



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

Massachusetts 2015 Air Monitoring Network Plan

Air Assessment Branch Bureau of Air and Waste

October 9, 2015

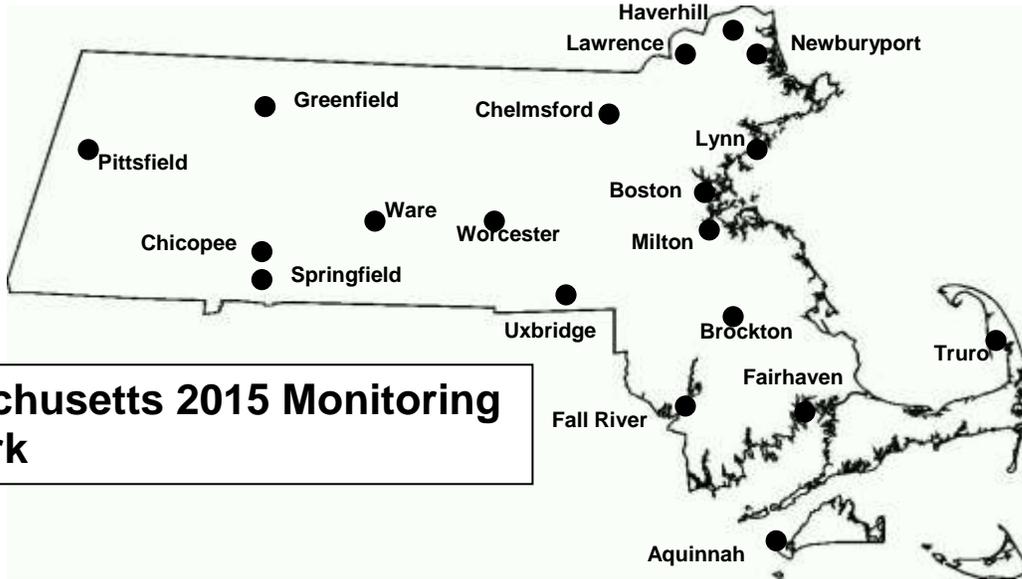
This is the Massachusetts 2015 Air Monitoring Network Plan, prepared by the Massachusetts Department of Environmental Protection (MassDEP) in accordance with Title 40 CFR Part 58.10. Each year, MassDEP is required to submit a Network Plan to the U.S. Environmental Protection Agency (EPA) for review and approval.

MassDEP operates a network of 24 ambient air quality monitoring stations in 18 communities located across the state. The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard operates an ozone monitoring station. MassDEP, the Wampanoag Tribe and EPA New England all are members of the same Primary Quality Assurance Organization (PQAO), which ensures consistent quality assurance of ambient air quality data collected in Massachusetts.

The Massachusetts monitoring network is part of a comprehensive program to collect and provide information about air quality to the public and to determine compliance with National Ambient Air Quality Standards. This Draft Network Plan reviews MassDEP's ambient air monitoring network to determine that the requirements of 40 CFR Part 58 Appendices A, C, D and E are met, describes which pollutants and other parameters MassDEP measures at its various ambient air monitoring stations, and discusses recent and planned changes to the network. For detailed information on monitor locations, pollutants analyzed, and methods used, see Attachments 1 – 4.

For more information on this Network Plan, please contact:

Thomas McGrath, Chief
MassDEP Air Assessment Branch
Senator William X. Wall Experiment Station
37 Shattuck Street
Lawrence, MA 01843-1398
Thomas.McGrath@state.ma.us



Massachusetts 2015 Monitoring Network

1. Criteria Pollutants

This section describes MassDEP’s network for monitoring criteria pollutants listed in the federal Clean Air Act for which EPA has set National Ambient Air Quality Standards (NAAQS), including ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter (PM₁₀ and PM_{2.5}) and lead. EPA periodically reviews and revises these standards based on new public health and scientific information. These revisions often require changes to air monitoring networks and methodologies.

National Ambient Air Quality Standards					
Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		primary and secondary	Rolling 3 month average	0.15 µg/m ³	Not to be exceeded
Nitrogen Dioxide		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb	Annual Mean
Ozone		primary and secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	PM _{2.5}	primary	Annual	12 µg/m ³	annual mean, averaged over 3 years
		secondary	Annual	15 µg/m ³	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

µg/m³ = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion

A. OZONE

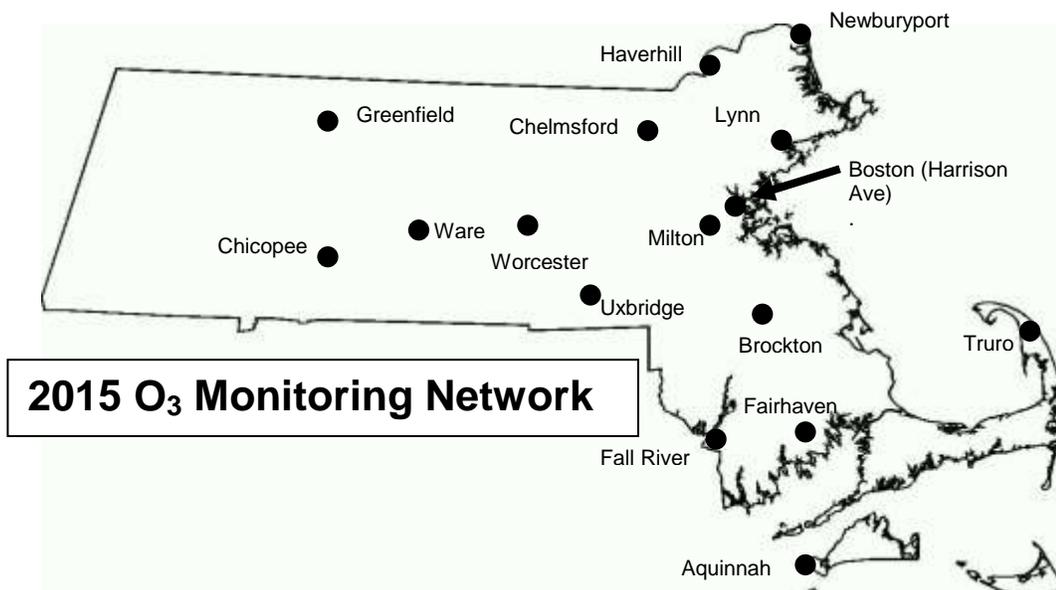
MassDEP operates 15 ozone monitors at the locations listed below (including the Site Identification Number). The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard also operates an ozone monitor.

Boston – Harrison Ave (25-025-0042)
Brockton (25-023-0005)
Chelmsford (25-017-0009)
Chicopee (25-013-0008)
Fairhaven (25-005-1006)
Fall River (25-005-1004)
Greenfield (25-011-2005)
Haverhill (25-009-5005)

Lynn (25-009-2006)
Milton (25-021-3003)
Newburyport (25-009-4005)
Aquinnah – Tribal Site (25-007-0001)
Truro (25-001-0002)
Uxbridge (25-027-0024)
Ware (25-015-4002)
Worcester – Airport (25-027-0015)

Below is a description of recent and planned network changes:

1. In 2014, MassDEP had to close the Boston - Long Island ozone site due to the removal of the bridge to the island.
2. MassDEP has decided not to close the Milton - Blue Hill ozone monitor as originally planned because of the Boston - Long Island closure. MassDEP believes that the new Brockton-Buckley Playground ozone monitor, together with the existing Milton - Blue Hill monitor, provide adequate coverage even with the loss of the Boston - Long Island site.
3. As planned, the new Greenfield ozone site has replaced the previous Amherst ozone site.
4. As discussed in several Network Plans, MassDEP has planned to replace the high-elevation Adams/Mt. Greylock ozone site with another location in Berkshire County that is more representative of population exposure. MassDEP had to close the Adams site earlier than planned, and is making progress in securing a replacement site in Pittsfield.



B. SULFUR DIOXIDE

MassDEP operates 6 sulfur dioxide (SO₂) monitors, which includes three full-scale monitors and three trace-level (i.e., very low concentration) monitors. SO₂ monitors are at the following locations:

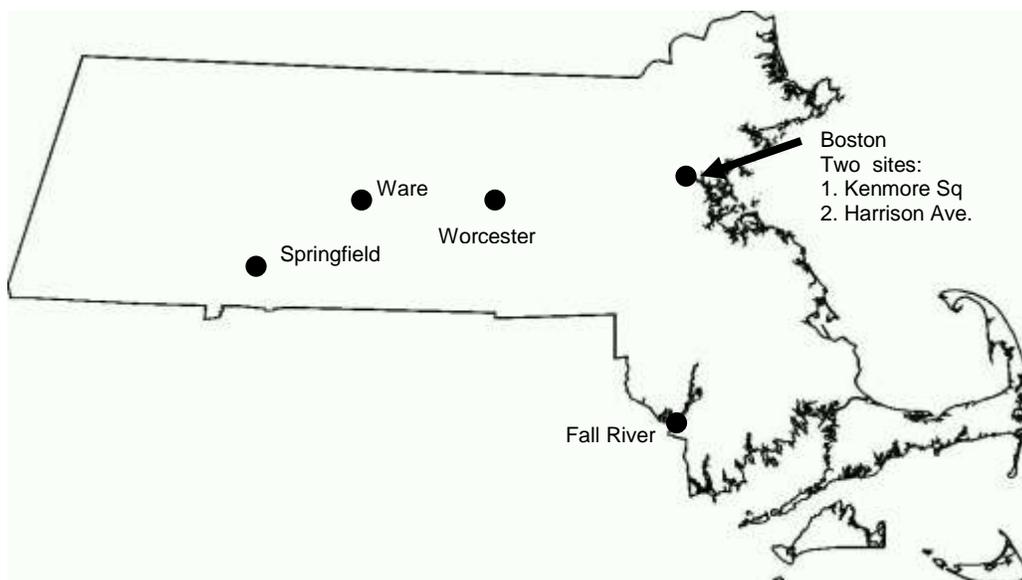
Boston – Harrison Ave (25-025-0042) <i>trace</i>	Springfield – Liberty Street (25-013-0016)
Boston – Kenmore Square (25-025-0002) <i>trace</i>	Ware (25-015-4002) <i>trace</i>
Fall River (25-005-1004)	Worcester – Summer Street (25-027-0023)

In June 2010, EPA revised the SO₂ NAAQS, establishing a 1-hour SO₂ standard of 75 ppb and new SO₂ monitoring requirements. EPA requires monitors to be placed in Core Based Statistical Areas (CBSAs) based on a population-weighted emissions index for the area and to be operational by January 1, 2013. EPA requires:

- Three monitors in CBSAs with index values of 1,000,000 or more;
- Two monitors in CBSAs with index values less than 1,000,000 but greater than 100,000; and
- One monitor in CBSAs with index values greater than 5,000.

Based on the SO₂ monitoring regulations, there must be one monitor in the Springfield CBSA, one monitor in the multi-state Providence/New Bedford/Fall River CBSA (MA/RI), and two monitors in the multi-state Boston area CBSA (MA/NH). MassDEP's existing SO₂ monitors, combined with existing SO₂ monitors in RI and NH, fulfill the requirements. MassDEP's goal is to convert all SO₂ monitors to the trace range (as resources allow) because of the low concentrations measured and the continuing decline of large fossil-fuel emission sources in the state.

MassDEP is reviewing EPA's Final Data Requirements Rule signed on August 10, 2015 for the 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS) that details modeling and monitoring guidance assessing large sources of SO₂ emissions and will work with EPA on implementing the final Rule.



2015 SO₂ Monitoring Network

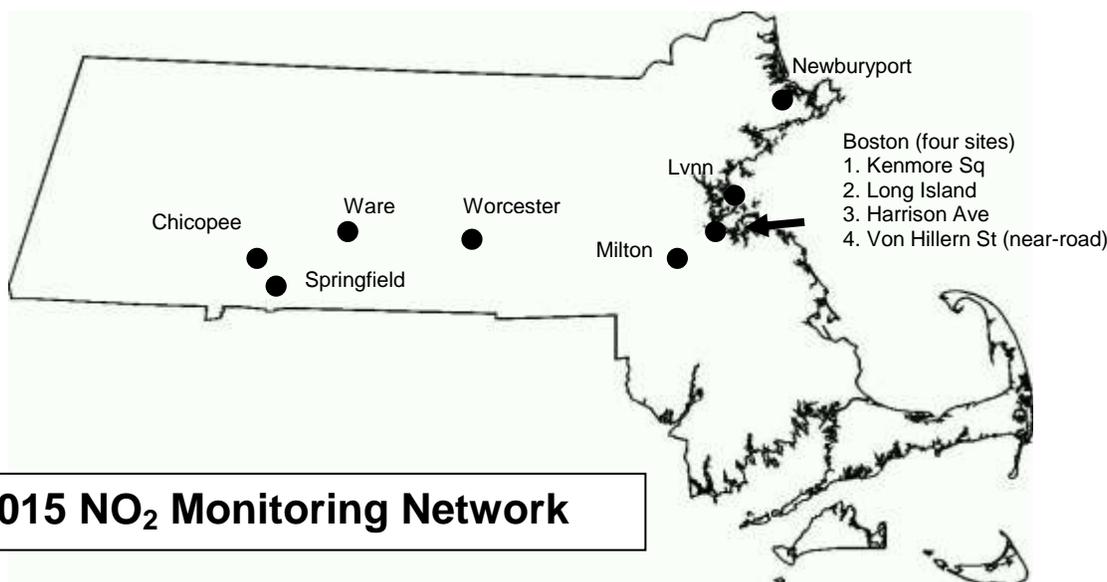
C. NITROGEN DIOXIDE

MassDEP operates 10 nitrogen dioxide (NO₂) monitors. These monitors measure NO₂ and nitrogen oxides [NO_x, which is NO₂ plus NO (nitric oxide)]. NO₂ is monitored as an NAAQS pollutant and as an ozone precursor. MassDEP operates four NO₂ monitors to determine compliance with the NAAQS (based on population exposure) and one near-road monitor that was added in 2013, and operates six additional monitors to measure ozone precursors as part of the Photochemical Assessment Monitoring Sites (PAMS) network. NO₂ monitors are at the following locations:

- | | |
|--|---|
| Boston – Harrison Ave (25-025-0042) | Milton (25-021-3003) |
| Boston – Kenmore Square (25-025-0002) | Newburyport (25-009-4005) <i>PAMS, yr-round</i> |
| Boston – Von Hillern Street (25-025-0044) <i>Near-road</i> | Springfield – Liberty Street (25-013-0016) |
| Chicopee (25-013-0008) <i>PAMS, year-round</i> | Ware (25-015-4002) <i>PAMS, summer only</i> |
| Lynn (25-009-2006) <i>PAMS, year-round</i> | Worcester – Summer Street (25-027-0023) |

In January 2010, EPA revised the NO₂ NAAQS establishing a 1-hour NO₂ standard of 100 ppb and new NO₂ monitoring requirements. This NAAQS revision included provisions for NO₂ measurements at near-road locations, to characterize the NO₂ exposure of populations living near major highways and community monitoring, to continue to characterize NO₂ exposure of populations living in large communities, where concentrations of NO₂ sources are present.

MassDEP will continue to operate its existing NO₂ monitors to address the community monitoring/vulnerable population requirements of the NO₂ monitoring NAAQS strategy. Boston - Harrison Ave, Boston - Kenmore Square, and Springfield - Liberty Street have been identified as sites that meet this requirement. MassDEP installed and began operating a near-road NO₂ monitor station at Boston - Von Hillern Street in June 2013. Rhode Island has established a near-road monitor in the multi-state (MA/RI) Providence CBSA. The Von Hillern Street near-road site has not recorded any hourly NO₂ concentrations which approach the 100 ppbv standard. MassDEP is in the process of locating a second Boston area near-road NO₂ site at a location north of Boston.



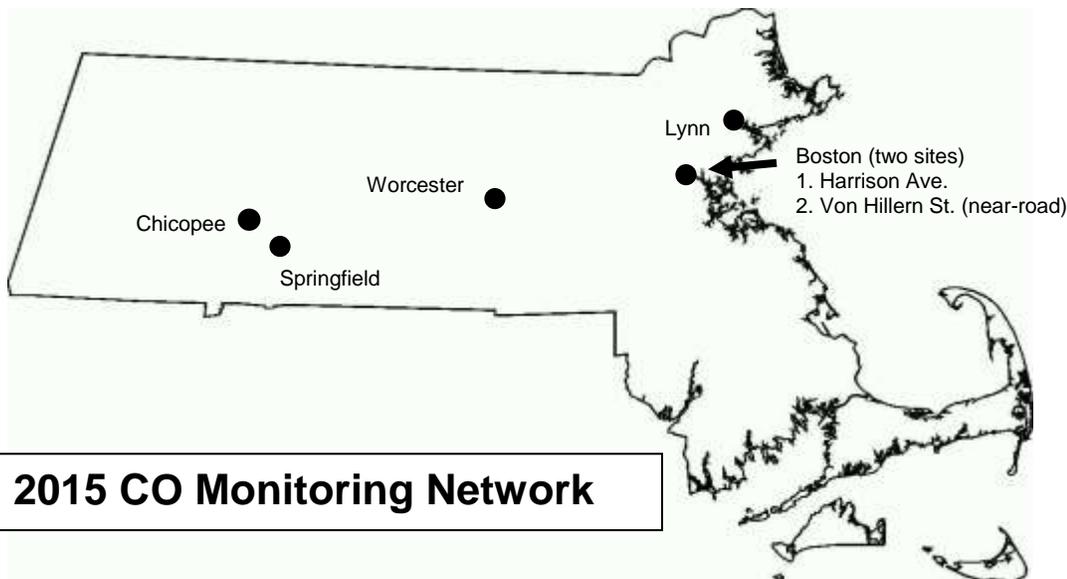
D. CARBON MONOXIDE

MassDEP operates 6 carbon monoxide (CO) monitors, including five trace-level monitors. Due to the very low concentrations of CO that have been measured statewide for a number of years, MassDEP is transitioning from full-scale (0 to 50 ppm) to trace-level (0 to 5 ppm) monitors for all CO monitoring locations to maximize measurement resolution. MassDEP CO monitors are at the following locations:

Boston – Harrison Ave (25-025-0042) *trace*
Boston – Von Hillern Street (25-025-0044) *trace*
Chicopee (25-013-0008) *trace*
Lynn (25-009-2006) *trace*
Springfield – Liberty Street (25-013-0016)
Worcester – Summer Street (25-027-0023) *trace*

In August 2011, EPA issued a decision to retain the existing CO NAAQS and to establish new CO monitoring requirements. The regulations require one CO monitor to be collocated with a NO₂ near-road monitor in an urban area with a population of 1 million or more. Monitors required in CBSAs of 2.5 million or more people must be operational by January 1, 2015, and monitors required in CBSAs having 1 million or more people must be operation by January 1, 2017. Based on the monitoring regulations, MassDEP began operating a CO monitor at the near-road NO₂ site at Boston - Von Hillern Street in June 2013, ahead of schedule.

MassDEP discontinued CO monitoring at the Boston - Kenmore Square site at the end of 2014. Hourly CO maximum concentrations have been no higher than 1.5 ppm at this site for the past 3 years, and the similarly sited Boston - Harrison Avenue NCore site is required to measure CO for the foreseeable future. MassDEP has no plans to alter the CO network in the next year, other than to upgrade the Springfield-Liberty Street instrument to a trace unit.



E. PARTICULATE MATTER

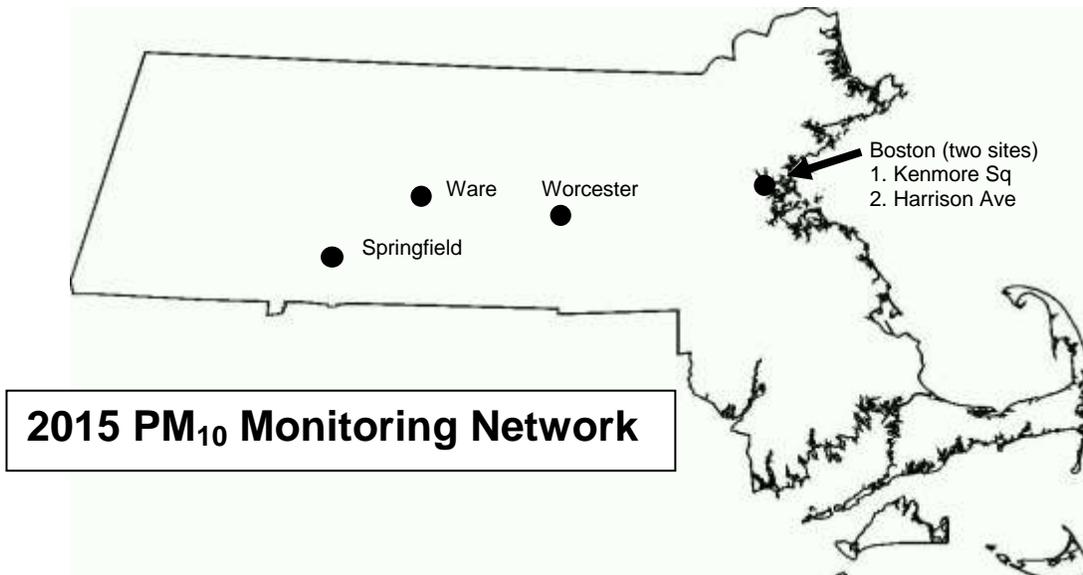
PM₁₀

MassDEP operates six PM₁₀ monitors (low volume instruments), including two monitors collocated at the Boston - Harrison Avenue NCore site for quality assurance purposes. PM₁₀ monitors are at the following locations:

- Boston – Harrison Avenue (25-025-0042) 2 monitors
- Boston – Kenmore Square (25-025-0002)
- Springfield – Liberty Street (25-013-0016)
- Ware – Quabbin Summit (25-015-4002)
- Worcester – Summer Street (25-027-0023)¹

Samples from the Boston - Harrison Avenue PM₁₀ monitors are used in association with samples from collocated PM_{2.5} monitors at the site to calculate PM_{coarse} concentrations, which is required for NCore sites. These samples also are used for PM₁₀-based lead monitoring and NATTS metals.

In July 2014, as described in the last two annual network plans, MassDEP moved the PM₁₀ monitor at Springfield - Main Street to the Springfield - Liberty Street site. This move also resulted in the switch of PM₁₀ based lead sampling in Springfield from the Main Street site to Liberty Street. MassDEP also closed the Boston - City Square site at the end of 2014, as described in the 2014 Network Plan.



¹ MassDEP notes that it operates a continuous atmospheric radiation sampler (TSP-based) at the Worcester - Summer Street station (25-027-0023) in cooperation with the EPA's National Air and Radiation Environmental Laboratory (NAREL).

PM_{2.5}

Filter-Based Monitors

MassDEP's operates 18 fine particulate matter (PM_{2.5}) Federal Reference Method (FRM) monitors at 15 locations. MassDEP collects samples at the Boston - North Street collocated monitors on a daily basis and samples the remaining monitors on an every third day schedule. Collocated monitors also are located at Brockton and Chicopee for quality assurance purposes. PM_{2.5} monitors are currently at the following locations:

Boston – Harrison Avenue (25-025-0042)	Greenfield (25-011-2005)
Boston – North St (25-025-0043) 2 monitors	Haverhill – Consentino School (25-009-5005)
Boston – Kenmore Square (25-025-0002)	Lawrence (25-009-6001)
Boston – Von Hillern Street (25-025-0044)	Lynn – Water Treatment Plant (25-009-2006)
Brockton – Buckley (25-023-0005) 2 monitors	Pittsfield (25-003-5001)
Chicopee (25-013-0008) 2 monitors	Springfield – Liberty St (25-013-0016)
Fall River – Globe Street (25-005-1004)	Worcester – Washington Street (25-027-0016)
	Worcester – Summer Street (25-027-0023)

As described in the 2014 Network Plan, MassDEP closed the Springfield-Main Street site (25-013-2009) on June 30, 2014 and closed the Boston-City Square site (25-025-0027) on December 31, 2014.

Continuous Monitors

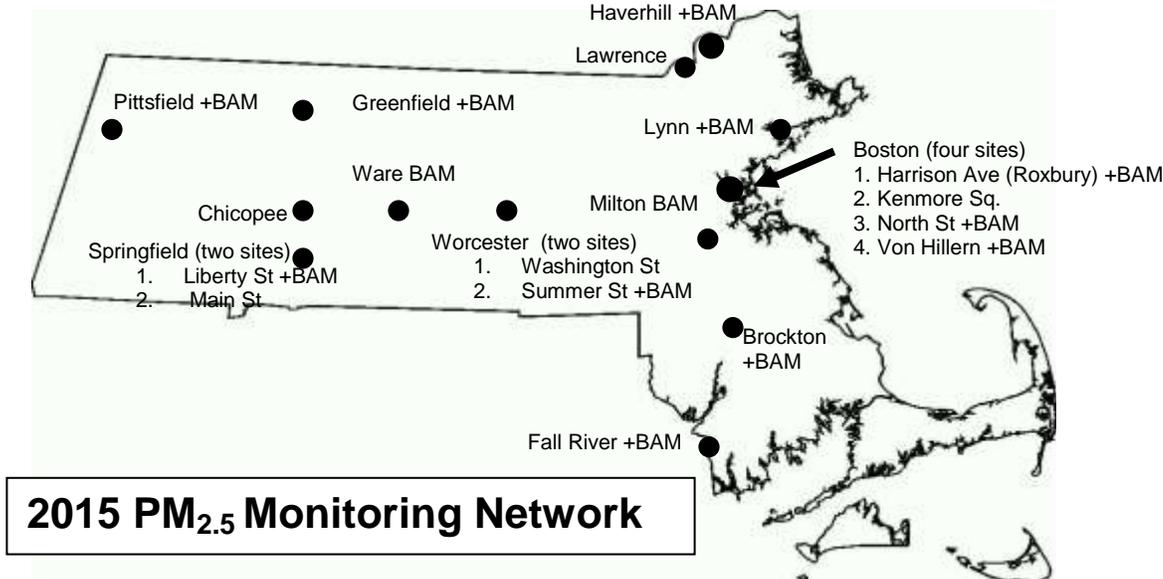
MassDEP has equipped 13 monitoring stations with continuous PM_{2.5} monitors (Beta Attenuation Monitors or BAMs). These continuous PM_{2.5} monitors are currently operating at the following locations:

Boston – Harrison Avenue (25-025-0042)	Lynn – Water Treatment Plant (25-009-2006)
Boston – North St (25-025-0043)	Milton – Blue Hill (25-021-3003)
Boston – Von Hillern Street (25-025-0044)	Pittsfield (25-003-0006)
Brockton – Buckley Playground (25-023-0005)	Springfield – Liberty Street (25-013-0016)
Fall River – Globe Street (25-005-1004)	Ware – Quabbin Summit (25-015-4002)
Greenfield – Veterans Field (25-011-2005)	Worcester – Summer Street (25-027-0023)
Haverhill – Consentino School (25-009-5005)	

All of MassDEP's BAMs have a Federal Equivalent Method (FEM) designation. FEM monitors provide the hourly PM_{2.5} data that appears on MassDEP's *MassAir* website. As part of each annual monitoring Network Plan, EPA requires each agency to specify its intention and rationale to use or not use data from continuous PM_{2.5} FEMs for comparison to the NAAQS. MassDEP will use data from its FEM monitors for comparison to the NAAQS, with the exception of the FEM monitor at Greenfield - Veterans Field because this monitor has less than 24 months of data, and the FEM monitor at Springfield - Liberty Street because this monitor continues to not have acceptable data comparability with the collocated FRM monitor (see Attachment for Comparability Assessment results for this monitor). MassDEP will continue to use data from the Greenfield and Springfield monitors for Air Quality Index reporting to the public.

MassDEP plans to install a second FEM monitor at Boston - Von Hillern Street (25-025-0044) as a collocated analyzer for Quality Control and Assurance purposes. MassDEP proposes to close the FEM

monitor at Milton – Blue Hill (25-021-3003) at the end of 2015. This monitor is located at a higher elevation relative to the surrounding area (635 feet), and it consistently reports low and negative values. Since this monitor has been operating at the low end of its acceptable range and there is adequate coverage of PM_{2.5} monitors in the area, MassDEP plans to discontinue PM_{2.5} monitoring at this site.



Speciated PM_{2.5}

MassDEP collects speciated PM_{2.5} samples at Boston - Harrison Avenue (25-025-0042) and Chicopee (25-013-0008). The speciated PM_{2.5} program is designed to determine some of the chemical components (elements, sulfates/nitrates, carbon species) that are contained in PM_{2.5}. EPA recently completed a nationwide assessment of the speciation network, which did not affect MassDEP’s sites.

IMPROVE sampling sites also provide speciated PM_{2.5} data. The IMPROVE program measures parameters that are similar to those measured by the speciation program, and is designed to measure species at rural locations to evaluate the contribution of fine particulates and their constituents to the degradation of visibility. Two IMPROVE samplers are located at the following MassDEP sites:

- Truro – National Sea Shore (25-001-0002), operated by the National Park Service
- Ware – Quabbin Summit (25-015-4002), operated by the University of Massachusetts

The Wampanoag Tribe on Martha’s Vineyard also operates an IMPROVE sampler.

MassDEP uses the Federal Reference Method (FRM) for PM_{coarse} in compliance with NCore requirements at the Boston - Harrison Avenue NCore site. This method consists of the subtraction of PM_{2.5} values from PM₁₀ values at a site that has side-by-side samplers of each type sampling on the same dates.

F. LEAD

In 2008, EPA lowered the NAAQS for lead from $1.5 \mu\text{g}/\text{m}^3$ to $0.15 \mu\text{g}/\text{m}^3$ and established new monitoring requirements. EPA required lead monitoring at NCore sites beginning January 1, 2012 and around industrial sources that emit 0.5 tons or more of lead (there are no such sources in Massachusetts). EPA requires lead to be monitored as lead in total suspended particles (TSP). However, EPA allows the use of low-volume lead-PM₁₀ monitors instead of lead-TSP monitors where lead is not expected to occur as large particles and where 3-month average concentrations are not expected to equal or exceed $0.10 \mu\text{g}/\text{m}^3$.

MassDEP monitors lead at its Boston - Harrison Avenue NCore site using the low-volume PM₁₀ method. In addition to the NCore site, MassDEP monitors lead-PM₁₀ sampling at Springfield – Liberty Street (25-013-0016) to obtain additional lead concentration data for a different urban environment. As described in the 2014 Network Plan, MassDEP closed the Springfield – Main Street site (25-013-2009) on June 30, 2014 and moved the PM₁₀ sampler from that site to Liberty Street. MassDEP does not plan to make any changes to the lead monitoring program in the next year.

2. Photochemical Assessment Monitoring Stations

MassDEP operates enhanced ozone, Photochemical Assessment Monitoring Stations (PAMS) in the Boston and Springfield Metropolitan Areas. PAMS are designed to measure ozone precursors (ingredients) and meteorological parameters in order to provide data about ozone formation and the effect of precursor controls on ozone production. At these sites MassDEP measures oxides of nitrogen and other ozone precursors, such as volatile organic compounds, including hydrocarbons and carbonyl compounds (e.g., formaldehyde, acetaldehyde). These are measured by taking discrete samples (carbonyls at Type 2 sites) and by operating hourly gas chromatographs that measure individual hydrocarbon compounds at all four PAMS locations. Type 1 sites generally are upwind of the studied urban area, Type 2 sites are at or near the downwind edge of the urban area, and Type 3 sites are downwind in a location of maximum ground-level ozone formation. MassDEP operates 4 PAMS sites in the Boston and Springfield areas at the following locations:

Chicopee (25-013-0008) *Type 2*
Lynn (25-009-2006) *Type 2*
Newburyport (25-009-4005) *Type 3*
Ware (25-015-4002) *Type 3*

During the PAMS season, MassDEP operates automated hourly gas chromatographs at all four sites and collects carbonyl samples at Chicopee and Lynn. MassDEP also collects every sixth day 24-hour canister VOC and carbonyl samples throughout the year at Chicopee and Lynn, in compliance with the original PAMS regulations.

Processing PAMS data is very labor intensive and MassDEP currently faces a data backlog. As described in the 2014 Network Plan, MassDEP is not processing data for the Newburyport and Ware PAMS sites in 2015 to enable MassDEP to catch up on the data backlog. MassDEP would process the data for these sites again beginning in 2016, depending on the new monitoring requirements associated with the 2015 ozone standard.

MassDEP continues to participate in national and regional discussions regarding the future of the PAMS monitoring network and may propose future changes to the Massachusetts PAMS network based on the results of these assessments and EPA guidelines.

3. Total Reactive Nitrogen (NO_y)

MassDEP operates NO_y analyzers during the PAMS season at Ware (25-015-4002) and Newburyport (25-009-4005). MassDEP operates a NO_y monitor at the NCore site at Boston - Harrison Avenue (25-025-0042) to fulfill NCore requirements. NO_y measurement is very similar to NO_x, except that the NO_y instrument configuration monitors for a wider range of nitrogen species than a traditional NO_x monitor. Compounds in this wider nitrogen compound group participate in ozone and particulate matter formation and can be pollutants themselves.

4. Air Toxics

Boston - Harrison Avenue (25-025-0042) is a National Air Toxics Trends Site (NATTS) monitoring station, in addition to being an NCore site. NATTS is an EPA program comprised of monitoring sites across the country equipped to measure a wide range of toxic air pollutants, including metals, VOCs, carbonyls, black carbon and semi-volatile organic compounds (SVOCs). At the Harrison Avenue site, MassDEP monitors black carbon (using an aethalometer), toxic VOCs, carbonyls (formaldehyde and acetaldehyde), toxic metals (from PM₁₀ filters), and polycyclic aromatic hydrocarbons (PAHs).

In addition to the NATTS site, MassDEP collects 24-hour VOC canister samples every sixth day for toxics analysis from Lynn (which serves as a Boston Area background location), and sends the samples to the State of Rhode Island Department of Public Health Laboratory for analysis. MassDEP also monitors black carbon at Boston - North Street (25-025-0043), Springfield - Liberty Street (25-013-0016), Boston - Von Hillern Street (25-025-0044) and Greenfield - Veterans Field (25-011-2005).

In November 2014, MassDEP installed a Synspec gas GC-PID at Kenmore Square (25-025-0002) to measure hourly concentrations of health-relevant hydrocarbon compounds (primarily from vehicle exhaust), which include benzene, toluene, xylenes and ethyl benzene.

5. Private Monitoring

The last private monitoring station, operated by the Constellation Generation Company, LLC in South Boston (25-025-0040) closed at the end of June 2014. This site measured sulfur dioxide, oxides of nitrogen and total suspended particulates.

6. Summary of Network Changes

- MassDEP closed the Boston – Long Island ozone site (25-025-0041) in October 2014 due to the removal of the bridge to the island.
- MassDEP closed the Amherst ozone site (25-015-0103) in June 2014 when site conditions could no longer support monitoring.
- MassDEP added PM₁₀ and PM₁₀-lead monitoring to the Springfield - Liberty Street site (25-013-0016) and closed the Springfield - Main Street (25-013-2009) PM₁₀ and PM_{2.5} site at the end of June 2014.
- MassDEP closed the Boston - City Square (25-025-0027) PM₁₀ and PM_{2.5} site at the end of 2014.

- MassDEP discontinued CO monitoring at the Boston - Kenmore Square (25-025-0002) site at the end of 2014. MassDEP has installed an Autosampling GC (for Toxic VOCs) at that location.
- Constellation Generation Company, LLC closed its private monitoring site in Boston at the end of June 2014.
- MassDEP closed the Adams/Mt. Greylock ozone site (25-023-4002) at the end of the 2014 ozone season due to the difficulty and cost of required improvements needed at the site. MassDEP already was planning to close this site, and is in the processing of finding a comprehensive population-oriented ozone and PM_{2.5} site in Berkshire County to consolidate and replace the Adams site and two PM_{2.5} monitoring sites currently located in Pittsfield.
- MassDEP is not processing data for the Newburyport and Ware PAMS sites in 2015 to enable MassDEP to catch up on a data backlog. MassDEP would process the data for these sites again beginning in 2016, depending on the new monitoring requirements associated with the revised 2015 ozone standard.
- MassDEP is in the process of locating a second Boston Area near-road NO₂ site in the vicinity of the Route 495/Route 3 intersection north of Boston.
- MassDEP plans to install a second FEM PM_{2.5} monitor at Boston – Von Hillern Street (25-025-0044) for Quality Control and Assurance purposes.
- MassDEP plans to discontinue FEM PM_{2.5} monitoring at the Milton – Blue Hill site (25-021-3003) at the end of 2015.