

Advances in High-Volume Sampling and Trace Analysis of Persistent Organic Pollutants

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Biographical Sketches of Authors

David Thal is the Specialty Organics Laboratory Manager at STL Knoxville, where he supervises production and research activities. The activities include organic extractions, purifications and GC/MS analysis. He provides consultation on analytical data/reports; assisting clients in determining analysis needs, training new personnel in isotope dilution, low- and high-resolution mass spectrometry; method development and applications. He has 15 years of experience in analysis of drinking water, waste water, soil, tissues, incinerator ash, sludges, oils, and gaseous mixtures. He has experience in analytical program design and management. Other experience includes, instrument control programming, and statistical process control.

Timothy Wilson is a hydrologist with the US Geological Survey in West Trenton, New Jersey. His current research involves large volume sampling for trace organics at the head-of-tides of the major tributaries to Newark and Raritan Bays in New Jersey. This work is being performed as part of the NY/NJ Harbor Estuary Plan and the NJDEP Contaminant Assessment and Reduction Program. He holds a Ph.D. in low-temperature geochemistry from Michigan State University, and has over 15 years experience working for academic, consulting, and government concerns.

Abstract

TMDL development and contaminant transport modeling require accurate, sensitive measurements of persistent organic pollutants (POPs) in estuarine waters. Detection in the fg/L to ng/L range is often needed to determine inputs from tributary and discharge waters. The exact detection limit required depends on the toxicity and presence of each compound, and is often below the limit obtainable by conventional EPA methods. Conventional water grab sampling and analyses result in frequent non-detects, that offer and little insight into loadings and background levels. New approaches to sampling and analysis have been developed, and applied, to overcome these problems.

Isotope dilution SIM-LRMS technique has been successfully applied to determine PAHs in aqueous and suspended matrices. Isotope dilution HRMS analysis has been evaluated as an option for organochlorine pesticides in environmental matrices. These methods and adaptations of EPA Methods 1613B (PCDD/PCDFs) and 1668A (PCB congeners) have been applied to components of a high-volume water sampling system. Trace organics platform samplers (TOPS) have been used in conducting sampling for the New Jersey Toxic Sediment Reduction Plan, in support of TMDL development. This innovative sampling method allows the effective sampling size to be increased to 50-1000 L.

The TOPS flow-integrated, high-volume sampling, coupled with high-specificity extraction, cleanup and analysis provided detection limits several orders of magnitude lower than established EPA grab sampling and analytical methodology. Good recovery and precision have been demonstrated in the laboratory methods. This approach has provided the Contaminant Assessment and Reduction Program (CARP) previously unattainable information regarding the background contamination and loading mechanisms for the Newark Bay estuary. The techniques are expected to be applicable in other water body systems, as well.

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