Fugitive Dust White Paper

The mission of the New Mexico Environment Department is to provide the highest quality of life throughout the state by promoting a safe, clean and productive environment. Through its statutory authority, the Environment Department is responsible for protecting and promoting the environmental health, safety, and welfare of New Mexico's inhabitants to provide the best quality of life possible. Satisfying this mission includes the prevention of the deterioration of air quality.

- Dust storms generated by high winds have caused unhealthy levels of airborne particulate matter (dust) and the concentrations of dust in the air have exceeded levels set by the U.S. Environmental Protection Agency to protect public health.

- Dust irritates the lungs, and can trigger allergic reactions and asthma attacks. In people with existing respiratory problems, these attacks can be serious and life-threatening.

- Particulate matter pollution negatively affects the health of animals and vegetation, corrodes building material, reduces visibility on public roadways, reduces crop production, and reduces the quality of life in an impacted area.

- The majority of the exceedances of the national standards occur in southern New Mexico in late winter and spring during regional high-wind events (sustained winds of 40 miles per hour or more).

- The Environment Department can request that the Environmental Protection Agency exclude these natural event high-wind exceedances from counting towards a determination that the standards have not been met (nonattainment), but the Department's analysis must include a demonstration that upwind man-made sources did not contribute to or cause the exceedances. Documentation that upwind sources were using best available control measures during the high wind events helps demonstrate that these sources did not contribute to or cause the exceedances.

- Nonattainment designations would result in the expenditure of significant state resources to develop strategies for reducing air pollution and implementing federal permitting requirements. Nonattainment areas may face reduced economic growth as businesses find it difficult to locate or expand in a nonattainment area due to more stringent pollution control requirements.

- Local governments (Doña Ana and Luna Counties) do not have the resources to efficiently and effectively enforce their existing dust control ordinances. Other counties in New Mexico have no ordinances to address dust control.

- It is necessary for the state Environment Department to develop and implement a fugitive dust rule to protect all citizens of New Mexico. The Environment Department has identified two possible paths to address fugitive dust emissions:

  1. Develop and implement a strict fugitive dust control program similar to the one adopted by Bernalillo County. Such a program would cover most sources of fugitive dust, requiring permitting (including fees), dust control plans, operator training, and mandatory shutdown

of operations during windy periods. This path would be resource- intensive for both the regulated community and the Environment Department.

2. Adopt a complaint-driven fugitive dust rule that will give the Environment Department compliance and enforcement authority over all fugitive dust sources. Such a path would encompass the most common sources of dust complaints and provide more flexibility to industry in selecting the most efficient and cost-effective control measures for their operations.

For additional information on health, safety and regulatory concerns please see the Technical Support Document "Windblown Dust Pollution in New Mexico."

Windblown Dust Pollution in New Mexico: Health, Safety, and Regulatory Concerns

I. Introduction

This technical support document discusses historical cases of exceptionally high PM exceedances; the health, safety, and welfare concerns due to windblown dust; sources of windblown dust; regulatory issues; and solutions to reduce dust. This discussion does not include Bernalillo County or tribal lands as the AQB does not have jurisdiction for these areas.

In order to address citizen complaints, minimize health effects, safety and welfare issues, and adverse regulatory issues, the Department has determined that a state-wide rule addressing sources of man-made fugitive dust should be developed and implemented.

II. Background

The mission of New Mexico Environment Department (NMED) is to provide the highest quality of life throughout the state by promoting a safe, clean and productive environment. Through the authority granted by the Legislature, the NMED is responsible for protecting and promoting the environmental health, safety, and welfare of New Mexico's inhabitants to provide the best quality of life possible. One part of achieving this mission is the prevention of the deterioration of air quality. The NMED Air Quality Bureau (AQB) is responsible for monitoring and maintaining air quality to meet federal standards.

The U.S. Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) to protect public health from harmful levels of common air pollutants. With the enactment of the federal Clean Air Act of 1970, these standards were developed for six "criteria" air pollutants that are commonly found throughout the country. Criteria air pollutant limits are established by health-based studies that inform the EPA at which level to set a NAAQS. Particulate matter (PM) is a criteria pollutant and consists of two categories: PM less than or equal to 10 microns in aerodynamic diameter, or PM_{10}; and PM less than or equal to 2.5 microns in aerodynamic diameter, or $PM_{2.5}$ (a single strand of hair averages 70 microns in diameter.). The most common components of airborne PM include dust, smoke, and soot.

Concerns regarding air quality impairments have been documented since the thirteenth century and they continue to be a top priority for communities throughout the U.S. For most of the year, air quality in New Mexico is very good. However, during periods of high winds, dust concentrations can reach unhealthy levels of airborne particulate matter and exceed the PM_{10} and $PM_{2.5}$ 24-hr NAAQS. Counties in southern New Mexico (especially Doña Ana and Luna Counties) have experienced exceedances of these NAAQS in the past.

While much of the dust in New Mexico is caused by natural events such as high wind speeds and ambient dry conditions, man-made dust sources are increasing as New Mexico becomes more populated and development expands. The frequency and severity of exceedances have been well above the PM_{10} NAAQS and pose a serious health and safety concern. In 1996, the AQB

prepared Natural Events Action Plans (NEAP) under EPA's Natural Events Policy in lieu of submitting a nonattainment recommendation for counties that had not met the standard (Doña Ana and Luna Counties).

Doña Ana and Luna Counties' NEAPs were developed using five guiding principles outlined in the Natural Events Policy. First and foremost was to ensure that public health is protected. Second, the public must be educated on the health hazards posed by dust storms and how to minimize exposure. Third, air quality monitoring data must be available to the public. Fourth, reasonable control measures must be in place to safeguard public health regardless of the dust source. Lastly, control measures should be in place for sources that contribute to exceedances of the PM_{10} NAAQS. The NMED believes that the NEAPs were successfully implemented for the first five years but the department received numerous complaints from 2006-2010 regarding the enforcement of best available control measures (BACMs) as required by the NEAPs. This indicates that these provisions were not successfully being implemented on a local level in Doña Ana and Luna Counties.

III. Historical Air Quality Monitoring Data

Since the late 1980's, the AQB has recorded hundreds of exceedances of the 24-hour average PM_{10} NAAQS of 150 micrograms per cubic meter ($\mu g/m^3$) at its air quality monitors in the state. The AQB measured the first exceedances of the 24-hour PM_{10} NAAQS in Doña Ana County in 1988. In 2003, the AQB also measured exceedances of the 24-hour PM_{10} NAAQS in Luna County, directly west of Doña Ana County. On average, exceedances are recorded at one or more monitors on twenty (20) days a year, with a low of nine (9) days in 2005 and a high of thirty-two (32) days in 2003. The highest recorded 24-hour average PM_{10} concentration was 12 times higher than the NAAQS (1841 $\mu g/m^3$). Figure 1 summarizes the number of exceedances and days with an exceedance from 1995-2008.

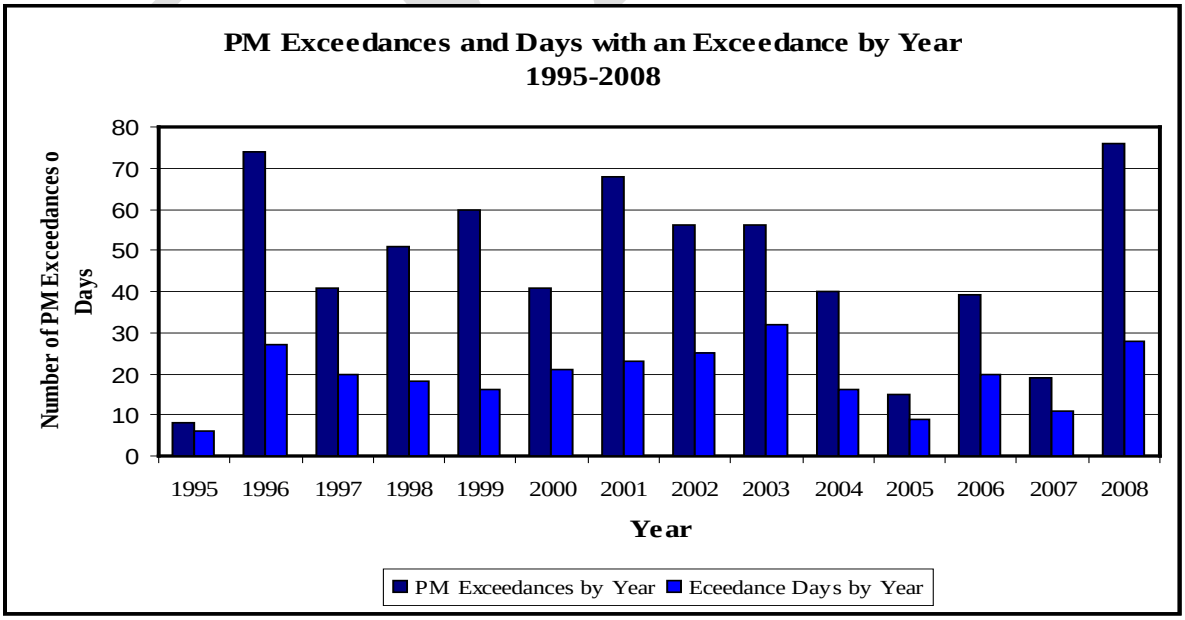

Figure 1. Number of PM_{10} Exceedances and days with at least one exceedance in NM from 1995-2008. Data compiled by the AQB from documentation sent to EPA.

The AQB's analysis of wind data and other conditions during the exceedances indicated that all but a few exceedance days were caused by high winds, which lift and carry dust from disturbed and exposed dry soil. Certain features of the state's natural environment are also conducive to wind erosion and windblown dust generation during high winds. These features include: aridity, sparse vegetation cover, and large areas of highly wind-erodible soil.

Most monitored high-wind exceedances occur in southern NM in late winter and spring during regional-scale high wind events associated with the passage of cold fronts. For these events, the NMED created time series plots of PM_{10} concentrations versus wind speed that demonstrate the co-occurrence of high wind and elevated PM_{10} concentrations. These time series plots follow a common pattern: abrupt increases in PM_{10} concentrations associated with high wind speeds and an equally abrupt decrease in PM_{10} when wind speeds decrease. The wind speed value that causes a significant increase in fugitive dust emissions varies due to the numerous factors affecting soil's vulnerability to erosion and the meteorological conditions that must be present in the upper atmosphere to lift and carry dust. The maximum hourly PM concentration usually occurred within the same hour as maximum wind speed. Figure 2 illustrates a typical day with an exceedance caused by wind blown dust.

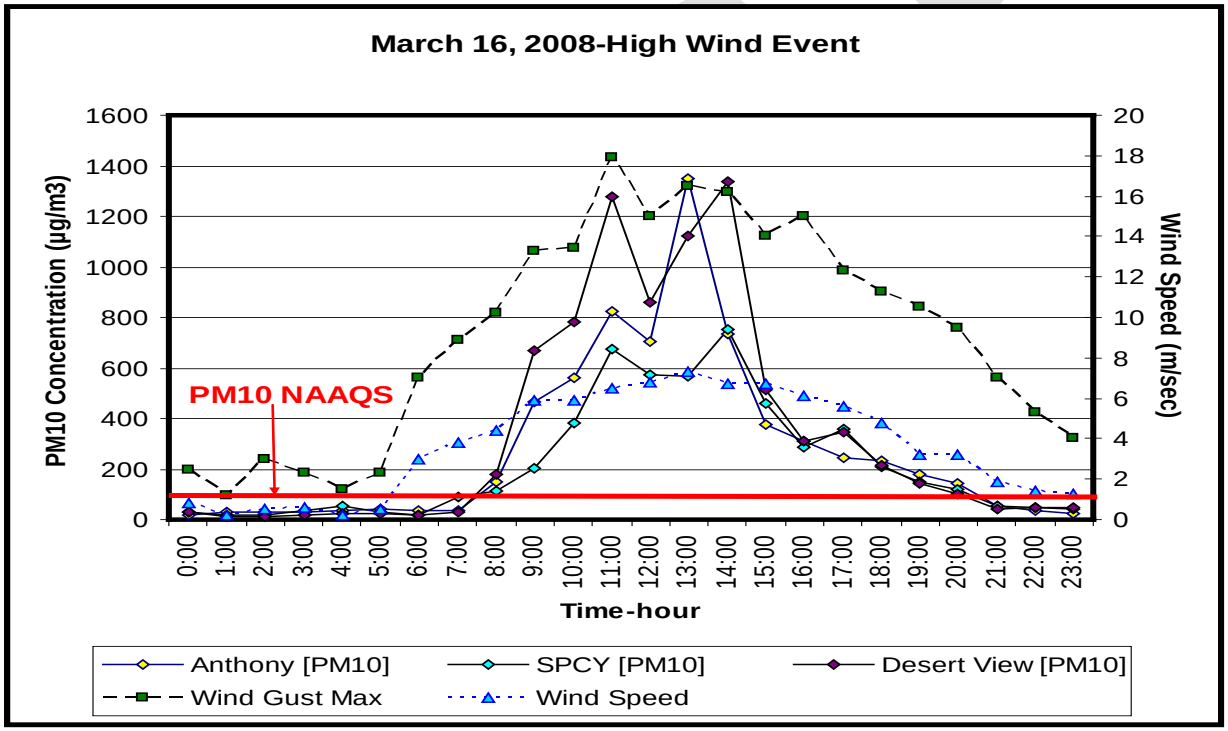

Figure 2. Time series plot of PM_{10} concentrations versus wind speeds at Anthony, Sunland Park City Yard, and Desert View monitoring sites. Wind speeds are for the Anthony site only.

In addition to anthropogenic (man-made) influences, windblown dust emissions are also affected by environmental factors, including meteorological conditions, vegetation cover, soil moisture content, soil particle size distribution, soil structure (crusts and clods), and surface roughness. Dust-emitting potential varies over the landscape, so even a shift in wind direction may result in changes in PM_{10} concentration at a monitoring site. The number and variability of factors

affecting dust emissions at a given wind speed make it impractical to determine a wind speed which will always distinguish high wind event exceedances from those with other causes.

The AQB has used 18 m/s (approximately 40 miles per hour) as a threshold for high wind events when providing EPA documentation of a wind blown dust exceedance. Our analysis of exceedance data from 2003-2008 shows that 70% of exceedances occurred at monitoring sites recording 18 m/s wind gusts or more.

IV. Citizen Complaints

The AQB frequently receives citizen complaints regarding fugitive dust concerns from all parts of the state covering a wide variety of activities as shown in Table 1. A review of the department's complaint tracking database shows that the AQB has received 747 outdoor air quality complaints from 2006 through 2010. Of those complaints, 256 or 34% are directly related to anthropogenic sources of fugitive dust. Nearly 51% or 130 of these complaints involve the aggregate, materials handling, and mining industries. In some but not all of these cases, the businesses involved hold an air quality permit from the AQB and must follow the requirements specified in their permit. Other operations, such as the construction industries, agriculture, confined animal feeding operations, unpaved roads and vacant land, are not required to obtain air quality permits. These complaints total 97 or 13% of the total complaints received by the AQB. In those instances when businesses are not subject to air quality permits, the AQB has had to explain to citizens that in the absence of a fugitive dust rule, the department does not have the regulatory authority to compel businesses to lessen the impact fugitive dust has on neighbors' health and quality of life.

The AQB suspects that the number of complaints entered into the database is greatly underreported. Since the AQB does not have regulatory authority to resolve certain cases, these complaints were "closed" or referred to local governments without entering them into the database. A "closed" complaint is one in which the AQB has done as much as possible within its purview to investigate violations of law and address the reporter's concerns. Historically, fugitive dust has been viewed as a local issue best addressed through local ordinances. As evidenced by a wind and water assessment completed in November 2010 by public engineers in Las Cruces, some local governments do not have the resources or expertise to efficiently and effectively enforce these rules. This assessment concluded that wind erosion control measures are insufficient or nonexistent in subdivisions that have not developed as quickly as originally planned and that local governments do not effectively enforce their wind erosion ordinances.

V. Health Effects

Dust is made up of tiny particles that can be entrained in the air and includes both PM_{10} and $PM_{2.5}$. These tiny particles can get past the body's natural defenses and build up in the respiratory system, causing damage to sensitive lung tissue. During severe dust storms, more dust becomes entrained and increases the health risk of exposure. Dust irritates the lungs, causes coughing, wheezing, runny noses, and can trigger allergic reactions and asthma attacks.

Complaint	Source Type	ID	Municipality	County	Date
Fugitive particulate emissions (dust) generated by aggregate material handling at a storage / distribution yard are impacting neighboring residents. Stockpiled aggregate is kept at boundaries with neighboring private property.	Aggregate	47	Velarde	Rio Arriba	10/20/2006
Cattle feed lot in Lemitar emits large quantities of particulates, including dried cow manure. Problem is worse on windy days. Operator allegedly does nothing to control emissions.	CAFO	6707	Lemitar	Socorro	4/28/2010
I live in a new, developing neighborhood. Because of the removal of all vegetation in preparation for development, there are extreme amounts of blowing sand. The sand accumulates in our yards, ruining landscaping, and damaging equipment such as air conditioners, grills, etc. When the wind is blowing it is impossible to be outside. The builder put up small, black fabric, fences, but they quickly blew down.	Construction	6776	Santa Teresa	Dona Ana	5/17/2010
Caller reported that county road is creating very dusty conditions at her house and making it hard to breathe outdoors. Explained that AQB does not regulate county roads and referred her to her county commission."	Roads	7050	Belen	Valencia	6/28/2010
Parking water trucks from the oil field in vacant lot. Blowing dust and dirt everywhere.	Vacant Lot	7639	Artesia	Eddy	11/9/2010
Fugitive particulate emissions from property development at a subdivision are impacting nearby residents.	Construction	3197	Santa Fe	Santa Fe	3/31/2008
Particulate emissions from asphalt paving aggregate facility are impacting neighboring resident. Permitee began clearing land for facility on 11/28/2007, causing a large, continuous particulate plume.	Aggregate	2497	Tucumcari	Guadalupe	11/28/2007

Table 1. Examples of fugitive dust complaints received by the AQB and entered into our complaint tracking database, the Environmental Notification and Tracking System. Each complaint is automatically assigned a notification ID so citizens may track the progress of an ongoing investigation. All language used in complaint section is original language except the AQB removed specific business names

For people who already have respiratory problems, these attacks can be serious and cause life-threatening breathing problems.

Breathing too much dust can harm anyone. However, the following groups are at the highest health risk: infants, children, teens, the elderly, pregnant women, individuals with respiratory conditions (e.g., asthma, bronchitis, or emphysema), and people with cardiovascular diseases. Healthy adults working or exercising outdoors should also take precautions when dust storms occur due to increased respiratory rate and a higher likelihood of breathing dust entrained air. Recent studies indicate that long term exposure to PM can be harmful to healthy individuals.

VI Safety and Welfare Issues

In addition to health concerns, dust generated from various activities is a safety concern and can create extremely hazardous situations on public roadways. Reduced visibility from windblown dust has resulted in motor vehicle accidents and closure of roadways. Furthermore, PM pollution impairs the health of animals and vegetation, contributes to lost productivity/work days, adversely impacts ecosystems, corrodes building material, reduces crop production, and in general reduces the quality of life in an area (Table 2). The AQB has received numerous complaints and analyses from citizens regarding unfinished subdivisions that document the impact of windblown dust on living conditions and private property (See Figure 3).

Health	Safety/Welfare
-Premature mortality (acute and long term)	-Decreased worker productivity
-Increased hospital admissions	-Landscape or property damage
-Acute and chronic bronchitis	-Vehicular traffic safety/visibility
-Development or worsening of Asthma	-Ecosystem damage
-Decreased pulmonary function	-Building and monument damage
-Infant mortality	-Regional Haze/visibility
-Lung tissue damage	-Loss of recreational opportunities
-Increased sensitivity to allergies	-Household soiling
-Immune system damage	-Reduced crop production
-Shortness of breath	-Reduced quality of life
-Upper and lower acute respiratory symptoms	-Impaired animal health

Table 2. Health, Safety and Welfare effects of PM.

VII. Sources of PM

In 2004, the AQB participated in EPA's Atlas Project, an effort to inventory pollution sources in the international border area with Mexico. As part of this project, an area source PM emission inventory was conducted for Doña Ana County. Individually, area sources usually emit less air pollution than the threshold amount that requires a permit, but collectively they emit enough pollution that they may significantly impact air quality. The emission inventory showed that airborne dust is generated by many types of anthropogenic activities and businesses. The largest anthropogenic sources of windblown dust in New Mexico are similar to those found in communities throughout the western United States and include: disturbed desert areas, paved and unpaved roadways, construction and development activities, agriculture, disturbed vacant land

areas, recreational activities, high-traffic industrial areas, unpaved playgrounds and parking lots, and military training exercises.

Although the natural desert with its areas of loose, dry, and/or barren soil is the largest individual source of windblown dust, human activities also cause a significant amount of emissions. Since these activities tend to occur in more populated or developing areas, people are more likely to breathe the dust entrained air and suffer welfare impacts. While windblown dust naturally occurs in undisturbed areas throughout the west, it becomes much more common where the natural soils have been disturbed by anthropogenic activities. Natural soils have a tendency to form a mineral and organic crust that is resistant to erosion. Human activities can remove or break this crust, allowing dust to escape much more easily. Even sparse desert vegetation acts like a windbreak, providing protection from erosion to the soil surface. When human activities remove vegetation, the soil is more susceptible to wind, and as a result, airborne dust is produced.

Figure 3. Windblown dust covering gravel landscape at a new home in Las Cruces. In the background lies disturbed lots that do not have dust control measures in place. Photo courtesy of Erin Ward, BEHC/NMSU.

VIII. Regulatory Issues

To protect public health, EPA designates areas where air pollution levels are greater than the NAAQS as "nonattainment areas." Nonattainment means that the NMED will have to spend time and money developing strategies for reducing air pollution through rigorous programs and permitting requirements. An area designated as nonattainment may face reduced economic growth as businesses find it difficult to locate or expand in a nonattainment area due to the more stringent pollution control requirements. An emissions offset program will need to be implemented to allow for growth, meaning that existing businesses would need to reduce their emissions to allow a new business to operate in the area. Obtaining air quality permits will be

more complex due to the increased regulatory requirements. Also, transportation projects will have to be evaluated for air quality impacts resulting in more burdensome requirements to complete such activities at the municipal, county and state level. Lastly, counties in nonattainment carry a stigma of having poor air quality making them less desirable places to live and work.

Regulatory requirements for these areas are typically focused on reducing air pollution from industries and motor vehicles. However, the traditional approach of controlling factories and tailpipe emissions will not alleviate PM_{10} exceedances due to natural events, such as dust raised by high winds. Since 1977, EPA has recognized the need to review and handle air quality data for which the normal planning and regulatory processes are not appropriate. Besides the fact that this traditional approach has been an ineffective means of dealing with this type of PM_{10} exceedance, it may be detrimental to economic growth. Because of this, the western states requested a new EPA rule for addressing air pollution from natural events. On March 22, 2007, the EPA promulgated its final rule for the review and handling of certain air quality monitoring data by state and local air quality management agencies. This rule is called "Treatment of Data Influenced by Exceptional Events" or the Exceptional Events Rule (EER).

Prior to the implementation of the EER, EPA policy and guidance dictated the handling of data affected by an exceptional event. The policy most pertinent to New Mexico was the May 30, 1996 Natural Events Policy (NEP) that addressed exceedances of the PM_{10} NAAQS caused by natural events such as high winds and wildfires. Similar to the EER, the NEP allowed the exclusion of ambient air quality monitoring data affected by natural events from determinations of attainment status, if certain requirements were met. The AQB managed its air quality monitoring data under this policy until the implementation of the EER (1996-2007). Many of the NEP provisions are included in the EER.

The EER allows the EPA to exclude flagged data showing exceedances of a NAAQS when determining an area's ability to meet the standard for a given criteria pollutant. When the AQB suspects that data was affected by an exceptional event, EPA is notified by placing a flag on the data submitted to EPA's air quality database. In order for EPA to concur on an exceptional event flag and exclude the data, the AQB must submit documentation that:

(A) the event satisfies the criteria in 40 CFR 50.1.(j) that it:

1. affects air quality;
2. that it is not reasonably controllable or preventable;
3. is caused by human activity that is unlikely to recur at a particular location, or is a natural event;
4. does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or pollution relating to source noncompliance;

(B) there is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected air quality in the area;

(C) the event is associated with a measured concentration in excess of normal historical fluctuations, including background, and

(D) there would have been no exceedances or violation but for the event.

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 that are covered under the rule. Hence, EPA determines data exclusion on a case-by-case basis after considering the weight of evidence provided in the demonstrations. Recent decisions made by EPA regarding exceptional events indicate that an area may not be eligible to exclude monitored data if best available control measures (BACMs) are not proven to be in place for a given area or EPA does not agree with an assessment that an exceptional event caused poor air quality.[1]

EPA takes the stance that air quality management agencies must take necessary measures to protect public health regardless of the source of air pollution. In federal register 72 FR 13560, the EPA states that air quality management agencies must "take responsible and appropriate measures" to mitigate the impacts of natural events on the public. The EER does not explicitly state what measures EPA believes are protective of public health, leaving this decision up to the state.

IX. Best Available Control Measures (BACMs)

It is unreasonable to expect that all windblown dust emissions can be controlled. Even the most stringent of control methods may be overcome by the natural forces of high winds. However, in the interest of public health, air quality agencies should adopt best available control measures (BACMs) to limit the amount of wind blown dust emissions and their associated health impacts on citizens. In Luna and Doña Ana Counties, the county and municipal governments adopted ordinances requiring BACMs as part of their NEAPs. BACM is defined as the maximum degree of emission reduction feasible for a source category, and are used to reduce or eliminate windblown dust emissions from anthropogenic sources. BACM is determined on a case-by-case basis, taking into account technical feasibility and energy, environmental, and economic impacts, as well as direct and indirect costs. The process of determining BACM takes into account the most common sources of anthropogenic dust within a community, when dust events occur, what measures can be used to reduce dust, and the relative cost of such measures to their effectiveness in controlling dust.

Most BACMs are physical methods of controlling dust from developed or undeveloped areas within communities. Many methods attempt to return native soils to a more protected state by re-vegetation or by replacing natural crusts with artificial covers. However, they also include practices to control and/or reduce airborne dust by minimizing the area of disturbed soil. In addition, the length of time the soil remains exposed to wind and the timing of the disturbance have a bearing on the need for a particular BACM. Considering all these factors, it is possible to develop best management practices for specific industries and land uses.

The BACMs discussed below includes methods used throughout the western US that vary greatly in effectiveness and cost. These variations may be due to the size of the area requiring

[1] EPA region 9 did not agree that certain exceptional events caused exceedances in the 2008 Imperial County, CA EER Demonstration because the air quality district did not prove that BACMs were in place for an area of desert that is frequently used by off road vehicles (ATVs and motorcycles). Also, EPA region 9 did not concur with all events included in the 2008 Maricopa County, AZ EER Demonstration because the county did not provide EPA with sufficient technical justification to conclude that upwind sources did not contribute to the flagged exceedance.

dust control, the ground slope of the area, the soil type involved and the amount of anthropogenic activity in an area. Larger areas may require several methods of dust control to adequately address problems of blowing dust. The following list does not represent all available types of dust control methods, and new methods are continually being developed. Persons responsible for dust sources can utilize existing or new types of dust control, although they should be thoroughly investigated for benefits and drawbacks. However, these measures have been successfully implemented in similar arid regions. Table 3 summarizes some of these methods for specific applications and provides cost and efficiency estimates.

Re-vegetation and Organic Mulches

Restoring a vegetative cover or using organic mulch can be an excellent method of reducing windblown dust. However, care must be taken to avoid introducing or promoting the spread of noxious weeds and plants. State or University Extension representatives who are knowledgeable about revegetation should be consulted prior to performing these options.

Using Water, Chemical Dust Suppressants and Soil Stabilizers

Water has long been used for the control of dust in arid regions. However, water use in New Mexico has increased greatly over the last decade and is being used primarily for domestic and agricultural purposes. The cost of water has also increased within the state. Water can be ineffective for dust control since dry soils are initially resistant to the influx of water. Therefore, large amounts of water need to be applied during short intervals for effective dust control. Water-soluble surfactants are often added to water to increase the wetting power by breaking down the initial resistance of dry soils to water. Surfactants are relatively inexpensive and greatly decrease the amount of water necessary for dust control.

Chemical dust suppressants and soil stabilizers can be useful in reducing the tendency of fine-grained and loose soils to produce large amounts of windblown dust. They bind fine soil particles into larger particles that resist becoming airborne and they retain moisture so that soils become more coherent. Also, they can form crusts that mimic the wind resistance of natural soil crusts.

Chemical dust suppressants are often added to water, which act to disperse the chemicals and evaporate after application. The chemicals that are left behind coat the particle surfaces and bind the soil particles together. Most products are designed for moderately traveled, low-cost roads, and are also used to stabilize shoulders of paved roads and to temporarily stabilize construction sites. When used to stabilize heavily trafficked areas, these products typically require ground preparation prior to application, as well as reapplication one to four times a year to remain effective. The crusting or binding of soil particles does not need to be nearly as strong for areas that will not be trafficked by vehicles, because the binding needs only to withstand the force of the wind. Therefore, stabilization of areas where there is no traffic requires much less of the chemical, less ground preparation, and less frequent reapplication.

Examples of chemical adhesives include anionic asphalt emulsion, latex emulsion, resin-water emulsions, and calcium chloride. Chemical adhesives should be used only on mineral soils. When considering chemical application to suppress dust, consideration should be taken as to whether the chemical is biodegradable or water-soluble and what effect its application could have on the surrounding environment, including water bodies, vegetation and wildlife.

Soil stabilizers such as straw mulches increase the organic content of sandy, dry soils. They provide soil structure and the organic materials bind with clay and sand to reduce erosion; they also increase the ability of soils to retain moisture. Some types of mulch require tilling to integrate them into the upper layer of soil, if they are to be effective in dust control.

Smart Timing or Phasing

In many cases, proper timing of the land disturbance and/or the application of the control measure can make dust control affordable, with little reduction in effectiveness. Based on exceedance data from 1995 through 2008, over 50% of the days with unhealthful levels of windblown dust occurred during the months of March through May, and over 70% were during December through May. For an activity that temporarily creates a potential source of windblown dust, this means that by planning dust-generating activities so that the erosion susceptibility is within the July to December period would be effective in controlling windblown dust. Alternatively, phasing the project to limit the size of the disturbed area is also effective in limiting the amount of windblown dust emitted by a given activity. Assuming the soils have been adequately stabilized, no direct costs (such as for chemical dust suppressants, water, water trucks, labor, etc.) would be incurred. If indirect costs (relating to financing, lost business opportunities, and so forth) are not prohibitive, these can be highly cost-effective methods of dust control. An added benefit is that environmental impacts from water use or introduction of chemicals into the environment are minimized.

If the potential dust source is expected to continue for many months or years, timing the application for optimal effectiveness can reduce the costs of short-term control measures such as watering or using chemical dust suppressants. Applying these methods to provide control only during the months of January through June can cut the cost of control by as much as half. For certain sources and control methods, the "smart timing or phasing" approach might even be feasible over shorter time periods. For example, decisions on water application could be determined by daily wind forecasts. For areas that have the potential to remain dust sources indefinitely or for many years, repeated application of short-term control measures might be more costly in the long run. Therefore, permanent controls such as paving or re-vegetation can by more cost effective, even though the permanent controls have a higher initial cost. Costs, effectiveness and environmental impacts all vary from case to case.

Wind Breaks

Wind breaks are barriers (either natural or constructed) that reduce wind velocity and therefore reduce the possibility of suspended particles. Trees or shrubs left in place during site clearing or constructed barriers such as a wind fence, snow fence, tarp curtain, hay bale, crate wall, or sediment wall can all serve as wind breaks. For each foot of vertical height, an 8-to 10-foot deposition zone develops on the leeward side of the barrier. The permeability of the barrier determines its effectiveness at capturing windborne sediment.

Gravel

Gravel can be an effective dust deterrent for construction roads and site entrances or as mulch in areas where vegetation cannot be established. The sizes of the stone can affect the amount of erosion to take place. In areas of high wind, small stones are not as effective as 20 cm stones.

Limitations
In areas where evaporation rates are high, water application to exposed soils may require near constant attention. Heavy water application can create excess site runoff and create conditions where vehicles could track mud onto public roads. Once dried, this material is susceptible to breakdown by vehicle traffic and subsequent entrainment into the ambient air.

Chemical applications should be used sparingly and only on mineral soils because their misuse can create surface water pollution from runoff or contaminate ground water. Chemical applications might also present a health risk if excessive amounts are used and proper precautions are not taken during application.

X. Does New Mexico Need a Fugitive Dust Rule?

The NMED has identified three courses of action to address fugitive dust emissions. NMED could continue to operate as it has in the past and not require BACM on non-permitted anthropogenic sources of dust. The positives of this scenario are that potentially regulated businesses will not have to spend money on compliance and the state will not have to spend money and other resources to implement a fugitive dust program. Some of the negatives of this scenario include EPA's increased scrutiny of the states' protection of public health and their exceptional events demonstrations. Previous reviews of exceptional event requests completed by EPA demonstrate that the agency will not concur with exceptional event flags where a state has not clearly demonstrated that sources located upwind from violating monitors are adequately controlling fugitive dust. Without EPA concurrence with flagged exceptional events data, some areas of the state will be designated as nonattainment.

Another option available to the state would be to implement a strict fugitive dust control program like those found in Bernalillo County, Maricopa County (Phoenix, AZ), or Clark County (Las Vegas, NV). These counties implement fugitive dust control programs covering nearly every source of fugitive dust and require owner/operator training, permitting and dust control plans, fees, mandatory shut down of operations during certain weather conditions, and dedicated staff to implement the program. This approach would cost the state and regulated businesses a large amount of money in order to have a successful program. The state has limited resources for such an effort and would need to add full time employees to its staff in order to carry out its efforts. Businesses would also have a large fiscal impact as the requirements would be more complex and the scope would cover a large number of businesses and activities.

NMED's preferred option is to find a middle ground between the two scenarios laid out above. This approach would balance state resources, public health, and economic impact to ensure that areas are able to continue growing in a healthy and sustainable manner. Currently, NMED responds to dust complaints by explaining to people that a rule does not exist to address their problem. Adopting a complaint driven fugitive dust rule would allow the NMED to operate with its current resources, but the department would gain compliance and enforcement authority. This

rule would cover the most common sources of dust complaints in the state and would have limited impact to businesses as they will be able to select which control measures are effective and cost efficient for their operation. Many of the possible control measures have already been identified as best management practices for various industries. This will also give the NMED more credibility in its efforts to protect public health when EPA is making regulatory decisions regarding attainment of the PM NAAQS.

Source Category	Control Measure	Published Control Efficiency	Estimated Costs	Comments/Assumptions
Unpaved Roads and Parking Areas	Pave roads	>90%	$44,100/mile-year	25 year lifespan
	Pave 100 'section before facility exit	>90%	$716/year	30' wide w/ 3" of asphalt;
	Pave parking lots	>90%	$0.23/ft^2-year	25 year lifespan
	Apply water to unpaved parking	10-74%	$68-$81/acre-day	
	Gravel bed to reduce track out	40-80%	$1,360/year	50' x 30' x 3"
	Post 15 mph speed limit sign	57%	$53/year	15 year lifespan for two signs
	Apply chemical dust suppressant	84%	$5,340/acre-year	1 year lifespan
Paved Roads	4' paved shoulder	>90%	$8,200/mile-year	20 year lifespan
	Use PM10 efficient street sweeper	4-26%	$190/mile-year	8 year lifespan-15 miles/day
	Clean spills ASAP	>90%	$640/cleanup	
	Use pipe grid track out control device	40-80%	$1,820/year	8 year lifespan
Construction and Demolition	Apply chemical dust suppressant	84%	$5,340/acre-year	1 year lifespan
	Apply water every three hours	61%	$204-$275/acre-day	
	Apply water during high winds	10-74%	$272/acre	Constant application
	Prohibit activities during high winds	98%	$3,100/day	40 acre site
	Onsite dust control coordinator	-	$100/day	
	Sprinkler system	50-90%	$138/acre	Maintain 12% soil moisture
	Post 25 mph speed limit sign	44%	$53/year	15 year lifespan for two signs
	Require air quality monitoring	-	$7,500/month	
Materials Handling	Implement wet suppression	50-90%	$22/day	100 yd^3 pile
	3-sided enclosure around storage piles	75%	$109/year	5 yd^3 pile
Disturbed open areas and vacant lots	Lay down gravel 1" deep	84%	$490/acre-year	15 year lifespan
	Apply chemical dust suppressant	84%	$2,140/acre	3 year lifespan w/ no disturbance
	Plant trees of shrubs as a windbreak	25%	Costs vary greatly	
	Build fencing around perimeter	4-88%	Costs vary greatly	
	Revegetation; apply cover crop	90%	Costs vary greatly	

Table 3-BACMs for specific sources with control efficiency and cost estimates. Taken from the Western Regional Air Partnership Fugitive Dust Handbook, September 7, 2006.