Hydrocarbon Remediation via In Situ Bioreactors in Riverbank

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Background/Objectives. Free phase fuel oil and diesel were released to the subsurface for a prolonged period of time (1950s through 1990) at a fuel oil depot situated on the Pequannock River in New Jersey. The free phase oil was released to the water way via the riverbank in 1990. Through engineering controls and interim remedial actions, the free-phase-oil seep was controlled and subsequently inhibited, however a hydrocarbon sheen and dissolved phase compounds seep occurs from time to time after heavy precipitation events. Enhanced bio-remediation using in situ bioreactors has been implemented to eliminate these petroleum residuals trapped within the riverbank materials.

Approach/Activities. The initial remedial plan consisted of a treatment train of erosion resistant barriers stabilizing a carbon based cut off layer coupled with in situ bioreactors (ISBRs). Since the engineered structures required waterway permits, the ISBR units were installed to initiate remedial efforts within the riverbank while the permitting process evolved. The use of Bio-Enhance's ISBRs promote the growth and transport of indigenous microbial organisms to stimulate and increase the biodegradation process within the riverbank.

The ISBR treatment approach relies on the use of Bio-Sep® beads as a medium for microbial growth and support. Bio-Sep® beads absorb the aquifer nutrients and contaminates and provide an incredibly larger amount of surface area that can be readily and rapidly colonized with high densities of microorganisms in groundwater. These microorganisms are subsequently released when the carrying capacity of the beads is reached. The circulation element through the ISBR, where contaminated groundwater is pulled in from the bottom of the ISBR, passes through the Bio-Sep® medium and exits into the formation allows for healthy microbes from within the ISBR to migrate into the formation surrounding and beyond the riverbank remediation wells to further promote the biodegradation of the residual petroleum hydrocarbons in the riverbank. Thus, the beads can act as a continuous source of degraders for release in the aquifer environment.

Results/Lessons Learned. The chemical, geochemical and microbial laboratory results will be presented to illustrate the viability of this remedial technology to degrade petroleum trapped within the riverbank to inhibit future seeps into the adjacent river way eliminating the costly erosion resistant barriers.