Sediment Ecosystem Assessment Protocol (SEAP): An Accurate and Integrated Weight-of-Evidence Based System

Objective: The purpose of this research is to develop an efficient, accurate and integrated approach for the assessment of ecosystem risk and recovery at sites where contaminated sediments exist, or previously existed, and addresses two high priority needs:

1) Develop and evaluate rapid measurement tools/screening assays to efficiently assess the ecological risk and recovery at contaminated sites for relevant receptors, particularly for assessing natural recovery.
2) Assess the ecological impacts to benthic communities of remedial technologies currently in use at contaminated sediment sites.

We propose the development of an integrated system (Sediment Ecosystem Assessment Protocol – SEAP) incorporating rapid in situ hydrological, chemical, biological and toxicological measurements to provide concise, decision-oriented scientific and ecological information to improve the overall management of contaminated sediment sites.

Background: The Trident and UltraSeep are currently being demonstrated under ESTCP and have been successfully used at a range of O&B and Superfund sites. Fate and transport of migrating sediment and groundwater contaminants will be assessed with tools on-board and adjacent to the current Trident and UltraSeep Systems.

Effects from surficial sediments, from spalling groundwater and sediment porewater contaminants, from mobilization of sediment-bound contaminants, or from overlying surface waters, will be evaluated, relevant receptors will be exposed in toxicity tests. The resulting data from these multiple lines-of-evidence will then be integrated into a Weight-of-Evidence based Geographic Information System, providing statistically based rankings of the likely dominant physical and chemical stressors at each station and across the site.

Benefits: This research will facilitate the development of an integrated capability to assess sites for ecological risk and recovery using exposure and effects data that characterize overlying waters, the sediment-water interface, pore waters and adjacent to the current Trident and UltraSeep Systems. The GIS will graphically demonstrate spatial and temporal displays of sediment quality and dominant stressor relationships with ecological risk. It is anticipated that this work will lay the foundation for certification of methods and development of a conceptual framework and user guide for site managers under follow-on support from the Environmental Security Technology Certification Program.

Key Accomplishments to Date

- Candidate Test Species Literature Review – 90% Complete.
- Candidate Test Species “Short List” Selection – 100% Complete
- Lab evaluation of Candidate Test Species – 50% complete
- Caging Tolerance studies of selected species (80% complete)
- Exposure chamber optimization (30% complete)
- Effects of salinity and temperature change on copper toxicity (70% completion)
- Final Trident Pore Water Sampling & Toxicity Study – 50% complete
- New QwikLite Unit Calibration/Database Development – 50% complete

Anticipated Accomplishments Next 12 Months

- Full Scale Evaluation of Selected Screening Toxicity Tests on Pore Water Collected in Situ (Trident)
- Final Test Site Selection
- UltraSeep Modifications to accommodate in situ chambers and controlled deployments with chambers
- Biomimetic tool development
- First Demo Site Deployment

Task 1: Screening-Level Bioresponse Assay Selection, Refinement and Evaluation

Task 2: Field System Selection, Adaptation and Evaluation for Screening Application

Task 3: Field Testing and Data Evaluation: SEAP Proof of Concept