

ESTCP PROJECT OF THE YEAR

PASSIVE SAMPLING TO SUPPORT REMEDICATION OF CONTAMINATED SEDIMENTS

DR. PHILIP M. GSCHWEND

Massachusetts Institute of Technology
Department of Civil and Environmental Engineering
Cambridge, Massachusetts
(617) 253-1638
pmschwe@mit.edu

CO-PERFORMERS: Mr. John MacFarlane, Dr. Loretta Fernandez, Ms. Elizabeth Follett, and Ms. Jennifer Apell (Massachusetts Institute of Technology); Mr. Kevin Palaia, Mr. Dean Gouveia, and Mr. Steven Reichenbacher (ICF International); and Mr. James Connolly (U.S. Army Natick Soldier Systems Center)

DoD manages hundreds of contaminated sediment sites in marine and estuarine bays, harbors, lakes, wetlands, and rivers. Historically, site managers assessed contamination at such sites by measuring how much of a specific chemical such as polychlorinated biphenyls (PCBs) is present in the sediment. In recent years, many studies have shown that these concentrations are poorly correlated with toxicity. What is needed is a way to measure the fraction of those chemicals at a particular field site that is bioavailable, i.e., can be taken up by an organism.

Dr. Philip Gschwend and his team demonstrated and validated a commercially viable, simple passive sampler that can measure the fraction of the chemical that is a health concern. Developed under SERDP, the passive samplers utilize an inert low-density polyethylene (PE) medium to accumulate hydrophobic organic compounds (HOCs) from contaminated sediment beds. The PE concentrations can be converted to corresponding pore water contaminant concentrations, which enables assessment of bed-to-bottom water gradients that may continue to contaminate the overlying water column as well as the concentrations that are available for bioaccumulation. Horizontal and vertical contaminant distributions can be assessed using this technique.

This accurate and robust passive sampling technique could be cost-effectively employed at virtually all DoD contaminated sediment sites to characterize the risk of contaminants entering the food chain. It provides significant savings in manpower, number of days in the field, equipment, and shipping costs as compared to traditional sediment and pore water sampling methods. For sites already in the remedial action process, the use of PE samplers could significantly reduce the costs of long-term monitoring. In addition to life-cycle cost reduction, risk is substantially reduced by the increase in certainty derived from more representative samples and improved understanding of the bioavailability of contaminants in the sediments.

For more specific information about this project, stop by Poster #191.