





PFAS in Soil: Regional Investigation 952.832.2901 of the Air Deposition Pathway

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Project background



Several facilities within the region historically utilized PFAS containing materials in their manufacturing processes (~1950 to 2000)



Potentially dispersed PFAS into the environment via atmospheric emissions and deposition



Regional-scale investigation, supporting multiple site investigations, designed to evaluate the air emission and deposition pathway was requested

Simplified conceptual model – single source



What about other sources, pathways and historical loading?



Objectives



Determine if PFAS impacts from air deposition were observable in representative **soils**



Determine if PFAS distribution in soils is **consistent** with an air deposition conceptual site model (CSM) for sources within the study area

Historical Aerial Imagery



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Tax Records

Topographic Maps



Geologic Maps Wetland/Floodplain Maps Regulatory Review Image: Cologic Maps Image: Cologic Maps

Investigation Design

Sampling Location Criteria

- Undisturbed for past 60 years;
- No indication of nearby source;
- Outside of wetland and floodplain;
- Sufficient soil thickness;
- Clear land ownership and ability to obtain access; and
- Inward-facing slope.

Radial Grid 1k to 10K feet Step-out



Site-Specific Meteorological Data



Investigation Design

- Access sought at more than 148 properties as potential sampling locations
- Mostly private properties, all wooded
- Goal of distribution with distance and direction



Investigation Design

Field Vetting and Sampling

- No evidence of dumping or disturbance;
- Avoid low lying/settling/wet areas;
- Type of tree and diameter;
- Mid-slope where possible;
- Oversite/agreement with agency on each location;
- Telescopic interval sampling (avoid sloughing); and
- Careful homogenization.



The Dataset

- Analytical Data
 - PFAS
 - Total Organic Carbon
 - pH
 - SPLP (limited subset)
- Field data
 - Tree cover
 - Soil classification
 - Elevation
 - Distance and direction
 - Slope position

PFOA and PFOS were most frequently detected **Detection Frequency** (All Sample Intervals)



PFCAs by increasing chain length

Significant differences in detection frequency by sampling interval



Significant differences in concentration by sampling interval



Significant differences in concentration by sampling interval



Significant differences in concentration by sampling interval

PFOA



PFAS concentrations consistent with source(s) within study area were anticipated to demonstrate:



Decreasing trend with distance (upwind and downwind)



Distance from Center of Study Area (meters)

Trends intersect at distance



Distance from Center of Study Area (meters)

Concentrations higher upwind at distance



Distance from Center of Study Area (meters)

Upwind sources indicated



Distance Upwind (Meters)

Distance Downwind (Meters)

Key Take-Aways

- Sample location vetting and selection were key
 - Reduces potential influence from potential sources/pathways
 - Confidence in representativeness
- Undisturbed soils may serve as a record of historical PFAS deposition
 - Important consideration for characterizing background conditions
 - Important considerations for disturbed soils
- Sample interval considerations
 - Wide intervals may "dilute" detections in surface soils
 - Caution in comparing samples with different intervals





Key Take-Aways

- Delineation is possible.....
 - CSM-focused investigation design
 - Large datasets likely needed
 - Expect other sources/background









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