

PM2.5 Exceptional Event – Independence Day Fireworks

Event Date – July 4, 2013

Ogden & Rose Park Monitoring Stations



Utah Department of
Environmental Quality

Table of Contents

Definition of Event	2
Introduction	2
Event Locations	2
Affect Air Quality	3
Normal Historical Fluctuation	4
Ogden	4
Rose Park	5
Causal Relationship	5
Meteorological Conditions	6
No Exceedance or Violation But For the Event	7
Mitigation	8
Utah Air Quality Public Notifications	8
Conclusion	9

Definition of Event

The Code of Federal Regulations (CFR) provides the definition and criteria for determining whether air quality data is impacted by an exceptional event. The 40 CFR 50.1 (j) definition states that “exceptional event means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event.” The demonstration to justify data exclusion, as outlined in 40 CFR 50.14, specifies that the following evidence must be provided:

1. The event meets the definition of an exceptional event;
2. There is a clear causal relationship between the measurements under consideration and the event that is claimed to have affected air quality in the area;
3. The event is associated with a measured concentration in excess of normal historical fluctuations, including background;
4. There would have been no exceedance or violation but for the event; and
5. The fireworks event was held on July 4, Independence Day, as part of a traditional or national culture event (40 CFR 50.14 (b)(2)).

Introduction

Exceedances of the 24-hr PM_{2.5} standard of 63 µg/m³ and 43.7 µg/m³ for the Ogden and Rose Park monitoring sites, respectively, occurred on July 4, 2013. The Division of Air Quality (DAQ) investigated the event and has determined that the exceedances are due to fireworks events celebrating the national 4th of July holiday.

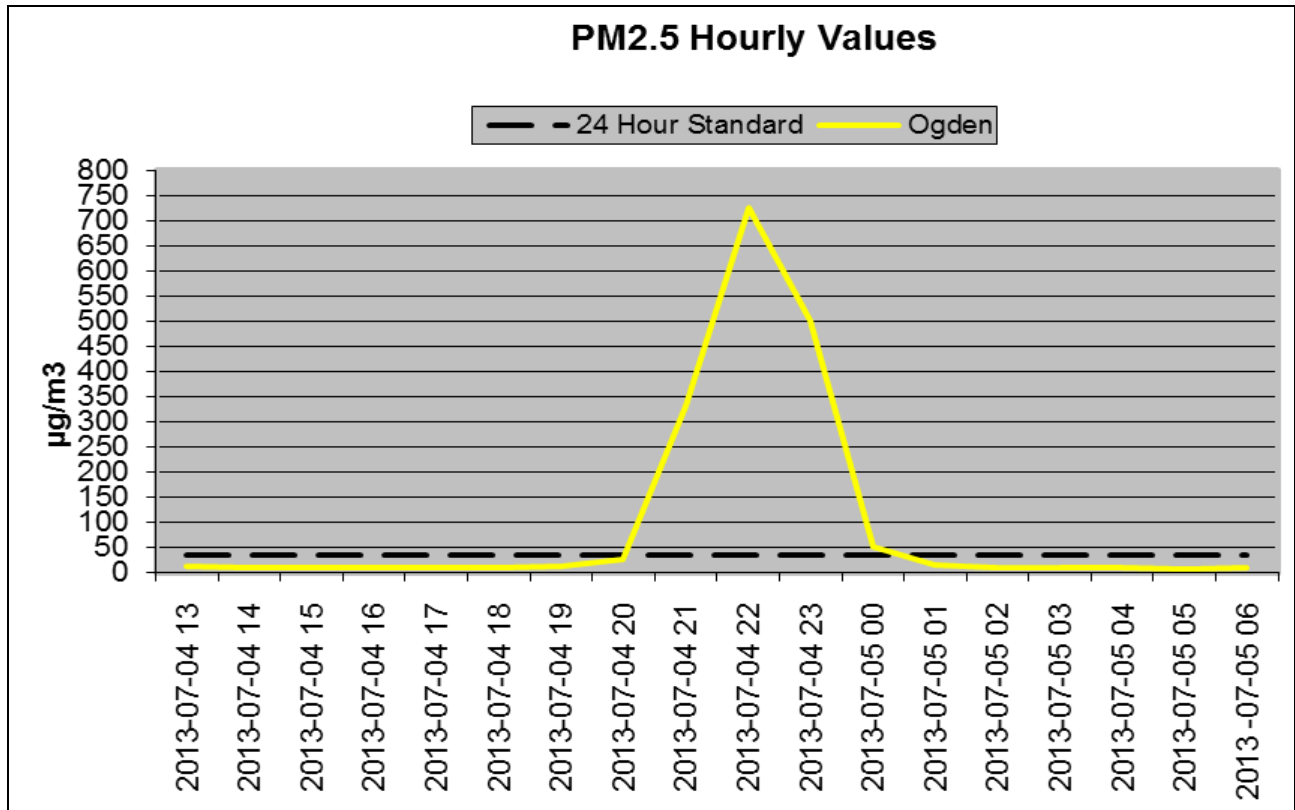
Event Locations

The City of Ogden is located north of Salt Lake City in Weber County. The Ogden monitoring station is located adjacent to the Ogden Community Action Center, where a large grass field is used for legal and illegal fireworks, as confirmed by Ogden Fire Department. DAQ and the Environmental Protection Agency have recognized a pattern of historical exceedances at the Ogden monitoring station from fireworks for the national 4th of July holiday.

Rose Park is located at 1400 West Goodwin Ave, Salt Lake City. The station is situated within a residential area and adjacent to a large grass field conducive for fireworks and has had past exceedances on the 4th of July.

Affect Air Quality

The graph presents the real time PM_{2.5} values before and after the 4th of July for the Ogden monitoring station. A spike in PM_{2.5} occurred in the late evening of July 4, corresponding with the time when fireworks are set-off, lingering in the atmosphere into July 5.



Actual filter values before, during and after the 4th of July:

July 3, 2013 – 11.5 µg/m³

July 4, 2013 – 63 µg/m³

July 5, 2013 – 6.7 µg/m³

The Rose Park monitoring station does not have a real time monitor. The actual filter values before, during and after the 4th of July are:

July 3, 2013 – 14.2 µg/m³

July 4, 2013 – 43.7 µg/m³

July 5, 2013 – 9 µg/m³

Normal Historical Fluctuation

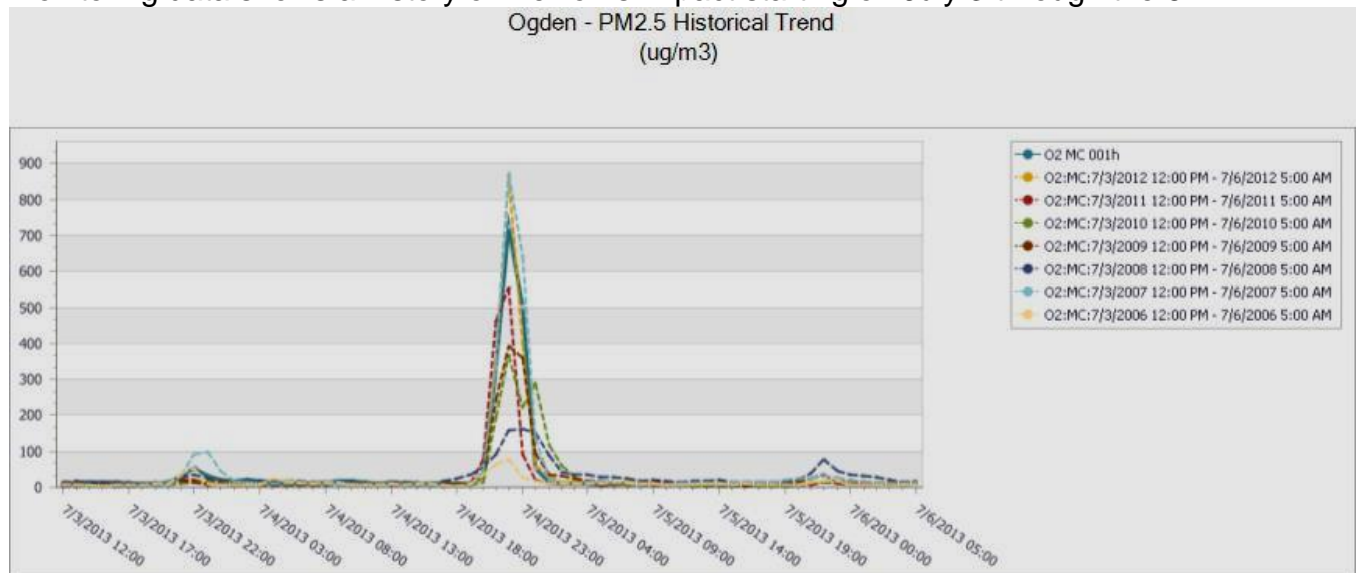
Ogden

The table below presents the annual mean and maximum values (including data for winter time inversion, influence from wildfires and fireworks) for the 24-hr PM_{2.5} at the Ogden station from its inception in 2001 to 2012. The range of the annual mean is 9.1-14.6 µg/m³. The observed value for this event is 63 µg/m³.

Ogden 24-hr Filter PM_{2.5}

Year	Observations	Annual Mean (µg/m ³)	Annual Max (µg/m ³)
2001	50	12.4	66.6
2002	119	14.6	108.3 (4 th of July)
2003	118	9.9	38.3
2004	118	13.9	74.2
2005	115	10.5	42.4
2006	120	9.8	47.6
2007	121	11.7	76.8
2008	358	9.9	46.7
2009	343	10.2	56.4
2010	341	9.2	56.1
2011	347	9.1	64.6
2012	341	9.1	63.7 (4 th of July)

This graph presents eight years of real time monitoring data around the holiday. Utah law permits fireworks from 3-days prior to the 4th of July until 3-days after. The real time monitoring data shows a history of fireworks impact starting on July 3 through the 6th.



Rose Park

The table below presents the annual mean and maximum values for the 24-hr PM_{2.5} at the Rose Park station from its inception in 2007 to 2012. The range of the annual mean is 9 –11 ug/m³. The observed value for this event is 43.7 ug/m³. The highest value in 2007 was due to the 4th of July fireworks. The maximum values for the remaining years were due to winter time inversions.

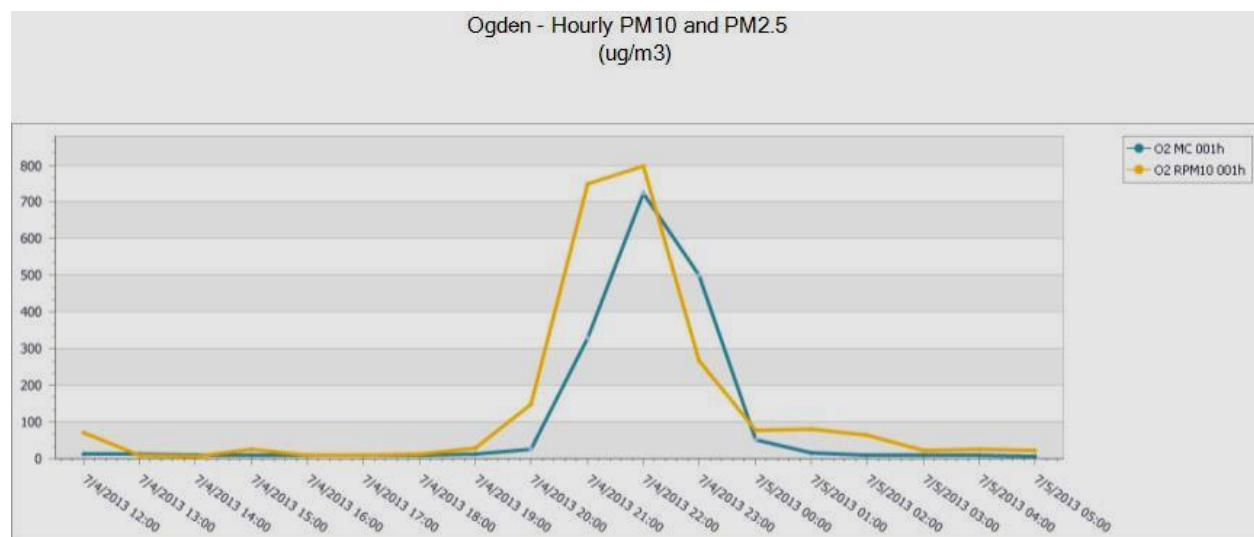
Rose Park 24-hr Filter PM_{2.5}

Year	Observations	Annual Mean (ug/m ³)	Annual Max (ug/m ³)
2007	275	10.9	78.2 (4 th of July)
2008	405	11	54.6
2009	424	10.1	64.3
2010	365	9.5	64.8
2011	363	9	43.7
2012	353	9	35.1

Causal Relationship

Fireworks consist of 75% gunpowder (potassium nitrate), 15% carbon and 10% sulfur. The materials react with each other when heat is applied from a fuse. Metal compounds and other elements are added to generate desired color and or pyrotechnic effects. The reaction results in particulate matter and smoke generation.

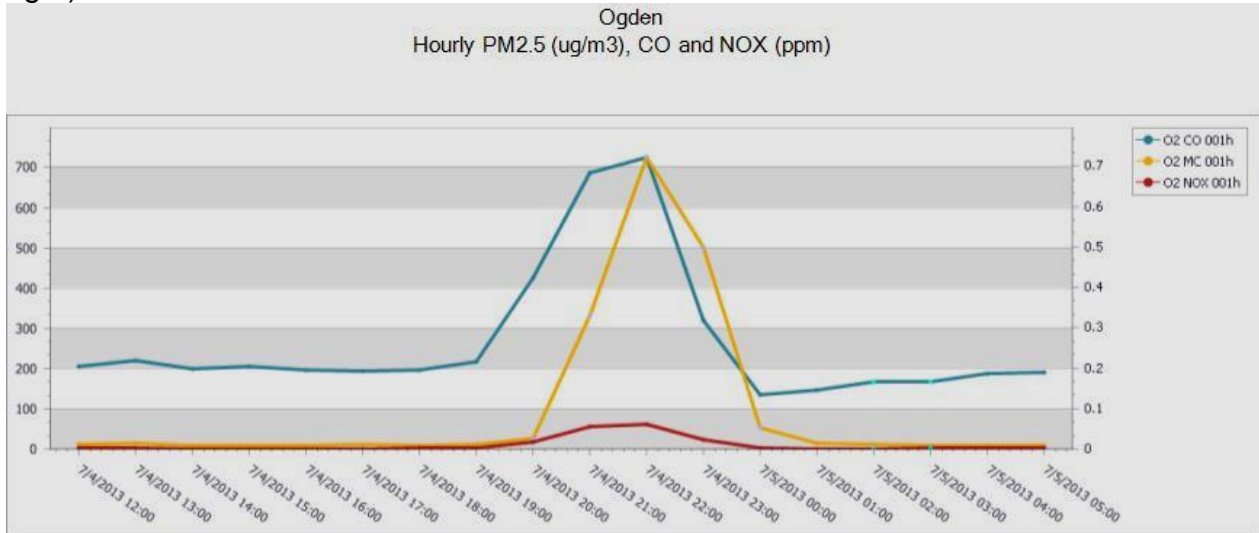
The first graph shows the hourly PM₁₀ (yellow) and PM_{2.5} (blue) values from noon on the 4th to the early morning hours on the 5th at Ogden. Particulate matter values peaked at 10 p.m., usually the time at which fireworks events end.



The second graph shows hourly PM_{2.5} (yellow), carbon monoxide (CO-blue) and nitrogen oxides (NOX-red) values at Ogden. CO and NOX are generated from the

Utah Division of Air Quality – Fireworks Exceptional Event
Event Date July 4, 2013

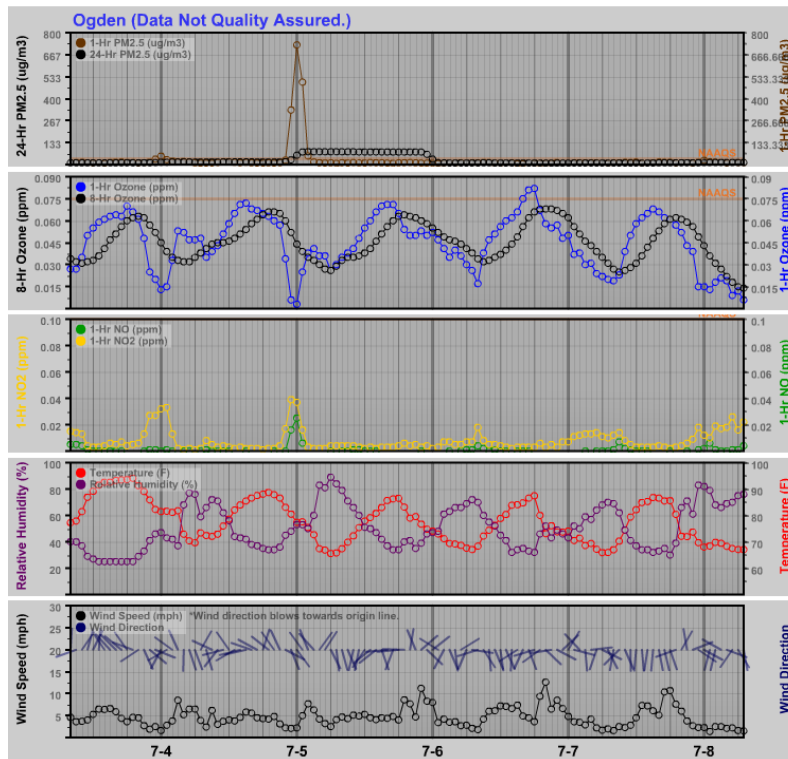
combustion process and should increase during fireworks (CO and NOX ppm legend on right).



Similar measurements are not available for the Rose Park station however, we can get a sense of the fireworks effects in the Salt Lake City area from data collected at the Hawthorne monitoring station, located at 1675 South 600 East, Salt Lake City.

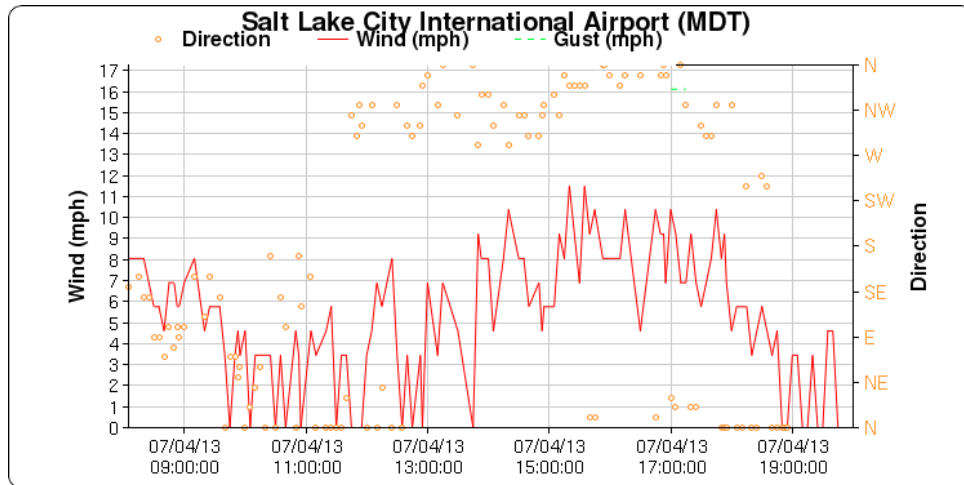
Meteorological Conditions

Meteorological data from the Ogden station shows that the late night winds were mostly southerly, with minimal wind speeds around 3 mph. Localized impact at the Ogden station would be expected with these stagnant conditions.



Utah Division of Air Quality – Fireworks Exceptional Event
Event Date July 4, 2013

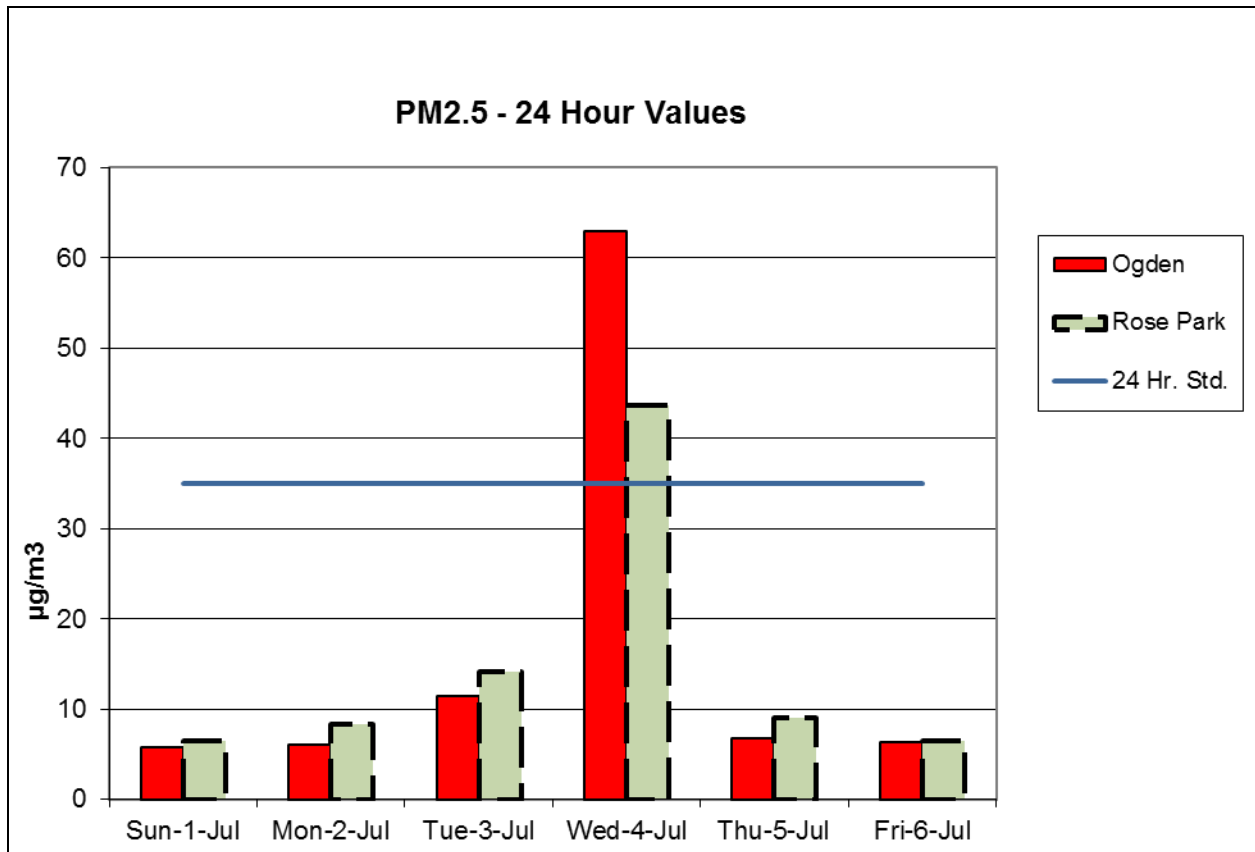
Conditions at Rose Park would be similar to those at the Salt Lake airport. Late night wind speed varied from 0 to 6 mph.



No Exceedance or Violation But For the Event

The figure shows the PM_{2.5} 24-hr values for the two monitoring stations from July 1 to July 6, 2013. The exceedance occurred during the national holiday.

PM_{2.5} 24-hr Values

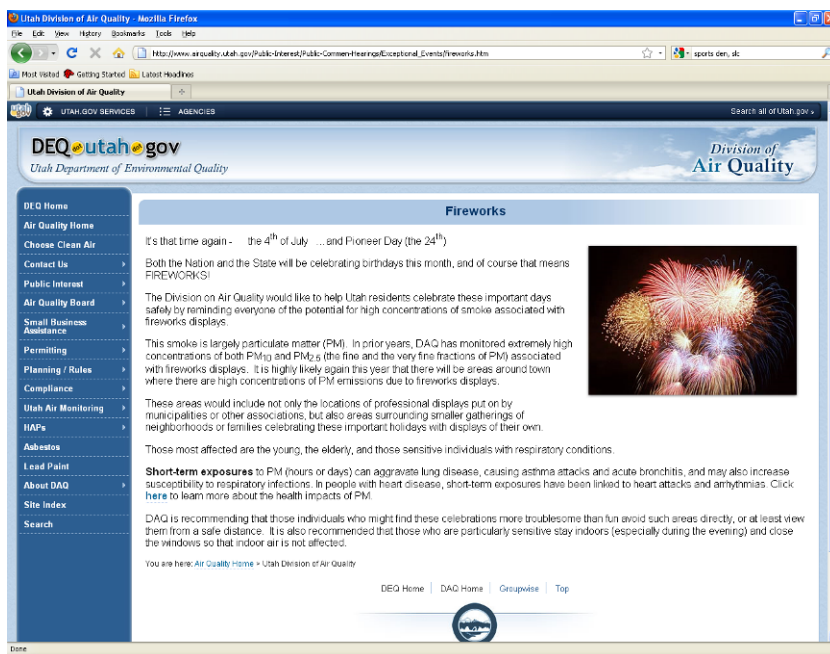


There were no other known anthropogenic events which could contribute to the level of PM_{2.5} measured on July 4th at these stations.

Mitigation

Utah Air Quality Public Notifications

The DAQ web page provides information on fireworks events, explaining the type of air quality impact from fireworks and warning sensitive populations to stay indoors.



The Salt Lake Tribune published the following article advising the public of health effects associated with fireworks emissions.

Northern Utah pollution skyrockets with fireworks

Environment » July Fourth celebrations left skies smoky, sometimes unhealthy.

By Judy Fahys

First Published Jul 05 2013 05:15 pm

Noxious smoke from fireworks skyrocketed overnight Thursday.

Utah Division of Air Quality's monitors logged a midnight reading in Ogden at 725.6 micrograms of PM_{2.5} pollution per cubic meter of air — more than 20 times the health-based standard under the Clean Air Act — following the Fourth of July celebrations.

At Salt Lake City's Hawthorne Elementary, the level was 75.9 at midnight, more than double the federal standard. And gauges at Lindon in Utah County, levels reached 222, or more than six times allowable levels. Pollution spikes also registered in Brigham City, Logan and Tooele.

"They are of concern," said Bryce Bird, director of the Utah Division of Air Quality. "It's far and away more than we ever see during the worst inversion periods."

And, while the pollution levels aren't out of the ordinary for post-fireworks air quality, they do pose health risks, especially for the very young, the very old and people with heart or lung conditions.

For people who are vulnerable to the affects of the fine soot particles that make up PM 2.5, it might be better to keep some distance even from neighborhood and family fireworks, Bird said.

The federal standard for PM 2.5 is 35 micrograms of pollution per cubic meter of air.

Conclusion

1. There is a clear causal relationship between the measurements under consideration and the event that is claimed to have affected air quality at the two stations based on particulate matter. Carbon monoxide and nitrogen oxide data provides supporting evidence at the Ogden station;
2. The event is associated with a measured concentration in excess of normal historical fluctuations, including background;
3. There would have been no exceedance or violation but for the event based on pre and post particulate matter values and because there were no other known events that could have produced comparable levels of short term emissions; and
4. The fireworks events were held on July 4, Independence Day, as part of a traditional or national culture event (40 CFR 50.14 (b)(2)).