

Enhanced In Situ Reduction of cVOCs Using Zero-Valent Iron

Ed Corack (ed.corack@ch2m.com) and
Scott MacEwen (CH2M HILL – Herndon, VA)
Michael Liskowitz (ARS Technologies – New Brunswick, NJ)
David Steckler (U.S. Navy, Washington, DC)

The enhanced *in situ* reduction of chlorinated volatile organic compounds (cVOCs) was evaluated at Site 13 of the former Naval Surface Warfare Center (NSWC) White Oak in Silver Spring, Maryland. Following pneumatic fracturing of the tight saprolite formation, liquid atomized injection was used to deliver approximately 74,000 pounds of zero-valent iron (ZVI) into 15 boreholes, spaced approximately 50 feet apart within the 13,000 square foot treatment area. Five days after injection, reducing conditions were evident in the injection area by the increase in pH (that is, from 4.9 pre- to 7.2 post-injection) and the decrease in oxidation-reduction potential (ORP) (that is, from 294 mV pre- to -290 mV post-injection). Reducing conditions continued in the treatment area 1 month (pH of 7.3 and ORP of -184 mV), 2 months (pH of 6.7 and ORP of -185 mV), 3 months (pH of 7.2 and ORP of -271 mV), 6 months (pH of 7.6 and ORP of -251 mV), and 9 months (pH of 6.8 and ORP of -55 mV) after injection of ZVI. Contaminant concentrations in the treatment area show significant decreases after the fracturing and injection. The 1,1,2,2-tetrachloroethane (PCA) concentration in the remediation area dropped from 700 µg/L (pre-injection) to 130 µg/L (5 days after the injection), and then to 110 µg/L (1 month), 51 µg/L (3 months), 17 µg/L (6 months), and less than 2 µg/L (nondetect) (9 months). Similarly, the trichloroethylene (TCE) concentration in the remediation area dropped from 150 µg/L (pre-injection) to 22 µg/L (5 days after the injection), and then to 17 µg/L (1 month), 8 µg/L (3 months), 3 µg/L (6 months), and less than 2 µg/L (nondetect) (9 months). As of 9 months post-injection, reductions in cVOC concentrations have not been observed in the nearest downgradient wells. In fact, slight increases have occurred, suggesting that some of the contamination may have been pushed outward during the injection. Long-term monitoring will continue until remediation goals are met as specified in the Record of Decision for Site 13.