CONTAMINATED SEDIMENT SITES AT THE CROSSROAD: CRITICAL CHALLENGES AND THE URGENT NEED FOR SUSTAINABLE SOLUTIONS

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SMWG Background

- Formed in May 1998 by parties responsible for developing and implementing contaminated sediment management strategies.
- Membership now includes more than 100 entities that work on sediment issues.

SMWG Mission

To advance scientifically sound approaches to improve sediment risk assessment, collect and share information to enhance and evaluate remedial technologies and alternatives, and promote risk-based and cost-effective sediment management decisions.

SMWG General Members

SMWG Associate Members

2014 ASSOCIATE MEMBERS (15)

American Chemistry Council

CGLI Council of GREAT LAKES INDUSTRIES

ERDC

American Forest & Paper Assoc.

AF&PA

EPRI Electric Power Research Institute

U.S. Navy, Space & Naval Warfare Systems Center, San Diego

SPAWAR

International Zinc Association

Zinc essential for life

U.S. Navy, Naval Facilities Eng. Command

NAVFAC Naval Facilities Engineering Command

AGA American Gas Association

National Council of Paper Industry for Air & Stream Improvement

ncasi

U.S. Navy, Chief of Naval Operations Office

American Petroleum Institute

Centre for Advanced Analytical Chemistry

CSIRO

Norwegian Institute for Water

NIVA Norsk institutt for vannforskning

Utility Solid Waste Activities Group

USWAG

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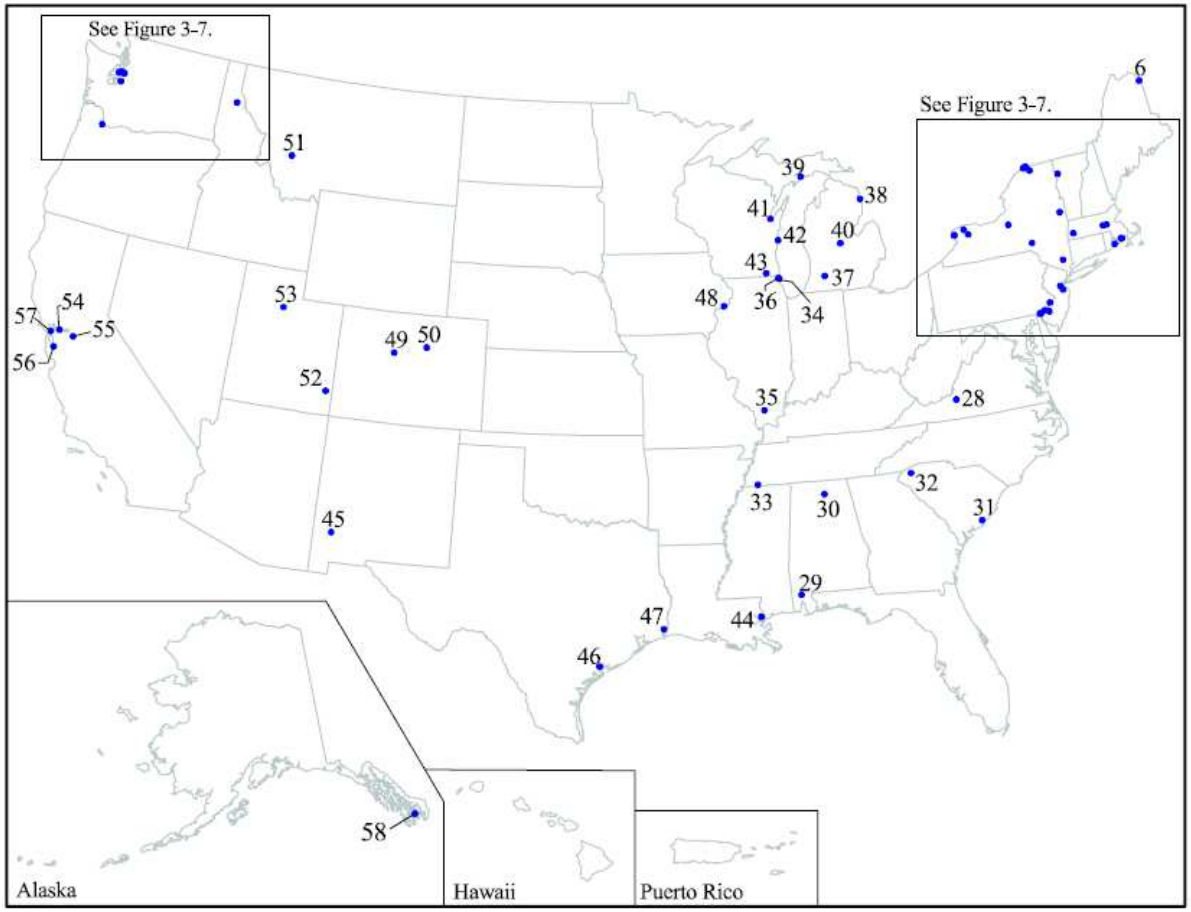
Contaminated Sediment Sites

- There are 11 “mega” contaminated sediment sites in the Superfund program.
  - Sediment portion of selected remedy > $50 million
- Other sites expected to become “mega” sites as investigations are completed and remedies selected.
- Examples
  - Proposed Plan, Lower Duwamish Waterway (2013, Region 10)
    - Sediment remedy = $305 million
  - Record of Decision, Gowanus Canal (2013, Region 2)
    - Sediment remedy = $506 million
  - Amended ROD, Fox River OUs 2-5 (2006, Region 5)
    - Sediment remedy = $390 million, now $700 million
  - Proposed Plan, Lower Passaic River (2014, Region 2)
    - Sediment remedy = $1.7 billion

Geographic Scope

- Nationally, sediment issues will be addressed under the Superfund program at more than 150 sites.
  - As many as 65 sites are large enough to be tracked at the national level.
  - Contaminated sediment sites are located in all EPA regions.



From USEPA, *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States,* EPA Number 823R04007 (2004*).*

Impact of the Problem

- Examples of contaminated sediment "mega" Superfund sites
  - Lower Duwamish Waterway (Proposed Plan 2013, Region 10)
    - Sediment remedy = $305 million
  - Gowanus Canal (Record of Decision 2013, Region 2)
    - Sediment remedy = $506 million
  - Lower Passaic River (Proposed Plan 2014, Region 2)
    - Sediment remedy = estimated to be $1.7 bilion
  - Fox River OUs 2-5 (Amended ROD 2006, Region 5)
    - Sediment remedy = $390 million, now $700 million

Key Objective

- Implement cost effective remedies that will control sources and achieve long-term protection while minimizing short-term impacts

Impediments

- Scope and technical complexity of contaminated sediment sites
- Uncertainty
  - Site characterization
  - Exposure & effects assessments
  - Estimating the effect and effectiveness of remedial actions
  - Models (including structure, parameters, output, etc.)
  - Need for consistency in following the National Contaminated Sediment Policy (EPA's 2005 Guidance)

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Manifestation of Difficulties

- Long, expensive remedial investigations
- Disputes over risk assessment
- Battles among experts over models
- Debate and deliberation over establishing “achievable” remediation goals
- Inefficient use of limited resources
- Agency discomfort with uncertainty
  draws out process and increases cost
- While grappling with the above,
  risks are on-going and expenses mount

Key Concept - National Consistency

- Nationally consistent program implementation at contaminated sediment sites
  - results in quicker, more effective, and more permanent risk reduction; and
  - facilitates alignment between USEPA, PRPs, and stakeholders.
- Outcomes
  - Faster, better risk reduction
  - Greater transparency and increased public trust

USEPA Policy – National Consistency

- USEPA Superfund guidance acknowledges the "critical importance of maintaining appropriate national consistency in the remedy selection process."
- "Appropriate consistency" means "applying decision-making processes recommended in national policies and guidance, using the criteria they lay out, and exercising the built-in flexibility as appropriate to address site-specific circumstances."
  - *National Consistency in Superfund Remedy Selection*, OSWER Directive 9200.0-21 (September 25, 1996), p. 2.

USEPA Is National Sediment Policy

- USEPA issued a comprehensive national policy guidance for evaluating cleanup alternatives at contaminated sediment sites in 2005.
  - Embodies national policy on contaminated sediment and should be followed at all contaminated sediment sites.
  - Reiterates 11 risk management principles described in 2002 guidance.
  - Focuses on remedies that control sources and achieve long-term protection while minimizing short-term impacts and being cost-effective.
    - *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, OSWER Directive 9355.0-85 (December 2005), Chapter 7 (emphasis added).

Key Issue - Source Control

- Characterize and understand contribution of on-going sources, especially in urban areas
- Quantify the impact of ongoing sources, e.g. bioavailability of contaminants in dry/wet weather water inputs and/or air deposition
- Control sources before implementing sediment remedies
- Coordinate CERCLA, CWA, and state programs

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Source Control Example

Gowanus Canal (Record of Decision, September 2013)

- Remedial investigation => more than 250 outfalls.
- ROD focused on only two sources (identified as most likely to cause ongoing contamination).
- Other outfalls must be permitted or discontinued.
- Critical issue is the timing and scope of state programs to control ongoing sources vs. sediment cleanup.
- Recontamination remains a significant concern.

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Key Issue – Risk Reduction vs. Mass Removal

- National Policy
  - There are no presumptive remedies at contaminated sediment sites (2005 Guidance, p. 7-16).
  - Regions should not presume “that removal of contaminated sediments from a water body will be necessarily more effective or permanent than capping or MNR” (2005 Guidance, p. 3-16).
  - Remedies should consider “the short-term and long-term risks of all potential cleanup alternatives consistent with the NCP’s nine remedy selection criteria” (2005 Guidance, p. 1), including implementation risks (2005 Guidance, p. 2-14).
  - Regions should select remedies that control sources and achieve long-term protection while minimizing short-term impacts and being cost-effective (2005 Guidance, p. 7-17).

Risk Reduction vs. Mass Removal Example

- Lower Duwamish Waterway (Proposed Plan, February 2013)
  - Remedy combines dredging with other remedial options (capping, enhanced monitored natural recovery, monitored natural recovery)
    - Alternatives 3 through 6 would achieve approximately the same level of long-term risk reduction
    - However, the selected remedy involves additional substantial dredging (+300,000 cy) targeting more mass removal than other protective alternatives
    - Additional dredging is likely to increase constituents of concern into the water and is likely to lead to increased COC concentrations in fish tissue for many years.

Key Issue – Achievable Cleanup Standards

- At many sites, the risk-based cleanup standard is below background.
- CERCLA then defaults to use of background as the standard [Role of Background at Superfund sites, OSWER 9285.6-078 (April 2002)].
- Significant lengthy and costly disputes on cleanup standards and/or appropriate "background" have slowed progress at many medium to mega sites.

Technically Impracticable Cleanup Standards Example

Lockheed West (ROD, Aug 2013); (**Duwamish** PP, 2/13)

- Risk-based sediment cleanup level < natural background
- MTCA: cleanup level = practical quantification limit or natural background, whichever is higher
- Natural background concentration less than anthropogenic background
- In contrast, an ambient water quality ARAR was waived as "technically impractical."
- ARAR cannot be achieved, should be waived.

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Solution - Achievable Cleanup Standards/Realistic Background

- Solution
  - Establish realistic background concentrations, especially for urban waterways
  - Establish realistic (not overly-conservative) reference conditions
  - Develop and implement a consistent, technically and scientifically acceptable approach

Key Issue – CERCLA's Cost-Effectiveness Requirement

- National Policy:
  - Remedies must be cost-effective. Cost-effective means that costs must be proportional to the overall remedial effectiveness.
    - *40 CFR §300.430 (f)(1)(ii)(D)*
  - "[I]f the difference in effectiveness is small but the difference in cost is very large, a proportional relationship between the alternatives does not exist."
    - *Preamble to the NCP, 55 Red Reg 8728 (March 8, 1990)*
  - Regions must select remedies that are cost-effective (2005 Guidance, p. 7-17).

Cost-Effectiveness Example

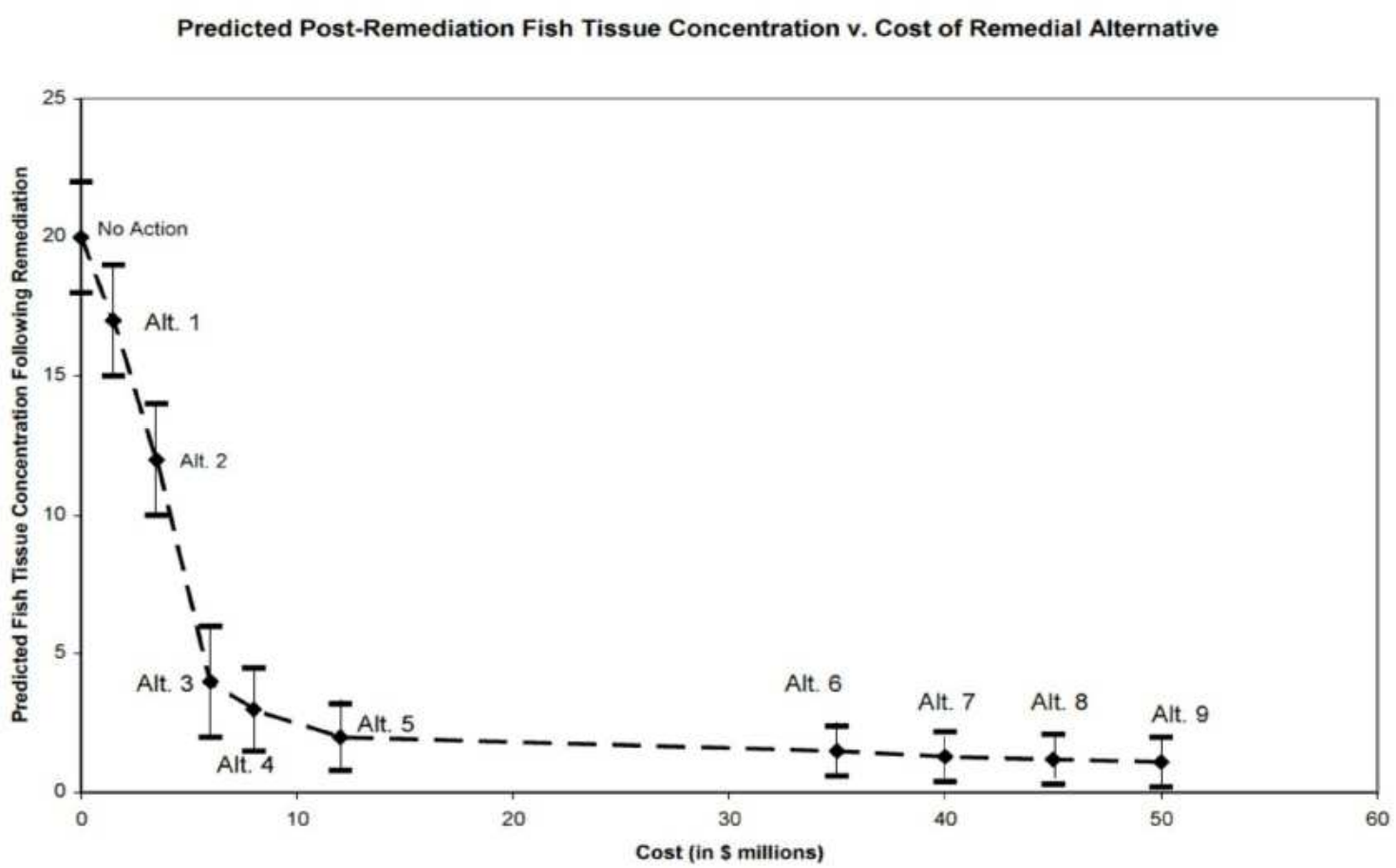
- Lower Duwamish Waterway (Proposed Plan, February 2013)
  - Cost of the remedy is not proportional to the incremental effectiveness it offers compared to other available remedies.
    - Three alternatives would achieve approximately the same level of long-term risk reduction.
    - Selected alternative would achieve almost the same risk reduction for $105 million more than another, equally protective alternative and has 4 additional years and 300,000 cy. of additional dredging.

Cost-Effectiveness Example

Lower 8 Miles of the Passaic River (Proposed Plan, April 2014)

- 48% of dredging ($850 million) for navigation, not remediation
- Confined Aquatic Disposal Facility (potential savings $700 million) not considered
- Benefits of dredging alternative were overstated because plan did not take into account risks created by the dredging remedy itself

Remedy/Cost-Effectiveness Proportionality



Summary – National Sediment Policy

- Nationally consistent program implementation is critical to efficient and effective cleanups.
- Remedy Selection should focus on risk reduction and not mass removal.
- Cleanup goals must be achievable and “background” realistic.
- Technically impracticability must be appropriately evaluated at the remedy selection stage.

USACE/SMWG Workshop

- 58 invited participants from EPA, USACE, Mass DEP, Industry, and Consultants
- **Bold Challenge**: Within the existing Superfund framework (*i.e.*, CERCLA and the NCP), how can we achieve better results at contaminated sediment sites in one half the time and at one half the cost?

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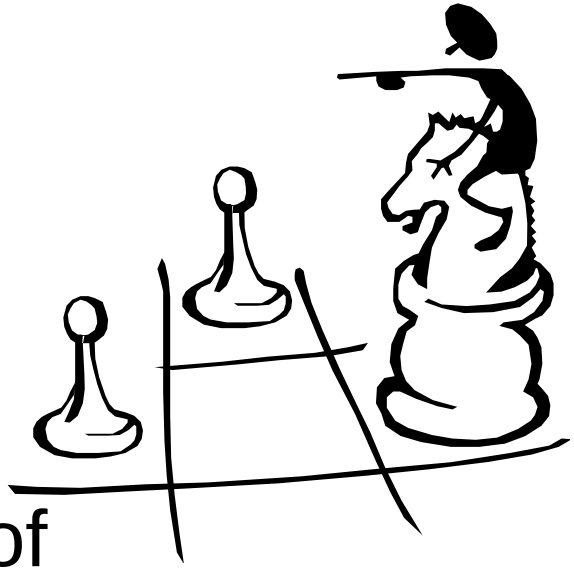
Five Opportunities Emerged

1. Project Vision
2. Stakeholder Engagement
3. Optimize Risk Reduction
   - Strategic Use of Early Actions
   - Sequential Risk Management Analysis
4. Incentivize Progress Toward Risk Reduction
5. Collaboration

Strategic Use of Early Actions

- Efficient and accelerated process for addressing obvious sources and contributors to site risks
- Main objective: Accelerating risk reduction
- Distinct from main objective of pilot studies:
  - Understanding site-specific issues
  - Reducing uncertainties
  - Evaluating what is feasible



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Key Concept - Strategic Use of Early Actions

1. Site enters Superfund
2. Concurrently develop CSM
   - Screen & prioritize areas of the site
     - Areas clearly requiring action ("Action Areas")
     - Areas not requiring action ("No Action Areas")
     - Areas that cannot be classified with available data ("Action Undetermined Areas")
   - Evaluate continuing external sources
3. Implement Early Action(s)
   - Use post-construction monitoring data to refine CSM & reduce uncertainties
4. Proceed with RI/FS
   - Collect additional data, as needed
   - Evaluate previously identified Action Undetermined Areas

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Key Concept – Use of Sequential Risk Management

1. Source Control Evaluation
2. Acknowledge No Action Alternative
3. Sequential Development of Alternatives
4. Quantify Δ Risk Reduction & Δ Cost
5. Evaluate Alternatives Using 9 Criteria
6. Apply Risk Management Principles to Selected Remedy

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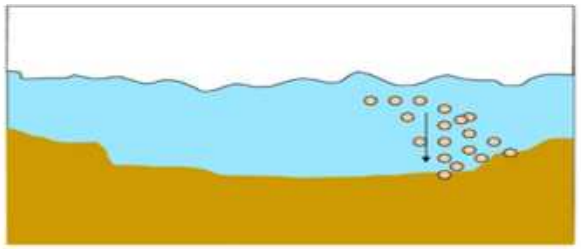
Sequential Risk Management

- MNR
- \+
- Internal Source Control
- \+
- Enhanced Natural Recovery Components
- \+
- Engineered Capping/In-Situ Amendments
- \+
- Dredging/Excavation



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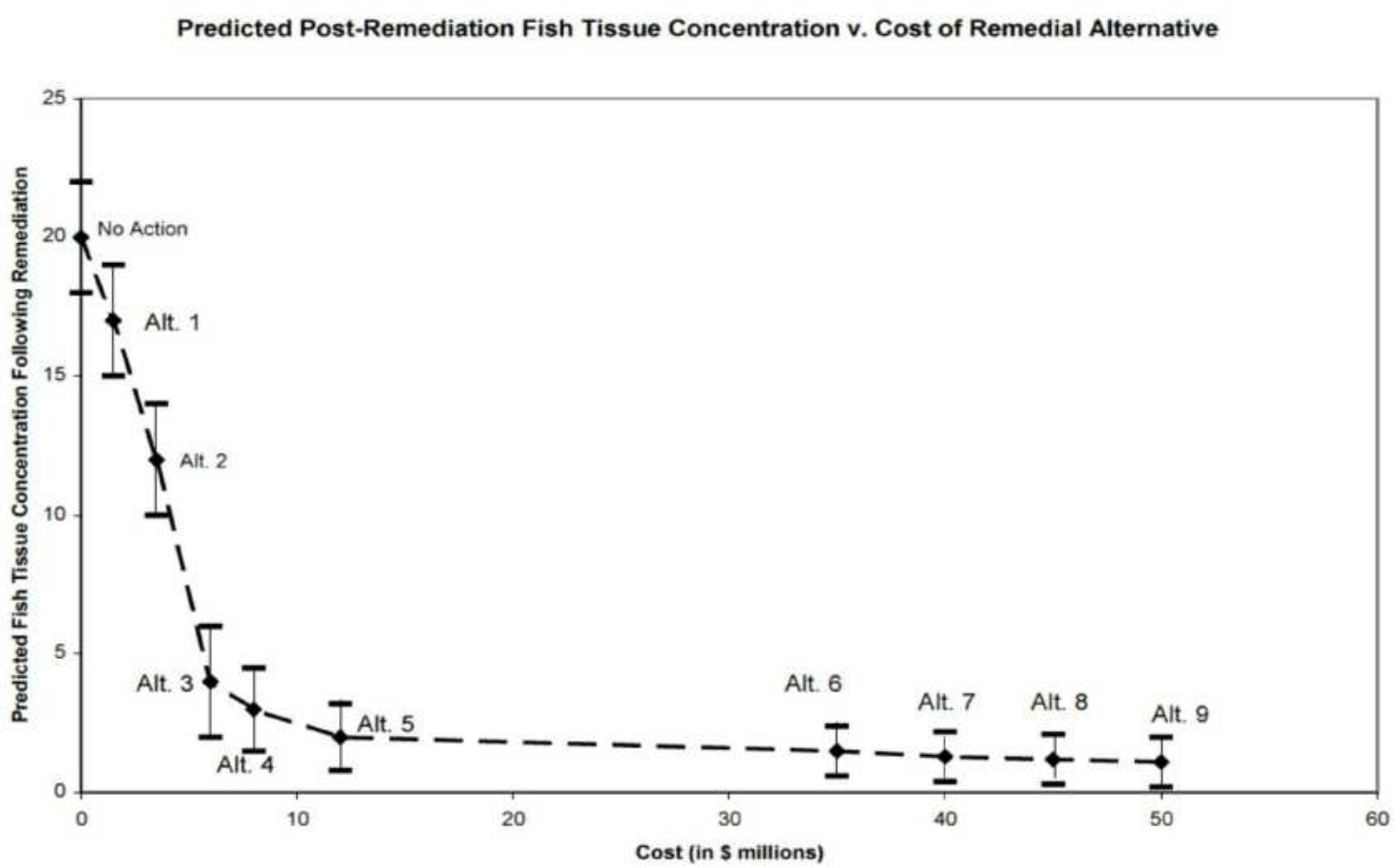
Sequential Risk Management Example



Approach Consistent with National Policy & State of Practice

- Approach is consistent with CERCLA and the NCP
- Approach is consistent with CERCLA guidance
- Approach is also consistent with ITRC's Sediment Remediation Guidance (6-step remedy evaluation framework)
  - ITRC's approach to assembling remedial alternatives
  - ITRC's approach to evaluating remedial alternatives

ITRC Sediment Guidance Update

Background – What is ITRC?

- Interstate Technology & Regulatory Council
- State-led coalition of stakeholders
  - All 50 states and Washington, D.C.
  - Federal agencies
  - Tribes
  - Public stakeholders
  - Industry stakeholders (Industrial Affiliates Program [IAP])
- Mission
  - Reducing barriers and speeding deployment of better, more cost-effective, innovative environmental techniques
- Numerous teams established, including contaminated sediments

ITRC Contaminated Sediment Remedy Selection Overview

- Guidance under development – issued September 2014
- Took longer than anticipated (400+ pages)
- Describes
  - Framework for site-specific evaluation and remedy selection
  - Evaluation tools
  - Sediment remediation technologies, including advancements
  - Monitoring aspects
  - Stakeholder interests

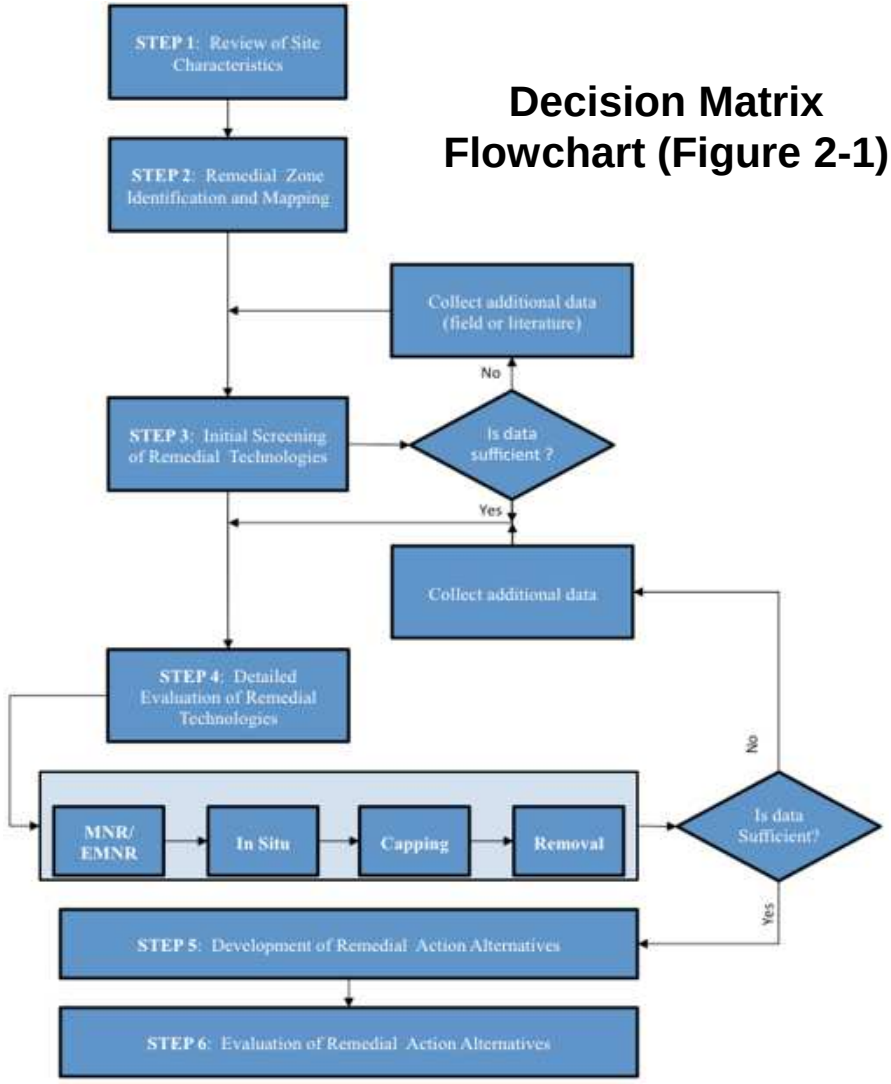
Type of Document (Technology Overview, Technical/Regulatory Guidance, Case Study]

Remedy Selection Framework for Contaminated Sediments

ITRC Contaminated Sediment Remedy Selection Framework

- Assumptions
  - RI and CSM adequate to support remedy selection
  - Risk assessed and unacceptable risk identified
  - RAOs established
  - Sources controlled

Decision Matrix Flowchart (Figure 2-1)



ITRC Contaminated Sediment Remedy Selection Contents

1. Introduction – includes discussion of background and source control
2. Remedy evaluation framework – document "hub"
3. MNR/EMNR
4. In situ treatment
5. Conventional and amended capping
6. Removal (dredging and excavation)
7. Monitoring
8. Stakeholder and tribal concerns
9. Case studies

Web-based document: http://www.itrcweb.org/contseds_remedy-selection/

PDF file: http://clu-in.org/download/contaminantfocus/sediments/Sediment-ITRC-CS-2.pdf

ITRC Contaminated Sediment Remedy Selection Key Elements

- Site characteristics compilation and importance for remedy selection
- Zone establishment
- Technology Assessment Guidelines
  - Quantitative and qualitative guidelines of all characteristics provided in technology sections
  - Based on simplified models, relationships, and experience
  - Intended to be used as practical guidelines in a weight-of-evidence approach, not as pass/fail criteria
- Worksheets to document evaluation
- Flexibility for multi-state use
- Links to related guidance (USEPA, USACE, etc.)
- Case studies – tables with links and summaries
- Stakeholder section – “beyond risk reduction” advocacy

Integrating Sustainability

- National Research Council, "Sustainability and the U.S. EPA" (2011) (cont.)
  - "Sustainability goes beyond risk management in being primarily concerned with maximizing benefit, while addressing risks of concern, rather than being an exercise focused mainly on achieving de minimis risk. The focus on de minimis risk…does not necessarily or typically encompass the social (including health), environmental, and economic pillars of sustainability" (p. 87).

Integrating Sustainability

- National Research Council, “Sustainability and the U.S. EPA” (2011) (cont.)
  - “Under the Sustainability Framework, in addition to considering possible technology options to minimize risk, consideration of opportunities and options for improvements along social, environmental, and economic dimensions would also be elements corresponding to the risk assessment and risk management framework….” (p. 87).

Integrating Sustainability

- National Research Council, “Sustainability and the U.S. EPA” (2011) (cont.)
  - “Analyses to characterize risks to the community, costs, community improvements, and trade-offs can provide the basis for choosing practicable management options that mitigate significant risks while providing benefits for the surrounding community” (p. 86).

Integrating Sustainability

- EPA response (L. Jackson, September 2011)
  - Sustainable solutions "…demand a more integrated, innovative, and forward-thinking response."
  - EPA needs to "build upon the ways the EPA has already incorporated sustainability into its work."

Key Objective

- Implement cost effective remedies that will control sources and achieve long-term protection while minimizing short-term impacts

Policy Drivers to Achieve the Key Objective

- Consistent application of National Sediment Guidance or the ITRC Guidance
  - Source control is essential
  - Mass removal alone typically does not reduce risk
  - Realistic cleanup standards
  - Cost-effectiveness
- Early Actions
- Sequential Risk Management
- Sustainable Remedies

Questions?

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