

Inexpensive Treatment of cVOC-Contaminated Groundwater Using a Biowall

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Site DP-32 at Whiteman AFB was a water treatment plant and possibly a burn pit for solid/liquid waste from the flight line. Chlorinated volatile organic compounds (cVOCs)—trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), and vinyl chloride (VC)—were identified in groundwater during the 2003 Remedial Investigation. Site DP-32 contaminant plumes migrate slowly because of tight clays underlain by weathered bedrock and confining shale bedrock. The 5-foot weathered bedrock layer is the water-bearing zone that transmits water at a rate of 16 ft/yr to a drainageway. The highest cVOC concentration of 1,300 µg/L is located 50 feet upgradient of the drainageway. TCE (200 µg/L) has been observed in surface water collected from the drainageway, along with cDCE and VC. The plume flows toward the drainageway at 0.05 gpm, and the estimated TCE mass flux to the ditch is 0.4 lb/yr. Six to 8 inches of water flow in the channel, and so TCE volatilizes to the atmosphere within 500 feet downstream.

Although not a requirement, the Base wanted to address the cVOCs to reduce risk to humans and the environment. TCE degrades rapidly in groundwater under anaerobic conditions, but aerobic conditions prevail at the site. Reductive dechlorination proceeds from TCE to cDCE to VC to carbon dioxide, chloride, and water. cDCE and VC present in the groundwater indicate that reductive dechlorination has occurred, but complete dechlorination did not occur prior to discharge to the drainageway.

CH2M HILL designed a, 270-foot long and 10 to 20 feet deep, treatment wall to intercept and treat the cVOC plume before the groundwater discharged to surface water. In March 2004, a biowall of free mulch and sand from the Base recycling center, was installed using a track hoe. Shoring and water control were unnecessary because of the tight clays and minimal water. The biowall was installed for only \$74,000. Groundwater and surface water samples were collected in 2004–2006 and analyzed for groundwater geochemistry parameters and VOCs to evaluate the biowall's effectiveness.

The biowall created anaerobic conditions to facilitate reductive dechlorination as the groundwater passes through the organic medium. TCE has been reduced by more than 88%. There appears to be no significant accumulation of daughter products as a result of cVOC degradation, which might be attributed to complete reductive dechlorination within or immediately downgradient of the biowall. (Final conclusions will be reached in April 2006).

cVOC concentrations at surface water sampling locations have declined about 29%. Thus, surface water at the site has not yet been affected by the biowall. Groundwater travel time from the biowall to the creek is a little more than 1 year. The fourth and final sampling event is scheduled for March 2006.