Importance of Adaptive Technical Approaches: Case Studies from a 10-Year Performance-Based Remediation Contract

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Background/Objectives. The objective is to present multiple case studies from a 10-year performance-based remediation contract demonstrating how a variety of technical approaches including mitigation measures and contingency actions were utilized to overcome challenges and achieve cleanup objectives. The case studies cover various contaminated sites at the former Myrtle Beach Air Force Base, South Carolina. The presentation addresses technical aspects including the importance of HRSC in refining CSMs, remedy selection and optimization, and contingency actions, in addition to coordination with local stakeholders to facilitate concurrent property redevelopment.

Approach/Activities. The case studies to be presented were selected to cover a variety of contaminant types, including metals, chlorinated solvents, and petroleum hydrocarbons. Case Study #1: Two former landfills both impacted with arsenic in groundwater at concentrations exceeding the MCL. Geochemical evaluation including comparison of arsenic, iron, and aluminum ratios was conducted to determine if the arsenic was naturally occurring as a result of reducing groundwater conditions, or if it was a site contaminant. For the first landfill, it was determined that arsenic is naturally occurring, but surprisingly for the second landfill, which is located beneath a golf course, the geochemical evaluation indicated that arsenic was a site contaminant. Further investigation revealed that arsenical herbicides such as MSMA were frequently used by the golf course grounds crew, and have likely resulted in the contaminated groundwater. Communication with the golf course maintenance staff requesting suspension of the use of the arsenical herbicides was sufficient to lower the arsenic levels in groundwater below the MCL. Regulatory approval for no further monitoring was obtained for both landfills. Case Study #2: A former training area impacted with petroleum hydrocarbons in soil and groundwater was initially targeted with aerobic bioremediation, but contaminant levels rebounded due to desorption and back diffusion from contaminant mass present in interbedded clay lenses in the saturated sandy aquifer. Supplemental investigation using MIP/HPT refined the CSM and identified the nature and extent of the residual contaminant mass. The bulk of the contamination was removed via excavation and off-site disposal, however, in situ soil mixing with activated persulfate was required to attain cleanup levels and obtain approval for no further action/site closure. Case Study #3: A site impacted with TCE and its breakdown products in shallow, intermediate, and deep groundwater had an operating remedy of groundwater extraction and treatment at the start of the contract. Remedy optimization entailed full-scale application of in situ anaerobic bioremediation with bioaugmentation using SDC-9 to address the bulk of the remaining TCE mass. Subsequently, a low-level MIP/HPT investigation was conducted to refine the CSM, resulting in the identification of clay lenses with residual TCE. Implementing additional focused remedial measures, including in situ chemical reduction followed by PlumeStop® and lactate, resulted in successfully achieving MCLs across the site.

Results/Lessons Learned. The main lessons learned demonstrate the importance of HRSC in refining CSMs for proper remedy selection and optimization, flexibility in the selection of remediation amendments and delivery methods, and frequent communication/coordination.