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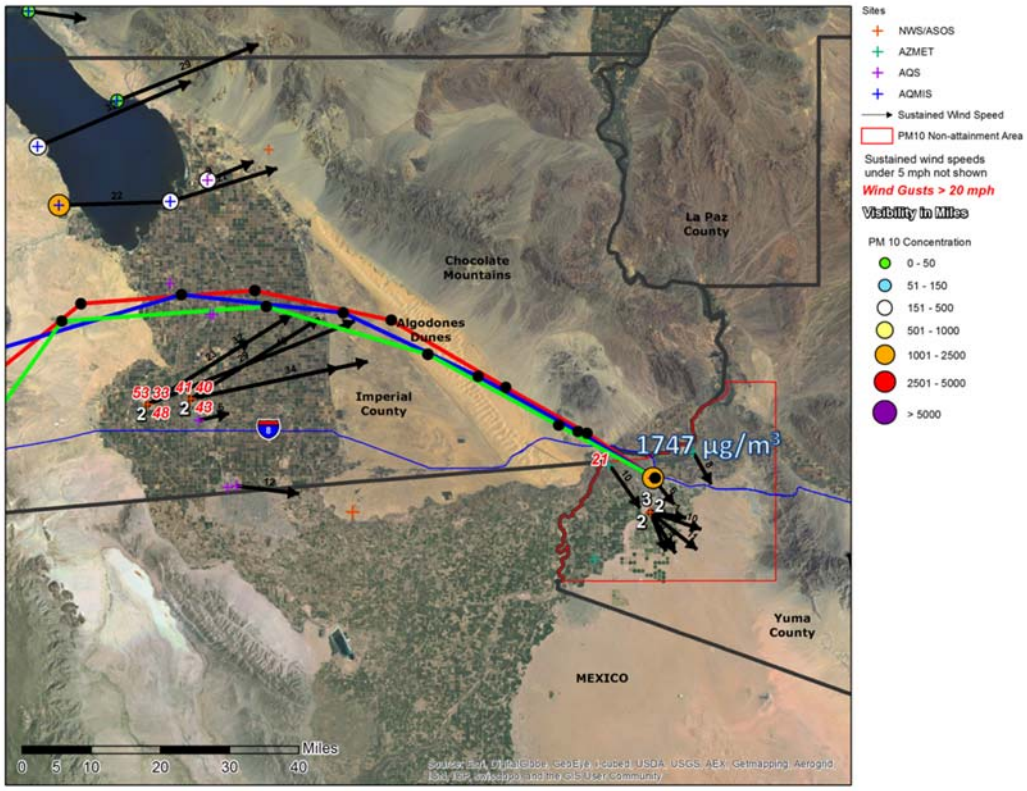
Air Quality Research and Innovative Solutions

State of Arizona Exceptional Event Documentation for the Event of April 11, 2012, for the Yuma County PM_{10} Nonattainment Area



Final Report Prepared for

Arizona Department of Environmental Quality
Phoenix, AZ

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State of Arizona Exceptional Event Documentation for the Event of April 11, 2012, for the Yuma County PM_{10} Nonattainment Area

Final Report

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Cover graphic illustrates transport of PM_{10} from open sand areas in Imperial County, CA, into Yuma, AZ, during the early morning hours of April 11, 2012. 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 April 11, 2012, the Yuma Supersite monitor recorded a 24-hr average PM_{10} concentration of 181 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, 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 windblown dust event that occurred on April 11, 2012, 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 April 11, 2012, 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 that help illustrate that the event of April 11, 2012, produced PM_{10} concentrations in excess of historical normal 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 April 11, 2012, 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 April 11, 2012, 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 advising citizens of the potential for increased winds along with the possibility of blowing dust and an increase in PM_{10} concentrations on April 11, 2012. More information on ADEQ's forecasting program can be found in Section 5.2 of this report. The forecast products that were issued for April 11, 2012, 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 the potential exists for a monitor's reading(s) to 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 September, 2012, to discuss all the days in calendar year 2011 that ADEQ intended to analyze under the EER. The PM_{10} exceedance that occurred at the Yuma Supersite monitor on April 11, 2012, in the Yuma PM_{10} Nonattainment Area was included in the 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 June 30, 2015.

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 501(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 April 11, 2012, 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, are a range of mountains with 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 April 11, 2012, 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 of this demonstration. Three AZMET sites are in operation in the Yuma area, located northeast, west, and southwest of the city. A 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**).

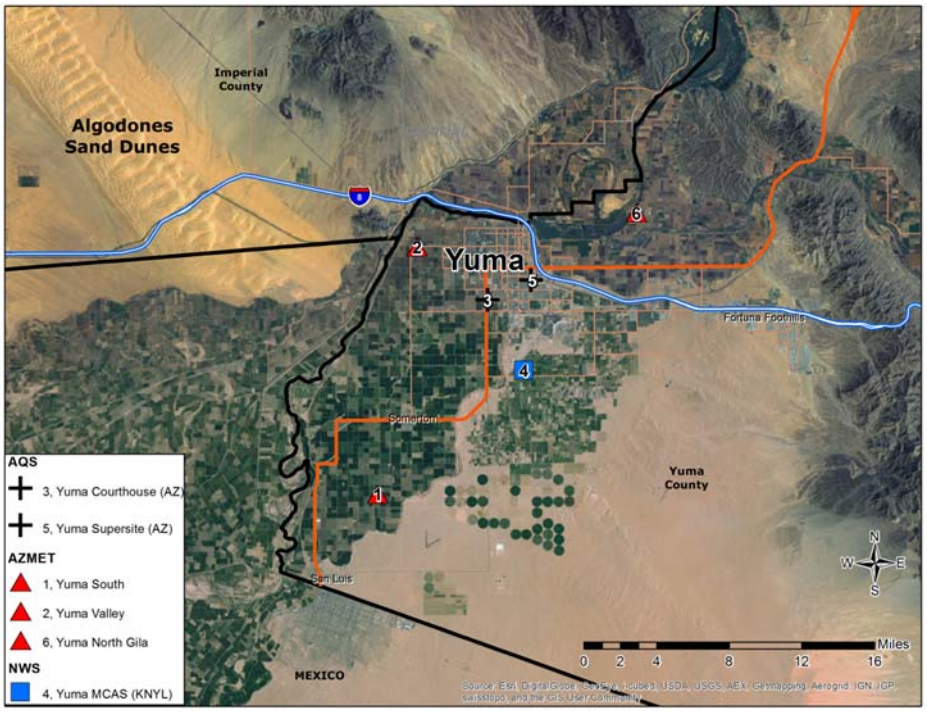

Figure 2-1. Air quality and meteorological monitors in the immediate Yuma region.

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

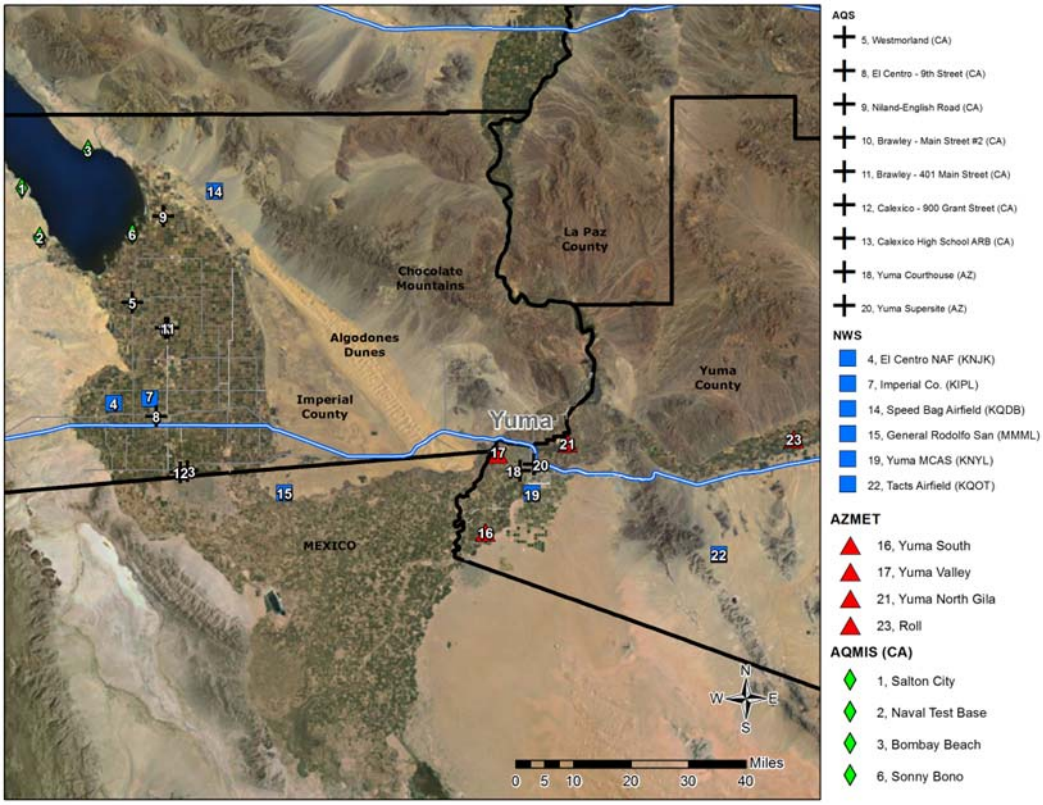

Figure 2-3. Location of air quality and meteorological monitors and relevant geographical features in the Yuma area.

2.2 Climate

Yuma is one of the hottest cities of any size 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 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.

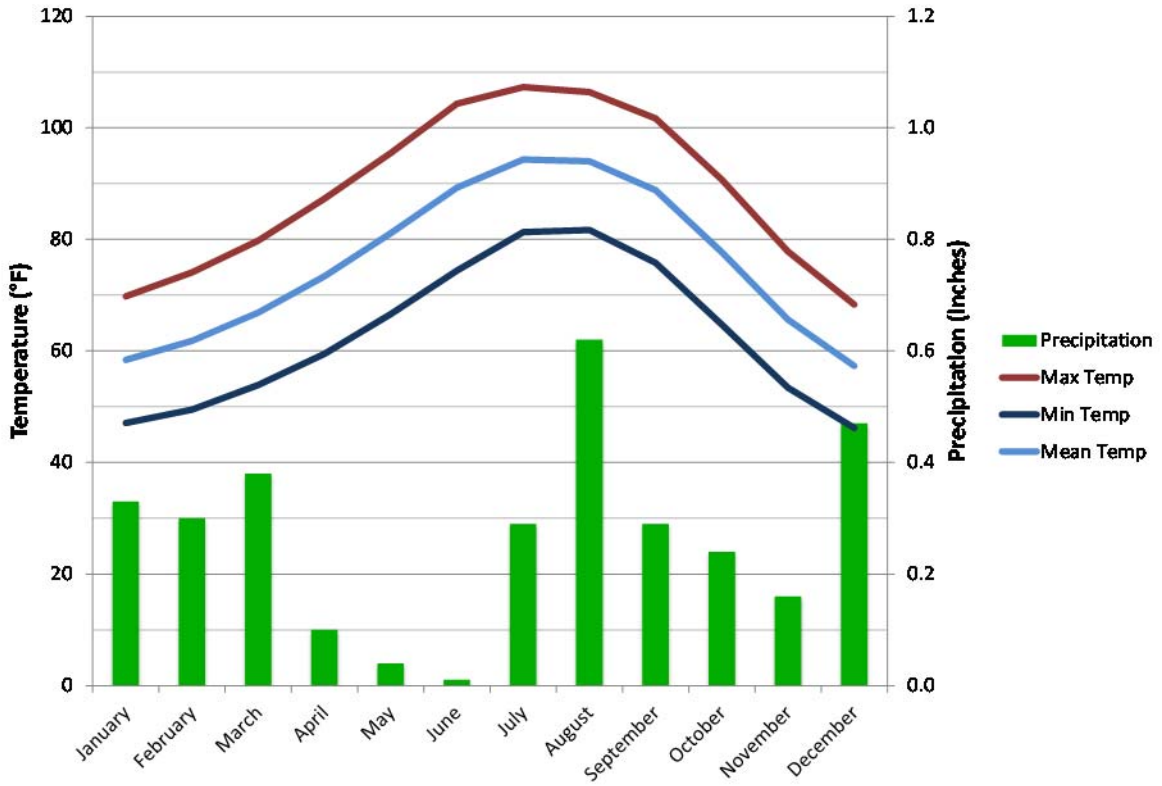

Figure 2-4. Average monthly temperatures and precipitation at Yuma MCAS, 1981–2010.

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 an 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 ones. 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 early morning of April 11, 2012, winds generated by a departing cold front transported dust into the Yuma area (**Figure 2-5**; cold front depicted in blue). The windblown dust resulted in a 24-hr average PM_{10} concentration of 181 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 from the Algodones sand dunes in Imperial County, California, outside the city of Yuma. The peak in PM_{10} concentrations in Yuma coincided with a wind shift to west-northwesterly. This wind direction is conducive to transport of dust and PM_{10} from the open sand dunes directly into

Yuma. Wind speeds in Imperial County were measured in excess of 40 mph; winds of this speed can easily loft dust and PM_{10} from the sand dunes, and thus, the resulting downwind transport of dust was unpreventable.

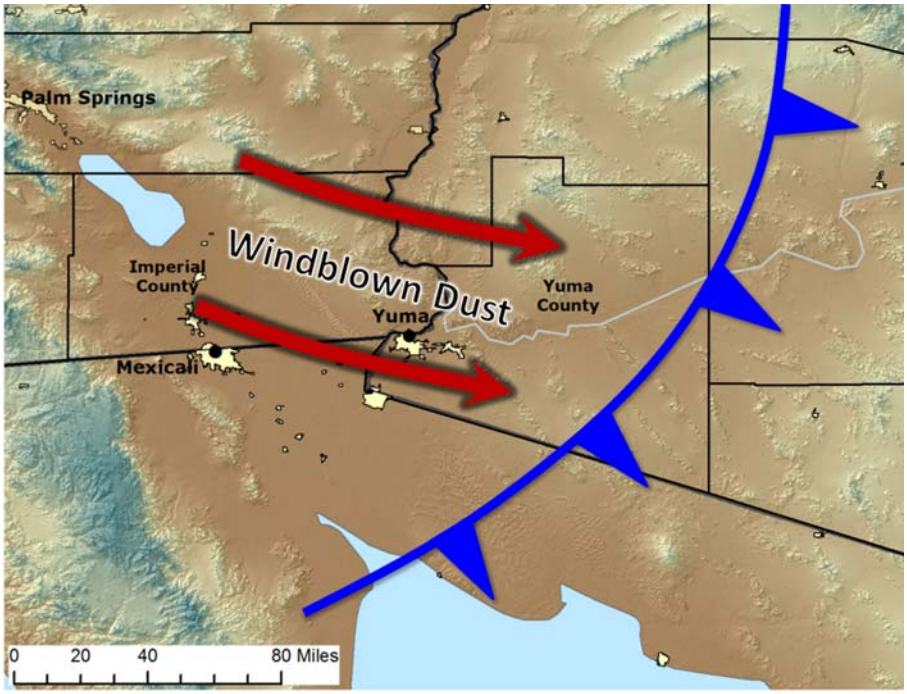

Figure 2-5. West-northwesterly winds associated with a departing cold front transported dust from undeveloped lands in southeastern California southwestward to the Yuma area on April 11, 2012.

Table 2-1. PM_{10} measurements collected in Arizona and southeastern California on April 11, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

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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	29	63	1700	
Cochise County							
Paul Spur Chemical Lime Plant	TEOM	ADEQ	04-003-0011-81102-3	22	61	1400	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	63	208	1300	IJ
Maricopa County							
West Phoenix	TEOM	MCAQD	04-013-0019-81102-1	44	109	1200	
North Phoenix	BAM	MCAQD	04-013-1004-81102-1	45	124	1200	
Glendale	TEOM	MCAQD	04-013-2001-81102-1	45	104	1200	
Central Phoenix	TEOM	MCAQD	04-013-3002-81102-4	41	89	1300	
Greenwood	TEOM	MCAQD	04-013-3010-81102-1	42	95	1300	
South Phoenix	TEOM	MCAQD	04-013-4003-81102-1	51	121	1300	
West Chandler	TEOM	MCAQD	04-013-4004-81102-1	33	68	0600	
Tempe	TEOM	MCAQD	04-013-4005-81102-1	38	106	1300	
Higley	TEOM	MCAQD	04-013-4006-81102-1	38	100	1200	
West 43rd Ave	TEOM	MCAQD	04-013-4009-81102-1	47	112	1300	
Dysart	TEOM	MCAQD	04-013-4010-81102-1	40	114	1200	
Buckeye	TEOM	MCAQD	04-013-4011-81102-1	54	150	1000	
Zuni Hills	TEOM	MCAQD	04-013-4016-81102-1	45	113	2000	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	37	N/A	N/A	
Durango Complex	TEOM	MCAQD	04-013-9812-81102-1	49	135	1300	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	40	101	1200	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	37	87	1200	
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	16	42	1600	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	53	116	1400	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	40	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	104	427	1000	IJ
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	46	N/A	N/A	
Green Valley	TEOM	PCAQCD	04-019-1030-81102-1	24	47	0100	
Geronimo	TEOM	PCAQCD	04-019-1113-81102-1	37	95	0900	

Table 2-1. PM_{10} measurements collected in Arizona and southeastern California on April 11, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Page 2 of 2

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							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	45	114	1300	
Apache Junction Fire Station	TEOM	PCAQCD	04-021-3002-81102-3	44	75	1300	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	57	215	1100	
Combs	TEOM	PCAQCD	04-021-3009-81102-3	68	189	1300	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	43	84	1400	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	82	380	1400	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	92	173	0700	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	42	85	0000	
Yuma County							
Yuma Supersite	**TEOM**	**ADEQ**	**04-027-8011-81102-3**	**181**	**1747**	**0200**	**RJ**
CALIFORNIA							
Imperial County							
Brawley-Main Street #2	BAM	ICAPCD	06-025-0007-85101-3	77	835	0100	
Niland-English Road	BAM	ICAPCD	06-025-4004-85101-3	95	492	0200	
Riverside County							
Riverside-Magnolia	BAM	SCAQMD	06-065-1003-81102-5	8	14	0000	
Torres-Martinez Admin Site	BAM	TMIR	06-065-1999-81102-1	106	358	1700	IJ
Indio-Jackson Street	TEOM	SCAQMD	06-065-2002-81102-3	16	42	0000	
Palm Springs-Fire Station	TEOM	SCAQMD	06-065-5001-81102-3	9	29	0000	
Riverside-Rubidoux	BAM	SCAQMD	06-065-8001-81102-9	10	21	0000	
Mira Loma-Van Buren	BAM	SCAQMD	06-065-8005-81102-3	12	21	0000	
Lake Elsinore-W Flint Street	TEOM	SCAQMD	06-065-9001-81102-3	9	19	0300	
San Bernardino County							
N/A	TEOM	MDAQMD	06-071-0306-81102-2	9	50	0000	
Upland	BAM	SCAQMD	06-071-1004-81102-3	6	18	0000	
San Bernardino-4th Street	TEOM	SCAQMD	06-071-9004-81102-3	13	21	0500	

TEOM: Tapered Element Oscillating Microbalance
BAM: Beta Attenuation Monitor
FRM: Federal Reference Method
WMAT: White Mountain Apache Tribe
MCAQD: Maricopa County Air Quality Department
FMIR: Fort McDowell Indian Reservation
PCAQCD: Pinal County Air Quality Control District
PCDEQ: Pima County Department of Environmental Quality
ICAPCD: Imperial County Air Pollution Control District
SCAQMD: South Coast Air Quality Management District
TMIR: Torres-Martinez Indian Reservation
MDAQMD: Mojave Desert Air Quality Management District
RJ: qualifier flag for high winds (for data exclusion)
IJ: qualifier flag for high winds (for information only)

3. Causal Relationship

3.1 Discussion

Meteorological and air quality observations indicate that dust lofted by gusty winds accompanying a cold front was directly responsible for high PM_{10} concentrations observed in Yuma on April 11, 2012. West-northwesterly winds during the time of this event transported of large quantities of dust and PM_{10} directly into Yuma from the Algodones Dunes, an expansive region of sand dunes in Imperial County. Early on April 11, a surface cold front ahead of an approaching upper-level trough of low pressure moved eastward across southwestern Arizona (**Figure 3-1**). A strong pressure gradient associated with this front led to the development of sustained winds of over 40 mph and wind gusts of over 50 mph in southeastern California, which lofted dust and PM_{10} from the Algodones Dunes in Imperial County. The last time Yuma recorded any measurable rainfall before the April 11, 2012, high-wind event was on March 17, when showers associated with a weak cold front produced 0.01 inches of rain at the Yuma MCAS. The combination of geography and lack of rainfall preceding the event resulted in a large fetch of soils that were particularly vulnerable to particulate suspension.

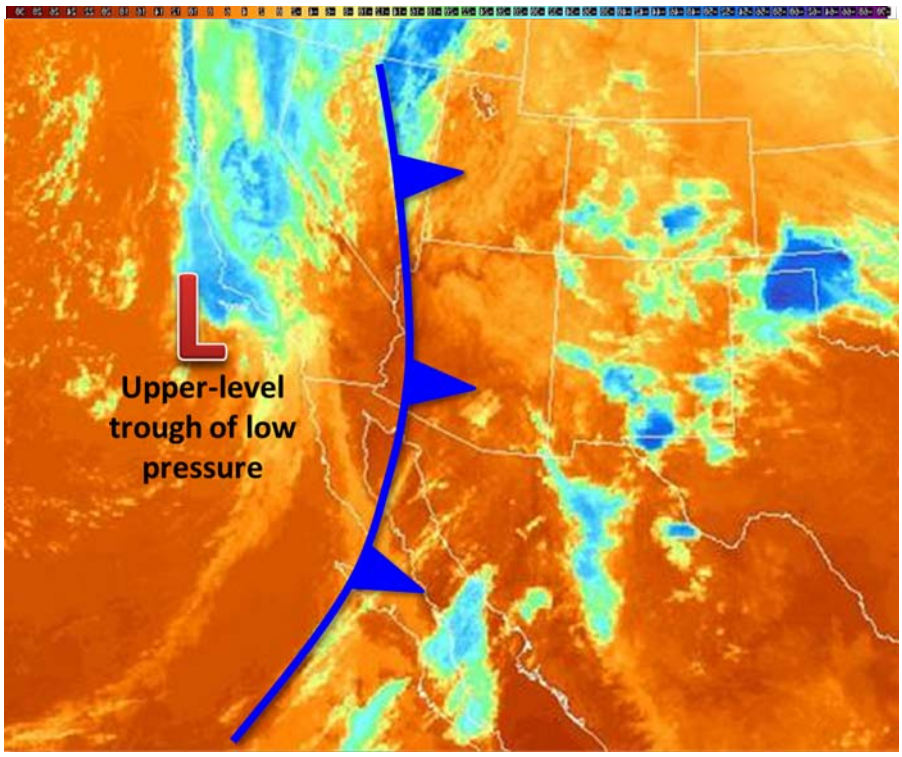


Figure 3-1. Infrared satellite image from 1:15 MST on April 11, 2012 (GOES-West). A surface cold front ahead of an approaching upper-level trough of low pressure moved through the Yuma area, causing winds to shift from southerly to west-northwesterly.

Figures 3-2 through 3-5 illustrate wind and PM_{10} data in southern California and southwestern Arizona before, during, and after passage of the cold front, respectively. Before frontal passage, winds were gusty from the southeast, PM_{10} concentrations were low, and visibilities were high regionwide (Figure 3-2). As the cold front moved through southeastern California(Figure 3-3), strong westerly and west-southwesterly winds behind it lofted dust and PM_{10} into the lower atmosphere. When the cold front later moved into southwestern Arizona between midnight and 2:00 MST on April 11, 2012, west-northwesterly winds behind the front transported this lofted dust into Yuma. Figure 3-4 illustrates the shift to west-northwesterly winds in Yuma and the sudden increase in PM_{10} concentrations, demonstrating a causal relationship between the transport of dust from the sand dune regions of Imperial County directly into Yuma and the resulting increase in PM_{10} concentrations. Wind speeds over the Algodones Dunes in Imperial County may have also been locally enhanced due to channeling effects from the Chocolate Mountains to the north. Later in the morning, hourly PM_{10} concentrations at the Yuma Supersite monitor decreased significantly. This decrease in PM_{10} concentrations is attributable to a shift in winds to southwesterly, which is not a direction conducive to transport of PM_{10} from the Algodones Dunes to Yuma (Figure 3-5). Please note that radar velocity data were also assessed during this analysis; however, because the event was driven by a large-scale cold front (as opposed to thunderstorm outflow), the radar data did not show distinct boundaries marking the arrival of dust in the Yuma area. Thus, the radar velocity data are not shown in Figures 3-2 through 3-5.

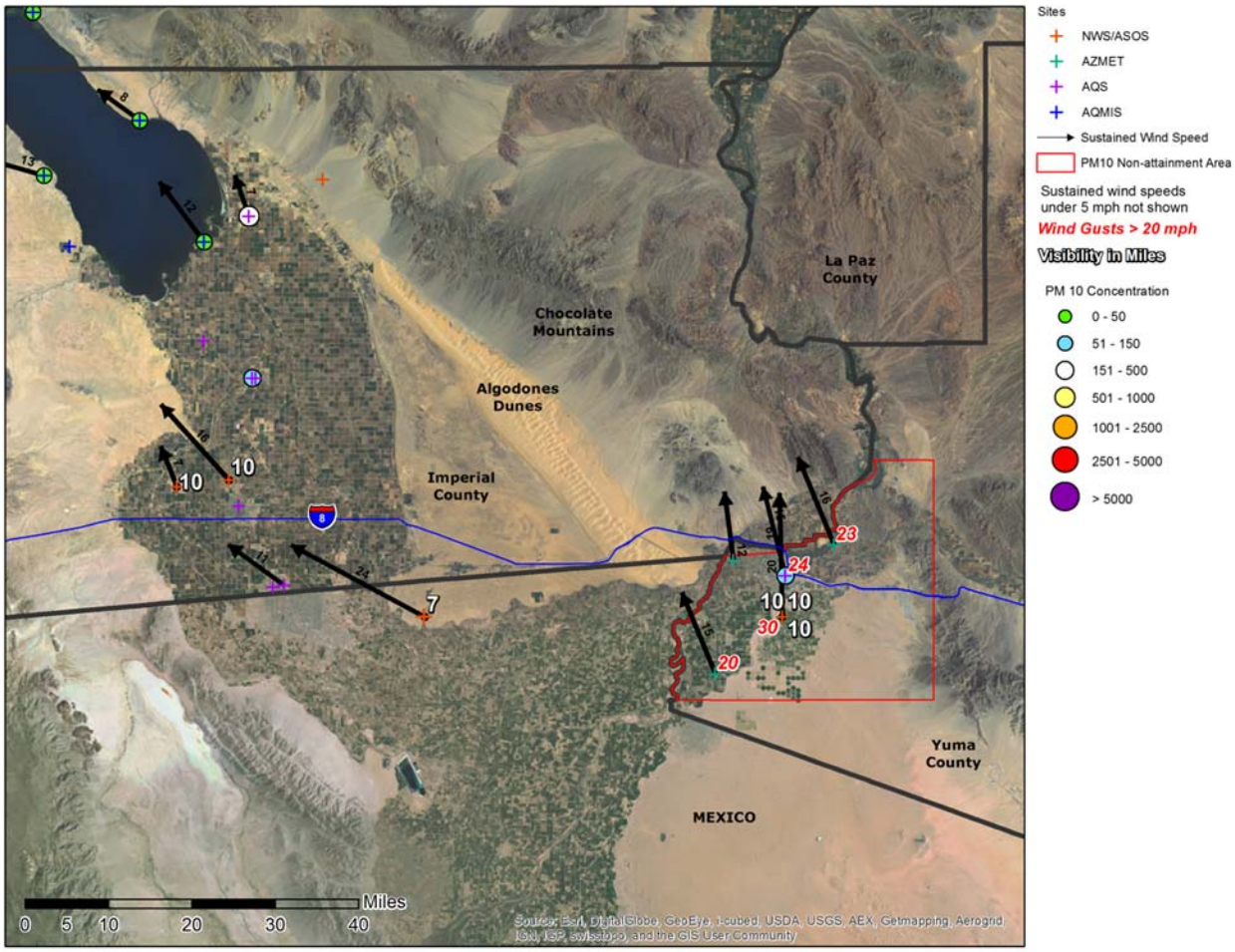


Figure 3-2. Hourly Yuma and Imperial County sustained wind vectors (arrows), wind gusts (red numbers), visibility (white numbers), and PM_{10} concentrations (colored circles) at meteorological and air quality monitors on at 16:00 MST on April 10, 2012, before passage of the cold front.

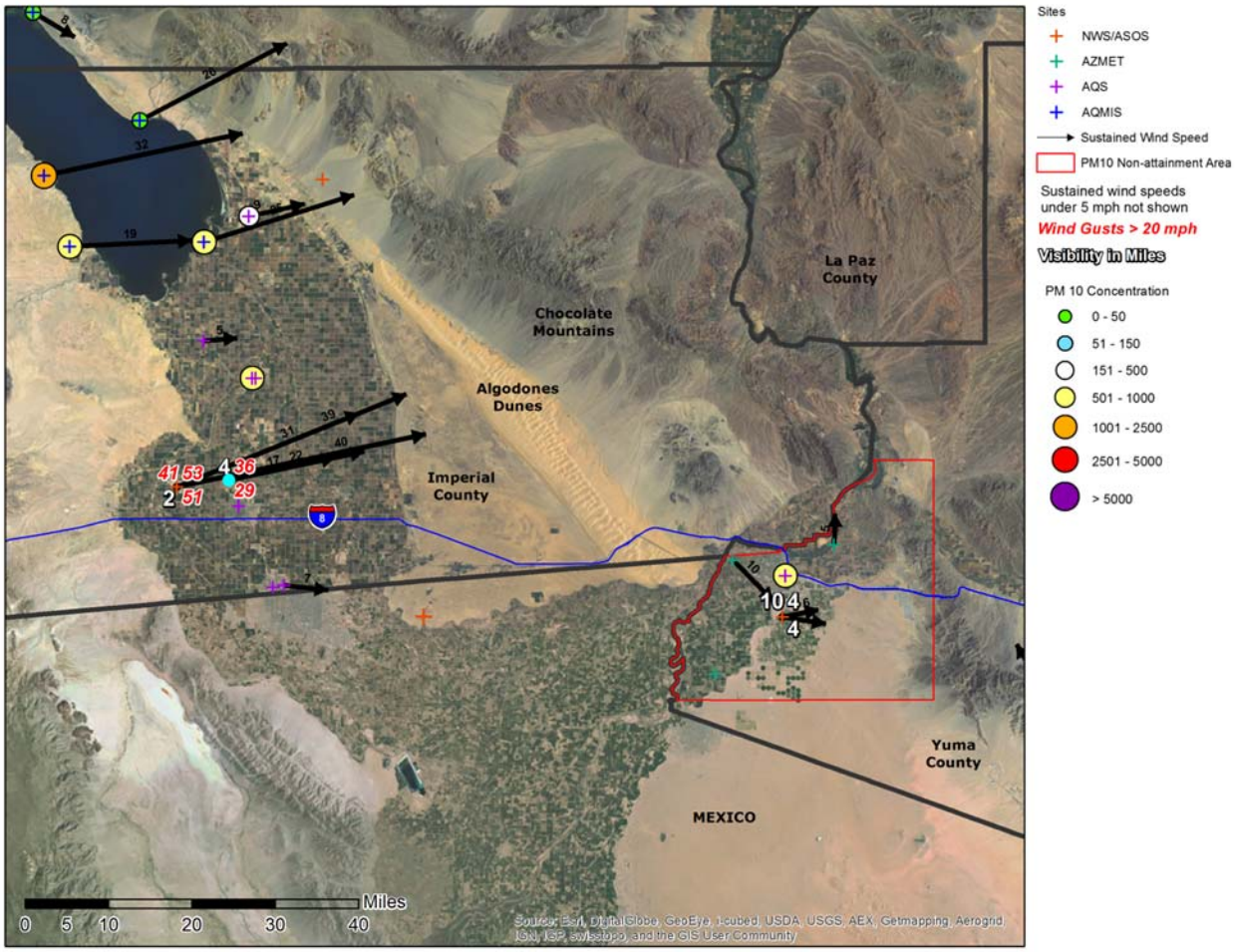


Figure 3-3. Hourly Yuma and Imperial County sustained wind vectors (arrows), wind gusts (red numbers), visibility (white numbers), and PM_{10} concentrations (colored circles) at meteorological and air quality monitors on at 1:00 MST on April 11, 2012. Strong winds developed in Imperial County behind a departing cold front. The cold front and associated strong winds had not yet arrived in Yuma.

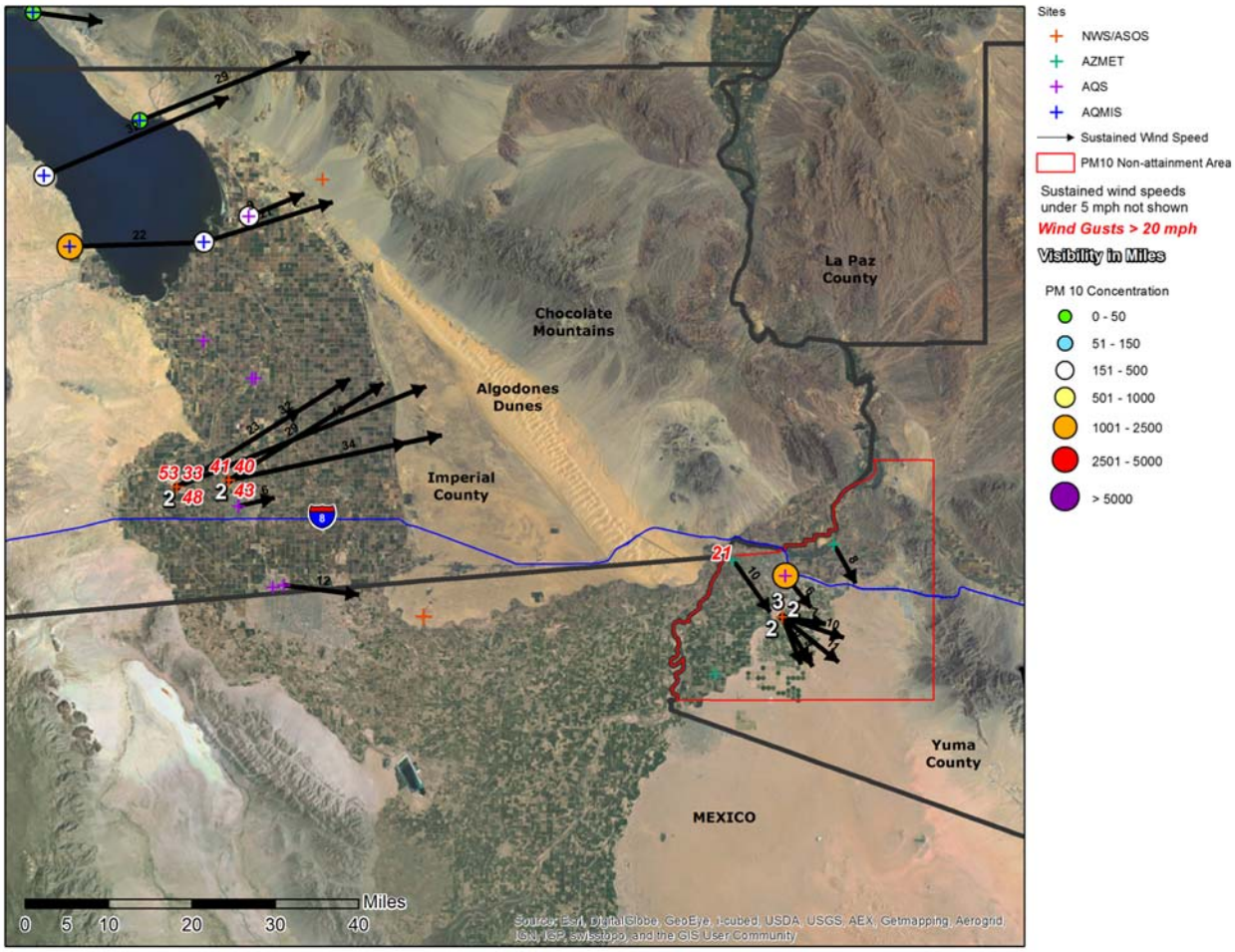


Figure 3-4. Hourly Yuma and Imperial County sustained wind vectors (arrows), wind gusts (red numbers), visibility (white numbers), and PM_{10} concentrations (colored circles) at meteorological and air quality monitors at 2:00 MST on April 11, 2012, during the dust storm.

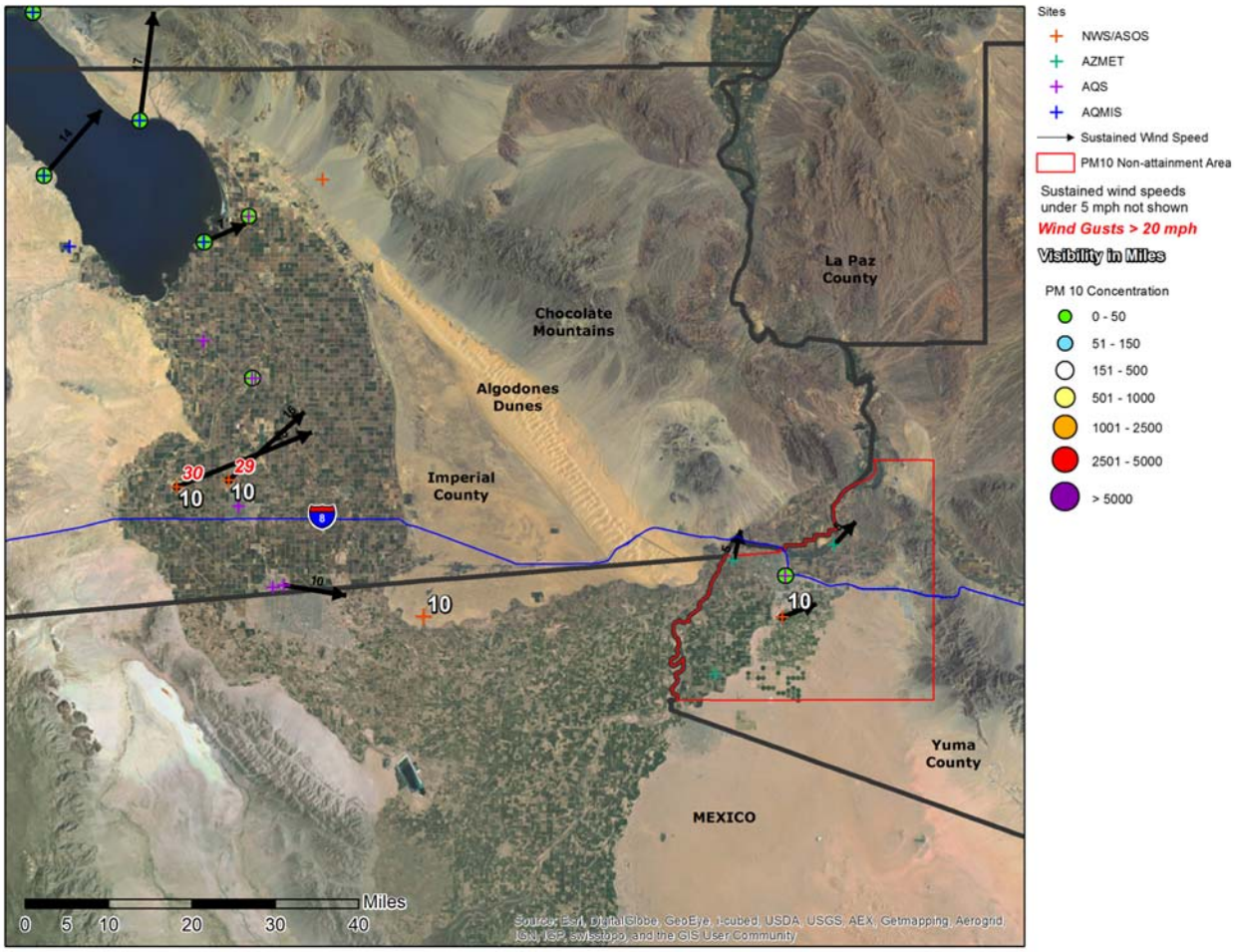


Figure 3-5. Hourly Yuma and Imperial County sustained wind vectors (arrows), wind gusts (red numbers), visibility (white numbers), and PM_{10} concentrations (colored circles) at meteorological and air quality monitors on at 10:00 MST on April 11, 2012.

Monitors in Imperial Valley, California, measured sustained winds as high as 43 mph and gusts as high as 53 mph following passage of the front (**Tables 3-1 and 3-2**). In addition, the NWS office in Phoenix issued a Wind Advisory for Imperial County during the early morning hours of April 11 (Appendix B). **Figure 3-6** shows wind speeds at monitors in Imperial and Yuma counties, and illustrates that strong winds occurred for several hours in Imperial County before winds peaked in Yuma. Air quality monitors in Imperial County, California, measured an increase PM_{10} concentrations associated with this cold front passage (**Figure 3-7**). The prolonged period of strong winds in Imperial County likely lofted large amounts of dust and PM_{10} into the lower atmosphere and transported the dust into Yuma following passage of the cold front.

Table 3-1. Observed wind speeds and wind gusts at Yuma and Imperial County monitors on April 10, 2012.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
Yuma Supersite	16	158	1500	27	1300
Roll	14	191	1500	23	1600
Yuma North Gila	17	159	1500	24	1500
Yuma South	15	159	1600	23	1800
Yuma Valley	12	174	1400	18	1600
Yuma MCAS	24	170	1500	30	1500 1600
Niland-English Road	17	258	2300	-	-
Imperial County Airport	21	290	2353	32	2253
El Centro Naval Air Facility	29	270	2256	36	2256

Table 3-2. Observed wind speeds and wind gusts at Yuma and Imperial County monitors on April 11, 2012.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
El Centro Naval Air Facility	43	250	0200	53	0200
Imperial County Airport	34	260	0215	43	0223
Yuma Valley	15	290 292	1800 1900	24	1900
Yuma North Gila	11	282	1900	18	1800
Roll	10	291	2000	18	2000
Yuma MCAS	18	310	2000	25	2000
Yuma South	10	295 293	2000 2100	16	2100
Yuma Supersite	11	283	2100	22	2200
Niland-English Road	24	257	2100	-	-

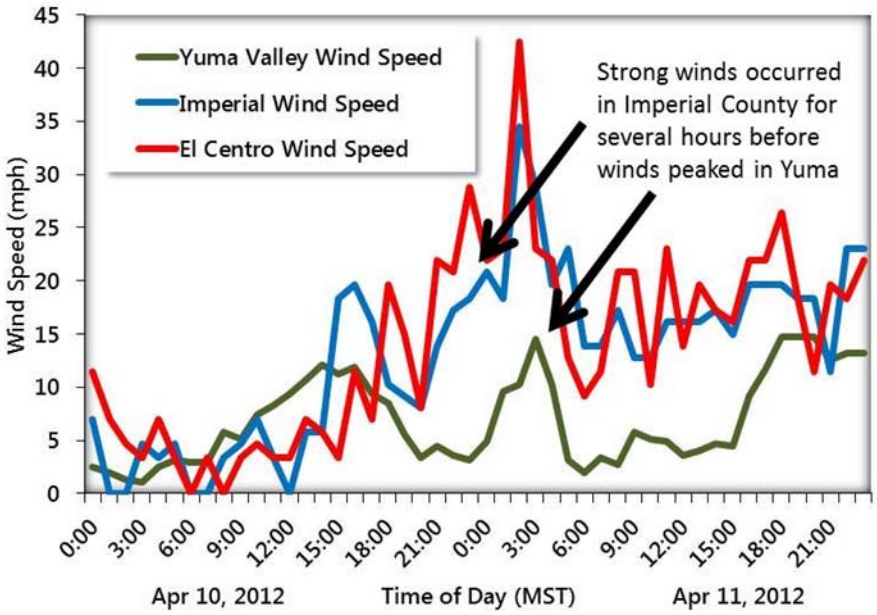


Figure 3-6. Wind speeds at monitors in Imperial and Yuma Counties on April 10 and 11, 2012. Strong winds developed for several hours in Imperial County due to a passing cold front, lofting large amounts of dust and PM_{10} into the lower atmosphere.

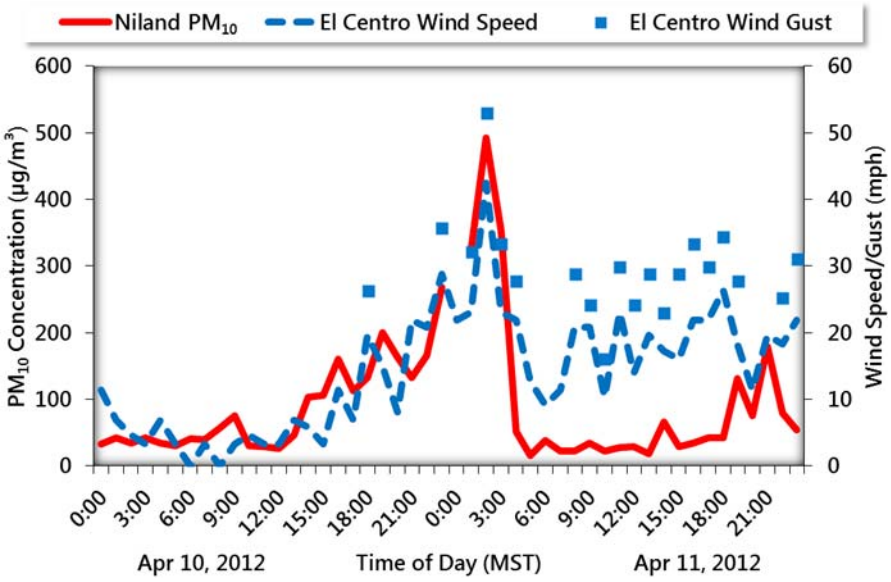


Figure 3-7. Hourly PM_{10} concentrations at Niland and wind speeds at El Centro NAF on April 10 and 11, 2012. Winds increased late on April 10 and early on April 11 coincident with an increase in PM_{10} concentrations, indicating the arrival of windblown dust.

Wind speeds measured at AQS, NWS, and AZMET monitors in the Yuma area were generally less than 15 mph during the hours of highest PM_{10} concentrations (**Figures 3-8 and 3-9** and Appendix A), and were lower than the wind speeds observed in Imperial County. The fact that winds were stronger in Imperial County compared to Yuma County is attributable to localized strengthening of the surface pressure gradient and local terrain effects. An Area Forecast Discussion issued by the NWS office in Phoenix contains more information on the development of locally strong winds in Imperial County and can be found in Appendix B. While wind speeds were not unusually high in the Yuma area during this event, sustained wind speeds in Imperial County were sufficient to loft and transport dust into Yuma.

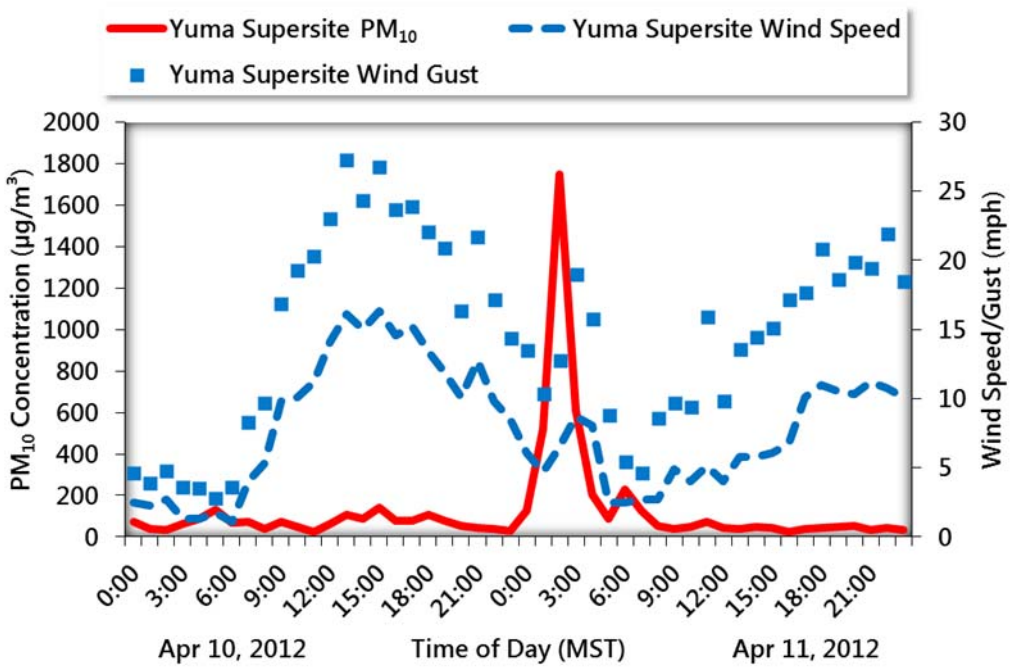


Figure 3-8. Hourly PM_{10} concentrations and wind speeds at the Yuma Supersite monitor on April 10 and 11, 2012.

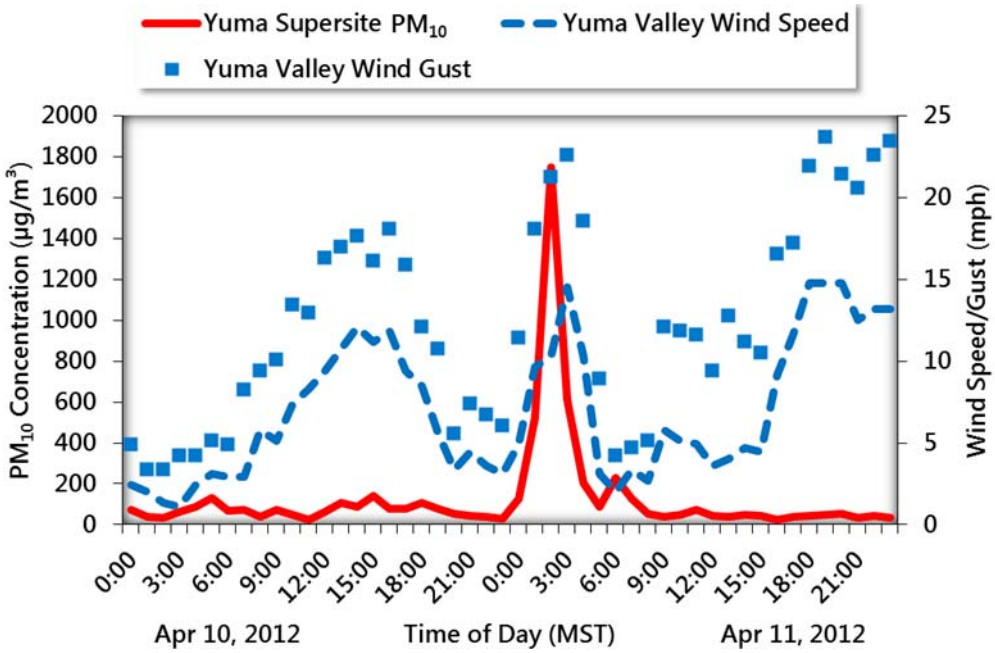


Figure 3-9. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speeds at the Yuma Valley monitor on April 10 and 11, 2012. PM_{10} concentrations and wind speeds sharply increased at midnight MST on April 11, 2012, coincident with the arrival of windblown dust.

Time-series graphs of PM_{10} concentrations and wind direction in Yuma clearly indicate a sharp increase in PM_{10} concentrations coincident with the wind shift to west-northwesterly (**Figure 3-10**), i.e., the direction of the dunes. Visibility at the Yuma MCAS also decreased significantly with the arrival of the dust (**Figure 3-11**). The Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model was used to further illustrate the direct transport of dust and PM_{10} from the Algodones Dunes into Yuma. **Figure 3-12** depicts backward trajectories originating at the Yuma Supersite monitor at 23:00 MST on April 10. At that time, the cold front was still west of Yuma and winds were southerly, as indicated by the wind vectors and trajectory lines. In addition, the PM_{10} concentration at Yuma Supersite was only 31 µg/m^3. **Figure 3-13** depicts the same information but at 2:00 on April 11, after passage of the cold front. The wind vectors and trajectory lines indicate west-northwesterly flow and direct transport from the sand dune region of Imperial County. As a result, the PM_{10} concentration at Yuma Supersite increased sharply to 1747 µg/m^3.

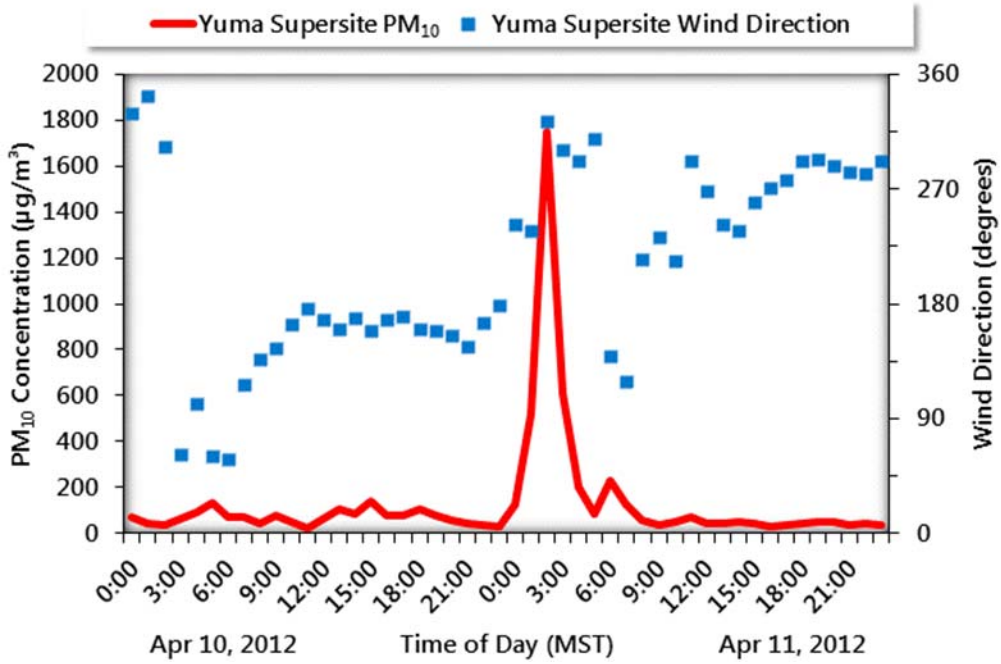


Figure 3-10. Hourly PM_{10} concentrations and wind direction at the Yuma Supersite monitor on April 10 and 11, 2012. Winds shifted to west-northwesterly at 2:00 MST, coincident with a sharp increase in PM_{10} concentrations.

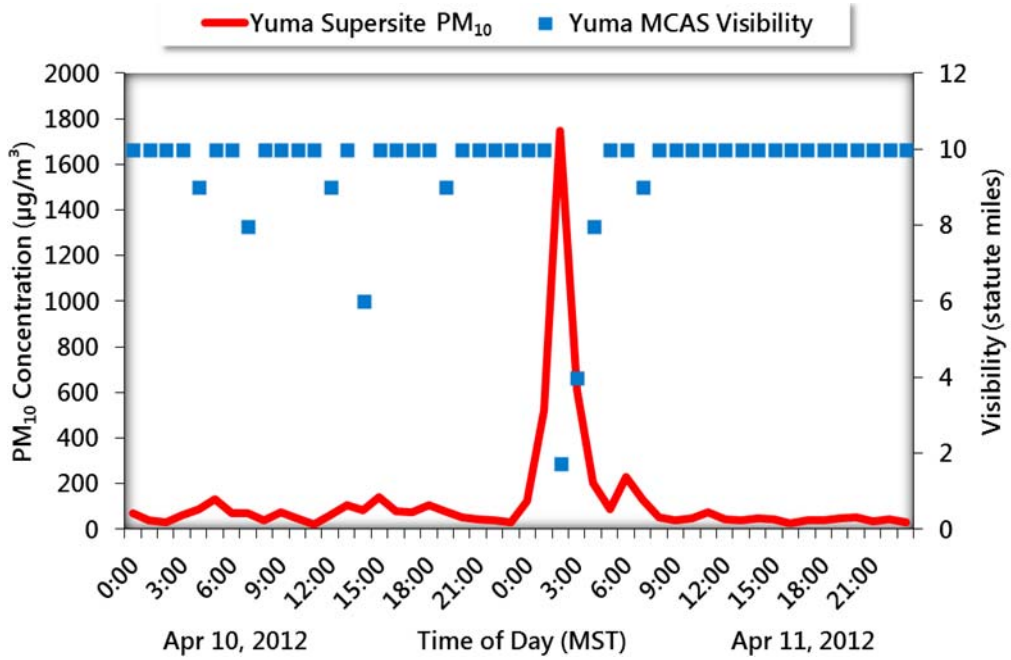


Figure 3-11. Hourly PM_{10} concentrations at the Yuma Supersite monitor and visibility at Yuma MCAS on April 10 and 11, 2012. Visibility was greatly reduced starting after 2:00 MST on April 11, coincident with the sharp increase in PM_{10} concentrations at the Yuma Supersite monitor.

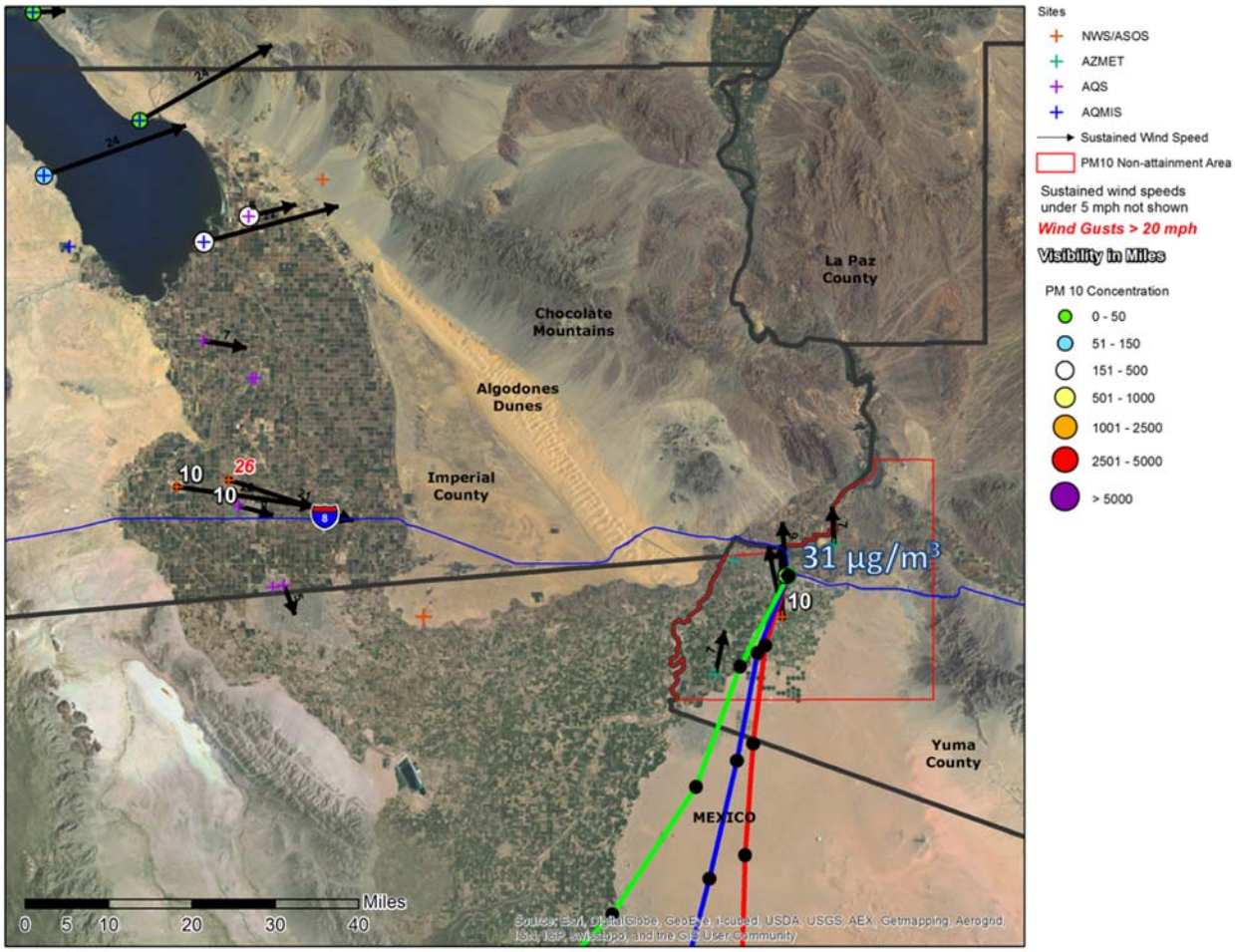


Figure 3-12. Back trajectories ending at 23:00 MST on April 10, 2012, at the Yuma Supersite monitor. Black dots indicate hourly positions along the trajectory path. Winds in the Yuma area were southerly in advance of an approaching cold front.

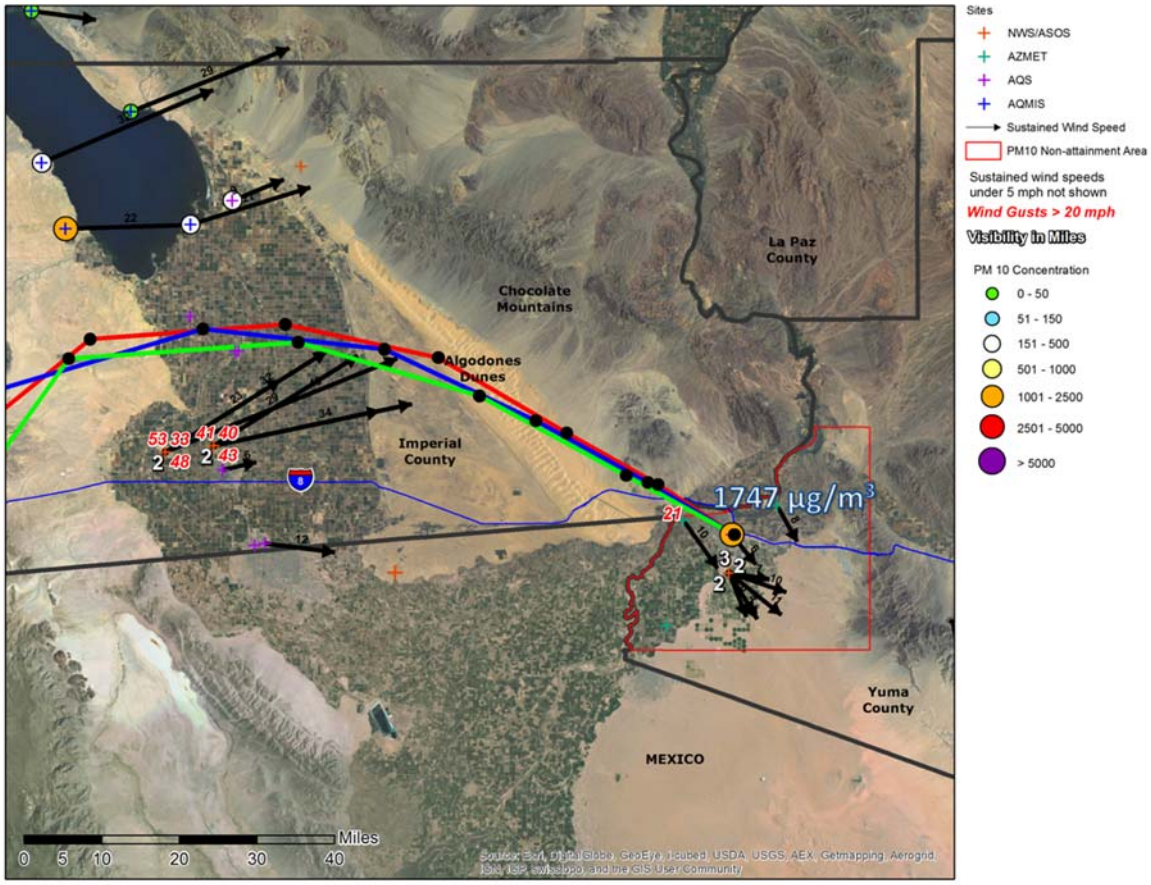


Figure 3-13. Back trajectories ending at 2:00 MST on April 11, 2012, at the Yuma Supersite monitor. Black dots indicate hourly positions along the trajectory path. Winds in the Yuma area shifted to west-northwesterly behind a departing cold front. These winds transported dust and PM_{10} from sand dunes in Imperial County directly into Yuma.

3.2 Summary

The information presented in this section demonstrates a clear causal relationship between the transport of windblown dust into Yuma and the PM_{10} exceedance measured at the Yuma Supersite monitor on April 11, 2012. The wind, visibility, and PM_{10} data shown in this section illustrate the spatial and temporal representation of the cold front and associated dust as it moved through Imperial and Yuma counties. Strong winds, which likely lofted large amounts of dust and PM_{10} into the lower atmosphere, were reported for several hours in Imperial County. This dust and PM_{10} were transported into Yuma following 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 in Yuma coincided with a wind shift from southerly to west-northwesterly, which was conducive to transport of dust and PM_{10} from the upwind open sand area into Yuma.

4. Historical Norm

4.1 Analysis

PM_{10} concentrations measured at the Yuma Supersite monitor on April 11, 2012, were unusual and in excess of normal historical fluctuations. The PM_{10} concentrations measured on April 11, 2012, were among the highest hourly and 24-hr averages measured over the last five years. To establish the severity of this event, PM_{10} concentrations measured on April 11, 2012, were compared to a historical 2008–2012 5-year annual data set. Time-series plots of the 24-hr average PM_{10} concentrations for the period January 1, 2008, through December 31, 2012, provide a historical perspective of PM_{10} concentrations (**Figure 4-1**). The 24-hr average PM_{10} concentration on April 11, 2012, is the 15th highest daily average in the last 5 years.

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 April 11, 2012, is the 6th highest concentration observed in the last 5 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 2008-2012 period to provide additional evidence to establish 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 April 11, 2012, 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 based on methods similar to those accepted by EPA, it is clear that the PM_{10} levels on April 11, 2012, 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.

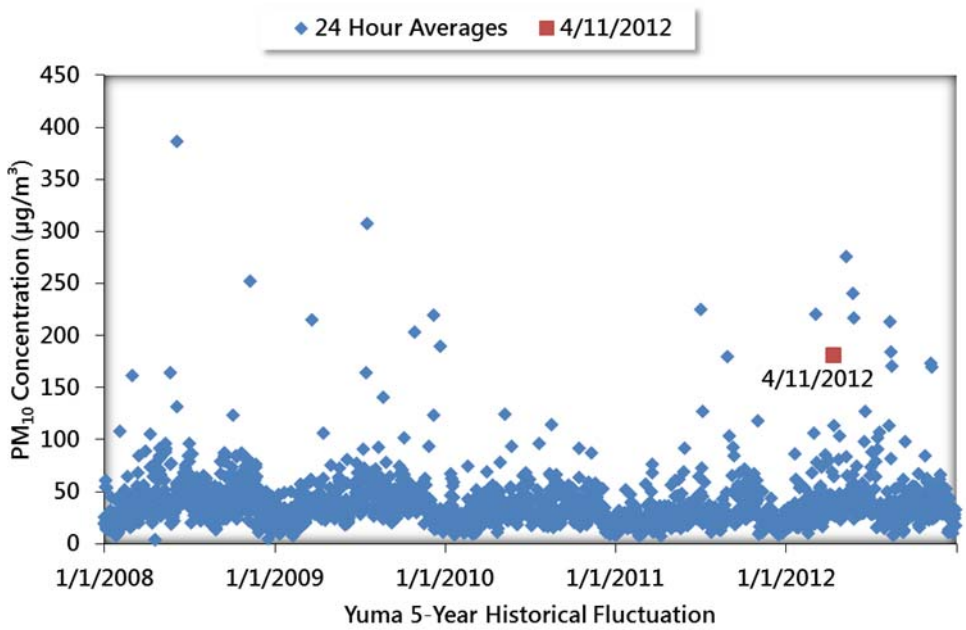


Figure 4-1. 24-hr average PM_{10} concentrations at the Yuma Supersite monitor (2008-2012). The 24-hr average PM_{10} concentration on April 11, 2012, is shown by the red square.

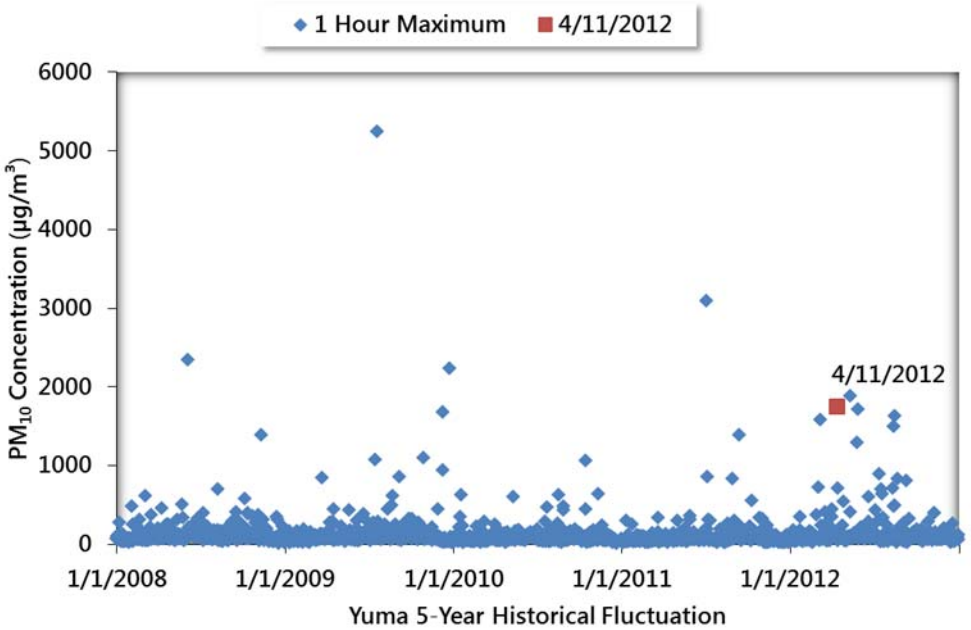


Figure 4-2. Daily maximum 1-hr PM_{10} concentrations at the Yuma Supersite monitor (2008–2012). The daily maximum 1-hr PM_{10} concentration on April 11, 2012, is shown by the red square.

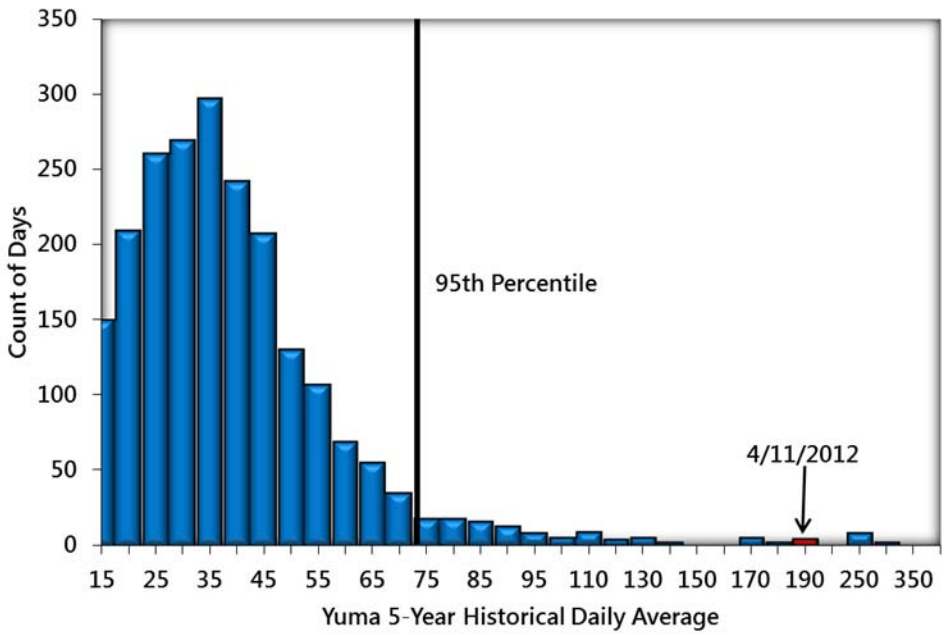


Figure 4-3. The 24-hr average PM_{10} concentrations at the Yuma Supersite monitor for 2008-2012. The 24-hr average PM_{10} concentration on April 11, 2012 (red bar), was in excess of the 95th percentile.

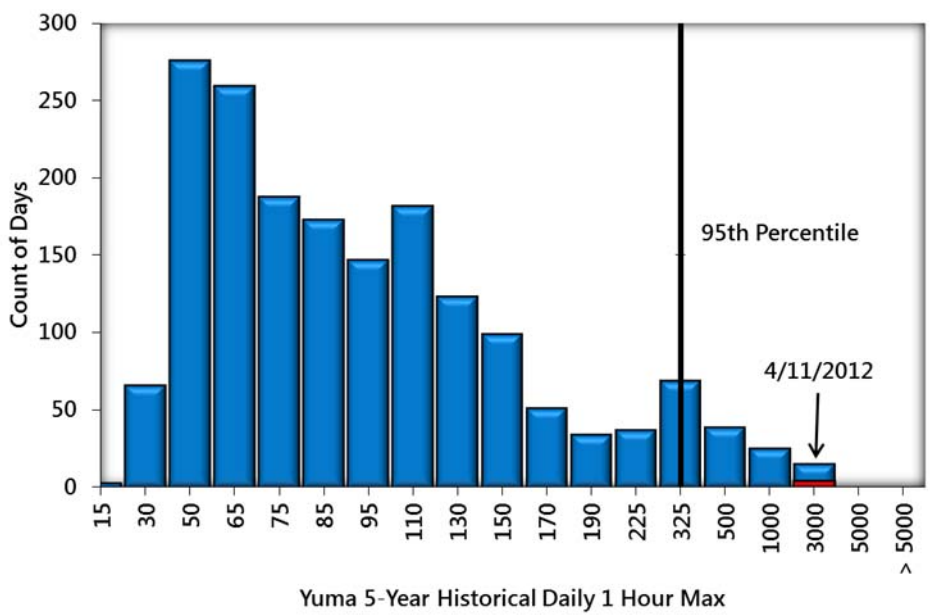


Figure 4-4. Daily maximum 1-hr PM_{10} concentrations at the Yuma Supersite monitor for 2008–2012. The daily maximum 1-hr PM_{10} concentration on April 11, 2012 (red bar), was in excess of the 95th percentile.

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 incomplete and 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 the development of a maintenance plan and 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 1994-2001 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 PM_{10} NAAQS occur.

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

Page 1 of 2

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, and 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.

Page 2 of 2

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

PM_{10} Maintenance Plan); (2) an analysis of RACM 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 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 April 11, 2012, PM_{10} exceedance. During the time period of April 8 through April 13, 2012, ADEQ inspectors responded to one complaint regarding PM emissions from undeveloped lots. No violations were reported during this inspection.

5.2 Forecasts and Warnings

ADEQ released dust forecasts for the Yuma area prior to the April 11, 2012, event (Appendix B). ADEQ's forecast for Yuma, issued on Tuesday, April 10, 2012, stated a possibility for "blowing dust and an increase in PM_{10} concentrations" due to the expected cold front passage early on Wednesday, April 11. The NWS also issued a Wind Advisory for neighboring Imperial County due to the potential for strong winds in excess of 30 mph and blowing dust.

5.3 Wind Observations

Strong winds were reported in Imperial County for several hours preceding the increase in PM_{10} concentrations in Yuma, with sustained winds of up to 43 mph and wind gusts of up to 53 mph (Section 3). Winds of this strength can easily loft dust into the lower atmosphere, especially from open sandy areas such as the Algodones Dunes. These dunes are located directly west-northwest of Yuma, and the peak in PM_{10} concentrations in Yuma occurred when winds shifted to west-northwesterly. Sustained wind speeds were generally less than 15 mph in the Yuma area during this event, with a peak wind gust of 25 mph at Yuma MCAS. However, wind speeds in Imperial County were sufficient to loft and transport dust into Yuma.

5.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that 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 being in moderate nonattainment for PM_{10}, such as Yuma County. Thus, the RACM in place at the time of the event were reasonable. In addition, surface wind speeds of over 40 mph were reported in the dust and PM_{10} source region (Imperial County), which likely easily lofted loose sand into the atmosphere.

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 April 11, 2012,

- the exceedance was not reasonably controllable or preventable, and
- there was a clear causal relationship between PM_{10} transported from gusty winds over open sand areas in Imperial County directly into Yuma 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 winds associated with a surface cold front and resulting 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 PM_{10} transported from gusty winds over open sand areas in Imperial County and the measured PM_{10} exceedance in Yuma. 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. Strong winds in Imperial County easily lofted large quantities of dust and PM_{10} into the lower atmosphere, and a wind shift from southerly to west-northwesterly transported these PM_{10} emissions directly into the Yuma area. Much of the dust likely originated from the Algodones Dunes. In addition, PM_{10} concentrations were well below the NAAQS on days immediately before and after this event, when winds were not from the direction of the open sand area. The source region for the PM_{10} is clearly identified as the sandy desert area 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 April 11, 2012, 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 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 April 11, 2012, 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 April 11, 2012, 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 501 (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 strong west-northwesterly winds in Imperial County 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 April 11, 2012, was not reasonably controllable or preventable (Section 5).

7.3 Natural Event

As discussed above, the PM_{10} exceedance in Yuma on April 11, 2012, was shown to be caused by transport of PM_{10} into Yuma by west-northwesterly winds behind a departing cold front, which blew across open sand areas. 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 plots of PM_{10} concentrations show that the timing of high PM_{10} at the Yuma Supersite was consistent with a wind shift to west-northwesterly and low visibilities at Yuma-area meteorological stations (Section 3).
- Trajectory analysis demonstrates that west-northwesterly winds transported dust and PM_{10} from open sand areas in Imperial County, California, directly into Yuma.
- High PM_{10} concentrations and gusty winds were reported in Imperial County, California, where PM_{10} was lofted from the Algodones sand dunes, illustrating the 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 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 April 11, 2012, at the Yuma Supersite monitor would not have occurred but for transport of dust from areas largely outside the Yuma PM_{10} Nonattainment Area.

Appendix A: Air Quality and Meteorological Data for Yuma County and the Surrounding Area

This section contains time-series plots of air quality and meteorological data for Yuma and other regional monitors on April 10 and 11, 2012. The data illustrate that strong winds in Imperial County lofted dust from open sand areas and transported the dust into Yuma.

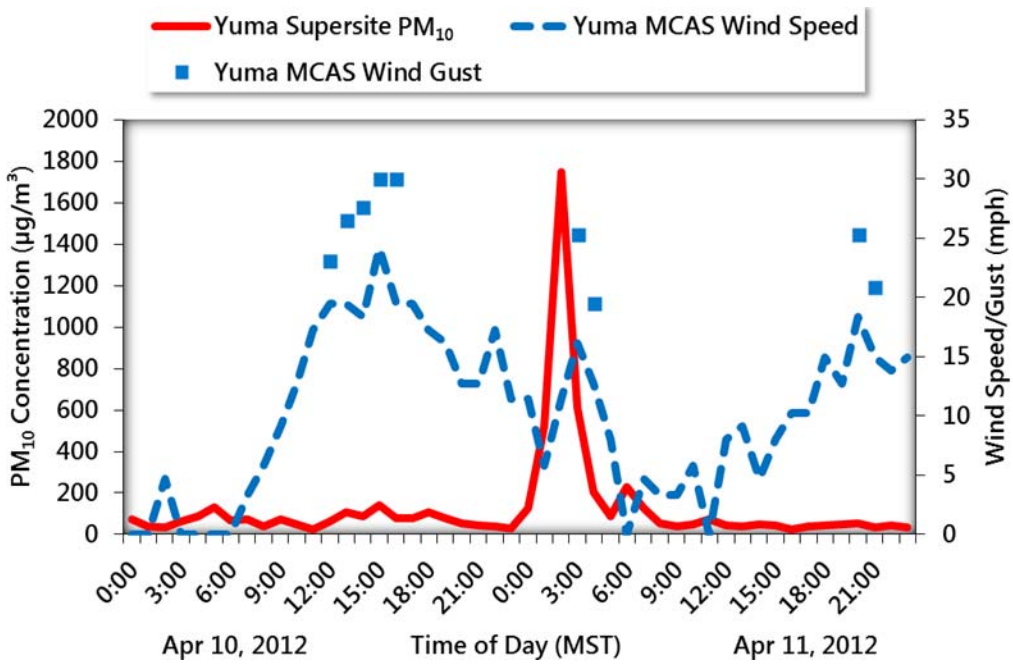


Figure A-1. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speed and wind gusts at the Yuma MCAS monitor on April 10 and 11, 2012.

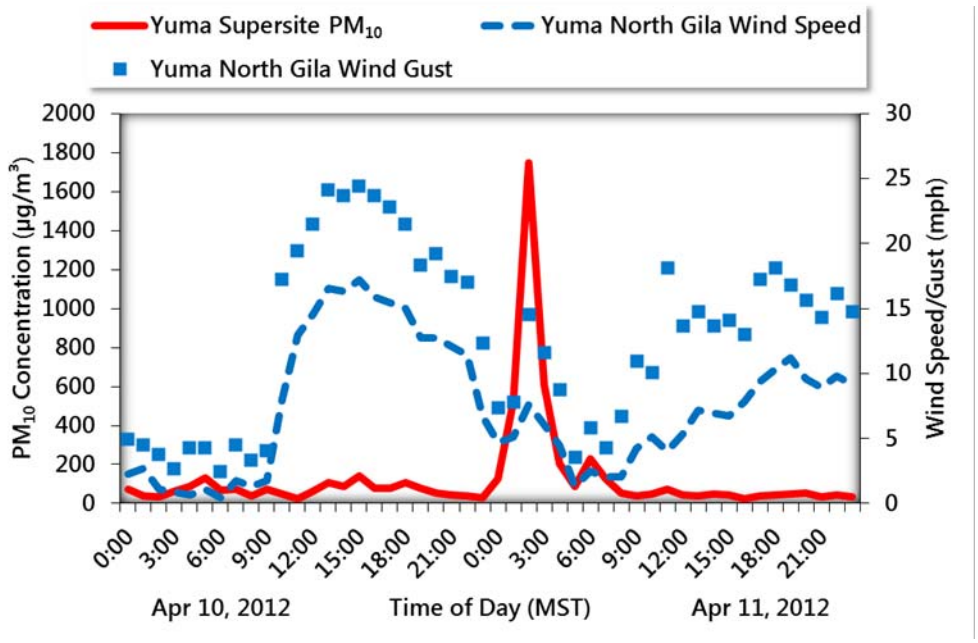


Figure A-2. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speed and wind gusts at the Yuma North Gila monitor on April 10 and 11, 2012.

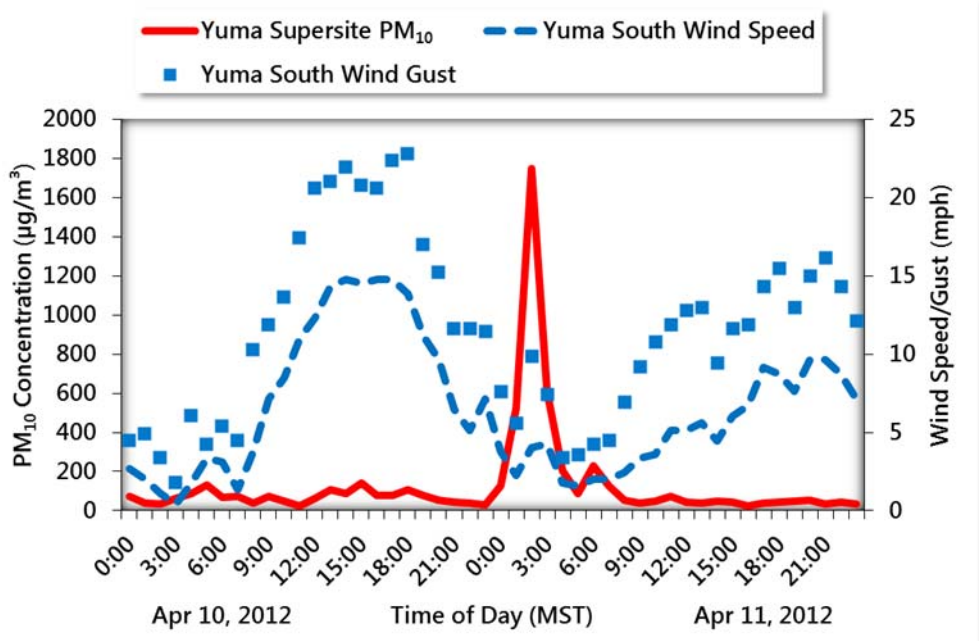


Figure A-3. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speed and wind gusts at the Yuma South monitor on April 10 and 11, 2012.

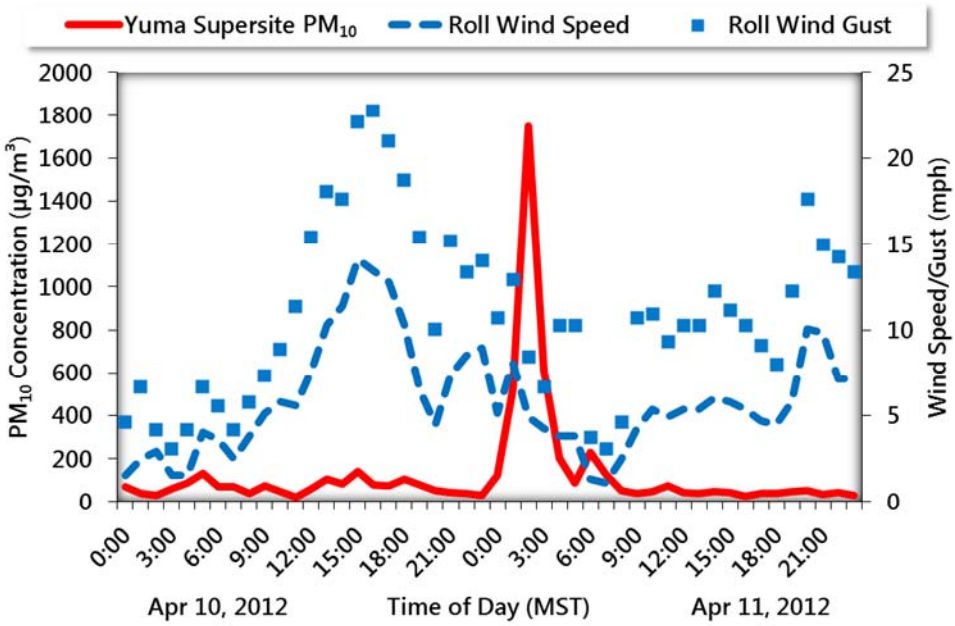


Figure A-4. Hourly PM_{10} concentrations at the Yuma Supersite monitor and wind speed and wind gusts at the Yuma Roll monitor on April 10 and 11, 2012.

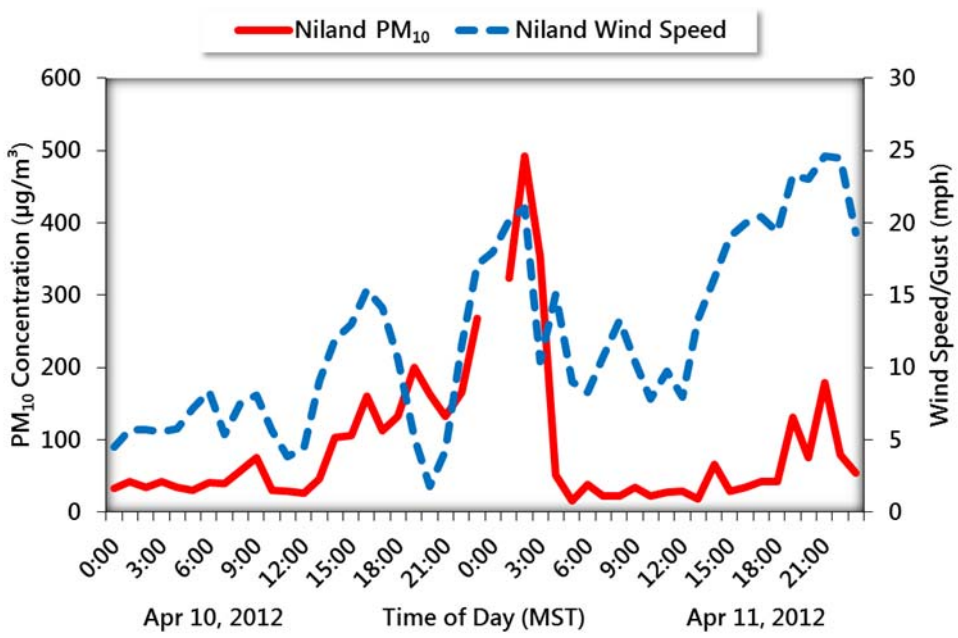


Figure A-5. Hourly PM_{10} concentrations and wind speeds at the Niland monitor in Imperial County, California, on April 10 and 11, 2012.

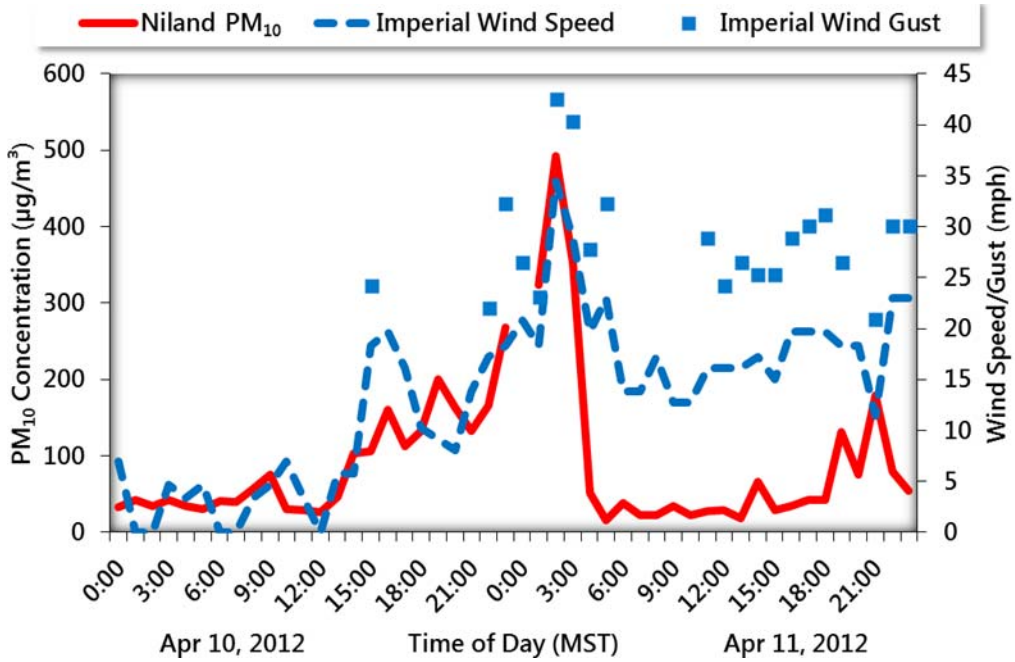


Figure A-5. Hourly PM_{10} concentrations at the Niland AQS monitor and wind speed and wind gusts at the Imperial County airport on April 10 and 11, 2012.

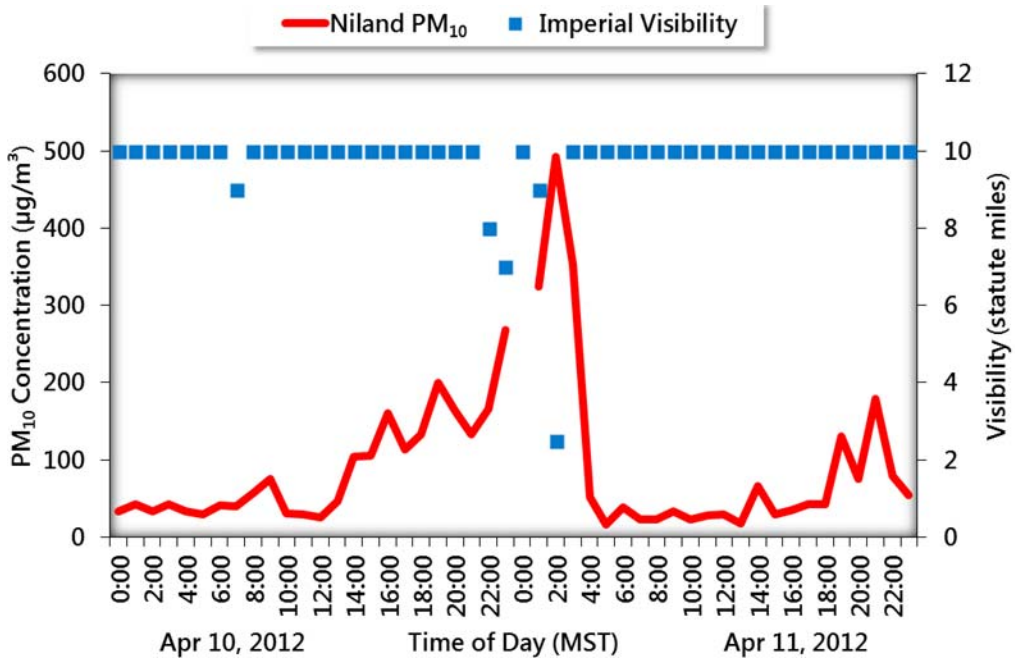


Figure A-6. Hourly PM_{10} concentrations at the Niland AQS monitor and visibility at the Imperial County airport on April 10 and 11, 2012.

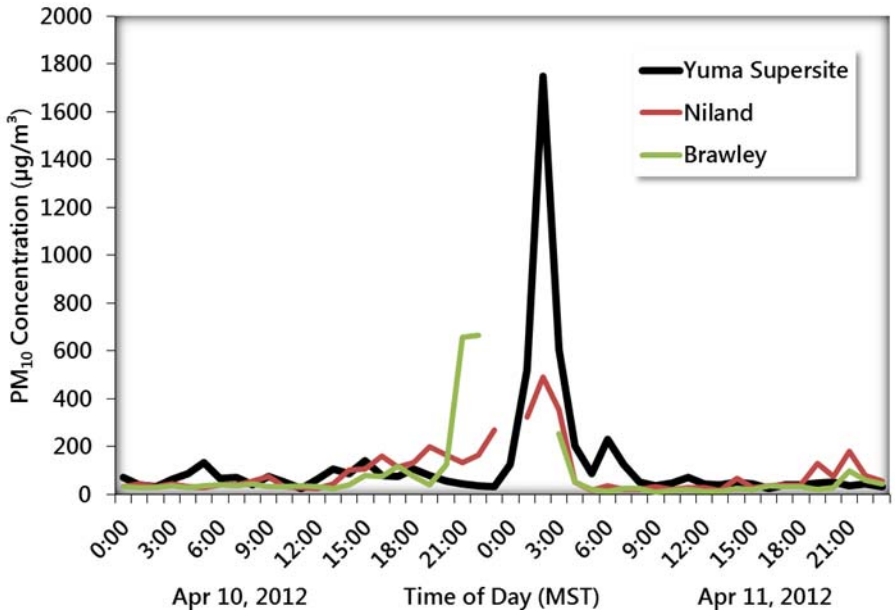


Figure A-7. Hourly PM_{10} concentrations and wind speeds at the Yuma Supersite and at the Brawley and Niland AQS monitors in Imperial County, California, on April 10 and 11, 2011. PM_{10} concentrations increased at area monitors due to dust lofted by strong winds associated with a cold front. Data are unavailable for several hours at the Brawley and Niland monitors, possibly because PM_{10} concentrations were higher than the valid reporting range of the monitors.

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
YUMA MCAS (03145), YUMA, AZ (04/10/2012)

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	CLR	10.00		70	21.1	50	10.2	28	-2.2	21	0	000		29.61			29.83	AA		29.84
10	0155	5	CLR	10.00		65	18.3	49	9.6	32	0.0	29	5	350		29.60	8	005	29.82	AA		29.83
10	0255	5	CLR	10.00		65	18.3	49	9.6	32	0.0	29	0	000		29.60			29.82	AA		29.83
10	0355	5	CLR	9.00		61	16.1	49	9.2	35	1.7	38	0	000		29.60			29.82	AA		29.83
10	0455	5	CLR	10.00		61	16.1	48	8.8	33	0.6	35	0	000		29.60	6	002	29.82	AA		29.83
10	0555	5	FEW100 SCT200	10.00		63	17.2	49	9.5	34	1.1	34	0	000		29.60			29.82	AA		29.83
10	0655	5	SCT200	8.00		61	16.1	49	9.2	35	1.7	38	3	160		29.62			29.85	AA		29.85
10	0755	5	SCT200	10.00		68	20.0	51	10.6	33	0.6	27	6	140		29.63	1	010	29.85	AA		29.86
10	0855	5	SCT200	10.00		73	22.8	54	12.3	36	2.2	26	9	150		29.62			29.84	AA		29.85
10	0955	5	SCT200	10.00		79	26.1	56	13.5	35	1.7	20	13	160		29.62			29.84	AA		29.85
10	1055	5	SCT200	10.00		83	28.3	59	15.1	39	3.9	21	17	170		29.61	6	006	29.83	AA		29.84
10	1155	5	FEW200	9.00		87	30.6	59	15.1	34	1.1	15	20	180	23	29.59			29.81	AA		29.82
10	1255	5	CLR	10.00		90	32.2	60	15.4	32	0.0	13	20	150	26	29.57			29.79	AA		29.80
10	1355	5	FEW150	6.00		90	32.2	60	15.4	32	0.0	13	18	180	28	29.55	7	020	29.77	AA		29.78
10	1455	5	CLR	10.00		91	32.8	60	15.3	30	-1.1	11	24	170	30	29.53			29.75	AA		29.76
10	1555	5	CLR	10.00		90	32.2	59	14.8	28	-2.2	11	20	180	30	29.51			29.74	AA		29.74
10	1655	5	CLR	10.00		88	31.1	58	14.3	28	-2.2	11	20	180		29.50	6	017	29.72	AA		29.73
10	1755	5	CLR	10.00		86	30.0	57	14.0	29	-1.7	13	17	180		29.49			29.71	AA		29.72
10	1855	5	CLR	9.00		82	27.8	57	13.8	33	0.6	17	16	170		29.49			29.71	AA		29.72
10	1955	5	FEW200	10.00		79	26.1	57	13.7	36	2.2	21	13	160		29.49	5	002	29.71	AA		29.72
10	2055	5	FEW200	10.00		76	24.4	55	13.0	36	2.2	23	13	150		29.49			29.72	AA		29.72
10	2155	5	FEW200	10.00		74	23.3	56	13.1	39	3.9	28	17	150		29.50			29.72	AA		29.73
10	2255	5	FEW200	10.00		71	21.7	56	13.1	42	5.6	35	11	180		29.52	3	011	29.75	AA		29.75
10	2355	5	CLR	10.00		68	20.0	56	13.1	45	7.2	44	11	170		29.55			29.77	AA		29.78

Figure A-7. Quality controlled local climatological data hourly observations table for the Yuma MCAS (03145), Yuma, AZ (04/10/2012). 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
YUMA MCAS (03145), YUMA, AZ (04/11/2012)

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
11	0055	5	CLR	10.00		64	17.8	55	12.9	48	8.9	56	6	260		29.58			29.80	AA		29.81
11	0155	5	BKN021	4.00		64	17.8	52	10.8	39	3.9	40	7	280		29.58	1	018	29.80	AA		29.81
11	0219	5	OVC015	2.00		64	18.0	51	10.4	37	3.0	37	10	290		29.58			M	SP		29.81
11	0224	5	OVC013	1.75		64	18.0	51	10.4	37	3.0	37	11	310		29.58			M	SP		29.81
11	0245	5	OVC013	2.50		63	17.0	51	10.5	39	4.0	41	8	340		29.59			M	SP		29.82
11	0252	5	OVC015	3.00		63	17.0	51	10.5	39	4.0	41	9	330		29.60			M	SP		29.83
11	0255	5	OVC015	2.50		63	17.2	51	10.8	40	4.4	43	8	330		29.60			29.82	AA		29.83
11	0313	5	OVC023	4.00		63	17.0	50	10.1	37	3.0	38	16	340	25	29.62			M	SP		29.85
11	0343	5	OVC031	7.00		63	17.0	51	10.5	39	4.0	41	11	310		29.62			M	SP		29.85
11	0355	5	BKN033	8.00		62	16.7	51	10.3	39	3.9	43	13	290	20	29.62			29.84	AA		29.85
11	0455	5	CLR	10.00		60	15.6	50	10.0	40	4.4	48	8	310		29.64	1	019	29.86	AA		29.87
11	0555	5	FEW100	10.00		60	15.6	50	10.0	40	4.4	48	0	000		29.66			29.88	AA		29.89
11	0655	5	FEW080	9.00		59	15.0	50	10.0	41	5.0	51	5	140		29.68			29.90	AA		29.91
11	0755	5	FEW080 SCT150	10.00		62	16.7	52	11.0	42	5.6	48	3	170		29.71	3	024	29.93	AA		29.94
11	0855	5	FEW080 SCT150	10.00		64	17.8	52	11.2	41	5.0	43	3	240		29.73			29.95	AA		29.96
11	0955	5	FEW080 SCT120	10.00		65	18.3	53	11.7	42	5.6	43	6	250		29.76			29.98	AA		29.99
11	1055	5	FEW080 SCT120	10.00		68	20.0	54	12.0	40	4.4	36	0	000		29.77	1	020	29.99	AA		30.00
11	1155	5	FEW080 SCT120	10.00		72	22.2	55	12.9	40	4.4	31	8	290		29.76			29.98	AA		29.99
11	1255	5	BKN090	10.00		74	23.3	56	13.4	40	4.4	29	9	290		29.75			29.98	AA		29.98
11	1355	5	SCT090	10.00		74	23.3	56	13.2	39	3.9	28	5	310		29.74	8	008	29.96	AA		29.97
11	1455	5	SCT080	10.00		77	25.0	57	13.6	38	3.3	25	8	270		29.72			29.94	AA		29.95
11	1555	5	BKN060	10.00		77	25.0	56	13.4	37	2.8	24	10	290		29.70			29.92	AA		29.93
11	1655	5	BKN060	10.00		76	24.4	56	13.0	36	2.2	23	10	320		29.70	6	015	29.92	AA		29.93
11	1755	5	BKN060	10.00		74	23.3	55	12.8	37	2.8	26	15	310		29.70			29.93	AA		29.93
11	1855	5	CLR	10.00		71	21.7	53	11.5	34	1.1	26	13	300		29.72			29.94	AA		29.95
11	1955	5	BKN095	10.00		68	20.0	51	10.6	33	0.6	27	18	310	25	29.74	3	013	29.96	AA		29.97
11	2055	5	BKN080 BKN095	10.00		66	18.9	51	10.7	36	2.2	33	15	300	21	29.76			29.99	AA		29.99
11	2155	5	BKN095	10.00		64	17.8	51	10.6	38	3.3	38	14	290		29.79			30.01	AA		30.02
11	2255	5	BKN080	10.00		62	16.7	50	9.9	37	2.8	40	15	290		29.80	1	023	30.03	AA		30.03
11	2355	5	CLR	10.00		61	16.1	49	9.4	36	2.2	39	14	300	22	29.81			30.03	AA		30.04

Figure A-8. Quality controlled local climatological data hourly observations table for the Yuma MCAS (03145), Yuma, AZ (04/11/2012). 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 (04/10/2012)

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		63	17.2	51	10.6	39	3.9	41	5	240		29.85	8	002	29.85	AA		29.81
10	0156	5	CLR	10.00		59	15.0	50	10.2	42	5.6	54	3	150		29.85			29.85	AA		29.81
10	0256	5	CLR	10.00		54	12.2	49	9.4	44	6.7	69	7	150		29.84	7	004	29.85	AA		29.80
10	0356	5	CLR	10.00		55	12.8	49	9.2	42	5.6	62	3	VR		29.84			29.84	AA		29.80
10	0456	5	SCT180	10.00		53	11.7	48	8.6	42	5.6	66	0	000		29.85			29.85	AA		29.81
10	0556	5	SCT150	10.00		52	11.1	48	8.9	44	6.7	74	3	160		29.86	1	007	29.86	AA		29.82
10	0656	5	SCT150	5.00	HZ	63	17.2	54	12.4	47	8.3	56	0	000		29.86			29.87	AA		29.82
10	0756	5	SCT150	7.00		69	20.6	57	14.1	48	8.9	47	3	210		29.87			29.87	AA		29.83
10	0856	5	SCT150	8.00		74	23.3	60	15.7	50	10.0	43	5	090		29.87	8	003	29.87	AA		29.83
10	0956	5	SCT150	10.00		78	25.6	61	15.8	47	8.3	34	3	140		29.85			29.86	AA		29.81
10	1056	5	CLR	10.00		82	27.8	60	15.5	42	5.6	24	3	VR		29.85			29.85	AA		29.81
10	1156	5	CLR	10.00		85	29.4	60	15.6	39	3.9	20	7	090		29.82	8	021	29.82	AA		29.78
10	1256	5	CLR	10.00		86	30.0	62	16.3	42	5.6	21	6	080		29.79			29.80	AA		29.75
10	1356	5	CLR	10.00		87	30.6	63	16.9	44	6.7	22	3	VR		29.76			29.77	AA		29.72
10	1456	5	CLR	10.00		86	30.0	63	17.2	46	7.8	25	11	140		29.73	6	022	29.74	AA		29.69
10	1556	5	FEW043	10.00		84	28.9	63	17.0	47	8.3	28	7	160		29.73			29.73	AA		29.69
10	1656	5	CLR	10.00		83	28.3	60	15.5	41	5.0	23	20	260	26	29.73			29.73	AA		29.69
10	1756	5	CLR	10.00		80	26.7	58	14.5	39	3.9	23	15	280		29.72	5	002	29.72	AA		29.68
10	1856	5	CLR	10.00		74	23.3	57	13.8	42	5.6	32	8	280		29.72			29.72	AA		29.68
10	1956	5	CLR	10.00		69	20.6	56	13.4	45	7.2	42	22	250		29.75			29.75	AA		29.71
10	2056	5	CLR	9.00		65	18.3	54	11.9	43	6.1	45	21	280		29.77	1	023	29.77	AA		29.73
10	2156	5	CLR	9.00		64	17.8	53	11.5	42	5.6	45	29	270	36	29.79			29.79	AA		29.75
10	2256	5	CLR	10.00		64	17.8	52	11.2	41	5.0	43	22	280		29.80			29.80	AA		29.76
10	2356	5	CLR	10.00		63	17.2	51	10.8	40	4.4	43	23	240	32	29.82			29.82	AA		29.78

Figure A-9. Quality controlled local climatological data hourly observations table for the NAF (23199), El Centro, CA (04/10/2012). 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 (04/11/2012)

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
11	0035	5	SCT005	3.00	HZ	63	17.0	52	11.0	41	5.0	45	31	250	41	29.81			M	SP		29.77
11	0042	5	BKN005	1.75	HZ	63	17.0	52	11.0	41	5.0	45	40	260	51	29.82	3	017	M	SP		29.78
11	0056	5	BKN005	2.00	HZ	62	16.7	52	11.0	42	5.6	48	39	250	53	29.84			29.84	AA		29.80
11	0100	5	BKN003	1.75	HZ	63	17.0	53	11.5	43	6.0	48	43	250	53	29.84			M	SP		29.80
11	0109	5	SCT003	3.00	HZ	63	17.0	53	11.5	43	6.0	48	32	240	48	29.86			M	SP		29.82
11	0156	5	CLR	10.00		60	15.6	51	10.7	43	6.1	54	23	240	33	29.89			29.90	AA		29.85
11	0256	5	CLR	10.00		60	15.6	52	11.0	44	6.7	56	22	240	28	29.89	1	025	29.90	AA		29.85
11	0356	5	CLR	10.00		59	15.0	52	11.0	45	7.2	60	13	250		29.91			29.92	AA		29.87
11	0456	5	SCT070	10.00		58	14.4	51	10.5	44	6.7	60	9	260		29.92			29.92	AA		29.88
11	0556	5	SCT070	10.00		59	15.0	52	11.2	46	7.8	62	11	230		29.94	3	021	29.95	AA		29.90
11	0656	5	BKN070 BKN100	10.00		63	17.2	53	11.7	44	6.7	50	21	240	29	29.97			29.98	AA		29.93
11	0731	5	SCT050 BKN070	10.00	-RA	61	16.0	52	11.0	43	6.0	52	13	230		29.99			M	SP		29.95
11	0742	5	SCT050 BKN070	10.00		61	16.0	53	11.5	45	7.0	56	16	220		29.99			M	SP	T	29.95
11	0756	5	FEW050 BKN070 BKN100	10.00		61	16.1	53	11.5	45	7.2	56	21	230	24	29.99			30.00	AA		29.95
11	0815	5	FEW050 BKN070 BKN100	10.00	-RA	61	16.0	54	12.2	48	9.0	63	18	240	26	30.00			M	SP		29.96
11	0849	5	FEW050 BKN070 BKN100	10.00		63	17.0	55	12.7	48	9.0	58	7	210		30.00			M	SP	0.01	29.96
11	0856	5	FEW050 BKN070 BKN100	10.00		63	17.2	55	12.7	48	8.9	58	10	240	16	30.00	3	020	30.01	AA		29.96
11	0956	5	SCT080 SCT110	10.00		69	20.6	56	13.1	44	6.7	41	23	250	30	30.03			30.03	AA		29.99
11	1056	5	SCT080 SCT110	10.00		70	21.1	57	13.6	45	7.2	41	14	220	24	30.02			30.03	AA		29.98
11	1156	5	SCT080 BKN110	10.00		73	22.8	57	14.1	44	6.7	35	20	230	29	30.02	8	007	30.02	AA		29.98
11	1256	5	SCT080 BKN110	10.00		75	23.9	58	14.3	43	6.1	32	17	240	23	30.01			30.01	AA		29.97
11	1356	5	SCT050 BKN080	10.00		74	23.3	57	13.8	42	5.6	32	16	250	29	30.00			30.01	AA		29.96
11	1456	5	SCT060	10.00		73	22.8	55	13.0	39	3.9	29	22	250	33	29.99	5	005	30.00	AA		29.95
11	1556	5	SCT080	10.00		73	22.8	55	12.6	37	2.8	27	22	250	30	29.99			30.00	AA		29.95
11	1656	5	SCT080	10.00		71	21.7	54	11.9	36	2.2	28	26	260	34	29.99			29.99	AA		29.95
11	1756	5	SCT080	10.00		67	19.4	53	11.8	40	4.4	37	18	250	28	30.01	3	014	30.01	AA		29.97
11	1856	5	SCT100	10.00		64	17.8	52	11.0	40	4.4	42	11	260		30.03			30.04	AA		29.99
11	1956	5	CLR	10.00		62	16.7	50	10.1	38	3.3	41	20	250		30.08			30.08	AA		30.04
11	2056	5	CLR	10.00		61	16.1	50	10.1	39	3.9	44	18	240	25	30.07	1	017	30.07	AA		30.03
11	2156	5	CLR	10.00		59	15.0	50	9.8	40	4.4	50	22	240	31	30.08			30.09	AA		30.04
11	2256	5	CLR	10.00		58	14.4	49	9.5	40	4.4	51	17	250		30.10			30.10	AA		30.0
11	2356	5	CLR	10.00		58	14.4	49	9.5	40	4.4	51	16	250		30.09			30.10	AA		

Figure A-10. Quality controlled local climatological data hourly observations table for the NAF (23199), El Centro, CA (04/11/2012). 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 (04/10/2012)

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 (F)	Dry Bulb Temp (C)	Wet Bulb Temp (F)	Wet Bulb Temp (C)	Dew Point Temp (F)	Dew Point Temp (C)	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)
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		63	17.2	49	9.2	32	0.0	31	0	000		29.87	8	002	29.81	AA		29.81
10	0153	12	CLR	10.00		61	16.1	48	8.8	33	0.6	35	5	190		29.87			29.80	AA		29.81
10	0253	12	CLR	10.00		60	15.6	48	9.0	35	1.7	39	3	170		29.86	8	003	29.80	AA		29.80
10	0353	12	CLR	10.00		62	16.7	50	9.9	37	2.8	40	5	160		29.86			29.80	AA		29.80
10	0453	12	CLR	10.00		54	12.2	47	8.4	40	4.4	59	0	000		29.87			29.80	AA		29.81
10	0553	12	CLR	9.00		55	12.8	49	9.2	42	5.6	62	0	000		29.87	2	007	29.81	AA		29.81
10	0653	12	CLR	10.00		66	18.9	53	11.5	40	4.4	39	3	130		29.88			29.82	AA		29.82
10	0753	12	CLR	10.00		71	21.7	57	14.1	46	7.8	41	5	120		29.88			29.82	AA		29.82
10	0853	12	CLR	10.00		76	24.4	57	13.8	40	4.4	27	7	120		29.88	8	003	29.82	AA		29.82
10	0953	12	CLR	10.00		80	26.7	58	14.1	37	2.8	21	3	040		29.87			29.81	AA		29.81
10	1053	12	CLR	10.00		82	27.8	59	14.7	38	3.3	21	0	000		29.86			29.80	AA		29.80
10	1153	12	CLR	10.00		83	28.3	59	14.8	37	2.8	19	6	140		29.84	8	021	29.78	AA		29.78
10	1253	12	CLR	10.00		86	30.0	61	16.1	41	5.0	20	6	VR		29.81			29.75	AA		29.75
10	1353	12	CLR	10.00		90	32.2	60	15.7	34	1.1	14	18	150	24	29.78			29.72	AA		29.72
10	1453	12	CLR	10.00		90	32.2	61	15.9	35	1.7	14	20	140		29.75	6	024	29.69	AA		29.69
10	1553	12	CLR	10.00		88	31.1	61	16.0	38	3.3	17	16	140		29.74			29.68	AA		29.68
10	1653	12	CLR	10.00		85	29.4	61	15.9	41	5.0	21	10	130		29.74			29.68	AA		29.68
10	1753	12	CLR	10.00		77	25.0	59	14.7	43	6.1	30	9	280		29.74	1	001	29.68	AA		29.68
10	1853	12	CLR	10.00		74	23.3	57	13.8	42	5.6	32	8	310		29.74			29.68	AA		29.68
10	1953	12	CLR	10.00		69	20.6	56	13.1	44	6.7	41	14	280		29.77			29.70	AA		29.71
10	2053	12	CLR	8.00		64	17.8	54	11.9	44	6.7	48	17	280	22	29.78	1	017	29.72	AA		29.72
10	2153	12	CLR	7.00		63	17.2	53	11.5	43	6.1	48	18	270	32	29.79			29.73	AA		29.73
10	2253	12	CLR	10.00		63	17.2	52	11.2	42	5.6	46	21	290	26	29.81			29.75	AA		29.75
10	2353	12	CLR	9.00		61	16.1	51	10.5	41	5.0	48	18	270	23	29.84			29.78	AA		29.78

Figure A-11. Quality controlled local climatological data hourly observations table for the Imperial County Airport (03144), Imperial, CA (04/10/2012). 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 (04/11/2012)

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 (F)	Dry Bulb Temp (C)	Wet Bulb Temp (F)	Wet Bulb Temp (C)	Dew Point Temp (F)	Dew Point Temp (C)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
11	0051	12	SCT009	5.00	HZ	63	17.0	52	11.0	41	5.0	45	17	260	29	29.86	0	019	M	SP		29.80
11	0053	12	BKN009	4.00	HZ	61	16.1	51	10.5	41	5.0	48	22	260	36	29.86			29.80	AA		29.80
11	0115	12	BKN005	2.50	HZ	61	16.0	52	11.0	43	6.0	52	34	260	41	29.84			M	SP		29.78
11	0123	12	SCT005	6.00	HZ	63	17.0	53	11.5	43	6.0	48	29	260	43	29.86			M	SP		29.80
11	0153	12	CLR	10.00		61	16.1	51	10.7	42	5.6	50	29	240	40	29.87			29.81	AA		29.81
11	0253	12	CLR	10.00		60	15.6	51	10.7	43	6.1	54	20	250	28	29.90	3	018	29.84	AA		29.84
11	0353	12	CLR	10.00		60	15.6	52	11.0	44	6.7	56	23	250	32	29.92			29.85	AA		29.86
11	0453	12	CLR	10.00		58	14.4	51	10.5	44	6.7	60	14	250		29.93			29.87	AA		29.87
11	0553	12	CLR	10.00		58	14.4	52	11.0	46	7.8	65	14	260		29.95	3	021	29.89	AA		29.89
11	0653	12	FEW070 BKN090 BKN110	10.00		65	18.3	55	12.7	46	7.8	50	17	250		29.98			29.92	AA	T	29.92
11	0753	12	OVC080	10.00		62	16.7	52	11.2	43	6.1	50	13	240		30.01			29.95	AA	T	29.95
11	0853	12	FEW050 BKN075 BKN090	10.00		64	17.8	54	12.4	46	7.8	52	13	250		30.02	1	019	29.96	AA		29.96
11	0953	12	CLR	10.00		70	21.1	56	13.1	43	6.1	38	16	230	29	30.03			29.97	AA		29.97
11	1053	12	CLR	10.00		72	22.2	56	13.4	42	5.6	34	16	240	24	30.03			29.97	AA		29.97
11	1153	12	SCT090	10.00		72	22.2	56	13.4	42	5.6	34	16	260	26	30.03	8	005	29.97	AA		29.97
11	1253	12	CLR	10.00		74	23.3	57	13.8	42	5.6	32	17	250	25	30.02			29.96	AA		29.96
11	1353	12	BKN085 BKN100	10.00		72	22.2	56	13.2	41	5.0	33	15	260	25	30.01			29.95	AA		29.95
11	1453	12	M	10.00		73	22.8	56	13.2	40	4.4	30	20	260	29	29.99			29.93	AA		29.93
11	1553	12	FEW100	10.00		72	22.2	55	12.7	39	3.9	30	20	270	30	30.00			29.94	AA		29.94
11	1653	12	CLR	10.00		69	20.6	53	11.4	36	2.2	30	20	270	31	30.00			29.94	AA		29.94
11	1753	12	CLR	10.00		66	18.9	53	11.5	40	4.4	39	18	270	26	30.02	3	012	29.96	AA		29.96
11	1853	12	CLR	10.00		63	17.2	52	11.0	41	5.0	45	18	260		30.03			29.97	AA		29.97
11	1953	12	CLR	10.00		61	16.1	49	9.4	36	2.2	39	11	260	21	30.08			30.01	AA		30.02
11	2053	12	CLR	10.00		60	15.6	50	9.8	39	3.9	46	23	250	30	30.07	1	018	30.01	AA		30.01
11	2153	12	CLR	10.00		59	15.0	49	9.3	38	3.3	46	23	250	30	30.09			30.03	AA		30.03
11	2253	12	CLR	10.00		58	14.4	49	9.3	39	3.9	49	15	270	24	30.10			30.04	AA		30.04
11	2353	12	CLR	10.00		56	13.3	48	9.0	40	4.4	55	14	260		30.11			30.04	AA		30.05

Figure A-12. Quality controlled local climatological data hourly observations table for the Imperial County Airport (03144), Imperial, CA (04/11/2012). 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
150
100
50

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

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 WEDNESDAY, APRIL 11, 2012

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 MON 04/09/2012 NONE AQI Reading/Category (Preliminary data only)	TODAY TUE 04/10/2012 NONE	TOMORROW WED 04/11/2012 NONE	EXTENDED THU 04/12/2012 NONE
O3*	46 GOOD	54 MODERATE	42 GOOD	44 GOOD
PM-10*	43 GOOD	37 GOOD	63 MODERATE	44 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 are possible.

Health message for Tuesday April 10: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Health message for Wednesday April 11: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Synopsis and Discussion

OZONE (O3): An increase in gradient winds is expected to begin today and especially on Wednesday along with a cooling trend. As a result, both ozone production and accumulation should continue to decrease with local ozone levels in the good range of the Air Quality Index thru Thursday.

COARSE PARTICLES (PM-10): A deep upper level trough off the U.S. west coast will begin to shift eastward today and on Wednesday the initial wave of the Pacific trough will approach the Yuma area bringing a marked increase in winds along with the possibility of blowing dust and an increase in PM-10 concentrations.

POLLUTION MONITOR READINGS FOR MONDAY, APRIL 09, 2012

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

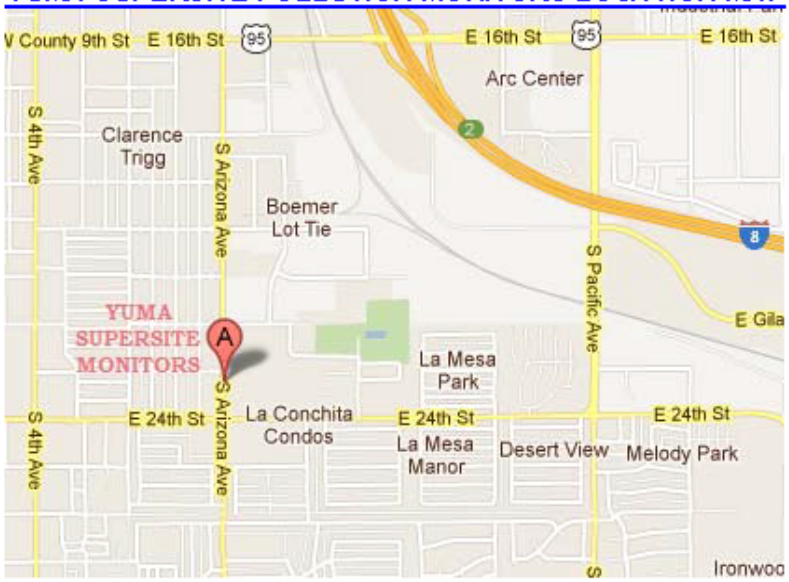
SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Yuma Supersite	54	46	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (µg/m3)	MAX AQI	AQI COLOR CODE
Yuma Supersite	46	43	

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

YUMA SUPERSITE POLLUTION MONITORS LOCATION MAP



URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
155 AM MST WED APR 11 2012
CAZ033-111300-
/O.NEW.KPSR.WI.Y.0013.120411T0855Z-120411T1300Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
155 AM PDT WED APR 11 2012
...WIND ADVISORY IN EFFECT UNTIL 6 AM PDT EARLY THIS MORNING...
THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND
ADVISORY...WHICH IS IN EFFECT UNTIL 6 AM PDT EARLY THIS MORNING.
* AFFECTED AREA...IMPERIAL COUNTY IN SOUTHEAST CALIFORNIA...INCLUDING
THE COMMUNITIES OF EL CENTRO...IMPERIAL...OCOTILLO AND GLAMIS.
* TIMING...THROUGH 6 AM PDT THIS MORNING.
* WINDS...SUSTAINED WINDS OF 25 TO 35 MPH WITH GUSTS AS HIGH AS 50
MPH.
* IMPACTS...WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT FOR HIGH
PROFILE VEHICLES...ESPECIALLY ALONG INTERSTATE 8.
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.
&&
$$
NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

WWUS75 KPSR 111234
NPWPSR
URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
534 AM MST WED APR 11 2012
CAZ033-111345-
/O.CAN.KPSR.WI.Y.0013.000000T0000Z-120411T1300Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
534 AM PDT WED APR 11 2012
...WIND ADVISORY IS CANCELLED...
THE NATIONAL WEATHER SERVICE IN PHOENIX HAS CANCELLED THE WIND
ADVISORY.
WINDS SPEEDS ACROSS IMPERIAL COUNTY HAVE DIMINISHED AND ARE NO LONGER
APPROACHING ADVISORY LEVELS AT THIS TIME. HOWEVER...WINDS ARE
EXPECTED TO INCREASE AND BECOME GUSTY ONCE AGAIN LATER TODAY AS A
COLD FRONT MOVES THROUGH THE AREA.
$$
NATIONAL WEATHER SERVICE PHOENIX IS ON THE INTERNET AT
WEATHER.GOV/PHOENIX

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE PHOENIX AZ
410 AM MST WED APR 11 2012

.SYNOPSIS...
A WEATHER DISTURBANCE LIFTING NORTHEAST THROUGH SOUTHERN CALIFORNIA WILL BRING BREEZY TO WINDY CONDITIONS AND COOLER TEMPERATURES TO THE REGION TODAY. THERE WILL BE A CHANCE FOR SHOWERS...AND POSSIBLY AN ISOLATED THUNDERSTORM...MAINLY OVER PORTIONS OF SOUTHEAST CALIFORNIA AND WEST-CENTRAL ARIZONA. DRY AND MORE TRANQUIL CONDITIONS WILL OCCUR THURSDAY...HOWEVER A MORE POWERFUL WEATHER SYSTEM WILL AFFECT THE AREA BEGINNING ON FRIDAY. A STRONG AND COLD LOW PRESSURE SYSTEM APPROACHING FROM THE NORTHWEST WILL CREATE WINDY CONDITIONS...WITH SOME BLOWING DUST OR SAND OVER THE LOWER DESERTS BY LATE FRIDAY AFTERNOON. UNSEASONABLY COOL AND UNSETTLED WEATHER WILL PREVAIL FRIDAY THROUGH SUNDAY...WITH SEVERAL CHANCES FOR SHOWERS OVER THE HIGHER TERRAIN...AND A SLIGHT CHANCE FOR A SHOWER OVER THE LOWER DESERTS...PRIMARILY DURING THE LATE AFTERNOON HOURS.

&&

.DISCUSSION...

A NEGATIVELY TILTED SHORTWAVE AND ASSOCIATED COLD CORE ALOFT WERE MAKING LANDFALL ACROSS THE LOS ANGELES BASIN EARLY THIS MORNING...WITH A LOW LEVEL FRONTAL BOUNDARY AND WAVE OF LOW PRESSURE PROPAGATING THROUGH THE INLAND EMPIRE AND TOWARDS THE LOWER COLORADO RIVER VALLEY. PRESSURE RISES ALONG THE CALIFORNIA COAST RANGE WERE TIGHTENING THE SYNOPTIC GRADIENT...AND LOCAL TERRAIN GAP EFFECTS (AND POSSIBLY EVEN A GRAVITY WAVE) WERE FURTHER ENHANCING WIND SPEEDS THROUGH PORTIONS OF RIVERSIDE AND IMPERIAL COUNTIES. HAVE ISSUED A WIND ADVISORY FOR IMPERIAL COUNTY WHERE THE STRONGEST WINDS HAVE ALREADY BEEN OBSERVED...AND ARE EXPECTED TO CONTINUE THROUGH SUNRISE BEFORE WAVE DISPERSION AND FRONTAL BOUNDARY PROXIMITY AWAY FROM THE HIGHER TERRAIN LIMITS ANY STRONGER GUSTS.

MODEL TRENDS HAVE CONTINUED TO DISPLACE THE COLD CORE SHORTWAVE BASE SLIGHTLY FARTHER SOUTHEAST INTO SOUTHEAST CALIFORNIA TODAY. ALTHOUGH RELATIVELY SHALLOW PER 00Z RAOBS AND SATELLITE IMAGERY...SOME BOUNDARY LAYER MOISTURE HAS SNUCK THROUGH THE PASSES INTO SOUTHEAST CALIFORNIA. HOWEVER...A NARROW PLUME TAPPING THE DEEPER COLUMN PACIFIC MOISTURE APPEARS TO HAVE BECOME PINCHED OFF OVER THE BAJA WITH PRECIPITATION BEING SQUEEZED OUT OVER THE COASTAL RANGE. GIVEN THE PROXIMITY AND FORECAST TRAJECTORY OF THE COLD CORE...FELT COMFORTABLE KEEPING CHANCE POPS IN THE NORTHWEST PARTS OF THE FORECAST AREA. IN ADDITION...THERE STILL LOOKS TO BE A BRIEF MIDDAY PERIOD WITH STEEP H7-H5 LAPSE RATES (7 C/KM) AND SLIGHTLY NEGATIVE SHOWALTER INDICES ADVECTING OVER THE JTNP VICINITY TO SUPPORT DEEPER CONVECTIVE DEVELOPMENT (ALBEIT OVERALL SHALLOW CLOUD DEPTHS GIVEN THE MORE INTENSE PV ANOMALY AND LOWER TROPOPAUSE HEIGHTS). ANY PRECIPITATION SHOULD SHUT DOWN QUICKLY BY THIS EVENING AS THE WAVE LIFTS WELL TO THE NORTH AND DEEPER SUBSIDENCE AND WARMING ALOFT OVERTAKES THE REGION.

INTENSE GULF OF ALASKA WAVE WITH OBJECTIVELY ANALYZED 130+KT

MIDLATITUDE JET CORE WILL DIVE SOUTHEAST INTO THE EASTERN PACIFIC ON THURSDAY FILLING THE HEIGHT VOID LEFT BY THE SYSTEM EXITING TO THE NORTH TODAY. H5 HEIGHTS NEAR 540DM WILL DIG UNSEASONABLY FAR INTO NORTHERN ARIZONA BY SATURDAY MORNING (REPRESENTING NEARLY 3 NORMALIZED STANDARD DEVIATIONS BELOW AVERAGE) BRINGING SEVERAL DAYS OF UNSETTLED WEATHER AND TEMPERATURES MUCH COLDER THAN NORMAL. THE HIGHEST IMPACT WEATHER WILL LIKELY OCCUR ON FRIDAY IN ADVANCE OF THE WAVE AND DURING THE TIME OF LARGEST HEIGHTS FALLS. THIS WILL ALLOW THE LOW LEVEL PRESSURE GRADIENT TO TIGHTEN SIGNIFICANTLY WITH STRONG DYNAMICS AND DEEP MIXING PRODUCING WINDY CONDITIONS DURING THE AFTERNOON AND EVENING. WOULD EXPECT A WIDESPREAD AREA OF SOUTHEAST CALIFORNIA AND FAR WESTERN ARIZONA TO EXPERIENCE SUSTAINED WINDS AT LEAST 30 MPH AND GUSTS IN THE 40 TO 50 MPH RANGE...LEADING TO LOCALIZED AREAS OF BLOWING DUST/SAND. AS TEMPERATURES ALOFT COOL WITH INCREASING MOISTURE BY SATURDAY...INSTABILITY SHOWERS (MOSTLY OVER THE HIGHER TERRAIN) WILL BECOME MORE COMMON. WITH STILL SOME UNCERTAINTY IN MORE PRECISE TEMPERATURES ALOFT AND LAPSE RATES...HAVE HELD OFF ON THUNDER MENTION FOR THE TIME BEING...THOUGH CONCEPTUALLY WOULD EXPECT DEEPER CONVECTION OFF THE HIGH TERRAIN TO THE NORTH AND EAST.

SUBSTANTIALLY COOLER TEMPERATURES CAN BE EXPECTED THROUGHOUT THE WEEKEND...WITH SATURDAY YIELDING THE MOST ANOMALOUS READINGS (SOME 15F OR SO BELOW NORMAL). A WARMING TREND WILL COMMENCE ON MONDAY AS THE WEEKEND SYSTEM TRANSLATES EASTWARD BEING REPLACED BY STRONGER SUBTROPICAL RIDGING...SUCH THAT A RETURN TO ABOVE AVERAGE TEMPERATURES WILL BE LIKELY BY THE END OF THE PERIOD.

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.AVIATION...
SOUTHEAST CALIFORNIA...SOUTHWEST AND SOUTH CENTRAL ARIZONA...
INCLUDING KIPL...KBLH...KPHX...AND KIWA...

A WELL-DEFINED BOUNDARY MOVED THROUGH THE PHOENIX AREA AROUND 01Z...PRODUCING WIND GUSTS AS HIGH AS 25 KT. WINDS HAVE SINCE SUBSIDED AND WILL GENERALLY REMAIN BELOW 10 KT OVERNIGHT ACROSS SOUTH-CENTRAL AZ. OTHERWISE...THE FLOW WILL ACQUIRE MORE OF A WESTERLY COMPONENT AHEAD OF AN APPROACHING FRONTAL BOUNDARY. INSTEAD OF A DOWNSLOPE EASTERLY WIND AT KPHX AND KIWA...THE WINDS WILL BE MORE OUT OF THE SOUTHEAST OR EVEN SOUTH THROUGH WEDNESDAY MORNING. THEREAFTER...SOUTHWESTERLY FLOW WILL INCREASE ALONG THE FRONTAL BOUNDARY. GUSTS AS HIGH AS 30 KT WILL BE POSSIBLE IN THE PHOENIX AREA AS WELL AS AT KIPL AND KBLH.

ISOLATED/SCATTERED PRECIPITATION ALONG THE FRONT WILL GENERALLY REMAIN WEST OF A LINE STRETCHING FROM YUMA TO WICKENBURG. THERE IS A SLIGHT CHANCE OF A SHOWER OR EVEN A THUNDERSTORM AT KBLH AROUND 18Z WEDNESDAY...THOUGH PROBABILITIES ARE TOO LOW TO INCLUDE IN THE TAF AT THIS POINT.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

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.FIRE WEATHER...

THURSDAY THROUGH MONDAY...
COOLER YET FAIRLY TRANQUIL CONDITIONS WILL COVER THE DISTRICT THURSDAY BEFORE A MUCH LARGER...STRONGER AND MORE MOIST WEATHER SYSTEM WILL AFFECT THE REGION FRIDAY THROUGH SUNDAY. THIS SYSTEM WILL SUPPORT ANOTHER ROUND OF PERIODICALLY GUSTY WINDS AND AT LEAST SLIGHT CHANCES FOR PRECIPITATION. HOWEVER...TEMPERATURES DURING THIS PERIOD WILL BE MUCH BELOW AVERAGE FOR THE MIDDLE OF APRIL...KEEPING RELATIVE HUMIDITY VALUES HIGHER THAN TYPICAL...AND PRECLUDING A HIGHER FIRE DANGER.

&&

.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...NONE.

CA...WIND ADVISORY UNTIL 6 AM PDT EARLY THIS MORNING CAZ033.