

State of Arizona Exceptional Event Documentation of a High Wind Dust Event PM₁₀ Exceedance on April 25, 2016 in the Maricopa County PM₁₀ Nonattainment Area

Produced by:

Arizona Department of Environmental Quality
Maricopa County Air Quality Department
Maricopa Association of Governments

DRAFT Report
April 2017



**Widespread Windblown Dust as Captured by the
South Mountain Visibility Camera at 3:30 PM on April 25, 2016**

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I. INTRODUCTION

This documentation is being submitted to the Environmental Protection Agency (EPA) to demonstrate that an exceedance of the 24-hour PM₁₀ standard at the West 43rd Avenue monitor in the Maricopa County PM₁₀ nonattainment area on April 25, 2016 should be excluded from use in determinations of exceedances or violations of the 24-hour PM₁₀ National Ambient Air Quality Standards (NAAQS) as an exceptional event caused by a high wind dust event. This documentation serves to meet the requirements of Clean Air Act Section 319(b) (Air quality monitoring data influenced by exceptional events) and the EPA final rule, *Treatment of Data Influenced by Exceptional Events* (81 FR 68216), as codified in 40 CFR Sections 50.1 and 50.14. Additionally, state and local agencies are in the process of developing a mitigation plan for the Maricopa County PM₁₀ nonattainment area to meet the requirements of 40 CFR Section 51.930. The mitigation plan will be submitted to EPA by September 30, 2018, as required by 40 CFR Section 51.930(b)(3).

Summary of the Exceptional Event

On April 25, 2016, a dry cold front moved through the Maricopa County PM₁₀ nonattainment area bringing strong and gusty southwest winds that created a high wind dust event in the region. The National Weather Service issued both a high wind advisory and a blowing dust advisory for the region as a result of the passing cold front. The advisories predicted sustained winds of 20 to 30 mph with gusts of 40 to 45 mph, and localized visibilities as low as 1 mile. Broad regional visibility degradation was expected to persist throughout the afternoon and into the evening hours. Nonattainment area monitors recorded sustained southwesterly winds above 25 mph and gusts above 40 mph at multiple sites.

Within the nonattainment area all monitors experienced a substantial increase in PM₁₀ concentrations as a result of the passing cold front. 24-hour average concentrations on April 25, 2016 in the nonattainment area were approximately 3 to 6 times higher than concentrations recorded on April 24, 2016. PM₁₀ concentrations were elevated throughout the afternoon and into the early evening in response to the high winds generated by the passing cold front, but were highest when the winds were strongest. One nonattainment area monitor (West 43rd Avenue) exceeded the 24-hour PM₁₀ standard as a result of the high wind dust event as listed in Table 1-1. Multiple source areas were identified as contributing to the windblown dust that caused the high and exceeding PM₁₀ concentrations, primarily including the natural, desert areas of Maricopa County, western Arizona and southeastern California. For the limited areas within the Maricopa County PM₁₀ nonattainment area that are anthropogenic sources of windblown dust, reasonable controls at these areas were overwhelmed by the strength of sustained winds which exceeded 25 mph at several locations within the nonattainment area.

Table 1-1. PM₁₀ Monitors Affected by the High Wind Dust Event.

Monitor Name	County	Operating Agency	Monitor ID	Exceeding 24-Hour PM ₁₀ Concentration
West 43rd Avenue	Maricopa	Maricopa County Air Quality Department	04-013-4009	172 µg/m ³

Statutory and Regulatory Requirements

Clean Air Act Section 319(b) defines an exceptional event as an event that:

- (i) affects air quality;
- (ii) is not reasonably controllable or preventable.;
- (iii) is an event caused by human activity that is unlikely to recur at a particular location or a natural event; and
- (iv) is determined by the Administrator through the process established in the regulations promulgated under paragraph (2) [Regulations] to be an exceptional event.

EPA regulation in 40 CFR Section 50.1(j) further defines an exceptional event as:

“...an event(s) and its resulting emissions that affect air quality in such a way that there exists a clear causal relationship between the specific event(s) and the monitored exceedance(s) or violation(s), is not reasonably controllable or preventable, is an event(s) caused by human activity that is unlikely to recur at a particular location or a natural event(s), and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include air pollution relating to source noncompliance. Stagnation of air masses and meteorological inversions do not directly cause pollutant emissions and are not exceptional events. Meteorological events involving high temperatures or lack of precipitation (*i.e.*, severe, extreme or exceptional drought) also do not directly cause pollutant emissions and are not considered exceptional events. However, conditions involving high temperatures or lack of precipitation may promote occurrences of particular types of exceptional events, such as wildfires or high wind events, which do directly cause emissions.”

EPA regulation in 40 CFR Section 50.14(c)(3)(iv) states that a demonstration to justify the exclusion of monitor data as an exceptional event must include:

- (A) A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);
- (B) A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;
- (C) Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) [clear causal relationship] of this section. The Administrator shall not require a State to prove a specific percentile point in the distribution of data;
- (D) A demonstration that the event was both not reasonably controllable and not reasonably preventable; and
- (E) A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.

Additionally, specific regulatory requirements related to demonstrations for high wind dust events are included in 40 CFR Section 50.14(b)(5). Details on how the statutory and regulatory requirements are addressed in this documentation are presented in the bulleted list below:

- Chapter II of this assessment includes a narrative conceptual model that describes the genesis of the high wind dust event and how PM₁₀ emissions from the high wind dust event caused the PM₁₀ exceedance on April 25, 2016 in the Maricopa County nonattainment area.
- Chapter III provides a detailed body of evidence that the event affected air quality through the clear causal relationship between the PM₁₀ emissions from the high wind dust event and the exceedance at the West 43rd Avenue monitor in the Maricopa County PM₁₀ nonattainment area. Section III also includes an analysis comparing the event-influenced exceeding PM₁₀ concentration at the West 43rd Avenue monitor to historical PM₁₀ concentrations at the monitor.
- Chapter IV presents evidence that the high wind dust event was a natural event and that the high wind dust event was neither reasonably controllable nor preventable.
- Chapter V includes a summary conclusion of the evidence presented in Chapters II-IV.

Procedural Requirements

This procedural requirements for submitting a demonstration to EPA for an exceptional event are included in 40 CFR Section 50.14(c). The procedural requirements include the schedules and procedures for notifying the public when an event occurs; for providing EPA with the initial notification of a potential exceptional event; and for documenting the public comment process. Specific procedural requirements are presented below:

- 40 CFR Section 50.14(c)(1)(i) – Public notification that event was occurring:

The Arizona Department of Environmental Quality (ADEQ) issued an ensemble air quality forecast for the Greater Phoenix area on April 24, 2016 and a dust control forecast for Maricopa County that discuss the possibility of blowing dust and elevated PM₁₀ concentrations from the approaching cold front and trough. The forecast products that were issued on April 24-26, 2016 are included in Appendix A.

- 40 CFR Section 50.14(c)(2)(i) – Initial notification of potential exceptional event by creating an initial event description and flagging the associated data that have been submitted to the AQS database:

The Maricopa County Air Quality Department has created an initial event description (high wind dust event) and flagged the associated air quality monitoring data for April 25, 2016 as an exceptional event in AQS. The following monitor has been flagged as exceeding the PM₁₀ standard on April 25, 2016 as a result of a high wind dust event:

West 43rd Avenue (04-013-4009)

- 40 CFR Section 50.14(c)(2)(i)(A) – Regular communication with the EPA Regional office to identify data that have been potentially influenced by an exceptional event, to determine whether the identified data may affect a regulatory determination and to discuss whether the State should develop and submit an exceptional events demonstration:

ADEQ began initial discussions with EPA about this event on December 14, 2016. From that date, frequent discussion continued with EPA on the development of documentation needed to support the event. ADEQ submitted formal initial notification of the April 25, 2016 high wind dust event to EPA Region IX on December 22, 2016.

- 40 CFR Section 50.14(c)(2)(i)(B) – For data that may affect an anticipated regulatory determination or where circumstances otherwise compel EPA to prioritize the resulting demonstration, EPA shall respond to the State’s initial notification with a demonstration due date:

EPA did not provide a due date for this demonstration.

- 40 CFR Section 50.14(c)(2)(i)(C) – EPA may waive the initial notification of potential exceptional event process on a case-by-case basis:

EPA did not waive the initial notification of potential exceptional event process.

- 40 CFR Section 50.14(c)(3)(v) – With submission of the demonstration containing the elements in 40 CFR Section 50.14(c)(3)(iv), the State must document that a public comment process was followed, submit any public comments received, and address in the submission to EPA those comments disputing or contradicting factual evidence provided in the demonstration:

ADEQ will post this assessment report on the ADEQ webpage and placed a hardcopy of the report in the ADEQ Records Management Center for public review. The 30-day public comment period is to TBD. A copy of the public notice certification, along with any comments received and responses to those comments, will be submitted to EPA, consistent with the requirements of 40 CFR Section 50.14(c)(3)(v).

Mitigation Requirements

Per the requirements of 40 CFR Section 51.930(b)(1)(B)(ii), EPA provided written notification in the Federal Register notice for the EPA final rule, *Treatment of Data Influenced by Exceptional Events* (81 FR 68216), that the Maricopa County PM₁₀ nonattainment area is required to develop a mitigation plan for high wind dust events that satisfy the requirements of 40 CFR Section 51.930(b)(2). A high wind dust event mitigation plan for the Maricopa County PM₁₀ nonattainment area is required to be submitted to EPA by September 30, 2018. State and local agencies are in the process of developing the mitigation plan. The documentation for the April 25, 2016 high wind dust event is being submitted to EPA before a mitigation plan for the Maricopa County PM₁₀ nonattainment area is in place as allowed under 40 CFR Section 50.14(b)(9)(ii)(B).

II. CONCEPTUAL MODEL

Geographic Setting and Climate

Geographic Setting

The Maricopa County PM₁₀ nonattainment area is located in the Salt River Valley in south-central Arizona. It lies at a mean elevation of 1,090 feet above mean sea level (msl) in the northeastern part of the Sonoran Desert. Other than the mountains in and around the area, the topography of the area is generally flat. The area is surrounded by the McDowell Mountains (~4,200 ft msl) to the northeast, the foothills of the Bradshaw (~7,900 ft msl) and Mazatzal (~7,900 ft msl) ranges to the north, the White Tank Mountains (~4,500 ft msl) to the west, the Sierra Estrella (~4,450 ft msl) to the southwest, and the Superstition Mountains (~5,000 ft msl) far to the east. Within the area are the Phoenix Mountains (~2,600 ft msl) and South Mountain (~2,600 ft msl). Current development is pushing north, west, and south into Pinal County.

The PM₁₀ nonattainment area contains a fairly dense network of PM₁₀ monitors throughout the area, with a much less dense network of monitors located throughout the rest of the state. Figure 2–1 shows the general geographic setting of the nonattainment area, as well as the locations of PM₁₀ monitors in the nonattainment area and throughout the state.

Figure 2–2 depicts the drainage systems or watersheds for the State of Arizona. Many of the rivers that form Arizona's drainage system are dry for most of the year and, consequently, are sources of silt and fine soils that become suspended and add to regional PM₁₀ loadings during high wind events. Much of this alluvial matter and fine soil is deposited in the low lying areas of central and southern Arizona, with larger depositional areas focused in and around the confluences of dry river channels.

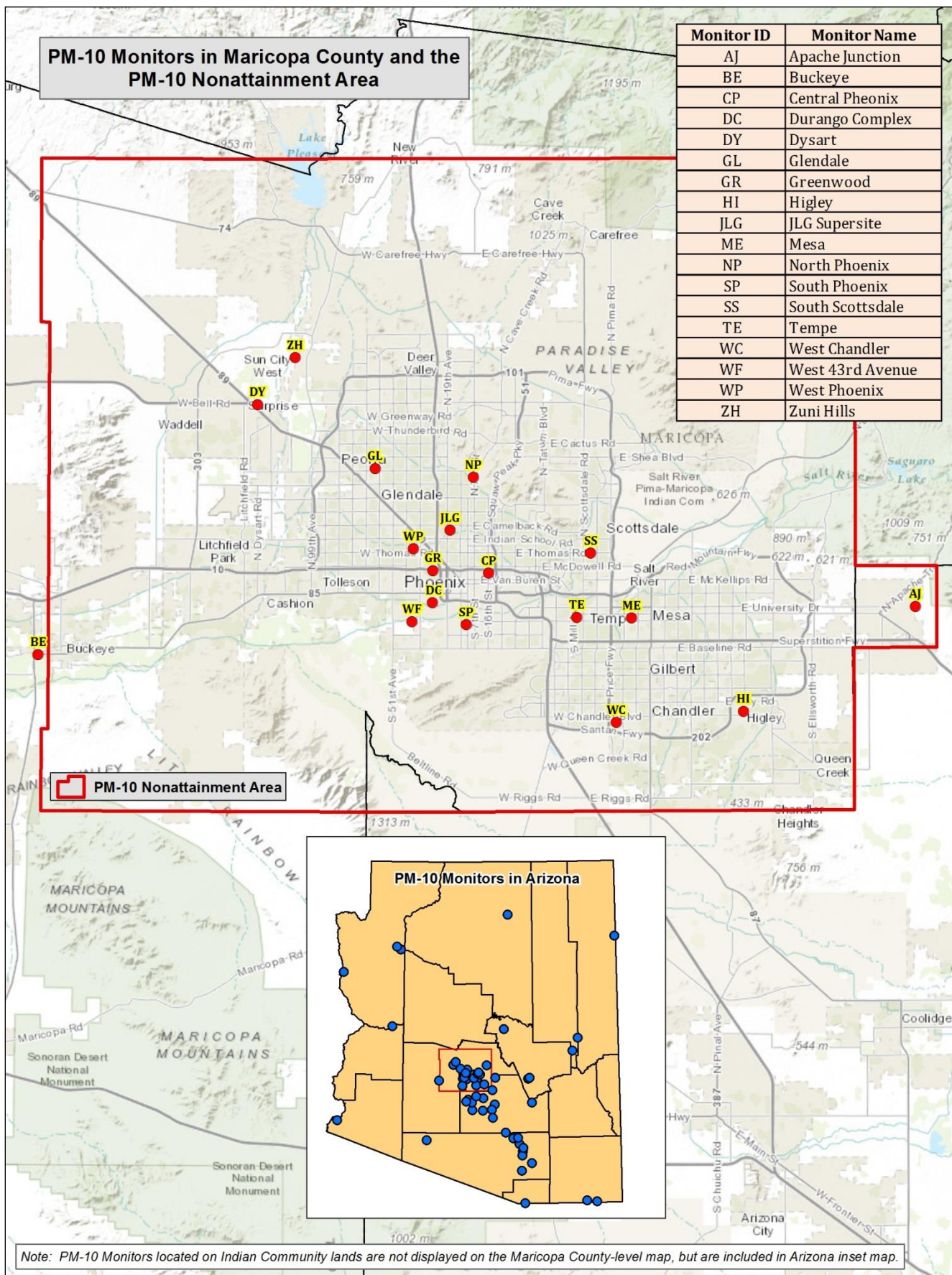


Figure 2-1. Maricopa County PM₁₀ nonattainment area geographic setting and PM₁₀ monitor locations.

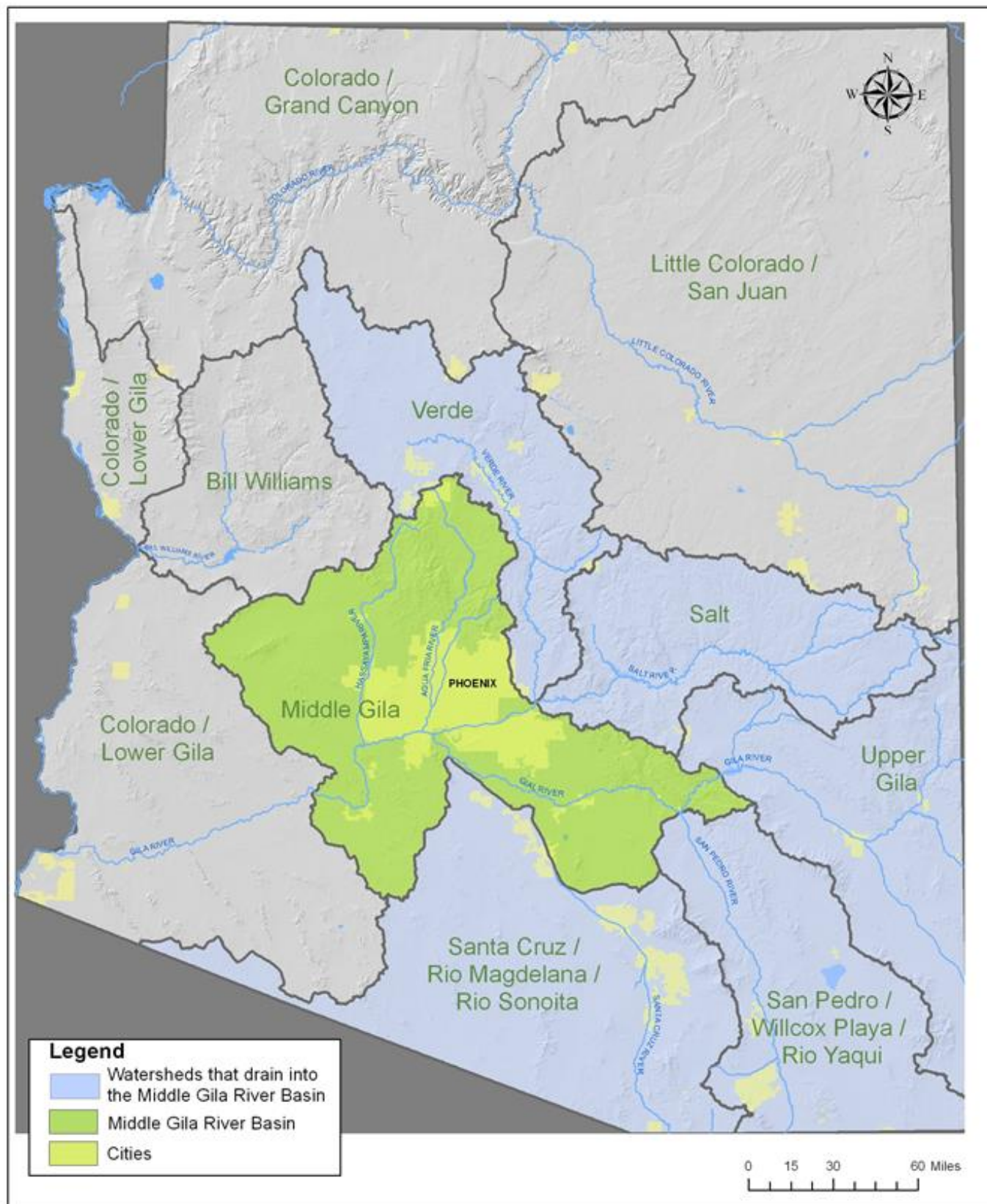


Figure 2-2. Drainage basins of the State of Arizona.

Climate

The Maricopa County PM₁₀ nonattainment area has an arid climate, with very hot summers and temperate winters. The average summer high temperature is among the hottest of any populated area in the United States. The temperature reaches or exceeds 100°F an average of 110 days during the year and highs top 110°F an average of 18 days during the year. The area receives an average of 7.66 inches of rain per year.

Precipitation is sparse during the first part of the summer, but the influx of monsoonal moisture, which generally begins in early July and lasts until mid-September, raises humidity levels and can cause heavy localized precipitation and flooding. Although thunderstorms are possible at any time of the year, they are most common during the monsoon season from July to mid-September as humid air is advected from the Gulf of California, Gulf of Mexico, and large thunderstorm complexes from the Sierra Madre Occidental Mountains in Mexico. This influx in moisture, combined with intense solar heating, often creates a very unstable environment that is ripe for thunderstorm development. These thunderstorms can bring strong winds and blowing dust, large hail, and heavy rain. Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before soaking rains help keep soil particles bound to one another. However, depending on the amount of precipitation received during the monsoon season, extremely hot temperatures act to dry out the surface quickly, and dust storms can occur at any time. During the December through March period, winter storms moving inland from the Pacific Ocean can bring strong winds, blowing dust and significant rains throughout Arizona. This December – March time period, and July – August time period are typically the wettest parts of the year. Meanwhile, a distinct dry season occurs during the period April through June for the nonattainment area and the rest of Arizona. While these weather patterns describe the general climatology for the nonattainment area over a long period of time, the area and the entire state of Arizona is also prone to a high degree of variability in these weather patterns from year to year.

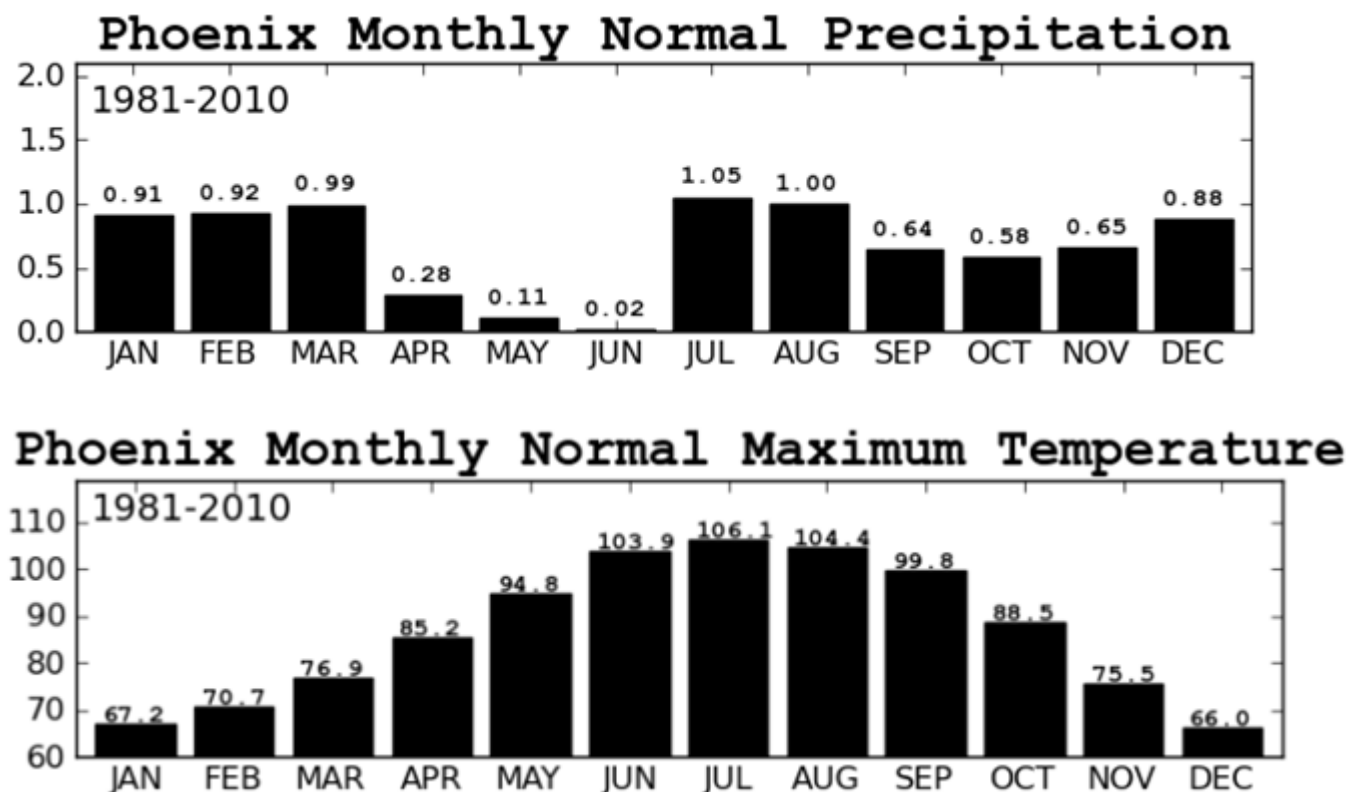


Figure 2-3 Phoenix monthly precipitation (top) and maximum temperature (bottom) climatology (source: National Weather Service).

Cold Front High Wind Dust Event Summary

According to the National Weather Service (NWS), a dry and “potent spring trough and upper low” moved through the Maricopa County PM₁₀ nonattainment area throughout the day and into the evening of April 25, 2016 (See Appendix B). The NWS issued both a high wind advisory and a blowing dust advisory at 1:13 PM for the region as a result of the passing cold front. The advisories predicted sustained winds of 20 to 30 mph with gusts of 40 to 45 mph, and localized visibilities as low as 1 mile, remaining in effect until 8:44 PM. Broad regional visibility degradation was expected to persist throughout the afternoon and into the evening. Blowing dust was initially noted in the deserts of southeastern California around the area near Twenty-Nine Palms. This blowing dust, along with dust from the deserts of western Arizona, was transported into the nonattainment area with the passing cold front. The strong winds of the cold front also generated windblown dust in the desert and natural areas of Maricopa County and the PM₁₀ nonattainment area while overwhelming reasonable controls on local anthropogenic sources. Figure 2–4 displays the approaching trough and cold front into Arizona on April 25, 2016. Upper-air wind fields associated with the passing of the cold front are displayed in Figure 2–5.

By 11:00 AM, the windblown dust from the passing cold front was consistently resulting in elevated PM₁₀ concentrations throughout the nonattainment area. PM₁₀ concentrations peaked during the 1:00 PM to 2:00 PM time frame with five-minute concentrations as high as 1,033 µg/m³ within the nonattainment area. Concentrations remained elevated throughout the afternoon and into the early evening. The passage of the cold front generated sustained winds above 25 mph as recorded at NWS stations and Maricopa County Air Quality Department monitors throughout the nonattainment area in the afternoon hours. Accompanying gusts generally ranged from 30 to 45 mph. Winds of these magnitudes are sufficient to generate windblown dust from natural, undisturbed desert surfaces as well as overwhelm reasonable controls on anthropogenic sources of windblown dust. Visibilities as low as 5.0 miles were recorded at multiple NWS stations in the nonattainment area during peak PM₁₀ concentration periods. Visibility photos show the wide-spread nature of the windblown dust, especially during the 3:00 PM to 4:00 PM time frame. While only one PM₁₀ monitor (West 43rd Avenue) within the nonattainment area exceeded as a result of the windblown dust generated by the passing cold front, 24-hour average PM₁₀ concentrations on April 25, 2016 throughout the nonattainment area were approximately 3 to 6 times higher than concentrations recorded on April 24, 2016, indicating the regional impacts of the blowing dust. While it is possible that local anthropogenic sources of windblown dust (in concert with regional windblown dust) may have contributed to the exceedance at the West 43rd Avenue monitor, sustained wind speeds recorded in the nonattainment area and at the West 43rd Avenue monitor were above 25 mph for multiple periods, sufficient to overwhelm any reasonable controls that may have been in place on anthropogenic sources of windblown dust in the nonattainment area and near the exceeding monitor.

As seen in Figure 2–6, moderate to severe drought conditions throughout southeastern California and Arizona likely exacerbated the amount of dust the passing cold front was able to entrain. No precipitation was recorded at PM₁₀ nonattainment area NWS stations in conjunction with the passing of this dry cold front.

As a summary of the PM₁₀ concentrations during the event, Table 2–1 contains PM₁₀ concentration data at Maricopa County and nonattainment area monitors from April 18 – May 2, 2016, indicating the high levels of PM₁₀ seen on April 25, 2016 as compared to the prior and following week. Figure 2–7 displays those same 24-hour average PM₁₀ concentrations while Figure 2–8 contains the diurnal pattern of PM₁₀ at the Maricopa County and PM₁₀ nonattainment area monitors on April 25, 2016. Lastly, Figure 2–9 displays hourly average PM₁₀ concentrations, maximum hourly 5-minute wind speeds, and maximum hourly gusts as recorded at the exceeding West 43rd Avenue monitor.

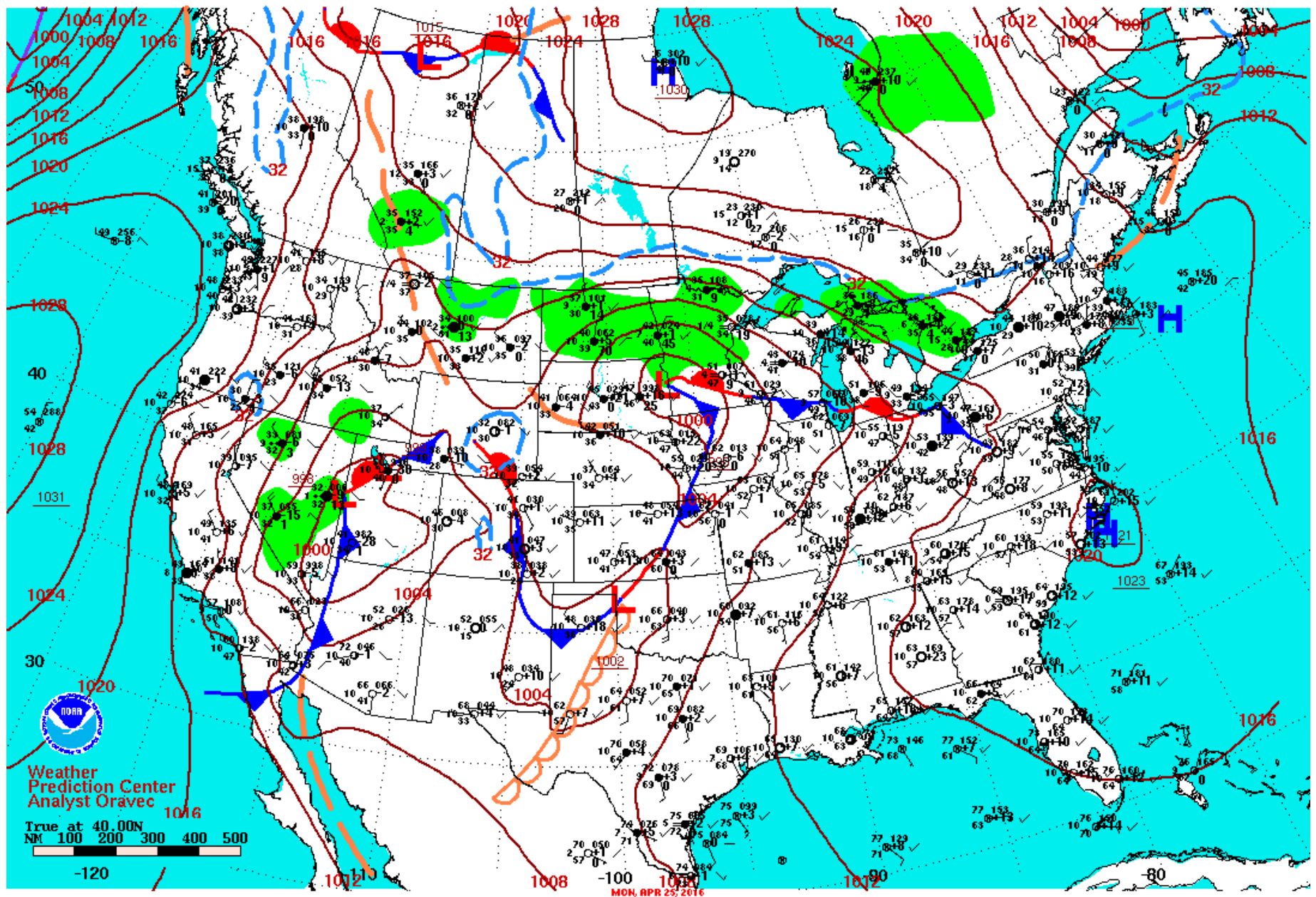


Figure 2-4. Location of trough and cold front as of 4:00 AM Arizona time on April 25, 2016 (NOAA Daily Weather Map).

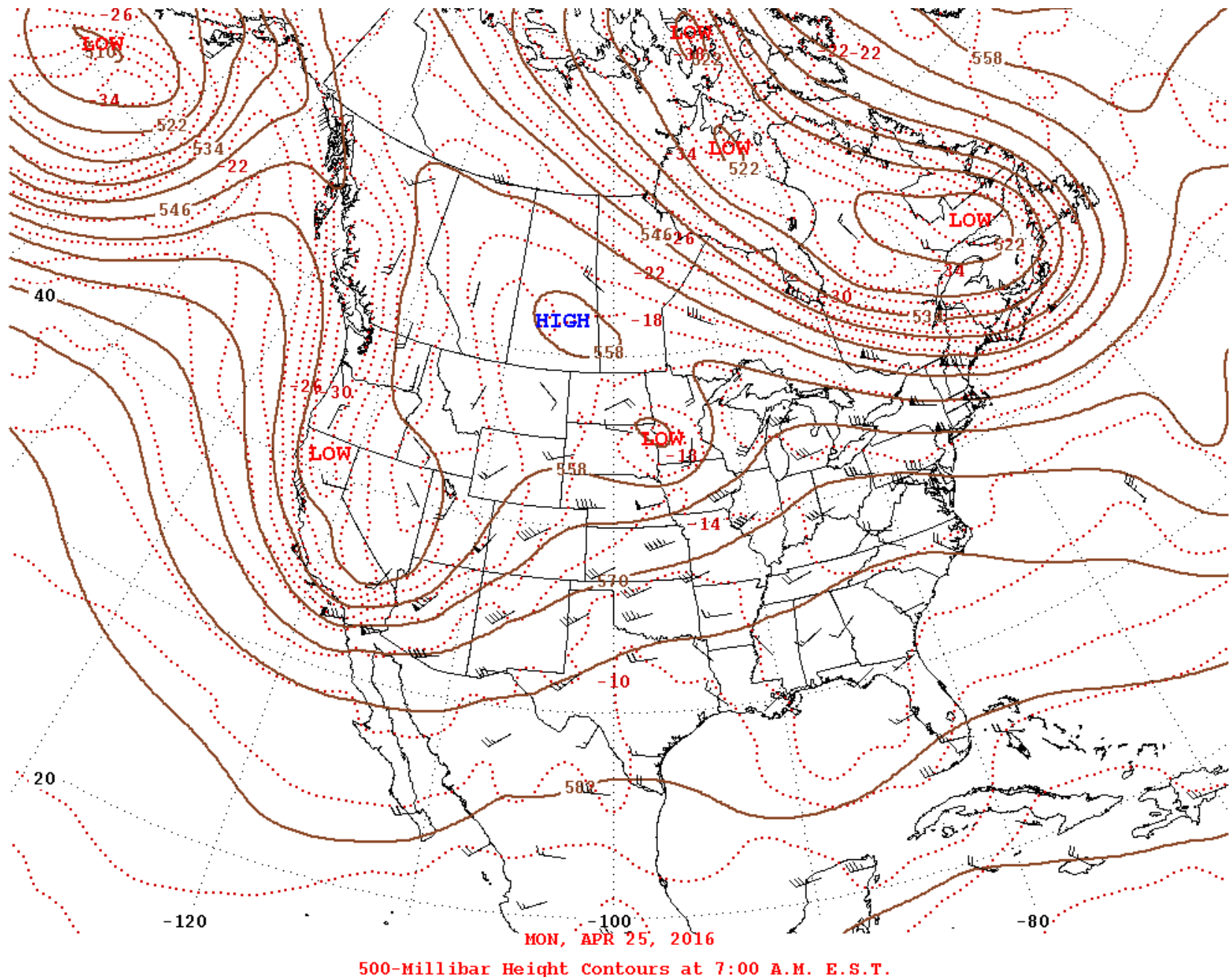
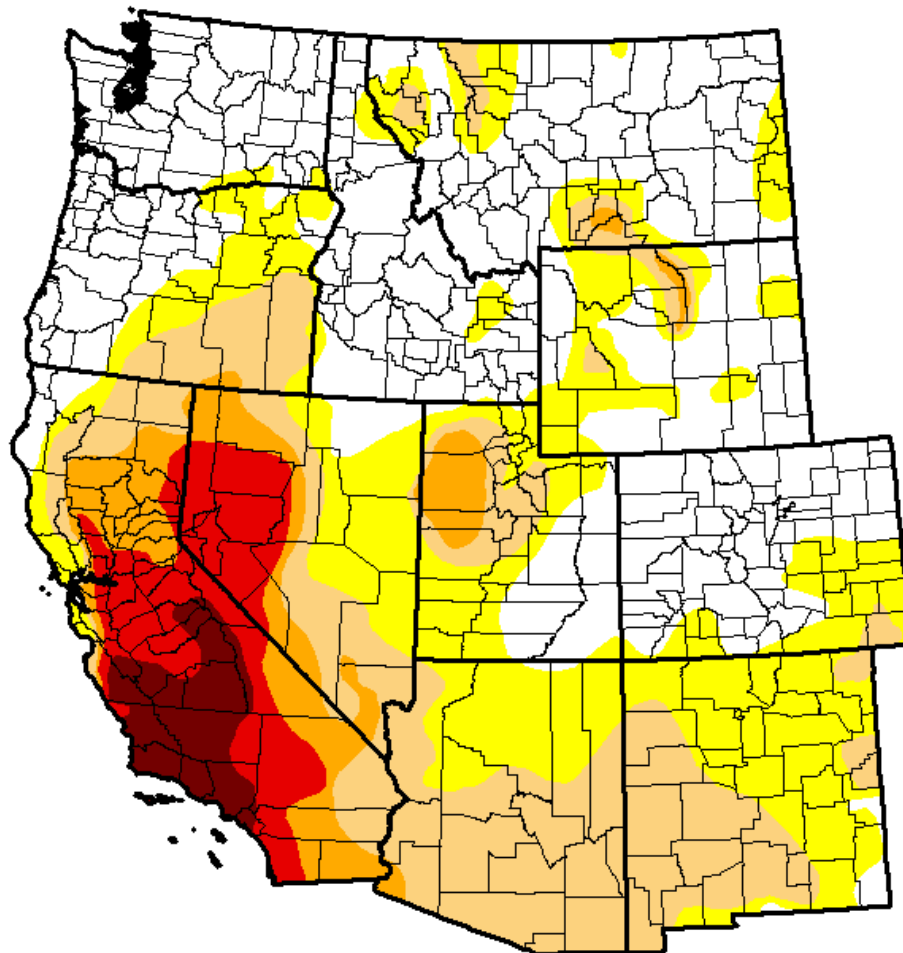


Figure 2-5. 500-Millibar wind field at 4:00 AM Arizona time on April 25, 2016. (NOAA Daily Weather Map).

U.S. Drought Monitor West

April 19, 2016
(Released Thursday, Apr. 21, 2016)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	40.56	59.44	34.76	14.89	8.71	2.81
Last Week 4/12/2016	38.87	61.13	35.75	15.15	9.53	4.33
3 Months Ago 1/19/2016	37.36	62.64	40.19	21.59	12.26	6.14
Start of Calendar Year 12/29/2015	33.17	66.83	45.07	29.30	15.92	6.85
Start of Water Year 9/29/2015	22.77	77.23	57.81	42.42	26.50	7.62
One Year Ago 4/21/2015	28.21	71.79	61.51	37.95	17.19	7.95

Intensity:

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Tinker
CPC/NOAA/NWS/NCEP



<http://droughtmonitor.unl.edu/>

Figure 2-6. Western states drought monitor as of April 19, 2016.

Table 2-1. 24-Hour Average PM₁₀ Concentrations (µg/m³) at Maricopa County and PM₁₀ Nonattainment Area Monitors on April 18-May 2, 2016.

Monitor	April 18	April 19	April 20	April 21	April 22	April 23	April 24	April 25	April 26	April 27	April 28	April 29	April 30	May 1	May 2
Apache Junction	10	15	19	19	22	26	24	76	90	27	40	31	29	19	20
Buckeye	29	32	39	54	50	39	31	105	56	39	52	36	38	21	29
Central Phoenix	17	24	36	31	32	29	23	95	64	39	45	35	27	24	29
Durango Complex	22	20	30	31	31	21	20	73	47	33	30	23	18	16	29
Dysart	12	26	27	28	26	35	17	96	63	33	56	30	24	16	16
Glendale	8	14	18	18	18	19	12	64	49	25	35	24	16	15	12
Greenwood	27	36	39	41	45	32	25	105	62	43	46	32	37	25	31
JLG Supersite	14	27	27	26	25	26	20	85	58	30	46	29	25	24	20
Mesa	7	12	22	19	22	16	15	44	58	25	29	19	17	13	15
North Phoenix	6	14	19	19	17	16	12	50	43	22	31	20	15	14	21
South Phoenix	13	18	27	28	27	28	24	70	54	30	32	27	23	22	27
South Scottsdale	14	20	27	29	25	33	21	66	63	27	38	28	25	20	28
Tempe	15	13	22	19	18	18	15	50	48	20	31	19	18	14	18
West 43rd Avenue	34	45	49	58	48	34	30	174	65	48	55	37	32	24	31
West Chandler	11	17	25	26	28	20	20	76	73	31	46	30	30	23	24
West Phoenix	12	23	25	27	25	21	18	71	50	26	35	24	22	18	18
Zuni Hills	12	20	21	21	22	33	17	109	59	30	47	27	19	15	15

Monitoring Data Notes: While not included in this demonstration, one PM₁₀ monitor in the Gila River Indian Community (04-013-7003) also exceeded the 24-hour PM₁₀ standard on April 25, 2016 as a result of the high wind dust event. This monitor is located upwind of the exceeding West 43rd Avenue monitor.

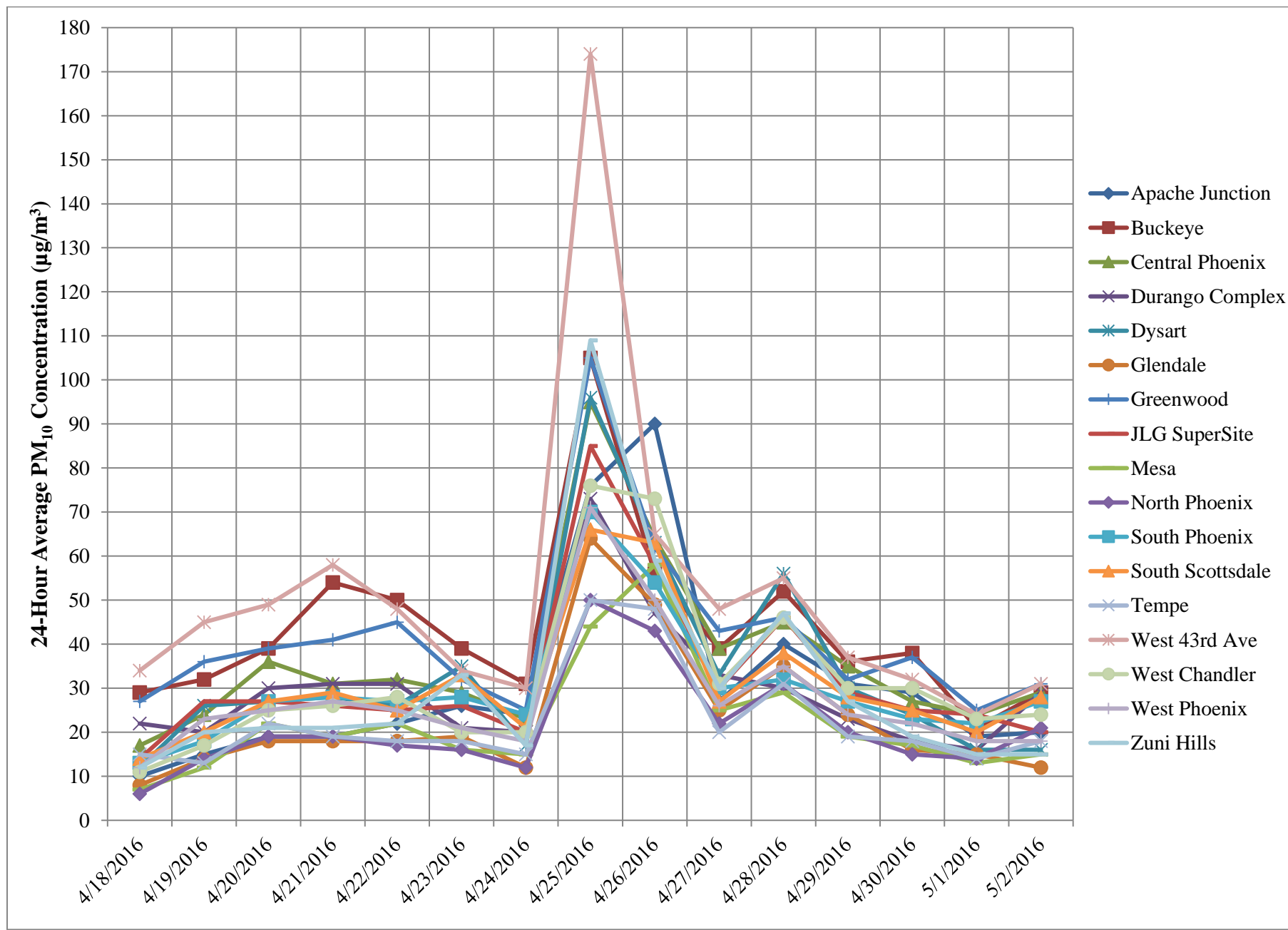


Figure 2-7. 24-hour average PM₁₀ concentrations (µg/m³) at Maricopa County and nonattainment area monitors on April 18-May 2, 2016.

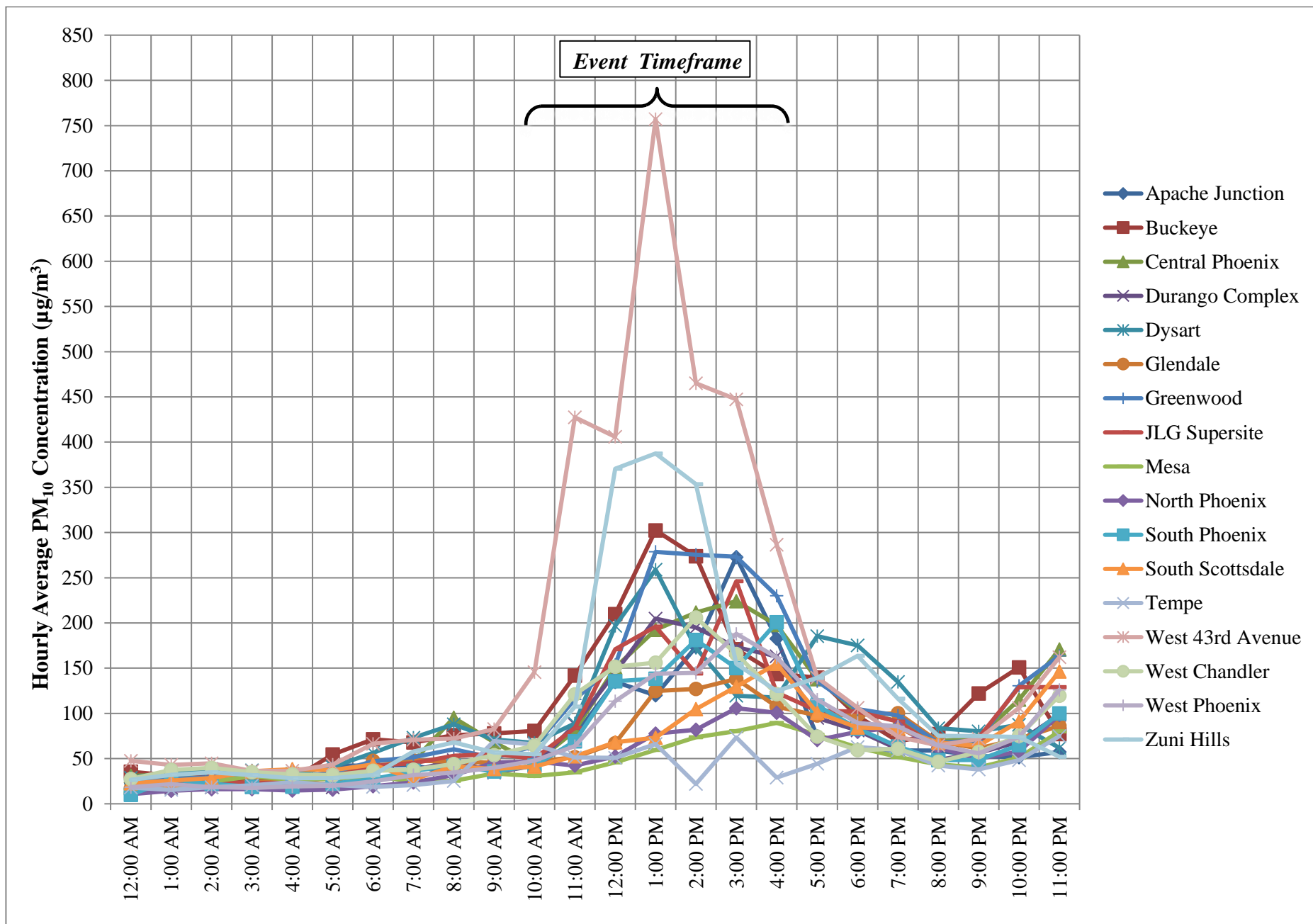


Figure 2-8. Diurnal profile of monitors on April 25, 2016.

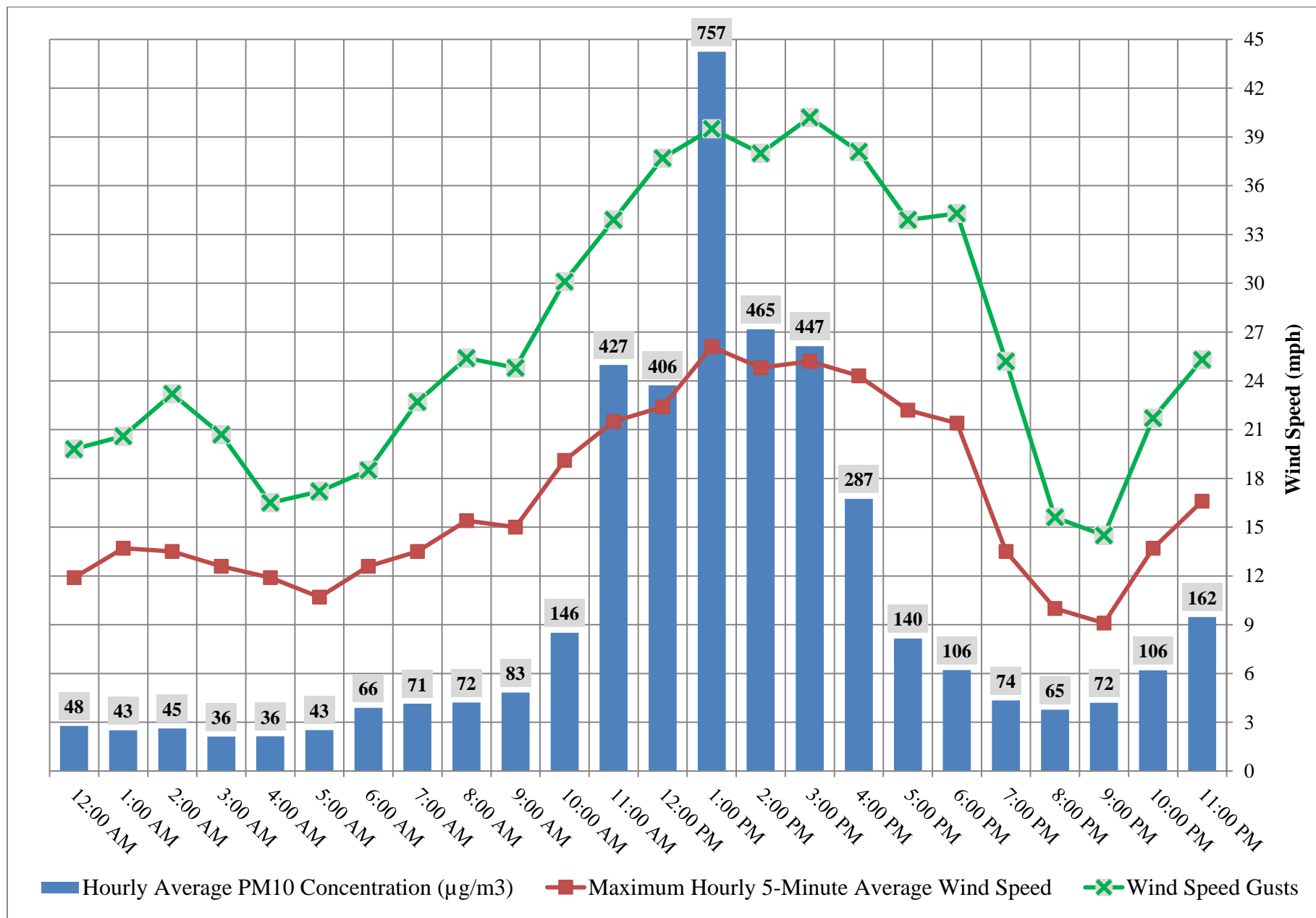


Figure 2-9. Hourly average PM₁₀ concentrations, maximum hourly 5-minute average wind speeds, and maximum hourly gusts as recorded at the exceeding West 43rd Avenue monitor.

III. CLEAR CAUSAL RELATIONSHIP

Introduction

One of the core statutory elements that must be addressed to exclude a monitored exceedance or violation caused by an exceptional event is a demonstration that the exceptional event “affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedance or violation.” The requirement to include this demonstration is codified in 40 CFR Section 50.14(c)(3)(iv)(B). To support the clear causal relationship requirements in 40 CFR Section 50.14(c)(3)(iv)(B), analyses comparing the claimed event-influenced concentration to concentrations at the same monitoring site at other times are required as stated in 40 CFR Section 50.14(c)(3)(iv)(C).

Additionally, specific to high wind dust events, the preamble to the revised exceptional events rule states that “EPA expects air agencies to provide relevant wind data...showing how the observed sustained wind speed compares to the established high wind threshold and demonstrates a relationship between the sustained wind speeds and measured PM concentrations at a particular monitoring location”. Demonstrations covering all of the required elements of a clear causal relationship are presented in the sections below.

Comparison of High Wind Dust Event Concentrations with Historical Concentrations

In Table 2 of the preamble to the revised exceptional events rule, EPA includes as guidance seven categories of “historical concentration evidence” that should be addressed in order to meet the requirement in 40 CFR Section 50.14(c)(3)(iv)(C) to provide analyses comparing the claimed event-influenced concentration to concentrations at the same monitoring site at other times. The seven categories listed by EPA and where they are addressed in this documentation are listed below:

1. Compare the concentrations on the claimed event day with past historical data (included in Figure 3–1).
2. Demonstrate spatial and/or temporal variability of the pollutant of interest in the area (included in Figures 3–3 through 3–28 and Figure 2-7).
3. Determine percentile ranking: 99th percentile (based upon five years of data, April 25, 2011 – April 25, 2016).
4. Plot annual time series to show the range of “normal” values (included in Figure 3–1).
5. Identify all “high” values in all plots (included in Figure 3–1).
6. Identify historical trends (optional, included in Figure 3–1).
7. Identify diurnal or seasonal patterns (included in Figures 3–1 and 3–2).

The bulk of the seven categories listed above are addressed in Figure 3–1. Figure 3–1 includes all 24-hour average PM₁₀ concentrations at the exceeding West 43rd Ave monitor from January 1, 2011 through September 30, 2016. This period includes the most recent five calendar years of concentration data at the exceeding monitoring site, as recommended by EPA in the preamble to the revised exceptional events rule. Within the time period presented, Figure 3–1 identifies all days that have been flagged as high wind dust events (including the concurrence status of those days by EPA) and all exceedance days.

All exceedances in Figure 3–1, with the exception of one day, have been identified as high wind dust events. Figure 3–1 generally indicates that high wind dust events normally occur in spring through fall

(when dry cold fronts and the summer monsoon season are most active), but may occur at any time. The high wind dust events are relatively rare occurring on 19 days out of 2100, or 0.9% of the time. The specific percentile ranking of this high wind dust event 24-hour average PM₁₀ concentration is in the 99th percentile, based upon five years of data (April 25, 2011 – April 25, 2016).

While not specifically indicated in Figure 3–1, it is important to note that some of the other high, but not exceeding PM₁₀ concentrations (100–150 µg/m³) at the West 43rd Avenue monitor, occurred on days when high wind dust events nearly caused an exceedance, or on days when high wind dust events caused exceedances at other monitors in the Maricopa County PM₁₀ nonattainment area. Because of the vast size of the nonattainment area, it is rare that a high wind dust event will cause all monitors within the nonattainment area to exceed the PM₁₀ standard. As seen in this high wind dust event, PM₁₀ concentrations were elevated across the nonattainment area, particularly at the western nonattainment area monitors (e.g., Buckeye monitor at 105 µg/m³, Zuni Hills monitor at 109 µg/m³), but only the West 43rd Avenue monitor exceeded on April 25, 2016.

Figure 3–1 also includes a linear trend line of the 24-hour average PM₁₀ concentration data at the West 43rd Avenue monitor. This trend line indicates approximately an average 8 µg/m³ decrease from January 1, 2011 to September 30, 2016 (i.e., a decrease from an average of about 48 µg/m³ to an average of about 40 µg/m³). While the trend line represents an average of concentration data that can vary significantly from day to day, the trend line does indicate that overall PM₁₀ concentrations at the West 43rd Avenue monitor have been decreasing with time, despite an increase in population, employment and vehicle traffic throughout the nonattainment area. This suggests that controls within the PM₁₀ nonattainment area continue to be effective at preventing PM₁₀ exceedances except during the uncontrollable meteorological conditions that lead to high wind dust events.

As can be seen in Figure 3–1, there is not a distinct seasonal pattern for PM₁₀, but rather concentrations can vary daily in all seasons. In general terms, wintertime inversion conditions can elevate PM₁₀ on stagnant days in the winter months, and elevated winds particularly during the monsoon season produce the highest overall PM₁₀ concentrations. However, these meteorological conditions are not constant enough to create a definite “season” when PM₁₀ is elevated or suppressed.

Figure 3–2 displays the average diurnal patterns of PM₁₀ as observed over 5 years from January 1, 2011 through December 31, 2015 at the West 43rd Avenue monitor. The figure includes annual hourly average concentrations, average hourly concentrations in April (the month the event occurred), and the diurnal pattern observed on the event day (April 25, 2016). Hourly PM₁₀ concentrations that were flagged in AQS as being the result of an exceptional event have been removed from the annual and April averages. As can be seen in the Figure 3–2, there is little difference between the annual hourly averages and the hourly averages in the month of April over the 5 year period. Diurnal emissions on the high wind dust event day (April 25, 2016) were very similar to the annual and April averages, except during the hours when high winds were present (approximately 9am to 7pm and 10pm to 11 pm), providing evidence that no unusual anthropogenic activity was occurring around the exceeding West 43rd Avenue monitor on the high wind dust event day (i.e., no elevated hourly PM₁₀ concentrations during non-windy conditions on the event day as compared to historical hourly averages).

In addition to the data presented in Figures 3–1 and 3–2, data in Figure 2–7 displays the 24-hour average PM₁₀ concentrations at all nonattainment area monitors a week before and after the high wind dust event on April 25, 2016. The figure indicates that PM₁₀ concentrations were relatively low throughout the nonattainment area both before and after the high wind dust event on April 25, 2016. While the West 43rd Avenue monitor experienced the highest increase in PM₁₀ concentrations, nearly all monitors spiked at a similar time in response to the arrival of the high wind dust event.

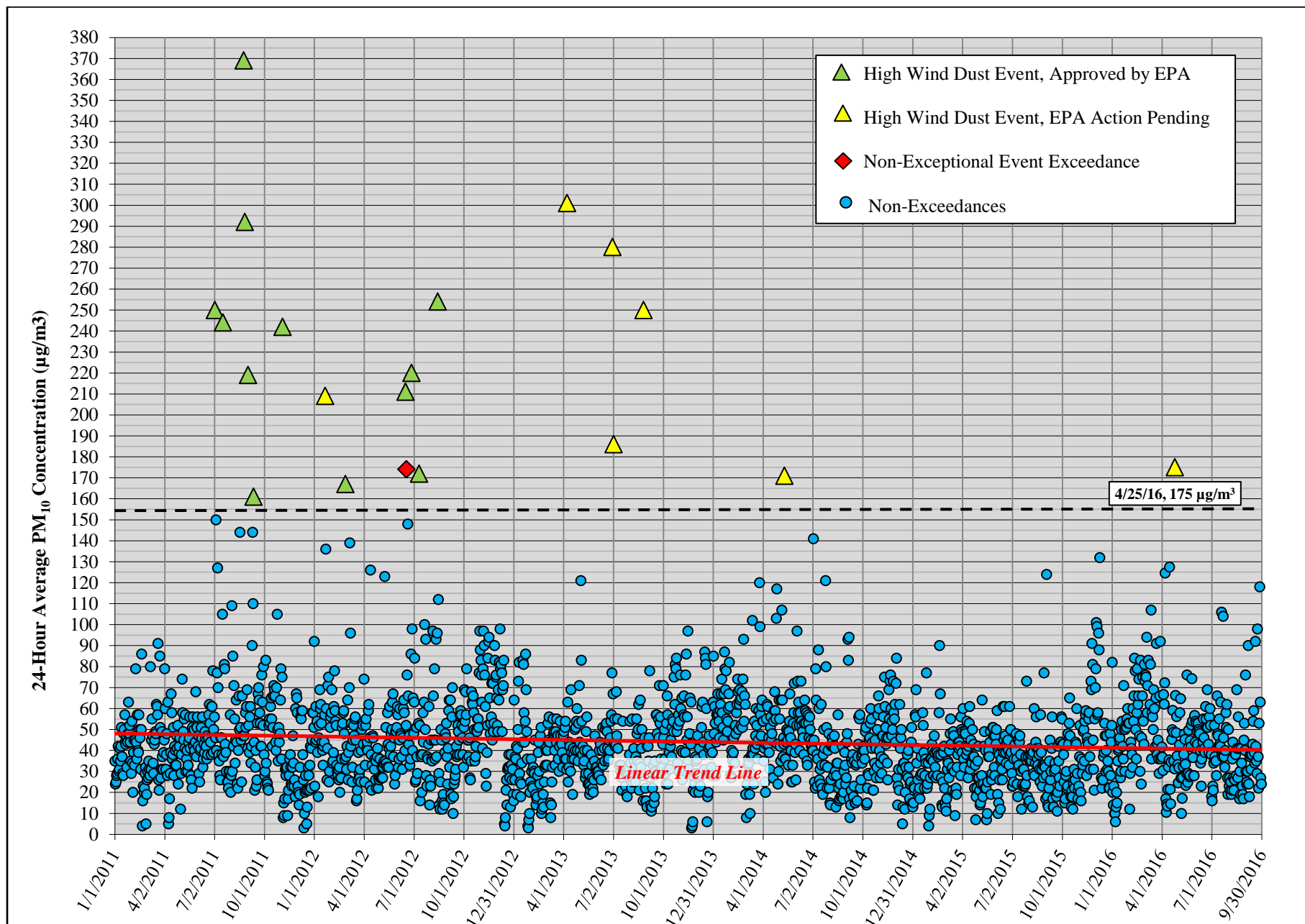


Figure 3-1. Plot of 24-hour average PM₁₀ concentrations at the West 43rd Avenue monitor, January 2011 – September 2016.

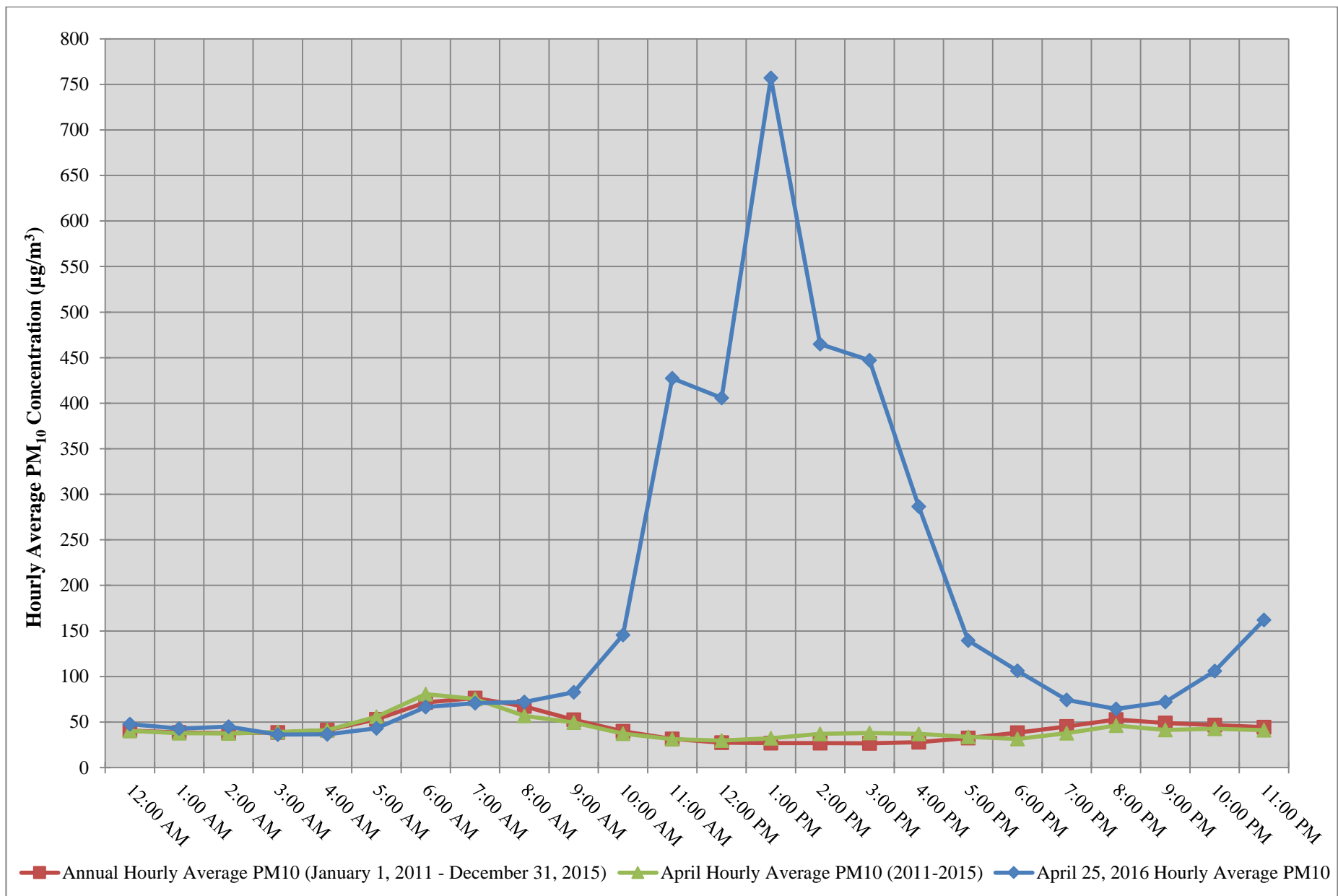


Figure 3-2. Plot of annual hourly average PM₁₀ concentrations (1/1/2011 – 12/31/2015), hourly average PM₁₀ concentrations in April (2011 – 2015), and diurnal PM₁₀ concentrations at the West 43rd Avenue monitor on the April 25, 2016 high wind dust event day.

Chronological and Spatial Presentation of Wind, Visibility, and PM₁₀ Concentration Data During the High Wind Dust Event in the Maricopa County PM₁₀ Nonattainment Area

In addition to the analyses focused on comparison of the high wind dust event PM₁₀ concentration to historical concentrations, Figure 3–3 through 3–27 display the chronological and spatial distribution of wind, visibility and PM₁₀ concentration data throughout the nonattainment area in mapped form. The figures establish a clear causal relationship between elevated PM₁₀ concentrations, elevated wind speeds and reduced visibility in the nonattainment area. The figures also establish the transport of PM₁₀ across the nonattainment area with the passing of the cold front winds.

PM₁₀ concentrations in the figures were highest at the exceeding West 43rd Avenue monitor when wind speeds were also at their highest. In 40 CFR Section 50.14(b)(5)(iii), EPA establishes a default high wind threshold of a sustained wind of 25 mph, as the wind speed necessary to entrain significant amounts of dust from undisturbed, natural areas, as well as disturbed, anthropogenic source areas that are subject to reasonable controls. Sustained winds, as represented in the figures, were above 25 mph at multiple locations throughout the nonattainment and at the exceeding West 43rd Avenue monitor, indicating that reasonable controls on anthropogenic sources of windblown dust were overwhelmed and that emissions of dust from natural desert areas would be expected. In summary, the figures make it clear that without the high wind dust event caused by the passing cold front, there would have been no exceedance at the West 43rd Avenue monitor.

The data displayed in the following figures were gathered from five data sources. All available meteorological and air quality data were used in order to present the most complete story of the event. Table 3–1 displays the types of data used from each agency in creating the maps. Each map in the figures represents the chronological and spatial distribution of wind, visibility and PM₁₀ concentration in a 30-minute period. The figures start with the 8:00-8:30 AM period and end with the 8:00-8:30 PM period, covering the arrival and passing of the cold front across the Maricopa County PM₁₀ nonattainment area.

Table 3-1. Data Sets Used in the Creation of Chronological and Spatial Maps.

Agency	Data Sets
Arizona Department of Environmental Quality (ADEQ)	Hourly PM ₁₀ Concentrations, Wind Speed, Wind Direction and Wind Gusts
Arizona Meteorological Network (AZMET)	Hourly Wind Speed, Wind Direction and Wind Gusts
Maricopa County Air Quality Department (MCAQD)	5-Minute PM ₁₀ Concentrations, 5-Minute Wind Speed and Wind Direction, and Maximum Hourly Wind Gusts
Pinal County Air Quality Control District (PCAQCD)	5-Minute and Hourly PM ₁₀ Concentrations, 5-Minute and Hourly Wind Speed, Wind Direction and Wind Gusts
National Weather Service (NWS)	Point in Time Wind Speed, Wind Direction, Wind Gusts, and Visibility

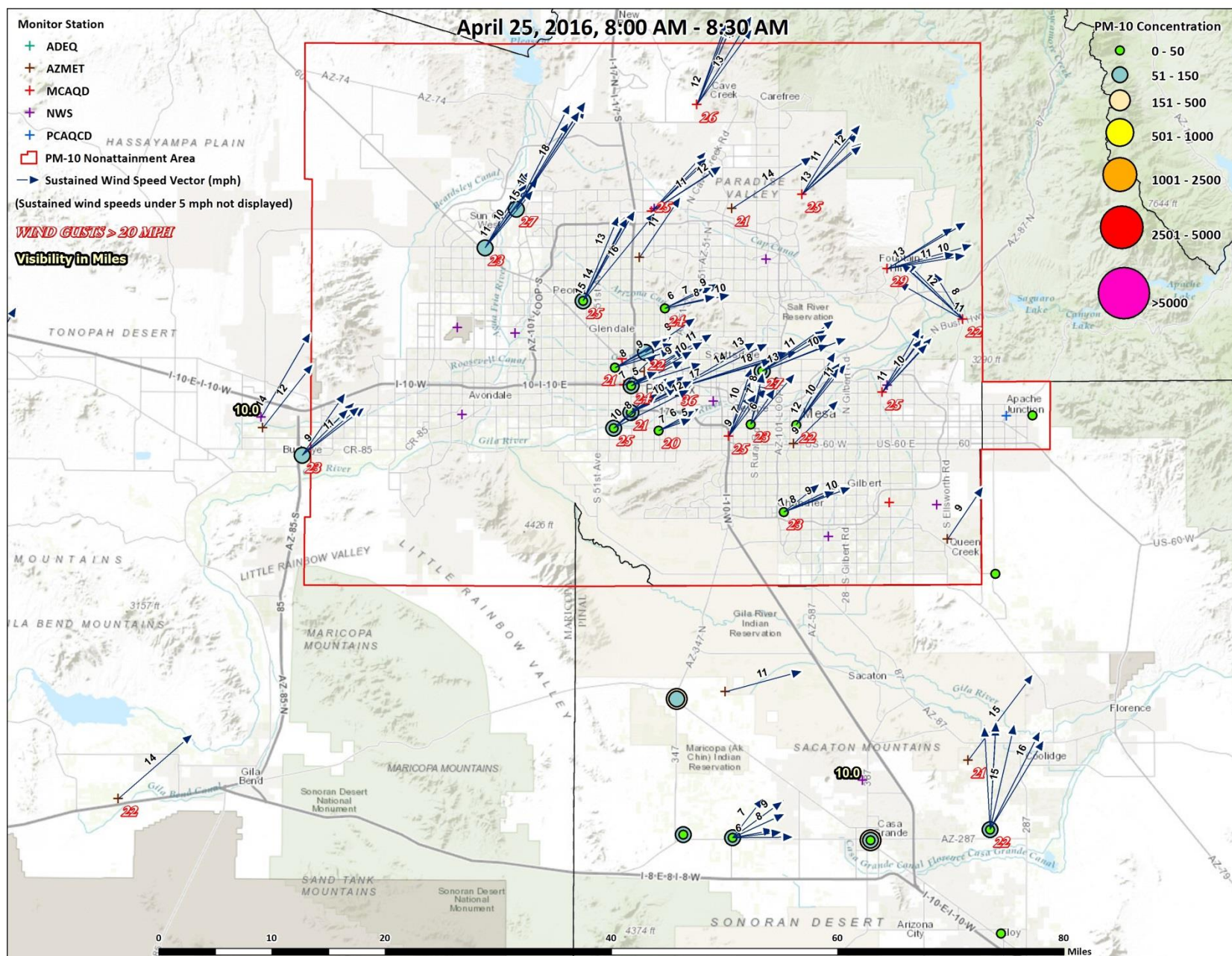


Figure 3-3. April 25, 2016, 8:00 AM – 8:30 AM.

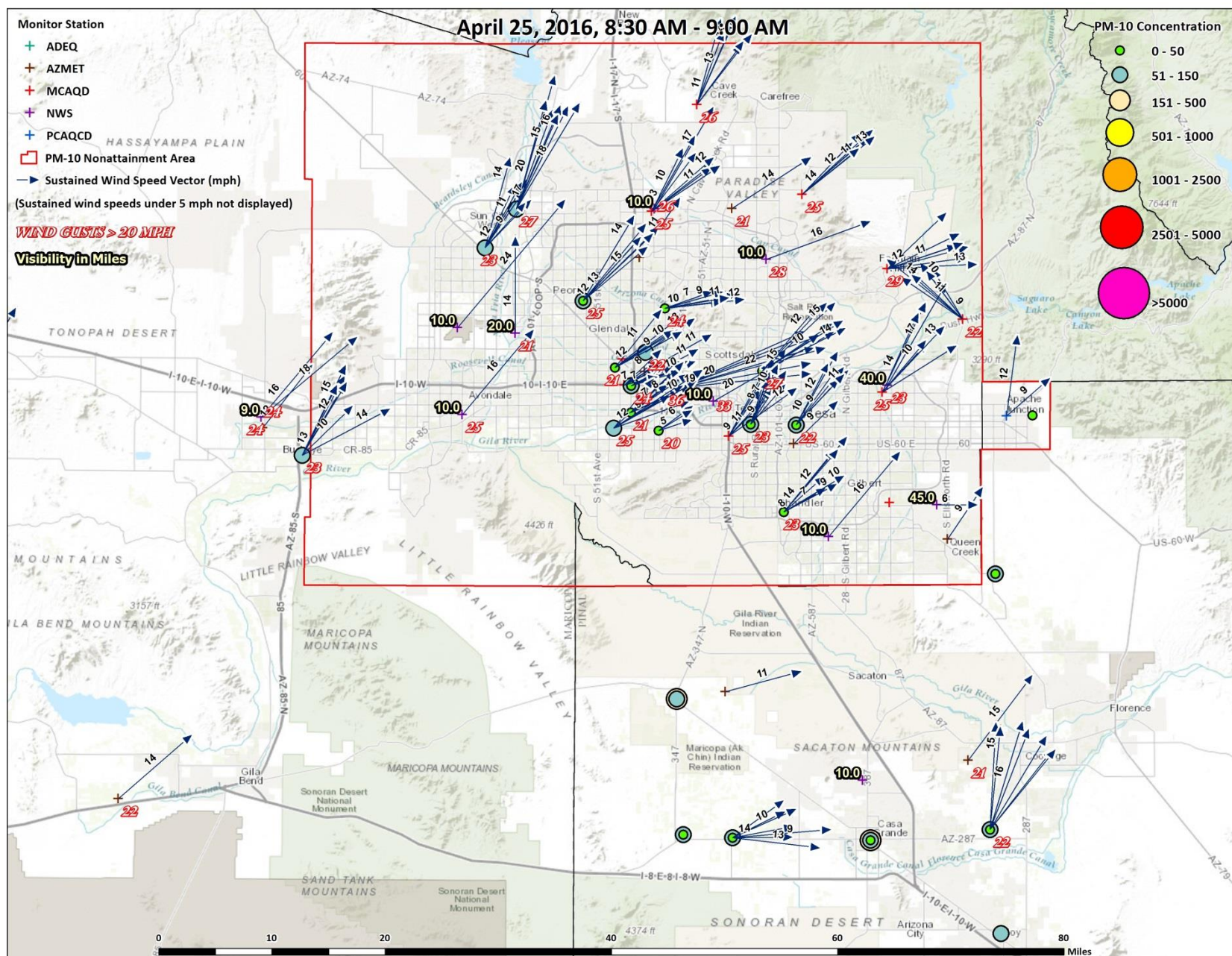
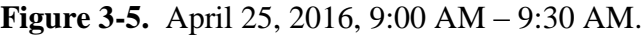


Figure 3-4. April 25, 2016, 8:30 AM – 9:00 AM.



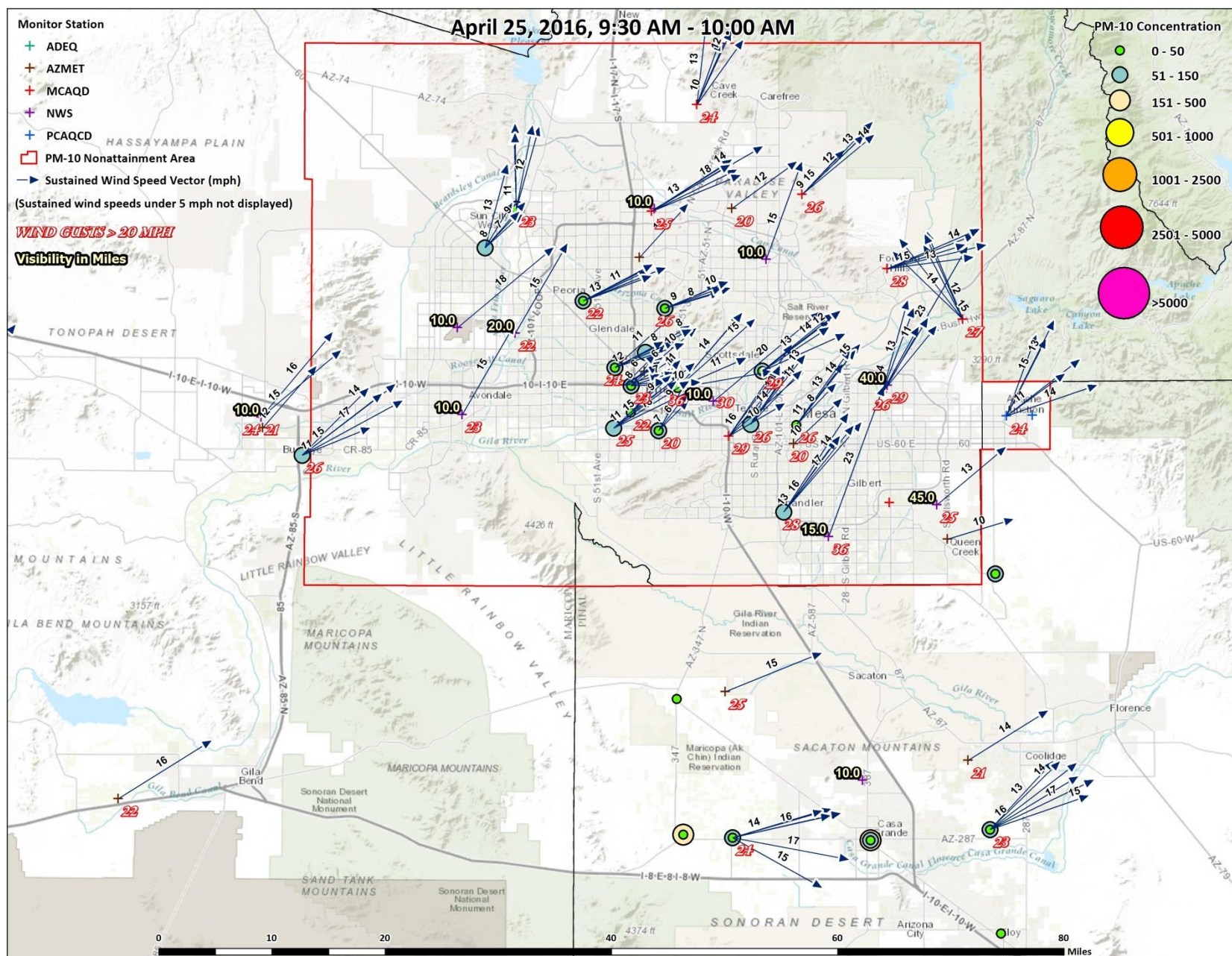


Figure 3-6. April 25, 2016, 9:30 AM – 10:00 AM.

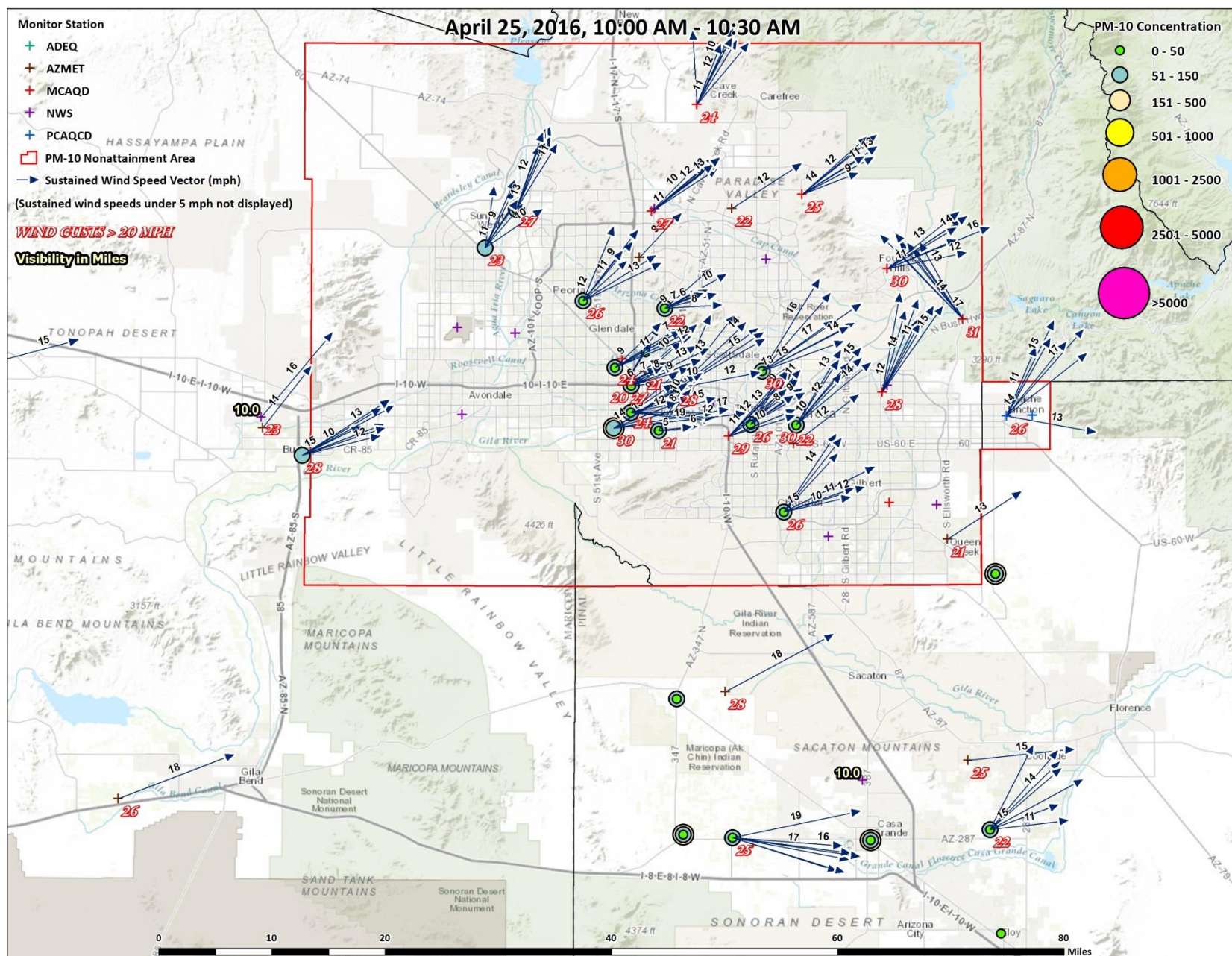


Figure 3-7. April 25, 2016, 10:00 AM – 10:30 AM.

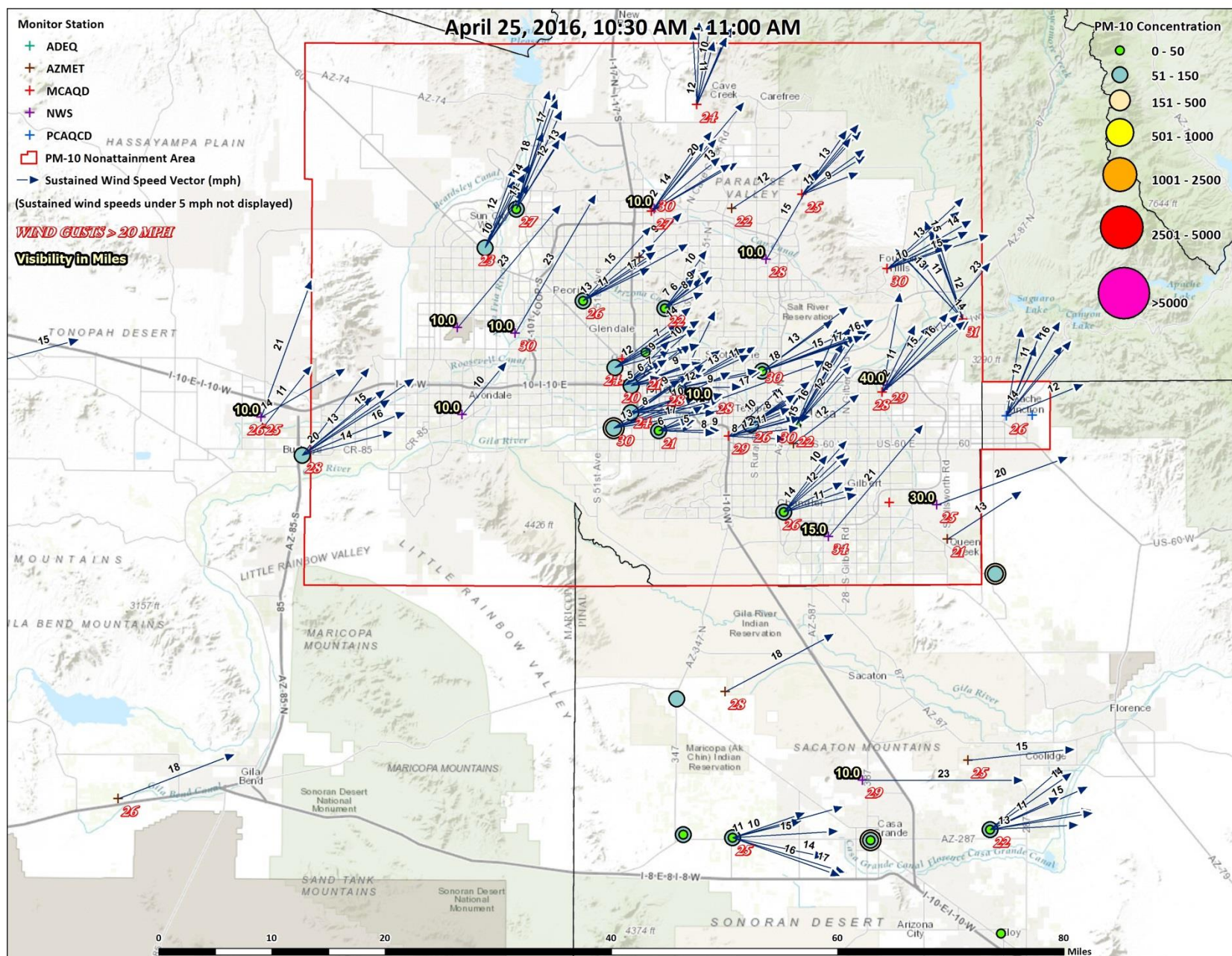


Figure 3-8. April 25, 2016, 10:30 AM – 11:00 AM.

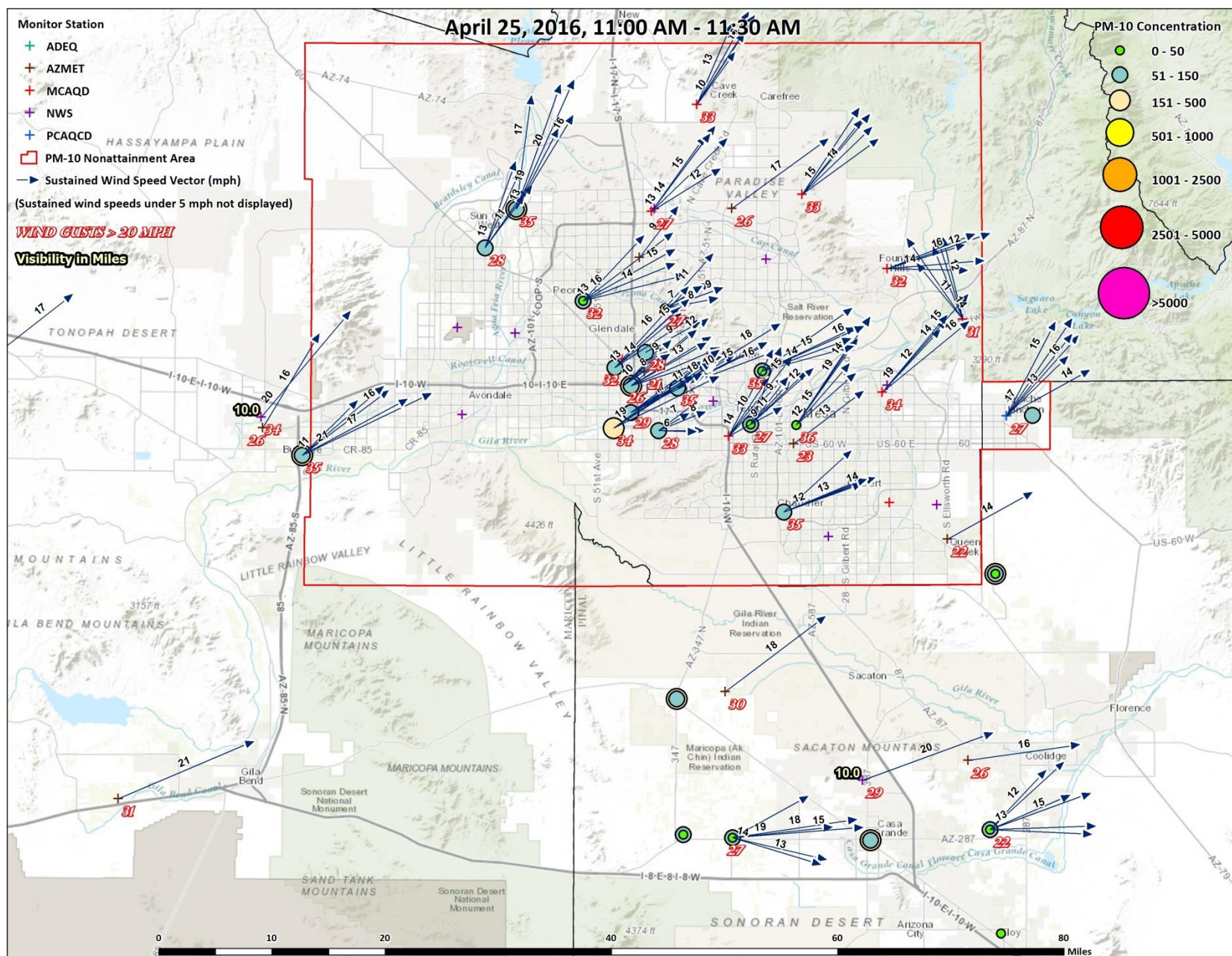


Figure 3-9. April 25, 2016, 11:00 AM – 11:30 AM.

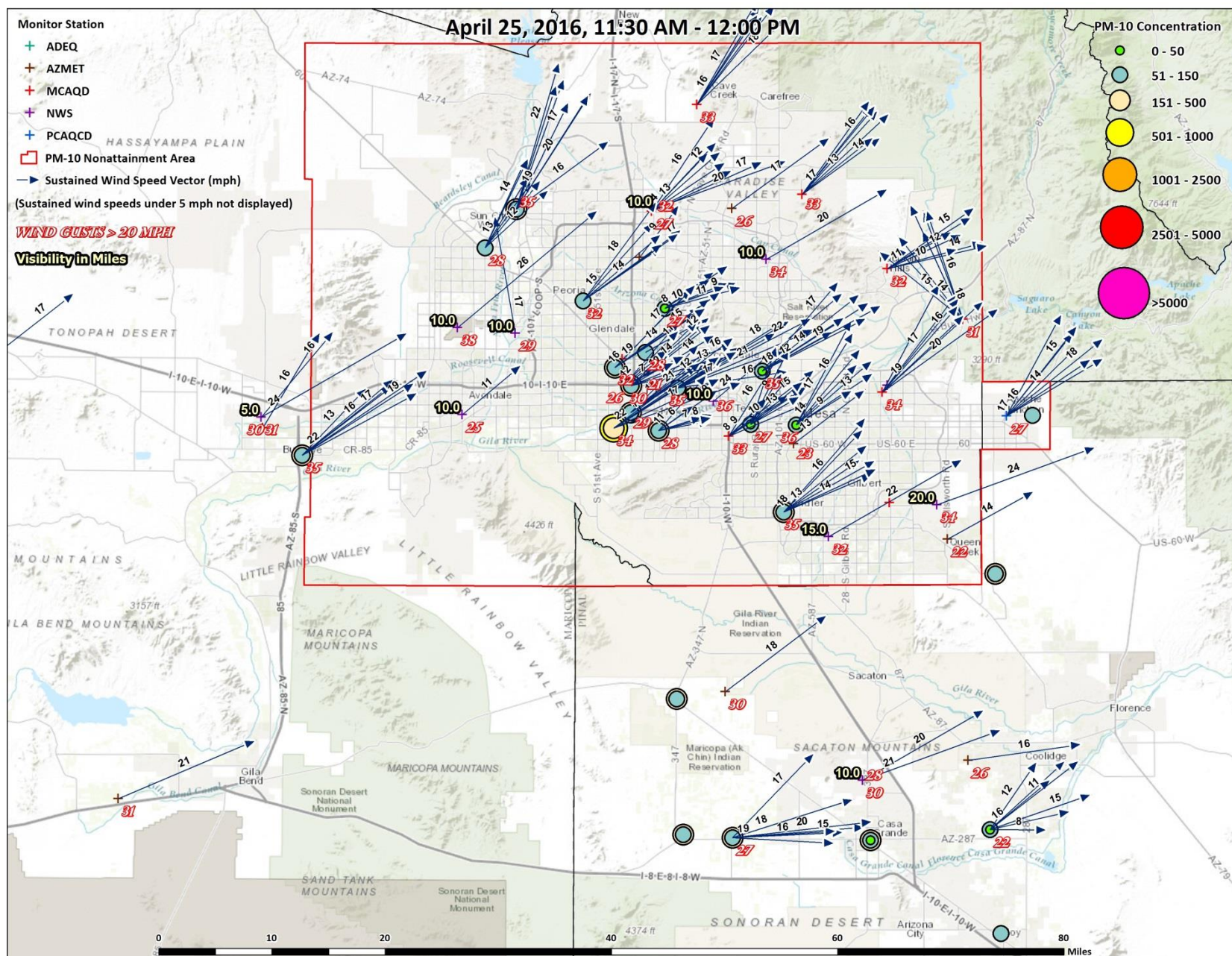


Figure 3-10. April 25, 2016, 11:30 AM – 12:00 PM.

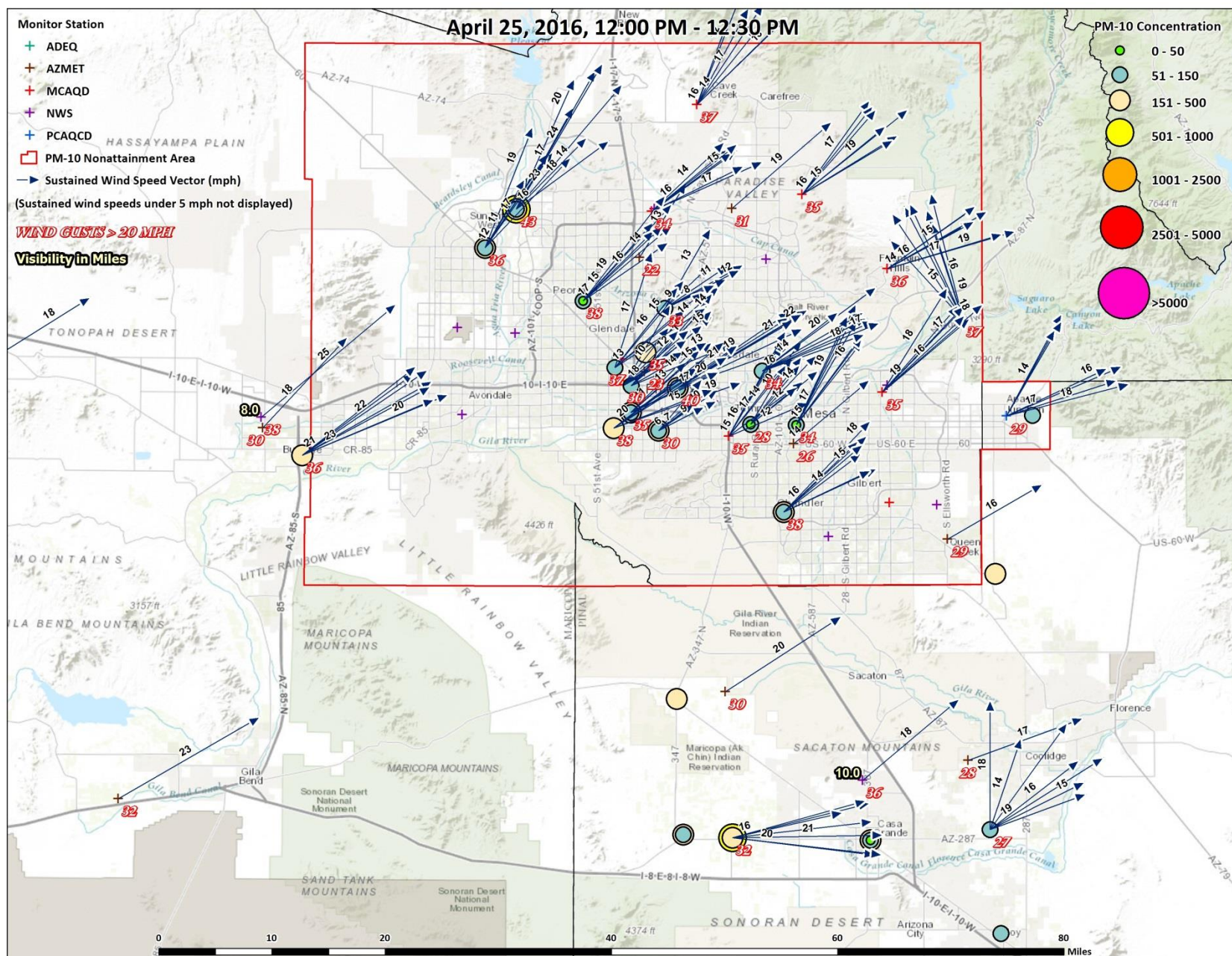


Figure 3-11. April 25, 2016, 12:00 PM – 12:30 PM.

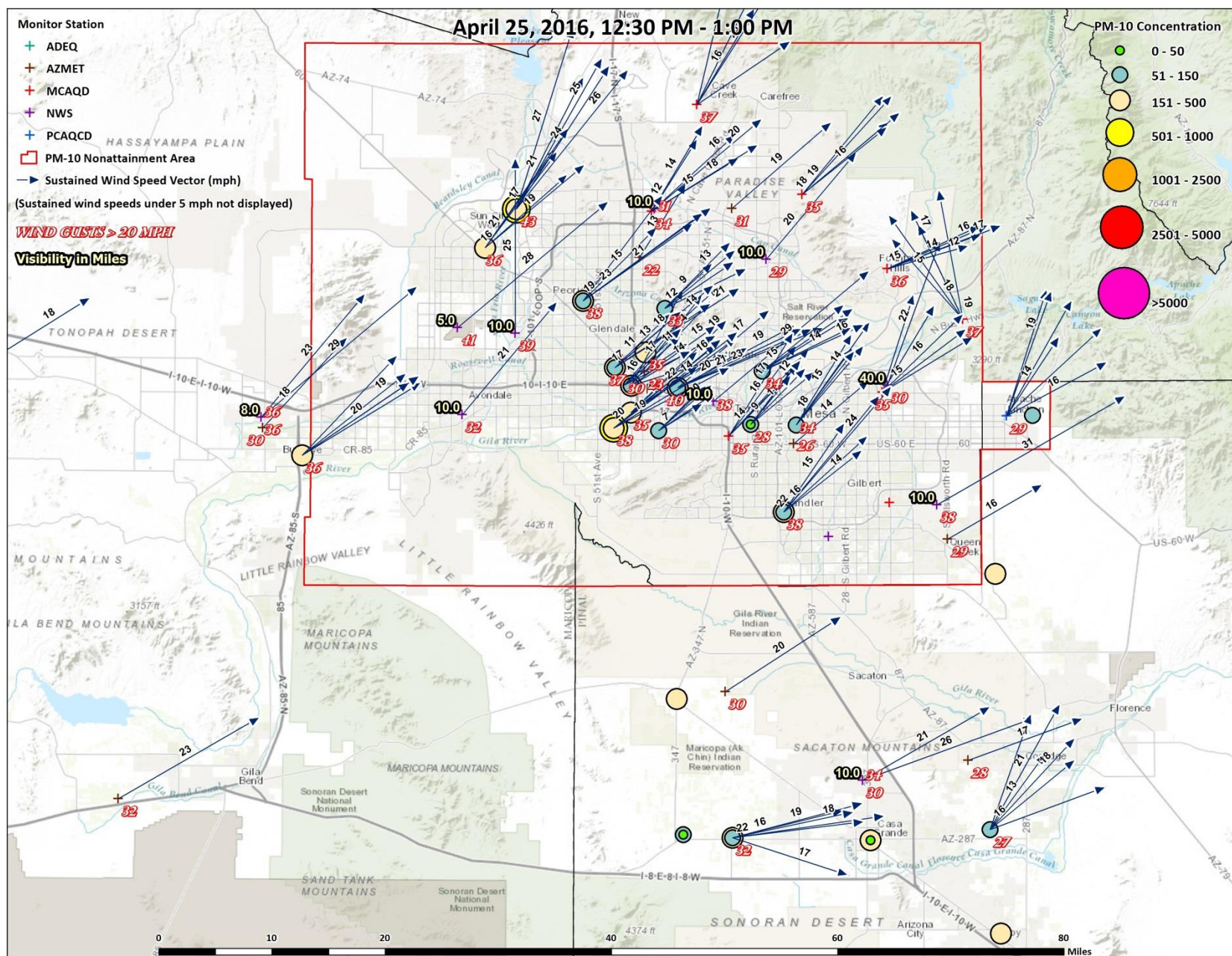
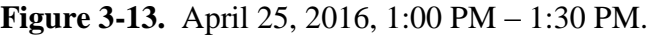


Figure 3-12. April 25, 2016, 12:30 PM – 1:00 PM.



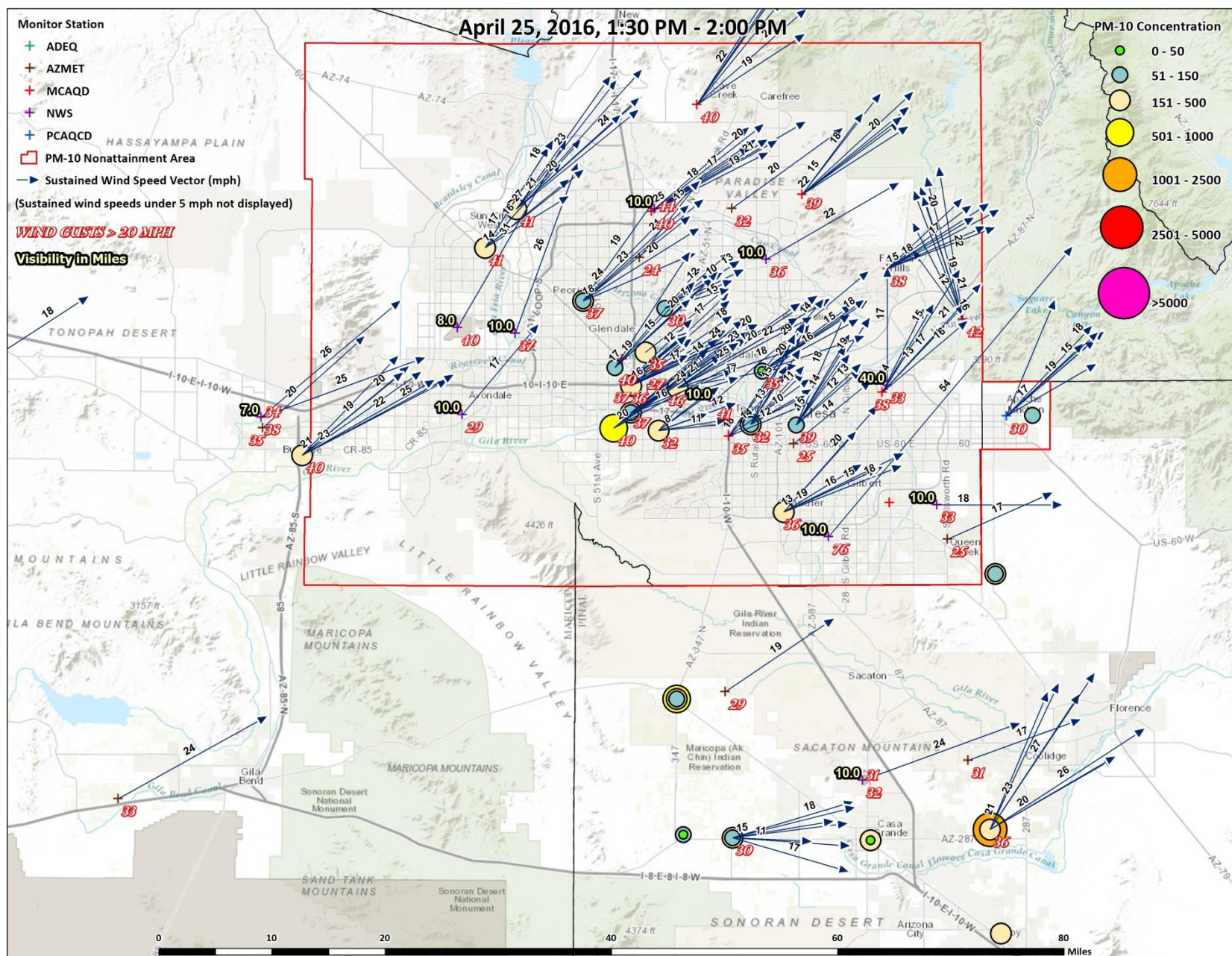


Figure 3-14. April 25, 2016, 1:30 PM – 2:00 PM.

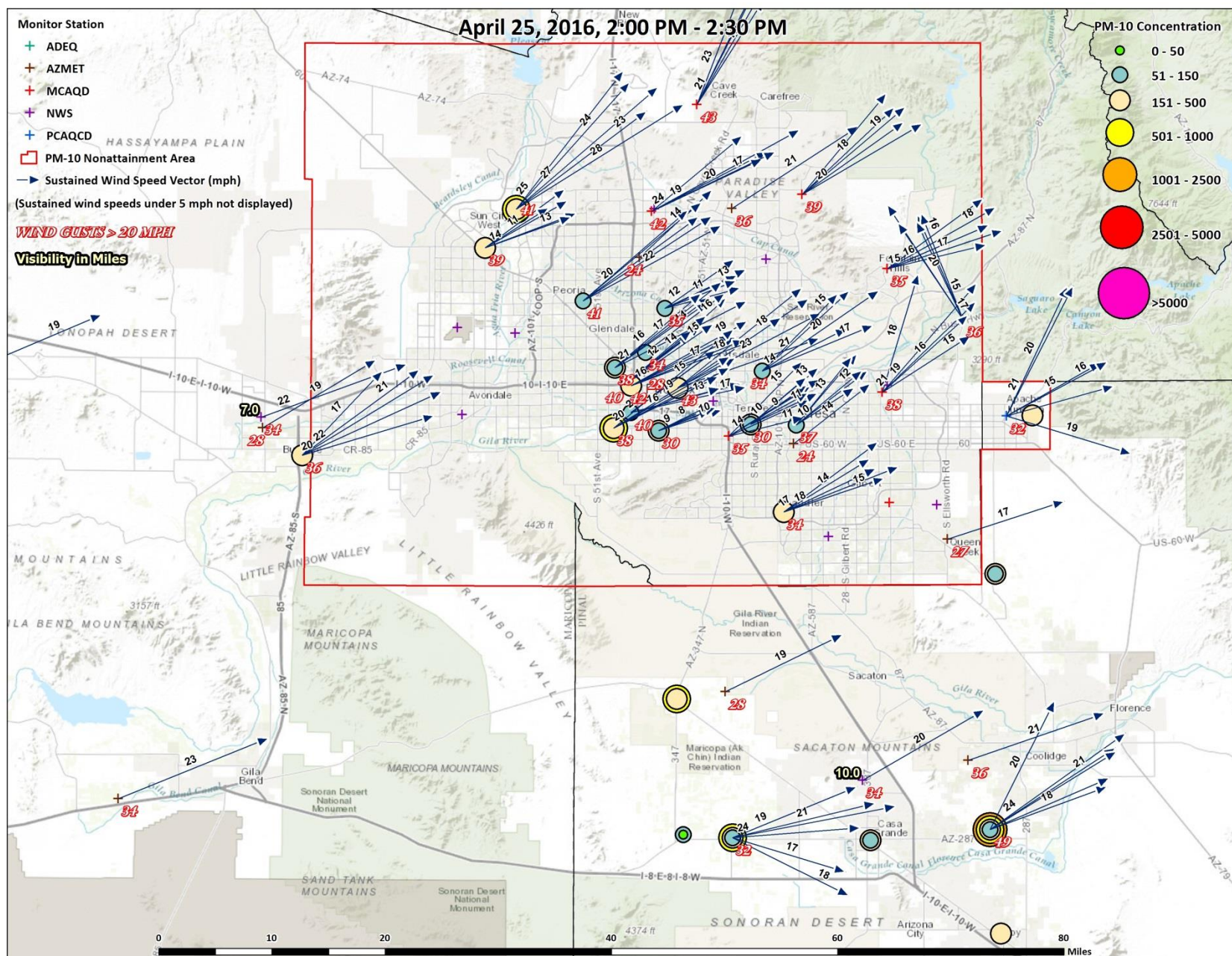


Figure 3-15. April 25, 2016, 2:00 PM – 2:30 PM.

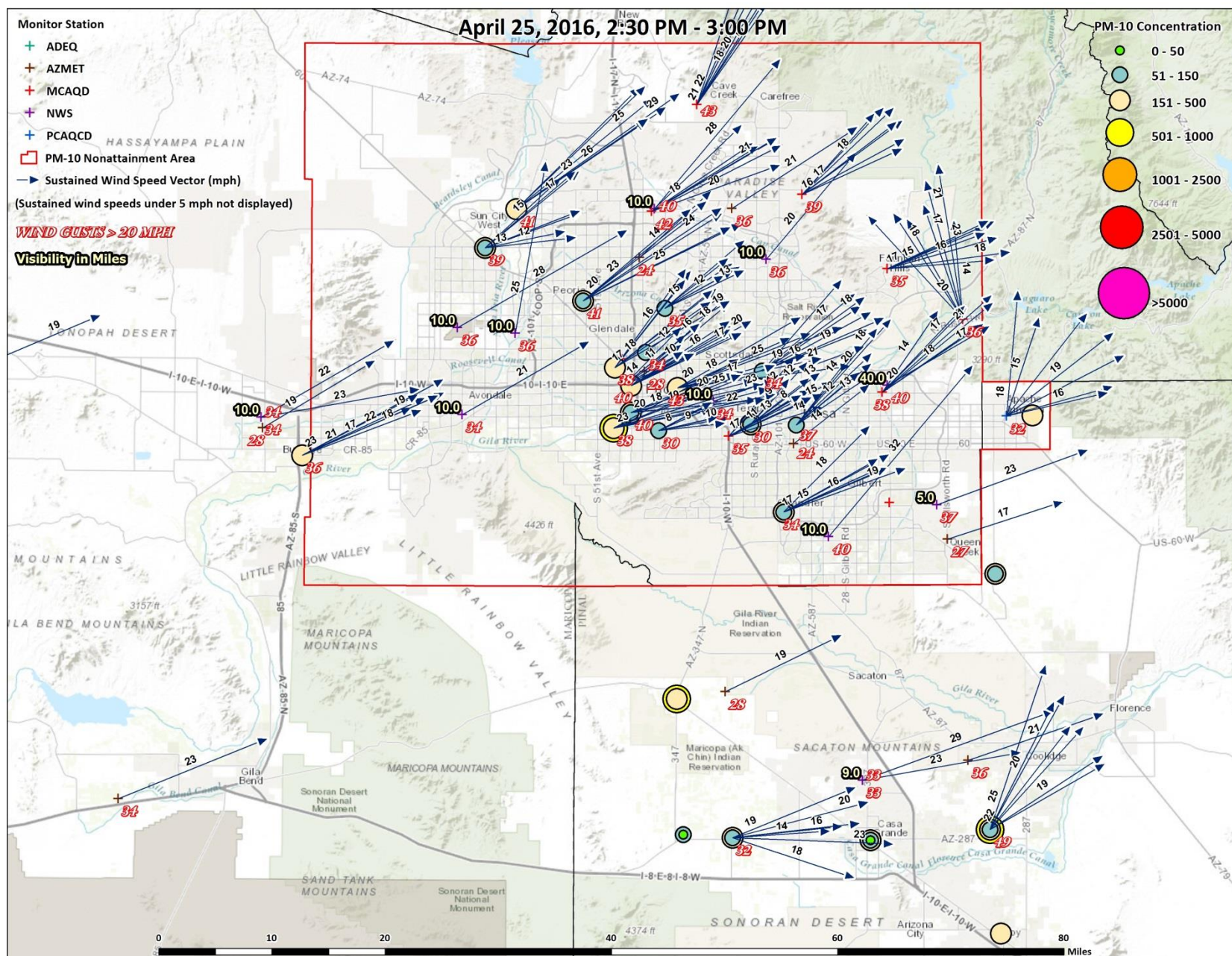


Figure 3-16. April 25, 2016, 2:30 PM – 3:00 PM.

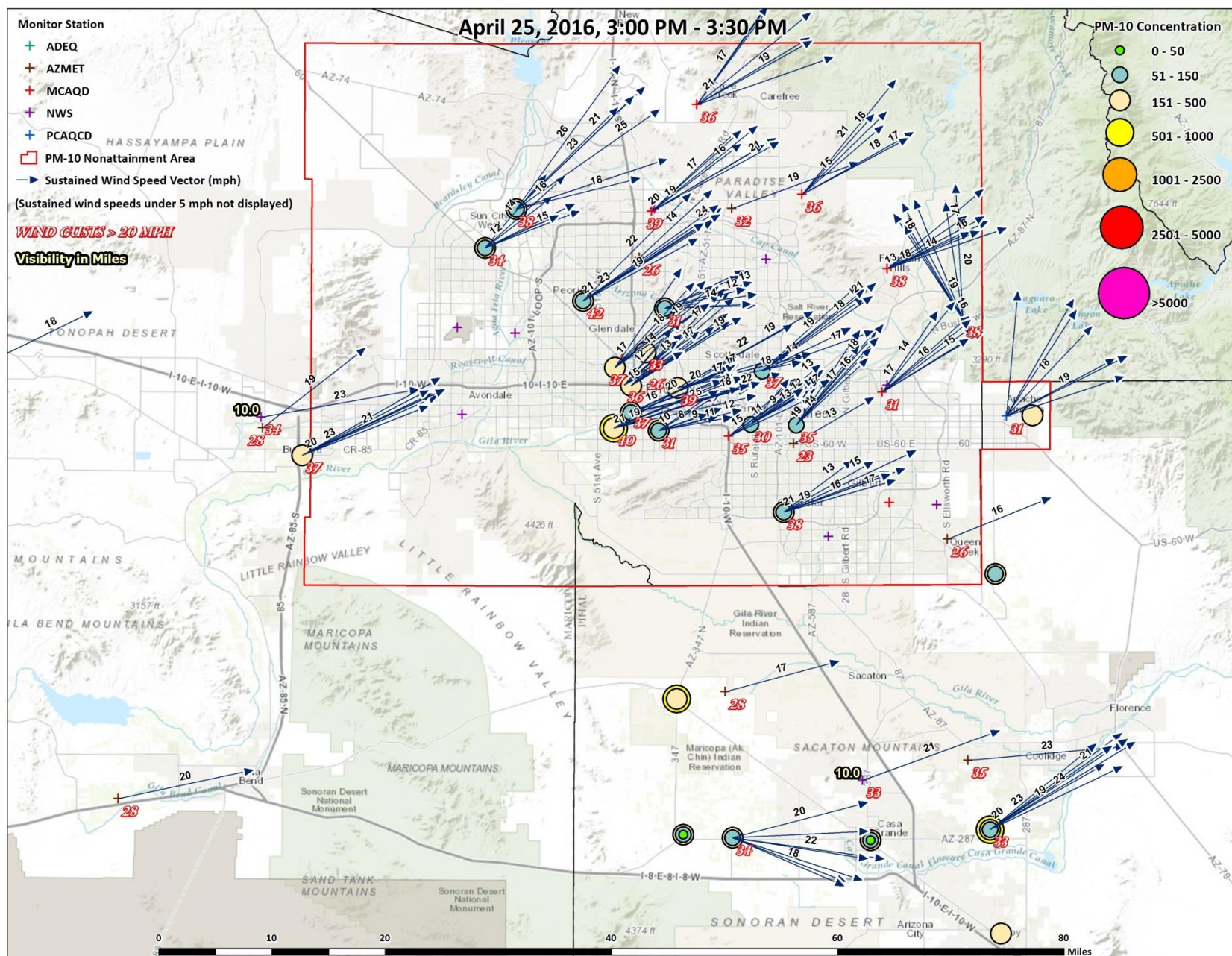


Figure 3-17. April 25, 2016, 3:00 PM – 3:30 PM.

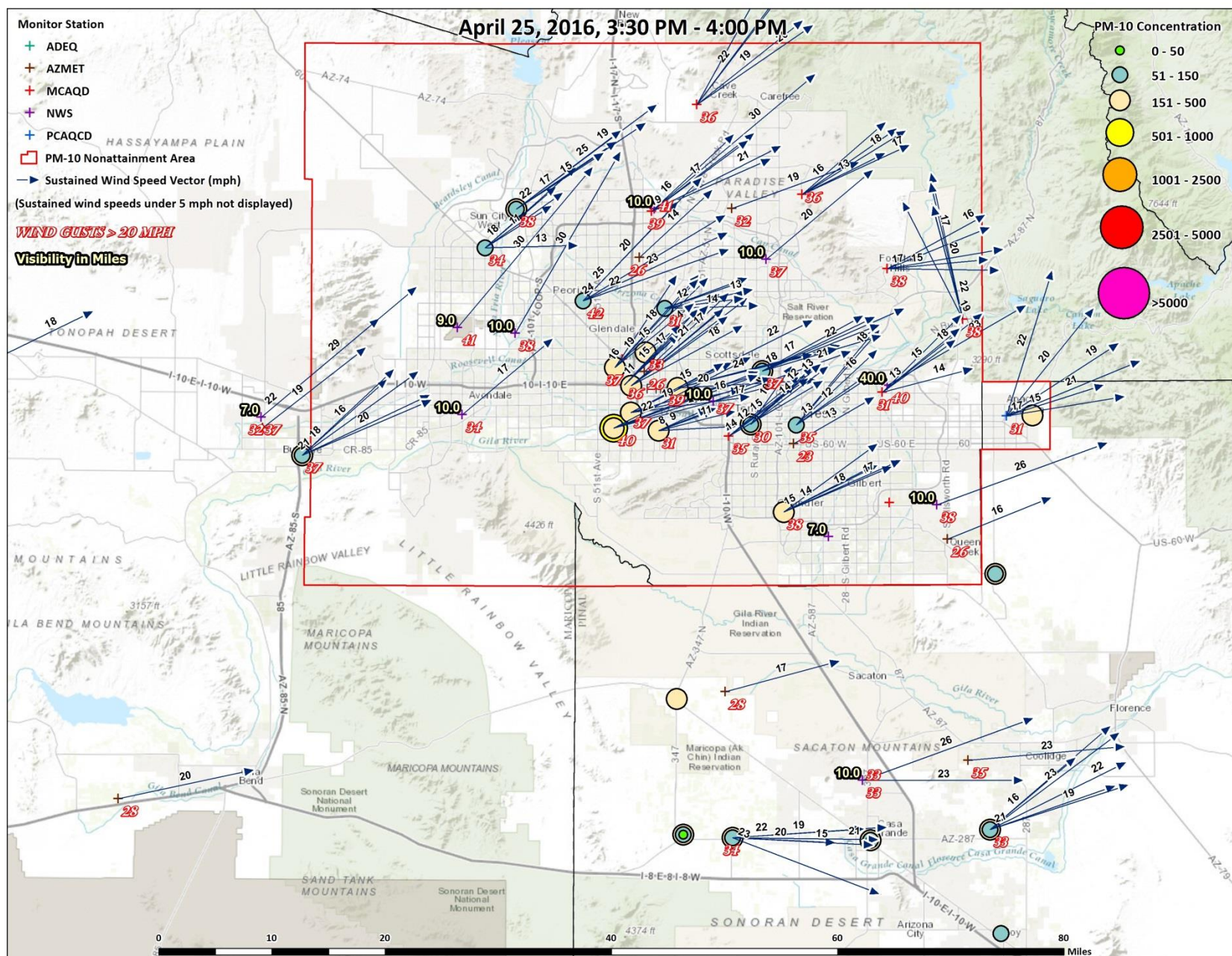


Figure 3-18. April 25, 2016, 3:30 PM – 4:00 PM.

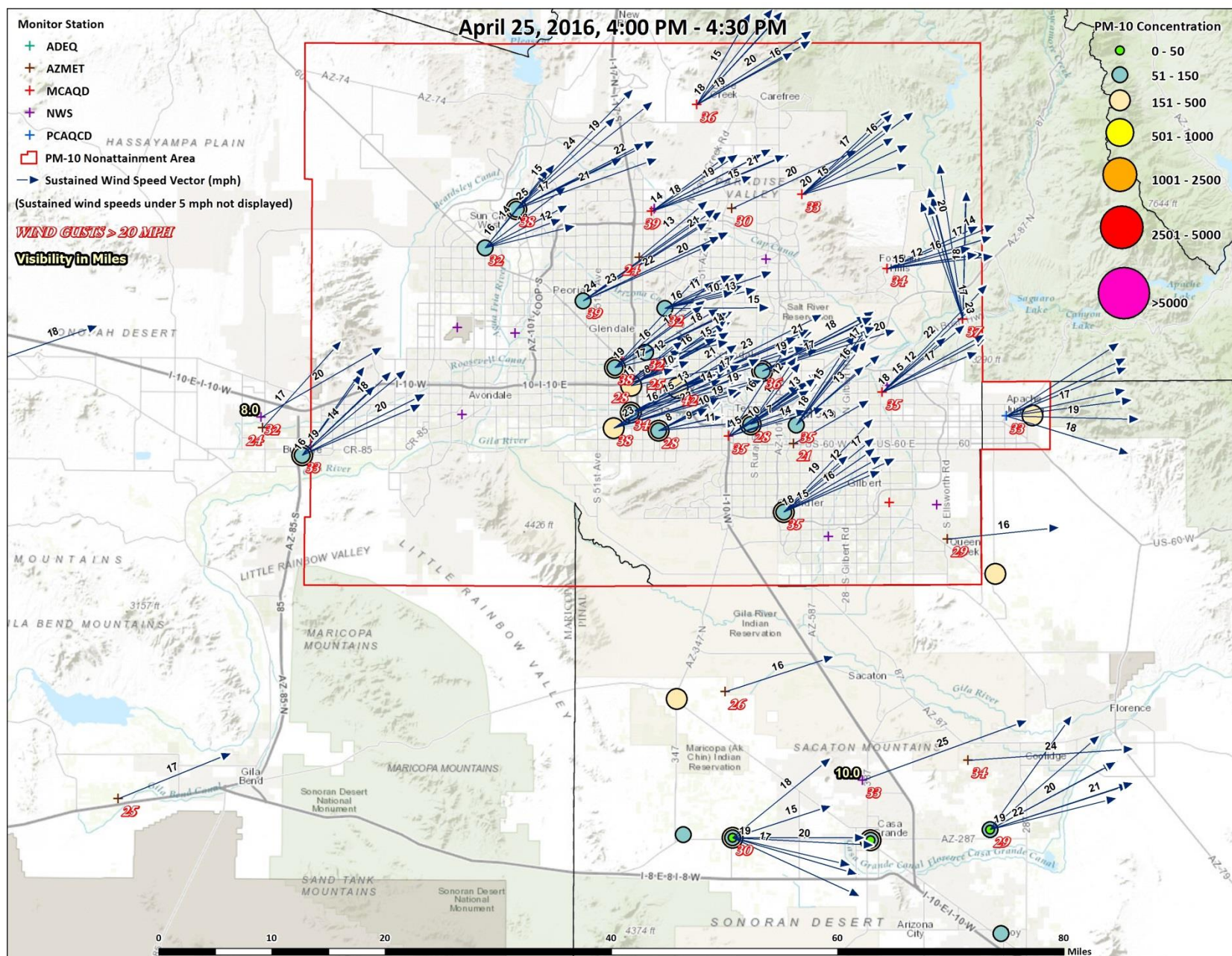


Figure 3-19. April 25, 2016, 4:00 PM – 4:30 PM.

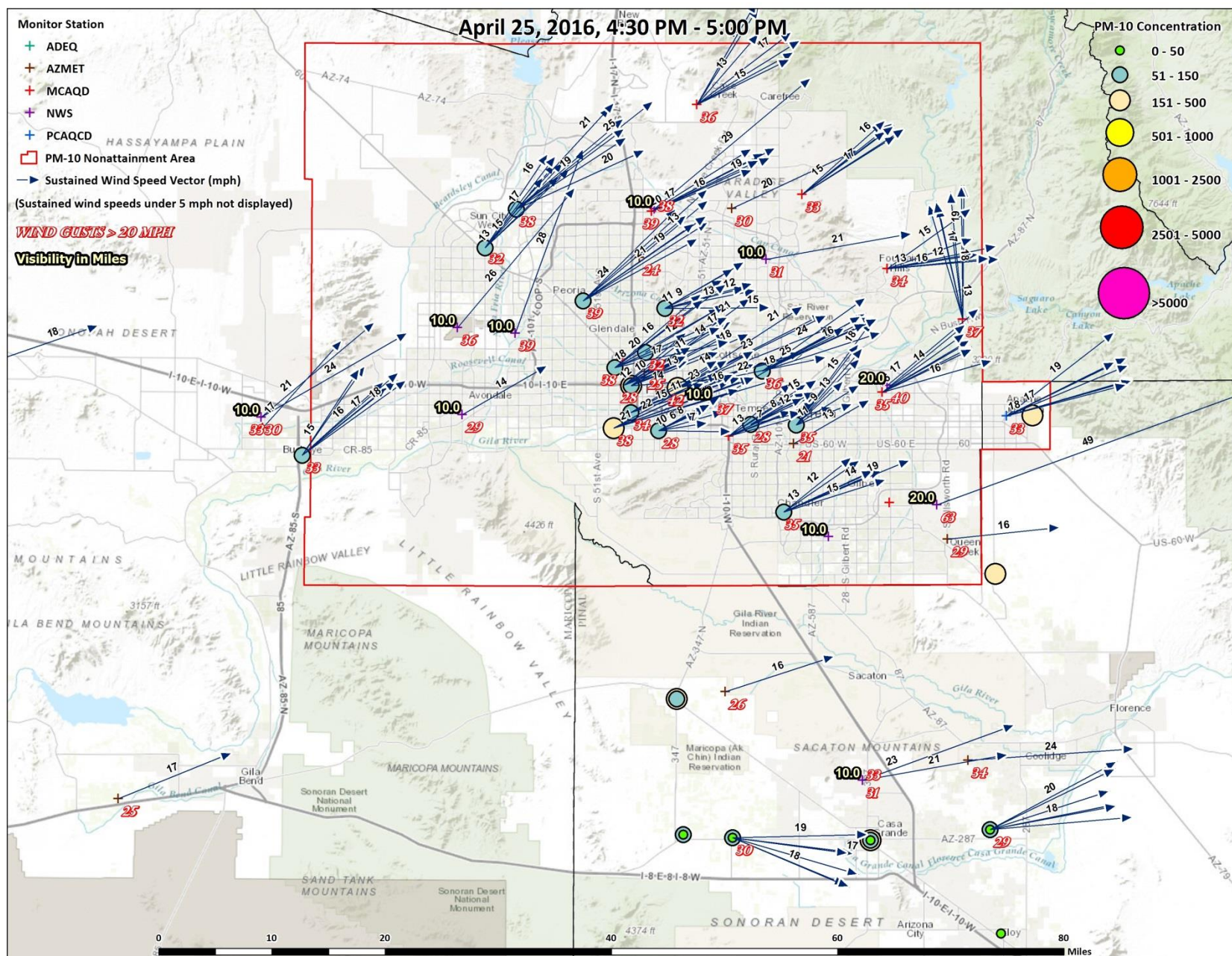


Figure 3-20. April 25, 2016, 4:30 PM – 5:00 PM.

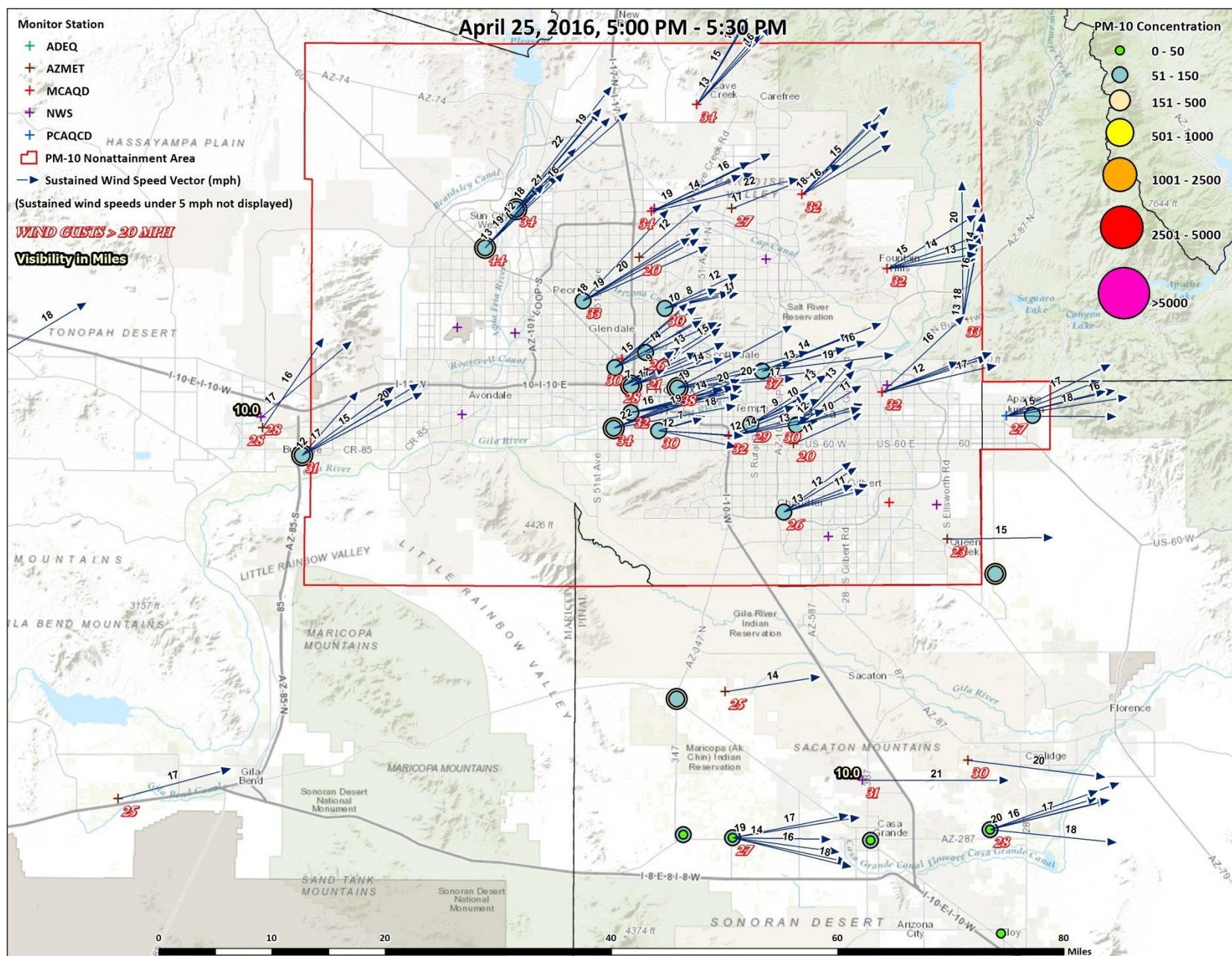


Figure 3-21. April 25, 2016, 5:00 PM – 5:30 PM.

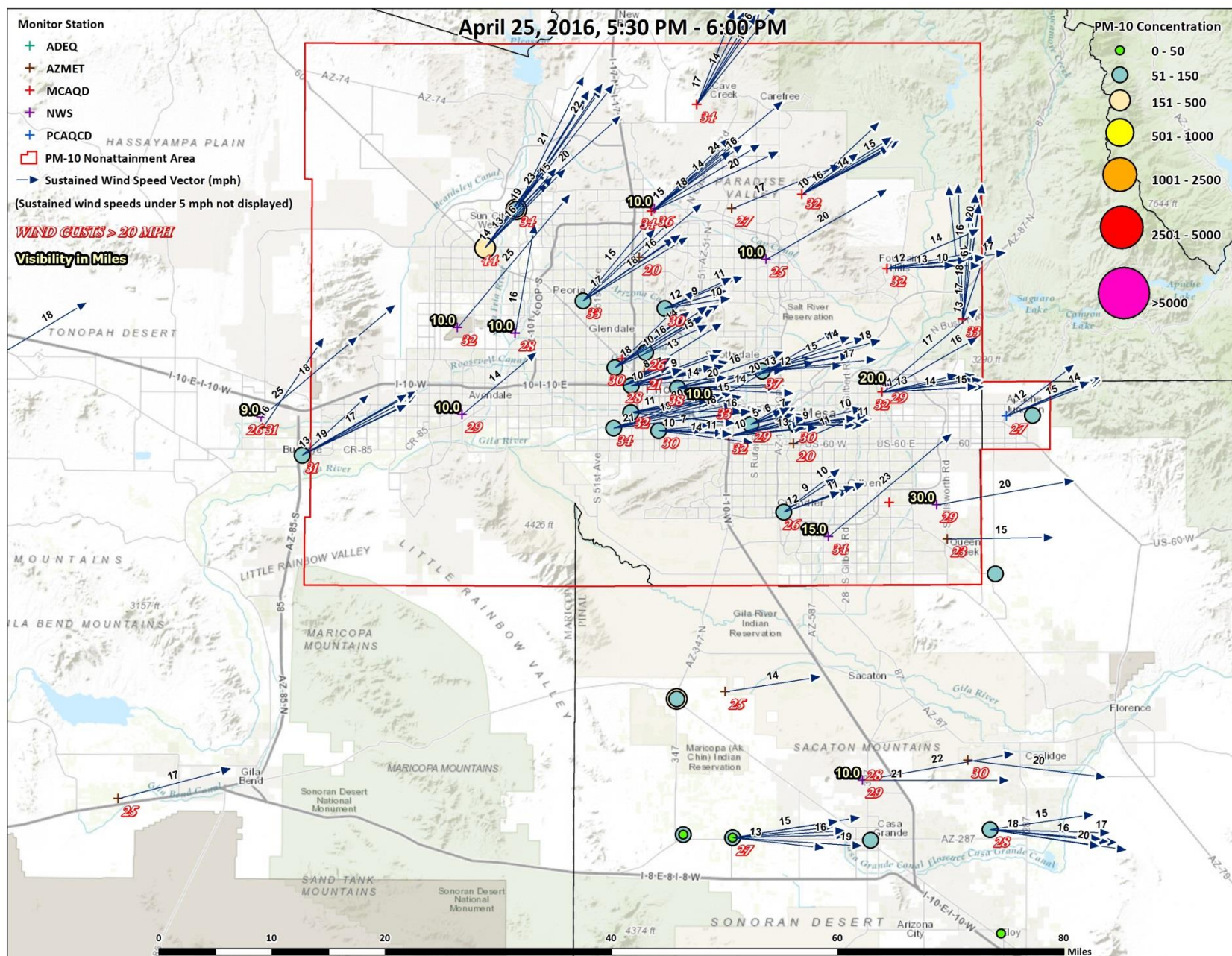


Figure 3-22. April 25, 2016, 5:30 PM – 6:00 PM.

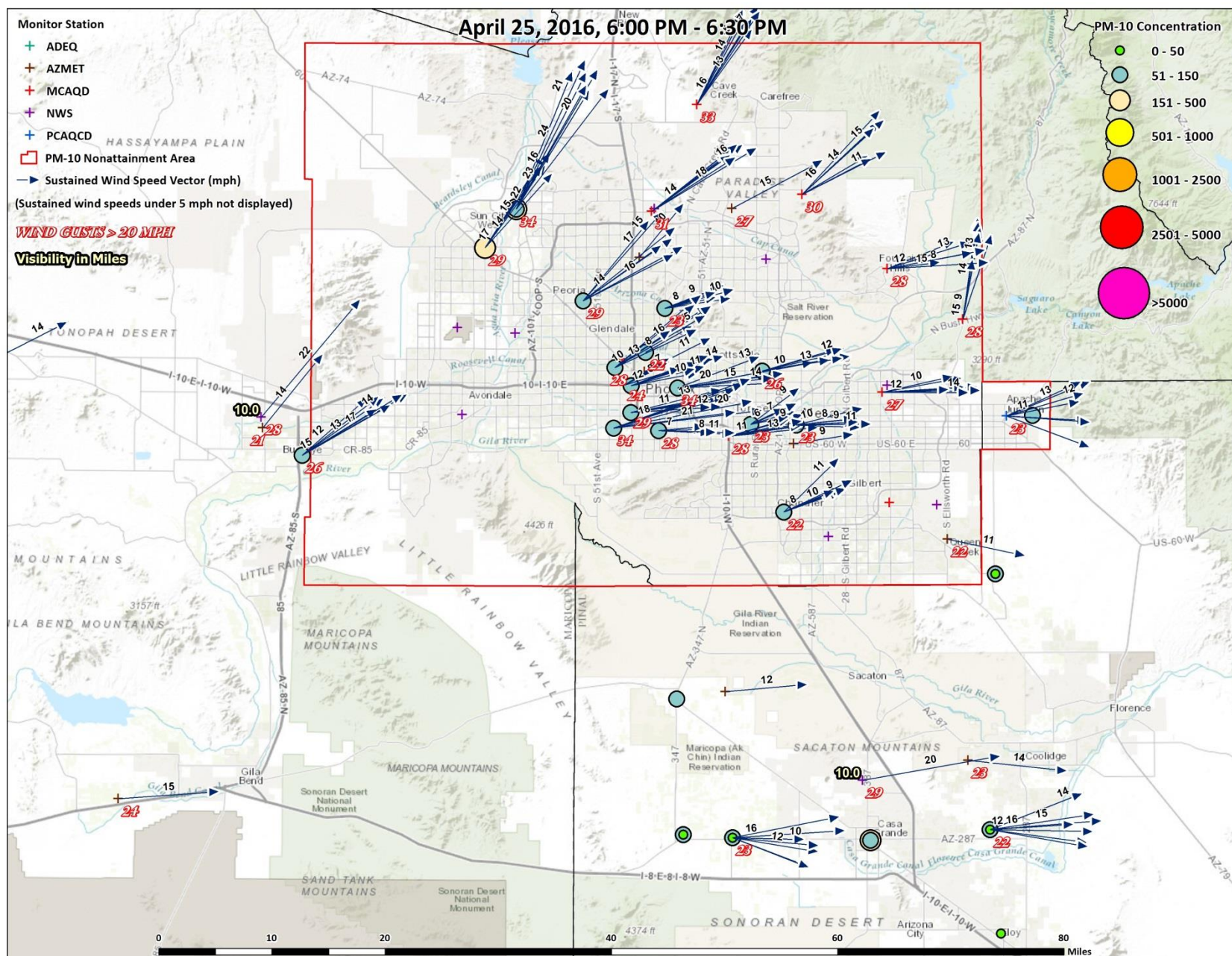


Figure 3-23. April 25, 2016, 6:00 PM – 6:30 PM.

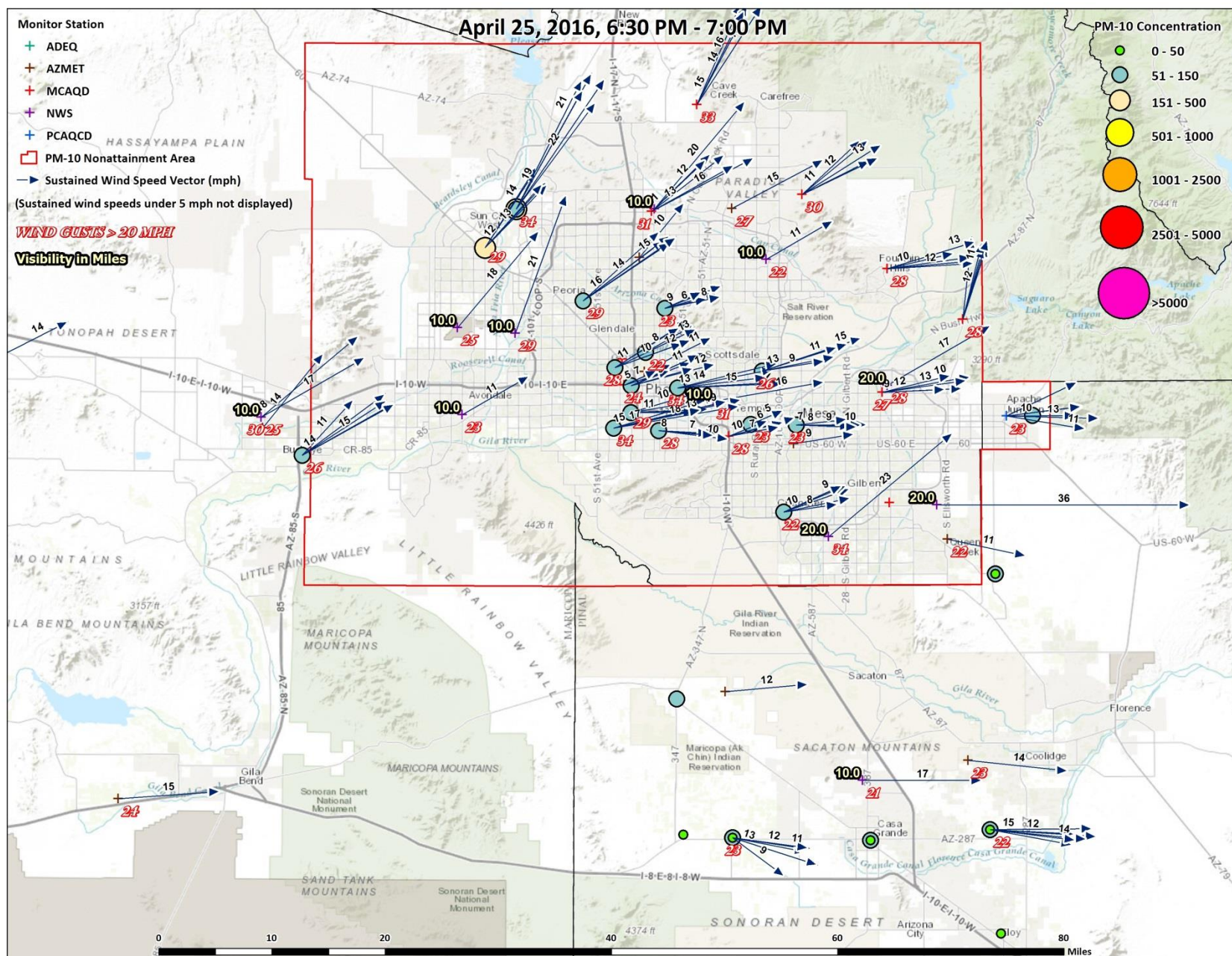


Figure 3-24. April 25, 2016, 6:30 PM – 7:00 PM.

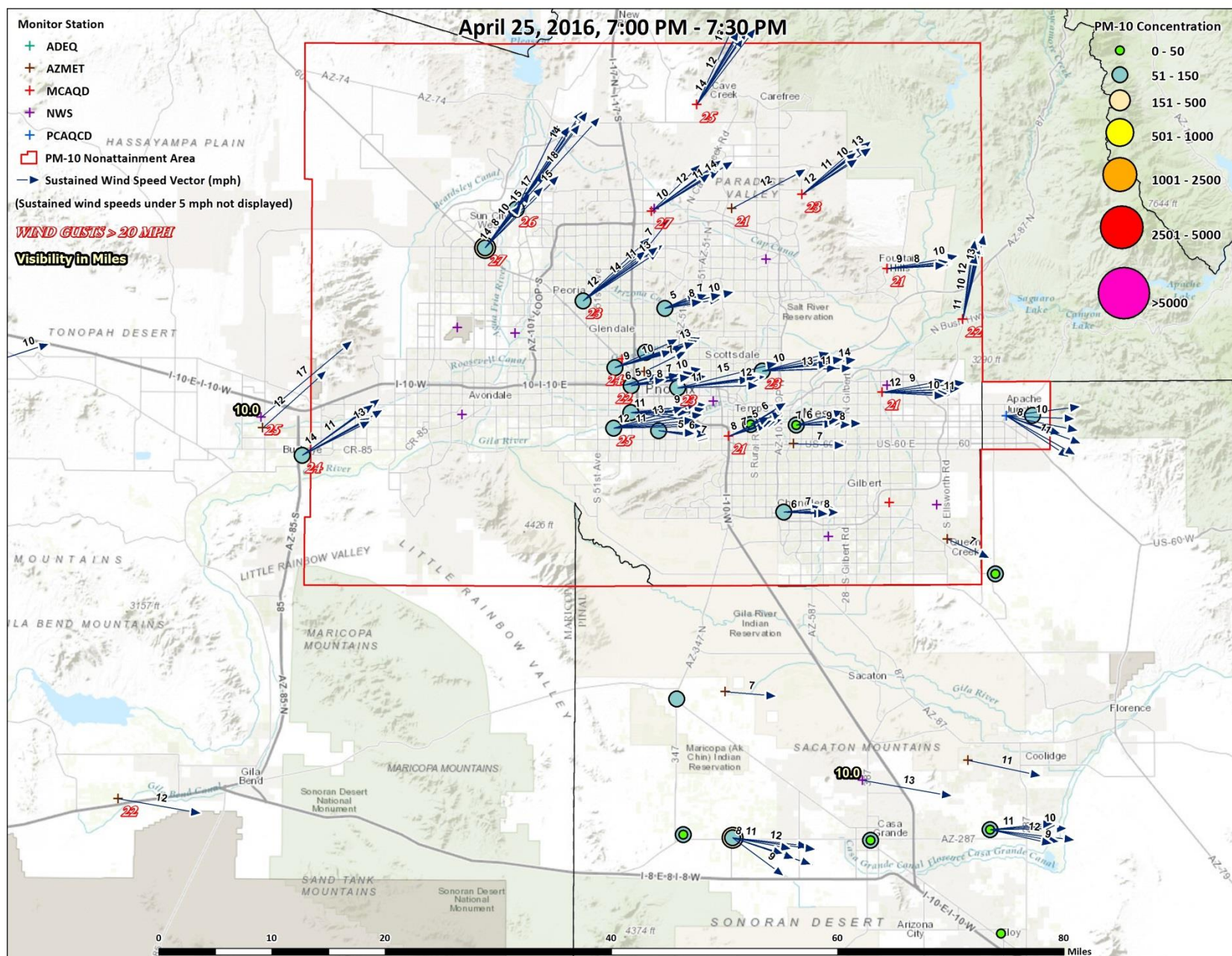
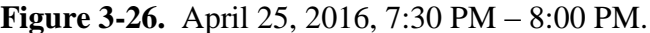


Figure 3-25. April 25, 2016, 7:00 PM – 7:30 PM.



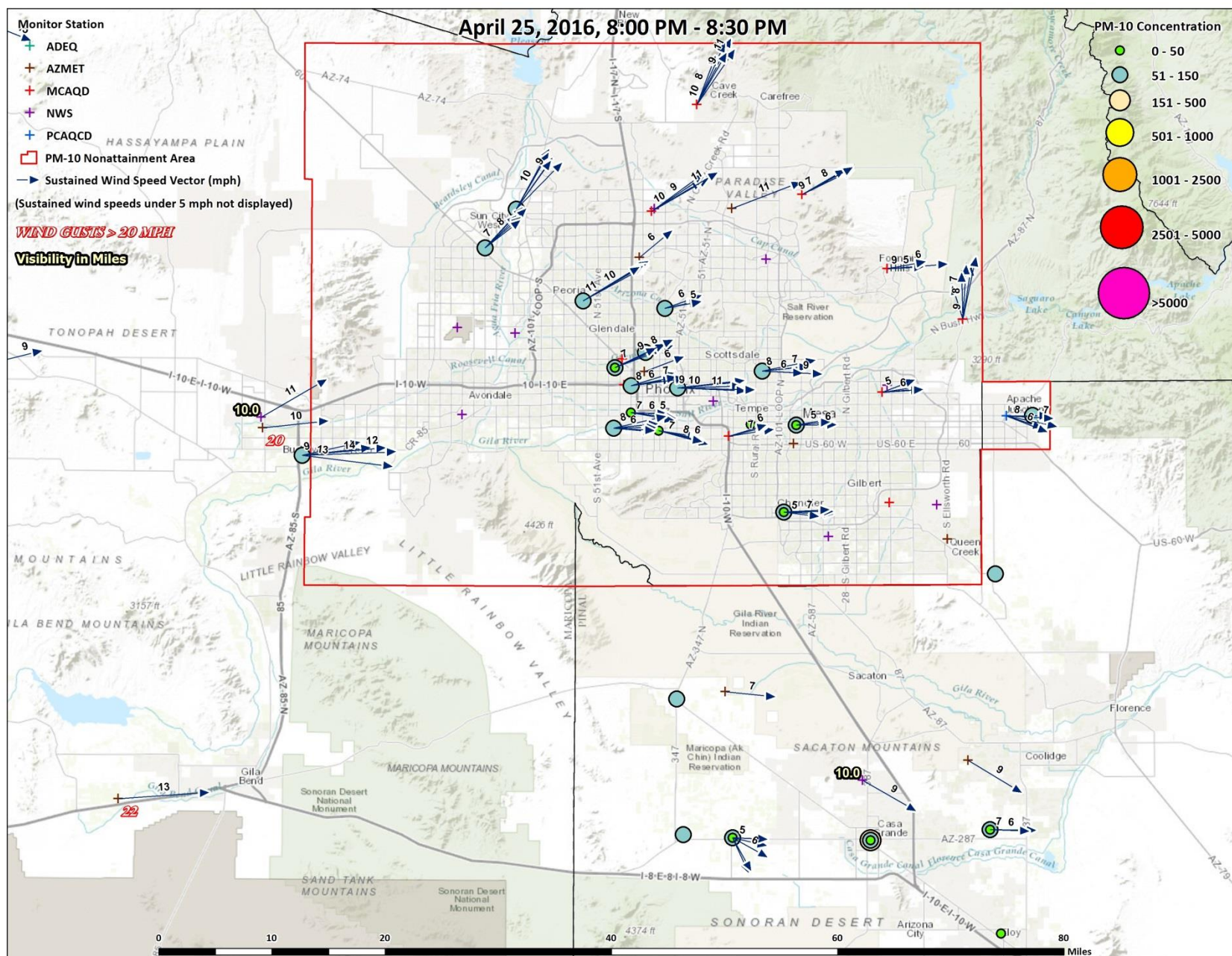


Figure 3-27. April 25, 2016, 8:00 PM – 8:30 PM.

Visibility Photos

Visibility photos taken within the Maricopa County PM₁₀ nonattainment area show the degradation of visibility as windblown dust from the high wind dust event passes through the nonattainment area. These photos provide additional evidence of the clear causal relationship between transported windblown dust from the high wind dust event and the exceedance at the West 43rd Avenue monitor. Figure 3–28 displays visibility conditions on April 25, 2016 before arrival of the high wind dust event (7:15 AM) and during the high wind dust event (3:30PM), respectively.



Figure 3-28. Visibility photos on April 25, 2016 at 7:15 AM and 3:30 PM, respectively.

Conclusion

In summary, on April 25, 2016 a high wind dust event passed through the Maricopa County PM₁₀ nonattainment area which generated and transported windblown dust in the form of PM₁₀ resulting in elevated concentrations of PM₁₀ across the nonattainment area and an exceedance of the PM₁₀ standard at the West 43rd Avenue monitor. The monitored PM₁₀ concentrations on April 25, 2016 at the exceeding West 43rd Avenue monitor were compared to historical concentrations at the site in several analyses. The analyses confirm a clear causal relationship between the exceedance and the high wind dust event as compared to historical high wind dust event days, non-event exceedance days, and non-exceedance days.

In addition to the comparison to historical concentrations, figures displaying the chronological and spatial distribution of wind, visibility and PM₁₀ concentration data confirm that (1) sustained winds above 25 mph were high enough to entrain significant windblown dust from natural desert areas and disturbed, anthropogenic source areas subject to reasonable controls; (2) PM₁₀ concentrations peaked when winds speeds peaked; and (3) visibility conditions throughout the nonattainment area were degraded as a result of generated and transported windblown dust from the high wind dust event. These analyses taken as a whole provide strong weight of evidence that the high wind dust event affected air quality in such a way that there exists a clear causal relationship between the high wind dust event on April 25, 2016 and the PM₁₀ exceedance at the West 43rd Avenue monitor on April 25, 2016, thus satisfying the clear causal relationship criterion.

IV. NATURAL EVENT AND NOT REASONABLY CONTROLLABLE OR PREVENTABLE CRITERIA

Natural Event

40 CFR Section 50.14(c)(3)(iv)(E) requires a demonstration that the exceptional event was either a human activity that is unlikely to recur at a particular location or was a natural event. The revised exceptional events rule defines a natural event at 40 CFR Section 50.1(k) as “an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.” Additionally, specific to high wind dust events, 40 CFR Section 50.14(b)(5)(ii) states that “[t]he Administrator will consider high wind dust events to be natural events in cases where windblown dust is entirely from natural undisturbed lands in the area or where all anthropogenic sources are reasonably controlled as determined in accordance with paragraph b(8) of this section.”

The clear causal relationship demonstration in the prior chapter found that high wind dust events can recur at the exceeding West 43rd Avenue monitor. Figure 3–1 indicates that 18 prior high wind dust events have occurred in the past five years at the monitor. The clear causal relationship demonstration also found that the PM₁₀ emissions which caused the exceedance at the West 43rd Avenue monitor were associated with windblown dust generated and transported by sustained wind speeds that exceeded the default high wind threshold of 25 mph established in 40 CFR Section 50.14(b)(5)(iii). EPA states in the preamble to the revised exceptional events rule that, “[f]or high wind dust events, if sustained wind speeds are above the high wind threshold and the anthropogenic emissions sources are reasonably controlled, it is more likely that human activity plays little or no direct role in causing emissions.” The following section of this chapter demonstrates that reasonable controls were in place on all windblown dust anthropogenic sources in the Maricopa County PM₁₀ nonattainment area during the high wind dust event. For these reasons, the high wind dust event on April 25, 2016, qualifies as a natural event.

Not Reasonably Controllable or Preventable

40 CFR Section 50.14(c)(3)(iv)(D) requires a demonstration that the exceptional event was both not reasonably controllable and not reasonably preventable. 40 CFR Section 50.14(b)(8) provides the demonstrations needed to establish that the exceptional event was not reasonably controllable or preventable for all exceptional events. Additionally, specific requirements regarding the not reasonably controllable or preventable criterion related to high wind dust events are provided in 40 CFR Section 50.14(b)(5).

40 CFR Sections 50.14(b)(8)(i) through (iii) states that “[t]he not reasonably controllable or preventable criterion has two prongs that the State must demonstrate: prevention and control. (ii) The Administrator shall determine an event is not reasonably preventable if the State shows that reasonable measures to prevent the event were applied at the time of the event. (iii) The Administrator shall determine that an event is not reasonably controllable if the State shows that reasonable measures to control the impact of the event on air quality were applied at the time of the event.”

Regarding whether the event was not reasonably preventable, the revised exceptional events rule has specific regulations for high wind dust events that exempt a State from needing to provide a case-specific justification that the event was not reasonably preventable (40 CFR Section 50.14(b)(5)(iv)). In keeping with the specific high wind dust event regulation, and because the high winds that entrain the windblown dust are by nature unpreventable, a case-specific justification that the high wind dust event on April 25, 2016 was not preventable is not needed or presented in this documentation.

Regarding whether the event was not reasonably controllable, 40 CFR Section 50.14(b)(8)(iv) states that EPA “shall assess the reasonableness of available controls for anthropogenic sources based on information available as of the date of the event”. Additionally, 40 CFR Section 50.14(b)(8)(v) provides deference to controls in a state implementation plan that have been approved by EPA within five years of the event date, “the Administrator shall consider enforceable control measures implemented in accordance with a state implementation plan...approved by the EPA within 5 years of the date of the event, that address the event-related pollutant and all sources necessary to fulfill the requirements of the Clean Air Act for the state implementation plan...to be reasonable controls with respect to all anthropogenic sources that have or may have contributed to the monitored exceedance or violation.”

The *MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area* contains a wide variety of control measures and projects that have been implemented to reduce and control PM₁₀ emissions, including PM₁₀ emissions generated under high wind conditions, which were in place and implemented at the time of the event. Requirements to reduce and control PM₁₀ emissions in the plan apply to a broad range of sources including: unpaved roads and shoulders, leaf blowers, unpaved parking lots, vacant lots, sweeping streets with certified sweepers, off-road vehicle use, open and recreational burning, residential wood burning, covered vehicle loads, dust generating operations, nonmetallic mineral processing, and other unpermitted sources. EPA published final approval of the MAG 2012 Five Percent Plan on June 10, 2014 (79 FR 33107).

On September 12, 2016 the U.S. Court of Appeals for the Ninth Circuit issued an opinion in the lawsuit filed by the Arizona Center for Law in the Public Interest (*Bahr v. U.S. EPA*) to challenge the Environmental Protection Agency approval of the MAG 2012 Five Percent Plan. The Court upheld EPA’s determination that the control measures in the plan did not need to be updated and also upheld EPA’s exclusion of PM₁₀ exceedances in 2011 and 2012 as exceptional events caused by high wind dust events. The Court remanded the contingency measures in the plan to EPA for further consideration. Because EPA has approved the MAG 2012 Five Percent Plan within five years of the high wind dust event, and the approved plan addresses the event-related pollutant and all sources necessary to fulfill the requirements of the Clean Air Act, and because the State is not currently under obligation to revise the state implementation plan, the controls in the MAG 2012 Five Percent Plan are considered reasonable controls with respect to all anthropogenic sources that have or may have contributed to the monitored exceedance.

Specific to high wind dust events, 40 CFR Section 50.14(b)(5)(v) states that “[w]ith respect to the not reasonably controllable criterion of paragraph (c)(3)(iv)(D) of this section, dust controls on an anthropogenic source shall be considered reasonable in any case in which the controls render the anthropogenic source as resistant to high winds as natural undisturbed lands in the area affected by the high wind dust event. The Administrator may determine lesser controls reasonable on a case-by-case basis.”

When evaluating this regulation, EPA considers whether wind speeds were above the high wind threshold (25 mph default) during the event as an important indicator for whether or not the implemented controls

were reasonable. In the preamble to the revised exceptional events rule, EPA states that, “[t]he EPA will continue to consider an area’s high wind threshold when reviewing demonstrations for events in a nonattainment or maintenance area where the EPA has approved a SIP, TIP or FIP within 5 years of the date of the event. For a demonstration in such a case, the not reasonably controllable criterion hinges only on implementation of the control measures in the SIP, TIP or FIP, not on the content of those measures. For events with sustained wind speeds above the high wind threshold that occur simultaneously with high monitored PM concentrations, it is very plausible that SIP, TIP, or FIP controls were being implemented and the high PM concentrations resulted from emissions generated by sources in the area despite implementation of those controls...Therefore, the comparison of sustained wind speeds during an event to the high wind threshold will help the EPA Regional offices determine what evidence must be included in a demonstration. Specifically, it will inform the evidence required for the not reasonably controllable or preventable criteria, the possibility of noncompliance, or emissions from non-event sources.”

The clear causal relationship demonstration in Chapter III of this documentation clearly establishes that high PM₁₀ concentrations at the exceeding monitor and throughout the nonattainment area occurred when sustained wind speeds were over the high wind threshold of 25 mph. This provides evidence that (1) the controls in place within the Maricopa County PM₁₀ nonattainment area and at the exceeding monitor during the high wind dust event on April 25, 2016 meet the requirements of 40 CFR Section 50.14(b)(5)(v) by rendering anthropogenic sources as resistant to high winds as natural undisturbed lands, and that (2) source noncompliance is less likely given the severity of the wind speeds.

Lastly, 40 CFR Section 50.14(b)(8)(viii) requires that the State must include the following components in a demonstration that addresses the not reasonably controllable or preventable criterion for prescribed fire events and certain high wind dust events: “(A) Identification of the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance or violation, including the contribution from local sources. (B) Identification of the relevant state implementation plan, tribal implementation plan, or federal implementation plan or other enforceable control measures in place for sources identified in paragraph...(A) of this section and the implementation status of these controls. (C) Evidence of effective implementation and enforcement of the measures identified in paragraph...(B) of this section.” The following sections satisfy the requirements of 40 CFR Section 50.14(b)(8)(viii).

Identification of Natural and Anthropogenic Sources of Emissions

As discussed in the narrative conceptual model and the clear causal relationship demonstration, the sources of the windblown dust in the high wind dust event on April 25, 2016 include both natural and anthropogenic sources. Windblown dust was both transported to, and generated within, the Maricopa County PM₁₀ nonattainment area. Because of the widespread nature of the windblown dust as seen in the visibility photo in Figure 3–28 and discussed in the National Weather Service forecast, exact source locations are not possible to identify.

The most likely natural sources given the prevailing wind patterns of the high wind event include the desert areas of the Maricopa County PM₁₀ nonattainment area, western Arizona, and southeastern California. The most likely anthropogenic sources to contribute to the exceedance at the West 43rd Avenue monitor include those sources located immediately upwind (southwest) of the monitor. These sources may include, but are not limited to: vacant lots, paved road dust, unpaved road dust, agricultural fields, sand and gravel operations, industrial haul roads, concrete production facilities, and other permitted facilities that may produce fugitive dust in the form of PM₁₀ emissions. Residential and commercial land uses are also located within the immediate area. It is important to point out that the area immediately upwind of the exceeding West 43rd Avenue monitor contains a mix of natural and anthropogenic sources.

The natural sources immediately upwind of the monitor include a dry riverbed and undeveloped pockets of desert areas. Figure 4-1 displays a recent aerial photo (2015) of the area immediately upwind (approximately four miles) of the West 43rd Avenue monitor.

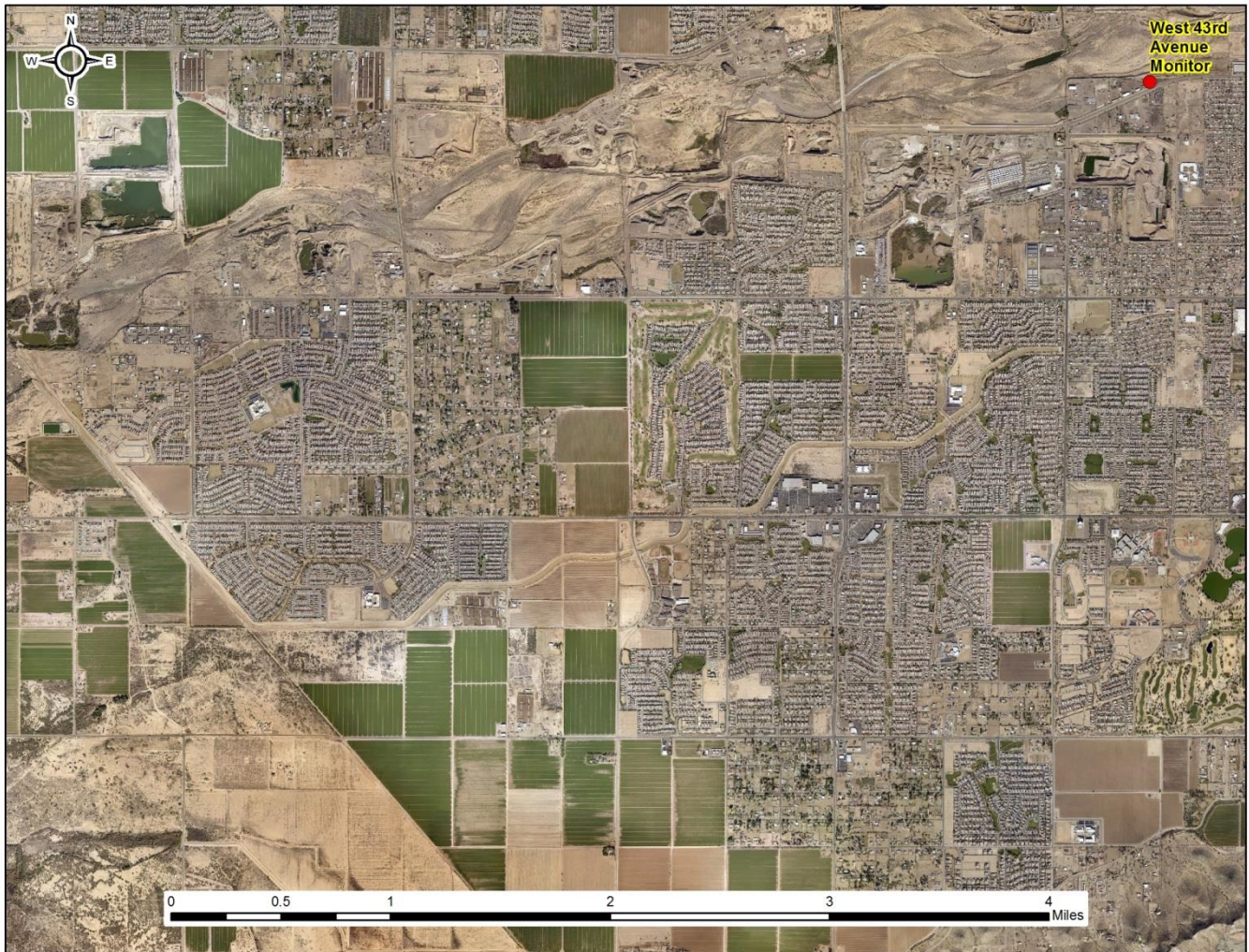


Figure 4-1. Aerial photo of the immediate area upwind of the exceeding West 43rd Avenue monitor.

Identification of Relevant Control Measures

As discussed above, the *MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area* is the latest state implementation plan approved by EPA. This plan contains a wide variety of control measures and projects that have been, and are being, implemented to reduce and control PM₁₀ emissions, including PM₁₀ emissions generated under high wind conditions, which were in place and implemented at the time of the event. Requirements to reduce and control PM₁₀ emissions in the plan apply to a broad range of sources including: unpaved roads and shoulders, leaf blowers, unpaved parking lots, vacant lots, sweeping streets with certified sweepers, off-road vehicle use, open and recreational burning, residential wood burning, covered vehicle loads, dust generating operations, nonmetallic mineral processing, and other unpermitted sources. Table 4-1 lists the control measures included in the MAG 2012 Five Percent Plan.

Table 4-1. Control Measures included in the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area.

Arizona Revised Statutes (A.R.S.)	Description
A.R.S. § 9-500.04. Only A.3., A.5., A.6., A.7., A.8., A.9. and H.	Air quality control; definitions [city and town requirements in Area A regarding targeting unpaved roads and shoulders; leaf blower restrictions; restrictions related to parking, maneuvering, ingress and egress areas and vacant lots; requirement for certified street sweepers]
A.R.S. § 9-500.27.	Off-road vehicle ordinance; applicability; violation; classification
A.R.S. § 11-871. Only A., B. and D.4.	Emissions control; no burn; exemptions; penalty [no burn restriction for any HPA day, increased civil penalty]
A.R.S. § 11-877.	Air quality control measures [county leaf blower restrictions]
A.R.S. § 28-1098. Only A. and C.1.	Vehicle loads; restrictions; civil penalties [for safety or air pollution prevention purpose]
A.R.S. § 49-424. Only 11.	Duties of department [develop and disseminate air quality dust forecasts for the Maricopa County PM-10 nonattainment area]
A.R.S. § 49-457.01.	Leaf blower use restrictions and training; leaf blower equipment sellers; informational material; outreach; applicability
A.R.S. § 49-457.03.	Off-road vehicles; pollution advisory days; applicability; penalties
A.R.S. § 49-457.04.	Off-highway vehicle and all-terrain vehicle dealers; informational material; outreach; applicability
A.R.S. § 49-457.05. Only A., B., C., D. and I.	Dust action general permit; best management practices; applicability; definitions
A.R.S. § 49-474.01. Only A.4., A.5., A.6., A.7., A.8., A.11., B. and H.	Additional board duties in vehicle emissions control areas; definitions [county requirements for stabilization of targeted unpaved roads, alleys and shoulders; restrictions related to parking, maneuvering, ingress and egress areas and vacant lots; requirement for certified street sweepers]
A.R.S. § 49-474.05.	Dust control; training; site coordinators
A.R.S. § 49-474.06.	Dust control; subcontractor registration; fee
A.R.S. § 49-501. Only A.2., B.1., C., F. and G.	Unlawful open burning; exceptions; civil penalty; definitions [ban on outdoor fires from May 1 to September 30; deletion of recreational purpose exemption; no burn day restrictions; penalty provision]
A.R.S. § 49-541. Only 1.	Definitions [Area A]
Maricopa County Air Quality Department Rules	Description
310	Fugitive Dust from Dust-Generating Operations Adopted 1/27/10 and submitted to EPA 4/12/10 [Notice of Final Rulemaking 75 FR 78167; 12/15/10]
310.01	Fugitive Dust From Non-Traditional Sources of Fugitive Dust Adopted 1/27/10 and submitted to EPA 4/12/10 [Notice of Final Rulemaking 75 FR 78167; 12/15/10]
314	Open Outdoor Fires and Indoor Fireplaces at Commercial and Institutional Establishments Adopted 3/12/08 and submitted to EPA 7/10/08 [Notice of Final Rulemaking 74 FR 57612; 11/9/09]

Table 4–1 (Continued)

Maricopa County Air Quality Department Rules	Description
316	Nonmetallic Mineral Processing Adopted 3/12/08 and submitted to EPA 7/10/08 [Notice of Final Rulemaking 74 FR 58553; 11/13/09]
Appendix C	Fugitive Dust Test Methods Adopted 3/26/08 and submitted to EPA 7/10/08 [Notice of Final Rulemaking 75 FR 78167; 12/15/10]
Maricopa County Ordinance	Description
P-26	Residential Woodburning Restriction Adopted 3/26/08 and submitted to EPA 7/10/08; [Notice of Final Rulemaking 74 FR 57612; 11/9/09]
Appendices to the Plan	Description
Appendix C, Exhibit 1	Arizona Revised Statutes Listed in Table 4-1
Appendix C, Exhibit 2	Maricopa County Resolution to Evaluate Measures in the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area
Appendix C, Exhibit 3	Arizona Department of Environmental Quality Dust Action General Permit
Appendix C, Exhibit 4	Arizona Department of Environmental Quality Commitment to Revise the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area if Necessary for the Emerging and Voluntary Measure

In addition to the statutes, rules and regulations listed in Table 4–1, other PM₁₀ reducing control measures (e.g., paving of unpaved roads, Agricultural Best Management Practices Program, Pinal County Fugitive Dust rules, etc.) have been committed to, and implemented by, local jurisdictions throughout the Maricopa County PM₁₀ nonattainment area, and incorporated into the Arizona SIP through prior PM₁₀ plans, such as the *Revised MAG 1999 Serious Area Particulate Plan for PM-10 for the Maricopa County Nonattainment Area*, and in separate EPA actions.

Implementation and Enforcement of Control Measures

The Maricopa County Air Quality Department (MCAQD) is prepared to proactively respond to high wind dust events and protect human health and well-being. MCAQD’s approach consists of two primary components: routine proactive inspections, as well as surveillance inspections, conducted both during and after significant events. MCAQD routinely inspects dust control-permitted sites and increases the frequency of inspections for permits covering areas of ten acres or more. Non-metallic surface mining sources under Rule 316 are also regularly inspected multiple times every year. Maricopa County also responds to the majority of air quality complaints within 24 hours.

Maricopa County monitors the five-day Maricopa County Dust Control Forecast issued by ADEQ to identify the potential for elevated PM₁₀ pollution levels due to high winds or stagnant conditions. When a High Pollution Advisory (HPA) is issued for Maricopa County, MCAQD conducts additional increased

surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities after an exceptional event that had not been forecast (i.e., those instances in which an HPA had not been issued).

The Maricopa County Dust Control Forecast issued on April 24, 2016, indicated a Moderate risk for unhealthy PM₁₀ levels, due to expected sustained winds of 15-20 mph with the passage of the cold front. Actual sustained winds of 20-30 mph during the event on April 25, 2016 exceeded forecast levels, leading to the exceedance at the West 43rd Avenue monitor.

During the event, MCAQD dispatched an inspector to do reconnaissance in the vicinity of the exceeding West 43rd Avenue monitor during the 12pm hour. The inspector did not find any rule violations or remark about significant anthropogenic sources of blowing dust in the area.

Pre-event surveillance consists of surveying high-risk areas for any dust-generating activities, educating sources of the impending HPA event, and issuing violations for failure to comply with local, state, or federal regulations. During the event, MCAQD inspectors survey high-risk areas to confirm that control measures are in place, document any violations, and contact other regulatory agencies if necessary. Post-event activities include continued surveys of high-risk areas, re-inspecting sources within two business days of receiving a violation, and an internal MCAQD debriefing of event activities.

Currently, a total of 16 MCAQD air monitoring sites are equipped to allow the automatic reporting of monitored readings at 5-minute intervals. The real-time data reporting system includes a mechanism to alert MCAQD inspectors when PM₁₀ concentrations are elevated. The system allows MCAQD inspectors to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the MCAQD responder to identify regional events and monitor specific issues. If necessary, the MCAQD responders can inform nearby stakeholders and local governments of the elevated PM₁₀ concentrations.

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM₁₀ emissions. During the time period of April 22 through April 28, 2016, MCAQD inspectors conducted a total of 306 inspections of permitted facilities, of which 188 were at fugitive dust sources. Additionally, MCAQD conducted 61 inspections on vacant lots and unpaved parking lots during this period.

During this 7-day period, a total of 19 Notice of Violations were issued county-wide for PM₁₀ and non-PM₁₀-related violations. No violations were issued to fugitive dust sources within a 4-mile radius of the exceeding West 43rd Avenue site.

Also during this 7-day period, a total of 61 vacant lots were inspected, but no 60-day letters were issued for non-compliant vacant lots and/or unpaved parking lots.

MCAQD was prepared for any complaints received due to the high wind event. During the 7 day period from April 22 through April 28, 2016, MCAQD received 47 complaints, of which 36 were windblown dust or PM₁₀ related. Nine of these complaints, located at 4 unique locations, were located within 4 miles of the exceeding West 43rd Avenue monitor. These complaints consisted of:

- A concrete batch plant at 43rd Avenue and Broadway Road creating dust when loading cement. Complaints made on 4/26/16.

- Blowing dust from a vacant lot at 47th Avenue and Southern Avenue, a property owned by the City of Phoenix. Six of the complaints were about this large vacant property and concerned such things as dust blowing from horseback riding in the area. The complaints occurred on 4/25/16 and 4/26/16.
- A construction site at 55th Avenue and Lower Buckeye Road was creating dust. The complaint occurred on 4/25/16.
- A construction site at 63rd Avenue and Broadway Road was creating dust. The complaint occurred on 4/27/16.

Inspections were completed for each of these complaints and no issues or violations were noted, though some complaints were kept open for further observations. Additionally, during the period of April 22, 2016 through April 28, 2016, no unusual agricultural activity in the upwind vicinity of the exceeding West 43rd Avenue monitor was noted by the Arizona Department of Environmental Quality.

Conclusion

In summary, the information presented in this chapter addresses whether the high wind dust event on April 25, 2016 was not reasonably preventable or controllable. EPA's approval of the *MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area* on June 10, 2014 allows the control measures in that plan to be established as reasonable controls. Sustained wind speeds were above the high wind threshold during the event, making it less likely that uncontrolled anthropogenic sources were the main source of the windblown dust emissions. The natural and anthropogenic sources of windblown dust during the event were identified, along with the enforceable control measures in place and implemented during the event. Extensive documentation of enforcement of the implemented control measures was provided by the Maricopa County Air Quality Department and the Arizona Department of Environmental Quality, revealing no evidence of unusual anthropogenic-based PM₁₀ emissions. For these reasons, the information presented in this chapter clearly demonstrates that the high wind dust event on April 25, 2016 was neither reasonably preventable nor controllable.

V. SUMMARY CONCLUSION

The documentation presented in the preceding chapters provides ample weight of evidence that the exceedance of the PM₁₀ standard on April 25, 2016 at the West 43rd Avenue monitor in the Maricopa County nonattainment area was caused by a high wind dust event, qualifying the exceedance for exclusion under the revised exceptional events rule. A bulleted summary of the demonstrations included in this documentation that meet the requirements of 40 CFR Sections 50.14(c)(3)(iv)(A) through (E) is provided below:

- The narrative conceptual model discussed the meteorological conditions (spring trough and dry cold front) that led to the creation of the high wind dust event on April 25, 2016. The narrative highlighted that sustained winds of 20 to 30 mph and gusts of 40 to 45 mph were sufficient to transport and generate windblown dust from natural sources and overwhelm reasonable controls on anthropogenic sources. Windblown dust from the high wind dust event was first noted by the National Weather Service in southeastern California, and then progressed into western Arizona and the Maricopa County PM₁₀ nonattainment area with the passing of the dry cold front. Tables and figures showing PM₁₀ concentrations during the event were included with the narrative, indicating the PM₁₀ concentrations on April 25, 2016 were elevated 3 to 6 times higher than concentrations on April 24, 2016, throughout the nonattainment area.
- The monitored PM₁₀ concentration on April 25, 2016 at the exceeding West 43rd Avenue monitor was compared to historical concentrations at the site in several analyses. The analyses confirm a clear causal relationship between the exceedance and the high wind dust event as compared to historical high wind dust event days, non-event exceedance days, and non-exceedance days.

In addition to the comparison to historical concentrations, figures displaying the chronological and spatial distribution of wind, visibility and PM₁₀ concentration data confirm that (1) sustained winds above 25 mph were high enough to entrain significant windblown dust from natural desert areas and disturbed, anthropogenic source areas subject to reasonable controls; (2) PM₁₀ concentrations peaked when winds speeds peaked; and (3) visibility conditions throughout the nonattainment area were degraded as a result of generated and transported windblown dust from the high wind dust event. These analyses taken as a whole provide strong weight of evidence that the high wind dust event affected air quality in such a way that there exists a clear causal relationship between the high wind dust event on April 25, 2016 and the PM₁₀ exceedance at the West 43rd Avenue monitor on April 25, 2016, thus satisfying the clear causal relationship criterion.

- The comparison to historical concentrations and the clear causal relationship demonstration found that high wind dust events can frequently recur at the exceeding West 43rd Avenue monitor and that the PM₁₀ emissions which caused the exceedance at the West 43rd Avenue monitor were associated with windblown dust generated and transported by sustained wind speeds that exceeded the default high wind threshold of 25 mph. EPA states that, “[f]or high wind dust events, if sustained wind speeds are above the high wind threshold and the anthropogenic emissions sources are reasonably controlled, it is more likely that human activity plays little or no direct role in causing emissions.” Since reasonable controls were in place on all significant anthropogenic sources of windblown dust in the Maricopa County PM₁₀ nonattainment area during the event and

sustained winds were greater than 25 mph, the high wind dust event on April 25, 2016, qualifies as a natural event.

- EPA's approval of the *MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area* on June 10, 2014 allows the control measures in that plan to be established as reasonable controls. Sustained wind speeds were above the high wind threshold during the event, making it less likely that uncontrolled anthropogenic sources were the main source of the windblown dust emissions. The natural and anthropogenic sources of windblown dust during the event were identified, along with the enforceable control measures in place and implemented during the event. Extensive documentation of enforcement of the implemented control measures was provided by the Maricopa County Air Quality Department and the Arizona Department of Environmental Quality, revealing no evidence of unusual anthropogenic-based PM₁₀ emissions. For these reasons, the high wind dust event on April 25, 2016 was neither reasonably preventable nor controllable.