Performance of the Monticello Millsite Permeable Reactive Barrier

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Abstract

In June 1999 a Permeable Reactive Barrier (PRB) wall was constructed at the former uranium processing mill site in Monticello, Utah. Zero Valent Iron was selected as the reactive media after evaluating numerous treatability tests and review of the preliminary results of the Fry Canyon Demonstration Project. The wall was constructed pursuant to an Interim Remedial Action Record of Decision for Operable Unit III - Surface and Ground Water. The PRB was constructed on private lands approximately 1000 feet down-gradient of the former millsite. The PRB is a funnel and gate structure that is more than 400 feet in length. The gate is 100 feet in length, approximately 8 ft in width and has a depth which varies between 12 and 14 feet. It has three zones, a pretreatment zone, consisting of approximately 14 percent by volume of ZVI, a four foot wide primary treatment zone with 100 percent ZVI, and a post treatment zone with 100 percent pea gravel in which necessary piping for an air sparging unit has been installed.. Since construction 14 rounds of sampling results have been completed. Performance is presently being monitored with an array of some 45 wells (originally 61 wells were in the monitoring plan), upgradient, within the wall and down-gradient. Results to date have been very encouraging. The PRB is treating between 5 and 9 gallons/minute and is reducing the concentrations of most of the constituents of concern (COC's). It is estimated that 6.25 million gallons of ground-water have passed through the reactive media. Concentrations of uranium, arsenic, vanadium, selenium, and molybdenum are being reduced to levels below the preliminary remediation goals (PRG's). Iron and manganese concentrations are increasing within and down-gradient of the wall. To date it is estimated that 13 kg of uraninite and 11 kg of vanadium trioxide have been removed from the ground water. Based on results from 279 core samples, it is determined that more than 8.8 tonnes of calcite have deposited in the PRB since installation. We have recently initiated studies to evaluate the long term performance and longevity of the PRB. In particular, we are studying losses in performance caused by the precipitation of carbonate and oxide minerals and are investigating methods to rejuvenate the PRB to extend the life of the wall. Techniques than can remove corrosion products may be more cost effective than periodic replacement of the ZVI..