Combining Biostimulation for Source Area Treatment with Monitored Natural Attenuation for Restoration of a Large TCE Plume

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A nearly 3 km trichloroethene (TCE) plume emanates from a former wastewater injection well completed from 60 to 90 m below land surface in fractured basalt at the Idaho National Engineering and Environmental Laboratory. A residual source of TCE, other chloroethenes, and tritium is present to a radius of about 30 m from the injection well. A 1995 Record of Decision (ROD) selected pump-and-treat as the site's default remedy; however, five innovative technologies were identified to be evaluated for their potential to replace pump-and-treat. A field evaluation of enhanced *in situ* bioremediation was performed in the residual source area, while natural attenuation was evaluated for the large, dissolved plume. Lactate was injected into the former wastewater injection well to stimulate reductive dechlorination. Within 8 months of the initial lactate injection, complete reductive dechlorination to ethene was observed 40 m downgradient of the injection well. In addition, accelerated degradation of the residual source was observed along with the cessation of contaminant flux to wells just outside the residual source area after about 21 months of operations. For the large, aerobic plume, natural attenuation was evaluated primarily by comparing the transport of TCE to both tetrachloroethene (PCE) and tritium. Using these compounds as "tracers", a method was developed to distinguish dispersion and degradation. It was determined that TCE is disappearing from the plume with a half-life of 10-20 years relative to the co-contaminants. Geochemical and microbiological data suggest intrinsic, aerobic cometabolism is responsible, in spite of the oligotrophic conditions. Based on these studies, enhanced *in situ* bioremediation and monitored natural attenuation have been selected by the regulatory agencies through a ROD amendment to replace pump-and-treat for the residual source area and most of the plume.