Vandenberg Space Force Base

Min-Trap Sampler

Media:	Groundwater
Study Type:	Side-by-side comparison
Technology:	Accumulation
Peer Reviewed:	No
Publication Date:	October 2022

Study Description

- Field and laboratory tank demonstration of Min-Trap sampler at two sites associated with Vandenberg Space Force Base in Central California.
- Ongoing in situ bioremediation remedy via enhanced reductive dechlorination (ERD) within clay, silt, and silty sand aquifers and target treatment area within 1,000 µg/L trichloroethene (TCE) plume and other areas with elevated TCE concentrations indicative of potential dense nonaqueous phase liquid (DNAPL).
- Ambient iron and sulfate groundwater chemistry at the two sites was sufficient to drive iron sulfide mineral formation following ERD implementation and development of reducing geochemical conditions.

Remedial Phase

This case study was a remedial phase demonstration of the use of the Min-Trap technology to collect mineralogical data to evaluate and manage the ERD remedy. There were multiple performance objectives, including, but not limited to, comparing data collected from Min-Trap with corresponding geochemical conditions and traditional soil core collection methods, determining minimum deployment time to obtain measurable amounts of reactive minerals and whether abiotic reaction rates can be measured, evaluating spatial variability in results from multiple locations, and assessing whether targeted microbial community characterization can be performed with the Min-Trap sampler.

Outcome

Sampling found the presence of reduced iron minerals in Min-Trap samples in monitoring wells confirmed in areas with highly reducing geochemical conditions and their absence in areas that did not exhibit reducing conditions. Significant biogenic iron sulfide minerals present in Min-Trap samples were consistent with chemical and spectroscopic analyses of collected soil cores. Deployment periods of 1–2 months indicated Min-Trap samples can detect iron sulfide minerals forming in the aquifer. Use of ^{14}C assay was able to adequately measure abiotic reaction rates for TCE on Min-Trap samples. Spatial variability of the presence or absence of reactive iron sulfide minerals was consistent with spatial variations in groundwater flux, geochemistry, and/or remediation system operation. Microbial testing results indicated that Min-Trap and Bio-Trap samples provide comparable microbiological data. Min-Trap sampling costs are low compared to overall performance monitoring costs, so these samplers can be used more frequently and reliably than conventional methods to allow for effective remedy implementation and optimization.

Case Study Source

Divine, C. 2022. Demonstration of Mineral Traps to Passively Evaluate and Monitor In-Situ Reactive Minerals for Chlorinated Solvent Treatment. Final Report. ESTCP Project ER19-5190. October. https://serdp-estcp.mil/projects/details/a5c9108a-49ff-4cf4-a222-95f1b2e8cda8