

CASE STUDY OF RESIDENCES WITH ANOMALOUS SOIL CONCENTRATIONS OF PCDDs, PCDFs AND PCBs IN A COMMUNITY IN MICHIGAN, USA

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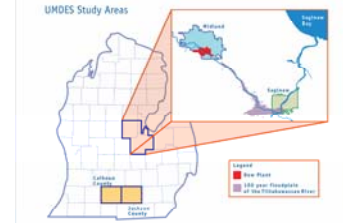
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INTRODUCTION & OBJECTIVES

As part of the University of Michigan Dioxin Exposure Study (UMDES), soil samples were collected from 766 residential properties from five populations in Michigan (Figure 1). Given the history of industrial contamination, high concentrations of PCDDs, PCDFs and PCBs were expected in the Floodplain and the Plume. But some residential properties located in the Other Midland/Saginaw and Jackson/Calhoun areas had high concentrations as well. The objective of this case study was to elucidate reasons for the higher than expected soil concentrations in properties in these areas.

Figure 1. Geographic Areas

Floodplain: Within the 100-year floodplain of the Tittabawassee River
Near Floodplain: Within the census block of the Floodplain, but outside the Floodplain
Midland Plume: Down wind of Dow Chemical
Other Midland/Saginaw: Within these counties but outside the other areas
Jackson/Calhoun: Within these counties, located about 100 miles south of Dow Chemical



METHODS

Case Study Eligibility: The types of soil sample composites analyzed in UMDES are listed in Table 1. To be eligible for the case study, a respondent had to have a TEQ value for one of the composites that was two standard deviations above the geometric mean for that area. Seven respondents were recruited to participate. These respondents completed an interview (Table 2) and additional soil samples were sometimes analyzed.

Table 1. Types of Soil Composites

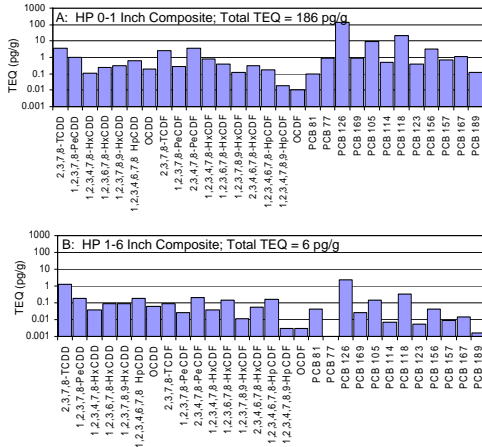
- House perimeter 0-1 inch composite (HP 0-1 inch)
- House perimeter 1-6 inch composite (HP 1-6 inch)
- Soil contact 0-6 inch composite (Garden)
- Near river 0-1 inch composite (NR 0-1 inch)
- Near river 1-6 inch composite (NR 1-6 inch)

Table 2. Interview Topics

- House Characteristics**
- Age of house, history of flooding, prior use of property, fire damage
- Soil Movement**
- Construction, renovation, landscaping, gardening
- Residential Use**
- Hobbies, trash or yard waste burning, pesticide spraying, other chemical usage

RESULTS

Figure 2. House Perimeter Soil Composites for CASE 1



CASE 1: Jackson/Calhoun The TEQ (WHO 2005) of the HP 0-1 inch composite was 186 pg/g, but the TEQ of the HP 1-6 inch composite was only 6 pg/g (Figure 2). Thus, the contamination seemed to impact the surface only. The TEQ was dominated by PCBs, particularly PCB 126 and PCB 118. By concentration, the dominant PCBs were PCB 105 and PCB 118, suggestive of Arochlor 1254, a compound found in caulk and waterproof paint.

From the interview, we learned that the respondent installed a pool in the backyard in 1969, which he sandblasted to repaint in 1993, creating a fine layer of dust over the property. An analysis of uncomposited soil samples (Figure 3) confirmed that the contamination was concentrated in the backyard. Thus, it appears that the property became contaminated through the sandblasting of the swimming pool.

Figure 3. House Perimeter Uncomposited Soil Samples for CASE 1

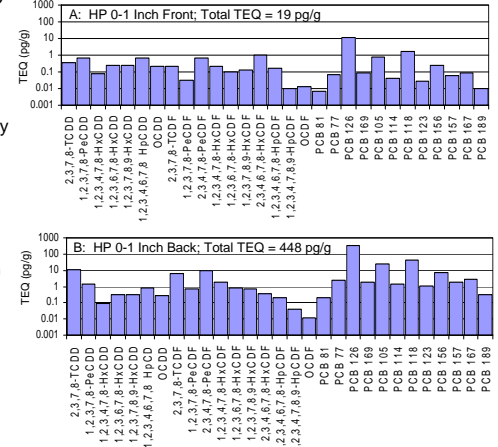
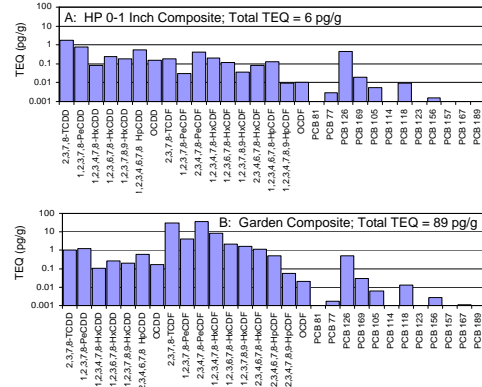


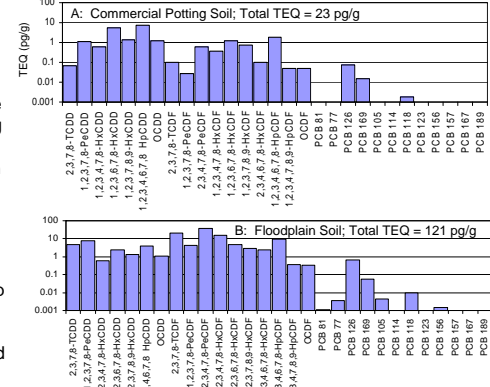
Figure 4. Soil Composites for CASE 2



CASE 2: Other Midland/Saginaw The TEQ (2005) of the HP 0-1 inch composite was 6 pg/g, yet the TEQ of the Garden composite was 89 pg/g, considerably higher (Figure 4). In addition, the congener pattern of the Garden composite did not resemble that of the HP composite or that of commercial gardening soil (Figure 5A). The Garden composite had a preponderance of PCDFs, a pattern found in the Floodplain (Figure 5B); despite the distance of the property from the Floodplain.

From the interview, we learned that the respondent had brought in mulch for the garden about 5 or 6 years ago from a township composting facility that was located within the floodplain of the Tittabawassee River. Thus it appears that the garden became contaminated through the use of contaminated mulch taken from the Floodplain.

Figure 5. Comparison Congener Patterns for CASE 2



CONCLUSIONS

This case study of anomalously high soil concentrations found that, in regions outside the Floodplain and Plume, respondents' property had become contaminated through mechanisms other than the deposition of historic industrial discharges. In Case 1, the respondent had contaminated his property by sandblasting painted surfaces; in Case 2, the contamination occurred through the movement of contaminated materials. The second case confirms concerns of area residents that the contamination in the Floodplain of the Tittabawassee River has been spread through the movement of contaminated materials from the River's vicinity.

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