

## Numerical Modeling of a Permeable Reactive Barrier for a PCE WQARF Site in Arizona.

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A three-dimensional groundwater flow model was used to test the design of a deep, passive in-situ groundwater remediation system (PIGRS) for a Dry Cleaning Facility PCE-DNAPL site located in Tucson, Arizona. The Arizona Department of Environmental Quality regulated the site under the Water Quality Assurance Revolving Fund (WQARF).

Numerical simulations of transport of dissolved-phase PCE in the aquifer system under pre- and post-construction conditions were conducted to assess the efficacy of various configurations.

Each PIGRS configuration included a permeable reactive barrier (PRB) which consisted of large diameter; overlapping wells using zero-valent iron (ZVI) and granulated activated carbon. The first PIGRS configuration was designed to function as a “funnel and gate” system (FGS) that would be constructed at a total depth of approximately 250 feet below ground surface (bgs). Two additional configurations were designed as long reactive walls perpendicular to the principal axis of groundwater flow.

The water table was at a depth of approximately 195 feet bgs. A four-layer, three-dimensional MODFLOW/ MT3D model was calibrated to the site conditions. Two layers represented the Unconfined Regional Aquifer (URA) and one layer represented the bottom confining clay layer.

The fourth layer represented a discrete soil zone at the bottom of the URA with hydraulic and chemical properties corresponding to the PIGRS. The first PIGRS-FGS design was approximately 600 feet long and consisted of a “funnel”, a 4-foot thick relatively impermeable vertical wall, and a “gate”, a 120-foot long by 4-feet thick PRB consisting of a combination of gravel and zero-valent iron (ZVI).

The twenty-year simulation using the first PIGRS-FGS design indicated that while it generally slowed the spread of the contamination; it did not meet the overall goal of containment. The only configuration that successfully contained the dissolved-phase PCE plume was one single long reactive wall.

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Mr. Weitzman has more than 25 years experience in remediation of soils and groundwater systems under CERCLA, RCRA, UMTRA, DOD, and DOE Regulations. His recent work includes: design of a zero-valent iron permeable reactive barrier for VOC and metals contamination, numerical modeling of dissolved- and multi-phase transport in groundwater flow systems, remedial investigation/feasibility studies, superfund oversight, risk assessments, hydrogeology, and well hydraulics.