The Significance of Filling Data Gaps and Developing Good Conceptual Site Models Prior to Remedy Implementation under Fixed-Price, Performance-Based Remediation Contracts

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Background/Objectives. At a former Air Force base in San Antonio, Texas, site closure (SC) was proposed for one of the sites, under a 10-year, fixed-price, performance-based remediation (PBR) contract, during the 2011-2021 period of performance (PoP). The site is approximately 3 acres and consisted of multiple disposal/evaporation pits. Chrome plating waste from reconditioning of aircraft engine cylinders was discharged into these pits from the 1940s to 1955. The contaminants of concern (COCs) at this site are tetrachloroethene, trichloroethene (TCE), cis-1,2-dichloroethene, vinyl chloride, and chromium. A stream flows along the western boundary of the site. A groundwater extraction and treatment system to remediate the solvent plume and prevent discharge to the nearby stream was installed in 1993 and modified in 2003. Excavation was performed in 2005 to remove the contaminated soil, and the excavation was backfilled with clean soil. Native subsurface geology consists of mostly tight clays, silts, silty sands and silty clays, with a gravel layer near the bottom of the saturated zone. A several hundred feet thick Navarro clay acts as the base of the saturated zone at a depth of 35 to 40 feet below ground surface (bgs). Groundwater occurs at a depth of approximately 25 feet bgs.

Approach/Activities. Based on a review of the available reports at the proposal stage, it was assumed that the sources in the soil were removed by excavation and the dissolved plume with maximum TCE concentration of 1,690 µg/L in 2010 was contained and being slowly remediated by the pump and treat system. No soil analytical data were available from the Navarro clay. The original remediation plan was to use in situ enhanced bioremediation (ISEB) utilizing emulsified vegetable oil and lactate injections using direct push technology, in conjunction with the existing extraction system to pull the amendments across the site. After multiple rounds of ISEB injections, concentrations of contaminants decreased, but cleanup goals were not achieved, and the site was not on course to achieve SC within the PoP. To expedite site cleanup, in situ chemical oxidation (ISCO) was planned and catalyzed hydrogen peroxide was selected based on a pilot study. ISCO injections reduced concentrations of COCs for a brief period but rebound occurred and TCE concentrations increased up to 39,400 µg/L after a few months. These results indicated that additional contaminant mass was likely present in the subsurface and was being desorbed by ISCO. An extensive high resolution site characterization (HRSC) effort using MiHPT technology was completed, followed by confirmation soil sampling. The data were used to determine the location and concentrations of the residual contaminant mass, and to quantify the contaminant mass for future remedial design and implementation.

Results/Lessons Learned. HRSC and soil sampling results indicated that significant contaminant mass was present in the subsurface. The pre-PBR excavation did not remove all of the source mass and previous investigations did not identify significant contaminant mass that was contained in the Navarro clay. It was clear that ISEB or ISCO would not be able to address the residual contamination in a reasonable timeframe. Instead, a more aggressive approach involving excavation or soil mixing may be required. This experience demonstrates the importance of a thorough data review, identification of data gaps, and detailed investigations

utilizing HRSC prior to design/implementation of the remedies. We provided a revised conceptual site model to the AF client at the end of PoP as a best value alternative to SC.