EXHIBIT H

RoseyFields LLC

Rebuttal Report Addressing the Expert Reports of Adam H. Love, Ph.D. Brent L. Finley, Ph.D. and Michael Lunsford Regarding Environmental Contamination, Exposure Risks, and Incident Response Following the February 3, 2023, Norfolk Southern Railway Train Derailment in East Palestine, Ohio

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May 29, 2026

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Subject: Rebuttal Report Addressing the Expert Reports of Adam H. Love, Ph.D. Brent L. Finley, Ph.D. and Michael Lunsford Regarding Environmental Contamination, Exposure Risks, and Incident Response Following the February 3, 2023, Norfolk Southern Railway Train Derailment in East Palestine, Ohio

Dear Mr. Conlin:

RoseyFields, LLC was retained by Cory Watson, P.C. to prepare this rebuttal report addressing the opinions, criticisms, methodologies, assumptions, and alternative explanations offered by Defendants' experts Dr. Adam Love, Dr. Brent Finley, and Mr. Michael Lunsford regarding dioxin and polycyclic aromatic hydrocarbon ("PAH") contamination associated with the February 3, 2023 Norfolk Southern train derailment in East Palestine, Ohio (the "Incident"). The derailment involved multiple railcars transporting hazardous materials, including vinyl chloride monomer ("VCM"), and resulted in large-scale fires, sustained thermal loading, pressure relief device ("PRD") venting events, and the February 6, 2023 vent-and-burn operation, conditions well recognized as conducive to the formation and atmospheric release of dioxins, furans, PAHs, soot-associated contaminants, and combustion-related particulate matter.

This rebuttal report addresses Defendants' criticisms regarding source characterization, atmospheric transport, plume behavior, meteorological representativeness, environmental sampling, background contamination, soot and particulate deposition, environmental persistence, and the use of AERMOD. In response to these criticisms, scores of additional AERMOD sensitivity analyses and alternative modeling scenarios were completed utilizing multiple EPA-recognized source configurations, including point, area, volume, and line source representations, together with varying source dimensions, plume

characteristics, release parameters, deposition assumptions, and meteorological sensitivity cases specifically designed to evaluate the issues raised by Defendants' experts. Importantly, regardless of whether the emissions were represented as point, area, volume, or line sources, the modeling consistently reproduced similar spatial deposition patterns and elevated dioxin and PAH deposition trends within the same general impacted areas identified by measured environmental contamination data.

This report additionally addresses Defendants' assertions regarding purportedly elevated regional "background" contamination and explains why the EPA/Arcadis background dataset was likely influenced by derailment-related plume transport and deposition, thereby artificially elevating the comparison baseline and understating the magnitude of contamination at the Plaintiff-owned CeramFab and WYG properties. Additionally, I have updated and supplemented the citations in my original report, where appropriate, in further response to Norfolk Southern's criticisms. That updated citation section is attached to this rebuttal as Exhibit E.

Paul E. Rosenfeld, Ph.D.

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A. Paul Rosenfeld, Ph.D. Curriculum Vitae
B. Soil Sampling Maps
C. Images of Air Modeling Superimposed Upon Soil Data
D. Sampling Results and UCL in East Palestine General Area
E. Additional Alternative Citations to NTSB

SUPPLEMENTAL FILES

1. AERMOD Files (AMZ, AMI, etc.) Folder
2. Variable Emission Folder
3. Dr. Love's AERMOD Folder
4. East Palestine Air Models Source Terms and Control Variables.xlsx
5. East Palestine Summary of Rebuttal AERMOD Results
6. Dioxin and PAH Full Data Summary Rebuttal
7. PRD Sensitivity Analysis.xlsx
8. Dataset #4 Updated Analysis Folder
9. ProUCL Folder

EXECUTIVE SUMMARY

RoseyFields, LLC was retained by Cory Watson, P.C., on behalf of Plaintiffs, to evaluate dioxin and polycyclic aromatic hydrocarbon ("PAH") contamination associated with the February 3, 2023 Norfolk Southern derailment, subsequent fires, pressure relief device ("PRD") actuations, and vent-and-burn operation in East Palestine, Ohio, and to evaluate the opinions, criticisms, methodologies, assumptions, and conclusions offered by Defendants' experts Dr. Adam Love, Dr. Brent Finley, and Mr. Michael Lunsford.

This rebuttal report is organized around the criticisms and recommendations advanced by Defendants' experts. Rather than merely responding to those opinions in narrative form, their recommendations and criticisms were evaluated using environmental sampling data, atmospheric transport modeling, source-term analyses, meteorological analyses, and scientific literature. Several recommendations advanced by Defendants' experts improved the evaluation and were incorporated into this report, including direct comparison of modeled deposition to measured contamination, evaluation of alternative source geometries, and evaluation of local meteorological datasets. Other conclusions advanced by Defendants' experts were tested against the environmental evidence and found to be unsupported by the measured contamination data. The analyses presented in this report therefore provide a direct evaluation of Defendants' opinions using the contamination actually measured throughout East Palestine. This rebuttal report also contains dedicated sections addressing the opinions of Dr. Love, Dr. Finley, and Mr. Lunsford on a point-by-point basis. Each significant criticism, recommendation, assumption, and conclusion advanced by Defendants' experts was evaluated using the environmental sampling data, atmospheric modeling results, and scientific literature. Collectively, these analyses demonstrate that while several recommendations improved the evaluation and were incorporated into this report, the environmental evidence consistently supports the conclusion that the Norfolk Southern Incident was a major and significant source of dioxin and PAH contamination throughout East Palestine, including the CeramFab and WYG properties.

The report begins with the environmental evidence because the contamination itself is the most important evidence in this matter. Table ES-1 and Figures ES-1 and ES-2 summarize and map community-wide dioxin and PAH contamination throughout East Palestine. These exhibits demonstrate that contamination is not limited to the derailment site, the CeramFab property, or the WYG property, but extends throughout substantial portions of the surrounding community. Elevated dioxin and PAH concentrations were measured at numerous locations and frequently exceed background concentrations regardless of whether EPA background values, Arcadis background values, Defendants' proposed

background locations, or alternative background assumptions are utilized. The magnitude, geographic extent, and spatial distribution of contamination demonstrate that the Incident was a major and significant source of dioxin and PAH contamination throughout East Palestine and cannot reasonably be explained solely by regional or historical background conditions.

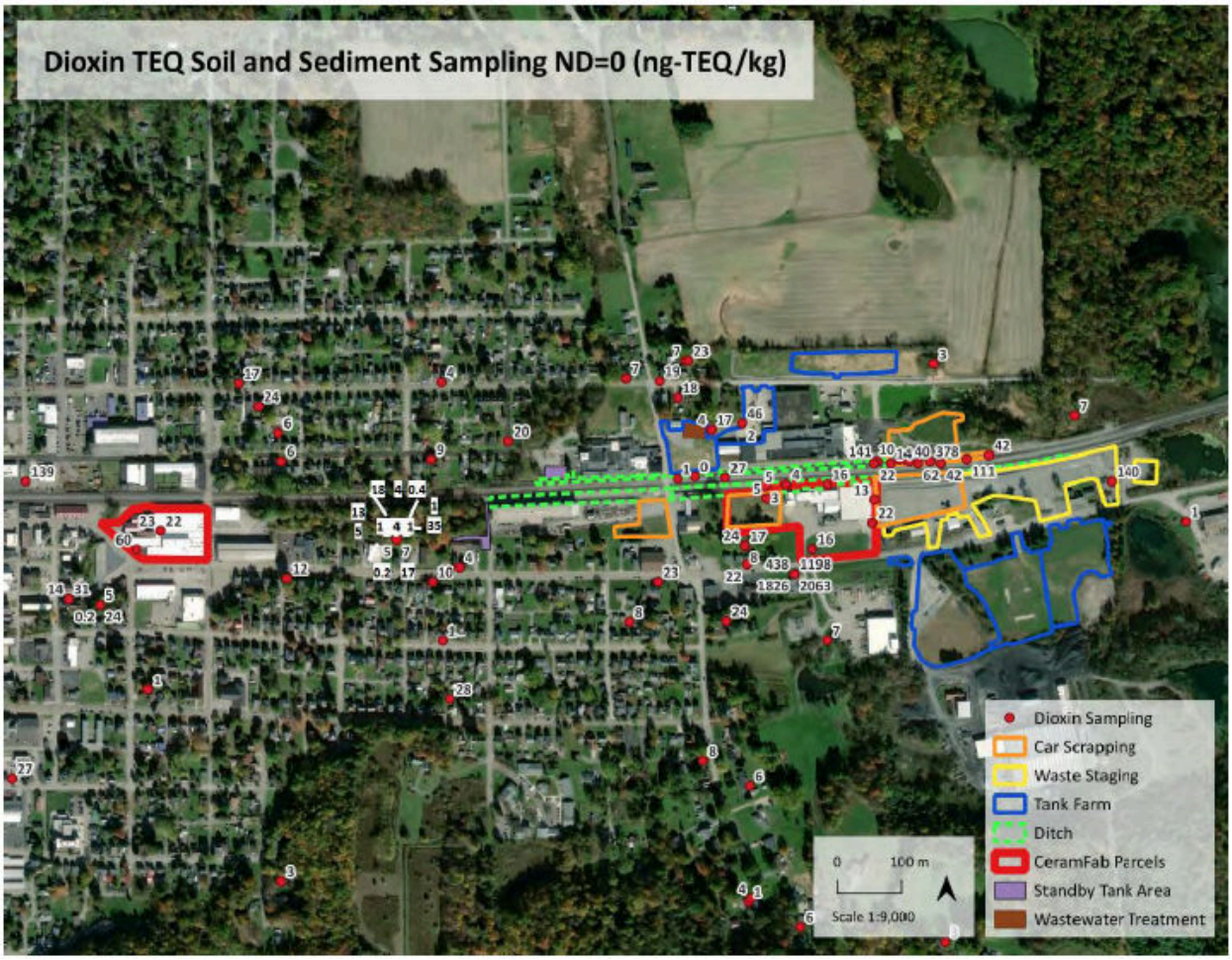


Figure ES-1. Dioxin TEQ Soil and Sediment Sampling ND=0 (ng-TEQ/kg)

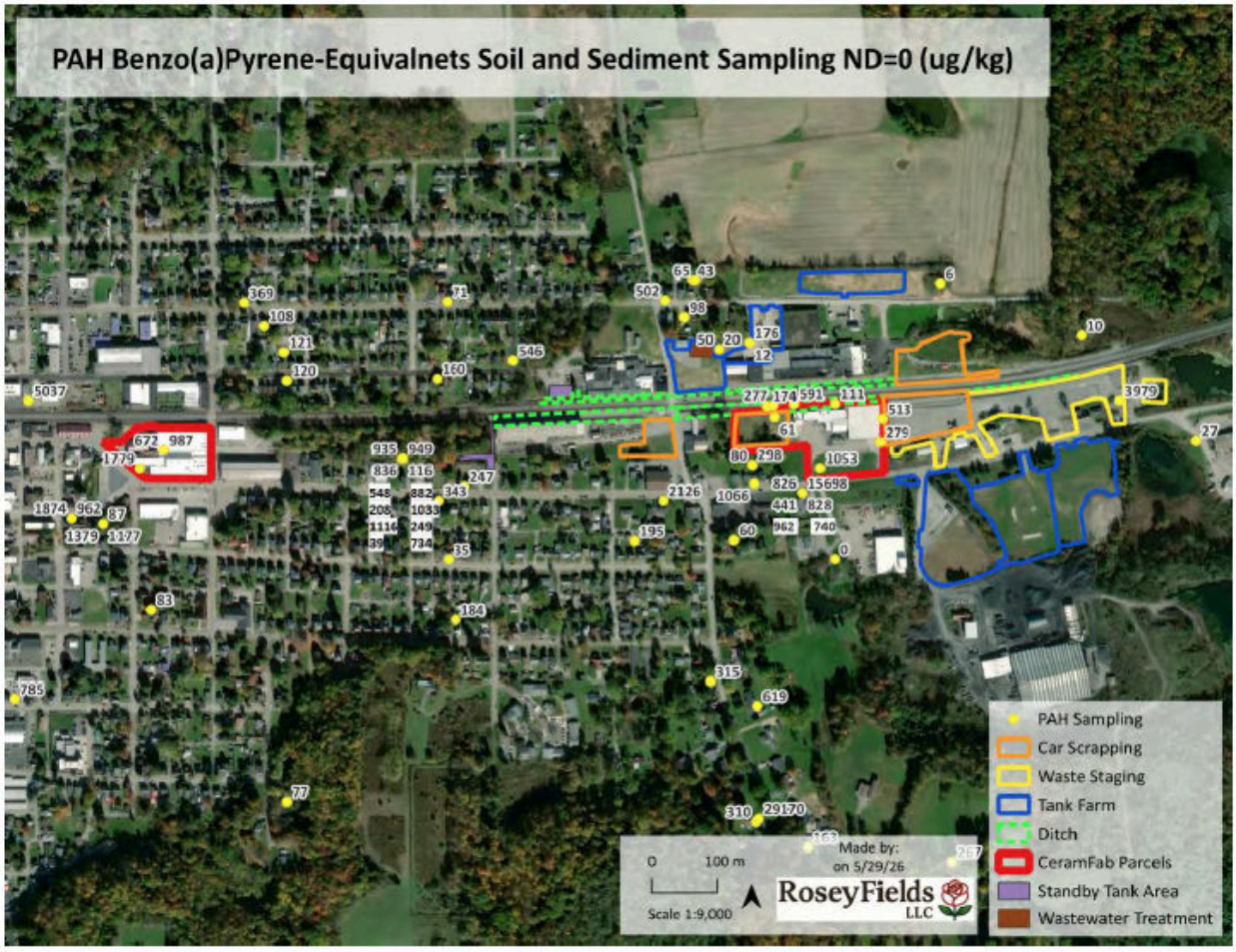


Figure ES-2. PAH Benzo(a)Pyrene-Equivalents Soil Sampling ND=0 (ug/kg)

Table ES-1: Dioxin in Soil and Benzo(a)pyrene Equivalents

In Soil and Sediment In East Palestine Area

Statistic	Dioxin and BaP Concentrations in East Palestine General Area			
	Dioxin Results		BaP Results	
	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
Number of Samples	105	105	90	90
Average	74.2	85.5	1,445	2,369
Max	2,063	2,327	29,170	31,528
95% UCL	121.3	136	2,142	3,245
Residential Soil RSL	4.8	4.8	110	110
Occupational Soil RSL	21.6	21.6	2110	2110
UCL Divided By Residential RSL	25.3	28.3	19.5	29.5
UCL Divided By Occupational RSL	5.6	6.3	1.0	1.5

Figures ES-3 through ES-6 and Tables ES-2 through ES-5 focus on the CeramFab and WYG properties and summarize measured dioxin and PAH concentrations, averages, maximum concentrations, statistical summaries, and 95% upper confidence limits ("UCLs"). These exhibits demonstrate that both Plaintiff properties contain elevated dioxin and PAH concentrations above background levels and that the contamination observed at these properties is consistent with the broader community-wide contamination pattern documented throughout East Palestine. Importantly, these conclusions remain unchanged regardless of which background dataset is utilized. The environmental evidence demonstrates that contamination at CeramFab and WYG is part of a larger deposition pattern associated with the derailment-related combustion events.

A principal criticism raised by Dr. Love and Dr. Finley was that atmospheric modeling should be evaluated against actual environmental data. This recommendation was incorporated into the analysis and ultimately became one of the strongest tests of the competing opinions in this matter. Tables ES-5 and ES-6 compare measured dioxin and PAH concentrations and UCLs to concentrations independently predicted by AERMOD after dilution into the upper one inch of soil. The comparison demonstrates that the modeled concentrations generally correspond to the measured concentrations and identify the same portions of East Palestine where elevated contamination was observed. At CeramFab, the modeled one-inch soil concentrations are generally of the same order of magnitude as the measured concentrations. The agreement between measured contamination and independently modeled deposition provides strong support for the atmospheric transport analyses and demonstrates that the modeling is consistent with actual environmental conditions.

At the WYG property, the modeling generally underpredicts the measured contamination. This finding is important because it demonstrates that the modeling is conservative and does not artificially overstate impacts. Instead, the underprediction suggests that actual deposition west of the derailment exceeded that predicted using conventional meteorological observations. This observation is scientifically consistent with the chaotic and turbulent conditions associated with a large uncontrolled industrial fire. Standard meteorological datasets do not directly capture fire-induced winds, localized plume meander, convective turbulence, fire-generated vortices, or short-duration westerly transport events generated by intense combustion. The elevated contamination measured at WYG suggests that these fire-generated effects likely enhanced westward transport during portions of the event. Consequently, the WYG results provide evidence that actual atmospheric transport may have been more extensive than predicted by conventional meteorological observations and that the modeling results are conservative.

Figure ES-3. Dioxin Sampling at CeramFab Facility Located at 900 E. Taggart St.

Table ES-2: Dioxin Sampling Results at CeramFab Facility Located at 900 E. Taggart St. (on left) and on Ceramfab Facility with 25 Meter Buffer (right)

Dioxin Soil and Sediment Samples within the CeramFab Facility		
Sample ID	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)
EP02-SO-2	5.47	5.76
EP02-SO-5	15.86	15.87
EP02-SO-6	12.92	12.92
EP02-SSS-3	22.31	22.31
410-271419-1	15.939	15.939
Average	**14.5**	**14.6**
Max	**22.3**	**22.3**
95% UCL	**20.3**	**20.3**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**4.2**	**4.2**
UCL Divided By Occupational RSL	**0.9**	**0.9**

Dioxin Soil and Sediment Samples within the CeramFab Facility and 25ft Meter Buffer		
Sample ID	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)
EP02-SO-1	3.7	111.4
EP02-SO-2	5.5	5.8
EP02-SO-3	4.8	4.8
EP02-SO-4	3.3	3.5
EP02-SO-5	15.9	15.9
EP02-SO-6	12.9	12.9
EP02-SSS-3	22.3	22.3
EP03-SO	16.7	16.7
410-126924-3	1,826.3	1,826.3
410-137121-3	438.0	438.0
410-175954-1	1,197.5	1,197.5
410-237292-1	2,062.6	2,327.1
S-72-4	27.4	27.4
410-130775-1	24.0	24.1
410-162165-2	8.0	10.5
410-271419-1	15.9	15.9
Average	**355.3**	**378.8**
Max	**2,062.6**	**2,327.1**
95% UCL	**658.9**	**700.8**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**137.3**	**146.0**
UCL Divided By Occupational RSL	**30.5**	**32.4**

Figure ES-4. PAH Sampling at CeramFab Facility Located at 900 E. Taggart St.

Table ES-3. PAH Sampling Results at CeramFab Facility Located at 900 E. Taggart St. (on left) and on Ceramfab Facility with 25 Meter Buffer (right)

PAH Soil and Sediment Samples within the CeramFab Facility		
Sample ID	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
EP02-SO-2	61.36	873.86
EP02-SO-5	111	878
EP02-SO-6	513.02	4296.02
EP02-SSS-3	278.84	3522.34
410-271419-1	1053.2	1053.2
Average	**403.5**	**2,124.7**
Max	**1,053.2**	**4,296.0**
95% UCL	**788.5**	**3,701**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**7.2**	**33.6**
UCL Divided By Occupational RSL	**0.4**	**1.8**

PAH Soil and Sediment Samples within the CeramFab Facility and 25ft Meter Buffer		
Sample ID	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
EP02-SO-1	591.13	4816.13
EP02-SO-2	61.36	873.86
EP02-SO-3	174.24	1168.74
EP02-SO-4	276.63	4397.63
EP02-SO-5	111	878
EP02-SO-6	513.02	4296.02
EP02-SSS-3	278.84	3522.34
EP03-SO	80.243	1250.243
410-126924-3	825.7	1065.7
410-126924-3	15698	15698
410-126924-3	961.8	961.8
410-137121-3	828.4	828.4
410-175954-1	739.8	739.8
410-237292-1	440.9	440.9
410-271419-1	1053.2	1053.2
410-130775-1	200.80	305.20
410-162165-2	298.30	298.30
Average	**1,360.8**	**2,505.5**
Max	**15,698.0**	**15,698.0**
95% UCL	**2,576**	**4,984**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**23.4**	**45.3**
UCL Divided By Occupational RSL	**1.2**	**2.4**

Figure ES-5. Dioxin Sampling at WYG Refractories Located at 193 N. James St.Table ES-2: Dioxin

Table ES-4: Dioxin Sampling Results at WYG Refractories - 193 N. James St.

Dioxin Samples within the CeramFab Facility		
Sample ID	**RESULT ng-TEQ/kg (ND = 0)**	**RESULT ng-TEQ/kg (ND = ½ MDL)**
EP08-SO	22.79	23.26
EP80-SO*	21.53	21.7
410-271421-1	59.954	59.954
Average	**34.8**	**35.0**
Max	**60.0**	**60.0**
95% UCL	**71.6**	**71.5**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**14.9**	**14.9**
UCL Divided By Occupational RSL	**3.3**	**3.3**

*Mislabeled as EP80-SO in the GEL dataset. This is noted in Table 2, "TENTATIVELY IDENTIFIED COMPOUND (TIC) RESULTS TS -- Reconnaissance Sampling and Analysis; Vicinity of the Norfolk Southern Derailment Site, East Palestine, Ohio" as a EP08 duplicate.[1]

[1] GEL Testing for CeramFab and WYG Buildings. August 7, 2023.

Figure ES-6. PAH Sampling at WYG Refractories Located at 193 N. James St.

Table ES-5: BaP-eq Sampling Results at WYG Refractories - 193 N. James St.

PAH Samples within the CeramFab Facility		
Sample ID	**RESULT ug-BaP_{eq}/kg (ND = 0)**	**RESULT ug-BaP_{eq}/kg (ND = ½ MDL)**
EP08-SO	986.6	9371.6
EP80-SO*	671.92	9056.92
410-271421-1	1779	1779
Average	**1,145.8**	**6,735.8**
Max	**1,779.0**	**9,371.6**
95% UCL	**2,108**	**13,978**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**19.2**	**127.1**
UCL Divided By Occupational RSL	**1.0**	**6.6**

*Mislabeled as EP80-SO in the GEL dataset. This is noted in Table 2, "TENTATIVELY IDENTIFIED COMPOUND (TIC) RESULTS TS -- Reconnaissance Sampling and Analysis; Vicinity of the Norfolk Southern Derailment Site, East Palestine, Ohio" as a EP08 duplicate.[2]

[2] GEL Testing for CeramFab and WYG Buildings. August 7, 2023.

Table ES-6: Dioxin TCDD-TEQ Deposition in Top Kilogram, 0.5 Inch and 1 Inch of Soil Using Area, Line, Volume and Point Source Emissions And Using Four Meteorological Datasets

Average Dioxin Deposition (ngTEQ/m²) In Top Kilogram of Soil																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	9	12,482	12,471	13,898	47	7,960	6,595	31,983	47	47,882	45,117	36,652	3	65	56	1,432
WYG	72	2	357	357	395	5	204	199	381	3	370	376	336	0	0	0	37

Average Dioxin Deposition (ngTEQ/m²) Diluted to 0.5 Inches																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.4	551	550	613	2	351	291	1,411	2	2,112	1,990	1,617	0.1	2.9	2.5	63
WYG	72	0.1	15.8	15.8	17.4	0.2	9.0	8.8	16.8	0.1	16.3	16.6	15	0.0	0.0	0.0	1.6

Average Dioxin Deposition (ngTEQ/m²) Diluted to 1 Inch																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.2	275	275	307	1	176	145	705	1	1,056	995	808	0	1	1	32
WYG	72	0.0	8	8	9	0	5	4	8	0	8	8	7	0	0	0	1

Table ES-7: Benza(a)pyrene Deposition in Top Kilogram, 0.5 Inch and 1 Inch of Soil Using Area, Line, Volume and Point Source Emissions And Using Meteorological Data From Four Airports

Average Benzo(a)Pyrene Deposition (ug BAP/m²) In Top Kilogram																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	90	127,754	127,644	142,245	478	81,467	67,502	327,349	482	490,075	461,770	375,130	35	665	576	14,659
WYG	2108	16	3,656	3,657	4,046	47	2,090	2,039	3,894	26	3,785	3,847	3,438	2	0	0	375

Average Benzo(a)Pyrene Deposition (ug BAP/m²) Diluted To 0.5 Inches																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	4	5,729	5,724	6,379	21	3,653	3,027	14,679	22	21,976	20,707	16,822	2	30	26	657
WYG	2108	1	164	164	181	2	94	91	175	1	170	173	154	0	0	0	17

Average Benzo(a)Pyrene Deposition (ug BAP/m²) Diluted To 1 Inch																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	2.0	2,864	2,862	3,189	11	1,827	1,513	7,340	11	10,988	10,354	8,411	1	15	13	329
WYG	2108	0.4	82	82	91	1	47	46	87	1	85	86	77	0	0	0	8

Dr. Love also criticized the original source representations and suggested that alternative source geometries should be evaluated. Figures ES-7 through ES-16 and Tables ES-7 through ES-16 present the results of analyses conducted in response to those recommendations. It must be noted that the isopleths in Figures ES-7 to ES-16 do not present the highest values, but show the deposition pattern. These exhibits evaluate point, area, line, and volume source representations together with multiple meteorological datasets. Collectively, they test whether the conclusions depend upon a particular source geometry, release configuration, or meteorological assumption. Importantly, the alternative source geometries generally improved the correspondence between the modeled deposition patterns and the measured contamination data. Rather than weakening the conclusions of the original report, the area, line, and volume source representations recommended by Dr. Love strengthened the relationship between the atmospheric transport modeling and the environmental sampling data and provided additional support for the conclusion that the contamination observed throughout East Palestine is consistent with deposition from the derailment-related combustion events.

Defendants also criticized the meteorological inputs utilized in the original analysis and suggested that local meteorological data should be evaluated. In response, additional analyses were completed utilizing the KOHEASTP7, KOHEASTP9, and KPABEAVE2 meteorological datasets. These analyses demonstrate that the principal conclusions remain unchanged regardless of which meteorological dataset is utilized. In many instances, the local meteorological datasets improved the agreement between modeled deposition and measured contamination relative to the original regional dataset. These findings indicate that localized meteorological conditions influenced contaminant transport but do not alter the fundamental conclusion that the derailment-related combustion events were a substantially significant source of contamination throughout East Palestine.

Defendants further criticized the source terms utilized in the original report and advocated substantially lower emission estimates. Those criticisms were also evaluated. Additional analyses were completed utilizing source terms derived from the methodologies discussed in Defendants' reports, including source terms similar to those advocated by Dr. Love. These analyses demonstrated that the lower source terms predict dioxin and PAH concentrations substantially below those measured throughout East Palestine. When diluted into the upper one inch of soil, the concentrations predicted using Defendants' preferred source terms are generally too low to reasonably explain the widespread contamination documented by the environmental sampling data. Defendants' suggested methodology here is, therefore, unsupported by the evidence. In contrast, the UNEP emission factors and combustion-based source terms utilized in this report produce modeled concentrations that more closely correspond to the contamination actually measured throughout the community. Accordingly, the environmental data support the source terms utilized in this report and do not support the substantially lower source terms advocated by Defendants.

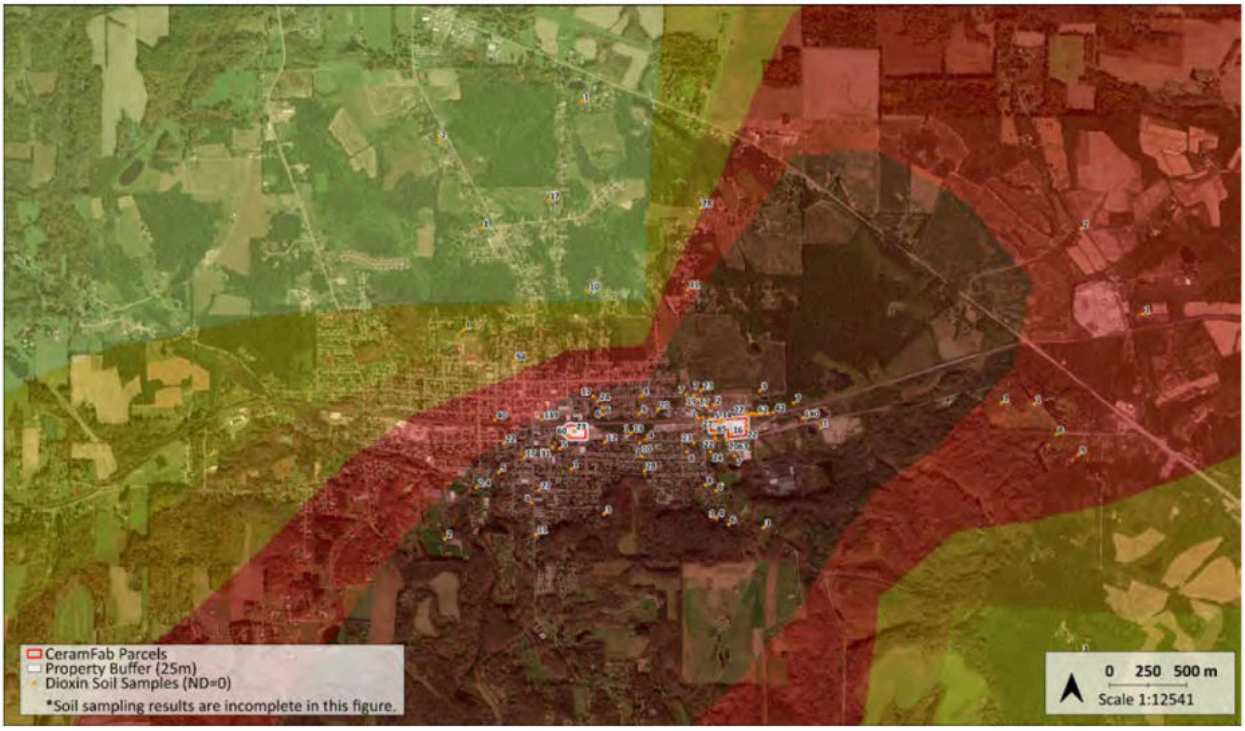


Figure ES-7: Volume Source Modeled With KOHEASTP9 Met Station

Table ES-8: Volume Source Modeled With KOHEASTP9 Met Station

	Volume Source Modeled With KOHEASTP9 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	75	3.3	1.7	768	33.9	16.9
	150	6.6	3.3	1535	67.7	33.9
	>300	>13.2	>6.6	>3070	>135.4	>67.7

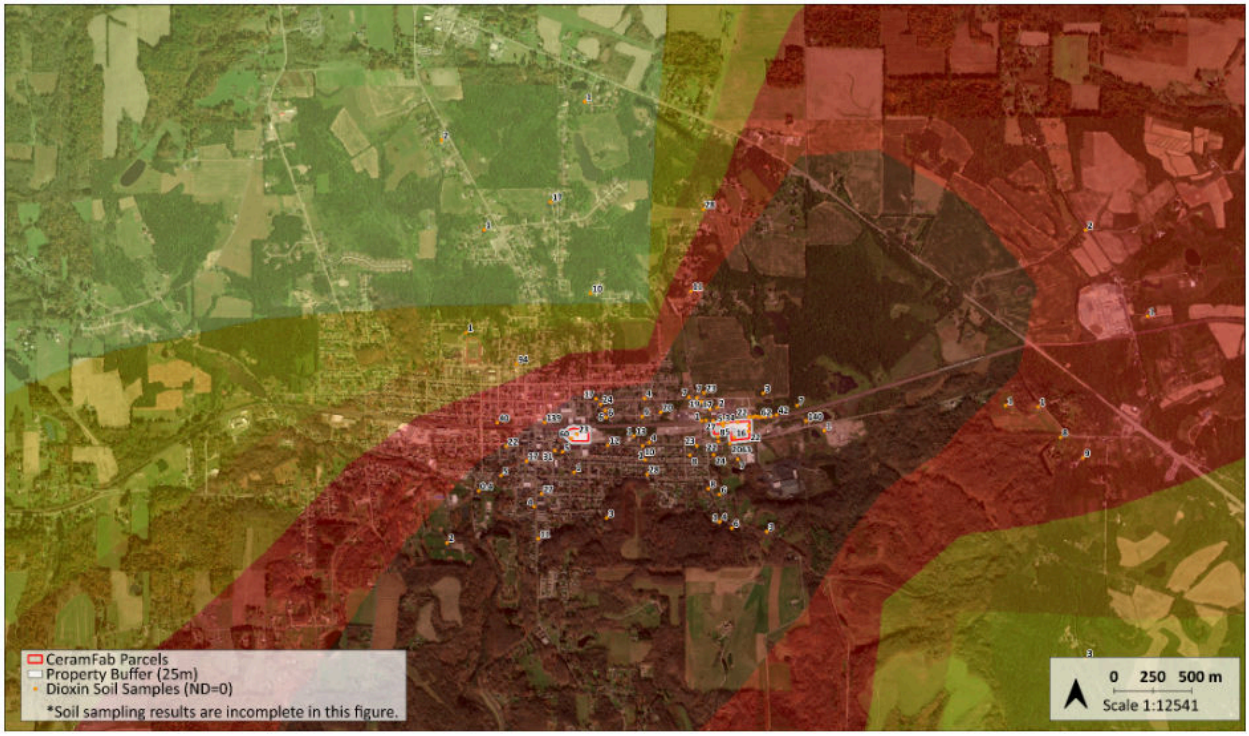


Figure ES-8: EPA Line Source Modeled With KOHEASTP9 Met Station

Table ES-9: Line Source Modeled With KOHEASTP9 Met Station

	Line Source Modeled With KOHEASTP9 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

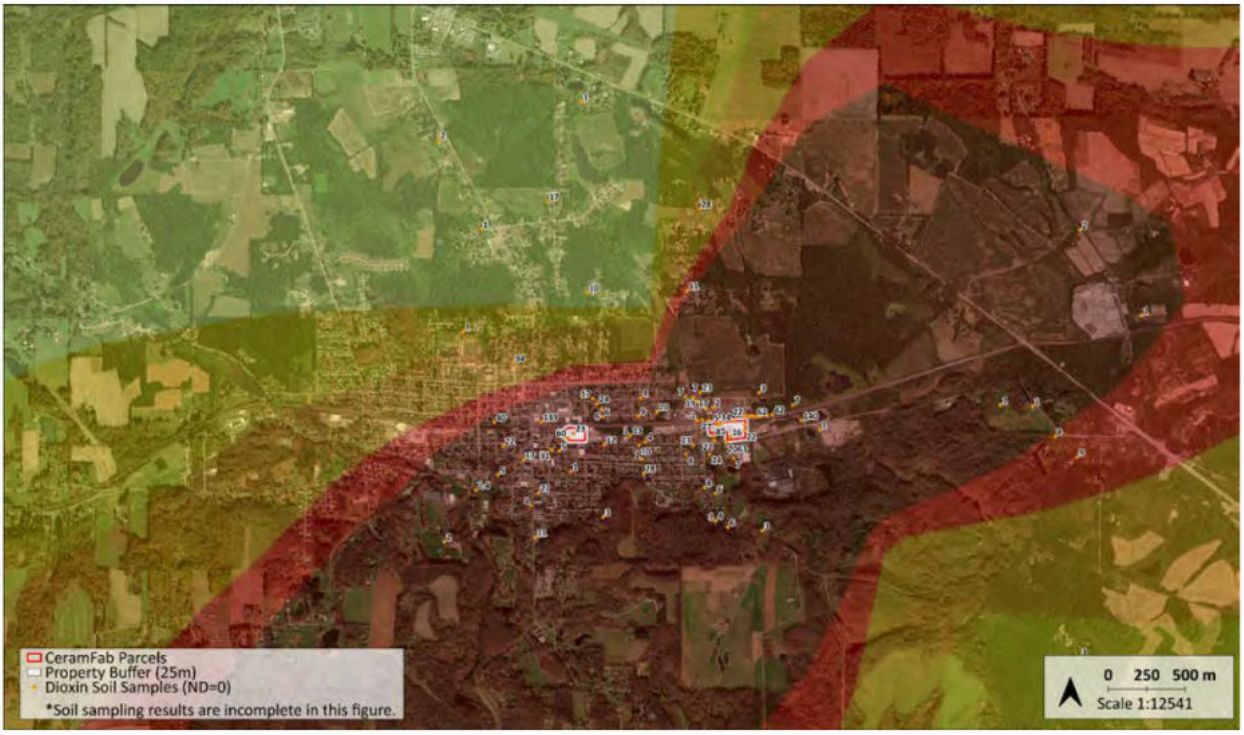


Figure ES-9: Area Source Modeled With KOHEASTP9 Met Station

Table ES-10:Area Source Modeled With KOHEASTP9 Met Station

	Area Source Modeled With KOHEASTP9 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	60	2.6	1.3	614	27.1	13.5
	>100	>4.4	>2.2	>1023	>45.1	>22.6

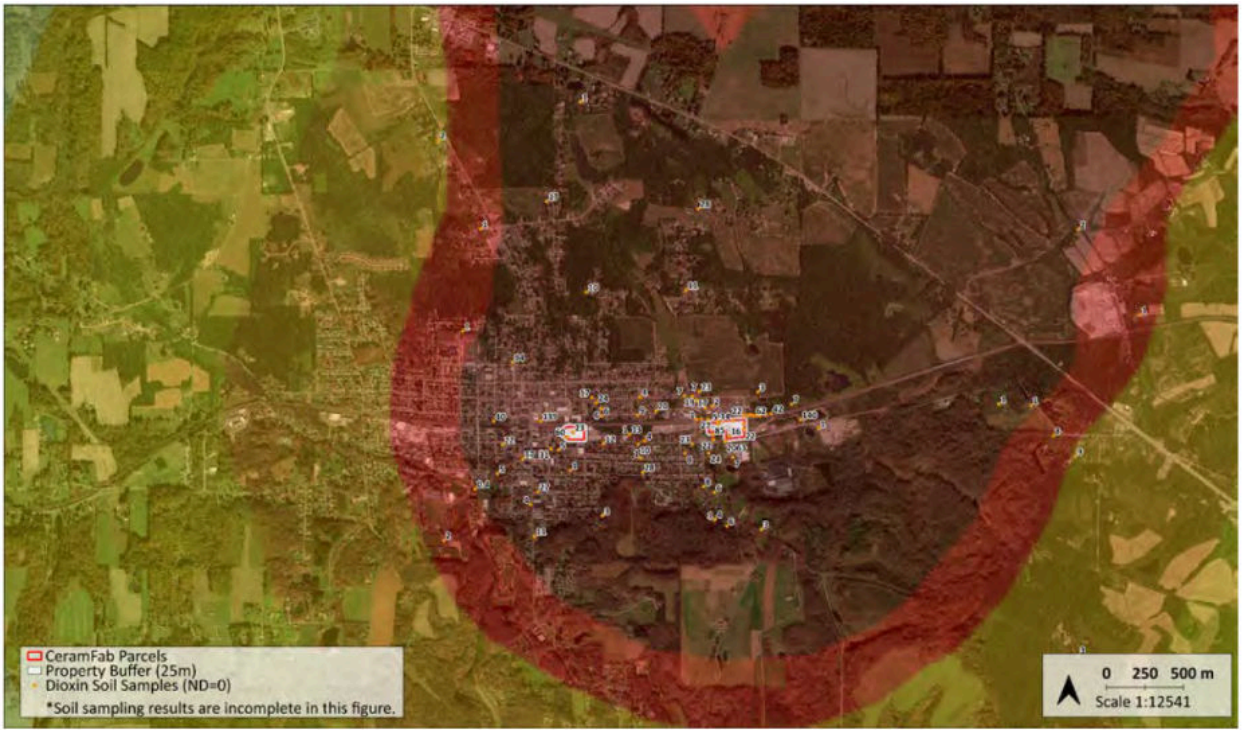


Figure ES-10: Volume Source Modeled With KOHEASTP7 Met Station

Table ES-11: Volume Source Modeled With KOHEASTP7 Met Station

	Volume Source Modeled With KOHEASTP7 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	100	4.4	2.2	1023	45.1	22.6
	>150	>6.6	>3.3	>1535	>67.7	>33.9

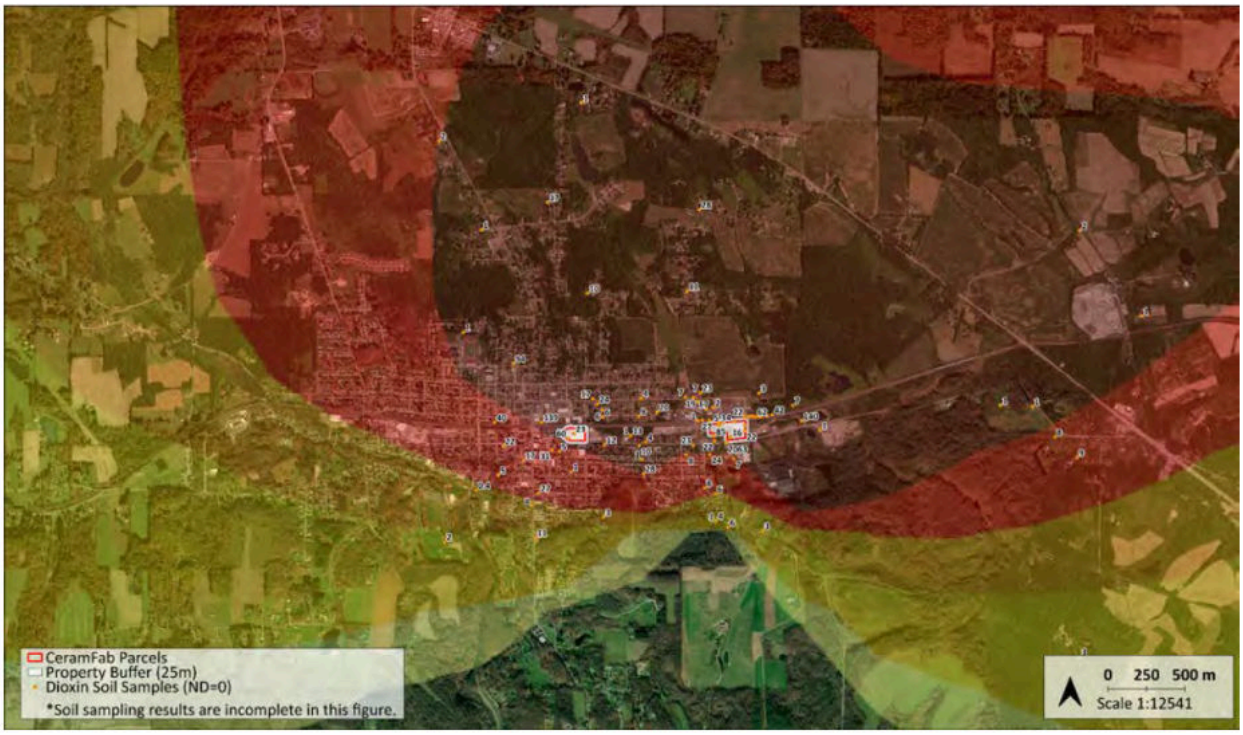


Figure ES-11: Line Source Modeled With KOHEASTP7 Met Station

Table ES-12: Line Source Modeled With KOHEASTP7 Met Station

	Line Source Modeled With KOHEASTP7 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

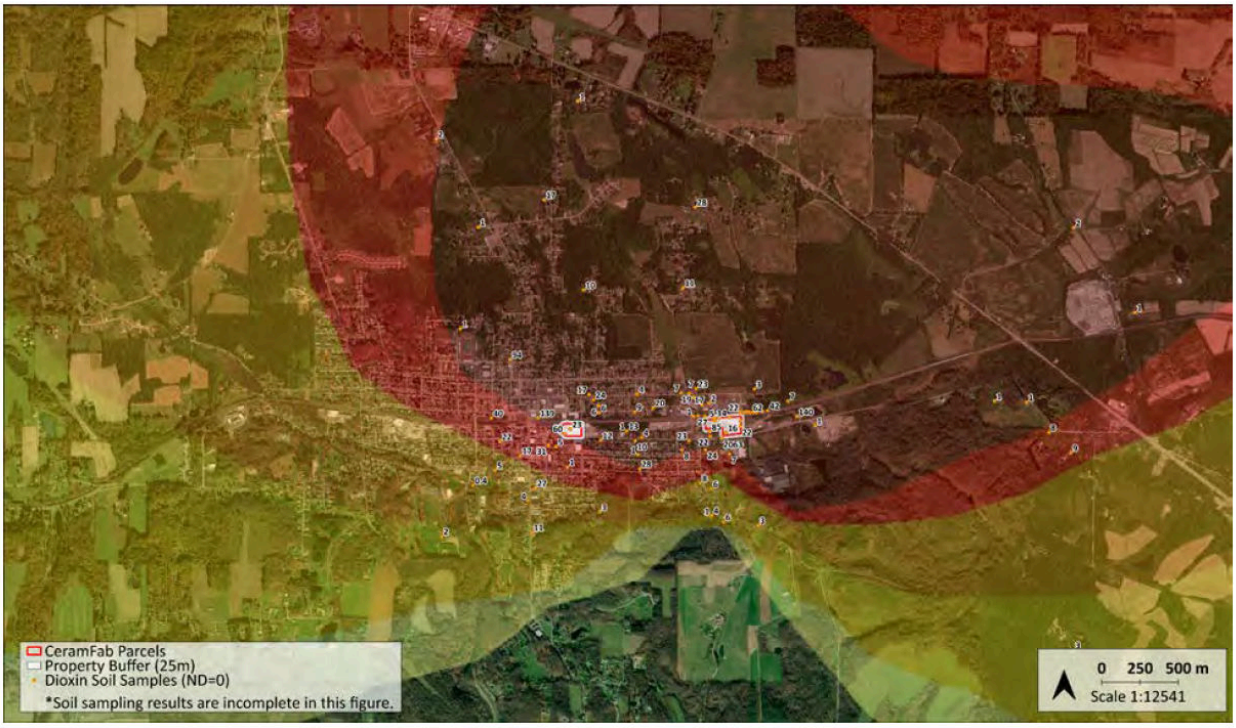


Figure ES-12: Area Source Modeled With KOHEASTP7 Met Station

Table ES-13: Area Source Modeled With KOHEASTP7 Met Station

	Area Source Modeled With KOHEASTP7 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_{eq}/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_{eq}/m²)	BAP Equivalents (ug-BaP_{eq}/m²) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

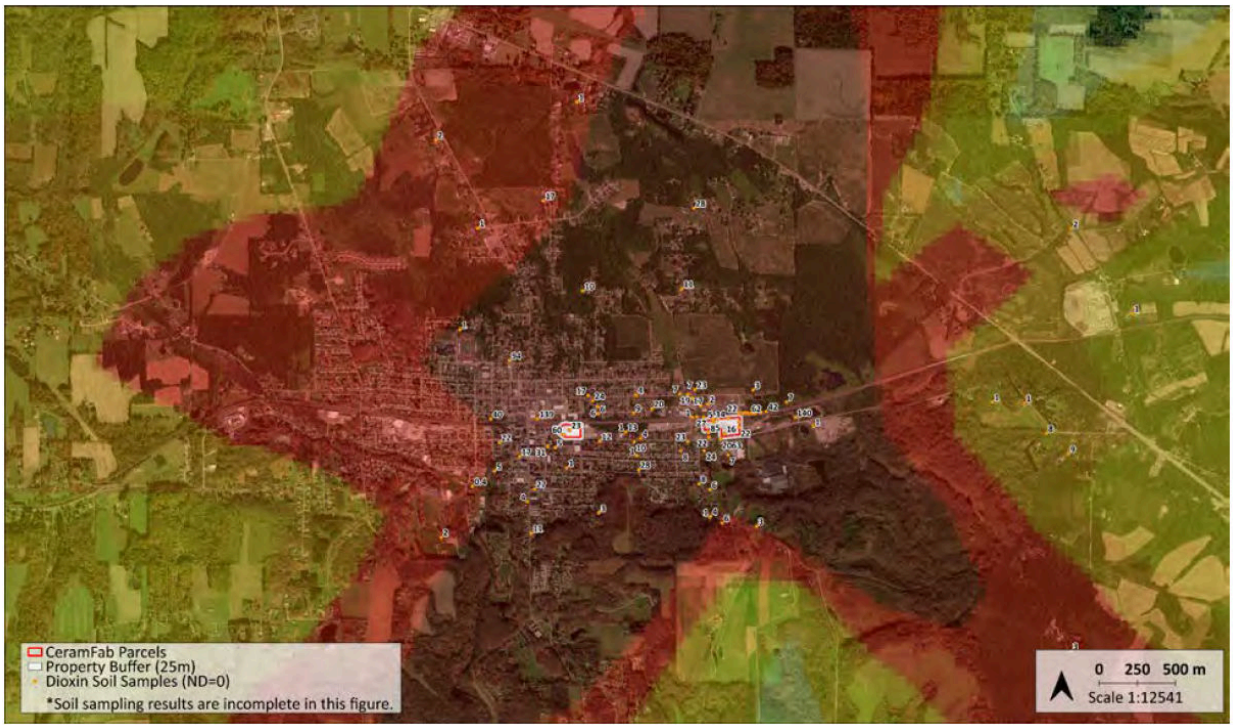


Figure ES-13: Volume Source Modeled With KPABEAVE2 Met Station

Table ES-14: Volume Source Modeled With KPABEAVE2 Met Station

	Volume Source Modeled With KPABEAVE2 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	100	4.4	2.2	1023	45.1	22.6
	>150	>6.6	>3.3	>1535	>67.7	>33.9

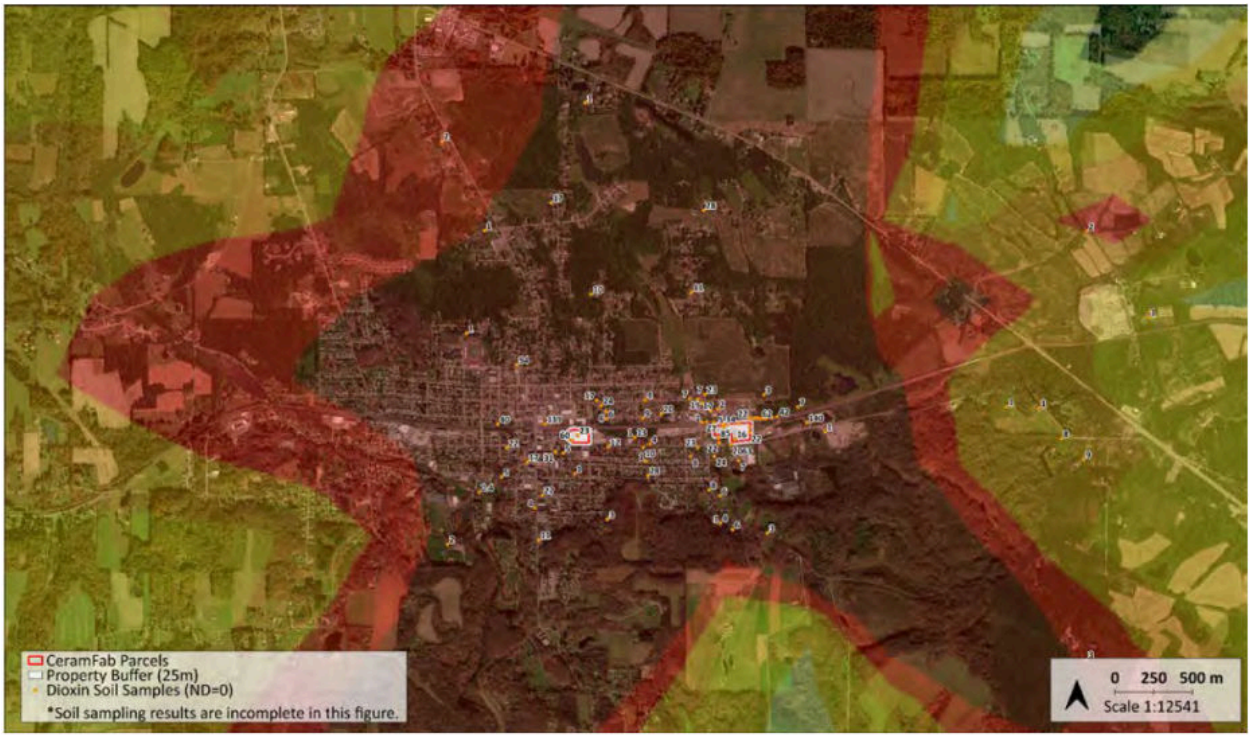


Figure ES-14: Line Source Modeled With KPABEAVE2 Met Station

Table ES-15: Line Source Modeled With KPABEAVE2 Met Station

	Line Source Modeled With KPABEAVE2 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m^2) in Top Kg of Soil	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m^2)	BAP Equivalents (ug-BaP_eq/m^2) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

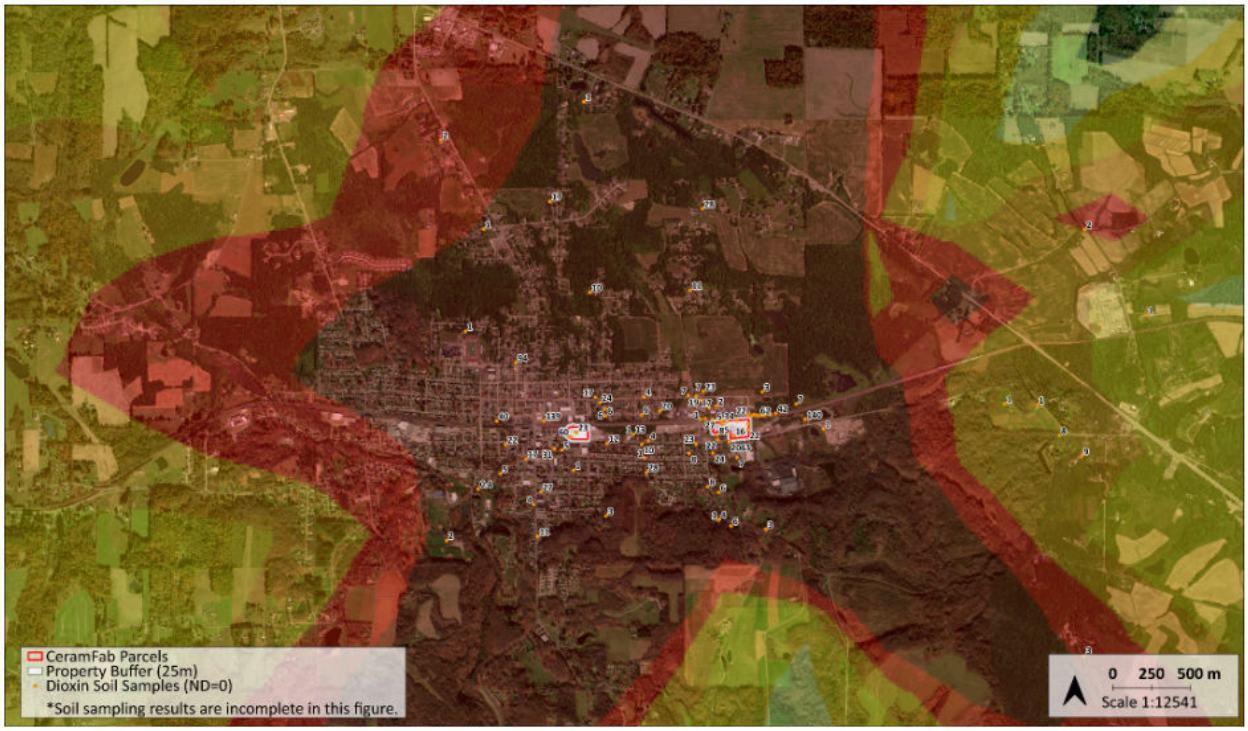


Figure ES-15: Area Source Modeled With KPABEAVE2 Met Station

Table ES-16: Area Source Modeled With KPABEAVE2 Met Station

	Area Source Modeled With KPABEAVE2 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²) in Top Kg of Soil	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>100	>4.4	>2.2	>1023	>45.1	>22.6

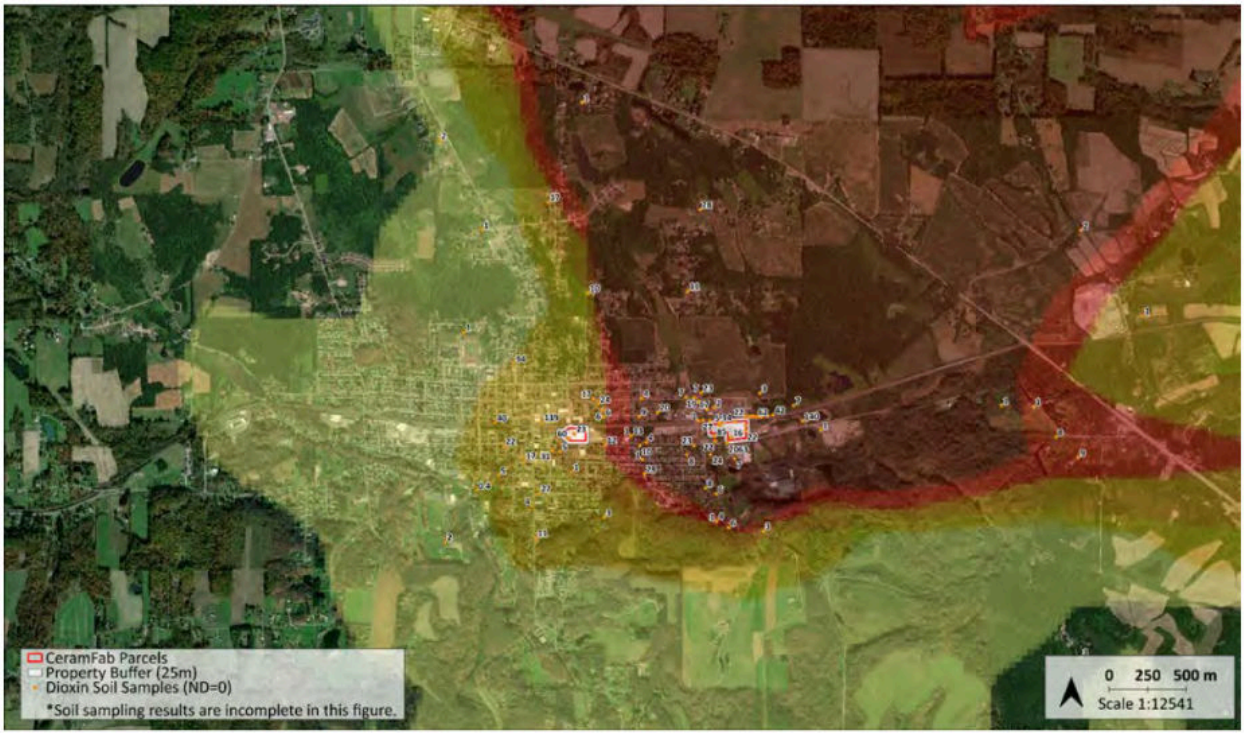


Figure ES-16: Volume Source Modeled With KPIT Met Station

Table ES-17: Volume Source Modeled With KPIT Met Station

	Volume Source Modeled With KPIT Met Station					
	Dioxin Deposition (ng-TEQ/m²)	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50.0	2.2	1.1	512	22.6	11.3
	100.0	4.4	2.2	1023	45.1	22.6
	>150.0	>6.6	>3.3	>1535	>67.7	>33.9

The analyses presented in this report further demonstrate that AERMOD, the U.S. EPA's preferred regulatory air dispersion model, is an appropriate and scientifically defensible tool for evaluating contaminant transport and deposition associated with the East Palestine combustion events. Most importantly, the AERMOD predictions correspond reasonably well with the measured dioxin and PAH concentrations observed throughout East Palestine, including at the CeramFab property, providing

real-world validation of the model's performance. While Defendants suggested alternative modeling approaches, many of those models are not designed to evaluate long-range deposition, complex source configurations, variable emissions, or community-wide soil contamination and cannot be readily calibrated to measured environmental sampling data. In contrast, AERMOD allows direct comparison between modeled deposition and measured contamination and, when evaluated using the recommendations advanced by Defendants' experts, consistently predicts contamination patterns that are similar to those observed throughout the community.

The environmental sampling data demonstrate where contamination accumulated. The atmospheric dispersion modeling predicts where contamination released during the derailment would be expected to deposit. In summary, the environmental sampling data demonstrate that the Norfolk Southern derailment, fires, PRD actuations, and vent-and-burn operation were a major and significant source of dioxin and PAH contamination throughout East Palestine, including the CeramFab and WYG properties. Collectively, Figures ES-1 through ES-16 and Tables ES-1 through ES-17 tell a consistent story. The analyses conducted in response to the recommendations and criticisms advanced by Dr. Love, Dr. Finley, and Mr. Lunsford strengthened the evaluation and improved the correspondence between the atmospheric modeling and the environmental sampling data. Perhaps most importantly, the recommendations that produced the strongest agreement between the atmospheric modeling and the environmental sampling data were the very recommendations advanced by Defendants' experts. When those recommendations were incorporated into the analysis, the relationship between the modeled deposition patterns and the measured contamination became stronger, not weaker. The close spatial agreement between the measured contamination patterns and the modeled deposition footprints, together with the similarity between the measured UCL concentrations and the modeled one-inch soil concentrations summarized in Tables ES-5 and ES-6, provides strong independent evidence that the derailment fires, PRD events, and vent-and-burn operation caused or materially contributed to the dioxin and PAH contamination measured throughout portions of the East Palestine community, including the CeramFab and WYG properties.

The environmental evidence, community-wide mapping, statistical analyses, atmospheric transport modeling, source-term evaluations, and meteorological analyses collectively demonstrate that dioxins, PAHs, soot-associated contaminants, and combustion-related particulate matter generated during the derailment-related combustion events were transported and deposited throughout East Palestine and were a dominant source and substantial contributing cause of the contamination observed throughout the community, Ceramfab and WYG.

1 INTRODUCTION

1.1 Purpose and Scope

1.1 Purpose and Scope

RoseyFields, LLC was retained by Cory Watson, P.C. to prepare this rebuttal report addressing the opinions, criticisms, methodologies, assumptions, source terms, modeling approaches, background evaluations, and alternative explanations offered by Defendants' experts Dr. Adam Love, Dr. Brent Finley, and Mr. Michael Lunsford regarding dioxin and polycyclic aromatic hydrocarbon ("PAH") contamination associated with the February 3, 2023 Norfolk Southern train derailment, subsequent fires, pressure relief device ("PRD") actuations, and vent-and-burn operation in East Palestine, Ohio (the "Incident").

The purpose of this report is to evaluate whether the opinions and conclusions offered by Defendants' experts are supported by the environmental sampling data, atmospheric transport modeling, scientific literature, and other available evidence. This report evaluates community-wide dioxin and PAH contamination throughout East Palestine, contamination identified at the CeramFab and WYG properties, background concentration assumptions, source-term estimates, atmospheric transport and deposition modeling, meteorological inputs, source geometries, and alternative explanations advanced by Defendants' experts. Where recommendations offered by Defendants' experts improved the evaluation, those recommendations were incorporated into the analyses presented herein. Where conclusions advanced by Defendants' experts were inconsistent with the environmental evidence, atmospheric modeling results, scientific literature, or other available information, those conclusions were evaluated and addressed.

This report presents community-wide environmental sampling data, property-specific analyses, statistical evaluations, contamination mapping, atmospheric transport and deposition modeling, source-term analyses, sensitivity analyses, meteorological evaluations, and comparisons between measured contamination and modeled deposition. Particular emphasis is placed on evaluating whether the contamination measured throughout East Palestine, including at the CeramFab and WYG properties, is consistent with atmospheric transport and deposition resulting from the derailment-related combustion events. The report further evaluates the appropriateness of AERMOD, the U.S. EPA's preferred regulatory air dispersion model, for assessing contaminant transport and deposition associated with the Incident and compares modeled concentrations to measured environmental concentrations to determine whether the modeling results are consistent with observed environmental conditions.

The analyses presented in this report demonstrate that the recommendations advanced by Defendants' experts can be evaluated using measured environmental data and atmospheric transport modeling and that the resulting analyses consistently support the conclusion that the Norfolk Southern derailment, subsequent fires, PRD actuations, and vent-and-burn operation were a major and significant source of dioxin and PAH contamination throughout East Palestine, including the CeramFab and WYG properties.

1.2 Qualifications

My name is Paul Rosenfeld, Ph.D. I am the founder and principal of the environmental consulting firm Roseyfields LLC, located at 2656 29th Street, Suite 201, in Santa Monica, California, 90405. I have practiced as an environmental risk and exposure assessor for over 25 years and have specific knowledge and experience that qualifies me to provide expert opinions in this matter as it relates to health risk and property damage resulting from emissions of lead, arsenic, and dioxin from a secondary lead smelter. I am being compensated at a rate of $325/hour for report preparation, $6000 per day of deposition over 4 hours, and $6500 for trial testimony.

I received a B.A. in Environmental Studies from the University of California, Santa Barbara in 1991, an M.S. in Environmental Science from the University of California, Berkeley in 1995, and a Ph.D. in Soil Chemistry from the University of Washington in 1999. In addition to my education, I have extensive experience in evaluating the fate and transport of environmental contaminants, risk and exposure assessment of contaminants released from pollution sources, monitoring and modeling of pollution sources that may cause impacts on human health and ecological systems, and evaluation of odorous chemicals. I served as co-founder and principal environmental scientist at SWAPE from 2003 to August 2025. I am presently a principal environmental scientist and risk assessor at Roseyfields, which I founded in September 2025.

I have conducted air modeling since I received my Ph.D. at the University of Washington. Since that time, I have used air dispersion models for a wide variety of projects, including emissions from landfills, military facilities, industrial facilities, refineries, and numerous other sources of air pollutants. My experience includes modeling emissions from manufacturing processes, chemical spills, combustion, and fugitive emissions sources.

My air dispersion modeling expertise is supported by peer-reviewed publications applying AERMOD to community exposure assessment, including Chen et al. (2012)[3], as well as multiple studies integrating airborne emissions, deposition, and exposure reconstruction for diesel exhaust, refinery fires, and

[3] Chen JA, Zapata AR, Sutherland AJ, Molmen DR, Chow BS, Wu LE, Rosenfeld PE, Hesse RC. Sulfur dioxide and volatile organic compound exposure to a community in Texas City, Texas evaluated using AERMOD and empirical data. *Am J Environ Sci.* 2012;8(6):622-632.

dioxin-contaminated dust, collectively demonstrating scientifically accepted methods for modeling pollutant transport, fate, and human exposure.[4] [5]

I obtained much of my experience in evaluating contaminated sites while working for the United States Navy, where I served as a Remedial Project Manager for the Navy Base Realignment and Closure ("BRAC") Team, South West Division on Treasure Island, California. While working for BRAC, my responsibilities included the management and oversight of many environmentally contaminated sites. These projects involved lead paint from buildings and from the Bay Bridge, which impacted the Bay sediment, surface soils, Treasure Islands, and local bird species such as swallows and peregrine falcons. This experience encompassed a considerable amount of work on-site investigations, air monitoring, and remedial actions.

I have prepared air models for multiple fire scenarios including the Chevron Richmond fire that resulted in 15,000 hospital emissions, and for a flaring incident at the BP Texas City Refinery using Aermod publishing three peer reviewed papers on the two subjects. I have modeled dioxin and PAH emissions from wood treatment facilities all over the country and published 4 papers on the subject.

I have previously taught courses on the subject of environmental health at the University of California, Los Angeles ("UCLA"), presented at professional environmental conferences on various subjects involving environmental contamination and remediation, and have published scientific studies of contaminant fate and transport of odorous chemicals. I have also co-authored several books concerning environmental contamination and best practices in the chemical industry. These publications include The Risks of Hazardous Waste (2011), Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Agrochemical Industry (2011), Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Wood and Paper Industries (2010), and Handbook of Pollution Prevention and Cleaner Production, Best Practices in The Petroleum Industry (2009).

I use my education, experience, knowledge, and expertise to conduct investigations and prepare exposure and risk assessments. I have performed numerous investigations, monitoring projects, and assessments for governmental and private entities concerning risks to human health and the environment due to contamination from diesel particulate matter, formaldehyde, odorous chemicals, pesticides, polychlorinated biphenyls, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, dioxins/furans, volatile organic compounds ("VOCs"), perchlorate, heavy metals, perfluorochemicals, asbestos, mold, bacteria, and other contaminants. I have conducted numerous exposure assessments and risk assessments over a period of more than twenty years specifically relating to air contaminants

[4] Remy LL, Clay T, Byers V, Rosenfeld PE. Hospital, health, and community burden after oil refinery fires, Richmond, California 2007 and 2012. *Environ Health.* 2019;18:48.

[5] Simons RA, Seo Y, Rosenfeld PE. Modeling the effect of refinery emissions on residential property value. *J Real Estate Res.* 2015;37(3):321-342.

and have testified at deposition and/or at trial as an expert witness on numerous cases involving environmental contamination, exposure, and human health risk. My Curriculum Vitae, including my expert witness testimony experience, is provided in Exhibit A.

1.3 Documents Reviewed and Limitations

This Expert Report is based on reasonably available documents and information obtained from multiple reliable sources. The principal sources of information relied upon in preparing this Report include:

- The retaining client and associated counsel ("Client");
- National Transportation Safety Board ("NTSB") investigative reports, factual materials, hearing transcripts, and supporting documentation;
- United States Environmental Protection Agency ("U.S. EPA") materials, including Region 5 memoranda, soil sampling results, dioxin investigation data, response action documents, removal action summaries, and background evaluation materials;
- Data, reports, and technical materials generated by Norfolk Southern and its consultants, including Arcadis, Eurofins Lancaster Laboratories, and other contractors and consultants retained by Defendants;
- Expert reports, rebuttal reports, deposition testimony, exhibits, modeling analyses, and supporting materials prepared by Defendants' experts, including Dr. Love, Dr. Finley, and Mr. Lunsford;
- Independent and plaintiff expert investigations, including soil, sediment, dust, soot, and environmental sampling conducted between 2023 and 2026, including investigations associated with the CeramFab and WYG/Strohecker properties;
- Agency for Toxic Substances and Disease Registry ("ATSDR") guidance documents, toxicological profiles, and public health resources;
- Peer-reviewed scientific literature addressing combustion byproducts, dioxin and PAH formation, soot and particulate deposition, environmentally persistent free radicals ("EPFRs"), atmospheric transport, environmental fate and transport, and combustion-related contaminant persistence;
- Site-specific analytical datasets, laboratory reports, environmental testing results, GIS mapping analyses, and spatial evaluations for properties in the vicinity of the derailment, including the CeramFab and WYG/Strohecker properties;
- Publicly available regulatory guidance, technical documents, environmental databases, meteorological data, and scientific materials from governmental, academic, and scientific organizations; and
- Additional documents, data, testimony, photographs, videos, and information obtained through discovery, public records, and other publicly available sources.
- As additional information becomes available I reserve the right to amend and update this report.

2. Soil Contamination Analysis and Mapping

This section addresses the opinions, criticisms, and alternative explanations offered by Defendants' experts Dr. Love, Dr. Finley, and Mr. Lunsford regarding the interpretation of environmental sampling data, the significance of measured dioxin and PAH concentrations, purported regional "background" contamination, and the relationship between measured contamination and derailment-related atmospheric deposition. Specifically, Defendants' experts contend that measured dioxin and PAH concentrations reflect historical or anthropogenic background conditions unrelated to the derailment, that the environmental sampling data do not support meaningful derailment-related impacts to the CeramFab and WYG properties, and that air dispersion modeling is less reliable than the available environmental sampling data. Defendant's experts' criticisms are without merit, are in many instances based on unsupported speculation, and often fail on their face when examined with any scientific rigor.

In response to these criticisms, extensive GIS-based spatial mapping, comparative concentration analyses, background evaluations, and environmental data reviews were completed utilizing soil, sediment, soot, dust, and related environmental datasets collected by EPA, Norfolk Southern and its consultants, independent investigators, and Plaintiffs' experts. These evaluations demonstrate consistent spatial relationships between the derailment corridor, combustion-related deposition patterns, elevated dioxin and PAH concentrations, soot-associated contamination, and the Plaintiff properties. Importantly, the mapped contamination patterns are also consistent with the results of the supplemental AERMOD sensitivity analyses utilizing point, area, volume, and line source representations, further supporting the conclusion that derailment-related combustion emissions materially contributed to the widespread deposition of dioxins, PAHs, soot-associated contaminants, and combustion-related particulate matter throughout portions of the East Palestine community.

The following maps and tables present the dioxin TEQ's and BaPeqs found present on the CeramFab and WYG properties. Since the first report, finalized lab results for additional sampling conducted by Scott Smith for dataset #4 have been available. The maps and tables below include the most up to date finalized sampling data. If any additional data is supplied we reserve the right to amend our sampling data analysis.

Figure 2-1. Dioxin Sampling at CeramFab Facility Located at 900 E. Taggart St.

Table 2-1: Dioxin Sampling Results at CeramFab Facility Located at 900 E. Taggart St. (on left) and on Ceramfab Facility with 25 Meter Buffer (right)

Dioxin Soil and Sediment Samples within the CeramFab Facility		
Sample ID	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)
EP02-SO-2	5.47	5.76
EP02-SO-5	15.86	15.87
EP02-SO-6	12.92	12.92
EP02-SSS-3	22.31	22.31
410-271419-1	15.939	15.939
Average	**14.5**	**14.6**
Max	**22.3**	**22.3**
95% UCL	**20.3**	**20.3**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**4.2**	**4.2**
UCL Divided By Occupational RSL	**0.9**	**0.9**

Dioxin Soil and Sediment Samples within the CeramFab Facility and 25ft Meter Buffer		
Sample ID	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)
EP02-SO-1	3.7	111.4
EP02-SO-2	5.5	5.8
EP02-SO-3	4.8	4.8
EP02-SO-4	3.3	3.5
EP02-SO-5	15.9	15.9
EP02-SO-6	12.9	12.9
EP02-SSS-3	22.3	22.3
EP03-SO	16.7	16.7
410-126924-3	1,826.3	1,826.3
410-137121-3	438.0	438.0
410-175954-1	1,197.5	1,197.5
410-237292-1	2,062.6	2,327.1
S-72-4	27.4	27.4
410-130775-1	24.0	24.1
410-162165-2	8.0	10.5
410-271419-1	15.9	15.9
Average	**355.3**	**378.8**
Max	**2,062.6**	**2,327.1**
95% UCL	**658.9**	**700.8**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**137.3**	**146.0**
UCL Divided By Occupational RSL	**30.5**	**32.4**

Figure 2-2. PAH Sampling at CeramFab Facility Located at 900 E. Taggart St.

Table 2-2. PAH Sampling Results at CeramFab Facility Located at 900 E. Taggart St. (on left) and on Ceramfab Facility with 25 Meter Buffer (right)

PAH Soil and Sediment Samples within the CeramFab Facility		
Sample ID	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
EP02-SO-2	61.36	873.86
EP02-SO-5	111	878
EP02-SO-6	513.02	4296.02
EP02-SSS-3	278.84	3522.34
410-271419-1	1053.2	1053.2
Average	**403.5**	**2,124.7**
Max	**1,053.2**	**4,296.0**
95% UCL	**788.5**	**3,701**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**7.2**	**33.6**
UCL Divided By Occupational RSL	**0.4**	**1.8**

PAH Soil and Sediment Samples within the CeramFab Facility and 25ft Meter Buffer		
Sample ID	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
EP02-SO-1	591.13	4816.13
EP02-SO-2	61.36	873.86
EP02-SO-3	174.24	1168.74
EP02-SO-4	276.63	4397.63
EP02-SO-5	111	878
EP02-SO-6	513.02	4296.02
EP02-SSS-3	278.84	3522.34
EP03-SO	80.243	1250.243
410-126924-3	825.7	1065.7
410-126924-3	15698	15698
410-126924-3	961.8	961.8
410-137121-3	828.4	828.4
410-175954-1	739.8	739.8
410-237292-1	440.9	440.9
410-271419-1	1053.2	1053.2
410-130775-1	200.80	305.20
410-162165-2	298.30	298.30
Average	**1,360.8**	**2,505.5**
Max	**15,698.0**	**15,698.0**
95% UCL	**2,576**	**4,984**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**23.4**	**45.3**
UCL Divided By Occupational RSL	**1.2**	**2.4**

Figure 2-3. Dioxin Sampling at WYG Refractories Located at 193 N. James St.

Table 2-3: Dioxin Sampling Results at WYG Refractories at 193 N. James St.

Dioxin Samples within the WYG Facility		
Sample ID	**RESULT ng-TEQ/kg (ND = 0)**	**RESULT ng-TEQ/kg (ND = ½ MDL)**
EP08-SO	22.79	23.26
EP80-SO*	21.53	21.7
410-271421-1	59.954	59.954
Average	**34.8**	**35.0**
Max	**60.0**	**60.0**
95% UCL	**71.6**	**71.5**
Residential Soil RSL	**4.8**	**4.8**
Occupational Soil RSL	**21.6**	**21.6**
UCL Divided By Residential RSL	**14.9**	**14.9**
UCL Divided By Occupational RSL	**3.3**	**3.3**

*Mislabeled as EP80-SO in the GEL dataset. This is noted in Table 2, "TENTATIVELY IDENTIFIED COMPOUND (TIC) RESULTS TS -- Reconnaissance Sampling and Analysis; Vicinity of the Norfolk Southern Derailment Site, East Palestine, Ohio" as a EP08 duplicate.[6]

[6] GEL Testing for CeramFab and WYG Buildings. August 7, 2023.

Figure 2-4. PAH Sampling at WYG Refractories Located at 193 N. James St.

Table 2-4: BaP-eq Sampling Results at WYG Refractories - 193 N. James St.

PAH Samples within the WYG Facility		
Sample ID	**RESULT ug-BaP$_{eq}$/kg (ND = 0)**	**RESULT ug-BaP$_{eq}$/kg (ND = ½ MDL)**
EP08-SO	986.6	9371.6
EP80-SO*	671.92	9056.92
410-271421-1	1779	1779
Average	**1,145.8**	**6,735.8**
Max	**1,779.0**	**9,371.6**
95% UCL	**2,108**	**13,978**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**19.2**	**127.1**
UCL Divided By Occupational RSL	**1.0**	**6.6**

*Mislabeled as EP80-SO in the GEL dataset. This is noted in Table 2, "TENTATIVELY IDENTIFIED COMPOUND (TIC) RESULTS TS -- Reconnaissance Sampling and Analysis; Vicinity of the Norfolk Southern Derailment Site, East Palestine, Ohio" as a EP08 duplicate.[7]

2.1 Analysis Of Background Soil Contamination

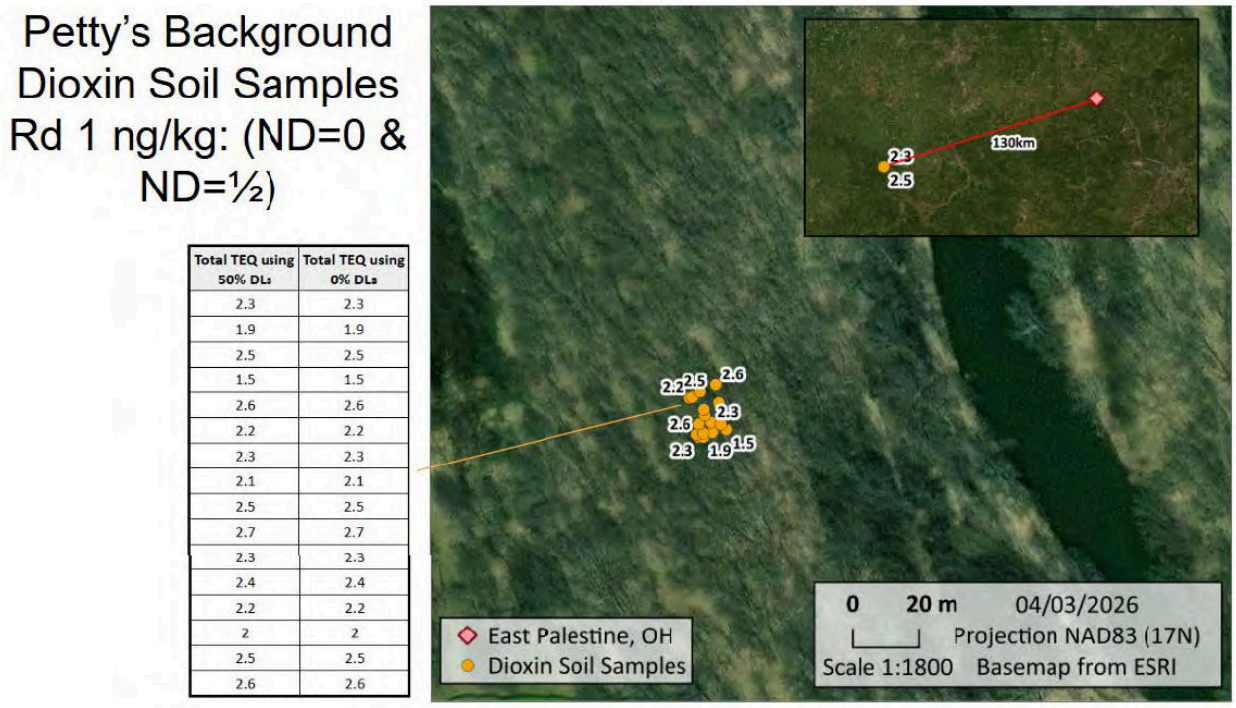
Dr. Love relies on the EPA and Arcadis Phase I Soil Investigation to argue that "no discernable impacts from Derailment fires had occurred via deposition of airborne soot, ash, and byproducts of combustion," and that all measured SVOC and dioxin/furan concentrations were within anthropogenic background ranges or otherwise unrelated to the derailment. I disagree because those conclusions depend on the unsupported and flawed assumption that the designated "background" soils surrounding East Palestine were themselves unaffected by derailment-related airborne deposition.

Further, I did not ignore the EPA and Arcadis soil data; rather, I conclude that the sampling design is fundamentally flawed because the uncontrolled fires and vent-and-burn created a large, dynamic smoke plume capable of dispersing fine particulate combustion byproducts in multiple directions over a broad area. EPA, and NS, selected "background" sampling locations based on the assumption that the plume traveled predominantly southeast toward the evacuation zone.[8] However, available meteorological data demonstrate shifting and conflicting wind directions during the incident, undermining the speculative assumption that nearby "background" areas remained unaffected by plume transport and deposition.

The EPA "background" soil samples yielded an average concentration of approximately 6.7 pg TEQ/g soil,[9] while sixteen background samples collected independently by Stephen Petty averaged approximately 2.3 ng TEQ/kg (Figure 2-5). The elevated concentrations measured in EPA-designated background locations are consistent with the possibility that these areas themselves experienced derailment-related deposition, thereby masking the true magnitude of contamination gradients attributable to the incident.

[7] GEL Testing for CeramFab and WYG Buildings. August 7, 2023.
[8] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.
[9] United States Environmental Protection Agency. *Summary of Phase 1 dioxin results for the East Palestine derailment incident*. US EPA; September 14, 2023. PDF Pg. 5.

Figure 2-5: Petty's Background Dioxin Soil Samples



Total TEQ using 50% DLs	Total TEQ using 0% DLs
2.3	2.3
1.9	1.9
2.5	2.5
1.5	1.5
2.6	2.6
2.2	2.2
2.3	2.3
2.1	2.1
2.5	2.5
2.7	2.7
2.3	2.3
2.4	2.4
2.2	2.2
2	2
2.5	2.5
2.6	2.6

Based on Tables 2-5 and 2-6, the environmental sampling data demonstrate that dioxin and benzo(a)pyrene-equivalent (BaP_eq) contamination is not confined to isolated locations, but is present throughout substantial portions of the East Palestine community at concentrations that exceed health-based screening levels and expected background concentrations. The statistical summaries, including average concentrations, maximum detected concentrations, and 95% upper confidence limits (UCLs), show that community-wide dioxin and PAH contamination remains elevated even when conservative assumptions are applied. The 95% UCLs exceed residential screening criteria and, in several instances, approach or exceed occupational screening levels, indicating that the elevated concentrations are not the result of isolated outliers but instead reflect a broader pattern of contamination across the community. These findings are consistent with widespread deposition of combustion-related contaminants following the Norfolk Southern derailment, fires, pressure relief device actuations, and vent-and-burn operation. The geographic extent, magnitude, and statistical persistence of the contamination demonstrate that the observed dioxin and PAH concentrations cannot reasonably be explained solely by normal regional background conditions and instead support the conclusion that the derailment-related combustion events materially contributed to contamination throughout East Palestine.

Table 2-5: Summary of Dioxin Soil and Sediment Sampling

Dioxin Soil Sampling Results (ng-TEQ/kg): ND= 0*												
	CeramFab	CF Within 25m Result	WYG	East Palestine General Area	#1 Petty	#2 Petty	#3 GEL	#4 Smith Soil + Sediment	EPA	Norfolk Southern (all)	EPA 2023 Background	Petty Background
Sampling Period	2/27/26 to 3/19/26	2/27/26 to 3/19/26	2/28/23 to 3/19/26	3/21/23 to 3/19/26	07/2023 to 12/2023	02/2023 to 04/2023	02/2023 to 03/2023	02/2023 to 03/2026	01/2024 to 05/2024	03/2023 to 04/2023	-	-
Sample Size (n)	5	16	3	105	98	36	18	74	4	262	25	16
Average	14	355	35	74	8	38	20	83	10	17	6.7	2.3
Max	22	2,063	60	2,063	46	378	94	2,063	15	670	-	2.7
95% UCL	20	659	72	121	10	61	30	79	15	23	-	2.4
Residential Soil RSL (ng-TEQ/kg)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Occupational Soil RSL	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6
% of Samples > Residential RSL	100%	88%	100%	69%	49%	86%	89%	47.3%	100%	46%	-	0%
UCL Divided by Residential RSL	**4.2**	**137.3**	**14.9**	**25.3**	**2.1**	**12.7**	**6.2**	**16.4**	**3.1**	**4.9**	-	0.50
UCL Divided by Occupational RSL	**0.9**	**30.5**	**3.3**	**5.6**	**0.5**	**2.8**	**1.4**	**3.6**	**0.7**	**1.1**	-	**0.1**

*EPA data is ND=MRL., Norfolk Southern is ND=0.5*LOD

Table 2-6: Summary of Benzo(a)pyrene Soil and Sediment Sampling

PAH Soil Sampling Results (ND=0) (µg/kg)								
	CeramFab	CF Within 25m Result	WYG	East Palestine General Area	#1 Petty	#2 Petty	#3 GEL	#4 Smith Soil + Sediment
Sampling Period	2/27/26 to 3/19/26	2/27/26 to 3/19/26	2/28/23 to 3/19/26	3/21/23 to 3/19/26	07/2023 to 12/2023	02/2023 to 04/2023	02/202 to 03/2023	03/2023 to 03/2026
Sample Size (n)	5	17	3	90	98	23	18	72
Average	403	1361	1146	1445	1154	1032	1337	1361
Max	1053	15698	1779	29,170	12307	5293	18463	29170
UCL	789	2576	2108	2,142	1537	1653	3093	2150
Residential Soil RSL (µg=TEF/kg)	110	110	110	110	110	110	110	110
Occupational Soil RSL (µg=TEF/kg)	2110	2110	2110	2110	2110	2110	2110	2110
% of Samples > Residential RSL	**80%**	**88%**	**100%**	**75.56%**	**69.39%**	**65.22%**	**66.67%**	**70.83%**
95 %UCL/ Residential RSL	**7.2**	**23.4**	**19**	**19**	**14**	**15**	**28**	**20**
95 %UCL/ Occupational RSL	**0.4**	**1.2**	**1.0**	**1.0**	**0.7**	**0.8**	**1.5**	**1.0**

PAHs are released into the environment from both natural and anthropogenic sources.[10] Natural sources include forest fires and volcanoes, while anthropogenic sources include burning wood in homes and emissions from cars and trucks.[11]

The highest concentrations of total PAHs in typical rural, agricultural, and urban soils are 1.7 ppm, 2.4 ppm, and 582 ppm, respectively.[12] Benzo(a)pryene is one of the most toxic and well-studied PAHs and is commonly used as an indicator compound for assessing the carcinogenic potential of PAH mixtures due to its strong association with cancer risk. Background levels for Benzo(a)pyrene are typically 0.002 to 1.3 mg/kg in rural soils, 0.005 to 0.90 mg/kg in agricultural soils and 0.165 - 0.220 mg/ kg in urban soils.[13]

In addition, a study from the Massachusetts Department of Environmental Protection established a generic background BaP levels at 2 mg/kg for 'natural' soils.[14] Another study of urban soils in the northeastern US reported an upper 95% confidence interval of approximately 25 mg/kg for total PAHs, with mean concentrations around 18 mg/kg. [15] It also established an interval of 3.3 mg/kg for total BaP toxic equivalents.[16] Another study by the Ohio Department of Health conducted specific background evaluations including soil samples from public rights-of-way in rural areas, and exhibited a BaP equivalent concentration of 1.49 mg/kg.[17]

Background levels of PAHs and Benzo(a)pyrene determined in a literature review are shown in **Table 2-7**. Petty conducted background sampling for PAHs which are shown in **Figure 2-6**. The collected background samples reveal BAPeqs significantly lower than sampling results seen in the impacted area.

[10] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services, Public Health Service; August 1995. PDF Pg. 247.
[11] Ibid.
[12] Ohio Department of Health, Health Assessment Section, under cooperative agreement with the Agency for Toxic Substances and Disease Registry. *Health Consultation: Baker Wood Creosoting, Marion, Marion County, Ohio.* Public Health Service, Agency for Toxic Substances and Disease Registry. September 28, 2000. PDF Pg. 6.
[13] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services, Public Health Service; August 1995. PDF Pg.280.
[14] Massachusetts Department of Environmental Protection. *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil*. Boston, MA: Office of Research & Standards; May 2002. PDF Pg. 5.
[15] Bradley, L. J. N., Magee, B. H., & Allen, S. L. (1994). Background levels of polycyclic aromatic hydrocarbons (PAH) and selected metals in New England urban soils. Journal of Soil Contamination, 3(4), 349–361. PDF Pg.6.
[16] Bradley, L. J. N., Magee, B. H., & Allen, S. L. (1994). Background levels of polycyclic aromatic hydrocarbons (PAH) and selected metals in New England urban soils. Journal of Soil Contamination, 3(4), 349–361. PDF Pg.11.
[17] Health Assessment Section, Ohio Department of Health. *Health Consultation: Evaluation of Ohio EPA Soil Sampling in Support of the Clyde and Eastern Sandusky County Childhood Cancer Investigation*. Columbus, OH: Ohio Department of Health; July 28, 2011. PDF Pg.30.

Table 2-7: Summary of Benzo(a)pyrene Soil and Sediment Sampling from Literature Review

Source	Location	Land Use Type	PAH(s) Measured	Concentration (mg/kg)
Ohio Department of Health 2000	United States (general background)	Rural	Total PAHs	1.7
Ohio Department of Health 2000	United States (general background)	Agriculture	Total PAHs	2.4
Ohio Department of Health 2000	United States (general background)	Urban	Total PAHs	582
ATSDR 1995	United States (general background)	Rural	Benzo(a)pyrene	0.002 - 1.3
ATSDR 1995	United States (general background)	Agriculture	Benzo(a)pyrene	0.005 - 0.90
ATSDR 1995	United States (general background)	Urban	Benzo(a)pyrene	0.165 - 0.220
Massachusetts DEP 2002	Massachusetts	Rural	Benzo(a)pyrene	2
Bradley et al. 1994	New England (Regional)	Urban	Benzo(a)pyrene	3
Bradley et al. 1994	New England (Regional)	Urban	Total PAHs	25
Ohio Department of Health 2011	Sandusky County, Ohio	Rural	Benzo(a)pyrene	1.49

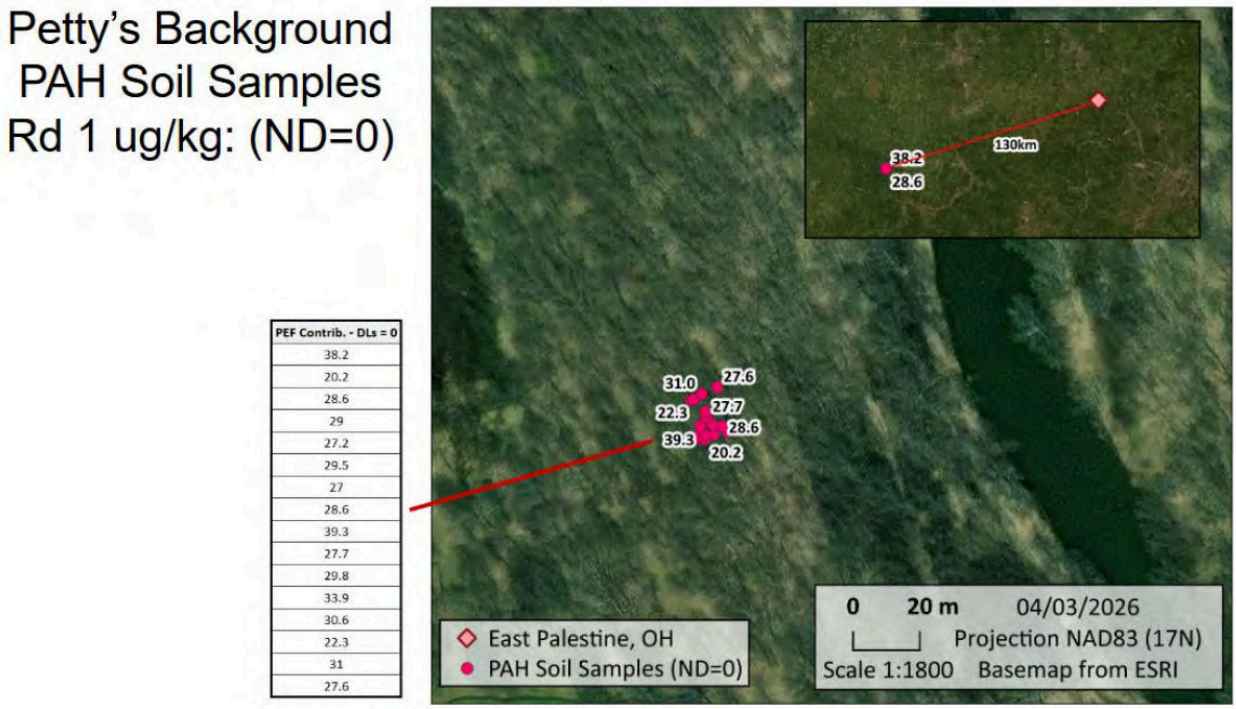


Figure 2-6. Petty's Background PAH Samples

Table 2-8 is one of the most important tables in this report because it summarizes dioxin and benzo(a)pyrene-equivalent ("BaP_{eq}") contamination measured throughout the East Palestine community. Unlike property-specific tables that evaluate individual locations, this table evaluates contamination across the broader community using 105 dioxin samples and 90 BaP-equivalent samples. As such, it provides a direct assessment of the overall environmental impact of the Norfolk Southern derailment, fires, pressure relief device actuations, and vent-and-burn operation on East Palestine residents.

The most important statistic in the table is the **95% Upper Confidence Limit (UCL)**. The UCL is not influenced by a single high sample and instead represents a statistically reliable estimate of

community-wide contamination levels. The dioxin UCLs of 121.3 and 136 ng-TEQ/kg exceed the residential screening level by factors of 25.3 and 28.3, respectively, and exceed the occupational screening level by factors of 5.6 and 6.3. Similarly, the BaP-equivalent UCLs of 2,142 and 3,245 µg-BaP_eq/kg exceed the residential screening level by factors of 19.5 and 29.5 and equal or exceed the occupational screening level.

These exceedances are highly significant because they demonstrate that elevated contamination is not limited to a few isolated "hot spots." Rather, the contamination is sufficiently widespread throughout East Palestine that the statistically derived community-wide concentrations remain substantially above health-based screening criteria. If the elevated concentrations were caused by only a handful of isolated samples, the UCL values would be much lower. Instead, the elevated UCLs demonstrate that contamination is broadly distributed across the community.

The maximum concentrations further demonstrate the magnitude of the impact, with dioxin concentrations reaching more than 2,000 ng-TEQ/kg and BaP-equivalent concentrations exceeding 29,000 µg/kg. However, the importance of this table is not the individual maximum values; it is the fact that the community-wide averages and UCLs remain elevated even when considering all samples collectively.

Accordingly, **Table 2-8** provides strong evidence that the derailment-related combustion events resulted in widespread dioxin and PAH contamination throughout East Palestine. The table demonstrates that the environmental impact was community-wide, not localized to the derailment site or a few adjacent properties, and supports the conclusion that the Norfolk Southern Incident was a major and significant source of contamination across substantial portions of the East Palestine community.

Table 2-8: Dioxin in Soil and Benzo(a)pyrene Equivalents

In Soil and Sediment In East Palestine Area

Statistic	Dioxin and BaP Concentrations in East Palestine General Area			
	Dioxin Results		BaP Results	
	RESULT ng-TEQ/kg (ND = 0)	RESULT ng-TEQ/kg (ND = ½ MDL)	RESULT ug-BaP_eq/kg (ND = 0)	RESULT ug-BaP_eq/kg (ND = ½ MDL)
Number of Samples	105	105	90	90
Average	74.2	85.5	1,445	2,369
Max	2,063	2,327	29,170	31,528
95% UCL	121.3	136	2,142	3,245
Residential Soil RSL	4.8	4.8	110	110
Occupational Soil RSL	21.6	21.6	2110	2110
UCL Divided By Residential RSL	25.3	28.3	19.5	29.5
UCL Divided By Occupational RSL	5.6	6.3	1.0	1.5

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The most important statistic in the table is the **95% Upper Confidence Limit (UCL)**. The UCL is not influenced by a single high sample and instead represents a statistically reliable estimate of community-wide contamination levels. The dioxin UCLs of 121.3 and 136 ng-TEQ/kg exceed the residential screening level by factors of 25.3 and 28.3, respectively, and exceed the occupational screening level by factors of 5.6 and 6.3. Similarly, the BaP-equivalent UCLs of 2,142 and 3,245 µg-BaP_eq/kg exceed the residential screening level by factors of 19.5 and 29.5 and equal or exceed the occupational screening level.

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Accordingly, Table 2-8 provides strong evidence that the derailment-related combustion events resulted in widespread dioxin and PAH contamination throughout East Palestine. The table demonstrates that the environmental impact was community-wide, not localized to the derailment site or a few adjacent properties, and supports the conclusion that the Norfolk Southern Incident was a major and significant source of contamination across substantial portions of the East Palestine community.

3. Air Modeling

3.1 Air Modeling Conducted to Address Abbreviated Love and Finley Criticisms

I appreciate the review and feedback provided by Dr. Adam Love and Dr. Brent Finley relating to the air modeling and I summarily address all of their criticisms later in the report. To ensure absolute transparency, demonstrate responsiveness, and provide a holistic evaluation of the incident, RoseyFields has incorporated all of the defendants' modeling recommendations into my updated atmospheric assessment. By executing scores of sensitivity analyses utilizing their exact preferred parameters, including alternative source geometries, modified thermodynamic inputs, and varying emission factors, this comprehensive approach conclusively demonstrates that the toxic contamination of the CeramFab and WYG properties is a robust physical reality that remains consistent regardless of the modeling variables selected.

3.1.1 Responsiveness Regarding Modeling Versus Physical Sampling

Dr. Love and Dr. Finley suggested that physical soil sampling alone might be sufficient to assess environmental exposures, expressing a preference for relying exclusively on field data rather than predictive numerical models. While we agree that actual environmental measurements are crucial,

physical, static soil sampling frequently fails to fully capture the transient, widespread deposition of contamination from a highly dynamic chemical fire. **My modeling was conducted to complement the robust sampling data, filling in geographic gaps and capturing the multidirectional and diffuse dispersion of the chemicals of interest. The elevated dioxin levels we predicted are directly validated by physical soil samples at the site, confirming the value of a combined modeling and sampling approach to understand the full footprint of the fallout.**

3.1.2 Appropriateness of AERMOD for Open Fires

The defense experts also raised considerations regarding the use of AERMOD, noting it is a steady-state Gaussian plume model, and suggested that non-steady-state or fire-specific models (such as CALPUFF or FDS) might better simulate the buoyant, episodic nature of massive chemical fires. While we respect their preference for alternative platforms, I disagree with this criticism. AERMOD is fully appropriate and widely accepted for estimating near-field deposition from open combustion events when represented with defensible parameters. Peer-reviewed literature demonstrates AERMOD's successful application for open fires. For instance, the Iowa City tire-fire study successfully utilized AERMOD point sources to simulate an 18-day open combustion event, and the Federal Aviation Administration (FAA) explicitly utilizes point sources in AERMOD to model unenclosed training fires.[18] [19] Thus, the foundational use of AERMOD remains scientifically sound and widely accepted, though we expanded our analysis to accommodate Defense experts' specific preferences.

3.1.3 Addressing Point Source Geometry Concerns

Regarding source representation, Dr. Love and Dr. Finley posited that modeling the spatially distributed derailment fire as a series of "point sources" might impose an engineered geometry that could mathematically influence plume coherence and near-field concentrations. They recommended utilizing area, volume, or buoyant line source representations instead. While the FAA and other researchers have successfully utilized point sources for open combustion,[20] we wanted to be fully responsive to their geometric preferences. Therefore, we performed comprehensive sensitivity analyses utilizing their exact recommendations for area, volume, and line sources to better reflect their preferred physical representation of a distributed release. Despite their offered criticisms, however, their preferences only served to further validate our opinions

[18] Downard et al. Uncontrolled combustion of shredded tires in a landfill. *Atmos Environ*. 2015;104:273-283.
[19] United States Department of Transportation, Federal Aviation Administration. *Emissions and Dispersion Modeling System (EDMS) Reference Manual*. FAA; 1997:25.
[20] Ibid.

3.1.4 EPA and Ohio EPA Guidance on Alternative Source Geometries

To directly address their geometric critiques and ensure strict regulatory compliance, we utilized EPA and Ohio EPA guidance to justify our supplemental modeling of these area, volume, and line sources. The Ohio Environmental Protection Agency explicitly recognizes in Engineering Guide #69 that if emissions do not exit a traditional stack, "characterization as an area or volume source might be appropriate" to accurately represent the physical release.[21] Furthermore, the U.S. EPA's Guideline on Air Quality Models (Appendix W) specifies that linearly distributed emissions can be effectively characterized using "AREA, LINE, and RLINE source types in AERMOD, or volume sources."[22] By proactively incorporating these approved algorithms, we accommodated the defense's request to evaluate the incident without forcing emissions through theoretical exhaust stacks.

3.1.5 Clarification on Meteorological Data Processing

The defense experts also expressed reservations about splicing ground-level wind speeds from local weather stations into regional upper-air data, suggesting it might affect the mathematical coupling of AERMET's boundary-layer physics. However, modifying these files to ensure local accuracy is a methodologically valid procedure expressly supported by the U.S. EPA. The AERMET User's Guide provides specific modification commands (like SUB_TTTD) to substitute parameters during complex shifting wind events.[23] The EPA's AERMOD Implementation Guide further notes that meteorological representativeness "cannot be based solely on proximity" to a distant station, requiring modelers to evaluate the actual dispersive capacity of the local atmosphere.[24] Peer-reviewed research confirms that substituting localized, high-resolution wind data significantly improves a model's ability to track wind shears over complex terrain.[25] Therefore, our meteorological processing was both appropriate and necessary to reflect true conditions.

3.1.6 Refining Temperature, Velocity, and Emission Factor Inputs.

Dr. Love and Dr. Finley further inquired about the specific input parameters utilized, such as an exit temperature of 250°C and exit velocities up to 50 m/s, suggesting that higher core temperatures might better reflect the fire's buoyancy and that applying certain emission factors could overestimate releases.

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[21] Ohio Environmental Protection Agency. *Engineering Guide #69: Air Dispersion Modeling Guidance*. Columbus, OH: Ohio EPA; 2018:17.

[22] U.S. EPA 2024. *Guideline on Air Quality Models, 40 CFR Part 51, Appendix W*. U.S. Environmental Protection Agency. November 29, 2024. Page 95057.

[23] US Environmental Protection Agency. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. US EPA; 2023:D-8.

[24] US Environmental Protection Agency. *AERMOD Implementation Guide*. US EPA; 2024:4.

[25] Carbonell LMT, Gacita MS, Oliva JJDR, Garea LC, Rivero ND, Ruiz EM. Methodological guide for implementation of the AERMOD system with incomplete local data. *Atmospheric Pollution Research*. 2010;1(2):102-111.

We appreciate their thorough review of these parameters. However, assigning an elevated exit velocity of 50 m/s for the PRD actuations was necessary to accurately capture the extreme aerodynamic momentum of a catastrophic, high-pressure railcar failure. Similarly, utilizing conservative hazardous waste emission factors ensured that community exposure was not systematically underestimated.

3.1.7 Addressing Temperature Issues

In response to Dr. Love's suggestion that a higher, core-flame temperature should be utilized, we clarified that the 250°C parameter was specifically chosen to model the peripheral fire areas and cooling flame edges where dioxins are actually formed. Established thermodynamic science confirms that dioxins are completely destroyed in the ultra-hot central core of a fire; instead, *de novo* synthesis of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) occurs exclusively as flue gases cool into a critical reformation window between 200°C and 450°C [26] By calibrating the source temperature to 250°C, the model accurately isolated the exact peripheral conditions where these toxic pollutants were synthesized.

3.1.8 Height Sensitivity Analysis and Responsiveness

To be as accommodating as possible to the defense experts' feedback regarding plume height and buoyancy, we executed an East Palestine Height & Temperature Sensitivity Analysis. We specifically addressed their claims regarding plume height by performing runs at various release heights, including 15ft, 30ft, 45ft, 60ft, and 100ft. Results of the height sensitivity analysis are presented in **Table 3-2.** This allowed us to holistically bound the estimates and prove that our spatial deposition findings were not reliant on a single assumed release height.

3.1.9 Velocity and Source Type Sensitivity Analyses

Similarly, to comprehensively address their thoughts regarding plume momentum and the suggestion that 20 m/s was unsubstantiated for the initial fire, we performed an East Palestine Velocity Sensitivity Analysis. We ran the model across a wide range of velocities: 1 m/s, 10 m/s, 20 m/s, 30 m/s, 40 m/s, and 50 m/s. Results of the velocity sensitivity analysis are presented in **Table 3-2.** Furthermore, we directly executed a Source Type Analysis to reflect their geometric preferences, providing results using Point, Area, EPA line, and Volume Source configurations, proving the geographic impact remains consistent across methodologies.

[26] Altarawneh M, Dlugogorski BZ, Kennedy EM, Mackie JC. Mechanisms for formation, chlorination, dechlorination and destruction of polychlorinated dibenzo-p-dioxins and dibenzofurans. *Prog Energy Combust Sci.* 2009;35(3):246.

3.1.10 Temperature, and PRD Actuation Analysis

To evaluate their thermodynamic inquiries, we executed an expansive East Palestine Temperature Sensitivity Analysis, running models at ambient conditions (17.22°C/290.372K), 150°C (423.15K), 250°C (523.15K), 350°C (623.150K), 450°C (723.15K), 650°C (923.15K), 750°C (1023.15K), and 1250°C (1523.15K). Results of the temperature analysis are presented in **Table 3-2.** To strictly follow Ohio EPA guidance regarding flare emissions and address PRD critiques, we adjusted the variable emission file to run the PRD Actuation at 1273K and changed the PRD energetic venting velocity to exactly 20 m/s for one run.[27]

3.1.11 Emissions Factor Analysis, Mass Loss, and Final Conclusions

Finally, we addressed Dr. Finley's observation regarding the uncertainty of mass lost during the PRD cycling. Because the EPA modeled the vent and burn assuming 90% full tank cars, we ran the PRD actuation assuming a 5% loss and a 10% loss to fully bound the estimates. We also conducted an East Palestine Alternative Emissions Factor Analysis, providing model runs that utilized Dr. Love's recommended varying emission factors alongside the baseline hazardous waste source term applied for everything **Table 3-1**. It should be noted that Dr. Love's calculations contain a mathematical error regarding source PRD2, as the emission factor and corrected amount burned reported in Table 6 of his expert report do not equate to his listed corrected emission rate of 29 g/s. With the exception of rectifying this specific calculation error, my alternative modeling scenario strictly utilized all of Dr. Love's suggested emission rates, mass burn amounts, exit temperatures, and velocities.[28] Ultimately, by proactively addressing every concern and providing all of these sensitivity runs for a holistic evaluation, we proved that the spatial deposition trends remain mathematically and geographically consistent. This confirms that the toxic fallout over the plaintiffs' properties is a robust physical reality, heavily supporting a responsive, scientifically sound methodology.

[27] Ohio EPA. *Engineering Guide #69: Air Dispersion Modeling Guidance.* Columbus, OH: Ohio EPA; 2018:19.

[28] Love AH. *Expert Report of Adam H. Love, Ph.D*. Roux Associates, Inc; May 15, 2026:115-116.

Table 3-1. Dr. Love's Recommended Emission Rates

Source ID	Rosenfeld Emission Factor (ug-TEQ/ton)	Love Emission Factor (ug-TEQ/ton)	Rosenfeld Emission Rate (g/s)	Love Emission Rate (g/s)
EF1	35,000	10,000	33,273	11,276
EF2	35,000	10,000	33,273	11,276
EF3	35,000	10,000	33,273	9,262
EF4	35,000	35,000	33,273	37,234
EF5	35,000	100	33,273	100
EF6	35,000	35,000	33,273	20,637
EF7	35,000	10,000	33,273	11,314
EF8	35,000	10,000	33,273	11,314
EF9	35,000	1,000	33,273	1,029
EF10	35,000	1,000	33,273	951
EF11	35,000	1,000	33,273	505
EF12	35,000	10,000	33,273	9,262
EF13	35,000	10,000	33,273	10,291
EF14	35,000	10,000	33,273	10,291
EF15	35,000	35,000	33,273	35,054
EF16	35,000	10,000	33,273	11,314
EF17	35,000	10,000	33,273	11,314
EF18	35,000	100	33,273	19
EF19	35,000	10	33,273	11
EF20	35,000	100	33,273	95
EF21	35,000	100	33,273	93
PRD1	35,000	35,000	5,211	5,211
PRD2	35,000	35,000	4,608	29
PRD3	35,000	35,000	5,240	5,240
PRD4	35,000	35,000	5,182	5,182
VB1	35,000	35,000	483,632	483,632
VB2	35,000	35,000	116,492	116,492

3.2 AERMOD Input Parameter Summary

To conduct representative air dispersion modeling, air dispersion modeling guidelines for ambient air boundary receptor creation and meteorological and terrain inputs were utilized.

3.2.1 Receptors

The Ohio EPA *Engineering Guide #90: Air Dispersion Modeling Guidance* provides receptor guidance.[29] It states:

> *"Receptor grids must be sufficiently dense to identify maximum ambient impacts. Receptor density should be higher in areas of special concern,e.g., areas of source interactions or significant terrain features. For most applications, receptor intervals should be greater than 50 meters at fence lines and "hotspots" as determined from preliminary modeling results."*[30]

The AERMOD adhered to the Ohio EPA guidelines. Three receptor grids were utilized: a coarse grid extending 50,000 meters, spaced 1,000 meters apart, a second extending 8,000 meters, spaced 100 meters apart, and a third extending 900 meters, spaced 50 meters apart. Additional discrete receptors were placed at the two CeramFab locations. Additional information on the receptor grid placement and the discrete receptors can be found in the **Supplemental File titled "AERMOD Control Variable and Source Terms.xlsx."**

3.2.2 Meteorological Data

AERMOD requires preprocessed meteorological surface (.SFC) and profile (.PFL) files containing surface and upper air atmospheric data. Meteorological data utilized in this analysis were obtained from the Ohio EPA AERMET-ready datasets, including surface and upper air data from the Pittsburgh International Airport ("KPIT") station. In response to criticisms regarding meteorological representativeness, supplemental analyses were also performed utilizing wind speed and direction data from local meteorological stations (KOHEASTP7, KOHEASTP9, and KPABEAVE2) located closer to East Palestine than the KPIT station. Hourly wind data from February 3-6, 2023 were evaluated and incorporated into supplemental meteorological sensitivity analyses to assess the influence of varying local wind conditions on modeled plume transport and deposition patterns. **Figure 3-1** below shows the relative location of the meteorological stations. **Figures 3-2 to 3-4** show the graphs of the meteorological data downloaded from the weather underground server.[31]

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[29] Ohio Environmental Protection Agency, Division of Air Pollution Control. *Engineering Guide #69: Air Dispersion Modeling Guidance.* Columbus, OH: Ohio EPA; 2018:8 (PDF pg. 13).
[30] Ibid.
[31] Local Weather Forecast, News and Conditions. Weather Underground. Available online at: https://www.wunderground.com/.

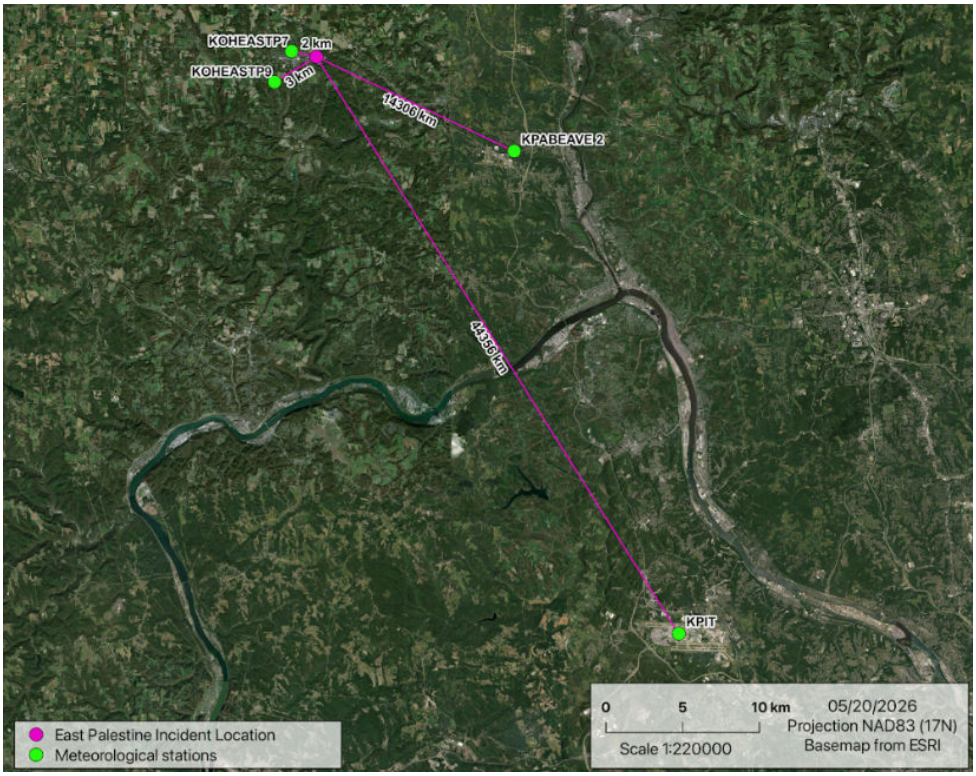

Figure 3-1. Map of Meteorological Stations Location Relative to East Palestine

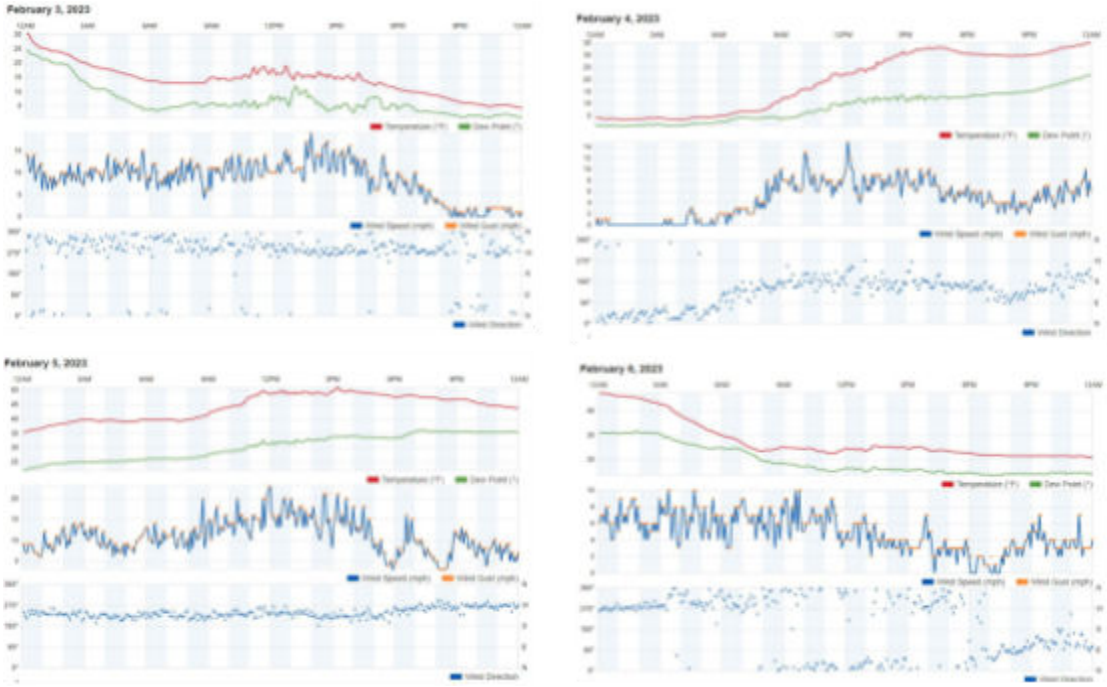

Figure 3-2. KPABEAVE2 Meteorological Station Wind Speed and Direction on February 3-6, 2023

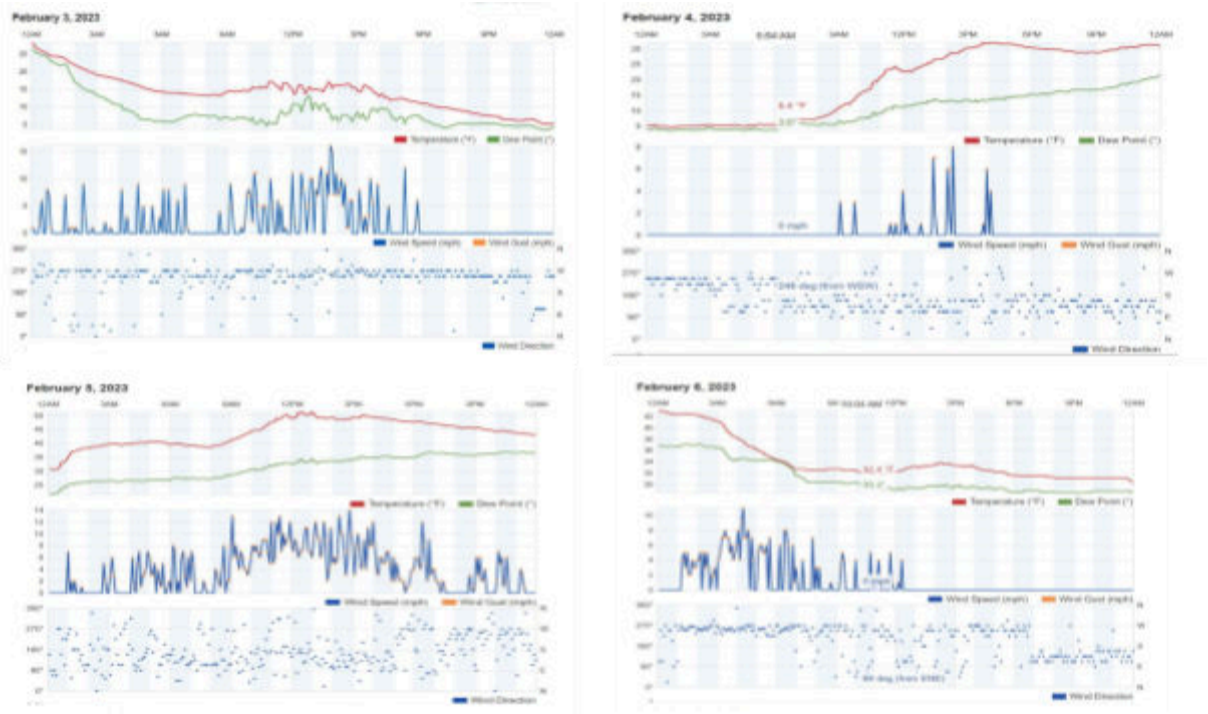

Figure 3-3. KOHEASTP7 Meteorological Station Wind Speed and Direction on February 3-6, 2023

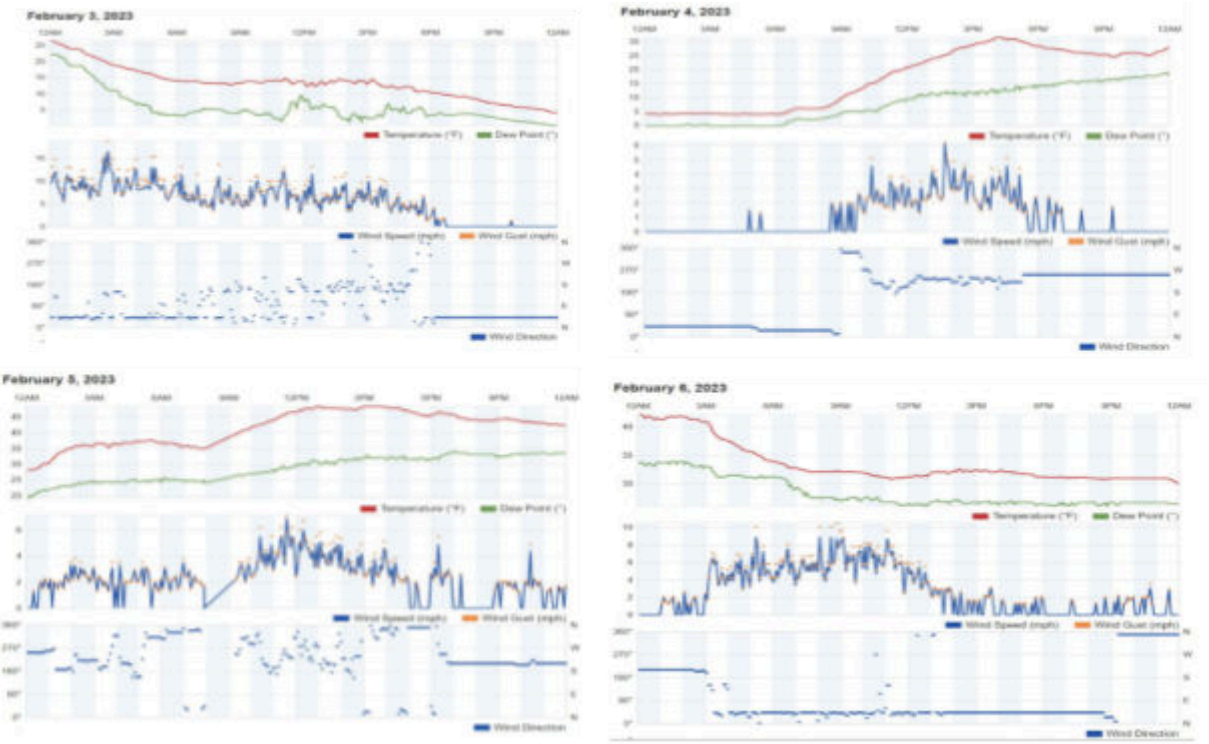

Figure 3-4. KOHEASTP9 Meteorological Station Wind Speed and Direction on February 3-6, 2023

The KPIT meteorological station primarily recorded winds from the south and southwest, whereas the closer local meteorological stations recorded more variable and multidirectional wind fields during the Incident. To evaluate the influence of these differing wind conditions, four separate AERMOD meteorological datasets were utilized, including the unaltered KPIT dataset and three modified datasets incorporating wind speed and direction data from the local stations. Upper air profile data from the Ohio EPA AERMET dataset were similarly modified to incorporate the local wind observations for supplemental sensitivity analyses evaluating plume transport and deposition variability under differing meteorological conditions.

3.2.3 Terrain Data

In accordance with the Ohio Environmental Protection Agency's (Ohio EPA) Engineering Guide #69 for air dispersion modeling, local topography was incorporated into the simulations using the AERMAP terrain preprocessor.[32] Following the agency's preferred methodology, National Elevation Dataset (NED) files for the East Palestine area were obtained directly from the United States Geological Survey (USGS). These files are included in the **Supplemental File Folder "AERMOD Files**."

3.3 Source Terms

Source terms refer to the characteristics of the emissions released into the atmosphere from a specific source. This term includes various parameters, such as the coordinates, temperature, velocity, release height, and rate of emission. The Incident was considered with three different events: the early fire that began on February 3rd, 2023, the pressure relief device (PRD) actuations on the VCM tanks, and the vent and burn trench fires. The section outlines the source terms utilized in AERMOD.

3.3.1 Particle Parameters

Distinct particle size distributions were utilized for the early mixed-material fire and the subsequent vinyl chloride monomer ("VCM") vent-and-burn and pressure relief device ("PRD") events to reflect differing combustion conditions and particulate behavior. Parameters for the early fire were derived from EPA AP-42 municipal waste combustion data representing oxygen-limited, fuel-rich combustion conditions similar to an uncontrolled chemical pile fire, while parameters for the VCM vent-and-burn events were derived from Barabad et al. (2018) for high-temperature waste vinyl combustion. A uniform soot particle density of 1.78 g/cm³ was utilized for all modeled fire phases consistent with published aerosol and soot characterization literature for fine carbonaceous combustion particles. .[33]

[32] Ohio Environmental Protection Agency, Division of Air Pollution Control. *Engineering Guide #69: Air Dispersion Modeling Guidance*. Columbus, OH: Ohio EPA; 2018.

[33] Park K, Kittelson DB, Zachariah MR, McMurry PH. Measurement of inherent material density of nanoparticle agglomerates. *J Nanopart Res.* 2004;6(2-3):267-272

Furthermore, establishing the material density of pure elemental carbon soot at approximately 1.8 g/cm³ is a widely accepted standard in aerosol science; this consensus value is supported by foundational soot characterization studies by Dobbins (2002), Mullins and Williams (1987), and Park et al. (2004).[34] [35] [36] This particle density ensures that the AERMOD algorithms correctly calculate the buoyancy, terminal settling velocity, and downwind dispersion profiles of the soot agglomerates generated throughout the entirety of the Incident.

3.3.2 Dioxin Emission Factors

In response to the criticisms raised by Dr. Love and Dr. Finley regarding source characterization, combustion assumptions, and dioxin emission estimates, the dioxin emissions associated with the East Palestine Incident were modeled utilizing the United Nations Environment Programme ("UNEP") emission factor developed specifically for hazardous waste combustion occurring under poor, uncontrolled, or unmitigated combustion conditions. The UNEP methodology identifies a default emission factor of 35,000 µg TEQ/t for "Class 1" hazardous waste combustion, representing low-technology or uncontrolled combustion lacking engineered combustion controls or air pollution control systems ("APCS").

The East Palestine derailment fires and vent-and-burn operations involved open-air combustion of hazardous petrochemical materials under highly abnormal and uncontrolled conditions, including sustained thermal loading, intermittent venting, uncontrolled oxygen conditions, widespread soot generation, and the absence of engineered combustion temperature regulation, filtration, scrubbing, or emission control systems. Accordingly, the UNEP emission factor directly addresses the precise combustion conditions present during the Incident and provides the most scientifically appropriate and conservative framework for estimating dioxin and furan emissions associated with the derailment fires and vent-and-burn operations.

Importantly, Defendants' experts criticize the use of elevated dioxin emission assumptions while simultaneously acknowledging the presence of large-scale combustion, soot deposition, prolonged smoke generation, and uncontrolled thermal events associated with the derailment response. The UNEP emission factor was specifically developed for precisely these types of uncontrolled hazardous waste combustion scenarios and therefore provides a scientifically appropriate basis for estimating dioxin

[34] Rissler J, Messing ME, Malik AI, et al. Effective density characterization of soot agglomerates from various sources and comparison to aggregation theory. *Aerosol Sci Technol.* 2013;47(7):792-805

[35] Dobbins, RA. Soot inception temperature and the carbonization rate of precursor particles. *Combust Flame.* 2002;130(3):204-214

[36] Mullins J, Williams A. The optical properties of soot - a comparison between experimental and theoretical values. *Fuel*. 1987;66(2):277-280.

emissions under the conditions that existed in East Palestine. Figure 3-1 below presents the UNEP emission factor utilized to calculate the dioxin emission estimates input into the supplemental AERMOD analyses.

Table 15: Emission factors for hazardous waste incineration

Classification	Emission Factors - µg TEQ/t HW Burned	
	Air	Residue (Fly Ash Only)
1. Low technology combustion, no APCS	35,000	9,000
2. Controlled combustion, minimal APCS	350	900
3. Controlled combustion, good APCS	10	450
4. High technology combustion, sophisticated APCS	0.75	30

Figure 3-5. Dioxin Emission Factors Table 15 from the UNEP (2005) *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases*

3.3.3 Benzo(a)Pyrene Equivalent (BaP_eq) Emission Factors

PAH emissions were evaluated using the benzo(a)pyrene equivalent ("BaP_eq") framework, which applies potency equivalency factors ("PEFs") to individual PAHs to estimate cumulative carcinogenic potency relative to benzo(a)pyrene ("BaP").[37] This methodology is widely used by ATSDR, EPA, and OEHHA for evaluating carcinogenic PAH mixtures associated with incomplete combustion events. EPA AP-42 guidance and peer-reviewed literature demonstrate that uncontrolled combustion of plastics, PVC, petrochemicals, and tires can generate substantial PAH emissions, particularly under oxygen-limited or smoldering conditions similar to portions of the East Palestine fires.[38] [39] [40] Supplemental emission factors from AP-42 and Hoffer et al. (2020) were evaluated to establish a scientifically grounded range of potential PAH emissions under varying combustion conditions.[41] These analyses demonstrated that PAH emissions can increase substantially under poorly controlled combustion conditions and support the use of a bounding emission approach for the East Palestine Incident.

[37] Agency for Toxic Substances and Disease Registry. *Guidance for Calculating Benzo(a)pyrene Equivalents for Cancer Evaluations of Polycyclic Aromatic Hydrocarbons.* Atlanta, GA: ATSDR; 2022:1.

[38] United States Environmental Protection Agency. *AP-42: Compilation of Air Pollutant Emissions Factors, Volume I: Stationary Point and Area Sources (Open Burning Guidance).* US EPA; 2010:1-2.

[39] Font R, Gálvez A, Moltó J, Fullana A, Aracil I. Formation of polychlorinated compounds in the combustion of PVC with iron nanoparticles. *Chemosphere*. 2010;78(2):152-159

[40] Zhang M, Buekens A, Jiang X, Li X. Dioxins and polyvinylchloride in combustion and fires. *Waste Manag Res*. 2015;33(7):630-643.

[41] Hoffer A, Jancsek-Turóczi B, Tóth Á, Kiss G, Naghiu A, Levei EA, Marmureanu L, Machon A, Gelencsér A. Emission factors for PM10 and polycyclic aromatic hydrocarbons (PAHs) from illegal burning of different types of municipal waste in households. Atmos Chem Phys. 2020;20(24):16135-16144. doi:10.5194/acp-20-16135-2020.

3.4 Point Source Model

3.4.1 Early Fire

The total mass combusted during the early fire was estimated using Norfolk Southern manifest data, NTSB docket records, and tank car specifications. The early fire was modeled in AERMOD from 9:00 p.m. on February 3, 2023 through 7:00 p.m. on February 4, 2023, using variable emissions consistent with Incident and EPA Emergency Operations Center reports documenting the duration and intensity of the fire. The early fire was represented as 21 point sources corresponding to the derailed tank cars extending along the derailment corridor. Modeling parameters included a 7.35-meter release height, 20-meter source diameter, 20 m/s exit velocity, and a source temperature of 523.15 K (250°C), representing the cooler combustion zone associated with dioxin formation.

3.4.2 Vent and Burn

The vent and burn trench fire were modeled as two separate points sources. The two locations of the fires are visible in **Exhibit B**. The vent and burn trench fires were modeled to reflect the start of the fire at 4:37pm on February 6th, 2023.[42] The vent and burn model followed the EPA's IMAAC model which accounts for six hours of active burning.[43]

The EPA's retrospective soot deposition analysis estimated that 90% of the total available mass of vinyl chloride was combusted during the vent-and-burn operation, accounting for an estimated 10% loss of material that had already spilled prior to the vent and burn event.[44] The model accordingly reflected 90% of the total mass burned during the vent and burn. The mass of the VCM load data was validated by the NTSB Incident report.[45] The report notes that the "entire load" was released.[46]

As in the modeling of the early fire, the stack height was estimated at 7.35 meters based on visual estimations of the flame tip and the temperature input into AERMOD was 523.15 K (250°C). A velocity of 20 m/s was used for modeling. The point source diameter was 20 meters for both vent and burn sources.

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[42] US Environmental Protection Agency. *EP EPA FOIA*. Chicago, IL: US Environmental Protection Agency Region 5; 2023

[43] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023.

[44] Ibid.

[45] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB. 2023 Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. Pg. 45. Table 9, "Summary of Breaching Damage to Hazardous Materials Tank Cars."

[46] Ibid.

3.4.3 Pressure Relief Device Actuation

During the East Palestine train derailment, the pressure relief device (PRD) actuations on four of the vinyl chloride monomer (VCM) tank cars involved the rapid, energetic release and subsequent combustion of highly pressurized VCM.[47] The four VCM tanks were: OCPX 80235, OCPX 80179, GATX 95098, and OCPX 80370. These actuations generated intense, localized flames escaping from the tops of the tanks cars making their physical and thermodynamic behavior similar to a flare. The pressure relief device ("PRD") actuations on four vinyl chloride monomer ("VCM") tank cars involved rapid releases and combustion of pressurized VCM under flare-like conditions. Consistent with Ohio EPA flare modeling guidance, the PRD events were modeled as nonstandard point sources utilizing source-specific release heights calculated using the Brigg's Equation, temperatures, and exit velocities designed to account for the buoyancy and radiative heat loss associated with the pressurized releases. The PRD emission estimates assumed approximately 10% of the total VCM load was released during the PRD events based on EPA and NTSB incident evaluations, with emissions distributed over the documented PRD cycling period on February 4, 2023. Source temperatures were adjusted to represent the cooler post-combustion zones associated with dioxin formation rather than the hotter combustion core, and the source geometry was adjusted to account for flame height and plume behavior associated with the pressurized releases.

3.4.4 Point Source Source Term Sensitivity Analysis

In response to criticisms raised by Dr. Love and Dr. Finley regarding source characterization, plume rise, combustion temperature, release velocity, and meteorological uncertainty, supplemental source term sensitivity analyses were performed to evaluate the influence of varying modeling assumptions on predicted deposition patterns. These analyses demonstrated that flame height, temperature, velocity, and wind conditions materially influence modeled deposition; however, the overall deposition patterns remained robust across the range of physically plausible source conditions evaluated. Specifically, the analyses demonstrated a positive correlation between release height and deposition and a negative correlation between release temperature and exit velocity with deposition. Table 3-1 compares the sensitivity analysis results against the baseline source parameters utilized in the modeling (45 ft release height, 20 m/s exit velocity, and 250°C source temperature).

Importantly, these supplemental analyses directly address, and refute, Defendants' criticisms that the modeled deposition results were allegedly dependent upon isolated or speculative source assumptions. Instead, the sensitivity analyses demonstrate that varying source parameters over broad physically plausible ranges still produced elevated deposition within the same general impacted areas identified by the environmental sampling and spatial mapping analyses. Accordingly, the overall conclusions are not

[47] Id. PDF pg. 16.

dependent upon any single assumed flame height, temperature, or velocity parameter, but instead reflect robust atmospheric transport and deposition behavior associated with the derailment fires, PRD actuations, and vent-and-burn operations.

Table 3-2. Height, Velocity and Temperature Sensitivity Analysis Results Showing the Percent Change in Deposition

Height (ft)	15	30	45	60	100			
% Change	59%	76%	100%	120%	158%			
Velocity (m/s)	1	10	20	30	40	50		
% Change	10694%	323%	100%	58%	42%	33%		
Temperature (°C)	17	150	250	350	450	650	750	1250
% Change	2130%	156%	100%	80%	70%	61%	58%	51%

3.5 Area, EPA LINE, and Volume Source Modeling

In response to Dr. Love's assertion that an "area, volume, or buoyant line sources incorporate initial geometric spread consistent with fire dimensions [...] producing lower, more realistic ground-level concentrations for the same emission rate," I conducted extensive supplemental AERMOD sensitivity analyses utilizing all of these EPA-recognized configurations.[48] The models demonstrate elevated dioxin deposition regardless of the assumed source geometry.

Consistent with Ohio EPA Engineering Guide #69, nontraditional releases should be modeled using source representations that accurately reflect the physical characteristics of the emission source rather than defaulting to a conventional stack configuration. Ohio EPA specifically states that when emissions do not exit a stack in an upward vertical direction, "alternative characterizations of the source should be developed to more accurately represent the release point" and further notes that an "area or volume source might be appropriate" for such releases.[1] The East Palestine derailment involved uncontrolled fires, pressure relief device actuations, venting events, and open combustion occurring across an extended derailment area rather than emissions released from a conventional stack. Accordingly, evaluation of line, area, and volume source representations is consistent with Ohio EPA guidance and provides a scientifically appropriate method for representing the physical nature of the release. Moreover, the alternative source configurations recommended by Defendants' experts improved the

[48] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026:108.

agreement between the AERMOD predictions and the measured environmental contamination data, providing additional support for the use of these source representations in evaluating the Incident.[49]

3.5.1. Area Source Parameters

In accordance with the area source parameters suggested by Dr. Love, an area source 350 meters long in length and 10 meters wide, was modeled to represent the early fire. Incident site and satellite imagery was used to georeference the location of the two vent and burn trenches and the location of the early fire.[50] These same area sources were used to model the pressure relief device actuations. The model consisted of three area sources to represent: the early fire, the vent and burn trench where the four VCM tanks were located (TILX402025, OCPX80235, OCPX80179, and GATX95098), and the vent and burn trench corresponding to the singular VCM tank (OCPX80370).

To calculate the emission rate for the early fire, I summed the total amount kilograms of material burned each hour and divided it by the area. Consistent with the point source model of this event, the area source was modeled as 90% of the VCM loading mass lost during the vent and burn and 10% lost during the pressure relief device actuation. This 90% of mass lost during the vent and burn is in accordance with the EPA's IMAAC model.[51] The summed amount of VCM released during the pressure relief device actuation and vent and burn from the four tanks located on the east side of the Incident was used for the eastern most area source. The emission rate (g/s) for the area source representing the singular tank, OCPX80370, remained the same as that of the point source model. Notably, Table 6 of Dr. Love's expert report explicitly adopts the exact same mass combustion rate for the early fire under his "Corrected Amount Burned" column; his own 'corrected' analysis accepts and relies upon my calculations for the total mass of material consumed per hour during the initial combustion event.[52] To ensure temporal consistency across the sensitivity analyses, the area source model utilized a variable emissions file that followed the same timeline as the variable emissions file employed in the point source model for the early fire, vent and burn, and pressure relief device actuations. As in the point source model, the release heights were 13.72 meters. The detailed calculations of material burned per hour during each event is

[49] Ohio Environmental Protection Agency. Engineering Guide #69: Air Dispersion Modeling Guidance. Division of Air Pollution Control. Revised November 14, 2018.

[50] Hazardous Materials Group Chair's Factual Report (Group B - Exhibit 10). National Transportation Safety Board; June 2, 2023. Docket ID: DCA23HR001.; Hazmat Factual Report Figure 1 (Group D - Exhibit 34). National Transportation Safety Board; 2023. Docket ID: DCA23HR001.; Derailment Photos and DOT FRA Guide Figures (Group H - Exhibit 8). National Transportation Safety Board; 2023. Docket ID: DCA23HR001.; Unmanned Aircraft System Aerial Imagery Group Chair's Factual Report (Group B - Exhibit 4). National Transportation Safety Board; 2023. Docket ID: DCA23HR001.

[51] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

[52] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026:115-117.

tabulated in the Supplemental Files "**Burn Chronology and Tank Mass Calculations.xlsx,"** and the "**Variable Emissions File Folder.**"

Figure 3-6. Below taken from the Breeze AERMOD program illustrates the location of the three area sources representing the early fire, and the two vent and burn trenches.

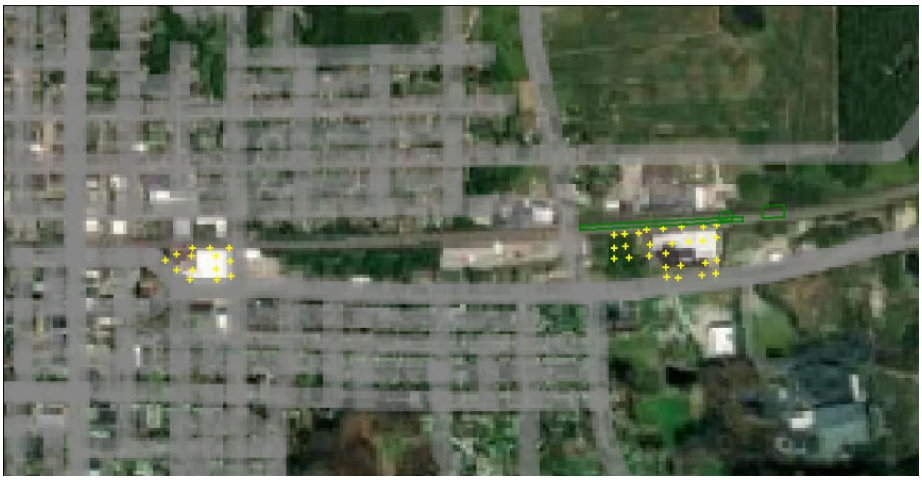

Figure 3-6. Discrete Receptors and Area Sources Modeled in Breeze AERMOD

3.5.2. Line Source Parameters

Dr. Love's recommendations include modeling the Incident as a buoyant line; however, AERMOD's buoyant line algorithm lacks the computational capability to model particulate deposition, the primary objective of my model. In a modification to this request that allows deposition to be captured, therefore, I executed the air models using an EPA LINE source. As in the area source model, I modeled three EPA line sources to capture the early fire, and the two vent and burn trenches.

In accordance with the area source model, the early fire was modeled 350 meters in length and 10 meters in width. In QGIS, I calculated the length and width of the vent and burn trenches from the georeferenced area source which resulted in lengths of 46 and 31 meters and widths of 27 and 23 meters.

Similarly, to the area source, the EPA LINE source representing the early fire utilized the total amount of materials burned each hour during the initial event. The EPA LINE source representing the four grouped together VCM tanks utilized the sum of the materials burned in these four tanks each hour during the pressure relief device actuation and the vent and burn event. The variable emission file remained consistent with that of the point source and area source model.

The position of the three EPA line sources are presented in **Figure 3-7** below.

Figure 3-7. Discrete Receptors and EPA Line Sources Modeled in Breeze AERMOD

3.5.3. Volume Source Parameters

To accurately model the elongated geometry and specific emissions characteristics of the East Palestine trench fires and early pool fire, the emissions were configured in AERMOD as a line source represented by a series of adjacent volume sources. This approach allows the model to appropriately capture the spatial extent and initial plume dimensions of the fire without distorting the source geometry. The parameters were calculated in accordance with the methodologies outlined in the EPA AERMOD User's Guide.[53]

I modeled thirty five, 10x10 meter, volume sources in a line to represent the early fire. The eastern most vent and burn trench was modeled using twelve adjacent vent and burn trenches that matched the location of the georeferenced tank and trench locations. The second vent and burn trench was modeled using five adjacent volume sources. In accordance with EPA guidelines, the initial lateral dimension was calculated by dividing the length of the side of each individual volume node by 2.15.[54] The initial vertical dimension of the volume source was calculated to capture the post-combustion cooling zone where de novo dioxin synthesis occurs.[55] The initial vertical dimension used incident photographic documentation

[53] USEPA 2022. User's Guide for the AMS/EPA Regulatory Model (AERMOD). Research Triangle Park, NC: US Environmental Protection Agency, Office of Air Quality Planning and Standards; June 2022. Publication No. EPA-454/B-22-007.

[54] Ibid.

[55] Ibid.; Addink 1998. Role of inorganic chlorine in the formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on incinerator fly ash. *Environ. Sci. Technol. 1998, 32, 21, 3356–3359.;* Addink 2000. Formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on municipal solid waste incinerator fly ash using $NA^{37}Cl$. Chemosphere. 44(2001), 1361-1367.

to determine a release height of 13.72 meters and past research which demonstrated that the active cooling layer occupies approximately the top 30% of the total flame height.[56] Following EPA guidelines for an elevated source that is not adjacent to a building, the initial vertical dimension was calculated by dividing the vertical dimension of the source by 4.3.[57] **Figure 3-8** below presents the volume sources and discrete receptors as modeled as in Breeze AERMOD.

More information on the control variable, emission rates and source terms used is available in the supplemental file "**EP Rebuttal Air Models Source Terms and Control Variables.xlsx.**"

Figure 3-8. Discrete Receptors and Volume Sources Modeled in Breeze AERMOD

3.6 Modeling Results and Analysis Section

3.6.1 Point, Area, Line, and Volume Source Results

Air modeling was conducted to approximate the deposition of Dioxin and PAHs in the surrounding community. The emission factor used in the modeling was specifically for Dioxin TEQs. In order to determine the PAH deposition, measured in Benzo(a)Pyrene equivalence (BaP_eq), emissions, an analysis of BaP_eq emission factors from the USEPA AP-42 and peer-reviewed literature was conducted.[58] The

[56] Gómez-Mares M, Muñoz M, Casal J. Axial temperature distribution in vertical jet fires. *Journal of Hazardous Materials*. 2009. Page 57.

[57] USEPA 2022. User's Guide for the AMS/EPA Regulatory Model (AERMOD). Research Triangle Park, NC: US Environmental Protection Agency, Office of Air Quality Planning and Standards; June 2022. Publication No. EPA-454/B-22-007.

[58] USEPA 1995. Section 2.5: Open Burning. In: Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (AP-42). 5th ed. Research Triangle Park, NC: US Environmental Protection Agency; 1995.

results of dioxin deposition modeling were subsequently scaled to BaP_eq deposition using the ratio of emission factors for chunk tire combustion.[59]

As demonstrated in the **Figure 3-6 to 3-8**, twenty-seven discrete receptors were placed on the CeramFab parcel and fourteen discrete receptors were placed within the parcel bounds of the WYG facility. The average results at the discrete receptor locations at the two properties for each of these AERMOD runs. The deposition (g/m^2) was considered under three scenarios: dioxin deposition in the top kilogram of soil due to the rapid nature of the event within a short time frame, diluted to the top half inch of soil, and the top inch of soil. The results of this analysis are presented below in **Table 3-3.** The results scaled to the BaP_eq emission factors from the USEPA AP-42 emission factors for chunk tire combustion are presented in **Table 3-4.**

Table 3-3: Dioxin TCDD-TEQ Deposition in Top Kilogram, 0.5 Inch and 1 Inch of Soil Using Area, Line, Volume and Point Source Emissions And Using Four Meteorological Datasets

Average Dioxin Deposition (ngTEQ/m²) In Top Kilogram of Soil																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	9	12,482	12,471	13,898	47	7,960	6,595	31,983	47	47,882	45,117	36,652	3	65	56	1,432
WYG	72	2	357	357	395	5	204	199	381	3	370	376	336	0	0	0	37

Average Dioxin Deposition (ngTEQ/m²) Diluted to 0.5 Inches																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.4	551	550	613	2	351	291	1,411	2	2,112	1,990	1,617	0.1	2.9	2.5	63
WYG	72	0.1	15.8	15.8	17.4	0.2	9.0	8.8	16.8	0.1	16.3	16.6	15	0.0	0.0	0.0	1.6

Average Dioxin Deposition (ngTEQ/m²) Diluted to 1 Inch																	
Locations	UCL of Dioxin Soil Samples Within 25 Meters (ng-TEQ/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.2	275	275	307	1	176	145	705	1	1,056	995	808	0	1	1	32
WYG	72	0.0	8	8	9	0	5	4	8	0	8	8	7	0	0	0	1

Table 3-4: Benza(a)pyrene Deposition in Top Kilogram, 0.5 Inch and 1 Inch of Soil Using Area, Line, Volume and Point Source Emissions And Using Meteorological Data From Four Airports

[59] Ibid.

Average Benzo(a)Pyrene Deposition (ug BAP/m²) In Top Kilogram																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	90	127,754	127,644	142,245	478	81,467	67,502	327,349	482	490,075	461,770	375,130	35	665	576	14,659
WYG	2108	16	3,656	3,657	4,046	47	2,090	2,039	3,894	26	3,785	3,847	3,438	2	0	0	375

Average Benzo(a)Pyrene Deposition (ug BAP/m²) Diluted To 0.5 Inches																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	4	5,729	5,724	6,379	21	3,653	3,027	14,679	22	21,976	20,707	16,822	2	30	26	657
WYG	2108	1	164	164	181	2	94	91	175	1	170	173	154	0	0	0	17

Average Benzo(a)Pyrene Deposition (ug BAP/m²) Diluted To 1 Inch																	
Locations	UCL of PAH Soil Samples Within 25 Meters (ug-BaP/kg) ND=0	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	2576	2.0	2,864	2,862	3,189	11	1,827	1,513	7,340	11	10,988	10,354	8,411	1	15	13	329
WYG	2108	0.4	82	82	91	1	47	46	87	1	85	86	77	0	0	0	8

Isopleths of the volume, line, and area sources modeled using meteorological data from the KOHEASTP9, KOHEASTP7, KPABEAVE2, and KPIT stations are presented in **Figures ES-7 to ES-15** in the executive summary of this report and **Exhibit C**. Details of the AERMOD results analyses are available in the supplemental file "**East Palestine Summary of Rebuttal AERMOD Results.xlsx.**"

The air model results using the EPA hazardous waste dioxin emission factors presented a strong relationship with the concentration of contamination around the facility demonstrating they were appropriately applied. The summarized results of the point, area, line, and volume source air models ran using Dr. Love's recommended emissions factors are available in the supplemental file "**Dr. Love's Emission Factor AERMOD Results.xlsx,**" the control variables and source terms are available in the supplemental file **"East Palestine Dr. Love's Emissions Factor AERMOD Control and Source Terms.xlsx.**"

3.6.2 Pressure Release Device Actuation Model Results

To address the criticism of modeling the pressure release device actuation as 10% of the total VCM mass, I conducted an air model in which the pressure release device actuation event consisted of 5% of the total VCM mass lost. Additionally, to address the critique of modeling the PRD event at 723.15K (450℃), a temperature used to capture cooling flame during the de novo synthesis, a model was conducted with the temperature of 1273K for the PRD events. The average results are presented in **Table 3-5** below.

Table 3-5. Sensitivity Analysis of the Material Burned and Temperature of the Pressure Release Device Actuation (PRD) Results Showing the Percent Change in Deposition

Material Burned During PRD (kg)	32,165	16,082
% Change	100%	81%
Temperature (K)	723.15	1273
% Change	100%	88%

The raw results, control variables and source terms for these runs are available in the supplemental file, "**Pressure Relief Device Sensitivity Analysis.xlsx.**"

4 Rebuttal to Mr. Lunsford

4.1 Polymerization Criticisms

Mr. Michael Lunsford claims that I incorrectly characterize Norfolk Southern and its contractors as having concluded that the VCM in the tank cars was polymerizing.[60] He asserts that responders had not reached a definitive conclusion; rather, they viewed polymerization as one of several potential factors that could lead to catastrophic car failure.[61]

This criticism overstates the importance of early uncertainty and ignores the stronger technical evidence available before the vent-and-burn. Oxy Vinyls stated that during three separate discussions with Norfolk Southern and its contractors, it communicated its conclusion that the stabilized VCM was not polymerizing.[62] Oxy Vinyls also explained that an exothermic polymerization reaction has a distinct temperature profile marked by rising and sustained high temperatures, and that temperature data collected on February 5th and 6th showed the VCM tank cars were stable and trending down.[63] Mr. Lunsford further contends that Steve Smith, Oxy Vinyls technical manager, stated that the derailed cars "could be polymerizing" and argues that this undermines my conclusion that Oxy Vinyls repeatedly advised that polymerization was not occurring.[64] Mr. Lunsford is not correct in his critique, misrepresents the testimony in this case, and his criticism is not supported by the other evidence at hand. Additionally, Mr. Smith's preliminary observation that cars "could" polymerize does not change this conclusion.

Mr. Smith testified that polymerization was outside his area of expertise and that he could not provide meaningful polymerization input until he spoke with the Oxy Vinyls personnel in Dallas.[65] After those discussions, Mr. Smith testified that Oxy Vinyls communicated that it ***did not see*** obvious polymerization because there was no indication of a runaway reaction occurring.[66] When asked whether there was "mixed messaging" that Oxy Vinyls did not feel polymerization was occurring, Mr. Smith stated that he did not think there was any mixed messaging and that was not Oxy Vinyls' intent to give mixed

[60] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. Opinion 129. PDF Pages 29-30.
[61] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Pages 27-30.
[62] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Pages 25-24.
[63] Id. PDF Page 24 and PDF Page 26-27.
[64] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Pages 27-30.
[65] National Transportation Safety Board. Interview Transcript: *Steve Smith, VCM Technical Manager, OxyVinyls, LP.* NTSB; April 27, 2023:10-14. Group G, Exhibit 7, Docket No. DCA23HR001. (PDF Pages 11-15)
[66] Id. Page 14 (PDF Page 15)

messaging.[67] Oxy Vinyls also explained that VCM cannot polymerize without an initiator, that no initiator was present in the five VCM railcars, and post-incident testing found no PVC in the railcar samples.[68]

Mr. Lunsford's fallback argument that polymerization was only "one factor" also does not undermine my environmental and toxicological opinions. Even if Norfolk Southern and its contractors also considered tank-car damage, fire exposure, or structural-integrity concerns, the environmental consequence remains the same. The five vinyl chloride tank cars were not initially breached by derailment damage, and all five were later intentionally punctured during the vent-and-burn operation.[69]

Because the tanks were cooling and polymerization was not occurring, the unreasonably aggressive decision to breach the tank cars with explosives and ignite the contents intentionally created an uncontrolled, open-air chemical fire. The United Nations Environment Programme (UNEP) standardized toolkit explicitly classifies this type of low-technology, uncontrolled, batch-type open burning as a worst-case scenario for the massive generation of highly toxic polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs).[70] Had Norfolk Southern and its contractors properly evaluated the cooling temperature trends and avoided the vent-and-burn, the catastrophic combustion of bulk vinyl chloride monomer and the subsequent widespread deposition of persistent free radicals and dioxins across the East Palestine community, and Plaintiffs' properties, would never have occurred.[71]

4.2 Opinion 258 Rebuttal

Mr. Lunsford argues that my opinion overstates Oxy Vinyls' certainty regarding polymerization. He contends that Oxy Vinyls provided conflicting information about whether VCM could polymerize when exposed to heat from pool fires.[72] Additionally, Mr. Lunsford argues that because Oxy Vinyls was not involved in response decision-making and lacked emergency response expertise, its technical input should not override Norfolk Southern's judgment.[73] Finally, he suggests that other risk factors such as

[67] Id. Page 19 (PDF Page 20).
[68] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 20-21.
[69] National Transportation Safety Board. *Investigative Hearing of: Norfolk Southern Railway Train Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023*. NTSB; June 22, 2023:29. Railroad Investigation Report, Docket DCA23HR001. PDF Page 29.
[70] United Nations Environment Programme. *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases.* UNEP; December 2005. PDF Pages 53 and 144.
[71] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025. Pages 733-734.
[72] Lunsford M. *Expert Report of Michael Lunsford.* CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. Page 61. (PDF Page 64).
[73] Ibid.

tank-car damage and fire exposure could justify concern about catastrophic failure regardless of polymerization.[74] I do not agree with these speculative arguments and find them not supported by the evidence in this case.

I do not dispute that Oxy Vinyls was not the Incident Commander and did not approve the vent and burn. However, that does not diminish the relevance of its technical input or how Norfolk Southern ignored that input and failed to share it with Unified Command. Oxy Vinyls manufactured the VCM and provided product-specific information, which was its core function in the response.[75] Oxy Vinyls was not offering command-level emergency direction; it was answering technical questions essential to risk assessment.[76] Whether the stabilized VCM tank cars were actually polymerizing was a key factual issue in evaluating the need for the vent-and-burn.

Finally, I do not need to resolve the polymerization debate to sustain my opinion, and this is where Mr. Lunsford's criticism misses the point. His effort to minimize Oxy Vinyls' input, whether by stressing internal conflict, Oxy Vinyls' non-decisional role, or the lab-versus-field distinction, does not address the environmental consequence of the decision that was ultimately made. Regardless of who made the final emergency-response decision, the vent-and-burn intentionally breached the VCM tank cars and caused an open-air combustion event involving chlorinated hydrocarbons.[77] My primary opinion is focused on that resulting release pathway, including the formation and deposition of dioxins, PAHs, soot-associated contaminants, and other combustion byproducts.[78]

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Mr. Lunsford claims that Norfolk Southern did not create a false sense of urgency and that the Incident Commander was not forced to make a decision in 13 minutes.[79] He argues that the Incident Commander had approximately "20 hours" to evaluate the vent-and-burn, meaning the decision was not rushed, and

[74] Ibid.
[75] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Pages 25 and 37.
[76] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 87.
[77] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Pages 78-79.
[78] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025. Pages 733-734.
[79]Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Pages 15-16.

that any timing pressure came solely from the practical safety requirements of placing explosive charges.[80]

While I do not agree with Mr. Lunsford' mischaracterization of the evidence and testimony in this case, his criticism also sorely misses the point. The issue is not simply how long the vent-and-burn option had been discussed. This issue is whether the final decision was made with complete and accurate technical information about the actual condition of the VCM cars. Oxy Vinyls' timeline states that the Incident Commander agreed to the vent-and-burn at 12:29 p.m. on February 6 after being given just 13 minutes for deliberation. The timeline also notes that the declining temperature data and Oxy Vinyls' conclusion that polymerization was not occurring were not discussed.[81] Instead, the information presented to the Incident Commander falsely indicated that the VCM was polymerizing, generating its own heat, and unstable due to the elevated temperatures — and the Oxy Vinyl's contradictory input on this speculation was not shared by Norfolk Southern with UNified Command.[82]

By pressing for a rapid final decision based on disputed polymerization and catastrophic-failure concerns, and without informing unified Command that Oxy Vinyls and the n scene measurements contradicted its vent-and-burn recommendation, Norfolk Southern and its contractors limited the Incident Commander's ability to evaluate the vent-and-burn with the benefit of a full technical record. The vent-and-burn charges were ultimately initiated at 4:37 p.m. on February 6, and the released vinyl chloride burned through the night.[83] This resulted in the synthesis of dioxins and PAHs which were subsequently released into the environment, contaminating the surrounding area.

4.4 Opinion 265 Rebuttal

Mr. Lunsford contends that my opinion is flawed for two reasons: I criticize the vent-and-burn tactic without offering a viable alternative, and I lack experience in railroad incident management and tank-car damage assessment.[84] Furthermore, he maintains that the vent-and-burn was the correct course of action because the VCM cars were damaged, pressurized, and exposed to fire—making it necessary to

[80] Ibid.
[81] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005. NTSB Docket No. 10. PDF Page 33 and 53.
[82] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005. Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 95.
[83] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 53.
[84] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Page 67.

mitigate the risk of a catastrophic failure, regardless of whether polymerization was occurring.[85] I disagree with these criticisms.

First, my opinion does not require proof that any one alternative was guaranteed to succeed; the question is whether the record supports treating the vent-and-burn as a necessity when less destructive options were identified during the response but never documented as having been evaluated and ruled out. These alternatives were not hindsight proposals because responders had already prepared to hot-tap and flare the cars, and that plan was paused only after one car behaved abnormally.[86] On February 5, crews also attempted to re-rail and move VCM car TILX 02025, which was stable at roughly 60 psig, and abandoned that effort only because of bolster damage.[87] The record itself identifies re-railing, product transfer, hot-tapping, and vent-and-burn as recognized response methods, with the vent-and-burn treated as the last option to be considered.[88]

Furthermore, the mechanical and temperature evidence does not establish imminent catastrophic failure. The five VCM cars were not breached in the derailment and remained intact until they were intentionally breached, and investigators observed no shell bulging or stretching.[89] Additionally, temperature data shows that car OCPX 80370 peaked near 138–139°F and then stabilized around 129–131°F—well below the roughly 185°F needed to reach the 247.5 psig relief-valve set point.[90] That stable-to-declining trend did not match the rising heat profile expected from polymerization.[91]

A more defensible route would have been continued cooling and monitoring while further evaluating recognized product removal options such as controlled transfer, re-railing, control venting or moving a structurally sound car to a safer unloading point. For those reasons, the vent-and-burn was not justified as a necessary last resort and it was a substantially contributing action that caused dioxins and other combustion byproducts to be released into the surrounding community.

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[85] Ibid.

[86] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 82.

[87] Id. PDF Page 86.

[88] Id. PDF Page 85.

[89] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 46.

[90] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board. November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 27-28.

[91] Ibid.

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Mr. Lunsford's next criticism improperly narrows the expertise required to evaluate the vent-and-burn. He argues that Plaintiffs' experts lack specialized experience in railroad hazardous material transportation, tank-car damage assessment, and derailment emergency response tactics.[92] That criticism does not fairly or accurately describe the opinions I offer. I am not offering opinions as a railroad incident commander or tank-car damage specialist. My opinions concern the foreseeable environmental and public health consequences of the vent-and-burn, including chemical fate and transport, combustion byproducts, dioxin and furan formation, air dispersion, deposition, exposure pathways, and contamination impacts.

Those subjects fall squarely within my expertise. I am an environmental chemist with more than 25 years of experience in evaluating hazardous pollutants, contaminated sites, exposure pathways, historical dose reconstruction, and air-modeling.[93] I have evaluated hazardous pollutants and hazardous-substance contamination in soil, dust, water, and air, and my work has included dioxins and furans, PAHs, volatile and semi-volatile organic compounds, PFAS, benzene, diesel particulate matter, silica, PCBs, pesticides, and heavy metals.[94] I have also relied on methodologies developed by agencies such as EPA, OSHA, ATSDR, and NIOSH, and have performed air-dispersion modeling using tools such as AERMOD, ALOHA, and BREEZE to evaluate acute and chronic inhalation risks.

My academic and authorial background further reflects this expertise. I served as a Lecturer and Adjunct Professor at the University of California, Los Angeles, where I taught environmental health and epidemiology. I also co-authored The Risks of Hazardous Waste and three volumes of the Handbook of Pollution Prevention and Cleaner Production, addressing the petroleum, wood and paper, and agrochemical industries. These are industries and subject areas involving hazardous substances, air emissions, chemical releases, pollution prevention, and human-health risk.

I am also trained and certified under OSHA's Hazardous Waste Operations and Emergency Response standard, 29 C.F.R. § 1910.120 (HAZWOPER).[95] That training included emergency-response planning, hazardous-substance safety, contaminant fate and transport, exposure pathways, OSHA regulatory compliance, hazardous-site investigation protocols, air-monitoring instrumentation, personal protective equipment (PPE), respiratory protection, decontamination procedures, chemical toxicology, and OSHA

[92] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Pages 9 and 68.
[93] Exhibit A.
[94] Exhibit A.
[95] Exhibit A.

exposure standards.[96] I do not claim that this training makes me a railroad tank-car emergency-response specialist. Rather, it is directly relevant to evaluating hazardous-substance releases, exposure pathways, emergency-response consequences, and environmental contamination.

Professionally, I also served as a Remedial Project Manager for the U.S. Navy's BRAC Program on Treasure Island.[97] In that role, I oversaw environmental testing and hazardous-pollutant cleanup activities and directed air monitoring to protect workers and nearby communities. That experience is directly relevant to evaluating hazardous-substance releases, contaminant migration, air monitoring, exposure pathways, and the environmental consequences of response actions.

Mr. Lunsford's research-output count does not undermine my qualifications. I understand hazardous substances, how they are released, how they move through the environment, and how they can create exposure and contamination.

4.6 Opinion 150 Rebuttal

Mr. Lunsford argues that the pressure relief device ("PRD") activity on the VCM tank cars showed that the cars were in a dangerous pressure condition and supports his broader conclusion that the vent-and-burn was justified for safety reasons.[98] He also criticizes plaintiffs' experts for stating that only four VCM tank cars vented through their PRDs, while other docket materials indicate that all five VCM tank cars experienced PRD activity.[99]

There is a discrepancy in the docket materials. Some references indicate that four PRDs vented during the active fire-response period, while others suggest that all five showed evidence of operation at some point after the derailment.[100] However, Norfolk Southern's own statement, recorded in the NTSB Hazardous Materials Group Chair's Factual Report, supports my identification of four VCM tank cars venting during active fire conditions.[101] At 17:50 on February 4th, NS official Robert Wood reported that

[96] Exhibit A.
[97] Exhibit A.
[98] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Page 12.
[99] Ibid.; National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB. 2023 Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 46.
[100] Ibid.; National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023:45. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 46.
[101] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report - Supplemental: Norfolk Southern Railway Train Derailment and Subsequent Hazardous Material Release and Fires, East Palestine, Ohio.* NTSB; October 25, 2023. Accident No. RRD23MR005, Docket Project No. 106864. PDF Page 7.

"4 of the 5 cars burned at different points," and that all PRDs had quit by 3 p.m., with one restarting after stopping for more than an hour.[102] The same chronology later describes responders' focus on "the four lead vinyl chloride cars" versus the separate western-most car (OCPX80370).[103]

However, whether four or five PRDs operated, the critical point is that PRD activity is not proof of a runaway polymerization reaction. The relevant question is what PRD cycling actually indicates about the tank-car pressure and structural integrity. The VCM tanks were equipped with PRDs set to discharge at 247.5 psig.[104] OxyVinyls' loading records show these cars carried substantially lower pressures, between 32 and 50 psig.[105]

Oxy Vinyls confirmed that this "cycling" is the normal functioning of a tank car's thermal-protection system, where PRDs vent pressure and reclose after normal pressure is restored.[106] Oxy Vinyls further explained that fire exposure increased internal tank pressure, causing the PRDs to open, relieve pressure, and then reclose once pressure dropped below the start-to-discharge point.[107] Thus, the PRD cycling pattern supports that the devices in the tank cars were relieving heat-driven pressure as designed; it does not establish that polymerization was occurring.[108]

Oxy Vinyls also concluded that the PRDs were appropriately sized, current on required inspections and testing, and functioned as intended during the incident by relieving internal pressure.[109] Furthermore, the company further stated that there was no objective evidence that the PRDs became plugged with polymer, and post-incident sampling found no PVC polymer in the tank- car residue samples.[110] The temperature record also supports this point. By February 6, four VCM tank-cars were measured at

[102] Ibid.
[103] Id. PDF Page 10.
[104] OxyVinyls, LP. *Email to NTSB: Temperature and Pressure Data.* National Transportation Safety Board Investigative Hearing. April 14, 2023. Docket ID: DCA23HR001. PDF Page 3.
[105] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board. November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 6.
[106] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 23.
[107] Id. PDF Pages 19-20 and 23.
[108] OxyVinyls, LP. *Email to NTSB: Temperature and Pressure Data.* National Transportation Safety Board Investigative Hearing; April 14, 2023. Docket ID: DCA23HR001. PDF Page 3.
[109] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 13.; Statement for the Record- Karenanne Stegmann. OxyVinyls — NTSB Investigation Stegmann Opening statement. February 3, 2023. PDF Page 3.
[110] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 13.

approximately 62 to 65°F, while OCPX80370 was approximately 126 to 127°F and remained stable through the afternoon before the vent-and-burn.[111]

The VCM tank cars remained intact after the derailment until they were purposefully breached with explosives during the vent-burn operation. Mr. Lunsford's PRD argument obscures the actual environmental injury; the deliberate ignition of vinyl chloride monomer in the open air, which generated and released dioxins across East Palestine.

4.7 NTSB, and Sourced, Citations

In response to Mr. Lunsford's claim that Oxy Vinyls provided conflicting information about polymerization, on page 31 of the RoseyFields original report, the conclusion said Oxy Vinyls advised that polymerization was not occurring, and the following evidence supports that: "Oxy Vinyls stated that VCM tank car temperatures did not indicate that polymerization was occurring."[112] This supports the conclusion that Oxy Vinyls' technical assessment was that the stabilized VCM was not undergoing a runaway polymerization reaction.

In response to Mr. Lunsford's criticisms regarding polymerization, on page 5 of the RoseyFields original report concluded that runaway polymerization did not occur and that the vent and burn was not necessary to prevent a runaway polymerization.[113] Oxy Vinyls' post-incident sampling supports that conclusion because no polyvinyl chloride ("PVC") was found in the railcar residue samples.[114] Since PVC is the polymerized form of VCM, the absence of PVC proves that polymerization did not occur.[115] Therefore, the vent and burn was not required to prevent a runaway reaction.

In response to Mr. Lunsford's argument that Norfolk Southern's contractors reasonably suspected polymerization based in part on the pressure relief device behavior, page 30 of the RoseyFields report

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[111] OxyVinyls, *LP. Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio.* National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 93.

[112] OxyVinyls, LP. *Party Submission: Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio*. National Transportation Safety Board; November 2023. Accident No. RRD23MR005, NTSB Docket No. 10. PDF Page 50.; East Palestine Report PDF Page 30.; Lunsford M. *Expert Report of Michael Lunsford.* CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Page 8.

[113] Lunsford M. *Expert Report of Michael Lunsford.* CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Page 27.; East Palestine Report PDF Page 5.

[114] National Transportation Safety Board. *Hazardous Materials Group Chair's factual report, Norfolk Southern Railway train 32N derailment, East Palestine, Ohio*. NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, Docket Project No. 106864. PDF Page 29.

[115] National Transportation Safety Board. *Hazardous Materials Group Chair's factual report, Norfolk Southern Railway train 32N derailment, East Palestine, Ohio*. NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, Docket Project No. 106864. PDF Page 27.

explains that contractors interpreted PRD activity as evidence of runaway polymerization.[116] This statement is supported by the Hazardous Materials Group Chair's Factual Report, which states: "In the early morning of February 5, the frequency of pressure relief device opening slowed down and abruptly stopped, leading Norfolk Southern to believe that dangerous polymerization was occurring in the tank cars and caused the pressure relief device to become plugged." [117]

In response to Mr. Lunsford's defense of the incident command decisions, on page 31 of the RoseyFields April 6th, 2026 original report, the conclusion said the incident commander was given approximately 13 minutes to decide whether to proceed with the vent and burn.[118] This statement is supported by the Incident Commander's account that the SPSI president and SRS project manager told him he had only 13 minutes to decide because they wanted to begin the vent-and-burn at 3:00 p.m.[119] This recounts the Incident Commander's direct interview testimony regarding the 13-minute ultimatum, anchoring the conclusion in witness statements.

Additional sources and information about the train derailment timeline are included in **Exhibit E**.

[116] Lunsford M. *Expert Report of Michael Lunsford*. CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Pages 37-38 ; East Palestine Report PDF Page 30.
[117] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio*. NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 77.
[118] Lunsford M. *Expert Report of Michael Lunsford.* CeramFab, Inc. v Norfolk Southern Corp, Civil Action No. 4:23-CV-02206-BYP. 2026. PDF Page 9. East Palestine Report PDF Page 31.
[119] National Transportation Safety Board. *Interview Transcript: Keith Drabick, Chief, East Palestine Fire Department.* NTSB; February 16, 2023. Accident No. RRD23MR005, Group G - Exhibit 1. PDF Page 16.

5. Rebuttal To Dr. Love

5.1 Opinions 1 and 2 Rebuttal

Dr. Love claims that, following stabilization of environmental releases from the February 3, 2023 derailment and the lifting of evacuation orders on February 8, 2023, no environmental data demonstrate a potential human health risk to workers at the CeramFab or CeramSource/WYG facilities located at either 900 East Taggart Street or 193 North James Street in East Palestine from derailment-related substances.[120] They further contend that I improperly "inflate" calculated soil concentrations for both PAHs and dioxins by assigning non-detect ND analytes a value equal to one-half the analytical detection limit.[121] Dr. Love asserts that substitution of one-half the detection limit may be acceptable when evaluating naturally occurring background compounds, but argues that I improperly attribute all substituted concentrations to derailment-related contamination, thereby overstating potential risk and mischaracterizing the significance of non-detect results.[122] These criticisms are without merit.

The ND = ½ used here are a result of the available EPA and Norfolk Southern data being downloaded or provided following data manipulation.[123] The available data from the EPA was presented as ND = MRL and Norfolk Southern data as ND= ½. As such, I did not misrepresent or inflate their data; instead, the plaintiff sampling data could be analyzed as ND = ½ or ND = MRL. Such an adjustment in data analysis would likely result in increased concentrations in my report. Therefore, my conclusions remain the same and any normalization of the "inconsistencies" would likely result in an increased average concentration of analyzed plaintiff sampling.

Dr. Love's criticism of the use of non-detect ("ND") substitution improperly assumes that an analyte reported below the laboratory detection limit is equivalent to a true zero concentration. In environmental risk assessment, however, a non-detect does not establish the absence of contamination. Rather, the detection limit represents the lowest concentration that can be reliably distinguished from zero, but not necessarily quantified with acceptable precision. Accordingly, concentrations may still be present below the analytical detection limit.[124] The non-zero nature of a ND creates a layer of uncertainty, which is why ND = ½ is may be used.

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[120] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Pages 44, 81.
[121] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Pages 77-80, 96, 101.
[122] Ibid.
[123] U.S. Environmental Protection Agency. Phase One Residential, Commercial, and Agricultural Soil Sampling Results. US EPA; 2025.
[124] United States Environmental Protection Agency, Region 3 Hazardous Waste Management Division. *Regional Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments*. Philadelphia, PA: Office of Superfund Programs; 1991. Regional Technical Guidance Manual, Risk Assessment. Updated August 20, 2025. PDF Page 1-2.

Regulatory and risk assessment guidance recognizes that assuming non-detects equal zero may be "unduly optimistic", particularly for hazardous substances capable of presenting health risks at concentrations below laboratory detection limits. As a result, substitution methodologies such as assigning non-detects a value equal to one-half the detection limit ("DL/2") are employed where professional judgment and site conditions support the conclusion that contaminants may reasonably be present below the detection limit. The DL/2 approach reflects the assumption that concentrations between zero and the detection limit may exist and that, on average, non-detect values may reasonably approximate one-half the detection limit.[125]

5.2 Opinion 3 Rebuttal

Air:

Dr. Love improperly equates the absence of widespread exceedances in VOC emergency-response air monitoring data to evidence that no derailment-related hazardous exposures occurred.[126] I disagree because the monitoring program was limited in scope and was not designed to comprehensively characterize all contaminants, locations, exposure durations, or transient release events associated with the derailment, fires, vent-and-burn operation, and cleanup activities.

The monitoring primarily focused on selected indicator compounds and acute-response screening thresholds intended to support emergency management decisions, not to reconstruct all potential community exposures. Air monitoring data only reflects the compounds measured, the timing and duration of sampling, the instrument detection limits, and the specific monitoring locations. As a result, short-duration concentration spikes and localized plume impacts could have occurred outside monitored areas or between sampling intervals without being captured.

I also disagree with Dr. Love's dismissal of community odor reports. Numerous volatile organic compounds and combustion byproducts associated with petrochemical fires have odor thresholds at or below concentrations capable of causing irritation and other acute sensory effects. For example, acrolein, which is a combustion byproduct formed during the burning of gasoline, oil, plastics, and other organic materials, is described by ATSDR and NIOSH as having a strong, pungent odor and being a potent eye and respiratory irritant at very low concentrations. ATSDR states that acrolein is released from "smoke from a fire" and from the burning of gasoline, oil, wood, and plastics, while toxicological

[125] Ibid.

[126] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Page 105.

literature reports an odor threshold below 0.1 ppm and irritation effects occurring at similarly low concentrations.[127]

While odor alone does not quantify exposure, contemporaneous odor complaints during documented chemical releases and visible smoke impacts are consistent with the migration of derailment-related airborne contaminants into nearby communities.

Soil:

Dr. Love relies on the EPA and Arcadis Phase I Soil Investigation to argue that "no discernable impacts from Derailment fires had occurred via deposition of airborne soot, ash, and byproducts of combustion," and to claim that all measured SVOC and dioxin/furan concentrations were within anthropogenic background ranges or otherwise unrelated to the derailment.[128] I disagree because those conclusions depend on the unsupported assumption that the designated "background" soils surrounding East Palestine were themselves unaffected by derailment-related airborne deposition.

I did not ignore the EPA and Arcadis soil data; rather, I conclude that the sampling design is fundamentally flawed because the uncontrolled fires and vent-and-burn created a large, dynamic smoke plume capable of dispersing fine particulate combustion byproducts in multiple directions over a broad area. EPA selected "background" sampling locations based on the assumption that the plume traveled predominantly southeast toward the evacuation zone.[129] However, available meteorological data demonstrate shifting and conflicting wind directions during the incident, undermining the assumption that nearby "background" areas remained unaffected by plume transport and deposition.

The EPA "background" soil samples yielded an average concentration of approximately 6.7 pg TEQ/g soil, while sixteen background samples collected independently by Stephen Petty averaged approximately 2.3 ng TEQ/kg.[130] The elevated concentrations measured in EPA-designated background locations are consistent with the possibility that these areas themselves experienced derailment-related deposition, thereby masking the true magnitude of contamination gradients attributable to the incident.

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[127] Agency for Toxic Substances and Disease Registry (ATSDR). Acrolein - ToxFAQs. U.S. Department of Health and Human Services. Published April 2025. PDF Pg. 1.; National Research Council. *Acute Exposure Guideline Levels for Selected Airborne Chemicals: Volume 8*. Washington, DC: National Academies Press; 2010. PDF Pg. 31-33.

[128] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Page 107.

[129] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

[130] United States Environmental Protection Agency. *Summary of Phase 1 dioxin results for the East Palestine derailment incident*. September 14, 2023. PDF Page 5.

Petty's Background Dioxin Soil Samples Rd 1 ng/kg: (ND=0 & ND=½)

Total TEQ using 50% DLs	Total TEQ using 0% DLs
2.3	2.3
1.9	1.9
2.5	2.5
1.5	1.5
2.6	2.6
2.2	2.2
2.3	2.3
2.1	2.1
2.5	2.5
2.7	2.7
2.3	2.3
2.4	2.4
2.2	2.2
2	2
2.5	2.5
2.6	2.6

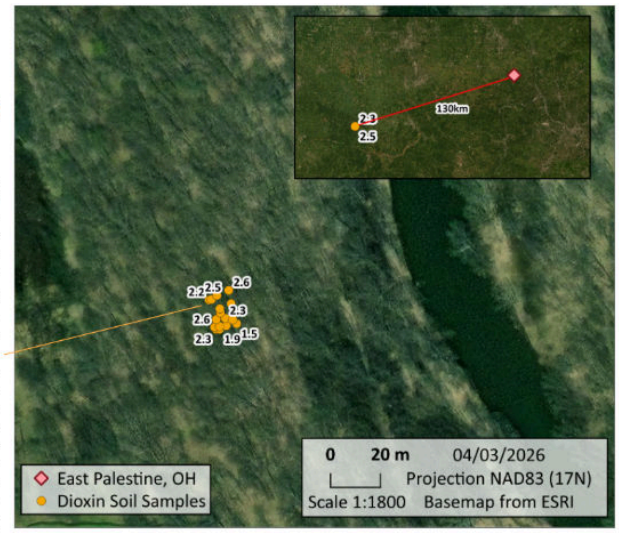

Figure 5-1. Petty's Background Dioxin Soil Samples

I further note that EPA's dismissal of certain elevated results as unrelated "outliers" based primarily on land use, roadway proximity, or lack of a clear spatial pattern does not establish that deposition did not occur in those areas. In complex fire events with highly variable meteorology, plume behavior and deposition patterns are often irregular and nonuniform.

Additionally, recent findings by *Lard et al.* reported statistically significant correlations between environmentally persistent free radicals ("EPFRs") and dioxin/furan congeners in soils surrounding the derailment area. The authors concluded that combustion of vinyl chloride and other chemicals in the presence of transition-metal oxides likely contributed to the formation of hazardous combustion byproducts, including dioxins and furans.[131] The study specifically noted that pentachlorinated congeners strongly correlated with mechanisms associated with vinyl chloride combustion. In my opinion, these findings are inconsistent with Dr. Love's conclusion that no meaningful airborne deposition impacts occurred outside the derailment site.[132]

Finally, I disagree with Dr. Love's reliance on localized soil remediation activities as evidence that community exposures were fully addressed. Concerns were raised regarding whether contaminated soils were covered or filled during rapid rail-line reconstruction activities, potentially leaving residual contamination subject to ongoing resuspension and redistribution within the community.

[131] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3). PDF page 1.
[132] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3). PDF page 1.

5.3 Opinion 4 Rebuttal

5.3.1. Opinion 4 Part 1

Next, Dr. Love incorrectly argues that air dispersion modeling is a far less reliable technical approach compared to real-world sampling.[133] He asserts that relying on numerical models over the extensive physical soil datasets generated by the EPA violates standard environmental practices and renders dispersion models completely unnecessary.[134] I utilize air dispersion models because relying exclusively on physical, static soil sampling grids frequently fails to capture the transient, widespread deposition of bioaccumulative toxins resulting from uncontrolled fires.

The intense thermal updrafts from the initial fires and the vent and burn created massive, buoyant plumes that acted as vertical pumps, drawing in air and expelling invisible plumes of fine, highly toxic particulate matter radially across the community.[135] Atmospheric dispersion modeling, calibrated to the exact temperature windows where de novo dioxin synthesis occurs during plume cooling, is a necessity to accurately map the widespread, multidirectional deposition of these combustion aerosols.[136]

During the incident response, independent scientists cautioned the EPA that the assumption of "dilution is the solution to pollution" is fundamentally flawed. The combustion byproducts of vinyl chloride are potent bioaccumulators that rapidly migrate through the food web and impact ecological systems across a broad area, meaning that physical point-sampling can easily miss the full geographic footprint. Additionally, as previously discussed in response to Dr. Love's Opinion 2, the conclusions presented by the EPA are based on sampling conducted following the derailment event and fire, which contributed to widespread contamination of the area.

Dr. Love claims that I attribute all dioxins and PAHs measured in the soil to derailment activities. I did not attribute all dioxins and PAHs measured in soil to derailment activities, rather I compared soil results to Regional Screening Levels (RSLs) and I recognized that there are trace levels of dioxin and PAH contamination.

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[133] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Page 109.
[134] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Page 109.
[135] US EPA 2004. AERMOD Model Formulation. US EPA. 2004.; Seitz et al. 2023. Atmospheric turbulence observed during a fuel-bed-scale low-intensity surface fire. Geophys Res Atmos. 2023.; Heilman et al. 2023. Turbulent momentum flux behavior above a fire front in an open-canopied forest. Int J Wildland Fire. 2023.
[136] Addink R. Role of inorganic chlorine in the formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on incinerator fly ash. *Environ. Sci. Technol. 1998, 32, 21, 3356–3359.*; Addink 2000. Formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on municipal solid waste incinerator fly ash using $NA^{37}Cl$. Chemosphere. 44(2001), 1361-1367.

Second, Dr. Love criticizes my methodology for failing to distinguish the derailment contamination from historical industrial background sources. He argues that I improperly attributed pre-existing trace chemicals in the soil to the Norfolk Southern incident. Studies evaluating routine polyvinyl chloride (PVC) and vinyl chloride monomer (VCM) manufacturing facilities demonstrate extremely low baseline environmental releases of dioxins into the surrounding air and soil.[137] A peer-reviewed study also analyzed soil samples surrounding the East Palestine derailment site and found elevated levels of EPFRs and dioxin/furan toxic equivalence (TEQ) near the derailment area compared to background levels.[138] The study hypothesized that the combustion of chemicals, including vinyl chloride, in the presence of transition-metal oxides from the train, tracks, and soil minerals were conducive to the formation of hazardous byproducts including EPFRs, dioxins, and furans.[139] The study offers insights into the formation mechanisms of dioxins and highlights the environmental health impacts of the derailment and associated combustion.[140]

A comparison of background levels of Dioxins and PAHs in literature also show elevated levels of both in the East Palestine area. Tables 6-1 and 6-2 in my April 6, 2026 report present the Dioxin and PAH results from the datasets analyzed in the report. Additionally, a literature review of background dioxin data in the US shows that rural background concentrations of dioxins are:

1. Rural background dioxin concentrations in U.S. soils ranged from approximately 0.1 to 22.9 ng/kg TEQ, with mean concentrations typically falling between 1.1 and 7.1 ng/kg TEQ.[141]
2. Soil sampling conducted as part of a Midwest soil survey reported urban concentrations ranging from approximately 2.2 to 7.6 ng/kg TEQ, with a mean concentration of 4.1 ng/kg.[142]
3. A 1996 U.S. Environmental Protection Agency study conducted in the Columbus area reported rural background concentrations with a mean TEQ concentration of 1.0 to 2.0 ng/kg TEQ in samples collected 28 miles from the Columbus Waste to Energy incinerator.[143]

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[137] Carroll WF, et al. Characterization of emissions of dioxins and furans from ethylene dichloride (EDC), vinyl chloride (VCM) and polyvinylchloride (PVC) facilities in the United States. *Chemosphere*. 1998 Oct-Nov;37(9-12):1957-72.

[138] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3):729-740.

[139] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3):729-740.

[140] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3) PDF page 1.

[141] Urban JD, Wikoff DS, Bunch AT, Harris MA, Haws LC. A review of background dioxin concentrations in urban/suburban and rural soils across the United States: implications for site assessments and the establishment of soil cleanup levels. *Sci Total Environ*. 2014;466-467:586-597. PDF Page 3, 10.

[142] Urban JD, Wikoff DS, Bunch AT, Harris MA, Haws LC. A review of background dioxin concentrations in urban/suburban and rural soils across the United States: implications for site assessments and the establishment of soil cleanup levels. *Sci Total Environ*. 2014;466-467:586-597. PDF Page 4.

[143] US Environmental Protection Agency, Region 5. *Columbus Waste-to-Energy Municipal Incinerator Dioxin Soil Sampling Project*. EPA Region 5; April 1996. NEPIS document 905R96018. PDF Page 16.

4. Steve Petty suggests the background of 2.3 ng TEQ/kg for dioxin.

Table 5-1: Dioxin Soil Sampling Results (ng-TEQ/kg): ND=0

Dioxin Soil Sampling Results (ng-TEQ/kg): ND= 0*												
	CeramFab	CF Within 25m Result	WYG	East Palestine General Area	#1 Petty	#2 Petty	#3 GEL	#4 Smith Soil + Sediment	EPA	Norfolk Southern (all)	EPA 2023 Background	Petty Background
Sampling Period	2/27/26 to 3/19/26	2/27/26 to 3/19/26	2/28/23 to 3/19/26	3/21/23 to 3/19/26	07/2023 to 12/2023	02/2023 to 04/2023	02/2023 to 03/2023	02/2023 to 03/2026	01/2024 to 05/2024	03/2023 to 04/2023	-	-
Sample Size (n)	5	16	3	105	98	36	18	74	4	262	25	16
Average	14	355	35	74	8	38	20	83	10	17	6.7	2.3
Max	22	2,063	60	2,063	46	378	94	2,063	15	670	-	2.7
95% UCL	20	659	72	121	10	61	30	79	15	23	-	2.4
Residential Soil RSL (ng-TEQ/kg)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Occupational Soil RSL	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6
% of Samples > Residential RSL	100%	88%	100%	69%	49%	86%	89%	47.3%	100%	46%	-	0%
UCL Divided by Residential RSL	**4.2**	**137.3**	**14.9**	**25.3**	**2.1**	**12.7**	**6.2**	**16.4**	**3.1**	**4.9**	-	0.50
UCL Divided by Occupational RSL	**0.9**	**30.5**	**3.3**	**5.6**	**0.5**	**2.8**	**1.4**	**3.6**	**0.7**	**1.1**	-	**0.1**

*EPA data is ND=MRL., Norfolk Southern is ND=0.5*LOD

Table 5-2: PAH Soil Sampling Results (ng-TEQ/kg): ND=0

PAH Soil Sampling Results (ND=0) (µg/kg)								
	CeramFab	CF Within 25m Result	WYG	East Palestine General Area	#1 Petty	#2 Petty	#3 GEL	#4 Smith Soil + Sediment
Sampling Period	2/27/26 to 3/19/26	2/27/26 to 3/19/26	2/28/23 to 3/19/26	3/21/23 to 3/19/26	07/2023 to 12/2023	02/2023 to 04/2023	02/202 to 03/2023	03/2023 to 03/2026
Sample Size (n)	5	17	3	90	98	23	18	72
Average	403	1361	1146	1445	1154	1032	1337	1361
Max	1053	15698	1779	29,170	12307	5293	18463	29170
UCL	789	2576	2108	2,142	1537	1653	3093	2150
Residential Soil RSL (µg=TEF/kg)	110	110	110	110	110	110	110	110
Occupational Soil RSL (µg=TEF/kg)	2110	2110	2110	2110	2110	2110	2110	2110
% of Samples > Residential RSL	**80%**	**88%**	**100%**	**75.56%**	**69.39%**	**65.22%**	**66.67%**	**70.83%**
95 %UCL/ Residential RSL	**7.2**	**23.4**	**19**	**19**	**14**	**15**	**28**	**20**
95 %UCL/ Occupational RSL	**0.4**	**1.2**	**1.0**	**1.0**	**0.7**	**0.8**	**1.5**	**1.0**

The highest concentrations of total PAHs in typical rural, agricultural, and urban soils are 1.7 ppm, 2.4 ppm, and 582 ppm, respectively.[144] Benzo(a)pryene is one of the most toxic and well-studied PAHs and is commonly used as an indicator compound for assessing the carcinogenic potential of PAH mixtures due to its strong association with cancer risk. Background levels for Benzo(a)pyrene are typically 0.002 to 1.3 mg/kg in rural soils, 0.005 to 0.90 mg/kg in agricultural soils and 0.165 - 0.220 mg/ kg in urban soils.[145]

In addition, a study from the Massachusetts Department of Environmental Protection established a generic background BaP levels at 2 mg/kg for 'natural' soils.[146] Another study of urban soils in the northeastern US reported an upper 95% confidence interval of approximately 25 mg/kg for total PAHs, with mean concentrations around 18 mg/kg. [147] It also established an interval of 3.3 mg/kg for total BaP toxic equivalents.[148] Another study by the Ohio Department of Health conducted specific background evaluations including soil samples from public rights-of-way in rural areas, and exhibited a BaP equivalent concentration of 1.49 mg/kg.[149]

Background levels of PAHs and Benzo(a)pyrene are shown here, which are lower than concentrations of BAPeqs seen in the impacted area:

Table 5-3: Summary of Benzo(a)pyrene Soil and Sediment Sampling from Literature Review

Source	Location	Land Use Type	PAH(s) Measured	Concentration (mg/kg)
Ohio Department of Health 2000	United States (general background)	Rural	Total PAHs	1.7
Ohio Department of Health 2000	United States (general background)	Agriculture	Total PAHs	2.4
Ohio Department of Health 2000	United States (general background)	Urban	Total PAHs	582
ATSDR 1995	United States (general background)	Rural	Benzo(a)pyrene	0.002 - 1.3
ATSDR 1995	United States (general background)	Agriculture	Benzo(a)pyrene	0.005 - 0.90
ATSDR 1995	United States (general background)	Urban	Benzo(a)pyrene	0.165 - 0.220
Massachusetts DEP 2002	Massachusetts	Rural	Benzo(a)pyrene	2
Bradley et al. 1994	New England (Regional)	Urban	Benzo(a)pyrene	3
Bradley et al. 1994	New England (Regional)	Urban	Total PAHs	25
Ohio Department of Health 2011	Sandusky County, Ohio	Rural	Benzo(a)pyrene	1.49

[144] Ohio Department of Health, Health Assessment Section, under cooperative agreement with the Agency for Toxic Substances and Disease Registry. *Health Consultation: Baker Wood Creosoting, Marion, Marion County, Ohio.* Public Health Service, Agency for Toxic Substances and Disease Registry. September 28, 2000. PDF Pg. 6.

[145] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services, Public Health Service; August 1995. PDF Pg.280.

[146] Massachusetts Department of Environmental Protection. *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil*. Boston, MA: Office of Research & Standards; May 2002. PDF Pg. 5.

[147] Bradley, L. J. N., Magee, B. H., & Allen, S. L. (1994). Background levels of polycyclic aromatic hydrocarbons (PAH) and selected metals in New England urban soils. Journal of Soil Contamination, 3(4), 349–361. PDF Pg.6.

[148] Bradley, L. J. N., Magee, B. H., & Allen, S. L. (1994). Background levels of polycyclic aromatic hydrocarbons (PAH) and selected metals in New England urban soils. Journal of Soil Contamination, 3(4), 349–361. PDF Pg.11.

[149] Health Assessment Section, Ohio Department of Health. *Health Consultation: Evaluation of Ohio EPA Soil Sampling in Support of the Clyde and Eastern Sandusky County Childhood Cancer Investigation*. Columbus, OH: Ohio Department of Health; July 28, 2011. PDF Pg.30.

Furthermore, peer-reviewed literature confirms that advanced dispersion modeling maintains an acceptable degree of correlation and provides high stability and reliability for predicting long-term deposition.[150] Air quality models provide a deterministic relationship between emissions, meteorology, and the spatial distribution of pollutants, serving as a critical tool to fill exposure gaps for locations situated outside the immediate processing or crash zone that were not thoroughly sampled during the acute phase.

Finally, my atmospheric dispersion modeling is directly validated by empirical field data. Peer-reviewed soil sampling studies conducted in the aftermath of the East Palestine derailment demonstrate statistically significant positive correlations between environmentally persistent free radicals (EPFRs) and highly toxic pentachlorinated dioxin and furan congeners dispersed widely into the surrounding soils beyond the immediate crash site.[151] This validates the use of the dispersion model to capture the true geographic extent of the plume.

5.3.2. Opinion 4 Part 2

Dr. Love argues that my meteorological analysis is unreliable because it relied on a single year of off-site meteorological data rather than five years of representative on-site data allegedly required under Appendix W to the USEPA Guideline on Air Quality Models. Dr. Love further contends that the manual substitution of surface and profile wind data into AERMET-processed files "breaks physical consistency" and produces meteorological conditions that allegedly could not exist in the atmosphere. According to Dr. Love, use of calendar year 2023 meteorological data improperly prioritizes temporal coincidence with the derailment over long-term representativeness and therefore fails to satisfy EPA dispersion modeling guidance applicable to AERMOD. Dr. Love incorrectly conflates regulatory permitting guidance with forensic reconstruction modeling.

This criticism mischaracterizes both the purpose of the modeling and the flexibility permitted under EPA guidance. Appendix W does not establish an absolute requirement that all AERMOD applications utilize five years of on-site meteorological data. Rather, Appendix W recognizes that representative meteorological data may consist of either five years of National Weather Service ("NWS") data or at least one year of site-specific meteorological data, depending on the objectives and circumstances of the

[150] Omidvarborna et al. 2018. Dispersion modeling of fugitive iron particles from an iron industry on nearby communities via AERMOD. *Environmental Monitoring and Assessment*. October 2018.
[151] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3).

modeling analysis.[152] EPA guidance further emphasizes that meteorological inputs should adequately represent the conditions relevant to the modeling objective.[153]

Dr. Love's criticism improperly assumes that Appendix W requires unmodified long-term on-site meteorological data regardless of the nature of the release event being modeled. Appendix W, however, expressly states:

> "The spatial representativeness of the data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area."[154]

Thus, the priority is whether the selected and processed data reasonably represent the atmospheric conditions controlling contaminant transport during the incident.

Moreover, adjustment of the meteorological inputs was necessary to more accurately characterize the unique atmospheric conditions created by the derailment fire itself. Fires modify their local environments and cause turbulent wind that can travel in various directions that differ from routine background meteorological observations.[155] Accordingly, reliance solely on unadjusted airport or station meteorological data would fail to fully capture the dynamic plume behavior associated with the combustion event. To address this issue, the analysis incorporated multiple meteorological observations demonstrating local wind transport patterns during the release period, including adjusting local wind speed and improving the accuracy of wind data, and adjusted the processed AERMET fields to better reflect the fire-influenced dispersion environment observed during the incident.

AERMOD/AERMET does not require every meteorological variable to originate from the same airport station; the governing question is whether the final meteorological dataset is representative of transport, dispersion, and planetary boundary layer conditions at the source/receptor area. EPA's AERMOD Implementation Guide states that meteorological representativeness is evaluated by whether the data construct "realistic planetary boundary layer similarity profiles" and adequately characterize the "dispersive capacity of the atmosphere," and EPA cautions that representativeness "cannot be based

[152] U.S. Environmental Protection Agency. *Guidance for $PM_{2.5}$ Permit Modeling*. Research Triangle Park, NC: Office of Air Quality Planning and Standards, Air Quality Assessment Division; May 2014. Publication No. EPA-454/B-14-001. PDF Page 120.
[153] Ibid.
[154] Environmental Protection Agency. Guideline on Air Quality Models. 40 CFR Part 51, Appendix W to Subpart DD. Published November 29, 2024. Section 8.4.1
[155] Seitz J, et al. Atmospheric turbulence observed during a fuel-bed-scale low-intensity surface fire. Atmos. Chem. Phys., 24, 1119–1142, 2024; Heilman WE, et al. Turbulent momentum flux behavior above a fire front in an open-canopied forest. Atmosphere 2021, 12, 956.

solely on proximity."[156] AERMET is specifically designed to combine surface observations, upper-air soundings, onsite data, surface characteristics, and other meteorological inputs into AERMOD-ready files.[157] State regulatory examples confirm this practice: South Coast AQMD processes AERMOD datasets using hourly wind/temperature data from SCAQMD and ASOS stations, cloud cover and one-minute winds from ASOS, and upper-air data from Miramar, while also stating that the closest station is not necessarily the most representative station.[158]

5.3.3. Opinion 4 Part 3

Dr. Love's critique incorrectly asserts that my analysis violates AERMOD methodology by "breaking" the coupling of the AERMET system. That claim misstates both the structure of AERMOD and EPA regulatory requirements. AERMOD relies on AERMET to generate a physically consistent boundary-layer framework, including stability, turbulence scaling, and mixing height derived from surface and upper-air observations, but EPA guidance does not prohibit evaluation of alternative meteorological representativeness where station data are not spatially reflective of site conditions.[159] In this case, the AERMET-generated thermodynamic and turbulence structure, including the full profile (PFL) system and upper-air inputs controlling boundary-layer evolution, was not altered. The analysis did not reconstruct or replace the AERMET system; it retained the internally consistent meteorological framework required by AERMOD and evaluated only the representativeness of surface wind conditions during a transient, fire-influenced event.

Appendix W states that meteorological data used in dispersion modeling should be selected on the basis of spatial and climatological (temporal) representativeness and their ability to characterize transport and dispersion in the area of concern.[160] Representativeness depends on factors including proximity of the monitoring site to the modeled area, terrain complexity, site exposure, and the period of record, all of which affect whether the data adequately reflect local transport conditions and boundary-layer structure. EPA further explains that representativeness must be evaluated in terms of the suitability of the data for constructing realistic boundary-layer profiles and, where applicable, three-dimensional

[156] U.S. Environmental Protection Agency. *AERMOD Implementation Guide*. EPA-454/B-24-009. November 2024.
[157] U.S. Environmental Protection Agency. User's Guide for the AERMOD Meteorological Preprocessor (AERMET). EPA-454/B-24-005. 2024.
[158] South Coast Air Quality Management District. Meteorological Data for AERMOD Applications.
[159] U.S. Environmental Protection Agency. *Guidance for PM2.5 Permit Modeling*. Research Triangle Park, NC: Office of Air Quality Planning and Standards, Air Quality Assessment Division; May 2014. Publication No. EPA-454/B-14-001. PDF Page 119-120.
[160] US Environmental Protection Agency. *Guideline on Air Quality Models. 40 CFR Part 51, Appendix W to Subpart DD.* Published November 29, 2024. PDF Page 55.

meteorological fields used in modeling. Site-specific data are preferred when properly collected and quality assured.[161]

Within this regulatory context, Dr. Love's assertion disregards EPA's central requirement that meteorological inputs be evaluated for representativeness rather than origin alone. The incorporation of supplemental local wind observations was not a replacement of AERMET processing but an evaluation of whether the available surface wind observations adequately represented transport conditions during the period of interest. This is especially important when considering that fires modify their local environments and cause turbulent winds that can travel in various directions that differ from routine background meteorological observations.[162] This approach is consistent with EPA's directive that meteorological data be assessed for their suitability in characterizing pollutant transport between sources and receptors, provided that the resulting inputs remain compatible with model requirements and preserve the physical consistency of the modeled boundary-layer framework. I prepared four different AERMOD meteorological surface files. For three of the AERMOD surface files used in this analysis, I used the KPIT meteorological parameters while substituting the wind data with that from the corresponding local meteorological stations. The first surface file contains unaltered data from the KPIT station. I ran four different AERMOD runs, each with a unique surface file, to account for the varying wind direction and speed data.

EPA guidance provides for the use of substitution procedures and alternative meteorological observations where the primary dataset may not adequately characterize conditions relevant to the modeling analysis. EPA Guidance states that substitution procedures should be developed "to replace missing data with a 'best estimate' so as to minimize the probable error of the estimate," and identifies as acceptable procedures the "[s]ubstitution from sensors located at comparable levels at nearby locations with similar site-specific (surface-specific) characteristics."[163] The guidance further explains that application-specific procedures may be necessary depending on "the availability of alternative sources of meteorological data" and the nature of the modeling application. EPA additionally recommends the use of "site-specific wind speed measurements" and recognizes that representative transport conditions are central to meteorological processing for dispersion modeling.[164]

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[161] US Environmental Protection Agency. *Guideline on Air Quality Models. 40 CFR Part 51, Appendix W to Subpart DD*. Published November 29, 2024. PDF Page 59-60.
[162] Seitz J, et al. Atmospheric turbulence observed during a fuel-bed-scale low-intensity surface fire. Atmos. Chem. Phys., 24, 1119–1142, 2024; Heilman WE, et al. Turbulent momentum flux behavior above a fire front in an open-canopied forest. Atmosphere 2021, 12, 956.
[163] U.S. Environmental Protection Agency. *Meteorological Monitoring Guidance for Regulatory Modeling Applications*. Research Triangle Park, NC: Office of Air Quality Planning and Standards; February 2000. EPA-454/R-99-005. Pages 6-32.
[164] Id. Pages 6-31 to 6-33.

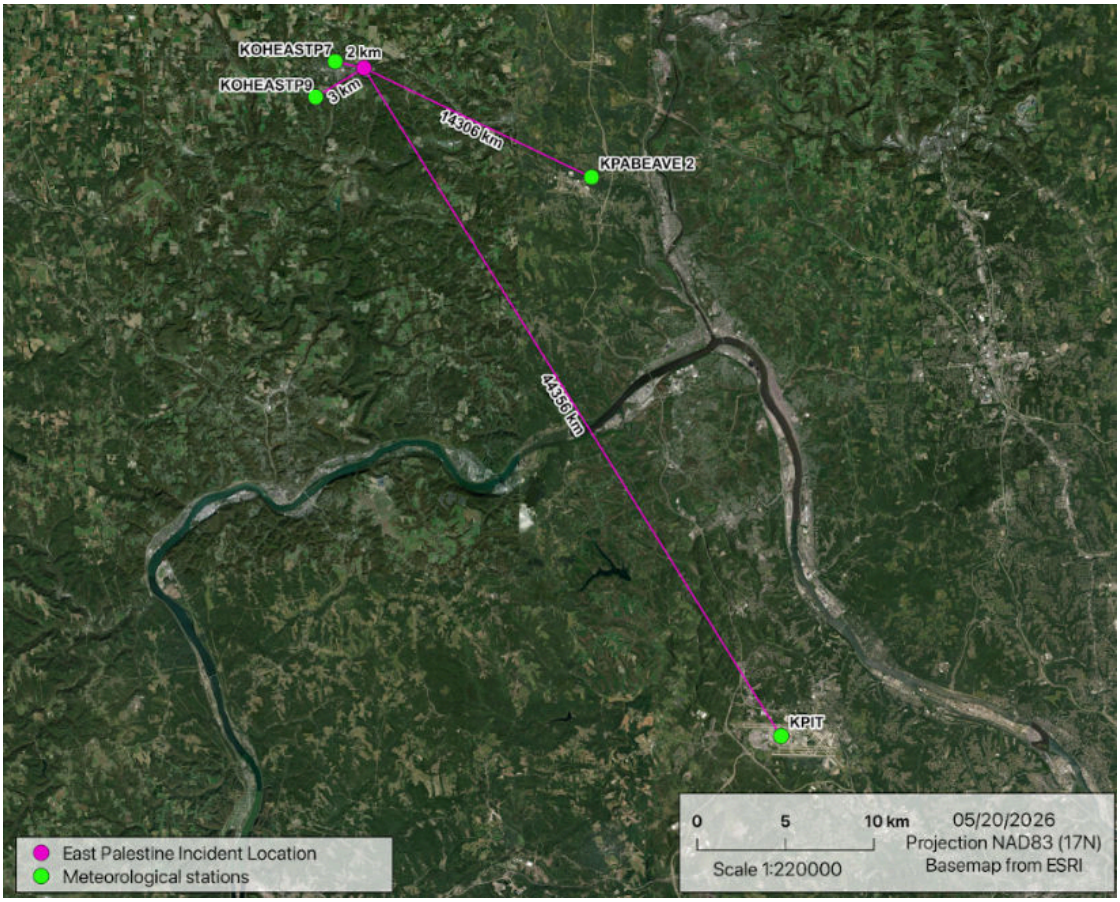

Figure 5-2. Map of Meteorological Stations Location Relative to East Palestine

Consistent with this guidance, preprocessed meteorological data were obtained from the Ohio EPA's AERMET Output Files for AERMOD Model Input using the nearest available surface and profile datasets from Pittsburgh International Airport (KPIT). Local wind observations from stations KOHEASTP7, KOHEASTP9, and KPABEAVE2 were evaluated to assess whether the more distant KPIT observations adequately represented localized transport conditions during the February 3–6, 2023 fire event. These stations are located substantially closer to the release area and provided additional site-relevant wind speed and direction information during the incident period. Atmospheric dispersion models are uniquely equipped to simulate transient boundary-layer movements over complex terrain only when properly paired with localized parameters.[165]

Peer-reviewed meteorological validation studies comparing dry deposition estimates emphasize that integrating high-resolution localized surface weather observations significantly improves a model's

[165] Tartakovsky D, Broday DM, Stern E. Comparison of dry deposition estimates of AERMOD and CALPUFF over complex coastal terrain. *Atmos Environ*. 2016;142:430-432.

computational stability and baseline capability to accurately track transient wind shears.[166] Without integrating nearby meteorological data into both the surface and profile datasets, the atmospheric model would be incapable of properly reconstructing the multi-directional plume shifts that actually blanketed the plaintiff properties and the surrounding community. Furthermore, peer-reviewed literature supports AERMOD implementation where local data are incomplete; Carbonell et al. published a methodology for using AERMOD when local meteorological, land-use, or upper-air data are incomplete, including case studies and comparison to measurement data.[167]

5.3.4. Opinion 4 Part 4

Dr. Love's next critique grossly overstates the implications of using a multi–point-source representation for a spatially distributed derailment fire and is not consistent with EPA regulatory guidance, AERMOD formulation, or established modeling practice. Under the EPA framework, modelers are explicitly permitted to use surrogate source representations (including point, area, volume, or combinations) when real-world emissions do not conform to a single idealized geometry, provided that the representation reasonably preserves total emission rate, effective release height, and relevant plume characteristics such as buoyancy and momentum.[168]

Dr. Love's assertion that a multi-point representation "exaggerate plume coherence" fails to recognize that AERMOD is scientifically appropriate for estimating near-field deposition from hot fire-related releases when the source term is represented with emission rates, release geometry, exit temperature, exit velocity, effective release height, and meteorology.[169] The strongest direct precedent is the Iowa City tire-fire study, which used AERMOD to estimate 1-hour PM2.5 smoke concentrations from an 18-day uncontrolled urban fire.[170] The methodology employed here uses defensible, multi-source approximation to map smoke dispersion and assess population exposure during large-scale fire emergencies.

Moreover, Dr. Love's assertion that multiple point sources necessarily create a "superplume" is unsupported. AERMOD independently disperses each source according to meteorology, buoyancy and source-specific parameters. The model does not mathematically "collapse" all emissions into a single source term. Notably, the EDMS literature also recognizes that certain fire-related sources continue to be

[166] Tartakovsky D, Broday DM, Stern E. Comparison of dry deposition estimates of AERMOD and CALPUFF over complex coastal terrain. *Atmos Environ.* 2016;142:430-432.
[167] Carbonell LMT, Gacita MS, Oliva JJDR, Garea LC, Rivero ND, Ruiz EM. Methodological guide for implementation of the AERMOD system with incomplete local data. *Atmospheric Pollution Research*. 2010;1(2):102-111.
[168] US Environmental Protection Agency. *Guideline on Air Quality Models. 40 CFR Part 51, Appendix W to Subpart DD.* Published November 29, 2024. Section 8.2.
[169] United States Environmental Protection Agency. Federal Register Vol. 89 2024
[170] Singh A, Spak SN, Stone EA, et al. Uncontrolled combustion of shredded tires in a landfill. *Atmos Environ*. 2015;104:273-283.

appropriately modeled as point sources. Training fires are open and unenclosed combustion events that were retained as point sources in the FAA's EDMS implementation.[171] This dispersion analysis requires specification of source height, combustion temperature, diameter and gas velocity for each fire.[172]

As discussed in the Executive Summary, the atmospheric dispersion modeling predicts where contamination released during the derailment would be expected to deposit. The analyses conducted in response to the recommendations and criticisms advanced by Dr. Love strengthened the evaluation and improved the correspondence between the atmospheric modeling and the environmental sampling data. Perhaps most importantly, the recommendations that produced the strongest agreement between the atmospheric modeling and the environmental sampling data were the very recommendations advanced by Defendants' experts. When those recommendations were incorporated into the analysis, the relationship between the modeled deposition patterns and the measured contamination became stronger, not weaker.

Dr. Love also incorrectly criticized the original source representations and suggested that alternative source geometries should be evaluated. Importantly, the alternative source geometries generally improved the correspondence between the modeled deposition patterns and the measured contamination data. Rather than weakening the conclusions of the original report, the area, line, and volume source representations recommended by Dr. Love strengthened the relationship between the atmospheric transport modeling and the environmental sampling data and provided additional support for the conclusion that the contamination observed throughout East Palestine is consistent with deposition from the derailment-related combustion events.

5.3.5. Opinion 4 Part 5

Exit Temperature

Dr. Love's criticism of the source temperature assumption improperly conflates combustion-zone temperatures with the effective thermodynamic conditions relevant to atmospheric dispersion modeling in AERMOD. AERMOD requires a representative effective release temperature associated with the portion of the plume entering atmospheric transport after entrainment and dilution have already begun. AERMOD is a steady-state Gaussian dispersion model that parameterizes plume behavior using

[171] Federal Aviation Administration. *Emissions and Dispersion Modeling System (EDMS) Reference Manual*. FAA; 1997:25. PDF Pg. 25

[172] Federal Aviation Administration. *Emissions and Dispersion Modeling System (EDMS) Reference Manual*. FAA; 1997:25. PDF Pg. 53

boundary-layer turbulence and effective plume characteristics rather than resolving detailed combustion chemistry or instantaneous flame-core physics.[173]

I calibrated the source temperature to 250°C (523.15 K in differing model phases) because established combustion chemistry confirms that dioxins are completely destroyed in the ultra-hot central core of a fire. De novo synthesis of PCDD/Fs occurs exclusively as flue gases cool into a critical reformation window between 200°C and 450°C.[174] The peer-reviewed scientific consensus establishes that de novo synthesis of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) does not occur in the flame core, but exclusively in the cooler post-combustion zones. As the flue gases and fly ash escape the flame and cool, they enter a critical temperature reformation window between 200°C and 450°C.[175] When the smoke plume of the fire cooled into the critical temperature window of 200°C to 450°C, dioxins likely formed directly on the surface of the soot particles.[176] The variable temperatures of the uncontrolled pool fire would have included the windows of 200-400 °C, and along with the presence of metal catalysts from the train, tracks, and soil, this created the necessary conditions for dioxin formation during the fire.

By setting the source parameter specifically to 250°C, I isolated the exact thermodynamic conditions at the flame tips and in the cooling smoke plume where the highly toxic dioxins were actually synthesized and released into the atmosphere. Modeling these precise flame-tip cooling parameters is needed to accurately quantify the localized generation and subsequent atmospheric deposition of these pollutants. Failing to isolate this specific temperature window would violate fundamental thermodynamic principles of dioxin synthesis and drastically underrepresent the chemical fallout on the community. Dr. Love incorrectly dismisses the relevance of the dioxin formation zone. Furthermore, I conducted a temperature sensitivity analysis, presented in Section 3, to showcase the effect different temperatures would have on the modeled deposition.

Exit Velocity

Dr. Love also argues that assigning an exit velocity in AERMOD means the derailment fire was modeled as a mechanically forced industrial stack. That is incorrect. AERMOD requires release parameters to characterize the initial upward transport of emissions for any buoyant plume source. Large fires generate

[173] US Environmental Protection Agency. *Guideline on Air Quality Models: Appendix W to 40 CFR Part 51 Appendix W to Subpart DD*. Published November 29, 2024. Section 7.2.1.1. PDF Page 39.
[174] Altarawneh et al. Mechanisms for formation, chlorination, dechlorination and destruction of polychlorinated dibenzo-p-dioxins and dibenzofurans. *Prog Energy Combust Sci.* 2009;35(3):246.
[175]Addink R. Role of inorganic chlorine in the formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on incinerator fly ash. *Environ. Sci. Technol. 1998, 32, 21, 3356–3359.;* Addink 2000. Formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on municipal solid waste incinerator fly ash using NA^{37}Cl. Chemosphere. 44(2001), 1361-1367.
[176] United Nations Environment Programme. *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases*. UNEP; December 2005. PDF Page 31.

strong convective uplift, and the assigned exit velocity was used only to represent the initial buoyant rise of the smoke plume into the atmosphere, not to impose "stack-like" behavior.

This approach is consistent with accepted regulatory and scientific practice. Ohio guidance for flare modeling recommends representing flares as point sources in AERMOD using an assumed velocity of approximately 20 m/s. Flares are an appropriate analog because they involve buoyant combustion-driven releases similar to those produced by the derailment fire.[177]

The analysis also did not rely on a single assumed velocity. A sensitivity analysis was conducted using 1, 10, 20, 30, 40, and 50 m/s, including 15–20 m/s values supported by fire-plume literature. Observational studies of large forest fires reported upward velocities exceeding 15 m/s and noted that measured values likely underestimated actual conditions near the fire base. These findings support the reasonableness of the modeled velocities.[178]

The methodology is also consistent with established AERMOD precedent for large uncontrolled fires. The Iowa City tire-fire study used AERMOD to estimate PM2.5 concentrations from an 18-day uncontrolled urban fire using similar plume approximations.[179] Likewise, FAA EDMS/AERMOD guidance models open combustion training fires as point sources requiring source height, temperature, diameter, and gas velocity inputs.[180]

Finally, AERMOD independently disperses each source according to meteorology, buoyancy, and source-specific parameters. Using an effective exit velocity does not convert the derailment fire into an industrial stack source; it is a standard and scientifically supported method for representing the initial convective transport of emissions from a large buoyant fire.

Emission Factor

Dr. Love argues that applying a worst-case hazardous waste incineration factor to largely non-hazardous materials overestimates TEQ formation and doesn't reflect best scientific practice for source assessments. I utilized the maximum UNEP emission factor (35,000 µg-TEQ/t) because the chaotic, unmitigated open-air pileup completely lacked any air pollution control systems or regulated combustion

[177] Ohio Environmental Protection Agency, Division of Air Pollution Control. *Engineering Guide #69: Air Dispersion Modeling Guidance*. Columbus, OH: Ohio Environmental Protection Agency; 2018. PDF Pg. 25

[178] Banta et al. Smoke-column observations from two forest fires using Doppler lidar and Doppler radar. *J Appl Meteorol*. 1992;31(11):1328-1349. Pg. 1342.

[179] United States Department of Transportation, Federal Aviation Administration. *Emissions and Dispersion Modeling System (EDMS) Reference Manual*. FAA; 1997:25.

[180] United States Department of Transportation, Federal Aviation Administration. *Emissions and Dispersion Modeling System (EDMS) Reference Manual*. FAA; 1997:25.

temperatures. The UNEP standardized toolkit explicitly assigns its highest tier to low-technology, uncontrolled, batch-type open burning events that lack abatement technologies, which is the exact scenario that occurred in East Palestine.[181] The derailment did not involve a controlled burn of non-hazardous waste; it involved the sustained, uncontrolled burning of bulk polyvinyl chloride (PVC) and liquified vinyl chloride monomer. Peer-reviewed empirical testing demonstrates that combusting mixed waste containing just 7.5% PVC increases dioxin toxic equivalency (TEQ) emissions exponentially, reaching massive yields of up to 8,000 ng/kg of material burned.[182]

During poorly controlled, oxygen-starved combustion, PVC acts as a massive chlorine donor. When combusted incompletely in a fuel-rich environment, vast quantities of products of incomplete combustion (PICs) are generated. These PICs survive and escape the central fire as highly reactive soot and black carbon particles.[183]

These black carbon particles provide the exact catalytic surface area needed for massive dioxin synthesis during the cooling phase of the smoke plume. Therefore, applying the highest-tier emission factor is not an exaggeration, but the most scientifically defensible representation of the uncontrolled, halogen-rich combustion conditions that actually occurred.[184]

Dr. Love presents the substantially lower emission estimates shown in **Table 5-4** as part of his criticism. As discussed in the Executive Summary, additional analyses were completed utilizing source terms derived from the methodologies brought up by Dr. Love. These analyses demonstrated that the lower source terms predict dioxin and PAH concentrations substantially below those measured throughout East Palestine. When diluted into the upper one inch of soil, the concentrations predicted using Defendants' preferred source terms are generally too low to reasonably explain the widespread contamination documented by the environmental sampling data. In contrast, the UNEP emission factors and combustion-based source terms utilized in this report produce modeled concentrations that more closely correspond to the contamination actually measured throughout the community. Accordingly, the environmental data support the source terms utilized in this report and do not support the substantially lower source terms advocated by Defendants.

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[181] United Nations Environment Programme. *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases*. UNEP; December 2005. PDF Page 48.
[182] Gullett BK, et al. Emissions of PCDD/F from uncontrolled, domestic waste burning. *Chemosphere.* 2001; 43 (2001): 721-725.
[183] Zhang M, Buekens A, Jiang X, Li X. Dioxins and polyvinylchloride in combustion and fires. *Waste Manag Res*. 2015;33(7). PDF Page 634.
[184] McKay G. Dioxin characterisation, formation, and minimisation during municipal solid waste incineration. *Chem Eng J.* 2002;86. PDF page 345.

Table 5-4. Dr. Love's Recommended Emission Rates

Source ID	Rosenfeld Emission Factor (ug-TEQ/ton)	Love Emission Factor (ug-TEQ/ton)	Rosenfeld Emission Rate (g/s)	Love Emission Rate (g/s)
EF1	35,000	10,000	33,273	11,276
EF2	35,000	10,000	33,273	11,276
EF3	35,000	10,000	33,273	9,262
EF4	35,000	35,000	33,273	37,234
EF5	35,000	100	33,273	100
EF6	35,000	35,000	33,273	20,637
EF7	35,000	10,000	33,273	11,314
EF8	35,000	10,000	33,273	11,314
EF9	35,000	1,000	33,273	1,029
EF10	35,000	1,000	33,273	951
EF11	35,000	1,000	33,273	505
EF12	35,000	10,000	33,273	9,262
EF13	35,000	10,000	33,273	10,291
EF14	35,000	10,000	33,273	10,291
EF15	35,000	35,000	33,273	35,054
EF16	35,000	10,000	33,273	11,314
EF17	35,000	10,000	33,273	11,314
EF18	35,000	100	33,273	19
EF19	35,000	10	33,273	11
EF20	35,000	100	33,273	95
EF21	35,000	100	33,273	93
PRD1	35,000	35,000	5,211	5,211
PRD2	35,000	35,000	4,608	29
PRD3	35,000	35,000	5,240	5,240
PRD4	35,000	35,000	5,182	5,182
VB1	35,000	35,000	483,632	483,632
VB2	35,000	35,000	116,492	116,492

Compound Impact

Dr. Love's re-run using substantially altered parameters (higher temperature, higher exit velocity, and modified emission rates from a different toolkit) does not demonstrate that the original inputs were "incorrect"; it demonstrates a scenario analysis with alternative assumptions. In regulatory dispersion modeling, such changes are expected to produce large shifts in predicted deposition because buoyancy-driven plume rise is highly nonlinear with respect to temperature and release conditions. The fact that alternative plausible assumptions yield different results does not invalidate the original modeling framework. Accordingly, the critique does not establish methodological error in the AERMOD setup but instead highlights expected sensitivity of a physically consistent, EPA-approved dispersion model applied to an inherently uncertain accidental release scenario.

The U.S. EPA explicitly allows engineering judgment in defining surrogate source representations under Appendix W, including the use of multiple point sources to approximate line- or area-like releases, provided that total emissions, release height, and buoyancy are preserved.[185] AERMOD produces receptor-level outputs; differences between raw output tables and summarized spreadsheets are almost always attributable to aggregation methodology (temporal averaging, receptor grouping, or post-processing transformations), not to the dispersion model physics. Without a documented chain of processing steps demonstrating identical inputs and identical post-processing logic, the claimed 26,400% discrepancy is not a valid model inconsistency. Furthermore, I conducted my own analysis, utilizing the parameters used in Dr. Love's model which is presented earlier in this report, to showcase the impacts these parameters would have on the modeled deposition.

5.3.6. Opinion 4 Part 6

Dr. Love further criticizes my conversion of modeled dioxin deposition from ng-TEQ/m² to ng-TEQ/kg as scientifically unsupported because it assumes an unrealistically thin 0.02-inch soil layer (1 kg/m²) rather than the EPA-standard 1-inch surface soil exposure zone, resulting in an approximately 50-fold overestimation of soil concentrations and falsely suggesting exceedances of the 4.8 ng/kg RSL. However, he does not provide any basis for the soil thickness calculation. There is no cited source supporting his assumption that soil bulk density is 1,785 kg/m³.

Dioxin deposition from the East Palestine fire occurred over a short time period and would not be expected to instantaneously and uniformly mix through the soil profile. The controlled burn occurred on

[185] *Meteorological Monitoring Guidance for Regulatory Modeling Applications*. Research Triangle Park, NC: US Environmental Protection Agency, Office of Air Quality Planning and Standards; February 2000. EPA-454/R-99-005. Section 6.8.1, Pgs. 6-31 to 6-33.; https://www.law.cornell.edu/cfr/text/40/appendix-W_to_part_51 - Section 8.4.4.1

February 6, 2023, at approximately 4:30 p.m., and the associated trench fire was reported out by approximately 9:00 p.m. that same evening.[186] The modeled deposition represents material deposited onto the land surface, where it would initially reside on the accessible surface, including soil, dust, vegetation, mulch, and other outdoor surfaces. This is especially important for dioxins because they are highly hydrophobic, have very low water solubility, and strongly bind to organic matter and fine particles.[187] As a result, freshly deposited dioxins would be expected to remain primarily at or near the surface rather than rapidly leaching or migrating downward through the soil column.[188] Therefore, for a short-duration deposition event, it is scientifically reasonable and health-protective to evaluate the deposited mass as a shallow surface-contact exposure rather than assuming immediate dilution through the full 0–1 inch soil interval.[189]

Consistent with that surface-contact exposure framework, I first conducted a conservative screening calculation assuming that each square meter of land contained approximately 1 kg of immediately accessible surface material. This calculation was not intended to represent a homogenized 0–1 inch soil sample, but rather to evaluate the potential concentration of newly deposited material on the surface where near-term human contact, incidental ingestion, tracking, and resuspension would occur. EPA's soil screening framework evaluates residential exposure pathways including direct contact with contaminated soil and inhalation of fugitive dust from soil, which supports the relevance of surface-accessible material for screening-level exposure evaluation.[190] To further evaluate the sensitivity of this assumption, I also calculated soil-equivalent concentrations assuming all modeled deposition was mixed into the upper 0.5 inch and the upper 1 inch of soil. Those additional calculations provide a more diluted comparison to conventional surface-soil sampling depths while preserving the conservative surface-deposition analysis appropriate for a short-duration release.

This focus on the surface soil is heavily supported by federal guidance when evaluating ingestion and inhalation pathways. For instance, the EPA's Urban Soil Lead Abatement Demonstration Project defines the top 2 centimeters as the "depth of soil where direct contact predominantly occurs."[191] Furthermore, the EPA's Superfund Lead-Contaminated Residential Sites Handbook mandates that five-point composite surface soil samples be collected from the 0 to 1-inch depth specifically for human health risk

[186] US Environmental Protection Agency. *Action Memorandum (Redacted): East Palestine Derailment Emergency Response*. US EPA; 2023.
[187] Agency for Toxic Substances and Disease Registry. *Toxicological Profile for Chlorinated Dibenzo-p-dioxins (CDDs): Draft for Public Comment*. US Department of Health and Human Services, Public Health Service; 2024:457. PDF Pg. 472.
[188] Ibid.
[189] Ibid; US Environmental Protection Agency. *Soil Screening Guidance: User's Guide*. US EPA; 1996.
[190] US Environmental Protection Agency. *Soil Screening Guidance: User's Guide*. US EPA; 1996.
[191] US Environmental Protection Agency. *Soil Screening Guidance: User's Guide*. US EPA; 1996. Page 12 (PDF Pg. 22).

assessment purposes.[192] The handbook further explains that "With respect to risk assessment, the top inch of soil best represents current exposure to contaminants."[193]

To calculate the soil-equivalent concentrations at mixing depths of 0.5 and 1.0 inches, I used the bulk density of 1785 kg/m3 provided in the Love report.[194] For the sensitivity analysis, the modeled deposition was converted to a soil-equivalent concentration using the following relationship:

> Soil mass per unit area (kg/m^2) = bulk density (1785 kg/m^3) × mixing depth (m)
> Soil concentration (ng-TEQ/kg) = modeled deposition (ng-TEQ/m^2) ÷ soil mass per unit area (kg/m^2)

Using this approach, I calculated soil-equivalent concentrations assuming the modeled deposition was mixed into the upper 0.5 inch and upper 1 inch of soil. The purpose of these calculations was to show how the modeled deposition results change under deeper, more diluted surface-soil mixing assumptions. The detailed calculations and resulting concentration tables are provided in the supplemental files. The air modeling deposition results and the resulting soil concentrations for mixing depths are presented in the table below.

[192] US Environmental Protection Agency. *Superfund Lead-Contaminated Residential Sites Handbook*. US EPA; 2003. Page 26 (PDF Pg. 40).
[193] Ibid.
[194] Love AH. *Expert Report of Adam H. Love, Ph.D.* Roux Associates, Inc; May 15, 2026. PDF Page 126.

Table 5-5. Air Modeling Deposition Results at the CeramFab and WYG Properties at the Surface, 0.5 Inches and 1.0 Inches

CeramFab Average Results Summary of Annual Deposition (ngTEQ/m²) at Discrete Receptor Locations																	
Locations	UCL of Dioxin Soil Samples Within 25km (ng-TEQ/kg)	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	9	12,482	12,471	13,898	47	7,960	6,595	31,983	47	47,882	45,117	36,652	3	65	56	1,432
WYG	72	2	357	357	395	5	204	199	381	3	370	376	336	0	0	0	37

CeramFab Max Results Summary of Annual Deposition (ngTEQ/m²) at Discrete Receptor Locations																	
Locations	UCL of Dioxin Soil Samples Within 25km (ng-TEQ/kg)	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	13	17,064	16,596	18,328	103	22,048	17,595	70,035	97	81,012	81,420	69,709	5	483	434	1,876
WYG	72	2	412	412	458	5	263	255	421	3	465	473	375	0	0	0	41

CeramFab Average Results Summary of Annual Deposition (ngTEQ/m²) at Discrete Receptor Locations Diluted to 0.5 Inch																	
Locations	UCL of Dioxin Soil Samples Within 25km (ng-TEQ/kg)	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.4	551	550	613	2	351	291	1,411	2	2,112	1,990	1,617	0.1	2.9	2.5	63
WYG	72	0.1	15.8	15.8	17.4	0.2	9.0	8.8	16.8	0.1	16.3	16.6	15	0.0	0.0	0.0	1.6

CeramFab Average Results Summary of Annual Deposition (ngTEQ/m²) at Discrete Receptor Locations Diluted to 1 Inch																	
Locations	UCL of Dioxin Soil Samples Within 25km (ng-TEQ/kg)	KPABEAVE2				KOHEASTP7				KOHEASTP9				KPIT			
		Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source	Point Source	Area Source	EPA Line Source	Volume Source
CeramFab	659	0.2	275	275	307	1	176	145	705	1	1,056	995	808	0	1	1	32
WYG	72	0.0	8	8	9	0	5	4	8	0	8	8	7	0	0	0	1

6. Finley Rebuttal

6.1 Finley Issue 1 Rebuttal

Dr. Finley falsely claims that my use of air modeling was unwarranted and unnecessary, and argues I have unsubstantiated assumptions in my analysis. His assertion that air dispersion modeling was entirely unwarranted and unnecessary demonstrates a severe misunderstanding of open-fire fluid dynamics and plume thermodynamics and calls into question whether he has the requisite, or even basic, expertise necessary to comment on the same.

In an uncontrolled open-air fire involving large volumes of vinyl chloride, acrylates, ethylene glycol, and complex polymeric cargo, the towering column of dense black smoke captured in photographs represents only the visible particulate component of a broader emissions mixture that may also include

invisible gases, VOCs, PAHs, and other combustion byproducts.[195] Smoke from combustion events is a complex mixture of gases, vapors, volatile organic compounds, semi-volatile organic compounds, and particulate matter; some particles are visible as soot, while fine and ultrafine particles and colorless gases may be less visually apparent.[196] Accordingly, the visible soot plume would have been accompanied by less apparent gas-phase and fine-particle plume components, including volatile organic compounds released from the railcars and/or generated by incomplete combustion.[197]

Relying exclusively on physical, static soil sampling grids can fail to capture the transient, widespread deposition of bioaccumulative toxins resulting from uncontrolled fires. The combustion byproducts of vinyl chloride are potent bioaccumulators that rapidly migrate and impact ecological systems across a broad area, meaning that localized physical point-sampling can easily miss the full geographic footprint of the contamination.

The intense thermal updrafts from the initial fires and the vent and burn created massive, buoyant plumes capable of entraining surrounding air, lofting combustion products, and transporting smoke constituents away from the derailment site.[198] Atmospheric dispersion modeling, calibrated to the exact temperature windows where *de novo* dioxin synthesis occurs during plume cooling, is a necessity to accurately map the widespread, multidirectional deposition of these combustion aerosols.[199]

Communications from the response period reveal criticisms from scientific experts regarding the agency's reliance on unsophisticated hand-held air monitoring devices to determine whether there is a health risk.[200] Because direct field monitoring was not capable of adequately resolving short-term,

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[195] Lemieux PM, Lutes CC, Santoianni DA. Emissions of organic air toxics from open burning: a comprehensive review. *Progress in Energy and Combustion Science.* 2004;30(1):1-32.; US Environmental Protection Agency. East Palestine, Ohio train derailment. US EPA. Updated March 24, 2026.; Singer LT, Schumacher F, Fabisiak J, Dietz LJ, Ciesielski T. The East Palestine train derailment: a complex environmental disaster. *Neurotoxicol Teratol*. 2025;110:107522.

[196] USEPA. Wildfire Smoke – A Complex Mixture. U.S. EPA. 6 October 2025.; California Air Resources Board. Combustion Pollutants & Indoor Air Quality. California Air Resources Board. 2026.; WHO. Air Quality, Energy and Health: Types of Pollutants. World Health Organization. 2026.

[197] USEPA. Wildfire Smoke – A Complex Mixture. U.S. EPA. 6 October 2025.; California Air Resources Board. Combustion Pollutants & Indoor Air Quality. California Air Resources Board. 2026.; WHO. Air Quality, Energy and Health: Types of Pollutants. World Health Organization. 2026.

[198] US EPA. AERMOD Model Formulation. US EPA. 2004.; Seitz et al.. Atmospheric turbulence observed during a fuel-bed-scale low-intensity surface fire. *Geophys Res Atmos*. 2023.; Heilman et al. Turbulent momentum flux behavior above a fire front in an open-canopied forest. *Int J Wildland Fire*. 2023.

[199] Addink R. Role of inorganic chlorine in the formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on incinerator fly ash. *Environ. Sci. Technol. 1998, 32, 21, 3356–3359.*; Addink 2000. Formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on municipal solid waste incinerator fly ash using $NA^{37}Cl$. Chemosphere. 44(2001), 1361-1367.; Altarawneh M, Dlugogorski BZ, Kennedy EM, Mackie JC. Mechanisms for formation, chlorination, dechlorination and destruction of polychlorinated dibenzo-p-dioxins and dibenzofurans. *Prog Energy Combust Sci.* 2009;35(3):246.

[200] US Environmental Protection Agency. *East Palestine FOIA Communications*. US EPA; 2023:161.

spatially variable airborne deposition of highly potent contaminants reported as toxic equivalents, predictive dispersion and deposition modeling was necessary to estimate exposure concentrations at relevant receptor locations.[201]

Peer-reviewed literature confirms that advanced dispersion modeling maintains an acceptable degree of correlation and provides high stability and reliability for predicting long-term deposition.[202] Air quality models provide a deterministic relationship between emissions, meteorology, and the spatial distribution of pollutants, serving as a critical tool to fill exposure gaps for locations situated outside the immediate processing or crash zone that were not thoroughly sampled during the acute phase.

Finally, my atmospheric dispersion modeling is directly validated by empirical field data. Peer-reviewed soil sampling studies conducted in the aftermath of the East Palestine derailment demonstrate statistically significant positive correlations between environmentally persistent free radicals (EPFRs) and highly toxic pentachlorinated dioxin and furan congeners dispersed widely into the surrounding soils beyond the immediate crash site.[203] This completely validates the use of the dispersion model to capture the true geographic extent of the plume.

6.2 Finley Issue 2 Rebuttal

Dr. Finley's reliance on the IMAAC plume model assumes that regional numerical meteorological inputs were sufficient to reconstruct localized deposition from the East Palestine open-air fire. That assumption is not supported by the limitations stated in the IMAAC analysis, itself. The IMAAC technical memorandum states that the retrospective analysis used NOAA numerical meteorological data, specifically the North American Model (NAM), with a grid resolution of 12-km, and that the model was based on "best estimates" rather than factual truth.[204] The same memorandum expressly cautions that there are "numerous unknowns and inherent uncertainty" in the model results, that the model "does not claim to be the ground truth," and that IMAAC did not have good information on the particle-size distribution of the fire, even though soot settling depends on particle size.[205]

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[201] ATSDR Endres Processing, LLC: Review of Air Emissions Data. U.S. Department of Health and Human Services. 7 September 2005. Pg. 5, 12.; Schaum et al. 2010. Screening Level Assessment of Risks Due to Dioxin Emissions from Burning Oil from the BP Deepwater Horizon Gulf of Mexico Spill. *Environ Sci Technol.* 2010.

[202] Omidvarborna et al. 2018. Dispersion modeling of fugitive iron particles from an iron industry on nearby communities via AERMOD. *Environmental Monitoring and Assessment*. October 2018.

[203] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3).

[204] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

[205] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

More broadly, regional numerical weather models are useful for synoptic and mesoscale meteorology, but they are not designed to explicitly resolve microscale wind fields created by local surface roughness, terrain discontinuities, and fire-induced buoyancy. The NOAA meteorological model used in the IMAAC model is described by NOAA as a forecast grid of 12-km resolution.[206] EPA guidance recognizes that surface roughness affects turbulence and boundary-layer stability, and that meteorological representativeness depends on comparing surface characteristics between the measurement site and the source location, not merely relying on proximity or gridded model output.[207] Likewise, mesoscale-modeling literature recognizes that mesoscale models do not resolve boundary-layer turbulence.[208]

This limitation is particularly important for a large open-air fire because intense heat release can alter the near-source wind field. Fire-atmosphere literature describes fire entrainment as air movement toward the fire driven by pressure gradients created by buoyant updrafts, with the resulting flow affected by fuels, topography, winds, fire geometry, and micrometeorological conditions.[209] Accordingly, nearby surface meteorological observations were scientifically important for testing and refining any retrospective plume reconstruction, especially where the question is whether transient near-surface transport and deposition intersected specific plaintiff properties. This is consistent with federal plume-modeling guidance recognizing that plume models should be used with field data, and that field data should be used to update plume predictions as the release is characterized.[210]

Additionally, the EPA's IMAAC soot deposition model does not consider all of the separate critical release and combustion scenarios pertinent to the Incident for a comprehensive air model.[211] Most notably, The EPA model only evaluated the vent and burn that occurred on February 6, 2023 noting that the "the burn was specified to occur over a duration of six hours [...] Soot deposition was calculated to last over the course of ten hours (six hours of burning plus four hours of transport after burning)."[212] By doing so, the IMAAC model omits the significant initial fire that began on February 3rd, as well as the subsequent pressure relief device (PRD) actuation events.

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[206] NOAA 2026. North American Mesoscale (NAM) Forecast System. NOAA NCEI. 2026.
[207] US Environmental Protection Agency. *AERMOD Implementation Guide*. EPA-454/B-24-009. Office of Air Quality Planning and Standards. November 2024:4, 6, 13. PDF pages 11, 13, 20.
[208] Haupt SE, Kosovic B, Shaw W, et al. On bridging a modeling scale gap: mesoscale to microscale coupling for wind energy. *Bull Am Meteorol Soc*. 2019;100(12):2533-2550.
[209] Linn RR, Hiers JK, O'Brien JJ, et al. Wildland fire entrainment: the missing link between wildland fire and its environment. *PNAS Nexus*. 2025;4(1).
[210] US Government Accountability Office. *Homeland Security: First Responders' Ability to Detect and Model Hazardous Releases in Urban Areas Is Significantly Limited*. US GAO; 2008:31–32, 101–102. Report No. GAO-08-180.
[211] IMAAC 2023. US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023.
[212] Id., Page 1.

The EPA model incorrectly assumes that all the hazardous materials, including five VCM tanks, as well as tanks carrying ethylene glycol, ethyl hexyl acrylate, butyl acrylate tanks, burned simultaneously during the six-hour vent and burn operation on February 6th 2023.[213] This assumption directly contradicts established incident data which confirm that ethylene glycol, ethyl hexyl acrylate, butyl acrylate tanks were breached upon impact, lost their lading, and burned in the initial fire and derailment.[214] These specific chemicals ignited and fueled the massive initial pool fire immediately following the derailment at 8:54 p.m. on February 3rd burning alongside thirty two tank, hopper and box cars.[215] Crucially, the material burned in this early, uncontrolled fire included four hopper cars filled with approximately 358,435 kg of PVC pellets, which act as a chlorine donor and produce dioxins during combustion.[216]

Furthermore, the IMAAC model only evaluated generalized soot deposition.[217] Unlike my model, it did not evaluate Dioxin or PAH deposition, nor did it apply the specific particle parameters to accurately model the fate and transport of those chemicals. The EPA acknowledges that "There are numerous unknowns and inherent uncertainty" in the model and that the "IMAAC model does not claim to be the 'ground truth' of what happened at the site."[218] The EPA's model contains a fundamental temporal flaw that omits the massive initial fire on February 3rd, the subsequent pressure relief device emissions and misrepresents the timeline, location and atmospheric dispersion of the chemical releases.[219] My model is more comprehensive, temporally correct, and specifically engineered to model Dioxin deposition. Therefore, Dr. Finley's assertion that my model is unwarranted relies on the mischaracterization of the simplified IMAAC model, ignoring the EPA's admission that the analysis contains "inherent uncertainty"

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[213] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Pages 78 and 90.

[214] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864.; National Transportation Safety Board. *Interview Transcript: Scott Deutsch, Northern Regional Manager, Hazardous Materials, Norfolk Southern Railway.* NTSB; February 8, 2023. Group G - Exhibit 2, Docket ID: DCA23HR001.

[215] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023:45. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864.; National Transportation Safety Board. *Interview Transcript: Scott Deutsch, Northern Regional Manager, Hazardous Materials, Norfolk Southern Railway.* NTSB; February 8, 2023. Group G - Exhibit 2, Docket ID: DCA23HR001.

[216] See Supplemental File titled "Fire Chronology and Tank Burn Mass Calculations"; Zhang M, Buekens A, Jiang X, Li X. Dioxins and polyvinylchloride in combustion and fires. *Waste Manag Res*. 2015;33(7):630-643.

[217] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

[218] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

[219] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.

and does not represent the "ground truth."[220] Dr. Finley's dismissal of the scientific necessity of a comprehensive, temporally accurate assessment to evaluate dioxin emissions, is therefore fundamentally flawed.

Dr. Finley acknowledges that the USEPA used the IMAAC model as the basis of developing the "Phase 1: Residential/Commercial/Agricultural Soil Sampling Plan," specifically amending the plan to target properties in the area of the highest estimated soot concentration based on the IMAAC plume. As noted, the IMAAC analysis explicitly compressed its simulation to the six-hour vent and burn operation on February 6, completely omitting the massive, uncontrolled pool fires that burned from February 3 onward and pressure release device emissions.[221] The IMAAC model does not consider the first three days of the incident and fails to account for the shifting, multi-directional wind vectors that dispersed toxic aerosols during this time. Consequently, the physical sampling plan based on this temporally truncated model is geographically flawed as it only considers the fallout in the footprint of the February 6 winds and lacks the broader environmental footprint of the chemical fallout from the earlier fires. The model's lack of consideration of the large-scale fire that occurred on February 3rd creates uncertainty in the modeled plume and the subsequent sampling plan designed on this basis.

Further, Dr. Finley incorrectly asserts that the majority of my report makes opinions based on air modeling under the premise that the USEPA did not collect soil samples in the correct locations. Dr. Finley's reliance on initial soil sampling data from the U.S. EPA and Arcadis to argue that property concentrations were "not significantly different than background samples" relies on a compromised background chemical baseline. As detailed in Section 5.5.2 of my Expert Report, the U.S. EPA's initial response program executed site-specific soil sampling at 25 designated background locations in the East Palestine area, which resulted in an elevated mean concentration of 6.7 pg TEQ/g soil.[222] These background sampling points were selected under the assumption that the smoke plume moved strictly southeast toward the evacuation zone, classifying areas to the north and west as unimpacted, "upwind" reference points. Splicing the actual site-specific meteorological datasets demonstrates that multi-directional shifting wind wind vectors existed throughout the multi-day fire and vent-and-burn; consequently, there was no true continuous "upwind" zone near the derailment site. The designated EPA background nodes were directly contaminated by the multidirectional transport vectors of the

[220] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.
[221] US Environmental Protection Agency / Interagency Modeling and Atmospheric Assessment Center (IMAAC). *Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response.* US EPA; May 31, 2023:1-2.
[222] USEP 2023. *Summary of Phase 1 dioxin results for the East Palestine derailment incident.* September 14, 2023. PDF Page 5.

derailment plume itself, artificially inflating the baseline and mathematically masking the true extent of the contamination across the plaintiff properties.

As verified in Section 6 of the Petty Expert Report, when true environmental background soil samples were extracted at a scientifically defensible distance entirely removed from the disaster plume, the regional background dioxin concentration was revealed to be much lower, yielding a baseline mean concentration of 2.3 ng-TEQ/kg (pg TEQ/g) soil.[223] Comparing the plaintiff properties' contamination signatures against the EPA's artificially elevated, plume-impacted baseline of 6.7 pg TEQ/g is invalid and ignores the chemical deposition in multiple directions from the incident. Delineating site impacts using a more reasonable regional background baseline of 2.3 pg TEQ/g clearly highlights a significant chemical spike in samples and confirms the validity of my air model.

6.3 Finley Issue 3 Rebuttal

Dr. Finley asserts that I inconsistently handled non-detect values. However, the "inconsistencies" stated here are from the available EPA and Norfolk Southern data from the EPA databases. The available data from the EPA was presented as ND = MRL and Norfolk Southern data as ND= ½.[224] As such, I did not misrepresent or inflate their data; instead, the plaintiff sampling data could be analyzed as ND = ½ or ND = MRL. Such an adjustment in data analysis would likely result in increased concentrations in my report. Therefore, my conclusions remain the same and any normalization of the argued "inconsistencies" would more likely than not result in an increased average concentration of analyzed plaintiff sampling.

6.4 Finley Issue 4 Rebuttal

Dr. Finley claims the levels of dioxins and PAHs are not above industrial noncancer RSLs and falsely asserts the soil was not impacted by derailment-related activities. His assertion that my risk assessment is invalid due to the selection of highlighted sample locations and the application of residential soil Regional Screening Levels (RSLs), also described elsewhere in EPA nomenclature as the Cancer Risk Screening Levels (RSLs), rather than industrial worker benchmarks is flawed and ignores the established mechanics of contaminant fate and transport active during an acute chemical disaster. The criticism regarding sample selection is inconsistent with the known environmental behavior of dioxins and

[223] Petty SE. *Factual Summary and Expert Opinions Report: CeramFab, Inc., et al. v. Norfolk Southern Corporation and Norfolk Southern Railway Company*. Pompano Beach, FL: Engineering & Expert Services, Inc. (EES Group, Inc.); March 30, 2026:7, 27-31, 50-51.
[224] USEPA 2025. Phase One Residential, Commercial, and Agricultural Soil Sampling Results. Available online at: https://www.epa.gov/east-palestine-oh-train-derailment/phase-one-residential-commercial-and-agricultural-soil-sampling.

high-molecular-weight PAHs.[225] These compounds are commonly particle-associated, and dioxins/PCDD-Fs and higher-molecular-weight PAHs are often enriched on fine combustion-derived particles, including soot and black carbon.[226] Once deposited, contaminated fine particles can be redistributed by wind erosion, resuspension, vehicle or equipment traffic, material handling, and other mechanical disturbance.[227] Accordingly, contamination associated with soot or fine fugitive dust is not physically constrained by parcel boundaries, and sample selection should account for the potential for off-site transport and redistribution.[228] Restricting an exposure analysis strictly to a localized area fails to capture the true geographic footprint left by the incident. Furthermore, the highlighted soil sampling locations adjacent to the plaintiff facilities identified a distinct chemical signature composed of n-butyl acrylate, vinyl chloride, and glycol ethers–hazardous constituents identical to the train's cargo–proving a direct transport and deposition link that cannot be dismissed as legacy industrial background pollution.

I maintain that the application of residential soil screening criteria is fully justified by the physical scale and community layout of East Palestine. East Palestine is a compact community in which airborne particulate emissions and deposition patterns overlap industrial and residential boundaries without distinction, rendering exposure inherently community-wide rather than confined to discrete industrial zones. Under the U.S. EPA Regional Screening Level framework, residential soil exposure is evaluated as a multi-pathway scenario that includes incidental ingestion of soil, dermal contact with soil, and inhalation of volatiles and fugitive dust.[229] EPA's soil-screening framework likewise recognizes residential exposure through direct contact with contaminated soils and inhalation of volatiles and fugitive dusts from soils.[230] Because EPA's particulate-emission-factor approach expressly relates soil contaminant concentrations to airborne contaminant concentrations resulting from particle suspension, the framework does not treat

[225] ATSDR 1998 Dioxins. Toxicological Profile for Chlorinated Dibenzo-p-Dioxins. U.S. Department of Health and Human Services. 1998.; ATSDR 1995 PAHs. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services. 1995. Ch. 5, Potential for Human Exposure.

[226] Chao MR, Hu CW, Ma HW, et al. Size distribution of particle-bound polychlorinated dibenzo-p-dioxins and dibenzofurans in the ambient air of a municipal incinerator. *Atmos Environ*. 2003;37(35):4945-4954.; World Health Organization. *WHO Guidelines for Indoor Air Quality: Selected Pollutants*. World Health Organization; 2010. Chapter 5, Polycyclic Aromatic Hydrocarbons.; Accardi-Dey A, Gschwend PM. Assessing the combined roles of natural organic matter and black carbon as sorbents in sediments. *Environ Sci Technol*. 2002;36(1):21-29.; Gustafsson Ö, Gschwend PM. Soot as a strong partition medium for polycyclic aromatic hydrocarbons in aquatic systems. *ACS Symp Ser*. 1997;671:365-381.

[227] USEPA. AP-42, Fifth Edition, Volume I, Chapter 13.2: Fugitive Dust Sources. January 1995.; USEPA 2006. AP-42, Fifth Edition, Volume I, Chapter 13.2.4: Aggregate Handling and Storage Piles. November 2006.

[228] USEPA. AP-42, Fifth Edition, Volume I, Chapter 13.2: Fugitive Dust Sources. January 1995.; USEPA 2006. AP-42, Fifth Edition, Volume I, Chapter 13.2.4: Aggregate Handling and Storage Piles. November 2006.

[229] U.S. Environmental Protection Agency. *Regional Screening Levels (RSLs) — User's Guide.* US Environmental Protection Agency; 1996.

[230] U.S. Environmental Protection Agency. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. US EPA; 2002:4-16-4-17.

contaminated outdoor soil as immobile or limited only to the point of original deposition.[231] Contaminated fine particles are continuously transported via wind resuspension, foot traffic, and vehicle movement directly into indoor commercial structures, settling across roofs, awnings, and porous materials as a persistent indoor dust burden that workers and community members routinely ingest and inhale over long timescales.[232] Evaluating these commercial structures under an industrial composite-worker lens artificially erases the true cumulative toxicological burden experienced across the community. As displayed in Table 6-1 of my Expert Report, the soil dioxin levels consistently exceeded RSL levels, including when adjusting for background.

As previously discussed in my responses to Dr. Finley, an open-air fire can generate localized buoyancy, plume rise, and fire-induced winds that alter near-field wind direction and dispersion patterns. The IMAAC model does not account for these localized differences near the incident, and Dr. Finley's assertion that "soil was not impacted by derailment-related activities" is an alarming conclusion given the proof of contamination and the scale of the incident.

6.5 Finley Issue 5 Rebuttal

Dr. Finley falsely characterizes my lodelling approach to contain "speculative assumptions."[233] He claims that the meteorological data processing and station splicing techniques employed in my analysis were "unsubstantiated assumptions," demonstrating a profound misunderstanding of micro-scale atmospheric behaviors and standard regulatory practices under official regulatory modeling frameworks. However, Dr. Finley is incorrect and there is nothing "speculative" or "unsubstantiated" about any of the rigorous analysis and methodology employed here.

The processing of the localized weather files adhered to the explicit protocols defined within the U.S. EPA's official User's Guide for the AERMOD Meteorological Preprocessor (AERMET).[234] AERMET includes procedures for quality-assessing upper-air, surface, site-specific, and prognostic meteorological data, and EPA guidance recognizes that site-specific meteorological data are preferred when available and adequately representative, and that wind measurements near plume height may be important in

[231] U.S. Environmental Protection Agency. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. US EPA; 2002:4-16-4-17. PDF pg. 60–62.
[232] USEPA. AP-42, Fifth Edition, Volume I, Chapter 13.2: Fugitive Dust Sources. January 1995.; USEPA 2006. AP-42, Fifth Edition, Volume I, Chapter 13.2.4: Aggregate Handling and Storage Piles. November 2006.; United States Environmental Protection Agency. Regional Screening Levels (RSLs) User's Guide. Washington, DC: US EPA; 2023.
[233] Finley BL. *Expert Report of Brent L. Finley, Ph.D. Regarding CeramFab Property Impacts*. ToxStrategies LLC; May 15, 2026:112.
[234] United States Environmental Protection Agency. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. Research Triangle Park, NC: Office of Air Quality Planning and Standards; 2023:D-8. Report No. EPA-454/B-23-002.; U.S. Environmental Protection Agency. *Guideline on Air Quality Models*; Appendix W to 40 CFR Part 51. 2024.; US Environmental Protection Agency. *AERMOD Implementation Guide*. US EPA; November 2024.

complex wind situations. Accordingly, reliance on distant or nonrepresentative regional meteorological data can be inappropriate where more representative local data or site-specific measurements are necessary to characterize pollutant transport and dispersion.[235] Under EPA modeling principles, utilizing localized, project-specific meteorological data is considered best practice to ensure the air dispersion model accurately reflects local environmental conditions rather than relying solely on distant regional NWS stations.[236]

AERMOD/AERMET does not require every meteorological variable to originate from the same airport station; the governing question is whether the final meteorological dataset is representative of transport, dispersion, and planetary boundary layer conditions at the source/receptor area. EPA's AERMOD Implementation Guide states that meteorological representativeness is evaluated by whether the data construct "realistic planetary boundary layer similarity profiles" and adequately characterize the "dispersive capacity of the atmosphere," and EPA cautions that representativeness "cannot be based solely on proximity."[237] AERMET is specifically designed to combine surface observations, upper-air soundings, onsite data, surface characteristics, and other meteorological inputs into AERMOD-ready files.[238] State regulatory examples confirm this practice: South Coast AQMD processes AERMOD datasets using hourly wind/temperature data from SCAQMD and ASOS stations, cloud cover and one-minute winds from ASOS, and upper-air data from Miramar, while also stating that the closest station is not necessarily the most representative station.[239] Peer-reviewed literature likewise supports AERMOD implementation where local data are incomplete; Carbonell et al. published a methodology for using AERMOD when local meteorological, land-use, or upper-air data are incomplete, including case studies and comparison to measurement data.[240] Therefore, substituting or incorporating higher-quality local wind speed and wind direction data while using a more complete representative airport/upper-air dataset for other AERMET variables is not a novel litigation method; it is consistent with EPA's representativeness framework, AERMET's data architecture, regulatory agency practice, and

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[235] United States Environmental Protection Agency. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. Research Triangle Park, NC: Office of Air Quality Planning and Standards; 2023:D-8. Report No. EPA-454/B-23-002.; U.S. Environmental Protection Agency. *Guideline on Air Quality Models*; Appendix W to 40 CFR Part 51. 2024.; U.S. Environmental Protection Agency. AERMOD Implementation Guide. November 2024.

[236] United States Environmental Protection Agency. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. Research Triangle Park, NC: Office of Air Quality Planning and Standards; 2023:D-8. Report No. EPA-454/B-23-002.; U.S. Environmental Protection Agency. *Guideline on Air Quality Models*; Appendix W to 40 CFR Part 51. 2024.; US Environmental Protection Agency. *AERMOD Implementation Guide*. US EPA; November 2024.

[237] U.S. Environmental Protection Agency. *AERMOD Implementation Guide*. EPA-454/B-24-009. November 2024.

[238] United States Environmental Protection Agency. User's Guide for the AERMOD Meteorological Preprocessor (AERMET). Research Triangle Park, NC: Office of Air Quality Planning and Standards; 2023:D-8. Report No. EPA-454/B-23-002.

[239] South Coast Air Quality Management District. Meteorological Data for AERMOD Applications. Available online at: https://www.aqmd.gov/home/air-quality/meteorological-data/data-for-aermod

[240] Carbonell LMT, Gacita MS, Oliva JJDR, Garea LC, Rivero ND, Ruiz EM. Methodological guide for implementation of the AERMOD system with incomplete local data. *Atmospheric Pollution Research*. 2010;1(2):102-111.

peer-reviewed AERMOD literature, provided the substitution is documented with wind roses, station-distance/terrain analysis, land-use comparison, completeness checks, and sensitivity testing.

Splicing site-specific ground-level wind data from the closest weather stations (including KOHEASTP7, KOHEASTP9, and KPABEAVE2) situated directly surrounding the derailment site into the regional Pittsburgh International Airport (KPIT) files was a necessity because distant macro-scale regional airport profiles – located approximately 27 miles away – are entirely unrepresentative of the immediate, fire-driven microclimates and localized wind fields active at the incident core. Atmospheric dispersion models are uniquely equipped to simulate transient boundary-layer movements over complex terrain only when properly paired with localized parameters.[241] Peer-reviewed meteorological validation studies comparing dry deposition estimates emphasize that integrating high-resolution localized surface weather observations significantly improves a model's computational stability and baseline capability to accurately track transient wind shears.[242] Without integrating nearby meteorological data into both the surface and profile datasets, the atmospheric model would be incapable of properly reconstructing the multi-directional plume shifts that actually blanketed the plaintiff properties and the surrounding community.

6.6 Finley Issue 6 Rebuttal

Dr. Finley attempts to claim that source parameters used in my model are speculative. I completely reject Dr. Finley's assertion that the point-source parameters, exit velocities, and soil-dose conversion factors applied in the air model represent unscientific assumptions.[243] Each parameter input was chosen to reflect the documented thermodynamic and physical realities of the incident. Modeling the initial early fire as 21 separate point sources, the vent-and-burn as two distinct points representing the trenches, and the four VCM tanks that had pressure relief device actuation events were georeferenced from satellite imagery of the Incident allowed the model to realistically represent the expansive geographic footprint of the burning area, rather than utilizing an unscientific single-point simplification or a model that lacks temperature parameters. Finley incorrectly states that the "stack heights for each car of the cars were 7.35 meters based on visual estimates."[244] In my air dispersion model, the point sources representing the early fire and the vent-and-burn trenches were configured with a release height of 13.72 meters (45 feet). This dimension was derived from visual estimations of incident drone and photographic documentation to accurately reflect the height of the cooler flame tip. The height of the

[241] Tartakovsky D, Broday DM, Stern E. Dispersion of TSP and PM10 emissions from quarries in complex terrain. *Science of the Total Environment*. 2016; 946.
[242] Tartakovsky D, Broday DM, Stern E. Dispersion of TSP and PM10 emissions from quarries in complex terrain. *Science of the Total Environment*. 2016; 946.
[243] Finley BL. *Expert Report of Brent L. Finley, Ph.D. Regarding CeramFab Property Impacts*. ToxStrategies LLC; May 15, 2026:113-114.
[244] Ibid.

modeled pressure relief device actuations from four VCM tanks were calculated using the Brigg's Equation recommended by the Ohio EPA summed with the height of the DOT 105 VCM Tank Cars established in industry tank manufacturer brochures.[245] This resulted in tank specific calculated heights of 7.51, 7.35, 7.52 and 7.50 meters.

I specifically calibrated the source temperature to 250°C (523.15 K) because established combustion chemistry confirms that dioxins are completely destroyed in the ultra-hot central core of a fire.[246] De novo synthesis of PCDD/Fs occurs as flue gases cool into a critical reformation window between 200°C and 450°C.[247] The peer-reviewed scientific consensus establishes that de novo synthesis of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) does not occur in the flame core, but in the cooler post-combustion zones. As the flue gases and fly ash escape the flame and cool, they enter a critical temperature reformation window between 200°C and 450°C.[248] Mathematically modeling the hottest part of the fire, as Dr. Finley seemingly prefers, would falsely erase the highly toxic pollutants that were actually synthesized at the cooling edges. Treating the PRD actuation within this framework correctly accounted for the complex thermodynamics of the incident, ensuring the model captures both the chemical formation window and the true aerodynamic trajectory of the pressurized release. Additional sensitivity analyses for release temperatures are presented in **Table 3-2**, ranging 17℃ to 1250°C.

Dr. Finley's objection to the elevated exit velocity of 50 m/s for the pressure relief device (PRD) actuations demonstrates a failure to distinguish between standard, engineered industrial flares and a catastrophic, unmitigated railcar incident.[249] Official incident records and National Transportation Safety Board (NTSB) investigation reports confirm that the PRDs on the four exposed vinyl chloride tank cars cycled under extreme pressure and temperature loading, with car OCPX80179 venting "vigorously" and continuously for approximately 70 minutes.[250] Standard regulatory default velocities of 20 m/s established for controlled industrial refinery flares are entirely insufficient to model the immense kinetic

[245] The Greenbrier Companies. *25,800 Gallon DOT 105 Tank Car.* Lake Oswego, OR: The Greenbrier Companies; 2019.; Ohio Environmental Protection Agency, Division of Air Pollution Control. *Engineering Guide #69: Air Dispersion Modeling Guidance*. Columbus, OH: Ohio Environmental Protection Agency; 2018.

[246] United Nations Environment Programme. *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases*. UNEP; December 2005.

[247] Altarawneh M, Dlugogorski BZ, Kennedy EM, Mackie JC. Mechanisms for formation, chlorination, dechlorination and destruction of polychlorinated dibenzo-p-dioxins and dibenzofurans. *Prog Energy Combust Sci.* 2009;35(3):246.

[248] Addink R. Role of inorganic chlorine in the formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on incinerator fly ash. *Environ. Sci. Technol. 1998, 32, 21, 3356–3359.;* Addink 2000. Formation of polychlorinated dibenzo-p-dioxins/dibenzofurans from residual carbon on municipal solid waste incinerator fly ash using NA^{37}Cl. Chemosphere. 44(2001), 1361-1367.

[249] Finley BL. *Expert Report of Brent L. Finley, Ph.D. Regarding CeramFab Property Impacts*. ToxStrategies LLC; May 15, 2026:113-114.

[250] National Transportation Safety Board. *Hazardous Materials Group Chair's Factual Report: Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio.* NTSB; 2023. Accident No. RRD23MR005, Group B - Exhibit 10, NTSB Docket Project No. 106864. PDF Page 76.

energy and aerodynamic thrust of a highly pressurized, actively failing pressure tank car. While 50 m/s is a reasonable velocity for an energetic release, changing this value to 20 m/s would have little to no effect on the results and my conclusions, as this portion of the PRD actuation model is a relatively small percentage of the modelled incident. As such, my opinions remain the same.

Dr. Finley further criticizes my conversion of modeled dioxin deposition from ng-TEQ/m² to ng-TEQ/kg as scientifically unsupported because it assumes a 0.02-inch soil layer (1 kg/m²) rather than the EPA-standard 1-inch surface soil exposure zone, resulting in an "overestimation" of soil concentrations. However, he does not provide any basis for the soil thickness calculation.

Dioxin deposition from the East Palestine fire occurred over a short time period and would not be expected to instantaneously and uniformly mix through the soil profile. The controlled burn occurred on February 6, 2023, at approximately 4:30 p.m., and the associated trench fire was reported out by approximately 9:00 p.m. that same evening.[251] The modeled deposition represents material deposited onto the land surface, where it would initially reside on the accessible surface, including soil, dust, vegetation, mulch, and other outdoor surfaces. This is especially important for dioxins because they are highly hydrophobic, have very low water solubility, and strongly bind to organic matter and fine particles.[252] As a result, freshly deposited dioxins would be expected to remain primarily at or near the surface rather than rapidly leaching or migrating downward through the soil column.[253] Therefore, for a short-duration deposition event, it is scientifically reasonable and health-protective to evaluate the deposited mass as a shallow surface-contact exposure rather than assuming immediate dilution through the full 0–1 inch soil interval.[254]

Consistent with that surface-contact exposure framework, I first conducted a conservative screening calculation assuming that each square meter of land contained approximately 1 kg of immediately accessible surface material. This calculation was not intended to represent a homogenized 0–1 inch soil sample, but rather to evaluate the potential concentration of newly deposited material on the surface where near-term human contact, incidental ingestion, tracking, and resuspension would occur. EPA's soil screening framework evaluates residential exposure pathways including direct contact with contaminated soil and inhalation of fugitive dust from soil, which supports the relevance of surface-accessible material for screening-level exposure evaluation.[255] To further evaluate the sensitivity

[251] USEPA 2023. *Enforcement Action Memorandum - Determination of Threat to Public Health and the Environment at the East Palestine Train Derailment Site, East Palestine, Columbian County, Ohio (Site ID: C5XR).* U.S. Environmental Protection Agency.
[252] ATSDR 2024. *Toxicological profile for chlorinated dibenzo-p-dioxins (CDDs)*. U.S. Department of Health and Human Services, Public Health Service. Page 457 (PDF Pg. 472).
[253] Ibid.
[254] Ibid; USEPA (1996). *Soil Screening Guidance: User's Guide*. U.S. Environmental Protection Agency.
[255] USEPA 1996. *Soil Screening Guidance: User's Guide*. U.S. Environmental Protection Agency.

of this assumption, I also calculated soil-equivalent concentrations assuming all modeled deposition was mixed into the upper 0.5 inch and the upper 1 inch of soil. Those additional calculations provide a more diluted comparison to conventional surface-soil sampling depths while preserving the conservative surface-deposition analysis appropriate for a short-duration release. Such calculations are displayed in **Section 5.3.6** of this Rebuttal Report.

This focus on the surface soil is heavily supported by federal guidance when evaluating ingestion and inhalation pathways. For instance, the EPA's Urban Soil Lead Abatement Demonstration Project defines the top 2 centimeters as the "depth of soil where direct contact predominantly occurs."[256] Furthermore, the EPA's Superfund Lead-Contaminated Residential Sites Handbook mandates that five-point composite surface soil samples be collected from the 0 to 1-inch depth specifically for human health risk assessment purposes.[257] The handbook further explains that "With respect to risk assessment, the top inch of soil best represents current exposure to contaminants."[258]

Finley incorrectly asserts that my analysis should have subtracted the footprint of commercial buildings from the parcel areas because deposition onto those areas supposedly "artificially" inflated the modeled surface area and total deposited mass. That criticism is not scientifically supported. Atmospheric deposition is a surface-loading process, and AERMOD's deposition algorithms estimate contaminant mass deposited to modeled surfaces over an area, not merely to only to exposed soil.[259] Deposition onto rooftops, pavement, and other impervious surfaces is not equivalent to permanent removal from the parcel. EPA recognizes that stormwater runoff from impervious surfaces can pick up and transport chemicals, dirt, sediment, and other pollutants.[260] Peer-reviewed literature likewise identifies atmospheric deposition as a source of urban runoff pollution, and particle resuspension from surfaces is a recognized environmental process.[261] Accordingly, subtracting building footprints would improperly assume, without site-specific support, that all contaminant mass deposited on those structures was permanently unavailable for runoff, washoff, redistribution to soil, or re-entrainment. Treating building footprints as areas of zero relevant deposition would be speculative and artificially deflate true contamination.

[256] USEPA 1996. *Soil Screening Guidance: User's Guide*. U.S. Environmental Protection Agency. Page 12 (PDF Pg. 22).
[257] USEPA 2003. *Superfund Lead-Contaminated Residential Sites Handbook*. Page 26 (PDF Pg. 40).
[258] Ibid.
[259] USEPA 2022. User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA; 2022.
[260] USEPA 2026. Urbanization and Stormwater Runoff. Updated January 8, 2026.
[261] Müller A, Österlund H, Marsalek J, Viklander M. The pollution conveyed by urban runoff: a review of sources. Sci Total Environ. 2020;709:136125. doi:10.1016/j.scitotenv.2019.136125.; Nicholson KW. A review of particle resuspension. Atmos Environ. 1988;22(12):2639-2651. doi:10.1016/0004-6981(88)90433-7.

6.7 Finley Issue 7 Rebuttal

Dr. Finley's extensive critique of the peer-reviewed soil sampling study published by *Lard et al.* (2025) represents a standard attempt to discredit empirical data which hinders the defense's position. Dr. Finley's hyper-technical objections regarding sample density, data normality, and statistical metrics ignore the foundational reality of scientific peer review; the Lard et al. investigation was published in a highly rigorous, leading environmental science journal (*Environmental Science: Processes & Impacts*), confirming that its analytical methodologies, statistical significance testing, and conclusions underwent exhaustive independent expert review before public dissemination.[262]

Far from relying on "uncertain and insufficient data," the *Lard et al.* study provides direct, real-world validation of the predictive atmospheric transport and deposition modeling executed by Roseyfields.[263] Independent field researchers physically extracted soil samples and measured elevated concentrations of toxic equivalents (TEQs) and environmentally persistent free radicals (EPFRs) precisely within the sectors where my air modeling predicted the toxic chemical plume transported and deposited.[264] This high-degree spatial and geographic convergence between numerical modeling and independent physical sampling thoroughly satisfies the rigid validation requirements of environmental model evaluation, providing definitive physical proof that the unmitigated derailment fires generated an enormous toxic plume that settled exactly as simulated.

Furthermore, Dr. Finley's attempt to frame the detected dioxin and furan concentrations as routine legacy background anomalies or prior industrial land-use artifacts is entirely contradicted by the regional baseline data. As established in my previous opinions, we cannot look at the local environment through an unimpacted lens because the EPA's site-specific background sampling mean of 6.7 pg TEQ/g soil was taken after the disaster within the multi-directional transport currents of the fire, making it potentially contaminated by the derailment plume itself. Section 6 of the *Petty Expert Report* demonstrates that when true control samples were extracted at a scientifically sound far-field distance completely isolated from the multi-directional transport current vectors of the disaster plume, the native regional background dioxin concentration was low, yielding a more reasonable baseline mean concentration of only 2.3 ng-TEQ/kg (pg TEQ/g) soil.[265] Comparing the plaintiff properties' severe contamination signatures against the EPA's plume-impacted reference levels, as Dr. Finley attempts to do, is a

[262] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3): 729-740.
[263] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3): 729-740.
[264] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3): 729-740.
[265] Petty SE. *Factual Summary and Expert Opinions Report: CeramFab, Inc., et al. v. Norfolk Southern Corporation and Norfolk Southern Railway Company*. Pompano Beach, FL: Engineering & Expert Services, Inc. (EES Group, Inc.); March 30, 2026: 216.

toxicologically invalid method designed to mathematically mask the acute deposition burden. Delineating site impacts against the true native regional baseline of 2.3 pg TEQ/g clearly exposes an acute, highly significant chemical spike that confirms severe derailment fallout deposition exactly within the trajectory zones identified by my air dispersion model.[266]

Finally, the strong spatial and statistical association mapped by Lard et al. between stable free-radical matrices and highly toxic pentachlorinated dioxin and furan congeners (PeCDD/Fs) provides an undeniable forensic chemical fingerprint.[267] Peer-reviewed emissions literature confirms that routine manufacturing operations release negligible baselines of these specific compounds, whereas the open-air, oxygen-limited partial combustion of vinyl chloride monomers and polyvinyl chloride (PVC) pellets acts as an ideal synthesis engine for these precise toxic arrangements.[268] The co-location of elevated EPFRs and PeCDD/Fs directly downwind of the crash site provides an empirical fingerprint that cannot be explained away by legacy industry, establishing a clear, unbroken causal link between the catastrophic combustion events and the severe environmental degradation of the plaintiff properties.[269]

6.8 Conclusion to Dr. Finley Rebuttal

Despite arguments, often unsupportable, by Dr. Finley attempting to invalidate my methods and opinions, the modelling conducted by Roseyfields is neither unwarranted nor speculative. It represents standard, rigorous regulatory practice under the U.S. EPA guidelines to evaluate uncertainty across complex, transient environmental profiles. Conducting four separate dispersion simulations using unique ground-level wind profiles was a scientific necessity because high-resolution meteorological arrays from localized weather stations simulated the multidirectional shifts that drove the toxic plume into the surrounding community. Relying on a single, static wind path or meteorological model would artificially restrict the dispersion footprint and fail to simulate the complex localized turbulence and potential wind field shifts that occurred during the incident and subsequent days.

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[266] Petty SE. *Factual Summary and Expert Opinions Report: CeramFab, Inc., et al. v. Norfolk Southern Corporation and Norfolk Southern Railway Company*. Pompano Beach, FL: Engineering & Expert Services, Inc. (EES Group, Inc.); March 30, 2026: 7, 27-31, 50-51.

[267] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts.* 2025;27(3).

[268] Zhang M, Buekens A, Jiang X, Li X. Dioxins and polyvinylchloride in combustion and fires. *Waste Manag Res*. 2015;33(7): 630-643.; Carroll WF, et al. Characterization of emissions of dioxins and furans from ethylene dichloride (EDC), vinyl chloride (VCM) and polyvinylchloride (PVC) facilities in the United States. *Chemosphere*. 1998 Oct-Nov;37(9-12):1957-72.

[269] Lard ML, Eichler SE, Gao P, et al. Soil contamination by environmentally persistent free radicals and dioxins following train derailment in East Palestine, OH. *Environ Sci Process Impacts*. 2025;27(3): 729-740.

7 CONCLUSIONS

The February 3, 2023, Norfolk Southern derailment and subsequent vent-and-burn operations created combustion conditions conducive to the formation and atmospheric release of dioxins, furans, PAHs, soot-associated contaminants, and combustion-related particulate matter.

1. Community-wide environmental sampling data demonstrate that dioxin and PAH contamination is present throughout substantial portions of East Palestine and is not limited to the derailment site, the CeramFab property, or the WYG property.
2. The magnitude, geographic extent, and spatial distribution of the contamination are inconsistent with isolated site-specific impacts and demonstrate a community-wide deposition event.
3. Elevated dioxin and PAH concentrations were identified throughout East Palestine and frequently exceed typical background concentrations regardless of whether EPA, Arcadis, Plaintiff, Defendant, or alternative background datasets are utilized.
4. The environmental sampling data demonstrate that both the CeramFab and WYG properties contain elevated dioxin and PAH concentrations that are consistent with the broader contamination pattern observed throughout East Palestine.
5. The contamination observed at CeramFab and WYG is consistent with atmospheric deposition associated with the February 2023 Norfolk Southern derailment, subsequent fires, pressure relief device actuations, and vent-and-burn operation.
6. The recommendations and criticisms advanced by Dr. Love, Dr. Finley, and Mr. Lunsford were evaluated using environmental sampling data, atmospheric transport modeling, source-term analyses, meteorological analyses, and scientific literature.
7. Several recommendations advanced by Defendants' experts improved the evaluation and were incorporated into this report, including direct comparison of modeled deposition to measured contamination, evaluation of alternative source geometries, and evaluation of local meteorological datasets.
8. Atmospheric transport modeling results were compared directly to measured environmental contamination as recommended by Dr. Love and Dr. Finley.
9. The modeled one-inch soil concentrations generally correspond to the measured dioxin and PAH concentrations and identify the same portions of East Palestine where elevated contamination was observed.
10. The agreement between measured environmental contamination and independently modeled deposition provides validation that AERMOD is an appropriate and scientifically defensible tool for evaluating contaminant transport and deposition associated with the Incident.
11. At the CeramFab property, modeled one-inch soil concentrations are generally of the same order of magnitude as measured dioxin and PAH concentrations.

12. At the WYG property, the modeling generally underpredicts measured contamination, indicating that the modeling is conservative and does not artificially overstate impacts.
13. The underprediction observed at WYG is consistent with fire-induced turbulence, plume meander, localized wind fields, convective effects, and short-duration westerly transport events that are not fully represented in conventional meteorological datasets.
14. Alternative area, line, and volume source representations recommended by Dr. Love generally improved the agreement between modeled deposition patterns and measured environmental contamination. The alternative source geometries strengthened, rather than weakened, the relationship between the atmospheric transport analyses and the environmental sampling data.
15. Additional analyses utilizing the KOHEASTP7, KOHEASTP9, and KPABEAVE2 meteorological datasets generally improved the agreement between modeled deposition and measured contamination.
16. The principal conclusions of this report remain unchanged regardless of which meteorological dataset is utilized.
17. Additional analyses utilizing lower source terms recommended by Defendants predict dioxin and PAH concentrations substantially below those measured throughout East Palestine.
18. When diluted into the upper one inch of soil, the concentrations predicted using Defendants' preferred source terms are generally too low to reasonably explain the widespread contamination documented by the environmental sampling data.
19. The UNEP dioxin emission factors and combustion-based source terms utilized in this report produce modeled concentrations that more closely correspond to the contamination measured throughout East Palestine than the substantially lower source terms advocated by Defendants.
20. The recommendations that produced the strongest agreement between the atmospheric modeling and the environmental sampling data were the source geometry and meteorological recommendations advanced by Defendants' experts.
21. The environmental sampling data, community-wide contamination mapping, atmospheric transport analyses, source-term evaluations, and meteorological analyses collectively demonstrate that the Norfolk Southern derailment, subsequent fires, pressure relief device actuations, and vent-and-burn operation were a major and significant source of dioxin and PAH contamination throughout East Palestine.
22. The Norfolk Southern derailment, subsequent fires, pressure relief device actuations, and vent-and-burn operation materially contributed to the contamination identified throughout East Palestine, including the CeramFab and WYG properties.
23. The opinions of Defendants' experts that the observed contamination primarily reflects background conditions, that the atmospheric transport analyses are not supported by environmental data, or that substantially lower source terms adequately explain the

contamination are not supported by the environmental sampling data, atmospheric modeling results, or the analyses presented in this report.

24. Based upon my education, training, experience, review of the available information, environmental sampling data, atmospheric transport analyses, source-term evaluations, meteorological analyses, scientific literature, and the analyses presented in this report, I hold the opinions expressed herein to a reasonable degree of scientific certainty.
25. I reserve the right to supplement, amend, modify, refine, or expand the opinions expressed in this report should additional information, testimony, environmental data, analytical results, modeling information, discovery materials, expert reports, agency records, or other relevant evidence become available.

Paul E. Rosenfeld, Ph.D.

EXHIBIT A

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May 4, 2026

Paul Rosenfeld Ph.D.

Principal Forensic Environmental Chemist

Chemical Fate and Transport, Risk-Dose Assessment and Air Dispersion Modeling

Education

Ph.D. Soil Chemistry, University of Washington, 1999. Dissertation on VOC filtration.
M.S. Environmental Science, U.C. Berkeley, 1995. Thesis on organic waste economics.
B.A. Environmental Studies, U.C. Santa Barbara, 1991. Focus on wastewater treatment.

Professional Skills

Dr. Paul Rosenfeld, founder and principal of RoseyFields LLC in Santa Monica, California, is an environmental chemist with more than 25 years of experience in exposure assessment, historical dose reconstruction, environmental forensics, and air-dispersion modeling. His work spans hundreds of contaminated sites across the United States, with deep expertise in asbestos and other hazardous pollutants. As a Remedial Project Manager for the U.S. Navy's BRAC Program on Treasure Island, Dr. Rosenfeld oversaw asbestos remediation in soils and friable building materials, directed environmental testing and cleanup activities, and conducted air monitoring to protect workers and nearby communities. He has also modeled asbestos emissions from serpentine road dust in California and reconstructed exposures for residents and schoolchildren.

Dr. Rosenfeld has taught environmental health and epidemiology at the University of California, Los Angeles (UCLA), and is the co-author of *The Risks of Hazardous Waste* (2011), which includes quantitative analysis of asbestos risks. He also co-authored three volumes of the *Handbook of Pollution Prevention and Cleaner Production*, covering the petroleum, wood and paper, and agrochemical industries. Over his career, he has prepared hundreds of exposure assessments, developed sampling and investigation strategies for complex multi-contaminant sites, directed multidisciplinary scientific teams, and trained remediation personnel in industrial hygiene and exposure-control practices. He has worked closely with government agencies and private clients on numerous high-profile environmental cases.

Dr. Rosenfeld is trained and certified under OSHA's Hazardous Waste Operations and Emergency Response standard, 29 C.F.R. § 1910.120 (HAZWOPER). Through this federally recognized program, he received formal instruction in hazardous-substance safety, contaminant fate and transport, exposure pathways, and OSHA regulatory compliance. His training included hazardous-site investigation protocols, respiratory protection, air-monitoring instrumentation, personal protective equipment (PPE), decontamination procedures, emergency-response planning, chemical toxicology, and OSHA exposure standards.

Beyond asbestos, Dr. Rosenfeld has conducted exposure evaluations for diesel particulate matter, silica, benzene, pesticides, PCBs, dioxins and furans, PAHs, volatile and semi-volatile organic compounds, perfluoroalkyl substances (PFAS), and heavy metals in soil, dust, water, and air. His peer-reviewed research includes studies on diesel-exhaust exposure in railroad workers, cancer risks associated with Camp Lejeune drinking-water contamination, PFAS exposure in firefighters, and community health burdens from refinery fires in Richmond, California. His work routinely relies on methodologies developed by the U.S. EPA, OSHA, ATSDR, and NIOSH, and he has performed air-dispersion modeling using tools such as AERMOD, ALOHA, and BREEZE to evaluate both acute and chronic inhalation risks.

Dr. Rosenfeld has been retained by municipalities, state agencies, and plaintiff law firms nationwide, and he has testified as an expert witness in numerous cases involving environmental contamination, asbestos exposure, air emissions, and human-health risk. His testimony has been admitted in state and federal courts at both deposition and trial.

Judicial Recognition of Expertise and Skills

Dr. Rosenfeld's exposure-assessment and environmental forensics methodologies have been repeatedly upheld under Federal Rule of Evidence 702 and the Daubert standard across federal and state courts.

- **U.S. District Court for the District of Vermont**
  Austin v. Monsanto Co. — Court upheld Dr. Rosenfeld's exposure and risk-assessment methodology, including Average Daily Dose calculations, hazard quotients, EPA default assumptions, and statistically supported upper confidence limits (UCLs), finding the approach scientifically reliable and admissible.

- **U.S. District Court for the Southern District of Texas**
  Cannon v. BP Products North America, Inc. — Court relied on Dr. Rosenfeld's AERMOD-based air-dispersion modeling to delineate geographic exposure zones from refinery emissions and accepted his plume modeling and exposure methodology as scientifically reliable.

- **U.S. District Court for the District of Nebraska**
  Gillett v. BNSF Railway Co. — Court found Dr. Rosenfeld qualified to offer opinions on historical diesel-exhaust exposure, environmental forensics, source attribution, and dose reconstruction, concluding his methodology was grounded in reliable scientific principles.

- **U.S. District Court for the District of Colorado**
  Gonzales v. BNSF Railway Co. — Court admitted testimony based on EPA-basead exposure modeling, integration of published emission factors, activity-pattern reconstruction, and cumulative-dose calculations supported by sufficient facts and data.

- **Seventeenth Judicial Circuit Court, Broward County, Florida**
  Hinton v. City of Fort Lauderdale — Court denied a Daubert motion and found Dr. Rosenfeld qualified in air modeling, environmental contamination, fate and transport, and exposure assessment.

- **Florida Fifth District Court of Appeal**
  Lewis v. Norfolk Southern Railway Co. — Appellate court affirmed admissibility of Dr. Rosenfeld's environmental exposure methodology under Daubert.

- **Eleventh Judicial Circuit Court, Miami-Dade County, Florida**
  Styles v. City of Miami (2025) — During Daubert proceedings involving dioxin and arsenic contamination from a municipal incinerator, the court permitted extensive testimony regarding Dr. Rosenfeld's EPA-based methodology, including RAGS risk equations, ProUCL statistical methods, and multi-consultant environmental datasets, overruling foundational objections and allowing the testimony to proceed.

Collectively, these rulings reflect a consistent judicial consensus that Dr. Rosenfeld is qualified across multiple technical domains—including air dispersion modeling, environmental forensics, exposure reconstruction, and human-health risk assessment—and that his methodologies are reliable, scientifically grounded, and helpful to the trier of fact.

Professional History:

RoseyFields LLC; 2025 to Present; Principal and Founder
Soil Water Air Protection Enterprise (SWAPE); 2003 to 2025; Principal and Founding Partner
UCLA School of Public Health; 2007 to 2011; Lecturer (Assistant Researcher)
UCLA School of Public Health; 2003 to 2006; Adjunct Professor
UCLA Environmental Science and Engineering Program; 2002-2004; Doctoral Intern Coordinator
UCLA Institute of the Environment, 2001-2002; Research Associate
Komex H_2O Science, 2001 to 2003; Senior Remediation Scientist
National Groundwater Association, 2002-2004; Lecturer
San Diego State University, 1999-2001; Adjunct Professor
Anteon Corp., San Diego, 2000-2001; Remediation Project Manager
Ogden (now Amec), San Diego, 2000-2000; Remediation Project Manager
Bechtel, San Diego, California, 1999 – 2000; Risk Assessor
King County, Seattle, 1996 – 1999; Scientist
James River Corp., Washington, 1995-96; Scientist
Big Creek Lumber, Davenport, California, 1995; Scientist
Plumas Corp., California and USFS, Tahoe 1993-1995; Scientist
Peace Corps and World Wildlife Fund, St. Kitts, West Indies, 1991-1993; Scientist

Publications:

Rosenfeld, P.E., Spaeth, K.R., McCarthy, S.J. et al. Camp Lejeune Marine Cancer Risk Assessment for Exposure to Contaminated Drinking Water From 1955 to 1987. Water Air Soil Pollut 235, 124 (2024). https://doi.org/10.1007/s11270-023-06863-y.

Rosenfeld P.E., Spaeth K.R., Remy L.L., Byers V., Muerth S.A., Hallman R,C., Summers-Evans J., Barker S. (2023) Perfluoroalkyl substances exposure in firefighters: Sources and implications, Environmental Research, Volume 220, https://doi.org/10.1016/j.envres.2022.115164.

Rosenfeld P.E. and Spaeth K.R., (2023) Authors' Response to Letter to the Editor from Bullock and Ramacciotti, Water Air Soil Pollution Volume 234, https://doi.org/10.1007/s11270-023-06165-3

Rosenfeld P. E., Spaeth K., Hallman R., Bressler R., Smith, G., (2022) Cancer Risk and Diesel Exhaust Exposure Among Railroad Workers. Water Air Soil Pollution. 233, 171.

Remy, L.L., Clay T., Byers, V., Rosenfeld P. E. (2019) Hospital, Health, and Community Burden After Oil Refinery Fires, Richmond, California 2007 and 2012. Environmental Health. 18:48

Simons, R.A., Seo, Y. Rosenfeld, P., (2015) Modeling the Effect of Refinery Emission On Residential Property Value. Journal of Real Estate Research. 27(3):321-342

Chen, J. A, Zapata A. R., Sutherland A. J., Molmen, D.R., Chow, B. S., Wu, L. E., Rosenfeld, P. E., Hesse, R. C., (2012) Sulfur Dioxide and Volatile Organic Compound Exposure To A Community In Texas City Texas Evaluated Using Aermod and Empirical Data. American Journal of Environmental Science, 8(6), 622-632.

Rosenfeld, P.E. & Feng, L. (2011). The Risks of Hazardous Waste. Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & Rosenfeld, P.E. (2011). Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Agrochemical Industry, Amsterdam: Elsevier Publishing.

Gonzalez, J., Feng, L., Sutherland, A., Waller, C., Sok, H., Hesse, R., Rosenfeld, P. (2010). PCBs and Dioxins/Furans in Attic Dust Collected Near Former PCB Production and Secondary Copper Facilities in Sauget, IL. Procedia Environmental Sciences. 113–125.

Feng, L., Wu, C., Tam, L., Sutherland, A.J., Clark, J.J., Rosenfeld, P.E. (2010). Dioxin and Furan Blood Lipid and Attic Dust Concentrations in Populations Living Near Four Wood Treatment Facilities in the United States. Journal of Environmental Health. 73(6), 34-46.

Cheremisinoff, N.P., & Rosenfeld, P.E. (2010). Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Wood and Paper Industries. Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & Rosenfeld, P.E., (2009). Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Petroleum Industry. Amsterdam: Elsevier Publishing.

Wu, C., Tam, L., Clark, J., Rosenfeld, P. (2009). Dioxin and furan blood lipid concentrations in populations living near four wood treatment facilities in the United States. WIT Transactions on Ecology and the Environment, Air Pollution, 123 (17), 319-327.

Cheremisinoff, N.P., Rosenfeld, P.E. Davletshin, A.R. (2008). Responsible Care. Gulf Publishing. Texas.

Tam L. K., Wu C. D., Clark J. J. and Rosenfeld, P.E. (2008). A Statistical Analysis Of Attic Dust And Blood Lipid Concentrations Of Tetrachloro-p-Dibenzodioxin (TCDD) Toxicity Equivalency Quotients (TEQ) In Two Populations Near Wood Treatment Facilities. Organohalogen Compounds, 70, 002252-002255.

Tam L. K., Wu C. D., Clark J. J. and Rosenfeld, P.E. (2008). Methods For Collect Samples For Assessing Dioxins And Other Environmental Contaminants In Attic Dust: A Review. Organohalogen Compounds, 70, 000527-000530.

Hensley, A.R. A. Scott, J. J. J. Clark, Rosenfeld, P.E. (2007). Attic Dust and Human Blood Samples Collected near a Former Wood Treatment Facility. Environmental Research. 105, 194-197.

Rosenfeld, P.E., J. J. J. Clark, A. R. Hensley, M. Suffet. (2007). The Use of an Odor Wheel Classification for Evaluation of Human Health Risk Criteria for Compost Facilities. Water Science & Technology 55(5), 345-357.

Rosenfeld, P. E., M. Suffet. (2007). The Anatomy of Odour Wheels for Odours of Drinking Water, Wastewater, Compost And The Urban Environment. Water Science & Technology 55(5), 335-344.

Sullivan, P. J. Clark, J.J.J., Agardy, F. J., Rosenfeld, P.E. (2007). Toxic Legacy, Synthetic Toxins in the Food, Water, and Air in American Cities. Boston Massachusetts: Elsevier Publishing

Rosenfeld, P.E., and Suffet I.H. (2004). Control of Compost Odor Using High Carbon Wood Ash. Water Science and Technology. 49(9),171-178.

Rosenfeld P. E., J.J. Clark, I.H. (Mel) Suffet (2004). The Value of An Odor-Quality-Wheel Classification Scheme for The Urban Environment. Water Environment Federation's Technical Exhibition and Conference (WEFTEC) 2004. New Orleans, October 2-6, 2004.

Rosenfeld, P.E., and Suffet, I.H. (2004). Understanding Odorants Associated with Compost, Biomass Facilities, and the Land Application of Biosolids. Water Science and Technology. 49(9), 193-199.

Rosenfeld, P.E., and Suffet I.H. (2004). Control of Compost Odor Using High Carbon Wood Ash, Water Science and Technology, 49(9), 171-178.

Rosenfeld, P. E., Grey, M. A., Sellew, P. (2004). Measurement of Biosolids Odor and Odorant Emissions from Windrows, Static Pile and Biofilter. Water Environment Research. 76(4), 310-315.

Rosenfeld, P.E., Grey, M and Suffet, M. (2002). Compost Demonstration Project, Sacramento California Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility. Integrated Waste Management Board Public Affairs Office, Publications Clearinghouse (MS–6), Sacramento, CA Publication #442-02-008.

Rosenfeld, P.E., and C.L. Henry. (2001). Characterization of odor emissions from three different biosolids. Water Soil and Air Pollution. 127(1-4), 173-191.

Rosenfeld, P.E., and Henry C. L., (2000). Wood ash control of odor emissions from biosolids application. Journal of Environmental Quality. 29, 1662-1668.

Rosenfeld, P.E., C.L. Henry and D. Bennett. (2001). Wastewater dewatering polymer affects on biosolids odor emissions and microbial activity. Water Environment Research. 73(4), 363-367.

Rosenfeld, P.E., and C.L. Henry. (2001). Activated Carbon and Wood Ash Sorption of Wastewater, Compost, and Biosolids Odorants. Water Environment Research, 73, 388-393.

Rosenfeld, P.E., and Henry C. L., (2001). High carbon wood ash effect on biosolids microbial activity and odor. Water Environment Research. 131(1-4), 247-262.

Chollack, T. and P. Rosenfeld. (1998). Compost Amendment Handbook for Landscaping. Prepared for and distributed by the City of Redmond, Washington State.

Rosenfeld, P. E. (1992). The Mount Liamuiga Crater Trail. Heritage Magazine of St. Kitts, 3(2).

Rosenfeld, P. E. (1993). High School Biogas Project to Prevent Deforestation on St. Kitts. Biomass Users Network, 7(1).

Rosenfeld, P. E. (1998). Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. Doctoral Thesis. University of Washington College of Forest Resources.

Rosenfeld, P. E. (1994). Potential Utilization of Small Diameter Trees on Sierra County Public Land. Master's thesis reprinted by the Sierra County Economic Council. Sierra County, California.

Rosenfeld, P. E. (1991). How to Build a Small Rural Anaerobic Digester & Uses Of Biogas In The First And Third World. Bachelor's Thesis. University of California.

Presentations:

Rosenfeld, P.E., "The science for Perfluorinated Chemicals (PFAS): What makes remediation so hard?" Law Seminars International, (May 9-10, 2018) 800 Fifth Avenue, Suite 101 Seattle, WA.

Rosenfeld, P.E., Sutherland, A; Hesse, R.; Zapata, A. (October 3-6, 2013). Air dispersion modeling of volatile organic emissions from multiple natural gas wells in Decatur, TX. 44th Western Regional Meeting, American Chemical Society. Lecture conducted from Santa Clara, CA.

Sok, H.L.; Waller, C.C.; Feng, L.; Gonzalez, J.; Sutherland, A.J.; Wisdom-Stack, T.; Sahai, R.K.; Hesse, R.C.; Rosenfeld, P.E. (June 20-23, 2010). Atrazine: A Persistent Pesticide in Urban Drinking Water. Urban Environmental Pollution. Lecture conducted from Boston, MA.

Feng, L.; Gonzalez, J.; Sok, H.L.; Sutherland, A.J.; Waller, C.C.; Wisdom-Stack, T.; Sahai, R.K.; La, M.; Hesse, R.C.; Rosenfeld, P.E. (June 20-23, 2010). Bringing Environmental Justice to East St. Louis, Illinois. Urban Environmental Pollution. Lecture conducted from Boston, MA.

Rosenfeld, P.E. (April 19-23, 2009). Perfluoroctanoic Acid (PFOA) and Perfluoroactane Sulfonate (PFOS) Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States. 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting, Lecture conducted from Tuscon, AZ.

Rosenfeld, P.E. (April 19-23, 2009). Cost to Filter Atrazine Contamination from Drinking Water in the United States" Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States. 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting. Lecture conducted from Tuscon, AZ.

Wu, C., Tam, L., Clark, J., Rosenfeld, P. (20-22 July (2009). Dioxin and furan blood lipid concentrations in populations living near four wood treatment facilities in the United States. Brebbia, C.A. and Popov, V., eds., Air Pollution XVII: Proceedings of the Seventeenth International Conference on Modeling, Monitoring and Management of Air Pollution. Lecture conducted from Tallinn, Estonia.

Rosenfeld, P. E. (October 15-18, 2007). Moss Point Community Exposure To Contaminants From A Releasing Facility. The 23rd Annual International Conferences on Soils Sediment and Water. Platform lecture conducted at University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (October 15-18, 2007). The Repeated Trespass of Tritium-Contaminated Water Into A Surrounding Community Form Repeated Waste Spills From A Nuclear Power Plant. The 23rd Annual International Conferences on Soils Sediment and Water. Platform lecture conducted from University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (October 15-18, 2007). Somerville Community Exposure To Contaminants From Wood Treatment Facility Emissions. The 23rd Annual International Conferences on Soils Sediment and Water. Lecture conducted from University of Massachusetts, Amherst MA.

Rosenfeld P. E. (March 2007). Production, Chemical Properties, Toxicology, & Treatment Case Studies of 1,2,3-Trichloropropane (TCP). The Association for Environmental Health and Sciences (AEHS) Annual Meeting. Lecture conducted from San Diego, CA.

Rosenfeld P. E. (March 2007). Blood and Attic Sampling for Dioxin/Furan, PAH, and Metal Exposure in Florala, Alabama. The AEHS Annual Meeting. Lecture conducted from San Diego, CA.

Hensley A.R., Scott, A., Rosenfeld P.E., Clark, J.J.J. (August 21 – 25, 2006). Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility. The 26th International Symposium on Halogenated Persistent Organic Pollutants – DIOXIN2006. Lecture conducted from Radisson SAS Scandinavia Hotel in Oslo Norway.

Hensley A.R., Scott, A., Rosenfeld P.E., Clark, J.J.J. (November 4-8, 2006). Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility. APHA 134 Annual Meeting & Exposition. Lecture conducted from Boston Massachusetts.

Paul Rosenfeld Ph.D. (October 24-25, 2005). Fate, Transport and Persistence of PFOA and Related Chemicals. Mealey's C8/PFOA. Science, Risk & Litigation Conference. Lecture conducted from The Rittenhouse Hotel, Philadelphia, PA.

Paul Rosenfeld Ph.D. (September 19, 2005). Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation PEMA Emerging Contaminant Conference. Lecture conducted from Hilton Hotel, Irvine California.

Paul Rosenfeld Ph.D. (September 19, 2005). Fate, Transport, Toxicity, And Persistence of 1,2,3-TCP. PEMA Emerging Contaminant Conference. Lecture conducted from Hilton Hotel in Irvine, California.

Paul Rosenfeld Ph.D. (September 26-27, 2005). Fate, Transport and Persistence of PDBEs. Mealey's Groundwater Conference. Lecture conducted from Ritz Carlton Hotel, Marina Del Ray, California.

Paul Rosenfeld Ph.D. (June 7-8, 2005). Fate, Transport and Persistence of PFOA and Related Chemicals. International Society of Environmental Forensics: Focus on Emerging Contaminants. Lecture conducted from Sheraton Oceanfront Hotel, Virginia Beach, Virginia.

Paul Rosenfeld Ph.D. (July 21-22, 2005). Fate Transport, Persistence and Toxicology of PFOA and Related Perfluorochemicals. 2005 National Groundwater Association Ground Water and Environmental Law Conference. Lecture conducted from Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld Ph.D. (July 21-22, 2005). Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation. 2005 National Groundwater Association Ground Water and Environmental Law Conference. Lecture conducted from Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. and Rob Hesse R.G. (May 5-6, 2004). Tert-butyl Alcohol Liability and Toxicology, A National Problem and Unquantified Liability. National Groundwater Association. Environmental Law Conference. Lecture conducted from Congress Plaza Hotel, Chicago Illinois.

Paul Rosenfeld, Ph.D. (March 2004). Perchlorate Toxicology. Meeting of the American Groundwater Trust. Lecture conducted from Phoenix Arizona.

Hagemann, M.F., Paul Rosenfeld, Ph.D. and Rob Hesse (2004). Perchlorate Contamination of the Colorado River. Meeting of tribal representatives. Lecture conducted from Parker, AZ.

Paul Rosenfeld, Ph.D. (April 7, 2004). A National Damage Assessment Model for PCE and Dry Cleaners. Drycleaner Symposium. California Ground Water Association. Lecture conducted from Radison Hotel, Sacramento, California.

Rosenfeld, P. E., Grey, M., (June 2003) Two stage biofilter for biosolids composting odor control. Seventh International In Situ And On Site Bioremediation Symposium Battelle Conference Orlando, FL.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. (February 20-21, 2003) Understanding Historical Use, Chemical Properties, Toxicity and Regulatory Guidance of 1,4 Dioxane. National Groundwater Association. Southwest Focus
Conference. Water Supply and Emerging Contaminants. Lecture conducted from Hyatt Regency Phoenix Arizona.

Paul Rosenfeld, Ph.D. (February 6-7, 2003). Underground Storage Tank Litigation and Remediation. California CUPA Forum. Lecture conducted from Marriott Hotel, Anaheim California.

Paul Rosenfeld, Ph.D. (October 23, 2002) Underground Storage Tank Litigation and Remediation. EPA Underground Storage Tank Roundtable. Lecture conducted from Sacramento California.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Understanding Odor from Compost, Wastewater and Industrial Processes. Sixth Annual Symposium on Off Flavors in the Aquatic Environment. International Water Association. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Using High Carbon Wood Ash to Control Compost Odor. Sixth Annual Symposium on Off Flavors in the Aquatic Environment. International Water Association. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Grey, M. A. (September 22-24, 2002). Biocycle Composting for Coastal Sage Restoration. Northwest Biosolids Management Association. Lecture conducted from Vancouver Washington.

Rosenfeld, P.E. and Grey, M. A. (November 11-14, 2002). Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility. Soil Science Society Annual Conference. Lecture conducted from Indianapolis, Maryland.

Rosenfeld. P.E. (September 16, 2000). Two stage biofilter for biosolids composting odor control. Water Environment Federation. Lecture conducted from Anaheim California.

Rosenfeld. P.E. (October 16, 2000). Wood ash and biofilter control of compost odor. Biofest. Lecture conducted from Ocean Shores, California.

Rosenfeld, P.E. (2000). Bioremediation Using Organic Soil Amendments. California Resource Recovery Association. Lecture conducted from Sacramento California.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation with High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., and C.L. Henry. (1999). An evaluation of ash incorporation with biosolids for odor reduction. Soil Science Society of America. Lecture conducted from Salt Lake City Utah.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Comparison of Microbial Activity and Odor Emissions from Three Different Biosolids Applied to Forest Soil. Brown and Caldwell. Lecture conducted from Seattle Washington.

Rosenfeld, P.E., C.L. Henry. (1998). Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. Biofest. Lecture conducted from Lake Chelan, Washington.

Rosenfeld, P.E, C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation with High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., C.L. Henry, R. B. Harrison, and R. Dills. (1997). Comparison of Odor Emissions from Three Different Biosolids Applied to Forest Soil. Soil Science Society of America. Lecture conducted from Anaheim California.

Teaching Experience:

UCLA Department of Environmental Health (Summer 2003 through 2010) Taught Environmental Health Science 100 to students, including undergrad, medical doctors, public health professionals and nurses. The course focused on the health effects of environmental contaminants.

National Ground Water Association, Successful Remediation Technologies. Custom Course in Sante Fe, New Mexico. May 21, 2002. Focused on fate and transport of fuel contaminants associated with underground storage tanks.

National Ground Water Association; Successful Remediation Technologies Course in Chicago Illinois. April 1, 2002. Focused on fate and transport of contaminants associated with Superfund and RCRA sites.

California Integrated Waste Management Board, April and May 2001. Alternative Landfill Caps Seminar in San Diego, Ventura, and San Francisco. Focused on both prescriptive and innovative landfill cover design.

UCLA Department of Environmental Engineering, February 5, 2002. Seminar on Successful Remediation Technologies focusing on Groundwater Remediation.

University Of Washington, Soil Science Program, Teaching Assistant for several courses including Soil Chemistry, Organic Soil Amendments, and Soil Stability.

U.C. Berkeley, Environmental Science Program Teaching Assistant for Environmental Science 10.
Academic Grants Awarded:

California Integrated Waste Management Board. $41,000 grant awarded to UCLA Institute of the Environment. Goal: To investigate the effect of high carbon wood ash on volatile organic emissions from compost. 2001.

Synagro Technologies, Corona California: $10,000 grant awarded to San Diego State University.
Goal: investigate the effect of biosolids for restoration and remediation of degraded coastal sage soils. 2000.

King County, Department of Research and Technology, Washington State. $100,000 grant awarded to University of Washington: Goal: To investigate odor emissions from biosolids application and the effect of polymers and ash on VOC emissions. 1998.

Northwest Biosolids Management Association, Washington State. $20,000 grant awarded to investigate the effect of polymers and ash on VOC emissions from biosolids. 1997.

James River Corporation, Oregon: $10,000 grant was awarded to investigate the success of genetically engineered Poplar trees with resistance to round-up. 1996.

United State Forest Service, Tahoe National Forest: $15,000 grant was awarded to investigating fire ecology of the Tahoe National Forest. 1995.

Kellogg Foundation, Washington D.C. $500 grant was awarded to construct a large anaerobic digester on St. Kitts in West Indies. 1993

Deposition and/or Trial Testimony:

In the Circuit Court for Wayne County Michigan
Paula Forester vs Norfolk Southern Railway C
Case N. 25-006972-NO
Rosenfeld Deposition 4-22-26

In the Circuit Court of Roanoke Virgina
Robert Cash v Norfolk Southern Railway Co
Case No. CL17-2381
Rosenfeld Deposition 4-10-26

In the District Court of Douglas County Nebraska
Craig Rickett vs Union Pacific Railroad Company
Case No D01CI240006321
Rosenfeld Deposition 4-8-26

In the United States District Court for The Southern District of Mississippi, Southern Division
Kenyatta Allen vs. Kansas City Southern Railway Company
Case No. 1:25-cv-196 TBM-RPM
Rosenfeld Deposition 3-19-26

In the 133rd Judicial District Court, Harris County, Texas,

MT Davis Interests, Inc., et al. v. Sesco Cement Corp., et al.,
Cause No. 2024-26512
Rosenfeld Deposition 2-10-2026

In the United States Court Middle District Fort Myers Division Florida
Joseph Pavone vs. American Contract Systems Inc.
Case No. 2:24-cv-01054-KCD-NPM
Rosenfeld Deposition 1-13-2026

In the Supreme Court of the state of New York, County of Erie
Patrice Kay and Andrew Kay vs Pfizer Inc. et al
Index No.: 190261-2024
Deposition 12-11-25 and 1-7-28

In the United States District South Bend Division For The Northern District of Indiana
Richard Mullenhour vs. Penn Central Corporation
Case No. 3:22-CV-00032-JD-GG
Rosenfeld Deposition 11-20-2025

In the United States District Court Eastern District of New York
Rosalie Romano et al. vs. Northrup Grumman Corporation
Case No. 16-cv-5760
Rosenfeld Deposition 11-18-2025

In the Circuit Court of the County of St. Louis State of Missouri
Tracy Whitaker vs. Dow Agrosciences
Case No. 18SL-CC01079
Rosenfeld Deposition 10-21-2025

In the Circuit Court of Virginia for the County of Norfolk
Randal Redford vs Norfolk Southern.
Case No. Cl22011540-0
Trial 10-7-25

In the Superior Court of California, County of Los Angeles
Sondra Scott vs Albertsons Co. et al.
Case No. 25STCV05372
Deposition 9-23-25

In the United States District Court of Vermont
Cristy Crawford vs. Monsanto
Docket No. 2:23-cv-752
Deposition 9-19-25

In the Supreme Court of the state of New York, County of Erie
Todd Hathaway vs Avon Products, Inc. et al
Index No.: 800575/2023
Deposition 8-22-25

In the District Court of Harris County Texas
Mt Davis Interest, Inc v Sesco Cement Corp
Cause No 2023-26512

Trial 6-2-25

In the United States Southern District of New York
Gallo vs Avon Products Inc., et al
Civil Action No.: 1:23-cv-2023
Deposition 4-24-2025

In Vanderburgh Superior Court 5, County of Vanderburgh, Indiana
Markello v CSX
Civil Action No 82D05-2011-CT-004962
Deposition 3-26-25

In the Circuit Court of Cook County Illinois
Jarosiewicz v Northeast Regional Railroad
Case No 2023 L 002290
Deposition 2-27-25

In the District Court 191st Judicial District Dallas County
Acklin v Poly America International
Cause No DC-22-08610
Deposition 1-8-2025

United States District Court, Northern District of California
Austin Vs Monsanto
Case No 2:23-cv-272
Deposition 12-20-25

In Jefferson Circuit Court Division One, Louisville, Kentucky
Stafford vs, CSX
Case No. 18-CI-001790
Deposition: 8-27-24

In the Twenty-Second Judicial Circuit of St. Louis. State of Missouri
Patricia Godfrey vs, Amtrak
Case No. 2122-CC-00525
Deposition: 7-17-24

In the Court of Common Please Lucas County, Ohio
Brenda Conkright vs. CSX
Case No. G-4801-CI-0202102664-000
Deposition: 6-4-24

In the Court of Common Pleas Lucas County Ohio
Sharon Whitlock vs Norfolk Southern
Case No. G-4801-0202102664-000
Trial 6-4-24

In the Commonwealth of Kentucky, Greenup Circuit Court
Patsy Sue Napier vs. CSX
Case No. 19-CI-0012
Deposition: 5-8-2-24

In United States District Court of Hawaii
Patrick Feindt, Jr. et al. vs. The United States of America

Case No. 1:22-cv-LEK-KJM
Trial 3-29-24 and 4-5-24

In the District Court of Hood County State of Texas
Artie Gray vs. Exxon Mobil
Case No. C-2018047
Rosenfeld Deposition:4-22-2024

In the Elkhart Superior Court State of Indiana
Estate of Clark Stacy vs. Penn Central Corporation
Cause No 2D01-2001-CT-00007
Rosenfeld Deposition 1-25-2024 and 3-7-2024

In the Circuit Court of Trempealeau County, State of Wisconsin
Michael J. Sylla et al. vs. High-Crush Whitehall LLC
Case No. 2019-CV-63, 2019-CV-64, 2019-CV-65, 2019-CV-66
Rosenfeld Deposition: 3-5-2024

In the Circuit Court of Trempealeau County, State of Wisconsin
Leland Drangstveit vs. High-Crush Blair LLC
Case No. 19-CV-66
Rosenfeld Deposition 3-5-2024

In the Circuit Court of Jefferson County Alabama
Donald Lee Ashworth vs. CSX Transportation Inc.
Case No CV-2021-901261
Rosenfeld Deposition 1-23-2024

In the United States District Court for the Eastern District of Wisconsin
Gary L Siepe vs. Soo Line Railroad
Case No. 2:21-cv-00919
Rosenfeld Deposition 1-19-2024

In the United States District Court for the Western District of Louisiana
Ricky Bush v. Clean Harbors Colfax LLC
Case No. 1:22-cv-02026-DDD-JPM
Rosenfeld Deposition 12-18-2023 and 1-15-2024

In United States District Court of Hawaii
Patrick Feindt, Jr. et al. vs. The United States of America
Case No. 1:22-cv-LEK-KJM
Rosenfeld Deposition 11-29-2023

In the Circuit Court for the Twentieth Judicial Circuit St. Clair County, Illinois
Timothy Gray vs. Rural King et al.
Case No 2022-LA-355
Rosenfeld Deposition 9-26-2023

In United States District Court Eastern District of Wisconsin
Gary L. Siepe vs. Soo Line Railroad Company
Case No. 2:21-cv-00919
Rosenfeld Deposition 9-15-2023

In the Circuit Court of Cook County Illinois
Donald Fox vs. BNSF
Case No. 2021 L12
Rosenfeld Deposition 9-12-2023

In the Court of Common Please Cuyahoga County, Ohio
Thomas Schleich vs. Penn Central Corporation
Lead Case No. CV-20-939184
Rosenfeld Deposition 8-27-2023

In the Circuit Court of Jackson County Missouri at Kansas City
Timothy Dalsing vs. BNSF
Case No. No. 2216-cv06539
Rosenfeld Deposition 7-28-2023

In the United States District Court for the Southern District of Texas Houston Division
International Terminals Company LLC Deer Park Fire Litigation
Lead Case No. 4:19-cv-01460
Rosenfeld Deposition 7-25-2023

In the Circuit Court of Livingston County Missouri
Shirley Ralls vs. Canadian Pacific Railway and Soo Lind Railroad
Case No. 28LV-CV0020
Rosenfeld Daubert Hearing 7-18-2023 Trial Testimony 7-19-2023

In the Circuit Court of Cook County Illinois
Brenda Wright vs. Penn Central and Conrail
Case No. No. 2032L003966
Rosenfeld Deposition 6-13-2023

In the Circuit Court Common Please Philadelphia of Jefferson County Alabama
Frank Belle vs. Birmingham Southern Railroad Company et al.
Case No. 01-cv-2021-900901.00
Rosenfeld Deposition 4-6-2023

In the Circuit Court of Jefferson County Alabama
Linda De Gregorio vs. Penn Central
Case No. 002278
Rosenfeld Deposition 3-27-20203

In the United States District Court Eastern District of New York
Rosalie Romano et al. vs. Northrup Grumman Corporation
Case No. 16-cv-5760
Rosenfeld Deposition 3-16-2023

In the Superior Court of Washington, Spokane County
Judy Cundy vs. BNSF
Case No. 21-2-03718-32
Rosenfeld Deposition 3-9-2023

In The Court of Common Pleas of Philadelphia County, PA Civil Trial Division
Feaster v Conrail
Case No. 001075

Rosenfeld Deposition 2-1-2023

In United States District Court for the Central District of Illinois
Sherman vs. BNSF
Case No. 3:17-cv-01192
Rosenfeld Deposition 1-18-2023

In United States District Court District of Colorado
Gonzales vs. BNSF
Case No. 1:21-cv-01690
Rosenfeld Deposition 1-17-2023

In United States District Court District of Colorado
Abeyta vs. BNSF
Case No. 1:21-cv-01689-KMT
Rosenfeld Deposition 1-3-2023

In United States District Court For The Eastern District of Louisiana
Nathaniel Smith vs. Illinois Central Railroad
Case No. 2:21-cv-01235
Rosenfeld Deposition 11-30-2022

In the General Court of Justice Superior Court Division, Mecklenburg County, State of North Carolina
Brenda Whitlock vs CSX
Case No. 21-CVS-6157
Depo 6-8-22

In the Court of Common Pleas Lucas County Ohio
Robert Martin vs Penn Central
Case No. CV 20 92889
Depo date 2022

In the Circuit Court of the Fourth Judicial Circuit In and For Duval County Florida
Precilla Lewis vs Norfolk Southern
Case No. CV-16-2017-CA-005800
Depo date 2022?

In the Superior Court of the State of California, County of San Bernardino
Billy Wildrick, Plaintiff vs. BNSF Railway Company
Case No. CIVDS1711810
Rosenfeld Deposition 10-17-2022

In the State Court of Bibb County, State of Georgia
Richard Hutcherson, Plaintiff vs Norfolk Southern Railway Company
Case No. 10-SCCV-092007
Rosenfeld Deposition 10-6-2022

In the Civil District Court of the Parish of Orleans, State of Louisiana
Millard Clark, Plaintiff vs. Dixie Carriers, Inc. et al.
Case No. 2020-03891
Rosenfeld Deposition 9-15-2022

In The Circuit Court of Livingston County, State of Missouri, Circuit Civil Division

Shirley Ralls, Plaintiff vs. Canadian Pacific Railway and Soo Line Railroad
Case No. 18-LV-CC0020
Rosenfeld Deposition 9-7-2022

In The Circuit Court of the 13th Judicial Circuit Court, Hillsborough County, Florida Civil Division
Jonny C. Daniels, Plaintiff vs. CSX Transportation Inc.
Case No. 20-CA-5502
Rosenfeld Deposition 9-1-2022

In The Circuit Court of St. Louis County, State of Missouri
Kieth Luke et. al. Plaintiff vs. Monsanto Company et. al.
Case No. 19SL-CC03191
Rosenfeld Deposition 8-25-2022

In The Circuit Court of the 13th Judicial Circuit Court, Hillsborough County, Florida Civil Division
Jeffery S. Lamotte, Plaintiff vs. CSX Transportation Inc.
Case No. NO. 20-CA-0049
Rosenfeld Deposition 8-22-2022

In State of Minnesota District Court, County of St. Louis Sixth Judicial District
Greg Bean, Plaintiff vs. Soo Line Railroad Company
Case No. 69-DU-CV-21-760
Rosenfeld Deposition 8-17-2022

In United States District Court Western District of Washington at Tacoma, Washington
John D. Fitzgerald Plaintiff vs. BNSF
Case No. 3:21-cv-05288-RJB
Rosenfeld Deposition 8-11-2022

In Circuit Court of the Sixth Judicial Circuit, Macon Illinois
Rocky Bennyhoff Plaintiff vs. Norfolk Southern
Case No. 20-L-56
Rosenfeld Deposition 8-3-2022, Trial 1-10-2023

In Court of Common Pleas, Hamilton County Ohio
Joe Briggins Plaintiff vs. CSX
Case No. A2004464
Rosenfeld Deposition 6-17-2022

In the Superior Court of the State of California, County of Kern
George LaFazia vs. BNSF Railway Company.
Case No. BCV-19-103087
Rosenfeld Deposition 5-17-2022

In the Circuit Court of Cook County Illinois
Bobby Earles vs. Penn Central et. al.
Case No. 2020-L-000550
Rosenfeld Deposition 4-16-2022

In United States District Court Eastern District of Florida
Albert Hartman Plaintiff vs. Illinois Central
Case No. 2:20-cv-1633
Rosenfeld Deposition 4-4-2022

In the Circuit Court of the 4th Judicial Circuit, in and For Duval County, Florida
Barbara Steele vs. CSX Transportation
Case No.16-219-Ca-008796
Rosenfeld Deposition 3-15-2022

In United States District Court Easter District of New York
Romano et al. vs. Northrup Grumman Corporation
Case No. 16-cv-5760
Rosenfeld Deposition 3-10-2022

In the Circuit Court of Cook County Illinois
Linda Benjamin vs. Illinois Central
Case No. No. 2019 L 007599
Rosenfeld Deposition 1-26-2022

In the Circuit Court of Cook County Illinois
Donald Smith vs. Illinois Central
Case No. No. 2019 L 003426
Rosenfeld Deposition 1-24-2022

In the Circuit Court of Cook County Illinois
Jan Holeman vs. BNSF
Case No. 2019 L 000675
Rosenfeld Deposition 1-18-2022

In the State Court of Bibb County State of Georgia
Dwayne B. Garrett vs. Norfolk Southern
Case No. 20-SCCV-091232
Rosenfeld Deposition 11-10-2021

In the Circuit Court of Cook County Illinois
Joseph Ruepke vs. BNSF
Case No. 2019 L 007730
Rosenfeld Deposition 11-5-2021

In the United States District Court For the District of Nebraska
Steven Gillett vs. BNSF
Case No. 4:20-cv-03120
Rosenfeld Deposition 10-28-2021

In the Montana Thirteenth District Court of Yellowstone County
James Eadus vs. Soo Line Railroad and BNSF
Case No. DV 19-1056
Rosenfeld Deposition 10-21-2021

In the Circuit Court Of The Twentieth Judicial Circuit, St Clair County, Illinois
Martha Custer et al. vs Cerro Flow Products, Inc.
Case No. 0i9-L-2295
Rosenfeld Deposition 5-14-2021
Trial October 8-4-2021

In the Circuit Court of Cook County Illinois
Joseph Rafferty vs. Consolidated Rail Corp. and National Railroad Passenger Corp. d/b/a AMTRAK,

Case No. 18-L-6845
Rosenfeld Deposition 6-28-2021

In the United States District Court For the Northern District of Illinois
Theresa Romcoe vs. Northeast Illinois Regional Commuter Railroad d/b/a METRA Rail
Case No. 17-cv-8517
Rosenfeld Deposition 5-25-2021

In the Superior Court of the State of Arizona In and For the County of Maricopa
Mary Tryon et al. vs. The City of Phoenix v. Cox Cactus Farm, L.L.C., Utah Shelter Systems, Inc.
Case No. CV20127-094749
Rosenfeld Deposition 5-7-2021

In the United States District Court for the Eastern District of Texas Beaumont Division
Robinson, Jeremy et al vs. CNA Insurance Company et al.
Case No. 1:17-cv-000508
Rosenfeld Deposition 3-25-2021

In the Superior Court of the State of California, County of San Bernardino
Gary Garner, Personal Representative for the Estate of Melvin Garner vs. BNSF
Case No. 1720288
Rosenfeld Deposition 2-23-2021

In the Superior Court of the State of California, County of Los Angeles, Spring Street Courthouse
Benny M Rodriguez vs. Union Pacific Railroad, A Corporation, et al.
Case No. 18STCV01162
Rosenfeld Deposition 12-23-2020

In the Circuit Court of Jackson County, Missouri
Karen Cornwell, Plaintiff, vs. Marathon Petroleum, LP, Defendant.
Case No. 1716-CV10006
Rosenfeld Deposition 8-30-2019

In the United States District Court For The District of New Jersey
Duarte et al, Plaintiffs, vs. United States Metals Refining Company et. al. Defendant.
Case No. 2:17-cv-01624-ES-SCM
Rosenfeld Deposition 6-7-2019

In the United States District Court of Southern District of Texas Galveston Division
M/T Carla Maersk vs. Conti 168., Schiffahrts-GMBH & Co. Bulker KG MS “Conti Perdido” Defendant.
Case No. 3:15-CV-00106 consolidated with 3:15-CV-00237
Rosenfeld Deposition 5-9-2019

In The Superior Court of the State of California In And For The County Of Los Angeles – Santa Monica
Carole-Taddeo-Bates et al., vs. Ifran Khan et al., Defendants
Case No. BC615636
Rosenfeld Deposition 1-26-2019

In The Superior Court of the State of California In And For The County Of Los Angeles – Santa Monica
The San Gabriel Valley Council of Governments et al. vs El Adobe Apts. Inc. et al., Defendants
Case No. BC646857
Rosenfeld Deposition 10-6-2018; Trial 3-7-19

In United States District Court For The District of Colorado
Bells et al. Plaintiffs vs. The 3M Company et al., Defendants
Case No. 1:16-cv-02531-RBJ
Rosenfeld Deposition 3-15-2018 and 4-3-2018

In The District Court Of Reagan County, Texas, 112th Judicial District
Phillip Bales et al., Plaintiff vs. Dow Agrosciences, LLC, et al., Defendants
Cause No. 1923
Rosenfeld Deposition 11-17-2017

In The Superior Court of the State of California In And For The County Of Contra Costa
Simons et al., Plaintiffs vs. Chevron Corporation, et al., Defendants
Cause No. C12-01481
Rosenfeld Deposition 11-20-2017

In The Circuit Court of The Twentieth Judicial Circuit, St Clair County, Illinois
Martha Custer et al., Plaintiff vs. Cerro Flow Products, Inc., Defendants
Case No.: No. 0i9-L-2295
Rosenfeld Deposition 8-23-2017

In United States District Court For The Southern District of Mississippi
Guy Manuel vs. The BP Exploration et al., Defendants
Case No. 1:19-cv-00315-RHW
Rosenfeld Deposition 4-22-2020

In The Superior Court of the State of California, For The County of Los Angeles
Warren Gilbert and Penny Gilbert, Plaintiff vs. BMW of North America LLC
Case No. LC102019 (c/w BC582154)
Rosenfeld Deposition 8-16-2017, Trail 8-28-2018

In the Northern District Court of Mississippi, Greenville Division
Brenda J. Cooper, et al., Plaintiffs, vs. Meritor Inc., et al., Defendants
Case No. 4:16-cv-52-DMB-JVM
Rosenfeld Deposition July 2017

In The Superior Court of the State of Washington, County of Snohomish
Michael Davis and Julie Davis et al., Plaintiff vs. Cedar Grove Composting Inc., Defendants
Case No. 13-2-03987-5
Rosenfeld Deposition, February 2017
Trial March 2017

In The Superior Court of the State of California, County of Alameda
Charles Spain., Plaintiff vs. Thermo Fisher Scientific, et al., Defendants
Case No. RG14711115
Rosenfeld Deposition September 2015

In The Iowa District Court In And For Poweshiek County
Russell D. Winburn, et al., Plaintiffs vs. Doug Hoksbergen, et al., Defendants
Case No. LALA002187
Rosenfeld Deposition August 2015

In The Circuit Court of Ohio County, West Virginia
Robert Andrews, et al. vs. Antero, et al.
Civil Action No. 14-C-30000

Rosenfeld Deposition June 2015

In The Iowa District Court for Muscatine County
Laurie Freeman et. al. Plaintiffs vs. Grain Processing Corporation, Defendant
Case No. 4980
Rosenfeld Deposition May 2015

In the Circuit Court of the 17th Judicial Circuit, in and For Broward County, Florida
Walter Hinton, et. al. Plaintiff, vs. City of Fort Lauderdale, Florida, a Municipality, Defendant.
Case No. CACE07030358 (26)
Rosenfeld Deposition December 2014

In the United States District Court Western District of Oklahoma
Tommy McCarty, et al., Plaintiffs, vs. Oklahoma City Landfill, LLC d/b/a Southeast Oklahoma City Landfill, et al. Defendants.
Case No. 5:12-cv-01152-C
Rosenfeld Deposition: July 2014

In the County Court of Dallas County Texas
Lisa Parr et al, Plaintiff, vs. Aruba et al, Defendant.
Case Number cc-11-01650-E
Rosenfeld Deposition: March and September 2013
Rosenfeld Trial: April 2014

In the County of Kern, Unlimited Jurisdiction
Rose Propagation Services vs. Heppe Enterprises
Case No. S-1500-CV-278190, LHB
Rosenfeld Deposition: May 2014

In the Circuit Court of Baltimore County Maryland
Philip E. Cvach, II et al., Plaintiffs vs. Two Farms, Inc. d/b/a Royal Farms, Defendants
Case Number: 03-C-12-012487 OT
Rosenfeld Deposition: September 2013

In the Court of Galveston County, Texas 56th Judicial District
MDL Litigation Regarding Texas City Refinery Ultracracker Emission Event Litigation
Cause No. 10-UC-0001
Rosenfeld Deposition: March 2013
Rosenfeld Trial: September 2013

In the United States District Court of Southern District of Texas Galveston Division
Kyle Cannon, Eugene Donovan, Genaro Ramirez, Carol Sassler, and Harvey Walton, each Individually an on behalf of those similarly situated, Plaintiffs, vs. BP Products North America, Inc., Defendant.
Case 3:10-cv-00622
Rosenfeld Deposition: February 2012
Rosenfeld Trial: April 2013

In the United States District court of Southern District of California
United States of America, Plaintiff vs. 2,560 Acres of Land, more or less, located in Imperial County, State of California; and Donald L. Crawford, et. al.
Civil No. 3:11-cv-02258-IEG-RBB
Rosenfeld Deposition: December 2012, January 2013

In the Court of Common Pleas of Tuscarawas County Ohio

John Michael Abicht, et al., Plaintiffs, vs. Republic Services, Inc., et al., Defendants
Case No. 2008 CT 10 0741 (Cons. w/ 2009 CV 10 0987)
Rosenfeld Deposition October 2012

In the Court of Common Pleas of Tuscarawas County Ohio
John Michael Abicht, et al., Plaintiffs, vs. Republic Services, Inc., et al., Defendants
Case Number: 2008 CT 10 0741 (Cons. w/ 2009 CV 10 0987)
Rosenfeld Deposition: October 2012

In the United States District Court for the Middle District of Alabama, Northern Division
James K. Benefield, et al., Plaintiffs, vs. International Paper Company, Defendant.
Civil Action No. 2:09-cv-232-WHA-TFM
Rosenfeld Deposition July 2010, June 2011

EXHIBIT B & C

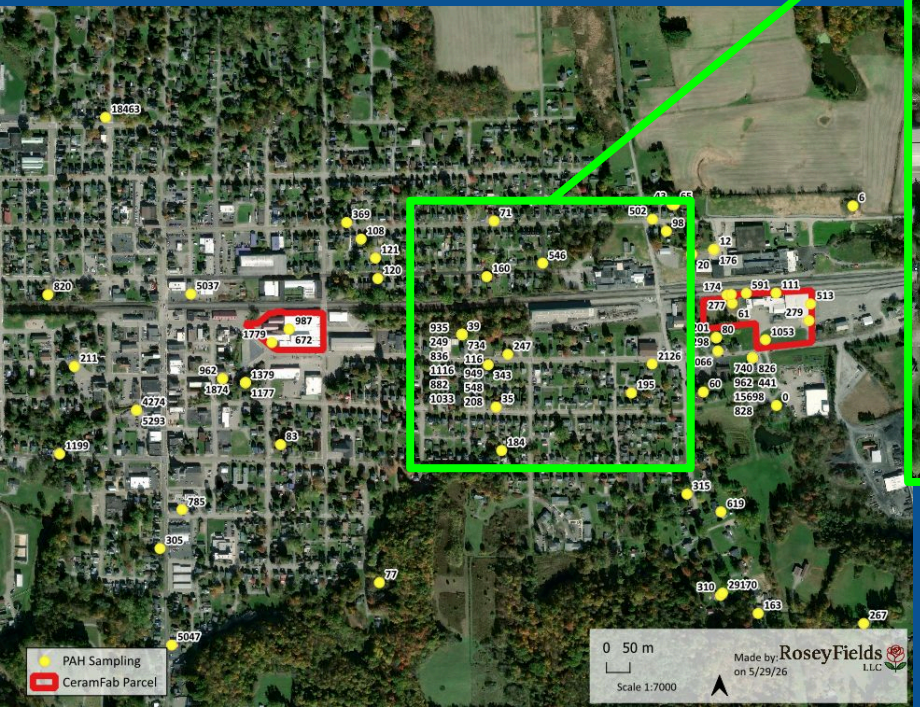
Exhibit B - Maps

RoseyFields LLC

PAH Sampling ND=0 (ug/kg) at WYG Refractories Located at 193 N. James St

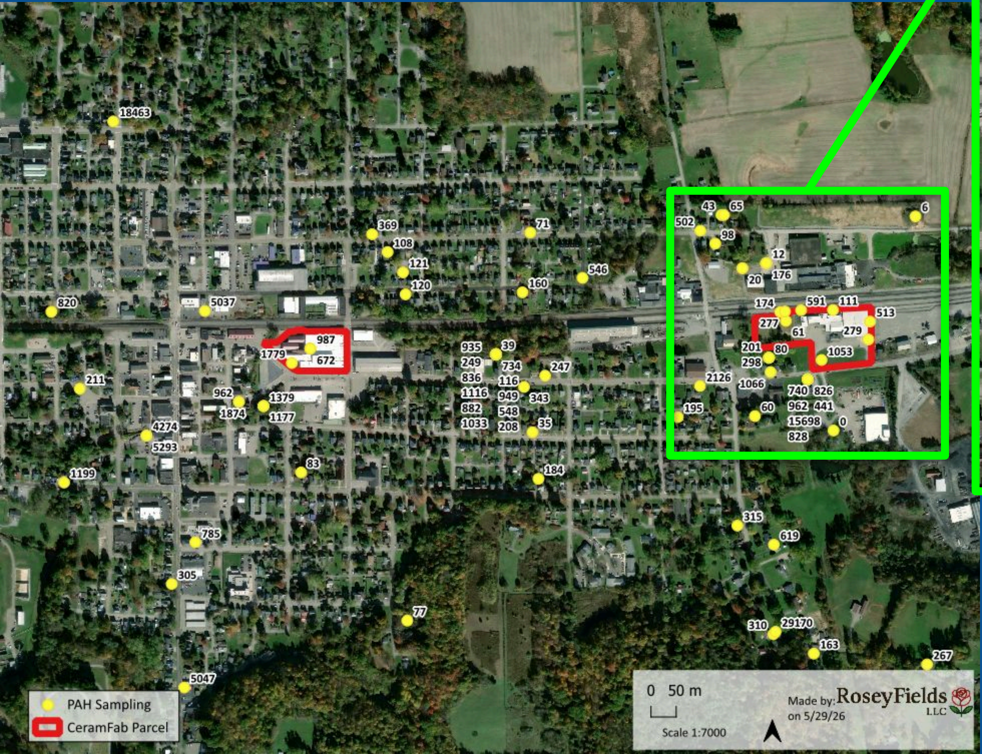
RoseyFields LLC

PAH Sampling ND=0 (ug/kg) Middle Quadrant



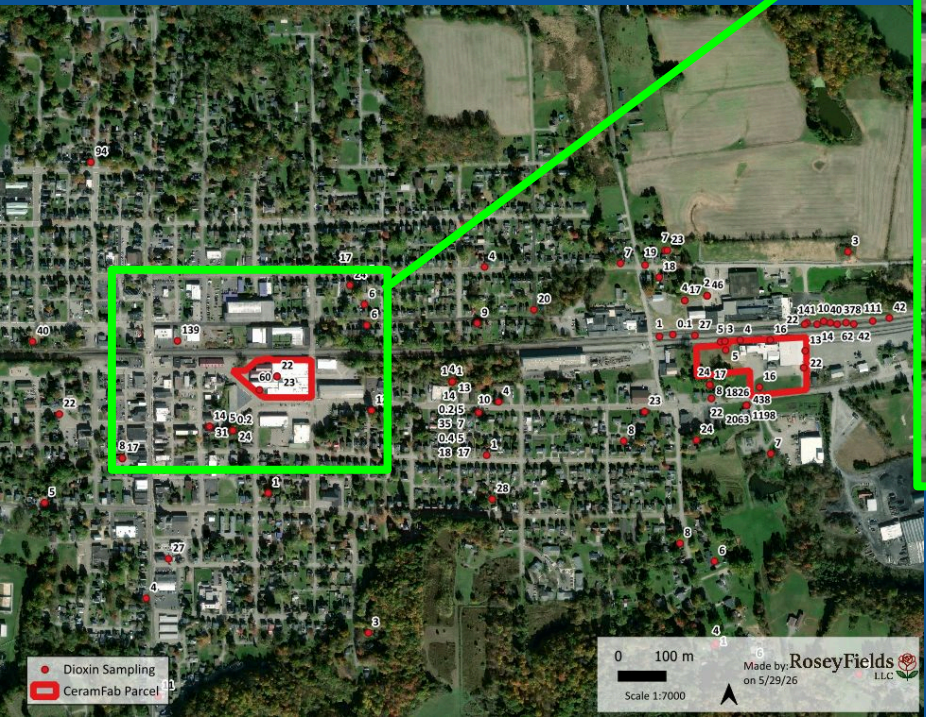
RoseyFields LLC

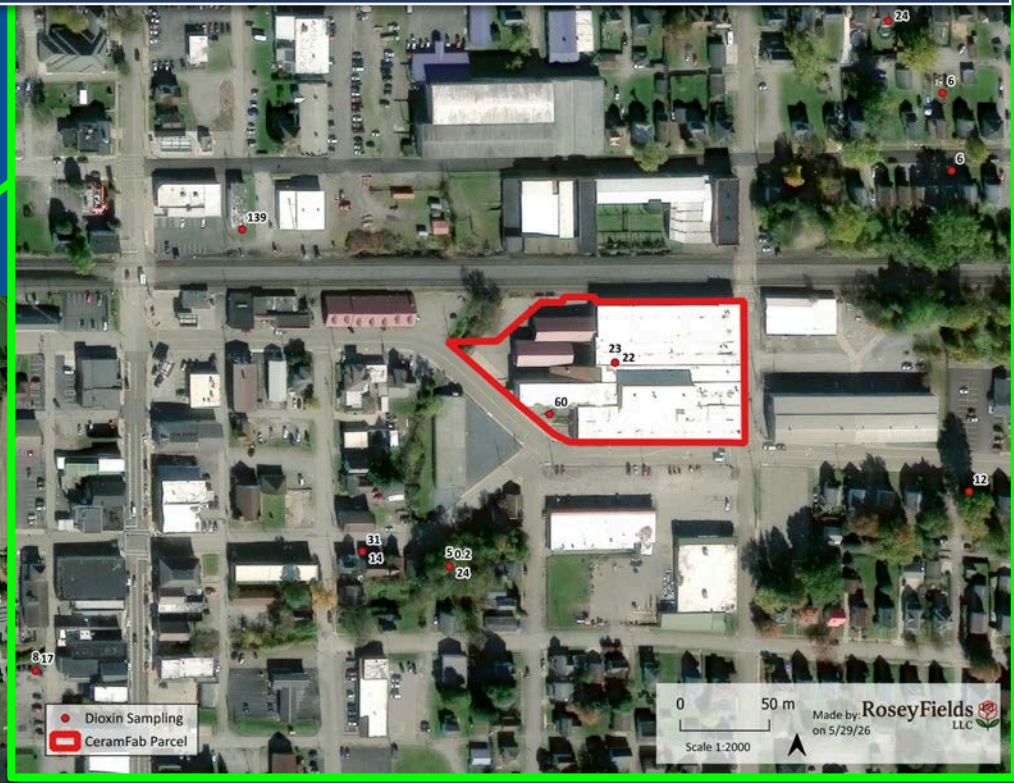
PAH Sampling ND=0 (ug/kg) at CeramFab Facility Located at 900 E Taggart St



RoseyFields LLC

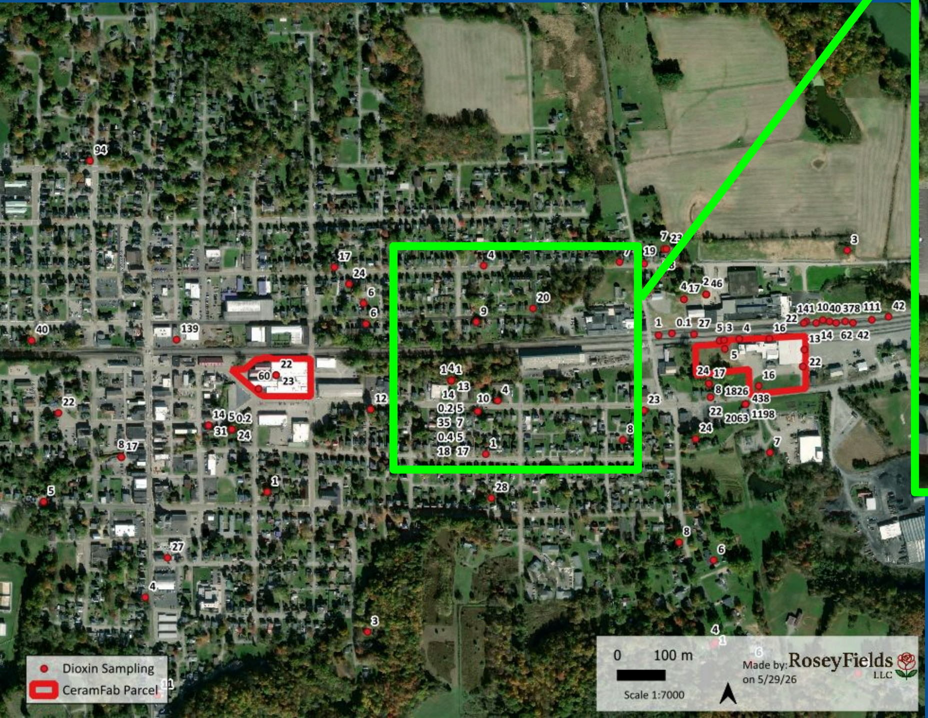
Dioxin Sampling ND=0 (ng-TEQ/kg) at WYG Refractories





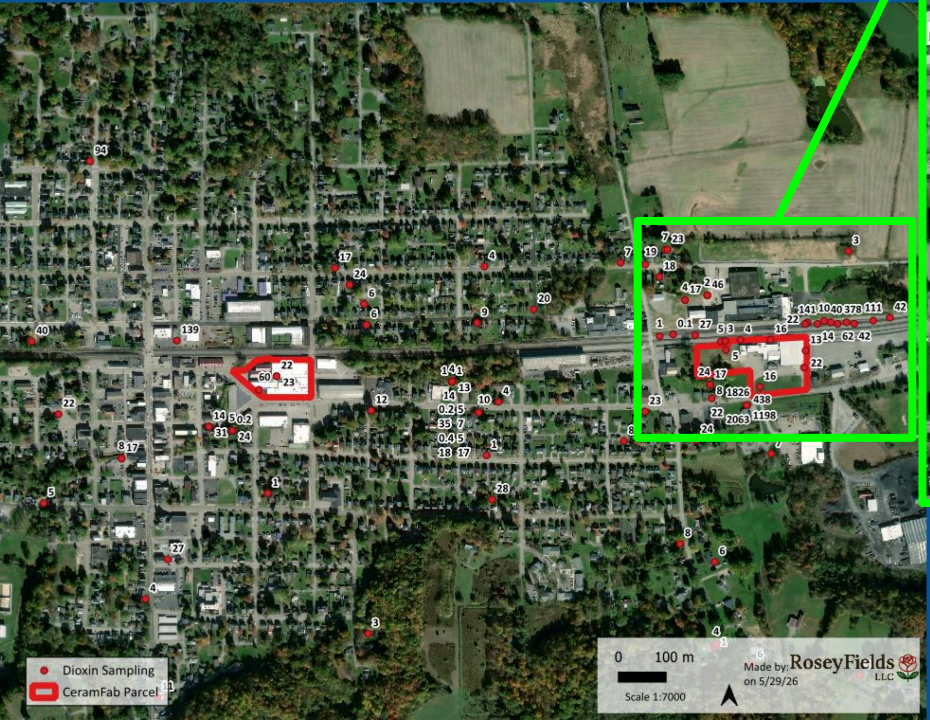
RoseyFields LLC

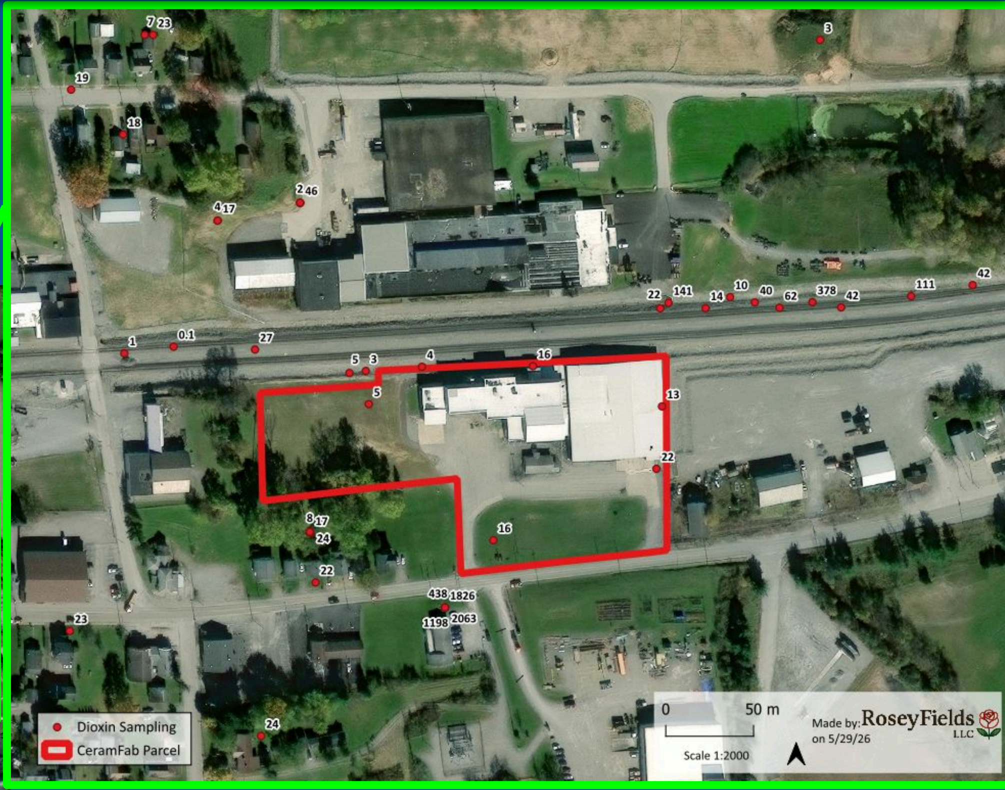
Dioxin Sampling ND=0 (ng-TEQ/kg) Middle Quadrant



RoseyFields LLC

Dioxin Sampling ND=0 (ng-TEQ/kg) at CeramFab Facility



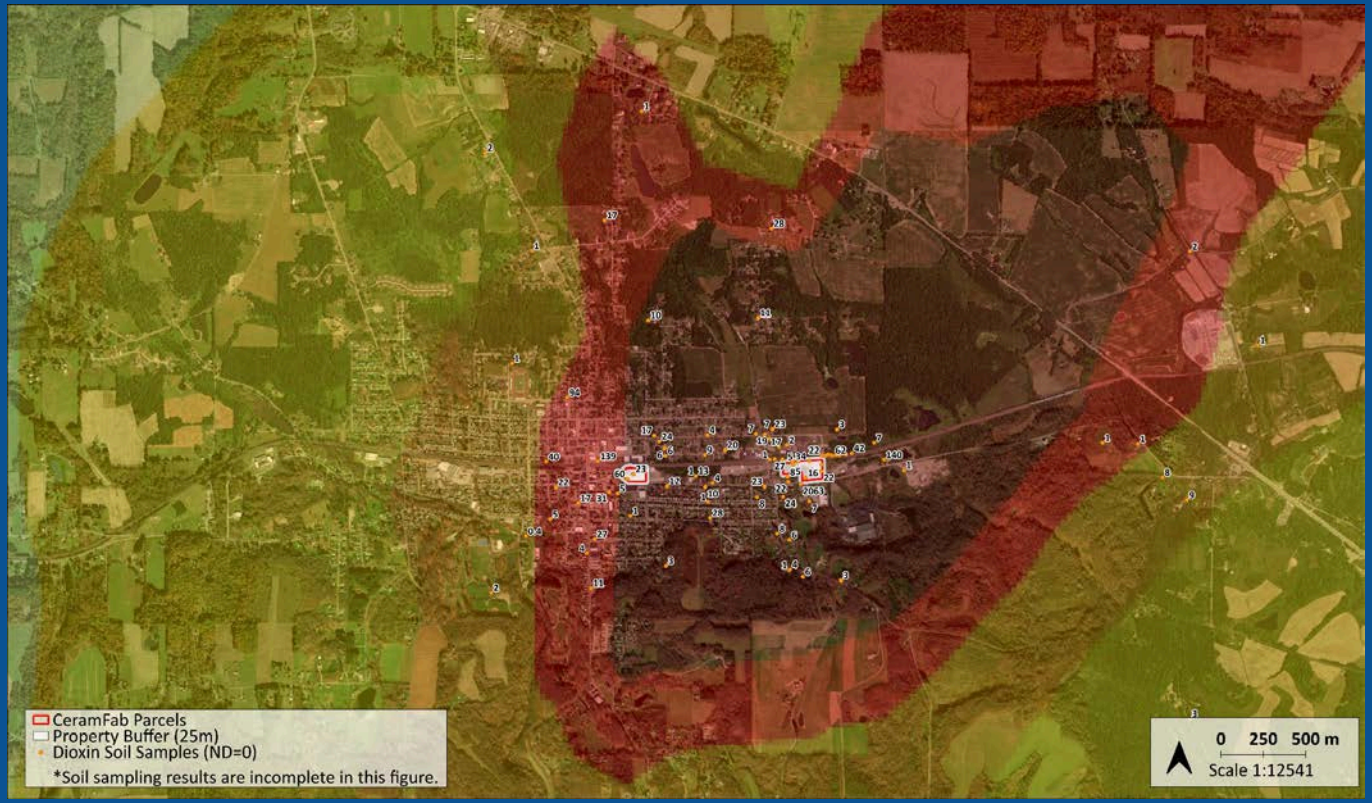


RoseyFields LLC

Exhibit C - Isopleths

RoseyFields LLC

Volume Source Modeled With KOHEASTP9 Met Station



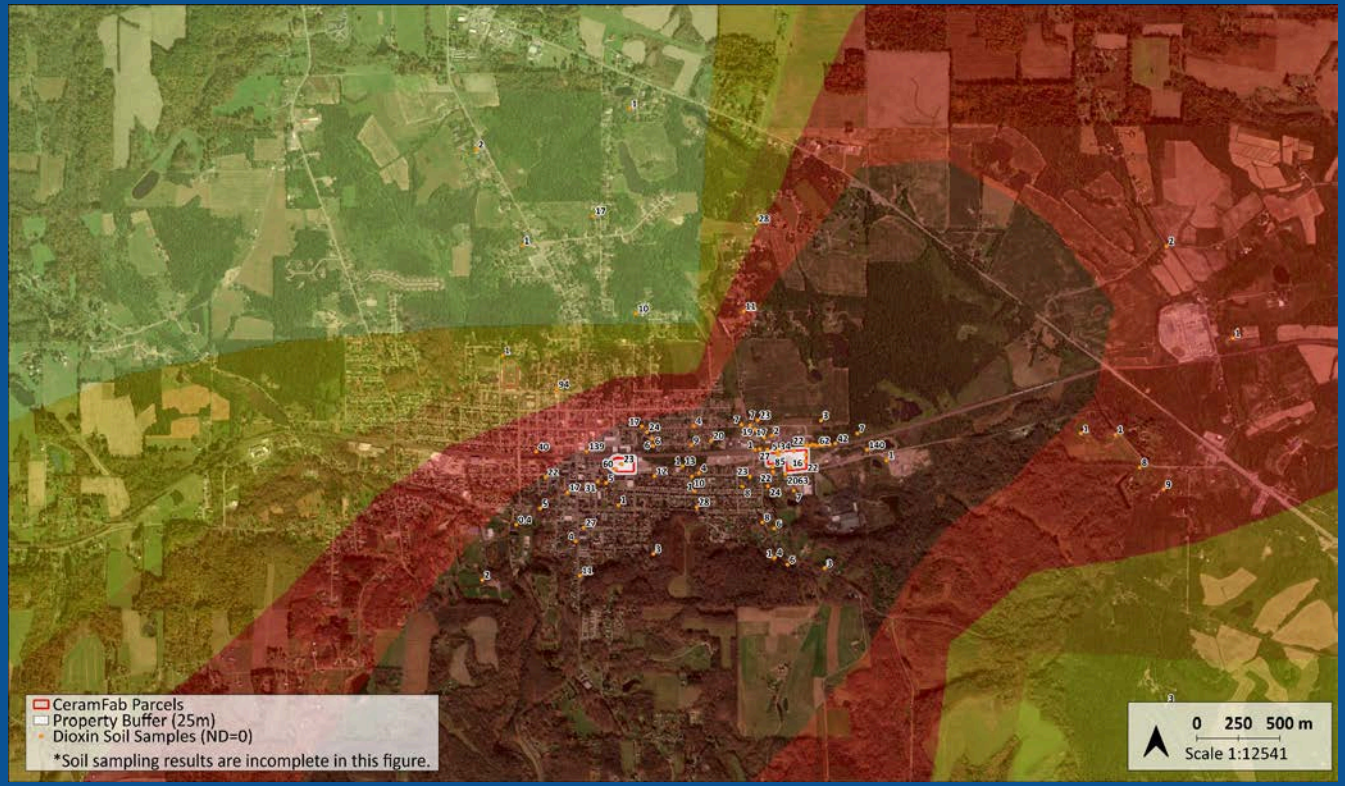
RoseyFields LLC

Volume Source Modeled With KOHEASTP9 Met Station

Volume Source Modeled With KOHEASTP9 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
75	3.3	1.7	768	33.9	16.9
150	6.6	3.3	1535	67.7	33.9
>300	>13.2	>6.6	>3070	>135.4	>67.7

RoseyFields LLC

Line Source Modeled With KOHEASTP9 Met Station



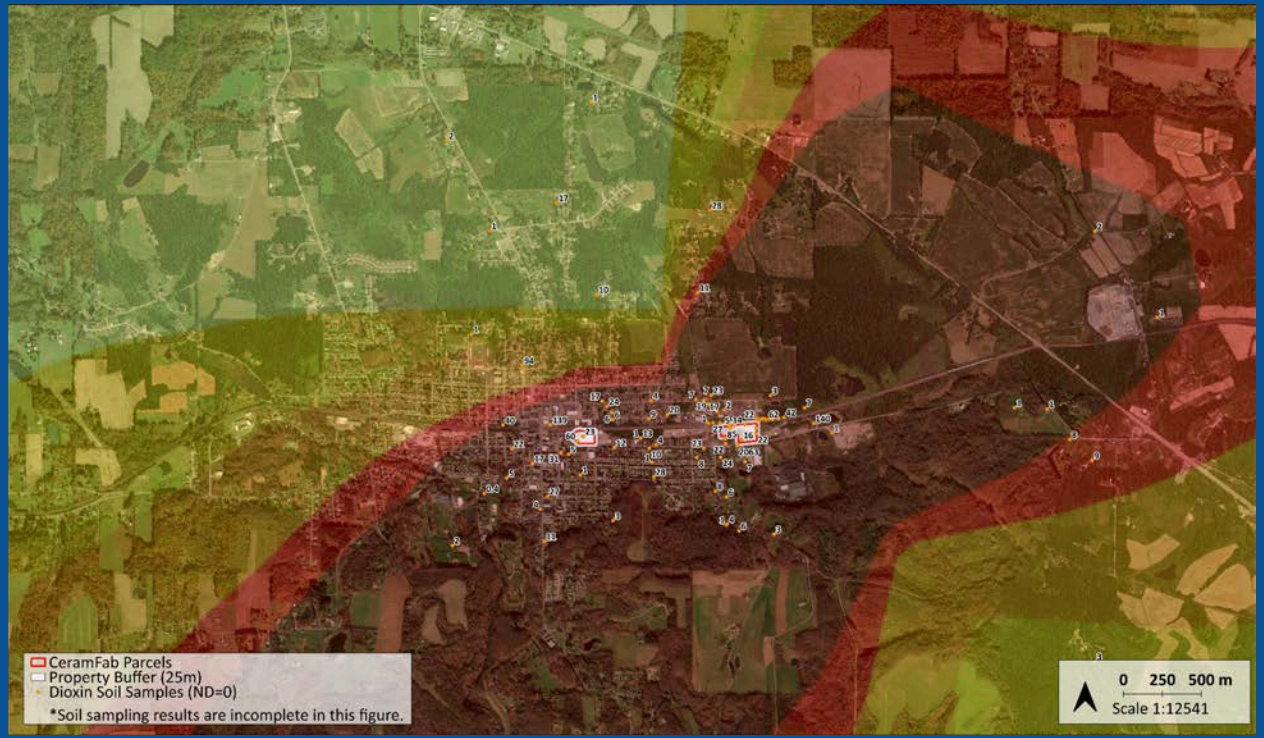
RoseyFields LLC

Line Source Modeled With KOHEASTP9 Met Station

	Line Source Modeled With KOHEASTP9 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

Area Source Modeled With KOHEASTP9 Met Station



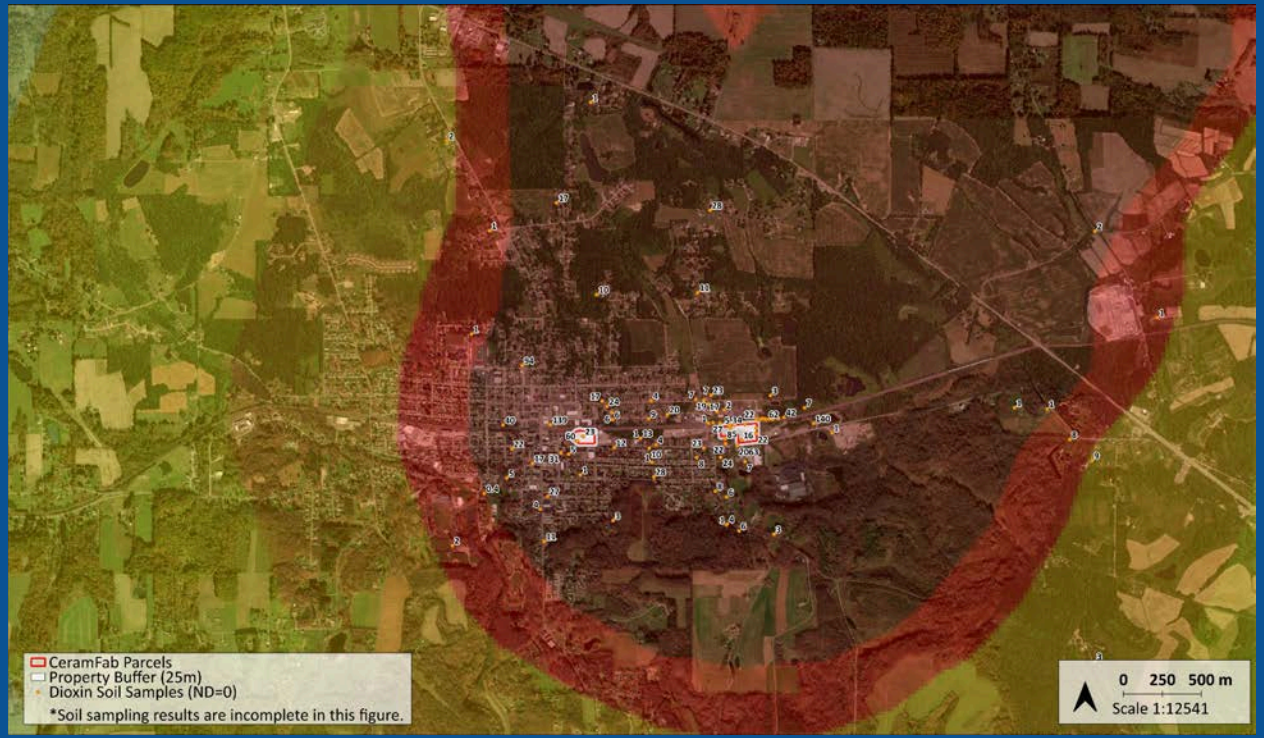
RoseyFields LLC

Area Source Modeled With KOHEASTP9 Met Station

Area Source Modeled With KOHEASTP9 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
1	0.04	0.02	10	0.5	0.2
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
60	2.6	1.3	614	27.1	13.5
>100	>4.4	>2.2	>1023	>45.1	>22.6

RoseyFields LLC

Volume Source Modeled With KOHEASTP7 Met Station



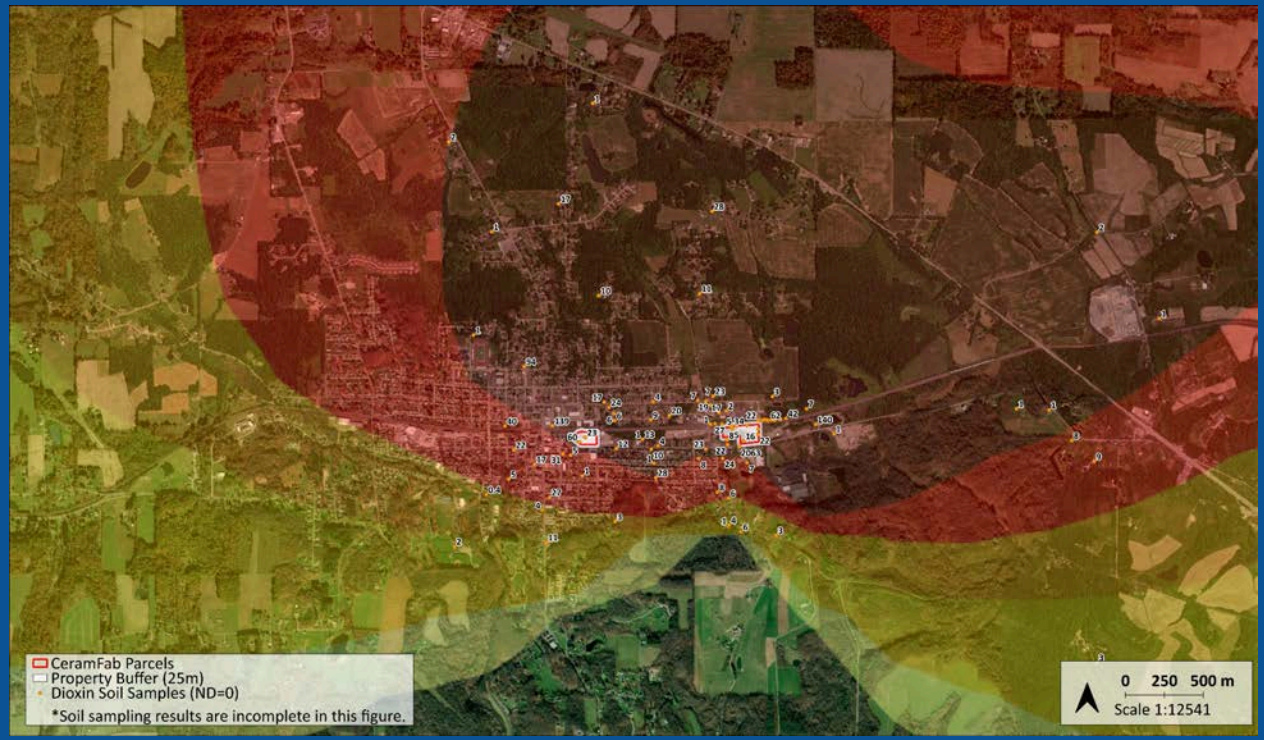
RoseyFields LLC

Volume Source Modeled With KOHEASTP7 Met Station

Volume Source Modeled With KOHEASTP7 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50	2.2	1.1	512	22.6	11.3
100	4.4	2.2	1023	45.1	22.6
>150	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

LINE Source Modeled With KOHEASTP7 Met Station



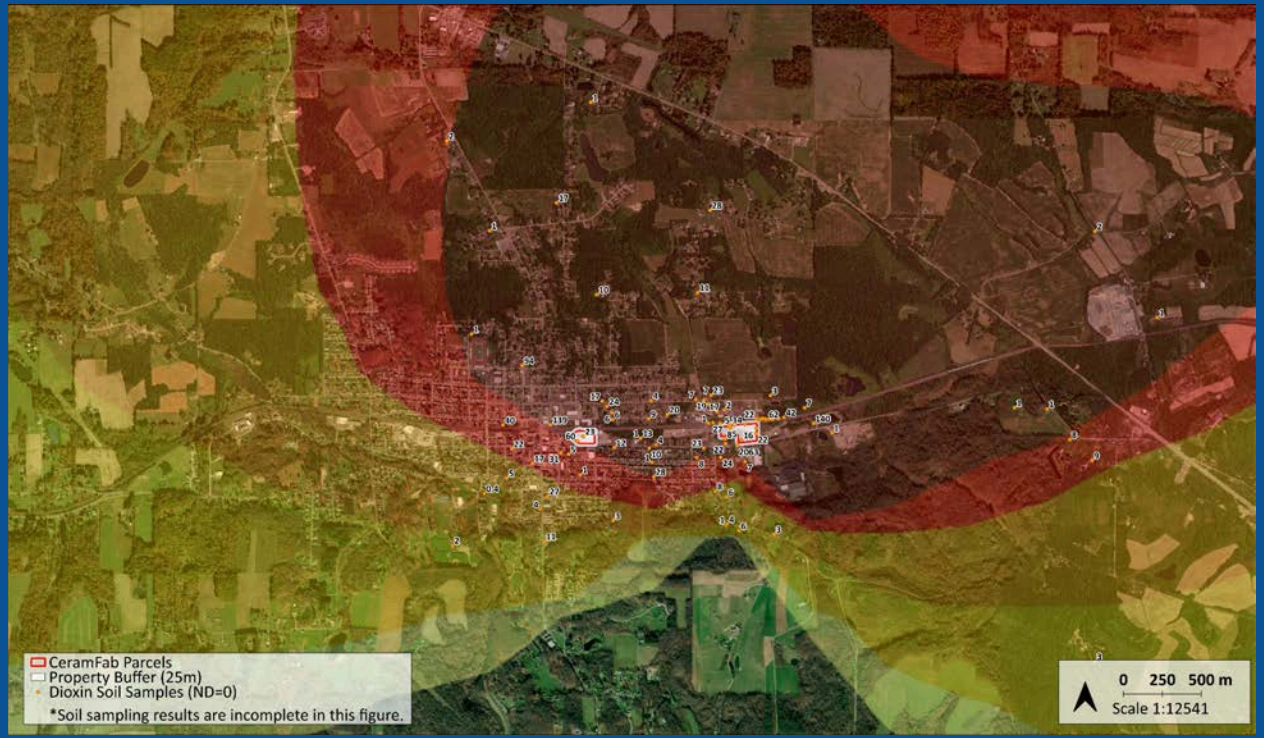
RoseyFields LLC

LINE Source Modeled With KOHEASTP7 Met Station

Line Source Modeled With KOHEASTP7 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m^2)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m^2)	BAP Equivalents (ug-BaP_eq/m^2) Diluted to 1 Inch of Soil
1	0.04	0.02	10	0.5	0.2
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50	2.2	1.1	512	22.6	11.3
>150	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

Area Source Modeled With KOHEASTP7 Met Station



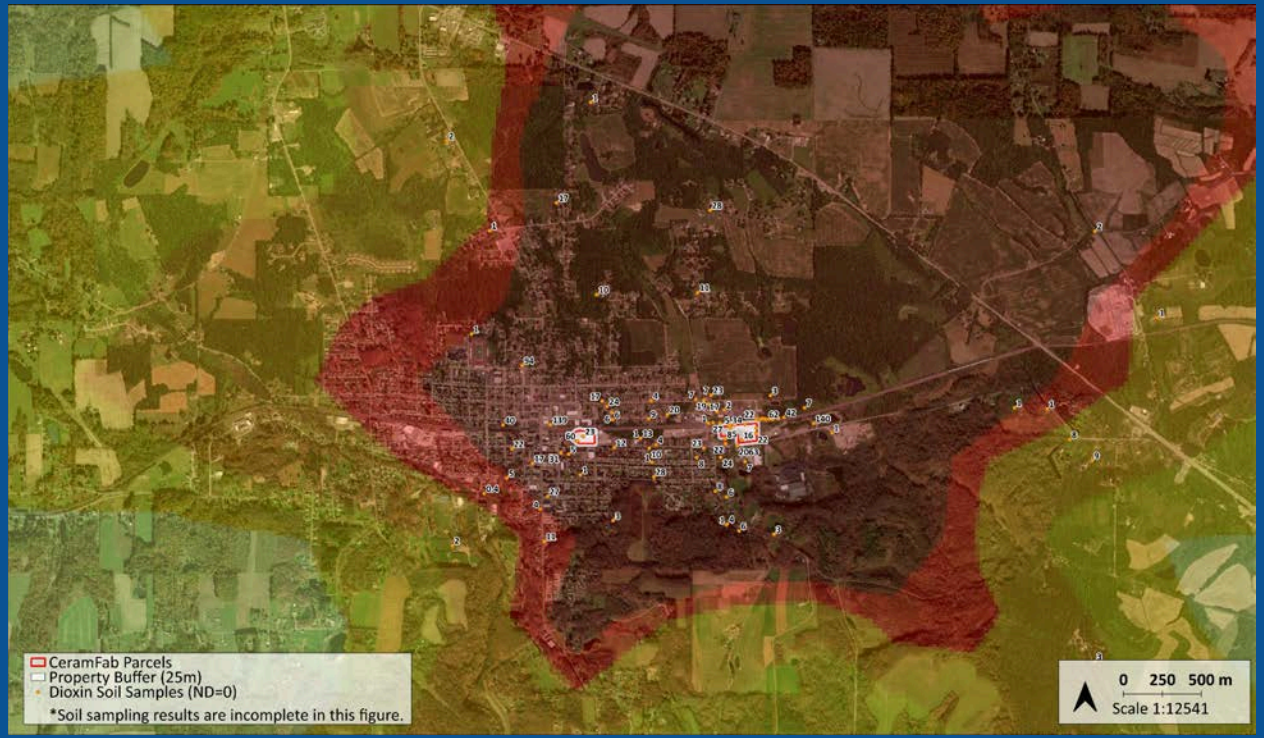
RoseyFields LLC

Area Source Modeled With KOHEASTP7 Met Station

Area Source Modeled With KOHEASTP7 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
1	0.04	0.02	10	0.5	0.2
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50	2.2	1.1	512	22.6	11.3
>150	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

Volume Source Modeled With KPABEAVE2 Met Station



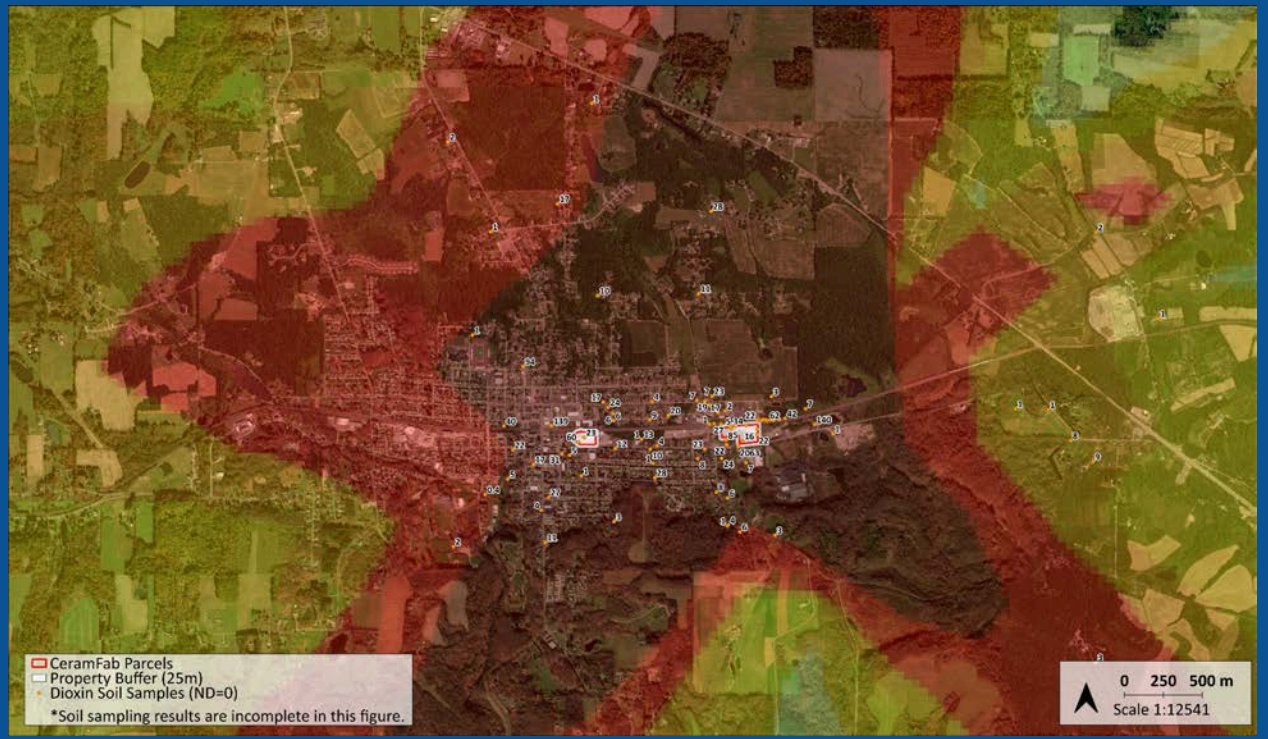
RoseyFields LLC

Volume Source Modeled With KPABEAVE2 Met Station

Volume Source Modeled With KPABEAVE2 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/kg)	BAP Equivalents (ug-BaP_eq/kg) Diluted to 1 Inch of Soil
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50	2.2	1.1	512	22.6	11.3
100	4.4	2.2	1023	45.1	22.6
>150	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

LINE Source Modeled With KPABEAVE2 Met Station



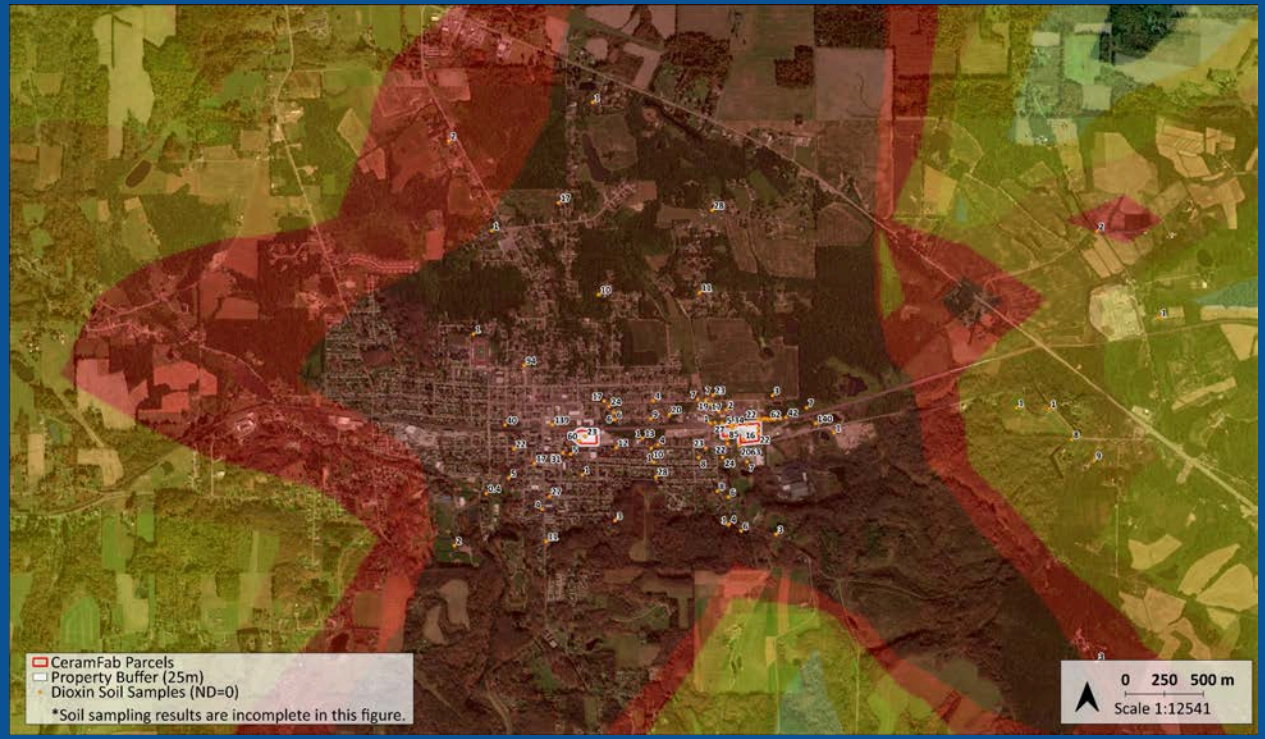
RoseyFields LLC

LINE Source Modeled With KPABEAVE2 Met Station

	Line Source Modeled With KPABEAVE2 Met Station					
	Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m^2) in Top Kg of Soil	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m^2)	BAP Equivalents (ug-BaP_eq/m^2) Diluted to 1 Inch of Soil
	1	0.04	0.02	10	0.5	0.2
	4.8	0.2	0.1	49	2.2	1.1
	22.5	1.0	0.5	230	10.2	5.1
	50	2.2	1.1	512	22.6	11.3
	>150	>6.6	>3.3	>1535	>67.7	>33.9

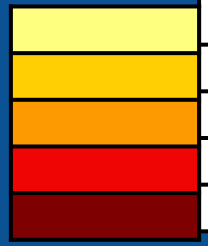
RoseyFields LLC

Area Source Modeled With KPABEAVE2 Met Station



RoseyFields LLC

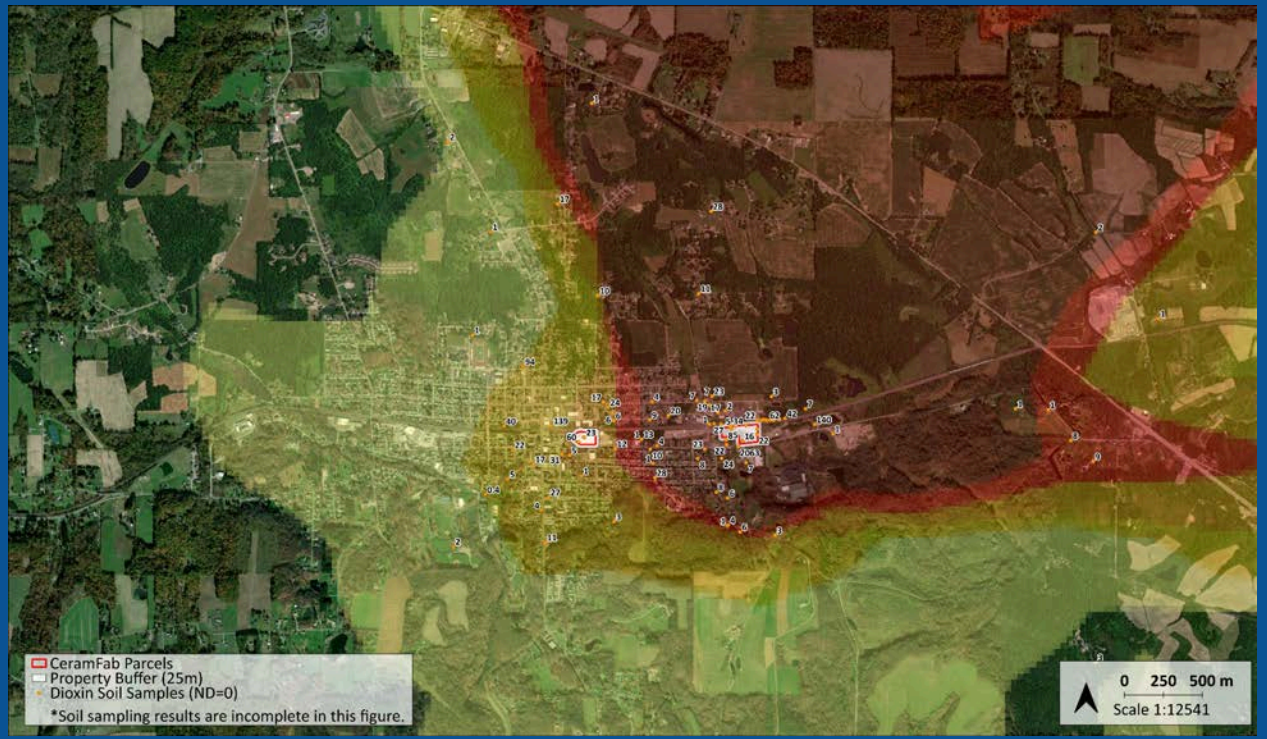
Area Source Modeled With KPABEAVE2 Met Station



Area Source Modeled With KPABEAVE2 Met Station					
Dioxin Deposition (ng-TEQ/m²) in Top Kg of Soil	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m^2) in Top Kg of Soil	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m^2)	BAP Equivalents (ug-BaP_eq/m^2) Diluted to 1 Inch of Soil
1	0.04	0.02	10	0.5	0.2
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50	2.2	1.1	512	22.6	11.3
>100	>4.4	>2.2	>1023	>45.1	>22.6

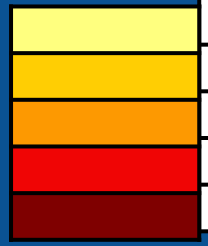
RoseyFields LLC

Volume Source Modeled With KPIT Met Station



RoseyFields LLC

Volume Source Modeled With KPIT Met Station



Volume Source Modeled With KPIT Met Station					
Dioxin Deposition (ng-TEQ/m²)	Dioxin Deposition Diluted to 0.5 Inch of Soil (ng-TEQ/kg)	Dioxin Deposition Diluted to 1 Inch of Soil (ng-TEQ/kg)	BAP Equivalents (ug-BaP_eq/m²)	BAP Equivalents Diluted to 0.5 Inch of Soil (ug-BaP_eq/m²)	BAP Equivalents (ug-BaP_eq/m²) Diluted to 1 Inch of Soil
4.8	0.2	0.1	49	2.2	1.1
22.5	1.0	0.5	230	10.2	5.1
50.0	2.2	1.1	512	22.6	11.3
100.0	4.4	2.2	1023	45.1	22.6
>150.0	>6.6	>3.3	>1535	>67.7	>33.9

RoseyFields LLC

EXHIBIT D

Exhibit D - Sample Results and UCL in East Palestine General Area

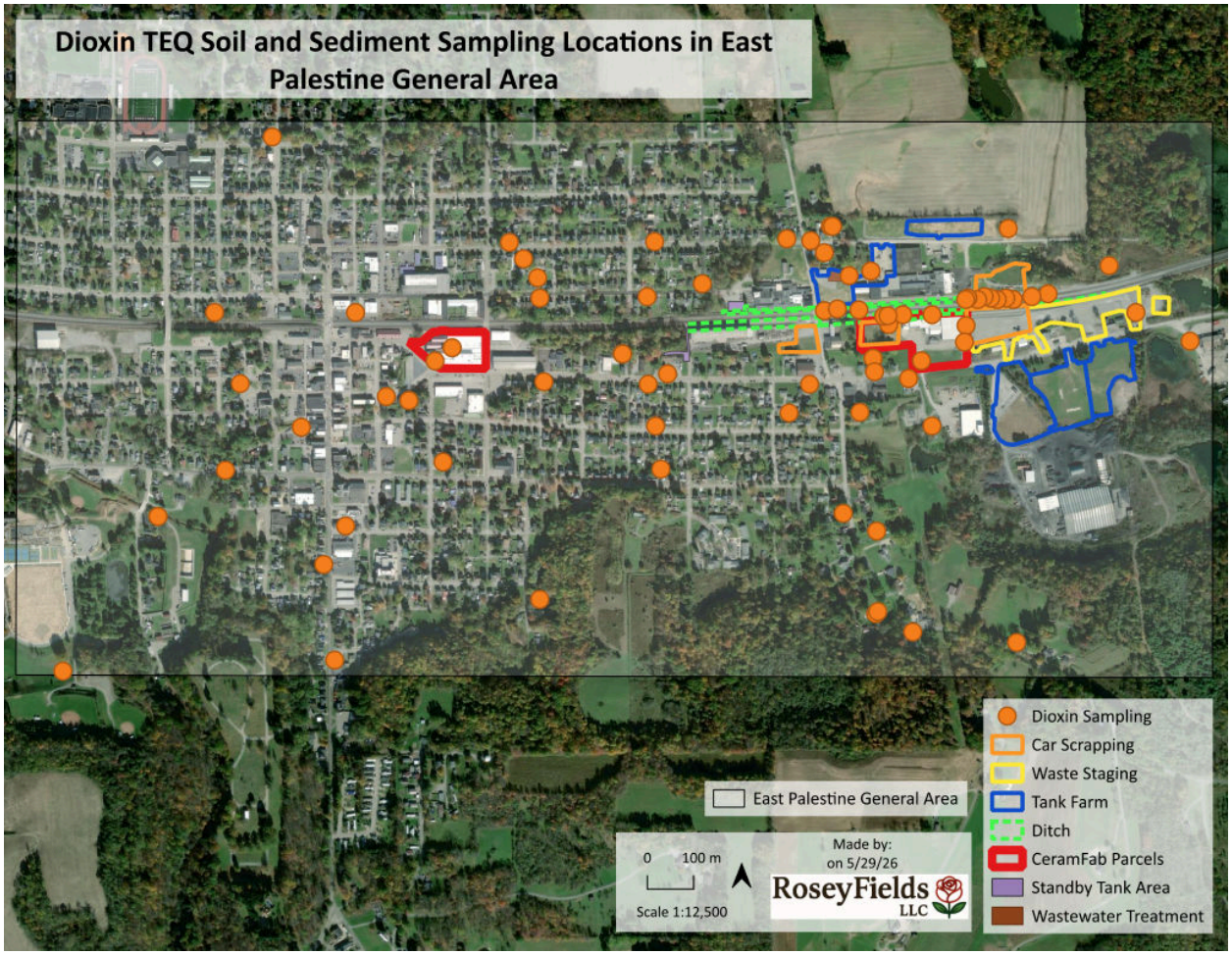


Figure 1. Dioxin TEQ Soil and Sediment Sampling Locations in East Palestine General Area

Table. 1 Dioxin TEQ Soil and Sediment Samples within the East Palestine General Area

Dioxin Soil and Sediment Samples within the East Palestine General Area		
Sample ID	**RESULT ng-TEQ/kg (ND = 0)**	**RESULT ng-TEQ/kg (ND = ½ MDL)**
CLASS 9	7	7
CLASS 10	11.1	11.1
CLASS 11	6	6
CLASS 12	3.9	3.9
S-1-4	138.6	138.7
S-2-4	8.3	8.3

Exhibit D - Sample Results and UCL in East Palestine General Area

S-3-4	139.8	139.8
S-4A-4	0.8	0.8
S-5-4	10.3	10.3
S-6A-4	17.3	17.3
S-6B-4	8.2	8.2
S-7A-4	5.3	5.3
S-8-4	2.7	2.7
S-10A-4	1.3	1.3
S-11A-4	5.5	5.5
S-30-4A	2.6	2.6
S-31-4A	22.8	22.8
S-32-4A	19.2	19.2
S-35-4A	1.7	1.7
S-36-4A	7.5	7.5
S-37-4A	20.1	20.1
S-38-4A	39.5	39.5
S-70-4	0.9	0.9
S-71-4	0.1	0.2
S-72-4	27.4	27.4
S-73-4	41.9	41.9
S-74-4	110.6	110.6
S-75-4	42.4	42.4
S-76-4	377.5	377.5
S-77-4	62.4	62.4
S-78-4	40.4	40.4
S-79-4	9.9	9.9
S-80-4	13.6	13.6
S-81-4	140.9	140.9
S-82-4	22.3	22.3
EP02-SO-1	3.69	111.43
EP02-SO-2	5.47	5.76
EP02-SO-3	4.83	4.83
EP02-SO-4	3.32	3.51

Exhibit D - Sample Results and UCL in East Palestine General Area

EP02-SO-5	15.86	15.87
EP02-SO-6	12.92	12.92
EP02-SSS-3	22.31	22.31
EP03-SO	16.73	16.73
EP05-SO	23.52	23.52
EP06-SO	5.71	6.02
EP06-SO-2	7.22	7.42
EP08-SO	22.79	23.26
EP10-SO	17.97	18.28
EP11-SO	24.37	24.55
EP12-SO	27.85	27.85
EP13-SO	27	29.67
EP14-SO	94.12	97.94
EP80-SO	21.53	21.7
410-141089-11	13.44	13.65
410-141089-9	1.19	4.46
410-237289-1	5.18	7.08
410-237289-3	0.54	3.25
410-237282-1	5.01	7.03
410-237282-3	24.46	24.66
410-127590-3	13.92	24.96
410-144711-8	31.29	31.42
410-126924-3	1826.3	1826.3
410-137121-3	437.98	437.98
410-175954-1	1197.5	1197.5
410-237292-1	2062.6	2327.1
410-119901-10	1.47	5.65
410-119901-13	0.9	3.58
410-126924-6	3.93	7.82
410-128628-10	8.74	8.89
410-137121-6	21.74	21.93
410-141089-5	11.73	11.88
410-141089-14	6.86	8.86

Exhibit D - Sample Results and UCL in East Palestine General Area

410-142486-7	45.99	48.96
410-142486-6	17.24	25.16
410-135745-1	23.17	23.33
410-271419-1	15.939	15.939
410-271421-1	59.954	59.954
410-271427-1	7.24	7.24
410-271429-1	3.485	3.49
410-141093-4	0.38	13.34
410-141093-5	2.258	15.158
410-141561-1	3.879	16.719
410-142284-1	1.554	12.254
410-142284-2	0	0
410-142284-3	3.654	16.494
410-147751-1	4.032	6.111
410-147751-2	5.745	8.094
410-237272-1	1.02	3.918
410-237272-3	0.511	3.55
410-118226-4	0.602	28.639
410-128628-1	35.204	544.258
410-141089-10	4.285	53.689
410-175955-1	4.526	55.66
410-237282-2	0.204	23.008
410-237289-2	0.237	25.649
410-116817-5	16.859	17.23
410-116817-6	17.667	17.84
410-130775-1	24.014	24.14
410-144711-16	16.788	16.94
410-162165-2	7.995	10.54
410-162165-1	21.849	22.04
410-170520-1	6.935	9.01
410-170520-3	3.894	6.19
410-170520-2	0.395	2.86
410-237272-1	0.16	2.873

Exhibit D - Sample Results and UCL in East Palestine General Area

Number of Samples	105	105
Average	74.2	85.5
Max	2,062.6	2,327.1
95% UCL	121.3	136
Residential Soil RSL	4.8	4.8
Occupational Soil RSL	21.6	21.6
UCL Divided By Residential RSL	25.3	28.3
UCL Divided By Occupational RSL	5.6	6.3

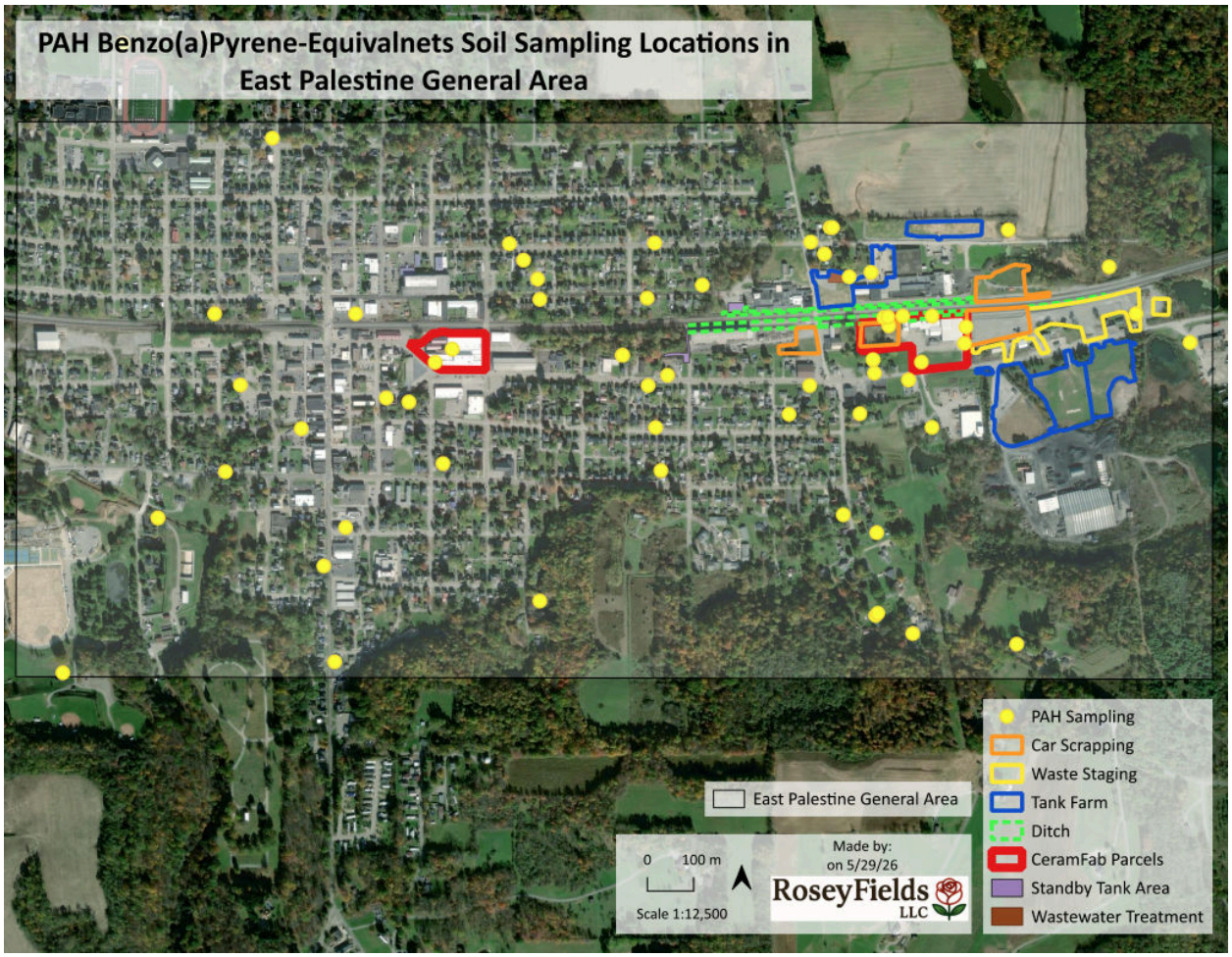


Figure 2. PAH Benzo(a)Pyrene-Equivalents Soil and Sediment Sampling Locations in East Palestine General Area

Exhibit D - Sample Results and UCL in East Palestine General Area

Table. 2 PAH Benzo(a)Pyrene-Equivalents Soil and Sediment Samples within the East Palestine General Area

PAH Soil and Sediment Samples within the East Palestine General Area		
Sample ID	**RESULT ug-BaP_eq/kg (ND = 0)**	**RESULT ug-BaP_eq/kg (ND = ½ MDL)**
CLASS 9	43.3	54.3
CLASS 10	5047	5047
CLASS 11	120.8	120.8
CLASS 12	70.8	70.8
S-1-2	5037	5037
S-2-2	195.3	195.3
S-3-2	3979	3979
S-4A-2	27.12	39.25
S-5-2	343.2	343.2
S-6A-2	5293	5293
S-6B-2	4274	4274
S-7A-2	1198.6	1198.6
S-8-2	77.22	90.42
S-10A-2	309.6	309.6
S-11A-2	119.64	119.64
S-30-2A/2B	267.3	267.3
S-31-2A/2B	65.48	75.68
S-32-2A/2B	501.7	501.7
S-35-2A/2B	36	46.78
S-36-2A/2B	315	315
S-37-2A/2B	546.1	546.1
S-38-2A/2B	819.5	819.5
EP02-SO-1	591.13	4816.13
EP02-SO-2	61.36	873.86
EP02-SO-3	174.24	1168.74

Exhibit D - Sample Results and UCL in East Palestine General Area

EP02-SO-4	276.63	4397.63
EP02-SO-5	111	878
EP02-SO-6	513.02	4296.02
EP02-SSS-3	278.84	3522.34
EP03-SO	80.24	1250.24
EP05-SO	59.51	989.01
EP06-SO	618.51	1782.01
EP06-SO-2	0	997.96
EP08-SO	986.6	9371.6
EP10-SO	97.84	4222.01
EP11-SO	107.76	4836.9
EP12-SO	183.5	9037.1
EP13-SO	784.8	9949.8
EP14-SO	18463	31528
EP80-SO	671.92	9056.92
410-141089-11	949	1081
410-141089-9	248.5	380.5
410-237289-1	734.2	734.2
410-237289-3	935.3	935.3
410-237282-1	1176.7	1176.7
410-237282-3	1379.4	1379.4
410-127590-3	961.8	961.8
410-144711-8	1874	1874
410-126924-3	825.7	1065.7
410-126924-3	15698	15698
410-126924-3	961.8	961.8
410-137121-3	828.4	828.4
410-175954-1	739.8	739.8
410-237292-1	440.9	440.9
410-119901-10	83.34	98.94
410-119901-13	35.3	45.5
410-126924-6	29170	29170
410-128628-10	159.5	261.15

Exhibit D - Sample Results and UCL in East Palestine General Area

410-137121-6	210.7	321.1
410-142486-7	176.2	262.6
410-142486-6	20.49	128.79
410-271419-1	1053.2	1053.2
410-271421-1	1779	1779
410-271427-1	10	268.8
410-271429-1	6.3	173.57
410-141093-4	1771.9	1771.9
410-141093-5	2307	2307
410-141561-1	304.9	496.9
410-142284-1	12.29	119.44
410-142284-2	0	0
410-142284-3	49.8	1322.8
410-147751-1	247.3	354.1
410-147751-2	162.6	273
410-237272-1	960.8	960.8
410-237272-3	1952	1952
410-118226-4	548.30	655.10
410-128628-1	208.30	340.30
410-141089-10	836.00	956.00
410-175955-1	1115.70	1115.70
410-237289-2	38.63	48.71
410-237282-2	86.52	86.52
410-130775-1	200.80	305.20
410-135745-1	2126.00	2126.00
410-144711-16	369.20	871.20
410-162165-2	298.30	298.30
410-162165-1	1066.00	1066.00
410-170520-1	882.20	882.20
410-170520-3	1032.50	1032.50
410-170520-2	116.20	208.60
410-237272-1	125.89	125.89

Exhibit D - Sample Results and UCL in East Palestine General Area

Number of Samples	**90**	**90**
Average	**1,445**	**2,369**
Max	**29,170**	**31,528**
95% UCL	**2,142**	**3,245**
Residential Soil RSL	**110**	**110**
Occupational Soil RSL	**2110**	**2110**
UCL Divided By Residential RSL	**19.5**	**29.5**
UCL Divided By Occupational RSL	**1.0**	**1.5**

EXHIBIT E

Exhibit E: NTSB Citations

1 Introduction

These citations further support the opinions in the original report.

1.1. Derailment Timeline

The derailment of Norfolk Southern (NS) Train 32N occurred on the evening of February 3, 2023, following the catastrophic failure of a wheel bearing.[1] The train, which consisted of 149 freight cars and 3 locomotives, measured 9,309 feet long and weighed 17,977 tons.[2] Of the 149 freight cars, 20 were transporting hazardous materials.[3]

The events leading to the crash unfolded over approximately one hour as the train traveled eastbound through Ohio.[4] At 7:37 p.m. EST, the train passed a hot bearing detector (HBD) in Sebring, Ohio, which recorded the left number 1 (L1) bearing on the 23rd car—a covered hopper car carrying polyethylene pellets (GPLX 75465)—at 38°F above ambient temperature.[5] At 8:13 p.m., the train passed the Salem, Ohio HBD, which recorded the same bearing at 103°F above ambient.[6] This triggered a non-critical alert to the NS Advanced Train Control desk, while security cameras in the area recorded visible fire and sparks emanating from the bearing.[7]

At 8:52 p.m., the train reached an HBD in East Palestine, Ohio, which recorded the bearing at 253°F above ambient temperature and immediately broadcasted a critical alarm to the train crew.[8]At 8:53 p.m., the engineer began to slow the train using dynamic braking.[9] At approximately 8:54 p.m., the overheated L1 bearing on the hopper car failed completely, causing the axle to separate and initiating the derailment at Milepost 49.5.[10]

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[1] Federal Railroad Administration. *FRA Safety Advisory 2023-01*. Washington, DC: US Department of Transportation; 2023. NTSB Group E - Exhibit 23. Docket ID: DCA23HR001. PDF Pg. 4.
[2] *Mechanical Factual Report - East Palestine, OH*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 5. Docket ID:DCA23HR001. PDF Pg. 7.
[3] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023. PDF Pg. 7.
[4] *Operations Factual Report*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 6. DocketID:DCA23HR001. PDF Pg. 4.
[5] *Mechanical Factual Report - East Palestine, OH*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 5. Docket ID:DCA23HR001. PDF Pg. 16.
[6] Ibid.
[7] *Operations Factual Report*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 6. DocketID:DCA23HR001. PDF Pg. 11.
[8] *Mechanical Factual Report - East Palestine, OH*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 5. Docket ID:DCA23HR001. PDF Pg. 16.
[9] *System Safety and Human Performance Group Chair's Factual Report*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group B - Exhibit 8. Docket ID:DCA23HR001. PDF Pg. 9.
[10] Ibid.

Several sources from the NTSB Docket reveal that an automatic emergency brake application engaged, and a total of 38 railcars (positions 25 through 62 in the consist) derailed in an accordion-style pileup, including 11 tank cars carrying hazardous materials.[11]

1.2. Pressure Relief Device (PRD) Activity Timeline

A massive fire ignited immediately following the derailment on February 3, 2023.[12] Three DOT-111 specification tank cars were mechanically breached upon impact, including one carrying butyl acrylates (a Class 3 flammable liquid), which was punctured and rapidly released its contents, the other two carrying Ethylene Glycol Monobutyl Ether and 2-Ethylhexyl Acrylate.[13]

The spilled butyl acrylates likely served as the ignition source, forming a large pool fire in a ditch along the tracks that burned for two to three hours.[14] This initial pool fire ignited other derailed freight, including plastic pellets from the breached hopper car, creating a sustained fire that engulfed and impinged upon adjacent cars.[15] Event records note that the initial pool fires lessened in intensity by approximately 6:30pm on February 4th, 2023, though the fire continued to smolder over the following days.[16]

Among the cars exposed to the intense heat were five mechanically intact DOT-105 pressure tank cars carrying stabilized vinyl chloride monomer (VCM), a flammable gas.[17] As the heat from the fires caused the internal pressure of the VCM tank cars to rise, their pressure relief devices (PRDs) began to actuate.[18] The first PRD switched on shortly after midnight on February 4, 2023, and the PRDs on the four

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[11] *Interview Transcript - SMART Union Officials*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group G - Exhibit 20. Docket ID: DCA23HR001. PDF Pg. 95.

[12] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023. PDF Pg. 7.

[13] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023. PDF Pg. 46.

[14] Interview Transcript– Scott Deutsch Northern Regional Manager, Hazardous Materials, Norfolk Southern Railway, February 8, 2023. NTSB, Group G - Exhibit 2. NTSB Docket ID: DCA23HR001. PDF Pg. 27.

[15] Interview Transcript, Drew McCarty, President Specialized Professional Services, Inc.,February 23, 2023. NTSB, Group G - Exhibit 31. Docket ID: DCA23HR001. PDF Pg. 15.; Interview Transcript – Jason Poe President, Explosives Services International, March 31, 2023. NTSB Group G - Exhibit 8. Docket ID: DCA23HR001. PDF Pg. 13.

[16] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023, 78. PDF Pg. 81

[17] Safety Advisory Notice for Tank Cars with Aluminum Manway Protective Housing Covers. NTSB, Group F - Exhibit 25. Docket ID: CA23HR001. PDF Pg. 3.

[18] Interview Transcript, Drew McCarty, President Specialized Professional Services, Inc.,February 23, 2023. NTSB Group G - Exhibit 31. Docket ID: DCA23HR001. PDF Pg. 13.

fire-exposed cars continued to cycle on and off for several hours to vent the building pressure.[19] By mid-afternoon on February 4, PRD actuations ceased.[20]

However, at 5:30 p.m. on February 4, the PRD on one VCM tank car (OCPX 80179) actuated and vented VCM energetically and continuously for approximately 70 minutes before permanently reclosing.[21] Norfolk Southern contractors interpreted this specific energetic release and the subsequent cessation of PRD activity as an indication that the VCM inside the tanks was undergoing a runaway polymerization reaction that had plugged the PRDs with polyvinyl chloride (PVC).[22] Several sources from the NTSB Docket corroborate the statements listed above. These are individually cited in the footnotes.

1.3. Vent and Burn Timeline

Based on their interpretation of the PRD activity and fluctuating temperature readings, Norfolk Southern (NS) and its contractors concluded that the VCM was polymerizing, which could lead to a catastrophic boiling liquid expanding vapor explosion (BLEVE).[23] On February 5, 2023, representatives from Oxy Vinyls (the manufacturer and shipper of the VCM) arrived on the scene and explicitly advised that the VCM remained in a stabilized, low-oxygen environment and that a polymerization reaction was not occurring.[24]

Despite this expert consensus, NS and its contractors continued to advocate for a deliberate "vent and burn" procedure to relieve the perceived explosion risk, without conveying Oxy Vinyls' dissenting opinion to the incident commander.[25] Shortly after noon on February 6, 2023, NS contractors informed the incident commander that a catastrophic tank failure was imminent and gave him 13 minutes to authorize the vent and burn procedure before a 3:00 p.m. deadline.[26] The incident commander, unaware of the shipper's dissenting technical assessment, approved the procedure.[27]

Following delays, the vent and burn was executed at 4:37 p.m. on February 6, 2023.[28] Contractors detonated shaped charges on all five derailed VCM tank cars, puncturing the vapor space and the liquid

[19] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023, 78. PDF Pg. 80.
[20] Interview Transcript, Drew McCarty, President Specialized Professional Services, Inc.,February 23, 2023. NTSB Group G - Exhibit 31. Docket ID: DCA23HR001. PDF Pg. 16.
[21] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023, 78. PDF Pg. 76.
[22] Id. PDF Pg. 77.
[23] Id. PDF Pg. 76.
[24] Id. PDF Pg. 91.
[25] Id. PDF Pg. 95.
[26] Ibid.
[27] Ibid.
[28] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023, 78. PDF Pg. 79.

pool of each tank to expel the VCM into an excavated trench.[29] The released VCM was ignited with flares, resulting in a towering column of black smoke that contained toxic combustion byproducts, including hydrogen chloride, carbon monoxide, soot, and traces of phosgene.[30]

1.4. Additional Citations

Page 5 in the original report states that "no runaway polymerization (leading to a potential explosion) had occurred." Further evidence supporting this statement is found in "Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio," which indicates that post-incident testing did not identify evidence of polymerization.[31]

On pages 68 and 69 of the original report, it is stated where the mass of the VCM tanks was derived from as well as the statement that the "entire load" was lost for the VCM tanks. Further evidence to support this statement is from the Hazardous Material Group Chair's Factual Report. The report published the following table (Table 9) which was used to specify the mass of the tanks and the amount of material released. This lists the amount released for all five vinyl chloride tanks as the "entire load".[32]

Table 9. Summary of breaching damage and hazardous materials released.

Line No.	Car No.	Load Vol. (Gal)	Commodity	Amount Released	Tank Specification	Primary Breaching Damage[27]
28	TILX402025	24,414	Vinyl chloride	Entire load	105J300W	PRD Release, Vent and Burn
29	OCPX80235	24,271	Vinyl chloride	Entire load	105J300W	PRD Release, Vent and Burn
30	OCPX80179	24,319	Vinyl chloride	Entire load	105J300W	PRD Release, Vent and Burn
31	GATX95098	24,394	Vinyl chloride	Entire load	105J300W	PRD Release, Vent and Burn
36	SHPX211226	25,000	Ethylene glycol monobutyl ether	Entire load	111A100W1	BTH head crack. BOV fully open
38	DOWX73168	29,000	2-ethylhexyl acrylate	Partial load	111A100W1	BTH and BBH cracks, ABH puncture
50	UTLX205907	30,000	Butyl acrylates	Entire load	111A100W1	ABH punctures, manway gasket burned away
55	OCPX80370	24,113	Vinyl chloride	Entire load	105J300W	PRD Release, Vent and Burn

[29] Id. PDF Pg. 78.
[30] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023. PDF Pg. 79.
[31] OxyVinyls Party Submission. Investigation of the February 2023 Norfolk Southern Train Derailment, East Palestine, Ohio. Accident No.RRD23MR005. NTSB Docket No. 10. November 2023. Pages 10-13 (PDF Pages 13-16).
[32] Hazardous Materials Group Chair's Factual Report, Norfolk Southern Railway Train 32N Derailment, East Palestine, Ohio, Accident No. RRD23MR005, NTSB, Group B - Exhibit 10. NTSB Docket Project No. 106864, 2023. PDF Pg. 46.

Following a review of the NTSB docket, we conclude the vent and burn was likely unnecessary and the process of vent-and-burning is what led to massive contamination surrounding the derailment. To provide additional support for this conclusion, an interview transcript with Paul Thomas, Vice President, Health, Environment, Safety, and Security, Oxy Vinyls LP, reveals that the temperature in the tanks was dropping.

"So were you -- given the temperatures, were you aware that the temperatures had spiked and were dropping, declining and dropping and leveling off, up until the decision to vent and burn? Yeah, not until Monday morning, you know, after we heard the announcement that there was extreme, you know, temperature rise, high probability of over-pressurization or explosion and, you know, blowing shrapnel for a mile, you know, we quickly reached out to Steve and they said no, the temperature, you know, went from 135 I think to 138, you know, Sunday evening, and then back to 130 Sunday evening and then I understand it continued to drop until noon or 1 o'clock where it was, you know, maybe 126 or 127"[33]

The two following images depict the derailment and help characterize the incident. The first image shows the derailment pileup and VCM tank cars.[34]

Figure 7. Derailment pileup and VCM tank cars.

Additionally, this image from the docket depicts the derailment and the fires associated with it.[35]

[33] *Interview Transcript – Paul Thomas Vice President, Health, Environment, Safety, and Security, Oxy Vinyls LP, May 5, 2023*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group G - Exhibit 5. Docket ID: DCA23HR001. PDF Pg. 35.

[34] Rosenfeld Expert Report, 2026, PDF Pg. 4.

[35] *Columbiana County Commissioner UAS Video Screenshot*. Washington, DC: National Transportation Safety Board; 2023. NTSB, Group D - Exhibit 56. Docket ID: DCA23HR001. PDF Pg. 2.