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Site file

FINAL
16 September 2005

Naval Facilities Engineering Command

Second Five-Year Review of Record of Decision

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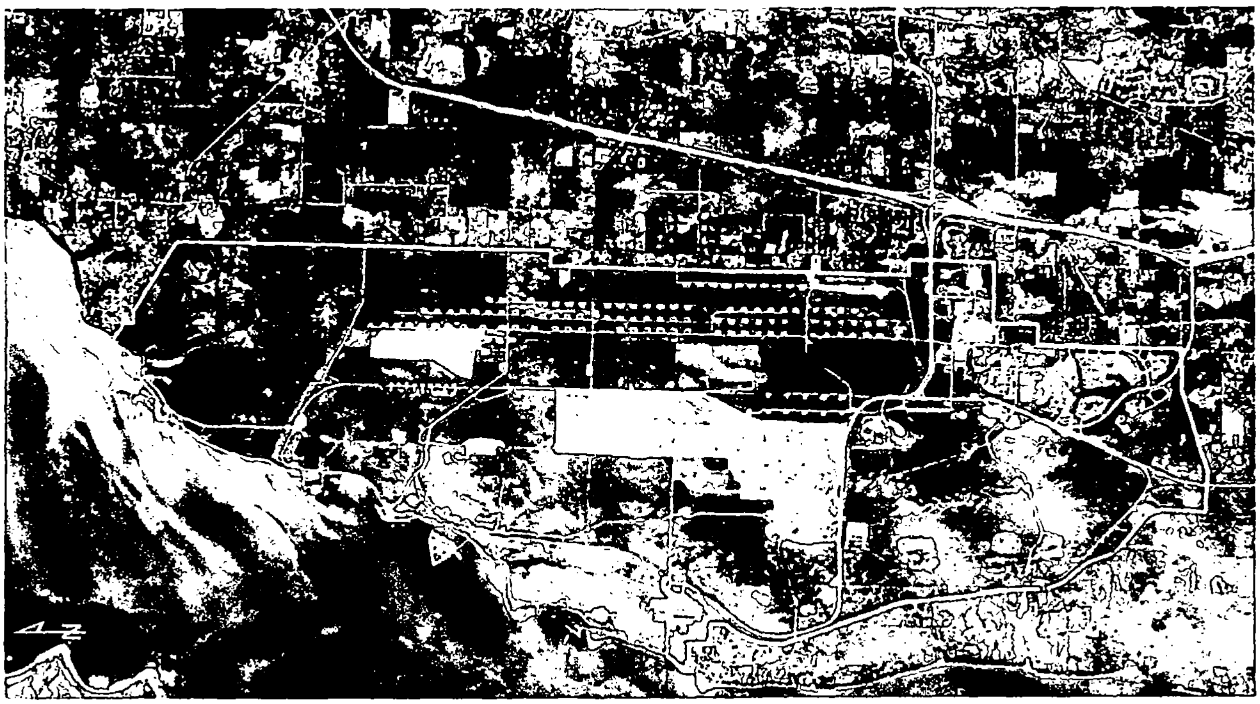
Environmental Cleanup Office

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 X Deleted Other (specify)__________

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

Multiple OUs?* YES X NO	**Construction completion date:** September 1997 (OU 1)

Has site been put into reuse? YES NO X

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#____ ~~Actual RA Start at OU~~
Construction Completion Previous Five-Year Review Report
Other (specify):__________

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.

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

10/27/05
Date

CONTENTS (Continued)

CONTENTS (Continued)

FIGURES

CONTENTS (Continued)

TABLES

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.

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.

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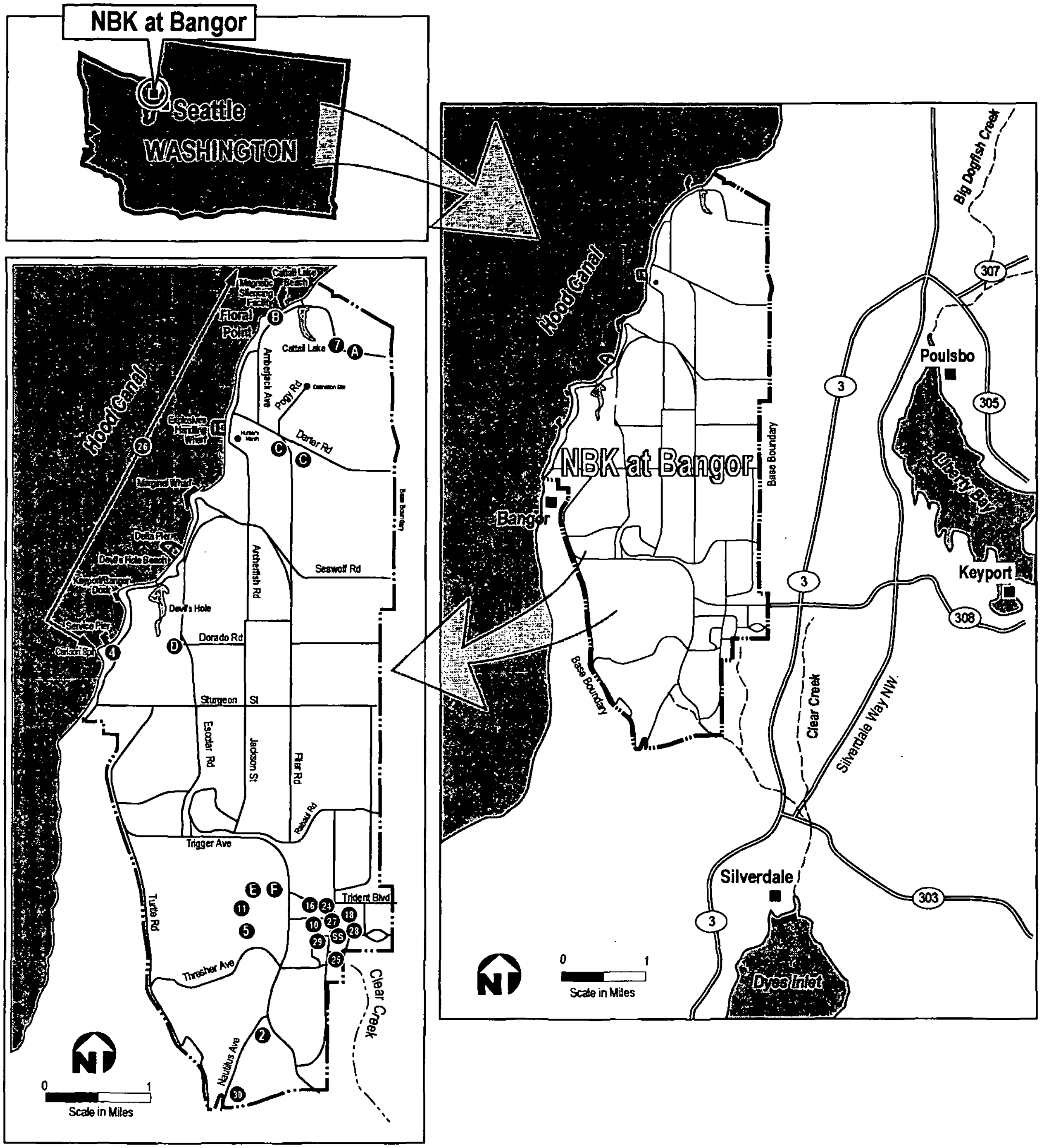

Legend:

❷ Location of Site

U.S.NAVY	**Figure 1-1** **NBK at Bangor Vicinity Map**	DO 0040 NBK at Bangor Second 5-Year Review

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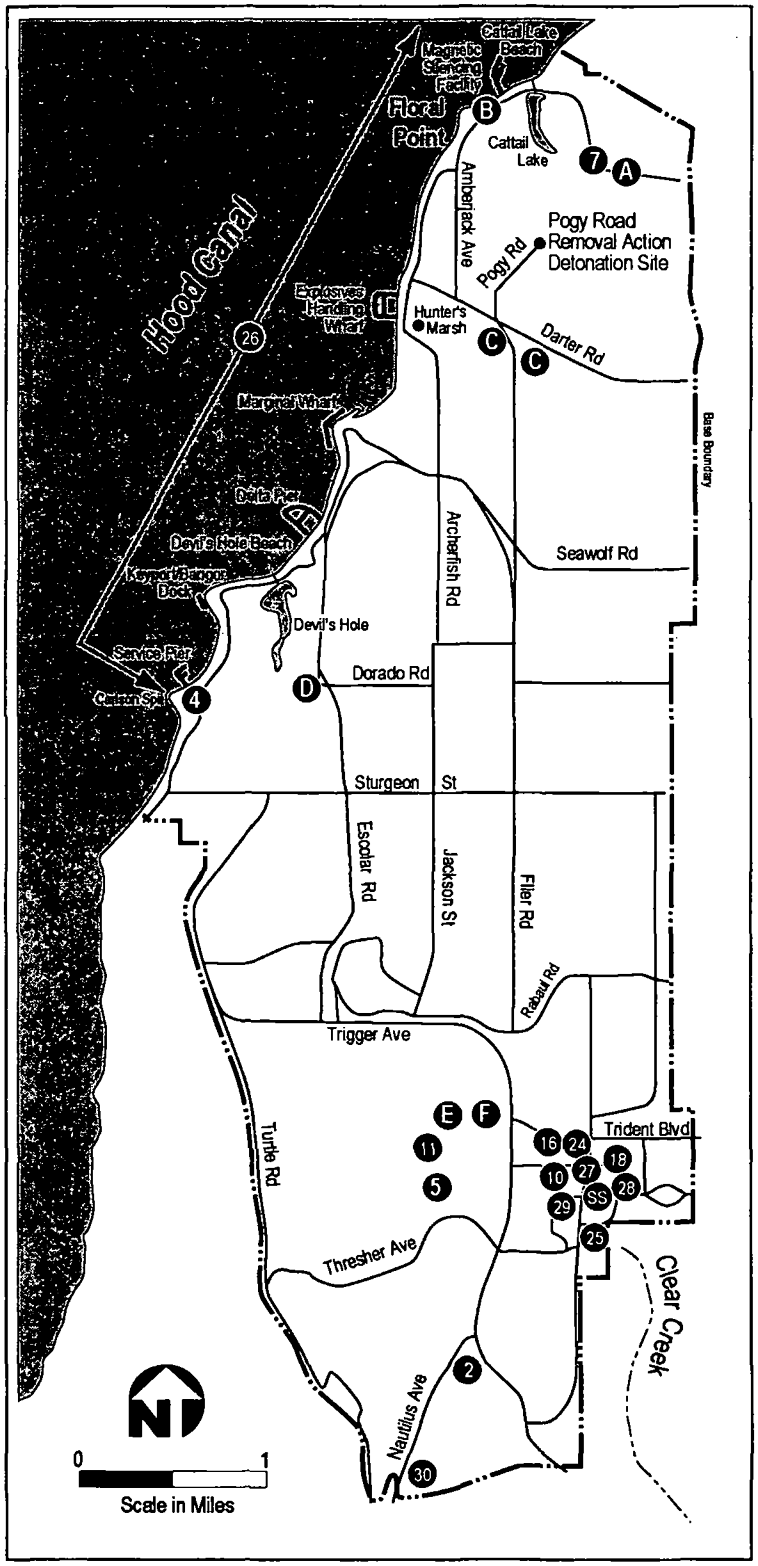


Legend:

❷ 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 at Bangor Sites and Operable Units**	DO 0040 NBK at 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)

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

[a]For interim remedial action ROD
[b]Although 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.

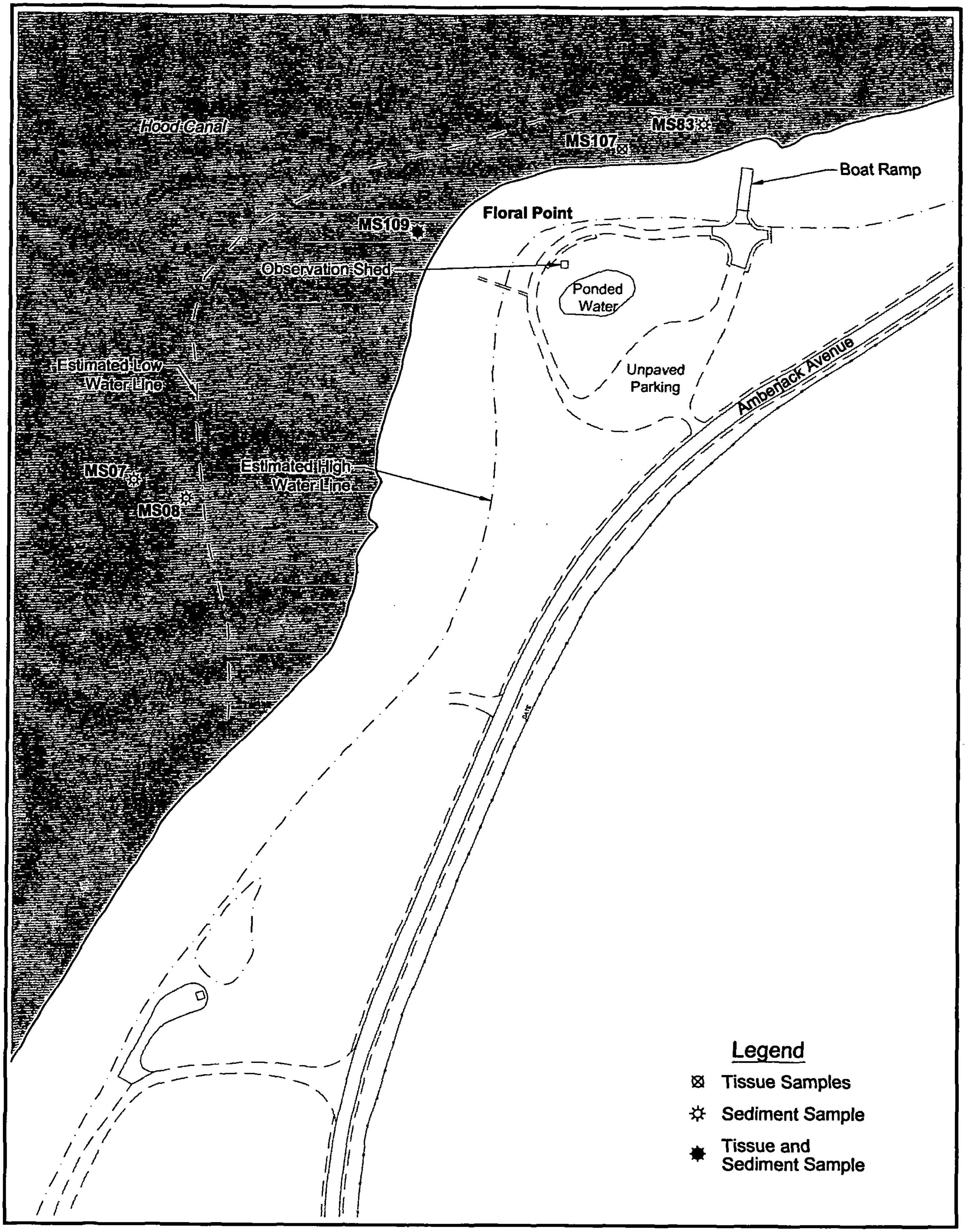
The inspection checklist from August 4, 2004, reports the following conditions:

- 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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U.S. NAVY	N 0 50 100 200 SCALE IN FEET	**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 µg/L between February 2000 and August 2004. The RG for RDX at Site A is 0.8 µg/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 µg/L), whereas concentrations at A-MW49 have been the highest measured at the site over the last 5 years (350 to 500 µg/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, $^{14}CO_2$, 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 μg/L between January 2000 and July 2004, compared to an RG of 0.8 μg/L. TNT and DNT concentrations ranged from not detected to 210 μg/L and not detected to 9.7 μg/L, respectively, during the same time period, compared to RGs of 2.9 μg/L and 0.13 μg/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 μg/L between January 2000 and July 2004. TNT and DNT concentrations ranged from not detected to 5,800 μg/L (TNT) and 366 μg/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 µg/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 µg/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 µg/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.

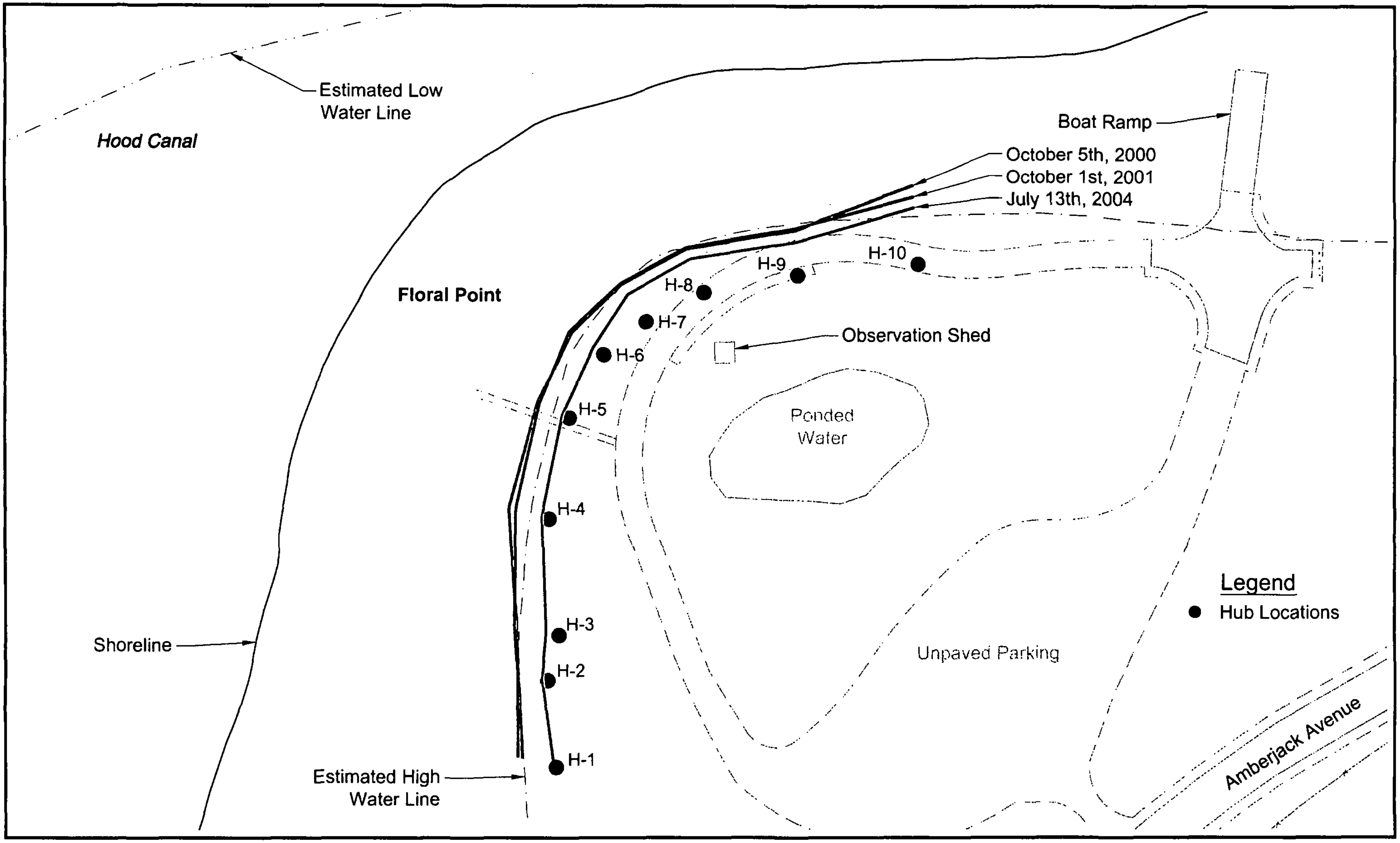
6.6.3 Agency Personnel

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	N 0 20 40 80 SCALE IN FEET	**Figure 6-1** **Floral Point Erosion Line Locations Over Time**	DO 0040 NBK at Bangor SECOND FIVE-YEAR REVIEW

FILENAME: T:\NAVY\Bangor\Sub-Tasks\DO40\2ND 5YR REVIEW\PAKUGO 1.25.05\FIG 6-1 FLORAL EROSION.dwg
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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

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

	RDX (µg/L)									
Well No.	Dec-94	Feb-95	Apr-95	Jun-95	Aug-95	Oct-95	Dec-95	Feb-96	Apr-96	Jun-96
Monitoring Wells										
F-MW21	150						120			
F-MW24	Dry						720			
F-MW27	280	240	210	170	140	140	150	150	140	160
F-MW31	480 J	370	230	190	230	300	350	360	210	190
F-MW32	54						53			
F-MW33	870	820	660	620	930	1,200	1,100	1,100	770	840
F-MW35	33						7.6			
F-MW36	240	240	310	350	420	390	340	350	520	620
F-MW37	3.0						2.4			
F-MW38	880	1,800	1,100	1,100	1,100	1,200	1,000	1,100	3,100	1,100
F-MW39	860	910	1,100	1,200	1,200	1,300	940	1,100	2,700	1,100
F-MW40	0.95 U			0.95 U			0.95 U			0.95 U
F-MW41	0.95 U	2.0	2.9	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U
F-MW42	1.6	6.9	22	50	68	100	110	150	90	120
F-MW43	0.95 U			2.4 U			0.95 U			0.95 U
F-MW44	1.0 J	0.95 U	0.95 U	2.4 U	1.0	0.95 U	0.95 U	0.95 U	0.93 U	0.95 U
F-MW45	1.6						1.8			1.9
F-MW46	0.95 U			0.95 U			0.95 U			0.95 U
F-MW48	22						29			
F-MW51	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	2.9 U	0.95 U
F-MW52	72	0.95 U	0.95 U	0.95 U	0.21 J	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U
F-MW53	990	1,100	700	430	420	370	300	290	160	250
F-MW54	0.95 U						0.95 U			
F-MW54S	1,100	1,100	780	820	790	780	590	290	98	100
F-MW55	7.8	4.1	5.5	4.5	3.6	6.1	7.4	3.1	5.8	5.5
F-MW55M										
F-MW56	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	2.3 U	0.95 U
F-MW57	0.95 U	0.95 U	0.95 U	0.95 U	0.31 J	0.95 U	0.95 U	0.95 U	1.3 U	0.95 U
F-MW58	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.1 U	0.95 U
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	1,300	670	470	450	410	350	360	330	240	270
F-EW2	540	800	580	590	510	420	510	480	450	430
F-EW3	1,100	450	370	390	330	290	300	280	310	260
F-EW4	9.5	8.8	15	22	38	81	110	110	160	180
F-EW5	320	64	60	65	77	72	82	91	98	110
F-EW6	1,100	850	620	680	660	590	570	640	520	530
F-EW7										
F-EW8										
F-EW9										
F-EW10										

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

Well No.	RDX (µg/L)									
	Aug-96	Oct-96	Jan-97	Apr-97	Jun-97	Jul-97	Aug-97	Sep-97	Oct-97	Nov-97
Monitoring Wells										
F-MW21										
F-MW24										
F-MW27	150		130							
F-MW31	250	180	380	280		160			180 J	
F-MW32			9.1							
F-MW33	1,100	880	580	420		400			420	
F-MW35			110							
F-MW36	600	610		550		430			380	
F-MW37			3.0							
F-MW38	1,200	1,200	1,200	1,100		1,300			1,100	
F-MW39	1,200	1,300	1,200	1,000		1,400			1,100	
F-MW40			0.95 U							
F-MW41	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW42	97	90	60	32		25			13	
F-MW43			0.95 U							
F-MW44	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW45			1.4							
F-MW46			0.95 U							
F-MW48			300							
F-MW51	0.95 U		250							
F-MW52	47		670							
F-MW53	210		1,000							
F-MW54										
F-MW54S	120	270	200	95		600			630	
F-MW55	5.7		7.7							
F-MW55M		1,000	760	460		1,100			1,000	
F-MW56	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW57	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW58	0.95 U	0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW59		660	230	520		770			850	
F-MW60		0.95 U	0.95 U	0.95 U		0.95 U			0.95 U	
F-MW61		0.95 U	0.95 U	11	23	75	130		70	64
F-MW62		520	540	280		170	70		100	71
F-MW63					0.95 U			0.95 U	0.95 U	0.22 J
F-MW64								6.5	8.8	8.4
F-MW65										
F-MW66										
F-MW67										
F-MW68										
F-MW69										
Extraction Wells										
F-EW1	250	250	240	200					390	
F-EW2	350	460	330	360		80			43	
F-EW3	190	240	220	210		220			170	
F-EW4	220		300	290		280			260	
F-EW5	120		400	190		160			140	
F-EW6	450		1,100	480		400			310	
F-EW7		170	76	87		82			92	
F-EW8		660	590	540		470			450	
F-EW9			1,100			630			590	
F-EW10			1,200	970		670			730	

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

Well No.	RDX (µg/L)									
	Dec-97	Jan-98	Feb-98	Mar-98	Apr-98	May-98	Jun-98	Jul-98	Aug-98	8-Oct-98
Monitoring Wells										
F-MW21										
F-MW24										
F-MW27		69								
F-MW31		370			320			8.4		
F-MW32		3.5								
F-MW33		350			320			350		
F-MW35		32								
F-MW36										
F-MW37		2.4								
F-MW38		1,000			710			620		
F-MW39		1,700			1,200			1,000		
F-MW40		0.27 J								
F-MW41		0.2 J			0.35 J			0.95 U		
F-MW42		6.2			3.6			2.7		
F-MW43		0.22 J								
F-MW44		0.95 U			0.95 U			0.95 U		
F-MW45		0.66 J								
F-MW46		0.95 U								
F-MW48		280								
F-MW51		0.28 J								
F-MW52		5.4								
F-MW53		320								
F-MW54										
F-MW54S		120			69			160		
F-MW55		180			910					
F-MW55M		1,300						1,100		
F-MW56		0.95 U			0.95 U			0.95 U		
F-MW57		0.95 U			0.95 U			0.95 U		
F-MW58		0.95 U			0.95 U			0.95 U		
F-MW59		700			590			500		
F-MW60		0.95 U			0.95 U			0.95 U		
F-MW61	52	45	44	36	30	25	21	19	17	
F-MW62	74	57	54	31	35	32	27	26	26	
F-MW63	1.8	1.3	11	14	15	31	34	54	63	0.95 U[a]
F-MW64	7.6	7.3	7.9	7.9	4.7	4.2	3.8	3.0	3.7	0.95 U[a]
F-MW65						0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
F-MW66										
F-MW67										
F-MW68										
F-MW69										
Extraction Wells										
F-EW1		200			160			150		
F-EW2		280			250			210		
F-EW3		200			160			160		
F-EW4		250			250			240		
F-EW5		140			120			170		
F-EW6		270			200			140		
F-EW7		60			62			50		
F-EW8		370			320			320		
F-EW9		520			450			460		
F-EW10		580			620			600		

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

Well No.	RDX (µg/L)									
	23-Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99
Monitoring Wells										
F-MW21										
F-MW24										
F-MW27				54						
F-MW31	290			270			330			260
F-MW32				3.8						
F-MW33	310			550			200			290
F-MW35				690						
F-MW36										
F-MW37				2.6						
F-MW38	89			280			280			280
F-MW39	1,000			1,300			1,400			2,700
F-MW40				0.95 U						
F-MW41	130			1.1			12			1.9 U
F-MW42	2.4			2.5			2.2			2.3
F-MW43				0.95 U						
F-MW44	0.95 U			0.95 U			0.95 U			0.84 U
F-MW45				0.61 J						
F-MW46				0.95 U						
F-MW48				280						
F-MW51				0.95 U						
F-MW52				8.4						
F-MW53				100						
F-MW54										
F-MW54S	140			60			25			66
F-MW55				42						
F-MW55M	1,400			1,100			1,100			1,300
F-MW56	0.95 U			0.95 U			0.95 U			1.1 U
F-MW57	0.95 U			0.95 U			0.95 U			0.84 U
F-MW58	0.95 U			0.95 U			0.95 U			0.62 U
F-MW59	380			400			360			340
F-MW60	0.95 U			0.95 U			0.95 U			1.1 U
F-MW61	14	13	11	11	10	0.95 U	7.6	6.4	5.7	5.6
F-MW62	22	22	20	18	15	16	13	13	12	12
F-MW63	350	100	110	120	110	150	100	95	93	96
F-MW64	2.5	100[a]	2.6	2.5	2.3	2.7	2.5	2.4	1.6	1.7
F-MW65	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.4 U	0.42 U
F-MW66										
F-MW67										
F-MW68										
F-MW69										
Extraction Wells										
F-EW1	110			120			91			93
F-EW2	170			190			160			180
F-EW3	130			160			130			97
F-EW4	210			140			260			250
F-EW5	130			110			140			110
F-EW6				110			91			84
F-EW7	47			44 J			56			54
F-EW8	230			270			190			240
F-EW9	340						340			320
F-EW10	510			530			520			510

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

Well No.	RDX (µg/L)									
	Aug-99	Oct-99	Jan-00	Apr-00	Jul-00	Oct-00	Jan-01	Apr-01	Jul-01	Oct-01
Monitoring Wells										
F-MW21										
F-MW24										
F-MW27							35			
F-MW31			260		290		51		60 J	
F-MW32							8.6			
F-MW33			230		170		210		220	
F-MW35							790			
F-MW36										
F-MW37							4.5			
F-MW38			200		120		120		28	
F-MW39			1,900		980		1,500		2200	
F-MW40							0.35 U			
F-MW41			10		9.2		8.3		6.7	
F-MW42			2.0		1.6		1.3		0.97	
F-MW43							0.82 U			
F-MW44			1.0 U		1.6 U		0.47 U		1 U	
F-MW45							0.83 U			
F-MW46							0.60 U			
F-MW48							200			
F-MW51							0.55 U			
F-MW52							1.9			
F-MW53							23			
F-MW54										
F-MW54S			31		21		37		35	
F-MW55							240			
F-MW55M			1,300		210		880		820	
F-MW56			1.6 U		0.79 U		0.99 U		0.46 U	
F-MW57			0.86 U		0.64 U		0.77 U		0.47 U	
F-MW58			1.2 U		0.77 U		0.49 U		0.53 U	
F-MW59			220		180		130		100	
F-MW60			1.2 U		0.29 U		0.34 U		0.49 U	
F-MW61	4.9	4.1	3.4	4.4	2.5	3.1	2.3	2.8	1.8	2.1
F-MW62	14	12	11	9.3	7.3	8.1	6.9	6.9	5.4	6.2
F-MW63	110	98	91	77	60	41	51	47	43	41
F-MW64	1.2	0.93	1.2 U	0.57 U	1.3 U	0.84 U	0.94 U	1.0 U	0.53 U	0.58 U
F-MW65	0.61 U	1.3 U	0.65 U	0.52 U	0.75 U	0.61 U	0.82 U	0.58 U	0.4 U	0.7 U
F-MW66										
F-MW67										
F-MW68										
F-MW69										
Extraction Wells										
F-EW1			87		70		58		56	
F-EW2			150		120		100		100	
F-EW3			110 J		83		81		79	
F-EW4			250		190		220		150	
F-EW5			120		87		84		86	
F-EW6			60		56		43		36	
F-EW7			40		26		23		19	
F-EW8			170		140		130		110	
F-EW9			230		200		180		150	
F-EW10			420		350		360		310	

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			
F-MW69								0.49 U			
Extraction Wells											
F-EW1	66		47		56		38				50
F-EW2	110		77		81		55				70
F-EW3	87		71		73		57				49
F-EW4	170		160		150		130				140
F-EW5	77		62		65		56				61
F-EW6	33		22		23		19				18
F-EW7	20		16		15 J		15				15
F-EW8	120		76		100		80				96
F-EW9	180		140		140		130				80
F-EW10	320		360		220		180				190

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

[a]Data 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
TNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

	TNT (µg/L)											
Well No.	Dec-94	Feb-95	Apr-95	Jun-95	Aug-95	Oct-95	Dec-95	Feb-96	Apr-96	Jun-96	Aug-96	Oct-96
Monitoring Wells												
F-MW21	2,200						2,100					
F-MW24	Dry						540					
F-MW27	700	0.65 U	0.65 U	0.65 U	0.33 J	0.65 U	0.65 U	0.65 U	2.6 U	0.65 U	0.65 U	
F-MW31	8,900	4,700	3,800	3,900	3,700	5,400	7,000	8,600	4,000	3,800	5,600	4,300
F-MW32	51						100					
F-MW33	2,200 J	2,000	2,400	2,000	1,800	1,600	1,300	890	1,400	1,500	1,200	1,800
F-MW35	6.5 U						0.17 J					
F-MW36	32 U	0.38 J	0.42 J	0.65 U	0.86	0.65 U	0.65 U	0.65 U	3.5 U	0.65 U	0.65 U	0.65 U
F-MW37	0.65 U						0.65 U					
F-MW38	0.65 U	0.65 U	0.16 J	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	2.30 U	0.65 U	0.65 U	0.65 U
F-MW39	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.80 U	0.65 U	0.65 U	0.65 U
F-MW40	0.65 U			0.19 J			0.65 U			0.65 U		
F-MW41	0.65 U	0.7 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.4 U	0.65 U	0.65 U	0.65 U
F-MW42	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U
F-MW43	0.65 U			1.6 U			0.65 U			0.65 U		
F-MW44	0.65 U	0.65 U	0.65 U	1.6 U	0.58 J	0.65 U	0.65 U	0.65 U	1 U	0.65 U	0.65 U	0.65 U
F-MW45	0.65 U						0.65 U			0.65 U		
F-MW46	0.65 U			0.65 U			0.65 U			0.65 U		
F-MW48	0.65 U						0.65 U					
F-MW51	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	3.2 U	0.65 U	0.65 U	
F-MW52	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	2.3 U	0.65 U	0.65 U	
F-MW53	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.95 U	1.4 U	0.65 U	0.65 U	
F-MW54	0.41 J						0.65 U					
F-MW54S	250	120 J	110	140	140	160	93	60 J	22	18	7.2	17
F-MW55	0.65 U	0.65 U	3.2 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U
F-MW55M												
F-MW56	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	2.6 U	0.65 U	0.65 U	0.65 U
F-MW57	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.4 U	0.65 U	0.65 U	0.65 U
F-MW58	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U
F-MW59												0.65 U
F-MW60												0.65 U
F-MW61												0.65 U
F-MW62												0.65 U
F-MW63												
F-MW64												
F-MW65												
F-MW66												
F-MW67												
F-MW68												
F-MW69												
Extraction Wells												
F-EW1	460	330	260	270	240	210	200	190	180	170	160	170
F-EW2	57 J	51 J	40	29	27	21 J	24 J	22 J	22	20	18	22 J
F-EW3	95	87	80	110	90	91	97	87	110	100	0.65 U	84
F-EW4	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2	0.65 U	2.7 U	0.65 U	87	
F-EW5	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	8	0.65 U	2.2 U	0.65 U	0.65 U	
F-EW6	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.39 J	0.65 U	1.4 U	0.65 U	0.65 U	
F-EW7												440
F-EW8												0.65 U
F-EW9												
F-EW10												

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

	TNT (µg/L)										
Well No.	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99
Monitoring Wells											
F-MW21											
F-MW24											
F-MW27	0.65 U				0.65 U				0.65 U		
F-MW31	5,300	4,800	3,800	3,600	4,000	4,100	64	4,600	5,800	4,500	5,100
F-MW32	32				10				7.6		
F-MW33	1,200	2,400	2,000	2,400 J	1,700	2,000	1,700	1,300	1,200	1,400	1,700
F-MW35	0.65 U				0.65 U				0.13 J		
F-MW36		0.65 U	0.65 U	0.65 U							
F-MW37	0.65 U				0.65 U				0.65 U		
F-MW38	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2 U
F-MW39	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.73 U
F-MW40	0.65 U				0.65 U				0.65 U		
F-MW41	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.9 U
F-MW42	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.44 U
F-MW43	0.65 U				0.65 U				0.65 U		
F-MW44	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.84 U
F-MW45	0.65 U				0.65 U				0.65 U		
F-MW46	0.65 U				0.49 J				0.65 U		
F-MW48	0.65 U				0.65 U				0.65 U		
F-MW51	0.65 U				0.65 U				0.65 U		
F-MW52	0.65 U				0.65 U				0.38 J		
F-MW53	0.65 U				0.65 U				0.65 U		
F-MW54											
F-MW54S	24 J	4.9	42	51	12	6.9	19 J	19	10	4.4	10
F-MW55	0.65 U				0.65 U	0.65 U			0.65 U		
F-MW55M	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.36 U
F-MW56	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.1 U
F-MW57	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.84 U
F-MW58	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.62 U
F-MW59	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.2 U
F-MW60	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	1.1 U
F-MW61	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.47 U
F-MW62	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.96 U
F-MW63				0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.42 U
F-MW64				0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.52 U
F-MW65							0.65 U	0.65 U	0.65 U	0.65 U	0.42 U
F-MW66											
F-MW67											
F-MW68											
F-MW69											
Extraction Wells											
F-EW1	160	150		260	150	130	110	86	94	64	72
F-EW2	16	20	45	25	28 J	22	16	13	14	12	15
F-EW3	89	92	92	82	120	95	95	79	95	84	77
F-EW4	0.65 U	0.65 U	0.23 J	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.20 U
F-EW5	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.21 U
F-EW6	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.65 U	0.75 U
F-EW7	370	350	300	480	240	260	200	200	270	290	280
F-EW8	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.42 J	0.65 U	0.75 U
F-EW9	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U	0.43 U
F-EW10	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.49 U

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

	TNT (µg/L)										
Well No.	Jan-00	Jul-00	Jan-01	Apr-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	5,800	5,400	2,800		2900	2500		3,300		1,900 J	
F-MW32			78							110	
F-MW33	1,200	900	610		650	660		960		500 J	
F-MW35			0.55 U							10	
F-MW36											
F-MW37			0.66 U							0.46 U	
F-MW38	1.1 U	0.34 U	0.68 U		0.18 UJ	0.56 U		0.61 U		0.77 U	
F-MW39	1.1 U	0.34 U	0.47 U		0.94 UJ	0.7 U		0.52 U		0.90 UJ	
F-MW40			0.35 U							0.81 UJ	
F-MW41	1.1 U	1.0 U	0.48 U		1 UJ	1.4 U		0.26 U		1.4 UJ	
F-MW42	0.52 U	1.4 U	0.84 U		0.57 UJ	0.47 U		0.51 U		1.2 UJ	
F-MW43			0.82 U							0.87 UJ	
F-MW44	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 U	
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	4.6	3.3	3.6		2.6	1.4 U		2.4		1.8 J	
F-MW55			0.40 U							0.73 U	
F-MW55M	0.70 U	0.68 U	0.88 U		0.86 U			0.86 U		1.3 UJ	
F-MW56	1.6 U	0.79 U	0.99 U		0.46 UJ	0.95 U		0.87 U		1.2 UJ	
F-MW57	0.86 U	0.64 U	0.77 U		0.47 UJ	0.99 U		0.52 U		0.65 UJ	
F-MW58	1.2 U	0.77 U	0.49 U		0.53 U	0.74 U		0.68 U		0.78 UJ	
F-MW59	0.47 U	0.74 U	0.74 U		0.77 U	0.51 U		1.0 U		0.30 U	
F-MW60	1.2 U	0.29 U	0.34 U		0.49 UJ	0.52 U		0.83 U		1.2 UJ	
F-MW61	1.2 U	0.60 U	0.35 U	1.4 U	0.56 U	1.1 U	0.96 U	0.53 U	0.6 U	0.94 UJ	0.56 UJ
F-MW62	0.94 U	1.1 U	0.44 U	0.77 U	0.39 U	0.82 U	0.62 U	0.7 U	0.61 U	1.2 UJ	0.83 UJ
F-MW63	1.6 U	0.90 U	1.30 U	0.70 U	0.62 U	0.48 U	1.1 U	0.53 U	0.49 U	0.81 UJ	0.64 UJ
F-MW64	1.2 U	1.3 U	0.94 U	1.0 U	0.53 U	1.1 U	0.94 U	0.83 U	0.59 U	0.79 UJ	0.64 UJ
F-MW65	0.65 U	0.75 U	0.82 U	0.58 U	0.4 U	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	67	61	35		37	43		43		38	
F-EW2	11	8.1	5.2		6.1	7.1		6.2		4.8	
F-EW3	87	78	52		57	68		74		61	
F-EW4	0.75 U	0.52 U	0.91 U		0.46 U	0.42 U		0.33 U		0.40 U	
F-EW5	0.64 U	0.52 U	0.38 U		1.6 U	1.2 U		0.79 U		0.90 UJ	
F-EW6	0.82 U	0.81 U	0.3 U		0.33 U	0.49 U		0.74 U		0.56 U	
F-EW7	210	170	130		110	150		140		110 J	
F-EW8	0.65 U	0.88 U	1.1 U		0.66 U	0.84 U		0.79 U		1.1 UJ	
F-EW9	0.31 U	0.96 U	0.55 U		0.38 U	0.84 U		0.77 U		1.2 UJ	
F-EW10	0.56 U	0.44 U	0.82 U		0.51 U	0.75 U		0.65 U		0.40 U	

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			
F-MW67		0.49 U			
F-MW68		0.49 U			
F-MW69		0.49 U			
Extraction Wells					
F-EW1	29				32
F-EW2	4.3				3.5
F-EW3	61				58
F-EW4	0.7 U				0.49 U
F-EW5	0.96 U				0.49 U
F-EW6	1.2 U				0.49 U
F-EW7	150				94
F-EW8	0.68 U				0.5 U
F-EW9	1.7 U				0.49 U
F-EW10	0.43 U				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
DNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	Total DNT (µg/L)										
	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)
DNT Analytical Results for the Shallow Aquifer at Site F Through July 2004

Well No.	Total DNT (µg/L)										
	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

	Total DNT (µg/L)										
Well No.	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

	SMS			MS07					MS08					MS109				MS83			
Metal	SQS	CSL	BSV	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

	AET				SMS		MS07				MS08					MS109				MS83				
Compound	**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 U	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 U	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 U	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 U	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

[a]When 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 C.
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	Butter	Littleneck Clam	Littleneck Clam	Littleneck Clam	Butter	Butter	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 (µg/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	3/16/98	50 U	50 U	16 J	700 J	7800	7800 J
	6/23/98	50 U	50 U	13 J	140	2900 J	16000 J
	9/28/98	100 U	100 U	100 U	250	5900	11000
	3/30/99	50 U	50 U	50 U	640 U	11000 J	2500 J
	9/27/99	50 U	50 U	50 U	50 U	3800 J	12000 J
	3/27/00	100 U	100 U	100 U	100 U	2000	5600 J
	6/22/00	100 U	100 U	100 U	100 U	2600 J	14000 J
	11/1/00	100 U	100 U	400 U	100 U	3200	22000
	1/17/01	50 U	50 U	20 J	50 U	3800	20000
	4/17/01	20 U	30 U	20 U	30 U	4400 D	19000 D
	7/18/01	20 U	24 U	15 U	23 U	4600 D	20000 D
	10/24/01	10 UD	12 UD	37 JD	290 D	7500 D	21000 D
	5/30/02	10 U	12 U	10 J	12 U	3600	18000
	10/30/02	10 U	12 U	24 J	12 U	7800	18000
	4/9/03	5 U	6 U	9.5 J	5.7 U	7300	12000 J
	10/9/03	2.5 U	3 U	33	160	8900	11000
	4/15/04	10 U	12 U	7.3 U	25 JD	4000 D	19000 D
8MW06	3/13/98	20 U	20 U	20 U	1100 J	73	4.4 J
	6/19/98	50 U	50 U	50 U	1500 J	250	18 J
	9/28/98	50 U	50 U	50 U	1200	110	6.5 J
	3/29/99	20 U	20 U	20 U	1000 J	53	3 J
	9/27/99	50 U	50 U	50 U	1100	130	20 J
	3/24/00	50 U	50 U	50 U	1600 J	170	11 J
	6/21/00	1 U	1 U	1 U	1200 D	470 J	82 D
	10/31/00	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)	1/18/01	1 U	1 U	3 J	1200	950	340
	4/17/01	2 U	3 U	2 U	1200 D	860 D	200 D
	7/18/01	2.5 U	3 U	1.9 U	1200 D	850 D	91 D
	10/23/01	0.5 U	0.6 U	1.8 JD	1400 D	830 D	180 D
	5/30/02	1 U	1.2 U	1.6 J	1700	1100	140
	10/30/02	1 U	1.2 U	2.5 J	1500	1400	180 J
	4/9/03	0.5 U	0.6 U	0.37 U	1100	910	27
	10/7/03	0.5 U	0.6 U	0.37 U	940	580	57
	4/14/04	0.5 U	0.6 U	1.6 JD	1100 D	1900 D	69 D
8MW33	3/13/98	20	9.2	1 U	270	0.73 J	1 U
	8/5/98	31	16	1 U	51	0.4 J	0.12 J
	9/25/98	34 J	15	1 U	35	0.44 J	1 U
	6/24/99	37 J	18 J	1 U	26 J	0.32 J	1 U
	9/22/99	28 J	18	1 U	18 J	0.3 J	1 U
	12/15/99	31 J	17	2 U	26 J	0.24 J	2 U
	3/23/00	27 J	18	1 U	20 J	0.23 J	1 U
	6/20/00	31 J	21	1 U	16	0.26 J	1 U
	10/31/00	31	20	2 U	15	0.2 J	0.1 J
	1/18/01	25	14	2 U	14	0.3 J	0.5 U
	4/17/01	25	14	0.08 U	16	0.2 J	0.4 J
	7/20/01	24	13	0.073 U	14	0.5 U	0.5 U
	10/24/01	24	15	0.073 U	14	0.18 J	0.26 U
	5/30/02	23	17	0.073 U	17	0.28 J	0.098 U
	10/30/02	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)	4/10/03	19	15	0.073 U	16	0.25 J	0.098 U
	10/8/03	19	18	0.073 U	12	0.14 J	0.098 U
	4/14/04	18	14	0.073 U	35	0.18 J	0.098 U
8MW03	3/9/98	5.4 J	2.1 J	1 U	150	29	1 U
	9/24/98	5	2	1 U	110	6.6	1 U
	6/23/99	6 J	2.7 J	1 U	90 J	4.8	1 U
	9/21/99	4.7	2.4	1 U	70 J	1.5	1 U
	3/21/00	4.2	2.4	1 U	69 J	0.83 J	1 U
	10/30/00	5.5	3.4	2 U	80	0.54	0.3 J
	1/16/01	4.9	3	0.8 U	61	0.53	0.5 U
	4/16/01	4.5	2.7	0.08 U	56	0.99	0.2 J
	7/18/01	3.6	2.9	0.073 U	49	0.11 U	0.5 U
	10/22/01	3.4	2.7	0.073 U	46	1.2	0.13 U
	5/30/02	3.7	2.7	0.073 U	47	2.3	0.16 J
	10/29/02	3	1.8	0.073 U	28	1.3	0.098 U
	4/7/03	1.7	1.6	0.073 U	18	0.28 J	0.098 U
	10/6/03	1.9	2	0.073 U	20	0.37 J	0.098 U
	4/12/04	0.87	0.68	0.073 U	11	0.11 U	0.15 J
8MW13	3/11/98	3.3	1.1	1 U	70	2.6	1 U
	6/17/98	2.1			32 J	2.3	
	9/23/98	1.5	0.45 J	1 U	24	2.4	1 U
	12/14/98	1.5	0.39 J	1 U	21	2.4	1 U
	3/25/99	0.95 J	1 U	1 U	7.3	0.3 J	1 U
	6/24/99	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)	9/20/99	0.86 J	1 U	1 U	3.4	0.29 J	1 U
	12/13/99	0.72 J	1 U	1 U	3.5	0.43 J	1 U
	3/23/00	0.58 J	1 U	1 U	2.7	0.3 J	1 U
	6/19/00	0.53 J	1 U	1 U	2.2	0.13 J	1 U
	11/2/00	0.52	0.5 U	2 U	2.9	0.5 U	0.5 U
	1/15/01	0.53	0.5 U	0.8 U	3.2	0.5 U	0.5 U
	4/19/01	0.1 U	0.2 U	0.08 U	2.9	0.2 U	0.1 U
	7/19/01	0.44 J	0.12 U	0.073 U	2.9	0.11 U	0.5 U
	10/25/01	0.41 J	0.12 U	0.073 U	2	0.11 U	0.18 U
	5/30/02	0.28 J	0.12 U	0.073 U	1.4	0.11 U	0.098 U
	10/29/02	0.04 J	0.12 U	0.073 U	1.6	0.11 U	0.098 U
	4/8/03	0.25 J	0.12 U	0.073 U	0.85	0.11 U	0.098 U
	10/6/03	0.23 J	0.12 U	0.073 U	0.76	0.11 U	0.098 U
	4/13/04	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 $(mg/kg\text{-}day)^{-1}$, 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 $(mg/kg\text{-}day)^{-1}$, 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 - trinitrotoleune

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]

[a]Method 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 - trinitrotoleune

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

[a]Not provided in ROD
[b]Based on background
[c]There 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

[a]MTCA 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

[a]Outside the wetlands boundary
[b]Inside the wetlands boundary
[c]MTCA 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.

10.0 NEXT REVIEW

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

11.0 REFERENCES

Bradley, Paul M, and Richard S. Dinicola. *RDX Biodegradation in Aquifer Sediments Under Metals-Reducing Conditions: Laboratory and Field Evidence.* In press.

Foster Wheeler Environmental Corporation (Foster Wheeler). 2003. Passive Skimmer Product Recovery Reporting, January 2003, Removal Action at Operable Unit 8, Naval Submarine Base, Bangor, Washington, Task Order 5. Letter report to EFA NW prepared under Contract No. N44255-05-D-2000, Task Order 005. January 30, 2003.

———. 1998. *Final Closeout Report, Bioremediation (Composting) of Site D Ordnance Contaminated Soil, Naval Submarine Base Bangor, Washington.* November 25, 1998.

Hart Crowser. 1989. *Current Situation Report, Sites C, D, E, F, 5, 6, 11, 12, 24, and 25, SUBASE Bangor, Bangor, Washington.* April 19, 1989.

———. 1988. *Current Situation Report, Site A, Naval Submarine Base, Bangor, Washington.* April 1, 1988.

Naval Energy and Environmental Support Activity (NEESA). 1983. *Initial Assessment Study of Naval Submarine Base Bangor, Bremerton, Washington.* NEESA 13-004. June 1983.

The Environmental Company, Inc. (TEC). 2003. *SUBASE Bangor Restoration Advisory Board, Operable Unit 8, Annual Monitoring Trends.* RAB meeting presentation slides by Kevin McNeill, P.E. March 17, 2003.

U.S. Environmental Protection Agency (USEPA). 2005. Integrated Risk Information System (IRIS) data accessed on January 24, 2005.

———. 2002. *Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities.* Memorandum posted on EPA Region 10 web page, regularly updated since 1999. Last update July 26, 2002. Available at <http://yosemite.epa.gov/r10/owcm.nsf/72b5220edcd9cf5b88256500005decf3/ae2ddc387dd5733b8825679f007ab1db?OpenDocument>.

———. 2001. *Comprehensive Five-Year Review Guidance.* Office of Emergency and Remedial Response. EPA 540-R-01-007. OSWER No. 9355.7-03B-P. June 2001.

U.S. Geologic Survey (USGS). Undated. *RDX Biodegradation in Aquifer Sediments Under Metals-Reducing Conditions: Laboratory and Field Evidence.* Undated draft USGS report prepared by Paul M. Bradley and Richard S. Dinicola.

U.S. Navy. 2004a. *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews.* November 2001 (Revised May 2004).

———. 2004b. *Final Round 9 Monitoring Report, Monitored Natural Attenuation, OU 8, Naval Submarine Base Bangor, Silverdale, Washington.* Prepared by The Environmental Company, Inc. for EFA NW under Contract No. N44255-98-D-4416, Contract Task Order 0061. February 2004.

———. 2004c. *Draft Point Paper, Post-ROD Free Product Recovery, Operable Unit 8, Naval Submarine Base Bangor, Silverdale, Washington.* Prepared by The Environmental Company, Inc., for EFA NW, under Contract No. N44255-98-D-4416, Contract Task Order 77. September 17, 2004.

———. 2004d. *Site A Groundwater Remedy Summary Report, Naval Submarine Base Bangor, Silverdale, Washington.* Prepared by The Environmental Company, Inc. for EFA NW under Contract No. N44255-98-D-4416, Task Order 070. April 2004.

———. 2004e. *Naval Submarine Base Bangor, Washington, Site A and F Remedial Action Operation (RAO) Optimization Report.* Prepared for EFA NW by URS Group, Inc., under Contract No. N47408-04-C-7508. October 2004.

———. 2004f. *Final 2003 Fourth Quarter Monitoring Report, Site F Long-Term Groundwater Monitoring, Submarine Base Bangor, Washington.* Prepared by Shannon and Wilson, Inc., for EFA NW, under Contract No. N68711-02-D-8305, Task Order 001. May 2004.

———. 2004g. *Sampling and Analysis Plan, Site 26/Floral Point Sediment and Clam Tissue Sampling, Naval Base Kitsap – Bangor, Silverdale, Washington.* Prepared for EFA NW by URS Corporation under Contract No. N445255-02-D-2008, Delivery Order 0040. September 24, 2004.

———. 2004h. *Draft Site A Long-Term Groundwater Monitoring Data Report, February (Wet Season) 2004 Monitoring Event, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared for EFA NW by The Environmental Company, Inc., under Contract No. N44255-D-98-4416, Contract Task Order 070. April 14, 2004.

———. 2004i. *Internal Draft, Site F Long-Term Groundwater Monitoring Data Report, July 2004 (Third Quarter) Groundwater Sampling Event, Naval Submarine Base Bangor, Washington*. Prepared for EFA NW by The Environmental Company, Inc., under Contract No. N44255-D-98-4416, Contract Task Order No. 082. September 2004.

———. 2004j. *Monthly Technical Progress Report, August 2004, Site F, Naval Submarine Base Bangor, Silverdale, Washington*. Prepared for EFA NW by Shannon & Wilson, Inc., under Contract No. N68711-02-D-8305, Task Order 0009. September 24, 2004.

———. 2004k. *Final Round 10 Monitoring Report, Monitored Natural Attenuation, OU 8, Naval Submarine Base Bangor, Silverdale, Washington*. Prepared by The Environmental Company, Inc. for EFA NW under Contract No. N44255-98-D-4416, Contract Task Order 0077. September 2004.

———. 2004l. *Addendum to Project Work Plans, Pogy Road Emergency Treatment Area Soil Sampling, Naval Station Bangor, Silverdale, Washington*. Prepared for EFA NW by The Environmental Company, Inc. under Contract No. N44255-98-D-4416, CTO 066. June 4, 2004.

———. 2003a. *Final Project Management Plan, Site A Groundwater Monitoring, Naval Submarine Base Bangor, Silverdale, Washington*. Prepared for EFA NW by The Environmental Company, Inc., under Contract No. N44255-98-D-4416, CTO 070. November 2003.

———. 2003b. *Final Quality Assurance Project Plan, Sites A and F, SUBASE Bangor*. Prepared for EFA NW by Shannon and Wilson, Inc., under Contract No. N68711-02-D-8305, Task Order 001. January 2003.

———. 2003c. *Final Site A 2002 Annual Report, Submarine Base Bangor, Washington*. Prepared for EFA NW by The Environmental Company, Inc. under Contract No. N44255-98-D-4416, Contract Task Order 036. June 2003.

———. 2003d. *Final Project Work Plans for Pogy Road Emergency Treatment Area Soil Sampling, SUBASE Bangor, Washington*. Prepared for EFA NW by The Environmental Company, Inc., under Contract No. N44255-98-D-4416, CTO 066. October 2003.

———. 2002. *Environmental Services Monitoring, Long-Term Monitoring, Final Monitoring Report, Site 10, Operable Unit 7, Naval Submarine Bangor, Washington*. Prepared by The Environmental Company, Inc., for EFA NW under Contract No. N44255-98-D-4416, Contract Task Order 018. June 2002.

———. 2001a. *Institutional Controls Management Plan, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by Engineering Field Activity, Northwest, Southwest Division, Naval Facilities Engineering Command Northwest, Poulsbo, Washington. August 28, 2001.

———. 2001b. *Final Technical Memorandum No. 3, Floral Point/Site 26 Hood Canal Sediment Monitoring, Naval Submarine Base, Bangor, Washington.* Prepared by Foster Wheeler Environmental Corporation for EFA NW under Contract No. N44255-95-D-6030, Delivery Order 0013. May 30, 2001.

———. 2001c. *Operation and Maintenance Manual, Passive Skimming Free Product Recovery, Operable Unit 8, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by Hart Crowser for EFA NW under Contract No. N44255-98-D-4408, Delivery Order 025. March 2001.

———. 2001d. *Final Preliminary Design Plan for Monitored Natural Attenuation and Free Product Recovery, Naval Submarine Base Bangor, Operable Unit 8, Kitsap County, Washington.* Prepared by EA Engineering, Science, and Technology, Inc. for EFA NW under Contract No. N44255-94-D-7309. January 2001.

———. 2000a. *Final Base-Wide Five-Year Review of Records of Decision, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared for Department of the Navy, Engineering Field Activity, Northwest, Naval Facilities Engineering Command Northwest by Hart Crowser under Contract No. N44255-98-D-4408, Delivery Order 025. September 2000.

———. 2000b. *Final Surveillance and Maintenance Plan, Removal Action at Operable Unit 8, Naval Submarine Base, Bangor, Washington.* Prepared by Foster Wheeler Environmental Corporation for EFA NW under Contract No. N44255-95-D-6030, Delivery Order 0010. May 19, 2000.

———. 2000c. *Operation and Maintenance Manual Addendum, Site A Groundwater Remedial System, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared for EFA NW by Hart Crowser, Inc. under Contract No. N44255-98-D-4408, Delivery Order 025. Revised August 2000.

———. 2000d. *Operation and Maintenance Manual Addendum No. 2, Site F Groundwater Remedial System, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared for EFA NW by Hart Crowser, Inc. under Contract No. N44255-98-D-4408, Delivery Order No. 009. Revised October 2000.

———. 2000e. *Final Inspection and Maintenance Plan, Floral Point/Site B, Operable Unit 7, Naval Submarine Base, Bangor, Washington (Revised).* Prepared for EFA NW by Foster Wheeler Environmental Corporation under Contract No. N44255-95-D-6030, Delivery Order 0012. Revised November 6, 2000.

———. 1999a. *Compliance and Performance Monitoring Plan for Enhanced Groundwater Remediation System, Naval Submarine Base Bangor, Site F, Silverdale, Washington. Revision 1.* Prepared by Hart Crowser, Inc. for EFA NW. September 14, 1999.

———. 1999b. *Final Technical Memorandum, Round 8 Sampling Results, Groundwater Monitoring at Site 25, Removal Action at Operable Unit 3.* Prepared for EFA NW by Foster Wheeler Environmental Corporation.

———. 1996a. *Monitoring Program Documents. Site 26 Hood Canal Sediment Monitoring, Naval Base Kitsap at Bangor, Washington.* Prepared for EFA NW by Foster Wheeler Environmental under RAC II/Delivery Order No. 0013. Poulsbo, Washington. July 1996.

———. 1994. *Final Remedial Investigation Report for Operable Unit 7, NBK at Bangor, Bremerton, Washington.* Prepared for EFA NW by URS Consultants, Inc. under CLEAN Contract, CTO 0058. October 28, 1994.

U.S. Navy, USEPA, and Ecology. 2000a. *Final Record of Decision, Naval Submarine Base Bangor, Operable Unit 8, Kitsap County, Washington.* September 27, 2000.

———. 2000b. *Explanation of Significant Differences (ESD) No. 3 for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington.* August 2, 2000.

———. 1998. *Explanation of Significant Differences (ESD) No. 2 for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington.* March 1998.

———. 1996. *Final Record of Decision, Operable Unit 7, Naval Submarine Base, Bangor, Silverdale, Washington.* Prepared by URS Consultants, Inc., Seattle, Washington, for Engineering Field Activity, Northwest, Southwest Division, Naval Facilities Engineering Command Northwest, Poulsbo, Washington. April 16, 1996.

———. 1994a. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 3, Bangor, Washington.* April 15, 1994.

———. 1994b. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 4, Silverdale, Washington.* July 19, 1994.

———. 1994c. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 6, Silverdale, Washington.* September 27, 1994.

———. 1994d. *Declaration of the Record of Decision, Decision Summary, and Responsiveness Summary for Final Remedial Action Naval Submarine Base Bangor Site F (Operable Unit 2), Silverdale, Washington.* September 28, 1994.

———. 1994e. *Explanation of Significant Differences (ESD) for Soil and Groundwater Remediation Changes, Site A, SUBASE Bangor, Bangor, Washington.* July 1994.

———. 1993. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Operable Unit 5, Bangor, Washington.* September 30, 1993.

———. 1991a. *Declaration of the Record of Decision, Naval Submarine Base, Bangor, Site A (Operable Unit 1), Bangor, Washington.* December 10, 1991.

———. 1991b. *Declaration of the Record of Decision, Decision Summary, Responsiveness Summary, and Administrative Record Index for Interim Remedial Action, Naval Submarine Base Bangor Site F (Operable Unit 2), Bangor, Washington.* August 1991 (signed September 1991).

Washington 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>.

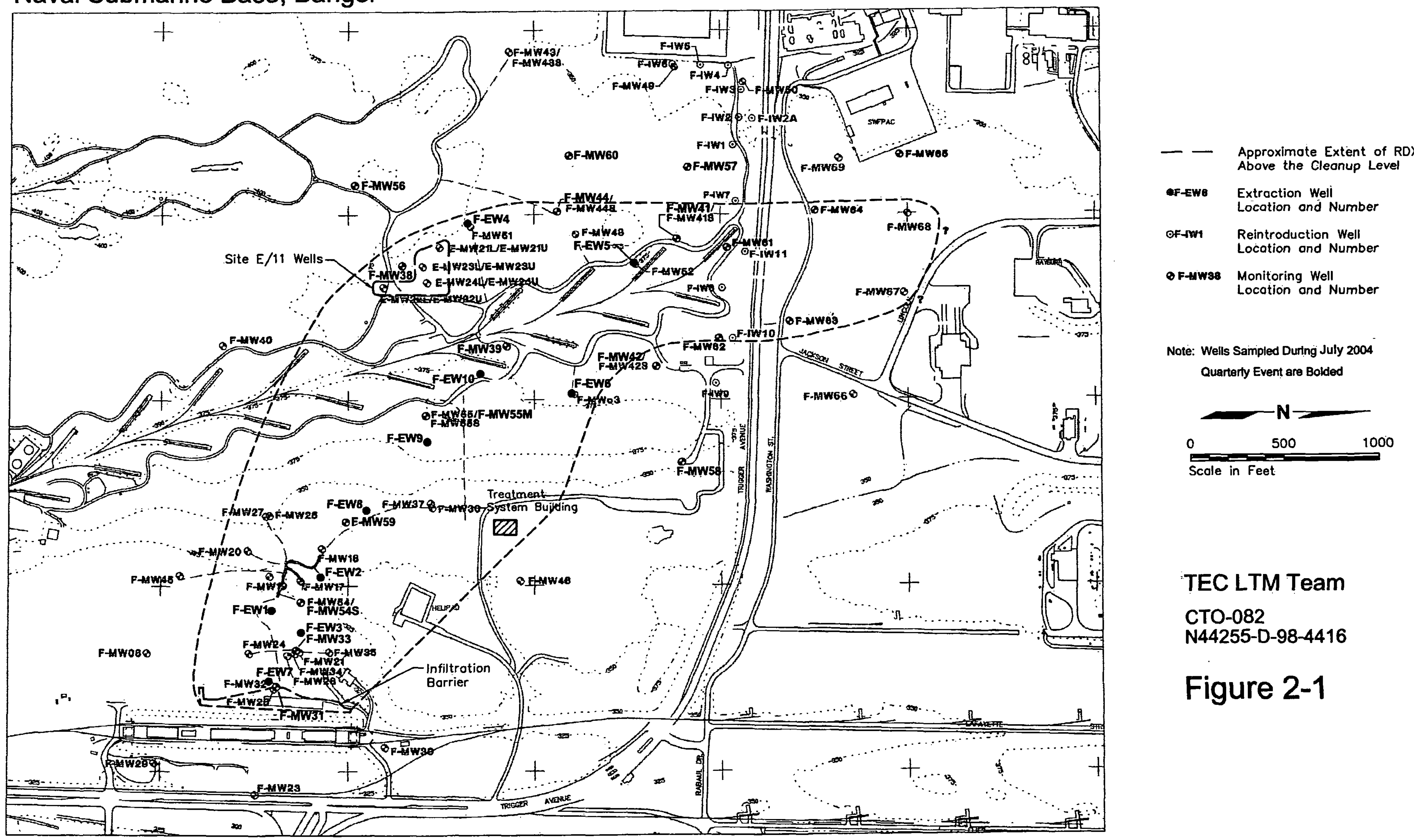
APPENDIX A

APPENDIX A

Figures Showing Recent Monitoring Trends

Appendix A Figures
(From TEC Reports)

Site F Compliance and Performance Well Network
July 2004
Naval Submarine Base, Bangor

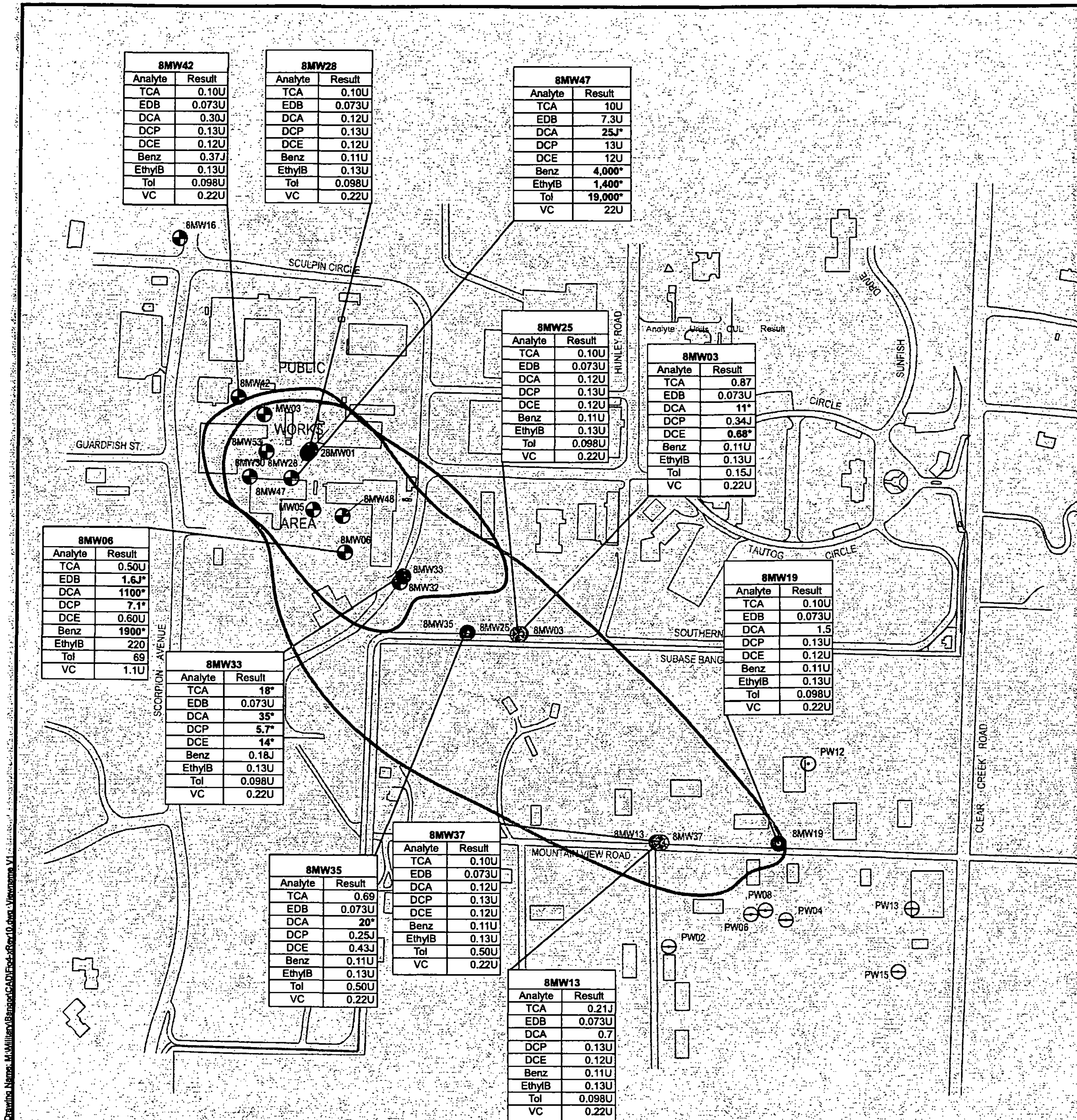


Modified from Hart Crowser (2000)

TEC LTM Team

CTO-082
N44255-D-98-4416

Figure 2-1



8MW42	
Analyte	Result
TCA	0.10U
EDB	0.073U
DCA	0.30J
DCP	0.13U
DCE	0.12U
Benz	0.37J
EthylB	0.13U
Tol	0.098U
VC	0.22U

8MW28	
Analyte	Result
TCA	0.10U
EDB	0.073U
DCA	0.12U
DCP	0.13U
DCE	0.12U
Benz	0.11U
EthylB	0.13U
Tol	0.098U
VC	0.22U

8MW47	
Analyte	Result
TCA	10U
EDB	7.3U
DCA	**25J***
DCP	13U
DCE	12U
Benz	**4,000***
EthylB	**1,400***
Tol	**19,000***
VC	22U

8MW25	
Analyte	Result
TCA	0.10U
EDB	0.073U
DCA	0.12U
DCP	0.13U
DCE	0.12U
Benz	0.11U
EthylB	0.13U
Tol	0.098U
VC	0.22U

8MW03	
Analyte	Result
TCA	0.87
EDB	0.073U
DCA	**11***
DCP	0.34J
DCE	**0.68***
Benz	0.11U
EthylB	0.13U
Tol	0.15J
VC	0.22U

8MW06	
Analyte	Result
TCA	0.50U
EDB	**1.6J***
DCA	**1100***
DCP	**7.1***
DCE	0.60U
Benz	**1900***
EthylB	220
Tol	69
VC	1.1U

8MW19	
Analyte	Result
TCA	0.10U
EDB	0.073U
DCA	1.5
DCP	0.13U
DCE	0.12U
Benz	0.11U
EthylB	0.13U
Tol	0.098U
VC	0.22U

8MW33	
Analyte	Result
TCA	**18***
EDB	0.073U
DCA	**35***
DCP	**5.7***
DCE	**14***
Benz	0.18J
EthylB	0.13U
Tol	0.098U
VC	0.22U

8MW37	
Analyte	Result
TCA	0.10U
EDB	0.073U
DCA	0.12U
DCP	0.13U
DCE	0.12U
Benz	0.11U
EthylB	0.13U
Tol	0.50U
VC	0.22U

8MW35	
Analyte	Result
TCA	0.69
EDB	0.073U
DCA	**20***
DCP	0.25J
DCE	0.43J
Benz	0.11U
EthylB	0.13U
Tol	0.50U
VC	0.22U

8MW13	
Analyte	Result
TCA	0.21J
EDB	0.073U
DCA	0.7
DCP	0.13U
DCE	0.12U
Benz	0.11U
EthylB	0.13U
Tol	0.098U
VC	0.22U

MONITORING LOCATIONS

- 8MW02 — SHALLOW MONITORING WELL (COMPLETED WITHIN 30' OF WATER TABLE)
- 8MW03 — INTERMEDIATE MONITORING WELL (APPROXIMATE COMPLETION DEPTH 220-180' MSL)
- 8MW37 — DEEP MONITORING WELL (COMPLETED WITHIN APPROXIMATELY 30' OF LAWTON CLAY SURFACE)
- PW10 — SHALLOW PRIVATE SUPPLY WELL (COMPLETED WITHIN 30' OF WATER TABLE)
- PW15 — INTERMEDIATE PRIVATE SUPPLY WELL (APPROXIMATE COMPLETION DEPTH 220-180' MSL)

VOC ANALYTICAL RESULTS

Analyte	CUL	Analyte	CUL
1,1,2-TRICHLOROETHANE (TCA)	5.0	BENZENE (Benz)	5.0
1,2-DIBROMOETHANE (EDB)	0.8	ETHYLBENZENE (EthylB)	700.0
1,2-DICHLOROETHANE (DCA)	5.0	TOLULENE (Tol)	1000.0
1,2-DICHLOROPROPANE (DCP)	5.0	VINYL CHLORIDE (VC)	0.5
1,2-DICHLOROETHENE (DCE)	0.5		

* Detected analyte concentrations reported above the compound specific cleanup level (CUL) highlighted in **bold**.

All results provided in ug/l.

Analytes include those detected in at least one monitoring location.

Value qualifier definitions are provided in Appendix C.

PRE -ROD PLUME BOUNDARIES

- HALOGENATED VOC PLUME (>1 µg/L)
- PETROLEUM-RELATED PLUME (>1 µg/L)

NOTE: Plume boundaries based on first quarter 2000 Benzene and DCA results (Foster Wheeler, 2000).

SUBASE Bangor OU 8

400 200 0 400
GRAPHIC SCALE IN FEET

Source: EA Engineering, Science and Technology, Inc. 2000

The Environmental Company, Inc.

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

APPENDIX B

Site 26/Floral Point Sampling Records

URS

SEDIMENT SAMPLING FORM

PROJECT: Bangor 5-Year Review
SITE: Floral Point
STATION NUMBER: MS-83
SAMPLE NUMBER: 229088
SAMPLING EQUIPMENT: SS Spoon

DATE: 10/28/04
SAMPLES COLLECTED BY: EL, ABH
WATER DEPTH: ∅
TIDAL LEVEL: -0.1 @ 1135 (10/27/04)

Replicate Number	Time	Penetration Depth	Location Coordinates (GPS)	Sample Conditions[1]
1	0001	0-2 cm		

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

Comments:

N 285933.039
E 1537790.642

NAD 1927

URS

SEDIMENT CHARACTERISTICS FORM

PROJECT: Bangor 5-Year Review
SITE: Floral Point
DATE: 10/28/04
STATION NUMBER: MS-B3
SAMPLES COLLECTED BY: EL, ABH
SAMPLE NUMBER: 229088
WATER DEPTH: ∅
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 10%	
	Coarse Sand 20%	Gravel 60%	Other___		

Comments:

URS

SEDIMENT SAMPLING FORM

PROJECT: Bangor 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: ∅

SAMPLING EQUIPMENT: SS Spoon

TIDAL LEVEL: -0.1 @ 1135

Replicate Number	Time	Penetration Depth	Location Coordinates (GPS)	Sample Conditions[1]
1	2302	0-2 cm		

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

Comments:

N 285696.440

E 1537476.260

NAD 1927

URS

SEDIMENT CHARACTERISTICS FORM

PROJECT: Bangor 5-Year Review
SITE: Floral Point
STATION NUMBER: MS 109
SAMPLE NUMBER: 229086, 229087 (FD)
SAMPLING EQUIPMENT: SS Spoon

DATE: 10/27/04
SAMPLES COLLECTED BY: EL, ABH
WATER DEPTH: ∅
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:

URS

SEDIMENT SAMPLING FORM

PROJECT: Bangor 5-Year Review
SITE: Floral Point
STATION NUMBER: MB 08
SAMPLE NUMBER: 229085
SAMPLING EQUIPMENT: SS Spoon

DATE: 10/27/04
SAMPLES COLLECTED BY: EL, ABH
WATER DEPTH: ø
TIDAL LEVEL: -0.1 @ 1135

Replicate Number	Time	Penetration Depth	Location Coordinates (GPS)	Sample Conditions[1]
1	2250	0-2 cm		

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

Comments:

N 285418.307
E 1537433.052
NAD 1927

URS

SEDIMENT CHARACTERISTICS FORM

PROJECT: Bangor 5-Year Review

SITE: Floral Point

DATE: 10/27/04

STATION NUMBER: MS 08

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229085

WATER DEPTH: ∅

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

URS

SEDIMENT SAMPLING FORM

PROJECT: Bangor 5-Year Review

SITE: Floral Point

DATE: 10/20/04

STATION NUMBER: MS 07

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229084

WATER DEPTH: 75

SAMPLING EQUIPMENT: Direct Fill

TIDAL LEVEL:

Replicate Number	Time	Penetration Depth	Location Coordinates (GPS)	Sample Conditions[1]
1	1223			C
2	1240	0-2cm		

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

Comments:

47° 46 999
122° 43 051

WGS 1984

Core Sampler not sucessful, Direct Fill Containers

URS

SEDIMENT CHARACTERISTICS FORM

PROJECT: Bangor 5-Year Review

SITE: Floral Point

DATE: 10/20/04

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:

URS

CLAM SUMMARY FORM

PROJECT: Bangor 5-Year Review

SITE: Floral Point

DATE: 10/27/04

STATION NUMBER: MS-109

SAMPLES COLLECTED BY: EL, ABH

SAMPLE NUMBER: 229089, 229090, 229091

WATER DEPTH: Ø

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
Butter clams	10	1,926	
Butter clams	8	1,242	
Little neck clams	11	758	

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

URS

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. Neck	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	49
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

APPENDIX C

Site 26/Floral Point Analytical Data

Memo

URS

1501 4th Avenue, Suite 1400
Seattle, Washington 98101
206.438.2700 Telephone
206.438.2699 Fax

To:	Michael Meyer, Project Manager	**Info:**	Data Report - Permanent File Ray Luce, Luce & Associates
From:	Karen Mixon, Senior Chemist KM	**Date:**	December 29, 2004
SUBJECT:	**Supplemental Data Quality Review** **Manganese Results for Sample 229084** **Bangor - Floral Point, Delivery Order #40** **Contract #N445255-02-D-2008** **Columbia Analytical-Kelso, SDG#229084**		

One sediment sample and one equipment blank 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 22, 2004 and logged them under SDG#229084 (Work Order #K2408411). The data deliverables were provided to URS Corporation (URS) on December 2, 2004. URS sent the data package to Luce & Associates for summary validation. During the review, the validator recognized that the results for manganese for the sediment sample had been omitted from the sample and associated QC summary sheets. This was noted in the data validation report received on December 18, 2004 from Luce & Associates. URS contacted CAS and requested that the summary pages be revised to include manganese results and resubmitted to URS. CAS provided the revised pages to URS on December 22, 2004. A URS chemist reviewed the manganese results. The results of this additional review are provided in this memorandum. This memorandum is intended to supplement the report provided by Luce & Associates.

The manganese data were reviewed to assess adherence to method requirements and the QC criteria documented in the Quality Assurance Project Plan (QAPP) included as Appendix A in the SAP. The review was conducted as a summary review and did not include evaluating instrumental raw data, although one calculation check was performed. Hold times, calibrations, method and instrumental blanks, ICP interference check sample results, matrix spike recoveries, laboratory duplicate results, blank spike recoveries (laboratory control samples), serial dilution results, and reporting limits were reviewed to assess compliance with the applicable method and the QAPP. Based on this review, no data qualifiers were assigned to the manganese results for sediment sample 229084 and the data is considered useable for project objectives.

Luce and Associates
Environmental Consulting Quality Assurance Data Validation

December 18, 2004

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

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.

Sample ID	Matrix	Total Solids (Method 160.3M)
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

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

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

Sample ID	Matrix	Ammonia (Method 350.3M)
229084	Sediment	X
229084DUP	Sediment	X
229084MS	Sediment	X

Sample ID	Matrix	Sulfide (Method 376.2M)
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.

_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 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.

Sample ID	Matrix	Total Solids (Method 160.3M)
229084	Sediment	X
229084DUP	Sediment	X
229084TRI	Sediment	X

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

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

Sample ID	Matrix	Ammonia (Method 350.3M)
229084	Sediment	X
229084DUP	Sediment	X
229084MS	Sediment	X

Sample ID	Matrix	Sulfide (Method 376.2M)
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.

Sample Number	Matrix	Sampling Date	Pest. Extraction	Pest. Analysis
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 (≤20%). DDT degradation and endrin degradation were within specified control limits (≤20% individually, ≤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 (≤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*.

CCV Standard	GC Column	Analyte	%D	Samples Affected	Qualifier Assigned
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 (≤20% individually, ≤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 μg/Kg for toxaphene and 1 μg/Kg for all other pesticides, reported on a dry weight basis. The reported detection limits for the sediment sample were 63 μg/Kg for toxaphene and 1.3 μg/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.

Sample	Matrix	Sampling Date	PCB Extraction	PCB Analysis
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 (≤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 (≤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.

Sample	Matrix	Sampling Date	ICP Analysis	Mercury Analysis
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.

Sample	Analyte	Time of Blank Analysis	Blank Result	Reported Sample Result	Action Taken
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*.

Spike Sample	Matrix	Analyte	Percent Recovery	Control Limits (%)	Samples Affected	Qualifier Assigned
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 X 0.05 mg/Kg = 0.10 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*.

Duplicate Sample	Matrix	Analyte	RPD	Samples Affected	Qualifier Assigned
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*.

Analyte	Original Sample (229084) Result (µg/L)	Diluted Sample (229084L) Result (µg/L)	Percent Difference	Samples Affected	Qualifier Assigned
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.

Sample Number	Matrix	Sampling Date	Total Solids Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Total Volatile Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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 ≤20%). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

Duplicate Sample	Matrix	Analyte	RPD	Samples Affected	Qualifier Assigned
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).

December 17, 2004

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:

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

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

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

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

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

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

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

Sample ID	Matrix	Ammonia (Method 350.3M)
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 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: 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.

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 ____________ 12/17/04

Raymond E. Luce II 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:

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

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

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

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

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

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

Sample ID	Matrix	Ammonia (Method 350.3M)
229085	Sediment	X
229085DUP	Sediment	X
229085MS	Sediment	X
229086	Sediment	X
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 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.

_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.

Sample Number	Matrix	Sampling Date	Pest. Extraction	Pest. Analysis
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 (≤20%). DDT degradation and endrin degradation were within specified control limits (≤20% individually, ≤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*.

CCV Standard	GC Column	Analyte	%D	Samples Affected	Qualifier Assigned
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

CCV Standard	GC Column	Analyte	%D	Samples Affected	Qualifier Assigned
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 (≤20% individually, ≤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 μg/Kg for toxaphene and 1 μg/Kg for all other pesticides, reported on a dry weight basis. The reported detection limits were 63 μg/Kg for toxaphene and 1.3 μg/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.

Sample	Matrix	Sampling Date	PCB Extraction	PCB Analysis
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 (≤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 (≤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.

Sample	Matrix	Sampling Date	ICP Analysis	Mercury Analysis
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.

Sample	Analyte	Time of Blank Analysis	Blank Result	Reported Sample Result	Action Taken
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*.

LCS ID	Analyte	Result (mg/Kg)	Control Limits (mg/Kg)	Samples Affected	Qualifier Assigned
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*.

Spike Sample	Matrix	Analyte	Percent Recovery	Control Limits (%)	Samples Affected	Qualifier Assigned
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 ≤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 X 0.013 mg/Kg = 0.026 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*.

Analyte	Original Sample (229085) Result (µg/L)	Diluted Sample (229085L) Result (µg/L)	Percent Difference	Samples Affected	Qualifier Assigned
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:

Analyte	Client-Requested Detection Limit (mg/Kg)	Reported Detection Limit (mg/Kg)
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.

Sample Number	Matrix	Sampling Date	Total Solids Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Total Volatile Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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.

Sample Number	Matrix	Sampling Date	Analysis Date
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 (≤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.

URS

Memo

1501 4th Avenue, Suite 1400
Seattle, Washington 98101
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To:	Michael Meyer, Project Manager	**Info:**	Data Report - Permanent File Ray Luce, Luce & Associates
From:	Karen Mixon, Senior Chemist KM	**Date:**	December 30, 2004
SUBJECT:	**Supplemental Data Quality Review** **Tissue Samples** **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

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:

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

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

920 2nd Avenue SE   Issaquah, Washington 98027   Tel: (206) 715-9511

Client Sample	Matrix	Metals (Method 6000/7000)	Mercury (Method 7471)
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

Sample ID	Matrix	Lipids (Bligh/Dyer)
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.

_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 ______________________ 12/19/04

Raymond E. Luce II 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:

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

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

Client Sample	Matrix	Metals (Method 6000/7000)	Mercury (Method 7471)
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

Sample ID	Matrix	Lipids (Bligh/Dyer)
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.

Sample Number	Matrix	Sampling Date	Pest. Extraction	Pest. Analysis
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*.

Sample	Action Taken
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 (≤20%). DDT degradation and endrin degradation were within specified control limits (≤20% individually, ≤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 (≤15%). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

CCV Standard	GC Column	Analyte	%D	Samples Affected	Qualifier Assigned
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 (≤20% individually, ≤30% combined).

IV. BLANKS

Method blanks were analyzed as required. The method blank associated with the water sample contained 4,4'-DDD (0.0022 µg/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 µg/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*.

Sample	Surrogate	Percent Recovery	Control Limits (%)	Action Taken
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 ≤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 (µg/Kg)	Reported Reporting Limit (µg/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.

Sample	Matrix	Sampling Date	PCB Extraction	PCB Analysis
229089	Tissue	10/27/04	*11/19/04*	12/01/04
229090	Tissue	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*.

Sample	Action Taken
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 (≤20%).

III. CONTINUING CALIBRATION

PCB continuing calibration standards were analyzed as required. Yes ___ No _X_

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 (≤15%). The qualifiers shown have been assigned by the reviewer based on the recommendations in *Functional Guidelines*.

CCV Standard	GC Column	Analyte	%D	Samples Affected	Qualifier Assigned
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:

Sample	Analyte	Client-Requested Reporting Limit (µg/Kg)	Reported Reporting Limit (µg/Kg)
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.

Sample	Matrix	Sampling Date	ICP Analysis	Mercury Analysis
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 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.

Sample	Analyte	Time of Blank Analysis	Blank Result	Reported Sample Result	Action Taken
229089	Antimony	11/17/04 09:34	0.06 µg/L	0.018 mg/Kg	0.05 U
229090	Antimony	11/17/04 09:34	0.06 µg/L	0.016 mg/Kg	0.05 U
229091	Antimony	11/17/04 09:34	0.06 µg/L	0.021 mg/Kg	0.05 U
229093	Antimony	11/23/04 08:59	0.034 µg/L	0.007 µg/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*.

Spike Sample	Matrix	Analyte	Percent Recovery	Control Limits (%)	Samples Affected	Qualifier Assigned
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:

Analyte	Client-Requested Detection Limit (mg/Kg)	Reported Detection Limit (mg/Kg)
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:

Analyte	Client-Requested Detection Limit (µg/L)	Reported Detection Limit (µg/L)
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.

Sample Number	Matrix	Sampling Date	Preparation Date	Analysis Date
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 (≤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

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

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

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

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

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

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

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

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		%

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

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

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

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

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

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

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

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

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

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

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

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	

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		

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	

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	

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	

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	

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

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

APPENDIX D

Site Inspection Checklists

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK at Bangor, OU 1 (Site A)*	**Date of inspection:** *September 23, 2004*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Fair*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other *Soil excavation and on-site treatment; leach basin closure; well abandonment*
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact Said Seddiki — Remedial Project Manager — September 15, 2004
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Barbara Chafin-Tissier — IR Program Coordinator — Not Recorded
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Patty Kelly — Former RPM — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Daniel Gravning — NTR — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Mick Butterfield — Former IR Program coordinator — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Response reported lost in mail

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 (b) (6) [redacted] Name — Not Recorded Date
Problems; suggestions; ☒ Report attached

Contact (b) (6) [redacted] Name — Date
Problems; suggestions; ☐ Report attached

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] Name — NA Date
Problems; suggestions; ☐ Report attached Chose not to respond

III. DOCUMENTS & RECORDS

1. **O&M Records**
   ☒ O&M manual ☒ Readily available ☒ Up to date ☐ N/A
   ☒ As-built drawings ☒ Readily available ☒ Up to date ☐ N/A
   ☒ Maintenance logs ☒ Readily available ☒ Up to date ☐ N/A
   Remarks *Monthly technical progress report, no annual summary report. Monthly progress meetings. Site is visited by staff once per week.*

2. **Leach basin closure records** ☒ Readily available ☒Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

3. **Soil excavation and treatment records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

4. **Well Abandonment Records** ☐ Readily available ☐ Up to date
   Remarks *No record of well abandonment found*

5. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
   Remarks

6. **Institutional Controls Inspection Records** ☒ Readily available ☒ Up to date
   Remarks *Checklist available*

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☐ Contractor for PRP
   ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   ☐ Other

2. **O&M Cost Records**
☒ Readily available ☒ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate: *Not broken out in ROD* ☐ Breakdown attached

Total annual cost by year for review period if available

Fiscal Year: 2000	$102,052 Total cost	☐ Breakdown attached
Fiscal Year: 2001	$285,693 Total cost	☐ Breakdown attached
Fiscal Year: 2002	$395,522 Total cost	☐ Breakdown attached
Fiscal Year: 2003	$279,460 Total cost	☐ Breakdown attached
Fiscal Year: 2004	$335,592 Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Site A Burn Area

1. **Treatment system secure?** ☒ Yes ☐ No
Remarks ______

2. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
Remarks ______

3. **Any wells installed except for environmental cleanup?** ☐ Yes ☒ No
Remarks ______

4. **Any indication of damage to leach basin liner?** ☐ Yes ☒ No
Remarks *None Observed*

5. **Any evidence of excavation?** ☐ Yes ☒ No
Remarks *None Observed*

B. Site A Debris Area 2

1. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
   Remarks

2. **Are signs and posts present, in good condition, and legible?** ☒ Yes ☐ No
   Remarks

3. **Is deterrent vegetation intact with no penetrating trails?** ☐ Yes ☒ No
   Remarks: *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.*

4. **Any evidence of excavation?** ☐ Yes ☒ No
   Remarks *None Observed*

C. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ☒ Yes ☐ No
   Site conditions imply ICs being fully enforced ☒ Yes ☐ No

   Type of monitoring (*e.g.*, self-reporting, drive by) *Self inspection and reporting by Navy*
   Frequency *Annual site walks*
   Responsible party *Installation Restoration Program Coordinator – NBK at Bangor*
   Contact *Barbara Chafin – Tissier*
   Name
   Reporting is up-to-date ☒ Yes ☐ No

   Specific requirements in decision documents have been met ☐ Yes ☒ No
   Violations have been reported ☐ Yes ☒ No
   Other problems or suggestions: ☐ Report attached
   Deterrent vegetation not in place

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks: *ICs are adequate because current policy restricts access to Debris Area 2 – but ROD requirements are technically not met.*

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater treatment system components

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☒ Carbon adsorbers
☒ Filters *Bag filters for particulates*
☐ Additive (*e.g.*, chelation agent, flocculent)
☐ Others
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☒ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually: *1,400,000 gallons*
☐ Quantity of surface water treated annually
Remarks: *Treated water discharged to storm sewer – reinfiltration has been discontinued. Five extraction wells.*

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: *Based on contractor reports. Observed extraction wellheads.*

B. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: *See text of 5-year review report* ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
C. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation portion of remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: *Based on contractor reports. Observed typical wellheads.*
D. Other Remedy Components	
1.	**Soil excavation** ☒ Completed ☐ Not Completed
2.	**Leach basin closure** ☒ Completed ☐ Not Completed
3.	**Well abandonment** ☒ Completed ☐ Not Completed
VII. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *See text of 5-year review report.*
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See text of 5-year review report.*
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. *See text of 5-year review report.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See text of 5-year review report.*

Site Inspection Checklist

I. SITE INFORMATION

Site name: *NBK at Bangor, OU 2 (Site F)*	**Date of inspection:** *September 23, 2004*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Fair*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other *Soil excavation and on-base treatment; infiltration barrier*
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact (Name)	Title	Date
Said Seddiki	Remedial Project Manager	September 15, 2004

Problems; suggestions; ☒ Report attached

Contact (Name)	Title	Date
Barbara Chafin-Tissier	IR Program Coordinator	Not Recorded

Problems; suggestions; ☒ Report attached

Contact (Name)	Title	Date
Patty Kelly	Former RPM	NA

Problems; suggestions; ☐ Report attached Chose not to respond

Contact (Name)	Title	Date
Daniel Gravning	NTR	NA

Problems; suggestions; ☐ Report attached Chose not to respond

Contact (Name)	Title	Date
Mick Butterfield	Former IR Program coordinator	NA

Problems; suggestions; ☐ Report attached Response reported lost in mail

2. O&M Contractor

Contact Ann Marie Johnson – Shannon and Wilson (Name) — Project Manager (Title) — August 31, 2004 (Date)
Problems; suggestions; ☒ Report attached

Contact Rick Weingarz – Foster Wheeler (Name) — Project Manager (Title) — September 8, 2004 (Date)
Problems; suggestions; ☒ Report attached

3. LTM Contractor Rick Osgood - TEC (Name) — Project Manager (Title) — August 20, 2004 (Date)
Problems, suggestions; ☒ Report attached

4. Regulatory authorities and response agencies

Agency Ecology
Contact Nnamdi Madako (Name) — Ecology PM for Site (Title) — August 4, 2004 (Date)
Problems; suggestions; ☒ Report attached

Agency Ecology
Contact Guy Barrett (Name) — Former Ecology PM (Title) — NA (Date)
Problems; suggestions; ☐ Report attached Chose not to respond

Agency EPA
Contact Nancy Harney (Name) — EPA Project Manager (Title) — NA (Date)
Problems; suggestions; ☐ Report attached Chose not to respond

Agency Kitsap County Health Department
Contact Bill Lum (Name) — (Title) — NA (Date)
Problems; suggestions; ☐ Report attached Chose not to respond

5. **Members of the public**

Contact (b) (6) [redacted] ______ Not Recorded
Name Date
Problems; suggestions; ☒ Report attached ____________________

Contact (b) (6) [redacted] __ ______________
Name Date
Problems; suggestions; ☐ Report attached ____________________

Contact (b) (6) [redacted] _____ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] ____________ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] __ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] _______ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] __ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] ___ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact (b) (6) [redacted] ___ NA____
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

III. DOCUMENTS & RECORDS

1. **O&M Records**
   ☒ O&M manual ☒ Readily available ☒ Up to date ☐ N/A
   ☒ As-built drawings ☒ Readily available ☒ Up to date ☐ N/A
   ☒ Maintenance logs ☒ Readily available ☒ Up to date ☐ N/A
   Remarks *Monthly technical progress report, no annual summary report. Site is visited by staff once per day.*

2. **Soil excavation and treatment records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

3. **Infiltration barrier as-built records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

4. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
   Remarks: *Also monitoring Site E/11 wells for Otto fuel.*

5. **Institutional Controls Inspection Records** ☒ Readily available ☒ Up to date
   Remarks____________________

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☐ Contractor for PRP
   ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   ☐ Other____________________

2. **O&M Cost Records**
   ☒ Readily available ☒ Up to date
   ☒ Funding mechanism/agreement in place
   Original O&M cost estimate: *$160,000/yr in 1994 dollars* ☐ Breakdown attached

   Total annual cost by year for review period if available

Fiscal Year	Total cost	
Fiscal Year: 2000	$171,313	☐ Breakdown attached
Fiscal Year: 2001	$441,187	☐ Breakdown attached
Fiscal Year: 2002	$1,113,549	☐ Breakdown attached
Fiscal Year: 2003	$291,703	☐ Breakdown attached
Fiscal Year: 2004	$321,248	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Site F

1. **Treatment system secure?** ☒ Yes ☐ No
Remarks______

2. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
Remarks______

3. **Any wells installed except for environmental cleanup?** ☐ Yes ☒ No
Remarks: *Per IC inspection by Navy in August 2004.*

4. **Any indication of damage to infiltration barrier or cracked asphalt?** ☐ Yes ☒ No
Remarks: *Per IC inspection by Navy in August 2004.*

5. **Any evidence of excavation?** ☐ Yes ☒ No
Remarks: *Per IC inspection by Navy in August 2004.*

B. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**
Site conditions imply ICs properly implemented ☒ Yes ☐ No
Site conditions imply ICs being fully enforced ☒ Yes ☐ No

Type of monitoring (*e.g.*, self-reporting, drive by) *Self inspection and reporting by Navy*
Frequency *Annual site walks*
Responsible party *Installation Restoration Program Coordinator – NBK at Bangor*
Contact *Barbara Chafin – Tissier*
Name
Reporting is up-to-date ☒ Yes ☐ No

Specific requirements in decision documents have been met ☒ Yes ☐ No
Violations have been reported ☐ Yes ☒ No
Other problems or suggestions: ☐ Report attached
______

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater treatment system components

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☒ Filters *Bag filters for particulates*
☐ Additive (*e.g.*, chelation agent, flocculent)
☐ Others
☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually *600-650 gpm – 2,700,000,000 gallons annually*
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☒ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: *Based on contractor reports*

B. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests: *See text of 5-year review report*
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

C. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation portion of remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks *Based on contractor reports. Observed typical wellheads.*

D. Other Remedy Components

1. **Soil excavation** ☒ Completed ☐ Not Completed
2. **Infiltration barrier** ☒ Completed ☐ Not Completed

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See text of 5-year review report.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
See text of 5-year review report.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
See text of 5-year review report.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
See text of 5-year review report.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK at Bangor, OU 3 (Sites 16/24 and 25)*	**Date of inspection:** *September 23, 2004*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Fair*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☒ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other *Verification monitoring of groundwater*
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. *No OU-specific interviews were conducted, as all actions at OU 3 are complete except annual IC inspections. Interviews for other OUs included general site-wide questions that pertain to this OU.*

III. DOCUMENTS & RECORDS

1. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
Remarks *Documented in first five-year review, with citations to record documents.*

2. **Institutional Controls Inspection Records** ☒ Readily available ☒ Up to date
Remarks

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house
☐ PRP in-house
☒ Federal Facility in-house
☐ Other
☐ Contractor for State
☐ Contractor for PRP
☐ Contractor for Federal Facility

2. **O&M Cost Records** – _NA – only IC inspections by Navy required_
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate__________________ ☐ Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ________________________________

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Site 16/24

1. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
Remarks: _Some parking and storage of small items. Fenced. Two drums present – IR coordinator to check on drums._

2. **Any evidence of excavation?** ☐ Yes ☒ No
Remarks________________________________

B. Site 25

1. No ICs Required or Established

C. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**
Site conditions imply ICs properly implemented ☒ Yes ☐ No
Site conditions imply ICs being fully enforced ☒ Yes ☐ No

Type of monitoring (*e.g.*, self-reporting, drive by) *Self inspection and reporting by Navy*
Frequency *Annual site walks*
Responsible party *Installation Restoration Program Coordinator – NBK at Bangor*
Contact *Barbara Chafin – Tissier*
Name
Reporting is up-to-date ☒ Yes ☐ No

Specific requirements in decision documents have been met ☒ Yes ☐ No
Violations have been reported ☒ Yes ☐ No
Other problems or suggestions: ☐ Report attached
Area should not be used to store full drums.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater Monitoring

2. **Verification Monitoring Completed?** ☒ Yes ☐ No
Remarks *Navy and regulatory agencies have concluded that monitoring is no longer required. Metals concentratrations in groundwater do not exceed background.*

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See text of 5-year review report.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
See text of 5-year review report.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations, such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. *See text of 5-year review report.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See text of 5-year review report.*

Site Inspection Checklist

I. SITE INFORMATION	
Site name: *NBK at Bangor, OU 6 (Site D)*	**Date of inspection:**
Location: *Kitsap, WA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other *Soil excavation and on-base treatment; short-term groundwater monitoring; surface water confirmation monitoring*

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. *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.*

III. DOCUMENTS & RECORDS

1. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

2. **Soil Treatment Records** ☒ Readily available ☒ Up to date
   Remarks *Documented in first five-year review, with citations to record documents.*

IV. REMEDY COSTS

1. **Implementing Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☐ Contractor for Federal Facility
   - ☒ Other *Not Applicable*

2. **Remedy Cost Records** – _Not Applicable_
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate__________________ ☐ Breakdown attached

Total annual cost by year for review period if available

From_________ To_________ _______________ ☐ Breakdown attached
Date Date Total cost
From_________ To_________ _______________ ☐ Breakdown attached
Date Date Total cost
From_________ To_________ _______________ ☐ Breakdown attached
Date Date Total cost
From_________ To_________ _______________ ☐ Breakdown attached
Date Date Total cost
From_________ To_________ _______________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High Costs During Review Period**
Describe costs and reasons: ______________________________

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Surface Water and Groundwater Monitoring

1. **Verification Monitoring Completed?** ☒ Yes ☐ No
Remarks _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._

B. Other Remedy Components

1. **Soil excavation and treatment** ☒ Completed ☐ Not Completed

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See text of 5-year review report.

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. *None required*
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations, such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. *See text of 5-year review report.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *Not applicable*

Site Inspection Checklist

I. SITE INFORMATION

Site name: *NBK at Bangor, OU 7 (Sites B, E/11, 2, 10, and 26)*	**Date of inspection:** *September 23, 2004*
Location: *Kitsap, WA*	**EPA ID:** *110000771219*
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Fair*

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment ☐ Monitored natural attenuation
☒ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☒ Groundwater pump and treatment (as part of Site F system)
☐ Surface water collection and treatment
☒ Other *Surface water control; off-site soil and debris disposal; verification monitoring of groundwater, sediment, and clam tissue*

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact Said Seddiki — Remedial Project Manager — September 15, 2004
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Barbara Chafin-Tissier — IR Program Coordinator — Not Recorded
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Patty Kelly — Former RPM — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Daniel Gravning — NTR — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Mick Butterfield — Former IR Program coordinator — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Response reported lost in mail

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 (Name) — Ecology PM for Site (Title) — August 4, 2004 (Date)
Problems; suggestions; ☒ Report attached

Agency: Ecology
Contact: Guy Barrett (Name) — Former Ecology PM (Title) — NA (Date)
Problems; suggestions; ☐ Report attached — Chose not to respond

Agency: EPA
Contact: Nancy Harney (Name) — EPA Project Manager (Title) — NA (Date)
Problems; suggestions; ☐ Report attached — Chose not to respond

Agency: Kitsap County Health Department
Contact: Bill Lum (Name) — (Title) — NA (Date)
Problems; suggestions; ☐ Report attached — Chose not to respond

5. **Members of the public**

Contact (b) (6) [redacted] ______ Not Recorded
Name Date
Problems; suggestions; ☒ Report attached

Contact (b) (6) [redacted] ______ ______
Name Date
Problems; suggestions; ☐ Report attached

Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

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Contact (b) (6) [redacted] ______ NA
Name Date
Problems; suggestions; ☐ Report attached Chose not to respond

III. DOCUMENTS & RECORDS

1. **Otto fuel monitoring of Site F system for Site E/11** ☒ Readily available ☐ Up to date
Remarks: *Appear to have missed 2004 sampling.*

2. **Soil and debris disposal records (Sites 2, B, and E/11)** ☒ Readily available ☒ Up to date
Remarks *Documented in first five-year review, with citations to record documents.*

3. **Soil cover and storm water control as-built records (Site B)** ☒ Readily available ☒Up to date
Remarks *Documented in first five-year review, with citations to record documents.*

4. **Soil cover inspection and maintenance records (Site B)** ☒ Readily available ☒ Up to date
Remarks

5. **Sediment and clam tissue monitoring records (Site 26)** ☒ Readily available ☒ Up to date
Remarks: *Performed as part of this 5-year review.*

5. **Groundwater monitoring records (Site 10)** ☒ Readily available ☒ Up to date
Remarks

6. **Institutional controls inspection records (Sites B, E/11, 10)** ☒ Readily available ☒ Up to date
Remarks

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate__________________ ☐ Breakdown attached

Total annual cost by year for review period if available

From	To	Total cost	
From ________ Date	To ________ Date	*Not reported by Navy* Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Site B – Floral Point (checklist items from ICMP)

1. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
Remarks____

2. **Any erosion along shoreline or on the vegetated cover?** ☒ Yes ☐ No
Remarks: *Scarps along shoreline imply ongoing erosion*

3. **Appropriate vegetation on cover?** ☒ Yes ☐ No
Remarks____

4. **Sufficient remaining gravel thickness on cap?** ☒ Yes ☐ 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 ☒ Yes ☐ No
   Site conditions imply ICs being fully enforced ☒ Yes ☐ No

   Type of monitoring (*e.g.*, self-reporting, drive by) *Self inspection and reporting by Navy*
   Frequency *Annual site walks*
   Responsible party *Installation Restoration Program Coordinator – NBK at Bangor*
   Contact *Barbara Chafin – Tissier*
   Name
   Reporting is up-to-date ☒ Yes ☐ No

   Specific requirements in decision documents have been met ☒ Yes ☐ No
   Violations have been reported ☐ Yes ☒ No
   Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. Groundwater treatment system components – USING SITE F SYSTEM.

B. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests: *See text of 5-year review report.*
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
   ☐ Sediments and clams are not being affected by COCs at Floral Point
   Remarks

C. Floral Point Cover

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent______ Depth______
   Remarks______

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths______ Widths______ Depths______
   Remarks______

3. **Erosion** ☒ Erosion noted ☐ Erosion not evident
   Areal extent: *Shoreline scarps* Depth______
   Remarks: *Measurements from survey hubs during last IC inspection also imply substantial erosion.*

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent______ Depth______
   Remarks______

5. **Vegetative Cover** ☒Grass ☒ Cover properly established ☒ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks______

6. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent______ Height______
   Remarks______

7. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent______
   ☐ Ponding ☐ Location shown on site map Areal extent______
   ☐ Seeps ☐ Location shown on site map Areal extent______
   ☐ Soft subgrade ☐ Location shown on site map Areal extent______
   Remarks______

8. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
   Areal extent______
   Remarks______

D. Surface water control swales

1. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
   Areal extent______ Depth______
   Remarks______

2. **Obstructions** Type______ ☒ No obstructions
☐ Location shown on site map Areal extent______
Size______
Remarks______

3. **Excessive Vegetative Growth** Type______
☒ No evidence of excessive growth
☒ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______
Remarks: *Grass growing in swales beside road does not appear to obstruct flow. Discharge inlet is clear.*

E. Cover Penetrations ☒ Applicable ☐ N/A

1. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks______

2. **Erosion Monuments** ☒ Located ☒ Routinely surveyed ☐ N/A
Remarks______

F. Other Remedy Components

1. **Soil and debris disposal** ☒ Completed ☐ Not Completed

VII. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See text of 5-year review report.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
See text of 5-year review report.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
See text of 5-year review report.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See text of 5-year review report.*

Site Inspection Checklist

I. SITE INFORMATION

Site name: *NBK at Bangor, OU 8 (Sites 27, 28, 29 and offsite plume)*	**Date of inspection:** *September 23, 2004*
Location: *Kitsap, WA*	**EPA ID:** 110000771219
Agency, office, or company leading the five-year review: *US NAVY, NAVFAC NW*	**Weather/temperature:** *Fair*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other *LNAPL removal*
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **Navy Staff**

Contact Said Seddiki — Remedial Project Manager — September 15, 2004
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Barbara Chafin-Tissier — IR Program Coordinator — Not Recorded
Name — Title — Date
Problems; suggestions; ☒ Report attached

Contact Patty Kelly — Former RPM — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Daniel Gravning — NTR — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Chose not to respond

Contact Mick Butterfield — Former IR Program coordinator — NA
Name — Title — Date
Problems; suggestions; ☐ Report attached Response reported lost in mail

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 (b) (6) [redacted] — Not Recorded
Name — Date
Problems; suggestions; ☒ Report attached

Contact (b) (6) [redacted] — July 30, 2004
Name — Date
Problems; suggestions; ☒ Report attached

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

Contact (b) (6) [redacted] — NA
Name — Date
Problems; suggestions; ☐ Report attached — Chose not to respond

III. DOCUMENTS & RECORDS

1. **LNAPL recovery system installation records** ☒ Readily available ☒ Up to date
Remarks ______

2. **Groundwater monitoring records** ☒ Readily available ☒ Up to date
Remarks ______

3. **Institutional controls inspection records** ☒ Readily available ☒ Up to date
Remarks ______

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ______

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate ______ ☐ Breakdown attached

Total annual cost by year for review period if available

From ______ To ______ *Not Reported by Navy* ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. OU 8 (all sites

1. **Current land use consistent with ROD and ICMP?** ☒ Yes ☐ No
   Remarks ____________

2. **Have any wells been installed except for environmental cleanup?** ☐ Yes ☒ No
   Remarks: *Per Barbara Chafin-Tissier*

3. **Monitoring reports supplied to Health Department?** ☒ Yes ☐ No
   Remarks: *Per Barbara Chafin-Tissier*

4. **Any wells allowed by Health Department in restricted area?** ☐ Yes ☒ No
   Remarks: *Per Barbara Chafin-Tissier*

B. Overall Institutional Controls Evaluation

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ☒ Yes ☐ No
   Site conditions imply ICs being fully enforced ☒ Yes ☐ No

   Type of monitoring (*e.g.*, self-reporting, drive by) *Self inspection and reporting by Navy*
   Frequency *Annual site walks*
   Responsible party *Installation Restoration Program Coordinator – NBK at Bangor*
   Contact *Barbara Chafin – Tissier*
   Name
   Reporting is up-to-date ☒ Yes ☐ No

   Specific requirements in decision documents have been met ☒ Yes ☐ No
   Violations have been reported ☐ Yes ☒ No
   Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks ____________

VI. TREATMENT COMPONENTS ☒ Applicable ☐ N/A

A. LNAPL and MNA Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2.	Monitoring data suggests: ☒ LNAPL is being removed ☒ Contaminant concentrations are declining ☒ MNA is effective Remarks: *LNAPL recovery has reached endpoint.*
B. Monitored Natural Attenuation Infrastructure	
1.	**Monitoring Wells** (natural attenuation portion of remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: *Per monitoring reports. Observed typical wellheads. Well protected in above-ground boxes with heat tape for freeze protection.*
VII. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). *See text of 5-year review report.*
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See text of 5-year review report.*
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. *See text of 5-year review report.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See text of 5-year review report.*

APPENDIX E

APPENDIX E

Interview Responses

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Community Member Interview
NBK at Bangor
Kitsap, WA

Individual Contacted:	(b) (6) [redacted]
Title:	Alternate Community Co-Chair
Organization:	RAB member, Community South
Telephone:	(b) (6) [redacted]
E-mail:	--
Address:	(b) (6) [redacted] 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
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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
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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
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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
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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: LNAP L 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
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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
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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.