Environmental Solutions

EHC® Liquid
Case Study

EHC® Liquid Treatment of PCE at a Dry Cleaner Site in Millbrae, California

Summary

Jiffy Cleaners is a dry cleaning facility located in Millbrae, California that is underlain by groundwater impacted with tetrachloroethene (PCE). Several small spills occurred in the vicinity of the dry cleaning machine during of the early years of operation, which date back to the 1960s. Although PCE impacts to underlying soil have attenuated over time, a relatively stagnant groundwater plume of PCE presents a vapor intrusion risk to the existing dry cleaning facility and adjacent businesses.

Challenge

After detailed site characterization, the consultant, TRC, developed a strategy for remediating on-site groundwater via enhanced *in situ* bioremediation (EISB). TRC evaluated the naturally existing microbial community at the site to determine if the appropriate bacteria were present in groundwater to facilitate degradation of PCE, and if so, whether or not the addition of a carbon food source for the bacteria would promote higher rates of degradation. Based on the analytical results from bio samplers with various amendments, EHC® Liquid reagent was selected as the remedial approach for the pilot study injection test. EHC Liquid is a two component technology consisting of ELS™ Microemulsion, which provides a controlled-release of carbon used to support the growth of fermenting bacteria, and EHC Liquid Mix, an organo iron dry powder.

Solution

On March 13, 2012, TRC conducted an injection test at IW-1. A mixture consisting of 550 gallons of water, 50 gallons of organic ELS Microemulsion, 25 lbs of water soluble organo ferrous iron EHC Liquid Mix and 2.5 kg of potassium bromide was injected at 10 to 12 psi. TRC injected 3 liters of Dehalococcoides (Dhc), followed by 94 gallons of semi-anoxic, distilled chase water. The intent of the inoculation was to introduce Dhc under anaerobic, non-toxic conditions with excess electron donor and carbon source present to encourage the population of Dhc in the treatment zone and formulate a thriving, sustainable microbial community. Three post-injection monitoring events were conducted for wells IW-1, MW-3R and MW-5. The first post-injection monitoring event took place on March 27, 2012, the second on April 23, 2012 and the third on June 4, 2012.

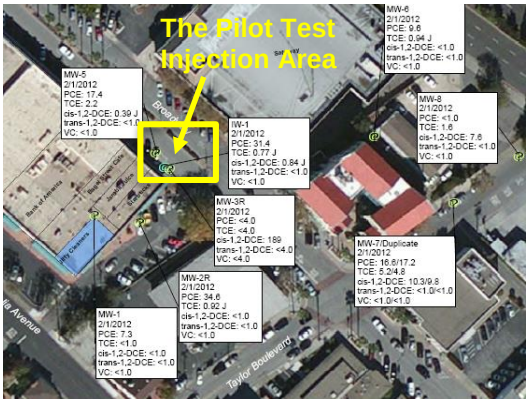

Figure 1 indicates the pilot test injection area and performance monitoring wells

Results

Figures 2 and 3 show the concentrations of CVOCs in wells MW 3R and IW-01 pre and post injection indicating significant reduction in contaminant concentrate post substrate and Inoculum injections in a short time frame.

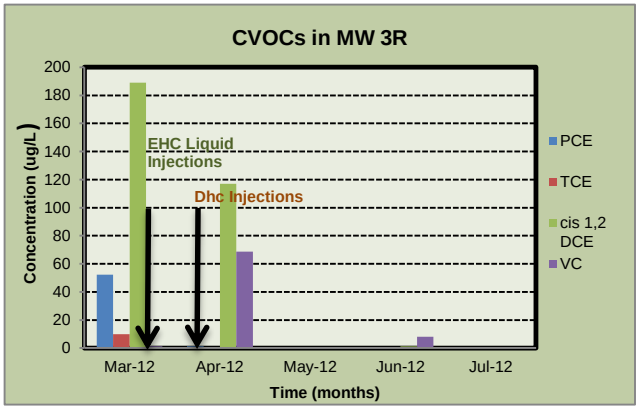

Figure 2

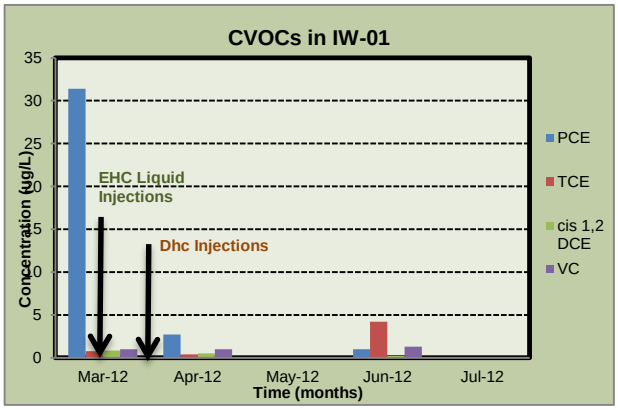

Figure 3

Discussion and Future Scope of Work

- A substantial decrease in CVOC concentrations and an increase in ethene concentrations was observed in IW-1 during the three rounds of post monitoring event.
- Geochemical data from MW-3R suggests acceptable reducing conditions for PCE biodegradation. Nitrate levels have consistently been below reporting limits, and sulfate concentrations have generally been low (less than 10 mg/L to 67.0 mg/L) and likely do not pose a substantial competitive threat to PCE degradation. ORP levels are also relatively low (-38.8 mV to -170.7 mV), suggesting reduced conditions. Increases in ferrous iron concentrations from 4.9 mg/L to 30.7 mg/L imply that naturally-occurring ferric iron concentrations are being depleted and/or DVI is being utilized for abiotic PCE degradation.
- Pilot study results suggest EISB using EHC Liquid is a valid remediation technology at the site. Evidence of complete reductive dechlorination of PCE was observed over a relatively short time period and Dhc inoculation appears to have been successful in IW-1.
- With regard to potential future EISB injections at the site, use of controlled-release carbon amendments with DVI, such as EHC Liquid Reagent will be continued, due to its demonstrated effectiveness and less frequent injections needed. Additionally, adding a buffer to the EHC Liquid injection solutions is recommended to maintain ideal pH levels for Dhc bacteria and performing Dhc inoculation approximately one month after the amendment injection.