

IN-SITU DELIVERY METHODS FOR REMEDIATION OF HEXAVALENT CHROMIUM IN SOIL AND GROUNDWATER

Presented at the National Association of Engineering Geologists and American Institute of Professional Geologists National Meeting, October 5, 2001; St. Louis, Missouri; Abstracts

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Conventional soil remediation of the hexavalent chromium relied on soil excavation and off-site disposal, which was expensive and disruptive. Without treating the soil, off-site disposal only transported the problem, without reducing the long-term liability. For groundwater, pump and treat remediation of chromium relied on pumps to remove groundwater from an aquifer through a series of extraction wells or trenches with above ground treatment or disposal. Both treatment methods are expensive, disruptive and time consuming.

An innovative in-situ method for treating chromium uses a sulfur-based reductant. Calcium polysulfide reduces the highly soluble hexavalent chromium to the soluble, but non-toxic trivalent chromium. Trivalent chromium is then precipitated as chromium hydroxide. In-situ delivery of treatment chemicals include enhanced direct push injection as well as a high-pressure lance system for the delivery of treatment chemicals. Higher injection tip pressures are used to induce hydrofracturing in low permeability sediments, allowing for movement of the treatment chemicals into the target zone.

Hexavalent chromium resulted from one specific wood-treating project in 1966 at a former wood treating facility in Ukiah, California. Up to 300 gallons (20 gpm) of reductant was injected into 114 ports to a maximum depth of 20 feet. The highest reduction rate (70%) occurred during the first six months. The reductant continued to react with the hexavalent chromium for a total of about 18 months, reducing the hexavalent chromium in groundwater by 99%. These same in-situ delivery methods have been used to successfully to remediate other metals, hydrocarbons, and chlorinated solvents.

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