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## PRELIMINARY DOCUMENTATION

### Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM<sub>10</sub>) Concentration Event in the Pima County Area on October 27, 2008

#### Background

On the morning of October 27, 2008, strong winds were observed at the Pima County Fairgrounds site, east-southeast of Tucson. A plume of wind-blown dust is evident south of downtown in pictures taken from downtown Tucson (Figure 1). These pictures were taken of the Santa Rita Mountains (left), Black Mountain (right), and Gonzales' Hill (center) throughout the morning. The elevated PM<sub>10</sub> event at the Santa Clara site on October 27, 2008, was the result of windborne transport of dust and soils caused by high winds that suspended soils from natural desert areas and from areas where Best Available Control Measures were in place. All appropriate measures were in place to meet permit requirements for anthropogenic sources during the event, demonstrating as required by 40 CFR 50.1(j) that the event "is not reasonably controllable or preventable."

The significant wind event created elevated ambient concentrations of PM<sub>10</sub> in an area on the south side of Tucson which exceeded the National Ambient Air Quality Standards (NAAQS) at the Pima County Department of Environmental Quality (PDEQ) Santa Clara elementary

school site. The 24-hour average PM<sub>10</sub> concentration of 173 µg/m<sup>3</sup> measured at the site on October 27<sup>th</sup> meets the requirement in 40 CFR 50.1(j) that the event "affects air quality". While this was the only exceedance in the PDEQ network on this day, all sites were affected by this regional high wind event. Nearly all sites in the Tucson area measured PM<sub>10</sub> concentrations on October 27<sup>th</sup> that exceeded their respective 99<sup>th</sup> percentile values (see Historical Distribution Table in Figure 1).

PDEQ follows a written protocol for issuing pollution advisories whenever levels are expected to exceed the NAAQS. No advisory was issued on 10/27/08 due to the fact that hourly concentration levels did not trigger the notification requirements of the protocol. PDEQ's public notification protocol fulfills the requirements of 40 CFR 51.930(a)(1).

The table below shows the key PM<sub>10</sub> monitor readings for the monitors examined in this report.

Monitor (Operator/Type)	AQS ID	24-hr Avg PM <sub>10</sub>	1-hr Max PM <sub>10</sub>	Time of Max 1-hr	Flag**
<b>PIMA COUNTY</b>					
<b>Santa Clara (FRM)</b>	<b>04-019-1026*</b>	<b>173</b>	<b>N/A</b>	<b>N/A</b>	<b>RJ</b>
<b>Geronimo (TEOM)</b>	<b>04-019-1113*</b>	<b>68</b>	<b>124</b>	<b>07:00</b>	<b>No</b>
<b>South Tucson (FRM)</b>	<b>04-019-1001*</b>	<b>90</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Prince Road (FRM)</b>	<b>04-019-1009*</b>	<b>83</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Broadway and Swan (FRM)</b>	<b>04-019-1023*</b>	<b>66</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Corona de Tucson (FRM)</b>	<b>04-019-0008*</b>	<b>89</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Orange Grove (FRM)</b>	<b>04-019-0011*</b>	<b>68</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Tangerine (FRM)</b>	<b>04-019-1018*</b>	<b>54</b>	<b>N/A</b>	<b>N/A</b>	<b>No</b>
<b>Green Valley (BAM)</b>	<b>04-019-1030*</b>	<b>60</b>	<b>179</b>	<b>05:00</b>	<b>No</b>

\* EPA Air Quality System Identification Number

\*\* 24-hr PM<sub>10</sub> concentration influenced by natural or exceptional event to be flagged.

Type Abbreviations: BAM – Beta-Attenuation Mass Monitor (Continuous monitor)

TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor)

FRM – Federal Reference Method

The preliminary findings from this analysis were presented at a stakeholders meeting on March 19, 2009, in Phoenix, Arizona. This document is being submitted to EPA to satisfy the

requirements of 40 CFR 50.14(c)(2)(iii), and will be supplemented and made available for public comment to satisfy the requirements of 50.14(c)(3)(i).

MARANA							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	62	24	-	3	10	SE	
2	65	20	-	9	18	SE	
3	65	20	-	11	16	SE	
4	67	19	-	7	10	SE	
5	71	19	-	6	14	SE	
6	76	18	-	11	19	SE	
7	76	18	-	15	22	SE	
8	77	19	-	7	18	SE	
9	79	18	-	8	23	SE	
10	79	17	-	17	27	SE	
11	82	16	-	18	30	SE	
12	85	14	-	17	25	SE	
1	87	13	-	15	28	SE	
2	88	13	-	16	24	SE	
3	89	12	-	15	21	SE	
4	89	12	-	13	21	SE	
5	88	12	-	12	18	SE	
6	86	13	-	9	17	S	
7	81	17	-	4	11	SE	
8	77	20	-	6	9	E	
9	75	23	-	9	16	SE	
10	77	23	-	14	24	SE	
11	76	24	-	15	23	SE	
12	73	27	-	12	21	SE	

NWS-Tucson							
Hr	T(F)	VR	Dust	Spd	Gust	Dir	
1	62	10	0	0	0	N	
2	61	10	0	0	0	N	
3	70	10	0	8	8	SE	
4	75	10	0	13	13	SE	
5	74	10	0	21	21	SE	
6	73	10	0	21	31	SE	
7	71	10	0	11	11	E	
8	72	7	0	32	38	SE	
9	73	10	0	30	43	SE	
10	76	10	0	32	46	SE	
11	79	10	0	31	38	SE	
12	81	10	0	26	36	E	
1	84	10	0	22	31	E	
2	86	10	0	21	29	E	
3	87	10	0	18	31	E	
4	86	10	0	16	25	E	
5	84	10	0	17	26	E	
6	81	10	0	13	21	E	
7	78	10	0	6	6	E	
8	76	10	0	10	10	SE	
9	76	10	0	16	16	E	
10	74	10	0	16	28	E	
11	70	10	0	8	8	SE	
12	71	10	0	16	23	SE	

PDEQ Fairgrounds							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	67	0	-	11	11	SE	
2	71	0	-	14	14	E	
3	72	0	-	19	19	E	
4	72	0	-	20	20	E	
5	70	0	-	19	19	E	
6	69	0	-	18	18	E	
7	68	0	-	28	28	E	
8	68	0	-	28	28	E	
9	70	0	-	24	24	E	
10	72	0	-	26	26	E	
11	75	0	-	29	29	E	
12	78	0	-	28	28	E	
1	81	0	-	26	26	E	
2	83	0	-	23	23	E	
3	84	0	-	24	24	E	
4	84	0	-	26	26	E	
5	82	0	-	22	22	E	
6	78	0	-	20	20	E	
7	75	0	-	18	18	E	
8	73	0	-	22	22	E	
9	71	0	-	24	24	E	
10	70	0	-	26	26	E	
11	69	0	-	22	22	E	
12	68	0	-	22	22	E	

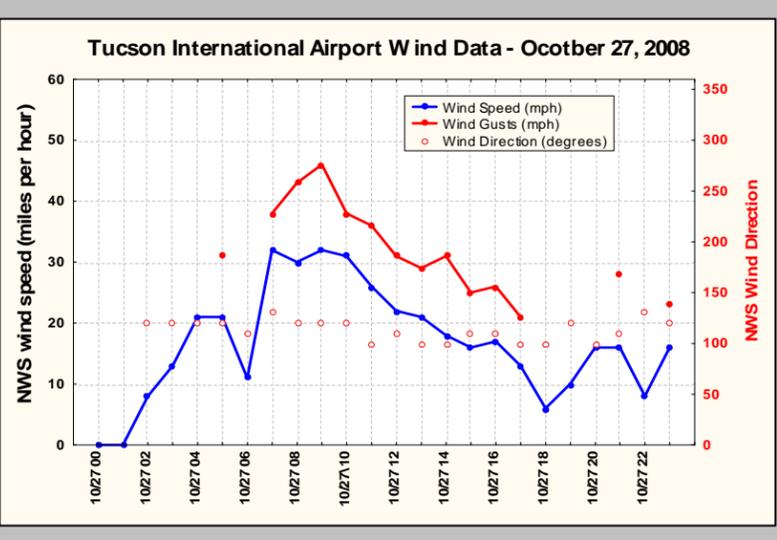
Historical Distribution 5-Yr. Dist. of Values (µg/m³)									
MONITORS:					Column Index				
1-SANTA CLARA					Yr - All Data (5-Yrs)				
2-SOUTH TUCSON					Sea - Data for Autumn season only (5-Yrs)				
3-CORONA DE TUCSON									
Cum. Freq.	Mon 1	Mon 2	Mon 3	Mon 4	Mon 5	Mon 6	Mon 7	Mon 8	Mon 9
Min	2	2	2	2	2	2	2	2	2
0.5%	3	3	7	8	2	2	2	2	2
1.0%	4	4	8	9	2	2	2	2	2
2.5%	6	6	10	11	2	4	4	4	4
5%	9	8	12	13	4	5	5	5	5
10%	11	10	15	15	6	8	8	8	8
25%	17	17	22	22	10	10	10	10	10
50%	25	26	30	31	15	15	15	15	15
75%	34	35	39	41	21	19	19	19	19
90%	43	42	49	49	28	28	28	28	28
95%	50	44	58	55	32	30	30	30	30
97.5%	73	47	65	57	47	33	33	33	33
99.0%	92	53	81	65	64	40	40	40	40
99.5%	99	59	97	67	88	43	43	43	43
Max	146	65	150	97	144	47	47	47	47



**Figure 1. Key Data for Event of October 27, 2008**

PHX WINDS	KEY	PM10 PLOT
CEN. AZ WINDS		SAT IMAGES
SO AZ WINDS		PHX VIS. CAMERAS

**SUMMARY OF EVENT**  
 Between 7:00 am and noon, a regional wind event was in progress in southern Arizona. At 7:00 am, winds were out of the E with gusts up to 35 mph. At 8:00 am, reduced visibilities and blowing dust were reported with winds out of the SE at 32 mph.

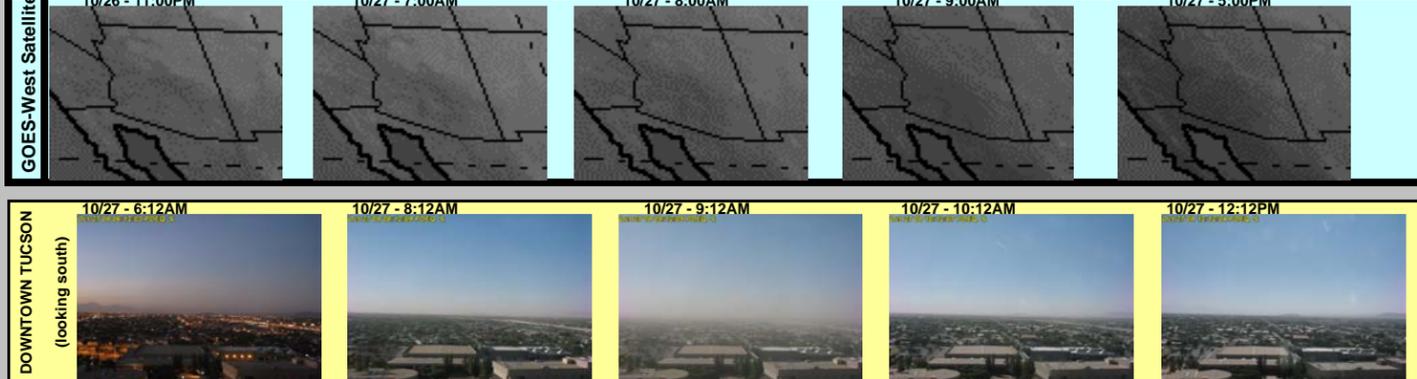


BUCKEYE							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	58	26	-	2	4	N	
2	57	27	-	3	6	N	
3	57	28	-	2	5	N	
4	56	29	-	2	4	NW	
5	55	33	-	2	6	NW	
6	55	37	-	2	6	SW	
7	59	42	-	3	13	SE	
8	76	16	-	15	22	E	
9	80	16	-	18	26	E	
10	83	16	-	20	28	E	
11	86	15	-	19	27	E	
12	90	13	-	20	27	E	
1	92	13	-	17	26	E	
2	93	13	-	18	24	E	
3	93	13	-	16	23	E	
4	93	13	-	14	20	E	
5	91	14	-	12	17	E	
6	86	17	-	7	12	E	
7	81	20	-	6	8	E	
8	79	22	-	6	8	E	
9	79	23	-	7	11	E	
10	77	25	-	8	12	E	
11	77	25	-	7	11	E	
12	75	27	-	8	14	E	

MARICOPA							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	83	27	-	4	7	S	
2	86	39	-	2	4	SE	
3	85	45	-	1	4	NE	
4	83	48	-	1	4	N	
5	81	43	-	2	5	NW	
6	82	42	-	2	5	W	
7	80	51	-	1	4	SW	
8	82	35	-	6	15	E	
9	80	21	-	13	20	E	
10	80	21	-	16	24	E	
11	82	21	-	18	26	E	
12	84	21	-	16	27	E	
1	85	20	-	17	26	E	
2	87	18	-	17	25	E	
3	88	17	-	15	23	E	
4	88	17	-	13	21	E	
5	87	17	-	13	21	E	
6	83	21	-	9	15	E	
7	78	25	-	7	11	E	
8	76	27	-	7	10	E	
9	77	25	-	9	13	E	
10	76	26	-	10	15	E	
11	75	28	-	9	16	E	
12	73	30	-	9	13	E	

COOLIDGE							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	56	41	-	3	6	S	
2	53	53	-	4	7	SE	
3	50	53	-	2	6	NE	
4	51	43	-	4	6	NW	
5	54	34	-	3	8	N	
6	61	30	-	3	5	NE	
7	69	26	-	8	13	E	
8	73	24	-	5	10	NE	
9	78	20	-	13	26	E	
10	81	18	-	19	27	E	
11	83	17	-	20	27	E	
12	85	16	-	19	27	E	
1	87	15	-	19	27	E	
2	88	15	-	18	28	E	
3	89	15	-	17	25	E	
4	89	14	-	15	22	E	
5	87	15	-	14	21	E	
6	84	17	-	12	18	E	
7	81	19	-	10	17	E	
8	78	22	-	7	12	E	
9	76	24	-	7	11	E	
10	73	28	-	5	8	E	
11	67	35	-	3	6	N	
12	68	34	-	5	11	NE	

Historical Distribution 5-Yr. Dist. of Values (µg/m³)									
MONITORS:					Column Index				
4-PRINCE ROAD					Yr - All Data (5-Yrs)				
5-BROADWAY / SW					Sea - Data for Autumn season only (5-Yrs)				
6-ORANGE GROVE									
Cum. Freq.	Mon 4	Mon 5	Mon 6	Mon 7	Mon 8	Mon 9	Mon 10	Mon 11	Mon 12
Min	5	7	6	6	4	5	4	5	5
0.5%	6	8	6	7	7	8	7	8	8
1.0%	6	8	6	9	8	9	8	9	9
2.5%	9	12	9	12	11	11	11	11	11
5%	12	15	11	13	13	13	13	13	13
10%	16	17	13	14	15	16	16	16	16
25%	23	24	17	18	21	21	21	21	21
50%	30	34	23	24	27	28	28	28	28
75%	40	43	30	32	36	36	36	36	36
90%	52	56	38	37	44	45	45	45	45
95%	61	64	44	44	51	51	51	51	51
97.5%	70	68	47	45	59	56	56	56	56
99.0%	88	76	66	51	73	62	62	62	62
99.5%	94	82	80	59	90	65	65	65	65
Max	126	88	122	66	152	101	101	101	101



YUMA							
Hr	T(F)	RH	Rn	Spd	Max	Dir	
1	62	46	-	2	4	NE	
2	62	35	-	2	5	NE	
3							

## Assessment Under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. October 27, 2008, was a filter sampling date (1-in-6 run day) for the 24-hour monitors listed in the table above. The collected data were reviewed by the PDEQ quality assurance coordinator, the Technical Operations manager, and the monitoring supervisor and subjected to QA/QC checks. All data for the date were found to be valid. In accordance with 40 CFR, Part 58, Appendix A, the monitor at Santa Clara received and passed a post-exceedance multi-point flow rate audit on December 3, 2008. No source, construction, or disturbed areas of soil were observed adjacent to the exceeding site that would have significantly contributed to the exceedance.

2. Review suspected contributing sources. The wind speed instrumentation at PDEQ's Fairgrounds site and photographs from downtown Tucson provide an explanation of the events leading to the exceedance. East-southeast winds blowing through the gap between the Rincon and Santa Rita mountains east of the city reached speeds sufficient to create windblown dust from the desert floor east of the city, from the well controlled source at the Los Reales landfill, as well as from an area of housing construction immediately northeast of Los Reales, which is also well controlled.

3. Examine all air quality monitoring information. Data from all PM<sub>10</sub> monitors in PDEQ's network were reviewed. Data from these monitors are summarized in the table in the Background section of this assessment. Despite generally lower PM<sub>10</sub> concentrations (relative to Santa Clara) throughout most of the Tucson Metro area, the data indicate that ambient concentrations of PM<sub>10</sub> were elevated and were in excess of site specific normal fluctuations. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the "Historical Distribution" table in Figure 1 has been included to demonstrate that the excess wind event is associated with measured PM<sub>10</sub> concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95<sup>th</sup> percentile).

4. Examine the meteorological conditions before and during the event. The AzMET, National Weather Service (NWS), and ADEQ meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the maximum wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. Wind speed data at the Fairgrounds site for October 27<sup>th</sup> are summarized in Figure 1. Tucson International Airport experienced strong east and southeasterly winds greater than 15 mph beginning around 5:00 a.m. and continuing throughout the afternoon hours

with gusts reaching as high as 46 mph. The fairgrounds experienced wind speeds in excess of 15 mph beginning at 2:00 a.m. and continuing through midnight with stronger gusts occurring throughout the morning and into the afternoon. The daily average wind speed was 22.3 mph, exceeding the 99.9th percentile for the period from 3/09/1994 through 10/27/2008.

5. Perform a qualitative attribution to emission source(s). Reports of blowing dust crossing I-19 in a narrow band south of 22<sup>nd</sup> Street and north of Green Valley indicate the elevated PM<sub>10</sub> level can be attributed to soil emissions from natural desert and from disturbed soil east of Tucson, generated by high winds and carried over the site at Santa Clara by those winds. The photographs in Figure 1 show that Gonzales' Hill and Black Mountain, south of Tucson, were completely obscured at ranges of 8 miles and 9 miles respectively, while other terrain features were easily visible at a range of 4 miles. The photographs are evidence of a plume of windblown dust generated upwind of Santa Clara, starting prior to 8:00 a.m. The wind direction at the Fairgrounds site for 8:00 a.m. to 11:00 a.m. was approximately 100 ± 11 degrees. Los Reales landfill is at a bearing of 94 to 101 degrees from the Santa Clara site. Los Reales was therefore upwind of the Santa Clara site during the high wind event. Due to the variation in wind direction during the high wind event, the area of housing construction immediately northeast of Los Reales was also upwind of Santa Clara during some of this period.

6. Estimation of Contribution from Sources or Events. Typically, hourly concentration data are used to quantify an estimate of the event contribution. Unfortunately, this event occurred at a location where continuous analyzers are not in use. Instead, only one value is given for each PM<sub>10</sub> monitor that represents the entire 24 hour period from October 27<sup>th</sup>. The primary source of PM<sub>10</sub> during this event appears to be windblown dust in a narrow band across eastern Pima County. There is no effective or efficient method to estimate the relative contributions from individual or specific sources related to this event. The demonstration analysis contained in this report establishes the linkage between the wind event and the measurement to be flagged, therefore satisfying the requirements of 40 CFR 50.14(c)(3)(iii)(B).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at the flagged monitoring site was attributed to a natural event.

## Conclusion

High-wind transport of dust from soils. The elevated concentrations at Santa Clara were a result of the airborne transport of dust and soils from high winds that suspended dust from natural desert areas and from areas where Best Available Control Measures were in place and should be

flagged for air quality planning purposes. The "high wind" (RJ) flag should be applied to the monitor readings indicated in the summary table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.