Developing Optimized Remedies for Complex Sites: Technology Assignment Framework, Sustainability, and Resiliency

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Background/Objectives. Remedies for complex sites often require periodic optimization to incorporate new information such as current treatment technologies, new site data, including pilot study results, and advancements in remedy management strategies. During the remedy optimization process, the evaluation criteria and methodologies used to update and re-evaluate remedial actions must be comprehensive and technically sound to successfully evaluate and select the most efficient remedy that incorporates a balanced approach to meeting multiple, and often disparate, objectives. These balancing criteria should also reflect stakeholder values related to risk management, sustainability, and resiliency and be quantitatively and/or qualitatively incorporated into a decision-making framework. This framework can facilitate the development of a new and/or improved remedy for a complex site that incorporates the environmental and societal benefits of the latest state of the practice.

Approach/Activities. An optimization review was performed on remedial alternatives including removal, in situ treatment, capping, and monitored natural recovery (MNR) presented in a feasibility study for the Hunters Point Naval Shipyard Parcel F sediment site in San Francisco Bay. The sediments at the site are impacted by copper, lead, mercury and PCBs and contribute to unacceptable risks to human health and the environment. A technology assignment framework was used to support the development of an optimized alternative and was comprised of site-specific metrics to aid in the selection and footprint refinement of remedial technologies: (1) contaminant concentration; (2) water depth; (3) hydrodynamics; (4) natural recovery rate; and (5) constructability. A sustainable remediation assessment was performed to aid technology assignment based on short-term adverse impacts associated with greenhouse gas emissions, natural resource use, and community disturbance. Similarly, a resiliency evaluation was performed to evaluate long-term effectiveness and permanence to climate change impacts. This framework facilitated developing an optimized alternative that balanced reducing the environmental footprint of the remedy with achieving remedial objectives within a reasonable timeframe and minimizing long-term risk.

Results/Lessons Learned. The multi-technology optimized alternative incorporated results from pilot studies demonstrating the effectiveness of in situ treatment. The optimized alternative incorporated focused removal, in situ treatment and MNR into a multi-technology strategy that reduced the environmental footprint by 42% to 75% relative to removal based alternatives. The optimized alternative was evaluated against the National Contingency Plan (NCP) criteria and ranked moderate to high in all comparative evaluation criteria. While the optimized alternative was not the lowest cost nor the most sustainable option, this alternative was selected based on balancing of the NCP remedy selection criteria to achieve the remedial objectives established for the site within a reasonable timeframe.