

Six-Phase Heating Project for DNAPL Mass Reduction at a Former Naval Air Station in the San Francisco Bay Area

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Six-Phase Heating (SPH) is an aggressive remedial technology used to address volatile compounds. Soil is heated by applying electrical current to the target area. Steam bubbles provide a transport medium for the volatile contaminants. All phases of the contaminant plume (dissolved, adsorbed, vapor, and NAPL) can be treated. SPH is characterized by short timelines and can remove hard-to-reach contaminants trapped in low-permeability media.

The project goals were to remove all DNAPL from seven discrete areas within Alameda Point. The existence of VOC concentrations in excess of 10 ppm was taken to indicate the presence of DNAPL, and stable concentrations below that threshold were conversely taken to indicate the absence of DNAPL. The strategy used to meet the goals included three major components: 1) define the extent of the DNAPL and the hydrogeologic regime at each area, 2) perform pilot tests, and 3) deploy full-scale SPH application.

The extent of the plumes and the geologic regime were studied via cone penetrometer testing, soil samples, and groundwater analytical samples.

The pilot tests at Plume 5-1 utilized equilateral hexagonal arrays to apply heat, a vapor extraction system to remove the volatilized contaminants, and groundwater monitoring wells to assess the effectiveness of the operation. The full-scale application has been designed on the basis of the data obtained during the pilot test, and construction is under way. Startup is expected during the first quarter of 2004, and a three-month duration of applied heating is planned for Plume 5-1.