

Horizontal Biosparging: Case Study of Southern California Pilot Study

Michael Lubrecht, LG (mike@horizontaldrill.com)
(Directed Technologies Drilling, Inc., Bremerton, WA)
Eric Davis (eric.davis@ch2m.com) (CH2M, Los Angeles, CA)
Mark Strong (mark.strong@ch2m.com) (CH2M, Charlotte, NC)

Background/Objectives. Horizontal wells and horizontal directional drilling (or HDD) are recognized technologies that provide access for a variety of treatment technologies. Historically, the installation of horizontal wells has been limited by depth, geologic conditions, and interference with locating systems from existing site infrastructure.

A Southern California site that formerly held several aboveground fuel storage tanks has been the focus of remediation efforts for several years. CH2M identified HDD as the preferred technology to install a biosparge well at the site to remedy LNAPL, sorbed-phase, and dissolved fuel hydrocarbons. The required well path combined several factors that complicated its installation, including single-ended configuration, proximity to active pipelines and an electrical substation, and potential flowing sand lithology.

By integrating advanced locating technology with a newly-patented installation method, an 850 foot, 4-inch horizontal biosparge well was installed in August 2014. Monitoring of the well and surrounding groundwater would be used to evaluate the technology for future remediation at the site.

Approach/Activities. For the well installation, DTD used an inertial guidance system most frequently used in the oil industry or for major pipeline crossings, enabled the accurate navigation of the well along a path cross by utilities, adjacent to active, high-pressure gas lines, and beneath an electrical substation. The consequences of deviation from the designed bore path were deemed too high to use traditional locating methods, resulting in the selection of a Gyroscopic Steering Tool (GST) to complete this project. Using the GST, the as-completed bore path never varied greater than a half-foot from the designed path, and the well was installed successfully.

This technology was combined with an installation method that allows well materials to be advanced inside the drill rods, and then remotely disconnect the drill bit to allow the rods to be retracted, leaving the single-ended or “blind” well in place. By combining the navigation and installation methods, the well could be precisely placed in soft soil without the risk of deviation from the accurately placed bore or obstruction of the bore from caved or flowing soil.

Following installation of the well, CH2M connected the well to blower system to meter compressed air at the desired rate across the screened zone. A previously-installed Soil Vapor Extraction system was operated simultaneously with the biosparge, to collect displaced volatile constituents. Pilot test activities included a tracer study to characterize the zone of influence (ZOI), as well as soil vapor monitoring and groundwater monitoring for contaminant concentrations and dissolved oxygen.

Results/Lessons Learned. Tracer studies, 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.