

An Innovative Approach to High Resolution GC/MS Analysis in Support of a PCB TMDL Study for the Delaware Estuary

Dale Hoover¹, Ed Santoro², Coreen Hamilton¹, and Gregory J. Cavallo²

¹AXYS Analytical Services Ltd., P.O. Box 2219, Sidney BC, Canada V8L 3S8

²Delaware River Basin Commission, 25 State Police Drive, West Trenton, NJ 08628-0360

Biographical Sketches of Authors

Dale Hoover is employed with AXYS Analytical Services, a commercial environmental laboratory providing routine and custom trace organic analysis. Since 1990 he has served as the Quality Manager for numerous large analytical projects including the National Study of Chemical Residues in Lake Fish Tissue directed by EPA's Office of Water, the 2001 National Sewage Sludge Survey directed by EPA's Office of Water, the Ohio River Sanitation Commission (ORSANCO) TMDL, and the Contaminant Assessment Reduction Program for the New York/New Jersey Harbor and Hudson River Watershed.

Edward D. Santoro is the Basin Monitoring Coordinator for the Commission and serves within the Modeling and Monitoring Branch. Mr. Santoro is responsible for conducting and coordinating monitoring activities within the Delaware River Basin. Previously, he worked with a private sector engineering firm for 15 years doing environmental & hazardous waste site activities, Environmental Impact Studies and wetland surveys. Prior to this he served with the U.S. Environmental Protection Agency, Region II for 8 years. While at USEPA he worked on a number of major activities including the NPDES permitting of power plants, the Ocean Disposal Program, wetland permitting and fisheries investigations. Mr. Santoro received a Master of Science in Marine & Environmental Science from Long Island University. He has published over 30 technical articles in the field.

Abstract

The detection limit requirements for water TMDL studies can challenge the capabilities of modern analytical methods. Solid phase extraction sampling has increasingly been used as a means of collecting large volumes of sample and thereby achieving lower detection limits. However, the technique requires specialized equipment and skills and is more difficult and expensive to perform in the field than conventional grab water sampling. Field based solid phase extraction also offers limited information on target compound capture efficiency.

Conventional water grab sampling has been combined with large volume solid phase extraction and high resolution GC/MS analysis to achieve PCB congener detection limits of less than 0.5 pg/L. True isotope dilution quantification to the point of sampling was achieved by the addition of isotopically labeled standards to 20 L water samples in the laboratory followed by XAD solid phase extraction and high resolution GC/MS analysis. Capture rate on the XAD was directly monitored from recovery of the isotopically labeled standards and final concentrations were recovery corrected by the isotope dilution quantification procedure. This technique offers a means of achieving highly accurate, sensitive and reliable measurement of PCBs in water.