

Principal Components Analysis of Potential Sources of Polychlorinated Dibenzo-*p*-Dioxin and Dibenzofuran Residues in Surficial Sediments from Newark Bay, New Jersey

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Abstract. The distributions of polychlorinated dibenzo-*p*-dioxins (PCDDs) and dibenzofurans (PCDFs) measured in surficial sediments from the lower Passaic River and Newark Bay, New Jersey, USA, were compared to those reported in various industrial process residues and effluents, contaminated soils, chemical formulations, and municipal waste disposal activities that are known or suspected to be sources of these compounds in the aquatic environment. Comparisons were conducted using data from published literature to determine whether the composition of tetra through octachlorinated congeners and 2,3,7,8-substituted residues reported in a broad range of potential environmental sources could explain the presence of these compounds in Newark Bay. Pattern similarities and differences between congener groups and isomers were obtained by principal components analysis. The congener and isomer fingerprint patterns found in surficial sediments appear to be the result of releases from several industrial and municipal sources commonly found in heavily industrialized and populated urban environments, including municipal sewage sludge, municipal solid waste incinerator fly ash, pentachlorophenol, sodium pentachlorophenate, newsprint, scrap metal reclamation incinerators, combustion engines, and pulp and paper mill black liquor recovery furnaces. The variations among the PCDD and PCDF residue and congener patterns were largely explained by the distributions of the hexa- and octachlorinated compounds and by 2,3,7,8,-TCDD, 2,3,7,8,-TCDF, and the penta-substituted isomers. Although it has been claimed that a single industrial source is responsible for the presence of these compounds in the sediments of Newark Bay, the available evidence indicates that the vast majority of the PCDDs and PCDFs are the result of contributions from several industries. There is no evidence from this analysis to indicate that a single source is responsible for the contamination.