

## **Karstic Terrain Hydrogeologic Characteristics Challenges to Protective Remedy Selection and Implementation**

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**Background/Objectives.** The Pohatcong Valley Groundwater Contamination Superfund site is situated in a fault dominated, fractured, karstic carbonate aquifer in a narrow, linear valley (approximately 1 mile wide) with crystalline bedrock walls. TCE groundwater impacts were discovered in the late 1970s and subsequent investigations documented the presence of an approximately 10-mile-long “TCE plume” within the valley. USEPA and the USGS conducted extensive investigations within the valley in the 1990s and 2000s and ultimately adopted a conservative, traditional, multi-remedy approach of vadose zone source area treatment, source area groundwater extraction and treatment, provision of alternative water supply, and long-term groundwater monitored natural attenuation (MNA). Remedy implementation has proceeded in a staggered sequence with MNA groundwater monitoring being initiated in August 2013, installation and operation of the source control groundwater extraction and treatment system (GWETS) in March 2016, design of the alternative water supply in June 2017, and initiation of the vadose source area treatment design in July 2017.

**Approach/Activities.** At the direction of USEPA, the MNA groundwater monitoring network is currently being expanded from 26 wells to 47 wells to expand density, the lateral extent, and vertical extent of the monitoring network. Groundwater data generated since 2008 indicate marked decrease in the concentration and extent of the “TCE plume” which has been further enhanced with the GWETS startup.

**Results/Lessons Learned.** Once the source of the TCE was effectively cut off from the aquifer, the aquifer’s very high hydraulic conductivity, which led to the creation of 10-mile long plume, is now aiding in the rapid reduction in the extent of the site’s “TCE plume.” The attenuation appears to be due to advection, dilution, and dispersion. Monitoring for natural attenuation parameters has indicated that there is minimal evidence of biodegradation. The rapid attenuation of the downgradient portion of the aquifer is not surprising when considering past USGS studies that concluded that the median age of the site’s groundwater is very young, ranging from only 6 to 12 years. The length of the “TCE plume” which exceeds the New Jersey regulatory threshold of 1 µg/L is now less than 5 miles and is continuing to shrink. The necessity of a yet to be installed, expensive alternative water supply remedy in former downgradient portion of the “TCE plume” with no detectable concentrations of TCE above its regulatory threshold is questionable given the profound and rapid recent improvements to the groundwater quality within the Pohatcong valley.