LNAPL REMEDIATION

Gasoline LNAPL and Dissolved Benzene

Client: US ACE

Hunter Army Airfield
Georgia

In the summer of 2001 Current Environmental Solutions (CES) was contracted to design, build and operate a Six Phase Heating (SPH) system at the Hunter Army Airfield, GA.

SITE BACKGROUND

The site was a flat grassy area located between the main taxiway and the main runway on an airfield. The last of ten 25,000 gallon fuel tanks were removed in 1998 from a former fuel handling area. Soil samples were collected and monitoring wells were installed as part of the closure activities at the site. As a result of the sampling activities, light non aqueous phase liquid (LNAPL) consisting of a mixture of gasoline and diesel with a larger dissolved phase benzene plume was identified down gradient of the former buried tanks.

The estimated area affected by the benzene plume covered 30,000 s.f. The LNAPL layer was up to two feet thick over an area of approximately 10,000 s.f. The contamination extended from 8 feet below grade (bg) to 16 ft bgs, and the total volume of soil and groundwater requiring treatment was roughly 8,900 c.y. The subsurface soil mainly consisted of silty sand grading to sand with depth. Groundwater was encountered at about 10 ft bg.

The following objectives were established for the for the SPH remediation:

1) Remove the LNAPL, and
2) Reduce benzene concentrations in groundwater to regulatory predetermined alternate concentration limits (ACL) of 469 ug/L.

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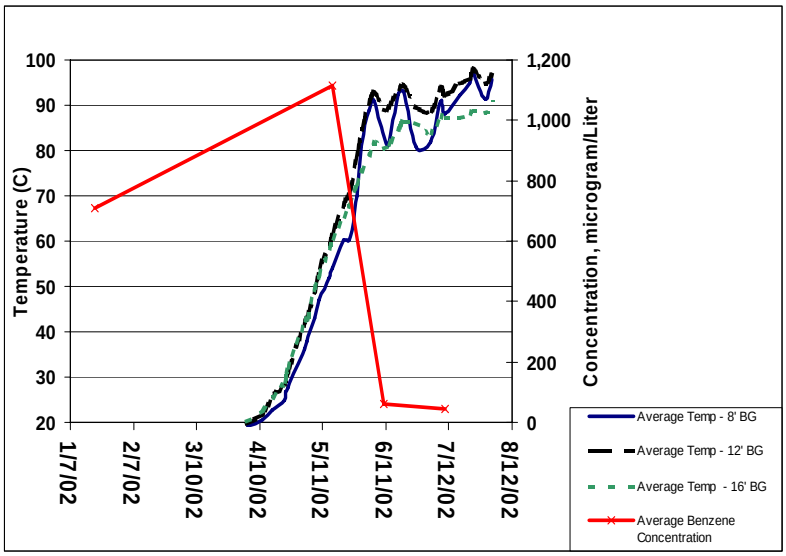
SIX PHASE HEATING SYSTEM

The SPH system consisted of 111 electrodes, 18 Soil Vacuum Extraction (SVE) wells and 5 Dual Vacuum Extraction (DVE) wells. Design, site preparation, and field construction took place between August 2001 and February 2002. Operations commenced in March 2002, and the system ran until early August 2002. Extracted vapors were discharged to the atmosphere within permitted limits, while the extracted groundwater was treated in an air-stripping tower, tested, and then discharged to an infiltration gallery.

RESULTS

Through four months of operation, nearly 1,678,000 kW-hrs of energy was input into the subsurface. Subsurface temperatures reached the boiling point 60 days after heating, exactly as predicted by CES' thermodynamic formation modeling. CES' proprietary electrodes operated to specification, and efficient power coupling between the electrodes and the formation was maintained throughout the remediation.



The SPH system proved extremely efficient, and contaminant mass was removed so quickly that careful management of the input power levels and extracted vapor concentrations was required to remain within a safe lower explosive limit (LEL) in the vacuum extraction system. An estimated 40,000 pounds of subsurface contamination was removed within twelve weeks of operation.

Overall, the SPH remediation was quite successful. CES was able to achieve 100 C evenly throughout the groundwater plume. All of the LNAPL was removed from the site, and the dissolved phase benzene concentrations were reduced to an average of 44 ug/L, far surpassing the regulatory guidelines, and thus achieving both treatment objectives.

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