

Site Management Decision Strategies: Case Study of a Sediment Remediation Decision Framework

Bjorn Bjorkman (bbjorkman@geiconsultants.com), Thomas Daigle (tdaigle@geiconsultants.com), Mike Hawthorne (mhawthorne@geiconsultants.com), and Camille Carter (ccarter@geiconsultants.com) (GEI Consultants, Denver, CO, USA)
Mike Ruetten (mruetten@geiconsultants.com) (GEI Consultants, Green Bay, WI, USA)

Background/Objectives. In some state jurisdictions, guidance for selecting appropriate remedial approaches to contaminated sediments is not well developed. While removal is often thought of as the most straightforward approach, dredging of contaminated sediments may not be a practical solution. In such situations, a process is needed for developing an approach to evaluating sediment contamination and determining the most effective, least disruptive, and yet protective, solution. This presentation presents a remediation decision framework for a sedimentation lagoon system part of which was used by a refinery for discharge prior to release to a major river. As a result, the lagoons contain elevated PAHs, VOCs, metals and other contaminants entrained in the sediment, topped by 3-7 feet of clean sediment deposited from periodic river flooding. The refinery developed a decision process based on the nature of any migration and/or ecological and human health exposure potential for the contaminants in various areas of the lagoons to craft solutions appropriate to the conditions, thereby drastically reducing the cost of the sediment remedy. This approach has been accepted by the State authorities and may serve as a precedent for other areas.

Approach/Activities. Based on existing guidance and site conditions, we developed a decision framework to identify the appropriate remedy for each part of the lagoons. The decision framework is based on the premise that contaminants have limited bioavailability, are not located such that unacceptable exposure may occur, and/or the contaminants are immobile and can be addressed via risk-based closure, including benthic community surveys and toxicity testing. For areas with higher concentrations of contaminants, and that are buried under clean sediment, potential vertical or horizontal mobility will be evaluated, and a remedy involving capping will be considered to immobilize the contaminants. NAPL is a special case, and an evaluation of whether the NAPL is migrating will determine the remedy required for those areas.

Results/Lessons Learned. The decision framework is in the process of implementation. Preliminary evaluation has shown that of the six lagoons at the Site, three have lower concentrations of contaminants and lack the presence of NAPL that will be addressed via risk-based closure. The other three lagoons contain varying amounts of contaminants buried under 3 to 6 feet of cleaner sediments. The preferred remedy for these areas will likely be capping to ensure that the deeper, impacted sediment is immobilized. Some areas of the lagoons have evidence of NAPL, and an investigation will determine if it is migrating or not. If the NAPL is not migrating, amended capping may immobilize the material. Only if the NAPL is migrating will a remedy of dredging be considered for those limited locations. The application of this decision framework will reduce the costs of remediation substantially, while remaining protective of human health and the environment and minimizing disruption to neighboring areas.