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Treatability Comparison of Biosparge and Enhanced Anaerobic Oxidation as Remediation Alternatives for BTEX in Groundwater

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Background. In 2008, an optimization review was performed to assess remedial actions taken at an underground storage tank (UST) site at Naval Air Station (NAS) Meridian in Meridian, Mississippi. An enhanced fluid recovery system had been operating at the active gas station from 1994 through 2006 to address elevated concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) in groundwater. The optimization study concluded that the continued system operation would no longer be cost effective and recommended biosparge to be tested as a remedial alternative. In 2009, a decision was made to conduct two pilot-scale studies, biosparge and enhanced anaerobic oxidation, to evaluate and compare the treatability of these remedial approaches in addressing BTEX concentrations exceeding groundwater cleanup goals.

Approach. The two pilot studies, both planned for one year, were initiated simultaneously at the site in April 2010. Each study was established in a separate test cell 25 ft long by 25 ft wide, targeting a groundwater aquifer between 15 and 25 ft below ground surface (bgs). The biosparge study consists of three biosparge wells in which air is injected under low pressure (~4 psi) into the shallow aquifer. A low flow rate of injected air (~1 to 2 cfm) within the biosparge wells has been sustained to enhance the biologically mediated aerobic oxidation of the hydrocarbons.

The enhanced anaerobic oxidation study consists of a recirculation system where contaminated groundwater is extracted using submersible pumps, amended with a nitrate and sulfate solution (electron acceptor), and reinjected by gravity flow into the aquifer. The operational wells are oriented as a large equilateral triangle with an extraction well at each of the vertices and an injection well at the midpoint of each line segment; one extraction well is located in the center of the triangle. Four quarterly recirculation events, each lasting approximately one week, were performed during the study and were followed at regular intervals by performance monitoring.

Results. Quarterly performance monitoring within the biosparge test area consists of geochemical parameters, contaminant concentrations, molecular biology tools (MBTs) and compound specific isotope analysis (CSIA) for ^{2}H and ^{13}C in BTEX. More frequent monitoring of the anaerobic oxidation test area is performed (at frequencies from two

weeks to twelve weeks post-injection) and consists of geochemical parameters, contaminant concentrations, dissolved H_2, MBTs, and CSIA for ^{2}H and ^{13}C in BTEX. The data obtained will demonstrate the amount of contaminant concentration reduction achieved and will provide several lines of evidence to support the degree to which biological degradation has contributed to the concentration reductions. The pilot study results obtained during the one year period from April 2010 through April 2011 will be presented.