# Aerobic Cometabolic Remediation of Chlorinated Ethenes as a Barrier to Impacted Groundwater Discharge to a Brook

***Brent O' Dell*** (brent.odell@wsp.com) and Sachin Sharma (sachin.sharma2@wsp.com) (WSP)
Brian Timmins (Remedial Assessment and Design)

**Background/Objectives.** This presentation provides a case study for design, implementation, system startup, performance evaluation and optimization of an aerobic cometabolic barrier consisting of oxygen and propane injection wells arranged in herring bone overlap perpendicular to an existing plume and parallel to the existing Brook. The system is designed for remediation of select chlorinated ethenes including trichloroethene (TCE), cis- and trans-dichloroethane (cis-DCE and trans-DCE), and vinyl chloride (VC). The subject site is currently owned and operated by an international home improvement retail store which demolished the previously existing buildings, constructed a new building, and opened a retail store in September 2005. The existing building has a sub slab depressurization system (SSDS) in place as well. The existing building and infrastructure limit access to residual soil impacts upgradient. The surrounding area consists of light industrial, commercial, and residential use. The site is bounded to the west by a shallow brook and by residential properties along the northwest property. The objective of the barrier is to mitigate ongoing groundwater discharges to the brook.

**Approach/Activities.** The concept for application is to degrade TCE, DCE, and VC to carbon dioxide and water via epoxide formation. Twenty in situ submerged oxygen curtains (iSOC) injection wells will be installed in three parallel rows. The first row of wells (six total) will have two iSOC units installed to overcome formation oxidant demand for COCs other than CVOCs and the remaining 14 wells will have one iSOC unit to help ensure oxygen demand and gas distribution is achieved. Prior to start of gaseous injections, a dilute diammonium phosphate solution (nutrient) will be injected throughout the treatment zone. Once the injection of nutrients is completed, oxygen gas infusion will be initiated to obtain an oxygenated condition in the formation. Once the formation is fully aerobic, oxygen infusion will cease, and the potential duration to shift to anoxic and/or anerobic will be monitored. If aerobic conditions are sustained, propane injections will be periodically initiated at 15- to 30-minute intervals into the iSOC wells. Nitrogen gas will be used to flush the injection lines when cycling between oxygen and propane gas for each well.

Cycling of gases will be based on frequent field monitoring and optimized as needed. Upgradient and downgradient monitoring of VOCs will be performed on a pre-set frequency and optimized as needed. The remedial field work is planned to start in December and the system installation is anticipated to be completed by early January 2023.

**Results/Lessons Learned.** The results during installation and startup will be presented, along with the initial results of the installation. The data collected after system installation will be presented in this case study and lessons learned during installation and from performance monitoring will be presented. Multiple wells upgradient and downgradient of the iSOC wells be used for quarterly performance monitoring and will be sampled for VOCs and field parameters (DO, OPR, pH, conductivity, and temperature). If necessary, hydrocarbon-degrading plate count or other microbial analysis will also be performed. The success of aerobic cometabolic is highly depended on the adequate cycling of gases (oxygen and propane), which will be shared in this presentation as well.