

**IDENTIFICATION OF HISTORICAL PCDD/F SOURCES IN NEWARK BAY ESTUARY
SUBSURFACE SEDIMENTS USING POLYTOPIC VECTOR ANALYSIS AND
RADIOISOTOPE DATING TECHNIQUES**

¹Huntley, S.L., ²Carlson-Lynch, H., ³Johnson, G.W., ⁴Paustenbach, D.J., and ⁵Finley, B.L.

¹Gradient Corporation, 44 Brattle St., Cambridge, MA 02138, USA

²ChemRisk, Division of McLaren/Hart, Inc., 1685 Congress St., Portland, ME 04102, USA

³Earth Sciences and Resources Institute, University of Utah, 1515 E. Mineral Sq.,
Salt Lake City, UT 84112, USA

⁴ChemRisk, Division of McLaren/Hart, Inc., 1135 Atlantic Ave., Alameda, CA 94501, USA

⁵ChemRisk, Division of McLaren/Hart, Inc., 29225 Chagrin Blvd., Cleveland, OH 44124, USA

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ABSTRACT

Fifty sediment cores, comprising a total of 194 individual samples, were collected throughout the Newark Bay Estuary including the Arthur Kill, Rahway River, Elizabeth River, Hackensack River, Kill van Kull, and Passaic River between November 1991 and March 1993. All samples were analyzed for polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs). An additional six to ten samples were collected from each core and analyzed for the radioisotopes ²¹⁰Pb and ¹³⁷Cs. The ²¹⁰Pb and ¹³⁷Cs results were used to estimate sediment accumulation rates for each core and approximate dates of sediment deposition for individual samples analyzed for PCDD/Fs. Sediment cores for which radioisotope results were inadequate for radiodating were excluded from the analysis, leaving a total of 26 cores, comprising 50 individual samples, for further statistical analysis. These remaining samples were grouped into three categories (models) based on their estimated dates of deposition. The time intervals represented by each model were 1950-1965 (model 5065), 1970-1979 (model 7079), and 1980-1989 (model 8089). Polytopic vector analysis (PVA) was performed separately on each model to determine the number of dominant fingerprint patterns (end members) present within each model. PVA results indicate that the 5065 model comprises five distinct end members, while the 7079 and 8089 models comprise six distinct end members. Comparison of end member patterns with source-specific fingerprint patterns found three PCDD/F congener patterns common to all models: combustion sources, sewage sludge sources, and sources associated with polychlorinated biphenyls (PCBs). In addition, each of the three models

*To whom correspondence should be addressed.