

TECHNICAL SUPPORT DOCUMENT FOR THE EPA'S CONCURRENCE ON PM_{2.5} EXCEEDANCES MEASURED IN GRAND RAPIDS, MI ON JUNE 6-8, 2023, JUNE 26-29, 2023, AND JULY 25-26, 2023, AS EXCEPTIONAL EVENTS

On February 6, 2025, the Michigan Department of Environment, Great Lakes, and Energy submitted an exceptional event 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 Grand Rapids-Monroe (Air Quality System ID: 26-081-0020) monitoring site on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023. The demonstration submitted by EGLE states that the exceedances measured on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023, were caused by smoke entering the region from multiple wildfires in Canada. Under the Exceptional Events Rule, air agencies can request the exclusion of event-influenced data, and the U.S. 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 event and the EPA's review of EGLE's submitted exceptional events demonstration.

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the current EER in 2016, pursuant to Clean Air Act Section 319. The EER added Sections 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

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 Air Quality System (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 Section 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.

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.”

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 5-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 5-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.

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

- 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.

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

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.”

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 September 12, 2024, EGLE submitted an Initial Notification of Potential Exceptional Events and on February 6, 2025, EGLE submitted an exceptional events demonstration. The demonstration is for 9 exceedances of the 2024 annual PM_{2.5} NAAQS that occurred at the Grand Rapids-Monroe monitoring site (AQS ID: 26-081-0020), located within the Grand Rapids-Wyoming Core Based Statistical Area on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023.⁴ The EPA worked with EGLE to identify the relevant exceedances and monitoring sites affected.

Regulatory Significance

The EPA determined that the exclusion of all 9 of the exceedances of the PM_{2.5} standard have regulatory significance for initial area designations for the 2024 annual PM_{2.5} standard and worked with EGLE to identify the relevant exceedances at the Grand Rapids-Monroe monitor site. Table 1 summarizes these exceedances.

Table 1: Summary of Data Requested for Exclusion⁵

Exceedance Date	Monitoring Site Name	AQS ID	Monitored Concentration (µg/m³)	Tier
June 6, 2023	Grand Rapids-Monroe	26-081-0020	29.7	1
June 7, 2023	Grand Rapids-Monroe	26-081-0020	39.5	1
June 8, 2023	Grand Rapids-Monroe	26-081-0020	35.8	1
June 26, 2023	Grand Rapids-Monroe	26-081-0020	27.8	1
June 27, 2023	Grand Rapids-Monroe	26-081-0020	143.0	1
June 28, 2023	Grand Rapids-Monroe	26-081-0020	100.9	1
June 29, 2023	Grand Rapids-Monroe	26-081-0020	85.8	1
July 25, 2023	Grand Rapids-Monroe	26-081-0020	44.8	1

⁴ Letter to EPA from EGLE, INI 2023 PM_{2.5} EEs Grand Rapids-Wyoming MI CBSA, September 12, 2024.

⁵ See AQS Report AMP 355, Report Request ID: 2246484, dated December 16, 2024.

July 26, 2023	Grand Rapids-Monroe	26-081-0020	27.9	1
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Concurrence on the exceedances listed in Table 1 would result in changing the 2021 to 2023 design value for Grand Rapids-Monroe monitoring site from 9.3 $\mu\text{g}/\text{m}^3$ to 8.9 $\mu\text{g}/\text{m}^3$. This reduction would result in the Grand Rapids CBSA attaining the 2024 annual $\text{PM}_{2.5}$ NAAQS. Table 2 summarizes the effect of this exceptional events demonstration on the monitor’s design value.

Table 2: Summary of Regulatory Significance

Monitoring Site	Affected Regulatory Action	2021-2023 Design Value without the EPA’s Concurrence	2021-2023 Design Value with the EPA’s Concurrence
Grand Rapids-Monroe	2024 Primary Annual $\text{PM}_{2.5}$ NAAQS	9.3 ($\mu\text{g}/\text{m}^3$)	8.9 ($\mu\text{g}/\text{m}^3$)

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 appropriately flag the affected data in the EPA’s Air Quality System?	EGLE INI 2023 $\text{PM}_{2.5}$ EEs Grand Rapids-Wyoming MI CBSA document	The EPA verified that EGLE applied request exclusion qualifiers to all $\text{PM}_{2.5}$ monitors from June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023.	Y
Did the agency submit an Initial Notification?	EGLE INI 2023 $\text{PM}_{2.5}$ EEs Grand Rapids-Wyoming MI CBSA document	EGLE submitted Initial Notification via email to the EPA on September 12, 2024.	Y
Did the initial notification and demonstration submittals meet the deadlines for	EGLE INI 2023 $\text{PM}_{2.5}$ EEs Grand Rapids-Wyoming MI CBSA document; 2023 $\text{PM}_{2.5}$ Exceptional	EGLE submitted Initial Notification via email to the EPA on September 12, 2024, and the final	Y

data influenced by exceptional events for use in initial area designations?	Events Demonstration for the Grand Rapids-Wyoming Core Based Statistical Area	demonstration to the EPA on February 6, 2025.	
Was the 30-day public comment process followed and documented?	Demonstration p. 38, Appendix A, and Appendix B	EGLE solicited, reviewed, and documented public comments per 40 CFR 50.14(c)(3)(v). The comment period was open from November 18, 2024, to December 17, 2024.	Y
Did the agency submit to the EPA, and address in their demonstration, any public comments received?	Demonstration Appendix A	All public comments were addressed by EGLE.	Y

Mitigation Requirements

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

Narrative Conceptual Model

EGLE’s demonstration provided a narrative conceptual model on pages 5-22 to describe how emissions from wildfires in the Canadian provinces of Quebec, Ontario, Saskatchewan, and Manitoba caused PM_{2.5} exceedances at the Grand Rapids-Monroe monitoring site. The conceptual model for the requested dates is supported by media reports, daily average PM_{2.5} concentration graphs, surface meteorological analyses, satellite imagery, and Canadian Wildland Fire Information System maps. These analyses support the conclusion that wildfire smoke was the primary contributor to the PM_{2.5} exceedances recorded at the Grand Rapids-Monroe monitoring site on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023.

The discussion of the interaction of wildfire smoke formation and meteorology resulting in smoke impacts at the Grand Rapids-Monroe monitoring site 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) and PM_{2.5} Wildland Fire Exceptional Events Tiering Document (EPA, 2014)). The regulatory significance of the proposed

data exclusion is discussed in the demonstration (see demonstration, pp. 1-5), as required by 40 CFR 50.14(c)(3)(i).

June 6-8, 2023, Narrative Conceptual Model Overview

EGLE’s demonstration provided a narrative conceptual model on pages 5-22 to describe how emissions from wildfires in the Quebec and Ontario provinces of Canada, caused PM_{2.5} exceedances at the Grand Rapids-Monroe monitoring site. By June 2, wildfire activity had developed across Ontario and Quebec that continued throughout the month of June with several active fires. The Canadian Interagency Forest Fire Centre reported a fire preparedness level 5 for Quebec, the highest alert level in Canada. The narrative conceptual model describes the continued transport of wildfire smoke from the Quebec and Ontario provinces resulting from meteorological conditions leading up to the June 6-8, 2023, event. A high-pressure system near the Hudson Bay region and a low-pressure system near Nova Scotia, formed a blocking pattern by June 6. These conditions formed a persistent north and northeastern wind flow pattern, bringing wildfire smoke plumes from active fires in Quebec and Ontario that remained over the Great Lakes Basin from June 5 through June 8 (see demonstration, pp. 7-9, Figs. 2-2, 2-3). The Hybrid Single-Particle Lagrangian Integrated Trajectory modeling trajectories from June 6-8, 2023, intersected the source regions of the Canadian wildfires, supporting the meteorology transport narrative in the demonstration (see demonstration, pp. 24-26, Figs. 3-1, 3-3, 3-5).

Table 4: Narrative Conceptual Model for June 6-8, 2023

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 9-10	EGLE described large wildfires across Quebec and Ontario including maps of active fires in Canada.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 5-10	EGLE included meteorological surface analyses and 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. 6-10	EGLE included meteorological surface analyses and explained how the wildfire emissions from Quebec and Ontario were	Y

		transported to the Grand Rapids area.	
Explains regulatory significance	Demonstration pp. 1-4	EGLE explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

June 26-29, 2023, Narrative Conceptual Model Overview

Throughout June 2023, wildfire activity continued across the Ontario and Quebec provinces, leading to the continued impact of wildfire smoke on the air quality in the Grand Rapids area. The CWFIS reported 81 active fires and hotspots across the Quebec province on June 26, 2023. The narrative conceptual model describes the transport of wildfire smoke from the Ontario and Quebec region resulting from meteorological conditions from June 25-30, 2023, shown in satellite imaging and meteorological surface analyses, leading to impacts at the Grand Rapids-Monroe monitoring site.

EGLE’s demonstration describes a low-pressure system moving from west to east across the Great Lakes region from June 25-27, 2023, which brought smoke from the wildfires in Ontario and Quebec to the midwest. By June 28, 2023, a high-pressure system moved into the area and persisted until June 29, 2023, trapping the wildfire emissions at the surface allowing PM_{2.5} concentrations to build.

Table 5: Narrative Conceptual Model for June 26-29, 2023

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 12, 16	EGLE described large wildfires across Quebec and Ontario including maps of active fires in Canada.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 12-16	EGLE included meteorological surface analyses and 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. 13-16	EGLE included meteorological surface	Y

		analyses and explained how the wildfire emissions from Quebec and Ontario were transported to the Grand Rapids area.	
Explains regulatory significance	Demonstration pp. 1-4	EGLÉ explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

July 25-26, 2023, Narrative Conceptual Model Overview

EGLÉ’s demonstration included a narrative conceptual model on pages 18-22 to describe the continued transport of wildfire smoke from the Canadian provinces of Saskatchewan, Manitoba, and Ontario which caused PM_{2.5} exceedances at the Grand Rapids-Monroe monitoring site on July 25-26, 2023.

Wildfire activity continued throughout the month of July in Canada, with some of the largest wildfire areas located in the Saskatchewan and Manitoba provinces. From July 23-25, 2023, a frontal system which originated from the northwest wavered near the Upper Peninsula of Michigan and eventually stalled by July 26, 2023. Upper-level wind flow was from the northwest and west in the region due to a low-pressure system near the Great Lakes Basin and a high-pressure system to the south. This transport pattern allowed wildfire smoke from central Canada to impact the Grand Rapids-Monroe monitoring site on July 25-26, 2023 (see demonstration, pp. 19-20, Fig. 2-10). The HYSPLIT modeling trajectories from July 25-26, 2023, intersected the source regions of the Canadian wildfires, supporting the meteorology transport narrative in the demonstration (see demonstration, pp. 31-32, Figs. 3-15, 3-17).

Table 6: Narrative Conceptual Model for July 25-26, 2023

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 20-21	EGLÉ described large wildfires across Saskatchewan, Manitoba, and Ontario including maps of active fires in Canada.	Y
Discussion of how emissions from the event(s) led to the	Demonstration pp. 18-20	EGLÉ included meteorological surface	Y

exceedance or violation at the affected monitor(s)		analyses and satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	
Discusses the interaction of emissions and meteorology	Demonstration pp. 18-21	EGLE included meteorological surface analyses and explained how the wildfire emissions from Saskatchewan, Manitoba, and Ontario were transported to the Grand Rapids area.	Y
Explains regulatory significance	Demonstration pp. 1-4	EGLE 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

EGLE’s demonstration included an analysis of the EPA’s Tiering Tool, comparison of events days with historical concentrations, Hazard Mapping System smoke and fire layer map, 24-hour PM_{2.5} surface concentrations, HYSPLIT trajectory analysis for the requested dates (forward and backward), Aerosol Optical Depth satellite imagery, visible satellite imagery and Public Health and Air Quality Alerts to demonstrate the clear causal relationship between the Canadian wildfires and the monitor in the Grand Rapids CBSA. Based on the measured PM_{2.5} values, as well as other criteria, all the requested dates for exclusion in EGLE’s demonstration are Tier I.

Comparison with Historical Concentrations

EGLE’s demonstration includes a comparison with historical concentrations as required for 40 CFR 50.14 (c)(3)(iv)(C). The demonstration compares daily average PM_{2.5} concentrations during the wildfire smoke events on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023, to the 2019-2023 5-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 (see demonstration, pp. 3, 4, 6, 13, and 18, Figs. 1-1, 1-2, 2-1, 2-5, and 2-9). Additionally, a tabular presentation of the concentration’s percentiles, rank, and tier illustrate the uniqueness of the data over a 5-year period (see demonstration, p. 3, Table 1). As shown in Figures 1 and 2 below, daily

concentrations of exceedance days for the Grand Rapids-Monroe monitoring site are compared to the Tier 1 cutoff for justification of the demonstration's tier selection.

Figure 1. The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis (June)

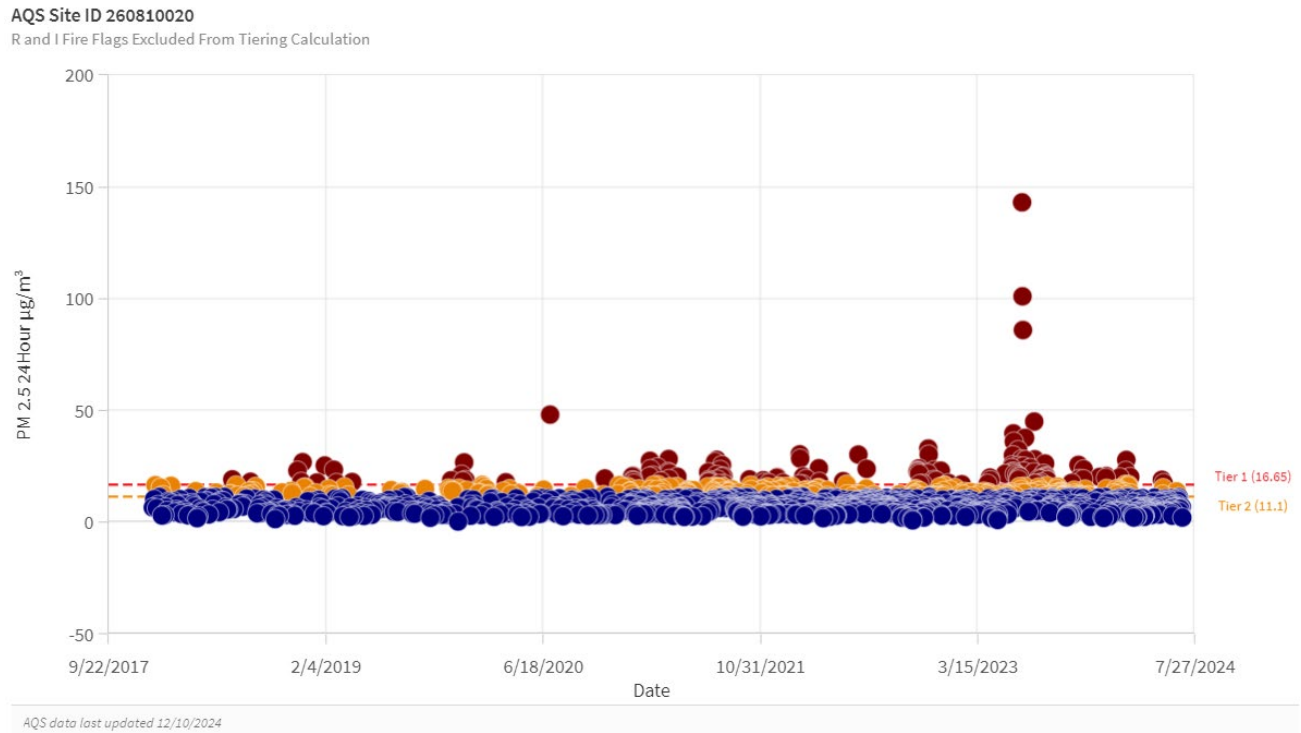


Figure 2. The EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis (July)

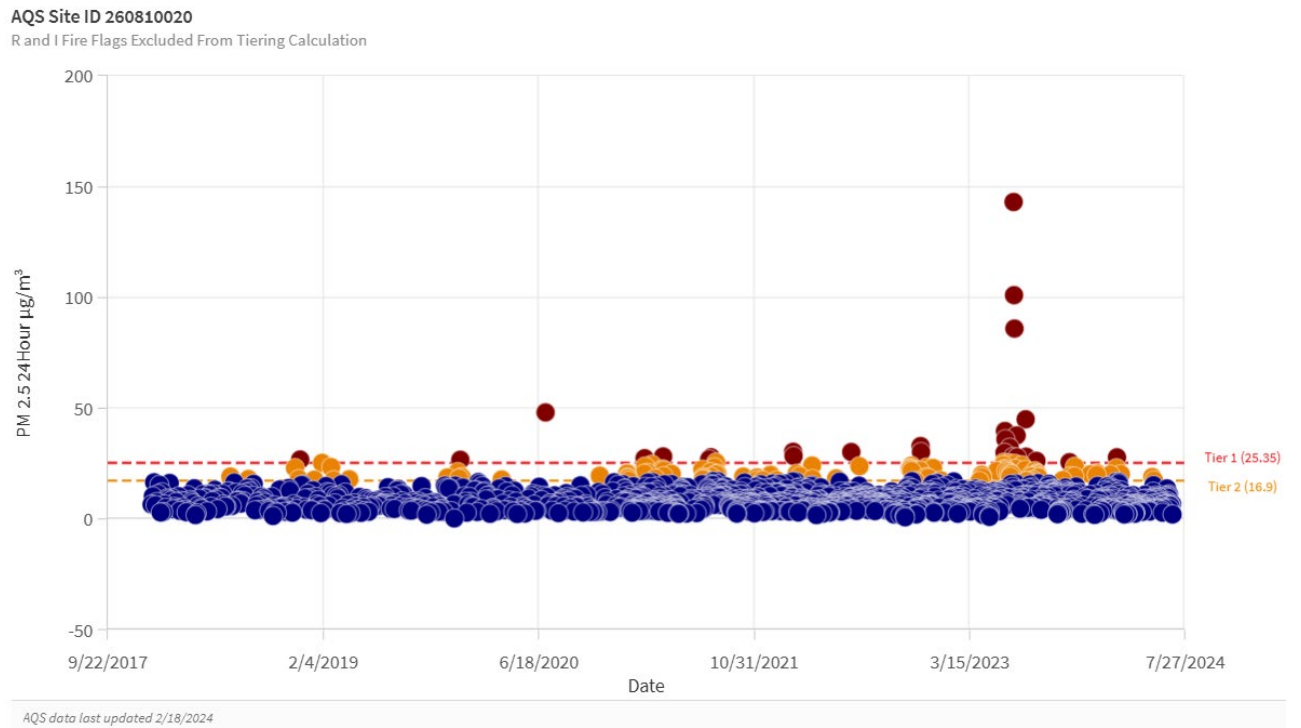


Table 7: Summary of Tiering for Relevant Monitoring Days

Tiering	Demonstration Citation	Tiering Details	Tiers
Tiering for June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023.	Demonstration pp. 2-4	EGLE cited the EPA’s Tiering Tool. Flags excluded from the EPA’s calculation included R and I Fire Flags. The tiering thresholds were determined by analyzing the full 5-year dataset from 2019-2023.	1

June 6-8, 2023

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

For the exceedances on June 6-8, 2023, EGLE’s demonstration presents evidence of smoke transport from Quebec and Ontario wildfires to the Grand Rapids area (see demonstration, pp. 23-26). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 23-26, Figs. 3-1, 3-3, and 3-5), and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 23-26, Figs. 3-2, 3-4, and 3-6). HYSPLIT trajectories illustrate transport of smoke from Quebec and Ontario to the Grand Rapids area on June 6-8, 2023, and smoke is evident on the satellite imagery.

Evidence of Wildfire Emissions Affecting the Monitors

EGLE included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from June 6-8, 2023 (see demonstration, pp. 24-26). These maps support the transport of the smoke and visually depict the smoke impacts on June 6-8, 2023. Additionally, media articles were included discussing the wildfire plume impacts in the eastern US as well as Grand Rapids (see demonstration, p. 12).

Table 8: Clear Causal Relationship for June 6-8, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations⁶			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 3-4	PM _{2.5} concentrations on June 6-8, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
Evidence that the Fire Emissions were Transported to the Monitor(s)⁷			
Satellite imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada), HYSPLIT trajectories (forward and backward)	Demonstration pp. 23-26	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec and Ontario to Grand Rapids on June 6-8, 2023.	Y
Evidence that the Fire Emissions Affected the Monitor(s)⁸			

⁶ The 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 day(s) with a set of similar days, a percentile of event-related concentration(s) relative to annual and/or seasonal data; 99th percentile over 5 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.

⁷ The 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.

⁸ The EPA’s Prescribed Fire Guidance offers examples of analyses that may be used to show impacts from emissions of wildland fires at the monitor, including: Plots of elevated fire-related species near the monitor (e.g., PM, carbon monoxide); Elevated light extinction measurements at or near the monitoring site; Photographic evidence of ground-level smoke at the monitor; The timing and spatial distribution of fire-related pollutants shown with data from multiple monitoring sites; Differences in Carbon monoxide: nitrogen oxides ratios, and/or; PM speciation data that indicate fire impacts; Inclusion of matching day analyses, statistical regression models, or photochemical models, as needed.

PM _{2.5} surface concentrations	Demonstration pp. 23-26	Spatial distribution of PM _{2.5} across the midwest demonstrates regional impacts of wildfire smoke at the ground level on June 6-8, 2023.	Y
<u>Concluding Statement</u>			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 39	EGLE’s demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

June 26-29, 2023

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

For the exceedances on June 26-29, 2023, EGLE’s demonstration presents evidence of smoke transport from Quebec and Ontario wildfires to the Grand Rapids area (see demonstration, pp. 26-30). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 26-30, Figs. 3-7, 3-9, 3-11, and 3-13), and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 26-30, Figs. 3-8, 3-10, 3-12, and 3-14). HYSPLIT trajectories illustrate transport of smoke from Quebec and Ontario to the Grand Rapids area on June 26-29, 2023, and smoke is evident on the satellite imagery.

Evidence of Wildfire Emissions Affecting the Monitors

EGLE included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from June 26-29, 2023 (see demonstration, pp. 27-29). These maps support the transport of the smoke and visually depict the smoke impacts on June 26-29, 2023. Additionally, media articles were included discussing the wildfire plume impacts in the eastern US as well as Grand Rapids (see demonstration, p. 17).

Table 9: Clear Causal Relationship for June 26-29, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
<u>Comparison of Event-Related and Historical Concentrations</u>			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 3-4	PM _{2.5} concentrations on June 26-29, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
<u>Evidence that the Fire Emissions were Transported to the Monitor(s)</u>			
Satellite imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada), HYSPLIT trajectories (forward and backward)	Demonstration pp. 26-30	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec and Ontario to Grand Rapids on June 26-29, 2023.	Y
<u>Evidence that the Fire Emissions Affected the Monitor(s)</u>			
PM _{2.5} surface concentrations	Demonstration pp. 26-30	Spatial distribution of PM _{2.5} across the midwest demonstrates regional impacts of wildfire smoke at the ground level on June 26-29, 2023.	Y
<u>Concluding Statement</u>			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 39	EGLE’s demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

July 25-26, 2023, Narrative Conceptual Model Overview

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

For the exceedances on July 25-26, 2023, EGLE’s demonstration presents evidence of smoke transport from Saskatchewan, Manitoba, and Ontario wildfires to the Grand Rapids area (see demonstration, pp. 30-32). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 30-32, Figs. 3-15 and 3-17), and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 30-32, Figs. 3-16 and 3-18). HYSPLIT trajectories illustrate transport of smoke from Saskatchewan, Manitoba, and Ontario to the Grand Rapids area on July 25-26, 2023, and smoke is evident on the satellite imagery.

Evidence of Wildfire Emissions Affecting the Monitors

EGLE included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from July 25-26, 2023 (see demonstration, pp. 31-32). These maps support the transport of the smoke and visually depict the smoke impacts on July 25-26, 2023. Additionally, media articles were included discussing the wildfire plume impacts in Michigan (see demonstration, p. 22).

Table 10: Clear Causal Relationship for July 25-26, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA’s Review	Criterion Met?
<u>Comparison of Event-Related and Historical Concentrations</u>			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 3-4	PM _{2.5} concentrations on July 25-26, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
<u>Evidence that the Fire Emissions were Transported to the Monitor(s)</u>			
Satellite imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada), HYSPLIT trajectories (forward and backward)	Demonstration pp. 30-32	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Saskatchewan, Manitoba, and Ontario to Grand Rapids on July 25-26, 2023.	Y

Evidence that the Fire Emissions Affected the Monitor(s)			
PM _{2.5} surface concentrations, links to photographic evidence of reduced visibility at ground level	Demonstration pp. 30-32	Spatial distribution of PM _{2.5} across the midwest demonstrates regional impacts of wildfire smoke at the ground level on July 25-26, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 39	EGLE’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 at 40 CFR §50.14(b)(4). EGLE’s demonstration provided evidence that the wildfire event meets definition of wildfire. Specifically, EGLE states that “the areas in which the June and July 2023 fires occurred are wildlands,” further stating that “the Canadian government estimates that on average 67% of the area burned in Canada from wildfires is due to lightning-caused fires.”⁹ Therefore, the documentation provided sufficiently demonstrates that the event was not reasonably controllable and not reasonably preventable.

Table 11: Not Reasonably Controllable or Preventable

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. 32-34	EGLE noted that wildfires from June 2023 and July 2023 started by lightning and occurred on wildlands.	Y
Did the wildfire occur predominately on wildland as defined in the EER?	Demonstration pp. 32-34	EGLE included satellite imaging of the fire locations which demonstrate the fires were on wildlands.	Y
<u>Concluding Statement</u>			
Inclusion of a concluding statement that explains how	Demonstration p. 34	EGLE summarized how the wildfire events started by	Y

⁹ See Demonstration p. 34

the demonstration meets the relevant statutory and regulatory criteria		lightning, were on wildland, and were not reasonably controllable or preventable.	
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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.” EGLE’s demonstration includes documentation that the event meets the definition of a wildfire, were ignited by lightning strikes, and occurred predominantly on wildland, including satellite imaging of the wildlands in Quebec, Ontario, Manitoba, and Saskatchewan, Canada that is consistent with the CWFIS map of active wildfires. EGLE has therefore shown that the event was a natural event.

Table 12: Natural Event or Human Activity Unlikely to Recur at a Particular Location

Evidence	Demonstration Citation	Summary of the EPA’s Review	Criterion Met?
Does the event meet the EER definition of a wildfire?	Demonstration p. 34-35	Fires were unplanned ignitions caused by natural factors, as defined in the EER. These fires that impacted the monitor also occurred on wildland.	Y
<u>Concluding Statement</u>			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 35	EGLE’s evidence demonstrated the fires were natural events occurring predominantly on wildland.	Y

CONCLUSION

The EPA has reviewed the documentation provided by EGLE to support claims that smoke from wildfires in Canada caused exceedances of the 2024 annual PM_{2.5} NAAQS at the Grand Rapids - Monroe monitoring site on June 6-8, 2023, June 26-29, 2023, and July 25-26, 2023. The EPA has determined that the flagged exceedances at this monitoring site 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 EGLE has satisfied the procedural requirements for data exclusion from comparison to the NAAQS.