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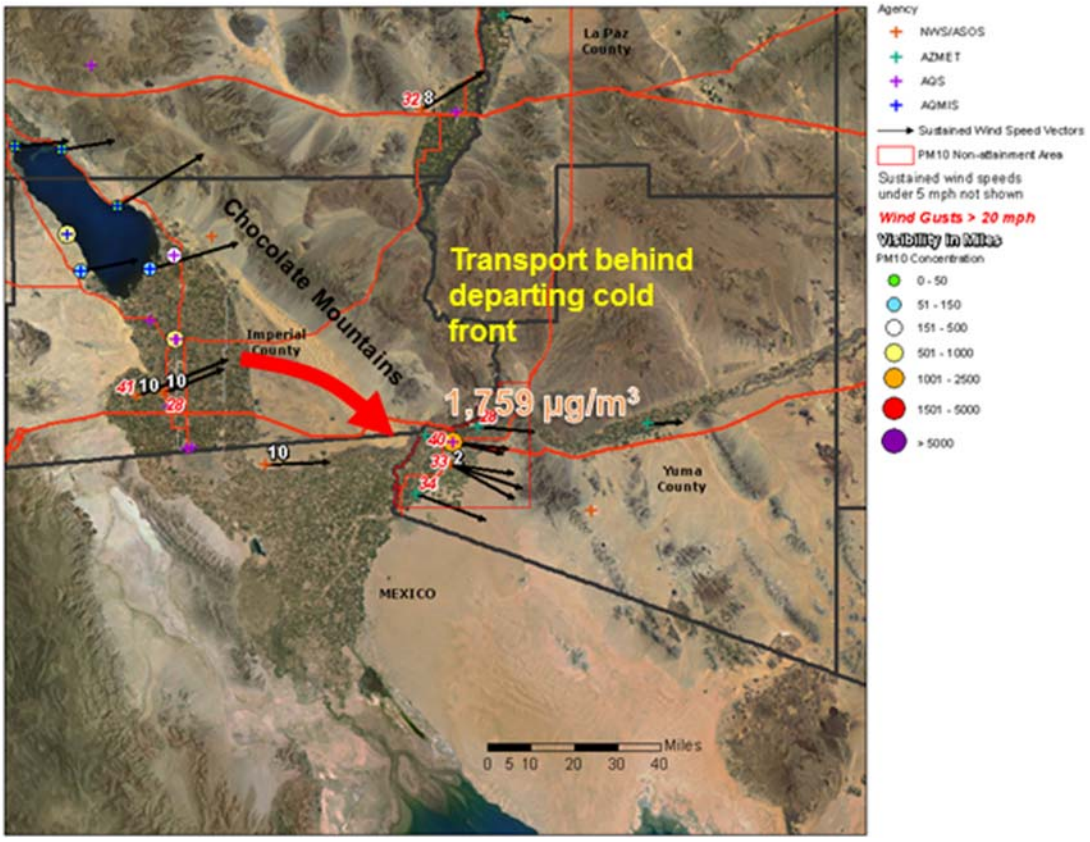
Air Quality Research and Innovative Solutions

State of Arizona Exceptional Event Documentation for the Event of January 10, 2013, for the Yuma County PM_{10} Nonattainment Area



Final Report Prepared for

Arizona Department of Environmental Quality
Phoenix, AZ

June 2013

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State of Arizona Exceptional Event Documentation for the Event of January 10, 2013, for the Yuma County PM_{10} Nonattainment Area

Final Report
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Cover graphic illustrates hourly wind speeds, visibilities, and PM_{10} concentrations in the Yuma, AZ, area during the January 10, 2013, event. See Section 3 for more information.

Acknowledgments

The authors would like to acknowledge the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency, Region 9, for helpful discussion and feedback during the preparation of this document.

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1. Introduction

On January 10, 2013, the Yuma Supersite monitor recorded 24-hr average PM_{10} concentrations of 229 µg/m^3. This value is in exceedance of the National Ambient Air Quality Standard (NAAQS) of 150 µg/m^3 for 24-hr PM_{10}. This report demonstrates that this exceedance was caused by naturally occurring windblown dust, was not reasonably controllable or preventable, was historically unusual, and would not have occurred "but for" the windblown dust and, therefore, the event is an exceptional event as defined by the U.S. Environmental Protection Agency's (EPA) Exceptional Events Rule (EER).

1.1 Report Contents

Section 2 of this assessment contains a conceptual model of the post-frontal windblown dust event that occurred on January 10, 2013, providing a background narrative of the exceptional event and an overall explanation that the event affected air quality. Section 2 also provides evidence that the event was a natural event.

Section 3 of this assessment establishes a clear causal connection between the natural event on January 10, 2013, and the exceedance of the 24-hr PM_{10} standard at the monitoring station. The evidence in this section also confirms that the event in question both affected air quality and was the result of natural events.

Section 4 of this assessment contains data summaries and time-series graphs which help illustrate that the event of January 10, 2013, produced PM_{10} concentrations in excess of normal historical fluctuations.

Section 5 of this assessment details the existing dust control measures and demonstrates that despite the presence and enforcement of these controls, the event of January 10, 2013, was not reasonably controllable or preventable.

Section 6 of this assessment builds upon the demonstration, showing a clear causal connection between the natural event and the exceedance, and concludes that the exceedance of the 24-hr PM_{10} standard on January 10, 2013, would not have occurred but for the event.

Appendix A contains time-series graphs and data tables to supplement Section 3. **Appendix B** contains air quality forecasts issued by the Arizona Department of Environmental Quality (ADEQ) and weather statements and warnings issued by the National Weather Service (NWS).

1.2 Exceptional Event Rule Requirements

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

1.2.1 Public Notification That the Event Was Occurring (40 CFR 50.14(c)(1)(i))

ADEQ issued Air Quality Forecasts for the Greater Yuma area on January 10, 2013, indicating that southwesterly winds of 15 to 25 mph, gusting to 35 mph at times, could generate some pockets of blowing dust across the drier parts of the desert. More information on ADEQ's forecasting program can be found in Section 5.2 of this report. The forecast products that were issued on January 10, 2013, are included in Appendix B.

1.2.2 Place Informal Flag on Data in AQS (40 CFR 50.14(c)(2)(ii))

ADEQ and other operating air quality agencies in Arizona submit data into the EPA's Air Quality System (AQS), the official repository of ambient air quality data. This data submittal to AQS includes particulate matter (PM) data from both filter-based and continuous monitors operated in Arizona.

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 other operating air quality agencies have determined that a potential exists that a monitor's reading(s) have been influenced by an exceptional event, a preliminary flag is submitted for the measurement in 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.

1.2.3 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 held informal conversations with EPA during March, 2013, to discuss all the days in calendar year 2013 that ADEQ intends to analyze under the Exceptional Events Rule. The PM_{10} exceedance that occurred at the Yuma Supersite monitor on January 10, 2013, in the Yuma PM_{10} Nonattainment Area was included in these discussions. This assessment report demonstrates support for the flagging of these data.

1.2.4 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 hard copy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on July 15, 2013. 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).

1.2.5 Submit Demonstration Supporting Exceptional Event Flag (40 CFR 50.14(a)(1-2))

At the close of the public 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 9 headquarters in San Francisco, California. The deadline for the submittal of this package is March 31, 2016.

1.2.6 Documentation Requirements (40 CFR 50.14(c)(3)(iii))

The EER states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j) that
    a. the event affected air quality,
    b. the event was not reasonably controllable or preventable, and
    c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
2. There is a clear causal relationship between the measurement(s) under consideration and the event;
3. The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
4. There would have been no exceedance or violation but for the event.

2. Conceptual Model

This section provides a narrative background and summarizes the meteorological and air quality conditions in place on January 10, 2013, in Yuma. Elements described in this section include

- A description and map of the geographic setting of the air quality and meteorological monitors.
- A description of Yuma's climate.
- An overall description of meteorological and air quality conditions on the event day.

2.1 Geographic Setting and Monitor Locations

Yuma is located in the Sonoran Desert and Lower Colorado River Valley in extreme southwestern Arizona at an elevation of 138 feet above sea level. The Yuma Metropolitan Statistical Area is defined as Yuma County, which reported a population of 195,751 in the 2010 census. Yuma County is bordered by Imperial County, California, to the north and northwest and by the Mexican state of Baja California to the west and south (**Figure 2-1**). Yuma lies just west of the confluence of the Colorado and Gila Rivers. Most of Yuma is located in the Colorado River Floodplain, commonly known as the Yuma Valley. The Yuma Valley follows the course of the Colorado River southward to the Sea of Cortez. Part of Yuma is built on the Yuma Mesa, a prominent land feature extending to the east of Yuma. The Gila Mountains, located roughly 15 to 20 miles east and southeast of Yuma, have a peak elevation of 3,156 feet. Directly west-northwest of Yuma in Imperial County, California, are the Algodones Dunes, an elongated, extensive region of open sand dunes (**Figure 2-2**). West-northwesterly winds can transport dust and sand from these dunes into the Yuma region. North of the sand dunes are the Chocolate Mountains, which rise to over 2,000 feet in elevation and may locally enhance wind speeds over the Algodones Dunes due to channeling effects.

The air quality and meteorological monitors used in this analysis are shown in Figure 2-1. AQS monitors measure air quality and meteorological data; Arizona Meteorological Network (AZMET) and NWS monitors measure meteorological data only. The PM_{10} exceedance on January 10, 2013, was recorded at the Yuma Supersite monitor, which is located in central Yuma and has been operational since January 1, 2010. The Yuma Courthouse monitor shown in Figure 2-1 is inactive, but measured PM_{10} prior to January 1, 2010. Data from the Yuma Courthouse monitor were used to supplement the Yuma Supersite data record for the Historical Norm section (Section 4) of this demonstration. Three AZMET sites are in operation in the Yuma area, located northeast, west, and southwest of the city. An NWS monitor is located at the Yuma Marine Corps Air Station (MCAS). Additional air quality and meteorological monitors with data relevant to this dust storm event are located in adjacent southeastern California and northwestern Mexico (**Figure 2-3**).

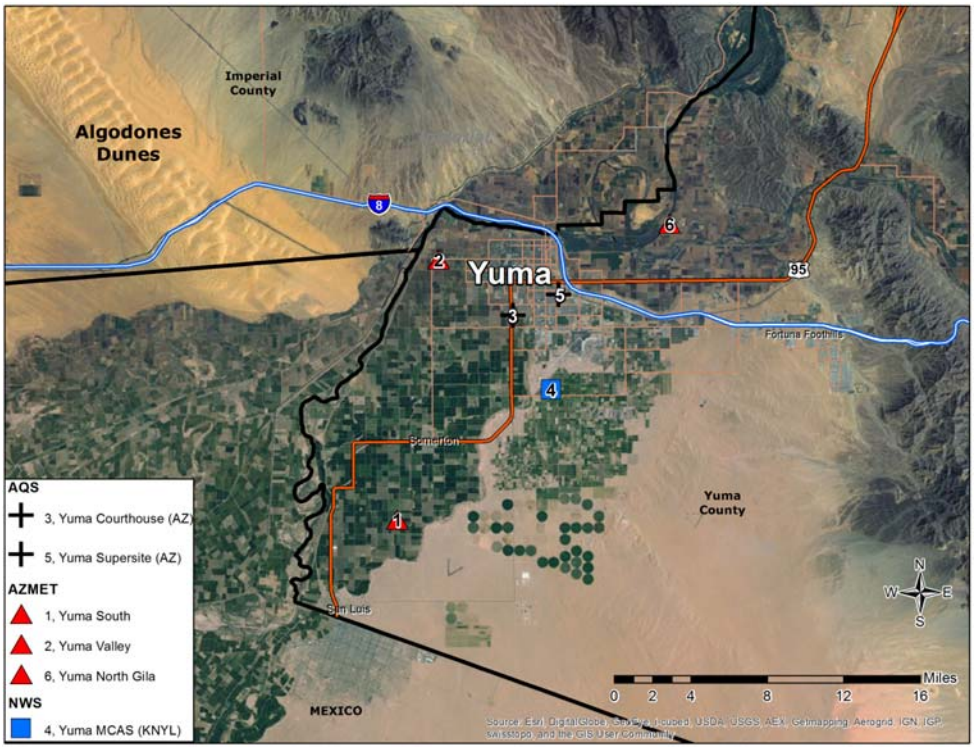


Figure 2-1. Air quality and meteorological monitors in the immediate Yuma region.

Figure 2-2. The Algodones Dunes in Imperial County, with the Chocolate Mountains in the background.

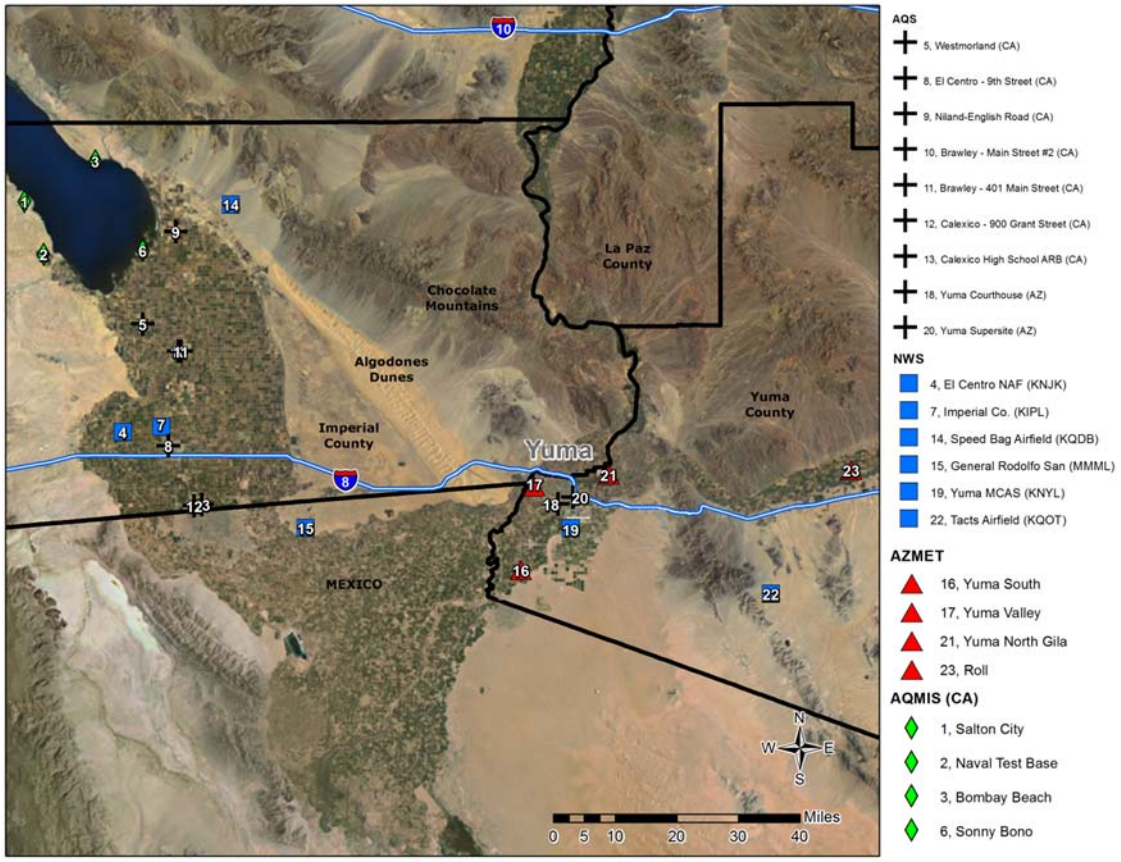


Figure 2-3. Location of air quality and meteorological monitors and relevant geographical features in the Yuma area.

2.2 Climate

Yuma is one of the hottest cities in the United States, with average high temperatures around 107°F in July and around 70°F in January (**Figure 2-4**). Yuma receives roughly 90% of possible sunshine each year. Yuma is also one of the driest cities in the United States, with an average annual rainfall of just over 3 inches. The bulk of this rain usually falls during the December-March and July-August time periods. During the December-March period, winter storms originating from the Pacific Ocean can produce significant rains in southwestern Arizona. During the July-August time period, monsoonal moisture originating from the Gulf of California, Gulf of Mexico, and large thunderstorm complexes over the Sierra Madre Occidental Mountains in Mexico move northward into Arizona.

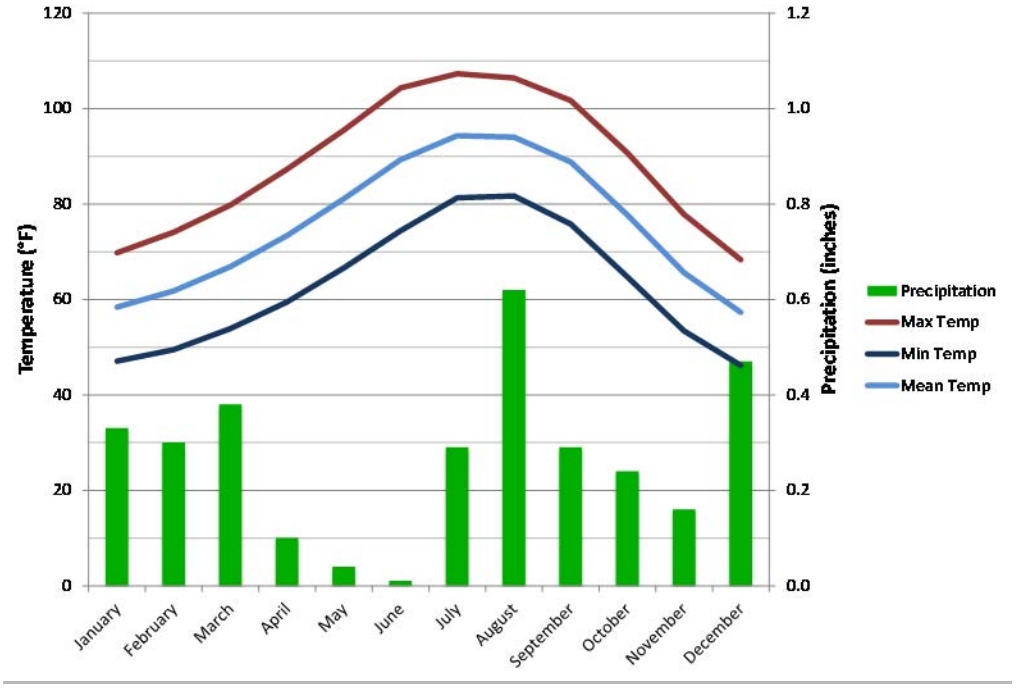


Figure 2-4. Average monthly temperatures and precipitation at Yuma MCAS, 1981–2010.

While windblown dust events in Arizona during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California and Arizona. These winds are the result of strong surface pressure gradients between the approaching low-pressure system (or cold front) and higher pressure ahead of it. As the low-pressure system (or cold front) approaches and passes, gusty southwesterly winds typically shift to northwesterly. The strong winds can loft dust into the air and transport it over long distances, especially if soils in the region are dry.

2.3 Event Day Summary

On the afternoon of January 10, 2013, winds generated by a departing cold front transported dust eastward into the Yuma area (**Figure 2-5**; cold front depicted in blue). The windblown dust resulted in 24-hr average PM_{10} concentrations of 229 µg/m^3 at the Yuma Supersite monitor (**Table 2-1**); this value is in exceedance of the NAAQS. The hourly and 24-hr average PM_{10} concentrations measured at the Yuma Supersite monitor were in excess of normal historical fluctuations. The dust was naturally occurring and likely originated over undeveloped lands of southeastern California outside the city of Yuma, including the Algodones Dunes; sustained winds over 29 mph with wind gusts in excess of 41 mph overwhelmed reasonable dust control measures. PM_{10} monitors in southeastern California also recorded high PM_{10} concentrations as the dust storm moved through, illustrating the regional nature of this event. The Yuma MCAS surface meteorological site reported blowing dust (BLDU) for several hours on January 10, 2013, coincident with peak PM_{10} concentrations (see Appendix A).

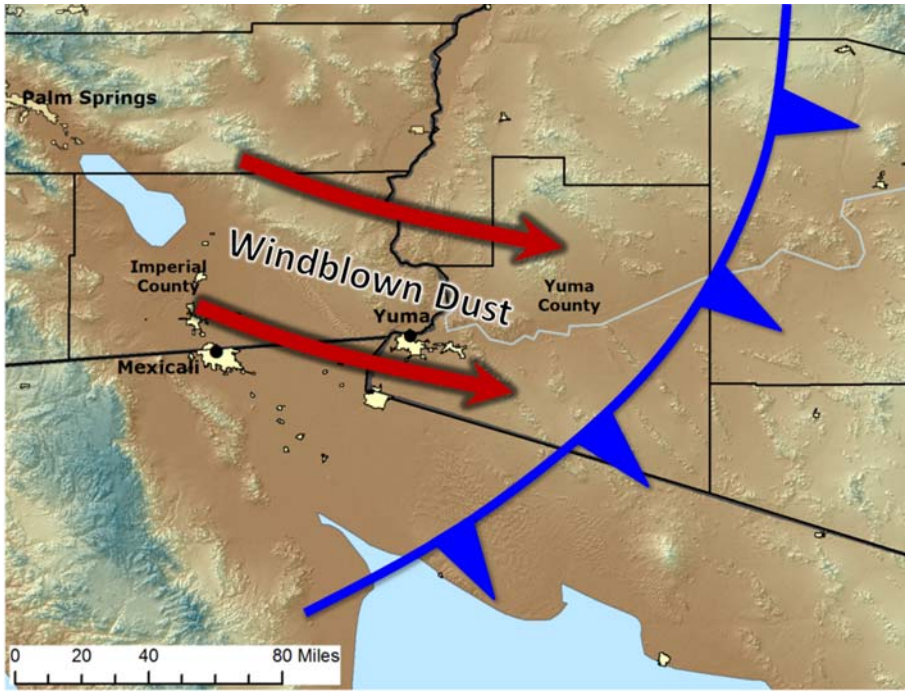


Figure 2-5. West-northwesterly winds associated with a departing cold front transported dust from undeveloped desert lands in southeastern California into the Yuma area on January 10, 2013.

Table 2-1. PM_{10} measurements collected in Arizona and southeastern California on January 10, 2013. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM_{10} ($\mu g/m^3$)	1-hr Max PM_{10} ($\mu g/m^3$)	Time of Max 1-hr PM_{10} (MST)	AQS Qualifier Flag
ARIZONA							
Apache County							
N/A	TEOM	WMAT	04-001-1003-81102-1	16	57	2300	
Maricopa County							
West Phoenix	TEOM	MCAQD	04-013-0019-81102-1	76	227	2200	
Mesa	TEOM	MCAQD	04-013-1003-81102-1	57	222	2200	
North Phoenix	BAM	MCAQD	04-013-1004-81102-1	40	170	2200	
Glendale	TEOM	MCAQD	04-013-2001-81102-1	43	138	2200	
Central Phoenix	TEOM	MCAQD	04-013-3002-81102-4	53	220	2200	
South Scottsdale	GRAV	MCAQD	04-013-3003-81102-1	41	183	2200	
Greenwood	TEOM	MCAQD	04-013-3010-81102-1	70	209	2200	
South Phoenix	TEOM	MCAQD	04-013-4003-81102-1	84	261	2200	
West Chandler	TEOM	MCAQD	04-013-4004-81102-1	53	166	2300	
Tempe	TEOM	MCAQD	04-013-4005-81102-1	53	219	2200	
Higley	TEOM	MCAQD	04-013-4006-81102-1	61	306	2300	
West 43rd Ave	TEOM	MCAQD	04-013-4009-81102-1	83	240	2200	
Dysart	TEOM	MCAQD	04-013-4010-81102-1	42	186	2100	
Buckeye	TEOM	MCAQD	04-013-4011-81102-1	75	252	2100	
Zuni Hills	TEOM	MCAQD	04-013-4016-81102-1	35	182	2100	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	22	N/A	N/A	
Durango Complex	TEOM	MCAQD	04-013-9812-81102-1	102	234	2200	
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	18	67	2300	
Pima County							
Green Valley	TEOM	PCAQCD	04-019-1030-81102-1	12	34	2300	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	95	555	2200	
Apache Junction Fire Station	GRAV	PCAQCD	04-021-3002-81102-1	22	N/A	N/A	
Apache Junction Fire Station	TEOM	PCAQCD	04-021-3002-81102-3	24	72	1800	
Coolidge	GRAV	PCAQCD	04-021-3004-81102-1	41	N/A	N/A	
Pinal Air Park	GRAV	PCAQCD	04-021-3007-81102-1	23	N/A	N/A	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	276	4381	2200	
Combs	TEOM	PCAQCD	04-021-3009-81102-3	50	136	2300	

Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	123	1028	2200	

Table 2-1. PM_{10} measurements collected in Arizona and southeastern California on January 10, 2013. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM_{10} ($\mu g/m^3$)	1-hr Max PM_{10} ($\mu g/m^3$)	Time of Max 1-hr PM_{10} (MST)	AQS Qualifier Flag
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-1	9	N/A	N/A	
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-2	61	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	83	273	2300	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	108	489	2200	
Eloy	GRAV	PCAQCD	04-021-3014-81102-1	54	N/A	N/A	
Yuma County							
Yuma Supersite	**TEOM**	**ADEQ**	**04-027-8011-81102-3**	**229**	**1759**	**1700**	
CALIFORNIA							
Imperial County							
Calexico High School	GRAV	CARB	06-025-0005-81102-1	100	N/A	N/A	IJ
Brawley-Main Street #2	GRAV	ICAPCD	06-025-0007-85101-1	196	N/A	N/A	IJ
El Centro-9th Street	GRAV	ICAPCD	06-025-1003-85101-1	38	N/A	N/A	IJ
El Centro-9th Street	GRAV	ICAPCD	06-025-1003-85101-2	37	N/A	N/A	IJ
Westmorland	GRAV	ICAPCD	06-025-4003-81102-1	144	N/A	N/A	IJ
Niland-English Road	BAM	ICAPCD	06-025-4004-81102-1	91	N/A	N/A	IJ
Niland-English Road	BAM	ICAPCD	06-025-4004-85101-3	146	995	1100	
San Bernardino County							
N/A	GRAV	MDAQMD	06-071-0013-81102-1	6	N/A	N/A	
N/A	GRAV	MDAQMD	06-071-0306-81102-1	21	N/A	N/A	
North Amer Chem Corp	GRAV	MDAQMD	06-071-1234-81102-1	36	N/A	N/A	
Hesperia-Olive Street	GRAV	MDAQMD	06-071-4001-81102-1	13	N/A	N/A	

BAM: Beta Attenuation Monitor
FMIR: Fort McDowell Indian Reservation
FRM: Federal Reference Method
GRAV: Gravimetric Analysis
GRIC: Gila River Indian Community
ICAPCD: Imperial County Air Pollution Control District
IJ: qualifier flag for high winds (for information only)
MCAQD: Maricopa County Air Quality Department
MDAQMD: Mojave Desert Air Quality Management District
PCAQCD: Pinal County Air Quality Control District
PCDEQ: Pima County Department of Environmental Quality
RJ: qualifier flag for high winds (for data exclusion)
SRPMIC: Salt River Pima-Maricopa Indian Community
TEOM: Tapered Element Oscillating Microbalance
WMAT: White Mountain Apache Tribe

3. Causal Relationship

3.1 Discussion

Meteorological and air quality observations indicate that dust carried by gusty winds accompanied by a strong cold front approaching Arizona was directly responsible for the high PM_{10} concentrations observed in Yuma on January 10, 2013. On the afternoon of January 10, a cold front moved southeastward across California and into western Arizona (**Figure 3-1**). A strong pressure gradient associated with this front led to the development of a prolonged period of widespread, gusty, west-southwesterly winds across much of southeastern California and west-northwesterly winds in western Arizona, including the Yuma area. The likely source region for PM_{10} during the January 10, 2013, event was the desert of southeastern California, including the Algodones Dunes, which largely consist of natural, undisturbed desert. Wind speeds over the Algodones Dunes may have also been locally enhanced and winds may have shifted to more of a west-northwesterly direction due to channeling effects from the Chocolate Mountains to the north. The last time Yuma recorded any measurable rainfall leading up to the January 10, 2013, high-wind event was on December 18, 2012, when showers associated with a cold front produced 0.05 inches of rain at the Yuma MCAS. This combination of geography and lack of rainfall preceding the event resulted in a large fetch of soils that were particularly vulnerable to particulate suspension.

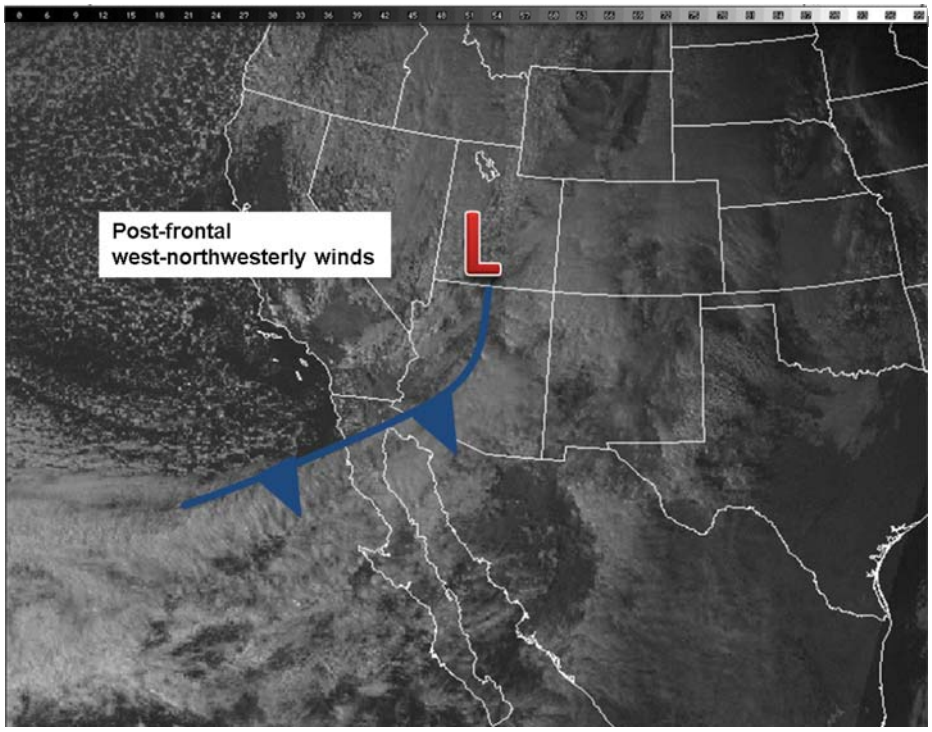


Figure 3-1. Visible satellite image from 16:00 mountain standard time (MST) on January 10, 2013 (GOES-West). A cold front was moving eastward across Arizona. Strong west-northwesterly winds behind this front transported dust and PM_{10} into the Yuma area.

As the cold front moved through the Yuma area, gusty southerly winds shifted to west-northwesterly. **Figures 3-2 through 3-4** illustrate wind, visibility, and PM_{10} data in southern California and southwestern Arizona, including Yuma before, during, and after passage of the cold front. Surface wind measurement data at 12:00 MST on January 10 (Figure 3-2) clearly indicates a wind shift from southerly to west-northwesterly directly west of Yuma. At 17:00 MST on January 10 (Figure 3-3), surface wind measurements showed strong west-southwesterly winds in southeastern California, which were likely locally enhanced and shifted to west-northwesterly by the Chocolate Mountains (red arrow in Figure 3-3), with reduced visibilities and high PM_{10} concentrations in Yuma. At 21:00 MST on January 10 (Figure 3-4), surface wind measurements showed strong west-northwesterly winds, which had now dispersed dust and PM_{10}, drastically reducing PM_{10} concentrations.

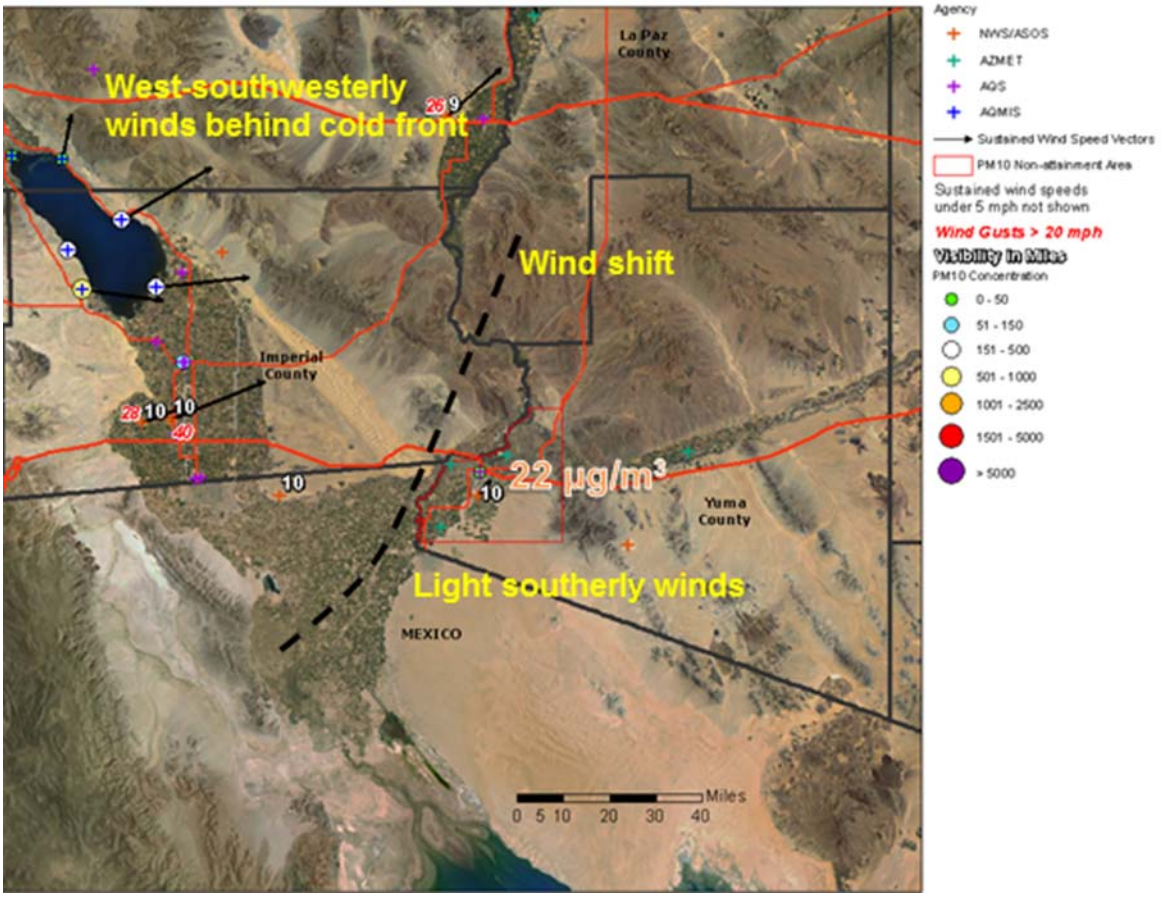


Figure 3-2. Hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts (red numbers), and minimum visibility (white numbers) observations at Yuma and Imperial county monitors between 12:00 MST and 13:00 MST on January 10, 2013. Hourly concentration at the Yuma Supersite monitor is annotated in orange; location of the wind shift is denoted as the dashed black line.

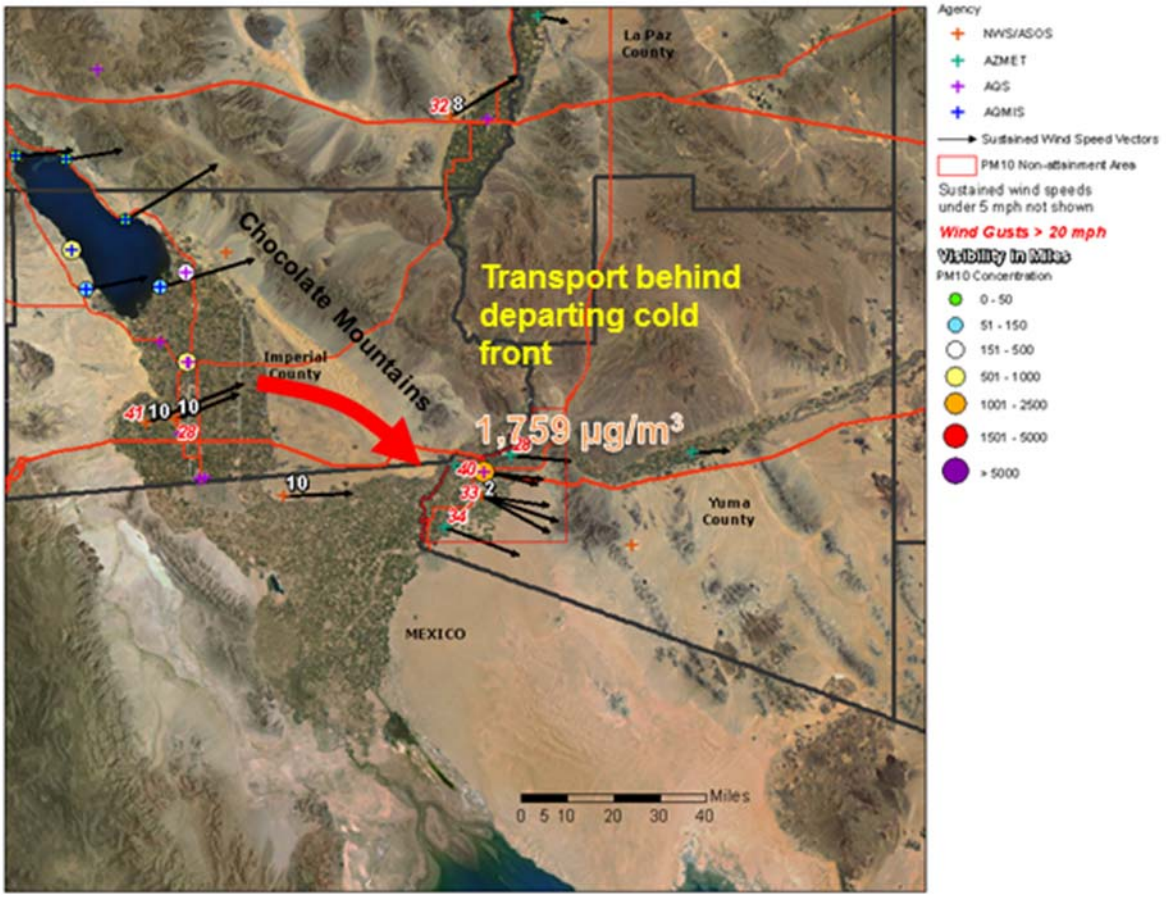


Figure 3-3. Hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts (red numbers), and minimum visibility (white numbers) observations at Yuma and Imperial county monitors between 17:00 MST and 18:00 PST on January 10, 2013. Hourly concentration at the Yuma Supersite monitor is annotated in orange. Funneling effect of the Chocolate Mountains denoted with a red arrow.

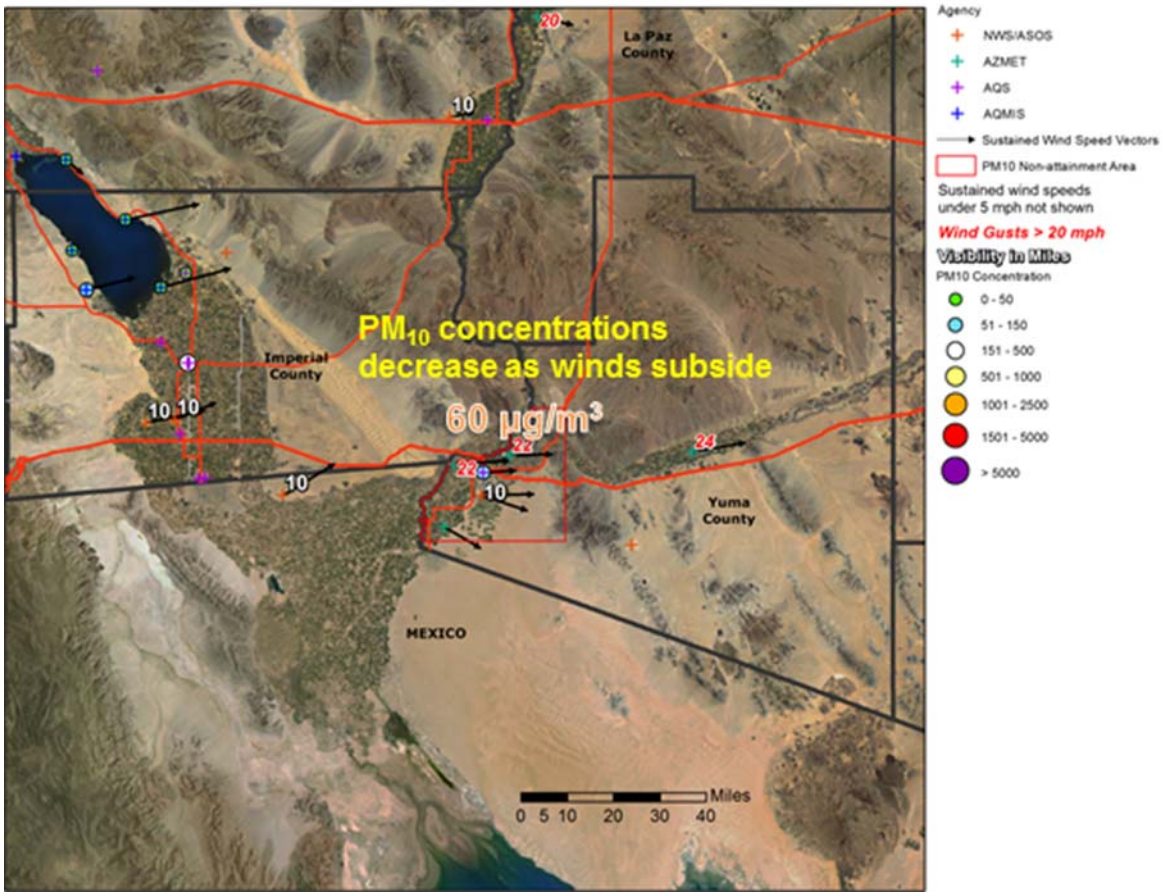


Figure 3-4. Hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts (red numbers), and minimum visibility (white numbers) observations at Yuma and Imperial county monitors between 21:00 MST and 22:00 MST on January 10, 2013. Hourly concentration at the Yuma Supersite monitor is annotated in orange.

A summary of maximum sustained winds and peak wind gusts at monitors in Yuma and Imperial counties is shown in **Table 3-1**, including a peak gust of 47 mph on January 10 at the Imperial County Airport. Monitors in the local Yuma area measured sustained winds of up to 29 mph and wind gusts of up to 41 mph (**Figure 3-5, Figure 3-6,** and Appendix A). Visibility at the Yuma MCAS also decreased significantly with the arrival of the dust (**Figure 3-7**). Furthermore, blowing dust was reported at the Yuma MCAS sites. The distinct periods of high PM_{10} concentrations at the Yuma Supersite monitor were each preceded by a period of high PM_{10} concentrations at the Imperial County monitors, illustrating the west to east progression of this windblown dust event (**Figure 3-8**). The NWS office in Phoenix also issued a Wind Advisory for the Yuma area due to the potential for strong winds and blowing dust during this event (Appendix B).

Table 3-1. Observed wind speeds and wind gusts at Yuma and Imperial county monitors on January 10, 2013. The Yuma Supersite monitor reported a PM_{10} concentration of 1,759 µg/m^3 at 17:00 MST on January 10, 2013, coincident with the peak wind speed and wind gust reported at that monitor.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
Yuma Supersite	17	280 278	18:00 19:00	32	19:00
Roll	15	261	21:00	23	21:00
Yuma North Gila	21	271	19:00	31	19:00
Yuma South	22	287	18:00	34	17:00
Yuma Valley	24	285	17:00	40	17:00
Yuma MCAS	29	290	18:55	41	18:55
Niland-English Road	32	259	14:00	n/a	n/a
Imperial County Airport	34	250	13:53 14:53	47	13:53
El Centro NAF	32	240	11:56	45	14:56

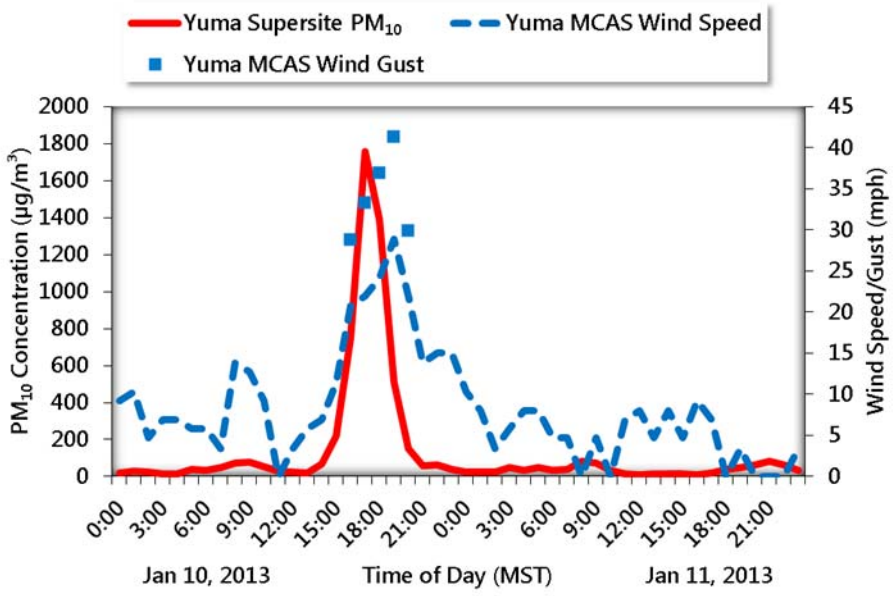


Figure 3-5. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speeds at the Yuma MCAS monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 16:00 MST on January 10, 2013, indicating the arrival of windblown dust.

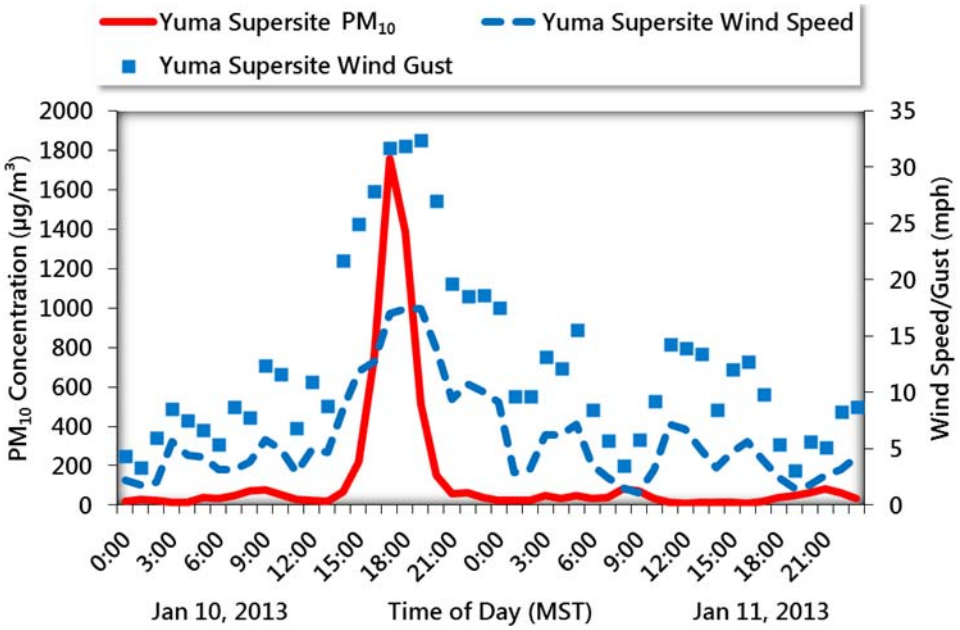


Figure 3-6. Hourly PM_{10} concentrations and wind speeds at the Yuma Supersite monitor January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 16:00 MST on January 10, 2013, indicating the arrival of windblown dust.

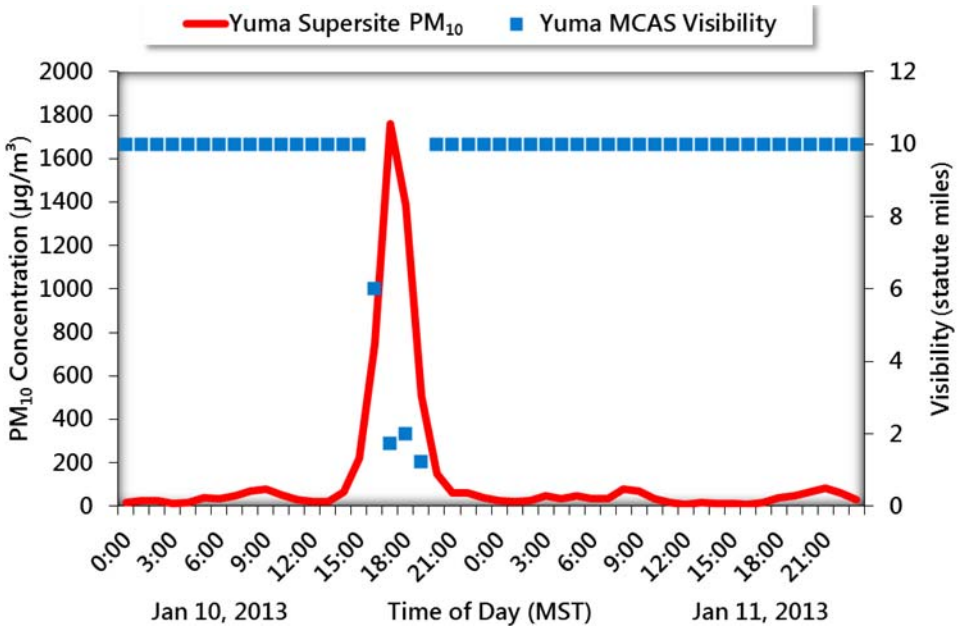


Figure 3-7. Hourly PM_{10} concentrations at the Yuma Supersite monitor and visibility at Yuma MCAS on January 10 and 11, 2013. Visibility was greatly reduced between 16:00 and 19:00 MST, coincident with the sharp increase in PM_{10} concentrations at the Yuma Supersite monitor, indicating the arrival of windblown dust.

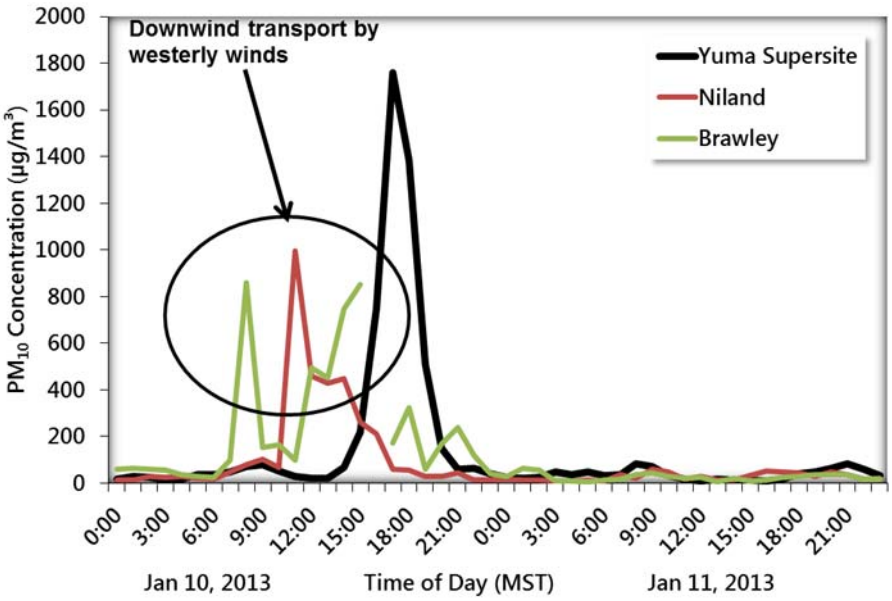


Figure 3-8. Hourly PM_{10} concentrations at the Yuma and Imperial county AQS monitors on January 10 and 11, 2013. High PM_{10} concentrations from windblown dust were reported at all three monitors during the morning and early afternoon hours on January 10; these concentrations were due to windblown dust. Data are unavailable for several hours at the Brawley and Niland monitors, possibly because PM_{10} concentrations were above the valid reporting range of the monitors.

3.2 Summary

The information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM_{10} exceedance measured at the Yuma Supersite monitor on January 10, 2013. The PM_{10}, wind, and visibility data shown in this section illustrate the spatial and temporal representation of the dust storm as it moved through southeastern California and southwestern Arizona. Strong winds likely lofted large amounts of dust and PM_{10} into the lower atmosphere. This dust likely originated in open desert areas of Imperial County, including the Algodones Dunes, and was transported into Yuma following the passage of the cold front. In addition, the time-series plots of air quality and meteorological data found in this section and in Appendix A show that the sharp increase in PM_{10} concentrations coincided with high wind speeds and a wind shift from southerly to west-northwesterly, and that the strong winds were experienced over a large area.

4. Historical Norm

4.1 Analysis

PM_{10} concentrations measured at the Yuma Supersite monitor on January 10, 2013, were unusual and in excess of normal historical fluctuations. The PM_{10} concentrations measured on January 10, 2013, were some of the highest hourly and 24-hr averages measured over the last five years, with hourly concentrations exceeding 1,000 µg/m^3. To establish the severity of this event, PM_{10} concentrations measured on January 10, 2013, were compared to a historical 2008–2013 data set. Time-series plots of the 24-hr average PM_{10} concentrations for the period January 1, 2008, through March 31, 2013, provide a historical perspective of PM_{10} concentrations (**Figure 4-1**). The 24-hr average PM_{10} concentration on January 10, 2013, is the seventh highest daily average during the January 2008 to March 2013 time period and the highest daily average in January through March 2013.

Additionally, time-series plots of the daily maximum 1-hr PM_{10} concentrations were created to provide a deeper understanding of the frequency with which short-term particulate concentrations affect the Yuma area **(Figure 4-2)**. The daily maximum 1-hr PM_{10} concentration on January 10, 2013, is the sixth highest concentration observed in the last five years.

Historical daily cumulative distributions of the 24-hr average and daily maximum 1-hr PM_{10} concentrations were created for the Yuma County monitor for the January 2008 to March 2013 period to provide additional evidence in establishing the severity of this event. **Figures 4-3 and 4-4** show histograms of 24-hr average PM_{10} concentrations and daily maximum 1-hr PM_{10} concentrations at the Yuma County monitor and the corresponding 95th percentile. The 24-hr average PM_{10} concentration and daily maximum 1-hr PM_{10} concentration on January 10, 2013, were above the 95th percentile at the Yuma Supersite monitor. Concentrations in excess of the 95th percentile are considered to be unusual.[1]

4.2 Summary

Given the recorded values and using similar methodology to the one accepted by EPA, it is clear that the PM_{10} levels on January 10, 2013, were outside of normal historical fluctuations. This analysis provides evidence that the event affected air quality on a historic scale.

[1] Excluding days on which concentrations caused by exceptional events exceed the 95th percentile threshold employs a general test of statistical significance and has the effect of ensuring that such concentrations would clearly fall beyond the range of normal expectations for air quality during a particular time of year. Source: "The treatment of Data Influenced by Exceptional Events," 71 FR 12598.

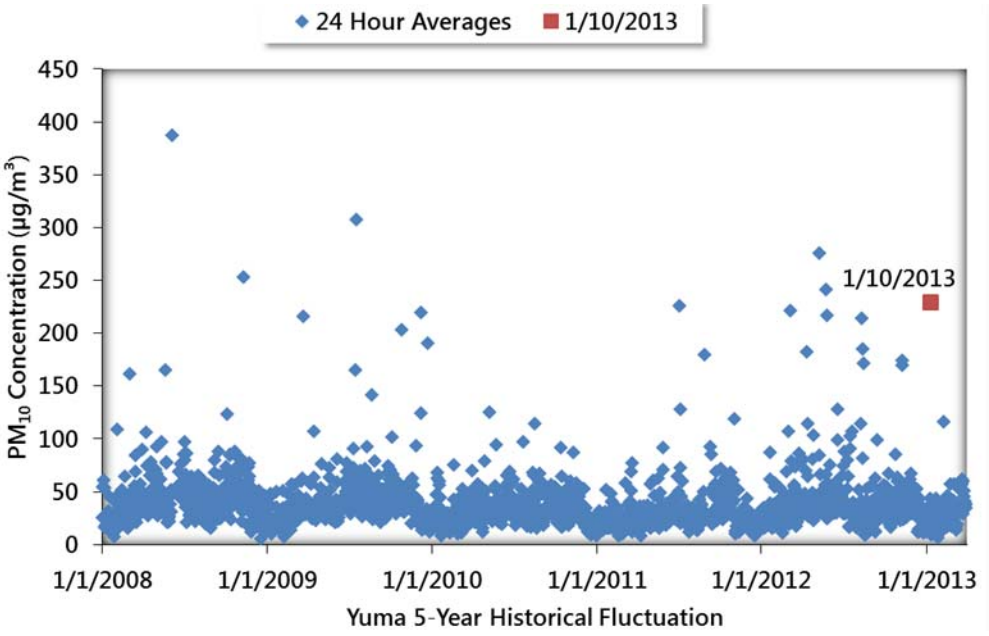


Figure 4-1. 24-hr average PM_{10} concentrations at the Yuma Supersite monitor (2008-2013). The 24-hr average PM_{10} concentration on January 10, 2013, is highlighted by the red square.

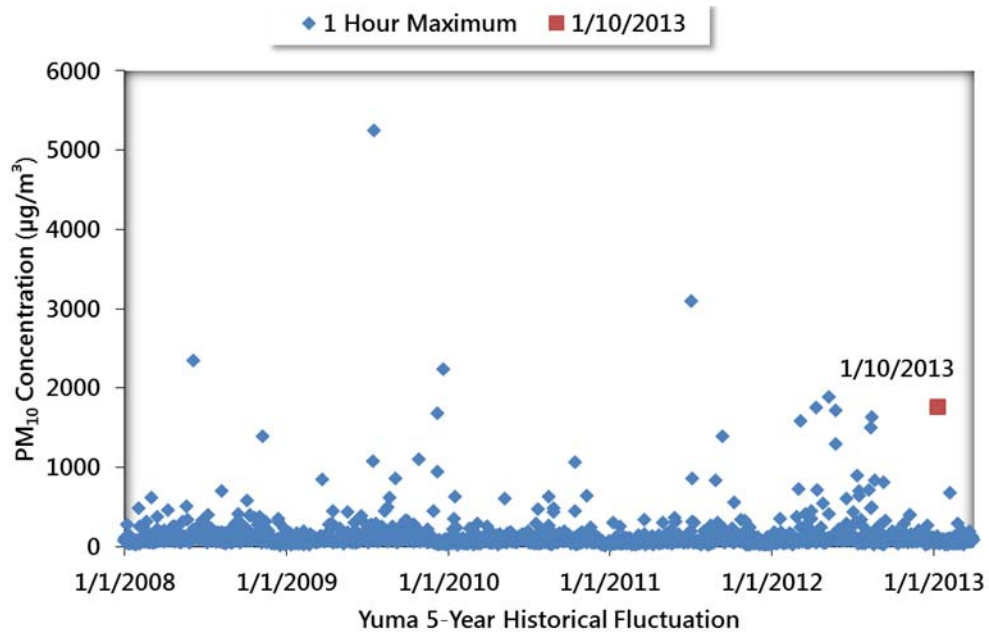


Figure 4-2. Daily maximum 1-hr PM_{10} concentrations at the Yuma Supersite monitor (2008–2013). The daily maximum 1-hr PM_{10} concentration on January 10, 2013, is highlighted by the red square.

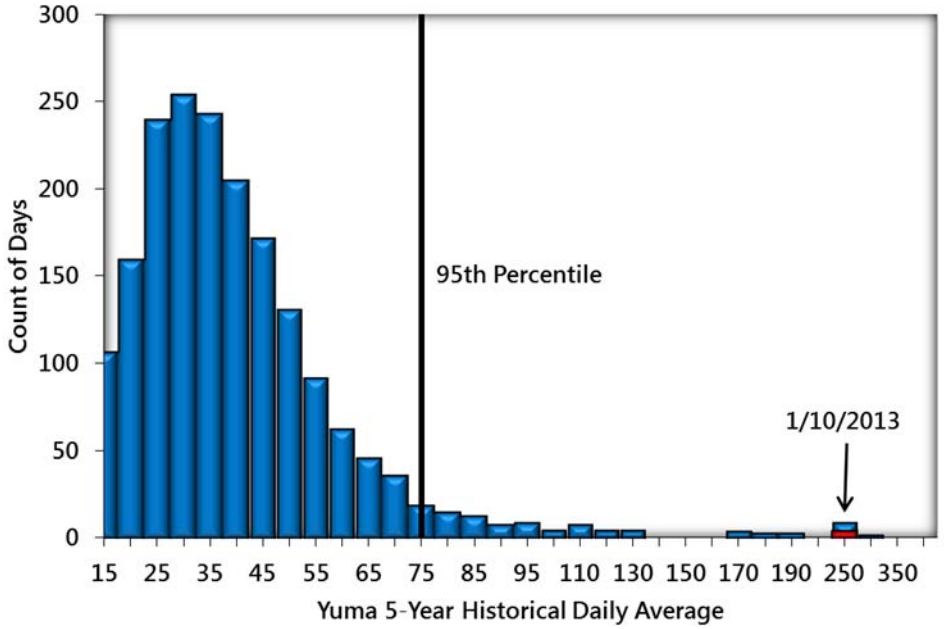


Figure 4-3. 24-hr average PM_{10} concentrations at the Yuma Supersite monitor for 2008-2013. The 24-hr average PM_{10} concentration on January 10, 2013, was in excess of the 95th percentile.

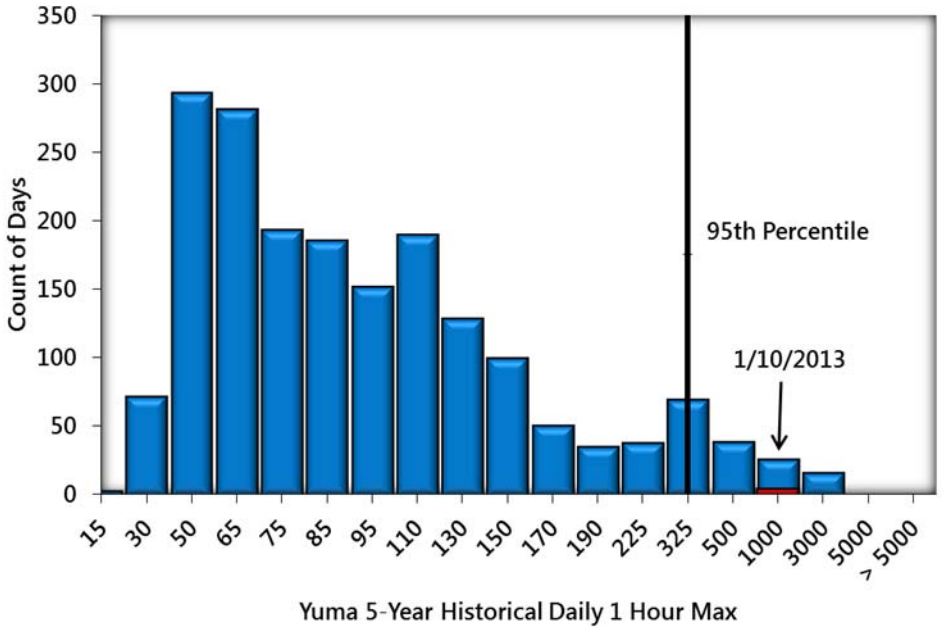


Figure 4-4. Daily maximum 1-hr PM_{10} concentrations at the Yuma Supersite monitor for 2008–2013. The daily maximum 1-hr PM_{10} concentration on January 10, 2013, was in excess of the 95th percentile.

5. Not Reasonably Controllable or Preventable

5.1 Background

Yuma was designated as a moderate PM_{10} nonattainment area by operation of the 1990 Clean Air Act. The nonattainment area is defined in 40 CFR 481.303. ADEQ completed a state implementation plan (SIP) for the area in 1991; however, the plan was found to be incomplete. In 1994, ADEQ updated the plan, identifying additional reasonably available control measures (RACM). In 2001, due to several years of "clean data" and the existence of permanent and enforceable measures, ADEQ began to develop a maintenance plan and a request for redesignation of the area to attainment. The maintenance plan was submitted to EPA in August 2006.

5.1.1 Control Measures

Details of the control measures implemented from 1994 to 2001 are in Appendix G of the 2006 Yuma PM_{10} Maintenance Plan. The control measures are listed in **Table 5-1**.

Table 5-1. Control measures implemented in the Yuma PM_{10} Nonattainment Area, 1994-2001.

Implementing Agency	Reasonably Available Control Measure
City of Yuma	Paving unpaved roads
	Closing unpaved roads
	Chemically stabilizing unpaved roads
	Paving or stabilizing parking lots
	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Dust control plans for land clearing, construction projects
	Stabilizing soil; controlling dust on open lands
	Amending building codes
Town of Somerton	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Dust control plans for land clearing, construction projects
	Stabilizing soil
Yuma County	Paving unpaved roads
	Stabilizing unpaved roads
	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Open Burn Permit Program (rural metro)
Irrigation Districts	Reducing traffic on unpaved roads
AZ Dept. of Transportation	Requiring contractors to adhere to local dust control plans

RACM for 2000 through 2004 can be found in Table 6.3 of the 2006 Yuma PM_{10} Maintenance Plan and are reproduced in part in **Table 5-2**. Chapter 7 of the maintenance plan also contains a list of contingency measures that could be implemented promptly should any violation of the NAAQS for PM_{10} occur.

Table 5-2. Control measures implemented in the Yuma area, 2000–2004.

Implementing Agency	Reasonably Available Control Measure
City of Yuma	Pave unpaved roads
	Pave unpaved alleys
	Pave unpaved vacant land
	Chemically stabilize unpaved roads
	Water shoulders
	Street sweep paved roads
	Install curbs and sidewalks
	Landscape median
	Magnesium chloride on alleys
	Magnesium chloride on city property
Town of Somerton	Water unpaved roads
	Water unpaved shoulders
	Pave unpaved roads
	Weekly cleanup of paved roads, mud, trackout, spills
	Pave unpaved lots
	Landscape shoulders
	Install curbs
	Pave/stabilize unpaved roads
	Chip/seal
	Magnesium chloride on unpaved roads
	Street sweeping
Yuma County	Pave unpaved roads
	Developers add new paved roads
	Chip/seal unpaved roads
	Magnesium chloride unpaved roads
	Street sweeping

Table 5-2. Control measures implemented in the Yuma area, 2000–2004.

Implementing Agency	Reasonably Available Control Measure
Immigration & Naturalization	Water drag roads
	Pipelined
	Maintain 350 “No Trespassing” signs and 50 barricades
	Patrol and water unpaved canal roads
	3 miles posted/barricaded
	Paved 2.5 miles
	2.5 miles fenced off
	Abandoned 3/8 mile
	Lined 8 miles of canal
N. Gila Irrigation District	20 miles posted
Unit B Irrigation District	3 miles posted/barricaded
Bureau of Reclamation	Water 960 miles of canal banks
Marine Corps Air Station	Remove 26 gas vehicles
	Remove 25 gas scooters
	Pave 240,329-ft roadway
	Pave 102,112-ft parking
	Sweeping 717,221-yd runway
	Sweeping 388,952-yd taxiway
	Sweeping 401,090-yd aprons and 121,380-yd other
	Stabilize desert

In 2010, the Yuma Metropolitan Planning Organization (YMPO) updated the Transportation Improvement Plan (TIP) as required to comply with the requirements for transportation conformity under Section 176(c)(2) of the Clean Air Act. The update required a review of control measures included in the 2006 Yuma PM_{10} Maintenance Plan to assure that emissions were within the limits found in both plans for the current review years through the 2016 projected maintenance period. Yuma’s plans related to transportation improvements can be found under “Plans and Reports” at ympo.org.

5.1.2 Additional Measures

On August 18, 2002, Yuma recorded a 24-hr average PM_{10} concentration of 170 µg/m^3, which is in exceedance of the NAAQS. A Natural Events Action Plan (NEAP) was created to address and potentially implement any measures that could prevent future violations of the NAAQS. The option to develop a NEAP is no longer available; however, Yuma reviewed existing measures and developed additional measures that were later incorporated into the 2006 PM_{10} Maintenance Plan. These included

1. a public notification and education program, still in place today, and augmented recently by a pilot flag program for public schools and facilities based on the Yuma Dust Control Action Forecast (Appendices D, E, and F of the 2006 Yuma PM_{10} Maintenance Plan);
2. an analysis of best available control measures (BACM) normally reserved for serious nonattainment areas; and
3. a review of existing control measures for construction sources, street sweepers, paved roads, covered trucks, off-highway vehicles, stationary source opacity limits, other stationary source control measures, and agricultural best management practices (Appendix H of the 2006 Yuma PM_{10} Maintenance Plan).

In 2002, ADEQ met with Yuma stakeholders and began work on the development of a Yuma Agricultural Best Management Practices (AgBMP) rule. The rule became effective July 18, 2005, as R18-2-613 of the Arizona Administrative Code, and was submitted to EPA on August 16, 2006.

5.1.3 Review of Source-Permitted Inspections and Public Complaints

ADEQ's Arizona Unified Repository for Information Tracking of the Environment (AZURITE) database was queried to compile a list of inspections for the permitted sources in the Yuma area around the time of the January 10, 2013, PM_{10} exceedance. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. During the time period of January 7 through January 12, 2013, ADEQ inspectors conducted two routine inspections of permitted sources.

5.2 Forecasts and Warnings

Dust forecasts were released prior to the event by both ADEQ and the NWS office in Phoenix (Appendix B). The ADEQ Yuma and Vicinity Dust Control Action Forecast issued on Wednesday, January 9, 2013, stated that "winds out of the southwest around 15-25 mph, gusting to 35 mph at times, could generate some pockets of blowing dust across the drier parts of the desert." The NWS issued a Wind Advisory on Wednesday, January 9, 2013, warning of the potential for strong winds with sustained wind speeds of between 35 and 45 mph, wind gusts of up to 50 mph, and reduced visibilities due to windblown dust in the Yuma area between 14:00 and 20:00 MST on Thursday, January 10, 2013.

5.3 Wind Observations

Wind data during the event were available at five Yuma-area monitors, including one AQS site, one NWS site, and three AZMET sites (Figure 3-3 and Appendix A). Sustained wind speeds of up to 29 mph were reported at the Yuma MCAS during the event. The Yuma South and Yuma North Gila sites also reported sustained wind speeds of over 25 mph. A peak wind gust of 41 mph was reported at the Yuma MCAS site. Sustained winds in excess of 30 mph were also reported at Imperial County monitors. Sustained wind speeds of over 25 mph are normally sufficient to overcome most PM_{10} control measures.

5.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that strong winds behind a departing cold front caused uncontrollable PM_{10} emissions. The RACM outlined in the Yuma PM_{10} Maintenance Plan were in place at the time of the event. These control measures are required for areas designated as Moderate non-attainment for PM_{10}, such as Yuma County. Thus, the RACM in place at the time of the event were reasonable. In addition, surface wind measurements in the Yuma area during the event were high enough (at or above 25 mph, with wind gusts over 40 mph) that most reasonable PM_{10} control measures would have been overwhelmed.

6. But-For Analysis

6.1 Discussion

Section 50.14(c)(3)(iv)(D) in 40 CFR Part 50 requires that an exceptional event demonstration satisfies 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, in regard to the PM_{10} exceedance at the Yuma Supersite monitor on January 10, 2013,

- the exceedance was not reasonably controllable or preventable, and
- there was a clear causal relationship between PM_{10} transported by strong west-northwesterly winds originating in desert areas outside the Yuma PM_{10} Nonattainment Area and the measured PM_{10} exceedance in Yuma.

The weight of evidence in these sections demonstrates that, but for the existence of dust emissions generated by strong winds behind a departing cold front and the associated transport of PM_{10}, there would have been no exceedance of the NAAQS for 24-hr average PM_{10}.

As shown in Section 3, time-series plots of PM_{10} and wind speeds establish a clear causal relationship between the arrival of dust-laden winds and elevated PM_{10} concentrations at the Yuma Supersite monitor. Multiple independent measurements of wind speed, wind direction, and visibility all point to the presence of west-northwesterly winds as the mechanism for transport of PM_{10} into the Yuma PM_{10} Nonattainment Area. High PM_{10} concentrations and gusty winds were also reported in other parts of Arizona and southeastern California, illustrating the widespread, regional nature of this event. In addition, PM_{10} concentrations were well below the NAAQS on days immediately before and after the windblown dust event. The source regions for the PM_{10} are clearly identified as open desert areas in Imperial County, including the Algodones Dunes, located west-northwest of the Yuma PM_{10} Nonattainment Area. The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of January 10, 2013, to any causal source except PM_{10} transported by west-northwesterly winds, confirming that there would have been no exceedance but for the presence of these uncontrollable natural events.

As detailed in Section 5, all reasonable control measures were in place and/or implemented on a continual basis. Air quality-related inspection and compliance data revealed no violations or complaints within three days before and after the time of the event. Local regulatory agencies, industry, and the general public were alerted to the possibility of dust storms due to strong winds behind a cold front via daily forecasts and media reports.

6.2 Summary

The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of January 10, 2013, to any causal source except PM_{10} transported by west-northwesterly winds, confirming that there would have been no exceedance but for the presence of these uncontrollable natural events.

7. Conclusions

The PM_{10} exceedance that occurred on January 10, 2013, satisfies the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j) that
   a. the event affected air quality,
   b. the event was not reasonably controllable or preventable, and
   c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
2. There is a clear causal relationship between the measurement(s) under consideration and the event;
3. The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
4. There would have been no exceedance or violation but for the event.

7.1 Affects Air Quality

As stated in the preamble to the EER, 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.

7.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 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 Yuma County, high winds overwhelmed all reasonably available controls. The PM_{10} exceedance discussed in this report was caused by naturally occurring west-northwesterly winds that transported dust into Yuma County from areas largely outside the Yuma PM_{10} Nonattainment Area. These facts provide strong evidence that the PM_{10} exceedance on January 10, 2013, was not reasonably controllable or preventable.

7.3 Natural Event

As discussed above, the PM_{10} exceedance in Yuma on January 10, 2013, was shown to be caused by transport of PM_{10} into Yuma by west-northwesterly winds behind a departing cold front. The event therefore qualifies as a natural event.

7.4 Clear Causal Relationship

The following points demonstrate that the high PM_{10} concentrations were caused by windblown dust:

- Time-series of PM_{10} concentrations show that the timing of high PM_{10} at the Yuma Supersite was consistent with gusty winds and low visibilities at Yuma-area meteorological stations (Section 3).
- High PM_{10} concentrations and gusty winds were reported in Yuma County, Arizona, and Imperial County, California, illustrating the widespread, regional, and uncontrollable nature of this event (Section 3).
- PM_{10} concentrations were well below the NAAQS on days immediately before and after the windblown dust event (Section 3).
- Dry conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by high winds (Section 3).

7.5 Historical Norm

The 24-hr average and daily 1-hr maximum PM_{10} values measured at the Yuma Supersite monitor were historically unusual compared to a multi-year data set (Section 4).

7.6 Not Reasonably Preventable

PM_{10} control and prevention measures were in place in the Yuma PM_{10} Nonattainment Area at the time of the event. Measured wind speeds and wind gusts were of sufficient strength to overcome reasonable control measures (Section 5).

7.7 But For

On the basis of the weight of evidence described above and in Section 6, the exceedance of the federal 24-hr PM_{10} standard on January 10, 2013, at the Yuma Supersite monitor would not have occurred but for the period of west-northwesterly winds that transported dust from open desert areas of Imperial County, including the Algodones Dunes, into the Yuma PM_{10} Nonattainment Area.

Appendix A:
Air Quality and Meteorological Data for Yuma County

This section contains time-series of air quality and meteorological data for Yuma and other regional monitors on January 10 and 11, 2013. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Yuma.

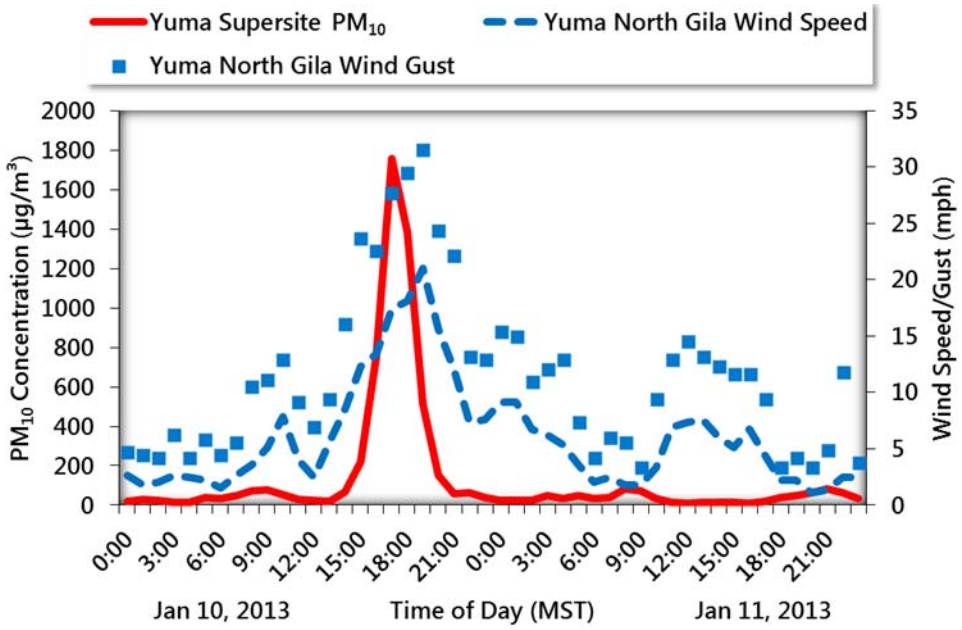


Figure A-1. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speeds at the Yuma North Gila monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 16:00 MST on January 10, 2013, indicating the arrival of windblown dust.

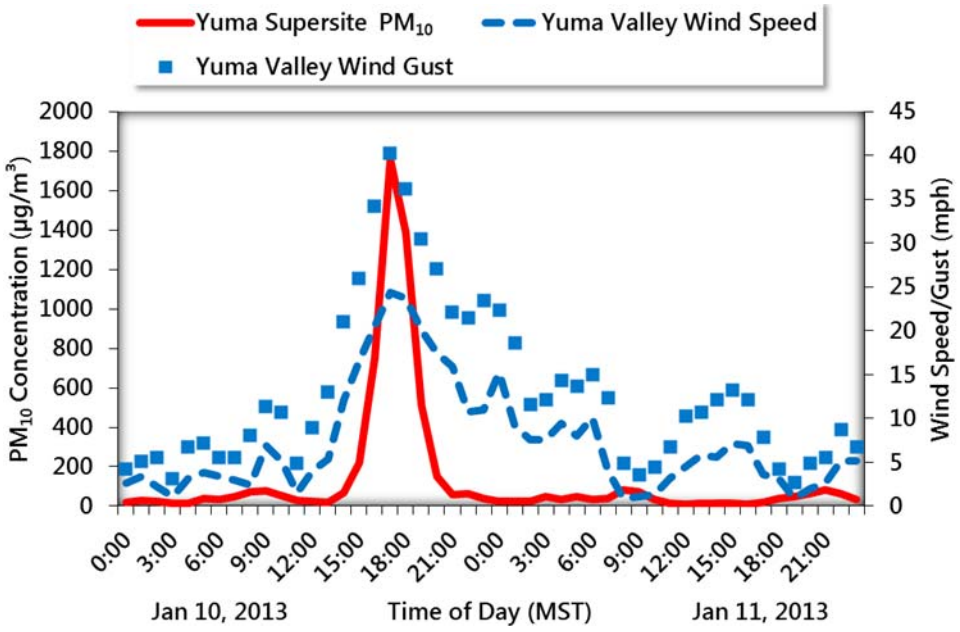


Figure A-2. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speeds at the Yuma Valley monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 16:00 MST on January 10, 2013, indicating the arrival of windblown dust.

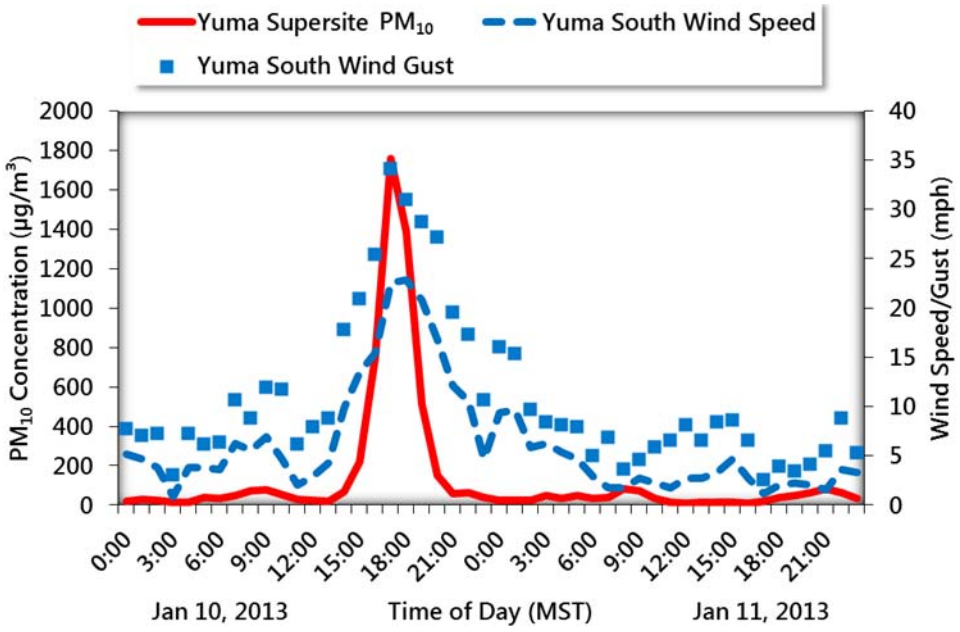


Figure A-3. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speeds at the Yuma South monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 16:00 MST on January 10, 2013, indicating the arrival of windblown dust.

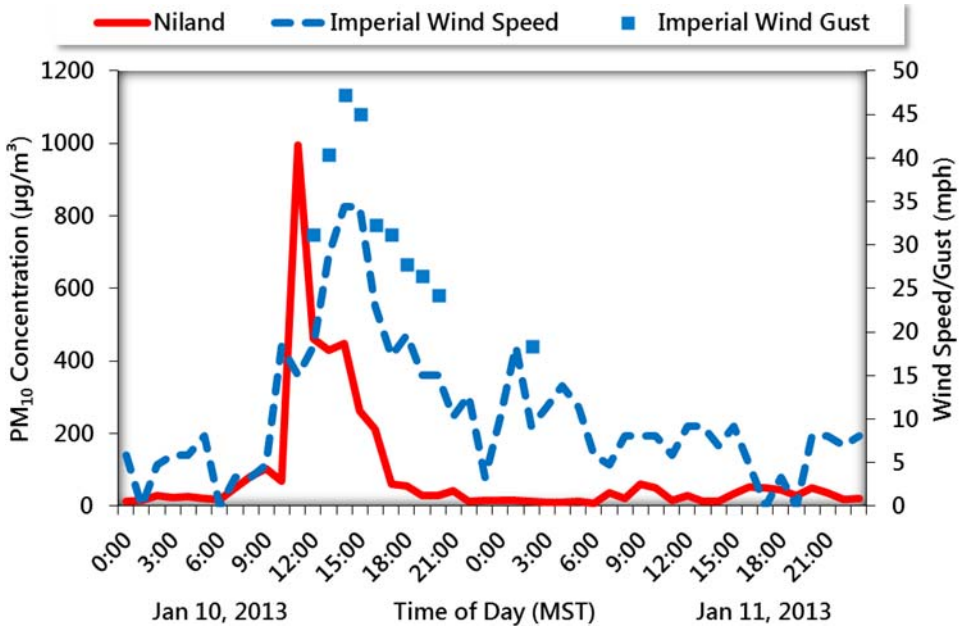


Figure A-4. Hourly PM_{10} concentrations at the Niland AQS monitor and wind speeds at the Imperial County airport on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 11:00 MST on January 10, 2013, indicating the arrival of windblown dust.

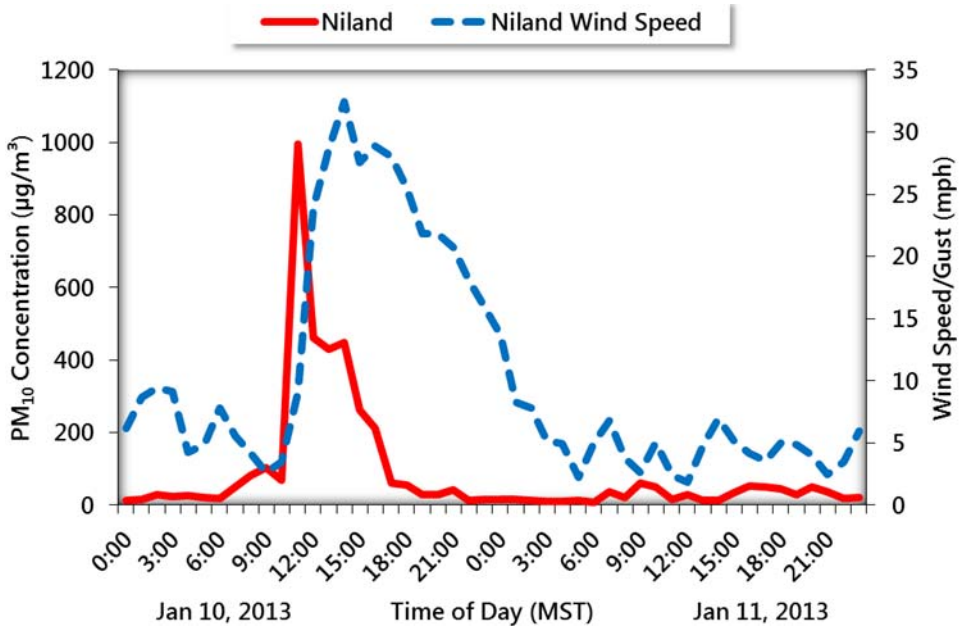


Figure A-5. Hourly PM_{10} concentrations and wind speeds at the Niland AQS monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 11:00 MST on January 10, 2013, indicating the arrival of windblown dust.

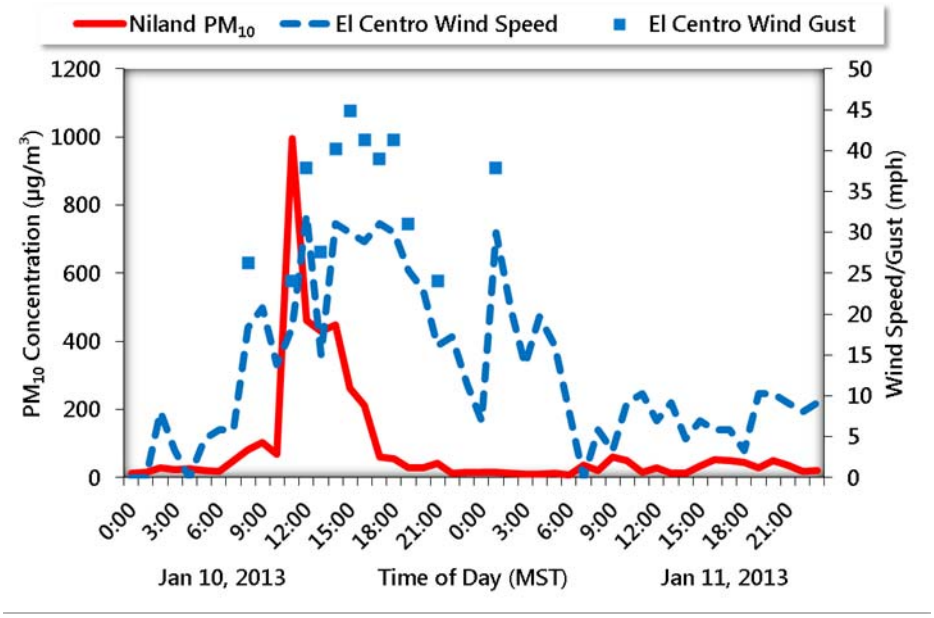


Figure A-6. Hourly PM_{10} concentrations at the Niland AQS monitor and wind speeds at the El Centro monitor on January 10 and 11, 2013. PM_{10} concentrations and wind speeds sharply increased at 11:00 MST on January 10, 2013, indicating the arrival of windblown dust.

U.S. Department of Commerce
National Oceanic &
Atmospheric Administration

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
YUMA MCAS (03145), YUMA, AZ (01/10/2013)

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: 213 ft. above sea level **Latitude:** 32.65 **Longitude:** -114.616 **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
10	0055	5	BKN200	10.00		51	10.6	42	5.7	31	-0.6	46	10	150		29.71			29.93	AA		29.94
10	0155	5	BKN200	10.00		53	11.7	43	6.2	31	-0.6	43	5	170		29.70			29.92	AA		29.93
10	0255	5	OVC200	10.00		53	11.7	43	6.1	30	-1.1	41	7	180		29.69			29.91	AA		29.92
10	0355	5	OVC200	10.00		53	11.7	43	6.1	30	-1.1	41	7	180		29.69			29.91	AA		29.92
10	0455	5	OVC200	10.00		52	11.1	42	5.6	29	-1.7	41	6	130		29.67			29.89	AA		29.90
10	0555	5	OVC200	10.00		50	10.0	42	5.4	31	-0.6	48	6	060		29.66			29.88	AA		29.89
10	0655	5	OVC200	10.00		51	10.6	42	5.3	29	-1.7	43	3	050		29.65			29.88	AA		29.88
10	0755	5	BKN200	10.00		58	14.4	45	6.9	27	-2.8	31	14	150		29.63			29.86	AA		29.86
10	0855	5	SCT100 BKN150 BKN200	10.00		59	15.0	43	6.3	21	-6.1	23	13	150		29.64			29.87	AA		29.87
10	0955	5	FEW100 BKN150 BKN200	10.00		57	13.9	46	7.5	32	0.0	39	9	290		29.68			29.91	AA		29.91
10	1055	5	FEW100 BKN150 BKN200	10.00		59	15.0	47	8.3	33	0.6	38	0	000		29.69			29.92	AA		29.92
10	1155	5	FEW080 BKN150 BKN200	10.00		61	16.1	51	10.7	42	5.6	50	3	300		29.65			29.87	AA		29.88
10	1255	5	FEW060 SCT100 SCT150	10.00		62	16.7	54	12.2	47	8.3	58	6	220		29.61			29.84	AA		29.84
10	1355	5	FEW060 SCT100 BKN150	10.00		63	17.2	54	12.4	47	8.3	56	7	260		29.61			29.83	AA		29.84
10	1455	5	SCT060 SCT100 BKN150	10.00		64	17.8	52	11.0	40	4.4	42	11	270		29.60			29.83	AA		29.83
10	1555	5	SCT060 SCT100 BKN150	6.00	BLDU	61	16.1	48	9.0	34	1.1	36	21	300	29	29.62			29.85	AA		29.85
10	1646	5	SCT060 SCT100 BKN150	1.75	BLDU	61	16.0	48	9.0	34	1.0	36	22	290	31	29.63			M	SP		29.86
10	1653	5	SCT060 SCT100 BKN150	2.00	BLDU	61	16.0	48	9.0	34	1.0	36	20	290	32	29.64			M	SP		29.87
10	1655	5	SCT060 SCT100 BKN150	2.00	BLDU	59	15.1	45	7.4	28	-2.0	31	20	280	32	29.64			29.86	AA		29.87
10	1708	5	SCT060 SCT100 BKN150	1.75	BLDU	59	15.0	44	6.9	25	-4.0	27	22	300	33	29.64			M	SP		29.87
10	1755	5	SCT060 SCT100 BKN150	1.50	BLDU	57	13.9	43	6.1	24	-4.4	28	23	290	31	29.63			29.86	AA		29.86
10	1807	5	SCT060 SCT100 BKN150	2.00	BLDU	57	14.0	42	5.7	21	-6.0	25	24	300	37	29.63			M	SP		29.86
10	1828	5	SCT060 SCT100 BKN150	3.00	BLDU	55	13.0	41	5.1	21	-6.0	27	24	300	33	29.64			M	SP		29.87
10	1837	5	SCT060 SCT100 BKN150	1.75	BLDU	55	13.0	41	5.1	21	-6.0	27	26	280	38	29.64			M	SP		29.87
10	1855	5	SCT060 SCT100 BKN150	1.25	BLDU	56	13.3	42	5.6	22	-5.6	27	29	290	41	29.65			29.87	AA		29.88
10	1922	5	SCT060 SCT100 BKN150	3.00	BLDU	55	13.0	41	5.1	21	-6.0	27	26	290	36	29.66			M	SP		29.89
10	1955	5	SCT060 SCT100 BKN150	10.00	BLDU	53	11.7	41	5.0	24	-4.4	32	22	280	30	29.67			29.90	AA		29.90
10	2055	5	FEW150 SCT200	10.00		51	10.6	41	4.8	26	-3.3	38	14	290		29.71			29.93	AA		29.94
10	2155	5	FEW150 SCT200	10.00		50	10.0	41	5.0	29	-1.7	44	15	270		29.74			29.96	AA		29.97
10	2255	5	FEW200	10.00		49	9.4	41	4.9	30	-1.1	48	15	280		29.75			29.98	AA		29.98
10	2355	5	FEW200	10.00		49	9.4	41	4.9	30	-1.1	48	10	290		29.77			29.99	AA		30.00

Figure A-7. Quality-controlled local climatological data hourly observations table for Yuma MCAS (03145), Yuma, AZ (01/10/2013). Note in the Weather Type column that BLDU (blowing dust) was reported, coincident with gusty, very strong winds and low visibilities. Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

U.S. Department of Commerce
National Oceanic &
Atmospheric Administration

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
NAF (23199), EL CENTRO, CA (01/10/2013)

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: -42 ft. above sea level **Latitude:** 32.816 **Longitude:** -115.683 **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
10	0056	5	CLR	10.00		52	11.1	45	7.2	37	2.8	57	8	140		29.94			29.95	AA		29.90
10	0156	5	CLR	10.00		50	10.0	44	6.7	37	2.8	61	3	100		29.93			29.93	AA		29.89
10	0256	5	CLR	10.00		48	8.9	42	5.4	34	1.1	59	0	000		29.92			29.92	AA		29.88
10	0356	5	CLR	10.00		47	8.3	41	5.1	34	1.1	61	5	080		29.91			29.91	AA		29.87
10	0456	5	CLR	10.00		48	8.9	43	5.9	36	2.2	63	6	320		29.90			29.91	AA		29.86
10	0556	5	CLR	10.00		56	13.3	48	8.8	39	3.9	53	6	210		29.92			29.92	AA		29.88
10	0656	5	SCT120 BKN200	10.00		58	14.4	50	10.0	42	5.6	55	18	250	26	29.93			29.93	AA		29.89
10	0703	5	SCT009	10.00		57	14.0	50	10.0	43	6.0	60	18	260	25	29.92			M	SP		29.88
10	0756	5	SCT120 BKN200	10.00		60	15.6	51	10.3	41	5.0	50	21	230		29.94			29.94	AA		29.90
10	0856	5	FEW060 BKN120 BKN200	10.00		61	16.1	51	10.7	42	5.6	50	14	230		29.94			29.94	AA		29.90
10	0956	5	FEW060 BKN120 BKN200	10.00		62	16.7	53	11.5	44	6.7	52	18	230	24	29.92			29.92	AA		29.88
10	1056	5	FEW060 SCT120 BKN150	10.00		65	18.3	54	12.0	43	6.1	45	32	240	38	29.90			29.91	AA		29.86
10	1156	5	SCT060 BKN150	10.00		64	17.8	52	11.0	40	4.4	42	15	250	28	29.91			29.91	AA		29.87
10	1256	5	CLR	10.00		63	17.2	50	9.9	36	2.2	37	31	240	40	29.90			29.91	AA		29.86
10	1356	5	FEW060 BKN200	10.00		62	16.7	47	8.4	29	-1.7	29	30	240	45	29.90			29.91	AA		29.86
10	1456	5	SCT040 BKN200	10.00		60	15.6	46	7.5	27	-2.8	28	29	250	41	29.92			29.93	AA		29.88
10	1556	5	SCT030	10.00		57	13.9	44	6.5	26	-3.3	30	31	250	39	29.94			29.94	AA		29.90
10	1656	5	SCT030	10.00		55	12.8	43	5.9	26	-3.3	33	30	250	41	29.96			29.96	AA		29.92
10	1756	5	SCT030	10.00		54	12.2	42	5.7	26	-3.3	34	25	250	31	29.96			29.97	AA		29.92
10	1856	5	SCT030	10.00		52	11.1	42	5.6	29	-1.7	41	23	250		29.97			29.98	AA		29.93
10	1956	5	CLR	10.00		49	9.4	41	4.7	29	-1.7	46	16	290	24	30.01			30.01	AA		29.97
10	2056	5	CLR	10.00		49	9.4	41	4.9	30	-1.1	48	17	260		30.02			30.03	AA		29.98
10	2156	5	CLR	10.00		47	8.3	40	4.3	30	-1.1	52	11	260		30.03			30.03	AA		29.99
10	2256	5	CLR	10.00		46	7.8	39	3.8	29	-1.7	52	7	250		30.05			30.05	AA		30.01
10	2356	5	CLR	10.00		51	10.6	40	4.5	24	-4.4	35	30	270	38	30.05			30.06	AA		30.01

Figure A-8. Quality-controlled local climatological data hourly observations table for the NAF (23199), El Centro, CA (01/10/2013). Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

U.S. Department of Commerce
National Oceanic &
Atmospheric Administration

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
IMPERIAL COUNTY AIRPORT (03144), IMPERIAL, CA (01/10/2013)

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: -58 ft. above sea level **Latitude:** 32.834 **Longitude:** -115.578 **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
10	0053	12	CLR	10.00		51	10.6	43	6.1	33	0.6	50	5	150		29.97			29.91	AA		29.91
10	0153	12	CLR	9.00		52	11.1	44	6.6	34	1.1	50	6	130		29.95			29.89	AA		29.89
10	0253	12	CLR	10.00		50	10.0	44	6.4	36	2.2	59	6	110		29.93			29.87	AA		29.87
10	0353	12	CLR	10.00		50	10.0	44	6.7	37	2.8	61	8	150		29.92			29.86	AA		29.86
10	0453	12	CLR	10.00		48	8.9	44	6.5	39	3.9	71	0	000		29.93			29.86	AA		29.87
10	0553	12	CLR	10.00		49	9.4	45	7.1	40	4.4	71	3	110		29.94			29.88	AA		29.88
10	0653	12	CLR	10.00		50	10.0	45	7.1	39	3.9	66	3	330		29.95			29.89	AA		29.89
10	0753	12	CLR	10.00		57	13.9	50	9.7	42	5.6	57	5	260		29.96			29.90	AA		29.90
10	0853	12	CLR	10.00		61	16.1	51	10.7	42	5.6	50	18	260		29.94			29.88	AA		29.88
10	0953	12	CLR	10.00		62	16.7	53	11.5	44	6.7	52	15	250		29.95			29.88	AA		29.89
10	1053	12	SCT065	10.00		65	18.3	54	12.2	44	6.7	47	18	240	31	29.93			29.87	AA		29.87
10	1153	12	CLR	10.00		64	17.8	52	11.0	40	4.4	42	29	250	40	29.89			29.83	AA		29.83
10	1253	12	CLR	10.00		64	17.8	52	10.8	39	3.9	40	34	250	47	29.90			29.83	AA		29.84
10	1353	12	CLR	10.00		62	16.7	48	8.7	31	-0.6	31	34	250	45	29.92			29.85	AA		29.86
10	1453	12	CLR	10.00		60	15.6	46	7.5	27	-2.8	28	23	250	32	29.96			29.90	AA		29.90
10	1553	12	CLR	10.00		58	14.4	45	6.9	27	-2.8	31	17	260	31	29.97			29.91	AA		29.91
10	1653	12	SCT095	10.00		55	12.8	43	6.1	27	-2.8	34	20	250	28	29.98			29.91	AA		29.92
10	1753	12	CLR	10.00		53	11.7	42	5.5	27	-2.8	37	15	250	26	29.98			29.91	AA		29.92
10	1853	12	CLR	10.00		52	11.1	43	5.8	30	-1.1	43	15	260	24	30.00			29.93	AA		29.94
10	1953	12	CLR	10.00		49	9.4	41	4.9	30	-1.1	48	10	260		30.02			29.96	AA		29.96
10	2053	12	CLR	10.00		50	10.0	42	5.4	31	-0.6	48	13	250		30.03			29.97	AA		29.97
10	2153	12	CLR	10.00		49	9.4	41	4.9	30	-1.1	48	3	120		30.05			29.99	AA		29.99
10	2253	12	CLR	10.00		47	8.3	40	4.5	31	-0.6	54	10	240		30.06			30.00	AA		30.00
10	2353	12	CLR	10.00		50	10.0	40	4.3	25	-3.9	38	18	290		30.07			30.01	AA		30.01

Figure A-9. Quality-controlled local climatological data hourly observations table for the Imperial County Airport (03144), Imperial, CA (01/10/2013). Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

Appendix B:
ADEQ and NWS Forecast Products

ADEQ Arizona Department of Environmental Quality

AQI AIR QUALITY INDEX

200 VERY UNHEALTHY (201-300)
150 UNHEALTHY (151-200)
100 UNHEALTHY FOR SENSITIVE GROUPS (101-150)
50 MODERATE (51-100)
GOOD (0-50)

For more information visit: http://www.airnow.gov/index.cfm?action=aqibasics.aqi

LINK TO HISTORICAL AIR POLLUTION EXCEEDANCE DATA FOR YUMA

YUMA AIR QUALITY FORECAST FOR Thursday, January 10, 2013

This report is updated by 1:00 p.m. Sunday thru Friday and is valid for areas within and bordering the city of Yuma, Arizona

FORECAST DATE NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY Tue 01/08/2013 AQI Reading/Category (Preliminary data only)	TODAY Wed 01/09/2013	TOMORROW Thu 01/10/2013	EXTENDED Fri 01/11/2013
O3*	35 GOOD	35 GOOD	30 GOOD	32 GOOD
PM-10*	28 GOOD	26 GOOD	55 MODERATE	33 GOOD

* O3 = Ozone PM-10 = Particles 10 microns & smaller

"Ozone Health Watch" means that the highest concentration of OZONE may approach the federal health standard.
"PM-10 Health Watch" means that the highest concentration of PM-10 may approach the federal health standard.
"High Pollution Advisory" means that the highest concentration of OZONE or PM-10 may exceed the federal health standard.
"DUST" means that short periods of high PM-10 concentrations caused by outflow from thunderstorms or frontal system passages are possible.

Health Statements	
Wednesday, 01/09/2013	No health impacts are expected.
Thursday, 01/10/2013	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Synopsis and Discussion

Yuma will see daytime highs in the mid 60s through Thursday. There is strong trough of low pressure that may bring clouds to the forecast area Thursday into early Friday. Much cooler air will move in behind the system, dropping daytime temperatures into the mid 50s Friday through Sunday.

Thursday's winds will be out of the southwest around 15-25 mph, gusting to 35 mph at times. This could generate some pockets of blowing dust across the drier parts of the desert. Thus, expect local PM10 concentrations to push into the Moderate range of the Air Quality Index (AQI) on Thursday, dropping back to the Good range by Saturday.

Check back tomorrow for the latest. Until then, have a good day! -J.Paul

POLLUTION MONITOR READINGS FOR Tuesday, January 8, 2013

O3 (OZONE)

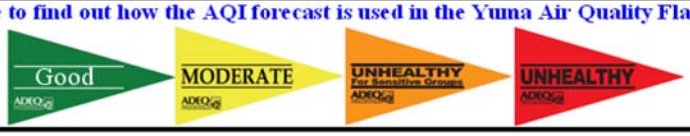
Info on current 8-hour ozone standard: http://www.epa.gov/air/ozonepollution/pdfs/2008_03_aqi_changes.pdf
For archived AQI maps go to: http://www.airnow.gov/index.cfm?action=airnow.maps

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Yuma Supersite	41	35	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (µg/m3)	MAX AQI	AQI COLOR CODE
Yuma Supersite	30.9	28	

Click Here to find out how the AQI forecast is used in the Yuma Air Quality Flag Program



YUMA SUPERSITE POLLUTION MONITOR LOCATION MAP

$$

AZZ020-021-025-026-CAZ031-101215-
/O.NEW.KPSR.WI.Y.0001.130110T2100Z-130111T0300Z/
/O.NEW.KPSR.FZ.A.0001.130112T0800Z-130115T1600Z/
LOWER COLORADO RIVER VALLEY AZ-WEST CENTRAL DESERTS-
YUMA/MARTINEZ LAKE AND VICINITY-SOUTHWEST DESERTS-
LOWER COLORADO RIVER VALLEY CA-
INCLUDING THE CITIES OF...EHRENBERG...PARKER...QUARTZSITE...
SALOME...FORTUNA FOOTHILLS...YUMA...TACNA...WELLTON...BLYTHE
207 PM MST WED JAN 9 2013 /107 PM PST WED JAN 9 2013/

...WIND ADVISORY IN EFFECT FROM 2 PM MST /1 PM PST/ TO 8 PM MST
/7 PM PST/ THURSDAY...
...FREEZE WATCH IN EFFECT FROM LATE FRIDAY NIGHT THROUGH TUESDAY
MORNING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND
ADVISORY...WHICH IS IN EFFECT FROM 2 PM MST /1 PM PST/ TO 8 PM
MST /7 PM PST/ THURSDAY. A FREEZE WATCH HAS ALSO BEEN ISSUED.
THIS FREEZE WATCH IS IN EFFECT FROM LATE FRIDAY NIGHT THROUGH
TUESDAY MORNING.

* AFFECTED WIND AREA...A LARGE PART OF SOUTHWEST ARIZONA INCLUDING
  THE COLORADO RIVER VALLEY...AND PORTIONS OF INTERSTATES 8 AND 10.

* TIMING...INCREASING WIND THURSDAY AFTERNOON...PEAKING TOWARD
  SUNSET.

* WINDS...35 TO 45 MPH WITH ISOLATED GUSTS TO 50 MPH.

* IMPACTS...STRONG CROSSWINDS WITH LOW VISIBILITIES IN BLOWING DUST
  AND SAND COULD CAUSE HAZARDOUS DRIVING CONDITIONS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN
30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND
58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY
FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT
AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER
A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA
CAUTION.

ALSO...A FREEZE WATCH FOR POSSIBLE WIDESPREAD SUB-FREEZING MORNING
TEMPERATURES ON THE DESERTS HAS BEEN POSTED FROM SATURDAY MORNING
THROUGH TUESDAY MORNING. THESE CONDITIONS COULD DESTROY OR DAMAGE
CROPS AND OTHER SENSITIVE VEGETATION.
$$

AZZ020-021-025-026-CAZ031-110200-
/O.CON.KPSR.WI.Y.0001.130110T2100Z-130111T0300Z/
/O.CON.KPSR.FZ.A.0001.130112T0800Z-130115T1600Z/
LOWER COLORADO RIVER VALLEY AZ-WEST CENTRAL DESERTS-
YUMA/MARTINEZ LAKE AND VICINITY-SOUTHWEST DESERTS-
LOWER COLORADO RIVER VALLEY CA-

INCLUDING THE CITIES OF...EHRENBERG...PARKER...QUARTZSITE...
SALOME...FORTUNA FOOTHILLS...YUMA...TACNA...WELLTON...BLYTHE
337 AM MST THU JAN 10 2013 /237 AM PST THU JAN 10 2013/

...WIND ADVISORY REMAINS IN EFFECT FROM 2 PM MST /1 PM PST/ THIS
AFTERNOON TO 8 PM MST /7 PM PST/ THIS EVENING...
...FREEZE WATCH REMAINS IN EFFECT FROM LATE FRIDAY NIGHT THROUGH
TUESDAY MORNING...

A WIND ADVISORY REMAINS IN EFFECT FROM 2 PM MST /1 PM PST/ THIS
AFTERNOON TO 8 PM MST /7 PM PST/ THIS EVENING. A FREEZE WATCH
REMAINS IN EFFECT FROM LATE FRIDAY NIGHT THROUGH TUESDAY MORNING.

* AFFECTED WIND AREA...A LARGE PART OF SOUTHWEST ARIZONA
  INCLUDING THE COLORADO RIVER VALLEY...AND PORTIONS OF
  INTERSTATES 8 AND 1O.

* TIMING...INCREASING WIND THIS AFTERNOON...PEAKING TOWARD SUNSET.

* WINDS...30 TO 40 MPH WITH ISOLATED GUSTS TO 50 MPH.

* IMPACTS...STRONG CROSSWINDS WITH LOW VISIBILITIES IN BLOWING
  DUST AND SAND COULD CAUSE HAZARDOUS DRIVING CONDITIONS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN
30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND
58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY
FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT
AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER
A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA
CAUTION.

ALSO...A FREEZE WATCH FOR POSSIBLE WIDESPREAD SUB-FREEZING
MORNING TEMPERATURES ON THE DESERTS HAS BEEN POSTED FROM SATURDAY
MORNING THROUGH TUESDAY MORNING. THESE CONDITIONS COULD DESTROY
OR DAMAGE CROPS AND OTHER SENSITIVE VEGETATION.