Using UV/AOP to Mineralize PCBs in Groundwater

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Background/Objectives. The Kaiser Aluminum Trentwood facility in Spokane Valley, Washington began operations in 1942 to support the manufacturing of planes and equipment for World War II. The Facility has operated almost continuously since that time and has evolved to keep pace with changing product demands. The Facility is located adjacent to the Spokane River and is underlain by glaciofluvial sediments from episodic Missoula Floods events. These sediment deposits also form the Spokane Valley-Rathdrum Prairie (SVRP) aquifer which is interconnected with the Spokane River and designated as a sole-source aquifer by EPA in 1978.

Historically, production at the Facility included the use of polychlorinated biphenyl- (PCB) containing hydraulic oils in various Aroclor formulations. Some of these oils were released to the subsurface resulting in soil and groundwater contamination. Kaiser has completed several interim actions to clean up contaminated soil and currently is conducting pilot-scale testing of ex situ technologies for treating contaminated groundwater.

Approach/Activities. This presentation discusses the findings from pilot-scale testing two, skid-mounted, ex situ treatment systems designed to mineralize PCBs in contaminated groundwater using ultraviolet light (UV) and the advanced oxidation processes (AOPs) via exposure to hydroxyl radicals. Pilot testing included conducting up to 30 test runs under various operating conditions, using hydrogen peroxide as the oxidizer, and analyzing influent and effluent samples for PCB congeners using EPA Method 1668. PCB congener data was analyzed to better understand the distribution of congeners pre- and post-treatment and the reaction mechanisms under various UV and peroxide dosing scenarios.

Results/Lessons Learned. Pilot testing data indicate that UV/AOP is a viable treatment technology for the ex-situ mineralization of PCBs in groundwater. Testing data from the pilot-scale units indicate that PCB destruction efficiency under certain operating conditions exceeded 90 percent and, at times achieved greater than 98% destruction.