

The Effect of Emulsified Zero Valent Iron on Trichloroethene in the Presence of Chlorofluorocarbon 113

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Background/Objectives. It has been widely reported that 1,1,2-trichloro-1,2,2-trifluoroethene (CFC-113) in groundwater can be inhibitory to the anaerobic biodegradation of chlorinated ethenes. Emulsified zero valent iron (EZVI) has been shown to be effective at degrading trichloroethene (TCE) as dense nonaqueous phase liquids (DNAPL). A field evaluation was conducted on the effects of EZVI and other amendments on TCE degradation in the presence of CFC-113 in shallow groundwater.

Approach/Activities. The approach involved assessing post-remediation monitoring results from the implementation of a remediation injection scheme with multiple reagents which included EZVI (for DNAPL treatment), vegetable oil, and KB-1® bacteria culture (SiREM) as remediation amendments to enhance the biogeochemistry of the subsurface and accelerate the reductive dechlorination reactions. EZVI was injected to treat the residual DNAPL source in the subsurface; KB-1® bacteria culture was injected to bioaugment the existing dechlorinating bacteria, and vegetable oil was injected to provide additional carbon for the microbial populations. A detailed review of the groundwater monitoring system results was used to assess the effectiveness of the TCE treatment and to evaluate the potential inhibitory effects of CFC-113.

Results/Lessons Learned. The results indicate that the inhibition of TCE dechlorination by CFC-113 when treated with EZVI in an anaerobic reductive environment did not occur. The EZVI treatment for the TCE DNAPL and the addition of the KB-1® bacteria culture was successful in treating the TCE with no perceived inhibition, and also resulted in the simultaneous reduction in CFC-113. These results are being used in an ongoing laboratory treatability study with subsequent supporting field data using EZVI to remediate a DNAPL source, also containing free product levels of CFC-113, with KB-1® Plus culture capable of degrading CFC-113 and TCE. Results from the field application and laboratory evaluation will be presented and lessons learned discussed.