

Successful Biosparging Application using Horizontal Remediation Wells

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Background/Objectives. Historical releases associated with a Department of Defense tank farm site in Southern California had resulted in groundwater contamination that extended beyond site boundaries and beneath adjoining residential properties. Removal of above-ground tanks and early remediation efforts had removed sources and remedied portions of the property, however several relatively inaccessible zones remained untreated. These areas included LNAPL, sorbed-phase, and dissolved fuel hydrocarbons. Complicating the cleanup was the presence of an active high pressure fuel line, an electrical substation, and flowing sands which could hinder well installation.

Approach/Activities. A phased approach to cleanup using horizontal directional drilling (HDD) was developed. One horizontal well was installed in a pilot project for biosparging to enhance microbial degradation of BTEX and VOCs in groundwater. After operation for several months, significant reduction of contamination within the radius of influence resulted in extension of a second well to expand the treated area within the site boundary, and later a pair of SVE and air sparge (AS) horizontal wells were extended beneath adjoining residential properties to remove contamination from the migrating plume. SVE and AS were used in this setting to assure complete control of mobilized volatile compounds and prevent emissions into buildings. All wells were single ended.

Wells were installed using advanced navigation techniques including Gyroscopic Steering Tools and Magnetic Guidance Systems at depths exceeding current walkover locating capabilities. Biodegradable drilling fluid was used to maintain formation permeability near the well bore and extensive well development was performed to optimize well performance. Well lengths exceeded 850 feet. Three of the four wells crossed beneath the fuel pipelines, requiring additional care and observation to assure safe distancing from the active pipelines. The pilot test included a tracer study and soil and groundwater monitoring of contaminant concentrations and dissolved oxygen.

Results/Lessons Learned. Tracer studies for the pilot, confirmed by other testing, indicated a ZOI of 100 feet (30 m) across the treated area, for the full 600 foot (183 m) of the biosparge screened interval. Dissolved oxygen data alone indicated some level of influence as far as 200 feet (60 m) from the well. Results of the testing after approximately one year of operation indicated significant removal of LNAPL, and significant reductions in TPH fractions, benzene, and MTBE. Similar results were observed in the other biosparge well.