

## RECEPTOR MODELING OF SOURCES AND SINKS IN THE LOWER PASSAIC RIVER

Juliana Atmadja(1), Solomon S. Gbondo-Tugbawa(1), Edward A. Garvey(1) and Clarissa Hansen (2)

(1) Malcolm Pirnie, Inc., 17-17 Route 208 North, 2<sup>nd</sup> Floor, Fair Lawn, NJ 07410,  
(p)201-797-7400, (f) 201-398-4443

(2) Malcolm Pirnie, Inc., 640 Freedom Business Center, Suite 310, King of Prussia, PA 19406, (p) 610-768-5813, (f) 610-768-5817

Beginning with the American Industrial Revolution, the Lower Passaic River in northern New Jersey has been subject to industrial discharges laden with contaminants. Coincident with this industrial development was the construction and subsequent neglect of an extensive shipping channel along much of the length of the lower river. As solids settled in the abandoned channel, thick, silty sediment beds were created, contaminated with a variety of constituents, notably 2,3,7,8-TCDD.

Since the 1980s, when the river became a Superfund site (under the American CERCLA federal law), several external-source hypotheses have been put forth to explain the fate and transport of contaminants in the system. While these hypotheses may explain some observations regarding contaminants, none are able to encompass the entire spectrum of observations. In particular, they are unable to explain the continued high concentrations of 2,3,7,8-TCDD at the sediment surface despite the cessation of discharges and the high rate of deposition.

Here, an empirical mass balance model using a novel, receptor-type modeling approach was developed to quantify the relative contaminant and solids contributions to the recently deposited surface sediments for nine individual contaminants. The model formulation uniquely characterizes each of the major external sources as well as estuarine sediment resuspension. With the exception of PAHs, the results confirm that the external sources alone cannot account for the observed chemical concentrations. Moreover, they identify sediment resuspension (based on its unique contaminant pattern) as the major source of the contaminant burden to surface sediments. While resuspended solids only comprise about 10 percent of the total annual deposition, the contaminant burden associated with resuspension accounts for over 95 percent of the 2,3,7,8-TCDD contaminant load and at least 40 percent of PCB, pesticide, and mercury loads in the Lower Passaic River.