

**GROUND WATER FORUM TELECONFERENCE**  
**Thursday August 2, 2001**

**GEO-CLEANSE AT ANNISTON ARMY DEPOT**

Kay Wischkaemper reported on the use of chemical oxidation by Geo-Cleanse International at the Anniston Army Depot to treat a DNAPL source area. The Army did not set remedial performance standards for the treatment of the source area under this specific cleanup action. The site has 15 to 31 feet of clay residuum overlying fractured bedrock with ground water at 14 feet bgs. From July 1997 to March 1999, Geo-Cleanse injected over 200,000 gallons of hydrogen peroxide into the subsurface. Their report stated that the action had destroyed over 97 percent of the DNAPL present in the injection zone. However, Kay found that they had never checked below their injectors, which were set originally above the water table and then about 5 feet below it in subsequent treatments. Her analysis of the data indicates that while the action may have decreased dissolved concentrations in the shallow water column from 100 mg/l to 20 mg/l, it appears to have pushed the DNAPLs deeper into the aquifer. At one long-term monitoring well, the contamination increased from around 2,000 µg/l to 600,000 µg/l, and the contamination went from an initial depth of about 20 feet bgs to 48 feet bgs.

Kay mentioned that she also believes that contamination at the Florida Petroleum site is being driven deeper, not destroyed, through the injection of  $\text{KMnO}_4$ . Kay is concerned that the Anniston report indicated that chemical oxidation was a success with over 97 percent destruction of the DNAPL, when, in fact, it was not. Concerns remain over the viability of the technology to address DNAPLs based on the data obtained from the sites.

Vince Malott said he was not aware of oxidation being used in Region 6 and asked if other regions had any experience. Steve Mangion said there are a couple of sites in Maine where  $\text{KMnO}_4$  is being used, but they did not have any long-term monitoring results yet. Steve also asked whether the increases in concentration and depth at Anniston were noted in existing wells or whether new wells were placed. Kay indicated that the Army installed deeper wells after the pilot testing phase was complete.

Ron Wilhelm asked if Kay thought a displacement had occurred. Kay thought that high-concentration dissolved fractions were being addressed, but that the DNAPL itself was being displaced deeper. Kevin Willis noted a site on Long Island where  $\text{KMnO}_4$  was used to oxidize PCE that had been disposed in a dry well. It is believed that the permanganate ion was surrounded by eight water molecules by the time it came in contact with the very viscous PCE sludge, and that displacement rather than mixing and reaction occurred.

**VOLUME 3 OF THE Kd REPORT**

Ron Wilhelm explained that the three volumes of the Kd report are the culmination of a 4-5 year project originally entitled "Understanding Variation in Partition Coefficient, Kd, Values." Volume 1 looks at the Kd model and the measurement and application of chemical reaction codes. Volume 2 is a review of geochemistry and available Kd values for selected radionuclides and other elements (e.g., cadmium, cesium, chromium, lead, strontium, plutonium). Volume 3 is also a review of geochemistry and Kd values for additional radionuclides (americium, curium, iodine, neptunium, uranium, and technetium) and arsenic. This final volume is in peer review, and Ron hopes that it will be available in October. Volumes 1 and 2 can be downloaded from [www.epa.gov/radiation/technology/partition.htm](http://www.epa.gov/radiation/technology/partition.htm). These volumes do not provide Kd values that can be used at any site, but give a background on what the Kd values mean. There is no alternative to using site-specific measurements for Kd values of the elements of concern. Do not use default values for these estimates.

Ron also is beginning work on a project entitled "Effects of Natural and Anthropogenic Compounds and Suspended Colloids on Partition Coefficient Kds for Selected Radionuclides and Other Inorganics." The project is examining whether it is possible to have enhanced Kd values for the different types of

facilitated transport. This involves looking at enhanced Kd values for those elements that are dependent upon complexation. The work is being performed at the Savannah River Ecology Laboratory.

Ron also mentioned a study done under the auspices of the University of California at Riverside by Rien van Genuchten (U.S. Salinity Laboratory, USDA). *Characterization and Measurement of the Hydraulic Properties of the Unsaturated Porous Media* (published in November 1999) is a very good reference for those working in the vadose zone. It contains 143 papers and is application-oriented. It has been used extensively by contractors for modeling purposes. Kay Wischkaemper provided the following website for ordering the reference (\$120) to the Forum: <http://www.ussl.ars.usda.gov/HYPROP/hyprop.htm>

#### NARPM MEETING SUMMARY

Vince summarized the meeting of the National Association of Remedial Project Managers (NARPM) held July 23-27 in San Diego. The meeting included a woodtreaters symposium led by the Engineering Forum. Jim Cummings (TIO) moderated. The symposium emphasized DNAPL removal and what can be done to address the source area. An update was presented on the Visalia Pole Yard site. More LNAPL fraction was encountered during the recovery than expected due to changes in the physical properties of the NAPL. The presenters also claimed that a surfactant effect was produced, based on the physical data of the recovered liquids; however, there has not been any chemical data collected to support the physical observations of a possible surfactant effect. The project cost \$21.5 million from 1996 through mid-2001 with the cost per cubic yard of soil treated estimated to be \$57. The discussion of lessons learned, however, indicated this could have lowered to \$38. The discussion compared the pros and cons of initiating the steam injection at the perimeter of the mass and working inward versus starting in the center and working out. Most of the other woodtreaters sites discussed were remediated using a passive recovery system with trenches or a limited pump and treat to contain the free phase.

#### ATTENDEES

Steve Mangion, Region 1

Darryl Luce, Region 1

Dean Maraldo, Region 2

Kevin Willis, Region 2

Kay Wischkaemper, Region 4

Luanne Vanderpool, Region 5

Vince Malott, Region 6

Bill Pedicino, Region 7

Herb Levine, Region 9

Kathy Baylor, Region 9

Curt Black, Region 10

Mark Filippini, Region 10

René Fuentes, Region 10

Bernie Zavala, Region 10

Brian Lewis, CA DTSC

Mavis Kent, OR DEQ

Ken Lovelace, HQ/OERR

Ron Wilhelm, HQ/ORIA/OAR

Jerry Jones, NRMRL-SPRD Ada

Bill Myers, EMS