



REGION 5 ADMINISTRATOR

CHICAGO, IL 60604

February 3, 2026

Mr. Clint Woods
Commissioner
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46204

Dear Commissioner Woods:

The U.S. Environmental Protection Agency has reviewed the August 14, 2025, letter from Matt Stuckey, Assistant Commissioner Office of Air Quality, requesting that the EPA concur with the Indiana Department of Environmental Management's exceptional events demonstration for air quality monitoring sites in Lake County. The EPA concurs with IDEM's demonstrations for the dates and locations listed below.

The EPA agrees that wildfires or fireworks caused exceedances of the 2024 annual PM_{2.5} National Ambient Air Quality Standard on several days, and that IDEM's demonstration for these dates meet the Exceptional Events Rule criteria at 40 C.F.R. Parts 50 and 51. In addition, the EPA finds that IDEM has met the schedule and procedural requirements in 40 C.F.R. 50.14(c). I have enclosed a technical support document that explains the EPA's analysis of IDEM's demonstration. My staff will enter "concurrence flags" for these data in the EPA's Air Quality System data repository.

Monitor Name	Date
East Chicago-Franklin School	July 4, 2022
East Chicago-Franklin School	June 5, 2023
East Chicago-Franklin School	June 8, 2023
East Chicago-Franklin School	June 17, 2023
East Chicago-Franklin School	June 23, 2023
East Chicago-Franklin School	June 26, 2023
East Chicago-Franklin School	June 29, 2023
East Chicago-Franklin School	July 26, 2023
Gary-Madison St	June 16, 2022

Monitor Name	Date
Gary-Madison St	July 4, 2022
Gary-Madison St	May 30, 2023
Gary-Madison St	June 2, 2023
Gary-Madison St	June 5, 2023
Gary-Madison St	June 8, 2023
Gary-Madison St	June 17, 2023
Gary-Madison St	June 23, 2023
Gary-Madison St	June 26, 2023
Gary-Madison St	June 29, 2023
Gary-Madison St	July 26, 2023
Gary-Madison St	August 4, 2023
East Chicago-Marina	July 4, 2022
East Chicago-Marina	June 8, 2023
East Chicago-Marina	June 17, 2023
East Chicago-Marina	June 23, 2023
East Chicago-Marina	June 26, 2023
East Chicago-Marina	June 29, 2023
East Chicago-Marina	July 26, 2023
Hammond-167th St	June 5, 2023
Hammond-167th St	June 8, 2023
Hammond-167th St	June 17, 2023
Hammond-167th St	June 23, 2023
Hammond-167th St	June 26, 2023
Hammond-167th St	June 29, 2023
Hammond-167th St	July 26, 2023

With the data adjustments noted above, Lake County shows attainment of the 2024 annual PM_{2.5} NAAQS for the 2022-2024 design value period.

At this time, the EPA is not taking action on the state’s demonstration for several days at the Lake County monitors, identified in the technical support document, since adjustments are not needed to meet air quality standards. The EPA is committed to revisit these demonstrations if necessary for regulatory purposes in the future.

The EPA’s concurrence is not a final agency action. If the EPA takes a regulatory action that is affected by the exclusion of these data, then the EPA will publish notice of its proposed action in the Federal Register. That regulatory action will serve as the final agency action subject to judicial review.

If you have any questions or wish to discuss this matter further, please contact me or have your staff contact John Mooney, Air and Radiation Division Director, at 312-886-6043.

Sincerely,

Vogel, Anne Digitally signed by Vogel,
Anne
Date: 2028.02.03
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Anne Vogel
US EPA Region 5 Administrator
& Great Lakes National Program Manager

Enclosure

1. Lake County PM_{2.5} Exceptional Events Concurrence Technical Support Document

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TECHNICAL SUPPORT DOCUMENT FOR THE EPA'S CONCURRENCE ON PM_{2.5} EXCEEDANCES MEASURED IN LAKE COUNTY, INDIANA ON JUNE 16, 2022, JULY 4, 2022, MAY 30, 2023, JUNE 2, 2023, JUNE 5, 2023, JUNE 8, 2023, JUNE 17, 2023, JUNE 23, 2023, JUNE 26, 2023, JUNE 29, 2023, JULY 26, 2023, AND AUGUST 4, 2023, AS EXCEPTIONAL EVENTS

On August 14, 2025, the Indiana Department of Environmental Management submitted an exceptional events demonstration for exceedances of the 2024 annual particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers National Ambient Air Quality Standards that occurred at the East Chicago-Franklin School (Air Quality System Monitor ID 18-089-0006), Gary-Madison St (AQS Monitor ID 18-089-0031), East Chicago-Marina (AQS Monitor ID 18-089-0034), and Hammond-167th St (AQS Monitor ID 18-089-0036) monitoring sites. IDEM's demonstration states that smoke entering the region from multiple wildfires in the United States and Canada or emissions from fireworks displays associated with the Fourth of July caused the exceedances measured on these dates. Under the Exceptional Events Rule, air agencies can request the exclusion of event-influenced data, and the United States Environmental Protection Agency can concur to exclude these data, from the data set used for certain regulatory decisions. The remainder of this document summarizes the EER requirements, the subject events and the EPA's review of IDEM's submitted exceptional events demonstration.

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the current EER in 2016 pursuant to Clean Air Act § 319. The EER added § 50.1(j)-(r), 50.14, and 51.930 to Title 40 of the Code of Federal Regulations. These sections contain definitions, criteria for the EPA's approval, procedural requirements, and requirements for air agency demonstrations. The EPA reviews the information and analyses in the air agency's demonstration package using a weight of evidence approach and decides to concur or not concur. The demonstration must satisfy all the EER criteria for the EPA to concur with excluding the air quality data from regulatory decisions. If the demonstration is found to not have regulatory significance, the EPA may defer making a concurrence determination.

Under 40 CFR § 50.14(c)(3)(iv), the air agency's demonstration to justify data exclusion must include:

- A. "A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);"
- B. "A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;"
- C. "Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times" to support requirement (B) above;
- D. "A demonstration that the event was both not reasonably controllable and not reasonably preventable;" and
- E. "A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event."¹

¹ A natural event is further described in 40 CFR § 50.1(k) as "an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions."

In addition, the air agency must meet several procedural requirements, including:

1. submission of an Initial Notification of Potential Exceptional Event (“initial notification”) and flagging of the affected data in the EPA's AQS as described in 40 CFR § 50.14(c)(2)(i);
2. completion and documentation of the public comment process described in 40 CFR § 50.14(c)(3)(v); and
3. implementation of any applicable mitigation requirements as described in 40 CFR § 51.930.

For data influenced by exceptional events to be used in initial area designations, air agencies must also meet the initial notification and demonstration submission deadlines specified in Table 2 to 40 CFR § 50.14. We include below a summary of the EER criteria, including those identified in 40 CFR § 50.14(c)(3)(iv).

Regulatory Significance

The EER includes regulatory language that applies the provisions of CAA § 319 to a specific set of regulatory actions. As identified in 40 CFR § 50.14(a)(1)(i), these regulatory actions include initial area designations and redesignations; area classifications; attainment determinations (including clean data determinations); attainment date extensions; findings of State Implementation Plan inadequacy leading to a SIP call; and other actions on a case-by-case basis as determined by the Administrator. Air agencies and the EPA should discuss the regulatory significance of an exceptional events demonstration during the Initial Notification of Potential Exceptional Event prior to the air agency submitting a demonstration for the EPA's review.

Narrative Conceptual Model

The EER directs air agencies to submit, as part of the demonstration, a narrative conceptual model of the event that describes and summarizes the event in question and provides context for analyzing the required statutory and regulatory technical criteria. Further, under 40 CFR § 50.14(a)(1)(i), the narrative conceptual model must describe the regulatory significance of the proposed data exclusion. For wildfire events, the EPA recommends that the narrative conceptual model also discuss emissions, meteorology, and pollutant transport. Air agencies may support the narrative conceptual model with summary tables or maps.

Clear Causal Relationship and Supporting Analyses

The EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between a specific event and the monitored exceedance or violation. For wildfire PM_{2.5} events, air agencies should compare the PM_{2.5} data requested for exclusion with annual historical concentrations at the air quality monitor to establish a clear causal relationship between the event and monitored data. In addition to providing this information on the historical context for the event-influenced data, air agencies should further support the clear causal relationship criterion by demonstrating that the wildfire's emissions were transported to the monitor, that the emissions from the wildfire influenced the monitored concentrations, and, in some cases, air agencies may need to provide evidence of the contribution of the wildfire's emissions to the monitored PM_{2.5} exceedance or violation.

For wildfire PM_{2.5} events, the EPA has published the *PM_{2.5} Wildland Fire Exceptional Events Tiering Document* which provides three tiers of analyses that apply to the “clear causal relationship” criterion

within an air agency's exceptional events demonstration.² This tiered approach recognizes that the clear causal relationship for some wildfire events may be more explicit and/or extreme and, under the weight of evidence approach, may require relatively less evidence to satisfy the rule requirements.

To determine the tier for an event, the air agency will first determine the tiering threshold for the monitor day. The tiering thresholds are based on the lesser value of either (a) the most recent five-year month specific 98th percentile for 24-hour PM_{2.5} data, or (b) the minimum annual 98th percentile for 24-hour PM_{2.5} data for the most recent five-year period. In calculating both (a) and (b), all data with any "Request Exclusion" (R) or fire related "Informational Only" (I) qualifiers are excluded when using the *PM_{2.5} Tiering Tool* available on the EPA's website. Air agencies are encouraged to evaluate their data carefully and consult with their EPA regional office about any data anomalies on a case-by-case basis. The EPA also retains its authority and discretion to evaluate data anomalies in submitted data and determine what tier is applicable for a candidate event.

- Tier 1:
 - **Key Factor for Tier 1 Analyses:** Distinct high levels of monitored 24-hour PM_{2.5} concentrations when compared to historical monthly or annual 24-hour levels of PM_{2.5}.
 - **Criteria:** Event-related exceedances should be greater than or equal to 1.5 times the tiering threshold as described for that candidate event day to be clearly distinguishable from non-event related concentrations.
 - In addition to the supporting analysis used to determine the Tier 1 criteria are met, the air agency should also supply at least one piece of additional evidence to support that the emissions from the fire were transported to the monitor location.
- Tier 2:
 - **Key Factor for Tier 2 Analyses:** High levels of monitored 24-hour PM_{2.5} concentrations, when compared to historical monthly or annual 24-hour levels of PM_{2.5}.
 - **Criteria:** Event-related exceedances are greater than or equal to the tiering threshold but less than 1.5 times the tiering threshold.
 - In addition to the evidence required for a Tier 1 analysis, the air agency should supply at least two additional pieces of evidence, one of which must be quantitative, to support a weight of evidence conclusion that it was the emissions from the wildfire, rather than other sources, that affected the monitored PM_{2.5} concentration.
- Tier 3:
 - **Key Factor for Tier 3 Analyses:** The relationship between the wildfire and the PM_{2.5} exceedance/violation is more complicated than the relationship in a Tier 2 analysis and thus would require more supporting documentation.
 - **Criteria:** Tier 3 demonstrations are appropriate when the measured 24-hour PM_{2.5} concentration is less than the tiering threshold and there are not any other extenuating circumstances or data anomalies that would point to a Tier 2 analysis being sufficient.
 - In addition to the analyses required for Tier 1 and Tier 2, an air agency may further support the clear causal relationship with additional evidence that the fire emissions caused the PM_{2.5} exceedance.

² See the EPA's *PM_{2.5} Wildland Fire Exceptional Events Tiering Document*, April 2024 (the EPA's PM_{2.5} Tiering Document).

Not Reasonably Controllable or Preventable

The EER requires that air agencies establish that the event be both not reasonably controllable and not reasonably preventable at the time the event occurred. This requirement applies to both natural events and events caused by human activities; however, it is presumed that wildfires on wildland will satisfy both factors of the “not reasonably controllable or preventable” element unless evidence in the record clearly demonstrates otherwise.³

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

According to the CAA and the EER, an exceptional event must be “an event caused by human activity that is unlikely to recur at a particular location or a natural event.” The EER includes in the definition of wildfire that “[a] wildfire that predominantly occurs on wildland is a natural event.” Once an agency provides evidence that a wildfire on wildland occurred and demonstrates that there is a clear causal relationship between the measurement under consideration and the event, the EPA expects minimal documentation would be needed to satisfy the “human activity that is unlikely to recur at a particular location or a natural event” element. The EPA will address wildfires on other lands on a case-by-case basis.

THE EPA’S REVIEW OF EXCEPTIONAL EVENTS DEMONSTRATION

On June 19, 2025, IDEM submitted an initial notification and on August 14, 2025, IDEM submitted an exceptional events demonstration. The demonstration is for 68 exceedances of the 2024 annual PM_{2.5} NAAQS that occurred in Lake County, Indiana but this TSD only evaluates the monitor days listed in Table 1, below, located within Lake County, Indiana. The EPA defers action on IDEM’s exceptional events requests at the East Chicago-Franklin School monitoring site on March 15, 2022, May 11, 2022, May 12, 2023, and August 22, 2023, the Gary-Madison St monitoring site on March 15, 2022, March 18, 2022, May 11, 2022, May 9, 2023, May 12, 2023, May 27, 2023, and August 22, 2023, the East Chicago-Marina monitoring site on March 17, 2022, May 11, 2022, June 4, 2023, June 6-7, 2023, June 27-28, 2023, July 4, 2023, and July 25, 2023, and the Hammond-167th St monitoring site on March 16-17, 2022, May 11, 2022, June 15, 2022, July 3, 2022, June 4, 2023, June 6-7, 2023, June 27-28, 2023, July 3-4, 2023, and July 24-25, 2023. The data for these days do not currently have regulatory significance.

Regulatory Significance

The EPA determined that exclusion of these exceedances of the PM_{2.5} standard have regulatory significance for initial area designations of Lake County for the 2024 annual PM_{2.5} NAAQS and worked with IDEM to identify the relevant exceedances, monitoring sites affected, and tiers. Table 1 summarizes these exceedances.

³ A wildfire is defined in 40 CFR § 50.1(n) as “any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.” Wildland is defined in 40 CFR § 50.1(o) as “an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.”

Table 1: Summary of Data Requested for Exclusion⁴

Exceedance Date	Monitoring Site Name	AQS ID	Monitored Concentration (µg/m³)	Tier
June 16, 2022	Gary-Madison St	18-089-0031	16.5	1
July 4, 2022	East Chicago-Franklin School	18-089-0006	17.3	2
July 4, 2022	Gary-Madison St	18-089-0031	18.3	2
July 4, 2022	East Chicago-Marina	18-089-0034	18.9	2
May 30, 2023	Gary-Madison St	18-089-0031	26.1	1
June 2, 2023	Gary-Madison St	18-089-0031	40.8	1
June 5, 2023	East Chicago-Franklin School	18-089-0006	16.9	1
June 5, 2023	Gary-Madison St	18-089-0031	28.3	1
June 5, 2023	Hammond-167th St	18-089-0036	18.3	1
June 8, 2023	East Chicago-Franklin School	18-089-0006	19.8	1
June 8, 2023	Gary-Madison St	18-089-0031	27.4	1
June 8, 2023	East Chicago-Marina	18-089-0034	19.7	1
June 8, 2023	Hammond-167th St	18-089-0036	24.7	1
June 17, 2023	East Chicago-Franklin School	18-089-0006	20	1
June 17, 2023	Gary-Madison St	18-089-0031	28.8	1
June 17, 2023	East Chicago-Marina	18-089-0034	19.7	1
June 17, 2023	Hammond-167th St	18-089-0036	29	1
June 23, 2023	East Chicago-Franklin School	18-089-0006	23.2	1
June 23, 2023	Gary-Madison St	18-089-0031	31.9	1

⁴ See AQS Report AMP 355, Report Request ID: 2319034 dated September 15, 2025.

Exceedance Date	Monitoring Site Name	AQS ID	Monitored Concentration (µg/m³)	Tier
June 23, 2023	East Chicago-Marina	18-089-0034	24.4	1
June 23, 2023	Hammond-167th St	18-089-0036	24.8	1
June 26, 2023	East Chicago-Franklin School	18-089-0006	28.9	1
June 26, 2023	Gary-Madison St	18-089-0031	30.9	1
June 26, 2023	East Chicago-Marina	18-089-0034	32.3	1
June 26, 2023	Hammond-167th St	18-089-0036	33.6	1
June 29, 2023	East Chicago-Franklin School	18-089-0006	43.6	1
June 29, 2023	Gary-Madison St	18-089-0031	44.2	1
June 29, 2023	East Chicago-Marina	18-089-0034	43.3	1
June 29, 2023	Hammond-167th St	18-089-0036	47.9	1
July 26, 2023	East Chicago-Franklin School	18-089-0006	19.2	1
July 26, 2023	Gary-Madison St	18-089-0031	20.8	1
July 26, 2023	East Chicago-Marina	18-089-0034	21.3	1
July 26, 2023	Hammond-167th St	18-089-0036	17.6	1
August 4, 2023	Gary-Madison St	18-089-0031	23.8	1

Concurrence on the exceedances listed in Table 1 would result in changing the design values for East Chicago-Franklin School, Gary-Madison St, East Chicago Marina, and Hammond-167 St from 8.4, 9.7, 9.0, and 8.5 µg/m³ to 8.0, 9.0, 8.9, and 8.4 µg/m³, respectively, for 2022-2024. The design value reductions for this site would result in Lake County, Indiana attaining the 2024 annual PM_{2.5} standard. Table 2 summarizes the effects of this exceptional events demonstration on the monitor design values.

Table 2: Summary of Regulatory Significance

Monitoring Site	Affected Regulatory Action	22-24 Design Value without the EPA's Concurrence (µg/m3)	22-24 Design Value with the EPA's Concurrence (µg/m3)
East Chicago-Franklin School	Initial area designations determinations for the 2024 annual PM _{2.5} NAAQS	8.4	8.0
Gary-Madison St	Initial area designations determinations for the 2024 annual PM _{2.5} NAAQS	9.7	9.0
East Chicago-Marina	Initial area designations determinations for the 2024 annual PM _{2.5} NAAQS	9.0	8.9
Hammond-167th St	Initial area designations determinations for the 2024 annual PM _{2.5} NAAQS	8.5	8.4

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR § 50.14(c) and 40 CFR § 51.930 specify schedule and procedural requirements an air agency must follow to request data exclusion. Table 3 outlines the EPA's evaluation of these requirements.

Table 3: Procedural Criteria

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Did the agency provide prompt public notification of the event?	Demonstration pp. 3-8	IDEM's air quality forecasting and real-time continuous data reporting through AirNow provided the public notice of Unhealthy for Sensitive Groups or greater Air Quality Index levels on the days requested for exclusion.	Y
Did the agency appropriately flag the affected data in the EPA's Air Quality System?	Indiana-PM _{2.5} Lake County Exceptional Events Initial Notification - 2022 and 2023	The EPA verified that IDEM applied request exclusion qualifiers to all PM _{2.5} monitor days listed in Table 1.	Y

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Did the agency submit an Initial Notification?	Indiana-PM _{2.5} Lake County Exceptional Events Initial Notification - 2022 and 2023	IDEM submitted the Initial Notification via email to the EPA on June 19, 2025.	Y
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations?	Demonstration p. 1, Indiana-PM _{2.5} Lake County Exceptional Events Initial Notification - 2022 and 2023	IDEM submitted the Initial Notification to the EPA on June 19, 2025, and the final demonstration to the EPA on August 14, 2025.	Y
Was the 30-day public comment process followed and documented?	Section 3.0, Attachment A	IDEM solicited, reviewed, and documented public comments per 40 CFR § 50.14(c)(3)(v). The comment period was open from June 27, 2025, to July 29, 2025.	Y
Did the agency submit to the EPA, and address in their demonstration, any public comments received?	Section 3.0, Attachment A	IDEM addressed all public comments in their demonstration.	Y

Mitigation Requirements

IDEM is not subject to mitigation planning requirements under 40 CFR § 51.930(b) for these events and the 2024 annual PM_{2.5} NAAQS.

Narrative Conceptual Model

IDEM's demonstration provided a narrative conceptual model for each event to describe how emissions from wildfires and fireworks caused PM_{2.5} exceedances at the East Chicago-Franklin School, Gary-Madison St, East Chicago-Marina, and Hammond-167th St sites.

The conceptual model for these events is supported by media reports, daily average PM_{2.5} concentration plots overlaid with the National Oceanic and Atmospheric Administration's Hazard Mapping System smoke plumes and active fire locations in AirNow-Tech, surface and upper air meteorological maps, and Canadian Wildland Information System active fire maps. These analyses support the conclusion that wildfire smoke was the primary contributor to the PM_{2.5} exceedances listed in Table 1. IDEM's analyses also support the conclusion that fireworks emissions were the primary contributor to the PM_{2.5} exceedances recorded at the East Chicago-Franklin School, Gary-Madison St, and East Chicago-Marina sites on July 4, 2022.

The discussion of the interaction of wildfire smoke formation, fireworks, and meteorology resulting in impacts at the monitors in the Lake County area is consistent with the EPA’s recommendations (Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations (EPA, 2016), PM_{2.5} Wildland Fire Exceptional Events Tiering Document (EPA, 2024) and 40 CFR § 50.14(b)(2)). The regulatory significance of the proposed data exclusion is also discussed (see demonstration, pp. 1, 5-20), as required by 40 CFR § 50.14(c)(3)(i).

June 16, 2022, Narrative Conceptual Model Overview

In June of 2022, there were active wildfires scattered throughout the southwestern United States and by June 16, 2022, there was a concentration of smoke in Lake County from New Mexico, Louisiana, Arkansas and the Mississippi River valley area. IDEM’s demonstration describes how a surface low-pressure system in the four corner states lifted out into the Central Plains and a large upper-level ridge was developing over the southeastern United States. On June 14, 2022, a strong low-pressure system over Nebraska and a large surface high-pressure over the southeastern United States drove strong dry winds up the plains and northward into the Ohio Valley, funneling wildfire smoke from New Mexico, Arizona, southeastern Missouri, Illinois, Arkansas and western Mississippi to northwestern Indiana. These meteorological features created a southwesterly flow pattern that transported wildfire smoke from the southern region to the eastern United States including Lake County, Indiana. Surface maps and Hybrid Single-Particle Lagrangian Integrated Trajectory analyses support IDEM’s demonstration narrative.

Table 4: Narrative Conceptual Model for June 16, 2022

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 90-91, 99, 112, 114-121	IDEM described wildfire complexes in New Mexico and the southcentral United States which caused PM _{2.5} exceedances on June 15-16, 2022.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 90-98	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Discusses the interaction of emissions and meteorology	Demonstration pp. 94-99, 100-105	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, surface and upper-level meteorological maps, Canadian Wildland Information System active fire maps, and a meteorological narrative describing how the wildfire emissions from New Mexico and the southcentral United States were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back trajectories that showed wildfire smoke transport from areas of wildfire activity in New Mexico and the southcentral United States.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for area designations for the 2024 annual PM _{2.5} NAAQS.	Y

July 4, 2022, Narrative Conceptual Model Overview

IDEM's demonstration describes fireworks impacts on July 4, 2022, due to the Fourth of July holiday causing elevated PM_{2.5} concentrations during the evening hours on July 4, 2022, at the Lake County, Indiana, monitors. There were four public fireworks displays within ten miles of the monitors on July 3-4, 2022. Elevated PM_{2.5} concentrations lingered into the early morning hours of July 4, 2022, due to fireworks displays from July 3, 2022, and steadily decreased through late morning. On the evening of July 4, 2022, spikes in PM_{2.5} concentrations were evident after 8:00 pm. The hourly data peaked at 35.7 ug/m³ on the evening of July 4, 2022, at 8:00pm for the East Chicago-Marina monitor. As the fireworks emissions lingered in the area due to stagnant conditions, the PM_{2.5} levels remained elevated at the East Chicago-Franklin, Gary-Madison, and East Chicago- Marina monitoring sites until around midnight on July 5, 2022. These meteorological conditions hindered the dispersion of the fireworks emissions until the lake effect winds increased and shifted from offshore to onshore near midnight on July 5, 2022.

Table 5: Narrative Conceptual Model for July 4, 2022

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 122-125, 131-133	IDEM described four public fireworks displays within ten miles of the Lake County monitors which caused PM _{2.5} exceedances on July 4, 2022.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 125-127, 129-131	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as hourly PM _{2.5} and carbon concentrations.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 125-128, 131-133	IDEM included daily average PM _{2.5} concentration plots, surface and upper air (500 and 850 mb heights) meteorological maps, and a meteorological narrative describing how the fireworks emissions affected Lake County, Indiana, monitors.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023, Narrative Conceptual Model Overview

Throughout the event, moderate to heavy fire danger conditions were reported across regions of Canada, with significant, out of control wildfire activity recorded in Quebec and Ontario, Canada. IDEM’s demonstration describes an upper-level high-pressure system over the northern plains and western Great Lakes throughout the May 30-June 8, 2023, period as well as a surface low-pressure over the northeastern United States. These meteorological features allowed multiple rounds of Canadian wildfire smoke to impact and remain in the Lake County area during the event period. A cold front moved through northwest Indiana on June 6, 2023, and was then positioned to the southwest of Lake County on June 7, 2023, forming a cool, high-pressure boundary. Northerly winds enhanced smoke transport on June 7-8, 2023. By June 8, 2023, the high-pressure in Canada created an anticyclonic flow of wildfire smoke over Indiana.

The HYSPLIT analyses show northerly transport from Canadian wildfires on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023, which supports the meteorological transport narrative in the demonstration.

Table 6: Narrative Conceptual Model for May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 178-181, 194-196	IDEM described wildfire complexes in Quebec and southeast Canada which caused PM _{2.5} exceedances on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 181- 196	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 181-203	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, surface and upper air meteorological maps, Canadian Wildland Information System and Fire Information for Resource Management System active fire maps, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back and forward trajectories that showed wildfire smoke transport from areas of wildfire activity in Canada.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for area designations for the 2024 annual PM _{2.5} NAAQS.	Y

June 17, 2023, Narrative Conceptual Model Overview

Throughout the event, moderate to heavy fire danger conditions were reported across regions of Canada, with significant, out of control wildfire activity recorded in Quebec and Ontario. IDEM’s demonstration describes a cold front on June 15, 2023, that moved south across the area from the northwest while high-pressure was building over the state. Behind the cold front, wildfire smoke was transported into the area under the influence of surface high-pressure and an upper air ridge to the west. The flow from these meteorological features allowed transport of Canadian wildfire smoke from Quebec to a wide swath of the Midwest, including Lake County, Indiana. The building high-pressure system allowed the smoke to build up in the area causing elevated PM_{2.5} concentrations in Lake County. The June 17, 2023, HYSPLIT analyses intersected the source regions of the Canadian wildfires, which supports the meteorological transport narrative in the demonstration.

Table 7: Narrative Conceptual Model for June 17, 2023

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 262-265, 277-281	IDEM described wildfire complexes in Quebec and Ontario which caused PM _{2.5} exceedances on June 17, 2023.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 265-272	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Discusses the interaction of emissions and meteorology	Demonstration pp. 265-272	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, surface and upper air meteorological maps, Canadian Wildland Information System and Fire Information for Resource Management System active fire maps, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back and forward trajectories that showed wildfire smoke transport from areas of wildfire activity in Quebec and Ontario, Canada.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for area designations for the 2024 annual PM _{2.5} NAAQS.	Y

June 23, 2023, June 26, 2023, and June 29, 2023, Narrative Conceptual Model Overview

Throughout the event, extreme fire danger conditions were reported across regions of Canada, with significant, out of control wildfire activity recorded in Quebec and Ontario. Canadian wildfire emissions were circulating over the Midwest under a surface high-pressure system on June 22-23, 2023, until a frontal boundary moved through on June 24-25, 2023, providing a brief reprieve of wildfire smoke enhancements on PM_{2.5} concentrations. On June 26, 2023, a low-pressure system was located over the eastern portion of the United States with a high-pressure settling in over the Hudson Bay. The flow around these two meteorological features allowed transport of Canadian wildfire smoke from Quebec to a wide swath of the eastern United States starting on June 26, 2023, including Lake County, Indiana. The building high-pressure system allowed the smoke to remain in the area causing elevated PM_{2.5} concentrations in Lake County. These meteorological features allowed transport and stagnation of Canadian wildfire smoke into eastern portions of the United States including Lake County. The June 23, 2023, and June 26-29, 2023, HYSPLIT analyses intersected the source regions of the Canadian wildfires which supports the meteorological transport narrative in the demonstration.

Table 8: Narrative Conceptual Model for June 23, 2023, June 26, 2023, and June 29, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 289-293, 327-338	IDEM described wildfire complexes in Quebec and Ontario which caused PM _{2.5} exceedances on June 23, 2023, June 26, 2023, and June 29, 2023.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 292-313	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 301-313	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, surface and upper-level meteorological maps, Canadian Wildland Information System active fire maps, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back and forward trajectories that showed wildfire smoke transport from areas of wildfire activity in Quebec and Ontario.	Y

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

July 26, 2023, Narrative Conceptual Model Overview

By mid-July 2023, wildfires in western and northwestern Canada began to rapidly increase in number and intensity with several millions of hectares burning in Saskatchewan and British Columbia alone. IDEM's demonstration describes Canadian wildfire smoke that moved into Indiana from the northwest along a warm front, impacting the Lake County monitors on July 26, 2023. Surface high-pressure ahead of this system allowed the wildfire smoke emissions that entered the region on July 25, 2023, to remain over the eastern United States including Lake County on July 26, 2023. The July 25-26, 2023, HYSPLIT analyses intersected the source regions of the Canadian wildfires and associated smoke plumes which support the meteorological transport narrative in the demonstration.

Table 9: Narrative Conceptual Model for July 26, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 366-369, 387-388	IDEM described wildfire complexes in Alberta, British Columbia, and Saskatchewan which caused PM _{2.5} exceedances on July 26, 2023.	Y
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 366-380	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Discusses the interaction of emissions and meteorology	Demonstration pp. 366-380	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, surface and upper-level meteorological maps, Canadian Wildland Information System active fire maps, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back and forward trajectories that showed wildfire smoke transport from areas of wildfire activity in Alberta, British Columbia, and Saskatchewan.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

August 4, 2023, Narrative Conceptual Model Overview

Out of control fires continued burning in northwestern and western Canada into August of 2023. IDEM's demonstration describes how northwesterly flow due to an upper-level ridge formed a transport corridor of Canadian wildfire smoke from wildfire complexes in western Canada to the Lake County monitors. The August 4, 2023, HYSPLIT analyses intersected the source regions of the Canadian wildfires and associated smoke plumes which support the meteorological transport narrative in the demonstration.

Table 10: Narrative Conceptual Model for August 4, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of events causing exceedance or violation	Demonstration pp. 396-397, 400, 408-409, 411-414	IDEM described wildfire complexes in Alberta which caused PM _{2.5} exceedances on August 4, 2023.	Y

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Discussion of how emissions from the events led to the exceedance or violation at the affected monitors	Demonstration pp. 396-403	IDEM included meteorological surface and upper air (500 and 850 mb heights) analyses as well as satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 396-403	IDEM included daily average PM _{2.5} concentration plots overlaid with the NOAA's HMS smoke plumes and active fire locations in AirNowTech, surface and upper air (500 and 850 mb heights) meteorological maps, Fire Information for Resource Management System active fire maps, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Lake County area. HYSPLIT trajectory analyses were also provided with back and forward trajectories that showed wildfire smoke transport from areas of wildfire activity in Canada.	Y
Explains regulatory significance	Demonstration pp. 1, 9-20	IDEM explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

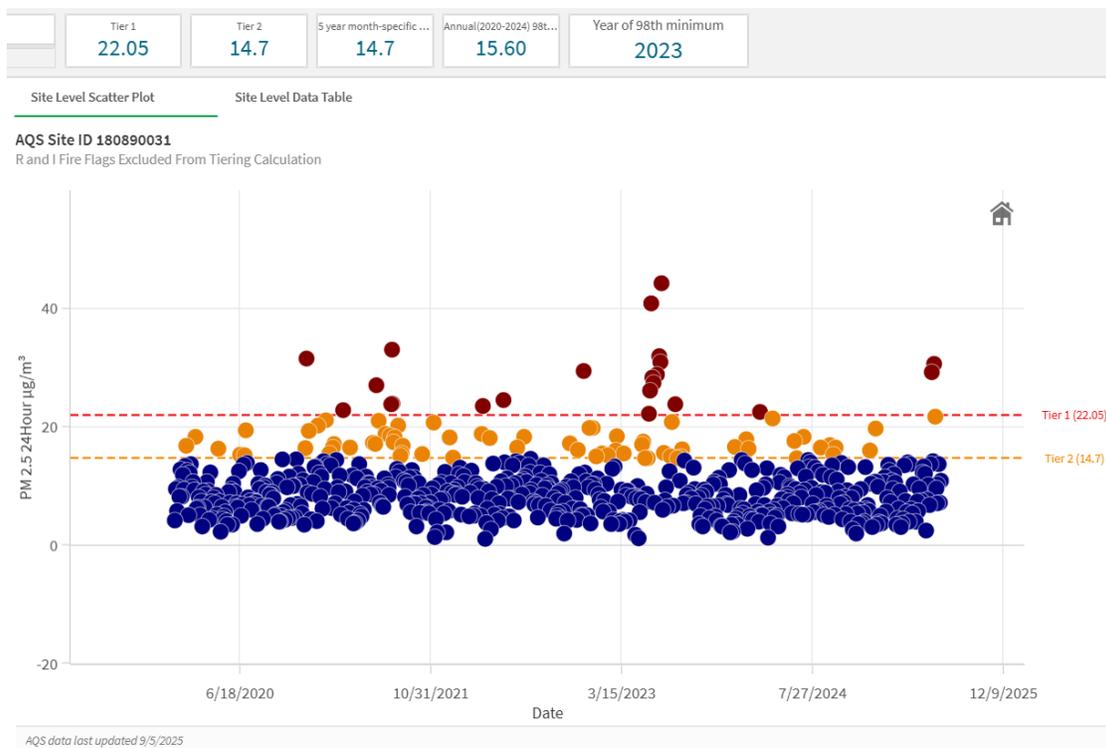
Clear Causal Relationship and Supporting Analyses

IDEM's demonstration included the EPA's Tiering Tool analysis, comparison of event days with historical concentrations, HYSPLIT trajectory analyses (forward and backward), Aerosol Optical Depth and visible satellite imagery, NOAA's HMS smoke plumes and active fire locations in AirNow-Tech, General Additive Model, High-Resolution Rapid Refresh-Smoke model, carbon and PM_{2.5} timeseries, media articles, IDEM air quality forecasts, and NOAA Satellite Smoke Narrative to demonstrate the clear causal relationship between wildfire smoke or fireworks emissions and the monitors in the Lake County area. Based on the measured PM_{2.5} values, as well as other criteria, the days described in this TSD for which the EPA is concurring on, are Tier I and Tier II events.

Comparison with Historical Concentrations⁵

The demonstration includes a comparison with historical concentrations, as required by 40 CFR § 50.14(c)(3)(iv)(C). The demonstration compares daily average PM_{2.5} concentrations during the wildfire smoke and fireworks events on June 16, 2022, July 4, 2022, May 30, 2023, June 2, 2023, June 5, 2023, June 8, 2023, June 17, 2023, June 23, 2023, June 26, 2023, June 29, 2023, July 26, 2023, and August 4, 2023, to the five-year average which illustrate the enhancement of PM_{2.5} concentrations on the event days compared to monitor concentrations during the rest of the year. As shown in Figures 1 to 10 below, daily concentrations of exceedances days for the monitor are compared to the Tier 1 and 2 cutoffs for justification of the demonstration's tier selection.

Figure 1: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, May, Gary-Madison St (AQS Monitor ID 18-089-0031)



⁵The EPA's *Guidance Prescribed Fire on Wildland that May Influence Ozone and Particulate Matter Concentrations* (Prescribed Fire Guidance) offers examples of analyses that may be used to satisfy the comparison to historical concentrations criterion for wildland fires that may have influenced PM concentrations, including: comparison of concentration on the claimed event days with a set of similar days, a percentile of event-related concentrations relative to annual and/or seasonal data, 99th percentile over five-years or fourth highest within one year, description of past high data points labeled as being associated with previous exceptional events, suspected exceptional events, other unusual occurrences, or high pollution days due to normal emissions, with basic evidence to support claims and recognition that a history of concentrations above the standard could indicate additional evidence needed, indication of how typically observed non-event diurnal or seasonal pattern differs, if such a deviation occurred, due to the event, with more weight given to effective statistical summaries that characterize non-event, high-concentration day historical data and the differences seen on event days over anecdotal or general assertions.

Figure 2: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, June, East Chicago-Franklin School (AQS Monitor ID 18-089-0006)

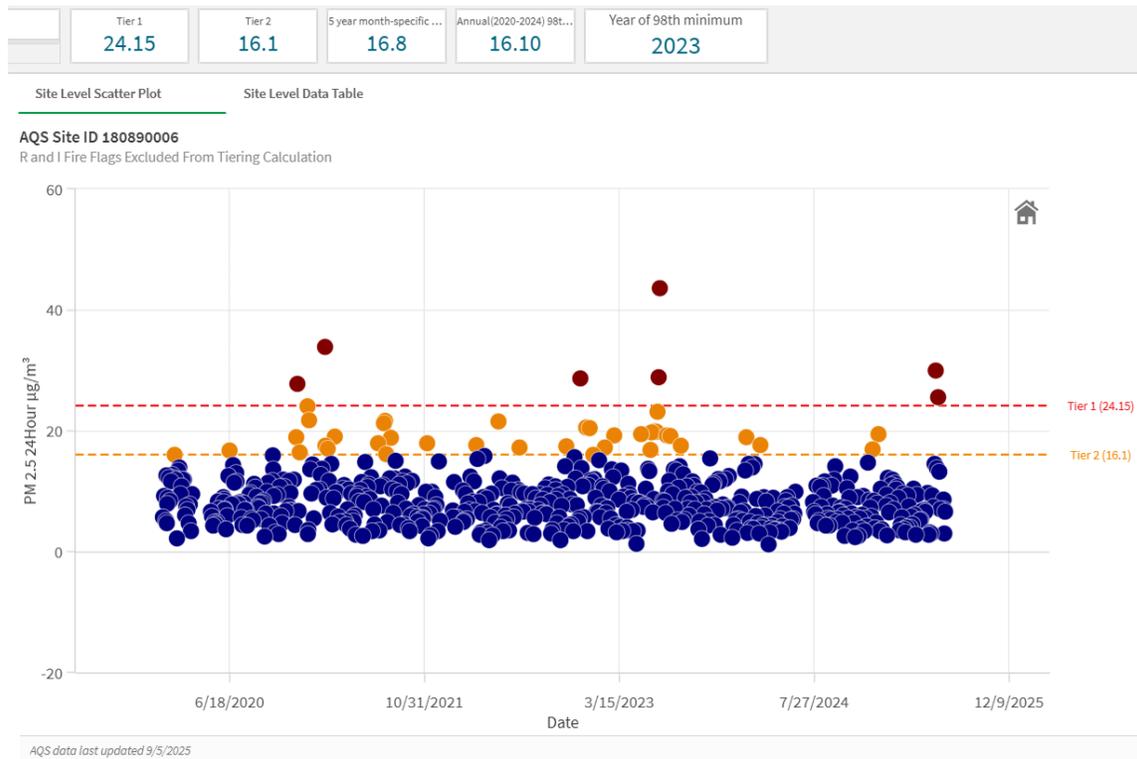


Figure 3: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, June, Gary-Madison St (AQS Monitor ID 18-089-0031)

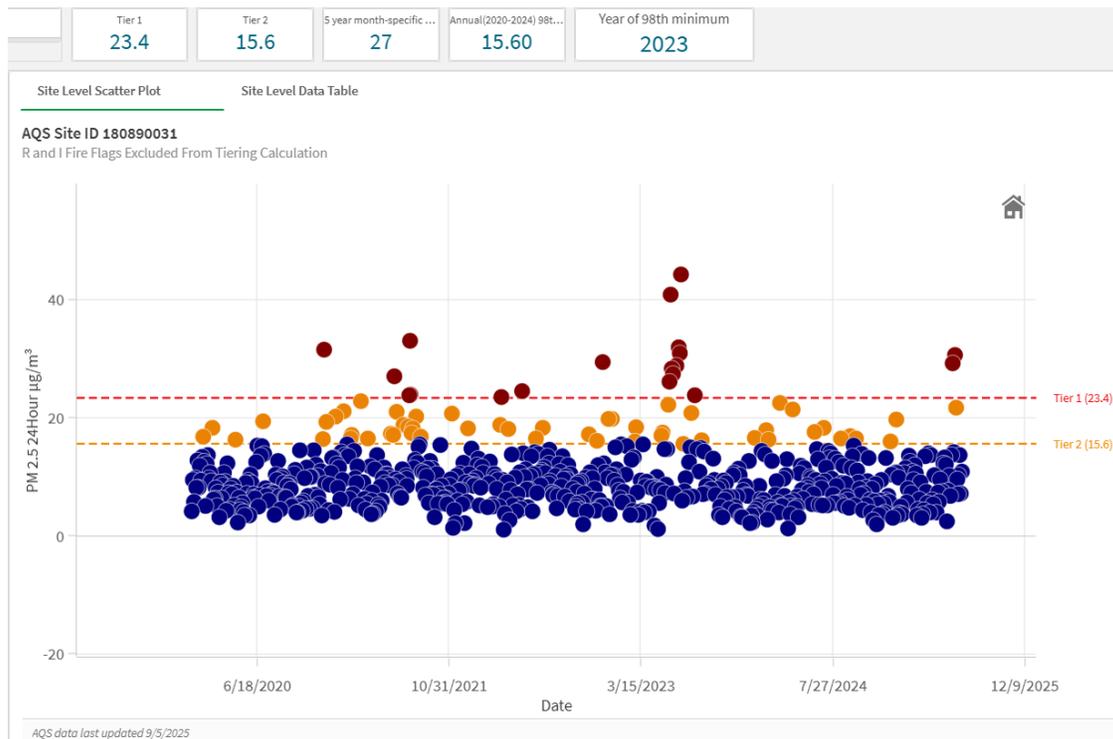


Figure 4: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, June, East Chicago-Marina (AQS Monitor ID 18-089-0034)

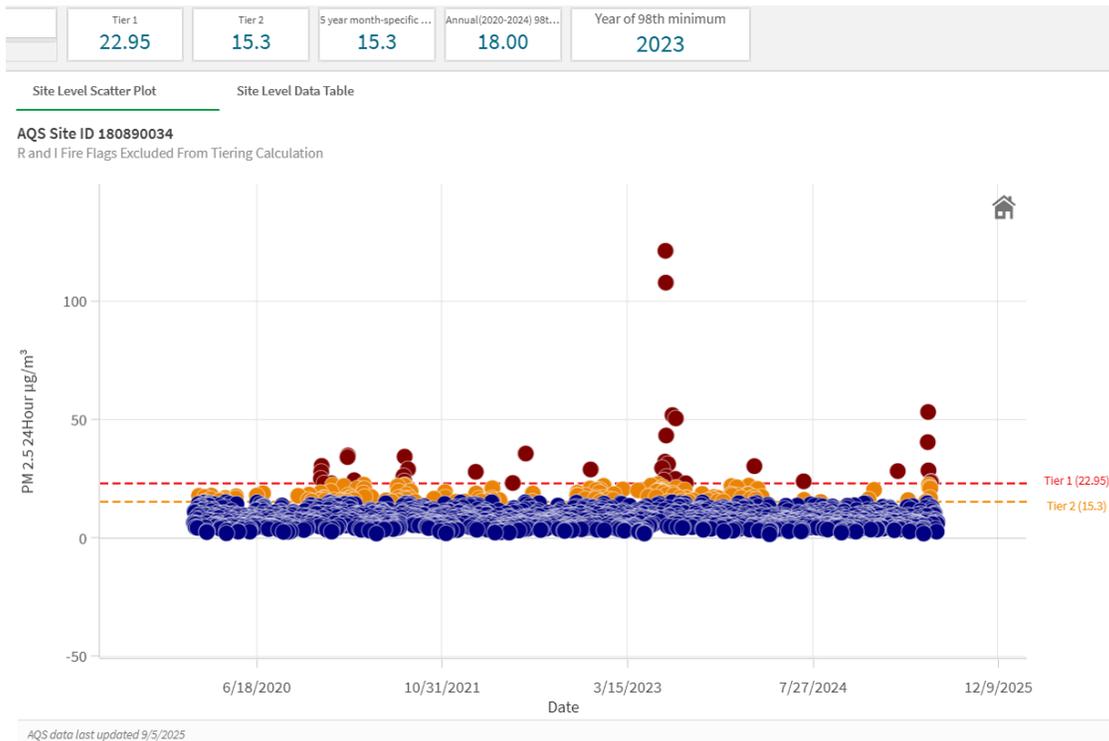


Figure 5: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, June, Hammond-167th St (AQS Monitor ID 18-089-0036)

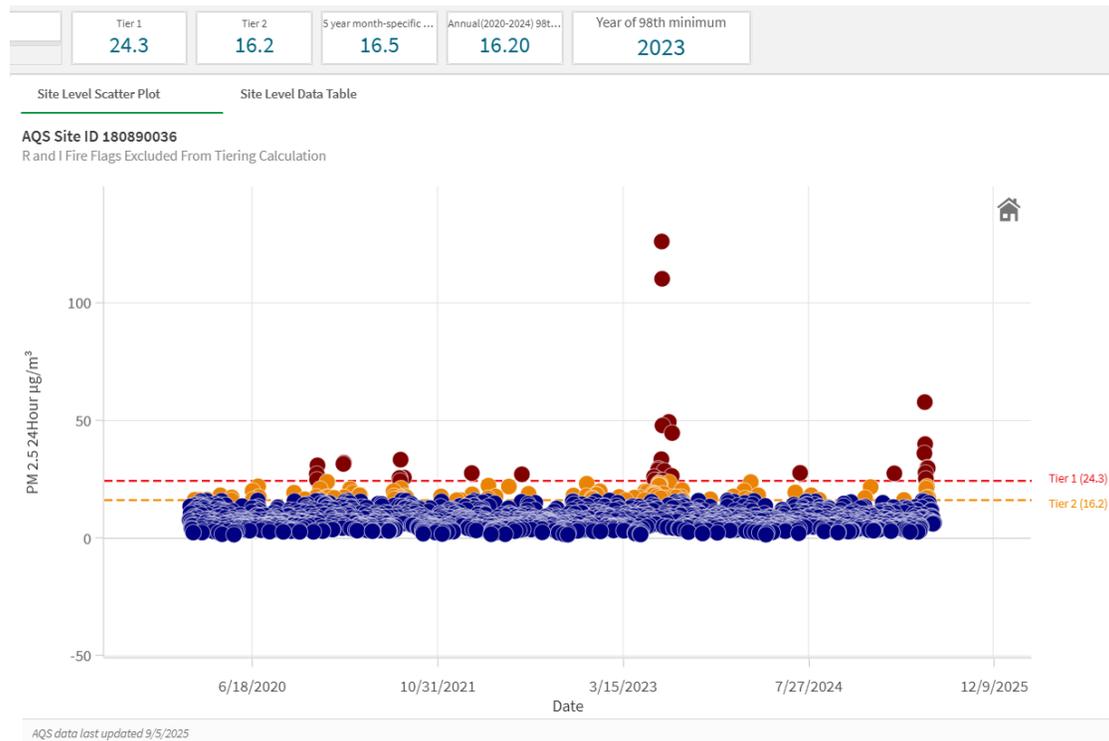


Figure 6: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, July, East Chicago-Franklin School (AQS Monitor ID 18-089-0006)

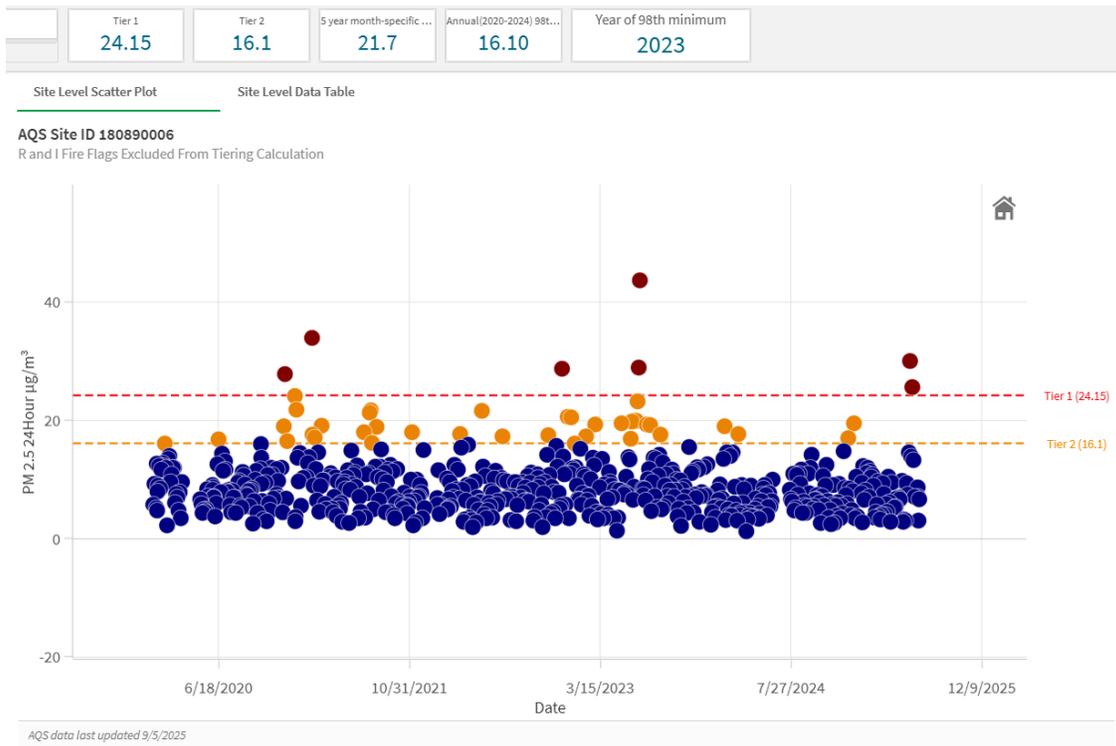


Figure 7: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, July, Gary-Madison St (AQS Monitor ID 18-089-0031)

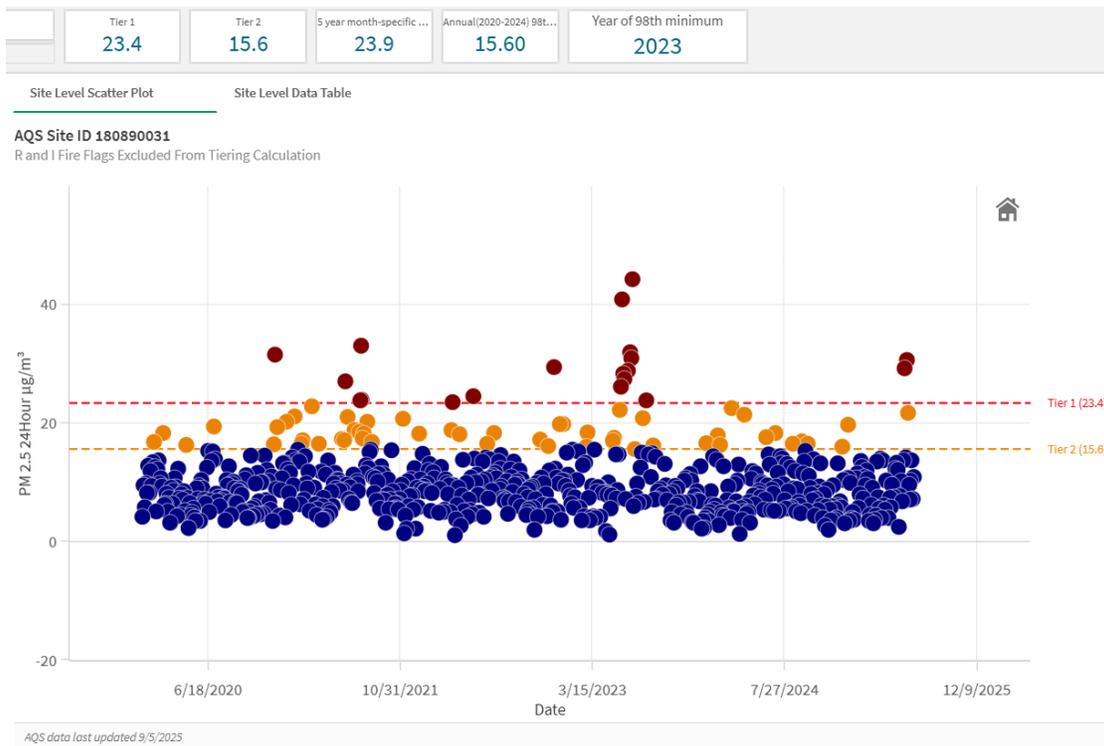


Figure 8: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, July, East Chicago-Marina (AQS Monitor ID 18-089-0034)

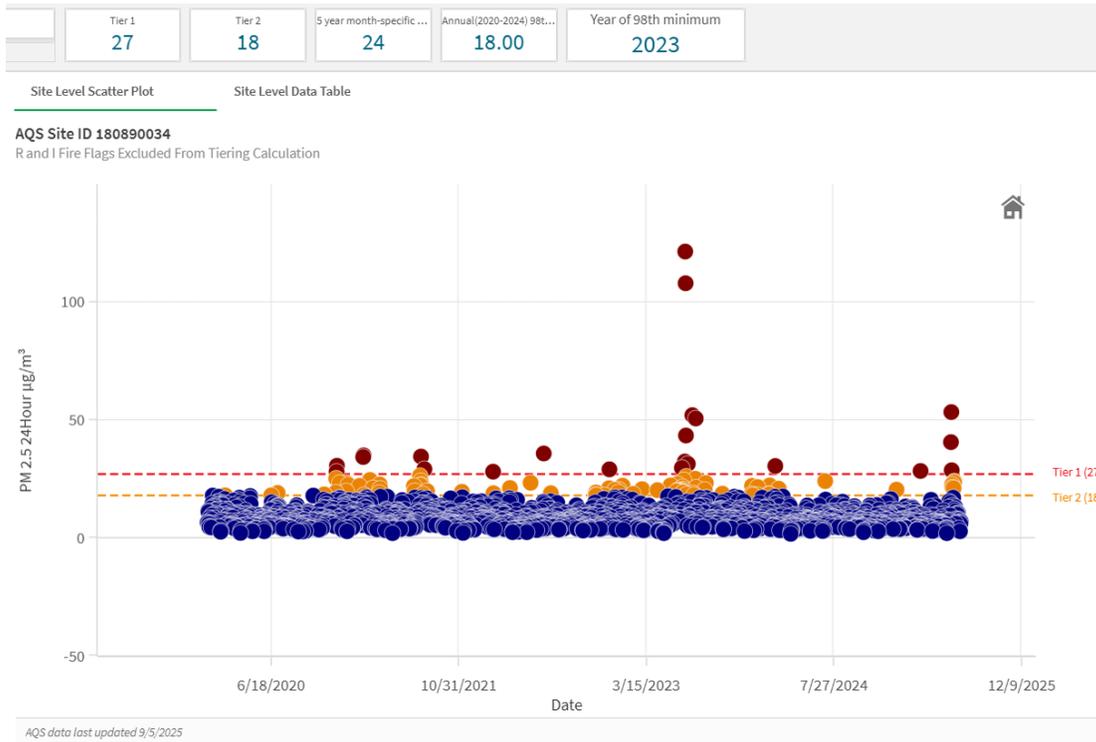


Figure 9: The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis, July, Hammond-167th St (AQS Monitor ID 18-089-0036)

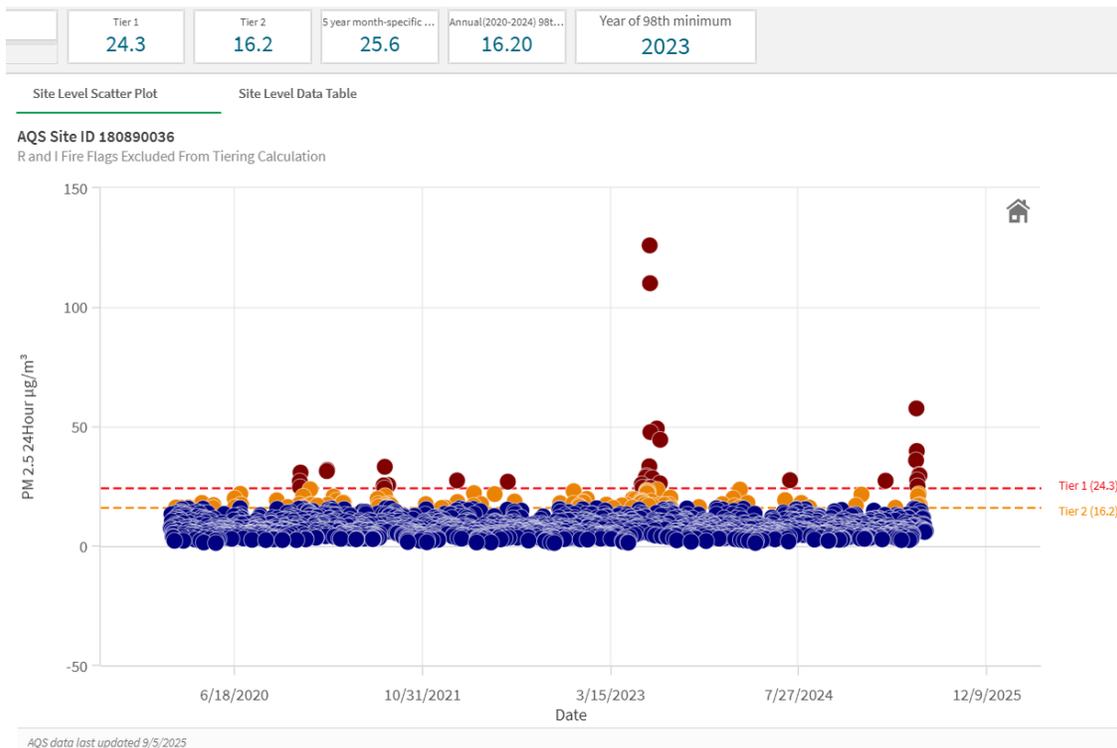


Figure 10: The EPA’s PM_{2.5} Tiering Tool for Exceptional Events Analysis, August, Gary-Madison St (AQS Monitor ID 18-089-0031)

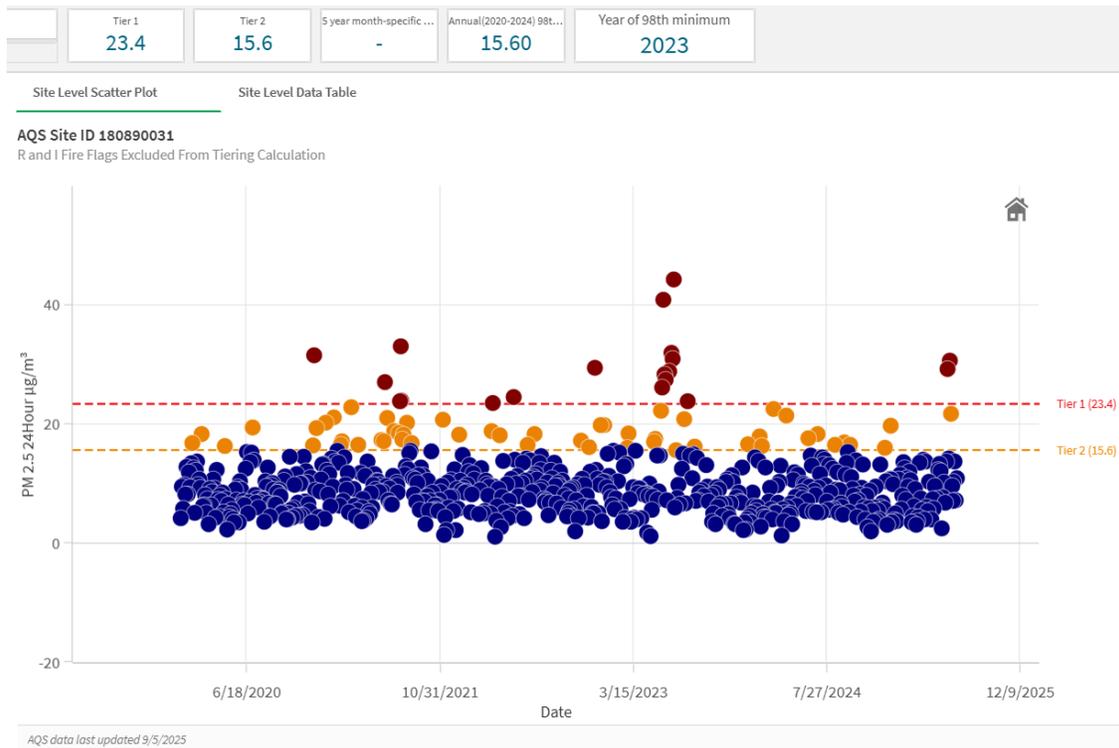


Table 11: Summary of Tiering for Relevant Monitoring Days

Tiering	Demonstration Citation	Tiering Details	Tiers
Tiering for the monitor days listed in Table 1	Demonstration pp. 9-13	IDEM cited the EPA’s Tiering Tool. Flags excluded from the calculation included R and I Fire Flags. The tiering thresholds were determined by analyzing the full five-year datasets from 2019-2023 and 2020-2024.	1 and 2

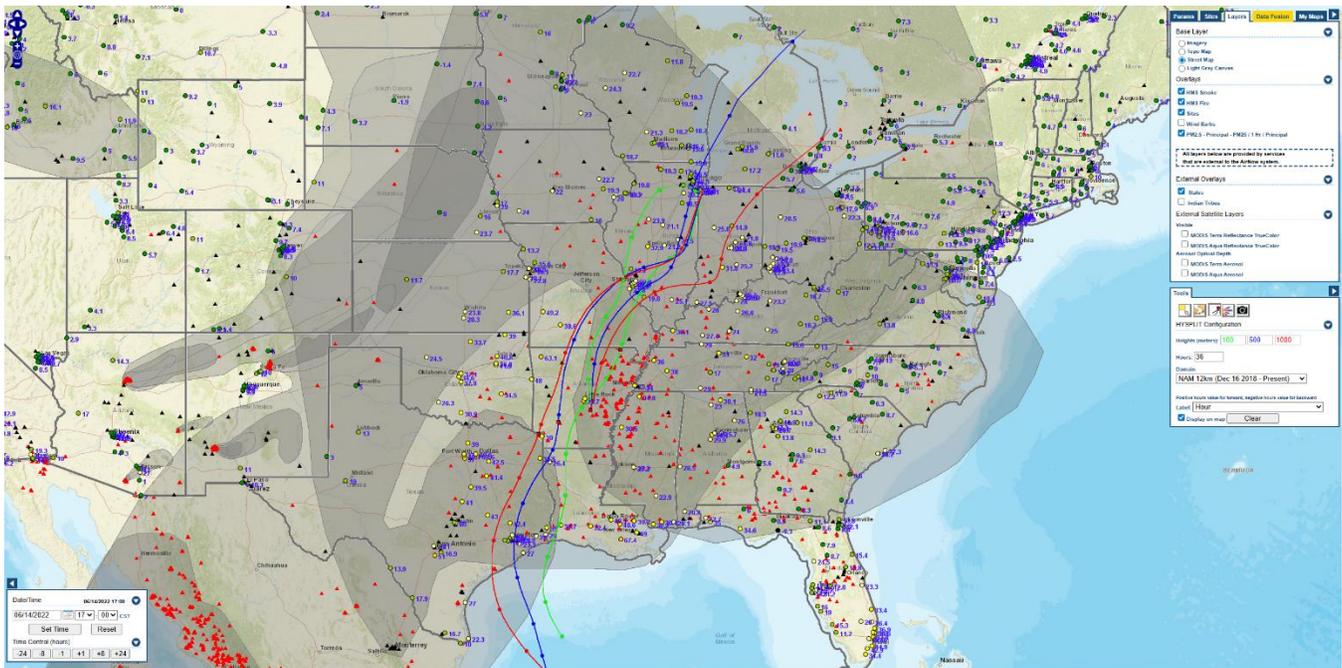
June 16, 2022

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 16, 2022, IDEM’s demonstration presents evidence of smoke transport from multiple wildfires in the United States to the Lake County area (see demonstration, pp. 95-98, Figs. 2.3.2-2.3.5). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 99-104 and 112, Figs. 2.3.6-2.3.12), and are accompanied by AOD satellite imagery (see demonstration, p. 105, Figs. 2.3.13-2.3.14), HRRR-Smoke vertically integrated model outputs (see demonstration, p. 107, Fig. 2.3.15), and GAM analyses (see demonstration, p. 108, Fig. 2.3.16). Smoke from New Mexico and southcentral

United States fires are also evident on the satellite imagery. The EPA further analyzed forward and backward trajectories for the June 16, 2022, event, and further demonstrated transport of smoke from the southwest (see Figure 11 below). HYSPLIT trajectories from IDEM's demonstration, additional trajectories analyzed by the EPA, and satellite imagery illustrate transport of smoke from the southwest to Lake County.

Figure 11: Backward trajectories at 100-, 500-, and 1,000-meter heights starting on June 16, 2022, at 12:00 AM CST from Lake County and forward trajectories at 100-, 500-, and 1,000-meter heights starting on June 14, 2022, at 5:00 PM CST. Trajectories were developed in AirNow-Tech's Navigator tool and the map was overlaid with hourly PM_{2.5} concentrations, HMS Fire satellite detected hotspots, and HMS Fire smoke plumes.



Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of smoke from the southcentral United States fires to Lake County and depict the smoke impacts at the monitor on June 16, 2022 (see demonstration, pp. 108-111, Figs. 2.3.16-2.3.19). Additionally, IDEM included media articles, NOAA Satellite Smoke text products, and IDEM air quality forecasts discussing the wildfire plume impacts in the southcentral United States (see demonstration, pp. 113-122).

Table 12: Clear Causal Relationship for June 16, 2022

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors⁶			
HYSPLIT trajectories, satellite imagery (AOD, HMS smoke plumes, and detections of active fires in United States), and the HRRR-Smoke model	Demonstration pp. 99-107, Figs. 2.3.6-2.3.15	HYSPLIT trajectories (backward and forward), satellite imagery, and HRRR-Smoke model outputs demonstrated smoke transport from across the United States to Lake County on June 16, 2022.	Y
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, and NOAA smoke narratives	Demonstration pp. 108-11, 113-122, Figs. 2.3.16-2.3.19	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 16, 2022. Additionally, IDEM’s GAM analyses, carbon concentration timeseries, and media articles show the wildfire smoke plume impacts at the surface.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 121-122, 445-452	IDEM’s demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

July 4, 2022

For the exceedances on July 4, 2022, IDEM’s demonstration presents evidence of fireworks impacts on July 4, 2022, due to four public fireworks displays within ten miles of the monitor on July 3-4, 2022. The fireworks impacts are supported by hourly PM_{2.5} and carbon timeseries showing a clear spike in concentrations at 8:00 pm on July 4, 2022 (see demonstration, pp. 129-131).

⁶The EPA’s Prescribed Fire Guidance offers examples of analyses that may be used to show emissions transport from wildland fires that may have influenced PM concentrations, including: atmospheric trajectory analysis/modeling, satellite imagery of plume with evidence of plume impacting the ground, satellite imagery of plume with evidence of plume impacting the ground, provision of additional information, such as analyses of relevant meteorological conditions (e.g., wind speed and direction at the height of the smoke plume) further supporting the clear causal relationship rule element.

Table 13: Clear Causal Relationship for July 4, 2022

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported and Affected the Monitors			
PM _{2.5} and carbon concentration timeseries, media articles	Demonstration pp. 129-134	The timing of the four public fireworks displays within ten miles of the Lake County monitors align with the PM _{2.5} and carbon concentration spikes on July 4, 2022.	
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 134-135, 445-452	IDEM’s demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	

May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023, IDEM’s demonstration presents evidence of smoke transport from Quebec, Ontario, Nova Scotia, and western Canadian wildfires to the Lake County area (see demonstration, pp. 204-238, Figs. 2.6.31-2.6.60). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and active fire data (see demonstration, pp. 204-210, Figs. 2.6.31-2.6.43), AOD and visible satellite imagery (see demonstration, pp. 211-217, Figs. 2.6.44-2.6.56), HRRR-Smoke model analyses (see demonstration, pp. 218-220, Fig. 2.6.57), and GAM analyses (see demonstration, pp. 221-223, Fig. 2.6.58). HYSPLIT trajectories provided in IDEM’s demonstration illustrate transport of smoke from Canada to the Lake County area. Smoke is also evident on the visible satellite imagery as shown in Figures 12-15 below. The EPA further analyzed forward and backward trajectories for May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023, and demonstrated transport of smoke from Canada (see Figures 12-15 below).

Figure 12: Backward trajectories at 100-, 500-, and 1,000-meter heights starting on May 30, 2023, at 12:00 PM CST from Lake County and forward trajectories at 100-, 500-, and 1,000-meter heights starting on May 27, 2023, at 12:00 PM CST. Trajectories were developed in AirNow-Tech's Navigator tool and the map was overlaid with hourly PM_{2.5} concentrations, HMS Fire satellite detected hotspots, and visual satellite imagery from May 30, 2023.

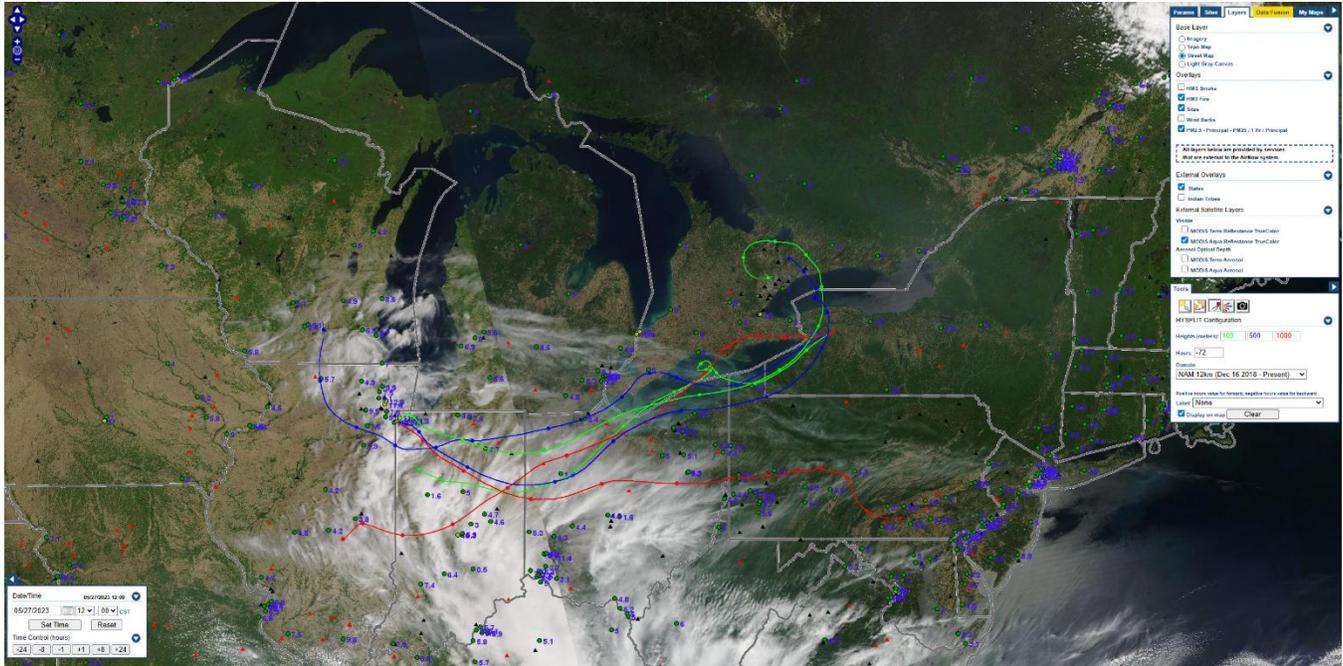


Figure 13: 72-hour backward trajectories at 100-, 500-, and 1,000-meter heights starting on June 2, 2023, at 8:00 PM CST from Lake County and 48-hour forward trajectories at 100-, 500-, and 1,000-meter heights starting on May 31, 2023, at 8:00 PM CST. Trajectories were developed in AirNow-Tech's Navigator tool and the map was overlaid with hourly PM_{2.5} concentrations, HMS Fire satellite detected hotspots, and visual satellite imagery from June 2, 2023.

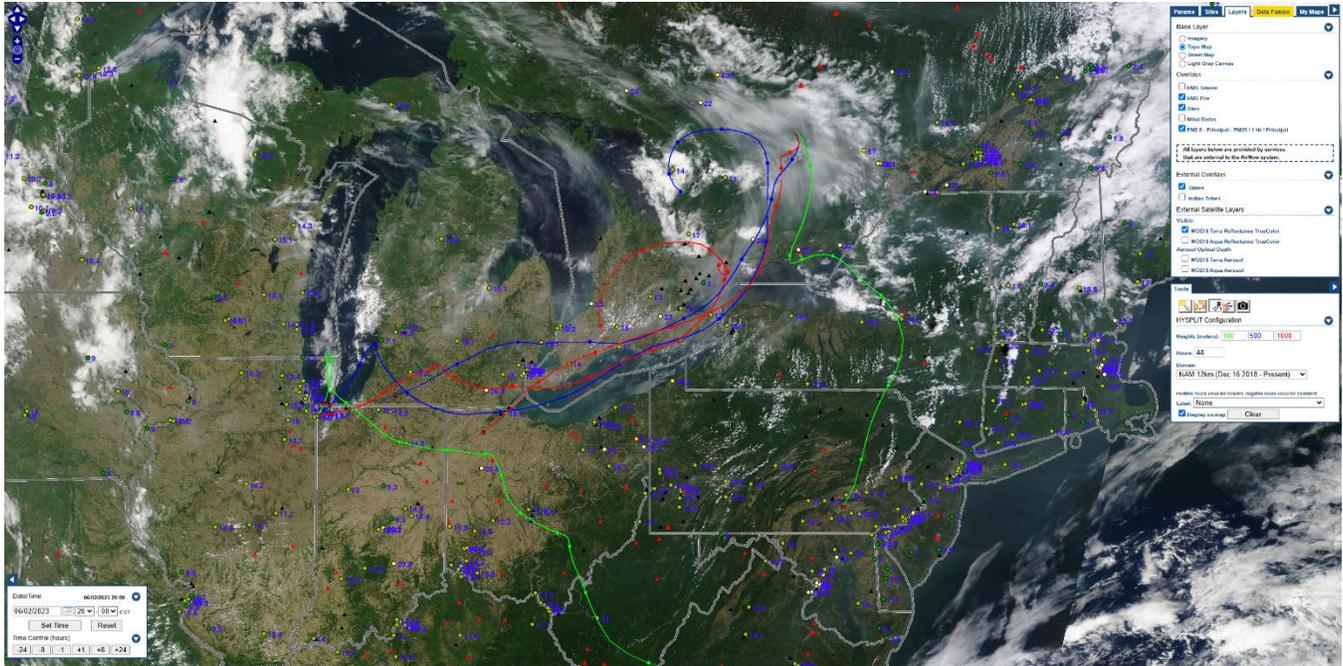


Figure 14: 60-hour backward trajectories at 100-, 500-, and 1,000-meter heights starting on June 5, 2023, at 5:00 PM CST from Lake County and 60-hour forward trajectories at 100-, 500-, and 1,000-meter heights starting on June 3, 2023, at 5:00 AM CST. Trajectories were developed in AirNow-Tech's Navigator tool and the map was overlaid with hourly PM_{2.5} concentrations, HMS Fire satellite detected hotspots, and visual satellite imagery from June 5, 2023.

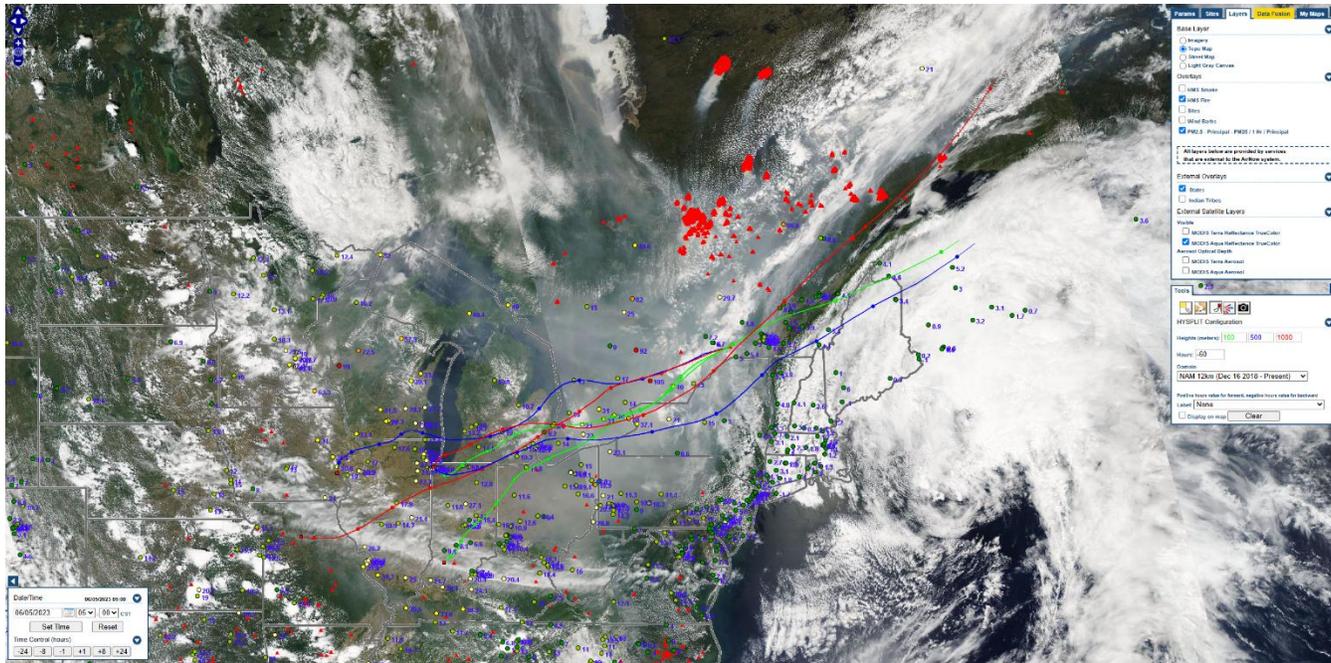
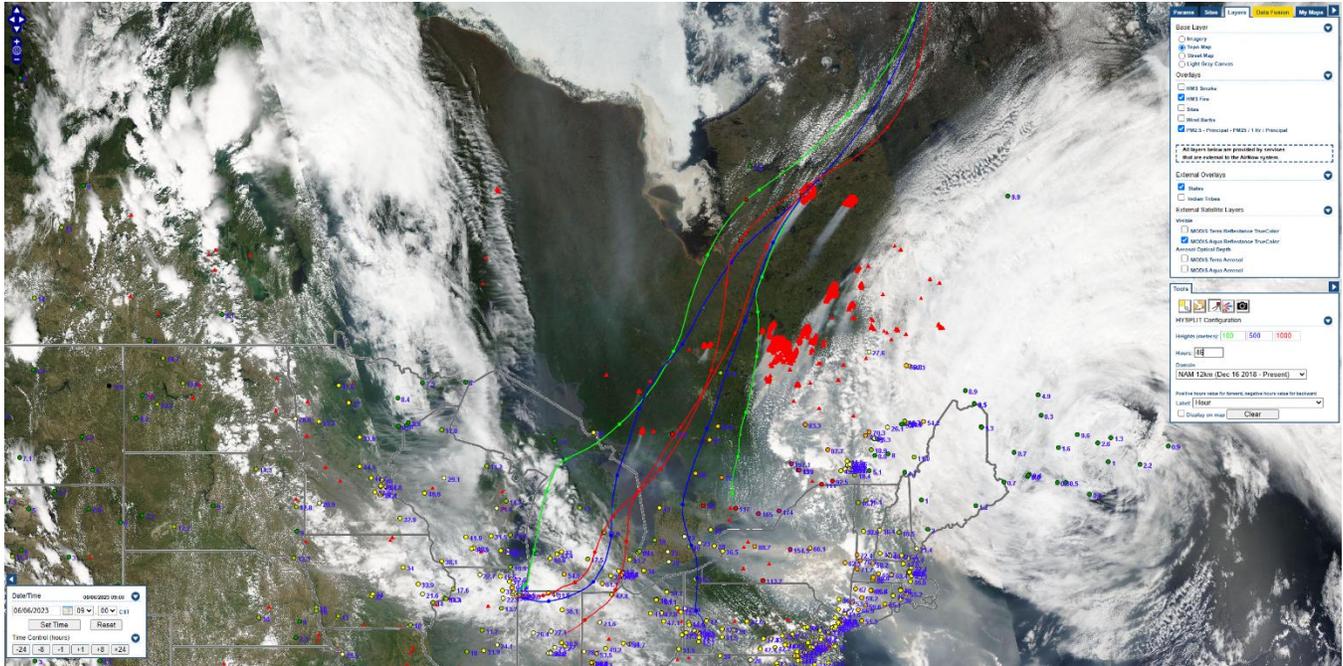


Figure 15: 72-hour backward trajectories at 100-, 500-, and 1,000-meter heights starting on June 8, 2023, at 11:00 AM CST from Lake County and 48-hour forward trajectories at 100-, 500-, and 1,000-meter heights starting on June 6, 2023, at 7:00 AM CST. Trajectories were developed in AirNow-Tech’s Navigator tool and the map was overlaid with hourly PM_{2.5} concentrations, HMS Fire satellite detected hotspots, and visual satellite imagery from June 6, 2023.



Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of smoke from western and southeastern Canadian wildfires to Lake County and depict the smoke impacts at the monitor on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023 (see demonstration, pp. 197-203, 221-238, Figs. 2.6.18-2.6.30, 2.6.58-2.6.60). Additionally, IDEM included media articles, NOAA Satellite Smoke text products, and IDEM air quality forecasts discussing the wildfire plume impacts in the Lake County area (see demonstration, pp. 239-262).

Table 14: Clear Causal Relationship for May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors			
HYSPLIT trajectories, satellite imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada), and the HRRR-Smoke model	Demonstration pp. 204-220, Figs. 2.6.31-2.6.57	HYSPLIT trajectories (backward and forward), satellite imagery, and HRRR-Smoke model outputs (vertically integrated and near-surface) demonstrated smoke transport from Canada to Lake County on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023.	Y

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts	Demonstration pp. 197-203, 220-260, Figs. 2.6.18-2.6.30, 2.6.58-2.6.60	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on May 30, 2023, June 2, 2023, June 5, 2023, and June 8, 2023. Additionally, IDEM's GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts show the wildfire smoke plume impacts at the surface.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 260-262, 445-452	IDEM's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

June 17, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 17, 2023, IDEM's demonstration presents evidence of smoke transport from the Quebec and Ontario wildfires to the Lake County area (see demonstration, pp. 262-288). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 270-271, Fig. 2.7.6), AOD satellite imagery (see demonstration, pp. 271-272, Fig. 2.7.7), HRRR-Smoke model analyses (see demonstration, pp. 272-273, Fig. 2.7.8), and GAM analyses (see demonstration, pp. 273-274, Fig. 2.7.9).

Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of Canadian wildfire smoke to Lake County and depict the smoke impacts at the monitor on June 17, 2023 (see demonstration, pp. 266, 270, 273-277). Additionally, IDEM included media articles, NOAA Satellite Smoke Text Products, and IDEM air quality forecasts and discussions that discussed the wildfire plume impacts in the United States as well as Lake County (see demonstration, pp. 277-287).

Table 15: Clear Causal Relationship for June 17, 2023

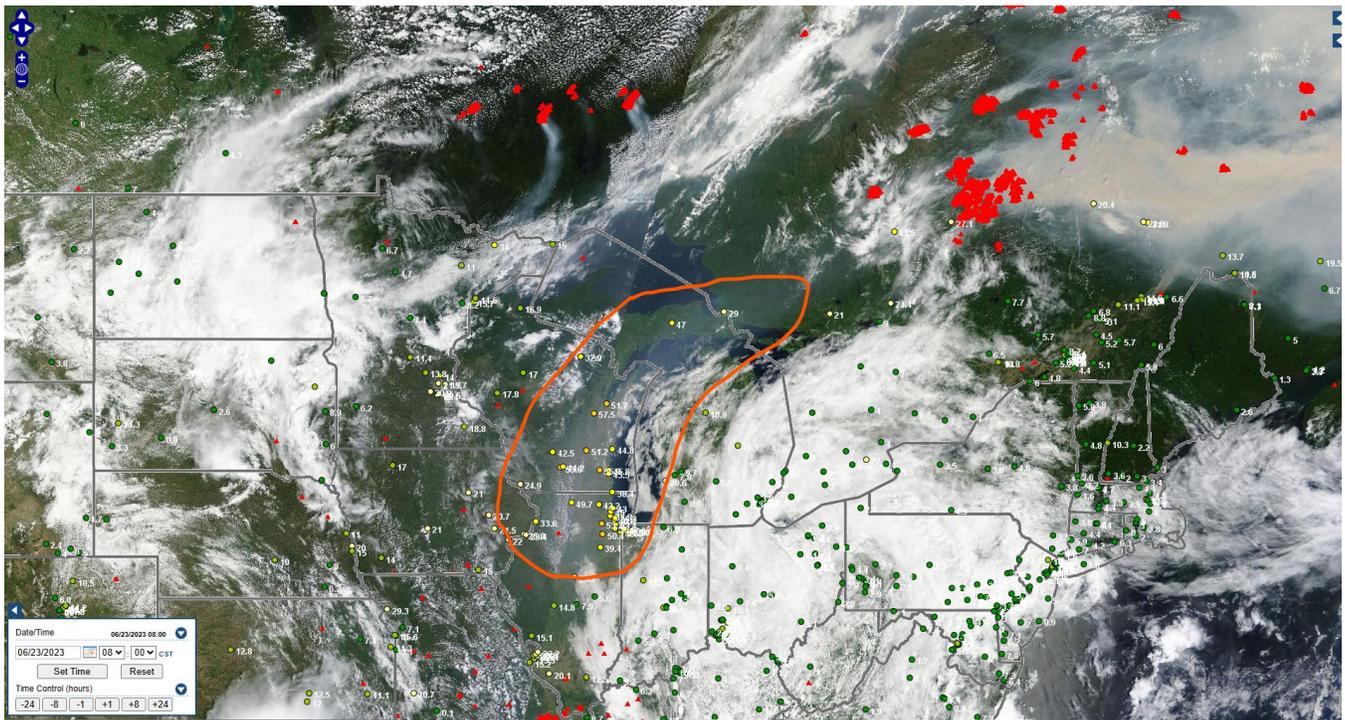
Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors			
HYSPLIT trajectories, satellite imagery (AOD, HMS smoke plumes, and detections of active fires in Canada), and the HRRR-Smoke model	Demonstration pp. 270-273, Figs. 2.7.6-2.7.8	HYSPLIT trajectories (backward and forward), satellite imagery, and HRRR-Smoke model outputs demonstrated smoke transport from Quebec and Ontario to Lake County on June 17, 2023.	Y
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts	Demonstration pp. 266, 270, 273-287, Figs. 2.7.2, 2.7.5, 2.7.9-2.7.11	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 17, 2023. Additionally, IDEM’s GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts show the wildfire smoke plume impacts at the surface.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 288-289, 445-452	IDEM’s demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

June 23, 2023, June 26, 2023, and June 29, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 23, 2023, June 26, 2023, and June 29, 2023, IDEM’s demonstration presents evidence of smoke transport from Quebec and Ontario wildfires to the Lake County area (see demonstration, pp. 290-327, Figs. 2.8.1-2.8.34). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 305-309, Figs. 2.8.17-2.8.23), AOD satellite imagery (see demonstration, pp. 309-313, Figs. 2.8.24-2.8.30), HRRR-Smoke analyses (see demonstration, pp. 313-316, Fig. 2.8.31), and GAM analyses (see demonstration, pp. 316-318, Fig. 2.8.32). Smoke is also evident on the visible satellite imagery as shown in Figure 16 below.

Figure 16: Visible satellite imagery on June 23, 2023, at 8:00 AM CST from the AirNow-Tech’s Navigator tool. The map was overlaid with hourly PM_{2.5} concentrations and HMS Fire satellite detected hotspots.



Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of the smoke from Canadian wildfires to Lake County and depict the smoke impacts at the monitor leading up to and on June 23, 2023, June 26, 2023, and June 29, 2023 (see demonstration, pp. 293-305, 316-326, Figs. 2.8.2-2.8.8, 2.8.10-2.8.16, 2.8.32-2.8.34). Additionally, IDEM included media articles, NOAA smoke narratives, and IDEM air quality forecasts discussing the wildfire plume impacts in the eastern United States as well as Lake County (see demonstration, pp. 327-351).

Table 16: Clear Causal Relationship for June 23, 2023, June 26, 2023, and June 29, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors			
HYSPLIT trajectories, satellite imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada), and the HRRR-Smoke model	Demonstration pp. 305-316, Figs. 2.8.17-2.8.31	HYSPLIT trajectories (backward and forward), satellite imagery, and the HRRR-Smoke model demonstrated smoke transport from Quebec and Ontario to Lake County on June 23, 2023, June 26, 2023, and June 29, 2023.	Y

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts	Demonstration pp. 293-351, Figs. 2.8.2-2.8.8, 2.8.10-2.8.16, 2.8.32-2.8.34	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 23, 2023, June 26, 2023, and June 29, 2023. Additionally, IDEM's GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts show the wildfire smoke plume impacts at the surface.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 351-352, 445-452	IDEM's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria	Y

July 26, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on July 26, 2023, IDEM's demonstration presents evidence of smoke transport from Alberta, British Columbia and Saskatchewan wildfires to the Lake County area (see demonstration, pp. 369-382, Figs. 2.10.2-2.10.17). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 375-376, Figs. 2.10.2-2.10.12), AOD satellite imagery (see demonstration, pp. 378-380, Figs. 2.10.13-2.10.15), HRRR-Smoke analyses (see demonstration, pp. 380-381, Fig. 2.10.16), and GAM analyses (see demonstration, p. 382, Fig. 2.10.17).

Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of the smoke from Canadian wildfires to Lake County and depict the smoke impacts at the monitor on July 26, 2023 (see demonstration, pp. 369-371, 373-385, 382-387, Figs. 2.10.2-2.10.4, 2.10.7-2.10.9, 2.10.17-2.10.19). Additionally, IDEM included media articles, NOAA smoke narratives, and IDEM air quality forecasts discussing the wildfire plume impacts in the eastern United States as well as Lake County (see demonstration, pp. 387-395).

Table 17: Clear Causal Relationship for July 26, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors			
HYSPLIT trajectories, satellite imagery (AOD, HMS smoke plumes, and detections of active fires in Canada), and the HRRR-smoke model	Demonstration pp. 375-382, Figs. 2.10.2-2.10.17	HYSPLIT trajectories (backward and forward), satellite imagery, and the HRRR-Smoke model demonstrated smoke transport from western Canada to Lake County on July 26, 2023.	Y
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts	Demonstration pp. 369-371, 373-385, 382-395, Figs. 2.10.2-2.10.4, 2.10.7-2.10.9, 2.10.17, 2.10.18-2.10.19	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on July 26, 2023. Additionally, IDEM's GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts show the wildfire smoke plume impacts at the surface.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 395-396, 445-452	IDEM's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

August 4, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on August 4, 2023, IDEM's demonstration presents evidence of smoke transport from Alberta and western Canada wildfires to the Lake County area (see demonstration, pp. 398-404, Figs. 2.11.2-2.11.7). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 401-402, Fig. 2.11.5), AOD satellite imagery (see demonstration, pp. 402-403, Figs. 2.11.6), and HRRR-Smoke analyses (see demonstration, pp. 403-404, Fig. 2.11.7).

Evidence that the Wildfire Emissions Affected the Monitors

The PM_{2.5} concentration maps, GAM analyses, and carbon concentration timeseries show the transport of the smoke from Canadian wildfires to Lake County and depict the smoke impacts at the monitor on August 4, 2023 (see demonstration, pp. 398-399, 400-401, 404-407, Figs. 2.11.2, 2.11.4, 2.11.8-2.11.10). Additionally, IDEM included media articles, NOAA smoke narratives, and IDEM air quality forecasts discussing the wildfire plume impacts in the eastern United States as well as Lake County (see demonstration, pp. 408-414).

Table 18: Clear Causal Relationship for August 4, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Evidence that the Fire Emissions were Transported to the Monitors			
HYSPLIT trajectories, satellite imagery (AOD, HMS smoke plumes, and detections of active fires in Canada), and the HRRR-Smoke model	Demonstration pp. 398-404, Figs. 2.11.2-2.11.7	HYSPLIT trajectories (backward and forward), satellite imagery, and the HRRR-Smoke model demonstrated smoke transport from Alberta and western Canada to Lake County on August 4, 2023.	Y
Evidence that the Fire Emissions Affected the Monitors			
PM _{2.5} surface concentrations, GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts	Demonstration pp. 398-399, 400-401, 404-414, Figs. 2.11.2, 2.11.4, 2.11.8-2.11.10	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on August 4, 2023. Additionally, IDEM’s GAM analyses, carbon concentration timeseries, media articles, NOAA smoke narratives, and IDEM air quality forecasts show the wildfire smoke plume impacts at the surface.	Y

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 414-415, 445-452	IDEM's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

Not Reasonably Controllable or Preventable

The EER presumes that wildfire events on wildland are not reasonably controllable or preventable per 40 CFR § 50.14(b)(4). IDEM's demonstration provided evidence that the wildfire events meet the definition of wildfire. As the wildfires in the United States and Canada were reported to have been started by unplanned ignitions such as lightning or prescribed fires that became out of control, they are considered wildfires. Additionally, IDEM demonstrated how fireworks emissions were caused by July Fourth celebrations, which is a cultural event as described in 40 CFR § 50.14(b)(2). Therefore, the documentation sufficiently demonstrates that the events were not reasonably controllable and not reasonably preventable.

Table 19: Not Reasonably Controllable for the United States and Canadian Wildfires

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Does the event meet the EER definition of a wildfire?	Demonstration pp. 111-120, 238-260, 277-287, 327-351, 387-395, 408-414	The wildfires were caused by natural factors such as lightning, or unexpected weather conditions affecting a preapproved prescribed burn.	Y
Did the wildfire occur predominately on wildland as defined in the EER?	Demonstration pp. 111-120, 238-260, 277-287, 327-351, 387-395, 408-414	Wildfires occurred in undeveloped areas across the United States and Canada, meeting the definition of wildland.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 121-122, 260-262, 288-289, 351-352, 395-396, 414-415	IDEM summarizes how the wildfire events were on wildland and not reasonably controllable or preventable.	Y

The EER states that fireworks displays that are significantly integral to traditional events, including the Fourth of July, shall be treated in the same manner as exceptional events per 40 CFR § 50.14(b)(2). IDEM’s demonstration provided evidence that the exceedances recorded on July 4, 2022, were the result of Fourth of July fireworks displays. Therefore, this sufficiently demonstrates that the event should be treated as not reasonably controllable or preventable.

Table 20: Not Reasonably Controllable or Preventable for Fireworks

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Do the events satisfy the EER requirements in 40 CFR § 50.14(b)(2) for fireworks displays?	Demonstration pp. 131-135	The fireworks emissions were caused by July Fourth celebrations, which is a cultural event.	Y

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

The definition of “wildfire” at 40 CFR § 50.1(n) states, “A wildfire that predominantly occurs on wildland is a natural event.” IDEM’s demonstration includes documentation that the events meet the definition of a wildfire and occurred predominantly on wildland, including satellite imagery, land-use maps, graphical data, media, and news reporting, demonstrating that the fires were unplanned and occurred in areas with little human activity or development. Additionally, IDEM demonstrated how fireworks emissions were caused by July Fourth celebrations, which is a cultural event as described in 40 CFR § 50.14(b)(2). IDEM has therefore shown that these events meet the EER criteria.

Table 21: Natural Event or Human Activity Unlikely to Recur at a Particular Location for Wildfires

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Do the events meet the EER definition of a wildfire?	Demonstration pp. 111-120, 238-260, 277-287, 327-351, 387-395, 408-414	The wildfires were unplanned ignitions caused by natural factors, as defined in the EER, or resulting from unexpected weather conditions affecting a preapproved prescribed burn. These fires that impacted the monitor also occurred on wildland.	Y

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 121-122, 260-262, 288-289, 351-352, 395-396, 414-415	IDEM's evidence demonstrated the fires were natural events occurring predominantly on wildland.	Y

Table 22: Natural Event or Human Activity Unlikely to Recur at a Particular Location for Fireworks

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Do the events satisfy the EER requirements in 40 CFR § 50.14(b)(2) for fireworks displays?	Demonstration p. 131-135	The fireworks emissions were caused by July Fourth celebrations, which is a cultural event.	Y

CONCLUSION

The EPA has reviewed the documentation provided by IDEM to support claims that fireworks emissions and smoke from wildfires in the United States and Canada caused exceedances of the 2024 annual PM_{2.5} standard on the monitor days listed in Table 1, located in Lake County, Indiana. The EPA has determined that the flagged exceedances at these monitoring sites on these days satisfy the exceptional events criteria: the event was a natural event, which affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedance and was not reasonably controllable or preventable. The EPA has also determined that IDEM has satisfied the procedural requirements for data exclusion from comparison to the NAAQS.