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PRELIMINARY DOCUMENTATION

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Yuma Area on March 2, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma area as part of their Natural Events Action Plans. On Friday, February 29, 2008, in response to an approaching trough of low pressure and a cutoff area of low-pressure forecast to move eastward south of the Arizona border, ADEQ air quality forecasters called for a high risk of wind-blown dust in the Yuma and Vicinity Dust Control Action Forecast for Sunday, March 2nd. The Forecast for Yuma called for northerly winds sustained at 25 mph and gusting even higher. This potential wind-blown dust event equated to a significant risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in the Yuma area. The forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

Strong winds were observed throughout much of the state of Arizona on March 2, 2008, with the strongest winds occurring in western and southwestern Arizona. The initialization of the wind-blown dust event is evident in the Phoenix visible camera images, particularly for the White Tank Mountains and Estrella Mountains, as well as the Arizona Meteorological Network (AzMET) and National

Weather Service (NWS) monitors (see Fig. 1). Significant reductions in visibility were noted at the Yuma Marine Corps Air Station (MCAS) monitor as were multiple hours of blowing dust. While no visible imagery is available for the Yuma area, wind speeds were even stronger than those in the Phoenix area. Thus, one can infer that visible imagery for the Yuma area would be comparable, though likely more affected by windblown dust, than those images for the Phoenix Metro area. All appropriate State Implementation Plan (SIP) control measures were in place during the event, demonstrating per 40 CFR 50.1(j) that the event "is not reasonably controllable or preventable."

The significant wind event brought elevated ambient concentrations of PM₁₀ to the Yuma area that exceeded the NAAQS at the Yuma Courthouse monitor operated by ADEQ. The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event "affects air quality."

The following are the key PM₁₀ monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM ₁₀	1-hr Max PM ₁₀	Max Time	Flag**
YUMA AREA					
Yuma Courthouse (ADEQ/BAM)	04-027-0004*	161	610	1200	RJ
PHOENIX METRO AREA					
West 43rd Ave (MC/TEOM)	04-013-4009*	45	178	1600	None
Durango Complex (MC/TEOM)	04-013-9812*	39	117	1800	None
Coyote Lakes (MC/TEOM)	04-013-4014*	25	87	2000	None
South Phoenix (MC/TEOM)	04-013-4003*	56	181	1800	None

* EPA Air Quality System Identification Number

** 24-hr PM₁₀ 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).

The preliminary findings from this analysis were presented at a stakeholders meeting on November 19, 2008. This update was reviewed at another 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).

ADEQ-Yuma Mesa						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	56	60	-	3	8	NW
2	57	46	-	4	9	NW
3	53	60	-	2	7	W
4	53	62	-	3	10	W
5	53	64	-	4	10	NW
6	53	71	-	5	10	NW
7	51	74	-	5	9	NW
8	52	70	-	5	11	NW
9	58	52	-	5	18	NW
10	66	15	-	12	28	N
11	68	11	-	16	32	N
12	70	10	-	15	30	N
1	71	9	-	18	36	N
2	71	10	-	17	41	N
3	70	9	-	17	33	N
4	69	8	-	18	36	N
5	69	9	-	19	36	N
6	67	10	-	17	33	N
7	64	12	-	14	31	N
8	63	12	-	10	24	N
9	61	13	-	9	20	N
10	60	13	-	9	20	N
11	59	14	-	10	19	NW
12	58	15	-	6	15	W

ADEQ-Yuma Agricultural Center Farm						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	62	36	-	5	14	NW
2	59	49	-	6	18	NW
3	58	53	-	6	15	NW
4	59	55	-	16	23	NW
5	57	59	-	12	20	NW
6	57	61	-	11	20	NW
7	57	61	-	9	14	NW
8	58	50	-	9	15	NW
9	62	29	-	16	28	N
10	64	20	-	24	43	N
11	65	17	-	28	41	N
12	67	16	-	28	44	N
1	67	14	-	33	46	N
2	67	15	-	30	44	N
3	66	14	-	31	47	N
4	67	14	-	30	45	N
5	66	15	-	28	39	N
6	65	14	-	29	43	N
7	63	15	-	26	38	N
8	62	15	-	22	33	N
9	61	14	-	27	38	N
10	60	15	-	23	34	N
11	59	16	-	18	29	N
12	58	17	-	19	28	N

NWS-YUMA MCAS						
Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	63	10	0	0	0	N
2	62	10	0	6	6	W
3	59	10	0	6	6	W
4	60	10	0	9	9	NW
5	59	10	0	9	9	W
6	57	10	0	7	7	NW
7	57	9	0	7	7	W
8	58	9	0	5	5	NW
9	68	10	0	16	24	N
10	71	4	0	21	32	N
11	73	6	0	28	37	N
12	75	3	0	29	43	N
1	75	3	0	29	46	N
2	75	4	BLDU	26	37	N
3	74	3	BLDU	26	43	N
4	74	9	BLDU	26	39	N
5	73	8	BLDU	26	41	N
6	71	10	BLDU	20	29	N
7	68	10	BLDU	22	31	N
8	66	10	BLDU	21	29	N
9	66	10	BLDU	16	26	N
10	64	10	BLDU	11	20	N
11	64	10	BLDU	N/A	N/A	N
12	64	10	BLDU	23	34	N

Event Contrib. Analysis			
Hourly PM ₁₀ Conc. (µg/m ³)			
MONITORS:	Hr	1	
1-Yuma CH	1	33.1	
	2	80.7	
	3	86.9	
	4	91.2	
	5	61.5	
	6	64.2	
	7	43.6	
	8	39.9	
	9		
	10	369	
	11	419	
	12	317	
> NAAQS			
< NAAQS			
Pink=Event Contrib.			
Conclusion: As shown above, the PM ₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).			

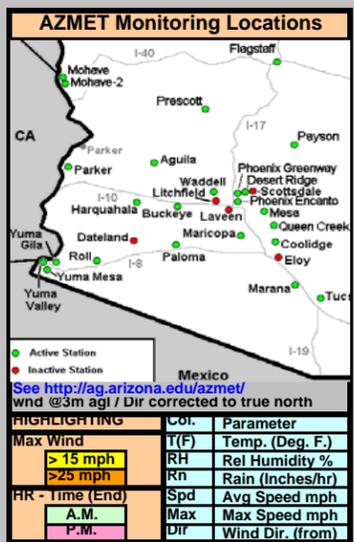
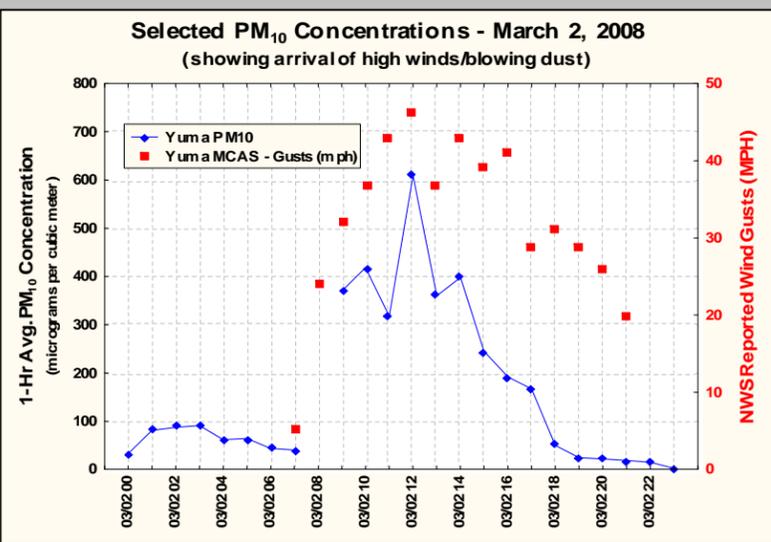


Figure 1. Key Data for Event of March 2, 2008

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

SUMMARY OF EVENT
A frontal system passed through Arizona on March 2, 2008, bringing elevated winds and PM10 concentrations to the Yuma Area in addition to the Phoenix Area. An exceedance of the PM10 NAAQS occurred as a result of the high winds.



BUCKEYE						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	58	41	-	4	6	NW
2	56	45	-	2	6	N
3	53	57	-	3	6	NW
4	52	55	-	3	8	N
5	51	55	-	3	5	N
6	51	55	-	2	5	SW
7	48	64	-	1	4	NE
8	46	73	-	4	7	NW
9	53	60	-	5	8	NW
10	60	53	-	4	7	W
11	66	33	-	9	17	NW
12	69	19	-	17	24	N
1	69	11	-	19	29	N
2	70	8	-	23	34	NW
3	70	6	-	26	34	N
4	69	6	-	25	36	N
5	67	7	-	25	36	N
6	65	9	-	22	34	N
7	62	10	-	17	25	N
8	60	11	-	17	24	N
9	57	12	-	13	19	N
10	56	12	-	14	20	N
11	53	13	-	11	16	N
12	50	17	-	10	14	N

W CEN AZ - AGUILA						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	47	55	-	3	7	NE
2	47	53	-	3	6	E
3	45	58	-	3	6	SE
4	47	53	-	3	7	NW
5	49	53	-	7	14	NW
6	50	51	-	7	12	W
7	50	51	-	7	12	NW
8	52	47	-	7	18	N
9	55	33	-	4	11	NW
10	58	28	-	13	24	NW
11	60	22	-	23	32	N
12	62	12	-	26	36	N
1	63	8	-	22	33	N
2	63	7	-	23	32	N
3	63	8	-	24	34	N
4	62	9	-	22	31	N
5	61	10	-	21	29	N
6	59	12	-	21	29	N
7	55	13	-	17	24	N
8	53	14	-	16	23	N
9	51	16	-	14	20	N
10	49	18	-	13	18	N
11	48	19	-	13	18	N
12	43	25	-	3	7	E

MARICOPA						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	56	47	-	6	9	S
2	53	54	-	4	7	SE
3	54	44	-	8	10	S
4	52	46	-	6	9	S
5	50	49	-	5	8	S
6	49	52	-	4	6	S
7	48	54	-	4	7	SW
8	53	48	-	4	9	S
9	59	39	-	6	11	SW
10	64	33	-	7	13	NW
11	66	30	-	6	11	W
12	68	28	-	7	12	NW
1	70	23	-	9	17	NW
2	71	20	-	13	24	NW
3	72	11	-	13	23	W
4	72	11	-	12	18	NW
5	70	9	-	16	24	NW
6	67	8	-	18	25	NW
7	62	10	-	16	24	NW
8	59	11	-	12	21	N
9	57	12	-	9	14	N
10	54	15	-	6	12	N
11	53	14	-	8	15	N
12	53	15	-	8	14	N

Historical Distribution			
5-Yr. Dist. of Values (µg/m ³)			
MONITORS:	Column Index		
1-YUMA CH	Yr	- All Data (5-Yrs)	
	Sea	- Data for Spring season only (5-Yrs)	
Cum. Freq.	Mon 1		
Min	8	8	
0.5%	12	9	
1.0%	14	14	
2.5%	16	16	
5%	19	19	
10%	23	22	
25%	31	29	
50%	42	40	
75%	57	51	
90%	77	76	
95%	96	109	
97.5%	127	182	
99.0%	186	210	
99.5%	211	212	
Max	349	349	
Flagged Value	161		
Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)			



YUMA						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	61	38	-	5	12	NW
2	59	46	-	5	11	N
3	58	50	-	4	13	NW
4	60	51	-	13	19	NW
5	57	57	-	9	15	NW
6	57	59	-	9	14	NW
7	56	61	-	8	12	NW
8	58	45	-	6	12	N
9	64	23	-	11	22	N
10	66	15	-	15	32	N
11	67	12	-	19	29	N
12	69	11	-	20	33	N
1	69	10	-	22	32	N
2	69	10	-	20	31	N
3	68	9	-	21	36	N
4	68	10	-	19	29	N
5	68	11	-	18	29	N
6	66	11	-	18	28	N
7	64	12	-	16	25	N
8	62	13	-	14	22	N
9	62	12	-	17	26	N
10	61	13	-	15	28	N
11	61	12	-	11	19	N
12	60	12	-	13	21	N

PALOMA						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	53	59	-	5	9	W
2	48	71	-	5	7	NW
3	49	65	-	5	6	W
4	47	69	-	5	7	W
5	48	68	-	5	6	SW
6	45	76	-	4	7	W
7	44	77	-	4	6	SW
8	47	71	-	5	7	SW
9	54	62	-	6	9	SW
10	59	53	-	7	10	W
11	64	42	-	6	9	W
12	67	36	-	8	18	NW
1	67	33	-	12	22	NW
2	67	27	-	16	27	NW
3	67	20	-	17	27	N
4	66	18	-	18	28	N
5	65	17	-	16	23	N
6	62	18	-	13	22	N
7	58	20	-	11	18	NW
8	58	17	-	13	21	NW
9	53	23	-	9	16	N
10	53	22	-	10	17	N
11	53	21	-	11	17	N
12	50	27	-	7	14	N

Assessment of March 2, 2008 event (Cont.)

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM₁₀ readings from the Yuma Courthouse monitor were valid for March 2nd. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. Exceedances of the NAAQS were recorded at the Yuma Courthouse monitor operated by ADEQ.

2. Review suspected contributing sources. The NWS, AzMET, and ADEQ surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to the meteorological conditions that were in place on March 2nd. Strong northerly down-river winds were occurring in the Yuma area during the mid-morning hours and continuing through the evening, due to the passing of a low pressure system and associated frontal boundary. For the rest of the state, strong north-northwesterly winds associated with the frontal system were reported throughout the afternoon. The plot of hourly PM₁₀ concentration data in the upper right corner of Figure 1 confirms the identical timing of elevated PM₁₀ concentrations at the Yuma Courthouse monitoring site with the onset of high winds at the Yuma Marine Corps Air Station.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the “Historical Distribution” Table in Figure 1 has been included to demonstrate that the event is associated with measured concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Monitors with readings greater than that of the NAAQS on March 2nd, 2008, which should be flagged, include the Yuma Courthouse monitor.

4. Examine the meteorological conditions before and during the event. The AzMET, NWS, and ADEQ meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. Yuma experienced hourly max wind speeds greater than 20 mph beginning at 8 a.m. and continuing through the rest of the day. Strong northerly winds were evident across the entire Yuma area. Locations in close proximity to the

Colorado River Valley saw even greater wind speeds in comparison to areas further away. This phenomenon is apparent in ADEQ’s Yuma Agricultural Center Farm (YACF) wind data, a site which is located approximately 1 mile east of the Colorado River. ADEQ’s YACF wind data indicate that wind speeds gusted over 40 mph for seven consecutive hours between 9:00 a.m. and 3:00 p.m. It was during this time when the Yuma Courthouse monitor recorded the highest hourly PM₁₀ concentrations. As can be seen in Figure 1, wind speeds did not pick up in central Arizona until approximately 11 a.m., when several stations reported gusty winds that approached 40 mph at times.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Yuma area can be attributed to soil emissions that were transported over a broad area in southwestern Arizona. No source-specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on March 2nd. Observational reports of blowing dust and reduced visibilities from trained officials in Yuma provide further proof that the elevated PM₁₀ concentrations in the Yuma area were attributed to soil emissions. These reports, in addition to the visual evidence of reduced visibility in the Phoenix area (most clearly seen in the 2:45 p.m. and 3:00 p.m. images of the White Tank and Estrella Mountains located in the lower right portion of Figure 1), provide proof that dust was being suspended due to the high winds causing elevated PM₁₀ concentrations.

6. Estimation of Contribution from Source or Event. The primary source appeared to be wind-blown dust over central and southwestern Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying a 40 CFR 50.14(c)(3)(iii)(B) requirement. Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the “Event Contrib. Analysis” Table in Figure 1 has been included to demonstrate that there would have been no exceedance or violation but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

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 Yuma Courthouse monitoring site can be attributed to a natural event.

Conclusion

Long-range transport of dust from soils. The region wide high-wind event on March 2, 2008, in Yuma County was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are 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 table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.