Combining Remedial Technologies and Implementation Methods to Address Chlorinated Solvent Impacts at Complex Sites

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Approach/Activities. Complex sites require complex solutions. Challenges typically include heterogeneous geology and contaminant mass distribution, vadose and/or saturated contaminant mass, and concentrations that span several orders of magnitude. These require us as practitioners to often consider multiple remedial technologies and approaches to reach the site specific goals within the desired timeframes. Often technologies are inefficiently implemented sequentially; this extends the remediation timeframe and requires re-characterization between remedial phases. This presentation will highlight two projects where multiple technologies were successfully implemented in concert. Technologies to be discussed include abiotic chemical reduction, enhanced reductive dechlorination, and in situ chemical oxidation. Application methods to be covered include injection via direct push, injection via permanent wells, and in situ soil blending. The strategies for each site included different approaches for source (e.g., soil blending) and plume (e.g., permeable reactive barrier) remediation.

Approach/Activities. The first step to any successful remediation project is to develop a thorough high density conceptual site model (CSM). This was achieved at each subject site using a combination of high density soil sampling, discrete groundwater sampling, high resolution site characterization (HRSC), and modeling. Once complete, the remedial approaches were surgically applied to leverage the individual strengths of each technology.

Results/Lessons Learned. Site #1: A large manufacturing facility used vapor degreasing in the 1970s and 1980s that resulted in chlorinated volatile organic compound contamination in soil and groundwater. In the source areas, trichloroethene (TCE) concentrations in groundwater exceeded 50 mg/L. BOS 100®, a specialized catalyst manufactured by Remediation Products Inc., was used in the source areas. Enhanced reductive dechlorination was selected for treatment of the plume areas and involved injection of an electron donor and a dechlorinating culture. All amendments were injected via a combination of direct push and permanent wells in both grid and barrier configurations. Site #2: An industrial property utilized chlorinated solvents for equipment maintenance from the 1950s to 1970s. Past operations resulted in multiple source areas and it is suspected that chlorinated solvents were discharged to drain pipes into a former settling pond. TCE concentrations have been detected in groundwater at a maximum concentration of 730 mg/L and in soils up to 6,800 µg/g. Soil blending was performed utilizing chemical oxidation (sodium permanganate) to treat the unsaturated TCE impacts exceeding an average 1,100 µg/g. BOS 100® was injected into the saturated zone in a barrier configuration to limit the mass flux from the source area and prevent contamination from leaving the subject property.