

# Successful Wildfire Ozone Exceptional Events Demonstrations in Washoe County

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**2018 National Air Quality Conference**

**January 25, 2018**

# 2015 and 2016 Wildfire Ozone Exceptional Events Demonstrations

- 2015 Wildfire Ozone
  - Submitted November 2016
    - August 21, 2015
  - Addendum March 2017
    - August 18-19, 2015
- 2016 Wildfire Ozone
  - April 2017
    - July 2-4, 2016
- 2016 Revisions EER
- Regulatory Significance
  - 2015 Ozone NAAQS Designations

Exceptional Events Demonstration for  
2015 Ozone Exceedance in  
Washoe County from the  
2015 California Wildfires  
August 21, 2015

Submitted to U.S. EPA Region IX November 10, 2016

Requesting Exclusion of Data from  
2015 and 2016 Events

Date of Event	Type of Event	NAAQS Standard	Site Name	Monitor Concentration
8/18/2015	Wildfires	8- Hour Ozone	Reno3	0.075ppm
8/19/2015	Wildfires	8- Hour Ozone	Reno3	0.073ppm
8/21/2015	Wildfires	8- Hour Ozone	Reno3	0.073ppm
7/2/2016	Wildfires	8- Hour Ozone	Reno3	0.073ppm
7/3/2016	Wildfires	8- Hour Ozone	Reno3	0.073ppm
7/4/2016	Wildfires	8- Hour Ozone	Reno3	0.073ppm

# Exceptional Events Demonstration Requirements

- **Narrative Conceptual Model**
  - Regional Description
  - Non-Event Ozone Formation
  - Exceptional Event Summary
- **Clear Causal Relationship**
  - Tiered Analysis
- Natural Event
- Not Reasonably Controllable or Preventable
- Conclusions and Recommendations



**Guidance on the Preparation of Exceptional Events Demonstrations  
for Wildfire Events that May Influence Ozone Concentrations**

**Final**

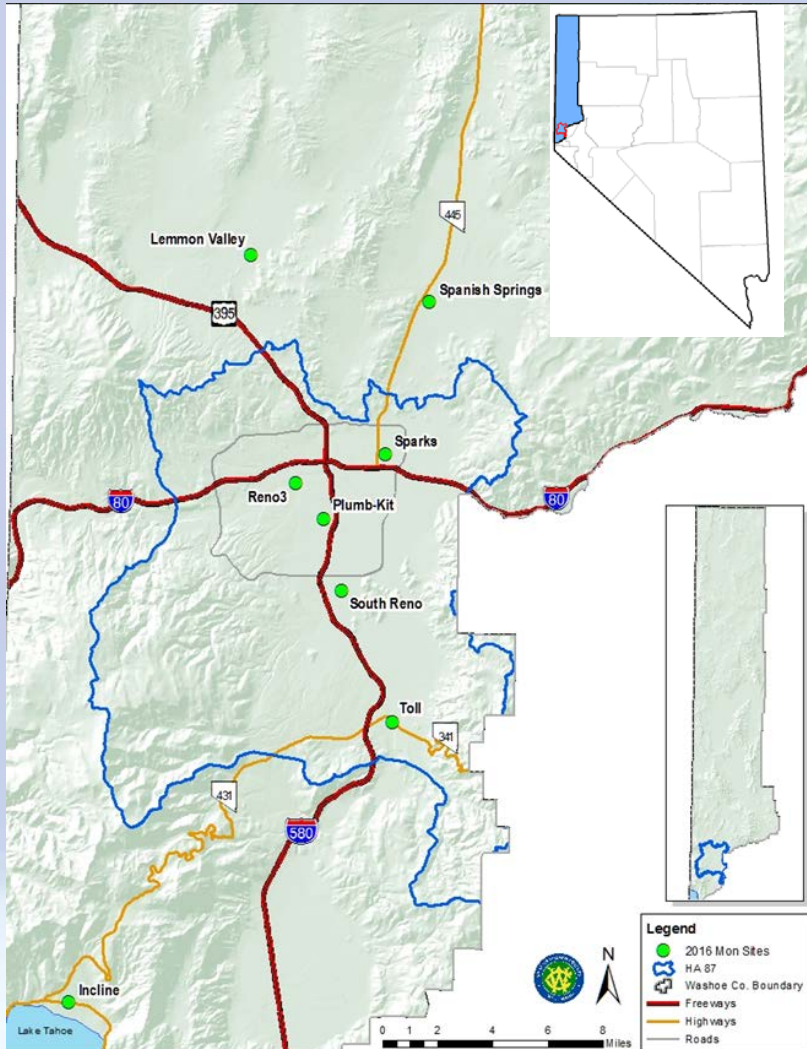
**September 2016**

U.S. Environmental Protection Agency  
Office of Air Quality Planning and Standards  
Air Quality Policy Division  
Geographic Strategies Group  
Research Triangle Park, North Carolina

# Narrative Conceptual Model

- Regional Description
- Overview of Monitoring Network
- Non-Event Historical O<sub>3</sub> Formation
- Exceptional Event Summary
  - Daily Event Summaries
  - Event Related Concentrations
  - Meteorological Conditions
  - Media Coverage

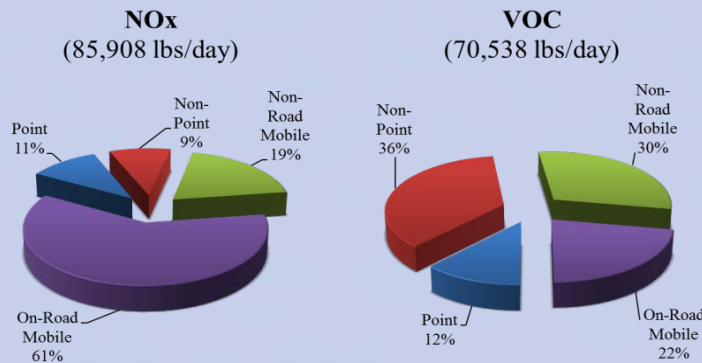
# Regional Description and Overview of Monitoring Network



- Washoe County
  - ~6,000 Square Miles
  - 440,000 Population
  - Truckee Meadows (HA87)
  - Elevation 4,400'
  - Surrounding Mountains
  - Summer O<sub>3</sub>, Winter PM<sub>2.5</sub>
- Overview of Network
  - 8 SLAMS
    - NCore
  - Speciation Trends Network

# Non-Event Historical Summertime Ozone Formation

## NOx and VOC Typical Summertime Emissions



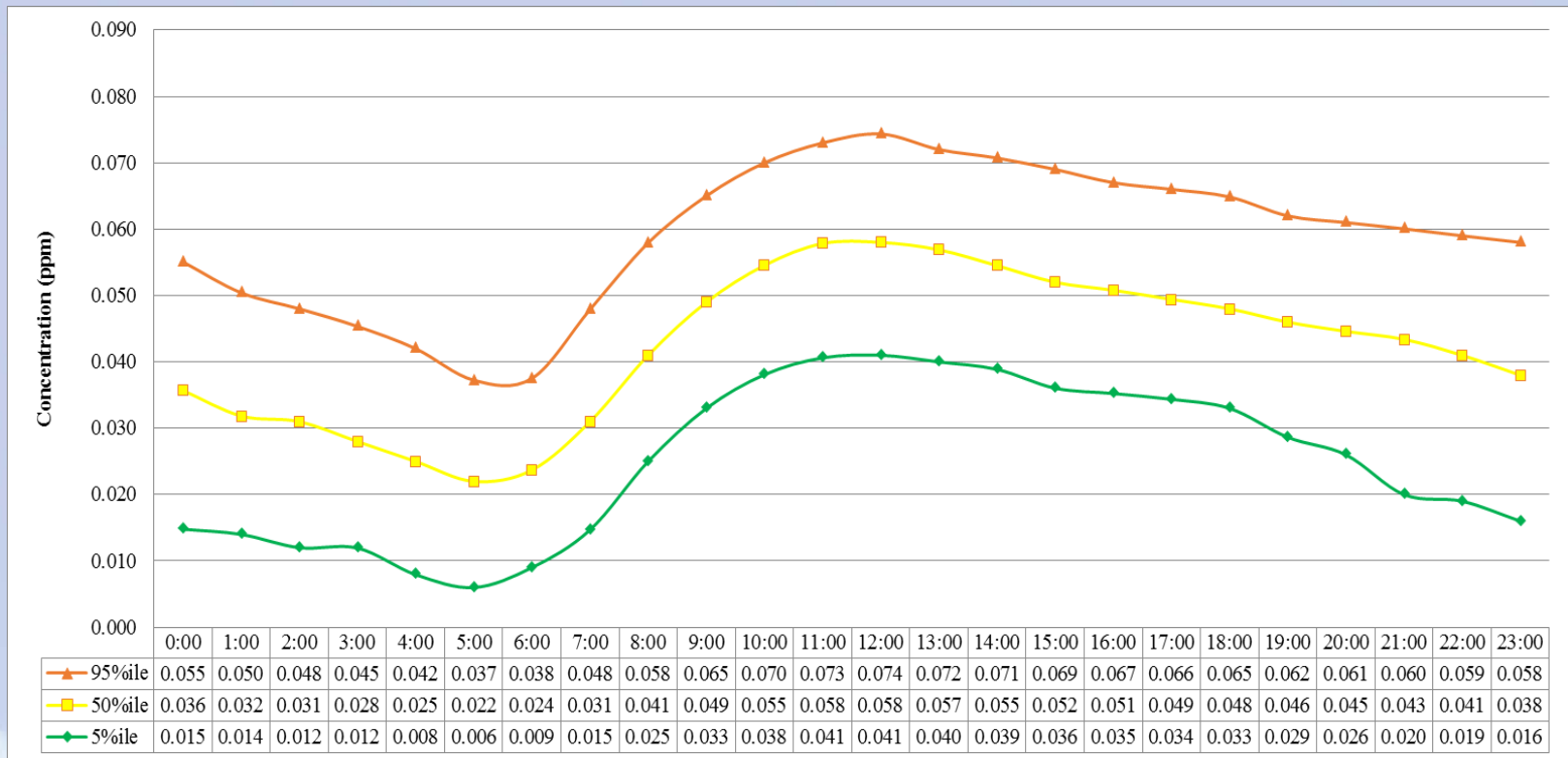
## 8-hour Summertime O<sub>3</sub> Concentrations at Reno3 (2011-2016)

Percentile	Concentration (ppm)
100	0.075
99	0.073
98	0.072
95	0.069
90	0.067
50	0.057

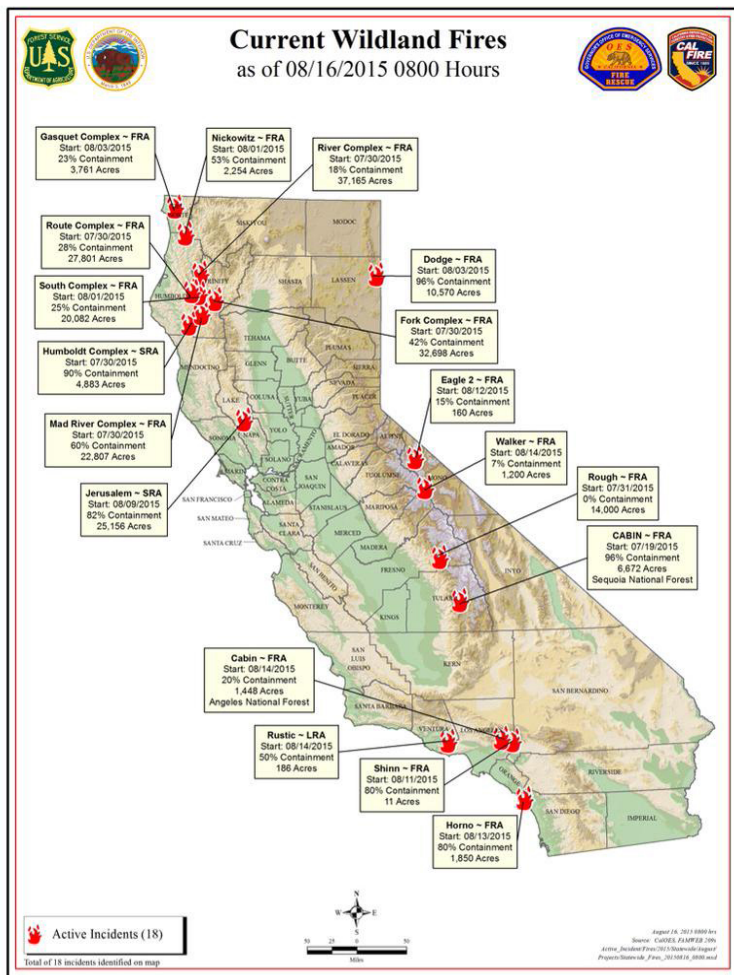
- June through August
  - Peak VMT
  - Increased Wildfires
- NOx and VOCs
  - Mobile Sources
- Historical 8-Hour O<sub>3</sub>
  - Excluding 2015 Events

# Typical 1-Hour Summertime Diurnal Ozone Pattern

June to August (2011-2015) at Reno3



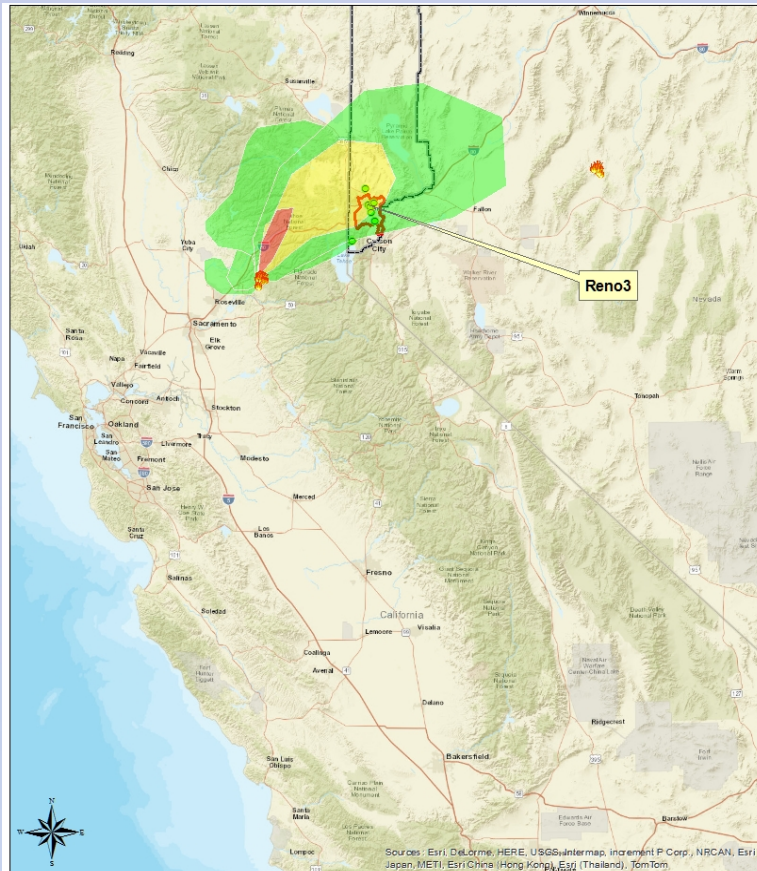
# Exceptional Event Summaries: 2015 Event Summary



- 2015 California Wildfire Season
  - Above 10-year Average
  - 8,745 Fires
  - 893,362 Acres
- Complex Fires/OR and WA
- August 16 – 21, 2015
  - 9 Ozone Exceedances
- August 18<sup>th</sup>, 19<sup>th</sup> and 21<sup>st</sup>
  - Exclusion of 3 O<sub>3</sub> Exceedances
  - Reno3 Monitoring Site



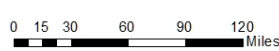
# 2016 Event Summary



- Trailhead Fire
  - Started June 28, 2016
  - 5,646 Acres
- June 29 to July 4, 2016
  - 3 Ozone Exceedances
- July 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup>
  - Exclusion of 3 O<sub>3</sub> Exceedances
  - Reno3 Monitoring Site



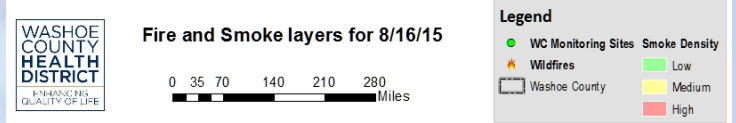
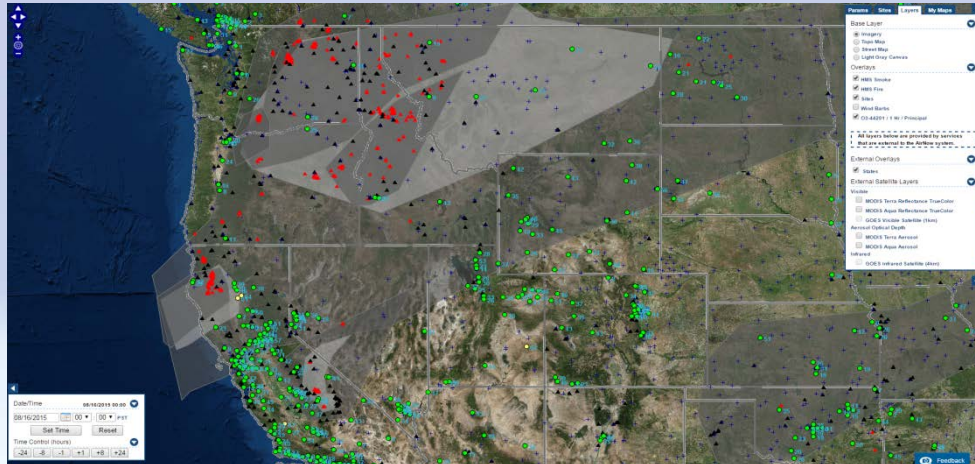
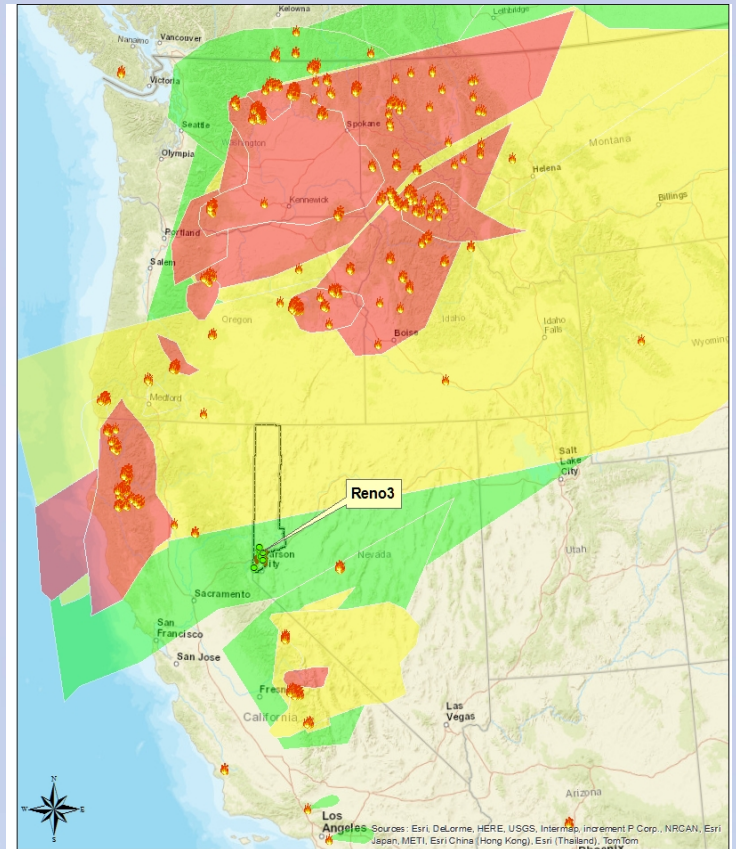
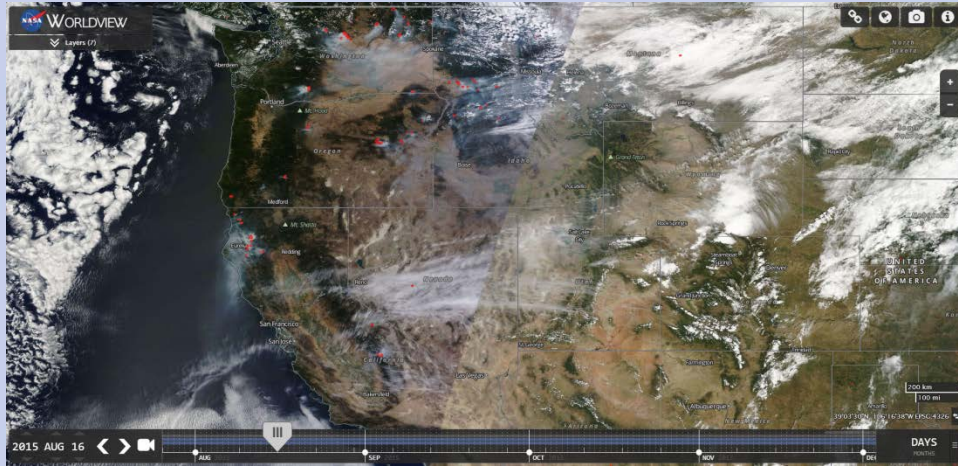
Fire and Smoke layers for 6/29/16



### Legend

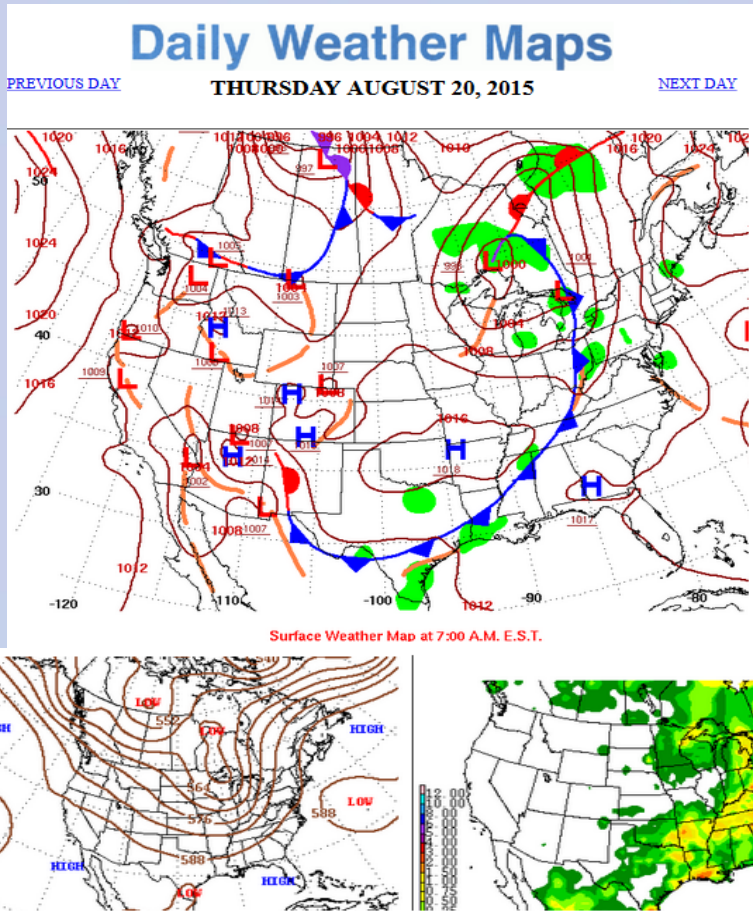
WC Monitoring Sites	Smoke Density
Hydrographic Area 87	Low
Washoe County	Medium
Fire	High

# Daily Event Summaries



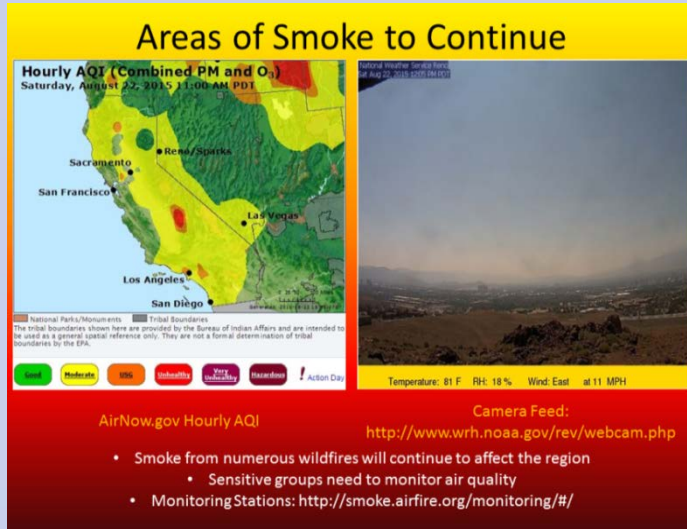
# Meteorological Conditions

## Event Weather Summary



Parameter	08/16	08/18	08/19	08/21	08/25
<b>O<sub>3</sub></b>					
8-hour maximum (ppb)	0.061	0.075	0.073	0.073	0.049
<b>Maximum Temperature</b>					
Observed (°F)	98	98	98	95	96
Normal (°F)	91	90	90	90	89
<b>Wind Speed</b>					
24-hour Observed (mph)	5.8	4.9	5.7	6.5	6.9
24-hour Normal (mph)	6.6	6.6	6.6	6.6	6.6
2-min Observed (mph)	26	18	22	22	23

# Media Coverage



- Demonstrate Timely and Consistent Information
  - NWS and Local Media
  - AirNow AQI
  - Enviroflash Alerts
  - Air Quality Hotline
- Current AQI
- Areas of Smoke Impacts
- Reduce Exposure

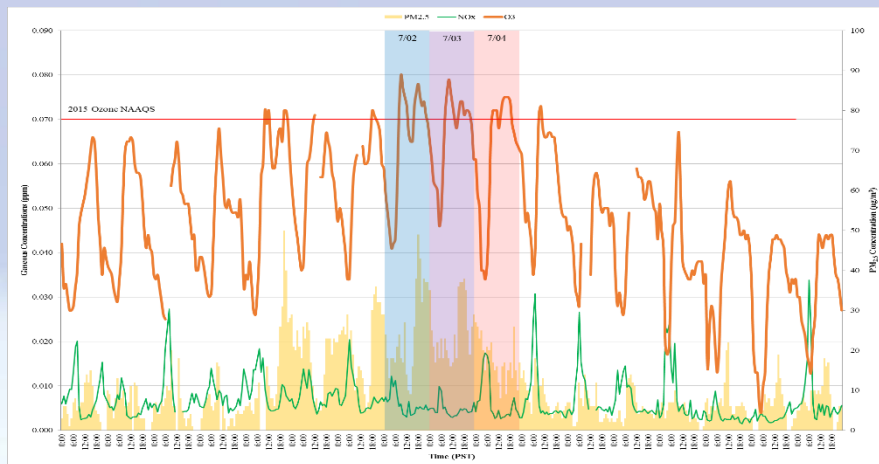
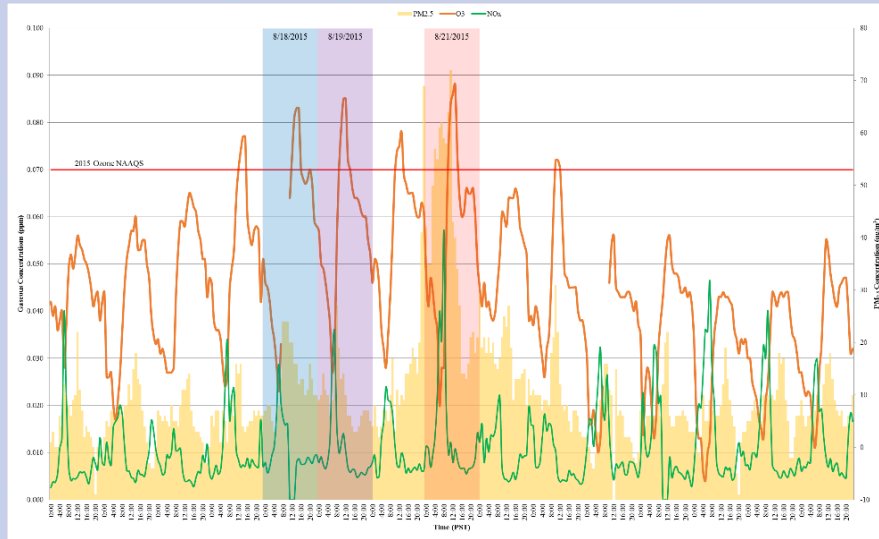


# Clear Causal Relationship

- Tier 3 Demonstration
  - Event Related Concentrations
  - Q/D (Emissions/Distance)
  - Historical Concentrations
  - Trajectory Analysis
  - PM<sub>2.5</sub> Analysis
- Additional Information
  - Area Forecast Discussions
  - Smoke Text Products

# Event Related Concentrations

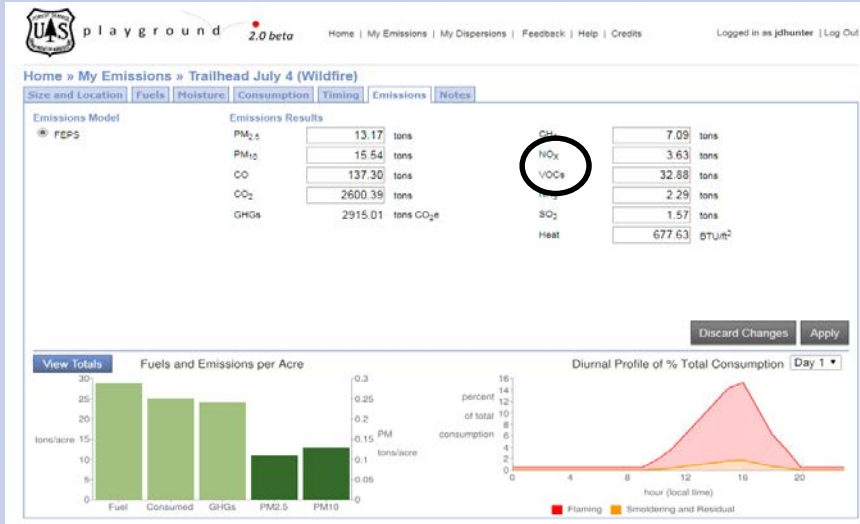
Reno3 O<sub>3</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> Hourly Concentrations



- O<sub>3</sub>, PM<sub>2.5</sub> and NO<sub>x</sub> Hourly Concentration Comparisons
- Before and After Event
- Elevated on Event Days
- NO<sub>x</sub> from Smoke Increased O<sub>3</sub>

# Emissions/Distance Calculations (Q/D)

## July 4, 2016

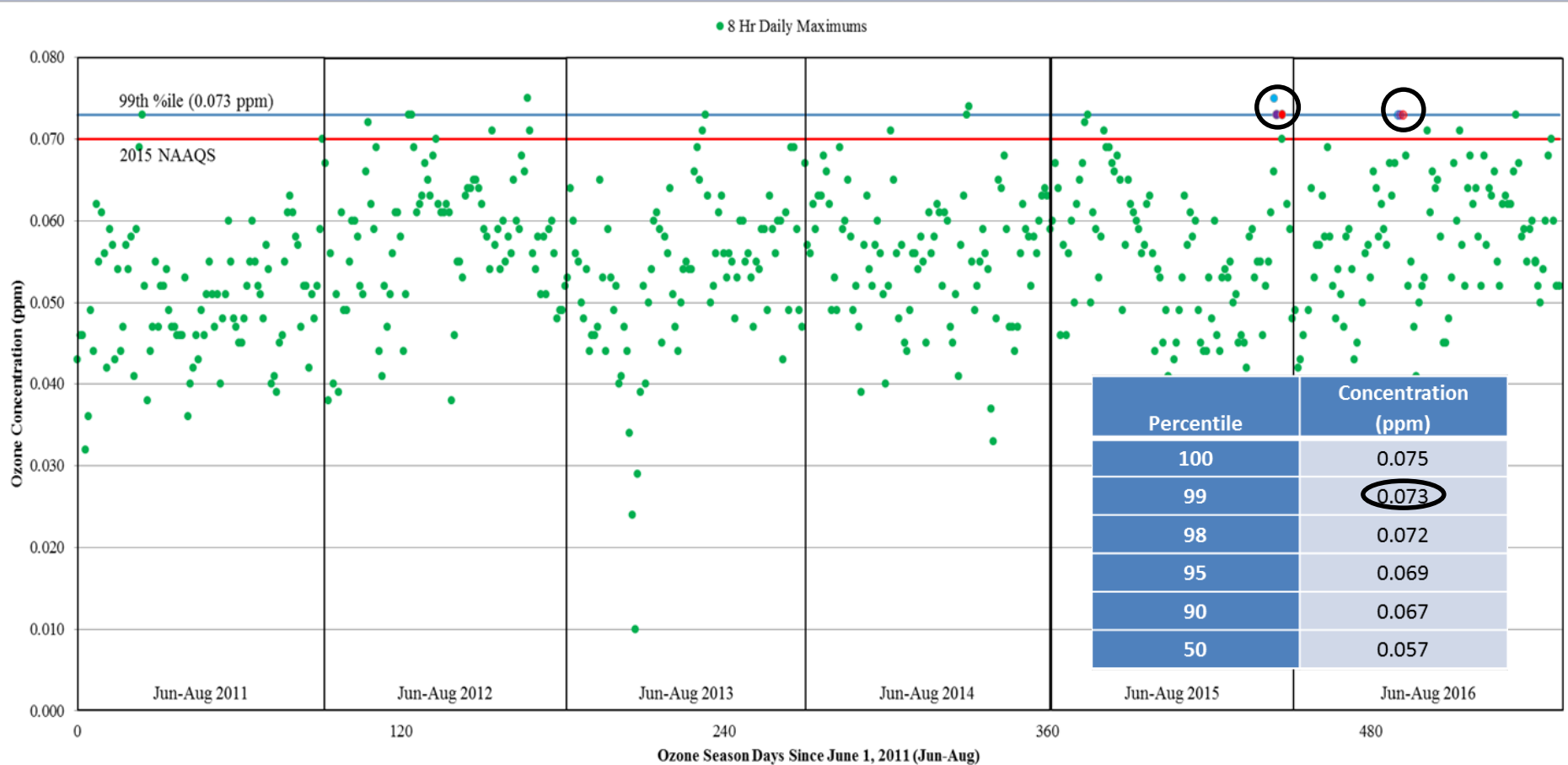


- Emissions/Distance
  - NOx + VOC (tons/day)
  - Distance to Monitor (km)
- Q/D > 100 (tpd/km)
- BlueSky Playground
  - Lat/Long – Fire Ignition
  - Emission Type – Wildfire
  - Fuel Moisture – Very Dry
  - FCCS Fuelbed – Default
  - 2015 and 2016 Q/D < 100

Date	Distance (km)	Acres	Emissions (tons)	Q/D (tpd/km)	Multi-day Q/D (tpd/km)
June 28, 2016	105	350	106	1.00	1.00
June 29, 2016	105	914	276	2.63	3.63
June 30, 2016	105	887	268	2.55	6.18
July 1, 2016	105	1,067	322	3.07	9.25
July 2, 2016	105	718	217	2.06	11.31
July 3, 2016	105	1,508	455	4.34	15.65
July 4, 2016	105	121	37	<1	16.00

# Comparison of Event to Historical Concentrations

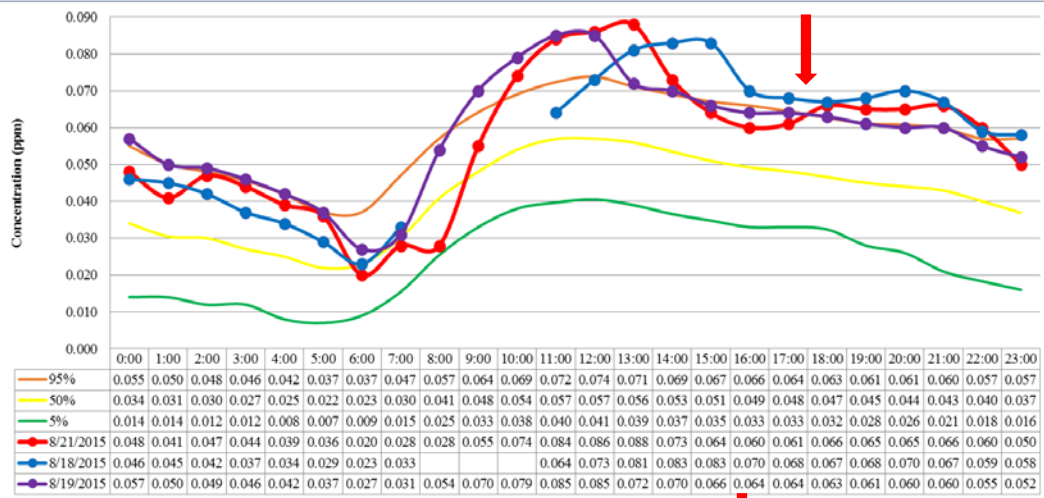
8-Hour Daily O<sub>3</sub> Maximums June-August, 2011-2016



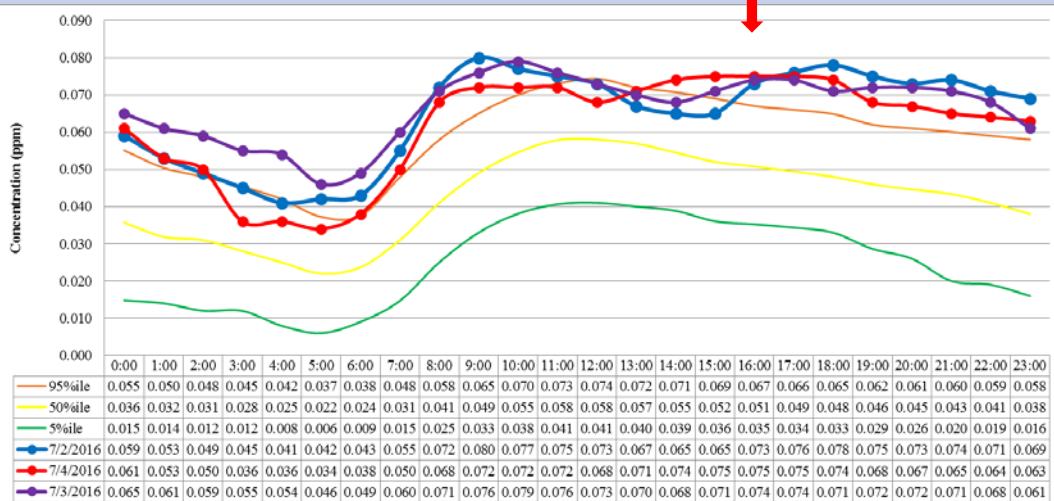


# Comparison of Event to Historical Concentrations

Percentiles for Hourly Seasonal Diurnal Ozone (2011-2015) Compared to Exceptional Events

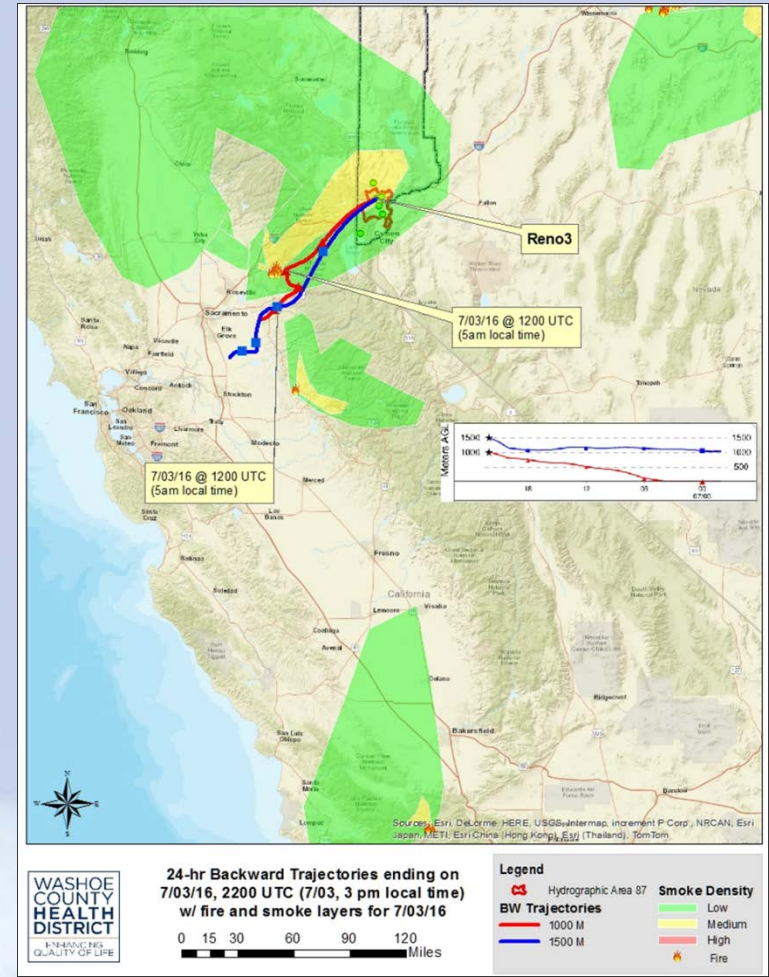
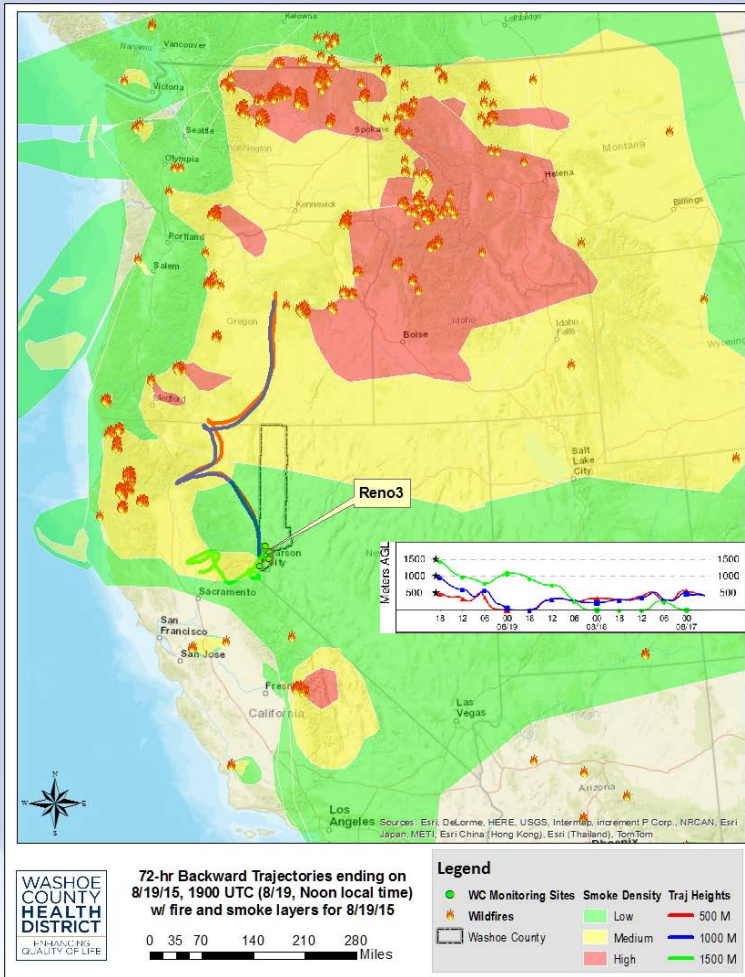


- Hourly Historical O<sub>3</sub> Compared to Events
- Above the 95<sup>th</sup>tile for Several Hours
- O<sub>3</sub> Evening Peaks
- O<sub>3</sub> 15-17ppb Higher than Non-Event Days



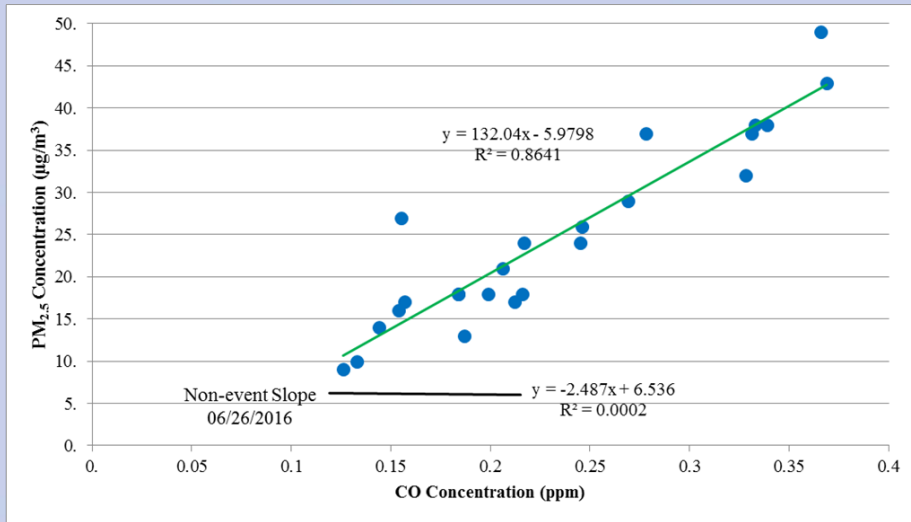
# Trajectory Analysis

Backward HYSPLIT Trajectories and HMS Detected Smoke Plumes

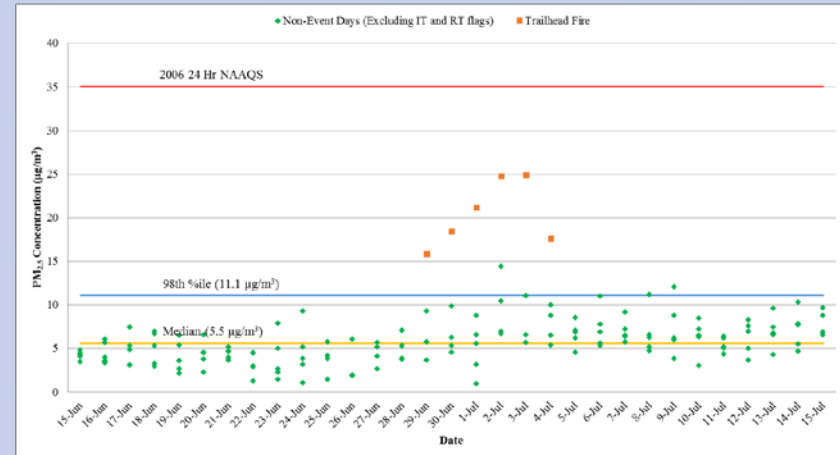


# PM<sub>2.5</sub> Analysis (2016 EE)

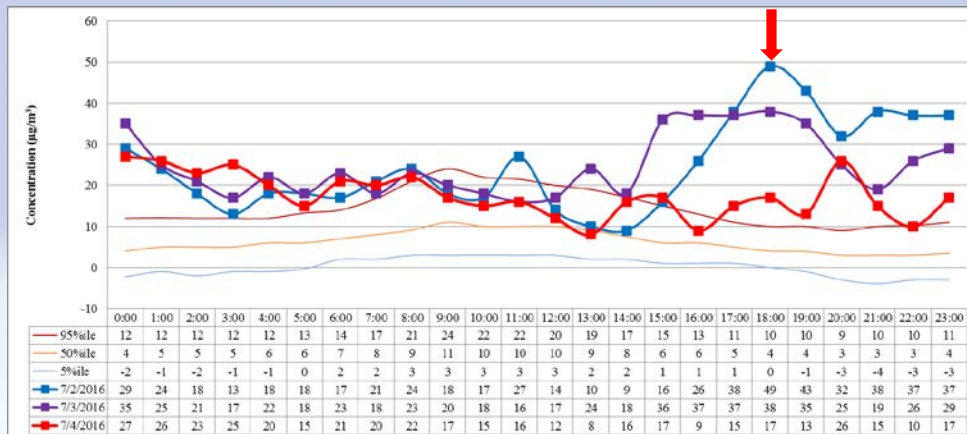
Hourly Reno3 PM<sub>2.5</sub> and CO for July 2, 2016



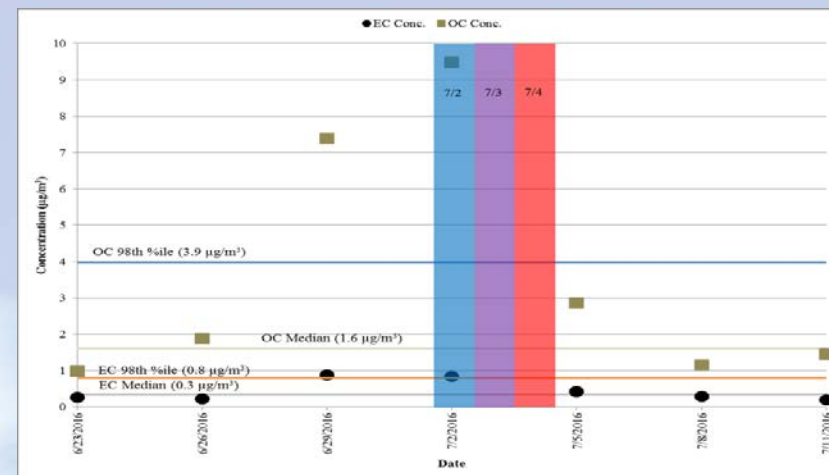
24-Hour PM<sub>2.5</sub> Averages



Percentiles for Hourly Seasonal PM<sub>2.5</sub> Compared to 2016 Events



Elemental & Organic Carbon Concentrations



# Additional Evidence

## NWS and Smoke Text Products

Area Forecast Discussion  
National Weather Service Reno NV  
135 PM PDT MON JUL 4 2016

.SYNOPSIS...

Dry and breezy conditions will prevail for the upcoming week. Smoke and haze from the Trailhead fire will move across much of the region each afternoon and evening through the week. A slow cooling trend continues with daytime temperatures near average starting Tuesday.

&&

.SHORT TERM...

Evolution of the forecast model guidance has changed very little today and thus the forecast reasoning has changed little with the models in good agreement.

Biggest impact this coming week will be an increase in winds Tuesday before dropping slightly Wednesday and Thursday. This increase in wind speeds is in response to an incoming long wave trough of low pressure pushing across the Pac NW with the far southern extent affecting our area. The gusty winds will prompt the issuance of Lake Wind Advisories for areas north of Highway 50 for Tuesday. Additional Lake Wind Advisories could be needed for Wednesday. The gusty winds will continue to draw smoke and haze from the Trailhead Fire east and northeast into the forecast area. The amount of smoke and the coverage extent will be hard to determine far in advance as it is dependent on how active the fire becomes.

3/21/2017

Smoke Text Product - Satellite Services Division

Sunday, July 3, 2016

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 0100Z July 4, 2016

SMOKE:

Northwestern to South Central Canada/Great Lakes Region:  
An extensive area of light density remnant smoke from fires in the Northwest Territories, northern Saskatchewan, northern Alberta, and northern Manitoba extends southeastward from northwest Nunavut to southern Ontario and the northern Great Lakes. Moderately dense to dense smoke is especially prevalent over the Northwest Territories directly north of the bulk of the fire activity. Numerous wildfires were seen in between cloud cover emitting light to heavy density smoke to the north in northern Saskatchewan and southeast of Great Slave Lake in the Northwest Territories. Wildfires in northern Manitoba were producing light to moderate density smoke to the west.

California/Nevada:

Areas of thin to moderately dense remnant smoke were seen over parts of northern and southern California, and Nevada. This smoke is largely from the Trailhead fire in California, the fire named Pine in Ventura County California and the Hot Pot fire in northern Nevada. The Pine fire was fanning light to moderate density to the southwest and northwest while the Trailhead fire in the Sierra foothills continues to emit a light to moderate density smoke plume to the northeast into western Nevada. The Hot Pot brush fire in west-central Elko county Nevada was seen spreading quickly to the east-northeast in shortwave IR imagery. A light to heavy density smoke plume was emanating to the east-northeast from this brush fire although clouds obscured the full extent of this smoke to the east.

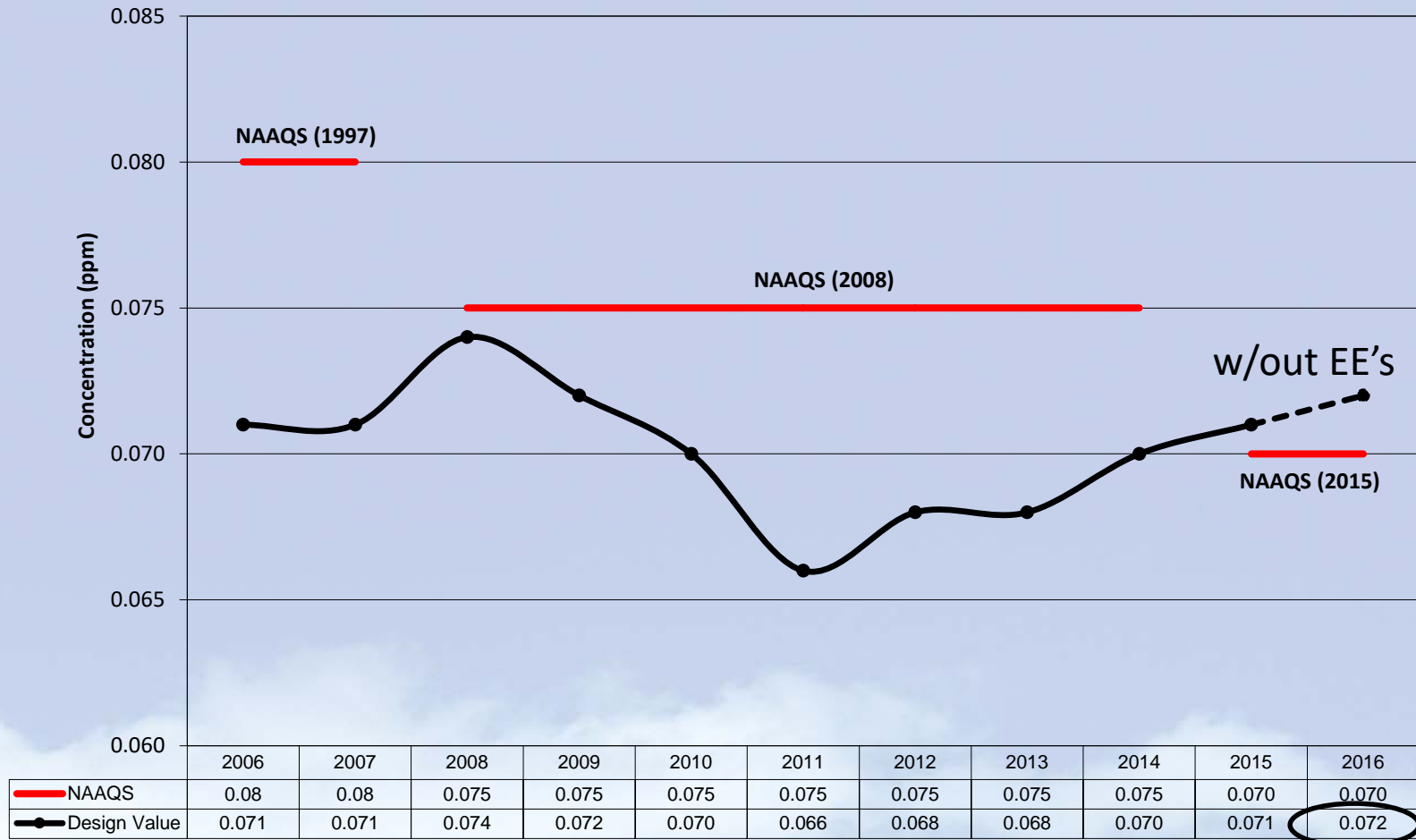
# Exceptional Events Demonstrations Conclusions and Recommendations

- Justify as an EE under 40 CFR 50.14
  - Wildfire Emissions Caused O<sub>3</sub> Exceedances at Reno3
  - A Clear Causal Relationship Exists
  - Event Concentrations Above Historical
  - Event was a Natural Event
  - Was not Reasonably Controllable or Preventable

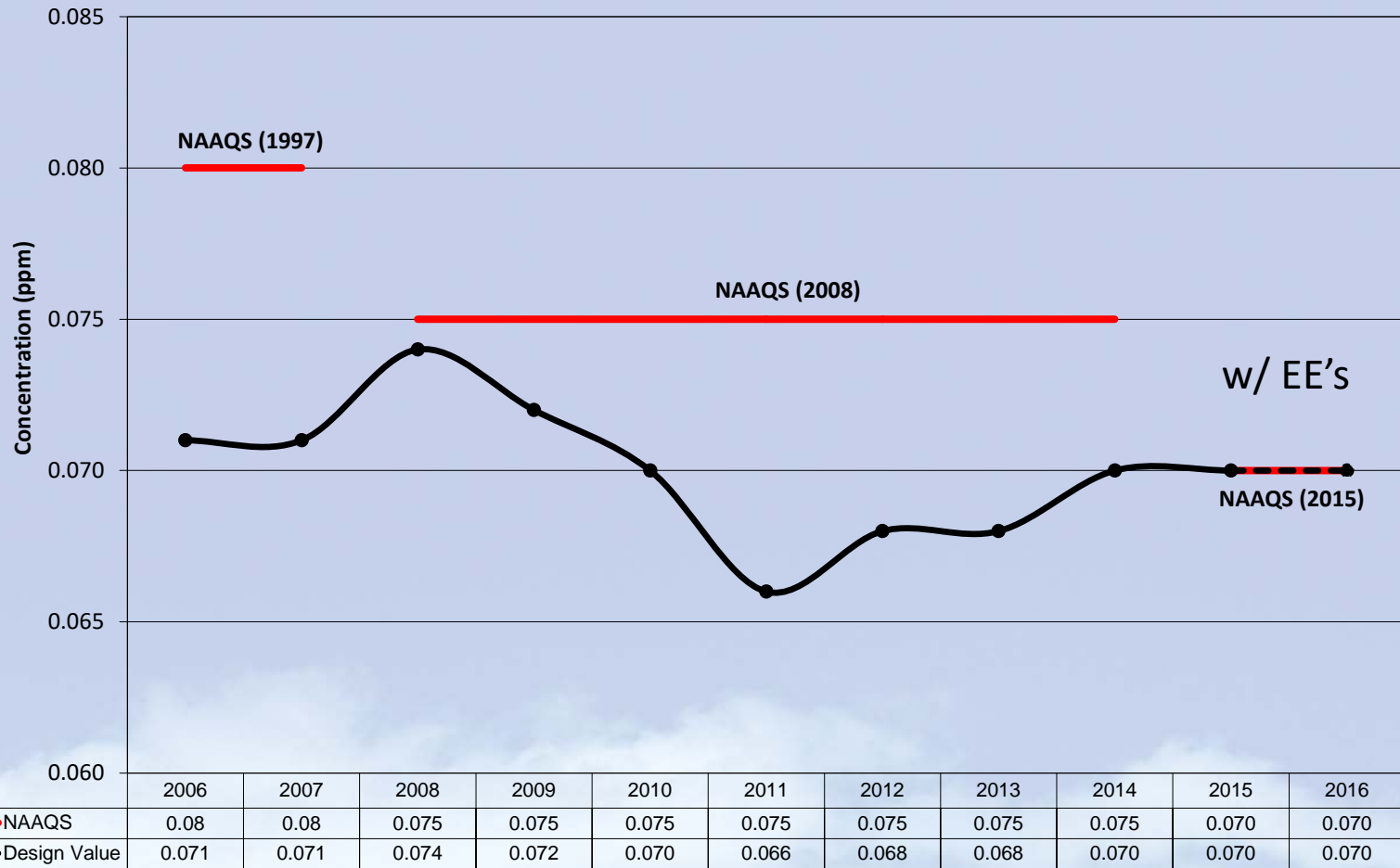
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# 8-hr Ozone Trends vs. NAAQS Without EE Concurrence



# 8-hr Ozone Trends vs. NAAQS with EE Concurrence



# Questions and Comments



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[OurCleanAir.com](http://OurCleanAir.com)