



Oil Refinery Pipeline Release

Summary ORIN successfully treated petroleum contaminated groundwater with an enhanced bioremediation chemistry. Contaminant levels were reduced from 4,700 ug/L to less than detection over a four-month period. ORIN's approach saved the client approximately \$28K to \$50K over traditional remediation approaches.

Site Characteristics:

Geology - fine grained, silty, calcareous sand.
Groundwater velocity – variable (10^{-3} to 10^{-5} cm/sec)
Contaminants – 4,700 ppb benzene in groundwater.
Size of plume treated – 60,000 ft³

Remediation Approach:

Treatment chemistry – Sodium persulfate and PermeOx[®] Plus
Treatment application – Chemical injection through a series of direct push points

Chemistries used during injection

An initial bench level treatability study performed at ORIN's treatability laboratory found that a combination of sodium persulfate and PermeOx[®] Plus effectively reduced the concentrations of benzene. PermeOx[®] Plus is chemical oxidant and a slow oxygen release chemistry that stimulates indigenous aerobic microbes to breakdown petroleum compounds.

Summary of Implementation

The chemistry was designed for the chemical oxidation and enhanced bioremediation of BTEX compounds found in the soils and groundwater at this site. The targeted injection area at the site was down gradient of a former pipeline release. Twenty-five direct push injection points received 50 gallons of sodium persulfate followed by 100 gallons of PermeOx[®] Plus, at a rate ranging from 2 to 6 gallons per minute.

In some instances during injection, fluid refusal was present and the chemical was forced to the surface. ORIN was able to

overcome this problem by using a specialized high-pressure pump to break open the soil formation and continue with the injection.

Evidence of oxidant influence was observed during the injection by the increase of key groundwater parameters such as DO, ORP, pH, TDS and conductivity in monitoring wells within the plume. Chemical influence was also observed in down gradient

wells where water elevation mounding was found.

Effectiveness

Four month following the injection, monitoring wells were purged and sampled for BTEX constituents. Benzene concentrations were reduced from 4,700 ug/l to 3.3 ug/l in highest impacted well within the plume. Down gradient wells outside

of active injection area also showed a significant reduction.

The Bottom Line

ORIN successfully remediated the site by injecting a sodium persulfate and PermeOx[®] Plus chemistry through a series of direct push points over a five-day period. Compared to alternative cleanup approaches, using chemical injection not only reduced site disruption, but was quicker and cheaper. Performing chemical injection saved the client over \$28,000 compared to competitive injection chemistries and over \$50,000 for a dig and haul approach.



Phone: 608-838-6699

Fax: 608-838-6695

Email: lkinsman@orinrt.com **Web:** www.orinrt.com