

**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR RESOURCES**

Rhode Island 2018 Annual Monitoring Network Plan



Posted for Public Review on June 28, 2018

Submitted to EPA on August 24, 2018

Table of Contents

Section	Page Number
Table of Contents.....	3
List of Tables	3
Acronyms and Abbreviations.....	4
Introduction and Regulatory Background.....	5
Rhode Island Monitoring Network.....	5
Summary of Proposed Changes in Rhode Island Monitoring Network.....	6
Network Evaluation.....	12
Ozone	12
Carbon monoxide.....	14
Sulfur Dioxide	16
Nitrogen Dioxide.....	17
Particular Matter.....	19
-PM10	19
-PM2.5.....	20
Speciation Monitoring.....	22
Lead (Pb).....	22
Ozone Precursor Air Toxics Measurements.....	22
-PAMS.....	23
- PAMS Monitoring Implementation Network Plan.....	24
- Enhanced Monitoring Plans.....	28
-Air Toxics.....	32
National Core (NCORE) Multi-pollutant Monitoring Stations Network.....	33
Detailed Site Information.....	34
Figure 1 – Air Quality Monitoring Network Continuous Gas Monitors Site Locations.....	41
Figure 2 – PM10 Air Pollution Monitoring Network Site Locations.....	42
Figure 3 – PM2.5 Air Pollution Monitoring Network Site Locations.....	43
Figure 4 – RI Monitoring Network.....	44

List of Tables

Section	Page Number
Table 1-National Ambient Air Quality Standards (NAAQS).....	7
Table 2-Monitoring Site Information....	9
Table 3- Monitoring Sites.....	10
Table 4-RI Ozone Monitoring Sites.....	12
Table 5-Ozone Design Values (ppb).....	13
Table 6-Carbon Monoxide Monitoring Network.....	14
Table 7-Sulfur Dioxide Monitoring Network.....	16
Table 8-Nitrogen Dioxide Monitoring Network.....	17
Table 9-PM10 Monitoring Network.....	19
Table 10-PM2.5 Monitoring Network.....	20
Table 11-PAMS Target Compound List.....	26
Table 12- Equipment Inventory East Providence for PAMS Plan.....	27

Acronyms and Abbreviations

AIRS-AQS	Aerometric Information Retrieval System - Air Quality System
AQI	Air Quality Index
BAM	Beta Attenuation Monitor
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DEM	Department of Environmental Management (RI)
DOH	Department of Health (RI)
EIS	Emissions Inventory System
EMP	Enhanced Monitoring Plan
EPA	Environmental Protection Agency
FEM	Federal equivalent method
FRM	Federal reference method
GC	Gas chromatograph
HAPs	Hazardous air pollutants
MADEP	Massachusetts Department of Environmental Protection
MDL	Method detection limit
MSA	Metropolitan statistical area
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trends Station
NCORE	National Core Multi-pollutant Monitoring Station
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
OAQPS	Office of Air Quality Planning and Standards
ORD	Office of Research and Development
OTR	Ozone Transport Region
PAMS	Photochemical Assessment Monitoring Stations
PAH	Polycyclic Aromatic Hydrocarbon
PM ₁₀	Particulate matter < 10 microns
PM _{2.5}	Particulate matter < 2.5 microns
QAPP	Quality assurance project plan
O ₃	Ozone
SIPs	State implementation plans
SLAMS	State and Local Air Monitoring Station
SOP	Standard operating procedure
SO ₂	Sulfur dioxide
STN	Speciation Trends Network
SVOC	Semi-Volatile Compound
TSA	Technical system audit
TSP	Total suspended particulate
VOC	Volatile organic compound

Introduction and Regulatory Background

This document will serve as Rhode Island's 2018 Annual Monitoring Network Plan, prepared by the Rhode Island Department of Environmental Management, in accordance with Section 58.10 (a) of Title 40 of the Code of Federal Regulations (40 CFR 58.10(a)), which requires states to submit a monitoring network plan to the United States Environmental Protection Agency (EPA) in July of each year. The plan provides a description of the state's current monitoring network, demonstrates that the network conforms to EPA requirements, and discusses any plans to remove or move a monitoring station in the 18 months following the plan submittal.

In addition, the recently revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCORE sites that are in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more. The Providence, New Bedford, Fall River, RI-MA Statistical Area qualifies as one of those sites. RIDEM is required to develop an implementation plan for this monitoring rule. That implementation plan is detailed within this monitoring plan. The Annual Monitoring Network Plan must be posted for public comment 30 days prior to submittal to the EPA. Additionally, RIDEM is required to develop and implement Enhanced Monitoring Plans (EMPs) as required by 40 CFR Part 58, Appendix D, 5.(h), as the state is within the Ozone Transport Region (OTR). This plan is required to be submitted no later than October 1, 2019. The proposed EMP is detailed within this monitoring plan.

Rhode Island Monitoring Network

The Rhode Island Department of Environmental Management (RIDEM), in conjunction with the Rhode Island Department of Health (RIDOH), operates a network of air monitoring stations to measure ambient concentrations of pollutants for which the EPA has established a National Ambient Air Quality Standard (NAAQS). Those pollutants, which are known as criteria pollutants, include ozone (O₃), particulate matter smaller than 10 microns (PM₁₀), particulate matter smaller than 2.5 microns (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO) and lead. The criteria pollutant monitoring sites are part of the EPA's State or Local Air Monitoring Stations network (SLAMS).

In addition, RI DEM and RI DOH monitor ambient levels of toxic air pollutants and of ozone precursors, which are substances that react in the atmosphere to form ground-level ozone. The State operates one monitoring site that is part of the National Air Toxics Trends Sites (NATTS) network, one that is part of the Photochemical Assessment Monitoring Stations (PAMS) network, one that is part of the PM_{2.5} Speciation Trends Network (STN) and one that is part of the network of core multipollutant monitoring stations (NCORE).

Table 1 summarizes the NAAQS and Table 2 lists the locations of the eight air monitoring stations that operated in the State in 2017 or are currently operating, along with the parameters monitored and monitoring methods used at each of the sites. Table 3 lists the sites as well as the methods used. The locations of those sites are shown in Figures 1-4. These sites have been approved by EPA Region 1 as meeting applicable siting criteria, as specified in Subpart B of 40 CFR Part 58. All criteria pollutants are monitored, as required in the CFR, using Federal Reference Methods (FRMs) or Federal Equivalent Methods (FEMs) and monitors are operated according to the procedures specified in Quality Assurance Project Plans (QAPPs)¹ that have been approved by EPA. All sites are located in the Providence-New Bedford-Fall River, RI-MA Metropolitan Statistical Area (MSA), which encompasses all of Rhode Island as well as Bristol County in Massachusetts.

Summary of Proposed Changes in the Rhode Island Monitoring Network

In summary, RI DEM plans to modify the current monitoring network as follows:

- RIDEM continues to work towards relocating the PM_{2.5} FEM monitor and NATTS monitoring activities at the current Urban League building to the proposed Community College of Rhode Island (CCRI) location by the end of 2018.
- RIDEM has ceased all monitoring at the Brown University site as of December 31, 2017.
- When necessitated by the progression of highway construction activity to the northbound side of I-95, RIDEM will discontinue monitoring at the Near-Road site and will ask EPA's approval of future Near-Road monitoring plans for Rhode Island. Work on the north side of the highway is currently scheduled to begin fall 2018 or later.
- Operation of the West Greenwich PM₁₀ monitor was discontinued as of December 31, 2017.
- RIDEM has discontinued NO₂ monitoring at the West Greenwich site as of December 31, 2017.
- RIDEM has discontinued the PM_{2.5} FRM monitor at the West Greenwich site as of December 31, 2017. The continuous FEM is the primary monitor.
- Due to logistical limitations at the proposed CCRI site at 1 Liston Street, Providence, RI is requesting discontinuation of FRM PM_{2.5} sampling currently at Urban League upon relocation. The FEM PM_{2.5} monitor will be the primary and only monitor at the new location. Also, RIDEM will be monitoring meteorological parameters with equipment mounted on a shelter, not from a 10-meter tower.
- RI DEM has purchased a continuous GC and has deployed that instrument at the East Providence site for measuring one-hour speciated VOCs as of June 2017 as required by the PAMS program.
- RI DEM will implement the revised PAMS requirements as promulgated in the final ozone NAAQS, including the possible expansion of carbonyl monitoring.
- RIDEM will implement the EMP prior to June 1, 2019.
- The Vernon Street, Pawtucket site, which is adjacent to I-95N, characterizes and records the highest PM₁₀ concentrations in the State. Although Vernon Street experiences the highest PM₁₀ values, at no point has the site approached the standard. As RIDEM seeks options for cost and workload savings, RIDEM proposes the option to discontinue monitoring at Vernon Street during 2018 and start reporting PM₁₀ mass measured at the East Providence site.
- RIDEM requests a waiver to allow meteorological measurements, in particular mixing height, using the ceilometer. It has yet to be determined if the ceilometer will be deployed at the NCORE site located in East Providence or the Vernon Street location, located 2.5 miles from East Providence.

RI DEM understands that all network modifications that involve discontinuation or moving of any sites are subject to EPA approval, even if the remaining network meets EPA's minimum requirements

¹RI DEM and RI DOH, "QAPP for Criteria Pollutants Including Particulates and NCORE Parameters, Revision 1.0," approved by EPA October 2017 and "QAPP: Air Toxics and PAMS Monitoring Programs, Revision 6.1," approved by EPA October 2017.

Table 1 National Ambient Air Quality Standards (NAAQS)

POLLUTANT (links to historical tables of NAAQS reviews)	AVERAGING TIME	PRIMARY STANDARD	SECONDARY STANDARD
Sulfur Dioxide (SO₂)	3-Hour ^A	None	0.5 ppm (1300 µg/m ³)
	1-Hour ^B	0.075 ppm (75 ppb)	None
Carbon Monoxide (CO)	8-Hour ^A	9 ppm	None
	1-Hour ^A	35 ppm	None
Ozone (O₃)	8-Hour ^C	0.070 ppm (70 ppb)	Same as Primary Standard
Nitrogen Dioxide (NO₂)	Annual Arithmetic Mean	0.053 ppm (53 ppb)	Same as Primary Standard
	1-Hour ^D	100 ppb	None
Particulate Matter (PM₁₀)	24-Hour ^E	150 µg/m ³	Same as Primary Standard
Particulate Matter (PM_{2.5})	Annual Arithmetic Mean ^F	12.0 µg/m ³	15.0 µg/m ³
	24-Hour ^G	35 µg/m ³	Same as Primary Standard
Lead (Pb)	Rolling 3-Month Average ^H	0.15 µg/m ³	Same as Primary Standard

Primary standards protect against adverse health effects.

Secondary standards protect against welfare effects such as damage to crops, vegetation, and buildings.

^A Not to be exceeded more than once a year.

^B A rule revoking the annual and 24-hour SO₂ NAAQS and promulgating a new 1-hour SO₂ NAAQS was signed on June 2, 2010. To attain the 1-hour NAAQS, the 3-year average of the 99th percentile of the daily maximum 1-hour average SO₂ level at each monitor must not exceed 75 ppb.

^C The ozone NAAQS is violated when the average of the 4th highest daily eight-hour concentration measured in 3 consecutive years exceeds 0.070 ppm (70 ppb). The 0.070 ppm NAAQS became effective December 28, 2015.

^D To attain the 1-hour NO₂ NAAQS, effective January 22, 2010, the 3-year average of the 98th percentile of the daily maximum 1-hour average NO₂ concentration at each monitor must not exceed 100 ppb.

^E To attain the PM₁₀ standard, the 24-hour concentration at each site must not exceed 150 µg/m³ more than once per year, on average over 3 years.

^F The primary annual average PM_{2.5} NAAQS was revised on December 10, 2012. The secondary NAAQS was not changed. To attain the PM_{2.5} annual standard, the 3-year average of the weighted annual means of the 24-hour concentrations must not exceed the NAAQS value.

^G To attain the PM_{2.5} 24-hour standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 35 µg/m³.

^H On October 15, 2008, the Pb NAAQS was changed to 0.15 µg/m³ as a rolling 3-month average, not to be exceeded in a 3-year period.

µg/m³ = micrograms per cubic meter

mg/m³ = milligrams per cubic meter

ppb = parts per billion

ppm = parts per million

Table 2 - Monitoring Site Information

The ambient air monitoring sites currently operated by DEM are listed in the Table 2 below. Detailed information for each monitoring site is provided in a later section of this plan.

Town	Site	PM2.5 (FRM), 1:3 (Except AJ 1:6)	PM2.5 (FRM, Collocated),1:6	PM2.5 (Continuous - FEM)	PM10/PM- (Hi Vol), 1:6	PM10/PM- (Hi Vol), Collocated), 1:6	PM10/PM-Coarse(lo-Vol), 1:3	Polycyclic aromatic hydrocarbons	Speciation, PM2.5 super SASS (CSN), 1:3	PM2.5 Carbon (URG) (CSN),1:3	Ozone	SO2	CO	Direct NO ₂	NO/NO ₂ /NOx	NO/NOY	VOCs 24 HR Canister (NATTS, State)	VOCs Hourly PAMS	Black Carbon	Black Carbon, Collocated	Carbonyls, 1:6	Carbonyls Collocated, 1:12	Particle Counter	Wind Speed	Wind Direction	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation	UV Radiation	Precipitation
Pawtucket	Vernon Street	X	X		X												X														
Providence	Brown University										T				T																
Narragansett	USEPA Lab			X						S													X	X	X						
East Providence	Myron Francis School	X		X		X	X	X	X	X	X	X	X	X	X	X	X	S	X	X	X	X	X	X	X	X	X	X	S	S	S
Providence	Urban League	X	T	X	X*	X**		X									X		X		X	X	X	X	X	X	X				
West Greenwich	Alton Jones Campus	T		X	T					S					T		X							X	X	X	S	X	S		
Providence	Near-Road Site			X									X		X				X				X								

X = Existing

T = Terminated in 2017

S = Seasonal Meteorology (June 1-August 31) Seasonal ozone March 1-Sep 30)

* Includes metals

** Includes collocated metals 1:12

Table 3: Monitoring Sites

Site	AQS ID	Latitude Longitude	Parameter Measured	Method Of Sampling	EPA Method Designation
Vernon Trailer Vernon Street Pawtucket	440070026	41.874675 -71.379953	PM _{2.5}	Lo Vol	Reference
			PM ₁₀	Hi Vol	Reference
			VOC	Canisters, GC/FID/MS	Reference
Brown University 10 Prospect Street Providence **terminated 12/31/17	440070012	41.825556 -71.405278	Oxides of Nitrogen	Chemiluminescence (low range)	Reference
			Nitrogen Dioxide		
			Sulfur dioxide	Pulsed Fluorescence (low range)	Equivalent
USEPA Laboratory 27 Tarzwell Drive Narragansett	440090007	41.4950779 -71.4236587	Ozone	U.V. Photometric	Reference
			PM _{2.5}	Beta Attenuation/Cont	Equivalent
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Temperature	Spot Reading	N/A
Myron Francis School 64 Bourne Avenue E. Providence	440071010	41.840920 -71.36094	Oxides of Nitrogen	Chemiluminescence (low range)	Reference
			Nitrogen Dioxide		
			NO/NO _y	Chemiluminescence (low range)	Reference
			Carbon Monoxide	Gas Filter Correlation (low range)	Equivalent
			Sulfur dioxide	Pulsed Fluorescence (low range)	Equivalent
			Ozone	U.V. Photometric	Reference
			PM _{2.5}	Lo Vol	Reference
			PM _{2.5}	Beta Attenuation/Cont	Equivalent
			Speciated PM _{2.5}	Speciation Monitor	N/A
			Coarse PM (PM _{10-2.5})	Lo Vols (PM ₁₀ & PM _{2.5})	Reference
			Black Carbon	Aethalometer	N/A
			VOC	Canisters, GC/FID/MS	Reference
			VOC	Continuous GC	Reference
			Carbonyls	HPLC Cartridges	Reference
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Barometric Pressure	Barometer	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
			Solar Radiation	Pyranometric	N/A
UV Radiation	UV Photometric	N/A			
Precipitation	Bucket/Continuous	N/A			

Site	AQS ID	Latitude Longitude	Parameter Measured	Method Of Sampling	EPA Method Designation
Urban League 212 Prairie Avenue Providence	440070022	41.807949 -71.415103	PM _{2.5}	Lo Vol	Reference
			PM _{2.5}	Beta Attenuation/Cont	Equivalent
			PM ₁₀ /Metals	Hi Vol	Reference
			VOC	Canisters, GC/FID/MS	Reference
			Carbonyls	HPLC Cartridges	Reference
			Black Carbon	Aethalometer	N/A
			Semi-volatiles	PUF/XAD, GC/MS	N/A
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
Particle Count	Water Based Condensation	N/A			
Alton Jones Campus Victory Highway West Greenwich	440030002	41.615600 -71.719900	Ozone	U.V. Photometric	Reference
			VOC	Canisters, GC/FID/MS	Reference
			PM _{2.5}	Beta Attenuation/Cont	Equivalent
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Barometric Pressure	Barometer	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
Solar Radiation	Pyranometric	N/A			
Near-Road Site Hayes and Park Streets Providence	440070030	41.829495 -71.417457	Oxides of Nitrogen	Chemiluminescence (low range)	Reference
			Nitrogen Dioxide		
			Carbon Monoxide	Gas Filter Correlation (low range)	Equivalent
			PM _{2.5}	Beta Attenuation/Cont	Equivalent
			Black Carbon	Aethalometer	N/A
Particle Count	Water Based Condensation	N/A			

Network Evaluation

Following is a discussion, by pollutant, of:

- The current monitoring network,
- The NAAQS and a comparison of recent measurements with the NAAQS,
- Whether that network meets EPA’s monitoring criteria,
- Whether new sites are needed,
- Whether any existing sites are no longer needed, and
- Plans for modification of the network in the next 18 months.

Ozone (O₃)

The sites in the current ozone monitoring network are listed in Table 4 and Figure 1:

Table 4: Rhode Island Ozone Monitoring Sites

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Alton Jones Campus Victory Highway West Greenwich	Regional	Upwind background Population exposure	Continuous Ozone Season March-September
USEPA Laboratory 27 Tarzwell Drive Narragansett	Regional	Population exposure	Continuous Ozone Season March-September
Myron Francis School 64 Bourne Avenue E. Providence	Neighborhood (PAMS, NCORE)	Maximum precursor emissions impact Population exposure	Continuous Year-Round

The 2015 ozone NAAQS is 70 ppb over an 8-hour average. A site is in violation of that NAAQS when the average of the 4th highest daily eight-hour ozone concentration measured in 3 consecutive years (the design value) at that site exceeds 70 ppb.

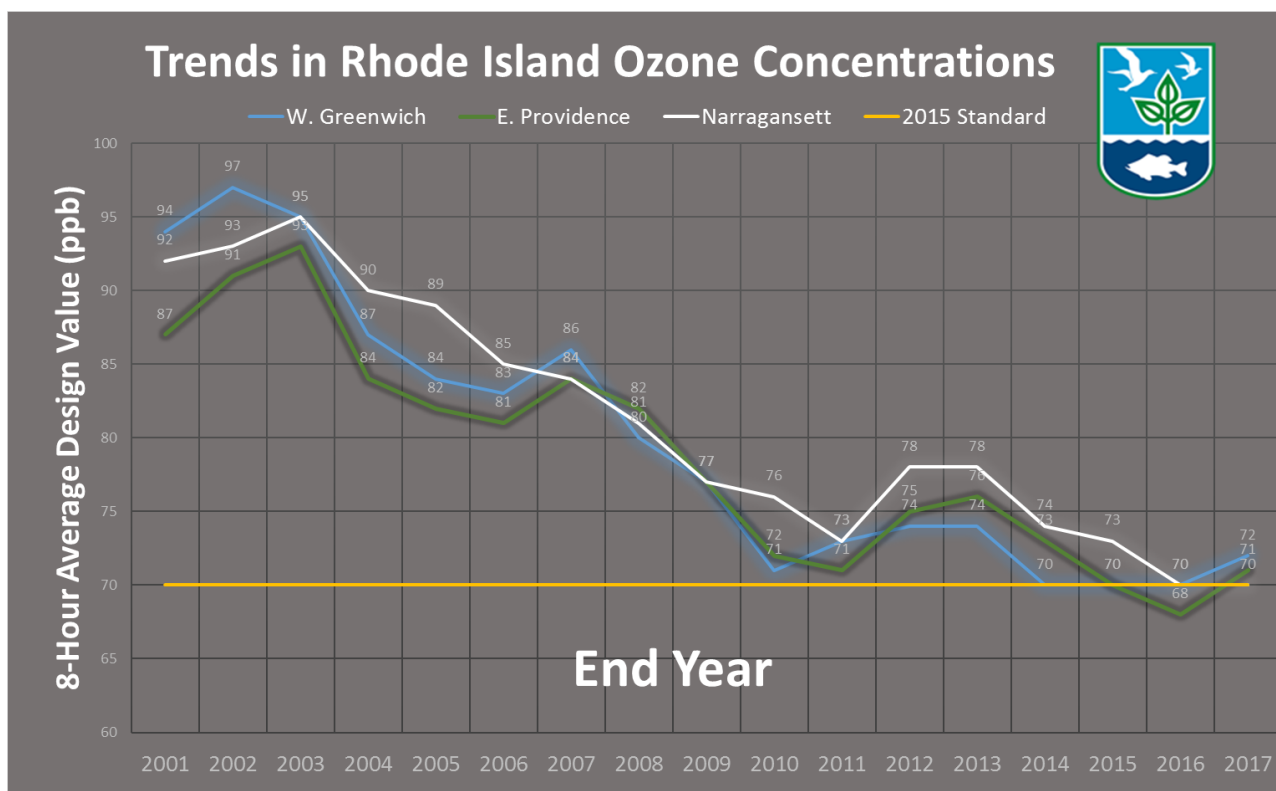
Ozone design values for Rhode Island sites have decreased over time, but design values increased or remained constant in 2012 and 2013, as shown in Table 5, and again in 2017. Based on 2009-2011 design values, EPA designated Rhode Island as unclassifiable/attainment for the 75 ppb NAAQS on April 30, 2012. Note, however, that the 2009-2011 design values were lower than normal, due to unusually cool temperatures in the summer of 2009. In the most recent three-year period, 2014-2016, the design values for both the West Greenwich and Narragansett sites met the 70 ppb NAAQS, while the design value for the E. Providence site was slightly lower than that standard.

On December 20, 2017, in a letter from Deborah A. Szaro, EPA Region I Acting Regional Administrator, to Governor Gina Raimondo, EPA preliminarily determined Kent and Washington Counties meet the 2015 ozone standard based on 2014-2016 data. This letter supplemented a prior letter from November 6, 2017 from EPA Administrator Scott Pruitt in which Bristol, Newport, and Providence Counties were designated

Attainment/Unclassifiable. Therefore, all counties in Rhode Island have been designated as Attainment/Unclassifiable. Note that the 2015-2017 design values have increased.

Table 5: Ozone Design Values (ppb)

	W. Greenwich	Narragansett	E. Providence
2002 - 2004	87	90	84
2003 - 2005	84	89	82
2004 - 2006	83	85	81
2005 - 2007	86	84	84
2006 - 2008	80	81	82
2007 - 2009	77	77	77
2008 - 2010	71	76	72
2009 - 2011	73	73	71
2010 - 2012	74	78	75
2011 - 2013	74	78	76
2012 - 2014	70	74	73
2013 - 2015	70	73	70
2014 - 2016	70	70	68
2015 - 2017	72	71	70



Since EPA’s rules require Rhode Island to operate at least two ozone monitors, the State has one more monitor than the minimum number required. Continued operation of all existing monitors is important for the following reasons:

- Ground-level ozone levels have generally decreased in the past several years; however, ozone concentrations in the State continue to reach unhealthy levels on several days each summer, and

moderate levels on many days. In 2017, there were 6 exceedances of the 8-hour ozone standard, and 35 days where ozone levels were in the moderate range (8-hour average between 55-70 ppb). In 2016, there were 13 exceedance days and 42 days in the moderate range. In 2015, there were 10 exceedance days and 31 days in the moderate range.

- EPA has strengthened the ozone NAAQS to 70 ppb to protect public health effective December 28, 2015.
- The three sites represent three distinct geographical areas that are affected by different localized weather patterns and therefore experience very different ozone levels on some days.
- The availability of real-time ozone data from the three ozone sites enables RIDEM to issue area-specific health advisories as appropriate and to provide residents with real-time information about ozone concentrations and associated health risks in their neighborhoods.

In 2011, RIDEM extended ozone monitoring season from April-September to March-October as to match the monitoring seasons for Massachusetts and Connecticut. EPA had directed a change in ozone season for those states, per 40 CFR Part 58 Appendix D Table D-3 Ozone Season (March – September). In 2011, ozone measurements became year-round at the East Providence site, consistent with NCORE requirements.

As part of RIDEM’s EMP, additional ozone monitoring will formally occur during 2019. Please refer to the EMP section of this monitoring plan for full details.

Carbon Monoxide (CO)

The current CO monitoring network is as shown in Table 6 and on Figure 1. All figures are at the end of the document.

Table 6: Carbon Monoxide Monitoring Network

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Myron Francis School 64 Bourne Avenue E. Providence	Neighborhood	Maximum precursor emissions impact Population exposure	Continuous Year-Round
Near-Road Site Hayes and Park Streets Providence	Microscale	Maximum emissions Near-road	Continuous Year-Round

The NAAQS for CO are:

- 35 ppm as a 1-hour average, not to be exceeded more than once per year (design value is the highest annual 2nd maximum 1-hour concentration) and
- 9 ppm as an 8-hour average, not to be exceeded more than once per year (design value is the highest annual 2nd maximum non-overlapping 8-hour concentration)

The 2017 CO design values for Rhode Island are:

Near Road:

- 2.6 ppm – 1-hour average, 7.4 % of NAAQS
- 1.6 ppm – 8-hour average, 17 % of NAAQS

East Providence:

- 1.3 ppm – 1-hour average, 3.7 % of NAAQS
- 0.9 ppm – 8-hour average, 10 % of NAAQS

The CO NAAQS has not been exceeded in Rhode Island since 1984. Since 2001, all CO levels recorded in Rhode Island have been in the “Good” category of the EPA’s Air Quality Index (AQI).

EPA’s regulations do not specify a minimum number of CO monitors that must be operated in a state, except that CO monitoring is required at NCORE sites (40 CFR 58, Appendix D 3(b)) and EPA regulations require a certain number of CO monitors to be operating near road based upon population. Since the East Providence site is both a PAMS site and the State’s NCORE site, carbon monoxide monitoring will continue at that site using a low range monitor, consistent with NCORE requirements.

On August 21, 2011, EPA issued a decision retaining the CO NAAQS at the current levels². The decision requires the operation of CO monitors at sites established to comply with the near-road monitoring requirements specified in the 2010 NO₂ NAAQS. Near-road sites are required in all urban areas which, like the Providence-New Bedford-Fall River, RI-MA MSA, have a population of 1,000,000 or more. Near-road CO monitoring was not required until January 1, 2017; however, Rhode Island began operating a low-range CO monitor at a site adjacent to Interstate Route 95 that meets the above near-road specifications in April 2014.

No changes to the CO monitoring network are planned in the next 18 months.

²US EPA, “Review of National Ambient Air Quality Standards of Carbon Monoxide: Final Rule,” Federal Register 76 (169):54294, August 31, 2011. <http://www.gpo.gov/fdsys/pkg/FR-2011-08-31/pdf/2011-21359.pdf> **Sulfur Dioxide (SO₂)**

With the discontinuation of the Brown University site, the remaining SO₂ monitor is as shown in Table 7 and on Figure 1:

Table 7: Sulfur Dioxide Monitoring Network

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Myron Francis School 64 Bourne Avenue E. Providence	Neighborhood	NCORE	Continuous Year-Round

The NAAQS for SO₂ are:

- 75 ppb, 1-hour average (primary standard effective June 2, 2010). The design value is the average of the 99th percentile maximum daily hour measured in 3 consecutive years.
- 0.5 ppm (500 ppb), 3-hour average (secondary standard) not to be exceeded more than once per year.

The SO₂ design values recorded in the last three years (2015 – 2017) in Rhode Island are:

- 6 ppb -- 1-hour average, 8 % of primary NAAQS - Brown monitor
- 4 ppb -- 1-hour average 5 % of primary NAAQS – East Providence monitor

The SO₂ NAAQS has never been exceeded in the State. One-hour design values for SO₂ have been below 75 ppb, the one-hour NAAQS promulgated in 2010³, since 1994. All measurements have been in the “Good” range of the AQI since 2007. SO₂ levels measured at the Brown University monitor in Providence declined dramatically in 2013, probably due to the increased use of natural gas rather than fuel oil by nearby sources.

EPA’s 2006 amended monitoring regulation requires SO₂ monitoring only at NCORE sites. However, the 2010 SO₂ NAAQS rule requires at least one SO₂ monitor in the Providence-New Bedford-Fall River RI, MA MSA, which includes all of Rhode Island and Bristol County, Massachusetts. That SO₂ monitor must be sited to meet one or more of the following objectives: (1) characterizing concentrations around emissions sources, (2) measuring the highest concentrations in an area, (3) determining population exposure, (4) establishing general background levels and (5) evaluating regional transport.

³An EPA rule amending the SO₂ NAAQS was signed on June 2, 2010. The rule revokes the previous annual and 24-hour NAAQS and sets a new one-hour average NAAQS at 0.075 ppm (75 ppb). Revisions of monitoring networks consistent with the requirements in the rule must be in place by January 1, 2013.

To meet NCORE requirements, RIDEM began operating a low-range SO₂ monitor at the East Providence site in January 2011. The Brown University SO₂ monitor was updated to a low-range unit in January 2013. RI DEM believes that the Brown University and East Providence monitors appropriately characterized population exposure in the major urban areas in Rhode Island for 2017. RI DEM has discontinued monitoring at the Brown University site as of December 31, 2017. Since a low-range SO₂ monitor is now in use at the East Providence site, RIDEM believes SO₂ monitoring is adequately characterized with the remaining East Providence monitor.

The State of Massachusetts operates a SO₂ monitor in the Providence Warwick RI-MA MSA, in Fall River. In prior years, the Fall River monitor was determined to be most appropriate for characterizing maximum SO₂ concentrations in the MSA, as it is situated 2 miles southeast of the Brayton Point coal fired power plant, which was the highest SO₂ emission source in the MSA. Emissions historically were substantially higher than Central Landfill, Rhode Island’s highest emitter. Brayton Point was permanently closed in May of 2017. With this closure, East Providence is positioned to represent the maximum concentrations in the MSA, as it is located upwind of the City of Providence.

Nitrogen Dioxide (NO₂)

The current NO₂ monitoring network is shown in Table 8 and on Figure 1:

Table 8: Nitrogen Dioxide Monitoring Network

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Myron Francis School 64 Bourne Avenue E. Providence	Neighborhood (PAMS)	Population exposure	Continuous Year-Round
Near-Road Site Hayes and Park Streets Providence	Microscale	Maximum emissions Near-road	Continuous Year-Round

In January 2013, NO₂ monitors at all sites were replaced with low-range units with the exception of Brown.

The NO₂ NAAQS are:

- 100 ppb – 1-hour average (effective January 22, 2010). The design value is the average of the 98th percentile maximum daily hour measured in 3 consecutive years.
- 0.053 ppm (53 ppb) - annual average
-

The design values for 2015-2017 are:

- 58 ppb – 1-hour average, 58 % of NAAQS – Near Road
- 44 ppb – 1-hour average, 44 % of NAAQS – Brown
- 39 ppb – 1-hour average, 39 % - East Providence
- 9 ppb – 1-hour average, 9 % - West Greenwich

The annual averages for 2017 are:

- 18 ppb annual average, 33 % of NAAQS – Near Road
- 9 ppb annual average , 16 % of NAAQS – Brown
- 7 ppb annual average, 13 % of NAAQS – East Providence
- 1 ppb annual average, 1 % of NAAQS – West Greenwich (did not meet minimum data capture criteria)

The NO₂ NAAQS have never been exceeded in Rhode Island. Since there was no short-term NAAQS for NO₂ until the standard was amended in 2010, this pollutant was not used for the Air Quality Index (AQI) before that date. The amended NO₂ NAAQS rule, which was published on February 9, 2010, establishes hourly concentrations of 54 -100 ppb as the range for a “Moderate” AQI⁴.

The 2010 amended NO₂ NAAQS requires Rhode Island to operate two NO₂ monitoring sites, one at “a location of expected highest NO₂ concentrations representing the neighborhood or larger spatial scales” and a second monitor at a near-road location where maximum microscale-representative concentrations are expected. Since 1994, Rhode Island has used the Brown University monitor to fulfill the requirement of neighborhood scale. As of December 31, 2017, RIDEM has ceased operations at the Brown location.

With the closure of Brown, the East Providence location will fulfill the neighborhood monitoring scale for NO₂. To fulfill PAMS requirements, NO₂/NO_x is also monitored at the East Providence year-round. A low-range monitor that measures NO and NO_y (total reactive nitrogen oxides) has been operated at the East Providence site since January 2011, consistent with the NCORE requirements.

In April 2014, RIDEM began operating a near-road site on the east side of the Interstate Route 95 near downtown Providence, monitoring for NO₂/NO_x, as well as CO, PM_{2.5} and black carbon to characterize those pollutants specifically in the near road environment upwind of the highway. Construction of the northbound highway and bridge, next to where the monitoring shelter is located, is estimated to begin sometime late in 2018, at which time the monitoring site will need to be relocated or discontinued. The construction of the southbound bridge of Route 95 was completed by the start of 2017.

Although not required under the new regulations, NO₂ was previously monitored at West Greenwich during the PAMS season only. West Greenwich is no longer designated a PAMS site, and NO₂ monitoring ceased operations as of December 31, 2017 as a cost savings measure.

⁴USEPA, “Primary National Ambient Air Quality Standards for Nitrogen Dioxide: Final Rule, “FR 75(26):6474, 9 February 2010. <http://www.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf>

Particulate Matter

Particles smaller than 10 microns (PM₁₀)

The current PM₁₀ monitoring network is as shown in Table 9 and Figure 2:

Table 9: PM₁₀ Monitoring Network

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Vernon Trailer Vernon Street Pawtucket	Middle	Population exposure	24-hour 1 in 6 day
Urban League 212 Prairie Avenue Providence	Neighborhood (NATTS)	Population exposure Highest concentration	24-hour 1 in 6 day Co-located 1 in 6 day
Myron Francis School 64 Bourne Avenue E. Providence	Neighborhood (NCORE)	Population exposure (Lead discontinued 6/30/16) and PM _{10-2.5})	24-hour 1 in 3 (PM _{10-2.5})

The PM₁₀ NAAQS is:

- 150 µg/m³ – 24-hour average, not to be exceeded more than once per year on average over 3 years (design value is 4th high value in a 3-year period)

The highest value for PM₁₀ recorded at a Rhode Island site for 2017 is:

- 38 µg/m³ – 24-hour average, 25.3 % of NAAQS, recorded at Vernon St.

The PM₁₀ NAAQS has never been exceeded in Rhode Island. Since PM₁₀ is measured using a filter-based method, results are not immediately available and cannot be used for Air Quality Index calculations. Levels tend to be highest at the Vernon Street site, which is adjacent to I-95, and higher at the two Providence sites than at the rural West Greenwich site. PM₁₀ levels appear to have slightly decreased over the past decade.

PM₁₀ is measured at the East Providence NCORE site every sixth day using a lo-vol sampler. The PM₁₀ measurements are used, in conjunction with PM_{2.5} measurements at that site, for calculating PM_{10-2.5} levels.

EPA's monitoring regulations require areas like the Providence-New Bedford-Fall River, RI-MA Metropolitan Statistical Area (MSA), which has a population greater than 1,000,000 and measured PM₁₀ concentrations below 80% of the NAAQS, to operate a minimum of 2 - 4 PM₁₀ monitoring sites.

As discussed, PM₁₀ measurements at the East Providence site are used for calculating PM_{10-2.5} levels and, since this measurement is required at NCORE sites, PM₁₀ sampling cannot be discontinued at that site. Similarly, PM₁₀ samples collected at the Urban League site in Providence are analyzed for metals to fulfill NATTS requirements, so PM₁₀ sampling at that location cannot be discontinued. The rural West

Greenwich monitor, which previously provided information about background concentrations of PM₁₀ in Rhode Island, ceased operations on December 31, 2017.

The Vernon St., Pawtucket site, which is adjacent to I-95, characterizes and records the highest PM₁₀ concentrations in the State. Although Vernon street experiences the highest PM₁₀ values, at no point has the site approached the standard. As RIDEM seeks options for cost and workload savings, RIDEM proposes the option to discontinue monitoring at Vernon Street during 2018.

Even with the potential closure of Vernon Street, the 2 remaining PM₁₀ monitors will adequately characterize exposure of the sensitive populations in urban areas to PM₁₀ and fulfills the minimum requirement of 2 monitors in the Providence-New Bedford-Fall River MSA.

Fine Particulate Matter (Particulate Matter Smaller than 2.5 microns, or PM_{2.5})

The current Federal Reference Method/Federal Equivalent Method (FRM/FEM) PM_{2.5} monitoring network is shown in Table 10 and in Figure 3:

Table 10: PM_{2.5} Monitoring Network

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
Vernon Trailer Vernon Street Pawtucket	Middle	Population exposure	24-hour, 1 in 3 day FRM Co-located FRM began operation 4/1/17
Urban League 212 Prairie Avenue Providence	Neighborhood	Population exposure Highest concentration	24-hour, daily Continuous FEM 1 in 3 day FRM sampler 2 nd 1 in 6 FRM Terminated 4/1/17 (moved to Vernon)
Myron Francis School 64 Bourne Avenue E. Providence	Urban	Population exposure Highest concentration	24-hour, daily Continuous FEM 1 in 3 day FRM
Alton Jones Campus Victory Highway West Greenwich	Regional	Population exposure General/Background Regional Transport	Continuous FEM
USEPA Laboratory 27 Tarzwell Drive Narragansett	Regional	Population exposure	Continuous FEM
Near Road Site Hayes and Park Sts. Providence	Microscale	Near-road	Continuous FEM

Filter-based FRM PM_{2.5} units are operated as the primary sampler at Vernon and Urban League sites. FEM continuous PM_{2.5} monitors are used as the primary samplers at West Greenwich, Narragansett, East Providence, and the Near-Road site in Providence. Co-located filter-based FRM samplers are operated at the Vernon and East Providence sites for quality assurance purposes.

The PM_{2.5} NAAQS are:

- 35 µg/m³ - 24-hour average (design value is the 3-year average of the 98th percentile 24-hour concentration)
- 12 µg/m³ - annual average (design value is calculated by averaging the daily concentrations from each quarter, averaging these quarterly averages to obtain an annual average, and then averaging the annual averages for three consecutive years)⁵

The highest PM_{2.5} values for 2017 are:

- 21.1 µg/m³ – 24-hour average, 60.3 % of NAAQS, recorded at East Providence.
- 8.3µg/m³ – annual average, 69.2 % of NAAQS, recorded at Near Road.

Annual average levels are consistently highest at the Vernon Street site, which is adjacent to I-95, and higher at the East Providence and the two Providence sites than at the rural West Greenwich site. PM_{2.5} levels have decreased over the past decade, although the additional data obtained from the New Road site is higher than other sites, no conclusion can be made as to whether the levels have decreased over the past decade.

EPA regulations requires a minimum of two PM_{2.5} Rhode Island monitoring sites to characterize the following:

- Community-wide air quality;
- Background PM_{2.5} levels in the State; and
- Regional transport of PM_{2.5}.

Although Rhode Island operates more PM_{2.5} sites than required, each site fulfills a specific information need or EPA requirement. The West Greenwich site fulfills EPA's requirements for measurement of background and regional transport concentrations of PM_{2.5} into the state. The 24-hour and annual PM_{2.5} design values for the Vernon Street, Pawtucket site, which is immediately adjacent to Interstate Rte. 95, tend to be higher than those at the other sites, so that is considered a maximum impact site. The East Providence monitor cannot be removed because PM_{2.5} monitoring is required at NCORE sites, and the Urban League and Narragansett monitors fulfill the need for air quality data for urban and coastal areas of the State, respectively.

As discussed above, near road PM_{2.5} monitoring began in April 2014 and will continue until such time that the site is no longer available, due to scheduled construction. The long-term future of the Urban League building is unclear, and RIDEM continues working towards a move to the approved location at the Community College of Rhode Island, Liston Campus. Since CCRI cannot accommodate all the equipment from the Urban League site, the PM_{2.5} from that location was moved to Vernon Street for co-locating with the existing FRM on April 1, 2017.

RIDEM has changed the FEM at the East Providence site to be the primary PM_{2.5} monitor and use the FEM and FRM data from that site to evaluate FEM-FRM comparability at Rhode Island sites. The advantages of using the East Providence, rather than the West Greenwich site for this purpose include:

⁵In December 2012, EPA revised the PM NAAQS, reducing the annual average PM_{2.5} NAAQS from 15 to 12 µg/m³. The rule left the PM₁₀ NAAQS and the 24-hour average PM_{2.5} NAAQS and the secondary annual average PM_{2.5} NAAQS unchanged.

- PM_{2.5} levels at the East Providence site, although still substantially below the NAAQS, tend to be higher than those at the West Greenwich site.
- Since the East Providence FRM runs 1 in 3 days, it generates more comparative data than West Greenwich.
- Historical data has demonstrated that the East Providence FEM and FRM measurements have better correlation and less bias than is observed at the W. Greenwich site.

Operation of the Near-Road site will be disrupted at some future date when construction activity of the I-95 northbound bridge begins, at which time RIDEM will notify EPA to discuss future plans for near-road monitoring. RIDEM changed the PM_{2.5} FRM sampling frequency from every day, to 1-in-3 at Francis School and Urban League beginning October 1, 2016. As of April 1, 2017, RIDEM moved the collocated FRM monitor from the Urban League site to Vernon Street.

Due to budgetary considerations RIDEM discontinued the FRM monitor at Alton Jones as of December 31, 2017. When RIDEM moves the monitoring station from Urban League to its new NATTS location at CCRI it plans to discontinue the FRM at this new location. No other changes to the PM_{2.5} network is anticipated in the next 18 months.

Speciation Monitoring

The EPA's PM_{2.5} Speciation Trends Network (STN) is designed to characterize metal, ion and carbon constituents of PM_{2.5}. In November 2008, the speciation equipment at the Urban League was replaced by a SASS speciation unit and, in March 2009, a URG carbon sampler began operation at that location as part of the speciation program. To conform to NCORE requirements, the speciation equipment, including the carbon sampler, was moved to the East Providence NCORE site in January 2011 and is now being operated there on a 1-in-3 schedule. Speciation filters are analyzed by an EPA contractor.

Lead (Pb)

As specified in the lead NAAQS rule, sampling of lead was previously conducted on a one-in-six-day schedule. EPA deleted the requirement to monitor for non-source Pb at NCORE sites from Appendix D of 40 CFR part 58.16 and to allow monitoring agencies to request permission to discontinue non-source monitoring following the collection of at least 3 years of data at urban NCORE sites. Since ambient lead monitoring was conducted in the State for more than 3 years and the lead levels were consistently considerably lower than the NAAQS since the inception of monitoring, RI DEM was granted permission to discontinue monitoring as of June 30, 2016.

Ozone Precursor and Air Toxics Measurements

Photochemical Assessment Monitoring Stations (PAMS)

The Clean Air Act Amendments of 1990 (CAAA) required serious, severe and extreme ozone nonattainment areas to establish enhanced monitoring networks to measure ozone and ozone precursors. In response to that mandate, the US EPA promulgated rules in 1993 that required the establishment of a network of Photochemical Assessment Monitoring Stations (PAMS) to measure ozone, NO_x, volatile organic compounds (VOCs), carbonyls, and meteorological parameters in serious and above nonattainment areas. This network was designed to provide comprehensive data on trends in ambient concentrations of ozone and ozone

precursors and to evaluate the spatial and diurnal variability of those pollutants, in order to track the formation and transport of ozone across large areas and to evaluate the effectiveness of strategies implemented to reduce levels of that pollutant.

The EPA rule identified four types of PAMS sites:

- Type 1 sites, located on the upwind side of the nonattainment area and used to characterize background and transported concentrations of ozone, NO_x and VOC;
- Type 2 sites, sited to measure the maximum impact of VOC and NO_x emitted in the area;
- Type 3 sites, sited to measure maximum ozone concentrations occurring downwind of the area, and
- Type 4 sites, sited to measure the concentration of ozone, NO_x and VOC exiting the area.

Two PAMS sites, including a Type 2 site, were required in each serious and above nonattainment area. At that time, Rhode Island was designated a serious nonattainment area for the one-hour average ozone standard, therefore requiring enhanced monitoring and a PAMS network. The Alton Jones monitoring site in West Greenwich was designated as the State's Type 1 PAMS site and the East Providence site as the Type 2 PAMS site. In addition, the Massachusetts Department of Environmental Protection (MA DEP) operated a site at the Blue Hills Observatory in Milton, Massachusetts (Site ID 25-021-3003) that served as the Type 1 (upwind) site for the Boston area and as the Type 3 (downwind) site for the Providence area.

The following PAMS pollutants have been monitored in the Rhode Island network:

- 24-hour speciated VOC samples have been collected every sixth day year-round at the Alton Jones and East Providence sites, VOC samples were collected daily during June, July and August at the East Providence site. As of June, July and August of 2017, VOC samples were collected hourly at East Providence using an Auto-GC.
- 24-hour carbonyl samples have been collected every sixth day year-round at the East Providence site. Eight 3-hour carbonyl samples per day were collected every third day during June, July and August through 2011 at that site. Note that 3-hour carbonyl samples were required only in nonattainment areas classified as serious or above for the 8-hour ozone standard. Since Rhode Island has never had a nonattainment classification higher than "moderate" for that NAAQS, this requirement did not apply to the State.
- In 2017, NO_x was measured continuously March through October at Alton Jones, year-round at East Providence, and year-round at the MA DEP site in Milton, MA.
- Rhode Island has measured reactive nitrogen oxides (NO and NO_y) at East Providence since January 2011 to fulfill NCORE requirements. The new EPA regulations require NO, NO_y, true NO₂ and mixing height measurements at required PAMS sites during the ozone season.
- Ozone was measured March through October at the West Greenwich and Narragansett sites since 2011, and monitored March through September beginning in 2017. Ozone has been measured year-round at East Providence to fulfill NCORE requirements.

- Surface meteorological parameters are measured at all three Rhode Island sites year-round.
- West Greenwich is no longer designated a PAMS site, and NO_x monitoring ceased operations as of December 31, 2017 as a cost savings measure.

PAMS recently revised monitoring rule (80 FR 65292; October 26, 2015) requirements

The recently revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCORE sites that are located in Core-Based Statistical Areas with populations of 1,000,000 or more. The Providence, New Bedford, Fall River, RI-MA Statistical Area qualifies as one of those sites. RIDEM is required to develop an implementation plan for this monitoring rule.

PAMS Monitoring Implementation Network Plan

RIDEM operated two Photochemical Assessment Monitoring Stations (PAMS) sites in the air monitoring network in 2017, at the West Greenwich and East Providence sites. West Greenwich is no longer designated a PAMS site.

Network Decision

The NCORE site located at Francis School in East Providence will serve as the location of the required PAMS site and will measure the following parameters described below. An inventory of equipment used at the site is provided in Table 13.

Auto GC Decision

Volatile organic compounds (VOCs) – A complete list of the targeted compounds are found in Table 12. For 2018, we will be measuring hourly speciated VOC measurements with an auto-gas chromatograph (GC) using Chromatotec GC 866 airmo VOC.

Meteorology Measurements Decision

RIDEM will continue to measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, and ultraviolet radiation. RIDEM anticipates measuring mixing height in 2019. The following instrumentation has been in operation to measure the parameters described above:

Wind speed- Met One 014A
 Wind direction – Met One 6929
 Temperature and Humidity all in one – Met One 083D
 Atmospheric pressure – Met One 091
 Precipitation - Met One 370C
 Solar radiation – LI-COR LI-200SZ pyranometer sensor
 Ultraviolet radiation – EPLAB model TUVR

RIDEM anticipates operating a ceilometer for determining mixing height, and is currently in the process of purchasing a ceilometer.

Other Required Measurements

Carbonyls - Carbonyl sampling at a frequency of three 8-hour samples on a 1 in 3 day basis (~90 samples per PAMS sampling season). RIDEM has purchased an ATEC 8000 sampler.

A complete list of the target carbonyl compounds may be found in Table 12. The TO-11A test method, as used in the National Air Toxics Trends (NATTS)⁶ program will be used.

Nitrogen Oxides – Will monitor for NO and NO_y (total oxides of nitrogen) to fulfill NCore requirements. True NO₂ will be measured June, July, and August as required by PAMS. The true NO₂ is required to be measured with a direct reading NO₂ analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter NO_x analyzer. We have not yet purchased a monitor for the true NO₂ measurement but plan on purchasing the TAPI T500U (CAPS). NO and NO_y will be measured using a Thermo 42iY.

PAMS Implementation Plan Waiver Requests and Rationale

Meteorological Waiver Request

We request a waiver to allow meteorological measurements, in particular mixing height, using the ceilometer. It has yet to be determined if the ceilometer will be deployed at the NCore site located in East Providence or the Vernon Street location, located 2.5 miles from East Providence.

Rationale for Waiver

This request is precautionary since there may be siting issues beyond our control for this instrument. It is initially hoped RIDEM will be able to site the ceilometer on the roof of the trailer at East Providence. If that preferred option is not feasible, there may not be sufficient space and may be permitting issues with the City of East Providence when trying to place this instrument at the East Providence site beyond the current footprint of the trailer. The site at Vernon Street has sufficient space and is located 2.5 miles away. Every effort will be made to place this instrument at the NCore site, but this waiver is requested to ensure that the meteorological data can be obtained nearby.

⁶ See NATTS Technical Assistance Document for TO-11A method

Table 11: PAMS Target Compound List

Priority Chemical Parameters (Required)	AQS Parameter Code	Compound Class	Optional Chemical Parameters	AQS Parameter Code	Compound Class
1,2,3-trimethylbenzene	45225	aromatic	1,3,5-trimethylbenzene	45207	aromatic
1,2,4-trimethylbenzene	45208	aromatic	1-pentene	43224	olefin
1-butene	43280	olefin	2,2-dimethylbutane	43244	paraffin
2,2,4-trimethylpentane	43250	paraffin	2,3,4-trimethylpentane	43252	paraffin
acetaldehyde	43503	carbonyl	2,3-dimethylbutane	43284	paraffin
benzene	45201	aromatic	2,3-dimethylpentane	43291	paraffin
cis-2-butene	43217	olefin	2,4-dimethylpentane	43247	paraffin
ethane	43202	paraffin	2-methylheptane	43960	paraffin
ethylbenzene	45203	aromatic	2-methylhexane	43263	paraffin
ethylene	43203	olefin	2-methylpentane	43285	paraffin
formaldehyde	43502	carbonyl	3-methylheptane	43253	paraffin
isobutane	43214	paraffin	3-methylhexane	43249	paraffin
isopentane	43221	paraffin	3-methylpentane	43230	paraffin
isoprene	43243	olefin	Acetone	43551	carbonyl
m&p-xylenes	45109	aromatic	Acetylene	43206	alkyne
m-ethyltoluene	45212	aromatic	cis-2-pentene	43227	olefin
n-butane	43212	paraffin	Cyclohexane	43248	paraffin
n-hexane	43231	paraffin	cyclopentane	43242	paraffin
n-pentane	43220	paraffin	isopropylbenzene	45210	aromatic
o-ethyltoluene	45211	aromatic	m-diethylbenzene	45218	aromatic
o-xylene	45204	aromatic	methylcyclohexane	43261	paraffin
p-ethyltoluene	45213	aromatic	methylcyclopentane	43262	paraffin
propane	43204	paraffin	n-decane	43238	paraffin
propylene	43205	olefin	n-heptane	43232	paraffin
styrene	45220	aromatic	n-nonane	43235	paraffin
toluene	45202	aromatic	n-octane	43233	paraffin
trans-2-butene	43216	olefin	n-propylbenzene	45209	aromatic
ozone	44201	criteria pollutant	n-undecane	43954	paraffin
true NO ₂	42602	criteria pollutant	p-diethylbenzene	45219	aromatic
total non-methane organic carbon	43102	total VOCs, non-methane	trans-2-pentene	43226	olefin
			α-pinene	43256	monoterpene olefin

	β-pinene	43257	monoterpene olefin
	1,3 butadiene	43218	olefin
	benzaldehyde	45501	carbonyl
	carbon tetrachloride	43804	halogenated
	Ethanol	43302	alcohol
	tetrachloroethylene	43817	halogenated

Table 12: Equipment Inventory at East Providence Site

NAME	Manufacturer	Model
Black Carbon-Aethalometer	Teldyne	M633
Black Carbon-Aethalometer	Magee	AE16-ER
Carbonyl sampler	Atec	2200
Carbonyl sampler	Atec	2200
Wind direction sensor	MetOne	590S (6929)
Pure air generator	aadco	737-R-12A
Chemiluminescence NO-NO2-NOx Analyzer	Thermo	42ITL
Sulphur Dioxide analyzer	Thermo	43ITLE
Caron Monoxide analyzer	Thermo	TE48i
Data logger	Agilaire	8832
Hydrogen generator	Packard	H2PD-150NA
Translator module	MetOne	126
Translator module	MetOne	2270
Barometric pressure sensor	MetOne	091
Rain sensor	MetOne	370-8"
Relative Humidity/temp sensor	MetOne	083D-1-35
Met Station Tower	MetOne	
Ultraviolet radiation sensor	EPLAB	TUVR
Wind Speed sensor	MetOne	014A
Solar Radiation pyranometer sensor	LI-COR	LI-200SZ
Chemiluminescence NO-DIF-NOy Analyzer	Thermo	TE42iY
Ozone analyzer	Thermo	TE49i
PM2.5 Sampler	MetOne	1020
PM2.5 Speciation	MetOne	SASS
PM2.5 Partisol-Plus	R&P	2025
PM2.5 Partisol-Plus	R&P	2025
Standard Calibrator,	API	M700E
Standard Calibrator	EnviroNics	6103
Standard-Zero Air	Teledyne	701
VOC sampler	Xontech	910A
VOC sampler	Xontech	910A
Compac II AC units	Marvair	
Compac II AC units	Marvair	

GC custom	Agilent	7890A
Mass Spec	Agilent	5973N
Auto GC	Chromatotec	866
Ceilometer **	Vaisala	CL51
Carbonyl Sampler **	Atec	8000
True No ₂ **	Teledyne	T500U

** To be purchased or awaiting delivery

The EPA promulgated a new NAAQS for ozone effective December 28, 2015. As a result, the following changes to the PAMS program have occurred because of the new regulations.

- The network design change involved EPA requiring PAMS measurements minimally during the PAMS season from June 1 through August 31, at all NCORE sites in CBSAs with a population of 1,000,000 people or more. Since the East Providence site is also the State's NCORE site, this requirement would not necessitate a relocation of that site. The second part of the network design requires states with moderate or above non-attainment areas or states in the Ozone Transport Region to develop and implement Enhanced Monitoring Plans. The EMP is intended to provide monitoring organizations with flexibility to implement additional monitoring to suit the needs of their area.
- As EPA strongly suggested that all required PAMS sites take hourly speciated VOC measurements with auto-gas chromatographs (GCs), RI DEM has purchased and has begun using a continuous GC at the East Providence PAMS site as of the summer of 2017.
- All required PAMS sites must monitor for NO and NO_y (total oxides of nitrogen) in addition to true NO₂ where the latter must be measured with a direct reading NO₂ analyzer, cavity attenuated phase shift (CAPS) spectroscopy analyzer, or photolytic-converter NO_x analyzer. Rhode Island installed a FRM low-range NO₂/NO_x analyzer at the East Providence site in 2013 and operates that analyzer year-round. EPA's preferences for a particular NO₂/NO_x monitoring technology will be considered when replacement of that equipment is necessary.
- All required PAMS sites must measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, ultraviolet radiation and mixing height. Although EPA is suggesting the use of ceilometers for mixing height, other types of meteorological equipment that provide for an indication of mixing height can be proposed. A waiver to allow meteorological measurements to be obtained from other nearby sites, such as National Oceanic and Atmospheric Administration Automated Surface Observing System sites. The required parameters are measured at the East Providence site, and the location of mixing height measurements will be considered prior to the required implantation date.

Enhanced Monitoring Plan

RIDEM has developed an Enhanced Monitoring Plan for implementing additional applicable PAMS requirements.

Based upon 2014-2016 data, Rhode Island has been designated as Attainment/Unclassifiable for the 2015 ozone standard by the Acting EPA Region I Administrator. However, the state of Rhode Island is part of the Ozone Transport Region (OTR) as defined in 40 CFR 51.900, making it subject to specific requirements, one of which is developing an Enhanced Monitoring Plan detailing enhanced ozone and ozone precursor

monitoring, per 40 CFR Part 58, Appendix D, 5.(h), to be submitted no later than October 1, 2019. This EMP is being submitted as part of the 2018 annual monitoring network plan, as required by 40 CFR 58.10.

The EMP is intended to provide monitoring organizations the flexibility to implement additional monitoring to suit the needs of their area. In developing this plan, RIDEM has coordinated with other States in the OTR, and reflects local needs within the context of interstate and interregional transport of ozone precursors.

The EMP will include monitoring activities deemed important to understanding the ozone problem in the state, and may include:

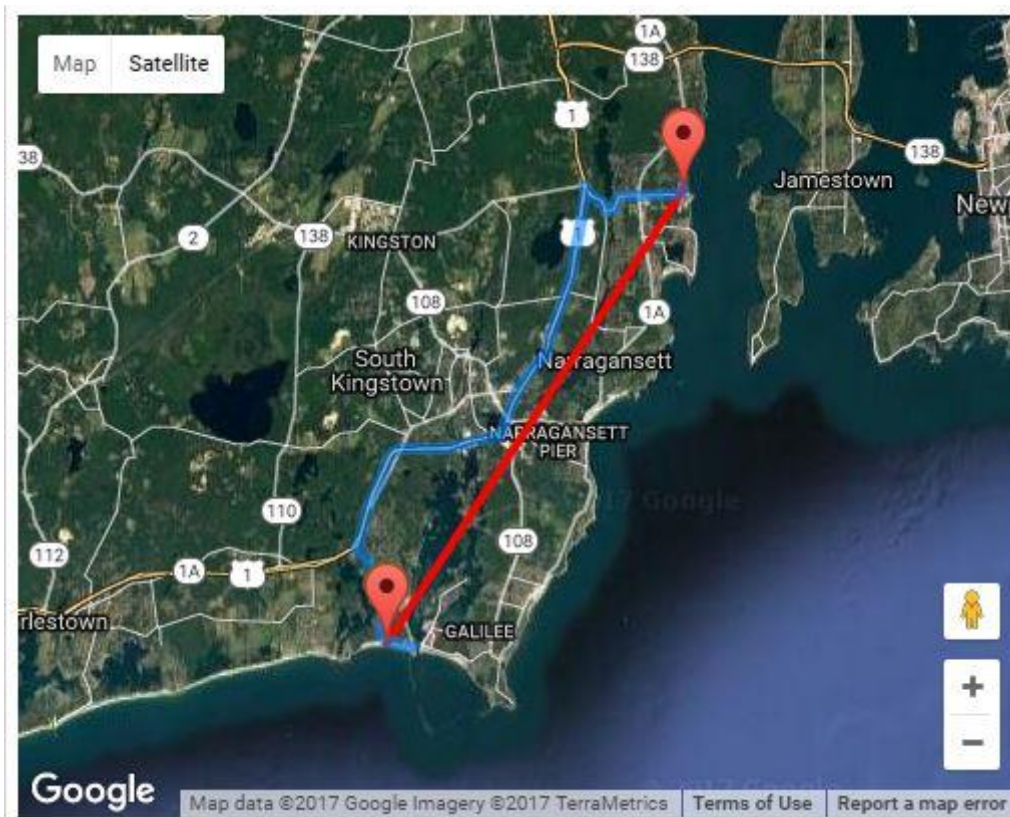
- 1) Additional O₃ monitors beyond the minimally required.
- 2) Additional NO_x monitors beyond those required.

Site Selection

Exploratory ozone monitoring of East Matunuck during the 2017 ozone season indicated that there may be value in establishing more comprehensive monitoring at the immediate coastline. Land-water interfaces can display sharp gradients of ozone concentrations, which can impact immediate coastal locations in Connecticut and possibly Rhode Island. Historically, ozone is also over predicted in and around water bodies by photochemical modeling. There may be mechanisms producing high ozone over water, which may then be transported onshore and impacting land locations and populations.

The East Matunuck site was selected for many reasons. The nearest ozone monitor is in Narragansett at the EPA Laboratories, which is approximately 9.63 miles to the north and east of the proposed East Matunuck location. East Matunuck is a small beach community in the town of South Kingstown on the south coast of Rhode Island exposed to the open ocean. The Narragansett monitor is sited on the west side of Narragansett Bay at the EPA laboratory. The closet monitor in proximity to the coastline is operated by CT DEEP at Fort Griswold in Groton, and is situated approximately 29 miles west of East Matunuck, and is not at the immediate coast.

An ozone monitor is also located at the NCORE site in East Providence, which runs year-round. This monitor is located 33.18 miles north and east of the proposed East Matunuck site. Although this location is within proximity of the mouth of Narragansett Bay, this monitor tends to capture more of an inland ozone plume during high ozone events. The Alton Jones ozone monitor in West Greenwich is situated 19.55 miles north and west of East Matunuck, and is situated to characterize background ozone transported over land into the state, as the site is in a very rural location.



The Narragansett monitoring location is represented by the northern red pushpin, while the southern red pushpin represents the East Matunuck location.

RIDEM searched for a location for a monitor at the immediate south facing coast of Rhode Island. The US Coast Guard Station at Point Judith was initially considered. The station sits on a small cape at the mouth of Narragansett Bay. But this site was not feasible due to security logistics with the USCG. A Block Island location was briefly considered, but was quickly dismissed due to a lack of public land spaces, infrastructure, and travel issues.

The Misquamicut State Beach in Westerly, which is a RIDEM property, was also considered. Due to the slight southwest to northeast orientation of the Rhode Island coastline, this location would have been ideal as it sits further south, is very close to the Connecticut boarder, and is located beyond the end of Long Island Sound. However, the travel time from the RIDOH Laboratory to the Misquamicut State Beach was problematic due to the small staff at RIDOH that manages the monitoring network. Additionally, more so than any other portion of the Rhode Island coastline, Misquamicut historically is the most prone to winter and tropical storm damage, with flooding, dune breach, and structural damage, which would pose risk to the equipment.

Ultimately, the East Matunuck State Beach was selected as the optimum location, as it is a RIDEM property, with available space to place an ozone analyzer short term in the life guard tower. Longer term, with assistance from a RIDEM state beach supervisor, a location will be selected for an EKTO Shelter with available electricity, free flowing ambient air exposure, and favorable sky view for a possible NASA Pandora siting. Additionally, the location will not interfere with the public use of the facility or impact the aesthetic of the building and facilities.

Because of the immediate coastal location of the East Matunuck monitor, RIDEM feels this position may uniquely capture ozone plumes migrating over water along Long Island Sound as they come ashore. These measurements will enhance the existing network of Rhode Island ozone monitors to complement transport coming into the state from inland, and now, the immediate coastline. Additionally, in summertime, the open ocean beaches along the Southern Rhode Island coastline are highly populated and it is important to understand the ground based ozone health risk in a region where hundreds of thousands of people visit and recreate.

Parameters

The parameters selected were ultimately decided by the availability of existing equipment and budgetary restraints. RIDEM and EPA Region I have entered into a personal property loan agreement to dedicate a portable 2B model 202 ozone monitor at this site. For the 2017 ozone season RIDEM/RIDOH operated a Thermo 49i ozone monitor within the lifeguard tower, and will continue to perform exploratory monitoring with the 2B unit for 2018. A Thermo 42i-TL NOx analyzer is now available with the closure of the Brown University site and will used in 2019. Both ozone and NO2 will be measured hourly. Following the end of a Near Road Community-Scale Monitoring study, RIDEM now has access to a dedicated EKTO shelter, and an ONSET Model S-WSET-B wind sensor set to measure wind speed and direction. All parameters will be fed to a dedicated Agilaire 8832 datalogger. This equipment will be installed for the 2019 season.

For quality control considerations, temperature in the shelter will be monitored continuously. An Environics Model #6103 calibrator will be performing periodic calibration checks on a schedule in accordance with the QAPP. The shelter and probe will be sited in accordance with 40 CFR Part 58, Appendix E and the siting criteria will be met for both ozone and NO₂.

Location Address	Latitude/ Longitude	Parameter Measured	Instrument Info	EPA Method Designation
950 Succotash Road, South Kingstown, RI 02879	41.377451 -71.524852	Ozone	2B Model – 202	Equivalent
		NO ₂	Thermo Model 42i-TL	Reference
		WS WD	Onset Model S-WSET-B	None

In addition to the parameters mentioned, RIDEM is a candidate for citing a PANDORA Spectrometer, which has preliminarily determined to be at the East Providence site. RIDEM hopes to secure a PANDORA at the East Matunuck site. RIDEM acknowledges the deployment of both of these PANDORA locations will be based on availability and understands that locations with direct NO₂ measurements may be given a priority due to the usefulness of those measurements relative to that of the PANDORA itself. The PANDORA Spectrometer was developed by NASA to measure total column concentrations of formaldehyde, ozone, sulfur dioxide, BrO, NO₂, and H₂O every 80 seconds. These data can be used to cross reference satellite data and ground comparison.

East Matunuck Site May Compliment LISTOS

During the summer of 2017 and currently in 2018, a regionally coordinated plan between several states in the Northeast was initiated, recently dubbed the Long Island Tropospheric Ozone Study (LISTOS). One

of the first initiatives was to deploy the University of Maryland aircraft during a forecasted high ozone event May 17-18, 2017 to make upper air observations of trace gases at states nearby and over the Long Island Sound. Additional flights (possibly 12) are scheduled for the 2018 ozone season. There are several other ground measurements efforts, LIDAR, Pandora, ozonesonde balloon launches, and potential Long Island Sound transects, along with possible NASA flights to compliment the UMD flights and further characterize the ozone problem over the Sound and the land/water interface.

The East Matunuck site is located on the Southern RI coastline on Block Island Sound, which abuts the mouth of Long Island Sound. The UMD flight path from 2017 ventured as far east as the Groton-New London airport before flying south near Gardiners Island at the east end of Long Island. East Matunuck is located 27 miles east of the Groton-New London airport, and 35 miles northeast of Gardiners Island. The East Matunuck location will “fill a gap” along the immediate coastline between the CT DEEP monitor in Groton, and the Narragansett ozone monitor along the immediate coast.

Timing

It was hoped that the EMP as outlined above would be implemented in time for the 2018 PAMS season. However, due to logistical setbacks and budget restrictions, the monitoring as outlined is not anticipated to be operational for the 2018 PAMS season. Rhode Island has once again deployed the ozone analyzer in the lifeguard tower for this season for exploratory purposes, and will perform calibration checks as often as staffing and travel permits. It is anticipated that the enhanced monitoring as outlined will begin fully in time for the 2019 PAMS season.

Air Toxics

Rhode Island operates one site that is part of the National Air Toxics Trends Stations (NATTS) network. The primary purposes of the NATTS network are to track trends in ambient air toxics levels, to characterize exposures, and to measure progress toward emission and risk reduction goals.

The Rhode Island NATTS site is located on the roof of the Urban League building in an urban residential neighborhood on the south side of Providence, approximately ½ mile west of I-95. This site was chosen as the State’s NATTS site because it is not dominated by local sources and because levels of air toxics at this site appear to be representative of those in urban areas in the State. Note that, since the long-term future of the Urban League building is unknown, RI DEM has entered into an agreement with the Community College of Rhode Island (CCRI) to relocate the NATTS site to the CCRI Liston campus. The Liston Campus abuts the Urban League property.

In keeping with EPA requirements, the following pollutants, at a minimum, are measured at the Rhode Island NATTS site:

Volatile Organic Compounds (VOC)

- Acrolein
- Perchloroethylene (tetrachloroethylene)
- Benzene
- Carbon tetrachloride
- Chloroform
- Trichloroethylene
- 1,3-butadiene
- Vinyl Chloride

Carbonyls

- Formaldehyde
- Acetaldehyde

Metals

- Nickel compounds (PM₁₀)
- Arsenic compounds (PM₁₀)
- Cadmium compounds (PM₁₀)
- Manganese compounds (PM₁₀)
- Beryllium (PM₁₀)

Semi-Volatile Organic Compounds (SVOC)

- Benzo(a)pyrene
- Napthalene

VOCs, carbonyls and PM₁₀ metal samples are analyzed by RIDOH. Semi-Volatile Organic Compounds (SVOC) samples are analyzed by an EPA contractor. Sampling at the NATTS site is conducted for the above parameters for 24-hour periods every sixth day. 24-hour VOC samples are also collected every sixth day at the West Greenwich site, East Providence site, and at the Vernon Street site, which is adjacent to I-95 in Pawtucket. 24-hour carbonyl samples are collected at the East Providence site on the same schedule.

In addition, RIDEM /RIDOH operates aethalometers, which measure black carbon, an indicator of diesel exhaust, at the Urban League NATTS site and the East Providence PAMS/NCORE site and, as of April 2014, at the near-road site in Providence.

It is anticipated that the Rhode Island NATTS site will be moved to CCRI by the end of 2018. No other changes are planned for the ozone precursor or air toxics monitoring sites in the next 18 months.

National Core Multi-Pollutant Monitoring Stations Network

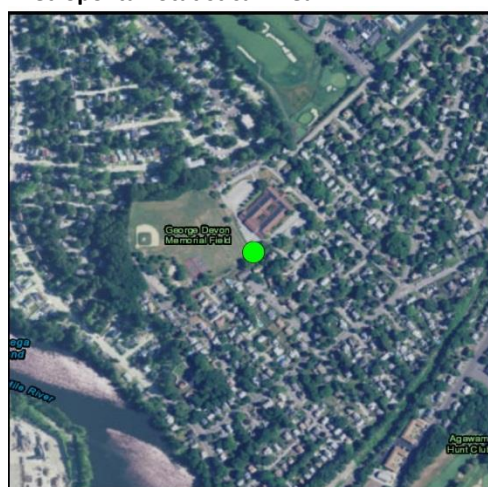
As required in an October 17, 2006 Federal Register notice (FR 71:61236), Rhode Island began operating a site that is part of EPA’s network of core multipollutant monitoring (NCORE) stations in January 2011. This network is designed to address the following monitoring objectives:

- Timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms
- Supporting development of emission strategies through air quality model evaluation and other observational methods
- Accessing accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors
- Supporting long-term health assessments that contribute to ongoing reviews of the NAAQS
- Establishing nonattainment/attainment areas by comparison with the NAAQS
- Supporting disciplines of scientific research, including; public health, atmospheric and ecological.

The East Providence site is operating as the State’s NCORE site. Ozone, low-range NO₂/NO_x, reactive oxides of nitrogen (NO and NO_y), low-range CO, low range SO₂, PM_{2.5} (FRM, continuous and speciated), coarse PM (PM_{10-2.5}), VOCs, carbonyls, black carbon, and meteorological parameters are monitored at that site. PM_{10-2.5} is measured as the difference between lo-vol PM₁₀ and lo-vol PM_{2.5} concentrations. The conventional NO₂/NO_x monitor at this site was replaced by a low-range NO₂/NO_x monitor in January 2013 and is being operated year-round.

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

Town – Site: **East Providence – Myron Francis School**
 County: **Providence** Latitude: **41.841039°**
 Address: **64 Bourne Street** Longitude: **-71.36097°**
 AQS Site ID: **440071010** Elevation: **62 ft.**
 Spatial Scale: **Neighborhood/ Urban** Year Established: **1993**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



PM2.5 (FRM), 1:3	X
PM2.5 (FRM, Collocated),1:6	
PM2.5 (Continuous - FEM)	X
PM10/PM- (Hi Vol), 1:6	
PM10/PM- (Hi Vol), Collocated), 1:12	
PM10/PM-Coarse(lo-Vol), 1:3	X
Polycyclic aromatic hydrocarbons (PAH), 1:6	
Speciation, PM2.5 super SASS (CSN), 1:3	X
PM2.5 Carbon (URG) (CSN),1:3	X
Ozone	X
SO2	X
CO	X
Direct NO2	
NO/NO2/NOx	X
NO/NOy	X
VOCs 24 HR Canister (NATTS, State)	X
VOCs Hourly PAMS	S
Black Carbon	X
Black Carbon, Collocated	X
Carbonyls, 1:6	X
Carbonyls Collocated, 1:12	X
Particle Counter	
Wind Speed	X
Wind Direction	X
Temperature	X
Dew Point / Rel. Humidity	X
Barometric Pressure	X
Solar Radiation	S
UV Radiation	S
Precipitation	S

x=Existing

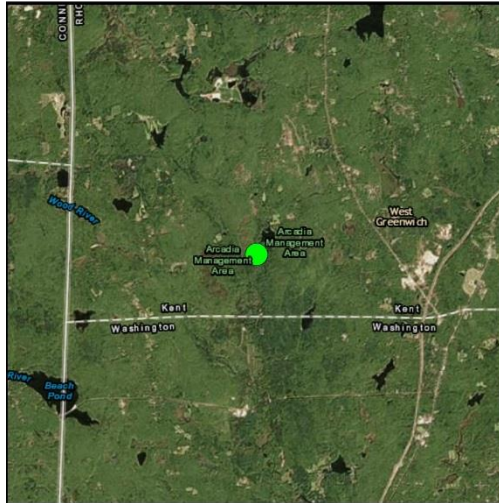
S =Seasonal PAMS and Meteorology 6/1-8/31

Site Description: The Myron Francis School site is a neighborhood scale site located in a suburban area in north-eastern Rhode Island in the City of East Providence. This site is operated by RIDEM as part of the NCore and PAMS network. Land use type: Playground/sports fields/Residential/Elementary School. It is located near Interstate RT 195 approximately 2 miles south, Pawtucket Ave. <1/2 mile to the north, North Broadway <1/2 mile to the south / east. This site is located behind an elementary school, on the backside of the school playground; it sits on city property, recreational park. It abuts residential property to the south. The trailer is approximately 12 X 23 feet with an attached shed housing liquid nitrogen.

Monitoring Objectives: The Myron Francis School monitoring site objective is to collect air quality measurements to assess long-term trends as part of the national NCore and PAMS network.

Planned changes for 2018-2019: As RIDEM seeks options for cost and workload savings, RIDEM proposes the option to discontinue PM₁₀ monitoring at Vernon and start reporting PM₁₀ mass measured at the East Providence site.

Town – Site: **West Greenwich –Alton Jones Campus**
 County: **Providence** Latitude: **41.61537°**
 Address: **401 Victory Highway** Longitude: **-71.72°**
 AQS Site ID: **440030002** Elevation: **253 ft.**
 Spatial Scale: **Regional** Year Established: **1976**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



T	PM2.5 (FRM 1:6)	
X	PM2.5 (FRM, Collocated), 1:6	
T	PM2.5 (Continuous - FEM)	
	PM10/PM- (Hi Vol), 1:6	
	PM10/PM- (Hi Vol), Collocated), 1:6	
	PM10/PM-Coarse(lo-Vol), 1:3	
	Polycyclic aromatic hydrocarbons (PAH), 1:6	
	Speciation, PM2.5 super SASS (CSN), PM2.5 Carbon (URG) (CSN), 1:3	
S	Ozone	
	SO2	
	CO	
	Direct NO ₂	
T	NO/NO ₂ /NOx	
	NO/NOy	
X	VOCs 24 HR Canister (NATTS, State)	
	VOCs Hourly PAMS	
	Black Carbon	
	Black Carbon, Collocated	
	Carbonyls, 1:6	
	Carbonyls Collocated, 1:12	
	Particle Counter	
X	Wind Speed	
X	Wind Direction	
X	Temperature	
	Dew Point / Rel. Humidity	
X	Barometric Pressure	
S	Solar Radiation	
	UV Radiation	
	Precipitation	

x=Existing

T = Terminated in 2016/2017

S = Seasonal Meteorology 6/1-8/31 Seasonal O₃ 3/1 - 9/30

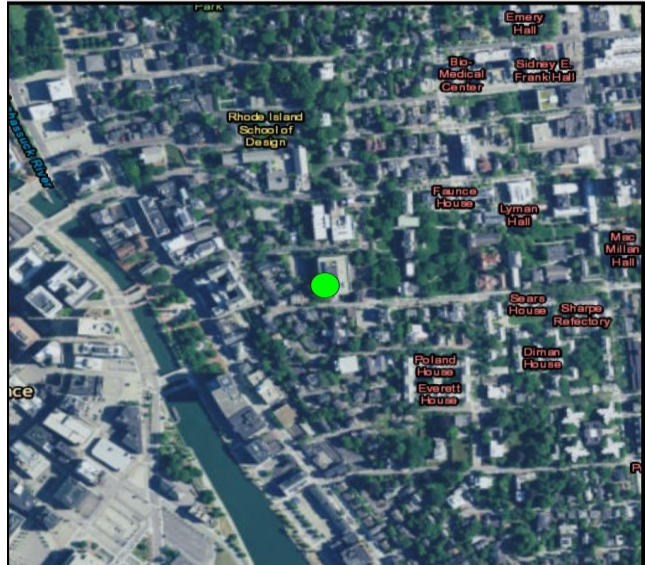
Site Description: The Alton Jones site is a regional scale site located in a meadow surrounded by trees in Rhode Island in the town of West Greenwich. This site is operated by RIDEM as part of the SLAMS and PAMS network. Land use type: Forest and recreation field. It is located near RT 102 approximately 2.5 miles east, and Interstate I-95, 5 miles south. The trailer approximately 12'X12', with a pressure treated deck off to the east side of the trailer. A meteorological tower sits on the west side of the trailer.

Monitoring Objectives: The Alton Jones monitoring site objective is to collect air quality measurements to assess long-terms trends as part of the SLAMS network.

Planned changes for 2018 -2019: None

Town – Site: **Providence – Rockefeller Library Brown University** **CLOSED**

County: **Providence** Latitude: **41.82556°**
 Address: **10 Prospect Street** Longitude: **-71.40528°**
 AQS Site ID: **440070012** Elevation: **75 ft.**
 Spatial Scale: **Neighborhood** Year Established: **1975**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



PM2.5 (FRM), 1:3 (Except AJ 1:6)	
PM2.5 (FRM, Collocated),1:6	
PM2.5 (Continuous - FEM)	
PM10/PM- (Hi Vol), 1:6	
PM10/PM- (Hi Vol), Collocated), 1:6	
PM10/PM-Coarse(lo-Vol), 1:3	
Polycyclic aromatic hydrocarbons (PAH), 1:6	
Speciation, PM2.5 super SASS (CSN), 1:3	
PM2.5 Carbon (URG) (CSN),1:3	
Ozone	
SO2	T
CO	
Direct NO ₂	
NO/NO ₂ /NOx	T
NO/NOY	
VOCs 24 HR Canister (NATTS, State)	
VOCs Hourly PAMS	
Black Carbon	
Black Carbon, Collocated	
Carbonyls, 1:6	
Carbonyls Collocated, 1:12	
Particle Counter	
Wind Speed	
Wind Direction	
Temperature	
Dew Point / Rel. Humidity	
Barometric Pressure	
Solar Radiation	
UV Radiation	
Precipitation	

x=Existing

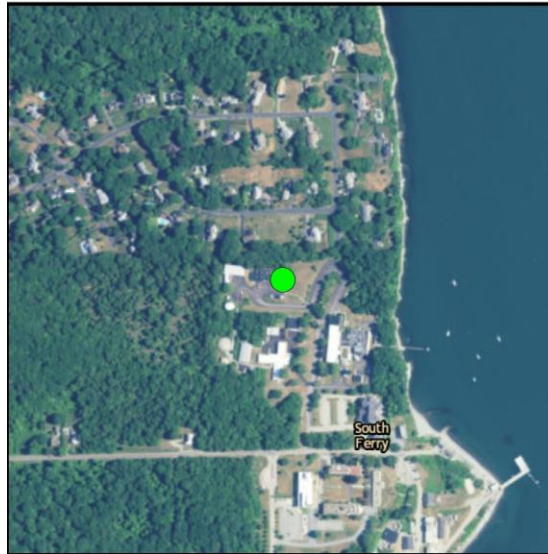
T = Terminated in 2016/2017

Site Description: The Rockefeller Library site was an urban City Center commercial scale site located on the 5th floor of the Brown University Library in the City of Providence. The site was on the corner of Prospect and George St., Benefit Street is 344.5 ft. to the west, South Main St. is 652.6 ft. to the west, I-195 is 3,510.9 ft. to the south, I 95 is 3,676.9 ft. to the west. Street traffic is light to moderate.

Monitoring Objectives: The Brown University monitoring site’s objective was to collect air quality measurements within an urban city setting.

Planned changes: **SITE PERMANENTLY CLOSED ON 12/31/2017**

Town – Site: **Narragansett – US EPA Lab**
 County: **Washington** Latitude: **41.495511°**
 Address: **27 Tarzwell Drive** Longitude: **-71.423705°**
 AQS Site ID: **440090007** Elevation: **19.69 ft.**
 Spatial Scale: **Regional** Year: **1997**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



PM2.5 (FRM), 1:3 (Except AJ 1:6)	
PM2.5 (FRM, Collocated), 1:6	
PM2.5 (Continuous - FEM)	X
PM10/PM- (Hi Vol), 1:6	
PM10/PM- (Hi Vol), Collocated, 1:6	
PM10/PM-Coarse(lo-Vol), 1:3	
Polycyclic aromatic hydrocarbons	
Speciation, PM2.5 super SASS (CSN),	
PM2.5 Carbon (URG) (CSN),1:3	
Ozone	S
SO2	
CO	
Direct NO ₂	
NO/NO ₂ /NOx	
NO/NOy	
VOCs 24 HR Canister (NATTS, State)	
VOCs Hourly PAMS	
Black Carbon	
Black Carbon, Collocated	
Carbonyls, 1:6	
Carbonyls Collocated, 1:12	
Particle Counter	
Wind Speed	X
Wind Direction	X
Temperature	X
Dew Point / Rel. Humidity	
Barometric Pressure	X
Solar Radiation	
UV Radiation	
Precipitation	

x=Existing

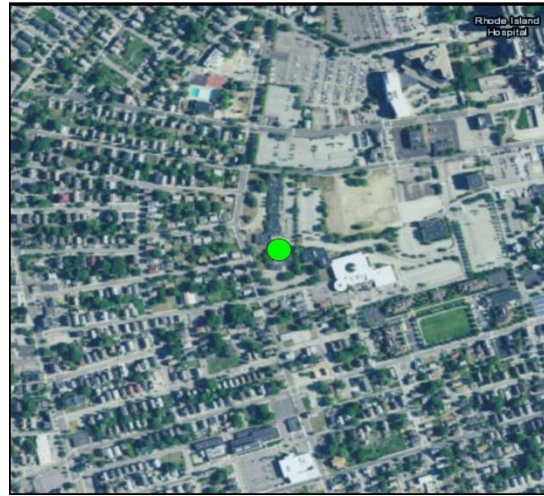
S = Seasonal 3/1-9/30

Site Description: The Narragansett USEPA laboratory is a regional scale site located 425 feet from the bay in southern Rhode Island in the town of Narragansett. This site is operated by RIDEM as part of SLAMS network. Equipment is in a small office on the east side of the EPA building. A staircase in the back of the building leads to the roof where the continuous PM2.5 sampler is placed. A meteorological tower sits on the east side of the building. RT 1 is 1.7 miles south. Rhode Island sound is 425 ft. to the east and the building sits at the top of a hill.

Monitoring Objectives: The Narragansett USEPA monitoring site objective is to collect air quality measurements to assess long-term trends as part of the national SLAMS network.

Planned changes for 2018-2019: None.

Town – Site: **Providence – Urban League**
 County: **Providence** Latitude: **41.80776°**
 Address: **212 Prairie Avenue** Longitude: **-71.415105°**
 AQS Site ID: **440070022** Elevation: **75 ft.**
 Spatial Scale: **Neighborhood** Year Established: **1999**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



	PM2.5 (FRM 1:3)	
X	PM2.5 (FRM, Collocated),1:6	T
X	PM2.5 (Continuous - FEM)	X
X*	PM10/PM- (Hi Vol), 1:6	
X**	PM10/PM- (Hi Vol), Collocated), 1:6	
	PM10/PM-Coarse(lo-Vol), 1:3	
X	Polycyclic aromatic hydrocarbons (PAH), 1:6	
	Speciation, PM2.5 super SASS (CSN),	
	PM2.5 Carbon (URG) (CSN),1:3	
	Ozone	
	SO2	
	CO	
	Direct NO2	
	NO/NO2/NOx	
	NO/NOy	
X	VOCs 24 HR Canister (NATTS, State)	
	VOCs Hourly PAMS	
X	Black Carbon	
	Black Carbon, Collocated	
X	Carbonyls, 1:6	
X	Carbonyls Collocated, 1:12	
X	Particle Counter	
X	Wind Speed	
X	Wind Direction	
X	Temperature	
	Dew Point / Rel. Humidity	
	Barometric Pressure	
	Solar Radiation	
	UV Radiation	
	Precipitation	

X=Existing

X* Includes metals



T = Terminated in 2016/2017

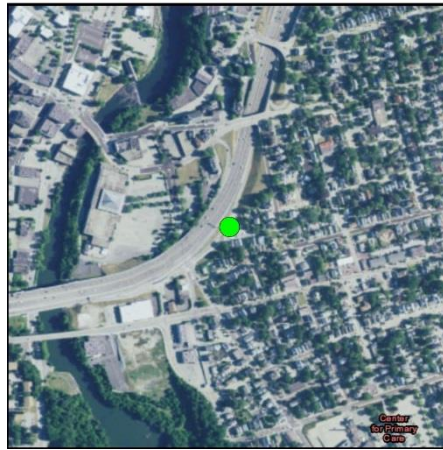
X** Includes collocated metals 1:12

Site Description: The Urban League site is a neighborhood scale site located in an urban area in north-eastern Rhode Island in the City of Providence. This site is operated by RIDEM as part of the SLAMS and toxics network. This site sits on the roof of a building approximately 18 feet off the ground. On the east side of this building is a 2-story school. There are some trees, residences and 2 story homes and buildings surrounding the location. It has street traffic from Prairie Ave, with Broad St. 0.28 miles west, and Elmwood Avenue 0.5 miles west. Interstate I-95 is 0.5 miles east with RI Hospital 0.40 miles away to the northeast.

Monitoring Objectives: The Urban League monitoring site objective is to collect air quality measurements to assess long-term trends as part of the SLAMS and NATTS network.

Planned changes for 2018-2019: Site will be moved to an alternative location nearby at the Community College of RI as logistically possible. At that time, the PM_{2.5} will be discontinued and the PM_{2.5} FEM will be the primary monitor.

Town – Site: **Pawtucket – Vernon Street**
 County: **Providence** Latitude: **41.874668°**
 Address: **Vernon Street** Longitude: **-71.379971°**
 AQS Site ID: **440070026** Elevation: **36 ft.**
 Spatial Scale: **Middle** Year Established: **2001**
 Statistical Area: **Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area**



	PM2.5 (FRM), 1:3	
X	PM2.5 (FRM, Collocated), 1:6	
	PM2.5 (Continuous - FEM)	
X	PM10/PM- (Hi Vol), 1:6	
	PM10/PM- (Hi Vol), Collocated, 1:12	
	PM10/PM-Coarse(lo-Vol), 1:3	
	Polycyclic aromatic hydrocarbons (PAH), 1:6	
	Speciation, PM2.5 super SASS (CSN),	
	PM2.5 Carbon (URG) (CSN), 1:3	
	Ozone	
	SO2	
	CO	
	Direct NO2	
	NO/NO2/NOx	
	NO/NOy	
X	VOCs 24 HR Canister (NATTS, State)	
	VOCs Hourly PAMS	
	Black Carbon	
	Black Carbon, Collocated	
	Carbonyls, 1:6	
	Carbonyls Collocated, 1:12	
	Particle Counter	
	Wind Speed	
	Wind Direction	
	Temperature	
	Dew Point / Rel. Humidity	
	Barometric Pressure	
	Solar Radiation	
	UV Radiation	
	Precipitation	

x=Existing

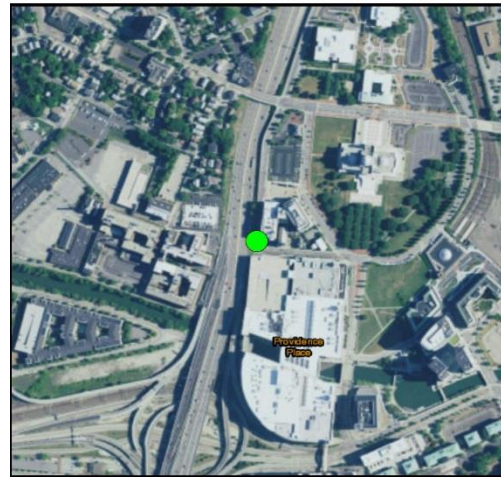
Site Description: The Vernon Street site is a middle scale site located in a suburban area in north-eastern Rhode Island in the City of Pawtucket. This site is operated by RIDEM as part of the SLAMS and Toxics network. Land use type: Highway/ Residential. It is located at grass level adjacent to Interstate RT I-95 and sits midway on a hill near the on-ramp with houses on the east-south sides.

This site is a small grassy median situated 22 meters from I-95 North and 7.6 meters to the ramp leading to the highway. The samplers are placed on a cement platform and pressure treated deck. The area is surrounded by a chain link fence.

Monitoring Objectives: The Vernon Street monitoring site objective is to collect air quality measurements to assess long-terms trends as part of the national SLAMS and Toxics network.

Planned changes for 2018-2019: As RIDEM seeks options for cost and workload savings, RIDEM proposes the option to discontinue PM₁₀ monitoring at Vernon and start reporting PM₁₀ mass measured at the East Providence site.

Town - Site	Providence – Near Road, Park/Hayes Street		
County:	Providence	Latitude:	41.829495°
Address:	Hayes and Park Street	Longitude:	-71.417457°
AQS Site ID:	440070030	Elevation:	75 ft.
Spatial Scale:	Microscale	Year Established:	2014
Statistical Area:	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		



PM2.5 (FRM 1:3)	
PM2.5 (FRM, Collocated), 1:6	
PM2.5 (Continuous - FEM)	X
PM10/PM- (Hi Vol), 1:6	
PM10/PM- (Hi Vol), Collocated), 1:12	
PM10/PM-Coarse(lo-Vol), 1:3	
Polycyclic aromatic hydrocarbons (PAH), 1:6	
Speciation, PM2.5 super SASS (CSN), 1:3	
PM2.5 Carbon (URG) (CSN), 1:3	
Ozone	
SO2	
CO	X
Direct NO2	
NO/NO2/NOx	X
NO/NOy	
VOCs 24 HR Canister (NATTS, State)	
VOCs Hourly PAMS	
Black Carbon	X
Black Carbon, Collocated	
Carbonyls, 1:6	
Carbonyls Collocated, 1:12	
Particle Counter	X
Wind Speed	
Wind Direction	
Temperature	
Dew Point / Rel. Humidity	
Barometric Pressure	
Solar Radiation	
UV Radiation	
Precipitation	

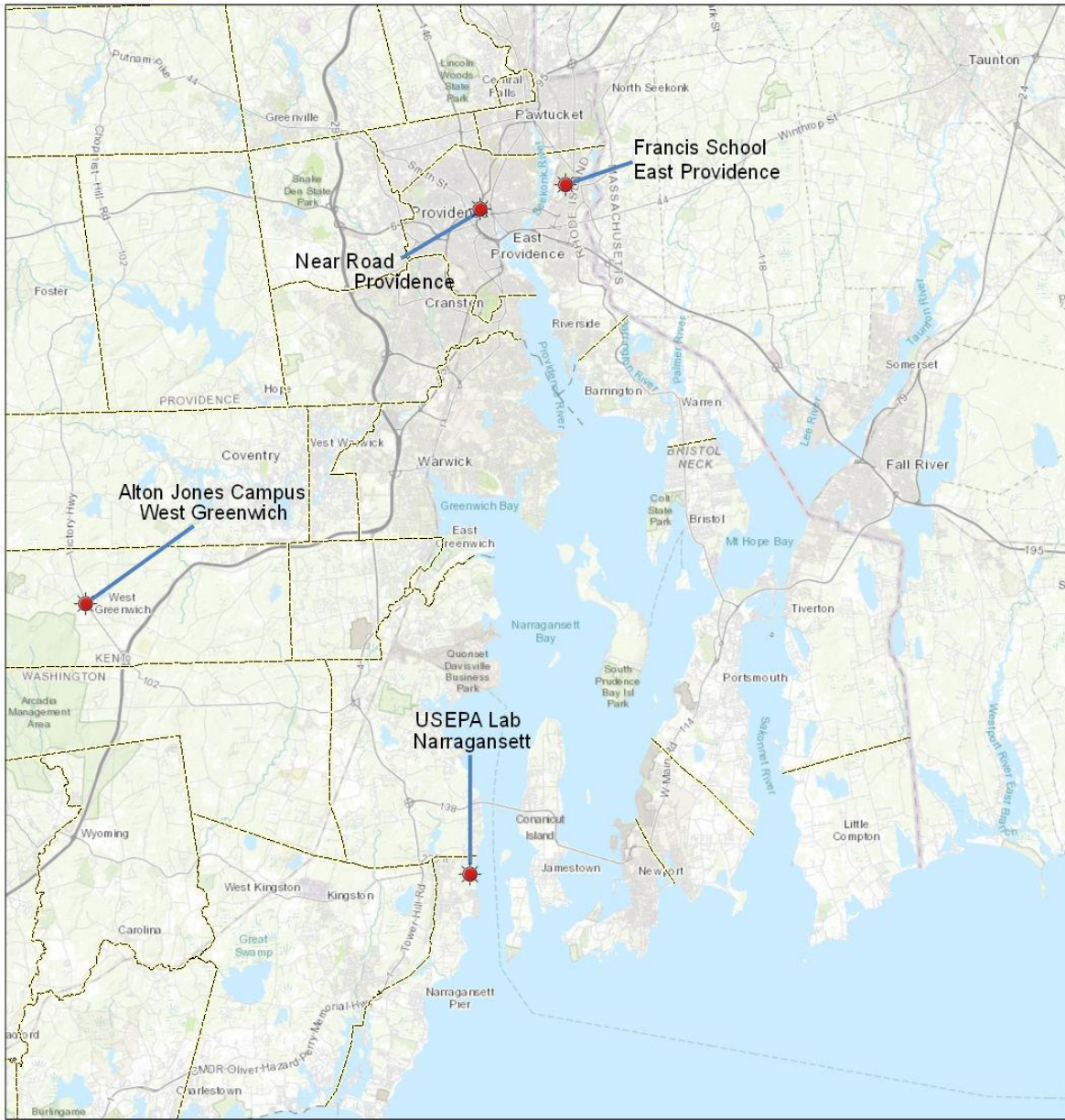
x=Existing

Site Description: The Near Road site is a microscale scale site located in an urban, commercial area along the northbound highway I-95 near the corner of Park/Hayes Street in the City of Providence near the RT-10 and RT-146 connectors. Land use type: Highway/City. This site is 4 meters from I-95 northbound. The 20' x 8" trailer sits level with the highway on a slight incline on Park Street. Veterans Memorial Auditorium sits just east and along Park Street to the north, with a Providence Place Mall parking garage just to the south. To the west across I-95 is the Foundry complex.

Monitoring Objectives: The Near Road monitoring site objective is to collect air quality measurements to assess long-term trends as part of the Near Road network.

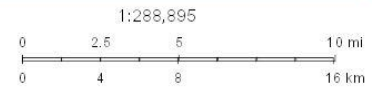
Planned changes for 2018-2019: Depending on RIDOT viaduct construction schedule, site may have to be relocated.

Figure 1 Air Quality Monitoring Network Continuous Gas Monitors



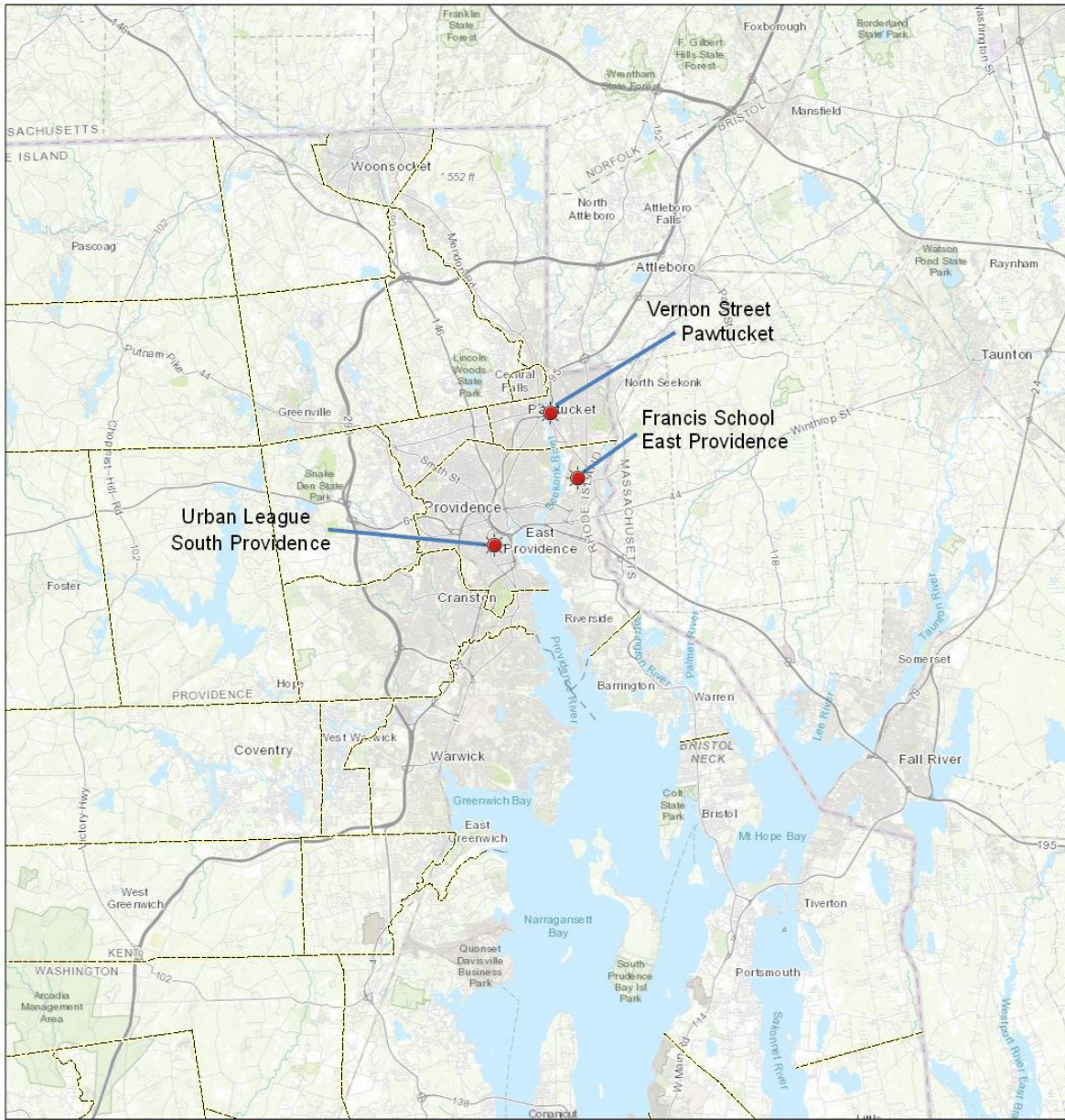
8/3/2018, 11:56:12 AM

- Continuous Gas Monitors
- Town Line



MassGIS, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

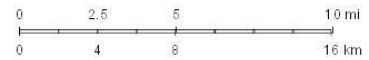
Figure 2 - PM-10 Air Pollution Monitoring Network Sites



8/3/2018, 12:16:25 PM

- PM-10 Site Locations
- Town Line

1:288,895



City of East Providence, City of Providence, MassGIS, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

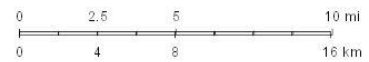
Figure 3 - PM-2.5 Air Quality Monitoring Network Sites



8/3/2018, 12:43:51 PM

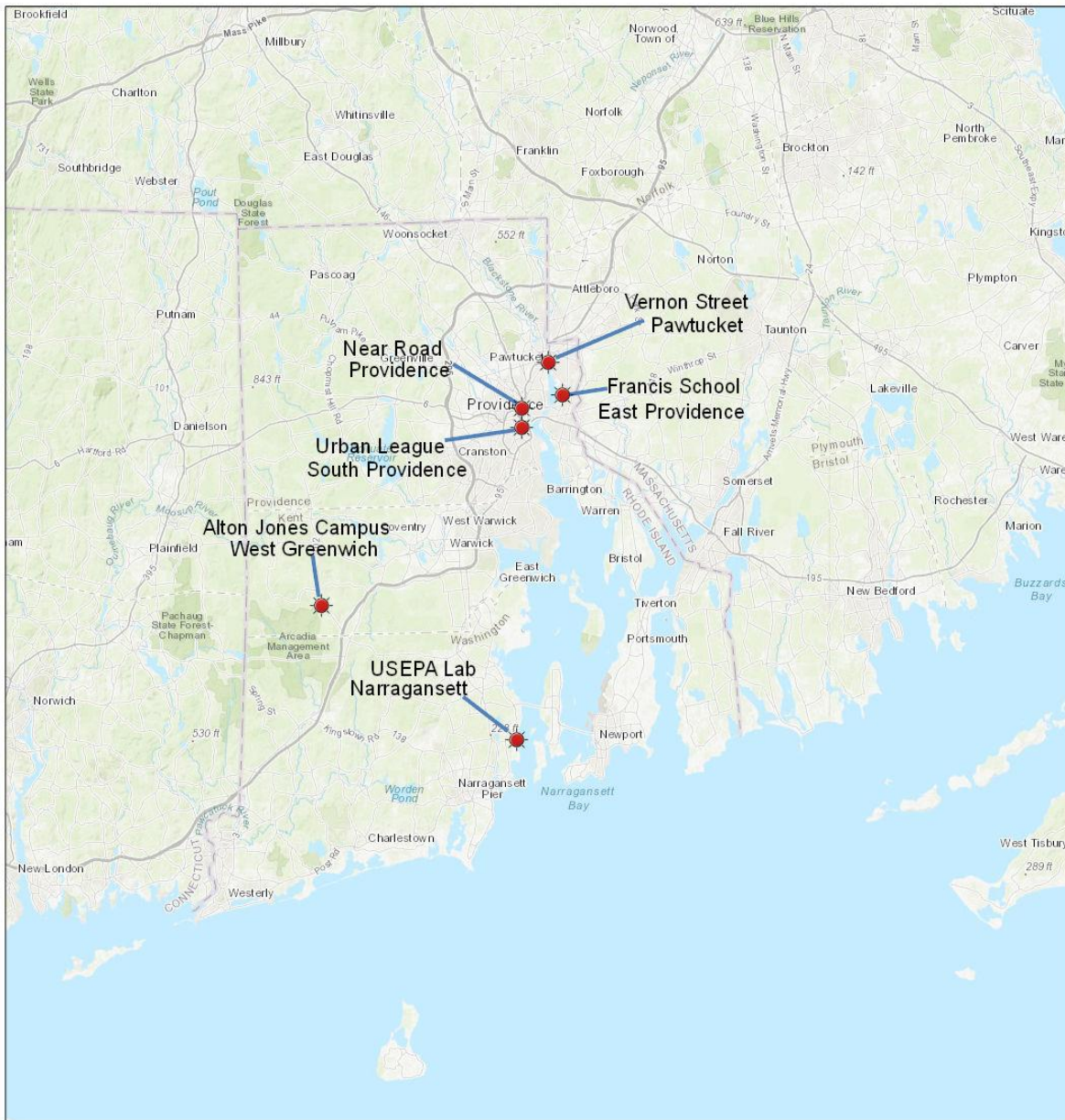
- PM-2
- Town Line

1:288,895



MassGIS, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

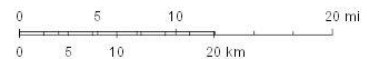
Figure 4 - RI Air Quality Monitoring Network



8/3/2018, 1:05:35 PM

● Rhode Island Air Quality Monitoring Network Sites

1:577,791



Eri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

a Center (URI/EDC), Rhode Island Department of Environmental Management (RIDEM) | RIGIS, University of Rhode Island Environmental Data Center | RIEMA | Eri, HERE | Eri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS |