

Passive In-Situ Oxygen and Nutrient Injection Project in Santa Rosa, California

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Enhanced bioremediation is a useful groundwater technology for sites containing residual petroleum hydrocarbons where source removal has occurred. Although enhanced aerobic bioremediation is a slow process, it can reduce site closure schedules from decades for natural attenuation in an anaerobic environment to a few years with the addition of dissolved oxygen. Several passive and semi-passive oxygen delivery systems have been developed over the past decade. The iSOC gas infusion system works in wells as small as 2-inch diameter and has been used on over 250 sites. The gas diffusion system allows oxygen to dissolve slowly at about 15 cc/min or 0.77 cubic feet per day per monitoring well.

For in-situ enhanced aerobic bioremediation of petroleum hydrocarbons, providing dissolved oxygen in the groundwater is necessary. Nonetheless, measuring dissolved oxygen has always been problematic and a potentially major source of error. A former gasoline underground storage tank case study from northern California had pre-treatment levels of dissolved oxygen ranging from 4.10 mg/l to 5.76 mg/l in the central core of the hydrocarbon plume (8,400 to 23,000 µg/l TPH-g) and 5.61 to 6.84 mg/l in the wells without reportable concentrations of TPH-g or BTEX compounds. The evaluation relied on a variety of indirect indicators in combination to obtain a clear understanding of the subsurface conditions. Based on a combination of indirect indicators, the dissolved oxygen data were questioned and the original interpretation was completely reversed, changing the course of remediation from monitored natural attenuation to enhanced bioremediation. Seven iSOC tools were installed in dedicated wells.

After 1 year, with marginal operational effort, the 4 monitoring wells in the core of the plume showed decreases in TPHg and BTEX compounds of 47% and 61%, respectively.

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