



Sediments Part I: Managing Sediment Sites Using Navy Policy and Guidance

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RITS Fall 2010

RITS Sediment Sessions Goals

Session 1: Sediment Policy

- Review key Navy policies and guidance that are relevant to sediment sites
- Provide an overview of the Sediment Policy and Watershed Contaminated Source Document (WCSD)
- Identify case studies that demonstrate policy implementation

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RITS Fall 2010: Sediments Part 1

Give main objective of the Part 1 presentation, e.g, “The main objective of the first part of this presentation is to provide a refresher to everyone of the available policies and guidance and resources that are available to RPMs to help support the investigation and remediation of sediment sites.”

The meat of the presentation will be an overview of the sediment policy, looking at each element or component individually

And finally we will look at 2 case-studies to see how the policy and other available tools were implemented in the field.

RITS Sediment Sessions Goals (cont.)

Session 2: Sediment Cleanup Goals

- Address challenges associated with establishing sediment cleanup goals, including identifying appropriate background locations
- Provide guidance on available tools and lessons learned in overcoming challenges
- Identify case studies that demonstrate lessons learned

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RITS Fall 2010: Sediments Part 2

Provide BRIEF overview of Part 2, e.g. “The second session of the sediment RITS will address one (or two) of the challenges identified by RPMs during the spring RITS Sediment RPM Survey”

Presentation Overview

- **Introduction**
 - Purpose
 - Sediment Survey
 - Quiz Time
 - Definition
- **Sediment Policies**
- **Sediment Guidance Documents**
- **Sediment Policy Details**
- **Sediment Case Studies**
- **Summary**

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RITS Fall 2010: Sediments Part 1

The slide (Presentation Overview) will serve as our guide for this presentation and will help us keep on-track this morning.

This slide presents the path that the part one of the presentation will follow, so let's get going and start with the Introduction....

Purpose

- **The Navy has more than 200 contaminated sediment sites**
- **Projected remediation cost of \$1.3 billion**
 - MRP sites add another \$1 billion
- **35% of Environmental Restoration, Navy (ER,N) budget is sediment sites**



So...why are we here today or how did we get here today? Why are there 2 sessions of the RITS dedicated to the topic of sediment?

The answer is because the Navy has over 200 contaminated sediment sites in some phase of investigation and cleanup and according to this source the estimated cleanup cost is \$1.3 billion. And these numbers don't include MRP sediment sites. In fact this remedial cost figure might double if MRP sites were included.

Approximately 35% of the ER,N budget is allocated to address sediment sites.

Sediment Survey

- **RPM phone survey (Spring, 2009)**
 - Clarified number of total active ER,N and Base Realignment and Closure (BRAC) sediment sites
 - Raised awareness of what qualifies as a sediment site
- **Sediment Issue Focus Team (SIFT) formed to develop guidance and target technical support needs**
 - Consists of NAVFAC RPMs & Technical Staff with sediment experience
 - Available to assist RPMs
- **RITS Sediment Survey (Fall, 2009)**
 - 67% of sites in investigation, 33% in remediation phase
 - 44% ocean/marine/brackish; 56% freshwater
 - Covered many contaminant classes

6 Introduction

RITS Fall 2010: Sediments Part 1

A couple of years ago NAVFAC started gathering information on the number of sediment sites and who the RPMs were

So to try to get our hands around this issue, a phone survey was conducted by NAVFAC Atlantic, specifically Tom Spriggs where he called about 100 RPMs of sediment sites to try to gather information about where they were with their sediment sites.

Because of the number of identified sediment sites and associated cost, sediment sites in general are being scrutinized more by not only NAVFAC, but other state and federal agencies as well. To help address this issue the SIFT was formed in 2009 to try to get our hands around the challenges associated with sediments sites and to evaluate available guidance, policy and determine if they are sufficient to meet/address these challenges.

One of the first efforts that the SIFT participated in was developing a sediment survey that was distributed as part of the Fall RITS and perhaps some you in today's audience participated in this. In total we received approximately 35 responses, which depending on your perspective, may not seem like a lot, but considering attendance at the RITS where sediment wasn't a topic and considering how much people love to fill out surveys, I was happy with the results. And this summarizes what we found.

Contaminant classes include Metals, pesticides, PCBs, PAHs.

Sediment Survey (cont.)

Ranking of Identified Sediment Challenges:

- 1. Developing site-specific cleanup goals**
- 2. Determining background/reference locations**
- 3. Identifying and controlling non-Navy sources/inputs**
4. Evaluating remedial alternatives for sediments
5. Assessing bioavailability of contaminants
6. Identification and delineation of potential sites
7. Evaluating sediment transport
8. Conducting sediment toxicity studies

The Fall RITS Sediment survey resulted in identification of 8 sediment challenges

Read top 3 challenges and indicate that part 1 of the presentation will shed some light on Challenge #3 and part 2 of the presentation will shed some light on Challenges #1 and 2

Definitions

- **Sediment, *n.* – 1. Finely divided solid material that settles to the bottom of a liquid.**

– Webster's II New College Dictionary



- **Sediments – Particulate matter that deposits to the bottom of a water body including, but not limited to lakes, seas, ponds, rivers, streams, harbors and storm drain systems**

– Policy on Sediment Site Investigation and Response Action, 2002

Sediments are defined by Webster as

And defined in the policy as.....

Presentation Overview

- Introduction
- Sediment Policies
 - Sediment Policy
 - Background Policy
 - ERA Policy
 - HHRA Policy
- Sediment Guidance Documents
- Sediment Policy Details
- Sediment Case Studies
- Summary

Now, let's move on to looking at the policies and guidance that are associated with sediment sites...

Sediment Policy

- **DON Policy on Sediment Site Investigation and Response Action (8 Feb 2002)**
 - NAVFAC ERB Web site under “Guidance, Policy & Regs”
- **Key Requirements**
 1. Identify all contaminated sources
 2. Link all investigations to a specific Navy CERCLA/RCRA/MRP site
 3. Follow the Navy Risk Assessment and Background Policies
 4. Base sediment cleanup goals on site specific, risk-based data
 5. Don't clean up non-Navy sources
 6. Develop a monitoring plan with exit strategies before collecting any monitoring samples

10 Sediment Policies

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Why do we have Navy policy? Provides guidance on how to handle the unique complexities of sediments including:

- co-mingling of multiple sources (Navy & non-Navy)
- background or anthropogenic risk
- complex CSMs that include unique exposure pathways
- unique geochemical and hydrogeological data needed to assess sources and fate and transport

Again, the official name of what we will be calling the “sediment policy” for the remainder of the presentation is the DON Policy on Sediment Site Investigation and Response Action and it was signed final in February of 2002.

And in the policy there are 6 specific requirements that we will talk about later that I grouped into some general statements or themes that the policy specifies.

- The policy specifies that the source or all sources must be identified and controlled prior to the Navy cleaning up the site.
 - Navy will not clean up sediments before the source is controlled
 - Document any potential re-contamination from non-Navy sources
- That the remediation of sediment sites must be based on risk assessments and cleanup goals must be site-specific
- And finally, that the monitoring criteria for any plan must be established before collecting any data.

Background Policy

- **Navy Policy on the Use of Background Chemical Levels (30 Jan 2004)**
 - NAVFAC ERB Web site under “Guidance, Policy & Regs”
- **Key requirements**
 - Understand what chemicals were released from the site
 - Use background concentration data in human health (HHRA) and ecological risk assessment (ERA)
 - **Don't set site cleanup goals below background levels**
 - Develop background/reference sediment database
 - **Develop site cleanup goals for site-related chemicals only**
 - Background/reference sediment database should consider anthropogenic non-point sources

Background policy - It was originally developed back in 1999 and was ultimately finalized after some coordination/debate with EPA HQ in the beginning of 2004. Now although not specific to sediment, there are components of the background policy that are critical to sediment sites and to the policy.

The four components of the background policy are (read bullets)...The take-home message of the background policy is that we will only clean-up chemical contamination that is related to the site release. With respect to sediment sites and the often dynamic and complex processes associated with these sites, it becomes even more critical to be able to distinguish between site-related chemicals and those chemicals associated with other non-Navy or non-ER releases. As we go through the policies I'm sure you are going to get a sense of overlap and repetition, in fact, I might sound like a broken record by the end of the talk...but there was a great amount of time spent in the development of the policies to ensure that they were complimentary and not conflicting of each other.

For human health, background data should be considered in both the screening risk assessment and, if necessary, the baseline risk assessment

For ecological, background data should be considered in Step 3a of the baseline risk assessment

Ecological Risk Assessment (ERA) Policy

- **Navy Policy for Conducting Ecological Risk Assessments (5 Apr 1999)**

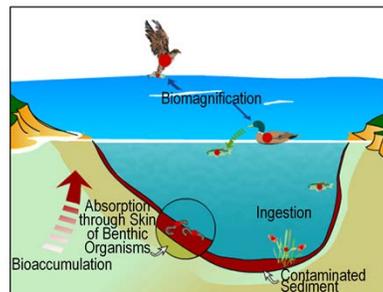
- NAVFAC ERB Web site under “Guidance, Policy & Regs”

- **Key Requirements**

- Use a 3-tiered approach
- Proceed to the next tier (greater level of assessment complexity) only if warranted by earlier tier results
- Develop clearly defined problem statements, risk hypotheses, and DQOs

- **Sediment Unique Pathways**

- Benthic community
- Piscivorous birds
- Wading birds



Contaminated Sediment Web Tool

12 Sediment Policies

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Eco risk policy or the formal title, the Navy Policy for Conducting Ecological Risk Assessments

This policy provides the requirements of a Navy ecological risk assessment. It purposely lines-up with the EPA's framework in that they are both iterative approaches moving from conservative to more realistic assumptions.

Use a 3-tiered approach – that is,

- Focus funding and effort only on activities that will generate data to support a risk management decision for chemicals of potential concern (COPC) driving ecological risks
- Begin with conservative assumptions and existing data to evaluate potential risk
- Use defined exit criteria and exit points within each Tier

HHRA and ERA at Sediment Sites:

Selection and use of appropriate tests for ecological risk assessments (ERAs)

(e.g., bioavailability evaluations, aquatic toxicity tests);

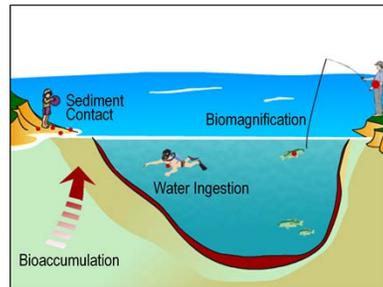
Use of background and reference site data in risk assessments;

Use of a weight-of-evidence (WOE) approach and other decision-making tools;

Development of site-specific risk-based cleanup goals

Human Health Risk Assessment (HHRA) Policy

- **Navy Policy for Conducting Human Health Risk Assessments Related to the Installation Restoration Program (12 Feb 2001)**
 - NAVFAC ERB Web site under “Guidance, Policy & Regs”
- **Key Requirements**
 - Use a 3-tiered approach
 - Develop clearly defined exit criteria and exit points within each Tier
 - Emphasize DQOs to ensure the sampling strategies meet the requirements of the HHRA and support risk management decisions
- **Sediment Unique Pathways**
 - Dermal exposure
 - Fish consumption
 - Ingestion



[Contaminated Sediment Web Tool](#)

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The HHRA policy, signed in 2001, is very similar in structure to the ERA policy. Again it requires the use of an iterative or phased approach moving from conservative to more site-specific and realistic approaches.

Focus funding and effort only on activities that will generate data to support a risk management decision for COPCs driving human health risks

Tier 1: Screening Risk Assessment

Tier 1A: Compare maximum detected concentration to appropriate risk-based screening level and background level

Tier 1B: Optional for chemicals that are retained after Tier 1A; allows for some site-specific considerations

Tier 2: Baseline HHRA

Conducted with input from appropriate regulators during the Remedial Investigation to document site-specific risks

Tier 3: Evaluation of Remedial Alternatives

Conducted during the Feasibility Study to evaluate remedial alternatives and residual risks

And again DQO to ensure that the sampling strategies and analytical data will be able to meet the requirements of the HHRA.

Dermal exposure – from wading, digging in sediments, etc

Fish consumption – shell fish & fish, tribal consumptions, subsistence fishing

Ingestion - suspended sediments while swimming

Presentation Overview

- Introduction
- Sediment Policies
- Sediment Guidance Documents
 - Sediment Implementation Guide
 - Sediment Transport Guide
 - Background Guide Vol. II – Sediments
 - Tools
- Sediment Policy Details
- Sediment Case Studies
- Summary

Let's move on to the available guidance documents that deal with sediment...

Sediment Implementation Guide

- **Implementation Guide For Assessing and Managing Contaminated Sediment at Navy Facilities (UG-2053-ENV) (Jan 2005)**
 - NAVFAC ERB Web site under “Guidance, Policy & Regs”
- **Key Components**
 - Discusses the complexity of sediment investigations
 - Identifies and discusses sediment-specific issues related to site characterization, risk assessment, and remedial alternative evaluation
 - Directs the reader to related Web sites and resources for more detailed technical information

UG – User Guide

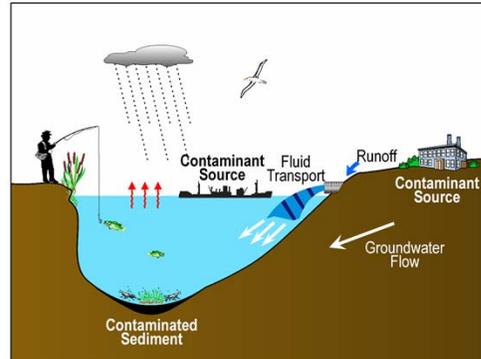
The Sediment Implementation Guide was developed specifically to support the Sediment Policy. It provides guidelines for how to incorporate the elements of the sediment policy into sediment site assessments and remedial alternative evaluations within the ER program and identifies the unique characteristics that should be considered at sediment sites vs. upland or terrestrial sites.

The next slide provide some examples of a CSM for a sediment site and some of the unique characteristics that need to be considered.

Sediment Implementation Guide (cont.)

• Sediment Site Characteristics

- Addressing multiple contaminant sources (Navy and non-Navy)
- Collection of key geochemical and physical data for characterizing the source, fate, and transport of chemicals in sediment
- Selection and use of appropriate Risk Assessment tests & pathways (e.g., bioavailability evaluations, aquatic toxicity tests)
- Evaluating remedial options for sediment and the risk and liabilities associated with each
- Evaluating the potential for re-contamination



Implementation Guide

Sediment Transport Guide

- **User's Guide for Assessing Sediment Transport at Navy Facilities
SPAWAR Technical Report (TR) #1960 (Sep 2007)**

- **Key Components**

- Practical guidance on planning and conducting sediment transport evaluations
- Identifies and reviews methods and tools that can be used to characterize sediment transport
- Framework to identify the types of measurements and data analysis methods that can be used at a contaminated sediment site
- Guidance on how the results of sediment transport evaluation can be used to develop management decisions for contaminated sediment sites
- Successfully applied case studies

One of the unique aspects of sediment sites is the dynamic and sometimes complex nature of where the site occurs. At these complex sites it is often critical to understand the fate and transport of the sediment particles prior to identifying remedial alternatives. I would even suggest that if you have a large, complex sediment site that sediment transport evaluations be included in the scope of the remedial investigation.

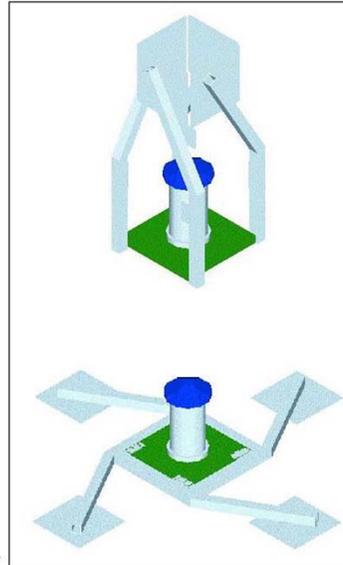
This guidance document provides all the essential elements of conducting a sediment transport evaluation and provides information on which level and which particular tools/techniques should be considered to be used at the site. The document also provides guidance on how to incorporate the results of the sediment transportation evaluation into the ultimate management decisions for sediment sites.

Pearl Harbor: Sediment Transport Data Collection

- Wave and current measurements
- Water column sampling in streams
- Radioisotope age dating
- Shear stress analysis
 - Sedflume

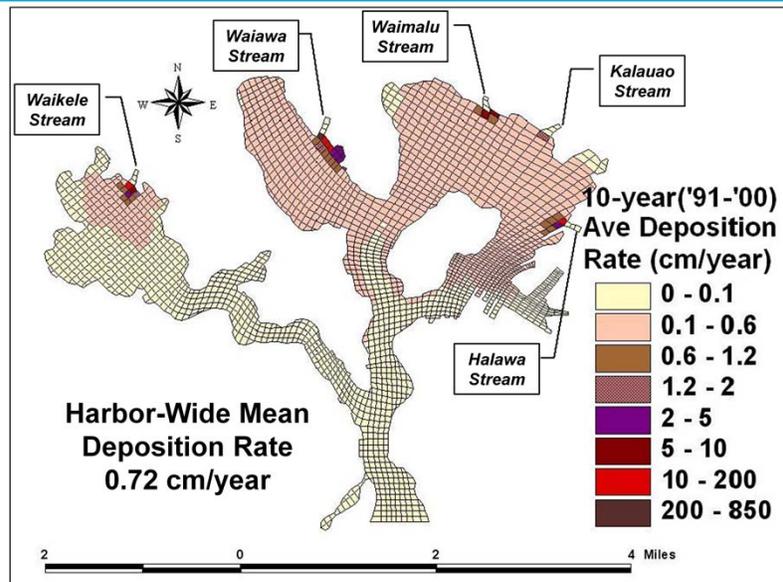
Acoustic Doppler Current Profiler (ADCP) in the stored position (above) and deployed position (below) to measure vertical current distributions in the water column.

Courtesy of U.S. Navy



We also collected sediment transport data to answer the questions on whether the sediment in the harbor is depositional or erosional, how the sediment will move in the harbor, and what forces have the most effect on sediment movement. Data collection included deployment of Acoustic Doppler Current Profile (ACDP) for current and wave measurements, radioisotope for age dating, and sedflume analysis for erosion.

Pearl Harbor: Sediment Transport Results

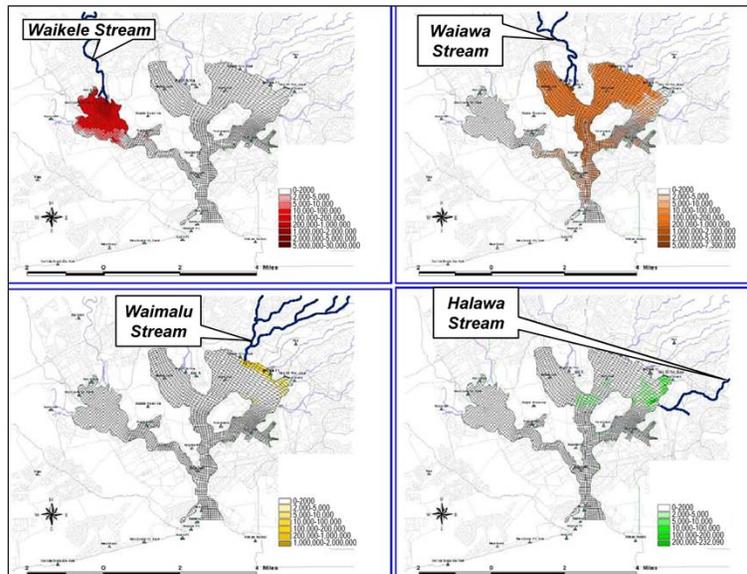


19 Sediment Guidance Documents

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The results of the sediment transport is that the harbor is a depositional area. This figure shows the relative deposition throughout the harbor.

Pearl Harbor: Sediment Transport Results (cont.)



20 Sediment Guidance Documents

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The data was inputted into the model that SPAWAR developed and the conclusion is that the harbor is a depositional environment. This figure here was generated by SPAWAR. It illustrates the loading and movement of sediment from the streams over a 90 day period. We can see that the Waikēle Stream has quite a bit of loading but the sediment stays in the West Loch area, while Waiawa Stream has the most impact on sediment loading, where sediment from this stream is transported to large parts of the harbor.

Background Analysis Guide for Sediments

- **Guidance For Environmental Background Analysis Volume II: Sediment (UG-2054-ENV) (Apr 2003)**
 - NAVFAC ERB Web site under Guidance, Policy & Regs
- **Key Components**
 - **Step-by-step instructions of how to complete a sediment background analysis using three methods**
 - **Unique considerations that apply only to sediments**
 - Multiple Background Sources
 - Variable Background Condition at depth
 - Depositional and erosional environments
 - Eco-risk driven investigations
 - Interaction of sediment and porewater
 - **Case studies that illustrate each method**

21 Sediment Guidance Documents

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This is volume 2 of 4 in the series (vol 1: soil; vol 3: groundwater; and upcoming vol 4: air) of background guidance documents and it discusses the unique considerations that apply to performing a sediment background evaluation and selection of background sediment locations.

3 Methods are:

1. Exploratory data analysis – establishing background ranges using spatial analysis and probability plots
2. Comparative Method – comparison of background data set to site data set to determine if site data is statistically different from background
3. Geochemical Method – compositional comparison of metals to parent rock compositions

Unique considerations that apply only to sediments:

1. Multiple Background Sources
2. Variable Background Condition at depth
3. Depositional and erosional environments
4. **Eco-risk driven investigations rather than human since less direct exposure to humans**
5. **Interaction of sediment and porewater**

Are #4 & 5 really background issues or just sediment complexity issues?

Tools: ERT2.org Contaminated Sediment Web Portal

Contaminated Sediment Web Portal

NAVFAC

Home
Overview
NAVFAC Guidance
T2 Resources
Other Resources
Contacts

Welcome to the T2 Contaminated Sediment Web Portal.

Contaminated sediment has become a major concern at many sites throughout the United States and the world. Persistent toxic contaminants have accumulated in sediments from both point and non-point sources including industrial and municipal waste. It is important that the Navy Remedial Project Manager (RPM) understands and follows the Navy policy and guidance available when actions at contaminated sediment sites.

The Contaminated Sediment Web Portal provides an interactive tool (Contaminated Sediment Action Plan) that can be used to assist Navy RPM's with managing contaminated sediment. This portal also contains a variety of links to access valuable resources related to contaminated sediment management, including Navy and EPA guidance documents, relevant agency websites, sediment-related conference and workshop information, and other publications.

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Home | Overview | NAVFAC Guidance | T2 Resources | Conferences | Other Resources | Contacts

22 Sediment Guidance Documents

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And lastly, in addition to Guidance, there is a Sediment Portal on the Environmental Restoration Technology Transfer (ERT2) web site for sediment related information – A “one stop” shop.

In addition to all the policies and guidance we just covered, there are T2 and other resources. The next slides show the T2 Resources available

Contaminated Sediment Portal: Past RITS Presentations

- Sediment Remedy Effectiveness (2007)
- Advanced Chemical Fingerprinting (2004)
- Coastal Contamination Migration Monitoring (2003)
- Assessing Risk to Amphibians Exposed to Sediment (2003)
- Toxicity Identification Evaluation (TIE) for Sediments (2003)
- Sediment Policy, Guidance and Characterization_(2002)
- Sediment Cleanup Alternatives (2002)
- Evaluating Sediments Using TIE Technology (2000)
- Rapid Sediment Characterization (RSC) Technologies (2000)

List of past sediment related RITS presentations are available

Contaminated Sediment Portal: Web Tool Resources

- Amphibian Risk Assessment
- Benthic Flux Sampling Device
- Chemical Fingerprinting
- Coastal Contamination Migration
- Degradation of Ordnance Constituents in Marine Sediments
- Environmental Background Analysis
- Interactive Sediment Remedy Assessment Portal (ISRAP)
- Polychlorinated Biphenyls (PCB) Multimedia Training
- Navy Sediment Investigation Data Sheet
- Sediment Remedy Effectiveness
- Sediment Guide Data Sheet

In addition, all the sediment related web tools are available in this Portal. If you don't remember anything else about the sediment resources, remember the ERT2.org Sediment Portal – It gets you to everything else.

Presentation Overview

- Introduction
- Sediment Policies
- Sediment Guidance Documents
- Sediment Policy Details
 - Policy Quiz
 - Sediment Policy Implementation
 - Specific Requirements of the Policy
 - Watershed Contaminated Source Document (WCSD)
- Sediment Case Studies
- Summary

Alright, now let's have some fun and get into the meat of the policy....

Quiz: Sediment Policy

Can you sample in an adjacent water body
(e.g., offshore sediments)
prior to determining that a clear link
exists back to a Navy source?



Now before we get into the policy, one more quiz.....

Read question. I'll read it for everyone because this is often a point of contention with stakeholders....

Let's see by a show of hands, don't be shy, how many people think that the answer is yes? And how many think that the answer is no?

Sediment Policy

- “Some ER,N/BRAC funds may be spent initially to determine if a link exists between the offshore area and the contaminated on-shore Navy source (from the site, for the contaminant).

– Navy/Marine Corps Installation Restoration Policy on Sediment Investigations and Response Actions, Sec. 2 (08 Feb 2002)

The answer is YES.....if there is a pathway to an adjacent water body and we have reason to believe that historically there have likely been releases, the policy does not prevent us from sampling, in fact the policy promotes us to sample, identify both Navy and non-Navy sources, and in the cases that there is mixed sources, the policy wants us to discriminate between what contamination might be the responsibility of the Navy, and what contamination is not.

Does everyone understand this....because this is a really important point.....Not sampling adjacent water bodies or refusing to sample adjacent water bodies is NOT the strength of the sediment policy – the real strength of the sediment policy is in determining whether to remediate or not...and hopefully this will become more apparent as we go through the rest of the presentation

Sediment Policy – Implementation

- **Sediment Policy applies to all site investigations and response actions funded under ER,N and BRAC**
 - Includes Munitions Response Program (MRP) sites
- **Policy applies to sediments found in many areas**
 - Particulate matter that deposits to the bottom of a water body, including, but not limited to, lakes, seas, ponds, rivers, streams, harbors, and storm drain systems
 - Includes water bodies found in areas not generally considered “wet” (i.e., deserts, mountains)

the sediment policy applies to all site investigations and response actions for both ER,N and BRAC, including MRP, and obviously the policy applies to sediments defined as the stuff that accumulates on the bottom of a water body

Overview of Sediment Policy Requirements

1. Identify all contaminated sources
2. Link all investigations to a specific Navy CERCLA/RCRA/MRP site
3. Follow the Navy Risk Assessment and Background Policy
4. Base sediment cleanup goals on site specific, risk-based data
5. Don't clean up non-Navy sources
6. Develop a monitoring plan with exit strategies before collecting any monitoring samples

Let's start exploring the policy – These are the 6 requirements of the policy and we are going to spend the next couple of minutes going through and looking at each requirement individually...

Sediment Policy Requirement #1

All sources shall be identified to determine if the Navy is solely responsible for the contamination.

- **Many Navy installations are adjacent to urbanized water bodies**
 - Exhibit complex hydrological and sediment dynamic processes
 - Commingling of contaminants from various sources
 - May be difficult to distinguish Navy contaminants from non-Navy sources within the same watershed, especially in urban and industrial settings
- **Critical to generate an understanding of inputs and sediment dynamics**
 - All sources should be identified through a Watershed Contaminated Source Document (WCSD) and a refined CSM
 - Help determine the Navy's cleanup responsibility
 - Evaluate the possibility of recontamination after cleanup is complete

Due to the dynamic nature of sediments, contamination can move around a lot so the source isn't always as direct or obvious.

Sediment Policy and the WCSD

- **Required by policy Requirement #1.**

- “... the project team will generate a Watershed Contaminated Source Document ... if there are potentially other non-Navy sources contributing to the contamination of the sediment. All sources of Navy and non-Navy contamination at the site should be identified.”

- **If it is determined that a significant source of contamination is coming from other (non-Navy) sources, then:**

- Document the information
- Inform the regulators (using the WCSD)
- Consult with counsel for appropriate action, and
- Inform Naval Facilities Engineering Command (NAVFAC HQ), if necessary

- **WCSD is the initial step in addressing Sediment Survey Challenge #3**

- *Identifying and controlling non-Navy sources/inputs*

- **CNO WCSD Fact Sheet – March 2003**

- NAVFAC ERB Web site, under Documents, search on the letter “C”

Source identification is very important in determining the Navy’s cleanup responsibility and if a site will be recontaminated after remediation is complete. The extent of the Navy responsibility shall be determined.

What is a WCSD?

- Stand alone summary report that documents both Navy and non-Navy sources whose activities may have or could continue to have an impact on sediments in a water body adjacent to Navy property
- Graphical representation of the water body and identifies potential contaminant sources, releases, and transport mechanisms
- It is a **critical component of the CSM** for those sediment sites that have both Navy and non-Navy inputs
 - Should be completed either during PA/SI or RI/FS phase

So, What is a WCSD, Anyway?

The WCSD is a summary report that documents all sources of Navy and non-Navy contamination inputs into the watershed that may have an impact on sediments in a water body

The WCSD contains a graphical representation of the water body and identifies potential contaminant sources, releases, and transport mechanisms.

So really a WCSD is a critical part of the overall CSM for those site that have mixed (Navy and non-Navy) sources....

What is a WCSD? (cont.)

- **Level of effort is dependent upon the complexity of the sediment site**
 - A simple site's WCSD should range between 2-10 pages
 - A complex site's WCSD could be 30 pages or greater
- **Illustrates watershed drainage basin(s)**
- **Documents all Navy and non-Navy sources**
- **Includes a pictorial CSM**
 - Identifies potential contaminant sources, releases, transportation routes, etc.
- **Given to regulators**

Not only is this an important part of the policy, but it also serves as an important component of the conceptual site model. Per the policy it is a summary report that describes all the potential Navy and non-Navy sources that may have contaminated the sediment in the water body. When this idea was first discussed, we envisioned a rather short document (2-10 pages) and a figure, but the WCSD over the years has evolved into a component of the CSM and the WCSD often is a robust document that is performed as part of the CSM, even if there are only Navy sources.

When is a WCSD Required?

- If there are **POTENTIALLY** other non-Navy sources contributing to the contamination of the sediment
 - Not required if only Navy sources
 - Only required by the Navy within the IR program; it is not a regulatory-mandated document
 - Includes MRP sites
 - Metals

A WCSD is required **ONLY** if you think that there are other non-Navy sources and if you think about it, you won't really know if there are other potential sources until you begin developing your CSM...in other words, only way to really determine this is to do the leg work for a WCSD. So my advice to you is to just do it. If you find that there are only Navy sources, then you are ahead of the game with developing a CSM which is still required as part of the ER program. If there are non-Navy sources, then continue with the development of the WCSD.

The decision to develop a WCSD is at the discretion of a Navy RPM and their management.

If metals are a risk driver at an MRP site, a WCSD may be needed to show other, non-Navy metal sources in the watershed

This is an example of a figure typically found in a WCSD. It is important to note that even though the majority of the sources identified on this figure are Navy sources (within blue line), notice this green line here – the watershed boundary goes beyond Navy property and identifies important non-Navy inputs into the watershed that might effect sediment contained on Navy property.

How is a WCSD Developed?

Step 1: Determine the need and scope of a WCSD

- Is the Navy the only source of contamination?
- Are there other potential sources of contamination?
- Amount of contamination that may have been contributed?

Step 2: Literature search

- Locations of other CERCLA, RCRA or state-listed hazardous waste sites
- Location and nature of industrial plants, power plants, wastewater treatment plants, marinas and boat maintenance shops
- Data on water and sediment quality

Don't Forget:

- NPDES permitted discharges, airborne sources, stormwater run-off

35 Sediment Policy Details – WCSD

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Step 1 is an internal discussion between the Navy RPM, technical support and contract support. The Navy makes the ultimate decision whether a WCSD is necessary.

Step 2 is the literature search which should include the following types of info (this is only a partial list):

- Locations and nature of potentially contaminated sites (CERCLA sites, RCRA sites, and state listed hazardous waste sites),
- Locations and nature of past response actions,
- Locations of petroleum-oil-lubricant sites,
- Data on water/sediment quality,
- Airborne release sources and associated air quality data,
- Dredging locations,
- Locations of storm water and wastewater outfalls,
- Location and nature of industrial plants (e.g., chemical plants, metal plating facilities) & power plants (including water outfall and air emission data),
- Locations of wastewater treatment plants (including outfall quantity and quality),
- Locations of boat facilities such as marinas and maintenance shops & ship activity/movement

- Aerial photographs and
- Other possible sources including new construction activities and discharges.

How is a WCSD Developed? (cont.)

Step 3: Preliminary watershed conceptual map

- Sources should be listed in generic terms and color coded

Step 4: Watershed Visit

Step 5: Research records to fill data gaps

Step 6: Conceptual Site Model

- Graphic CSM with supporting text
- Identifies Navy and non-Navy sources and release and transport mechanisms

Step 7: Write Document

- Include: Introduction, General Setting, Results, Conclusions and Recommendations and References

Step 3 – Identify and plot on a map all of the potential sources found in the literature search and non-Navy sources should be listed in generic terms (power plant, CERCLA site, etc.) and color coded. Actual company and municipality names should not be used.

Step 4 – A site visit should be conducted to verify and confirm information from literature search.

Step 5 – Update the literature search and Watershed Conceptual map based on the visit and any follow on record searches.

Step 6 – Again, non-Navy sources should be mentioned in generic terms and color coded. Once finalized the WCSD should be incorporated into a complete, refined CSM.

Step 7 – Contents should include: Introduction (why required, purpose), General Setting (installation info, surrounding area info like industries, towns, agriculture), Results (CSM and results of literature search), Conclusions and Recommendations (concludes with a list of Navy and non-Navy sources and how results should be taken into consideration during investigation, remediation or LTMP), and finally References

Sediment Policy Requirement #2

All investigations shall primarily be linked to a specific Navy CERCLA/RCRA site [including MRP].

- Requires the use of DQOs and developing a refined CSM
- Consider innovative investigation tools
 - Forensic chemistry/Fingerprinting
 - Rapid assessment/Field screening tools
- Allows for the expenditure of ER,N/BRAC funds to determine link between onshore/source and offshore/sediment



Courtesy U.S. Navy

- **If primary source is non-Navy, then investigations should cease**
 - Inform counsel and NAVFAC HQ

Requirement number 2....

Simply there has to be a link to a site for a sediment investigation to continue. If a clear link is not discovered, then any further investigation should cease and management and counsel should get involved.

There are RITS and T2 tools available to assist with both of these innovative tool examples.

Sediment Policy Requirement #3

All sediment investigations and response actions shall be consistent with Navy policies on risk assessment and background chemical levels.

- HRA policy
- ERA policy
- Background policy

DEPARTMENT OF THE NAVY
12 APR 10

From: Chief of Naval Operations
To: Commander, Naval Facilities Engineering Command

Subject: NAVY POLICY ON THE USE OF BACKGROUND CHEMICAL LEVELS

1. Reference (1) is provided in response to field requests to clarify Navy policy on the management of background chemical levels in sediment in the Department of Defense Program. This policy clarifies the Navy's interpretation of the Department of Defense's Risk Assessment and Response Policy (DOD-RARP) and the Navy's Risk Assessment and Response Policy (Navy-RARP) in the context of the Department of Defense's Risk Assessment and Response Policy (DOD-RARP) and the Navy's Risk Assessment and Response Policy (Navy-RARP).

2. Questions can be addressed to your office at (703) 692-1711, DD Form 1375 or to me at (703) 692-1711, DD Form 1375.

David L. Allen
Special Assistant for RAS

Copy to:
NAVFACENGCOM (Code 30)
NAVFACENGCOM (Code 30)

Requirement 3....

As stated previously the Navy policies all complement each other and do not conflict. Investigation and remediation of sediment sites need to comply with the other policies. For example, reference concentrations need to be established, site-specific cleanups need to be calculated and be risk-based...

Sediment Policy Requirement #4

Sediment cleanup goals shall be developed based on site-specific information and shall be risk-based.

- Link between unacceptable risks from contaminants to a Navy CERCLA/RCRA source
- Risk-based sediment cleanup goals shall be developed using site-specific information
- Review of response action alternatives must include evaluation of
 - The protectiveness of human health and the environment,
 - The short and long term implementation risk,
 - The potential impact to the natural resources, and the
 - Potential for sediment to be re-contaminated from non-Navy sources
- All reasonably feasible remedies should be evaluated

39 Sediment Policy Details

RITS Fall 2010: Sediments Part 1

Risk-based sediment cleanup goals shall be developed using site-specific information

- Screening values must not be used as cleanup goals nor shall cleanup values below background chemical levels be used.
- Develop cleanup goals to include, but not be limited to, land use and bioavailability.

Review of response action alternatives must include evaluation of

- The protectiveness of human health and the environment,
- The short and long term implementation risk,
- The potential impact to the natural resources, and the
- Potential for sediment to be recontaminated from non-Navy sources (WCSD helps with this)

All reasonably feasible remedies should be evaluated

- Monitored Natural Recovery/Natural Attenuation of sediments and/or a combination of other cleanup alternatives should be considered

Sediment Policy Requirement #5

The Navy shall not clean up contamination from a non-Navy source where the Navy has not contributed to the risk in sediments. The Navy will not clean up a site before the source is contained. Any potential re-contamination by non-Navy sources shall be documented.

- Only sediment sites with known Navy contamination sources that demonstrate unacceptable risk will be remediated
- All Navy sources shall be contained before sediment response actions are initiated
- Potential re-contamination from non-Navy sources shall be documented before any response action is undertaken
 - Document in the response action completion report

Potential re-contamination from non-Navy source(s) shall be documented in the investigation report and ROD before any response action is undertaken and in the response action completion report

Any potential for re-contamination from other sources needs to be communicated with NAVFAC HQ.

Sediment Policy Requirement #6

A monitoring plan with exit strategies shall be developed before collecting the first monitoring sample.

- Monitoring plan must be completed before the first sample is collected
- The DQO process must be employed to design the plan
- The monitoring plan must have the number, type (biota or bulk chemistry), location, and duration of all samples
- Exit strategies must be included in all monitoring plans
 - Must be measurable
 - Specific to the site

Exit strategies and exit criteria need to be measurable and specific to the site and the CSM to the extent possible. For example an exit point based on the reduction of fish tissue concentrations is not specific to the site as it can be influenced by many factors that may be unrelated to the site.

Presentation Overview

- Introduction
- Sediment Policies
- Sediment Guidance Documents
- Sediment Policy Details
- Sediment Case Studies
- Summary

- Pearl Harbor, HI
- Old Fire Fighting Training Area (OFFTA), Naval Station Newport, RI

Sediment Policy Case Study #1 – Pearl Harbor

- **Sediment samples collected in 1996 throughout the harbor using a random, stratified sampling approach**
- **Additional RI sampling conducted in 2009 to fill data gaps in 1996 data**
- **2010 RI identified areas recommended for further consideration in FS, including an area attributable to non-Navy contamination**

In 1996, sediment samples were collected from 219 locations throughout the harbor with more samples collected in locations suspected of having contamination and in nearshore areas. The samples were collected from the top 2 cm of sediment, which was the recommendation from the regulators at the time to follow the NOAA status and trend sampling program. In addition, tissue samples were collected of fish and crab in 15 locations, shown in blue on the figure and macroinvertebrate samples were collected from each sediment location. The samples were analyzed for 243 chemicals and toxicity tests were also run on the samples.

In 2009, sediment samples were collected where the 1996 data showed higher concentrations and near suspected sources, including the stream mouths. Sediment samples were collected from 4 to 6 foot cores using a van deem sampler for the surface samples and a vibracore for the deeper samples. Tissue sampling was limited to fish samples. The samples were collected in areas with higher concentrations and near suspected sources and co-located with sediment samples. The targeted species that were agreed upon were bandtailed goatfish and tilapia, which were the same fish collected in 1996. This way the results were comparable and also limited to territorial fish with limited home range so the results could be tied to the sediment.

Pearl Harbor Policy Consistencies

- Navy “owns” submerged lands of Pearl Harbor
- Policy Consistencies
 - Identify all sources
 - Investigations & cleanups consistent with policies on Risk Assessment and Background
 - Sediment Cleanup Goals based on site-specific info and be risk-based
 - Navy shall not clean up non-navy contamination
 - Navy shall not clean up before sources are contained
 - Must have a monitoring plan with an exit strategy prior to collecting any monitoring data
 - Development of a WCSD

Pearl Harbor is a relatively unique in that the Navy owns the submerged lands. Still the following policy items apply to Pearl Harbor.

Pearl Harbor Policy Challenges

- **Characterize sediment where contamination is suspected regardless of source**
- **Evaluate and recommend remedy for areas requiring remediation regardless of source**
- **Recover cost from Potentially Responsible Parties (PRP)**

Where Pearl Harbor deviates from the policy is...

Pearl Harbor Project Challenges

- **The establishment of cleanup levels**
- **Determining PRP responsibility**
- **Impact of future dredging**
 - Compared sample depth against dredge depth to determine if contaminated sediment would be exposed in the future
 - Regulator requesting monitoring and five-year reviews even in areas where data shows contaminated sediment will not be exposed
- **Addressing continuing inputs**
- **Investigation/remediation under piers**
- **Determining fish monitoring responsibility**

Listed here are some future challenges for this project. One challenge will be getting agreement on cleanup levels based on new bioaccumulation numbers. Next there's at least one area in the harbor we're recommending further action that isn't a Navy source. The source of this area's contamination is most likely the power plant. From discussion with HQ this area will be included in the FS work plan and alternatives will be developed for the area and then cost may be passed onto the PRP. We also need to address the impact of future dredging both in areas where the final dredge depth may be below the length of our cores or in areas where there's construction dredging that hasn't been identified yet. Another challenge will be addressing continuing inputs especially inputs from storm drains that are meeting NPDES requirements. Next is we still need to figure out what we do with sediment under piers. We didn't sample under piers and even if the sediment is contaminated, how do we sample and remediate this sediment. Lastly there may be some debate over who's responsibility it will be if the FS determines certain areas require fish monitoring as part of the remedy. This will need to be discussed further with HQ if it's the Navy's responsibility since the Navy owns the submerged lands.

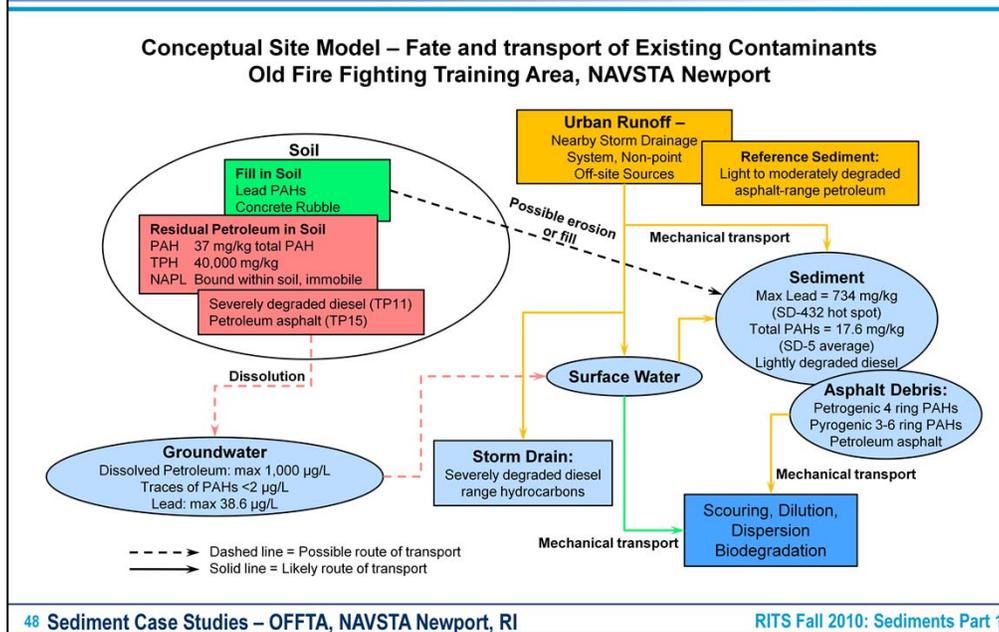
Sediment Policy Case Study #2 – Old Fire Fighting Training Area, Naval Station Newport, RI

- 1. Down-bay contaminant migration**
- 2. Regional stormwater and industrial runoff**
- 3. Tidal exchange from both north and south ends of the harbor**
- 4. Historic site discharges**

Lastly, I just want to quickly go through an example of a maybe successful example of implementing the sediment policy. This is not a perfect example because the investigation of this site started in the late 90s prior to the sediment policy, but for some reason, maybe just dumb luck, we ended up following the majority of the requirements of the policy.

The site is the Old Fire Fighting Training Area in Newport RI. This figure shows a tier 1 level WCSD and gives you an approximation of where the site is.

Development of OFFTA CSM



That fact along with concentration of PAHs detected in reference areas lead us to further refine the CSM to include urban runoff and storm water inputs into the CSM and to investigate the potential contribution, we performed forensic chemistry and too make a very long, complex story short...reference areas also had hits for PAHs, became apparent that there was another source...

OFFTA Sediment Examination Results

- Fire-fighting training activities led to releases of contaminants into soils and probably into the nearshore sediments
- Performed RI, HHRA, and ERA and calculated cleanup goals
- Forensic studies indicate that PAHs in sediments more closely resemble those in urban runoff and storm drain water, than the PAHs that were detected in soil and groundwater at the site
- Performed interim source removal (surface & subsurface soils)
- FS is Final
 - EPA agreed that sediment contamination is not site-related

This is where we are currently....

1. Forensics used
2. Determined they were related to offsite Anthropogenic sources
3. Interim removal action for actual onsite sources under state's UST program (and not under CERCLA)
4. Hit requirements #1 (ref sources), 2 (all invest traced to distinguish site sources v. pkg lots sources -thru forensics), 3 (consistent w/bkgd policy, others), 4 (calc'd PRGs, but not needed), 5 (Navy shall not cleanup non-navy sources – ref samples not navy source), 6 not met/Not applicable

Presentation Overview

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- **Summary**
 - Summary/Take-Home Messages
 - SIFT Points of Contact
 - References

Summary/Take-Home Messages

- All Navy sediment investigations need to be linked to a specific Navy CERCLA/RCRA/MRP site
- WCSD is required when there are potential non-Navy sources
- Navy shall not clean up contamination from a non-Navy source where the Navy has not contributed to the risk
- Policies, guidance and tools are available to assist RPMs with identified sediment challenges
- NAVFAC Sediment Issues Focus Team (SIFT) personnel are available to support RPMs

References

- **DON Policy on Sediment Site Investigation and Response Action, Feb 2002**
- **DON Policy on the Use of Background Chemical Levels, Jan 2004**
- **Implementation Guide for Assessing and Managing Contaminated Sediments at Navy Facilities, Jan 2005**
- **User's Guide for Assessing Sediment Transport at Navy Facilities, Sep 2007**
- **NAVFAC Guidance for Environmental Background Analysis Vol. II - Sediments, Apr 2003**
- **DON Guidance for Planning & Optimizing Monitoring Strategies, Ch 6 – Contaminated Sediments, Aug 2008**
- **CNO Watershed Contaminated Source Document (WCSD) Factsheet , Mar 2003**
- **Using Sediment Toxicity Identification Evaluation to Improve the Development of Remedial Goals for Aquatic Habitats, Mar 2003**
- **User's Guide for Determining the Source of Contaminants in Sediments, Sep 2003**

References (cont.)

- **Navy Policy for Conducting Ecological Risk Assessments, Apr 1999**
- **CNO Policy on Conducting Human Health Risk Assessments Under the Environmental Restoration Program, Feb 2001**
- **NAVFAC Ecological Risk Assessment Website**
- **NAVFAC Human Health Risk Assessment Guidance**