Full-Scale Application of Abiotic and Biotic Reductive Dechlorination to Treat Dissolved Trichloroethene and Daughter Products

Angel Cuellar, RG, LPG (angel.cuellar@tetratech.com)
Lesa Sweet, CHMM, CPG (Tetra Tech, Inc., Ann Arbor, Michigan)

Background/Objectives. The site is a manufacturing facility, which currently produces automotive components in southeastern Michigan. Groundwater at the site was impacted with trichloroethene (TCE) and its daughter products near a former degreaser that operated from approximately 1965 to 1992. Three pilot tests using three different treatment chemistries were completed to determine the final remedy approach. Abiotic and biotic reductive degradation treatment chemistry had the best pilot test results and was selected as the final remedy. The objective of the final remedy was to reduce concentrations of TCE, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) below the remedial objectives (RO) established for the site. The aerial extent of the impacted groundwater plume exceeding ROs is approximately 160 feet wide and 170 feet long. The highest baseline concentrations of TCE are 6,350 micrograms per liter (µg/L), cis-1,2-DCE at 86,000 µg/L, and VC at 10,800 µg/L. *Dehalococcoides* (DHC) was detected in the groundwater at concentrations ranging from 164,000 to 6,110,000 cells per milliliter during the baseline groundwater sampling event in select wells.

The site geology is predominantly fill and glacial moraine deposits composed of interbedded units of sand, silt and clay. The impacted unit is perched groundwater that has a static groundwater level of approximately 16 to 17 feet below the facility's floor. Slug test completed in the area have estimated the hydraulic conductivity to be 0.02 to 2.8 feet per day (ft/day). The groundwater flow velocity in the area has been estimated to be 0.0005 ft/day to 0.07 ft/day.

Approach/Activities. A mixture of lactates, fatty acids, alcohols, and a phosphate buffer (electron donor) with zero valent iron (ZVI) was injected to promote abiotic and biotic reductive dechlorination. The amendments were mixed and injected to the target depth of 17 to 27 feet below the facility's floor through direct push technology (DPT) injection points. Bioaugmentation will be completed using DHC culture at wells where DHC concentrations were not measured during the baseline sampling event.

Results/Lessons Learned. Each DPT injection point received approximately 100 pounds of electron donor and 15 pounds of ZVI. A total of 24 DPT injection points were installed in July 2018 and 26 additional DPT injection points are scheduled for installation in September 2018. Visual evidence of the amendments in nearby wells suggested a radius of influence of up to 22 feet during the July event. Mounding and minimal daylighting occurred in wells located near the injection area during implementation. Five proposed locations were inaccessible due to new manufacturing equipment. The amendment scheduled for these five locations, was instead injected into other planned injection points location increasing the amount of amendment in select locations to approximately 200 pounds of electron donor and 30 pounds of ZVI. The results of up to three post-injection performance monitoring events will be presented.