

**Documentation of Natural Events:  
Particulate Matter Exceedances Caused by High Winds  
Doña Ana County, New Mexico**

**Update for April 2002 – June 2002**

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## INTRODUCTION

In a memorandum dated May 30, 1996, the Environmental Protection Agency (EPA) issued the Natural Events Policy (NEP) concerning violations of the PM<sub>10</sub> ambient air quality standard that are caused by natural events such as high winds. This policy allows for ambient air quality monitoring data affected by natural events to be excluded from determinations of attainment status, if certain requirements are met.

One requirement of the NEP is that the state or local air quality agency provide adequate documentation to show that the exceedances were caused by natural events and are therefore to be noted as such in the EPA Aerometric Information Retrieval System (AIRS). The state or local air quality agency must also document that Best Available Control Measures (BACM) were required for anthropogenic sources of wind-generated dust, and that the sources were in compliance with BACM requirements at the time of the event. The purpose of this update is to meet these requirements for documentation of PM<sub>10</sub> exceedances which occurred during the current reporting period.

Particulate matter monitoring sites in Doña Ana County are listed in Table 1. Previous reports documenting natural events for the period 1995-2001 should be consulted for a map of monitoring site locations and other background information. These reports are available on the New Mexico Environment Department's web site ([www.nmenv.state.nm.us](http://www.nmenv.state.nm.us)).

Table 1. PM<sub>10</sub> and PM<sub>2.5</sub> monitoring sites in Doña Ana County; only Wedding monitor at Las Cruces, all others with continuous (TEOM) monitor.

| Site Name     | PM <sub>10</sub> | PM <sub>2.5</sub> | AIRS Number | Lat (d-m-s) | Long (d-m-s) |
|---------------|------------------|-------------------|-------------|-------------|--------------|
| Roadrunner    | ✓                | ...               | 35-013-0018 | 32-20-30.64 | 106-45-37.07 |
| Chaparral*    | ✓                | ...               | 35-013-0020 | 32-02-27.48 | 106.24-33.09 |
| Anthony       | ✓                | ✓                 | 35-013-0016 | 32-00-11.54 | 106-35-57.67 |
| Sunland Park* | ✓                | ...               | 35-013-0017 | 31-47-49.91 | 106-33-24.17 |
| Desert View*  | ...              | ✓                 | 35-013-0021 | 31-47-46.32 | 106-35-02.13 |
| Santa Teresa* | ...              | ✓                 | 35-013-0022 | 31-47-15.77 | 106-40-58.36 |
| La Union**    | ...              | ...               | 35-013-0008 | 31-55-06.03 | 106-37-58.99 |
| West Mesa*    | ✓                | ...               | 35-013-0024 | 32-16-39.9  | 106-51-49.68 |
| Las Cruces    | ✓                | ...               | 35-013-1006 | 32-19-08    | 106-46-16    |

\* meteorological monitoring at these sites

\*\* meteorological monitoring data from this site is used for comparison with Anthony PM<sub>10</sub>

## EXCEEDANCES CAUSED BY HIGH WIND

Table 2 lists the exceedances occurring during the current reporting period and which we have determined to have been caused by high wind.

Table 2. PM<sub>10</sub> and PM<sub>2.5</sub> exceedances documented in this report as resulting from high wind. PM<sub>10</sub> and PM<sub>2.5</sub> values are 24-hour average concentrations, at local temperature and pressure.

| DATE      | SITE         | PM <sub>10</sub><br>(µg/m <sup>3</sup> ) | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | Peak Gust<br>(m/s) | Gust ≥18 |
|-----------|--------------|--|---|--------------------|----------|
| 7-Apr-02  | Chaparral    | 189                                      |   | 20                 | ✓        |
| 26-Apr-02 | Anthony      | 522                                      | 69  | 21                 | ✓        |
| 26-Apr-02 | Chaparral    | 762                                      |   | 24                 | ✓        |
| 26-Apr-02 | Roadrunner   | 255                                      |   | 23                 | ✓        |
| 26-Apr-02 | Sunland Park | no data                                  | 94  | 19                 | ✓        |
| 26-Apr-02 | West Mesa    | 367                                      |   | 21                 | ✓        |
| 26-Apr-02 | Desert View  |  | 108                                       | 19                 | ✓        |
| 26-Apr-02 | Santa Teresa |  | 90  | 19                 | ✓        |
| 1-May-02  | Chaparral    | 165                                      |   | 20                 | ✓        |
| 2-May-02  | Chaparral    | 179                                      |   | 20                 | ✓        |
| 2-May-02  | Anthony      | 161                                      |   | 20                 | ✓        |
| 13-May-02 | Anthony      | 551                                      |   | 13                 |          |
| 13-May-02 | Sunland Park | 278                                      |   | 19                 | ✓        |
| 7-Jun-02  | Roadrunner   | 169                                      |   | 9                  |          |
| 7-Jun-02  | West Mesa    | 271                                      |   | 10                 |          |
| 14-Jun-02 | Anthony      | 233                                      |   | 14                 |          |
| 14-Jun-02 | Sunland Park | 209                                      |   | 18                 | ✓        |
| 14-Jun-02 | Chaparral    | 187                                      |   | 16                 |          |
| 20-Jun-02 | Anthony      | 189                                      |   | 18                 | ✓        |
| 20-Jun-02 | Sunland Park | 190                                      |   | 22                 | ✓        |
| 20-Jun-02 | Chaparral    | 172                                      |   | 18                 | ✓        |
| 20-Jun-02 | Roadrunner   | 202                                      |   | 24                 | ✓        |
| 28-Jun-02 | Anthony      | 166                                      |   | 18                 | ✓        |
| 28-Jun-02 | Sunland Park | 194                                      |   | 17                 |          |

We consider the occurrence of peak wind gusts greater than 18 meters per second (40 miles per hour) to be sufficient evidence that an exceedance was caused by high wind. This wind gust criterion was determined by analysis of data for the 101 exceedances which occurred during the years 1999 and 2000, and which were shown by detailed analysis to have been caused by high wind. Approximately 90% of these exceedance days had peak wind gusts greater than 18 meters per second.

For those exceedances which do not meet the peak gust criterion of 18 meters per second, we provide additional evidence and analysis to document that they were caused by high wind. Such exceedances can result from wind events in which wind speeds are only moderate (8 to 18 meters per second) but nevertheless strong enough to raise some dust, and which last for several hours. Others can result from localized high wind events that raise clouds of windblown dust which are then carried to the monitoring site by winds of lower speed.

## Additional documentation for exceedances with peak wind gusts < 18 m/s

### 1) 13-May-02, Anthony

The peak wind gust for this date at La Union, the meteorological station nearest to Anthony, was 13.4 m/s, there is evidence that the PM<sub>10</sub> exceedance was caused by windblown dust raised by high winds. The peak gust at Sunland Park City Yards, less than 15 miles south of Anthony, was over 19.7 m/s, which is over the a priori criterion for high wind events (Table 2). Plots of hourly values of PM<sub>10</sub> at Anthony and Sunland Park show that both sites had high hourly PM<sub>10</sub> values at around the same time, in the early morning hours (App. 1A and 1B). The Texas Commission on Environmental Quality (TCEQ) has documented that a large dust storm affected El Paso and parts of west Texas during the early morning hours of this date (App. 1C). TCEQ suggested that dust was most likely picked up by stronger winds north and east of the area and then transported into the city.

Some windblown dust may also have been generated locally, as evidenced by the 19.7 m/s peak gust at Sunland Park. Wind gusts at or near Anthony may have been stronger than recorded at La Union, perhaps strong enough to raise dust from local sources. Winds were blowing from the northeast during the early morning dust episode (App. 1C and 1D). As described in earlier documentation, when winds are from the east, Anthony may experience higher wind speeds than recorded at La Union because it is located directly downwind of a pass in the Franklin Mountains.

We therefore conclude that this exceedance was a high-wind event.

### 2) 07-Jun-02, Roadrunner and West Mesa

Plots of hourly PM<sub>10</sub> concentration and wind speed (App. 2A and 2B) indicate that the episode of high PM<sub>10</sub> actually began an hour or two before midnight on June 6th, peaked near or shortly after midnight, and extended into the early hours of daylight on June 7th. There was a period of moderately windy conditions during the late evening hours of June 6th, but peak gusts were only 12 m/s or less. During the predawn hours of June 7th, when PM<sub>10</sub> levels were still high, winds were nearly calm. The drop in PM<sub>10</sub> levels during the early daylight hours of June 7th coincided with slightly increased wind speeds, and probably increased convective mixing near the surface due to heating of the surface.

A similar pattern was observed at Anthony (App. 2C), which also had a period of high PM<sub>10</sub> near midnight of June 6th, following a late-evening period of moderately windy conditions. As at Roadrunner and West Mesa, moderately elevated PM<sub>10</sub> levels (200-400 µg/m<sup>3</sup>) persisted until the early daylight hours. At monitoring sites south of Anthony, hourly PM<sub>10</sub> values were not substantially elevated during the nighttime hours of June 6-7. We therefore conclude that this was a large-scale episode, extending at least 25 miles north-to-south, but not as far south as the Paso del Norte area.

During the hour with peak PM<sub>10</sub> at Anthony, the PM<sub>2.5</sub>/PM<sub>10</sub> ratio was about 0.13, which indicates that the particulate matter was crustal material (dust) rather than smoke.

At the Las Cruces Airport, about 2 ½ miles west of the West Mesa site, the late evening hours (1800-2100 h local standard time) of June 6th had sharp increases in wind speed and dew point, a brief period of cloud cover, "haze", and visibility reduction to 1.75 miles (App. 2D). These observations are consistent with the passage nearby of a convective thunderstorm with strong downdraft-induced surface winds. Soils in the area were likely to be highly susceptible to blowing, since the region was in a severe drought (121 days since measurable rainfall at El Paso Airport; see [www.srh.noaa.gov/elp/climat](http://www.srh.noaa.gov/elp/climat)).

The best explanation of the available data is that one or more strong thunderstorms produced strong dust-generating winds, but probably little rain, during the late evening hours of June 6th. After the thunderstorm had passed or abated, winds calmed and the dust remained suspended until it was dispersed by convective mixing in the early daylight hours. We therefore conclude that this exceedance was a high wind event.

### 3) 14-Jun-02, Anthony and Chaparral

These exceedances resulted in large part from an episode of high PM<sub>10</sub> which began in the late evening hours of the preceding day, June 13th, and extended into the morning hours of the 14th. (App. 3A and 3B). At Chaparral, there was an additional brief episode of high PM<sub>10</sub> concentrations and high winds in the late evening of the 14th.

During the evening/morning episode of the 13th-14th, wind speeds at these sites were sometimes high enough to raise dust from local source areas, but PM<sub>10</sub> concentrations do not appear to be very strongly correlated with wind speed. This same episode was also caused an exceedance at Sunland Park, where the peak gust met the 18 m/s criterion and onset of the episode corresponded to a sharp increase in wind speed (App. 3C). Also at Sunland Park, the episode was characterized by low PM<sub>2.5</sub>/PM<sub>10</sub> ratios (about 0.12-0.18), indicating that the particulate matter was mostly crustal material (dust) rather than smoke (App. 3D).

Regional weather on these dates is described in reports from the Albuquerque and El Paso National Weather Service offices. From Albuquerque NWS,

*"A strong cold front raced southward through the eastern plains on the 13th and poured through the canyons and passes of the central mountains into the Rio Grande Valley on the night of the 13th. Plenty of moisture was behind this front and was aided by easterly upslope winds. ... The combination of this wind profile and plenty of moisture led to the development of showers and thunderstorms from the Continental Divide to the Texas border on the 14th. Numerous reports of severe weather were reported as well."*

(from: [www.srh.noaa.gov/abq/climate/Monthlyreports/June/Jun2002.htm](http://www.srh.noaa.gov/abq/climate/Monthlyreports/June/Jun2002.htm))

From El Paso NWS,

*"June 14: Thunderstorms drop .08 inch of rain at El Paso Airport ending a string of 128 consecutive days with no measurable rainfall. Widespread thunderstorms also brought strong winds with 5 mobile homes damaged near Horizon City. To the west, hail up to an inch in diameter fell south of Hillsboro with hail depths of up to 8 inches in the area."*  
(from: [www.srh.noaa.gov/elp/swww/v6n2/Wxbul.6.2.1.htm](http://www.srh.noaa.gov/elp/swww/v6n2/Wxbul.6.2.1.htm))

*"Special Weather Statement, National Weather Service, El Paso TX, 905 PM MDT Fri Jun 14 2002.....Strong thunderstorms will be over southeast Doña Ana County for the next hour and El Paso County for the next two hours. These storms will bring strong winds gusting to near 50 mph with blowing dust...heavy downpours...frequent lightning...and hail. Watch for ponding on roads and poor visibility with blowing dust or heavy rain...."*

We conclude that the episode of the evening of the 13th to the morning of the 14th was caused by windblown dust, probably raised in part from sources at some distance from the monitoring sites. The episode of the evening of the 14th was caused by thunderstorm-generated high winds near the monitoring site. Other sites in the county may have experienced high winds but also had rainfall which would have prevented local dust generation.

We conclude that these exceedances were high wind events.

#### 4) 28-Jun-02, Sunland Park

Although Sunland Park experienced strong winds on this day, the main episode of high PM<sub>10</sub> occurred at a different time than the peak winds. The daily peak gust of 17.5 m/s (near the *a priori* criterion of 18 m/s) occurred in the 1700-1800 hour period, but the high PM<sub>10</sub> concentrations occurred about 3-4 hours later in the evening, when peak gusts had dropped to 5-8 m/s (App 4A). PM<sub>2.5</sub>/PM<sub>10</sub> ratios were low, about 0.10-0.12, during the high PM<sub>10</sub> episode, indicating the particulate matter was predominantly crustal (dust) (App. 4B).

At Anthony, peak gusts exceeded the 18 m/s criterion, and occurred during the same hour as the peak PM<sub>10</sub> concentration (App. 4C), which indicates large amounts of wind-generated dust.

Data from El Paso National Weather Service (in Santa Teresa) indicate that there were thunderstorms in the vicinity. Records for this date indicate 0.13 in. of precipitation, a trace of "snow" (probably hail), thunder in the vicinity, and a peak wind gust of 37 mph (see [www.srh.noaa.gov/elp/climat/elpjun2002p.html](http://www.srh.noaa.gov/elp/climat/elpjun2002p.html)).

We conclude that high winds from thunderstorms in the vicinity raised wind-blown dust that caused this exceedance.

## **BEST AVAILABLE CONTROL MEASURES (BACM)**

BACM was required and in place for anthropogenic sources during the recorded PM<sub>10</sub> exceedances from high-wind events during the current reporting period. Letters confirming control measure implementation by the City of Las Cruces, Doña Ana County, and other stakeholders are available in previous documentation for 1999-2001. These measures remain in place.

#### **REFERENCE**

Saxton, K., D. Chandler, L. Stetler, B. Lamb, C. Claiborn, and B.-H. Lee. 2000. Wind erosion and fugitive dust fluxes on agricultural lands in the Pacific northwest. Transactions of the ASAE 43:623-630.