

Comparing Parallel ERD and Oxidation Pilot Tests in a Low Permeability Area

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Background/Objectives. Groundwater impacts have been identified at a closed chemical research facility in the gulf coast of Texas. The site geology is primarily silty sands with low hydraulic conductivity. The groundwater flow velocity is estimated to be less than one-half foot per year. Therefore injection activities present a particular challenge. Two remediation pilot studies were completed to address separate plumes. Chemical oxidation was applied to a chlorobenzene plume and enhanced reductive dechlorination (ERD) was applied to a carbon tetrachloride plume. The plumes are distinct without any commingling.

Approach/Activities. The injection activities were initiated during a single mobilization and are located a few hundred feet apart. The injections were both completed at similar depths. The initial concentration of chlorobenzene was 35 milligrams per liter (mg/L). The initial concentration of carbon tetrachloride was 2.3 mg/L. Quarterly data is being gathered to measure the effectiveness of each injection. In addition to providing pilot study data for possible further activity regarding each plume, this activity has provided a fairly unique opportunity to compare two different remedial activities under virtually identical characteristics, including both site conditions and also external impacts such as changes in weather

Results/Lessons Learned. Different patterns have emerged in the remediation progress so far. More details will be observed in the upcoming quarters. The purpose of this presentation will be to document the case studies for these established remedial approaches, and to more significantly show how understood conditions and understood remedial science can interact to produce differing results.

Already the data have shown that the treatment progress has been distinctly different for each plume. Despite injection being very close to the “hot” well, the initial three quarters showed no change at all in the chlorobenzene concentrations. Substantial increases in oxidation-reduction potential (ORP) were noted in the first sampling event. This event was completed one month after injection. But the 35 mg/L concentration was unchanged. The concentration remained unchanged over the next six months. However, in the third quarter the concentration dropped by over 65%. This change occurred at the exact same time as a significantly lower ORP was measured in the target well.

With regard to the carbon tetrachloride target well, the ORP was observed to immediately drop into the target remediation zone. And the target concentration also immediately dropped by over 75%. However, the ORP has begun to increase and unlike the improving result seen in the chlorobenzene area, the carbon tetrachloride data has stabilized and rebounded to approximately 50% of initial levels.

Further data will be needed to establish whether or not either pilot test is a true success, but this data will provide interesting insight through the comparison of these parallel processes.