

Use of Sodium Dithionite for Groundwater Restoration Following Uranium In-Situ Recovery at the Smith Ranch Highland Site in Wyoming

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Sodium dithionite is currently being evaluated as part of a new groundwater restoration technique following uranium in-situ recovery (ISR) at the Smith-Ranch Highland site located near Casper, Wyoming. Sodium dithionite is a strong chemical reductant that has been used to remediate aqueous chromium plumes, but it has not been used for groundwater restoration after uranium ISR. Dithionite reacts quickly with aquifer sediments to reduce several elements present in the sediments, most notably iron, which then facilitates reduction of soluble U(VI) to insoluble U(IV). Reduction is favored as a mechanism for groundwater restoration because it is less reversible than sorption.

In September 2017, a 0.05 M sodium dithionite solution buffered with 0.05 M sodium sulfite was injected into two in-situ recovery wells at the Smith-Ranch Highland site. The wells were pumped back starting three days after the dithionite injections. Uranium concentrations stayed below pre-test values for 25 times the injection volumes of water pumped back in both wells. Samples analyzed for ²³⁸U to ²³⁵U ratios yielded a clear reduction signal. The results of this field study suggest that sodium dithionite should be considered as part of a groundwater restoration strategy following uranium ISR.