Integrated Chemometric Assessment PCDD/F Contamination and Sources Passaic River, NJ

Robert Barrick and Mark Cejas

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Source Identification

Evidence	ΤοοΙ
Upland Association	Documentation PVA Endmember
Concentration	Containment Cell Characteristics Geospatial Distribution
Composition	RSIMCA Classification PVA Allocation
Release History	Documentation Geospatial Depth Distribution
Transport Evidence	RSIMCA PVA Proportions Geospatial Analysis

Passaic River Setting



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Average 2,3,7,8-TCDD Waste Concentration Facility A and Facility B Containment Cells



Robust Classification and PVA End Member Components

Robust Soft independent Modelling of Class Analogies





Polytopic Vector Analysis



Release and Transport History Highest TCDD Found in RSIMCA Clusters 1 – 4



Release and Transport History Additional Sources Contribute to Clusters 5 – 7



Cluster 7: Enriched 2,3,7,8-TCDF source

t-SNE* Map of Passaic River RSIMCA Clusters 1-7 and Sediment End-Members (SEM)



Passaic River Sediment End-Members (SEM) and Samples with Distance from Facility A (RM3.1)



t-SNE Map of Facility A Containment Cell, Removal Area, and RM10.9 Sediment Samples



Distinction of Facility A and B Containment Cells, Facility A Removal Area, and RM10.9 Vicinity Sediments



t-SNE Comparison of Upland Facility A and B Containment Cells and Facility A Removal Area



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Conclusions

- Distinct PCDD/Fs fingerprints at Facilities A and B
- Facility B fingerprint not found in >2,800 river samples
- RM3 Removal Area reflects mixture of Facility A discharges over time
- Removal Area mixtures and river dynamics account for dominant PCDD/F distribution
- Facility A, upstream, and non-point sources account for contamination in Facility B vicinity
- No identifiable contribution of Facility B wastes

What's the Gain?

- Deep dive into 25 years of studies and thousands of samples
- ✓ Methodical detection limit and histogram review maximized data usage and resolution
- Tiered approach allowed comprehensive assessment with multiple tools to distinguish patterns and sources

