# Remedy Optimization at Navy Restoration Sites

Tanwir Chaudhry (Consultant NAVFAC ESC)

Karla Harre (NAVFAC ESC)

Environment, Energy Security, & Sustainability Symposium

Denver, CO

June 14-17, 2010

# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **JUN 2010** | | **00-00-2010 to 00-00-2010** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **Remedy Optimization at Navy Restoration Sites** | 5b. GRANT NUMBER |
| | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | 5d. PROJECT NUMBER |
| | 5e. TASK NUMBER |
| | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Facilities Engineering Command,Engineering Service Center,1100 23rd Street,Port Hueneme,CA,93043** | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |

12. DISTRIBUTION/AVAILABILITY STATEMENT
**Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES
**Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 14-17 June 2010 in Denver, CO.**

14. ABSTRACT

15. SUBJECT TERMS

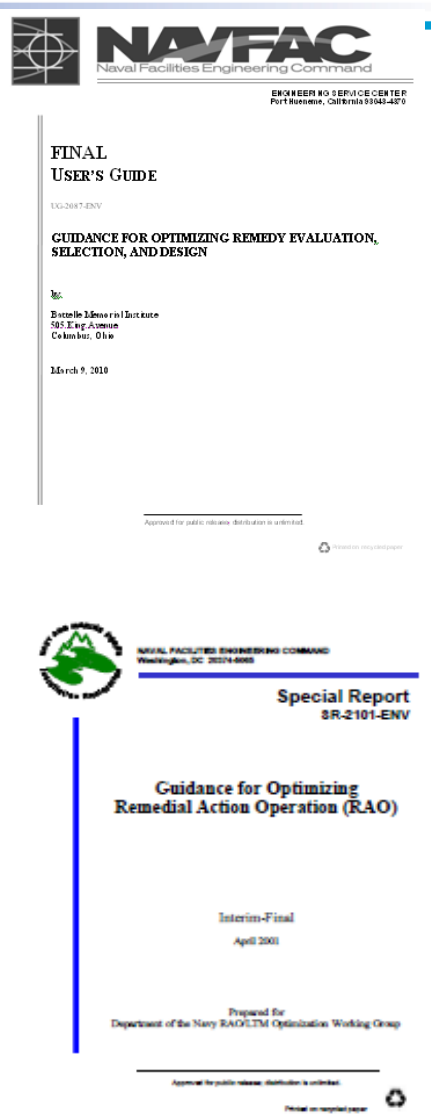
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | |
| **unclassified** | **unclassified** | **unclassified** | **Same as Report (SAR)** | **27** | |

# Presentation Outline

- Background
- Optimizing Remedy Selection
- Optimization Remedial Action Operation
- Implementing and Tracking Optimization Actions
- Summary

# Navy Guidance Documents

- Developed by Navy Optimization Workgroup
- Guidance for Optimizing Remedy Evaluation, Selection, and Design – March 2010
  - –Expands and updates 2004 version
- Guidance for Optimizing Remedial Action Operation (RAO), April 2001
  - – Planned update 2011


NAVFAC
Naval Facilities Engineering Command

FINAL
USER'S GUIDE

GUIDANCE FOR OPTIMIZING REMEDY EVALUATION, SELECTION, AND DESIGN

March 9, 2010

Special Report
SR-2101-ENV

Guidance for Optimizing
Remedial Action Operation (RAO)

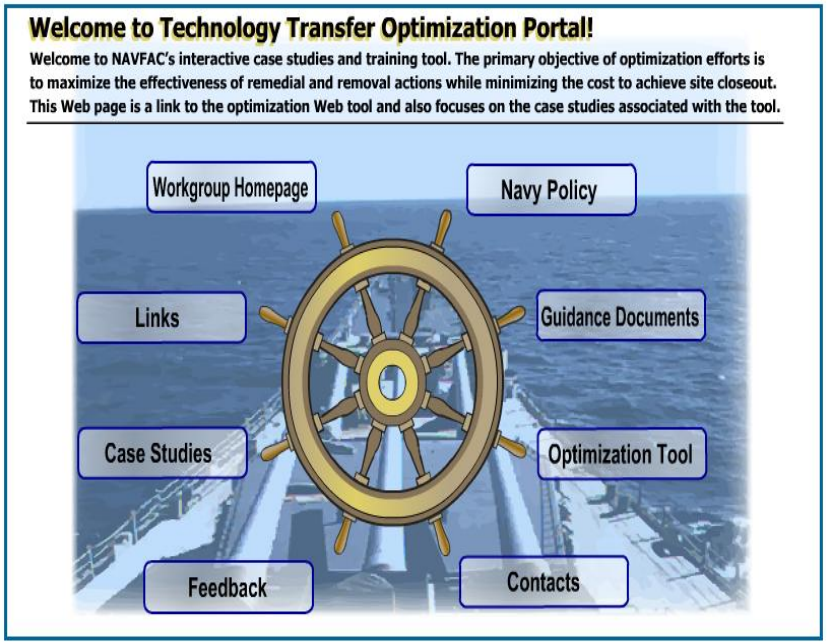
Interim-Final

April 2001

# Navy Guidance Documents

- Guidance documents available form Optimization Portal

www.ert2.org/T2Opt



# Navy Optimization Policy

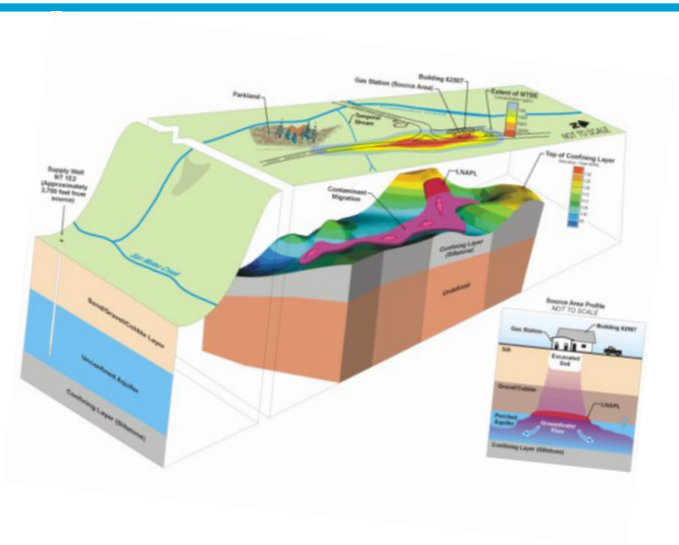
- Policy issued April 2004
  - –Optimization during all ER Program phases
  - –Third party for conducting optimization evaluations
  - –Requirements for New Pump &Treat systems
  - –New NORM module to track optimization projects and progress
  - –Use Navy optimization guidance documents

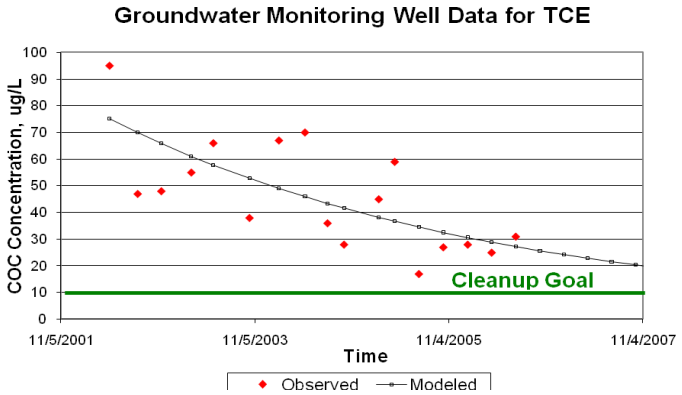
- Background
- Optimizing Remedy Selection
- Optimization Remedial Action Operation
- Implementing and Tracking Optimization Actions
- Summary

# Basic Concepts - Optimization Elements

## Conceptual Site Model

- An effective CSM provides information on:
  - –Contaminant source and release
  - –Contaminant distribution, transport, and fate
  - –Geologic and hydrogeologic conditions
  - –Risk assessment
- Need to update CSM as site conditions change
- Graphical representations are very helpful





# Basic Concepts - Optimization Elements

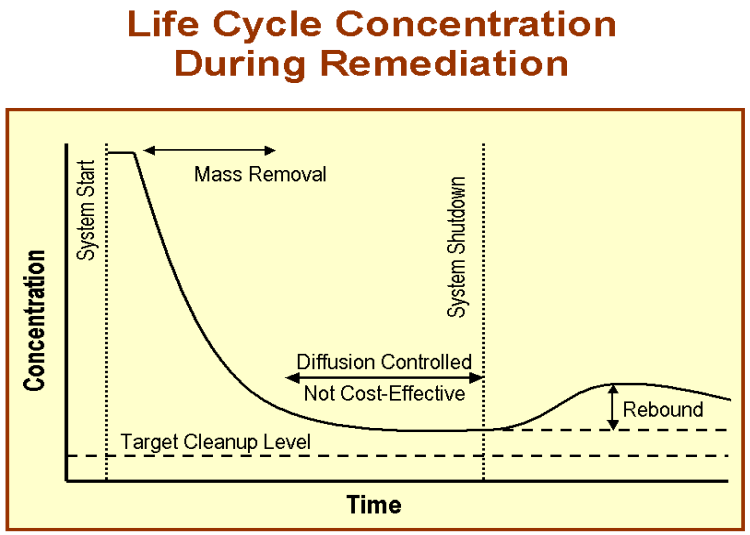
## Remedial Action Objectives

- Provide a clear and concise description of what the remedial/removal action will accomplish. Examples:
  - –Prevent, to the extent practicable, migration of VOCs in soil to groundwater
  - –Minimize off-site migration of VOCs in groundwater to protect beneficial uses
- Do not specify technology or length of time

## Target Treatment Zones

- Identify plume zones ( e.g. source area, moderate COC levels in dissolved plume, very dilute plume) and then target these areas with specific technologies
  - –Remedy for source area not suitable for dilute plume

# Basic Concepts - Optimization Elements



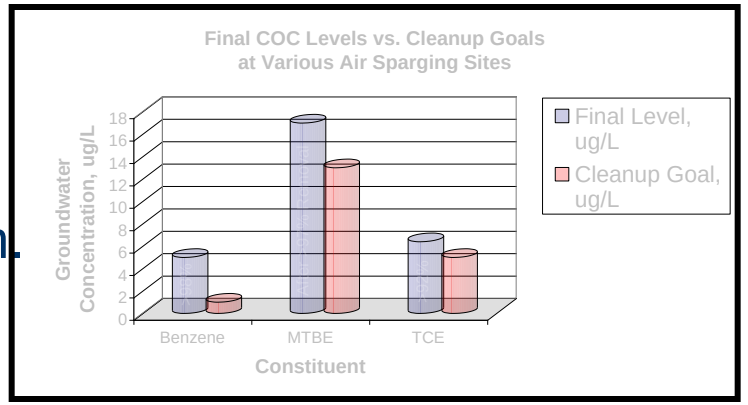

## Treatment Train

- Using multiple technologies for achieving cleanup goals cost effectively
  - –Active remediation for a plume zone followed by less O&M intensive remedy such as MNA

# Basic Concepts - Optimization Elements

## Performance Objectives

- Need performance objectives based on operational efficiency and suitability of the selected remedy
  - Typical engineering performance & tech. limitations
- Examples
  - Reduction of overall contaminant concentrations
  - Mass removal to asymptotic levels (following optimization)



# Optimization Considerations - Feasibility Study

- Identify and evaluate potential remediation alternatives & select the preferred alternative
- Technology selection based on life cycle and optimization concepts is a must for cost effective site closeout
- EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA - EPA/ 540/ G- 89/ 004
  - Nine evaluation criteria
  - Not focused on life cycle concepts

- DON remedy selection optimization includes:
  - Optimizing Pre-FS - Remedial Alternatives Analysis
  - Optimization review draft FS - Third party review
  - Green and Sustainable Remediation Evaluation

- Optimization Workgroup is developing guidance for GSR
  - GSR Web portal

# Optimization Considerations- Flexible ROD

- Flexible to change remedy based on:
  - Performance objectives
  - Optimization
- A single remedy is often not able to reduce COCs to MCLs
- Facilitate treatment train / technology substitution
- ROD flexibility could avoid cost and time consuming process for ROD modification
- Navy improved ROD projects
  - Reduced length of the document
  - Consolidated outline
  - Improved graphics & data tables
  - Detailed references to admin. record

# Optimization Considerations- Remedial Design

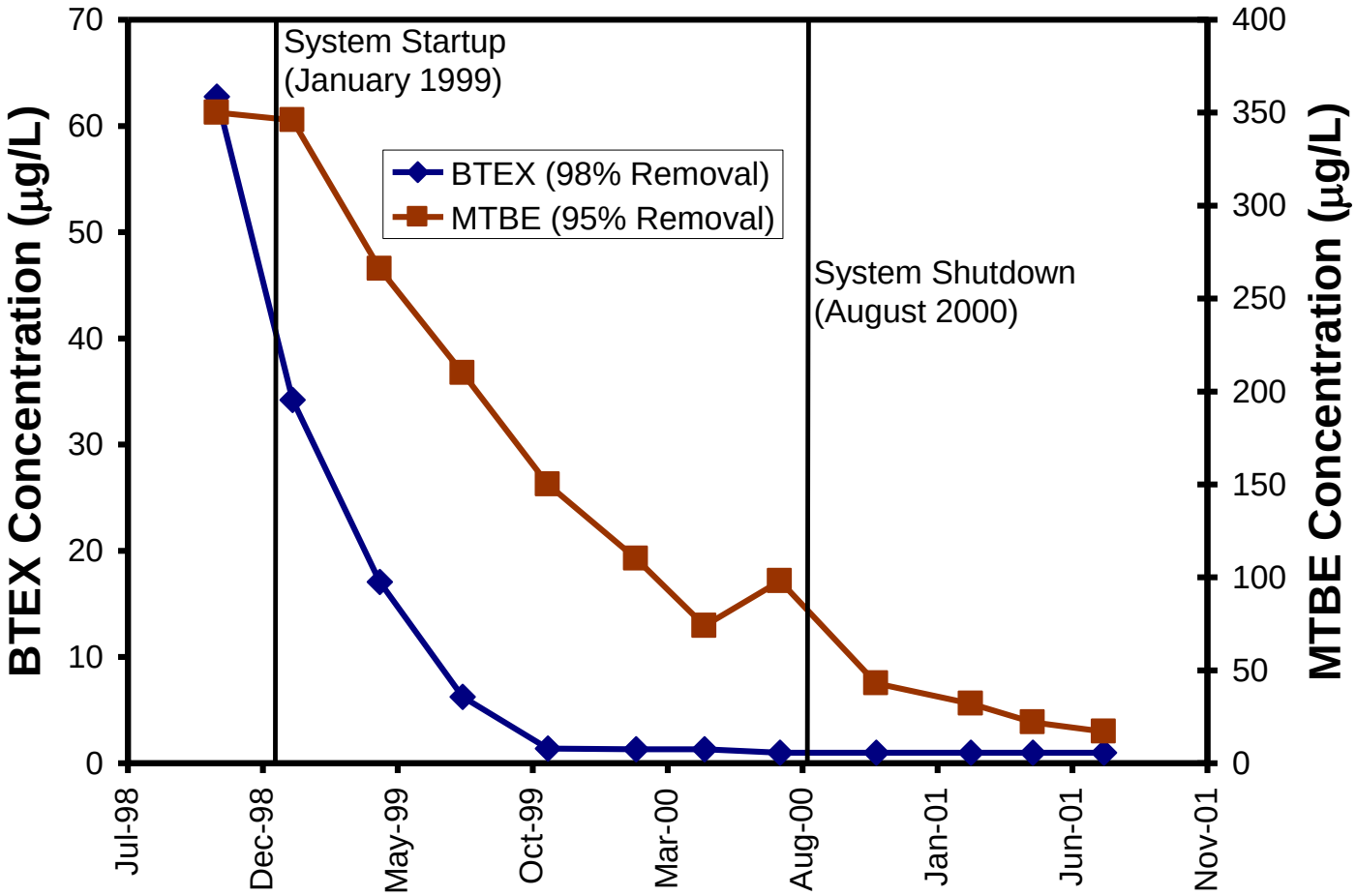
- Remedy design based on life-cycle concept
  - Declining contaminant concentration
  - Design for high initial concentration for the entire life of the project will be high in capital and O&M cost
- Based on updated CSM
- General Considerations
  - Passive delivery systems
  - Lease equipment?
  - Design for intermittent operation
  - Process control options
  - Standard design and parts
  - Ex situ treatment options
  - Sustainable remediation practices

- Background
- Optimizing Remedy Selection
- Optimization Remedial Action Operation
- Implementing and Tracking Optimization Actions
- Summary

# RA-O Optimization Process

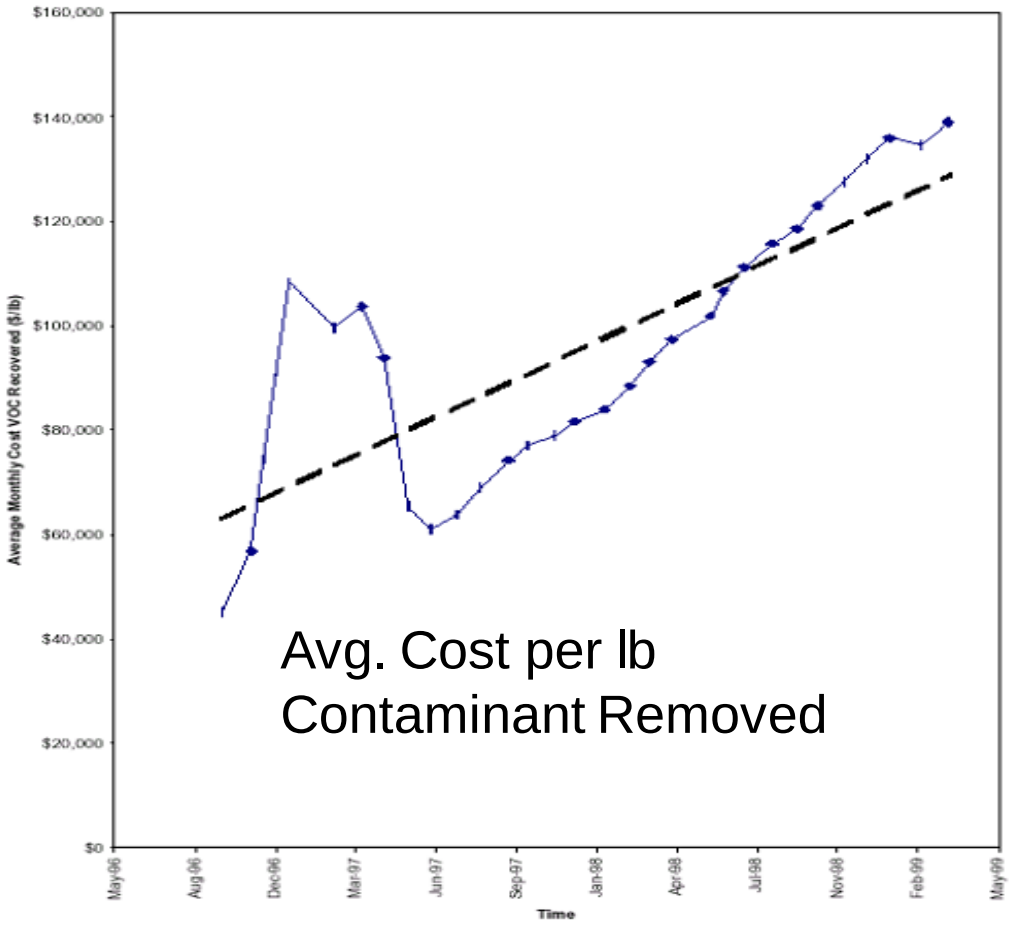
- Step 1: Review and Evaluate Remedial Action Objectives
- Step 2: Evaluate Remedial System Performance
  - Remediation effectiveness - contaminant removal
  - Is there a definite trend indicating progress toward cleanup objectives?
  - Will objectives be achieved as estimated?
  - Time series plots
    - –Concentration vs. time
    - –Cumulative mass removed versus time
    - –New green & sustainable remediation metrics
      - »Greenhouse gas emission
      - »Energy consumption
      - »Other metrics

# Contaminant Reduction

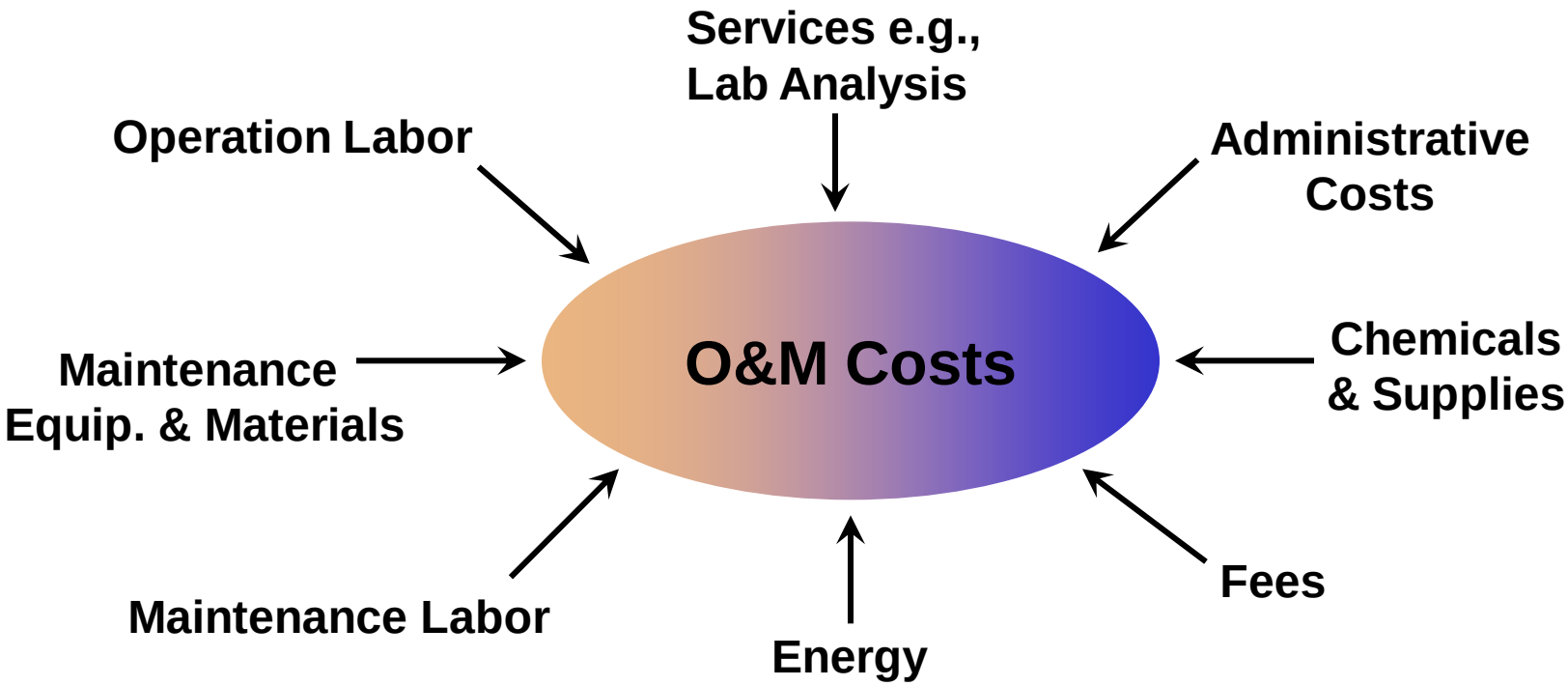


# Step 3: Evaluate Cost Effectiveness of Existing System

- Is contaminant removal cost-effective?
  - –Plot cumulative mass re versus cumulative cost
  - –Plot cost per unit mass removed versus time
- Are annual O&M costs decreasing?



# Typical O&M Costs



# Step 4. Identify System Modifications / Alternatives

- Modify Remedial System Operations
- Minimize O&M costs
- Modifications to the Existing Remedial Strategy
- Identify Alternative Remedial Strategy
- Other Considerations
  - Revising cleanup goals, LUCs, TI (not common)

# Step 5. Develop & Prioritize Optimization Strategies

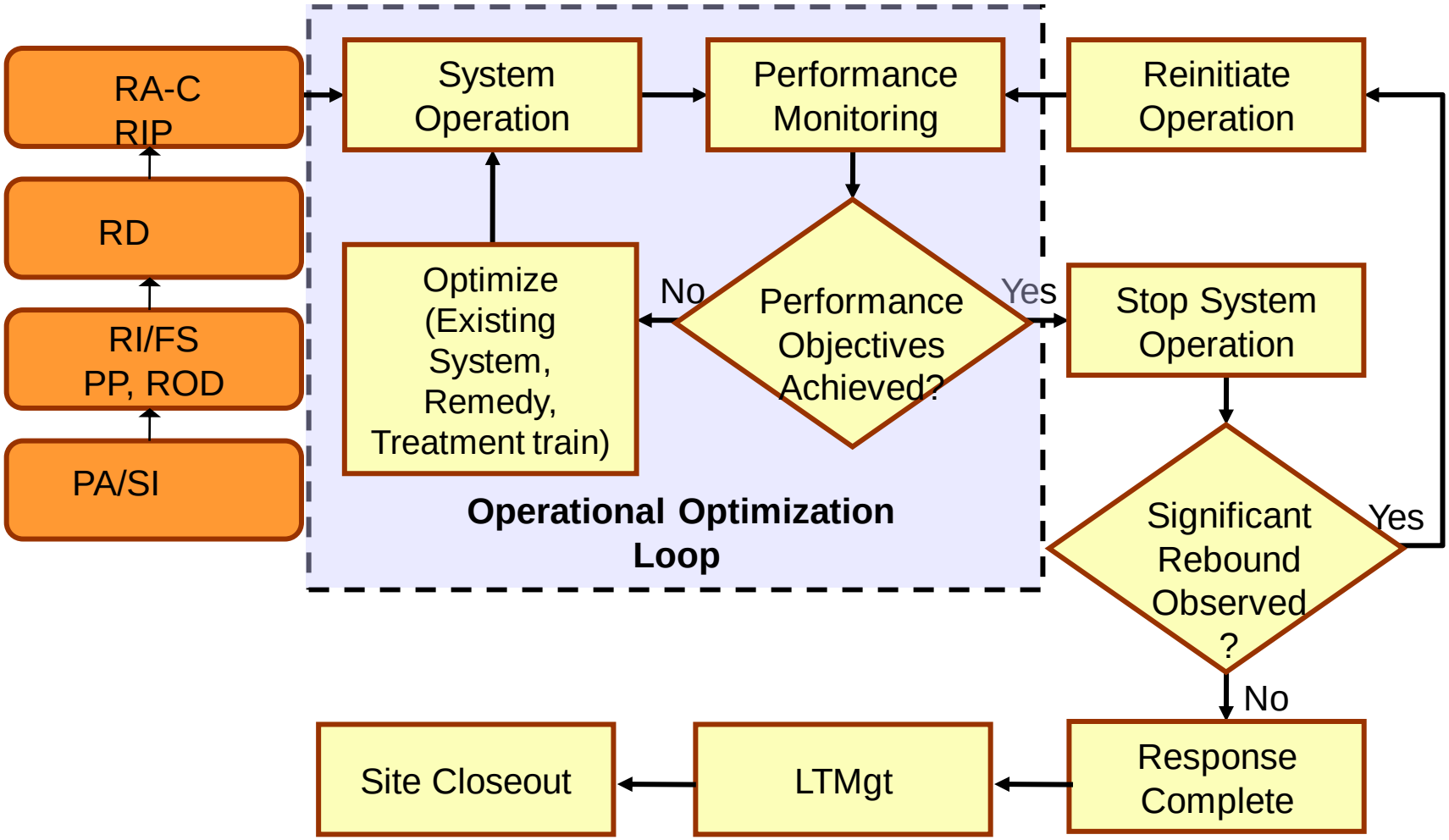
- Life cycle cost analysis - basis for prioritization
  - Include capital costs for modifications and O&M costs
  - Net Present Value approach and Total Cost
  - Low hanging fruit
- Develop Optimization Report

- Background
- Optimizing Remedy Selection
- Optimization Remedial Action Operation
- Implementing and Tracking Optimization Actions
- Summary

# Navy RPM Actions

- RPM and contractor implement optimization recommendations
- Regulatory buy-in
- For evaluating additional remedial options, may need a focused feasibility study
- May need to prepare Explanation of Significant Differences, or ROD modification (not very common)
- Continue to track remediation progress and costs

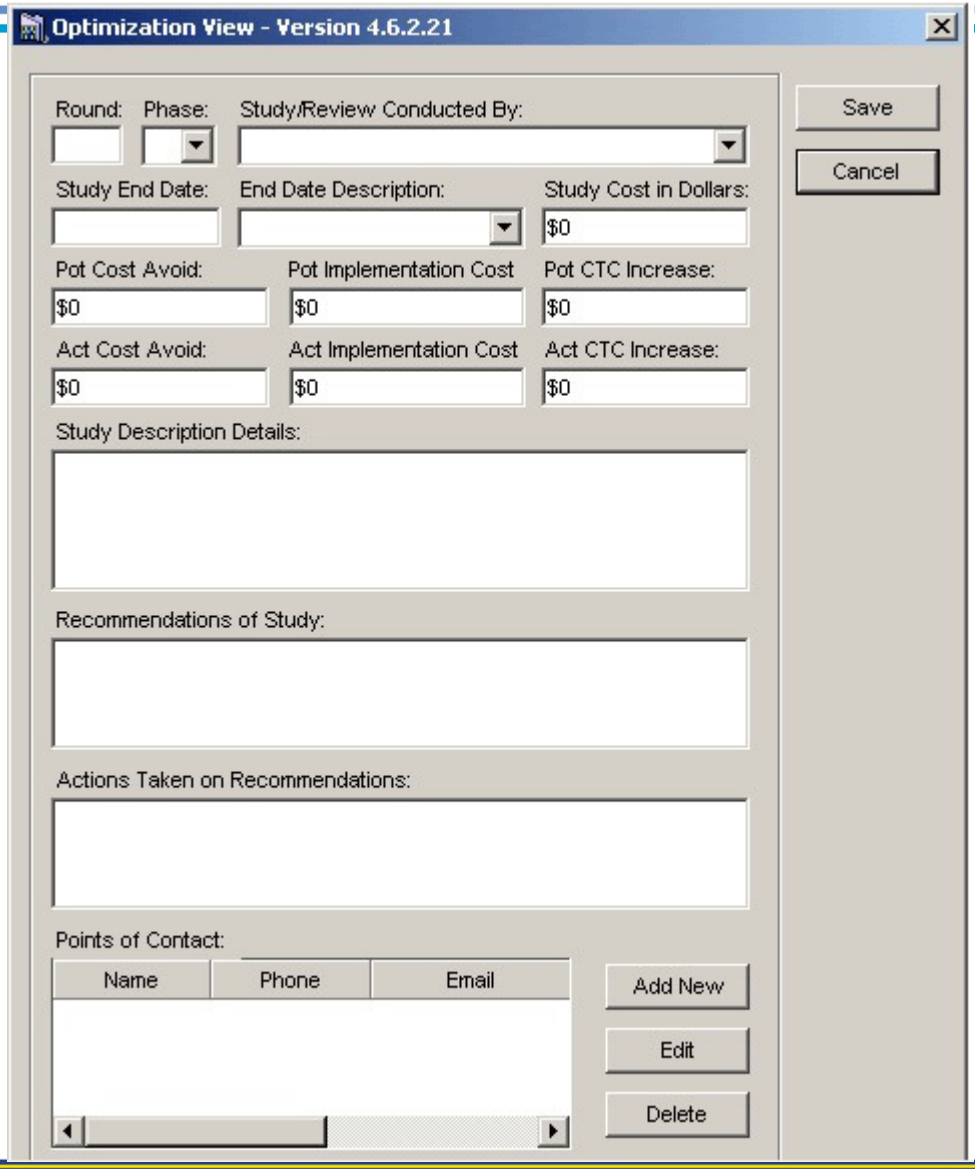
# Optimization & Exit Strategy Example



# Resources for Navy RPMs

- Regular classes through Naval Civil Engineers Officers School (CECOS)
- NAVFAC Remediation Innovative Technology Seminar offerings
- Annual Navy & Marine Corp Cleanup Conference
- Navy Optimization Workgroup members
- NAVFAC Website. Optimization portal – www.ert2.org

# Optimization Tracking - NORM Optimization Module



# Summary

- Navy requires optimization of all remedial action during all ER phases
- Guidance documents are available and training opportunities are routinely provided to Navy RPMs and contractors
- Improve remedy selection – must consider various concepts
- Flexible RODs
- Evaluate performance and optimize remedy performance
- Implement and track optimization actions


Questions