

## Connecticut 2020 Annual Air Monitoring Network Plan



Connecticut Department of Energy and Environmental Protection  
Bureau of Air Management

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## Acronyms and Abbreviations

AQI – Air Quality Index  
AQS – Air Quality System  
BAM – Beta Attenuation Monitor  
BC – Black Carbon (Aethalometer)  
CAA – Clean Air Act  
CBSA – Core-Based Statistical area  
CFR – Code of Federal Regulations  
CO – carbon monoxide  
CSA – combined statistical area  
CSN – Chemical Speciation Network  
DEEP – Connecticut Department of Energy and Environmental Protection  
DAS – data acquisition system  
EC/OC – Elemental Carbon/Organic Carbon  
EMP – Enhanced Monitoring Plan for ozone  
EPA – Environmental Protection Agency  
FEM – Federal Equivalent Method  
FRM – Federal Reference Method  
GC – gas chromatography  
GC/MS – gas chromatography/mass spectrometry  
HAP – hazardous air pollutant  
IMPROVE – Interagency Monitoring of Protected Visual Environments  
LC – local conditions of temperature and pressure  
LISTOS – Long Island Sound Tropospheric Ozone Study  
LMP – limited maintenance plan  
MPA – monitoring planning area  
MSA – metropolitan statistical area  
NAAQS – National Ambient Air Quality Standards  
NCore – National Core Monitoring Stations  
NOAA – National Oceanic and Atmospheric Administration  
NO<sub>x</sub> – nitrogen oxides  
NO<sub>y</sub> – reactive oxides of nitrogen  
OAQPS – Office of Air Quality Planning and Standards  
OTR – Ozone Transport Region  
PAMS – Photochemical Assessment Monitoring Stations  
PM<sub>2.5</sub> – fine particulate matter (<2.5 microns)  
PM<sub>10</sub> – respirable particulate matter (<10 microns)  
PM<sub>10-2.5</sub> – coarse particulate matter (PM<sub>10</sub> – PM<sub>2.5</sub>)  
QA – quality assurance  
QA/QC – quality assurance/quality control  
QAPP – quality assurance project plan  
QMP – quality management plan  
RH – relative humidity  
SIP – State Implementation Plan  
SLAMS – state and local monitoring stations  
SO<sub>2</sub> – sulfur dioxide  
SOP – standard operating procedure  
STP – standard conditions of temperature and pressure (40 CFR 50.3: 25°C and 760 mm Hg)  
TSA – technical system audit  
TSP – total suspended particulate  
UVC – Ultra-violet carbon (aethalometer)  
VOC – volatile organic compound

## Introduction

The Connecticut 2020 Air Monitoring Network Plan (Network Plan) is prepared by the Connecticut Department of Energy and Environmental Protection (DEEP) in accordance with 40 CFR 58.10. This plan meets the requirement to develop and submit to the Environmental Protection Agency (EPA) an annual air quality monitoring network plan to describe the air monitoring network and propose any planned changes to air quality monitoring sites and monitored air pollutants to occur within 18 months following submittal.

The draft Network Plan is posted on DEEP's website at [DEEP: Air Monitoring Network](#). DEEP made this Network Plan available for public review and accepted comments from May 29, 2020 to June 28, 2020. DEEP received one set of comments, which were from EPA Region 1. In response to those comments, the carbon monoxide (CO) design values presented on page 7 were revised to reflect a change in EPA's method for deriving the values.

## Background

The Clean Air Act of 1970 (CAA) established the EPA as the principal administrative body to enact regulations to meet the requirements of the CAA and subsequent amendments thereto. One such requirement directed EPA to set primary and secondary air quality standards, known as the National Ambient Air Quality Standards (NAAQS) for the six "criteria pollutants" that Congress determined presented serious negative impacts to human health and welfare. For areas within Connecticut that do not meet a NAAQS, DEEP develops State Implementation Plans (SIPs) to detail the steps to be taken to bring air quality into attainment. Ambient air quality monitoring is essential to track progress towards meeting clean air goals and demonstrate attainment.

While DEEP monitors ambient air quality in Connecticut primarily for comparison with the NAAQS, there are other important objectives to ambient air quality monitoring. This monitoring provides local air quality data to the public, supports air quality forecasting and the Air Quality Index (AQI), supports long-term health assessments and other scientific research, assists with air permitting and identifying long-term air quality trends to gauge effectiveness of air pollution control strategies and serves as an accuracy check on computer based air quality models.

DEEP's ability to manage the air quality monitoring network greatly depends on federal grant support from EPA. DEEP matches a portion of the federal grant by covering personnel costs from its general fund allocation. As potential state budget challenges related to the COVID-19 pandemic begin to impact DEEP, there may need to be a greater reliance on federal funds. Future federal funding levels for air monitoring programs continue to remain uncertain and many indications are that federal funding will be reduced during the time period covered by this plan. In addition, as with state governmental operations everywhere, state resources allocated to ambient air quality monitoring are unable to keep pace with rising costs. DEEP will strive to provide an acceptable level of service within these constraints by continually improving operations and focusing its efforts to ensure the completion of the most critical ambient air quality monitoring. As operating costs and federal monitoring requirements increase, DEEP must operate within its means by either improving operational efficiencies or reducing other aspects of the air monitoring network. Efficiencies being employed and expanded include improving data acquisition software and hardware, streamlining access to the public thorough DEEP's website, and reducing the number of monitoring sites or parameters measured by increasing multi-pollutant monitoring or terminating duplicative or unnecessary monitors.

## Network Overview

DEEP currently operates 14 stations in its air-monitoring network (Figure 1) as part of the national State and Local Air Monitoring Stations (SLAMS) network, established under the CAA. In October 2006, EPA instituted a network of core multi-pollutant sites. These sites are known as the National Core (NCore) network, the primary purpose of which is to consolidate monitoring of multiple pollutants at fewer sites for efficiency and cost savings. In addition, the NCore sites provide a comprehensive suite of high-resolution pollutant data for NAAQS compliance assessment, research studies and long-term trends analysis. There are two NCore sites located in Connecticut: Criscoolo Park in New Haven, and Mohawk Mountain in Cornwall. The NCore network is part of the SLAMS network.

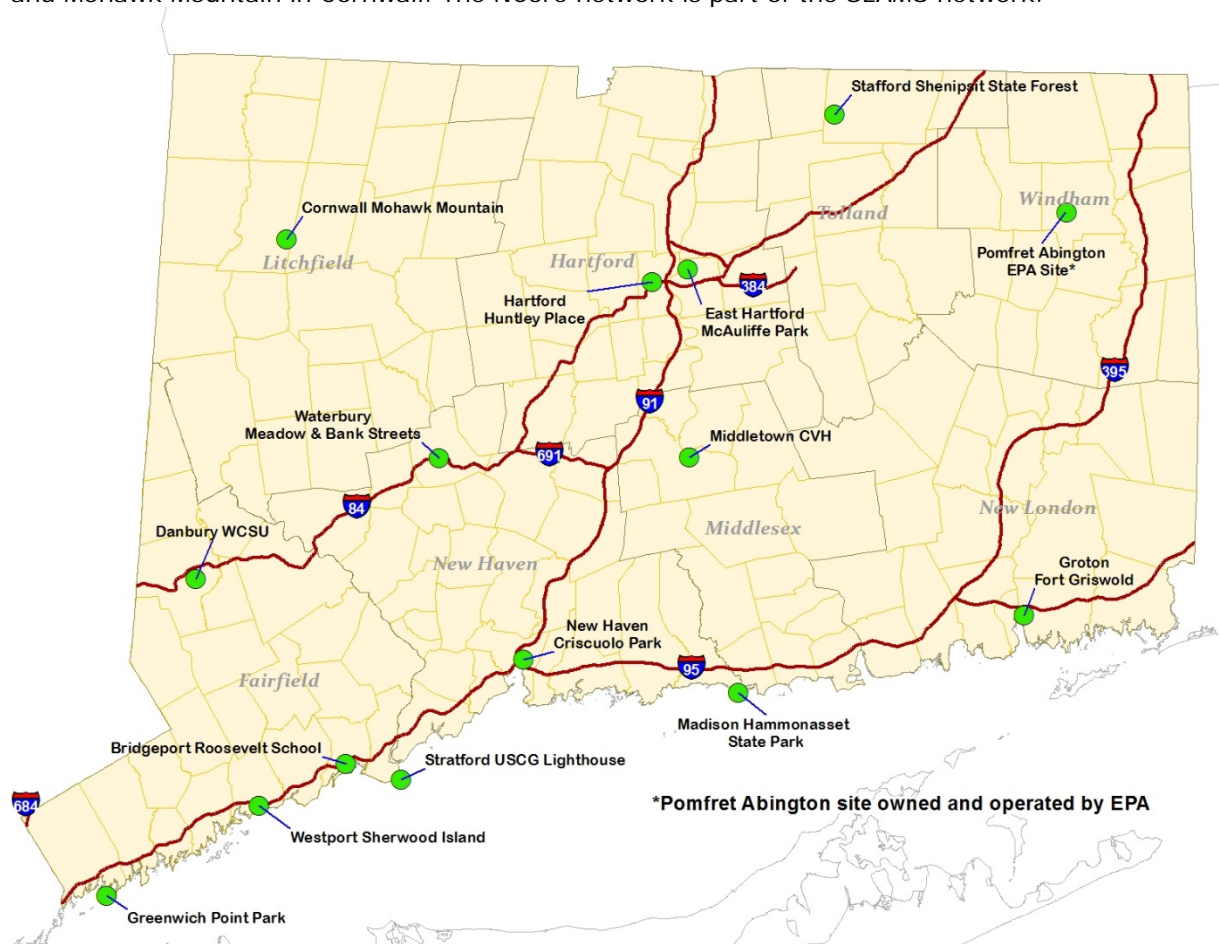


Figure 1: Connecticut DEEP Air Monitoring Network

## Proposed Network Changes

Details of the proposed monitoring network configuration are described in the following site information pages. In addition to infrastructure maintenance and improvements, DEEP proposes the following changes to the monitoring network during the period 2020-2021:

- Deploy a portable ozone monitor on a ferry operating between Bridgeport and Port Jefferson, NY during the 2021 ozone season. The ferry crosses Long Island Sound several times each day during daytime hours.
- Commence formaldehyde (HCHO) monitoring at Westport, possibly during 2020 or 2021, pending acceptable commercially available models\*.
- Commence mixing height monitoring at Westport during the period 2020 – 2021\*.

\* Note: These two proposed changes were previously requested in the 2018 Network Plan as part of the Enhanced Monitoring Plan, which was submitted one year in advance as requested by EPA.

## Monitoring Site Information

The ambient air monitoring sites currently operated by DEEP are listed in the Table 1 below. Detailed information for each monitoring site is provided in a later section of this plan.

**Table 1: Monitoring Network Summary**

Town	Site	PM2.5 (FRM)	PM2.5 (FRM, collocated)	PM2.5 (continuous FEM)	PM2.5 (continuous FEM, secondary)	PM10/PM10-2.5 (FRM)	PM10/PM10-2.5 (FRM, collocated)	PM10/PM10-2.5 (continuous FEM)	PM10/PM10-2.5 (cont. FEM, secondary)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, continuous)	Ozone	SO <sub>2</sub>	CO	NO <sub>2</sub>	NO/NOy	HCHO (continuous)	Total Column NO <sub>2</sub> /HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation	Mixing Height
Bridgeport	Roosevelt School		1/6	X				X						X									X				
Bridgeport	Park City Vessel												P														
Cornwall	Mohawk Mountain	1/3		X				X		1/3	X	X	X	X			X				X	X	X	X	X	X	
Danbury	Western Connecticut State University	1/6		X				X				X	X								X	X	X		X		
East Hartford	McAuliffe Park			X				X				X	X			X					X	X	X	X	X		
Greenwich	Point Park												X								X	X	X				
Groton	Fort Griswold			X				X					X										X				
Hartford	Huntley Place	1/6		X				X				X			X	X				X	X	X	X		X		
Madison	Hammonasset State Park												X						X		X	X	X				
Middletown	Connecticut Valley Hospital												X								X	X	X		X		
New Haven	Criscuolo Park	1/3	1/6	X	X	1/3	1/6	X	X	1/3		X	X	X	X	X	X		X		X	X	X	X	X	X	X
Stafford	Shenipsit State Forest												X								X	X	X				
Stratford	Stratford Lighthouse												X										X				
Waterbury	Meadow & Bank Street			X				X													X	X	X				
Westport	Sherwood Island State Park												X			X		P	X		X	X	X		X		P

X=Existing    P = Planned in 2020/2021    T = Terminated in 2020/2021

## National Ambient Air Quality Standards (NAAQS)

The EPA's Office of Air Quality Planning and Standards (OAQPS) has set NAAQS for six principal pollutants, known as the criteria pollutants. Table 2, reprinted here from EPA's website<sup>1</sup>, summarizes the current NAAQS compliance requirements for the criteria pollutants.

**Table 2: National Ambient Air Quality Standards**

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
<a href="#">Carbon Monoxide (CO)</a>		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
<a href="#">Lead (Pb)</a>		primary and secondary	Rolling 3 month average	0.15 µg/m <sup>3</sup> <sup>(a)</sup>	Not to be exceeded
<a href="#">Nitrogen Dioxide (NO<sub>2</sub>)</a>		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb <sup>(b)</sup>	Annual Mean
<a href="#">Ozone (O<sub>3</sub>)</a>		primary and secondary	8 hours	0.070 ppm <sup>(c)</sup>	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
<a href="#">Particle Pollution (PM)</a>	PM <sub>2.5</sub>	primary	1 year	12.0 µg/m <sup>3</sup>	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m <sup>3</sup>	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m <sup>3</sup>	98th percentile, averaged over 3 years
	PM <sub>10</sub>	primary and secondary	24 hours	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over 3 years
<a href="#">Sulfur Dioxide (SO<sub>2</sub>)</a>		primary	1 hour	75 ppb <sup>(d)</sup>	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Notes for Table 2:

<sup>a</sup> In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m<sup>3</sup> as a calendar quarter average) also remain in effect.

<sup>b</sup> The level of the annual NO<sub>2</sub> standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

<sup>c</sup> Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O<sub>3</sub> standards additionally remain in effect in some areas. Revocation of the previous (2008) O<sub>3</sub> standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

<sup>d</sup> The previous SO<sub>2</sub> standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO<sub>2</sub> standards or is not meeting the requirements of a SIP call under the previous SO<sub>2</sub> standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

<sup>1</sup> <https://www.epa.gov/criteria-air-pollutants/naqs-table>

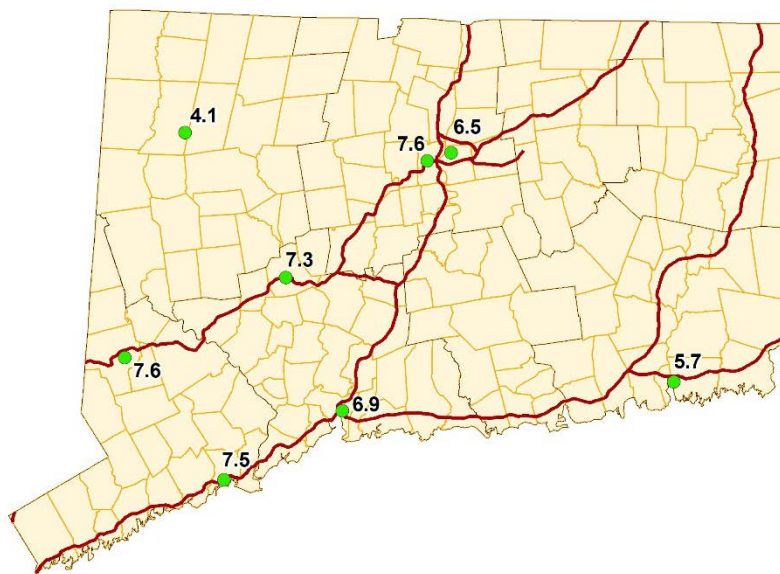


### PM<sub>2.5</sub> Annual Design Values (2019)

The 2018 annual design values for PM<sub>2.5</sub>, based on 2017 through 2019 data, are presented in the table and figure below. PM<sub>2.5</sub> annual design values are calculated using the 3-year average of the respective annual weighted averages. The current annual PM<sub>2.5</sub> NAAQS is 12.0 µg/m<sup>3</sup>. All Connecticut monitors demonstrate compliance with the design value for the annual PM<sub>2.5</sub> NAAQS.

Site	Design Value (µg/m <sup>3</sup> )
Bridgeport	7.5
Cornwall	4.1
Danbury	7.6
East Hartford	6.5
Groton	5.7*
Hartford	7.6
New Haven	6.9
Waterbury	7.3
<b>NAAQS</b>	<b>12.0</b>

\*Design values considered invalid due to incomplete quarters over the period 2017-2019.

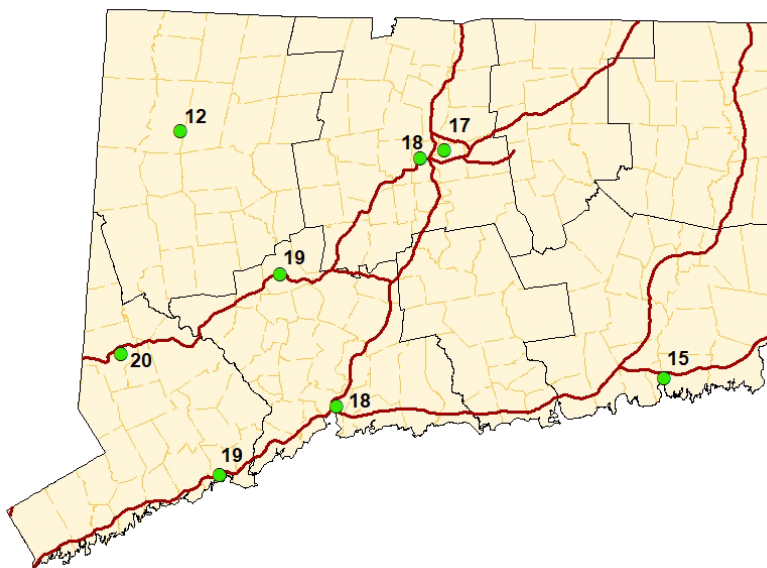


### PM<sub>2.5</sub> Daily Design Values (2019)

Daily design values for PM<sub>2.5</sub> using 2017 through 2019 data are given below. PM<sub>2.5</sub> daily design values are calculated using the 3-year average of the annual 98th percentile values. The daily PM<sub>2.5</sub> NAAQS is 35 µg/m<sup>3</sup>. Final designations relative to the 2006 24-hour PM<sub>2.5</sub> NAAQS were finalized by EPA in November 2009 (effective as of December 14, 2009), based upon measured data from 2006 through 2008. All Connecticut monitors demonstrate compliance with the design value for the 24-hour PM<sub>2.5</sub> NAAQS.

Site	Design Value (µg/m <sup>3</sup> )
Bridgeport	19
Cornwall	12
Danbury	20
East Hartford	17
Groton	15*
Hartford	18
New Haven	18
Waterbury	19
<b>NAAQS</b>	<b>35</b>

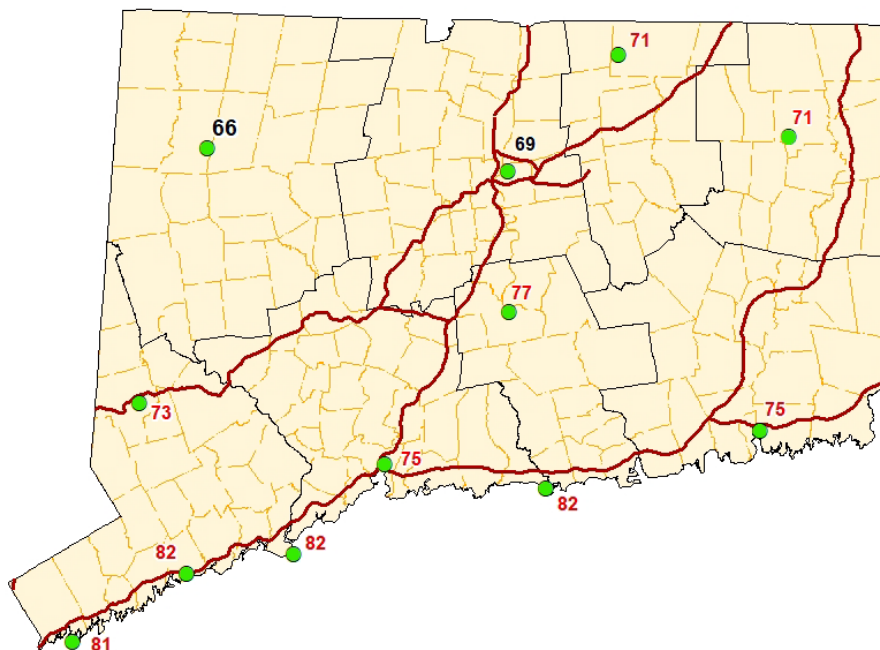
\*Design values considered invalid due to incomplete quarters over the period 2017-2019.



### Ozone Design Values (2019)

The 2019 ozone 8-hour design values for the 2015 NAAQS are given in the table below. Ozone design values are derived by averaging three consecutive annual fourth highest daily maximum 8-hour ozone values. Based on both the 2008 ozone standard of 0.075 ppm (75 ppb) and the October 2015 revised ozone standard of 0.070 ppm (70 ppb), 10 out of 12 sites indicate nonattainment, shown in red font below. Starting in 2017, the ozone monitoring season in Connecticut is extended by a month, beginning March 1 and ending September 30.

Site	Design Value (ppb)
Abington	71
Cornwall	66
Danbury	73
East Hartford	69
Greenwich	81
Groton	75
Madison	82
Middletown	77
New Haven	75
Stafford	71
Stratford	82
Westport	82
<b>NAAQS</b>	<b>70</b>



### CO, SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub> and Pb NAAQS Comparisons (2019)

Comparisons of ambient levels of CO, SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub> and Pb to the primary NAAQS are provided in the tables below. The design values for each pollutant were derived in accordance with 40 CFR 50. For PM<sub>10</sub>, the 3-year fourth-high value, rounded to the tens place, is given to indicate the ambient level relative to the standard, as the actual design value is the expected number of annual exceedances of the standard, averaged over a 3-year period, which is in attainment with a value of less than or equal to one.

#### CO NAAQS Comparison\*

Site	1-Hr Design Value (ppm)	8-Hr Design Value (ppm)
Bridgeport	2.5	1.7
Cornwall	0.5	0.3
Hartford	1.5	1.0
New Haven	2.1	1.2
<b>NAAQS</b>	<b>35</b>	<b>9</b>

\*Design values represent highest of 2018 and 2019 2<sup>nd</sup> high values

**SO<sub>2</sub> NAAQS Comparison**

Site	1-Hr Design Value (ppb)
Bridgeport	4
Cornwall	2
New Haven	2
<b>NAAQS</b>	<b>75</b>

**NO<sub>2</sub> NAAQS Comparison**

Site	1-Hr Design Value (ppb)	Annual Design Value (ppb)
East Hartford	42	8
Hartford	46	13
New Haven	52	12
Westport*	39*	8
<b>NAAQS</b>	<b>100</b>	<b>53</b>

\*Invalid design value based on only 2 year of complete data (2018)

**PM<sub>10</sub> NAAQS Comparison**

Site	Daily "Design Value"* ( $\mu\text{g}/\text{m}^3$ STP)
Bridgeport	40
Cornwall	30
East Hartford	20
Hartford	60
New Haven	30
<b>NAAQS</b>	<b>150</b>

\*Daily "design values" given are the fourth high daily concentrations over three years (2017-2019), presented here for comparison to the standard. The actual PM<sub>10</sub> design value form is the expected number of exceedance days per year, averaged over three years, which should be less than or equal to one.

## Overview of Network Operation

DEEP operates a network of 14 State and Local Air Monitoring Stations (SLAMS) sites throughout Connecticut used for monitoring air pollutants and meteorological parameters. This section contains information about monitoring methods and sampling frequencies, as well as monitoring network maps for each pollutant parameter. Network changes planned before the end of 2021 are discussed as are any anticipated network changes beyond that period.

### PM<sub>2.5</sub> Monitoring

**Network Design** The DEEP PM<sub>2.5</sub> network consists of Thermo Partisol®-Plus 2025i sequential FRM air samplers with BGI VSCC (RFPS-0498-118/EQPM-020-145) and Teledyne API T640X continuous air samplers (EQPM-0516-238) for NAAQS compliance at eight air monitoring stations. The distribution of PM<sub>2.5</sub> monitors in the network and their applicability to NAAQS attainment are shown in Table 3. All valid data from designated primary monitors is used in the derivation of NAAQS design values. Additionally, valid data from collocated and supplemental monitors, respectively, are used to fill in any missing or invalidated scheduled or nonscheduled days for the primary monitor data used for computing the design values.



The filter-based FRM monitors operate at a one-in-six day frequency, except for at the two NCore sites, New Haven and Cornwall, which run on a one-in-three day schedule. As shown in Table 3, there are three primary PM<sub>2.5</sub> FRM monitors, so the collocated monitor in New Haven meets the collocation requirement of 15 percent of the network<sup>2</sup>. The FEM monitor in Bridgeport is designated as primary, collocated with FRM monitor, to meet collocation requirements for the FEM network<sup>3</sup> and to provide precision data. The FEM monitors in East Hartford McAuliffe Park, Groton Fort Griswold, Hartford Huntley Place, and Waterbury Bank Street are designated as primary monitors. The two Continuous FEM monitors in New Haven are used to provide precision data for the Teledyne T640X analyzers.

<sup>2</sup> 40 CFR 58 Appendix A 3.2.3

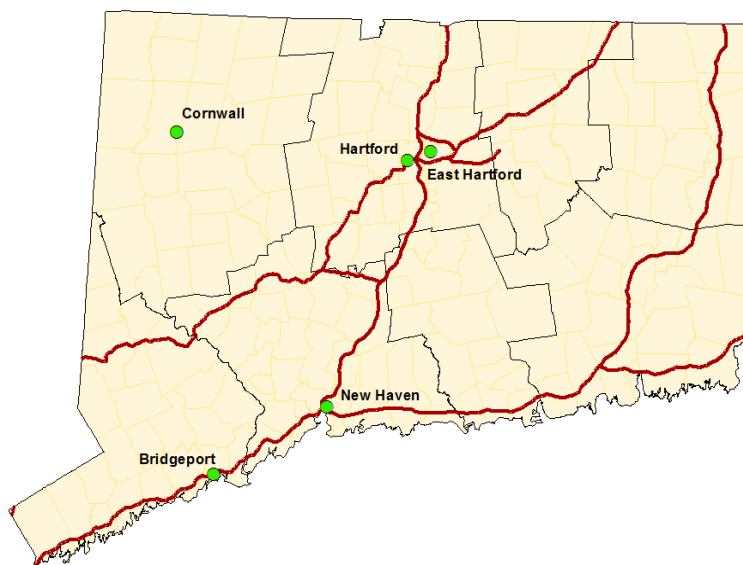
<sup>3</sup> Ibid.

**Table 3: DEEP PM<sub>2.5</sub> FRM/FEM Network Summary**

Site	Primary	Collocated	Supplemental
Bridgeport-Roosevelt Sch.	Continuous FEM	1-in-6 FRM	
Cornwall-Mohawk Mt.	1-in-3 FRM		Continuous FEM
Danbury-WCSU	1-in-6 FRM		Continuous FEM
East Hartford-McAuliffe Pk.	Continuous FEM		
Groton-Ft. Griswold	Continuous FEM		
Hartford-Huntley Pl.	1-in-6 FRM		Continuous FEM
New Haven-Criscuolo Pk.	1-in-3 FRM	1-in-6 FRM	2 Continuous FEMs
Waterbury-Bank St.	Continuous FEM		

**PM<sub>10</sub>/PM<sub>10-2.5</sub> Monitoring**

DEEP operates one PM<sub>10</sub>/PM<sub>10-2.5</sub> FRM sites in the air monitoring network using Thermo Partisol®-Plus 2025i sequential air samplers (RFPS-1298-127). The New Haven NCore site operates on a 1-in-3 day sample schedule. The New Haven site has a collocated PM<sub>10</sub> FRM sampler operating on a 1-in-6 day sample schedule. All primary and collocated PM<sub>10</sub> FRM samplers are paired with PM<sub>2.5</sub> FRM samplers for coarse PM (PM<sub>10-2.5</sub>). The New Haven site has PM<sub>10-2.5</sub> collocated FRM monitors, as requested by EPA as part of a minimum number of PM<sub>10-2.5</sub> collocated sites for data quality assessment.



In addition to the FRM PM<sub>10</sub> monitors, 8 sites have FEM Teledyne API T640 continuous PM mass monitors with 640X option for FEM PM<sub>10</sub> (EQPM-0516-239). The current PM<sub>10</sub> network configuration is shown in Table 4. The T640X analyzers produce 1-minute and 60-minute average PM<sub>2.5</sub>, PM<sub>10</sub> (at local (LC) and standard (STP) conditions of temperature and pressure) and PM<sub>10-2.5</sub> (coarse PM). Coarse PM is defined as thoracic PM having particle aerodynamic diameters between 2.5 and 10 microns, operationally defined as the difference PM<sub>10</sub> minus PM<sub>2.5</sub>.

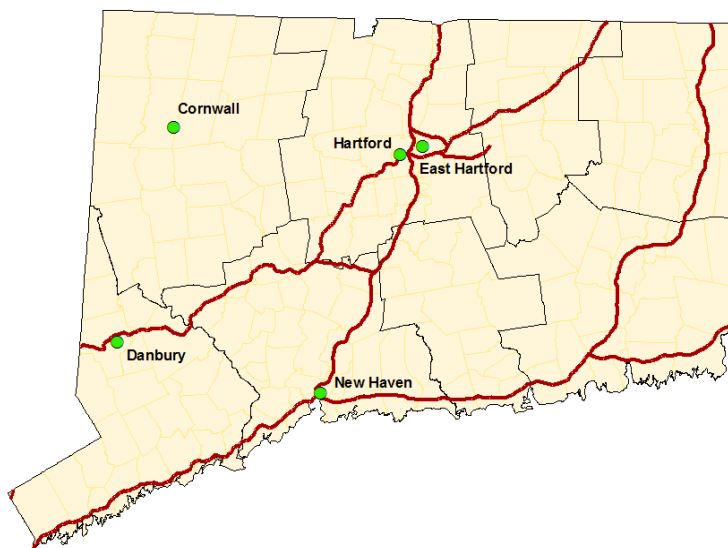
**Table 4: DEEP PM<sub>10</sub> Network Configuration**

Site	Primary	Collocated	Supplemental
Bridgeport-Roosevelt Sch.	Continuous FEM		
Cornwall-Mohawk Mt.	Continuous FEM		
Danbury-WCSU	Continuous FEM		
East Hartford-McAuliffe Pk.	Continuous FEM		
Groton-Ft. Griswold	Continuous FEM		
Hartford-Huntley Pl.	Continuous FEM		
New Haven-Criscuolo Pk.	1-in-3 FRM	1-in-6 FRM	2 Continuous FEMs
Waterbury-Bank St.	Continuous FEM		

### PM Speciation Monitoring

PM<sub>2.5</sub> chemical speciation measurements are obtained at five sites in the DEEP air monitoring network. These include filter-based daily composite 1-in-3 day samples at the 2 NCore sites, and continuous hourly black carbon at five sites.

The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitor is located at the Cornwall site and the Chemical Speciation Network (CSN) monitor is at the New Haven Criscuolo Park site. Both sites are operated on the standard EPA 1-in-3 day PM sample schedule and provide 24-hour integrated filter-base measurements.



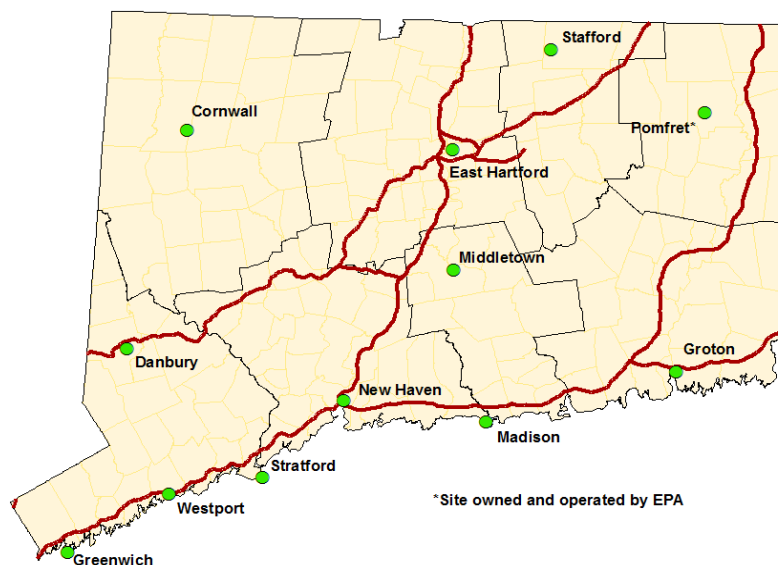
Black carbon (BC) and ultra-violet channel carbon (UVC), a wood smoke PM surrogate, are monitored at the Criscuolo Park, Cornwall, Hartford, East Hartford McAuliffe Park and Danbury WCSU sites using 7-channel TAPI Model 633 aethalometers. No changes are proposed to the PM speciation network during 2020-2021.



## Ozone Monitoring

DEEP operates eleven ozone sites in its air monitoring network for NAAQS compliance. The ozone analyzers at the Cornwall Mohawk Mountain, East Hartford McAuliffe Park and New Haven Criscuolo Park sites are operated year-round, while the remaining sites are operated during the EPA-defined ozone season, which for Connecticut is from March 1 to September 30. In addition to the DEEP network, EPA operates an ozone monitor in Abington (Pomfret) during the ozone season as part of its Clean Air Status and Trends (CASTNET) network.

NAAQS compliance ozone monitoring in the DEEP network is conducted using Teledyne-API Model T400 UV photometric ozone analyzers (method EQOA-992-087). Ozone measurements are sent to the EPA AIRNow website for AQI purposes on an hourly basis.



In addition to the NAAQS compliance monitors discussed above, DEEP deployed a portable ozone monitor (Teledyne API model 430) during the 2018 ozone season on a ferry operating between Bridgeport and Port Jefferson, NY. The ferry crosses Long Island Sound several times each day during daytime hours. Pending approval from the ferry owner, DEEP intends to deploy the same type of portable ozone monitor during the 2021 ozone season to complement planned research efforts in the greater New York/Long Island Sound area. The monitor is intended only for scientific study only and will not be used to determine NAAQS compliance.

## Ozone Enhanced Monitoring Plan

This section consists of the Enhanced Monitoring Plan (EMP) for Connecticut pursuant to 40 CFR sections 58.10 (a) (11) and 58 App D 5(h). These federal regulations, revised under the 2015 National Ambient Air Quality Standards (NAAQS) for ozone<sup>4</sup>, require that any state with any area designated moderate nonattainment or above, or any state within the Ozone Transport Region (OTR), submit an Enhanced Monitoring Plan for ozone (EMP) to the regional office of the Environmental Protection Agency (EPA) no later than October 1, 2019.

### Background

Recent ozone (O<sub>3</sub>) levels in Connecticut are generally the highest in the eastern U.S, placing all regions of the state in serious nonattainment for the 2008 ozone National Ambient Air Quality Standards (NAAQS). The southwestern three counties of the state (Connecticut portion of the New York-N. New Jersey-Long Island, NY-NJ-CT non-attainment area) have been designated moderate for the 2015 ozone NAAQS, while the remainder of the state is designated marginal, under the 2015

<sup>4</sup> FR 80 65292, October 26, 2015

NAAQS. These levels largely result from transport of ozone precursors into Connecticut from the south-west direction along the northeast urban corridor. Modeling and other analyses have shown significant contributions to ozone levels in Connecticut from sources both inside and outside of the greater New York and greater Connecticut nonattainment areas<sup>5</sup>.

DEEP has documented through numerous public comment submissions, communications and even litigation, that EPA<sup>6</sup> must implement the Clean Air Act provisions designed to address interstate air pollution transport before Connecticut can reasonably expect to attain either the 2008 or 2015 ozone NAAQS in the Connecticut portion of the Northern New Jersey – New York – Connecticut nonattainment area. Nonetheless, EPA continues to fail to adopt sufficiently stringent national measures to control ozone precursor emissions or enforce the tools EPA claims the states possess (CAA section 176A or 126 petitions or the section 110(a)(2)(D) good neighbor provisions). As such, DEEP is proposing monitoring activities under this EMP to increase the scientific knowledge and understanding of the fate and transport mechanisms of ozone and related ozone precursor pollutants in this region, with specific attention to impacts of the water-land boundary. DEEP expects the data from these enhanced monitoring activities will further clarify the critical role that interstate air pollution transport plays in the Northern New Jersey-New York-Connecticut and Greater Connecticut nonattainment areas and further inform the development and implementation of meaningful national programs that will protect public health and the environment.

The 2015 O<sub>3</sub> NAAQS amended monitoring requirements for the Photochemical Air Monitoring Stations (PAMS) network. Previously, Connecticut operated PAMS volatile organic compounds (VOC) monitors at three sites: East Hartford McAuliffe Park, New Haven Criscuolo Park and Westport Sherwood Island State Park. The revised rule now requires VOC monitoring at all National Core (NCore) monitoring sites in Core-Based Statistical Areas (CBSAs) having populations greater than 1 million. In addition, areas with moderate or higher levels of O<sub>3</sub> nonattainment, as well as all areas within the Ozone Transport Region (OTR), are required to develop Enhanced Monitoring Plans (EMPs). EMPs are required to provide for any additional monitoring beyond the minimum requirements for State and Local Air Monitoring Stations (SLAMS) that would be beneficial in identifying pollutant levels, sources, transport and progress towards attainment. The EMP mandate is intended to provide state and local environmental agencies an opportunity to implement additional monitoring beyond SLAMS that addresses the particular needs of nonattainment areas not explicitly covered under the revised PAMS network.

### **Strategic Approach and Objectives**

State and local environmental agencies have conducted considerable surface monitoring of O<sub>3</sub>, O<sub>3</sub> precursors [e.g.: nitrogen oxides (NO, NO<sub>2</sub>, NO<sub>x</sub>, NO<sub>y</sub>), volatile organic compounds (VOCs)] and meteorological parameters for many years as part SLAMS and PAMS networks. Current strategies for analyzing O<sub>3</sub> production and transport are typically based on computer modeling with source emissions and meteorological inputs, where high resolution speciated VOC data have limited usefulness in model development or validation.

PAMS monitoring programs also include, in addition to VOCs, three carbonyls that are more typically abundant: formaldehyde, acetaldehyde and acetone. The most significant of these, formaldehyde (HCHO), has been used extensively as a proxy for VOC free radical formation in research and analyses on tropospheric ozone<sup>7</sup>. Given the understanding that O<sub>3</sub> formation may be sensitive to changes in either VOCs (VOC limited regime) or NO<sub>x</sub> (NO<sub>x</sub> limited regime), as demonstrated with photochemical

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<sup>5</sup> FR 82 1733, January 6, 2017

<sup>6</sup> [Greater CT Ozone Attainment Demonstration for the 2008 NAAQS](#)

<sup>7</sup> Jin, X et. al, 2017, Evaluating a Space-Based Indicator of Surface Ozone-NO<sub>x</sub>-VOC Sensitivity Over Midlatitude Source Regions and Application to Decadal Trends, J. of Geophysical Research, 122 (19) 10,439-10,461



numeric computer models, the ratio of HCHO to NO<sub>2</sub> from ambient air monitoring during high O<sub>3</sub> events can be key in the validation of computer modeling approaches.

In addition to monitoring strategies aimed at understanding aspects of the regional O<sub>3</sub> chemistry, collecting data that clearly show the spatial variability of surface O<sub>3</sub> concentrations is critical to developing approaches to address non-attainment in Connecticut. DEEP maintains an extensive network of O<sub>3</sub> monitoring sites, particularly along its prevailing upwind (south-southwestern) border to effectively track ozone plumes transported into the state, and these sites consistently show the highest ozone concentrations in Connecticut.

### **Proposed Enhanced Monitoring Activities**

DEEP is proposing the following activities and resource commitments to meet the objectives for enhanced monitoring under this EMP. DEEP believes these proposed actions meet the requirements of the EMP and will assist DEEP's ongoing efforts toward assessing and understanding ozone nonattainment issues in Connecticut:

- Continued operation of two additional O<sub>3</sub> monitors beyond those minimally required for the State and Local Air Monitoring Station (SLAMS) in the Bridgeport-Stamford-Norwalk Core-Based Statistical Area (CBSA).
- Continued operation of one additional ozone monitor beyond those minimally required in the Hartford-West Hartford-East Hartford CBSA.
- Continued operation of one additional NO<sub>2</sub> monitor, located at the Westport Sherwood Island State Park site.
- Targeted deployment of a compact O<sub>3</sub> monitor on one of the Bridgeport, CT – Port Jefferson, NY ferries crossing the Long Island Sound to assist scientific research of ozone fate and transport mechanisms in the greater New York-Long Island Sound region.
- Installation of one HCHO continuous monitor at the Westport site.
- Installation and operation of two ceilometers, at Westport and New Haven, for atmospheric mixing height (boundary layer depth).
- Provision of on-site technical support for EPA's Pandora spectrophotometers, which continuously monitor total column NO<sub>2</sub> and HCHO, at three coastal monitoring sites (Westport Sherwood Island, New Haven Criscuolo Park and Madison Hammonasset State Park).
- Provision of technical and/or financial support for select scientific or engineering research projects that have the potential to further develop understanding of the mechanisms of ozone production and transport impacting Connecticut. For example, DEEP participated in the multi-faceted LISTOS (Long Island Sound Tropospheric Ozone Study) project in 2017 – 2018. In particular, DEEP hosted enhanced surface and upper air monitoring at multiple coastal sites. In addition, DEEP (1) contracted with Stony Brook University for a study to characterize the meteorology of the Long Island Sound region; (2) contributed funding and planning support for air quality and meteorological monitoring from a light aircraft during multiple high ozone episodes; and (3) contributed funding for continuous VOC monitoring on the north shore of Long Island, which was conducted by Stony Brook University.

DEEP has participated as a joint effort with multiple state and federal agencies, academic researchers, non-governmental organizations and private businesses in the development, planning and implementation of these activities. Figure 2 shows the proposed DEEP monitoring network with EMP activities included.

### **SLAMS Ozone Monitoring**

The ozone monitoring requirements in 40 CFR 58 for state and local air monitoring stations (SLAMS) set minimum numbers of monitors based on ozone NAAQS design values and population for each core-based statistical area (CBSA). In addition, the months of the ozone season are determined for

each location, which for Connecticut is March through September. Ozone monitors at National Core (NCore) multipollutant sites operate year-round, using Teledyne API 400E analyzers (reference method ID EQOA-0992-087).

Minimum SLAMS ozone monitoring requirements are provided in Table D-2 of Appendix D, 40 CFR 58. An assessment for the Connecticut network, shown in Table 1 below, gives populations and design values for each CBSA. For both the Bridgeport-Stamford-Norwalk and Hartford-West Hartford-East Hartford CBSAs, a minimum of 2 monitors are required, while there are 4 and 3 monitors in each CBSA, respectively. DEEP proposes to consider these 3 additional monitors as part of this EMP.

**Table 5: Summary of Connecticut Ozone Monitoring Network Design Compliance**

CBSA	2016 Population (estimated)	Maximum 2017 design value	No. of required SLAMS monitors	Current no. of SLAMS monitors
Bridgeport-Stamford-Norwalk, CT	944,177	83	2	4
Hartford-West Hartford-East Hartford, CT	1,206,836	79	2	3
New Haven-Milford, CT	856,875	82	2	2
Norwich-New London, CT	269,801	76	1	1
Worcester, MA-CT	935,781	68	2	3
Torrington, CT	182,571	72	1	1



Figure 2: Map of CT DEEP SLAMS and Proposed EMP Monitoring

### **SLAMS NO<sub>2</sub> Monitoring**

Connecticut meets its regulatory NO<sub>2</sub> monitoring requirements for near road and area-wide monitors with two monitors in the Hartford CBSA. An additional NO<sub>2</sub> monitor required by the Regional Administrators for the protection of sensitive and vulnerable populations is located at the New Haven NCore site. A fourth monitor, located in Westport as part of the enhanced monitoring plan, is intended to provide further data to assist in understanding ozone precursor transport into Connecticut. All NO<sub>2</sub> monitors are Teledyne API T500U cavity attenuated phase shift spectroscopy (CAPS) (reference method ID EQNA-0514-212).

### **Long Island Sound Ferry-Based Monitoring**

In an effort to collect surface data on Long Island Sound, DEEP has conducted ozone monitoring on a ferry operating continuously during daytime hours between Bridgeport, CT and Port Jefferson, NY during the 2018 ozone season, to coincide with the most of the targeted monitoring associated with the Long Island Sound Tropospheric Ozone Study (LISTOS). Pending permission of the ferry owner, DEEP plans to deploy the monitor on the ferry during the 2021 season. The portable ozone monitoring modules are Teledyne API model 430 analyzers, equipped with battery back-up, global positioning system (GPS) sensor and cellular data transmission equipment.

### **Formaldehyde Monitoring**

DEEP intends to purchase and deploy a continuous automated formaldehyde (HCHO) sensor at Westport during the ozone monitoring season. HCHO measurements will be a complement to NO<sub>2</sub> measurements, as the ratio is an important indicator to assess whether the ozone production regime is VOC or NO<sub>x</sub> limited. The particular analyzer make or model is yet to be determined at this time.

### **Upper Air Measurements**

The planetary boundary layer (PBL) is the near-surface portion of the troposphere that is generally considered to be well mixed, such that pollutants emitted or created are more or less mixed but confined within the PBL. As such, lower boundary layer heights are associated with higher pollutant concentrations. The different radiative and absorptive capacities of land and water can affect the PBL height, also known as the mixing height (MH). Thus, coastal areas downwind of large water bodies may have higher concentrations than inland levels where the mixing heights are increased. DEEP is proposing to operate two ceilometers, at New Haven and Westport, for automated mixing height measurements. The ceilometers are model CL51, manufactured by Vaisala, Oyj, that operate based on optical backscattering by fine particulate aerosols that tend to concentrate just below the mixing height. The New Haven ceilometer has been in operation since November 2015, and the Westport ceilometer is expected to be purchased and deployed in 2020.

### **Long Island Sound Tropospheric Ozone Study**

Starting in 2017, and continuing through 2018, DEEP partnered with EPA, the National Aeronautics and Space Administration (NASA), the Northeast States for Coordinated Air Use Management (NESCAUM), other states and academic institutions to conduct field studies of O<sub>3</sub> atmospheric chemistry and transport in the greater New York – Long Island Sound – Connecticut area, with a particular focus on the mechanisms that result in the high O<sub>3</sub> levels observed along the Connecticut coastline. This study, named the Long Island Tropospheric Ozone Study (LISTOS)<sup>8</sup>, has utilized, in addition to the enhanced monitoring conducted by DEEP as described above (fixed site and ferry O<sub>3</sub>, NO<sub>2</sub> HCHO, MH), ground-based upper air monitoring, investigations into coastal meteorology, intensive upper air chemical and meteorological monitoring during high O<sub>3</sub> events, aircraft-based high resolution remote sensing of trace gases for source identification during high O<sub>3</sub> events, and ground-based episode monitoring of trace NO<sub>2</sub> and VOCs using a mobile laboratory.

LISTOS activities for which DEEP provided monetary or in-kind support include:

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<sup>8</sup> <http://www.nescaum.org/documents/listos/>



- Three Pandora spectrophotometers, located at the Madison, New Haven and Westport sites, for column  $\text{NO}_2$  and HCHO.
- An  $\text{O}_3$  Light Detection and Ranging (LIDAR) sensor, located at Westport from mid-July 2018 to the end of the  $\text{O}_3$  season, for upper air ozone concentration vertical profiling.
- Multiple balloon sonde launches at Westport for upper air ozone and meteorological profiling. Ozone sonde data will allow for calibration of the  $\text{O}_3$  LIDAR.
- Low altitude atmospheric meteorological and chemical monitoring with the University of Maryland (UMD) experimental light aircraft during several forecasted high  $\text{O}_3$  events. This was first conducted in 2017, and is planned for the 2018 and 2019 ozone seasons.
- An intensive meteorological study of the Long Island Sound region conducted by Stony Brook University. The study will use measurements collected from ground-based and aircraft wind field monitoring, combined with computer modeling, to determine atmospheric transport characteristics typical of high ozone events.
- A monitoring study of reactive VOCs by Stony Brook University based at a site located on the north shore of Long Island, approximately forty miles east of New York City. Surface ambient air monitoring will be conducted during selected high ozone events for VOC, trace gas and meteorological parameters. VOC analysis will employ Stony Brook's high resolution proton transfer time of flight mass spectrometer.

### Project Assessment and Future Planning

Assessment of the data generated by the LISTOS project will be ongoing, and most of the activities described above were planned only for the 2018 period. Additional monitoring may be deployed in the future if the results and analysis of LISTOS indicate that new directions of investigation are warranted to further characterize the regional  $\text{O}_3$  chemistry and transport.

### $\text{NO}_2$ and $\text{NO}/\text{NO}_x$ Monitoring

DEEP monitors nitrogen dioxide ( $\text{NO}_2$ ) at four sites in the monitoring network using Teledyne-API Model T500U (EQNA-0514-212), which are capable of directly measuring  $\text{NO}_2$  using cavity attenuated phase shift (CAPS) spectroscopy methodology. The  $\text{NO}_2$  monitors are maintained at Hartford Huntley Place, East Hartford McAuliffe Park, New Haven Criscuolo Park and Westport Sherwood Island State Park for regulatory compliance.

DEEP also operates two nitrogen oxide/total reactive oxides of nitrogen ( $\text{NO}/\text{NO}_x$ ) TAPI model T200U/501 monitors, at Cornwall Mohawk Mountain and New Haven Criscuolo Park, to comply with NCore requirements.  $\text{NO}_x$  is defined as

$\text{NO} + \text{NO}_2 + \text{NO}_z$ , where  $\text{NO}_z$  represents higher oxides of nitrogen. The major components of  $\text{NO}_z$  include nitrous acids [nitric acid ( $\text{HNO}_3$ ), and nitrous acid ( $\text{HONO}$ )], organic nitrates [peroxyl acetyl nitrate (PAN), methyl peroxyl acetyl nitrate (MPAN), and peroxyl propionyl nitrate, (PPN)], and particulate nitrates.

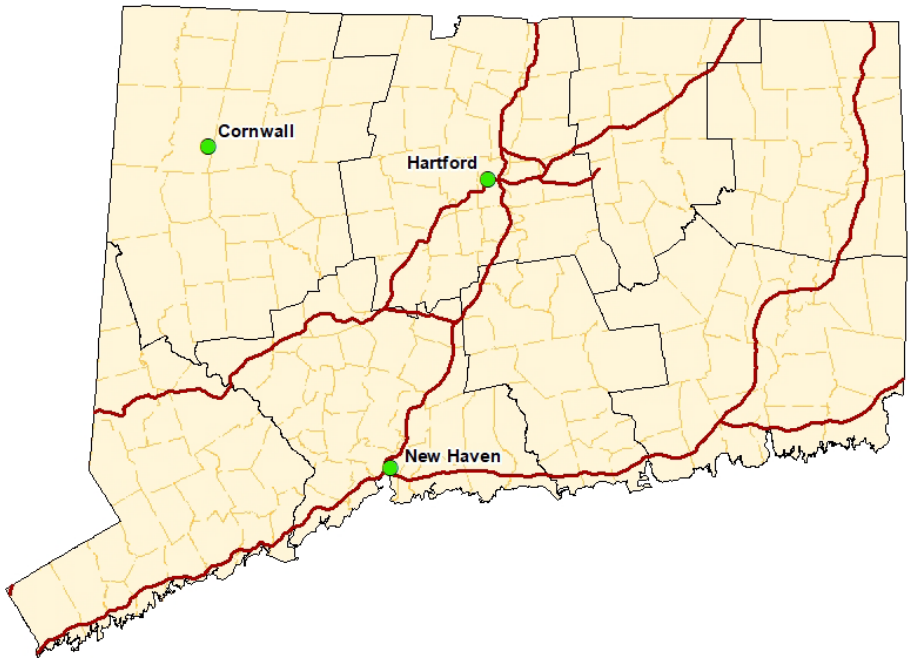


The  $\text{NO}_2$  and  $\text{NO}/\text{NO}_x$  networks fulfill requirements for NCore and SLAMS monitoring of these parameters. These requirements include: near road and area wide  $\text{NO}_2$  monitoring in a core-based statistical area (CBSA) with a population greater than 1,000,000 (Hartford and East Hartford sites, respectively);

nationwide NO<sub>2</sub> monitoring for susceptible and vulnerable populations at site selected by EPA (New Haven) and NCore NO/NO<sub>y</sub> monitoring (Cornwall and New Haven). The Westport NO<sub>2</sub> monitor is operated in fulfillment of Connecticut's enhanced monitoring plan.

## CO Monitoring

DEEP operates three carbon monoxide (CO) sites in the air monitoring network, as shown on the map at right. All CO samplers are operated year-round and employ TEI 48i- TLE analyzers (RFCA-0981-054), which DEEP is transitioning to TEI 48iQ analyzers (RFCA-0981-054). Of the 3 sites, New Haven and Cornwall satisfy the requirement for CO monitoring at NCore sites and Hartford fulfills requirements for co-location with an NO<sub>2</sub> near road monitor in a CBSA having a population greater than 1 million.<sup>9</sup> The EPA Regional Administrator has not indicated any locations in the state for additional CO monitoring aimed at susceptible and vulnerable populations.

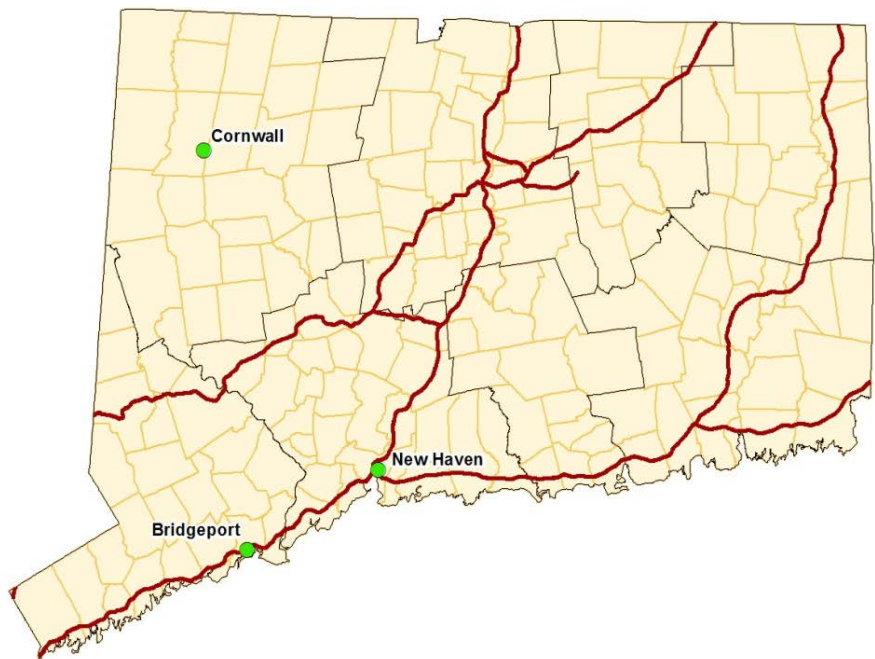


## SO<sub>2</sub> Monitoring

DEEP currently operates three sulfur dioxide (SO<sub>2</sub>) sites in the air monitoring network

All samplers are TEI 43i-TLE SO<sub>2</sub> analyzers (EQSA-0486-060) and are operated year-round. Both 1-hour average and 5-minute block average SO<sub>2</sub> data are validated and reported to EPA. DEEP is replacing the older 43i-TLE units with TEI 43iQTL SO<sub>2</sub> analyzers (EQSA-0486-060).

The network requirements for SO<sub>2</sub> monitoring include NCore, population-weighted emissions index (PWEI) and Regional Administrator-required monitoring.<sup>10</sup> The Cornwall and



<sup>9</sup> [76 FR 54294; August 31, 2011](#)

<sup>10</sup> [75 FR 35520; June 22, 2010](#)

New Haven sites satisfy the NCore SO<sub>2</sub> requirement.

Table 6 shows the PWEI values for CBSAs that are within or intersecting Connecticut, based on the 2014 National Emissions Inventory and US Census Bureau 2015 county population estimates. The SO<sub>2</sub> NAAQS monitoring requirements based on PWEI values state that a monitor is required in areas having PWEI values greater than or equal to 5,000 MMperson-tons/yr. Therefore, no PWEI SO<sub>2</sub> monitors are currently required in the state. In addition, the EPA has not indicated any additional SO<sub>2</sub> monitors in areas having the potential to violate the NAAQS, areas where vulnerable or sensitive populations may be impacted, or near large sources not conducive to modeling. We also note that the SO<sub>2</sub> primary design values, as provided in an earlier section of this Network Plan, range from 2 to 4 ppb, and are well below the 1-hour NAAQS of 75 ppb.

Although not covered by PWEI requirements, DEEP intends to continue SO<sub>2</sub> monitoring at Bridgeport Roosevelt School at this time, given that it is located in an area of higher concentrations, vulnerable and sensitive populations and a large emission source. The source, Bridgeport Harbor Unit 3, is scheduled for a complete shutdown in 2021.

**Table 6: Population Weighted Emissions Index (PWEI) Values for Connecticut CBSAs**

Core-Based Statistical Area (CBSA)	SO <sub>2</sub> (tpy)	Population	PWEI (MMperson- tons/yr)
Bridgeport-Stamford-Norwalk, CT	3573.11	948053	3387
Hartford-West Hartford-East Hartford, CT	3762.76	1211324	4558
Torrington, CT	731.01	183603	134
New Haven-Milford, CT	2690.13	859470	2312
Norwich-New London, CT	1209.38	271863	329
Worcester, MA-CT	2258.63	935536	2113

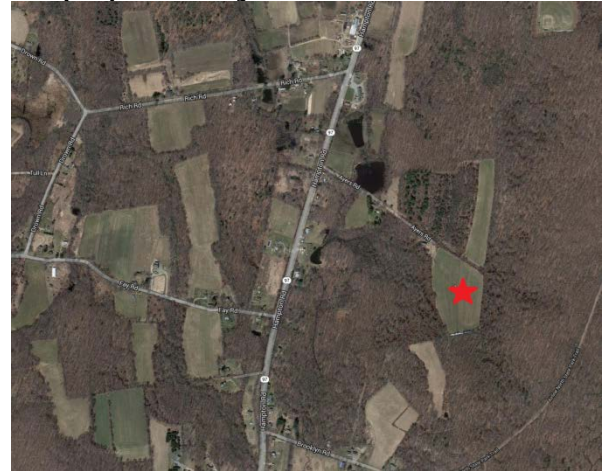
## Detailed Site Information

The following section presents detailed information for each monitoring site, such as: identification code, location, history, monitored parameters, monitoring objectives, history and descriptive information.

Town – Site: **Pomfret – Abington**  
 County: **Windham** Latitude: **41.84046°**  
 Address: **80 Ayers Road** Longitude: **-72.010368°**  
 AQS Site ID: **09-015-9991** Elevation: **209 m (686 ft)**  
 Spatial Scale: **Regional** Year Established: **1993**  
 Statistical Area: **CBSA Willimantic, CT**



**This site is not under the operational control or purview of DEEP and is included in this Network Plan for informational purposes only**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NOx	NO/NOy	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
											X													

X=Existing P = Planned in 2019/20 T = Proposed to terminate in 2019/2020

**Site Description:** The Abington site is a regional-scale site located in a rural/agricultural area in northeast Connecticut in the town of Pomfret. This site is operated by the National Park Service under the direction of EPA as part of their Clean Air Status and Trends Network (CASTNET). It is located on a hilltop approximately 2.3 km south of State Route (SR) 44 and 0.6 km east of SR 97. The site includes a portable shed located in the center of an agricultural field that is surrounded by forest. DEEP tracks ambient air quality and quality assurance data from the site but is not responsible for site operations and planning.

**Monitoring Objectives:** The Abington monitoring site objective is to collect ozone measurements to assess long-term trends as part of the national CASTNET network. The site will also be used to determine compliance with the ozone NAAQS in Windham County.

**Planned changes for 2020-2021:** This site is not under the operational control or purview of DEEP and is included in this Network Plan for informational purposes only.



Town – Site: **Bridgeport – Roosevelt School**  
 County: **Fairfield** Latitude: **41.17086°**  
 Address: **Park Avenue** Longitude: **-73.19476°**  
 AQS Site ID: **09-001-0010** Elevation: **7 m (23 ft)**  
 Spatial Scale: **Neighborhood** Year Established: **1982**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO2	NO/NO2/NOx	NO/NOy	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
	1/6	X			X							X										X		

X=Existing **P** = Planned in 2020/21 **T** = Proposed to terminate in 2020/21

**Site Description:** The Roosevelt School site is a neighborhood-scale site located in southwestern Connecticut in the city of Bridgeport. This site is located 50 m to the north of I-95 and 200 m to the west of the I-95 and Rte 8 interchange. This coastal site is located in a schoolyard and residential neighborhoods are present in every direction of the site. This site meets all siting requirements and criteria and has been approved internally by DEEP and independently by EPA Region I.

**Monitoring Objectives:** The Bridgeport Roosevelt School monitoring site objectives include collecting continuous FEM PM<sub>2.5</sub> measurements for compliance purposes and for AQI and forecasting purposes. The PM<sub>2.5</sub> FEM is designated as the primary sampler to for NAAQS.

**Planned changes for 2020-2021:** DEEP proposes no changes in 2020-2021

Town – Site: **Cornwall – Mohawk Mountain**  
 County: **Litchfield** Latitude: **41.82140°**  
 Address: **Mohawk Mountain** Longitude: **-73.29733°**  
 AQS Site ID: **09-005-0005** Elevation: **505 m (1656 ft)**  
 Spatial Scale: **Regional** Year Established: **1988**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO2	NO/NO2/NOx	NO/NOy	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
1/3		X			X				1/3	X	X	X	X			X			X	X	X	X	X	X

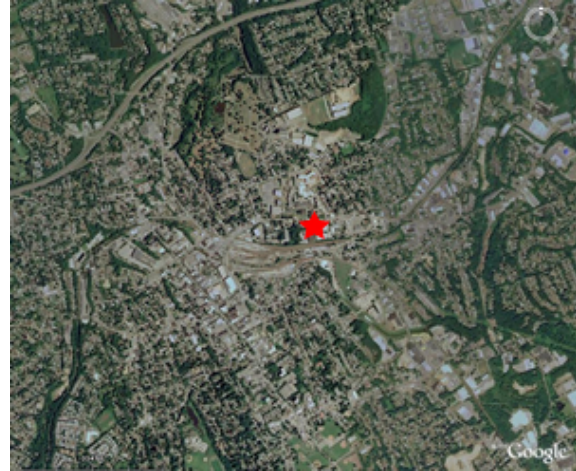
X=Existing    **P** = Planned in 2020/21    **T** = Proposed to terminate in 2020/2021

**Site Description:** The Mohawk Mountain site is a rural regional-scale site located in northwestern Connecticut in the town of Cornwall. The site is located at the summit of Mohawk Mountain with an elevation of 505 m (1656 ft), and is approximately 17 km to the east of the New York border and 25 km to the south of the Massachusetts border. This site meets all siting requirements and criteria and has been approved by EPA as an NCore site.

**Monitoring Objectives:** The primary monitoring objectives are to meet NCore requirements for O<sub>3</sub>, CO, SO<sub>2</sub>, NO, NO<sub>y</sub>, PM<sub>2.5</sub> FRM, PM<sub>10</sub> FRM, PM<sub>10-2.5</sub> FRM, PM<sub>2.5</sub> speciation, continuous PM<sub>2.5</sub> and surface meteorology. PM<sub>2.5</sub> chemical speciation measurements are collected through the IMPROVE network as one-in-three day 24-hour samples and by continuous analyzers for fine particulate carbon parameters (BC/UVC).

**Planned changes for 2020-2021:** None.

Town – Site: **Danbury – Western Connecticut State University**  
 County: **Fairfield** Latitude: **41.398692°**  
 Address: **White Street** Longitude: **-73.443148°**  
 AQS Site ID: **09-001-1123** Elevation: **116 m (380 ft)**  
 Spatial Scale: **Neighborhood** Year Established: **1974**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NOx	NO/NOy	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
1/6		X			X					X	X								X	X	X		X	

X=Existing P = Planned in 2020/21 T = Proposed to terminate in 2020/2021

**Site Description:** The Western Connecticut State University (WCSU) site is a neighborhood-scale site for PM<sub>2.5</sub> and an urban-scale site for O<sub>3</sub>, located in western Connecticut in the city of Danbury. This site is located on the top level of a parking garage on the WCSU campus. This site is located approximately 140 m to the southeast of I-84 on White Street. Residential neighborhoods are located in all directions of the site. This site meets all siting requirements and criteria and has been approved by EPA Region I. The downtown area of Danbury has a generally bowl-shaped topography, and therefore is subject to occasional high PM<sub>2.5</sub> events during the winter.

**Monitoring Objectives:** The Danbury WCSU monitoring site objectives include collecting PM<sub>2.5</sub> and PM<sub>10</sub>/PM<sub>10-2.5</sub> measurements for NAAQS compliance and for AQI forecasting purposes. Ozone is measured at the Danbury site for compliance assessment and AQI forecast reporting. Black carbon (BC/UVC) aethalometer monitoring is included to track the wood smoke contribution to PM pollution.

**Planned changes for 2020-2021:** None.





	PM2.5 (FRM)	
	PM2.5 (FRM, Collocated)	
×	PM2.5 (Continuous - FEM)	
	PM10/PM-Coarse (FRM)	
	PM10/PM-Coarse (FRM, Collocated)	
×	PM10/PM-Coarse (Continuous)	
	Lead-PM10	
	Lead-PM10 (Collocated)	
	PM Speciation (cSN)	
	PM Speciation (IMPROVE)	
×	PM2.5 Carbon (BC/UVC, Continuous)	
×	Ozone	
	SO2	
	CO	
×	Direct NO2	
	NO/NO2/NOx	
	NO/NOy	
	VOCs (PAMS)	
	Traffic Count	
×	Wind Speed	
×	Wind Direction	
×	Temperature	
×	Dew Point / Rel. Humidity	
×	Barometric Pressure	
	Solar Radiation	

X=Existing    **P** = Planned in 2020/21    **T** = Proposed to terminate in 2020/2021

**Monitoring Objectives:** The East Hartford McAuliffe Park monitoring site objectives include collecting PM<sub>2.5</sub> and PM<sub>10</sub>/PM<sub>10-2.5</sub> measurements for NAAQS compliance and AQI forecasting purposes using continuous FEM samplers. Ozone is measured at the McAuliffe Park site for compliance assessment and AQI and forecast reporting. The NO<sub>2</sub> monitor meets the requirement for area-wide monitoring in the Hartford-West Hartford-East Hartford CBSA.

**Planned changes for 2020-2021:** There are no proposed changes in 2020-2021





X=Existing    **P** = Planned in 2020/21    **T** = Proposed to terminate in 2020/2021

**Monitoring Objectives:** The Groton Fort Griswold monitoring site objectives include monitoring of the two key pollutants, ozone and PM<sub>2.5</sub>, for the southeastern part of Connecticut. Ozone is measured at the Fort Griswold site for compliance assessment and AQI and forecast reporting. PM<sub>2.5</sub> is currently monitored NAAQS compliance and AQI reporting. The FEM monitor is designated as primary.

Planned changes for 2020-2021: None



Town – Site: **Hartford – Huntley Place**  
 County: **Hartford** Latitude: **41.771444°**  
 Address: **10 Huntley Place** Longitude: **-72.679923°**  
 AQS Site ID: **09-003-0025** Elevation: **57.2 m (187.7 ft)**  
 Spatial Scale: **Near Road** Year Established: **2013**  
 Statistical Area: **CSA (Hartford-West Hartford-Willimantic)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NO <sub>x</sub>	NO/NO <sub>y</sub>	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
1/6		X			X					X			X	X				X	X	X	X		X	

X=Existing **P** = Planned in 2020/21

**T** = Proposed to terminate in 2020/2021

**Site Description:** The Huntley Place site is a near-road site located in north central Hartford. The site, located on the north west side of US I-84, is approximately 0.25 km to the west of the US I-91 corridor and the Founders and Buckley Bridges over the Connecticut River. Residential neighborhoods are located to the north, east and west of the site. This site meets all siting requirements for a near-road NO<sub>2</sub> site, and has been approved by EPA.

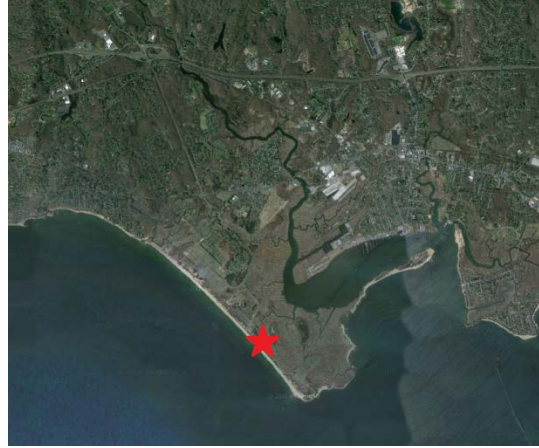
**Monitoring Objectives:** The primary monitoring objectives for the site are to capture NO<sub>2</sub> concentrations near heavily trafficked roads, to assess area-wide NO<sub>2</sub> concentrations, and to assess NO<sub>2</sub> concentrations for vulnerable and susceptible populations in adjacent neighborhoods. The data will also be used to help determine compliance with the 1-hour NO<sub>2</sub> NAAQS as established by EPA in 2010. This site also collects CO, FRM PM<sub>2.5</sub>, continuous FEM PM<sub>2.5</sub> & PM<sub>10</sub>, BC/UVC and traffic counts.

**Planned changes for 2020-2021:** None

Town – Site:

**Madison – Hammonasset State Park**

County: **New Haven**      Latitude: **41.25984°**  
 Address: **Hammonasset SP**      Longitude: **-72.55018°**  
 AQS Site ID: **09-009-9002**      Elevation: **3 m (10 ft)**  
 Spatial Scale: **Regional**      Year Established: **1981**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NOy	VOCs (PAMS)	Total Column NO <sub>2</sub> /HCHO	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
											X						X	X	X	X			

X=Existing

**P**

= Planned in 2020/21

**T**

= Proposed to terminate in 2020/2021

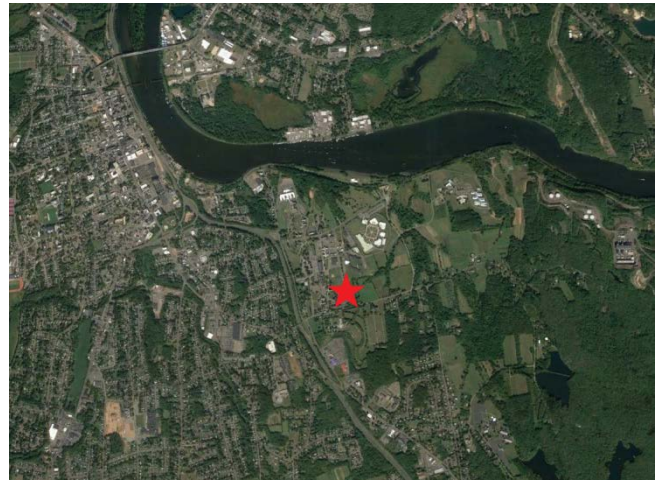
**Site Description:** The Hammonasset State Park site is a regional-scale site located in central coastal Connecticut in the town of Madison. This site is located approximately 1.5 km to the south of Rte 1 and 3.0 km to the south of I-95 on the Long Island Sound. Residential neighborhoods are located primarily to the northeast, north and northwest of the site. This site meets all siting requirements and criteria and has been approved internally by DEEP and independently by EPA Region I.

**Monitoring Objectives:** The Madison Hammonasset State Park monitoring site objective is to collect ozone measurements for compliance assessment and AQI forecast reporting. A second objective is to collect data in support of the Enhanced Monitoring Plan (Appendix B of this Network Plan) for research on regional ozone transport.

**Planned changes for 2020-2021:** None.



Town – Site: **Middletown – Connecticut Valley Hospital**  
 County: **Middlesex** Latitude: **41.55224°**  
 Address: **Shew Hall** Longitude: **-72.63004°**  
 AQS Site ID: **09-007-9007** Elevation: **58 m (190 ft)**  
 Spatial Scale: **Neighborhood** Year Established: **1980**  
 Statistical Area: **CSA (Hartford-West Hartford-Willimantic)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NOx	NO/NOy	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
											X								X	X	X		X	

X=Existing **P** = Planned in 2020/2021

**T** = Proposed to terminate in 2020/2021

**Site Description:** The Middletown Connecticut Valley Hospital (CVH) site is an urban-scale ozone site located in central Connecticut. This site is located approximately 0.2 km to the east of Rte 9. Residential neighborhoods are located to the west, north and south of this site. This site meets all siting requirements. DEEP relocated the site within the CVH campus to a shed near Battelle Hall in 2017.

**Monitoring Objectives:** The CVH monitoring site objective is to collect ozone measurements for compliance assessment and AQI forecast reporting.

**Planned changes for 2020-2021:** None.

Town – Site: **New Haven – Criscuolo Park**  
 County: **New Haven** Latitude: **41.30117°**  
 Address: **1 James Street** Longitude: **-72.90288°**  
 AQS Site ID: **09-009-0027** Elevation: **3 m (10 ft)**  
 Spatial Scale: **Neighborhood** Year Established: **2004**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (FEM, Continuous)	PM2.5 (Cont. FEM, secondary)	PM10/PM-Coarse (Cont. FEM, secondary)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>y</sub>	VOCs (PAMS)	Total Column NO <sub>2</sub> /HCOC	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation	Mixing Height
1/3	1/6	X	1/3	1/6	X	X	X	1/3		X	X	X	X	X	X		X	X	X	X	X	X	X	X

X=Existing

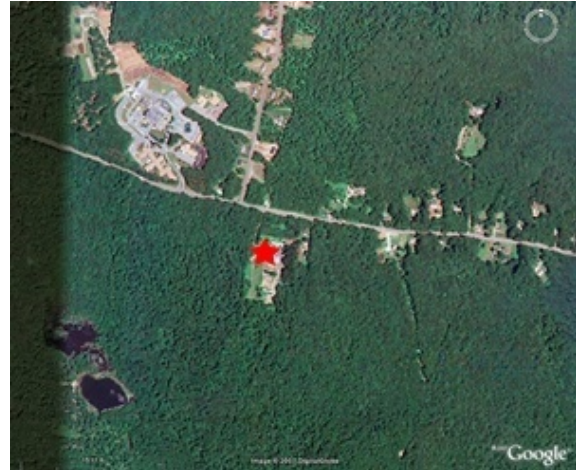
P = Planned in 2020/21

T = Proposed to terminate in 2020/2021

**Site Description:** The Criscuolo Park site is a neighborhood-scale site located on the western side of the city of New Haven. The site is approximately 0.25 km to the north of the I-95 Quinnipiac River Bridge. The site is approximately 1.0 km to the east of the I-91 and I-95 interchange. Bulk petroleum transfer stations are located 0.3 to 2.0 km to the south of the site. Residential neighborhoods are located to the west, north and east of the site.

**Monitoring Objectives:** The primary monitoring objectives are to meet NCore requirements for O<sub>3</sub>, CO, SO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, PM<sub>10-2.5</sub>, PM<sub>2.5</sub> speciation, NO/NO<sub>y</sub> and surface meteorology. NO<sub>2</sub> monitoring is conducted in fulfillment of the requirement for NO<sub>2</sub> monitoring of vulnerable and sensitive populations at 40 nationwide sites selected by the Regional Administrators. PM<sub>2.5</sub> chemical speciation measurements are collected through the Chemical Speciation Network (CSN) as one-in-three day 24-hour samples and by continuous analyzers for fine particulate carbon parameters (BC/UVC and EC/OC) and sulfate.

**Planned changes for 2020-2021:** There are no planned changes in 2020-2021.



	PM2.5 (FRM)
	PM2.5 (FRM, Collocated)
	PM2.5 (Continuous - FEM)
	PM10/PM-Coarse (FRM)
	PM10/PM-Coarse (FRM, Collocated)
	PM10/PM-Coarse (Continuous)
	Lead-PM10
	Lead-PM10 (Collocated)
	PM Speciation (CSN)
	PM Speciation (IMPROVE)
	PM2.5 Carbon (BC/UVC, Continuous)
×	Ozone
	SO2
	CO
	Direct NO <sub>2</sub>
	NO/NO <sub>2</sub> /NO <sub>x</sub>
	NO/NO <sub>y</sub>
	VOCs (PAMS)
	Traffic Count
×	Wind Speed
×	Wind Direction
×	Temperature
	Dew Point / Rel. Humidity
	Barometric Pressure
	Solar Radiation

X=Existing	P	= Planned in 2020//21	T	= Proposed to terminate in 2020/2021
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**Site Description:** The Shenipsit State Forest site is a regional-scale site that is located in northern Connecticut in the town of Stafford. The site is approximately 100 m to the south of Rte 190, 17 km to the east of I-91 and 12 km to the southwest of I-84. This site is located 34 km to the northeast of the city of Hartford. This site meets all siting requirements and criteria and has been approved internally by DEEP and independently by EPA Region 1.

**Monitoring Objectives:** The Stafford Shenipsit State Forest monitoring site objective is to collect ozone measurements for compliance assessment and AQI forecasting purposes.

Planned changes for 2020-2021: None.



Town – Site: **Stratford – Lighthouse**  
 County: **Fairfield** Latitude: **41.15181°**  
 Address: **Prospect Drive** Longitude: **-73.10334°**  
 AQS Site ID: **09-001-3007** Elevation: **3 m (10 ft)**  
 Spatial Scale: **Regional** Year Established: **1980**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	
PM2.5 (FRM, Collocated)	
PM2.5 (Continuous - FEM)	
PM10/PM-Coarse (FRM)	
PM10/PM-Coarse (FRM, Collocated)	
PM10/PM-Coarse (Continuous)	
Lead-PM10	
Lead-PM10 (Collocated)	
PM Speciation (CSN)	
PM Speciation (IMPROVE)	
PM2.5 Carbon (BC/UVC, Continuous)	
Ozone	X
SO2	
CO	
Direct NO <sub>2</sub>	
NO/NO <sub>2</sub> /NO <sub>x</sub>	
NO/NO <sub>y</sub>	
VOCs (PAMS)	
Traffic Count	
Wind Speed	
Wind Direction	
Temperature	X
Dew Point / Rel. Humidity	
Barometric Pressure	
Solar Radiation	

X=Existing **P** = Planned in 2020/21 **T** = Proposed to terminate in 2020/2021

**Site Description:** The Stratford Lighthouse site is a regional-scale site located in southwestern Connecticut in the town of Stratford. This is a coastal site that is located 4.5 km to the southeast of I-95 and is directly on the Long Island Sound. This site is approximately 45 km to the northeast of the New York State border. This site meets all siting requirements and criteria and has been approved internally by DEEP and independently by EPA Region I.

**Monitoring Objectives:** The Stratford Lighthouse monitoring site objective is to collect ozone measurements for compliance assessment and AQI forecasting purposes.

**Planned changes for 2020-2021:** None

Town – Site: **Waterbury – Bank Street**  
 County: **New Haven** Latitude: **41.55046°**  
 Address: **Meadow & Bank** Longitude: **-73.04365°**  
 AQS Site ID: **09-009-2123** Elevation: **80 m (269 ft)**  
 Spatial Scale: **Neighborhood** Year Established: **1975**  
 Statistical Area: **CSA (New York-Newark-Bridgeport)**



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NO <sub>x</sub>	NO/NO <sub>y</sub>	VOCs (PAMS)	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
		X			X														X	X	X			

X=Existing

P

= Planned in 2020/21

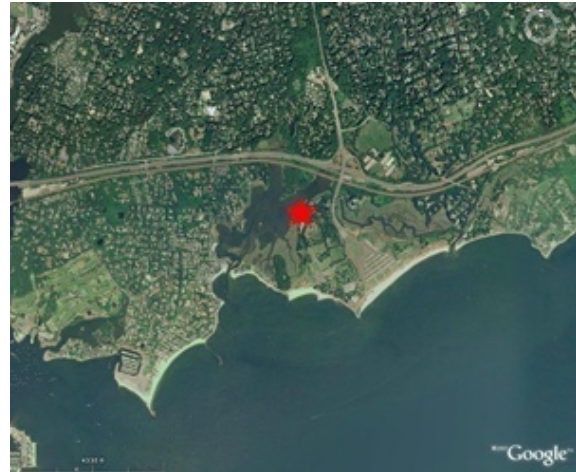
T

= Proposed to terminate in 2020/2021

**Site Description:** The Waterbury site is a neighborhood-scale site located in western Connecticut at Meadow Street and Bank Street in the Naugatuck River Valley. This site is approximately 170 m to the south of I-84, 300 m to the east of Rte 8 and 0.75 km to the east of the I-84 and Rte 8 interchange. Residential neighborhoods are located in all directions of the site. This site meets all siting requirements and criteria and has been approved internally by DEEP and independently by EPA Region I.

**Monitoring Objectives:** The Waterbury Bank Street site monitoring objectives include collecting PM<sub>2.5</sub>/PM<sub>10</sub> FEM measurements for compliance purposes and AQI forecast reporting.

**Planned changes for 2020-2021:** None



X=Existing    **P** = Planned in 20/21    **T** = Proposed to terminate in 2020/2021

**Planned changes for 2020-2021:** A total column NO<sub>2</sub> (and other trace gas) analyzer, operated by EPA, was installed in May 2018 to support studies of ozone fate and transport in the Long Island Sound/Coastal Connecticut region. A continuous HCHO analyzer and mixing height is also planned to be installed.

## Appendix A: Network Plan Public Comments and Responses

Comments received from Bob Judge, US EPA Region 1, on June 12, 2020:

1. We acknowledge the following overall changes to your network, on page 3:

***Proposed Network Changes:***

*In addition to infrastructure maintenance and improvements, DEEP proposes the following changes to the monitoring network during the period 2020-2021:*

*- Deploy a portable ozone monitor on a ferry operating between Bridgeport and Port Jefferson, NY during the 2021 ozone season. The ferry crosses Long Island Sound several times each day during daytime hours.*

*- Commence formaldehyde (HCHO) monitoring at Westport, possibly during 2020 or 2021, pending acceptable commercially available models\*.*

*- Commence mixing height monitoring at Westport during the period 2020 – 2021\*.*

*\* Note: These two proposed changes were previously requested in the 2018 Network Plan as part of the Enhanced Monitoring Plan, which was submitted one year in advance as requested by EPA.*

**CT DEEP response:** *No response needed.*

2. EPA acknowledges the implementation of the changes that were made pursuant to our August 15, 2019 ANP approval. In addition, EPA approved your Enhanced Monitoring Plan on October 25, 2018 which included the 2 planned activities at Westport (described above), and the continued deployment of a portable ozone monitor on (at least) one ferry operating between Bridgeport, CT and Port Jefferson, NY.

**CT DEEP response:** *No response needed.*

3. Pages 6-8. EPA released design values for all criteria pollutants in May of 2020 which includes 2019 data for the entire country. All design values represented here are consistent with those values with the exception of carbon monoxide relative to the 1- hour standard. (We also note that for PM<sub>10</sub> the standard is based on exceedances.) <https://www.epa.gov/air-trends/air-quality-design-values#report>

**CT DEEP response:** *The carbon monoxide 1-hour design values have been revised to align with the values released by EPA in May of 2020, which were derived based on 2018-2019 data (2-year maximum of the annual second maximum values).*

4. Pages 9-11 notes that CT DEEP is utilizing all its continuous PM<sub>2.5</sub> monitors for NAAQS compliance purposes and coded as 88101 effective the beginning of 2016. We acknowledge that you have availed yourself of many of the resource saving opportunities we suggested in the PM<sub>2.5</sub> network.

**CT DEEP response:** *No response needed.*

Additional EPA comment: As you are aware, EPA- New England has developed a GIS tool which can be helpful to identify valley locations across the region which may be impacted by wood smoke. Given the recent changes to your network and associated resource savings, we think there might be additional opportunities to conduct PM<sub>2.5</sub> monitoring in CT, and we urge you to consider the results of that tool as it relates to some areas in Connecticut that may be impacted by wood smoke.

**CT DEEP response:** *DEEP has used the valley tool to identify several areas in Connecticut that have the potential for wood smoke impact. The results of this analysis will be included in Connecticut's 2020*

*Network Assessment. Some of these locations have had citizen monitoring stations during the 2019-2020 winter season as part of the Western Connecticut Clean Air Action group's activities.*