Connecticut 2020 Ambient Air Monitoring

5-Year Network Assessment

Connecticut Department of Energy and Environmental Protection
Bureau of Air Management
October 2020

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Acronyms and Abbreviations

AQI – Air Quality Index
CAA – Clean Air Act
CASTNet – Clean Air Status and Trends Network
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
DV – design value
ED-XRF – energy dispersive x-ray fluorescence
EPA – Environmental Protection Agency
FEM – Federal Equivalent Method
FRM – Federal Reference Method
GC – gas chromatography
HAP – hazardous air pollutant
IMPROVE – Interagency Monitoring of Protected Visual Environments
LC – local conditions of temperature and pressure (air volumes)
LMP – limited maintenance plan
$\mu g/m^3$ – micrograms per cubic meter
mm Hg – millimeters of mercury (unit of pressure)
MPA – monitoring planning area
MSA – metropolitan statistical area
NAAQS – National Ambient Air Quality Standards
NCore – National Core Monitoring Station
NEI – National Emission Inventory
NO – nitrogen oxide
NO_2 – nitrogen dioxide
NOx – oxides of nitrogen
NOy – total reactive oxides of nitrogen
PAMS – Photochemical Assessment Monitoring Stations
$PM_{2.5}$ – fine particulate matter (<2.5 microns)
PM_{10} – respirable particulate matter (<10 microns)
$PM_{10-2.5}$ – coarse particulate matter (between 2.5 and 10 microns)
PMSA – primary metropolitan statistical area
ppm – parts per million
ppb – parts per billion
PWEI – population-weighted emission index
r^2 – Pearson correlation coefficient
RH – relative humidity
SIP – State Implementation Plan
SLAMS – state and local monitoring stations
SO_2 – sulfur dioxide
SPM – special purpose monitoring station
STN – Speciation Trends Network
STP – standard conditions of temperature and pressure (air volumes at 25°C, 760 mm Hg)
tpy – tons per year
TSP – total suspended particulate
UA – urban area
VOC – volatile organic compound
XRF – X-ray fluorescence

Background

Introduction

The Connecticut Department of Energy and Environmental Protection (DEEP) performs monitoring of pollution in the ambient air to support efforts to improve air quality and protect public health and the environment. Monitoring data is crucial to determining compliance with the primary and secondary National Ambient Air Quality Standards (NAAQS) adopted by the U.S. Environmental Protection Agency (EPA) and gauging the efficacy of regulatory programs. Monitoring data is also used to inform EPA's air quality reporting index (Air Quality Index or AQI) and issuing air quality forecasts, long-term health assessments, and tracking long-term air quality both to gauge effectiveness of emission reduction strategies and to improve the accuracy of air quality and photochemical grid models.

The Connecticut 2020 Ambient Air Monitoring Five Year Network Assessment is developed in accordance with the requirements of 40 CFR §58.10(d), which states:

> *"The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and where new technologies are appropriate for incorporation in the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan to the Regional Administrator. The first assessment is due July 1, 2010."*

The primary purpose of this assessment is to determine the extent to which the current air monitoring network in Connecticut meets federal requirements cited above. This assessment does not propose any changes to the air monitoring network, but rather determines whether each parameter at each site is of critical, credible or marginal value in meeting the regulatory objectives. Any changes to the network indicated by the assessment will be proposed in a future Annual Air Monitoring Network Plan after careful consideration of EPA's monitoring requirements, Connecticut's air quality data needs, and available resources. Each year by July 1, the Annual Network Plan is made available to the public review and comment and then subsequently submitted to EPA Region I for review and approval.

Network Overview

DEEP operates 14 pollutant monitoring stations. Figure 1 below shows the EPA-approved DEEP ambient air monitoring site network map as of 2020. A current and projected listing of the parameters monitored at each site is given in Table 1.

In October 2006, EPA established a network of core multi-pollutant monitoring sites. These sites are known collectively 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 sites located in Connecticut designated and approved by EPA as part of the national NCore network: Criscuolo Park in New Haven, and Mohawk Mountain in Cornwall.

Figure 1: DEEP Ambient Air Monitoring Stations

Table 1: DEEP Ambient Air Monitoring Network Summary (as of July, 2020)

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/PM-10.2.5 (continuous FEM)	PM10/PM10-2.5 (cont. FEM, secondary)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, continuous)	Ozone	SO2	CO	NO_2	NO/NOy	HCHO (continuous)	Total Column NO_2/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 LIS Ferry	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

Air Quality Summary/Air Quality Index

DEEP provides near real-time hourly pollutant and meteorological data and daily air quality index (AQI) forecasts to EPA for the state of Connecticut. Ambient data is available to agencies through the AirNow Tech website, and forecasts are accessible on the AirNow and DEEP websites, DEEP call-in telephone lines (800-249-1234 or 860-424-4167) and daily email reports. In addition, interested persons may sign up for daily email Connecticut AQI forecasts on the DEEP air quality list server (https://portal.ct.gov/DEEP/Air/Forecasting/AQI/Air-Quality-

Information-Listservs) or for email air quality alerts through AirNow Enviroflash (http://www.enviroflash.info/).

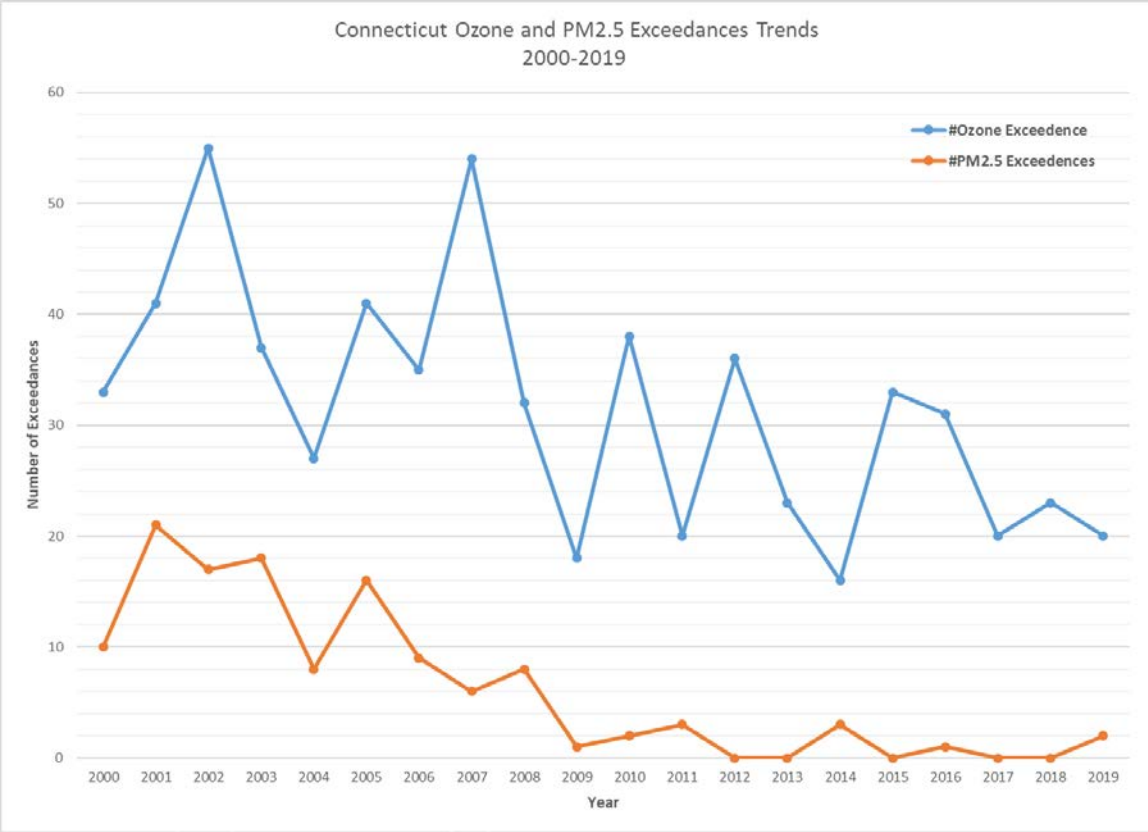
The AQI indicates air quality levels on a scale with six defined categories (*Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy and Hazardous*). An AQI greater than 100, which is a category of *Unhealthy for Sensitive Groups (USG)* or worse, is equivalent to ambient air concentrations that exceed the NAAQS. Table 2 below displays the number of days in 2019 in which air quality exceeded 100 on the AQI (e.g., the number of NAAQS exceedances by site). Compliance with the 2015 ozone NAAQS of 70 ppb is determined by the 3-year average of the annual fourth highest daily maximum 8-hour average The annual average NAAQS for $PM_{2.5}$ is currently 12 µg/m^3(micrograms per cubic meter) and the 24-hour average NAAQS is 35 µg/m^3. Compliance with the annual fine particulate matter NAAQS is determined by the 3 year average of the annual mean and compliance with the 24-hour standard is determined by the 3 year average of the 98th high percentile value.

Table 2: CT AQI Exceedances in 2019

Pollutant	Location of monitors exceeding the applicable NAAQS	Days above 100 on the AQI in 2019
Ozone	Cornwall, Danbury, East Hartford, Greenwich, Groton, Madison, Middletown, New Haven, Stafford, Stratford, Westport	20
$PM_{2.5}$	Bridgeport	2
PM_{10}	None	0
SO_2	None	0
CO	None	0
NO_2	None	0

While overall trends of ozone and $PM_{2.5}$ exceedances are downward since 2000, as shown in the Figure 2, data from the last five years do not indicate a clear trend. All ozone exceedances are based on the 2015 8-hour standard of 0.070 ppm, and the $PM_{2.5}$ exceedances are based on the 2012 daily standard of 35 µg/m3.

Figure 2: Connecticut Ozone and $PM_{2.5}$ Exceedance Trends



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 3 summarizes the current NAAQS compliance requirements for the criteria pollutants.

Table 3: National Ambient Air Quality Standards

Pollutant [links to historical tables of NAAQS reviews]		Primary / Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m^3 [a]	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb [b]	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb [d]	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 3:

[a] 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/m3 as a calendar quarter average) also remain in effect.

[b] The level of the annual NO_2 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.

[c] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[d] The previous SO_2 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_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 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.

Network Design Analysis

The design of Connecticut's ambient air monitoring network is based on EPA regulatory requirements for National Core (NCore) sites, pollutant-specific state and local air monitoring stations (SLAMS), and Photochemical Assessment Monitoring Station (PAMS) and enhanced ozone monitoring. This section includes an assessment of the network relative to these requirements.

Population

Several of EPA's monitoring requirements are based on definitions of metropolitan areas developed by the US Office of Management and Budget and the US Census Bureau; these are: metropolitan statistical areas (MSA), micropolitan statistical areas, core-based statistical areas (CBSA), and combined statistical areas (CSA). Both MSAs and micropolitan statistical areas are CBSAs, defined as having an urbanized cluster with a population of at least 50,000 or 10,000, respectively. A CSA consists of two or more adjacent CBSAs, which, although highly integrated, may cross state or other political boundaries. A map showing CBSA delineations is given in Figure 3. Table 4 lists the Connecticut MSAs and 2019 U.S. Census Bureau population estimates.

Figure 3: Connecticut CBSA Boundaries

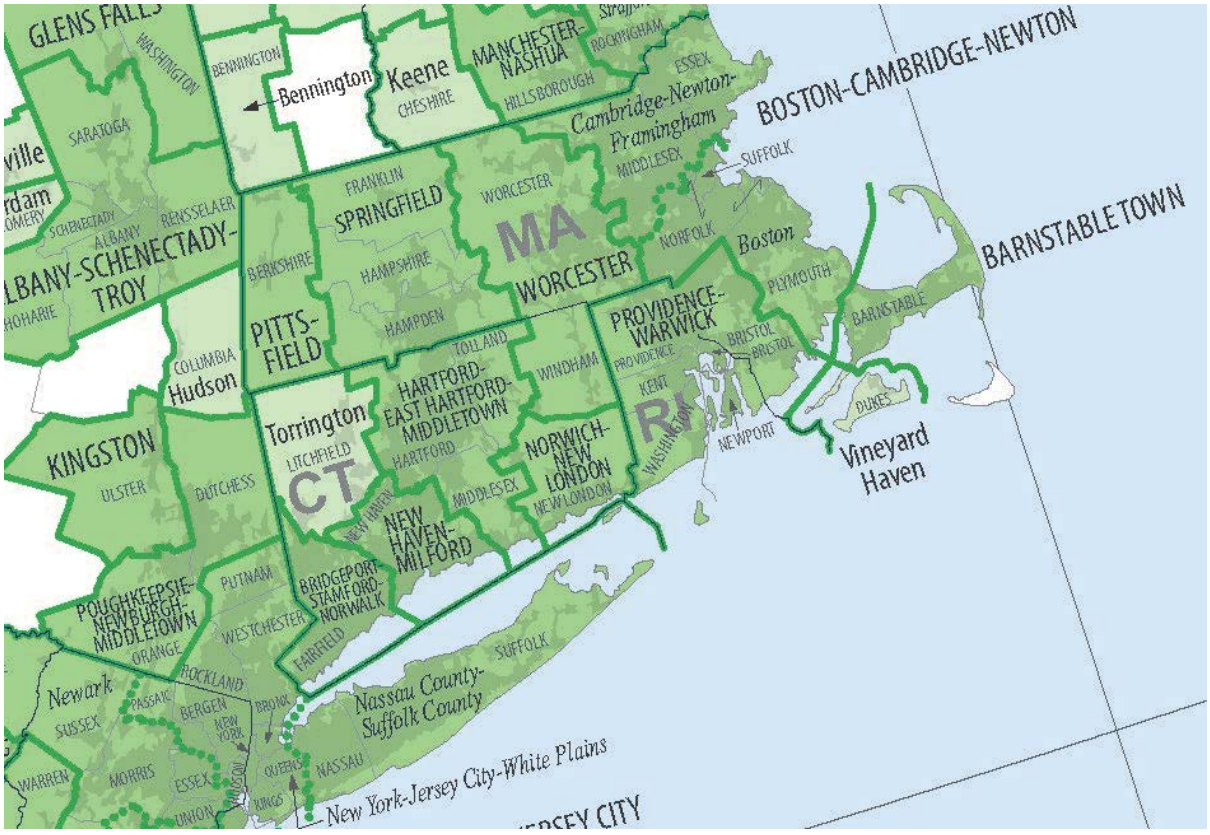


Table 4: Population of Connecticut Core-based Statistical Areas

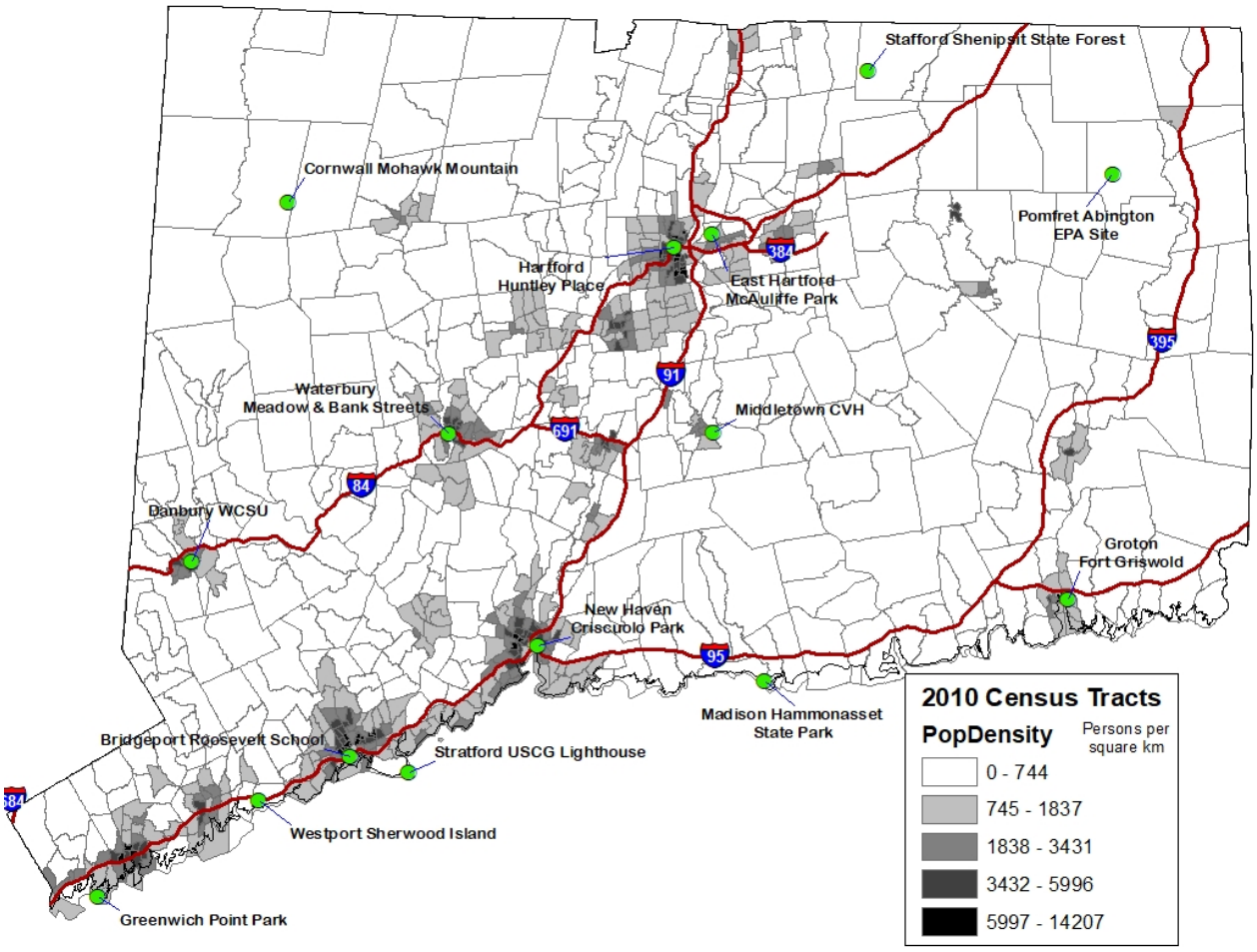
CBSA Code	CBSA Name	Counties included in CBSA	Population (2019 estimates)
14860	Bridgeport-Stamford-Norwalk	Fairfield	943,332
25540	Hartford- East Hartford-Middletown	Hartford, Middlesex, Tolland	1,204,877
35300	New Haven-Milford	New Haven	854,757
35980	Norwich-New London	New London	265,206
49340	Worcester	Worcester, MA; Windham, CT	947,404
45860	Torrington (micropolitan statistical area)	Litchfield	180,333

Population Distribution and Susceptible and Vulnerable Communities

The majority of the monitors in the network are sited to assess the potential exposure of populations to maximum levels of air pollution. In locating these monitors, the spatial distributions of population density, susceptible and vulnerable populations, and low-income communities should be considered to ensure that air pollution mitigation strategies fairly address exposures of these groups. Siting monitors within areas with the highest densities of such populations helps to best characterize the impacts of ambient air pollution on human health. While it is reasonable that monitoring in densely populated areas would be more protective than in a sparsely populated areas, it is also critical to take into account areas where there might be higher impacts on susceptible populations, such as children and the elderly, as well as on and low-income citizens, who either may be more sensitive to the health effects of air pollution or may have inherent barriers in their access to health care.

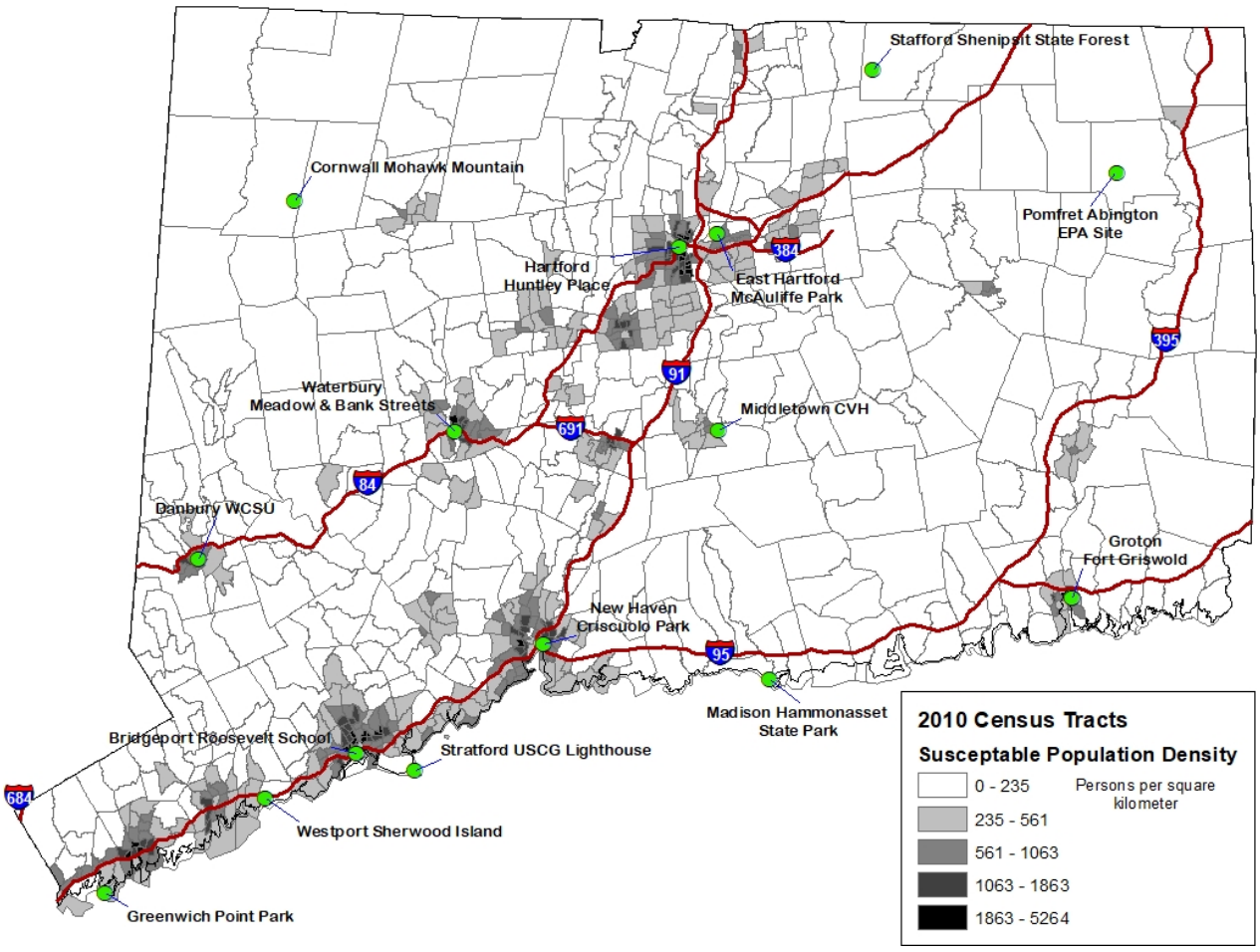
Generally, higher density population areas in Connecticut are clustered along busy interstate transportation corridors, which are sources of transportation related emissions, such as fine and coarse particulates, carbon monoxide and oxides of nitrogen. Additionally, more densely populated areas are more likely to be in proximity of industrial sources of air pollution. Figure 4, which shows state population density by census block area, indicates that most of Connecticut's monitoring sites are located within the highest density blocks.

Figure 4: Population Density by Census Tract and Air Quality Monitors



People who are particularly susceptible to air pollution are more likely to suffer adverse effects at lower concentrations. Examples of susceptible groups include children, the elderly and individuals with compromised physiological or medical conditions, such as asthma or other pulmonary disorders and heart disease. Figure 5 shows the distribution of the population below 18 and above 65 years of age for 2010 census tracts, which generally follows the overall population profile.

Figure 5: Susceptible Population Density by Census Tract and Air Quality Monitors



In accordance with EPA's Environmental Justice Agenda 2020[1] and DEEP's incorporation of environmental justice principles at all levels of decision making (see Equity & Environmental Justice Draft Report[2], DEEP recognizes the importance of collaboration and teamwork in addressing issues of environmental quality in overburdened communities. Two such areas served by air monitoring stations are New Haven and Hartford, which ranked #11 and #13, respectively, among the 100 largest U.S. cities were it is most challenging to live with asthma, according to a recent study[3].

Environmental justice communities in Connecticut are defined as census tract areas in which 30% or greater of the population have an income below 200% of the federal poverty level or areas of distressed municipalities as defined by Connecticut Department of Economic and Community Development. The 2020 list of distressed municipalities with rankings is given in Table 5.

Figure 6 below displays the areas that fall under the definition of environmental justice communities along with DEEP's ambient air monitoring stations. Most of the environmental

[1] EPA's Environmental Justice Agenda 2020

[2] Equity & Environmental Justice (DEEP) September 21, 2020

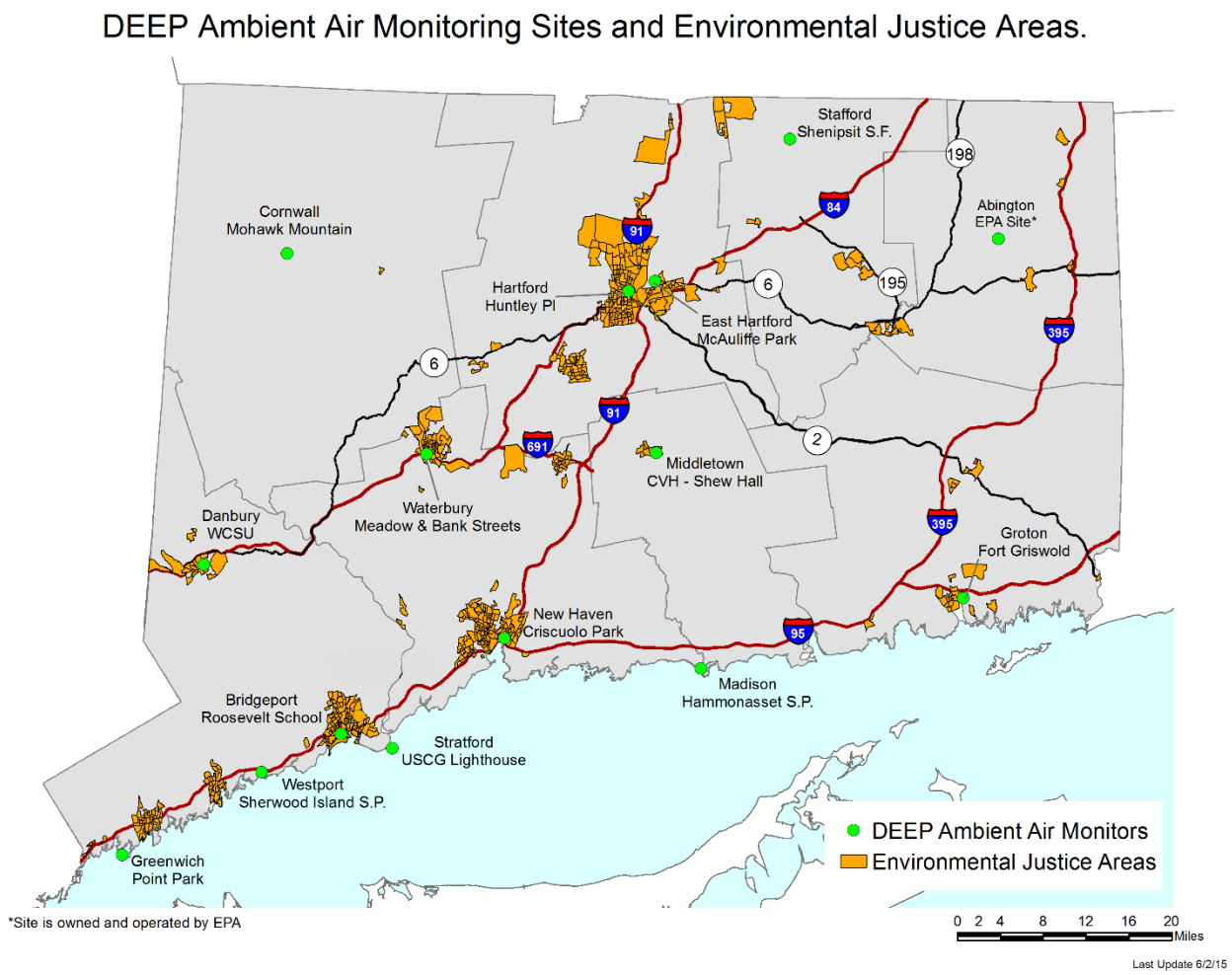
[3] Asthma Capitals 2019

justice areas located in areas with higher emissions, such as industrial/commercial zones or high motor vehicle traffic areas, are served by ambient air monitors.

Table 5: List of Connecticut Distressed Municipalities

Town	Rank	Town	Rank	Town	Rank
Ansonia	1	Torrington	10	Meriden	19
Waterbury	2	Sprague	11	New Haven	20
New London	3	Norwich	12	Putnam	21
New Britain	4	East Hartford	13	Preston	22
Derby	5	Montville	14	West Haven	23
Hartford	6	Griswold	15	Stratford	24
Bridgeport	7	Voluntown	16	Chaplin	25
Bristol	8	East Haven	17		
Windham	9	Winchester	18		

Figure 6: Connecticut Environmental Justice Areas and Air Quality Monitors



Connecticut Major Emission Sources

Data from process emission point sources, and other sources where applicable, are presented in previous sections where needed to identify minimum monitoring requirements, such as for SO_2 Population Weighted Emissions Index (PWEI). In this section, major process emission source locations for selected pollutant groups are presented as a reference for consideration of the siting of monitors within the network. Figures 7 - 10 shows process emission source 2017 National Emission Inventory[4] (NEI) levels and locations for SO_2, NO_X, $PM_{2.5}$ and VOCs in Connecticut.

[4] EPA, 2017 National Emissions Inventory

Figure 7: Connecticut NOx Point Source Emissions (tons/year)

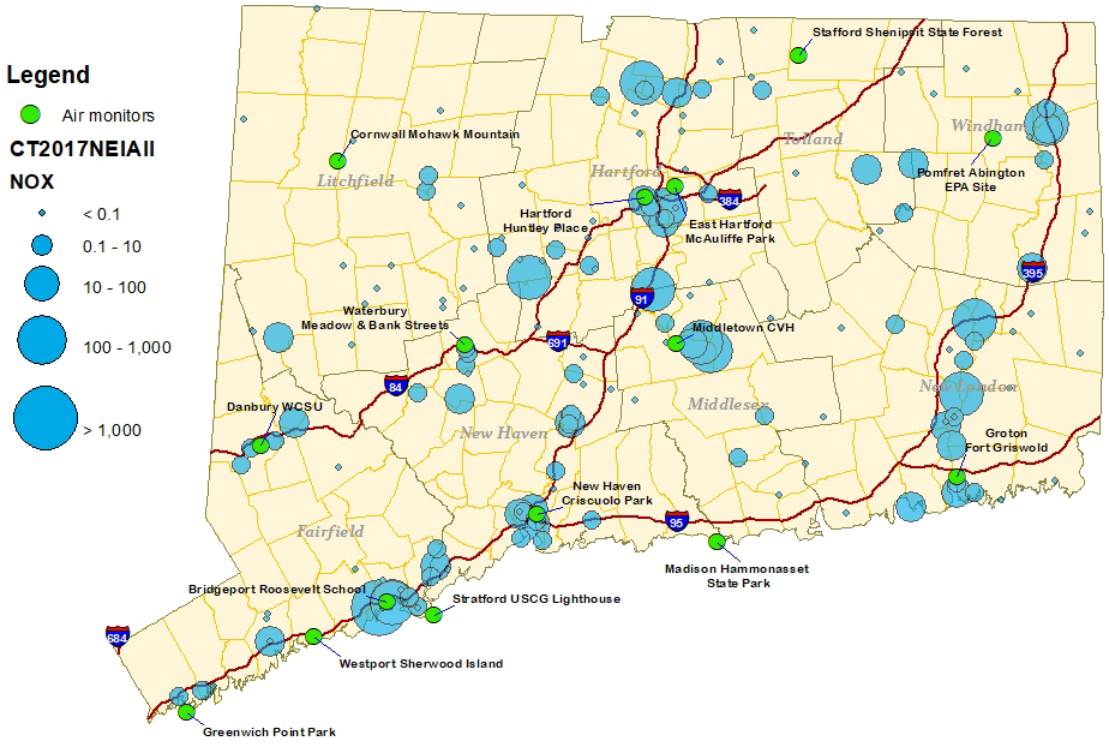


Figure 8: Connecticut PM2.5 Point Source Emissions (tons/year)

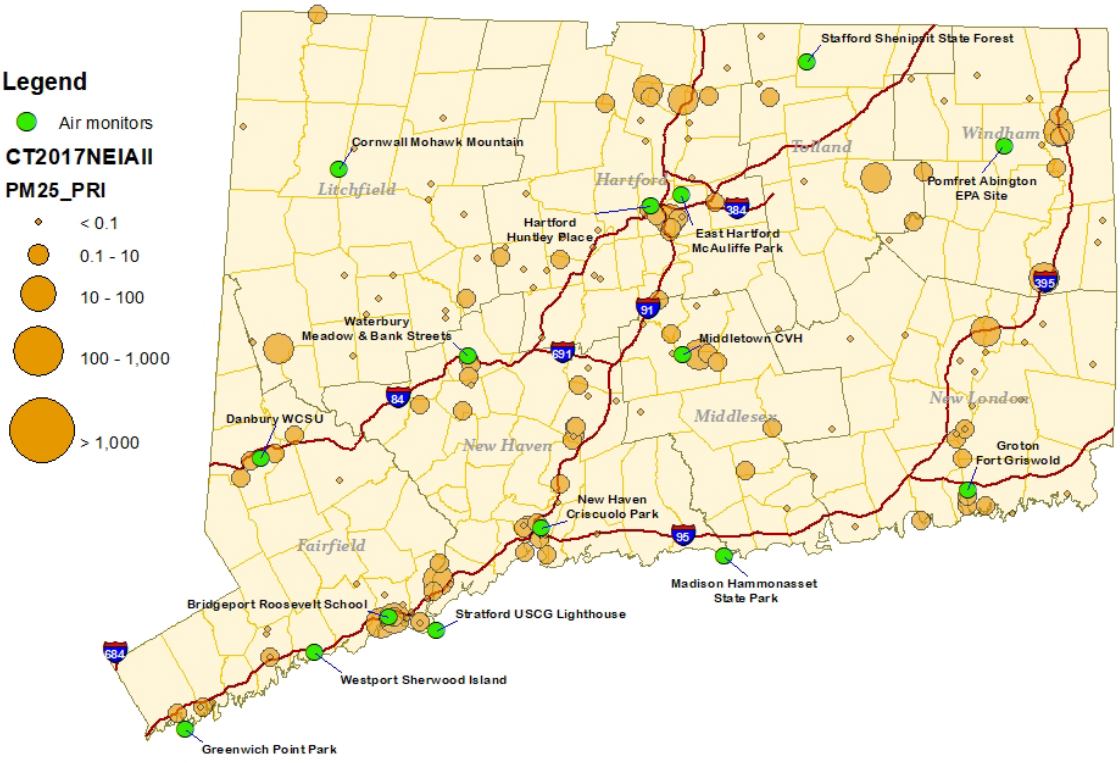


Figure 9: Connecticut SO2 Point Source Emissions (tons/year)

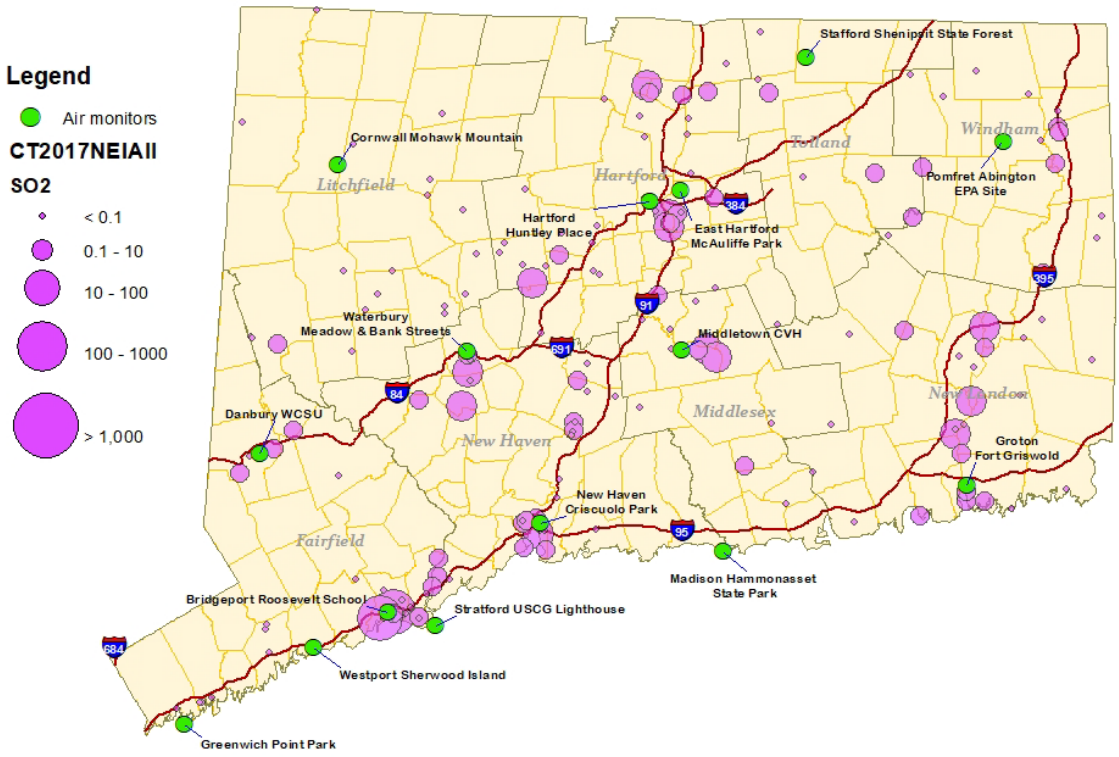


Figure 10: Connecticut VOC Point Source Emissions (tons/year)

State Topography and Potential Air Quality Issues

Connecticut's topography includes mountainous areas in the northwest, coastal plains to the south, numerous river valleys, including the broad Connecticut River valley, and hilly terrain throughout the state. While most of these features have the potential to impact local air quality, narrow, steep-sided valleys have a higher tendency for more severe impacts under certain conditions. These conditions include cooler ambient temperatures and significant overnight radiative cooling enhanced by clear skies, such as are more typically found in late fall, winter and early spring. These conditions can set up local inversions that can trap pollutants generated from local sources, causing elevated concentrations, typically of combustion by-products such as nitrogen oxides and fine particulate matter.

EPA Region 1 developed a topographic tool (Valley ID Tool) for identifying areas that may be most impacted by these conditions. The Valley ID Tool, which at this time is only applicable to the New England region, is available at:

https://www.arcgis.com/apps/webappviewer/index.html?id=646ebe715800410d9e5c02aa3653546d

DEEP investigated the valley areas in Connecticut that were identified by the tool. The tool creates elevation cross sections of transects selected by the user. Areas with potential valley air quality issues identified in Connecticut include: West Cornwall, Gaylordsville, Torrington and New Milford. Valley ID Tool output graphics for these locations are presented in Appendix A. DEEP will consider screening air quality in some or all of these identified areas through use of mobile or community based monitoring efforts. For example, data from the Western Connecticut Clean Air Action network of community based monitors, some of which are located in identified valleys, will be reviewed for valley inversion impacts. Additionally, DEEP will have the capacity for localized mobile monitoring in the near future using its Geospatial Measurement of Air Pollution (GMAP) vehicle.

Monitoring Objectives and Spatial Scales

The objectives of an ambient air monitoring network operated in accordance with SLAMS requirements[5] are to: (a) provide air pollution data to the public in a timely manner, (b) support compliance with ambient air quality standards and pollution control strategies and (c) support air pollution research studies.

To support Connecticut's and EPA's air monitoring objectives, the monitoring network includes a variety of sites that provide information on peak air pollution levels, typical air pollution levels, air pollution transport and air pollution levels near significant sources. EPA has identified the following six general site types:

- Sites located to determine the highest concentrations expected to occur in the area covered by the network.
- Sites located to measure typical concentrations in areas of high population density.
- Sites located to determine the impact of significant sources or source categories.
- Sites located to determine general background levels.
- Sites located to determine the extent of regional pollutant transport among populated areas.
- Sites located to measure air pollution impacts on visibility, vegetation or other welfare-based impacts.

[5] 40 CFR 58

Monitoring sites are spatially positioned relative to pollutant sources and receptors to characterize air quality impacts, taking into account aspects of the sources and pollutants, as well as the local terrain, meteorology, population, and public welfare-related receptors. For example, although ozone typically has concentrations that are similar over areas with dimensions of 10 or more kilometers, an ozone monitor located near high NO_X sources would likely represent lower levels over a smaller area due to chemical reactions between these pollutants. A spatial scale of representativeness, defined as a dimension indicating the extent of an area impacted with similar concentrations throughout by a source or type of source, is identified for each monitor. The scales of representativeness of most interest for the above monitoring site types are as follows:

- Microscale—Defines concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- Middle scale—Defines concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
- Neighborhood scale—Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
- Urban scale—Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
- Regional scale—Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.
- National and global scales—Represent concentrations characterizing the nation and the globe as a whole.

Value Assignment to Sites and Monitors

To assist in the network planning process, qualitative values of *critical*, *credible* or *marginal* are assigned to the monitors to assess their relative importance to monitoring objectives. Criteria used to apply these value assignments are:

Critical Sites and Monitors – These sites are of high value and should be retained.

- Design value site for an area at or above 85 percent of the NAAQS.
- Long-term multi-pollutant site(s) used by multiple data users for trends and model evaluation (i.e., SIP development and tracking). Note: often these are the design value or other important sites that perform additional complimentary measurements.
- Monitor required to satisfy minimum monitoring requirements for specific parameters (i.e. NCore, near-road), as identified in the individual parameter network sections below.
- Dedicated site for health or atmospheric study, or to inform policy options for State or local agency (often collocated with above; however, if not, a sunset date should be associated with the site).

Credible Sites and Monitors – These sites are the locations that are expected to continue, but may not be the design value location at or above the NAAQS. Sites in this category are generally retained, but occasionally may move to provide the optimum spatial coverage in a network. Examples include:

- Sites that are used to comply with EPA minimum network monitoring requirements.
- Sites that provide the spatial richness of a network to identify exposures and support AQI forecasting and reporting.
- Sites that, while not the design value location, are occasionally the highest across the metropolitan area due to seasonal meteorology or unique winds (e.g., winds are normally from the Southwest, but occasionally come from the East which puts the area downwind of a much larger metropolitan area).

- Sites that are design value locations, but with levels relatively low compared to the NAAQS. These might include source oriented monitors that are required, but are below the NAAQS.
- Sites that may be useful for NAAQS now in review.

Marginal Sites and Monitors – These sites and monitors are candidates for removal or movement. This category includes:

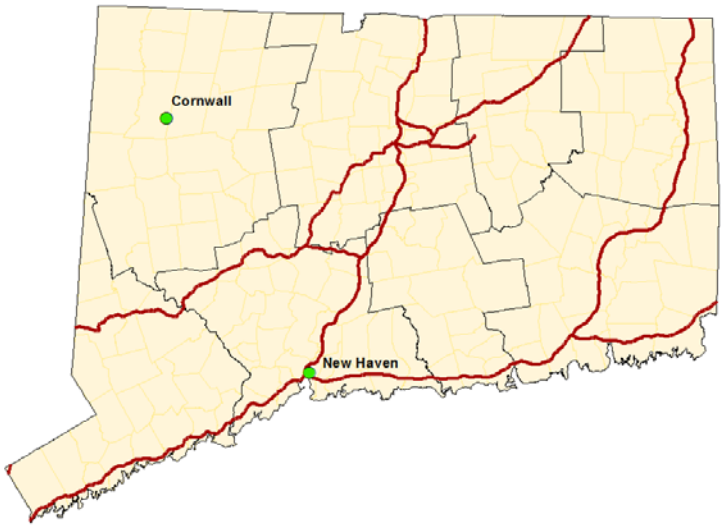
- Sites that have outlived their intended purpose.
- Sites that have measurements that are of low value relative to the NAAQS and are not counted towards minimum network monitoring requirements.
- Sites that are not candidates for continued investment due to problems with siting criteria which cannot be resolved.
- Special Purpose Monitors (SPMs) – If a monitor remains at a site for more than two years it is strongly encouraged that the site become a SLAMS and would fit into the critical or credible category, otherwise it is assumed that the SPM has fulfilled its objective and can be moved to another location to characterize the measurement of interest.
- Sites that correlate well (i.e., are not unique) with a nearby site(s), but which measure low levels than the nearby site.

New Sites and Monitors – These sites represent potential areas of investment pending movement of monitoring resources from other locations or new resources introduced to our program. Generally, these are:

- Locations that may result in a change to the design value location of a pollutant.
- Newly required locations from recent NAAQS reviews.
- Additional measurements at critical and credible locations that would provide additional insight to data users.

The specific objectives and spatial scales for each of the monitors in the DEEP network are described in the Pollutant Network and Monitor and Site Summary sections below.

NCore Network Requirements



Nationally, NCore monitoring stations include a range of pollutant monitors and are sited primarily to characterize urban area-wide pollutant levels, although a smaller number of NCore stations are in rural locations. As such, they should be sited away from direct emission sources. Each state is required to have a minimum of one NCore site, located in an MSA (states with multiple large air sheds may be required to have two or three NCore sites). Connecticut has two NCore sites, one urban and one rural, located in New Haven (Criscuolo Park) and Cornwall (Mohawk Mountain), respectively. Both of DEEP's NCore sites meet and exceed EPA's NCore monitoring requirements shown in Table 6. Monitors at NCore sites may also be utilized to satisfy non-NCore requirements as discussed in the subsections below.

Table 6: Minimum Required NCore Monitoring Parameters

Required Parameter	Description
$PM_{2.5}$ speciation	organic and elemental carbon, major ions and trace metals (24 hour average; every 3rd day); IMPROVE or CSN
$PM_{2.5}$ FRM mass	24 hr. average at least every 3rd day
continuous $PM_{2.5}$ mass	1 hour reporting interval; FEM or pre-FEM monitors
$PM_{(10-2.5)}$ mass	Filter-based or continuous
ozone (O_3)	all gases through continuous monitors
carbon monoxide (CO)	capable of trace levels (low ppm and below) where needed
sulfur dioxide (SO_2)	capable of trace levels (low ppb and below) where needed
nitrogen oxide (NO)	capable of trace levels (low ppb and below) where needed
total reactive nitrogen (NO_Y)	capable of trace levels (low ppb and below) where needed
surface meteorology	wind speed and direction (reported as "resultant"), temperature, relative humidity

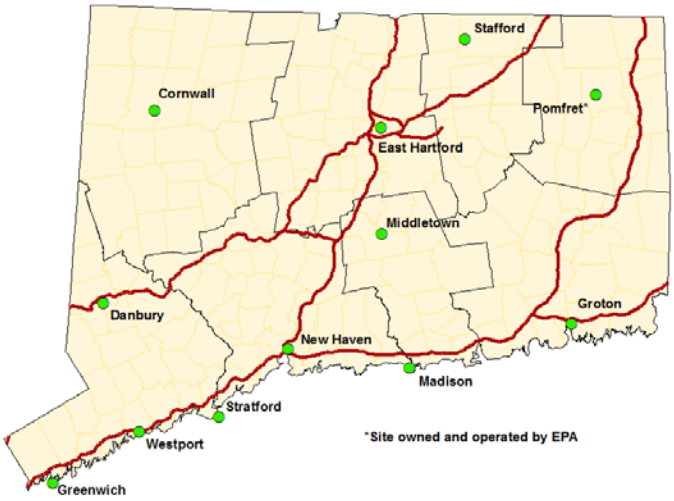
In addition to the minimum requirements in Table 6, the two NCore sites monitor several additional parameters as shown in Table 7.

Table 7: Additional Parameters Monitored at NCore Sites

NCore Site	Additional Parameters Monitored Beyond Minimum NCore Requirements
Cornwall-Mohawk Mountain	Continuous $PM_{2.5}$, continuous $PM_{2.5}$ black carbon/organic carbon, barometric pressure, dew point, solar radiation.
New Haven-Criscuolo Park	Collocated FRM $PM_{2.5}$, collocated FRM PM_{10}, collocated FRM $PM_{10-2.5}$, continuous $PM_{2.5}$, Continuous $PM_{10}/PM_{10-2.5}$, collocated continuous $PM_{2.5}/PM_10/PM_{10-2.5}$, NO_2, total column NO_2/HCHO, continuous $PM_{2.5}$ black carbon/organic carbon, mixing height, barometric pressure, dew point, solar radiation.

Ozone Network

Ozone Monitoring Overview



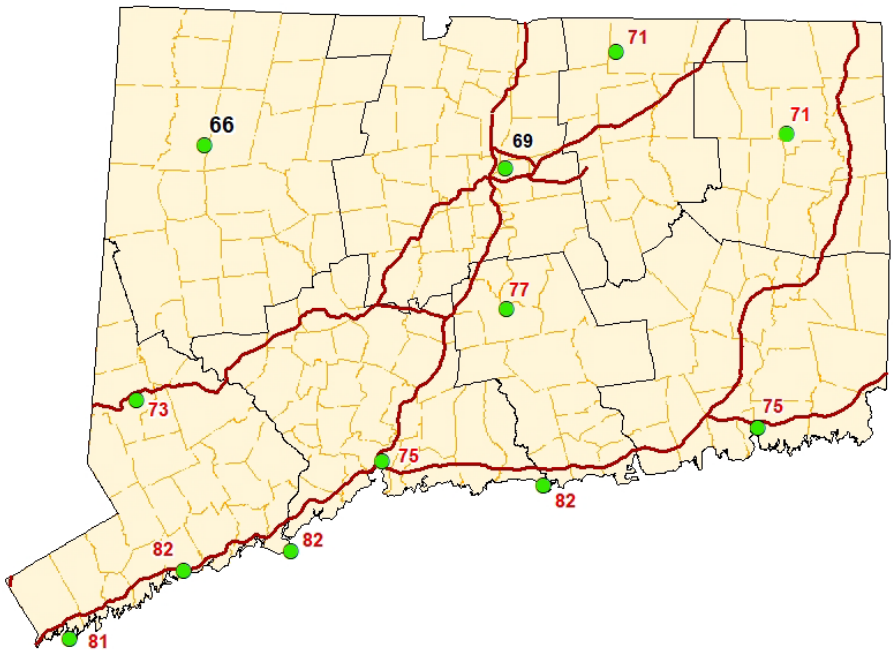
The DEEP ozone network consists of eleven sites distributed over seven of Connecticut's eight counties, as shown in the map to the right. In addition, EPA operates an ozone monitor in Abington village in the town of Pomfret, as part of EPA's Clean Air Status and Trends Network (CASTNET) program. The Greenwich, Westport, Stratford and Madison sites, situated on the state's southern coast, are upwind background/regional transport sites for ozone, as the prevailing wind direction during higher ozone episodes is generally southwesterly. The principal monitoring objective for all interior sites, with the exception of Cornwall, is population exposure. Due to its location at high elevation in the rural northwestern hills of the state, the Cornwall ozone monitor objective is General/Background. All ozone sites operate from March 1 through September 30, per 40 CFR Part 58 App D, except for the New Haven and Cornwall NCore sites, and the East Hartford McAuliffe Park site, which operate year-round.

Ozone NAAQS Attainment

The 2019 ozone 8-hour design values for the 2015 NAAQS are given in the figure below. Ozone design values are derived by averaging three consecutive annual fourth highest daily maximum 8-hour ozone values. Based on the October 2015 revised ozone standard of 0.070 ppm (70 ppb), 10 out of 12 sites indicate nonattainment, shown in red font below.

Figure 11: Connecticut 2019 Ozone Design Values

	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
NAAQS	70



Ozone Network Design

The ozone monitoring network design requirements are primarily based on MSA population and ozone design value levels. Table 8 gives the minimum number of ozone sites per area in accordance with EPA requirements[6].

The 2019 8-hr ozone design values are above eighty-five percent of the 2015 ozone NAAQS at all DEEP monitoring sites. As such, these locations are considered to have monitoring value assessments of "critical" in the network."

Table 8: SLAMS Minimum Ozone Monitoring Requirements

MSA Population	DV≥85% NAAQS	DV<85% NAAQS
>10 million	4	2
4 - 10 million	3	1
350,000 - <4 million	2	1
50,000 - <350,000	1	0

Table 8 below is a summary of the ozone network design criteria for each Core-Based Statistical Area (CBSA) that is located partially or totally within Connecticut. These consist of five Metropolitan Statistical Areas (MSAs), with populations greater than or equal to 250,000, and one Micropolitan Statistical Area, with a population of less than 250,000. The CBSA population values are from the 2019 U.S. Census Bureau population estimates using the 2010 census as the base year.

As indicated in Table 9, the number of ozone monitors in the network exceeds EPA's minimum number by 2 in the Bridgeport-Stamford-Norwalk MSA and by 1 in the Hartford-East Hartford-Middletown MSA. As shown in the Network Assessment Analysis section below, these additional monitors provide the spatial coverage necessary to characterize ozone concentrations during exceedance events, during which there may be significant differences in peak concentrations over distances of 20 to 40 kilometers. While the Worcester MSA has 3 ozone monitors, one more than required, CT DEEP does not operate any of these monitors, and most of the area lies outside of Connecticut.

Table 10 provides the measurement scales, monitoring objectives and value assignments for the ozone network. In each non-attainment area, one site is designated for monitoring the maximum concentrations for the area, per network design requirements. However, other sites within these areas may record the highest levels during particular ozone events.

[6] 40 CFR 58 Appendix D Table D-2

Table 9: Summary of Ozone Network Minimum Monitoring Requirements

Core-Based Statistical Area	Estimated 2019 Population	Design Values > 85% Ozone NAAQS?	No. Monitors	Minimum No. Monitors Required
Bridgeport-Stamford-Norwalk	943,332	Y	4	2
Hartford-East Hartford-Middletown	1,204,877	Y	3	2
New Haven-Milford	854,757	Y	2	2
Norwich-New London	265,206	Y	1	1
Worcester (includes Windham County)	947,404	Y	3	2
Torrington (non-MSA)	180,333	Y	1	NA[1]

[1] Not applicable per MSA requirements, but one monitor is required at the Cornwall NCore site located within the Torrington micropolitan statistical area.

Table 10: Ozone Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Monitor Type
Pomfret	Abington	Regional	Regional Transport, Welfare-related Impacts	N/A[1]	CASTNET
Cornwall	Mohawk Mountain	Regional	Regional Transport	Critical	NCORE
Danbury	Western Connecticut State University	Urban	Population Exposure	Critical	SLAMS
East Hartford	McAuliffe Park	Urban	Population Exposure	Critical	PAMS
Greenwich	Point Park	Regional	Regional Transport, Population Exposure	Critical	SLAMS
Groton	Fort Griswold	Urban	Population exposure	Critical	SLAMS
Madison	Hammonasset State Park	Regional	Population exposure, Maximum Ozone Concentration	Critical	SLAMS
Middletown	Connecticut Valley Hospital	Urban	Population Exposure	Critical	SLAMS
New Haven	Criscuolo Park	Neighborhood	Population Exposure	Critical	NCORE
Stafford	Shenipsit State Forest	Regional	Population Exposure, General Background	Critical	SLAMS
Stratford	Stratford Lighthouse	Regional	Population Exposure, Highest Conc.	Critical	SLAMS
Westport	Sherwood Island State Park	Regional	Maximum Ozone Conc., Population Exposure, Regional Transport	Critical	SLAMS

[1] Not a SLAMS monitor, operated by EPA CASTNET

Network Assessment Analysis

DEEP's analysis of the correlations between pairs of adjacent ozone sites indicates that the existing monitors provide unique critical data in assessing ozone population exposure and fate and transport patterns. DEEP compared 8-hour daily maximum values, greater than 60 parts per billion (ppb), to focus on the most critical concentrations for exposure assessment and NAAQS compliance. The results of this analysis are summarized in Table 11 below. Plots of the correlations are given in Appendix B. There is reasonable correlation between nearby coastal sites ($r^2 > 0.65$), with the exception of New Haven, which is the most heavily urban-influenced, where ozone would more likely be scavenged by higher NOx concentrations. However, the variability in the values in the exceedance range has the potential to alter the occurrence of ozone violation days. The data suggests that the higher-concentration portions of ozone and precursor plumes approaching the Connecticut coast from the southwest are often localized to the extent that adjacent monitors may have significantly different maximum concentrations. Marine inversions mitigating the diffusion effect of ozone and precursor plumes could contribute to such localized events. Given the ozone plume coverage afforded by the current network configuration, DEEP supports the continued operation of the existing ozone network.

Table 11: Summary of Ozone Near-Sites Correlations

Site comparison	Dis-tance (km)	Correl-ation r^2	Linear reg. slope	Linear reg. int.	Count	Avg diff. (ppb)	Stnd. Dev. (ppb)
Danbury vs. Greenwich	45.5	0.488	1.032	0	74	0	9.59
Greenwich vs. Westport	24.1	0.7378	0.8481	11.341	59	-2	9.74
Westport vs. Stratford	19.8	0.7446	0.8381	11.759	73	0	9.30
Stratford vs. New Haven	23.3	0.4855	0.8465	2.0531	71	8	10.38
New Haven vs. Madison	29.9	0.2005	0.3909	45.614	82	-8	10.71
Madison vs. Groton	40.7	0.3672	0.8531	3.0622	75	7	11.09
Middletown vs. East Hartford	26.4	0.3661	0.5673	23.431	65	6	8.35
Middletown vs. New Haven	35.2	0.2594	0.6363	21.079	72	3	9.94
Cornwall vs. Stafford	77.4	.0627	0.3366	41.972	52	0	7.70
Stafford vs. Abington	34.8	0.144	0.4099	37.62	44	1	8.04

$PM_{2.5}$ Network

$PM_{2.5}$ Monitoring Overview

The DEEP $PM_{2.5}$ 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 $PM_{2.5}$ monitors in the network and their applicability to NAAQS attainment are shown in Table 12. 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 $PM_{2.5}$ Teledyne API T640X continuous air samplers (EQPM-0516-238) data is also used for air quality index (AQI) forecasting, regardless of FEM/non-FEM status.

Table 12: Current $PM_{2.5}$ Network Configuration

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.	Continuous FEM		1-in-6 FRM
New Haven-Criscuolo Pk.	1-in-3 FRM	1-in-6 FRM	2 Continuous FEMs
Waterbury-Bank St.	Continuous FEM		

$PM_{2.5}$ Design Values

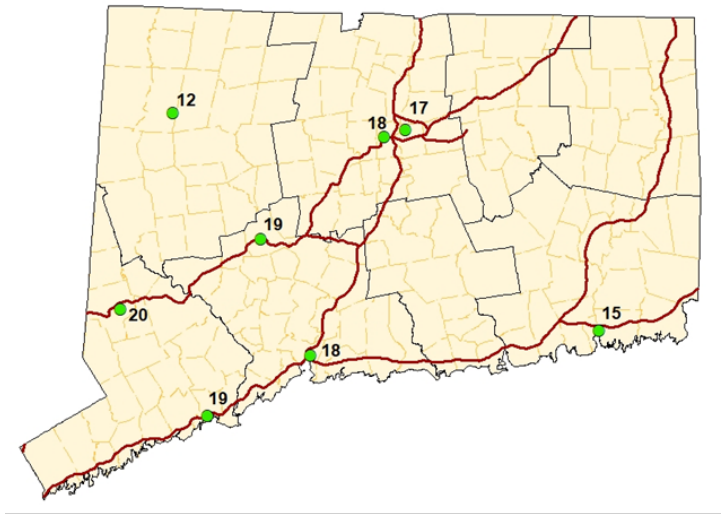
The $PM_{2.5}$ design values for 2017 through 2019 are listed in Table 13, and the spatial distribution of the 2019 design values are shown in Figure 12 below. Each $PM_{2.5}$ design value is defined as the average of the yearly metrics from three successive years, where the *annual* metric is annual weighted mean and the *24-hour* metric is the 98th percentile value. All Connecticut sites have attained the annual and the 24-hour $PM_{2.5}$ NAAQS. No sites exceed the 85 percent of NAAQS threshold, which would necessitate more intensive monitoring per 40 CFR Part 58 App D Table D-5.

Table 13: Connecticut 2019 $PM_{2.5}$ Design Values (µg/m3)

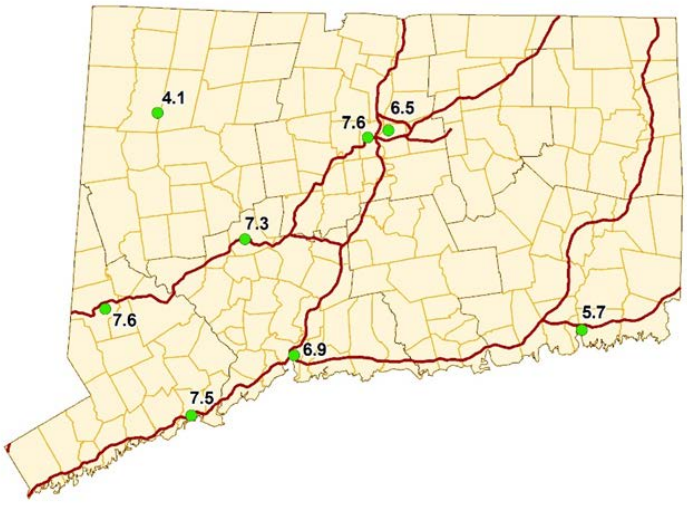
Town	Site Description	2015-2017		2016-2018		2017-2019	
		Annual	24-Hour	Annual	24-Hour	Annual	24-Hour
Bridgeport	Roosevelt School	8.6	21	8.1	20	7.5	19
Cornwall	Mohawk Mt	4.6	13	4.2	13	4.1	12
Danbury	WCSU	8.1	22	7.7	21	7.6	20
East Hartford	McAuliffe Park	6.7	18	6.5	18	6.5	17
Groton	Fort Griswold	5.5	15	5.4	15	5.7*	15*
Hartford	Huntley Place	8.2	20	7.5	18	7.6	18
New Haven	Criscuolo Park	7.0	20	6.8	19	6.9	18
Waterbury	Meadow & Bank St	7.4	20	7.2	20	7.3	19

*Incomplete data
The annual $PM_{2.5}$ NAAQS is 12 µg/m3
The 24-hour $PM_{2.5}$ NAAQS is 35 µg/m3

Figure 12: Connecticut 2019 $PM_{2.5}$ Design Values (µg/m3)



$PM_{2.5}$ 2019 Daily Design Values



$PM_{2.5}$ 2019 Annual Design Values

$PM_{2.5}$ Monitoring Network Design

General $PM_{2.5}$ network requirements: The minimum $PM_{2.5}$ monitoring requirements for each MSA, which is based on populations and design values, are in Table 14:

Table 14: EPA General Requirements for $PM_{2.5}$ Monitoring

MSA population[1 2]	Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS[3]	Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS[3 4]
>1,000,000	3	2
500,000-1,000,000	2	1
50,000-<500,000[5]	1	0

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2]Population based on latest available census figures.
[3]The $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
[4]These minimum monitoring requirements apply in the absence of a design value.
[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

Connecticut currently meets the minimum $PM_{2.5}$ monitoring requirements based on MSA population and observed concentrations relative to the NAAQS as shown in Table 15 below. The maximum 2019 design values in each MSA and in the Torrington micropolitan statistical area are well below 85 percent of the daily and annual NAAQS levels. The minimum monitoring requirement for the Worcester-Connecticut MSA is satisfied by the two monitors located in Worcester County, Massachusetts, as there are no $PM_{2.5}$ monitors within the Connecticut portion of the MSA.

Table 15: Specific $PM_{2.5}$ Network Minimum Monitoring Requirements

Core-Based Statistical Area	Estimated 2019 Population	Design Values[1] > 85% $PM_{2.5}$ NAAQS?	No. Monitors	Minimum No. Monitors Required
Bridgeport-Stamford-Norwalk	943,332	N	3	1
Hartford- East Hartford-Middletown	1,204,877	N	2	2
New Haven-Milford	854,757	N	2	1
Norwich-New London	265,206	N	1	0
Worcester-Connecticut	947,404	N	2[2]	1
Torrington (non-MSA)	180,333	N	1	0

[1]*2019 design value, based on 2017-2019 data
[2]Monitors located in Worcester County, Massachusetts

Specific $PM_{2.5}$ network requirements: In addition to the minimum required number of monitors in each MSA discussed above, the $PM_{2.5}$ network must fulfill the following specific design requirements:
Monitors implemented under the minimum monitoring requirements must be sited to represent area-wide concentrations. Under EPA guidance, monitors representing area-wide

concentrations are typically at neighborhood or urban spatial scales. All of DEEP's $PM_{2.5}$ monitors, except the Cornwall NCore monitor, are sited to represent neighborhood or urban spatial scales.
For CBSAs with populations of at least 1,000,000, a $PM_{2.5}$ monitor must be co-located at the NO_2 near road station. While this requirement is effective January 1, 2017, DEEP has been operating a $PM_{2.5}$ monitor at the Hartford Huntley Place near road station since March 2014.
At least one monitor must be sited at neighborhood or larger scale in an area of expected maximum concentrations. The Bridgeport Roosevelt School monitor meets this criterion.
For areas with additional required monitors, a monitoring station is to be sited in an area of "poor air quality." The DEEP network has several monitors located in areas where high air pollutant concentrations are expected, (i.e.: in close proximity to highways with high motor vehicle traffic and in areas having high densities of industrial emission sources). These include Bridgeport Roosevelt School, New Haven Criscuolo Park, Hartford Huntley Place and Waterbury Meadow Street.

Requirement for continuous $PM_{2.5}$ monitoring: Continuous $PM_{2.5}$ monitors must be located at a minimum of ½ of the sites required to have $PM_{2.5}$ monitoring under the general requirements described and summarized in Table 13 above. DEEP has exceeded this requirement by locating continuous $PM_{2.5}$ FEMs at all $PM_{2.5}$ FRM sites.

Requirement for background and transport $PM_{2.5}$ sites: Each state must have at least one site to monitor for regional background and one site to monitor for regional transport. The Cornwall Mohawk Mountain NCore site is appropriate for monitoring long-range transport from southwestern trajectories. Speciated particulate data collected at Cornwall is used to identify contributing source types. The East Hartford McAuliffe Park $PM_{2.5}$ monitor is representative of general/background levels, being located in a suburban neighborhood away from large industrial sources and high traffic roadways.

Requirement for $PM_{2.5}$ chemical speciation: Each state must have a $PM_{2.5}$ chemical speciation monitor as part of the Chemical Speciation Network (CSN). DEEP operates a CSN sampler at the New Haven NCore site. In addition, there is speciation monitoring at the Cornwall NCore site, and continuous black carbon/ultraviolet carbon (BC/UVC) (aethalometer) monitoring at Cornwall, Danbury, East Hartford, Hartford and New Haven. Further information is provided in the PM speciation section below.

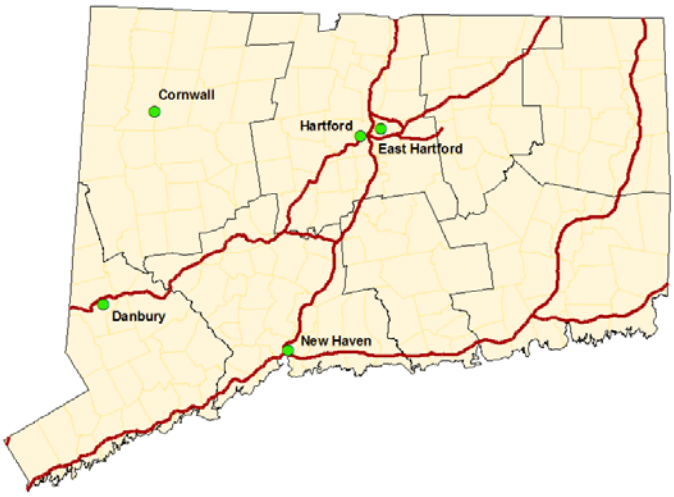
$PM_{2.5}$ network spatial scales, monitoring objectives and value assignments: $PM_{2.5}$ network site characteristics are summarized in Table 16. Most of the sites are in locations that represent neighborhood spatial scale concentrations, while the Cornwall and Westport sites have regional scales. Cornwall, located in a remote rural area, is a general/background site. The Bridgeport Roosevelt School and Hartford Huntley Place sites monitoring objectives are representative of the highest concentrations in their respective CBSAs, due to their close proximity to major interstate highways with high traffic counts and patterns of traffic congestion.

Connecticut currently meets and exceeds the minimum number of required monitors for each CBSA as required in 40 CFR Part 58 Appendix D. None of the monitors has design values within 85 percent of the NAAQS nor exceeds the NAAQS. Monitors are also included in the network for the two NCore sites, located in New Haven and Cornwall. Although there are no monitors in Windham County, which is the Connecticut part of the Worcester, MA-CT CBSA, the low population density (no urban areas with population greater than 50,000) and the absence of high vehicle traffic areas indicates a low probability of exceeding the $PM_{2.5}$ NAAQS.

Table 16: $PM_{2.5}$ Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Bridgeport	Roosevelt School	Neighborhood	Highest concentration	Credible	SLAMS
Cornwall	Mohawk Mountain	Regional	Regional transport; general/background	Critical	NCORE
Danbury	Western Connecticut State University	Neighborhood	Population exposure	Credible	SLAMS
East Hartford	McAuliffe Park	Neighborhood	Population exposure; general/background	Credible	SLAMS
Groton	Fort Griswold	Urban	Population exposure	Credible	SLAMS
Hartford	Huntley Place	Neighborhood	Highest concentration	Critical	SLAMS, Near-road
New Haven	Criscuolo Park	Neighborhood	Population exposure	Critical	NCORE
Waterbury	Bank Street	Neighborhood	Population exposure; highest concentration	Credible	SLAMS

PM Speciation Monitoring Overview



$PM_{2.5}$ chemical speciation measurements are being obtained at five sites in the DEEP air monitoring network. The IMPROVE (Interagency Monitoring of Protected Visual Environments) site is located at the Cornwall site and the EPA CSN (Chemical Speciation Network) site is at the New Haven Criscuolo Park site. Both sites are operated on the EPA designated 1-in-3 day PM sample schedule and provide 24-hour integrated filter-base measurements. Aethalometers, which are used to provide continuous measurements of black carbon and ultra-violet channel carbon (BC/UVC) $PM_{2.5}$, are in operation at the New Haven, Cornwall, Danbury and East Hartford sites. A summary of $PM_{2.5}$ speciation monitoring siting characteristics is provided in Table 17.

Table 17: $PM_{2.5}$ Speciation Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Cornwall	Mohawk Mountain	Regional Scale	General/Background	Credible	NCore/IMPROVE
East Hartford	McAuliffe Park	Neighborhood	Population Exposure	Credible	SPM
Danbury	WCSU	Neighborhood	Population Exposure	Credible	SPM
Hartford	Huntley Pl	Neighborhood	Population Exposure	Credible	SLAMS/Near Road
New Haven	Criscuolo Park	Neighborhood	Population Exposure	Credible	NCore/CSN

PM_{10}/$PM_{10\text{-}2.5}$ Network

PM_{10}/$PM_{10\text{-}2.5}$ Network Overview

DEEP operates one PM_{10}/$PM_{10\text{-}2.5}$ FRM site in the air-monitoring network using Thermo Partisol-Plus 2025i sequential air samplers (RFPS-1298-127). The New Haven NCore PM_{10} primary monitor operates on a 1-in-3 day sample schedule. The New Haven site has a collocated PM_{10} FRM sampler operating on a 1-in-6 day sample schedule. The New Haven primary and collocated PM_{10} FRM samplers are paired with primary and collocated $PM_{2.5}$ FRM samplers for primary and collocated coarse PM ($PM_{10\text{-}2.5}$). The New Haven collocated $PM_{10\text{-}2.5}$ FRM monitors were requested by EPA as part of a national network of $PM_{10\text{-}2.5}$ collocated sites for pooled data quality assessment.

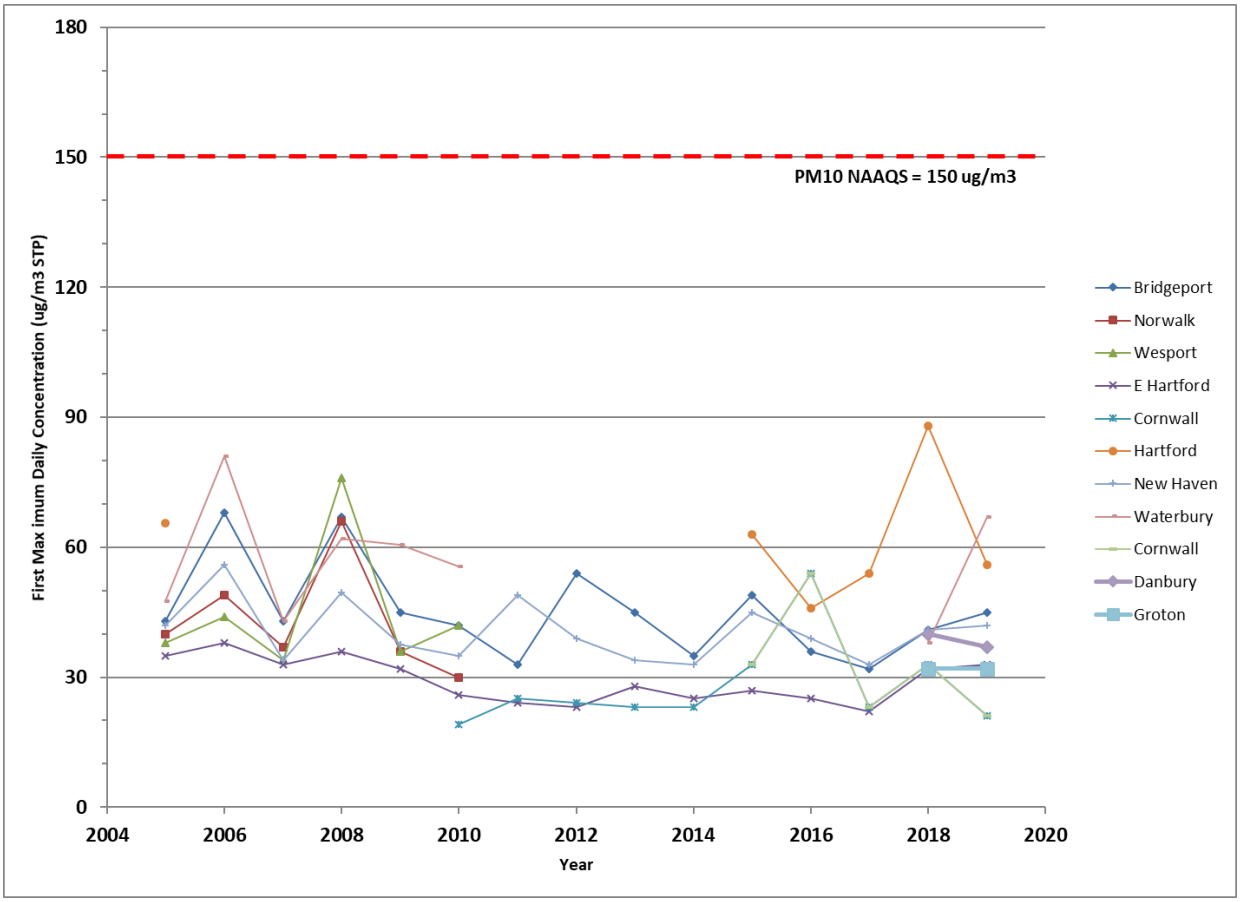
In addition to the FRM PM_{10} monitors, 8 sites have FEM Teledyne API T640X continuous PM mass monitors for FEM PM_{10} (EQPM-0516-239) and FEM $PM_{10\text{-}2.5}$ (EQPM-0516-240). The current PM_{10} network configuration is shown in Table 18. The T640X analyzers produce 1-minute and 60-minute average $PM_{2.5}$, PM_{10} (at local (LC) and standard (STP) conditions of temperature and pressure) and $PM_{10\text{-}2.5}$ (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_{10} minus $PM_{2.5}$.

Table 18: Current PM_{10}/$PM_{10-2.5}$ 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		

Monitoring data indicate that PM_{10} levels in Connecticut are well below the 24-hour NAAQS of 150 µg/m3, where the standard is based on a 3 year average of the annual number of expected exceedances that is less than or equal to 1. Figure 13 shows annual maximum 24-hour PM_{10} trends in Connecticut from 2005-2019.

Figure 13: PM_{10} Daily First High Value Trends in Connecticut MSAs



PM_{10} Monitoring Network Requirements

Population-based PM_{10} monitoring requirements: The requirements for PM_{10} monitoring stations are based on MSA populations and ambient PM_{10} levels, as shown in Table 19. All of Connecticut's stations have PM_{10} levels less than 80 percent of NAAQS, which put them in the "low concentration" category of the table. Table 20 shows compliance of the PM_{10} monitoring network with EPA requirements for the CBSAs that are within or intersecting Connecticut. Al

primary monitors indicated are FRMs, except for the Hartford Huntley monitor in the Hartford-West Hartford-East Hartford CBSA, which is a continuous FEM monitor.

Coarse PM monitoring requirements: Coarse PM, designated $PM_{10-2.5}$ or PM_C, is defined as the mass of particles with aerodynamic diameters between 2.5 and 10 microns, which can be derived by taking the difference in concentrations between paired, co-located PM2.5 and PM10 samplers. The network design requirement for $PM_{10-2.5}$ is that monitors be located at all NCore stations. DEEP has both paired FRMs and paired FEMs for discreet and continuous PM_C measurements at the New Haven NCore site, while the Cornwall NCore site has continuous FEM coarse PM monitoring.

PM_{10}/PM_C Measurement Scales, Monitoring Objectives and Value Assignments: The PM_{10} network measurements scales, monitoring objectives and value assignments are given in Table 21. All sites have value assignments of "credible," as they are counted towards minimum monitoring requirements but do not indicate potential for violation of the NAAQS.

Table 19: EPA PM_{10} Minimum Monitoring Requirements

Population category	High concentration[2]	Medium concentration[3]	Low concentration[4 5]
>1,000,000	6-10	4-8	2-4
500,000-1,000,000	4-8	2-4	1-2
250,000-500,000	3-4	1-2	0-1
100,000-250,000	1-2	0-1	0

[1]Selection of urban areas and actual numbers of stations per area will be jointly determined by EPA and the State agency.
[2]High concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding the PM_{10} NAAQS by 20 percent or more.
[3]Medium concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding 80 percent of the PM_{10} NAAQS.
[4]Low concentration areas are those for which ambient PM_{10} data show ambient concentrations less than 80 percent of the PM_{10} NAAQS.
[5]These minimum monitoring requirements apply in the absence of a design value.

Table 20: Connecticut PM_{10} Minimum Monitoring Compliance

Core-Based Statistical Area	Estimated 2019 Population	PM_{10} Concentration levels[1]	No. Monitors	Minimum No. Monitors Required[1]
Bridgeport-Stamford-Norwalk	943,332	Low	1	1-2
Hartford- East Hartford-Middletown	1,204,877	Low	2	2-4
New Haven-Milford	854,757	Low	2	1-2
Norwich-New London	265,206	Low	1	0-1
Worcester	947,404	Low	1	1-2
Torrington (non-MSA)	180,333	Low	1	0

[1] Per Table D-4 of 40 CFR 58 Appendix D

Table 21: PM_{10} Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Bridgeport	Roosevelt	Neighborhood	Highest concentration	Credible	SLAMS
Cornwall	Mohawk Mountain	Regional	General background	Credible	NCORE
East Hartford	McAuliffe Park	Neighborhood	Population exposure	Credible	SLAMS
Hartford	Huntley Place	Middle	Highest concentration	Credible	SLAMS
New Haven	Criscuolo Park	Neighborhood	Population exposure	Credible	NCORE

PAMS Network

DEEP formerly operated two Photochemical Assessment Monitoring Stations (PAMS) sites in the air monitoring network in 2015, at the New Haven Criscuolo Park and East Hartford McAuliffe Park sites. However, the 2015 ozone NAAQS rule[7] requires PAMS measurements at NCore sites that are located in CBSAs with populations of 1,000,000 or more. Since Connecticut's NCore sites are located in CBSAs with populations less than one million, this requirement does not apply. Therefore, Connecticut ended PAMS monitoring in January 2016. However, the rule requires that states located within the Ozone Transport Region (OTR) and/or states with O_3 nonattainment areas classified moderate and above develop and implement Enhanced Monitoring Plans (EMPs) proposing additional O_3, O_3 precursor and/or meteorological monitoring activities. Connecticut's EMP is addressed in the following section.

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[8], 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_3) levels in Connecticut are generally the highest in the eastern U.S., placing all regions of the state in nonattainment for the 2015 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 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[9].

DEEP has documented through numerous submissions and communications with EPA[10] that purposeful implementation of the interstate transport provisions (i.e., "good neighbor"

[7] 80 FR 65292; October 26, 2015

[8] FR 80 65292, October 26, 2015

[9] FR 82 1733, January 6, 2017

[10] Greater CT Ozone Attainment Demonstration for the 2008 NAAQS

provisions) of the Clean Air Act is needed before Connecticut can reasonably expect to attain either the 2008 or 2015 ozone NAAQS. 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). 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.

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_3 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 O3, O3 precursors [e.g.: nitrogen oxides (NO, NO2, NOX, NOY), volatile organic compounds (VOCs)] and meteorological parameters for many years as part SLAMS and PAMS networks. Current strategies for analyzing O3 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 ozone11. Given the understanding that O3 formation may be sensitive to changes in either VOCs (VOC limited regime) or NOX (NOX limited regime), as demonstrated with photochemical numeric computer models, the ratio of HCHO to NO2 from ambient air monitoring during high O3 events can be key in the validation of computer modeling approaches.

In addition to monitoring strategies aimed at understanding aspects of the regional O3 chemistry, collecting data that clearly show the spatial variability of surface O3 concentrations is critical to developing approaches to effectively address non-attainment in Connecticut. DEEP maintains an extensive network of O3 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

[11] Jin, X et. al, 2017,Evaluating a Space-Based Indicator of Surface Ozone-NOx-VOC Sensitivity Over Midlatitude Source Regions and Application to Decadal Trends, J. of Geophysical Research, 122 (19) 10,439-10,461

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_3 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_2 monitor, located at the Westport Sherwood Island State Park site.
- Possible installation and operation of a compact O_3 monitor on one of the Bridgeport, CT – Port Jefferson, NY ferry crossing the Long Island Sound during the 2021 ozone season.
- Installation of one HCHO continuous monitor, located 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_2 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.

NOx / NOy Network

NO_2 and NO/NO_Y Monitoring

DEEP monitors nitrogen dioxide (NO_2) at four sites in the monitoring network using Teledyne-API Model T500U (EQNA-0514-212), which are capable of directly measuring NO_2 using cavity attenuated phase shift (CAPS) spectroscopy. The NO_2 monitors are maintained at Hartford Huntley Place, East Hartford McAuliffe Park, New Haven Criscuolo Park and Westport Sherwood Island State Park.

DEEP also operates two nitrogen oxide/total reactive oxides of nitrogen (NO/NO_Y) TAPI model T200U/501 monitors, at Cornwall Mohawk Mountain and New Haven Criscuolo Park, to comply with NCore requirements. NOY is defined as NO+NO2+NOZ, where NOZ represents higher oxides of nitrogen. The major components of NOZ include nitrous acids [nitric acid (HNO3), and nitrous acid (HONO)], organic nitrates [peroxyl acetyl nitrate (PAN), methyl peroxyl acetyl nitrate (MPAN), and peroxyl propionyl nitrate, (PPN)], and particulate nitrates.

The NO2 and NO/NOY networks fulfill requirements for NCore and SLAMS monitoring of these parameters. These requirements include: near road and area wide NO2 monitoring in a core-based statistical area (CBSA) with a population greater than 1,000,000 (Hartford and East Hartford sites, respectively); nationwide NO2 monitoring for susceptible and vulnerable populations at site selected by EPA (New Haven) and NCore NO/NOY monitoring (Cornwall and New Haven). The Westport NO2 monitor is operated as part of Connecticut's enhanced monitoring plan to provide data for analysis and research of regional ozone fate and transport.

On January 22, 2010, EPA finalized a revision to the 1-Hour NO2 NAAQS[12] at 100 ppb, retaining the annual average NO2 standard at a level of 53 ppb. The 1-hour NO2 NAAQS is an annual 3-year average of the 98th percentile of the highest daily maximum concentration in each year. The 98th percentiles of Connecticut's daily highs are approximately 50% of the standard, as shown in Table 22 for 2019.

[12] 75 FR 6474-6537, January 22, 2010

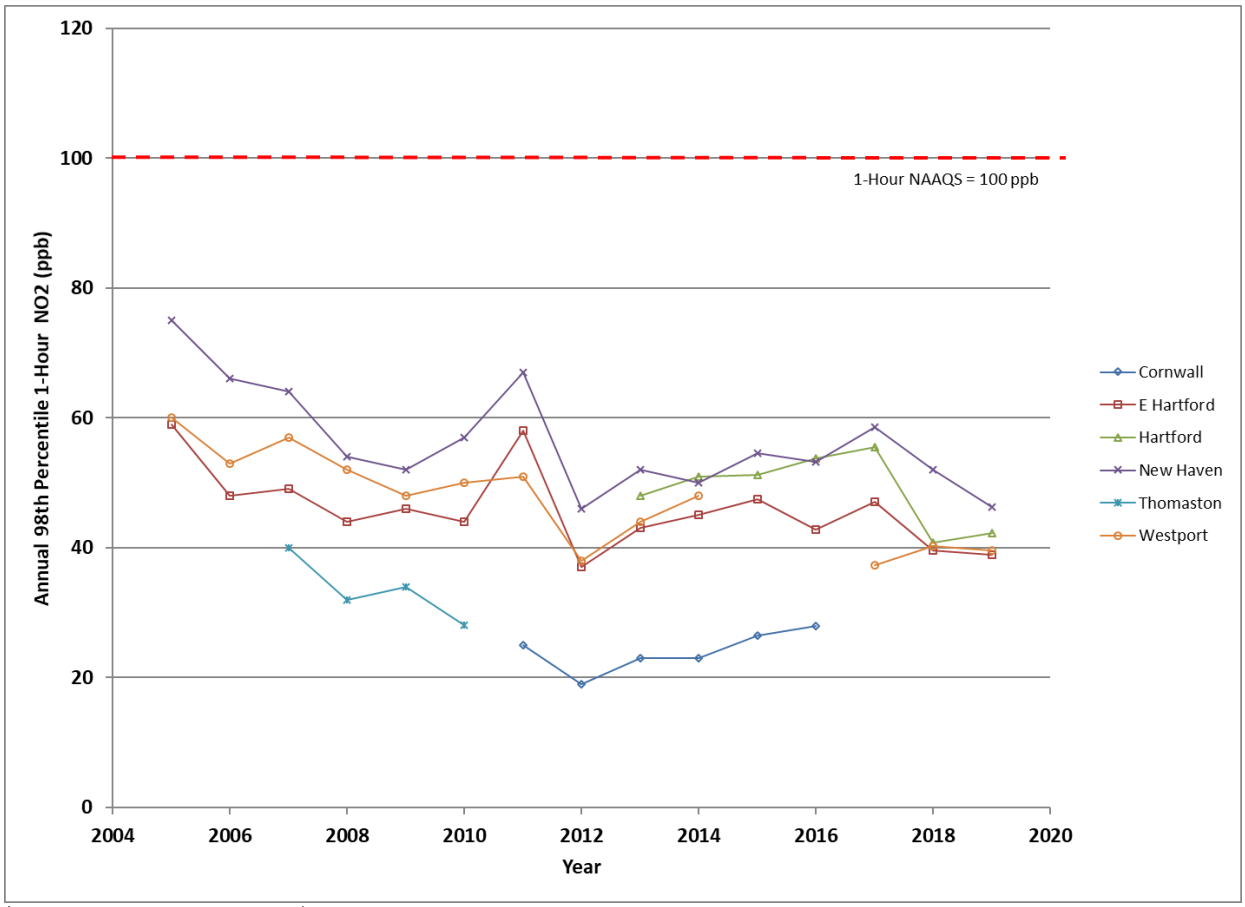
Table 22: NO_2 2019 NAAQS Design Values

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

*Incomplete data (2018-2019)

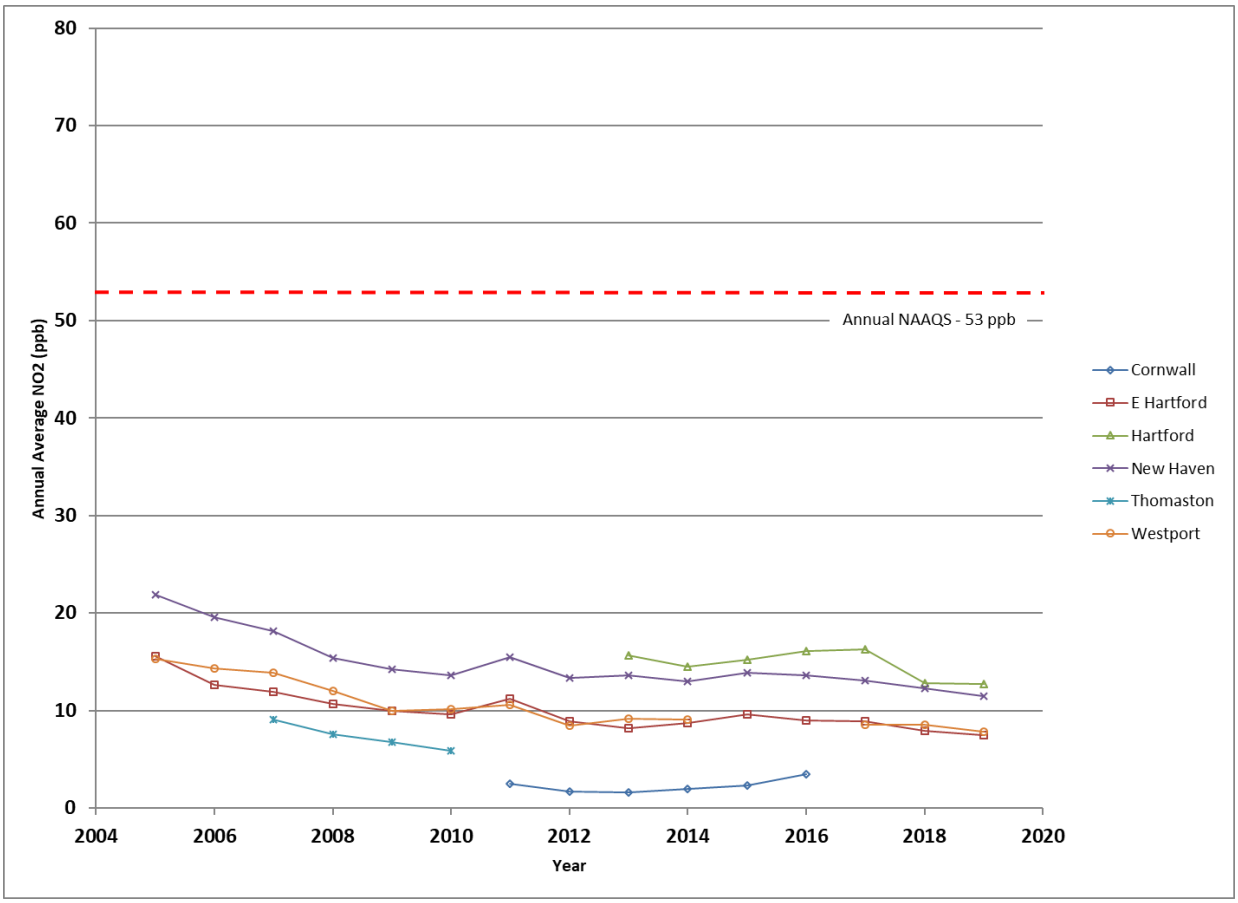
The annual 1-hour 98th percentile daily maximum and annual average NO_2 values are shown in comparison to NAAQS levels in Figures 14 and 15 below. There has been a slight decreasing NO_2 trend since 2005.

Figure 14: Connecticut 1-Hour† NO2 Trends



†Daily maximum 1-hour 98th percentile values

Figure 15: Connecticut Annual Average NO2 Trends



NO_2 Network Design

NO_2 network design requirements include those for near road, area-wide, Regional Administrator. These specific requirements are discussed below.

Near Road Monitoring Requirements: In accordance with the 2010 NO_2 NAAQS rule, DEEP must site and operate a microscale near road monitor in each CBSA having a population greater than 500,000. This monitor must be located along a road segment with expected maximum hourly NO_2 concentrations as determined by analysis of annual average daily traffic (AADT) counts, traffic patterns, topography, roadway and other structures and meteorological considerations. Specific near road requirements are given in 40 CFR 58 Appendix D 4.3.2.

Subsequent NO_2 monitoring rules[13],[14] revised the implementation requirements for near road monitors to require monitors in areas with 1,000,000 or more persons, with a second monitor required in areas with populations of at least 2,500,000. As Connecticut has one CBSA with a population greater than 1,000,000 and no areas greater than 2,500,000, one near road monitor is required. Connecticut has operated its near road monitor in Hartford since April 2013.

Area-wide Monitoring Requirements: For CBSAs with populations of at least 1,000,000, there must be an NO_2 monitor in a location of expected highest concentrations representing

[13] 78 FR 16184-16188, March 14, 2013

[14] 81 FR 96381-96388, December 30, 2016

neighborhood or larger spatial scales. Within the Hartford-East Hartford –Middletown CBSA, the East Hartford McAuliffe Park NO_2 monitor is designated as the area-wide monitor.

Regional Administrator Monitoring Requirements: The 2010 NO_2 rule requires a minimum of 40 additional NO_2 monitors nationwide above the minimum monitoring requirements. These additional monitors should be sited in locations that may be approaching or exceeding the NAAQS but are not covered by minimum monitoring requirements, or in areas where area-wide required monitors are not sufficient to meet monitoring objectives. The NO_2 monitor at New Haven Criscuolo Park has been identified as part of this additional monitoring requirement. Table 23 presents a summary of the NO_2 network scales, objectives and value assignments.

Table 23: NO_2 Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
East Hartford	McAuliffe Park	Neighborhood	Population Exposure	Critical	SLAMS/Area-Wide
Hartford	Huntley Place	Middle	Highest Concentration, Population Exposure	Critical	SLAMS/Near Road
New Haven	Criscuolo Park	Neighborhood	Population Exposure	Critical	Regional Administrator
Westport	Sherwood Island State Park-	Regional	Population Exposure	Credible	SLAMS/EMP

NO_Y Network Design

NO/NO_Y monitoring is required at all NCore sites, as well as in the PAMS program. Table 24 is a summary of the DEEP NO/NO_Y network design.

Table 24: NO/NO_Y Network Measurement Scales, Monitoring Objectives, and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Cornwall	Mohawk Mountain	Regional Scale	General/Background, Regional Transport	Critical	NCORE
New Haven	Criscuolo Park	Neighborhood	Population Exposure	Critical	NCORE

SO_2 Network

SO_2 Monitoring Overview

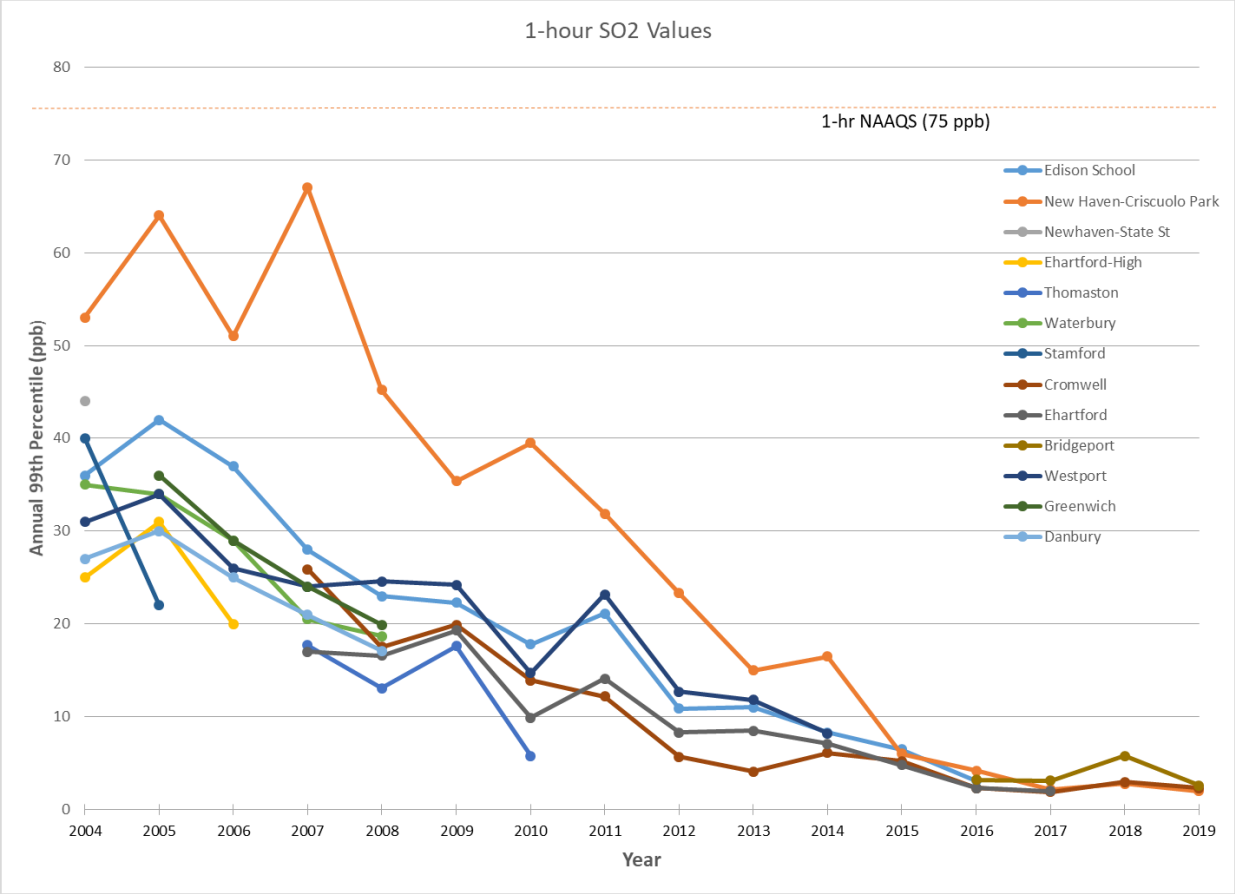
The DEEP operates three sulfur dioxide (SO_2) sites in the air monitoring network. All SO_2 samplers are operated year-round. SO_2 monitoring is conducted at the Cornwall Mohawk Mountain, New Haven Criscuolo Park, and Bridgeport Roosevelt School.

Current SO_2 monitoring indicates that concentrations are well below the primary (1-hour) and secondary (3-hour) standards of 75 ppb and 50 ppb, respectively. Figure 17 shows recent downward trends in the annual 99th percentile metrics, which are used to compute the 3-year design values. Table 25 shows the 2019 SO_2 design values for Connecticut.

Table 25: 2019 SO_2 Design Values

Site	1-Hr Design Value (ppb)
Bridgeport	4
Cornwall	2
New Haven	2
NAAQS	**75**

Figure 16: Connecticut Annual 99th Percentile Daily Maximum 1-hour SO_2 Values, 2004-2019



SO_2 Network Design

EPA requirements for SO_2 network monitors include those for NCore sites, population weighted emission index (PWEI) sites and any additional monitors that may be required by the Regional Administrator.

NCore monitoring: trace-level SO_2 measurements are included within the NCore multi-pollutant site requirements. These are used to characterize trends and assist in understanding transport. SO_2 monitors at NCore sites within CBSAs with minimum monitoring based on the PWEI may count toward meeting those requirements. DEEP operates SO_2 monitors at the two NCore stations in Connecticut, New Haven Criscuolo Park and Cornwall Mohawk Mountain.

Population Weighted Emission Index (PWEI) monitoring: PWEI values are defined in the regulations for a CBSA as product of the population (millions of people) and the total SO_2 emissions (tons). Table 26 below gives the minimum number of monitors required based on PWEI values.

Table 26: PWEI CBSA Monitoring Requirements

PWEI value (M-person-t)	Minimum number of monitors per CBSA
≥ 1,000,000	3
≥100,000 and <1,000,000	2
≥5,000 and < 100,000	1
<5,000	0

Table 27 shows the PWEI values for CBSAs that are within or intersecting Connecticut, based on the 2017 National Emissions Inventory and US Census Bureau 2019 county population estimates. The SO_2 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_2 monitors are currently required in the state. In addition, the EPA has not indicated any additional SO_2 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_2 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_2 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 and decommissioning in 2021.

Table 27: Population Weighted Emissions Index (PWEI) Values for Connecticut CBSAs

Core-Based Statistical Area (CBSA)	SO_2 (tons/yr)	Population (2019 estim.)	PWEI (MMperson-tons/yr)	No. of PWEI Required Monitors
Bridgeport-Stamford-Norwalk	359	943332	339	0
Hartford-East Hartford-Middletown	284	1204877	342	0
Torrington	1	180333	0	0
New Haven-Milford	90	854757	77	0
Norwich-New London	109	265206	29	0
Worcester	273	947404	259	0

Regional Administrator required monitoring: The Regional Administrator may require additional SO2 monitors beyond the minimum network described above in areas where there is a potential to violate or contribute to a violation of the NAAQS, there are impacts from sources not conducive to modeling, or there are impacts to susceptible or vulnerable populations. At this time, the Regional Administrator has not requested any additional SO2 monitoring in Connecticut.

SO2 monitoring objectives, spatial scales and value assignments: Both the New Haven and Bridgeport monitors represent neighborhood scale areas that are principally impacted by nearby sources. The New Haven Criscuolo Park is within close proximity to marine shipping terminals in New Haven harbor, while the Bridgeport Roosevelt School site is located within one kilometer of the state's largest SO2 point source, the Bridgeport at a distance of 3.2 kilometers to the northeast. The East Hartford site, which is apparently not impacted

significantly by large local sources, represents an urban scale that consists of the greater Hartford urban area and local suburbs. Cornwall is remotely located away from urban and industrial sources, and thus represents a regional measurement scale for general, background and long range transport objectives. Table 28 summarizes objectives, scales and value assignments.

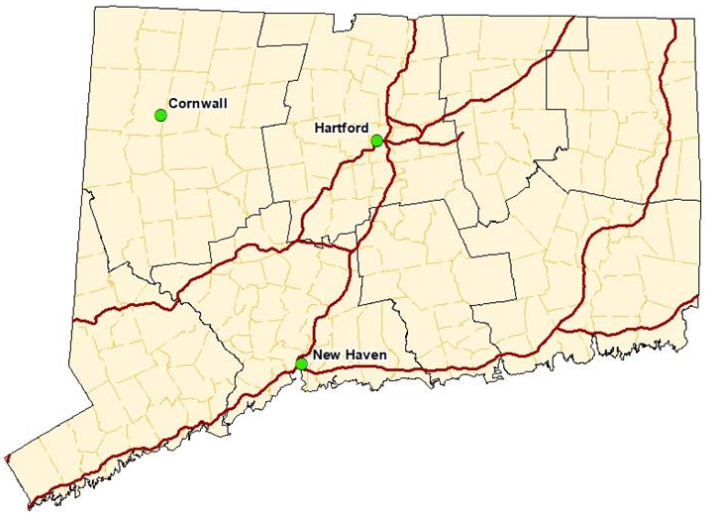
Cornwall and New Haven have SO2 values assignments of "credible," as they are required to satisfy minimum NCore monitoring requirements as indicated in Table 26. The Bridgeport site has a value assignment of credible/marginal, as it is not used to meet a current specific requirement, and while source oriented, will not be relevant as such when the source, the Bridgeport Harbor Station coal-fired energy facility, operates minimally and will be decommissioned in 2022.

Table 28: SO_2 Network Monitoring Objectives, Spatial Scales and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Bridgeport	Roosevelt School	Neighborhood	Source impact, highest concentration, population exposure	Credible/ Marginal	SLAMS
Cornwall	Mohawk Mountain	Regional	General background, regional transport	Credible	NCORE
New Haven	Criscuolo Park	Neighborhood	Population exposure	Credible	NCORE

CO Network

CO Monitoring Overview



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_2 near road monitor in a CBSA having a population greater than 1 million.[15] The EPA Regional Administrator has not indicated any locations in the state for additional CO monitoring aimed at susceptible and vulnerable populations

Table 29 shows the CO NAAQS design values for the 2 forms of the standard, 1-hour and 8-hour, where the standards are not to be exceeded more than once per year. As such, the design values are the 2nd maximum 1-hour and 8-hour values, respectively.

[15] 76 FR 54294; August 31, 2011

Figures 18 and 19 show trends in CO design values since 2005, indicating CO levels are generally only about 25 percent of the NAAQS values.

Table 29: Connecticut 2019 CO Design Values

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
NAAQS	**35**	**9**

Figure 17: 1-Hour CO Design Value Trends, 2005-2019

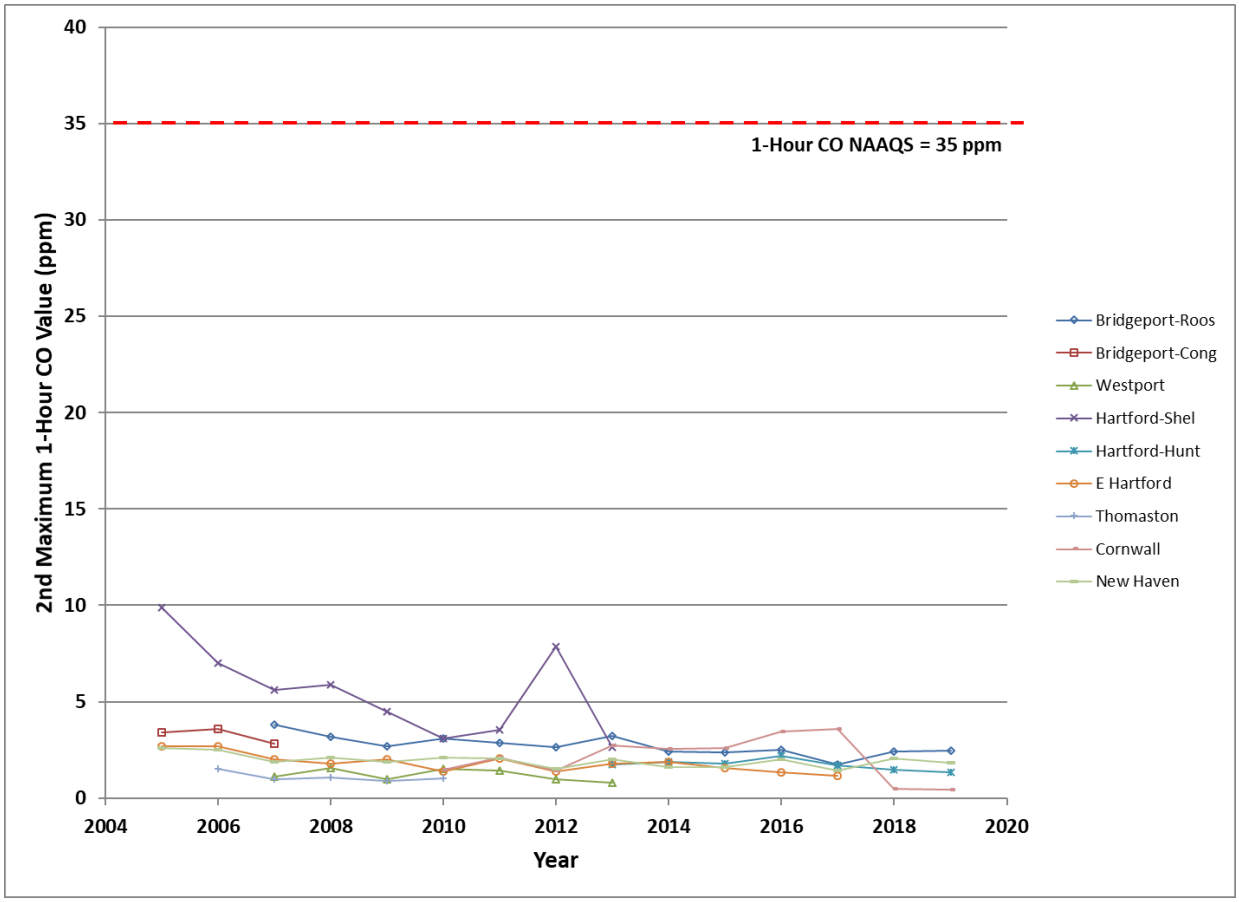
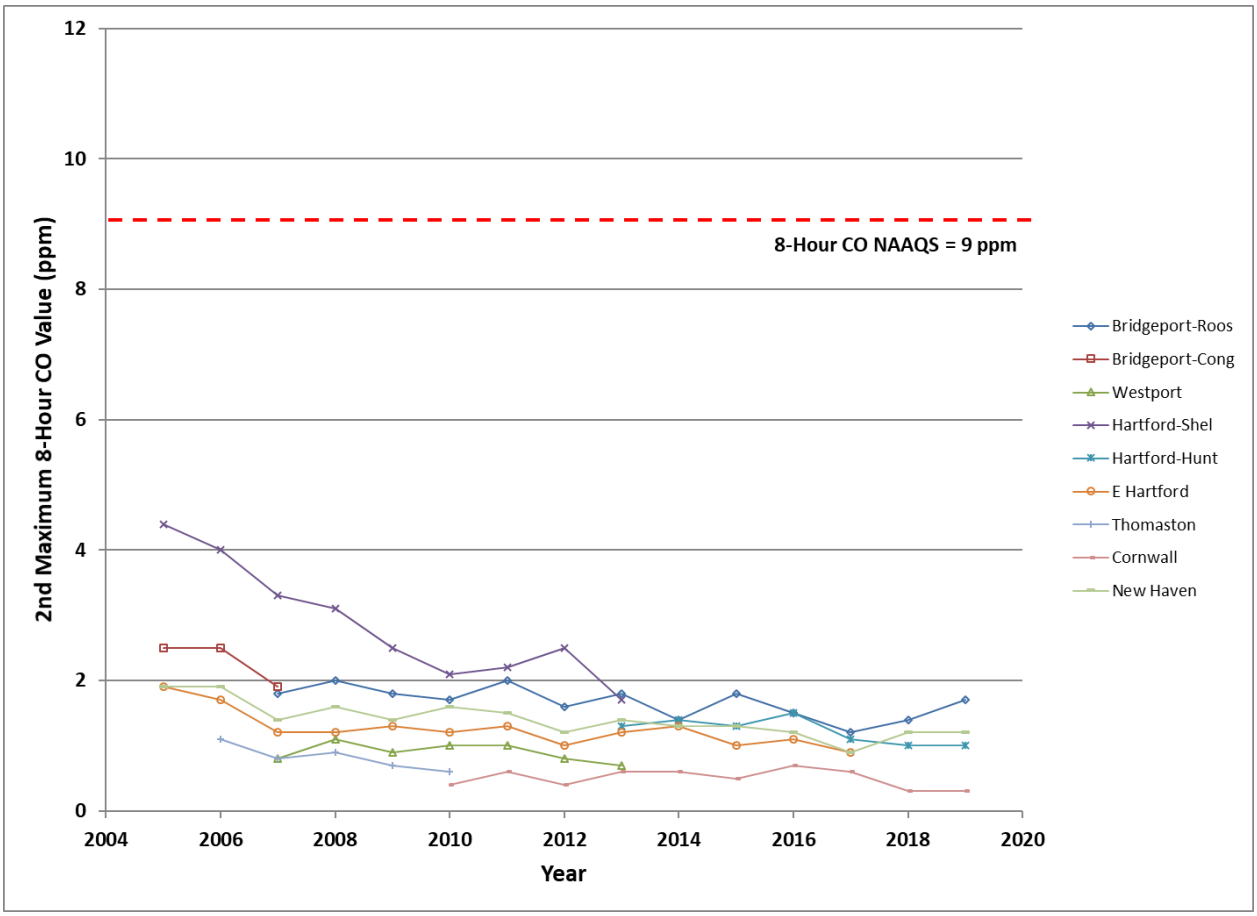


Figure 18: 8-Hour CO Design Value Trends, 2005-2019



CO Network Design

The current CO network is designed to meet general, NCORE and Regional Administrator network requirements, as well as satisfy the state's limited maintenance plans. CO is monitored at NCORE sites as a useful co-pollutant that can aide in source determination.

General requirements: Effective January 1, 2017, in any CBSA having a population of at least 1,000,000, a CO monitor must be co-located with the area's required near-road monitor, unless another location where the highest CO levels are expected within the area is approved by the Regional Administrator. The Hartford area near road CO monitor at the Huntley Place site has been in operation since January 1, 2013.

NCore requirements: CO measurements are included within the NCore multi-pollutant site requirements. DEEP operates CO monitors at the 2 NCore stations in Connecticut, New Haven Criscuolo Park and Cornwall Mohawk Mountain.

Regional Administrator required monitoring: The Regional Administrator may require additional CO monitors beyond the minimum network described above in areas where there is a potential to violate or contribute to a violation of the NAAQS, there are potentially significant impacts from stationary sources, in downtown areas or street canyons or in areas subject to high ground levels due to or enhanced by topographical or meteorological characteristics. At this time, the Regional Administrator has not requested any additional CO monitoring.

Limited Maintenance Plan requirements: CO monitors must be located and operated in accordance with Connecticut's limited maintenance plan (LMP). This monitoring allows for the measurement and tracking of CO concentrations in areas that were previously non-attainment.

If appropriate, and with Regional Administrator approval, LMP-required monitors by may also be counted towards compliance with other minimum monitoring requirements noted above. Connecticut's CO LMP covers the greater Hartford, greater New Haven and the Connecticut portion of the greater New York maintenance areas. Currently, LMP area CO monitoring is required at least through the end of each area's second ten-year maintenance period. The CO monitor operating in compliance with the LMP is at the New Haven Criscuolo Park.

Table 30 lists the measurement scales, monitoring objectives and value assignments for the DEEP CO network. All sites have value assignments of "credible" as they each fulfill explicit monitoring requirements but do not indicate a potential for air quality violations.

Table 30: CO Network Measurement Scales, Monitoring Objectives and Value Assignments

Town	Site	Measurement Scale	Monitoring Objective	Value Assignment	Site Type
Cornwall	Mohawk Mountain	Regional	Regional transport	Credible	NCORE
Hartford	Huntley Place	Neighborhood	Highest concentration, population exposure	Credible	SLAMS/ Near road
New Haven	Criscuolo Park	Neighborhood	Population exposure	Credible	NCORE

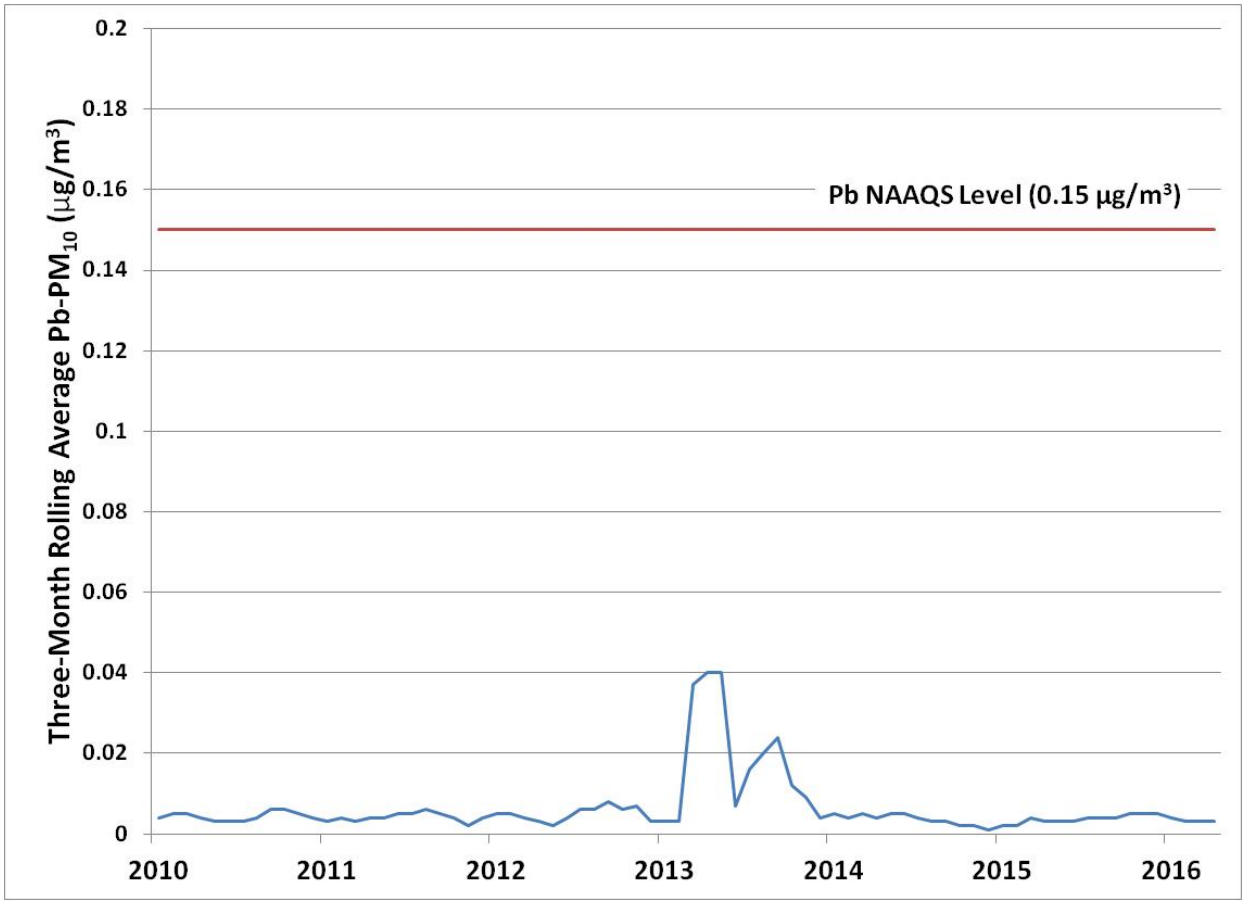
Lead Network

Lead (Pb) Monitoring

The DEEP lead (Pb) monitoring network, which consisted of primary 1-in-6 day and collocated 1-in-12 day sampling at the New Haven Criscuolo Park urban NCore site, was discontinued on June 30, 2016 under provisions of EPA's March 2016 Monitoring Rule,[16] which removed the requirement for urban NCore Pb monitoring (existing monitors with three years of data could be removed with EPA concurrance). No additional Pb monitors are required in Connecticut for stationary source or airport monitoring as required by the 2010 Pb NAAQS rule.[17]

Lead measurements were obtained from Energy Dispersive X-Ray Fluorescence (XRF) analysis of the 47 mm Teflon filter samples collected using a low-volume (lo-vol) FRM R&P Partisol Plus 2025 PM_{10} Sequential Air Samplers. Although the Pb NAAQS is defined as 0.15 µg/m^3 lead in total suspended particulates (TSP), Pb monitoring regulations allow surrogate monitoring of Pb in PM_{10} (Pb-PM_{10}), providing that design values are below two-thirds of the NAAQS, or below 0.10 µg/m^3. New Haven Pb-PM_{10} values remained well below this threshold, with a 2015 design value of 0.04 µg/m^3, while most monthly averages are in the range of 0.00-0.01 µg/m^3 (Figure 20).

Figure 19: Pb-PM10 Monitored Levels, Jan 2010 – Jun 2016



[16] 81 FR 17248; March 28, 2016

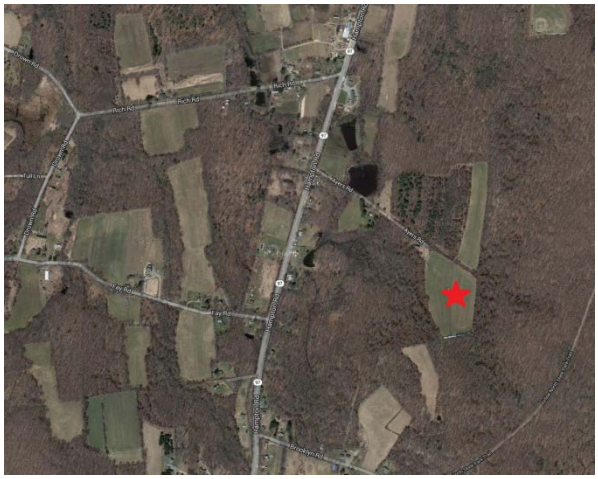
[17] 75 FR 81126; December 27, 2010

Detailed Site Information

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

Pomfret – Abington

Town – Site:			
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**		



PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
												X												

X=Existing, P =Proposed, = Planned to terminate

*Note: Site operated by EPA contractor under CASTNET program; scale and objective from 2020

Parameter	Measurement Scale*	Monitoring Objective[1]	Assigned Value from Assessment	Plan for Network Optimization
O_3	Regional	Welfare-related impacts; regional transport		

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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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
	1/6	X				X							X								X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ FRM	Neighborhood	Highest concentration	Credible	Keep
$PM_{2.5}$ Continuous	Neighborhood	Highest concentration	Credible	Keep
PM_{10} FRM / PM-Coarse	Neighborhood	Highest concentration	Credible	Keep
SO2	Neighborhood	Population exposure	Credible / Marginal	Keep
Temperature			Credible	Keep

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)	PM2.5 (Continuous – non-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	NO_2	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 =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ FRM	Regional	Population Exposure, Regional Transport	Credible	Keep
$PM_{2.5}$ Continuous	Regional	Population Exposure, regional transport	Credible	Keep
PM_{10} / $PM_{10-2.5}$ Continuous	Regional	General background	Credible	Keep
IMPROVE	Regional	Regional Transport	Credible	Keep

BC/UVC	**Regional**	**Regional Transport**	**Credible**	**Keep**
Ozone	**Regional**	**Regional Transport**	**Critical**	**Keep**
SO_2	**Regional**	**Regional Transport**	**Credible**	**Keep**
CO	**Regional**	**Regional Transport**	**Credible**	**Keep**
NO/NOy	**Regional**	**General background, Regional Transport**	**Credible**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	
Dew Point/ Rel. Humidity			**Credible**	
Barometric Pressure			**Credible**	
Solar Radiation			**Credible**	

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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
1/6		P	X								X	X							X	X	X			

X=Existing, P =Proposed = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ FRM	Neighborhood	Population exposure	Credible	Keep
$PM_{2.5}$ Continuous	Neighborhood	Population exposure	Credible	Keep
Ozone	Urban	Population exposure	Critical	Keep
BC/ UVC	Neighborhood	Population exposure	Credible	Keep
Wind Speed			Credible	
Wind Direction			Credible	
Temperature			Credible	

Town – Site: **East Hartford – McAuliffe Park**

County:	**Hartford**	Latitude:	**41.78471°**
Address:	**McAuliffe Park**	Longitude:	**-72.63158°**
AQS Site ID:	**09-003-1003**	Elevation:	**15 m (50 ft)**
Spatial Scale:	**Neighborhood**	Year Established:	**1981**
Statistical Area:	**CSA (Hartford-West Hartford-Willimantic)**		

PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
		X				X					X	X			X				X	X	X	X	X	

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ Continuous FEM	Neighborhood	Population exposure	Credible	Keep
PM_{10} / $PM_{10-2.5}$ Continuous FEM	Neighborhood	Population exposure	Credible	Keep
BC/UVC	Neighborhood	Population exposure	Credible	Keep
Ozone	Urban	Population exposure	Critical	Keep
NO_2	Neighborhood	Population exposure	Credible	Keep
Wind Speed			Credible	

Wind Direction			**Credible**	
Temperature			**Credible**	
Dew Point / Rel. Humidity			**Credible**	

Town – Site:	**Greenwich – Point Park**		
County:	**Fairfield**	Latitude:	**41.005047°**
Address:	**Point Park**	Longitude:	**-73.58382°**
AQS Site ID:	**09-001-0017**	Elevation:	**3 m (10 ft)**
Spatial Scale:	**Urban**	Year Established:	**1978**
Statistical Area:	**CSA (New York-Newark-Bridgeport)**		

PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
												X							X	X	X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Regional**	**Population exposure, regional transport**	**Critical**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	
Rain Fall			**Credible**	

Town – Site:	**Groton – Fort Griswold**		
County:	**New London**	Latitude:	**41.35362°**
Address:	**141 Smith Street**	Longitude:	**-72.07882°**
AQS Site ID:	**09-011-0124**	Elevation:	**37 m (120 ft)**
Spatial Scale:	**Neighborhood**	Year Established:	**2007**
Statistical Area:	**MSA (Norwich-New London)**		

PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
		X				X						X									X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ Continuous	Urban	Population exposure	Credible	Keep
Ozone	Urban	Population exposure	Critical	Keep
Temperature			Credible	

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)**

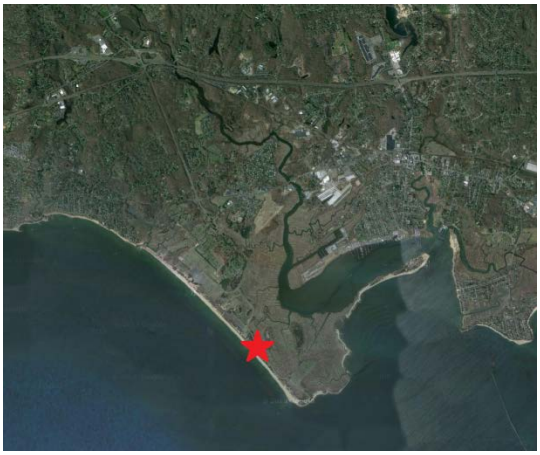
PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	NO_2	NO/NOy	HCHO	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 =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ FRM	Neighborhood	Population exposure, source-oriented, highest concentration	Credible	Keep
$PM_{2.5}$ Continuous	Neighborhood	Population exposure, source-oriented, highest concentration	Credible	Keep
PM_{10} Continuous	Middle	Population exposure, highest concentration	Credible	Keep

NO_2	**Middle**	**Population exposure, highest concentration**	**Credible**	**Keep**
CO	**Middle**	**Highest concentration, population exposure**	**Credible**	**Keep**
BC/ UVC	**Neighborhood**	**Population exposure**	**Credible**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	
Traffic Count			**Credible**	

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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Total Column NO2/HCHO	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
												X						X	X	X	X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Regional**	**Population exposure, maximum ozone concentration**	**Critical**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	

Town – Site: **Middletown – Central Valley Hospital**

County:	**Middlesex**	Latitude:	**41.55224°**
Address:	**Shew Hall**	Longitude:	**-72.63004°**
AQS Site ID:	**09-007-0007**	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)	PM2.5 (Continuous – non-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	NO_2	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 =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Urban**	**Population exposure**	**Critical**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	
Rain Fall			**Credible**	
Barometric Pressure			**Credible**	

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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Total Column NO2/HCHO	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			1/3		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ FRM	Neighborhood	Population exposure	Credible	Keep
$PM_{2.5}$ Continuous FEM	Neighborhood	Population exposure	Credible	Keep
PM_{10} Continuous FEM	Neighborhood	Population exposure	Credible	Keep
PM_{10} FRM	Neighborhood	Population exposure	Credible	Keep
PM-Coarse Continuous FEM	Neighborhood	Population exposure	Credible	Keep
CSN	Neighborhood	Population exposure	Credible	Keep

BC/UVC	**Neighborhood**	**Population exposure**	**Credible**	**Keep**
Ozone	**Urban**	**Population exposure**	**Critical**	**Keep** – required year-round operation.
SO_2	**Neighborhood**	**Highest Concentration, population exposure**	**Credible**	**Keep**
CO	**Neighborhood**	**Population exposure**	**Credible**	**Keep**
NO_2	**Neighborhood**	**Population exposure**	**Credible**	**Keep**
NOy	**Neighborhood**	**Population exposure**	**Credible**	**Keep**
HCHO	**Neighborhood**	**General background**	**Credible**	**Add**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	
Dew Point/ Rel. Humidity			**Credible**	
Barometric Pressure			**Credible**	
Solar Radiation			**Credible**	

Town – Site:	**Stafford – Shenipsit State Forest**		
County:	**Tolland**	Latitude:	**41.97568°**
Address:	**Route 190**	Longitude:	**-72.38674°**
AQS Site ID:	**09-013-1001**	Elevation:	**265 m (869 ft)**
Spatial Scale:	**Regional**	Year Established:	**1980**
Statistical Area:	**CBSA (Hartford-West Hartford-Willimantic)**		

PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
												X							X	X	X			

X=Existing P =Proposed , = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Regional**	**Population exposure/ general background**	**Critical**	**Keep**
Wind Speed			**Credible**	
Wind Direction			**Credible**	
Temperature			**Credible**	

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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
												X									X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Regional**	**Regional transport, highest concentration, population exposure**	**Critical**	**Keep**
Temperature			**Credible**	

Town – Site: **Waterbury – Meadow & 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)	PM2.5 (Continuous – non-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	NO_2	NO/NOy	HCHO	Traffic Count	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation
		X				X													X	X	X			

X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
$PM_{2.5}$ Continuous FEM	Neighborhood	Population exposure	Credible	Keep
PM_{10} / $PM_{10-2.5}$ Continuous FEM	Neighborhood	Population exposure	Credible	Keep
Wind Speed	Neighborhood	Population exposure	Credible	
Wind Direction	Neighborhood	Population exposure	Credible	
Temperature	Neighborhood	Population exposure	Credible	

Town – Site:	**Westport – Sherwood Island State Park**		
County:	**Fairfield**	Latitude:	**41.11822°**
Address:	**Sherwood Island SP**	Longitude:	**-73.33681°**
AQS Site ID:	**09-001-9003**	Elevation:	**4 m (13 ft)**
Spatial Scale:	**Regional**	Year Established:	**1996**
Statistical Area:	**CSA (New York-Newark-Bridgeport)**		

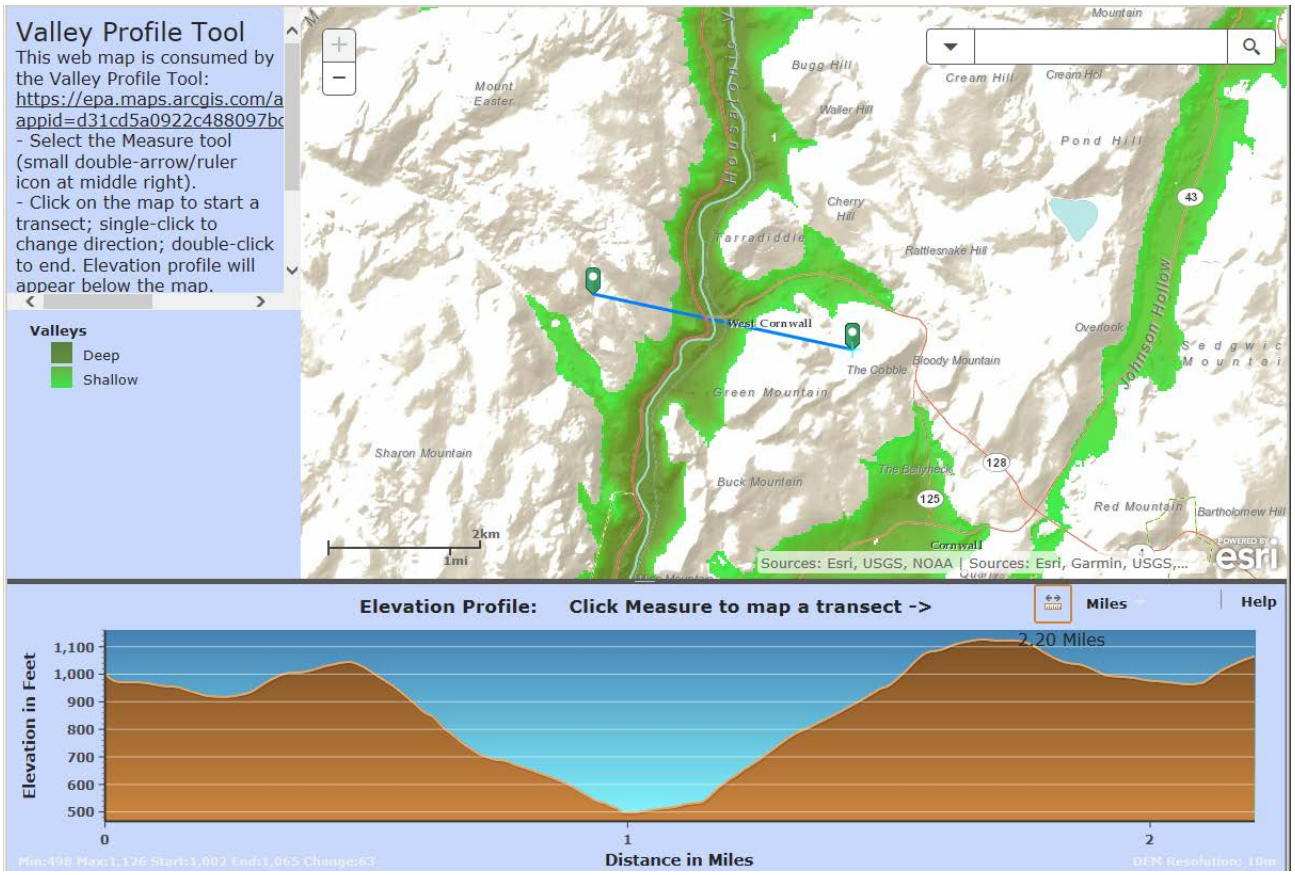
PM2.5 (FRM)	PM2.5 (FRM, Collocated)	PM2.5 (Continuous - FEM)	PM2.5 (Continuous – non-FEM)	PM10/PM-Coarse (FRM)	PM10/PM-Coarse (FRM, Collocated)	PM10/PM-Coarse (Continuous)	Lead-PM10	Lead-PM10 (Collocated)	PM Speciation (CSN)	PM Speciation (IMPROVE)	PM2.5 Carbon (BC/UVC, Continuous)	Ozone	SO2	CO	NO_2	NO/NO_y	HCHO	Total Column NO_2/HCOC	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation	Mixing Height
												X			X		P	X	X	X	X				P

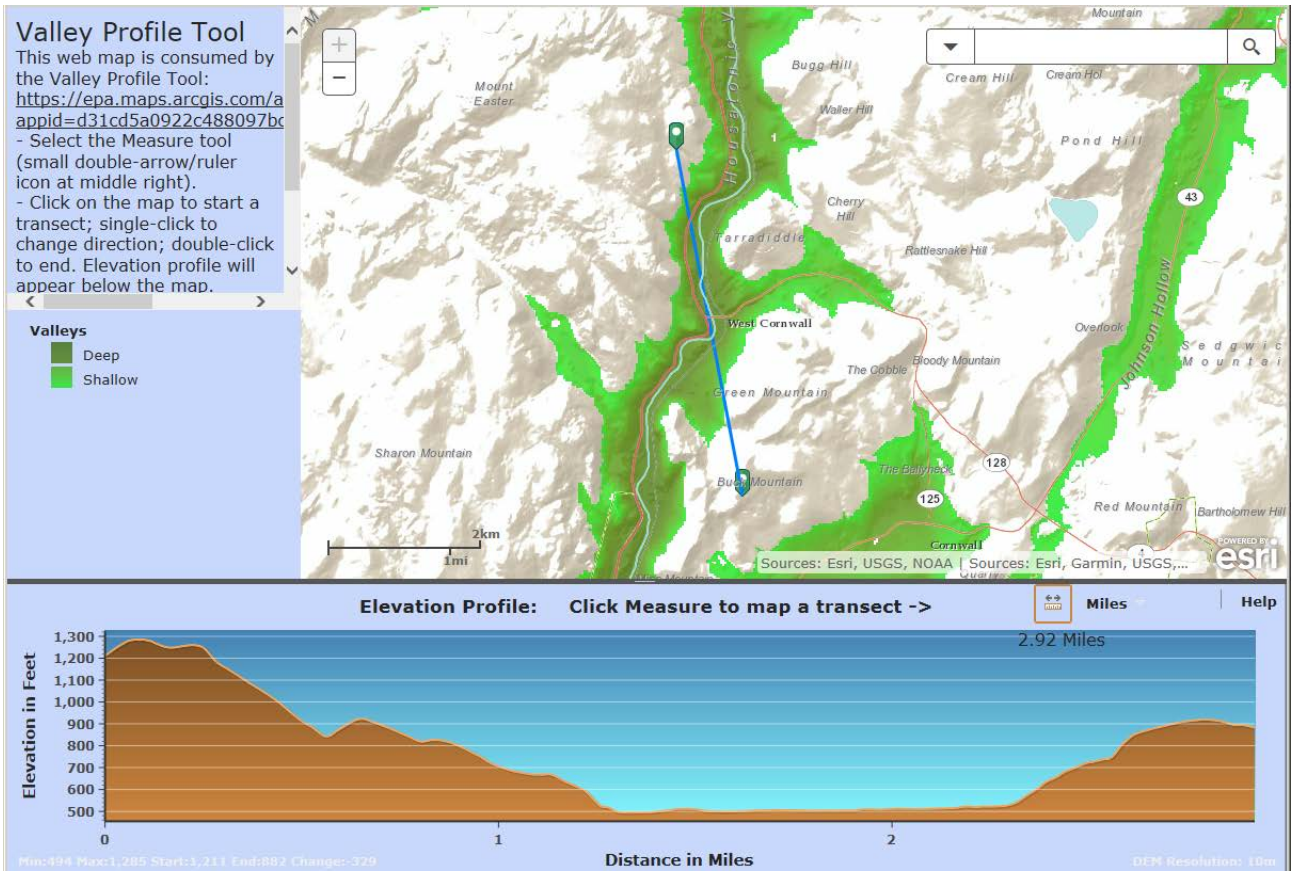
X=Existing, P =Proposed, = Planned to terminate

Parameter	Measurement Scale	Monitoring Objective	Assigned Value from Assessment	Plan for Network Optimization
Ozone	**Regional**	**Maximum concentration, regional transport, population exposure**	**Critical**	**Keep**
NO_2	**Urban**		**Credible**	**Keep**
HCHO	**Urban**		**Credible**	**Add**
Wind speed			**Credible**	**Keep**
Wind direction			**Credible**	**Keep**
Temperature			**Credible**	**Keep**
Mixing Height			**Credible**	**Add**

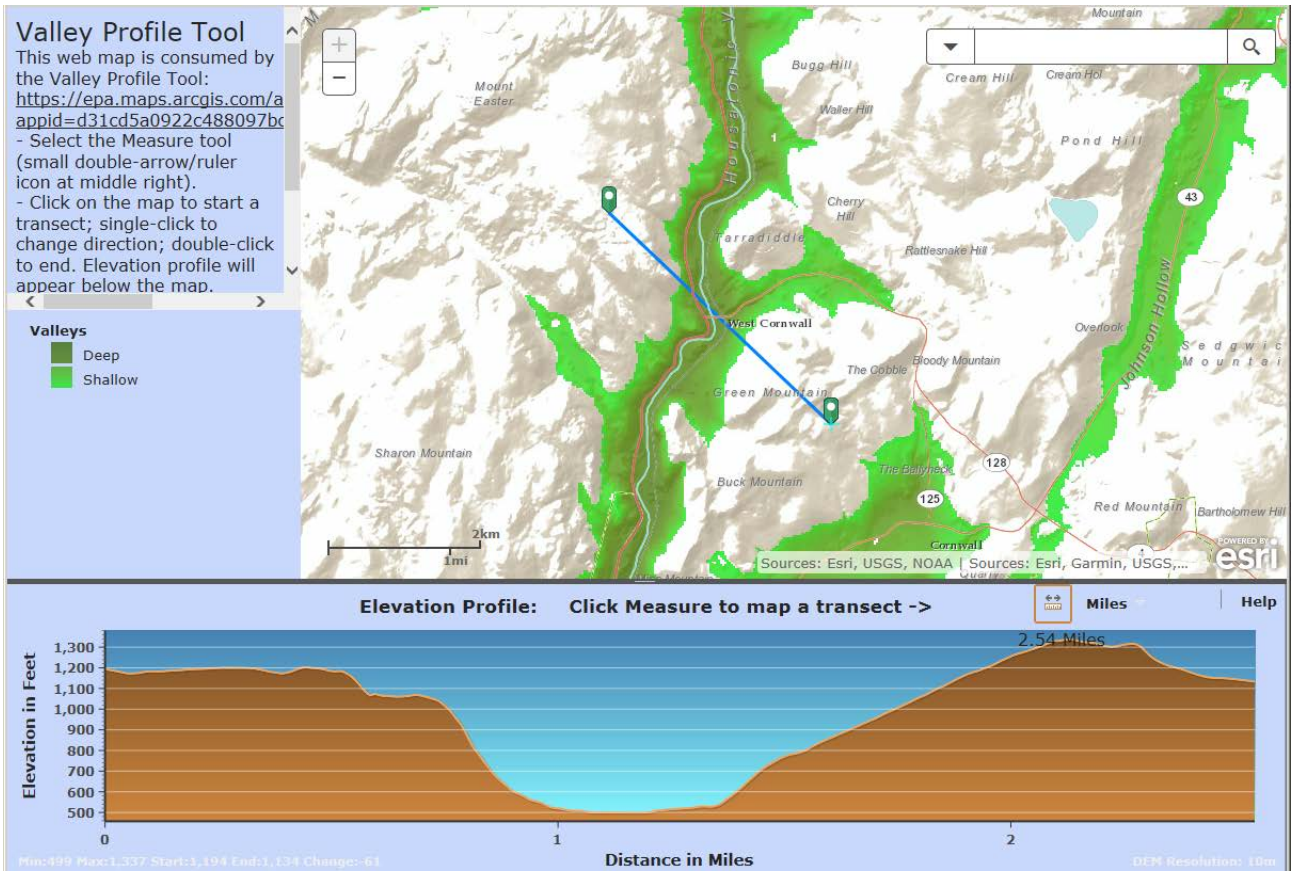
Appendix A Valley ID Tool Graphical Output

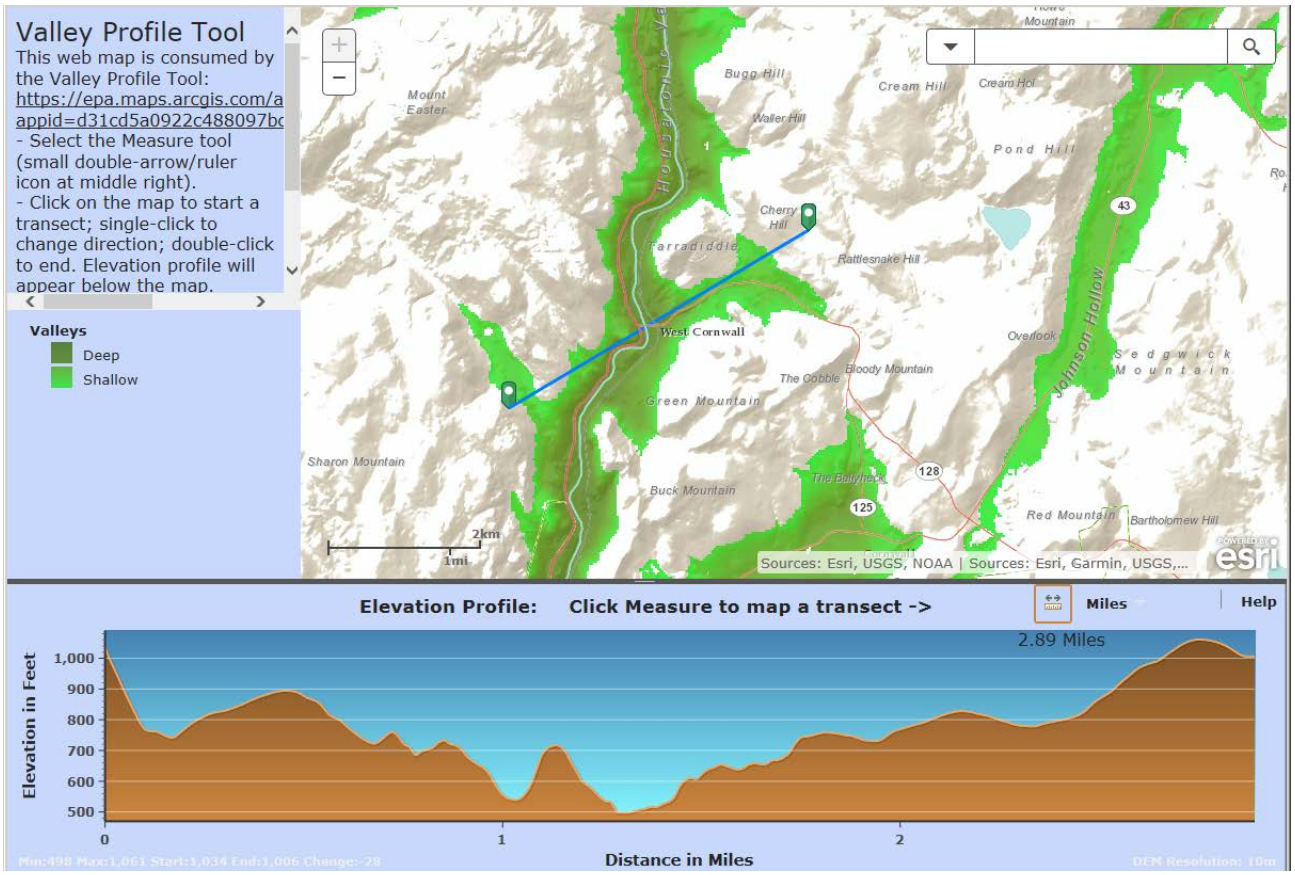
West Cornwall



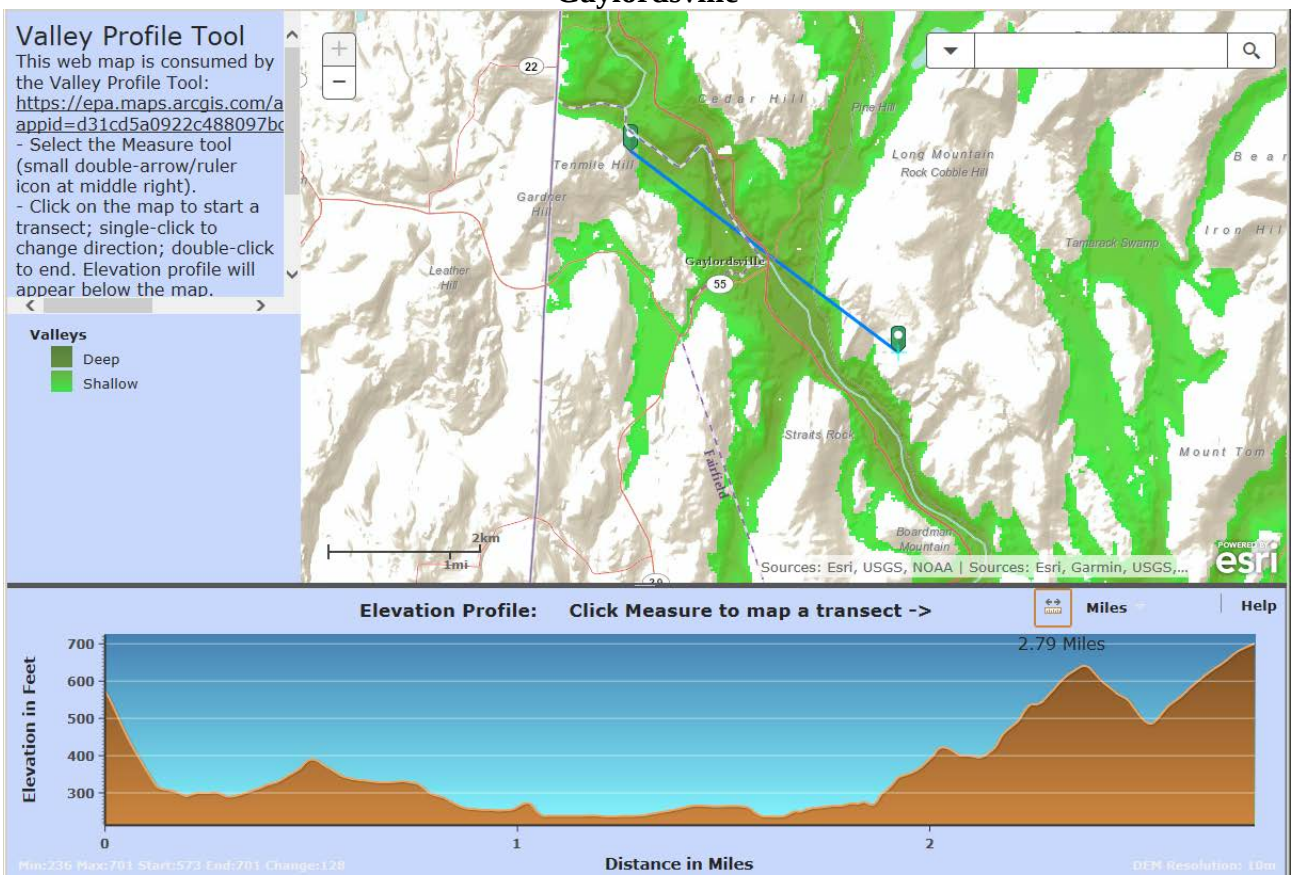


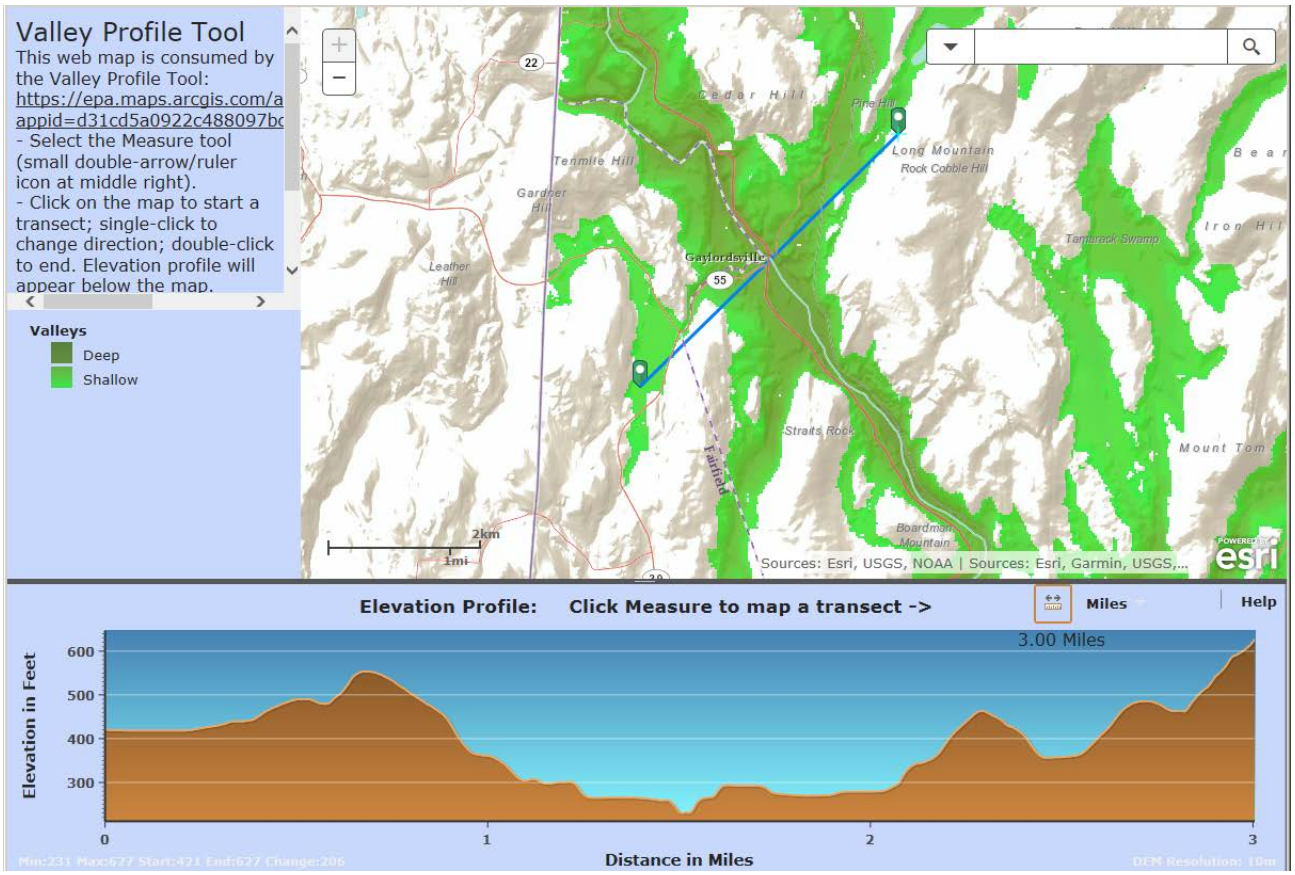
West Cornwall



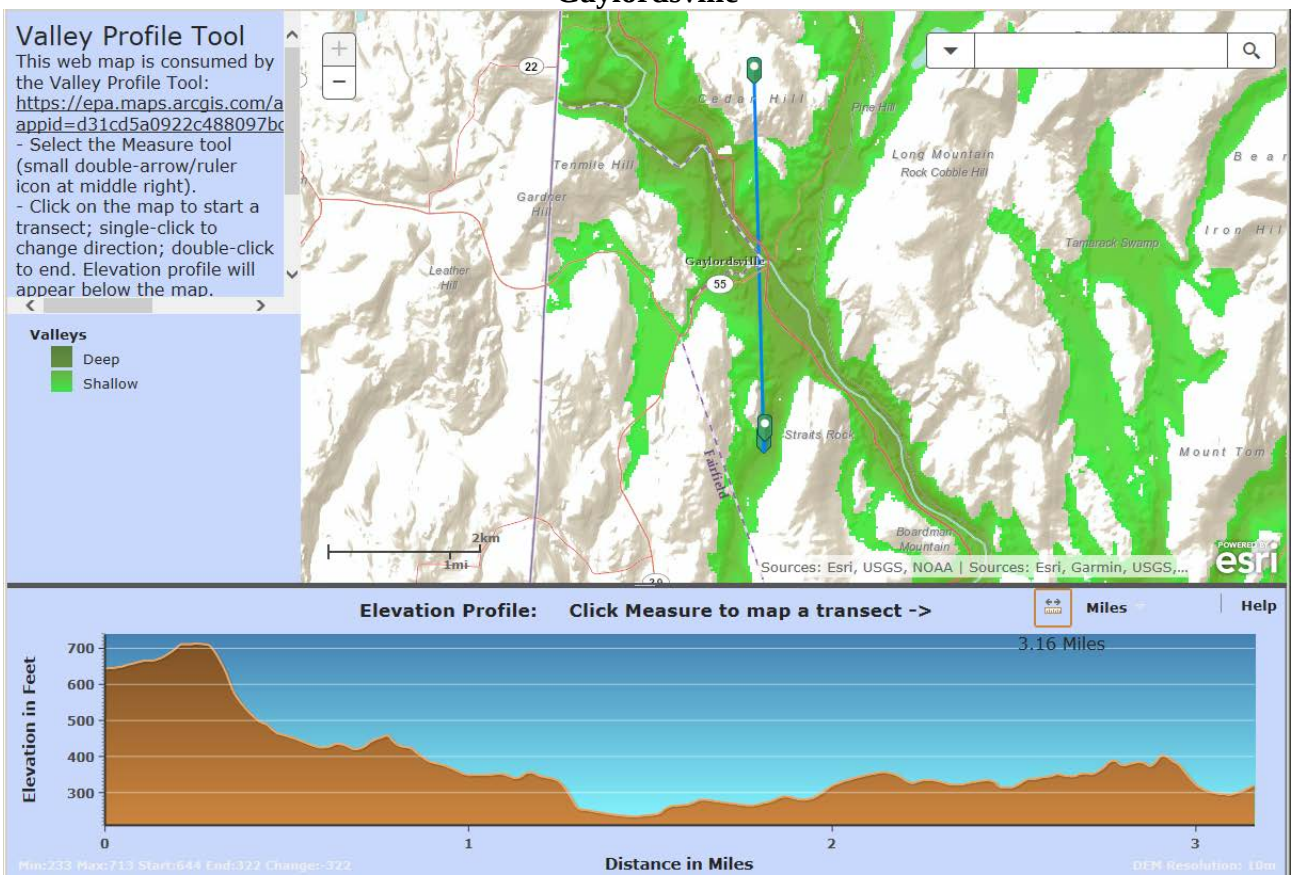


Gaylordsville

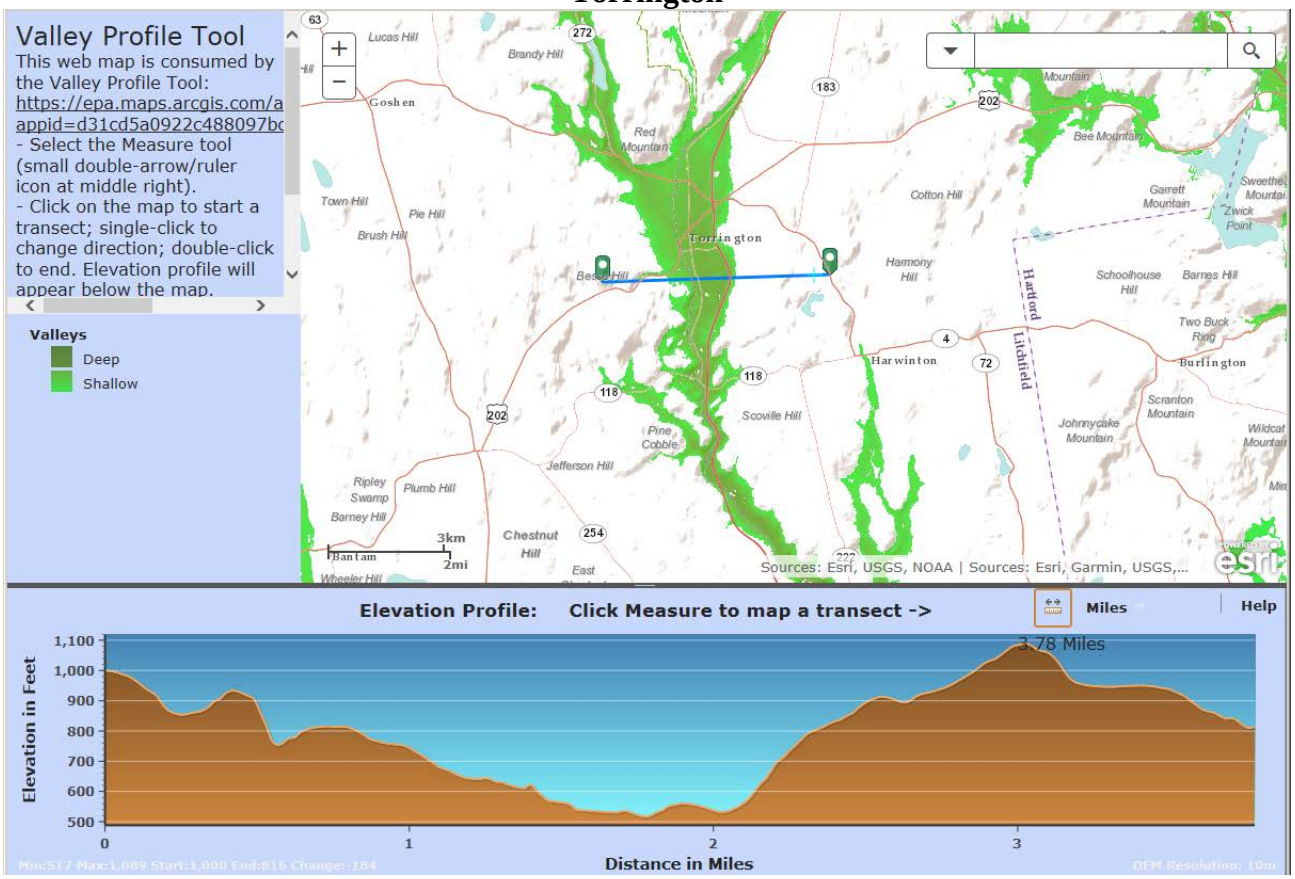


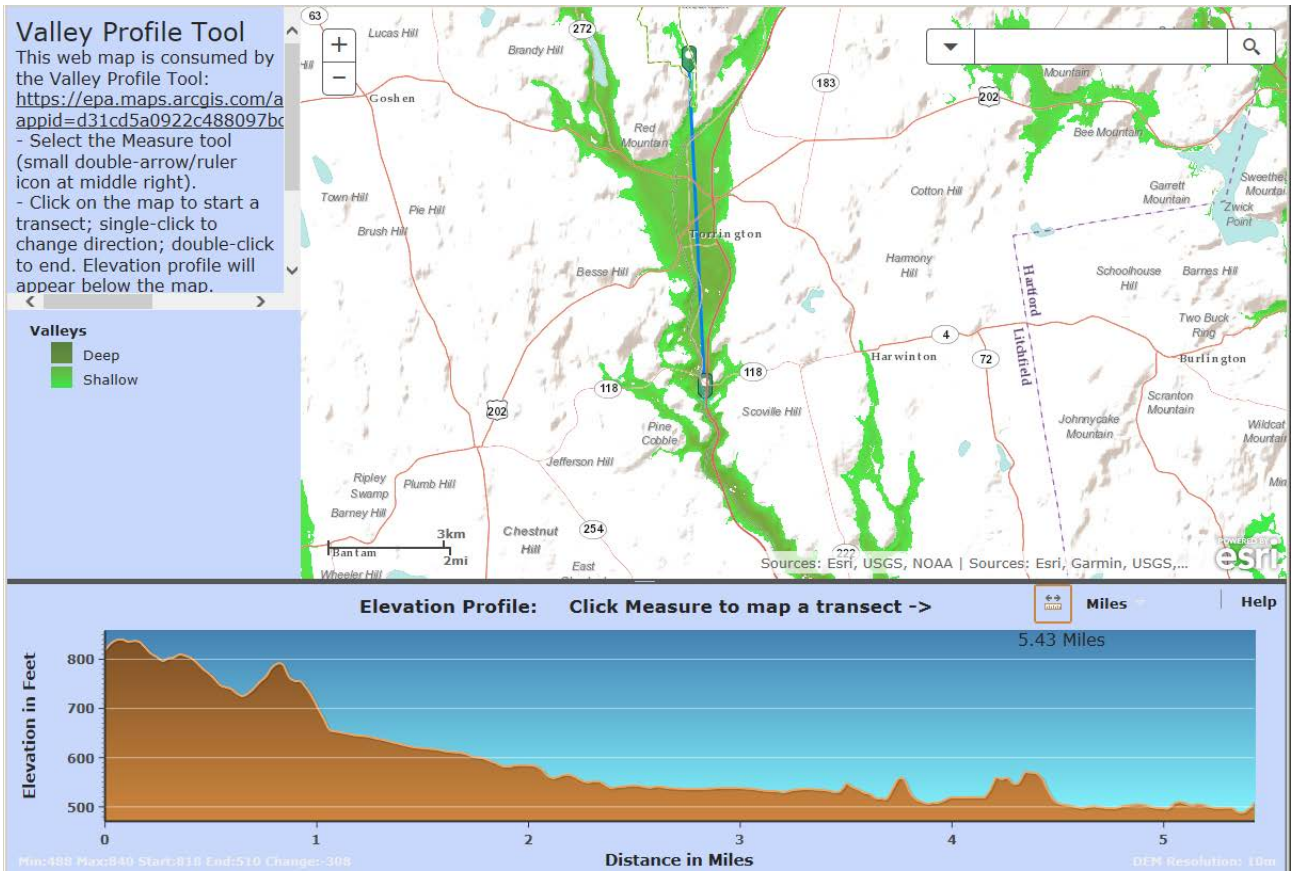


Gaylordsville

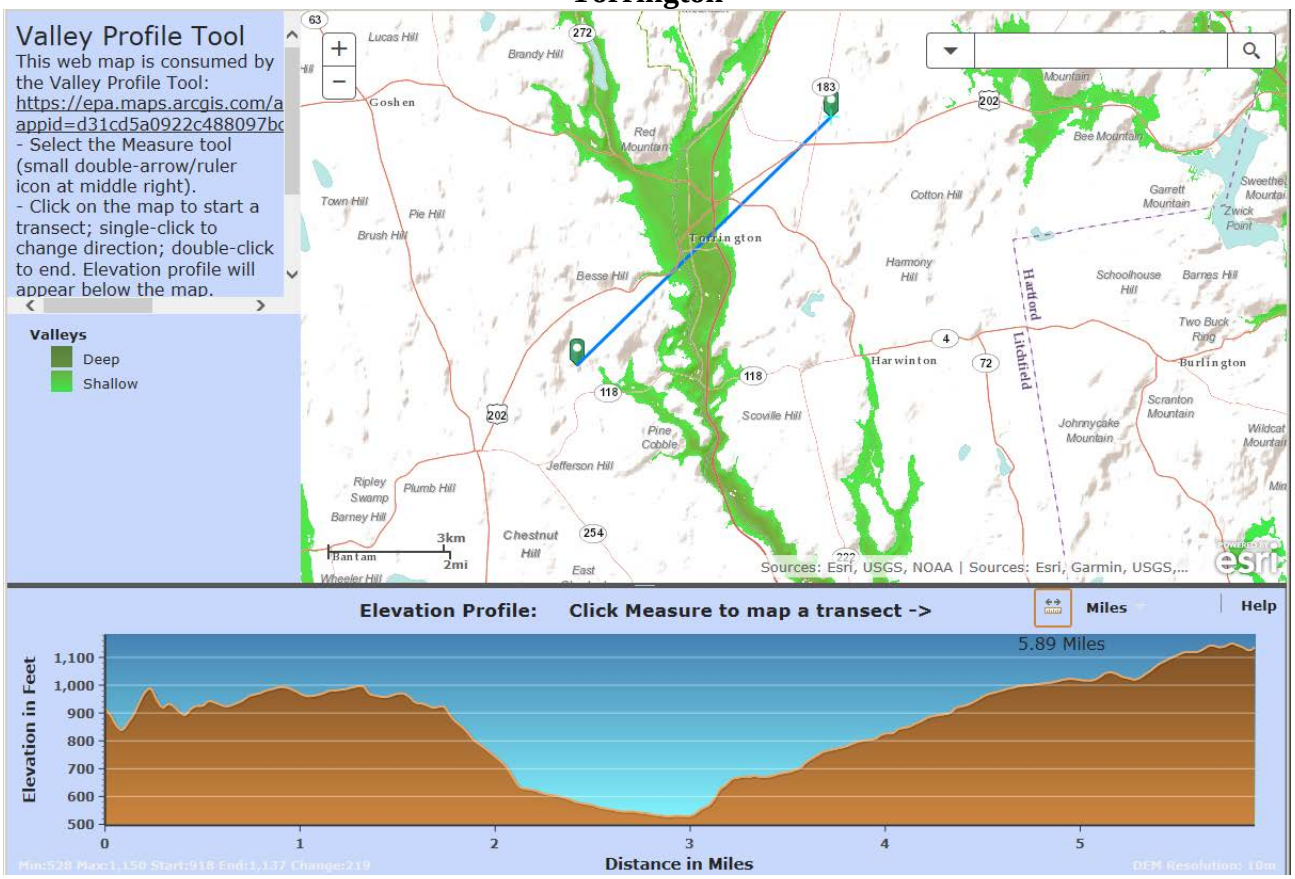


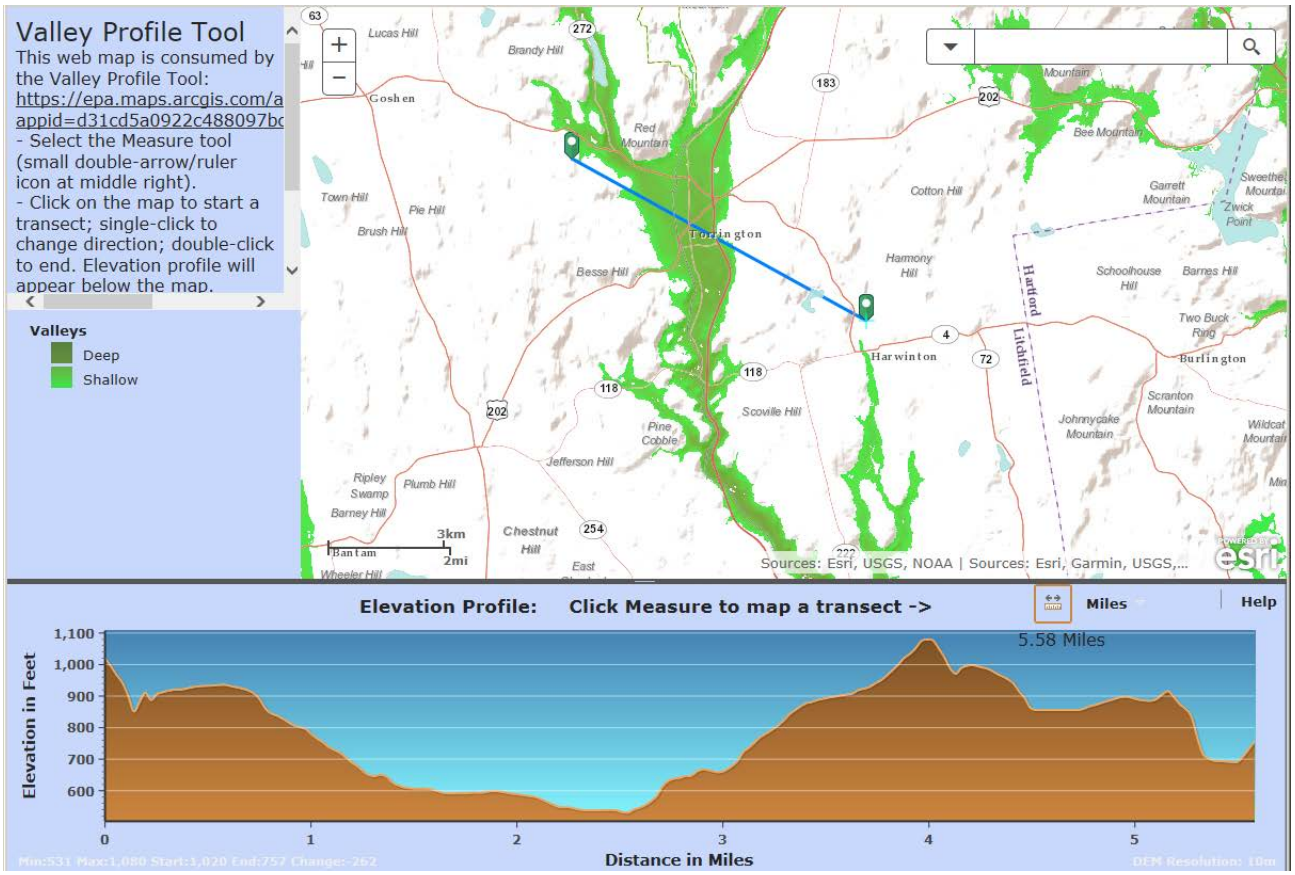
Torrington


Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
Torrington
Harwinton
Burlington
Goshen
Cotton Hill
Scoville Hill
Jefferson Hill
Hamony Hill
Besse Hill
Pine Cobble
Chestnut Hill
Barney Hill
Ripley Swamp
Plumb Hill
Pie Hill
Brush Hill
Town Hill
Red Mountain
Bee Mountain
Garrett Mountain
Schoolhouse Hill
Barnes Hill
Two Buck Rung
Scranton Mountain
Johnnycake Mountain
Wildcat Mountain
Hartford
Litchfield
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
3.78 Miles
Elevation in Feet
1,100
1,000
900
800
700
600
500
0
1
2
3
Distance in Miles

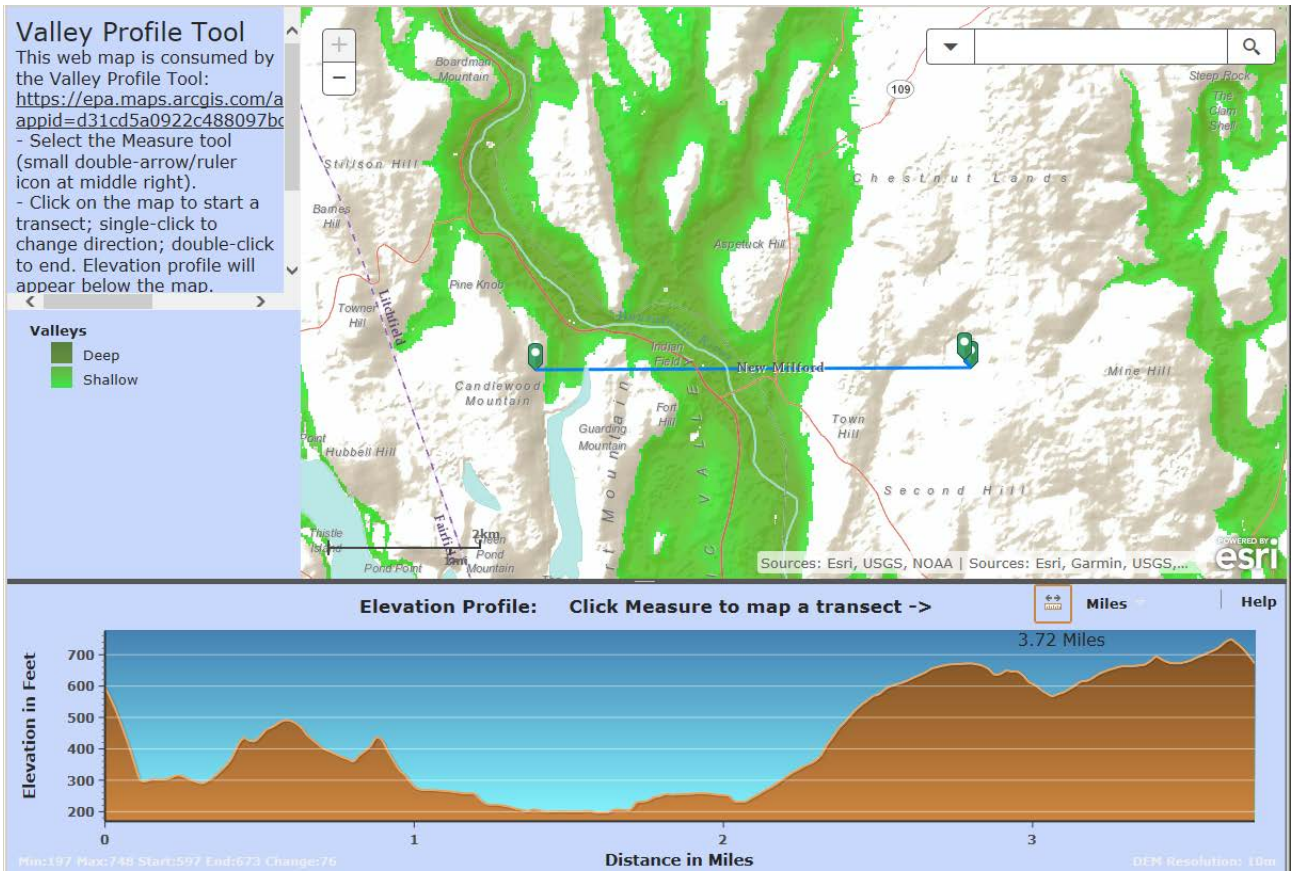

Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
Torrington
Harwinton
Burlington
Goshen
Cotton Hill
Scoville Hill
Jefferson Hill
Hamony Hill
Besse Hill
Pine Cobble
Chestnut Hill
Barney Hill
Ripley Swamp
Plumb Hill
Pie Hill
Brush Hill
Town Hill
Red Mountain
Bee Mountain
Garrett Mountain
Schoolhouse Hill
Barnes Hill
Two Buck Rung
Scranton Mountain
Johnnycake Mountain
Wildcat Mountain
Hartford
Litchfield
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
5.43 Miles
Elevation in Feet
800
700
600
500
0
1
2
3
4
5
Distance in Miles

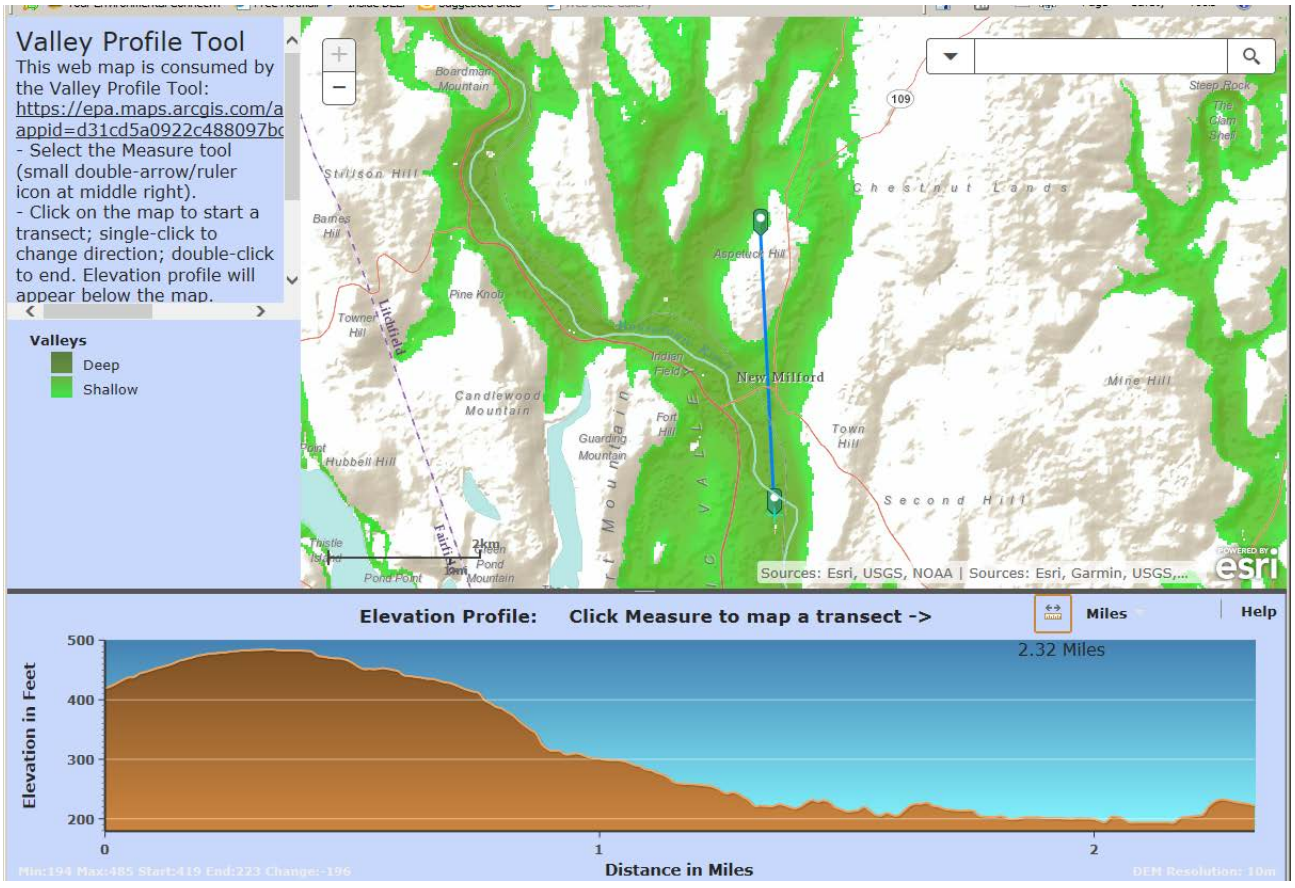
Torrington


Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
Torrington
Harwinton
Burlington
Goshen
Cotton Hill
Scoville Hill
Jefferson Hill
Besse Hill
Harmony Hill
Red Mountain
Brandy Hill
Lucas Hill
Town Hill
Pie Hill
Brush Hill
Ripley Swamp
Plumb Hill
Barney Hill
Chestnut Hill
Pine Cobble
Johnnycake Mountain
Scranton Mountain
Garrett Mountain
Bee Mountain
Schoolhouse Hill
Barnes Hill
Two Buck Rng
Zwick Point
Wildcat Mountain
Hartford
Litchfield
Bantam
East
3km
2mi
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
5.89 Miles
Elevation in Feet
1,100
1,000
900
800
700
600
500
0
1
2
3
4
5
Distance in Miles
Min:528 Max:1,150 Start:918 End:1,137 Change:219
DEM Resolution: 10m

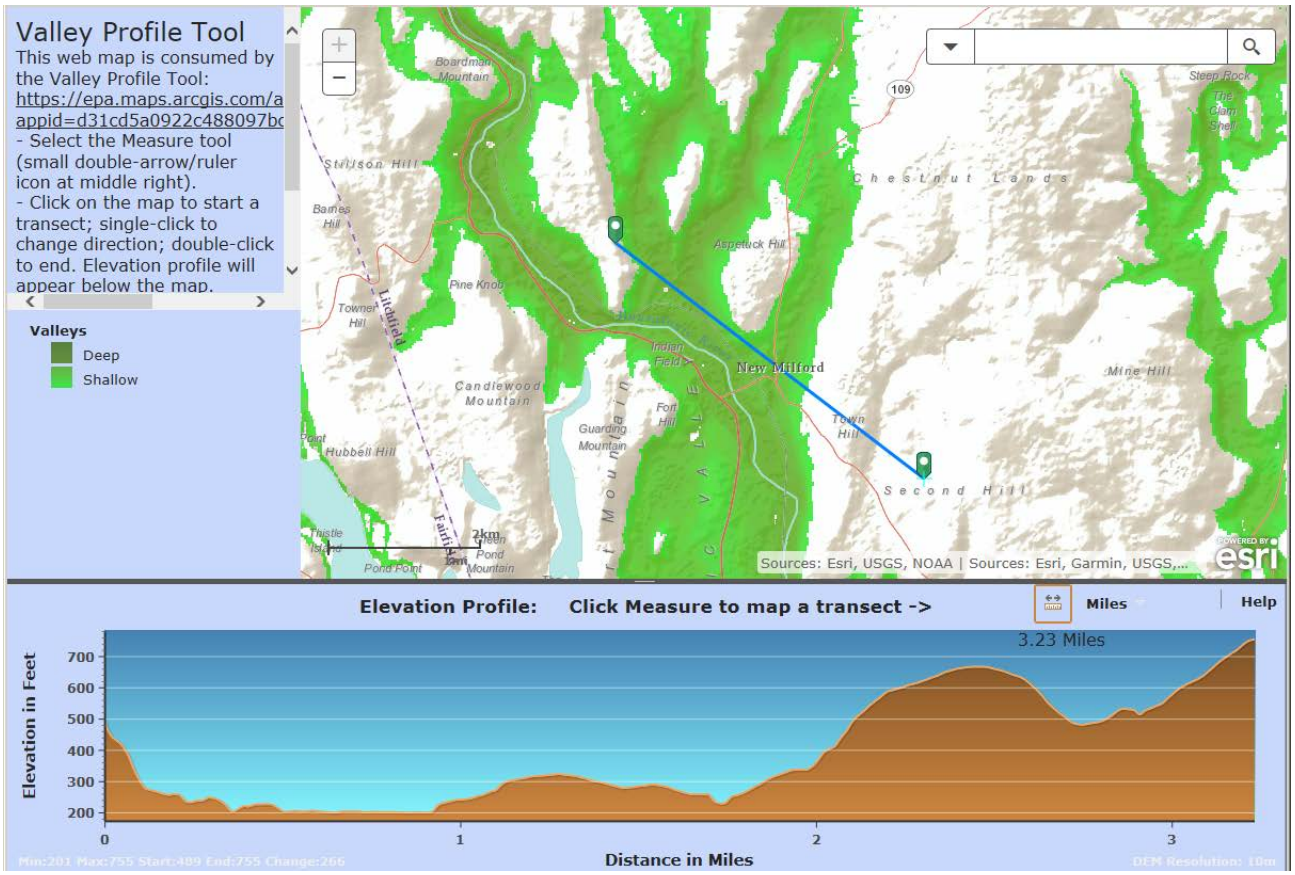

Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
Torrington
Harwinton
Burlington
Goshen
Cotton Hill
Scoville Hill
Jefferson Hill
Besse Hill
Harmony Hill
Red Mountain
Brandy Hill
Lucas Hill
Town Hill
Pie Hill
Brush Hill
Ripley Swamp
Plumb Hill
Barney Hill
Chestnut Hill
Pine Cobble
Johnnycake Mountain
Scranton Mountain
Garrett Mountain
Bee Mountain
Schoolhouse Hill
Barnes Hill
Two Buck Rng
Zwick Point
Wildcat Mountain
Hartford
Litchfield
Bantam
East
3km
2mi
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
5.58 Miles
Elevation in Feet
1,100
1,000
900
800
700
600
0
1
2
3
4
5
Distance in Miles
Min:531 Max:1,080 Start:1,020 End:757 Change:-262
DEM Resolution: 10m

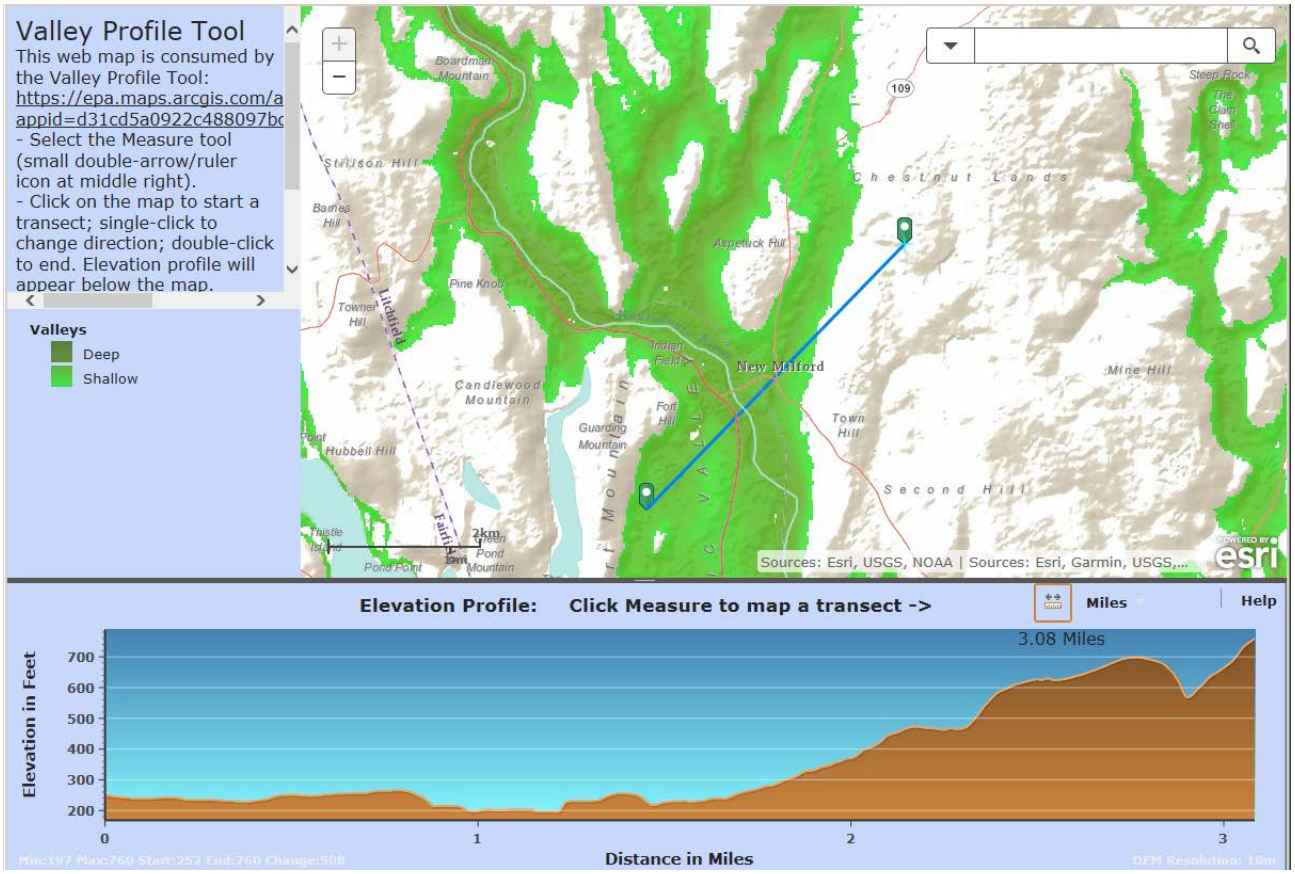
New Milford


Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
New Milford
Chestnut Lands
Second Hill
Mine Hill
Town Hill
Fort Hill
Guarding Mountain
Candlewood Mountain
Aspetuck Hill
Pine Knob
Hubbell Hill
Strillson Hill
Boardman Mountain
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
3.72 Miles
Elevation in Feet
700
600
500
400
300
200
0
1
2
3
Distance in Miles

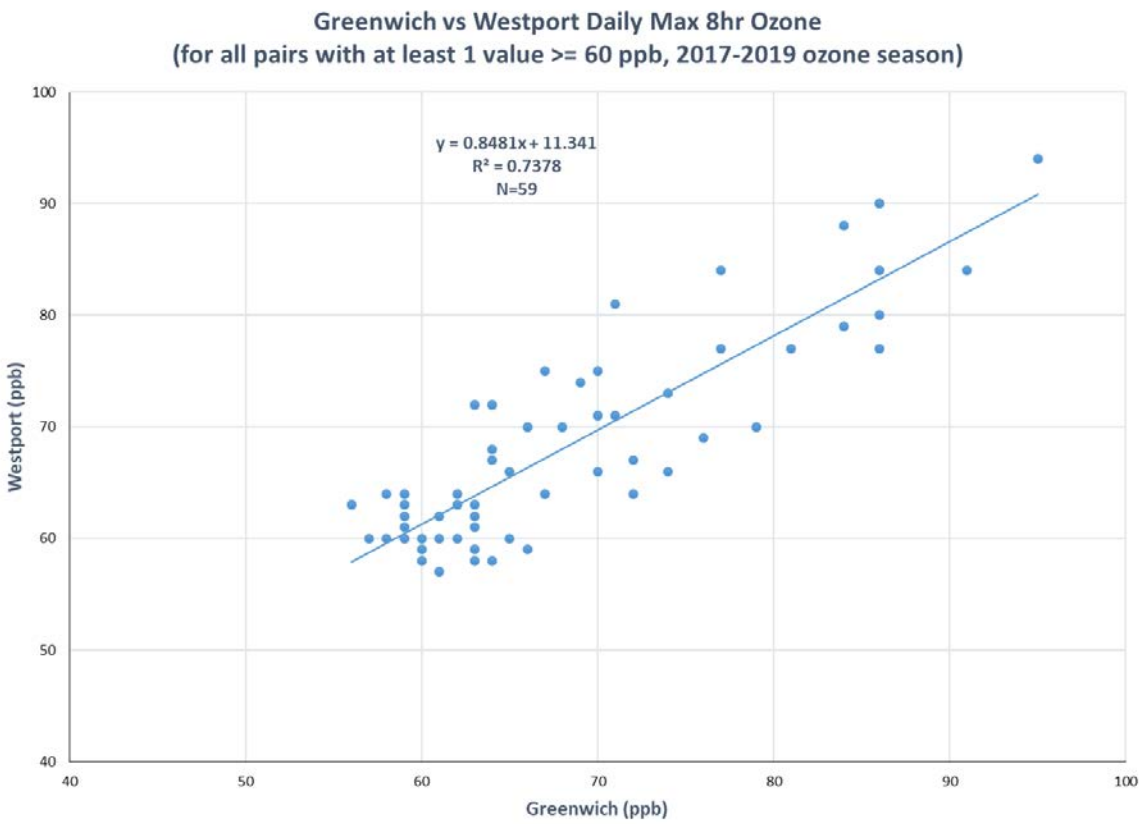

Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
New Milford
Chestnut Lands
Second Hill
Mine Hill
Town Hill
Fort Hill
Guarding Mountain
Candlewood Mountain
Aspetuck Hill
Pine Knob
Hubbell Hill
Strillson Hill
Boardman Mountain
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
2.32 Miles
Elevation in Feet
500
400
300
200
0
1
2
Distance in Miles

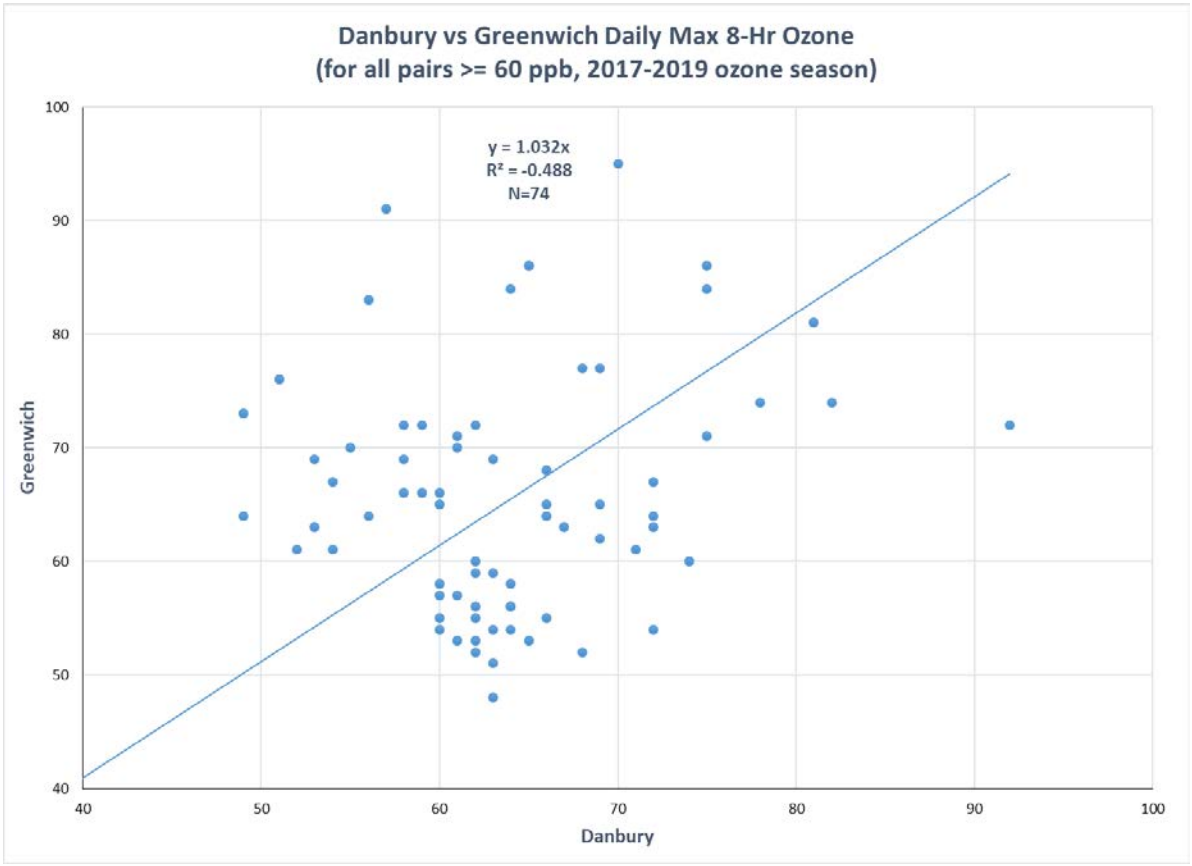
New Milford

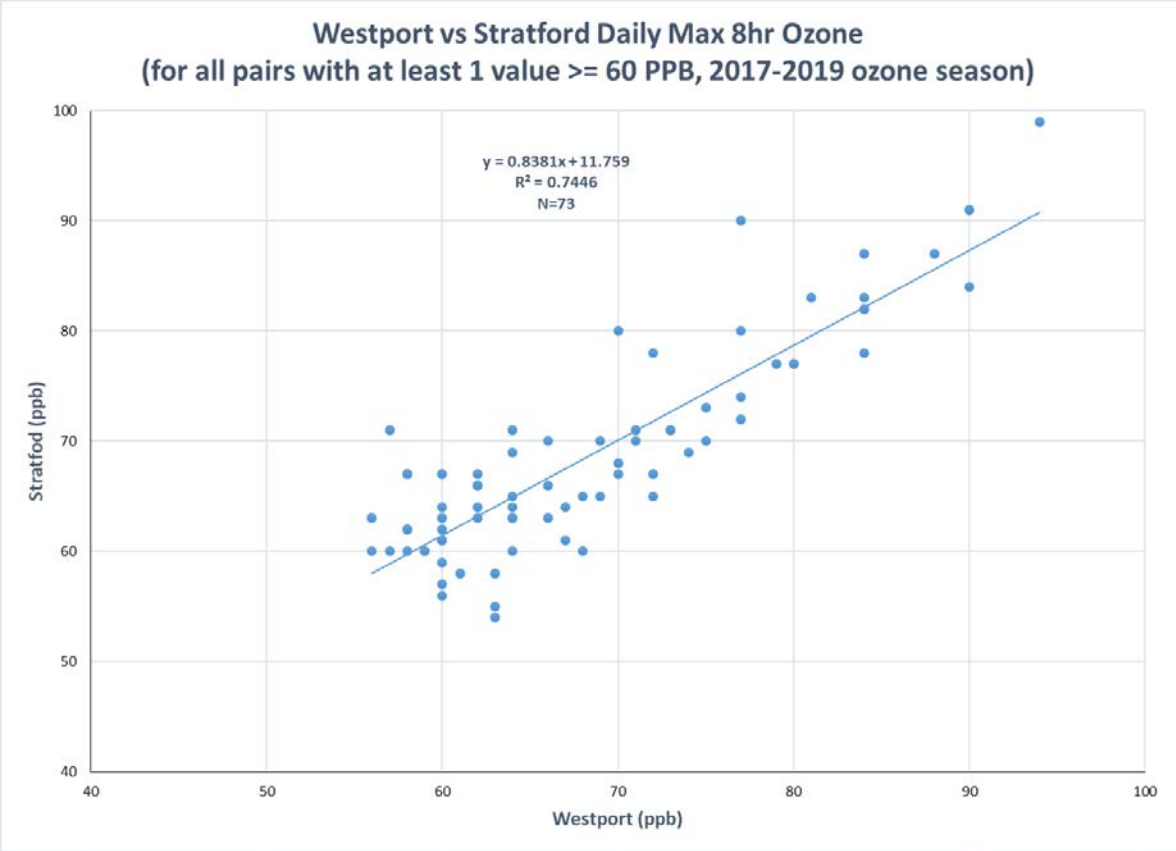

Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
New Milford
Second Hill
Mine Hill
Chestnut Lands
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
3.23 Miles
Elevation in Feet
Distance in Miles

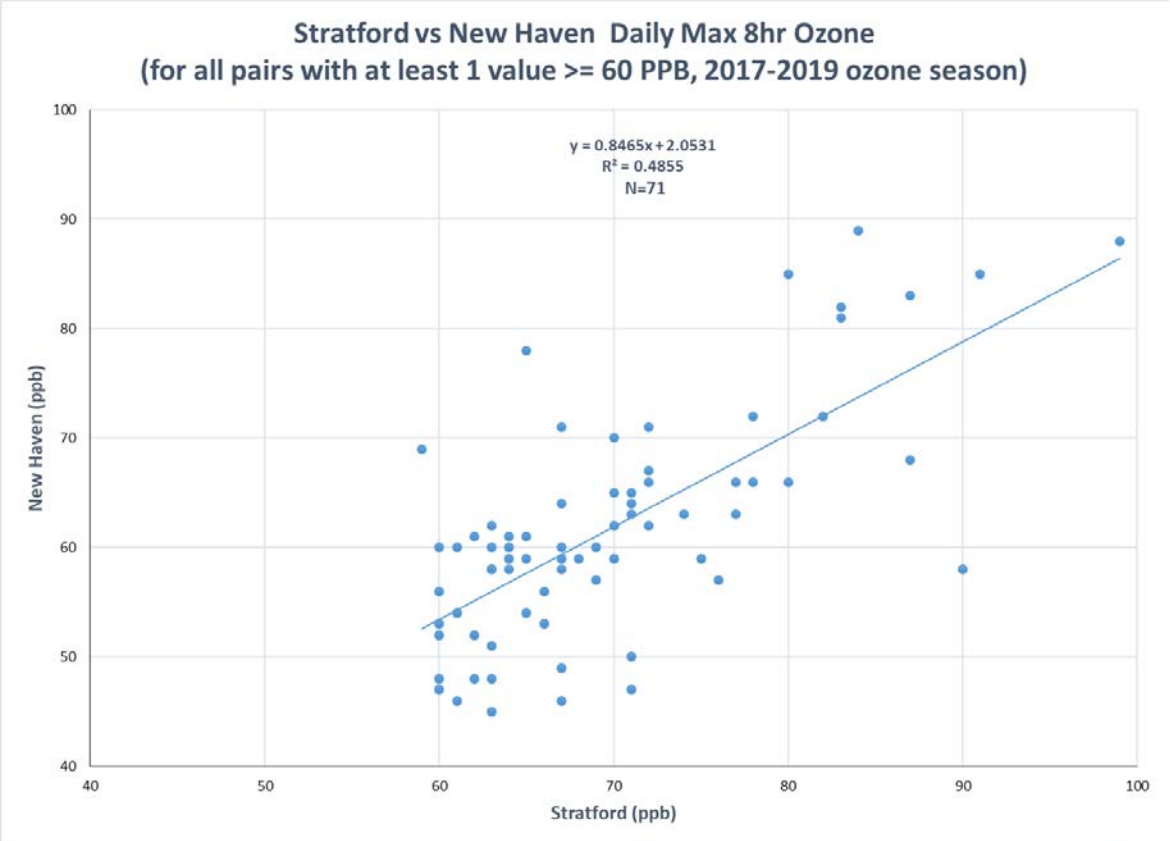

Valley Profile Tool
This web map is consumed by the Valley Profile Tool:
https://epa.maps.arcgis.com/appid=d31cd5a0922c488097bc
- Select the Measure tool (small double-arrow/ruler icon at middle right).
- Click on the map to start a transect; single-click to change direction; double-click to end. Elevation profile will appear below the map.
Valleys
Deep
Shallow
New Milford
Second Hill
Mine Hill
Chestnut Lands
Sources: Esri, USGS, NOAA | Sources: Esri, Garmin, USGS,...
Elevation Profile: Click Measure to map a transect ->
Miles
Help
3.08 Miles
Elevation in Feet
Distance in Miles

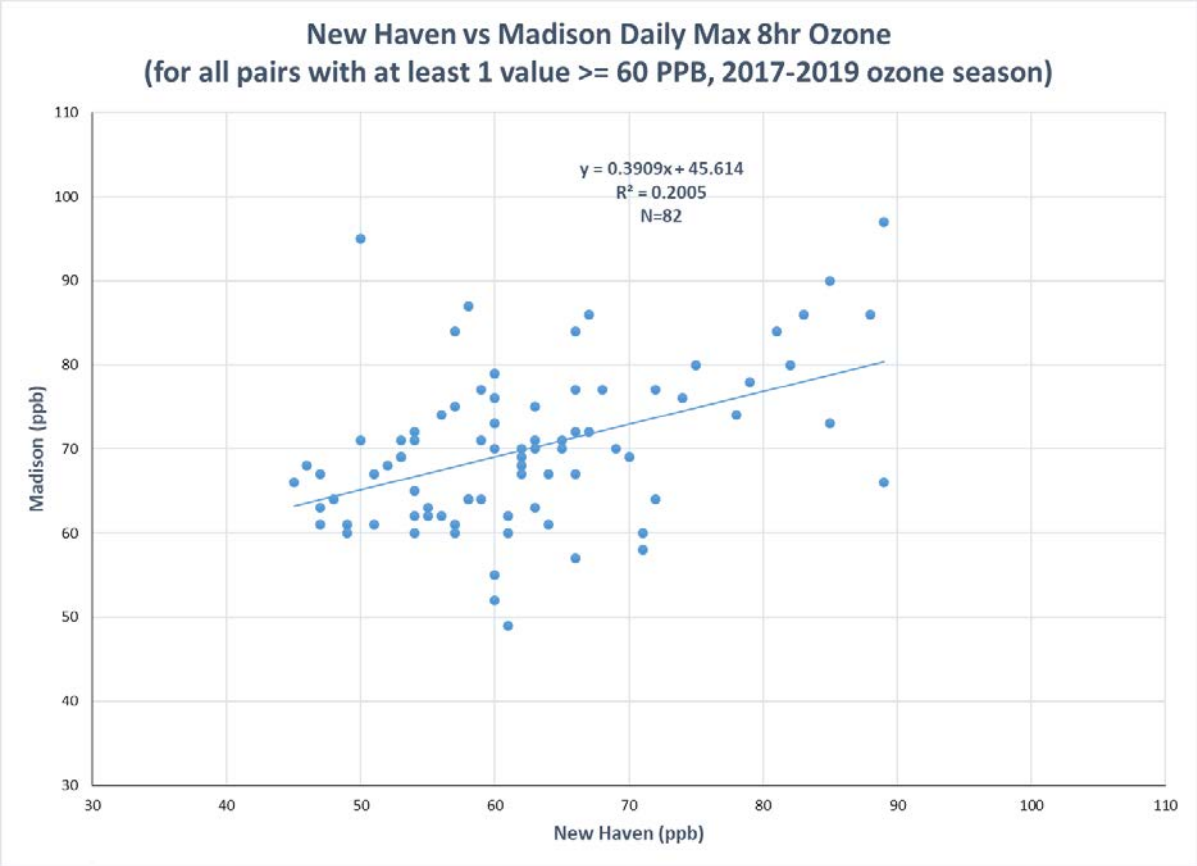
Appendix B Ozone Adjacent Site Correlation Plots

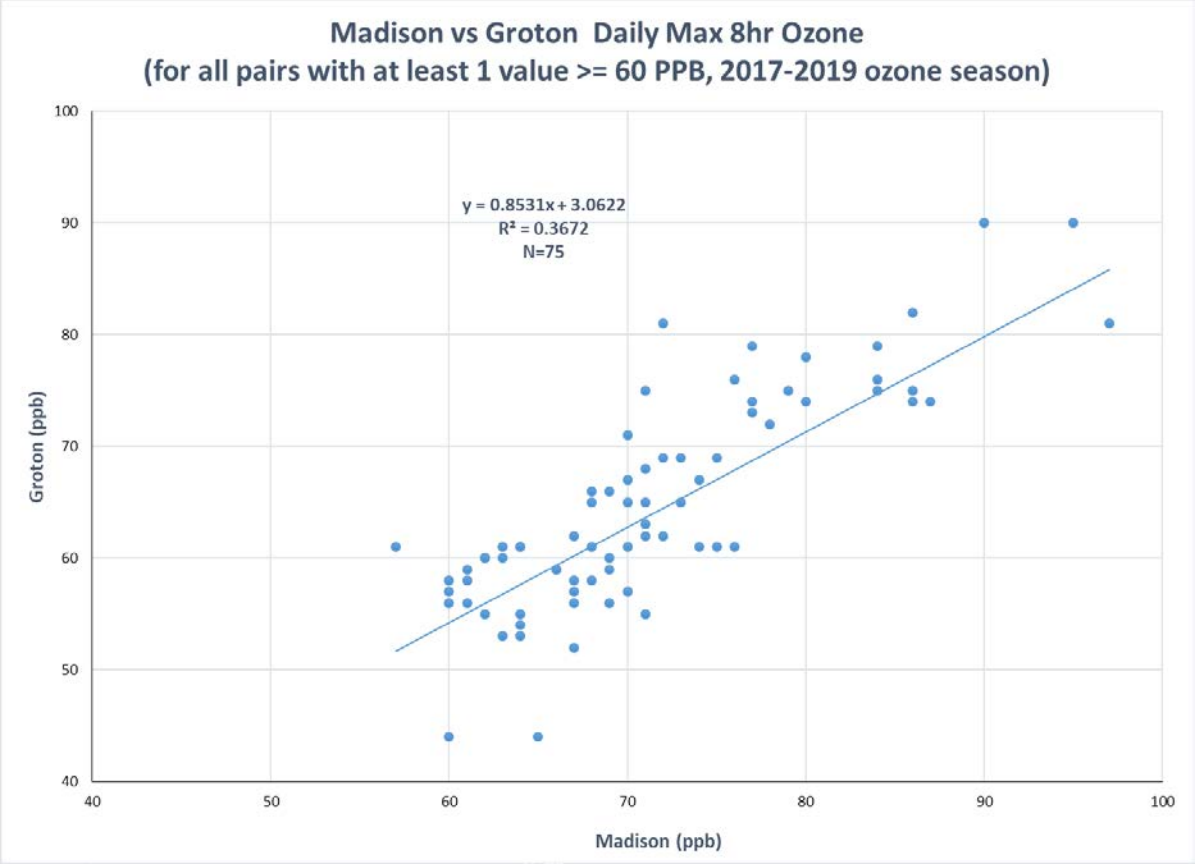

Greenwich vs Westport Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 ppb, 2017-2019 ozone season)
y = 0.8481x + 11.341
R² = 0.7378
N=59
Westport (ppb)
Greenwich (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100

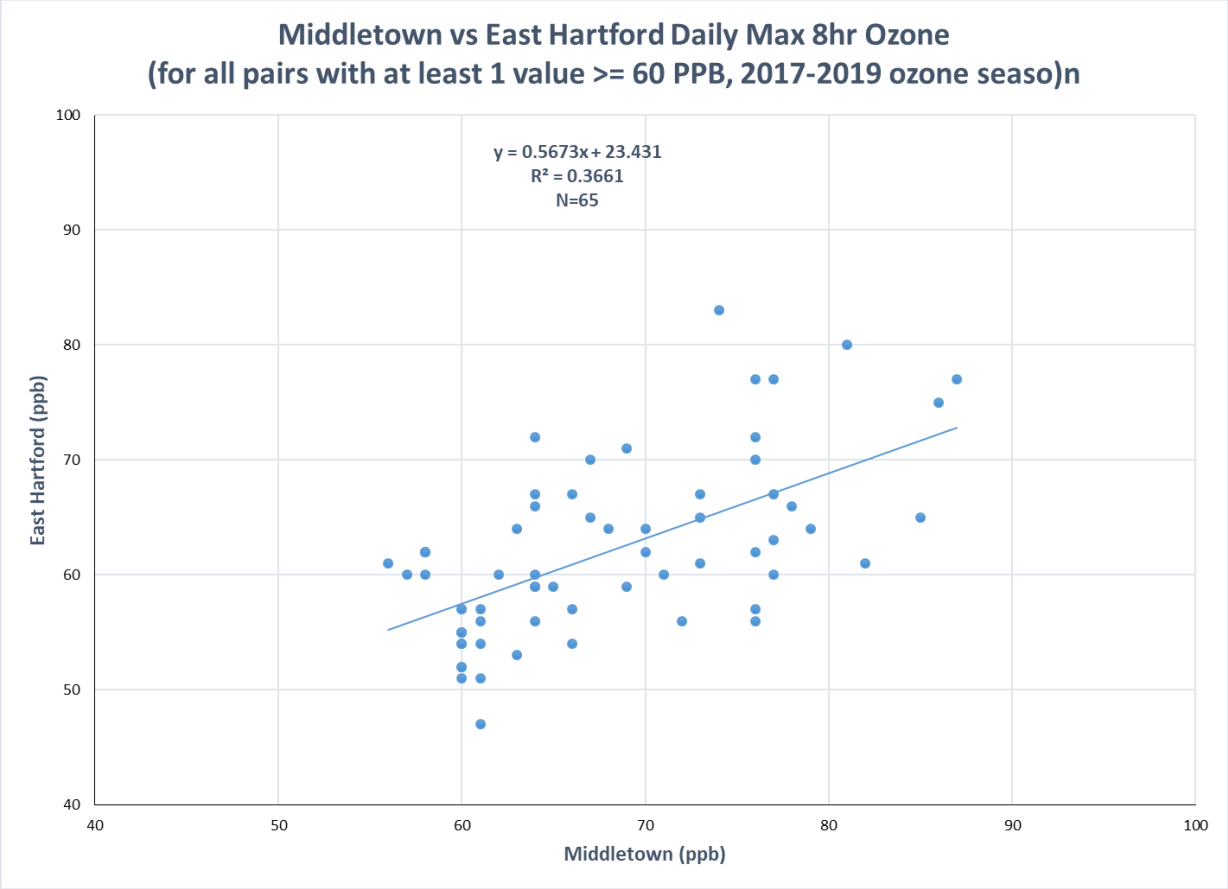

Danbury vs Greenwich Daily Max 8-Hr Ozone
(for all pairs >= 60 ppb, 2017-2019 ozone season)
y = 1.032x
R² = -0.488
N=74
Greenwich
Danbury
100
90
80
70
60
50
40
40
50
60
70
80
90
100

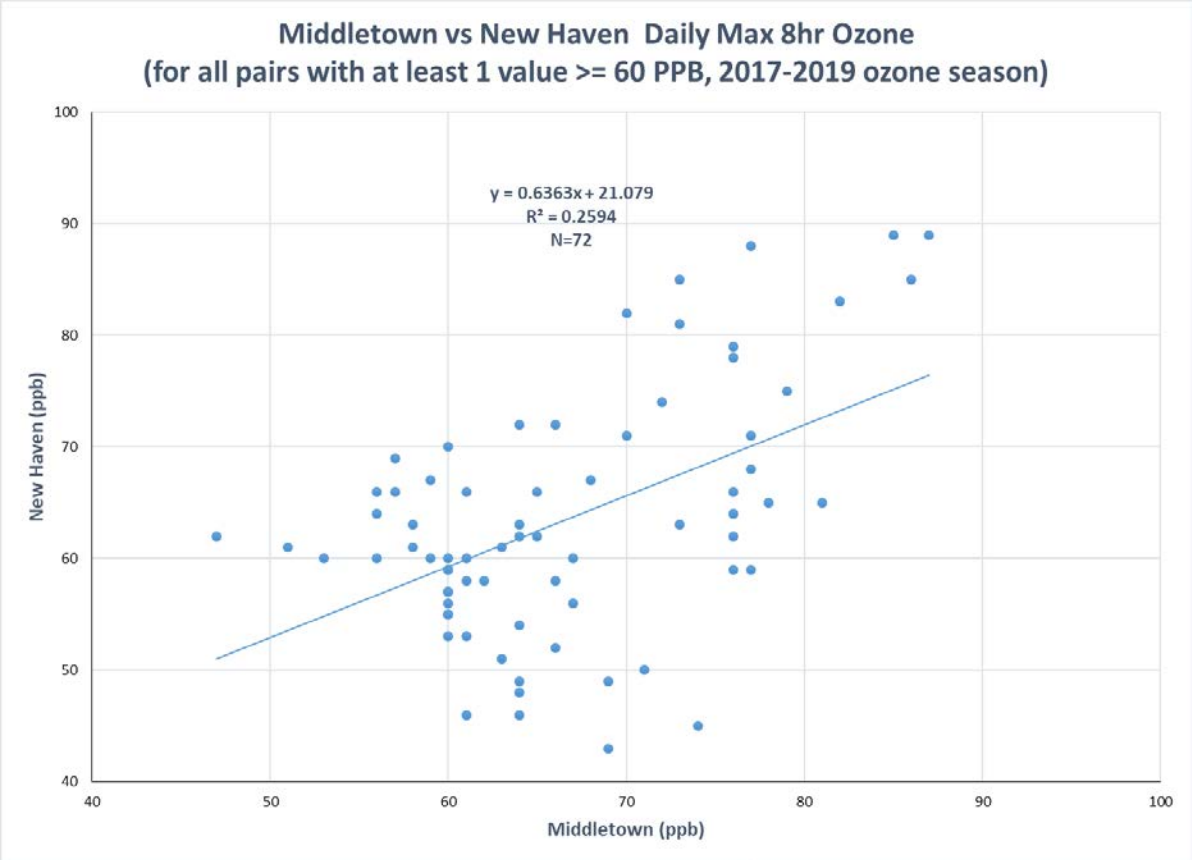

Westport vs Stratford Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.8381x + 11.759
R² = 0.7446
N=73
Stratfod (ppb)
Westport (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100

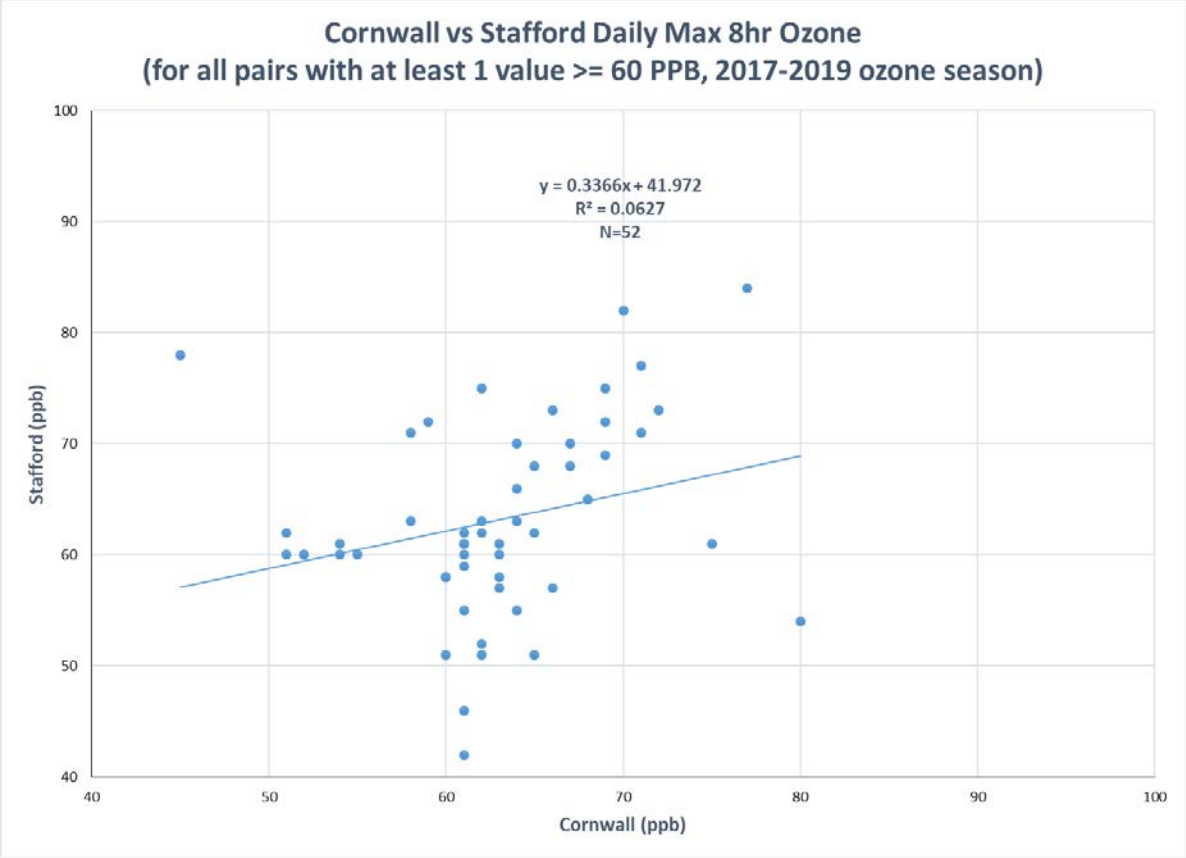

Stratford vs New Haven Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.8465x + 2.0531
R² = 0.4855
N=71
New Haven (ppb)
Stratford (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100

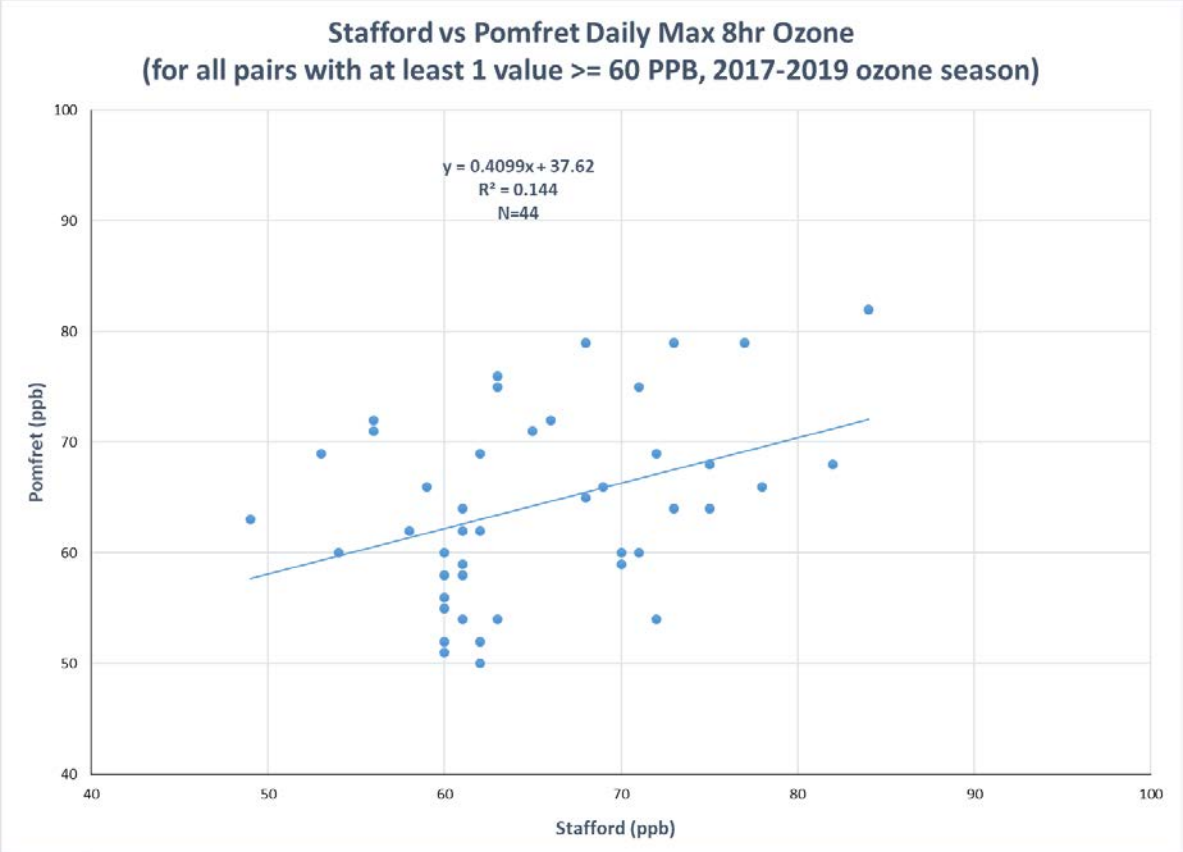

New Haven vs Madison Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.3909x + 45.614
R² = 0.2005
N=82
Madison (ppb)
New Haven (ppb)
110
100
90
80
70
60
50
40
30
30
40
50
60
70
80
90
100
110


Madison vs Groton Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.8531x + 3.0622
R² = 0.3672
N=75
Groton (ppb)
Madison (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100


Middletown vs East Hartford Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone seaso)n
y = 0.5673x + 23.431
R² = 0.3661
N=65
East Hartford (ppb)
Middletown (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100


Middletown vs New Haven Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.6363x + 21.079
R² = 0.2594
N=72
New Haven (ppb)
Middletown (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100


Cornwall vs Stafford Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.3366x + 41.972
R² = 0.0627
N=52
Stafford (ppb)
Cornwall (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100


Stafford vs Pomfret Daily Max 8hr Ozone
(for all pairs with at least 1 value >= 60 PPB, 2017-2019 ozone season)
y = 0.4099x + 37.62
R² = 0.144
N=44
Pomfret (ppb)
Stafford (ppb)
100
90
80
70
60
50
40
40
50
60
70
80
90
100