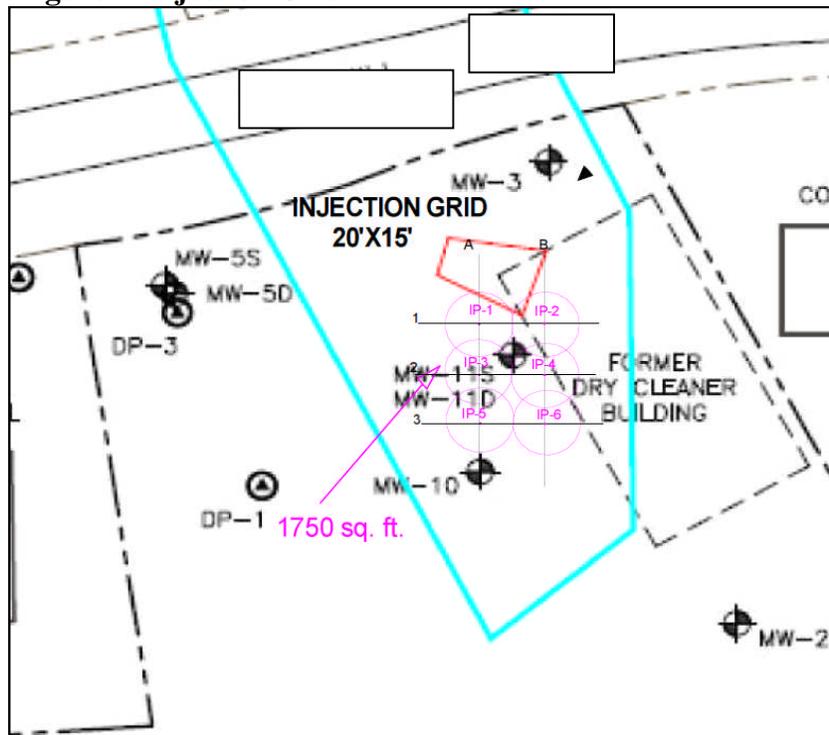


The subject site is located near the Village of Pinehurst Park in Pinehurst, NC. The site has historically had soil and groundwater impacted by the use of dry cleaning agents, tetrachloroethene (PCE) and trichloroethene (TCE). The in-situ injection program was a pilot that targeted these compounds and their anaerobic daughter products such as cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC). A total of 12 injections were completed on February 22nd, 2011 through direct push, advanced utilizing a Geoprobe 6620. The injections were made at 13-19 feet below ground surface (bgs). The contamination plume outline and the specific injection point locations can be viewed below in Figure 1.

Figure 1. Injection Grid

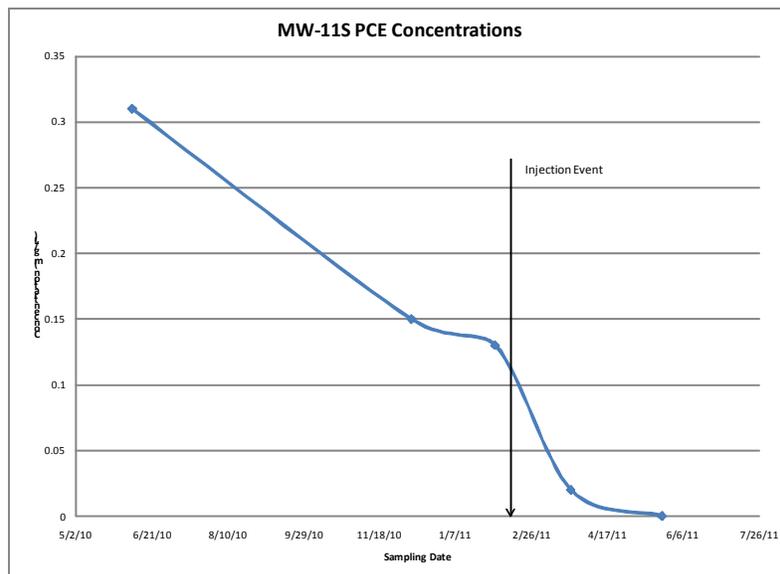


Remediation Plan

The pilot scale injection program utilized direct-push technology to apply a mixture of vitamins, nutrients, sodium sulfite (an oxygen scavenger), calcium propionate, zero valent iron, HRC[®], and EHC[®]. The overall design was a pilot to show an effective reduction in source area concentrations, as well as promote anaerobic conditions in the groundwater favorable to anaerobic bacteria that degrade CVOCs. The stimulus of these indigenous bacteria in the subsurface, in conjunction with the ZVI component, is utilized to effect the rapid and measurable removal of the targeted compounds in the groundwater and saturated soils.

Results

One monitoring well is located within the treatment area at the treated screened interval, while four other monitoring wells are outside of the pilot area. Monitoring well MW-11S is located within the remedial treatment area and is screened from 5-20 feet bgs, which corresponds to the targeted subsurface intervals that range from 13-19 ft bgs. Based on the May 2011 sampling event results, MW-11S was strongly affected by the remedial action. The remedial event changed both the geochemistry and groundwater contamination concentrations. All contaminants of concern are below their laboratory detection limits. The concentration of PCE decreased from 130 $\mu\text{g/L}$ in February 2011 to $<0.7 \mu\text{g/L}$ in May 2011. Daughter products such as TCE, cis-1,2-DCE, and vinyl chloride remain below the laboratory detection limit. All targeted compounds were below the groundwater standard 90 days following the pilot scale injection event. A graph of PCE concentrations is located below.



The field parameters also indicate that the subsurface was affected by the injection event. A pH increase was measured from 5.79 pH units in February 2011 to 7.34 pH units in May 2011. The increase in pH can be attributed to the oxidation of the zero valent iron injected into the subsurface which releases hydroxide ions when the iron is oxidized. The redox potential has become more reducing since the February 2011 sampling event, decreasing from +151.4 mV to -410.7 mV in March, although the ORP was recorded at -250.8 mV in May 2011. The pilot injection event resulted in a 99.5% reduction in PCE concentrations in the injection events targeted area within the source. Due to the effectiveness of the event, a full scale remedial proposal has been submitted and is planned to take place in 2012.