EAST PALESTINE TRAIN DERAILMENT AND CONTROLLED BURN: ENVIRONMENTAL DATA REVIEW

October 2023

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List of Acronyms and Abbreviations

ACE	Assessment of Chemical Exposures
ATSD	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
COC	Contaminant of Concern
CSM	Conceptual Site Model
CTEH	Center for Toxicology and Environmental Health
EPA	Environmental Protection Agency
IMAAC	Interagency Modeling Atmospheric Assessment Center
mg/kg	Milligrams per Kilogram
mg/m^2	Milligrams per square meter
µg/L	Micrograms per liter
Ohio DNR	Ohio Department of Natural Resources
Ohio DOA	Ohio Department of Agriculture
Ohio DOH	Ohio Department of Health
Ohio EMA	Ohio Emergency Management Agency
Ohio EPA	Ohio Environmental Protection Agency
ORSANCO	Ohio River Valley Sanitation Commission
ORVI	Ohio River Valley Institute
PAH	Polycyclic Aromatic Hydrocarbon
PPT	Parts Per Trillion
PDEP	Pennsylvania Department of Environmental
PDOH	Protection Pennsylvania Department of Health
PFAS	Per- and Polyfluoroalkyl Substances
PM	Particulate Matter
SVOC	Semi-Volatile Organic Compound
TAGA	Trace Atmospheric Gas Analyzer
TASC	Technical Assistance Services for Communities
TEQ	Toxicity equivalency
VOC	Volatile Organic Compound
WHO	World Health Organization
U.S. EPA	United States Environmental Protection Agency

Introduction and Purpose

This report provides East Palestine officials and area residents with a summary of information gathered to characterize the contamination released during the train derailment that occurred in East Palestine, Ohio, on February 3, 2023, and subsequent controlled burn that occurred on February 6, 2023. This information summary answers the following questions:

- What does the information mean?
- Are there information gaps?
- What are some key questions to ask?
- Are there other information needs?

This document is provided by the U.S. Environmental Protection Agency's (U.S. EPA's) Technical Assistance Services for Communities (TASC) program. The TASC program is one of several technical assistance programs offered by U.S. EPA to communities facing environmental contamination. The contents of this report do not necessarily reflect the policies, actions or positions of U.S. EPA.

What happened?

At about 8:55 p.m. Eastern Time on February 3, 2023, a Norfolk Southern freight train derailed in East Palestine, about a quarter mile west of the Ohio-Pennsylvania state line (Figure 1). Twenty of the affected rail cars contained hazardous materials, including vinyl chloride, ethylene glycol, ethylhexyl acrylate, butyl acrylate and isobutylene. U.S. EPA staff arrived hours after the derailment and started monitoring the air for volatile organic compounds (VOCs) such as vinyl chloride and butyl acrylate, which can be harmful to people. U.S. EPA contractors installed booms and underflow dams to try and restrict the flow of contaminated water and collect floating material to mitigate any possible impacts to the nearby Sulphur Run and Leslie Run streams.

Vinyl chloride in the derailed rail cars was considered unstable due to a drop in temperature discovered on Sunday night, February 5, 2023. According to Norfolk Southern, the pressure relief valves had stopped working on some of the cars, putting them at risk of exploding. Rather than let that happen, Norfolk Southern made the decision to do a controlled release of the vinyl chloride. A railroad spokesman said small charges would be used to create small holes with diameters of 2½ to 3 inches in the tanks for the slow release of the material into trenches dug in the ground where flares were lined up to ignite the chemical and burn it off. This is sometimes referred to as a vent and burn operation.

Prior to the controlled burn, the governors of Ohio and Pennsylvania ordered an immediate evacuation of a 1-mile-by-2-mile area covering the eastern part of East Palestine and the Darlington area of Pennsylvania in Beaver County.

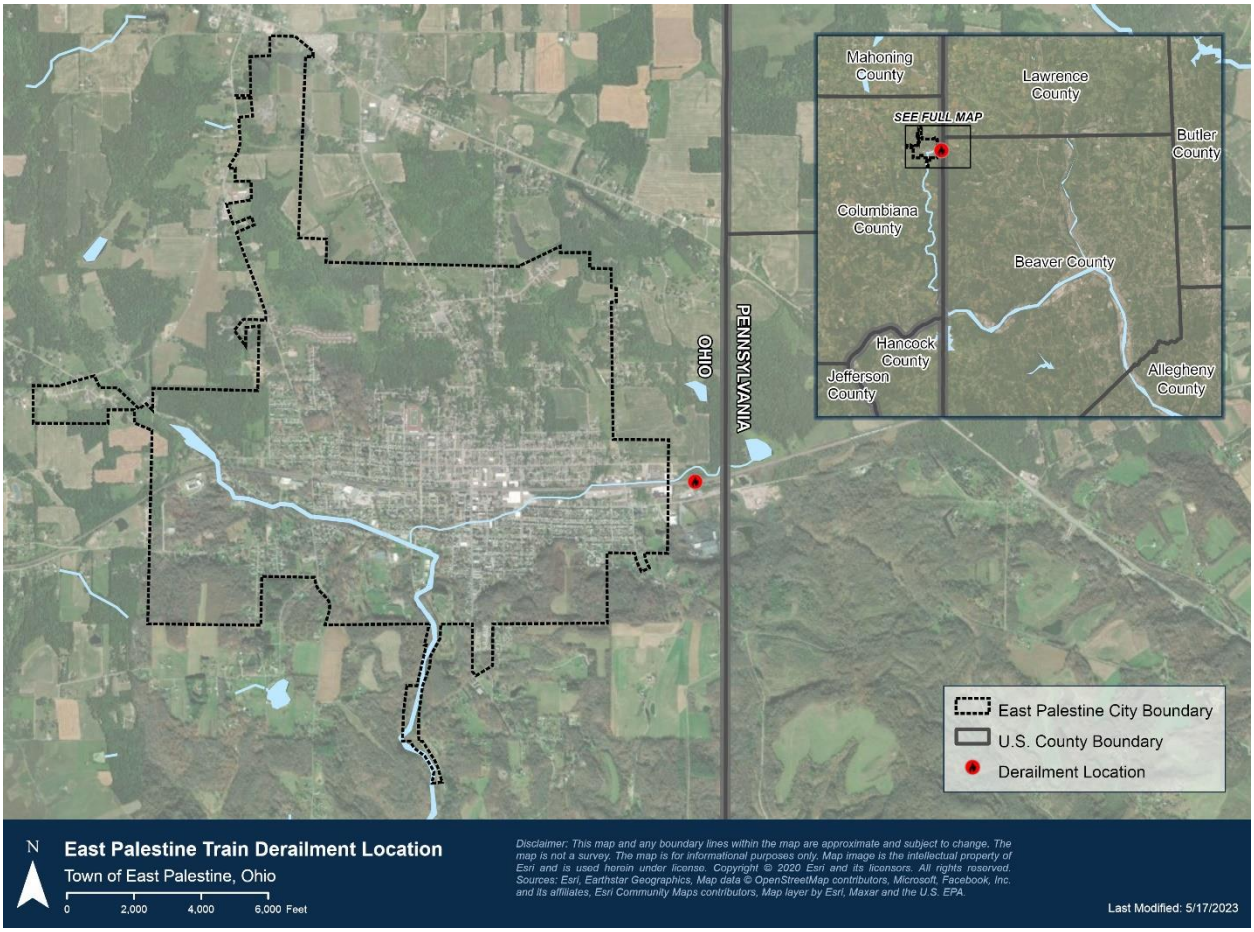


Figure 1. East Palestine Derailment Location.

Norfolk Southern lit the flames in the pit area near the rail cars of the derailed train at 4:35 p.m. on Monday, February 6, 2023. At 4:38 p.m., Norfolk Southern detonated small charges to make small holes in the cars to release the chemical. The residual fire in the pit burned out and was monitored through the night. The whole process was estimated to take one to three hours. The concern was that if the tanks exploded on their own, the result would be far more damaging and deadly. This way, the officials controlled what happened.

The derailed train caused a cascade of activity. Emergency response workers were first on the scene, followed by officials and workers associated with a variety of federal and state agencies and representatives. Emergency response workers focused on addressing immediate hazards posed by the derailment. As part of the emergency response, federal and state agency responders also began extensive environmental monitoring.

What was sampled for and who conducted the sampling?

Air monitoring and sampling was one of the first emergency response activities. After the derailed train area was deemed safe to enter by the emergency responders from U.S. EPA, they then also began sampling other potentially contaminated media (e.g., soil, sediment and surface water). Air quality was a primary focus since people live and work in the immediate area. As emergency responders gathered more information, U.S. EPA and regulatory partners started more studies to further understand the effect of train derailment spill materials on drinking water, surface water, sediment, groundwater and soil. U.S. EPA and partners began studying the potential footprint of the controlled burn ash fallout by collecting soils from around the community, including residential areas at a later date.

Agencies mobilized quickly to assist with the monitoring of the derailment and controlled burn impacts. U.S. EPA took the lead monitoring media of primary concern to the community (air, soil, surface water and sediment). Since the impacts of the derailment and controlled burn extended across state boundaries, representatives from the states of Ohio and Pennsylvania were involved. In addition, since impacts could move downstream and affect neighboring communities, Allegheny County in Pennsylvania and two cities (Cincinnati, Ohio and Louisville, Kentucky) were also involved.

State agencies, including the Pennsylvania Department of Environmental Protection (PDEP), the Ohio Environmental Protection Agency (Ohio EPA), the Ohio Emergency Management Agency (Ohio EMA) and the Ohio Department of Health (Ohio DOH), sampled media of interest, including groundwater and drinking water. Regional, county and city governments – the Ohio River Valley Sanitation Commission (ORSANCO), Columbiana County in Ohio, Allegheny County, the city of Cincinnati and the city of Louisville – assisted with eventual monitoring of additional media of concern such as drinking water resources. The work completed on site involved representatives from these agencies as well as support from Norfolk Southern (including sampling, analysis, and cleanup activities). Certain types of information gathered by these entities is shared and made publicly available. These information resources provide the basis for this report. Some information is confidential. It is shared privately with residents within the

Key Environmental Terms

Nature and extent: "Nature" defines the characteristics of the chemicals released (the composition of these materials, their structure and how they behave in the environment), while the "extent" refers to where the chemicals ended up in the environment when they were released (for instance, spilled materials ended up in nearby soils and dispersed into the air).

Fate and transport: *Refer to how the released chemicals behave in the environment. For instance, certain chemicals (vinyl chloride) released by the derailment are unstable and tend to volatilize, which means they move from a liquid phase into a vapor phase in the air. When this happens, air movement transports vinyl chloride from the derailment site to surrounding areas.*

Air sampling versus air monitoring: *A sample is a small amount of material (such as air or soil) that is collected and submitted to a laboratory for chemical analysis. Monitoring is an activity where the chemical content of materials is evaluated over time.*

Downgradient: *When a chemical is released to a stream, it may move with the flow of water, which is referred to as moving "downgradient."*

Stationary versus continuous air monitoring versus roving air monitoring*: Air monitoring relies on several methods, including the use of stationary (fixed in one place) sampling, continuous sampling (constant analysis of air flowing past a given point) and roving sampling (mobile air monitoring devices that traveled around the East Palestine area using trailers and vehicles).*

community (such as groundwater samples from private drinking water wells at a home) or managed by the collecting entity.

In addition, Ohio DOH and Pennsylvania Department of Health (PDOH) completed Assessment of Chemical Exposure (ACE) investigations for people exposed to train derailment related chemicals in Ohio and Pennsylvania. ACE investigations evaluate chemical exposure impacts on community health by conducting surveys or gathering health data from health facilities. Summaries of the ACE investigations evaluating chemical exposure impacts on Ohio residents, emergency responders from Pennsylvania and Pennsylvania residents are provided below.

- *Ohio.* A total of 528 Ohio residents who live or work within a 2-mile radius of the derailment completed the ACE survey. The most-reported symptoms included headache (74%), anxiety (61%) and coughing (53%). Results also showed that 78% of people surveyed had at least one new or worsening symptom affecting their mental health, which included tiredness, difficulty sleeping, nervousness, agitation, feeling hopeless or unexplained fear (Ohio DOH, 2023).

- *Pennsylvania.* A total of 114 Pennsylvania-based first responders completed the ACE survey. The most common symptoms among the responders were symptoms that afflicted the ears, nose and throat (37%) and heart and lungs (21%). Findings suggest that chemical exposure played an important role in the number and type of symptoms reported since these symptoms were consistent with the known short-term health effects associated with the hazardous materials released during the derailment (PDOH, 2023a).

- *Pennsylvania.* A total of 174 Pennsylvania residents completed the ACE survey, with 86% of respondents reporting symptoms. The most-reported symptoms included headaches, anxiety, and increased pain, burning or irritation of the eyes (PDOH, 2023b and 2023c).

What does this information mean?

The purpose of the environmental sampling and health studies to date in response to the train derailment and controlled burn is to determine the **nature and extent, fate and transport, and possible human health impacts related to the release of the spilled materials and fallout from the controlled burn.** For example, the results of the emergency response air sampling are used to identify immediate risks to human health. Results from train derailment area soil samples are used to delineate the footprint of contaminated soils to be removed. Groundwater monitoring will determine if chemicals are moving toward the municipal water supply well field. Surface water and sediment samples are being used to determine if spill-related chemicals are moving downstream. Collection of samples for each type of sampled media is ongoing.

This report describes the types of sampling accomplished to date (as of August 1, 2023), by media. Table 1 lists the entities that are doing studies and the types of samples they are

collecting. In addition, this document provides summaries of the ACE surveys completed by Ohio DOH and PDOH.

Table 1: Sampling Conducted to Date, by Media and Lead Party

Media	Entity									
	U.S. EPA	Ohio DNR	Ohio EMA	Ohio EPA	PDEP	County	Ohio Dept. of Health	ORSAN-CO	COC[3]	City of Louisville
Air	√				√	√[1]				
Drinking Water			√	√	√	√[2]	√	√	√	√
Surface Water	√			√	√					
Sediment	√									
Groundwater				√	√					
Soil	√				√					
Biological[4]		√		√	√					

Notes:
1 – Allegheny County
2 – Columbiana County
3 – City of Cincinnati
4- Ohio EMA summarizes crop studies completed by Ohio Department of Agriculture and Ohio State University.

What is the goal of this report?

This report summarizes environmental data and ACE health studies available through August 1, 2023, from various entities (federal, state, regional and local government agencies, and Norfolk Southern) and their contractors in response to the train derailment and controlled burn. Researchers have evaluated air, drinking water, surface water, sediment, groundwater, soil and biological media in and around East Palestine. This report summarizes the publicly available environmental data resources and ACE health studies listed in Appendix A. This report reflects information gathered from February 4, 2023, through August 1, 2023. Gathering and analysis of more environmental data are ongoing. Agencies are adding new data to their East Palestine websites and related online resources as they become available.

Results show:

- *Air*: Air is sampled and monitored using a variety of methods. Results show VOCs detected above levels protective of human health on dates during the controlled burn and cleanup efforts. These samples are from locations near the derailment. Monitoring of air using continuous and roaming methods has identified some air quality concerns. These potential impacts (poor air quality) are often short term (hours in length) and occur in areas near the derailment.

- *Drinking water:* Drinking water sources in East Palestine and other drinking water sources downstream of the derailment are being monitored. Sampling is also done on private wells of East Palestine residents. Publicly available sampling data from public water supplies show that there are no derailment/controlled burn chemicals of concern impacting these sources. The results for private wells are shared with well owners. They are not publicly available.

- *Surface water:* Surface water was sampled next to the derailment area shortly after (about 5 days) the train derailment. Sampling was also done along streams that may carry spilled materials downgradient to drinking water supplies. Only a limited amount of data for surface water is publicly available. Findings from the surface water samples collected to identify impacts on drinking water resources are summarized above. Results of surface water samples collected (not for drinking water) show the presence of chemicals around the trail derailment area that quickly became undetectable downstream. More current information is being collected (July – August). This data will need to be reviewed through the data quality process and may be available by Fall of 2023. It is likely that surface water quality is improving, however this needs to be verified with sampling.

- *Sediment*: U.S. EPA collected sediment samples on February 10, 2023, shortly after the derailment. Only a limited amount of chemical analysis data (i.e., data generated following laboratory chemical analysis of the samples) for sediment are publicly available. The data available likely reflect sediment conditions prior to cleanup actions undertaken soon after the derailment to address the contamination within and near the derailment area. Therefore, these data are likely out of date and

identify conditions that have changed. More current information is being collected (July – August) with data to possibly be available by fall 2023. Available results show that most of the contamination was limited to the derailment area and had not moved downgradient at the time of sampling.

- *Groundwater:* East Palestine-area groundwater information primarily focuses on the drinking water well data described above. Ohio EPA is collecting groundwater information to monitor possible movement of derailment contamination toward the East Palestine municipal well field. Results indicate that there are no data to suggest that groundwater has been contaminated by the derailment.

- *Soils:* Soils were tested immediately after and close to the derailment. Additional soils have been collected from the City Park and residential areas impacted by the deposition of soot. Data from the tests immediately taken after the derailment, from the City Park soils and a portion of the residential soot depositional areas are publicly available. The soils collected immediately after the derailment in areas near the derailment showed polycyclic aromatic hydrocarbons (PAHs) were at levels higher than levels considered protective of human health. However, the area where these samples were collected has been the focus of cleanup efforts. Therefore, conditions have likely improved significantly. Results from the areas affected by soot deposition showed that minimal chemicals occur at levels above typical concentrations. A targeted sampling of soils at East Palestine City Park on March 9, 2023, did not identify any contaminants at levels of concern. There continues to be ongoing and planned soil sampling associated with residential surface soils and other community areas potentially impacted by the controlled burn. These results may come available as the soils removal efforts are completed.

- *Biological*: Plant tissue samples from crops and monitoring of aquatic life including fish and invertebrates is available. Several entities have conducted analysis of crops. Results indicate that area crops are not showing signs of contaminants at levels of concern in plant tissues. Ohio Department of Natural Resources (Ohio DNR) initially conducted monitoring efforts to identify aquatic life mortalities. Ohio EPA is now conducting studies to monitor aquatic life recovery.

- *Impacts to human health:* ACE investigations completed by Ohio DOH and PDOH identify possible exposure impacts to both residents and first responders. Symptoms from exposure included headache, irritation of the eye, anxiety, coughing, and at least one new or worsening symptom affecting their mental health which could include tiredness, difficulty sleeping, nervousness, agitation, feeling hopeless, or unexplained fear.

Are there information gaps? What are some key questions to ask? Are there other information needs?

These questions focus on understanding if all possible impacts caused by the train derailment and controlled burn have been sufficiently addressed. To answer these questions, TASC used a Conceptual Site Model (CSM) approach (see Figure 2) to track the completeness of the sampling. To determine exposure and impacts to human health, each piece of the CSM is evaluated as follows:

Source: The "source" of chemicals came from the spill of materials from the train derailment, and from the controlled burn. Source information related to the train derailment was evaluated to identify all the possible chemicals released, and possible degradational products from these chemicals. The bill of lading released by Norfolk Southern provided the starting point from which to identify the "parent chemicals" transported by the train (Table 2). TASC conducted research to identify the degradation products of these parent chemicals. Degradation products are chemicals created by natural decay or by the decay from burning. The lists of "parent" and degradation chemicals was compared to the chemical analytes for the sampled media to determine if all potential chemicals of interest were evaluated.

Key Environmental Terms

Conceptual Site Model (CSM): *A graphic or table that clarifies a source area and how contamination from the source area may move through the environment and result in exposures impacting human health or the environment.*

Source: *The origin of chemicals in an environmental release area. For instance, the source of chemicals in the derailment release are the train cars from which they were spilled. The controlled burn is also a source of chemicals released when the vinyl chloride was burned.*

Degradation products: *Unstable chemicals will degrade over time. As they do so, they form smaller, less-complex chemicals. For instance, when vinyl chloride degrades, it forms hydrogen chloride, phosgene and gases.*

Parent or source chemical: *The original chemicals transported by the train (such as vinyl chloride) are referred to as the "parent chemical."*

Chemical analytes: *When samples are collected and analyzed for chemical content, these chemicals are referred to as "chemical analytes." Laboratories analyze samples of contaminated media using standard lists of chemical analytes. These lists of analytes include VOCs, semi-volatile organic compounds and PAHs, among others.*

Table 2. Parent Chemical Released by the Train Derailment and Their Potential Degradation Products[1]

Parent Chemical	Environmental Fate			Degradation products		Degradation products analysis performed			Notes
	Soil	Water	Air	Ambient - Environmental	Thermal	Soil	Water	Air[3]	
Polyethylene	N/A	N/A	N/A	Aerosols	Aldehydes, formic, acetic acid	Yes[5]	Yes[6]	Yes[1]	Solid at ambient pressure and temperature
Vinyl Chloride	Highly mobile in soil, will volatilize, and may leach to groundwater	Will rapidly evaporate, resistant to biodegradation in aerobic and anaerobic conditions	Will exist in the vapor phase, produce hydroxide, half-life of 1.5 days	Creates hydroxide and chlorine (photodegradation)	Hydrogen chloride			Yes[1]	
Propylene Glycol	Mobile in soil, and can migrate to groundwater	Will stay in water	Will not volatilize under ambient pressure and temperature	Formic, acetic, oxalic and lactic acids	Formic, acetic, oxalic and pyruvic acids	No	No	No	
Ethylene Glycol MonoButyl Ether	Can biodegrade in soil, can migrate to water	Rapid degradation in water	Will not volatilize under ambient pressure and temperature	n-Butanol, butanoic acid (biodegradation)		No	No[2]	No	
Ethylene Acrylate	Will volatilize to air	Will volatilize to air	Will exist in the vapor phase		Carbon dioxide and Water upon complete combustion	No		Yes[1]	
Isobutylene	Will volatilize to air	Will volatilize to air	Will exist in the vapor phase		Carbon monoxide	No	No	Yes	

[1] Table prepared by TASC.

Parent Chemical	Environmental Fate			Degradation products		Degradation products analysis performed			Notes
	Soil	Water	Air	Ambient - Environmental	Thermal	Soil	Water	Air[3]	
Butyl Acrylates	Medium to high mobility in soils	Relatively stable, will slowly volatilize	Will partition to air, degraded by photodegradation	Ozone and hydroxide	Hydrogen cyanide and carbon monoxide	No	No	Yes	
Benzene	Highly mobile in soil, will volatilize, portion that does not volatilize may leach to groundwater	Short half-life, will volatilize	Stay in gas phase 13.4-day half-life	Hydroxide, phenol, nitrophenols. nitrobenzene, formic, peroxyacetyl acid	Complete combustion yields carbon dioxide and water	Yes[4]	Yes[4]	Yes[1]	Degrades in aerobic conditions

Notes:
1 – Analyzed by the larger category of VOCs.
2 – Analysis was run for n-butyl acrylate. Hydrolysis of n-butyl acrylate creates n-butano and acrylic acid.
3 – Particulate Matter (PM), PM 2.5 and PM 10 were monitored and detected. Increased particulates can be produced by rogue chlorine and hydroxide, which are often products of photolysis and pyrolysis.
4 – Samples were analyzed for several types of phenols/nitrophenols.
5 – Benzaldehyde was a non-detect in one run.
6 – Benzaldehyde was the only aldehyde analyzed.

Affected Media: Using the CSM, TASC researched if all potentially affected environmental media (air, drinking water, surface water, sediment, groundwater, soil and biological media) have been sufficiently considered, and if enough samples from all potentially affected media have been collected.

Exposure Pathways: The CSM shows the possible ways that people could be exposed to the contamination resulting from the train derailment and controlled burn. East Palestine residents and officials have identified specific potential pathways: exposure to soils in East Palestine City Park and exposure to swimming pools that may have been impacted by chemical fallout from the controlled burn. Understanding the exposure pathways helps to determine if enough representative samples have been collected for each affected media.

Results of the evaluation indicate there are several potential additional data needs:

- Dioxins, furans and PAHs are chemicals that could be released by the derailment or the controlled burn. To date, analysis of these chemicals in soil indicate minimal concern. There is ongoing analysis of soils in the community and residential area. However, TASC recommends taking more samples for these chemicals from surface water, sediment and groundwater.

- Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease and water. PFAS chemicals were historically a component of aqueous film forming foams used for flammable liquid fires (also called Class B fires). PFAS chemicals are surfactants that spread the foam to cool and suppress the fire. These chemicals are of concern because they can move through soils and contaminate drinking water sources and can build up (bioaccumulate) in fish and wildlife. TASC is not aware if PFAS chemicals may have been used as part of the controlled burn. Therefore, TASC recommends sampling media (drinking water, surface water, sediment, groundwater and soils) near the derailment and controlled burn areas to confirm the presence or absence of these chemicals. For instance, U.S. EPA indicates that sampling of surface water and sediment in Sulphur Run is to be conducted in the near future. It may be appropriate to add PFAS chemicals as a suite of analysis for these media.

- Cyanide is a possible degradation product from butyl acrylates. To date, there has been no known analysis for this chemical which is toxic and of potential concern to human health.

- Sampling has focused on organic chemicals (hydrocarbons) that are volatile and semi volatile. Metals and nutrients have not been evaluated. The focus of sampling on organic chemicals (hydrocarbons) is appropriate given the type of source materials released into the environment (which were mostly VOCs and semi-volatile organic compounds [SVOCs]). However, it is possible for low levels of inorganic elements (metals and nutrients) to occur in these source materials. To date, TASC is not aware of sampling of metals or nutrients in any media of concern. TASC

recommends determining if these elements are of potential concern by sampling drinking water, surface water, sediment, groundwater and soils.

- Soil, surface water and sediment quality characteristics have not been evaluated, however there are several pending future studies that are relevant and should be shared with the community. The U.S. EPA indicates that surface water and sediment sampling in Sulphur run is likely to occur in August 2023. The Department of Natural Resources within Ohio EPA acknowledges the need to focus on Sulphur Run, Leslie Run and other tributaries within its annual Little Beaver Creek watershed studies. The methods and results from these two studies are likely of particular interest to the East Palestine community and should be shared with them at earliest convenience.

- Stormwater-flow pathways can move residual materials contaminated from the derailment and controlled burn areas to other areas. Therefore, these pathways need to be evaluated thoroughly. Entities are evaluating these surface water-flow pathways associated with Sulphur Run. However, in the reports available, stormwater drainage patterns are not well documented. Although it is likely that stormwater pathway routes are being evaluated in order to contain any train derailment spill releases, publicly available information on surface water-flow pathways is limited.

- Unique pathways of community interest such as deposition of chemicals from the derailment or controlled burn into residential swimming pools and gardens should be evaluated by sampling swimming pool water and garden soil.

- Remote-sensing tools such as infrared aerial photography taken before and after the derailment and controlled burn may be useful in interpreting the footprint of impacts on surrounding vegetation and ecological resources. Remote-sensing tools, if available, may help document the presence or absence of impacts.

- Biological monitoring can also measure impacts and recovery. Remote-sensing tools (mentioned above) can be useful in understanding impacts on vegetation. In-field measurements such as plant cover, density and diversity are also useful.

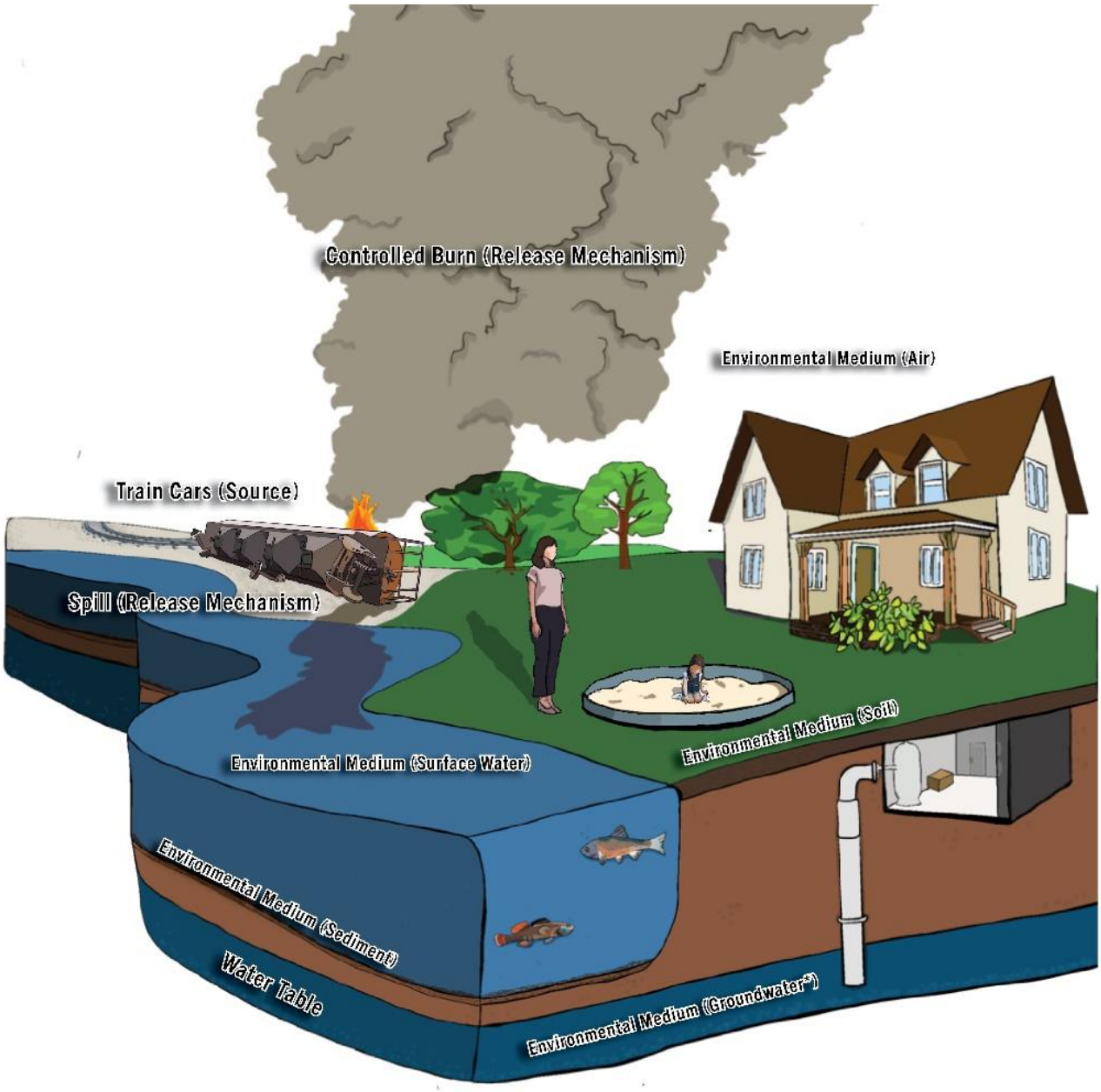


Figure 2. Conceptual Site Model.

Are there information gaps?

TASC identified two main types of information gaps: analysis of media and the availability of public information.

Key Environmental Terms
Dioxins and furans: *These terms refer to a family of toxic substances that share a similar chemical structure. Dioxins and furans are not made for a specific purpose. They are created during the development of products such as herbicides. In addition, they can be produced when products are burned.*
PFAS: *This large, complex group of synthetic chemicals have been used in consumer products and are ingredients in many everyday products. PFAS do not degrade easily in the environment.*
Phosgene: *A colorless poisonous gas made by the reaction of chlorine and carbon monoxide. It is a possible product from the degradation of vinyl chloride.*

Analysis of Media

Organic chemicals, such as those chemicals spilled by the train derailment, will degrade and create byproducts. Similarly, the controlled combustion of vinyl chloride is known to release carbon dioxide, hydrogen chloride and phosgene. Degradation of butyl acrylates can produce cyanide. Incineration of waste materials can create more complex chemicals (such as dioxin, furans and PAHs). It is not clear if sampling and monitoring are addressing these byproducts. In addition, there may be elements (metals and nutrients) that are not typical components of the source materials, which may be present in trace amounts. As a result, there may be information gaps, including the lack of chemical analysis for certain chemicals such as phosgene, cyanide, dioxins, furans, PAHs, metals and nutrients.

There is also the potential gap in the measurement of soil, surface water and sediment quality characteristics such as pH and dissolved oxygen. TASC recommends sampling for soil pH, and dissolved oxygen, dissolved organic carbon, conductivity and pH of surface water. TASC also recommends the use of remote sensing, continued evaluation of the possible ash footprint from the controlled burn, and biological monitoring to better understand potential impacts of the train derailment and controlled burn. In addition, community pathways of interest such as swimming pools and gardens should be considered.

Availability of Public Information

There is a significant information gap due to the lag time between sample collection and the time when results are released to the public. In U.S. EPA's newsletters and site status reports, it appears that a considerable amount of sampling has been accomplished. The amount of data that is publicly available is a small fraction of the total data gathered to date. A significant amount of data is being validated and reviewed for precision and accuracy.

Website and public news announcements indicate that entities gathering samples include universities, nonprofits, Norfolk Southern and federal and state agencies. Research for this report identified chemical analysis data from federal, state and local government sources. The scope of efforts by other entities is unknown.

Information available on public websites can be plentiful or limited, depending on the format of the data. Some resources provide interpretive maps with location-specific results. Other resources provide links to data packages from laboratory analysis. These formats are not always easy to interpret and do not always discuss how to interpret the information. To assist local officials with interpreting environmental data going forward, TASC recommends that the data are:

- Provided with complete data packages to enable reviewers to verify the accuracy and precision of the data records.
- Provided in a downloadable electronic format.
- Sorted by sample location, with each location clearly identified on a corresponding map.
- Sorted by date, so a person reviewing the information can see changes over time, where appropriate.
- Compared to reporting limits to identify data points below detection.
- Compared to appropriate human health screening levels to provide the community a "first-step" screen in understanding any potential concerns.

What are key questions to ask?

- Will more media be collected for sampling for phosgene, cyanide, dioxins, furans, PAHs and PFAS?
- Will pH, dissolved oxygen and other quality measurements for soil, surface water and sediment be collected?
- Are all released materials contained? How is containment verified? Can containment be clarified with the public using online mapping tools?
- Is there any indication that spilled materials have reached groundwater that may be used as drinking water by private well owners?
- When will U.S. EPA and other entities "interpret" the data and share findings related to risk to human health and the environment? To date, only screening level information has been evaluated. There is a substantial amount of additional information forthcoming that would be useful to interpret in terms of risk to human health.
- Can additional community pathways of interest (swimming pools and gardens) be evaluated?

Are there other information needs?

During cleanup activities, as contaminated materials are removed, continued monitoring is needed to make sure chemicals do not move through the environment and create impacts elsewhere. It is important to have access to data that reflect current conditions, and these data need to be evaluated to identify any potential impacts on human health and the environment. Therefore, other information needs may include:

- More data from continued monitoring of drinking water, air, surface water, sediment, groundwater, soils and biological media to measure ongoing recovery.

- Public access to current chemical analysis results to enable the public to be more aware of existing conditions. Historical soils data (for soils that have been removed) have little value for describing current conditions. More current soils data results need to be made publicly available.
- Comparison of chemical analysis information to levels protective of human health and the environment to determine if more sampling and removal activities are necessary.
- More chemical analysis information from media collected at areas with significant community use, such as playgrounds, or community pathways of interest such as swimming pools and gardens.

Summary of Sampling Sources, Results and Conclusions

For this report, TASC accessed publicly available resources. Detailed internet-based research identified federal, state, county and city agencies that have collected samples and conducted chemical analysis (Table 1). TASC determined that the amount of publicly available chemical analysis data is small compared to the amount of data that is being or will ultimately be generated. Figure 3 depicts the number of sampling locations that existed early-on in the studies completed for the East Palestine area. A significant amount of sampling is underway therefore the locations shown in Figure 3 capture only a portion of the amount of information available. Furthermore, there is a time lag between sample collection and when the data are generated by a laboratory and validated for review. Data validation is a critical process that checks its accuracy and precision. U.S. EPA releases validated reports for sampling on a webpage that is part of its website (see references provided in Appendix A for the U.S. EPA data validation website link).

Information from certain resources (e.g., PDEP) provides interpretation of the data that is helpful for residents to understand if certain issues are of concern. However, the data are not available, and the conclusions cannot be verified. Other resources provide data and no interpretation. U.S. EPA and Ohio EPA both provide interactive maps that enable the public to review data by media, location and chemical. However, this information is difficult to compile and review. In some cases, there are resources that provide both data and interpretation.

To compile this information and provide East Palestine officials and the community with a single summary, TASC combined available information from all resources by media (air, drinking water, surface water, sediment, groundwater, soil and biological media). As part of its independent review, TASC downloaded the available data, compiled the results and interpreted the data independent of any conclusions provided by others. In certain instances, however, data was not available, and TASC could only reference the conclusions drawn by others. If chemical analysis data were available, TASC compiled and summarized them. TASC then compared data with levels (often referred to as toxicity thresholds) that are considered protective of human health. This comparison assisted in understanding if detected chemicals are of potential concern to the East Palestine community.

Appendix A lists the information resources accessed by TASC for this report. Appendix B provides data summaries compiled by TASC during TASC's research as well as summaries prepared by other entities responding to the train derailment. Appendix C includes additional figures of interest. Appendix D provides a summary of the methods and results of the ACE investigations completed by Ohio DOH and PDOH.

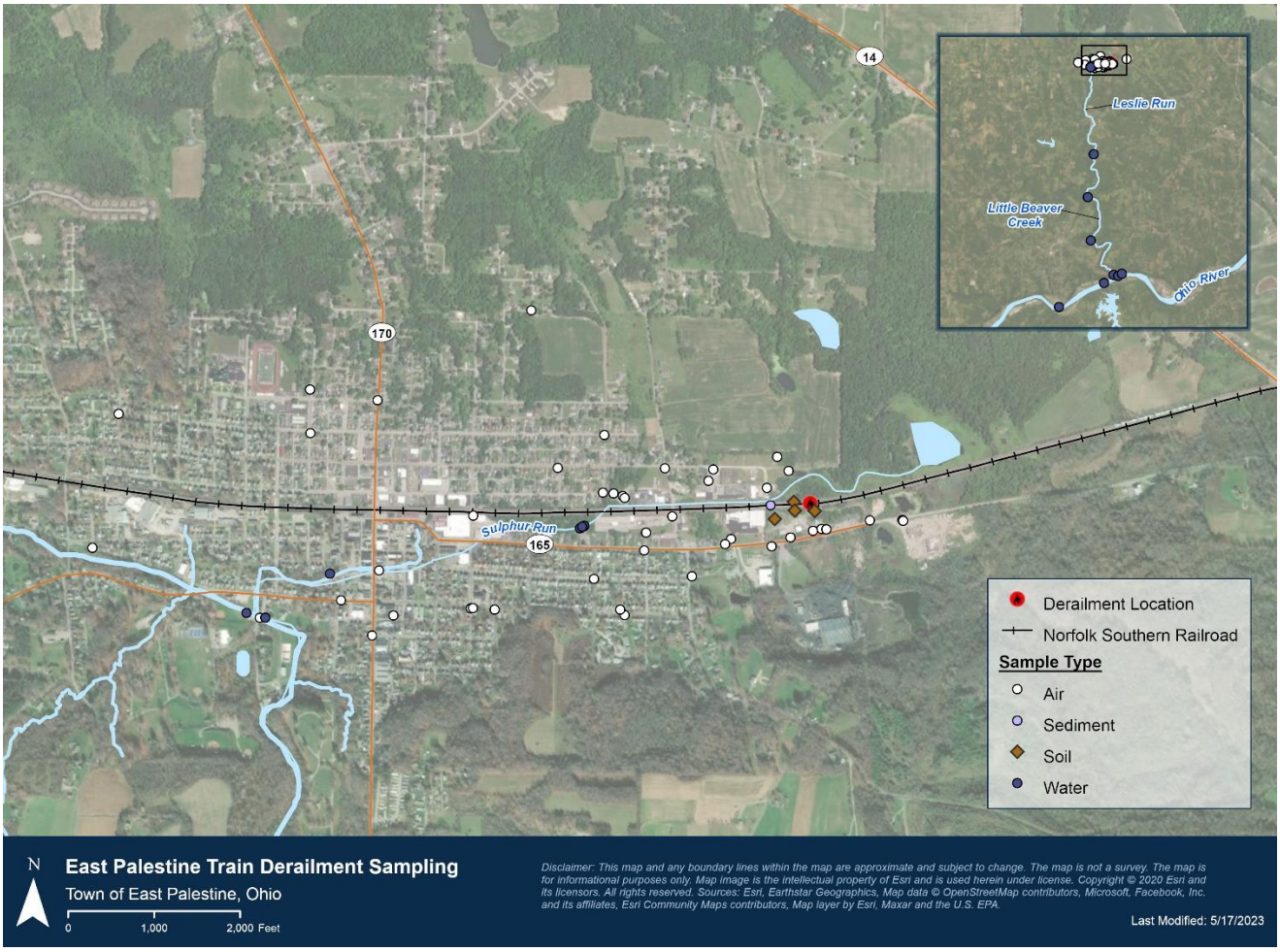


Figure 3. Air, Sediment, Soil, and Surface Water Sampling Locations in and around East Palestine Immediately Following the Train Derailment.

Air

The evaluation of air is one of the most important aspects to understanding the impacts related to the derailment and the controlled burn since the chemical releases were primarily to the air. One federal agency (U.S. EPA) is evaluating air in East Palestine. The county government in Allegheny County, Pennsylvania, is evaluating air in Allegheny County in Pennsylvania.

Publicly available data are available for air sampling and air monitoring. Sampling and monitoring are two different ways to evaluate air; the use of both methods is ongoing. An Air Sampling and Analysis Plan for the East Palestine area describes how air is sampled and monitored during ongoing work (such as soil removal and cleanup) and routine monitoring (Center for Toxicology and Environmental Health [CTEH] 2023). The Air Sampling and Analysis Plan describes required monitoring and associated action levels for particulates, total VOCs, vinyl chloride, hydrogen chloride, n-butyl acrylate and benzene, as appropriate.

U.S. EPA coordinates its cleanup and sampling activities with air sampling and monitoring efforts, as described in its site sampling and cleanup work plans (e.g., the Interim Soil Removal Work Plan, ARCADIS, 2023a). U.S. EPA is the only agency evaluating air in East Palestine. Allegheny County is monitoring air quality in the county, which is 25 miles from East Palestine. The amount of combined air monitoring and sampling information available is substantial since these efforts began almost immediately after the derailment and are continuing to date. The information available is summarized by agency below.

U.S. EPA: The Agency relies on two types of methods to evaluate air: 1) air sampling; and 2) air monitoring. Air sampling involves the collection of discrete samples using canisters, sorbent tubes and scientific bags. Air monitoring relies on monitoring devices that collect air and analyze the chemical (or physical particulate) content of air in real time. Air sampling is beneficial because it produces data for a full suite of chemical analytes and can produce data that detect low concentrations of these chemicals. Air monitoring is beneficial because it identifies any real-time hazards that require response. Air monitoring data are not as refined as air sampling. A summary of U.S. EPA's air sampling and monitoring efforts in East Palestine is provided below.

Air Sampling: U.S. EPA collects outdoor air samples and tests them for VOCs such as vinyl chloride, n-butyl acrylate and 2-ethylhexyl acrylate. The purpose of the air sampling is to measure how much of a specific chemical is present in the air over a time period. For the East Palestine sampling, samples are collected over time periods ranging from four hours to 24 hours and are submitted to a laboratory for analysis. The types of sample collection devices include:

1. Canisters to collect samples for VOCs.
2. Sorbent tubes to collect acrylate samples because the contaminant will stick to the inside of the tube.
3. A scientific bag tool to hold air to be sent to a lab for analysis for vinyl chloride and benzene.
4. Badges worn by field personnel to test breathing space air quality.

U.S. EPA has provided a compiled data summary and an interactive map that enables users to review air sampling results (links to U.S. EPA's websites are provided in Appendix A). To date (as of August 1, 2023), U.S. EPA's air sampling database contains nearly 90,500 results for 9,500 samples collected from February 4 through August 1, 2023. Figure 4 shows a portion of these sampling locations. A summary of the types of samples collected to date includes:

- Sorbent tube sampling (2,700 samples and 5,400 results).
- Steel cannister sampling (1,300 samples and 79,600 results).
- Bag sampling (2 samples and 4 results).
- Badge sampling (5,500 samples and 5,500 results).

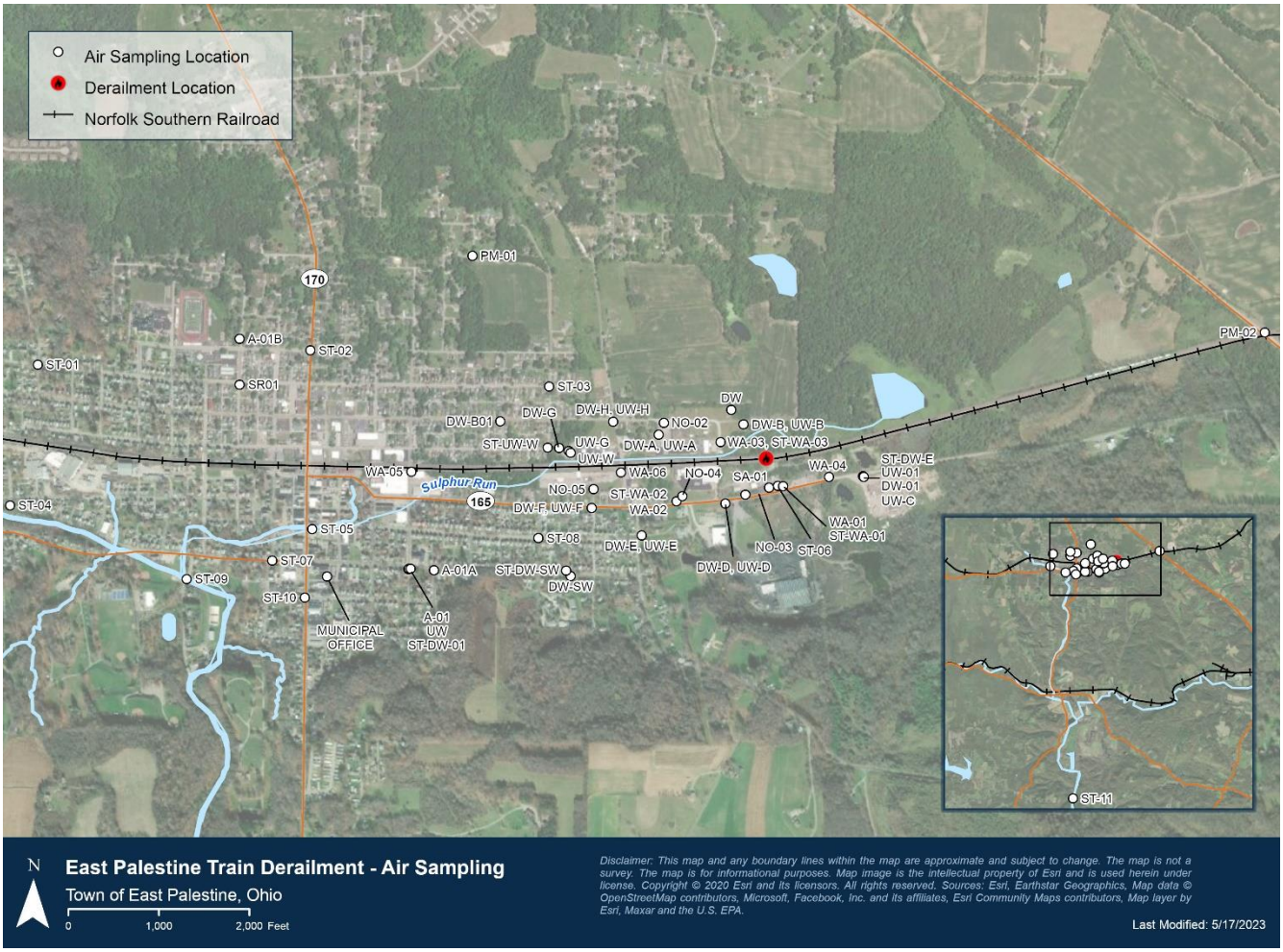


Figure 4. Air Sampling Locations in and around East Palestine.

TASC downloaded the air sampling data available through August 1, 2023. The data included nearly 90,500 analysis results. A substantial portion of these results were below detectable limits of the analysis method, meaning the concentrations are low and undetectable using standard analysis methods. Results identify 236 chemicals that are detectable and occur above levels protective of human health. Figure 5 below shows the detected chemicals that exceed levels protective of human health on each day of sampling. The height of the bars shows the number of exceedances of a given chemical on a particular day. The days that demonstrate the higher numbers of exceedances may be attributable to cleanup disturbance activities. These exceedances are short in duration.

The ability to analyze the detect butyl acrylate in air is a concern since handheld air monitoring devices may not be sensitive enough to detect this chemical at low levels. EPA issued a notice describing the issue and the next steps being taken to address it (refer to 'East Palestine, Ohio Train Derailment Unified Command' memo issued on March 31, 2023) is working with meter manufacturers to obtain more information about the handheld devices and conducting tests to evaluate these devices. Butyl acrylate has an analytical detection limit that is greater than screening levels protective of human health. The

accuracy and precision of the analytical method requires further evaluation as the results cannot be interpreted to determine potential impacts to human health.

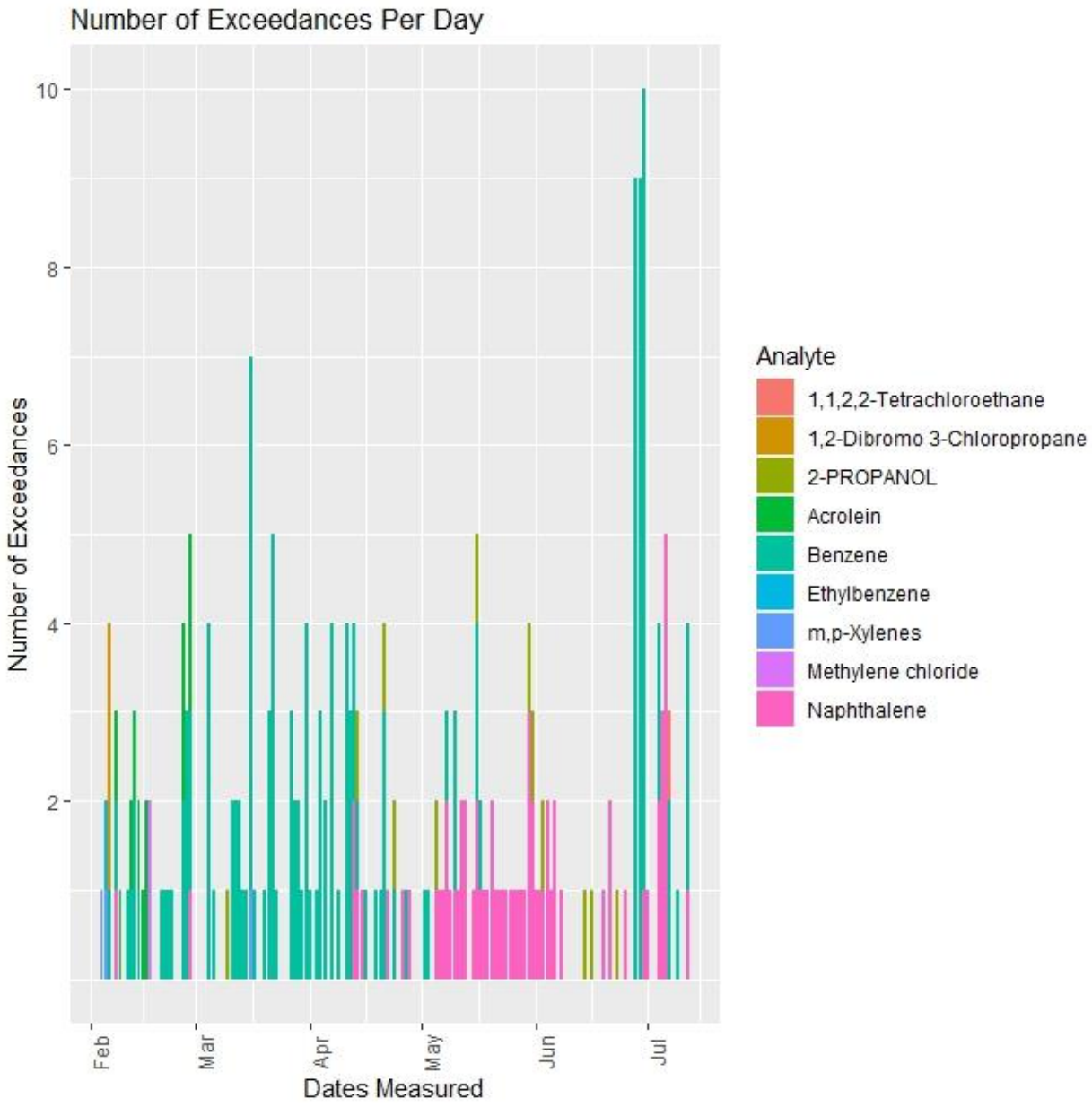


Figure 5. Air Sampling: Detected Chemicals that Exceed Levels Protective of Human Health, by Location.

Air Monitoring: The goal of the U.S. EPA air monitoring is to detect contaminants in the air quickly so that actions can be taken to reduce air emissions, if necessary. Air monitoring uses electronic devices to measure concentrations of contaminants. These devices can be set up quickly and collect real-time air data. Environmental agencies use these data to guide actions in the field by indicating the location of the chemicals in the air that may be of concern. Data are compared to the levels considered safe for human health and described on U.S. EPA's website. If contaminant results are above safe levels, agencies further evaluate the results and determine if action to protect human health and environment may be needed. There are three types of monitoring methods in use in East Palestine:

1. Stationary (not moving) and mobile (moving or roving) air monitors provide continuous real-time data of air contamination to inform when concentrations rise above the protective levels. Figure 6 shows the locations of roving sampling monitoring. Table
2. B-1 within Appendix B provides a data summary of U.S. EPA air monitoring results and links to data packages gathered around the time of the trail derailment.
3. Roving crews with mobile monitoring instruments collect data at locations around the train derailment area, such as locations where odor complaints have been received. Data from mobile instruments can also be used to confirm data from stationary instruments. Table B-2 within Appendix B provides a data summary of U.S. EPA community stationary and roving air monitoring results gathered around the time of the trail derailment.
4. A Trace Atmospheric Gas Analyzer (TAGA) bus contains air monitoring and air sampling equipment. It is in use for air monitoring during U.S. EPA's removal work. The TAGA has been active since early March and will continue to monitor air quality near the derailment site and in the surrounding community. The TAGA bus spends most of its time close to the four main areas of contamination, including the derailment location where soil is being removed, mounds of soil covered with a tarp, stockpiles of contaminated soil, tanks of wastewater, and staging areas where trucks are loaded. If contaminants go above the protective level, a system alerts the TAGA crew; the TAGA crew then notifies a site team to put procedures in place to protect workers and the public.

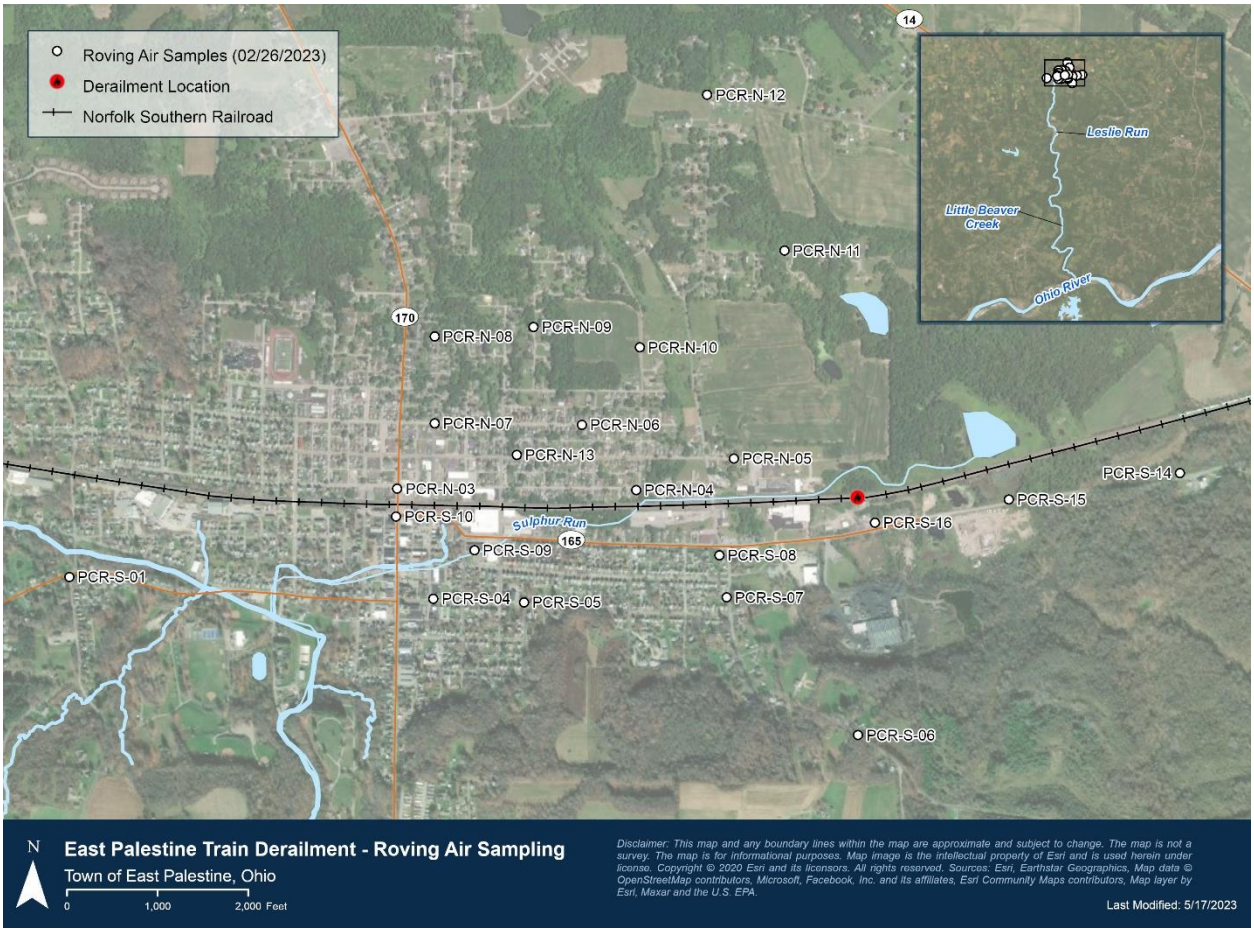


Figure 6. Roving Air Sampling Locations in and around East Palestine.

U.S. EPA provides air monitoring results in documents on its website. To date (as of August 1, 2023), U.S. EPA air monitoring documents provide records as follows:

- Continuous or Fixed air monitoring reports (February 4 to August 1, 2023).
- Work Area Station monitoring reports (April 11 to June 1, 2023).
- Roving air monitoring reports (February 9 to July 31, 2023).
- TAGA monitoring (March 2 to May 12, 2023).

Compiled results from the continuous and roving air monitoring reports gathered through April 2023 are in Appendix B. TASC compared results to protective levels to identify any concerns. The most substantial air quality concerns occurred on dates around the time of the controlled burn. These results are expressed in measurements of particulate matter (PM). Airborne particulate matter is not a single pollutant. It is a mixture of solids and aerosols composed of small droplets of liquid, dry solid fragments and solid cores with liquid coatings. Particles vary widely in size, shape and chemical composition. Particles are defined by their diameter for air quality regulatory purposes. Those with a diameter of 10 microns or less (PM 10) are inhalable into the lungs and can induce adverse health effects.

Fine particulate matter is defined as particles that are 2.5 microns or less in diameter (PM 2.5).

PDEP and Allegheny County Health Department: PDEP provides a narrative summary about air quality effects in Pennsylvania on its website. PDEP does not provide data on its website. PDEP's website states, "The air plume from the vent dissipated, and air quality monitors around the perimeter of the derailment site did not measure any harmful pollutant levels entering Pennsylvania as a result of the derailment or the controlled burn. Based on this information, the governors of Pennsylvania and Ohio announced on February 8, 2023, that residents may return to their homes and no longer need to shelter in place. There are no long-term air quality concerns related to the derailment."

The Allegheny County (Pennsylvania) Health Department continues to monitor air quality and provide updates to residents as needed. The Allegheny Health Department website can be queried using a zip code. The Allegheny County Health Department provided a news release after the derailment stating that "staff continue to monitor and analyze the county's air quality data and have not seen any air quality changes that can be attributed to the derailment. The county's air quality monitors do detect several of the pollutants like benzene and vinyl chloride. With more than 25 miles from East Palestine to the county border, any emissions are likely dispersed before reaching the county, but will still continue to be monitored."

An additional air quality resource is available to the public through AirNow.gov. This website hosts the U.S. air quality index. The link is provided in Appendix A. This data can be queried by area.

Summary: There is an abundance of air quality information for both air samples and air monitoring. Results of air samples show that there were VOCs above levels protective of human health during the early stages of the derailment, controlled burn and cleanup activities. However, more recent monitoring results indicate that outdoor air is safe. U.S. EPA continues to actively monitor air quality in areas that are likely to exhibit air quality impacts from cleanup or storage of contaminated materials. The agency also has a response procedure in place to address any chemical of concern monitored in real time using the TAGA bus system.

U.S. EPA hosts an Air Sampling Dashboard website that is actively updated (Figure 7). Results from all four types of sample collection methods (continuous or fixed, work area station, roving and TAGA monitoring) are posted routinely and can be queried by type and location. At the time of this document, U.S. EPA has posted 90,500 lab results for 9,502 samples.

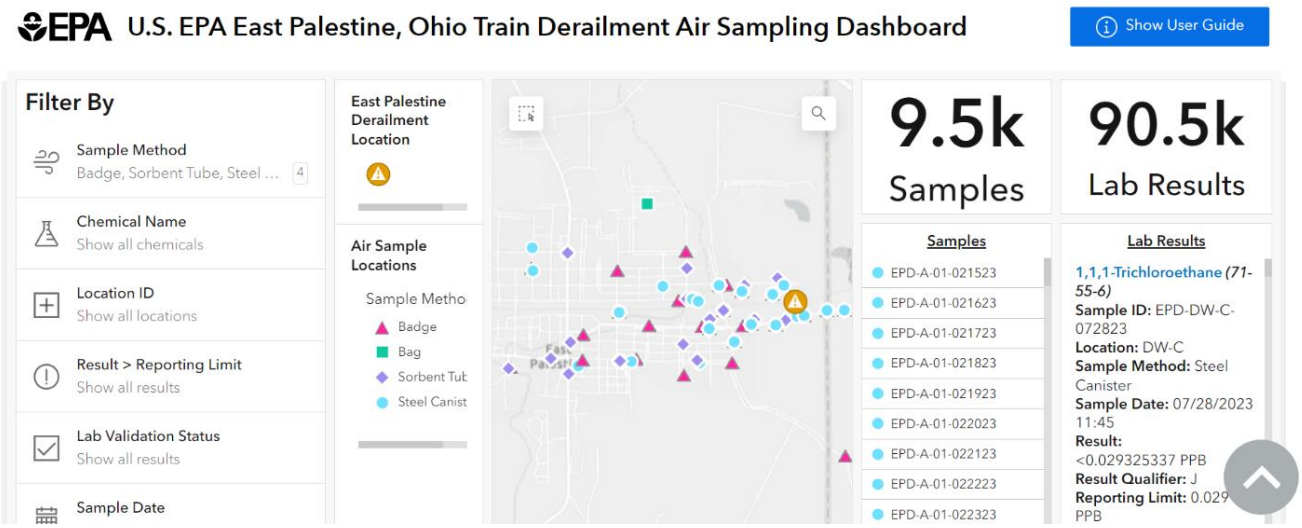


Figure 7. Screenshot of the U.S. EPA Air Sampling Dashboard Website (https://www.epa.gov/east-palestine-oh-train-derailment/air-sampling-data).

Drinking Water

Many agencies are involved in the evaluation of drinking water. Several agencies evaluate East Palestine water supplies (PDEP, Ohio EPA, Ohio EMA, Columbiana County) and individual residential groundwater wells. Other agencies focus on water supplies for communities downgradient of the derailment along the Ohio river (Cities of Cincinnati and Louisville).

U.S. EPA, Ohio EPA and Columbiana County are coordinating sampling of private drinking water wells located within certain zones around the trail derailment. These agencies have posted outreach messages for residents to request sampling and assistance. Residents will be contacted if they are within the priority zones and have signed up for private well sampling. Within 60 days after the first sample, private wells are resampled, and residents will be contacted to schedule resampling. Pennsylvania residents living within two miles of the derailment site can also request private well sampling.

Considerable sampling work is also being done on the Ohio River, which is the source of drinking water for many communities. Water samples are collected from about 30 locations throughout Ohio, stretching from East Liverpool to Cincinnati. At East Liverpool, Wellsville, Toronto, Steubenville, Bellaire and Cincinnati, samples are collected from the municipal water intakes. A summary of the samplings and results of drinking water studies by each entity is provided below.

PDEP: PDEP tests water samples (drinking water, groundwater and surface water) in East Palestine for VOCs, SVOCs, glycols and ethanol to identify five contaminants of concern

related to the train derailment: vinyl chloride, ethylene glycol, butyl acrylate, ethylhexyl acrylate and ethanol. PDEP is contacting residents within a 2-mile radius of the train derailment site to initiate water testing.

As of March 10, 2023, PDEP had collected water samples from all private wells within a 1-mile radius of the derailment and completed sampling of one third of the wells within 2 miles of the derailment (zone of private well mapping shown within Figure C-1, Appendix C). PDEP also sampled the raw water supplies of Ellwood City and Beaver Falls and coordinates with all public water suppliers within 5 miles of the derailment to test their source water.

PDEP does not provide private well sampling data on its website, but it does provide a summary of findings. Per PDEP's website, as of April 17, 2023: "Preliminary results have been received for seven wells within a one-mile radius for three of the contaminants of concern: vinyl chloride, ethylene glycol, and ethanol. No contaminants of concern were detected" and "PDEP will conduct independent testing of private wells for at least six months and up to one year."

Ohio EPA: Ohio EPA's website provides substantial background information describing the East Palestine municipal water system and Ohio EPA's sampling approach. East Palestine is served by a public water system with sources of water from five wells that pump water from 52 feet to 98 feet below ground. None of the wells are within 1.4 miles of the train derailment site. Groundwater at the derailment site is not expected to reach the source area for the municipal water system (refer to Figure 8). However, five monitoring wells (referred to as sentinel wells) have been installed between the two impacted waterways, Sulfur Run and Leslie Run, and East Palestine's wellfield to ensure the continued safety of the water supply. By testing the water in these wells, any potential contaminants should be discovered before they reach East Palestine.

Ohio EPA independently tests the municipal water supply in East Palestine on a weekly basis. Samples are shipped securely to an independent lab for analysis. A separate contractor also collects samples, under Ohio EPA supervision, and sends them to a different lab for analysis. These efforts will continue for the foreseeable future.

TASC downloaded the latest test results from Ohio EPA's East Palestine Municipal Drinking Water Results webpage. Ohio EPA provides results including:

1. Summary of Detections in East Palestine's Wells that presents detected chemicals in the East Palestine Water System prior to treatment (provided in Table B-3; TASC also summarized the detected chemicals by well location, which is provided in Appendix B, Table B-4).
2. Summary of Detections in Treated Drinking water that presents detected chemicals in water following treatment.
3. Sentinel well data representing groundwater quality potentially flowing toward the East Palestine drinking water wells (Table B-5).

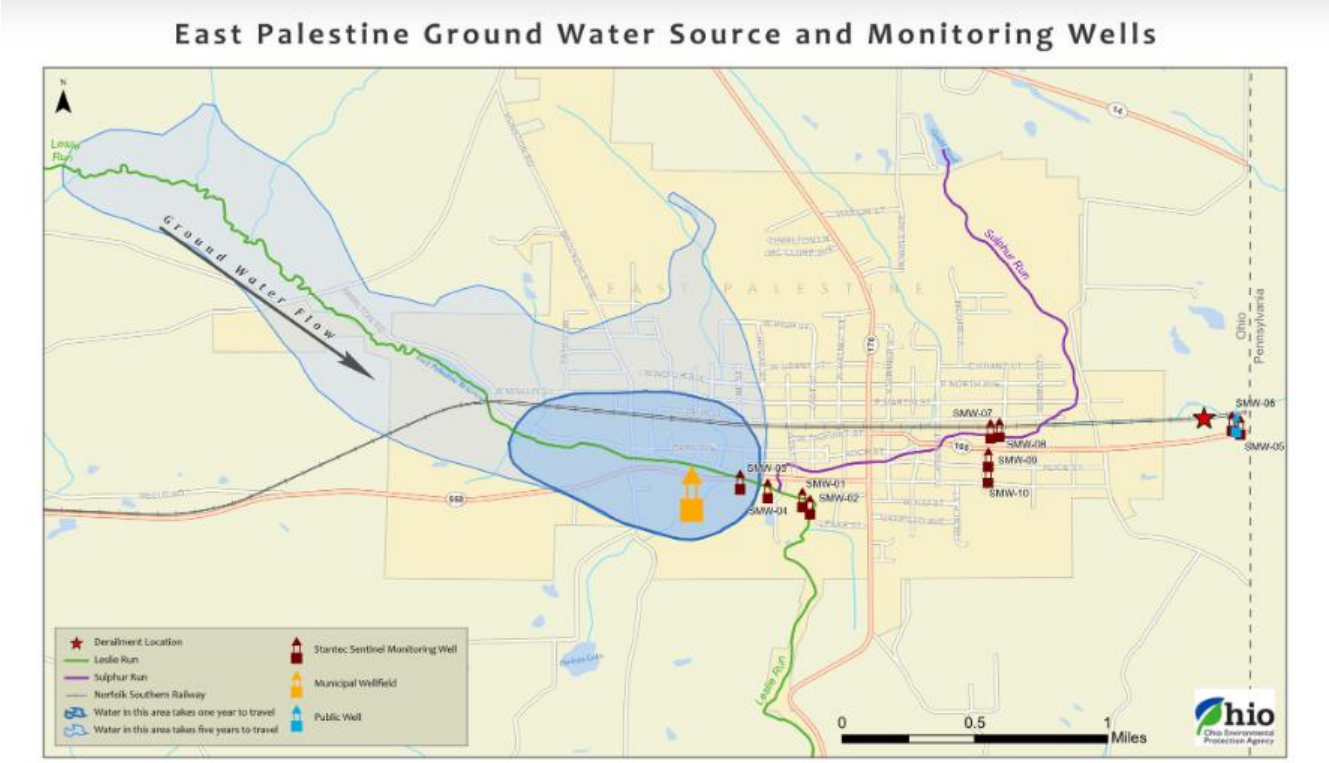


Figure 8. Ohio EPA Map of East Palestine Groundwater Flow and Monitoring Wells.

A summary of the results is below.

- *Summary of Detections in East Palestine's Wells (provided in Appendix B):* Summarizes detected chemicals analyzed by two laboratories. Detected chemicals were determined to be below screening levels and/or unrelated to the derailment.

- *Summary of Detections in Treated Drinking Water:* Summarizes detected chemicals in treated drinking water analyzed by two laboratories. Most of the results were below protective screening levels and found to be unrelated to the derailment.

- *Sentinel Well Data (data provided in Appendix B)*: Data describes detected chemicals in groundwater flowing toward the East Palestine wells. Several chemicals were detected including bromodichloromethane, chloroform, 1,3-dichloropropane, chlorodibromomethane and methylene chloride. However, these chemicals were identified as common by-products of drinking water chlorination and not associated with the train derailment.

Results show that there is no indication of risk to East Palestine public water customers. Treated drinking water shows no detection of contaminants associated with the derailment. These data do not apply to private wells. Ohio EPA provides resources for residents with private wells to have their wells tested at no cost to them. Ohio EPA

provides summaries of the weekly tests and states on its website that it will continue to post raw data for expert and public review.

Ohio EMA, Ohio Department of Health and Columbiana County Health District: Ohio EMA provides up-to-date summaries of the Ohio Department of Health and Columbiana County Health district private well testing. Its website states that "the Ohio Department of Health, working with the Columbiana County Health District, has received verified laboratory results from 667 samples from private water systems as of Tuesday afternoon. Of those, 565 showed no detectable contaminants. One hundred samples have had trace detections at levels below safe drinking-water standards. There is no evidence that these trace detections are linked to the train derailment."

Columbiana County sampling results are available on Columbiana County Health District's website. The website provides a map of the area where it is recommended that residents have their private wells tested (provided in Appendix C, Figure C-1). The website also provides links to the data packages for each sample taken. These data packages are numerous and associated with single samples. Due to their volume and complexity, these data are not reproduced in this report. These data packages are large (100^{+} pages per sample) and may be difficult to interpret. The website provides a link to a guide that discusses how to review the data. Appendix A provides the links to the Columbiana County data resources.

ORSANCO, City of Cincinnati and Louisville Water: This group of municipal water supply agencies coordinate their testing and results related to city supply water quality. The data and summaries are linked among each agency's websites.

ORSANCO's priority is providing sampling results to Ohio River drinking water utilities to ensure drinking water quality. ORSANCO posts Ohio River sample results collected by ORSANCO and analyzed by Greater Cincinnati Water Works with permission to share with the public. The latest samples were collected on April 24 and 25, 2023, and reflect the most recent data available. ORSANCO data summaries are provided in Table B-6 within Appendix B. ORSANCO uses its Organics Detection System to monitor the Ohio River in the unlikely event that any additional diluted chemical remnants from the derailment reach the Ohio River. It is important to note that six Organics Detection System units, located downstream from the Little Beaver Creek's intersection with the Ohio River, are gas chromatography mass spectrometers. These sophisticated instruments can detect thousands of VOCs in addition to the 30 VOCs for which the system is calibrated to detect and quantify. It was one of these units that first detected the spill remnants from the East Palestine train derailment that initially reached the Ohio River. Most of the chemicals included in the train's manifest can be detected through the use of these units. The most recent tests (April 24 and 25) by ORSANCO indicate no butyl acrylate or vinyl chloride have been detected in the Ohio River. Sample location specific results can be found on the ORSANCO interactive website map shown in Figure 9.

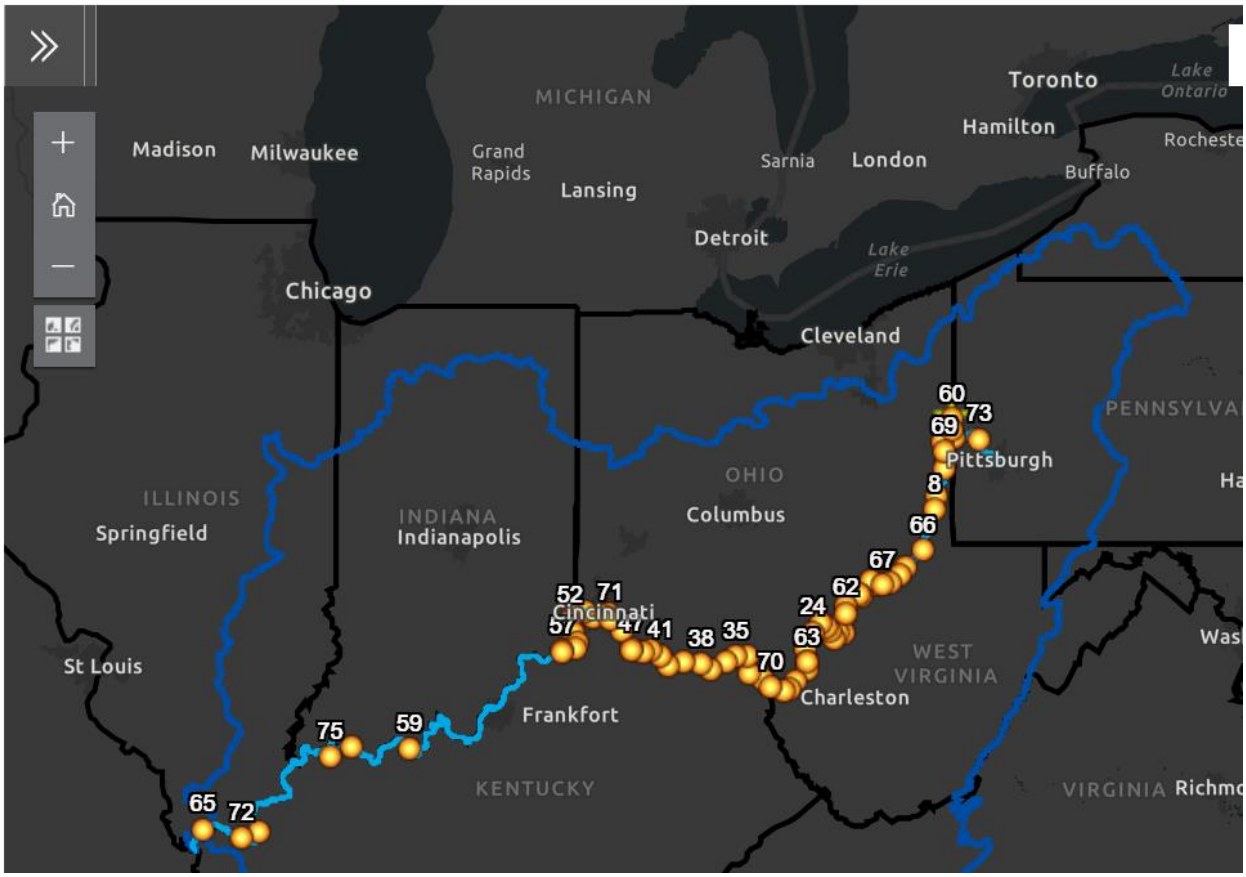


Figure 9. Screenshot of ORSANCO Interactive Surface Water Sampling Map (https://www.orsanco.org/east-palestine-train-derailment-spill-response).

The city of Cincinnati presents sample results collected and analyzed by the Greater Cincinnati Water Works at its intake. The link to its results table is in Appendix A. A summary on the city of Cincinnati's website notes that, "there have been no detections of the specific chemicals from the train derailment ... an extremely low detection of the compound 2-Ethyl-1-hexanol in one sample collected in the river near the closed intake occurred Sunday afternoon, Feb. 19. However, there have been no detections since that time ... after continued monitoring and sampling, around 12 p.m. Monday, Feb. 20, Greater Cincinnati Water Works determined it is safe to reopen the water intake."

Louisville Water's water quality team continues to conduct sampling and posts messages on its website stating that Louisville's drinking water is high quality and safe to drink, and that sampling results have not identified any detections of chemicals attributed to the train derailment.

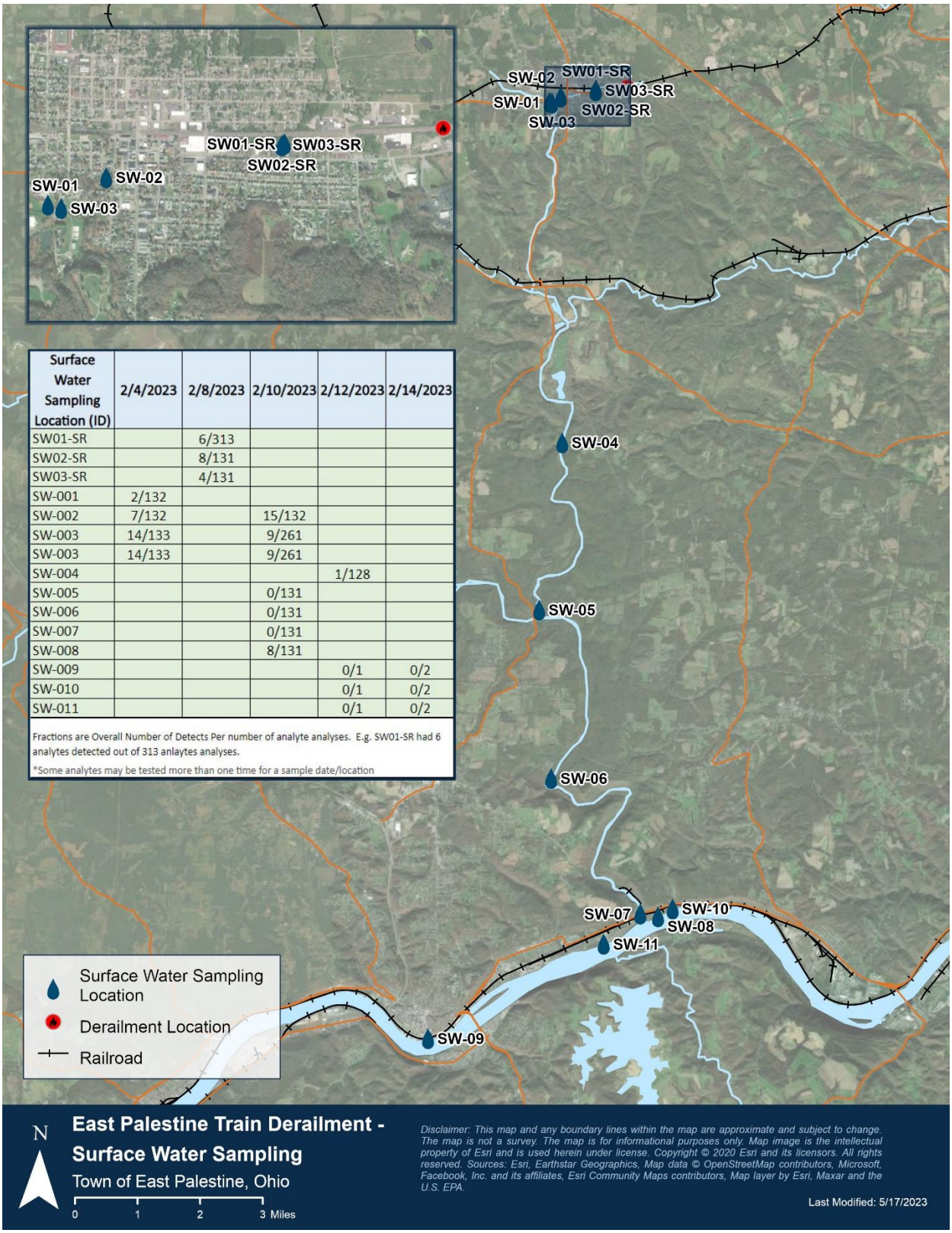
Surface Water

Several agencies (U.S. EPA and PDEP) evaluate surface water specifically impacted by the train derailment, while Ohio DNR is coordinating its watershed monitoring efforts to assist

with the assessment of the impacts to the watershed. Other agencies (city of Cincinnati, city of Louisville) monitor surface water quality downgradient of the derailment to identify potential impacts on drinking water resources. A summary of surface water sampling and results is provided below, by entity.

U.S. EPA: U.S. EPA collected surface water samples for analysis of VOCs, butyl acrylate and ethylene glycol monobutyl ether immediately following the trail derailment. U.S. EPA continues to support water sampling efforts by Ohio EPA, ORSANCO and Norfolk Southern. In addition, as posted on the U.S. EPA website on July 28, 2023, U.S. EPA states that "sediment and water sampling started on Sulphur Run to develop a characterization of the creek. Stream cleaning is on hold while sediment and water sampling goes on." This statement indicates that surface water data will likely become available in the near future.

The existing surface water data was gathered immediately after the train derailment. Surface water sample locations were selected based on site observations and how water flows from derailment area to nearby creeks. Samples were collected in Sulphur Run, Leslie Run and other waterways downstream to the Ohio River. A map of U.S. EPA sampling locations is below (Figure 10). This map also provides a table summary of surface water sample results for samples collected shortly after the derailment.



Surface Water Sampling Location (ID)	2/4/2023	2/8/2023	2/10/2023	2/12/2023	2/14/2023
SW01-SR		6/313			
SW02-SR		8/131			
SW03-SR		4/131			
SW-001	2/132				
SW-002	7/132		15/132		
SW-003	14/133		9/261		
SW-003	14/133		9/261		
SW-004				1/128	
SW-005			0/131		
SW-006			0/131		
SW-007			0/131		
SW-008			8/131		
SW-009				0/1	0/2
SW-010				0/1	0/2
SW-011				0/1	0/2

Fractions are Overall Number of Detects Per number of analyte analyses. E.g. SW01-SR had 6 analytes detected out of 313 anlaytes analyses.

*Some analytes may be tested more than one time for a sample date/location

Figure 10. Surface Water Sampling Locations and Results.

U.S. EPA's website hosts an interactive map that allows users to query results by chemical and location (Figure 11). The combined data summary is also provided on the website. TASC downloaded the combined data summary and compiled the data as shown in the data table summary embedded within Figure 10 above and Table 3 below. The table provided within Figure 10 summarizes the number of detected chemicals by date and location, while Table 3 provides the results of the chemical detections by sample.

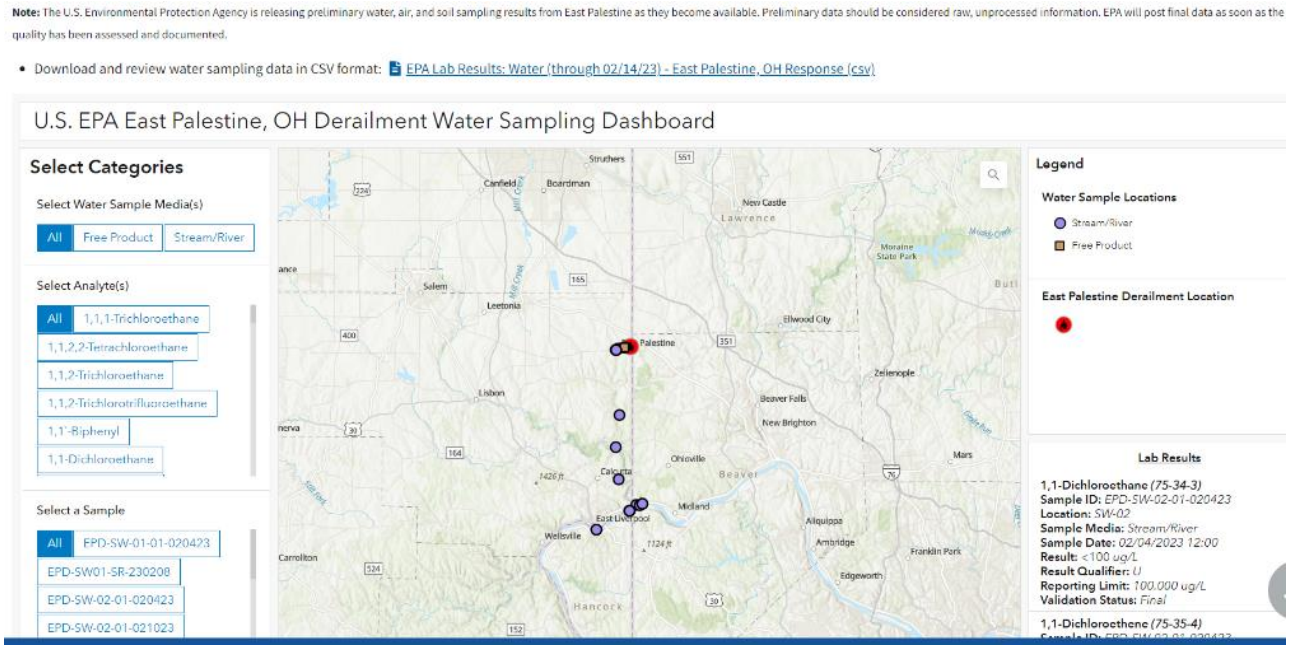


Figure 11. Screenshot of the Interactive Map on U.S. EPA's East Palestine Webpage Showing Sampling Locations and Results (https://www.epa.gov/east-palestine-oh-train-derailment/water-sampling-data).

To date, U.S. EPA has provided surface water sample results for samples taken through February 14, 2023. Since then, U.S. EPA has led removal actions and put surface water controls in place, and additional sampling has taken place. As a result, the interpretation of this information (Table 3 below) represents a snapshot of time prior to these activities. Samples from February 2023 may not be reflective of current conditions. Figure 10 (see previous page) provides a summary of the number of detected chemicals by location and sampling date. For instance, results for location SW01-SR (located next to the derailment site) indicated six detected chemicals out of 313 of the total number of chemicals analyzed for (analytes) for a frequency of detection of 6/313 (about 2%) for February 8, 2023. Figure 10 shows that most of the contamination is contained at the source area. Very little contamination appears to have moved downgradient.

Table 3. Summary of U.S. EPA Surface Water Sample Analysis Results[2]

Analyte	Units	Location and Date								
		SW01-SR	SW02-SR	SW03-SR	SW02		SW03[(a)]		SW04	SW08
		2/8/23	2/8/23	2/8/23	2/4/23	2/10/23	2/4/23	2/10/23[(a)]	2/12/23	2/10/23
Acenaphthene	µg/L					0.18	0.87			
Acenaphthylene	µg/L					0.19	1			
Anthracene	µg/L					0.11	0.74			
Benzo(a)anthracene	µg/L					0.11	0.68			0.25
Benzo(a)pyrene	µg/L					0.14 J+				0.22 J-
Benzo(b)fluoranthene	µg/L					0.2 J-				0.2 J-
Benzo(k)fluoranthene	µg/L									0.17
Benzo(g,h,i)perylene	µg/L									0.2
Chrysene	µg/L						0.74			0.15
Fluoranthene	µg/L	43 J	45		9.1	0.37	2.7	0.14/(0.12)		
Fluorene	µg/L					0.24	1			
1-Methylnaphthalene	µg/L						0.46			
2-Methylnaphthalene	µg/L					0.12	0.82			
Naphthalene	µg/L				7.9	0.57			0.17	
Phenanthrene	µg/L	41 J	42		10	0.57	3.1	0.17/(0.16)		0.18
Pyrene	µg/L		12		7.3	0.24	2.2			0.26
4-Chloroaniline	µg/L		88							
Vinyl Chloride	µg/L	2400 J+	2200	0.65		3.9				

Notes:
(a) A duplicate sample was taken and analyzed for SW03 on 2/10/2023. The detectable results of this sample are in parenthesis.
µg/L = micrograms per liter

[2] Data sorted and organized by TASC.

PDEP: PDEP provides an interactive map displaying surface water sample results by location. PDEP does not provide conclusions drawn from its surface water sample results. TASC queried the observable locations shown on the PDEP website and found only nondetectable levels of chemicals. However, without access to the original data set, TASC was not able to conduct a thorough evaluation. PDEP has collected samples from surface water bodies within a 1-mile radius of the derailment. PDEP is testing water samples for VOCs, SVOCs, glycols and ethanol to identify five contaminants of concern related to the train derailment: vinyl chloride, ethylene glycol, butyl acrylate, ethylhexyl acrylate and ethanol.

Ohio EPA: Ohio EPA provides an interactive website map (Figure 12) that provides surface water sample results by chemical and sampling location. The map of Ohio EPA's sampling locations is in Appendix C, Figure C-2.

Since Ohio EPA does not provide a combined data summary, TASC was not able to evaluate this information independently. TASC identified 162 surface water data reports on Ohio EPA's webs site that span surface water collection dates from February 4 through June 18, 2023. This sampling data is generated from daily monitoring from 20 sampling locations. These locations include background samples collected upstream to show that the detected chemicals are from the train derailment and not from an unrelated source upstream.

On its website Ohio EPA states that, "Sulphur Run flows into Leslie Run, which flows into

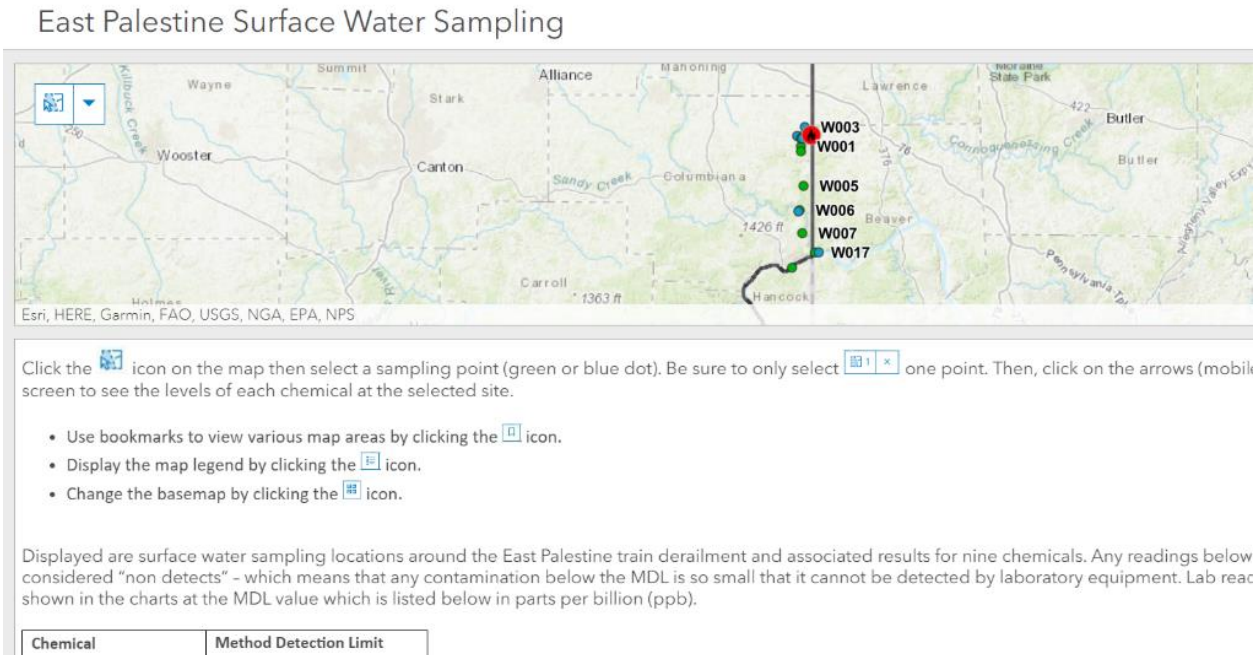


Figure 12. Ohio EPA's Interactive Map for East Palestine Displays Surface Water Sampling Locations and Results (https://geo.epa.ohio.gov/portal/apps/dashboards/9ce820a86edd48b7bd0f0e5365552d14).

Bull Creek, which flows into North Fork Little Beaver Creek, which flows into Little Beaver

Creek, which empties into the Ohio River. The water in Sulphur Run near the derailment site is grossly contaminated, and a containment area was created on February 8, 2023. Clean water from upstream is being pumped around the containment area to isolate any grossly contaminated water and sediment. This minimizes the amount of contaminants that could flow downstream.

The latest water quality results show the following:

- Sulphur Run (sample locations W010, W002, and W003): This continues to serve as the primary containment area to isolate grossly contaminated water and sediments. The lower portion of Sulphur Run is also used to begin water treatment efforts. The latest data in Sulphur Run continues to show non-detect levels of benzene and vinyl chloride and shows decreasing levels of acrylates. Glycols have been added to the analytical package and shows impact that lessens downstream.

- Leslie Run/Bull Creek (sample locations W001, W004, W009, and W011): Additional aeration and air diffusion to remedy the spilled materials is occurring in the upper portion of Leslie Run near the confluence with Sulphur Run. The enhanced oxygen enrichment is having a positive effect on breaking down chemicals in the water column. The latest data from all sampling points in Leslie Run continue to show non-detect levels of benzene and vinyl chloride. Decreasing trace levels of acrylates are present (just above the detection level) in the middle Leslie Run sampling points (W001) and (W004). Results show non-detect in sampling point (W011). Glycol levels in Leslie Run show a decreasing trend/trace detection.

- North Fork Little Beaver Creek (sample locations W005 and W006): These sampling points show non-detect levels of vinyl chloride, benzene and acrylates. The glycol levels at these sampling points are trace, just above the detection levels.

- Little Beaver Creek (sample locations W007, W008 and W017): The three sampling points on Little Beaver Creek continue to show non-detect levels of vinyl chloride, benzene and acrylates. The glycol levels at these sampling points are generally non-detect, with occasional low-level detections.

- Ohio River (sample locations W018 and W019): There are two sampling points on the Ohio River. One is upstream of the confluence of Little Beaver and the Ohio River and the other is just downstream of this confluence. Recent data for both points continue to show non-detect levels of vinyl chloride, benzene, acrylates and glycols.

Future data updates will be posted within 24-48 hours after receipt of the laboratory's final data package for each sampling event."

Summary: In summary, TASC was able to review surface water sampling efforts by U.S. EPA, PDEP and Ohio EPA. U.S. EPA data were accessible. Data from PDEP were available by location on its interactive website; however, TASC is unable to download this data set for

review. This limits the ability for someone to fully understand the entire amount of PDEP data collected. Ohio EPA provided only raw data packages (no electronic data summaries). Results from U.S. EPA sampling capture surface water quality immediately after the derailment. Cleanup activities have occurred since then and train derailment spill controls are now in place. U.S. EPA plans to conduct further surface water characterization in the near future as stated on its website (posted on the EPA website on July 28, 2023, U.S. EPA states that "sediment and water sampling started on Sulphur Run to develop a characterization of the creek. Stream cleaning is on hold while sediment and water sampling goes on").

Ohio EPA is continuing with surface water sampling, making results available through Ohio EPA's interactive map website. Results from the early surface water sampling identified the presence of organic chemicals around the train derailment spill area that quickly became undetectable downstream. This trend continues and is verified by ongoing surface water sampling being conducted to evaluate water quality for drinking water resources (refer to drinking water discussion above). Ohio EPA continues to update its website describing the current water quality conditions. As per the Ohio EPA information, water quality conditions are improving. In addition, Ohio DNR activities to study the Little Beaver Creek watershed will supplement this monitoring (refer to information provided in the biological section below).

Sediment

To date, only one agency (U.S. EPA) is involved in the evaluation of sediment, however Ohio DNR plans to incorporate surveys of water, sediment and biological characteristics within the streams as part of its Little Beaver Creek watershed studies (refer to further description within the biological section).

To date, only preliminary sediment data from U.S. EPA that was collected immediately after the train derailment is available. Contaminated sediment is a focus of cleanup activities. For instance, as per U.S. EPA Site Updates (posted on its website on April 14, 2023) air sparging has been completed in Leslie Run and Sulphur Run. Air sparging is a common cleanup technique that involves putting air into the water so that oxygen and microbes break down chemicals. Next steps will include sampling and characterization of sediment. As posted on the U.S. EPA website on July 28 2023, "sediment and water sampling started on Sulphur Run to develop a characterization of the creek. Stream cleaning is on hold while sediment and water sampling goes on."

A summary of U.S. EPA's sampling completed immediately following the train derailment is below.

U.S. EPA: U.S. EPA collected sediment samples at the derailment site for analysis for extended VOCs, which include the standard suite of target contaminants of concern list and tentatively identified compounds, SVOCs (target contaminants of concern list and tentatively identified compounds), gasoline range organic compounds, diesel range organic compounds, and oil range organic compounds. U.S. EPA sediment sample locations were

selected near surface water sample locations in Sulphur Run. A map of U.S. EPA sampling locations is below (Figure 13).

U.S. EPA's website provides an interactive map that allows users to query results by chemical and location. The website also includes the combined data summary. TASC downloaded the combined summary and compiled the data, as shown in the embedded table provided in Figure 13. The table summarizes the number of detected chemicals over the total number of analytes (frequency of detection) by location. For instance, location SD01 had one detected chemical out of 127 chemicals analyzed. The detected chemical was acetone at an estimated (as denoted with a "J" qualifier) concentration of 0.025 milligrams acetone per kilogram of sediment.

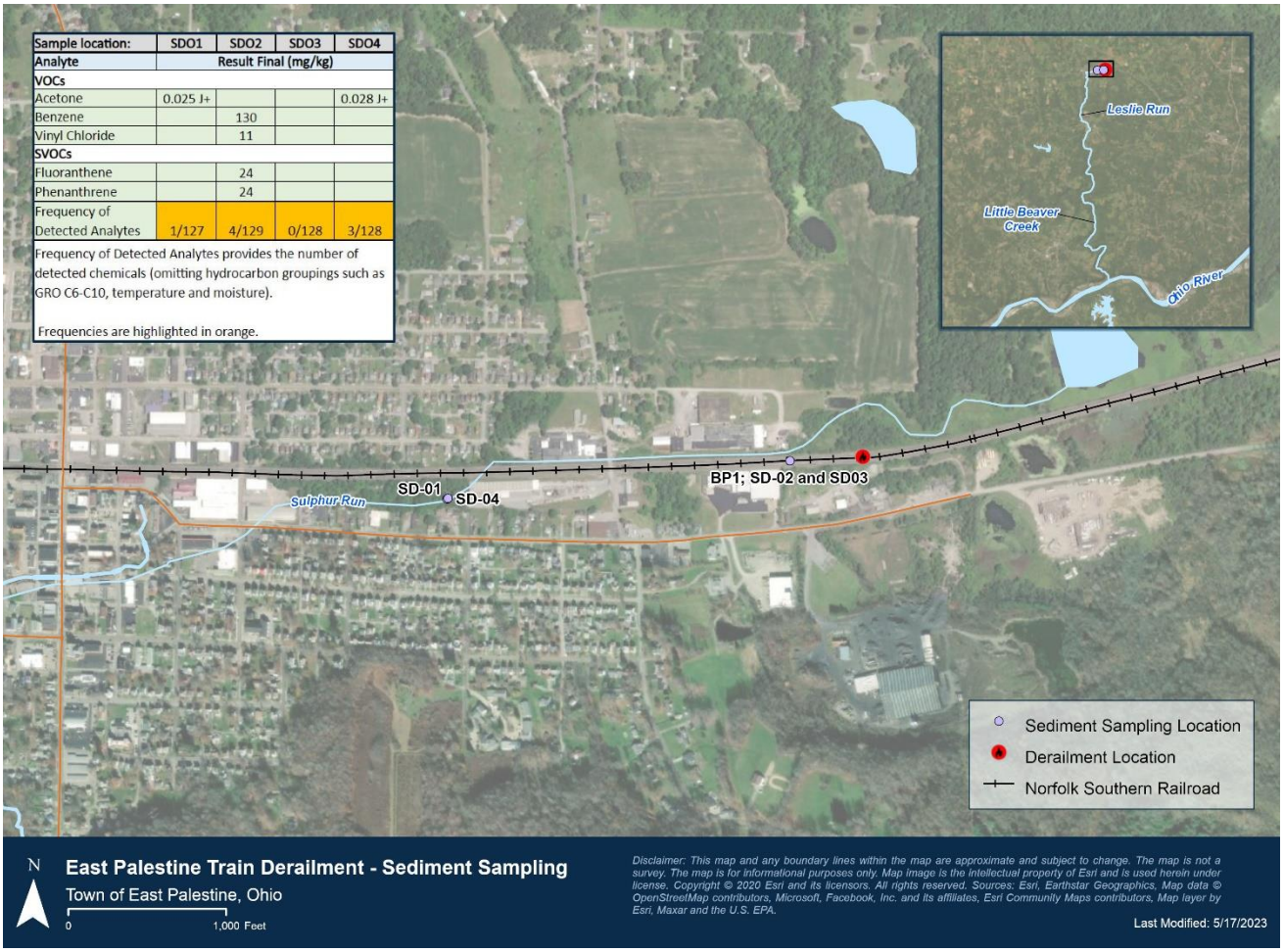


Figure 13. Sediment Sampling Locations and Results.

U.S. EPA's currently posted data provides sediment sample results for samples taken through February 10, 2023. U.S. EPA has posted on its website that it is conducting more sampling at this time. A considerable amount of change has occurred since the original sediment data was collected, including source material removal, which will likely affect existing sediment conditions. In addition, Ohio EMA indicates that Sulphur Run is being

reinforced on the north side of the railroad tracks as a precaution to prevent sediments washing downstream during rain events. Further, Ohio EPA has stated that "cleaning of creek sediment is ongoing through the use of multiple techniques designed to free contamination from within the sediment and capture the contamination with vacuum trucks. The captured material is collected in storage tanks and sent off for disposal at an approved hazardous waste facility." As a result, the interpretation of U.S. EPA's information (from February 10, 2023) represents a snapshot of time prior to U.S. EPA removal actions and other cleanup efforts. Results show that most of the contamination was contained at the source area and that very little material had moved down stream.

Summary: TASC reviewed sediment chemical analysis data collected by U.S. EPA. The Agency's data represents sediment conditions prior to several contamination source removal actions. Therefore, these data are likely out of date and captures conditions that have changed. There were no other known sources of publicly available sediment data located for this evaluation. Results show that most of the contamination was contained at the derailment source area and had not moved downgradient at the time of sampling (February 10, 2023).

More information will become available from U.S. EPA and Ohio DNR. U.S. EPA has posted on its website (July 28, 2023) which states that "sediment and water sampling started on Sulphur Run to develop a characterization of the creek. Stream cleaning is on hold while sediment and water sampling goes on." Ohio DNR watershed monitoring activities to study the Little Beaver Creek watershed will encompass streams impacted by the trail derailment (refer to information provided in the biological section below).

Groundwater

TASC could not identify sampling focused on East Palestine area groundwater (that is not associated with public drinking water or sampling of private wells). There are numerous studies that focus on drinking water public supply wells, as described in the drinking water section above. Both PDEP and Ohio EPA provide a description of the potential for groundwater impacts attributable to the derailment. This information is summarized below. In addition, Ohio EPA has installed monitoring wells to evaluate groundwater to determine if chemicals are moving toward the East Palestine municipal supply groundwater well field. Results are available from these wells and have been interpreted in this section. Private well water quality is held in confidence and provided only to the well owners. A summary of the groundwater information provided by entity is provided below.

Ohio EPA: Ohio EPA indicates that there is ongoing and future monitoring of East Palestine area groundwater with the installation of monitoring wells that are located between the two impacted waterways, Sulfur Run and Leslie Run, and the village's wellfield. These wells are being monitored to ensure the continued safety of the public water supply. By testing the water in these wells, any potential contaminants should be discovered before they reach the village. There are chemical analysis data currently available for these wells. A summary of the samples collected to date (April 19, 2023) is provided in Table 4 below.

PDEP: PDEP states that short or long-term impacts from the derailment on groundwater is not expected in Pennsylvania. PDEP performed a geologic assessment of regional Pennsylvania geology using published reports and references. It indicates that Pennsylvania groundwater near the derailment site flows south westward and therefore should not carry any chemicals from the derailment site towards groundwater wells in Pennsylvania. The geology of the area would likely slow the spread of any surface contamination to the groundwater below. PDEP will continue testing to ensure there are no impacts to Pennsylvania.

A PDEP news release on March 10, 2023, stated that "PDEP reports no signs of groundwater contamination with first results from independent water sampling." The news release does not provide details about the location or data results of the groundwater samples. However, this news release indicates that the results are "negative", meaning they show no sign of contamination from the train derailment. Recent operation news releases posted on U.S. EPA's East Palestine Site Profile webpage state that PDEP found no contamination in first results from groundwater sampling near the derailment site and will continue to sample in the months to come.

Table 4. Summary of Ohio EPA Groundwater Samples Collected[3]

Date Sampled	Laboratory	Well						
		MW-01	MW-02	MW-03	MW-04	SMW05	SMW06	SMW07
2/23/2023	Eurofins	√	√					
2/24/2023	Eurofins			√	√			
3/2/2023	Summit	√	√					
3/3/2023	Eurofins			√	√			
3/3/2023	Summit			√	√			
3/8/2023	Eurofins	√				√		
3/8/2023	Summit		√					
3/9/2023	Eurofins		√	√	√			
3/9/2023	Summit			√	√			
3/15/2023	Eurofins	√	√					
3/15/2023	Summit	√	√					
3/16/2023	Eurofins			√	√			
3/16/2023	Summit			√	√			
3/22/2023	Eurofins	√	√					
3/22/2023	Summit	√	√					
3/23/2023	Eurofins			√	√		√	
3/23/2023	Summit			√	√			
3/29/2023	Eurofins	√	√	√	√			

[3] Data organized by TASC.

Date Sampled	Laboratory	Well						
		MW-01	MW-02	MW-03	MW-04	SMW05	SMW06	SMW07
4/5/2023	Eurofins	√	√	√	√		√	
4/5/2023	Summit	√	√	√	√			
4/12/2023	Eurofins	√	√	√	√		√	√
4/19/2023	Ohio EPA	√	√	√	√			

Summary: East Palestine area groundwater information is primarily focused on the drinking water well data described above. Ohio EPA collects groundwater information to monitor possible movement of derailment contamination toward the East Palestine municipal well field. Currently, there is no information that suggests that groundwater has been contaminated by the derailment.

Soil

Two agencies (U.S. EPA and PDEP) evaluate soil. Derailment-contaminated soil is a focus of cleanup activities. However, to date, publicly available soil data are limited. U.S. EPA has provided summary materials that describe ongoing soil sampling results. The content below summarizes the data gathered to date (as of August 1, 2023), as well as ongoing and future soil sampling conducted by these agencies.

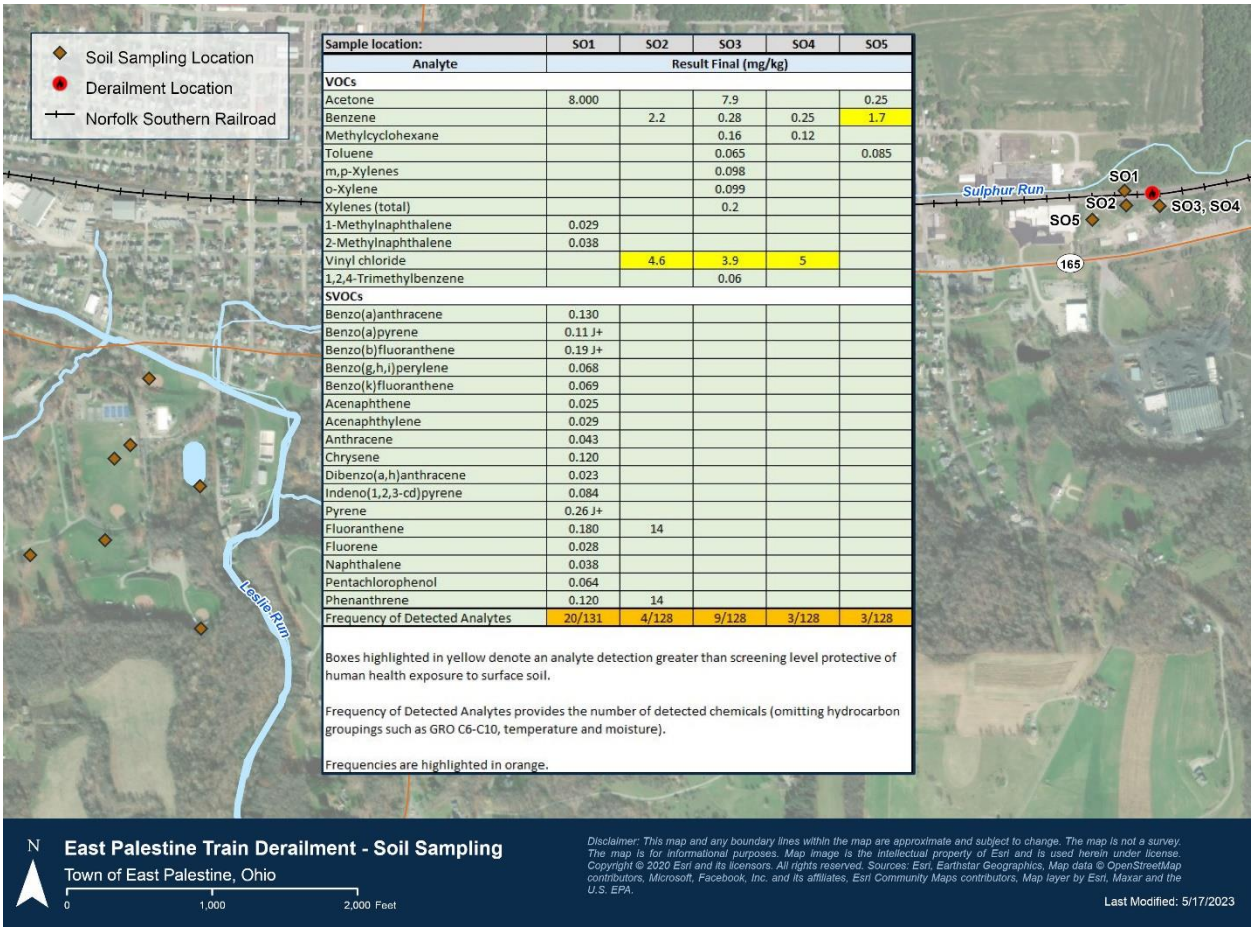
U.S. EPA: Shortly after the derailment, soil sample collection was used to define the area of cleanup. As cleanup is accomplished, more samples are collected to determine the extent of contamination and verify the completeness of cleanup (removal of contaminated soils) and determine if shallow soils in the area are impacted by the controlled burn. The following describes soil sampling led or directed by U.S. EPA by timeline which includes:

- Sampling completed immediately following the derailment.
- Sampling for East Palestine City Park soils.
- Ongoing sampling that defines the soil removal activities.
- Soil analyses for farms in Pennsylvania.

Completed Derailment Area and East Palestine City Park Soils Sampling

U.S. EPA collected soil samples at the derailment site soon after the accident. U.S. EPA submitted these samples for analysis for extended VOCs (target contaminants of concern list and tentatively identified compounds), SVOCs (target contaminants of concern list and tentatively identified compounds), gasoline range organic compounds, diesel range organic compounds and oil range organic compounds. The sample locations were selected near the derailed train cars. They are shown in Figure 14 as locations SO1 through SO5. Figure 14 also shows the soil sampling locations for soils collected from East Palestine City Park. These samples were analyzed for a targeted suite of analytes, including PAHs, dioxins and furans. Figure 14 also provides a summary table of individual soil sample results, by date, taken by U.S. EPA shortly after the derailment. Results from the East Palestine City Park soils analysis are in Appendix B, Table B-7.

U.S. EPA's website provides an interactive map that allows users to query results by chemical and location. U.S. EPA also provides the combined data summary on its website. TASC downloaded the combined summary and compiled the data. The summary in Figure 14 provides the number of detected chemicals of interest, by date and location. The data available on U.S. EPA's website provide soil sample results for samples taken through February 10, 2023. Cleanup activities since that time, including source material removal, will likely affect existing soil conditions.



Sample location:	SO1	SO2	SO3	SO4	SO5
Analyte	Result Final (mg/kg)				
VOCs					
Acetone	8.000		7.9		0.25
Benzene		2.2	0.28	0.25	1.7
Methylcyclohexane			0.16	0.12	
Toluene			0.065		0.085
m,p-Xylenes			0.098		
o-Xylene			0.099		
Xylenes (total)			0.2		
1-Methylnaphthalene	0.029				
2-Methylnaphthalene	0.038				
Vinyl chloride		4.6	3.9	5	
1,2,4-Trimethylbenzene			0.06		
SVOCs					
Benzo(a)anthracene	0.130				
Benzo(a)pyrene	0.11 J+				
Benzo(b)fluoranthene	0.19 J+				
Benzo(g,h,i)perylene	0.068				
Benzo(k)fluoranthene	0.069				
Acenaphthene	0.025				
Acenaphthylene	0.029				
Anthracene	0.043				
Chrysene	0.120				
Dibenzo(a,h)anthracene	0.023				
Indeno(1,2,3-cd)pyrene	0.084				
Pyrene	0.26 J+				
Fluoranthene	0.180	14			
Fluorene	0.028				
Naphthalene	0.038				
Pentachlorophenol	0.064				
Phenanthrene	0.120	14			
Frequency of Detected Analytes	20/131	4/128	9/128	3/128	3/128

Boxes highlighted in yellow denote an analyte detection greater than screening level protective of human health exposure to surface soil.

Frequency of Detected Analytes provides the number of detected chemicals (omitting hydrocarbon groupings such as GRO C6-C10, temperature and moisture).

Frequencies are highlighted in orange.

Figure 14. Soil Sampling Locations and Results.

Ongoing Sampling

U.S. EPA's soil sampling strategy is documented within the Phase I Residential/Commercial/Agricultural Soil Sampling Plan (ARCADIS, 2023a). The samples collected under this plan are linked to the plume of soot that was mapped by the Interagency Modeling Atmospheric Assessment Center (IMAAC; and is further described in the Soot description below). A map of the ongoing soil sampling strategy from ARCADIS 2023a is included in Appendix C (Figure C-3).

U.S. EPA also requires soil sampling takes place as contaminated materials are removed. The Main Line Interim Soil Removal Plan (ARCADIS, 2023b) describes the sampling

procedure. When removal is complete, soil samples will be collected from the base of the excavation (to a sample depth of about 2 inches) using a grid approach. Each sample will be analyzed for VOCs and SVOCs on U.S. EPA's target compound list (including vinyl chloride), as well as butyl acrylate, ethyl hexyl acrylate, methyl acrylate and 2-butoxyethanol.

U.S. EPA provided a soil sampling update to the public on April 20, 2023 (for presentation link, see U.S. EPA Soil Sampling Presentation in References). A map from U.S. EPA's Soil Sampling Presentation showing soil sampling completed through April 18, 2023, is provided in Appendix C (Figure C-4). Key information from that update is included below:

- 148 sample locations were identified, with two samples collected per location.
- Norfolk Southern collected samples at all locations under U.S. EPA oversight; U.S. EPA collected split samples at approximately 20% of the locations to verify accuracy by an independent lab.
- Samples were analyzed for SVOCs, dioxins and furans. Results were compared to U.S. EPA regional screening levels protective of human health.

TASC downloaded the Norfolk Southern and U.S. EPA soil split sample data sets provided on the U.S. EPA website. There were limitations to TASC being able to interpret the data provided for the following reasons:

- The data was lacking soil location identifiers that are necessary to be able to compare split samples gathered by Norfolk Southern and U.S. EPA.
- The soil samples appear to have been gathered from different depth fractions.
- The analytical methods used by Norfolk Southern and U.S. EPA appear to be different based on the reported detection limits.

Tables B-8 and B-9 within Appendix B summarize Norfolk Southern and the U.S. EPA soils data posted on the U.S. EPA website. These summaries represent the combined soil depth fraction results. Summary statistics (minimum, maximum, median, and number of samples) are provided for both data sets.

U.S. EPA provides a video describing its soil data results through April on its website. U.S. EPA conclusions include:

- Phase 1 sampling is complete.
- Most preliminary data is in.
- Vast majority of results are within typical soil ranges.
- No noticeable difference in results between shallow and deeper soils.
- On-property sample results look good.
- A few right-of-way samples have elevated levels of compounds.

In summary, a considerable amount of soil sample collection has been completed and is ongoing. A portion of this information is publicly available and presents split sample results for Norfolk Southern and U.S. EPA. TASC was unable to verify the split analysis results to

determine the comparability, accuracy and precision between the two data sets. U.S. EPA interpretation of the results indicate that the majority of results fall within typical soil ranges of concentrations for these chemicals.

There is a substantial amount of soils information that is not publicly available. However, it is likely that U.S. EPA will share information similar to the U.S. EPA April 20, 2023 presentation provided to the community, as it comes available.

Pennsylvania Farms Soils

Soil sampling at farms in Pennsylvania has finished. The data are not publicly available. U.S. EPA Region 3, in coordination with PDEP and the Pennsylvania Department of Agriculture, completed soil sampling at 15 priority farms within 2 to 8 miles of the derailment site. The sampling was conducted in coordination with the Lawrence County and Beaver County extension offices. U.S. EPA's website states that the preliminary results from this round of sampling do not show any impacts from the derailment. U.S. EPA's web page providing "EPA Residential, Commercial, and Agricultural Soil Sampling Results" provides a link to the Norfolk Southern's soil data set to date which indicates agricultural soils results are provided. However, this data holds property owner (and soil sample location information) in confidence, therefore results cannot be correlated to a particular location.

PDEP: As of March 10, 2023, PDEP began collecting soil samples from Pennsylvania properties within a 2-mile radius of the derailment site to determine any impacts from soot and ash on agricultural properties from the derailment and the controlled burn.

PDEP took multiple samples in four areas. Properties were selected for sampling based on reported ash and other materials deposited from the derailment and fire. These samples will be used to help inform farmers about any risks ahead of the upcoming planting season. There is an interactive map available to the public that allows queries of soil sample results by location (Figure 15). The public cannot download any data files. The map allows a person to view location specific results for soils and co-located agricultural plant tissue samples. TASC was unable to download the PDEP soils database and therefore could not analyze the results, unless a location by location query was to be conducted. PDEP indicates that, as laboratory results become available, summaries of the results will be made available. Finalized lab reports will be mailed to each property owner whose soil was tested.

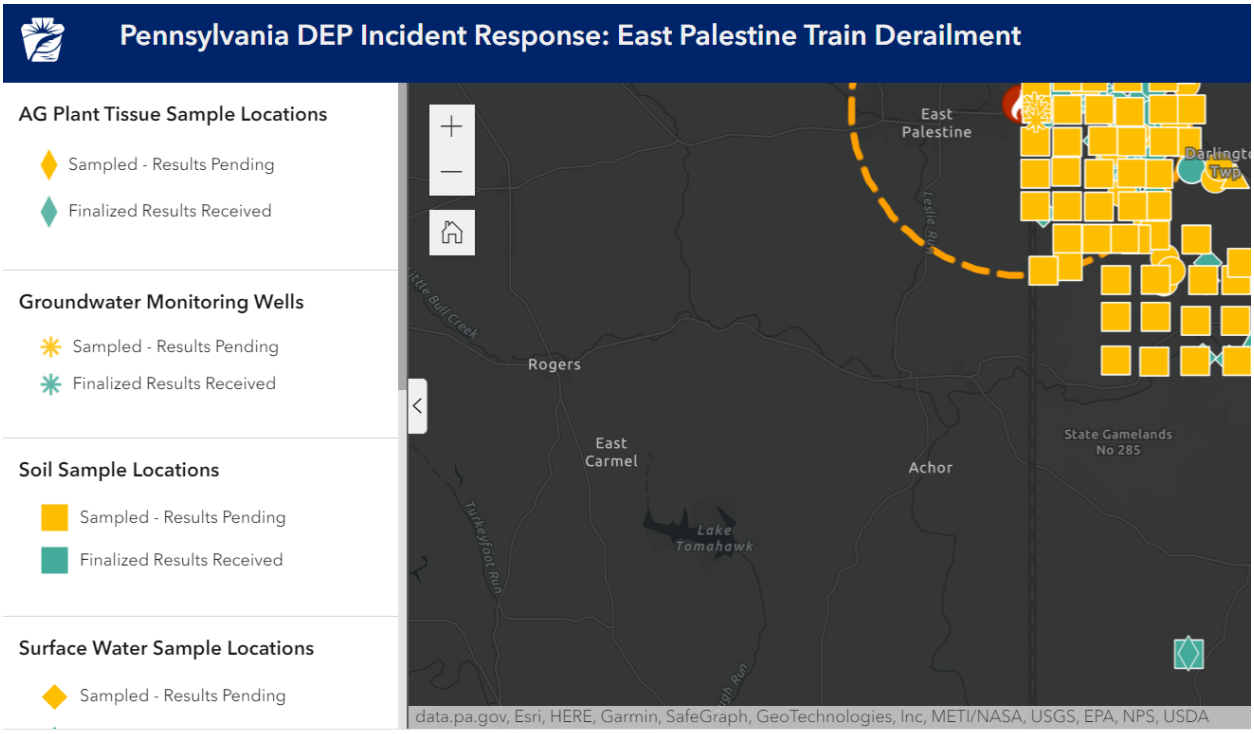


Figure 15. PDEP Interactive Map Resource for Analysis Results (https://experience.arcgis.com/experience/685eede45e6d48e39f078583edccbe69).

Summary: Several soils analysis results are publicly available including a small set of soil sampling analysis collected immediately after the derailment (shown in Figure 14), sample results from the East Palestine City Park soils (provided in Table B-7, Appendix B) and a portion of soils samples collected by Norfolk Southern and U.S. EPA (provided in Tables B-8 and B-9, Appendix B) as part of the ongoing soot depositional study area. Samples from agricultural areas (Pennsylvania farms) are described, however data is difficult to identify from the sources available. The results from these agricultural areas are narrated in publicly available web site sources.

Results indicate that soils immediately around the derailment area were contaminated with PAHs at levels of potential concern. Given that this area has been the focus of cleanup efforts, current conditions have likely improved considerably. The East Palestine City Park soils analysis did not identify any chemicals at concentrations of concern. The ongoing soils sample results show concentrations of SVOCs, dioxins and furans at concentrations that are typical of soils and show minimal concern in public right-of-way areas.

The publicly available data gathered from ongoing studies is difficult to interpret. Results are held in confidence for the private landowners whose property was sampled. There is a considerable amount of ongoing and future planned soils sampling. It is important that the data from these efforts be made available to the public.

Surface Deposited Soot

To evaluate soils most likely impacted by smoke and soot from the February 6, 2023 vent-and-burn operation, U.S. EPA requested an event reconstruction model and map from the IMAAC that shows the smoke plume and resulting soot surface deposition. The map (shown in Figure 16) estimates the extent and concentration of soot deposited within Ohio and Pennsylvania. The map shows the highest estimated concentration of soot (0.1 mg/m^2) is downwind from the derailment site covering an area roughly 8-miles long by 2-miles wide within western Pennsylvania. This concentration is approximately equal to 0.014 ounces of soot per acre of land. The results from this map helped inform U.S. EPA's Phase I Residential/Commercial/Agricultural Soil Sampling Plan. PDEP and U.S. EPA expanded their initial sampling approach to target properties in highest estimated soot concentration areas.

Results of samples taken from within the soot plume indicate minimal impacts. One of the families of chemicals sampled for were dioxins and furans. Results are posted on the U.S. EPA web site and are provided below in Table 5. Results fall within typical background ranges for rural and urban soils indicating minimal concern to residents. Table 5 shows results using Toxicity Equivalency values (TEQ). TEQ values are based on the 2005 World Health Organization (WHO) recommended toxic equivalency factors (Van den Berg et al. 2006). TEQs are a weighted quantity measure based on the toxicity of each member of the dioxin and dioxin-like compounds category relative to the most toxic members of the category.

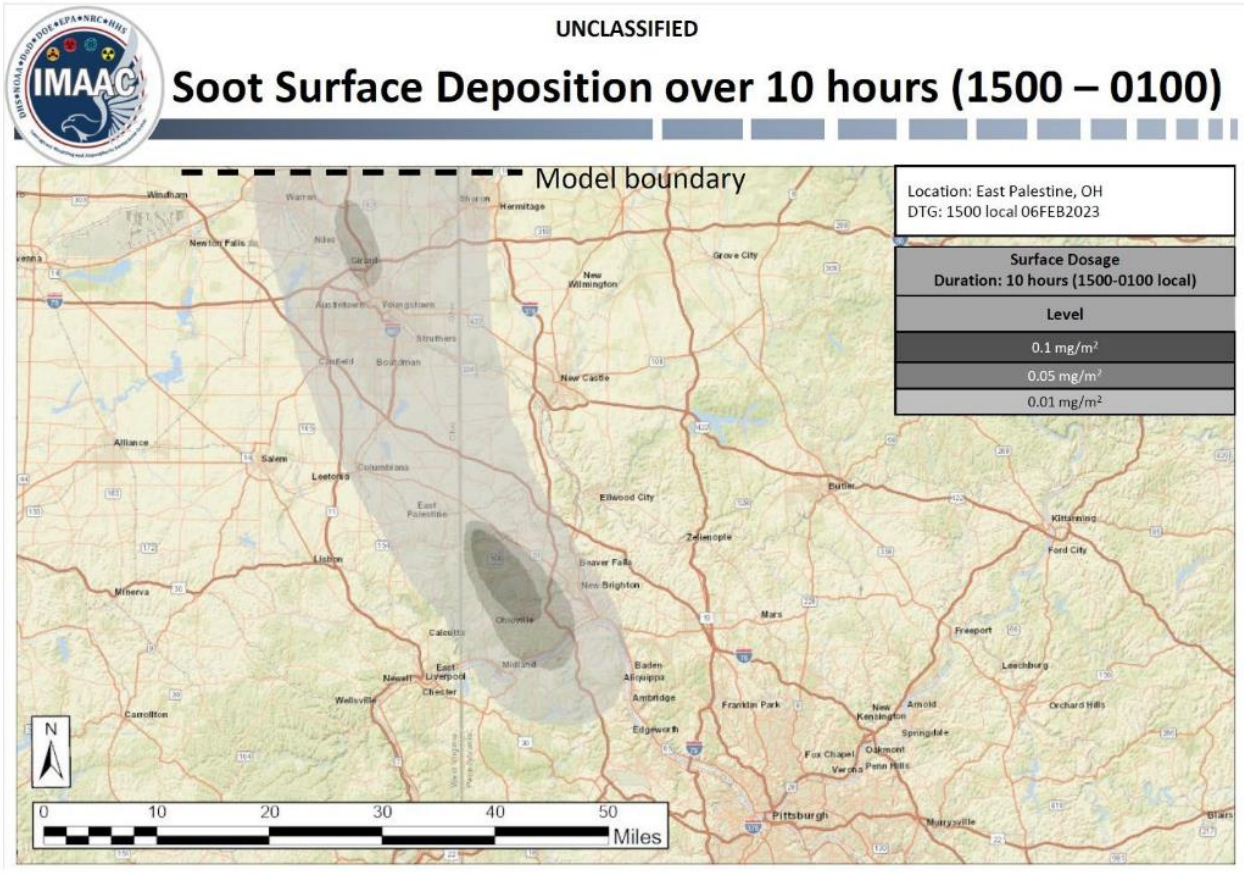


Figure 16. East Palestine Train Derailment Soot Surface Deposition Map (IMAAC Retrospective Analysis provided on U.S. EPA's Event Reconstruction Plume Map.

Table 5. Results Summary – Phase I and Additional PDEP TEQ Dioxin Results (mg/kg).[4]

Sampling Event	Analyte	Number of Samples	Average	Minimum	Maximum
Phase I	Total Toxic Dioxins and Furans	22	0.00000463[1]	0.0000024	0.000017
PDEP Additional	Total TEQ	19	0.0000033	0.000000371	0.00000676
Overall	TEQ	41	0.00000402	0.000000371	0.000017

Notes:
1—Interpreting Results Example: 0.00000463 = 4.63 x 10-6 = 4.62 parts per trillion (ppt)

[4] Table prepared by TASC.

Biological

Pennsylvania Department of Agriculture collected samples of biological media (agricultural plant species). Ohio EMA summarizes plant tissue results from additional agencies and institutions including the Ohio Department of Agriculture and The Ohio State University. The original data could not be located for the studies summarized by Ohio EMA.

Two additional agencies (Ohio DNR and Ohio EPA) have monitored aquatic life in the streams affected by the derailment. Monitoring involves the measurement of aquatic life features such as species diversity and does not involve the collection of samples for fish tissue analysis. Ohio DNR mobilized immediately after the derailment to monitor aquatic life within Sulphur Run and Leslie Run. Ohio EPA personnel routinely monitor the Little Beaver Creek watershed (which includes Sulphur Run, Leslie Run and streams downstream of these two streams) to measure surface water quality and aquatic health.

A summary of the efforts accomplished by these agencies is described below.

Pennsylvania Department of Agriculture: Technicians took tissue samples from triticale, grass, hay, spelts (grain), garlic, and blueberry bushes to determine levels of 26 SVOCs present. Pennsylvania State University scientists tested the samples and found no compounds present above reportable limits for that substance. Results indicate that plant tissue is an unlikely source of exposure to SVOCs. Complete plant tissue test results appear along with final sample results from PDEP's soil and water testing on the interactive map on PDEP's website (refer to Figure 15 above).

Ohio EMA posted a summary of the sampling as follows: “Crop Conditions: Ohio Department of Agriculture. Ohio EMA summarized the findings from the Department of Agricultural study of crops in the East Palestine area. As stated on the Ohio EMA website, “crops are in good condition, according to Columbiana County reports, six months following the train derailment. Plant tissue sampling results released in May by the Ohio Department of Agriculture (ODA) and The Ohio State University (OSU) College of Food, Agricultural, and Environmental Sciences showed no contamination of semi-volatile organic compounds (SVOCs) related to the train derailment. Analysis of scientific data by OSU shows plant materials from agricultural sites in the East Palestine area were not contaminated with SVOCs associated with the train derailment. Using U.S. EPA-approved methods, ODA’s plant health inspectors collected plant tissue samples from 16 agricultural areas in Columbiana County in April. All samples -- including winter wheat, pasture grasses, malting barley, and forage covers -- were taken within a five-mile radius of the train derailment site. Samples collected and tested closest to the derailment site (inner radius) were considered the most likely for potential contamination, and plant tissue samples collected farther from the derailment site (background radius) were tested to serve as a baseline comparison. OSU’s analysis did not find reportable levels of SVOCs in the inner or background radius zones attributable to the train derailment.

All samples were analyzed for the same 26 selected SVOCs the U.S. EPA had been testing for in soil samples. OSU scientists used an EPA-approved method (8270e) routinely used to

identify and quantify SVOCs in materials. Corn and soybean crops will be harvested in late August and into September."

Ohio DNR: Ohio DNR completed a fish kill survey immediately following the derailment. A field team worked for two consecutive days (February 6 and 7) to collect and identify dead fish at four collection stations. A map of the collection stations is provided below (Figure 17). Ohio DNR provided a summary of the numbers of dead fish recovered after the derailment on its website and by video. The results are:

- The final sample count of aquatic species killed in waterways impacted in the area totaled 2,938. Of this collected sample, most - nearly 2,200 - were small minnows.
- Based on this sample count, Ohio DNR used a calculation endorsed by the American Fisheries Society to estimate the total number of minnows killed in the entire 5-mile span of waterway from the derailment site to the point where Bull Creek flows into the north fork of Little Beaver Creek. Of the estimate, 38,222 were minnows, ranging in size between 1 and 3 inches.
- Ohio DNR also estimated the total number of other aquatic life killed as a result of the derailment, including small fish, crayfish, amphibians, and macroinvertebrates. This number is approximately 5,500.

Ohio DNR states that "although dead aquatic species still remain in the impacted waterways, the entirety of the impact to the aquatic life is believed to have occurred in the first 24-hours after the derailment. There is no immediate threat to minnows, fish, or other aquatic species – in fact, live fish have returned to Leslie Run. None of the species killed are believed to be endangered or threatened."

Ohio EPA: Ohio EPA routinely monitors the surface water quality and aquatic health of watersheds within its resource area. Results from its surface water monitoring program for the Little Beaver Creek watershed overlap and include streams affected by the derailment (Sulphur Run, Leslie Run and streams downgradient). Ohio EPA's approach is a comprehensive monitoring method that measures multiple indicators of stress to aquatic life including measurements of water quality, sediment quality, habitat, land use, toxicity tests, fish tissue measurements and biological measurements of fish and macroinvertebrate communities (numbers of species, diversity etc.). Ohio EPA plans to continue its water chemistry, ecological and sediment sampling into 2023. There are no publicly available results at the time of this report.

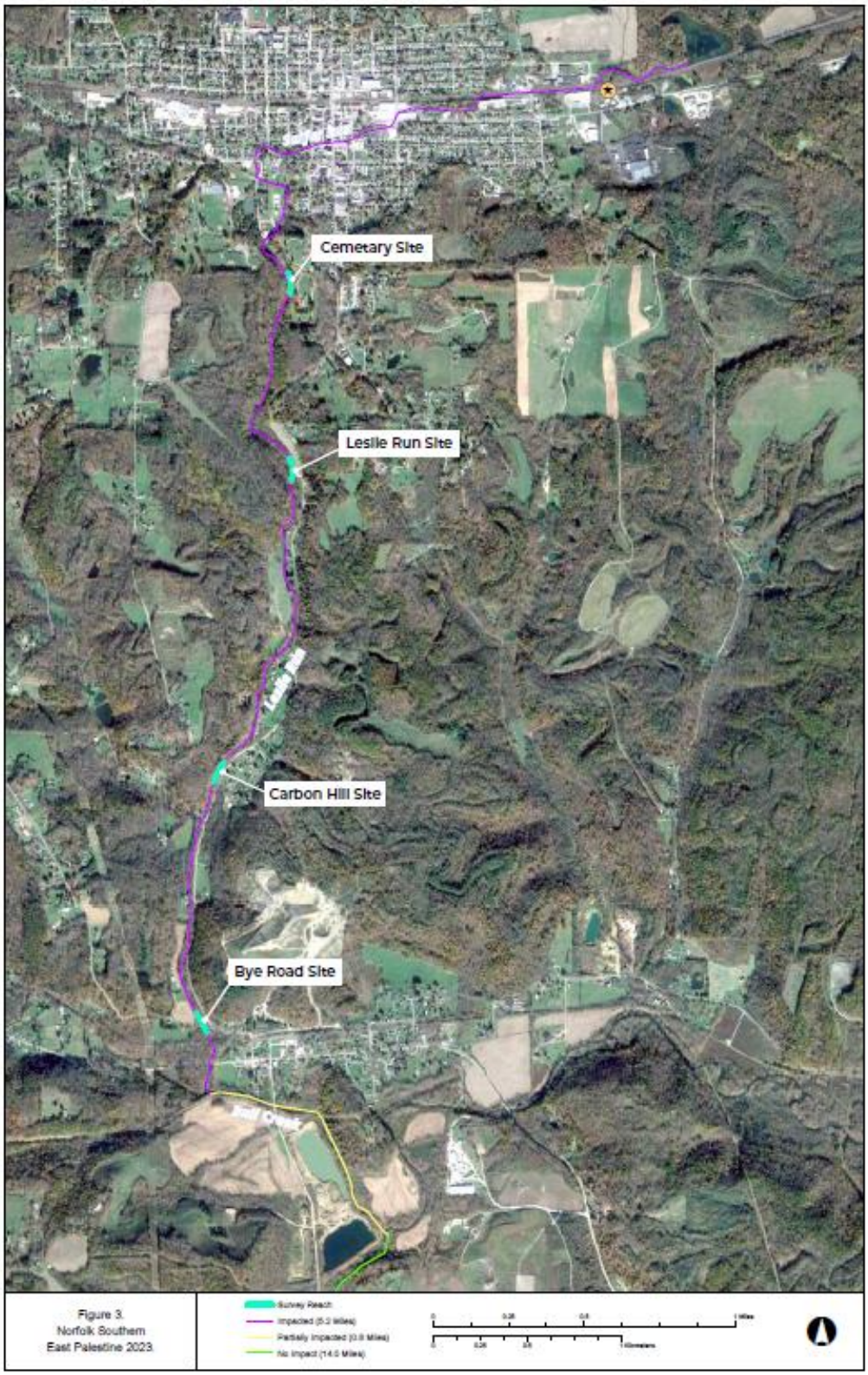


Figure 17. Map of Ohio DNR Fish Kill Monitoring Station Locations.

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Appendix B: Data Summary Tables to Date

Air

Table B-1. U.S. EPA Air Monitoring Data Results and Resources (Report Date and Link to Tables and Maps).[5]

Air Monitoring Type –Community Stationary (CS), Roving Air (RA)	Report Date and Link	Results Above Screening Levels? (Yes/No)	Chemical detected greater than screening level
CS	Continuous Monitoring Summary Table and Map, 3-19-2023 (pdf) (3.04 MB)	No	
CS	Continuous Monitoring Summary Table and Map, 3-17-2023 (pdf) (2.3 MB)	Yes	PM 2.5 and PM 10
CS	Continuous Monitoring Summary Table and Map, 3-15-2023 (pdf) (2.26 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 3-10-2023 (pdf) (pdf) (2.15 MB)	Yes	Carbon Monoxide
CS	Continuous Air Monitoring Summary Tables and Map, 3-09-2023 (pdf) (pdf) (2.2 MB)	Yes	PM 10
CS	Continuous Air Monitoring Summary Tables and Map, 3-08-2023 (pdf) (2.13 MB)	Yes	PM 10
CS	Continuous Air Monitoring Summary Tables and Map, 3-07-2023 (pdf) (2.27 MB)	Yes	PM 2.5 and PM 10
CS	Continuous Air Monitoring Summary Tables and Map, 3-06-2023 Rev 1 (pdf) (2.28 MB)	Yes	PM 2.5 and PM 10
CS	Continuous Air Monitoring Summary Tables and Map, 3-06-2023 (pdf) (2.22 MB)	Yes	Potential duplicate of listing above
CS	Continuous Air Monitoring Summary Tables and Map, 3-05-2023 (pdf) (2.27 MB)	Yes	PM 2.5 and PM 10

[5] Data sorted and organized by TASC.

Air Monitoring Type –Community Stationary (CS), Roving Air (RA)	Report Date and Link	Results Above Screening Levels? (Yes/No)	Chemical detected greater than screening level
CS	Continuous Air Monitoring Summary Tables and Map, 3-04-2023 (pdf) (2.28 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 3-03-2023 (pdf) (2.22 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 3-02-2023 (pdf) (2.23 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 3-01-2023 (pdf) (2.23 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 2-28-2023 (pdf) (2.05 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 2-27-2023 (pdf) (2.26 MB)	No	
CS	Continuous Air Monitoring Summary Tables and Map, 2-26-2023 (pdf) (8.67 MB)	Yes	Three exceedances with eight-hour average of 0
CS	Continuous Air Monitoring Summary Table and Map 2-25-2023 (pdf) (2.2 MB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 2-24-2023 (pdf) (794.72 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-23-2023 (pdf) (807.52 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-22-2023 (pdf) (792.41 KB)	No	

Air Monitoring Type –Community Stationary (CS), Roving Air (RA)	Report Date and Link	Results Above Screening Levels? (Yes/No)	Chemical detected greater than screening level
CS	Continuous Air Monitoring Summary Table and Map, 02-21-2023 (pdf) (797.28 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-20-2023 (pdf) (790.86 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-19-2023 (pdf) (788.15 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-17-2023 (pdf) (791.59 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-16-2023 (pdf) (764.3 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-15-2023 (pdf) (830.91 KB)	No	
CS	Continuous Air Monitoring Summary Table and Map, 02-13-2023 (pdf) (796.53 KB)	No	
CS	Air Monitoring Summary Table and Map Post Controlled Burn (02/06 - 02/07/2023) (pdf) (1.12 MB)	Yes	Numerous PM 10 and PM 2.5 exceedances
CS	Air Monitoring Summary Table and Map Pre Controlled Burn (02/04 - 02-06/2023) (pdf) (1.12 MB)	Yes	PM 10 and PM 2.5
CS	Fixed Discrete Air Monitoring Summary Table and Map, 02-08-2023 (pdf) (988.33 KB)	Yes	Numerous PM 10 and PM 2.5 exceedances
CS	Fixed Discrete Air Monitoring Summary Table and Map, 02-08-2023 (pdf) (988.33 KB)	Yes	Numerous PM 10 and PM 2.5 exceedances
RA	Roving Air Monitoring Results Summary Table and Map 03/19/2023 (pdf) (2.13 MB)	No	

Air Monitoring Type –Community Stationary (CS), Roving Air (RA)	Report Date and Link	Results Above Screening Levels? (Yes/No)	Chemical detected greater than screening level
RA	Roving Air Monitoring Results Summary Table and Map 03/18/2023 (pdf) (2.21 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/15/2023 (pdf) (2.12 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/14/2023 (pdf) (2.12 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/13/2023 (pdf) (2.15 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/12/2023 (pdf) (2.12 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/11/2023 (pdf) (2.09 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/10/2023 (pdf) (2.66 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/09/2023 (pdf) (2.06 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/08/2023 (pdf) (2.07 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/06/2023 (pdf) (2.05 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map 03/05/2023 (pdf) (2.06 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map, 03/04/2023 (pdf) (2.04 MB)	No	

Air Monitoring Type –Community Stationary (CS), Roving Air (RA)	Report Date and Link	Results Above Screening Levels? (Yes/No)	Chemical detected greater than screening level
RA	Roving Air Monitoring Results Summary Table and Map, 03/03/2023 (pdf) (2.09 MB)	Yes	One exceedance of a VOC
RA	Roving Air Monitoring Results Summary Table and Map, 03/02/2023 (pdf) (2.03 MB)	Yes	PM 2.5 and PM 10
RA	Roving Air Monitoring Results Summary Table and Map, 03/01/2023 (pdf) (1.99 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map Rev 2 02/26/2023 (pdf) (6.6 MB)	Yes	PM 2.5 and PM 10
RA	Roving Air Monitoring Results Summary Table and Map, 2-26-2023 (pdf) (2.04 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map, 2-25-2023 (pdf) (2.06 MB)	No	
RA	Roving Air Monitoring Results Summary Table and Map (Rev 1), 2-24-2023 (pdf) (899.95 KB)	Yes	PM 2.5 and PM 10
RA	Roving Air Monitoring Results Summary Table and Map (Rev 1), 02-09-2023 (pdf) (780.25 KB)	No	
RA	Roving Air Monitoring Results Summary Table and Map (Rev 2) 02/09/2023 (pdf) (930.53 KB)	Yes	PM 2.5 and PM 10
RA	Roving Air Monitoring Results Summary Table and Maps, 02-10-2023 (pdf) (995.96 KB)	No	
RA	Roving Air Monitoring Results Summary Table and Map, 02-09-2023 (pdf) (881 KB)	Yes	PM 2.5 and PM 10 Carbon Monoxide

Table B-2. Summary of U.S. EPA Community Stationary and Roving Air Monitoring Results from February through March 19, 2023.[6]

Air Monitoring Type – Community Stationary (CS) or Roving Air (RA)	Results Above Screening Levels? (Yes/No)	Parameter Above Screening Level
CS: March 19	No	
CS: March 17	Yes	PM 2.5 and PM 10
CS: March 15	No	
CS: March 10	Yes	Carbon monoxide
CS: March 9	Yes	PM 10
CS: March 8	Yes	PM 10
CS: March 7	Yes	PM 2.5 and PM 10
CS: March 6	Yes	PM 2.5 and PM 10
CS: March 5	Yes	PM 2.5 and PM 10
CS: March 4	No	
CS: March 3	No	
CS: March 2	No	
CS: March 1	No	
CS: February 28	No	
CS: February 27	No	
CS: February 26	Yes	Three exceedances with eight-hour average of 0
CS: February 25	No	
CS: February 24	No	
CS: February 23	No	
CS: February 22	No	
CS: February 21	No	
CS: February 20	No	
CS: February 19	No	
CS: February 17	No	
CS: February 16	No	
CS: February 15	No	
CS: February 13	No	
CS: February 6-7	Yes	Numerous PM 10 and PM 2.5 exceedances

[6] Data sorted and organized by TASC.

Air Monitoring Type – Community Stationary (CS) or Roving Air (RA)	Results Above Screening Levels? (Yes/No)	Parameter Above Screening Level
CS: pre-controlled burn – February 4-6	Yes	PM 10 and PM 2.5
Fixed discreet – February 8	Yes	Numerous PM 10 and PM 2.5 exceedances
Fixed discreet – February 8	Yes	Numerous PM 10 and PM 2.5 exceedances
RA: March 19	No	
RA: March 18	No	
RA: March 15	No	
RA: March 14	No	
RA: March 13	No	
RA: March 12	No	
RA: March 11	No	
RA: March 10	No	
RA: March 9	No	
RA: March 8	No	
RA: March 6	No	
RA: March 5	No	
RA: March 4	No	
RA: March 3	Yes	One VOC exceedance
RA: March 2	Yes	PM 2.5 and PM 10
RA: March 1	No	
RA: February 26	Yes	PM 2.5 and PM 10
RA: February 26	No	
RA: February 25	No	
RA: February 24	Yes	PM 2.5 and P.M. 10
RA: February 9	No	
RA: February 9	Yes	PM 2.5 and P.M. 10
RA: February 10	No	
RA: February 9	Yes	PM 2.5 and PM 10, carbon monoxide

Drinking Water

Table B-3. Summary of Detections in East Palestine Drinking Water Wells (Pre-Treatment) Water: East Palestine Public Water System Data (Ohio EPA).

East Palestine Public Water System Data

Summary of Detections in East Palestine's Wells

Sample Collection Date	Location	Chemical Name	NS Lab	Independent Lab (Summit)	Units	Comments
5/23/2023	Well water entering the plant (Well 3)	cis-1,3-dichloropropene	NS	0.779	PPB	Health standard for total 1,3-dichloropropene in drinking water is 0.47 ppb. Commonly used in farming to control nematodes. This is not associated with the train derailment.
5/23/2023	Well water entering the plant (Well 3)	Tetrachloroethene	NS	0.54	PPB	Maximum allowed (MCL) of 5 ppb. Commonly used as a dry cleaning agent and metal degreasing solvent. It is also used as a starting material for manufacturing other chemicals and is used in some consumer products.
5/23/2023	Well water entering the plant (Well 5)	cis-1,3-dichloropropene	NS	0.76	PPB	Health standard for total 1,3-dichloropropene in drinking water is 0.47 ppb. Commonly used in farming to control nematodes. This is not associated with the train derailment.
4/4/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	<RL	0.36	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
4/4/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	<RL	0.57	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
4/4/2023	Well water entering the plant (Well 5)	Di-n-butyl phthalate	<RL	0.49	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/28/2023	Well water entering the plant (Well 2)	Di-n-butyl phthlate	<RL	0.76	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/28/2023	Well water entering the plant (Well 5)	Di-n-butyl phthlate	<RL	0.33	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/21/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	< RL	0.42	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/21/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	< RL	0.56	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/21/2023	Well water entering the plant (Well 5)	Di-n-butyl phthalate	< RL	0.42	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/14/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	<RL	0.23	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/14/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	<RL	0.2	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/14/2023	Well water entering the plant (Well 5)	Di-n-butyl phthalate	<RL	0.46	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/7/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	<RL	0.19	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/7/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	<RL	0.34	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/7/2023	Well water entering the plant (Well 5)	Bis(2-ethylhexyl) phthalate	<RL	0.22	PPB	Maximum allowed (MCL) of 6 ppb in treated drinking water, it is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
3/7/2023	Well water entering the plant (Well 5)	Di-n-butyl phthalate	<RL	0.70	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/28/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	<RL	0.49	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/28/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	<RL	0.37	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/28/2023	Well water entering the plant (Well 4)	Bis(2-ethylhexyl) phthalate	<RL	0.23	PPB	Maximum allowed (MCL) of 6 ppb in treated drinking water, it is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/28/2023	Well water entering the plant (Well 5)	Di-n-butyl phthalate	<RL	0.39	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/24/2023	Well water entering the plant (Well 5)	Perfluorobutanoic acid (PFBA)	1.9	<RL	PPT	This is part of a group of man-made chemicals called per- and polyfluoroalkyl substances (PFAS), which are applied to many consumer goods to make them [illegible]
2/21/2023	Well water entering the plant (Well 1)	Di-n-butyl phthlate	<RL	0.36	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/21/2023	Well water entering the plant (Well 2)	Di-n-butyl phthlate	<RL	0.82	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/21/2023	Well water entering the plant (Well 5)	Di-n-butyl phthlate	<RL	0.66	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 4)	Bis(2-ethylhexyl) phthalate	<RL	0.19	PPB	Maximum allowed (MCL) of 6 ppb in treated drinking water, it is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 3)	Methoxychlor	<RL	0.10	PPB	This comes from runoff or leaching from insecticide used on fruits, vegetables, alfalfa, livestock. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Benzo(b)fluoranthene	<RL	0.11	PPB	This is a substance generated from natural sources such as forest fires and human activity including emissions from coal and gas fired boilers, incinerators, and wide variety of industrial processes. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Bis(2-ethylhexyl) phthalate	<RL	0.27	PPB	Maximum allowed (MCL) of 6 ppb in treated drinking water, it is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Butachlor	<RL	0.11	PPB	This is an herbicide used worldwide in corn, soybean and other crop cultures. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Di-n-butyl phthalate	<RL	0.67	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Methoxychlor	<RL	0.14	PPB	This comes from runoff or leaching from insecticide used on fruits, vegetables, alfalfa, livestock. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 1)	Di-n-butyl phthalate	<RL	0.66	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
2/10/2023	Well water entering the plant (Well 2)	Carbon Disulfide	1.10	< RL	PPB	This can be found in gases released to the Earth's surface or produced by microorganisms in the soil. This is not associated with the train derailment.

NOTE: NS = Not Sampled

Table B-4. Summary of Detections in East Palestine Drinking Water Wells (Pre-Treatment) from the East Palestine Public Water Wells (Ohio EPA).[7]

Analyte	Location and Date															
	4/11/23	4/18/23	4/19/23	4/25/23	5/2/23	5/3/23	5/9/23	5/15/23	5/17/23	5/23/23	5/30/23	5/31/23	6/6/23	6/13/23	6/14/23	6/20/23
Acetone									SMW-1						QA	
Bis(2-ethylhexyl) phthalate			SMW-6						SMW-3							
Bromodichloromethane	PW-207				PW-207		PW-207			PW-207, QA	PW-207		PW-207	PW-207		
Chloroform	PW-207	PW-207		PW-207	PW-207		PW-207	PW-207		PW-207	PW-207		PW-207	PW-207		
Dibromochloromethane	PW-207	PW-207			PW-207		PW-207			PW-207						
Diethyl phthalate	PW-207															
Methylene chloride								PW-201 FB, PW-202, PW-203, PW-204, PW-205, PW-207, QA	QA, SMW-6				PW-201, PW-203, PW-204, PW-205, QA			PW-201, PW-201 FB, PW-202, PW-203, PW-204, PW -205
Tetrachloroethene							PW-207			PW-203						

[7] Data sorted and organized by TASC.

Analyte	Location and Date															
	4/11/23	4/18/23	4/19/23	4/25/23	5/2/23	5/3/23	5/9/23	5/15/23	5/17/23	5/23/23	5/30/23	5/31/23	6/6/23	6/13/23	6/14/23	6/20/23
Toluene							PW-21 FB, QA		SMW-3 FB	PW-201 FB, QA						PW-201 FB, QA
Trichlorofluoromethane									SMW-1 FB	PW-201 FB						
Trihalomethanes (THMs)	PW-207				PW-207		PW-207			PW-207	PW-207			PW-207		
1,2-Dichloroethane								QA								
1,3-Dichloropropane										PW-207				PW-207		
cis-1,3-Dichloropropene									SMW-4	PW-203, PW-205	PW-204, PW-207					
1,2,3-Trichlorobenzene								QA								
2-Butanone						QA, SMW-3 FB, SMW-6 FB		QA	SMW-3, SMW-3 FB, SMW-4, SMW-6 FB	PW-201 FB	PW-201, PW-205, QA	SMW-1 FB, SMW-6, SMW-6 FB	QA			
2-Butoxyethyl acetate						SMW-1			SMW-1							

Notes:

QA – Quality Assurance sample was collected, such as a Field Blank (FB) or Trip Blank (TB)

Table B-5. Summary of Detections in East Palestine Sentinel Wells (Groundwater Flowing Toward East Palestine Drinking Water Wells) Water: East Palestine Public Water System Data (Ohio EPA).

East Palestine Public Water System Data

Summary of Detections in Treated Drinking Water

Sample Collection Date	Location	Chemical Name	NS Lab	Independent Lab (Ohio EPA)	Units	Comments
6/6/2023	Drinking Water distributed to customers	Bromodichloromethane	NS	0.524	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
6/6/2023	Drinking Water distributed to customers	Chloroform	NS	0.73	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/30/2023	Drinking Water distributed to customers	Chloroform	NS	0.983	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/23/2023	Drinking Water distributed to customers	1,3-dichloropropane	NS	0.605	PPB	Health standard in drinking water is 370 ppb. May be found as a contaminant in soil fumigants containing 1,3-dichloropropene. This is not associated with the train derailment.
5/23/2023	Drinking Water distributed to customers	Chloroform	NS	1.01	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/23/2023	Drinking Water distributed to customers	Chlorodibromomethane	NS	0.901	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/15/2023	Drinking Water distributed to customers	Chloroform	NS	0.658	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/9/2023	Drinking Water distributed to customers	Chloroform	NS	0.986	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/9/2023	Drinking Water distributed to customers	Bromodichloromethane	NS	0.839	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/9/2023	Drinking Water distributed to customers	Chlorodibromomethane	NS	0.685	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
5/9/2023	Drinking Water distributed to customers	Methylene chloride	NS	0.586	PPB	Maximum allowed (MCL) 5 ppb. Common laboratory solvent and paint remover. This is not associated with the train derailment.
4/25/2023	Drinking Water distributed to customers	Chloroform	NS	0.66	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination

East Palestine Public Water System Data

Summary of Detections in Treated Drinking Water

Sample Collection Date	Location	Chemical Name	NS Lab	Independent Lab (Ohio EPA)	Units	Comments
4/18/2023	Drinking Water distributed to customers	Bromodichloromethane	NS	0.73	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
4/18/2023	Drinking Water distributed to customers	Chloroform	NS	1.03	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
4/11/2023	Drinking Water distributed to customers	Diethylphthalate	NS	2.41	PPB	This is part of a group of chemicals used to make plastics more durable. This is not associated with the train derailment.
4/11/2023	Drinking Water distributed to customers	Chlorodibromomethane	NS	0.72	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
4/4/2023	Drinking Water distributed to customers	Bromodichloromethane	0.67	0.81	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
4/4/2023	Drinking Water distributed to customers	Chloroform	<RL	0.74	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
4/4/2023	Drinking Water distributed to customers	Bis(2-chloroethyl) ether	<RL	1.3	PPB	Exceeds drinking water screening limit of 0.014 ppb. Mainly used as a chemical intermediate in industry. Limited health effects information is available on this chemical.
3/28/2023	Drinking Water distributed to customers	Bromodichloromethane	0.72	0.73	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
3/28/2023	Drinking Water distributed to customers	Chloroform	0.70	0.66	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
3/28/2023	Drinking Water distributed to customers	Bis(2-chloroethyl) ether	<RL	1.34	PPB	Exceeds drinking water screening limit of 0.014 ppb. Mainly used as a chemical intermediate in industry. Limited health effects information is available on this chemical.
3/28/2023	Drinking Water distributed to customers	Chlorodibromomethane	0.52	<RL	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
3/21/2023	Drinking Water distributed to customers	Bromodichloromethane	1.0	0.88	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
3/21/2023	Drinking Water distributed to customers	Chlorodibromomethane	0.71	0.59	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination
3/21/2023	Drinking Water distributed to customers	Chloroform	0.93	1.11	PPB	Maximum allowed (MCL) 80 ppb. Common by-product of drinking water chlorination

Surface Water

Table B-6. Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics (ORSANCO).

Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics

Data is preliminary, therefore subject to review and may be changed.

Samples collected by Ohio River Valley Water Sanitation Commission (ORSANCO); Analyzed by Greater Cincinnati Water Works (GCWW)

Highlighted in gray are the most recent Ohio River sample results collected by ORSANCO and analyzed by Greater Cincinnati Water Works with permission to share. The last samples were collected on April 3-4, 2023 and reflect the most recent data available. We will update this table as new data becomes available. The ATSDR Health Guidance Value listed below the table is for *Finished Drinking Water*, whereas all samples shown are raw water, collected directly from the river.

Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
1	Grimms Bridge	East Liverpool	OH	Little Beaver Creek	3.0	Surface Grab	2/8/2023	1305	4.40	<0.50	<0.50	Present	Present
2	Lock 57 Park	Ohioville	PA	Little Beaver Creek	0.2	Surface Grab	2/8/2023	1330	12.5	<0.50	<0.50	Present	Present
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	2/8/2023	1345	<1.00	<0.50	<0.50	Not Detected	Not Detected
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	2/8/2023	1430	2.94	<0.50	<0.50	Not Detected	Not Detected
5	Toronto	Toronto	OH	Ohio River	59.2	Intake: 19 ft	2/8/2023	1515	<1.00	<0.50	<0.50	Not Detected	Not Detected
6	Steubenville	Steubenville	OH	Ohio River	65.3	Intake: 18 ft	2/8/2023	1550	1.23	<0.50	<0.50	Not Detected	Not Detected
7	Pike Island Lock & Dam	Wheeling	WV	Ohio River	84.2	Surface Grab	2/8/2023	1715	4.30	<0.50	<0.50	Not Detected	Not Detected
8	Bellaire	Bellaire	OH	Ohio River	93.9	Intake: N/A	2/8/2023	1805	<1.00	<0.50	<0.50	Not Detected	Not Detected
9	New Matamoras Boat Ramp	New Matamoras	OH	Ohio River	142.1	Surface Grab	2/12/2023	1330	<1.00	<0.50	<0.50	Not Detected	Not Detected
10	Wayne National Forest Boat Ramp	Grandview Township	OH	Ohio River	148.6	Surface Grab	2/12/2023	1400	<1.00	<0.50	<0.50	Not Detected	Not Detected
11	The Jug Dock	Newport	OH	Ohio River	155.7	Surface Grab	2/12/2023	1420	1.63	<0.50	<0.50	Not Detected	Not Detected
12	Campground Boat Lauch	Reno	OH	Ohio River	167.8	Surface Grab	2/12/2023	1440	2.16	<0.50	<0.50	Not Detected	Not Detected
13	Public Launch Ramp	Williamtown	WV	Ohio River	172.0	Surface Grab	2/12/2023	1500	1.47	<0.50	<0.50	Not Detected	Not Detected
14	Point Park	Parkersburg	WV	Ohio River	184.5	Surface Grab	2/12/2023	1535	<1.00	<0.50	<0.50	Not Detected	Not Detected
15	Belpre Boat Ramp	Belpre	OH	Ohio River	186.1	Surface Grab	2/12/2023	1600	<1.00	<0.50	<0.50	Not Detected	Not Detected
16	Athens Boat Club Dock	Hockingport	OH	Ohio River	199.3	Surface Grab	2/12/2023	1630	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/12/2023	1650	<1.00	<0.50	<0.50	Not Detected	Not Detected
12	Campground Boat Lauch	Reno	OH	Ohio River	167.8	Surface Grab	2/13/2023	1110	<1.00	<0.50	<0.50	Not Detected	Not Detected
13	Public Launch Ramp	Williamstown	WV	Ohio River	172.0	Surface Grab	2/13/2023	1140	<1.00	<0.50	<0.50	Not Detected	Not Detected
14	Point Park	Parkersburg	WV	Ohio River	184.5	Surface Grab	2/13/2023	1210	1.86	<0.50	<0.50	Not Detected	Not Detected
15	Belpre Boat Ramp	Belpre	OH	Ohio River	186.1	Surface Grab	2/13/2023	1240	<1.00	<0.50	<0.50	Not Detected	Not Detected
16	Athens Boat Club Dock	Hockingport	OH	Ohio River	199.3	Surface Grab	2/13/2023	1345	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/13/2023	1415	<1.00	<0.50	<0.50	Not Detected	Not Detected
18	Ravenswood Public Boat Launch	Ravenswood	WV	Ohio River	221.1	Surface Grab	2/13/2023	1505	<1.00	<0.50	<0.50	Not Detected	Not Detected
19	Private Dock	Letart Township	OH	Ohio River	226.8	Surface Grab	2/13/2023	1530	<1.00	<0.50	<0.50	Not Detected	Not Detected
14	Point Park	Parkersburg	WV	Ohio River	184.5	Surface Grab	2/14/2023	1245	<1.00	<0.50	<0.50	Not Detected	Not Detected
15	Belpre Boat Ramp	Belpre	OH	Ohio River	186.1	Surface Grab	2/14/2023	1320	<1.00	<0.50	<0.50	Not Detected	Not Detected
16	Athens Boat Club Dock	Hockingport	OH	Ohio River	199.3	Surface Grab	2/14/2023	1435	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/14/2023	1500	<1.00	<0.50	<0.50	Not Detected	Not Detected
18	Ravenswood Public Boat Launch	Ravenswood	WV	Ohio River	221.1	Surface Grab	2/14/2023	1535	<1.00	<0.50	<0.50	Not Detected	Not Detected
19	Private Dock	Letart Township	OH	Ohio River	226.8	Surface Grab	2/14/2023	1620	<1.00	<0.50	<0.50	Not Detected	Not Detected
20	Old Lock & Dam 23	Apple Grove	OH	Ohio River	231.5	Surface Grab	2/14/2023	1645	<1.00	<0.50	<0.50	Not Detected	Not Detected
21	Racine Hydro	Racine	OH	Ohio River	237.7	Surface Grab	2/14/2023	1720	<1.00	<0.50	<0.50	Not Detected	Not Detected
10	Wayne National Forest Boat Ramp	Grandview Township	OH	Ohio River	148.6	Surface Grab	2/15/2023	1625	<1.00	<0.50	<0.50	Not Detected	Not Detected
12	Campground Boat Lauch	Reno	OH	Ohio River	167.8	Surface Grab	2/15/2023	1555	<1.00	<0.50	<0.50	Not Detected	Not Detected

Updated ATSDR comparison Values for Drinking Water- 02/11/23

based off derivation worksheet

Analyte	Screen Value, ppb	Source
n-Butyl acrylate	560	ATSDR Provisional Health Guidance Value (HGV)
2-ethylhexyl acrylate	500	ATSDR Provisional Health Guidance Value (HGV)
2-ethyl hexanol	200	ATSDR Provisional Health Guidance Value (HGV)

Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics

Data is preliminary, therefore subject to review and may be changed.

Samples collected by Ohio River Valley Water Sanitation Commission (ORSANCO); Analyzed by Greater Cincinnati Water Works (GCWW)

Highlighted in gray are the most recent Ohio River sample results collected by ORSANCO and analyzed by Greater Cincinnati Water Works with permission to share. The last samples were collected on April 3-4, 2023 and reflect the most recent data available. We will update this table as new data becomes available. The ATSDR Health Guidance Value listed below the table is for *Finished Drinking Water* , whereas all samples shown are raw water, collected directly from the river.

Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
13	Public Launch Ramp	Williamstown	WV	Ohio River	172.0	Surface Grab	2/15/2023	1520	<1.00	<0.50	<0.50	Not Detected	Not Detected
14	Point Park	Parkersburg	WV	Ohio River	184.5	Surface Grab	2/15/2023	1430	<1.00	<0.50	<0.50	Not Detected	Not Detected
15	Belpre Boat Ramp	Belpre	OH	Ohio River	186.1	Surface Grab	2/15/2023	1410	<1.00	<0.50	<0.50	Not Detected	Not Detected
16	Athens Boat Club Dock	Hockingport	OH	Ohio River	199.3	Surface Grab	2/15/2023	1340	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/15/2023	1320	<1.00	<0.50	<0.50	Not Detected	Not Detected
18	Ravenswood Public Boat Launch	Ravenswood	WV	Ohio River	221.1	Surface Grab	2/15/2023	1235	1.29	<0.50	<0.50	Not Detected	Not Detected
19	Private Dock	Letart Township	OH	Ohio River	226.8	Surface Grab	2/15/2023	1210	1.62	<0.50	<0.50	Not Detected	Not Detected
20	Old Lock & Dam 23	Apple Grove	OH	Ohio River	231.5	Surface Grab	2/15/2023	1150	<1.00	<0.50	<0.50	Not Detected	Not Detected
21	Racine Hydro	Racine	OH	Ohio River	237.7	Surface Grab	2/15/2023	1130	1.44	<0.50	<0.50	Not Detected	Not Detected
22	Village of Syracuse Ramp	Syracuse	OH	Ohio River	245.5	Surface Grab	2/15/2023	1105	<1.00	<0.50	<0.50	Not Detected	Not Detected
23	Mason Public Ramp	Mason	WV	Ohio River	250.2	Surface Grab	2/15/2023	1035	<1.00	<0.50	<0.50	Not Detected	Not Detected
24	Cheshire Public Ramp	Cheshire	OH	Ohio River	257.8	Surface Grab	2/15/2023	0945	<1.00	<0.50	<0.50	Not Detected	Not Detected
25	Gallipolis Riverfront Boat Access	Gallipolis	OH	Ohio River	270.1	Surface Grab	2/15/2023	0915	<1.00	<0.50	<0.50	Not Detected	Not Detected
16	Athens Boat Club Dock	Hockingport	OH	Ohio River	199.3	Surface Grab	2/16/2023	1315	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/16/2023	1340	<1.00	<0.50	<0.50	Not Detected	Not Detected
18	Ravenswood Public Boat Launch	Ravenswood	WV	Ohio River	221.1	Surface Grab	2/16/2023	1410	<1.00	<0.50	<0.50	Not Detected	Not Detected
19	Private Dock	Letart Township	OH	Ohio River	226.8	Surface Grab	2/16/2023	1425	<1.00	<0.50	<0.50	Not Detected	Not Detected
20	Old Lock & Dam 23	Apple Grove	OH	Ohio River	231.5	Surface Grab	2/16/2023	1445	<1.00	<0.50	<0.50	Not Detected	Not Detected
21	Racine Hydro	Racine	OH	Ohio River	237.7	Surface Grab	2/16/2023	1500	<1.00	<0.50	<0.50	Not Detected	Not Detected
22	Village of Syracuse Ramp	Syracuse	OH	Ohio River	245.5	Surface Grab	2/16/2023	1530	<1.00	<0.50	<0.50	Not Detected	Not Detected
23	Mason Public Ramp	Mason	WV	Ohio River	250.2	Surface Grab	2/16/2023	1550	1.18	<0.50	<0.50	Not Detected	Not Detected
24	Cheshire Public Ramp	Cheshire	OH	Ohio River	257.8	Surface Grab	2/16/2023	1620	<1.00	<0.50	<0.50	Not Detected	Not Detected
25	Gallipolis Riverfront Boat Access	Gallipolis	OH	Ohio River	270.1	Surface Grab	2/16/2023	1645	<1.00	<0.50	<0.50	Not Detected	Not Detected
26	RC Byrd Lock & Dam	Gallipolis Ferry	WV	Ohio River	279.2	Surface Grab	2/16/2023	1725	<1.00	<0.50	<0.50	Not Detected	Not Detected
17	Forked Run Ramp	Olive Township	OH	Ohio River	207.0	Surface Grab	2/17/2023	1350	<1.00	<0.50	<0.50	Not Detected	Not Detected
18	Ravenswood Public Boat Launch	Ravenswood	WV	Ohio River	221.1	Surface Grab	2/17/2023	1245	<1.00	<0.50	<0.50	Not Detected	Not Detected
19	Private Dock	Letart Township	OH	Ohio River	226.8	Surface Grab	2/17/2023	1230	<1.00	<0.50	<0.50	Not Detected	Not Detected
20	Old Lock & Dam 23	Apple Grove	OH	Ohio River	231.5	Surface Grab	2/17/2023	1210	<1.00	<0.50	<0.50	Not Detected	Not Detected
21	Racine Hydro	Racine	OH	Ohio River	237.7	Surface Grab	2/17/2023	1155	<1.00	<0.50	<0.50	Not Detected	Not Detected
23	Mason Public Ramp	Mason	WV	Ohio River	250.2	Surface Grab	2/17/2023	1125	<1.00	<0.50	<0.50	Not Detected	Not Detected
24	Cheshire Public Ramp	Cheshire	OH	Ohio River	257.8	Surface Grab	2/17/2023	1055	<1.00	<0.50	<0.50	Not Detected	Not Detected
25	Gallipolis Riverfront Boat Access	Gallipolis	OH	Ohio River	270.1	Surface Grab	2/17/2023	1025	1.01	<0.50	<0.50	Not Detected	Not Detected
26	RC Byrd Fishing Access	Ohio Township	OH	Ohio River	279.1	Surface Grab	2/17/2023	1005	<1.00	<0.50	<0.50	Not Detected	Not Detected
27	KH Butler Fishing Access	Crown City	OH	Ohio River	284.5	Surface Grab	2/17/2023	0945	<1.00	<0.50	<0.50	Not Detected	Not Detected
28	Athalia Boat Ramp	Athalia	OH	Ohio River	296.6	Surface Grab	2/17/2023	0915	<1.00	<0.50	<0.50	Not Detected	Not Detected

Updated ATSDR comparison Values for Drinking Water- 02/11/23

based off derivation worksheet

Analyte	Screen Value, ppb	Source
n-Butyl acrylate	560	ATSDR Provisional Health Guidance Value (HGV)
2-ethylhexyl acrylate	500	ATSDR Provisional Health Guidance Value (HGV)
2-ethyl hexanol	200	ATSDR Provisional Health Guidance Value (HGV)

Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics

Data is preliminary, therefore subject to review and may be changed.

Samples collected by Ohio River Valley Water Sanitation Commission (ORSANCO); Analyzed by Greater Cincinnati Water Works (GCWW)

Highlighted in gray are the most recent Ohio River sample results collected by ORSANCO and analyzed by Greater Cincinnati Water Works with permission to share. The last samples were collected on April 3-4, 2023 and reflect the most recent data available. We will update this table as new data becomes available. The ATSDR Health Guidance Value listed below the table is for *Finished Drinking Water* , whereas all samples shown are raw water, collected directly from the river.

Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
29	Old Lock & Dam 27	Proctorville	OH	Ohio River	301.1	Surface Grab	2/17/2023	0905	<1.00	<0.50	<0.50	Not Detected	Not Detected
30	Harris Park Public Ramp	Huntington	WV	Ohio River	308.1	Surface Grab	2/17/2023	0830	<1.00	<0.50	<0.50	Not Detected	Not Detected
31	Ashland Public Ramp	Ashland	KY	Ohio River	322.6	Surface Grab	2/18/2023	0917	<1.00	<0.50	<0.50	<2.00*	<1.00*
32	Ironton Public Ramp	Ironton	OH	Ohio River	327.0	Surface Grab	2/18/2023	0941	<1.00	<0.50	<0.50	<2.00	<1.00
33	Greenup Lock and Dam	Greenup	KY	Ohio River	341.0	Surface Grab	2/18/2023	1005	<1.00	<0.50	<0.50	<2.00	<1.00
34	Wheelersburg Ramp	Wheelersburg	OH	Ohio River	347.0	Surface Grab	2/18/2023	1028	<1.00	<0.50	<0.50	<2.00	<1.00
35	Portsmouth Public Ramp	Portsmouth	OH	Ohio River	355.6	Surface Grab	2/18/2023	1055	<1.00	<0.50	<0.50	<2.00	<1.00
36	Nace Run, Shawnee State Park Mar	Shawnee State	OH	Ohio River	363.0	Surface Grab	2/18/2023	1113	<1.00	<0.50	<0.50	<2.00	<1.00
37	Sandy Springs Campground	Rockville	OH	Ohio River	375.9	Surface Grab	2/18/2023	1137	<1.00	<0.50	<0.50	<2.00	<1.00
38	Rome Boat Ramp	Rome	OH	Ohio River	383.9	Surface Grab	2/18/2023	1155	<1.00	<0.50	<0.50	<2.00	<1.00
39	Manchester Public Access Boat Ran	Manchester	OH	Ohio River	395.8	Surface Grab	2/18/2023	1219	<1.00	<0.50	<0.50	<2.00	<1.00
40	Aberdeen Ramp	Aberdeen	OH	Ohio River	408.7	Surface Grab	2/18/2023	1248	<1.00	<0.50	<0.50	<2.00	<1.00
41	Ripley	Ripley	OH	Ohio River	415.8	Surface Grab	2/18/2023	1305	<1.00	<0.50	<0.50	<2.00	<1.00
42	White Oak Creek Marina	Pleasant Township	OH	Ohio River	424.0	Surface Grab	2/18/2023	1324	<1.00	<0.50	<0.50	<2.00	<1.00
43	Shady Rest Riverside Campground	Utopia	OH	Ohio River	430.0	Surface Grab	2/18/2023	1342	<1.00	<0.50	<0.50	<2.00	<1.00
44	Meldahl Lock and Dam	Felicity	OH	Ohio River	436.2	Surface Grab	2/18/2023	1408	<1.00	<0.50	<0.50	<2.00	<1.00
45	Thomas More Field Station	California	KY	Ohio River	451.0	Surface Grab	2/19/2023	0818	<1.00	<0.50	<0.50	<2.00	<1.00
46	Schmidt Field Ramp	Cincinnati	OH	Ohio River	466.5	Surface Grab	2/19/2023	0854	<1.00	<0.50	<0.50	<2.00	<1.00

*** 2-ethyl hexanol (2EH) and 2-ethylhexyl acrylate (EHA) were *qualitively* screened from February 8th to 17th. For samples beginning February 18th, GCWW lab calibrated for 2EH and EHA after acquiring standards. The practical quantitation limit (PQL) of 2EH is 2.00ppb, and the PQL of EHA is 1.00ppb.**

47	Mehldahl Fishing Pier	Foster	KY	Ohio River	436.4	Surface Grab	2/19/2023	0750	<1.00	<0.50	<0.50	<2.00	<1.00
48	Cincinnati Public Landing	Cincinnati	OH	Ohio River	470.1	Surface Grab	2/19/2023	0915	<1.00	<0.50	<0.50	<2.00	<1.00
49	Anderson Ferry Ramp	Addyston	OH	Ohio River	477.5	Surface Grab	2/19/2023	0935	<1.00	<0.50	<0.50	<2.00	<1.00
50	Fernbank Park	Addyston	OH	Ohio River	483.6	Surface Grab	2/19/2023	0950	<1.00	<0.50	<0.50	<2.00	<1.00
51	Lawrenceburg	Lawrenceburg	IN	Ohio River	493.1	Surface Grab	2/19/2023	1030	<1.00	<0.50	<0.50	<2.00	<1.00
52	Aurora Public Landing (lower)	Aurora	IN	Ohio River	497	Surface Grab	2/19/2023	1059	<1.00	<0.50	<0.50	<2.00	<1.00
53	Rising Sun Public Ramp	Rising Sun	IN	Ohio River	506.1	Surface Grab	2/19/2023	1120	<1.00	<0.50	<0.50	<2.00	<1.00
54	Patriot-1	Patriot	IN	Ohio River	511.9	Surface Grab	2/19/2023	1145	<1.00	<0.50	<0.50	<2.00	<1.00
55	Patriot-2	Patriot	IN	Ohio River	518.5	Surface Grab	2/19/2023	1215	<1.00	<0.50	<0.50	<2.00	<1.00
56	Patriot-3	Patriot	IN	Ohio River	524.2	Surface Grab	2/19/2023	1233	<1.00	<0.50	<0.50	<2.00	<1.00
57	Markland	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	1251	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	1900	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2110	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2310	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	1902	<1.00	<0.50	<0.50	<2.00	<1.00

Updated ATSDR comparison Values for Drinking Water- 02/11/23

based off derivation worksheet

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n-Butyl acrylate	560	ATSDR Provisional Health Guidance Value (HGV)
2-ethylhexyl acrylate	500	ATSDR Provisional Health Guidance Value (HGV)
2-ethyl hexanol	200	ATSDR Provisional Health Guidance Value (HGV)

Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics

Data is preliminary, therefore subject to review and may be changed.

Samples collected by Ohio River Valley Water Sanitation Commission (ORSANCO); Analyzed by Greater Cincinnati Water Works (GCWW)

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Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2105	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2305	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	1904	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2100	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/19/2023	2300	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0110	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0310	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Surface	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0510	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0105	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0305	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Mid Depth	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0505	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0100	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0300	<1.00	<0.50	<0.50	<2.00	<1.00
58	Markland-Bottom	Florence	IN	Ohio River	531.5	Surface Grab	2/20/2023	0500	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/21/2023	1657	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Depth	Cannelton	IN	Ohio River	720.7	Surface Grab	2/21/2023	1657	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/21/2023	1858	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/21/2023	2105	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/21/2023	2256	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/22/2023	0053	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/22/2023	0317	<1.00	<0.50	<0.50	<2.00	<1.00
59	Cannelton Lock and Dam-Surface	Cannelton	IN	Ohio River	720.7	Surface Grab	2/22/2023	0455	<1.00	<0.50	<0.50	<2.00	<1.00
60	Leslie Run	East Palestine	OH	Leslie Run	1.7	Surface Grab	2/23/2023	0830	3.22	<0.50	<0.50	27.6	17.1
61	North Fork Little Beaver Creek	Calcutta	OH	North Fork Little Beaver	0.1	Surface Grab	2/23/2023	0900	<1.00	<0.50	<0.50	3.31	1.40
1	Grimms Bridge	East Liverpool	OH	Little Beaver Creek	3.0	Surface Grab	2/23/2023	0925	<1.00	<0.50	<0.50	2.36	<1.00
2	Lock 57 Park	Ohioville	PA	Little Beaver Creek	0.2	Surface Grab	2/23/2023	0940	<1.00	<0.50	<0.50	2.44	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	2/23/2023	1035	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	2/23/2023	1110	<1.00	<0.50	<0.50	<2.00	<1.00
5	Toronto	Toronto	OH	Ohio River	59.2	Intake: 19 ft	2/23/2023	1150	<1.00	<0.50	<0.50	<2.00	<1.00
6	Steubenville	Steubenville	OH	Ohio River	65.3	Intake: 18 ft	2/23/2023	1225	<1.00	<0.50	<0.50	<2.00	<1.00
62	Belleville Lock & Dam	Reedsville	OH	Ohio River	203.9	Surface Grab	3/6/2023	1330	<1.00	<0.50	<0.50	<2.00	<1.00
63	RC Byrd Lock & Dam	Gallipolis Ferry	WV	Ohio River	279.2	Surface Grab	3/6/2023	1100	<1.00	<0.50	<0.50	<2.00	<1.00
64	Smithland Lock & Dam	Brookport	IL	Ohio River	918.5	Surface Grab	3/6/2023	1530	<1.00	<0.50	<0.50	<2.00	<1.00
65	Olmsted Lock & Dam	Olmsted	IL	Ohio River	964.6	Surface Grab	3/6/2023	1330	<1.00	<0.50	<0.50	<2.00	<1.00
7	Pike Island Lock & Dam	Wheeling	WV	Ohio River	84.2	Surface Grab	3/7/2023	1450	<1.00	<0.50	<0.50	<2.00	<1.00

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based off derivation worksheet

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n-Butyl acrylate	560	ATSDR Provisional Health Guidance Value (HGV)
2-ethylhexyl acrylate	500	ATSDR Provisional Health Guidance Value (HGV)
2-ethyl hexanol	200	ATSDR Provisional Health Guidance Value (HGV)

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Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
66	Hannibal Lock & Dam	Hannibal	OH	Ohio River	126.4	Surface Grab	3/7/2023	1220	<1.00	<0.50	<0.50	<2.00	<1.00
67	Willow Island Lock & Dam	Newport	OH	Ohio River	161.7	Surface Grab	3/7/2023	1030	<1.00	<0.50	<0.50	<2.00	<1.00
68	Newburgh Lock & Dam	Newburgh	IN	Ohio River	776.1	Surface Grab	3/7/2023	1200	<1.00	<0.50	<0.50	<2.00	<1.00
2	Lock 57 Park	Ohioville	PA	Little Beaver Creek	0.2	Surface Grab	3/8/2023	1415	<1.00	<0.50	<0.50	<2.00	<1.00
69	New Cumberland Lock & Dam	Stratton	OH	Ohio River	54.4	Surface Grab	3/8/2023	0930	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	3/13/2023	1600	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	3/14/2023	1145	<1.00	<0.50	<0.50	<2.00	<1.00
70	Ashland	Ashland	KY	Ohio River	319.7	Surface Grab	3/14/2023	1239	<1.00	<0.50	<0.50	<2.00	<1.00
71	Cincinnati	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	3/14/2023	1415	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	3/16/2023	1430	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	3/20/2023	945	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	3/20/2023	1300	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	3/20/2023	1330	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	3/20/2023	1327	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	3/21/2023	1200	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	3/27/2023	905	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	3/27/2023	1200	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	3/27/2023	1320	<1.00	<0.50	<0.50	<2.00	<1.00
70	Ashland	Ashland	KY	Ohio River	319.7	Surface Grab	3/27/2023	1048	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	3/27/2023	849	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	3/28/2023	755	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	4/3/2023	945	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	4/3/2023	1450	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	4/3/2023	956	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	4/3/2023	930	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	4/4/2023	1215	<1.00	<0.50	<0.50	<2.00	<1.00
70	Ashland	Ashland	KY	Ohio River	319.7	Surface Grab	4/4/2023	840	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	4/10/2023	935	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	4/10/2023	1230	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	4/10/2023	1500	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	4/10/2023	844	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	4/10/2023	740	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	4/17/2023	1230	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	4/17/2023	1300	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	4/17/2023	909	<1.00	<0.50	<0.50	<2.00	<1.00

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Analyte	Screen Value, ppb	Source
n-Butyl acrylate	560	ATSDR Provisional Health Guidance Value (HGV)
2-ethylhexyl acrylate	500	ATSDR Provisional Health Guidance Value (HGV)
2-ethyl hexanol	200	ATSDR Provisional Health Guidance Value (HGV)

Preliminary Data from East Palestine (Ohio) Train Derailment for Volatile Organics

Data is preliminary, therefore subject to review and may be changed.

Samples collected by Ohio River Valley Water Sanitation Commission (ORSANCO); Analyzed by Greater Cincinnati Water Works (GCWW)

Highlighted in gray are the most recent Ohio River sample results collected by ORSANCO and analyzed by Greater Cincinnati Water Works with permission to share. The last samples were collected on April 24-25, 2023 and reflect the most recent data available. We will update this table as new data becomes available. The ATSDR Health Guidance Value listed below the table is for *Finished Drinking Water* , whereas all samples shown are raw water, collected directly from the river.

Ref	Site Description	City	State	River	Stream Mile Point	Sample Depth	Date	Time	n-Butyl Acrylate (ppb)	other VOCs (ppb)	Vinyl Chloride (ppb)	2-Ethyl Hexanol (ppb)	2-Ethylhexyl acrylate (ppb)
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	4/17/2023	900	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	4/18/2023	1315	<1.00	<0.50	<0.50	<2.00	<1.00
73	West View	Baden	PA	Ohio River	20.1	Intake: N/A	4/24/2023	1005	<1.00	<0.50	<0.50	<2.00	<1.00
4	Buckeye	Wellsville	OH	Ohio River	47.1	Intake: N/A	4/24/2023	1150	<1.00	<0.50	<0.50	<2.00	<1.00
74	Henderson	Cincinnati	OH	Ohio River	462.8	Intake: 27ft	4/24/2023	814	<1.00	<0.50	<0.50	<2.00	<1.00
72	Paducah	Paducah	KY	Ohio River	935.5	Intake: 15ft	4/24/2023	730	<1.00	<0.50	<0.50	<2.00	<1.00
3	East Liverpool	East Liverpool	OH	Ohio River	40.2	Intake: 10 ft	4/25/2023	1045	<1.00	<0.50	<0.50	<2.00	<1.00
70	Ashland	Ashland	KY	Ohio River	319.7	Surface Grab	4/25/2023	1525	<1.00	<0.50	<0.50	<2.00	<1.00

Soil

Table B-7. Summary East Palestine City Park Soil Sampling Results[8]

Analyte[(a)]	Protective Screening level[(b)] mg/kg		L5		M5-1		M5-2		M5-3		N4-1		N4-2		N5	
			Surface	Below Surface	Surface	Below Surface	Surface	Below Surface	Surface	Below Surface	Surface	Below Surface	Surface	Below Surface	Surface	Below Surface
Chemical Name	RSL Int	RSL Chr	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
2-Methylnaphthalene	24	24	0.13	0.2	0.33	0.1	0.035	0.064	0.019 J	0.065	1	0.84	0.077	0.054		
Acenaphthylene	NSL	NSL		0.014 J						0.0071 J						
Anthracene	5980	5980	0.02 J	0.014 J						0.009 J	0.032	0.021				
Benz[a]anthracene	1.1	1.1	0.053	0.041	0.02 J	0.012 J		0.021 J	0.012 J	0.049 Bcn	0.087 Bcn	0.074 Bcn	0.023 Bcn	0.022 JBcn	0.032 JBcn	0.021 JBcn
Benzo[a]pyrene	1.4	0.12	0.069	0.06	0.019 J	0.011 J				0.052 Bcn	0.078 Bcn	0.061 Bcn	0.029 Bcn	0.022 JBcn	0.02 JBcn	0.021 JBcn
Benzo[b]anthracene	NSL	NSL			0.024	0.018 J				0.062	0.097	0.072	0.034	0.016 J	0.026 J	0.0095 J
Benzo[b]fluoranthene	14	1.2	0.1	0.077	0.024	0.018 J				0.062	0.097	0.072	0.034	0.016 J	0.026 J	0.0095 J
Benzo[g,h,i]perylene	NSL	NSL	0.06	0.051	0.024	0.021				0.04 Bcn	0.076 Bcn	0.07 Bcn			0.02 JBcn	0.021 JBcn
Benzo[k]fluoranthene	140	12	0.038	0.03	0.011 J	0.0047 J				0.03	0.022	0.02	0.014 J	0.011 J	0.009 J	
Chrysene	1390	12	0.085	0.072	0.043	0.028	0.022 J	0.031	0.016 J	0.067	0.15	0.12	0.033	0.017 J	0.02 J	0.0072 J
Dibenz[a,h]anthracene	1.4	0.12		0.014 J						0.011 J	0.019 J					
Fluoranthene	598	59.8	0.11	0.088	0.034	0.016 J	0.022 J	0.033	0.018 J	0.089	0.12	0.096	0.045	0.022	0.022 J	0.0099 J
Fluorene	239	2390			0.013 J											
Indeno[1,2,3-cd]pyrene	14	1.2	0.048	0.038	0.01 J			0.017 J		0.029	0.025	0.027	0.019 J	0.0091 J	0.017 J	
Naphthalene	14	2	0.088	0.13	0.19	0.061	0.022 J	0.043	0.015 J	0.039	0.57	0.46	0.045	0.034		
Phenanthrene	NSL	NSL	0.11	0.13	0.23	0.09	0.033	0.084	0.013 J	0.065	0.78	0.68	0.064	0.043	0.012 J	0.0077 J
Phenol	1900	1900	0.14													
Pyrene	1790	1791	0.096	0.076	0.044	0.018 J	0.02 J	0.034	0.014 J	0.079	0.13	0.11	0.039	0.02 J	0.024 J	0.0096 J
Dioxins																
2,3,7,8-tetrachlorodibenzo-p-dioxin	0.0000048	0.0000048							0.0000011 J	0.00000084 J						0.00000027 J
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	0.00048	0.00048	0.000054	0.000028			0.0000092	0.0000082	0.000023	0.000016	0.0000042 J	0.0000041 J	0.000017	0.000013	0.000036	0.0000052 J
1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin	0.00048	0.00048	0.00039	0.00021	0.000018	0.00001 J	0.000055	0.000051	0.00016	0.00011	0.000073	0.0001	0.00012	0.000096	0.00034	0.00007
Furans																
2,3,7,8-tetrachlorodibenzofuran	0.000048	0.000048		0.00000027 J					0.0000012 J	0.00000089 J		0.00000043 J	0.00000049 J	0.00000068 J		
2,3,4,7,8-pentachlorodibenzofuran	0.000016	0.000016		.0000029 J												
1,2,3,4,6,7,8-heptachlorodibenzofuran	0.00048	0.00048	0.000021	0.000014			0.0000051 J	0.0000031 J	0.00001	0.0000057 J			0.0000068 J	0.0000051 J	0.0000092 J	
1,2,3,4,6,7,8,9-octachlorodibenzofuran	0.0016	0.0016	0.000025	0.000014			0.0000055 J	0.0000048 J	0.000012 J	0.0000087 J		0.0000024 J	0.000011 J	0.000009 J	0.000029	0.0000034 J
Total Dioxin-Furan	0.0000048	0.0000048	0.0000045	0.0000036	0.0000028	0.0000026	0.0000034	0.0000033	0.0000047	0.0000038	0.0000029	0.0000027	0.0000033	0.0000031	0.0000046	0.0000028

Footnotes:

(a) Only detected chemicals are listed.

(b) Residential Soil Levels protective of int and chr =

No Screening Levels (NSL) are available for these chemicals, therefore the RSLs for Benzo(a)pyrene were conservatively used for comparison.

[8] Data organized by TASC.

Table B-8. Norfolk Southern Soil Data Summary Statistics.[9]

Norfolk Southern Soil Data Summary Statistics for Detected and Non-detected Data (ppm or mg/kg).								
Analyte	**Detected**				**Non-Detected**			
	Minimum	**Maximum**	**Median**	**Number**	**Minimum**	**Maximum**	**Median**	**Number**
Acenaphthene	0.0052	0.65	0.049	63	0.0038	0.14	0.019	198
Acenaphthylene	0.0059	0.74	0.045	99	0.0046	0.14	0.018	162
Anthracene	0.0042	3.4	0.0355	158	0.0038	0.14	0.006	103
Benzo(a)anthracene	0.0044	9.7	0.062	242	0.0038	0.054	0.021	19
Benzo(a)pyrene	0.0064	10	0.087	215	0.0038	0.054	0.00475	46
Benzo(b)fluoranthene	0.0059	12	0.09	245	0.0038	0.054	0.005	16
Benzo(g,h,i)perylene	0.0059	7.7	0.0815	206	0.0038	0.054	0.006	55
Benzo(k)fluoranthene	0.0043	4.8	0.046	198	0.0038	0.11	0.005	63
Chrysene	0.0071	10	0.0825	252	0.0038	0.028	0.0049	9
Dibenzo(a,h)anthracene	0.0089	1.8	0.0865	98	0.0076	0.14	0.013	163
Fluoranthene	0.0044	25	0.096	260	0.054	0.054	0.054	1
Fluorene	0.0047	0.84	0.042	77	0.0038	0.14	0.018	184
Hexachlorobenzene	All Data Below Detection Limits				0.0076	0.14	0.021	261
Indeno(1,2,3-cd)pyrene	0.0065	7	0.064	209	0.0046	0.064	0.00595	52
Naphthalene	0.0082	5.7	0.081	212	0.0076	0.14	0.0094	49
Pentachlorophenol	0.13	0.13	0.13	2	0.076	1.4	0.21	259
Phenanthrene	0.007	13	0.11	251	0.0046	0.042	0.00585	10
2-Chlorophenol	All Data Below Detection Limits				0.019	0.33	0.046	261
2-Methylnaphthalene	0.0066	3.4	0.088	139	0.0057	0.08	0.00705	26
2,4-Dichlorophenol	All Data Below Detection Limits				0.023	0.39	0.055	261
2,4,5-Trichlorophenol	0.03	0.03	0.03	1	0.019	0.33	0.046	260
2,4,6-Trichlorophenol	All Data Below Detection Limits				0.019	0.33	0.046	261

[9] Data sorted and organized by TASC. Summary statistics prepared by TASC.

Norfolk Southern Soil Data Summary Statistics for Detected and Non-detected Data (ppm or mg/kg).								
Analyte	Detected				Non-Detected			
	Minimum	Maximum	Median	Number	Minimum	Maximum	Median	Number
4-Chloro-3-Methylphenol	All Data Below Detection Limits				0.023	0.42	0.063	261
4-Chlorophenyl-phenylether	All Data Below Detection Limits				0.019	0.33	0.046	261
Dioxins and Furans								
1,2,3,4,7,8-HxCDF	2.4E-06	0.00011	5.5E-06	80	1.8E-06	9.4E-06	2.8E-06	182
1,2,3,6,7,8-HxCDD	0.0000034	0.0007	0.000011	62	0.00000095	9.4E-06	0.000003	200
1,2,3,6,7,8-HxCDF	2.4E-06	0.00017	0.0000069	83	1.6E-06	9.4E-06	2.8E-06	179
1,2,3,4,6,7,8-HpCDD	0.0000032	0.015	0.000042	255	0.0000022	0.0000062	0.0000024	7
1,2,3,4,6,7,8-HpCDF	0.0000015	0.0023	1.6E-05	218	0.0000022	0.0000083	0.00000265	44
1,2,3,4,7,8,9-HpCDF	0.0000011	0.0001	6.05E-06	54	0.0000011	9.4E-06	2.8E-06	208
OCDF	2.4E-06	0.0042	2.6E-05	207	0.0000022	1.3E-05	0.0000025	19
OCDD	0.0000031	0.11	0.00062	259	Not Available			
1,2,3,7,8-PeCDD	7.2E-07	0.00019	0.00000445	60	0.00000074	9.4E-06	0.0000029	202
1,2,3,7,8-PeCDF	2.4E-06	0.00013	5.4E-06	32	0.0000015	9.4E-06	2.8E-06	230
2,3,4,6,7,8-HxCDF	0.0000025	0.00014	0.0000066	93	0.0000015	9.4E-06	2.8E-06	169
2,3,4,7,8-PeCDF	2.4E-06	0.0001	6.2E-06	94	0.0000013	9.4E-06	2.8E-06	168
2,3,7,8-TCDD	All Data Below Detection Limits				0.00000018	0.0000019	2.9E-07	179
2,3,7,8-TCDF	2.3E-07	5.4E-05	9.2E-07	183	0.00000022	0.0000019	2.9E-07	79
TOTAL Dioxins and Furans	2.3E-07	0.00067	0.0000044	254	Not Applicable - Total Value is Calculated			

Table B-9. U.S. EPA Soil Data Summary Statistics. [10]

U.S. EPA Soil Data Summary Statistics for Detected and Non-detected Data (ppm or mg/kg).								
Analyte	**Detected**				**Non-Detected**			
	Minimum	**Maximum**	**Median**	**Number**	**Minimum**	**Maximum**	**Median**	**Number**
Acenaphthene	All Data Below Detection Limits				0.038	0.685	0.074	71
Acenaphthylene	0.065	0.065	0.065	1	0.0207	0.478	0.07375	6
Benzo(a)anthracene	0.0642	20.2	0.14	15	0.038	0.624	0.4	33
Benzo(a)pyrene	0.0133	11.9	0.0718	26	0.0135	0.598	0.045	27
Benzo(b)fluoranthene	0.0402	33.1	0.13	19	0.0188	1.08	0.0375	18
Benzo(g,h,i)perylene	0.0514	13.3	0.11795	14	0.038	0.624	0.339	47
Dibenzo(a,h)anthracene	0.0476	2.34	0.16135	6	0.0076	0.685	0.044	59
Fluoranthene	0.053	51.6	0.2	18	0.038	0.624	0.354	33
Fluorene	All Data Below Detection Limits				0.038	0.685	0.075	70
Hexachlorobenzene	0.0688	0.471	0.08865	74	Not Available			
Indeno(1,2,3 cd)pyrene	0.0535	18.9	0.1985	16	0.049	0.049	0.049	1
Naphthalene	0.0839	0.601	0.178	15	0.038	2.32	0.387	42
Pentachlorophenol	All Data Below Detection Limits				0.15	3.93	0.32	73
Phenol	0.963	0.963	0.963	1	0.075	2.32	0.18	88
Pyrene	0.0484	38	0.188	29	0.038	0.624	0.4025	40
2 Chlorophenol	All Data Below Detection Limits				0.075	2.32	0.15	74
2 Methylnaphthalene	0.0438	0.945	0.183	20	Not Available			
2,4 Dichlorophenol	All Data Below Detection Limits				0.19	2.32	0.341	74
2,4,5 Trichlorophenol	All Data Below Detection Limits				0.19	2.32	0.341	74
4 Chlorophenyl phenyl ether	All Data Below Detection Limits				0.075	2.32	0.15	74
4 Chloro 3 methylphenol	All Data Below Detection Limits				0.19	2.32	0.341	74
Dioxins and Furans								
1,2,3,7,8,9 HxCDD	3.9E-07	0.00002	4.33E-06	25	1.63E-06	0.0000076	4.65E-06	18

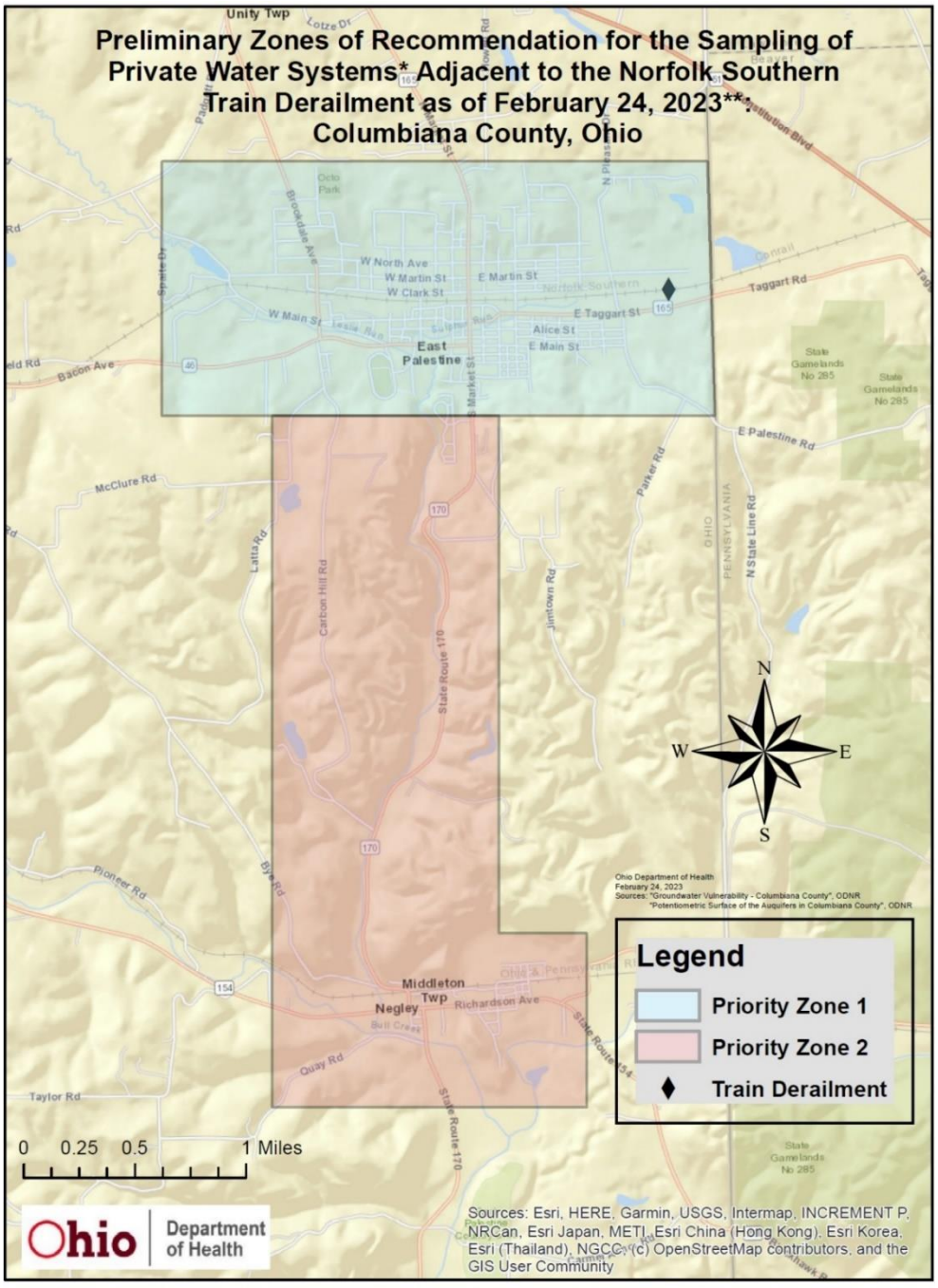
[10] Data sorted and organized by TASC. Summary statistics prepared by TASC.

U.S. EPA Soil Data Summary Statistics for Detected and Non-detected Data (ppm or mg/kg).								
Analyte	Detected				Non-Detected			
	Minimum	Maximum	Median	Number	Minimum	Maximum	Median	Number
1,2,3,7,8,9-HxCDF	4.4E-07	4.4E-07	4.4E-07	1	3.21E-07	0.0000076	1.715E-06	74
1,2,3,4,7,8 HxCDD	3.1E-07	0.0000112	3.87E-06	14	1.63E-06	0.0000076	4.15E-06	18
1,2,3,6,7,8-HxCDF	4.1E-07	9.37E-06	3.07E-06	21	1.64E-06	0.0000076	0.0000048	25
1,2,3,4,7,8-HxCDF	2.8E-07	0.0000106	3.41E-06	21	1.64E-06	0.0000076	0.0000049	23
1,2,3,4,6,7,8 HpCDD	6.27E-07	0.00058	0.000016	61	0.0000036	0.0000054	0.0000043	4
1,2,3,4,6,7,8 HpCDF	1.49E-06	0.0000054	0.0000036	11	1.49E-06	0.0000054	0.0000036	11
1,2,3,6,7,8-HxCDD	4.5E-07	0.000031	5.63E-06	30	1.63E-06	0.0000076	0.0000048	19
1,2,3,4,7,8,9-HpCDF	3.8E-07	0.000012	3.335E-06	16	1.53E-06	8.35E-06	0.0000043	31
2,3,4,6,7,8 HxCDF	3.8E-07	0.0000127	3.73E-06	23	1.64E-06	0.0000076	0.000005	18
OCDD	3.32E-07	0.0054	0.000264	55	0.0000071	0.000011	8.55E-06	4
OCDF	0.0000015	0.00032	0.0000112	45	0.0000071	0.000011	0.0000084	8
1,2,3,7,8-PeCDD	1.8E-07	3.98E-06	2.255E-06	10	1.53E-06	0.0000076	3.85E-06	30
1,2,3,7,8-PeCDF	2.1E-07	4.94E-06	2.31E-06	3	1.53E-06	0.0000076	0.0000036	25
2,3,4,7,8-PeCDF	1.6E-07	0.0000136	2.43E-06	25	2.26E-07	0.0000076	3.95E-06	20
2,3,7,8-TCDF	1.6E-07	4.99E-06	6.11E-07	23	3.06E-07	0.0000815	7.8E-07	27
Total TEQ	2.9E-07	0.000014	7.7E-07	29	Not Applicable - Total Value is Calculated			

Appendix C: Additional Figures

Drinking Water

Figure C-1. Ohio Department of Health Preliminary Zones of Recommendation for the Sampling of Private Water Systems

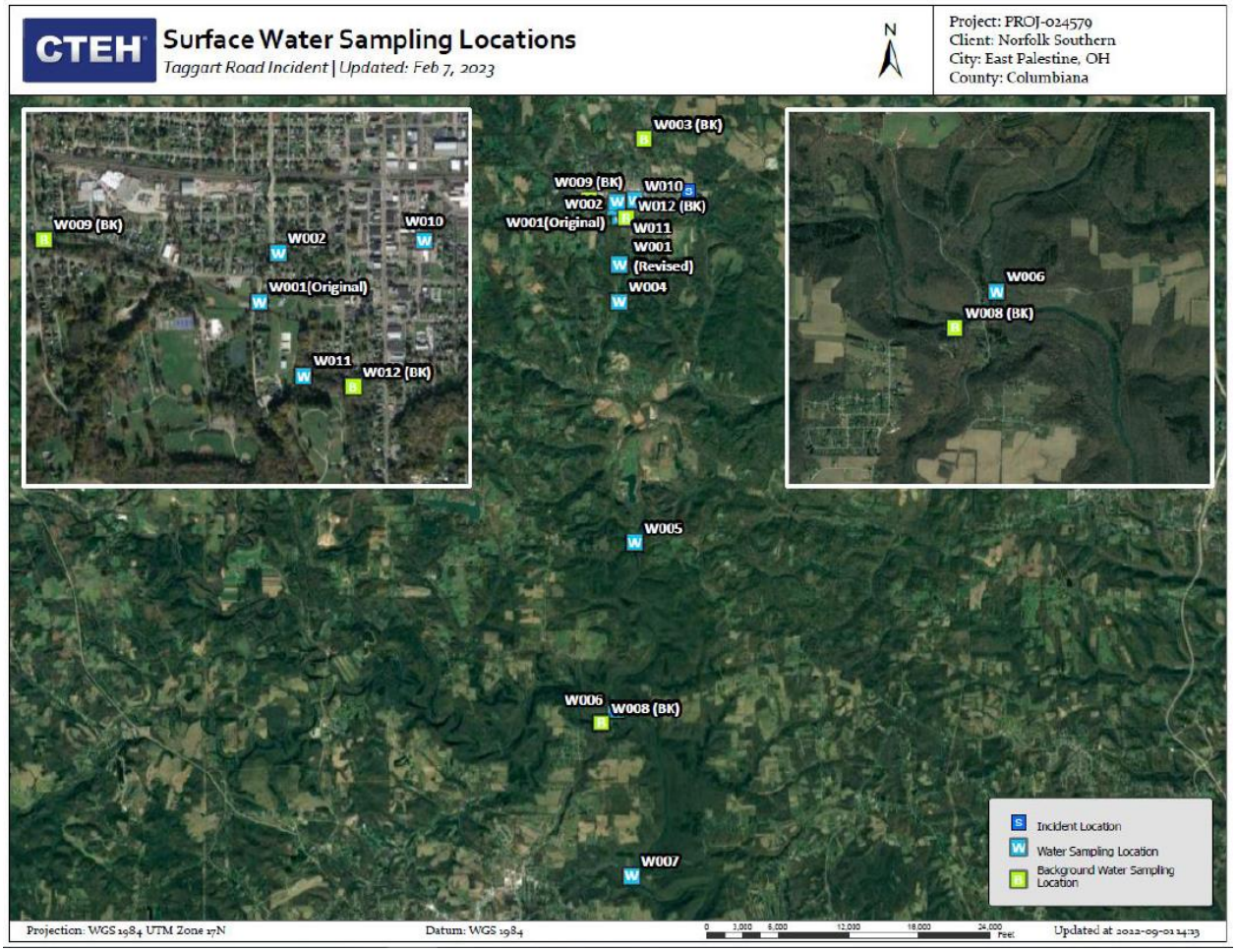


*For those on private water systems, ODH is recommending drinking bottled water until you have the results of your private water system test. Call 330-849-3919 to schedule a free private water system test.

**Map as of February 24, 2023. Recommended sampling zones are subject to change.

Surface Water

Figure C-2. Ohio EPA: Surface Water Sampling Locations.



Soil

Figure C-3. ARCADIS: Sampling Location Information, including Proposed Soil Sampling

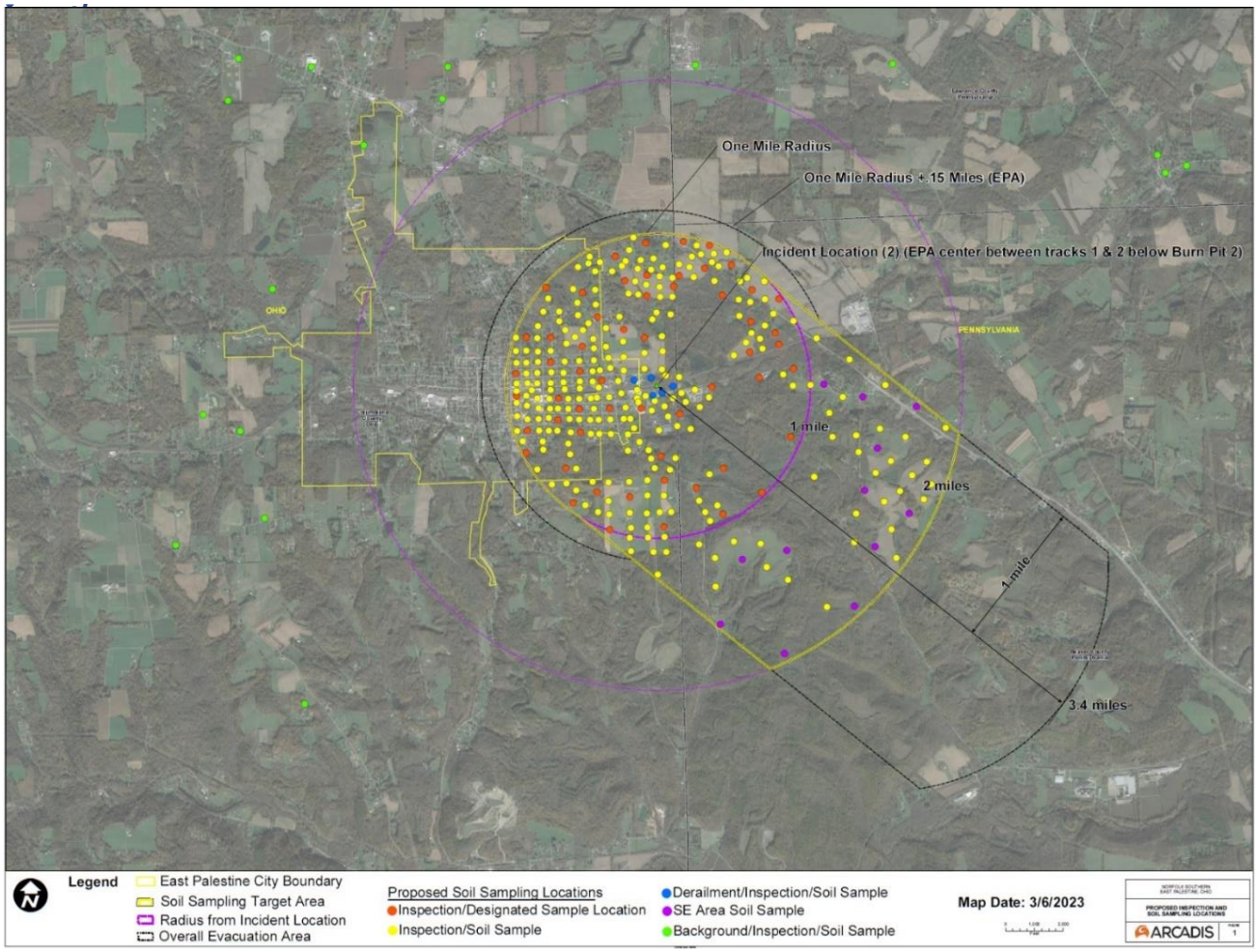
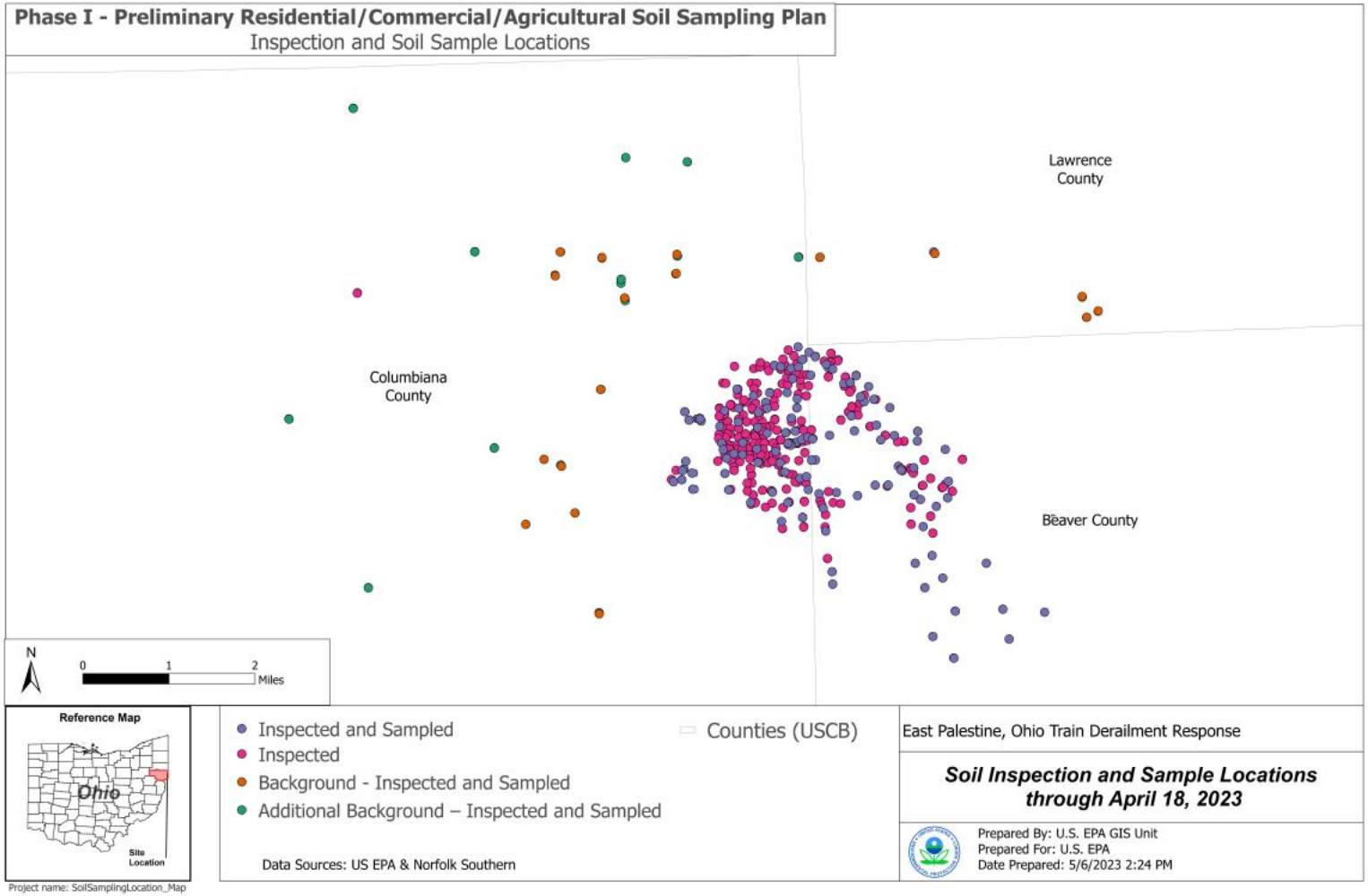


Figure C-4. Completed Soil Sampling through April 18, 2023 (U.S. EPA).



Appendix D: Summary of ACE Surveys

Overview of ACE Survey Process

Health agencies use Assessment of Chemical Exposure (ACE) investigations to evaluate chemical exposure impacts on community health. ACE investigations evaluate chemical exposure impacts on community health by conducting surveys or gathering health data from health facilities. ACE investigations summarize possible impacts on exposed people.

The hazardous materials released from the derailment are known eye and skin irritants that can cause immediate, short-term symptoms such as watery eyes or irritation of the eyes, nasal passages or respiratory tracts. Some of the hazardous materials are also known sensitizers, meaning they can cause a person to become allergic or sensitive to a chemical after repeated exposure. In addition to the hazardous materials, particulate matter from the fire (during the initial derailment and the controlled burn) can exacerbate existing medical conditions such as asthma, can cause shortness of breath, and can cause eye, lung and throat irritation. Disasters are also known to negatively impact the mental health of people affected.

ACE surveys were completed for Ohio and Pennsylvania communities. Ohio DOH and PDOH worked in collaboration with ATSDR and the Centers for Disease Control and Prevention (CDC) to complete ACE surveys for their communities. Ohio DOH summarized its assessment of chemical investigation results (Ohio DOH, 2023) from Ohio residents who came to Ohio DOH's Health Assessment Clinic. PDOH has made available the ACE investigations for Pennsylvania responders and residents (PDOH, 2023a, b and c).

ACE survey methods and results for Ohio residents and Pennsylvania first responders and residents are summarized below.

Ohio ACE Results for Residents

Ohio residents completed an ACE survey from February 21 to March 31, 2023. A total of 528 residents who live or work within a 2-mile radius of the derailment completed the survey.

- In total, 88% of residents surveyed said they were exposed to harmful substances in the air, water and/or soil. Of the people who reported contact with a substance, 68% had contact with smoke, 53% had contact with dust, 23% had contact with debris and 6% had contact with other substances.
- Of the residents surveyed, 88% reported smelling odors after the incident. Of the people who reported smelling an odor, 54% described the odor as a chemical smell (19% described it as sweet and 15% described it as smoky).

- In total, 94% of residents surveyed said they had at least one new or worsening symptom, most commonly affecting their ears, nose or throat, nervous system, lungs, eyes, skin or heart.
- The most commonly reported specific symptoms included headache (74%), anxiety (61%) and coughing (53%).
- Of the residents surveyed, 78% said they had at least one new or worsening symptom affecting their mental health, including tiredness, difficulty sleeping, nervousness, agitation, feeling hopeless or unexplained fear.

Pennsylvania ACE Methods and Results for First Responders

The ACE survey included questions about demographic characteristics, duration and timing of response work, use of personal protective equipment and preparedness to respond, exposure characteristics, health impacts and concerns about response work. In total, adult Pennsylvania residents (ages 18 years and older) who worked as responders during the train derailment completed 114 ACE first responder surveys from March 5 to March 31, 2023. Most responders were white males (88%), had a median age of 39.0, were firefighters (68%) and worked during the critical exposure period from February 3 to February 8, 2023 (88%). Other responder roles included government worker, police officer and hazardous materials handling. Only 11 respondents reported knowing the chemical they were exposed to during their response work. Figure D-1 lists the responder groups analyzed by this study.

Almost all firefighters wore fire gear during the response; however, only 15 of the respondents reported wearing a mask. The most common exposure route was inhalation, and most respondents reported contact with smoke, vapor/gas and dust. Fifty-four responders reported at least one new or worsening symptom, while 46 responders reported multiple symptoms (Figure D-1). The most-common symptoms among responders were those symptoms that afflicted the ears, nose and throat (37%) and heart and lungs (21%). Findings suggest that chemical exposure played an important role in the number and type of symptoms reported and symptoms were consistent with the known short-term health effects associated with the hazardous materials released during the derailment.

Figure D-1. Groups Analyzed in the Pennsylvania ACE Survey for First Responders

Table 1. Variable Groups for Analysis

Variable	Groups (specific responses if applicable)
Age	• 18-24 • 25-34 • 35-44 • 45-54 • 55+
Responder Role	• Firefighter • All Other Response Roles (Hazmat, Police officer, Government worker, Other)
Hours spent working within a 1-mile radius of the derailment between February 3 – 8	• ≤ 5 hours (including 0 hours) • ≥ 6 hours
Number of days working within a 1-mile radius of the derailment between February 3 – 8	• ≤1 day (including no days) • 2 days • ≥ 3 days
PPE Used	• Yes (Sometimes, Always) • No (Never, Unsure)
At least one symptom reported	• No symptoms • ≥ 1 symptom
At least two symptoms reported	• ≤ 1 symptom (including no symptoms) • ≥ 2 symptoms
Respiratory symptoms	• No respiratory symptoms • ≥ 1 symptom (including ears, nose & throat and heart & lungs)

Pennsylvania ACE Methods and Results for Residents

The June 2023 PDOH report describing the ACE survey for residents used three data sources to identify health impacts for Pennsylvania residents living near the derailment site. These data sources and summary results are described below.

Community ACE survey data from residents was gathered both in person and online. The data included information on peoples' concerns, potential exposures, health and the health of their pets and livestock. A total of 174 Pennsylvania residents completed the ACE survey. Most respondents were female (62.6%), White (95.4%), and not Hispanic or Latino (93.1%). The median age of respondents was 60 years, with a range from 1 to 87 years. A total of 137 respondents (78.7%) believed they were exposed to hazardous substances and all of them felt that their exposure was via air (100%). Some of these respondents identified additional exposures from water (37.9%) and soil (46.7%). A total of 102 respondents (58.6%) indicated that they had come in contact with smoke, dust, debris or

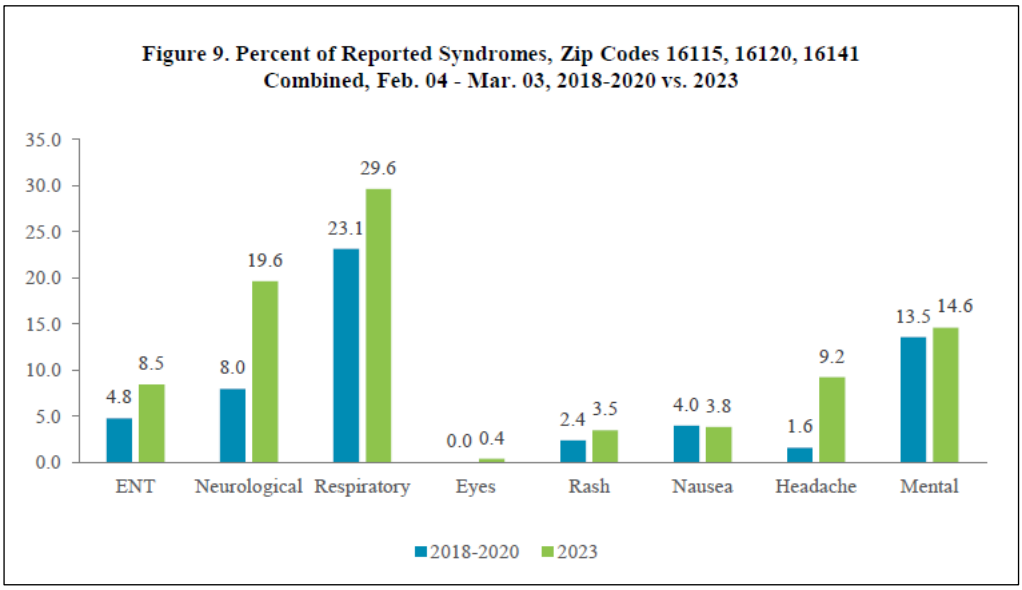
another substance. Figure D-2 lists the highest level of healthcare received by respondents with exposure symptoms. Most respondents with symptoms did not receive any healthcare (46.7%), or self-treated symptoms at home (21.3%).

Figure D-2. Highest Level of Healthcare Received by Symptomatic Respondents

Table 5. Highest Level of Healthcare Received by Symptomatic Respondents (N=150)		
Level of Care	**N=**	**%**
Hospitalized	2	1.33
Seen in an emergency department, urgent care, or outpatient care	28	18.67
Consulted a healthcare provider via phone/video conferencing	16	10.67
Self-treated	32	21.33
No healthcare needed	70	46.67
Missing	2	1.33

Pennsylvania syndromic surveillance data collect “syndrome” data from all emergency departments in the state. Some emergency department visits for the post-derailment and controlled burn period indicated a higher percentage of patient visits with symptoms corresponding to “Ear, Nose, Throat”, “Respiratory” and “Headache” syndromes that progressively declined through March 25, 2023. The percentage of visits due to “Neurological”, “Nausea”, “Mental” and “Rash” syndromes fluctuated during the post-derailment period, though “Neurological” and “Mental” syndromes remained high through March 25 compared to pre-derailment percentages. The percentages of reported syndromes were higher in 2023 than in 2018-2020 for “Ear, Nose, Throat”, “Neurological”, “Respiratory”, “Rash”, “Headache” and “Mental”. The percentage of “Nausea” was slightly higher in 2018 - 2020 than in 2023 (4.0 vs. 3.8) (Figure D-3).

Figure D-3. Percent of Reported Syndromes



Poison control centers in Pennsylvania and Ohio received a variety of calls from Pennsylvania residents following the derailment. Through May 24, 2023, Pennsylvania residents made 82 calls to poison control centers after the derailment. Most calls were about symptoms of human exposure. However, poison control center clinicians determined that reported symptoms were related to the derailment in only 11 instances. The most-common related symptoms were labored breathing, eye irritation/pain, throat irritation/pain and headaches. Figure D-4 shows the location of people with exposure symptoms. Darker-colored areas show the higher numbers of people with chemical exposure symptoms by zip code. The zip code with the highest number of people with chemical exposure symptoms is 16115 (Darlington).

Results from all three data sources indicated similar short-term chemical exposure effects among the residents in a similar geographic area. These symptoms were consistent with the known short-term health effects of the hazardous materials involved in the East Palestine train derailment.

Figure D-4. Poison Control Center Human Exposure Calls with Reported Symptoms by Zip Code in Pennsylvania, February 4 – May 24, 2023