

EXCEPTIONAL EVENTS RULE REQUIREMENTS

EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. The EER added 40 CFR §50.1(j), (k) and (l); §50.14; and §51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements, and requirements for air agency demonstrations, all of which must be met before EPA can concur under the EER on the exclusion of air quality data from regulatory decisions.

Under 40 CFR §50.14(c)(3)(iv), the air agency demonstration to justify exclusion of data must provide evidence that:

- A. “The event satisfies the criteria set forth in 40 CFR §50.1(j)” for the definition of an exceptional event;
 - The event “affects air quality.”
 - The event “is not reasonably controllable or preventable.”
 - The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”¹
- B. “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;”
- C. “The event is associated with a measured concentration in excess of normal historical fluctuations, including background;” and
- D. “There would have been no exceedance or violation but for the event.”

Not Reasonably Controllable or Preventable (nRCP)

EPA evaluates whether an event was not reasonably controllable or preventable at the time of the event by taking into account controls in place and wind speed, along with other factors.² For *natural* sources of dust, a high wind dust event can generally be considered to be not reasonably controllable or preventable if winds are high enough to cause emissions from natural undisturbed areas. For *anthropogenic* sources of dust, a high wind dust event is also eligible to be considered to be not reasonably controllable or preventable if:

1. The anthropogenic sources of dust have reasonable controls in place,
2. The reasonable controls have been effectively implemented and enforced, and
3. The wind speed was high enough to overwhelm the reasonable controls.

Historical Fluctuations (HF)

EPA evaluates whether a measured exceedance is in excess of historical fluctuation by taking into account the level of the exceedance in relation to historical data, which is typically 3 to 5 years.

¹A natural event is further described in 40 CFR 50.1(k) as “an event in which human activity plays little or no direct causal role.”

²See e.g., Affirmation of Attainment of PM-10 NAAQS for the San Joaquin Valley Nonattainment Area, 73 FR 14691 (March 19, 2008).

Clear Causal Relationship (CCR)

EPA considers a variety of evidence when evaluating 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. Demonstrations typically include documentation showing that the event in fact occurred and that emissions related to the event were transported in the direction of the monitor(s) where elevated concentrations measurements were recorded; the size of the area affected by the transported emissions; the relationship in time between the event, transport of emissions, and recorded concentrations; and, as appropriate, pollutant species-specific information supporting a causal relationship between the event and the measured concentration.

Affects Air Quality (AAQ)

Generally, EPA will consider events to have affected air quality if the CCR and HF requirements have been adequately demonstrated.

Natural Event

Generally, EPA will consider a high wind dust event to be a natural event in cases where windblown dust is entirely from natural sources or where all significant anthropogenic sources of windblown dust have been reasonably controlled.³ This typically involves adequately demonstrating both the nRCP and CCR requirements.

No Exceedance or Violation But For the Event (NEBF)

Generally, for high wind dust events, the NEBF demonstration is similar to and informed by the demonstration of the nRCP and CCR requirements, and is expected to show that the measured concentration would have been below the applicable NAAQS without the effect of the event.

OVERVIEW OF EVENTS

On January 28, 2013, Arizona Department of Environmental Quality (ADEQ) submitted nine exceptional events demonstrations for 65 exceedances of the 24-hour PM₁₀ standard that occurred at several monitoring stations within the Phoenix PM₁₀ nonattainment area on the following days: February 19, July 18, August 3, August 18, August 25-28, September 2, October 4, November 4, 2011 and February 27, 2012. Table 1 summarizes these exceedances.

³The EPA will generally consider human activity to have played little or no *direct* role in causing emissions of the dust generated by high wind for purposes of the regulatory definition of “natural event” if contributing anthropogenic sources of the dust are reasonably controlled, regardless of the amount of dust coming from these reasonably controlled anthropogenic sources, and thus the event could be considered a natural event. In such cases, the EPA believes that it would generally be a reasonable interpretation of its regulations to find that the anthropogenic source had “little” direct causal role. If anthropogenic sources of windblown dust that are reasonably controllable but that did not have those reasonable controls applied at the time of the high wind event have contributed significantly to a measured concentration, the event would not be considered a natural event. See preamble to the EER at 72 FR 13566, f.n. 11.

Generally, ADEQ states that the exceedances measured on July 18, August 3, August 18, August 25-28, and September 2, 2011 were associated with “monsoonal thunderstorm activity” and “thunderstorm-driven high winds,” while the exceedances measured on February 19, October 4, November 4, 2011, and February 27, 2012 were associated with the passage of “low pressure systems” or “strong Pacific cold fronts.” ADEQ provided a comprehensive description and discussion of each of these events in the respective demonstrations.⁴

Table 1: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
February 19, 2011	West Chandler	04-013-4004-1	168
July 18, 2011	Buckeye	04-013-4011-1	196
	Central Phoenix	04-013-3002-4	210
	Durango Complex	04-013-9812-1	267
	Dysart	04-013-4010-1	163
	Greenwood	04-013-3010-1	208
	South Phoenix	04-013-4003-1	303
	West 43 rd	04-013-4009-1	159
	West Phoenix	04-013-0019-1	244
August 3, 2011	West Chandler	04-013-4004-1	249
August 18, 2011	Buckeye	04-013-4011-1	296
	Central Phoenix	04-013-3002-4	232
	South Phoenix	04-013-4003-1	179
	West Chandler	04-013-4004-1	186
August 25, 2011	Buckeye	04-013-4011-1	235
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	436
	Dysart	04-013-4010-1	273
	Glendale	04-013-2001-1	240
	Buckeye	04-013-4011-1	388
	JLG Supersite	04-013-9997-3	227
	JLG Supersite	04-013-9997-4	228
	South Phoenix	04-013-4003-1	308
	West 43 rd	04-013-4009-1	369
	West Chandler	04-013-4004-1	278
	West Phoenix	04-013-0019-1	212
	Zuni Hills	04-013-4016-1	212
August 26, 2011	Apache Junction	04-021-3002-1	169
August 27, 2011	Buckeye	04-013-4011-1	225
	Central Phoenix	04-013-3002-4	233
	Durango Complex	04-013-9812-1	261
	Glendale	04-013-2001-1	219
	Greenwood	04-013-3010-1	207
	South Phoenix	04-013-4003-1	301
	West 43 rd	04-013-4009-1	292
	West Chandler	04-013-4004-1	228
	West Phoenix	04-013-0019-1	164
August 28, 2011	Apache Junction	04-021-3002-1	283
	Higley	04-013-4006-1	175

⁴ADEQ also submitted an exceptional events demonstration for exceedances of the 24-hour PM₁₀ standard that occurred on January 21-22, 2012 within the Phoenix PM₁₀ nonattainment area and an exceedance measured in Yuma, AZ on July 3, 2011. At this time, EPA is not acting on the January 21-22, 2012 or the July 3, 2011 Yuma, AZ demonstrations.

Table 1: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m³)
September 2, 2011	Apache Junction	04-021-3002-1	217
	Buckeye	04-013-4011-1	169
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	225
	Greenwood	04-013-3010-1	198
	Higley	04-013-4006-1	213
	JLG Supersite	04-013-9997-4	208
	South Phoenix	04-013-4003-1	339
	West 43 rd	04-013-4009-1	219
	West Chandler	04-013-4004-1	387
October 4, 2011	Higley	04-013-4006-1	158
	West Chandler	04-013-4004-1	251
November 4, 2011	Apache Junction	04-021-3002-1	225
	Buckeye	04-013-4011-1	284
	Central Phoenix	04-013-3002-4	223
	Durango Complex	04-013-9812-1	251
	Dysart	04-013-4010-1	224
	Glendale	04-013-2001-1	229
	Greenwood	04-013-3010-1	231
	Higley	04-013-4006-1	258
	JLG Supersite	04-013-9997-3	200
	JLG Supersite	04-013-9997-4	199
	North Phoenix	04-013-1004-1	186
	North Phoenix	04-013-1004-2	186
	South Phoenix	04-013-4003-1	231
	West 43 rd	04-013-4009-1	242
	West Chandler	04-013-4004-1	670
	West Phoenix	04-013-0019-1	279
Zuni Hills	04-013-4016-1	258	
February 27, 2012	West 43 rd	04-013-4009-1	167

FEBRUARY 19, 2011

Table 2: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
February 19, 2011	West Chandler	04-013-4004-1	168

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM₁₀ nonattainment area and Pinal County. For example, maximum sustained wind speeds of 33 mph with gusts of 52 mph, 33 mph with gusts of 43 mph, and 31 mph with gusts of 44 mph were measured at Chandler Municipal Airport, Williams Gateway Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the pre-frontal storm winds generated and transported high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the nonattainment area. Sustained winds over 30 mph and gusts over 50 mph easily overwhelmed all available efforts to limit PM₁₀ concentrations from the event. The fact that this was a natural event involving pre-frontal storm winds that generated and transported PM₁₀ emissions in Maricopa County provided strong evidence that the exceedance on February 19, 2011 recorded at the West Chandler monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 3: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section IV: p. 17-23, Section V: p. 24-41	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ 24-hour averages and PM₁₀ daily maximum hourly averages in Figures 3-1 and 3-2 of the demonstration, respectively. ADEQ also stated that these figures “indicate that the PM₁₀ concentrations seen at the West Chandler monitor on February 19, 2011 were in excess of normal historical fluctuations.” ADEQ's analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on February 19, 2011 were in excess of normal historical fluctuations.

Table 4: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section III: p. 15-16	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ's demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate information, and surface weather maps for the event for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on February 19, 2011 and a time series graph for the event that included hourly PM₁₀ concentrations for monitors in the Phoenix PM₁₀ nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM₁₀ concentrations, sustained wind speeds, wind gusts, wind direction, precipitation, and visibility to track the transport of PM₁₀ throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time. The timing of the event is consistent with the issuance of a National Weather Service (NWS) Wind Advisory for the period of 11:00 AM to 2:00 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), haze (HZ), and dust (DU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: http://www.phoenixvis.net/videos/mpeg4/SOMT_02192011.mp4
- Superstition Mountains: http://www.phoenixvis.net/videos/mpeg4/SUPM_02192011.mp4
- Camelback Mountains: http://www.phoenixvis.net/videos/mpeg4/CAME_02192011.mp4

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust generated and transported by the pre-frontal storm winds and the exceedance at the West Chandler monitor.” ADEQ further stated that “the particular wind magnitudes and wind direction, the proximity of the exceeding monitor to open and desert areas of Pinal County, and the delay in the storm precipitation reaching the areas around the exceeding monitor provide solid evidence as to why only one monitor within the Maricopa County nonattainment area recorded an exceedance.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, GIS maps, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility, blowing dust, haze, and dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from pre-frontal storm winds and the exceedance measured at the West Chandler monitor. Furthermore, while exceedances occurring at only

one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through 5-10) indicates that a shift in wind direction from the southwest to west, the spatial extent of precipitation throughout the Phoenix PM₁₀ nonattainment area, and stronger wind speeds in the eastern portion of the nonattainment area are likely responsible for the isolated exceedance at the West Chandler monitoring station.

Table 5: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section II: p.4-14, Section V: p. 24-41, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstration for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 6: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VII: p. 44	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause this exceedance was emissions of PM₁₀ caused by pre-frontal storm winds on February 19, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 7: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VII: p. 44	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding both the nRCP and CCR requirements and also included a time series graph that included hourly PM₁₀, hourly, wind speeds, and wind gusts showing that PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedance on February 19, 2011 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the pre-frontal storm winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 8: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VI: p. 42-43	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 9 outlines EPA’s evaluation of these requirements.

Table 9: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1, App. A	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ⁵	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p.2, App. C	Yes

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by pre-frontal storm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 2 on February 19, 2011. EPA has determined that the flagged exceedances at this location on this day meet the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the pre-frontal storm provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedance, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

⁵See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

JULY 18, 2011

Table 10: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
July 18, 2011	Buckeye	04-013-4011-1	196
	Central Phoenix	04-013-3002-4	210
	Durango Complex	04-013-9812-1	267
	Dysart	04-013-4010-1	163
	Greenwood	04-013-3010-1	208
	South Phoenix	04-013-4003-1	303
	West 43 rd	04-013-4009-1	159
	West Phoenix	04-013-0019-1	244

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that, sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 25 mph with gusts of 37 mph and 29 mph with gusts of 38 mph were measured at Phoenix Sky Harbor International Airport and Casa Grande Municipal Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM₁₀ nonattainment area, specifically at Williams Gateway Airport, Chandler Municipal Airport, Glendale Municipal Airport, and Luke Air Force Base Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs and a few localized, low-impact violations of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Strong thunderstorm outflows with sustained winds typically ranging from 20-30 mph, and even greater nearest the source regions, were enough to overwhelm all available efforts to limit PM₁₀ concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM₁₀ emissions into Maricopa County, with a majority of the PM₁₀ emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provided strong evidence that the events and exceedances of July 18, 2011, recorded within the Phoenix PM₁₀ nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area

were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event is not reasonably controllable or preventable.

Table 11: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section IV: p.18-24, Section V: p.25-33	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ daily maximum hourly averages and PM₁₀ 24-hour averages. ADEQ also stated that these figures show that “the event that occurred on July 18, 2011 resulted in one of the top ten highest 24-hour average PM₁₀ concentrations seen in the last five years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on July 18, 2011 were in excess of normal historical fluctuations.

Table 12: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section III: p. 14-17, App. A	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on July 18, 2011 and a time series graph for the event that included hourly PM₁₀ concentrations from monitors in the Phoenix PM₁₀ nonattainment area.

Section V of the demonstration included satellite imagery, a time series graph for the event that included hourly PM₁₀ concentrations from monitors in the Phoenix PM₁₀ nonattainment area, visibility, and sustained wind speed from Phoenix Sky Harbor International Airport, and a time series graph that included PM₁₀ concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Also, a time-lapse video of the event was included and can be found at the following location:

- South Mountain: www.phoenixvis.net/videos/mpeg4/SOMT_07182011.mp4

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on July 18, 2011 at 3:00 PM (central deserts) and 5:00 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 3:00 PM to 6:45 PM, NWS Significant Weather Advisory for the period of 2:38 PM to 7:15 PM, and a NWS Dust Storm Warning for the period of 2:30 PM to 7:00 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS).

ADEQ stated that the evidence presented shows a “clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the satellite images, time series graphs, and meteorological data tables provided in this section show the temporal progression of the dust events from the development of the thunderstorms, to the increase in wind speeds, and to the rise in PM₁₀ concentrations. The combination of the PM₁₀ and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM₁₀ nonattainment area. This information supports the conclusion that the events were primarily drawing from emission sources outside of Maricopa County and were being transported into the Phoenix area.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, thunderstorms, blowing dust, haze and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the monitors identified in Table 10 of this document.

Table 13: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section II: p 4-13, Section V: p. 25-33, App. D	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 14: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section VII: p.35	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the events shown to cause these exceedances were emissions of PM₁₀ driven by high winds caused by thunderstorm activity and related outflow boundaries on July 18, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 15: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section VII: p.35	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provided no alternative that could tie the exceedances of July 18, 2011, to any other causal source but transported and re-entrained PM₁₀ generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” Also, PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS, providing further support of ADEQ’s conclusion. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 16: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section VI: p. 34	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 17 outlines EPA’s evaluation of these requirements.

Table 17: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1 App. B	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ⁶	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p.2 App. D	Yes

⁶See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 10 on July 18, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

August 3, 2011

Table 18: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
August 3, 2011	West Chandler	04-013-4004-1	249

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 20 mph. For example, maximum sustained wind speeds of 22 mph with maximum gusts of 25 mph were measured at Williams Gateway Airport, while sustained wind speeds of 20 mph were measured at other locations in Maricopa and Pinal Counties. For example, sustained wind speeds of 20 mph with gusts of 32 mph, 20 mph with gusts of 26, and 20 mph with gusts of 29 mph were measured at the Pinal County Housing, Higley, and West Chandler monitoring stations, respectively.

Due to the timing of the event, data from NWS stations that ADEQ typically uses in exceptional event demonstrations were not available. Some locations did not begin reporting meteorological measurements until after the event had occurred, which was approximately from 1:00 AM to 3:00 AM at the West Chandler monitor. For example, the Chandler Municipal Airport station began reporting meteorological measurement at 5:47 AM, and the Casa Grande Municipal Airport station began reporting measurements at 3:35 AM on August 3, 2011. Despite the lack of data from the early hours of the day, it is nevertheless plausible that higher wind speeds occurred in the source area where the thunderstorm outflows were strongest. ADEQ explains that “it is very likely the thunderstorm outflow generated dust storm developed in the area south of the PCH monitor [in Pinal County], but north of Pima County.”

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the nonattainment area. Strong thunderstorm outflows with gusts over 30 mph, were enough to overwhelm all available efforts to limit PM₁₀ concentrations from the events. The fact that this was a natural event involving strong thunderstorm outflow winds that transported PM₁₀ emissions into Maricopa County from source regions outside of the nonattainment area provided strong evidence that the event and exceedance of August 3, 2011 recorded at the West Chandler monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area, the timing of the event, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 19: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section IV: p. 16-22, Section V: p. 23-41, App. B	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ 24-hour averages and PM₁₀ daily maximum hourly averages in Figures 3-1 and 3-2 of the demonstration, respectively. ADEQ also stated that these figures “indicate that the PM₁₀ concentrations seen at the West Chandler monitor on August 3, 2011 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on August 3, 2011 were in excess of normal historical fluctuations.

Table 20: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section III: p. 14-15	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on August 3, 2011 and a time series graph for the event that included hourly PM₁₀ concentration.

Section V of the demonstration included a detailed and extensive GIS analysis that shows the spatial and temporal representation of the events as they move throughout Maricopa and Pinal Counties. The analysis included PM₁₀ concentrations, sustained wind speeds, wind gusts, wind direction, visibility, and base velocity radar to track the transport of PM₁₀ throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time. The timing of the event is consistent with the issuance of a NWS Dust Storm Warning for the period of 1:00 AM to 2:00 AM, and the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of haze (HZ). While time-lapse videos of the event are not available, ADEQ included a number of visibility images looking northeast towards Camelback Mountain for 12:00 AM, 3:00 AM and 6:00 AM, and stated that “these images provide additional evidence for a clear causal connection between the transported windblown dust from thunderstorm outflow winds with the high PM₁₀ concentrations at monitors throughout the nonattainment area.”

ADEQ stated that the evidence presented “has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the West Chandler monitor.” ADEQ further stated that “the particular wind magnitudes and wind direction, and the proximity of the exceeding monitor to open and desert areas of Pinal County provide solid evidence as to why only one monitor within the Maricopa County nonattainment area recorded an exceedance. It is clear from these data that thunderstorm outflow winds transported uncontrollable windblown PM₁₀ emissions to the West Chandler monitor, demonstrating a clear causal connection between the event and the exceedance.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, GIS maps, visibility images, NWS advisories, and NWS station reports of reduced visibility, and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the West Chandler monitor. Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through 5-12) shows that the isolated spatial extent of the thunderstorm outflow and stronger wind speeds in the eastern portion of the nonattainment area are likely responsible for the isolated exceedance at the West Chandler monitoring station.

Table 21: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section V: p. 23-41, Section II: p. 4-13, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 22: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section VII: p. 44	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause this exceedance was emissions of PM₁₀ driven by high winds caused by thunderstorm activity and related outflow boundaries on August 3, 2011” and that “the events therefore qualifies as natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 23: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section VII: p. 44	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph that included hourly PM₁₀, hourly wind speeds, and wind gusts showing that PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedance on August 3, 2011 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the thunderstorm outflow winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 24: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section VI: p. 42-43	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 25 outlines EPA’s evaluation of these requirements.

Table 25: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ⁷	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p.2 App.C	Yes

⁷See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 18 on August 3, 2011. EPA has determined that the flagged exceedance at this location on this day meets the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, the timing of the event, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedance, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

August 18, 2011

Table 26: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
August 18, 2011	Buckeye	04-013-4011-1	296
	Central Phoenix	04-013-3002-4	232
	South Phoenix	04-013-4003-1	179
	West Chandler	04-013-4004-1	186

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that, sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 32 mph with gusts of 41 mph and 28 mph with gusts of 39 mph were measured at Chandler Municipal Airport and Phoenix Sky Harbor International Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM₁₀ nonattainment area and Pinal County, specifically at Williams Gateway Airport, Glendale Municipal Airport, Luke Air Force Base Airport, Gila Bend Air Field, and Casa Grande Municipal Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high-wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Widespread thunderstorm outflows with sustained winds in excess of 20 mph with gusts over 30 mph were enough to overwhelm all available efforts to limit PM₁₀ concentrations during the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM₁₀ emissions into and across the Phoenix area, with a majority of the PM₁₀ emissions recorded by Phoenix area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provided strong evidence that the exceedances of August 18, 2011 recorded within the Phoenix PM₁₀ nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 27: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section V: p. 1-7, Section III: p. 1-6, App. A, App. B	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ daily maximum hourly averages and PM₁₀ 24-hour averages. ADEQ also stated that these figures show that “the PM₁₀ concentrations...on August 18, 2011 were among the highest 24-hr averages measured over the five-year period” and “the PM₁₀ levels on August 18, 2011, were outside of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on August 18, 2011 were in excess of normal historical fluctuations

Table 28: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section IV: p. 1, App. C	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on August 18, 2011.

Section III and Appendix A of the demonstration included satellite imagery, radar base velocity data for 1806 LST, PM₁₀ and meteorological data for the time period of 6:00 PM to 8:00 PM, and time series graphs that included hourly PM₁₀ concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM₁₀ concentrations from Buckeye, Central Phoenix, South Phoenix, and West Chandler monitors, and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County. Also, time-lapse videos of the event were included in Appendix B of ADEQ’s demonstration and can be found at the following locations:

- South Mountain: www.phoenixvis.net/videos/mpeg4/SOMT_08182011.mp4
- Superstition Mountains: www.phoenixvis.net/videos/mpeg4/SUPM_08182011.mp4
- Camelback Mountains: www.phoenixvis.net/videos/mpeg4/CAME_08182011.mp4

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on August 18, 2011 at 4:00 PM (central deserts), and at 5:00 PM hours (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Dust Storm Warning for the period of 4:45 PM to 8:00 PM and a NWS Severe Thunderstorm Warning for the period of 5:00 PM to 7:00 PM, observed increased PM₁₀ concentrations in the Phoenix area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS).

Again, while not included in the final documentation, it is important to note that hourly PM₁₀ concentrations at the southern monitoring sites (Pinal County Housing, Stanfield, and Casa Grande) in Pinal County began also to dramatically increase at 5:00 PM, while PM₁₀ concentrations at more northern monitoring sites (Cowntown, Combs School, and Maricopa) in the County began to increase at

6:00 PM. Sustained wind speeds above 25 mph that were associated with the increase in PM₁₀ in Pinal County were measured at Casa Grande Municipal Airport at 4:55, 5:15, 6:15, 6:35, and 6:55 PM. These data indicate that PM₁₀ was largely transported from outside of the nonattainment area from thunderstorm outflow winds. ADEQ stated that, “the information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM₁₀ exceedances measured at four Phoenix-area monitors on August 18, 2011.”

The analysis in Sections II, III and Appendix A, specifically, the PM₁₀ time series graph, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, thunderstorms, blowing dust, haze, and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the monitors identified in Table 26 of this document.

Table 29: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section III: p. 1-6, Section V: p. 1-7, App. A, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstration for both the CCR and HF requirements, “we can reasonably conclude the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 30: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VII: p. 1	Sufficient	Yes

Natural Event

ADEQ provided adequate documentation for both the nRCP and CCR requirements and generally stated that, “the PM₁₀ exceedances on August 18, 2011, were shown to be caused by PM₁₀ transported into the Phoenix area by thunderstorm outflow” and that “the event therefore qualifies as a natural event.”

Table 31: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VII: p. 1	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information presented in the documentation that demonstrate both the nRCP and CCR requirements have been met and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedances of August 18, 2011, to any causal source except PM₁₀ transported by thunderstorm outflow, confirming that there would have been no exceedances but for the presence of this uncontrollable natural event.” Also, PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS, providing further support of ADEQ’s conclusion.

Table 32: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VI: p. 1	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 33 outlines EPA’s evaluation of these requirements.

Table 33: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ⁸	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p. 2-3 App. E	Yes

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 26 on August 18, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

⁸See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

AUGUST 25, 2011 – AUGUST 28, 2011

Table 34: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
August 25, 2011	Buckeye	04-013-4011-1	235
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	436
	Dysart	04-013-4010-1	273
	Glendale	04-013-2001-1	240
	Buckeye	04-013-4011-1	388
	JLG Supersite	04-013-9997-3	227
	JLG Supersite	04-013-9997-4	228
	South Phoenix	04-013-4003-1	308
	West 43 rd	04-013-4009-1	369
	West Chandler	04-013-4004-1	278
	West Phoenix	04-013-0019-1	212
	Zuni Hills	04-013-4016-1	212
August 26, 2011	Apache Junction	04-021-3002-1	169
August 27, 2011	Buckeye	04-013-4011-1	225
	Central Phoenix	04-013-3002-4	233
	Durango Complex	04-013-9812-1	261
	Glendale	04-013-2001-1	219
	Greenwood	04-013-3010-1	207
	South Phoenix	04-013-4003-1	301
	West 43 rd	04-013-4009-1	292
	West Chandler	04-013-4004-1	228
	West Phoenix	04-013-0019-1	164
August 28, 2011	Apache Junction	04-021-3002-1	283
	Higley	04-013-4006-1	175

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph, including maximum sustained wind speeds of 26 mph with gusts of 33 mph at Phoenix Sky Harbor International Airport on August 25, 2011, 30 mph at Williams Gateway Airport on August 26, 2011, and 29 mph at Luke Air Force Base Airport on August 27, 2011. Sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM₁₀ nonattainment area throughout the three-day period. ADEQ also asserts that due to the timing of the August 27, 2011 late evening event, the conditions that led to nine exceedances in the Phoenix PM₁₀ nonattainment area on

August 27, 2011, were similarly responsible for the exceedances measured at Higley and Apache Junction on August 28, 2011.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs and a few localized, low-impact violations of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Numerous strong thunderstorm outflows with sustained winds typically ranging from 20-30 mph, and even greater nearest the source regions, were enough to overwhelm all available efforts to limit PM₁₀ concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM₁₀ emissions into Maricopa County, with a majority of the PM₁₀ emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provided strong evidence that the events and exceedances of August 25-28, 2011, recorded within the Phoenix PM₁₀ nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM₁₀ transport described above. For all events, the analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area, the timing of the August 25, 2011 event, and the wind speeds associated with the event sufficiently establishes that these events were not reasonably controllable or preventable.

Table 35: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section IV: p. 22-28, Section V: p. 29-37, p. 63, App. D	Sufficient	Yes
August 26, 2011	Section IV: p. 22-28, Section V: p. 38-46, p. 63, App. D	Sufficient	Yes
August 27, 2011	Section IV: p. 22-28, Section V: p. 47-62, p. 63, App. D	Sufficient	Yes
August 28, 2011	Section IV: p. 22-28, Section V: p. 47-62, p. 63, App. D	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ daily maximum hourly averages and PM₁₀ 24-hour averages. ADEQ also stated that these figures show that for a number of monitors “the highest 24-hour averaged PM₁₀ concentrations measured in the last five years occurred on August 25” and that “the other events in the August 25th-28th period were generally among the top 12 events in the last five years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on August 25 – 28, 2011 were in excess of normal historical fluctuations.

Table 36: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 26, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 27, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 28, 2011	Section III: p. 18-21, App. A	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ's demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of each of the events that occurred in the August 25 – 28, 2011 time period and time series graphs for the events that included hourly PM₁₀ concentrations from monitors within the Phoenix PM₁₀ nonattainment area.

Section V of the demonstration included, for each of the event days, satellite imagery, metrological data from various NWS stations within the Phoenix PM₁₀ nonattainment area and Pinal County, time series graphs for the events that included hourly PM₁₀ concentrations from monitors in the Phoenix PM₁₀ nonattainment area, visibility, and sustained wind speed from Phoenix Sky Harbor International Airport, and a time series graph that included PM₁₀ concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Also, while not available for the August 25, 2011 event, time-lapse videos of the events on August 26, 2011 and August 27, 2011 can be found at the following locations:

- August 26, 2011: http://www.phoenixvis.net/videos/mpeg4/SOMT_08262011.mp4
- August 26, 2011: http://www.phoenixvis.net/videos/mpeg4/SUPM_08262011.mp4
- August 27, 2011: http://www.phoenixvis.net/videos/mpeg4/SOMT_08272011.mp4

The timing of the August 25, 2011 event is consistent with the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of haze (HZ). While not included in the demonstration, it is important to note that NOAA's National Climatic Data Center Storm events database included dust storm observations on August 26, 2011 at 4:15 PM (central deserts) and at 4:30 PM (greater Phoenix area). The timing of these dust storm reports for the August 26, 2011 event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 4:00 PM to 8:00 PM, NWS Dust Storm Warning for the period of 4:00 PM to 6:00 PM, NWS Significant Weather Advisory for the period of 12:52 PM to 6:45 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS). The timing of the August 27, 2011 – August 28, 2011 event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 6:00 PM to 8:00 PM, NWS Dust Storm Warning for the period of 6:00 PM to 8:00 PM, NWS Significant Weather Advisory for the period 6:00 PM to 9:00 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), and haze (HZ).

ADEQ stated that the evidence presented “has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the combination of the PM₁₀ and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM₁₀ nonattainment area.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graphs, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports sufficiently establishes, for each of the events, that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the monitors identified in Table 34 of this document.

Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the time series graphs (Figures 5-5 and 5-6) and NWS meteorological data tables showed that stronger wind speeds in the eastern portion of the nonattainment area that were followed a significant decrease in wind speed and a shift in wind direction from the west-southwest to south-southeast are likely responsible for the isolated exceedance at the Apache Junction monitoring station on August 26, 2011.

Table 37: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section V: p. 29-37, p. 63, App. D	Sufficient	Yes
August 26, 2011	Section V: p. 38-46, p. 63, App. D	Sufficient	Yes
August 27, 2011	Section V: p. 47-62, p. 63, App. D	Sufficient	Yes
August 28, 2011	Section V: p. 47-62, p. 63, App. D	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations, for both the CCR and HF requirements, “we can reasonably conclude the events in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 38: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section VII: p. 65	Sufficient	Yes
August 26, 2011	Section VII: p. 65	Sufficient	Yes
August 27, 2011	Section VII: p. 65	Sufficient	Yes
August 28, 2011	Section VII: p. 65	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the events shown to cause these exceedances were emissions of PM₁₀ driven by high winds caused by thunderstorm activity and related outflow boundaries during the period of August 25-28, 2011” and that “the events therefore qualify as natural events.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 39: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section VII: p. 65	Sufficient	Yes
August 26, 2011	Section VII: p. 65	Sufficient	Yes
August 27, 2011	Section VII: p. 65	Sufficient	Yes
August 28, 2011	Section VII: p. 65	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provided no alternative that could tie the exceedances of August 25-28, 2011 to any other causal source but transported and re-entrained PM₁₀ generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” Also, PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 40: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section VI: p. 64	Sufficient	Yes
August 26, 2011	Section VI: p. 64	Sufficient	Yes
August 27, 2011	Section VI: p. 64	Sufficient	Yes
August 28, 2011	Section VI: p. 64	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 41 outlines EPA’s evaluation of these requirements.

Table 41: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 1 App. B	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p. 1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ⁹	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p. 2 App. D	Yes

⁹See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 34 on August 25, August 26, August 27, and August 28, 2011. EPA has determined that the flagged exceedances at these locations on these days meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that events were not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, the timing of the events, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that these events were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the events and the measured exceedances, there would have been no exceedance but for the events, and the measured exceedances are in excess of normal historical fluctuations.

September 2, 2011

Table 42: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
September 2, 2011	Apache Junction	04-021-3002-1	217
	Buckeye	04-013-4011-1	169
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	225
	Greenwood	04-013-3010-1	198
	Higley	04-013-4006-1	213
	JLG Supersite	04-013-9997-4	208
	South Phoenix	04-013-4003-1	339
	West 43 rd	04-013-4009-1	219
	West Chandler	04-013-4004-1	387

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 28 mph with gusts of 34 mph and 31 mph with gusts of 37 mph were measured at Phoenix Sky Harbor International Airport and Williams Gateway Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at Casa Grande Municipal Airport in Pinal County.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM₁₀ into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Widespread thunderstorm outflows with sustained winds in excess of 20 mph with gusts over 30 mph were enough to overwhelm available efforts to limit PM₁₀ concentrations during the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM₁₀ emissions into and across the Phoenix area, with a majority of the PM₁₀ emissions recorded by Phoenix area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provided strong evidence that the exceedances of September 2, 2011 recorded within the Phoenix PM₁₀ nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to

the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area, the timing of the event, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 43: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section V: p. 1-8, Section III: p. 1-6, App. A, App. B	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ daily maximum hourly averages and PM₁₀ 24-hour averages. ADEQ also explains that these figures show that “the PM₁₀ concentrations measured... on September 2, 2011 resulted in some of the highest 24-hr averages over the five year period” and “PM₁₀ concentrations measured at Phoenix area monitors on September 2, 2011 were... in excess of normal historical fluctuations.” ADEQ's analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on September 2, 2011 were in excess of normal historical fluctuations.

Table 44: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section IV: p. 1, App. C	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on September 2, 2011.

Section III and Appendix A of the demonstration included satellite imagery, a map of the Phoenix area that displays wind speed and direction at peak hours of PM₁₀ during the event, radar base velocity data for 0150 LST, PM₁₀ and meteorological data for the time period of 2:00 AM, and time series graphs that included hourly PM₁₀ concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM₁₀ concentrations from the Buckeye, Central Phoenix, Durango Complex, Greenwood, Higley, JLG supersite, North Phoenix, South Phoenix, West 43rd Avenue, and West Chandler monitors, and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County.

The timing of the September 2, 2011 event is consistent with the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), dust (DU), and haze (HZ). Also, while not included in the final documentation, it is important to note that hourly PM₁₀ concentrations at the southern monitoring sites (Pinal County Housing, Stanfield, and Casa Grande) in Pinal County began also to dramatically increase at 1:00 AM, while PM₁₀ concentrations more northern monitoring sites (Cowtown, Combs School, Maricopa, and Apache Junction) in the County began to increase at 2:00 AM, and sustained wind speeds above 25 mph that were associated with the increase in PM₁₀ in Pinal County were measured at Casa Grande Municipal Airport at 1:15 AM. These data indicate that PM₁₀ was largely transported from outside of the nonattainment area from thunderstorm outflow winds.

ADEQ stated that, “the information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM₁₀ exceedances measured at four Phoenix area monitors on September 2, 2011.” The analysis in Sections II, III and Appendix A, specifically, the PM₁₀ time series graph, winds speed and direction measurements, and NWS station reports of reduced visibility, blowing dust, dust, and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the monitors identified in Table 10 of this document.

Table 45: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section III: p. 1-6, Section VII: p. 2, App. A, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations, “we can reasonably conclude the event in question affected air quality.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 46: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VII: p. 1	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the PM₁₀ exceedances on September 2, 2011, were shown to be caused by transport of PM₁₀ into the Phoenix area from thunderstorm outflow” and that “the event therefore qualifies as a natural event.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 47: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VII: p. 1	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding both the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedances of September 2, 2011, to any causal source except PM₁₀ transported by thunderstorm outflow, confirming that there would have been no exceedances but for the presence of this uncontrollable natural event.” Also, PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ's summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 48: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VI: p. 1	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 49 outlines EPA’s evaluation of these requirements.

Table 49: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ¹⁰	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 1-2 App. E	Yes

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 42 on September 2, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, the timing of the event, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

¹⁰See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

OCTOBER 4, 2011

Table 50: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
October 4, 2011	Higley	04-013-4006-1	158
	West Chandler	04-013-4004-1	251

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM₁₀ nonattainment area and Pinal County. For example, maximum sustained wind speeds of 34 mph with gusts of 46 mph, 30 mph, and 30 mph with gusts of 38 mph were measured at Chandler Municipal Airport, Williams Gateway Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the low pressure system generated and transported high concentrations of PM₁₀ emissions into, and also overwhelmed controls within, the nonattainment area. Sustained winds over 30 mph and gusts over 45 mph easily overwhelmed all available efforts to limit PM₁₀ concentrations from the event. The fact that this was a natural event involving a low pressure storm system that generated and transported PM₁₀ emissions in Maricopa County provided strong evidence that the exceedances on October 4, 2011 recorded at the West Chandler and Higley monitors were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM₁₀ transport described above. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 51: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section IV: p. 19-25, Section V: p. 26-48, App. B	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ 24-hour averages and PM₁₀ daily maximum hourly averages in Figures 3-1 and 3-2, respectively. ADEQ also stated that these figures “indicate that the PM₁₀ concentrations seen at the West Chandler and Higley monitors on October 4, 2011 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on October 4, 2011 were in excess of normal historical fluctuations.

Table 52: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section III: p. 15-18	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate information, surface weather maps for the event, and a NOAA Storm Prediction Center mesoscale discussion figure for the Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on October 4, 2011 and a time series graph for the event that included hourly PM₁₀ concentrations for monitors in the Phoenix PM₁₀ nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM₁₀ concentrations, sustained wind speeds, wind gusts, wind direction, and visibility to track the transport of PM₁₀ throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time.

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on October 4, 2011 at 12:30 PM (south central Pinal County) and 2:00 PM (central deserts). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 1:00 PM to 7:00 PM, NWS Significant Weather Advisory for the period of 9:56 AM to 2:15 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: http://www.phoenixvis.net/videos/mpeg4/SOMT_10042011.mp4
- Superstition Mountains: http://www.phoenixvis.net/videos/mpeg4/SUPM_10042011.mp4

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust generated and transported by the low pressure system winds and the exceedance at the West Chandler and Higley monitors.” ADEQ further stated that “the particular wind magnitudes and wind direction, the proximity of the exceeding monitors to open and desert areas of Pinal County, and the delay in the low pressure system winds exiting the areas around the exceeding monitors provide solid evidence as to why only these monitors within the Maricopa County nonattainment area recorded exceedances.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, GIS analysis, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility and blowing dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from low pressure system winds and the exceedances measured at the monitors identified in Table 50 of this document.

Table 53: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section V: p. 26-48, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 54: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VII: p. 51	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause these exceedances were emissions of PM₁₀ caused by low pressure system winds on October 4, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 55: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VII: p. 51	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph included presenting hourly PM₁₀, hourly wind speeds, and wind gusts that show that PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedances on October 4, 2011 were a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the low pressure system winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 56: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VI: p. 49-50	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 57 outlines EPA’s evaluation of these requirements.

Table 57: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ¹¹	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. C	Yes

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by low pressure system high winds were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 50 on October 4, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the low pressure system provide sufficient evidence to conclude that the event were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

¹¹See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

NOVEMBER 4, 2011

Table 58: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
November 4, 2011	Apache Junction	04-021-3002-1	225
	Buckeye	04-013-4011-1	284
	Central Phoenix	04-013-3002-4	223
	Durango Complex	04-013-9812-1	251
	Dysart	04-013-4010-1	224
	Glendale	04-013-2001-1	229
	Greenwood	04-013-3010-1	231
	Higley	04-013-4006-1	258
	JLG Supersite	04-013-9997-3	200
	JLG Supersite	04-013-9997-4	199
	North Phoenix	04-013-1004-1	186
	North Phoenix	04-013-1004-2	186
	South Phoenix	04-013-4003-1	231
	West 43 rd	04-013-4009-1	242
	West Chandler	04-013-4004-1	670
	West Phoenix	04-013-0019-1	279
Zuni Hills	04-013-4016-1	258	

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ states, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these previously approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 34 mph with gusts of 40 mph and 31 mph with gusts of 37 mph were measured at Chandler Municipal Airport and Luke Air Force Base Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Maricopa and Pinal Counties, specifically at the Gila Bend Air Field, and Casa Grande Municipal Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the approaching cold front transported high concentrations of PM₁₀ into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Widespread sustained winds in excess of 20 mph with some sustained winds as high as 32 mph and gusts frequently over 35 mph were strong enough to overwhelm available efforts to limit PM₁₀ concentrations during the event. The fact that these were natural events involving strong winds that transported PM₁₀ emissions into and across Maricopa County, with a majority of the PM₁₀

emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provided strong evidence that the exceedances of November 4, 2011, recorded within the Phoenix PM₁₀ nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM₁₀ transport described above.. This analysis indicates that monitors in the Phoenix PM₁₀ nonattainment area were affected by PM₁₀ transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 59: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section V: p. 1-9, Section III: p. 1-5, App. A, B, and D	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ daily maximum hourly averages and PM₁₀ 24-hour averages. ADEQ also explains that these figures show that “PM₁₀ concentrations measured at Phoenix area monitors on November 4, 2011 were... in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on November 4, 2011 were in excess of normal historical fluctuations.

Table 60: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section IV: p. 1, App. C	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on November 4, 2011.

Section III and Appendix A of the demonstration included satellite imagery, a map of the Phoenix area that displays wind speed and direction at peak hours of PM₁₀ during the event, PM₁₀ and meteorological data for the time period of 3:00 PM to 6:00 PM, and time series graphs that include hourly PM₁₀ concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM₁₀ concentrations from monitors in the Phoenix PM₁₀ nonattainment area and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County. Also, time-lapse videos of the event were included in Appendix B and can be found at the following locations:

- South Mountain: http://www.phoenixvis.net/videos/mpeg4/SOMT_11042011.mp4
- Superstition Mountains: http://www.phoenixvis.net/videos/mpeg4/SUPM_11042011.mp4

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on November 4, 2011 at 1:15 PM (central deserts). The timing of the dust storm report for this event is consistent with the issuance of a NWS Wind Advisory for the period of 11:00 AM to 11:00 PM, NWS Blowing Dust Advisory for the period of 11:00 AM to 8:00 PM, NWS Dust Storm Warning for the period of 2:00 PM to 8:00 PM, observed increased PM₁₀ concentrations in the Phoenix area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU) and haze (HZ). Again, while not included in the final documentation, it is important to note that hourly PM₁₀ concentrations at the southern monitoring sites (Stanfield and Casa Grande) in Pinal County began to dramatically increase at 12:00 PM, while PM₁₀ concentrations monitoring sites located further north and east (Cowtown, Combs School, Maricopa, and Apache Junction) in the County began to increase at 1:00 PM and measured peak PM₁₀ concentrations at 3:00 PM. Also, sustained wind speeds above 25 mph that were associated with the increase in PM₁₀ in Pinal County were measured at Casa Grande Municipal Airport at 1:35, 2:15, 2:35, 2:55, and 3:35 PM. These data indicate that PM₁₀ was largely transported from outside of the nonattainment area from strong winds associated with an approaching cold front.

ADEQ stated that the evidence presented “demonstrates a clear causal relationship between the windblown dust and the PM₁₀ exceedances measured in the Phoenix PM₁₀ nonattainment area on November 4, 2011.” The analysis in Sections II, II, and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, the GIS map, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, blowing dust and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from winds associated with an approaching cold front and the exceedances measured at the monitors identified in Table 58 of this document.

Table 61: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section III: p. 1-5, App. A, B, and D	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 62: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VII: p. 1	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the PM₁₀ exceedances in the Phoenix area on November 4, 2011, were shown to be caused by transport of PM₁₀ into the Phoenix area from widespread strong winds associated with an approaching cold front” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 63: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VII: p. 1	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedance of November 4, 2011, to any causal source other than PM₁₀ transported by strong winds associated with an approaching cold front, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” Also, PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 64: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VI: p. 1	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 65 outlines EPA’s evaluation of these requirements.

Table 65: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ¹²	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2-3 App. E	Yes

¹²See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by high winds associated with the passage of a cold front were transported into the Phoenix PM₁₀ nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 58 on November 4, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM₁₀ from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the passing cold front provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

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Table 66: EPA PM₁₀ Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m ³)
February 27, 2012	West 43 rd	04-013-4009-1	167

Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM₁₀ nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM₁₀ nonattainment area and Pinal County. For example, maximum sustained wind speeds of 30 mph with gusts of 36 mph and 31 mph with gusts of 37 mph were measured at Luke Air Force Base Airport and Casa Grande Municipal Airport, respectively. Sustained wind speeds greater than 25 mph were also measured at other locations, specifically at Williams Gateway Airport, Chandler Municipal Airport, and Gila Bend Air Field.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the low pressure system generated high concentrations of PM₁₀ within the nonattainment area. Sustained winds up to 30 mph and gusts up to 43 mph easily overwhelmed all available efforts to limit PM₁₀ concentrations from the event. The fact that this was a natural event involving a low pressure storm system that generated PM₁₀ emissions in the nonattainment area provided strong evidence that the exceedance on February 27, 2012 recorded at the West 43rd Avenue monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the statements described above. This analysis clearly demonstrates the “spatial and temporal representation of the low pressure system winds and associated windblown dust as they move throughout Maricopa and Pinal counties.” Information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 67: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section IV: p. 17-23, Section V: p. 25-51, App. B	Sufficient	Yes

Historical Fluctuations (HF)

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM₁₀ 24-hour averages and PM₁₀ daily maximum hourly averages in Figures 3-1 and 3-2, respectively. ADEQ also stated that these figures “indicate that the PM₁₀ concentrations seen at the West 43rd Avenue monitor on February 27, 2012 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM₁₀ concentrations measured on February 27, 2012 were in excess of normal historical fluctuations.

Table 68: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section III: p. 15-16	Sufficient	Yes

Clear Causal Relationship (CCR)

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate, surface weather maps, and NOAA 500-Milibar wind fields for the Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on February 27, 2012, and a time series graph for the event that included hourly PM₁₀ concentrations for monitors in the Phoenix PM₁₀ nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM₁₀ concentrations, sustained wind speeds, wind gusts, wind direction, and visibility to track the transport of PM₁₀ throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time.

The timing of the event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 12:30 PM to 11:00 PM, NWS Wind Advisory for the period of 4:00 PM to 11:00 PM, NWS Dust Storm Warning for the period of 1:00 PM to 3:00 PM, the observed increased PM₁₀ concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: http://www.phoenixvis.net/videos/mpeg4/SOMT_02272012.mp4
- Superstition Mountains: http://www.phoenixvis.net/videos/mpeg4/SUPM_02272012.mp4

ADEQ stated that the evidence presented demonstrated a clear causal relationship between the windblown dust emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “It is clear from these data that sustained wind speeds of 30 mph and gusts of 43 mph were strong enough to generate uncontrollable windblown PM₁₀ emissions to the West 43rd Avenue monitor and demonstrates the clear causal relationship between the low pressure system winds and the recorded exceedance.”

The analysis in Sections II and V, specifically, the PM₁₀ time series graph, winds speed and direction measurements, GIS analysis, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility and blowing dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from low pressure system winds and the exceedance measured at the West 43rd Avenue monitor. Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through -5-21) shows stronger wind speeds in the western portion of the nonattainment area are likely responsible for the isolated exceedance at the West 43rd Avenue monitoring station.

Table 69: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section V: p. 25-51, App. B	Sufficient	Yes

Affects Air Quality (AAQ)

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 70: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VII: p. 54	Sufficient	Yes

Natural Event

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause the exceedance was emissions of PM₁₀ caused by low pressure system winds on February 27, 2012” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 71: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VII: p. 54	Sufficient	Yes

No Exceedance or Violation But For the Event (NEBF)

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph included that presents hourly PM₁₀, hourly, wind speeds, and wind gusts showing that PM₁₀ concentrations before the event were below the 24-hour PM₁₀ NAAQS. ADEQ further also stated that “the body of evidence presented in this submittal confirms that the exceedance on February 27, 2012 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the low pressure system winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 72: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VI: p. 52-53	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 73 outlines EPA’s evaluation of these requirements.

Table 73: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 st of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter ¹³	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. C	Yes

Conclusion

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by low pressure system high winds caused exceedances of the 24-hour PM₁₀ NAAQS at the locations outlined in Table 66 on February 27, 2012. EPA has determined that the flagged exceedances at this location on this day meet the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that event was not reasonably controllable and preventable due to high wind conditions that overwhelmed reasonable controls within the Phoenix PM₁₀ nonattainment area. In reviewing the GIS analysis included in Section V of the demonstration and time series of PM₁₀ for the Phoenix PM₁₀ nonattainment area in conjunction with the time-lapse video evidence for the event, it is plausible that the elevated PM₁₀ from the hours of 11:00 AM to 2:00 PM was caused by transported PM₁₀ from sources outside of the nonattainment area, which indicates that the emissions causing the exceedance at West 43rd Avenue monitor were not reasonably controllable or preventable. Also, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM₁₀ concentrations measured in the area, and the wind speeds associated with the low pressure system provide sufficient evidence to conclude that the event were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

¹³See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

CONCLUSION

EPA finds that the weight of evidence is sufficient for concurrence on the flagging of the data for the monitors identified in Table 1 on February 19, July 18, August 3, August 18, August 25-28, September 2, October 4, November 4, 2011 and February 27, 2012. These concurrences do not constitute final EPA action to exclude these data from consideration for purposes of determining the attainment status of the area. Final actions will come only after EPA completes notice and comment rulemaking on any such determinations.