

## **Integration Chemical and Biological Technologies for Remediation of Contaminated Soil and Groundwater**

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While environmental remediation literature has contained references to 'treatment trains' for decades, the last 3-5 years have seen a significant increase in actual field deployments to address contaminated groundwater. ISCO and enhanced bioremediation are promising technologies for the treatment of source areas. Several field demonstrations were recently completed to demonstrate the efficacy of coupling in situ chemical oxidation (ISCO) to rapidly remove accessible mass with in situ enhanced bioremediation to degrade and contain the remaining mass.

Two case studies will be discussed in detail. The first was a former retail gasoline station in which chemical oxidation was followed sequentially with enhanced bioremediation were used to remediate BTEX contamination in and around an excavation resulting from a tank removal. The initial concentrations were in the 50 ppm range, and treatment goals were achieved within 2 months. Mass flux calculations based on groundwater measurement indicate significant reduction in contaminant mass. In a second field demonstration, similar BTEX removal (96%) was seen with a simultaneous application of chemical oxidation and enhanced biodegradation. Treatment goals were reached in 4 months.

This presentation will provide an overview of the results from these field demonstrations, draw conclusions for the applicability of the technology for groundwater remediation and provide recommendations for a best-practice approach for future work with the combined chemical oxidation and enhanced bioremediation technologies.