



Janice K. Brewer
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov



Benjamin H. Grumbles
Director

PRELIMINARY DOCUMENTATION

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Phoenix Area on April 30, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts as part of the Natural Events Action Plan for the Phoenix area. On Tuesday, April 29, 2008, in response to a tightening pressure gradient associated with the tail end of a trough of low pressure and cold frontal passage through Arizona, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a moderate risk of wind-blown dust and thus a moderate risk for unhealthy PM₁₀ levels in the Phoenix area for Wednesday, April 30th. The Dust Control Action Forecast called for southwesterly winds of 15 to 25 mph with stronger gusts possible during the afternoon. In anticipation of these high winds and associated blowing dust, a PM₁₀ Health Watch was issued for April 30th (See Attachments). These forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

This regional high-wind event created the potential for a wind-blown dust event with a moderate risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in Maricopa County. Strong winds did occur and were observed throughout portions of Maricopa County and much of the Phoenix Metro area on April 30th, 2008. Beginning in the morning and continuing until the early evening hours of April 30th, strong southwesterly winds

generated blowing dust which moved into portions of the Phoenix Metro area. All appropriate State Implementation Plan (SIP) control measures were in place during the event, demonstrating per 40 CFR 50.1(j), that the event “is not reasonably controllable or preventable.”

The initialization of a wind-blown dust event is evident in the Phoenix visible camera images, as well as the Arizona Meteorological Network (AzMET) and National Weather Service (NWS) monitors (see Fig. 1). Strong winds gusting to 30 mph at the NWS Phoenix Sky Harbor station and as high as 41 mph at the NWS Deer Valley station were reported between 9:00 a.m. and 6:00 p.m., while many other Valley monitoring locations measured wind gusts over 20 mph. Due to the spatial variability of PM sources both within and outside of the Phoenix urban core, the PM₁₀ NAAQS was only exceeded at the West 43rd Ave. monitor operated by Maricopa County (see Section 2 for more detail). The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event “affects air quality.”

The following are the key PM₁₀ monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM ₁₀	1-hr Max PM ₁₀	Max Time	Flag**
PHOENIX METRO AREA					
West 43 rd Ave (MC/TEOM)	04-013-4009*	172	1065	1100	RJ
Durango Complex (MC/TEOM)	04-013-9812*	69	220	1100	None
Greenwood (MC/TEOM)	04-013-3010*	63	121	1100	None
Higley (MC/TEOM)	04-013-4006*	63	200	0600	None
West Phoenix (MC/TEOM)	04-013-0019*	55	96	1100	None
Central Phoenix (MC/TEOM)	04-013-3002*	51	78	1200	None
JLG Supersite (ADEQ/TEOM)	04-013-9997*	46	91	1100	None
Coyote Lakes (MC/TEOM)	04-013-4014*	53	165	0600	None
South Phoenix (MC/TEOM)	04-013-4003*	88	218	1600	None

* EPA Air Quality System Identification Number

** 24-hr PM₁₀ concentration influenced by natural or exceptional event to be flagged

Type Abbreviations: TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor)

The preliminary findings from this analysis were presented at stakeholders meetings on November 19, 2008, and March 19, 2009, in Phoenix, Arizona. This document is being submitted to

EPA to satisfy the requirements of 40 CFR 50.14(c)(2)(iii), and will be supplemented and made available for public comment to satisfy the requirements of 50.14(c)(3)(i).

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was a filter sampling date (1-in-6 run day), data from both the continuous analyzers and filter based monitors were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM₁₀ readings from the West 43rd Ave. monitoring site were valid for April 30, 2008. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. Exceedances of the NAAQS were only recorded by the continuous monitor located at the West 43rd Ave. monitoring site operated by Maricopa County.

2. Review suspected contributing sources. The NWS and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to what meteorological conditions were in place on April 30th. Strong westerly to southwesterly winds occurred in the Phoenix area due to a low pressure system approaching from the west. The plot of hourly PM₁₀ concentration data in the upper right corner of Figure 1 confirms the nearly identical timing of the elevated PM₁₀ concentrations recorded by the West 43rd Ave. monitor and the strong wind gusts at Sky Harbor and Deer Valley Airports. The high wind event was a regional phenomenon that affected the entire Phoenix Metro area. However, PM sources are highly variable across space; therefore, the locations of higher PM₁₀ concentrations (namely the Salt River channel) are likely an indication that these locations (or areas upwind of these locations) contain greater sources of PM than other locations within the Phoenix Metropolitan area. While no specific source allocation can be determined for this particular day, the 2005 ADEQ revised PM₁₀ SIP for the Salt River area (attached) contains modeled source contributions on high wind days (see section 4.2 – Source Categories). Results estimate that approximately 76% of PM₁₀ concentrations can be attributed to windblown dust, of which 21% is from agricultural fields, 15% from alluvial channels, and 21% from vacant lots. It is not clear whether similar source allocations can be assumed for this April 30, 2008, high wind event.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the “Historical Distribution” Table in Figure 1 has been included to demonstrate that the event is associated with a measured concentration in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). The

monitor with readings greater than that of the NAAQS on April 30, 2008, which should be flagged, is West 43rd Ave.

4. Examine the meteorological conditions before and during the event. The AzMET meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. As can be seen in Figure 1, wind speeds did not pick up in central Arizona until approximately 9:00 a.m., when several stations reported gusty winds over 20 mph. This timing corresponds to the onset of elevated PM₁₀ concentrations recorded at the West 43rd Ave. monitoring site, which remained elevated through the afternoon hours until a time when winds, such as those reported at Sky Harbor and Deer Valley airports, decreased to below 20 mph.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Phoenix area can be attributed to soil emissions that were transported over portions of the Phoenix Metro area in Maricopa County. No source specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on April 30, 2008. Visual evidence of reduced visibility can be seen in the images located in the lower right portion of Figure 1. These images, along with the graph of Deer Valley wind gusts and West 43rd PM₁₀ concentrations, provide proof that the elevated PM₁₀ concentrations in Phoenix were coincident with strong gusty winds and can be attributed to soil emissions.

6. Estimation of Contribution from Source or Event. The primary source appears to be wind-blown dust over central Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the “Event Contrib. Analysis” Table in Figure 1 has been included to demonstrate that there would have been no exceedance or violation but for the event (i.e., the contribution during the event overwhelmed the 24-hour average).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentration in West 43rd Ave. was attributed to a natural event.

Conclusion

Long-range transport of dust from soils. The elevated PM₁₀ event on April 30, 2008, in Maricopa County was the result of the transport of dust and soils from high winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should be

flagged for air quality planning purposes. The “high wind” (RJ) flag should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.