Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Analysis of Western Connecticut Clean Air Action Monitoring Data

August 5, 2019 through September 30, 2019

SIPRAC
December 12, 2019

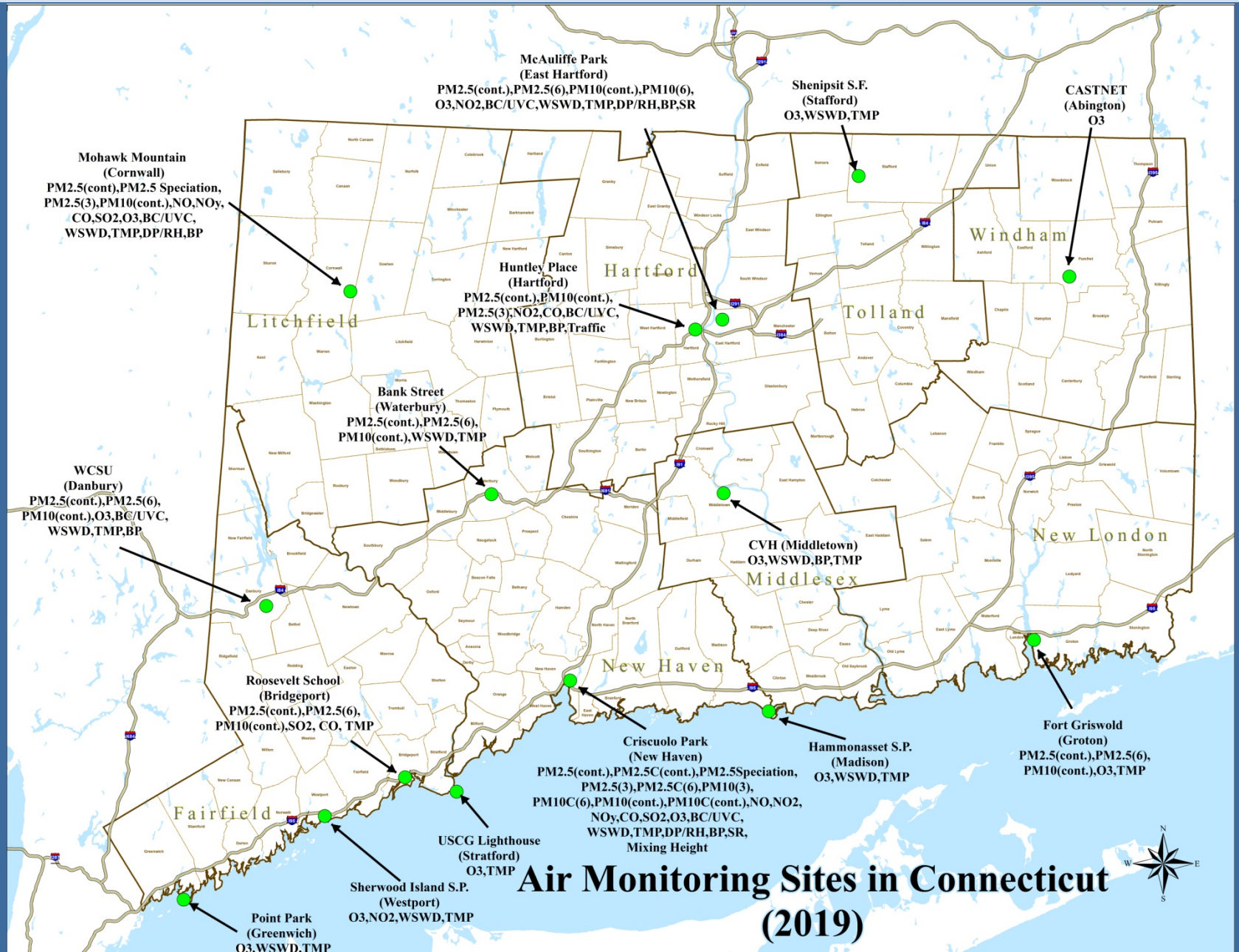
Connecticut Department of Energy and Environmental Protection

Overview

- Per PA 19-29, DEEP is required to analyze data from WCCAA's monitoring network to establish baseline air quality near Cricket Valley Energy.
- WCCAA's monitors perform well and generally correlate to DEEP's monitors
- There are potential nitrogen dioxide (NO_2) calibration issues WCAAA should further explore
- There are potential siting issues WCCAA should further explore

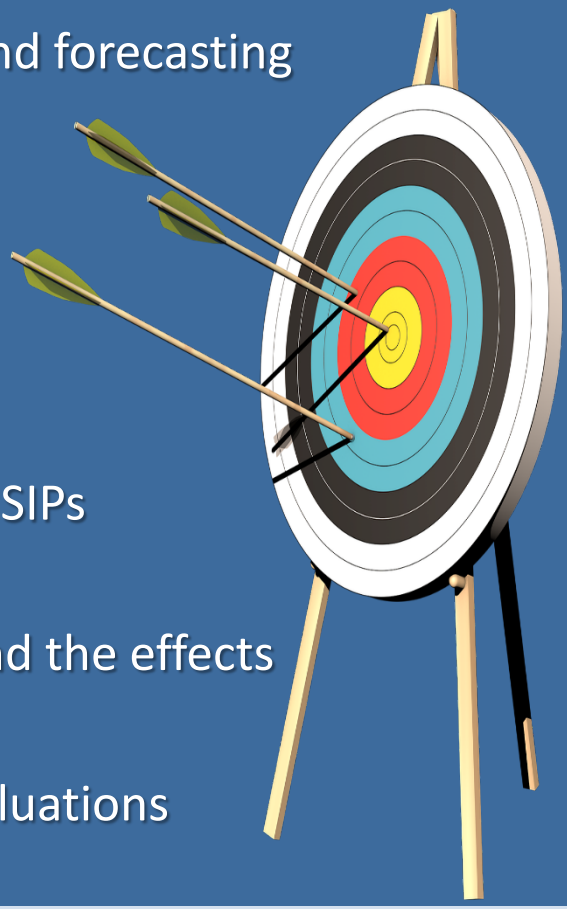
Background
DEEP's Air Monitoring Network and Public Act 19-29
An Act Concerning Air Quality Monitoring in Towns Near the Cricket Valley Energy Center

Connecticut's Air Monitoring Network



Ambient Air Monitoring Objectives

- **Compliance Purposes**
  Determine attainment status for 6 criteria pollutants
- **AQI Reporting**
  Provide timely and accurate data for Air Quality Index and forecasting
- **Control Strategies**
  Develop new strategies and assess existing ones
- **Trend Analysis**
  Assess short-term and long-term pollutant trends
- **SIP Development**
  Provide data used in modeling to aid in development of SIPs
- **Characterize Sources**
  Distinguish between contributions from local sources and the effects of long range transport.
- **Support** long-term health assessments and model evaluations



Summary of Public Act 19-29 (*effective October 1, 2019*)

Requires the Department of Energy and Environmental Protection (DEEP) to:

- Provide technical assistance and support to **any** municipality that purchases, leases, or is provided the use of air monitoring equipment to:
  - establish an air quality baseline in the municipality, and
  - determine any effect of the Cricket Valley Energy Center in New York on the baseline.

- The Cricket Valley Energy Center (CVEC) is a 1000 MW natural gas-fired power plant being constructed in Dover, New York.
- CVEC is about 5 miles from the NY/CT border near Kent, CT

DEEP's Responsibilities under PA 19-29

DEEP **shall** provide technical assistance and support including, but not limited to:

1. Best practices for establishing the baseline (e.g., pollutant levels prior to CVEC operation),
2. Guidance on siting and placing air quality monitors,
3. Information on how to maintain and use the monitors to assure accuracy,
4. Proposed schedules for retrieving data during the calendar year, and
5. Review of and conclusion from the data.

The General Assembly did not provide DEEP any resources to meet these responsibilities

Data Review
of
WCCAA Air Monitors

Connecticut Department of Energy and Environmental Protection

Community Based & State Monitoring Network

Power Plant Location Data:

55 km radius from Cricket Valley

Cricket Valley

Proposed Network*:

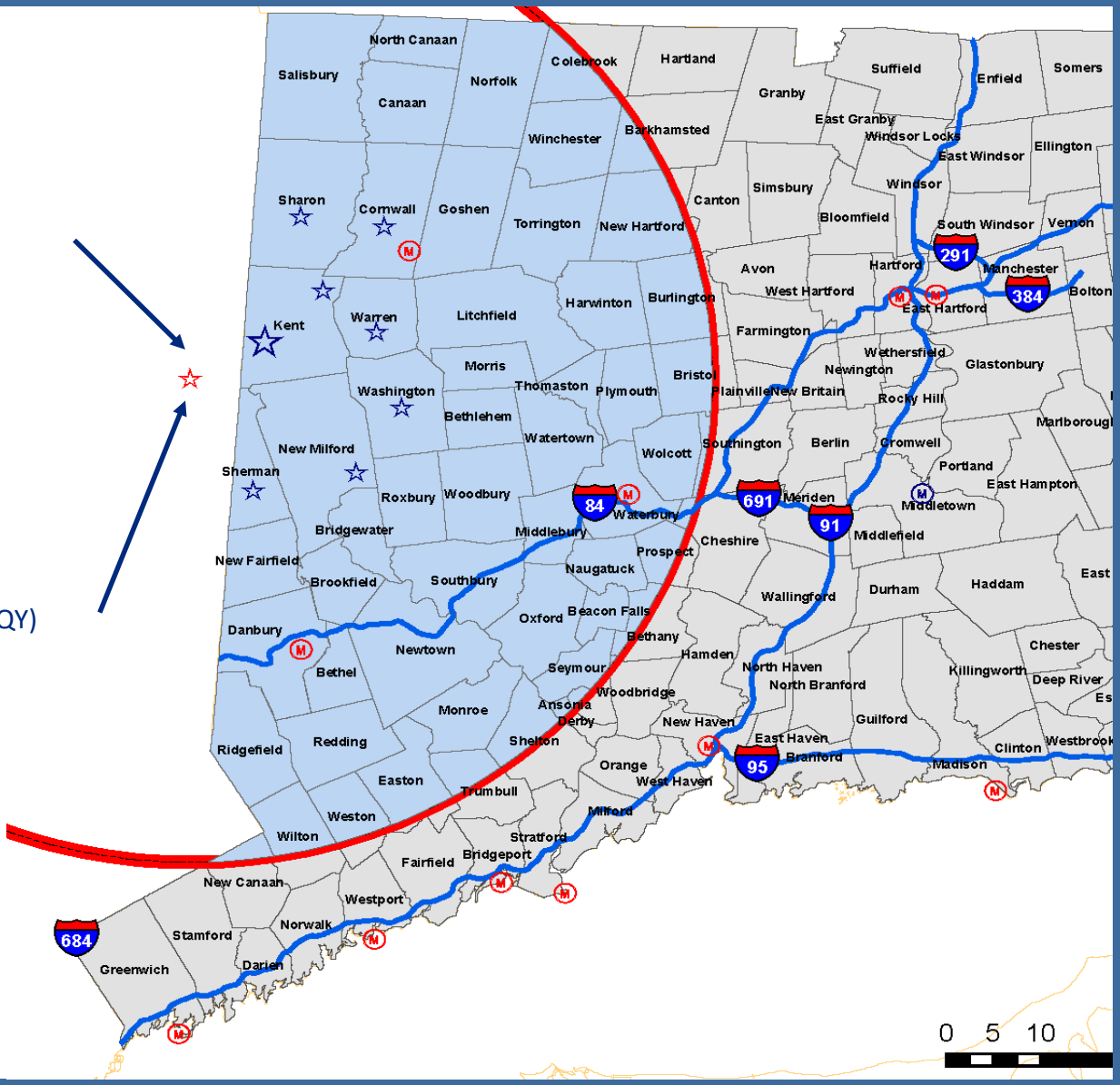
Air Quality Monitoring Station (AQM)

Micro Air Quality Monitoring Station (AQY)

Existing Air Monitoring Network

DEEP Air Monitoring Station

Prevailing Winds



**As of June 15, 2019*

Next Generation Air Monitoring (NGAM)

Compact Ambient Air Quality Monitoring AQM 65

Aeroqual AQY1

AQY1 Monitor at Cornwall Town Offices

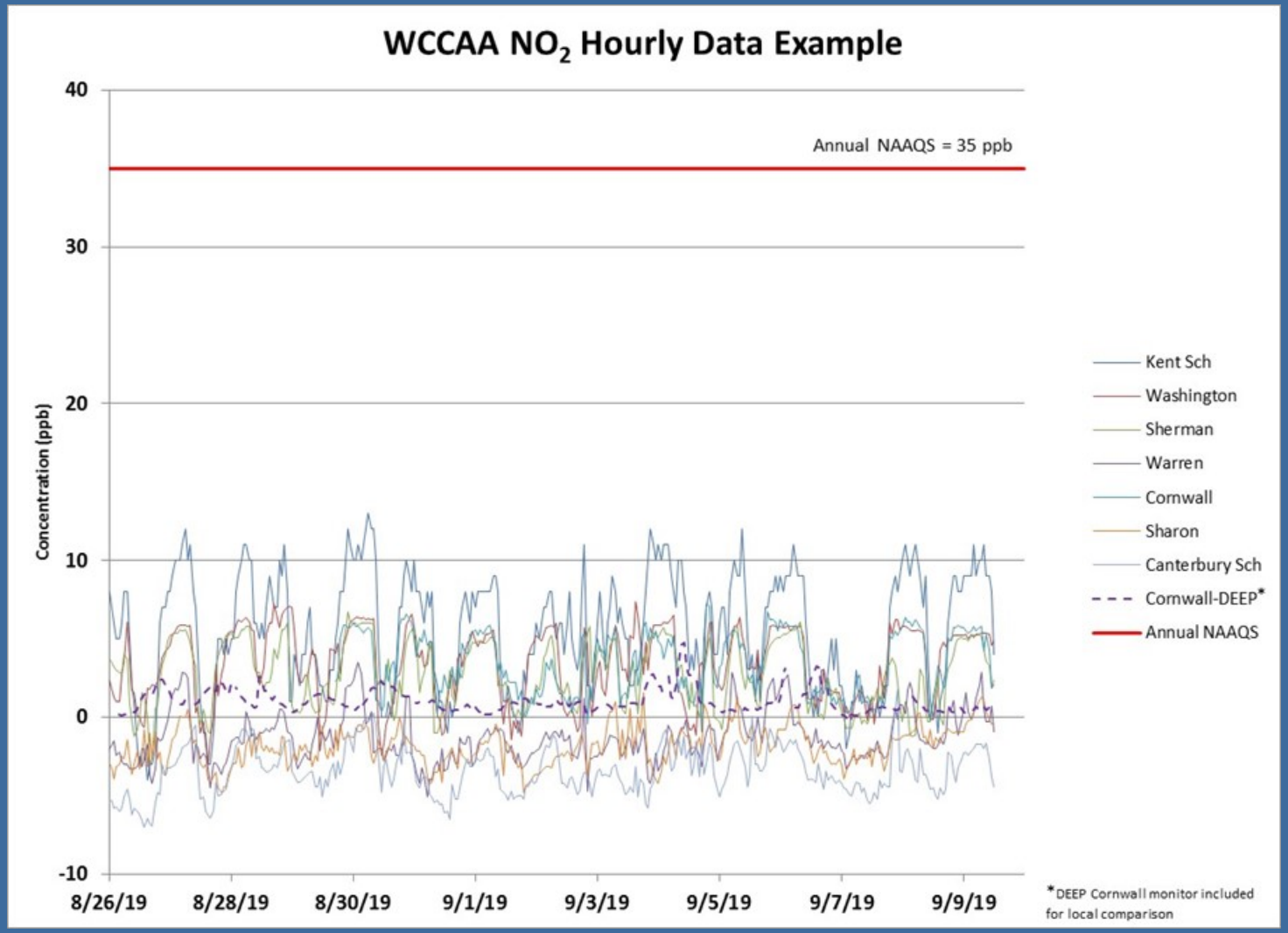
NO_2, $PM_{2.5}$ and O_3 Data Review

- Review of nitrogen dioxide (NO_2) ozone (O_3) and fine particulate matter ($PM_{2.5}$) data from the WCCAA network with comparisons to CT DEEP monitoring network data.
- Dates covered – Aug. 5 – Sept. 30, 2019
- WCCAA air monitoring network:
  - AQM-65 at Kent School
  - AQYs at Washington, Sherman, Warren, Cornwall, Sharon, New Milford (Canterbury School), and Kent High Watch (offline)

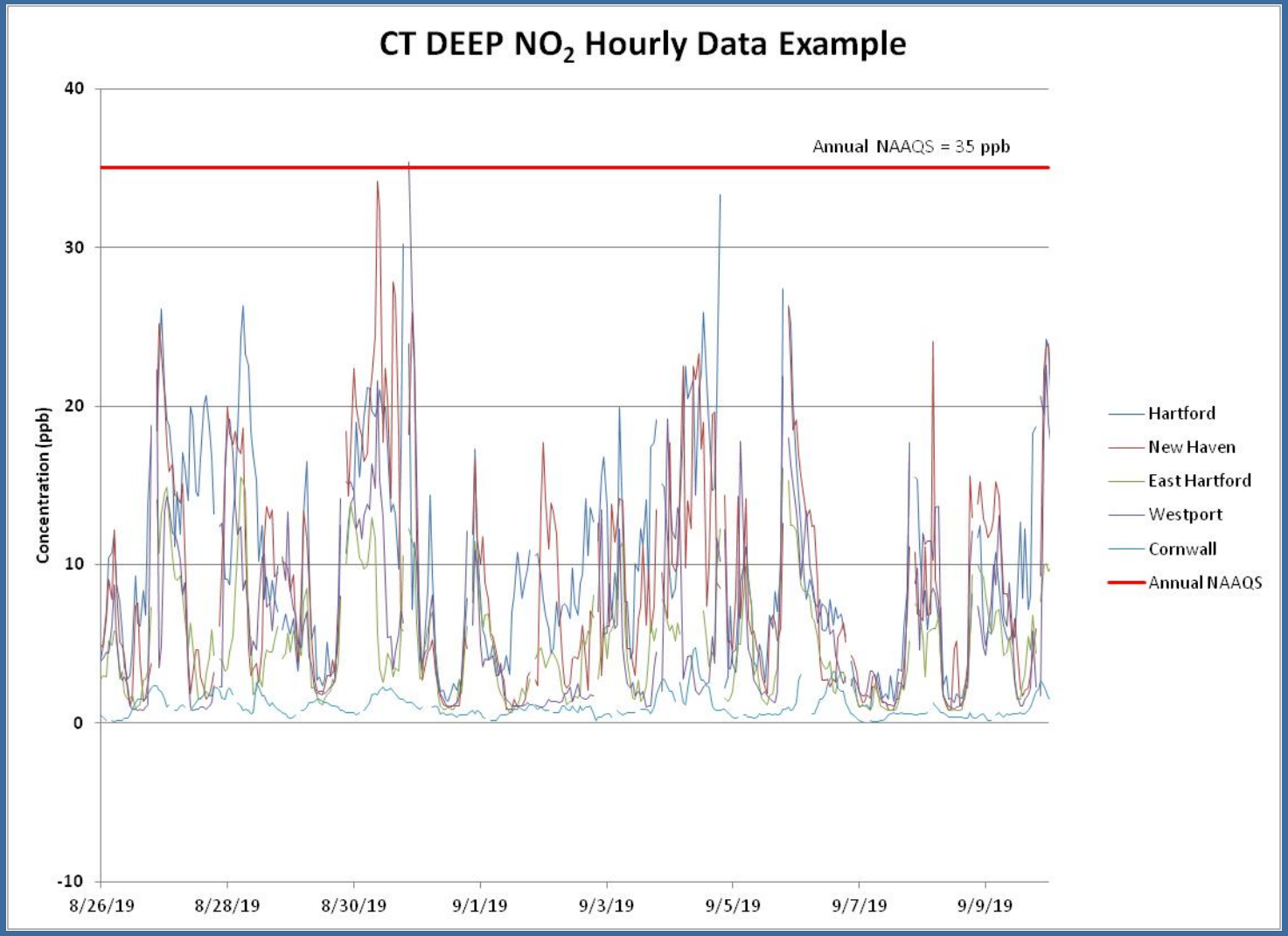
NO_2 Methodology

- DEEP compared hourly and daily maximum 1-hour time series plots from the WCCAA network with data from the DEEP NO_2 network.
  - Cornwall NO_2 from the CT DEEP monitoring network is derived from the NO_Y/NO analyzer as NO_Y – NO, which may have a slight positive bias compared to true NO_2.
- The plots demonstrate:
  - Ambient NO_2 values in all areas are well below the 1-hour National Ambient Air Quality Standard (NAAQS) of 100 parts per billion (ppb), and
  - The WCCAA sites generally have lower NO_2 levels and a less marked diurnal pattern than the DEEP sites.
- Kent School shows the highest NO_2 levels among the WCCAA sites, which are in the range of the suburban East Hartford DEEP site.

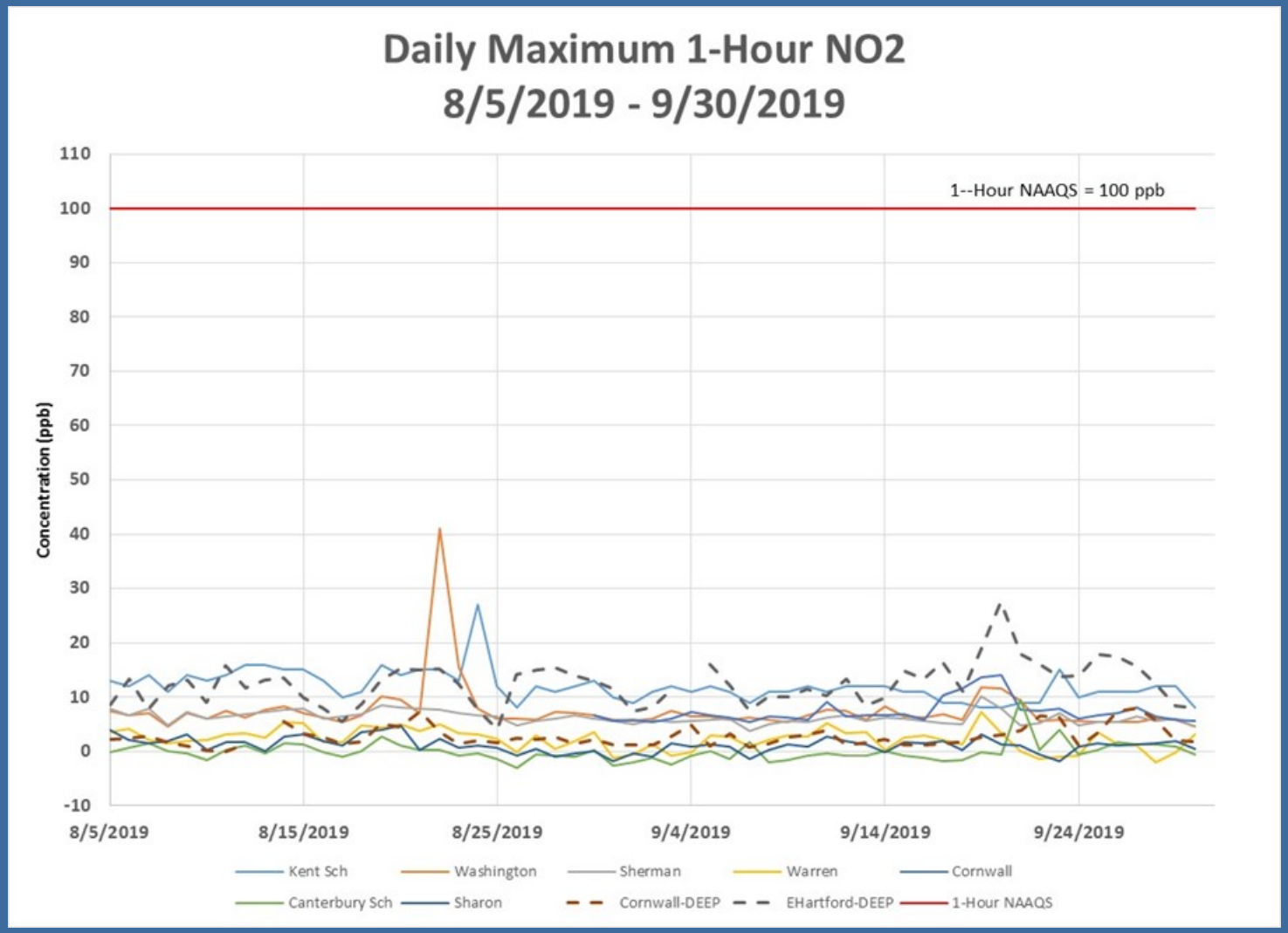
Hourly NO_2 Data



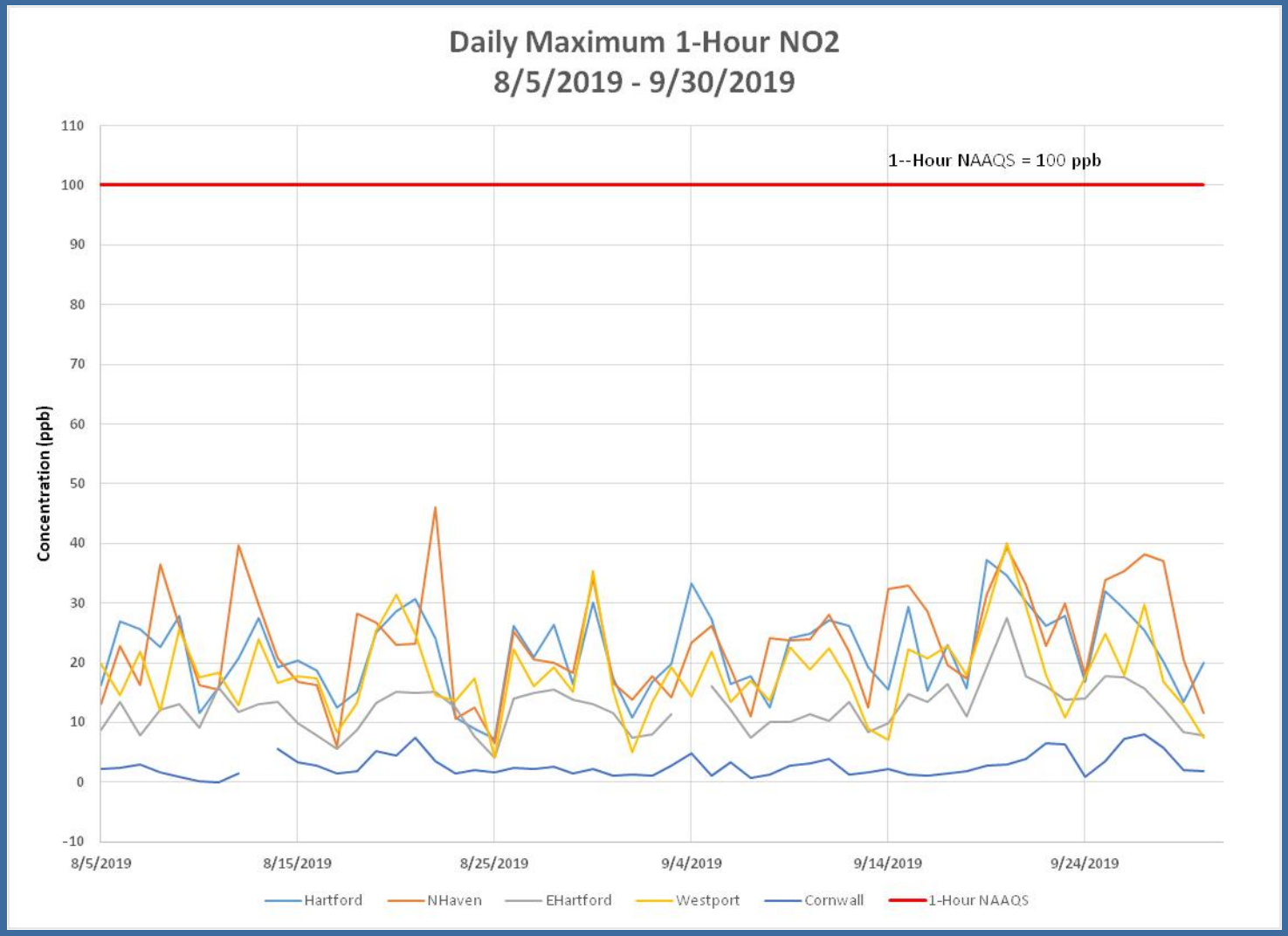
Hourly NO_2 (Cont.)



WCCAA Daily Maximum 1-Hour NO_2



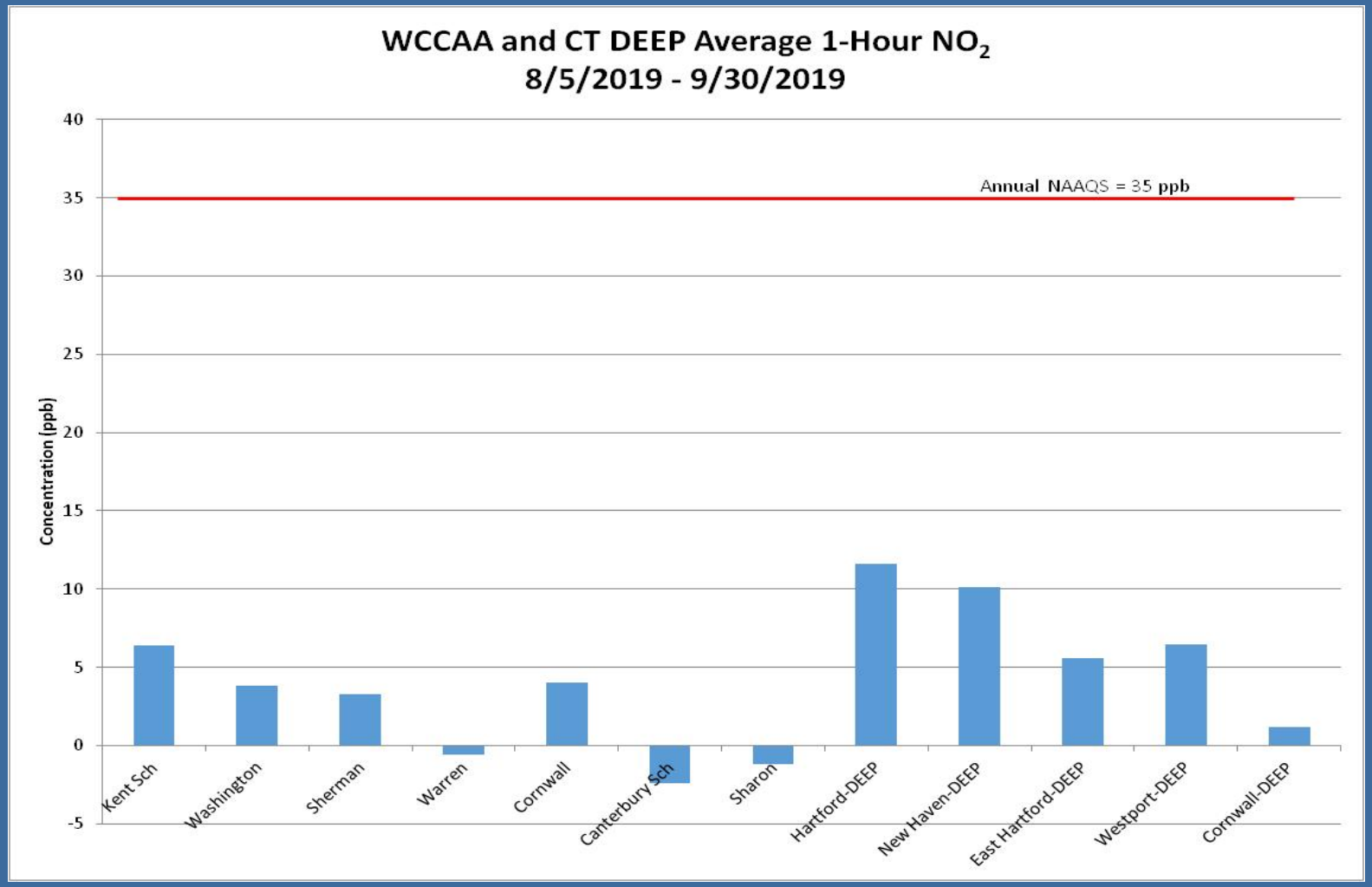
DEEP Daily Maximum 1-Hour NO_2



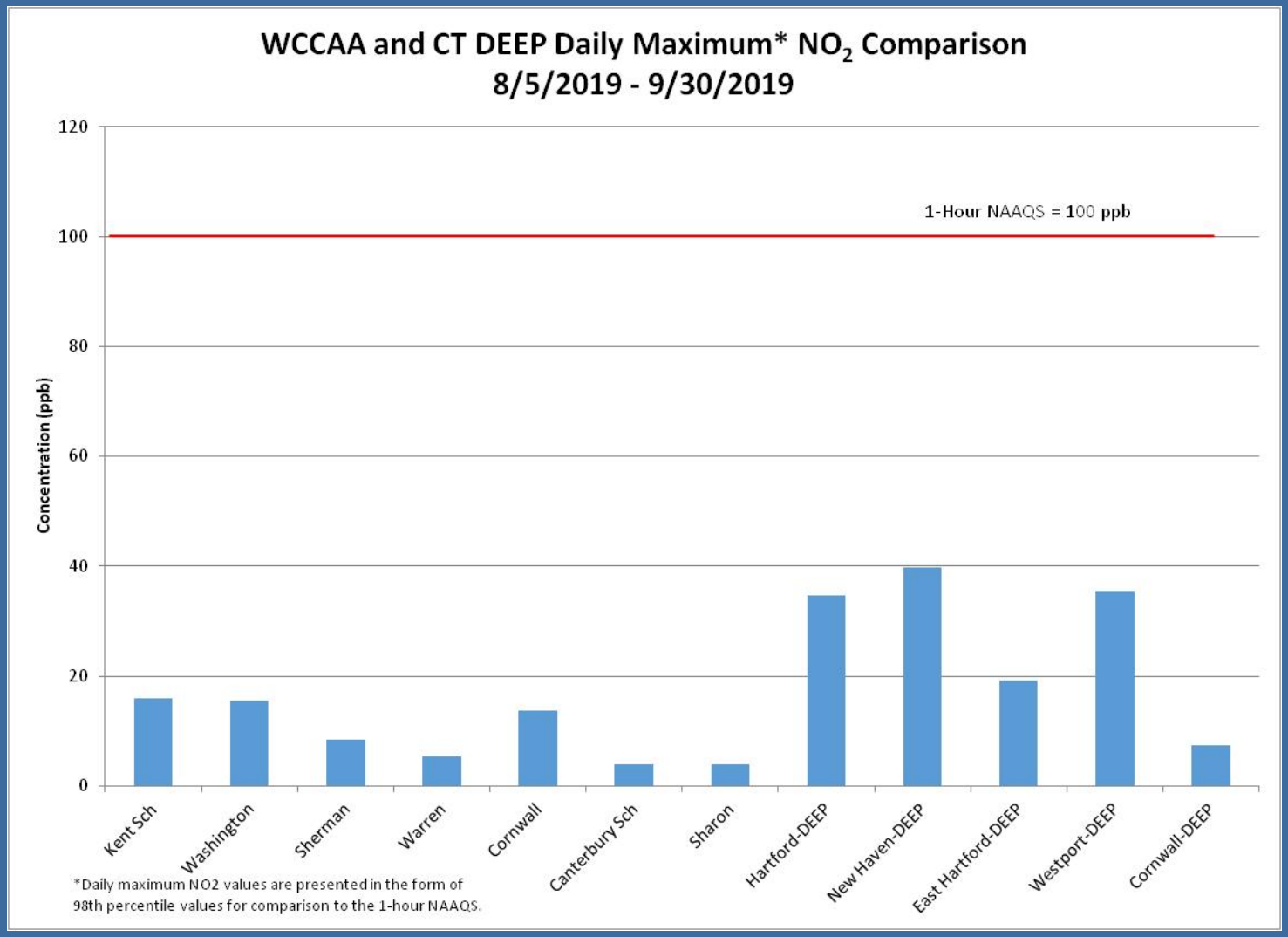
NO_2 Methodology continued

- For comparison to the NAAQS, the following 2 plots present the average 1-hour and 98th percentile of the daily maximum 1-hour NO_2 values for the WCCAA and DEEP monitors.
- These metrics do not represent a true assessment of NAAQS compliance due to the short monitoring period and WCCAA's monitors are not federally approved for this purpose.
- The data indicates NO_2 values far below the respective NAAQS.
- Three WCCAA monitors are problematic (Warren, Canterbury School and Sharon), as they indicate negative 1-hour average values, possibly related to calibration and/or siting issues.

WCCAA and DEEP Avg 1-Hr NO_2



WCCAA and DEEP Daily Max 1-Hour NO_2



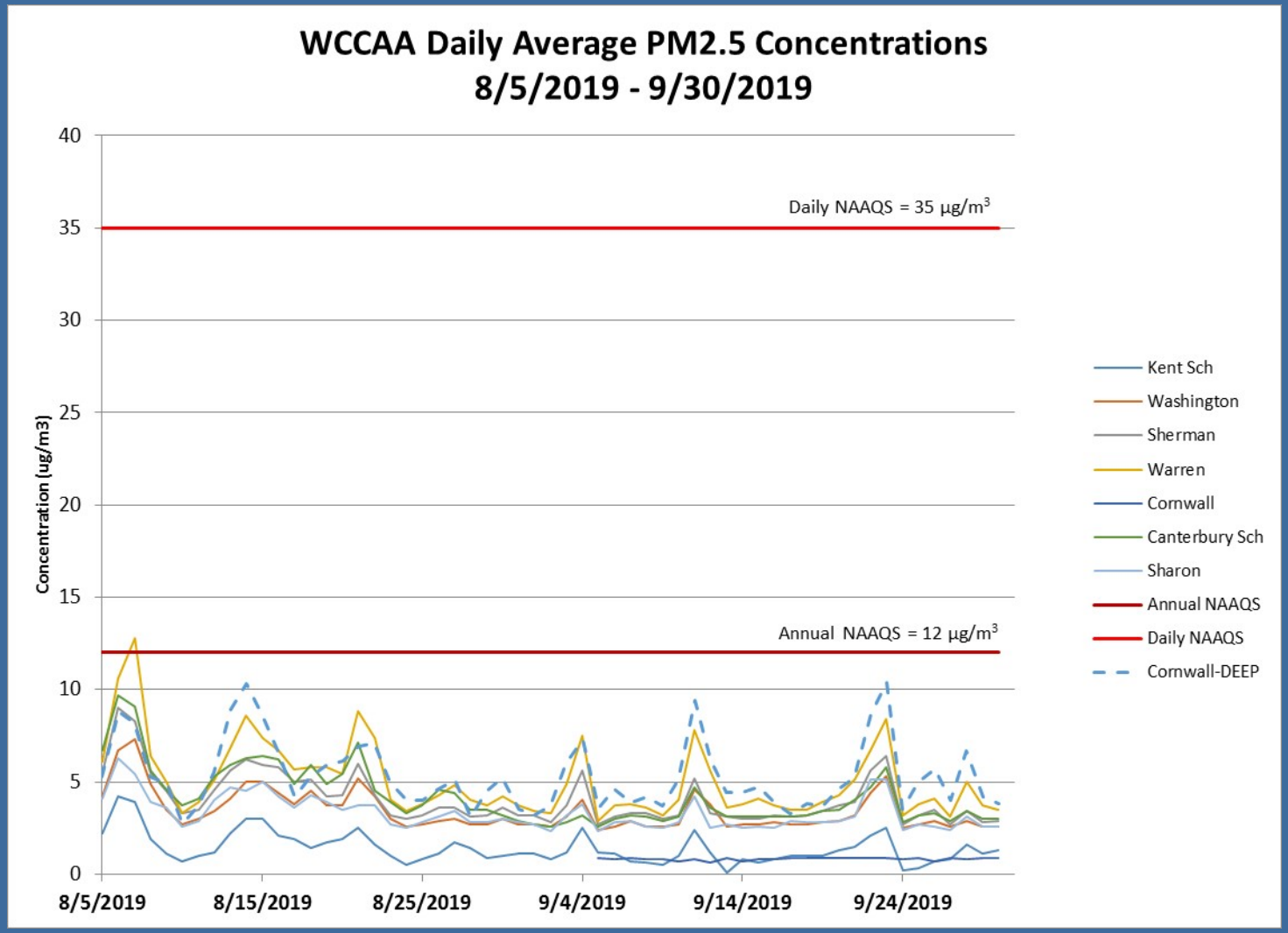
$PM_{2.5}$ Methodology

- Fine particulate matter ($PM_{2.5}$) monitoring indicates levels well below NAAQS for the WCCAA and DEEP networks
- WCCAA $PM_{2.5}$ levels are generally lower than those of the DEEP network
- The levels for the Kent School and Cornwall WCCAA monitors are below the baseline levels for all other monitors
  - may indicate calibration issues

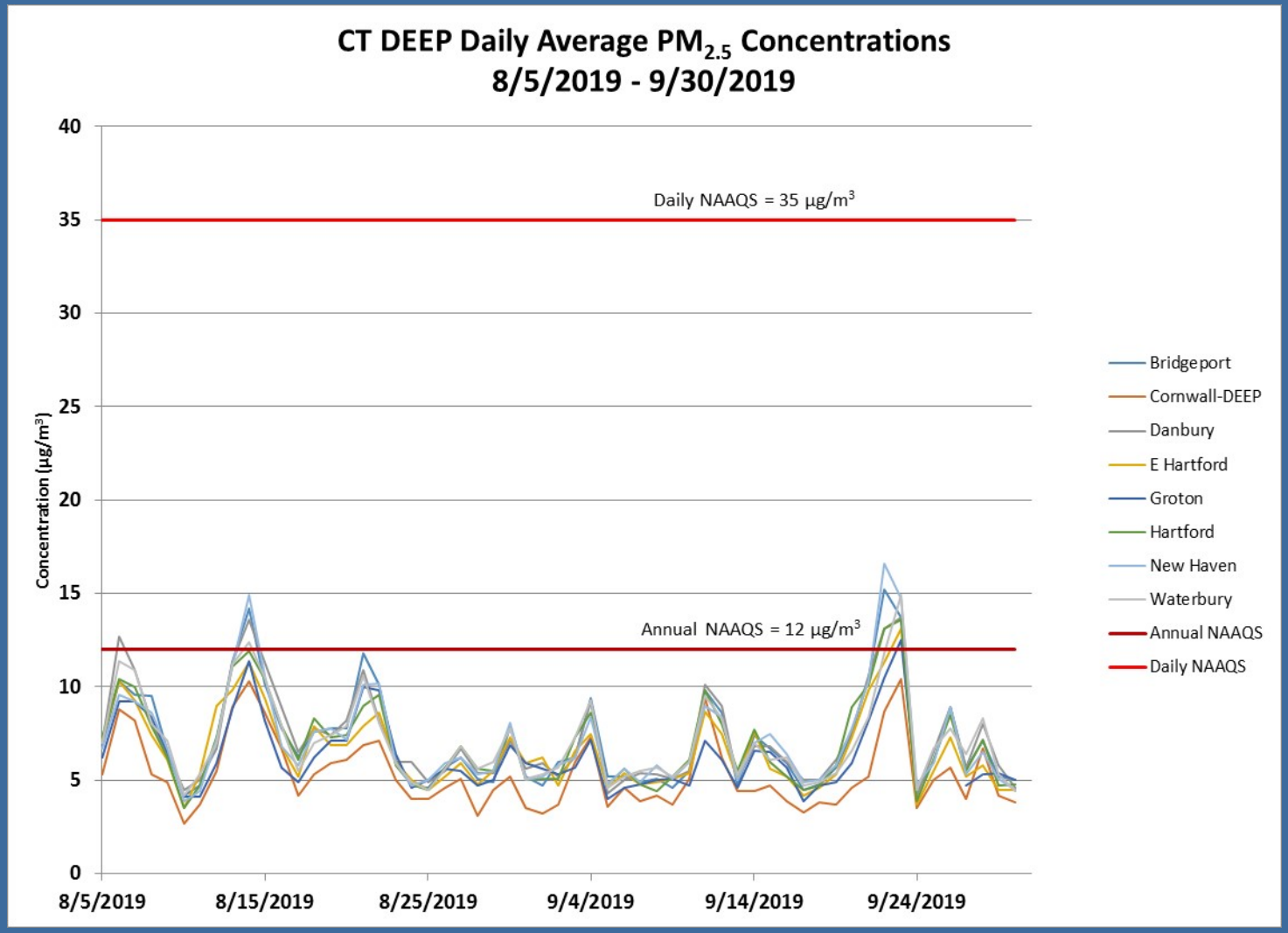
$PM_{2.5}$ Methodology (cont.)

- The following 2 charts are time series of daily average $PM_{2.5}$ for the WCCAA and DEEP sites.
- The third chart shows metrics that approximate values comparable to the NAAQS (these represent only a portion of a calendar quarter, rather than a period of 3 consecutive years needed for an valid regulatory comparison).
- The metrics shown are:
  - Arithmetic average of all daily average concentrations (compare to annual NAAQS), and
  - 98^{th} percentile of all daily average concentrations (compare to daily NAAQS).

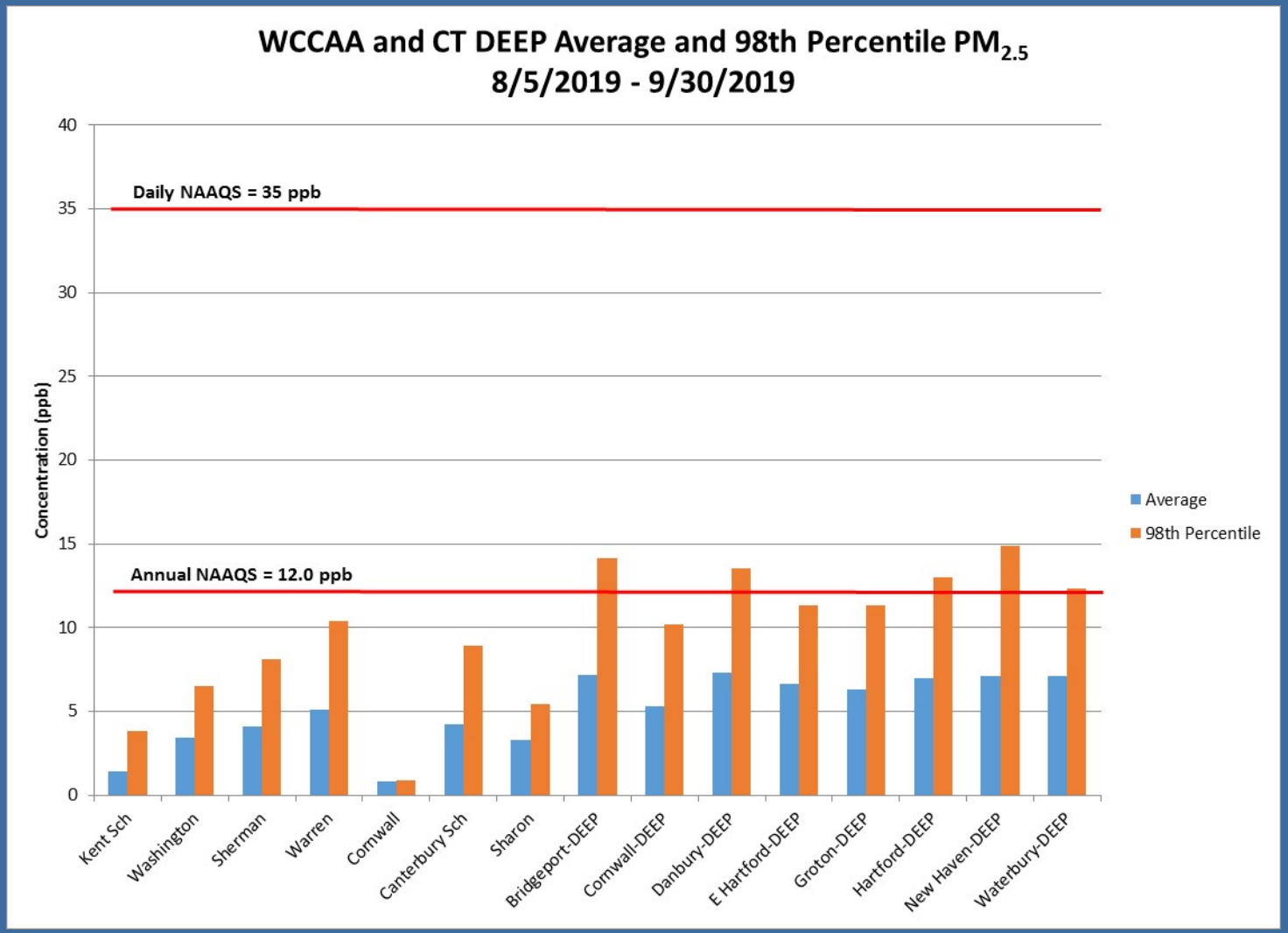
WCCAA $PM_{2.5}$ Concentrations



DEEP $PM_{2.5}$ Concentrations



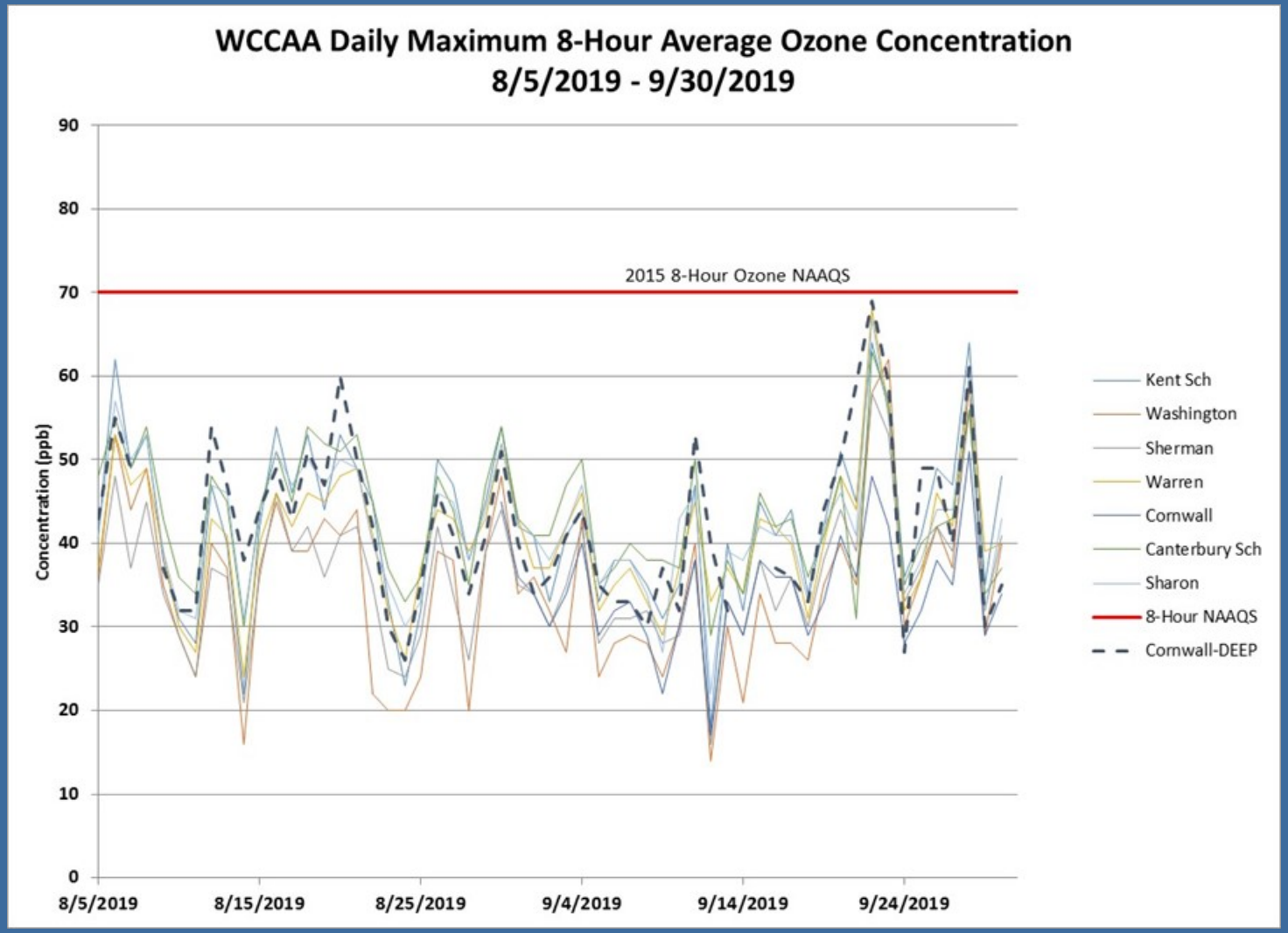
WCCAA and DEEP PM2.5 Comparison



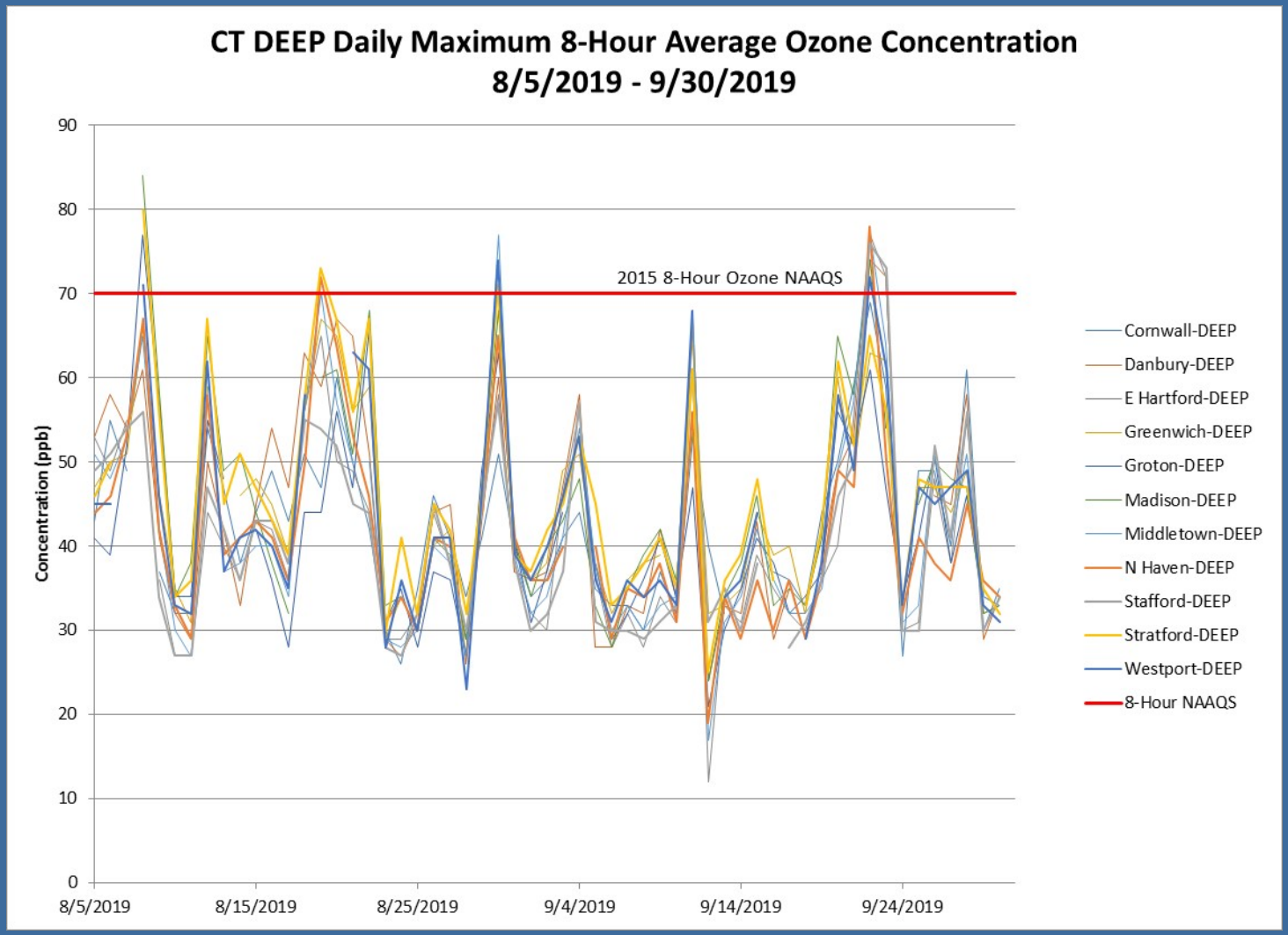
Ozone Data Review

- Ozone is a seasonal pollutant and levels peak between April and September
- DEEP compared WCCAA's data to its ozone monitors
- Maximum ozone levels of WCCAA's monitors are lower than those of most DEEP monitors
  - Expected outcome for ozone monitors in northern Connecticut rural sites
- There were no ozone exceedances at WCCAA sites during this period, while there were 4 statewide exceedance days for the DEEP monitors.

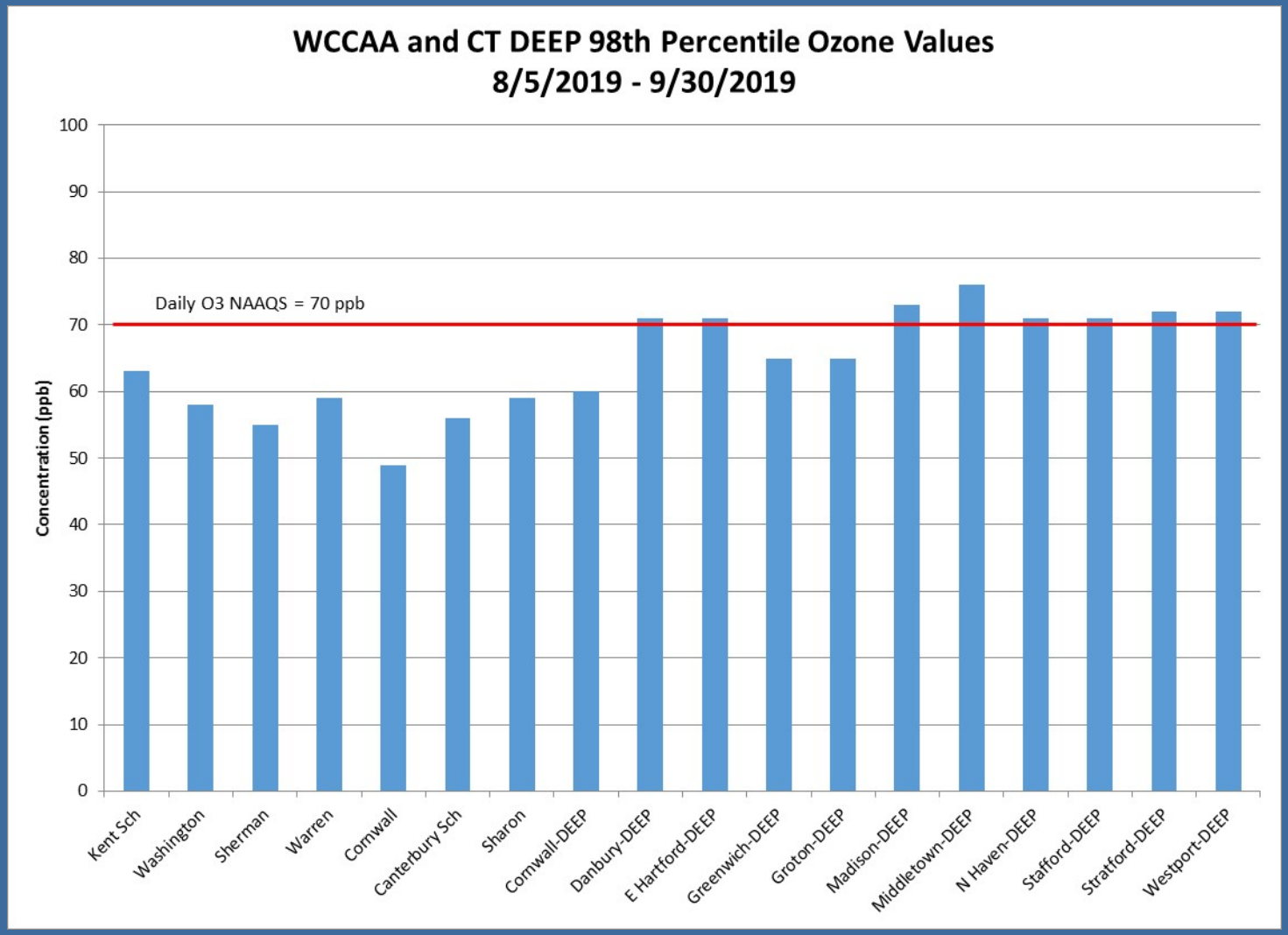
Daily Maximum O_3 at WCCAA Monitors



Daily Maximum O3 at DEEP Monitors



Comparison of WCCAA and DEEP O3 98th Percentiles



Ozone Data Review (cont)

- WCCAA ozone data compares well to DEEP data
  - Minimum and maximum values are consistent with regional ozone concentrations
  - Sites with higher overnight NO_2 also have near-zero O_3 minima, as is typical due to NO-O_3 titration effect.
- Sherman, Washington and Cornwall are generally similar in NO_2 and O_3 levels, which tend to be the highest.

Analysis and Recommendations

- Warren, Sharon and New Milford generally have similar NO_2 patterns with low values.
  - Many points are below zero with overall minima around -4.5 ppb.
  - Analyzer calibration and/or operation should be further examined
  - Kent School has patterns similar to the higher NO_2 sites, but with values shifted -7 to -8 ppb, which could indicate a calibration issue
- The DEEP Cornwall Mohawk Mountain NO_2 monitor shows consistently low NO_2 values
  - May not compare well with the other sites because of its high elevation and lack of local NO_2 sources.
- $PM_{2.5}$ data for all sites seem to have a minimum at about 2.5 ug/m^3, except for Kent School, which dipped down to around 0.2 ug/m^3 on multiple occasions.

Analysis and Recommendations

- NO_2 levels in WCCAA network are low, averaging below 8 ppb.
- Monitors located in more developed areas (e.g., in valleys) show similar patterns and levels, with one exception:
  - Kent School AQM-65 monitor may require calibration.
- Siting of monitors in Sharon, New Milford, and possibly Kent High Watch should be re-examined
  - Siting monitors below building overhangs and under trees can restrict air flow and may indicate lower NO_2 and O_3 values due to reactivity with structures and vegetation
  - Multiple negative minimum values could indicate calibration issues.
- The Kent School AQM65 monitor $PM_{2.5}$ levels are low compared to other monitors, possibly indicating a need for calibration.