

521d Process Optimization of Pulsed Pumping Remediation Systems

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A computational model is presented for the optimization of pulsed pumping systems for efficient in situ remediation of groundwater contaminants. In the pulsed pumping mode of operation, periodic rather than continuous pumping is used. During the pump-off or trapping phase, natural gradient flow transports contaminated groundwater into a treatment zone surrounding a line of injection and extraction wells that transect the contaminant plume. Prior to breakthrough of the contaminated water from the treatment zone, the wells are activated and the pump-on or treatment phase ensues, wherein extracted water is augmented to stimulate pollutant degradation and recirculated for a sufficient period of time to achieve mandated levels of contaminant removal.

An important consideration in the design of pulsed pumping groundwater remediation systems is the pumping schedule adopted to best minimize operational costs for the well grid while still satisfying treatment requirements. Using an analytic two-dimensional potential flow model, optimal pumping frequencies and pumping event durations have been investigated for a set of model aquifer-well systems with different well spacings and well-line lengths, and for varying aquifer physical properties. The flow model serves as a computationally efficient tool for initial design and selection of the pumping regimen best suited for pulsed pumping operation for a particular well configuration and extraction rate.