Enhanced Bioremediation of Chlorinated Solvent Source Areas

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Groundwater at a former textile manufacturing facility is impacted with tetrachloroethene (PCE) and its daughter products at concentrations up to 100 ppm. Groundwater data suggested favorable conditions for a bioremediation remedy; however, microbial testing indicated variable results for *Dehalococcoides ethenogenes*, the only microbes known to reductively dechlorinate PCE completely to the non-toxic end product ethene. A pilot test was conducted to evaluate the feasibility of enhanced in situ biodegradation as a remedial approach for the site.

HRC was injected in a grid of 12 direct-push injection borings in November 2006. Performance monitoring was conducted over a 9-month period to evaluate the effectiveness of the HRC in creating conditions favorable for reductive dechlorination and stimulating complete degradation of PCE to the non-toxic end product ethene.

Based on performance monitoring results, the HRC was highly effective at creating anaerobic, reducing conditions within the injection grid. Anaerobic biodegradation of the target compounds was successfully stimulated with a 99% reduction in PCE, 89% reduction in trichloroethene (TCE), and 99% reduction in vinyl chloride (VC) observed in the pilot test grid. Cis-1,2-DCE increased, as expected, but then started to decreasing. Furthermore, a significant increase in ethene was also observed confirming complete degradation of PCE.

Geochemical parameters confirm anaerobic conditions as evidenced by decreased DO, ORP, and sulfate and increases in dissolved iron, dissolved manganese, and methane. Substantial increases in total organic carbon (TOC) and metabolic acids were also observed indicating that the HRC was effectively distributed within the injection grid.

Based on the HRC pilot test results, full-scale implementation of a bioenhancement remedy was conducted at the site in May and June 2008. The full-scale remedy consisted of injecting approximately 40,000 lbs of 3D Microemulsion concentrate mixed with water in a 1:10 (concentrate to water) ratio over a grid of approximately 400 injection points. Quarterly monitoring is being conducted to evaluate full-scale performance.

The presentation will provide details of the design and results of both the pilot study and the full-scale source area remedy.