ENCLOSURE: TECHNICAL SUPPORT DOCUMENT FOR EPA CONCURRENCE ON $PM_{2.5}$ EXCEEDANCES MEASURED IN GRASS VALLEY ON APRIL 20, 2021, AS EXCEPTIONAL EVENT

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319.[1] In 2016, the EPA finalized revisions to the EER.[2] The 2007 EER and 2016 revisions added 40 CFR §50.1(j)-(r); §50.14; and §51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, procedural requirements, and requirements for air agency demonstrations, all of which must be met before the EPA can concur with a demonstration requesting exclusion of event-influenced air quality data from the data set used in determinations by the Administrator with respect to exceedances or violations of the national ambient air quality standards (NAAQS).

Under 40 CFR §50.14(c)(3)(iv), the air agency demonstration requesting exclusion of event-influenced data 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.[3]

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

1. Submission of an Initial Notification of Potential Exceptional Event and qualifying, or "flagging" 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

[1] 72 FR 13560 (May 21, 2007).
[2] 81 FR 68216 (Oct. 3, 2016).
[3] 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."

3. Implementation of any relevant mitigation requirements as described in 40 CFR §51.930.

Also, for data influenced by exceptional events to be used in initial area designations, the submitting air agency must meet the initial notification and demonstration submission deadlines specified in Table 2 to 40 CFR §50.14.

The EPA expects that the documentation and analyses that air agencies include in their demonstrations will vary consistent with the event characteristics, the relationship to the monitor where the exceedance or violation occurred, and the complexity of the airshed, among other points. The EPA reviews exceptional events demonstrations on a case-by-case basis using a weight of evidence approach considering the specifics of the individual event.

Narrative Conceptual Model

The EPA expects that a narrative conceptual model of the event will describe and summarize the event in question and provide context for analyzing the required statutory and regulatory technical criteria. Air agencies may support the narrative conceptual model with summary tables or maps. For prescribed fire on wildland events that influence fine particulate matter ($PM_{2.5}$) concentrations, the narrative conceptual model should discuss how emissions from a prescribed fire (or group of prescribed fires) caused exceedances or violations at a particular location and how these event-related emissions and resulting exceedances or violations differ from typical high episodes in the area. The narrative conceptual model should include a brief description of the intended objective for the prescribed fire on wildland and should address whether the prescribed fire was conducted in compliance with either a state-certified smoke management program (SMP) or basic smoke management practices (BSMPs). The narrative conceptual model should also identify whether the prescribed fire followed an established natural fire return interval or was conducted to conform with a fire return interval established in accordance with a multi-year land or resource management plan.

Clear Causal Relationship and Supporting Analyses

The EPA uses a weight-of-evidence approach when evaluating submitted demonstrations to determine whether there is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area. For prescribed fire on wildland $PM_{2.5}$ events, air agencies should support the clear causal relationship, at a minimum, with a comparison of the data requested for exclusion with historical concentrations at the air quality monitor. In addition to comparing event-related concentrations with historical concentrations, air agencies should further support the clear causal relationship criterion by demonstrating that emissions from the prescribed fire on wildland were transported to the monitor (*i.e.*, that the emissions were transported to the area and reached down to the level of the monitor), demonstrating that the emissions from the fire(s) influenced the monitored concentrations, and, in some cases, quantifying the contribution of the fire emissions to the monitored exceedance or violation.

For wildland prescribed fire $PM_{2.5}$ events, the EPA has drafted an informational document, "$PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document"[4] that provides three tiers of analyses that apply to the "clear causal relationship" criterion within an air agency's exceptional events demonstration. The EPA has also issued "Exceptional Events Guidance: Prescribed Fire on Wildland that May Influence Ozone and Particulate Matter Concentrations" (issued in 2019, hereafter referred to as the Prescribed Fire Guidance).[5] The tiered approach recognizes that some prescribed fire events may be clearer and, therefore, require relatively fewer pieces of evidence to satisfy the rule requirements. If a $PM_{2.5}$ prescribed fire event satisfies the key factors for either Tier 1 or Tier 2 clear causal analyses, then the Agency generally expects that those analyses would be sufficient to support the clear causal relationship criterion within an air agency's demonstration for that particular event. Other $PM_{2.5}$ prescribed fire events will be considered based on Tier 3 analyses.

- Tier 1: Tier 1 clear causal analyses are intended for wildland fire events that cause unambiguous $PM_{2.5}$ impacts well above historical 24-hour concentrations, thus requiring fewer pieces of evidence to establish a clear causal relationship.
- Tier 2: Tier 2 clear causal analyses are likely appropriate when the impacts of the wildland fire on $PM_{2.5}$ concentrations are less distinguishable from historical 24-hour concentrations, and require more pieces of evidence, than Tier 1 analyses.
- Tier 3: Tier 3 clear causal analyses should be used for events in which the relationship between the wildland fire and $PM_{2.5}$ 24-hour concentrations are more complicated than a Tier 2 analysis, when 24-hour $PM_{2.5}$ concentrations are near or within the range of historical concentrations, and thus require more pieces of evidence to establish the clear causal relationship than Tier 2 or Tier 1.

Not Reasonably Controllable or Preventable

According to the CAA and the EER, an exceptional event must be "not reasonably controllable or preventable." The preamble to the Exceptional Events Rule clarifies that the EPA interprets this requirement to contain two factors: the event must be both not reasonably controllable and not reasonably preventable at the time the event occurred. The controllability prong can be satisfied if (1) the prescribed fire was conducted under an adopted and implemented certified SMP, or (2) the prescribed fire was conducted with appropriate BSMPs. The state must either certify to the Administrator that it has adopted and is implementing a SMP at the time of the burn, or the state must demonstrate that the burn manager employed appropriate BSMPs.[6] An air agency can satisfy the preventability prong by describing the benefits that would have been foregone if the prescribed fire were not conducted.[7] In addressing "foregone benefits,"

[4] The $PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document will be available, when finalized at https://www.epa.gov/air-quality-analysis/final-2016-exceptional-events-rule-supporting-guidance-documents-updated-faqs

[5] The EPA's August 2019 Prescribed Fire Guidance is available at https://www.epa.gov/sites/default/files/2019-08/documents/ee_prescribed_fire_final_guidance_-_august_2019.pdf.

[6] *See* 40 CFR 50.14(b)(3)(ii)(A) and (B).

[7] *See* 81 FR at 68253, Table 4 (October 3, 2016).

the air agency can rely on a multi-year land or resource management plan for a wildland area with a stated objective to establish, restore and/or maintain a sustainable and resilient wildland ecosystem and/or to preserve endangered or threatened species through a program of prescribed fire.[8] Air agencies can either include a copy of the plan or an internet link to the plan in the demonstration with adequate information to ensure the EPA and the public can access the plan.[9] This documentation may be similar to evidence supporting that the prescribed fire was human activity unlikely to recur.

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" (emphasis added). Prescribed fires are not considered natural events, and therefore must satisfy the "human activity unlikely to recur at a particular location." The general benchmark for recurrence (*i.e.*, three events in 3 years) for most "human activities that are unlikely to recur" does not apply to prescribed fires, and in some situations prescribed fires happening more frequently than three times in 3 years can be considered unlikely to recur.[10] Rather than using this general benchmark for prescribed fire on wildland, the EER states that recurrence for prescribed fires is defined by either "the natural fire return interval or the prescribed fire frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem contained in a multi-year land or resource management plan with a stated objective to establish, restore and/or maintain a sustainable and resilient wildland ecosystem and/or to preserve endangered or threatened species through a program of prescribed fire."[11] Thus, the recurrence frequency for prescribed fire is specific to the ecosystem and resource needs of the affected area.

OVERVIEW OF EVENT

On September 19, 2023, California Air Resources Board (CARB) and Northern Sierra Air Quality Management District (NSAQMD) submitted an Initial Notification of Potential Exceptional Event for an exceedance of the 2012 annual $PM_{2.5}$ NAAQS that occurred at the Grass Valley monitoring site (Air Quality System Site ID 06-057-0005) on April 20, 2021. The Grass Valley monitor is in Nevada County, California, which is classified as unclassifiable/attainment for the 2012 annual $PM_{2.5}$ NAAQS. The EPA determined at the time of submission of the initial notification that data exclusion of this event did not, and still does not, have regulatory significance for a specific action under that NAAQS. However, because no air agency has prepared and submitted a demonstration for a wildland prescribed fire smoke event for the EPA to review since the Agency finalized regulatory provisions for prescribed fires on wildland in the 2016 Exceptional Events Rule revisions, CARB, NSAQMD, and the EPA jointly agreed there was compelling interest in developing a demonstration for a prescribed fire on wildland event.

[8] *See* 40 CFR 50.14(b)(ii)(C).
[9] *See* 81 FR at 68250 (October 3, 2016).
[10] *See* 81 FR 68216, 68255.
[11] 40 CFR 50.14(b)(3)(iii). "Historically documented" or "known seasonal" events include events of the same type and pollutant (*e.g.*, high wind dust/ PM or wildfire/O_3) that recur every year, either seasonally or throughout the year.

The purpose of the demonstration is to both provide an example for air and land management agencies of such a demonstration and to help identify (and address) challenges for agencies in the demonstration preparation process, for both the current and 2024 revised annual $PM_{2.5}$ NAAQS. As such, CARB and NSAQMD submitted this demonstration to the EPA for review under the case-by-case provision in 40 CFR 50.14(a)(1)(i)(F).

On January 12, 2024, CARB submitted an exceptional events demonstration for an exceedance of the 2012 annual $PM_{2.5}$ NAAQS that occurred at the Grass Valley monitoring site within Nevada County, California on April 20, 2021. Table 1 summarizes this exceedance.

The demonstration[12] states that the exceedance measured on April 20, 2021, was from smoke from a prescribed fire on wildland that transported overnight to the Grass Valley area in Nevada County, California and impacted the Grass Valley-Litton Building $PM_{2.5}$ monitor (Grass Valley monitor or monitoring site) operated by NSAQMD early the following morning causing the exceedance of the 2012 annual $PM_{2.5}$ NAAQS on April 20, 2021. On April 19, 2021, the Tahoe National Forest (TNF) unit of the U.S. Forest Service (USFS) conducted a prescribed fire as part of the Deadwood Vegetation Management and Fuels Reduction Project (Deadwood Project) in Placer County, California.

Table 1: 2012 Annual $PM_{2.5}$ Exceedance Summary

Exceedance Date	**Monitor/Site Name**	**AQS ID**	***Concentration (ug/m^3)***
April 20, 2021	Grass Valley	*06-057-0005*	15.8

Narrative Conceptual Model

The demonstration provided a narrative conceptual model to describe how emissions from prescribed fires as part of the Deadwood Project caused $PM_{2.5}$ exceedances at the Grass Valley monitoring site within Nevada County, California on April 20, 2021. The narrative conceptual model in the submitted demonstration discusses how the smoke from the April 19, 2021, Deadwood Project prescribed fire, which was needed to achieve land management objectives consistent with the requirements in the EER, was transported to the Grass Valley area overnight due to local meteorological patterns and topography influences and caused an exceedance of the 2012 annual $PM_{2.5}$ NAAQS at the Grass Valley monitor between 1:00 a.m. and 10:00 a.m. PST on April 20, 2021. Efforts to mitigate impacts of the prescribed fire emissions on public health included public notification and education (*i.e.*, social media alerts as well as news releases to local air quality districts and local media representatives), as well as smoke mitigation measures required by the SMP (*e.g.*, evaluation of burn alternatives).

[12] A team with representatives from EPA, CARB, NSAQMD, Placer County Air Pollution Control District and the U.S. Forest Service collected and compiled supporting documentation and prepared this demonstration.

Table 2: Documentation of Narrative Conceptual Model

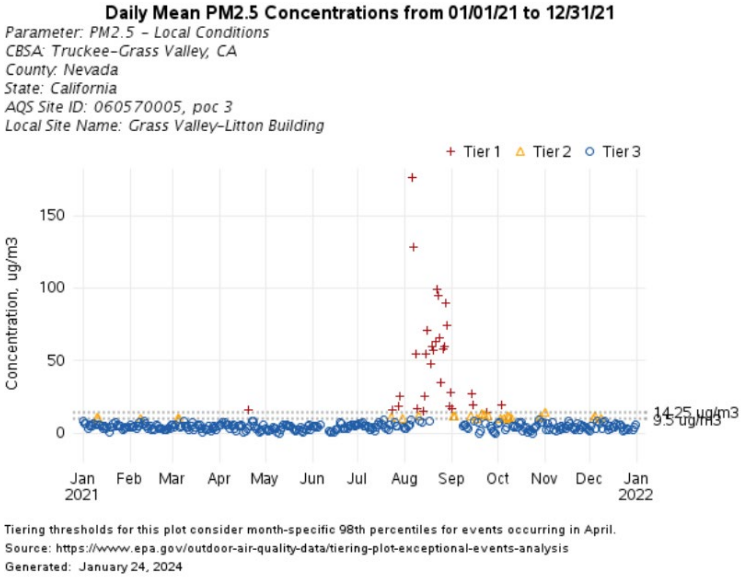
Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
April 20, 2021	Section 2: p 12-15	Sufficient	Yes

Clear Causal Relationship

The EPA ran the Tiering Plot[13] for the event day and air monitor in the Grass Valley area. The tool identified the exceedance day, April 20, 2021, as a Tier 1 event for the $PM_{2.5}$ NAAQS. Figure 1 highlights the tool's plots for the year 2021. According to the $PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document, Tier 1 analyses for the clear causal relationship are likely appropriate for wildland fire events that cause extreme $PM_{2.5}$ impacts resulting in 24-hour average concentrations well-above historical concentrations, thus requiring less evidence than less extreme events. As such, the evidence suggested to meet the clear causal relationship should include a comparison of the fire-influenced exceedance with historical concentrations, by providing two data plots appropriate to the chosen tiering threshold calculation methodology (*i.e.*, request concurrence or "R" qualified data removed; R and informational or "I" qualified data removed) and evidence of transport of fire-related emissions from the fire to the affected monitor (one of these): (1) trajectories linking the fire with the monitor (forward and backward), (2) consideration of the height of trajectories, or (3) satellite evidence in combination with surface measurements.

[13] This tool displays daily $PM_{2.5}$ concentrations, along with tier levels based on the methodology described in the $PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document. The tool is available at: https://www.epa.gov/air-quality-analysis/tiering-plot-exceptional-events-analysis

Figure 1: EPA Tiering Plot for Exceptional Analysis



The demonstration includes a comparison to historical data, as required by 40 CFR §50.14(c)(3)(iv)(C), that shows the event concentration of 15.8 µg/m^3 is the highest recorded springtime concentration measured at the site in the 2018-2022 timeframe, is well over the 99th percentile concentration value for the springtime and is approximately 1.4 times larger than the next highest springtime concentration. Further, the demonstration shows, through analysis of satellite observations, HYSPLIT trajectory modeling, and analysis of hourly $PM_{2.5}$ data, that emissions were transported to the monitor and caused the exceedance of the 2012 annual $PM_{2.5}$ NAAQS at the Grass Valley monitor, thus demonstrating a clear causal relationship between the event and exceedance as required by 40 CFR §50.14(c)(3)(iv)(B).

Specifically, the demonstration included plots of the 24-hour $PM_{2.5}$ concentrations for all data in the years 2018-2022 and a comparison of the event day to the historical data (data are presented in Figures 7, 8 and 9). Considered together, these plots compare the event-related exceedance with historical concentrations. A summary table (Table 4 in the demonstration) provides the rank and percentile for the event concentration during the 1-year and 5-year periods. Table 5 in the demonstration shows the monthly statistics for the $PM_{2.5}$ concentrations at this monitoring site for 2018 through 2022 and in March through June the only flagged exceeded is in April due to the exceptional event.

Figures 9 and 10 of the demonstration depict satellite MODIS/Terra Reflectance visual images from April 19, 2021, and April 20, 2021, and provide visual evidence of the smoke plumes coming from the Deadwood Project April 19 and 20 prescribed fires. Additionally, Figure 12 in the demonstration shows the back trajectories that pass over the Deadwood Project and provide strong evidence that residual smoke from the two units that were burned on April 19, 2021, likely transported to the Grass Valley monitor. Also, Figure 13 in the demonstration

displays the hourly data for all April days in 2018-2022 and the morning of April 20, 2021, had much higher hourly $PM_{2.5}$ concentrations than any other April day for those years.

The analysis included in the demonstration sufficiently demonstrates a clear causal relationship between the emissions generated by the Deadwood Project prescribed fires and the exceedances measured at the Grass valley monitoring site.

Table 3: Documentation of the Clear Causal Relationship

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
April 20, 2021	Section 3: p 16-25	Sufficient	Yes

Not Reasonably Controllable or Preventable

As previously indicated in this technical support document, a demonstration for a prescribed fire on wildland must show that an event was both not reasonably controllable and not reasonably preventable. The demonstration provides evidence that the wildland prescribed fire was conducted under the California SMP (an adopted and implemented state-certified SMP), thus satisfying the not reasonably controllable prong.

To address the not reasonably preventable prong, the demonstration described the benefits that would have been foregone if the fire were not conducted. Specifically, the Tahoe National Forest Land Management Plan and its amendments identify that without prescribed burning the Deadwood Project area's tree stands and underbrush would continue to become increasingly dense and homogeneous making the area more susceptible to insect disturbance and tree mortality and less desirable to biodiversity and certain sensitive species (*e.g.*, California red legged frog, California spotted owl, etc.).

Based on the documentation provided, the demonstration sufficiently demonstrates that the event was both not reasonably controllable and not reasonably preventable.

Table 4: Documentation of Not Reasonably Controllable or Preventable

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
April 20, 2021	Section 5: p. 29-32	Sufficient	Yes

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

Prescribed fires and their emissions are events caused by human activity and must, therefore, address the "human activity unlikely to recur at a particular location" criterion by describing the actual burn frequency and showing that this frequency is consistent with either the natural fire return interval or the frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem. The demonstration indicates that, while the natural fire return interval is difficult to ascertain because of historical logging and fire suppression over the past

century, the natural fire return interval for regional ponderosa pine and mixed conifer forests is estimated to be between 8-22 years.

The demonstration then refers to the Tahoe National Forest Land Management Plan with amendments and additional land management documents for the Deadwood Project and discusses employing a combination of mechanical treatment within the Deadwood units within the past 10-12 years and prescribed burns to achieve land management objectives. Thus, the demonstration addresses the human activity unlikely to recur criterion as required by 40 CFR §50.14(c)(3)(iv)(E) by establishing that the prescribed fire was conducted consistent with the prescribed fire frequency needed to establish, restore, and/or maintain a sustainable and resilient wildland ecosystem as supported by land management plans and prescribed fire documentation.

Table 5: Documentation of Event Caused by Human Activity that is Unlikely to Recur

Exceedance Date	**Demonstration Citation**	**Quality of Evidence**	**Criterion Met?**
April 20, 2021	Section 4: p 26-28	Sufficient	Yes

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 6 outlines EPA's evaluation of these requirements.

Table 6: Schedules and Procedural Criteria

Procedural Criterion	**Reference**	**Demonstration Citation**	**Criterion Met?**
Did the agency provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section 2: p 14-15; Appendix B	Yes
Did the agency submit an Initial Notification of Potential Exceptional Event and flag the affected data in the EPA's Air Quality System (AQS)?	40 CFR §50.14 (c)(2)(i)	Appendix A: p. 36	Yes
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations, if applicable? Or the deadlines established by EPA during the Initial Notification of	40 CFR §50.14 Table 2 40 CFR §50.14 (c)(2)(i)(B)	September 19, 2023, Letter	Yes

Procedural Criterion	Reference	Demonstration Citation	Criterion Met?
Potential Exceptional Events process, if applicable?			
Was the public comment process followed and documented? • Did the agency document that the comment period was open for a minimum of 30 days? • Did the agency submit to EPA any public comments received? • Did the state address comments disputing or contradicting factual evidence provided in the demonstration?	40 CFR §50.14 (c)(3)(v)	Section 6: p. 33	Yes
Has the agency met requirements regarding submission of a mitigation plan, if applicable?	40 CFR §51.930 (b)	Not Applicable	Not Applicable

Conclusion

The EPA has reviewed the documentation to support claims that smoke from wildland prescribed fires in Placer County, California caused exceedances of the 2012 annual $PM_{2.5}$ NAAQS at the Grass Valley monitoring site on April 20, 2021. The EPA has determined that the flagged exceedances at this monitoring site on April 20, 2021, meet the definition of an exceptional event: the event affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedance, was not reasonably controllable or preventable, and meets the definition of a natural event or an event caused by human activity that is unlikely to recur. The EPA has also determined that the NSAQMD has satisfied the schedule and procedural requirements for data exclusion. Therefore, the EPA concurs on the demonstration under the authority under 40 CFR §50.14(a)(1)(i)(F), other actions on a case-by-case basis as determined by the Administrator. While data exclusion associated with this event does not have regulatory significance for a specific action for the 2012 annual $PM_{2.5}$ NAAQS, the EPA concurs on this demonstration to provide an example for future events associated with prescribed fires on wildland that may have regulatory significance for other NAAQS.