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Integrated Source Isolation and Targeted Phytoremediation to Address a VOC/1,4-Dioxane and Arsenic Plume in Fractured Bedrock

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Background/Objectives. The former facility manufactured speed and proximity sensors and was operational at this location since the early 1970s until plant operations ceased in 2008. Trichloroethene was historically used as a degreasing agent in the operations until the early 1980s, when it was replaced by 1,1,1-trichloroethane. Groundwater at the site is contaminated with elevated levels of chlorinated solvents, 1,4-dioxane and arsenic resulting from facility activities and geochemical changes created by those activities. Conditions at the site are very complex with residual source areas both on and off site, multiple plumes both on and off site, complex lithology including fractured bedrock, and multiple contaminants. A pump and treat system, consisting of air stripping, UV/peroxide oxidation and ion exchange was installed in 2006, and was proving to be of limited effectiveness, and operation of the system was projected to require an additional 20 years or more to reach closure conditions. Costs of operation and maintenance for this system were in excess of $300,000 annually.

Approach/Activities. The objectives of this project were to determine the location of and define a remaining source area of groundwater contaminants, define the relationship between contaminant distribution and lithology, and to develop an understanding of lithologic and hydrologic characteristics influencing the fate and transport of the contaminants in groundwater. This information was then used evaluate the potential for the use of phytoremediation as a final remedy for plume treatment and control, coupled with engineering controls to isolate the source area and prevent further transport of contaminants into the dilute plume.

Results/Lessons Learned. A groundwater model was developed to facilitate the design of the phytoremediation system, and the remedy approach was installed in the spring of 2013. The combined remedy approach, utilizing source isolation in conjunction with phytoremediation using the patented *TreeWell*® system, has proven to be successful in achieving significant ongoing mass reductions and hydraulic containment of the multiple plumes at the Site that closely follows the groundwater flow model. Changes in the groundwater flow direction were seen following the first growing season, and a request to shut down the existing pump and treat system was granted in the spring of 2014. The treatment system equipment was dismantled the following year. The State regulatory body has expressed a favorable disposition to a risk-based conditional closure, and a proposal for closure of the Site is currently being negotiated.