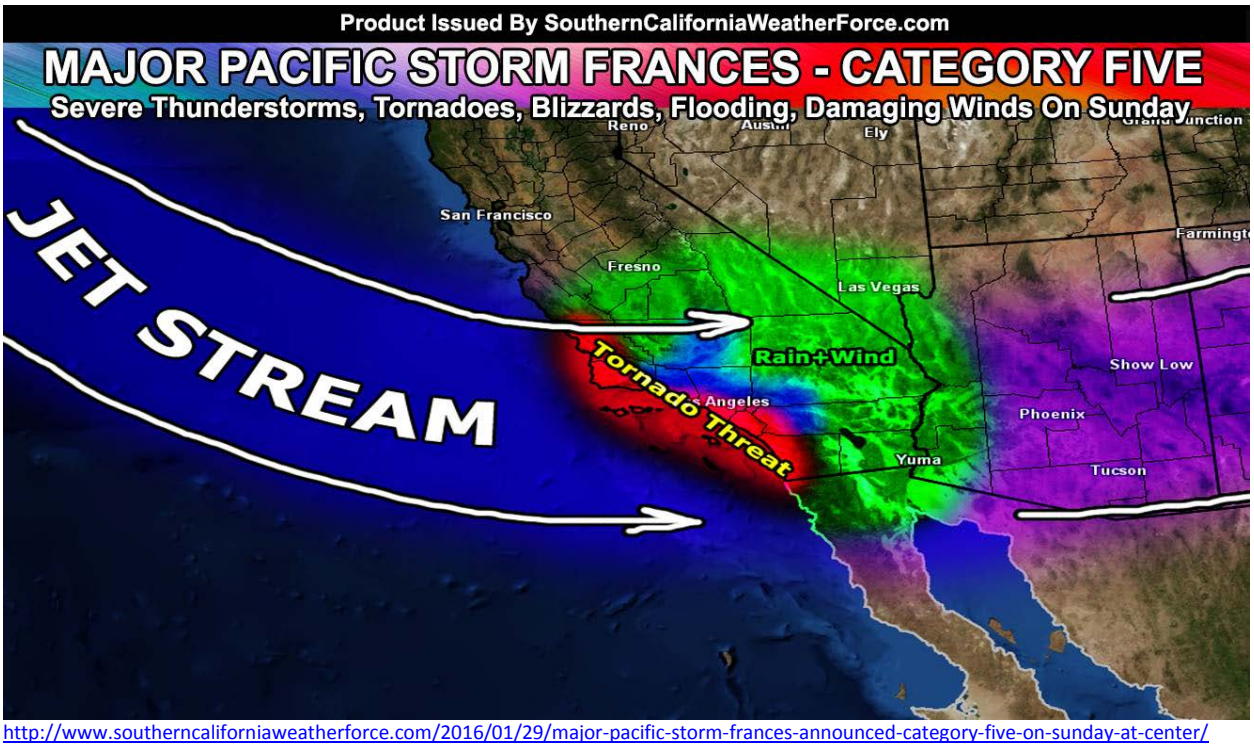
IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT



http://www.southerncaliforniaweatherforce.com/2016/01/29/major-pacific-storm-frances-announced-category-five-on-sunday-at-center/

January 31, 2016 and February 1, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL

March 16, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On January 31, 2016 and February 1, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007), Niland (AQS Site Code 060254004) and Westmorland (AQS Site Code 060254003), California measured exceedances of the National Ambient Air Quality Standard (NAAQS). The Federal Referenced Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler and the Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 218 µg/m^3, 236 µg/m^3, 225 µg/m^3, 259 µg/m^3, 344 µg/m^3 and 208 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley, Niland and Westmorland were the only stations in Imperial County to measure exceedances of the PM_{10} NAAQS on January 31, 2016 and February 1, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON JANUARY 31, 2016 AND FEBRUARY 1, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
1/31/2016	**Brawley**	**06-025-0007**	**1**	**24**	**218**	**150**
1/31/2016	**Brawley**	**06-025-0007**	**3**	**24**	**236**	**150**
1/31/2016	**Niland**	**06-025-4004**	**1**	**24**	**225**	**150**
1/31/2016	**Niland**	**06-025-4004**	**3**	**24**	**259**	**150**
1/31/2016	**Westmorland**	**06-025-4003**	**3**	**24**	**344**	**150**
2/1/2016	**Brawley**	**06-025-0007**	**3**	**24**	**208**	**150**
1/31/2016	Calexico	06-025-0005	3	24	93	150
1/31/2016	El Centro	06-025-1003	4	24	49	150
2/1/2016	Calexico	06-025-0005	3	24	48	150
2/1/2016	El Centro	06-025-1003	4	24	40	150
2/1/2016	Niland	06-025-4004	3	24	56	150
2/1/2016	Westmorland	06-025-4003	3	24	141	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On January 31, 2016 and February 1, 2016, the Brawley, Niland and Westmorland monitors were impacted by elevated particulate matter

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016, Pacific Daylight Time (PDT) is March 13 through November 3. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

caused by the entrainment of fugitive windblown dust from high winds associated with a large winter low-pressure system and accompanying cold front entering Imperial County.

This report demonstrates that a naturally occurring event caused an exceedance observed on January 31, 2016 and February 1, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 208 µg/m^3, 218 µg/m^3, 236 µg/m^3, 225 µg/m^3, 259 µg/m^3 and 344 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the January 31, 2016 and February 1, 2016 event as it occurred in California and in Imperial County, providing background information on the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley, Niland and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley, Niland and Westmorland monitors this section discusses and establishes how the January 31, 2016 and February 1, 2016 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the January 31, 2016 event and its resulting emissions defining the event as a "natural event".[3]

Section IV - Provides evidence that the event of January 31, 2016 and February 1, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirements of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD and the National Weather Service (NWS) provided an extended week to weekend notification via the ICAPCD's webpage on January 27, 2016 explaining that a strong Pacific storm would sweep a cold front across the region by Sunday, January 31, 2016. The San Diego NWS weather story and the ICAPCD web notification advised of the possibility of "very strong winds" through the mountains and desert regions potentially elevating particulate matter through the weekend. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on January 31, 2016 and February 1, 2016. **Appendix A** contains copies of notices pertinent to the January 31, 2016 and February 1, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley, Niland and Westmorland monitors on April 17, 2017. The INPEE, for the January 31, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for January 31, 2016 and February 1, 2016. The submitted request included a brief description

of the meteorological conditions for January 31, 2016 and February 1, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted on the web, for a 30-day public review, a draft version of the demonstration and published a notice of availability in the Imperial Valley Press on December 20, 2017. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 208 µg/m^3, 218 µg/m^3, 236 µg/m^3, 225 µg/m^3, 259 µg/m^3 and 344 µg/m^3 (**Table 1-1**) which occurred on January 31, 2016 in Brawley, Niland and Westmorland, and on February 1, 2016 in Brawley. The final closing date for comments was December 20, 2017. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the January 31, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on January 31, 2016 and February 1, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event “is not reasonably controllable and not reasonably preventable.”

e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."

f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, Niland and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II January 31, 2016 and February 1, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the January 31, 2016 and February 1, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

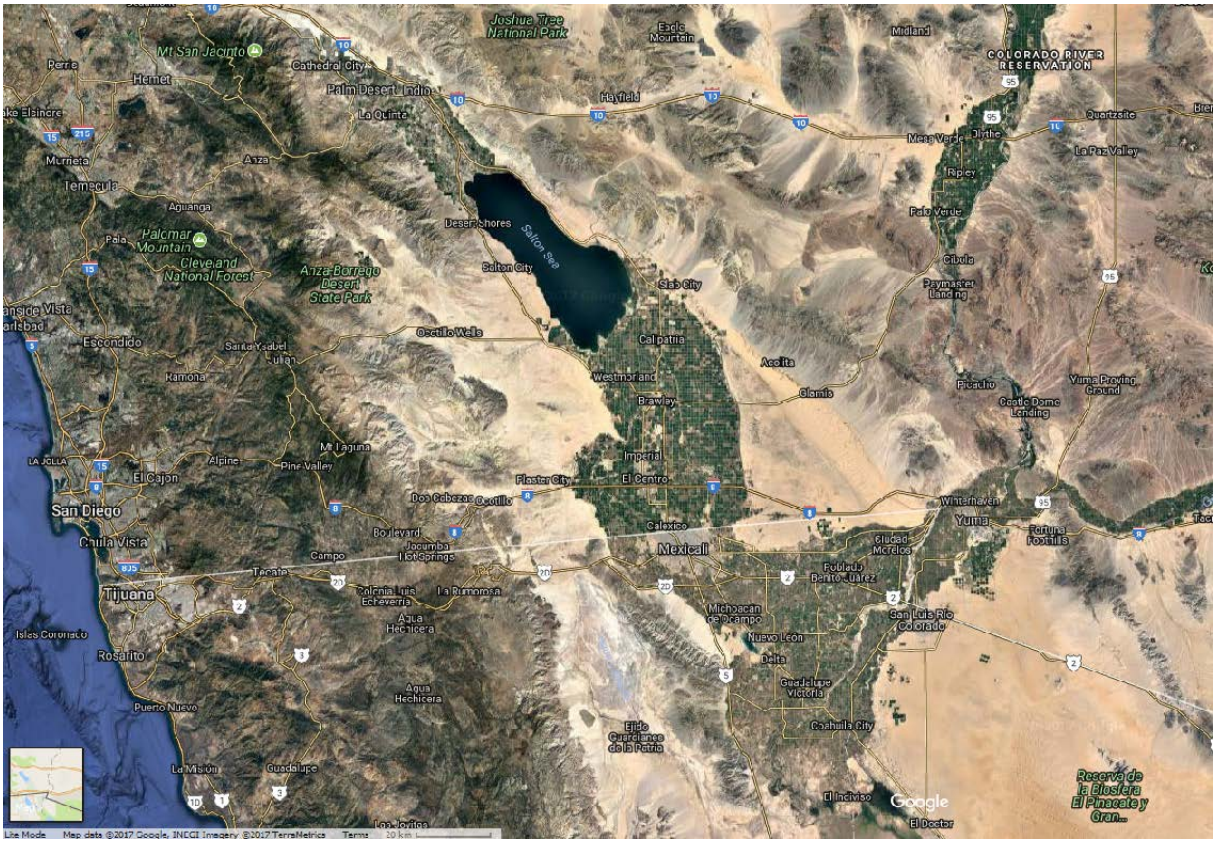


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on January 31, 2016 and February 1, 2016, occurred at the Brawley, Niland and Westmorland stations. The Brawley, Niland and Westmorland stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on January 31, 2016 and February 1, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

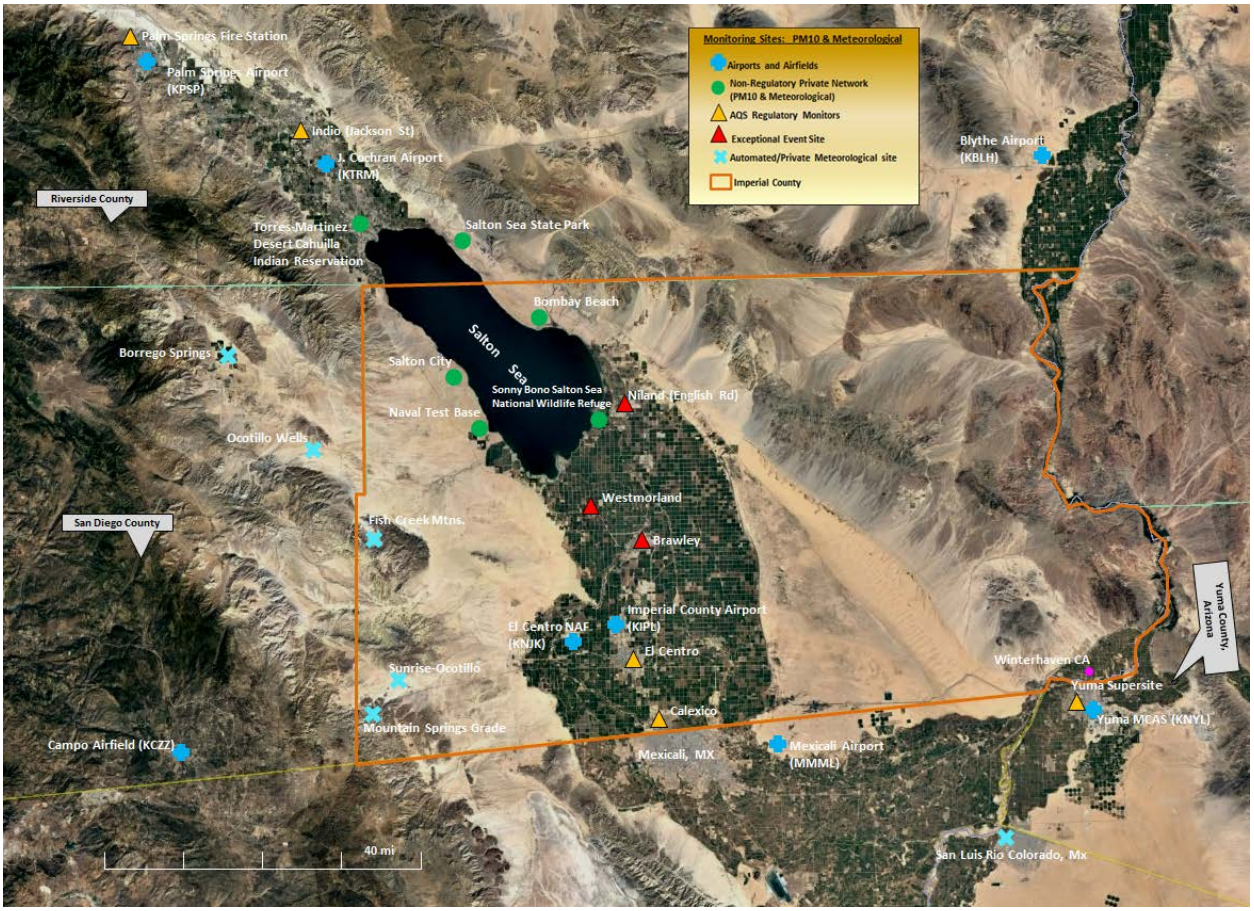


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These privately owned stations are non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west

of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

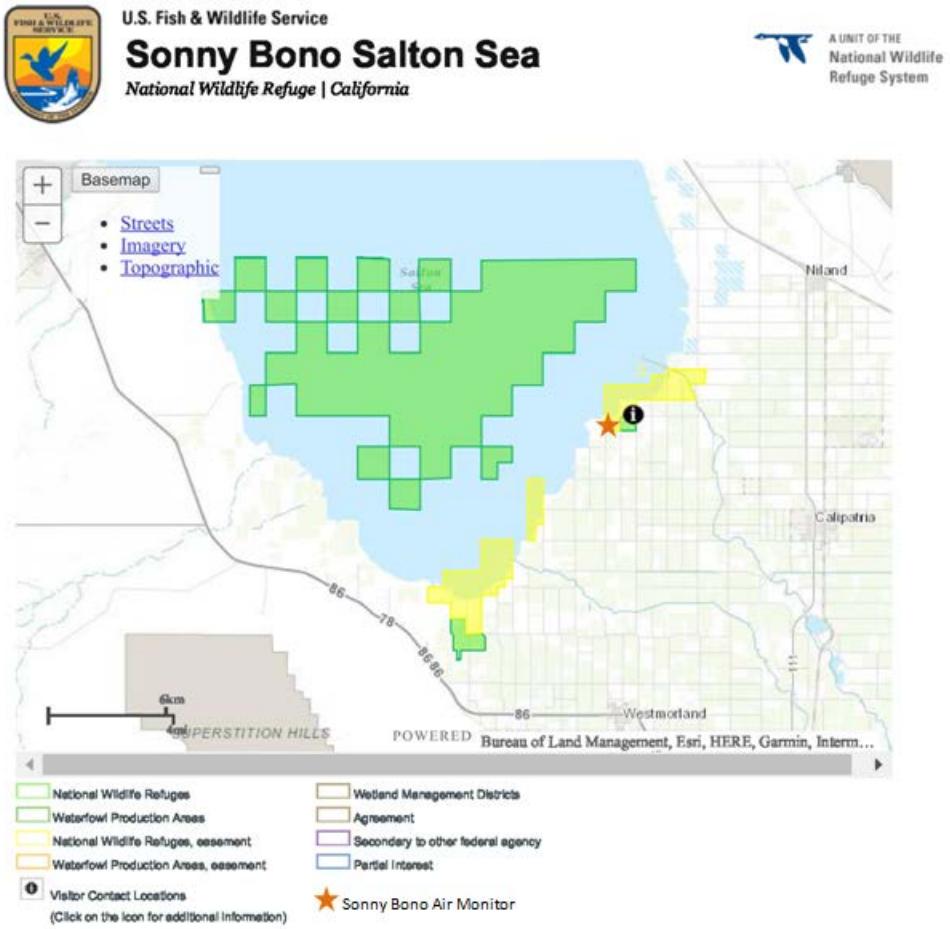


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
JANUARY 31, 2016 AND FEBRUARY 1, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	24-hr PM_{10} ($\mu g/m^3$) Avg***	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY												
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	81102	13701	-15	31	218	-	-	-	-
		BAM 1020						236	995	18:00		
		Hi-Vol Gravimetric					1	-	-	-	-	-
		BAM 1020						208	995	1:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	81102	13698	3	31	93	534	19:00	20	20:00
							1	48.3	232	1:00	19.9	12:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	81102	13694	9	31	49	214	20:00	20.2	19:00
							1	40	141	07:00	16.1	3:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	81102	13997	-54	31	225	-	-	20.2	19:00
		BAM 1020						259	995	13:00		
		Hi-Vol Gravimetric					1	-	-	-	16.1	3:00
		BAM 1020						56	392	01:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	81102	13697	-43	31	344	995	09:00	15.5	15:00
							1	141	886	03:00	17.8	12:00
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	81102	33137	174	31	21	108	00:00	16	22:00
							1	12.3	20	3:00	14	1:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	81102	33157	1	31	119	785	20:00	17	20:00
							1	56	165	13:00	13	10:00
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	81102	N/A	60	31	166	985	14:00	32	14:00
							1	89	274	2:00	24	2:00

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question in Pacific Standard Time (PST) unless otherwise noted
February 1, 2016 was not a scheduled run day

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

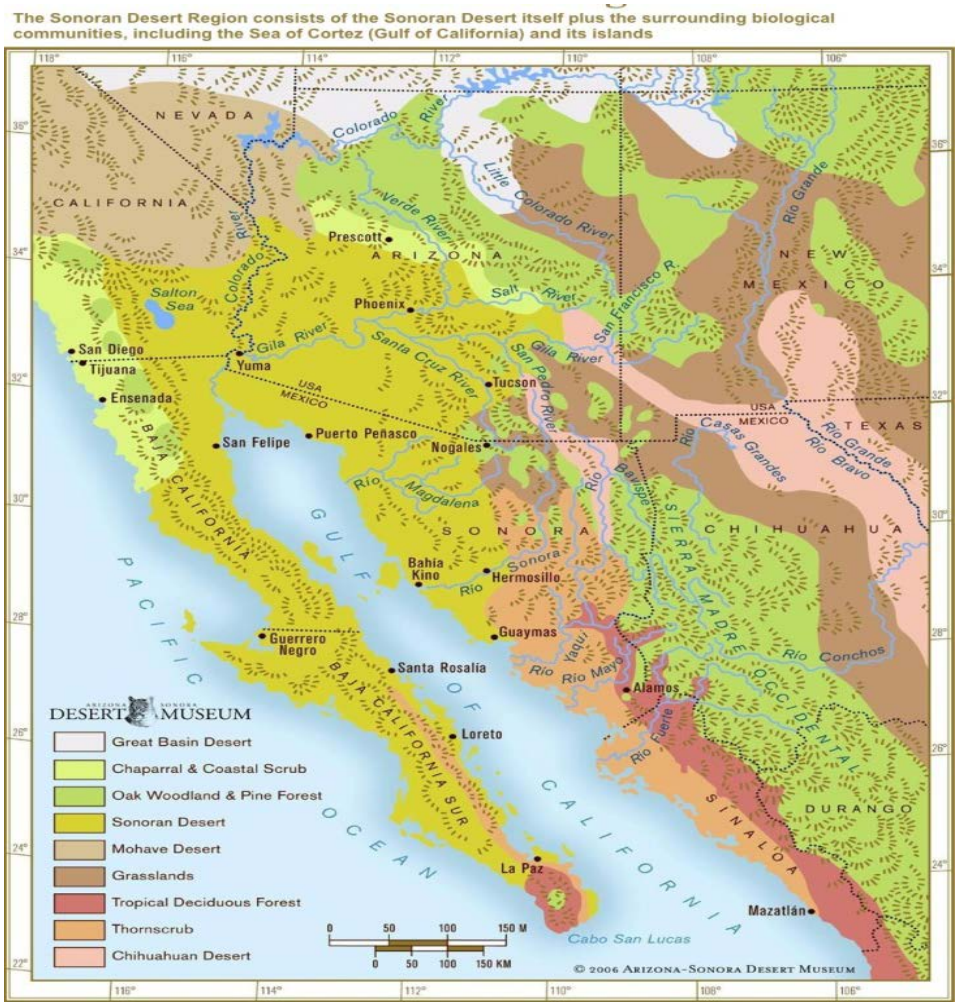


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater

summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16)**. During the 12-month period prior to the January 31, 2016 event, Imperial County recorded a total annual precipitation of 1.68 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

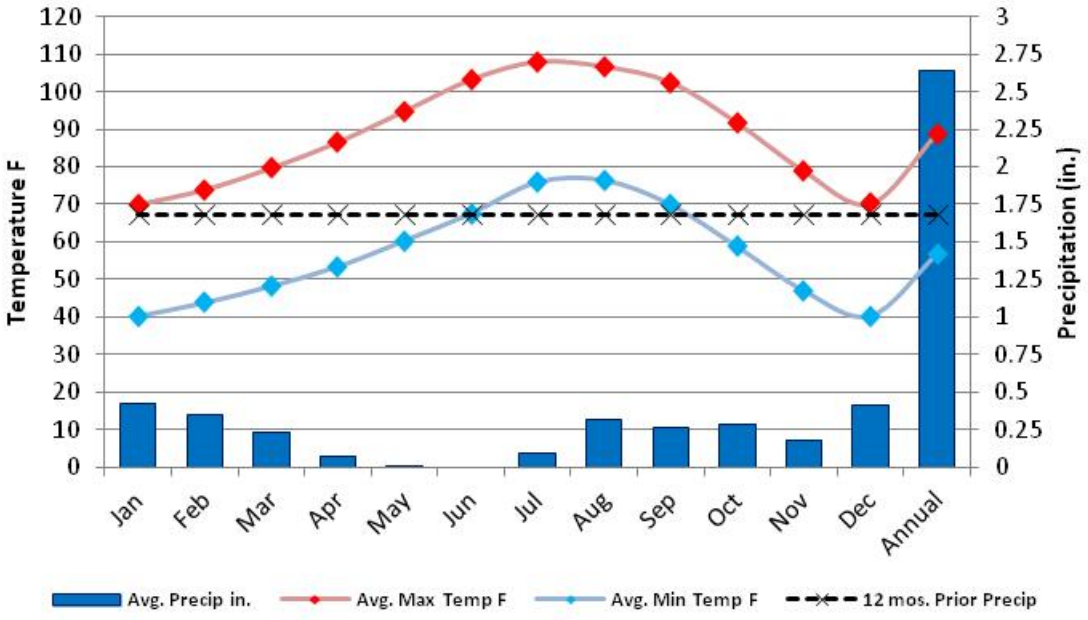


Fig 2-16: Historical Imperial County weather. Prior to January 31, 2016, the region had suffered abnormally low total precipitation of 1.68 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for January 31, 2016 and February 1, 2016, which was caused by a large winter low-pressure system and accompanying strong cold front, which was strengthened and steered by a deepening upper level trough, moved through southern California with pre-frontal winds as early as January 30, 2016. The low strengthened as it moved inland, resulting in a tightening (increasing) of the pressure gradient that in turn created extremely strong west winds from the coastal basin to the mountains and deserts of southeastern California. On January 31, 2016 and February 1, 2016 extremely strong westerly winds swept across southeastern California as the system moved through the region affecting air quality and causing exceedances in Brawley, Niland and Westmorland.

Figures 2-17 through 2-20 provides information regarding the expected movement of the cold front, associated low-pressures approaching southern California and the tightening (increase) of the pressure gradients at the surface, which led to high winds across southeastern California as an upper level low moved inland over California.

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

FIGURE 2-17
DAILY FORECAST CHARTS – JANUARY 30, 2016 & JANUARY 31, 2016

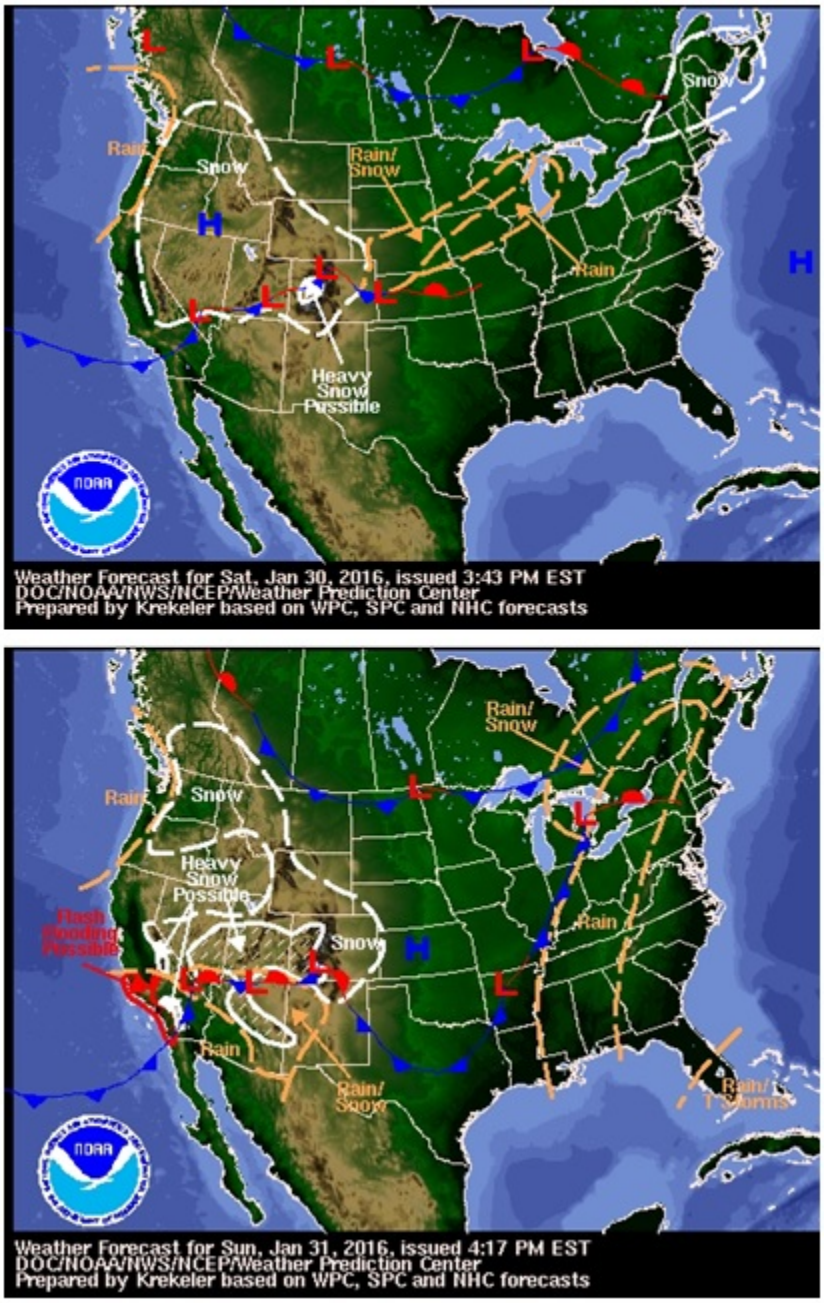


Fig 2-17: A Daily Forecast Chart (top) on January 30, 2016 at 12:43 PST (3:43pm EST) showing the expected movement of the cold front approaching southern California. The bottom image is for January 31, 2016 at 13:17 PST. The system was strong enough to cause an exceedance at Brawley on February 1, 2016. Source: Weather Prediction Center http://www.wpc.ncep.noaa.gov/noaa/noaa_archive.php?month=01&day=30&year=2016&cycle=12&lang=english&format=gif

FIGURE 2-18
GOES E-W INFRARED SATELLITE IMAGE

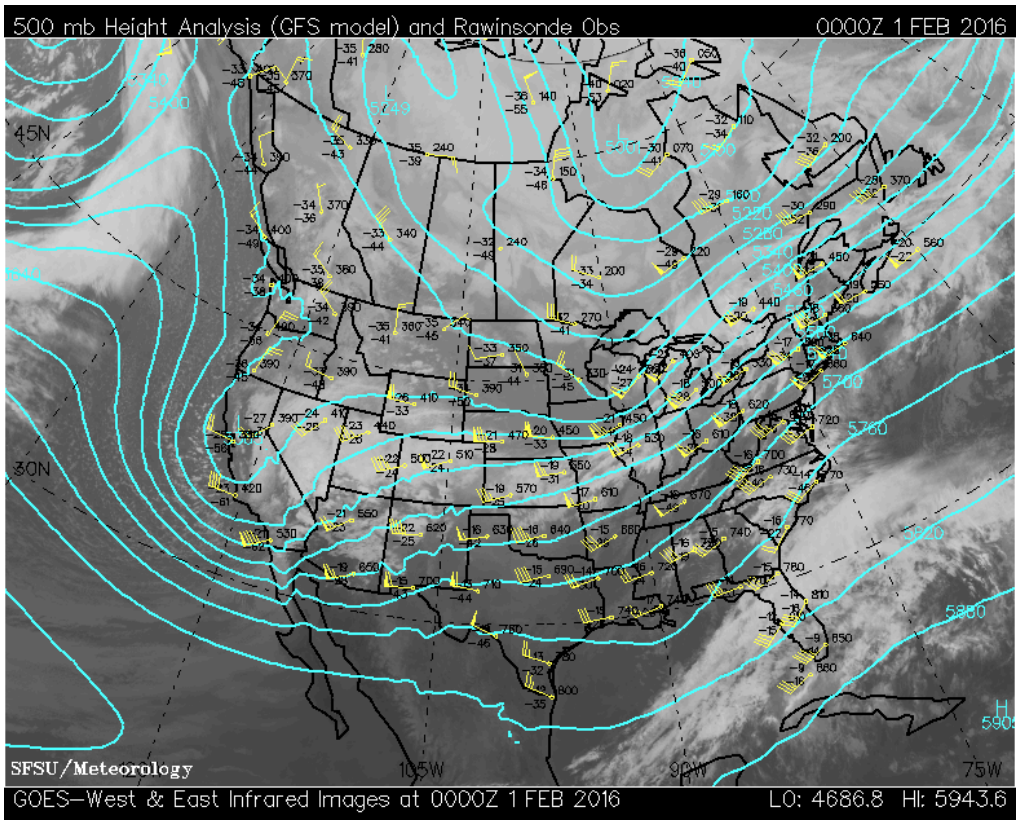


Fig 2-18: A GOES E-W infrared satellite image (4:00 pm PST January 31, 2016) at the 500mb height shows the upper level trough moving inland over northern California. The deepening of the low led to a tightening of pressure gradient resulting in high, gusty winds across southeastern California and into southwestern Arizona. The winds remained strong enough through the early part of February 1, 2016 to cause an exceedance at the Brawley monitor. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_500/1602/16020100_sathts_500_alt.gif

FIGURE 2-19
SURFACE ANALYSIS IMAGES

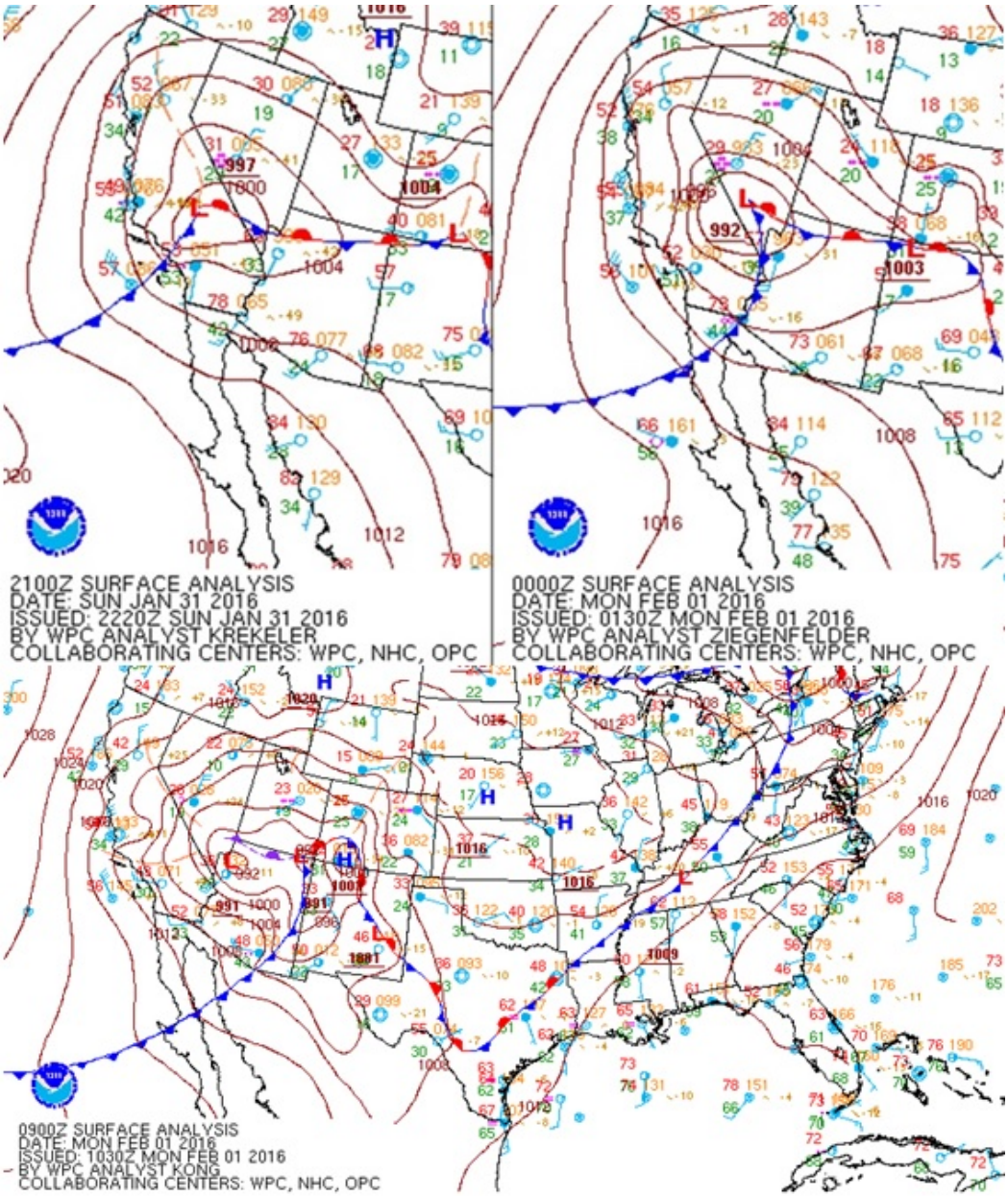


Fig 2-19: A pair of surface analysis (top right and left) shows the long cold front (blue line with point flags) moving southeast across southern California.[5] The image on the right shows the gradient moderately packed supporting the late afternoon to evening high wind activity on January 31, 2016. The left image is at 1:00pm PST and the right image is at 4:00pm PST. The bottom image is for 01:00 PST on February 1, 2016. Surface gradients remained moderately packed at this point. During the 01:00 hour the Brawley monitor recorded its highest 24-hour peak. Source: Weather Prediction Center Surface Analysis Archive

[5] How to read the symbols and colors on weather maps https://www.thoughtco.com/symbols-on-weather-maps-3444369

FIGURE 2-20
GOES-W SATELLITE IMAGES

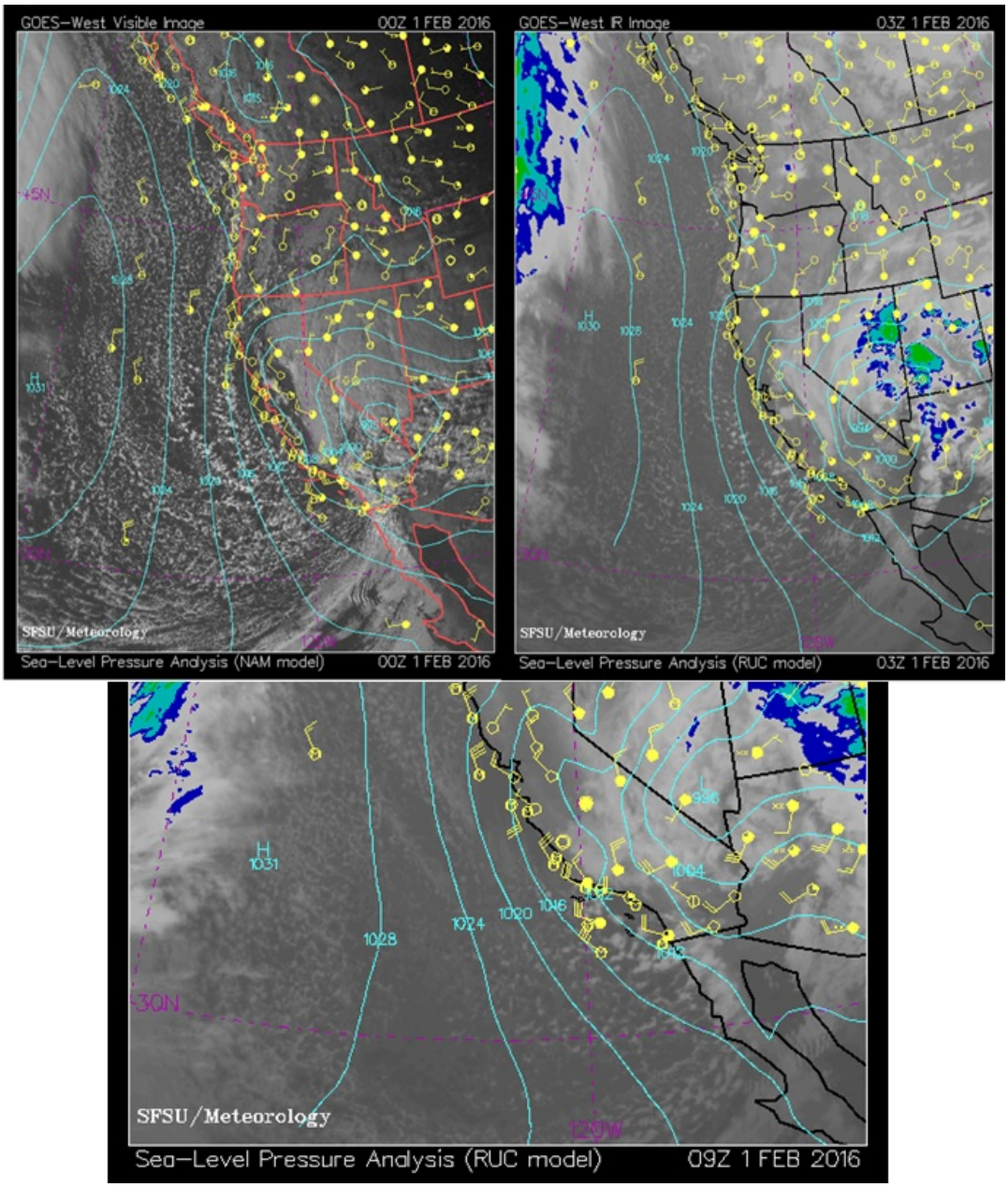


Fig 2-20: A pair of GOES-W sea-level pressure analysis images (top right and left) captured the low pressure centered over the CA-NV border. The left image captured at 4:00pm PST and the right image captured at 7:00pm PST on January 31, 2016 shows west to southwest wind barbs with winds of ~25 knots (at least 28.8 mph). These images represent the period when winds were at their strongest over Imperial County. The bottom image is at 01:00 PST February 1, 2016. Winds remained strong over the region during the early morning hours. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1601

Strong westerly winds blew across the mountains of San Diego County and down the desert slopes at points like Mountain Springs Grade, Sunrise-Ocotillo, and the Fish Creek Mountains which measured multiple and consecutive hours of gusts at or above 30 mph, particularly during the afternoon and evening hours when elevated concentrations affected air monitoring stations in Imperial County. Locally, both airports measured consecutive hours of elevated winds speed at or above 25 mph as well as several hours of gusts at or above 30 mph.

The intensity of the unsettled weather prompted the San Diego and Phoenix NWS offices to issue weather briefings and wind advisories for San Diego County, including the mountains and deserts and Imperial County. The wind advisories issued as early as January 30, 2016, remained in effect until the morning hours of February 2, 2016.[6] A High Wind Warning was in effect for the area as well as forecasted west winds up to 35 mph with gusts reaching 55 and blowing dust.[7] An issued wind and Blowing Dust advisory was in effect for areas in Imperial County, eastern Riverside County and southwest Arizona.[8] **Figure 2-21** is a graphical illustration of the chain of events for January 31, 2016.

[6] A wind advisory is issued when the following conditions are met for one hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016, http://www.weather.gov/lwx/WarningsDefined#Wind

[7] High Wind Warning issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. A High Wind Watch is issued when these conditions may be met 12 to 48 hours in the future

[8] A Blowing Dust Advisory is issued when blowing dust is expected to reduce visibility to between 1/4 and 1 mile, generally with winds of 25 mph or greater

FIGURE 2-21
RAMP-UP ANALYSIS JANUARY 31, 2016

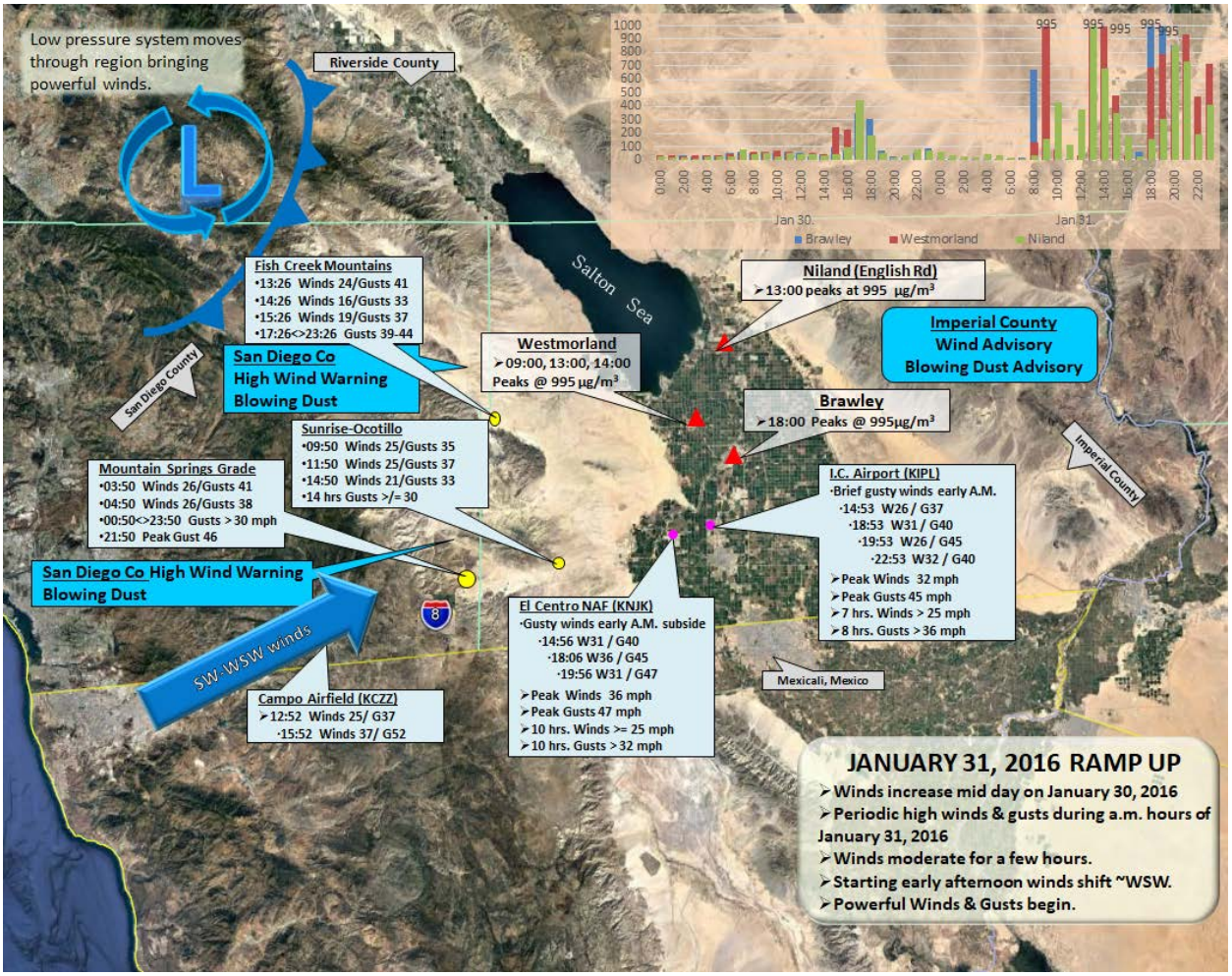


Fig 2-21: A brief increase of moderately strong gusty winds in the early morning hours was followed in the afternoon by much stronger winds and gusts. Strong, gusty winds within the San Diego mountains measured in areas like Campo blew through desert slopes and across natural open areas west of Brawley, Westmorland, and Niland. Suspended dust was transported downstream into the Imperial County. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

FIGURE 2-22
RAMP-UP ANALYSIS FEBRUARY 1, 2016

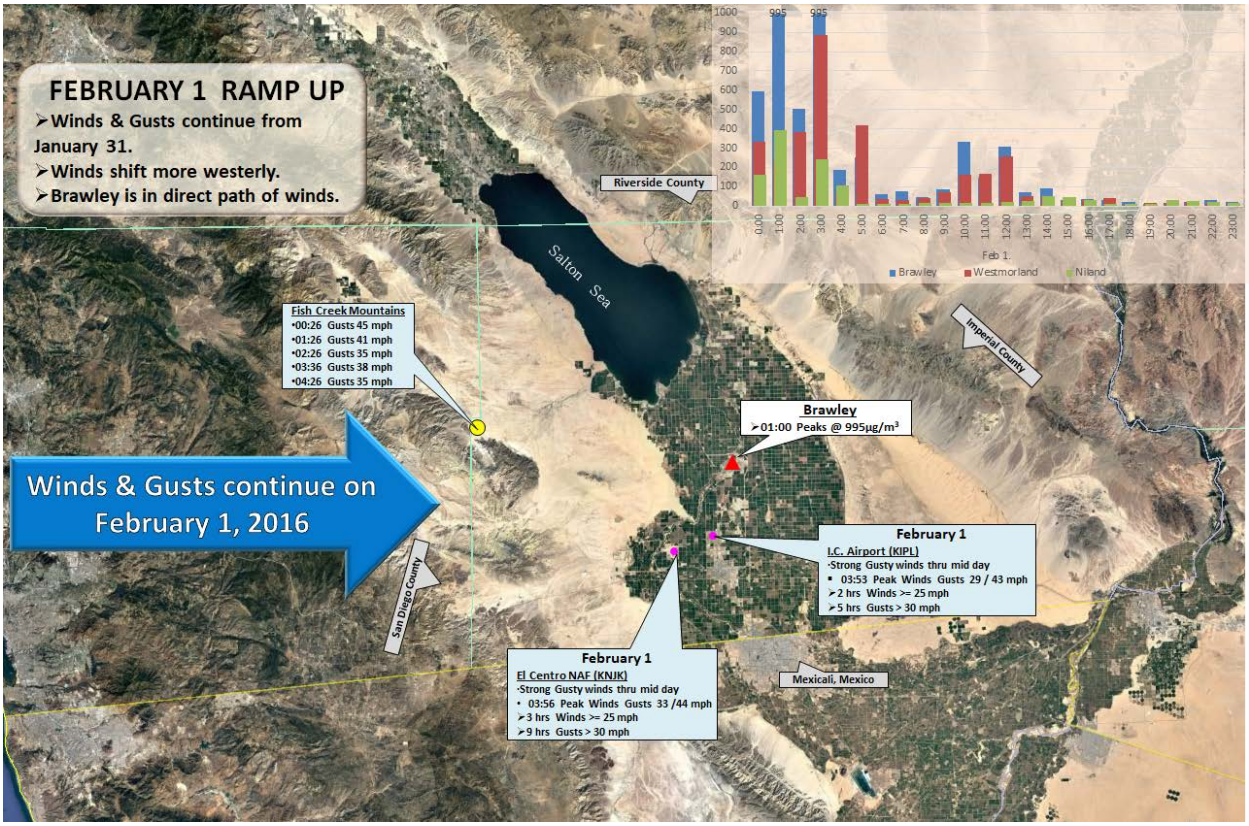


Fig 2-22: The strong winds and gusts on January 31, 2016 carried over into much of February 1, 2016. Winds and gusts were strongest in the early morning hours. Winds shifted from a WSW direction to a more predominant westerly direction on February 1, 2016. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON JANUARY 31, 2016 AND FEBRUARY 1, 2016

Station Monitor	Day	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed				
							Brly	CX	EC	Nlnd	Wstmd
Airport Meteorological Data											
IMPERIAL COUNTY											
Imperial Airport (KIPL)	31	32	250	22:53	45	19:53	359	106	30	189	472
	1	29	260	3:53	43	3:53	995	60	138	240	886
Naval Air Facility (KNJK)	31	36	250	18:06	47	19:56	995	72	62	161	687
	1	33	250	3:56	44	3:56	995	60	138	240	886
Calexico (Ethel St)	31	20	265	20:00	-	-	856	337	214	856	812
	1	19.9	278	12:00	-	-	307	213	49	23	256
El Centro (9th Street)	31	20.2	248	19:00	-	-	995	534	178	306	787
	1	16.1	266	3:00	-	-	995	60	138	240	886
Niland	31	15.5	220	15:00	-	-	350	94	73	349	480
	1	29.6	255	0:00	-	-	596	70	29	163	331
Westmorland	31	32	211	13:00	-	-	107	148	64	995	995
	1	17.8	285	12:00	-	-	307	213	49	23	256
RIVERSIDE COUNTY											
Blythe Airport (KBLH)	31	31	230	18:52	47	20:28	995	72	62	161	687
	1	22	230	0:12	33	10:52	596	70	29	23	256
Palm Springs Airport (KPSP)	31	29	310	21:53	43	21:53	420	190	72	732	938
	1	25	310	0:53	40	0:53	596	70	29	163	331
Jacqueline Cochran Regional Airport (KTRM) - Thermal	31	28	270	20:52	40	20:52	856	337	214	856	812
	1	22	310	13:52	31	13:52	73	58	33	24	53
ARIZONA - YUMA											
Yuma MCAS (KNYL)*MST	31	32	220	14:57	39	14:57	121	121	149	679	995
	1	24	230	2:57	30	2:57	506	47	63	44	385
MEXICALI - MEXICO											
Mexicali Int. Airport (MXL)	31	20.7	240	15:23	-	-	350	94	73	349	480
	1	32.2	260	11:54	-	-	148	38	104	14	168

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The back trajectory National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT model,[9] depicted in **Figure 2-23**, indicate the path of the airflow 12 hours prior to the Brawley (green icon), Westmorland (blue icon), and Niland (red icon) monitors measuring the 3:00pm PST hourly PM_{10} concentrations.

Strong winds transporting dust particles from natural areas within the mountain and desert soils to the west affected PM_{10} monitors throughout southeastern California and Arizona. Although all air monitors in Imperial County measured elevated concentrations of PM_{10} only the Brawley, Westmorland, and Niland monitors measured elevated concentrations as early as 8:00am PST on January 31, 2016. The trajectories illustrate a typical scenario when west winds (airflow) funnel through the mountain passes, many times increasing in speed, and down the desert slopes of San

[9] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

Diego County onto the valley floor. Strong westerly winds typically blow through these mountain passes and desert slopes entraining PM_{10} across the desert floor and agricultural lands within Imperial County. The path of airflow on January 31, 2016 allowed for winds to pass through a greater area of urbanization towards the El Centro monitor allowing for the El Centro monitor to measure the least amount of elevated concentrations of PM_{10}.

It is of some worth to point out that from time to time modeled winds differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-23
HYSPLIT MODELS JANUARY 31, 2016

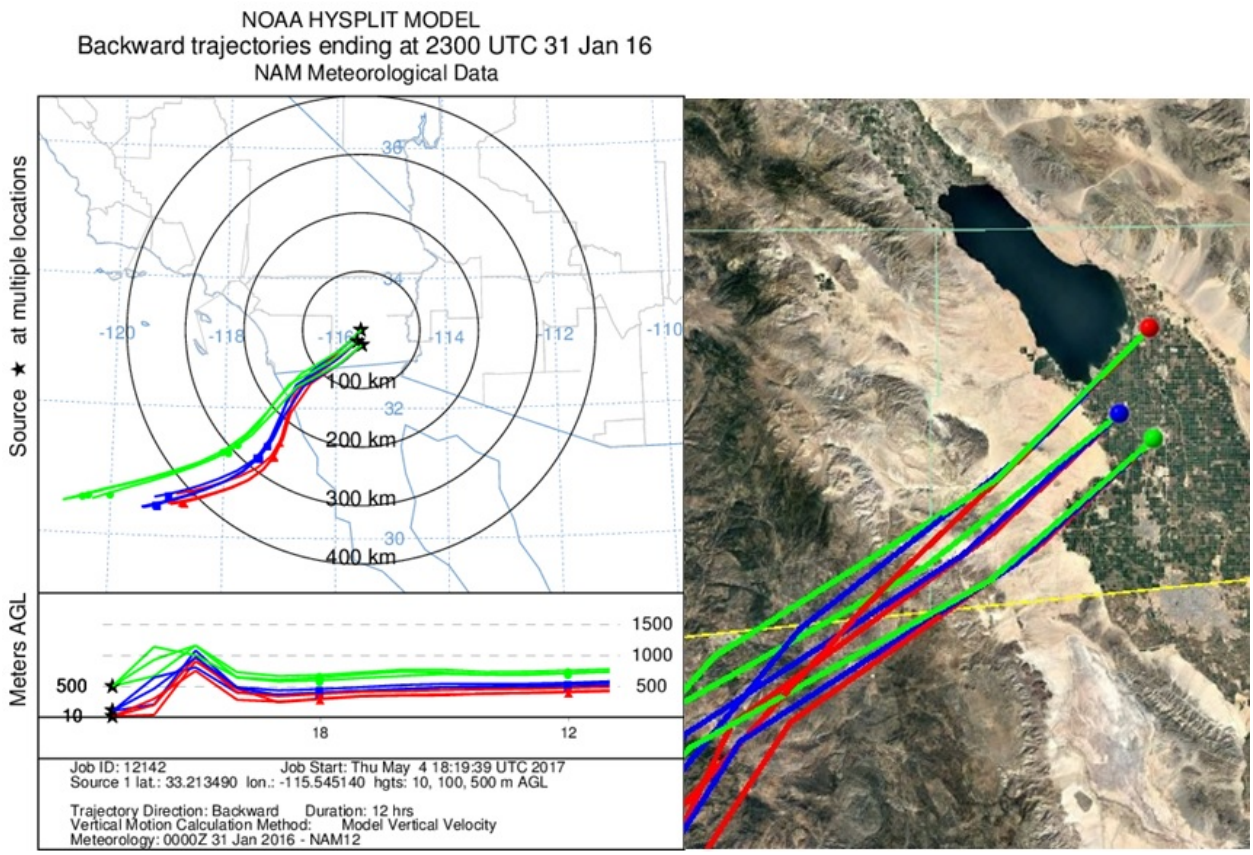


Fig 2-23: A 12-hour back trajectory ending at 1500 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 2-24 depicts the modeled HYSPLIT trajectory for February 1, 2016. The 12-hour back-trajectory ends at 01:00 coincident with the peak concentrations measured at the Brawley

monitor. A shift in wind direction to a predominant west direction from a southwest direction and the duration of the wind speeds contributed to reduce concentrations at some of the air monitoring sites. While all air monitors measured elevated concentrations, only the Brawley and Westmorland monitors measured 8 hours of elevated concentrations. The combination of a shift in wind direction to a predominantly west direction and a reduced duration of wind speeds allowed for less deposition at the Niland, El Centro and Calexico monitors. As suspended dust blew over the Salton Sea reduced saltation allowed for less deposition onto the Niland monitor. Greater areas of urbanization, with buildings acting as wind barriers allowed for less deposition at the Calexico and El Centro monitors. As seen in the left image surface winds (10m level) entrained PM_{10} across mountain and desert areas affecting the Brawley and Westmorland monitors.

FIGURES 2-24
HYSPLIT MODELS FEBRUARY 1, 2016

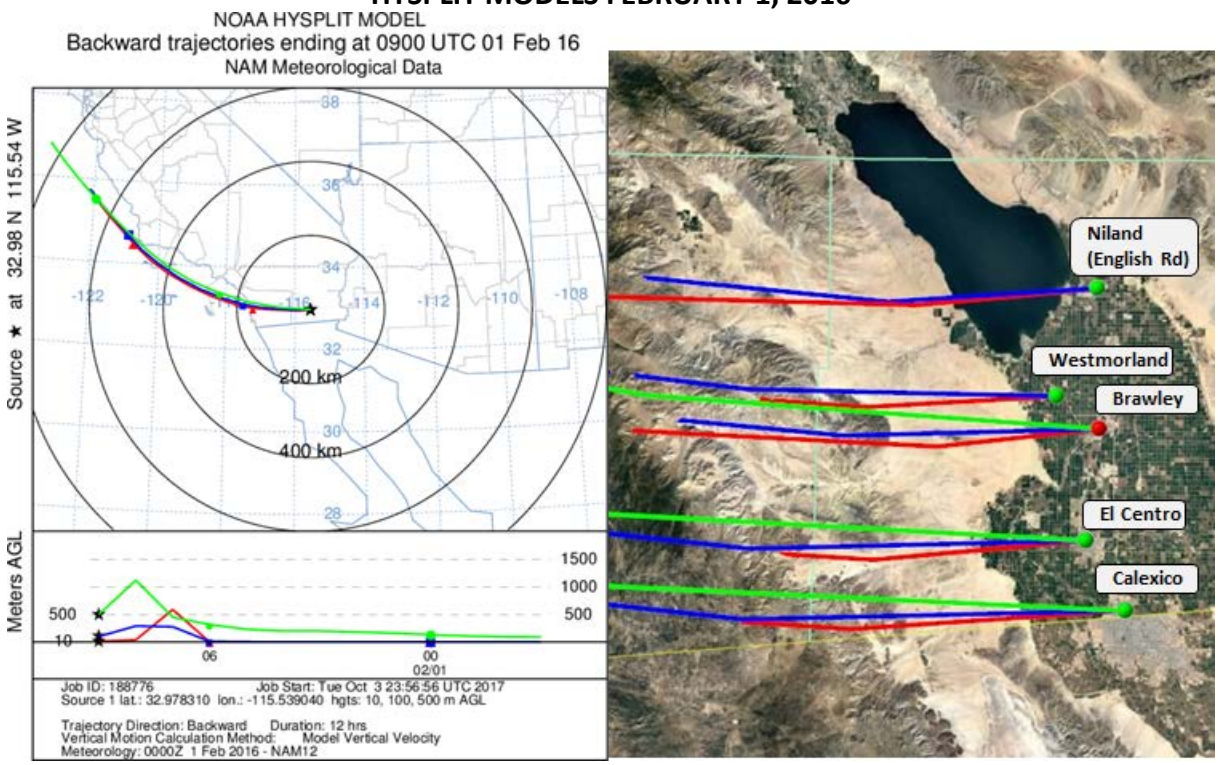


Fig 2-24: A 12-hour back trajectory ending at 0100 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-25 and 2-26 illustrate the elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties for a total of four days, January 30, 2016 through February 2, 2016. Elevated emissions entrained into Imperial County affected the Brawley, Niland and Westmorland monitors when gusty west winds, associated with the passage of a low-pressure

system and surface trough situated over California passed through Imperial County as early as January 30, 2016 through February 2, 2016. The Brawley, Niland and Westmorland monitors measured the highest elevated concentrations between 08:00 PST and 23:00 PST coincident with continual measured wind speeds and gusts above 20mph, with more than one hour at or above 25pmh.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[10] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the January 31, 2016 and February 1, 2016 high, wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-25
96 HOUR WIND SPEEDS AT VARIOUS SITES

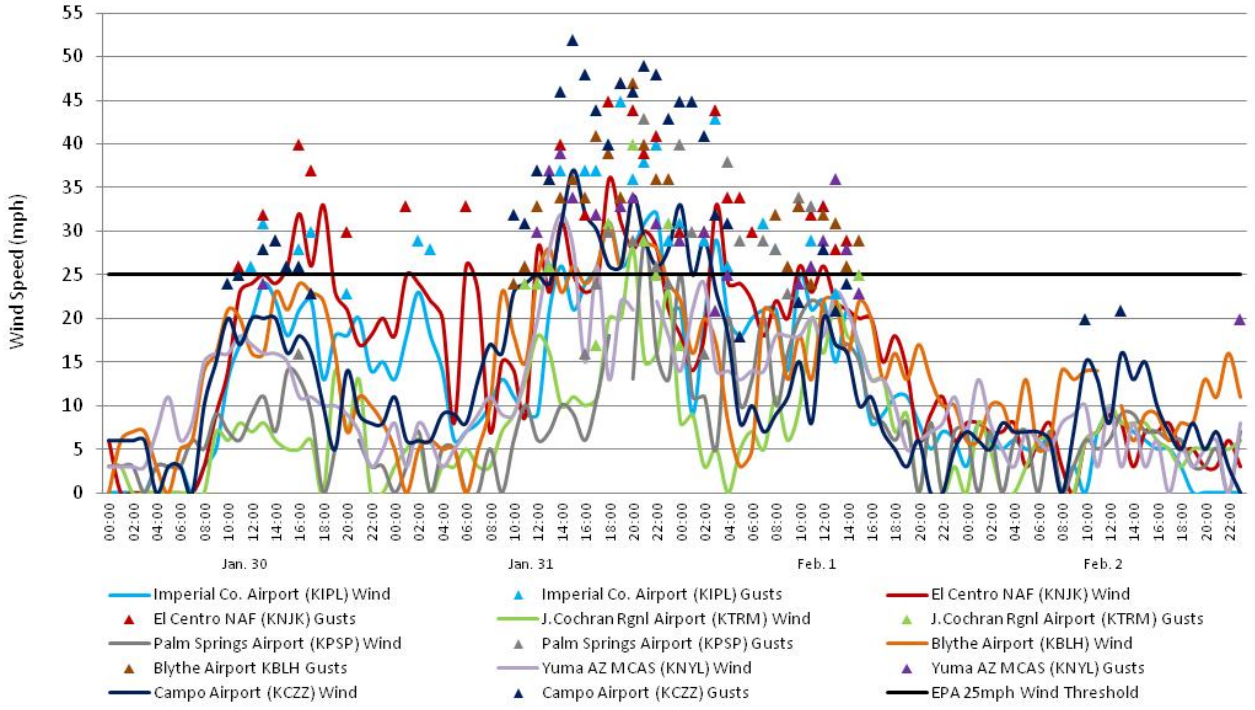


Fig 2-25: Is the graphical representation of the 96 hour measured winds speeds and gusts at various sites including regional airfields in California and Arizona. The graph illustrates the significant number of hours where measured wind speeds and wind gusts where above 25 mph. Immediate upstream sites like Campo, Imperial County Airport, and El Centro NAF had winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system

[10] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-26
96 HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

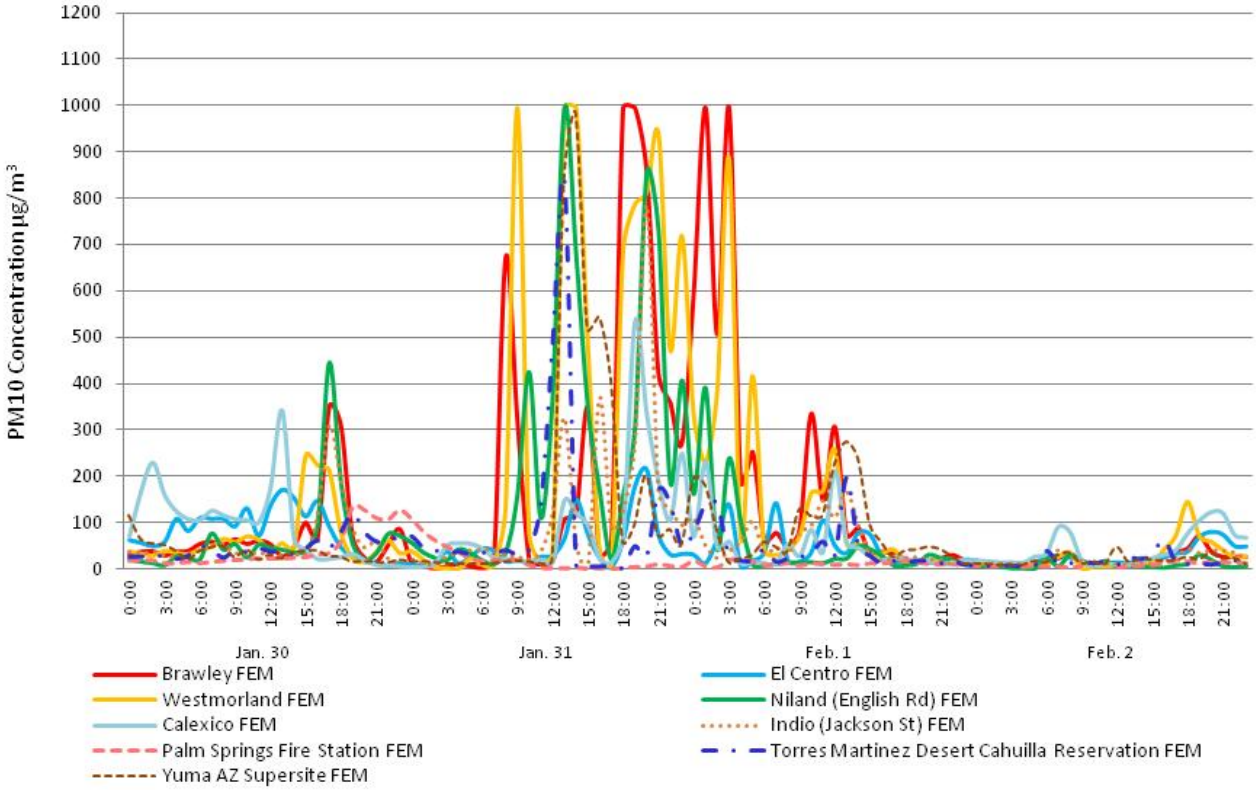


Fig 2-26: Is the graphical representation of the 96 hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at all sites on January 31, 2016 and February 1, 2016, demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley, Niland, and Westmorland monitors on January 31, 2016 and February 1, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis also provides supporting evidence that there exists a clear causal relationship between the January 31, 2016 and February 1, 2016 high wind event and the exceedance measured at the Brawley, Niland, and Westmorland monitors.

Figures 3-1 through 3-6 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley, Westmorland, and Niland stations for the period of January 1, 2010 through February 1, 2016. Note that prior to 2013, BAM data was not FEM therefore was not reported into AQS.[11] In order to properly establish the variability of the event as it occurred on January 31, 2016 and February 1, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and February 1, 2016 were compiled and plotted as a time series. All six figures illustrate that the exceedance, which occurred on January 31, 2016 and February 1, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[11] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO FEBRUARY 1, 2016

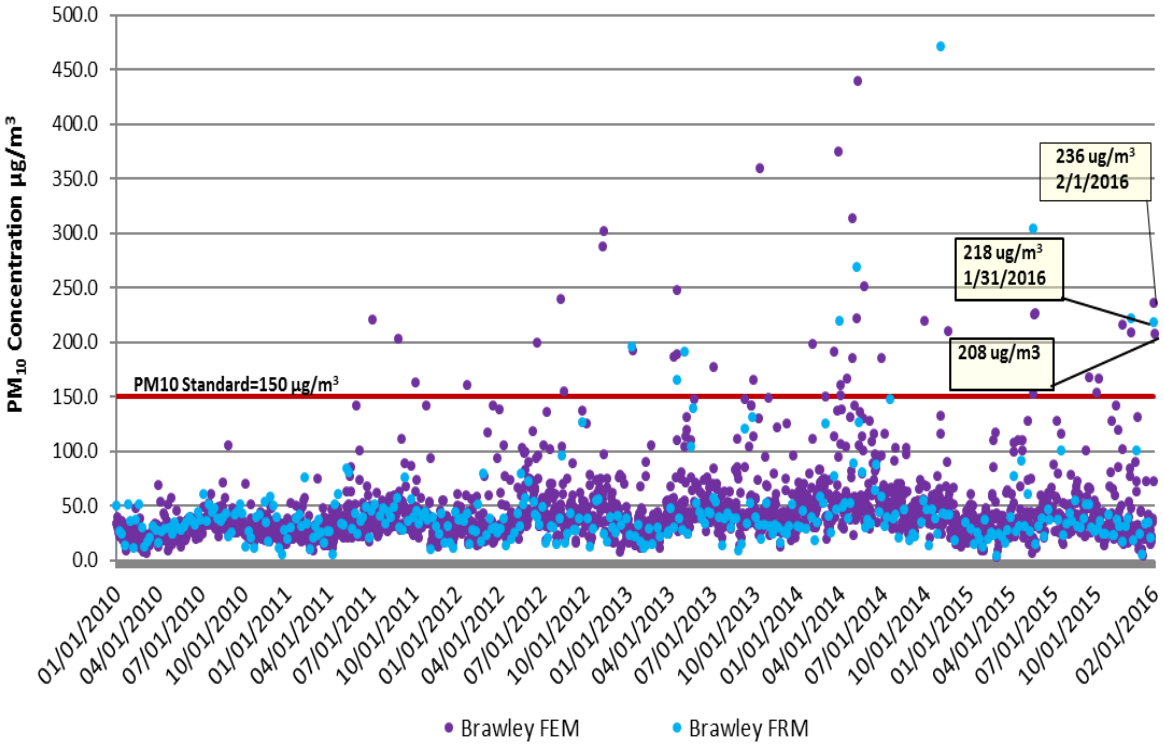


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 208 µg/m^3, 236 µg/m^3 and 218 µg/m^3 on January 31, 2016 and February 1, 2016 by the Brawley monitor were outside the normal historical concentrations when compared to similar event days and non-event days. Of the 2,575 credible samples measured within 2,223 sampling days the Brawley monitor measured 40 exceedance days, which equates to a less than a 2% occurrence rate

FIGURE 3-2
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO FEBRUARY 1, 2016

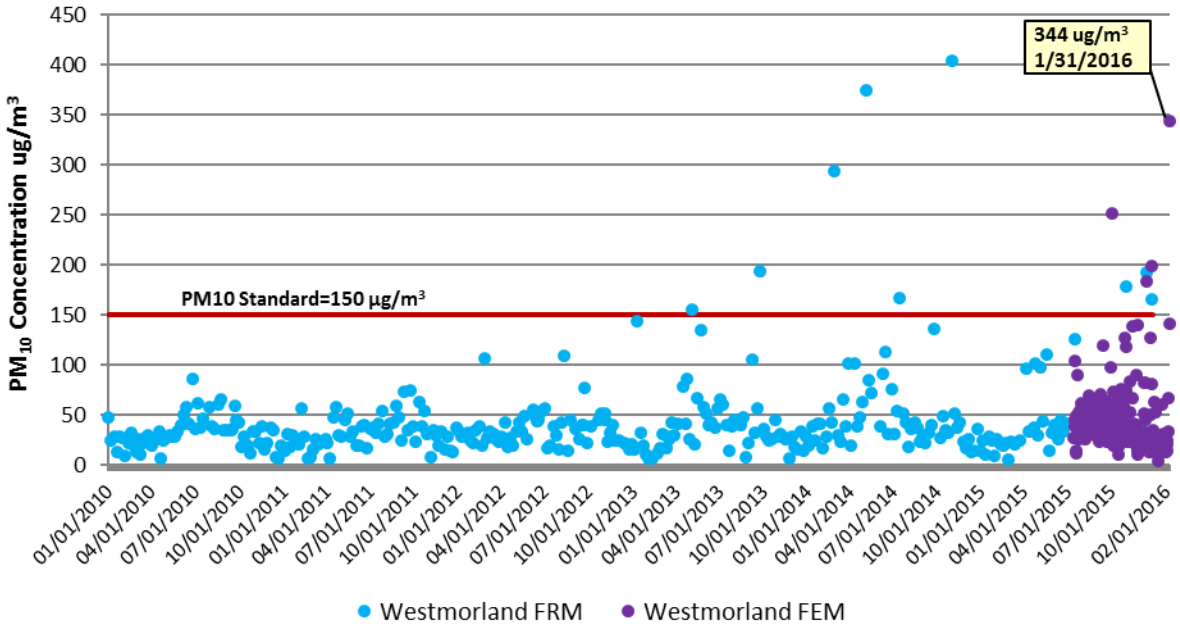


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 344 µg/m^3 on January 31, 2016 and February 1, 2016 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 559 credible samples measured within 552 sampling days the Westmorland monitor measured 11 exceedance days, which equates to a less than a 2% occurrence rate

FIGURE 3-3
NILAND HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO FEBRUARY 1, 2016

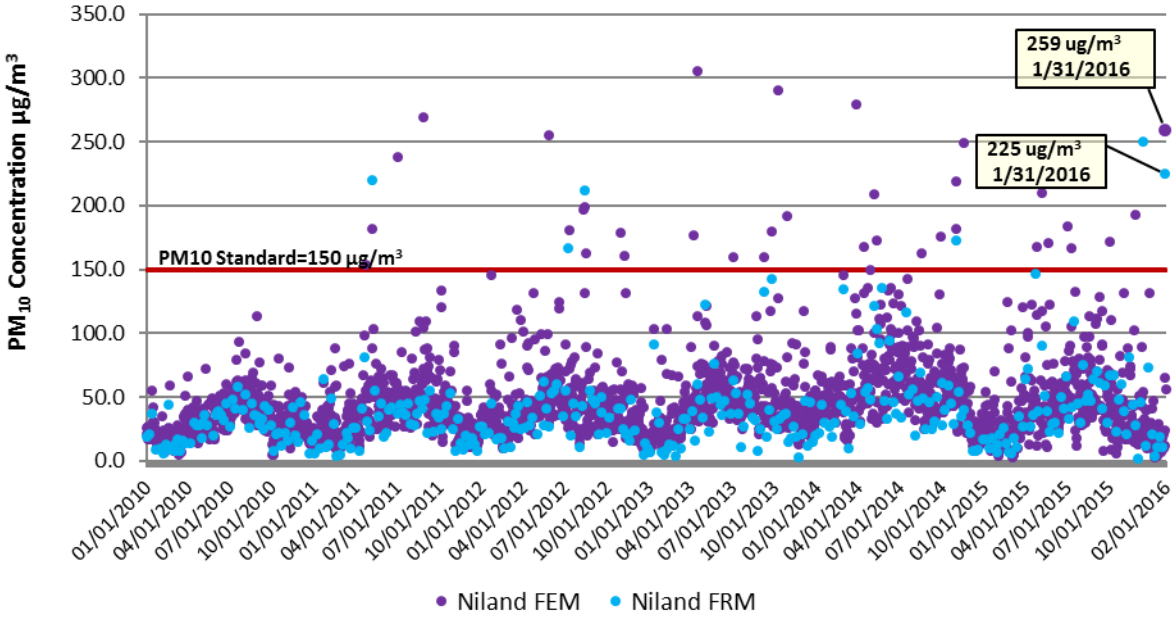
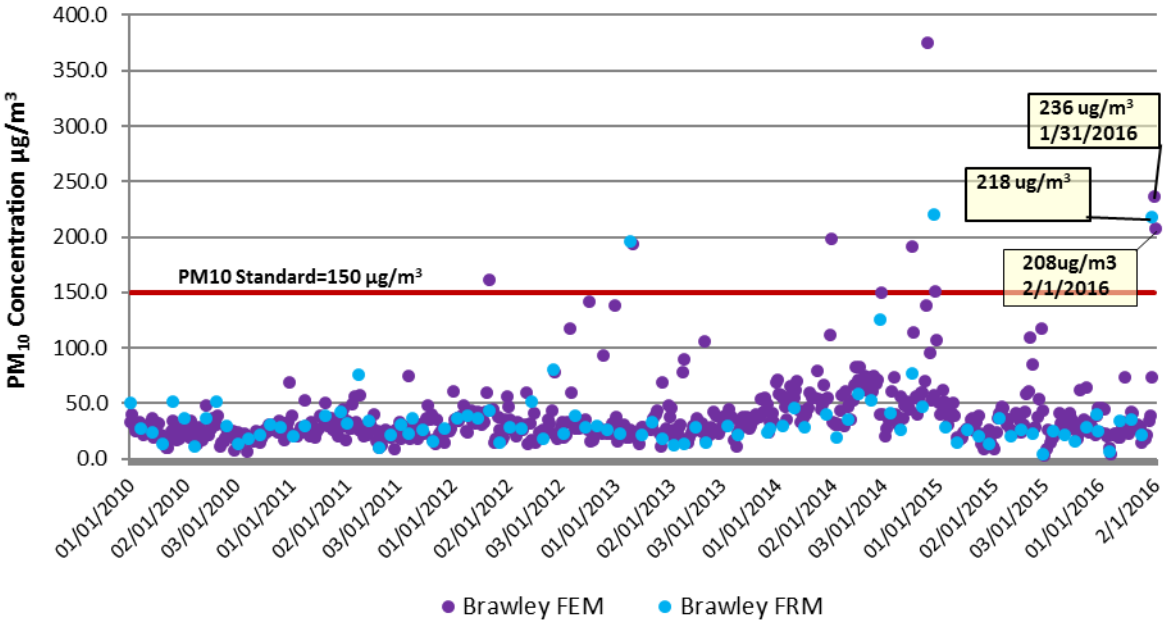


Fig 3-3: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 225 µg/m^3 and 259 µg/m^3 on January 31, 2016 and February 1, 2016 by the Niland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 2,573 credible samples measured within 2,223 sampling days the Niland monitor measured 38 exceedance days, which equates to a less than a 2 % occurrence rate

The time series, **Figures 3-1 thru 3-3** for Brawley, Niland and Westmorland provides historical concentration to concentration analysis for each monitor. Combined, the monitors measured 5707 credible samples within 2,223 sampling days (January 1, 2010 through February 1, 2016). During the January 1, 2010 through February 1, 2016 period the Brawley monitor measured 2,575 credible samples, the Niland monitor measured 2,573 credible samples and the Westmorland monitor measured 559 credible samples.

Overall, the time series illustrates that collectively the Brawley, Niland and Westmorland monitors, measured 64 exceedance days out of the 2,223 sampling days, which is less than a 3.5% occurrence rate. Of the 64 exceedance days, nine (9) exceedance days occurred during the first quarter (January – March). The remaining 58 exceedance days occurred during the second, third and fourth quarters. The January 31, 2016 and February 1, 2016 concentrations are outside the normal historical measurements for the first quarter when compared to event days and non-event days. No exceedances of the standard occurred during 2010. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

FIGURE 3-4
BRAWLEY SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016



***January 1, 2010 to March 30, 2015 and January 1, 2016 to February 1, 2016**

Fig 3-4: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 208 µg/m^3, 236 µg/m^3 and 218 µg/m^3 on January 31, 2016 and February 1, 2016 by the Brawley monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 666 credible samples measured within 573 sampling days the Brawley monitor measured eight (8) exceedance days, which equates to a less than a 2 % occurrence rate

FIGURE 3-5
WESTMORLAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016

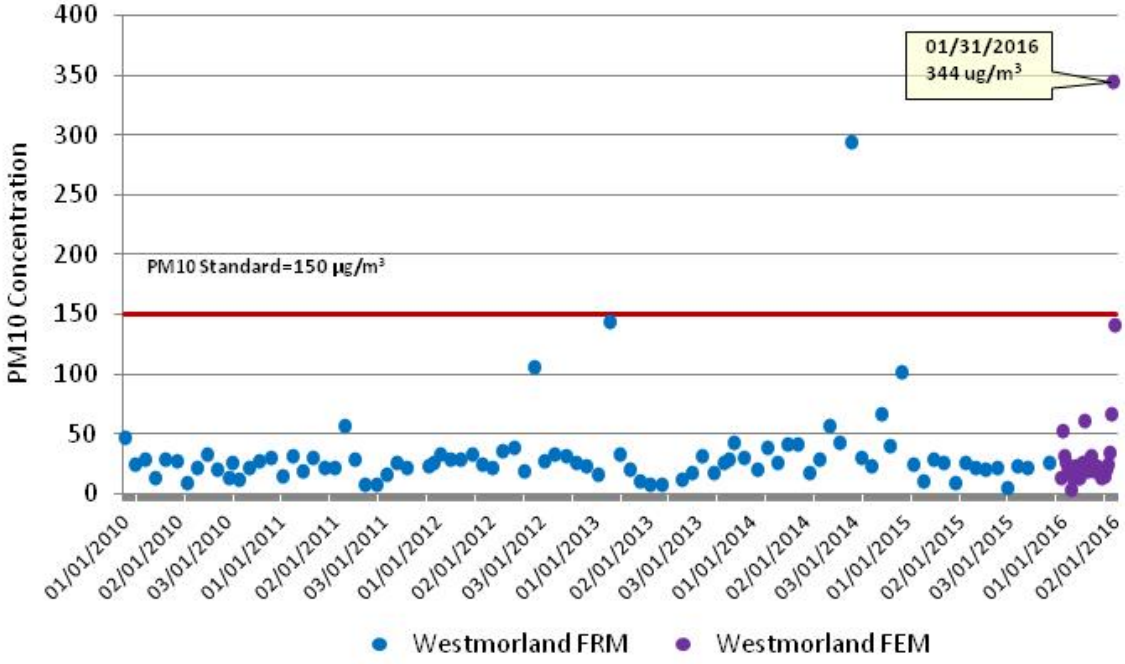


Fig 3-5: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 344 µg/m^3 on January 31, 2016 and February 1, 2016 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 121 credible samples measured within 125 sampling days the Westmorland monitor measured two (2) exceedance days, which equates to a less than a 2 % occurrence rate

FIGURE 3-6
NILAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016

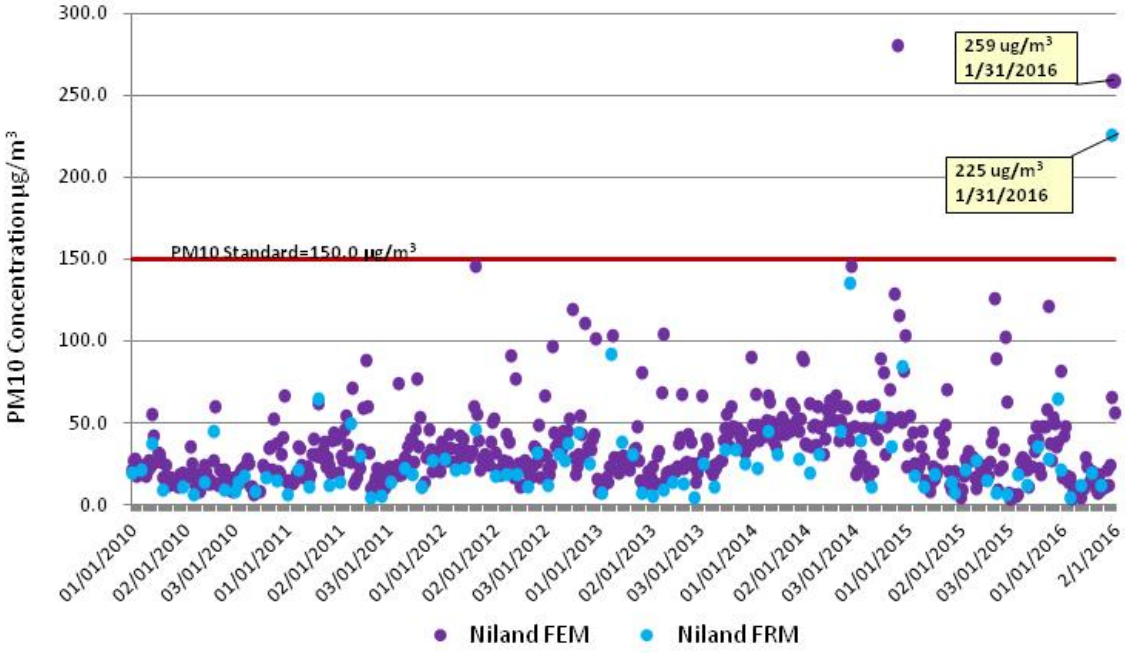


Fig 3-6: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 225 µg/m^3 and 259 µg/m^3 on January 31, 2016 and February 1, 2016 by the Niland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 664 credible samples measured within 573 sampling days the Niland monitor measured two (2) exceedance days, which equates to a less than a 2 % occurrence rate

Figures 3-4 through 3-6 display the seasonal fluctuations over 573 sampling days at the Brawley, Westmorland, and Niland stations for months January through March of years 2010 through 2016 (2016 ending February 1). The seasonal sampling period for Brawley (**Figure 3-4**) had a total 661 credible samples with eight exceedance days equates to 1.2 percent of all samples. The seasonal sampling period for Westmorland (**Figure 3-5**) contains 121 credible samples collected during 125 sampling days only two exceedances occurred.[12] This equates to 1.7 percent of all credible samples. The seasonal sampling period for Niland (**Figure 3-6**) contains 664 credible samples measured during 573 sampling days. Of these, there were just two exceedances, or just 0.3 percent of all samples.

Figures 3-7 through 3-9 graphically represent the percentile rankings for Brawley, Niland, and Westmorland over the historical period of January 1, 2010 through February 1, 2016.

[12] FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

FIGURE 3-7
BRAWLEY HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016

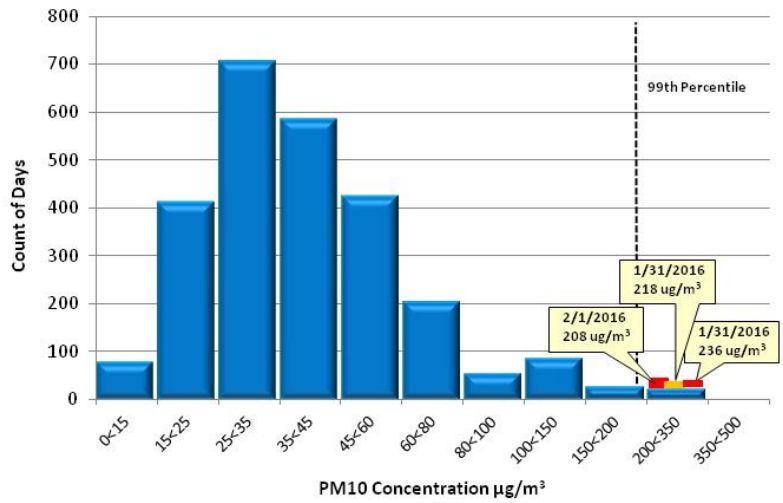


Fig 3-7: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the concentrations of 208 µg/m³, 218 µg/m³, and 236 µg/m³ all fall above the 99th percentile

FIGURE 3-8
WESTMORLAND HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016

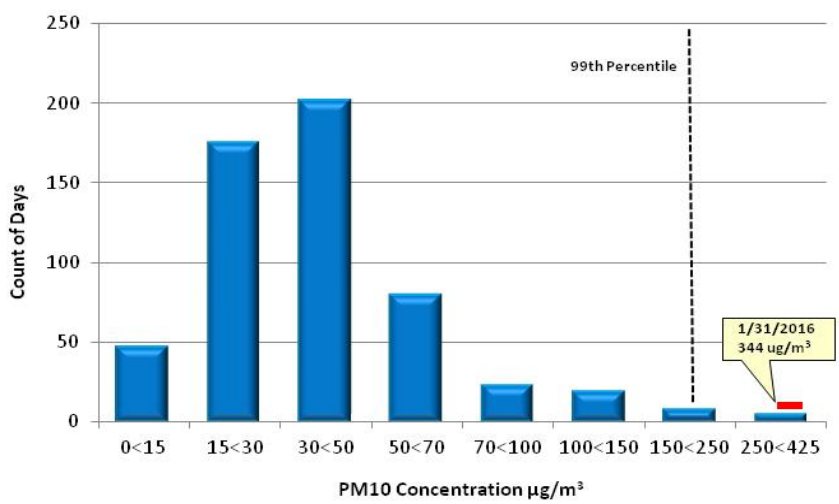
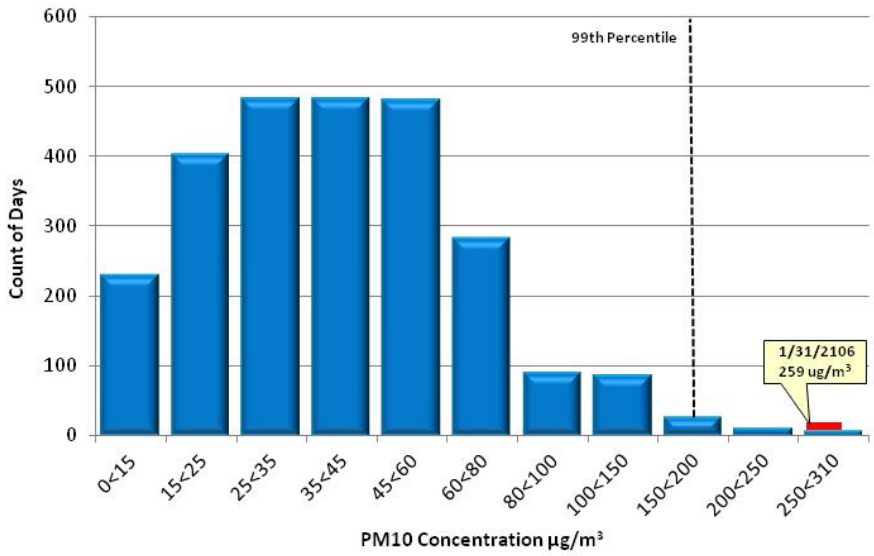


Fig 3-8: The 24-hr average PM_{10} concentration at the Westmorland monitoring site demonstrates that the January 31, 2016 and February 1, 2016 event was in excess of the 99th percentile

FIGURE 3-9
NILAND HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH FEBRUARY 1, 2016



***January 1, 2010 to December 31, 2015 and January 1, 2016 to February 1, 2016**

Fig 3-9: The 24-hr average PM_{10} concentration at the Niland monitoring site demonstrates that the January 31, 2016 and February 1, 2016 event was in excess was above the 99th percentile

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM_{10} concentrations of 208 µg/m^3, 236 µg/m^3, and 218 µg/m^3 for Brawley, 225 µg/m^3 and 259 µg/m^3 for Niland, and 344 µg/m^3 for Westmorland are all above the 99th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns the January 31, 2016 and February 1, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on January 31, 2016 and February 1, 2016 occurs infrequently. When comparing the measured PM_{10} levels on January 31, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, Niland, and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the January 31, 2016 and February 1, 2016 natural event affected the concentrations levels at the Brawley, Niland, and Westmorland monitors causing an exceedance. The concentration analysis further

supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on January 31, 2016 and February 1, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for January 31, 2016 and February 1, 2016. In addition, this January 31, 2016 and February 1, 2016 demonstration provides technical and non-technical evidence that strong gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley, Niland, and Westmorland monitors on January 31, 2016 and February 1, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the January 31, 2016 and February 1, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

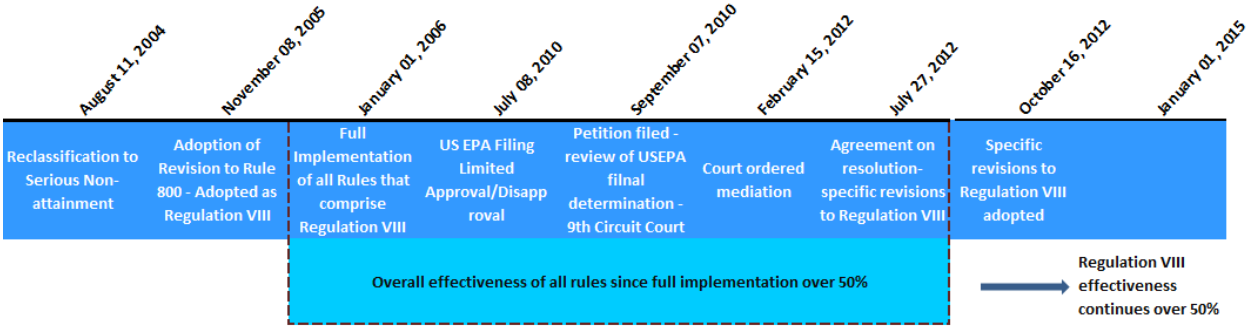


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII, which is comprised of seven fugitive dust rules is found below. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the

former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four-quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is the Good Neighbor Policy. On January 31, 2016 and February 1, 2016, the ICAPCD declared a No Burn day **(Appendix A).** There were no complaints filed for agricultural burning on January 31, 2016 and February 1, 2016.

IV.1.c Review of Source-Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland, Niland, and Brawley during the January 31, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol

Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on January 31, 2016, officially declared as No Burn days, related to agricultural burning, waste burning or dust. The ICAPCD and the IC Fire Department investigated a single complaint filed February 1, 2016 officially declared, a No Burn day, jointly. No violation was issued by ICAPCD as the incident included smoldering mulch that was extinguished and whose root investigative cause was conducted by IC Fire Department. The incident occurred at 3600 Highway 86 in Desert Shores approximately 39 miles northwest of Brawley. Because this was not a fire but a suspicious smoldering pile and because of the significant distance and direction from Brawley no impact to the Brawley monitor would have been possible.

FIGURE 4-2
PERMITTED SOURCES

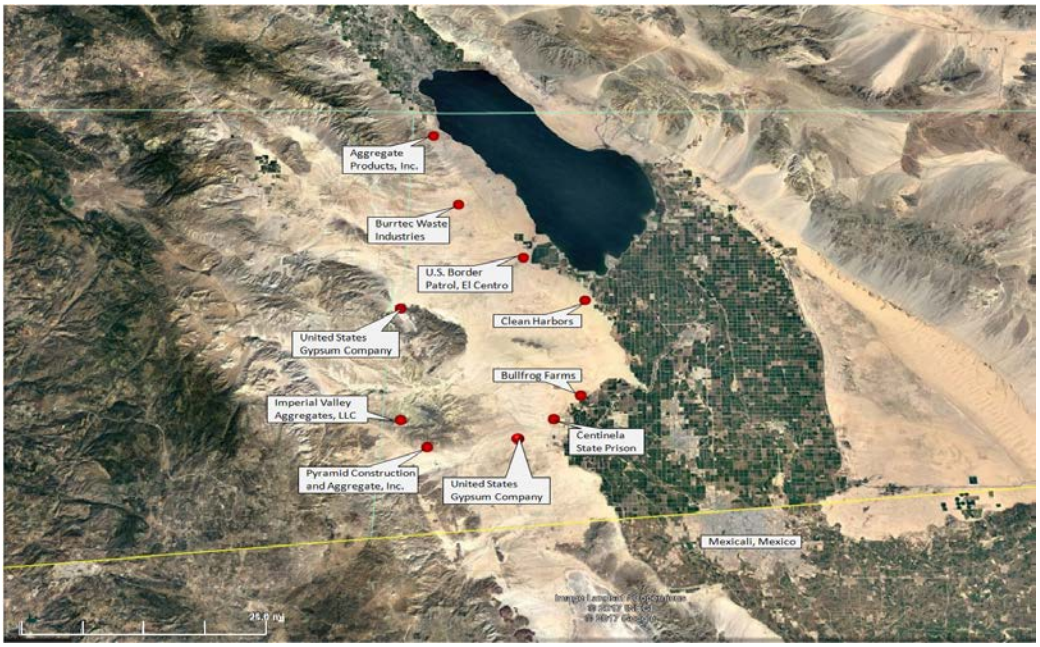


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Niland monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

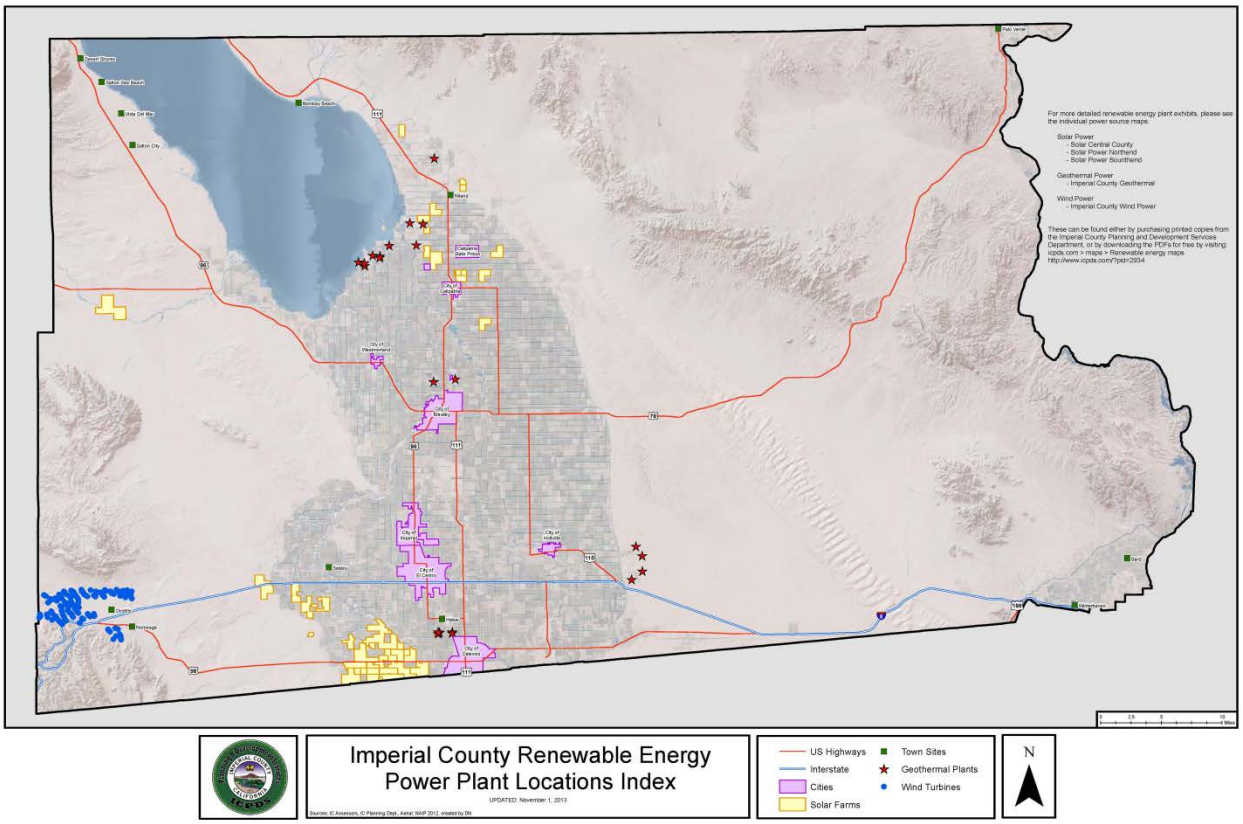


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

As early as 07:15 on January 30, 2016 the San Diego NWS office issued a High Wind Warning for San Diego County deserts effective through 18:00. The High Wind Waring advised of potential winds 25 mph with gusts up to 35 mph along with blowing dust and sand. The forecast indicated that winds would potentially increase through January 31, 2016 with winds up to 35 mph and gusts reaching 55 mph.

The NWS Phoenix office issued both a Wind and Blowing Dust Advisory for Imperial County and neighboring areas in anticipation of the severity of the weather system. The Phoenix NWS office issued a Wind Advisory for Imperial County at 05:13 PST effective from 14:00 Sunday, January 31, 2016 through 16:00 February 1, 2016. By 12:27 January 31, 2016 the NWS office added a Blowing Dust Advisory effective through 05:00 February 1, 2016, which forecasted sustained winds 35 mph with gusts up to 50 mph.

The ICAPCD posted on its website a forecast from the NWS San Diego office regarding the high winds for Sunday, January 31, 2016 through Monday, February 1, 2016. The notice also carried an advisory that high winds had the potential to suspend particulate matter into the air, and possibly pose an impact to public health. Although ICAPCD issues air quality alerts when levels of particulate matter reach orange or levels that are unhealthy for sensitive groups, air quality is affected when levels reach yellow or moderate. The Air Quality Index (AQI) did not reach yellow or moderate levels until the late afternoon hours of January 31, 2016. ICAPCD Air Quality Alerts advising the public of unhealthy air quality began during the early morning hours of February 1, 2016. The alerts categorized air quality in Niland and Brawley by February 1, 2016 as unhealthy and very unhealthy. See **Appendix A** for advisories, forecasts, and air quality alerts.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Similarly, other data from automated meteorological instruments upstream from the Brawley, Westmorland, and Niland monitors during the wind event. On January 31, 2016 the El Centro NAF (KNJK) measured wind speeds at or above 25mph for 10 hours, five of which were consecutive (18:06 through 22:56). Imperial County Airport (KIPL) had seven hours of winds above 25 mph, with five of those hours (17:00 through 22:53) consecutive. The Niland station measured six hours of wind speeds above the 25 mph threshold, with a seventh hour just below the threshold. On February 1, 2016 the El Centro NAF (KNJK) measured three hours of wind speeds at or above 25 mph and nine hours of gusts at or above 30 mph. The Imperial County Airport (KIPL) measured two hours of wind speeds above 25 mph, with five hours of gusts above 30 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the January 31, 2016 and February 1, 2016 event, wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong cold front that moved through southern California entrained particulate matter that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements west of the Brawley, Niland, and Westmorland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 47 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions 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 that occurred on January 31, 2016 and February 1, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The January 31, 2016 and February 1, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for January 31, 2016 and February 1, 2016, identified a low-pressure system and sharp cold front accompanied by a deep upper-level trough that moved across southwest California and into Imperial County (Pacific System). The strengthening of the onshore flow, as the low-pressure system intensified as it moved inland caused gusty west winds in the San Diego mountain passes and desert slopes during the morning and afternoon hours in southeastern California.

Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley, Niland and Westmorland, along with anthropogenic sources controlled with BACM, confirmed by the meteorological and air quality observations January 31, 2016 and February 1, 2016 caused an exceedance January 31, 2015 and February 1, 2015 at the Brawley, Westmorland and Niland monitors. These monitors are part of the northern section of the Imperial County Air Monitoring Network. The remaining two monitors located within the central and southern section of the Air Monitoring Network measured intermittent elevated concentrations below the level of an exceedance. While the Calexico monitor did not measure an exceedance, the monitor did measure a higher concentration than the El Centro monitor. The path of the airflow and the level of urbanization contributed to the lower level intermittent measured concentrations at the El Centro monitor.

Figure 5-1 is an Aqua MODIS satellite image of visible blowing dust in Imperial County. The entrained windblown dust affected air quality in Imperial County and caused measured exceedances of the NAAQS at the Brawley, Niland and Westmorland stations (both FRM and FEM monitors).

FIGURE 5-1
AQUA MODIS CAPTURED BLOWING DUST

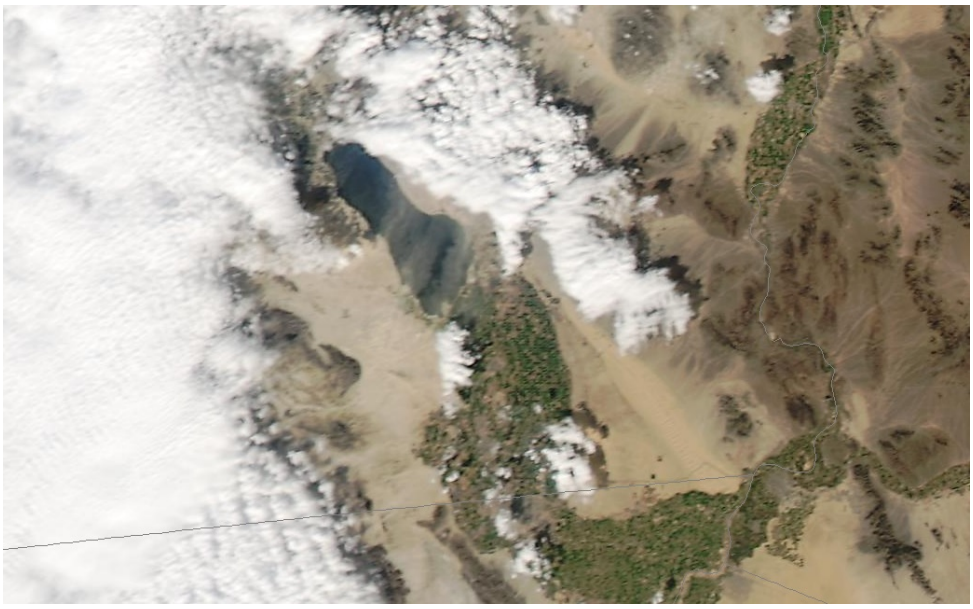


Fig 5-1: The MODIS instrument onboard the Aqua satellite captured entrained dust visible across Imperial County at ~13:30 PST on January 31, 2016. Source: MODIS Today

FIGURE 5-2
TERRA MODIS CAPTURED BLOWING DUST

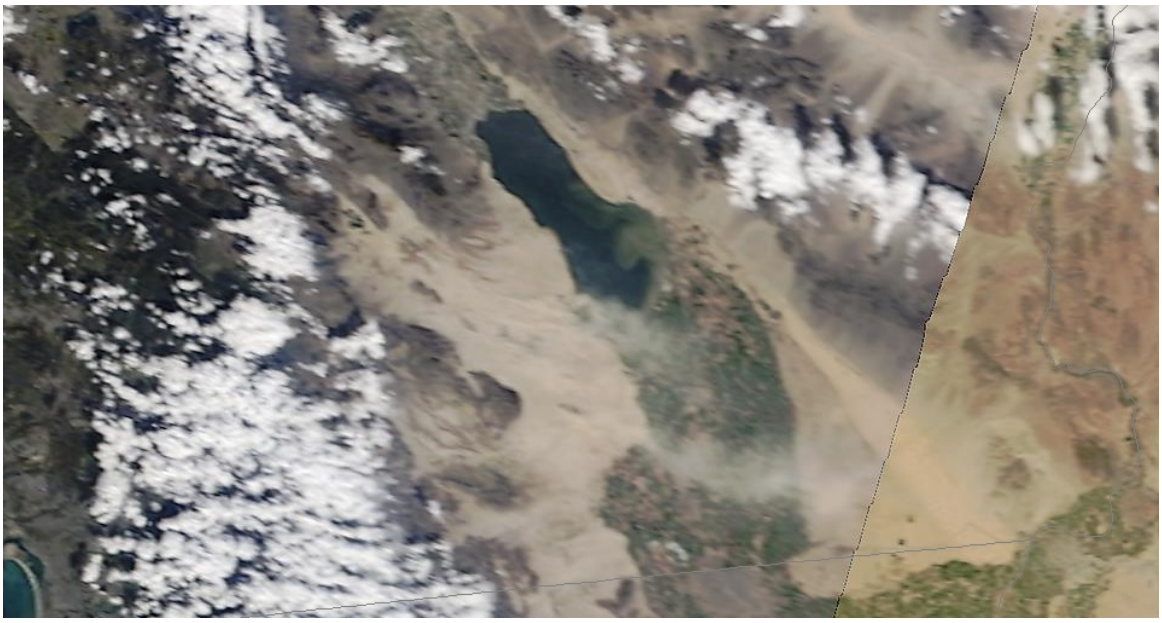


Fig 5-2: The MODIS instrument onboard the Aqua satellite captured entrained dust across Imperial County at ~10:30 PST on February 1, 2016. Source: MODIS Today

Figure 5-3 is a series of satellite images that show the steepening of the pressure gradient across southern California that led to the high winds on January 31, 2016. The gradient began to steepen at 1000 PST (top right image), then grew progressively tighter at 1600 through 2200. This is the period when winds across Imperial County were at their strongest. The winds resulted in the entrainment of dust as seen in **Figure 5-1 and Figure 5-2**.

FIGURE 5-3
PRESSURE GRADIENT TIGHTENS

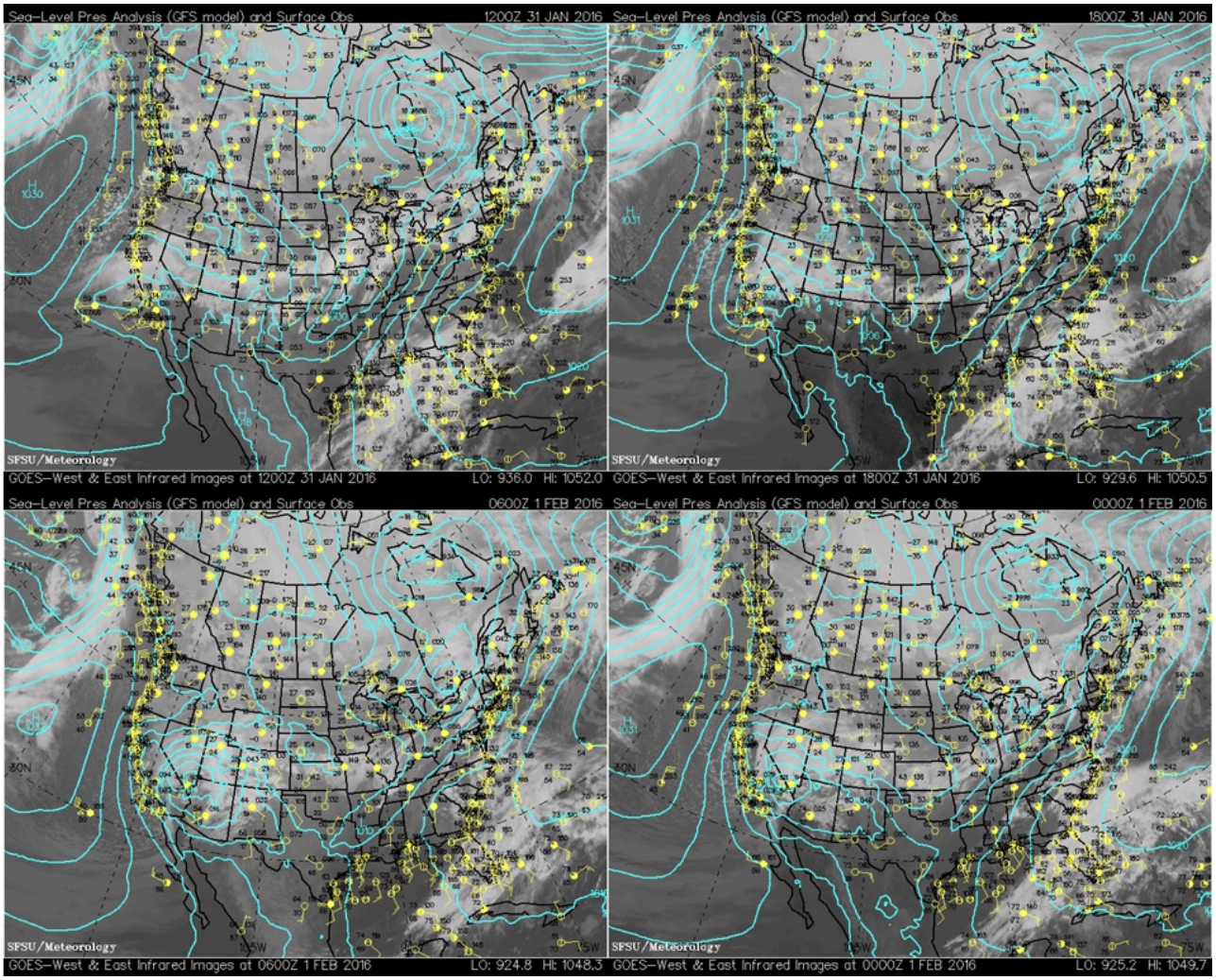


Fig 5-3: Four GOES-W infrared sea level pressure analysis images show the tightening of the pressure gradient during January 31, 2016. Clockwise, from top left: 0400; 1000; 1600; 2200 on January 31. All times PST. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

Figure 5-3 and Figure 5-4 are satellite images of aerosols drifting over Imperial County. Warmer colors indicate increasing Aerosol Optical Depth (AOD)[13] thickness. Although the Terra and Aqua satellites carrying the MODIS instrument[14] made passes over Imperial County prior to the measured peak concentrations it did capture the suspended particles brought by winds as early as the evening hours of January 30, 2016.

FIGURE 5-4
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY

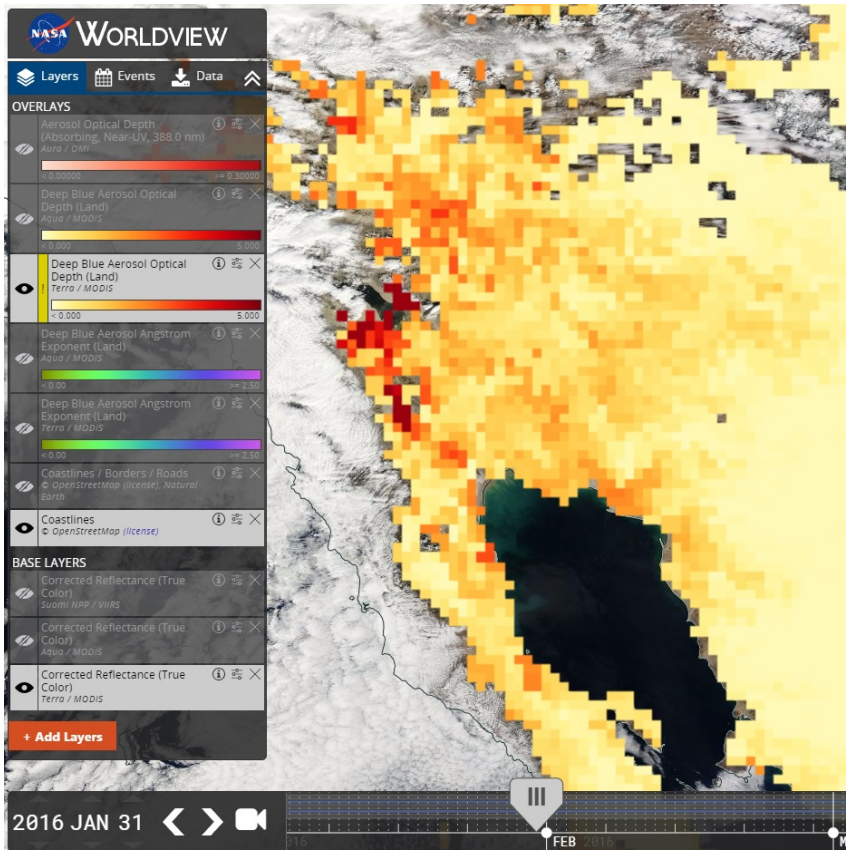


Fig 5-4: The MODIS instrument onboard the Terra satellite captured moderately thick AOD drifting over parts of Imperial County on January 31, 2016. Warmer colors indicate thicker layers of aerosols. Source: https://worldview.earthdata.nasa.gov

[13] Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov

[14] MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. MODIS Technical Specifications identify the Terra orbit at 10:30am and the Aqua at 1:30pm.

FIGURE 5-5
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY

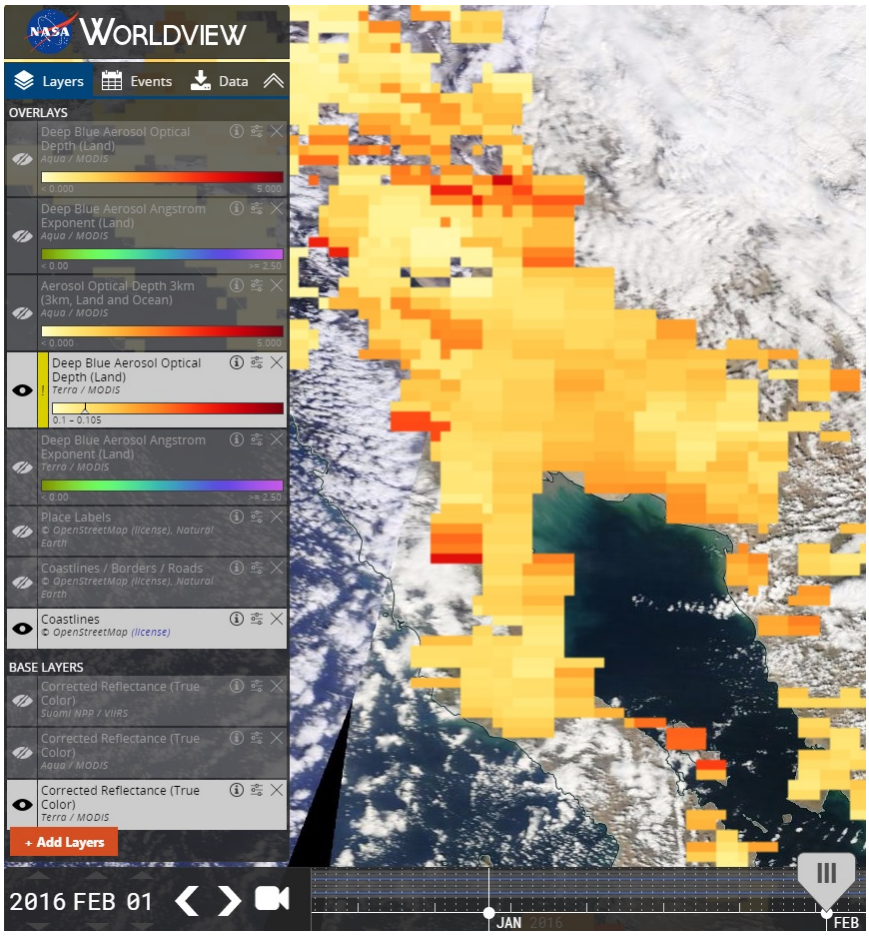


Fig 5-5: The MODIS instrument onboard the Terra satellite captured moderately thick AOD drifting over parts of Imperial County on February 1, 2016 coincident with prior hours of elevated concentrations that continued from January 31, 2016. Warmer colors indicate thicker layers of aerosols. Source: https://worldview.earthdata.nasa.gov

The thickening of the AOD is supported by the issued Blowing Dust Advisory for Imperial County. The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[15] **Tables 5-1 through 5-3** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding stations.[16]

The Brawley monitor shows peak hourly concentrations following or during the period of high upstream wind speeds. The Brawley station does not have its own meteorological instruments, as does Niland and Westmorland thus the Mountain Springs Grade station located southwest of Brawley is included in the table. The Mountain Springs Grade measured strong west winds blowing across and through the mountain passes of San Diego County, down the canyon/desert

[15] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016
[16] Please refer to **Appendix B** for a brief explanation regarding the meteorological differences between stations.

slopes along Interstate 8 and onto the desert floor of Imperial County.

The Westmorland and Niland monitors also show peak concentration hours in relationship to high upstream winds and gusts, particularly at El Centro NAF, Imperial County Airport, and Sunrise-Ocotillo. Wind speeds at the Niland station were a bit higher than measured at the Westmorland station. This accounts for the somewhat lower hourly concentrations levels at Niland. The stronger winds blew dust past the monitor, while the weaker winds at Westmorland allowed for more deposition.

On January 31, 2016 and February 1, 2016, the strong west winds entrained windblown dust toward Brawley, Niland, and Westmorland, elevating concentrations sufficiently to cause an exceedance.

TABLE 5-1
BRAWLEY WIND SPEEDS—PM_{10} CONCENTRATIONS JANUARY 31, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			MOUNTAIN SPRINGS GRADE (TNSC1)			BRAWLEY FEM
DATE	**HOUR**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**PM_{10} (µg/m³)**
01/31/2016	0000	18		250	13		240	15	24	248	21	34	225	12
01/31/2016	0100	25	33	250	18		250	16	26	250	21	37	223	6
01/31/2016	0200	24		260	23	29	260	15	28	253	25	40	210	1
01/31/2016	0300	22		260	18	28	270	14	27	249	26	41	212	6
01/31/2016	0400	20		270	14		260	13	25	250	26	38	211	11
01/31/2016	0500	8		250	6		170	17	30	278	22	38	217	6
01/31/2016	0600	26	33	260	7		120	14	23	298	24	36	215	2
01/31/2016	0700	23		280	8		170	12	23	271	21	37	209	14
01/31/2016	0800	7		150	10		200	15	30	242	22	33	206	671
01/31/2016	0900	15		160	13		160	25	35	229	18	31	193	322
01/31/2016	1000	14		150	11		170	22	35	232	19	36	208	21
01/31/2016	1100	9		150	9		130	25	37	235	14	36	212	10
01/31/2016	1200	28		230	9		140	20	28	229	14	29	209	17
01/31/2016	1300	23		230	21	26	230	18	29	237	14	25	204	107
01/31/2016	1400	31	40	240	26	37	230	21	33	230	19	38	226	121
01/31/2016	1500	25		220	21		230	16	26	220	16	31	213	350
01/31/2016	1600	23	32	230	24	37	240	19	35	272	19	37	245	28
01/31/2016	1700	24	32	240	26	37	240	22	36	273	18	38	251	61
01/31/2016	1800	36	45	250	31	40	250	19	34	255	24	42	239	995
01/31/2016	1900	31	47	250	26	45	250	22	37	274	22	42	239	995
01/31/2016	2000	28	44	250	28	36	240	19	35	276	23	39	248	856
01/31/2016	2100	30	39	250	31	38	250	22	37	278	22	46	249	420
01/31/2016	2200	28	41	260	32	40	250	26	38	285	15	42	263	359
01/31/2016	2300	21		240	21	29	250	27	40	282	17	35	268	273

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees

TABLE 5-2
WESTMORLAND WIND SPEEDS—PM_{10} CONCENTRATIONS JANUARY 31, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			WESTMORLAND			WESTMORLAND FEM
DATE	**HOUR**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**PM_{10} (µg/m³)**
01/31/2016	0000	18		250	13		240	15	24	248	5.3	-	230	37
01/31/2016	0100	25	33	250	18		250	16	26	250	5.2	-	225	19
01/31/2016	0200	24		260	23	29	260	15	28	253	5.6	-	228	2
01/31/2016	0300	22		260	18	28	270	14	27	249	5.9	-	233	1
01/31/2016	0400	20		270	14		260	13	25	250	6.1	-	259	-1
01/31/2016	0500	8		250	6		170	17	30	278	6	-	229	21
01/31/2016	0600	26	33	260	7		120	14	23	298	4.6	-	237	8
01/31/2016	0700	23		280	8		170	12	23	271	7.1	-	241	8
01/31/2016	0800	7		150	10		200	15	30	242	7.4	-	344	132
01/31/2016	0900	15		160	13		160	25	35	229	14.4	-	231	995
01/31/2016	1000	14		150	11		170	22	35	232	9.9	-	214	75
01/31/2016	1100	9		150	9		130	25	37	235	9.8	-	174	11
01/31/2016	1200	28		230	9		140	20	28	229	6.5	-	189	32
01/31/2016	1300	23		230	21	26	230	18	29	237	13.2	-	233	995
01/31/2016	1400	31	40	240	26	37	230	21	33	230	14.6	-	234	995
01/31/2016	1500	25		220	21		230	16	26	220	15.5	-	220	480
01/31/2016	1600	23	32	230	24	37	240	19	35	272	8.8	-	236	33
01/31/2016	1700	24	32	240	26	37	240	22	36	273	9.8	-	229	10
01/31/2016	1800	36	45	250	31	40	250	19	34	255	12.5	-	240	687
01/31/2016	1900	31	47	250	26	45	250	22	37	274	8.9	-	248	787
01/31/2016	2000	28	44	250	28	36	240	19	35	276	8.7	-	344	812
01/31/2016	2100	30	39	250	31	38	250	22	37	278	10.5	-	255	938
01/31/2016	2200	28	41	260	32	40	250	26	38	285	9.8	-	257	472
01/31/2016	2300	21		240	21	29	250	27	40	282	13.1	-	281	718

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Westmorland does not record gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

TABLE 5-3
NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS JANUARY 31, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			NILAND			NILAND FEM
DATE	**HOUR**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**PM_{10} (µg/m³)**
01/31/2016	0000	18		250	13		240	15	24	248	3.2	-	98	58
01/31/2016	0100	25	33	250	18		250	16	26	250	5.8	-	99	37
01/31/2016	0200	24		260	23	29	260	15	28	253	8.3	-	104	25
01/31/2016	0300	22		260	18	28	270	14	27	249	7.1	-	117	20
01/31/2016	0400	20		270	14		260	13	25	250	4.7	-	133	44
01/31/2016	0500	8		250	6		170	17	30	278	6.3	-	109	36
01/31/2016	0600	26	33	260	7		120	14	23	298	7.2	-	101	20
01/31/2016	0700	23		280	8		170	12	23	271	8.6	-	130	12
01/31/2016	0800	7		150	10		200	15	30	242	6.6	-	129	36
01/31/2016	0900	15		160	13		160	25	35	229	11.5	-	200	159
01/31/2016	1000	14		150	11		170	22	35	232	21.6	-	217	426
01/31/2016	1100	9		150	9		130	25	37	235	18.6	-	181	111
01/31/2016	1200	28		230	9		140	20	28	229	26.2	-	210	373
01/31/2016	1300	23		230	21	26	230	18	29	237	32	-	211	995
01/31/2016	1400	31	40	240	26	37	230	21	33	230	23.5	-	224	679
01/31/2016	1500	25		220	21		230	16	26	220	25.3	-	215	349
01/31/2016	1600	23	32	230	24	37	240	19	35	272	27.2	-	217	171
01/31/2016	1700	24	32	240	26	37	240	22	36	273	13.1	-	250	22
01/31/2016	1800	36	45	250	31	40	250	19	34	255	15.7	-	269	161
01/31/2016	1900	31	47	250	26	45	250	22	37	274	20.8	-	255	306
01/31/2016	2000	28	44	250	28	36	240	19	35	276	24.2	-	262	856
01/31/2016	2100	30	39	250	31	38	250	22	37	278	26	-	259	732
01/31/2016	2200	28	41	260	32	40	250	26	38	285	24.8	-	344	189
01/31/2016	2300	21		240	21	29	250	27	40	282	31	-	344	408

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Niland does not record gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees.

TABLE 5-4
BRAWLEY WIND SPEEDS—PM_{10} CONCENTRATIONS FEBRUARY 1, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			FISH CREEK MOUNTAINS (FHCC1)			BRAWLEY FEM
DATE	HOUR	W/S	W/G	W/D	W/S	W/G	W/D	W/S	W/G	W/D	W/S	W/G	W/D	PM_{10} (µg/m³)
2/1/2016	0	18	W/G	260	21	31	260	20	33	296	16	45	284	596
2/1/2016	100	14	30	270	9		260	20	31	289	13	41	305	995
2/1/2016	200	18		270	20	29	280	18	29	283	17	35	301	506
2/1/2016	300	33	30	250	29	43	260	19	30	287	14	38	275	995
2/1/2016	400	24	44	280	20	26	260	15	28	269	6	35	44	189
2/1/2016	500	24	34	270	18		270	15	23	274	12	23	256	253
2/1/2016	600	22	34	280	20		270	12	18	280	19	40	278	63
2/1/2016	700	18	30	260	21	31	280	17	28	259	9	35	262	78
2/1/2016	800	22		260	21	28	270	16	30	261	9	16	251	48
2/1/2016	900	20		270	14		260	21	31	277	18	32	239	84
2/1/2016	1000	26		280	25	33	270	19	35	277	22	36	263	335
2/1/2016	1100	23	33	280	21	29	280	21	32	274	20	35	274	148
2/1/2016	1200	26	32	270	22	33	270	12	23	276	12	43	299	307
2/1/2016	1300	22	33	310	15	23	310	13	24	269	11	27	290	73
2/1/2016	1400	21	28	290	21	28	290	12	20	272	11	24	316	89
2/1/2016	1500	20	29	300	16		330	12	19	280	12	23	299	31
2/1/2016	1600	20		280	8		320	11	17	272	11	23	297	37
2/1/2016	1700	15		280	9		300	8	15	267	12	21	267	32
2/1/2016	1800	18		290	11		280	8	15	259	11	23	273	21
2/1/2016	1900	14		260	11		260	10	15	277	12	19	260	13
2/1/2016	2000	6		280	8		250	5	8	270	2	16	331	16
2/1/2016	2100	9		290	5		270	6	8	285	2	7	143	22
2/1/2016	2200	11		330	7		360	3	6	273	2	8	6	30
2/1/2016	2300	6		280	6		310	4	7	268	4	5	200	19

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph;Direction = degrees.

As discussed in section II, strong gusty westerly winds blew over areas within the San Diego Mountain passes and desert slopes such as the Mountain Springs Grade, Sunrise-Ocotillo, and the Fish Creek Mountains which measured multiple and consecutive hours of gusts at or above 30 mph, particularly during the afternoon and evening hours when concentrations peaked at the Brawley, Niland and Westmorland monitors. Similarly, both local airports the El Centro NAF (KNJK) and the Imperial County Airport (KIPL) measures several hours of elevated wind speeds at or above 25 mph and gusts at or above 30 mph.

Entrained windblown dust affected air quality and air monitoring stations in Imperial County when strong west-to-southwest winds blew from the mountains and deserts resulted in exceedances at the Brawley, Niland, and Westmorland monitors. **Figure 5-6** is a graphic depiction that combines the HYSPLIT trajectory, upstream wind speeds, and important peak concentration times.

FIGURE 5-6
TIMELINE OF ENTRAINMENT JANUARY 31, 2016

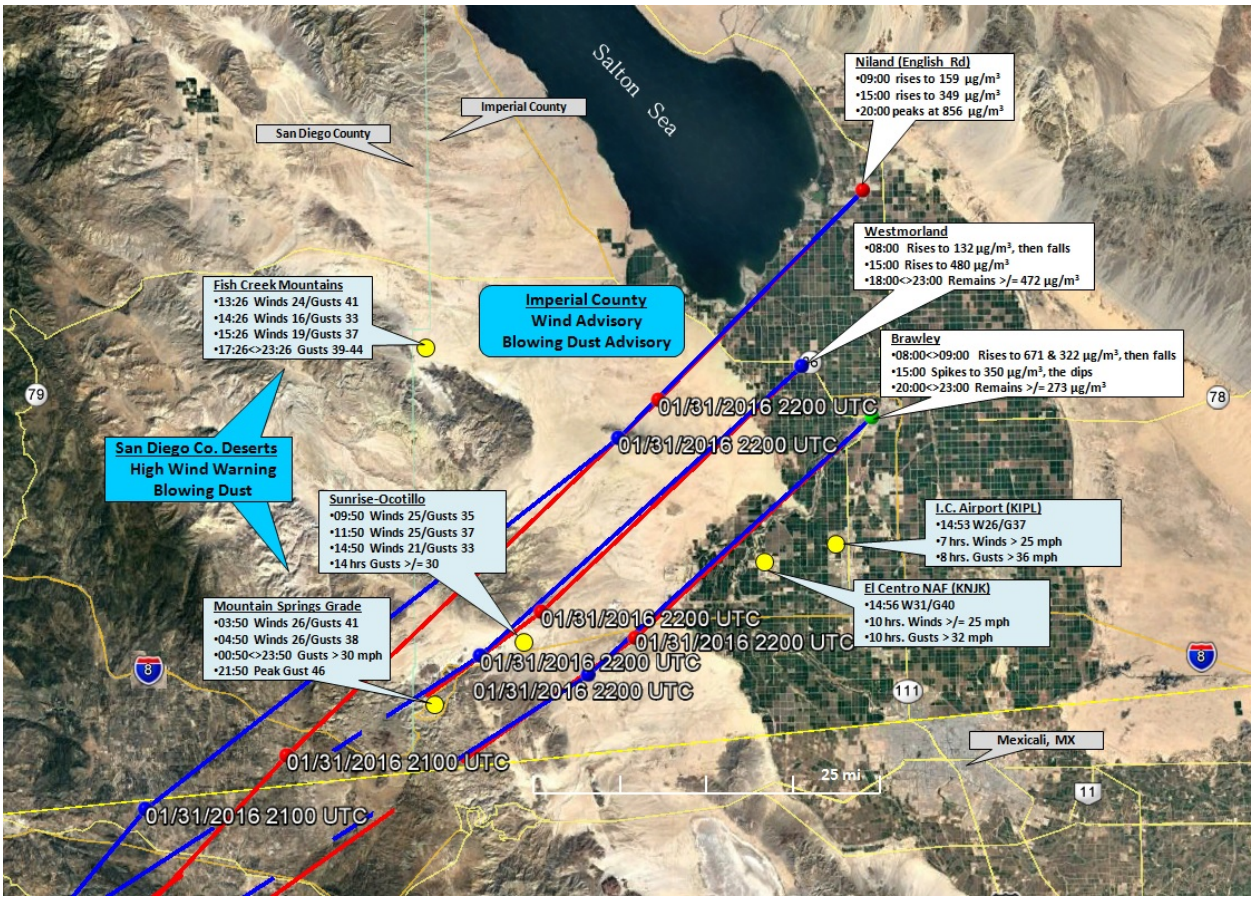


Fig 5-6: High winds at upstream sites helped entrain dust west of the Brawley, Westmorland, and Niland monitors. Air quality data is from the EPA's AQS data bank. The 12-hour HYSPLIT back-trajectory ends at 1500 PST. Red trajectory depicts airflow at the 10m level; blue is 100m. Generated through NOAA's Air Resources Laboratory. Google Earth base map

High winds at upstream sites helped entrain dust from the mountain passes and desert areas within San Diego County into Imperial County affecting air monitors in Brawley and Westmorland. As discussed above, the wind direction shifted to a more predominant west direction as winds continued into February 1, 2016, albeit for a shorter amount of time (**Figure 5-7**). While all air monitors measured elevated concentrations, the combination of a shift in wind direction to a predominantly west direction and a reduced duration of wind speeds allowed for less deposition at the Niland, El Centro and Calexico monitors. As suspended dust blew over the Salton Sea reduced saltation allowed for less deposition onto the Niland monitor. Greater areas of urbanization, with buildings acting as wind barriers allowed for less deposition at the Calexico and El Centro monitors.

FIGURE 5-7
TIMELINE OF ENTRAINMENT

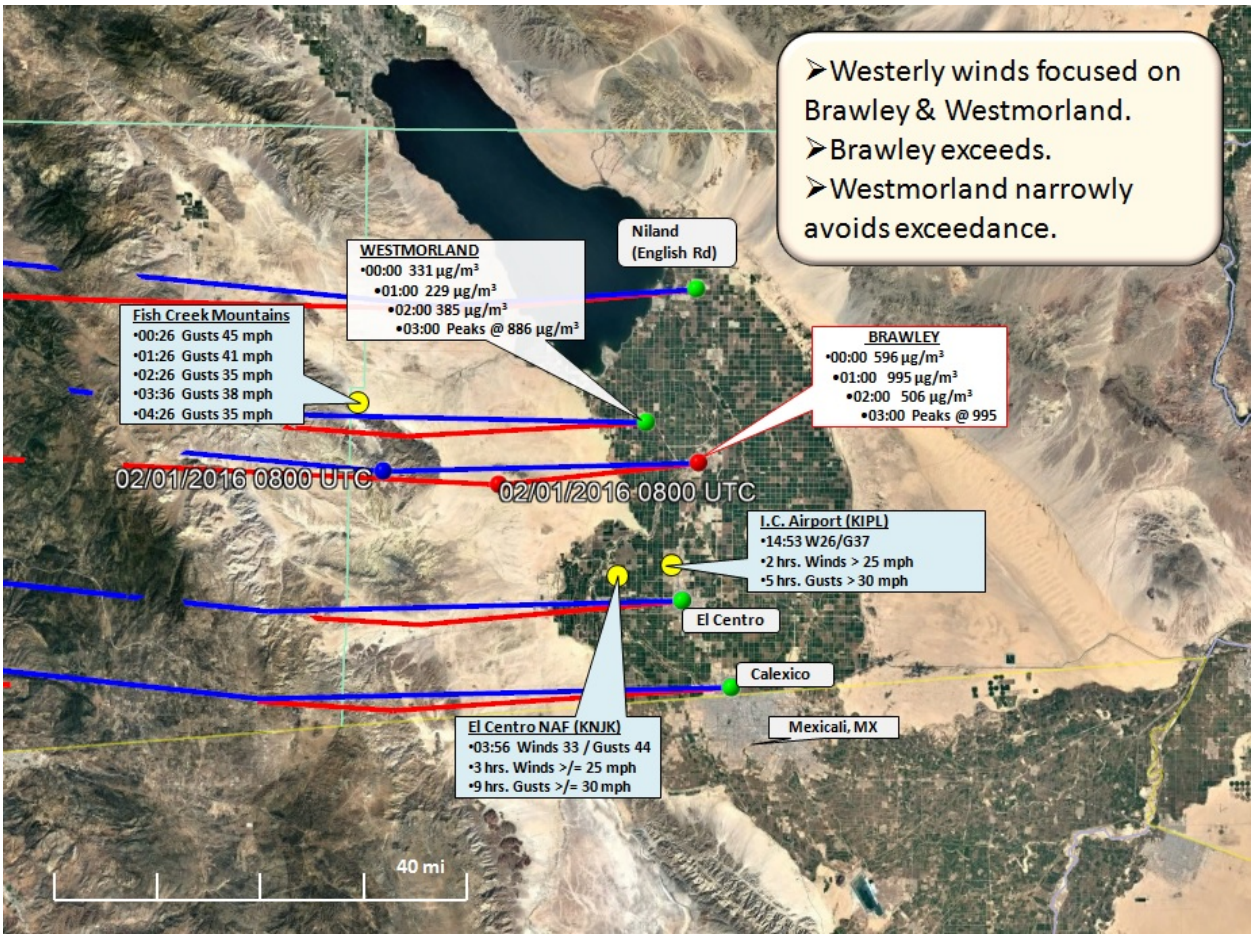


Fig 5-7: Winds remained gusty through February 1, 2016. Winds shifted to a predominantly west direction. High winds at upstream sites helped entrain dust from the mountain slopes and deserts of San Diego County west of the Brawley and Westmorland monitors. Both Brawley and Westmorland measured elevated concentrations but only Brawley exceeded. Air quality data is from the EPA's AQS data bank. The 12-hour HYSPLIT back-trajectory ends at 0100 PST on February 1, 2016. Red trajectory depicts airflow at the 10m level; blue is 100m. Generated through NOAA's Air Resources Laboratory. Google Earth base map

Figures 5-8 through 5-10 depict PM_{10} concentrations and wind speeds over a 96-hour period at Brawley, Westmorland, and Niland. Fluctuations in hourly concentrations at Brawley (**Figure 5-8**) over 96 hours show a positive correlation with wind speeds, and gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL).

FIGURE 5-8
BRAWLEY PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

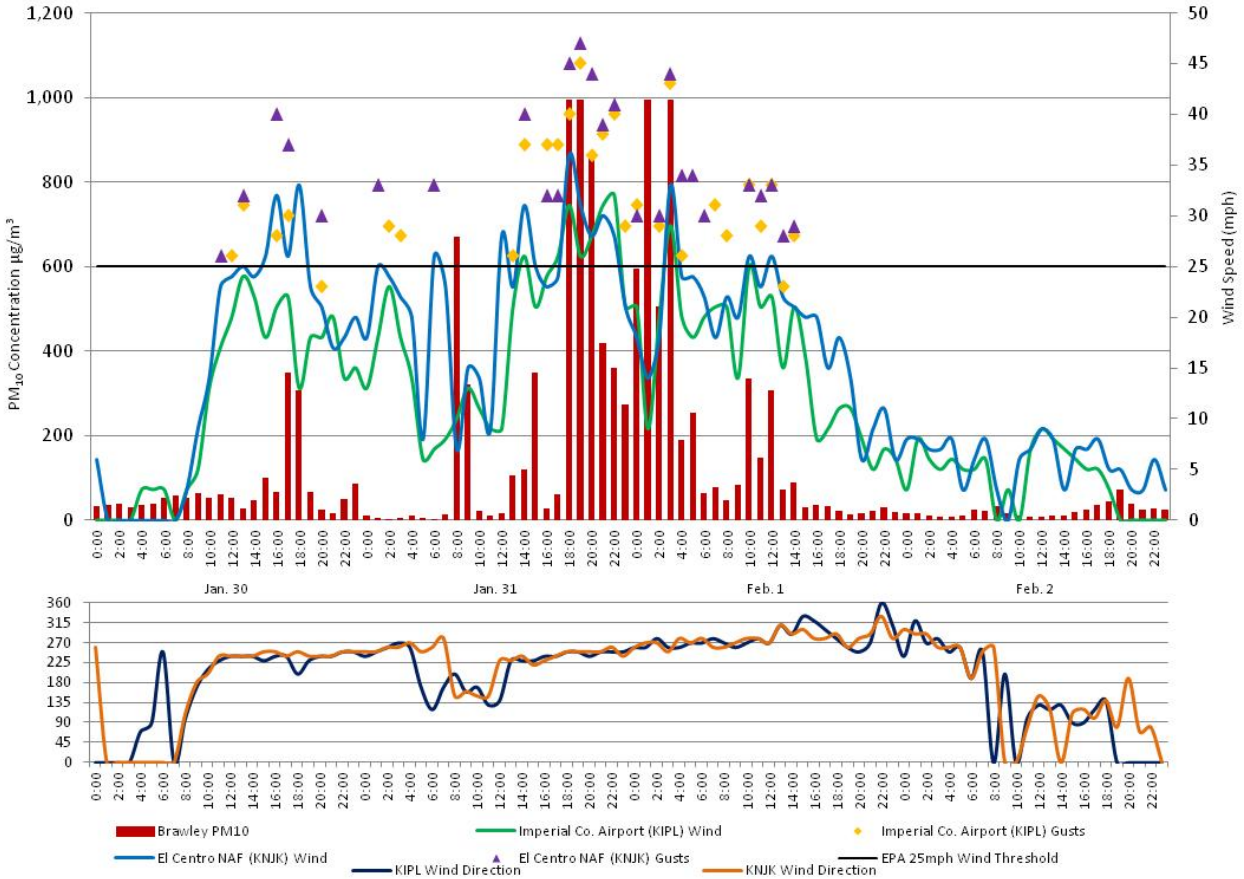


Fig 5-8: Fluctuations in hourly concentrations over 96 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

Winds at Niland surpassed the 25 mph threshold (**Figure 5-9**). Although the station was farther north than Brawley or Westmorland, this allowed the suspended dust to reach the monitor.

FIGURE 5-9
NILAND PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

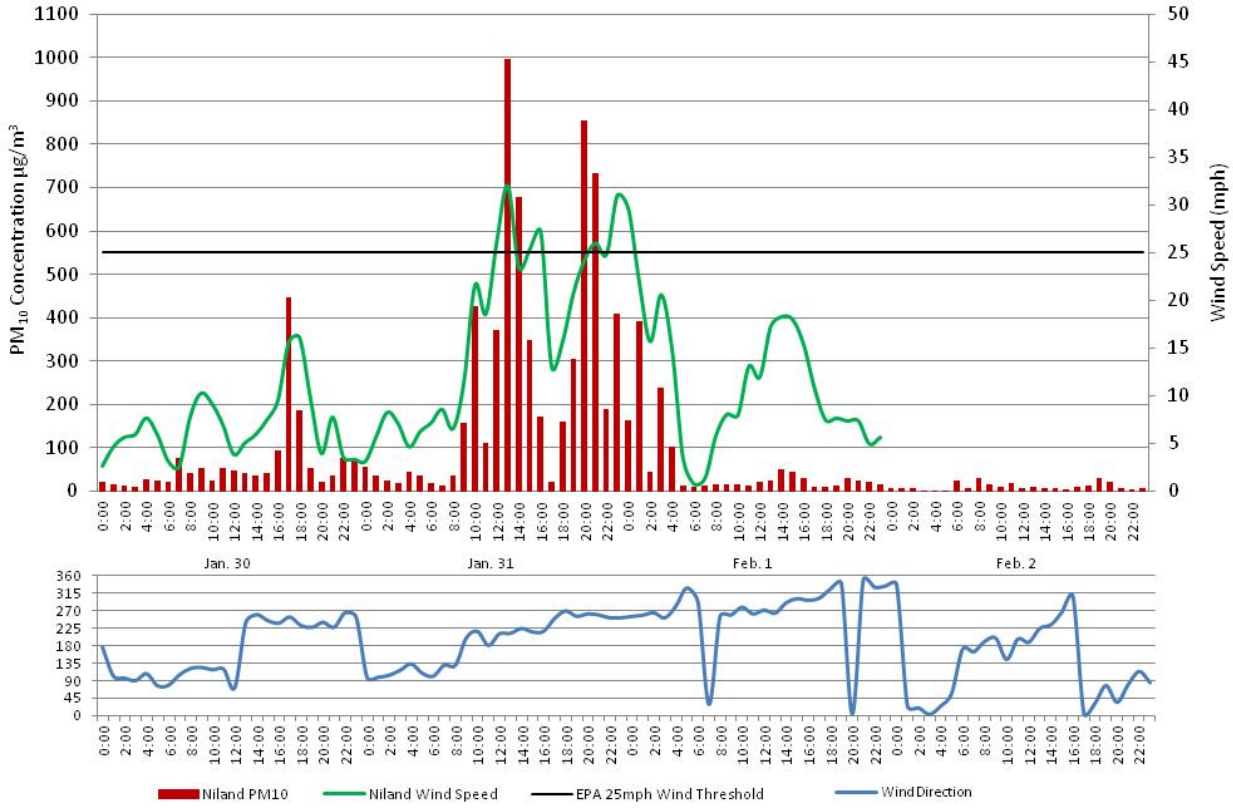


Fig 5-10: Winds at Niland surpassed the 25 mph threshold. Although the station was farther north than Brawley or Westmorland, this allowed the suspended dust to reach the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Winds at Westmorland (**Figure 5-10**) were not as high as at Niland or at El Centro NAF and Imperial County Airport. The lesser wind speeds allowed for greater deposition of dust on the monitor, resulting in higher concentrations of PM_{10} than either the Brawley or Niland FEM monitors.

FIGURE 5-10
WESTMORLAND PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

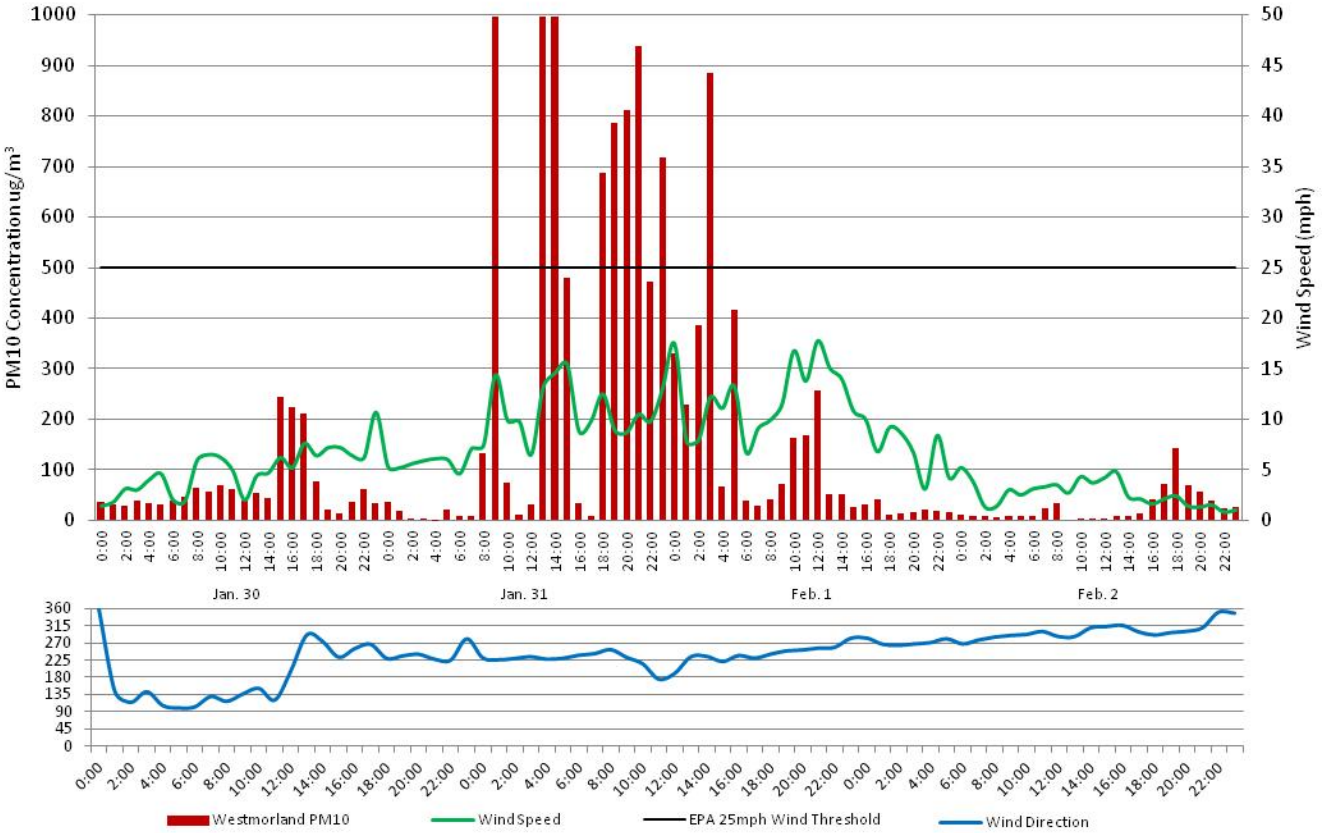


Fig 5-10: Winds at Westmorland measured the lowest levels than Niland or the more open areas of El Centro NAF and Imperial County Airport. The lesser wind speeds allowed for greater deposition of dust on the monitor resulting in higher concentrations of PM_{10} than either the Brawley or Niland FEM monitors. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-11 depicts the relationship between the 96-hour PM_{10} fluctuations by the Brawley, Westmorland, and Niland monitors together with upstream wind speeds, along with wind speeds recorded at Westmorland and Niland. A positive correlation can be seen, between an increase in wind speeds, particularly with gusts at KNJK, KIPL, and Sunrise-Ocotillo. **Appendix C** contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-11
PM_{10} CONCENTRATIONS & WIND SPEED CORRELATIONS

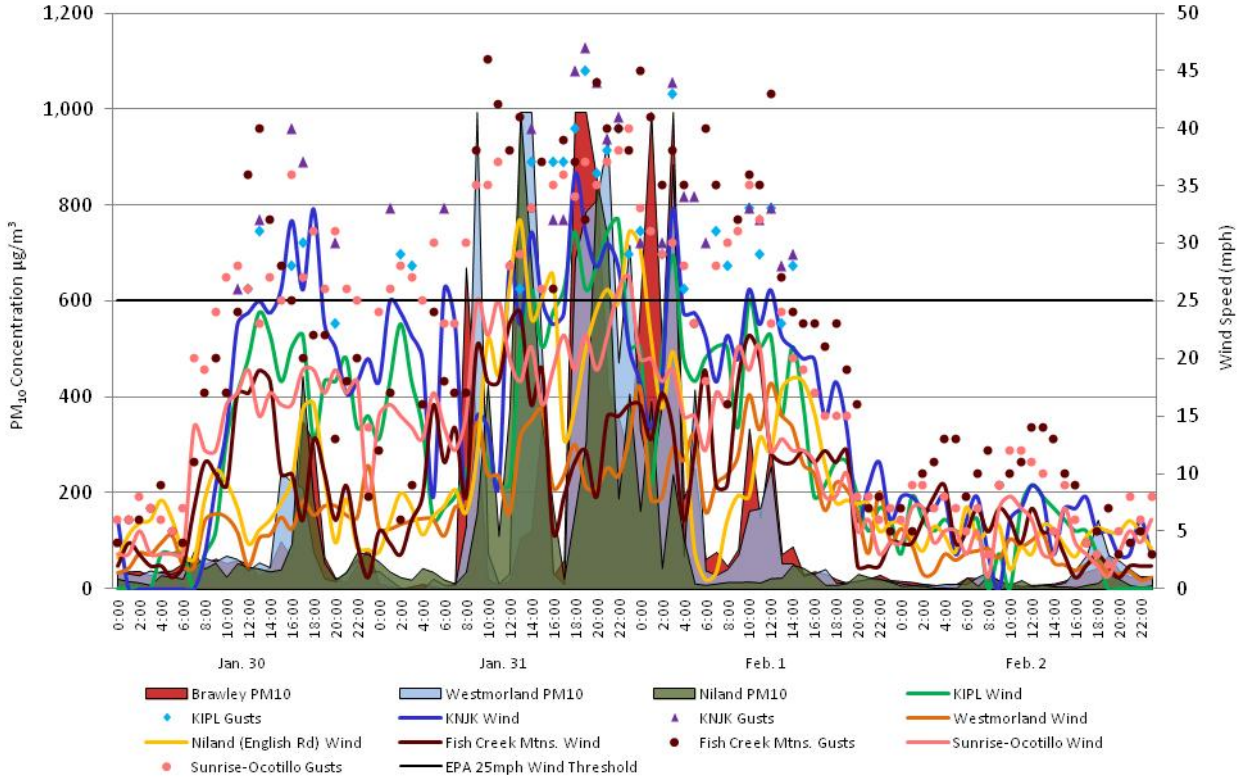


Fig 5-11: This graph depicts the 96-hour PM_{10} fluctuations by the Brawley, Westmorland, and Niland monitors together with upstream wind speeds, along with wind speeds measured at the Westmorland and Niland sites. Evident is a positive correlation between an increase in wind speed, particularly with gusts at KNJK, KIPL, and Sunrise-Ocotillo and concentrations. Black line indicates the 25 mph threshold

Figure 5-12 compares the 96-hour concentrations at Calexico, El Centro, Brawley, Westmorland, and Niland over a 96-hour period between January 30, 2016 and February 1, 2016. Visibility at Imperial County Airport (KIPL) reduced significantly (~16:00) just prior to measured peak concentrations at Brawley, Niland, and Westmorland. The El Centro NAF (KNJK), similarly, saw visibility during the same time.[17]

[17] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm.

FIGURE 5-12
96 HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

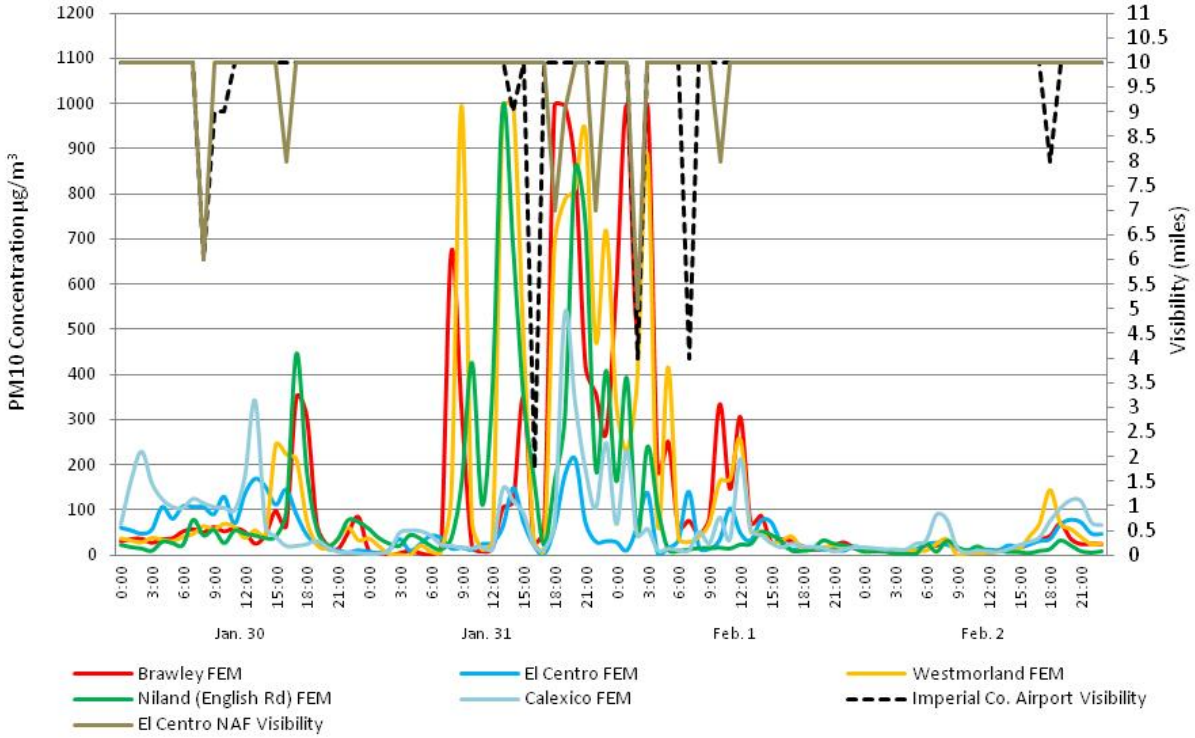


Fig 5-12: Visibility as reported from El Centro NAF (KNJK) and Imperial County Airport (KIPL) shows that visibility dropped significantly at KIPL prior to measured peak concentrations at Brawley, Westmorland, and Niland. Visibility data from the NCEI's QCLCD data bank

As strong westerly winds transported suspended dust into Imperial County, air quality was affected. **Figures 5-13** and **5-14** are copies of the issued Air Quality Index[18] for Brawley and Niland on January 31, 2016 that provide information regarding the level of effect on air quality. Niland's air quality remained in the "Yellow" or Moderate range (PM_{10} 51-100 µg/m^3) through the day until concentrations reached the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) at 10:00 p.m. An Air Quality Alert issued at 10:00pm notified the public that air quality was considered Unhealthy for Sensitive Groups. As winds continued through February 1, 2016 with subsequent concentration elevations an air quality alert issued for Niland at 12:00 a.m. February 1, 2016 notified the public that air quality was at an Unhealthy level or "Red" (PM10 151-200 µg/m^3). Brawley's air quality index remained in the "Yellow" or Moderate range (PM_{10}

[18] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi

51-100 µg/m^3) through the day until the evening hours of January 31, 2016 and early morning hours of February 1, 2016. Notices that air quality was Unhealthy for Sensitive Groups or "Orange" (PM_{10} 101-150 µg/m^3) were published for the Brawley area. These AQI's shows that the entrained windblown dust transported by strong westerly winds affected the air quality in Imperial County

FIGURE 5-13
IMPERIAL VALLEY AIR QUALITY INDEX IN NILAND
JANUARY 31, 2016

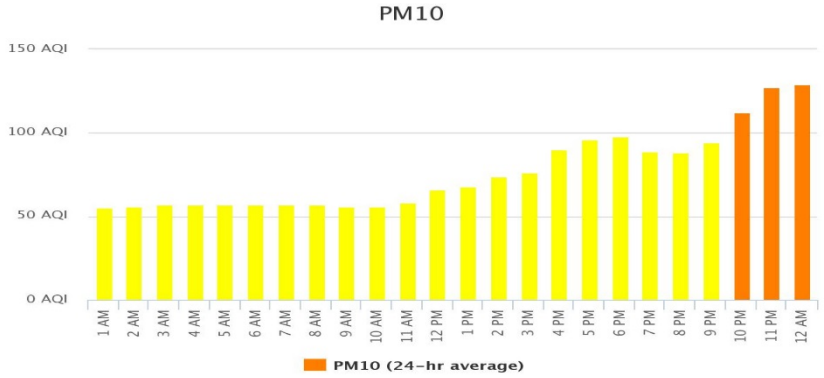


Fig 5-13: The reduced air quality in Niland shows that the fugitive dust lofted by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-14
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
JANUARY 31, 2016

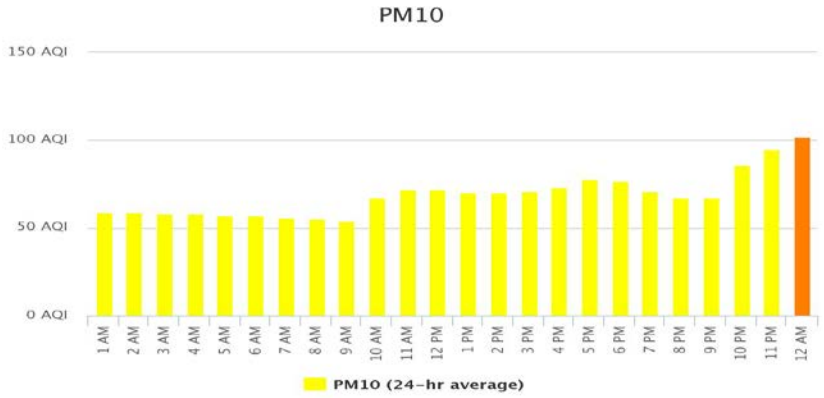


Fig 5-14: The reduced air quality in Brawley shows that the fugitive dust lofted by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the steep pressure gradient accompanying the low-pressure system that passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley, Westmorland and Niland monitors on January 31, 2016 and February 1, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} transported by strong westerly winds into the lower atmosphere caused a change in the air quality conditions within Imperial County. The entrained windblown dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on January 31, 2016 and February 1, 2016 coincided with high wind speeds and that gusty west winds experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-15
JANUARY 31, 2016 AND FEBRUARY 1, 2016 WIND EVENT TAKE AWAY POINTS

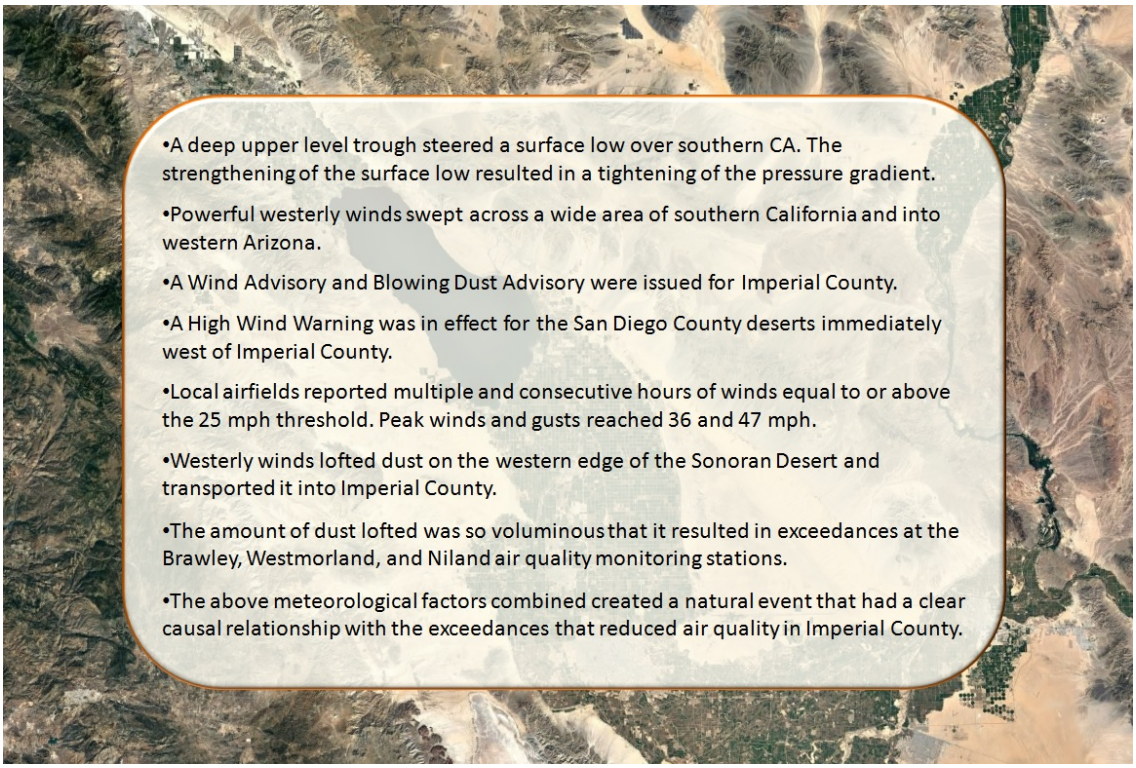


Fig 5-15: Illustrates the factors that qualify the January 31, 2016 natural event, which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on January 31, 2016 and February 1, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Pgs. 6-32
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	Pgs. 52-69
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	Pgs. 34-42
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	Pgs. 44-51
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	Pgs. 21-31; 49-51

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the January 31, 2016 and February 1, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played little or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial

County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley, Westmorland, and Niland monitors were caused by naturally occurring strong gusty west winds that transported windblown dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west and southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedances at Brawley, Westmorland, and Niland on January 31, 2016 and February 1, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event with its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at Brawley, Westmorland, and Niland on January 31, 2016 and February 1, 2016, were caused by the transport of windblown dust into Imperial County by strong westerly winds associated with the passage of low-pressure system and accompanying trough that moved through the region. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley, Westmorland, and Niland during different days and the comparative analysis of different monitors in Imperial and Riverside Counties demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} on January 31, 2016 and February 1, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on January 31, 2016 and February 1, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley, Westmorland, and Niland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around January 31, 2016 and February 1, 2016. In addition, this Appendix contains the air

quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.