Effective Use of Performance Assessments to Optimize Combined Remedial Strategies

Pamela Groff Robertson and Scott Haitz (WSP USA, Herndon, VA)
Matt Burns (WSP USA, Boston, MA)
Colleen Myers (WSP USA, Pittsburgh, PA)

Background/Objectives. Historical operations at a former manufacturing site in Georgia included the use of trichloroethene (TCE) for metals degreasing. Releases of TCE from the former degreaser impacted the upper and lower water-bearing sand units, with dense non-aqueous phase liquid (DNAPL) detected in the vicinity of the former degreaser. The impacted groundwater area pre-treatment containing over 1,000 micrograms per liter (µg/l) was over 22 acres, extending 1,800 feet beyond the site and underlying a residential community.
The site remedial action objectives (RAOs) are to control the offsite migration of affected groundwater and remove contaminant mass. Implementation of interim measures, including onsite source soil removal and groundwater extraction and treatment, were expedited in 1999. An optimized groundwater extraction and treatment remains in operation. An innovative, combined remedial strategy, capable of evolving with changes in the TCE-affected groundwater plume and regulatory environment, was needed to promote a reduction in the extent and magnitude of groundwater contamination and accelerate attainment of the RAOs.

Approach/Activities. Periodic performance assessments have been conducted over the past 18 years to identify methods to reduce long-term cost, optimize TCE mass recovery, and potentially limit the footprint and operation of the groundwater extraction and treatment system. Key components of the assessments include updating the site conceptual site model, evaluating the response to groundwater extraction, and estimating the contaminant mass trends and removal.

The performance assessments have resulted in the identification of remedies that can to accelerate attainment of the RAOs and reduce the long-term project cost and liability. The implemented combined remedial approach to date includes: 1) multiple modifications to the groundwater extraction network to maximize hydraulic containment and TCE mass removal efficiency, 2) DNAPL in situ treatment for supplemental source treatment using SRS®-Z formulation of emulsified zero-valent iron and TSI DC® Bioaugmentation Culture, a dechlorinating bioaugmentation culture containing key halo-respiring microbes from the genius *Dehalococcoides*, and 3) in situ treatment using soluble (QRS™-SL sodium lactate) and lipid (SRS®-SD emulsified vegetable oil) based fermentable electron donors, TSI DC® Bioaugmentation Culture, micro-nutrients, and a pH buffer to reduce contaminant mass and facilitate overall plume stability, promoting further reduction in the footprint of the groundwater extraction network.

Results/Lessons Learned. Over 18 years of combined remedial strategies have resulted in successful attainment of the RAOs. More than 15,000 pounds of TCE mass has been removed, and measurable DNAPL has not been identified following the in situ DNAPL treatment application. The extent of the TCE-affected groundwater area (above 1,000 µg/L) has been reduced by 14.5 acres, and TCE concentrations in groundwater samples have reduced an average of 78% from their maximum historical concentrations. An estimated 15 percent of annual remediation cost is being saved through the combined remedial application.