3 HIGH WIND EXCEPTIONAL EVENT ANALYSIS: May 21, 2008

3.1 Description of Exceedances

Violations of the PM10 NAAQS were recorded in the Coachella Valley at the AQMD air quality monitoring stations at Indio and Palm Springs on May 21, 2008. The 24-hour mass concentrations were 180 and 170 $\mu g/m^3$ at Indio and Palms Springs, respectively, as measured with FEM BAM PM10 samplers, based on 24 hourly measurements averaged from midnight to midnight. While Indio typically has an FRM sample every third day, the sample on this day was not valid due to the sample time being out of limits. This was not a routine 1-in-6 FRM sampling day, so FRM PM10 mass, sulfate, nitrate and chloride mass loadings from the filters from Palms Springs are also not available on this day. The FEM data has been submitted to the AQS database and flagged to request exclusion as a high wind natural event under the U.S. EPA Exceptional Event Rule. This analysis documents the high wind event on May 21 that caused the FEM PM10 exceedances.

The continuous, hourly BAM data from Indio and Palm Springs are shown in Table 3-1, starting at 1200 PST on May 20 before the concentrations started to increase and ending at 0600 PST on May 22 after the elevated concentrations ended. Concentrations exceeding 150 $\mu g/m^3$ are highlighted in bold type. The hourly concentrations at both Indio and Palm Springs were fluctuating and elevated through the afternoon of May 20, due to locally gusty winds starting in the Coachella Valley. The Indio monitor spiked to 232 $\mu g/m^3$ for the 2300 hour on May 20, then dropped slightly for three hours. The concentration climbed rapidly above 150 $\mu g/m^3$ during early morning hours on May 21, with a peak concentration of 794 $\mu g/m^3$ recorded at 0400 PST at Indio. The hourly concentrations remained high until 1100 PST on May 21, then dropped below 150 $\mu g/m^3$, but remained elevated through the rest of the day. PM10 concentrations spiked again at the hour beginning at midnight on May 22 for one hour then dropped and remained low for the rest of the day on May 22 and the following days. The Palm Springs BAM was also high through much of the same period in the morning, peaking at 403 $\mu g/m^3$ for the hour starting at 0200 PST in the early morning of May 21. A strong Pacific storm system and cold front moved through southern California during this period, causing strong pressure gradients and high winds through the San Gorgonio Pass and down the Coachella Valley. In general, the hourly PM10 spikes at Palm Springs occurred one to two hours earlier than Indio due to its general location further upwind in the Coachella Valley, but the concentrations were lower. The differences in the hourly PM10 concentrations between Palm Springs and Indio are due to the terrain shielding that occurs at Palm Springs from the San Jacinto Mountains causing less consistent flows from the blowsand source areas.

TABLE 3-1
Hourly and 24-Hour FEM BAM PM10 Measurements at the AQMD Indio and Palm Springs Air Monitoring Stations in the Coachella Valley Between 1200 PST May 20 and 0600 PST May 22, 2008

(No FRM data samples were collected during this period at Coachella Valley sites)

		Indio Monitoring Station			Palm Springs Monitoring Station		
DATE	**HOUR (PST)**	**BAM Hourly PM10 (μg/m³)**	**24-Hour Average PM10 (μg/m³) (midnight to midnight)**		**BAM Hourly PM10 (μg/m³)**	**24-Hour Average PM10 (μg/m³) (midnight to midnight)**	
			BAM	**FRM**		**BAM**	**FRM**
5/20/08	1200	64			31		
	1300	24			57		
	1400	105			74		
	1500	40			55		
	1600	97			89		
	1700	102			87		
	1800	73			79		
	1900	55			86		
	2000	53			**216**		
	2100	62			**242**		
	2200	93			118		
	2300	**232**	63.7	N/A	**195**	74.0	N/A
5/21/08	0000	140			**188**		
	0100	115			**250**		
	0200	117			**403**		
	0300	**241**			**244**		
	0400	**794**			**241**		
	0500	**202**			100		
	0600	111			104		
	0700	**218**			**304**		
	0800	**391**			**294**		
	0900	**597**			**160**		
	1000	108			121		
	1100	**172**			109		
	1200	99			110		
	1300	92			128		
	1400	61			125		
	1500	89			138		
	1600	89			111		
	1700	96			144		
	1800	94			122		
	1900	79			142		
	2000	80			146		
	2100	108			121		
	2200	127			143		
	2300	104	**180.2**	N/A	137	**170.2**	N/A
5/22/08	0000	**497**			97		
	0100	104			92		
	0200	89			77		
	0300	87			83		
	0400	74			64		
	0500	63			75		
	0600	58	61.9	N/A	55	36.7	N/A

3.2 Conceptual Model: How the Event Unfolded

Strong, gusty winds developed in the Coachella Valley, starting in the afternoon of May 20 and increasing in the morning of May 21, 2008, to cause FEM PM10 NAAQS exceedances at the Palm Springs and Indio stations on May 21. The analysis of the meteorological setting, including weather charts, pressure gradients and satellite imagery, indicates significant potential for strong winds in the Coachella Valley on May 21. Previous natural event analyses defined four primary meteorological mechanisms that lead to high-wind PM10 events in the Coachella Valley, including: (Type 1) strong pressure and density gradients forcing high winds through the San Gorgonio Pass; (Type 2) storms and frontal passages; (Type 3) thunderstorm outflow winds; and (Type 4) Santa Ana wind events. The meteorological conditions on May 21 can be classified primarily as a Type 2 event, as an unseasonably strong Pacific low pressure system aloft and associated surface cold front brought locally high winds to many areas of California and Nevada starting May 20 and continuing through May 22. The storm system contributed to strong pressure gradients between the coastal and desert air masses, bringing strong, gusty winds through the San Gorgonio Pass and down the Coachella Valley, especially in the morning of May 21, enhanced by coupled along-valley flows aloft.

Wind speeds in the Coachella Valley upwind of the Indio and Palm Springs air monitoring stations were high on this day, with sustained winds speeds well over 25 mph. The high PM10 measured at Indio and Palm Springs on May 21 occurred with consistent along-valley wind flows that prevailed throughout the day. This wind event was relatively widespread throughout the Valley, but the strongest winds were measured at the AQMD Whitewater Wash wind station, located near the centerline of the Valley southeast of the San Gorgonio Pass in the primary natural desert blowsand source area in the northwestern Coachella Valley. The peak sustained hourly winds were 46 mph and the peak gusts reached 68 mph in the morning of May 21. Hourly averaged sustained wind speeds at Whitewater Wash exceeded 28 mph for every hour throughout the day on May 21, well in excess of the 23 mph threshold that is typical for windblown dust in this area, with west-northwesterly wind directions. In the morning, the 1-hour sustained winds exceeded 33 mph for every hour. The Whitewater Wash instantaneous gusts reached 42 mph or higher during every hour of the day and remained above 52 mph through the morning hours. The timing of the strongest winds correlate well with the timing of the highest hourly PM10 concentrations.

Further from the centerline of the Coachella Valley, sustained winds to 33 mph were recorded at the National Weather Service (NWS)/Federal Aviation Administration (FAA) station at Palm Springs Airport, along with peak wind gusts to 47 mph. *(The NWS/FAA airport stations measure sustained winds as the 2-minute average before the observation time and gusts as a running 3-second average.)* The highest sustained (1-minute averages) winds at the Palm Springs air monitoring station peaked at 24 mph on

May 21. This indicates that windblown PM10 from localized sources close to the Palm Springs monitoring station were not very significant and that most of the PM10 at Palm Springs would have been generated closer to the San Gorgonio Pass. Further to the southeast, the AQMD Palm Desert wind station measured sustained 1-hour averaged winds to 25 mph and gusts as high as 52 mph, with 11 hours reaching hourly winds of 25 mph or higher. In this area, the Coachella Valley widens and the wind speeds are typically not as strong as those measured closer to the San Gorgonio Pass at Whitewater Wash.

Further down the Coachella Valley at Indio where the highest PM10 concentrations were measured, the 1-minute sustained winds peaked at 27 mph for the day while hourly averages only reached 18 mph. While windblown dust entrained from localized sources near Indio was a potential factor as controls were overwhelmed by the strong winds, most of the particulates were generated further upwind in the natural blowsand source areas. At the NWS/FAA Thermal Airport weather station, located approximately 8.6 miles further downwind from the Indo monitor, sustained (2-minute average) winds peaked to 36 mph, with peak wind gusts to 45 mph, reduced visibilities and haze reported. The gusty northwesterly winds, reduced visibilities and haze reported from Thermal Airport support the presence of windblown dust at the Indio monitor throughout the morning of May 21. In addition, NWS forecast discussions, wind advisories and news reports also describe strong winds and blowing dust in the Coachella Valley, providing substantial weight-of-evidence for the sequence of events.

Figure 3-1 shows a snapshot of the Coachella Valley sustained winds and hourly PM10 concentrations measured during the hour starting at 0400 PST on May 21 to give a geographical perspective to this wind event. This is the time of the peak hourly PM10 measurement at Indio (794 $\mu g/m^3$) and during a high PM10 concentration at Palm Springs (241 $\mu g/m^3$). During this time, winds in the Coachella Valley were representative of flows through the San Gorgonio Pass, with stronger along-valley (west-northwesterly to northwesterly) flows at the centerline of the valley and some turning and slowing of the winds near the edges of the as the topography of the foothills and mountains influenced the flow. The Whitewater Wash wind station measured the strongest winds at this time, with sustained 1-hour averaged wind speeds of 40 mph and instantaneous gusts to 62 mph. There was a time lag between the Indio PM10 peak and the Whitewater Wash wind peak due to distance down the Valley. The previous hour had Whitewater Wash 1-hour sustained winds of 46 mph and gusts to 68 mph, the peak winds measured on May 21. The winds at AQMD Desert Hot Springs wind monitor, in the northern portion of the Coachella Valley, were northwesterly with sustained 1-hour averaged speeds of 23 mph and gusts to 51 mph for the 0400 PST hour. While 1-to-5-minute sustained winds were not recorded at the supplemental AQMD wind stations (Whitewater Wash, Desert Hot Springs and Palm Desert), they would certainly be higher than the 1-hour averages.

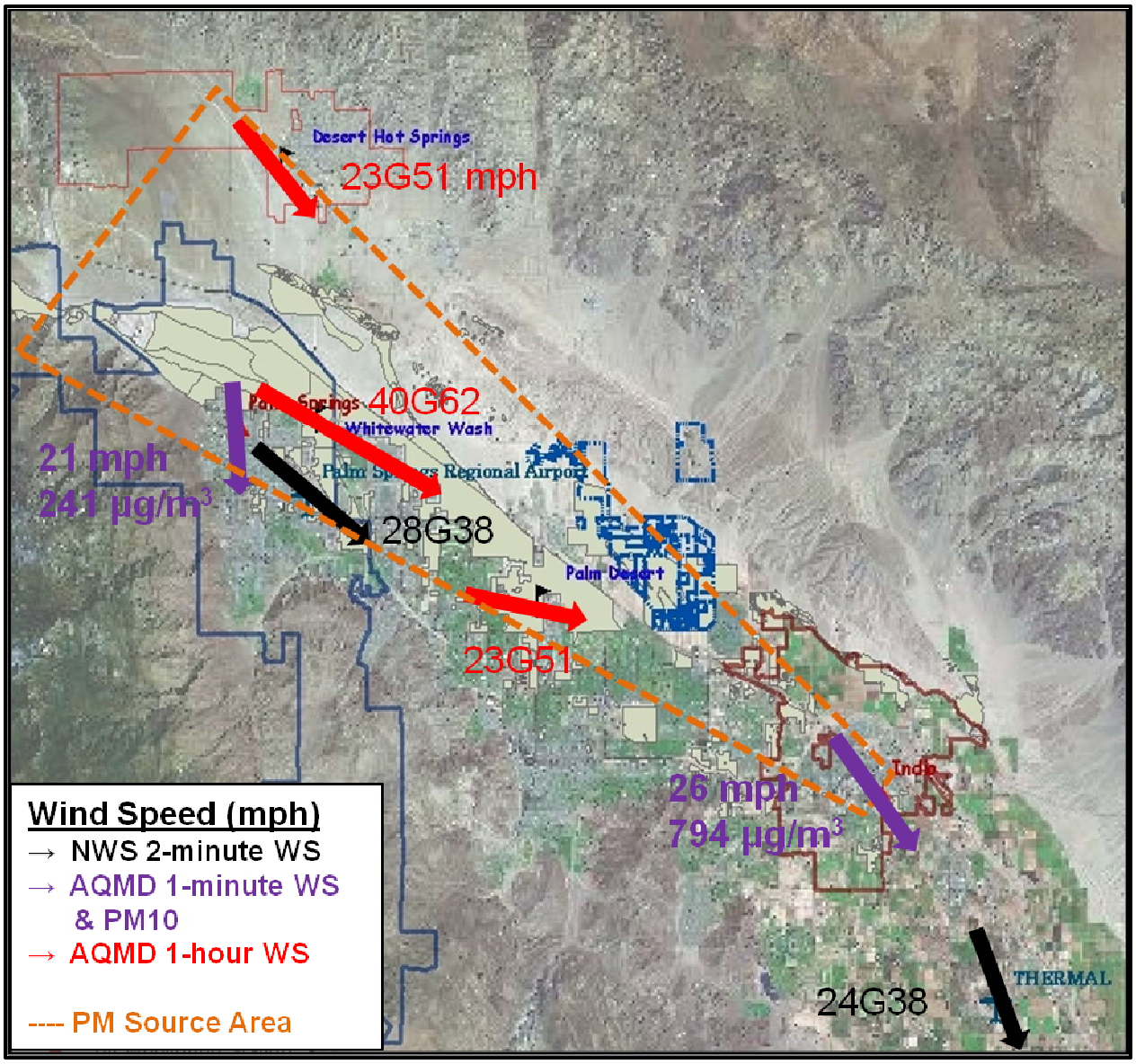

FIGURE 3-1

Map Showing Geography and Sustained Winds with Gusts (mph) Affecting the Coachella Valley PM10 Measurements (µg/m^3) during the Hour Starting at 0400 PST on May 21, 2008

[Sustained winds are 2-minute averages for NWS Airport METAR stations (black), 1-minute averages for AQMD Air Monitoring Stations (violet) and 1-hour averages for AQMD supplemental wind stations (red). Estimated PM10 source areas shown inside dashed orange border.]

Winds at the AQMD Palm Springs air monitoring station at 0400 PST were turned more northerly and slowed by the terrain of the San Jacinto Mountains, with 1-minute sustained speeds of 21 mph. Moving away from the terrain influence, Palm Springs Airport recorded a 2-minute sustained observation of 28 mph with gusts to 38 mph. Further down the Coachella Valley, the 1-hour averaged sustained speeds were 23 mph at Palm Desert with gusts to 51 mph. The peak 1-minute averaged sustained wind speed was 26 mph at Indio. The extremely high winds at Whitewater Wash indicate that the Whitewater River Wash and the open desert lands of this area are the primary source for the wind entrainment of dust and sand.

Due to the widespread gusty winds in the Coachella Valley on May 21, sources of the windblown dust were both natural areas, primarily the Coachella Valley Preserve areas, and BACM-controlled anthropogenic sources. On this day, the wind entrained dust originated primarily from non-anthropogenic natural sources within the Coachella Valley, mainly the natural blowsand source areas of the Whitewater Wash and Coachella Valley Preserve System and other open desert areas. A portion of the wind-entrained dust may have also originated from anthropogenic sources, including some agricultural operations, construction activities and roadways, that are well controlled in the Coachella Valley as described in Section 1.6, Regulatory Measures. The timing of this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly BAM PM10 measurement data from the Coachella Valley. With the weight of evidence provided, AQMD concludes that the PM10 exceedances would not have occurred without the high winds and wind-entrained dust from sources that were not reasonably controllable or preventable.

3.3 Technical Criteria for a High Wind Dust Exceptional Event Demonstration

Exceptional Event Criteria Summary

The technical criteria outlined in the Exceptional Event Rule for this high wind and windblown dust exceptional event demonstration are addressed in the order set forth in Table 3-2. The following sections describe how the technical criteria are met for the May 21, 2008 natural event.

TABLE 3-2
Technical Criteria for High Wind PM10 Exceptional Event Demonstration

Technical Criteria	Document Section
Not reasonably controllable or preventable	3.3.1
Clear causal relationship between the measurement and the event	3.3.2
Evidence that the event is associated with a concentration in excess of normal historical fluctuations, including background	3.3.2.1
Affects air quality	3.3.3
Caused by human activity unlikely to recur at a particular location OR a natural event	3.3.4
No exceedance or violation but for the event	3.3.5

3.3.1 Is Not Reasonably Controllable or Preventable

This demonstration identifies the sources that were expected to have contributed to the event, both natural and anthropogenic, and indicates how they were not reasonably controllable or preventable.

3.3.1.1 Source areas and categories expected to have contributed to the exceedance

Sources of windblown dust were both natural areas, particularly from the mountains and deserts, and BACM-controlled anthropogenic sources. This area is mapped in Figure 3-1, with the primary source areas outlined. The source area upwind of the Palm Springs

monitor includes part of the Whitewater River Wash with large areas of natural blowsand below the canyons of the San Gabriel and San Jacinto Mountains and portions at the northern and western portion of the Coachella Valley. The Whitewater Wash and the Coachella Valley Preserve have been set aside as an undisturbed, natural ecological preserve under the Coachella Valley Multiple Species Habitat Conservation Plan, since the shifting sand is important to several wildlife species. The primary sources with the potential to contribute PM10 in this area include undeveloped public and privately held lands. Other potential sources are construction activities, landfill operations, freeways and other roadways, light industry, and rock and gravel operations. The same potential PM10 sources are also upwind of the Indio monitor, with much larger portions of the Whitewater River Wash and the Coachella Valley Preserve system creating the blowsand zone along the centerline of the Coachella Valley upwind of Indio. The mix of potential BACM-controlled anthropogenic sources upwind of Indio is similar. Further down the Valley, beyond Indio and into Imperial County, agriculture becomes more prevalent. These and all sources in the Coachella Valley are subject to strict AQMD regulatory controls.

Analysis of Source Influence

A statistical model relating wind speeds at the Whitewater Wash blowsand source area to the PM10 measured at the Indio air monitoring station has been presented for several previous Coachella Valley natural event evaluations. Figure 3-2 shows this model graphically. The statistical model further illustrates that the May 21 exceedance of the PM10 NAAQS at Indio qualifies as a high-wind natural event, with the windblown dust emanating mainly from the natural PM10 source area of the Whitewater Wash Blowsand Area. Using the 24-hour, 10-meter wind speed of 36.9 mph from the Whitewater Wash site, the predicted PM10 concentration is 177.8 $\mu g/m^3$ on the best-fit curve of Whitewater 24-hour averaged wind speed versus Indio 24-hour averaged PM10 (Figure 3-2). The 37 $\mu g/m^3$ local background that the model estimates at Indio regardless of wind is then subtracted to give 140.8 $\mu g/m^3$ that would be contributed by blowsand from the Whitewater Wash Blowsand source area. In other words, the blowsand source model is unable to distinguish whether this 37 $\mu g/m^3$ average is caused by wind action on the blowsand, so it is conservatively assumed to be primarily anthropogenic and not from the natural source and it is removed from consideration as part of the windblown dust from the natural source. Therefore, without the high-wind event entraining dust from the natural source, PM10 concentrations of approximately 39.4 $\mu g/m^3$ (180.2 $\mu g/m^3$ measured minus 140.8 $\mu g/m^3$ blowsand) would have been expected at Indio on May 21, below the 24-hour PM10 NAAQS. This conservatively estimated PM10 source influence at Indio on May 21, 2008 is summarized in Table 3-3.

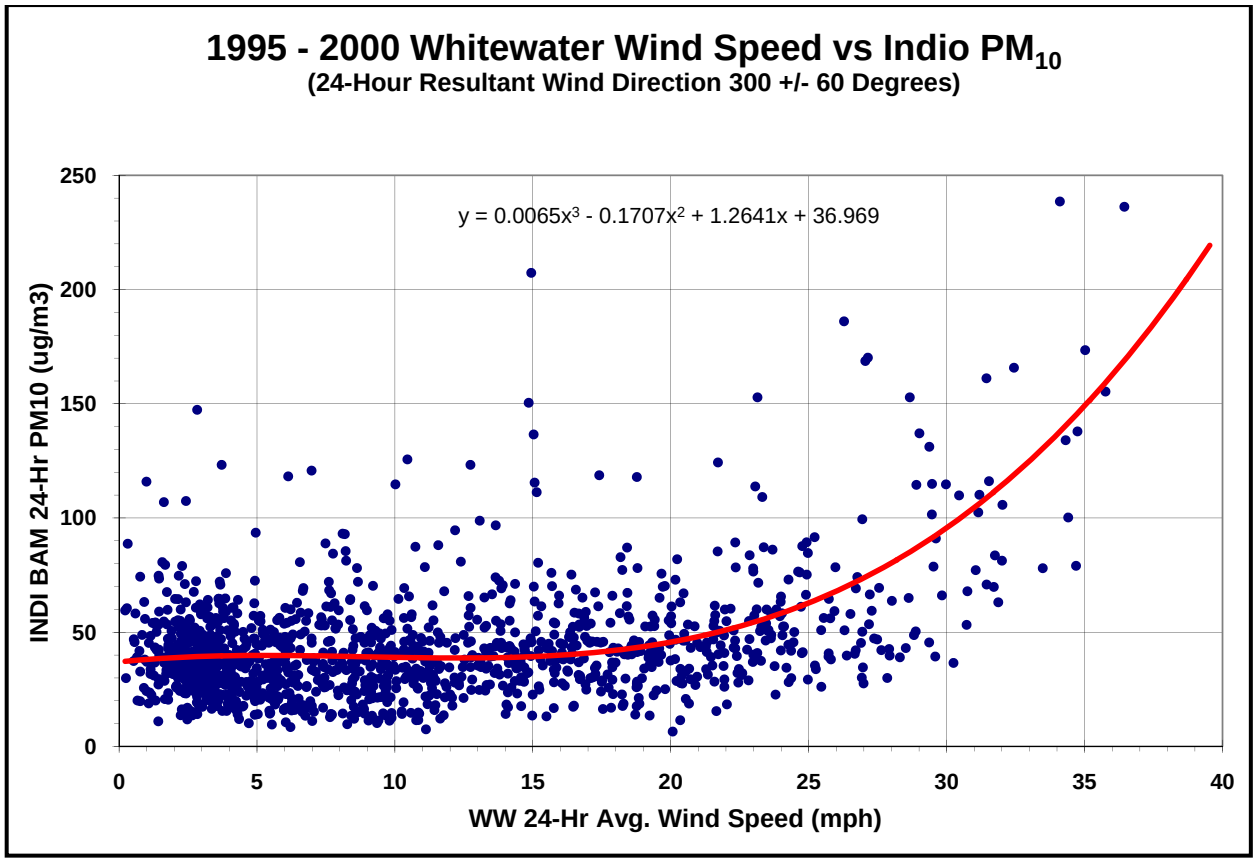

FIGURE 3-2

Plot of Paired 1995 - 2000 Whitewater Wash 24-Hour Averaged Wind Speeds (mph) versus Indio 24-Hour Averaged BAM PM10 Concentrations ($\mu g/m^3$) for winds through the Banning Pass

Plotted curve is best-fit polynomial to data

TABLE 3-3
Estimated PM10 Source Influence at Indio on May 21, 2008 using the 24-Hour Period with High Winds and PM10 Concentrations

PM10 Origin	PM10 Concentration
Total Measured PM10 (24-hour FEM BAM Sampler)	**180.2 μg/m^3**
Model-Estimated PM10 (36.9 mph 24-Hour Avg. Wind)	177.8 μg/m^3
Avg. Local Background PM10 (24-Hour)	37.0 μg/m^3
Natural Source PM10 (24-Hour)	**140.8 μg/m^3**
PM10 without Natural Event	**39.4 μg/m^3**

3.3.1.2 Analysis of wind speed

The high PM10 measured at Indio and Palm Springs on May 21 occurred with strong northwesterly, along-valley wind flows that prevailed throughout the day. Table 3-4 summarizes the peak wind speeds measured in the Coachella Valley on May 21, including 1-hour averaged sustained, 1-to-5-minute averaged sustained and 1-to-3-second gusts, as available. This wind event was relatively widespread throughout the Valley and all wind monitors, except the AQMD Palm Springs air monitoring station, measured sustained winds in excess of 25 mph. Wind speeds near 25 mph are commonly used as a threshold for when undisturbed natural lands will allow wind entrainment of PM10 dust or when BACM controls on anthropogenic PM10 sources are likely to be overwhelmed. This threshold is reasonable for the purpose of this analysis. The strongest winds were measured at the AQMD Whitewater Wash wind station, located near the centerline of the Valley southeast of the San Gorgonio Pass in the primary natural desert blowsand source area. Hourly averaged sustained wind speeds at Whitewater Wash exceeded 29 mph for every hour throughout the day on May 21. Throughout the morning when hourly PM10 concentrations were above 150 μg/m^3, the Whitewater hourly averaged winds exceeded 33 mph, well in excess of the 25 mph threshold. The 24-hour wind speed at Whitewater Wash, averaged over the whole day, was nearly 37 mph from the northwest on May 21, providing windblown dust from the northwestern Coachella Valley, downwind to the Palm Springs and Indio 24-hour PM10 monitors. The Whitewater Wash instantaneous gusts reached 42 mph or higher during

every hour of the day and were 53 mph or higher during the morning hours when PM10 concentrations were highest. The peak sustained hourly wind speed was 44 mph and the peak gusts reached 65 mph. It is clear that winds in the general vicinity upwind of the PM10 monitors reached sustained speeds high enough to overwhelm controls on anthropogenic sources and entrain dust from natural sources and then transport it to the Palm Springs and Indio PM10 monitors.

TABLE 3-4
Sustained Wind Speeds and Peak Wind Gusts (mph) Measured in Coachella Valley on May 21, 2008 with Time of Occurrence (PST)

(AQMD air monitoring stations at Palm Springs and Indio measure hourly averaged and 1-minute maximum sustained wind speeds; no gusts are recorded. AQMD Coachella Valley Wind Network stations measure hourly averaged sustained winds and instantaneous gusts. Sustained winds at the NWS airport stations are 2-minute averages preceding the observation time. Peak wind gusts at the NWS stations are defined as the highest 3-second running average during the hour preceding the observation time.)

Station Location	Hourly Averaged Peak Sustained Wind Speed (mph)	Time of Peak Hourly Sustained Wind (PST)	1-5 Minute Averaged Peak Sustained Wind Speed (mph)	Time of Peak 1-5 Minute Sustained Wind (PST)	Peak Wind Gust (mph)	Time of Peak Gust (PST)
AQMD Whitewater Wash (blowsand source area near Coachella Valley centerline)	**46**	0100 0200 0300			**68**	0300
NWS Thermal Airport (~8.6 miles SE of Indio monitor)			**36**	0752	**45**	0752
NWS Palm Springs Airport (E of Palm Springs monitor)			**33**	0253 1053	**47**	0153 0253
AQMD Desert Hot Springs (northern Coachella Valley)	**28**	0100 1500			**53**	0100
AQMD Palm Desert (between Indio & Palm Springs monitors)	**25**	0500			**52**	0500
AQMD Indio Air Monitoring Station (southeastern Coachella Valley)	18	0300 0700 0800	**27**	0700		
AQMD Palm Springs Air Monitoring Station (northwestern Coachella Valley)	19	0200	24	0200		

3.3.1.3 Recurrence frequency

The sustained (hourly averaged) winds at the Whitewater Wash wind monitor in the blowsand source area exceed 25 mph quite often, on approximately one third of all days during the 2005 through 2009 period, as shown previously in Figure 1-6 in Section 1.6.3, Historical Perspective. In the 2005-2009 period, exceedances of the PM10 NAAQS occur approximately 1.4 times per year at Indio and 0.8 times per year at Palm Springs (Figures 1-4 and 1-5). That there are not more exceedances of the federal PM10 standard shows that other factors play a role and that the BACM controls on windblown dust sources in the Coachella Valley are effective on all but very windy days. All the PM10 24-hour NAAQS exceedances in the Coachella Valley since 1993 have been attributed to high-wind natural events, which may recur and still be considered for exclusion under the exceptional event rule.

3.3.1.4 Controls analysis

This requirement is met by demonstrating that despite having reasonable and appropriate measures in place, the May 21, 2008 wind event caused the NAAQS violation. During this event, there were no other unusual PM10-producing activities occurring in the Coachella Valley and anthropogenic emissions were approximately constant before, during and after the event. Reasonable and appropriate measures were in place, as has been described in Section 1.5, Regulatory Measures. Examining the make-up of the Coachella Valley PM10 on this day using the available PM10 and PM2.5 data, the coarse particles (PM10-2.5), which are associated with windblown dust, represent over 93% of the total PM10 mass collected at both Indio and Palm Springs. PM10 sulfates, nitrates and chloride components were not available for analysis, since FRM data was not available in the Coachella Valley on this day. Smoke from wildfires, agricultural or residential burning did not appear to have added any significant amount of PM10 to the concentrations recorded at Indio and Palm Springs; PM2.5 mass in the Coachella Valley was low.

Wind speeds were high enough to entrain dust from natural areas including undisturbed mountain and desert areas upwind of the monitors. Natural particulate source areas contributed heavily to the measured PM10 at Palm Springs and Indio on May 21, from the upwind Whitewater River Wash and Coachella Valley Preserve areas, the undeveloped terrain of the northwestern Coachella Valley. Dust from these natural sources was not reasonably controllable or preventable during this event, due to the cost of applying controls over such a large land area and potential detrimental effects that controls could have on the natural ecosystems. PM10 was emitted from some BACM-controlled anthropogenic sources (mainly construction related activities) as control measures were locally overwhelmed by the high winds. Due to the AQMD High Wind

Day forecasts issued for May 21, earth-moving construction and agricultural operations were minimal in the Coachella Valley on this day. The primary source of the windblown dust on May 21 was the natural blowsand preserve areas that were most impacted by the strong winds. These BACM-controlled sources are mainly in the developed areas of the Coachella Valley, mostly southwest of the Valley centerline from Palm Springs to Indio, as outlined in Figure 3-1.

A survey of the AQMD complaint records and inspection reports for the Coachella Valley indicated no evidence of unusual particulate emissions on May 21, 2008, other than related to the windblown dust event. The complaints are summarized in Table 3-5 from the AQMD CLASS database for complaints and compliance actions. Due to the windy conditions, AQMD Compliance staff responded to twelve complaints related to windblown dust in the Coachella Valley on May 21. No Notices of Violation or Notices to Comply were issued for fugitive dust violations on this day. Several complaints were directly related to the strong winds and windblown dust that overwhelmed the strict fugitive dust controls that are enforced in the Coachella Valley. The control methods were generally effective throughout the Coachella Valley, but were apparently overwhelmed in several instances by the strong, gusty winds, causing windblown dust and sand to be entrained in the atmosphere.

TABLE 3-5
Summary of PM-Related Complaints in the Coachella Valley on May 21, 2008

Complaint Date/Time	Location	Complaint Description	Disposition
5/21/08 0143 PST	Palm Desert	Blowing dust from construction site.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 0610 PST	Palm Desert/La Quinta	Sand from construction is flying onto complainant's almost completed construction site.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 0636 PST	Palm Desert/La Quinta	Sand blowing everywhere. The site is not being contained.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 0638 PST	La Quinta	Excess amount of dust. No dust control.	Inspector visit on 5/21: AQMD certified PM10 representative for the site noted overwhelming high winds in the morning causing some fugitive dust, in spite of measures to mitigate dust. Reviewed alleged construction source's dust control plan, observed 3 water trucks operating, no track out, entrance road closed, proper signage, observed winds of 38 mph with no dust crossing property line at 0728 PST. Operating in Compliance. No further action taken.
5/21/08 0639 PST	La Quinta (near La Quinta High School)	Although today is windy, no watering being done.	Inspector visit on 5/21 at 1437 PST: Inspector surveyed the area and did not find any source of fugitive dust in or around the area mentioned in the anonymous complaint, including a construction site and undisturbed land covered with natural vegetation. No further action taken.
5/21/08 0747 PST	Palm Desert	Fugitive dust. Area not watered down. Very windy.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 0820 PST	Rancho Mirage	Breaking up concrete in neighbor's driveway causing a lot of dust.	Inspector arrived at 1329 PST on 5/21. The driveway in question was already removed and the soil watered down. Operating in compliance at inspection. No further action taken.
5/21/08 0902 PST	La Quinta (empty single lots)	Excess amounts of dust. Happening now.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 1109 PST	Palm Desert	Dust from construction site going into business (Hampton Inn). Losing business.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 1140 PST	Indio	Construction site creating a lot of dust. No containment.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 1325 PST	Palm Desert	Fugitive dust. Area not being watered down. Nearby stores are closing because the sand is plummeting their business.	Inspector did not find any specific source in violation. No further action taken.
5/21/08 2028 PST	Indio	Dust blowing from construction site.	Inspector follow-up on 5/22/08 did not find any issues. No further action taken.

3.3.2 Causal Connection

This demonstration shows a clear causal connection between the PM10 measured at the Palm Springs and Indio air monitoring stations and the high wind event. In this case, there is a clear causal connection between the onset of the strong, gusty winds upwind of the air monitoring stations, starting in the afternoon of May 20 and peaking through the morning of May 21, and coinciding increases in the hourly PM10 concentrations at Palm Springs and Indio.

3.3.2.1 Historical fluctuations

While high wind natural events may recur, sometimes frequently, and qualify for exclusion under the exceptional events rule, information on the historical fluctuations of the particulate concentrations and the winds can give insight as to the frequency of events that may be expected in a given area. This also helps to demonstrate that an event affected air quality with a causal connection. The historical perspective is presented in detail in Section 1.6.3 and is summarized here in relation to May 21, 2008. Five-year time series of the FRM PM10 (2005-2009) concentrations and the FEM BAM 24-hour PM10 concentrations (2008-2009), since submittal of the FEM data to AQS, are shown in Figures 1-4 and 1-5 for Indio and Palms Springs, respectively. Daily maximum sustained (1-hour averaged) wind speeds from the AQMD Whitewater Wash wind station are shown in Figure 1-6 for the same period. These show that PM10 exceedances occur an average of 1.4 times per year at Indio and less than once per year at Palm Springs. As was shown previously in Tables 1-2 and 1-3, on May 21 the 180 $\mu g/m^3$ 24-hour PM10 concentration at Indio was the 99.6^{th} percentile value (the fifth highest of the period) for the full 5-year period and the 170 $\mu g/m^3$ concentration at Palm Springs was the 99.7^{th} percentile value (the third highest of the period). If considering the 3-month seasonal period of April through June, the Indio concentration was the 99.5^{th} percentile value and the Palm Springs concentration was the 99.6^{th} percentile value. This event on May 21 was associated with the second highest sustained (1-hour averaged) wind speed at the AQMD Whitewater Wash wind monitor, 46 mph, measured during the 2005-2009 period.

3.3.2.2 Event occurrence and geographic extent

This section contains details of the high-wind natural event occurrence on May 21, 2008, including a description of meteorological conditions with details of the sequence of events that led to the PM10 NAAQS exceedances. Wind measurements, weather analysis charts, reports of blowing dust and reduced visibilities, wind advisories, news reports, and satellite images were all analyzed for this evaluation. Figure 3-1 shows the

geographic extent of the wind near the time of the peak hourly PM10 measurement at Indio and a high concentration at Palms Springs.

Meteorological Setting

An unseasonably strong Pacific storm system and associated surface cold front moved through southern California, causing strong pressure gradients and high winds through the San Gorgonio Pass and down the Coachella Valley, as well as in many areas of California and Nevada starting on May 20 and continuing through May 22. As such, May 21 can be classified primarily as a Type 2 event, using the classification scheme previously defined. The storm system contributed to strong pressure gradients between the coastal and desert air masses, bringing strong winds through the San Gorgonio Pass and down the Coachella Valley, enhanced by coupled along-valley flows aloft.

In addition to the Coachella Valley high winds during this 3-day period, gusty winds were reported in the San Joaquin Valley, the Kern County mountains and deserts, the Sierra Nevada mountains, Owens Valley, the Mojave Desert, Antelope Valley, Los Angeles and Ventura County mountains, Yucca Valley and the Morongo Basin (north of the Coachella Valley), with winds as high as 85 mph reported according to the National Climatic Data Center (NCDC) Event Record Reports.[14] This high wind event also led to violations of the PM10 NAAQS in the San Joaquin Valley at the Bakersfield station in Kern County and the Corcoran station in Kings County on May 21 and at Corcoran on May 22.[15]

The storm had brought strong thunderstorms and flash flooding to southern California as the moisture and instability increased in the afternoon of May 21. In Los Angeles County, thunderstorms produced damaging winds and heavy rains, along with power poles and lines knocked down by thunderstorm winds in Azusa, over an inch of small hail accumulated in Baldwin Park, and significant flooding with lane closures along Interstates 10 and 605. This late-season storm dropped three inches of snow above 5,000 feet in the San Bernardino County Mountains and heavier snow in the San Gorgonio Wilderness overnight on May 21 and in the morning of May 22. On May 22, the increased instability brought severe thunderstorms and caused: hail in Murrieta (Riverside County) and Santa Fe Dam (Los Angeles County); significant flooding along Interstate 10 and 605 (Los Angeles County); flooding and debris flows in Modjeska Canyon, Williams Canyon and Trabuco Canyon of the Santiago Burn Area (Orange County) after over an inch of rain in a half-hour period in the Santa Ana Mountains;

[14] *NOAA/NESDIS/NCDC:* http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

[15] U.S. EPA concurred with the San Joaquin Valley exceptional event documentation for May 21 and 22, 2008 on September 24, 2008

flash flooding and debris flows in the Witch Creek and Poomacha Burn Areas (San Diego County); and at least four tornados, flash flooding and several inches of accumulated hail through the area north of Moreno Valley and southward to Perris (Riverside County) in the afternoon. The largest of the tornados in the afternoon of May 22 lifted a semi-truck 30-40 feet and derailed nine empty railroad cars in Riverside County near March Air Reserve Base. Over east-central Los Angeles County, strong thunderstorms developed, producing damaging winds and heavy rain. In Azusa, severe thunderstorm winds knocked power poles and lines. In Baldwin Park, over one inch of small hail accumulated. The strong thunderstorms also brought heavy rain and flash flooding to the area. Significant flooding and lane closures were reported along Interstate 10 and Interstate 605.

Figure 3-3 shows the height analysis chart of the 500 millibar (MB) pressure level at 1600 PST, May 20, as an upper level trough was starting to deepen over the west coast. The winds aloft at this level were mostly westerly at this time over California, with speeds to 46 mph (40 knots) at the coast in Southern California and 58 mph (50 knots) in central and northern California. By 0400 PST in the morning of May 21 (Figure 3-4), the trough had deepened over southern California and the trough axis had shifted eastward, causing stronger northwesterly winds aloft with speeds over 80 mph (70 knots) over southern California. At 1600 PST in the afternoon of May 21, (Figure 3-5), the trough shifted a little to the east and strengthened further, with the low centered over Utah. This continued the northwesterly winds aloft over the southern California, with wind speeds at this level reaching 115 mph (100 knots) over San Diego. The trough provided upper-level support for the strong westerly and northwesterly winds at the surface during this period.

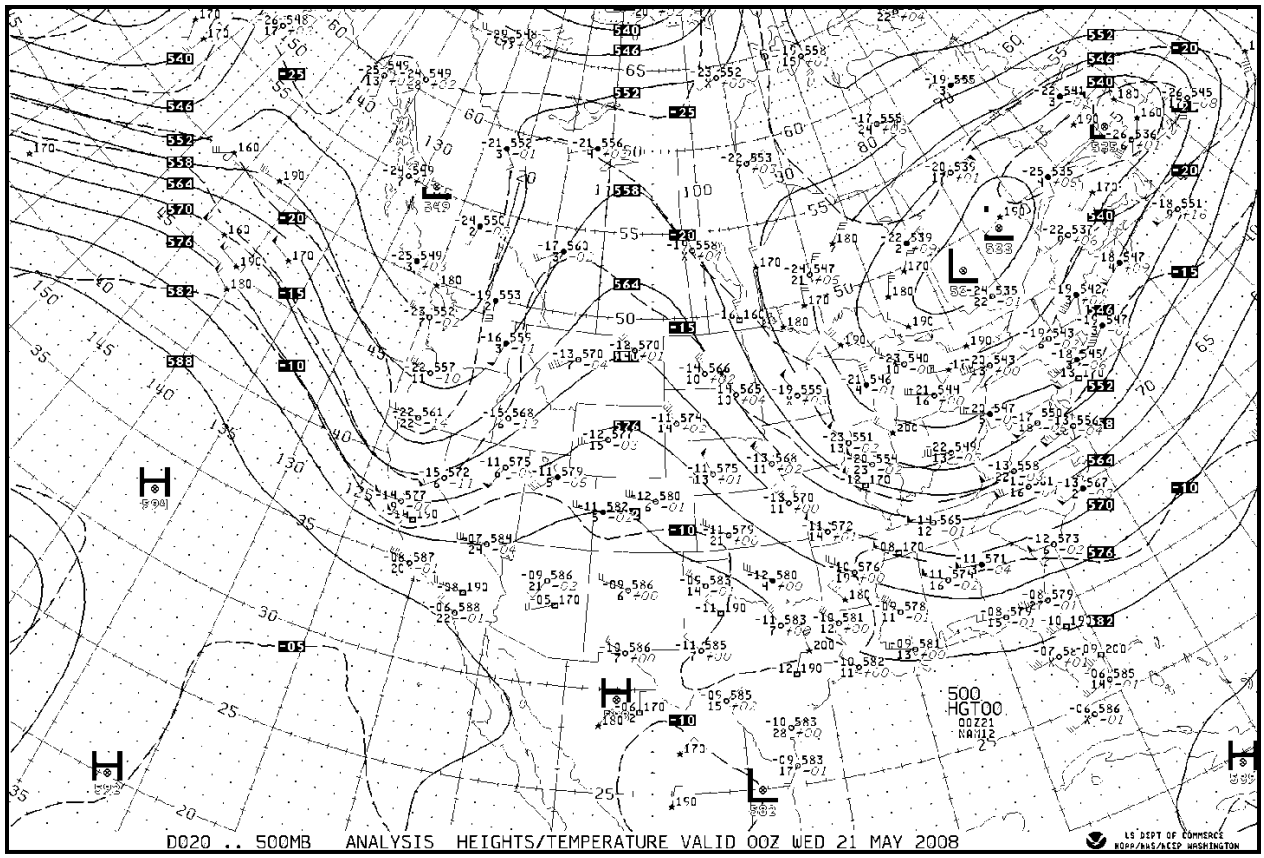

FIGURE 3-3

National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 1600 PST Tuesday, May 20, 2008

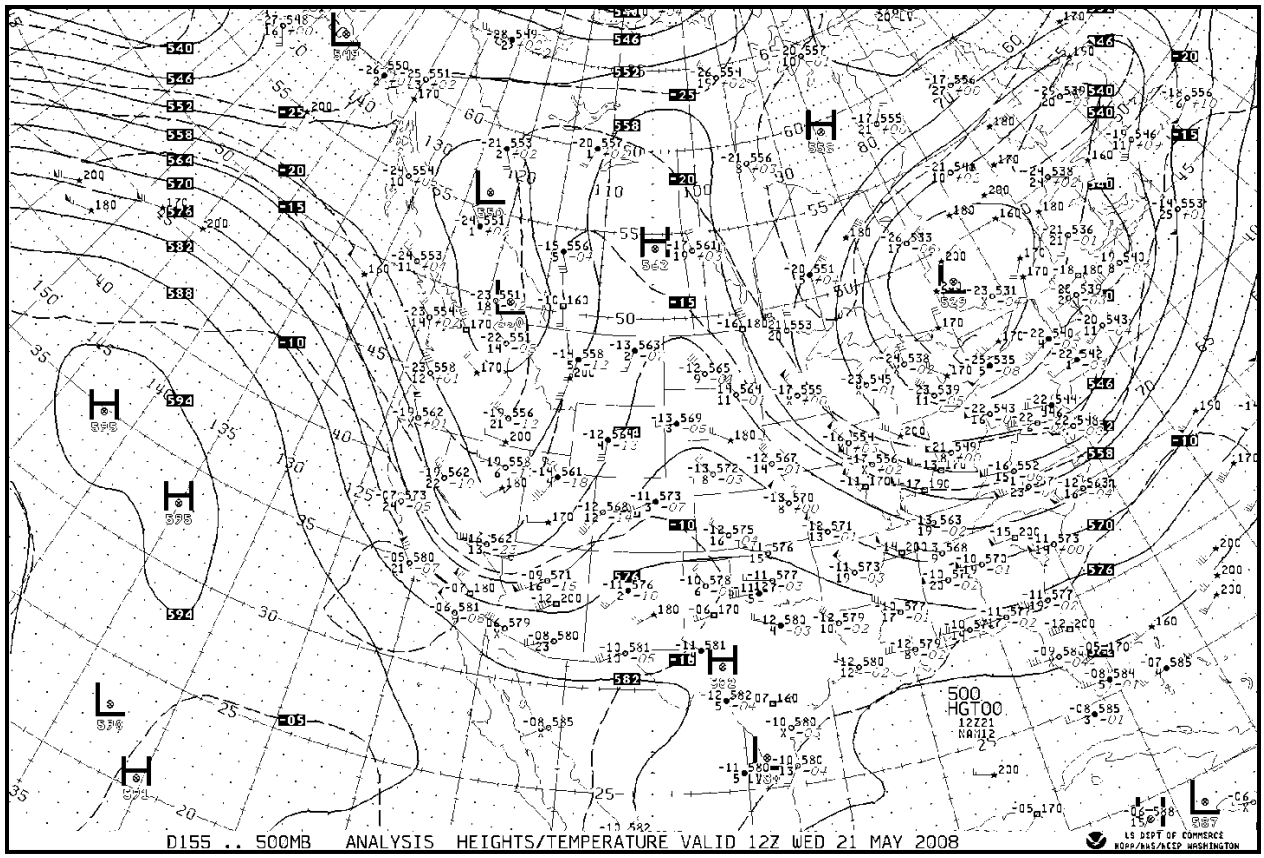

FIGURE 3-4

National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 0400 PST Wednesday, May 21, 2008

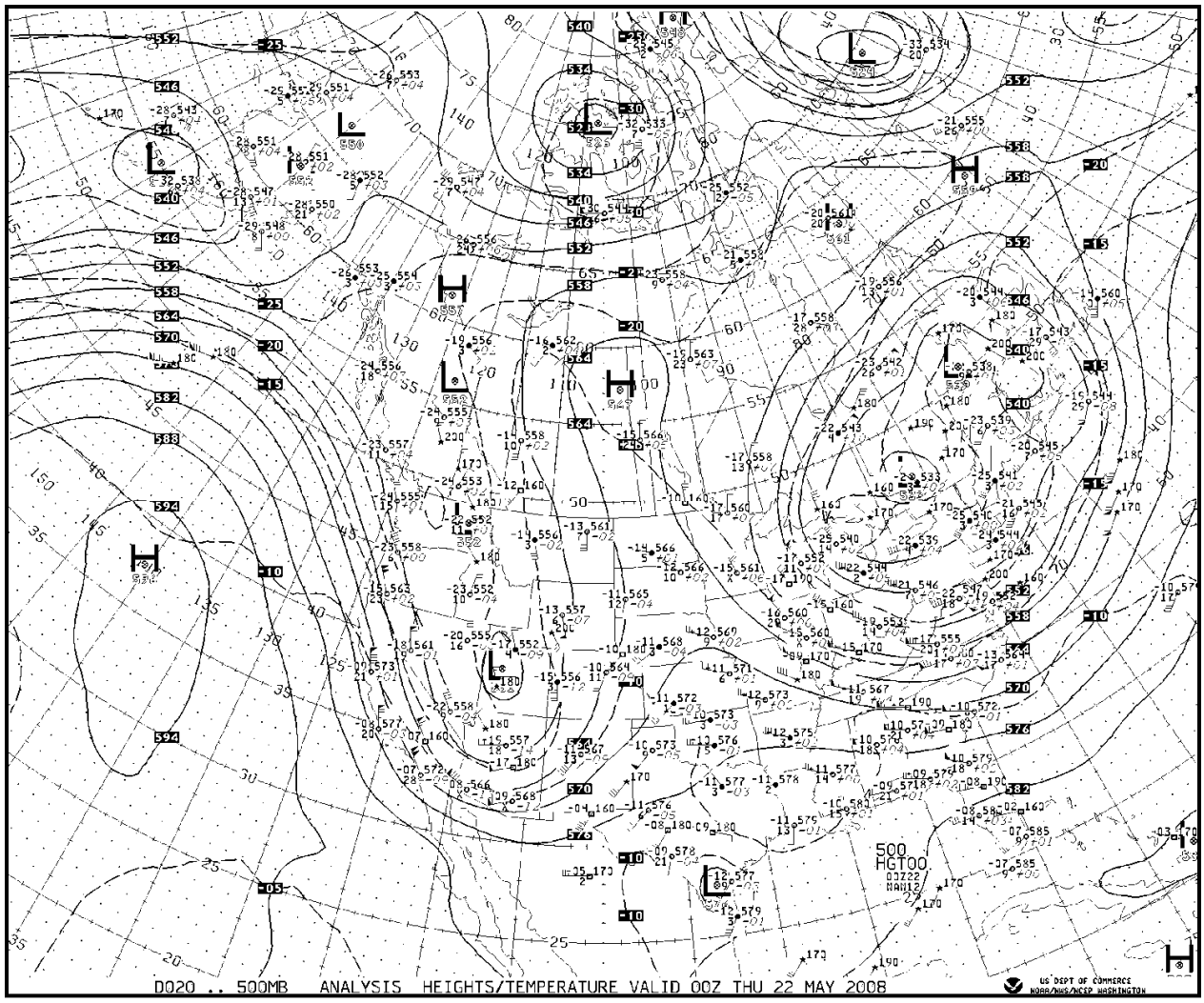

FIGURE 3-5

National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 1600 PST Wednesday May 21, 2008

Figures 3-6A and 3-6B show the NWS mean sea level pressure analysis every three hours throughout the day on May 21, 2008, starting at 0100 PST. An area of low pressure was centered over the southern portion of the Nevada/Utah border through 0400 PST with a second area of low pressure over the states of Wyoming, Montana, Colorado and Utah through the period. A cold front extended westward through southern California that moved southward and through the Coachella Valley before 1600 PST. With the frontal system impacting the Coachella Valley area, the tighter spacing of the isobars indicates stronger pressure gradients and stronger surface winds throughout the area. This pattern brought strong west and northwesterly winds at the surface across

southern California and through the Coachella Valley for much of the day through 1600 PST, peaking in the morning.

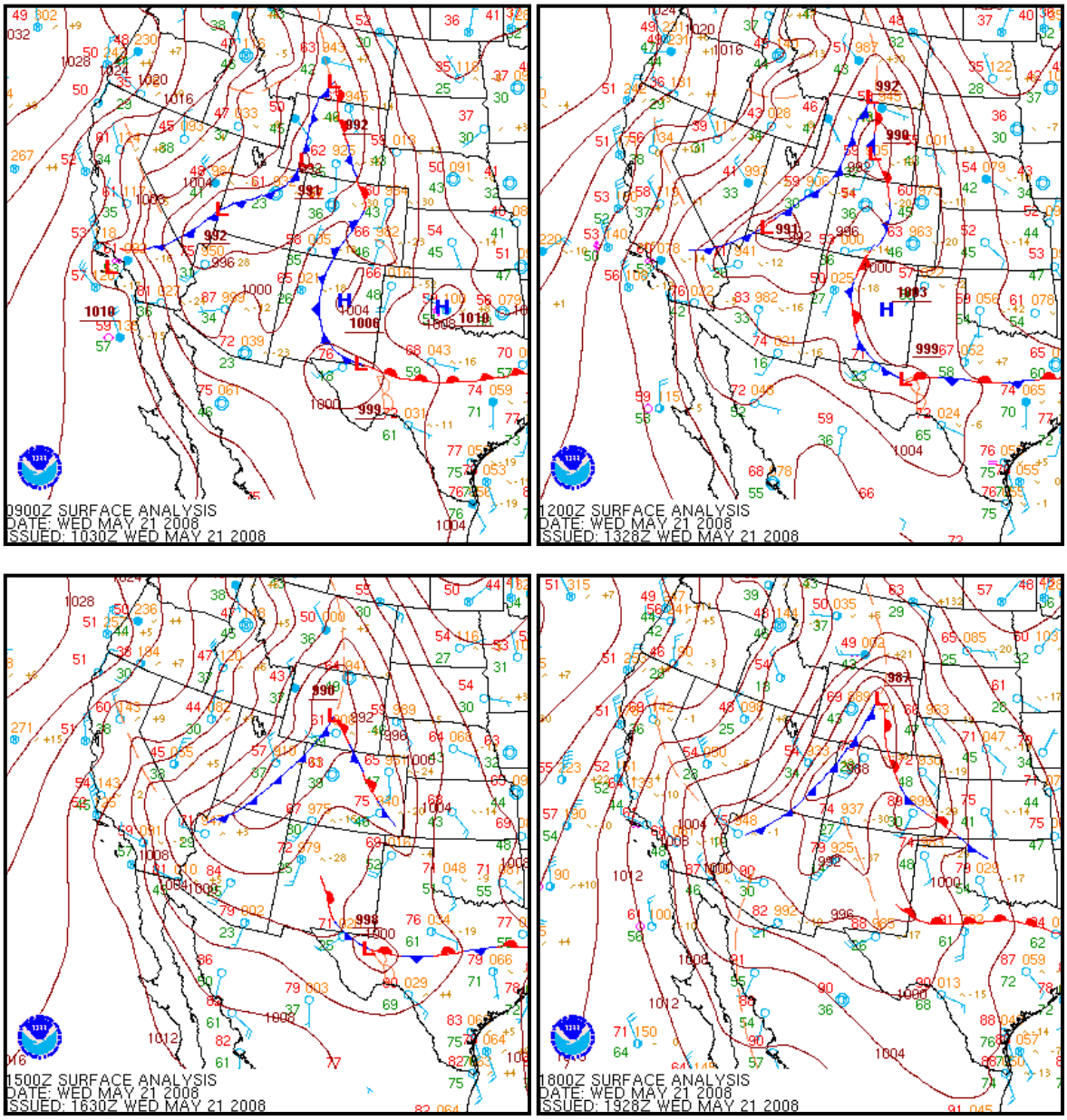

FIGURE 3-6A

National Weather Service Sea-Level Pressure Analysis (contours every 4 millibars) for every three hours between 0100 and 1000 PST Wednesday, May 21, 2008

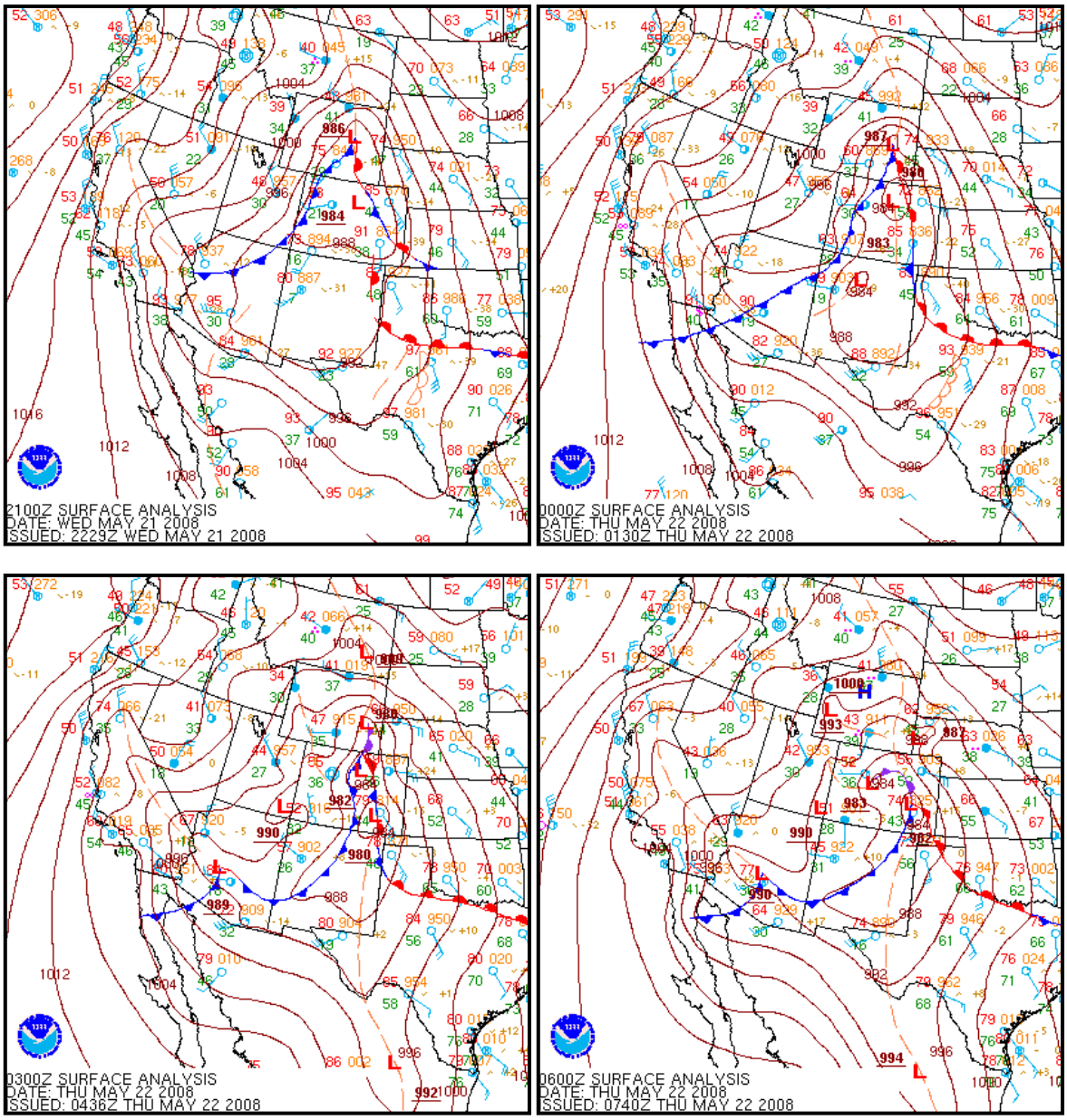

FIGURE 3-6B

National Weather Service Sea-Level Pressure Analysis (contours every 4 millibars) for every three hours between 1300 and 2200 PST Wednesday, May 21, 2008

The coastal inversion base at 0400 PST in the morning of May 21 was 3,925 feet, an increase in the marine layer depth of over 1,500 feet from 2,400 feet the previous morning. The trough had created a coastal eddy in the clouds offshore and a surge of status north of Point Conception, deepening the marine layer and bringing low clouds and patchy fog to the South Coast Air Basin overnight and in the morning of May 21. This is illustrated in the satellite image from approximately 1030 PST on May 21 (Figure 3-7), that shows few clouds over the deserts and a weak coastal eddy and stratus surge bringing low clouds west of the mountains surrounding the South Coast Air Basin and north of Point Conception. The deep marine layer and onshore flow supported the onshore pressure and density gradient through the San Gorgonio Pass and the gusty winds observed in the Coachella Valley.

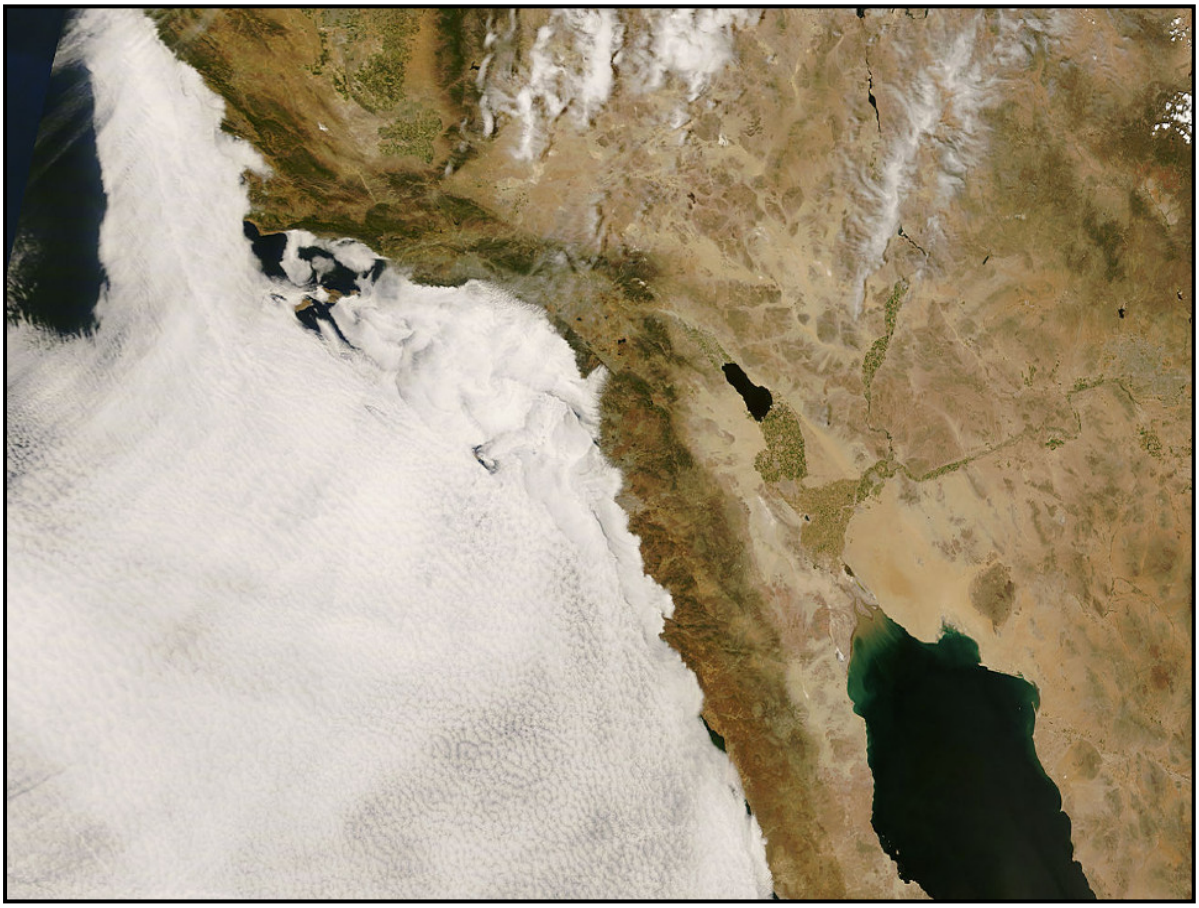

FIGURE 3-7

NASA MODIS Terra True Color Satellite Image at approximately 1030 PST in the morning of Wednesday, May 21, 2008

In their forecasts for the Coachella Valley, the NWS San Diego Forecast Office predicted gusty northwesterly winds to start in the evening of Tuesday, May 20 and to continue through Wednesday evening, May 21, along with blowing dust and sand and reduced visibilities. The peak wind gusts were expected to reach 50 mph overnight and as high as 65 mph in the morning of May 21. With their forecast issued at 0642 PST on Tuesday morning, NWS San Diego issued a wind advisory for the Coachella Valley as well as for the Apple and Lucerne Valleys in San Bernardino County, the San Bernardino and Riverside County Mountains and the San Diego County Mountains and Deserts. These wind advisories were to be in effect between 1300 PST Tuesday, May 20 and 1700 PST on Wednesday, May 21. For the Apple and Lucerne Valleys in the high desert, there was a high wind warning from 1300 to 2300 PST on Tuesday, May 20 and a high wind advisory that continued until 1700 PST on Wednesday, May 21. The following summarizes the NWS Zone Forecasts issued for the Coachella Valley during the period, including the wind advisories.

CAZ061-210445-
COACHELLA VALLEY-
642 AM PDT TUE MAY 20 2008 (0542 PST, Tuesday, May 20, 2008)

...WIND ADVISORY IN EFFECT FROM 2 PM THIS AFTERNOON TO 6 PM PDT WEDNESDAY...

.REST OF TODAY...MOSTLY SUNNY. AREAS OF BLOWING SAND AND BLOWING DUST IN THE AFTERNOON. HIGHS 103 TO 108. LIGHT WINDS BECOMING NORTHWEST 15 TO 25 MPH IN THE AFTERNOON.
.TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND BLOWING DUST IN THE EVENING. VISIBILITY ONE QUARTER MILE OR LESS AT TIMES IN THE EVENING. LOWS 71 TO 81. WINDS NORTHWEST 15 TO 25 MPH. NEAR BANNING PASS...WINDS NORTHWEST 25 TO 30 MPH BECOMING WEST 15 TO 20 MPH AFTER MIDNIGHT.
.WEDNESDAY...MOSTLY SUNNY. NOT AS HOT. AREAS OF BLOWING SAND AND BLOWING DUST IN THE AFTERNOON. HIGHS 88 TO 93. WINDS NORTHWEST 15 TO 25 MPH. GUSTS TO 40 MPH IN THE AFTERNOON.
.WEDNESDAY NIGHT...MOSTLY CLEAR. COOLER. AREAS OF BLOWING SAND AND BLOWING DUST IN THE EVENING. LOWS 62 TO 68. WINDS NORTHWEST 15 TO 25 MPH. GUSTS TO 40 MPH...BECOMING 30 MPH AFTER MIDNIGHT.

CAZ061-202100-
COACHELLA VALLEY-
915 AM PDT TUE MAY 20 2008 (0815 PST, Tuesday, May 20, 2008)

...WIND ADVISORY IN EFFECT FROM 2 PM THIS AFTERNOON TO 9 AM PDT WEDNESDAY...

...HIGH WIND WATCH IN EFFECT FROM WEDNESDAY MORNING THROUGH WEDNESDAY AFTERNOON...

.REST OF TODAY...MOSTLY SUNNY. AREAS OF BLOWING SAND AND BLOWING

DUST IN THE AFTERNOON. HIGHS 103 TO 108. WINDS EAST 15 MPH
BECOMING NORTHWEST IN THE AFTERNOON. NEAR BANNING PASS...LIGHT
WINDS BECOMING NORTHWEST 15 TO 25 MPH IN THE AFTERNOON.
.TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND BLOWING DUST
IN THE EVENING. VISIBILITY ONE QUARTER MILE OR LESS AT TIMES IN
THE EVENING. LOWS 71 TO 81. WINDS NORTHWEST 20 TO 30 MPH WITH
GUSTS 50 MPH.
.WEDNESDAY...MOSTLY SUNNY. NOT AS HOT. AREAS OF BLOWING SAND AND
BLOWING DUST IN THE AFTERNOON. HIGHS 88 TO 93. WINDS NORTHWEST
25 TO 40 MPH. GUSTS TO 65 MPH.
.WEDNESDAY NIGHT...MOSTLY CLEAR. COOLER. AREAS OF BLOWING SAND
AND BLOWING DUST IN THE EVENING. LOWS 62 TO 68. WINDS NORTHWEST
15 TO 25 MPH. GUSTS TO 40 MPH...BECOMING 25 MPH AFTER MIDNIGHT.

CAZ061-211115-
COACHELLA VALLEY-
200 PM PDT TUE MAY 20 2008 (1300 PST, Tuesday, May 20, 2008)

...WIND ADVISORY IN EFFECT UNTIL 9 AM PDT WEDNESDAY...
...HIGH WIND WATCH IN EFFECT FROM WEDNESDAY MORNING THROUGH
WEDNESDAY AFTERNOON...

.TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND BLOWING DUST
IN THE EVENING. VISIBILITY ONE QUARTER MILE OR LESS AT TIMES IN
THE EVENING. LOWS 71 TO 81. WINDS NORTHWEST 20 TO 30 MPH...
BECOMING 15 TO 20 MPH WITH GUSTS TO 30 MPH AFTER MIDNIGHT.
.WEDNESDAY...MOSTLY SUNNY. AREAS OF BLOWING SAND AND BLOWING DUST
IN THE AFTERNOON. HIGHS 88 TO 93. WINDS NORTHWEST 15 TO 25 MPH.
GUSTS TO 35 MPH.
.WEDNESDAY NIGHT...MOSTLY CLEAR. COOLER. AREAS OF BLOWING SAND
AND BLOWING DUST IN THE EVENING. LOWS 62 TO 68. WINDS NORTHWEST
15 TO 25 MPH. GUSTS TO 40 MPH IN THE EVENING.

CAZ061-211915-
COACHELLA VALLEY-
914 PM PDT TUE MAY 20 2008 (2014 PST, Tuesday, May 20, 2008)

...WIND ADVISORY IN EFFECT UNTIL 6 PM PDT WEDNESDAY...

WEDNESDAY...MOSTLY SUNNY. AREAS OF BLOWING SAND AND BLOWING DUST
IN THE AFTERNOON. HIGHS 88 TO 93. WINDS NORTHWEST 15 TO 20 MPH...
BECOMING 20 TO 30 MPH WITH GUSTS TO 40 MPH IN THE AFTERNOON.
.WEDNESDAY NIGHT...MOSTLY CLEAR. COOLER. AREAS OF BLOWING SAND
AND BLOWING DUST IN THE EVENING. LOWS 62 TO 68. WINDS NORTHWEST
15 TO 25 MPH. GUSTS TO 40 MPH IN THE EVENING.

CAZ061-212130-
COACHELLA VALLEY-
330 AM PDT WED MAY 21 2008 (0230 PST, Wednesday, May 21, 2008)

...WIND ADVISORY IN EFFECT UNTIL 6 PM PDT THIS AFTERNOON...

.TODAY...MOSTLY SUNNY. AREAS OF BLOWING SAND AND BLOWING DUST IN

THE AFTERNOON. HIGHS 88 TO 93. WINDS NORTHWEST 15 TO 25 MPH.
GUSTS TO 45 MPH IN THE AFTERNOON.
.TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND BLOWING DUST.
LOWS 59 TO 68. WINDS NORTHWEST 20 TO 30 MPH WITH GUSTS TO
45 MPH...BECOMING 15 TO 20 MPH WITH GUSTS TO 30 MPH AFTER
MIDNIGHT.

CAZ061-221100-
COACHELLA VALLEY-
200 PM PDT WED MAY 21 2008 (1300 PST, Wednesday, May 21, 2008)

...WIND ADVISORY IN EFFECT UNTIL 6 PM PDT THIS AFTERNOON...

.TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND BLOWING DUST.
LOWS 59 TO 68. WINDS NORTHWEST 20 TO 30 MPH WITH GUSTS TO
45 MPH...BECOMING 15 TO 20 MPH WITH GUSTS TO 30 MPH AFTER
MIDNIGHT.

CAZ061-221800-
COACHELLA VALLEY-
746 PM PDT WED MAY 21 2008 (1846 PST, Wednesday, May 21, 2008)

.REST OF TONIGHT...MOSTLY CLEAR. AREAS OF BLOWING SAND AND
BLOWING DUST IN THE EVENING. LOWS 59 TO 68. WINDS NORTHWEST 15 TO
25 MPH. GUSTS TO 40 MPH...BECOMING 30 MPH AFTER MIDNIGHT.

The criteria used by the AQMD Meteorology Section to forecast high winds and windblown dust events in the Coachella Valley in accordance with AQMD Rule 403.1, Wind Entrainment of Fugitive Dust, require:

(1) 0700 PST Pressure Gradient Index (PGI) > 17 MB,

where PGI = the 0700 PST Summation Pressure Gradient [SPG = (SAN-LAS)[16] + (LGB-DAG)[17] + (RIV-DAG)[18]] + the 24-hour change in the SPG from the previous day;

and

(2) 0400 PST Coastal Temperature Inversion Base > 1,500 feet;

or

[16] Sea Level Pressure difference between San Diego and Las Vegas
[17] Sea Level Pressure difference between Long Beach and Daggett
[18] Sea Level Pressure difference between Riverside and Daggett

0700 PST (SFO-TRM)[19] Pressure Gradient ≥ 8 MB.

On the morning of May 21, the 0700 PST Summation Pressure Gradient (SPG) was 21.5 MB. The 24-hour change in the SPG was -2.6 MB, giving a Pressure Gradient Index (PGI) of 24.1 MB and exceeding the high wind criteria. The San Francisco to Thermal pressure gradient was 17.0 MB, also well over the high wind criteria. The coastal inversion base at 0400 PST in the morning of May 21 was 3,925 feet. Thus, the conditions favored strong winds through the San Gorgonio Pass and down the Coachella Valley on this day. The AQMD Meteorology Section predicted this on the previous day and issued a Rule 403.1 high wind forecast for May 21. The AQMD high-wind forecast is available to the public and facilities subject to AQMD Rule 403.1 as part of the AQMD daily air quality forecast, available on the web at:

http://www.aqmd.gov/telemweb/Forecast.aspx.

A section of the text forecast valid May 21 was as follows:

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 Coachella Valley Rule 403.1 Wind Forecast:  High Wind Day

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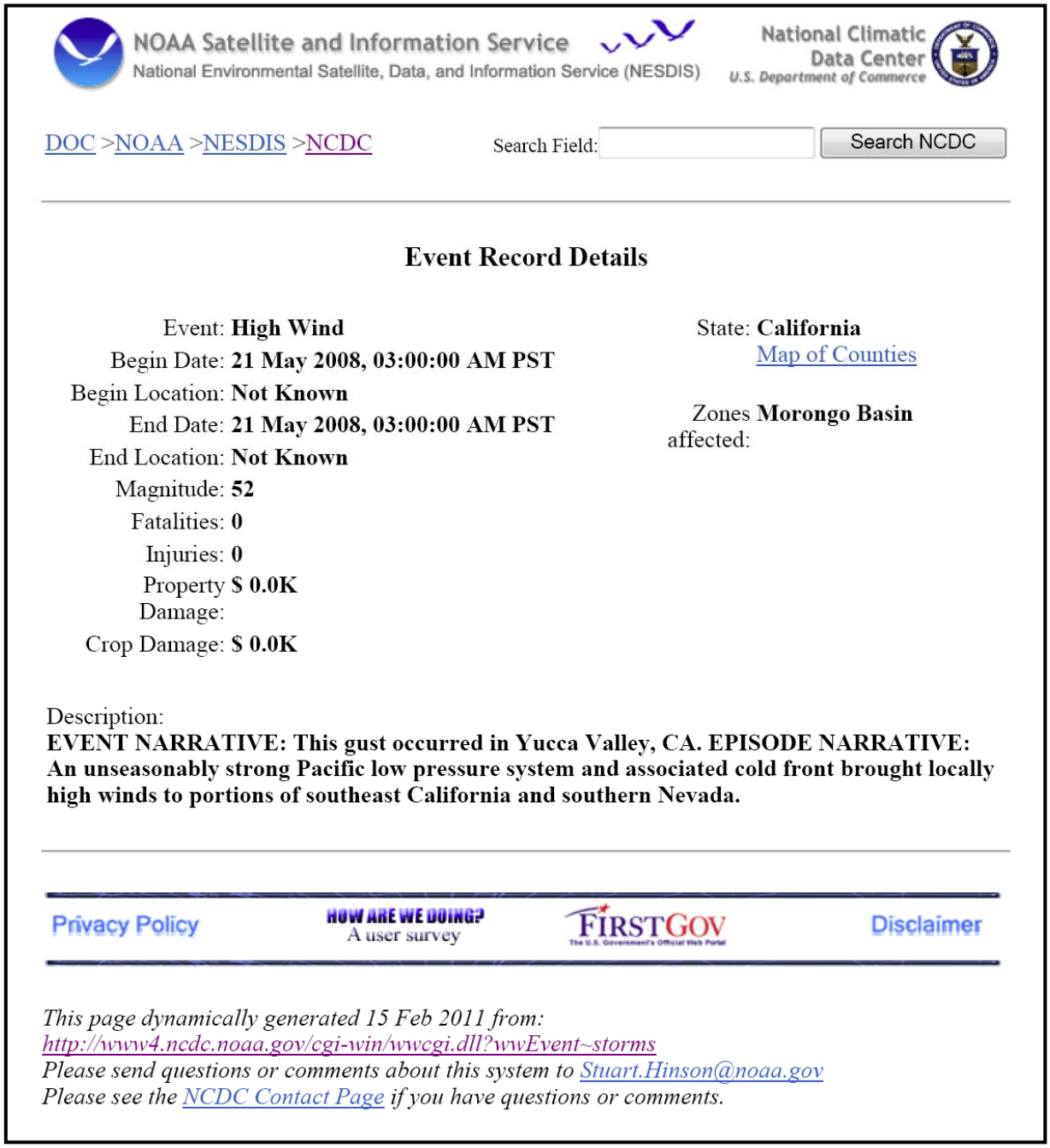
A daily recorded message for the AQMD Coachella Valley wind forecast is also available through 1-800-CUT-SMOG or directly at 909-396-2399. The wording for the Rule 403.1 high-wind advisory forecast message on May 21 was as follows:

> The following forecast is valid for Friday, May 21, 2008.
>
> The South Coast Air Quality Management District has designated Wednesday, May 21 as a Rule 403.1 High Wind Day in the Coachella Valley. This means that localized wind gusts are expected to exceed 25 miles per hour throughout the valley.

While the NCDC Event Record did not report wind damage specifically in the Coachella Valley, there were several high-wind reports throughout southern California. The nearest NCDC report was from the Morongo Basin, in Riverside County just north of the Coachella Valley. Wind gusts to 52 mph were recorded in Yucca Valley. This provides additional evidence of the windblown PM10 measured at Palm Springs, which is often

[19] Sea Level Pressure difference between San Francisco and Thermal

somewhat sheltered from the winds through the San Gorgonio Pass by the San Jacinto Mountains, since some of the strong winds in the Morongo Basin would come through the Morongo Valley and into the northern end of the Coachella Valley.



NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC Search Field: Search NCDC

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 03:00:00 AM PST**
Begin Location: **Not Known**
End Date: **21 May 2008, 03:00:00 AM PST**
End Location: **Not Known**
Magnitude: **52**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Morongo Basin**

Description:
EVENT NARRATIVE: This gust occurred in Yucca Valley, CA. EPISODE NARRATIVE: An unseasonably strong Pacific low pressure system and associated cold front brought locally high winds to portions of southeast California and southern Nevada.

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This page dynamically generated 15 Feb 2011 from:
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms
Please send questions or comments about this system to Stuart.Hinson@noaa.gov
Please see the NCDC Contact Page if you have questions or comments.

On Wednesday, May 21 at 1435 PST the Coachella Valley Desert Sun released the following description of road closures due to blowing dust and sand, via email:

Breaking News Alert: High winds cause road closure

Breaking News from The Desert Sun and mydesert.com:
Gene Autry Trail closed for 'indefinite time'

Gene Autry Trail between I-10 and Via Escuela remains closed and will be for an indefinite time, according to Palm Springs police. All other roads in Palm Springs remain open. Drivers are cautioned to watch for drifting sand and sudden decreased visibility due to blowing sand. Watch out for blowing dust and debris today. Forecasters at the National Weather Service are calling for winds between 20 and 25 mph, with gusts as high as 35 mph. The high winds have closed Gene Autry Trail, from I-10 to Via Escuela and have prompted a red flag warning due to fire danger. A wind advisory is in effect until 6 this evening.
For more on this story, please visit mydesert.com throughout the day.

In the morning of Thursday, May 22, the following article appeared in the Desert Sun newspaper, describing the wind event of May 21 and blowing sand near the Whitewater Wash blowsand source area (Gene Autry Trail near the 10 Freeway and Date Palm Drive at Vista Chino in Cathedral City).

Gusty winds are expected to fade

Colin Atagi • The Desert Sun • May 22, 2008

Coachella Valley residents can expect calmer winds today after strong gusts wreaked havoc across the desert on Wednesday, when blowing sand closed some high-traffic roadways.

Sustained winds of 15 to 20 mph are expected, with gusts of up to 30 mph.

Wednesday's gusts peaked at 45 mph in the morning.

"It looks like it was pretty much downhill after that," National Weather forecaster Stefanie Sullivan said. "It picked up again a little bit about 4 p.m. and it died down quite a bit after that."

The gusts were blamed on an onshore flow that sent wind funneling through the San Gorgonio Pass and into the Coachella Valley, Sullivan said.

"The coastal areas - we didn't really have any issue with wind and even the Inland Empire wasn't too windy either," she said.

Blowing sand made it difficult for motorists to get around the Coachella Valley on Wednesday.

Gene Autry Trail between Interstate 10 and Via Escuela was closed all day because sand limited visibility, the Palm Springs Police Department reported.

Southbound Date Palm Drive at Vista Chino in Cathedral City was closed temporarily Wednesday night so road crews could remove sand that blew onto the road, according to the Cathedral City Police Department.

Wednesday's high temperature of 88 degrees in Palm Springs was below the normal high of 96 degrees.

Today's temperatures are expected to peak in the 80s, Sullivan said.

Windblown Dust Analysis

Table 3-6 shows the winds from the AQMD air monitoring stations at Indio and Palm Springs in the Coachella Valley and at Banning Airport at the western portion of the San Gorgonio Pass in the South Coast Air Basin. The Banning Airport winds remained westerly throughout the day on May 21, consistent with onshore pressure gradients causing flow through the pass. The 1-minute maximum sustained winds from each hour reached 29 mph with at least six hours with 1-minute winds over 25 mph on May 21. The 1-hour averaged wind speeds reached 22 mph in the morning of May 21. Note that the extreme values shown at Banning for the 0200 and 0300 PST hours are likely errors (full-scale spikes) in the sonic anemometer used at that location during this period (that instruments has since been replaced). The Banning winds demonstrate that that there was significant forcing of the flows through the San Gorgonio Pass and into the Coachella Valley.

The AQMD Palm Springs air monitoring station winds were more northerly through the period, typical of wind flows down the Valley as the winds turn around a portion of the San Jacinto Mountains. The winds at the Indio station were from the northwest starting at noon on May 20 and continuing through the day on May 21, also consistent with winds blowing through the San Gorgonio Pass and down the Coachella Valley. Hourly averaged wind speeds did not exceed 20 mph at either Coachella Valley air monitoring station, with Indio peaking at 18 mph and Palms Springs at 19 mph. The 1-minute averages from Indio peaked at 27 mph during the 0700 PST hour with three hours measuring 1-minute winds over 25 mph in the morning. The Palm Springs peak 1-minute average was only 24 mph. Instantaneous gusts would be higher at these stations, if they were available. Some local contribution to the PM10 concentrations was possible, especially at Indio, as the local winds were occasionally strong enough to locally overwhelm dust controls, but the wind speeds at these sites are not consistently strong enough to generate sufficient local windblown dust near the stations to cause the high PM10 measured. Although the wind speeds were elevated at these air monitoring stations throughout the morning on May 21, they were relatively light as compared to the winds measured along the centerline of the Coachella Valley in the Whitewater Wash area.

TABLE 3-6

Hourly Wind Directions (degrees), Wind Speeds (mph) and Maximum 1-Minute Average Speed for each Hour (mph) for AQMD Air Quality Monitoring Stations in the San Gorgonio Pass and the Coachella Valley on May 21, 2008

		Banning Airport Monitoring Station (BNAP)			Palm Springs Monitoring Station (PLSP)			Indio Monitoring Station (INDI)		
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**
5/20/08	1200	270	12	17	15	9	14	327	4	8
	1300	242	13	17	343	11	15	310	7	12
	1400	238	14	20	7	10	15	320	10	15
	1500	247	14	21	355	11	15	326	13	19
	1600	239	13	18	9	11	16	335	14	19
	1700	255	12	15	3	10	16	323	14	20
	1800	267	12	15	11	11	16	330	14	19
	1900	260	13	16	348	13	18	333	12	17
	2000	266	14	20	344	14	20	325	12	18
	2100	279	15	20	354	12	18	318	13	22
	2200	269	14	18	356	15	21	318	16	23
	2300	251	14	18	352	16	23	308	14	21
5/21/08	0000	243	15	23	355	16	21	315	15	22
	0100	243	18	**26**	356	17	21	313	16	23
	0200	233	**48***	**93***	1	19	24	311	15	20
	0300	201	**51***	**93***	359	18	22	327	18	**26**
	0400	232	20	**28**	356	14	21	324	17	**26**
	0500	233	22	**29**	358	13	17	316	13	24
	0600	239	16	24	13	14	19	313	16	23
	0700	254	14	23	3	15	19	311	18	**27**
	0800	239	15	21	351	13	22	310	18	**25**
	0900	249	16	**26**	4	14	19	316	17	24
	1000	246	17	**26**	13	15	20	317	17	23
	1100	240	18	**26**	2	13	17	322	16	22
	1200	256	18	**25**	354	14	19	316	15	20
	1300	242	17	**25**	355	13	19	316	15	21
	1400	232	17	24	1	14	19	318	14	20
	1500	245	13	19	360	13	19	318	15	21
	1600	239	13	21	360	13	16	322	14	19
	1700	235	14	21	360	13	20	323	14	20
	1800	238	11	18	355	12	16	328	14	19
	1900	263	10	14	13	11	16	325	14	19
	2000	281	11	15	356	9	15	339	14	19
	2100	280	12	16	2	11	17	336	14	20
	2200	285	13	17	355	12	16	334	13	19
	2300	276	13	15	358	12	16	317	13	19
5/22/08	0000	273	14	17	1	11	13	329	13	17
	0100	271	14	18	0	10	13	333	11	15
	0200	276	15	20	4	11	15	312	9	13
	0300	280	11	15	358	13	17	301	10	17
	0400	267	11	14	354	13	17	308	11	17
	0500	284	10	13	359	13	18	303	9	13
	0600	278	12	16	355	12	16	301	11	17
	0700	241	11	16	350	11	15	307	13	19
	0800	256	11	15	343	10	15	311	15	21

* Banning Airport high wind speeds suspect due to full-scale error spikes with sonic anemometer

Further to the east of the AQMD Palm Springs station and closer to the natural blowsand source areas in the center of the Valley, the winds at the NWS Palm Springs Airport station (Table 3-7) were northwesterly with mostly elevated speeds, except for two hours in the morning on May 21 when the winds became southerly with low speeds. Wind gusts (3-second averages) over 25 mph were reported for all but three hours on May 21. The 2-minute averaged sustained wind speeds peaked at 33 mph at 0253 and 1053 PST and the wind gusts peaked at 47 mph during the 0153 and 0253 PST observation periods, when wind squalls were reported. Consistent with the winds measured at Palm Springs Airport, the PM10 measured at the AQMD Palm Springs air monitoring station was elevated with the gusty winds and peaked during the period of recorded squalls and strongest gusts at 403 $\mu g/m^3$ for the 0200 PST hour. The PM10 dropped to near 100 $\mu g/m^3$ for the two hours when the winds became light and southerly between 0500 and 0600 PST. After the winds shifted back to northwesterly, the PM10 jumped back to 300 $\mu g/m^3$, then slowly decreased until 1000 PST. After 1000 PST, the Palm Springs PM10 concentrations remained elevated, over 120 $\mu g/m^3$ through the rest of the day, but never exceeded 150 $\mu g/m^3$. The clouds increased on May 22 and light rain was recorded in the afternoon at Palm Springs Airport. The winds diminished gradually, ending the PM10 event.

TABLE 3-7

Hourly Wind Directions (degrees), Wind Speeds (mph), Wind Gusts (mph) when reported, Visibilities (statute miles), Weather Conditions and Observer Remarks for the National Weather Service Palm Springs Airport Station on Wednesday, May 21, 2008

Palm Springs Airport (PSP)									
DATE	**Time (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**VIS (miles)**	**Peak WD (deg)**	**Peak WS (mph)**	**PK Wind Time (PST)**	**Remarks**
5/20/08	1153	340	14		10				mostly clear
	1253	330	22	**29**	10				mostly cloudy
	1353	320	15	**30**	10				clear
	1453	310	20	24	10				partly cloudy
	1553	340	23	**33**	10				clear
	1643	320	21	**29**	10				clear
	1653	320	22	**36**	10				clear
	1753	340	20	**26**	10				partly cloudy
	1853	320	15	**32**	10				clear
	1953	320	**33**	**43**	10				clear
	2053	320	17	**25**	10				clear
	2153	310	12	18	10				clear
	2253	310	8		10				clear
	2353	290	8	**30**	10				clear
5/21/08	0053	320	16	**36**	10				clear
	0153	300	23	**47**	9				clear
	0253	310	**33**	**47**	10				squalls
	0353	310	**28**	**38**	10				clear
	0453	170	7		10				clear
	0553	200	7		10				clear
	0653	310	**26**	**37**	10		**37**		clear
	0753	320	**25**	**46**	10				clear
	0853	310	**26**	**39**	10				clear
	0953	320	22	**35**	10				clear
	1053	310	**33**	**41**	10				mostly clear
	1153	320	**32**	**41**	10				clear
	1253	310	24	**44**	10				clear
	1353	320	**26**	**37**	10				clear
	1453	320	23	**38**	10				clear
	1553	320	**26**	**44**	10				clear
	1653	310	16	**39**	10				clear
	1753	290	15	**26**	10				clear
	1853	290	15	**29**	10				clear
	1953	300	9		10				clear
	2051	310	22	**31**	10				clear
	2053	320	22	**31**	10				clear
	2153	330	24	**33**	10				clear
	2253	320	**26**	**32**	10				clear
	2353	310	24	**33**	10				clear
5/22/08	0053	320	22	**30**	10				clear
	0153	330	17		10				clear
	0253	310	18	**25**	10				clear
	0353	310	29	**35**	10				clear
	0453	310	18	**29**	10				partly cloudy
	0553	320	**25**	**31**	10				partly cloudy
	0653	320	**28**	**41**	10				mostly cloudy
	0753	320	24	**35**	10				mostly cloudy
	0853	320	24	**35**	10				overcast
	0953	310	16	22	10				mostly cloudy

The strongest winds typically occur through the centerline of the Coachella Valley, just below the San Gorgonio Pass, weakening with distance toward the southeast as the Valley widens before Indio. These strong winds are often observed along the I-10 corridor and near the Whitewater Wash, especially near the Coachella Valley Preserve where much of the blowsand that affects the Valley is generated. This case was as expected in that strongest winds were measured at the AQMD Whitewater Wash wind station, part of the supplemental AQMD Coachella Valley Wind Network. This data is shown in Table 3-8, along with wind data from the AQMD wind stations at Desert Hot Springs (northern Coachella Valley – east of the valley centerline) and Palm Desert (further down the valley between Palm Springs and Indio).

The winds at Whitewater Wash were consistently from the west-northwest throughout the day on May 21. Hourly averaged sustained wind speeds peaked at 46 mph for each of the three hours between 0100 and 0300 PST and never dropped lower than 29 mph throughout the day. The Whitewater Wash hourly peak instantaneous wind gusts reached 68 mph at 0300 PST, exceeding 53 mph for every hour throughout the morning and exceeding 42 mph for every hour of the day. The 24-hour averaged wind at Whitewater Wash was 36.9 mph.

TABLE 3-8
Hourly Wind Directions (degrees) and Speeds with Peak Gusts (mph) for the AQMD Coachella Valley Meteorological Network Stations on May 21, 2008

		Whitewater Wash Blowsand Site (WWW)			Desert Hot Springs Wind Station (DHS)			Palm Desert Wind Station (PDT)		
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**
5/20/08	1200	304	**27**	**43**	280	24	**46**	346	8	24
	1300	306	**30**	**49**	280	24	**45**	328	11	**25**
	1400	307	**31**	**48**	282	22	**39**	321	14	**30**
	1500	306	**31**	**48**	286	22	**41**	320	13	**32**
	1600	307	**31**	**52**	276	**25**	**45**	319	13	**30**
	1700	308	**32**	**53**	277	**25**	**45**	327	13	**28**
	1800	309	**33**	**51**	278	21	**39**	327	13	**30**
	1900	305	**37**	**56**	282	23	**43**	325	15	**29**
	2000	300	**39**	**68**	282	22	**40**	325	14	**31**
	2100	303	**39**	**59**	277	21	**41**	320	12	**30**
	2200	299	**40**	**59**	312	19	**43**	324	18	**46**
	2300	293	**43**	**64**	300	20	**38**	326	16	**37**
5/21/08	0000	297	**43**	**65**	299	22	**43**	316	9	23
	0100	301	**46**	**64**	304	**28**	**53**	297	11	**30**
	0200	300	**46**	**64**	293	24	**45**	307	18	**43**
	0300	298	**46**	**68**	277	**27**	**52**	330	17	**41**
	0400	300	**40**	**62**	282	23	**51**	322	23	**51**
	0500	310	**34**	**53**	289	19	**39**	325	**25**	**52**
	0600	311	**38**	**59**	276	23	**45**	316	21	**44**
	0700	305	**42**	**63**	273	23	**44**	318	24	**49**
	0800	302	**41**	**61**	273	24	**46**	316	21	**42**
	0900	303	**41**	**64**	272	**25**	**44**	315	18	**39**
	1000	306	**40**	**60**	270	**25**	**46**	318	20	**40**
	1100	307	**37**	**55**	269	24	**43**	316	22	**45**
	1200	303	**36**	**53**	270	**25**	**45**	316	20	**43**
	1300	301	**35**	**53**	261	**25**	**48**	315	16	**35**
	1400	299	**37**	**52**	265	**26**	**49**	309	15	**37**
	1500	300	**36**	**54**	270	**28**	**50**	302	11	**27**
	1600	299	**36**	**50**	273	**27**	**52**	299	10	**28**
	1700	293	**35**	**52**	276	**25**	**45**	314	12	**28**
	1800	298	**31**	**49**	279	**25**	**46**	314	13	**29**
	1900	305	**30**	**45**	286	23	**44**	315	13	**30**
	2000	309	**29**	**43**	285	21	**39**	322	16	**32**
	2100	310	**29**	**44**	282	21	**43**	321	14	**32**
	2200	310	**29**	**43**	282	20	**40**	318	13	**30**
	2300	308	**29**	**42**	281	17	**35**	314	11	**27**
5/22/08	0000	307	**28**	**42**	273	17	**30**	314	10	21
	0100	309	24	**37**	275	12	24	311	9	20
	0200	308	**27**	**43**	280	13	**33**	316	15	**30**
	0300	305	**31**	**47**	274	16	**30**	318	14	**31**
	0400	299	**33**	**47**	275	18	**35**	320	14	**29**
	0500	300	**30**	**44**	287	14	**29**	321	14	**30**
	0600	300	**31**	**47**	276	15	**30**	318	14	**29**
	0700	303	**29**	**45**	272	18	**34**	307	13	**30**
	0800	306	**25**	**39**	275	16	**30**	309	14	**29**
	0900	295	**25**	**36**	270	16	**29**	294	10	**29**
	1000	293	17	**30**	265	18	**33**	265	7	18

Given the strong, gusty winds throughout much of the day at Whitewater Wash, windblown dust was entrained from the Coachella Valley blowsand source areas throughout the day, although the strongest winds and most consistent transport to the Indio and Palm Springs PM10 BAM monitors occurred in the morning. The Indio PM10 hourly peaks were 794 and 597 $\mu g/m^3$ for the hours starting at 0400 and 0900 PST, respectively. The readings were above 100 $\mu g/m^3$ for the first twelve hours of the day and were above 200 $\mu g/m^3$ between 0300 and 1000 PST, except for the 0600 PST hour. The peak hourly winds at Whitewater Wash correspond well to the Palm Springs hourly PM10 and also to the Indio PM10 with a time lag for the transport down the valley. The peak instantaneous gust of 68 mph measured at the Whitewater Wash on May 21 occurred during the hour beginning at 0300 PST when the 1-hour averages sustained wind speed was 46 mph. The peak hourly BAM PM10 measurement at Indio occurred one hour later, during the hour beginning at 0400 PST.

The AQMD Desert Hot Springs meteorological station is further east from the centerline of the Valley and the Whitewater Wash station. As a result, the winds at Desert Hot Springs (Table 3-8) were more westerly and weaker as they flowed from the San Gorgonio Pass and around the Morongo Mountains at north end of the Coachella Valley. The 1-hour sustained wind speeds exceeded 25 mph for five hours on May 21, peaking at 28 mph, although instantaneous wind gusts reached as high as 53 mph in the early morning and most hours of the day exceeded 40 mph. The gusty winds at Desert Hot Springs indicate that some windblown dust was entrained from the northern portion of the Coachella Valley in addition to the centerline locations near Whitewater Wash. Further southeast, down the Valley from the Palm Springs and Whitewater Wash stations, the winds at the AQMD Palm Desert wind station (Table 3-8) were weaker that those measured at Whitewater Wash or Desert Hot Springs. This is due to the widening of the Coachella Valley and the distance from the San Gorgonio Pass. The wind directions were northwesterly at Palm Desert, along the Valley at that point. No 1-hour averaged sustained winds at Palm Desert exceeded the 25 mph maximum measured for the 0500 PST hour. Instantaneous wind gusts exceeded 30 mph during every hour starting at 0100 PST through 1400 PST, peaking at 52 mph during the 0500 hour. That the winds were strongest in the Whitewater Wash area than the other locations throughout the Coachella Valley provides evidence that this was the primary source area for PM10 that was measured at Indio. This is the most significant natural blowsand source area and the most significant source of PM10, either natural or anthropogenic, in the Coachella Valley.

A few miles southeast of Indio, the NWS weather station at Thermal Airport reported sustained wind speeds (2-minute averages) over 25 mph during most hours of the morning on May 21, after which the winds were weaker (Table 3-9). Wind gusts were measured over 25 mph starting in the night of May 20 and continuing through much of the day on May 21, with the strongest gust of 45 mph at occurring during the 10 minute period between 0742 and 0752 PST in the morning. Haze was reported between

midnight and 0907 PST by the automated weather station, with reduced visibilities reported throughout the morning to a minimum of 1.5 miles. The winds remained north-northwesterly through the morning. This supports that the windblown dust measured at Indio mainly occurred in the morning of May 21.

TABLE 3-9

Hourly Wind Directions (degrees), Wind Speeds (mph), Wind Gusts (mph) when reported, Visibilities (statute miles), Weather Conditions and Observer Remarks for the National Weather Service Thermal Airport Station on Wednesday, May 21, 2008

Thermal Airport (TRM)									
DATE	**Time (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**VIS (miles)**	**Peak WD (deg)**	**Peak WS (mph)**	**PK Wind Time (PST)**	**Remarks**
5/20/08	1152	90	3		10				
	1252	150	8		10				
	1352		5		10				
	1428	300	15	22	10				
	1452	290	15		10				
	1552	320	15		10				
	1652	310	17		10				
	1752	340	24	**30**	10				
	1852	340	14		10				
	1952	330	15		10				
	2052	330	21	**28**	10				
	2152	330	22	**30**	10				
	2252	340	24	**35**	**7**				
	2352	330	**28**	**37**	8				
5/21/08	0052	340	**26**	**32**	10				
	0152	330	20	**30**	9				
	0252	330	18	**32**	**6**				**HZ**
	0352	340	24	**38**	8				
	0452	330	**28**	**36**	**6**				**HZ**
	0529	330	24	**41**	**2**				**HZ**
	0540	330	24	**40**	**5**				**HZ**
	0552	330	23	**35**	10				
	0652	320	**29**	**37**	**3**				**HZ**
	0656	320	**31**	**44**	**1.75**				**HZ**
	0708	330	**28**	**38**	**3**				**HZ**
	0735	320	**28**	**44**	**2**				**HZ**
	0742	330	**26**	**40**	**1.5**		**44**		**HZ**
	0752	330	**36**	**45**	**1.5**		**45**		**HZ**
	0806	330	**25**	**41**	**3**				**HZ**
	0852	330	**31**	**43**	**2**				**HZ**
	0907	330	**30**	**39**	**4**				**HZ**
	0952	330	**30**	**37**	9				
	1052	330	**28**	**36**	9				
	1152	330	**25**	**33**	9				
	1252	330	22	**29**	10				
	1352	310	18	**25**	10				
	1452	330	20	**32**	10				
	1552	290	13	20	10				
	1652	280	14	21	10				
	1752	310	12		10				
	1852	340	18	**28**	10				
	1952	350	13	24	10				
	2052	330	21	**26**	10				
	2152	340	21	**29**	10				
	2252	330	16	23	10				
	2352	340	20	**25**	10				
5/22/08	0052	330	20	**25**	10				
	0152	320	14		10				
	0252	320	14		10				
	0352	310	15	24	10				
	0452	320	18	24	10				
	0552	330	17		10				

3.3.2.3 Transport of emissions related to the event

The mapped winds in Figure 3-1 in Section 3.3.1 and the wind data presented in the tables in Section 3.3.2.2 provide wind direction data showing that emissions from sources identified as part of the "not reasonably controllable or preventable" demonstration were upwind of the Indio and Palm Springs monitors in question. The transport of emissions related to the event was in the direction of the monitors where the PM10 federal standard exceedances were recorded.

3.3.2.4 Temporal relationship between the high wind and elevated PM concentrations

The timing of the this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly FEM PM10 measurement data. Figure 3-8 shows the hourly BAM PM10 data from the Palm Springs and Indio air monitoring stations, along with the wind speeds from the AQMD Whitewater Wash wind station. This shows that winds in the northwestern Coachella Valley (Whitewater Wash) increased in the afternoon of May 20, causing increasing hourly PM10. The high winds continued, with some speed variability, throughout the morning of May 21, when the highest hourly PM10 averages that contributed to the 24-hour NAAQS violations occurred. Several relatively high PM10 spikes occurred at the Palm Springs and Indio monitoring stations, primarily after hourly wind speeds at Whitewater Wash exceeded 40 mph and gusts exceeded 60 mph.

The strong winds in the first few hours of May 21 caused the hourly PM10 at Palms Springs to increase, spiking to a peak of 403 $\mu g/m^3$ for the hour beginning at 0200 PST. With a time lag for the distance down the Coachella Valley, this was followed by PM10 increases at Indio with the peak hourly concentration of 794 $\mu g/m^3$ during the hour beginning at 0400 PST. The Whitewater Wash 1-hour sustained winds decreased briefly in the morning to 34 mph at 0500 PST, with corresponding drops in the PM10 at Indio and Palm Springs. The winds increased again through 0900 PST with corresponding increases in the measured hourly PM10. By the afternoon, the hourly PM10 concentrations at Indio and Palm Springs were elevated through the rest of the day, but remained below 150 $\mu g/m^3$. Note that while the Indio and Palm Springs air monitoring station wind speeds were elevated at this time, all the sustained wind speeds at Palm Springs were below 25 mph and only 3 hours had 1-minute averaged winds above 25 mph at Indio. This indicates that the PM10 was mainly transported from the windier areas upwind of these stations, with minor contributions from locally generated PM10 in the immediate vicinity of the Palm Springs and Indio stations.

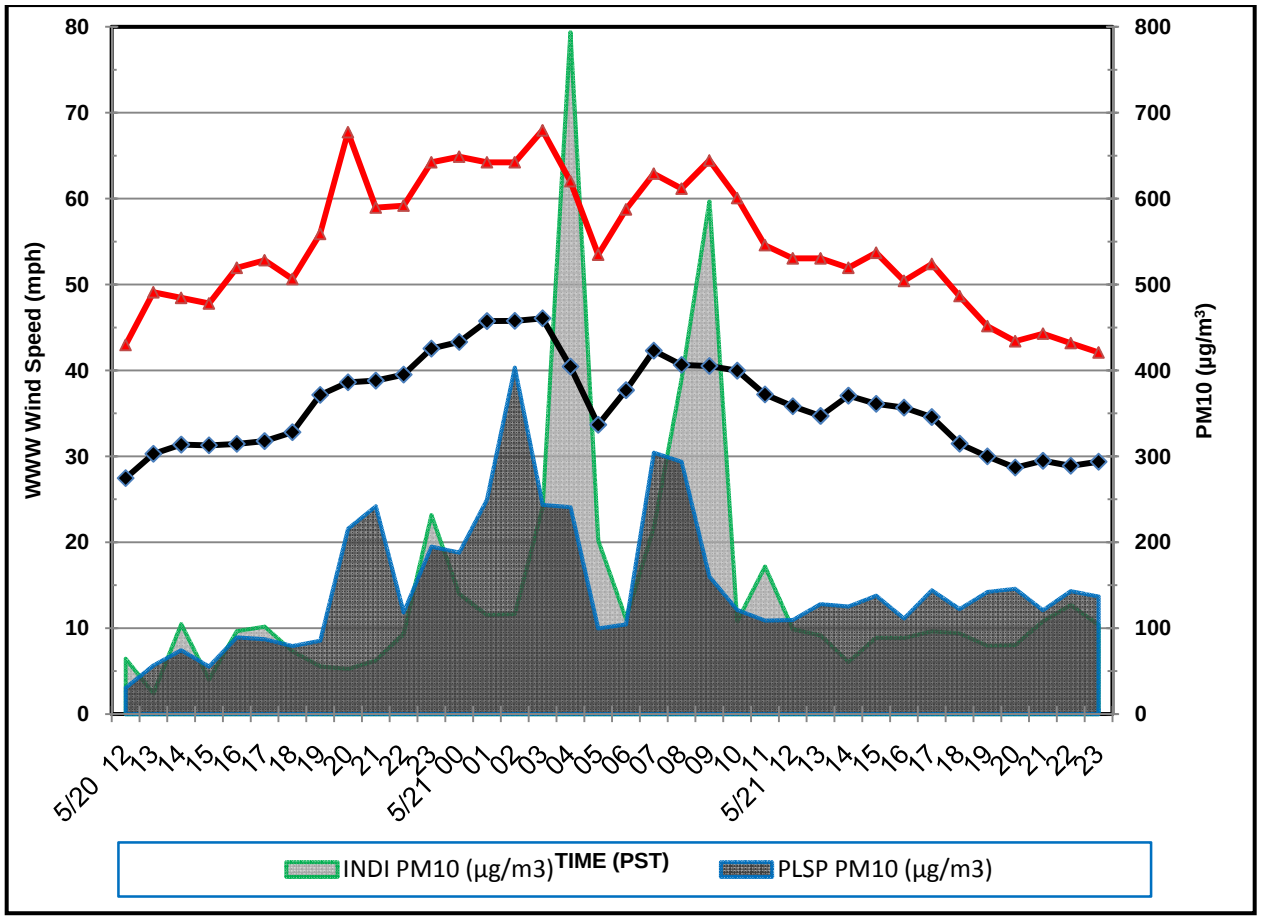

FIGURE 3-8

Time Series of Whitewater Wash (WWW) Wind Speeds (Hourly Average and Gust, mph) with Indio and Palm Springs Hourly BAM PM10 (µg/m^3) from 1200 PST May 20 through May 21, 2008

3.3.2.5 Chemical composition of measured pollution with that expected from sources identified as upwind

Since the FRM PM10 filter measurements were not collected in the Coachella Valley on May 21, the FRM sulfate, nitrate and chloride mass loadings are not available to help indicate that the PM10 was primarily crustal materials on this day due to windblown sand and dust. The 24-hour PM10 and PM2.5 concentrations and the PM-Coarse percentage [(PM10-PM2.5)/PM10] on the days surrounding May 21 for the Coachella Valley stations, as well as the two nearest South Coast Air Basin stations in Riverside County (Banning and Riverside-Rubidoux), are summarized in Table 3-10. The FRM PM2.5 mass concentrations measured on May 21, 12.3 and 10.4 µg/m^3, respectively at

Indio and Palm Springs, were well below the 24-hour PM2.5 NAAQS and only a small portion of the PM10 mass. Using the collocated FEM BAM PM10 and FRM PM2.5 at each station on May 21, the coarse particles (PM10-2.5), which are associated with windblown dust, represent over 93% of the total PM10 mass collected at both Indio and Palm Springs. The South Coast Air Basin stations at Riverside-Rubidoux and Banning Airport show a greater influence from the PM2.5 from combustion sources in the PM-Coarse percentage. This provides further evidence that the PM10 in the Coachella Valley was primarily due to the wind event and not related to fires, transportation or other combustion processes. No continuous PM2.5 monitors are deployed in the Coachella Valley due to the consistently low concentrations measured with the FRM samplers.

TABLE 3-10

24-Hour FRM and FEM PM10 and PM2.5 Measurements (μg/m^3) and PM-Coarse (PM10-2.5) fraction of PM10 (%) from the Coachella Valley (Indio and Palm Springs) and the nearest South Coast Air Basin (Banning Airport and Rubidoux) Air Monitoring Stations between May 18 and May 24, 2008

Station	Type	18-May	19-May	20-May	21-May	22-May	23-May	24-May
PM10								
Indio	PM10 FRM	33			N/A			14
Indio	PM10 BAM	29	42	63.7	**180.2**	61.9	22	37
Palm Springs	PM10 FRM	25						10
Palm Springs	PM10 BAM	25	35	74.0	**170.2**	36.7	20	10
Banning Airport	PM10 FRM	38						8
Rubidoux	PM10 FRM	61			48			11
Rubidoux	PM10 TEOM	66	67	53	43	45	26	16
PM2.5								
Indio	PM2.5 FRM	9.0			12.3			3.4
Palm Springs	PM2.5 FRM	N/A			10.4			4.3
Banning Airport	PM2.5 BAM	17.0	20.9	20.6	19.0	14.4	11.3	8.8
Rubidoux	PM2.5 FRM	N/A	23.6	18.9	12.0	11.8	6.7	4.0
Rubidoux	PM2.5 BAM	18.6	20.1	24.6	18.9	12.0	8.8	4.8
PM-Coarse (%)								
Indio	FRM – FRM	72.7						75.7
Indio	BAM – FRM	69.0			**93.2**			90.8
Palm Springs	FRM – FRM							57.0
Palm Springs	BAM – FRM				**93.9**			57.0
Banning Airport	FRM – BAM	55.3						-10.0*
Rubidoux	FRM – FRM				75.0			63.6
Rubidoux	TEOM – BAM	71.8	70.0	53.6	56.0	73.3	66.2	70.0

* Banning Airport calculation suspect on May 24 due to PM2.5 concentration higher than PM10, based on low concentrations from different instruments.

3.3.2.6 Comparison of event-affected day(s) to specific non-event days

The 24-hour PM10 and PM2.5 concentrations and the PM-Coarse percentage [(PM10-PM2.5)/PM10] on the days surrounding May 21 for the Coachella Valley stations (Indio and Palm Springs), as well as the two nearest South Coast Air Basin stations in Riverside County (Banning and Riverside-Rubidoux), are summarized above in Table 3-10. The AQMD FRM PM10 filter samples are collected on a 1-in-6 day schedule, except at Riverside-Rubidoux and Indio where 1-in-3-day data is collected. These show that the PM10 concentrations were relatively low on the days before and after the high wind event at all locations. The elevated PM10 was only found in the Coachella Valley on May 21, showing that the windblown dust event did not affect the South Coast Air Basin and that PM10 transport from the urban South Coast Air Basin was not a significant factor. The PM10 was higher at both Indio and Palm Springs on May 21 than on the surrounding days due to the strong winds in the Coachella Valley. The lower measurement at Palm Springs on May 21 also shows that most of the PM10 measured at Indio was generated in the Coachella Valley. The low PM10 concentrations before and after May 21 demonstrate that the NAAQS violation would not have occurred if not for the high wind natural event. While the PM2.5 was generally higher at the South Coast Air Basin sites, it was relatively low in the Coachella Valley, only increasing slightly with the wind event on May 21. This indicates that urban transport from the South Coast and combustion sources, including wildfires and prescribed fires, were not significant to this PM10 event on May 21. The PM10 concentrations in the Coachella Valley were over three times that measured on the sampling days before and after that day. This indicates the impact of the natural event on the May 21 PM10 air quality, resulting in the higher than typical PM10 concentrations above the federal standard level at Indio and Palm Springs.

3.3.3 Affects Air Quality

This criterion is supported by historical concentration data and demonstrated as part of the clear causal relationship. AQMD has provided evidence for the clear causal relationship which serves also to demonstrate that the event affected air quality.

3.3.4 Was a Natural Event

A high wind dust event can be considered a natural event, even when a portion of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event was not reasonably controllable or preventable, in spite of the strong and enforced AQMD BACM-based

control program. It has also established a clear causal relationship between the exceedance and the high wind event timeline and geographic location. This event can be treated as a natural event under the exceptional event rule.

3.3.5 The "But For" Test

To qualify as an exceptional event, it is necessary to demonstrate that there would have been no exceedance "but for" the event. To meet this "but for" requirement, it must first be shown that no unusual anthropogenic activities occurred in the affected area that could have resulted in the exceedances, besides the high wind event. Activities that generate anthropogenic PM10 were approximately constant in the Coachella Valley immediately preceding, during and after the event. Activity levels in the Valley were typical for the time of year and PM10 emissions control programs were being implemented, not only for fugitive dust-generating activities, but also for agricultural burning and other activities. Furthermore, due to the forecasts for high winds on May 21, the AQMD compliance teams were ready to respond to fugitive dust complaints to minimize emission-causing activities and to enforce mitigation methods like watering and soil stabilization.

Vehicular traffic, cooking and residential fires do not directly cause PM10 24-hour NAAQS violations in the Coachella Valley. Activity levels were typical for the time of year and PM10 emissions control programs were being implemented, for fugitive dust-generating activities, as well as open burning. With the unsettled windy conditions on May 21, such emissions would not contribute significantly to the PM10 measured. There were reasonable and appropriate measures in place to control PM10 in the Coachella Valley on May 21, 2008, including AQMD Rules 403, 403.1, 444, 1157 and 1186. Moreover, U.S. EPA has approved AQMD's BACM demonstration for all significant sources of PM10 in the Coachella Valley.

Examining the make-up of the PM10 in the Coachella Valley on this day using PM2.5 data, the coarse particles (PM10-2.5), which are associated with windblown dust, represent over 93% of the total PM10 mass collected at both Palm Springs and Indio. PM2.5 remained relatively low throughout the Coachella Valley on this day with no exceedance of the 24-hour NAAQS, indicating mainly crustal material as opposed to combustion sources. Based on the data provided in this report, AQMD concludes that there would not have been exceedances of the PM10 NAAQS in the Coachella Valley on May 21, 2008 if high winds were not present. The causal connection of the measured PM10 and the strong winds through the Coachella Valley, along with the high contribution of fugitive dust to the PM10 mass indicate that but for the high wind event this NAAQS violation would not have occurred.

3.3.6 Conclusion

The PM10 NAAQS exceedance on May 21, 2008 is an example of a Type 2 high wind event in the Coachella Valley, where a synoptic-scale storm system and frontal passage leads to instability and strong surface pressure gradients that force high winds through the San Gorgonio Pass. These storm systems occur mainly in the winter and spring months and create strong, gusty winds along the centerline of the Coachella Valley near the AQMD Whitewater Wash site and in the Coachella Valley Preserve areas. On May 21, surface winds associated with the passage of the upper level low pressure system and its associated frontal passage, were enhanced by the onshore pressure gradients and coupled northwesterly flow aloft along the Coachella Valley. Sustained hourly wind speed to 46 mph and instantaneous wind gusts to 68 mph were measured at the Whitewater Wash station. Strong, gusty winds were recorded at stations throughout the Coachella Valley. NWS observations of reduced airport visibilities, haze and blowing dust and news accounts also support the windblown dust analysis. Due to the widespread winds, sources of the windblown dust included both natural, undisturbed areas, particularly in the mountains and high deserts, and BACM-controlled anthropogenic sources. The timing of this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly BAM PM10 measurements from available monitors. These show a strong correlation between the high winds and high hourly PM10 concentrations. This evidence supports that this episode is a high-wind natural event under the U.S. EPA exceptional events regulation. If not for the high wind event and the associated wind-entrained dust, the PM10 NAAQS violations measured at Palm Springs and Indio on May 21 would not have occurred. Therefore, with the weight of evidence provided, AQMD staff recommends the flagging of the PM10 NAAQS violations on May 21, 2008 as exceptional events due to high winds in the U.S. EPA AQS database.