

South River Remedial Options Program (ROPs) – Results of Remedy Screening

Between 2009 and 2012, the ROPs Work Group performed detailed reviews of a range of remediation technologies and associated implementation approaches that might be applicable to the South River aquatic system. The objectives of the remedy screening process were to identify potentially implementable technologies and strategies, provide focus for ongoing science and engineering activities on the river, and develop a remedies matrix for the remediation proposal. The South River Conceptual Site Model (CSM), including abiotic and biotic pathway diagrams, guided the ROPs Work Group in assessing the applicability of potential remedial technologies. Remedial technologies were sorted and rated as high, medium, or low according to their potential to address internal and external mercury loading to the South River aquatic system.

Criteria considered in this initial sorting of potential remedies built upon current Superfund NCP evaluation criteria, and included the following:

- Effectiveness
 - Overall protection of human health and environment
 - Compliance with specific regulatory requirements
 - Long-term effectiveness and permanence
 - Short-term effectiveness
 - Reduction of toxicity, mobility, or volume
- Implementability
 - Technical feasibility
 - Constructability
 - Safety
 - Community acceptance
 - Regulatory acceptance
- Cost effectiveness
- Sustainability

The product of this effort was a preliminary remedial technology matrix specific to different mercury loading sources to the aquatic system. Table 1 summarizes the results of the technology screening evaluation.

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Table 1 - Preliminary Remedial Technology Screening Matrix

Potential Sources	Remediation Target	Remediation Priority ¹	Remedial Alternatives or Approach	Notes
External Sources of Mercury Loading	Site Outfalls	High: – Most upstream source – Relatively large IHg load – IHg from outfalls may be more available for methylation than other sources of IHg – May confound potential downstream remedies	On-site source remediation (sewers, sumps, soil, SWMUs)	– Mass load and variation are quantified – Relative bioavailability of source is assumed to be high – Time required for interim remedial measure success is not known – Very high cost/benefit ratio for end-of-pipe treatment of large, dilute stream
			Filtration (membrane, sand, etc.)	
			Filtration plus pre- and post-treatment: – Thiol-based polymer – Activated carbon – Polymeric adsorption resin	
			SnCl ₂ reduction and air stripping plus capture	
	River Banks	High: – Potentially most significant source of mercury to the river system – Soil-derived IHg may be more available for methylation than sediment-derived IHg	Physical stabilization or isolation	– Length of time to achieve desired objective is uncertain – Longevity of stabilization
			Chemical stabilization: – Carbon amendment and coagulants	– Length of time to achieve desired objective uncertain – Behavior/efficacy of amendments if eroded or inundated not known – Potential for deleterious ecological effects unknown
			Best management practices to reduce soil erosion: livestock management Targeted removal plus stabilization or disposal	Soil may be removed as part of physical stabilization
	Floodplain Runoff	Low: – Floodplain (adjacent to eroding banks) contributes less than 10% of total load between RRM 0 and 10	Sediment traps Rerouting river/runs Flood control measures (e.g., increase storage capacity)	The importance of floodplain runoff is not known, but considered low based on the conceptual site model
	Internal Sources of Mercury Loading	Fine-Grained Sediment Deposits	High: – Areas potentially support high rates of mercury methylation	Monitored natural recovery ²
(Im)permeable and/or reactive cap: – AquaBlok [®] , AquaGate [®] , Reactive Core Mat™, etc.				Changes in hydraulic shear stress over time could destabilize cover
Targeted removal plus stabilization/disposal				Removal may expose higher mercury concentrations at depth
Large woody debris management				
Maintenance/filling ditches/millraces				Account for very small proportion of MeHg to system
Aeration/oxidation				– Effectiveness questionable – Bioavailability of IHg in sediment over time uncertain
Interstitial Sediment		Moderate: – Areas potentially support high rates of mercury methylation	Monitored natural recovery ²	Reduced bioavailability of IHg over time unknown
			(Im)permeable and/or reactive cap: – AquaBlok [®] , AquaGate [®] , Reactive Core Mat™, etc. Aeration/oxidation	Change in hydraulic shear stress may occur over time
Water Column		Moderate: – Important exposure medium at base of food web – Water column is an important transport pathway	Monitored natural recovery ²	Length of time to achieve desired objective unknown
			Chemical treatment: – Removable carbon sorbent – Pump and treat	– Proportion of volume that must be treated unknown – Treatment longevity unknown
	Phytoremediation			
	Sediment traps Aeration/oxidation		Likely that methylation areas will not respond to treatment	

Notes:

¹ Remediation priority from Reed Harris (2012)

² Includes institutional controls on fish consumption by humans

- Green shading denotes a technology with a high potential to control mercury loading
- Yellow shading denotes a technology with a medium potential to control mercury loading
- Orange shading denotes a technology with a low potential to control mercury loading