Technical Support Document
For the
April 16, 2013
Alamosa, Pagosa Springs, Durango and Crested Butte Exceptional Event

Prepared by the Technical Services Program
Air Pollution Control Division
Colorado Department of Public Health and Environment

December 28, 2015

Executive Summary

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature[1] (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the semi-arid nature of parts of the state, Colorado is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the 24-hour PM_{10} NAAQS. This document contains detailed information about the large regional windblown dust event that occurred on April 16, 2013. The Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) has prepared this report for the U.S. Environmental Protection Agency (EPA) to demonstrate that the elevated PM_{10} concentrations were caused by a natural event.

EPA's June 2012 draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed…". In addition, in both eastern and western Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see the Lamar, Colorado, Blowing Dust Climatology at http://www.colorado.gov/airquality/tech_doc_repository.aspx). For these blowing dust events, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in Colorado and the surrounding states.

The PM_{10} exceedances in Alamosa, Durango, Pagosa Springs, and Crested Butte on April 16, 2013, would not have occurred if not for the following: a) dry soil conditions over source regions with 30-day precipitation totals below the threshold identified as a precondition for blowing dust; and (b) meteorological conditions that caused strong surface winds over the area of concern. These PM_{10} exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources outside the monitored areas. These sources are not reasonably controllable during significant windstorms under abnormally dry or moderate drought conditions.

APCD is requesting concurrence on exclusion of the PM_{10} values from the Alamosa ASC (08-003-0001), Pagosa Springs (08-007-0001), Crested Butte (05-051-0004) and Durango (08-067-0004) monitors on April 16, 2013.

[1] Section 319 of the Clear Air Act (CAA), as amended by section 6013 of the Safe Accountable Flexible Efficient-Transportation Equity Act: A Legacy for Users (SAFE-TEA-LU of 2005, required EPA to propose the Federal Exceptional Events Rule (EER) no later than March 1, 2006.

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1.0 Exceptional Events Rule Requirements

In addition to the technical requirements that are contained within the EER, procedural requirements must also be met in order for EPA to concur with the flagged air quality monitoring data. This section of the report lays out the requirements of the EER and discusses how the APCD addressed those requirements.

1.1 Procedural Criteria

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (Treatment of Air Quality Monitoring Data Influenced by Exceptional Events) and explains how APCD fulfills them.

The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. APCD has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1)(i))
APCD issued a Blowing Dust Advisory for southeastern, western and south-central Colorado advising citizens of the potential for high wind/dust on April 16, 2013. This area included: Craig, Meeker, Grand Junction, Rifle, Montrose, Delta, Telluride, Cortez, Durango, Pagosa springs, Alamosa, Trinidad, La Junta, Kim, Pueblo, Ordway and Las Animas. The advisories that were issued on April 16, 2013 can be viewed at http://www.colorado.gov/airquality/report.aspx and are described further in Section 2.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))
APCD and other applicable agencies in Colorado submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Colorado are submitted to AQS.

When APCD and/or the Primary Quality Assurance Organization operating monitors in Colorado suspects that data may be influenced by an exceptional event, APCD and/or the other operating agency expedites analysis of the filters collected from the potentially-affected filter-based air monitoring instruments, quality assures the results and submits the data into AQS. APCD and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If APCD and/or the applicable operating agency have determined a potential exists that the sample value has been influenced by an exceptional event, a preliminary flag is submitted with the measurement when the data are uploaded to AQS. The data are not official until they are certified by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag with a date/time stamp can be confirmed in AQS.

Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))
In early 2011, APCD and EPA Region 8 staff agreed that the notification of the intent to flag data as an exceptional event would be done by submitting data to AQS with the proper flags and the initial event descriptions. This was deemed acceptable, since Region 8 staff routinely pull the data to review for completeness and other analyses.

On April 16, 2013 sample values greater than 150 µg/m^3 were taken at multiple sites across southwestern Colorado during the high wind event that occurred that day. These were the monitors located in Alamosa at Adams State College (SLAMS), Pagosa Springs (SLAMS), Crested Butte (SLAMS), Durango (SLAMS), and Telluride (SLAMS). All of these monitors are operated by APCD in partnership with local operators.

> ***Note**: A separate Exceptional Event Technical Support document was developed and submitted for the Telluride exceedance that occurred on April 16, 2013. This document was submitted to the EPA on October 1, 2013. This document can be accessed at http://www.colorado.gov/airquality/tech_doc_repository.aspx. A concurrence letter for this exceedance in Telluride was issued by EPA on November 1, 2013.*

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))
APCD posted this report on the Air Pollution Control Division's webpage for public review. APCD opened a 30-day public comment period on December 28, 2015 and closed comments on January 28, 2016. A copy of the public notice certification (in cover letter), along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))
At the close of the comment period, and after APCD has had the opportunity to consider any comments submitted on this document, APCD will submit this document, along with any comments received (if applicable), and APCD's responses to those comments to EPA Region VIII headquarters in Denver, Colorado.

1.2 Documentation Requirements

Section 50.14(c)(3)(iv) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
   (1) the event affected air quality,
   (2) the event was not reasonably controllable or preventable, and
   (3) the event was caused by human activity unlikely to recur in a particular location or was a natural event;
b. There is a clear causal relationship between the measurement under consideration and the event;
c. The event is associated with a measured concentration in excess of normal historical fluctuations; and
d. There would have been no exceedance or violation but for the event.

2.0 Meteorological Analysis of the April 16, 2013 Blowing Dust Event and PM_{10} Exceedances – Conceptual Model and Wind Statistics

On April 16, 2013, a powerful spring storm system caused exceedances of the twenty-four hour PM_{10} standard at multiple monitors in south-central and southwest Colorado. Exceedances were recorded at the Adams State College monitor in Alamosa with a concentration of 237 $\mu g/m^3$, along with monitors in Durango, Pagosa Springs, Telluride and Crested Butte with concentrations of 419, 295, 265 and 187 $\mu g/m^3$, respectively. Those elevated readings and the location of each monitor are plotted on the map in Figure 1. The exceedances were the result of intense south to southwesterly pre-frontal surface winds moving over drought-stricken soils. These surface features were associated with a vigorous upper-level trough that was moving over the western United States. Consequently, significant blowing dust was produced across large parts of northeast Arizona, northwest New Mexico, southeast Utah and south-central and southwest Colorado.

EPA's June 2012, Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states, "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed…". In addition, in Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see the Technical Support Documents for the April 3, 2009 Pagosa Springs Exceptional Event, the Lamar Blowing Dust Climatology, and the Grand Junction Blowing Dust Climatology at http://www.colorado.gov/airquality/tech_doc_repository.aspx). For this blowing dust event, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in the Four Corners region of Colorado, Arizona, New Mexico and Utah.

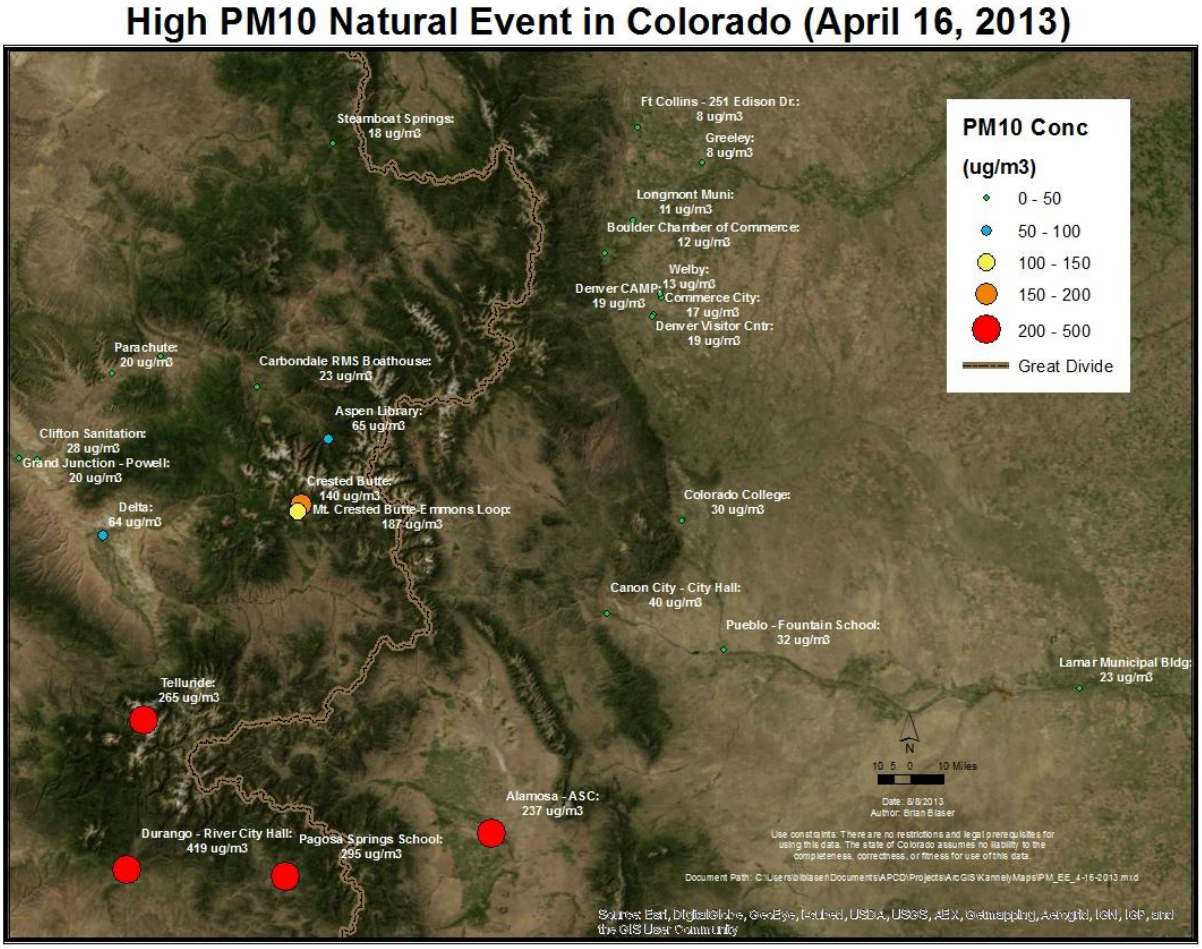

Figure 1: 24-hour PM_{10} concentrations for April 16, 2013.
(Source: http://webapps.datafed.net/datafed.aspx?dataset=AQS_D&parameter=pm10)

The upper level trough associated with this storm system is shown on the 700 mb and 500 mb height analysis maps at 5:00 AM MST, April 16, 2013 in Figure 2 and Figure 3, respectively. The 700 mb level is located roughly 3 kilometers (km) above mean sea level (MSL) while the 500 mb level is approximately 6 km above MSL. These two charts show that a deep trough of low pressure was present at both the 700 and 500 mb level just a few hours before the blowing dust event of April 16 and that it was moving over the southwestern United States. This is a typical upper-air pattern for blowing dust events in south-central and southwest Colorado (see the Technical Support Document for the May 22 and 23, 2010 Alamosa, Pagosa Springs and Grand Junction Exceptional Event at http://www.colorado.gov/airquality/tech_doc_repository.aspx).

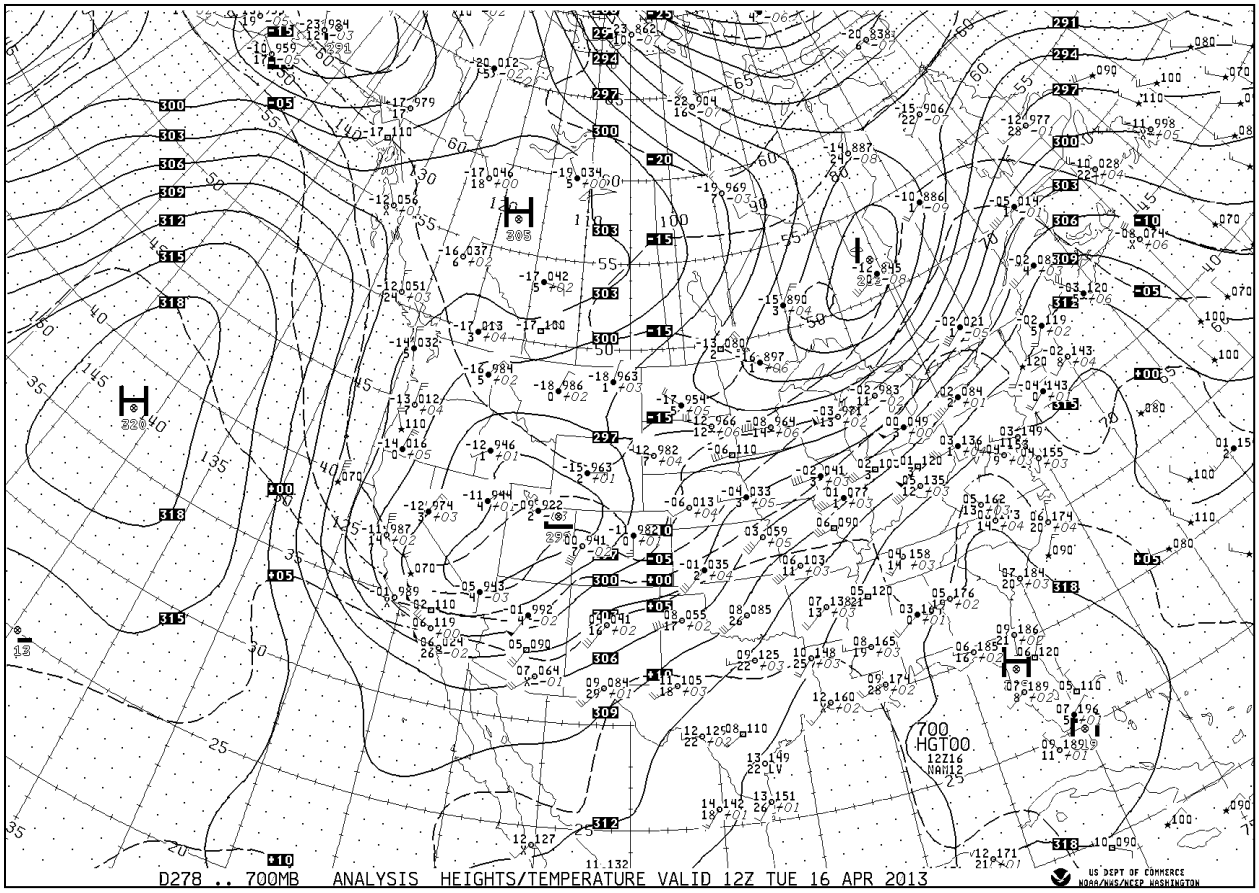

Figure 2: 700 mb (about 3 kilometers above mean sea level) analysis for 12Z April 16, 2013, or 5:00 AM MST April 16, 2013.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

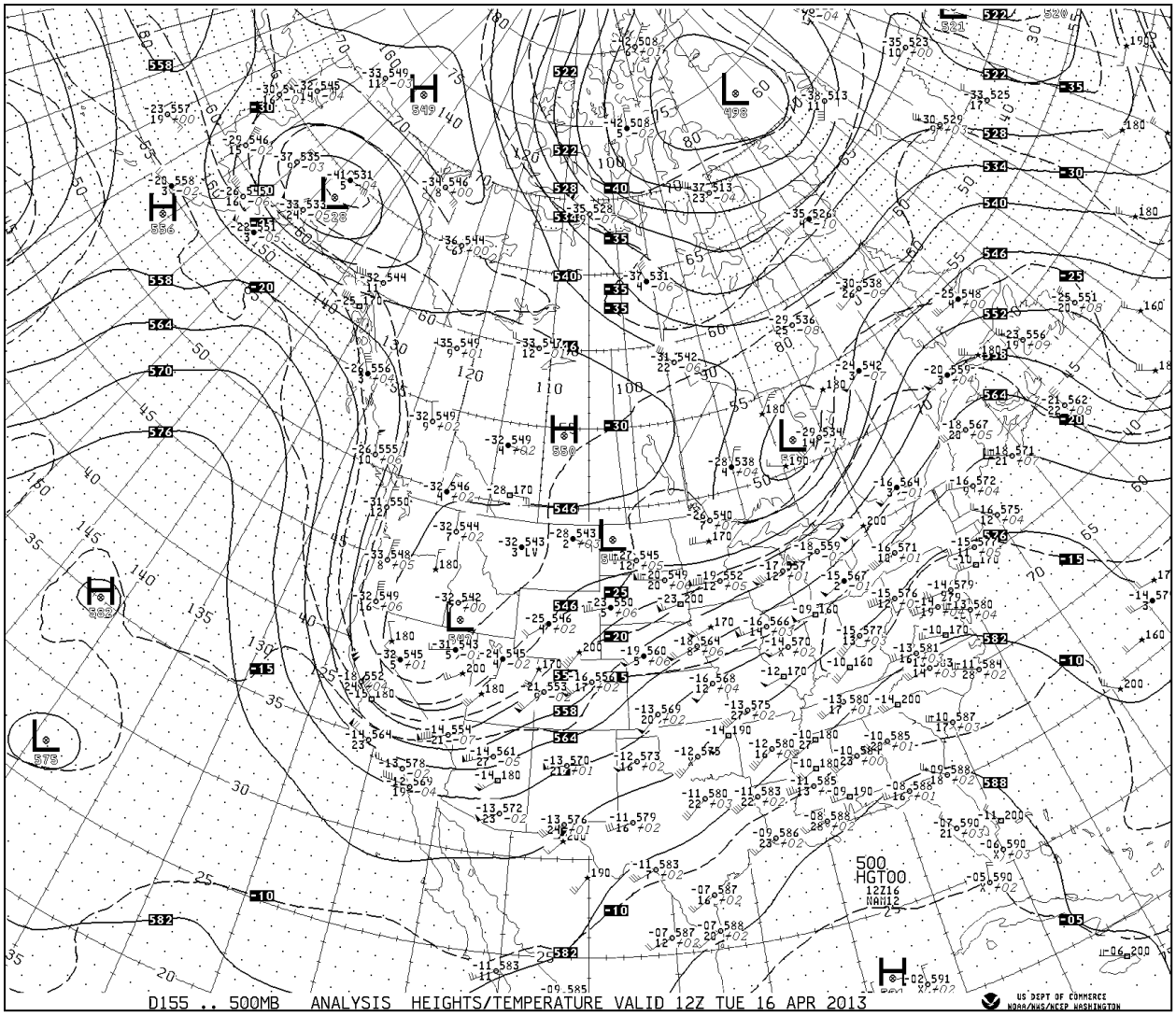

Figure 3: 500 mb (about 6 kilometers above mean sea level) analysis for 12Z April 16, 2013, or 5:00 AM MST April 16, 2013.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The surface weather associated with the storm system of April 16, 2013, is presented in Figure 4 and Figure 5. Significant surface features at 11:00 AM MST (Figure 4) included a stationary front extending from northwest Arizona into southwest Colorado, while a strong cold front was moving eastward through Arizona. By 5:00 PM MST (Figure 5) an area of low pressure had intensified and was moving northwestward into central Colorado while the trailing cold front was surging eastward into the Four Corners region.

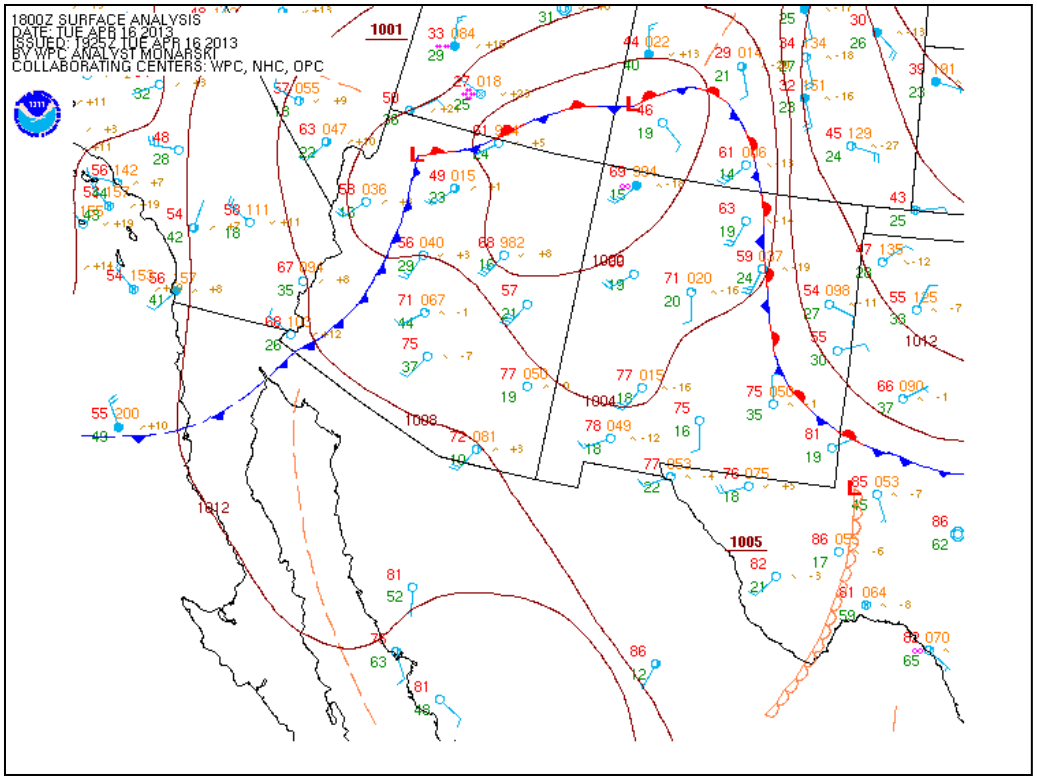

Figure 4: Surface Analysis for 18Z April 16, 2013, or 11:00 AM MST April 16, 2013. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

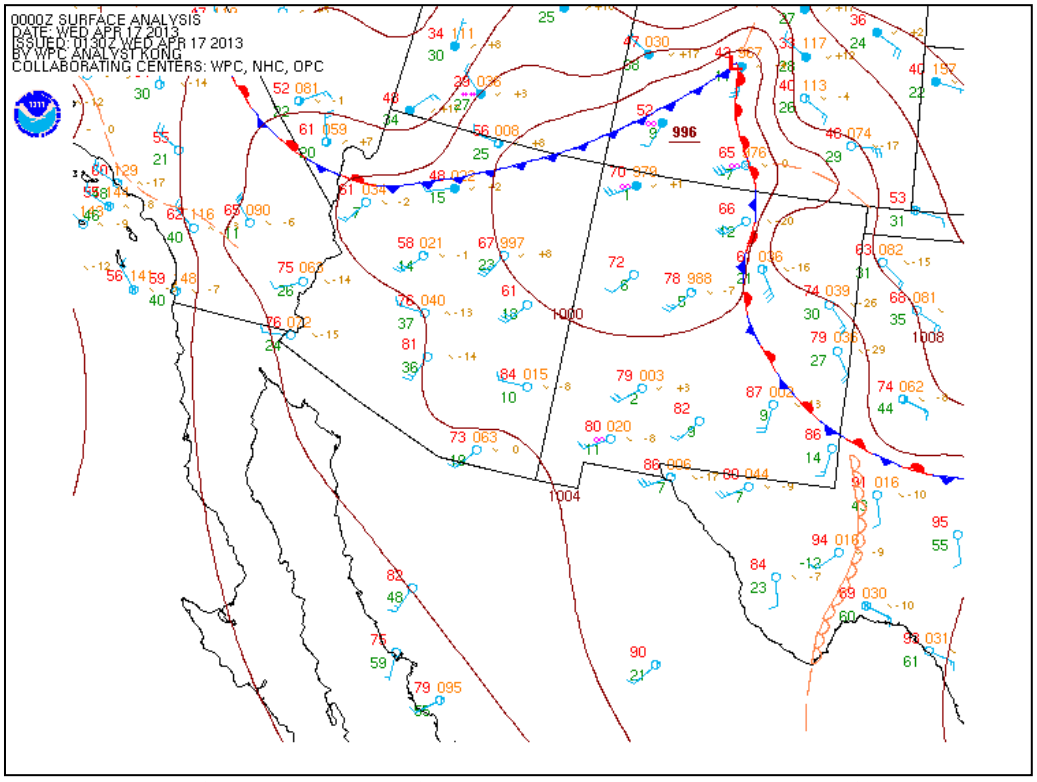

Figure 5: Surface Analysis for 0Z April 17, 2013, or 5:00 PM MST April 16, 2013. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

In order to fully evaluate the synoptic meteorological scenario of April 16, 2013, a regional surface weather map is provided showing individual station observations during the height of the event in question. Figure 6 presents weather observations for the Four Corners region at 4:43 PM MST, April 16. On the map in Figure 6 several station observations in south-central and southwest Colorado show winds sustained at 25-30 knots (29-35 mph) and gusts to 35-50 knots (40-57 mph), including in Alamosa (ALS), Durango (DRO) and Telluride (TEX). Additionally, the weather symbol of infinity (∞) appears often with this collection of observations. The infinity sign is the weather symbol for haze. Haze is often reported during dust storms, and in dry and windy conditions haze typically refers to blowing dust (see the following link for the description of haze published by the National Oceanic and Atmospheric Administration (NOAA): http://www.erh.noaa.gov/er/box/glossary.htm). Also note that just to the south of the Colorado-New Mexico state line in Farmington (FMN), similar weather conditions were reported with high winds along with the weather symbol of the dollar sign ($). The dollar sign in meteorological observations is defined as "dust or sand raised by the wind at the time of the observation" (Source: http://oceanservice.noaa.gov/education/yos/resource/JetStream/synoptic/ww_symbols.htm). This not only confirms that blowing dust was observed in the Four Corners region on the afternoon of April 16, 2013, but also suggests that this was a regional dust event that was not confined solely to south-central and southwest Colorado.

Hourly surface observations, in table form, from Alamosa, Durango, Pagosa Springs and Telluride provide supporting evidence that there was an extended period of high winds and haze (blowing dust) in south-central and southwest Colorado. These observations can be found in Table 1 through Table 4, respectively. Additionally, observations from Winslow, Arizona (Table 5) and Farmington, New Mexico (
Table 6) are included to provide additional evidence that the blowing dust event of April 16 was regional in scale. Observations that are climatologically consistent with blowing dust conditions (see the Lamar Blowing Dust Climatology, the Grand Junction Blowing Dust Climatology, and the April 3, 2009 Pagosa Springs Exceptional Event at http://www.colorado.gov/airquality/tech_doc_repository.aspx) are highlighted in yellow. Collectively, these six sites experienced an extended period of reduced visibility along with sustained wind speeds and gusts at or above the thresholds for blowing dust.

Surface weather maps and hourly observations show that a regional dust storm occurred under south to southwesterly flow in advance of a cold front. This data provides clear evidence of blowing dust and winds above the threshold speeds for blowing dust on April 16, 2013.

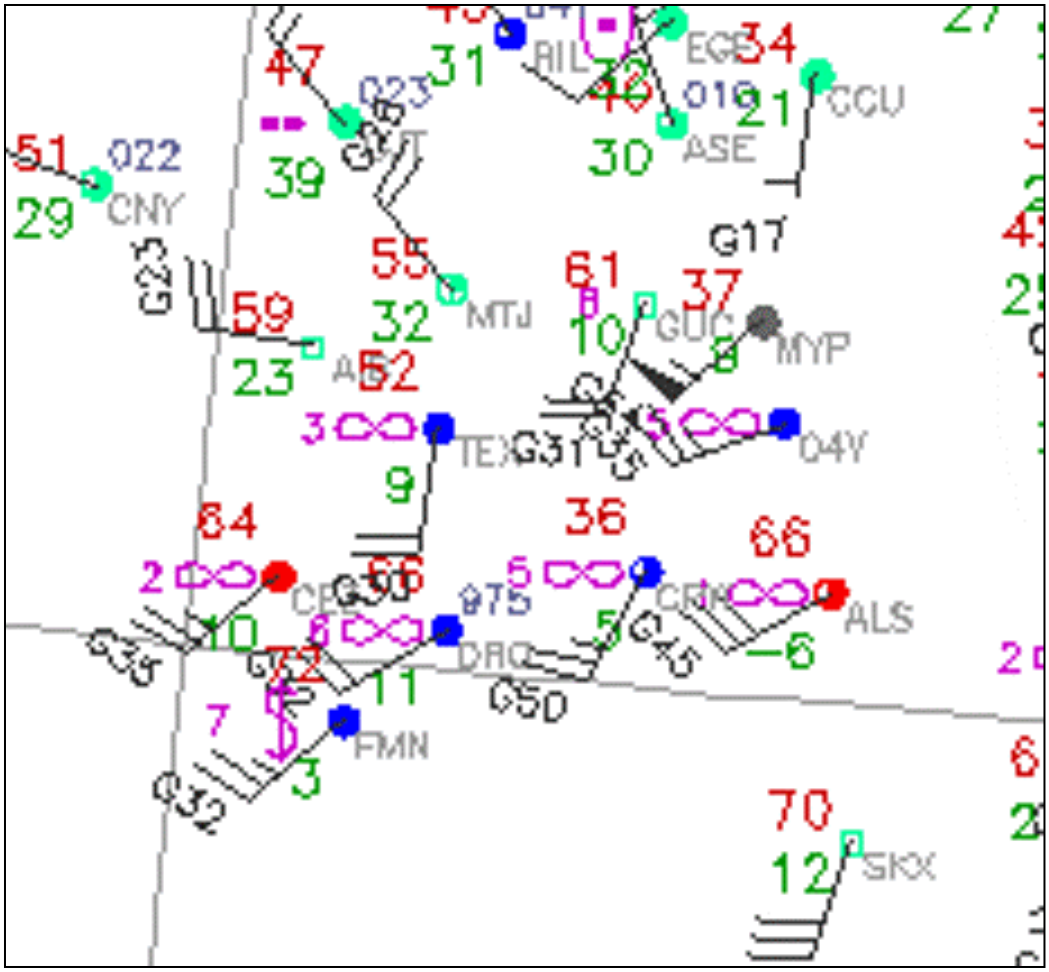

Figure 6: Four Corners regional surface analysis for 4:43 PM MST, April 16, 2013. (Source: http://weather.rap.ucar.edu/surface/)

Table 1: Weather observations for Alamosa, Colorado, on April 16, 2013. (Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:52	44	36	13	22	190		10
1:52	41	41	10		140		10
2:52	39	44	8	17	160		10
3:52	36	48	13		180		10
4:52	38	42	14		210		10
5:52	38	44	15	23	220		10
6:52	46	34	22	31	210		10
7:52	50	29	32	46	220		10
8:52	54	25	27	38	210		10
9:52	59	17	33	47	220		10
10:52	61	16	37	50	220		10
11:52	62	14	32	61	220	haze	4
12:52	65	14	33	41	220	haze	4
13:52	65	13	29	45	220	haze	5
14:00	66	11	37	50	230	haze	2
14:16	64	13	39	51	200	haze	6
14:52	67	11	28	46	210		10
15:14	70	7				haze	1
15:21	70	5				lt rain	0.25
15:36	68	6	36	51	240	haze	0.5
15:41	68	6	43	55	220	haze	2
15:52	67	5				haze	1
16:04	66	5	32	52	240	haze	1.25
16:47	64	5	40	54	230	haze	0.75
16:52	65	5	35	54	240	haze	0.75
17:03	64	5	37	50	250	haze	1.5
17:12	64	6	37	54	240	haze	2
17:17	63	6	33	54	230	haze	3
17:27	63	6	27	43	240		9
17:52	61	7	29	40	240		8
18:52	57	10	22	32	240		9
19:52	53	15	18		230		7
20:40	52	17	15		230		7
20:52	50	18	16		230		8
21:52	48	19	15		220		7
22:52	45	26	15		210		9
23:52	45	28	20		230		10

Table 2: Weather observations for Durango, Colorado, on April 16, 2013. (Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	41	46	0				10
1:53	40	53	4		40		9
2:53	45	45	4		170		10
3:53	45	45	12		200		8
4:53	45	43	12		200		8
5:53	44	45	4			haze	6
6:53	46	43	6		150		8
7:53	51	39	17	23	190		10
8:53	54	34	18	35	210		10
9:53	57	30	17	28	190		8
10:53	59	25	22	33	220	haze	5
11:11	61	22	22	33	200	haze	5
11:53	63	19	21	36	200	haze	6
12:33	64	16	17	33	240		7
12:53	66	15	20	35	230	haze	5
13:25	66	13	23	40	240	haze	4
13:53	67	12	28	38	230	haze	5
14:00	66	12	31	41	210	haze	5
14:28	66	13	25	48	250	haze; squalls	6
14:36	66	12	24	43	220	haze	5
14:53	67	12	31	44	220	haze	5
15:25	66	11	27	47	230	haze	6
15:38	66	11	29	45	220	haze	6
15:53	66	11	23	37	240	haze	6
16:53	64	12	28	39	220	haze	6
17:53	62	12	18	39	240	haze	4
18:53	58	16	21	29	250	haze	3
19:53	54	22	16	22	250	haze	5
20:53	51	27	10		270	haze	6
21:53	50	29	10		260	haze	6
22:53	48	32	9		250		9
23:53	45	38	6		190		10

Table 3: Weather observations for Pagosa Springs, Colorado, on April 16, 2013. (Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:55	47	35	14	23	210		10
1:55	46	40	10		190		10
2:55	45	40	9	16	200		10
3:55	44	38	9		210		10
4:55	43	40	9		210		10
5:55	43	40	9		210		7
6:55	45	38	10	17	210		10
7:55	47	37	17	29	210		10
8:55	49	31	16	31	230		10
9:55	53	26	18	27	210		10
10:55	55	24	16	24	240		10
11:55	59	17	23	35	220		10
12:55	60	12	29	41	230	haze	3
13:55	62	10	28	43	230	haze	4
14:55	63	9	33	43	220	haze	4
15:55	63	8	27	39	220	haze	5
16:55	62	8	27	43	230	haze	5
17:55	60	9	22	38	220		7
18:55	57	10	23	29	220		7
19:55	56	12	18	32	230		7
20:55	52	19	13	17	250	haze	4
21:55	50	23	8		220	haze	5
22:55	46	31	6		250	haze	5
23:55	44	37	7		260	haze	5

Table 4: Weather observations for Telluride, Colorado, on April 16, 2013.
(Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:55	41	38	13	39	200		10
1:55	39	41	17	24	170		10
2:55	39	41	18	31	180		7
3:55	37	48	7		100		7
4:55	37	44	20	31	180	haze	5
5:55	37	38	25	35	170		7
6:55	37	38	24	38	170		10
7:55	41	36	12	38	210		10
8:55	43	31	17	43	150		7
9:55	45	33	13	37	180		7
10:55	46	34	9	30	130		10
11:55	48	29	23	38	180		10
12:55	50	23	29	53	180		10
13:55	52	22	22	38	210		7
14:55	52	22	24	47	180		7
15:55	52	17	15	41	180	haze	4
16:55	52	17	12	25	200	haze	3
17:55	50	18	14	21	200	haze	3
18:55	46	25	14	23	210	haze	3
19:55	45	26	9	20	210	haze	4
20:55	43	31	9	18	210	haze	5
21:55	41	41	15	28	190		7
22:55	41	36	20	36	200		10
23:55	39	41	10	32	150		10

Table 5: Weather observations for Farmington, New Mexico, on April 16, 2013. (Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
9:03	60	28	17	28	190		9
9:53	61	27	16	24	190		8
10:06	65	21	22	28	220	blowing dust	4
10:13	66	19	18	28	210	blowing dust	6
10:53	66	18	23	31	210	blowing dust	6
11:53	69	12	28	36	220	blowing dust	4
12:53	73	8	30	39	240	blowing dust	5
13:53	74	8	36	44	240	blowing dust	3
14:53	75	8	29	41	220	blowing dust	5
15:53	74	7	33	41	230	blowing dust	7
16:17	72	8	28	40	240	blowing dust	6
16:53	72	7	30	37	230	blowing dust	7
17:53	70	6	28	39	240	blowing dust	5
18:51	67	8	24	35	240	blowing dust	7
18:53	63	14	22	29	250	blowing dust	4
19:53	63	13	18	29	250	blowing dust	5
20:07	59	18	18		260	blowing dust	10
20:53	57	19	16	23	270	blowing dust	7
21:53	57	22	20	27	270	blowing dust	6
22:19	54	28	17	25	270	blowing dust	8
22:53	54	28	17	24	270	blowing dust	9
23:53	49	34	7		240	blowing dust	10

Table 6: Weather observations for Winslow, Arizona, on April 16, 2013. (Source: http://mesowest.utah.edu/)

Time MST April 16	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:56	55	37	35	45	220		10
1:56	55	32	31	43	210		10
2:56	55	30	33	44	210		10
3:56	54	32	36	47	200		10
4:56	53	35	40	53	200		10
5:56	54	35	40	52	200		10
6:56	58	29	47	60	200	haze	5
7:56	62	22	47	61	200	haze	5
8:03	63	22	45	60	200	haze	3
8:56	65	17	50	62	210	haze	5
9:56	68	13	47	66	210		8
10:56	71	11	43	58	220		8
11:56	71	11	43	59	220	haze	5
12:56	70	13	43	60	220		9
13:56	70	13	45	59	200		10
14:56	69	17	37	52	190		10
15:56	67	19	43	51	210		10
16:56	63	23	33	46	220		10
17:56	59	29	29	40	210		10
18:56	56	35	16		220		10
19:56	53	41	10		220		10
20:56	51	42	10		270		10
21:56	48	47	6		250		10
22:56	50	32	16	28	230		10
23:56	43	38	7		260		10

Satellite imagery from April 16, 2013 provides strong, supporting evidence that dust caused the PM_{10} exceedances in south-central and southwest Colorado. Specifically, the MODIS (Moderate Resolution Imaging Spectroradiometer) Aqua image (Figure 7) clearly shows extensive dust plumes blowing from northeast Arizona and northwest New Mexico into Colorado at approximately 1:55 MST. This is the same time when haze and reduced visibility were being reported at all the Colorado weather observation stations listed in the tables above. Additional information on MODIS can be found at the National Aeronautics and Space Administration (NASA) website (https://earthdata.nasa.gov/data/near-real-time-data/data/instrument/modis).

Figure 8 displays the Atmospheric Infrared Sounder (AIRS) Dust Score zoomed on the southwest corner of Colorado. The AIRS Dust Score was generated from the MODIS Aqua Satellite image shown in Figure 7 (see the following link for more information on Dust Score

and other AIRS variables: http://disc.sci.gsfc.nasa.gov/nrt/data-holdings/airs-nrt-products). This image reveals that blowing dust was present far to the northeast of the source region, as it can be observed well into central parts of Colorado (including near the exceedance location of Crested Butte). The tan pixels represent dust scores greater than 360, which is indicative of dust particles.

The National Oceanic and Atmospheric Administration (NOAA) Satellite Services Division was in agreement with the conclusion that blowing dust was occurring across the western half of Colorado and that it originated in the Four Corners region. The Smoke Text Product from NOAA at 7:45 PM MST on April 16, 2013, stated:

> "Very dense blowing sand/dust is observed swiftly moving NE through 0145Z (local sunset) in the vicinity of the four corners region. Dust/sand is mainly originating from 2 areas: 1) The desert area located approx 30mi NE of Flagstaff, AZ and 2) The desert area extending 10 to 75mi north of Gallup, NM. Collectively, a broad area of sand/dust is sweeping from NE Arizona through the far SE corner of UT, NW corner of New Mexico, and much of the western half of Colorado this evening. Heavy cloud cover is preventing detection beyond that, though it is likely that the dust edge extends further." (Source: http://www.ssd.noaa.gov/PS/FIRE/DATA/SMOKE/2013/2013D170309.html)

Additionally, on April 16, 2013, the Colorado Department of Public Health and Environment issued a Blowing Dust Advisory for south-central and southwest Colorado while the Grand Junction office of the National Weather Service issued a Wind Advisory explicitly warning about the threat for blowing dust. Text from these advisories included:

> "People with heart or lung disease, older adults, and children in the affected area should reduce prolonged or heavy indoor and outdoor exertion." (Source: http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=04%2f16%2f20143)

> "Blowing dust will limit visibility." (Source: http://mesonet.agron.iastate.edu/wx/afos/)

And to further confirm the presence of a dust storm in south-central and southwest Colorado, webcam images from various locations across the region are presented in Figure 9 through Figure 12. These images were captured during the afternoon and evening hours of April 16 and verify that there was a considerable amount of airborne dust throughout south-central and southwest Colorado with visibility highly obscured.

Satellite products combined with reports, advisories and webcam imagery from the Four Corners area on April 16, 2013, clearly reveal that a regional dust storm was anticipated and did take place, which was not controllable or preventable.

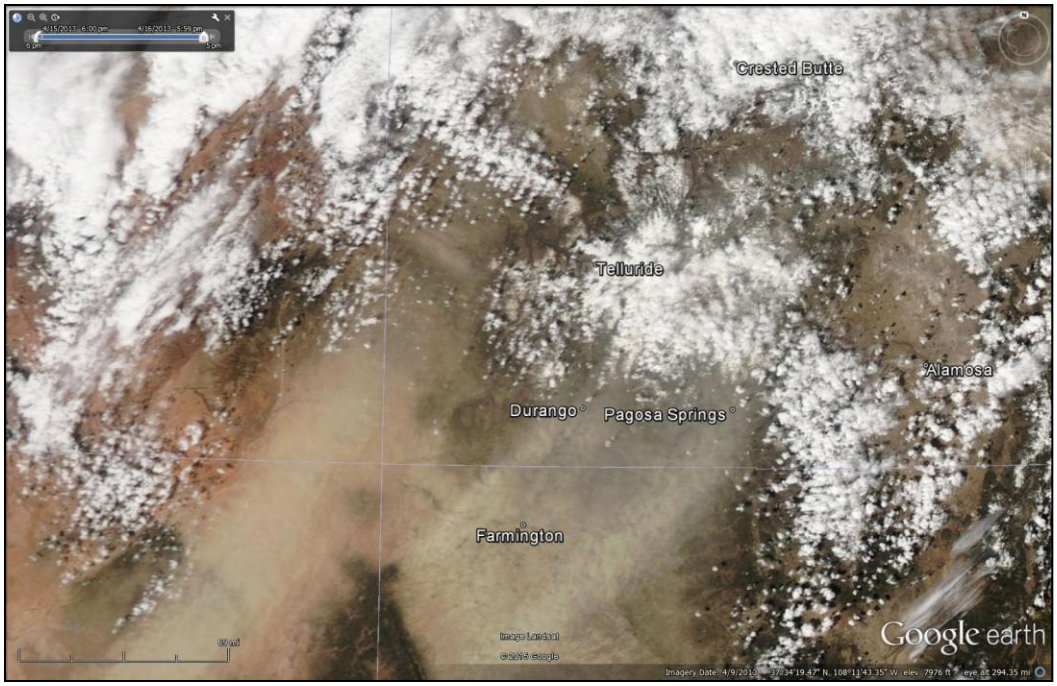

Figure 7: MODIS Aqua satellite image at approximately 1:55 PM MST (2055Z) April 16, 2013.
(Source: http://ge.ssec.wisc.edu/modis-today/index.php)

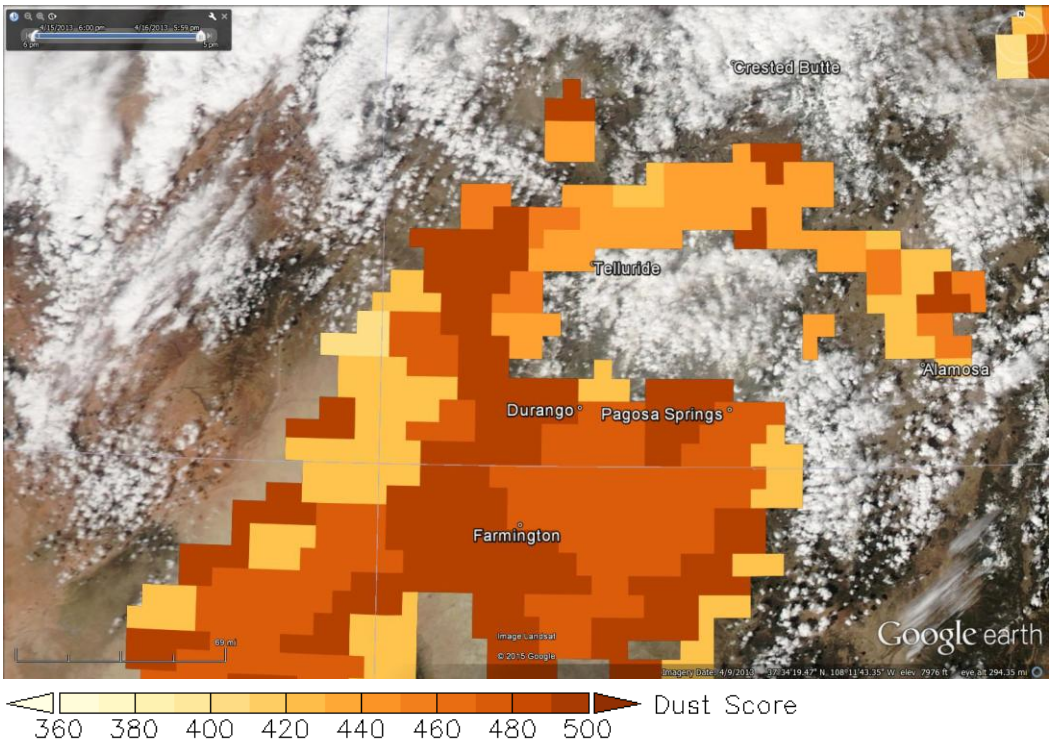

Figure 8: AIRS Dust Score from the MODIS Aqua satellite image at approximately 1:55 PM MST (2055Z) April 16, 2013.
(Source: http://www.earthdata.nasa.gov/labs/worldview)

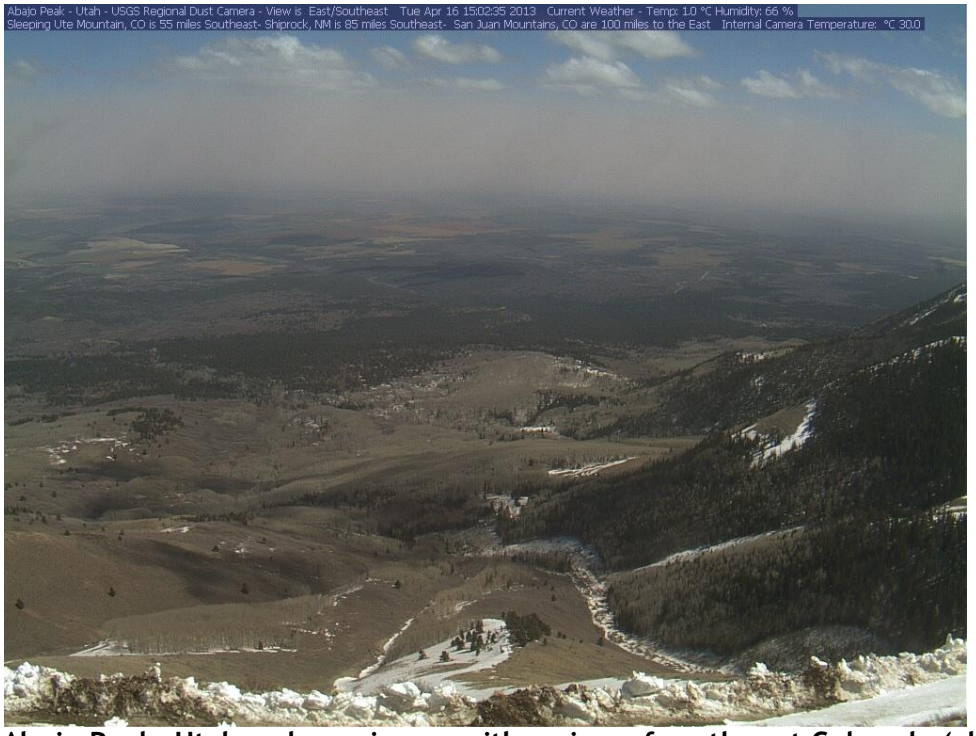

Figure 9: Abajo Peak, Utah webcam image with a view of southwest Colorado (about 50 miles to the east-southeast of the webcam) at 3:02 PM MST April 16, 2013. (Source: http://esp.cr.usgs.gov/projects/regional_cams/abajo_peak_cam.html)

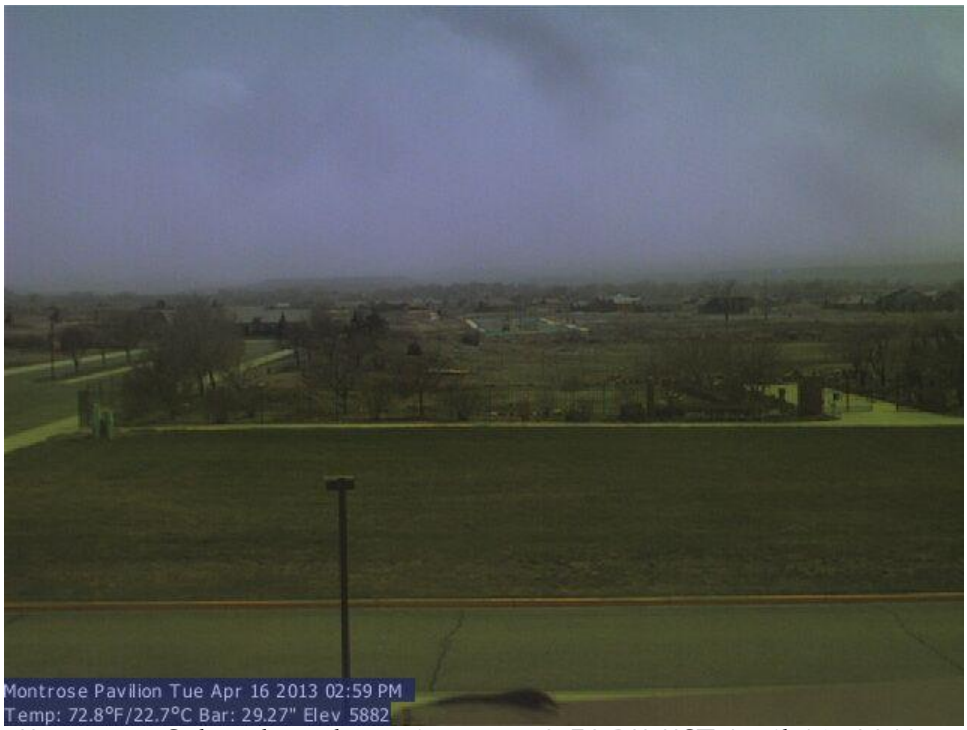

Figure 10: Montrose, Colorado webcam image at 2:59 PM MST April 16, 2013. (Source: http://apps.cityofmontrose.org/webcam/citycams.php?image=pavilion)

Figure 11: Pagosa Springs, Colorado webcam image at 2:00 PM MST April 16, 2013. (Source: http://www.airportview.net/wx/usa/co/kpso/avjet/camera4/viewer.php)

Figure 12: Alamosa, Colorado webcam image during the evening hours (exact time unknown) of April 16, 2013. (Source: http://www.wunderground.com/webcams/NEalamosa/1/show.html?year=2013&month=04&time=evening)

The synoptic weather conditions described above impacted a region that was in the midst of a moderate to severe drought (Figure 13). Sustained drought conditions are known to make topsoil susceptible to high winds and produce blowing dust (see the following link from the National Climatic Data Center for more information: https://www.ncdc.noaa.gov/paleo/drought/drght_history.html). Figure 14 shows the total precipitation in inches from March 17, 2013 to April 15, 2013 for the Four Corners region of Colorado, Arizona, New Mexico and Utah. Based on previous research 0.5 to 0.6 inches of precipitation over a 30-day period has been found to be the approximate threshold, below which, blowing dust exceedances are more likely to occur in Colorado when combined with high winds (see the Lamar Blowing Dust Climatology, Grand Junction Blowing Dust Climatology, and the April 3, 2009 Pagosa Springs Exceptional Event at http://www.colorado.gov/airquality/tech_doc_repository.aspx). Figure 14 clearly shows that the vast majority of the Four Corners region received less than 0.5 inches of precipitation during the 30-day period leading up to the April 16 dust event. The MODIS satellite imagery in Figure 7 and Figure 8 have already established northeast Arizona and northwest New Mexico as the likely source region for the blowing dust in south-central and southwest Colorado. This collection of data provides further evidence of a regional blowing dust event.

The U.S. Drought Monitor and 30-day precipitation totals indicate that soils in the Four Corners region were dry enough to produce blowing dust when winds were at or above the thresholds for blowing dust. This information, combined with other evidence provided in this report, proves that this dust storm was a natural, regional event that was not reasonably controllable or preventable.

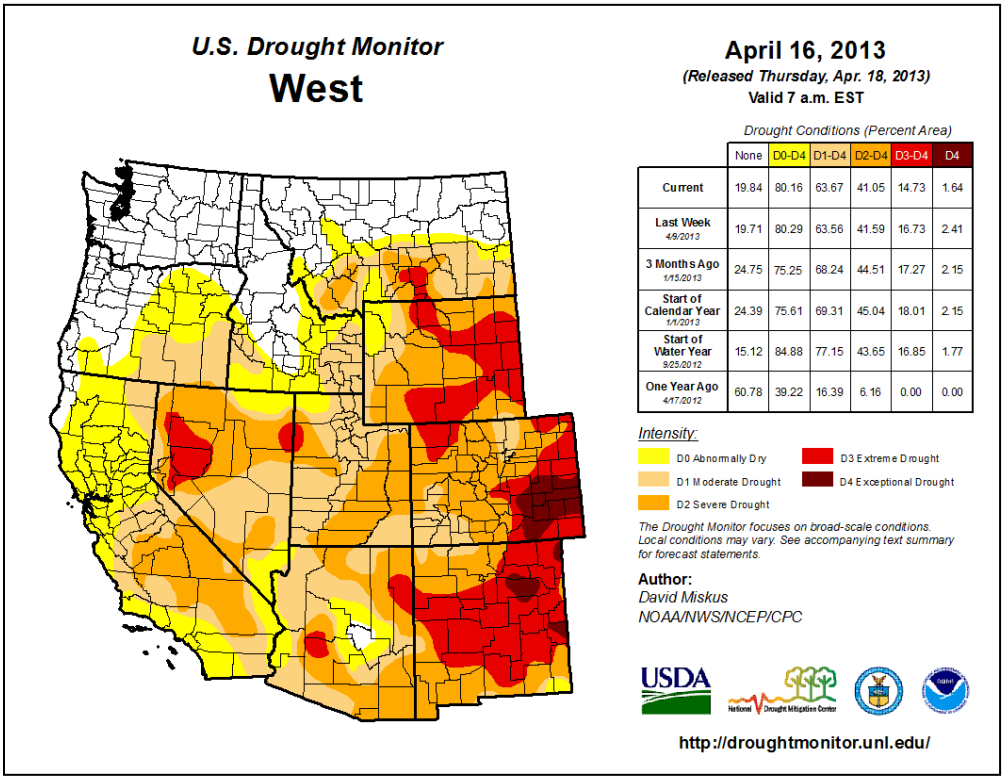

Figure 13: Drought conditions for the western United States at 5:00 AM MST April 16, 2013.
(Source: http://droughtmonitor.unl.edu/MapsAndData/MapArchive.aspx)

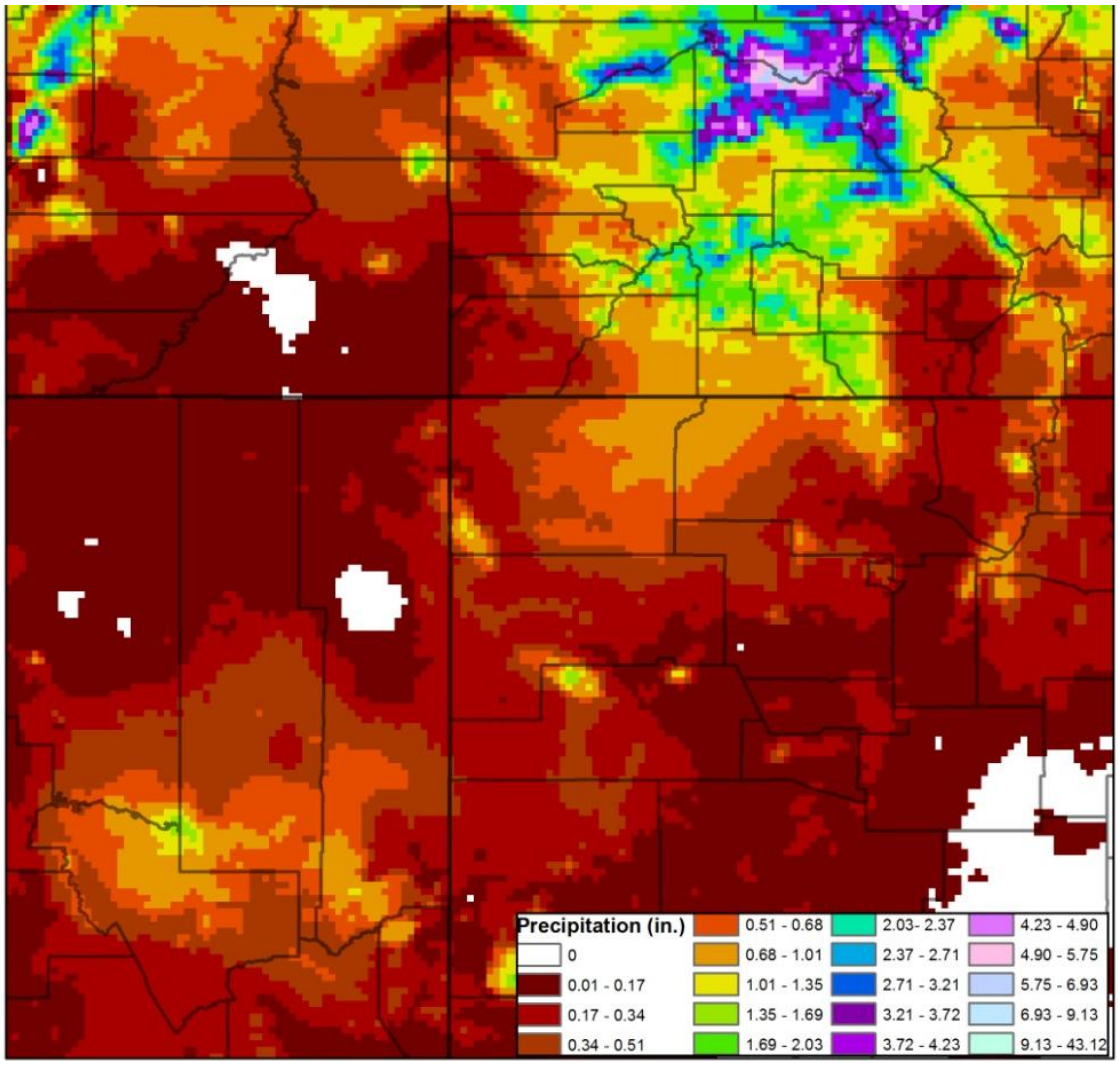

Figure 14: Total precipitation in inches for the Four Corners region, March 17, 2013 – April 15, 2013.
(Source: http://prism.nacse.org/recent/)

3.0 Evidence - Ambient Air Monitoring Data and Statistics

On April 16, 2013, a strong upper-level trough combined with an intensifying surface low pressure system and strong cold front moved across Colorado. During this interval PM_{10} sample values greater than 150 $\mu g/m^3$ were taken at multiple sites across southwestern Colorado. Samples in excess of 150 $\mu g/m^3$ were recorded at Alamosa - Adams State College (Alamosa ASC, 237 $\mu g/m^3$), Pagosa Springs (Pagosa, 295 $\mu g/m^3$), Mt. Crested Butte (187 $\mu g/m^3$), Durango, River City Hall (Durango, 419 $\mu g/m^3$) and Telluride (265 $\mu g/m^3$). Additionally, an exceptionally high sample (greater than the 99th percentile for the site) was recorded at the PM_{10} monitor at Crested Butte (140 $\mu g/m^3$). The high values were the consequence of strong southwesterly pre-frontal winds beginning early on April 16 and extending through much of the day in combination with dry conditions which caused significant blowing dust across much of Arizona, northwest New Mexico, and southwest Colorado.

3.1 Historical Fluctuations of PM_{10} Concentrations Alamosa, Pagosa Springs, Crested Butte, Durango and Telluride

This evaluation of PM_{10} monitoring data for sites affected by the April 16, 2013 event was made using valid samples from PM_{10} samplers in Alamosa, Pagosa Springs, Crested Butte, Durango, and Telluride from 2008 through available samples in 2013. APCD has been monitoring PM_{10} concentrations in these areas since 1985. Data in this analysis for sites affected by the event are from January 2008 through (generally) June of 2013. The overall data summary for the affected sites is presented in Table 7, with all data values being presented in $\mu g/m^3$:

Table 7: April 16, 2013, Event Data Summary

	Alamosa ASC	*Pagosa Springs*	Crested Butte	*Mt. Crested Butte*	*Durango*	*Telluride*
4/16/2013	**237**	**295**	**140**	**187**	**419**	**265**
Mean	24.1	23.7	24.6	16.5	21.5	18.3
Median	19	20	21	14	17	14
Mode	17	16	10	9	18	11
St. Dev.	27.1	21.2	17.3	12.3	26.2	22.5
Variance	735.9	450.6	299.7	150.8	688.4	508.1
Minimum	1	2	5	1	3	1
Maximum	440	349	174	187	419	354
Count	1775	1846	650	1926	632	626

Table 7 demonstrates that the spatial scope of this event, addressed elsewhere in this document, was broad and had an impact on PM_{10} concentrations at multiple sites covering an extensive geographical area. A snapshot summary of data from all sites affected by the event is presented in Figure 8.

Table 8, along with the approximate percentile value that data point represents for each site for their unique historical data sets, for the month of the event (every sample in any April), and for the year of the event. All percentile calculations presented in this section were made using the entire dataset, including known high wind events. There is no difference between

the two datasets (with and without high wind events) in regards to percentile calculations. Percentile calculations for all sites affected by the event are presented in Figure 8.

Table 8: Site Percentile (All Affected Sites)

	Alamosa ASC	*Pagosa Springs*	Crested Butte	*Mt. Crested Butte*	*Durango*	*Telluride*
4/16/2013	**237**	**295**	**140**	**187**	**419**	**265**
Overall	99.6%	99.9%	99.8%	Max Value	Max Value	99.8%
All April	98.3%	99.4%	98.2%	Max Value	Max Value	98.2%
2013	Max Value	Max Value	Max Value	Max Value	Max Value	Max Value

The samples at Alamosa ASC, Pagosa Springs, Mt. Crested Butte, Durango and Telluride are exceptional within their own datasets for any evaluation criteria. The overall magnitude and broad geographical extent of affected sites suggests that there was a common contribution to each sample from non-local sources.

Those data sets for sites with samples for which exclusion is being requested are further summarized by month. As with previous submittals, these summaries demonstrate the data presents no obvious 'season'; PM_{10} levels at any particular site in Colorado do not necessarily fluctuate by season. Of greater importance affecting day-to-day, typical PM_{10} concentrations are local sources, e.g. road sanding and sweeping, local burning from agriculture and residential heating, vehicle contributions via road dust, unpaved lots or roads, etc. While the historic monthly mean values for the affected sites can be higher during the winter and spring months there is little month-to-month variation. Additionally, some of the sites exhibit monthly medians over these periods (winter and early spring) that are generally lower than other months of the year. This time frame (winter and early spring) is most likely to experience the regional meteorological and dry soil conditions necessary for this type of event and is discussed elsewhere in this document. Although the maximum values for these months (winter and early spring) are the highest in the data set the 'typical' data (i.e. day-to-day, reflective of local conditions) are similar or lower than the same 'typical' data for the rest of the year. The summary data for the month of April (all samples in any April from 2008 - 2013) and for 2013 for all affected sites are presented in Table 9.

Table 9: PM_{10} Evaluation by Month and Year

	Alamosa ASC		***Pagosa Springs***		**Crested Butte**		***Mt. Crested Butte***		***Durango***		***Telluride***	
	April	2013	April	2013	April	2013	April	2013	April	2013	April	2013
Mean	34.1	30.2	34.8	27.9	30.8	21.7	21.3	16	42	25.6	21.5	21.4
Median	19	21	23	21	23	18	16	13	18.5	18	18.5	15
Mode	16	10	23	13	12	7	12	12	13	18	14	11
St. Dev.	51.0	36.2	46.2	36.6	30.7	20.5	23.6	15.6	74.5	56.0	57.1	36.0
Variance	2599	1309	2133	1337	942	418	559	242	5548	3132	3262	1299
Minimum	1	4	2	3	6	6	1	4	6	5	3	3
Maximum	389	237	349	295	174	140	187	187	419	419	354	265
Count	174	141	169	157	57	51	168	155	58	52	58	51

3.1.1 Alamosa ASC – 080030001

The PM_{10} sample on April 16, 2013, at Alamosa ASC of 237 µg/m^3 is the fourth largest sample recorded among all April samples, is the maximum value for all 2013 data, and is the eighth largest sample value for the entire dataset. All seven samples greater than the event sample are associated with a high wind event. There are 1,775 samples in this dataset. The sample of April 16 clearly exceeds the typical sample value for this site.

Figure 15 and Figure 16 graphically characterize the Alamosa ASC PM_{10} data and demonstrate the extent to which the event sample is exceptional. **Figure 15** is a simple time series; both samples in this dataset (2008 – 2013) greater than 150 µg/m^3 are identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 1,775 samples in this data set less than 1% are greater than 100 µg/m^3.

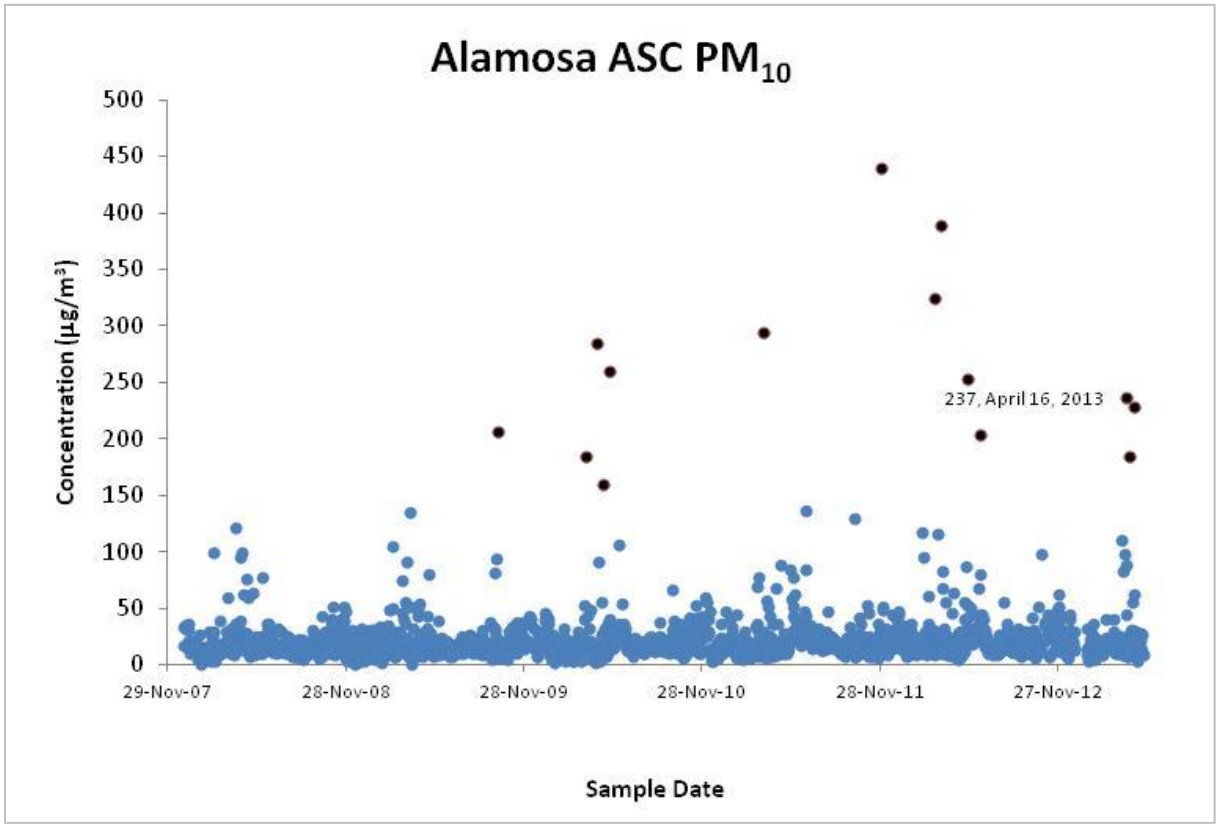

Figure 15: Alamosa ASC PM_{10} Time Series, 2008 - 2013

The monthly box-whisker plot in Figure 16 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 16, 2013. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

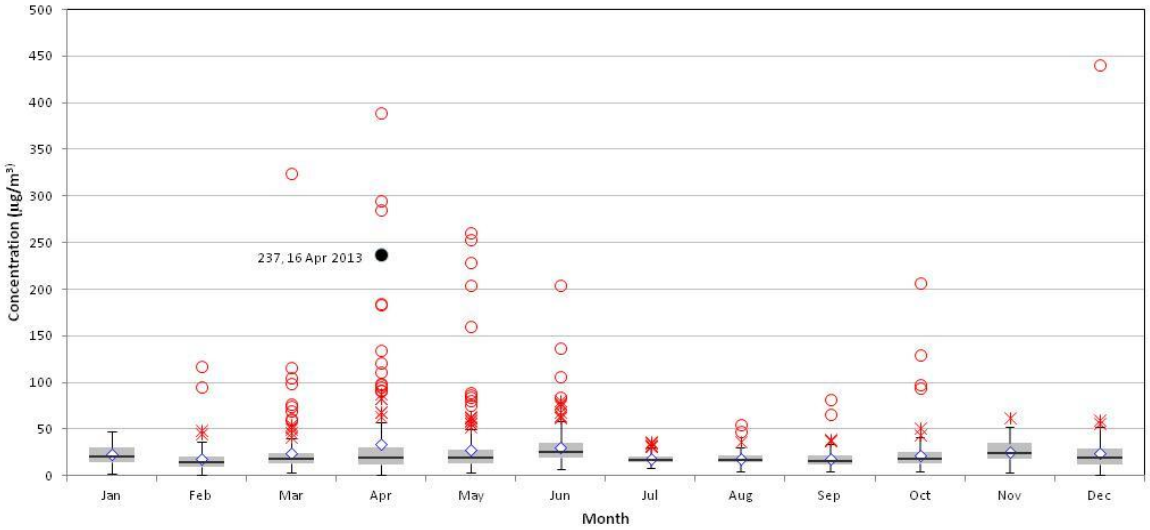

Figure 16: Alamosa ASC PM_{10} Box-Whisker Plot, 2008 - 2013

The box-whisper plots graphically represent the overall distribution of each data set including the mean (◊), the inner quartile range (IQR, defined to be the distance between the 75th% and 25th%), the median (represented by the horizontal black line) and two types of outliers identifed in these plots: outliers greater than 75th% +1.5*IQR (✳)and outliers greater than 75th% + 3*IQR (○). The outliers that satisfy the last criteria and are greater than 150 µg/m^3 are labeled with sample value and sample date. Each of these outliers is associated with a known high-wind event similar to that of April 16, 2013.

Note the degree to which the data in early spring spring, including April, are skewed. The April mean (34.1 µg/m^3) is greater than the April 75th percentile value (19 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. The sample of April 16, 2013, clearly exceeds the typical data at this site.

3.1.2 Pagosa Springs – 080070001

The PM_{10} sample on April 16, 2013, at Pagosa Springs of 295 µg/m^3 is the second largest sample recorded among all April samples, is the maximum value for all 2013 data, and is the second largest sample value for the entire dataset. The one sample greater than the event sample is associated with a high wind event. There are 1,846 samples in this dataset. The sample of April 16 clearly exceeds the typical samples for this site.

Error! **Reference source not found.**Figure 17 and Figure 18 graphically characterize the Pagosa Springs PM_{10} data and demonstrate the extent to which the event sample is exceptional. Error! **Reference source not found.**Figure 17 is a simple time series; all samples in this dataset (2008 – 2013) greater than 150 µg/m^3 are identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 1,846 samples in this data set less than 1% are greater than 100 µg/m3.

Error! Reference source not found.**Figure 17: Pagosa Springs PM_{10} Time Series, 2008 - 2013**

The monthly box-whisker plot in Figure 18 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 16, 2013. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

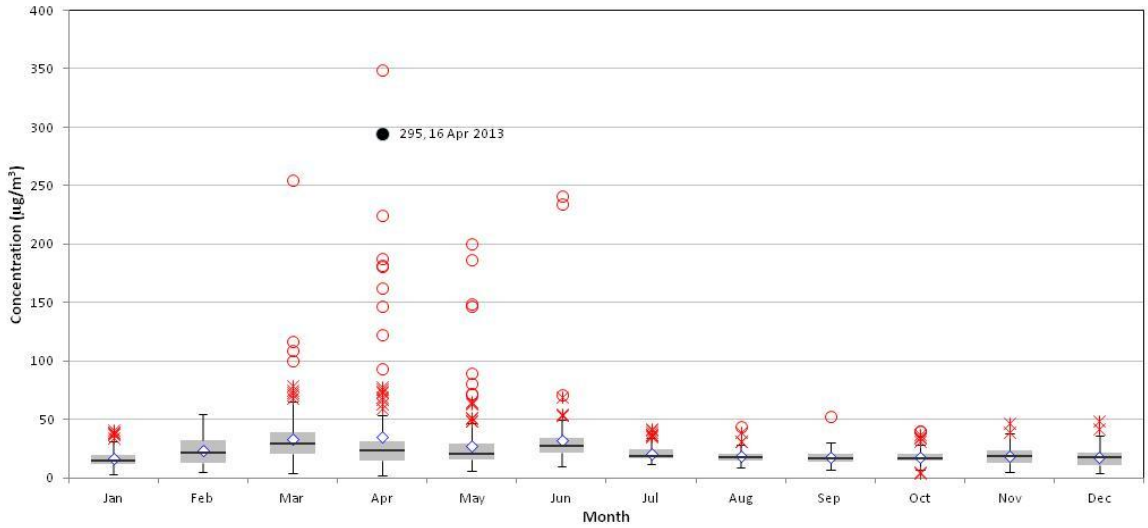

Figure 18: Pagosa Springs PM_{10} Box-Whisker Plot, 2008 - 2013

Note the degree to which the data in early spring spring, including April, are skewed. The April mean (34.8 µg/m^3) is nearly greater than the April 80th percentile value (35 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. The sample of April 16, 2013, clearly exceeds the typical data at this site.

3.1.3 Mt. Crested Butte – 080510007

The PM_{10} sample on April 16, 2013, at Mt. Crested Butte of 187 µg/m^3 is the largest sample recorded among all April samples, is the maximum value for all 2013 data, and is the largest sample value for the entire dataset. There are 1,926 samples in this dataset. The sample of April 16 clearly exceeds the typical samples for this site.

Figure 19 and Figure 20 graphically characterize the Mt. Crested Butte PM_{10} data and demonstrate the extent to which the event sample is exceptional. Figure 19 is a simple time series; all samples in this dataset (2008 – 2013) greater than 150 µg/m^3 are identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 1,926 samples in this data set less than 1% are greater than 100 µg/m^3.

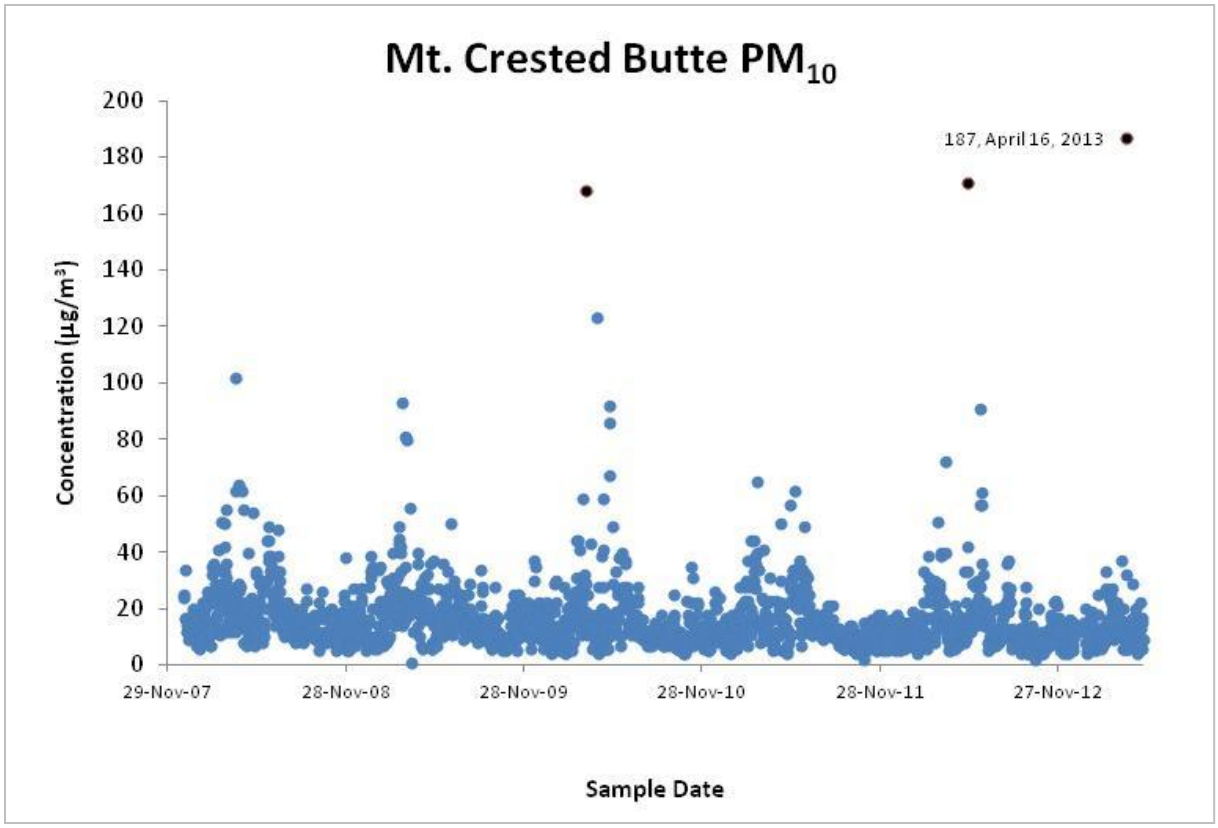

Figure 19: Mt. Crested Butte PM_{10} Time Series, 2008 - 2013

The monthly box-whisker plot in Figure 20 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 16, 2013. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

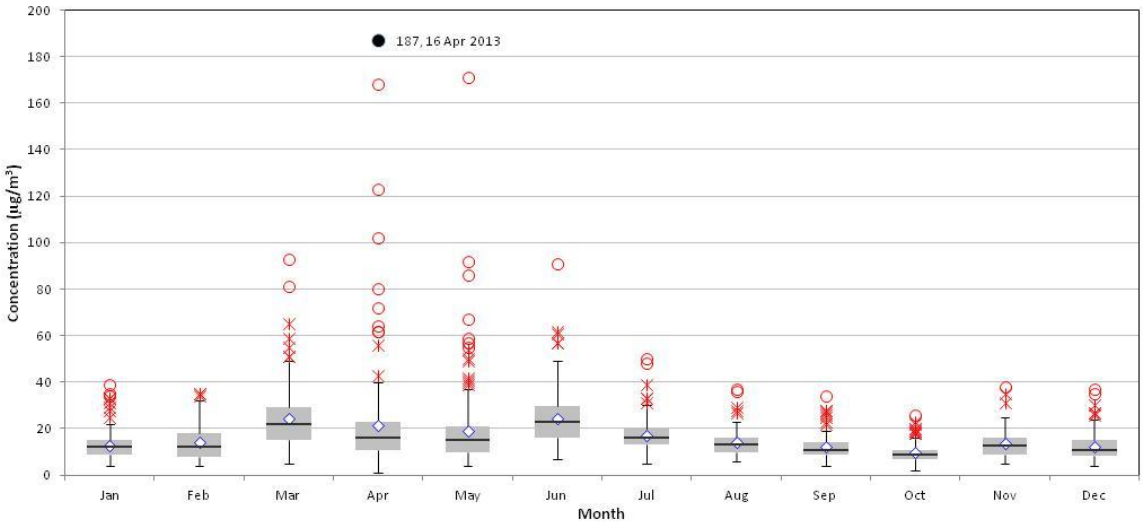

Figure 20: Mt. Crested Butte PM_{10} Box-Whisker Plot, 2008 - 2013

Note the degree to which the data in early spring spring, including April, are skewed. The April mean (30.8 µg/m^3) is greater than the April 85th percentile value (28 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. The sample of April 16, 2013, clearly exceeds the typical data at this site.

3.1.4 Durango – 080670004

The PM_{10} sample on April 16, 2013, at Durango of 419 µg/m^3 is the largest sample recorded among all April samples, is the maximum value for all 2013 data, and is the largest sample value for the entire dataset. There are 632 samples in this dataset. The sample of April 16, 2013, clearly exceeds the typical data at this site.

Figure 21 and Figure 22 graphically characterize the Durango PM_{10} data and demonstrate the extent to which the event sample is exceptional. Figure 21 is a simple time series; all samples in this dataset (2008 – 2013) greater than 150 µg/m^3 are identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3. Of the 632 samples in this data set less than 1% are greater than 100 µg/m^3.

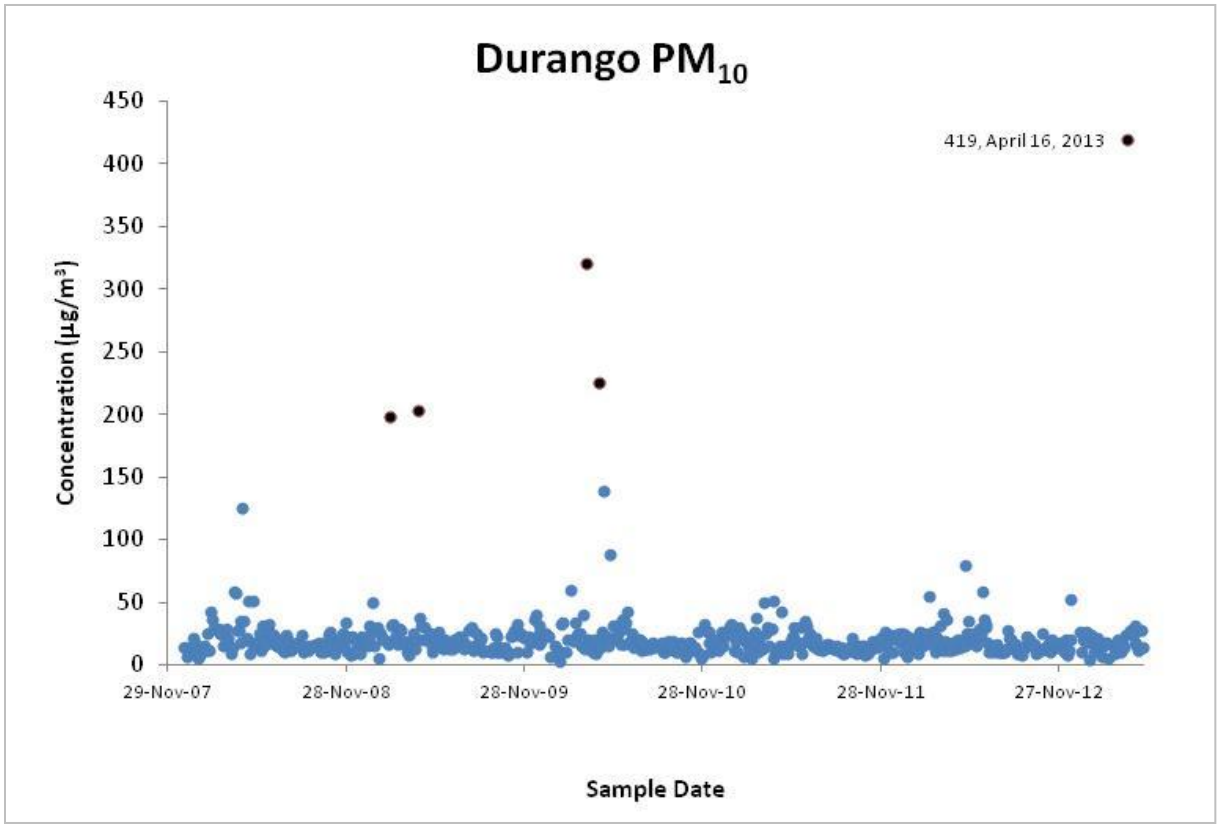

Figure 21: Durango PM_{10} Time Series, 2008 - 2013

The monthly box-whisker plot in Figure 22 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 16, 2013. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

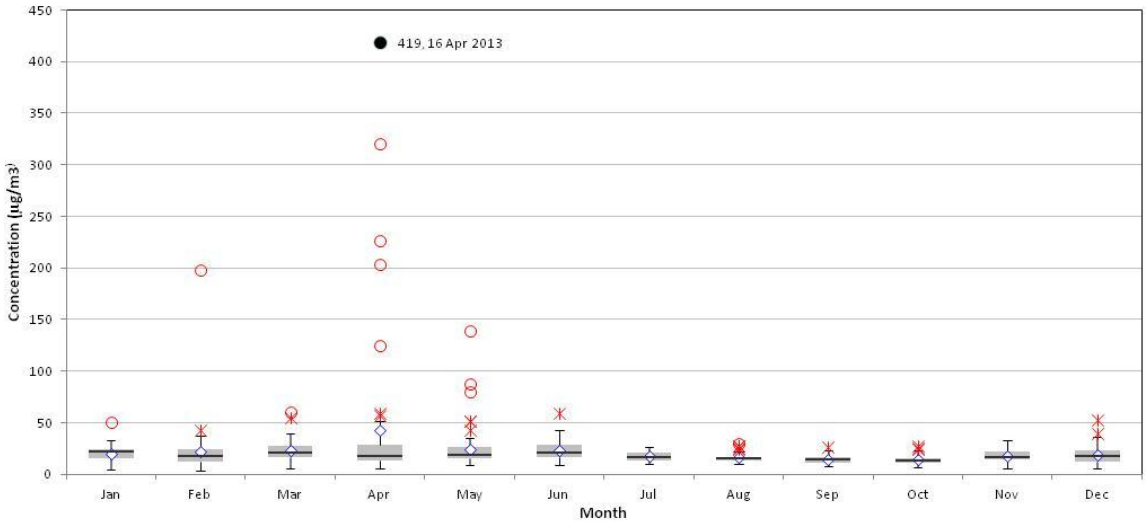

Figure 22: Durango PM_{10} Box-Whisker Plot, 2008 - 2013

Note the degree to which the data in early spring spring, including April, are skewed. The April mean (42 µg/m^3) is only slightly more than the April 85th percentile value (40 µg/m^3). This is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. The sample of April 16, 2013, clearly exceeds the typical data at this site.

3.2 Clear Causal Relationship

Wind speeds around the region (Southwest Colorado, Northeast Arizona and Northwest New Mexico) increased mid morning April 16, 2013 and stayed elevated throughout the rest of the day, gusting to speeds in excess of 50 mph. **Figure 23** displays wind speed (mph) as a function of date from four widely dispersed stations throughout the region. Every one of these stations, despite being in completely disparate locations, exhibits nearly the same behavior in regards to the sustained high winds on April 16.

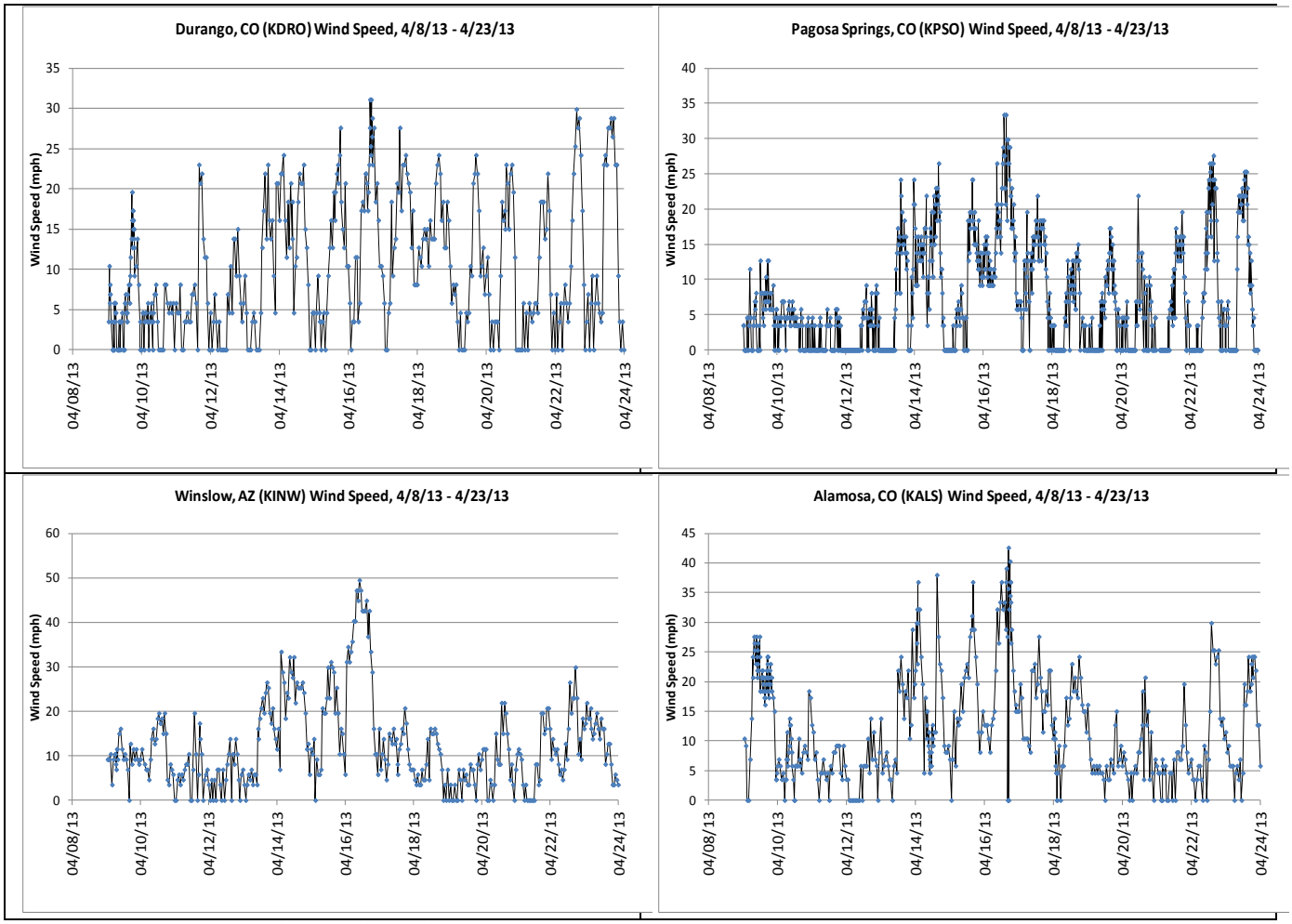

Figure 23: Wind Speed (mph) Various Stations, 04/08/2013 – 04/23/2013

Figure 24 plots PM_{10} concentrations from the affected sites in Colorado for the period for seven days prior to and following the sample(s) of April 16, 2013.

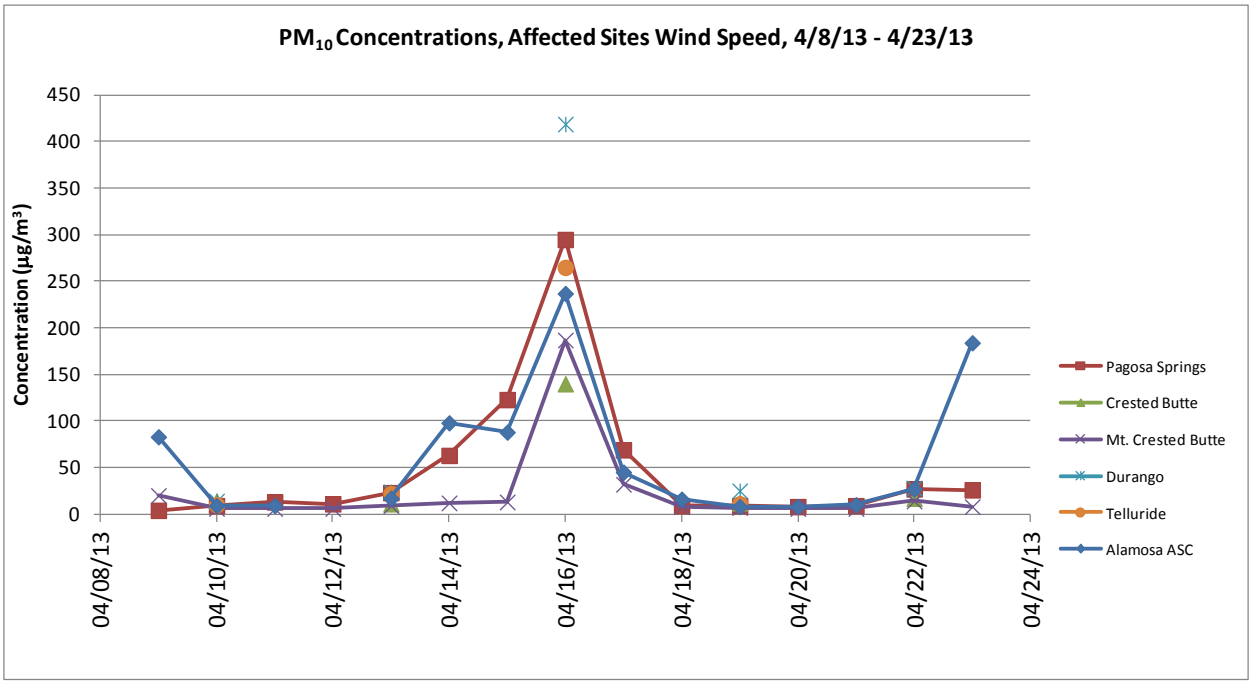

Figure 24: PM_{10} Concentrations, Affected Sites, 04/08/2013 - 04/23/2013

Figure 24 mimics the plots for wind speed, suggesting an association between the regional high winds and PM_{10} concentrations at the affected sites. Although not every sample in the region from April 16 is in excess of 150 µg/m^3 the elevated concentrations are clearly associated with the elevated wind speeds. Given the spatial dislocation of the sites (meteorological and PM_{10}) the relationship between the two data sets would suggest that the regional high winds had an effect on PM_{10} samples across a broad spatial region in Colorado.

3.3 No Exceedance But For the Event

Monthly percentile plots demonstrate a high degree of association between monthly median values and relatively high monthly percentile values, e.g. the r^2 value between the Telluride monthly 90th percentile value and the Telluride monthly median is 0.82. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the median increases sharply.

It is certainly the case that monthly median values are indicative of typical, day to day concentrations. Additionally, there is a range of samples that are a product of normal variation subject to typical, day to day local effects. This range may be restricted to percentile values that are well correlated with the median. For the data sets of concern in this document the percentile value that is reflective of typical, day to day variation may be the April 70th percentile value. Nearly all of the variation in the monthly 70th percentile values of these data sets can be explained by the variation in monthly medians. In contrast, a reasonable estimate of the contribution to the event from local sources for these data sets

may be the April 80th percentile values. The portion of the sample concentration remaining from these monthly percentile values would be the sample contribution due to the event.

Table 10 identifies various percentile values that are representative of the maximum contribution due to local sources from the affected sites selected from all April data. The range estimate in the 'Est. Conc. Above Typical' column is derived using the difference between the actual sample value and the 80th percentile as the minimum (reasonable) event contribution estimate and the difference between the actual sample value and the 70th percentile as the maximum (conservative) event contribution estimate. This column represents the range of estimated contribution to the April 16, 2013 sample concentrations due to the high wind event.

Table 10: Estimated Maximum Event PM_{10} Contribution – Affected Sites

Site	Event Day Concentration (mg/m^3)	April Median (mg/m^3)	April Average (mg/m^3)	April 70th % (mg/m^3)	April 80th % (mg/m^3)	Est. Conc. Above Typical (mg/m^3)
Alamosa ASC	237	19	34.1	25	38	**199 - 212**
Pagosa Springs	295	23	34.7	29	35	**260 - 266**
Mt. Crested Butte	187	16	21.3	21	25	**162 - 171**
Durango	419	18	42.3	28	36	**393 - 391**

Clearly, there would have been no exceedance but for the additional contribution to the PM_{10} samples provided by the event.

4.0 News and Credible Evidence

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Southwestern dust found in snow across Colorado

Author: Associated Press

POSTED: 11:30 AM MDT Apr 19, 2013

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KTVI via CNN

DENVER - Dust blown in from the Southwest settled on snow through much of Colorado during this week's storm and will eventually affect how fast the snowpack melts.

Researchers say it fell in Steamboat Springs, Fort Collins, Summit County, and the San Juan mountains. It was also seen in the Denver area.

Chris Landry of the Center for Snow and Avalanche Studies has been surveying the conditions for water providers. He said Friday that if more clean snow keeps falling, the impact of the dust will be delayed. However, he said once this week's snow layer and another deeper layer of dust from an April 8 storm are exposed, the snowmelt will accelerate because the dust absorbs sunlight.

http://www.denverpost.com/breakingnews/ci_23057359/good-news-deep-snow-colorado-foiled-by-dust?source=rss

Good news of deep snow in Colorado foiled by dust that will speed melt

Updated: 04/18/2013 11:54:11 PM MDT

DenverPost.com

Weather Blog

Get connected to our live weather blog for more coverage of mother nature's next assault on Colorado.

The blessed snow that blanketed the high country and bolstered emaciated snowpacks this week was swirling with dirty trouble.

Little specks of Arizona, New Mexico and Utah rode in on the potentially record-setting 61-hour storm and promise to hasten snowmelt.

And then, below that fresh layer of sun-absorbing, snow-melting dust is an uncommonly dense layer from an April 8 dust storm — the sixth of the season, or "D6" — that will send the snowmelt down in surging torrents, drowning hope for a sustained release deep into summer.

"None of the dust events we had last year were comparable to the April 8 event we had this year," said Chris Landry, executive director of the Center for Snow and Avalanche Studies in Silverton, who has studied dust events and the impact on snowpack in southern Colorado for the last decade.

The state has heralded recent storms that pushed snowpacks in every basin in the state beyond last year's record-low levels, floating hope that the still-growing snowpacks could dampen the impact of the sustained drought. But the dust storms — eight so far this year and more possibly on the way — will melt this year's snow faster than last year's, thanks to what Landry described as "the latent, very acute dust effect that's now inevitable."

There is hope. More snow — as in several feet piling deep and hiding the latest dust from penetrating sunshine — could delay the deluge.

Water managers across Colorado, many of whom fund Landry's research, lament the late-season dirt. That dark layer covering even the deepest snowpack prevents the slow and steady runoff that keeps rivers rolling and reservoirs replenished.

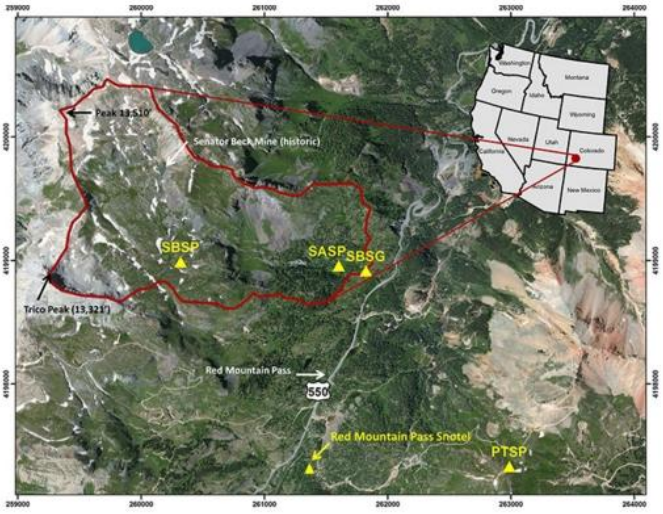
Instead, the runoff comes down at once, forcing precious water that could irrigate fields in July and float rafts in August to run through the state months early.

"Snowpack above 9,000 feet is our biggest water storage, and our best reservoir, and we want to keep water in that reservoir as long as possible," said Jim Pokrandt with the Colorado River Water Conservation District. "The worse these dust layers are, you get the snow (disappearing) quicker and that affects late-season base flows in streams. The effects are felt from high elevation down to where we use the water for irrigation."

Still, Pokrandt noted, at least "there is more snow to melt," especially in the Colorado River Basin, which saw its snow-water-equivalent climb from 72 percent of average in early February to 97 percent of average after Wednesday's storm.

CENTER FOR SNOW & AVALANCHE STUDIES

COLORADO DUST-ON-SNOW PROGRAM WY 2013 SUMMARY



SUMMARY

Water Year 2013 entered late winter with dismal snowpack development at ten of eleven CODOS dust-on-snow monitoring sites, Willow Creek Pass being the single exception. Through March 2013, snowpack SWE totals at all other sites resembled or even fell short of the very dry winter of WY 2012, raising concerns about back-to-back drought seasons. That broadly consistent spatial pattern in scant precipitation began to diverge in April, 2013. CODOS sites in the northern Front Range and Colorado River headwaters benefitted most from a series of April and May winter storms that augmented snowpacks and eventually resulted in average or even above average peak SWE levels on average or later-than-average dates. In the southwestern mountains, fewer and/or smaller April/May storms failed to offset the dry beginning to WY2013 winter. CODOS sites in the San Juan Mountains experienced, for the second year, substantially sub-par peak SWE values, on near-average dates. In between, the Central Mountains, Hoosier Pass, Park, and northern Gore ranges came closer to but still fell short of average snowpacks.

At the CSAS Senator Beck Basin Study Area at Red Mountain Pass, the primary CODOS monitoring site, WY2013 produced a total of ten separate dust-on-snow events, a lower total count than in the past three seasons. However, the actual mass of dust deposited at Senator Beck Basin in WY 2013 was greater than in any prior season, including the "Martian Winter" of WY 2009. Dust season began at Senator Beck Basin in November with a single event, February and March delivered four additional events, but the vast majority of dust deposition occurred during events D6 on April 8th and the long-duration D8 event of April 15-17. As of late March, dust layers observed at Senator Beck Basin were either weak or not present at CODOS sites farther north and east, creating some hope that WY 2013 might be dust-free in parts of the state. Then, dust events D6 and D8 spelled the end to that possibility with significant depositions statewide near the top of the snowpack.

Historical Weather For The Last Twelve Months in Telluride, Colorado, USA

Location

This report describes the historical weather record at the Telluride Regional Airport (Telluride, Colorado, United States) during the last 12 months. This station has records back to February 1987.

Telluride, Colorado has a humid continental climate with warm summers and no dry season. The area within 25 miles of this station is covered by *forests*(98%)

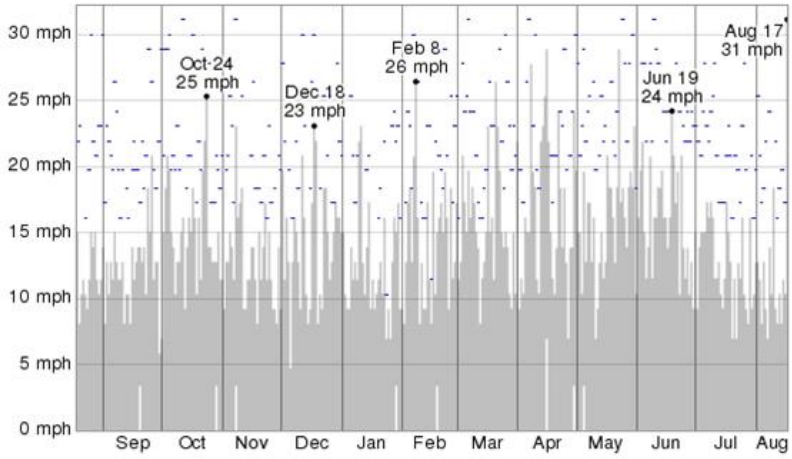
(Excerpt:)

Wind

The highest *sustained wind speed* was 31 mph, occurring on August 17; the highest *daily mean wind speed* was 17 mph (April 16); and the highest wind *gust speed* was 53 mph (April 16).

The *windiest month* was April, with an average wind speed of 7 mph. The *least windy month* wasAugust, with an average wind speed of 4 mph.

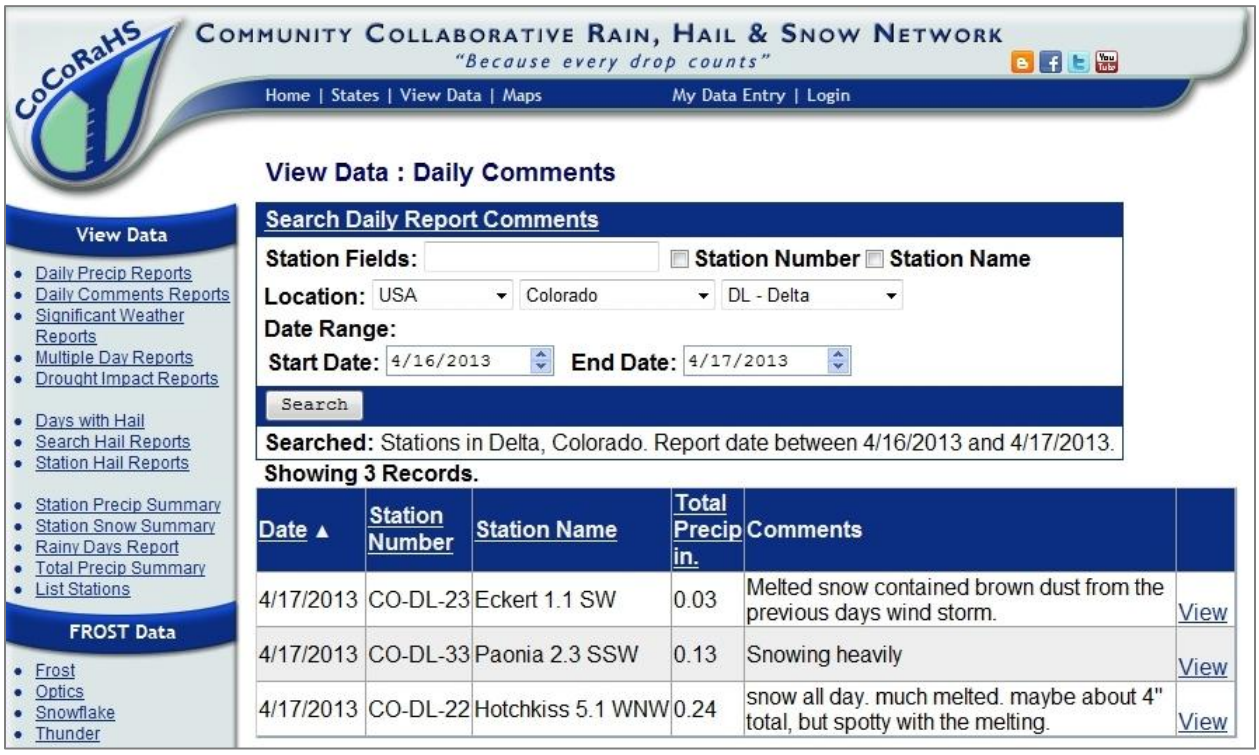
Wind Speed

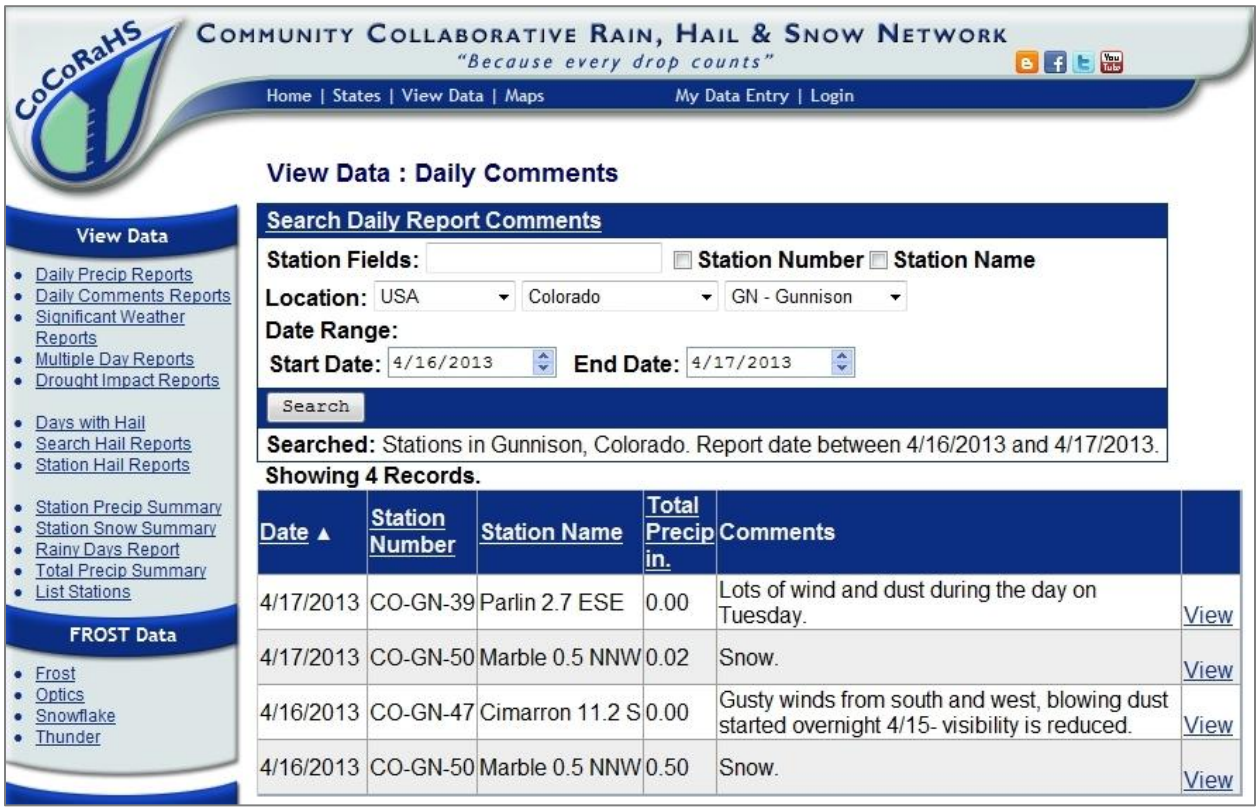


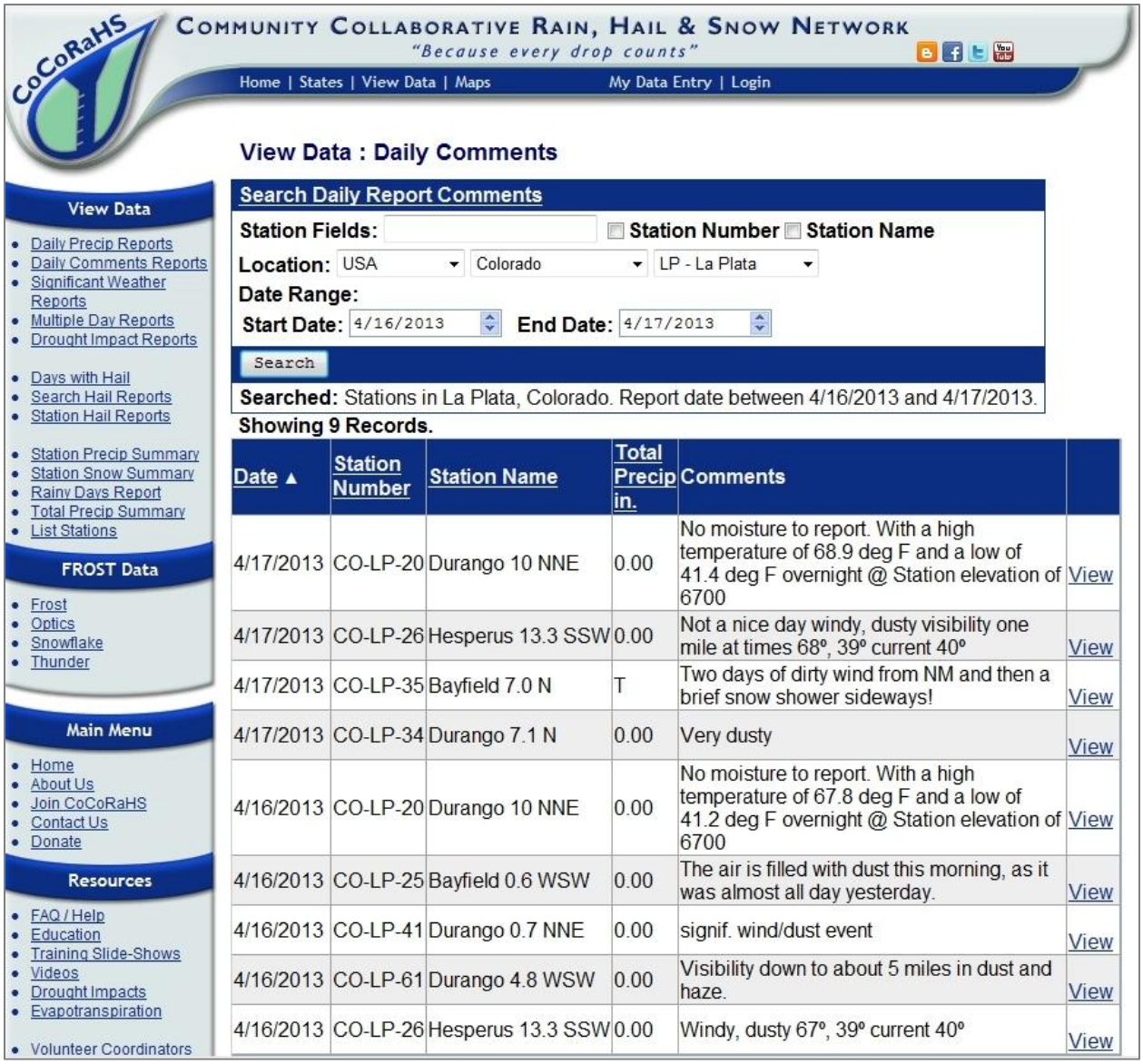
The daily low and high wind speed (light gray area) and the maximum daily wind gust speed (tiny blue dashes).

http://weatherspark.com/history/31757/2013/Telluride-Colorado-United-States

Community Collaborative Rain, Hail, & Snow Network reports (www.cocorahs.org):







COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK

"Because every drop counts"

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View Data : Daily Comments

View Data

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- Station Precip Summary
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- Thunder

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- Training Slide-Shows
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- Drought Impacts
- Evapotranspiration
- Volunteer Coordinators

Search Daily Report Comments

Station Fields: ☐ Station Number ☐ Station Name

Location: USA | Colorado | LP - La Plata

Date Range:

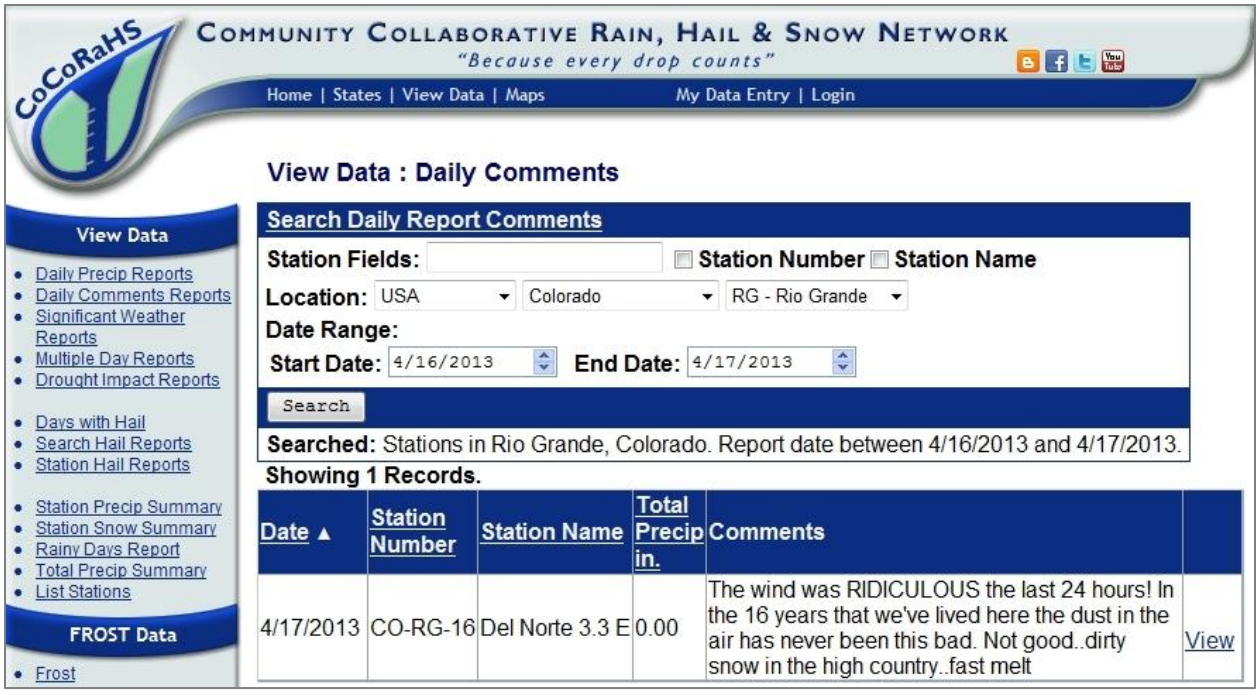
Start Date: 4/16/2013 **End Date:** 4/17/2013

Search

Searched: Stations in La Plata, Colorado. Report date between 4/16/2013 and 4/17/2013.

Showing 9 Records.

Date ▲	Station Number	Station Name	Total Precip in.	Comments	
4/17/2013	CO-LP-20	Durango 10 NNE	0.00	No moisture to report. With a high temperature of 68.9 deg F and a low of 41.4 deg F overnight @ Station elevation of 6700	View
4/17/2013	CO-LP-26	Hesperus 13.3 SSW	0.00	Not a nice day windy, dusty visibility one mile at times 68º, 39º current 40º	View
4/17/2013	CO-LP-35	Bayfield 7.0 N	T	Two days of dirty wind from NM and then a brief snow shower sideways!	View
4/17/2013	CO-LP-34	Durango 7.1 N	0.00	Very dusty	View
4/16/2013	CO-LP-20	Durango 10 NNE	0.00	No moisture to report. With a high temperature of 67.8 deg F and a low of 41.2 deg F overnight @ Station elevation of 6700	View
4/16/2013	CO-LP-25	Bayfield 0.6 WSW	0.00	The air is filled with dust this morning, as it was almost all day yesterday.	View
4/16/2013	CO-LP-41	Durango 0.7 NNE	0.00	signif. wind/dust event	View
4/16/2013	CO-LP-61	Durango 4.8 WSW	0.00	Visibility down to about 5 miles in dust and haze.	View
4/16/2013	CO-LP-26	Hesperus 13.3 SSW	0.00	Windy, dusty 67º, 39º current 40º	View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Daily Precip Reports
Daily Comments Reports
Significant Weather Reports
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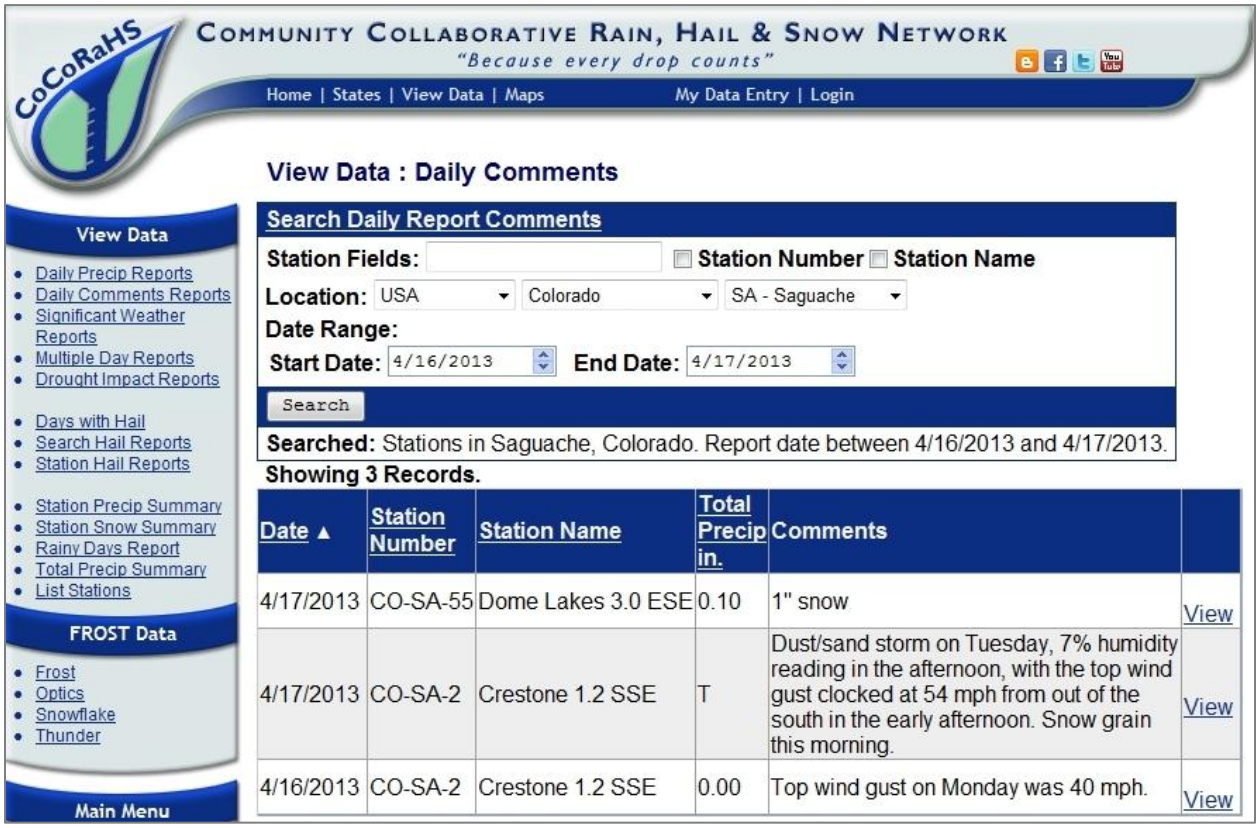
Search Hail Reports
Station Hail Reports
Station Precip Summary
Station Snow Summary
Rainy Days Report
Total Precip Summary
List Stations
FROST Data
Frost
Search Daily Report Comments
Station Fields:
Station Number
Station Name
Location: USA Colorado RG - Rio Grande
Date Range:
Start Date: 4/16/2013
End Date: 4/17/2013
Search
Searched: Stations in Rio Grande, Colorado. Report date between 4/16/2013 and 4/17/2013.
Showing 1 Records.
Date ▲
Station Number
Station Name
Total Precip in.
Comments
4/17/2013
CO-RG-16
Del Norte 3.3 E
0.00
The wind was RIDICULOUS the last 24 hours! In the 16 years that we've lived here the dust in the air has never been this bad. Not good..dirty snow in the high country..fast melt
View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Station Snow Summary
Rainy Days Report
Total Precip Summary
List Stations
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Frost
Optics
Snowflake
Thunder
Main Menu
Search Daily Report Comments
Station Fields:
Station Number
Station Name
Location: USA Colorado SA - Saguache
Date Range:
Start Date: 4/16/2013
End Date: 4/17/2013
Search
Searched: Stations in Saguache, Colorado. Report date between 4/16/2013 and 4/17/2013.
Showing 3 Records.
Date ▲
Station Number
Station Name
Total Precip in.
Comments
4/17/2013
CO-SA-55
Dome Lakes 3.0 ESE
0.10
1" snow
View
4/17/2013
CO-SA-2
Crestone 1.2 SSE
T
Dust/sand storm on Tuesday, 7% humidity reading in the afternoon, with the top wind gust clocked at 54 mph from out of the south in the early afternoon. Snow grain this morning.
View
4/16/2013
CO-SA-2
Crestone 1.2 SSE
0.00
Top wind gust on Monday was 40 mph.
View

5.0 Not Reasonably Controllable or Preventable: Local Particulate Matter Control Measures

While it is likely that some dust was generated within the local communities as gusts from the regional dust storm passed through Colorado on April 16, 2013, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to the dust transported in from surrounding area. The following sections will describe in detail the regulations and programs in place designed to control PM_{10} in the affected communities. These sections will demonstrate that the events were not reasonably controllable, as laid out in Section 50.1(j) of Title 40 CFR 50, within the context of reasonable local particulate matter control measures. As shown from the meteorological and monitoring analyses (Sections 2 and 3), the source regions for the associated dust that occurred during the April 16, 2013 event originated outside of the monitored areas.

The APCD conducted thorough analyses and outreach with local governments to confirm that no unusual anthropogenic PM_{10} producing activities occurred in these areas and that despite reasonable control measures in place, high wind conditions overwhelmed all reasonably available controls. The following subsections describe in detail Best Available Control Measures (BACM), other reasonable control measures, applicable federal, state, and local regulations, appropriate land use management, and an in-depth analysis of potential areas of local soil disturbance for each affected community during the April 16, 2013 event. This information shall confirm that no unusual anthropogenic actions occurred in the local communities on April 16, 2013.

5.1 Regulatory Measures - State

The APCDs regulations on PM_{10} emissions are summarized in Table 11.

Table 11: State Regulations Regulating Particulate Matter Emissions

Rule/Ordinance	Description
Colorado Department of Public Health and Environment Regulation 1- Emission Control For Particulate Matter, Smoke, Carbon Monoxide, And Sulfur Oxides	Applicable sections include but are not limited to: Everyone who manages a source or activity that is subject to controlling fugitive particulate emissions must employ such control measures and operating procedures through the use of all available practical methods which are technologically feasible and economically reasonable and which reduce, prevent and control emissions so as to facilitate the achievement of the maximum practical degree of air purity in every portion of the State. Section III.D.1.a) Anyone clearing or leveling of land greater than five acres in attainment areas or one acre in non-attainment areas from which fugitive particulate emissions will be emitted are required to use all available and practical methods which are technologically feasible and economically reasonable

	in order to minimize fugitive particulate emissions.(Section III.D.2.b) Control measures or operational procedures for fugitive particulate emissions to be employed may include planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques approved by the APCD. (Section III.D.2.b) Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions (Section III.D.2.a.(i))
Colorado Department of Public Health and Environment Regulation 3- Stationary Source Permitting and Air Pollutant Emission Notice Requirements	Construction Permit required if a land development project exceeds 25 acres and spans longer than 6 months in duration (Section II.D.1.j) All sources with uncontrolled actual PM_{10} emissions equal to or exceeding five (5) tons per year, must obtain a permit. The new source review provisions require all new and modified major stationary sources in non-attainment areas to apply emission control equipment that achieves the "lowest achievable emission rate" and to obtain emission offsets from other stationary sources of PM_{10}.
Colorado Department of Public Health and Environment Regulation 4- New Wood Stoves and the Use of Certain Woodburning Appliances During High Pollution Days	Regulates wood stoves, conventional fireplaces and woodburning on high pollution days. Prohibits the sale and installation a wood-burning stove in Colorado unless it has been tested, certified, and labeled for emission performance in accordance with criteria and procedures specified in the Federal Regulations and meets emission standards. (Section II) Section III regulates pellet stoves. Section IV regulates masonry heaters. Section VII limits the use of stoves on high pollution days.
Colorado Department of Public Health and Environment Regulation 6- Standards of Performance for New Stationary Sources	Implements federal standards of performance for new stationary sources including ones that have particulate matter emissions. (Section I)

Colorado Department of Public Health and Environment Regulation 9- Open Burning, Prescribed Fire, and Permitting	Prohibits open burning throughout the state unless a permit has been obtained from the appropriate air pollution control authority. In granting or denying any such permit, the authority will base its action on the potential contribution to air pollution in the area, climatic conditions on the day or days of such burning, and the authority's satisfaction that there is no practical alternate method for the disposal of the material to be burned. Among other permit conditions, the authority granting the permit may impose conditions on wind speed at the time of the burn to minimize smoke impacts on smoke-sensitive areas. (Section III)
Colorado Department of Public Health and Environment- Common Provisions Regulation	Applies to all emissions sources in Colorado When emissions generated from sources in Colorado cross the state boundary line, such emissions shall not cause the air quality standards of the receiving state to be exceeded, provided reciprocal action is taken by the receiving state. (Section II A)
Federal Motor Vehicle Emission Control Program	The federal motor vehicle emission control program has reduced PM_{10} emissions through a continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles; the PM_{10} emissions in areas will be reduced.

5.2 Alamosa

Natural Events Action Plan (NEAP)

The Final NEAP for High Wind Events in Alamosa, Colorado was completed in May 2003. The NEAP addresses public education programs, public notification and health advisory programs, and determines and implements Best Available Control Measures (BACM) for anthropogenic sources in the Alamosa area. The APCD followed up with the City and County of Alamosa in January 2007 and in the spring of 2013 on whether the NEAP mitigation measures and commitments were satisfied, the results of which are detailed below. The City of Alamosa, Alamosa County, the APCD, and participating federal agencies worked diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy.

Please refer to the Final Natural Events Action Plan for High Wind Events, Alamosa, Colorado at http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=AlamosaNaturalEventsActionPlan2003.pdf for more detail if needed.

Regulatory Measures - City and County

The APCD, the City of Alamosa, and Alamosa County are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Alamosa. Alamosa's ordinances of PM_{10} emissions are summarized in Table 12.

Table 12: Rules and Ordinances Regulating Particulate Matter Emissions in Alamosa

Rule/Ordinance	Description
City of Alamosa Code of Ordinances Article VII of Section 21-140 (5)	Addresses dust control for home occupations
City of Alamosa Code of Ordinances Article V Sec. 17-87(3))	Requires all new roads and alleys to be paved
City of Alamosa Code of Ordinances (Article VI Sec. 21-119(g)(3)).	New large commercial/retail establishments must install underground automatic irrigation systems for all landscaped areas
Alamosa County Land Use and Development Code (1.4.2)	Agriculture an important part of the economy and adds intrinsic value to life in Alamosa County. Agriculture, as a business, brings dust and other inconveniences. To maintain this way of life, Alamosa County intends to protect agricultural operators from unnecessary, intrusive litigation. Therefore, no inconvenience shall be considered a nuisance so long as it occurs as a part of non-negligent and legal agricultural practice, as stated in C.R.S. 35-3.5-101, 102 and 103.
Alamosa County Land Use and Development Code (3.5.2(A)(8))	For Feed lot, animal waste treatment, or animal waste collection facilities fugitive dust shall be confined on the property
Alamosa County Land Use and Development Code (3.5.6(D)(2))	For a proposed oil and gas well installation, any interior transportation network shall be paved, or the company shall undertake appropriate dust abatement measures
Alamosa County Land Use and Development Code (3.5.7(G))	All roads, driveways, parking lots and loading and unloading areas within 500 feet of any lot line shall be graded and paved with an approved concrete or asphalt/concrete surface as to limit adjoining lots and public roads the nuisance caused by wind-borne dust.
Alamosa County Land Use and Development Code (4.2.3(C)(2))	Where off-street facilities are provided for parking or any other vehicular use area, they shall be surfaced with asphalt bituminous, concrete or other dustless material approved by the administrator and shall be maintained in a smooth, well-graded condition.

City of Alamosa's Control Measures

The City of Alamosa has been active in addressing potential PM_{10} sources within the Alamosa area through various efforts. Some of these efforts, plus other potential future measures, include the adoption of local ordinances to reduce PM_{10}. Copies of current ordinances and any related commitments are included in the Final NEAP (See http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=AlamosaNaturalEventsActionPlan2003.pdf). According to the City's Public Works Director, in 2013, the City is planning on adding additional dust control best management practices to the International Building Codes that are adopted by the city in the next update. The best management practices will include requiring a Dust Control Plan for any site that is issued a clearing permit for any site over 2 acres. In 2013 the City was also working on revising part of their landscaping ordinances to require mulch in areas that are not vegetated or covered by rock to help mitigate fugitive particulate emissions. These efforts have been stalled in the past due to employee turnover at City Manager's Office.

Street Sweeping
The City of Alamosa sweeps on an every 4-week schedule or as needed, as determined by local officials on a case by case situation (e.g., following each snowstorm and/or where sand was applied). Sweeping occurs on every single City street with an emphasis on the downtown corridor where public exposure is expected to be greatest. As of spring 2013, street sweeping in the downtown corridor takes place twice per week according to the City's Public Works Director.

According to the City's Public Works Director in 2013, the city owns an Elgin Pelican (mobile mechanical sweeper) and a Tymko 600 (brush-assisted head) street sweeper. In June 2013, the City also acquired a new Elgin Broom Badger street sweeper and the Tymko 600 was sent in for a re-build. The new Elgin Broom Badger street sweeper can be used in the winter months when the Tymko cannot due to freezing of the water delivery system.

Unpaved Roads within the City
The City of Alamosa (as of 2008) requires all new roads and alleys to be paved according to the Municipal Code (Article V Sec. 17-87(3)) and some existing unpaved roads are being treated with dust suppressants until all underground utilities are installed. No new development is allowed until paving is complete unless a performance bond is in place.

According to the City's Public Works Director, in 2013, less than 3% of City roads were unpaved; most of these unpaved roads are legacy annexations. One of these unpaved roads was scheduled for paving in 2013. The remaining unpaved roads are all low traffic (less than 100 ADT) and the City continues to seek funding sources for paving these streets.

Sod/Vegetative Cover Projects in the City of Alamosa
In 2008, the City of Alamosa placed vegetative cover in all city parks and has installed irrigation systems to maintain the cover. In 2013, the City began emphasizing more low-water use landscaping with shrubs, mulch, etc. including both organic and rock. All turf areas do have irrigation systems which utilize drip systems for specimen plantings.

Alamosa County's Control Measures

Alamosa County has also been active in addressing blowing dust as detailed below.

Unpaved Roads
Alamosa County continues to address unpaved roads and lanes that are anticipated to contribute to PM_{10} emissions in the community. In 2002, Alamosa County was nearing the end of its five-year road paving plan and was developing their next plan with the intention of paving on a yearly basis, based on traffic, community needs/priorities, and funding availability.

In 2002, Alamosa County addressed approximately ten (10) miles of unpaved roads. This included the stabilization of approximately five section roads, the seal coating of two roads, and the overlay (repaving) of four (4) additional roads.

In 2003, approximately 14 miles of roads were paved. This includes the Seven Mile Road (three miles long), Road 109 (one mile long), and 10^{th} Street (also one mile long). These roads are in close proximity to the City of Alamosa, are upwind (prevailing) from the city, and have heavy traffic. Paving is anticipated to greatly reduce blowing dust and impacts in the vicinity.

No paving projects took place between 2004 and 2010 due to lack of funding. Between 2010 and 2013, the County was able to get funding but only for maintenance paving on previously paved roads that needed repair. Now that the county is caught up on maintenance paving, it is focusing on paving the remaining unpaved roads. The County's goal is to pave about 2.5 miles of unpaved road per year depending on funding availability.

In 2013, Alamosa County had funding to pave approximately 2.5 miles of County Road 106 North (located north of Alamosa off of Highway 17) which is currently unpaved. After this paving project the County will only have 2.5 miles of unpaved road remaining on the 106 North which is anticipated to be paved in the summer of 2014.

In the summer time the County regularly hauls water and wets down the unpaved roads (mostly gravel, clay and sand) to reduce the fugitive particulate emissions. The County wets the unpaved roads on an as needed basis based on weather conditions and traffic volume. In addition, in the winter, the County wets down some of the more sandy roads. Once the water soaks in and freezes, good dust suppression is seen. Road construction areas are being dampened with water for dust control. These practices reduce PM_{10} emissions in and near Alamosa. This control measure is balanced with the availability of water in the area.

Alamosa County used to assess the need to use $MgC1_2$ treatment on roads in front of residences that request such service. This practice stopped in 2004 when funding was lost. Assessments included the sensitivity to dust of residents, the materials of the road base for safety reasons, and possible environmental concerns of the neighborhood. Most requests for treatment were granted. Other areas for treatment, such as commercial construction zones or gravel pits, were investigated on a case by case basis. The County hopes to be able to start offering this service again when funding is restored.

Dust Control Plans
Alamosa County requires dust control plans for selected construction/developments. The dust control plans are typically done through a negotiated agreement by the Alamosa Land Use Department and is supported by zoning codes.

The County may update the Comprehensive Plan to include a dust control plan. The Land Use Administrator is researching the potential for a dust control ordinance. This effort is anticipated to reduce PM_{10} emissions in Alamosa, especially as it relates to impacts on the community and high recorded PM_{10} values. At the time of this submittal, this effort is still underway.

Wind Erosion of Open Areas

To reduce PM_{10} emissions from open areas outside of the City limits, low tilling and other soil conservation practices continue to be utilized in the community. The Mosca-Hooper Conservation District and Natural Resources Conservation Service is working on education efforts to promote cover crops and no-till agriculture. In addition, the community is strategically using the Colorado State Forest Service's program to purchase and plant shelter trees to reduce wind erosion in open areas. Nursery seedlings from the program have been sold in Alamosa County since 1956. The number of seedlings sold has varied over the last few years as illustrated in Table 13.

Table 13: Number of Seedlings Sold in Alamosa per Year.

Year	2008	2009	2010	2011	2012	2013
Seedlings Sold:	7,432	5,963	2,805	4,197	3,327	4,231

These trees have a demonstrated advantage for the community and for air quality. Once the trees reach maturity, it is anticipated that the equivalent of 112 miles of double-rowed trees will be in place. The survival rate of the tree seedlings varies but according to the District Coordinator for the Seedling Tree Program, potted seedlings have about a 60% to 80% survival rate and the bare root seedlings have about a 40% to 60% survival rate. The Seedling Program recommends Siberian elm and Rocky Mountain juniper trees for low maintenance, drought resistance windbreaks in the valley, but offers over 40 varieties to suit specific site conditions. The Colorado State Forest Service and the Mosca-Hooper Conservation District promote the windbreak program through workshops and consulting landowners.

In addition, there is ongoing planting of trees (approximately 50) on newly developed Alamosa County property south/southwest of Alamosa (prevailing winds from southwest) and the Airport south of Alamosa for added air quality improvement. Also, The Bureau of Reclamation has an ongoing project to plant windbreaks along their Closed-Basin Canal.

Windblown Dust from Disturbed Soils

Alamosa has a semi-arid climate with approximately 7.25 inches of precipitation annually. The San Luis Valley is primarily comprised of forests (43%) and scrublands (42%). Consequently, soils in all areas are typically a mixture of silt and sand with limited vegetation due to low precipitation. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity windstorms that Alamosa experiences most of the PM_{10} problems for the area. The City zoning map in Figure 26 which was provided by the City of Alamosa, depicts various areas of possible soil disturbance. These were evaluated by Air Division staff in conjunction with local input from the City and County staff for the Alamosa Adams State PM_{10} monitor and Municipal monitors over the past years. The area zoned agricultural remains mostly natural grassland and "Chico" shrubs. Figure 25 through Figure 35

illustrate other potential areas of local soil disturbance that have also been evaluated by the APCD for the Alamosa Adams State PM_{10} monitor and the Alamosa Municipal Building PM_{10} monitor.

5.2.1 Potential areas of local soil disturbance south and southwest of Alamosa ASC monitor

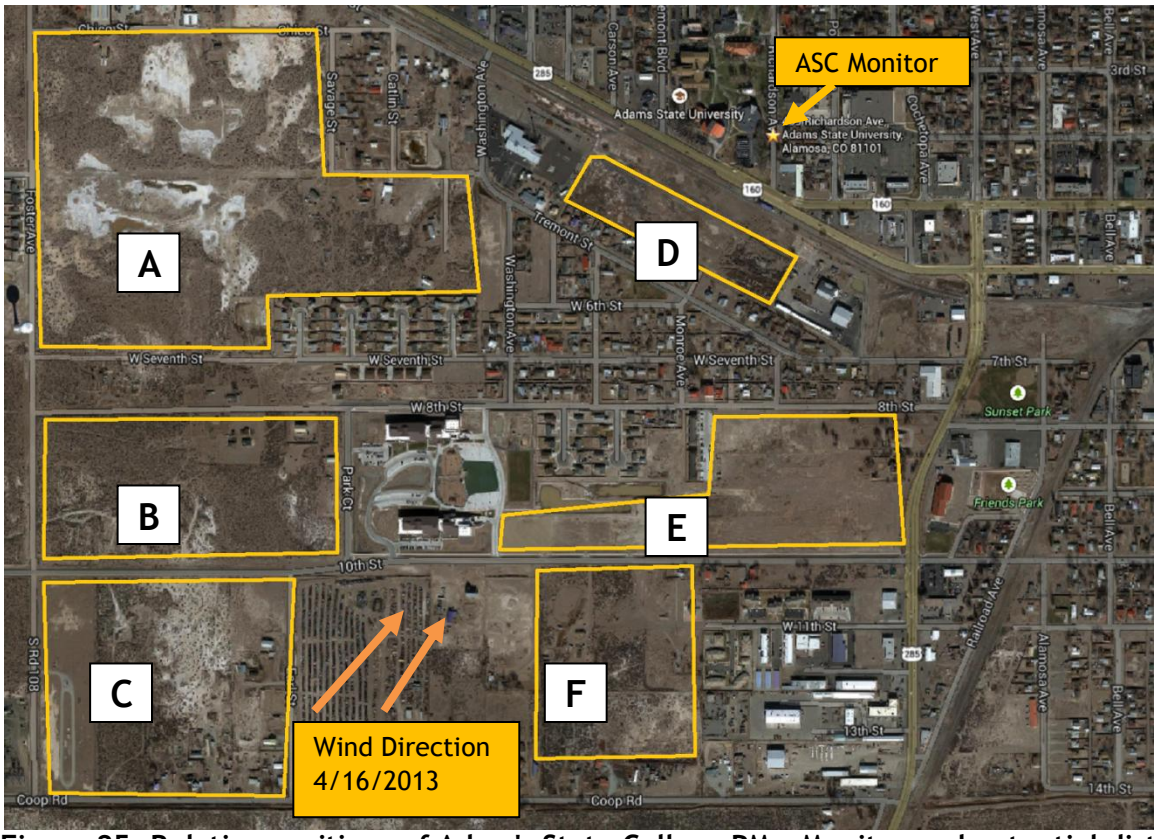

Figure 25: Relative positions of Adam's State College PM_{10} Monitor and potential disturbed soil (~1 mile distance). (Google Image 2015)

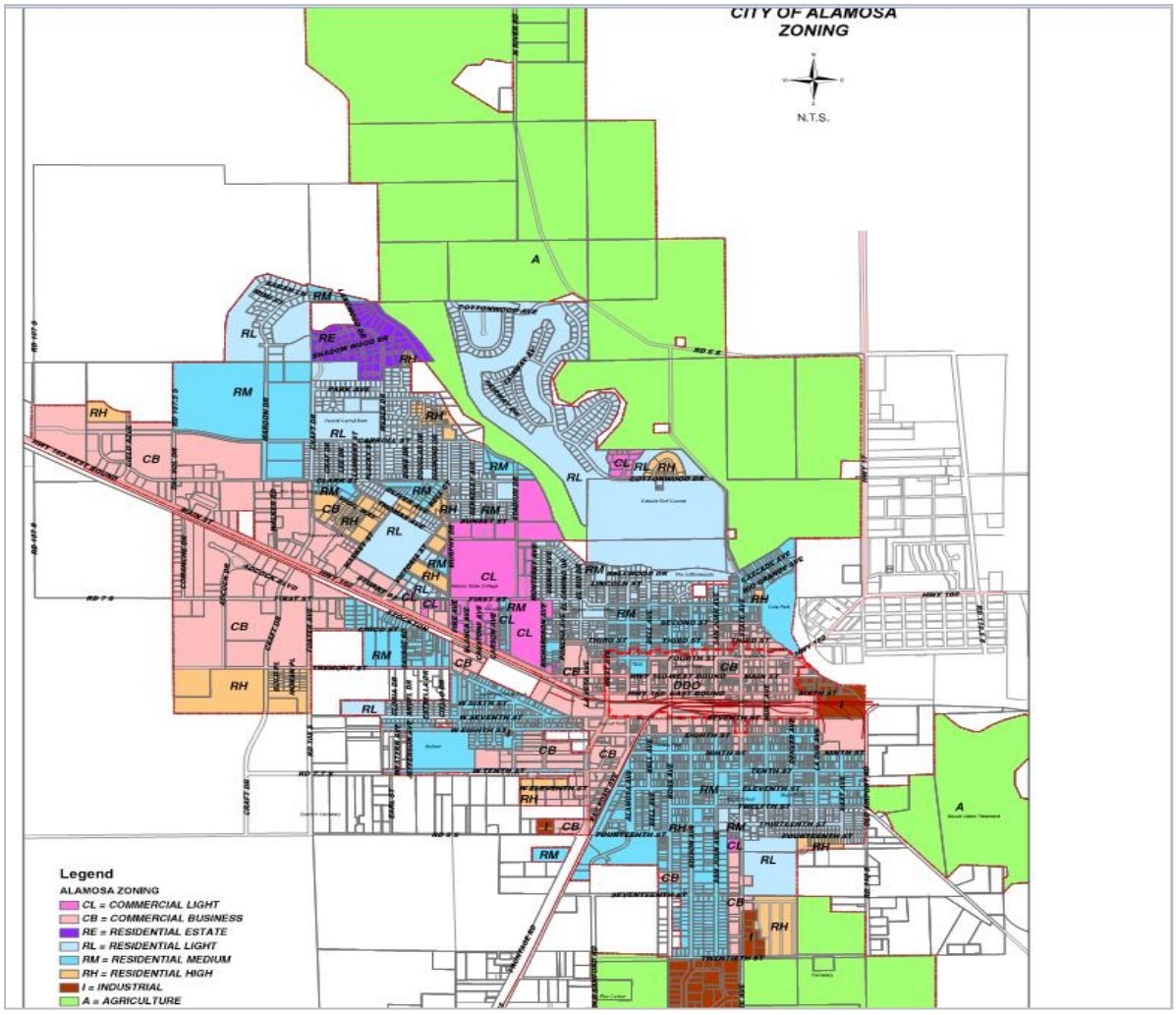

Figure 26: 2011 City of Alamosa Zoning Map (Provided by the Public Works Department)

Site A in Figure 25 (approximately 85 acres) is East of Rd S 108 and South of Chico St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 26. The eastern portion of site A is being considered for annexation into the City. A photo of site A is shown in Figure 27 which shows that Site A is covered in shrubby vegetation.

Figure 27: Site A facing north (CDPHE August 2013)

Site B in Figure 25 (approximately 34 acres) is north of 10th Street, east of Road S 108, west of Park Ct, and south of 8th St. It is zoned as a "Parcel" outside of the city's limits as shown in Figure 26. A photo of site B is shown in Figure 28, which shows that this site is primarily covered in natural vegetation.

Figure 28: Site B facing north. (CDPHE August 2013)

Sites A, B, and C are noted by the City of Alamosa's Public Works Director and County Health Director to be vacant land with natural vegetation (i.e. scrubland, mostly Chico bush) with no artificial irrigation and no access restriction. The City emphasizes that the areas are not suited for motorized travel. These lots are not considered to be anthropogenically disturbed soils and should be considered to be natural sources as of this writing. If future high wind or other exceptional events occur, the APCD will re-assess these lots to determine if they are still natural sources.

Site D in Figure 25 (approximately 22 acres) is south of Highway 160 and north east of Tremont St. It is zoned as a "Parcel" outside of the city's limits as shown in Figure 26. Site E in Figure 25 (approximately 30 acres) is north of 10th St, south of 8th St, east of Park Ct, and west of West Ave. It is zoned mostly as a "Commercial Business" as shown in Figure 26. There is a small portion in the top right corner that is zoned as a "Parcel" and is outside of the city's limits. Site F (approximately 23 acres) in Figure 25 is east of Earl St, south of 10th St, and north of Rd 8 S. It is zoned as "Commercial business", "Residential High" and some "Industrial" as shown in Figure 26. Sites D, E, and F are naturally vegetated and potentially irrigated as shown in Figure 29. Figure 29 demonstrates that these sites are minimally (if at all) disturbed soil areas as of this writing. Photos of sites D, E, and F are shown in Figure 30 through Figure 33.

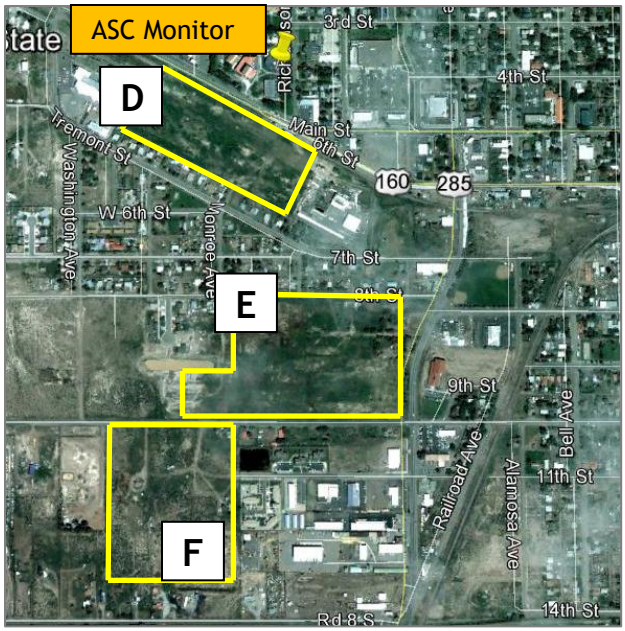

Figure 29: Sites D, E, and F with natural vegetation (Google Earth 2007)

Figure 30: Site D (CDPHE August 2013)

Figure 31: Site E facing north (CDPHE August 2013)

Figure 32: West end of site E, gravel elementary school overflow parking lot (CDPHE August 2013)

Figure 33: Site F with natural vegetation (CDPHE August 2013)

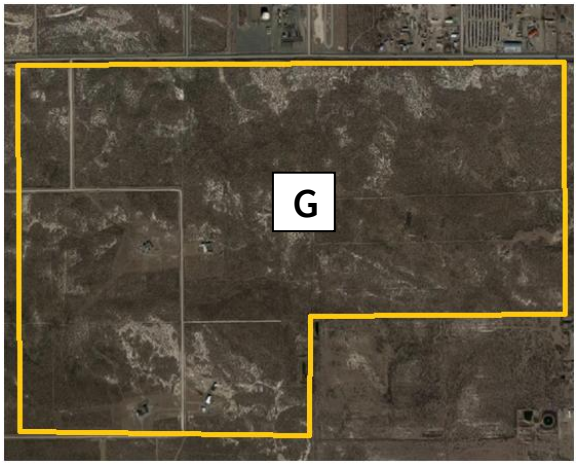

Figure 34: Site G (Approx ~2 mile distance from ASC monitor). (Google Image 2015)

Site G is land located further southwest of the ASC monitor. This land is primarily undisturbed and covered in natural vegetation as show in Figure 35. There are a few homes on the land but disturbances around them are minimal and the land is fenced to restrict access. The APCD considers natural vegetation and restricted access appropriate and practical methods that are technologically feasible and economically feasible for minimizing fugitive particulate emissions for this site.

Figure 35: Site G – two views (Google Image 2012)

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 25 through Figure 35 were present during the 2013 exceedances. During the course of these assessments, the APCD discovered that these sites were either reasonably controlled or considered to be natural sources during the April 16, 2013 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Alamosa area during the April 16, high wind event.

Sod and Vegetative Projects in the County

The development and construction of a local park, Eastside Park, is complete in Alamosa County. It has been completed with turf grass, shrubs, and landscape rock. No exposed soil remains.

Numerous other projects to reduce blowing dust and its impacts have happened or are happening at the County Airport. For example:

- Through additional grounds maintenance of the 40-acre Alamosa County airport south of the city, "Xeriscape" has been installed for aesthetics and dust control.
- Decorative rock and xeriscape have been implemented in the landscaping of the Alamosa County property (2007-2012). These measures have directly abated blowing dust at the Airport.
- The widening of the airport's safety areas (250 feet on either side of the runway) is complete and seeding of natural grasses was incorporated in the project. Trees and grass were incorporated in the approaches to the airport and have provided additional wind-break advantages to South Alamosa.

In other areas where watering is a problem, xeriscape (the use of native drought resistant vegetation and/or rock cover) is being encouraged for County owned property and for all other property owners.

Colorado State University Co-Op Extension Office

In response to extremely dry conditions, the need to maintain area topsoil, and reduce impacts, the Colorado State University Co-Op Extension Office of Alamosa County provides the following outreach efforts and recommendations:

- Modification of grazing practices to improve protective crop cover
- Increasing crop residues left in the fields to reduce blowing dust
- Planting of fall crops to maintain fields
- Application of manure to protect top soils from blowing away
- Staggering of the harvest to minimize blowing dust
- Outreach programs on soil conservation efforts
- Development of outreach/education materials (e.g., news articles, newsletters, fact sheets, etc.), and
- Attendance at Statewide workshop to educate other Co-Op offices to various practices to reduce blowing top soil and minimize impacts.

These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Natural Resources Conservation Service (NRCS)

Alamosa County is a predominately agricultural area where limited water, coupled with the frequent high winds experienced during late fall and early spring, can destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion. Thus, activities that improve the topsoil and prevent its lifting during high wind events are encouraged. Some notable NRCS and agricultural examples include:

- Local Conservation Districts and farmers hold monthly meetings as an informal Soil Health Group, discussing ways to improve soil health. Cover crops, compost applications, and reduced tillage are the targeted practices. Public tours are held twice a year.
- NRCS continues to work with area farmers in the development of conservation compliance plans to also protect topsoil;
- NRCS encourages planting perennial grasses or the leaving weeds undisturbed or mowed on the corners of center pivots (instead of tilling that might lead to open, barren lands) to reduce soil blowing;

- NRCS "cost shares" on soil health practices and perennial grass seeding conservation practices with local farmers to prevent soil erosion, and;
- The NRCS is working with Colorado State University, local Water Conservation District, and Farm Service Agency to encourage retirement of marginal cropland in the Conservation Enhanced Reserve Program (CREP) and seeding those acreages back to native grass, forbs and shrubs.

Other successful agricultural practices encouraged in the area include: timing of tillage, crop rotation, amount of crop residue left on the land, and proper water usage. These control strategies are also not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Please refer to the Final NEAP for Alamosa at http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=AlamosaNaturalEventsActionPlan2003.pdf for more detail if needed.

5.3 Pagosa Springs

Regulatory Measures - City and County

The APCD and the Archuleta County are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Pagosa Springs. Archuleta County regulations of PM_{10} emissions are summarized in Table 14.

Table 14: Rules and Ordinances Regulating Particulate Matter Emissions in Archuleta County

Rule/Ordinance	Description
Pagosa Springs Land Use and Development Code 6.6.3(h)	Requires that all new developments have paved streets.
Pagosa Springs Land Use and Development Code 6.6.3(m)(i)	All new roads having a projected trip generation of 200 or greater ADT (average daily traffic) shall be paved.

The following control measures resulted in the area's attainment of the PM_{10} NAAQS, and these measures should ensure continued maintenance of the PM_{10} NAAQS through the year 2021, which is the duration of the maintenance period.

Control of Emissions through Road Paving
The Town of Pagosa Springs paved 6.5 miles of unpaved roads during 1992, 1993, and 1994 in order to reduce PM_{10} emissions. This strategy was adopted locally in 1991 and included in State regulation in 1992 (Section I.B. of the State Implementation Plan-Specific Regulations for Nonattainment - Attainment/Maintenance Areas (Local Elements)). The rule was approved by EPA in 1994 and was removed from the Colorado regulation in 2000 as the paving requirements had been completed.

Street Sanding Controls
There is a requirement that any user that applies street sanding material on Highway 160 and Highway 84 in the Pagosa Springs attainment/maintenance area must use materials containing less than one percent fines. Users of street sand on these highways must also use 15 percent less sand than an established base sanding amount. These strategies were adopted in 1992 and approved by EPA in 1994, and they are defined in detail in Sections I.B. and C., respectively, of the —State Implementation Plan-Specific Regulations for Nonattainment - Attainment/Maintenance Areas (Local Elements) Regulations (5 CCR 1001-20).

Control of Emissions from Stationary Sources
Although there are no stationary sources located southwest of the Pagosa Springs attainment/maintenance area, the State's comprehensive permit rules will limit emissions from any new source that may, in the future, locate in the area. These rules are outlined in Table 11.

As indicated above, emissions from new or modified major stationary sources emissions of PM_{10} are controlled under AQCC Regulation No. 3's nonattainment-area (NAA) new source review (NSR) permitting requirements. The NSR provisions require all new and modified major stationary sources to apply emission control equipment that achieves the "lowest achievable emission rate" (LAER) and to obtain emission offsets from other stationary sources of PM_{10}.

The EPA approval of the original PM_{10} Maintenance Plan, effective on 08/14/2001, reinstates the prevention of significant deterioration (PSD) permitting requirements in the Pagosa Springs Attainment/Maintenance area. The federal PSD requirements are considered a relaxation from the NAA NSR requirements, as LAER is no longer required and is replaced by the less stringent "best available control technology" (BACT), along with the removal of the requirement to offset PM_{10} emissions. The future reapplication of NAA NSR provisions appears unlikely in the Pagosa Springs Attainment/Maintenance area based on current PM_{10} monitoring trends.

Voluntary and State-Only Measures

In addition to the mandatory control measures discussed above, there are other activities that result in the reduction of PM_{10} emissions that are not classified as "federally enforceable control measures." Some notable examples include:

The Town of Pagosa Springs has historically cleaned Highway 160 in town throughout the winter and spring using regenerative air vacuum sweepers. The frequency of this voluntary sweeping/cleaning has been about once after each street sanding deployment. The Town of Pagosa Springs is committed to regularly vacuum sweep/clean Highway 160 within four days of the roadway becoming free and clear of snow and ice following each street sanding deployment, as weather, temperature, and street conditions permit, between the intersections of Highway 84 to the east and 14th street to the west. The town also conducts street sweeping on the side streets regularly.

The Town of Pagosa Springs encourages private businesses to properly clean/sweep private parking lots on a regular basis. These strategies are considered to be voluntary local initiatives intended to reduce PM_{10} emissions. These strategies are not intended to be federally enforceable.

Archuleta County annually treats about 95 miles of unpaved roadways that exceed 200 ADT with $MgCl_2$ to control dust and stabilize the road according to the County Public Works Director.

Windblown Dust from Disturbed Soils

Pagosa Springs has a semi-arid climate with approximately 17 inches of precipitation annually. The town is located about 35 miles north of the New Mexico border at 7,000 feet. This area is considered a high desert plateau, creating an unusually mild climate. In winter and spring, regional windstorms are common, especially in drier years. It is during these high velocity windstorms that Pagosa Springs experiences PM_{10} issues. Figure 36 through Figure 38 illustrate potential areas of local soil disturbance that have been evaluated by the Division.

5.3.1 Potential areas of local soil disturbance south and southwest of Pagosa Springs monitor

Figure 36: Relative positions of Pagosa Springs PM_{10} Monitor and potential disturbed soil (~2 mile distance). (Google Image 2015)

As shown in Figure 36, most of the area around Pagosa Springs is covered in natural vegetation and there are few areas of potential windblown dust.

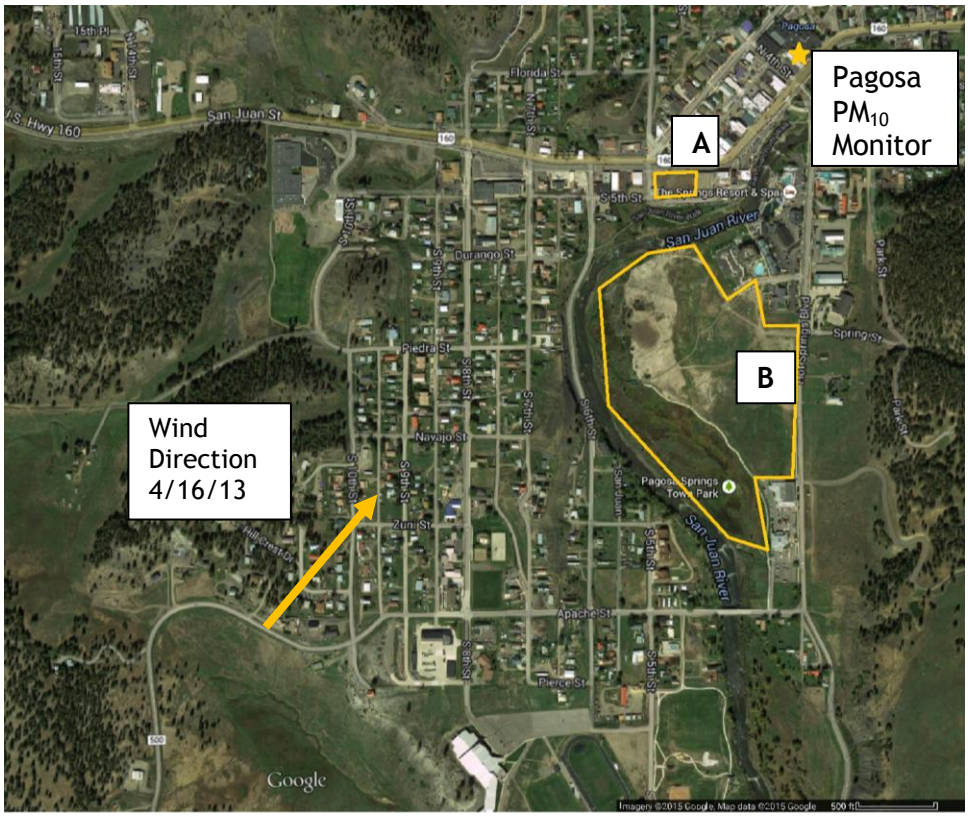

Figure 37: Relative positions of Pagosa Springs PM_{10} Monitor and potential disturbed soil (~1 mile distance). (Google Image 2015)

Site A in Figure 37 shows a 1 acre vacant lot that previously contained a small convenience store which was torn down by the new owner between March and April of 2006. Division conversations with neighboring local business owners indicate the owner seeded the vacant lot (site A) with grass soon after demolishing the building. According to several nearby businesses and a court house clerk, the lot has been under continuous vegetative cover since the seeding in 2006. The grass is well maintained and is enclosed by a small fence (shown in Figure 38) to deter people from walking on the grass. Moreover, the lot is not used for parking or storage.

Figure 38: View of the fence surrounding the vacant lot (Site A) (Google Image 2007)

Site B in Figure 37 is a 35-acre area of vacant land that is the proposed site of a future 35 acre hotel expansion. According to the Pagosa Springs Parks Department, the area is private property and is entirely naturally vegetated because of a continuous supply of ground water

from the nearby stream. The Parks Department also indicates that off-road recreational vehicles are prohibited on the property. The Parks Department is very aware of dust prevention practices and does not believe that the area is a significant source of dust during high winds. With regard to AQCC Regulation 1 requirements (Section III.D.2.b), the APCD considers the natural vegetation with regular ground water availability due to the low-lying terrain to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this lot at this time. Local sources, including the Pagosa Daily Post, cite the proposed future 35-acre hotel expansion (Site B) to be projected to occur in several phases over a 10-15 year time period.

The APCD will conduct appropriate outreach and compliance assistance so the hotel is aware of potentially applicable AQCC Regulation 1 (Section III.D.2.b) and Regulation 3 (Construction Permit required if the project exceeds 25 acres and spans longer than 6 months in duration) requirements for future construction projects. The APCD has specific Air Pollutant Emissions Notices (APENs) for land development and associated guidance documents posted on its website for these type of sources. Additionally, the APCD has staff that conducts Small Business Assistance outreach as warranted. Compliance and enforcement inspectors from the APCD are assigned regions throughout the state. As part of their work plans, they are required to be reasonably (within 1-2 business days) responsive to community and local government concerns and complaints regarding air quality issues, including fugitive dust.

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 37 were present during the 2013 exceedance. During the course of these assessments, the Division discovered that these sites were reasonably controlled during the April 16, 2013 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Pagosa Springs area during the April 16, 2013 high wind event.

5.4 Durango

Regulatory Measure - City and County

The APCD, the City of Durango, La Plata County, and the Southern Ute Indian Tribe are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Durango. A summary of regulations regarding PM_{10} emissions is in Table 15.

Table 15: Rules and Ordinances Regulating Particulate Matter Emissions in Durango

Rule/Ordinance	Description
City of Durango's Municipal Code No. 10-1-22 (b)(6 &8)	Requires that all temporary (not to exceed eighteen months) office structures parking areas must have all weather surface gravel to eliminate exposed dirt. Also, the landscaping must have vegetative ground cover in all areas not covered by the building, pavement, or gravel.
City of Durango's Municipal Code Ord. No. 10-1-6 (a) "Vehicular Circulation Areas" Ord. No. 10-1-28 (a) "Driveways"	All developed vehicular traffic areas, driveways, on-site parking areas, and off-site parking districts are required to be properly graded for

Ord. No. 10-2-1 (m)(6) "On-site Parking" Ord. No. 4-3-12 (d)(1)	drainage and surfaced with concrete, asphaltic concrete, or any other dust-free surface materials, and maintained in good condition, free of weeds, dust, trash, and debris
City of Durango's Municipal Code Ord. No. 10-1-8 "Pollution"	Dust from developments is required to be effectively minimized to not be injurious to the neighborhood or detrimental to the general public
City of Durango's Municipal Code Ord. No. 10-1-17 (f)(14)"Recycling Facilities"	Recycling facilities are permitted and encouraged for redemption and recycling of reusable materials in order to reduce litter. These facilities are not allowed to produce dust that is detectable on neighboring properties.
City of Durango's Municipal Code Ord. No. 10-1-31 (l) (6) "Self-storage Facilities"	Self-storage facilities are prohibited for any use that produces dust or fumes
City of Durango's Municipal Code Ord. No. 10-2-4 "Bicycle Parking Spaces"	The surfaces of all bicycle parking spaces do not have to be paved, but shall be finished to reduce mud and dust
City of Durango's Municipal Code Ord. No. 10-5-14 (a)(6) "Campgrounds"	All recreational campgrounds that have parking spaces and interior roads are required to be paved or treated to reduce dust
City of Durango's Municipal Code Ord. No. 10-10-16 (c)(11) (e)	Construction sites are required to evaluate and control dust pollutants for runoff potential
City of Durango's Municipal Code Ord. No. 10-10-16 (y)(1)(d)	Construction sites are required to have an erosion control plan for gravel, sand, dirt, or topsoil removal
City of Durango's Municipal Code Ord. No. 2000-10, § 1, 5-2-00	All work in the public right-of-way shall control dust and debris and promptly remove dirt and material deposited on roadways
City of Durango's Municipal Code Ord. No. 6-2-1 (a)(4))	All planned residential districts must comply with dust ordinances and not be objectionable due to dust emissions
La Plata County Land Use Code (LPLUC)[2] Sec. 82-191-193	Proposed developments must conduct a compatibility assessment, including a neighborhood meeting, if there is a potential to produce dust or significant dust influence. Possible solution for dust may include changing emitter specifications to mitigate problem. Dust emissions cannot have significant adverse impacts on neighbors.
La Plata County Land Use Code (LPLUC)[1] Sec. 82-167 (b)(3)	Proposed multiple unit developments are required to contain and/or mitigate dust among other external nuisances.
La Plata County Land Use Code (LPLUC)[1] Sec. 90-124 (c)(8)	Roads and access driveways for all new facilities shall be constructed in a manner that suppresses dust through construction, drilling, and

[2] The LPLUC applies to all county lands, which includes the exterior boundaries of the Southern Ute Indian Reservation, except trust lands, in order to decrease nuisances from approved land uses.

	operational activities. Facilities that reduce or destroys existing vegetation may consult with the Soil Conservation Service (renamed the Natural Resources Conservation Service in 1994) and develop a re-vegetation plan, specifying particular species as well as appropriate planting schedules and methods
La Plata County Land Use Code (LPLUC)[1] Sec. 74-174 (a)	Cattle guards are required to be kept clean of all sand, silt, dirt, and other solid debris.

The City of Durango, La Plata County, and the Southern Ute Indian Tribe have implemented dust control regulatory measures for numerous sources. Both the City and the County have a number of proactive programs that reduce dust from significant PM_{10} source categories in La Plata County. The following detail local dust control ordinances as of March 2012 for the Durango area:

Street Sweeping and Sanding Controls
The City of Durango performs street sweeping five days per week in the downtown area on a rotating basis and once every two months in residential areas. The City is responsible for street sweeping State Highways 550 and 160 that run through the City. In 2012, the City estimated sweeping an average of 11,873 miles per year, running sweeper operations 2,130 hours, and removing 4,195 cubic yards of debris. The town of Bayfield in La Plata County performs street sweeping on town streets periodically as well.

The City of Durango employs a Snow and Ice Division that uses street maintenance crews to remove snow and ice for 30% of their time. This Division de-ices major streets prior to snow with magnesium chloride ($MgCl_2$). Streets are plowed and sanded according to priority (i.e. hazardous intersections, snow routes, downtown, and bus routes) after snowstorms. The City spends on average 2,968 hours per year plowing streets (as of 2012). The City estimates that it spends on average 979 hours sanding/salting streets (as of 2012).

Dust Suppressant Program
La Plata County currently employs a dust suppressant program. The major focus of the program is to reduce dust from gravel roads. La Plata County has approximately 196 miles of paved roads and about 490 miles of gravel roads. Approximately 220 centerline miles of gravel road are treated with about 950,000 million gallons of $MgCl_2$ annually. The County typically begins application of $MgCl_2$ in late April or early May, and continues as needed through September. In May and June (annually), roads not slated to receive new gravel are the first to be treated with $MgCl_2$. During July through September (annually), other roads are treated, including roads being resurfaced, and those roads needing a second application.

Landfills
La Plata County closed the Durango Landfill in 1990, and has been working with the Colorado Department of Public Health and Environment to ensure post-closure care and maintenance standards are met. These include, but are not limited to, minor grading to correct any erosion, maintenance of the surface drainage, and ground cover enhancement.

The remaining landfill in La Plata County, Bondad Landfill, is located approximately 15 miles south of Durango within the exterior boundaries of the Southern Ute Indian Reservation, and has been in operation since 1997. The landfill is privately owned and operated by WCA Waste

Corporation. The landfill has a fugitive dust emission control plan in its Part 71 permit currently enforced by the Environmental Protection Agency (EPA) (Region 8).

On March 2, 2012, the Southern Ute Indian Tribe received full approval from EPA to administer its Part 70 Operating Permit Program within the exterior boundaries of the Reservation. The Tribe is currently conducting the process of its Transition Plan to inform the Landfill (and other Title V sources) about the jurisdictional change. The Southern Ute Indian Tribe will transition Part 71 permits to the Tribe-issued Part 70 permits for all Reservation Title V sources. This transition process will take place over a three-year period in accordance with the Tribe's Transition Plan (found at: *http://www.southernute-nsn.gov/air-quality/part-70*). The transition process is planned to be completed by March 2, 2015 (three years (36 months) after the program was approved by EPA).

Durango Train Smoke Mitigation Task Force

The Durango and Silverton Narrow Gauge Railroad operates historic coal-fired steam locomotives from its yard located on the south-side of Durango. Because of the potential for thermal stress damage (cracking) to the antique boilers (greater than 100 years in age) from repeated cycling between cold and hot, they must idle throughout the night in order to be ready for use the next day, creating emissions from various pollutants. In 2001, the train operator installed scrubbers at the train yard roundhouse to control emissions from some of the locomotives while idling overnight. However, space limitations at the roundhouse prevented the operator from controlling all of the locomotives.

In 2007, the train operator pledged to spend $1 million over 5 years to reduce emissions by 10% each year. The railroad employs several emission-reducing alternatives, including burning wood pellets instead of coal at night to keep engines warm, building a new ash pit in Silverton to reduce idle time in Durango in 2005, using diesel for all switching and track maintenance, and specialized training for engine firemen on how to place coal and wood pellets. Durango Service Clubs collaborated to completely offset the carbon footprint of the D&SNGRR through the purchase of Green Power through La Plata Electric Association. In 2009, the Urban Reforestation Project to offset Greenhouse gas emissions associated with Railroad vehicle fleet planted 2,587 trees in Durango and Silverton. The planted trees also reduce wind erosion and blowing dust.

There is a Train Smoke Mitigation Task Force that was created to proactively implement a responsible smoke mitigation program that maintains the railroad's historic steam engine operations while reducing smoke and pollution. The Task Force began meeting in late 2005 to address public and neighborhood concerns. In 2013, the Train Smoke Mitigation Task Force began seeking funding to construct an expanded scrubber system, estimated at $1.2 million dollars.

Vegetative Cover/Parks

The Durango Parks and Recreation Department removes sand, dirt, and organic debris from park roads, City parking lots, and hard surfaces twice a year and sweeps the hard surface trails monthly. There are 14.49 miles of hard surface trails in Durango. The multi-use trails systems are either in completion or construction phases, which have multiple benefits, including reducing motor vehicle use and reducing fugitive dust from lengthy unpaved trails. The largest of these projects are the Animas River Trail (ART) and the Safe, Multi-Modal, Aesthetic, Regional Transportation trail aligning along Highway 160 (SMART 160). The ART is an ongoing project to provide a 10 foot wide cement trail along the river corridor. Each year

the City completes a new stage of the project as it is all cash funded. The SMART 160 project is also ongoing. There is a large section of the walking trails that will be finished in the summer of 2014. There are approximately 93.2 miles of natural surface unpaved trails in the open space surrounding Durango that are primarily dirt and native rock.

The City of Durango built a new 15 acre soccer complex at 700 Talon Lane on the Fort Lewis College campus. It is called Smith Sports Complex and opened in 2013. The 15 acre site was previously open dirt (as shown in Figure 39) and now it is full covered with turf grass, parking, restroom facility and playground area (as shown in Figure 40). The complex including the 8-acre turf grass playing fields is irrigated.

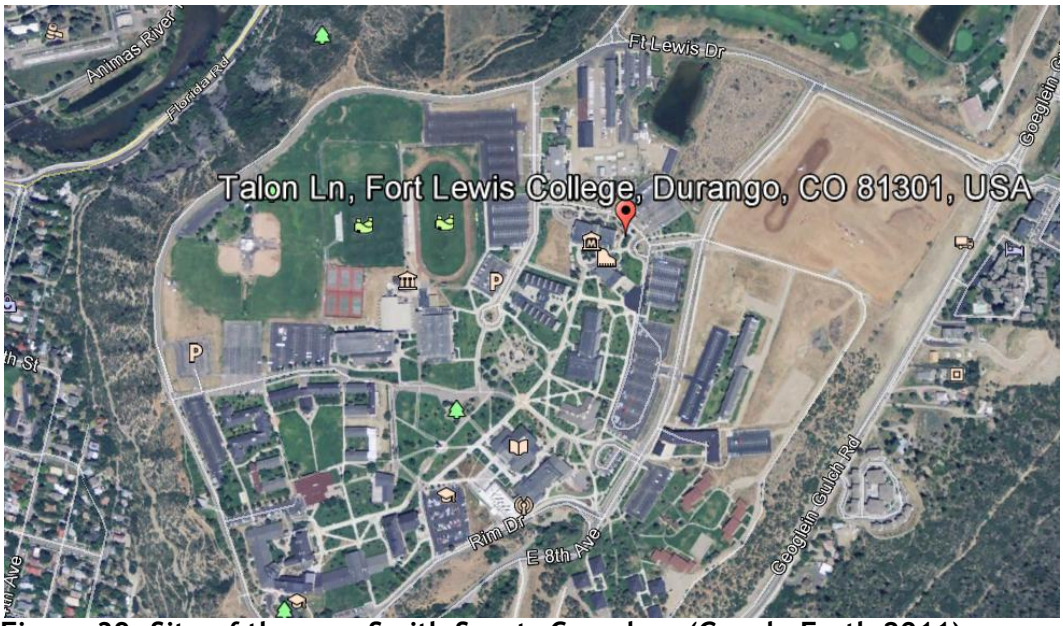

Figure 39: Site of the new Smith Sports Complex. (Google Earth 2011)


Figure 40: Smith Sports Complex (Jerry McBride for the Durango Herald, 9/20/13)

From 2010-2013, the Three Springs subdivision developer planted and irrigated the vegetation in the 34.78 acre Three Springs Southern Open Space located at 700 Wilson Gulch Drive (shown in Figure 41). Additionally, the 15.28 acre Three Springs Confluence Park has been constructed in phases within the development at 100 Confluence Avenue (also shown in Figure 41).

Figure 41: Three Springs Southern Open Space and the Three Springs Confluence Park before Completion (Google Earth 2011)

Oil and Gas Exploration and Development Standards for Federal Lands

- La Plata County and the Southern Ute Indian Reservation contain oil and gas exploration and development sites. The Bureau of Land Management (BLM) and the Forest Service (FS) have surface operating standards and guidelines for oil and gas exploration and development (see: (http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf). These standards control dust from a number of contributing sources, including:
- Road maintenance is required for all roads that will be constructed or used in conjunction with drilling. These maintenance plan activities include blading, surface replacement, dust abatement, spot repairs, slide removal, ditch cleaning, culvert cleaning, litter cleanup, noxious weed control, and snow removal. Key maintenance considerations include regular inspections; reduction of ruts and holes; maintenance of crowns and outslope to keep water off the road; replacement of surfacing materials; clearing of sediment blocking ditches and culverts; maintenance of interim reclamation; and noxious weed control (page 30).
- Regarding BLM resource and FS local roads (page 25):

- The design speed limit on roads, specific to oil and gas roads, is 10 to 30 miles per hour. For the FS, this should generally be less than 15 miles per hour.
- The road gradient should not exceed 8 percent except for pitch grades (300 feet or less in length) in order to minimize environmental effects.
- Drainage control must be ensured over the entire road through the use of drainage dips, insloping, natural rolling topography, ditch turnouts, ditches, or culverts.

- Regarding BLM local and FS collector roads (page 26):
  - The design speed limit is generally 15 to 50 miles per hour. For the FS, it is 15 to 25 miles per hour.
  - Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.
- Regarding BLM collector and FS arterial roads:
  - Design speed is 30 miles per hour or greater unless otherwise directed.
  - Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.

Windblown Dust from Disturbed Soils

Durango has a semi-arid climate with approximately 19 inches of precipitation annually. The town is located in southwest Colorado near the Four Corners area where New Mexico, Colorado, Utah, and Arizona connect at about 6,500 feet. In winter and spring, regional windstorms are common, especially in drier years. It is during these high velocity windstorms that Durango may experience PM_{10} issues. Figure 42 illustrates potential areas of local soil disturbance that have been evaluated by the Division.

5.4.1 Potential areas of local soil disturbance southwest of Durango monitor

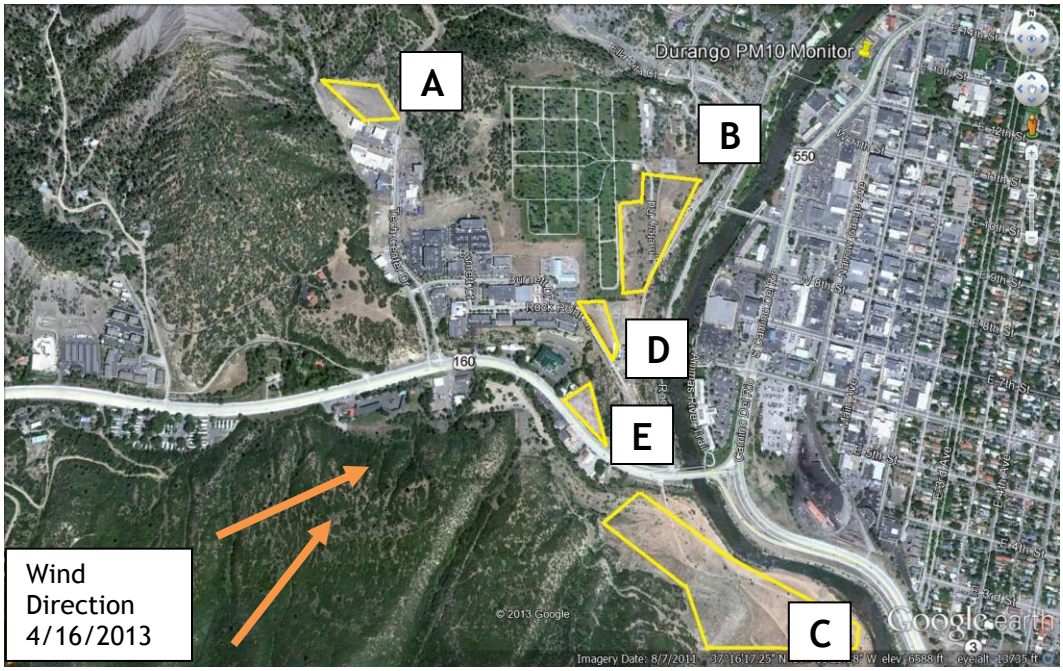

Figure 42: Relative positions of Durango PM_{10} Monitor and potential disturbed soil. (Google Earth Image 2011)

Site A (approximately 2.5 acres) in Figure 42 is west of town at the north end of Tech Center Dr. This land is zoned by the City of Durango as “Industrial”. The land was once leveled and compacted but has since been allowed to return to its natural state. The site is now naturally vegetated and the soil is very compacted. Therefore, this lot is not considered to be anthropogenically disturbed soils and should be considered to be a natural source as of this writing.

Site B (approximately 11 acres) in Figure 42 is west of Roosa Ave, south of Ella Vita Court and east of the Greenmount Cemetery. This land is zoned by the City of Durango as “Planned Development”. The cemetery informed the APCD that this land is open space that is naturally vegetated as shown in Figure 43. Therefore, this lot is not considered to be anthropogenically disturbed soils and should be considered to be a natural source.

Figure 43: Site B in Durango (CDPHE March 2014)

Site C (approximately 35 acres) in Figure 42 is along the river to the south west of town. This land is zoned by the City of Durango as “Public”. Further investigation revealed that this site is the Durango Dog Park Off-Leash area. The park is comprised of scrublands with a natural surface trail and was converted from a city park into an off-leash dog park in 2003. The park is fenced to limit access as shown in Figure 44.

Figure 44: Dog Park (CDPHE March 2014)

Site D in Figure 42 is located along Rock Point Drive, south of Greenmount Cemetery. The land is covered in natural vegetation and shrubs as shown in Figure 45.

Figure 45: Site D (Google Image 2012)

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 42 were present during the 2013 exceedance. During the course of these assessments, the Division discovered that these sites were either reasonably controlled or considered to be natural sources during the April 16, 2013 high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Durango area during the April 16, 2013 high wind event.

6.0 Summary and Conclusions

APCD is requesting concurrence on exclusion of the PM_{10} values from the Alamosa ASC (08-003-0001), Pagosa Springs (08-007-0001), Crested Butte (05-051-0004) and Durango (08-067-0004) monitors on April 16, 2013.

> ***Note**: A separate Exceptional Event Technical Support document was developed and submitted for the Telluride exceedance that also occurred on April 16, 2013. This document was submitted to the EPA on October 1, 2013. This document can be accessed at http://www.colorado.gov/airquality/tech_doc_repository.aspx. A concurrence letter for this exceedance in Telluride was issued by EPA on November 1, 2013.*

Elevated 24-hour PM_{10} concentrations were recorded across Colorado on April 16, 2013. All of the noted twenty-four-hour PM_{10} concentrations were above the 90th percentile concentrations for their locations (see Table 8). These events exceeded the overall 98th percentile value of any evaluation criteria. The statistical and meteorological data clearly shows that but for this high wind blowing dust event, Alamosa, Pagosa Springs, Crested Butte and Durango would not have exceeded the 24-hour NAAQS on April 16, 2013. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. This is evidence that the events were associated with measured concentrations in excess of normal historical fluctuations including background.

The PM_{10} exceedances in Alamosa, Pagosa Springs, Crested Butte and Durango would not have occurred if not for the following: (a) dry soil conditions over source regions with 30-day precipitation totals below the threshold identified as a precondition for blowing dust; and (b) meteorological conditions that caused strong surface winds over the area of concern.

Surface weather observations provide strong evidence that a dust storm took place on April 16, 2013. The meteorological conditions during this event caused regional surface winds over 30 mph with gusts exceeding 40 mph. These speeds are above the thresholds for blowing dust identified in EPA draft guidance and in detailed analyses completed by the State of Colorado (see the Lamar, Colorado, Blowing Dust Climatology at http://www.colorado.gov/airquality/tech_doc_repository.aspx). These PM_{10} exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large source region outside of the monitored areas. These sources are not reasonably controllable during significant windstorms under abnormally dry or moderate drought conditions.

Both wind speeds and soil moisture in surrounding areas were conducive to the generation of significant blowing dust. Multiple sources of data for the event in question and analyses of past dust storms in this area prove that this was a natural event and, more specifically, a significant natural dust storm originating outside the monitored areas. But for the large, regional dust storm on April 16, 2013, these PM_{10} exceedances would not have occurred in Alamosa, Pagosa Springs, Crested Butte and Durango.

7.0 References

United States Environmental Protection Agency, June 2012. *Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule*.