

State of Arizona Exceptional Event Documentation for the Event of July 18, 2011, for the Phoenix PM₁₀ Nonattainment Area

Produced by:

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

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EXECUTIVE SUMMARY

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature¹ (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. Based on numerous comments EPA received on the May 2011 draft, EPA issued a revised draft guidance document in June 2012. The EER allows for states and tribes to “flag” air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the arid nature of the state, Arizona is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the PM10 NAAQS. In the past, the Arizona Department of Environmental Quality (ADEQ) has submitted exceptional event documentation for these events. Due in part to issues within the EER, obtaining concurrence on these events has been a difficult task. The ADEQ is now taking a new approach and focusing exceptional event documentation on events that are believed to be clear-cut exceptional events that are not controllable by human intervention, such as the dust events that frequently occurred during the monsoon season of 2011. This new approach was used for the exceptional event demonstration submitted in March 2012 by ADEQ for several PM10 events that occurred from July 2 – July 8, 2011, in the Phoenix region. In September 2012, EPA concurred that the July 2–8, 2011 events were indeed exceptional. As a result, this document is designed to follow the format used in the July 2–8, 2011 events submission.

This demonstration contains detailed information about the windblown dust event that affected the Phoenix PM10 nonattainment area on July 18, 2011. On that day, eight exceedances of the PM10 NAAQS occurred within the nonattainment area. Additional exceedances occurred outside of the Phoenix PM10 nonattainment area on this date, and additional documentation may be submitted as a separate package at a later time. ADEQ contends that the exceedances that were measured on July 18, 2011, within the Phoenix PM10 nonattainment area were the result of natural events that were not reasonably controllable or preventable. This assessment report of the July 18, 2011 dust event was a collaborative effort involving staff from the Arizona Department of Environmental Quality, Maricopa Association of Governments, Maricopa County Air Quality Department, and Pinal County Air Quality Control District.

Section I of this assessment provides a summary of the exceptional event rules and requirements and lays out how those rules are met within this specific assessment.

Section II of this assessment introduces the conceptual model of the thunderstorm events that transpired on July 18, 2011, providing a background narrative of the exceptional events.

Section III of this assessment provides data summaries and time series graphs that help illustrate that the events of July 18, 2011, produced PM10 concentrations in excess of normal historical fluctuations.

¹ Section 319 of the Clean Air Act (CAA), as amended by section 6013 of the Safe Accountable Flexible Efficient-Transportation Equity Act: A Legacy for Users (SAFE-TEA-LU of 2005), required EPA to propose the Federal Exceptional Events Rule (EER) no later than March 1, 2006.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the event on July 18, 2011, was not reasonably controllable or preventable.

Section V of this assessment establishes a clear causal connection between the natural events of July 18, 2011, and the exceedances of the 24-hour PM10 standard at the monitoring stations. The evidence in this section (and the previous section on historical fluctuations) also confirms that the event in question both affected air quality and was the result of natural events.

Section VI of this assessment builds upon the demonstration showing a clear causal connection between the natural events and the exceedances and concludes there would have been no exceedances on July 18, 2011, but for the presence of the natural events.

Section VII contains conclusions that summarize the exceptional event that occurred on July 18, 2011, and relates the requirements in the EER to the information within this document.

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I. EXCEPTIONAL EVENT RULE (EER) REQUIREMENTS

In addition to the technical requirements that are contained within the EER, procedural requirements must be met in order for EPA to concur with the flagged air quality monitoring data. This section of the report lays out the requirements of the EER and associated guidance, and discusses how the Arizona Department of Environmental Quality (ADEQ) addressed those requirements.

Procedural Requirements

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (*Treatment of Air Quality Monitoring Data Influenced by Exceptional Events*) and explains how ADEQ fulfills them. The Federal EER requirements include notifying the public that an event was occurring, placing informational flags on data in EPA's Air Quality System (AQS), notifying EPA of the intent to flag through submission of initial event description, documenting that the public comment process was followed, and submitting a demonstration supporting the exceptional events flag. ADEQ has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1)(i))

ADEQ issued a Dust Control Action Forecast and an Ensemble Forecast for the Greater Phoenix area advising citizens of the potential for high winds and blowing dust on July 18, 2011. More information on ADEQ's forecasting program can be found in Section IV. The forecast products that were issued for July 18, 2011, are included in Appendix B.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))

ADEQ and other operating agencies in Arizona submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Arizona are submitted to AQS.

When ADEQ and/or another agency operating monitors in Arizona suspects that data may be influenced by an exceptional event, ADEQ and/or the other operating agency expedites analysis of the filters collected from the potentially affected filter-based air monitoring instruments, quality assures the results, and submits the data into AQS. ADEQ and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If ADEQ and/or the operating agency have determined a potential exists that the monitor reading has been influenced by an exceptional event, a preliminary flag is submitted for the measurement in the AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1 of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))

ADEQ submitted notice to EPA on August 29, 2012, listing all days from calendar year 2011 that ADEQ intended to analyze under the Exceptional Events Rule and notifying the EPA of which PM10 data were flagged in AQS. Exceedances that occurred on July 18, 2011, within the Phoenix PM10 nonattainment area were included on that list. This report serves as the demonstration supporting the flagging of these data.

On July 18, 2011, eight monitoring sites within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard during the high wind event that occurred during the late afternoon/evening hours. The PM10 monitors impacted were the Buckeye, Central Phoenix, Durango Complex, Dysart, Greenwood, South Phoenix, West 43rd, and West Phoenix monitors operated by Maricopa County Air Quality Department (MCAQD).

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))

ADEQ posted this assessment report on the ADEQ webpage and placed a hardcopy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on December 3, 2012. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv). See Appendix D for a copy of the affidavit of public notice.

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))

At the close of the comment period, and after ADEQ has had the opportunity to consider any comments submitted on this document, ADEQ will submit this document, the comments received, and ADEQ's responses to those comments to EPA Region IX headquarters in San Francisco, California. The deadline for the submittal of this demonstration package is September 30, 2014.

Documentation Requirements

Section 50.14(c)(3)(iii) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

- a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
 - (1) the event affected air quality,
 - (2) the event was not reasonably controllable or preventable, and
 - (3) the event was caused by human activity unlikely to recur in a particular location or was a natural event;
- b. There is a clear causal relationship between the measurement under consideration and the event;
- c. The event is associated with a measured concentration in excess of normal historical fluctuations; and
- d. There would have been no exceedance or violation but for the event.

Section II of this assessment introduces the conceptual model of the high wind event that transpired on July 18, 2011, providing a background narrative of the exceptional events and an overall explanation on how "the event affected air quality." Further evidence that "the event affected air quality" is provided in Section V. Sections II and V also provide evidence that the event was a natural event.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the event on July 18, 2011, was not reasonably controllable or preventable.

Section V of this assessment establishes a clear causal connection between the natural events of July 18, 2011 and the exceedances of the 24-hour PM10 standard at the monitoring stations. The evidence in this section (and the previous section on historical fluctuations) also confirms that the events in question both affected air quality and were the result of natural events.

Section III of this assessment provides data summaries and time series graphs that help illustrate that the event on July 18, 2011, produced PM10 concentrations in excess of normal historical fluctuations.

Section VI of this assessment builds upon the demonstration showing a clear causal connection between the natural events and the exceedances and concludes there would have been no exceedances on July 18, 2011, but for the presence of the natural events.

II. CONCEPTUAL MODEL

Geographic Setting and Climate

This section describes the geographic and climatic setting of the monitors.

Geographic Setting of Monitors

Phoenix 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 city, the topography of Phoenix is generally flat. The Phoenix area is surrounded by the McDowell Mountains (~4,200 ft msl) to the northeast, the foothills of the Bradshaw (~7,900 ft msl) and Mazataal (~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 City 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 Phoenix metropolitan 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 Phoenix, as well as the locations of PM10 monitors throughout the state. It should be noted that some of the monitors shown in Figure 2-1 are filter-based monitors; therefore, monitoring data from all locations may be available only for select days (i.e., 1-in-6 run days).

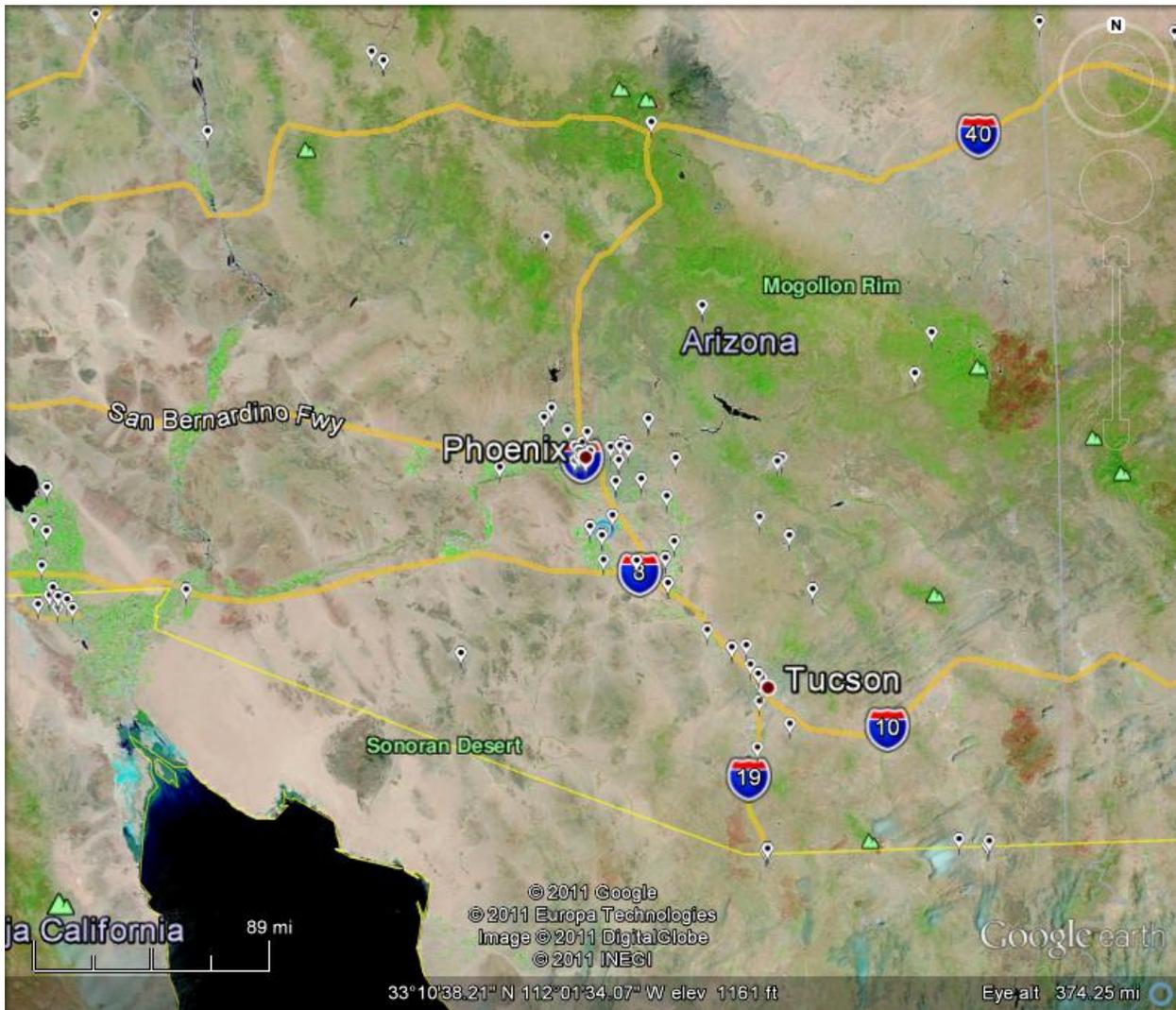
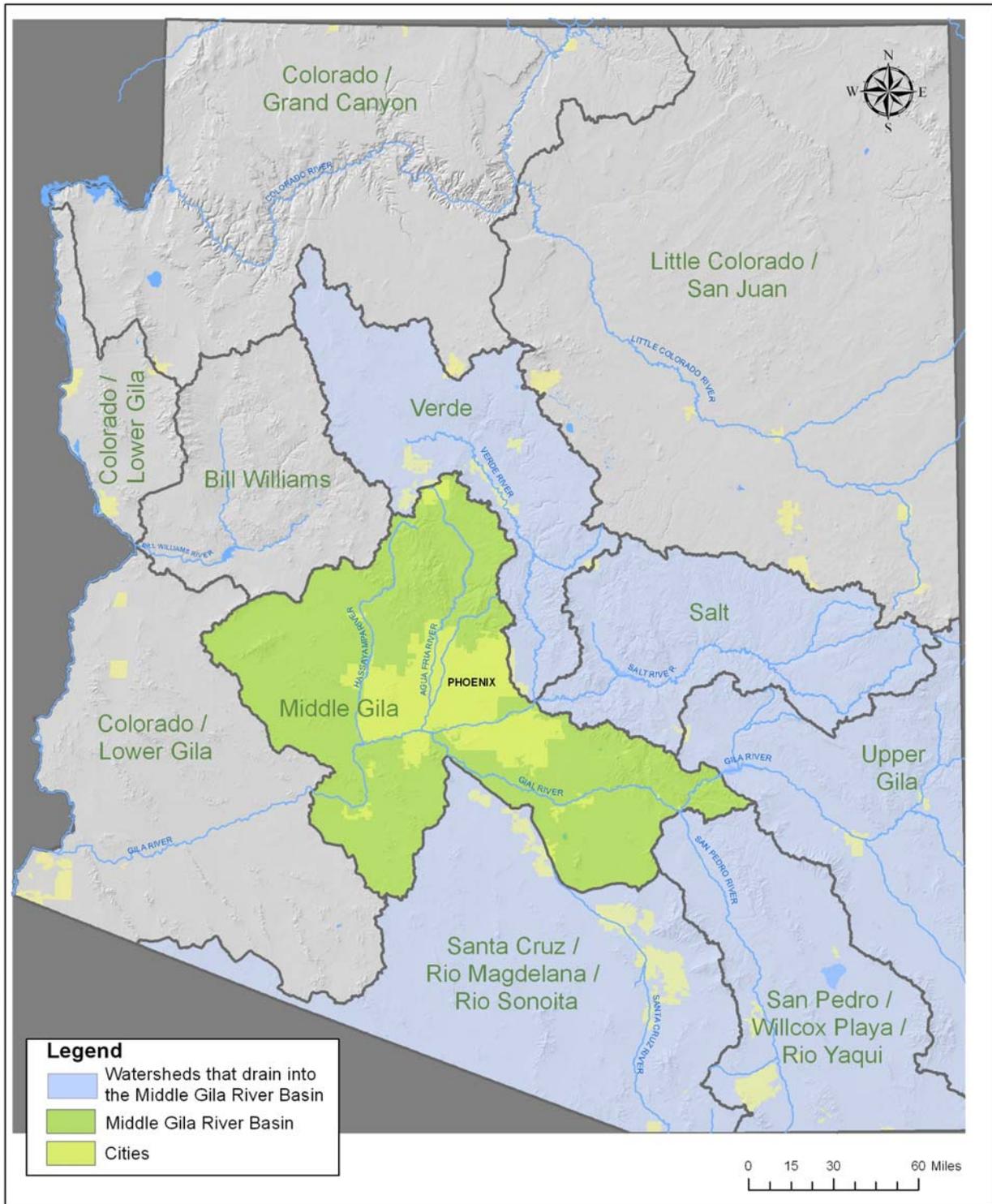


Figure 2-1. Phoenix Geographic Setting and PM10 Monitor Locations (source: EPA AQS DataMart, NASA MODIS Satellite, Google Earth). PM10 monitor locations are indicated by the white markers.

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.



Map 2
Drainage System Phoenix, Arizona

Author: N. Caroli, March 15, 2010



Figure 2-2. Drainage System of Phoenix, Arizona.

Climate

Phoenix 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. Phoenix receives an average of 7.66 inches of rain per year.

As shown in Figure 2-3, 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 that form over the Sierra Madre Occidental Mountains in Mexico. This influx of 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/August) 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 produce significant rains throughout Arizona. This December–March time period and the July–August time period are typically the wettest parts of the year. Meanwhile, a distinct dry season occurs from April through June for the Phoenix area and the rest of Arizona. While these weather patterns describe the general climatology for the Phoenix area over a long period of time, Phoenix and the entire state of Arizona are also prone to a high degree of variability in these weather patterns from year to year.

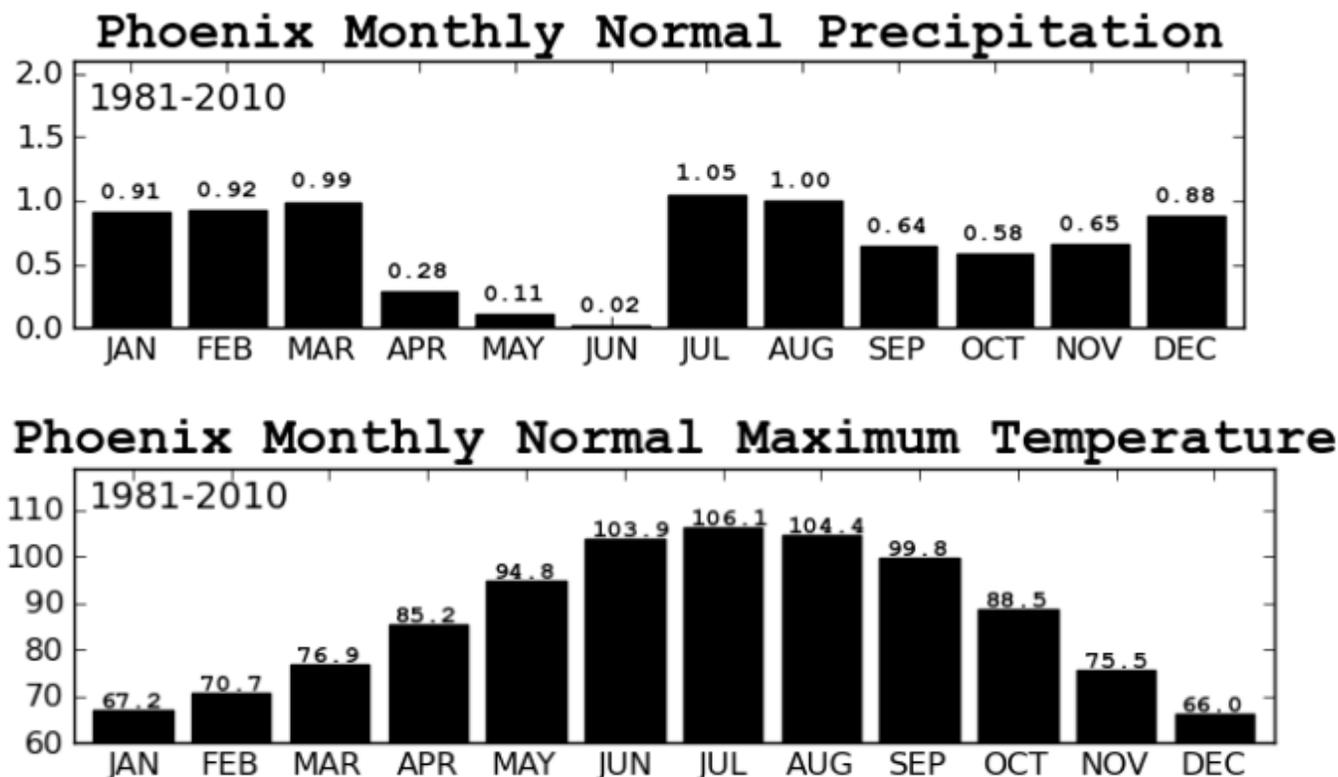


Figure 2-3. Phoenix Monthly Precipitation (top) and Maximum Temperature (bottom) Climatology (source: National Weather Service)

Monsoon Season Description and Event Summary

A multi-day period, including the event day of July 18, 2011, was characterized by monsoonal thunderstorm activity throughout Arizona. The North American Monsoon is a shift in wind patterns in the summer that occurs as Mexico and the southwest U.S. warm under intense solar heating. As this happens, low level moisture is transported primarily from the Gulf of California and eastern Pacific Ocean into the southwestern U.S. The Gulf of California, a narrow body of water surrounded by mountains, is particularly important for low-level moisture transport into Arizona and Sonora. Mid- and upper-level moisture is also transported into the region, mainly from the Gulf of Mexico by easterly winds aloft. This combination causes a distinct rainy season over large portions of western North America, which develops rather quickly and sometimes dramatically. Rainfall during the monsoon is not continuous and varies considerably, depending on a variety of factors. There are usually distinct “burst” periods of heavy rain during the monsoon, and “break” periods with little or no rain. Even during active monsoon periods, some areas can go without receiving any significant precipitation while other nearby areas experience heavy rains and flooding.

The thunderstorm activity in Arizona on July 18 was active in and around the desert areas of central and southern Arizona and northern Mexico. These thunderstorms did not result in much precipitation for the Phoenix area, but many of the storms were severe in nature and caused many dust-carrying outflow boundaries, the most significant of which propagated into the Phoenix area in the late afternoon. Downdrafts associated with heavy precipitation from thunderstorms or from collapsing thunderstorms can end up producing what are called downbursts, or sometimes more concentrated and severe microbursts, which are rapidly descending bursts of air that come through the thunderstorms. These downward bursts of air hit the ground and then disperse away from the storms as areas of outflow. These outflow boundaries from the thunderstorms can kick up large areas of dust, sometimes called haboobs, and transport that dust for long distances from the initiating thunderstorms (see Figure 2-4).

The active monsoon occurring on July 18 led to numerous thunderstorms and thunderstorm outflows that produced blowing dust in many parts of Arizona, including the Phoenix Metropolitan area. The windblown dust event produced eight PM10 exceedances in the Phoenix PM10 nonattainment area on July 18. The event was primarily driven by strong outflows from severe thunderstorms producing wind gusts from one prominent direction. The July 18th event was a widespread dust event with mostly south-southeasterly winds transporting dust from the desert areas of Pinal County into the central and western side of the Phoenix region. Further details on the event can be found in Section V.

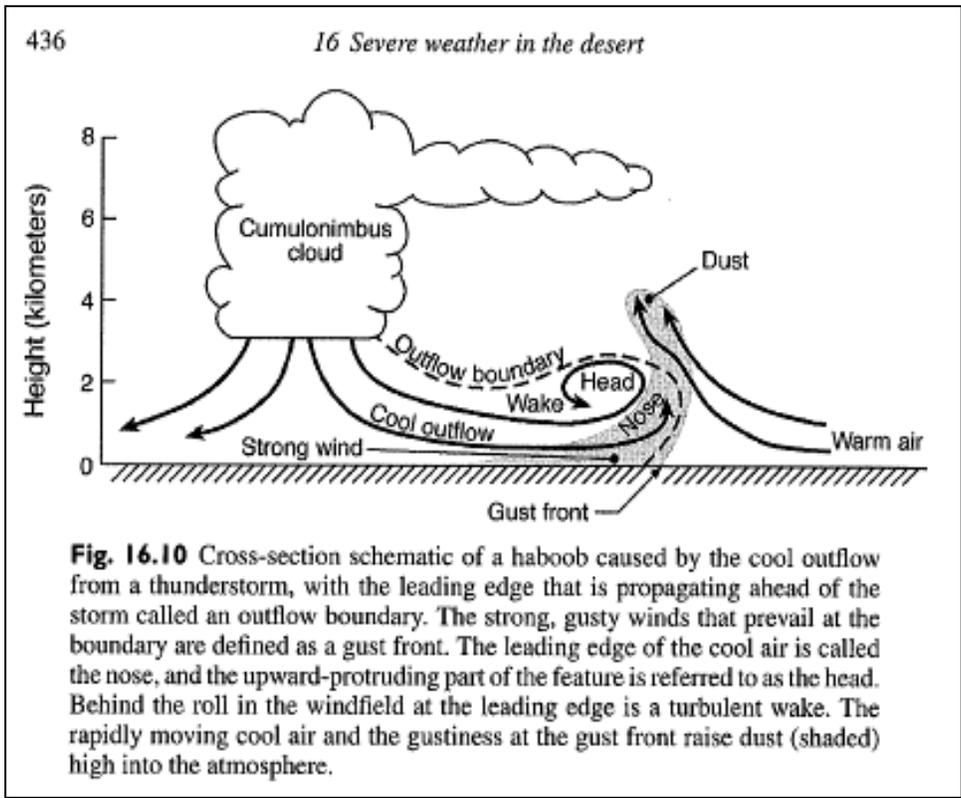


Figure 2-4. Cross-section of a thunderstorm creating an outflow boundary and haboob (Source: Desert Meteorology. Thomas T. Warner. 2004.)

The nature of these monsoonal dust events is such that specific source areas are difficult to determine, as outflow from thunderstorms can carry dust over vast distances encompassing many source areas. Because of this, it is more appropriate to speak of general source regions for these monsoonal dust storms, which typically are identified based upon the locations of the thunderstorms that are believed to have created the dust generating and carrying outflow winds. A vast majority of the PM₁₀ impacting the Phoenix area from thunderstorm-driven high winds on July 18 originated outside of the Phoenix PM₁₀ nonattainment area. The contributing source regions to the dust event were somewhat widespread, but the majority of the PM that was transported into Maricopa County likely came from areas within Pinal County to the south and southeast of Maricopa County. Other potential source contributors to the PM₁₀ events were areas in northern Pima County and southeastern and southern Maricopa County. The exact origin of the PM sources is often difficult to determine due to the less dense monitoring networks in the general source area.

Another important factor that led to these significant dust storms was the on-going drought across the region. The most recent U.S. Drought Monitor placed the area between Tucson and Phoenix, the primary dust source region for winds out of the southeast, in D1 (Moderate) to D3 (Extreme) drought (see Figure 2-5). Rainfall in Phoenix since October 1, 2010, had been 55% of normal, and only 44% of normal since January 1, 2011 (see the Daily Climate Report for July 18 in Appendix D). For additional information pertaining to the 2011 monsoon season in Arizona, see the news media web links provided below.

2011 Monsoon Season Summary and Review → <http://bcove.me/krh3qk29>

This video contains information about the monsoon season, the formation of dust storms in Arizona, and the uniqueness of the 2011 monsoon season.

2011 Monsoon Season Review 2 → <http://bcove.me/tc6otk0h>

This video contains information about the 2011 monsoon season, focusing on the large number of dust storms that occurred, and a discussion of why there were so many dust storms in 2011.

The abnormally dry conditions that were in place during the early part of the monsoon season (which persisted throughout the duration of the monsoon season) resulted in a large fetch of soils that were vulnerable to particulate suspension. The thunderstorm outflow boundaries that affected Maricopa and Pinal counties on July 18 resulted in very little rainfall throughout south-central Arizona, but the high winds associated with the outflows did transport moderate to very high levels of particulate concentrations into the Phoenix area. A timeline summarizing the July 18 event can be seen in Figure 2-6. This figure shows hourly PM10 concentrations for a three-day period around, and including, the event day. During the 24 hours prior to the event, there were low PM10 concentrations across the Phoenix region for much of the day, but late afternoon thunderstorms produced weak outflows and moderate winds that caused a one hour spike in PM10 concentrations around 11 p.m., but the spike was not high enough at any monitoring sites to cause an exceedance of the 24-hour standard. On the event day, the figure shows low PM10 concentrations during the day and then very high PM10 concentrations during the evening hours when the thunderstorm outflows traveled through the Phoenix area. Lastly, the figure shows that PM10 concentrations dropped back down to low levels during the 24 hours after the event, indicating that without the impacts of the thunderstorm outflows, PM10 concentrations at all sites in the Phoenix PM10 nonattainment area July 18, 2011, would have been below the 24-hour average PM10 exceedance threshold of 150 $\mu\text{g}/\text{m}^3$.

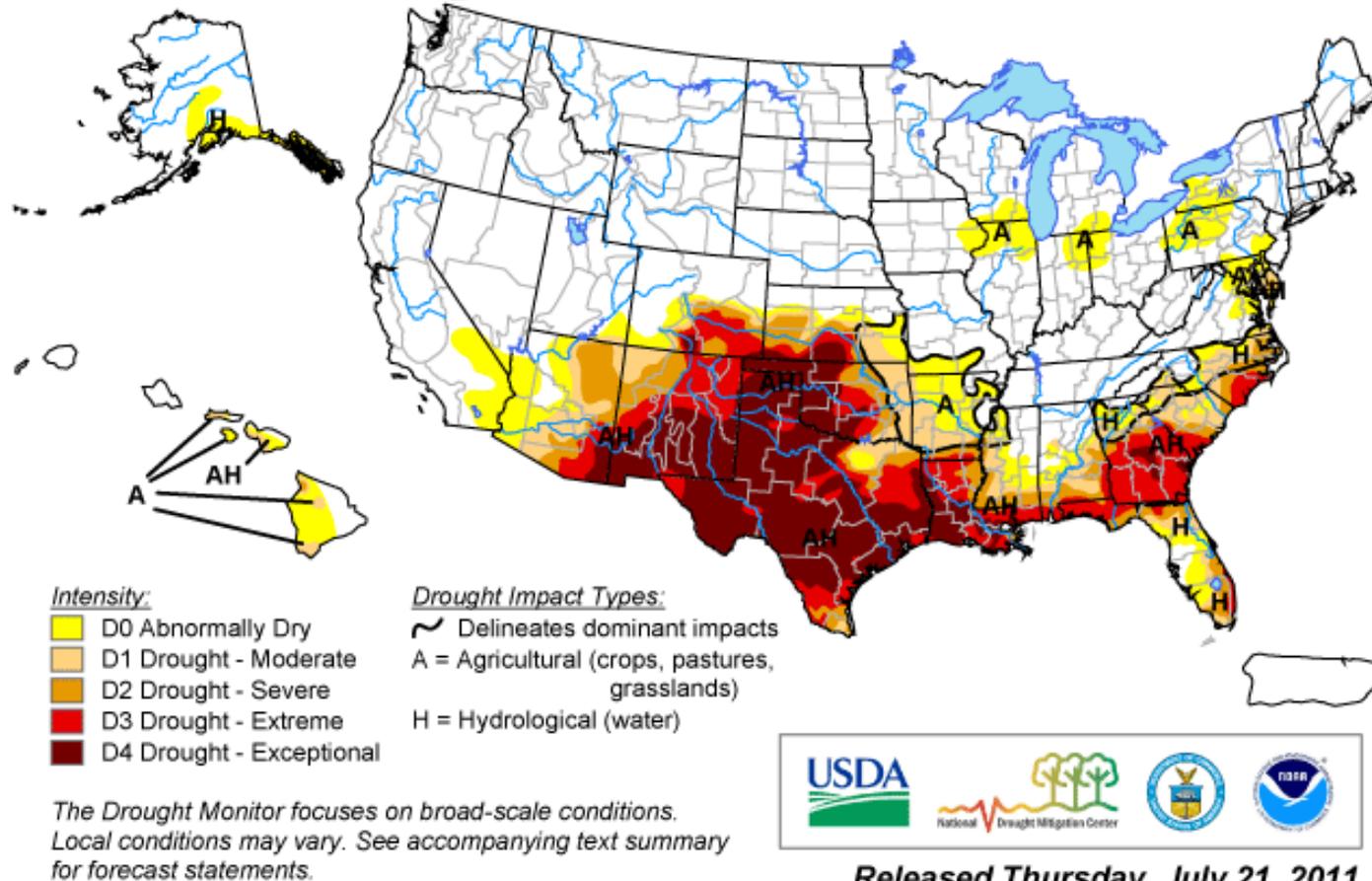
Following Figure 2-6, Table 2-1 details the PM10 24-hour average concentrations, the daily maximum hourly concentrations and the time at which they occurred, and the flag given to the data in EPA's AQS for all PM10 monitoring sites in Arizona for the event day.

Conclusions

This Conceptual Model was created to provide a basic description of the general climate and weather patterns that led to the active thunderstorm period on July 18 and produced the dust storms and eight PM10 exceedances in the Phoenix PM10 nonattainment area during the one-day episode. A more detailed analysis of the windblown dust event is included in Section V, where a demonstration of the clear causal connection between the uncontrollable natural events and PM10 exceedances is presented.

U.S. Drought Monitor

July 19, 2011
Valid 8 a.m. EDT



<http://drought.unl.edu/dm>

Released Thursday, July 21, 2011

Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

Figure 2-5. U.S. Drought Monitor analysis released during the time period of the exceedances described in this report.

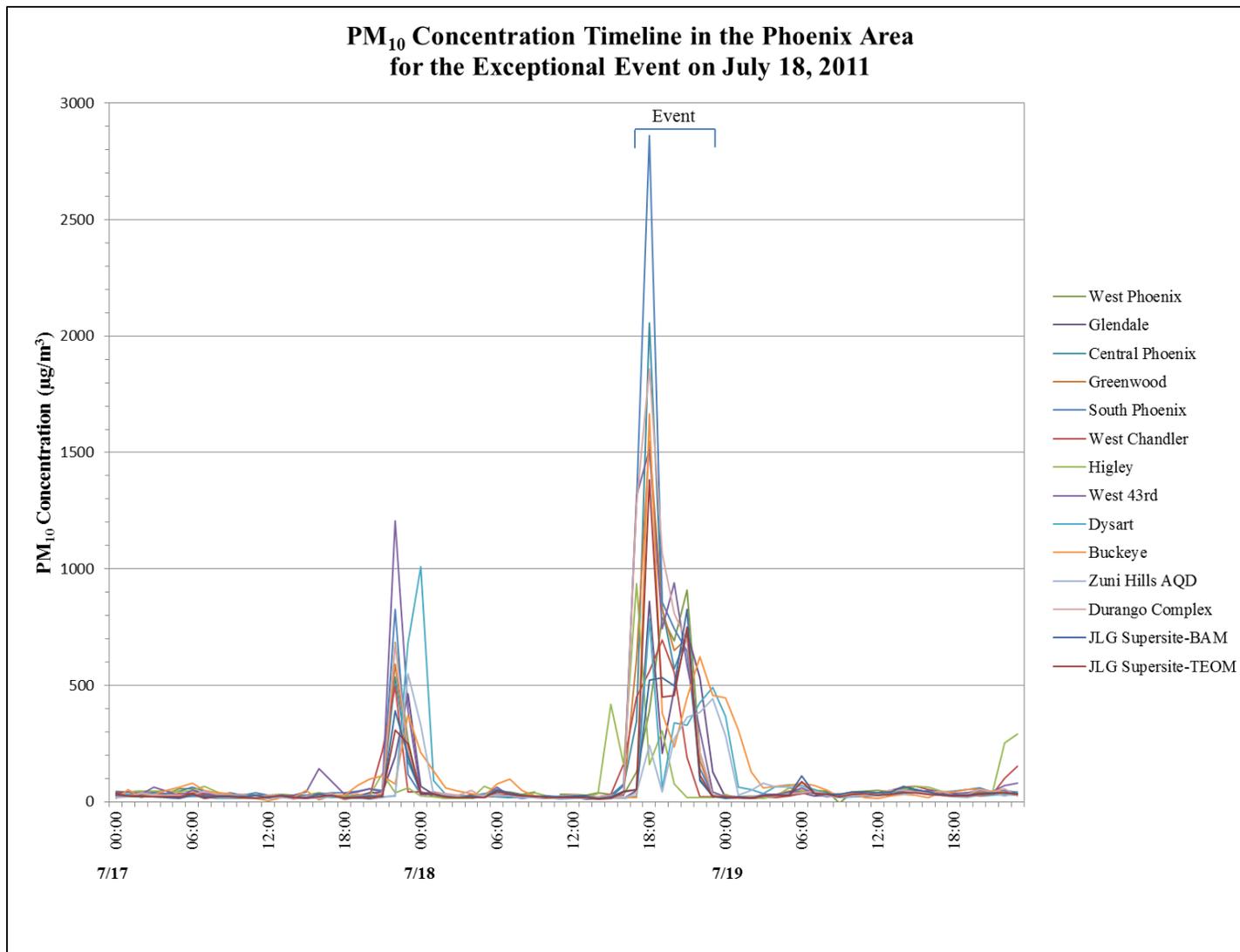


Figure 2-6. Timeline of PM₁₀ concentrations at monitors in the Phoenix area before, during and after the July 18, 2011 event

July 18, 2011

Table 2-1. Summary of Statewide PM10 Measurements for July 18, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m ³)	1-hr Max PM10 (µg/m ³)	Max Time	AQS Qualifier Flag
Apache County							
N/A	TEOM	WMAT	04-001-1003-81102-1	11	33	1300	
Coconino County							
N/A	TEOM	NN	04-005-1237-81102-1	15	31	0200	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	24	93	1300	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	196	1665	1800	RJ
Central Phoenix	TEOM	MC	04-013-3002-81102-4	210	2056	1800	RJ
Durango Complex	TEOM	MC	04-013-9812-81102-1	267	1859	1800	RJ
Dysart	TEOM	MC	04-013-4010-81102-1	163	1008	0000	RJ
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-8112-1	32	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	141	862	1800	
Greenwood	TEOM	MC	04-013-3010-81102-1	208	1549	1800	RJ
Higley	TEOM	MC	04-013-4006-81102-1	104	937	1700	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	125	826	2100	IJ, EH
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	151	1383	1800	IJ
South Phoenix	TEOM	MC	04-013-4003-81102-1	303	2861	1800	RJ
West Chandler	TEOM	MC	04-013-4004-81102-1	126	696	1900	
West Forty Third	TEOM	MC	04-013-4009-81102-1	244	1515	1800	RJ
West Phoenix	TEOM	MC	04-013-0019-81102-1	159	908	2100	RJ
Zuni Hills	TEOM	MC	04-013-4016-81102-1	100	441	2300	
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	11	30	1300	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	27	95	2300	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	15	57	1400	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	12	47	1300	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	14	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	43	151	1400	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	18	N/A	N/A	
Pinal County							
Apache Junction Fire Stn.	TEOM	PCAQCD	04-021-3002-81102-3	N/A	N/A	N/A	
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	219	2919	1600	RJ
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	66	405	1500	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	1638	24976	1700	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	531	9756	1700	RJ
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	271	3088	1600	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	567	9716	1600	RJ
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	13	28	1600	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	22	73	0700	

Operator Abbreviations:

MC – Maricopa County Air Quality Department
 PCAQCD – Pinal County Air Quality Control District
 ADEQ – Arizona Department of Environmental Quality
 FMIR – Fort McDowell Indian Reservation
 NN – Navajo Nation, AZ, NM, UT
 PCDEQ – Pima County Department of Environmental Quality
 SRP-MIC – Salt River Pima-Maricopa Indian Community of Salt River Reservation, AZ
 WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

III. HISTORICAL FLUCTUATIONS

The PM10 concentrations measured across much of Maricopa County on July 18, 2011, were some of the highest hourly and 24-hour averages measured over the last five years. Time series plots of the 24-hour PM10 concentrations for the period January 1, 2007, through December 31, 2011, were created for all PM10 monitors in the Phoenix PM10 nonattainment area. Additionally, time series plots of the daily maximum hourly average PM10 concentrations were created for two monitors in Maricopa County. These two additional plots were created to provide a deeper understanding of the magnitude of short-term particulate concentrations and their contribution to PM10 exceedances in the Phoenix PM10 nonattainment area. Time series plots for two monitoring sites (South Phoenix and Buckeye) are included within this section, while the remaining 24-hour average plots are available in Appendix A. The South Phoenix monitor was selected because of its central location in relation to all monitors in Maricopa County and it was the most severely impacted site during the July 18 windblown dust event. The Buckeye monitor was selected because it is representative of western Maricopa County, an area of the region frequently impacted by dust storms caused by thunderstorm outflow events. The graphs below and in Appendix A show that the July 18 event was in the top five most extreme events of the last five years for multiple sites.

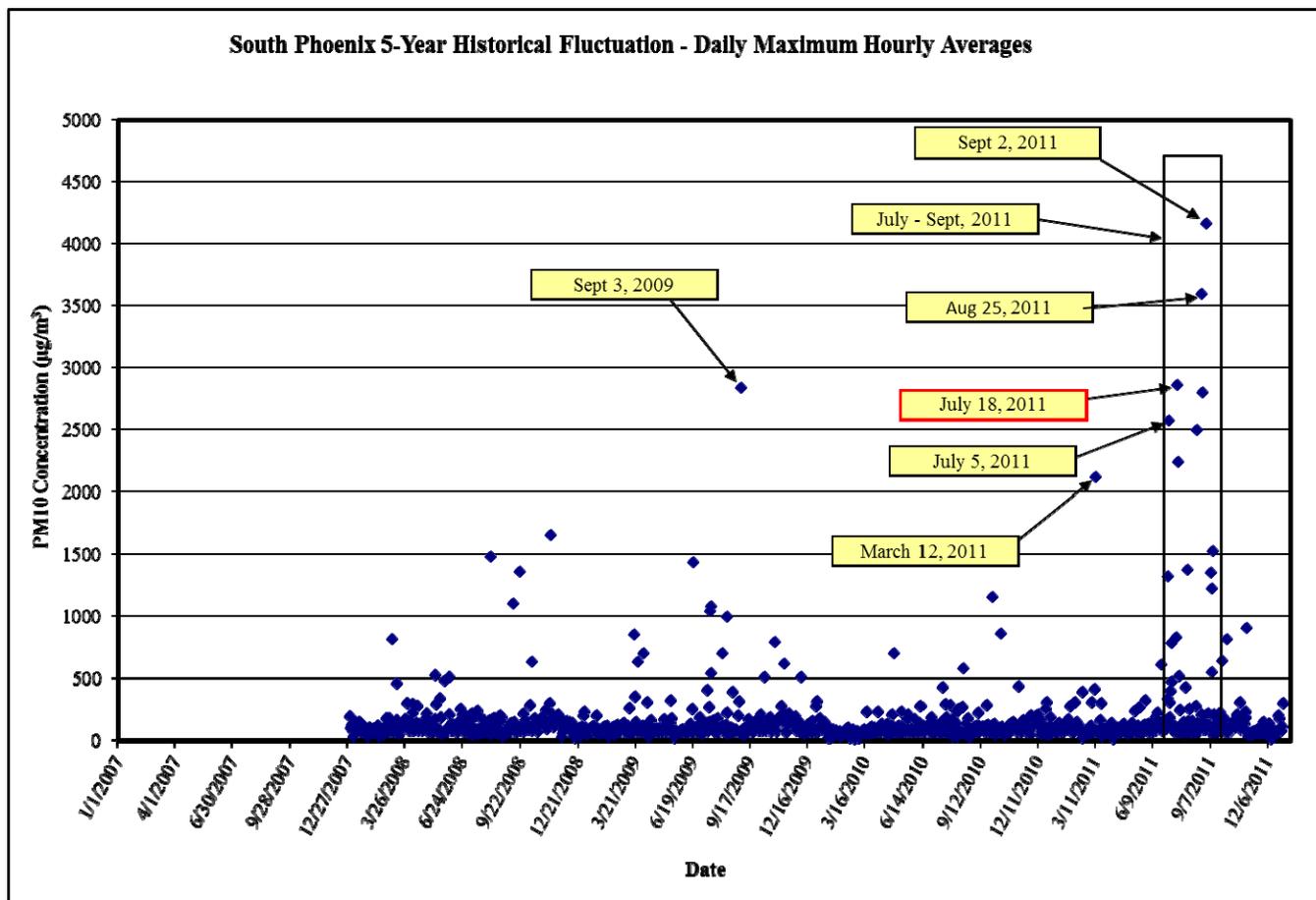


Figure 3-1. Plot of daily hourly maximum PM10 concentrations (2007 – 2011) at the South Phoenix monitoring site.

Figure 3-1 shows the daily maximum hourly averages from the South Phoenix PM10 monitor. The plot shows that the July 18th hourly average of 2861 $\mu\text{g}/\text{m}^3$ was the third highest hourly PM10 concentration recorded in the last five years. The plot also shows that the maximum hourly average was greater than that observed during the July 5, 2011 haboob event which recently received EPA concurrence. The hourly average concentrations from this event were surpassed only by two additional dust storms that occurred in August and September 2011, another indication of the severity of the 2011 monsoon season. It is also clear that the most significant hourly average PM10 concentrations at the South Phoenix monitor typically occur during the July through September time frame, a period during which the monsoon season is most active and the Phoenix region is frequently impacted by haboob events.

Figure 3-2 shows the daily 24-hour averages from the South Phoenix PM10 monitor and indicates that the July 18th event produced the third highest 24-hour average PM10 concentration measured in the last five years. Similar to haboob events that occurred on the same date in 2009, during the first week of July 2011, and during the last week of August 2011, the July 18 event experienced PM10 concentrations that were well above the 24-hour exceedance threshold.

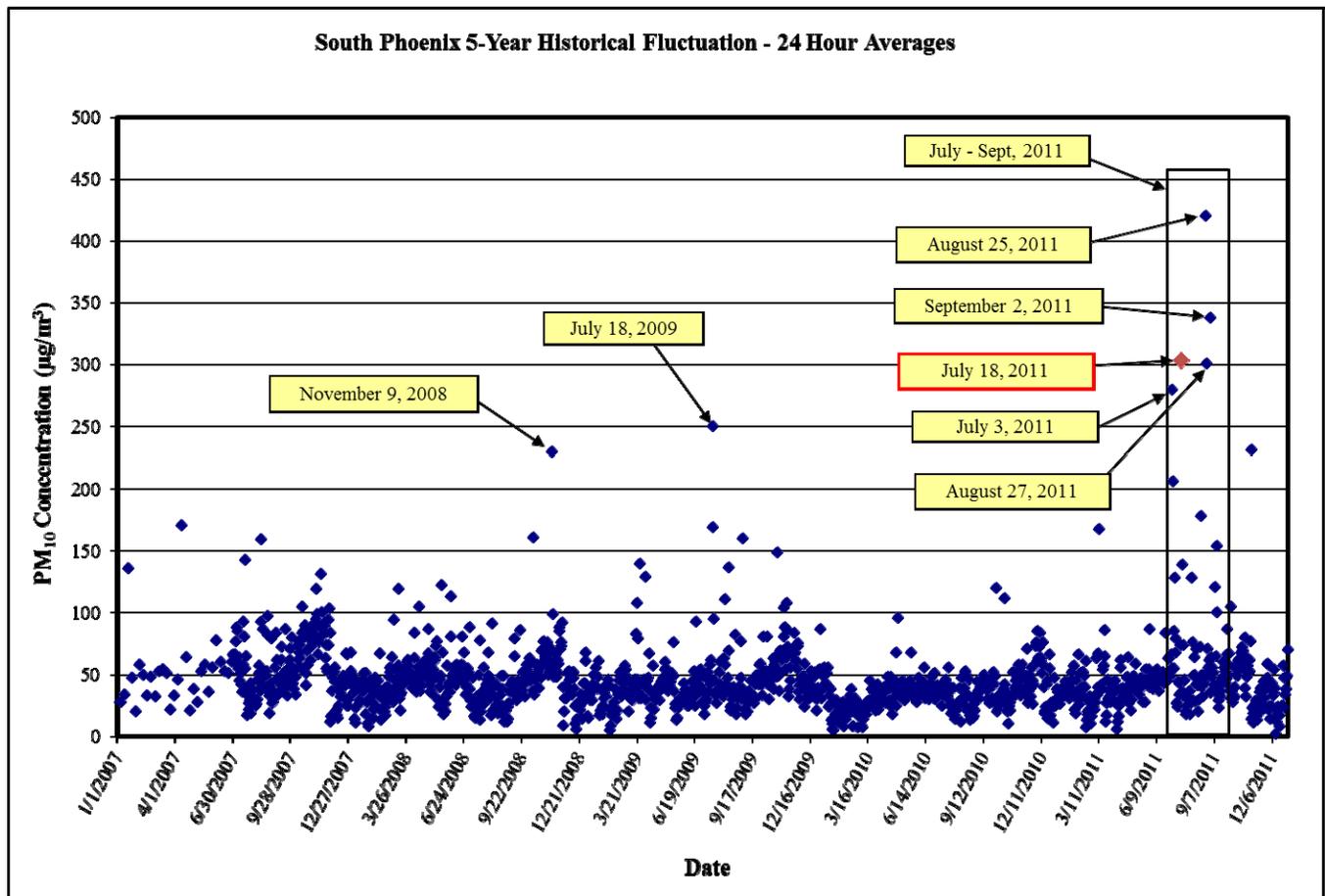


Figure 3-2. Plot of 24-hour average PM10 concentrations (2007 – 2011) at the South Phoenix monitoring site.

Figures 3-3 and 3-4 provide an historical look at the daily maximum hourly averages and daily 24-hour averaged PM10 concentrations from the Buckeye monitor. The plots also show that the maximum hourly concentration and exceedance measured at the Buckeye monitor on July 18 was among the nine highest PM10 concentrations measured over the last five years. As was the case for the South Phoenix monitor,

the most significant hourly average PM10 concentrations at the Buckeye monitor typically occur during the July through September time frame, a period during which the monsoon season is most active and the Phoenix region is frequently impacted by haboob events.

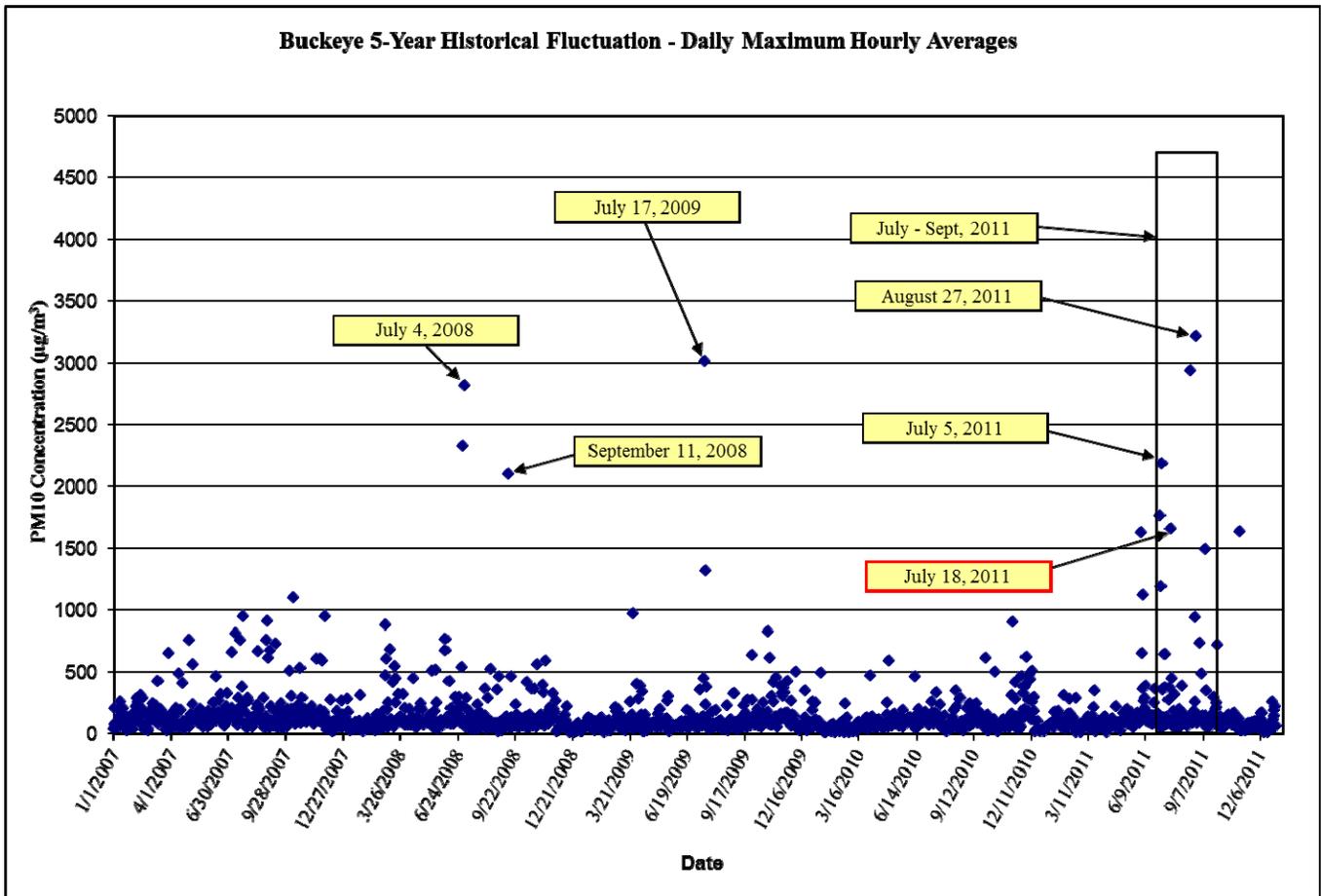


Figure 3-3. Plot of daily hourly maximum PM10 concentrations (2007 – 2011) at the Buckeye monitoring site.

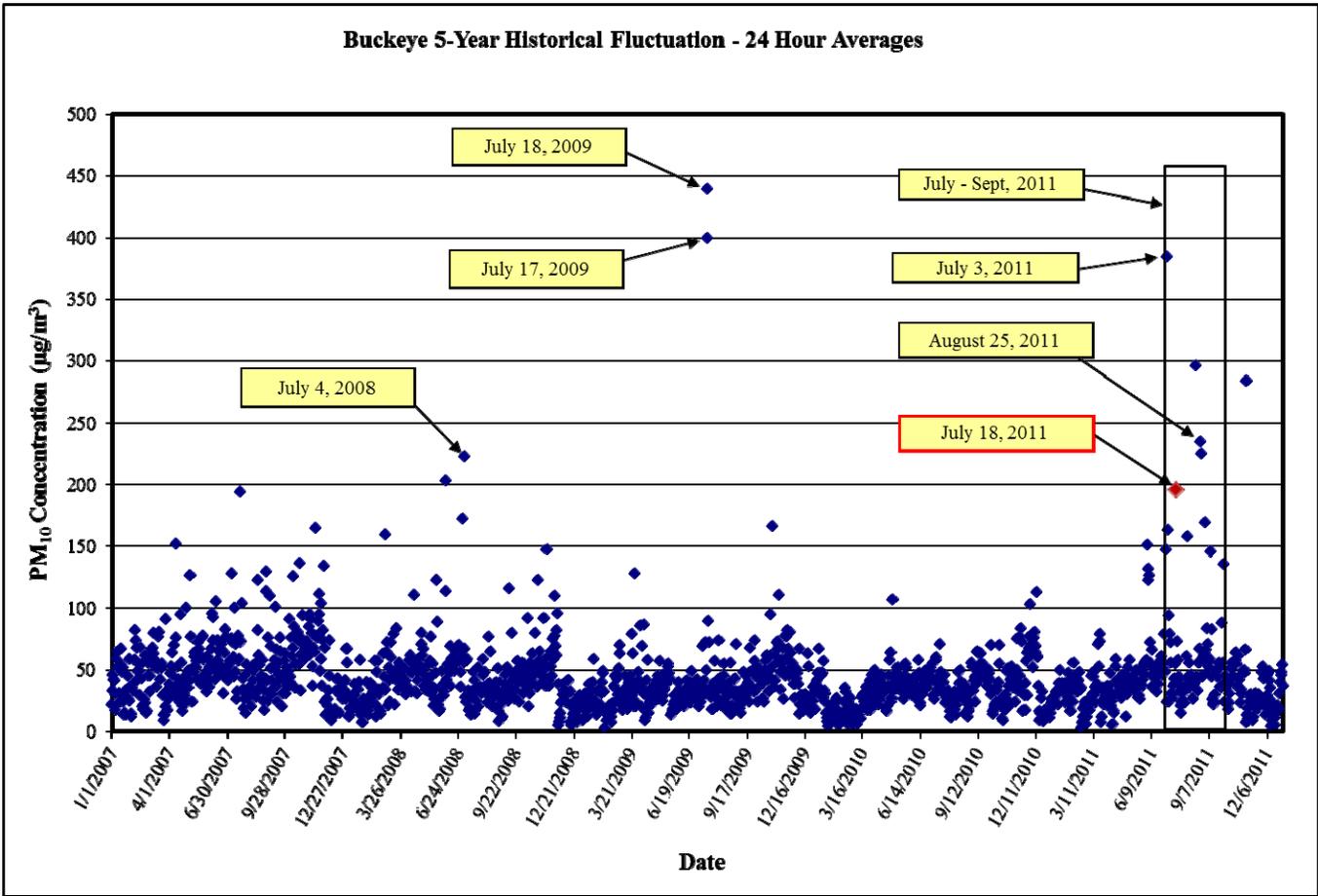


Figure 3-4. Plot of 24-hour average PM10 concentrations (2007 – 2011) at the Buckeye monitoring site.

The plots within this section provide an historical perspective of PM10 concentrations since 2007. These plots, along with those in Appendix A, show that the haboob event that occurred on July 18, 2011, resulted in one of top ten highest 24-hour average PM10 concentrations seen in the last five years. This equates to PM10 concentrations in the 99.5th percentile when compared to historic data. In the case of the Greenwood, South Phoenix, and Durango monitoring sites, the 24-hour averaged PM10 concentrations measured on July 18 were in the top five highest concentrations observed during the last five years. While the PM10 concentrations that were measured on July 18th were extreme in many cases, the plots also show that similar events are not uncommon during the monsoon season. As documented in several published journals and academic text books, haboobs generated from thunderstorm outflow boundaries are a phenomenon that Arizona deals with every year, some years more so than others, namely in 2007, 2009, and 2011.

IV. NOT REASONABLY CONTROLLABLE OR PREVENTABLE

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable control measures in place within Maricopa County and the Phoenix PM10 nonattainment area, high wind conditions overwhelmed all reasonably available controls. The event occurring on July 18, 2011, was directly related to strong and gusty winds generated by thunderstorm outflow boundaries. The strong winds overwhelmed all reasonably available controls, and were also responsible for transporting PM into the Phoenix PM10 nonattainment area from areas outside of the nonattainment area. As explained in the conceptual model, downdrafts from collapsing thunderstorms produce outflow boundaries that contain gusty, turbulent wakes that raise dust from the desert surfaces that can be as wide as 100 miles in severe cases. As shown in Section V, the source region for all of the dominant thunderstorm outflows and associated transported dust on July 18, 2011, generally came from areas outside of the Phoenix PM10 nonattainment area—primarily from the deserts of Pinal, Pima, and southern Maricopa counties. While it is likely that some dust was generated within the PM10 nonattainment area as gusts from the thunderstorm outflows passed through the area, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to, the dust transported in from the source regions of the thunderstorm outflows. Strict controls on local sources of fugitive dust were in place and enforced on July 18, 2011, but were not capable of controlling transported dust and PM10 raised by the gusty and turbulent thunderstorm outflows on these dates.

The following sections describe the BACM- and MSM-level PM10 control measures in place July 18, 2011, and the robustness of the programs designed to enforce these measures. Pro-active response and analysis of each event as it is occurring verify the uncontrollable nature of each event, while inspections of local sources performed before, during, and after the July 18, 2011 event confirmed that no unusual anthropogenic PM10-producing activities occurred in Maricopa County, the Phoenix PM10 nonattainment area, or the local areas surrounding the exceeding monitors.

Regulatory Measures and Control Programs

ADEQ and MCAQD are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Maricopa County. Three major programs provide or contribute to air pollution control measures for the Greater Phoenix area:

1. ADEQ’s Agricultural Best Management Program (AgBMP);
2. Maricopa County’s Inspection and Compliance Program; and
3. ADEQ’s Air Quality Forecasting Program.

Specifically, ADEQ is responsible for compliance assistance and enforcement of Agricultural Best Management Practices developed by the Governor’s Agricultural Best Management Practices Committee, while MCAQD is responsible for compliance assurance for all other significant sources of PM10 emissions. In addition to routine inspections and inspections driven by complaints, inspections are often increased when (1) ADEQ forecasters issue a High Risk for the Maricopa County Dust Control Forecast, (2) ADEQ forecasters issue a High Pollution Advisory, or (3) near-real-time monitoring data indicate unique activity via high PM concentrations. The forecasting program and inspection/compliance programs work together so that resources can be best utilized during days that are of greatest risk for elevated PM emissions.

On July 25, 2002, EPA took initial action to finalize approval of the Best Available Control Measure (BACM) and the Most Stringent Measure (MSM) demonstrations in the Serious Area PM10 plan for the Maricopa County portion of the metropolitan Phoenix PM10 nonattainment area (67 FR 48718). These BACM and MSM demonstrations were again approved by EPA on July 14, 2006 (71 FR 43979). The Agricultural Best Management Practices General Permit rule and related definitions have been approved into the Arizona Administrative Code as R18-2-610 and R18-2-611 pursuant to Arizona Revised Statutes § 49-457.² Maricopa County regulations of PM10 emissions are listed in Table 4-1.

Table 4-1. Rules and Ordinances Regulating Particulate Matter Emissions in Maricopa County

Rule/Ordinance Number & Title	Description
Rule 300: Visible Emissions	Establishes standards for visible emissions and opacity.
Rule 310: Fugitive Dust from Dust-Generating Operations	Establishes limits for the emissions of particulate matter into the ambient air from any property, operations, or activity that may serve as a fugitive dust source
Rule 310.01: Fugitive Dust from Non-Traditional Sources of Fugitive Dust	Establishes limits for the emissions of particulate matter into the ambient air from open areas, vacant lots, unpaved parking lots, and unpaved roadways that are not regulated by Rule 310 and that are not required to have either a permit or a dust control plan
Rule 311: Particulate Matter from Process Industries	Establishes emission rates based on process weight applicable to any affected operations not subject to Rule 316.
Rule 312: Abrasive Blasting	Establishes limits for particulate emissions from abrasive blasting operations
Rule 314: Open Outdoor Fires and Indoor Fireplaces at Commercial and Institutional Establishments	Establishes limits for the emissions of air contaminants produced from open burning
Rule 316: Nonmetallic Mineral Processing	Establishes limits for the emissions of particulate matter into the ambient air from any nonmetallic mining operation or rock product processing plant
Rule 317: Hospital/Medical/ Infectious Waste Incinerators	Establishes limits for the emissions of air pollutants from medical waste incinerators
Rule 322: Power Plant Operations	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from existing power plants and cogeneration plants
Rule 323: Fuel Burning Equipment from Industrial/Commercial/ Institutional (ICI) Sources	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from ICI sources

² Updates to the AgBMP program in December, 2011, clarified BMPs for crop and added BMPs for animal operations. Effective 12/29/2011, R18-2-611 was renumbered to R18-2-610.01 **Agricultural PM10 General Permit for Crop Operations** and R18-2-611.01 **Animal Operations PM10 General Permit** was added. Definitions for Crop Operations were revised at R18-2-610, and new definitions for Animal Operations were added at R18-2-611.

Rule/Ordinance Number & Title	Description
Rule 324: Stationary Internal Combustion (IC) Engines	Establishes limits for the emissions of carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds, and particulate matter from stationary internal combustion engines, including stationary IC engines used in cogeneration
Rule 325: Brick and Structural Clay Products (BSCP) Manufacturing	Establishes limits for particulate matter emissions from the use of tunnel kilns for curing in the brick and structural clay product (BSCP) manufacturing processes
Ordinance P-25: Leaf Blower Restriction	Establishes restrictions for leaf blowers in incorporated and unincorporated sections of Area A in Maricopa County
Ordinance P-26: Residential Woodburning Restriction	Establishes restrictions for residential woodburning
Ordinance P-27: Vehicle Parking and Use on Unstabilized Vacant Lots	Establishes restrictions for vehicle parking and use on unstabilized vacant lots in unincorporated sections of Area A in Maricopa County
Ordinance P-28: Off-Road Vehicle Use in Unincorporated Areas of Maricopa County	Establishes restrictions for operating vehicles on unpaved property in unincorporated areas of Maricopa County
Arizona Administrative Code R18-2-611 & 610: Agricultural PM10 General permit	Establishes a requirement for commercial farmers to implement best management practices and maintain a record demonstrating compliance

In addition to the rules and regulations listed in Table 4-1, other PM10 reducing control measures (e.g., paving of unpaved roads, PM10 certified street sweepers, controlling unpaved parking lots, etc.) have been committed to, and implemented by, local jurisdictions throughout the PM10 nonattainment area, and incorporated into the Arizona SIP through PM10 plans such as the Revised MAG 1999 Serious Area Particulate Plan for PM10 for the Maricopa County Nonattainment Area. The Pinal County Air Quality Control District (PACQCD) also implements regulatory control measures on emissions from existing and new non-point sources within Pinal County (see Table 4-2). Additionally, the PACQCD implements specific nonattainment rules for that part of the Phoenix PM10 nonattainment area that resides in Pinal County (see Table 4-3).

Table 4-2. Pinal County Rules Regulating Existing and New Non-point Sources in Pinal County

Article Number & Title	Description
Chapter 4, Article 2: Fugitive Dust	Provides a mechanism to reasonably regulate operations which periodically may cause fugitive dust emissions into the atmosphere
Chapter 4, Article 3: Construction Sites – Fugitive Dust	Improves the control of excessive fugitive dust emissions that have been traditionally associated with construction, earthwork, and land development, and thereby minimize nuisance impacts

Table 4-3. Pinal County Rules Regulating Fugitive Dust in Pinal County Portion of Maricopa County PM10 Nonattainment Area

Article Number & Title	Description
Chapter 4, Article 4: Nonattainment Area Rules; Dustproofing for Commercial Parking, Drives and Yards	Establishes rules to avoid violations of the prevailing PM10 standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from unpaved parking lots
Chapter 4, Article 5: Nonattainment Area Rules; Stabilization for Residential Parking and Drives	Establishes rules for stabilizing residential properties
Chapter 4, Article 6: Restrictions on Vehicle Parking and Use on Vacant Lots	Establishes rules for unpaved or unstabilized vacant lots (valid in Pinal County portion of Area A)
Chapter 4, Article 7: Construction Sites in Nonattainment Areas – Fugitive Dust	Establishes rules to avoid violations of the prevailing PM10 standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from activities associated with construction, earthwork, or land development
Chapter 4, Article 8: Nonattainment Area Rules, Requirement for Stabilization of Disturbed Areas at Vacant Lots	Establishes rules for stabilizing disturbed areas at vacant lots

PM10 Rule Effectiveness

MCAQD analyzed the effectiveness of its fugitive dust rules (Rules 310, 310.01 and 316) in terms of permit compliance rates. This rule effectiveness (RE) study was designed to assess how many sources regulated by MCAQD during the subject time period received no PM10 emissions-related violations. As a basis for comparison, the percentage of permitted sources in compliance during calendar year 2007 was 76% for sources subject to Rule 310, 85% for Rule 310.01 sources, and 40% for Rule 316 sources. In early 2008, Rules 310, 310.01, and 316 were strengthened, and new ordinances (covering additional source categories such as leaf blowers, vacant lots, and off-road vehicles) were adopted. These enhancements resulted from MCAQD department’s obligations under such agreements as the 2005 Revised PM10 State Implementation Plan for the Salt River Area and the Maricopa Association of Governments (MAG) 2007 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area to reduce PM10 emissions throughout the county. Three major areas that contributed to increased compliance were an increase in departmental staffing (especially inspectors), a robust training program, and regulatory changes that broadened and strengthened control measures under Rules 310, 310.01, and 316.

Source compliance rates were re-assessed for FY 2009 (July 2008–June 2009), a period that allowed time for the new and revised regulations to take effect. The results showed significant increases in compliance compared with the earlier period: to 90% (from 76%) for Rule 310 sources, to 95% compliance (from 85%) for Rule 310.01 sources, and to 65% (from 40%) for Rule 316 sources. These improvements continued into calendar year 2010 with compliance rates of 94% for Rule 310 sources, 96% for Rule 310.01, and 73% for Rule 316 sources. The timeline provided in Figure 4-1 illustrates the improvements in RE over the last several years, and also points out significant revisions to previous rules, as well as newly adopted rules and ordinances.

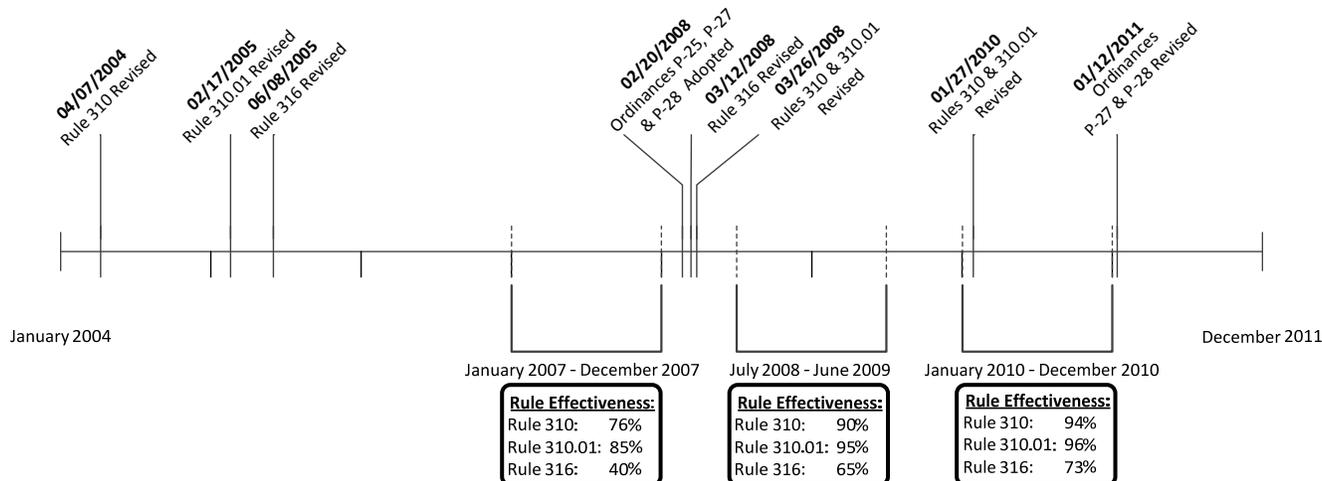


Figure 4-1. Timeline of Maricopa County Fugitive Dust Rules and Ordinances.

Compliance and Enforcement Activities

MCAQD is proactively prepared to respond to high wind events and to protect human health and well-being. MCAQD’s approach consists of two primary components: routine proactive inspections and surveillance inspections, conducted both during and after significant events. MCAQD proactively inspects dust control-permitted sites, and increases the frequency for larger sites of 10 acres or more. Rule 316 sources are also proactively inspected multiple times every year. Maricopa County also responds to the majority of complaints within 24 hours.

Maricopa County monitors the ADEQ Five-Day Dust Control Forecast 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 surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities on exceedance days that had not been forecast (i.e., those instances in which an HPA had not been issued).

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-inspection of sources that had received violations within two business days, and an internal MCAQD debriefing of event activities.

Recently, a total of 12 MCAQD air monitoring sites have been updated with new equipment that allows the monitoring sites to report automatically monitored readings at five-minute intervals, where previously only hourly data were available. The real-time monitoring data programming includes threshold triggers that cause the system to send alerts to MCAQD staff that the PM concentrations are elevated. The system allows MCAQD responders to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the 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.

For July 18, 2011, a Maricopa County Dust Control Forecast was issued indicating a moderate risk level for unhealthy PM₁₀. The Dust Control Forecast also indicated a potential for strong and gusty winds, and a potential for dense blowing and transported dust generated by outflow from thunderstorms.

An evaluation of inspection reports and compliance records indicate no evidence of unusual anthropogenic-based PM₁₀ emissions. During the time period of July 15 through July 21, 2011, MCAQD inspectors conducted a total of 165 inspections of permitted facilities, of which 147 were at fugitive dust sources. Additionally, MCAQD conducted 91 inspections on vacant lots and unpaved parking lots.

During this 7-day period, a total of 16 violations were issued county-wide for PM₁₀ and non-PM₁₀-related violations. Two violations were issued for PM₁₀ emissions within a 4-mile radius of an exceeding monitor; West Phoenix and Central Phoenix.

On July 15, 2011, a violation was issued to an owner of a vacant lot for failure to stabilize surface areas that had been disturbed by horse-riding activity. The vacant lot is located 3.2 miles southwest of the West Phoenix monitor, and the total disturbed surface area was 0.11 acres. No horse-riding activity was observed during the inspection. The violation was the result of a complaint MCAQD received on July 15. The owner was issued a 60-day letter informing them of the stability issue. The owner stabilized the area, installed "No Trespassing" signs, and provided the City of Phoenix with the authority to arrest any trespassers on the property.

Additionally on July 15, 2011, a violation was issued to an owner of a residence for parking vehicles on a dirt surface that did not meet the control measures requirements of Rule 310.01 Section 302.6(b). The residence is located 2.4 miles north of the Central Phoenix monitor. The violation was the result of a complaint MCAQD received on July 14, 2011. Though the unpaved parking area did not meet the control measure requirements of Rule 310.01, Section 302.6(b), the inspector did not observe unstabilized areas during the inspection. The owner of the residence was issued a 60-day letter informing him of the control measure requirements. No compliance issues were observed on subsequent inspections.

MCAQD was prepared for any complaints received due to the high wind event. During the 7 day period from July 15 through July 21, 2011, MCAQD received 36 complaints, of which 30 were windblown dust-related. Each complaint was assigned to and investigated by a MCAQD inspector. A review of all records during this period reveals that MCAQD inspectors only observed two PM₁₀ violations of local, state, or federal regulations within a 4-mile radius of the exceeding monitors.

In addition to MCAQD's efforts in pre-event surveillance and proactive inspections, ADEQ's Agricultural Best Management Practice Program (Ag BMP) inspector monitors the ADEQ Five-Day Dust Control Forecast and the MCAQD air monitoring sites that include real-time data. The ADEQ Ag BMP inspector uses specific knowledge of seasonal activities and associations with the local growers and dairymen to communicate the importance of limiting dust-generating activities, especially during high-wind events. Additional outreach is conducted with facility representatives prior to forecasted high-wind alert days. Should the PM₁₀ readings at a MCAQD air monitoring site show notable increases, the ADEQ Ag BMP inspector is dispatched to contact the owners and operators of agriculture fields in the area to discern if their activities are causing negative impacts. The Ag BMP inspector is prepared to respond to most agriculture complaints within 24 hours.

Based on a review of the inspection reports and site visit documentation, there is no evidence to suggest that agricultural activities produced unusual PM₁₀ emissions. From July 19 through July 22, 2011, the ADEQ Ag BMP inspector received three complaints and performed site visits at one agricultural

operation. The agriculture fields visited had established crops of corn, which would not have contributed to PM10 emissions.

Conclusions

The thunderstorm outflow event of July 18, 2011, produced strong gusts and turbulent wakes that transported dust and PM10 into the Phoenix PM10 nonattainment area. The source region of the outflows that caused the exceedances was largely located in areas outside the Phoenix PM10 nonattainment area, primarily the deserts of Pinal, Pima, and southern Maricopa County. The Phoenix area is designated as a serious nonattainment area for PM10 and is required to have BACM for all significant sources of PM10. 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.

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, provides strong evidence that the events and exceedances of July 18, 2011, recorded within the Phoenix PM10 nonattainment area, were not reasonably controllable or preventable.

V. CLEAR CAUSAL RELATIONSHIP

Introduction

A demonstration of the clear causal connection between uncontrollable natural events or uncontrollable emissions associated with thunderstorm outflows and PM10 exceedances on July 18, 2011, is presented in the following time series graphs, infrared satellite imagery, and National Weather Service (NWS) data tables for selected, representative airports. These various pieces of information contain data on sustained wind speed, wind speed gusts, PM10 concentrations, visibility, weather observations, and thunderstorm development areas and provide the causal connection between the uncontrollable emissions associated with thunderstorm outflows and elevated PM10 concentrations. For reference, Appendix D provides additional NWS text products issued preceding and on July 18 containing forecasts and warnings of blowing dust due to thunderstorms outflows. A summary of the event day is provided below.

Event – July 18, 2011

On July 18, 2011, the Phoenix region experienced typical summertime weather conditions with a maximum temperature of 111°F, relative humidity of 10-30%, winds at 5-12 miles per hour (mph) from various directions, and visibility at 10 miles all day, as reported at the Phoenix Sky Harbor Airport. Despite a spike in PM10 concentrations at most of the PM10 monitoring sites in the region late on July 17 due to windblown dust caused by moderate thunderstorm outflow winds, PM10 concentrations on July 18 were generally very low all day (20-50 $\mu\text{g}/\text{m}^3$ range). Between 3 p.m. Mountain Standard Time (MST) and 5 p.m. MST on July 18, severe thunderstorms developed over portions of Arizona to the southeast of the Phoenix region (as shown in Figure 5-1) and by 4 p.m., outflows from the thunderstorms entrained dust from desert areas of Pinal County and generated a “haboob” that progressed northwestward into Maricopa County, transporting large amounts of PM10. As shown in Figure 5-2, the “haboob” had the following impacts in the Phoenix area: southeasterly winds increased to 21-25 mph, with gusts up to 37 mph; visibility dropped from 10 miles to 1 mile; weather conditions were reported as “haze” and “blowing dust”; and hourly PM10 concentrations increased to nearly 3000 $\mu\text{g}/\text{m}^3$ at the South Phoenix monitoring site and exceeded 1500 $\mu\text{g}/\text{m}^3$ at six sites. Once the winds subsided, visibility remained below 10 miles and PM10 concentrations remained high for several hours, resulting in 24-hour average concentrations above 200 $\mu\text{g}/\text{m}^3$ at five monitoring sites on July 18. In total, eight monitoring sites in the region exceeded the PM10 NAAQS and, as was mentioned in the Historical Fluctuation section, most of those eight PM10 monitoring sites saw one of their 10 highest 24-hour average PM10 concentrations measured in the past five years. Without the existence of the emissions generated by the thunderstorm outflows, there would not have been any exceedances of the 24-hour PM10 standard in the Phoenix PM10 nonattainment area.

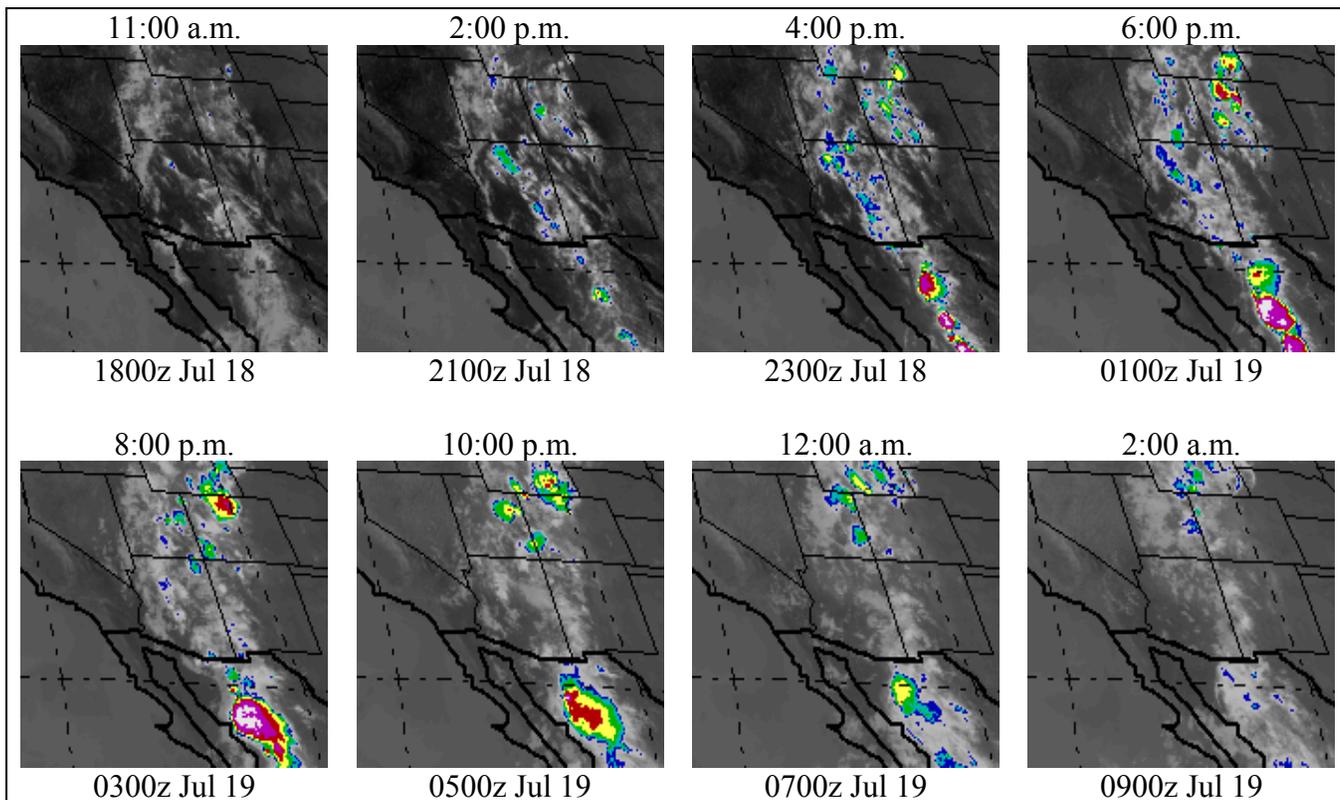


Figure 5-1. Satellite imagery showing strong storms developing and dissipating over Pinal County and areas to the southeast of Phoenix. These storms are believed to have been responsible for the thunderstorm outflow boundary that caused PM10 exceedances in Maricopa and Pinal counties on July 18.

Figure 5-2 depicts the dust event that occurred in Maricopa County impacting the Phoenix area on July 18. Hourly averaged PM10 concentrations at monitors throughout Maricopa County are shown along with visibility readings (blue diamonds) and wind speeds reported at the Phoenix Sky Harbor Airport. Measurements at Sky Harbor were used due to its central location amongst most of the monitors that experienced exceedances on July 18. As can be seen in the graph, visibility was reduced down to 1 mile at the Sky Harbor Airport during the windblown dust event, and this visibility reduction coincided with rapidly increasing PM10 concentrations and sustained wind speeds up to 25 mph in the Phoenix area. The NWS data tables after Figure 5-3 also show reports of haze and blowing dust during the 6 p.m. hour, when PM10 concentrations were the highest.

A review of the 5-minute wind and PM10 data at several of the Maricopa County monitoring sites showed that within 15 minutes, rapid wind speed increases and significant wind direction changes associated with the arrival of the haboob produced very rapid spikes in PM10 concentrations. For example, the Greenwood site, near the intersection of highways I10 and I17, had 5-minute average winds at 8 mph out of the east-southeast and a PM10 concentration of $68 \mu\text{g}/\text{m}^3$ at 5:40 p.m. By 5:55 p.m., the 5-minute wind speed average had increased to over 18 mph out of the south and PM10 concentrations reached $4704 \mu\text{g}/\text{m}^3$. Similarly, as the haboob raced to the northwest, the Dysart monitoring site had 5-minute average winds at 2 mph out of the southwest and a PM10 concentration of $20 \mu\text{g}/\text{m}^3$ at 6:00 p.m.; however, by 6:15 p.m., the 5-minute average winds had exceeded 26 mph out of the southeast and PM10 concentrations reached $2964 \mu\text{g}/\text{m}^3$. It was clearly evident that a thunderstorm outflow boundary had passed through the Phoenix region and the direction of flow caused the greatest increases in PM10 concentrations in the central and western portions of the Phoenix PM10 nonattainment area.

As shown in Figure 5-3, several monitoring sites in the upwind, dust source region of Pinal County measured 24-hour average PM10 exceedances, with the peak site—Cowtown—having a 24-hour average of 1,638 $\mu\text{g}/\text{m}^3$ and an extremely high maximum 1-hour average during the 5 p.m. hour of 24,976 $\mu\text{g}/\text{m}^3$. Two other monitoring sites also measured concentrations of nearly 10,000 $\mu\text{g}/\text{m}^3$. These spikes preceded the PM10 concentration spikes at the monitoring sites in Maricopa by one to two hours, which is consistent with wind speeds and directions observed at the Phoenix Sky Harbor Airport in Maricopa County and the Casa Grande Airport in Pinal County for the propagation of the haboob across the region. Only monitoring sites in Maricopa and Pinal counties exceeded the NAAQS due to thunderstorm outflows on this day, but the broad range of sites and the extreme hourly- and daily-averaged PM10 concentrations reflect the magnitude of the “haboob.” Additionally, the NWS airport meteorological data tables for the Phoenix Sky Harbor and Casa Grande airports show that the strongest winds associated with the haboob were out of the southeast. These winds, combined with the high PM10 concentrations in Pinal County, indicate that PM10 was already entrained in the atmosphere outside of the Phoenix PM10 nonattainment area and then transported into the region by the strong winds.

A visualization of this dust event was created using Phoenix visibility camera images that can be viewed as an animation here:

Looking south toward Phoenix, with South Mountain in the distance:

www.phoenixvis.net/videos/mpeg4/SOMT_07182011.mp4

The video clearly shows the wall of dust blowing across the Phoenix region in the late afternoon/early evening of July 18, 2011. The snapshot on the cover of this report was taken from the 5:50 p.m. mark of the video and coincides exactly with the PM10 concentration spikes seen in the 5-minute data from the PM10 monitoring sites in the central Phoenix area. Videos showing other views across the Valley on this date are also available (see Visibility Cameras section).

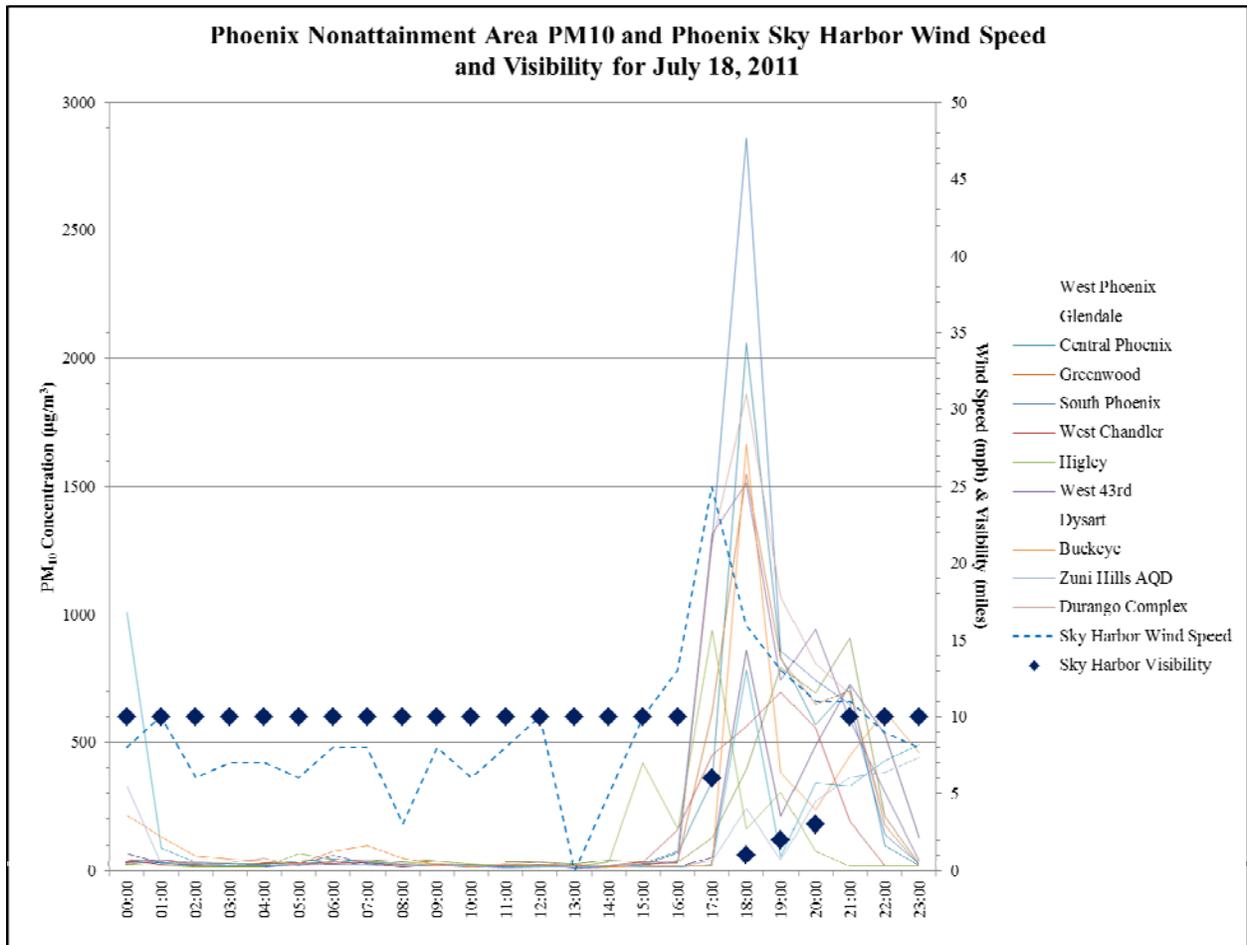


Figure 5-2. Phoenix nonattainment area PM10 monitor readings and Sky Harbor wind speed and visibility for July 18, 2011.

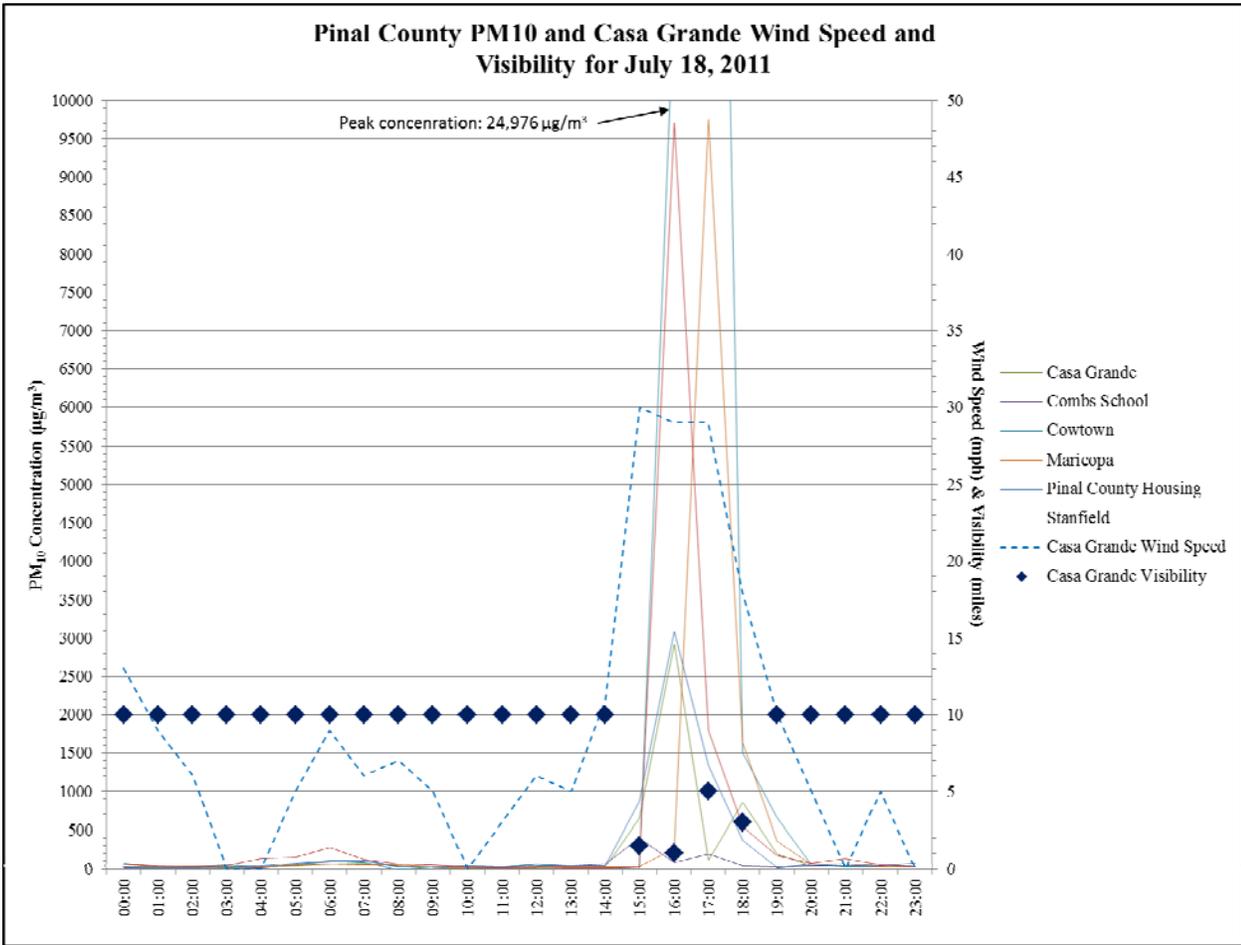


Figure 5-3. Pinal County PM10 monitor readings and Casa Grande wind speed and visibility for July 18, 2011.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT
(23183) PHOENIX, AZ (07/2011)**

Elevation: 1107 ft. above sea level
Latitude: 33.427
Longitude: -112.003
Data Version: VER3

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
18	0051	11	SCT150 BKN200	10.00		95	35.0	70	21.3	57	13.9	28	8	150		28.65			AA		29.82	
18	0151	11	SCT150 BKN200	10.00		93	33.9	71	21.5	59	15.0	32	10	140		28.65	0	004	AA		29.82	
18	0251	11	SCT150 BKN200	10.00		93	33.9	71	21.8	60	15.6	33	6	120		28.65			AA		29.82	
18	0351	11	SCT150 BKN200	10.00		92	33.3	70	21.3	59	15.0	33	7	160		28.65			AA		29.82	
18	0451	11	SCT150 BKN200	10.00		91	32.8	70	21.2	59	15.0	34	7	160		28.66	3	001	AA		29.83	
18	0551	11	SCT150 SCT200	10.00		90	32.2	70	21.0	59	15.0	35	6	160		28.66			AA		29.84	
18	0651	11	FEW180 BKN210	10.00		92	33.3	71	21.6	60	15.6	34	8	140		28.68			AA		29.85	
18	0751	11	FEW180 SCT210	10.00		94	34.4	71	21.6	59	15.0	31	8	150		28.69	1	012	AA		29.86	
18	0851	11	FEW180 SCT210	10.00		95	35.0	71	21.8	59	15.0	30	3	150		28.69			AA		29.86	
18	0951	11	FEW180 SCT210	10.00		99	37.2	72	22.1	58	14.4	26	8	100		28.69			AA		29.86	
18	1051	11	FEW095 SCT180 SCT210	10.00		100	37.8	72	22.0	57	13.9	24	6	VR		28.68	8	003	AA		29.85	
18	1151	11	FEW100 SCT210 SCT250	10.00		104	40.0	72	22.4	56	13.3	20	8	160	16	28.66			AA		29.84	
18	1251	11	FEW110 SCT210 SCT250	10.00		106	41.1	72	22.2	54	12.2	18	10	100		28.64			AA		29.81	
18	1351	11	FEW120 SCT210 SCT250	10.00		107	41.7	72	22.3	54	12.2	17	0	000		28.61	8	024	AA		29.78	
18	1451	11	FEW120 SCT210 SCT250	10.00		108	42.2	71	21.8	51	10.6	15	5	170	17	28.59			AA		29.76	
18	1551	11	FEW120 SCT210 SCT250	10.00		111	43.9	72	22.1	50	10.0	13	10	190	20	28.58			AA		29.75	
18	1651	11	FEW120 SCT210 BKN250	10.00		108	42.2	73	22.5	54	12.2	17	13	120		28.57	6	015	AA		29.74	
18	1739	11	FEW006 SCT120 SCT190	10.00		108	42.0	72	22.0	52	11.0	16	21	130	30	28.57			M		29.74	
18	1751	11	SCT009 SCT029 SCT120	6.00		103	39.4	72	22.0	55	12.8	20	25	140	37	28.58			AA		29.75	
18	1816	11	BKN022 BKN120 BKN180	5.00		100	38.0	72	22.0	57	14.0	24	23	190	30	28.62			M		29.79	
18	1830	11	BKN022 BKN120 BKN250	2.00	HZ BLDU	99	37.0	71	21.9	57	14.0	25	16	180	28	28.64			M		29.81	
18	1831	11	BKN022 BKN120 BKN250	1.00	HZ BLDU	99	37.0	71	21.9	57	14.0	25	16	190	28	28.65			M		29.82	
18	1851	11	BKN020 BKN120 OVC250	1.00	HZ BLDU	97	36.1	71	21.6	57	13.9	26	13	210		28.66			AA		29.83	
18	1901	11	BKN030 BKN120 BKN250	1.00	HZ BLDU	97	36.0	71	21.6	57	14.0	26	13	170	18	28.66			M		29.83	
18	1922	11	BKN030 BKN120 BKN250	2.00	HZ BLDU	95	35.0	70	21.3	57	14.0	28	15	160		28.66			M		29.83	
18	1951	11	SCT030 BKN120 BKN160	2.00		95	35.0	70	21.3	57	13.9	28	13	140		28.65	0	027	AA		29.82	
18	2014	11	SCT045 BKN120 BKN160	3.00		95	35.0	70	21.3	57	14.0	28	8	150		28.64			M		29.81	
18	2051	11	SCT090 BKN140 BKN230	3.00	HZ	95	35.0	71	21.5	58	14.4	29	11	110		28.65			AA		29.82	
18	2151	11	SCT090 BKN140 BKN230	10.00		95	35.0	70	21.3	57	13.9	28	11	110		28.66			AA		29.84	
18	2251	11	SCT090 BKN140 BKN230	10.00		94	34.4	70	21.1	57	13.9	29	9	110		28.68	3	010	AA		29.85	
18	2351	11	SCT090 BKN140 BKN230	10.00		93	33.9	71	21.5	59	15.0	32	8	130		28.69			AA		29.86	

Dynamically generated Wed Oct 31 17:28:33 EDT 2012 via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
CASA GRANDE MUNICIPAL ARPT (03914)
CASA GRANDE, AZ (07/2011)**

Elevation: 1462 ft. above sea level
Latitude: 32.95
Longitude: -111.766
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
18	0015	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	11	110		28.34		M	AA		29.89	
18	0035	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	14	100	22	28.34		M	AA		29.89	
18	0055	0	CLR	10.00		91	33.0	68	20.0	55	13.0	30	13	110		28.32		M	AA		29.87	
18	0115	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	8	130		28.32		M	AA		29.87	
18	0135	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	9	130		28.32		M	AA		29.87	
18	0155	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	9	120		28.32	2	003	M	AA		29.87
18	0215	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	5	120		28.31		M	AA		29.86	
18	0235	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	0	000		28.30		M	AA		29.85	
18	0255	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	6	110		28.31		M	AA		29.86	
18	0315	0	CLR	10.00		88	31.0	68	20.1	57	14.0	35	0	000		28.32		M	AA		29.87	
18	0335	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	0	000		28.32		M	AA		29.87	
18	0355	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	0	000		28.32		M	AA		29.87	
18	0415	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	0	000		28.32		M	AA		29.87	
18	0435	0	CLR	10.00		88	31.0	68	20.1	57	14.0	35	0	000		28.32		M	AA		29.87	
18	0455	0	CLR	10.00		86	30.0	69	20.3	59	15.0	40	0	000		28.32	4	000	M	AA		29.87
18	0515	0	CLR	10.00		86	30.0	69	20.3	59	15.0	40	0	000		28.33		M	AA		29.88	
18	0535	0	CLR	10.00		86	30.0	69	20.3	59	15.0	40	6	050		28.32		M	AA		29.87	
18	0555	0	CLR	10.00		84	29.0	67	19.4	57	14.0	40	5	070		28.33		M	AA		29.88	
18	0615	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	7	050		28.34		M	AA		29.89	
18	0635	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	7	080		28.34		M	AA		29.89	
18	0655	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	9	090		28.34		M	AA		29.89	
18	0715	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	8	100		28.35		M	AA		29.90	
18	0735	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	10	110		28.35		M	AA		29.90	
18	0755	0	CLR	10.00		90	32.0	71	21.5	61	16.0	38	6	100		28.35		M	AA		29.90	
18	0815	0	CLR	10.00		91	33.0	71	21.7	61	16.0	37	6	110		28.35		M	AA		29.90	
18	0835	0	CLR	10.00		91	33.0	71	21.7	61	16.0	37	6	100		28.35		M	AA		29.90	
18	0855	0	CLR	10.00		93	34.0	71	21.4	59	15.0	32	7	120		28.35		M	AA		29.90	
18	0915	0	CLR	10.00		95	35.0	71	21.8	59	15.0	30	11	120		28.35		M	AA		29.90	
18	0935	0	CLR	10.00		95	35.0	71	21.8	59	15.0	30	8	100		28.35		M	AA		29.90	
18	0955	0	CLR	10.00		97	36.0	71	21.5	57	14.0	26	5	130		28.35		M	AA		29.90	
18	1015	0	CLR	10.00		99	37.0	71	21.8	57	14.0	25	7	170		28.35		M	AA		29.90	
18	1035	0	CLR	10.00		97	36.0	72	22.1	59	15.0	28	3	070		28.35		M	AA		29.90	
18	1055	0	CLR	10.00		99	37.0	71	21.8	57	14.0	25	0	000		28.34	7	003	M	AA		29.89
18	1115	0	CLR	10.00		100	38.0	72	22.0	57	14.0	24	7	100		28.34		M	AA		29.89	
18	1135	0	CLR	10.00		102	39.0	72	22.3	57	14.0	23	0	000		28.34		M	AA		29.89	
18	1155	0	CLR	10.00		100	38.0	72	22.0	57	14.0	24	3	150		28.33		M	AA		29.88	

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
18	1215	0	CLR	10.00		102	39.0	72	22.3	57	14.0	23	5	110		28.32		M	AA		29.87	
18	1235	0	CLR	10.00		102	39.0	72	22.3	57	14.0	23	9	060		28.32		M	AA		29.87	
18	1255	0	CLR	10.00		102	39.0	71	21.8	55	13.0	21	6	110		28.31		M	AA		29.86	
18	1315	0	CLR	10.00		102	39.0	72	22.3	57	14.0	23	3	100		28.29		M	AA		29.84	
18	1335	0	CLR	10.00		104	40.0	73	22.6	57	14.0	21	0	000		28.28		M	AA		29.83	
18	1355	0	CLR	10.00		106	41.0	72	22.4	55	13.0	19	5	070		28.27	7	024	M	AA		29.82
18	1415	0	CLR	10.00		104	40.0	72	22.1	55	13.0	20	0	000		28.27		M	AA		29.82	
18	1435	0	CLR	10.00		106	41.0	72	22.4	55	13.0	19	8	190		28.27		M	AA		29.81	
18	1455	0	CLR	10.00		108	42.0	73	22.7	55	13.0	17	11	140	18	28.27		M	AA		29.81	
18	1515	0	CLR	10.00		108	42.0	73	22.7	55	13.0	17	6	290		28.25		M	AA		29.80	
18	1535	0	BKN011	1.50		106	41.0	73	22.8	57	14.0	20	30s	070	34	28.25		M	AA		29.80	
18	1555	0	FEW011	8.00		102	39.0	72	22.3	57	14.0	23	21	060	33	28.25		M	AA		29.80	
18	1615	0	CLR	10.00		106	41.0	73	22.8	57	14.0	20	20	080	26	28.25		M	AA		29.80	
18	1635	0	CLR	4.00		104	40.0	73	22.6	57	14.0	21	26	110	34	28.27		M	AA		29.82	
18	1655	0	BKN006 BKN011	1.00	VCTS	95	35.0	72	22.3	61	16.0	32	29	120	38	28.28	2	003	M	AA		29.83
18	1715	0	CLR	9.00	VCTS	97	36.0	71	21.5	57	14.0	26	28	120	37	28.27		M	AA		29.81	
18	1735	0	CLR	5.00		93	34.0	70	20.9	57	14.0	30	29	150	37	28.28		M	AA		29.83	
18	1755	0	CLR	10.00		91	33.0	70	21.1	59	15.0	34	28	150		28.28		M	AA		29.83	
18	1815	0	CLR	10.00		95	35.0	69	20.7	55	13.0	26	18	150	29	28.28		M	AA		29.83	
18	1835	0	CLR	3.00		91	33.0	70	21.1	59	15.0	34	18	170	25	28.28		M	AA		29.83	
18	1855	0	CLR	2.50		91	33.0	69	20.6	57	14.0	32	16	160		28.28		M	AA		29.83	
18	1915	0	CLR	5.00		93	34.0	69	20.4	55	13.0	28	13	160	21	28.28		M	AA		29.83	
18	1935	0	CLR	7.00		91	33.0	70	21.1	59	15.0	34	9	210		28.30		M	AA		29.85	
18	1955	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	10	170		28.30	2	007	M	AA		29.85
18	2015	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	0	000		28.32		M	AA		29.87	
18	2035	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	8	150		28.32		M	AA		29.87	
18	2055	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	5	150		28.32		M	AA		29.87	
18	2115	0	CLR	10.00		91	33.0	69	20.6	57	14.0	32	5	090		28.33		M	AA		29.88	
18	2135	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	10	100		28.33		M	AA		29.88	
18	2155	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	0	000		28.34		M	AA		29.89	
18	2215	0	CLR	10.00		90	32.0	69	20.4	57	14.0	33	6	110		28.34		M	AA		29.89	
18	2235	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	7	130		28.34		M	AA		29.89	
18	2255	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	5	130		28.35		M	AA		29.90	
18	2315	0	CLR	10.00		86	30.0	70	20.9	61	16.0	43	6	120		28.35		M	AA		29.90	
18	2335	0	CLR	10.00		86	30.0	70	20.9	61	16.0	43	5	140		28.36		M	AA		29.91	
18	2355	0	CLR	10.00		84	29.0	69	20.5	61	16.0	46	0	000		28.36		M	AA		29.91	

Dynamically generated Wed Oct 31 15:26:23 EDT 2012 via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>

Visibility Cameras

Visibility camera images were compiled into time lapse photography videos in order to visually show the dust impacts on portions of Maricopa County on July 18. The animations are available online for each event and for each of the visibility camera sites in Maricopa County. These views can be accessed using the camera site codes SOMT (South Mountain), CAME (Camelback Mountains), SUPM (Superstition Mountains), ESMO (Estrella Mountains), and WHTM (White Tank Mountains). It should be noted that these time lapse photography videos may require the installation of a mp4 viewer.

The video files can be accessed as follows:

http://www.phoenixvis.net/videos/mpeg4/xxxx_mmddyyy.mp4

xxxx = 4-character site code (ie. SOMT)

mm = 2-character month (ie. 07)

dd = 2-character day (ie. 18)

yyyy = 4-character year (ie. 2011)

Conclusion

The information presented within this section has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors. 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.

VI. “BUT FOR” ANALYSIS

Section 50.14(c)(3)(iv)(D) in 40 CFR part 50 requires that an exceptional event demonstration must satisfy that “[t]here would have been no exceedance or violation but for the event.” The prior sections of this submittal have provided detailed information that the exceedances on July 18, 2011, were not reasonably controllable or preventable and there is a clear causal relationship between transported PM10 from thunderstorm outflows originating in the desert areas outside of the Phoenix PM10 nonattainment area and the measured exceedances within the nonattainment area. The weight of evidence in these sections demonstrates that but for the existence of emissions generated by these thunderstorm outflows and associated transported PM10, there would have been no exceedances of the 24-hour PM10 standard.

As detailed in Section IV, all reasonable control measures were in place and actively enforced before, during, and after the exceedances of July 18, 2011. Inspection and compliance data of local fugitive dust sources during this time period revealed that PM10 from anthropogenic activities was well controlled and constant. Local regulatory agencies, industry, and the general public were alerted to the possibility of dust storms due to thunderstorm activity through daily forecasts and media reports. Heightened, real-time surveillance of PM10 monitoring stations during the events established a clear link between rapidly rising PM10 concentrations and the arrival of the thunderstorm outflows. On-the-ground observations recorded during the events consistently identify transported or re-entrained PM10 as the cause of the elevated concentrations near the exceeding monitors.

As shown in Section V, detailed, time series data establish a clear causal relationship between the arrival of emissions generated by thunderstorm outflows and elevated PM10 concentrations at the monitors. Multiple, independent measurements of wind speed, wind direction, and visibility all point to the presence of thunderstorm outflows as the delivery vehicle for transported PM10 into the nonattainment area. Any local PM10 emissions generated during the arrival of the thunderstorm outflows are linked to the turbulent and gusty outflow front of the storm and pale in comparison to the amount of transported PM10 originating outside the nonattainment area. The source regions for the thunderstorm outflows and transported PM10 are clearly identified as the desert areas outside of the Phoenix PM10 nonattainment area.

The body of evidence presented in this submittal provides 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.

VII. CONCLUSIONS

The exceedances that occurred on July 18, 2011, satisfy the following criteria of 40 CFR 50.1(j) and meet the definition of an exceptional event:

- The event affects air quality;
- The event is not reasonably controllable or preventable; and
- The event is unlikely to reoccur at a particular location or [is] a natural event.

Affects Air Quality

As stated in the preamble to the Exceptional Events Rule, the event in question is considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in Sections 2, 3, 4, and 5, we can reasonably conclude that the event in question affected air quality.

Not Reasonably Controllable or Preventable

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that, despite reasonable control measures in place within Maricopa County and the Phoenix PM10 nonattainment area, high wind conditions overwhelmed all reasonably available controls. 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. The event discussed in this document that caused the exceedances in this request (see Sections II and V) were caused by thunderstorm-driven outflow winds that transported dust into Maricopa County from areas largely outside of the Phoenix PM10 nonattainment area. 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, provides strong evidence that the event and exceedances of July 18, 2011 recorded within the nonattainment area were not reasonably controllable or preventable.

Natural Event

As discussed above, 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. The events therefore qualify as natural events.

Summary

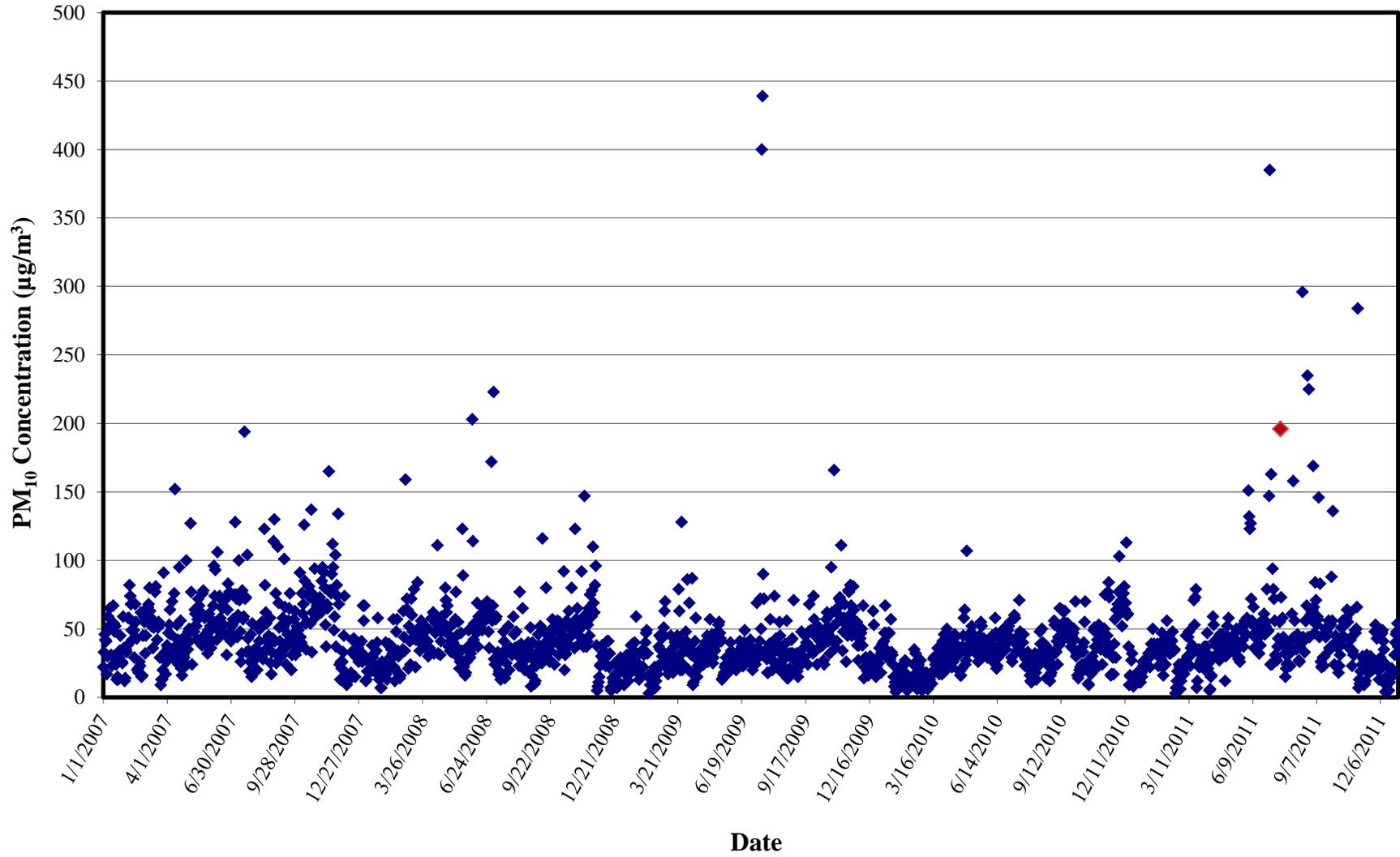
In summary, the exceedances of the federal 24-hour PM10 standard on July 18, 2011, would not have occurred but for the monsoonal thunderstorm-driven high winds and windblown dust transport from areas largely outside the Phoenix PM10 nonattainment area, based on the weight of evidence summarized below.

- Graphs of PM10 at various Phoenix area monitors in Section V and the tables containing meteorological data for representative NWS airport sites show that the timing of elevated PM10 events was consistent with decreased visibility and high winds at the NWS sites.
- Visibility camera imagery discussed in Section V indicates that large quantities of PM10 were transported into the Phoenix Metro area during the July 18th event. The timing of the dust storms depicted in the visibility camera imagery is consistent with the PM10 concentration measurements, elevated winds, and reduced visibility reported during the event.
- Historical Fluctuation analyses and graphs in Section III and Appendix A showing five years of 24-hour average data for each of the Phoenix PM10 nonattainment area monitors depict numerous atypically high PM10 concentrations during the third quarter of 2011, including the day of July 18. The sudden increase in the frequency of elevated PM10 concentrations during this time period was exceptional from an historical perspective.
- Each of the exceedances of the PM10 standard recorded on July 18 is tied to thunderstorm activity and thunderstorm generated outflow winds, as can be seen in data and analyses in Section V.
- Figures and tables in Section V show that the timing of thunderstorm-generated outflow boundary passage and increases in wind speeds at monitoring locations and National Weather Service stations during each of the events during this period is consistent with the timing of elevated PM10 concentrations recorded at the monitoring locations in the Phoenix PM10 nonattainment area.
- Wind directions, thunderstorm-generated outflow boundary propagation, and concentration patterns showing elevated levels of PM10 in Pinal County prior to levels increasing in Maricopa County, all depicted in Section V, help show that a vast majority of the dust that impacted Phoenix PM10 nonattainment area monitors originated in Pinal County and other areas located generally south of the Phoenix PM10 nonattainment area.
- Section IV discusses rules that are in place in the Phoenix PM10 nonattainment area as well as inspections that were conducted in the area to verify compliance with those rules in order to show that the events are not reasonably controllable or preventable. Additionally, the visibility webcam time lapse photography videos referenced in Section II help illustrate the magnitude and scale of these events, which supports the claim that the exceedances recorded during this period were not reasonably controllable or preventable.

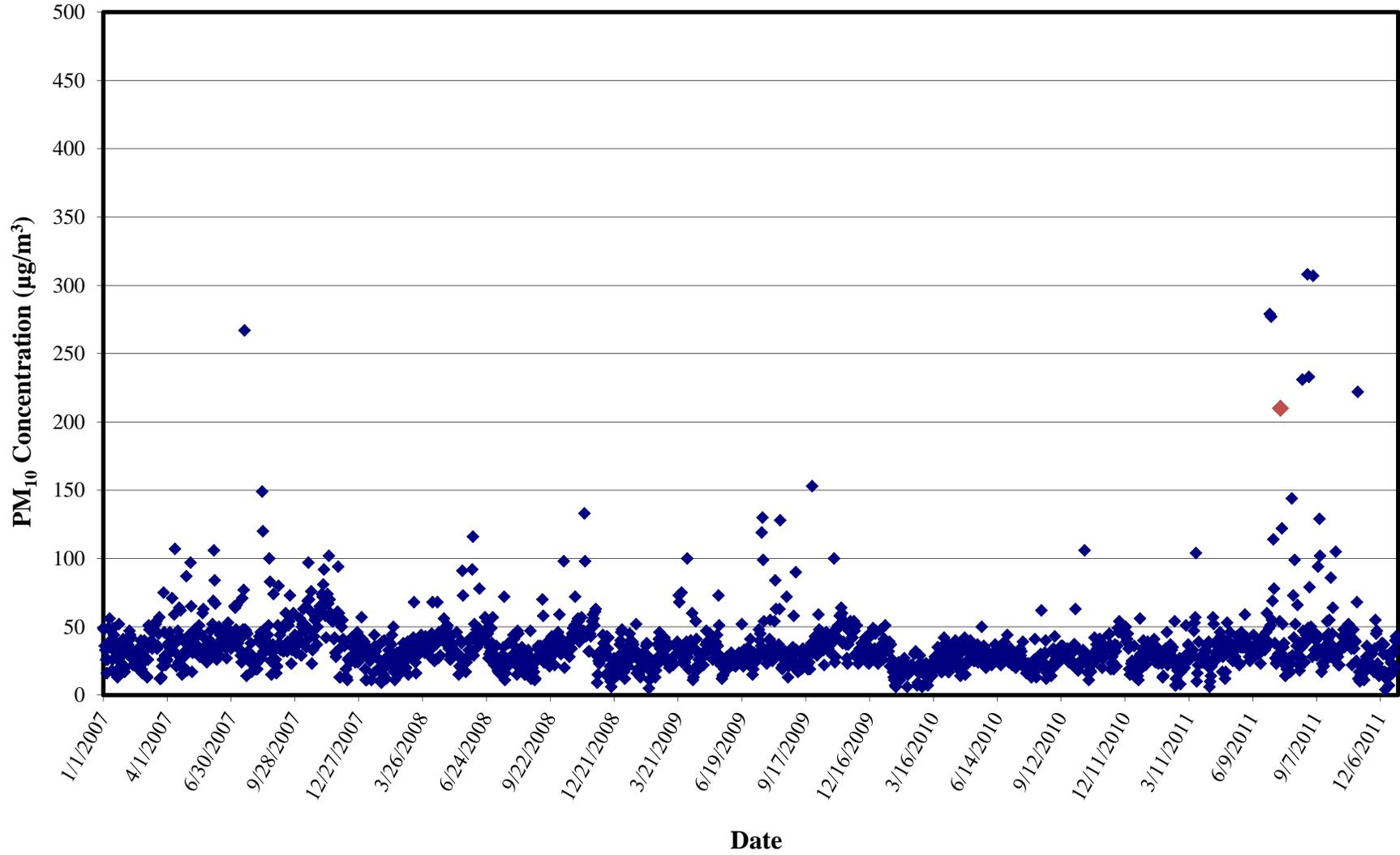
APPENDIX A

**5-YEAR HISTORICAL FLUCTUATION GRAPHS FOR
THE PHOENIX PM10 NONATTAINMENT AREA MONITORING SITES**

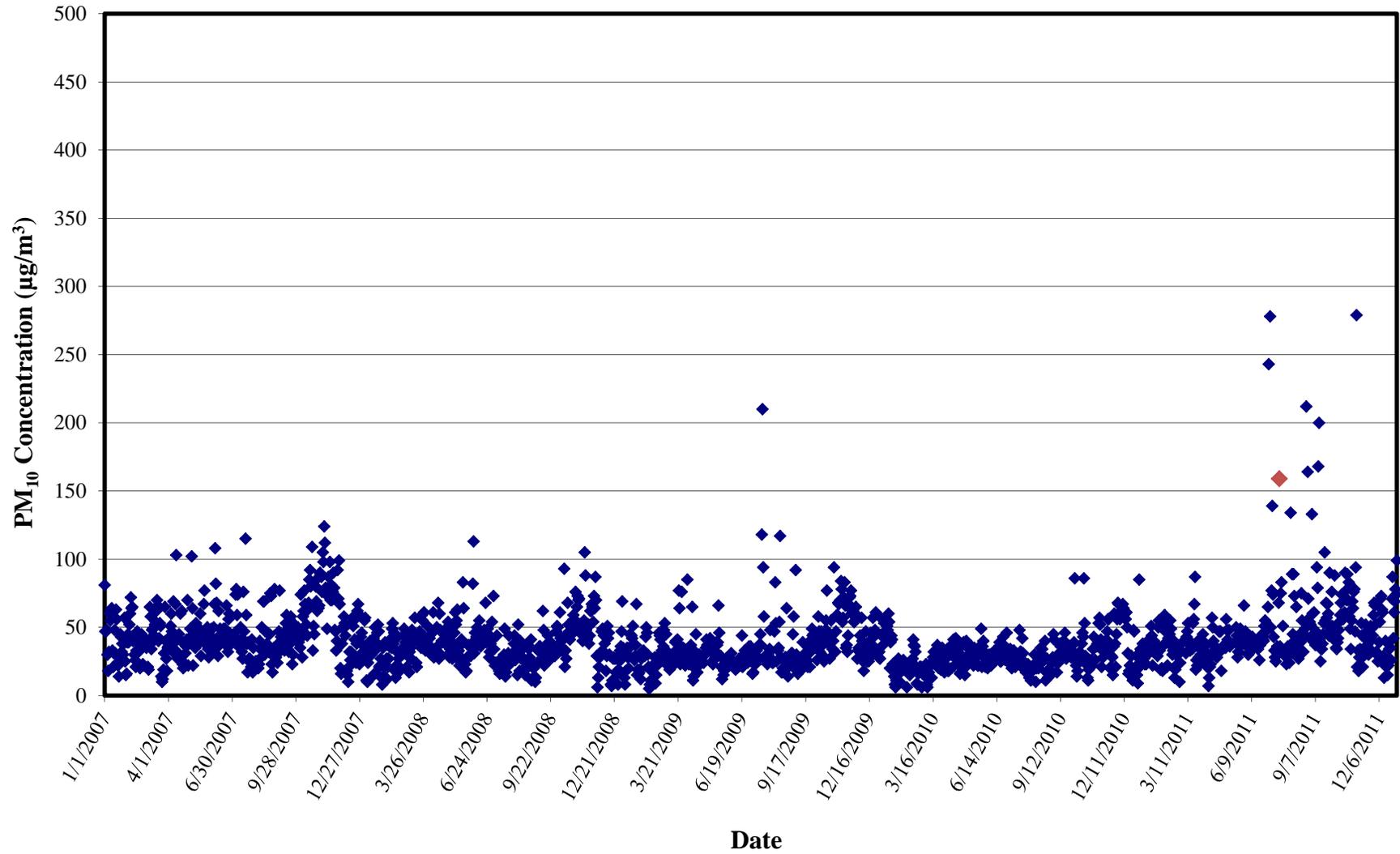
Buckeye 5-Year Historical Fluctuation - 24 Hour Averages



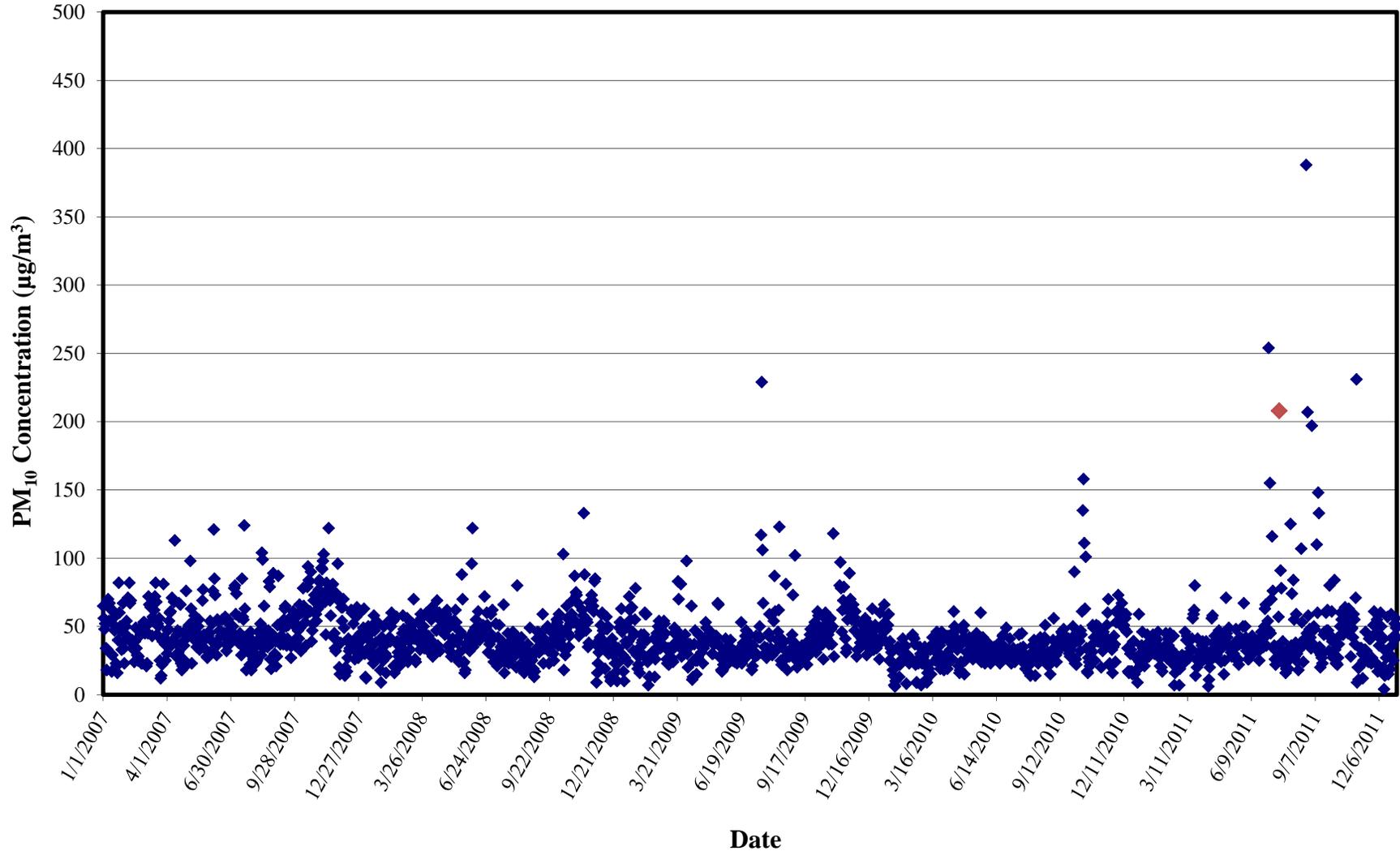
Central Phoenix 5-Year Historical Fluctuation - 24 Hour Averages



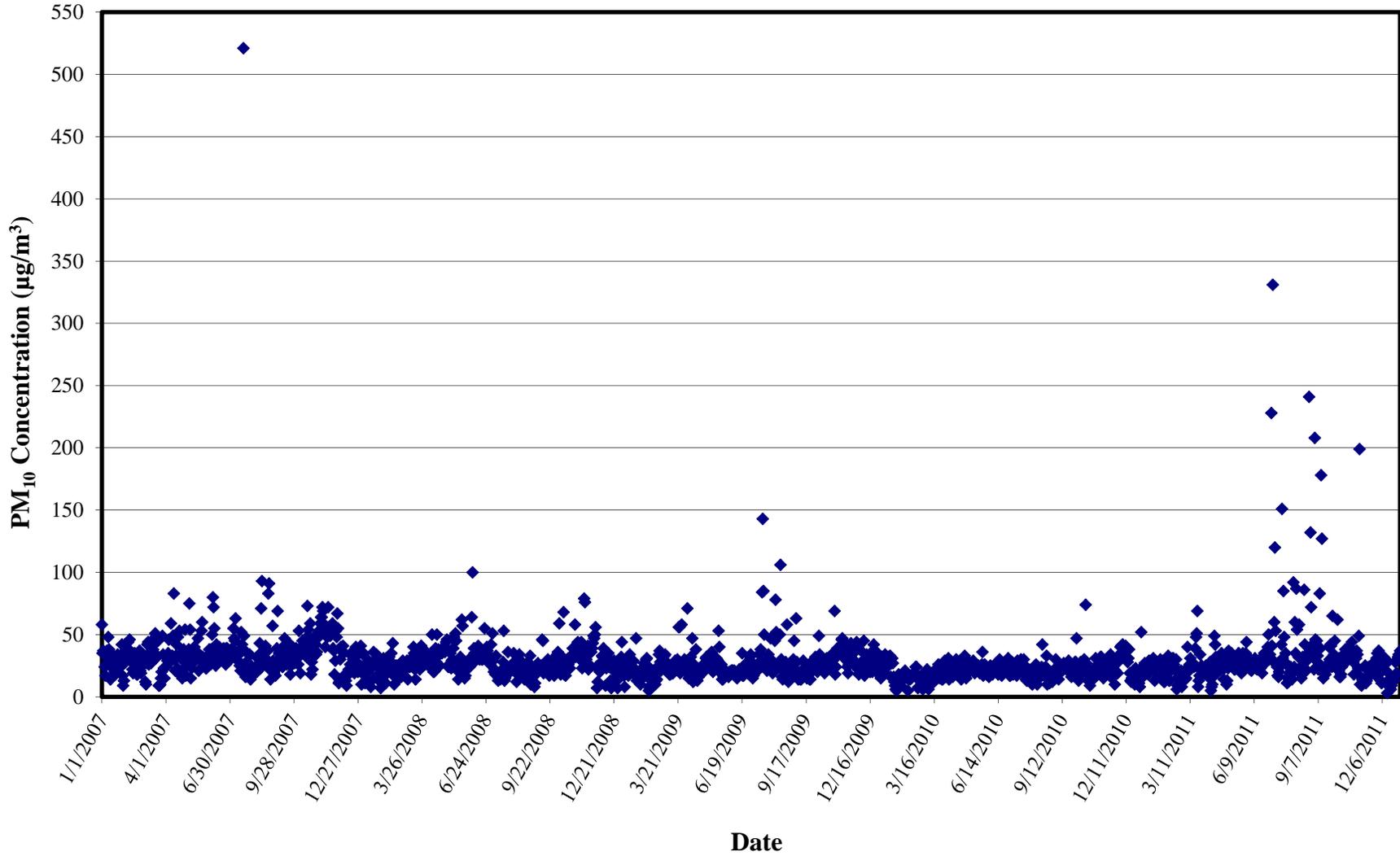
West Phoenix 5-Year Historical Fluctuation - 24 Hour Averages



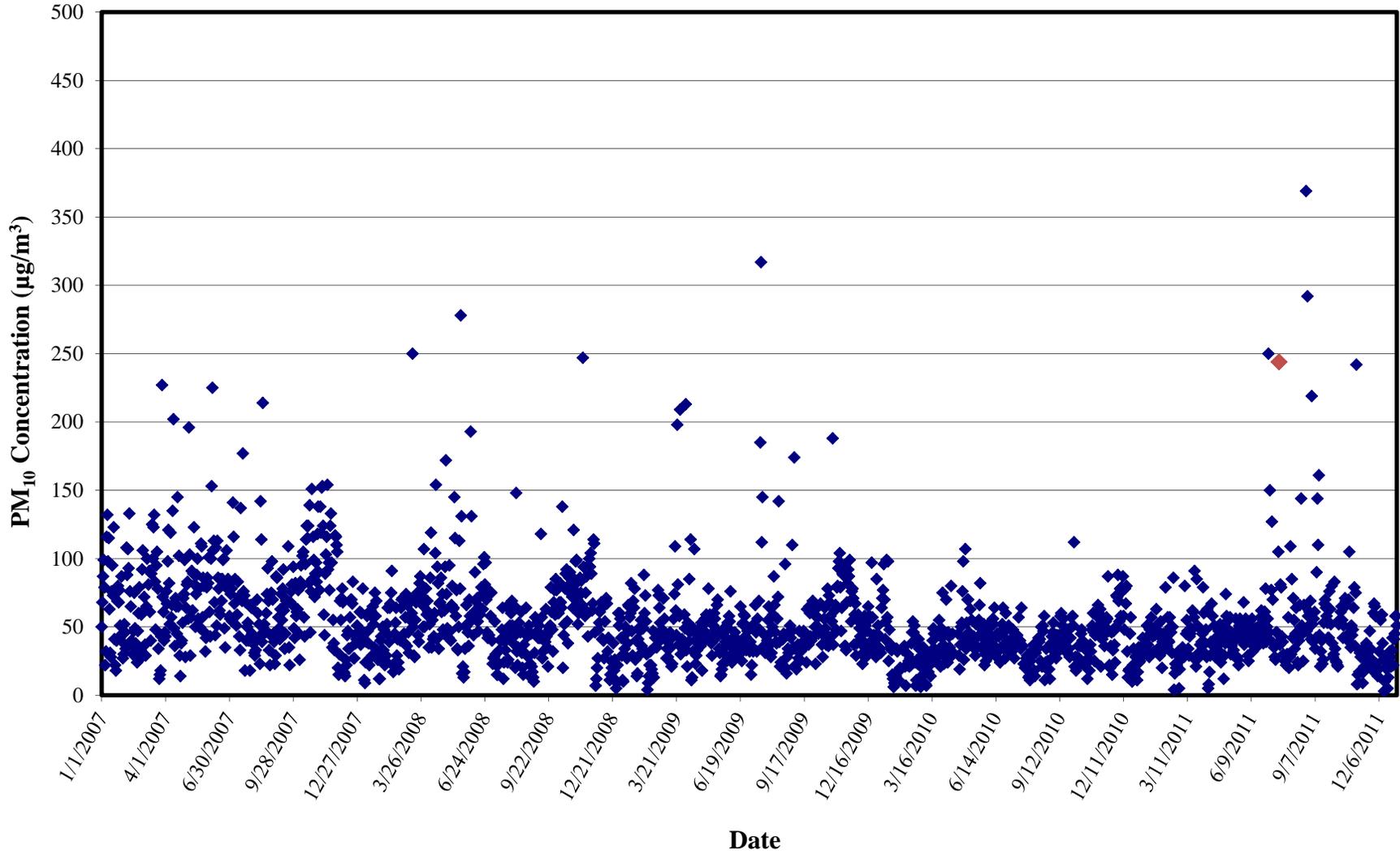
Greenwood 5-Year Historical Fluctuation - 24 Hour Averages



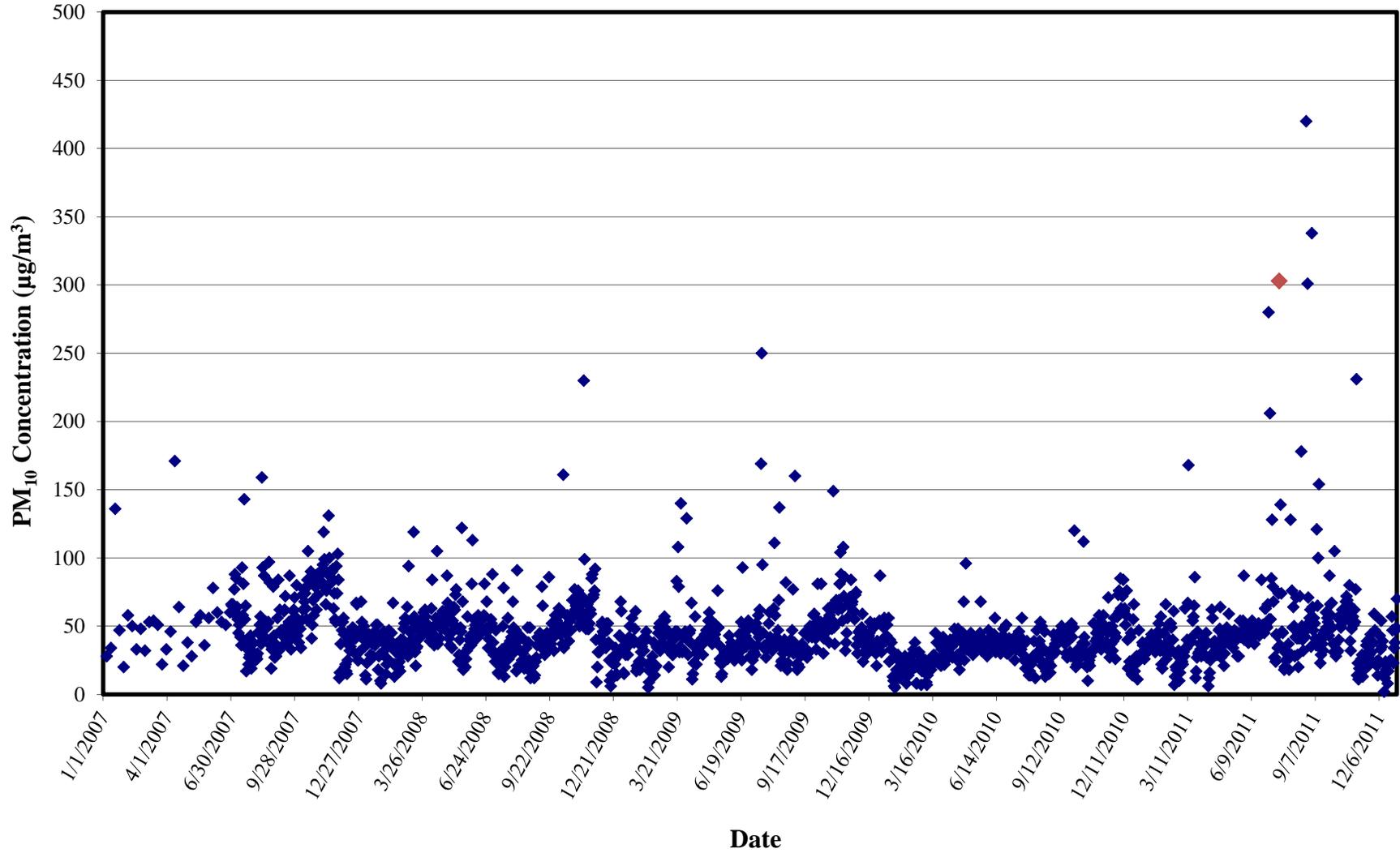
JLG Supersite 5-Year Historical Fluctuation - 24 Hour Averages



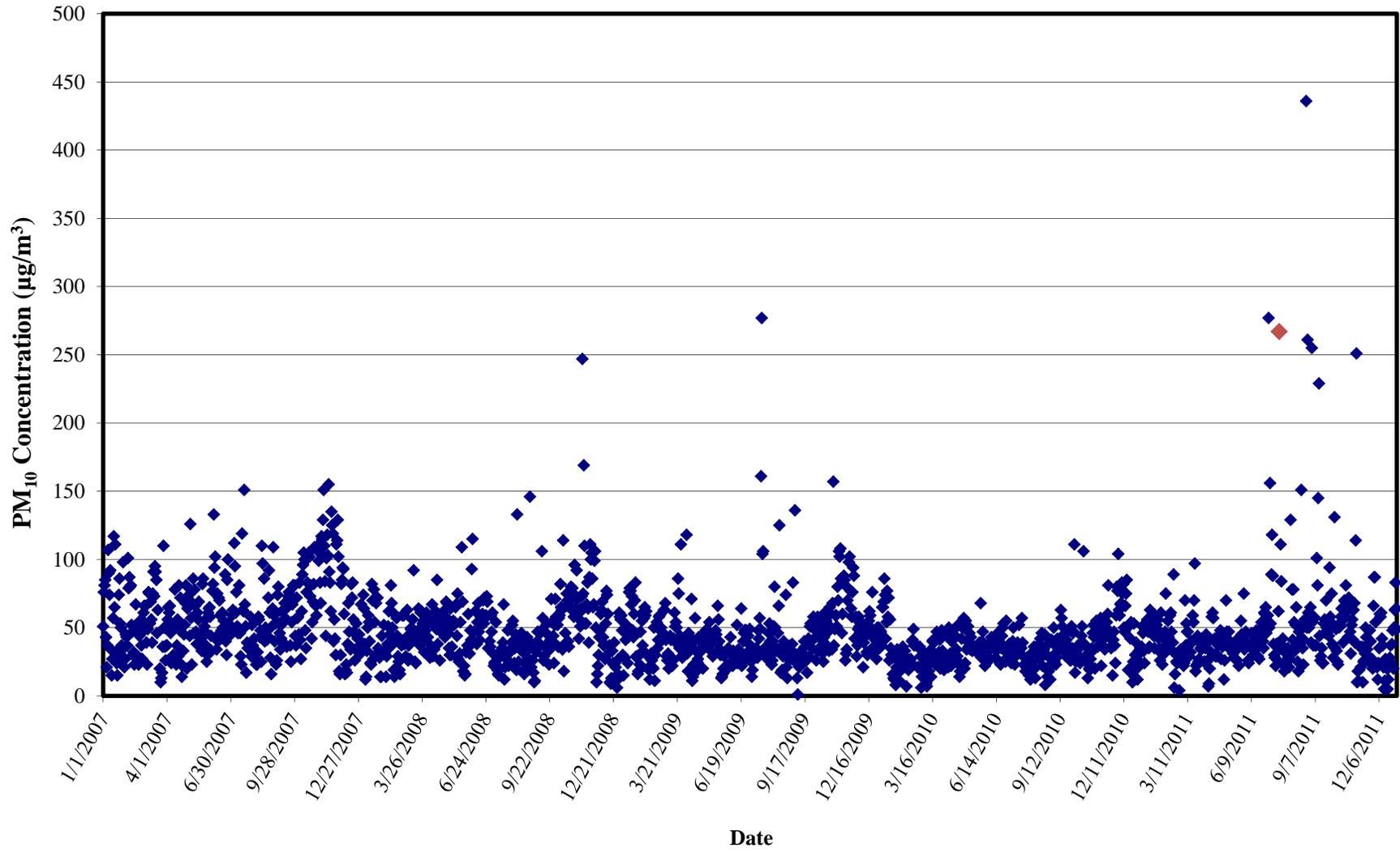
West 43rd 5-Year Historical Fluctuation - 24 Hour Averages



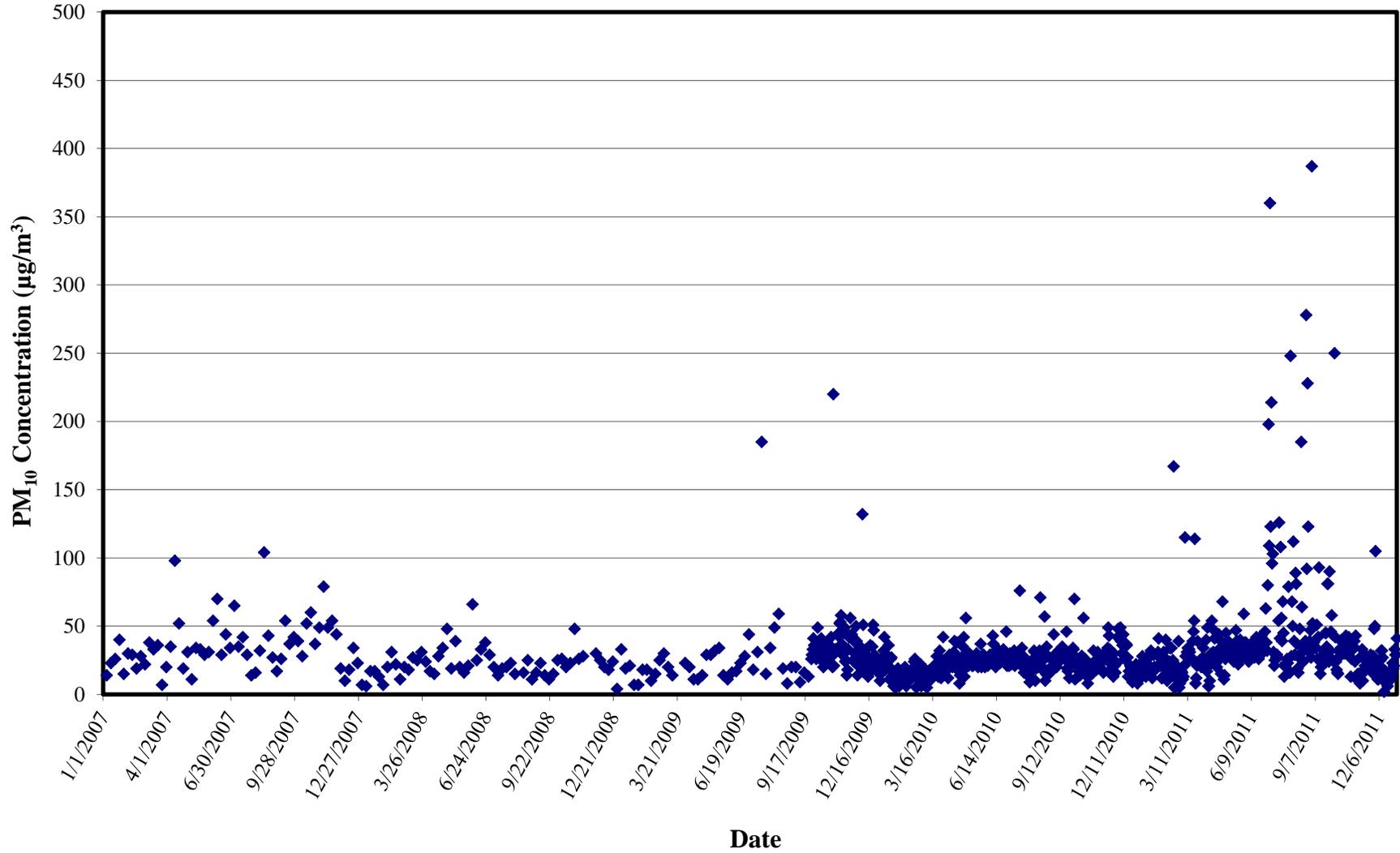
South Phoenix 5-Year Historical Fluctuation - 24 Hour Averages



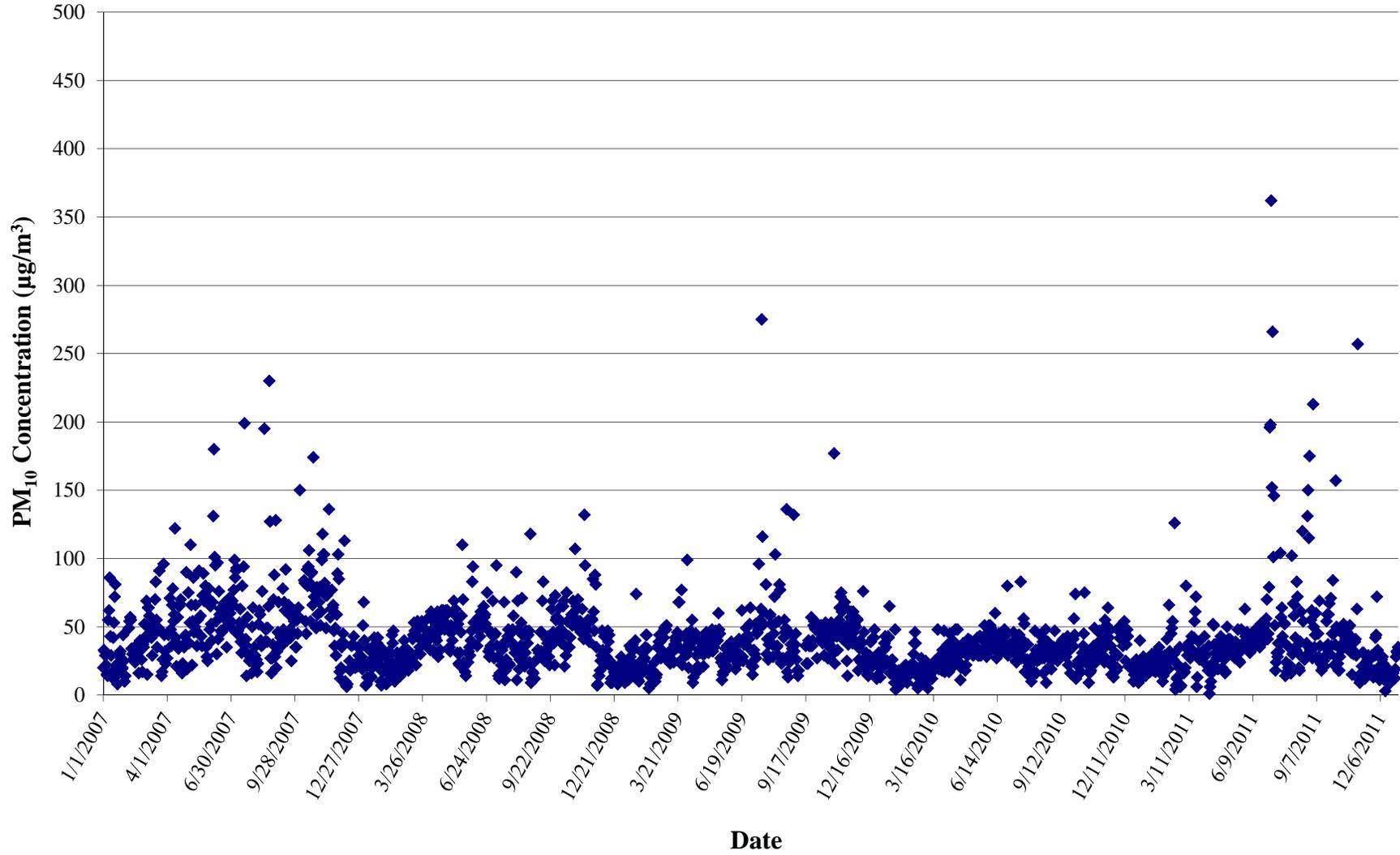
Durango 5-Year Historical Fluctuation - 24 Hour Averages



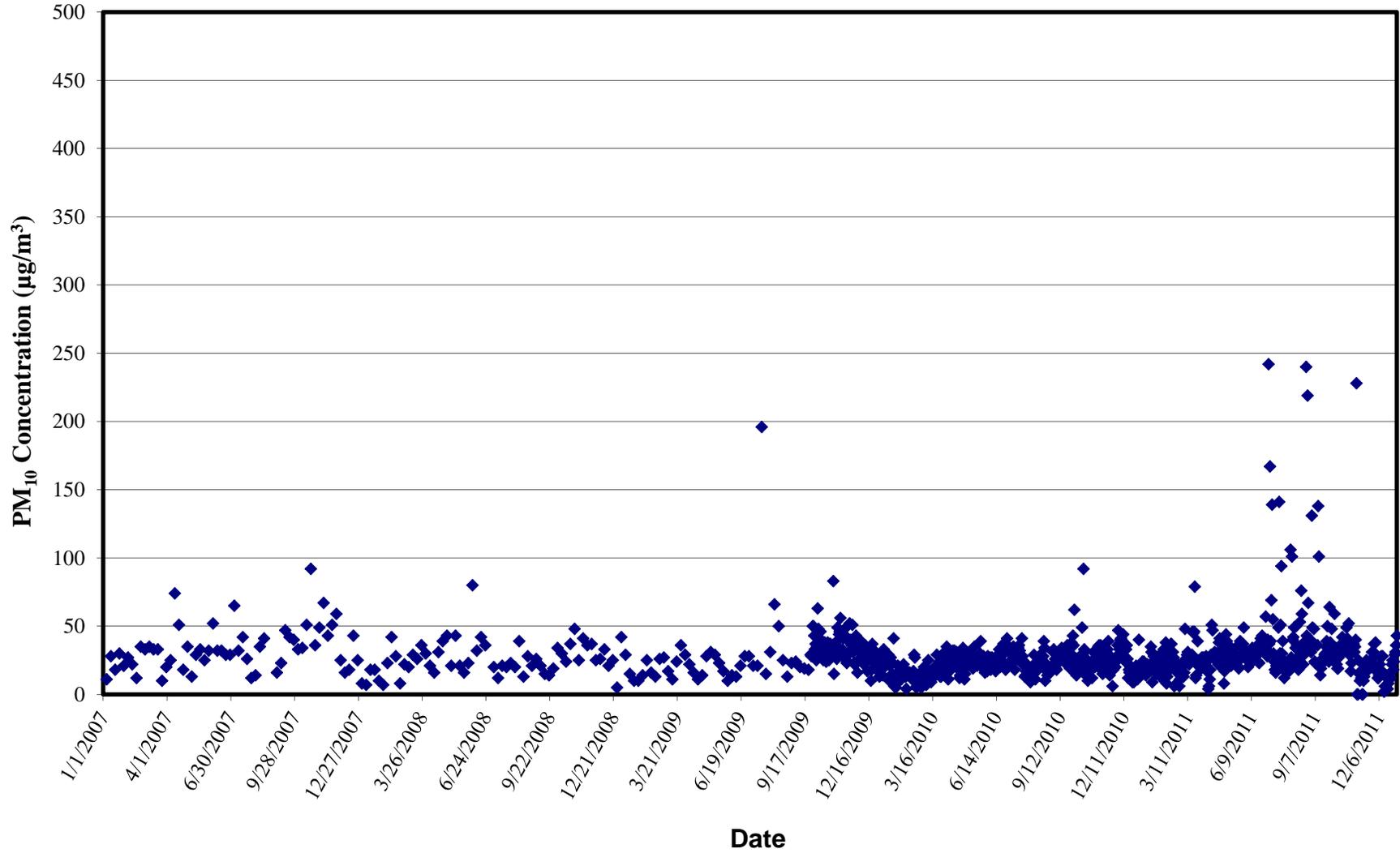
West Chandler 5-Year Historical Fluctuation - 24 Hour Averages



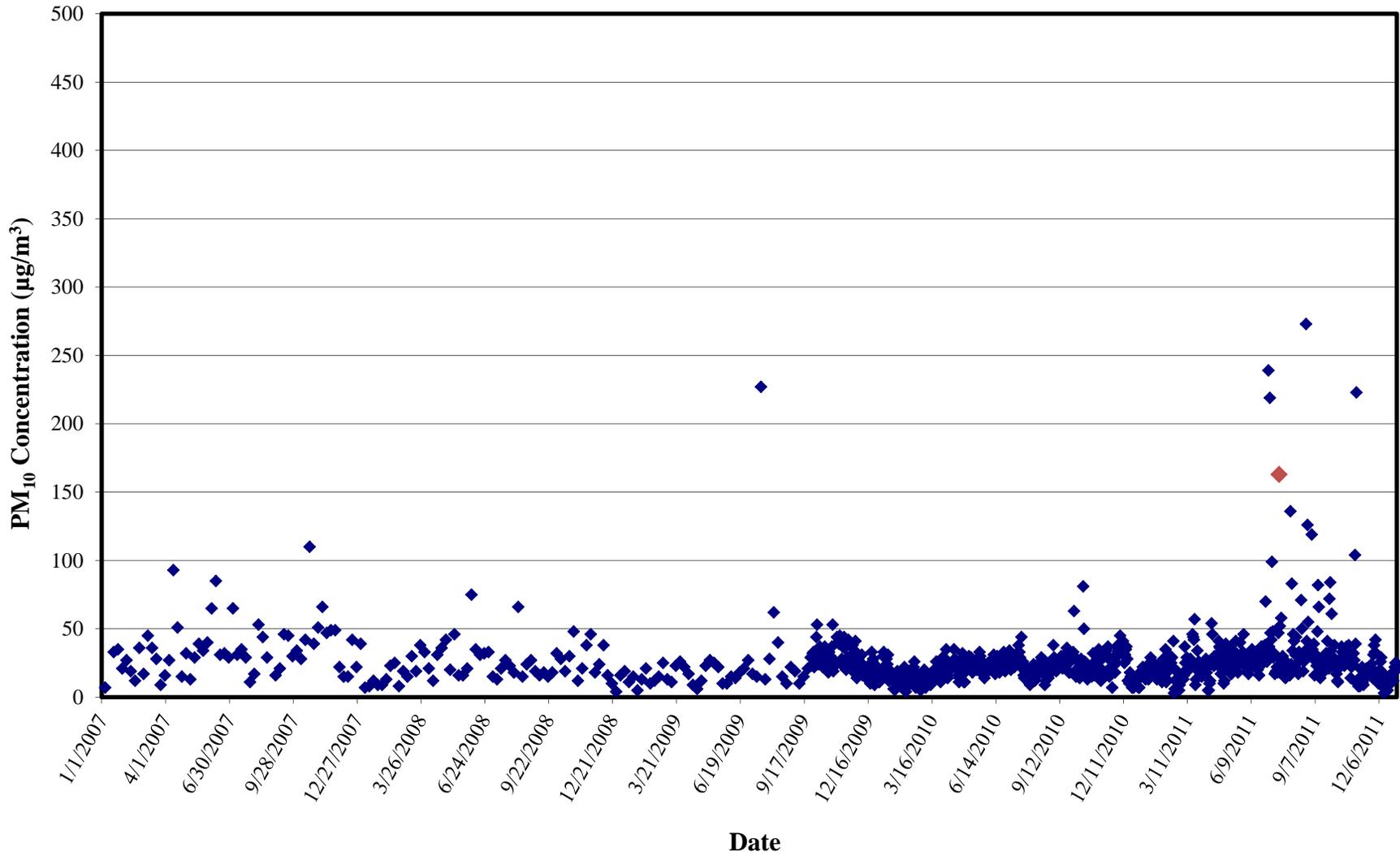
Higley 5-Year Historical Fluctuation - 24 Hour Averages



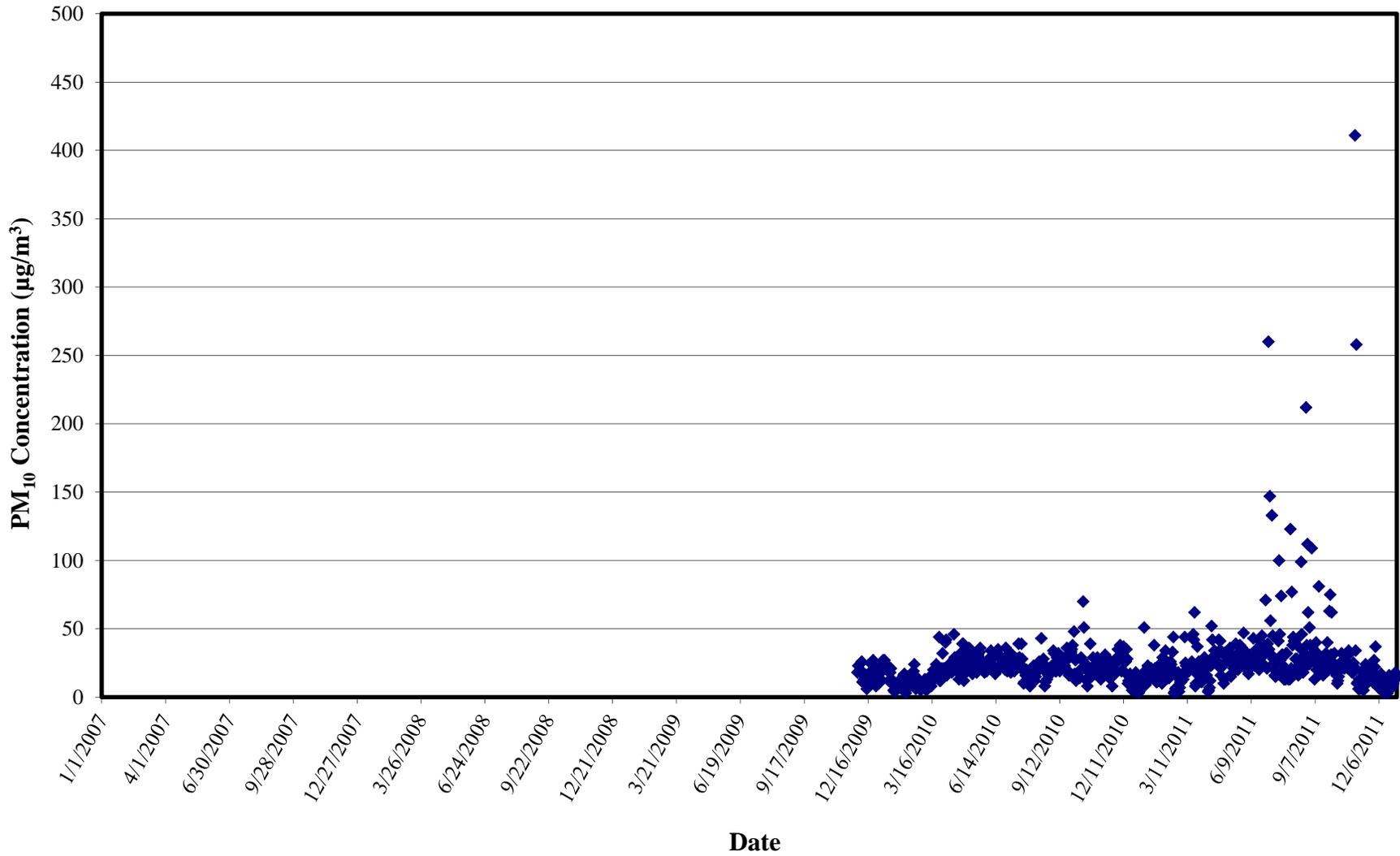
Glendale 5-Year Historical Fluctuation - 24 Hour Averages



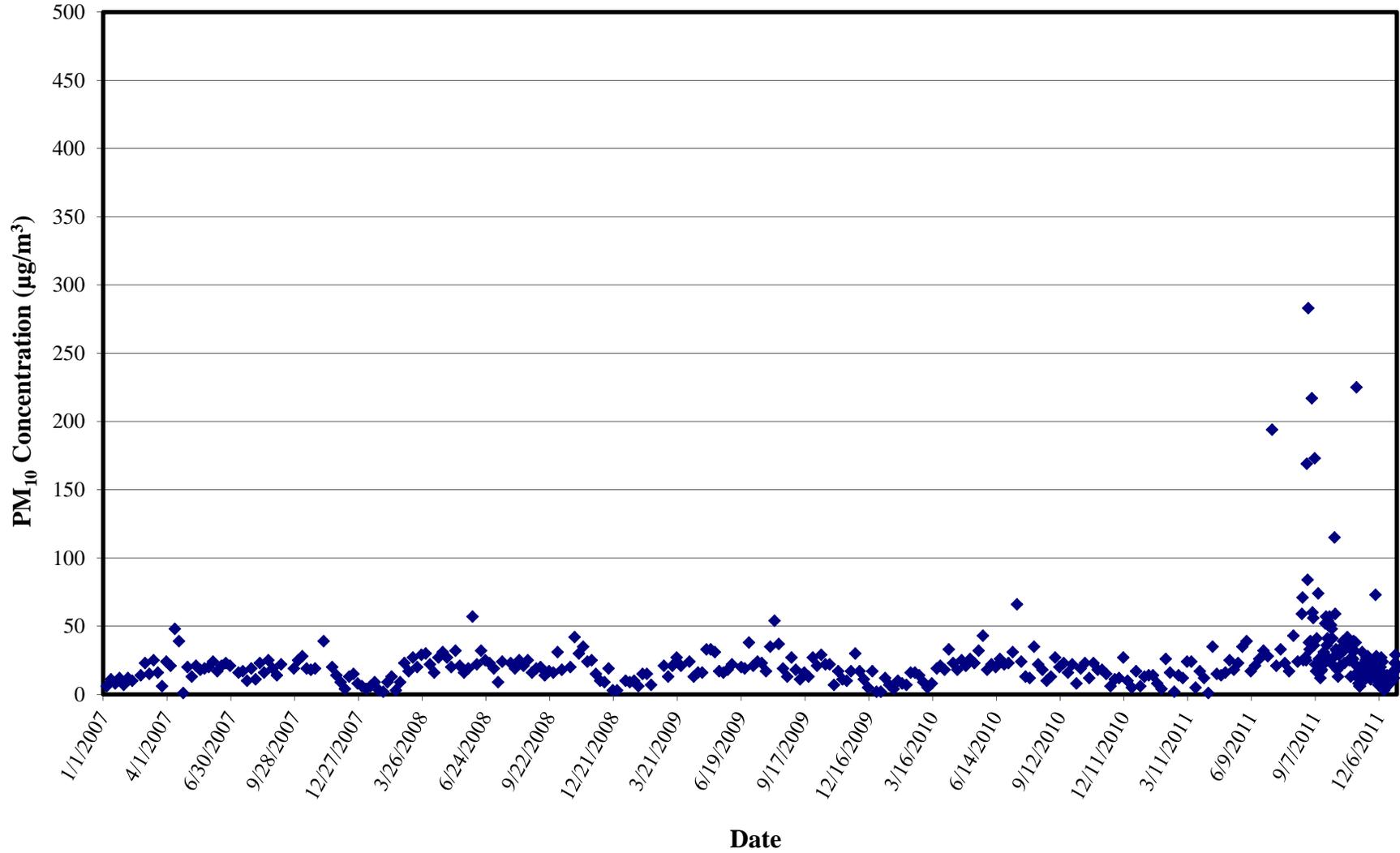
Dysart 5-Year Historical Fluctuation - 24 Hour Averages



Zuni Hills 5-Year Historical Fluctuation - 24 Hour Averages



Apache Junction 5-Year Historical Fluctuation - 24 Hour Averages



APPENDIX B

ADEQ FORECAST PRODUCTS FOR PHOENIX,
MARICOPA COUNTY, AND PINAL COUNTY



MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED SUNDAY, JULY 17, 2011

Five-day weather outlook:

DURING ACTIVE SUMMER MONSOON EPISODES STRONG GUSTY WINDS AND DENSE BLOWING DUST ARE POSSIBLE EVEN FROM DISTANT THUNDERSTORMS

The summer monsoon circulation pattern has resumed and for the Phoenix metro area this means a slight chance for thunderstorms each day thru this forecast period. Gradient winds will be relatively light. Since last week's rainfall has reduced but not eliminated the risk for periods of dense blowing and/or transported dust generated by outflow boundaries, there will be a moderate risk for unhealthy PM-10 levels.

R I S K F A C T O R S

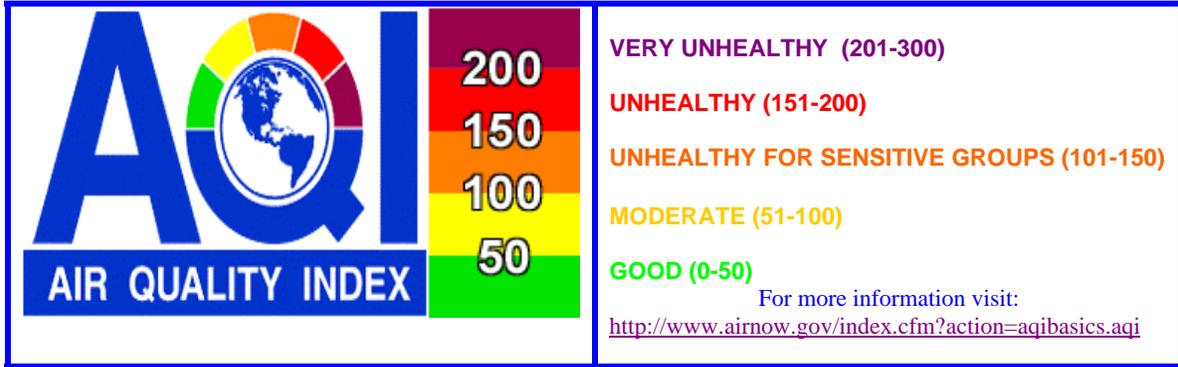
	<u>WINDS</u>		<u>STAGNATION</u>		<u>UNHEALTHY PM-10 RISK LEVEL</u>
Day 1: Mon 07/18/2011	No significant winds expected except strong and gusty due to outflow from thunderstorms.	+	No significant stagnation expected.	=	MODERATE
Day 2: Tue 07/19/2011	No significant winds expected except strong and gusty due to outflow from thunderstorms.	+	No significant stagnation expected.	=	MODERATE
Day 3: Wed 07/20/2011	No significant winds expected except strong and gusty due to outflow from thunderstorms.	+	No significant stagnation expected.	=	MODERATE

EXTENDED OUTLOOK

Day 4: Thu 07/21/2011	No significant winds expected except strong and gusty due to outflow from thunderstorms.	+	No significant stagnation expected.	=	MODERATE
Day 5: Fri 07/22/2011	No significant winds expected except strong and gusty due to outflow from thunderstorms.	+	No significant stagnation expected.	=	MODERATE

The Maricopa County Dust Control Action Forecast is issued to assist in the planning of work activities to help reduce dust pollution. A recorded message of this forecast can be accessed at [602-771-2368](tel:602-771-2368). To review the complete air quality forecast for the Phoenix metropolitan area, as well as the health impacts and reduction methods for different air pollutants, call [602-771-2367](tel:602-771-2367) for recorded forecast information or click on ADEQ's Air Quality Forecast at <http://www.azdeq.gov/environ/air/ozone/ensemble.pdf>.

CKR 04/28/2011



NEW!!! CLICK HERE FOR UPDATED OZONE SEASON STATS NEW!!!
AIR QUALITY FORECAST FOR MONDAY, JULY 18, 2011

This report is updated by 1:00 p.m. Sunday thru Friday and is valid for areas within and bordering Maricopa County in Arizona

FORECAST DATE	YESTERDAY SAT 07/16/2011	TODAY SUN 07/17/2011	TOMORROW MON 07/18/2011	EXTENDED TUE 07/19/2011
NOTICES (*SEE BELOW FOR DETAILS)	OZONE HEALTH WATCH	OZONE HEALTH WATCH	OZONE HEALTH WATCH	OZONE HEALTH WATCH LIKELY/ OZONE HIGH POLLUTION ADVISORY POSSIBLE
AIR POLLUTANT	DUST Highest AQI Reading/Site (Preliminary data only)	DUST	DUST	DUST
O3*	87 TONTO NATIONAL MONUMENT	90 MODERATE	97 MODERATE	100 MODERATE
CO*	09 GREENWOOD	06 GOOD	07 GOOD	08 GOOD
PM-10*	35 BUCKEYE	70 MODERATE	75 MODERATE	75 MODERATE
PM-2.5*	30 PHOENIX SUPERSITE	48 GOOD	42 GOOD	44 GOOD

* O3 = Ozone CO = Carbon Monoxide PM-10 = Particles 10 microns & smaller PM-2.5 = Particles smaller than 2.5 microns
 *"Ozone Health Watch" means that the highest concentration of OZONE may approach the federal health standard.
 "PM-10 or PM-2.5 Health Watch" means that the highest concentration of PM-10 or PM-2.5 may approach the federal health standard.
 "High Pollution Advisory" means that the highest concentration of OZONE, PM-10, or PM-2.5 may exceed the federal health standard.
 "DUST" means that short periods of high PM-10 concentrations caused by outflow from thunderstorms are possible.

Health message for Sunday, July 17: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Health message for Monday, July 18: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Synopsis and Discussion

OZONE: TODAY'S OZONE HEALTH WATCH HAS BEEN EXTENDED THRU MONDAY JULY 18

The synoptic weather pattern for today thru Tuesday will feature a strong upper level high situated to the northeast of Arizona. This location often yields a low-level easterly wind flow that tends to inhibit local ozone dispersion. At the same time, afternoon high temperatures near 110 degrees F – forecasted to occur under mostly sunny skies – will contribute to very efficient ozone production. Thus, ozone concentrations near or at unhealthy levels are expected the next few days and as a result the Ozone Health Watch currently in effect has been extended thru at least Monday.

PARTICLES: The summer monsoon circulation pattern has resumed and for the Phoenix metro area this means a slight chance for thunderstorms each day thru this forecast period. Gradient winds will be relatively light. Since last week's rainfall has reduced but not eliminated the risk for periods of dense blowing and/or transported dust generated by outflow boundaries, there will be a moderate risk for unhealthy PM-10 levels.

MONITORING SITE MAPS: STATIC MAP - <http://www.azdeq.gov/environ/air/monitoring/images/map.jpg>

INTERACTIVE MAPS - <http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx>

<http://www.airnow.gov/>



POLLUTION MONITOR READINGS FOR SATURDAY, JULY 16, 2011



O3 (OZONE)

Info on current 8-hour ozone standard: http://www.epa.gov/air/ozonepollution/pdfs/2008_03_aqi_changes.pdf

For archived AQI maps go to: <http://www.airnow.gov/index.cfm?action=airnow.maps>

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Alamo Lake (La Paz County)	53	45	Green
Apache Junction (Pinal County)	65	67	Yellow
Blue Point	63	61	Yellow
Buckeye	48	41	Green
Casa Grande (Pinal County)	55	47	Green
Cave Creek	60	51	Yellow
Central Phoenix	62	58	Yellow
Dysart	51	43	Green
Falcon Field	64	64	Yellow
Fountain Hills	63	61	Yellow
Glendale	59	50	Green
Humboldt Mountain	57	48	Green
North Phoenix	66	71	Yellow
Phoenix Supersite	65	67	Yellow
Pinal Air Park (Pinal County)	54	46	Green
Pinnacle Peak	57	48	Green
Queen Valley (Pinal County)	64	64	Yellow
Rio Verde	59	50	Green
South Phoenix	61	54	Yellow
South Scottsdale	66	71	Yellow
Tempe	60	51	Yellow
Tonto Nat'l Mon. (Gila County)	71	87	Yellow
West Chandler	62	58	Yellow
West Phoenix	62	58	Yellow
Yuma (Yuma County)	53	45	Green

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.7	08	
Greenwood	0.8	09	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.4	05	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Buckeye	38	35	
Central Phoenix	26	24	
Combs School(Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Durango	26	24	
Dysart	18	17	
Glendale	21	19	
Greenwood	28	26	
Higley	33	31	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	25	23	
South Phoenix	35	32	
West Chandler	27	25	
West Forty Third	38	35	
West Phoenix	34	31	
Zuni Hills	18	17	

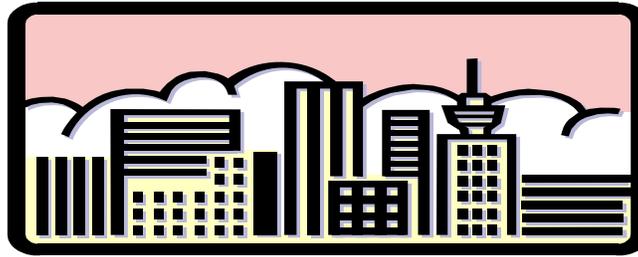
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

For maps go to: <http://www.airnow.gov/>

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Durango	7.0	23	
Dysart	3.1	10	
Estrella Mountain Park	5.4	18	
Glendale	4.6	15	
Phoenix Supersite	9.3	30	
South Phoenix	4.6	15	
Vehicle Emissions Lab	3.7	12	
West Phoenix	5.3	17	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

Description – This is a secondary pollutant that is formed by the reaction of other primary pollutants (precursors) such as VOCs (volatile organic compounds) and NO_x (Nitrogen Oxides) in the presence of heat and sunlight.

Sources – VOCs are emitted from motor vehicles, chemical plants, refineries, factories, and other industrial sources. NO_x is emitted from motor vehicles, power plants, and other sources of combustion.

Potential health impacts – Exposure to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other effects include decrease in lung function, chest pain, and cough.

Unit of measurement – Parts per billion (ppb).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight).

Reduction tips – Curtail daytime driving, refuel cars and use gasoline-powered equipment as late in the day as possible.

CO (CARBON MONOXIDE):

Description – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely.

Sources – In cities, as much as 95 percent of all CO emissions emanate from automobile exhaust. Other sources include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak concentrations occur in colder winter months.

Potential health impacts – Reduces oxygen delivery to the body's organs and tissues. The health threat is most serious for those who suffer from cardiovascular disease.

Unit of measurement – Parts per million (ppm).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight)

Reduction tips – Keep motor vehicle tuned properly and minimize nighttime driving.

PM-10 & PM-2.5 (PARTICLES):

Description – The term “particulate matter” (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as “fine” particles and are responsible for many visibility degradations such as the “Valley Brown Cloud” (see <http://www.phoenixvis.net/>). Particles with diameters between 2.5 and 10 micrometers are referred to as “coarse”.

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.

Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.

Units of measurement – Micrograms per cubic meter (ug/m³)

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{ Updated 03/23/2010 }

APPENDIX C

NOTICE OF PUBLIC COMMENT PERIOD



PUBLIC NOTICE

Request for Public Comments on Exceptional Events in the Greater Phoenix Area

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls.) In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to “flag” air quality monitoring data as an exceptional event. If flagged, these data can be excluded from consideration in air quality planning if EPA concurs with the demonstration submitted by the flagging agency documenting that all procedural and technical requirements have been met.

Pursuant to 40 CFR 50.14(c)(3)(i), the Arizona Department of Environmental Quality (ADEQ) is soliciting comments on its final demonstrations of events that have caused elevated concentrations of PM₁₀ in the Greater Phoenix area on February 19; July 18; August 3; August 18; August 25 through 28; September 2; October 4; November 4, 2011; January 21 – 22 and February 27, 2012. ADEQ has decided to flag these episodes based on these analyses. Copies of the demonstrations are available for review beginning Monday, December 3, 2012, on the ADEQ website at www.azdeq.gov/environ/air/plan/. Interested parties can submit written comments throughout the comment period which will end at 5:00 p.m. on Tuesday, January 1, 2013. Any comments received will be responded to and forwarded to EPA with the final demonstrations.

Written comments should be addressed, faxed, or e-mailed to:

Andra Juniel, Air Assessment Section, Arizona Department of Environmental Quality, 1110 W. Washington Street, 3415-A, Phoenix, AZ 85007, PHONE: (602) 771-4417; FAX: (602) 771-2366, E-mail: juniel.andra@azdeq.gov.

In addition to being available on-line, copies of the analyses are available for review, Monday through Friday, 8:30 a.m. to 4:30 p.m., at the [ADEQ Records Center](#), 1110 W. Washington St., Phoenix, AZ, 85007, Attn: David Olivo, (602) 771-4380, email: olivo.david@azdeq.gov.

Persons with a disability may request reasonable accommodations by contacting Linda Morrison at (602) 771-4793 or 1-800-234-5677 ext. 771-4793. This document is available in alternative formats by contacting ADEQ TDD phone number at (602) 771-4829.

APPENDIX D

NATIONAL WEATHER SERVICE FORECASTS,
WARNINGS, AND ALERTS

378
CDUS45 KPSR 190712
CLIPHX

CLIMATE REPORT
NATIONAL WEATHER SERVICE PHOENIX AZ
1211 AM MST TUE JUL 19 2011

.....

...THE PHOENIX AZ CLIMATE SUMMARY FOR JULY 18 2011...

CLIMATE NORMAL PERIOD 1971 TO 2000
CLIMATE RECORD PERIOD 1895 TO 2011

WEATHER ITEM	OBSERVED VALUE	TIME (LST)	RECORD VALUE	YEAR	NORMAL VALUE	DEPARTURE FROM NORMAL	LAST YEAR
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TEMPERATURE (F)

YESTERDAY

MAXIMUM	112	301 PM	115	1989	107	5	109
MINIMUM	90	627 AM	68	1946	84	6	89

1908
1899

AVERAGE	101				95	6	
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PRECIPITATION (IN)

YESTERDAY	0.00		1.04	1946	0.03	-0.03	T
MONTH TO DATE	0.58				0.48	0.10	T
SINCE OCT 1	3.36				6.09	-2.73	5.40
SINCE JAN 1	1.62				3.65	-2.03	4.92

SNOWFALL (IN)

YESTERDAY	0.0
MONTH TO DATE	0.0
SINCE JAN 1	0.0
SINCE JUL 1	0.0
SNOW DEPTH	0

DEGREE DAYS

HEATING

YESTERDAY	0	0	0	0
MONTH TO DATE	0	0	0	0
SINCE JUN 1	0	0	0	0
SINCE JUL 1	0	0	0	0

COOLING

YESTERDAY	36	30	6	34
MONTH TO DATE	540	524	16	611
SINCE JUN 1	1323	1269	54	1405
SINCE JAN 1	2187	2064	123	2057

.....

WIND (MPH)

HIGHEST WIND SPEED 31 HIGHEST WIND DIRECTION SE (140)
HIGHEST GUST SPEED 39 HIGHEST GUST DIRECTION SE (140)
AVERAGE WIND SPEED 8.9

SKY COVER

POSSIBLE SUNSHINE MM
AVERAGE SKY COVER 0.6

WEATHER CONDITIONS

THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
HAZE
SANDSTORM

RELATIVE HUMIDITY (PERCENT)

HIGHEST 37 600 AM
LOWEST 14 400 PM
AVERAGE 26

THE PHOENIX AZ CLIMATE NORMALS FOR TODAY

Table with 4 columns: MAXIMUM TEMPERATURE (F), NORMAL, RECORD, YEAR. Values include 107, 116, 1989 for max temp and 84, 68, 1913, 1899 for min temp.

SUNRISE AND SUNSET

JULY 19 2011.....SUNRISE 532 AM MST SUNSET 737 PM MST
JULY 20 2011.....SUNRISE 532 AM MST SUNSET 736 PM MST

- INDICATES NEGATIVE NUMBERS.
R INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T INDICATES TRACE AMOUNT.

&&

DEW POINT

HIGHEST DEW POINT MM
LOWEST DEW POINT MM
AVERAGE DEW POINT MM

\$\$

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE PHOENIX AZ
700 PM MST SUN JUL 17 2011

.SYNOPSIS...

A FLOW ALOFT FROM THE SOUTHEAST IN THE CLOCKWISE FLOW OF AIR AROUND STRONG HIGH PRESSURE ALOFT OVER THE CENTRAL UNITED STATES WILL BRING SOMEWHAT HIGHER HUMIDITY TO OUR AREA TONIGHT AND MONDAY. THIS MEANS POSSIBLE DESERT BLOWING DUST AND A SLIGHT CHANCE OF THUNDERSTORMS IN SOUTH-CENTRAL AND SOUTHWEST ARIZONA MAINLY IN THE LATE AFTERNOON AND NIGHTTIME HOURS THROUGH TUESDAY. TEMPORARY DRYING IS EXPECTED FOR MOST OF THE AREA LATE WEDNESDAY THROUGH THURSDAY INTO FRIDAY... FOLLOWED BY MORE MOISTURE AND AN INCREASING CHANCE OF SHOWERS AND THUNDERSTORMS NEXT WEEKEND.

&&

.DISCUSSION...

UPDATED THE HIGH AND LOW RESOLUTION FORECAST PRODUCTS TO BETTER REFLECT THE EXPECTED WEATHER DURING THE REMAINDER OF THIS EVENING AND THROUGH THE OVERNIGHT HOURS. 18.00Z KPSR SOUNDING IS VERY STABLE...EVIDENT FROM THE AREA OF CONVECTION CROSSING PINAL COUNTY THAT SEEMED TO HIT A BRICK WALL AS NEARED CASA GRANDE. SCATTERED CONVECTION CONTINUES ACROSS FAR EASTERN ARIZONA...AND LOOKS TO HAVE INCREASED A BIT IN COVERAGE THE PAST TWO HOURS. THIS IS BEING FORCED BY TWO MID-LEVEL LOWS /LARGER ONE OVER SONORA MX WITH ANOTHER NEAR THE WHITE MOUNTAINS/. EXPECTING THE SONORA LOW TO LIFT NNW THROUGH THE OVERNIGHT HOURS...WITH THE POSITIVE VORTICITY ADVECTION AND MOISTURE ADVECTION AROUND 500 MB WE SHOULD SEE SOME ISOLATED/SCATTERED CONVECTION DEVELOP AND MOVE THROUGH OUR CWA THROUGH THE EARLY MORNING HOURS ON MONDAY.

PREVIOUS DISCUSSION...

ALTHOUGH MOST RAINFALL AMOUNTS ARE EXPECTED TO BE LESS THAN A QUARTER OF AN INCH TONIGHT...SOME AMOUNTS OVER A QUARTER OF AN INCH ARE EXPECTED IN SOUTH-CENTRAL ARIZONA WITH THE BEST CHANCE SOUTHEAST...EAST AND NORTHEAST OF PHOENIX. THERE IS ALSO A SLIGHT CHANCE OF SHOWERS AND THUNDERSTORMS ACROSS SOUTHWEST ARIZONA TONIGHT THROUGH MONDAY NIGHT...AND IN SOUTHEAST CALIFORNIA MAINLY LATE TONIGHT AND MONDAY MORNING.

DRIER AIR FROM THE SOUTHWEST IS EXPECTED TO TEMPORARILY MOVE OVER MOST OF THE AREA INCLUDING THE GREATER PHOENIX AREA LATE WEDNESDAY THROUGH THURSDAY INTO FRIDAY. THIS IS EXPECTED TO HAPPEN AS THE WEST COAST LOW PRESSURE SYSTEM MOVES INLAND. THUS...HAVE CONFINED THE POSSIBILITY OF ANY SHOWERS AND THUNDERSTORMS TO THE HIGHER TERRAIN EAST OF THE GREATER PHOENIX AREA WEDNESDAY THROUGH DAYTIME FRIDAY.

IT IS STILL TOO EARLY TO TELL YET HOW CLOSE A TROPICAL STORM OR POSSIBLY STRONGER WILL GET TO THE SOUTHERN TIP OF BAJA CALIFORNIA LATE THIS COMING WEEK...FRIDAY OR SATURDAY. THIS SYSTEM BEARS WATCHING IN TERMS OF THE AMOUNT OF MOISTURE THAT MAY MOVE INTO THE SOUTHWESTERN UNITED STATES INCLUDING OUR AREA NEXT WEEKEND FOR A SIGNIFICANT INCREASE IN SHOWERS AND THUNDERSTORMS.

FOR THE TIME BEING...HAVE BROUGHT BACK THE POSSIBILITY OF SHOWERS

AND THUNDERSTORMS TO ALL OF SOUTH-CENTRAL ARIZONA FRIDAY NIGHT...THEN SPREAD THAT POSSIBILITY FROM SOUTH-CENTRAL ARIZONA WEST TO THE LOWER COLORADO RIVER VALLEY BY SATURDAY NIGHT...AND THE ENTIRE AREA FROM SOUTH-CENTRAL ARIZONA ACROSS SOUTHWEST ARIZONA AND SOUTHEAST CALIFORNIA SUNDAY. AS WE GET CLOSER TO NEXT WEEKEND AND EARLY NEXT WEEK...WE WILL MOST LIKELY HAVE TO INCREASE THE CHANCE OF SHOWERS AND THUNDERSTORMS FOR AT LEAST ONE OF THE LATE AFTERNOON AND NIGHTTIME PERIODS...DURING THE WEEKEND AND EARLY NEXT WEEK.

&&

.AVIATION...

SOUTH-CENTRAL ARIZONA INCLUDING KPHX AND KIWA...
DRY/STABLE ENVIRONMENT OVER PHOENIX THIS EVENING WHICH IS CRUSHING CONVECTION AS IT APPROACHES FROM THE SOUTHEAST. OUTFLOW FROM THE SE IS WASHING OUT RIGHT NOW...LIKELY NOT TO MAKE IT TO KPHX. BETTER CONVECTION FURTHER EAST SHOULD HOLD SOMEWHAT CAUSING AN INCREASE IN CLOUDS AND SOME -SHRA DURING THE LATE EVENING THROUGH EARLY MORNING HOURS. COULD SEE BETTER COVERAGE OF /WEAK/ CONVECTION ON MONDAY.

SOUTHEAST CALIFORNIA INCLUDING KIPL AND KBLH...
GENERALLY LIGHT WINDS WITH INCREASING MID/HIGH CLOUDS HEADING INTO MONDAY MORNING. A STRAY SHOWER MAY WANDER TOWARD KBLH EARLY MONDAY MORNING.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

&&

.FIRE WEATHER...

WEDNESDAY THROUGH SUNDAY...
HIGH PRESSURE CENTERED OVER THE CENTRAL UNITED STATES WILL SKIRT FURTHER EAST IN RESPONSE TO AN UPPER LEVEL TROUGH APPROACHING THE PACIFIC COAST. THIS WILL HELP TO SET UP A RETURN FLOW OF MONSOONAL MOISTURE FROM THE GULF OF CALIFORNIA INTO ARIZONA...INCREASING THE PROBABILITY OF MAINLY AFTERNOON AND EVENING SHOWERS. THE GREATEST THREAT FOR STORMS LOOKS TO BE ON FRIDAY AND SATURDAY...WITH THE BIGGEST THREATS BEING HEAVY RAINFALL...GUSTY SURFACE WINDS...AND BLOWING DUST.

&&

.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...NONE.

CA...NONE.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT

WEATHER.GOV/PHOENIX

DISCUSSION...INIGUEZ/ELLIS

AVIATION...INIGUEZ
FIRE WEATHER...MEYERS/MCLANE

339
FXUS65 KPSR 181003
AFDPSR

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE PHOENIX AZ
300 AM MST MON JUL 18 2011

.SYNOPSIS...
MEXICAN MONSOON MOISTURE HAS STARTED TO MOVE DEEPER INTO CENTRAL AND EASTERN ARIZONA. A COUPLE OF WEAK WEATHER DISTURBANCES MOVING INTO ARIZONA FROM MEXICO WILL INCREASE THE THREAT FOR AFTERNOON AND EVENING SHOWERS AND THUNDERSTORMS MAINLY OVER CENTRAL AND EASTERN ARIZONA TODAY AND TUESDAY. A PACIFIC LOW PRESSURE SYSTEM MOVING THROUGH THE WESTERN STATES NORTH OF ARIZONA WILL BEGIN TO PUSH THE MONSOON MOISTURE EAST...INTO EASTERN ARIZONA WHERE MOST OF THE THUNDERSTORM ACTIVITY WILL DEVELOP WEDNESDAY THROUGH FRIDAY. MONSOON MOISTURE WILL PUSH BACK DEEPER INTO ARIZONA THIS WEEKEND FOR MORE WIDESPREAD THUNDERSTORM COVERAGE THIS WEEKEND.

&&
DISCUSSION...
MONSOON MOISTURE CONTINUED TO INCREASE FROM THE SOUTH...AND HAD BECOME A LITTLE THICKER OVER SOUTHERN AZ DURING THE PREVIOUS 24 HOURS. AT THE SAME TIME...AN INVERTED TROF LOCATED SOUTHWEST OF EL PASO TEXAS AT 07Z MON...SEEN THE BEST IN WATER VAPOR IMAGERY... CONTINUED TO MOVE TOWARD AZ. A VERY NOTICEABLE UPPER LEVEL DEFORMATION ZONE AHEAD OF THIS FEATURE...AND DEVELOPING OVER SOUTH CENTRAL AZ...WILL CONTINUE TO PRODUCE A SLIGHT CHANCE OF SHOWERS INTO THE MORNING HOURS. AT 08Z ONLY SPOTTY LIGHT SHOWERS WERE DETECTED BY RADAR VICINITY PHOENIX...CASA GRANDE...AND OVER ZONE 24. NO LIGHTNING. SOUTHEAST CA AND THE COLORADO RIVER VALLEY HAD MOSTLY CLEAR SKIES.

THERE WAS ABSOLUTELY NO UPPER AIR DATA OVER A LARGE PORTION OF NORTHWEST MEXICO...I.E. NO CHIHUAHUA NOR GUAYMAS SOUNDINGS LAST EVENING...AND IS PERHAPS THE REASON WHY MODELS DIDNT INITIALIZE THE INVERTED TROF SOUTHWEST OF EL PASO VERY WELL. THE EUROPEAN MODEL CAME CLOSEST AND WE WILL PRETTY MUCH FOLLOW ITS KINEMATIC FLOW REGIME AT AND ABOVE 500 MB WITH A SLIGHT MODIFICATION.

THE MEXICAN INVERTED TROF WILL CONTINUE TO MOVE TOWARD THE NORTHWEST AND INTO SOUTHERN AZ THIS AFTERNOON BUT IN A MUCH WEAKENED STATE. WEAKNESS ALOFT COMBINED WITH INCREASED MOISTURE...AND FAIRLY STIFF SOUTHEASTERLY MID LEVEL CONVECTIVE STEERING CURRENTS /10-15 KTS/... CERTAINLY BODE WELL FOR AN ELEVATED THUNDERSTORM THREAT THIS AFTERNOON AND EVENING. SINCE WE TALK IN PROBABILITY TERMS...THE ABOVE ATMOSPHERIC PARAMETERS TODAY CONVEY AN ATYPICAL MONSOON DAY AND WARRANT THE ELEVATED CONVECTIVE THREAT...REplete WITH GUSTY OUTFLOW WINDS AND A CHANCE OF DENSE BLOWING DUST ON THE DESERTS.

SOUTHEAST CA AND THE FAR SOUTHWEST AZ DESERTS VICINITY THE COLORADO

RIVER VALLEY WILL REMAIN DRY AND MORE STABLE ALOFT.

TUESDAY...

ANOTHER BUT VERY WEAK UPPER LEVEL PERTURBATION WILL FLOW INTO CENTRAL AND SOUTHERN AZ FROM THE SOUTHWEST DIRECTION. MID LEVEL CONVECTIVE STEERING CURRENTS OVER THE CENTRAL AZ DESERTS WILL DECREASE TO LIGHT AND VARIABLE WINDS...BUT DEEP MONSOON MOISTURE REMAINS. IT APPEARS MOST CONVECTION TUESDAY AFTERNOON/EVENING WILL DEVELOP OVER THE MOUNTAINS EAST OF PHOENIX AND IN SOUTHEAST AZ... HOWEVER SINCE THERE IS SOME WEAKNESS ALOFT...CONVECTIVE OUTFLOW BOUNDARIES AND POSSIBLE BOUNDARY COLLISIONS COULD GENERATE EVENING CONVECTION ON THE CENTRAL DESERTS BETWEEN CASA GRANDE AND PHOENIX.

AGAIN...SOUTHEAST CA AND THE FAR SOUTHWEST AZ DESERTS VICINITY THE COLORADO RIVER VALLEY WILL REMAIN DRIER AND MORE DYNAMICALLY STABLE ALOFT.

WEDNESDAY THROUGH FRIDAY...

A PACIFIC TROF PASSING THROUGH THE WESTERN STATES NORTH OF AZ WILL BEGIN TO TREND THE WINDS ALOFT TO A MORE STABLE AND DRIER WEST AND SOUTHWESTERLY DIRECTION. ONLY A SLIGHT CHANCE OF AFTERNOON AND EVENING SHOWERS WILL EXIST EAST OF PHOENIX...BUT CONCENTRATED OVER EASTERN AZ.

SATURDAY THROUGH MONDAY...

A COUPLE OF WELL DEFINED INVERTED TROFS IN THE MEXICAN EASTERLIES... WILL BRUSH SOUTHEAST AZ THIS PERIOD. THIS WILL ENABLE MONSOON MOISTURE TO PUSH BACK INTO AZ FOR AN ELEVATED CHANCE OF AFTERNOON AND EVENING THUNDERSTORMS OVER CENTRAL AND EASTERN AZ.

&&

.AVIATION...

SOUTH-CENTRAL ARIZONA INCLUDING KPHX AND KIWA... DRY/STABLE ENVIRONMENT OVER PHOENIX THIS EVENING WHICH IS CRUSHING CONVECTION AS IT APPROACHES FROM THE SOUTHEAST. OUTFLOW FROM THE SE IS WASHING OUT RIGHT NOW...LIKELY NOT TO MAKE IT TO KPHX. BETTER CONVECTION FURTHER EAST SHOULD HOLD SOMEWHAT CAUSING AN INCREASE IN CLOUDS AND SOME -SHRA DURING THE LATE EVENING THROUGH EARLY MORNING HOURS. COULD SEE BETTER COVERAGE OF /WEAK/ CONVECTION ON MONDAY.

SOUTHEAST CALIFORNIA INCLUDING KIPL AND KBLH...

GENERALLY LIGHT WINDS WITH INCREASING MID/HIGH CLOUDS HEADING INTO MONDAY MORNING. A STRAY SHOWER MAY WANDER TOWARD KBLH EARLY MONDAY MORNING.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

&&

.FIRE WEATHER...

WEDNESDAY THROUGH SUNDAY...

HIGH PRESSURE CENTERED OVER THE CENTRAL UNITED STATES WILL SKIRT FURTHER EAST IN RESPONSE TO AN UPPER LEVEL TROUGH APPROACHING THE PACIFIC COAST. THIS WILL HELP TO SET UP A RETURN FLOW OF MONSOONAL MOISTURE FROM THE GULF OF CALIFORNIA INTO ARIZONA...INCREASING THE PROBABILITY OF MAINLY AFTERNOON AND EVENING SHOWERS. THE GREATEST

THREAT FOR STORMS LOOKS TO BE ON FRIDAY AND SATURDAY...WITH THE BIGGEST THREATS BEING HEAVY RAINFALL...GUSTY SURFACE WINDS...AND BLOWING DUST.

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.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...NONE.

CA...NONE.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT

WEATHER.GOV/PHOENIX

DISCUSSION...VASQUEZ

AVIATION...INIGUEZ

FIRE WEATHER...MEYERS/MCLANE

176

FXUS65 KPSR 182252

AFDPSR

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE PHOENIX AZ

340 PM MST MON JUL 18 2011

.SYNOPSIS...

A FLOW ALOFT FROM THE SOUTHEAST IN THE CLOCKWISE FLOW OF AIR AROUND STRONG HIGH PRESSURE ALOFT CENTERED OVER THE NATIONS MIDSECTION IS BRINGING SOMEWHAT HIGHER HUMIDITY TO OUR AREA. THIS MEANS POSSIBLE DESERT BLOWING DUST AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS IN SOUTH-CENTRAL AND SOUTHWEST ARIZONA MAINLY IN THE LATE AFTERNOONS AND EVENINGS THROUGH WEDNESDAY. TEMPORARY DRYING IS EXPECTED FOR MOST OF THE AREA BY THURSDAY INTO FRIDAY...FOLLOWED BY A RETURN OF SOME HUMIDITY AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS MAINLY IN THE LATE AFTERNOON AND NIGHTTIME HOURS THIS COMING WEEKEND AND EARLY NEXT WEEK.

&&

.DISCUSSION...

A LINE OF THUNDERSTORMS WAS MOVING FROM SOUTHERN GILA COUNTY WEST OVER NORTH-CENTRAL PINAL COUNTY AND NORTHEAST MARICOPA COUNTY AT MID AFTERNOON TODAY. IT WAS MOSTLY SUNNY WITH SOME CLOUDS WEST OF THERE ACROSS THE REST OF SOUTH-CENTRAL AND SOUTHWEST ARIZONA...AND SUNNY OVER SOUTHEAST CALIFORNIA.

TEMPERATURES WERE GENERALLY CLOSE TO THE SAME TO A FEW DEGREE WARMER TODAY COMPARED WITH THE SAME TIME YESTERDAY. IT WAS MORE HUMID TODAY WITH DEW POINT TEMPERATURES GENERALLY 10 TO 20 DEGREES HIGHER EARLY

THIS AFTERNOON COMPARED WITH THE SAME TIME YESTERDAY. WIND WAS GENERALLY FROM THE SOUTH AND SOUTHWEST 10 TO 20 MPH...EXCEPT STRONG GUSTY AND VARIABLE NEAR THE THUNDERSTORMS.

THE CENTER OF VERY STRONG HIGH PRESSURE ALOFT CONTINUED OVER THE NATIONS MIDSECTION TODAY. THE SOUTHWEST EXTENSION OF THIS HIGH PRESSURE SYSTEM RESULTED IN ANOTHER HOT DAY IN OUR AREA TODAY WITH A HIGH OF 112 DEGREES AT SKY HARBOR IN PHOENIX AS OF 301 PM MST. THIS HIGH PRESSURE CENTER IS EXPECTED TO WEAKEN SOMEWHAT AND MOVE TO THE SOUTHEASTERN UNITED STATES BY THURSDAY THROUGH SATURDAY.

A FLOW ALOFT FROM THE SOUTHEAST IN THE CLOCKWISE FLOW OF AIR AROUND THE HIGH PRESSURE SYSTEM IS BRINGING SOMEWHAT HIGHER HUMIDITY MAINLY TO SOUTH-CENTRAL ARIZONA. LOW PRESSURE SYSTEMS IN THIS FLOW MEAN POSSIBLE DESERT BLOWING DUST AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS IN SOUTH-CENTRAL AND SOUTHWEST ARIZONA IN THE LATE AFTERNOON AND EVENING HOURS AT LEAST THROUGH TUESDAY INTO WEDNESDAY. ONE SUCH HIGH LEVEL LOW PRESSURE SYSTEM WAS CENTERED OVER FAR SOUTHEAST ARIZONA AND MOVING NORTH NEAR THE NEW MEXICO BORDER TODAY. HOWEVER...THERE ARE OTHER LESS DISCERNIBLE SYSTEMS IN THE FLOW.

MOST OF WHAT THUNDERSTORMS ARE ABLE TO MOVE FROM THE HIGHER TERRAIN INTO THE LOWER DESERT OF SOUTH-CENTRAL ARIZONA THIS EVENING ARE EXPECTED TO BE SOUTHEAST AND EAST OF PHOENIX. OTHERWISE...SOME GUSTY OUTFLOW WINDS AND BLOWING DUST ARE EXPECTED TO BE THE MAIN RESULTS OF THE THUNDERSTORMS ON THE LOWER SOUTH-CENTRAL ARIZONA DESERT INCLUDING THE GREATER PHOENIX AREA INTO THIS EVENING.

ANOTHER LOW PRESSURE SYSTEM CURRENTLY OVER THE SOUTHERN GULF OF CALIFORNIA IS EXPECTED TO MOVE NORTH OVER SOUTHWEST AND SOUTH-CENTRAL ARIZONA TUESDAY NIGHT AND WEDNESDAY. THIS WILL BRING A BETTER POSSIBILITY OF SHOWERS AND THUNDERSTORMS TO SOUTHWEST ARIZONA TUESDAY NIGHT AND WEDNESDAY AS WELL AS SOUTH-CENTRAL ARIZONA.

DRIER AIR FROM THE SOUTHWEST IS EXPECTED TO TEMPORARILY MOVE OVER MOST OF THE AREA INCLUDING THE GREATER PHOENIX AREA THURSDAY INTO FRIDAY. THIS IS EXPECTED TO HAPPEN AS A LOW PRESSURE SYSTEM FROM THE GULF OF ALASKA MOVES INLAND OVER THE WESTERN UNITED STATES. THUS... THE POSSIBILITY OF ANY SHOWERS AND THUNDERSTORMS IS CONFINED TO THE HIGHER TERRAIN EAST OF THE GREATER PHOENIX AREA THURSDAY THROUGH DAYTIME FRIDAY.

A RETURN OF SOME HUMIDITY AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS MAINLY IN THE LATE AFTERNOON AND NIGHTTIME HOURS IS EXPECTED THIS COMING WEEKEND AND EARLY NEXT WEEK. THIS IS EXPECTED TO HAPPEN AS HIGH PRESSURE ALOFT BUILDS NEAR THE 4 CORNERS WITH A FLOW ALOFT FROM THE SOUTHEAST BRINGING SOME MOISTURE FROM MEXICO OVER OUR AREA IN THE CLOCKWISE FLOW AROUND THE HIGH PRESSURE SYSTEM.

&&

.AVIATION...

SOUTH-CENTRAL ARIZONA INCLUDING KPHX AND KIWA...

ISOLATED SHOWERS AND STORMS DEVELOPING THIS AFTERNOON AND EVENING ACROSS SOUTH-CENTRAL ARIZONA. MOST ACTIVITY IS EXPECTED TO REMAIN OVER THE HIGHER TERRAIN NORTH AND EAST OF THE PHOENIX METROPOLITAN AREA WITH A SOME STORMS MOVING INTO THE LOWER DESERTS. OUTFLOW

BOUNDARIES FROM ALL SHOWERS AND STORMS COULD RESULT IN GUSTY SURFACE WINDS AND BLOWING DUST.

SOUTHEAST CALIFORNIA INCLUDING KIPL AND KBLH...
LIGHT WINDS WITH ONLY A FEW CLOUDS WILL EXTEND THROUGH THE PERIOD.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

&&

.FIRE WEATHER...
THURSDAY THROUGH MONDAY...
HIGH PRESSURE MOVING TOWARDS THE EAST WILL ALLOW MONSOON MOISTURE TO ENTER INTO THE SOUTHWEST...INCREASING THE PROBABILITY OF AFTERNOON AND EVENING SHOWERS. RESULTING IN GUSTY WINDS...LOCALIZED DUST...AND EXTENSIVE AREAS OF LIGHTNING.

&&

.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...NONE.

CA...NONE.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

DISCUSSION...ELLIS
AVIATION...WATERS
FIRE WEATHER...WATERS/MCLANE

694
FXUS65 KPSR 190230
AFDPSR

AREA FORECAST DISCUSSION...UPDATED
NATIONAL WEATHER SERVICE PHOENIX AZ
730 PM MST MON JUL 18 2011

.SYNOPSIS...
A FLOW ALOFT FROM THE SOUTHEAST IN THE CLOCKWISE FLOW OF AIR AROUND STRONG HIGH PRESSURE ALOFT CENTERED OVER THE NATIONS MIDSECTION IS BRINGING SOMEWHAT HIGHER HUMIDITY TO OUR AREA. THIS MEANS POSSIBLE DESERT BLOWING DUST AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS IN SOUTH-CENTRAL AND SOUTHWEST ARIZONA MAINLY IN THE LATE AFTERNOONS AND EVENINGS THROUGH WEDNESDAY. TEMPORARY DRYING IS EXPECTED FOR MOST OF THE AREA BY THURSDAY INTO FRIDAY...FOLLOWED BY A RETURN OF SOME HUMIDITY AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS MAINLY IN THE LATE AFTERNOON AND NIGHTTIME HOURS THIS COMING WEEKEND AND EARLY NEXT WEEK.

&&

.DISCUSSION...

A NUMBER OF OUTFLOW BOUNDARIES MOVED THROUGH MARICOPA AND PINAL COUNTIES THIS EVENING RESULTING IN SEVERAL DUST STORMS. A NUMBER OF REPORTS WERE RECEIVED WITH VISIBILITY WELL BELOW CRITERIA /QUARTER MILE OR LESS/. A CLUSTER OF STRONG STORMS DID DEVELOP OVER THE WEST VALLEY AS A COUPLE OF THE BOUNDARIES COLLIDED...PRODUCING LOCALIZED STRONG WINDS AND HEAVY RAINFALL /HIGHEST MEASURED ON FLOOD CONTROL DISTRICTS NETWORK WAS 0.91 INCHES/. THE VAST MAJORITY OF THE VALLEY DID NOT GET RAIN THOUGH MOST AREAS DID GET VARYING DEGREES OF DUST.

REDUCED RAIN CHANCES FOR THE REST OF THE EVENING AS ACTIVITY IS DECREASING AND WITHOUT THE OUTFLOW BOUNDARIES/LIFTING MECHANISMS THE 100 J/KG OF CIN WILL NOT BE OVERCOME TO RELEASE THE 300-500 J/KG OF CAPE EVIDENT IN THE 19.00Z KPSR SOUNDING. HRRR MODEL HAS BEEN DOING WELL SO FAR TODAY WITH THE CONVECTION AND THE LATEST RUN AGREES WITH T-STORM COVERAGE DECREASING WITH SHOWERS STRAGGLING INTO THE EARLY MORNING HOURS.

PREVIOUS DISCUSSION...

THE CENTER OF VERY STRONG HIGH PRESSURE ALOFT CONTINUED OVER THE NATIONS MIDSECTION TODAY. THE SOUTHWEST EXTENSION OF THIS HIGH PRESSURE SYSTEM RESULTED IN ANOTHER HOT DAY IN OUR AREA TODAY WITH A HIGH OF 112 DEGREES AT SKY HARBOR IN PHOENIX AS OF 301 PM MST. THIS HIGH PRESSURE CENTER IS EXPECTED TO WEAKEN SOMEWHAT AND MOVE TO THE SOUTHEASTERN UNITED STATES BY THURSDAY THROUGH SATURDAY.

ANOTHER LOW PRESSURE SYSTEM CURRENTLY OVER THE SOUTHERN GULF OF CALIFORNIA IS EXPECTED TO MOVE NORTH OVER SOUTHWEST AND SOUTH-CENTRAL ARIZONA TUESDAY NIGHT AND WEDNESDAY. THIS WILL BRING A BETTER POSSIBILITY OF SHOWERS AND THUNDERSTORMS TO SOUTHWEST ARIZONA TUESDAY NIGHT AND WEDNESDAY AS WELL AS SOUTH-CENTRAL ARIZONA.

DRIER AIR FROM THE SOUTHWEST IS EXPECTED TO TEMPORARILY MOVE OVER MOST OF THE AREA INCLUDING THE GREATER PHOENIX AREA THURSDAY INTO FRIDAY. THIS IS EXPECTED TO HAPPEN AS A LOW PRESSURE SYSTEM FROM THE GULF OF ALASKA MOVES INLAND OVER THE WESTERN UNITED STATES. THUS... THE POSSIBILITY OF ANY SHOWERS AND THUNDERSTORMS IS CONFINED TO THE HIGHER TERRAIN EAST OF THE GREATER PHOENIX AREA THURSDAY THROUGH DAYTIME FRIDAY.

A RETURN OF SOME HUMIDITY AND AT LEAST A SLIGHT CHANCE OF THUNDERSTORMS MAINLY IN THE LATE AFTERNOON AND NIGHTTIME HOURS IS EXPECTED THIS COMING WEEKEND AND EARLY NEXT WEEK. THIS IS EXPECTED TO HAPPEN AS HIGH PRESSURE ALOFT BUILDS NEAR THE 4 CORNERS WITH A FLOW ALOFT FROM THE SOUTHEAST BRINGING SOME MOISTURE FROM MEXICO OVER OUR AREA IN THE CLOCKWISE FLOW AROUND THE HIGH PRESSURE SYSTEM.

&&

.AVIATION...

SOUTH-CENTRAL ARIZONA INCLUDING KPHX AND KIWA... DUST WILL CONTINUE TO SETTLE AROUND THE PHX AREA DURING THE NEXT TWO HOURS LEADING TO GRADUAL IMPROVEMENT IN VISIBILITY. TSTM ACTIVITY FOR THE MOST PART IS OVER FOR THIS EVENING/TONIGHT THOUGH A SHOWER

OR TWO WILL BE POSSIBLE OVERNIGHT. SOUTHEAST WINDS WILL GRADUAL
DECAY AND BECOME LIGHT BY 04Z/9 PM MST.

SOUTHEAST CALIFORNIA INCLUDING KIPL AND KBLH...
LIGHT WINDS WITH ONLY A FEW CLOUDS WILL EXTEND THROUGH THE PERIOD.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

&&

.FIRE WEATHER...
THURSDAY THROUGH MONDAY...
HIGH PRESSURE MOVING TOWARDS THE EAST WILL ALLOW MONSOON MOISTURE TO
ENTER INTO THE SOUTHWEST...INCREASING THE PROBABILITY OF AFTERNOON
AND EVENING SHOWERS. RESULTING IN GUSTY WINDS...LOCALIZED DUST...AND
EXTENSIVE AREAS OF LIGHTNING.

&&

.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...NONE.

CA...NONE.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

DISCUSSION...INIGUEZ/ELLIS
AVIATION...INIGUEZ
FIRE WEATHER...WATERS/MCLANE

813
FPUS75 KPSR 182143
NOWPSR

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE PHOENIX AZ
243 PM MST MON JUL 18 2011

AZZ023-182345-
GREATER PHOENIX AREA-
INCLUDING THE CITIES OF...BUCKEYE...CAREFREE...CAVE CREEK...
CHANDLER...FOUNTAIN HILLS...GILBERT...GLENDALE...MESA...PEORIA...
PHOENIX...SCOTTSDALE...SUN CITY...AND TEMPE
243 PM MST MON JUL 18 2011

.NOW...
STRONG WINDS FROM THUNDERSTORMS OVER PINAL COUNTY WILL ENTER
SOUTHEAST PORTIONS OF THE PHOENIX METRO AREA AFTER 3 PM. WINDS OF
30 TO 40 MPH ALONG WITH BLOWING DUST WILL AFFECT QUEEN CREEK AND EAST

MESA. LOCAL VISIBILITIES BELOW 1 MILE CAN BE EXPECTED WITH LARGER AREAS OF VISIBILITIES BELOW 3 MILES. MOTORISTS ARE ADVISED TO USE CAUTION DUE TO SUDDENLY REDUCED VISIBILITIES.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

AJ

805
WUUS55 KPSR 182205
SVRPSR
AZC021-182300-
/O.NEW.KPSR.SV.W.0014.110718T2205Z-110718T2300Z/

BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE PHOENIX AZ
305 PM MST MON JUL 18 2011

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

- * SEVERE THUNDERSTORM WARNING FOR...
CENTRAL PINAL COUNTY IN SOUTH CENTRAL ARIZONA...
THIS INCLUDES THE CITY OF FLORENCE...
- * UNTIL 400 PM MST
- * AT 302 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A SEVERE THUNDERSTORM CAPABLE OF PRODUCING DAMAGING WINDS IN EXCESS OF 60 MPH. IN ADDITION...DENSE BLOWING DUST MAY ACCOMPANY THIS SEVERE STORM. THIS STORM WAS LOCATED 7 MILES SOUTH OF FLORENCE... AND MOVING NORTHWEST AT 15 MPH.
- * OTHER LOCATIONS IN THE WARNING INCLUDE BUT ARE NOT LIMITED TO SAN TAN VALLEY AND MAGMA

LAT...LON 3289 11146 3320 11160 3326 11139 3307 11120
3304 11123
TIME...MOT...LOC 2205Z 149DEG 12KT 3295 11134

\$\$

LEINS

280
WUUS55 KPSR 190106
SVRPSR
AZC013-190145-
/O.NEW.KPSR.SV.W.0015.110719T0106Z-110719T0145Z/

BULLETIN - EAS ACTIVATION REQUESTED

SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE PHOENIX AZ
606 PM MST MON JUL 18 2011

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

- * SEVERE THUNDERSTORM WARNING FOR...
CENTRAL MARICOPA COUNTY IN SOUTH CENTRAL ARIZONA...
THIS INCLUDES THE CITIES OF...GLENDALE...YOUNGTOWN...WADDELL...
SURPRISE...SUN CITY WEST...SUN CITY...PEORIA...EL MIRAGE...
- * UNTIL 645 PM MST
- * AT 605 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A
SEVERE THUNDERSTORM CAPABLE OF PRODUCING DAMAGING WINDS IN EXCESS
OF 60 MPH. THIS STORM WAS LOCATED NEAR GLENDALE SPORTS COMPLEX...
OR NEAR YOUNGTOWN...AND MOVING NORTH AT 15 MPH.
- * THE SEVERE THUNDERSTORM WILL CONTINUE TO MOVE THROUGH THE WEST
SIDE OF THE PHOENIX METRO AREA.

LAT...LON 3365 11247 3373 11215 3350 11214 3348 11230
TIME...MOT...LOC 0106Z 165DEG 13KT 3355 11227

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LEINS

891
WWUS55 KPSR 190112
SVSPSR

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
612 PM MST MON JUL 18 2011

AZC013-190145-
/O.CON.KPSR.SV.W.0015.000000T0000Z-110719T0145Z/
MARICOPA AZ-
612 PM MST MON JUL 18 2011

...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 645 PM MST
FOR CENTRAL MARICOPA COUNTY...

AT 611 PM MST...A SEVERE THUNDERSTORM WAS REPORTED CAPABLE OF
PRODUCING DAMAGING WINDS IN EXCESS OF 60 MPH. THIS STORM WAS LOCATED
NEAR YOUNGTOWN...MOVING NORTH AT 15 MPH. SPOTTERS HAVE REPORTED
WINDS OF 50 MPH WITH THIS STORM ALONG WITH MINOR TREE DAMAGE.

OTHER LOCATIONS IN THE WARNING INCLUDE BUT ARE NOT LIMITED TO EL
MIRAGE...WADDELL...SUN CITY...SURPRISE...PEORIA AND SUN CITY WEST

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REPORT SEVERE WEATHER TO THE NEAREST LAW ENFORCEMENT AGENCY. THEY
WILL RELAY YOUR REPORT TO THE NATIONAL WEATHER SERVICE FORECAST
OFFICE.

&&

LAT...LON 3365 11247 3373 11215 3350 11214 3348 11230
TIME...MOT...LOC 0112Z 165DEG 13KT 3357 11228

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LEINS

792

WWUS55 KPSR 190120
SVSPSR

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
620 PM MST MON JUL 18 2011

AZC013-190145-
/O.CON.KPSR.SV.W.0015.000000T0000Z-110719T0145Z/
MARICOPA AZ-
620 PM MST MON JUL 18 2011

...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 645 PM MST
FOR CENTRAL MARICOPA COUNTY...

AT 618 PM MST...A SEVERE THUNDERSTORM WAS REPORTED CAPABLE OF
PRODUCING DAMAGING WINDS IN EXCESS OF 60 MPH. THIS STORM WAS LOCATED
NEAR YOUNGTOWN...MOVING NORTH AT 15 MPH. SPOTTERS CONTINUE TO REPORT
PEA SIZED HAIL AND GUSTY WINDS OVER 50 MPH.

OTHER LOCATIONS IN THE WARNING INCLUDE BUT ARE NOT LIMITED TO EL
MIRAGE...WADDELL...SUN CITY...SURPRISE...PEORIA AND SUN CITY WEST

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REPORT SEVERE WEATHER TO THE NEAREST LAW ENFORCEMENT AGENCY. THEY
WILL RELAY YOUR REPORT TO THE NATIONAL WEATHER SERVICE FORECAST
OFFICE.

&&

LAT...LON 3365 11247 3373 11215 3350 11214 3348 11230
TIME...MOT...LOC 0119Z 165DEG 13KT 3360 11228

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LEINS

710

WWUS55 KPSR 190144
SVSPSR

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
644 PM MST MON JUL 18 2011

AZC013-190154-
/O.EXP.KPSR.SV.W.0015.000000T0000Z-110719T0145Z/
MARICOPA AZ-
644 PM MST MON JUL 18 2011

...THE SEVERE THUNDERSTORM WARNING FOR CENTRAL MARICOPA COUNTY WILL
EXPIRE AT 645 PM MST...

THE STORM NEAR YOUNGTOWN WILL CONTINUE TO WEAKEN...HOWEVER GUSTY
WINDS MAY CONTINUE THROUGH 7 PM.

REPORT SEVERE WEATHER TO THE NEAREST LAW ENFORCEMENT AGENCY. THEY
WILL RELAY YOUR REPORT TO THE NATIONAL WEATHER SERVICE FORECAST
OFFICE.

LAT...LON 3365 11247 3373 11215 3350 11214 3348 11230
TIME...MOT...LOC 0144Z 165DEG 13KT 3369 11231

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LEINS

058
WWUS75 KPSR 182129
NPWPSR

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
229 PM MST MON JUL 18 2011

AZZ028-182300-
/O.NEW.KPSR.DS.W.0006.110718T2129Z-110718T2300Z/
NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
INCLUDING THE CITIES OF...APACHE JUNCTION...CASA GRANDE...
FLORENCE
229 PM MST MON JUL 18 2011

...DUST STORM WARNING IN EFFECT UNTIL 4 PM MST THIS AFTERNOON...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM
WARNING...WHICH IS IN EFFECT UNTIL 4 PM MST THIS AFTERNOON.

* AFFECTED AREA: NORTHERN PINAL COUNTY.

* LOCATIONS INCLUDE: QUEEN VALLEY...SAN TAN VALLEY...APACHE
JUNCTION...COOLIDGE...AND FLORENCE.

* TIMING: STRONG WINDS MOVING WESTWARD WILL CREATE DENSE BLOWING DUST
THROUGH AT LEAST 3 PM WITH LINGERING POOR VISIBILITIES UNTIL ABOUT
4 PM.

* WINDS: 35 TO 45 MPH...MOSTLY FROM THE EAST.

- * VISIBILITY: LOCAL VISIBILITIES AT OR BELOW ONE QUARTER MILE WITH LARGE AREAS BELOW 1 MILE.
- * IMPACTS: POOR VISIBILITIES WILL CREATE HAZARDOUS DRIVING CONDITIONS. AFFECTED ROADWAYS INCLUDE...BUT ARE NOT LIMITED TO...HIGHWAY 60...HIGHWAY 79...AND HIGHWAY 287.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT

WEATHER.GOV/PHOENIX

765

WWUS75 KPSR 182339

NPWPSR

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
439 PM MST MON JUL 18 2011

.ANOTHER ROUND OF DENSE BLOWING DUST WILL MOVE ACROSS NORTHERN PINAL COUNTY AND INTO THE PHOENIX AREA THIS AFTERNOON.

AZZ023-028-190100-
/O.NEW.KPSR.DS.W.0007.110718T2339Z-110719T0100Z/
GREATER PHOENIX AREA-NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
INCLUDING THE CITIES OF...MESA...PHOENIX...APACHE JUNCTION...
CASA GRANDE...FLORENCE
439 PM MST MON JUL 18 2011

...DUST STORM WARNING IN EFFECT UNTIL 6 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 6 PM MST THIS EVENING.

- * AFFECTED AREA: NORTHERN PINAL COUNTY AND EASTERN PORTIONS OF THE PHOENIX METRO AREA.
- * LOCATIONS INCLUDE: CASA GRANDE...COOLIDGE...FLORENCE...QUEEN CREEK...MESA...GILBERT...CHANDLER...TEMPE...INTERSTATE 10...HIGHWAY 79...HUNT HIGHWAY.
- * TIMING: BLOWING DUST WILL CONTINUE TO OVERSPREAD NORTHERN PINAL COUNTY THROUGH 5 PM WITH LINGERING POOR VISIBILITIES UNTIL ABOUT 6

PM. FOR THE PHOENIX AREA...DENSE BLOWING DUST WILL ENTER THE
SOUTHEAST VALLEY AT ABOUT 445 PM AND SPREAD OVER MAINLY EASTERN
PORTIONS OF THE METRO AREA UNTIL ABOUT 6 PM.

* WINDS: SOUTHEAST 30 TO 40 MPH.

* VISIBILITY: ONE QUARTER MILE OR LESS.

* IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR
VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE
IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR
VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT
OFF THE BRAKE PEDAL.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT

WEATHER.GOV/PHOENIX

360

WWUS75 KPSR 190000
NPWPSR

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
500 PM MST MON JUL 18 2011

.ANOTHER ROUND OF DENSE BLOWING DUST WILL MOVE ACROSS NORTHERN
PINAL COUNTY AND INTO MARICOPA COUNTY...INCLUDING THE PHOENIX AREA...THIS
AFTERNOON.

AZZ027-190200-
/O.EXB.KPSR.DS.W.0007.000000T0000Z-110719T0200Z/
SOUTHWEST MARICOPA COUNTY-
INCLUDING THE CITY OF...GILA BEND
500 PM MST MON JUL 18 2011

...DUST STORM WARNING IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM
WARNING...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING.

* AFFECTED AREA: SOUTHWEST MARICOPA COUNTY

* LOCATIONS INCLUDE: GILA BEND...INTERSTATE 8...HIGHWAY 85.

* TIMING: BLOWING DUST WILL OVERSPREAD SOUTHWEST MARICOPA COUNTY

THROUGH 630 PM WITH LINGERING POOR VISIBILITIES UNTIL ABOUT 7 PM.

* WINDS: EAST 25 TO 35 MPH.

* VISIBILITY: ONE QUARTER MILE OR LESS.

* IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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AZZ023-028-190100-
/O.CON.KPSR.DS.W.0007.000000T0000Z-110719T0100Z/
GREATER PHOENIX AREA-NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
INCLUDING THE CITIES OF...MESA...PHOENIX...APACHE JUNCTION...
CASA GRANDE...FLORENCE
500 PM MST MON JUL 18 2011

...DUST STORM WARNING REMAINS IN EFFECT UNTIL 6 PM MST THIS EVENING...

A DUST STORM WARNING REMAINS IN EFFECT UNTIL 6 PM MST THIS EVENING.

* AFFECTED AREA: NORTHERN PINAL COUNTY AND EASTERN PORTIONS OF THE PHOENIX METRO AREA.

* LOCATIONS INCLUDE: MESA...PHOENIX...APACHE JUNCTION...CASA GRANDE...FLORENCE

* TIMING: BLOWING DUST WILL CONTINUE TO OVERSPREAD NORTHERN PINAL COUNTY AND THE PHOENIX AREA THROUGH 530 PM WITH LINGERING POOR VISIBILITIES UNTIL ABOUT 6 PM.

* WINDS: SOUTHEAST 30 TO 40 MPH.

* VISIBILITY: ONE QUARTER MILE OR LESS.

* IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

800
WWUS75 KPSR 190100
NPWPSR

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
600 PM MST MON JUL 18 2011

.ANOTHER ROUND OF DENSE BLOWING DUST WILL MOVE ACROSS NORTHERN
PINAL COUNTY AND INTO MARICOPA COUNTY...INCLUDING THE PHOENIX
AREA...THIS AFTERNOON.

AZZ028-190200-
/O.EXP.KPSR.DS.W.0007.000000T0000Z-110719T0100Z/
NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
INCLUDING THE CITIES OF...APACHE JUNCTION...CASA GRANDE...
FLORENCE
600 PM MST MON JUL 18 2011

...DUST STORM WARNING WILL EXPIRE AT 6 PM MST THIS EVENING...

THE DUST STORM WARNING WILL EXPIRE AT 6 PM MST THIS EVENING FOR
NORTHWEST PINAL COUNTY.

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AZZ022-190200-
/O.EXB.KPSR.DS.W.0007.110719T0100Z-110719T0200Z/
NORTHWEST MARICOPA COUNTY-
INCLUDING THE CITIES OF...BUCKEYE...NEW RIVER...WICKENBURG
600 PM MST MON JUL 18 2011

...DUST STORM WARNING IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM
WARNING...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING.

* AFFECTED AREA: NORTHWEST MARICOPA COUNTY

* LOCATIONS INCLUDE: BUCKEYE...NEW RIVER...WICKENBURG

* TIMING: THROUGH 7 PM.

* WINDS: EAST 25 TO 35 MPH.

* VISIBILITY: ONE QUARTER MILE OR LESS.

* IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR

VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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AZZ023-190200-
/O.EXT.KPSR.DS.W.0007.000000T0000Z-110719T0200Z/
GREATER PHOENIX AREA-
INCLUDING THE CITIES OF...BUCKEYE...MESA...PHOENIX
600 PM MST MON JUL 18 2011

...DUST STORM WARNING NOW IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE DUST STORM WARNING IS NOW IN EFFECT UNTIL 7 PM MST THIS EVENING.

- * AFFECTED AREA: WESTERN PORTIONS OF THE PHOENIX METRO AREA.
- * LOCATIONS INCLUDE: BUCKEYE...MESA...PHOENIX
- * TIMING: BLOWING DUST WILL CONTINUE TO OVERSPREAD THE PHOENIX AREA THROUGH 7 PM.
- * WINDS: SOUTHEAST 30 TO 40 MPH.
- * VISIBILITY: ONE QUARTER MILE OR LESS.
- * IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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AZZ027-190200-
/O.CON.KPSR.DS.W.0007.000000T0000Z-110719T0200Z/
SOUTHWEST MARICOPA COUNTY-
INCLUDING THE CITY OF...GILA BEND
600 PM MST MON JUL 18 2011

...DUST STORM WARNING REMAINS IN EFFECT UNTIL 7 PM MST THIS

EVENING...

A DUST STORM WARNING REMAINS IN EFFECT UNTIL 7 PM MST THIS EVENING.

* AFFECTED AREA: SOUTHWEST MARICOPA COUNTY

* LOCATIONS INCLUDE: GILA BEND

* TIMING: BLOWING DUST WILL OVERSPREAD SOUTHWEST MARICOPA COUNTY THROUGH 630 PM WITH LINGERING POOR VISIBILITIES UNTIL ABOUT 7 PM.

* WINDS: EAST 25 TO 35 MPH.

* VISIBILITY: ONE QUARTER MILE OR LESS.

* IMPACTS: DANGEROUS DRIVING CONDITIONS DUE TO SUDDENLY POOR VISIBILITIES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

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NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

897
WWUS85 KPSR 182138
SPSPSR

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
238 PM MST MON JUL 18 2011

AZZ024-028-182215-
PINAL AZ-
238 PM MST MON JUL 18 2011

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

SIGNIFICANT WEATHER ADVISORY FOR...

NORTH CENTRAL PINAL COUNTY IN SOUTH CENTRAL ARIZONA
UNTIL 315 PM MST.

AT 234 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED STRONG THUNDERSTORMS NEAR FLORENCE JUNCTION AND QUEEN VALLEY. THE STORMS WERE MOVING SLOWLY WESTWARD.

WIND GUSTS UP TO 55 MPH ARE EXPECTED WITH THIS STORM.

LOCATIONS IMPACTED INCLUDE...

FLORENCE...QUEEN VALLEY...AND RURAL NORTHERN PINAL COUNTY...

IN ADDITION TO VERY STRONG WINDS...DENSE BLOWING DUST IS POSSIBLE ALONG WITH LOCALIZED BRIEF HEAVY RAINFALL. TAKE SHELTER INSIDE OF A STURDY BUILDING UNTIL THE STORMS PASS.

LAT...LON 3298 11131 3295 11136 3295 11140 3346 11140

3335 11103 3318 11103

TIME...MOT...LOC 2135Z 180DEG 0KT 3316 11125

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AJ

531

WWUS85 KPSR 182212

SPSPSR

SPECIAL WEATHER STATEMENT

NATIONAL WEATHER SERVICE PHOENIX AZ

312 PM MST MON JUL 18 2011

AZZ023-024-028-182300-

GILA AZ-MARICOPA AZ-PINAL AZ-

312 PM MST MON JUL 18 2011

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

SIGNIFICANT WEATHER ADVISORY FOR...

WEST CENTRAL GILA COUNTY IN EAST CENTRAL ARIZONA

NORTH CENTRAL PINAL COUNTY IN SOUTH CENTRAL ARIZONA

EAST CENTRAL MARICOPA COUNTY IN SOUTH CENTRAL ARIZONA

UNTIL 400 PM MST

AT 302 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A STRONG THUNDERSTORM 8 MILES NORTH OF QUEEN VALLEY...MOVING WEST AT 20 MPH.

WIND GUSTS UP TO 50 MPH ARE EXPECTED WITH THIS STORM...ALONG WITH FREQUENT DANGEROUS LIGHTNING.

LOCATIONS IMPACTED INCLUDE...

KINGS RANCH...

APACHE JUNCTION...

EAST MESA...

HIGLEY...

QUEEN CREEK...

SOME UNSECURED OBJECTS WILL BE BLOWN AROUND...TREE LIMBS COULD BE
SNAPPED OFF...AND ISOLATED POWER OUTAGES WILL BE POSSIBLE. SEEK
SHELTER INDOORS UNTIL THE STORM PASSES.

LOCALLY DENSE BLOWING DUST IS POSSIBLE. IF YOU ENCOUNTER BLOWING DUST
WHILE DRIVING...PULL OVER AS FAR OFF THE ROADWAY AS POSSIBLE AND
PARK. TURN OFF YOUR HEADLIGHTS AND KEEP YOUR FOOT OFF THE BRAKE.

LAT...LON 3335 11175 3385 11142 3347 11105 3311 11126
TIME...MOT...LOC 2212Z 111DEG 16KT 3343 11131

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WATERS

485
WWUS85 KPSR 182304
SPSPSR

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
404 PM MST MON JUL 18 2011

AZZ022>024-028-190000-
GREATER PHOENIX AREA-NORTHWEST AND NORTH CENTRAL PINAL
COUNTY-NORTHWEST MARICOPA COUNTY-SOUTHERN GILA/TONTO NF FOOTHILLS-
404 PM MST MON JUL 18 2011

...AREAS OF BLOWING DUST POSSIBLE THROUGH RUSH HOUR...

AT 400 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED
GUSTY WINDS FROM DISSIPATING THUNDERSTORMS. THESE WINDS WILL RESULT
IN AREAS OF BLOWING DUST

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494
WWUS85 KPSR 182306 CCA
SPSPSR

SPECIAL WEATHER STATEMENT...CORRECTED
NATIONAL WEATHER SERVICE PHOENIX AZ
406 PM MST MON JUL 18 2011

AZZ022>024-028-190000-
GREATER PHOENIX AREA-NORTHWEST AND NORTH CENTRAL PINAL
COUNTY-NORTHWEST MARICOPA COUNTY-SOUTHERN GILA/TONTO NF FOOTHILLS-
406 PM MST MON JUL 18 2011

...AREAS OF BLOWING DUST POSSIBLE THROUGH RUSH HOUR...

AT 400 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED

GUSTY WINDS FROM DISSIPATING THUNDERSTORMS. THESE WINDS WILL RESULT IN AREAS OF BLOWING DUST WHICH WILL REDUCE VISIBILITIES TO 2 MILES. SIGNIFICANT REDUCTIONS IN VISIBILITIES ARE NOT EXPECTED...BUT USE CAUTION IF TRAVELING DURING RUSH HOUR AND IF YOU ENCOUNTER BLOWING DUST.

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LEINS

725
WWUS85 KPSR 190022
AWWPHX
AZZ023-190130-

AIRPORT WEATHER WARNING FOR SKY HARBOR AIRPORT
NATIONAL WEATHER SERVICE PHOENIX AZ
522 PM MST MON JUL 18 2011

...AIRPORT WEATHER WARNING FOR SKY HARBOR AIRPORT IN EFFECT UNTIL
630 PM MST...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED AN AIRPORT WEATHER WARNING FOR SKY HARBOR AIRPORT FOR STRONG GUSTY WINDS.

A DUST STORM IS MOVING TOWARD THE AIRPORT...WHICH WILL DROP VISIBILITY TO A HALF MILE OR LESS AND CAUSE WINDS TO GUST INTO THE 30 TO 40 KNOT RANGE FROM THE SOUTH.

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INIGUEZ

129
WWUS85 KPSR 190054
SPSPSR

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
554 PM MST MON JUL 18 2011

AZZ023-190145-
MARICOPA AZ-
554 PM MST MON JUL 18 2011

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

SIGNIFICANT WEATHER ADVISORY FOR...

CENTRAL MARICOPA COUNTY IN SOUTH CENTRAL ARIZONA

UNTIL 645 PM MST

AT 553 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A STRONG THUNDERSTORM NEAR GLENDALE...MOVING NORTH AT 15 MPH.

WIND GUSTS UP TO 50 MPH ARE EXPECTED WITH THIS STORM.

LOCATIONS IMPACTED INCLUDE...

LUKE AFB...
YOUNGTOWN...
SUN CITY... EL MIRAGE AND WADDELL...
SURPRISE...
SUN CITY WEST...

LAT...LON 3367 11239 3369 11210 3348 11210 3337 11240
TIME...MOT...LOC 0054Z 165DEG 13KT 3353 11221

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LEINS

602
WWUS85 KPSR 190129
SPSPSR

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE PHOENIX AZ
629 PM MST MON JUL 18 2011

AZZ022-023-190215-
MARICOPA AZ-
629 PM MST MON JUL 18 2011

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A
SIGNIFICANT WEATHER ADVISORY FOR...
NORTH CENTRAL MARICOPA COUNTY IN SOUTH CENTRAL ARIZONA
UNTIL 715 PM MST

AT 626 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A
STRONG THUNDERSTORM 9 MILES NORTH OF PHOENIX. THIS STORM WAS
DISSIPATING AND PRODUCING GUSTY OUTFLOW WINDS AROUND 40 MPH.

LOCATIONS IMPACTED INCLUDE...
WITTMANN...
ANTHEM...
NEW RIVER...

SOME UNSECURED OBJECTS COULD BE BLOWN AROUND. SEEK SHELTER INDOORS
UNTIL THE STORM PASSES.

LOCALLY DENSE BLOWING DUST IS POSSIBLE. IF YOU ENCOUNTER BLOWING DUST
WHILE DRIVING...PULL OVER AS FAR OFF THE ROADWAY AS POSSIBLE AND
PARK. TURN OFF YOUR HEADLIGHTS AND KEEP YOUR FOOT OFF THE BRAKE.

LAT...LON 3371 11204 3380 11217 3373 11242 3353 11254
3398 11265 3398 11261 3390 11228 3392 11224

3396 11224 3404 11217 3405 11209
TIME...MOT...LOC 0128Z 180DEG 0KT 3367 11205

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LEINS