$PM_{2.5}$ Exceptional Event – Independence Day Fireworks

Event Date – July 4, 2017

Ogden Monitoring Station
Lindon Monitoring Station
Rose Park Monitoring Station

Table of Contents

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. 40 CFR 50.14(b)(2) states that EPA "shall exclude data from use in determinations of exceedances and violations where a State demonstrates to the Administrator's satisfaction that emissions from fireworks displays caused a specific air pollution concentrations in excess of one or more national ambient air quality standards.. such use of fireworks is significantly integral to traditional national, ethnic, or other cultural events, but not limited to, July Fourth celebrations.."

The demonstration to justify data exclusion, as outlined in 40 CFR 50.14, specifies that the following evidence must be provided:

1. A narrative conceptual model that describes the 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. Analyses comparing the claimed event influenced concentrations to concentrations at the same monitoring site at other times;
4. A state must take appropriate and reasonable actions to protect public health from exceedances or violations of the national ambient air quality standards by developing and implementing a mitigation plan for recurring events and;
5. The Event documentation must be made available for a 30-day public comment period.

Conceptual Model

The Fourth of July, also known as Independence Day or July 4th, has been a federal holiday in the United States since 1941. It is traditionally celebrated with evening fireworks. Fireworks generate transient, episodes of high concentrations of particle (PM) and gaseous air pollutants. Elevated PM levels were noted on the evening of July 4, 2017 at the Ogden, Lindon and Rose Park monitoring stations, which resulted in exceedances of the 24-hour $PM_{2.5}$ ambient air quality standard;

- Ogden: The filter based sampling equipment was off-line during the 4th of July. Consequently, the continuous monitoring equipment is used to report $PM_{2.5}$ values.
  - 24-hour average - 77.3 µg/m^3
  - Maximum value - 790.3 µg/m^3
  - Minimum value – 3.6 µg/m^3

- Lindon filter value – 46.6 µg/m^3

- Rose Park filter values:
  - Primary monitor – 37.8 µg/m^3
  - Co-located monitor – 41 µg/m^3

Clear Causal Relationship

Fireworks consist of 75% gunpowder (potassium nitrate), 15% carbon and 10% sulfur. Metal compounds and other elements are added to generate desired color and or pyrotechnic effects. The materials react with each other when heat is applied from a fuse. The reaction results in the development of PM, with the potential to cause an exceedance of the $PM_{2.5}$ 24-hour ambient air quality standard.

$PM_{2.5}$ is a sensitive indicator of fireworks emissions. The table below shows $PM_{2.5}$ concentrations three days before and three days after the 4th of July, indicating that there is a clear causal relationship between the fireworks on the 4th and the air quality exceedances.

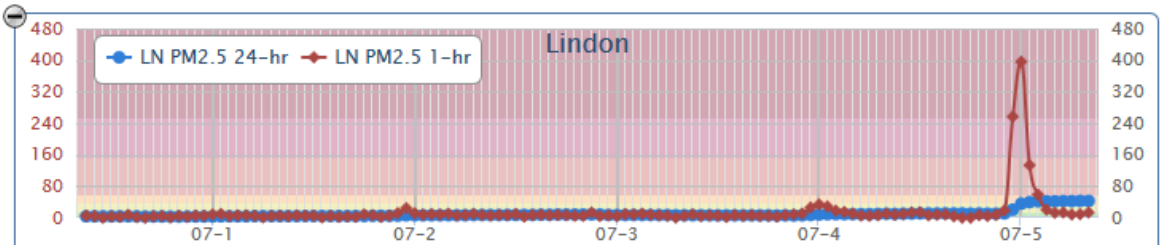
$PM_{2.5}$ Concentrations (µg/m^3)

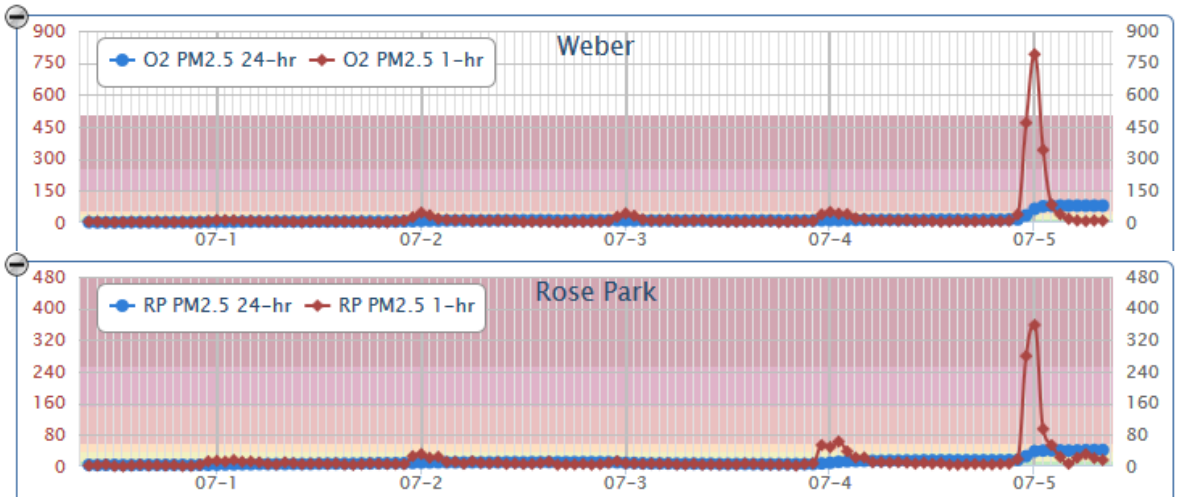
	Lindon	Ogden*	Rose Park	Rose Park Co-located
1-Jul-17	6.7	9.7	11.4	12.6
2-Jul-17	8.5	10.8	9.3	11
3-Jul-17	11.3	11.7	14.5	19.1
4-Jul-17	46.6	77.3	37.8	41
5-Jul-17	13.1	12.9	14	16.9
6-Jul-17	12.4	8.5	10.3	12.9
7-Jul-17	12.3	9.2	10.7	13.4

*Continuous monitor averages

Comparative Data

Continuous monitors operating on the 4th of July confirm that the elevated $PM_{2.5}$ levels are consistent with the time fireworks are set-off. The red lines are hourly values while the blue lines indicate the 24-hour average. The gray vertical lines denote midnight. The hourly $PM_{2.5}$ levels quickly escalate at 10 p.m., peaking around midnight.





Mitigation

It is incumbent upon a state air quality agency to provide for prompt public notification whenever air quality concentrations exceed or are expected to exceed an applicable ambient air quality standard and to provide for public education concerning actions that individuals may take to reduce exposures to unhealthy levels of air quality during and following an exceptional event. Therefore, DAQ has prepared educational information on the DAQ web page on air quality impact from fireworks and warning sensitive populations to stay indoors.

Further, DAQ issues an annual press release regarding air quality and health impact from fireworks prior to the 4th of July. The major local networks provide segments about fireworks and especially cover the threat of fireworks related fires due to drought conditions that are common during July.