

Enhanced Reductive Dechlorination Using a Vegetable Oil Emulsion in a Fractured Bedrock Aquifer

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Enhanced reductive dechlorination of tetrachloroethene (PCE) was implemented within a fractured bedrock aquifer at Solid Waste Management Unit 87 (SWMU-87) of the former Naval Surface Warfare Center (NSWC) at White Oak, Silver Spring, Maryland. The field scale remedial action involved hot spot bioremediation of groundwater to permanently reduce contaminant levels to less than the Media Cleanup Standards.

Due to the low permeability of the aquifer sediments (saprolite), pneumatic fracturing (PF) was used to increase subsurface permeability and enhance distribution of a vegetable oil substrate within the target treatment zone. Approximately 10,440 pounds of 60% oil substrate was injected into forty-five boreholes spaced within a 60,000 square foot treatment area. Five existing monitoring wells, located within 30 feet (ft) of the injection points, were used to monitor the distribution and persistence of the substrate and assess the treatment effectiveness of the injections. PF and substrate injection pressures ranged between 60-700 psig and 35–260 psig, respectively. During both the PF and substrate injection processes, pressure influence was observed in monitoring wells at distances exceeding 30 ft.

Short term evidence of substrate distribution was confirmed through visual identification of the vegetable oil emulsion in monitoring well ground water samples and elevated total organic carbon (TOC). Long term treatment of the target chlorinated Volatile Organic Compounds (CVOC's) will be evidenced by reduction in target compounds at these same wells. Performance monitoring is currently being employed and will consist of quarterly groundwater collection and analysis from the wells situated within the remediation area to assess the progress of the CVOC reductions under the existing groundwater monitoring program. A total of four quarterly rounds of groundwater data will be available by the time of the conference and will include all relevant CVOCs and biological geochemical parameters.

This site provides data on the application of an innovative injection method for the distribution of a vegetable oil emulsion into a low conductivity aquifer and the use of emulsified oil substrate for the biological degradation of chlorinated solvents.