

**SRST Update:
Remedial Options Program (ROP)
Work Group Activities**

South River Science Team

July 21, 2009

***Purpose of the SRST ROP Work Group:
Review, evaluate and test promising
remediation strategies for the South River***

SRST Remedial Options Program – Work Group Members

- **Don Kain (VA DEQ)**
- **Robert Brent (VA DEQ)**
- **Calvin Jordan (VA DEQ)**
- **Nesha Mizel (VA DCR)**
- **Mike Jacobi (USEPA)**
- **Joel Hennessey (USEPA)**
- **Mark Chappell (USACE-ERDC)**
- **Jim Pizzuto (UD)**
- **James Dyer (DuPont)**
- **Mike Sherrier (DuPont)**
- **Mike Liberati (DuPont)**
- **Rich Landis (DuPont)**
- **Bill Berti (DuPont)**
- **Erin Mack (DuPont)**
- **Nancy Grosso (DuPont)**
- **Ralph Turner (RT Geo)**
- **Dick Jensen (Unique Env.)**

South River Remedial Options Program

- **Recent Meetings: June 10 and July 20, 2009**
- **Presentation Topics**
 - **Hg Remediation Case Studies Review (Ralph Turner)**
 - **Approach for Reviewing and Testing Remediation Technologies**
 - **Soil characterization and geochemistry at Shifflett farm and Plant Site debris (Mark Chappell)**
 - **Laboratory Studies Findings "Sedimite" (Rich Landis)**
 - **Update – Bank Stabilization Pilot**
- **Update on Innovative Remediation Technology / Approach Task Team (Reed Harris)**

Hg-Remediation Case Studies of Sites with Fluvial Receiving Environments (Ralph Turner)

Objective:

Review other fluvial Hg-contaminated sites that have been addressed by actual or planned remediation (~17) sites. Evaluate success.

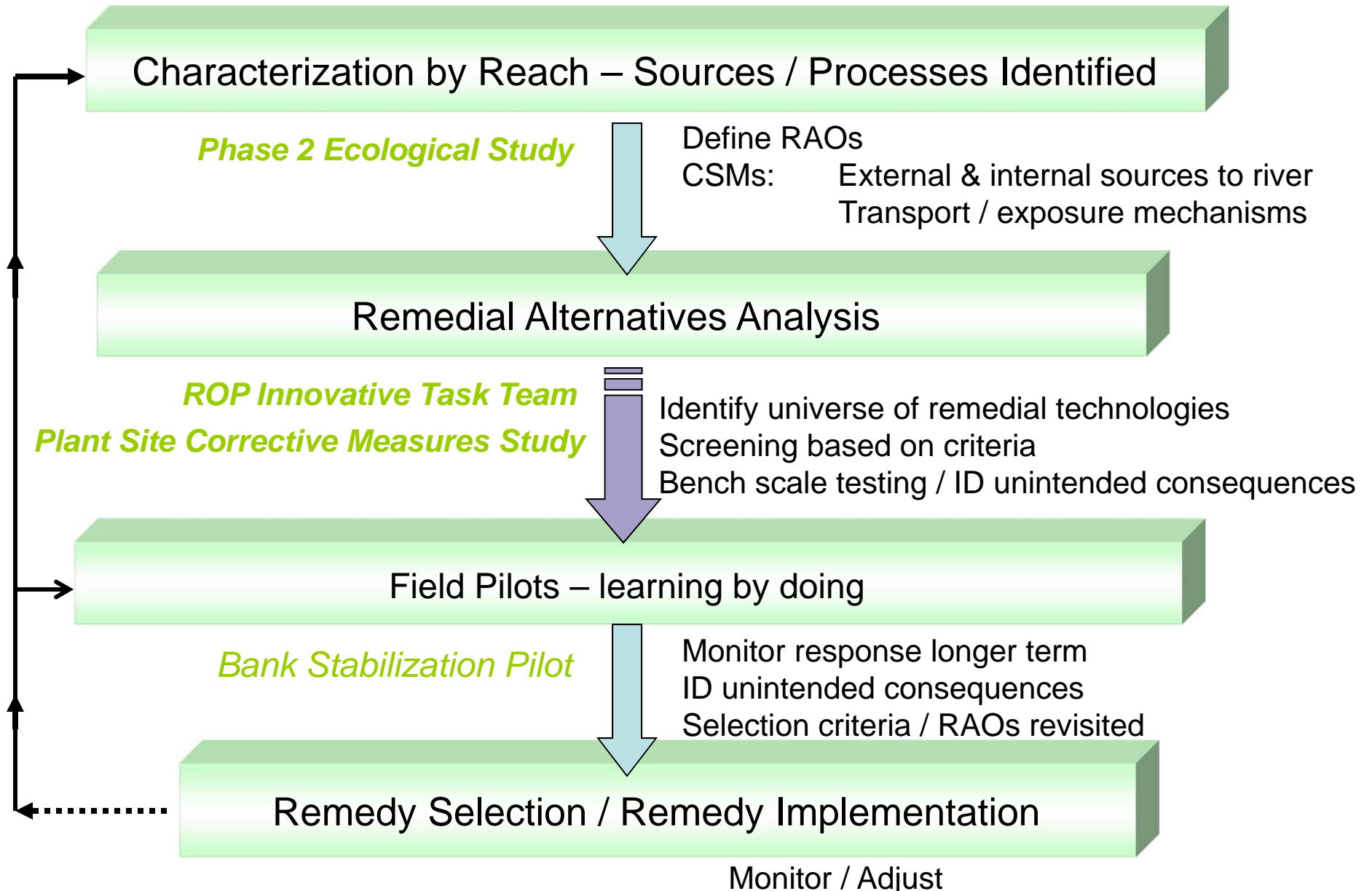
General Findings of Hg Remediation Case Study Review (Ralph Turner)

- Hg remediation at the facility itself (controlling initial source) has been most effective in reducing fish tissue concentrations.
- Targeted removal in the river sediments is the most common, or only, remedy applied.
- In-stream (removal) measures either show no incremental improvement in river biota or monitoring is insufficient to determine effectiveness.

See South River Science Team ftp Site for Full draft Word Document
<ftp.southernriverstec.com/SRST> ROP Workgroup/Jun09

Remedial Options Program

Remedial Action Selection Process for SR



Preliminary Results: Solid Phase Speciation of Soil Hg along the South River

*Mark Chappell and Jen Seiter, U.S. Army ERDC – EL
Kirk Scheckel, USEPA - ORD
Mike Jacobi and Joel Hennessy, USEPA – Region 3*

- **Objective:** Determine Hg valence and associated ligands and ions
- **Purpose:** Determine whether the natural state of the soils/debris reveal geochemistry that can be exploited for sequestering Hg in soils / sediments
- **Tools:** XANES and EXAFS (spectroscopy) potentially powerful but several confounding factors for interpretation of low Hg concentrations.

Solid Phase Speciation of Soil Hg along the South River (Mark Chappell)

2 Sample Sites:

- Shifflett Farm Soil (THg: 5 to 50 ppm)
- Debris from plant site containing elemental mercury (sample washed with Na nitrite)

Preliminary results:

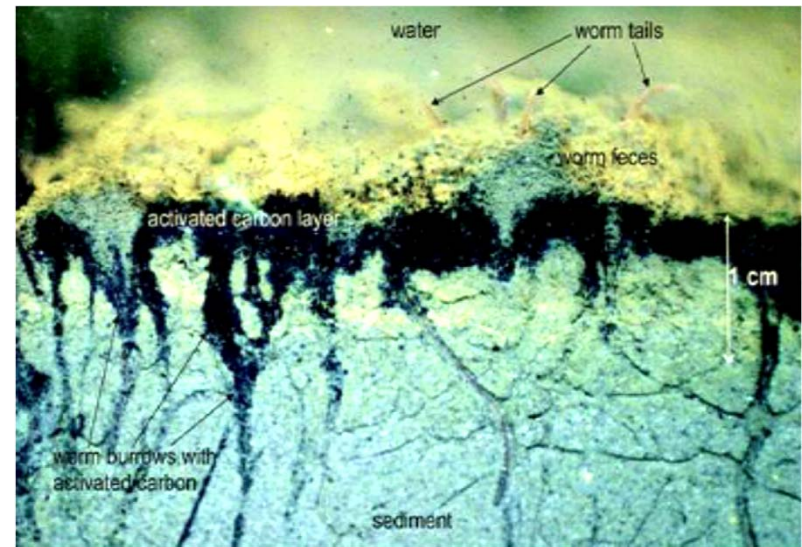
- In Shifflett Farm soils, Hg is primarily in the divalent state
- In the debris sample, elemental mercury appears to have been oxidized to the +1 and (predominantly) +2 states
- In the soils, Hg is bound to O, C, and S groups, but there appears to be linkages to a heavy metals as well (Zn, Cu)
 - Hg may be predominantly associated with mixed domains of organic carbon and heavy metal groups, common to soil humic material.
- Interpretation is ongoing

***Sedimite* Bench Scale Testing**

(Rich Landis)

Sedimite: Delivery system for activated carbon in sediments

- Powdered activated carbon (PAC) is pelletized with bonding agent
- Sedimite is placed on the sediment surface and benthic biota mix it into the sediments - bioactive zone.
- Binding agents eventually breakdown and activated carbon is mixed into the sediment to sorb contaminants



***Sedimite* Bench Scale Testing**

(Rich Landis)

- **Personnel**
 - Principal Investigators: Upal Ghosh (U MD Baltimore County)
Cindy Gilmour (Smithsonian)
 - Project Managers: Betsey Henry and Charlie Menzie (Exponent)
- **Objective:** Assess the effect sediment amendments on MeHg partitioning, production and bioaccumulation
- **Sediment sample:** Schifflett Farm at FGCM deposit RRM4.0
- **Amendments**
 - Powdered Activated Carbon (PAC)
 - Modified Organo-clay (MRM)
 - Thiol SAMMS* (TS)

**this is a porous microsphere w/monolayer*

Microcosm Design

"Enhanced" 14-day *Lumbriculus* exposure studies
Examine Hg and MeHg concentrations and
partitioning, and sediment geochemistry

Buckets o'mud: ~750 cc each mud and water

Amendments mixed into sediments:
South River 2.8% wet weight

3 Treatments (Thiol SAMMS, Particulate AC, MRM) +
Control

Each with 5 replicates (n=20 microcosms per site)

Incubated at ~25° C, 12 h light; 12 h dark



“Sedimite” Microcosm Results Compared to Control (avg. 5 replicates)

		TS	MRM	PAC
SEDIMENT	THg	1.08	1.03	0.91
	MeHg	0.95	1.44	2.50
PORE WATER	THg	0.7	1.3	0.2
	MeHg	0.3	1.6	0.1
WORMS	THg	0.23	0.58	0.16
	MeHg	0.04	0.29	0.10

Bank Stabilization Pilot Update

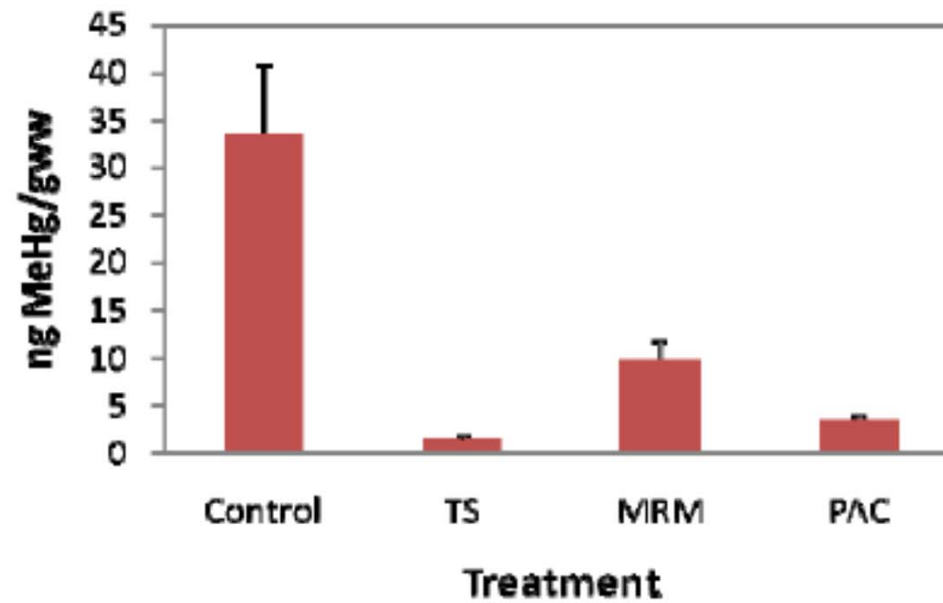
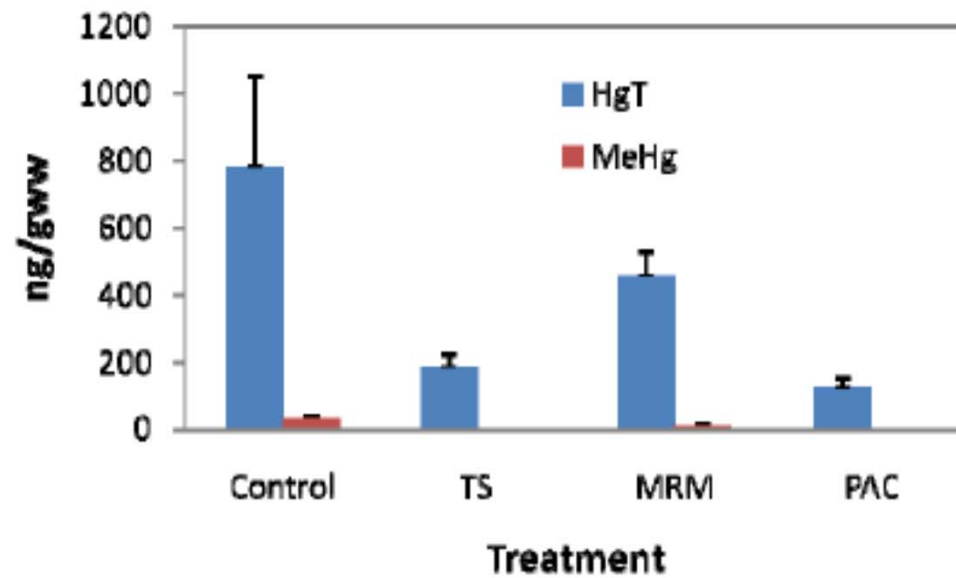
- Construction (Kevin Suter, URS PM)
 - Permit approvals expected by end of July
 - Bid Process underway
 - Construction begins mid- to late August
- Technical (Todd Morrison, URS PM)
 - Baseline Monitoring completed
 - Monitoring Manual preparation underway

July 20 Meeting

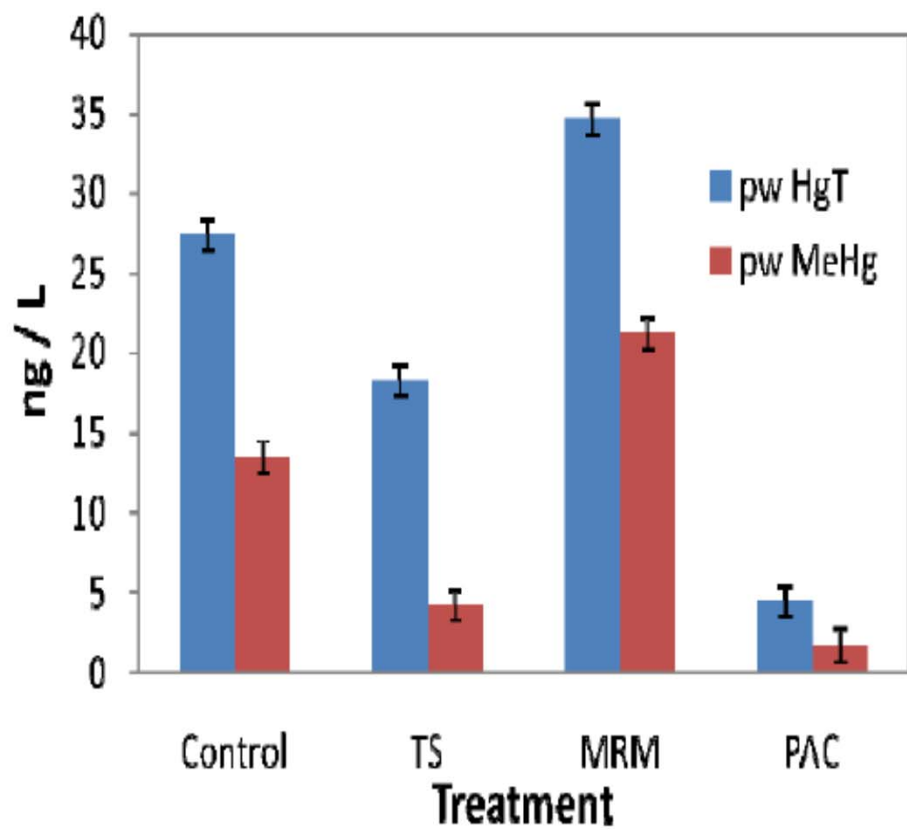
- **Reed Harris** - Update on Innovative Remediation Technology / Approach Task Team

BACKUP SLIDES

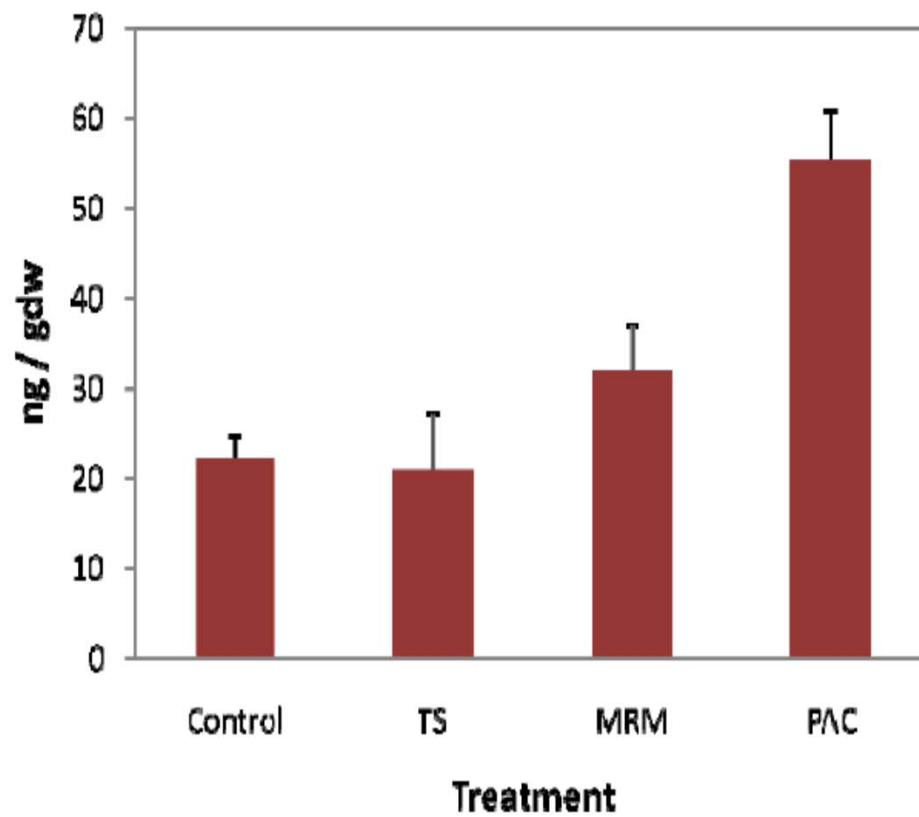
Microcosm Results Hg and MeHg in *Lumbriculus*



Microcosm Results
Pore waters



Microcosm Results
Sediment MeHg



Sedimite Bench Tests – Preliminary Results

- Fourteen day trials with South River sediment appear promising
- All amendments reduced accumulation of MeHg in worms
 - Thiol SAMMS reduced MeHg in worms by roughly 95%
 - PAC reduced MeHg in worms by roughly 90%
 - Organoclay from Cetco (MRM) reduced MeHg in worms by roughly 70%
- Thiol SAMMS and PAC reduced total Hg and MeHg in porewater
- MRM and PAC: increased production of MeHg in sediment ?
 - Needs further evaluation