



"The Influence of Hydrogeology on 25 Years of Natural Attenuation at a Crude Oil Spill Site"

**Presented by Dr. Barbara Bekins
2004 Birdsall-Dreiss Distinguished Lecturer**

October 14, 2004

Natural attenuation has been used as a practical method to dispose of wastes throughout human history. It is now clear that the subsurface environment has a limited ability to assimilate wastes and that this ability depends on the nature and quantity of the wastes and the characteristics of the subsurface. To increase our knowledge of the capabilities and limitations of natural attenuation, the USGS Toxic Substances Hydrology Program conducts studies on the fate of contaminants in the natural environment. Results from the research have documented the effectiveness of a variety of individual processes that together contribute to natural attenuation of several classes of contaminants.

This talk will illustrate important principles using examples from research at a crude-oil spill site located near Bemidji, Minnesota. The Bemidji results show that groundwater flow plays a central role in regulating subsurface microbial activity during natural attenuation. Microbial populations and reaction rates are inextricably linked to recharge, permeability, and hydraulic gradient. At the Bemidji site, degradation rates for constituents of non-aqueous crude oil vary strongly with recharge rates. In addition, the temporal evolution of microbial populations and associated benzene degradation capabilities vary with permeability. The Bemidji results show that thorough characterization of the hydrogeology of a site is essential for understanding the subsurface microbial populations, their activities, and the associated effects on water quality.

Presenting October's program is Barbara Bekins of the U. S. Geological Survey (USGS), the 2004 Birdsall-Dreiss Distinguished Lecturer, sponsored by the GSA Hydrogeology Division and funded by the GSA Foundation.

After studying both geology and mathematics, Bekins received a B.A. in Mathematics from University of California, Los Angeles. She worked for eight years as a computer specialist in the Seismology Branch of the USGS, and studied part-time to earn an M.S. in

Mathematics from San Jose State University. She then left the USGS to pursue Ph.D. studies at University of California, Santa Cruz, under the direction of Shirley Dreiss.

After completing her Ph.D. she obtained a post-doctoral position at the USGS, modeling the biodegradation of groundwater contaminants with funding from the Environmental Protection Agency. In 1997, she joined the USGS staff as a Research Hydrologist in Menlo Park, California. From 1998-2000, she was a member of the National Research Council's Committee on Intrinsic Remediation. The committee's report "Natural Attenuation for Groundwater Remediation," describes the capabilities of natural attenuation and the adequacy of the published guidelines for demonstrating its effectiveness.

Bekins' current research interests encompass two broad areas. The first is the role of groundwater along plate-boundary faults, including effects of pore pressure on fault strength and the use of natural tracers to understand regional flow systems. The second research area involves the effects of groundwater flow and aquifer properties on subsurface microbial activities including natural attenuation of contaminants.

Meeting logistics: The meeting will take place on Thursday, October 14th at the Sheraton Syracuse University Hotel (801 University Ave, Syracuse). A social hour will be held at the Inn from 5:30 p.m. to 6:30 p.m., followed by a buffet dinner. The dinner will start at 6:30 p.m. and our featured speaker, Dr. Bekins of the U. S. G. S., will begin her program at 7:30 p.m. The cost of dinner is \$20 for members, \$22 for non-members, and \$15 for student members.

Please RSVP by Monday, October 11, 2004 to Bonnie at Parratt-Wolff via e-mail at bolney@pwinc.com or 437-1429.