

ITRC PROJECT PROPOSAL: Contaminated Sediments - Final

PROPOSAL DATE: June 1st, 2007 [Proposals are due to ITRC Program Administrator by June 1 each year]

Please use brief statements or bullet items to input the requested information.

Proposal Contact:

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Problem Statement (why is this project necessary?)

Quoting the USEPA Contaminated Sediment Management Strategy: "The U.S. Environmental Protection Agency estimates that approximately 10 percent of the sediment underlying our nation's surface water is sufficiently contaminated with toxic pollutants to pose potential risks to fish and to humans and wildlife that eat fish. This represents about 1.2 billion cubic yards of contaminated sediment out of the approximately 12 billion cubic yards of total surface sediments (upper five centimeters) where many bottom dwelling organisms live, and where the primary exchange processes between the sediment and overlying surface water occur." Based on current average costs for managing contaminated sediments, this volume of material could cost several trillions of dollars to dredge. The primary risk pathways are drinking water supplies, food chain effects, fish consumption, direct contact, etc.

EPA Regions and the States have had to make decisions in the absence of guidance. There is much debate regarding evolving sediment quality criteria and their application for assessing and remediating contaminated marine and freshwater sediments. Over 25 percent of the contaminated sediments sites addressed to date in the US have had state drivers. As activity accelerates, this percentage is likely to grow.

Unfortunately, the relationship between contaminant concentration in sediments and risk from exposure is not a simple linear relationship. Further, due to the lack of guidance there have been a number of problems when attempts have been made to evaluate the relationship between contaminant concentrations in sediments and risk. For these reasons, the recognized scientific, engineering and regulatory experts in the contaminated sediment field should develop national guidance. A consistent approach to monitoring the chemical, physical, and biological characteristics/conditions of contaminated sediments across all of EPA's programs would be advantageous.

Procedures to determine the potential effect of sediment contamination on human or ecological health are normally based on total concentrations in the bulk sediment. However, research conducted over the past fifteen years has shown that the availability of many of these contaminants to receptors is much less than the total amount. The bioavailable fractions of the contaminants provide a more accurate characterization of potential harmful effects to receptors. There are a variety of approaches, at varying stages of development, to determining sediment contaminant bioavailability. The characterization of sediment contamination in freshwater, estuarine, and marine settings should emphasize assessing the bioavailability of these contaminants to humans and ecological receptors.

- POCs identified the need to address the assessment of potential impacts of contaminated sediments during the characterization phase. Quantification of chemical constituents in sediment samples is relatively simple; however, subsequent assessment of selected constituents that exceed regulatory guidelines can become quite involved and expensive, often without a clear understanding of the regulatory endpoint.
- Sediment Contaminant Bioavailability Alliance (SCBA) is an alliance supported by ITRC to get input/advice from State agencies on sediment contaminant bioavailability on Industry projects. One goal of SCBA is to increase State, Federal and Industry understanding of what governs chemical exposure in sediments and how to measure it. ITRC has funded participation of several state members, including NJ, NY, MA, WA, and TX, to review industry approaches to assessing bioavailability.
- SERDP and ESTCP have sponsored an Expert Panel Workshop for the Research and Development Needs for the In Situ Management of Contaminated Sediments (October 2004). SERDP and ESTCP are involved with approximately 27 projects that deal with the characterization and monitoring, remediation, and risk assessment of contaminated sediments. One of the main interests of this Expert Panel is the characterization of contaminated sediments and bioavailability in the hopes of developing a remediation strategy. DoD has stated that contaminated aquatic sediments represent a complex issue that is growing in significance. Industry representatives within the ESTCP Sediment Expert Panel include Alcoa and RETEC. Alcoa has approximately 12 to 15 current projects that involve assessing sediment bioavailability such as using solid phase microextraction devices to assess bioavailability.
 - Alcoa, CICEET, and RETEC have offered their case studies for team review and have expressed interest in understanding State and Federal issues around sediment characterization, bioavailability and remediation. (see attached Letters of Support)
 - A *SERDP and ESTCP Project List* is attached in this proposal.

Remedial processes, such as dredging, have caused concern that the removal of sediments causes more harm than good. Conversely, how does one effectively manage and limit exposure to contaminated sediments (i.e., capping)? Accurately characterizing potentially contaminated sediments (i.e., development of a Site Conceptual Model) and understanding bioavailability of chemical constituents in sediments can aid in the selection of a remedial process and the development of a management plan that best minimizes exposure. The Team would transition from this project that focuses on characterization of contaminated sediments and bioavailability into proposing another project that would address remedial processes, best management practices, and risk mitigation of the "characterized" sediment contamination.

Solution / Impact (how will the project impact the environmental marketplace?)

Project Focus:

Develop a Tech-Reg Guidance document about the contaminated sediment investigative processes including the 3-dimensional delineation of source term and characterization of exposure term using tools to evaluate bioavailability.

This will be based upon:

- Collection of data and information using surveys, cases studies and literature review to identify and evaluate real site tests and experiences of characterization practices of contaminated sediment.

This information will be used to:

- Evaluate and provide an overview of bioavailability terms, measurement tools and application

By developing a Tech-Reg guidance document that incorporates the consideration of bioavailability in assessing the threat from contaminated sediments, the environmental customer will have a tool to assess the optimal remedial alternative for the site. This will assure there is a net environmental and health benefit to any remedial alternative chosen by :

- o Identifying and evaluating appropriate methods, technologies and techniques to characterize a site containing contaminated sediments;
- o Defining bioavailability, bioaccumulation, bioconcentration and biotransformation terms;
- o Summarizing existing or developing methods/tools for measuring bioavailability and the site conditions in which they are most effective;
- o Evaluating how the bioavailable fraction (rather than total concentration) can be used within a risk-based assessment program; and,
- o Identifying that the bioavailability assessment can be used to quantify exposure to contaminated sediments during long term monitoring of the site and performance expectations of available technologies.

Success Measures (how you determine the project impact to the market place)

The primary objective of this project is to present a review of the technical elements of assessing contaminated sediment sites. It is intended as a resource for project managers, citizen stakeholders, and the private sector to identify, assess, and evaluate contaminated sediments in a scientifically sound, protective, timely, and cost-effective manner. Success measures for this problem statements would include:

- Consistent use of the bioavailability terms in State and Federal agencies
- Adding clarity to the approach of assessing potentially contaminated sediments
- State technical oversight developed to detail sediment screening and toxicity values

Summary of Deliverables (primary project outputs)

Consistent with the Project Focus the group intends to produce a guidance document that covers the items listed above. The team plans to review, use and build on the work conducted by the previous ITRC Sediment Group to the maximum extent possible.

Products:

1. Overview of Bioavailability would summarize literature reviews and case studies of contaminated sediment projects dealing with assessing contaminant bioavailability in the site characterization process. (Examples: EPA Great Lakes initiative (including New York Hudson River Project (EPA lead NPL Project +/- \$ 500 M project) and the Onondaga Lake Project (State Lead NPL Project +/- \$ 500 M project)). Additional case studies will be solicited through the network of ITRC state regulators, federal partners, and consultants (i.e., ALCOA and RETEC). The Overview document will define bioavailability, biotransformation, bioconcentration and biomagnification terms; measurement tools associated with these terms; and case studies dealing with assessing contaminant bioavailability to get a better understanding of contaminant bioavailability in sediments and how bioavailability can be

quantified during the site characterization process. The Overview may be published separately but will, at least, be the basis that leads to the development of a Tech-Reg Guidance document, described as Product 2 below.

2. Tech-Reg Guidance for the Characterization of Contaminated Sediments with additional focus on the Application of Bioavailability basically addressing the process of characterizing potentially contaminated sediments and how bioavailability fits into that process. Investigative processes for monitoring contaminated sediments include characterization/assessing existing conditions, tracking spatial and temporal changes, and determining if the current and/or future pathway(s) has been addressed. The document would also cite the "Overview of Bioavailability" as background to the Tech-Reg Guidance document. The Tech-Reg Guidance document should add detail to how contaminant bioavailability fits into the process of characterizing contaminated sediments. The Internet-based training curriculum would be also part of this project's deliverable.

Project Schedule

- 2008 – Build the team knowledge by collecting data and information using surveys, case studies and literature review to identify and evaluate real site tests and experiences of characterization practices of contaminated sediment. The prior Sediment Team Draft Tech-Reg Guidance document will be an information source the Team will use for this Project.
- 2009 –Use this information and data to evaluate and provide an overview of bioavailability terms, measurement tools and applications in the process of characterizing the threat at contaminated sediment sites.
- 2010 - Develop a Tech-Reg guidance document and associated Internet-based training curriculum that incorporates the consideration of bioavailability in assessing the threat from contaminated sediments.

Target Audience

- Primary audience = State and federal regulators and other environmental professionals engaged in contaminated sediment investigation and remediation. (i.e., DoD, DoE, EPA)
- Secondary audience = community stakeholders and members of the general public concerned with exposure from contaminated sediment, Port operators, water resource agencies, state and federal fish and wildlife agencies, transportation agencies. Resource management agencies (i.e., mine impacted sediments)

Resources Required

Personnel:

Team Leader : Kimberly Ward (NJDEP)

Supporting State Members:

AL - Sonja Favors (Sr Env. Engineer, oversight of NPL Sites -Waste Programs Branch)

OR - Jennifer Sutter (Sediment Cleanup Sites PM, helped develop OR. bioaccumulation evaluation guidance)

PA - Irwin Lourie (Env. Chemist - humic substances in relation to sediment contaminant availability)

SC - Gregory Simmons (PG, Risk Assessor, Federal Remediation Section)

NH - Lori Siegel (PhD, PE, Ecological Risk Assessor, developed NH Guidance on the Evaluation of Sediment Quality)

DE- John Cargill (P.G., Env. Scientist - Dept. of Natural Resources and Environmental Control)

Following States have possible members if funded:

New York , New Jersey, Utah, Virginia

Following States show interest:

Missouri, Wyoming

- **Skill Mix of Team Members (e.g., regulatory, engineering, scientific, etc.)**

Scientific - Biologists (marine, freshwater) , Sedimentary Geologists, Hydrogeologists

Regulatory - Ecological Risk Assessors, Reviewers of Ecological Evaluations, Brownfield Case Managers, Superfund Site Coordinators Case Managers that deal with Ecological Evaluations assess Natural Resource Damages

Educational - University of New Hampshire - Institute for Coastal and Estuarine Environmental Technology

- **Sectors of Team Members (e.g., federal, state, community, regulated, regulator, etc.)**

SERDP and ESTCP Sediment Expert Panel -Industry reps. RETEC, CICEET, and Alcoa;

- Alcoa Inc. Letter of Support Attached

- CICEET Letter of Support Attached

IIRC Sediment Bioavailability Contaminant Alliance (SCBA), US ACOE - Sediment Experts, EPA Superfund and Brownfield Divisions, EPA Great Lakes Sediment Committee, NOAA, USGS, Army Corp of Engineers, Navy, GORE, Community Stakeholders - Great Lakes area, Tribal Communities

Financial Resources:

Sediments	Team	Contractor	Calls, Print,	Project
Calendar Year	Travel	Support	& Materials	Totals
2008-Collecting info & data	\$15,000	\$60,000	\$5,000	\$80,000
2009 –Evaluate technologies	\$15,000	\$60,000	\$5,000	\$80,000
2010 –Develop Tech-Reg	\$15,000	\$60,000	\$12,000	\$87,000
2011-Implementation	\$10,000	\$5,000	\$200	\$15,200
2012-Implementation	\$10,000	\$5,000	\$200	\$15,200
Project Total	\$65,000	\$190,000	22,400	\$277,400

Related Work:

There are a number of groups working on discrete or regional issues related to Contaminated Sediments. The team will review and reference this work as appropriate to avoid duplication of effort, and explore partnerships where appropriate. The initiatives include, but are not limited to:

1. The Great Lakes Dredging Team (GLDT) <http://www.glc.org/index.html>, is a partnership of federal and state agencies created to assure that the dredging of U.S. harbors and channels throughout the Great Lakes, Connecting Channels and tributaries is conducted in a timely and cost effective manner while meeting environmental protection, restoration, and enhancement goals. State members include IL, IN, MI, MN, NY, OH, PA, WI. The IIRC Sediments Team will explore a partnership with the GLDT to build on their collaborative efforts and complement their activities with respect to sediment remediation.

2. EPA-GLNPO <http://www.epa.gov/glnpo>: Realizing Remediation, A Summary of Contaminated Sediment
3. The Sediment Management Work Group <http://www.smwg.org> has published a set of 9 technical papers on sediment management issues, including an interactive decision tree for managing non-navigational sites.
4. RTDF: Sediments Working Group of Remediation Technology Development Forum <http://www.rtdf.org/public/sediment/default.htm>
5. USACE/EPA Northwest Regional Sediment Evaluation Framework, interim final September, 2006. <http://www.epa.gov/owow/oceans/ndt/05ndtmeeting/nwregion1.pdf>
6. Northeast Waste Management Association NWMOA <http://www.newmoa.org/>
7. Hazardous Substance Research Center (HSRC): Sediments Research <http://www.hsrb.org/>

Additionally there are a number of agencies and organizations with information related to contaminated sediments. These include but are not be limited to:

1. The US Army Corps of Engineers has done considerable work on contaminated sediments, related to navigational dredging and handling/disposal of dredged materials, and are active in the GLDT and NW RSET cited above.
2. The National Academy of Sciences and the USEPA are active in research and have produced applicable products, and both of these efforts are ongoing. None yet provide project-level, science-based guidance on remedy selection. Considerable effort has been directed at demonstrating large volume approaches for treatment and/or reuse of dredged materials.
3. The Sediments RTDF Action Team is currently preparing a series of white papers on sediment assessment issues.
4. EPA: The Incidence and Severity of Sediment Contamination in Surface Waters of the United States. <http://www.epa.gov/ebtpages/watercontaminatedsediment.html>
5. EPA: TMDL Program. <http://www.epa.gov/OWOW/tmdl/index.html>
6. EPA: CASRGW <http://www.smwg.org/brochure.htm>
7. NAS: Remediation of PCB-Contaminated Sediments. <http://www.epa.gov/HUDSON/nasstudy.htm>
8. USACE: Waterways Experiment Station. <http://el.erdc.usace.army.mil/index.cfm>
9. USACE: Reports Database - Environmental Effects of Dredging and Disposal
10. GE: Major Contaminated Sediments Sites (MCSS) Database. <http://www.ge.com/en/citizenship/ehs/remedial/HUDSON/mcss/>
11. Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) <http://ciceet.unh.edu/>.
12. State of Washington Sediment Management Standards. <http://apps.leg.wa.gov/WAC/default.aspx?cite=173-204&full=true>



May 29, 2007

Mr. Robert Mueller
Co-Chair, Interstate Technology Regulatory Council (ITRC)
New Jersey Department of Environmental Protection
Bureau of Sustainable Communities and Innovative Technologies
PO Box 409
Trenton, NJ 08625-0409

Re: Letter of support for the proposed 2008 ITRC Contaminated Sediments team

Dear Mr. Mueller,

I am writing this letter to express the support of CICEET for the proposed 2008 ITRC Contaminated Sediments team. CICEET has funded and have plans to continue supporting research related to developing and applying new technologies/methodologies to the issue of assessing bioavailability of organic contaminants in marine and estuarine sediments.

The issue of making sure that intended users approve of and are aware of new technologies is a challenge. Therefore, CICEET is enthusiastic about ITRC's process for developing technology and regulatory overview documents, as well as producing multi-media teaching tools to educate state and federal regulators. We hope that, by supporting this endeavor, we may be paving the way for future collaborations between NOAA entities and ITRC.

On behalf of CICEET, I am pleased to support the ITRC, both financially and technically in this endeavor, and hope the Board of Directors approve the creation of this project.

Sincerely,

Kalle Matso
Program Manager
The Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET)

cc:

Kim Ward, NJDEP
Marvin Unger, ESTCP
Rajat Ghosh, ALCOA
Rich Langan, CICEET



Alcoa

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May 24, 2007

Mr. Robert Mueller
Co-Chair, Interstate Technology Regulatory Council (ITRC)
New Jersey Department of Environmental Protection
Bureau of Sustainable Communities and Innovative Technologies
PO Box 409
Trenton, NJ 08625-0409

Re: Letter of support for the proposed 2008 ITRC Contaminated Sediments team

Dear Mr. Mueller:

I am writing this letter to express the support of Alcoa Inc., Remediation Operations for the proposed 2008 ITRC Contaminated Sediments team. The development of ITRC technology and regulatory overview documents, as well as ITRC multi-media teaching tools to educate state and federal regulators, as well as other stakeholders, on the most effective methods to achieve an accurate and complete characterization of sediment contamination is important.

On behalf of Alcoa Inc., Remediation Operations, I am pleased to help support the ITRC, both financially and technically in this endeavor, and hope the Board of Directors approve the creation of this project.

Sincerely,

A handwritten signature in cursive script that reads "Peter V. Swallow".

Peter V. Swallow
Technical Manager, Remediation Operations
Alcoa Inc.

cc: Kim Ward, NJDEP
Marvin Unger, ESTCP
Rajat Ghosh, ALCOA

ESTCP SEDIMENTS PROJECT PAGE

<http://estcp.org/technology/ER-Sediments.cfm>

Project Title	Project #	Lead	Institution	Status
Site Characterization and Monitoring				
Quantifying In Situ Organic Contaminant Mobility in Marine Sediments	ER-9712b	Mr. Tom Hampton	SPAWAR Systems Center	On-Going
Demonstration of an Integrated Compliance Model for Predicting Copper Fate and Effects in DoD Harbors	ER-0523	Dr. Bart Chadwick	SPAWAR Systems Center	On-Going
SPME for In-Situ Assessment of Bioavailability	ER-0624	Dr. Danny Reible	University of Texas	On-going
Determination of Sediment Polycyclic Aromatic Hydrocarbon Bioavailability Using Supercritical Fluid Extraction (SFE) and Ultra-Trace Porewater (UTP) Analysis (ER-0709)	ER-0709	Dr. David Nakles	The RETEC Group	FY07 New Start
Remediation				
An Innovative Capping Material for Contaminated Sediments	ER-0433	Mr. Arun Gavaskar	Battelle Memorial Institute	On-Going
Field Testing of Activated Carbon Mixing and In Situ Stabilization of PCBs in Sediment	ER-0510	Dr. Richard G. Luthy	Stanford University	On-going
Constructed Wetlands for the Remediation and Beneficial Reuse of Dredged Sediments	ER-0522	Ms. Leslie Karr	Naval Facilities Engineering Service Center	On-Going
Development of DoD Guidance for Monitored Natural Recovery at Contaminated Sediment Sites	ER-0622	Dr. Victor Magar	ENVIRON International Corp.	On-going

SERDP SEDIMENTS PROJECT PAGE

<http://www.serdp.org/Research/er-sediments.cfm>

Project Title	Project #	Lead	Institution	Status
Risk Assessment				
Characterization of Contaminant Migration Potential Through In-Place Sediment Caps	ER-1370	Dr. Bruce Sass	Battelle Memorial Institute	On-going
Integrating Uncertainty Analysis in the Risk Characterization of In-Place Remedial Strategies for Contaminated Sediments	ER-1371	Dr. Peter Adriaens	University of Michigan	On-going
An Integrated Field and Laboratory Study of the Bioavailability of Metal Contaminants in Sediments	ER-1494	Dr. Nicholas Fisher	Stony Brook University	FY06 New Start
Sediment Ecosystem Assessment Protocol (SEAP): An Accurate and Integrated Weight-of-Evidence Based System	ER-1550			FY07 New Start
Measurement and Modeling of Ecosystem Risk and Recovery for In Situ Treatment of Contaminated Sediments	ER-1552			FY07 New Start
Remediation				
In-Situ Stabilization of Persistent Organic Contaminants in Marine Sediments	ER-1207	Dr. Richard G. Luthy	Stanford University	Completed FY04
In-Situ Enhancement of Anaerobic Microbial Dechlorination of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans in Marine and Estuarine Sediments	ER-1208	Dr. Max M. Häggblom	Rutgers University	Completed FY06
Rational Selection of Tailored Amendment Mixtures and Composites for In Situ Remediation of Contaminated Sediments	ER-1491	Dr. Upal Gosh	University of Maryland Baltimore County	On-going
Quantifying Enhanced Microbial Dehalogenation Impacting the Fate and Transport of Organohalide Mixtures in Contaminated Sediments	ER-1492	Dr. Max M. Häggblom	Rutgers University	On-going
Reactive Capping Mat Development and Evaluation for Sequestering Contaminants in Sediments	ER-1493	Ms. Amy Hawkins	Naval Facilities Engineering Service Center	On-going

Project Title	Project #	Lead	Institution	Status
Modeling and Decision Support Tools Based on the Effects of Sediment Geochemistry and Microbial Populations on Contaminant Reactions in Sediments Site Characterization and Monitoring	ER-1495	Dr. Jeanne Van Briesen	Carnegie Mellon University	On-going
Pathway Ranking for In-Place Sediment Management (PRISM)	ER-1209	Dr. Sabine E. Apitz	SPAWAR Systems Center	On-going
Biotic and Abiotic Attenuation of Nitrogenous Energetic Compounds (NEC) in Coastal Waters and Sediments	ER-1431	Dr. Michael Montgomery	Naval Research Laboratory	On-going
Modeling and Decision Support Tools Based on the Effects of Sediment Geochemistry and Microbial Populations on Contaminant Reactions in Sediments	ER-1495	Dr. Jeanne Van Briesen	Carnegie Mellon University	On-going
Using Passive Polyethylene Samplers to Evaluate Chemical Activities Controlling Fluxes and Bioaccumulation of Organic Contaminants in Bed Sediments	ER-1496	Dr. Philip Gschwend	Massachusetts Institute of Technology	On-going
Development of Accurate Methods for Characterizing and Quantifying Cohesive Sediment Erosion Under Combined Current-Wave Conditions	ER-1497	Dr. Joseph Gailani	U.S. Army Corps of Engineers	On-going
Application of Tools to Measure PCB Microbial Dechlorination and Flux into Water During In-Situ Treatment of Sediments	ER-1502	Dr. Joel Baker	University of Maryland	On-going
Application of Tools to Measure PCB Microbial Dechlorination and Flux into Water During In-Situ Treatment of Sediments	ER-1503	Dr. Celia Chen	Dartmouth College	On-going
Sequestering Agents for Contaminants in Sediments - Application to the Development of Active Caps	ER-114	Dr. Anna Sophia Knox	Savannah River National Laboratory	On-going