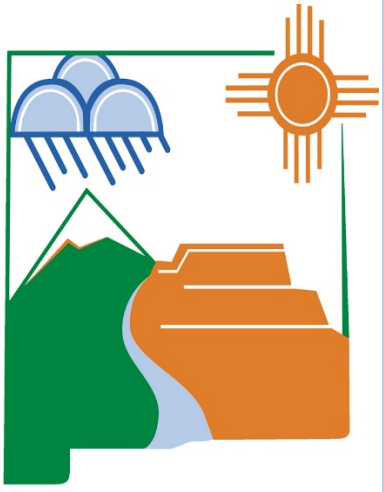
Exceptional Events Demonstration July 1-December 31, 2013

NMED
New Mexico Environment Department



Public Review Draft

Air Quality Bureau

Control Strategies Section

August 2016

The New Mexico Environment Department's Air Quality Bureau prepared this document. It is available for review at the website located at www.env.nm.gov/aqb or in person at the address listed below. The Air Quality Bureau will accept public comment on this document from August 26, 2016 to September 26, 2016. For further information or to request a copy of this document, please contact the bureau by phone or in writing at:

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1 Introduction

Purpose

The U.S Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM) with an aerodynamic diameter of 10 microns or less (PM_{10}). The level of the PM_{10} NAAQS is set at a 24-hour average of 150 $\mu g/m^3$.

From July 1-December 31, 2013, the New Mexico Environment Department (NMED) Air Quality Bureau (AQB) recorded 5 exceedances of the PM_{10} NAAQS on 5 days due to exceptional events.

The evidence presented in this document substantiates the AQB's request to exclude exceedance data from the PM_{10} NAAQS attainment determinations for Doña Ana and Luna Counties in New Mexico. Table 1-1 lists the dates, monitoring sites and 24-hour averages of the exceedances requested for exclusion (highlighted yellow) when the EPA makes a determination that a county meets the PM_{10} NAAQS. The elevated levels of PM recorded on the dates highlighted below were due to fireworks, high winds entraining dust in the air and transporting it to the monitoring sites or smoke impacts from wildfires. ND stands for no data for that day due to malfunctioning equipment.

Site	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Pollutant	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}
7/4/2013	40	27	28	44	178	19
7/7/2013	35	40	33	34	37	159
7/26/2013	23	23	21	31	269	13
10/10/2013	179	88	71	94	ND	44
11/22/2013	83	28	74	155	62	42

Table 1-1: 24-Hour PM_{10} concentrations requested for exclusion.

2 Background

Exceptional Events Rule

On March 22, 2007, the EPA adopted its final rule for state and local air quality management agencies regarding the review and handling of certain air quality monitoring data (72 FR 13560). The regulation, "Treatment of Data Influenced by Exceptional Events", or more commonly called the Exceptional Events Rule (EER), became effective on May 22, 2007 (40 CFR Part 50.14). The EER allows the EPA to exclude data affected by an exceptional event that caused an exceedance of a NAAQS when determining an area's ability to meet the standard for a given criteria pollutant. The rule does not include specific requirements concerning the type or level of evidence an agency must provide due to the wide range of events and circumstances covered under the rule. Hence, EPA determines data exclusion on a case-by-case basis after considering the weight of evidence provided in a demonstration. The procedural requirements of the EER are:

1. flagging of data in EPA's Air Quality System (AQS) database by air quality management agencies,
2. submission of demonstrations proving an exceptional event caused an exceedance within three years of the calendar quarter in which it was recorded, and
3. EPA placing a concurrence flag in AQS for those dates that are exceptional events.

In order for EPA to concur on a demonstration and exclude data under the EER, an agency must meet six technical elements. These elements include:

1. whether the event in question was not reasonably controllable or preventable (nRCP),
2. whether there was a clear causal relationship (CCR),
3. whether there would have been no exceedance or violation but for the event in question (NEBF),
4. whether the event affects air quality (AAQ),
5. whether the event was caused by human activity unlikely to reoccur or it was a natural event (HAURL/Natural Event), and
6. whether the event was in excess of normal historical fluctuations (HF).

This report demonstrates that NMED met the procedural and technical requirements for excluding data due to exceptional events in New Mexico for the third and fourth quarter of calendar year 2013.

2.2 Monitoring Network and Data Collection

The AQB operates a State and Local Air Monitoring Stations (SLAMS) network to measure the concentration of criteria pollutants and meteorological parameters (Table 2-1). The Bureau maintains five PM_{10} monitoring sites in Doña Ana County and one in Luna County to track windblown dust and smoke impacts. All monitoring sites in Doña Ana and Luna Counties are equipped with continuous Federal Equivalent Method (FEM) Tapered Element Oscillating

Microbalance (TEOM) PM_{10} instruments, with the Anthony (Doña Ana County) site equipped with a filter-based Federal Reference Method (FRM) Hi-Volume Wedding PM_{10} monitor. The Anthony Wedding monitor did not record any exceedances during these quarters.

The Bureau maintains seven meteorological monitoring sites in Doña Ana and Luna Counties. The Anthony site does not have a standard 10-meter wind tower and the La Union monitoring site is used for measuring meteorological parameters due to their proximity. The Santa Teresa, monitoring site is included in this report because it may inform wind speeds at areas upwind of PM_{10} monitors in Doña Ana County. Figure 2-1 shows the location of the monitoring sites listed in Table 2-1. Gaps in the charts below depicting hourly PM_{10} or meteorological data are due to routine operation and maintenance, malfunctioning equipment or invalid data.

Site Name	AIRS Number	County	Sampling Frequency	Parameters
Holman	35-013-0019	Doña Ana	Continuous	PM_{10} and Meteorological
Chaparral	35-013-0020	Doña Ana	Continuous	PM_{10} and Meteorological
Anthony	35-013-0016	Doña Ana	Continuous and 1-in-6 Day	PM_{10}
Desert View	35-013-0021	Doña Ana	Continuous	PM_{10} and Meteorological
West Mesa	35-013-0024	Doña Ana	Continuous	PM_{10} and Meteorological
La Union	35-013-0008	Doña Ana	Continuous	Meteorological
Santa Teresa	35-013-0022	Doña Ana	Continuous	Meteorological
Deming Airport	35-029-0003	Luna	Continuous	PM_{10} and Meteorological

Table 2-1. SLAMS designated monitoring sites operated by NMED in 2013. The Anthony Site has collocated TEOM and Wedding instruments.

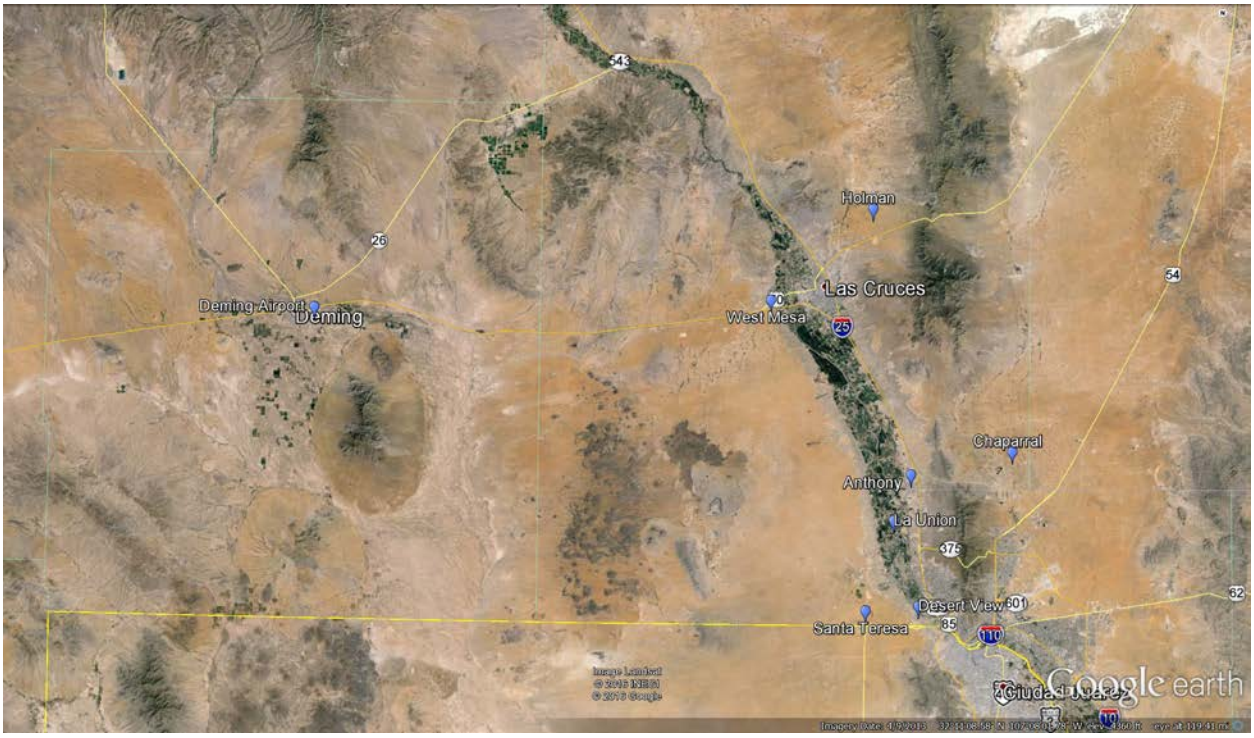

Figure 2-1. PM_{10} and meteorological monitoring sites in Luna and Doña Ana Counties.

3 Exceptional Event: July 4, 2013

Summary of the Event

During the Independence Day fireworks display on the evening of July 4, 2013, PM_{10} concentrations exceeded the National Ambient Air Quality Standard (NAAQS) at the Deming Airport monitoring station in Luna County, New Mexico. This report demonstrates that these PM_{10} exceedances meet the criteria of the EPA Exceptional Events Rule and that without the fireworks display, the PM_{10} NAAQS would not have been exceeded at Deming on July 4, 2013.

Particulate matter concentrations increased significantly during the evening of July 4 at Deming due to fireworks emissions and increased to high peak hourly concentrations. The highest hourly measurement was 2,544 µg/m3. The meteorological conditions were stagnant and stable, with limited vertical mixing in the evening of July 4. Traditionally, fireworks displays are an important part of the Independence Day celebration on July 4. The city of Deming confirmed that the display was set up on the old runways near the monitoring site in 2013 (per phone conversation with a city of Deming representative).

Is Not Reasonably Controllable or Preventable

No other unusual significant PM_{10} producing activities occurring in Luna County, including nearby construction or agricultural activities, strong winds or wildfires occurred on this day. While anthropogenic emissions of PM_{10} were elevated due to holiday vehicular traffic and barbeques, the fireworks had the most significant impact to the exceedances.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring site in and Luna County has recorded exceedances of the PM_{10} NAAQS. High winds have caused theses exceedances in the past and they occur at any time of year. Most exceedances occur from late winter through early summer, and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 3-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values at the other monitoring sites for this day are below the 95th percentile of all 24-hour averages recorded. However, the Deming site recorded a value above the 95th percentile of data. Because NMED believes all previous exceedances were due to exceptional events, the exceedances for this day would be the maximum values recorded if no exceptional event exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	40	27	28	44	178	19

Table 3-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 3-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three-month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are below the 95th percentile of the seasonal 24-hour averages recorded except for the Deming site. Because NMED believes all previous exceedances were due to exceptional events, the exceedances for this day would be the maximum values recorded if no exceptional event exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	40	27	28	44	178	19

Table 3-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

This documentation shows a clear causal connection between the PM_{10} measured at the Deming Airport on July 4 and the fireworks display that occurred there. Wind speeds remained relatively steady throughout the day and the timing of the increase in particulate matter coincides with the start of the fireworks show that began as the sun set (Figure 3-1).

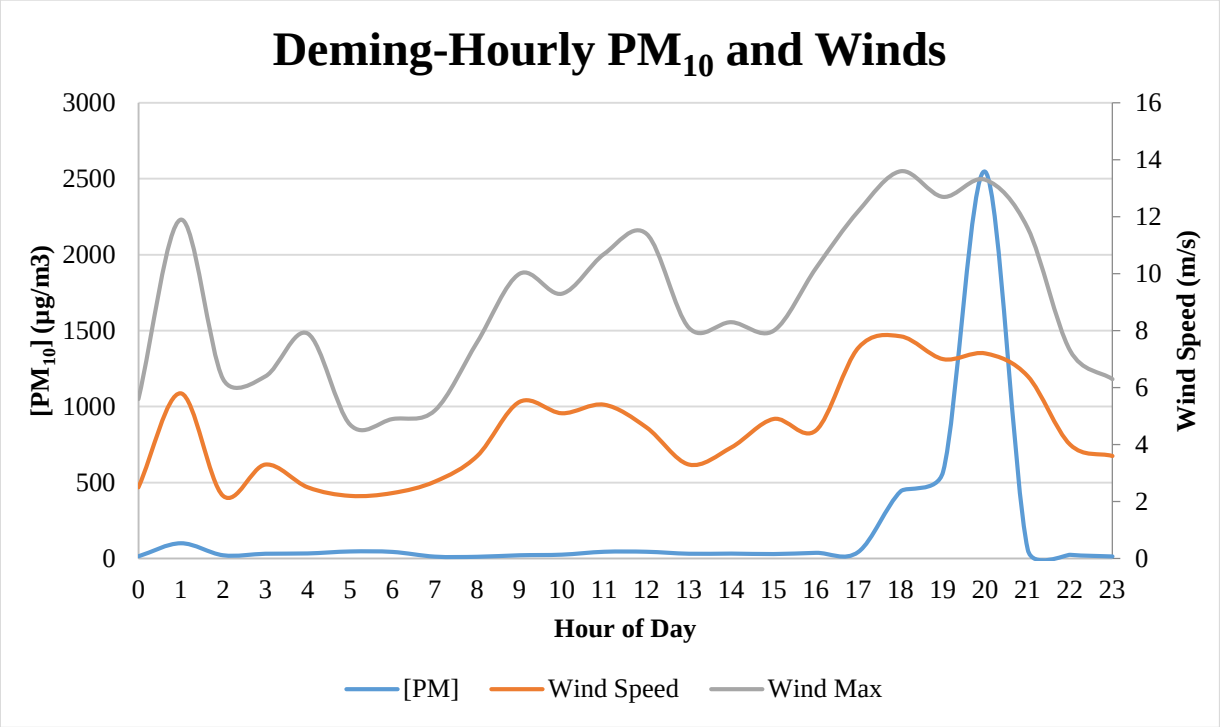

Figure 3-1. PM_{10} and wind speeds at the Deming monitoring site.

Affects Air Quality

The documentation provided herein for the July 4, 2013 PM_{10} NAAQS exceedances provide the required information to establish a causal connection between the fireworks displays in the Deming Airport on July 4 and PM_{10} measured at the same airport monitoring site. The measured 24-hour PM_{10} concentration of 179 µg/m^3 show that air quality was affected. PM_{10} concentrations were relatively low on the days before and after the fireworks event (Figure 3-2).

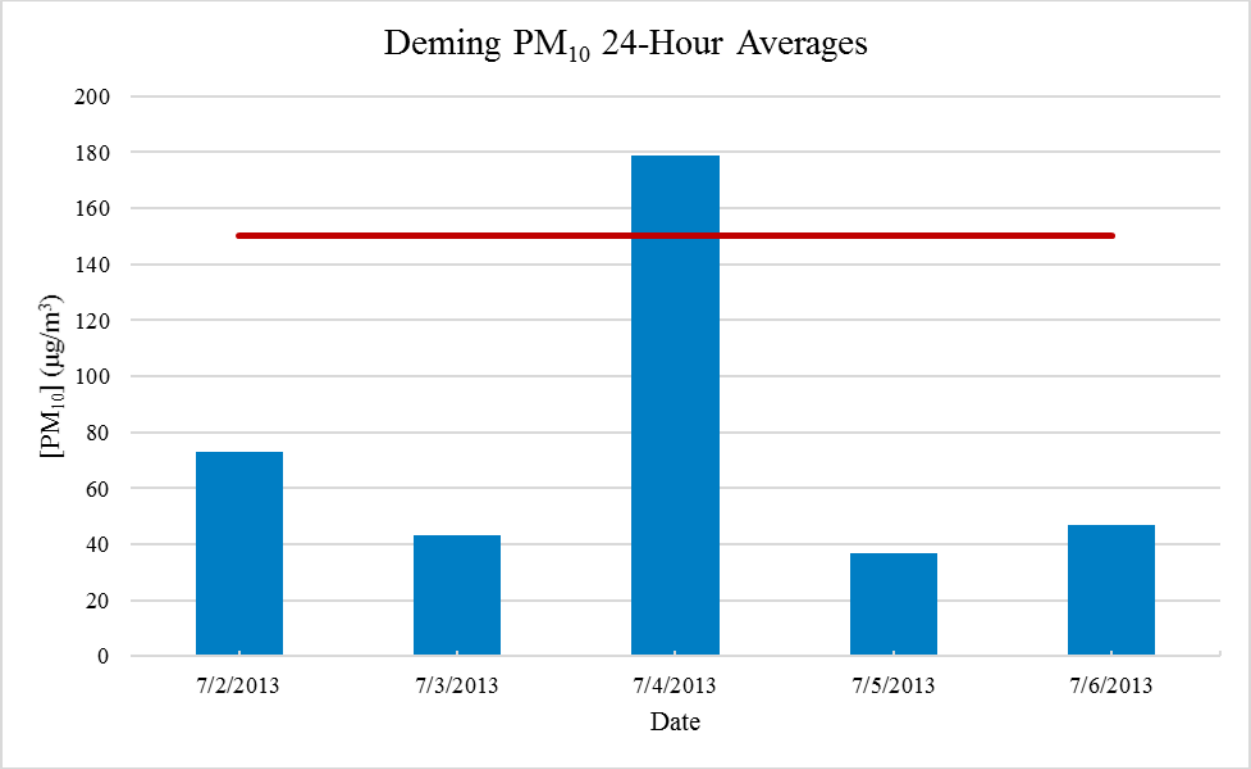

Figure 3-2. PM_{10} Concentrations before and after the event.

Exceptional Event

The rule treats emissions from fireworks displays related to traditional national, ethnic, or other cultural events, similar to the way that exceptional events are treated under the rule. Emissions from fireworks displays that are integral to traditional national, ethnic or cultural events such as Independence Day or Chinese New Year celebrations may be treated like an exceptional event.

The documentation provided herein for the July 4, 2013 PM_{10} NAAQS exceedances provide the required information to establish that the display affected air quality and a causal connection between the event and PM_{10} measured in the Deming Airport.

No Exceedance but for the Event

Activities that generate anthropogenic PM_{10} were approximately constant in the Luna County immediately preceding, during and after the event. Industrial, trucking and construction activities were diminished on July 4 due to the holiday, especially at the time when the hourly PM_{10} started to increase. Vehicular traffic, cooking and residential fires do not directly cause PM_{10} 24-hour NAAQS violations in Luna County. Activity levels in the County were typical for the time of the year and PM_{10} emissions control programs were being implemented for fugitive dust-generating activities.

4 Exceptional Event: July 7, 2013

Summary of the Event

Smoke from fires in southern New Mexico caused an exceedance of the PM_{10} 24-hour NAAQS at the West Mesa monitoring site on this date (Table 1-1). NMED measured low sustained hourly wind speeds during the time that elevated PM_{10} concentrations were measured. The presence of wildfires, little to no point sources in the area, and the high PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by wildfire smoke.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of smoke contributing to this exceedance include fires in the Gila National Forest of New Mexico. Lightning ignited the Silver Fire in a rugged, forested area in the vicinity of Kingston, New Mexico. According to InciWeb, the Silver Fire had spread across nearly 138,546 acres by the morning of July 7, 2013 (http://inciweb.nwcg.gov/incident/article/3414/19033). Figure 4-1 shows satellite imagery of the fire.

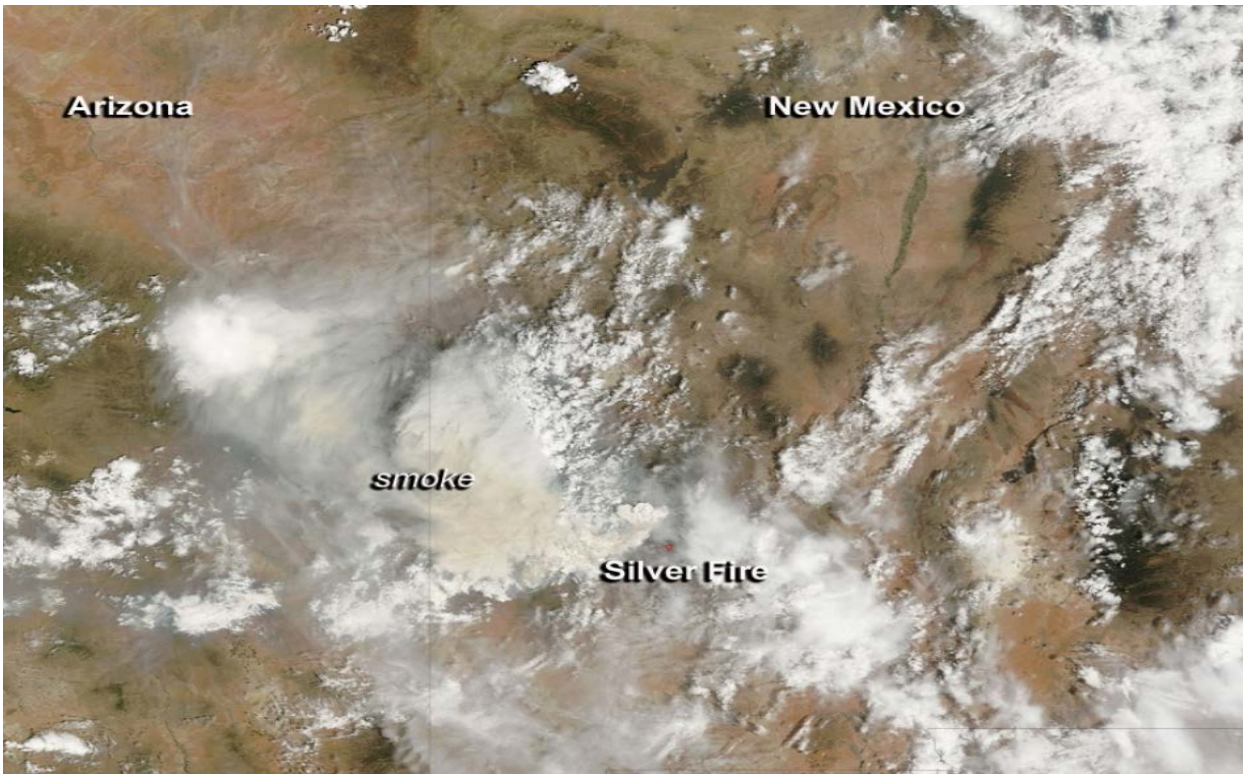

Figure 4-1. NASA satellite imagery of the Silver Fire in southern New Mexico.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds have caused theses exceedances in the past and they occur at any time of year. Most exceedances occur from late winter through early summer, and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 4-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values at the other monitoring sites for this day are below the 95th percentile of all 24-hour averages recorded. However, the West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to exceptional events, the exceedances for this day would be the maximum values recorded if no exceptional event exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	35	40	33	34	37	159

Table 4-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 4-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three-month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are below the 95th percentile of the seasonal 24-hour averages recorded except for the West Mesa site. The West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to exceptional events, the exceedances for this day would be the maximum values recorded if no exceptional event exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
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Event Day	35	40	33	34	37	159

Table 4-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Smoke caused elevated levels of PM_{10} during the time period when winds stayed steady as demonstrated by the time series plot in Figure 4-2. A Pollution rose was created using hourly data from the West Mesa site showing that PM_{10} concentrations greater than 250 µg/m^3 traveled to the site from the east. Winds travelled from the east at other times of the day but showed that PM_{10} concentration were below 50 µg/m^3. During the hours of elevated concentrations at West Mesa, hourly PM_{10} concentrations also increased at the Deming and Chaparral monitoring sites (Figure 4-4).

Air parcel trajectories were modeled using the NOAA HYSPLIT model. This model helps describe causal connections between the suspected source are (e.g. wildfire locations) and the monitoring site. HYSPLIT forward trajectories from the location of the wildfire were run using the ensemble mode starting at the 1400 hour on July 6 for a 24-hour period. A cluster of trajectories can be seen in northeastern Doña Ana County with movement toward the south-southwest direction (Figure 4-5).

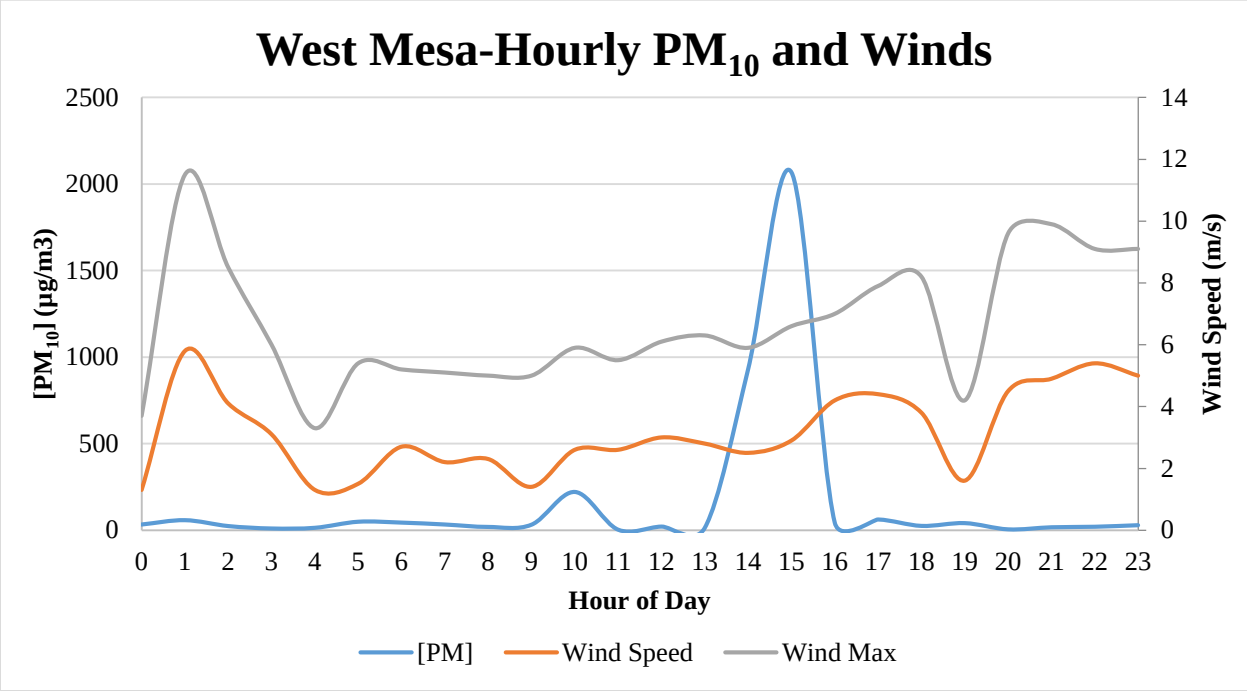


Figure 4-2. Time series plot of hourly observations showing increased PM10 concentrations while wind speeds and gusts stay constant.

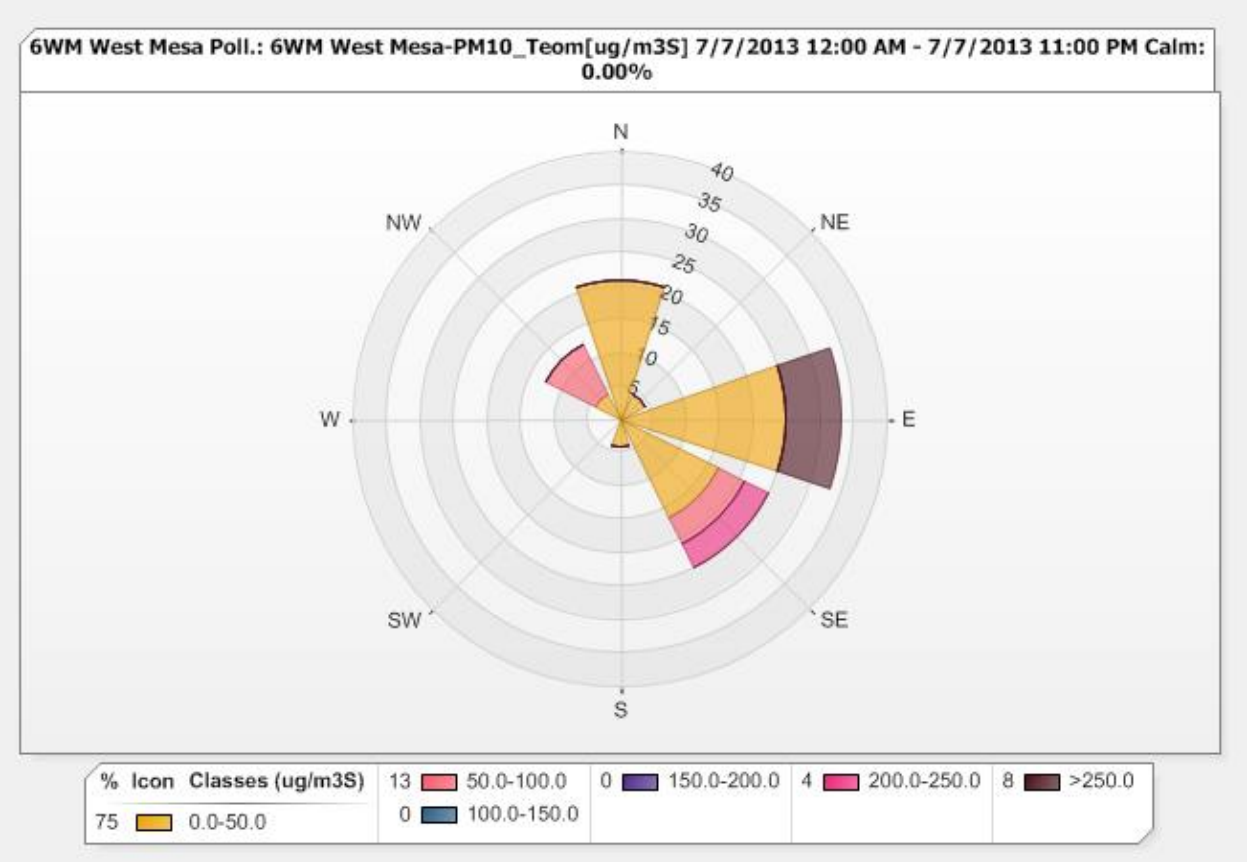


Figure 4-3. Pollution rose at the West Mesa Monitoring site on July 7, 2013.

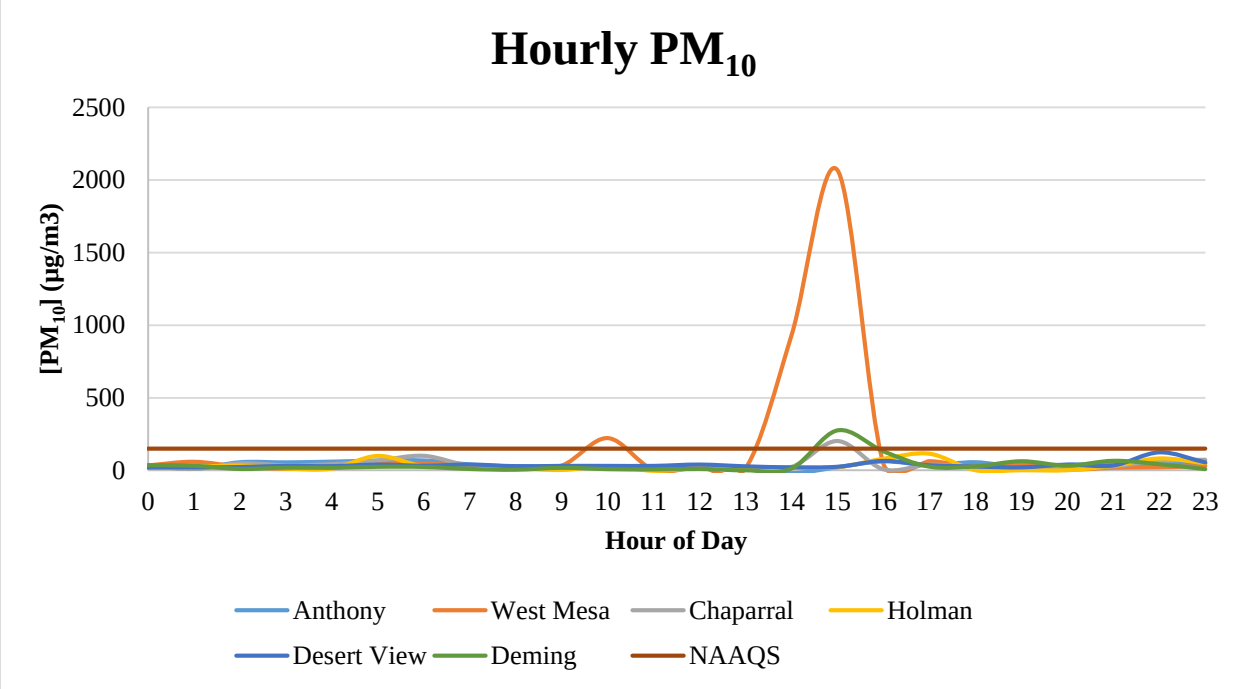


Figure 4-4. Hourly PM10 concentrations for Doña Ana and Luna Counties monitors.

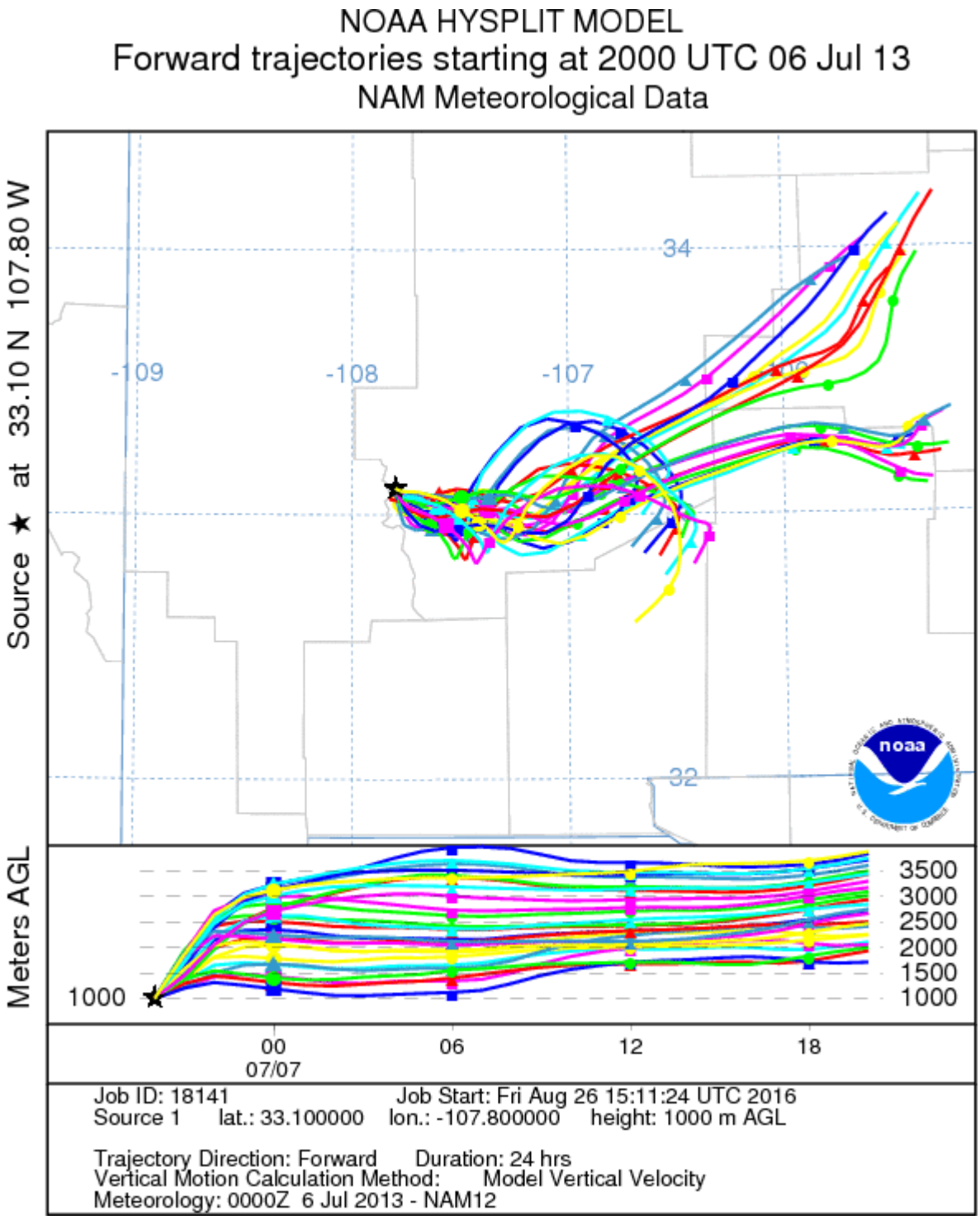


Figure 4-5. HYSPLIT forward trajectories for July 7, 2013.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by smoke from wildfires.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the smoke impact from the fire event in the Gila National Forest, an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the smoke event clearly caused these exceedances. The causal connection of the measured PM_{10} and the wildfire indicate that but for wildfire event these exceedances would not have occurred.

5 Exceptional Event: July 26, 2013

Summary of the Event

The passing of a thunderstorm caused high winds and blowing dust in Luna County resulting in an exceedance of the PM_{10} 24-hour NAAQS at the Deming monitoring site on this date. The FEM TEOM continuous monitor at this site recorded a 24-hour average concentration of 269 µg/m^3.

As the event unfolded, the wind blew from the north and northeast. These high velocity winds passed over large areas of desert within New Mexico. NMED measured strong sustained hourly wind speeds at the Deming Airport monitoring site. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust are the natural desert and the playas in New Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On July 26, sustained wind speeds exceeded EPA's default threshold (Figure 5-1) and wind gusts exceeded the NEAPs agreed upon threshold (Figure 5-2) at the Deming Airport site.

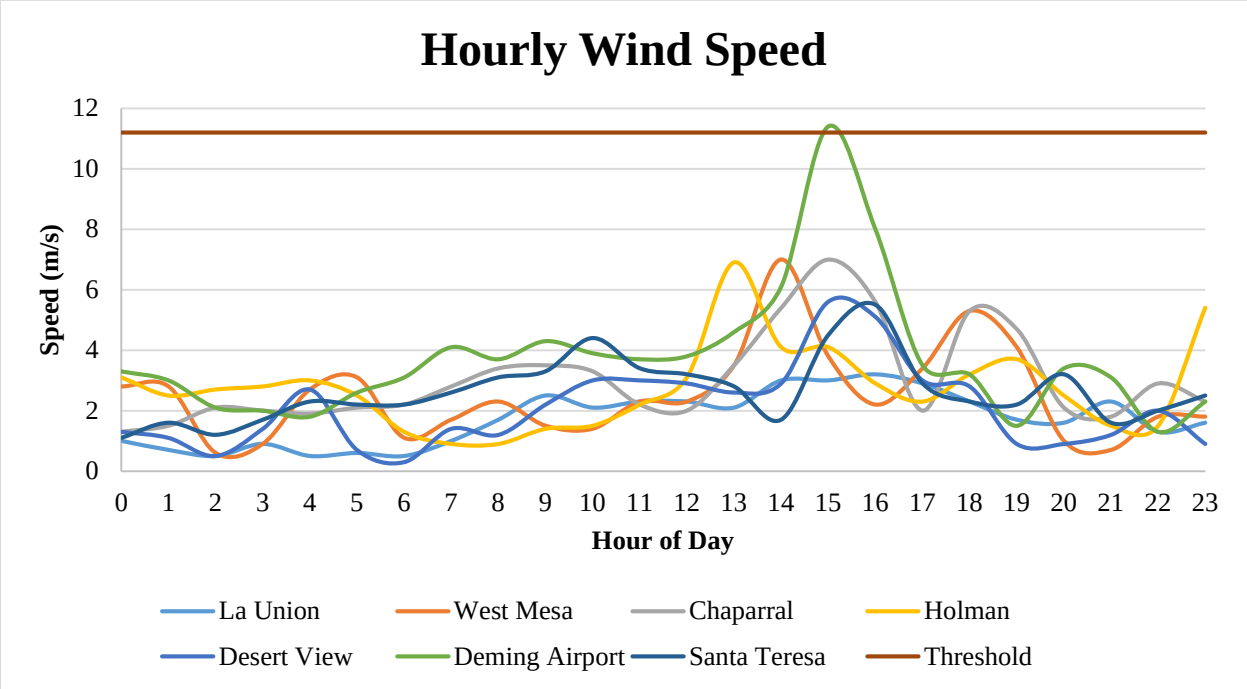


Figure 5-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

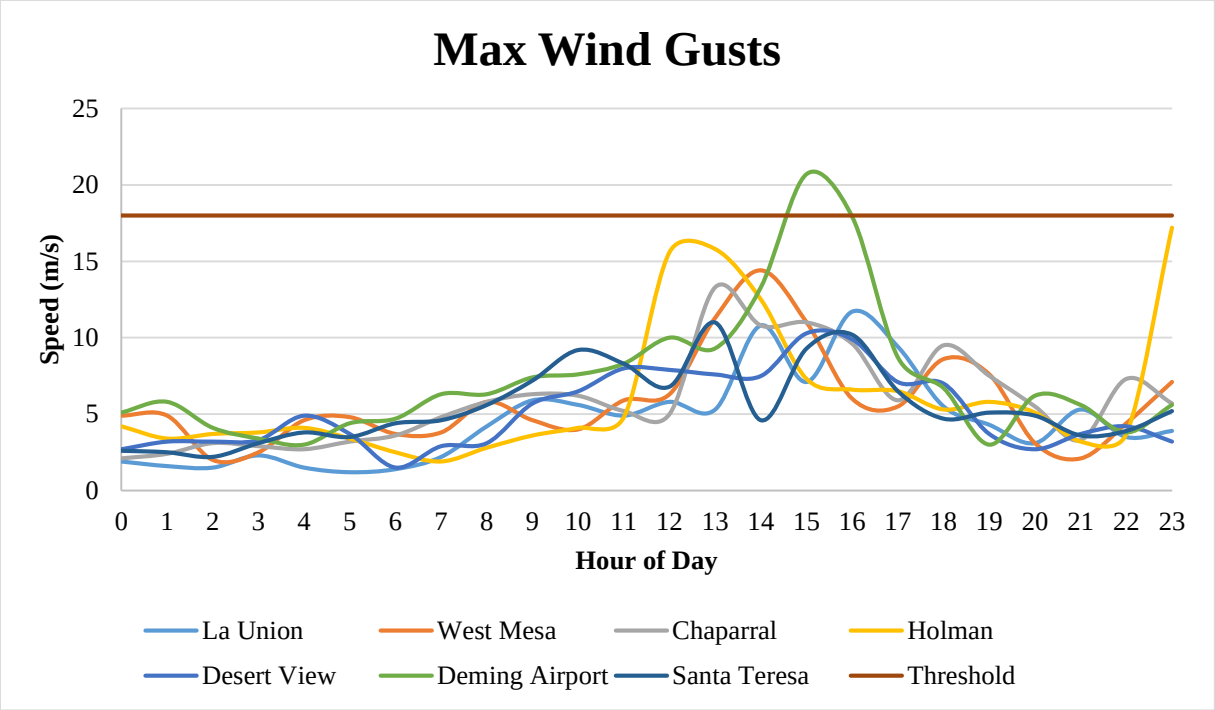


Figure 5-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should

suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 5-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded value for this day is above the 95th percentile of all 24-hour averages recorded at the Deming site. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	23	23	21	31	269	13

Table 5-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 5-2 shows the percentile rank of the 24-hour average PM10 concentration on this day relative to all measurements during the winter season, including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis, summer season was defined as the three-month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only, since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded value for this day at the Deming site is above the 99th percentile of the seasonal 24-hour averages recorded. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	23	23	21	31	269	13

Table 5-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Severe thunderstorms caused high winds and blowing dust on July 26, 2013. Moisture was present in the upper atmosphere all along western and southwestern New Mexico (Figure 5-3) Day time heating allowed for convection and forming thunderstorms in the afternoon (Figure 5-4). The windy conditions were caused by outflow winds from the thunderstorms.

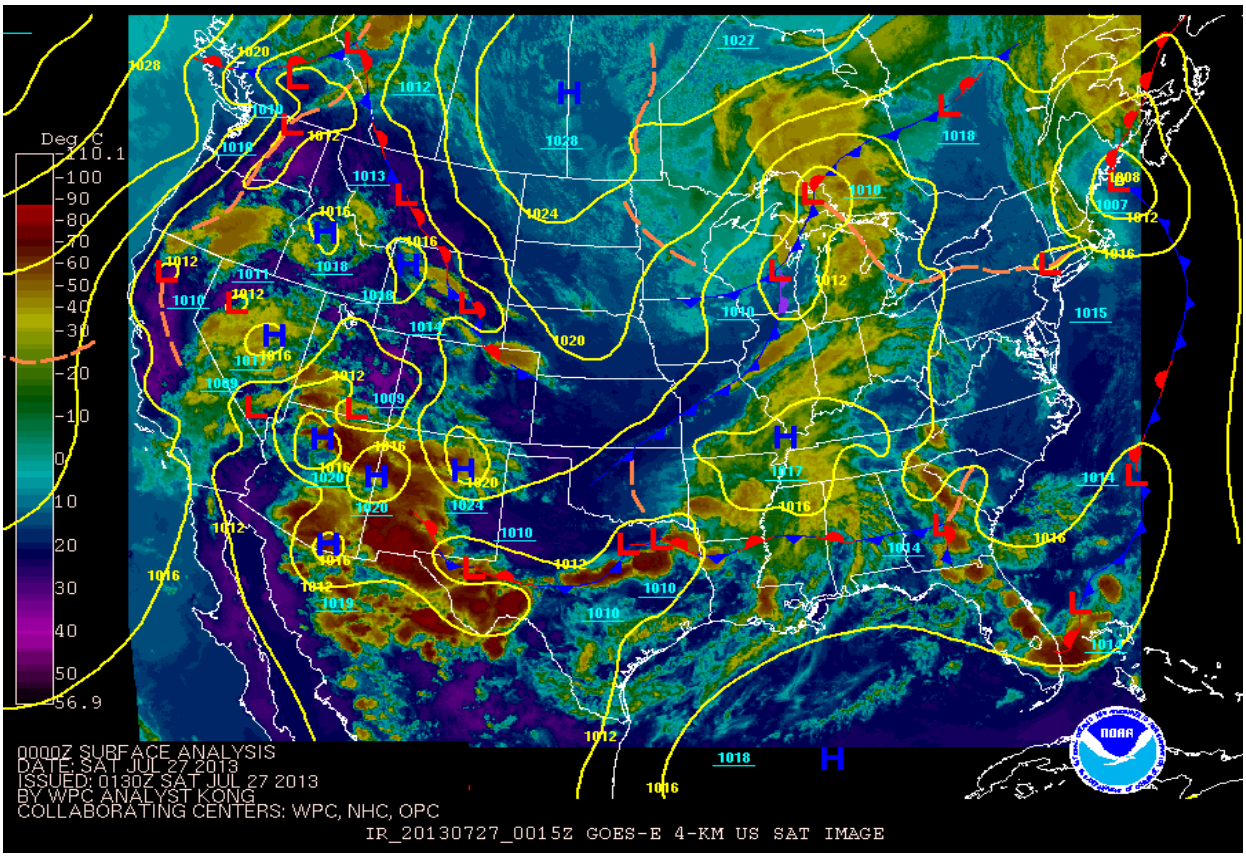


Figure 5-3. Surface weather map with IR imagery showing moisture in the region at the 2100 UTC hour on July 26, 2013.

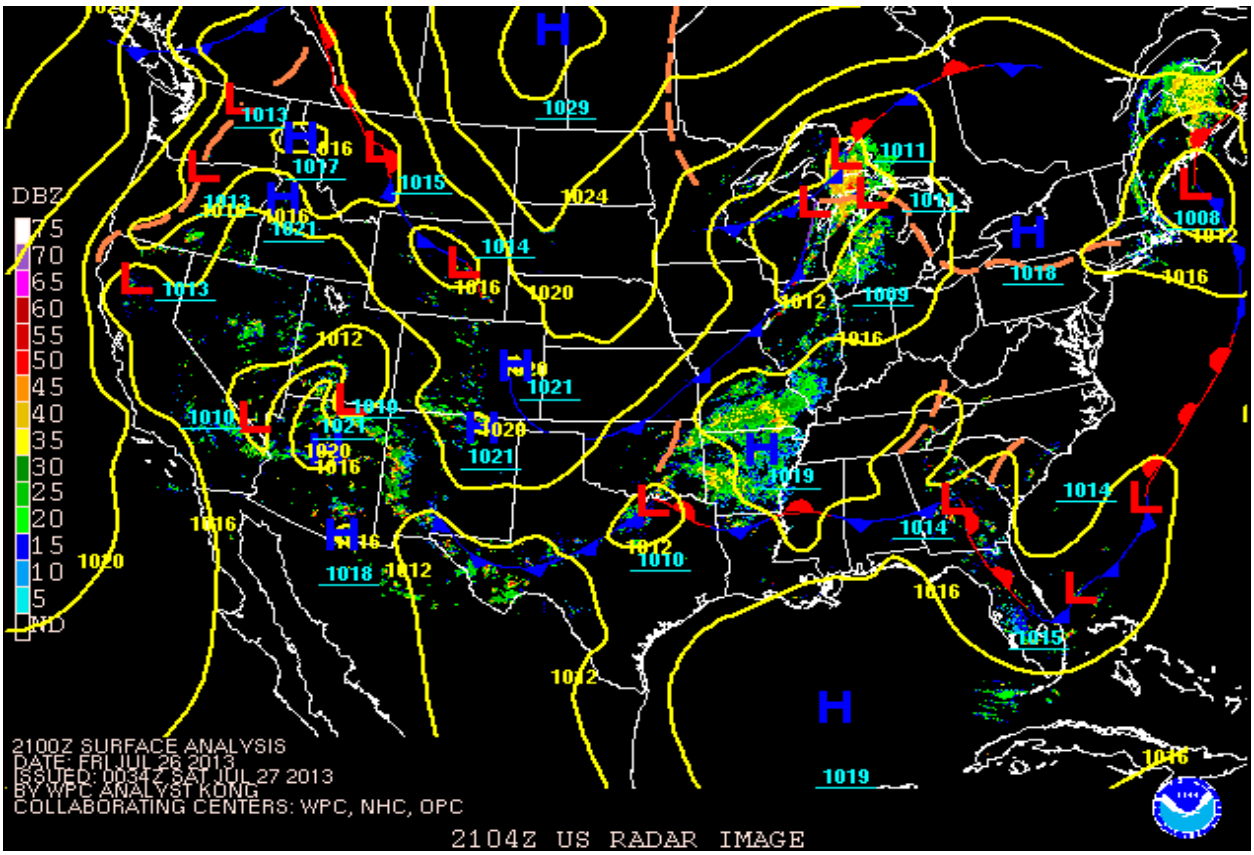


Figure 5-4. Surface weather map with radar images showing thunderstorm activity for July 26, 2013 at the 2100 UTC hour.

The weather pattern described above generated strong winds from the northeast direction beginning at the 1500 hour. Beginning at the 1500 hour, wind speeds exceeded 11.4 m/s at the Deming monitoring site as shown in Figure 5-1. Peak wind gusts reached 20.7 m/s as shown in Figure 5-2. Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plot in Figure 5-5.

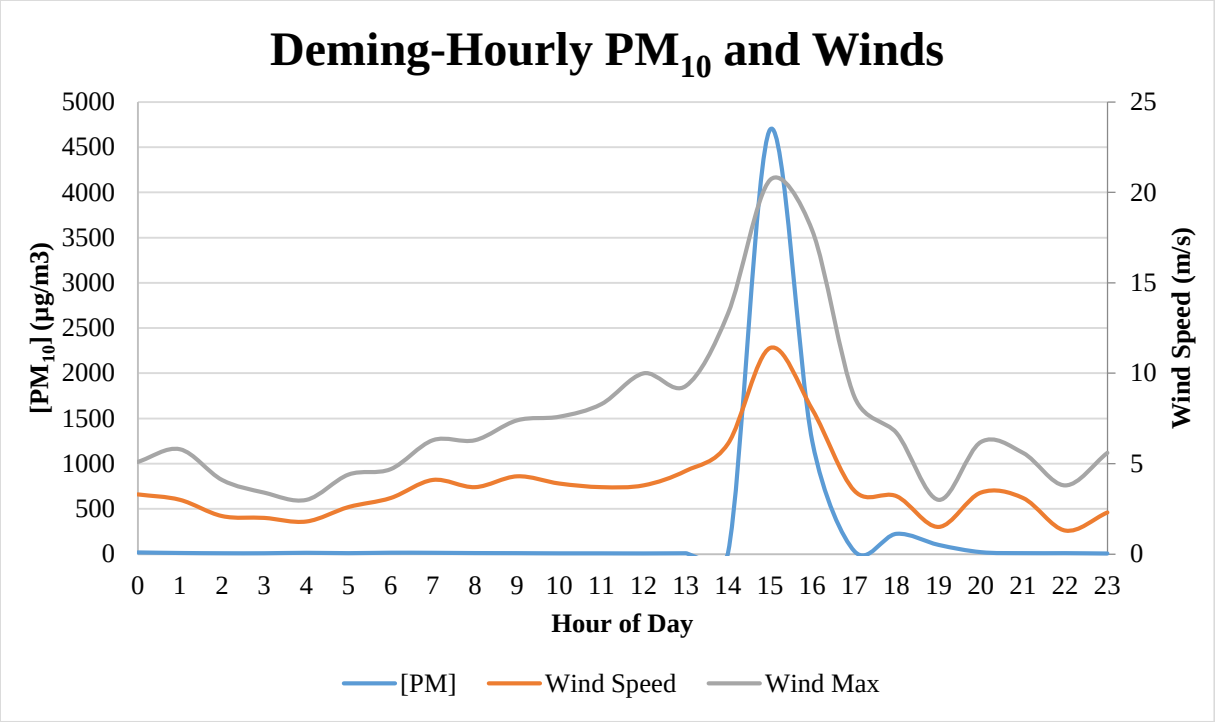


Figure 5-5. Time series plot of hourly observations showing increased PM10 concentrations as wind speeds and gusts increase.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on July 26, 2013.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, not-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the County. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. The causal connection of the measured

PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

6 Exceptional Event: October 10, 2013

Summary of the Event

The passing of a fall storm caused high winds and blowing dust in Doña Ana County resulting in an exceedance of the PM_{10} 24-hour NAAQS at the Anthony monitoring site on this date (Table 1-1). Although the Chaparral, Desert View and Holman sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period. The Deming monitor did not record data on this date due to malfunctioning equipment.

As the event unfolded, the wind blew from the southwest throughout the border region. These high velocity winds passed over large areas of desert within Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust are the natural desert and the playas in New Mexico and northern Mexico (see satellite imagery below).

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at three of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at four of these sites (Figures 6-1 and 6-2). Although the La Union monitoring site did not record sustained wind speeds above the 11.2 m/s threshold, it did record a sustained hourly wind speed of 10.8 m/s (24.2 mph).

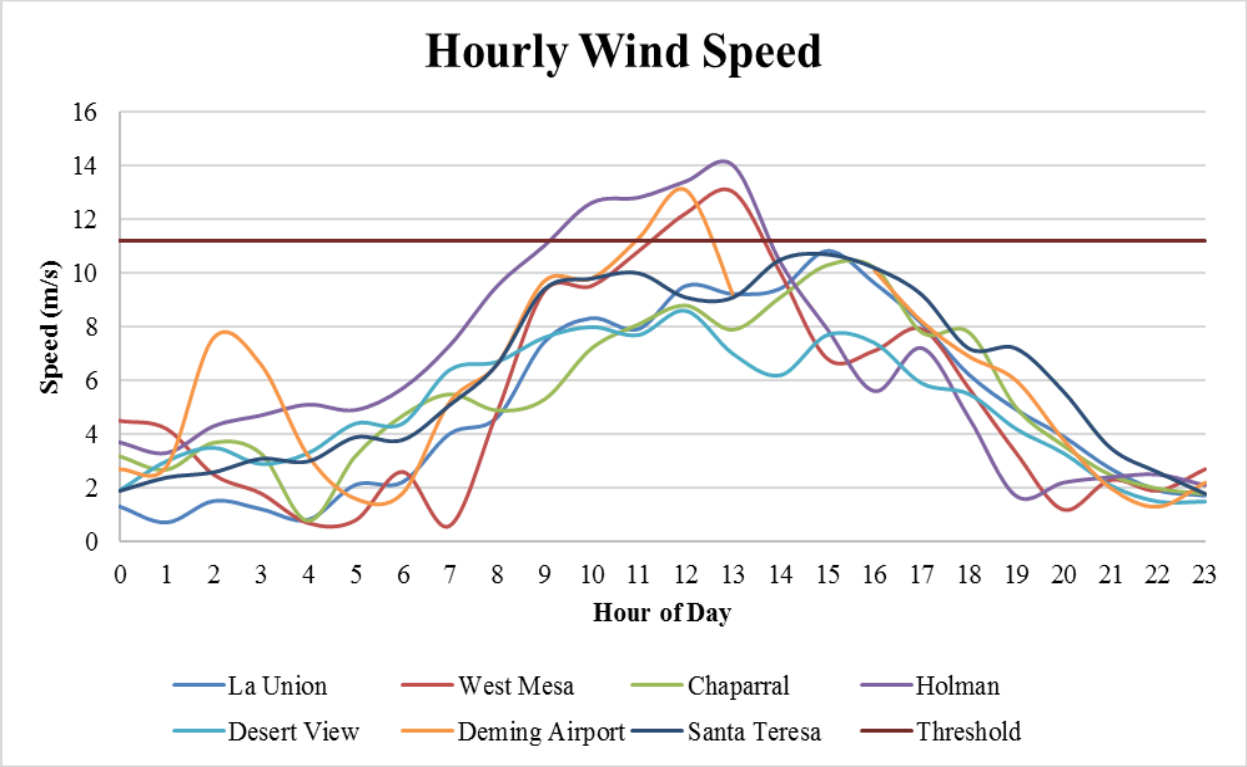


Figure 6-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

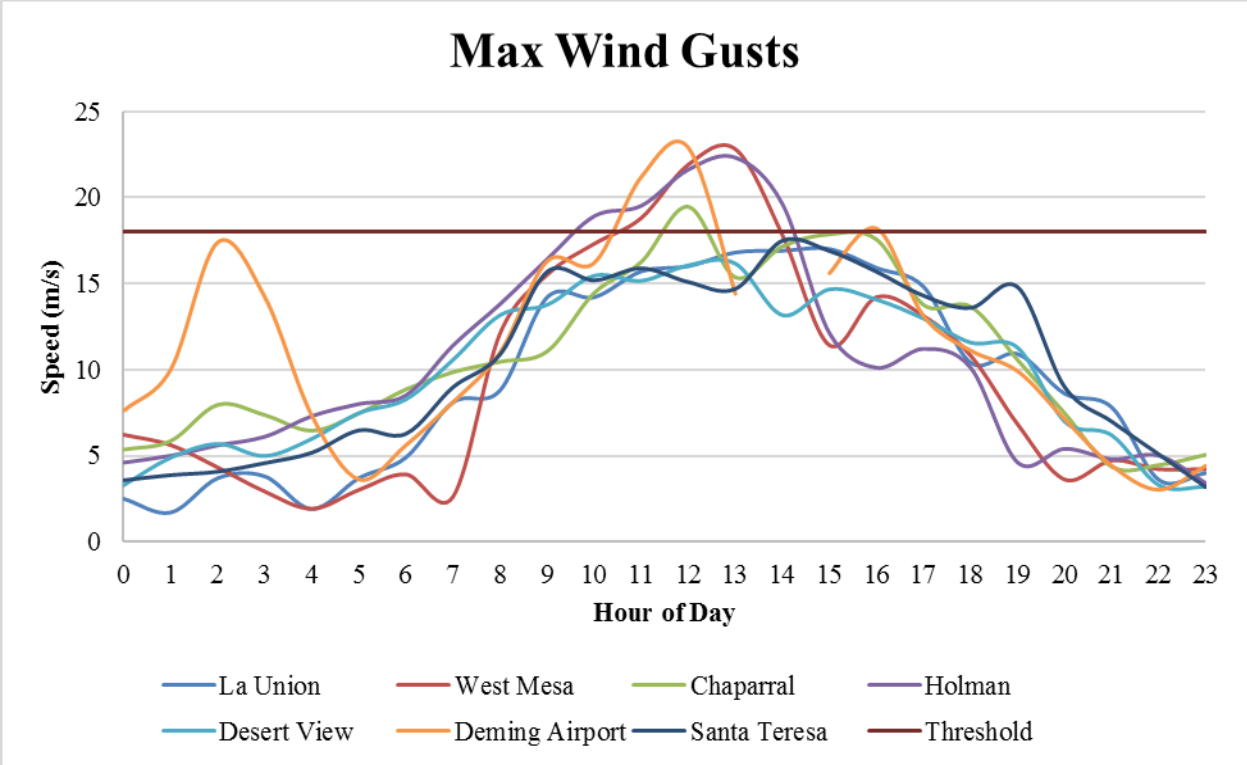


Figure 6-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 6-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical

analysis. The recorded value for this day at Anthony is above the 95th percentile of all 24-hour averages recorded. The Holman, Desert View and West Mesa sites recorded values approaching or exceeding the 95th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	179	88	71	94	ND	44

Table 6-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 6-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis fall season was defined as the three-month period from September through November. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	470	430	311	231	236	121
99th Percentile	126	173	107	109	68	58
95th Percentile	83	61	52	68	47	35
Event Day	179	88	71	94	ND	44

Table 6-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong storm passed through New Mexico on October 10. An area of low pressure moved into the Four Corners region creating a pressure gradient over southeastern Arizona, southwestern New Mexico and northern Mexico. As the associated cold front moved into New Mexico, the surface pressure gradient tightened and winds became stronger (Figure 7-3). Surface winds flow perpendicular to the isobars from high to low pressure. Diurnal heating of the surface allowed winds aloft to mix downward, increasing the surface wind velocities and provided the turbulence required for vertical mixing and horizontal transport of dust.

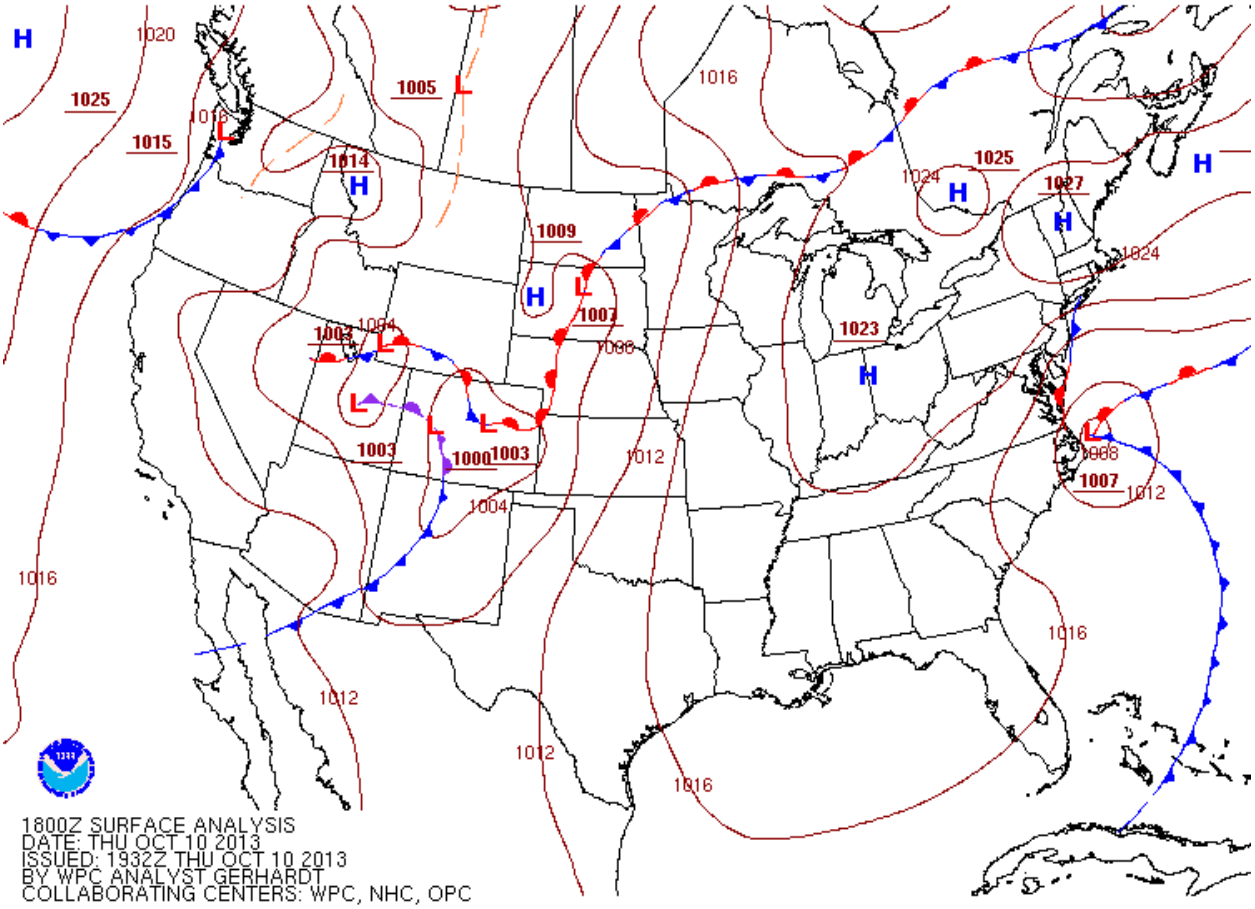
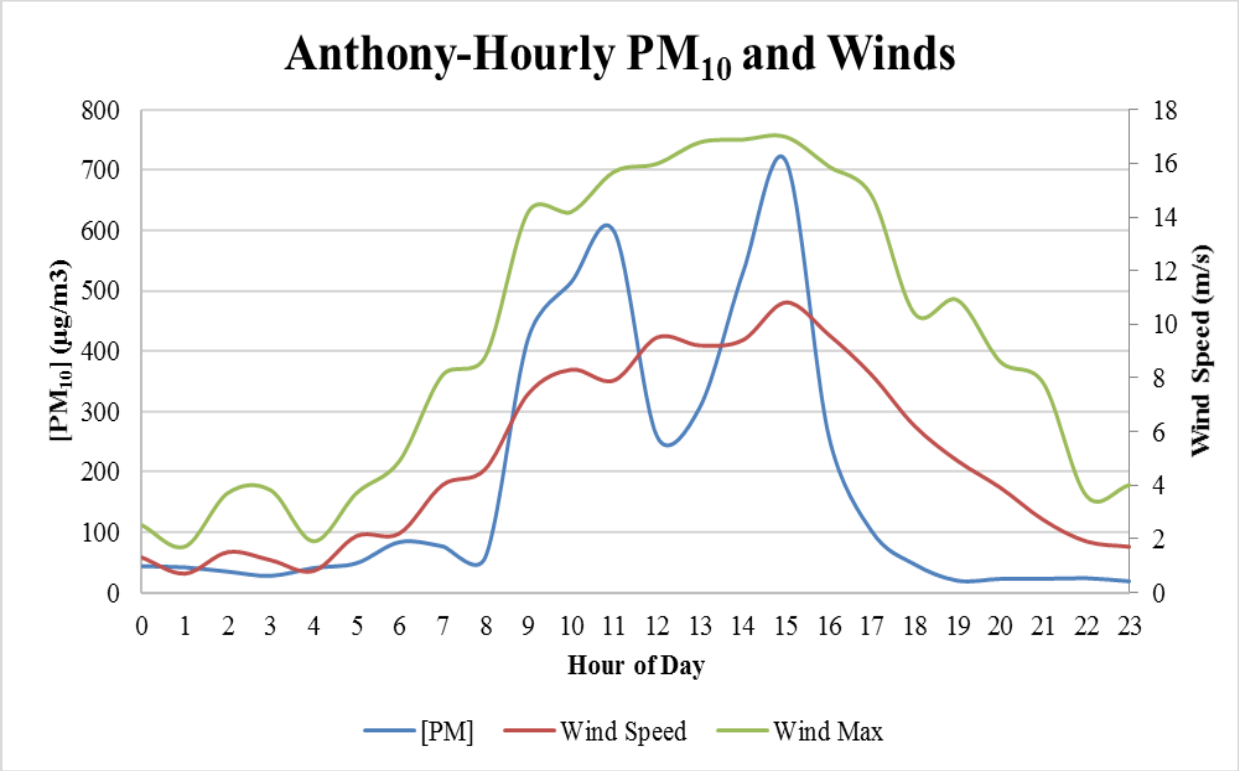


Figure 6-3. Surface weather map showing cold front, areas of low pressure and isobars of constant pressure (red lines).

The weather pattern described above generated strong winds beginning at the 900 hour and lasted through the 1600 hour. Beginning at the 900 hour, wind speeds exceeded 11.2 m/s at Holman as shown in Figure 6-1. Peak wind speeds ranged from 8.6 m/s at Desert View to 14.0 m/s at Holman (Figure 6-1). Peak wind gusts ranged from 16.2 m/s at Desert View to 22.9 m/s at the Deming Airport (Figure 6-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 6-4. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 6-5).



Figures 6-4. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

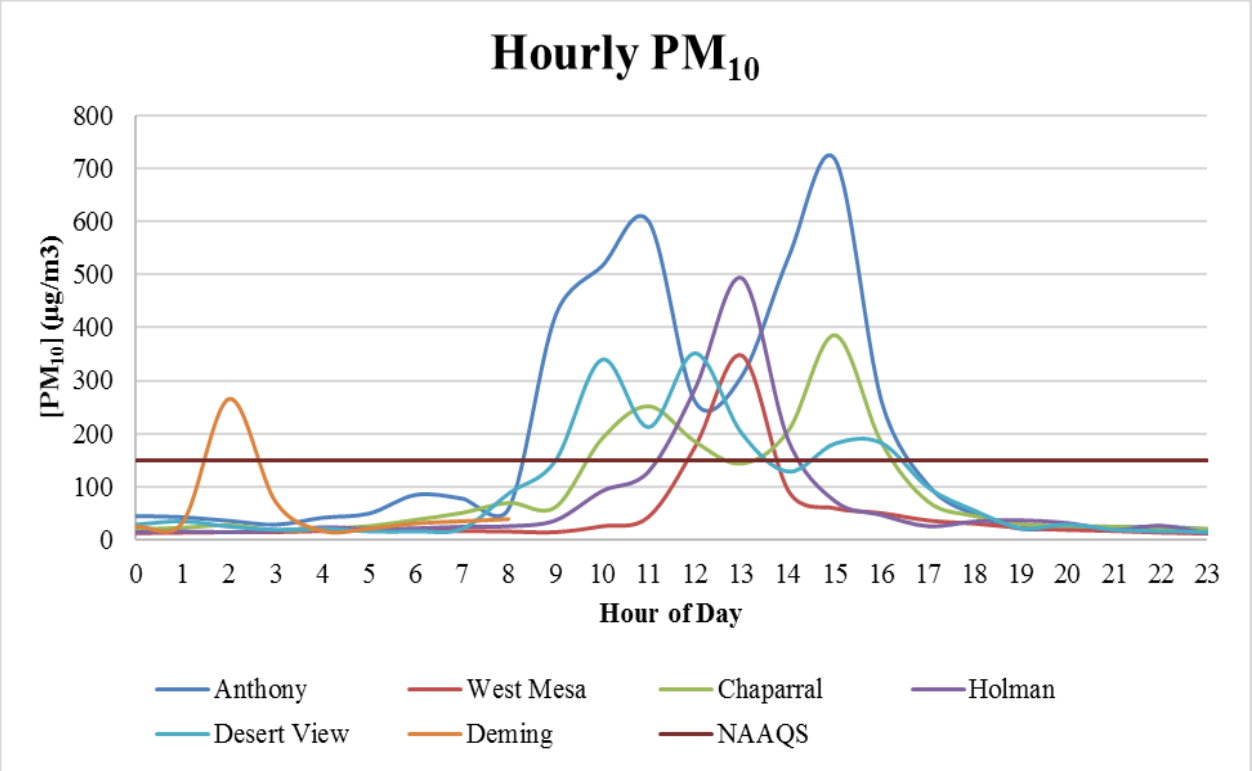


Figure 6-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Wind Advisory and High Wind Warning for this date. A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer. A High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. These were in place for southwestern New Mexico and west Texas to warn the public of the high wind event. An excerpt from the NWS text product can be found below.

> WIND SPEEDS WILL INCREASE AFTER SUNRISE ON THURSDAY MORNING OVER THE HIGHER SLOPES. STRONG WINDS WILL MIX DOWN TO LOWER ELEVATIONS BY MIDDAY AND PEAK DURING THE MID TO LATE AFTERNOON HOURS BEFORE DECREASING SOON AFTER SUNSET.

The event was also captured on satellite imagery showing dust plumes originating in northern Mexico (Figure 6-7).

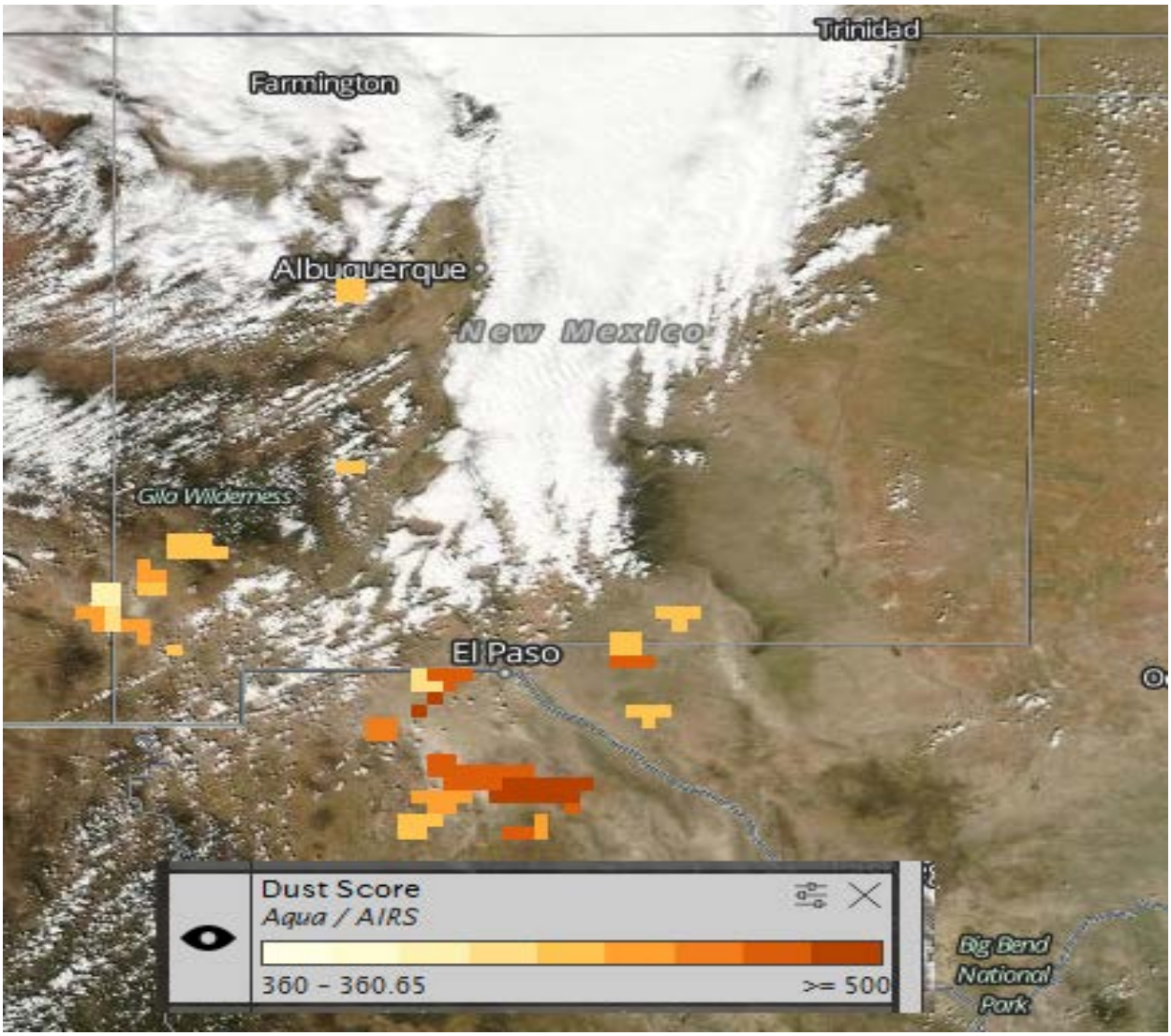


Figure 6-6. NASA satellite imagery of the border area.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

7 Exceptional Event: November 22, 2010

Summary of the Event

The passing of a fall storm caused high winds and blowing dust in Doña Ana County resulting in an exceedance of the PM_{10} 24-hour NAAQS at the Desert View monitoring site on this date (Table 1-1). Although the other sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the east and southeast throughout the border region. These high velocity winds passed over large areas of desert within New Mexico and Texas. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust are the natural desert in New Mexico and Texas.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at two of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at three of these sites (Figures 7-1 and 7-2). Although the Desert View monitoring site did not record sustained wind speeds above the 11.2 m/s threshold, the nearby monitoring site of Santa Teresa did.

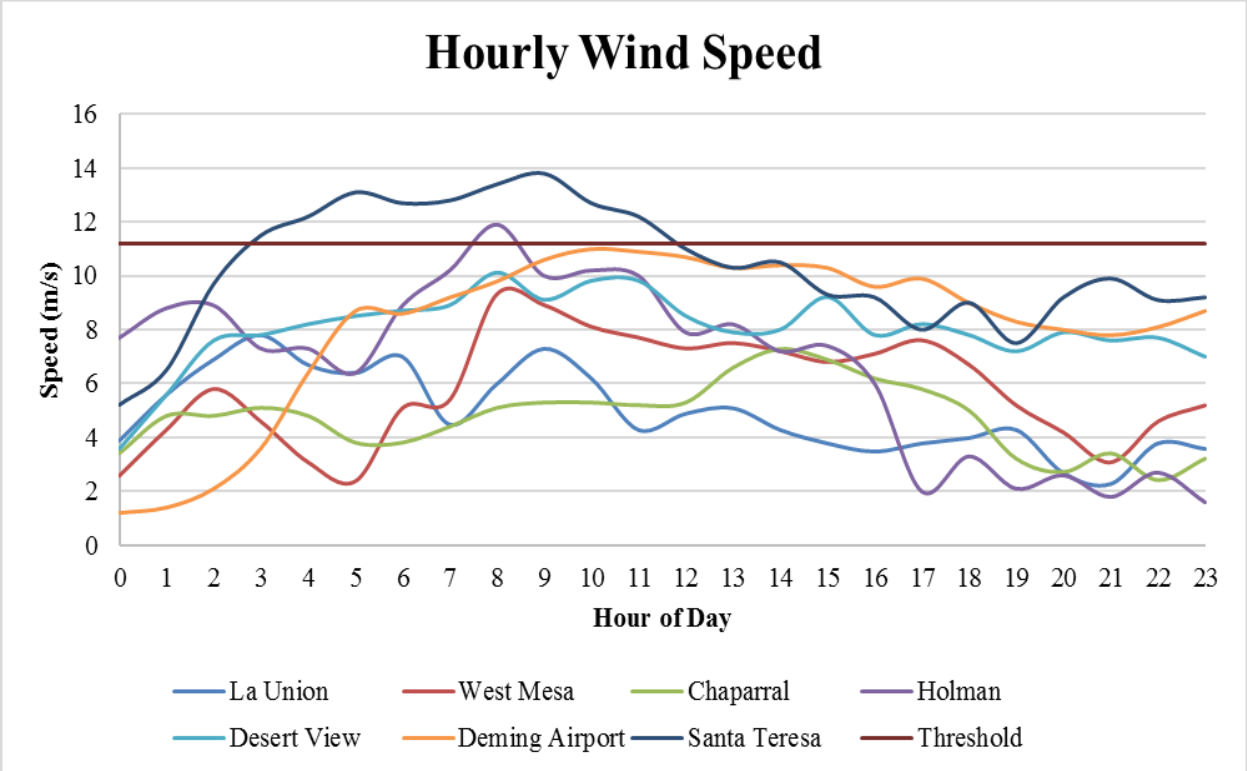


Figure 7-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

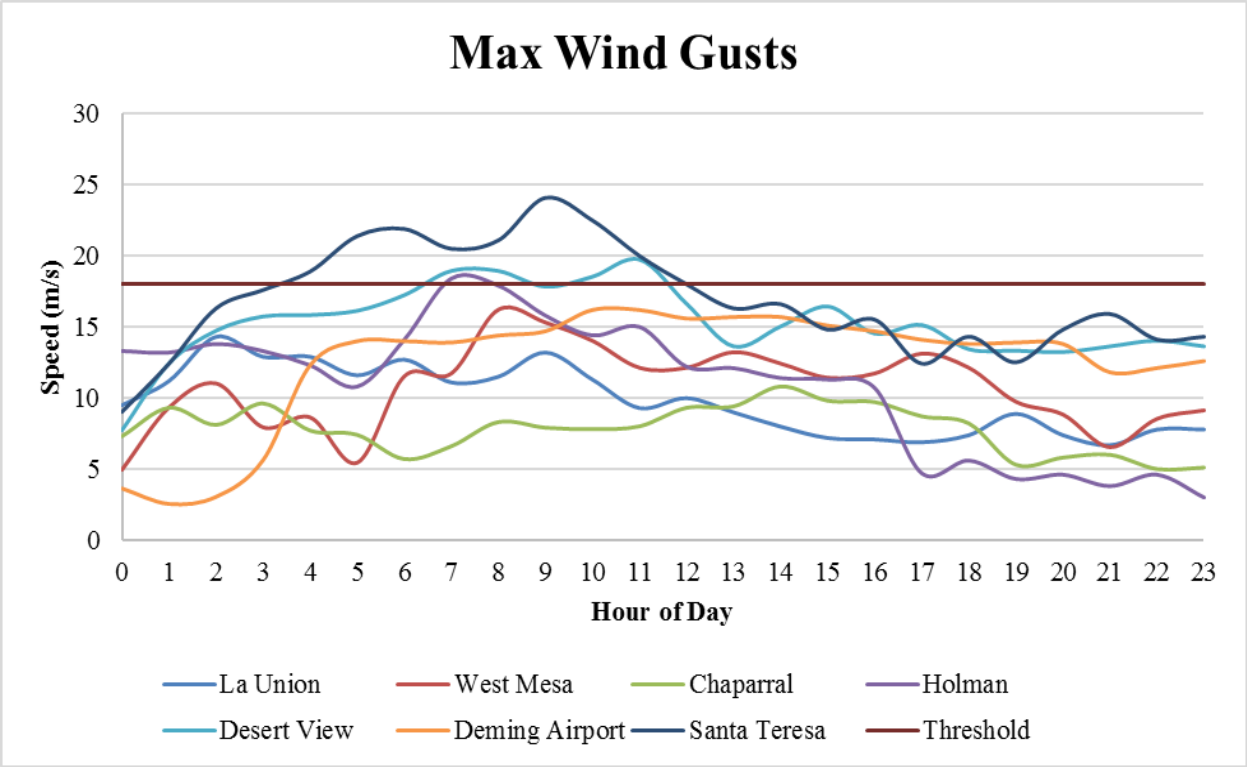


Figure 7-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 7-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded value for this day is above the 95th percentile of all 24-hour averages recorded at the Desert View and Holman monitoring sites. The West Mesa and Deming sites recorded values approaching the 95th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	83	28	74	155	62	42

Table 7-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 7-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis fall season was defined as the three-month period from September through November. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded at all monitoring sites except for Chaparral. The Desert View site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	470	430	311	231	236	121
99th Percentile	126	173	107	109	68	58
95th Percentile	83	61	52	68	47	35
Event Day	83	28	74	155	62	42

Table 7-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong storm passed through New Mexico in the early morning hours of November 22. As the storm system moved through northern New Mexico to the south, a strong surface pressure gradient developed with high winds behind the cold front (Figure 7-3). Surface winds flow perpendicular to the isobars from high to low pressure.

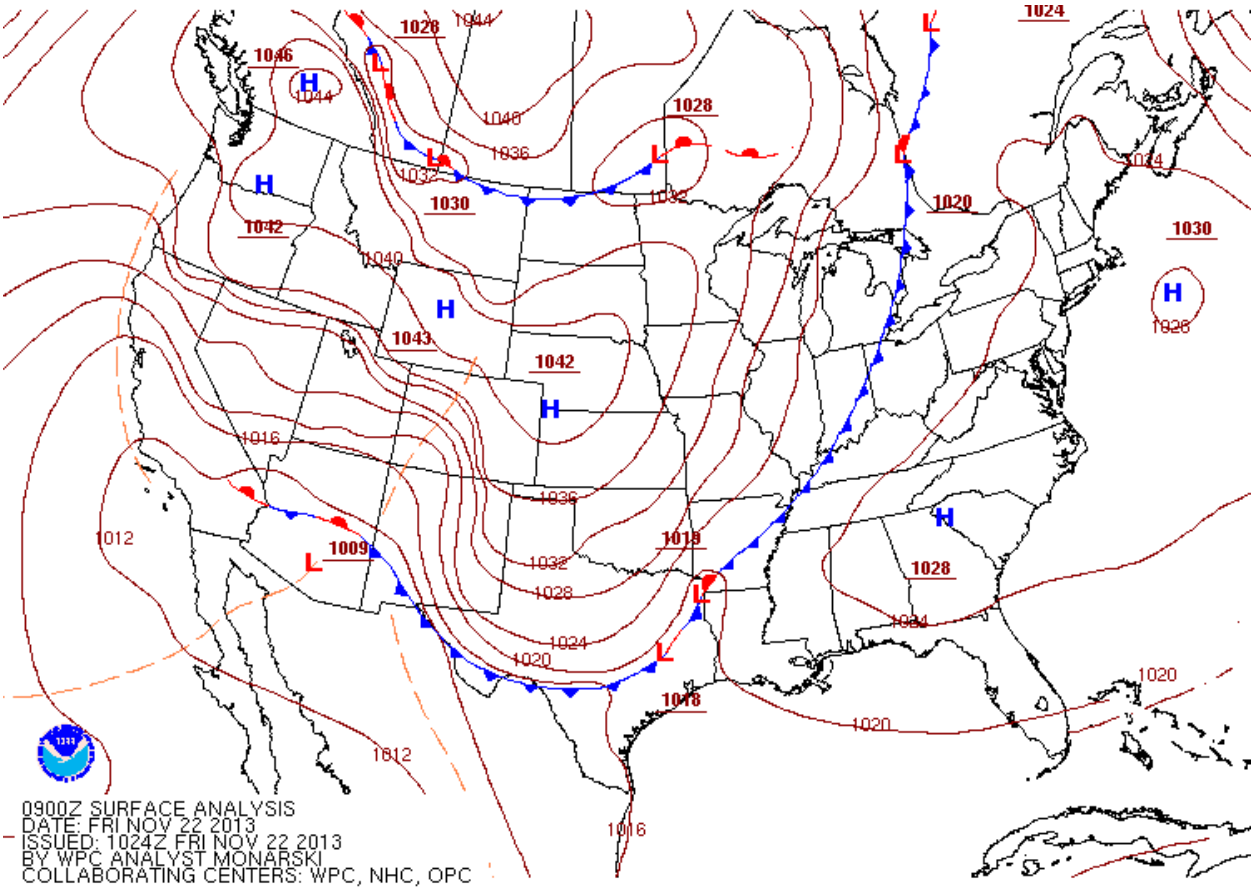


Figure 7-3. Surface weather map showing cold front, areas of low pressure and isobars of constant pressure (red lines).

The weather pattern described above generated strong winds beginning at the 200 hour and lasted through the 1100 hour. Beginning at the 300 hour, wind speeds exceeded 11.2 m/s at Santa Teresa as shown in Figure 7-1. Peak wind speeds ranged from 7.3 m/s at Chaparral to 13.8 m/s

at Santa Teresa (Figure 7-1). Peak wind gusts ranged from 10.8 m/s at Chaparral to 24.1 m/s at Santa Teresa (Figure 7-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 7-4. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 7-5).

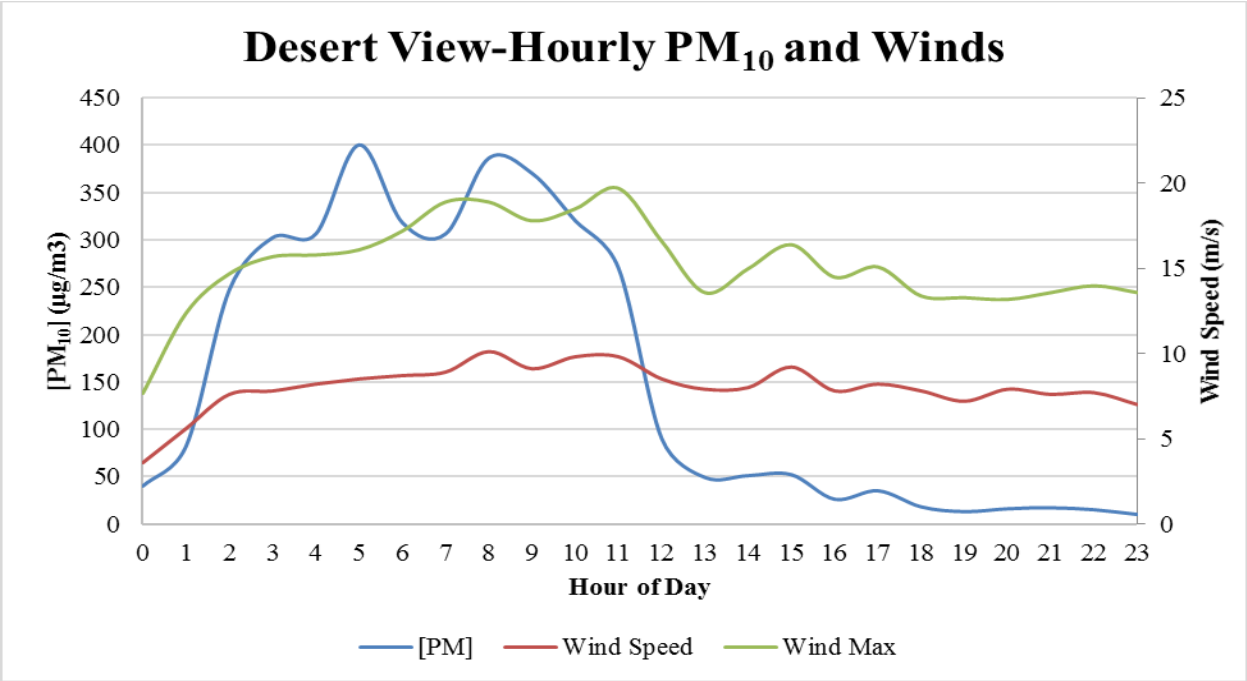


Figure 7-4. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

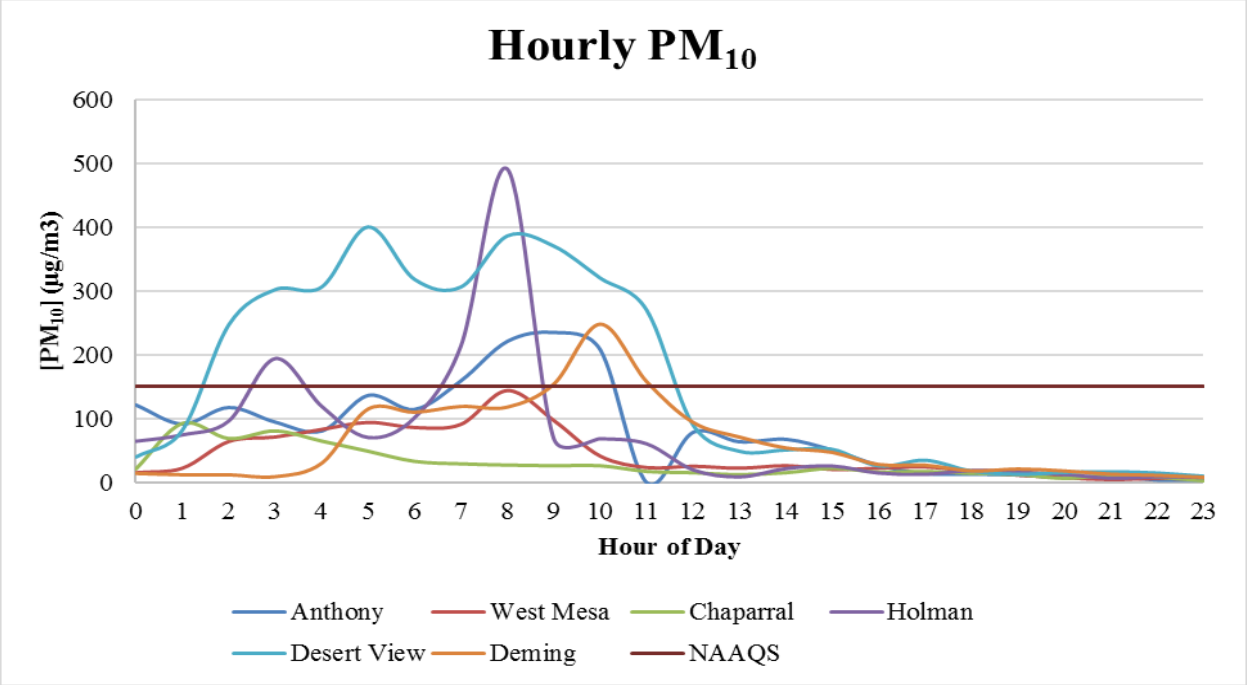


Figure 7-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Wind Advisory for this date. A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer. This was in place for southwestern New Mexico and west Texas to warn the public of the high wind event. An excerpt from the NWS text product can be found below.

> STRONG EAST WINDS WILL BLOW BEHIND THIS FRONT FOR THE DURATION OF THE DAY AND INTO THE EVENING HOURS. THE STRONGEST WINDS WILL BE ALONG THE WESTERN SLOPES OF AREA MOUNTAINS AND COULD PRODUCE SOME BLOWING DUST AS WELL.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

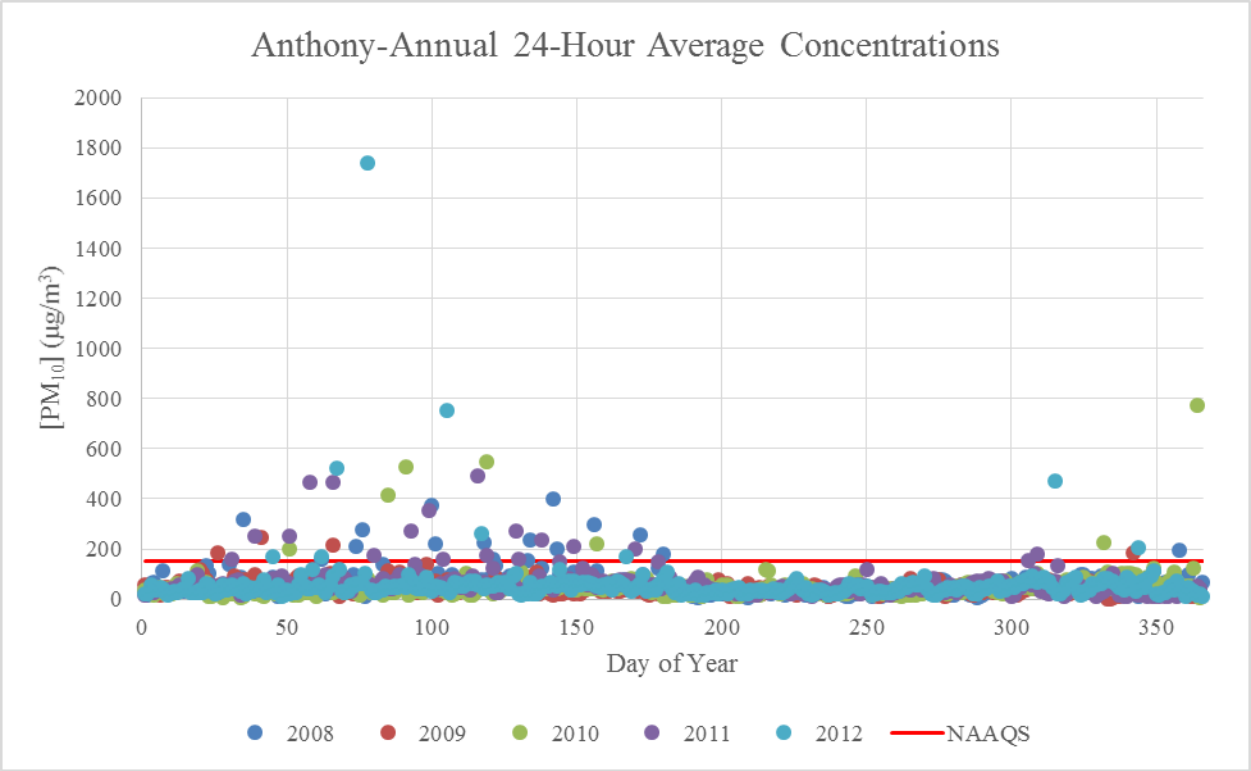
The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

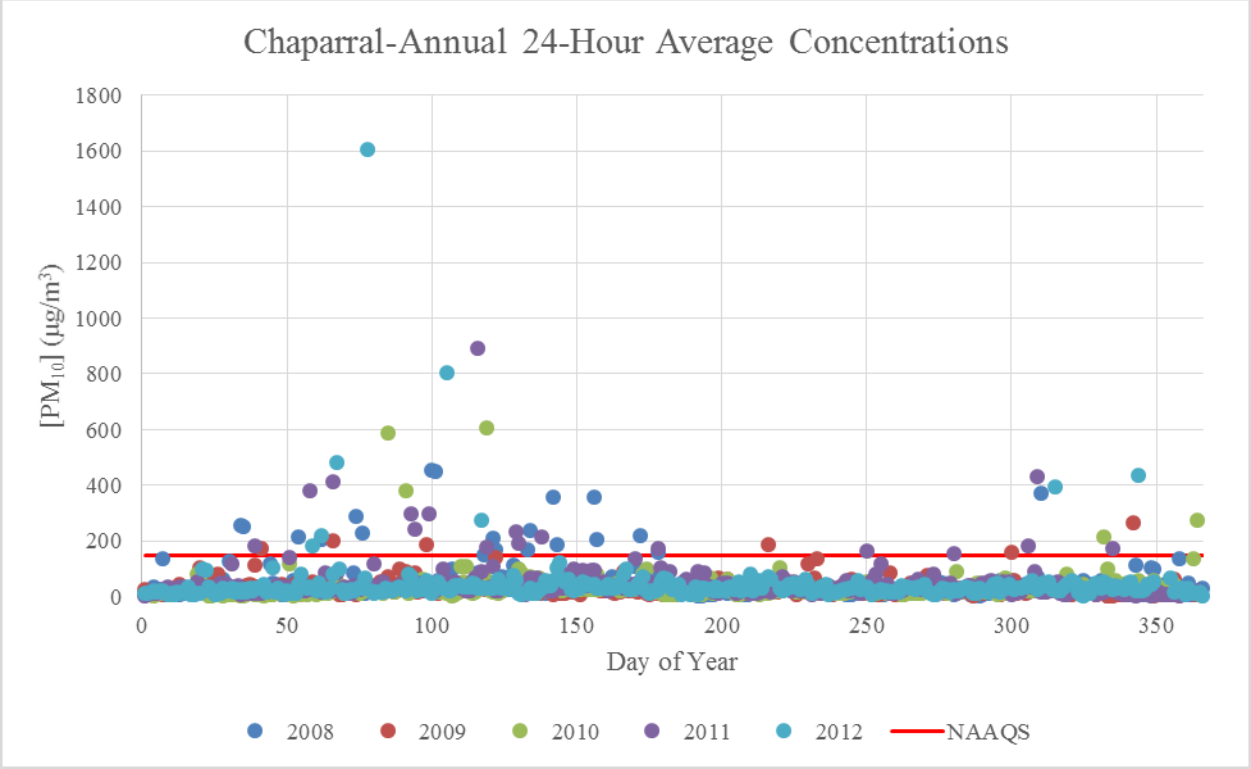
No Exceedance but for the Event

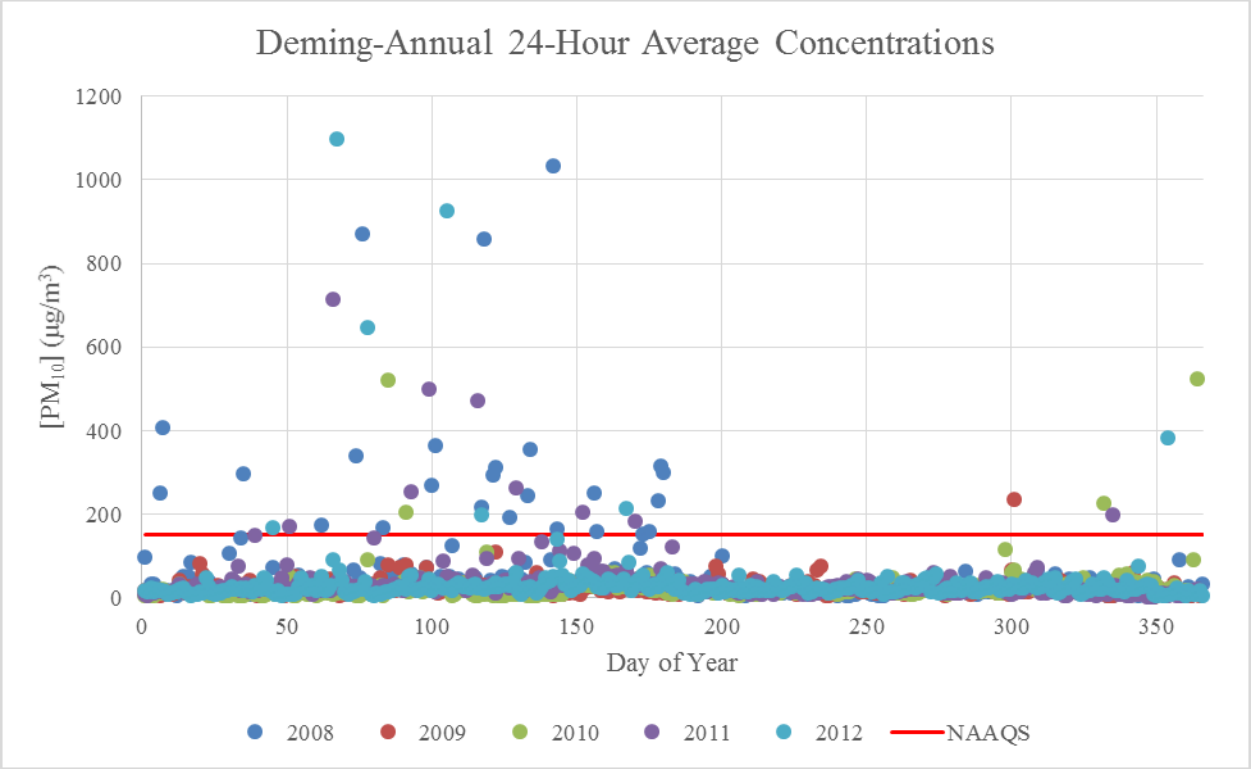
Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

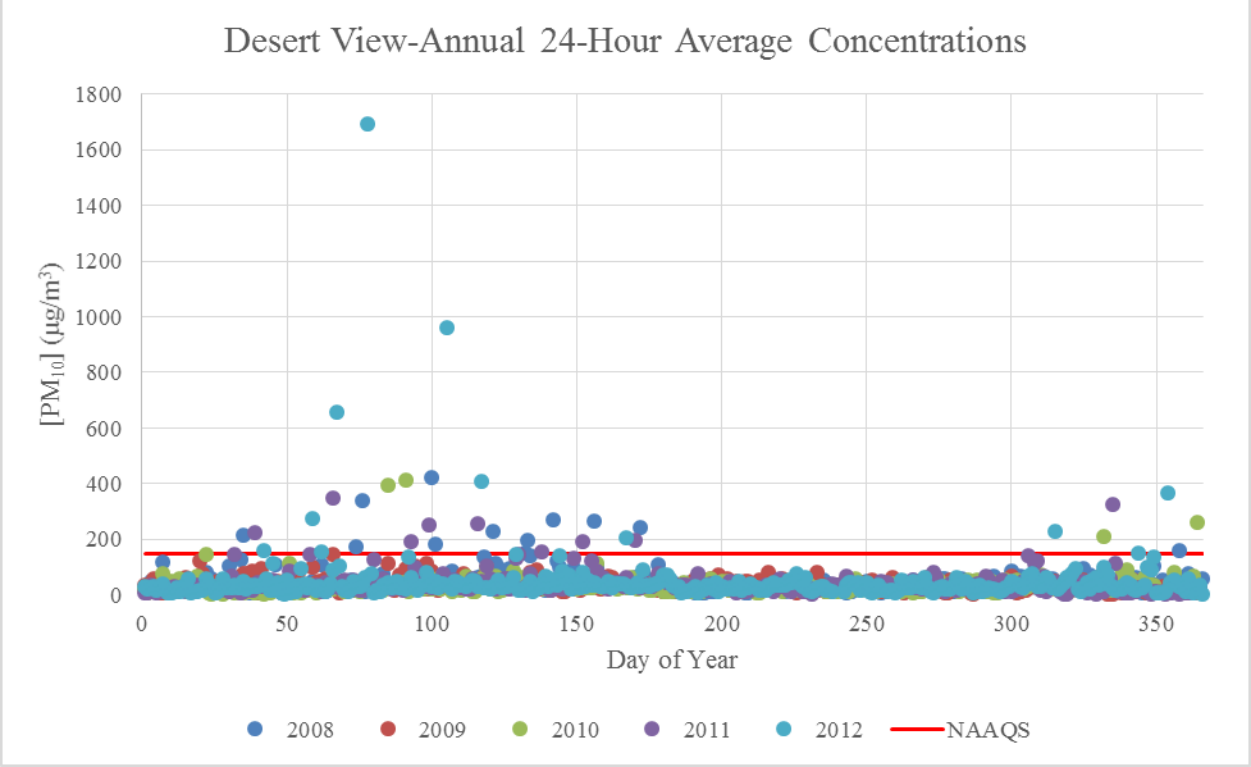
Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

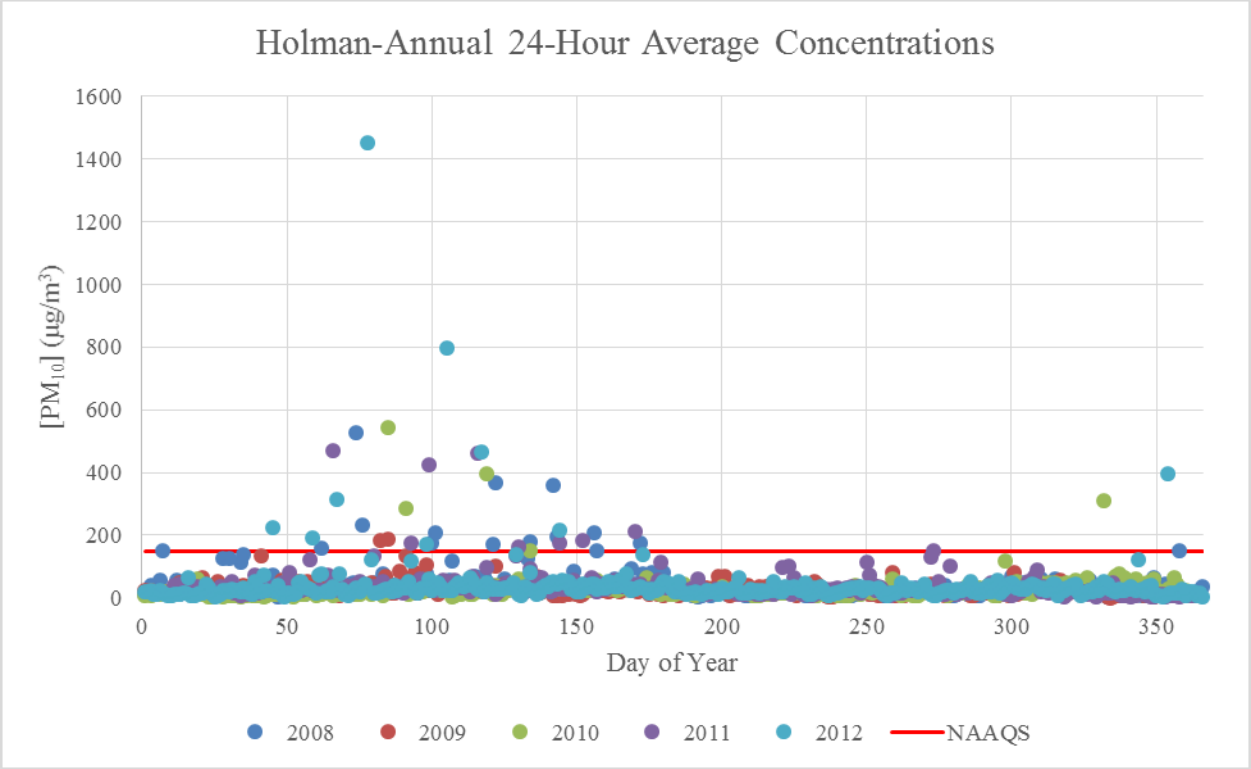
8 Appendix A-Historical Fluctuations 2008-2012

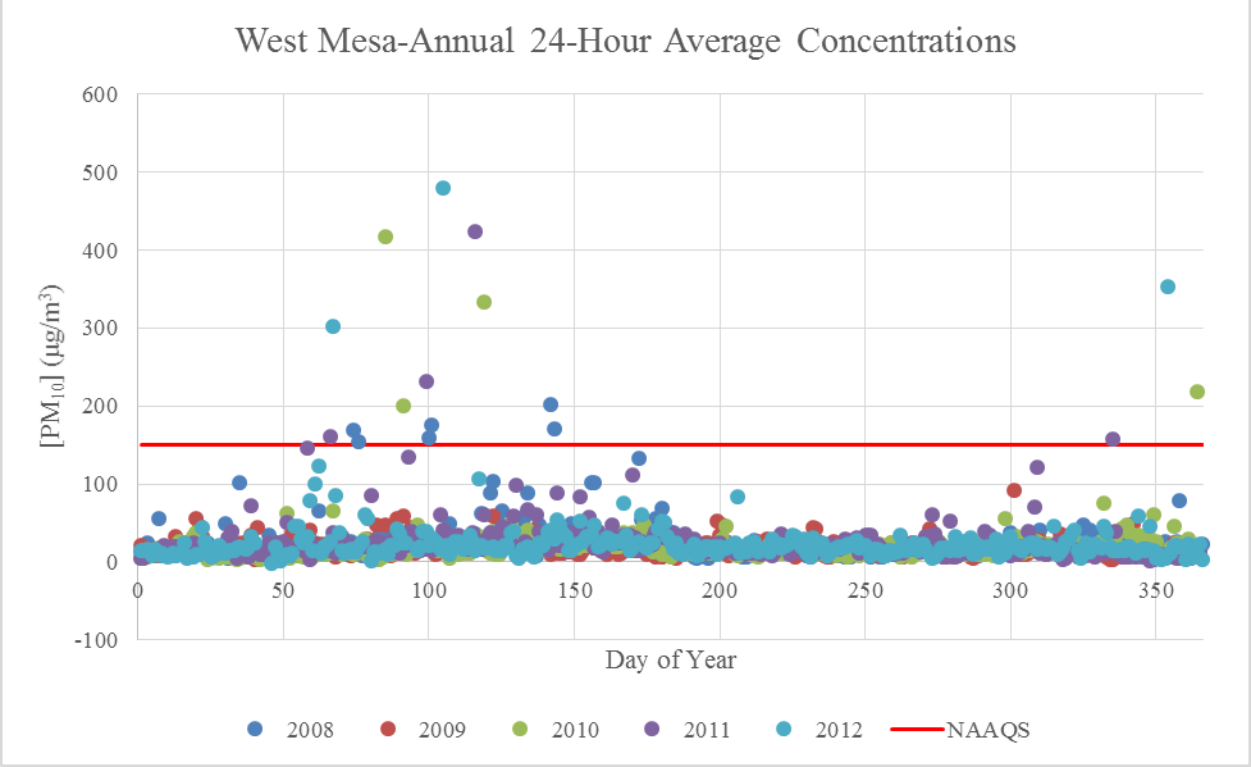





Deming-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


Desert View-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


Holman-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


West Mesa-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
600
500
400
300
200
100
0
-100
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS

9 Appendix B-Public Notice and Comments