

## A.1 Technology Name

### Semipermeable Membrane Device (SPMD)

#### A.1.1 Source

McCarthy, John F., George R. Southworth, Kenneth D. Ham, and Jennifer A. Palmer. 2000. Time-Integrated, Flux-Based Monitoring Using Semipermeable Membrane Devices to Estimate the Contribution of Industrial Facilities to Regional Polychlorinated Biphenyl Budgets. *Environmental Toxicology and Chemistry* 19 (2): 352–59. <https://doi.org/10.1002/etc.5620190215>.

#### A.1.2 Summary

<b>Media:</b>	Water column
<b>Study Type:</b>	In-situ
<b>Technology:</b>	SPMD
<b>Peer Reviewed:</b>	Yes
<b>Publication Date:</b>	2000

#### A.1.3 Site Description

- The objective of this study was to characterize the flux of dissolved PCB (mass of PCB per unit time) contributed by the three U.S. Department of Energy (DOE) facilities and to compare these point source discharges to both nonpoint inputs and to the total flux of PCB in the Clinch River.
- The flux (*i.e.*, load) was calculated from the time-integrated estimates of the dissolved PCB concentrations ( $C_{\text{free}}$ ) from SPMD and estimates of the volumetric flow rates of discharges and receiving streams during the deployment period.
- SPMD comprises of polyethylene lay-flat tubing (86 cm long, 2.6 cm wide, and 0.05 mm thick), with one milliliter of triolein lipid. Six devices were deployed in the water column at each of the locations for a 28-d period during December 1995 to January 1996.  $C_{\text{free}}$  were estimated from literature sampling rate.
- Principal components analysis (PCA) of PCB congeners was used to further differentiate potential PCB sources.

#### A.1.4 Remedial Phase

RI/FS.

#### A.1.5 Outcome

PCB concentrations were highest at outfalls containing process waste from the DOE industrial facilities. The DOE discharges accounted for most of the flux of PCB entering the Clinch River from the DOE drainage areas, but these sources constituted only 10% of the flux in the Clinch River. Results from PCA show that in a stream receiving multiple inputs of PCB, congener profiles from upstream sources and discrete discharges were consistent with a mixture of those congener profiles in the downstream receiving water. In another stream with a single upstream source of PCB, the spatial variation in PCB flux and congener profiles suggested an apparent

34 steady-state distribution between dissolved PCB and PCB adsorbed to organic matter on the  
35 streambed. Flux from time-integrated SPMD monitoring can be useful across a range of spatial  
36 scales for evaluating the significance of point and nonpoint contaminant sources and can help  
37 identify and prioritize feasible remedial alternatives.

#### 38 **A.1.6 References**

39 None.

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