

Data Brief: Soil

A Norfolk Southern freight train carrying hazardous materials derailed in East Palestine, OH on February 3, 2023. This is a summary of publicly available data gathered after the derailment about possible impacts on soil as of July 2024.

Key Points:

- Based on soil samples from U.S. EPA/Norfolk Southern and Pennsylvania DEP:
 - SVOCs: residential and agricultural soil can continue to be used for gardening and crop production. Typical outdoor activities related to land use for homeowners or renters should not be negatively impacted.
- Dioxins/furans: Site specific evaluation may be required prior to use normal outdoor activities.

Sampling

U.S. Environmental Protection Agency (EPA) and Norfolk Southern Data Source



- Sampling dates: March 9 - April 14, 2023
- Phase I residential, commercial, and agricultural soil sampling.
- Collected at surface (0-1 inch) and subsurface (1-6 inch) intervals; 148 total inspection/sample locations, and 211 inspection-only locations.
- If ash was observed, it was collected as a surface scraping, which included any leaf, grass, or natural material in contact.
- 25% of samples were “split sampled” where each sub-sample was analyzed at different labs to cross-check methods.

Pennsylvania Department of Environmental Protection (DEP) Data Source



- Sampling dates: March 7 - September 14, 2023; two additional samples taken April 13, 2024.
- Collected at surface (0-1 inch) and subsurface (1-6 inch) intervals; about 85 sampling locations.

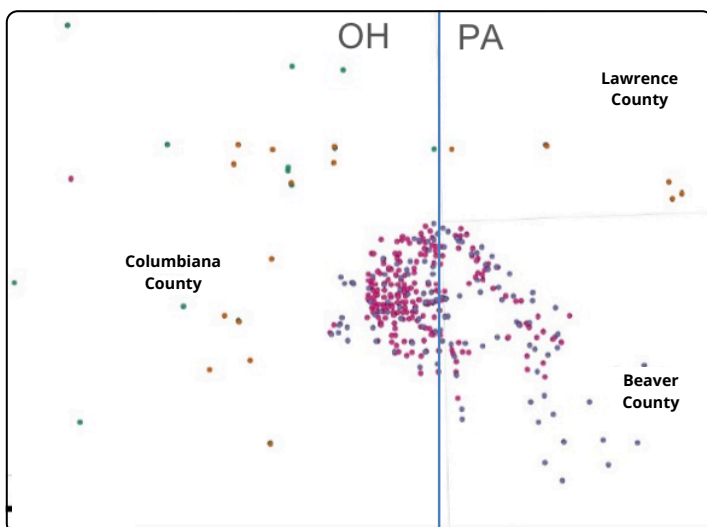


Fig. 1 EPA/Norfolk Southern Sampling Map

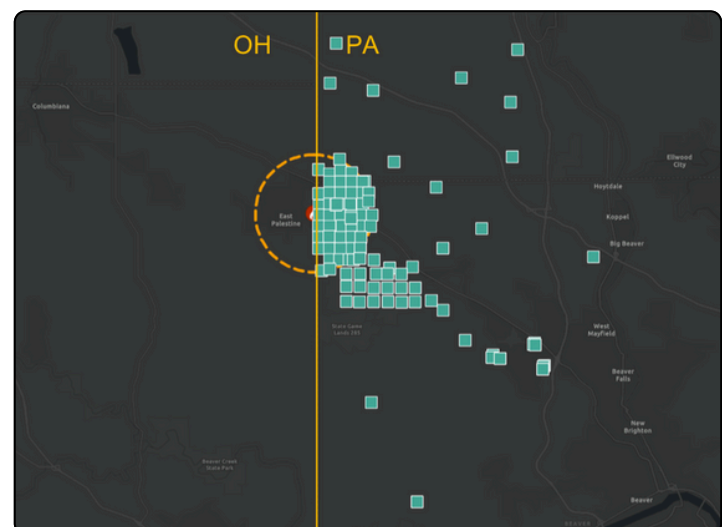


Fig. 2 Pennsylvania DEP Sampling Map

Findings

U.S. EPA and Norfolk Southern

- Six semi-volatile organic compounds (SVOCs) had observations above the regional screening level (RSL).
- Fifteen dioxins/furans had observations above the RSL.

Pennsylvania DEP

- Three SVOCs had observations above RSL.
- Only one dioxin/furan was tested for (dibenzofuran), and it did not exceed the RSL.

Conclusions

- Summary data were from approximately 800 SVOC samples and 704 dioxin/furan samples.
- Few of the selected chemicals were observed at levels greater than the RSL.
- Where RSLs were elevated, they seem to be isolated; no pattern suggests a region-wide issue.
- Samples utilized in this data brief are free of data qualifiers, meaning all data are valid and do not represent estimated values.
- Soil sampling is ongoing as part of the full site characterization. An additional soil data summary will be provided after data are reviewed.

Chemicals tested in soil samples and percentages of observations of chemicals above the RSL, 2023-2024, East Palestine, OH. Source: U.S. EPA/Norfolk Southern, and Pennsylvania DEP.

Chemical	CAS Number	Chemical Type	Percentage of Observations Above Regional Screening Level (RSL)	
			Phase I	PA DEP
Hexachlorodibenzo-p-dioxin, 1,2,3,4,7,8-	39227-28-6	DIOXIN	0.57	
HpCDD, 1,2,3,4,6,7,8,-	35822-46-9	DIOXIN	3.98	
HxCDD, 1,2,3,6,7,8-	57653-85-7	DIOXIN	1.56	
HxCDD, 1,2,3,7,8,9-	19408-74-3	DIOXIN	1.56	
OCDD	3268-87-9	DIOXIN	1.28	
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	40321-76-4	DIOXIN	5.68	
TCDD, 2,3,7,8-	1746-01-6	DIOXIN	4.12	
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562-39-4	FURAN	1.28	
Hexachlorodibenzofuran, 1,2,3,4,7,8-	70648-26-9	FURAN	1.28	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	FURAN		
HxCDF, 1,2,3,6,7,8-	57117-44-9	FURAN	0.99	
HxCDF, 1,2,3,7,8,9-	72918-21-9	FURAN	0.57	
HxCDF, 2,3,4,6,7,8-	60851-34-5	FURAN	0.71	
OCDF	39001-02-0	FURAN		
PeCDF, 1,2,3,7,8-	57117-41-6	FURAN	0.43	
PeCDF, 2,3,4,7,8-	57117-31-4	FURAN	3.70	
TCDF, 2,3,7,8-	51207-31-9	FURAN	0.14	
Dibenzofuran	132-64-9	FURAN		
Total Toxic Dioxins and Furans (TEQ)		DIOXIN/ FURAN	26.28	
Pentachlorophenol	87-86-5	HERB		
Acenaphthene	83-32-9	PAH		
Anthracene	120-12-7	PAH		

Chemical	CAS Number	Chemical Type	Percentage of Observations Above Regional Screening Level (RSL)	
			Phase I	PA DEP
Benz[a]anthracene	56-55-3	PAH	6.40	
Benzo[a]pyrene	50-32-8	PAH	36.50	11.80
Benzo[b]fluoranthene	205-99-2	PAH	11.10	
Benzo[e]pyrene	192-97-2	PAH		
Benzo[e]pyrene	192-97-2	PAH		
Benzo[j]fluoranthene	205-82-3	PAH		
Benzo[k]fluoranthene	207-08-9	PAH		
Chrysene	218-01-9	PAH		
Dibenz[a,h]anthracene	53-70-3	PAH	15.60	0.56
Fluoranthene	206-44-0	PAH		
Fluorene	86-73-7	PAH		
Indeno[1,2,3-cd]pyrene	193-39-5	PAH	4.20	
Methylnaphthalene, 2-	91-57-6	PAH		
Naphthalene	91-20-3	PAH	1.00	0.56
Pyrene	129-00-0	PAH		
Hexachlorobenzene	118-74-1	PEST		
Bis(2-ethylhexyl)phthalate	117-81-7	SVOC		
Cresol, p-chloro-m-	59-50-7	SVOC		
Dichlorophenol, 2,4-	120-83-2	SVOC		
Nitroaniline, 2-	88-74-4	SVOC		
Nitroaniline, 4-	100-01-6	SVOC		
Phenol	108-95-2	SVOC		
Trichlorophenol, 2,4,5-	95-95-4	SVOC		
Trichlorophenol, 2,4,6-	88-06-2	SVOC		
Acetophenone	98-86-2	VOC		
Benzaldehyde	100-52-7	VOC		
Biphenyl, 1,1'-	92-52-4	VOC		
Chlorophenol, 2-	95-57-8	VOC		

Notes: PAHs (Polycyclic Aromatic Hydrocarbons) are a specific group of SVOCs produced by incomplete combustion or high-pressure processes. VOCs (Volatile Organic Compounds) are similar to SVOCs, but are more likely to be a gas at lower temperatures. PEST=pesticide. HERB=herbicide, also an SVOC.

Regional Screening Levels:

Risk-based thresholds of a chemical concentration used to identify locations where more detailed analysis is needed.