

A Multiple Technology Approach for Management of Dense Non-Aqueous Phase Liquids (DNAPL)

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ABSTRACT: A combined slurry wall/phytoremediation/ZVI PRB/groundwater extraction and treatment system approach was developed for control and management of free phase trichloroethene (TCE) DNAPL at Site 17 Beale Air Force Base (the Site). Historic TCE solvent storage and disposal at the site has resulted in the presence of dense aqueous phase liquids (DNAPL) and dissolved phase TCE being present in the subsurface. TCE, cis 1,2 dichloroethene (DCE), vinyl chloride (VC) and ethene/ethane are present at the site indicating that reductive dechlorination is occurring at portions of the site. A slurry wall was keyed into siltstone bedrock approximately 35 feet below ground surface (ft bgs) to isolate and control/contain the DNAPL source. The area within the slurry wall is about 5 acres. A dissolved phase plume extends about 4,000 feet (ft) (1,250 metres [m]) downgradient from the source of DNAPL. A phytoremediation system that included the use of 400 native cottonwood (*Populus Fremontii*), native willow (*Salix lucida*) and holly (*Ilex sp.*) was designed and installed to control water levels (inward gradient) within the slurry wall. A temporary groundwater extraction and treatment system (GETS) was constructed to control groundwater levels within the slurry wall until trees are large enough to extract sufficient water to maintain the inward gradient. Design basis modeling (MODFLOW), indicated that an average annual pumping rate of about 4 gallons per minute (gpm) would maintain an average 0.5 foot (0.15 m) inward head difference across the slurry wall. Cottonwood and willow growth has more than quadrupled their initial planting size of 4 ft (1.2 m) in only 4 growing seasons (2002 to 2005). Groundwater extraction has averaged about 2.15 million gallons (8,080 m³) per year (2002, 2003 and 2004) with the bulk of the extraction occurring during rainy winter months. The reliance on the pumping system has shown a gradual decrease over time (when precipitation has been factored in) indicating that the phytoremediation system has possibly decreased the reliance on the GETS to control water levels within the slurry wall during parts of the year. A secondary source (1 acre) of DNAPL was discovered adjacent to and outside the slurry wall. A combined slurry wall/ZVI PRB was designed and will be built in 2006 to control this source area.