



Management and Monitoring Approach

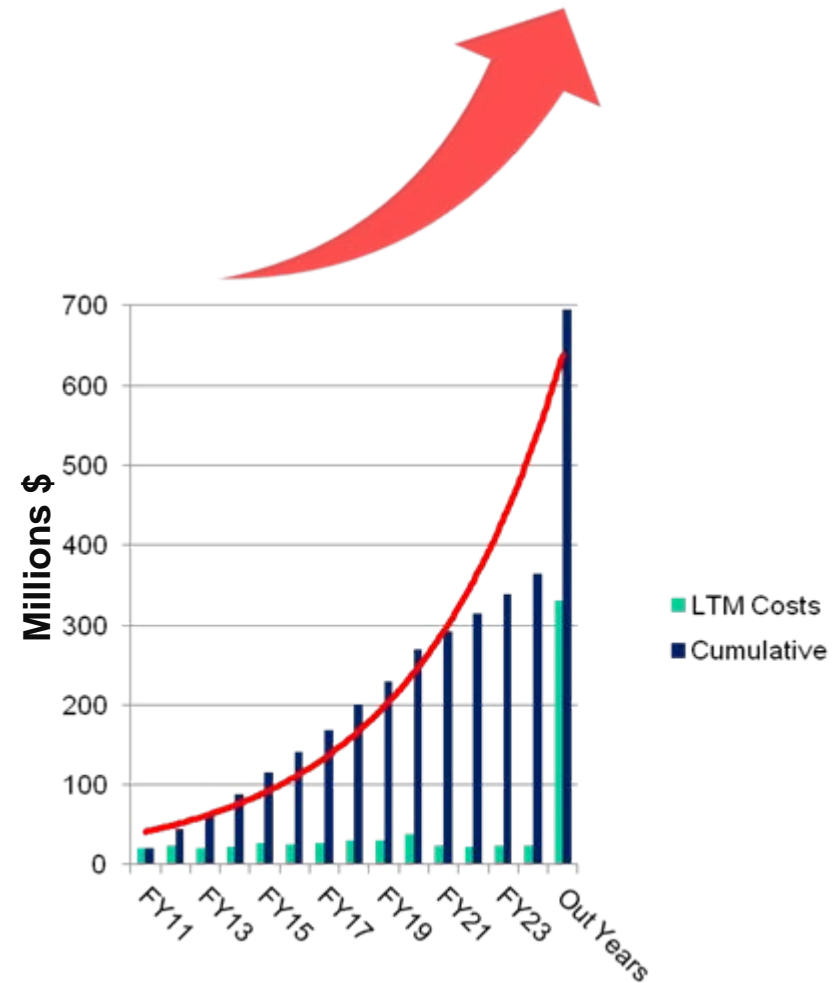
Jan Nielsen
NAVFAC Atlantic

November 2011

Why Develop this Approach?



- Long Term Management Costs
- Power in Decision Making
 - Consistent High Quality Information
 - Transparency Promotes Understanding
 - Document Sampling Strategy and Methods
 - Site Closure Requirements
- Smart Tool
 - Tells the Story of the Site
 - Captures Past Actions and Agreements
 - Reinforces Exit Strategy



Source: NAVFAC NORM Database Spring 2011

Introduction



1. Introduction

This Remedial Action Operations and Long-Term Monitoring (LTM) Report presents the Year 12 (Round 16) groundwater and ecological monitoring activities completed at Site 1, Landfill at Oyster House Creek Naval Radio Transmitting Facility (NRTF) Driver, located in Suffolk, Virginia (facility). The LTM at Site 1 is required in accordance with the selected remedy identified in the Record of Decision (ROD) signed in September 1997. This Remedial Action Operations and report was prepared by the Naval Facilities Engineering Command (NAVFAC) for submittal to the Navy and the Virginia Department of Environmental Quality (VDEQ).

1.1 Objective

The LTM being conducted at Site 1 evaluates whether contamination has migrated outside the lan boundary and if the selected remedy—Institutional Controls (ICs) (site restrictions with LTM remains protective of human health and the environment.

The objectives of this report are to:

- Present the results for Round 16 of Site 1's LTM Program
- Evaluate these results through trend analysis of all 16 rounds of data collected over the past 12 years
- Better define metrics used to evaluate whether Remedial Action Objectives (RAOs) have been met at the site
- Present an exit strategy for LTM at Site 1 and describe the site's progress toward closure

1.2 Organization

The LTM Report is organized as follows:

- Section 1 – Introduction
- Section 2 – Site Background

DECLARATION

Site Name and Location

Site 1, Landfill at Oyster House Creek
Naval Radio Transmitting Facility Driver
Suffolk, Virginia

Statement of Basis and Purposes

This decision document presents the selected remedy for Site 1, Radio Transmitting Facility (NRTF) Driver that was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for Site 1.

The State of Virginia Department of Environmental Quality (DEQ) and the United States Environmental Protection Agency (USEPA) Region III support the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from Site 1, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedy is Remedial Action Alternative (RAA) No. 2 - Institutional Controls with Long-Term Monitoring.

Under the Institutional Controls with Long-Term Monitoring Alternative, institutional controls in the form of site restrictions would be implemented in the vicinity of Site 1, west of monitoring well MW-01GW-03 (see Figure 4), to restrict the future disturbance and/or development of the site, and the use of the shallow aquifer. Implementation of this alternative through site restrictions would eliminate exposure pathways to potential human receptors such as future potential residents or construction workers.

Long-term monitoring would be performed to further evaluate shallow groundwater contamination and migration. Monitoring would also be conducted to further assess potential ecological risks and impacts. Long-term monitoring would involve periodic sampling of shallow groundwater, sediment, and fish. The sampling of fish will be conducted as part of a base-wide ecological monitoring program. A Long-Term Monitoring Program (LTMP) Work Plan will be prepared as part of the design phase of this remedial action. The LTMP Work Plan also will include the following post-closure plans: an inspection plan; a preparedness and prevention plan; and a contingency/emergency procedures plan.

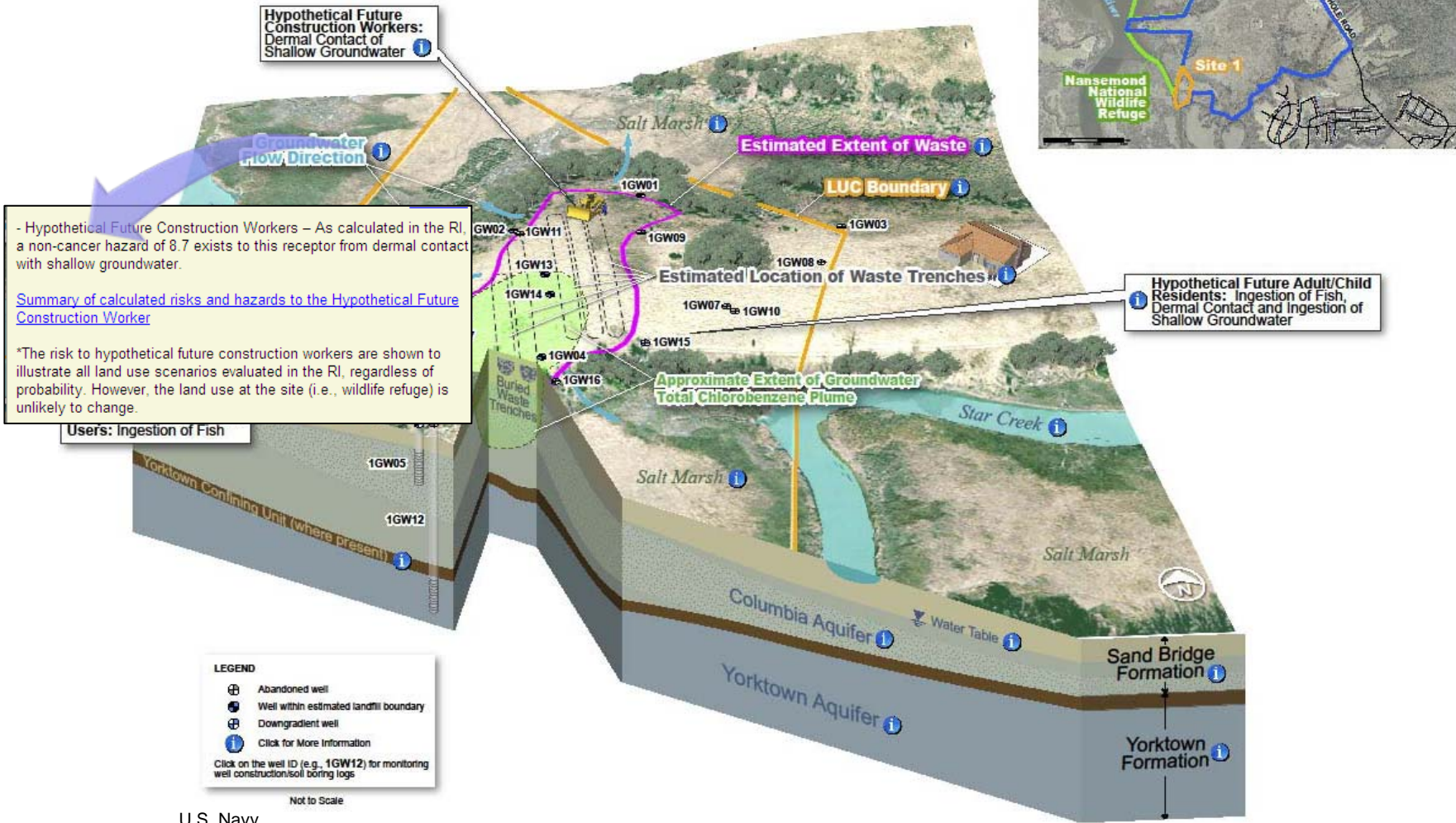
vi

U.S. Navy

Conceptual Site Model



FIGURE 4 (Enlarge) (View as PDF) (Historical CSM [1970])
 Conceptual Site Model - NRTF Driver Site 1, Landfill at Oyster House Creek



U.S. Navy

Conceptual Site Model



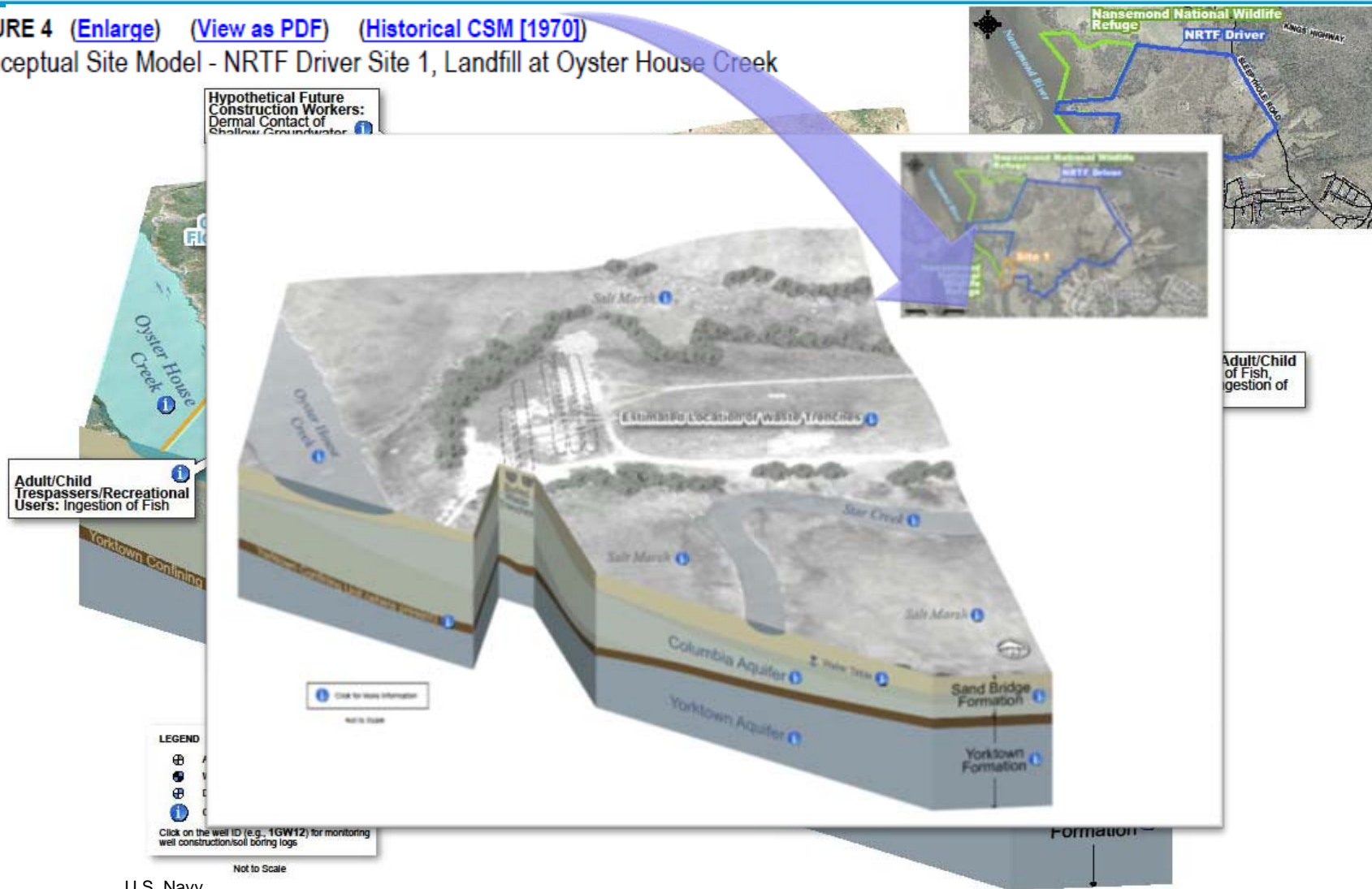
FIGURE 4 (Enlarge) (View as PDF) (Historical CSM [1970])
 Conceptual Site Model - NRTF Driver Site 1, Landfill at Oyster House Creek



Conceptual Site Model



FIGURE 4 (Enlarge) (View as PDF) (Historical CSM [1970])
 Conceptual Site Model - NRTF Driver Site 1, Landfill at Oyster House Creek



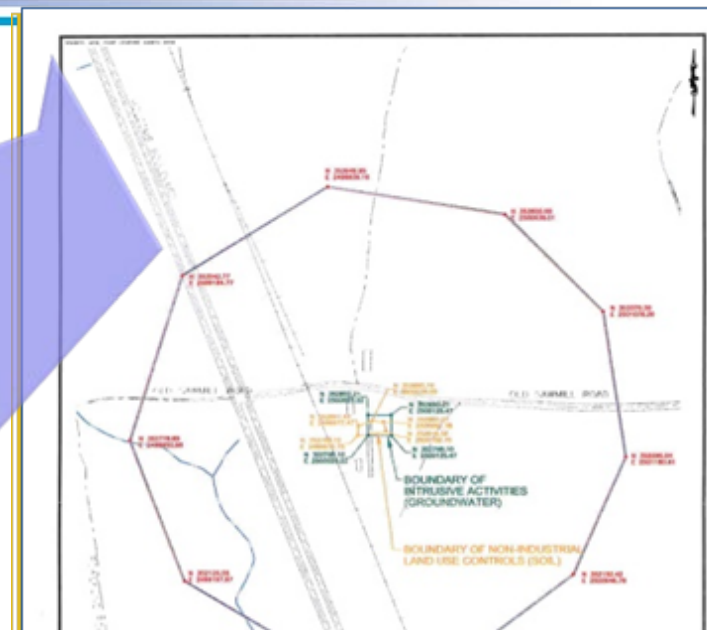
Previous Investigations and Decisions



4. SITE 3 LTM

TABLE 4-1
Site 3 - Previous Investigations and Remedial Actions

Pre-ROD Previous Investigation	Date	Activities	Admin. Record No.
Remedial Investigation (RI) (Baker)	1996	Evaluated the nature and extent of contamination. VOCs (particularly fuel constituents) and SVOCs (primarily PAHs) were detected in groundwater within the surficial and Castle Hayne aquifers. SVOCs were identified in both the surface and subsurface soil, particularly within the creosote treatment area. The human health risk assessment (HHRA) identified potential risks to future residential children and adults due to exposure to the following SVOCs in groundwater: benzo(a)pyrene, benzo(a)anthracene, dibenzofuran, phenanthrene, and acenaphthalene.	001699 and 001700
FS (Baker)	1996	Following an evaluation of remedial alternatives for both soil and groundwater, the following two-part alternative was selected: Source removal with onsite biological treatment of PAH-contaminated subsurface soils. Monitored natural attenuation (MNA) with LUCs for groundwater.	001721
ROD (Baker)	1997	Established Remedial Action Objectives (RAOs) and defined the selected remedy. The RAOs were: <ul style="list-style-type: none"> Prevent leaching of PAH contaminants from subsurface soil to the groundwater. Remediate subsurface soil and shallow groundwater. Prevent exposure to contaminated groundwater. 	001753
Post-ROD Previous Investigations	Date	Activities	Admin Record No.
LTM	1998	LTM monitoring begins.	NA
Treatability Study (Baker)	1998	Biological treatment of PAH-contaminated subsurface soil was tested. The study indicated that biological treatment was not effective.	NA
Amended ROD (DoN)	2000	Based on the results of the 1998 Treatability Study, the remedy was amended to remove biological treatment of soils. Soil excavation with offsite disposal was chosen to address source removal at this site.	NA
Non-Time Critical Removal Action (NTCRA) (Shaw)	2000	Approximately 3,295 tons of PAH-contaminated soil was removed from Site 3 and disposed of offsite.	NA
Land-Use Control Implementation Plan (LUCIP) (DoN)	2001	The LUC objectives are to: <ul style="list-style-type: none"> Prohibit intrusive activities that could potentially expose workers to impacted groundwater. Prohibit the withdrawal and any use of contaminated groundwater, except for environmental monitoring, for the aquifers within 1,000 ft of the estimated extent of impacted groundwater. 	NA
LTM Optimization Update	2009	Site 3 LTM program determined sufficient to meet objectives.	NA
Current LTM Activities	2010	Annual groundwater sampling from four monitoring wells for VOC and SVOC analyses were increased to quarterly sampling for one year to reassess the site for possible closeout.	NA



2009 LONG-TERM MONITORING OPTIMIZATION UPDATE

OU 12 (Site 3)

Site 3, Old Creosote Plant, is located on the main side portion of MCB CamLej, approximately 1 mile north of Wallace Creek along Holcomb Boulevard. Site 3 encompasses approximately 5 acres, is generally flat, and is intersected by a dirt access road.

Currently, four wells are being sampled annually for VOCs and semivolatile organic compounds (SVOCs) utilizing low-flow sampling techniques. Included in the sampling are three shallow wells and one intermediate well.

Within OU 12, Site 3 is included as part of the LTM Program. The groundwater flow direction is generally northeast towards the receptor Wallace Creek, and NCGWQS exceedances from the August 2008 LTM Sampling event are shown on **Figure 11**.

Site 3 sampling currently utilizes low-flow sampling techniques. Deploying a PDB would greatly reduce the LTM Program effort at this site; however, since SVOCs require monitoring at the site and sampling procedures of SVOCs require a significant volume to be sampled, low-flow sampling techniques must continue to be employed at Site 3 as long as SVOCs are monitored.

Site 3 Recommendations Summary

The LTM program is determined to be sufficient and therefore there are no optimization recommendations for Site 3 under the LTM Program.

Remedy Implementation and Evaluation



3. Remedial Action Objectives

The Site 1 ROD (Pakos, 1997) identified the RAOs:

- Prevent future exposure to landfill materials
- Prevent future exposure to contaminated shallow groundwater
- Prevent future exposure to contaminated fish tissue

The LTM approach (Pakos, 1997) and fish. Sixteen and 14), and five date. Sediment Name Creeks. S (2004) to modify than 100 for all recommended current LTM approach.

The Work Plan d specific applicab and established (MCLs) and the V to surface water, based on analytic target endpoints Water Quality St Screening Value of inconsistency described in deta

TABLE 3
Summary of Remedial Action Objectives – NRTF Driver Site 1, Landfill at Oyster House Creek

Risk	RAO	Remedy Component	Metric/Cleanup Level	Expected Outcome
Landfill materials	Prevent future potential exposure to landfill materials	LUCs (site restrictions on intrusive activities, land use and development)	Maintain LUCs into foreseeable future and	Current land use (landfill with vegetative soil cover)
SVOCs in shallow groundwater	Prevent future potential exposure to contaminated shallow groundwater and monitor plume migration	LTM for shallow groundwater LUCs (site restrictions prohibit withdrawal of groundwater at residential use)		
PCBs in fish tissue	Prevent future potential exposure to contaminated fish tissue	LTM for fish tissue		

TABLE 2
Summary of Cleanup Levels – NRTF Driver Site 1, Landfill at Oyster House Creek

Contaminant of Concern	Cleanup Level	
	Groundwater (µg/L)	Fish Tissue (µg/kg)
Aroclor-1260	0.5	50
1,2-Dichlorobenzene	600	N/A
1,4-Dichlorobenzene	75	N/A
1,2,4-Trichlorobenzene	70	N/A
2,4,6-Trichlorophenol	6.1*	N/A

* Groundwater cleanup level is the RSL since no MCL is available

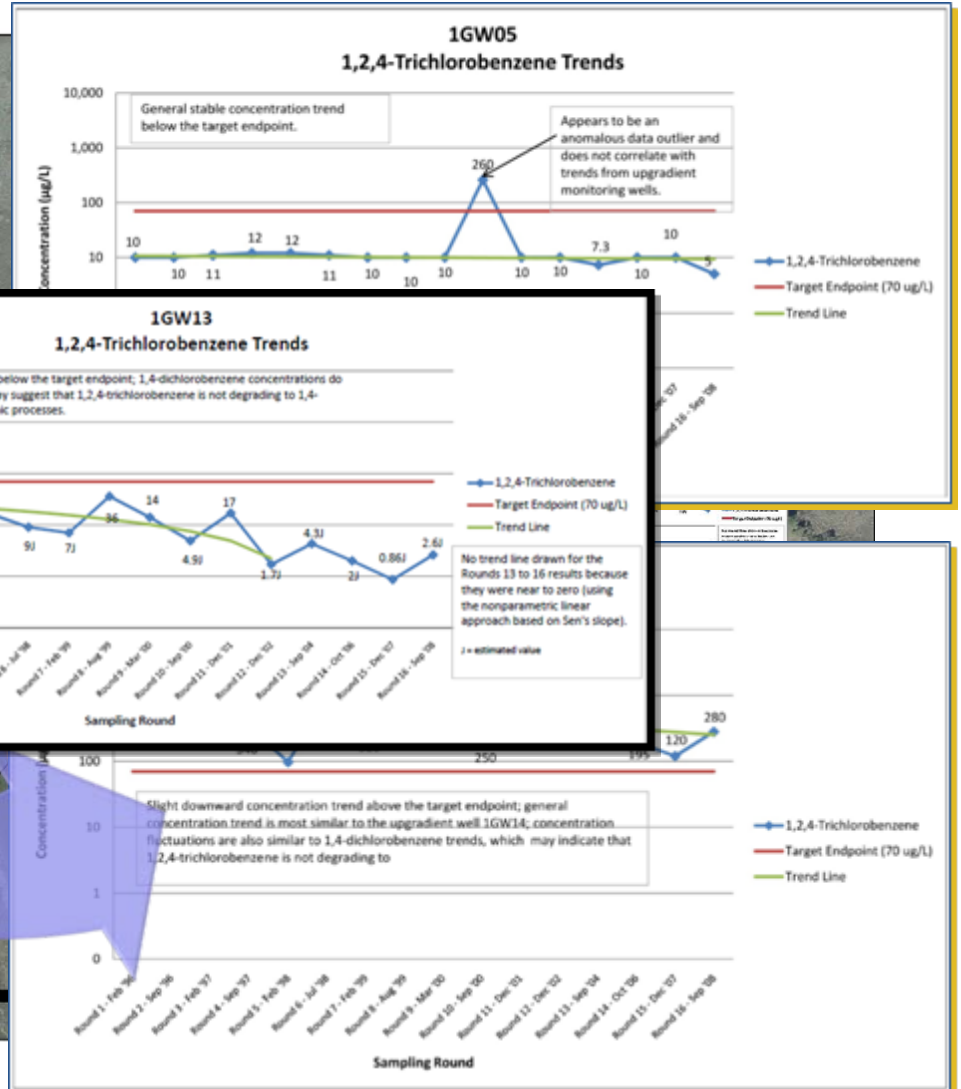
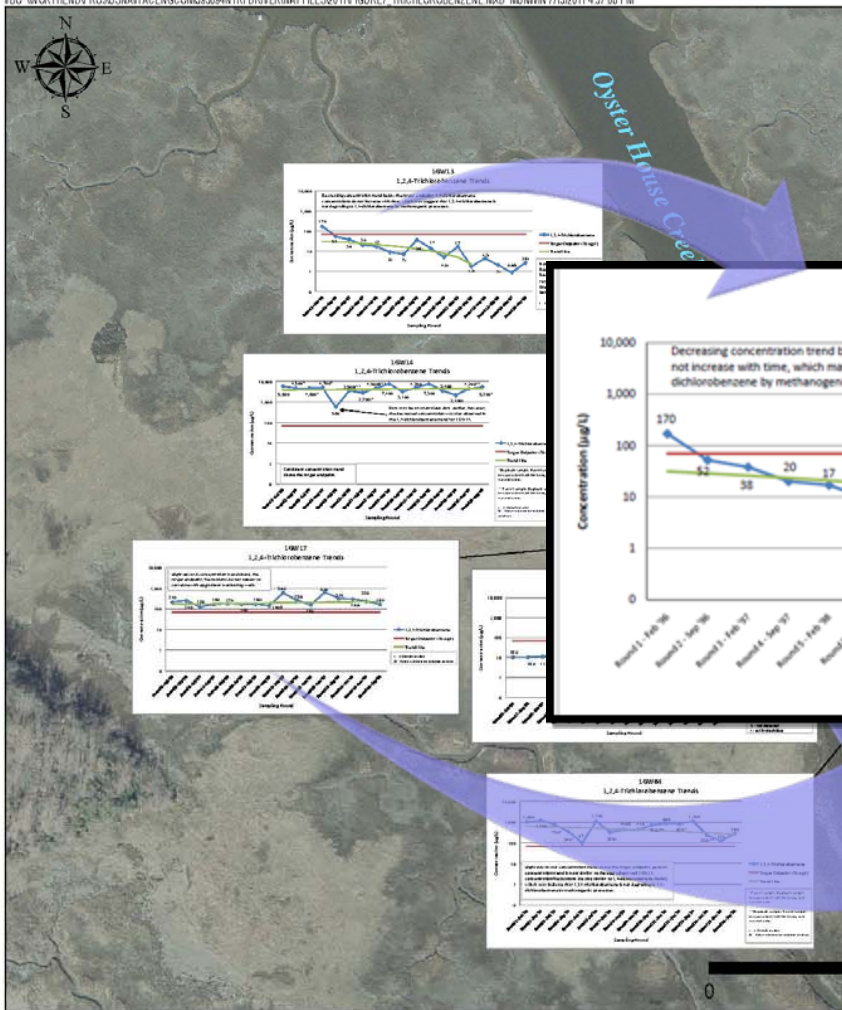
µg/L = micrograms per liter

µg/kg = micrograms per kilogram

Data Evaluation: Trend Charts

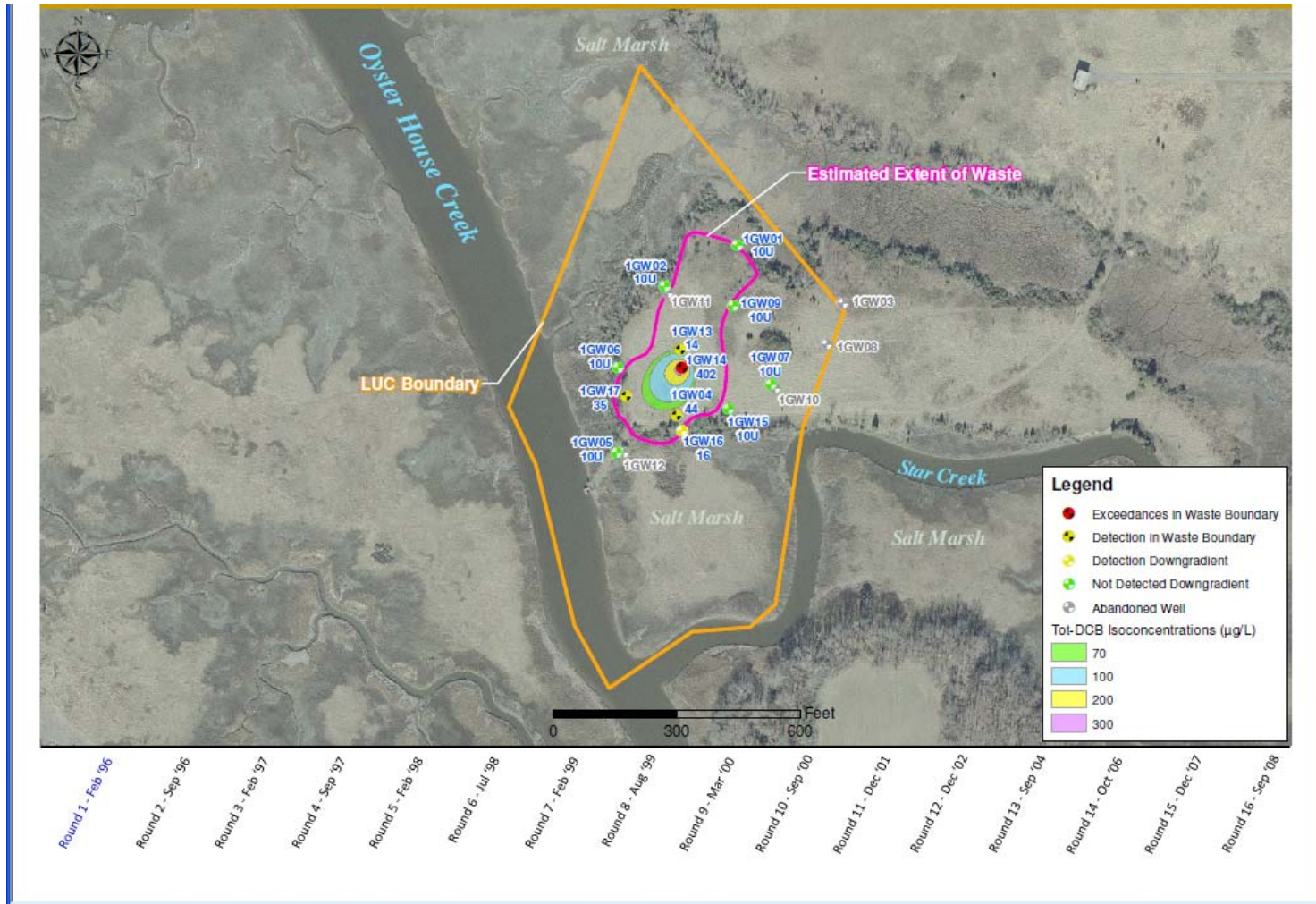


FIGURE 5 (Enlarge) (View as PDF) Historical Water Quality Data
Round 18 (2008) Water Quality Data - NRTF Driver Site 1, Landfill at Oyster House Creek



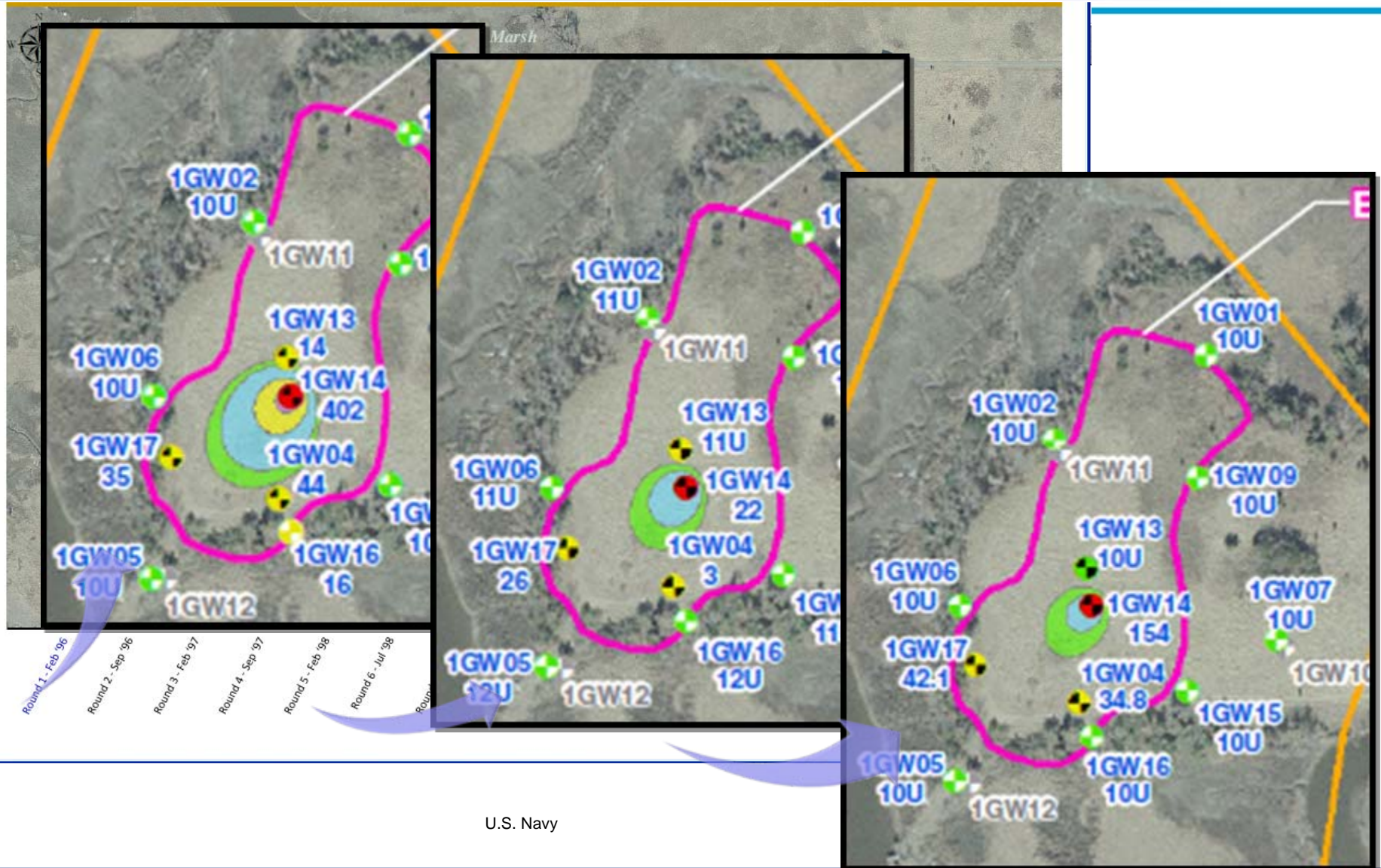
U.S. Navy

Data Evaluation: Monitored Natural Attenuation



U.S. Navy

Data Evaluation: Monitored Natural Attenuation



U.S. Navy

Evolution of Approach



Information Shared

- Navy Remedial Project Managers – February 2011
- Environmental Protection Agency - March 2011
- EPA Head Quarters – May 2011
- EPA Region 3 Tier III Team – May 2011
- EMEC - EPA and States
 - San Francisco – July 2011
 - Boston - August 2011

• More

Refined and Applied

- Prototype
- Other Navy Sites



Monitoring Report Template

Introduction to the Monitoring Report Template

As part of the Navy's effort to incorporate continual process improvements, this template has been developed for preparing annual monitoring reports for the environmental restoration program. This template encourages consistency in the format for reporting monitoring results and managing sites in the monitoring phase. This was designed for Remedial Project Managers to use as a resource for developing and publishing monitoring reports to support the Navy's cleanup program.

Objective:
Develop a Standardized Approach and Template for Monitoring Reports

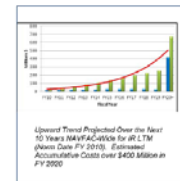
The goals of this effort are as follows:

- Provide a consistent format for use across the Navy
- Identify and report clean up goals
- Develop reporting format for results of trends
- Site Closure

This template is set up to provide insight on each element in the report. Each numbered section matches the Report Elements. The write up provides insight into the content and purpose of the section and suggested ways to achieve the goals for that element. The left hand column discusses the purpose of the section and information to be included. The right hand column provides examples or additional information to understand how to present the content.

Opportunity for Improvement?

- Program Dollars Shifting to Monitoring
- Opportunity to Improve the Report Formats
- Opportunity to Include Optimization as Standard Step
- Capture Clear Conclusions and Recommendations



Format



- Based on ROD Toolkit

- Elements

- Examples and guidelines
- Not fill in the blank

- Main Body

- Left column
 - Information recommended
 - Helpful hints
- Right Column
 - Examples
 - Clarification for presentation

Monitoring Report Template

1. Introduction

This element is designed to ensure the reader understands the intent of the report. Include the facility, site name, site identification number of sampling events, and date of sampling in the document title and introduction paragraph.

The section should clearly state the title, date, and author of the applicable Decision Document (s).

Any Guidance or Policy Documents used to prepare the report should be included in the introduction and in the list of references.

Clearly state Agency and cc Stakeholders

1. Introduction

This Remedial Action Operations and Long-Term Monitoring (LTM) Report presents the Year 12 (Round 16) groundwater and ecological monitoring activities completed at Site 1, L-1408B at Oyster House Creek for Naval Radio Transmitting Facility (NRTF) Dover, located in Suffolk, Virginia (the Facility). The LTM of Site 1 is required in accordance with the selected remedy identified in the site's Record of Decision (ROD) signed in September 1997. This Remedial Action Operations and LTM report was prepared by CH2M HILL under contract to the United States Navy (the Navy), Naval Facilities Engineering Command (NAVFAC), for submittal to the Navy and the Virginia Department of Environmental Quality.

3. Selected Remedy

This introductory section should include a very brief statement of the remedies being implemented at the site.

There can be reference to documents that contain detailed description and specifics of each remedy.

4. Land Use Controls with Long-Term Monitoring

The selected remedy identified in the ROD is LUCs and LTM. The selected remedy consists of the following:

4.1 Land Use Controls

Remedy 4.1 requires that the site be managed in accordance with the ROD to ensure that LUCs are implemented and maintained in accordance with the ROD. The site is managed in accordance with the ROD to ensure that LUCs are implemented and maintained in accordance with the ROD. The site is managed in accordance with the ROD to ensure that LUCs are implemented and maintained in accordance with the ROD.

4.2 Long Term Monitoring

Remedy 4.2 requires that the site be managed in accordance with the ROD to ensure that LTM is implemented and maintained in accordance with the ROD. The site is managed in accordance with the ROD to ensure that LTM is implemented and maintained in accordance with the ROD.

Reference Plats and recorded deeds as appropriate

Monitoring Report Template



• BRAC Template Published

- http://www.ert2.org/T2Opt/guidance_docs.htm
- In use for sites with monitoring
- Applied Successfully

Monitoring Report Template

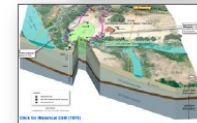
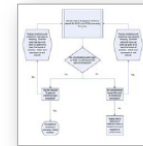


Report Elements

- 1 Introduction**
 - 1.1 Objective – Introduces the report including the site name, facility, stakeholders, decision documents and cleanup program.
 - 1.2 Table of Contents – Presents the report layout to familiarize readers with content.
- 2 Selected Remedy**
 - 2.1 Remedial Action Objectives (RAOs) – Restates the current RAOs developed.
 - 2.2 Site Closeout Strategy – Provides a clear path to allow for completion of efforts at the site and reduces the possibility of straying from the agreed to path forward. This section should identify any interim goals, final goals and status of effort to meet those goals.
- 3 Monitoring Program**
 - 3.1 Monitoring Objectives – Data Quality Objectives- Provides clearly stated objectives and questions that the data being gathered will answer.
 - 3.2 Sample Approach – Provides enough detail that the locations, constituents of concern, other parameters to be sampled, frequency, sampling procedures and methods for analysis are understood.
- 4 Data Evaluation**
 - 4.1 Sampling Results – Compiles results from the current rounds of sampling and appropriate historical data. This section includes figures and tables to clearly show the results of the monitoring efforts.
 - 4.2 Trend Analysis Concentrations of Constituents of Concerns – Presents trends to allow reader to readily understand if the site conditions are as anticipated based on the CSM or if there are other conditions that need to be considered. It documents the status of the site to allow for understanding of where the site is on the path to closeout. Answers the question of whether the RAOs are being met or if the site is moving towards response complete.
 - 4.3 Trend Analysis Costs – Documents historical and current cost to allow for an understanding of the use of limited resources to meet the requirements for the site.
 - 4.4 Optimization and Site Closeout Progress – Documents third party and routine optimization efforts at the site and captures the history and outcome of optimization. Trend analyses are discussed to document progress towards site closeout.
- 5 Conclusions** – Clearly and concisely states conclusions drawn from the trend analysis.



- Decision Trees
- Conceptual Site Models
- Trend Charts



Refined Approach



- Review Phase

The image shows the cover page of a draft report titled "Draft Navy Environmental Restoration Program Management and Monitoring Approach". At the top left is the NAVFAC logo (Naval Facilities Engineering Command). The title is centered in a dark blue gradient box. Below the title are three images: a photograph of yellow monitoring posts in a wooded area, a 3D topographic map of a site with various colored zones, and a photograph of a construction site with a large pile of rocks and a concrete structure. In the bottom right corner, the date "September 2011" is displayed, and a small circular seal is visible in the bottom right corner of the page.

U.S. Navy

Expanded Elements Refined Approach



- Approach
- Executive Summary
 - Key Decisions
 - Conclusions
 - Major Site Changes
- Land Use Controls
- Monitoring Program
 - Matrices
 - Locations
 - Methods
 - Parameters
 - Lab Requirements

Land Use Controls

Document Content

This section should describe the land use controls (LUCs) and LUC objectives. Include discussion of the following that occurred during the reporting period:

- Site operations – any activities that have occurred on the site in support of the former mission (e.g., utility repair, general construction, etc.)
- Site inspections – dates of inspection, infractions noted, and corrective measures taken
- Site operations and maintenance (OM&M) – activities related to OM&M (e.g., fence repair, sign replacement, soil cover repair, etc.)

Consider the use of figures, LUC checklists, letters, memos, plans, etc., when applicable. LUC checklists should be developed and agreed upon by regulatory stakeholders, prior to use.

Document view

4. Land Use Controls

LUCs were implemented in 2001 to prohibit exposure to site soil and groundwater. A survey plan of the site has been completed and approved with the City of Naples Beach, and is included in the Base EIS and current planning plan. Fences were installed around the perimeter of the site to enforce the LUC objectives (see 3):

- Prohibit the entrance and any use of contaminated groundwater, except for environmental monitoring, within 100 feet of the authorized regulated groundwater extent
- Prohibit outdoor activities within the vicinity of the authorized regulated groundwater, soil, and water source
- Prohibit non-essential land use which includes restrictions on the construction of residential, accessory, temporary, hotels, morning lawns, and day care facilities.
- Prohibit site access

Quarterly inspections are conducted by the 30th Air Force to verify that LUCs are still in place and operative. New signage on all base and off-base buildings, quarterly inspections, base LUC compliance and annual reports, no construction, no excavation, no drilling, and during the quarterly LUC inspections, however, it was noted that a large sign was removed from the site during the fourth quarter inspection date (2/1/12). The sign was removed and a new one was installed at Report 2012.

Additional Information

Optional Link

Monitoring Program: Sampling and Analysis

Document Content

The sampling and analysis section should include the details of the monitoring program. A table can be used to summarize the following:

- Sample matrices
- Sample locations
- Sample methods
- Sample parameters
- Laboratory methods
- Laboratory requirements (e.g., Department of Defense Environmental Laboratory Accreditation Program accreditation, state certification, etc.)

A figure showing the study area and sample locations should also be provided.

Consistent sampling and laboratory analytical methods should be used to reduce data variability and increase data comparability within each monitoring event and over time.

Document view

4. Monitoring Program

Table 4.1 summarizes the current monitoring approach to detect and characterize the site area. Specific sampling requirements are discussed in further detail in sections 4.1 and 4.2 of this report.

Matrix	Analysis		
	Insure Program	Sampling	Production
Soil	Yes	Yes	Yes
Water	Yes	Yes	Yes
Air	Yes	Yes	Yes
Biota	Yes	Yes	Yes

Additional Information

Optional Link

Analysis	Sampling Method	Frequency	Analysis and Method	Location	Parameter	PLC (ppb)	Minimum (ppb)
M01	Line Hole	Annually	USEPA 8160	ELAP	PAHs	10	20
M02	Line Hole	Annually	USEPA 8160	ELAP	PAHs	1	1.7
M03	Line Hole	Annually	USEPA 8160	ELAP	PAHs	2	2.7

Field Measurements: Water Quality Requirements

Parameter	Method	Frequency	NA	AN	AN	AN
DO	Handheld	Annually	NA	AN	AN	AN
pH	Handheld	Annually	NA	AN	AN	AN
Temperature	Handheld	Annually	NA	AN	AN	AN
Water Turbidity	Handheld	Annually	NA	AN	AN	AN

Monitored Natural Attenuation Indicators

Parameter	Method	Frequency	USEPA 8160	ELAP	NA	AN
Chloride	Line Hole	Early 3	USEPA 8160 <td>ELAP <td>NA</td> <td>AN</td> </td>	ELAP <td>NA</td> <td>AN</td>	NA	AN
Sulfate	Line Hole	Early 3	USEPA 8160 <td>ELAP <td>NA</td> <td>AN</td> </td>	ELAP <td>NA</td> <td>AN</td>	NA	AN
Ammonia	Line Hole	Early 3	USEPA 8160 <td>ELAP <td>NA</td> <td>AN</td> </td>	ELAP <td>NA</td> <td>AN</td>	NA	AN
Iron	Line Hole	Early 3	USEPA 8160 <td>ELAP <td>NA</td> <td>AN</td> </td>	ELAP <td>NA</td> <td>AN</td>	NA	AN

Accredited DoD ELAP Laboratory
 ENVIRONMENTAL CONSERVATION LABORATORIES - JACKSONVILLE
 Environmental Testing

Navy Environmental Restoration Program Management and Monitoring Approach 15

Expanded Elements Refined Approach



- Remedy in Place
 - Protectiveness
 - 5-Year Review Planning

- Cost

- Optimization

 - Tools
 - Documentation

- Recommendations

Cost

Document Content

The cost section should provide a summary of the capital cost for construction of the remedy, current costs, and project-to-date costs for management and monitoring. Table(s) can be used to present detailed cost information for labor, equipment/materials, and travel for key project tasks. This will help Remedial Project Managers (RPMs) project future costs and identify areas for potential cost avoidance.

If historical cost data is not available to track cost, the RPM should arrange for the collection and tracking of current and future cost data from this point forward. A comparison of the total remedy cost in the Record of Decision (ROD) versus projected actual costs should also be provided. Include an explanation of any reductions or increases in remedy costs. If the cost change is significant, refer to the Conclusions and Recommendations section for information on how to document post-ROD changes.

Document View

4.5 Cost

Remedy implementation began in FY2003. The capital cost for construction was approximately \$40,000. Following remedy construction, four rounds of groundwater monitoring for VOCs and nitrate attenuation indicator parameters have been conducted. Table 4-5 outlines the FY2009 and project to date (PTD) costs for groundwater monitoring. Table 4-6 outlines the FY2009 and PTD costs for site operations and maintenance (SOM). O&M costs include one additional O&M injection conducted during FY2009 management and monitoring activities.

Table 4-5 Monitoring Costs

Task	Labor		Equipment/Material		Travel	
	FY2009	PTD	FY2009	PTD	FY2009	PTD
Project Planning	\$ 5,000	\$ 50,000	\$ -	\$ -	\$ -	\$ -
Sampling	\$ 9,000	\$ 39,000	\$ 650	\$ 2,700	\$ 400	\$ 1,700
Waste Disposal	\$ 700	\$ 3,800	\$ 150	\$ 700	\$ 300	\$ 1,300
Analysis	\$ 8,000	\$ 35,000	\$ -	\$ -	\$ -	\$ -
Reporting	\$ 22,000	\$ 44,000	\$ 200	\$ 400	\$ -	\$ -
Optimization	\$ 12,000	\$ 12,000	\$ -	\$ -	\$ -	\$ -
Subtotal	\$ 57,700	\$ 183,000	\$ 1,000	\$ 3,800	\$ 700	\$ 3,000
FY2009 Total						\$ 36,400
PTD Total						\$ 189,800

Table 4-6 Operations and Maintenance Costs

Task	Labor		Equipment/Material		Travel	
	FY2009	PTD	FY2009	PTD	FY2009	PTD
Project Planning	\$ -	\$ 4,500	\$ -	\$ -	\$ -	\$ -
Injection	\$ -	\$ 18,500	\$ -	\$ 11,500	\$ -	\$ 400
Inspections	\$ 400	\$ 1,600	\$ 100	\$ 200	\$ 100	\$ 400
Waste Disposal	\$ -	\$ 700	\$ -	\$ 150	\$ -	\$ 300
Subtotal	\$ 400	\$ 22,800	\$ 100	\$ 11,850	\$ 100	\$ 1,100
Project Total						\$ 400

Additional Information

Optional Link

Optimization Tools: Summit

Summit – more technically complex monitoring optimization software that provides:

- Identifies redundant sampling locations and/or frequencies
- Considers numerous sampling plans with fewer samples than baseline
- Allows for comparison of baseline vs. optimized plume maps
- Allows for comparison of trends at various sampling frequencies
- Calculates error where samples are removed
- Evaluates multiple constituents of concern simultaneously

Data Tracking/Evaluation Module

- Flags new sample results out of expectations
- Tracks relative plume mass over time

Key Use:

- Evaluates large, complex sites with numerous wells or high sampling frequency

Import data as comma-delimited text file

Date	WellID	EastCoordinate	NorthCoordinate	c2DOE	Client	TCE
6/15/2009	BP-3	2160004	326510	0.05	0.42	1.1
6/15/2009	DD02	2171842	327632	0.05	0.05	0.35
6/15/2009	DD20	2160118	325038	0.05	0.05	0.35
6/15/2009	DD38W1	2179661	325468	1.7	0.05	8.8
6/15/2009	DD38W2	2179136	322664	1	0.05	4.7

All sampling locations (55 wells) | Plan 07 (41 wells) | Plan 14 (30 wells)

The Sample Optimization Module shows how the monitoring network can be reduced. For example, at this site the well network can be reduced from 55 to 41 wells with virtually no change in the plume configuration for the site. Reducing the well network to 30 wells results in a minimal change to the plume configuration. Therefore, the well network can likely be reduced to 30 wells at this site without resulting in any changes in the site management and monitoring approach.

The Data Tracking/Evaluation Module shows when new data collected are out of expected "bounds."

Concentration vs. Sample Dates graph showing "Current Data: Out of Bounds"

33

On the Right Road



U.S. Navy