

FACT SHEET

Assessing the Long-Term Performance and Impacts of ISCO and ISBR Remediation Technologies

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ESTCP Project ER-201585

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14. ABSTRACT There is a critical need to conduct accurate, quantitative performance assessments over longer time scales. This is especially important for the many complex sites that contain DNAPL source zones and large groundwater contaminant plumes comprising persistent contamination, which are recognized to present the most difficult challenges to site closure. The implementation of longer-term performance assessments is expected to reduce the risk and costs associated with remediation and management of these complex sites. The overall goal of this project was to demonstrate the effectiveness of longer-term performance assessments for evaluating the benefits of remedial actions. The specific objectives of the project were as follows: 1. Assess the long-term performance of fracturing-enhanced ISBR remediation for a specific application site. 2. Compare the observed performance of the FE-ISBR project to the prior ISCO project conducted at the same site. 3. Compare the observed performance of the FE-ISBR project to other projects that have employed fracturing to enhance amendment delivery for ISBR or ISCR.						
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Assessing the Long-term Performance and Impacts of ISCO Technologies

ESTCP Project ER-201585

This fact sheet summarizes the results of a recent ESTCP project designed to conduct a long-term assessment of the performance of fracturing-enhanced in situ bioremediation (ISBR) at a site contaminated by trichloroethene (TCE), 1,4-dioxane (dioxane), and chromium.

The project was conducted at Air Force Plant 44, which is part of the Tucson International Airport Area federal Superfund site located in Tucson, AZ.

- The site comprises several primary source zones and a large, several kilometer long, groundwater contaminant plume that resides in the regional aquifer.
- The remedial action and performance monitoring were conducted by the Air Force contractor. Performance monitoring data were obtained for a period of greater than three years after completion of ISBR.
- The project focused on treating the interface between the vadose zone and saturated zone. This interface region, which consists of primarily lower permeability (clay) media, has been identified as a primary location for remaining contaminant. Slow release of contaminant from this domain is considered a primary cause of the observed delayed attainment of cleanup objectives.



Map of the treatment system for ISBR implementation at the DP003 source zone. The white triangles represent the wells used for hydrofracturing-enhanced injection of amendments. The pictured region is approximately 300 by 300 meters.

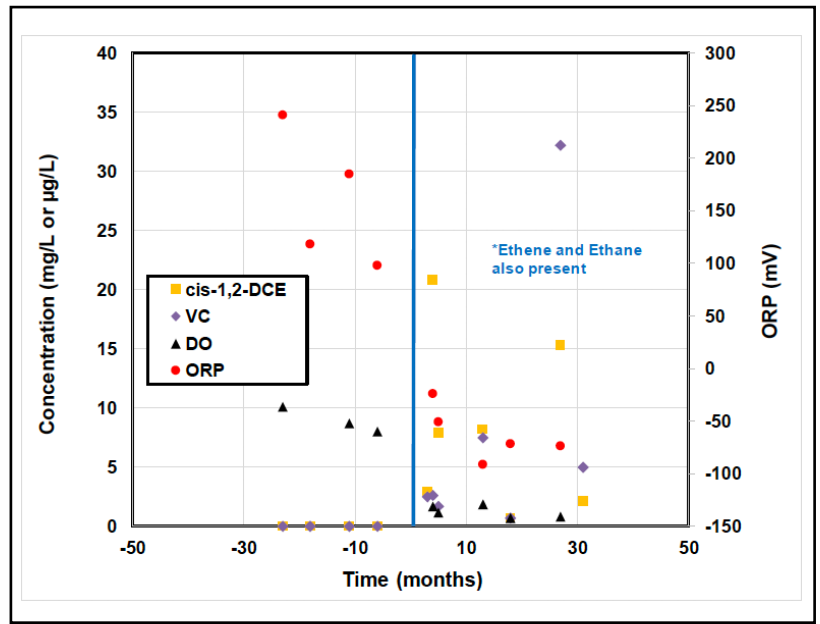
About ESTCP

The Environmental Security Technology Certification Program (ESTCP) is the U.S. Department of Defense's environmental technology demonstration and validation program. The program's goal is to identify and assess innovative technologies that address DoD's high-priority environmental requirements efficiently and cost-effectively.

KEY RESULTS

ISBR employing enhanced reductive dechlorination (ERD) was effective. TCE, chromium, and dioxane concentrations at site DP003 were reduced by 94, 83, and 36%, respectively. The observation of cis-1,2-dichloroethene, vinyl chloride, ethene, and ethane in groundwater samples after ISBR implementation (but not before) supports that reductive dechlorination of TCE was initiated in the treatment zone.

ISBR employing enhanced aerobic cometabolism (EAC) was effective. Dioxane and TCE concentrations at site DP003 were reduced by 92 and 60%, respectively. The concentrations of chromium remained essentially unchanged over the course of the EAC-ISBR treatment, which indicates that the generation of aerobic conditions had no measurable impact on chromium levels in groundwater.



Concentrations before and after implementation of ERD-ISBR at site DP003. DCE= dichloroethene, VC=vinyl chloride, DO=dissolved oxygen, ORP=oxidation-reduction potential.

The performance results are consistent with other field tests. A meta-analysis was recently reported of enhanced anaerobic bioremediation projects conducted for sites wherein the original contaminants of concern (COC) were either tetrachloroethene or TCE. The median concentration reduction was 90% for 34 sites for which the performance-monitoring period was at least.

The longer-term performance assessment provided more robust assessment. Concentrations of the COCs measured after >3 years of monitoring were approximately 50% lower than the values measured after three months for a majority of the sampling points. This demonstrates the advantage of conducting longer-term performance assessments.

FOR MORE INFORMATION

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