Controlling Back-Diffusive Mass Loading at Three Midwest Sites with Glaciogenic Interbedded Geology Utilizing a Colloidal Liquid Activated Carbon

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Background/Objectives. Three individual case studies have been compiled to demonstrate a remediation technique intended to achieve similar results at each individual site. The sites are alike in their plume propagation is one of a mature plume, meaning that mass loading is occurring from clay formations above, below, or within the sand unit transporting the dissolved phase plume. In these cases, most of the impact that would create mass loading into the transport zone has either been remediated or has simply been depleted through desorption over time. Back-diffusion is a common and well understood late plume phenomenon that slowly continues to load the plume for many years into the future if not treated.

Approach/Activities. A liquid activated carbon substrate was applied to sandy transport zones surrounded by clay storage zones to sequester chlorinated solvent mass diffusing from the clay units. The approach included both initial and continual design verification throughout the target treatment zone. The initial verification at two of the sites established the radius of influence that the transport zone would allow. The continual design verification was needed to confirm the injection interval and potential dosing alterations within each injection zone. Electron donor and bioaugmentation substrates were also applied at two of the three sites. A distribution analysis was conducted following the injections consisting of soil cores collected at locations investigated prior to injection.

Results/Lessons Learned. The results suggest a very significant decrease in dissolved phase contaminants (up to 98%) within 30-45 days post injection. Microbial populations were observed to both increase and persist. The distribution analysis, where conducted, demonstrated a complete coverage of the sediments within the transport zone and along the clay units in contact with the sand. This indicates that the properly distributed liquid activated carbon is effective in removal of back-diffusing contaminants and will theoretically be effective for a significant time period.