Agenda Item #8

MARICOPA ASSOCIATION of GOVERNMENTS

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June 29, 2011

Ms. Gina McCarthy
Assistant Administrator for Air and Radiation
U.S. Environmental Protection Agency
Room 5406 Ariel Rios North
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Assistant Administrator McCarthy,

The Maricopa Association of Governments ("MAG") is pleased to submit the following comments regarding draft Exceptional Events Rule ("EER") guidance documents, released by the Environmental Protection Agency ("EPA") on May 2, 2011.

We appreciate your continued interest in this matter and the Agency's follow-up to your March 8, 2010 commitment to "develop solutions that will improve rule implementation."[1] We also appreciate the time and effort that EPA staff have invested in developing various documents to help guide the review and consideration of requests to exclude certain ambient air quality data on the basis of exceptional events.

We strongly believe, however, that the current draft guidance documents can be improved substantially to both clarify matters regarding the implementation of the EER, and to save scarce federal, state and local resources. Specifically, we would recommend that:

- EPA should provide that implementation of Reasonably Available Control Measures ("RACM") and Best Available Control Measures ("BACM") will be considered to meet EER requirements related to "reasonably controllable or preventable."
- EPA should not specify a minimum wind speed for definition of an exceptional event ("EE") or create a regulatory presumption as to minimum wind speed.
- EPA should not link the "recurrence" criteria in the statutory EE definition to requirements for additional controls or to otherwise establish a "more than once a year" definition of recurrence.
- If EPA decides to allow for voluntary High Wind Action Plans, the Agency should not require continual revision and updating of the plans (e.g., upon recurrence of EEs).
- EPA should recognize that EEs can and do occur at one monitor while other monitors in the same area may not violate an air quality standard.

[1] Letter to Martin Bauer, President, Western States Air Resources Council, March 8, 2010.

- EPA should accelerate the contemplated timeframes for review and decisions on EEs and not require up to 18 months for Agency review of complete requests for treatment of data as an EE.
- EPA should consider additional technical information with regard to wind speed and aerodynamic entrainment (such as that provided in the attached detailed comments) and correct errors in its analysis of these matters.

Altogether, we thank you for your efforts in this area and for your thorough consideration of our comments. We look forward to working with you, the Office of Air and Radiation, the Office of Air Quality Policy and Standards and EPA Regional offices as the Agency works to finalize its EER guidance and any associated policies or statements. We would be happy to provide additional information on any of the matters discussed in the attached detailed comments.

If you have any questions please do not hesitate to contact Lindy Bauer or Matt Poppen, MAG, at (602) 254-6300.

Sincerely,

Thomas L. Schoaf
Mayor, City of Litchfield Park
Chair, MAG Regional Council

cc: Janet McCabe, EPA Office of Air and Radiation Principal Deputy Assistant Administrator
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MAG Comments on EPA Draft Guidance Regarding Implementation of the Exceptional Events Rule Including Associated Attachments

I. Requirements Relating to the "Not Reasonably Controllable or Preventable" Element Should be Revised.

In the draft guidance[2], EPA makes several assertions regarding its interpretation of Clean Air Act ("CAA") section 319 and the definition of an EE contained within CAA section 319(b)(1)(A)(ii). In specific, EPA states that it "believes the event-relevant measures that have already been included in the approved SIP as RACM or BACM to be an essential part of the set of controls that need to be in place for an event to be considered 'not reasonably controllable or preventable', but they may not be sufficient by themselves particularly if the SIP has not been recently reviewed or revised."[3] EPA also indicates that, under the "reasonableness" factor, "[t]here is no defined *de minimis* emission rate or ambient contribution that limits which sources should be considered for control, and EPA will review this on a case by case basis."[4] EPA further states that "RACM/BACM list may be a reference point, but not the sole means, by which EPA assesses the reasonableness of controls."[5]

We do not believe that the plain language of CAA section 319 can or should be interpreted by EPA in this manner. The statutory language that EPA relies on is part of the definition of an "exceptional event." It only requires that an event not be "reasonably controllable or preventable" and does not convey any additional authority to EPA to apply stricter requirements. In this regard, it is notable and relevant that measures that have been adopted into a State Implementation Plan ("SIP") pursuant to CAA section 110, have previously been determined to be measures "*necessary to assure* that national ambient air quality standards are achieved . . ." (Emphasis added) Thus, EPA has already rendered an assessment of the adequacy of such measures. Moreover, under CAA section 110, a SIP must contain adequate provisions "*as may be necessary or appropriate* to meet the applicable requirements [of the CAA]" including elements to provide for sufficient monitoring, data compilation and enforcement. Therefore, not only do SIP elements easily meet any requirement of "reasonableness" under CAA section 319 but EPA's prior approval of such elements constitutes an a priori determination by the Agency that the measures are, in fact, reasonable.

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[2] Guidance on Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule, United States Environmental Protection Agency, May 2, 2011.
[3] Id. at 13.
[4] Id.
[5] Id. at 14.

On a policy level – by indicating that if a SIP is not recently reviewed or revised, it automatically merits additional scrutiny -- EPA is creating a situation in which states and localities can never have any assurance that EPA will not use the EER to effectively "reopen" a SIP and impose a series of ad hoc determinations and assessments. This is precisely the opposite of a major goal of the new EER guidance -- to provide assurance to states and localities that properly classified EEs can be excluded from ambient air quality data. The current structure of EPA's guidance provides no means for a state or local agency to be assured that prior determinations with respect to existing and planned controls will be considered "reasonable" upon implementation, even if these controls have been previously determined to constitute BACM or MSM through an approved SIP process. In effect, EPA is taking the "we'll know it when we see it" approach to evaluating reasonableness of existing controls on a case by case basis.

The approach as outlined in the guidance also has no *de minimis* level for emission sources and includes no limits regarding EPA's evaluation of controls on natural sources. Such an approach is diametrically opposed to the intent of Congress to protect state and local agencies from being penalized for events outside of their control, particularly events that arise from natural conditions.. In fact, it is striking to the degree which the draft guidance fails to even discuss natural events at all, even though this is a separate and distinct category of EE under CAA section 319(b)(1)(A)(iii). There is literally no discussion of the type of events that may be considered to be "a natural event" under the definition of an EE even though arid areas like Arizona may be subject to unique natural events such as haboobs and lesser dust storms.

This approach is also contrary to the statutory structure of CAA section 319 which specifically limited the scope of EE regulations. Under CAA section 319, EE regulations were limited to the "review and handling of air quality monitoring data . . ." Guidance cannot and should not attempt to read the definition of an EE far more broadly or attempt to convey additional authority for EPA to revise previous SIP determinations. Such an approach would constantly "move the chains" on what state and local efforts would be considered as adequate by EPA Regional Offices, again opposite the Congressional goal of providing more certainty and uniformity to EPA's assessment of EEs. This effect can be demonstrated in several specific areas of EPA's approach to the determination of "reasonableness" discussed below.

A. Wind Speed.

The guidance indicates that "[i]n evaluating reasonableness, EPA will generally consider first and foremost whether the wind speeds were above the minimum threshold to entrain dust from stable

surfaces."[6] EPA also states that "[i]n the absence of local studies, EPA intends to use 25 mph as the minimum sustained wind speed sufficient to entrain particles from stable surfaces for western states."[7]

We are providing technical comments regarding the use of a specific wind speed threshold in Sections IV and V of this document. However, as an overall comment, it is important to point out that other jurisdictions have reported significantly lower thresholds for the initiation of windblown dust (12, 15 and 18 mph)[8] and that the individual conditions of the land (soil moisture, soil texture, vegetative cover, topography, land use, etc.) over which the wind passes on the event day will have a greater influence on the amount of windblown dust created than an averaged wind tunnel threshold can provide. Therefore, we believe that state and local agencies should be given the opportunity to explain these conditions without bias from EPA based upon a pre-determined wind speed threshold. As explained below, this concern is heightened by our technical assessment that a 25 mph is not supportable. Rather than add clarity to the determination of exceptional "high wind" events, we believe a presumed level of wind speed would place an unfair burden on a state or locality of defeating an unsupported presumption.

B. Requirements Regarding "Recurrence"

We believe that EPA has misinterpreted CAA section 319 as it respects the recurrence of anthropological events. The Agency has not: (1) clearly confined this concept to events caused by human activity as required by CAA section 319(b)(1)(A)(iii); (2) attempted to create new authority not conveyed by statute to require additional controls based merely on the existence of recurrence; and (3) established an empirical threshold for recurrence without adequate support. In specific, EPA states that "[f]or recurring high wind dust events, EPA believes these principles can be achieved using a progressive approach in which states are expected to consider and implement further controls as events continue to recur"[9] and that "[m]ore stringent controls are reasonable if an area experiences frequent and/or severe exceptional event exceedances due to high winds than if the area has experienced only rare and/or mild isolated exceedances."[10] Finally, the Agency states that it "will generally consider recurrence for high wind dust events as more than one high wind dust event per year, averaged over three years."[11] We find no support in the statute for such statements and believe

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[6] Id. at 12.
[7] Id. at 14.
[8] 12 mph (Maricopa County Air Quality Department, Appendix 4 of 2008 PM-10 Periodic Emissions Inventory); 15 mph (Imperial County, as quoted in Mojave County April 12, 2007 Exceptional Event Documentation); and 18 mph (San Joaquin Valley, as quoted in Mojave County April 12, 2007 Exceptional Event Documentation and 73 Fed. Reg. 14,696).
[9] Id. at 2.
[10] Id. at 12.
[11] Id. at 15.

that it is inappropriate, arbitrary and outside the scope of the EER for EPA to set a recurrence threshold for high wind dust events, or any other natural event (e.g., wildfires, volcanic eruptions).

The EER plainly acknowledges that natural events such as high winds can recur and that they do not have to be rare to be considered exceptional. The frequency of high wind events are clearly outside the control of state and local agencies. But the guidance documents nonetheless appear to require additional actions based on recurrence for natural events (e.g., "analysis should be more extensive if events recur, particularly at wind speeds below 25 mph . . ."[12] EPA may consider High Wind Action Plans "reasonable as long as events do not recur . . ."[13]). Yet CAA section 319 applies "recurrence" only to the definition of exceptional events where human activity is involved (i.e., the statute clearly separates such events from natural events by use of the term "or" in CAA section 319(b)(1)(A)(iii)). While EPA acknowledges this fact in the guidance document,[14] EPA does not clearly state that other parts of the guidance document addressing recurrence as inapplicable, as a matter of law, to natural events. Instead, the guidance document appears to ignore the explicit association of recurrence with human activity and create overarching obligations on state and local entities simply because they are located in areas where exceptional events may occur more often than other areas. This not only is unfair, but it is again opposite of Congressional intent to alleviate the burden on such areas.

There is even less support in the statute or legislative history for a requirement that more than one exceptional event per year means that an event is likely to recur. Setting aside the fact that this standard is being set without statutory support, it is clear that EEs can extend over several days, affecting the air quality data for sometimes weeks at a time (e.g., fires that have plagued Southern California and Arizona are proof of this concept). In addition, EPA provides no data or technical support to buttress its determination that events happening more than once a year should be considered as those likely to recur given that exceedances in any one year may plausibly be related to different types of EEs.. EPA should therefore not impose an arbitrary "trigger" of one event/year for which it has provided no empirical support. At bottom, there should be no quota system on EEs, nor can any quota system be derived from the language of CAA section 319.

C. High Wind Action Plans

The guidance provides that "EPA and the submitting state can consider the development of a High Wind Action Plan that would identify mutually agreed upon reasonable controls that a state could implement for subsequent high wind events."[15] EPA further provides that it "would consider the

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[12] Id.
[13] Id. at 20.
[14] EPA states that "natural events can be likely to recur and still be eligible for data exclusion." Id. at 23.
[15] Id. at 19.

controls to be reasonable as long as events do not recur...If events recur, EPA will need to re-approve the High Wind Action Plan regardless of whether it is revised or remains as-is."[16]

EPA can clearly not require a High Wind Action Plan under CAA section 319. No such authority is conveyed by this provision. As noted above, the scope of regulatory authority within CAA section 319 is constrained to the review and handling of air quality data. In the event that EPA pursues a "voluntary" provision to allow states to consider and EPA to review High Wind Action Plans, however, we would note that linking a High Wind Action Plan to recurrence provides no incentive for state or local agencies to complete such a plan. The purpose of such a plan should be the opposite of what EPA proposes.

For example, if a state or local agency details all of the control measures in place, and the implementation and enforcement strategies for those control measures (as concurred by EPA), then the state or local agency should be protected from having to vigorously demonstrate that future events were not reasonably controllable or preventable. An incentive for completing such a plan by the state or local agency would be that they would have some assurance ahead of time that EPA finds their existing controls and implementation measures adequate. If the High Wind Action Plan is not valid for recurring events, than there is little or no benefit for a state or local agency to complete such an intensive, publicly reviewed, SIP-like plan for one event a year. The state or local agency would be better served under the current scenario by simply documenting the reasonableness of controls in place during each recurring event, rather than trying to update a High Wind Action Plan after every exceptional event occurrence.

II. Requirements Relating to the "Clear Causal Relationship" Element Should be Revised.

A. EPA Wrongly Concludes That Single Monitors Cannot Show Exceptional Events from High Winds.

EPA's guidance document attempts to oversimplify the conditions under which EEs can occur. The guidance document provides that EE event demonstrations are "less compelling" if there is evidence which is inconsistent with the conceptual model or theory under which the exceptional event occurs. While this observation may border on a truism (data at variance with a theory will no doubt detract from the theory) the observation has limited utility and cannot serve as an overall "screen" between supportable and unsupportable EEs. In this regard, we specifically and strongly disagree with EPA's contention that "an exceedance was caused by a large-scale wind event is inconsistent with a situation where an isolated monitor exceeds while nearby monitors do not."[17]

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[16] Id. at 20.
[17] Id. at 22.

In making this statement, EPA seems to be implying that a large-scale wind event must result in large-scale transport of windblown dust. This is a simplistic view of the relationship between wind speed and the creation of windblown dust. There are dozens of factors that control the production of windblown dust (e.g., wind, precipitation, temperature, soil texture, soil composition, soil aggregation, soil moisture, surface roughness length, vegetation, land uses, topography) and these factors vary significantly within a region affected by a large-scale wind event. In almost all cases, windblown dust production is not a homogenous process, but rather is linked to a specific set of conditions that allow for the energy from the wind to entrain dust.

As stated by Gillette, "[p]revious field studies and remote sensing studies have pointed out that the sources of dust carried globally are not homogenous over large areas...These 'hot spots' are often part of 'source regions' that for a large extent are 'hot spots' surrounded by areas of much lower dust production. On a smaller scale, aerial photographs of agricultural lands in the West Texas USA show that a very small fraction of the fields actually produce visible dust plumes. The fields where I studied dust emissions in West Texas (Gillette, 1981) were hot spots: intense areas of dust production surrounded fields where little if any dust was being emitted." [18]

A common source of a windblown dust event in the West is the prefrontal storm system. Gillette takes pains to point out that this type of system does not produce homogenous dust levels. In specific, Gillette states that "[s]ynoptic scale and meso-scale meteorological systems deliver momentum to the surface in a variety of forms. An example of a synoptic-scale structure that is often associated with wind erosion is the prefrontal wind storm. Large-scale systems do not explain the existence of local 'hot spots' since strong dust production is not uniformly observed for the entire land surface over which the system passes. Meso-scale structures such as haboobs (downdrafts of thunderstorms) create short-lived intense local dust production, but are short lived, and may cause erosion in locations that do not normally produce dust." [19]

Given these observations, it is expected that events resulting from synoptic scale wind events would not result in uniform exceedances or elevated monitor concentrations across a region or monitoring network. In fact, this type of event is previously documented, with three western state agencies submitting examples of exceedances that occur only at one monitor in the region during synoptic scale wind events.[20] It is completely plausible that the monitor located nearest an area that has the most potential of producing "hot spots" should exceed while other monitors in the region do not.

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[18] Gillette, 1999. A Qualitative Geophysical Explanation for "Hot Spot" Dust Emitting Source Regions. Contr. Atmos. Phys., 72, 67–77.

[19] Id.

[20] Examples include but are not limited to: San Joaquin Valley Air Pollution Control District, January 4, 2008 Event; Clark County Department of Air Quality and Environmental Management, May 21, 2008 Event; Arizona Department of Environmental Quality, March 14, 2008 Event. Additionally, South

Exceedances at one monitor in a network cannot be assumed a priori to be caused by anthropogenic activities causing soil disturbance near the exceeding monitor. PM-10 monitors throughout a network have different land uses and monitoring purposes. A PM-10 monitor located near sources of windblown dust (open, and exposed soils) should be expected to record higher concentrations of PM-10 during a wind event than monitors located in a downtown or residential core that are surrounded by built sources incapable of producing windblown dust.

Additionally, it is unclear what EPA exactly means by the phrase, "nearby monitors". The guidance document does not detail whether the Agency is intending by use of this term to impose a specific distance requirement. Should this be the intent, setting such a distance requirement would be extremely tenuous, given the limited knowledge on transport and deposition rates of PM-10 from a high wind event. Moreover, if EPA would adopt this approach, it would be arbitrarily setting up a system where regions that have a dense network of PM-10 monitors face more scrutiny during natural events than do regions with fewer PM-10 monitors (for the simple reason that dense monitoring networks will have more situations where only individual monitors exceed). There is nothing in the EER that even hints that large-scale high wind events are required to show multiple monitored exceedances in order to be considered an exceptional event. In fact, the opposite reality is reflected in the preamble of the EER.[21]

III. Timelines Contained in the Draft Guidance Are Too Long.

With regard to the review and approval of exceptional events, EPA indicates that "[t]he timing of EPA's final decision will depend on the regulatory impact of the data and will be described in the initial review letter. For EE packages that impact a regulatory decision EPA intends to make a decision regarding concurrence within 18 months of submittal of the complete package, or sooner if required by a regulatory action."[22]

Eighteen months is clearly an excessive and unnecessary amount of time for EPA to act upon a final submittal. This is especially true, since under the process outlined in the EER and the draft guidance, prior to a final decision on an exceptional event request, EPA will have already done a completeness

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Coast Air Quality Management District also reported a single monitor exceedance under Santa Ana wind conditions on October 13, 2008.

[21] For example, the EER states that "[s]ince the conditions that cause or contribute to high wind events vary from area to area with soil type, precipitation, and the speed of wind gusts, States should provide appropriate documentation which indicates what types of circumstances contributed to the exceedances or violations at the monitoring site in question." 72 Fed. Reg. 13,560, 13577 (March 22, 2007)

[22] Draft Guidance at 28-29.

review (within a prior timeframe of 120 days) and possibly asked for additional information from the submitting agency (which would extend this timeframe another 60 days). Given the fact the EPA intends to only act upon exceptional events that have a regulatory impact, EPA should be able to issue a final concurrence with these events in substantially less time than 18 months. State and local agencies need quick action on these decisions, as waiting for concurrence from EPA on regulatory significant exceptional events can easily hold planning processes hostage.

IV. Technical Comments on Use of Wind Speed.

The draft guidance provides the following discussion of wind speed calculation:

> Sustained wind speed is generally calculated as the wind speed averaged over a period of at least one minute: typical averaging times for a sustained wind speed are one to five minutes.[31] EPA will not consider any average less than one minute to represent a sustained wind speed. Packages should include the maximum sustained wind speed for each hour of the event and also the number of periods above 25 mph (as part of the clear causal relationship a time series with sustained wind speeds during the event should also be included (see Section 6.2.2.4)). The maximum sustained wind speed does not necessarily have to be at the site of the exceedance, but it should represent the source area. If the sustained wind speed provided is not at the exceeding monitor then the CCR demonstration will generally be expected to support this claim. Sustained wind speed data are typically available from sources such as local air monitoring stations and National Weather Service Stations.[23]

There are important technical details to be cognizant of when comparing wind speed values during a high wind dust event. First, meteorological stations operated by different agencies can report significantly different wind speeds from the same area depending upon the unique conditions of their exact location and averaging time used to report wind speed. As an example, data from National Weather Service (NWS) stations comes from meteorological towers located at airports, where surface roughness is low and long fetches of open space exist. Also, the averaging time of the NWS sustained wind speed values is either one or two minutes. As a result, NWS wind speeds are usually the highest wind speeds reported for an area. Meteorological stations run by air agencies often report wind speed in hourly averages and have stations towers that are situated in areas with high surface roughness values (e.g., near or on existing buildings, in dense residential or industrial areas, etc.) in order to access available power sources. As an example, see the table below which shows wind speeds as measured by the Maricopa County Air Quality Department Central Phoenix monitor and the NWS Sky Harbor Airport station. These two sites are approximately 3 miles apart and are both located within the urban core of Phoenix.

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[23] Id. at 34.

Date	Hour	MCAQD wind speed	NWS wind speed
9/11/08	18:00	20 mph hourly avg.; 28 mph highest 5-minute avg.	39 mph 2-minute avg.
11/9/08	17:00	15 mph hourly avg.; 18 mph highest 5-minute avg.	25 mph 2-minute avg.

This example shows that under the same region-wide wind conditions, two monitors located in the same micro-area can report vastly differing wind speeds due to averaging times and surface roughness changes. Some state and local agencies do not operate their own meteorological stations and rely exclusively on NWS data. In the example table above, both of these days would be good candidates for exceptional events using EPA's threshold of 25 mph at 10 meters. However, for those jurisdictions like Maricopa County that do operate independent meteorological stations, the local wind data in the example table above does not exceed the 25 mph threshold based upon hourly average data, and only slightly exceeds the threshold on one day based upon a 5-minute average. The same level of wind energy passed over both monitoring sites in the example above, yet the unique micro-conditions (especially surface roughness as compared to an ultra-smooth paved runway) and differing averaging times yield differing wind speed values. It is important for EPA to realize the differences between measurement techniques and micro-site conditions and not penalize agencies that have more meteorological data available for comparison.

Additionally, the most common wind speed value reported by meteorological stations is wind speed at 10 meters. However, what is most critical to windblown dust production is not the wind speed at 10 meters, but the wind shear at ground level, usually represented as u^*. This value is highly controlled by surface roughness. The following example shows 10-meter wind speeds (U) values at a given wind shear value with differing surface roughness heights.[24]

u^* (cm/s)	Surface roughness value (cm)	10-meter wind speed (mph)
40	0.001	30.9
40	0.01	25.8
40	0.1	20.6
40	1.0	15.5

This table demonstrates that rough surfaces significantly diminish the 10-meter wind speed under the same wind shear force. The soils in the table above are all subject to the same wind shear of 40 cm/s, yet the 10-meter wind speeds are dramatically different. This also helps to explain why in the previous example the NWS stations located at airport runways have consistently higher 10-meter

[24] The fluid dynamics Prandtl equation: — —, allows for the calculation of U, where U is wind speed at 10 meters, k is Von Karman's constant (0.4), z is 10 meters, and z_o is measured surface roughness value.

wind speeds than a monitor located in a residential or industrial area surrounded by built structures. The majority of the wind tunnel tests performed by Clark County (as referenced by EPA) were done on smooth surfaces, with almost all surface roughness values at 0.04 cm or less. As such, the 25 mph 10-meter threshold is representative of wind speeds across smooth surfaces. 10-meter wind speeds over rougher surfaces will be less than 25 mph while still producing wind shears capable of generating windblown dust. It is critical that EPA is cognizant of the effects of surface roughness and averaging times when evaluating wind speed data and when comparing wind speed measurements at different meteorological stations in the same region.

V. Technical Comments Related to Appendix A.

Appendix A provides that:

> In EPA's weight of evidence analysis of high wind dust events, sustained wind speeds above 25 mph will be assumed to have the potential ability to raise dust emissions from some stable surfaces in arid, semi-arid, or seasonally dry regions. Wind speeds below this threshold will be assumed to entrain dust primarily from disturbed anthropogenic sources that have not been reasonably controlled...The 2004 data [Clark County wind tunnel tests] show that non-linear increases in PM10 flux generally begin to occur at sustained 10 meter velocities exceeding 25 mph. These data form the basis for EPA's selection of a 25 mph threshold for natural events.[25]

Wind speed thresholds for the creation of PM-10 emissions from fugitive dust sources provide one insight into the wind erosion process, but do not address the phases of transport and deposition of PM-10 at differing monitoring sites. Wind speed at the PM-10 concentration monitor in question may not be relevant especially during long range transport events. Additionally, EPA should not presume that PM-10 dust generated at wind speeds lower than 25 mph must be a result of disturbed soils, especially since the Clark County data EPA references shows that stable and disturbed soils appear to emit at about the same rate under 25 mph. EPA should take a neutral stance on the source of emissions and let the state or local agency present their evidence on likely sources of windblown PM-10 emissions and the status of the implementation of controls on those same suspected sources. A presumption that all dust from wind speed events below 25 mph must be the result of uncontrolled anthropogenic activity is unfairly biased against any agency submittal. If the agency submits evidence that all reasonable controls were in place and enforced, either in an individual submittal or through an agreed upon High Wind Action Plan, than EPA should not summarily dismiss such demonstration unless there is proof that anthropogenic activities were the cause of the exceedance exists.

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[25] Appendix A at 57.

A. Aerodynamic Entrainment

EPA's Appendix A further states that "the Clark County study found small amounts of entrainment below 25 mph. The small PM_{10} fluxes observed at lower wind speeds could be attributed to aerodynamic entrainment, which occurs primarily when fine particles are lifted directly off the ground and remain elevated. While it is expected that small amounts of aerodynamic entrainment could occur when wind speeds are below 25 mph, these are not expected to result in exceedances in most western areas, particularly the desert areas such as in Clark County."[26]

Several recent articles have shown how direct aerodynamic entrainment can produce substantial dust, if not the majority of dust in the absence of saltation.[27] While the Clark County wind tunnel tests did collect sediment in the elutriation chamber, cyclone, and glass fiber filter, this sediment data was not used to estimate PM-10. Specifically, the study notes that:

> Experience in the 1995, 1998-99 and 2003 wind tunnel studies showed that, unless an unusually high PM-10 concentration was eroded from the soil surface, 10-minute wind tunnel sampling runs were of insufficient duration to obtain detectable weight changes on the glass fiber filters. For this reason, TSI Dust-Trak PM-10 data were used to estimate PM-10 fluxes. Additionally, since the 2004 study used progressive velocity increases, the collected saltation, cyclone or filter data do not correspond to any particular velocity during a run, but instead represent an integrated mass measurement. The mass data could be analyzed to determine if there are differences between stable and unstable soil surface conditions.[28]

Because saltation was not specifically measured in concert with PM-10 concentrations, it cannot be known if the dust emissions recorded in the Clark County wind tunnel studies are the result of direct

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[26] Id.

[27] Macpherson et al., 2008. Dust emissions from undisturbed and disturbed supply-limited desert environments. J. GeoPhys. Res. 113, F02S04; Roney and White, 2004. Definition of measurement of dust aeolian threshold. J. GeoPhys. Res. 109, F01013; Kjelgaard et al., 2004. PM_{10} emission from agricultural soils on the Columbia Plateau: Comparison of dynamic and time-integrated field-scale measurements and entrainment mechanisms. Agric. For. Meteorol. 125, 259-277; Loosmore and Hunt, 2000. Dust suspension without saltation. J. GeoPhys. Res. 105, 20663-20671; Harrison et al., 2009. A Monte Carlo Model for Soil Particle Resuspension Including Saltation and Turbulent Fluctuations. Aero. Sci. and Technol. 43, 161-173.

[28] Pages 37-38 of: Wacaser et al., 2006. Refined PM_{10} Aeolian Emission Factors for Native Desert and Disturbed Vacant Areas. In: Appendix E of PM10 State Implementation Milestone Achievement Report. Clark County, Nevada Department of Air Quality and Environmental Management.

aerodynamic entrainment, saltation, or some combination of both, for any of the recorded velocities. Thus it is not appropriate to assume (based upon Clark County wind tunnel data) that direct aerodynamic entrainment is not responsible for high PM-10 concentrations, or may even lead to exceedances, at elevated wind speeds.

The majority of field studies regarding threshold velocities rely on the visible movement of soil before determining a minimum threshold velocity for windblown dust to occur (see discussion below on effects of soil disturbance) and subsequently rely on the horizontal movement of soil to be a surrogate for the vertical production of dust. Visible verification of soil movement is only possible for particles approximately PM-70 or greater. PM-10 particles are likely ejected from the surface much earlier than can be visibly verified through observation of saltation. For those studies that actually measure vertical PM-10 emissions, the role of direct aerodynamic entrainment plays a significant role and results in threshold friction velocities for dust that are much lower than what is required for saltation.

B. Soil Disturbance

Appendix A states that "[t]he effect of surface disturbance on threshold wind speed was further examined for a number of natural desert soils by a number of researches. The main conclusion was that disturbance of soils profoundly lowers the threshold friction velocity of desert soils."[29]

In the four studies referenced by EPA in support of the above quotation, it is vital to remember that the threshold friction velocity measured in these studies was the horizontal movement of soil. As quoted from the studies EPA references:

> "The threshold velocity profile was obtained when continuous movement of grains was first visible" (Gillette 1980 & 1982). "The threshold friction velocity (TFV) was defined as the velocity at which fragments were initially detached from the soil surface. Wind speed inside the wind tunnel was gradually increased until forward particle movement was observable across the soil surface" (Belnap et al., 2007).

None of the four studies measured actual dust concentrations (vertical flux), but rather relied on the traditional assumption that dust concentrations scale with horizontal flux (saltation). This is an important distinction, because recent studies performed in the same locations as the articles referenced by EPA[30] show that significant dust emissions occur in the absence of saltation and are not

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[29] Id. at 59.

[30] In the Macpherson article, some of the soils from the same general area as the EPA referenced 1980 Gillette article are tested. Macpherson et al., 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces, J. Geophys. Res., 113, F02S04.

directly correlated with horizontal flux.[31] While the studies referenced by EPA indicate that disturbance lowers the threshold friction velocity at which saltation occurs, the threshold friction velocity at which dust emissions occur is often significantly lower (50 to 75%) than the threshold required for saltation to occur.[32] Additionally, the saltation threshold friction velocities of undisturbed soils measured by Gillette (1980) were often unobtainable, or only reached at velocities higher than what occurs in nature (> 100 cm/s),[33] suggesting that many undisturbed desert soils never produce windblown dust. However, dust emissions from the natural soils studied by Gillette are frequent and occur in both undisturbed and disturbed states, regardless if saltation was observed.[34] Since the concern of EPA, and state and local air agencies, is the control of fugitive dust (particularly PM-10), it is essential to recognize that the threshold velocity required to create dust emissions is significantly lower than saltation thresholds and often is uncorrelated to the measured horizontal flux.

Additionally, assuming disturbance only has the effect of lowering threshold friction velocities implies that disturbed and undisturbed soils have the same emission rate, just with differing trigger points (i.e., assume a hypothetical soil with an undisturbed threshold friction velocity of 50 cm/s and a disturbed threshold friction velocity of 25 cm/s. Both soils will emit at the same rate once velocities exceed 50 cm/s). The Clark County wind tunnel data earlier referenced by EPA disputes this (Figure ES-1, pg. 58). The disturbed and stable soils have the same threshold friction velocity of approximately 10 mph, with the disturbed soils producing more dust relative to stable soils as wind velocities increase. This result is consistent with the Macpherson et al. 2008 study which found that, "Following mechanical disturbance, clay-crusted and non-cohesive surfaces experience an increase in available fines on the surface, resulting in a large increase in emission rate and E_{total}/q." [35]

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[31] "Past research suggests that when dust uplift is driven by saltation, a linear relationship exists between the dust emission rate and the saltation flux [Shao et al., 1993; Houser and Nickling, 2001], thus abrasion efficiency is relatively constant with u*. Evaluating the relationship between E_{total}/q and u* revealed large data scatter and failed to produce and significant trends with strong correlation coefficients (shown in Figure 6), indicating that E_{total}/q is not constant, nor can it be accurately described by a direct relationship with u*." Macpherson et al., 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces, J. Geophys. Res., 113, F02S04.

[32] Roney and White, 2004. Definition and measurement of dust aeolian thresholds. J. Geophys. Res., 109, F01013.

[33] "Since field measurements show that u* only exceptionally reaches 100 cm/s on Earth, this will be the upper limit for our computations." Alfaro and Gomes, 2001. Modeling mineral aerosol production by wind erosion: Emission intensities and aerosol size distribution in source areas. J. Geophys. Res., 106, 18075–18084.

[34] Macpherson et al., 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces, J. Geophys. Res., 113, F02S04. The April 12, 2007 exceptional event in the Mojave Desert documents high PM-10 concentrations from non-anthropogenic sources associated with wind speeds below the saltation friction velocities of undisturbed soils recorded by Gillette (1980).

[35] Macpherson et al., 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces, J. Geophys. Res., 113, F02S04.

This shows that dust emissions (E) increase at a faster rate with rising wind than do saltation (q) rates. This is an important distinction, and shows that the role of disturbance primarily increases the reservoir of material available for dust suspension and does not necessarily lower the threshold velocity. A correct understanding of the differences between how disturbed and undisturbed soils create dust in response to high winds is key to explaining dust emissions during an exceptional event, especially at speeds that are lower than observed saltation thresholds.

VI. Conclusion

MAG appreciates the difficult task that EPA faces in constructing an EE guidance document that can both lend certainty to the process of excluding certain ambient air data as an EE while maintaining the ability to recognize varying conditions in different states and regions. We are more than willing to continue to work with EPA to develop a more robust and responsive guidance document that can further our mutual goal of protecting the public health while not unduly penalizing areas that experience EEs. On a macro level, we believe one approach that EPA should consider is fuller reliance on state and local authorities to both consider and designate certain conditions as constituting EEs. The current guidance document offers little assurance that EPA is willing to improve the efficiency of the EE process by relying more heavily on state and local air pollution agencies to determine, based on their on-the-ground knowledge of conditions in an area, what natural and anthropologically-based events are exceptional and what events are not.

MAG also believes that neither the CAA nor EE policy should be interpreted as requiring or authorizing EPA to "second guess" SIP requirements related to the control of National Ambient Air Quality pollutants and their precursors. EPA can and should rely on previous determinations of RACM and BACM. Such an approach could both simplify the process of EE review and lend more certainty to the EE process. In an era when federal, state and local governments need to do "more with less," it seems incredible that we are engaging in a process that may take 400 hours to determine the approvability of a single EE event. Relying on existing SIP mechanisms and the considered professional judgment of state and local air regulators offers a way to streamline this process and ensure that determinations on EE can be made quickly and efficiently. Finally, EPA could also presume that SIP measures were implemented and are being implemented to reasonably address EEs unless evidence exists otherwise. This is not just a matter of trust. States and localities have committed, by law, to implement such measures. In addition, under other provisions of EER, a public review process for EEs is provided. Such factors are more than sufficient to assure EPA that state and local governments are carrying out duties and measures they have previously agreed to implement.