg
						8082	Aroclor 1254	.01	U	mg/kg
						8082	Aroclor 1260	.01	U	mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: BCLAM Method Class: Miscellaneous Organics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	LIPIDS_NOAA	Lipids	1		%

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: LCLAM Method Class: Miscellaneous Organics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	LIPIDS_NOAA	Lipids	.77		%

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: BCLAM Method Class: Total Inorganics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	6010	Aluminum	13.9		mg/kg
						6010	Calcium	342		mg/kg
						6010	Chromium	.32		mg/kg
						6010	Iron	28		mg/kg
						6010	Magnesium	757		mg/kg
						6010	Manganese	.95		mg/kg
						6010	Potassium	1980		mg/kg
						6010	Sodium	4390		mg/kg
						6010	Vanadium	.1	U	mg/kg
						6010	Zinc	14.9		mg/kg
						6020	Antimony	.0029	U	mg/kg
						6020	Arsenic	2.75		mg/kg
						6020	Barium	.0791		mg/kg
						6020	Beryllium	.001	U	mg/kg
						6020	Cadmium	.0626		mg/kg
						6020	Cobalt	.115		mg/kg
						6020	Copper	2.2		mg/kg
						6020	Lead	.053		mg/kg
						6020	Nickel	.794		mg/kg
						6020	Silver	.468	J	mg/kg
						6020	Thallium	.0006	J	mg/kg
						7471	Mercury	.004		mg/kg
						7740	Selenium	.22		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: LCLAM Method Class: Total Inorganics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	6010	Aluminum	11.1		mg/kg
						6010	Calcium	959		mg/kg
						6010	Chromium	.54		mg/kg
						6010	Iron	27.6		mg/kg
						6010	Magnesium	666		mg/kg
						6010	Manganese	.788		mg/kg
						6010	Potassium	1810		mg/kg
						6010	Sodium	4390		mg/kg
						6010	Vanadium	.1	U	mg/kg
						6010	Zinc	9.14		mg/kg
						6020	Antimony	.0035	U	mg/kg
						6020	Arsenic	1.78		mg/kg
						6020	Barium	.316		mg/kg
						6020	Beryllium	.001	J	mg/kg
						6020	Cadmium	.315		mg/kg
						6020	Cobalt	.102		mg/kg
						6020	Copper	1.21		mg/kg
						6020	Lead	.021		mg/kg
						6020	Nickel	.3		mg/kg
						6020	Silver	.462	J	mg/kg
						6020	Thallium	.0009	J	mg/kg
						7471	Mercury	.005		mg/kg
						7740	Selenium	.46		mg/kg

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: BCLAM Method Class: Miscellaneous Inorganics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	FREEZE DRY	Total Solids	17.9		%

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Tissue Tissue Type: LCLAM Method Class: Miscellaneous Inorganics
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
109	MS109	IT	-	27-OCT-04	COLUMBWA	FREEZE DRY	Total Solids	16.4		%

Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Water Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
902	QC	QC	-	20-OCT-04	COLUMBWA	8081	4,4-DDD	.01	U	ug/l
						8081	4,4-DDE	.01	U	ug/l
						8081	4,4-DDT	.01	U	ug/l
						8081	Aldrin	.01	U	ug/l
						8081	Dieldrin	.01	U	ug/l
						8081	Endosulfan I	.01	U	ug/l
						8081	Endosulfan II	.01	U	ug/l
						8081	Endosulfan sulfate	.01	U	ug/l
						8081	Endrin	.01	U	ug/l
						8081	Endrin Aldehyde	.01	U	ug/l
						8081	Endrin ketone	.01	U	ug/l
						8081	Heptachlor	.01	U	ug/l
						8081	Heptachlor epoxide	.01	U	ug/l
						8081	Lindane	.01	U	ug/l
						8081	Methoxychlor	.01	U	ug/l
						8081	Toxaphene	.5	U	ug/l
						8081	alpha-BHC	.01	U	ug/l
						8081	alpha-Chlordane	.01	U	ug/l
						8081	beta-BHC	.01	U	ug/l
						8081	delta-BHC	.01	U	ug/l
						8081	gamma-Chlordane	.01	U	ug/l
						8082	Aroclor 1016	.2	U	ug/l
						8082	Aroclor 1221	.4	U	ug/l
						8082	Aroclor 1232	.2	U	ug/l
						8082	Aroclor 1242	.2	U	ug/l
						8082	Aroclor 1248	.2	U	ug/l
						8082	Aroclor 1254	.2	U	ug/l
						8082	Aroclor 1260	.2	U	ug/l
902	QC	QC	-	28-OCT-04	COLUMBWA	8081	4,4-DDD	.0097	UJ	ug/l
						8081	4,4-DDE	.0097	UJ	ug/l

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations
Matrix Type: Water Tissue Type: Method Class: Pesticides and Aroclors
Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
902	QC	QC	-	28-OCT-04	COLUMBWA	8081	4,4-DDT	.0097	UJ	ug/l
						8081	Aldrin	.0097	UJ	ug/l
						8081	Dieldrin	.0097	UJ	ug/l
						8081	Endosulfan I	.0097	UJ	ug/l
						8081	Endosulfan II	.0097	UJ	ug/l
						8081	Endosulfan sulfate	.0097	UJ	ug/l
						8081	Endrin	.0097	UJ	ug/l
						8081	Endrin Aldehyde	.0026	J	ug/l
						8081	Endrin ketone	.0097	UJ	ug/l
						8081	Heptachlor	.0097	UJ	ug/l
						8081	Heptachlor epoxide	.0097	UJ	ug/l
						8081	Lindane	.0097	UJ	ug/l
						8081	Methoxychlor	.0097	UJ	ug/l
						8081	Toxaphene	.49	UJ	ug/l
						8081	alpha-BHC	.0097	UJ	ug/l
						8081	alpha-Chlordane	.0097	UJ	ug/l
						8081	beta-BHC	.0097	UJ	ug/l
						8081	delta-BHC	.0097	UJ	ug/l
						8081	gamma-Chlordane	.0097	UJ	ug/l
						8082	Aroclor 1016	.2	UJ	ug/l
						8082	Aroclor 1221	.39	UJ	ug/l
						8082	Aroclor 1232	.2	UJ	ug/l
						8082	Aroclor 1242	.2	UJ	ug/l
						8082	Aroclor 1248	.2	UJ	ug/l
						8082	Aroclor 1254	.2	UJ	ug/l
						8082	Aroclor 1260	.2	UJ	ug/l

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Water Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
902	QC	QC	-	20-OCT-04	COLUMBWA	6010	Calcium	9	U	ug/l
						6010	Iron	20	U	ug/l
						6010	Magnesium	17.9	J	ug/l
						6010	Potassium	700	U	ug/l
						6010	Sodium	60	U	ug/l
						6020	Aluminum	2	U	ug/l
						6020	Antimony	.02	U	ug/l
						6020	Arsenic	.2	U	ug/l
						6020	Barium	.02	U	ug/l
						6020	Beryllium	.006	U	ug/l
						6020	Cadmium	.02	U	ug/l
						6020	Chromium	.05	J	ug/l
						6020	Cobalt	.01	U	ug/l
						6020	Copper	.03	U	ug/l
						6020	Lead	.009	U	ug/l
						6020	Manganese	.02	U	ug/l
						6020	Nickel	.06	U	ug/l
						6020	Selenium	.2	U	ug/l
						6020	Silver	.009	U	ug/l
						6020	Thallium	.02	U	ug/l
						6020	Vanadium	.04	J	ug/l
						6020	Zinc	.3	U	ug/l
						7470	Mercury	.04	U	ug/l
902	QC	QC	-	28-OCT-04	COLUMBWA	6010	Calcium	20	U	ug/l
						6010	Chromium	3	U	ug/l
						6010	Iron	24.7		ug/l
						6010	Magnesium	12.9	J	ug/l
						6010	Potassium	30	U	ug/l
						6010	Sodium	46.7	J	ug/l
						6010	Vanadium	5	U	ug/l

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Analytical Results for Detected Analytes (Detected and Nondetected Values)

Installation: BANGOR CTO Number: 40 Site: 26 Zone: All Locations

Matrix Type: Water Tissue Type: Method Class: Total Inorganics

Sorted by Location ID, Depth, Sample Date, Analyte

Location ID	Location Cross Reference	Location Type	Depth Range (Feet)	Sample Date	Lab Code	Analytical Method	Analyte	Analytical Value	Data Qualifier	Unit of Measure
902	QC	QC	-	28-OCT-04	COLUMBWA	6020	Aluminum	5.3		ug/l
						6020	Antimony	.05	J	ug/l
						6020	Arsenic	.09	U	ug/l
						6020	Barium	.03	U	ug/l
						6020	Beryllium	.007	U	ug/l
						6020	Cadmium	.007	U	ug/l
						6020	Cobalt	.004	U	ug/l
						6020	Copper	2.52		ug/l
						6020	Lead	.037		ug/l
						6020	Manganese	.05		ug/l
						6020	Nickel	.38		ug/l
						6020	Selenium	.2	U	ug/l
						6020	Silver	.002	U	ug/l
						6020	Thallium	.003	U	ug/l
						6020	Zinc	.9		ug/l
						7470	Mercury	.04	U	ug/l

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 6010

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	DL	DL
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Aluminum		8960		9060	1
Calcium		30200		21300	35
Chromium		20.2		22.5	11
Copper		14.9		13.4	11
Iron		15300		15300	
Magnesium		6220		6570	5
Manganese		202		192	5
Potassium		786		1000	24
Sodium		3720		3410	9
Vanadium		37.4		36.4	3
Zinc		38.6		36.8	5

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 6010

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	DL	DL
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Potassium	1980		1940		2
Sodium	4390		4000		9

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 6010

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Aluminum		10.6		13.9	27
Calcium		338		342	1
Chromium		.32		.23	33
Iron		22.7		28	21
Magnesium		757		752	1
Manganese		.763		.95	22
Vanadium		.1 U		.1 U	
Zinc		11.7		14.9	24

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 6020

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	DL	DL
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Antimony	.06	UJ	.05	UJ	
Arsenic	1.62		1.66		2
Barium	13.6		9.99		31
Beryllium	.109		.111		2
Cadmium	.139		.15		8
Cobalt	5.21	J	4.92	J	6
Lead	3.03		2.92		4
Nickel	21.6	J	23.2	J	7
Selenium	.34	J	.42	J	21
Silver	.086		.093		8
Thallium	.05		.045		11

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40
Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 6020

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	DL	DL
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Antimony	.003	U	.0029	U	
Arsenic	2.75		1.64		51
Barium	.0791		.0642		21
Beryllium	.001	U	.001	U	
Cadmium	.0626		.0552		13
Cobalt	.115		.105		9
Copper	2.2		1.84		18
Lead	.051		.053		4
Nickel	.738		.794		7
Silver	.404	J	.468	J	15
Thallium	.0006	J	.0006	J	

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 7471

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Mercury	.014	J	.014	J	

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 7471

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Mercury	.004		.003	J	29

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 7740

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	DL	DL
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Selenium		.22		.22	

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 8081

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
4,4-DDD	.0017	UJ	.0016	UJ	
4,4-DDE	.0017	UJ	.0016	UJ	
4,4-DDT	.0017	UJ	.0016	UJ	
Aldrin	.0017	UJ	.0016	UJ	
Dieldrin	.0017	UJ	.0005	J	
Endosulfan I	.0017	U	.0016	U	
Endosulfan II	.0017	UJ	.0016	UJ	
Endosulfan sulfate	.0017	U	.0016	U	
Endrin	.0017	U	.0016	U	
Endrin Aldehyde	.0017	UJ	.0016	UJ	
Endrin ketone	.0017	UJ	.0016	UJ	
Heptachlor	.0017	UJ	.0016	UJ	
Heptachlor epoxide	.0017	UJ	.0016	UJ	
Lindane	.0017	UJ	.0016	UJ	
Methoxychlor	.00047	J	.0016	U	
Toxaphene	.083	U	.079	U	
alpha-BHC	.0017	UJ	.0016	UJ	
alpha-Chlordane	.00064	J	.00058	J	10
beta-BHC	.0017	UJ	.0016	UJ	
delta-BHC	.0017	UJ	.0016	UJ	
gamma-Chlordane	.0017	U	.0016	U	

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 8081

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
4,4-DDD	.001	U	.001	U	
4,4-DDE	.001	U	.001	U	
4,4-DDT	.001	U	.001	U	
Aldrin	.001	U	.001	U	
Dieldrin	.00054	J	.001	U	
Endosulfan I	.001	U	.001	U	
Endosulfan II	.001	U	.001	U	
Endosulfan sulfate	.001	U	.001	U	
Endrin	.001	UJ	.001	UJ	
Endrin Aldehyde	.001	U	.001	U	
Endrin ketone	.001	U	.001	U	
Heptachlor	.001	U	.001	U	
Heptachlor epoxide	.001	U	.0011	U	
Lindane	.001	U	.001	U	
Methoxychlor	.001	U	.001	U	
Toxaphene	.05	U	.05	U	
alpha-BHC	.001	U	.001	U	
alpha-Chlordane	.001	U	.001	U	
beta-BHC	.002	U	.0022	U	
delta-BHC	.001	U	.001	U	
gamma-Chlordane	.001	U	.001	U	

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Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 8082

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Aroclor 1016	.017	U	.016	U	
Aroclor 1221	.033	U	.032	U	
Aroclor 1232	.017	U	.016	U	
Aroclor 1242	.017	U	.016	U	
Aroclor 1248	.017	U	.016	U	
Aroclor 1254	.017	U	.016	U	
Aroclor 1260	.017	U	.016	U	

Date: 05-JAN-05

Time: 15:30:14

Report: rep2531

Page: 11

Run #: 0

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: 8082

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Aroclor 1016	.01	U	.01	U	
Aroclor 1221	.02	U	.02	U	
Aroclor 1232	.01	U	.01	U	
Aroclor 1242	.01	U	.01	U	
Aroclor 1248	.01	U	.01	U	
Aroclor 1254	.01	U	.01	U	
Aroclor 1260	.01	U	.01	U	

Date: 05-JAN-05

Time: 15:30:14

Report: rep2531

Page: 12

Run #: 0

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: FREEZE DRY

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	%	%

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Total Solids		16.8		17.9	6

Date: 05-JAN-05

Time: 15:30:14

Report: rep2531

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Run #: 0

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: LIPIDS NOAA

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	-	-
Matrix Type	TI	TI
Sample Number	229089	229090
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	%	%

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Lipids	.94		1		6

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: PS-PSEP

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	%	%

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Percent Clay		1.45		1.32	9
Percent Gravel		37.6		53.6	35
Percent Sand, Coarse		13.7		8.77	44
Percent Sand, Fine		9.41		7.4	24
Percent Sand, Medium		18		12.7	35
Percent Sand, Very Coarse		8.62		5.29	48
Percent Sand, Very Fine		7.55		6.17	20
Percent Silt		3.47		2.91	18

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: TOC-PSEP

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	%	%

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Total Organic Carbon		.34		.38	11

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: TS-PSEP

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	%	%

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Total Solids		76.1		79.2	4

Relative Percent Difference Between Field Duplicate Samples

Installation: BANGOR CTO Number: 40

Sorted by Analytical Method, Matrix, Sample Number, Parameter Name

Analytical Method: TS2-PSEP

Site ID / Location ID	26 / 109	26 / 109
Location Cross Reference	MS109	MS109
Location Type	IT	IT
Sample Date	27-OCT-04	27-OCT-04
Depth Range (ft)	0-2	0-2
Matrix Type	SD	SD
Sample Number	229086	229087
Sample Type	ES	FD
Analysis Type	ES	ES
Unit of Measure	mg/kg	mg/kg

Parameter Name	Parameter	Data	Parameter	Data	Relative Percent
Total Sulfides		5.1		4.7	8

APPENDIX D

Site Inspection Checklists

Site Inspection Checklist

I. SITE INFORMATION			
Site name: <i>NBK at Bangor, OU 1 (Site A)</i>		Date of inspection: <i>September 23, 2004</i>	
Location: <i>Kitsap, WA</i>		EPA ID: <i>110000771219</i>	
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>		Weather/temperature: <i>Fair</i>	
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <i>Soil excavation and on-site treatment; leach basin closure; well abandonment</i> </div> <div style="width: 45%;"> <input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>			
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. Navy Staff			
Contact	<u>Said Seddiki</u> Name	<u>Remedial Project Manager</u> Title	<u>September 15, 2004</u> Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Barbara Chafin-Tissier</u> Name	<u>IR Program Coordinator</u> Title	<u>Not Recorded</u> Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Patty Kelly</u> Name	<u>Former RPM</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			
Contact	<u>Daniel Gravning</u> Name	<u>NTR</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			
Contact	<u>Mick Butterfield</u> Name	<u>Former IR Program coordinator</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Response reported lost in mail</u>			

2. O&M Contractor

Contact Ann Marie Johnson – Shannon and Wilson Project Manager August 31, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Contact Rick Weingarz – Foster Wheeler Project Manager September 8, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

3. LTM Contractor Rick Osgood - TEC Project Manager August 20, 2004
Name Title Date

Problems, suggestions; ☒ Report attached _____

4. Regulatory authorities and response agencies

Agency Ecology
Contact Nnamdi Madako Ecology PM for Site August 4, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Agency Ecology
Contact Guy Barrett Former Ecology PM NA
Name Title Date

Problems; suggestions; ☐ Report attached Chose not to respond

Agency EPA
Contact Nancy Harney EPA Project Manager NA
Name Title Date

Problems; suggestions; ☐ Report attached Chose not to respond

Agency Kitsap County Health Department
Contact Bill Lum NA
Name Title Date

Problems; suggestions; ☐ Report attached Chose not to respond

5. **Members of the public**

Contact Bill Hahn Not Recorded
Name Date
Problems; suggestions; ☒ Report attached _____

Contact Peggy Adkins _____
Name Date
Problems; suggestions; G Report attached _____

Contact Dennis McMenamin NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Russ Harris NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Leonard Burien NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Steve Fairweather NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Ester Starcevich NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Sue Edwards NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Randy Hatch NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

III. DOCUMENTS & RECORDS					
1.	O&M Records				
	<input checked="" type="checkbox"/> O&M manual	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	G	N/A
	<input checked="" type="checkbox"/> As-built drawings	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	G	N/A
	<input checked="" type="checkbox"/> Maintenance logs	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	G	N/A
	Remarks <u>Monthly technical progress report, no annual summary report. Monthly progress meetings. Site is visited by staff once per week.</u>				
2.	Leach basin closure records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date		
	Remarks <u>Documented in first five-year review, with citations to record documents.</u>				
3.	Soil excavation and treatment records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date		
	Remarks <u>Documented in first five-year review, with citations to record documents.</u>				
4.	Well Abandonment Records	G Readily available	G Up to date		
	Remarks <u>No record of well abandonment found</u>				
5.	Groundwater Monitoring Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date		
	Remarks _____				
6.	Institutional Controls Inspection Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date		
	Remarks <u>Checklist available</u>				
IV. O&M COSTS					
1.	O&M Organization				
	G State in-house	G Contractor for State			
	G PRP in-house	G Contractor for PRP			
	G Federal Facility in-house	<input checked="" type="checkbox"/> Contractor for Federal Facility			
	G Other _____				

2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate: <u>Not broken out in ROD</u> G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 35%;">Fiscal Year: <u>2000</u></td> <td style="width: 20%; text-align: right;"><u>\$102,052</u></td> <td style="width: 45%;">G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2001</u></td> <td style="text-align: right;"><u>\$285,693</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2002</u></td> <td style="text-align: right;"><u>\$395,522</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2003</u></td> <td style="text-align: right;"><u>\$279,460</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2004</u></td> <td style="text-align: right;"><u>\$335,592</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> </table>	Fiscal Year: <u>2000</u>	<u>\$102,052</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2001</u>	<u>\$285,693</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2002</u>	<u>\$395,522</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2003</u>	<u>\$279,460</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2004</u>	<u>\$335,592</u>	G Breakdown attached		Total cost	
Fiscal Year: <u>2000</u>	<u>\$102,052</u>	G Breakdown attached																													
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	Total cost																														
Fiscal Year: <u>2004</u>	<u>\$335,592</u>	G Breakdown attached																													
	Total cost																														
3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____																														
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable G N/A																															
A. Site A Burn Area																															
1.	Treatment system secure? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____																														
2.	Current land use consistent with ROD and ICMP? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____																														
3.	Any wells installed except for environmental cleanup? G Yes <input checked="" type="checkbox"/> No Remarks _____ _____																														
4.	Any indication of damage to leach basin liner? G Yes <input checked="" type="checkbox"/> No Remarks <u>None Observed</u> _____ _____																														
5.	Any evidence of excavation? G Yes <input checked="" type="checkbox"/> No Remarks <u>None Observed</u> _____ _____																														

B. Site A Debris Area 2			
1.	Current land use consistent with ROD and ICMP?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Remarks _____			
2.	Are signs and posts present, in good condition, and legible?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Remarks _____			
3.	Is deterrent vegetation intact with no penetrating trails?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Remarks: <u>Oregon grape and salal are present – no obvious deterrent vegetation. No apparent regular usage or well-defined trails. Access to debris area on foot not difficult.</u>			
4.	Any evidence of excavation?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Remarks <u>None Observed</u>			
C. Overall Institutional Controls Evaluation			
1.	Implementation and enforcement		
	Site conditions imply ICs properly implemented	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	Site conditions imply ICs being fully enforced	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	Type of monitoring (e.g., self-reporting, drive by) <u>Self inspection and reporting by Navy</u>		
	Frequency <u>Annual site walks</u>		
	Responsible party <u>Installation Restoration Program Coordinator – NBK at Bangor</u>		
	Contact <u>Barbara Chafin – Tissier</u>		
	Name		
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	Specific requirements in decision documents have been met	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	Other problems or suggestions: <input type="checkbox"/> Report attached		
	<u>Deterrent vegetation not in place</u>		

2.	Adequacy	<input checked="" type="checkbox"/> ICs are adequate	<input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A
Remarks: <u>ICs are adequate because current policy restricts access to Debris Area 2 – but ROD requirements are technically not met.</u>			

VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Groundwater treatment system components			
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input checked="" type="checkbox"/> Carbon adsorbers <input checked="" type="checkbox"/> Filters <i>Bag filters for particulates</i> _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> Sampling ports properly marked and functional <input checked="" type="checkbox"/> Sampling/maintenance log displayed and up to date <input checked="" type="checkbox"/> Equipment properly identified <input checked="" type="checkbox"/> Quantity of groundwater treated annually: <i>1,400,000 gallons</i> <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks: <i>Treated water discharged to storm sewer – reinfiltration has been discontinued. Five extraction wells.</i> _____		
2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks: _____		
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks: _____		
4.	Discharge Structure and Appurtenances <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks: _____		
5.	Treatment Building(s) <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks: _____		
6.	Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks: <i>Based on contractor reports. Observed extraction wellheads.</i> _____		

B. Monitoring Data			
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <u>See text of 5-year review report</u> G Groundwater plume is effectively contained G Contaminant concentrations are declining		
C. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation portion of remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled G Good condition <input checked="" type="checkbox"/> All required wells located G Needs Maintenance G N/A Remarks: <u>Based on contractor reports. Observed typical wellheads.</u>		
D. Other Remedy Components			
1.	Soil excavation	<input checked="" type="checkbox"/> Completed	G Not Completed
2.	Leach basin closure	<input checked="" type="checkbox"/> Completed	G Not Completed
3.	Well abandonment	<input checked="" type="checkbox"/> Completed	G 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.). <u>See text of 5-year review report.</u>			
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. <u>See text of 5-year review report.</u>			
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. <u>See text of 5-year review report.</u>			
D. Opportunities for Optimization			
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>See text of 5-year review report.</u>			

Site Inspection Checklist

I. SITE INFORMATION			
Site name: <i>NBK at Bangor, OU 2 (Site F)</i>		Date of inspection: <i>September 23, 2004</i>	
Location: <i>Kitsap, WA</i>		EPA ID: <i>110000771219</i>	
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>		Weather/temperature: <i>Fair</i>	
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u><i>Soil excavation and on-base treatment; infiltration barrier</i></u> </div> <div style="width: 45%;"> <input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>			
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. Navy Staff			
Contact	<u>Said Seddiki</u> Name	<u>Remedial Project Manager</u> Title	<u>September 15, 2004</u> Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Barbara Chafin-Tissier</u> Name	<u>IR Program Coordinator</u> Title	<u>Not Recorded</u> Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Patty Kelly</u> Name	<u>Former RPM</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			
Contact	<u>Daniel Gravning</u> Name	<u>NTR</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			
Contact	<u>Mick Butterfield</u> Name	<u>Former IR Program coordinator</u> Title	<u>NA</u> Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Response reported lost in mail</u>			

2. O&M Contractor

Contact Ann Marie Johnson – Shannon and Wilson Project Manager August 31, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Contact Rick Weingarz – Foster Wheeler Project Manager September 8, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

3. LTM Contractor Rick Osgood - TEC Project Manager August 20, 2004
Name Title Date

Problems, suggestions; ☒ Report attached _____

4. Regulatory authorities and response agencies

Agency Ecology
Contact Nnamdi Madako Ecology PM for Site August 4, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Agency Ecology
Contact Guy Barrett Former Ecology PM NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

Agency EPA
Contact Nancy Harney EPA Project Manager NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

Agency Kitsap County Health Department
Contact Bill Lum NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

5. **Members of the public**

Contact Bill Hahn Not Recorded
Name Date
Problems; suggestions; ☒ Report attached _____

Contact Peggy Adkins _____
Name Date
Problems; suggestions; G Report attached _____

Contact Dennis McMenamin NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Russ Harris NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Leonard Burien NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Steve Fairweather NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Ester Starcevich NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Sue Edwards NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Randy Hatch NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

III. DOCUMENTS & RECORDS																																	
1.	O&M Records <input checked="" type="checkbox"/> O&M manual <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Maintenance logs Remarks <u>Monthly technical progress report, no annual summary report. Site is visited by staff once per day.</u>	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date G N/A G N/A G N/A																														
2.	Soil excavation and treatment records Remarks <u>Documented in first five-year review, with citations to record documents.</u>	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date																														
3.	Infiltration barrier as-built records Remarks <u>Documented in first five-year review, with citations to record documents.</u>	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date																														
4.	Groundwater Monitoring Records Remarks: <u>Also monitoring Site E/11 wells for Otto fuel.</u>	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date																														
5.	Institutional Controls Inspection Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date																														
IV. O&M COSTS																																	
1.	O&M Organization <div style="display: flex; justify-content: space-between;"> <div> G State in-house G PRP in-house G Federal Facility in-house G Other _____ </div> <div> G Contractor for State G Contractor for PRP <input checked="" type="checkbox"/> Contractor for Federal Facility </div> </div>																																
2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate: <u>\$160,000/yr in 1994 dollars</u> G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 35%;">Fiscal Year: <u>2000</u></td> <td style="width: 20%; text-align: right;"><u>\$171,313</u></td> <td style="width: 45%;">G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2001</u></td> <td style="text-align: right;"><u>\$441,187</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2002</u></td> <td style="text-align: right;"><u>\$1,113,549</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2003</u></td> <td style="text-align: right;"><u>\$291,703</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> <tr> <td>Fiscal Year: <u>2004</u></td> <td style="text-align: right;"><u>\$321,248</u></td> <td>G Breakdown attached</td> </tr> <tr> <td></td> <td style="text-align: right;">Total cost</td> <td></td> </tr> </table>			Fiscal Year: <u>2000</u>	<u>\$171,313</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2001</u>	<u>\$441,187</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2002</u>	<u>\$1,113,549</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2003</u>	<u>\$291,703</u>	G Breakdown attached		Total cost		Fiscal Year: <u>2004</u>	<u>\$321,248</u>	G Breakdown attached		Total cost	
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____	
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable G N/A		
A. Site F		
1.	Treatment system secure? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____	
2.	Current land use consistent with ROD and ICMP? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____	
3.	Any wells installed except for environmental cleanup? G Yes <input checked="" type="checkbox"/> No Remarks: <u>Per IC inspection by Navy in August 2004.</u>	
4.	Any indication of damage to infiltration barrier or cracked asphalt? G Yes <input checked="" type="checkbox"/> No Remarks: <u>Per IC inspection by Navy in August 2004.</u>	
5.	Any evidence of excavation? G Yes <input checked="" type="checkbox"/> No Remarks: <u>Per IC inspection by Navy in August 2004.</u>	
B. Overall Institutional Controls Evaluation		
1.	Implementation and enforcement Site conditions imply ICs properly implemented <input checked="" type="checkbox"/> Yes G No Site conditions imply ICs being fully enforced <input checked="" type="checkbox"/> Yes G No Type of monitoring (<i>e.g., self-reporting, drive by</i>) <u>Self inspection and reporting by Navy</u> Frequency <u>Annual site walks</u> Responsible party <u>Installation Restoration Program Coordinator – NBK at Bangor</u> Contact <u>Barbara Chafin – Tissier</u> Name Reporting is up-to-date <input checked="" type="checkbox"/> Yes G No Specific requirements in decision documents have been met <input checked="" type="checkbox"/> Yes G No Violations have been reported G Yes <input checked="" type="checkbox"/> No Other problems or suggestions: G Report attached _____ _____ _____	

2.	Adequacy Remarks _____ _____ _____	<input checked="" type="checkbox"/> ICs are adequate	G ICs are inadequate	G N/A
VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable G N/A				
A. Groundwater treatment system components				
1.	Treatment Train (Check components that apply) G Metals removal G Oil/water separation G Bioremediation G Air stripping G Carbon adsorbers <input checked="" type="checkbox"/> Filters <u>Bag filters for particulates</u> G Additive (e.g., chelation agent, flocculent) _____ G Others _____ <input checked="" type="checkbox"/> Good condition G Needs Maintenance <input checked="" type="checkbox"/> Sampling ports properly marked and functional G Sampling/maintenance log displayed and up to date <input checked="" type="checkbox"/> Equipment properly identified <input checked="" type="checkbox"/> Quantity of groundwater treated annually <u>600-650 gpm – 2,700,000,000 gallons annually</u> G Quantity of surface water treated annually _____ Remarks _____ _____			
2.	Electrical Enclosures and Panels (properly rated and functional) G N/A <input checked="" type="checkbox"/> Good condition G Needs Maintenance Remarks _____ _____			
3.	Tanks, Vaults, Storage Vessels G N/A <input checked="" type="checkbox"/> Good condition G Proper secondary containment G Needs Maintenance Remarks _____ _____			
4.	Discharge Structure and Appurtenances G N/A <input checked="" type="checkbox"/> Good condition G Needs Maintenance Remarks _____ _____			
5.	Treatment Building(s) G N/A <input checked="" type="checkbox"/> Good condition (esp. roof and doorways) G Needs repair <input checked="" type="checkbox"/> Chemicals and equipment properly stored Remarks _____ _____			
6.	Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located G Needs Maintenance G N/A Remarks: <u>Based on contractor reports</u> _____			

B. Monitoring Data			
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <u>See text of 5-year review report</u> G Groundwater plume is effectively contained G Contaminant concentrations are declining		
C. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation portion of remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located G Needs Maintenance G N/A Remarks <u>Based on contractor reports. Observed typical wellheads.</u>		
D. Other Remedy Components			
1.	Soil excavation	<input checked="" type="checkbox"/> Completed	G Not Completed
2.	Infiltration barrier	<input checked="" type="checkbox"/> Completed	G 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.). <u>See text of 5-year review report.</u>			
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. <u>See text of 5-year review report.</u>			
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. <u>See text of 5-year review report.</u>			
D. Opportunities for Optimization			
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>See text of 5-year review report.</u>			

Site Inspection Checklist

I. SITE INFORMATION			
Site name: <i>NBK at Bangor, OU 3 (Sites 16/24 and 25)</i>	Date of inspection: <i>September 23, 2004</i>		
Location: <i>Kitsap, WA</i>	EPA ID: <i>110000771219</i>		
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>	Weather/temperature: <i>Fair</i>		
Remedy Includes: (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>Verification monitoring of groundwater</u> </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </td> </tr> </table>		<input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>Verification monitoring of groundwater</u>	<input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls
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Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. <i>No OU-specific interviews were conducted, as all actions at OU 3 are complete except annual IC inspections. Interviews for other OUs included general site-wide questions that pertain to this OU.</i>			
III. DOCUMENTS & RECORDS			
1.	Groundwater Monitoring Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks <u>Documented in first five-year review, with citations to record documents.</u>		
2.	Institutional Controls Inspection Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____ _____		
IV. O&M COSTS			
1.	O&M Organization <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Other _____ </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input type="checkbox"/> Contractor for Federal Facility </td> </tr> </table>	<input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Other _____	<input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input type="checkbox"/> Contractor for Federal Facility
<input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Other _____	<input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input type="checkbox"/> Contractor for Federal Facility		

2.	<p>O&M Cost Records – <u>NA – only IC inspections by Navy required</u></p> <p>G Readily available G Up to date</p> <p>G Funding mechanism/agreement in place</p> <p>Original O&M cost estimate _____ G Breakdown attached</p> <p style="text-align: center;">Total annual cost by year for review period if available</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table>	From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost		
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3.	<p>Unanticipated or Unusually High O&M Costs During Review Period</p> <p>Describe costs and reasons: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>																																																												
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable G N/A																																																													
A. Site 16/24																																																													
1.	<p>Current land use consistent with ROD and ICMP? <input checked="" type="checkbox"/> Yes G No</p> <p>Remarks: <u>Some parking and storage of small items. Fenced. Two drums present – IR coordinator to check on drums.</u></p>																																																												
2.	<p>Any evidence of excavation? G Yes <input checked="" type="checkbox"/> No</p> <p>Remarks _____</p> <p>_____</p>																																																												
B. Site 25																																																													
1.	<p>No ICs Required or Established</p>																																																												

C. Overall Institutional Controls Evaluation			
1.	Implementation and enforcement Site conditions imply ICs properly implemented <input checked="" type="checkbox"/> Yes G No Site conditions imply ICs being fully enforced <input checked="" type="checkbox"/> Yes G No Type of monitoring (e.g., self-reporting, drive by) <u>Self inspection and reporting by Navy</u> Frequency <u>Annual site walks</u> Responsible party <u>Installation Restoration Program Coordinator – NBK at Bangor</u> Contact <u>Barbara Chafin – Tissier</u> Name Reporting is up-to-date <input checked="" type="checkbox"/> Yes G No Specific requirements in decision documents have been met <input checked="" type="checkbox"/> Yes G No Violations have been reported <input checked="" type="checkbox"/> Yes G No Other problems or suggestions: G Report attached <u>Area should not be used to store full drums.</u>		
2.	Adequacy	<input checked="" type="checkbox"/> ICs are adequate G ICs are inadequate	G N/A
Remarks _____			

VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable G N/A			
A. Groundwater Monitoring			
2.	Verification Monitoring Completed? <input checked="" type="checkbox"/> Yes G No Remarks <u>Navy and regulatory agencies have concluded that monitoring is no longer required.</u> <u>Metals concentrations in groundwater do not exceed background.</u>		
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.). <u>See text of 5-year review report.</u>			
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. <u>See text of 5-year review report.</u>			

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. <i>See text of 5-year review report.</i>
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <i>See text of 5-year review report.</i>

Site Inspection Checklist

I. SITE INFORMATION	
Site name: <i>NBK at Bangor, OU 6 (Site D)</i>	Date of inspection:
Location: <i>Kitsap, WA</i>	EPA ID:
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>	Weather/temperature:
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>Soil excavation and on-base treatment; short-term groundwater monitoring; surface water confirmation monitoring</u> </div> <div style="width: 45%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. <u>No OU-specific interviews were conducted, as all actions at OU 6 are complete and no IC inspections are required. Interviews for other OUs included general site-wide questions that pertain to this OU.</u>	
III. DOCUMENTS & RECORDS	
1. Groundwater Monitoring Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks <u>Documented in first five-year review, with citations to record documents.</u>	
2. Soil Treatment Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks <u>Documented in first five-year review, with citations to record documents.</u>	
IV. REMEDY COSTS	
1. Implementing Organization <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input type="checkbox"/> Federal Facility in-house <input checked="" type="checkbox"/> Other <u>Not Applicable</u> </div> <div style="width: 45%;"> <input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input type="checkbox"/> Contractor for Federal Facility </div> </div>	

2.	Remedy Cost Records – <u>Not Applicable</u> G Readily available G Up to date G Funding mechanism/agreement in place Original O&M cost estimate _____ G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table>	From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost			From _____	To _____				G Breakdown attached	Date	Date		Total cost		
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VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable G N/A																																																													
A. Surface Water and Groundwater Monitoring																																																													
1.	Verification Monitoring Completed? <input checked="" type="checkbox"/> Yes G No Remarks <u>Navy and regulatory agencies have concluded that surface water and groundwater monitoring is no longer required. COC concentrations were not detected or were below RGs.</u>																																																												
B. Other Remedy Components																																																													
1.	Soil excavation and treatment <input checked="" type="checkbox"/> Completed G Not Completed																																																												
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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. <u>None required</u>
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. <u>See text of 5-year review report.</u>
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>Not applicable</u>

I. SITE INFORMATION			
Site name: <i>NBK at Bangor, OU 7 (Sites B, E/11, 2, 10, and 26)</i>		Date of inspection: <i>September 23, 2004</i>	
Location: <i>Kitsap, WA</i>		EPA ID: <i>110000771219</i>	
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>		Weather/temperature: <i>Fair</i>	
Remedy Includes: (Check all that apply) <input checked="" type="checkbox"/> Landfill cover/containment G Monitored natural attenuation <input checked="" type="checkbox"/> Access controls G Groundwater containment <input checked="" type="checkbox"/> Institutional controls G Vertical barrier walls <input checked="" type="checkbox"/> Groundwater pump and treatment (as part of Site F system) G Surface water collection and treatment <input checked="" type="checkbox"/> Other <u><i>Surface water control; off-site soil and debris disposal; verification monitoring of groundwater, sediment, and clam tissue</i></u>			
Attachments: G Inspection team roster attached G Site map attached			
II. INTERVIEWS (Check all that apply)			
1. Navy Staff			
Contact	<u>Said Seddiki</u>	<u>Remedial Project Manager</u>	<u>September 15, 2004</u>
	Name	Title	Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Barbara Chafin-Tissier</u>	<u>IR Program Coordinator</u>	<u>Not Recorded</u>
	Name	Title	Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			
Contact	<u>Patty Kelly</u>	<u>Former RPM</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; G Report attached <u>Chose not to respond</u>			
Contact	<u>Daniel Gravning</u>	<u>NTR</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; G Report attached <u>Chose not to respond</u>			
Contact	<u>Mick Butterfield</u>	<u>Former IR Program coordinator</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; G Report attached <u>Response reported lost in mail</u>			

2. **O&M Contractor** - None. Navy Performs OU 7 inspections.

3. **LTM Contractor** - None. Sediment and clam tissue sampling done once every 5 years as part of 5-year review.

4. **Regulatory authorities and response agencies**

Agency Ecology
Contact Nnamdi Madako Ecology PM for Site August 4, 2004
Name Title Date
Problems; suggestions; ☒ Report attached _____

Agency Ecology
Contact Guy Barrett Former Ecology PM NA
Name Title Date
Problems; suggestions; G Report attached Chose not to respond

Agency EPA
Contact Nancy Harney EPA Project Manager NA
Name Title Date
Problems; suggestions; G Report attached Chose not to respond

Agency Kitsap County Health Department
Contact Bill Lum NA
Name Title Date
Problems; suggestions; G Report attached Chose not to respond

5. **Members of the public**

Contact Bill Hahn Not Recorded
Name Date
Problems; suggestions; ☒ Report attached _____

Contact Peggy Adkins _____
Name Date
Problems; suggestions; G Report attached _____

Contact Dennis McMenamin NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Russ Harris NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Leonard Burien NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Steve Fairweather NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Ester Starceвич NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Sue Edwards NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

Contact Randy Hatch NA
Name Date
Problems; suggestions; G Report attached Chose not to respond

III. DOCUMENTS & RECORDS		
1.	Otto fuel monitoring of Site F system for Site E/11 <input checked="" type="checkbox"/> Readily available G Up to date Remarks: <u>Appear to have missed 2004 sampling.</u>	
2.	Soil and debris disposal records (Sites 2, B, and E/11) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks <u>Documented in first five-year review, with citations to record documents.</u>	
3.	Soil cover and storm water control as-built records (Site B) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks <u>Documented in first five-year review, with citations to record documents.</u>	
4.	Soil cover inspection and maintenance records (Site B) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____	
5.	Sediment and clam tissue monitoring records (Site 26) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks: <u>Performed as part of this 5-year review.</u>	
5.	Groundwater monitoring records (Site 10) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____	
6.	Institutional controls inspection records (Sites B, E/11, 10) <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____	
IV. O&M COSTS		
1.	O&M Organization G State in-house G Contractor for State G PRP in-house G Contractor for PRP G Federal Facility in-house <input checked="" type="checkbox"/> Contractor for Federal Facility G Other _____	

2.	O&M Cost Records G Readily available G Up to date G Funding mechanism/agreement in place Original O&M cost estimate _____ G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 20%; text-align: center;"><u>Not reported by Navy</u></td> <td style="width: 50%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>	From _____	To _____	<u>Not reported by Navy</u>	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost	
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Date	Date	Total cost																																							
3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____																																								
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable G N/A																																									
A. Site B – Floral Point (checklist items from ICMP)																																									
1.	Current land use consistent with ROD and ICMP? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____																																								
2.	Any erosion along shoreline or on the vegetated cover? <input checked="" type="checkbox"/> Yes G No Remarks: <u>Scarps along shoreline imply ongoing erosion</u>																																								
3.	Appropriate vegetation on cover? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____																																								
4.	Sufficient remaining gravel thickness on cap? <input checked="" type="checkbox"/> Yes G No Remarks _____ _____																																								

B. Sites E/11 and 10 covered by ICs at Sites F and OU 8, respectively.			
C. Overall Institutional Controls Evaluation			
1.	Implementation and enforcement Site conditions imply ICs properly implemented <input checked="" type="checkbox"/> Yes G No Site conditions imply ICs being fully enforced <input checked="" type="checkbox"/> Yes G No Type of monitoring (e.g., self-reporting, drive by) <u>Self inspection and reporting by Navy</u> Frequency <u>Annual site walks</u> Responsible party <u>Installation Restoration Program Coordinator – NBK at Bangor</u> Contact <u>Barbara Chafin – Tissier</u> <div style="text-align: center;">Name</div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes G No Specific requirements in decision documents have been met <input checked="" type="checkbox"/> Yes G No Violations have been reported G Yes <input checked="" type="checkbox"/> No Other problems or suggestions: G Report attached _____ _____ _____ _____		
2.	Adequacy Remarks _____ _____ _____	<input checked="" type="checkbox"/> ICs are adequate G ICs are inadequate G N/A	
VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable G N/A			
A. Groundwater treatment system components – USING SITE F SYSTEM.			
B. Monitoring Data			
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <u>See text of 5-year review report.</u> G Groundwater plume is effectively contained G Contaminant concentrations are declining G Sediments and clams are not being affected by COCs at Floral Point Remarks _____ _____ _____		

C. Floral Point Cover			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	G Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident
3.	Erosion Areal extent: <u>Shoreline scarps</u> Remarks: <u>Measurements from survey hubs during last IC inspection also imply substantial erosion.</u>	<input checked="" type="checkbox"/> Erosion noted Depth _____	G Erosion not evident
4.	Holes Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover G Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	<input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established	<input checked="" type="checkbox"/> No signs of stress
6.	Bulges Areal extent _____ Remarks _____	G Location shown on site map Height _____	<input checked="" type="checkbox"/> Bulges not evident
7.	Wet Areas/Water Damage G Wet areas G Ponding G Seeps G Soft subgrade Remarks _____	<input checked="" type="checkbox"/> Wet areas/water damage not evident G Location shown on site map G Location shown on site map G Location shown on site map G Location shown on site map	Areal extent _____ Areal extent _____ Areal extent _____ Areal extent _____
8.	Slope Instability Areal extent _____ Remarks _____	G Slides G Location shown on site map	<input checked="" type="checkbox"/> No evidence of slope instability
D. Surface water control swales			
1.	Erosion Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> No evidence of erosion

2.	Obstructions Type _____ <input checked="" type="checkbox"/> No obstructions G Location shown on site map Areal extent _____ Size _____ Remarks _____
3.	Excessive Vegetative Growth Type _____ <input checked="" type="checkbox"/> No evidence of excessive growth <input checked="" type="checkbox"/> Vegetation in channels does not obstruct flow G Location shown on site map Areal extent _____ Remarks: <u>Grass growing in swales beside road does not appear to obstruct flow. Discharge inlet is clear.</u>
E. Cover Penetrations <input checked="" type="checkbox"/> Applicable G N/A	
1.	Monitoring Wells (within surface area of landfill) G Properly secured/locked G Functioning G Routinely sampled G Good condition G Evidence of leakage at penetration G Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____
2.	Erosion Monuments <input checked="" type="checkbox"/> Located <input checked="" type="checkbox"/> Routinely surveyed G N/A Remarks _____
F. Other Remedy Components	
1.	Soil and debris disposal <input checked="" type="checkbox"/> Completed G 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.). <u>See text of 5-year review report.</u>	
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. <u>See text of 5-year review report.</u>	
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. <u>See text of 5-year review report.</u>	

D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>See text of 5-year review report.</u>

Site Inspection Checklist

I. SITE INFORMATION			
Site name: <i>NBK at Bangor, OU 8 (Sites 27, 28, 29 and offsite plume)</i>		Date of inspection: <i>September 23, 2004</i>	
Location: <i>Kitsap, WA</i>		EPA ID: <i>110000771219</i>	
Agency, office, or company leading the five-year review: <i>US NAVY, NAVFAC NW</i>		Weather/temperature: <i>Fair</i>	
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u><i>LNAPL removal</i></u> </div> <div> <input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>			
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. Navy Staff			
Contact	<u>Said Seddiki</u>	<u>Remedial Project Manager</u>	<u>September 15, 2004</u>
	Name	Title	Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			

Contact	<u>Barbara Chafin-Tissier</u>	<u>IR Program Coordinator</u>	<u>Not Recorded</u>
	Name	Title	Date
Problems; suggestions; <input checked="" type="checkbox"/> Report attached _____			

Contact	<u>Patty Kelly</u>	<u>Former RPM</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			

Contact	<u>Daniel Gravning</u>	<u>NTR</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Chose not to respond</u>			

Contact	<u>Mick Butterfield</u>	<u>Former IR Program coordinator</u>	<u>NA</u>
	Name	Title	Date
Problems; suggestions; <input type="checkbox"/> Report attached <u>Response reported lost in mail</u>			

2. O&M Contractor

Contact Ann Marie Johnson – Shannon and Wilson Project Manager August 31, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Contact Rick Weingarz – Foster Wheeler Project Manager September 8, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

3. LTM Contractor Rick Osgood - TEC Project Manager August 20, 2004
Name Title Date

Problems, suggestions; ☒ Report attached _____

4. Regulatory authorities and response agencies

Agency Ecology
Contact Nnamdi Madako Ecology PM for Site August 4, 2004
Name Title Date

Problems; suggestions; ☒ Report attached _____

Agency Ecology
Contact Guy Barrett Former Ecology PM NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

Agency EPA
Contact Nancy Harney EPA Project Manager NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

Agency Kitsap County Health Department
Contact Bill Lum NA
Name Title Date

Problems; suggestions; G Report attached Chose not to respond

5. **Members of the public**

Contact Bill Hahn Not Recorded
Name Date
Problems; suggestions; ☒ Report attached _____

Contact Peggy Adkins July 30, 2004
Name Date
Problems; suggestions; ☒ Report attached _____

Contact Dennis McMenamin NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Russ Harris NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Leonard Burien NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Steve Fairweather NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Ester Starcevich NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Sue Edwards NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Randy Hatch NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

III. DOCUMENTS & RECORDS																																	
1.	LNAPL recovery system installation records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____ _____																																
2.	Groundwater monitoring records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____ _____																																
3.	Institutional controls inspection records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks _____ _____																																
IV. O&M COSTS																																	
1.	O&M Organization <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> G State in-house G PRP in-house G Federal Facility in-house G Other _____ </div> <div style="width: 45%;"> G Contractor for State G Contractor for PRP <input checked="" type="checkbox"/> Contractor for Federal Facility </div> </div>																																
2.	O&M Cost Records G Readily available G Up to date G Funding mechanism/agreement in place Original O&M cost estimate _____ G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 20%;">To _____</td> <td style="width: 20%; text-align: center;"><u>Not Reported by Navy</u></td> <td style="width: 40%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;">G Breakdown attached</td> </tr> </table>	From _____	To _____	<u>Not Reported by Navy</u>		Date	Date	Total cost	G Breakdown attached	From _____	To _____	Total cost	G Breakdown attached	Date	Date	Total cost	G Breakdown attached	From _____	To _____	Total cost	G Breakdown attached	Date	Date	Total cost	G Breakdown attached	From _____	To _____	Total cost	G Breakdown attached	Date	Date	Total cost	G Breakdown attached
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____																																

V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable G N/A			
A. OU 8 (all sites)			
1.	Current land use consistent with ROD and ICMP? <input checked="" type="checkbox"/> Yes G No	Remarks: _____	
2.	Have any wells been installed except for environmental cleanup? G Yes <input checked="" type="checkbox"/> No	Remarks: <u>Per Barbara Chafin-Tissier</u>	
3.	Monitoring reports supplied to Health Department? <input checked="" type="checkbox"/> Yes G No	Remarks: <u>Per Barbara Chafin-Tissier</u>	
4.	Any wells allowed by Health Department in restricted area? G Yes <input checked="" type="checkbox"/> No	Remarks: <u>Per Barbara Chafin-Tissier</u>	
B. Overall Institutional Controls Evaluation			
1.	Implementation and enforcement Site conditions imply ICs properly implemented <input checked="" type="checkbox"/> Yes G No Site conditions imply ICs being fully enforced <input checked="" type="checkbox"/> Yes G No Type of monitoring (e.g., self-reporting, drive by) <u>Self inspection and reporting by Navy</u> Frequency <u>Annual site walks</u> Responsible party <u>Installation Restoration Program Coordinator – NBK at Bangor</u> Contact <u>Barbara Chafin – Tissier</u> <div style="text-align: center;">Name</div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes G No Specific requirements in decision documents have been met <input checked="" type="checkbox"/> Yes G No Violations have been reported G Yes <input checked="" type="checkbox"/> No Other problems or suggestions: G Report attached _____ _____ _____ _____		
2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate G ICs are inadequate G N/A	Remarks: _____	
VI. TREATMENT COMPONENTS <input checked="" type="checkbox"/> Applicable G N/A			
A. LNAPL and MNA Monitoring Data			
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		

2.	Monitoring data suggests: <input checked="" type="checkbox"/> LNAPL is being removed <input checked="" type="checkbox"/> Contaminant concentrations are declining <input checked="" type="checkbox"/> MNA is effective Remarks: <u>LNAPL recovery has reached endpoint.</u>
B. Monitored Natural Attenuation Infrastructure	
1.	Monitoring Wells (natural attenuation portion of remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located G Needs Maintenance G N/A Remarks: <u>Per monitoring reports. Observed typical wellheads. Well protected in above-ground boxes with heat tape for freeze protection.</u>
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.). <u>See text of 5-year review report.</u>	
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. <u>See text of 5-year review report.</u>	
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. <u>See text of 5-year review report.</u>	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>See text of 5-year review report.</u>	

APPENDIX E

Interview Responses

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Community Member Interview
NBK at Bangor
Kitsap, WA

Individual Contacted:	Peggy Adkins
Title:	Alternate Community Co-Chair
Organization:	RAB member, Community South
Telephone:	(360) 275-5633
E-mail:	--
Address:	10183 W. Old Belfair Hwy. Bremerton, WA 98312
Contact made by:	Susan King, URS, for Said Sedikki, EFA NW (Navy)
Response type:	Written
Date:	Mailed 7/30/04

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) at Bangor, the Records of Decision (RODs) for 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 September 2000.

Response: I was totally familiar with the ROD's and the remedies at the time they were started. Sorry, but it's been a long time since any decisions were made, and I don't remember some of it. The monitoring etc. has been as it was decided on and has gone as planned. I have been involved with the RAB from the beginning.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK at Bangor?

Response: Very good!

3. Do you feel well informed about the remediation activities and progress at NBK at Bangor? Please elaborate.

Response: Yes, the RAB has been informed at all stages of the activities.

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: None.

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 environment at NBK at Bangor?

Response: None.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Community Member Interview
NBK at Bangor
Kitsap, WA

Individual Contacted: Mr. Bill Hahn
Title: RAB Community Co-Chair
Organization: Restoration Advisory Board
Telephone: (360) 779-7656
E-mail: bhahn@kpud.org
Address:

Contact made by: Susan King
Response type: Written questionnaire
Date:

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) at Bangor, the Records of Decision (RODs) for 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 September 2000.

Response: I have been a member of the RAB since its inception. I was also a member of the advisory group that preceded the RAB and served as the CO of Subase Bangor from the spring of 1988 until the summer of 1990.

2. What is your overall impression of the on-going protectiveness of the remedies at NBK at Bangor?

Response: The remedial action has been generally very effective and innovative in several cases. The expense of the various projects and amount of administrative work required is alarming.

3. Do you feel well informed about the remediation activities and progress at NBK at Bangor? Please elaborate.

Response: Information provided to the RAB has been very comprehensive and public outreach extensive. I have continually gotten the impression from

individuals in the community that they think clean-up efforts have been satisfactory.

4. What effects on the community have you observed as a result of on-going remedy implementation?

Response: People feel the Navy has been responsible in cleaning up the contamination and risk to the population has been minimized.

5. Are you aware of any community concerns regarding implementation of the remedies? If so, please give details.

Response: None

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 at Bangor?

Response: As a tax payer, I would like to see a less cumbersome and more cost effective process be developed.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Navy Contractor Personnel Interview

NBK at Bangor

Kitsap, WA

Individual Contacted: Ann Marie Johnson
Title: Program QC/HSO Manager
Organization: Shannon & Wilson, O&M contractor
Telephone: 206.632.8020
E-mail: amj@shanwil.com
Address:

Contact made by: Susan King
Response type: Email
Date: Sent 8/4/04

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 involvement in implementing, operating, maintaining, and monitoring the remedy components for Operable Units (OUs) at Naval Base Kitsap (NBK) at Bangor since September 2000.

Response:

OU 1 and OU 2: Shannon & Wilson, Inc. has been responsible for the day-to-day routine and non-routine operations and maintenance (O&M) activities associated with the groundwater treatment systems at OU 1 (Site A) and OU 2 (Site F) since October 2002. This includes performing the monthly monitoring of the treatment plant influent and effluent water at OU 1 and OU 2. Shannon & Wilson has not been tasked with performing groundwater monitoring of the OU 1 monitoring well network, this work has been and is currently being performed by The Environmental Company. However, in 2003, Shannon & Wilson was tasked with conducting one year of groundwater monitoring at OU 2. Groundwater monitoring activities were performed in accordance with the requirements outlined in the *Compliance and Performance Monitoring Plan* (CPMP) for the OU 2 groundwater treatment system (Hart Crowser, 1999). As of 2004, The Environmental Company has resumed the responsibilities for conducting groundwater monitoring at OU 2.

OU 8: From January 6, 2003 until July 6, 2004 (the end of the task order), Shannon & Wilson was responsible for inspecting, maintaining, and

monitoring the performance of the passive skimmer free product recovery system at Operable Unit 8 (OU 8). Since the moth-balling of the system in December 1999, weekly visits to conduct the necessary inspections, maintenance, and product recovery activities were performed throughout the 18-month task order. Another contractor is conducting groundwater monitoring of the off-base and on-base wells associated with OU 8.

2. For the OUs at which you are conducting monitoring, has the monitoring performed since September 2000 been sufficiently thorough and frequent to meet the goals of the RODs? What are the trends or other overall results of the monitoring that you have conducted?

Response:

OU 1 and OU 2: As stated previously, Shannon & Wilson is responsible for performing monthly monitoring of the OU 1 and OU 2 treatment plant influent and effluent groundwater streams since October 2002. Since our involvement with OU 1 and OU 2, the monthly monitoring of the influent and effluent streams at both sites does meet the goals of the respective RODs. Since October 2002, detected concentrations of RDX and TNT in the influent water for both OU 1 and OU 2 have remained relatively consistent with those obtained prior to our takeover of the contract.

Shannon & Wilson conducted quarterly monitoring of the OU 2 monitoring well network during 2003. Prior to 2003 and since January 2004, groundwater monitoring of the OU 2 monitoring well network has been performed by another contractor. While Shannon & Wilson was conducting the 2003 quarterly monitoring events at OU 2, monitoring activities were conducted in accordance with the CPMP to fulfill the requirements of the ROD. The types of analytes and the concentrations detected during the quarterly sampling events are consistent with historic results for OU 2. However, results obtained during all four quarterly sampling events conducted by Shannon & Wilson showed RDX detected at concentrations above the ROD-specific cleanup level in existing monitoring wells, F-MW44 and F-MW64, and two new monitoring wells, F-MW67 and F-MW68, which were installed in December 2003 as part of system enhancements performed on the OU 2 treatment system to fill gaps identified by the quarterly groundwater monitoring and enhance containment of the plume. Based on these results, it appears that the RDX plume at OU 2 extends beyond the original footprint presented in the 2002 quarterly monitoring reports. Copies of OU 2 (Site F) figures showing the approximate locations of the new monitoring wells, along with the 2002 and 2003 footprints of the RDX plume are attached to this questionnaire.

OU 8: Shannon & Wilson was not tasked with performing groundwater monitoring of the on-base and off-base monitoring wells associated with OU 8.

3. To the best of your knowledge, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

Response:

OU 1 (Site A): Based on our weekly O&M activities performed at OU 1 since October 2002, the treatment system has not been as effective at the removal of contaminants in the groundwater as originally planned in the OU 1 ROD. This is due to lower groundwater extraction volumes than originally anticipated and the low groundwater recharge rates observed at the site. Shannon & Wilson has not been tasked with performing periodic monitoring of the OU 1 wells; thus, we can not address or interpret the data obtained from these monitoring events with regards to the effectiveness of the OU 1 treatment system.

OU 2 (Site F): Based on our O&M involvement at OU 2 since October 2002, the treatment system has generally operated as intended and been effective in the removal of ordnance-related compounds from the groundwater underlying the site. As mentioned previously, in addition to performing the daily O&M activities at OU 2, Shannon & Wilson was tasked with performing the 2003 quarterly groundwater monitoring in accordance with the CPMP (Hart Crowser 1999). The analytical results for the quarterly sampling events in 2003 indicate that the RDX plume extends beyond the footprint presented in the 2002 quarterly monitoring reports (prepared by The Environmental Company). From the 2003 quarterly monitoring data, it appears the plume extends farther to the northwest across Trigger Avenue and includes monitoring wells, F-MW42, F-MW63 and F-MW64 (see attached figures). Modifications to the system to enhance the groundwater treatment and plume containment at OU 2 were performed between November 2003 and February 2004. These modifications included: the installation of higher capacity extraction pumps in select extraction wells; cleaning of the ten extraction wells to allow for increased flows of contaminated water into the treatment system; abandoning and redrilling one injection well (F-IW-2) and adding two new injection wells (F-IW-10 and F-IW-11) along the northwest portion of the site between F-IW-7 and F-IW-8 and F-IW-8 and F-IW-9; evaluating groundwater flow patterns to better evaluate potential contaminant migration pathways; and installation of four new monitoring wells within the SWFPAC area (F-MW-66, F-MW-67, F-MW-68, and F-MW-69) along the northwestern portion of the site to increase the monitoring capabilities of the RDX plume.

Following the installation of the four new monitoring wells in SWFPAC, Shannon & Wilson collected one round of groundwater samples in February 2004. RDX was detected in the samples collected from two of the four new monitoring wells (F-MW-67 and F-MW-68) at a concentration of 3.7 micrograms per liter (ug/L) at each well. A copy of a Site F figure showing

the approximate locations of the new monitoring wells and the extent of the RDX plume is attached to this questionnaire. Shannon & Wilson has not been tasked with additional sampling and analysis of the monitoring well network at OU 2; thus, we can not provide any additional information regarding the effectiveness of the system modifications performed in 2003/2004. However, from the results of groundwater modeling performed as part of the system modifications, the increased capacity of the OU 2 treatment system as a result of these modifications should be effective in containing the RDX contaminant plume if the groundwater treatment system is operated at its increased capacity.

4. For the treatment systems that you operate and maintain, what is the frequency and staffing of site inspections and maintenance?

Response: OU 1 and OU 2: Since October 2002, Shannon & Wilson has had a dedicated Treatment Plant Operator performing routine operations and maintenance activities at both OU 1 and 2 on a full-time basis. Inspections, monitoring, operations, and maintenance activities at both sites are performed in accordance with the schedules provided in the Final O&M Manual Addendums (Hart Crowser, 2000) for both sites and as specified in our contractual agreements with EFANW.

OU 8: Shannon & Wilson conducted O&M activities at OU 8 between January 6, 2003 and July 6, 2004. O&M activities were performed in accordance with the requirements outlined in the *Final Surveillance and Maintenance Plan, Removal Action at Operable Unit 8*, prepared by Foster Wheeler Environmental Corporation (May 2000). These activities included inspections, maintenance, and product recovery activities performed on a weekly basis, with more frequent site visits to perform product recovery during the months when a larger volume of product was present in the wells.

5. Do you know of any significant operation and maintenance difficulties with the pump and treat systems that could have impacted the protectiveness of these components of the remedies?

Response: OU 2: With the exception of short-term shutdowns of the system for routine maintenance and minor repairs, the only difficulties with the pump and treat system that could have impacted the protectiveness of the system have for the most part been addressed through the system modifications performed between November 2003 and February 2004 to enhance the groundwater treatment and plume containment.

6. Do you have any recommendations for optimizing the pump and treat systems, or for implementing alternatives to the pump and treat systems (such

as monitored natural attenuation at Site A as discussed in the last five-year review)?

Response: OU 2: If not being done so already, consideration should be given to incorporating the four new monitoring wells inside SWFPAC into the quarterly groundwater monitoring performed at OU 2. Data obtained from these wells would aid in evaluating groundwater flow patterns and contaminant plume migration. In addition, this data would be beneficial in monitoring the treatment system's effectiveness.

7. To the best of your knowledge, has the LNAPL recovery system at OU 8 been effectively implemented? To the best of your knowledge, what is the status of this system?

Response: Monthly product recovery volumes obtained during our 18-month task order were similar to those obtained since 2002. The monthly average recovered for a 12-month period was 1.37 liters per month, which is below the ROD-specified limits of 1.9 liters per month over a 12-month period; thus, indicating the cleanup objectives have been met.

It is our understanding that the system is still mothballed and initiation of site closure procedures is being evaluated at this time.

8. To the best of your knowledge, has the monitored natural attenuation component of the OU 8 remedy been fully implemented? Have monitoring data collected to date been adequate for meeting the intent of the ROD?

Response: Shannon & Wilson was not tasked with providing services associated with the natural attenuation component or for the collection of monitoring data from OU 8. However, While conducting product recovery activities during our 18-month task order, product not consistent with the typical product recovered from the wells at OU 8 was observed sporadically in recovery wells 8MW49 and MW04. Samples of both the unknown product recovered from 8MW49 and product that is typically recovered at OU 8 were collected and analyzed on base. According to the results, both products are hydrocarbon based; however, "...the product recovered from 8MW49 was found to be a lighter hydrocarbon with a characteristic gasoline odor, while the product typically recovered from OU 8 was heavier and more closely resembled an hydraulic based oil". No other known or potential source for this product has been identified.

9. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK at Bangor?

Response: None.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW

Regulatory Agency Interview

NBK at Bangor

Kitsap, WA

Individual Contacted: Nnamdi Madakor P.HG, P.G
Title: Project Manager
Organization: Washington State Department of Ecology
Telephone: 360.407.7244
E-mail: Nmad461@ecy.wa.gov
Address:

Contact made by: Susan King, URS Corp.
Response type: Written
Date: August 4, 2004

Questions

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) at Bangor, the Records of Decision (RODs) for 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 September 2000.

Response: State Project Manager on Bangor for 2 years

2. What is your overall impression of the on-going protectiveness of the remedies at NBK at Bangor?

Response: Data from the various reports show that the remedies at the Bangor site are protective of the human health and the environment. On going compliance monitoring/institutional control measures at the site continues to ensure the overall protectiveness of the remedies.

3. Do you feel well informed about the remediation activities and progress at NBK at Bangor? Please elaborate.

Response: Yes, I have reviewed all relevant reports; ROD, Compliance monitoring reports, additional work performed since the ROD, attended RAB

meetings to discuss and address citizen's concerns, strategy and concurrence of project milestones.

4. To the best of your knowledge, since September 2000 have there been any new scientific findings that relate to potential site risks that might call into question the protectiveness of the remedies?

Response: Post ROD site issues identified as a result of the ongoing monitoring at the site, like detections in the new monitoring wells that may suggest ongoing plume movement does not in itself suggest the overall lack of protectiveness of the remedy. It may be pointing to areas where the remedy may be further optimized. The overall protectiveness of the remedies at the Bangor Site seems adequate to meet the stated remedial action objectives in the ROD.

5. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

Response: Adequate

6. In your opinion, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

7. **Response:** The pump and treat systems at OU 2 (Site F) has been effective. The detections in the new monitoring well may suggest an appropriate optimization steps depending on the scope of the final determinations around the new well(s). The pump and treat systems at OU 1 (Site A) has been effective.

8. Since September 2000, have there been any complaints, violations, or other incidents related to NBK at 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: None

9. To the best of your knowledge, has the on-going program of environmental monitoring at NBK at Bangor been sufficiently thorough and frequent to meet the goals of the RODs?

Response: Yes

10. Are you aware of any community concerns regarding implementation of the remedies at NBK at Bangor? If so, please give details.

Response: All relevant issues are being adequately addressed in the RAB.

11. 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 at Bangor?

Response: None

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Navy Contractor Personnel Interview

NBK at Bangor

Kitsap, WA

Individual Contacted: Rick Osgood
Title:
Organization: The Environmental Co., LTM contractor
Telephone: 425.453.4040
E-mail: REOsgood@tecinc.com

Contact made by: Susan King
Response type: Email
Date: Sent 8/20/04

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 involvement in implementing, operating, maintaining, and monitoring the remedy components for Operable Units (OUs) at Naval Base Kitsap (NBK) at Bangor since September 2000.

Response: I am the current project manager for The Environmental Company, Inc. supporting the Navy’s Long-Term Monitoring Programs at Site A (OU 1), Site F (OU 2), and OU 8.

2. For the OUs at which you are conducting monitoring, has the monitoring performed since September 2000 been sufficiently thorough and frequent to meet the goals of the RODs? What are the trends or other overall results of the monitoring that you have conducted?

Response: All monitoring activities at Site A, Site F, and OU 8 are being conducted in accordance with ROD specification and under approved project work plans. Overall monitoring trends for each site are summarized as follows:

OU 8: The MNA remedy, in conjunction with free-product recovery and institutional controls at OU 8, continues to provide protection to human health and the environment by limiting the migration of the contaminant plume into areas where groundwater is being used. There continues to be an overall decreasing trend in contaminant concentrations, with DCA and DCE representing the only contaminants that currently exceed the ROD-specified

CULs at the base boundary. No contaminants exceeded the CULs at Mountain View Road. (Also see response to Question 8 below).

Site A: There are no distinct trends in ordnance compound concentrations in the shallow aquifer at Site A based on monitoring results to date. The current RDX concentrations are similar to the concentrations that were observed when the system began operation in 1997. Groundwater treatment has had very little affect on the core of the existing RDX plume. Both the size of the plume core and the magnitude of the concentrations in the core remain largely unchanged since pumping began in 1997 (Also see response to Question 6 below).

Site F: Although there remains an overall decreasing trend in ordnance compound concentrations, the rate of concentration decline has slowed considerably over time. Ordnance compound concentrations in the shallow aquifer remain well above ROD-established groundwater cleanup levels.

3. To the best of your knowledge, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

Response: To the best of my knowledge the pump and treat system at Site F has been an effective component of the ROD-specified remedy, although the rate of contaminant concentration decline in the shallow aquifer has slowed considerably over time (see above).

In regards to Site A, the Navy continues its evaluation of the ROD-specified groundwater remedy. The ROD-specified goal for the groundwater remedial action at Site A is to restore the Shallow Aquifer to support possible future drinking water use. However, since the ROD was signed in 1991, a strong base of information has been developed from construction and operation of the existing Site A pump-and-treat system and associated long term monitoring to demonstrate that it is not practicable to restore the Shallow Aquifer at Site A to drinking water standards in a reasonable time frame. This finding is consistent with those presented in the previous Base-Wide Five-Year Review of RODs for SUBASE Bangor, and commensurate with existing environmental conditions and associated groundwater remedy performance to date at Site A (Also see response to Question 6 below).

4. For the treatment systems that you operate and maintain, what is the frequency and staffing of site inspections and maintenance?

Response: I am not involved in the operation and maintenance of the existing pump-and-treat systems at Sites A and F. I currently oversee the inspection and maintenance of the mothballed groundwater treatment system at OU 8.

Weekly inspections and monthly maintenance activities are conducted in accordance with approved OU 8 Surveillance and Maintenance Plan.

5. Do you know of any significant operation and maintenance difficulties with the pump and treat systems that could have impacted the protectiveness of these components of the remedies?

Response: I am not involved in the operation and maintenance of the existing pump-and-treat systems at Sites A and F. However, I am aware that existing hydrogeologic constraints at Site A significantly limit the potential to restore the shallow aquifer to drinking water standards using the existing pump-and-treat remedy (Also see response to Question 6 below).

6. Do you have any recommendations for optimizing the pump and treat systems, or for implementing alternatives to the pump and treat systems (such as monitored natural attenuation at Site A as discussed in the last five-year review)?

Response: I have no recommendation concerning optimization of the existing Site F treatment system. It is my opinion that the existing Site A pump and treat system has been optimized to full extent possible given the existing hydrogeologic constraints at the site. It is also clear that after over six years of remediation the selected groundwater clean-up action for Site A, although remaining protective of human health and the environment, is not functioning as intended in the ROD. Based on current evaluation (including recent USGS studies concerning biodegradation of RDX in the Shallow Aquifer), it is recommended that an alternative groundwater remedy incorporating monitored natural attenuation (MNA) with continued maintenance of existing institutional controls replace the existing pump-and-treat remedy at Site A. The MNA strategy includes proposed alternative point of compliance based on contaminant migration via groundwater discharge to adjacent (downgradient) surface water, and use of established surface water cleanup levels to evaluate remedy performance. This modification is intended to bring the past decisions into line with the current state of remedial knowledge, and by doing so, improve the cost effectiveness of site remediation while ensuring reliable short and long term protection of human health and the environment.

7. To the best of your knowledge, has the LNAPL recovery system at OU 8 been effectively implemented? To the best of your knowledge, what is the status of this system?

Response: To the best of my knowledge the Post-ROD LNAPL recovery system at OU 8 has been effectively implemented since initial operation began in April 2001. Results have shown that over the past 2 years of operation product recovery rates have been below the ROD-specified practical endpoint of 0.5 gallons per month, as averaged over a one-year period. As such, the

Navy has recommended discontinuation of LNAPL recovery at OU 8 with continued long-term monitoring consistent with ROD specification.

8. To the best of your knowledge, has the monitored natural attenuation component of the OU 8 remedy been fully implemented? Have monitoring data collected to date been adequate for meeting the intent of the ROD?

Response: To the best of my knowledge the monitored natural attenuation (MNA) component of the OU 8 remedy has been fully implemented and the data collected to date have been in accordance with ROD specification. Recent predictive modeling indicates that DCA will still have concentrations (estimated at 25 µg/L) above the remediation goal (5 µg/L) at the base boundary beyond the ROD-predicated 2008 time period. The difference in recent predictive modeling results to those established during the RI/FS is discussed in detail in the annual reports prepared for OU 8.

9. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK at Bangor?

Response: To the best of my knowledge the remedies at Site A, Site F, and OU 8 continue to be protective of human health and the environment in accordance with ROD specification.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Type 1 Interview – Navy Personnel

NBK at Bangor

Kitsap, WA

Individual Contacted:	Said Seddiki
Title:	Project Manager
Organization:	EFA NW
E-mail:	said.seddiki@navy.mil
Address:	Poulsbo, Washington
Contact made by:	Susan King
Response type:	Written
Date:	September 15, 2004

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) at Bangor, the Records of Decision (RODs) for OUs 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OU's, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since September 2000.

Response: I'm familiar with RODs for OUs 1, 2, 7, and 8. I assumed RPM responsibility December 2003.

2. To the best of your knowledge, what is the status of the Institutional Controls Management Plan (ICMP) covering all of the OUs?

Response: The ICMP doesn't need to be updated

3. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

Response: Protective and effective

4. 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: No

5. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

Response: Yes

6. To the best of your knowledge are the leach basin barrier at Site A, the infiltration barrier at Site F, and the vegetative cap at Site B intact?

Response: Yes

7. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since September 2000 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

Response: Since I assumed this responsibility I Task different contractors to conduct Operation and Maintenance, monitoring, and documenting results. So far the data is meeting the Goals set by RODs.

8. To the best of your knowledge, has the monitoring deficiency noted in the last five-year review for Site 10 (OU 7) been resolved?

Response: Yes

9. To the best of your knowledge, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

Response: At OU 1 (Site A) The pump and treat system showed poor effectiveness and low cost efficiency, the P&T system is not suited to the site conditions and an alternative approach should be considered. With regard site F, since 2000, contamination mass removal by the P&T system is effective, but the rate of mass removal is decreasing.

10. Do you know of any significant operation and maintenance difficulties with the pump and treat systems that could have impacted the protectiveness of these components of the remedies?

Response: The system is getting old.

11. Do you have any recommendations for optimizing the pump and treat systems, or for implementing alternatives to the pump and treat systems (such as monitored natural attenuation at Site A as discussed in the last five-year review)?

Response: I recommend discontinue operation of the site A P&T system, implement a contingency remedy that incorporates land use control (LCUs) to restrict groundwater use and establishes alternate concentration limits (ACLs) based on surface water protection at the point where groundwater discharges to surface water. And finally reduce the frequency of groundwater monitoring to annual.

12. To the best of your knowledge, has the LNAPL recovery system at OU 8 been effectively implemented? To the best of your knowledge, what is the status of this system?

Response: LNAPL recovery system was effective. Product recovery is discontinued, because it reached the ending point set by the ROD

13. To the best of your knowledge, has the monitored natural attenuation component of the OU 8 remedy been fully implemented? Have monitoring data collected to date been adequate for meeting the intent of the ROD?

Response: The component of MNA at OU 8 is fully implemented, and Navy contractor is conducting monitoring, and collecting Data adequately to meet the intent of the ROD.

14. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

Response: No

15. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK at Bangor?

Response: The concern I have is about site A, please see my response to comment 11.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

NBK at Bangor

Kitsap, WA

Individual Contacted: Barbara Tissier
Title: Navy Co-Chair, Restoration Advisory Board
Organization: NBK at Bangor
Telephone: 360.396.5094
E-mail: barbara.chafin@navy.mil

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1013 Silversides Road
Silverdale, WA 98315-1087

Contact made by: Susan King, URS Corp.
Response type: Email questionnaire
Date Submitted:

Questions

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) at Bangor, the Records of Decision (RODs) for OUs 1, 2, 3, 6, 7, and 8, the implementation of the remedies at these OU's, and the monitoring and maintenance that has taken place since implementation of the remedies. Please also describe your involvement since September 2000.

Response: I just took over as the IR Manager in February 2004. I am pretty familiar with NBK since I started working here in 1985, but still not very familiar with all of the RODs. I have skimmed them on CD, but have much to learn about them. I know that the remedies have all been implemented and either completed or are nearing completion. I know that the monitoring and maintenance is taking place as required and on schedule.

2. To the best of your knowledge, what is the status of the Institutional Controls Management Plan (ICMP) covering all of the OUs?

Response: The ICMP was complete as of August 28, 2001. In my opinion, it is effective.

3. What is your overall impression of the on-going effectiveness of the institutional controls components of the remedies?

Response: The institutional controls are effective.

4. 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: No violations that I am aware of.

5. To the best of your knowledge, are regular inspections of the institutional controls remedy components being conducted and documented?

Response: Yes, I do the inspections. I just completed them for 2004 and turned them over to EFANW, RPM.

6. To the best of your knowledge are the leach basin barrier at Site A, the infiltration barrier at Site F, and the vegetative cap at Site B intact?

Response: Yes, I have inspected them recently.

7. To the best of your knowledge, has the on-going environmental monitoring performed at many of the OUs since September 2000 been sufficiently thorough and frequent to meet the goals of the RODs? Have the monitoring data been timely and of acceptable quality?

Response: Yes

8. To the best of your knowledge, has the monitoring deficiency noted in the last five-year review for Site 10 (OU 7) been resolved?

Response: I am not familiar with that deficiency, but was told by the previous IR Mgr here that it was resolved.

9. To the best of your knowledge, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

Response: At OU 1 the system has not been efficient, due to the geology, and also the system does not pump enough water out for it to be cost effective. They are only pumping out 12 gpm. At OU 2 the system is being studied for effectiveness and institutional controls are being considered as an alternative. I do not believe they are very effective at this point. Studies have shown that pump and treat is not a very good method for treatment. They worked well in the beginning.

10. Do you know of any significant operation and maintenance difficulties with the pump and treat systems that could have impacted the protectiveness of these components of the remedies?

Response: The systems are getting older and always seem to have some kind of maintenance problems. But, the LTM contractors are doing a good job keeping them running.

11. Do you have any recommendations for optimizing the pump and treat systems, or for implementing alternatives to the pump and treat systems (such as monitored natural attenuation at Site A as discussed in the last five-year review)?

Response: I would recommend monitored natural attenuation for Site A. It is not an efficient system.

12. To the best of your knowledge, has the LNAPL recovery system at OU 8 been effectively implemented? To the best of your knowledge, what is the status of this system?

Response: The skimmers are being used, and recovering some product, not much anymore. In the summer there is insufficient water column for skimmer operation on several wells.

13. To the best of your knowledge, has the monitored natural attenuation component of the OU 8 remedy been fully implemented? Have monitoring data collected to date been adequate for meeting the intent of the ROD?

Response: None

14. Are you aware of any community concerns regarding implementation of the remedies at any of the OUs? If so, please give details.

Response: Normally, the people that live closest to the site are the most concerned. There aren't any big concerns voiced at the RAB meetings, but there is poor attendance. I would like to think that the reason for that is because we have done a good job in cleaning up and that they have a high degree of confidence in the Navy.

15. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK at Bangor?

Response: I believe the Navy has been very proactive and has put a lot of good effort into the remedies.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Navy Contractor Personnel Interview

NBK at Bangor

Kitsap, WA

Individual Contacted: Rick Weingarz
Title: Delivery Order Manager
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Contact made by: Susan King
Response type: Email
Date: Sent 8/31/04

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 involvement in implementing, operating, maintaining, and monitoring the remedy components for Operable Units (OUs) at Naval Base Kitsap (NBK) at Bangor since September 2000.

Response: I was the Delivery Order Manager for Sites A and F (OU 1 and 2) under DO 36, OU8 under DO 10, and Public Works Gas Station under DO 10 and 33. I ensured that the pump and treat systems were operated as specified in the compliance monitoring plans.

2. For the OUs at which you are conducting monitoring, has the monitoring performed since September 2000 been sufficiently thorough and frequent to meet the goals of the RODs? What are the trends or other overall results of the monitoring that you have conducted?

Response: We conducted performances monitoring of the treatment systems (influent, mid-system and effluent sampling). Samples were collected monthly for offsite analytical analysis of ordnance compounds and weekly RDX/TNT field screening was conducted. Data collected was used to document that the effluent was below discharge criteria and to estimate ordnance loading on carbon vessels. Results were fairly consistent not showing much for trends outside of seasonal variations.

Water levels were collected monthly and reviewed by another contractor (Hart Crowser) also monthly/quarterly GW monitor was conducted by CH2M HILL.

3. To the best of your knowledge, have the pump and treat systems at OU 1 (Site A) and OU 2 (Site F) been effective components of the remedies since September 2000?

Response: At Site A, the effectiveness of the system is effected by the extraction rates of the groundwater. This is a result of the geology in the area, clays and silts with small water producing sand layers. The production rate was measure to be only 10 to 20 GPM from the seven extraction wells. *It is unlikely that the groundwater compound will be cleaned up using this system, unless is possible to increase the extraction rates.*

Site F continued to remove 20 to 30 pounds of RDX per month. As mentioned above, this rate was fairly consistent. Efforts were made to optimize the ordnance extraction by balancing the hydrological parameters, the analytical data, and the treatment plant design specifications. The limiting factor in balancing equations was the individual well pump rates which had to be met to maintain the hydrologic capture area. This meant that cleaner water had to be treated rather than pulling water from the hot spots.

4. For the treatment systems that you operate and maintain, what is the frequency and staffing of site inspections and maintenance?

Response: The Sites had one to two full time technicians onsite for 40 hour per week. Daily inspections were conducted at Site F and weekly inspections were performed at Site A.

5. Do you know of any significant operation and maintenance difficulties with the pump and treat systems that could have impacted the protectiveness of these components of the remedies?

Response: There was an increase in piping failures at Site F. This most likely was the result of the age of the system and minor engineering oversights (not isolating hydraulic hammering from the starting and stopping of well pumps from the underground piping).

6. Do you have any recommendations for optimizing the pump and treat systems, or for implementing alternatives to the pump and treat systems (such as monitored natural attenuation at Site A as discussed in the last five-year review)?

Response: Hart Crowser was working with EFA NW to present MNA as the final remedial technology. I was not involved.

7. To the best of your knowledge, has the LNAPL recovery system at OU 8 been effectively implemented? To the best of your knowledge, what is the status of this system?

Response: There was an attempt to restart active product recovery at the Public Work Industrial Area. The amount of product present and the location of the extraction wells made this system ineffective. Passive skimmers were installed and product recovered effectively. I am unsure of the current status; TTFW transitioned the OM to Shannon Wilson at the end of the contract in 2002.

8. To the best of your knowledge, has the monitored natural attenuation component of the OU 8 remedy been fully implemented? Have monitoring data collected to date been adequate for meeting the intent of the ROD?

Response: TTFW collected quarterly sampling for OU8 until 9/00. Since 12/00 the well monitoring was performed by CH2M HILL. I can not say that has or has not met the intent of the ROD since the ROD was completed after TTFW's contract ended.

9. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NBK at Bangor?

Response: None.