

Application Note

Successful Remediation Pilot Study Uses TROLL® 9500 Instrument for Real-Time Monitoring

Remediation specialists stay informed, improve safety, and provide defensible results

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Remediation Pilot Study

Kennedy/Jenks Consultants completed an in-situ chemical oxidation (ISCO) pilot study to assess the treatment effectiveness of chlorinated hydrocarbons (particularly tetrachloroethene [PCE]) in an alluvial aquifer. The ISCO pilot study was performed using a groundwater recirculation system and application of the RemOx® L sodium permanganate chemical oxidant, as manufactured by Carus Chemical of Peru, Illinois. The system consisted of a network of extraction, injection, and monitoring wells.

In general, groundwater was extracted downgradient of the target treatment area, amended with the chemical oxidant, and injected upgradient to create a subsurface treatment cell. The objective of the pilot study was to contact the PCE-source-containing matrix with the chemical oxidant at a sufficient sustained concentration for an adequate reaction duration. During the groundwater recirculation treatment process, groundwater monitoring was performed to evaluate the ability to maintain the design sodium permanganate dosage within the target treatment area and to assess treatment progress. Monitoring consisted of groundwater sample collection for field parameter measurement (electrical conductivity [EC] and oxidation-reduction potential

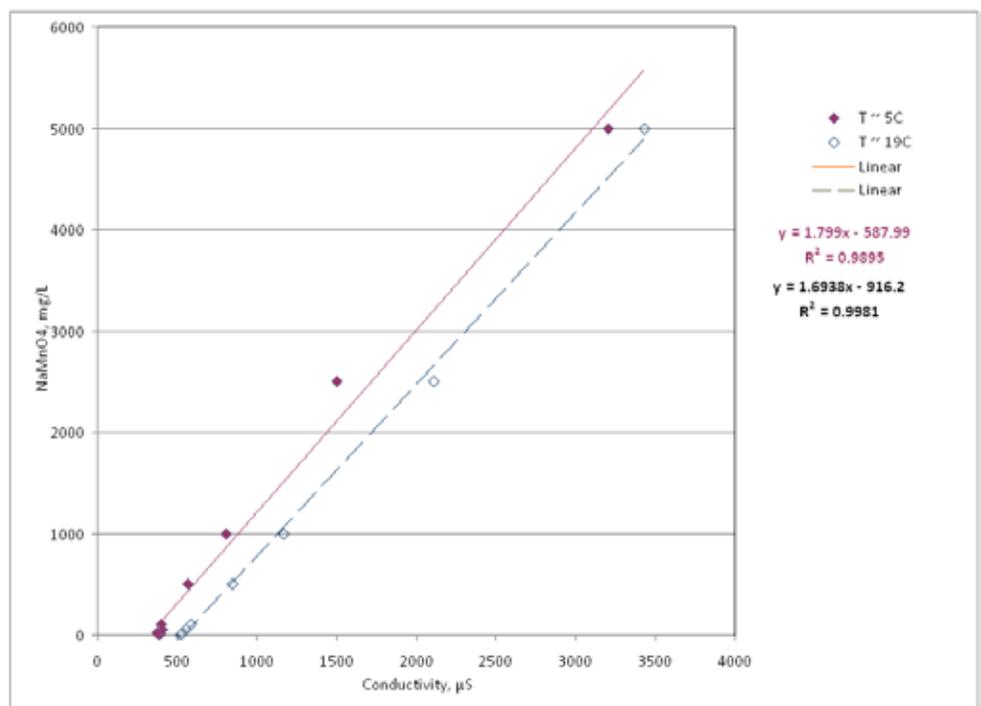


Figure 1. PRIMA Environmental, Inc. of El Dorado Hills, California conducted a bench-scale study to establish a correlation between EC/ORP and sodium permanganate for the site. This standard curve was developed and used to estimate the in-field sodium permanganate concentration through EC real-time measurement using the TROLL 9500 Instruments.

[ORP]) and volatile organic carbon (VOC) chemical analyses. Groundwater samples were also collected to determine sodium permanganate concentrations using a portable colorimeter. The groundwater samples were collected from monitoring wells installed within the target treatment area and from an above-ground mixing tank.

To streamline the monitoring process, Kennedy/Jenks Consultants elected to install In-Situ® TROLL® 9500 Water Quality Instruments into monitoring wells and the above-ground mixing tank. The sub-2-inch TROLL 9500 Instruments were equipped with pressure, EC, and ORP sensors. The TROLL 9500 Instruments provided the ability for real-time measurements with data-logging capabilities.

Prior to pilot study activities, a bench-scale study was conducted by PRIMA Environmental, Inc. of El Dorado Hills, California to establish a correlation between EC/ORP and sodium permanganate concentrations for this site. The bench-scale testing determined an approximately linear correlation between EC and sodium permanganate concentration. A standard curve was developed and used to estimate the in-field sodium permanganate concentration through EC real-time measurement using the TROLL 9500 Instruments.

Advantages of Real-Time Monitoring

In general, field technicians would collect a groundwater sample from a well or mixing tank to determine the subsurface sodium permanganate concentrations using a colorimeter. With the real-time measurement of EC using the TROLL 9500 Instruments, grab sample collection was reduced and technicians could quickly estimate sodium permanganate concentrations by using the developed standard curve. Overall, the TROLL 9500 Instruments served as a system optimization “tool” to maintain the desired chemical oxidant concentration within the target treatment area. This optimization resulted in improved chemical usage and reduced project costs.

For a larger-scale remediation system, automation using a TROLL 9500 Instrument (i.e., EC and sodium permanganate relationship) could be implemented to regulate a sodium permanganate metering pump. This design feature would eliminate manual additions of sodium permanganate to the mixing tank, thereby reducing potential for system operator contact with the chemical oxidant.



For more information, contact In-Situ Inc.

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