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KB-1 plus®

Case Study

Client:
GSI Water Solutions
Portland, Oregon

Site Location:
Oregon

Services Provided:
- KB-1® Bioaugmentation
- Gene-Trac® *Dehalococcoides* and *Dehalobacter* testing

"Within 8 months of KB-1® Plus bioaugmentation, 1,1,1-TCA and TCE concentrations decreased to below 5 µg/L in 4 of 6 monitoring wells."

1,1,1-TCA/TCE Remediation Using KB-1® Plus

Project Highlights

- Effective bioremediation of a comingled 1,1,1-TCA/TCE plume
- All chlorinated VOCs were below or near ROD specified limits within 18 months
- KB-1® Plus and electron donor applied in a single mobilization into an aerobic aquifer using anaerobic chase water
- Successful pilot study led to two full scale KB-1® Plus bioaugmentation implementations at the Site

Problem Definition

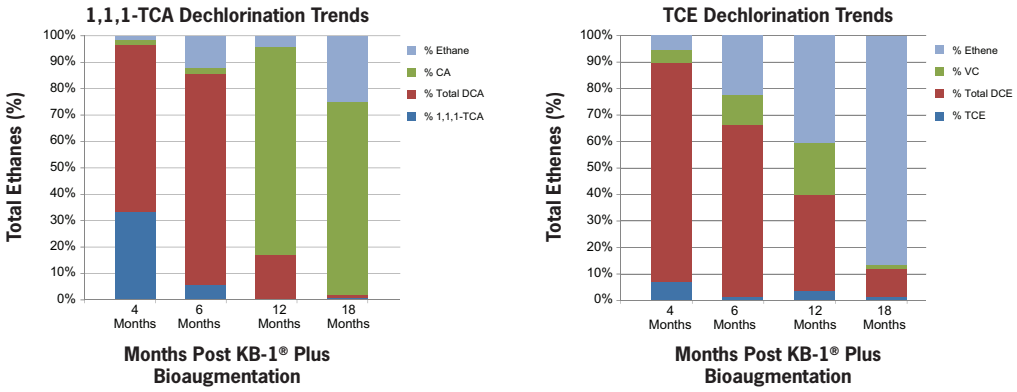
Three Site areas were impacted with 1,1,1-trichloroethane (1,1,1-TCA) and trichloroethene (TCE) associated with historical solvent use. Notably, 1,1,1-TCA is known to inhibit the reductive dechlorination of TCE if the requisite dechlorinating microorganisms are absent. Gene-Trac® testing indicated that dechlorinating *Dehalococcoides (Dhc)* and *Dehalobacter (Dhb)* microbes were absent prior to bioaugmentation. The Site groundwater was aerobic and not conducive to growth of dechlorinating microorganisms prior to enhanced *in situ* bioremediation (EISB). A pilot study was conducted to determine if: (1) EISB would promote degradation of TCE and 1,1,1-TCA below EPA Record of Decision (ROD) limits; and (2) would EISB reduce overall remediation costs.

Solution

The pilot study, initiated in June 2008, included 17 temporary injection points which were used to apply emulsified vegetable oil (EVO) and 1 liter of KB-1® Plus per point to introduce *Dhc* and *Dhb* microorganisms. Anaerobic water was injected before and after KB-1® Plus to limit the culture's exposure to aerobic groundwater. This allowed the electron donor and KB-1® Plus to be applied in the same mobilization, minimizing application costs.

Notable Results

Within 8 months of KB-1® Plus bioaugmentation, 1,1,1-TCA and TCE concentrations decreased to below 5 µg/L in 4 of 6 monitoring wells. After 18 months, all chlorinated VOCs were below or near ROD limits. The pilot test was deemed sufficiently effective that full-scale application in this area was not required. Full-scale KB-1® Plus bioaugmentation was implemented at two other Site areas in 2009 and 2010.



Monitoring results from a typical performance monitoring well for 1,1,1-TCA dechlorination (left) and TCE dechlorination (right). 1,1,1-TCA dechlorination through 1,1-DCA to chloroethane (CA) was observed with greater than 90% of the reported mass as CA and ethane after 18 months. TCE dechlorination through cDCE and VC to ethene was observed with greater than 80% of the mass as ethene after 18 months. Courtesy of GSI Water Solutions.