A Case Study on Adaptive Management and the Optimization of a Pilot Bank Stabilization Remedy for a Mercury-Impacted River

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Background

Historical mercury (Hg) releases from textile manufacturing facility on the South River, Virginia:
- Increased Hg concentrations in botic and abiotic media have not declined in 30 years.
- Erosion of legacy Hg-impacted bank soils is highest loading source (see Figure 1).
- Adaptive Management Framework is optimal remediation strategy due to size, linear nature, complexity and spatial variability of the South River system.

Bank Stabilization Pilot

- Constructed along a 500-ft river reach.
- Hypothesis: reducing Hg load; bank stabilization will result in reduced Hg concentrations in the aquatic environment (see Figure 2).
- Remedial approach confirmed by post-stabilization monitoring.
- Significant reduction in near-bank sediment and pore water Hg concentrations within three to five years.

Adaptive Management Process

- Three Interim Measures implemented to date, based on Bank Pilot design (see Figure 3).
- Remedial design focuses on control of Hg loading to the aquatic system through bank stabilization (see Figure 6).
- Key learnings from each project's design, construction and monitoring integrated into future remedial designs
- Ability to optimize design to integrate landowner preferences & site-specific challenges including:
  - Preservation of riparian habitats
  - South River Greenway Trail (see Figure 7)
  - Cultural resources

Remedy Effectiveness

- Approximately 60% of Hg loading from eroding banks in first two river miles below site will be addressed upon completion of the 5th Remedial Action (see Figure 8).
- Monitoring data show:
  - Temporary increase in near-bank pore water inorganic mercury (IHg) concentrations following construction (see Figure 8).
  - Consistent decline in near-bank Hg sediment concentrations after first year of monitoring (see Figure 9).

Findings

The Pilot Bank stabilization project demonstrates that bank stabilization is an effective remedial strategy for the South River that:
- Reduces Hg concentrations in near-bank media
- Is implementable, cost effective and sustainable
- Provides context for Post-IM monitoring data

Implementation is accelerated through an Adaptive Management Framework, facilitating incorporation of stakeholder values and key learnings from previous projects into progressive remedial designs.

The work described in this poster has been performed in conjunction with the South River Science Team (SRST), a multi-stakeholder group including representatives from local, state and federal governments, academia, environmental groups and DuPont. The SRST is a collaborative team created to provide input into the watershed-level, risk-based assessment framework to address mercury in the system. For more information visit the South River Science Team website.