

## Using passive samplers to calculate the diffusive flux of DDTs and PCBs from sediments to water column at the Palos Verdes Shelf Superfund site

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**Background/Objectives.** The Palos Verdes Shelf (PVS) Superfund site is in over 50 meters of water on the continental shelf and slope off the coast of southern California (USA). The site includes over 25 km<sup>2</sup> of sediments contaminated over several decades by municipal treatment plant effluent discharged via outfall pipes at a depth of 60 meters. Contaminants of concern include polychlorinated biphenyls (PCBs) and the pesticide DDT and its degradation products (e.g., DDE). As at other contaminated sediment sites, one remedial alternative that has been explored for the PVS is capping the most contaminated sediments with a clean layer of sand. In 2000, three 45-acre pilot sand caps were installed on the PVS in order to test cap placement techniques. Subsequent water sampling found comparable dissolved concentrations of persistent organic pollutants (POPs) above capped and uncapped areas. Because advection from up-current areas along the shelf is likely, water sampling is insufficient to determine the efficacy of the caps in limiting flux of contaminants from the sediment beds to the water column. The objective of this work was to simultaneously measure porewater and overlying water concentrations using passive sampling, allowing for the assessment of fluxes due to concentration gradients.

**Approach/Activities.** In this study, strips of polymeric passive samplers (polyethylene (PE) and polyoxymethylene (POM)) were deployed across the sediment-water interface at four stations within the Palos Verdes Shelf Superfund site, including one station within a pilot sand cap. In addition, samplers were deployed at one station far from the Superfund site (Santa Monica Bay). The deployment platforms were designed to allow sampling of the sediment interstitial waters at 2 cm increments to a depth of up to 20 cm, and to sample the bottom water in the 20 cm above the sediment-water interface.

**Results/Lessons Learned.** Dissolved concentrations deduced using both types of samplers agreed within an order of magnitude for the nineteen contaminants measured (i.e., five DDT breakdown products and fourteen PCBs). Within the Superfund site, diffusive fluxes measured using PE strips at stations outside of a pilot remedial sand cap area were similar to those measured at a station inside the capped area: 240 to 260 ng cm<sup>-2</sup> y<sup>-1</sup> for *p,p'*-DDE. Outside of the Superfund site, flux was not detectable at a station in Santa Monica Bay because concentrations in the water column and sediment porewater were too similar. The largest diffusive fluxes of POPs were calculated at a station where the highest sediment concentrations have been measured in the past, 1100 ng cm<sup>-2</sup> y<sup>-1</sup> for *p,p'*-DDE. This work demonstrates the utility of passive samplers for making in situ flux measurements at contaminated sediment sites.