US EPA CONTAMINATED SEDIMENT REMEDIATION GUIDANCE

In December 2005, the US Environmental Protection Agency published a document on *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* This document provides technical and policy guidance for project managers and management teams making remedy decisions for contaminated sediment sites. It states that project managers should evaluate each of the three potential remedy approaches (sediment removal, capping and monitored natural recovery). In evaluating dredging, project managers should also make realistic, site-specific predictions of residual contamination (i.e., contamination that remains within or adjacent to the dredged area after dredging). Where residuals are a concern, capping may also be needed.

The excerpts from chapter 5 below provide guidance on in-situ capping of contaminated sediments. Of particular significance is the section on identification of capping materials, section 5.5.1. It discusses the use of "specialized materials to enhance the chemical isolation capacity of the cap". It is an acknowledgment that reactive capping, utilizing materials such as CETCO's Reactive Core Mat™, may enhance chemical isolation or provide reduction in cap thickness in certain circumstances.

5.1 INTRODUCTION

For purposes of this guidance, in-situ capping refers to the placement of a subaqueous covering or cap of clean material over contaminated sediment that remains in place. Caps are generally constructed of granular material, such as clean sediment, sand, or gravel. A more complex cap design can include geotextiles, liners, and other permeable or impermeable elements in multiple layers that may include additions of material to attenuate the flux of contaminants (e.g., organic carbon). Depending on the contaminants and sediment environment, a cap is designed to reduce risk through the following primary functions:

- Physical isolation of the contaminated sediment sufficient to reduce exposure due to direct contact and to reduce the ability of burrowing organisms to move contaminants to the surface;
- Stabilization of contaminated sediment and erosion protection of sediment and cap, sufficient to reduce resuspension and transport to other sites; and/or
- Chemical isolation of contaminated sediment sufficient to reduce exposure from dissolved and colloidally bound contaminants transported into the water column.

Caps may be designed with different layers to serve these primary functions or in some cases a single layer may serve multiple functions.

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5.5.1 Identification of Capping Materials

Caps are generally composed of clean granular materials, such as upland sand-rich soils or sandy sediment; however, more complex cap designs could be required to meet site-specific RAOs. The project manager should take into consideration the expected effects of bioturbation, consolidation, erosion, and other related processes on the short- and long-term exposure and risk associated with contaminants. For example, if the potential for erosion of the cap is significant, the level of protection could be raised by increasing cap thickness or by engineering the cap to be more erosion-resistant through use of cap material with larger grain size, or by using an armor layer. Porous geotextiles do not contribute to contaminant isolation, but serve to reduce the potential for mixing and displacement of the underlying sediment with the cap material. A cap composed of naturally occurring sand is generally preferred over processed sand because the associated fine fraction and organic carbon content found in natural sands are more effective in providing chemical isolation by sequestering contaminants migrating through the cap. However, sand containing a significant fraction of finer material may also increase turbidity during placement.

Specialized materials may be used to enhance the chemical isolation capacity or otherwise decrease the thickness of caps compared to sand caps. Examples include engineered clay aggregate materials (e.g., AquaBlok™), and reactive/adsorptive materials such as activated carbon, apatite, coke, organoclay, zero-valent iron and zeolite. Composite geotextile mats containing one or more of these materials (i.e., reactive core mats) are becoming available commercially.

References

Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, US EPA Office of Solid Waste and Emergency Response, EPA-540-R-05-012, December 2005.
http://www.epa.gov/superfund/resources/sediment/guidance.htm.

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