THE NEW HAMPSHIRE
AMBIENT AIR MONITORING PROGRAM
2023/2024 ANNUAL
NETWORK REVIEW and PLAN

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New Hampshire Department
of Environmental Services

NEW HAMPSHIRE
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THE NEW HAMPSHIRE AMBIENT AIR MONITORING PROGRAM 2023/2024 ANNUAL NETWORK REVIEW and PLAN

prepared by the
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Introduction

The New Hampshire Department of Environmental Services (NHDES) is pleased to submit this 2023/2024 Ambient Air Monitoring Program Annual Network Review and Plan (Plan) in accordance with the *Code of Federal Regulations Title 40, PART 58.* Part 1 of this Plan reviews structure, objectives, history and data trends associated with NHDES' Air Monitoring Program (AMP). Part 2 of this Plan details individual air monitoring station information. Appendix A presents comparability assessments between collocated particulate sampling stations.

PART 1 – 2023/2024 Annual Network Review and Plan

NHDES continually stresses basic air monitoring fundamentals and strives to identify efficiency initiatives to allow for reliable, high quality data capture and analysis, as cost effectively as possible and within a defined budget. Key objectives include providing quality ambient air data to:

- Protect public health by measuring and tracking the most common air pollutants and to support forecasting and real-time mapping and air pollution alert initiatives.
- Determine attainment status with the National Ambient Air Quality Standards (NAAQS, see Table 1.5).
- Guide future air quality policy decisions at the state and national level.

Tables 1.1 through 1.4, presented later in this section, summarize the current details of the New Hampshire ambient air monitoring network.

Monitoring Objectives

In accordance with the NHDES mission "to help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire," NHDES operates a network of air monitoring sites throughout the state. These sites facilitate monitoring of ambient ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NO_2 and NO_y), volatile and semi-volatile organic compounds (VOCs), carbon monoxide (CO), lead (Pb), particulate matter chemistry (PM, $PM_{2.5}$, PM_{10}) and photochemical precursors to ozone. Air monitoring data from NHDES' network helps assess air quality within New Hampshire, evaluate the status of air quality coming from areas upwind and helps assess New Hampshire's contribution to downwind areas. These data combined with similar data collected in other states allow NHDES to predict air pollution episodes, enact protective actions and warnings, develop and assess effectiveness of emission reduction strategies and support health assessments and NAAQS reviews.

Ambient air pollution monitoring began in New Hampshire in the 1970s in a few communities. Over subsequent years, the network grew to the point where each of the state's 10 counties hosted monitoring stations for air pollutants known to exist in the area. Over time, some local industrial facilities either established pollution controls or shut down, resulting in improvements in air quality in those counties. For example, paper mills in Coos County emitted fairly high levels of sulfur dioxide and particles, resulting in periodic unhealthy air quality. Many of these facilities have since shut down and the air quality has improved to the point that there is no longer the need for monitoring in the area. Accordingly, NHDES has reallocated monitoring resources, however, NHDES continues to

track emission inventories and reports of health concerns in these areas to assess any potential need to reestablish air monitoring infrastructure. In recent years, NHDES has coordinated with the U.S. Environmental Protection Agency (USEPA) to review and further streamline the monitoring network to meet demands for increased efficiency. NHDES carefully considered the need to maintain adequate public protection and long-term pollution trending information in deciding between options for improving efficiency.

The current New Hampshire ambient air monitoring network is carefully configured based on air pollution emission patterns to provide air quality data in populated areas which are potentially at risk for unhealthy air quality of one or more pollutants. Most populated areas in the state are represented by an air monitoring station unless previous monitoring has demonstrated that either the community is not considered to be at risk or can be adequately represented by a nearby monitor. NHDES also considered topography, geographic coverage and air pollution modeling in the current network design.

Now, in 2023, most of the major pollution sources that are in operation in New Hampshire are generally well controlled. Areas of continued concern are mobile vehicles of various types and area emission sources (general home- and business-based emission sources) where population density and highway networks are dense enough to multiply the emissions of these relatively small individual sources many times over. The cumulative emissions are greatest in the southeastern portion of the state where population and highway densities are greatest. This region is generally bounded by the Massachusetts state line to the south, Nashua and Manchester to the west, Concord to the north and Rochester and Portsmouth to the east. This same region is also the most exposed portion of the state to air pollution transport, which generally crosses the southeastern part of the state from southwest to the northeast and along the New Hampshire coastline. Populated valley communities where wood burning is commonly used for residential heating are also being closely watched for $PM_{2.5}$ during cold weather seasons and have been subject to special monitoring studies to better understand events, geographical coverage and trends.

Pollutants of most concern in New Hampshire in 2023 include ozone, ozone precursors (nitrogen oxides (NOx) and VOCs), $PM_{2.5}$ and SO_2. The New Hampshire monitoring network is densest in the southern portion of the state to reflect potential air quality concerns in heavily populated regions with diverse geography. While the greatest risk of unhealthy air quality occurs in these portions of New Hampshire, unhealthy air quality events can occur anywhere in the state for ozone and small particles. Accordingly, the monitoring network for these pollutants extends into all portions of the state and even at higher elevations. Small particles also lead to visibility impairment, and there are federal regulations to track visibility progress with a special kind of speciation monitoring (IMPROVE) near the Class I airsheds (Great Gulf Wilderness and Presidential Dry-River Wilderness) located adjacent to Mt. Washington in northern New Hampshire. Additional IMPROVE network monitors have been added at the NHDES NCORE locations (Londonderry and Miller State Park in Peterborough).

As part of the 2015 8-hour Ozone NAAQS implementation, USEPA required states located within the Ozone Transport Region (OTR) to submit an Enhanced Monitoring Plan (EMP) by

October 2019. This plan was submitted with NHDES' previous Network Review and was approved by USEPA in October 2018. NHDES became an early adopter of some photochemical assessment monitoring (PAMS) requirements and continues to collaborate with USEPA and other states in the region to apply EMP monitoring technology and to study ozone formation and transport.

Network Summary

Below is a summary of the New Hampshire Air Monitoring network as of May 2023 and the role each station plays for public protection. The list is presented alphabetically by community.

Concord

The Concord monitoring site is primarily intended to track ozone, the only criteria pollutant for which recent air monitoring and modeling has indicated possible population exposure to unhealthy levels. The Hazen Drive site has the advantage of being near the NHDES main office, for both outreach opportunities and ease of maintenance. It is also in the proximity of residential neighborhoods, retirement communities and schools. NHDES initiated SO_2 monitoring at this station in October 2010 to help quantify local SO_2 levels relative to the new SO_2 NAAQS. This monitoring was then discontinued at the end of 2016 due to the low SO_2 concentrations measured. The Concord Hazen Drive station represents population on a neighborhood scale.

Greens Grant – Mt. Washington base

The Greens Grant, Camp Dodge ozone monitor at the base of Mt. Washington is now the primary monitor representing the northern portion of New Hampshire. NHDES partners with the Appalachian Mountain Club for general support and operation of the ozone monitoring at this station. This monitoring location is also important since it represents two federally recognized Class I airsheds, which also require IMPROVE visibility monitoring. Personnel from the US Forest Service's White Mountain National Forest operate the IMPROVE sampler. NHDES tracks $PM_{2.5}$ levels measured by the IMPROVE monitor for the purpose of estimating current exposures and the demand for more comprehensive $PM_{2.5}$ monitoring. This station represents population exposure on a regional scale.

Keene

The monitoring station in the city of Keene tracks ozone and $PM_{2.5}$ on a continuous basis. The southwest portion of the state can experience periods each year when ozone and $PM_{2.5}$ concentrations have the potential to reach levels that are unhealthy for sensitive groups. NHDES installed a continuous $PM_{2.5}$ monitor at this station in September 2007 to better track the risks of wintertime wood smoke accumulation, which is a product of residential heating in the community. Keene is a prime example of a city distinguished by the factors, such as population density, woodstove use, and valley topography that are necessary for these winter events. Concentrations measured here may be reflective of air quality conditions in other similar valley communities. The continuous $PM_{2.5}$ equipment has been invaluable in better understanding the winter $PM_{2.5}$ events and improving air pollution forecasts for the

area. The data measured for ozone and non-winter $PM_{2.5}$ are considered valuable on a regional basis, and the data for winter $PM_{2.5}$ is considered non-regional. This station represents population exposure on a neighborhood scale.

Laconia

The Laconia monitor tracks ozone and $PM_{2.5}$ in the "Lakes Region" of the state. The population of this area swells during the summer months with tourists. The monitor represents the very northern edge of the Boston CMSA (combined metropolitan statistical area) and periodically experiences elevated ozone and $PM_{2.5}$ concentrations. This station represents population exposure on a regional scale for ozone and non-winter $PM_{2.5}$, and on a neighborhood scale for winter $PM_{2.5}$. Special studies have explored wood smoke impacts in various neighborhoods of Laconia with stationary monitoring equipment during 2017 through 2019, and again during the recent winter of 2021-22. Additional $PM_{2.5}$ measurements were made in the Laconia region with mobile monitoring technology during winter 2018-2019. General findings of these studies suggest that the current Green Street $PM_{2.5}$ monitor does not adequately represent in-town $PM_{2.5}$ concentrations. Because $PM_{2.5}$ represents the greatest public health risk from air pollution in Laconia, NHDES is working with EPA to relocate the Green Street monitor to a more representative area.

Lebanon

The Lebanon monitoring station is sited to provide population and regional based monitoring for the Lebanon/White River Junction (VT) metropolitan area with information on regional ozone and $PM_{2.5}$. This site is also important since it represents the consolidation of the closed Claremont (ozone) and Haverhill (ozone and $PM_{2.5}$) monitoring stations. The station is located on a ridge at the Lebanon airport, just above the river valley. The site was chosen primarily to represent the regional exposure, and the station is important to the New Hampshire network for its geographic coverage. Concentrations of $PM_{2.5}$ from winter wood smoke may be higher on occasion in the nearby populated valleys at lower elevations, but past exploratory monitoring efforts have indicated that such concentrations are unlikely to reach levels high enough to create neighborhood or community health risk. This station represents population exposure on a regional scale.

Londonderry

The Londonderry station came online January 1, 2011, as an NCore superstation measuring a wide selection of pollutants. NHDES worked closely with USEPA to carefully select this site for its central proximity to the highly populated southeastern suburban portion of New Hampshire. The site has no nearby emission sources of significance but lies in the air pollution transport corridor that crosses the southern portion of the state. The site is expected to track a number of potentially unhealthy ozone events each year. NHDES relocated photochemical assessment monitoring (PAMS) from Nashua to this station in April 2015 and it is the required PAMS site for NH. PAMS measures important precursors to the development of ozone. These precursors include a wide variety of volatile organic compounds and nitrogen oxides. Changes to the site are documented in the Network Modifications section of this report in accordance with the new PAMS site

requirements. The changes largely took place in time for the 2019 PAMS season. In addition, a Pandora Spectrometer was installed in April of 2021 as part of the Pandora Project, a collaborative effort between state monitoring agencies, USEPA and NASA. Being a multi-parameter station located in an area representative of a large population living in the northern suburbs of Boston, as well as between the major population centers of Nashua and Manchester, the data collected at this site will be ideal for future research and health-related analysis. This station also pairs with the Pack Monadnock NCore station to give the low elevation perspective as compared to Pack Monadnock's high elevation data for similar air masses transported into the area. This station represents population exposure on a regional scale.

Mt. Washington – Summit

The Mt. Washington summit monitoring site is of special value for scientific research for tracking ozone transport. The summit is located 6,288 feet above sea level and is far away from any significant pollution sources; thus, it is ideal for receiving long-range pollution transport into the northern portion of the state. The data are often compared to the data collected at Greens Grant (Camp Dodge) located about 4,000 feet lower at the base of the mountain, just a few miles to the east, to give a vertical gradient perspective. Ozone concentrations measured at the summit are normally higher than those measured at the base, and they occasionally reach levels that are considered unhealthy for sensitive groups. This station provides valuable high elevation data on a regional scale but should not be considered representative of population exposure in nearby communities at lower elevation. NHDES is optimistic about completing installation and establishing trace level carbon monoxide monitoring at this site during the Summer of 2023 under the PAMS Enhanced Monitoring Plan (EMP). These carbon monoxide measurements will help differentiate ozone originating by human air pollution sources from ozone of natural (stratospheric) origin.

Nashua – Gilson Road

In past years, the Nashua area often saw the highest ozone concentrations in the state and thus there is an ongoing need to continue tracking ozone in this area. While this station is on the upwind side of the city of Nashua, it is critical to the network for tracking transport into the state and into the city of Nashua from the southwest. This station represents population exposure on a regional scale.

Peterborough, Pack Monadnock Mountain – Summit (Miller State Park)

NHDES has monitored several parameters at the Pack Monadnock station since 2002 and it became the state's second NCore site in 2011. The site's true value lies in the fact that it is located on a rural mountain top in the south-central portion of the state. At 2,288 feet above sea level, the station is ideally located to pick up the transport airflow from the heavily populated northeast urban corridor (Washington, D.C. to Boston) and is at the northern terminus of the low-level jet that begins near the middle of Virginia. This non-population-based monitor does not have nearby sources of significance. This site measures a wide variety of pollutants, including PAMS ozone precursors, IMPROVE, ozone, and $PM_{2.5}$. Due to its location and elevation, NHDES

considers this station to be of high scientific value for transport measurements on a regional scale. When paired with data collected at Londonderry, Peterborough PAMS and $PM_{2.5}$ data provide a critical high-low cross section for regional photochemical models. Due to these unique characteristics, NHDES included continued PAMS operations at this location under the EMP.

Pembroke

The Pembroke monitoring station is located along the Merrimack River, just to the south of the Merrimack Station power plant. The power plant is a large coal burning source which until recently caused relatively high levels of SO_2 at this monitor. While the power plant has completed pollution control upgrades for SO_2, this station tracks progress in reducing emissions and measures exposure to SO_2 in a nearby community. This station represents population exposure to SO_2 on a local scale.

Portsmouth

The Portsmouth monitoring station is located on Peirce Island on the Piscataqua River just to the east of downtown Portsmouth. NHDES established a long-term agreement for siting this monitor at its current location and has found the location to be suitable for tracking emissions from around the Portsmouth and Kittery (ME) areas. The station also picks up some sea breeze ozone events that work their way up the river. This station represents population exposure on a limited regional scale.

Rye

The Rye Monitoring station is located at Odiorne State Park. Its purpose is primarily to track summertime ozone events brought ashore by sea breezes. Past experience with monitoring ozone in Rye found that these events sometimes result in ozone measurements that are among the highest in the state. Such sea breeze events are generally limited to the coastline area and rarely penetrate more than a few miles inland. The data from this site are of scientific interest for air pollution flow dynamics when compared with data from the Portsmouth station. This station represents a specific and limited population along the New Hampshire coastline for these periodic high ozone events.

Light Scattering $PM_{2.5}$ Federal Equivalency Method (FEM) Monitoring

NHDES currently operates two T640x samplers (Londonderry and Portsmouth) and four T640 non-x samplers (Lebanon, Laconia, Keene and Peterborough) covering a total of six permanent PM stations. NHDES also operates Federal Reference Method (FRM) filter-based samplers at Keene, Londonderry and Peterborough to facilitate data comparison assessments between the continuous and filter-based methodologies.

There are several factors that can work against good correlation between FRM and FEM data. Some of these factors can be controlled by a monitoring organization and some cannot. NHDES continually strives to get better correlations through process controls and limiting variables that can be controlled, however, there are basic uncontrollable differences between the FRM and FEM methods that work against good correlations. One key uncontrollable factor relates to volatiles and semi-volatile components in the air mass. Key

differences between filter based and other continuous methodologies are based on the time between sample collection and sample analysis. The API 640 analyzes the air mass continually through light scattering technology, whereas the FRM collects the sample over an integrated 24-hour period, with analysis performed several weeks later. This extended time between sampling and analysis for the FRM likely allows volatile and/or semi-volatile compounds (when present) to leave the sample media prior to analysis – creating a negative bias when compared to the BAM and T640. Please note information below relative to these data comparability assessments (FEM vs FRM) and declaration of primary sampler type for each station. For more information, see data comparability assessments in Appendix A.

Keene – NHDES operates an API T640 FEM at this station as the primary monitor as of 2-21-23. Any FRM data generated at Keene is considered secondary when T640 data are available. Based on the 3-year data Comparability Assessment between FRM and FEM data – Summer, Winter, Fall, 2022 and all data combined (for the past three years) are within acceptable bias limits. However, data comparisons for Spring, 2020 and 2022 fell just outside acceptable bias limits. This data set continues to improve over time as changes associated with filter weighing take hold. The three-year data set correlates with an overall R = 0.88 and has an intercept of .27 micrograms per cubic meter ($\mu g/m^3$). 2022 was the last comparison year with a BAM 1020. (See Comparability Assessments in Appendix A).

Lebanon – NHDES operates an API T640 FEM at this station. NHDES does not currently operate or plan to operate FRM samplers in Lebanon in the foreseeable future. The FEM data at Lebanon is primary toward the NAAQS.

Laconia – NHDES initiated continuous FEM monitoring at Laconia during the 4th quarter of 2018 with a Met One 1020 BAM. The BAM was replaced with a T640 in November 2022. T640 data at Laconia is primary toward the NAAQS as there are no FRM vs FEM comparison data for the Comparability Assessment, and NHDES does not plan to run FRM filters at this station in the foreseeable future.

Londonderry – NHDES has operated an API T640x at Londonderry since May 2020. The T640x is considered primary toward the NAAQS. Any FRM data generated at Londonderry is considered secondary when 640x data are available. The FRM to FEM comparative data appear promising with a correlation factor of R = 0.96 and an intercept of 0.62. Although the correlation is strong, not all the data fall within additive vs. multiplicative bias acceptability limits (see Comparability Assessments in Appendix A) most notably, winter and 2021, with summer just outside the box. Note that the T640x consistently reads higher than the filter-based data, which may be a result of volatiles and semi-volatiles in the air mass that cannot be captured with filter-based methodology. (see Comparability Assessments in Appendix A).

Peterborough, Pack Monadnock Mountain – Summit (Miller State Park) - NHDES has operated an API T640 at Peterborough since September 2020. The T640 is considered primary toward the NAAQS. Any FRM data generated at Peterborough is considered

secondary when 640 data are available. The FRM to FEM comparative data appear promising with a correlation factor of R = 0.93 and an intercept of 0.63. All the data since 2020, falls within additive vs. multiplicative bias acceptability criteria. Note that, similar to Londonderry (although not as extreme), the T640 consistently reads higher than the filter-based data, which may be a result of volatiles and semi-volatiles in the air mass that cannot be captured with filter-based methodology (see Comparability Assessments in Appendix A).

***Portsmouth* –** NHDES operates an API T640x at Portsmouth, and its data is considered primary toward the NAAQS. NHDES discontinued FRM filter based sampling at Portsmouth during June 2020 and does not plan to run FRM filters at this station in the foreseeable future. Building upon the early success of the FRM and T640 data comparison from Londonderry and Peterborough, NHDES is optimistic that the T640x will provide FRM like results in Portsmouth as well.

Network Modifications

NHDES made the following modifications to the air monitoring network between June 1, 2022 and June 30, 2023.

***Peterborough* –** NHDES installed and operated a Thermo 48iQTLE for Carbon Monoxide monitoring starting 6/17/22 due to parts shortages and a lack of like replacement units. This unit came with challenges with regard to the auto zero function and was replaced with a like 48iQTLE due to the former reporting erratic values. In April 2023, NHDES installed an API T300 which should alleviate the auto zero function problems.

Keene – NHDES operated a BGI PQ-200 PM sampler up until January 2023 when the unit started to malfunction. It was replaced with a Met One E-SEQ sampler.

Laconia – NHDES operated a Thermo 49C Ozone analyzer for the 2022 monitoring season. For 2023, NHDES chose to operate an API T400 based on available equipment.

Lebanon – NHDES operated a Thermo 48i Carbon Monoxide analyzer for the 2022 monitoring season and up to 5/12/2023. On 5/12/23 NHDES installed a T300 replacement unit to allow the Thermo unit to come in for annual maintenance.

Londonderry – NHDES operated a Thermo 49C Ozone analyzer for the 2022 monitoring season. For 2023, NHDES chose to operate an API T400 based on available equipment.

Laconia – NHDES operated a Thermo 49C Ozone analyzer for the 2022 monitoring season. For 2023, NHDES chose to operate an API T400 based on available equipment.

Nashua – NHDES operated a Thermo 49C Ozone analyzer for the 2022 monitoring season. For 2023, NHDES chose to operate an API T400 based on available equipment.

Rye – NHDES operated an API T400 Ozone analyzer for the 2022 monitoring season. For 2023, NHDES chose to operate a 2B 205 based on available equipment.

Mt. Washington – NHDES operated an API T400 Ozone analyzer until June of 2022. Due to equipment damage and availability, NHDES chose to replace the unit with a 2B 205.

PAMS – New Hampshire met the June 1, 2021, date for the 2015 NAAQS implementation monitoring requirements cited in in 40 CFR part 58. Upgrades included: new instrumentation at Londonderry in 2018, True NO_2 monitoring installed in 2018, carbonyl sampling convened at the required site started in 2019, and the Vaisala CL-51 Ceilometer was online starting in 2019 and is now part of the University of Maryland ceilometer network. In 2022, the Perkin Elmer VOC system that had been at Peterborough since 2006 was replaced with a Markes Agilent system, mirroring the PAMS system at Londonderry. The new system will provide superior data collection including improved detection limits and the ability to capture α and β pinene at this rural forested location. In response to a shift in ozone exceedances seen in NH during the past 8 years, PAMS monitoring now begins in May and ends August 31st.

Future Plans

In support of continuous efforts to improve performance and maximize network efficiency, NHDES continues to seek efficiencies where possible within the network. NHDES presents the following future plans:

Enhanced Monitoring Plan (EMP) – NHDES' EMP was approved by EPA in October 2018. As part of this plan, NHDES will continue to report VOCs at the Miller State Park NCORE site, as well as install a trace-level CO monitor at the summit of Mt. Washington. Additional sampling using borrowed ozone sonde equipment was outlined in the EMP but will not take place in 2023/24 unless financial resources and staffing are designated.

Mt. Washington Summit, Sargent's Purchase – NHDES is planning to install and operate a trace level carbon monoxide analyzer on Mt Washington during the Spring/Summer of 2023. This project has been delayed for over a year due to equipment problems and because the unique environment at this site presents a number of challenges. Thanks to steady progress and infrastructure improvements, the CO monitor should be operational in 2023.

Laconia, Green Street – NHDES continues to work towards relocating Laconia monitoring (ozone and $PM_{2.5}$) to better capture winter wood smoke within the city neighborhoods. NHDES worked with USEPA and set up a network of Purple Air Sensors around Laconia during the 2021-2022 winter that helped investigate the neighborhood impacts of wood smoke and identify a preferred location to replace the current Green Street station. During this study, NHDES identified potential locations and could establish a new station as early as late Spring/Summer 2023. The relocated "in-town location" would continue to monitor both ozone and $PM_{2.5}$ with a T640 and an ozone analyzer. NHDES will coordinate with USEPA to address any siting or operational concerns.

Purchasing/Expenses

NHDES' budget cycle runs from July 1 through June 30 each year. During this budget cycle the Air Monitoring Program continued to focus on updating antiquated air

monitoring equipment with limited funding. NHDES routinely exhausts nearly all its federal air monitoring funding for personnel, consumables, parts and supplies to operate the air monitoring network. Additional demands include air monitoring vehicle maintenance, station contracts, utilities for existing facilities, and enhancements to the air monitoring stations as needed throughout the network. Other key expenses include calibrating, repairing, and maintaining equipment to meet USEPA and safety standards.

Table 1.0 presents equipment, analyzer, and sampler types that NHDES currently uses for ambient air quality monitoring. NHDES' monitoring network is summarized in Tables 1.1 through 1.4.

Table 1.0: Equipment – (Method)
SO_2
Teledyne – API 100A and EU – (Automated Equivalent Method EQSA-0495-100)
Teco 43C – (Automated Equivalent Method EQSA-0486-060)
Thermo 43i – (Automated Equivalent Method EQSA-0486-060)
CO
Teco 48C - (Automated Reference Method RFCA-0981-054)
Thermo 48i – (Automated Reference Method RFCA-0981-054)
Teledyne – API 300 U EU – (Automated Equivalent Method RFCA-1093-093)
O_3
Teledyne – API 400E T400 - (Automated Equivalent Method EQOA-0992-087)
Teco 49 - (Automated Equivalent Method EQOA-0880-047)
Teco 49C - (Automated Equivalent Method EQOA-0880-047)
Thermo 49i - (Automated Equivalent Method EQOA-0880-047)
Teco 49iQ – (Automated Equivalent Method EQOA –0880-047
Teco 49i PS – (Lab Standard EQOA-0880-047)
Teco 49iQ PA (Lab Standard EQOA-0880-047)
2B Technologies Model 205 (Automated Equivalent Method: EQOA-0410-190)
NO_2
Teledyne – Model T500U CAPS – (Automated Equivalent Method EQNA-0514-212)
2B Model 405nm – (Automated Equivalent Method: EQNA-0217-243)
NOy
Ecotech Model 9843 Noy Analyzer
Teledyne Model T200U NOy Analyzer
Thermo 42iY Noy Analyzer
Particulate Matter
Thermo Partisol Model 2025i (filter based) (RFPS-1006-145)
Met One E-Seq Sampler (filter based) (RFPS-0717-245)
API 640x and 640 non-X (EQPM-0516-238) (EQPM-0516-236)
IMPROVE Visibility Speciation Monitor
Calibrator (multiple parameter)
TECO 165 Multi Gas Calibrator
Teledyne – API Model 700, 700E and 700U Gas Calibrators
Environics Series 6103 Multi Gas Calibrator

Table 1.0: Equipment – (Method)
2B Technology Model 306 Ozone Calibrator
Data Acquisition System
Environmental Systems Corporation (ESC and Agilaire) Data Loggers Models 8816, 8832, 8864 and 8872
PAMS
Agilent/Markes Ozone Precursor Systems consisting of7890B GC, Markes CIA Advantage (4 channel), UNITY-xr, Kori-xr Moisture Removal System
Agilent Open Labs CDS, version 2.7, Chemstation Edition
Markes OS v. 2.0.9
Parker Balston TOC Gas Generators
Parker Balston Hydrogen Generators
ATEC 8000 Carbonyl Sampler
Vaisala CL-51 Ceilometer
Werther oil-less air compressors

Table 1.1: New Hampshire State and Local Air Monitoring Stations Network – 2023/2024					
SO_2					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Pembroke	Pembroke Highway Dept.	33 013 1006	Continuous	Neighborhood	High Concentration
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
Portsmouth	Peirce Island	33 015 0014	Continuous	Neighborhood	Population
CO					
Town	**Name**	**AIRS#**	**Frequency**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
O_3					
Town	**Name**	**AIRS#**	**Frequency**	**Scale**	**Objective**
Concord	Hazen Drive	33 013 1007	March - Sept	Neighborhood	Population
Greens Grant	Camp Dodge	33 007 4002	March - Sept	Regional	Research
Keene	Water Street	33 005 0007	Continuous	Neighborhood	Population
Laconia	Lakes Region	33 001 2004	March - Sept	Regional	Population
Lebanon	Lebanon	33 009 0010	Continuous	Regional	Population
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Mount Washington	Mt. Washington Summit	33 007 4001	Continuous	Regional	Research
Nashua	Gilson Road	33 011 1011	March - Sept	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
Portsmouth	Peirce Island	33 015 0014	Continuous	Neighborhood	Population

Rye, Odiorne	Seacoast Science Center	33 015 0016	March - Sept	Neighborhood	High Concentration
NO_2/NO_y					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Londonderry NOy	Moose Hill School	33 015 0018	Continuous	Regional	Population
Londonderry NO_2	Moose Hill School	33 015 0018	Continuous	Regional	Population
Peterborough NOy	Pack Monadnock	33 011 5001	Continuous	Regional	Research

Table 1.2: New Hampshire Particulate Matter Network – 2023/2024					
$PM_{2.5}$					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Keene	Water Street	33 005 0007	1 in 6 filter	Neighborhood	Colocation
Keene	Water Street	33 005 0007	Continuous – API T640	Neighborhood	Population
Laconia	Green Street	33 001 2004	Continuous – API T640	Regional	Population
Lebanon	Lebanon Airport	33 009 0010	Continuous – API T640	Regional	Population
Londonderry	Moose Hill School	33 015 0018	1 in 3 filter	Regional	Colocation
Londonderry	Moose Hill School	33 015 0018	Continuous – API T640x	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous – API T640	Regional	Research
Peterborough	Pack Monadnock	33 011 5001	1 in 3 filter	Regional	Research
Portsmouth	Peirce Island	33 015 0014	Continuous – API T640x	Regional	Population
$PM_{2.5}$ Speciation					
Peterborough	Pack Monadnock	33 011 5001	1 in 3 IMPROVE	Regional	Research
Londonderry	Moose Hill School	33 015 0018	1 in 3 IMPROVE	Regional	Population
PM_{10}					
Londonderry	Moose Hill School	33 015 0018	Continuous – API T640x	Regional	Population
Portsmouth	Peirce Island	33 015 0014	Continuous – API T640x	Neighborhood	Audit

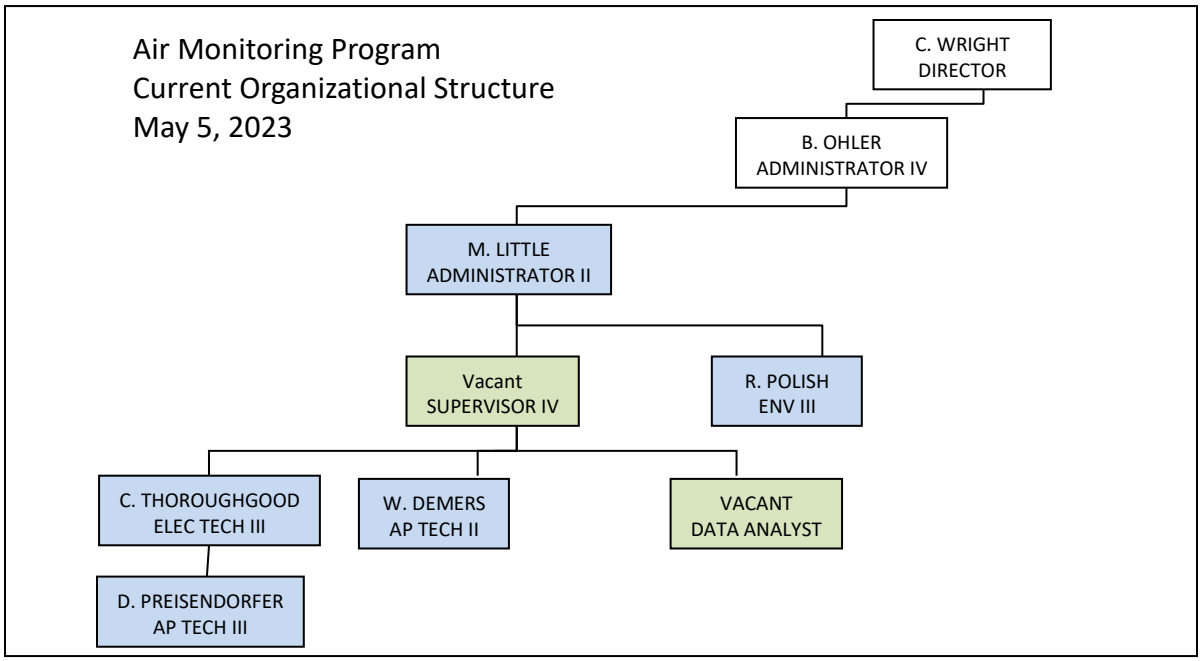
Table 1.3: New Hampshire PAMS Network – 2023/2024					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Starting 2015 May - August	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	May - August	Regional	Research

Table 1.4: New Hampshire NCore Network – 2022/2023					
Town	**Name**	**AIRS #**	**Status**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Operational on Jan 1, 2011	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Operational on Jan 1, 2011	Regional	Research

Personnel

The AMP continues to operate with two full-time positions vacant as well as one technical position previously eliminated, as of May 2023. To fulfill monitoring requirements, NHDES plans to fill one of the positions as soon as possible and allocate funding from the remaining vacant position toward equipment replacement and maintenance. In the meantime, NHDES assigns some technical support duties to individuals outside the official AMP organizational structure, including PAMS management duties.

Figure 1.1: Current Air Monitoring Program Organizational Chart



Cooperative Air Monitoring Initiatives

NHDES is involved in numerous cooperative air monitoring initiatives with local, state and private entities.

For over 30 years now, the Appalachian Mountain Club (AMC) and NHDES have collectively conducted ozone monitoring in Coos County. AMC and NHDES started working together in 1990 to establish an ozone monitor at the summit of Mount Washington to determine the exposure of hikers and other visitors to this pollutant and to quantify ozone transport from upwind areas. Significant concentrations of ozone have been measured at times on the summit during the spring and summer months, especially during the earlier years. AMC and NHDES built on this partnership by establishing and maintaining a second monitoring station near the

base of Mt. Washington at Camp Dodge in 1996. The Camp Dodge monitor tracks visibility-impairing air pollutants in the White Mountain National Forest Class I Wilderness areas located on Mt Washington. AMC's involvement in air monitoring activities saves NHDES significant resources.

NHDES also partners with the US Department of Agriculture (Forest Service) in a Challenge Cost Share Agreement relative to air monitoring activities at Camp Dodge in Greens Grant. This agreement provides a framework of cooperation for station work such as upgrades, tree trimming and routine costs. The Forest Service operates an IMPROVE (Interagency Monitoring of Protected Visual Environments) sampler at this station. NHDES and AMC currently maintain ozone sampling, upkeep and routine site inspections at this station.

NHDES maintains a near real-time air quality and forecasting website and contributes to a regional air quality website maintained by USEPA. These sites provide forecast information on New Hampshire's air quality that can be used by media, medical professionals, schools and athletic coaches, and individuals to help plan daily activities and protect public health. The air quality forecast for New Hampshire is also available on the NHDES' Air Quality Information Line at (800) 935-SMOG.

NHDES also partners with Keene State College (KSC) which shares a common concern about winter wood smoke population exposure. KSC supplements NHDES monitoring with low-cost PurpleAir PM monitoring units, helping NHDES track air quality patterns and trends in the area. NHDES will build on this partnership, which has expanded to include staff at NESCAUM (Northeast States for Coordinated Air Use Management), by sharing technology and information tools to enable higher quality tracking of privately owned and operated PurpleAir units in the state.

Monitoring Trends

Each year, NHDES reviews its monitoring data and calculates design values for comparison to the National Ambient Air Quality Standards (NAAQS) – Table 1.5. USEPA establishes these standards to protect public health and welfare. In general, design values consider the three most recent years for an averaging period in the form of the NAAQS, for example, the ozone design value looks at the three-year average of the annual fourth highest measured 8-hour values.

New Hampshire air quality data trends reveal the important progress that has been made in improving air quality in New Hampshire. During 2022, New Hampshire experienced three ozone exceedances at two different locations on two dates. Though these exceedances occurred, New Hampshire's air quality remains "good" most days and is not currently at risk of violating the national standards. NHDES did not record any $PM_{2.5}$ exceedances for 2022. Overall, the air quality in New Hampshire has improved significantly over the years. Cleaner vehicles, fuels, power plants, industry and small engines located throughout the region have all contributed to much-improved air quality since the 1980s. More recent trends show that additional progress is still being made, but the task becomes more difficult as there are becoming fewer pollution sources that remain uncontrolled. It is also important

to note that while progress has been made, the NAAQS have been strengthened in some cases to be more protective, thus more progress must be made.

Figures 1.2 through 1.15 present monitoring trends for the key criteria pollutants for the period 2000 through 2022. In all cases, air quality is significantly improved from the 1970s and 1980s. Currently, monitored levels of nitrogen dioxide (NO_2), $PM_{2.5}$, PM_{10}, lead (Pb) and carbon monoxide (CO) are safely below the current levels of the NAAQS. $PM_{2.5}$ concentration reductions represent important progress over the past 10 years from levels that were very close to the standards. Ozone and $PM_{2.5}$ remain of primary focus in New Hampshire for their potential for daily exceedances under certain weather conditions, and as a result receive significant attention by NHDES for network monitoring and SIP planning. Ozone in New Hampshire has been substantially reduced from concentrations measured in the 1980s and 1990s. Ozone rose slightly over the last year but is still at a level that is below the current NAAQS.

Monitoring trends for SO_2 indicate that all areas of New Hampshire meet the 3-hour SO_2 secondary NAAQS and the 1-hour primary SO_2 NAAQS. Although current data shows significantly lower SO_2 concentrations since 2011, concentrations at one location, Pembroke, have increased, with design values increasing each of the last three years although still below the NAAQS.

Table 1.6 summarizes exceedances of NAAQS thresholds for each of the criteria air pollutants in New Hampshire during recent years.

Tables 1.7 through 1.11 provide the maximum of the five most recent design values and most recent (2020-22) design values for each criteria pollutant. These are also expressed as percentages of the current NAAQS. CO, NO_2, and 1- and 3-hour SO_2 design values are all under 30% of the NAAQS during the 2020-22 design value period. The highest SO_2 site, Pembroke, exceeded the 1-hour NAAQS during 2021 on one occasion but is not at risk of violating the standard. With the lower ozone standard of 0.070 ppm, Rye and Mt. Washington Summit meet the NAAQS by a slim margin and must continue to be watched over the next few years.

In 2022, New Hampshire operated two Photochemical Assessment Monitoring Stations (PAMS): Pack Monadnock and Londonderry. Tables 1.12 and 1.13 show maximum 24-hour average PAMS species concentrations and compares them with the 24-hr Ambient Air Limits (AALs) from New Hampshire's air toxics rule Env-A 1400. Tables 1.12 and 1.13 show that none of the toxic PAMS parameters are near their Ambient Allowable Limits (AALs) at either site. Benzene has the lowest AAL, 5.7 $\mu g/m^3$. At Londonderry and Pack Monadnock, the maximum 24-hour averages for benzene over the 2022 PAMS season were about 0.34 and 0.13 $\mu g/m^3$, respectively, or about 6%-2% of the AAL. Maximum values for all the other parameters for both sites are consistently less than 1% of their AAL.

Table 1.5: National Ambient Air Quality Standards

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3-month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)), A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

Table 1.6: NAAQS Exceedances (Days) in New Hampshire (2017-2022)

	Number of Exceedances						Most Recent (Relative to NAAQS from Each Year)
Parameter/Location/Standard	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	
CO							
1-Hour (1971 standard)	0	0	0	0	0	0	1978
8-Hour (1971 standard)	0	0	0	0	0	0	1996
Lead							
Quarterly (2008 standard)	--	--	--	--	--	--	None
NO_2							
1-Hour (2010 standard)	0	0	0	0	0	0	None
Ozone							
8-Hour (2015 standard)							
Camp Dodge	0	0	0	0	0	0	2004
Concord	0	0	0	0	1	0	2021
Keene	0	0	0	0	0	0	2016
Laconia	0	0	0	0	0	0	2010
Lebanon	0	0	0	0	0	0	2008
Londonderry	1	1	1	0	0	0	2019
Miller	1	0	0	0	0	0	2017
Mt. Washington	3	2	0	0	1	0	2021
Nashua	0	0	0	0	0	0	2016
Portsmouth	0	0	0	0	0	1	2022
Rye	1	2	0	0	2	2	2022
Woodstock[1]	0	0	0	0	0	0	None
PM_{10}							
24-Hour (2006 standard)	0	0	0	0	0	0	1989
$PM_{2.5}$							
Annual (2012 standard)	0	0	0	0	0	0	None
24-Hour (2012 standard)							
Keene	0	0	0	0	1	0	2021 (Exceptional Event)
Laconia	0	0	0*	0	1	0	2021(Exceptional Event)
Lebanon	0	0	0	0	1	0	2021(Exceptional Event)
Londonderry	0	0	0	0	1	0	2021 (Exceptional Event)
Miller	0	0	0	0	1	0	2021 (Exceptional Event)
Portsmouth	0	0	0	0	1	0	2021(Exceptional Event)
SO_2							
Annual (1971 standard)	0	0	0	0	0	0	None
1-Hour (2010 standard)							
Concord	--	--	--	--	--	--	2011
Londonderry	0	0	0	0	0	0	None
Miller	0	0	0	0	0	0	None
Pembroke	0	0	0	0	1	0	2021
Portsmouth	0	0	0	0	0	0	None

* - Denotes measured by FRM equipment; otherwise measured by FEM method.

Station startups/closures: Concord station discontinued SO_2 monitoring in 2016; lead monitoring was discontinued at end of 2nd quarter 2016.

[1] Woodstock was part of EPA's Clean Air Status and Trends Network (CASTNET) as further discussed in the Individual Station Information in Part II. The Castnet network was shut down in 2022.

Table 1.7: 2020 – 2022 Ozone Design Values (ppb)

Ozone	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2020-22 Max DV	% of NAAQS	Location
8-Hour	3-year average of 4th- highest daily maximum 8-hour averages	70	67	96	Rye (2016-2018 Mt. Washington (2016-18)	65	93	Rye

Table 1.8: 2022 Carbon Monoxide Design Values (ppm)

CO	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2020-22 Max DV	% of NAAQS	Location
1-Hour	2nd maximum	35	0.6	2	Londonderry	0.5	1	Londonderry
8-Hour	2nd maximum	9	0.6	7	Londonderry	0.5	6	Londonderry

Table 1.9: 2020 – 2022 Sulfur Dioxide Design Values (ppb)

SO_2	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2020-22 Max DV	% of NAAQS	Location
1-Hour	3-year average of 99th percentile of daily maximum 1-hour averages	75	38	51	Pembroke	38	51	Pembroke
3-Hour	2nd maximum	500	54	11	Pembroke	54	11	Pembroke

Table 1.10: 2020 – 2022 Nitrogen Dioxide Design Values (ppb)

NO_2	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2020-22 Max DV	% of NAAQS	Location
1-Hour	3-year average of 98th percentile of daily maximum 1-hour averages	100	22	23	Londonderry (2016-18, 2019-21)	21*	21	Londonderry
Annual	Annual average	53	3	6	Londonderry (2015-19, 2021)	2*	4	Londonderry

*Insufficient Data – DV not official

Table 1.11: 2020 – 2022 Fine Particulate Matter Design Values (µg/m^3)

$PM_{2.5}$	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2020-22 Max DV	% of NAAQS	Location
24-Hour	3-year average of 98th percentile of midnight- midnight 24-hour averages	35	18	51	Keene (2016-18)	17	49	Keene
Annual	Annual average over 3 years	12	6.6*	55	Portsmouth (2019-21)	6.6*	55	Keene, Portsmouth *

*Insufficient Data – DV not official

Figures 1.2 and 1.3 show how ozone concentrations in the state have risen since the past couple years but remain just under the NAAQS.

Figure 1.2: Ozone trends for the 8-hour NAAQS (2000-2022)

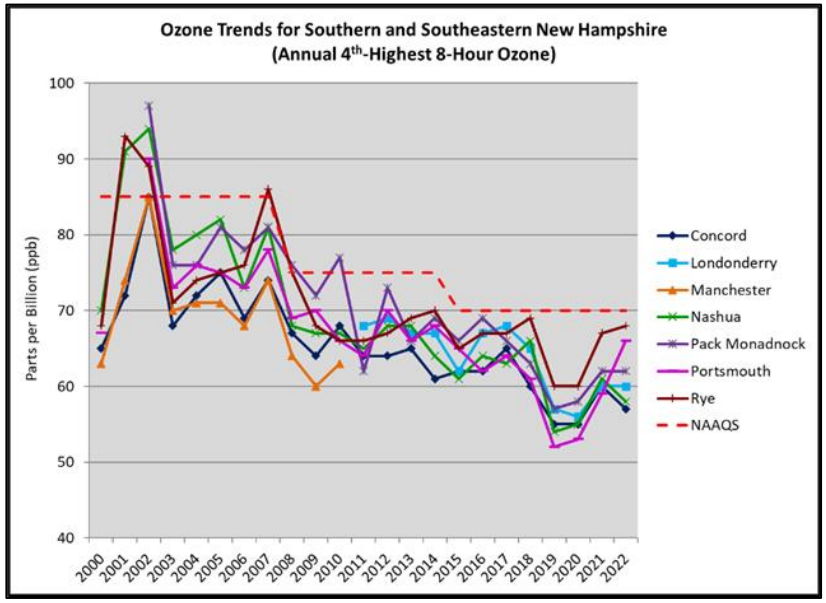
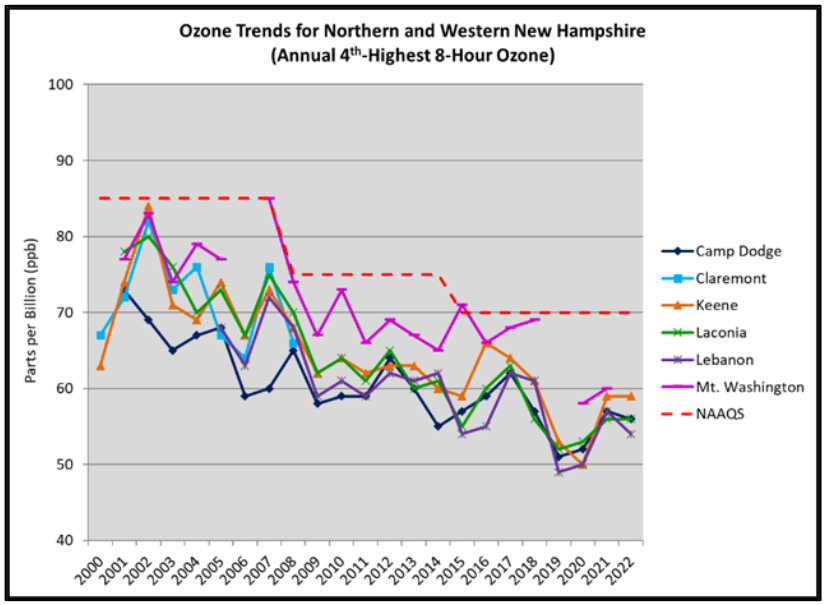


Figure 1.3: Ozone trends for the 8-hour NAAQS (2000-2022)



Figures 1.4 and 1.5 show very low carbon monoxide concentrations in the state, well below the NAAQS.

Figure 1.4: Carbon Monoxide trends for the 1-hour NAAQS (2000-2022)

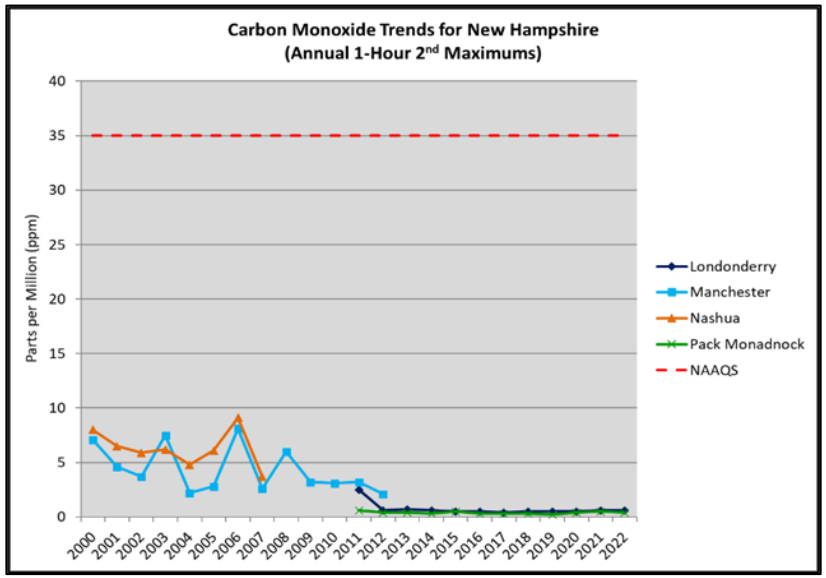
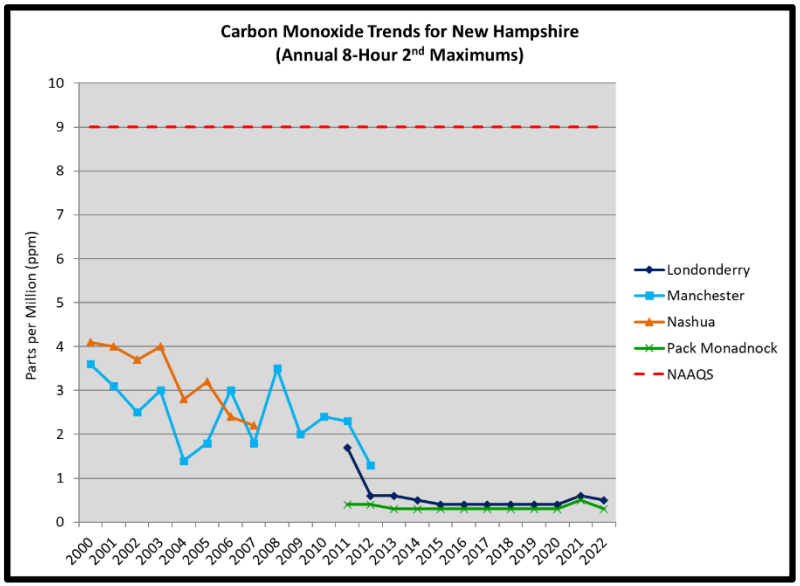


Figure 1.5: Carbon Monoxide trends for the 8-hour NAAQS (2000-2022)



Figures 1.6 and 1.7 show declining 24-hour $PM_{2.5}$ concentrations in the state with some sites starting to trend upwards, though still well below the NAAQS.

Figure 1.6: $PM_{2.5}$ trends for the 24-hour NAAQS (2000-2022)

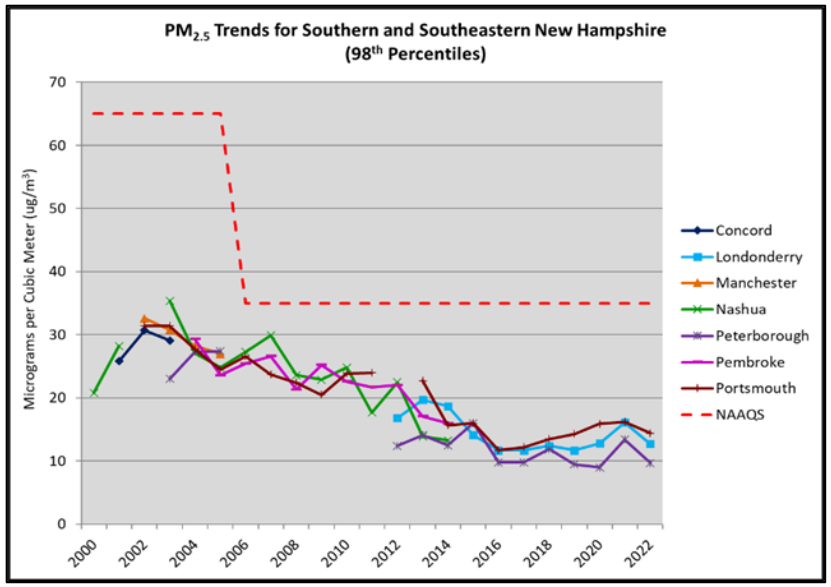
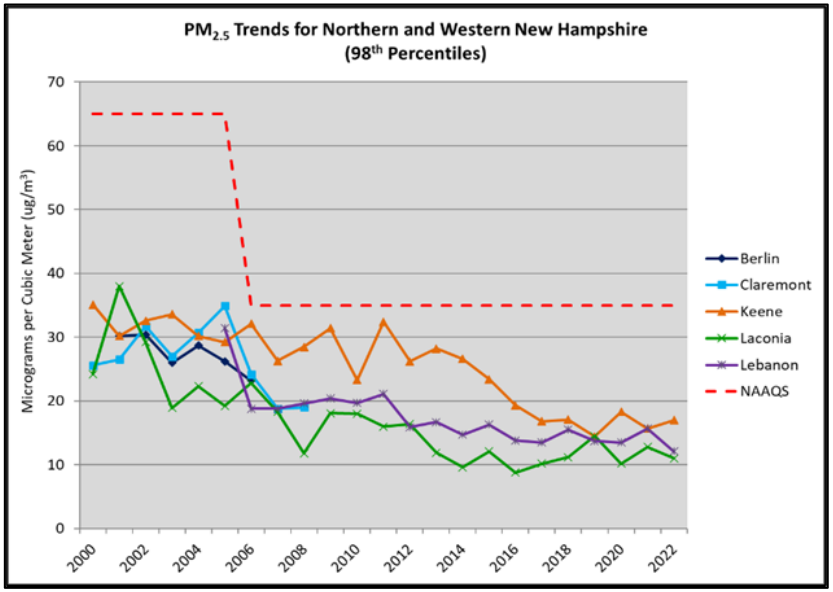


Figure 1.7: $PM_{2.5}$ trends for the 24-hour NAAQS (2000-2022)



Figures 1.8 and 1.9 show an increase in annual $PM_{2.5}$ concentrations over the past few years, though all remain well below the NAAQS.

Figure 1.8: $PM_{2.5}$ trends for the annual NAAQS (2000-2022)

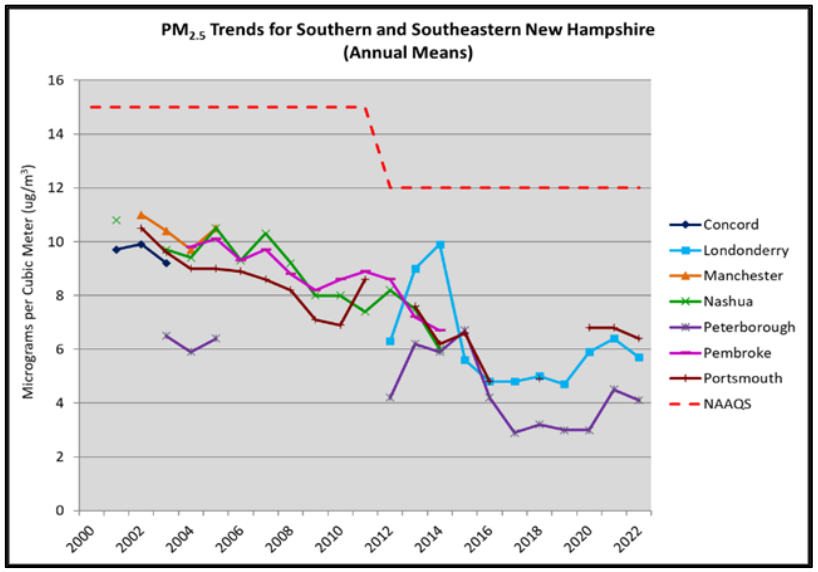
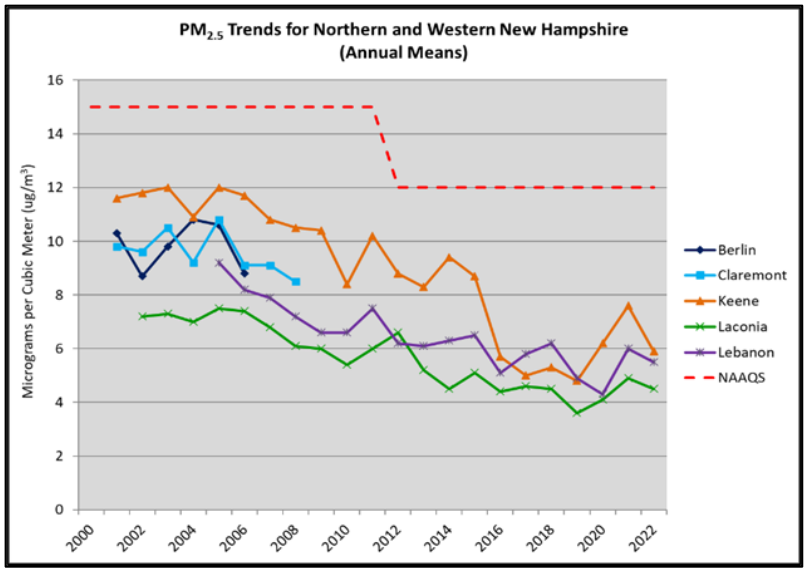


Figure 1.9: $PM_{2.5}$ trends for the annual NAAQS (2000-2022)



Figures 1.10 and 1.11 show very low nitrogen dioxide and lead concentrations in the state, well below the NAAQS.

Figure 1.10: Nitrogen Dioxide trends for the 1-hour NAAQS (2000-2022)

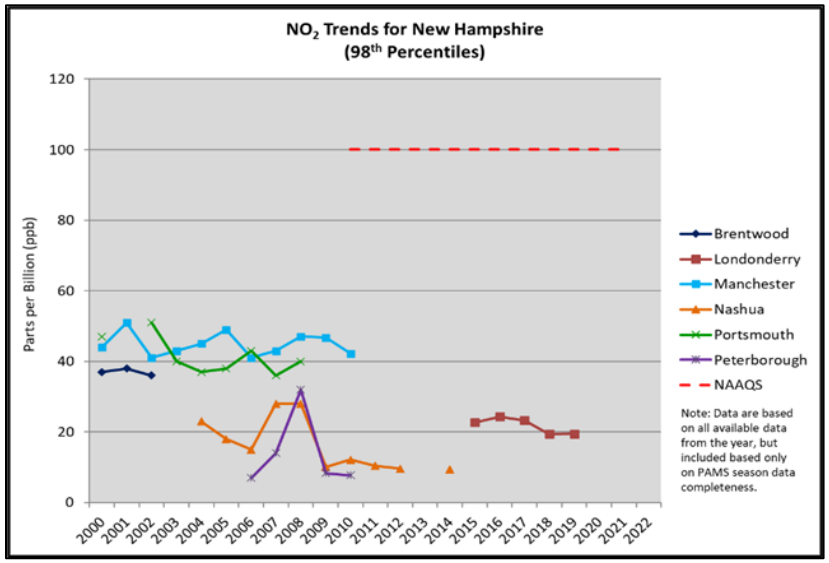
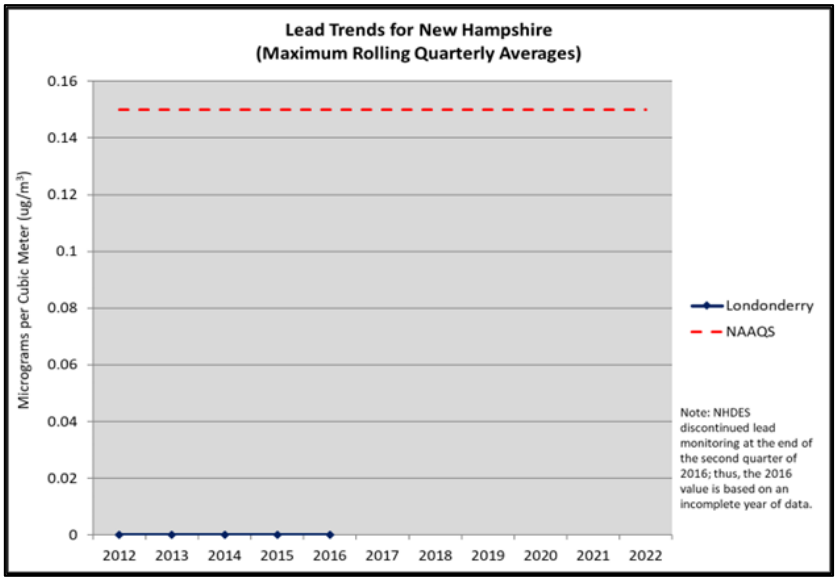


Figure 1.11: Lead trends for the 3-month NAAQS (2012-2022)



Figures 1.12 and 1.13 show low and declining sulfur dioxide concentrations with one location increasing over the past few years, still well below the NAAQS.

Figure 1.12: Sulfur Dioxide trends for the 1-hour NAAQS (2000-2022)

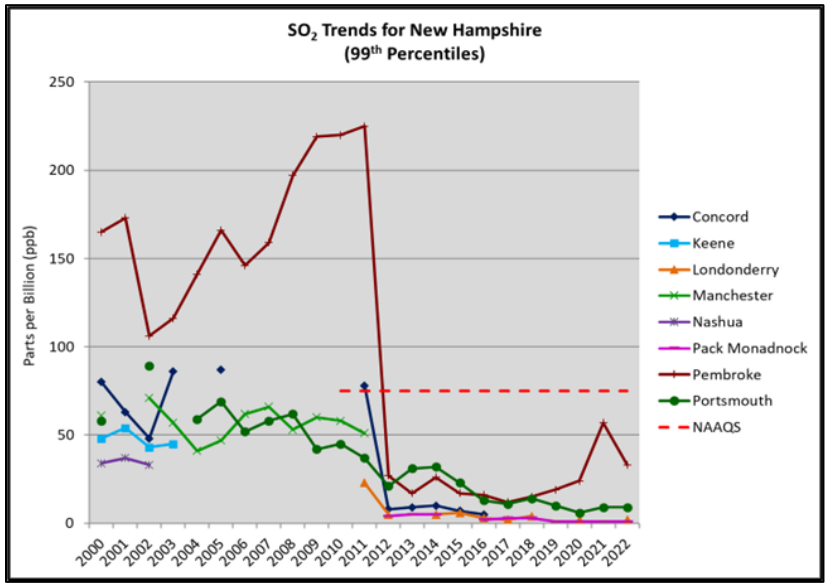
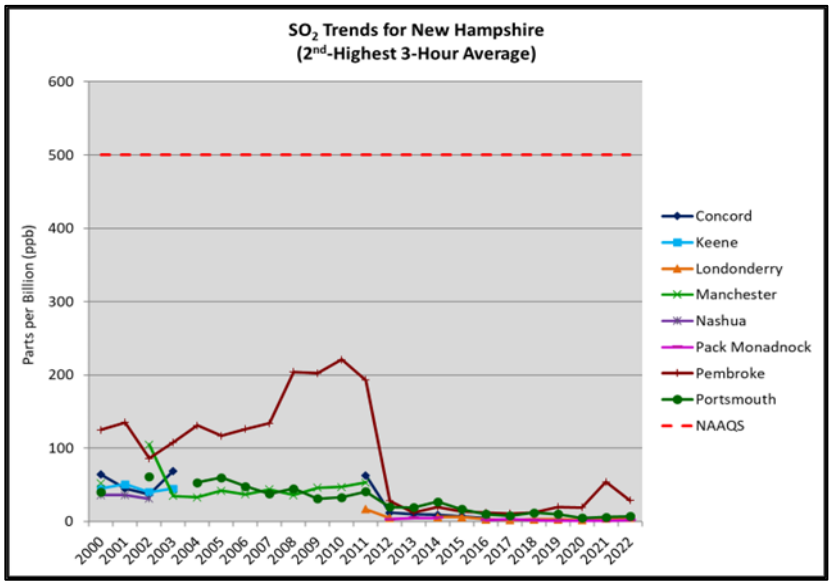


Figure 1.13: Sulfur Dioxide trends for 3-hour secondary NAAQS (2000-2022)



Figures 1.14 and 1.15 show very low PM_{10} concentrations in the state with a slight increase over the past year, though still well below the NAAQS.

Figure 1.14: PM_{10} trends for the 24-hour NAAQS (2000-2022)

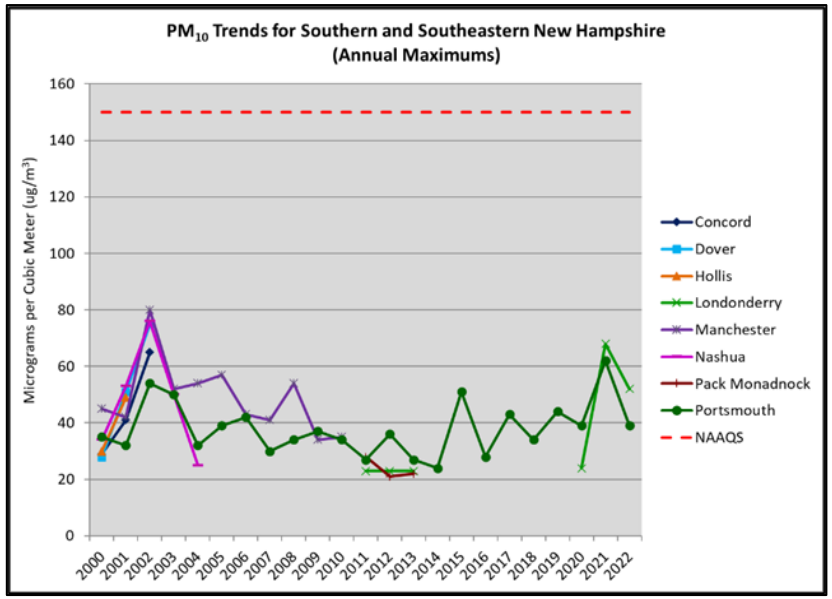


Figure 1.15: PM_{10} trends for the 24-hour NAAQS (2000-2022)

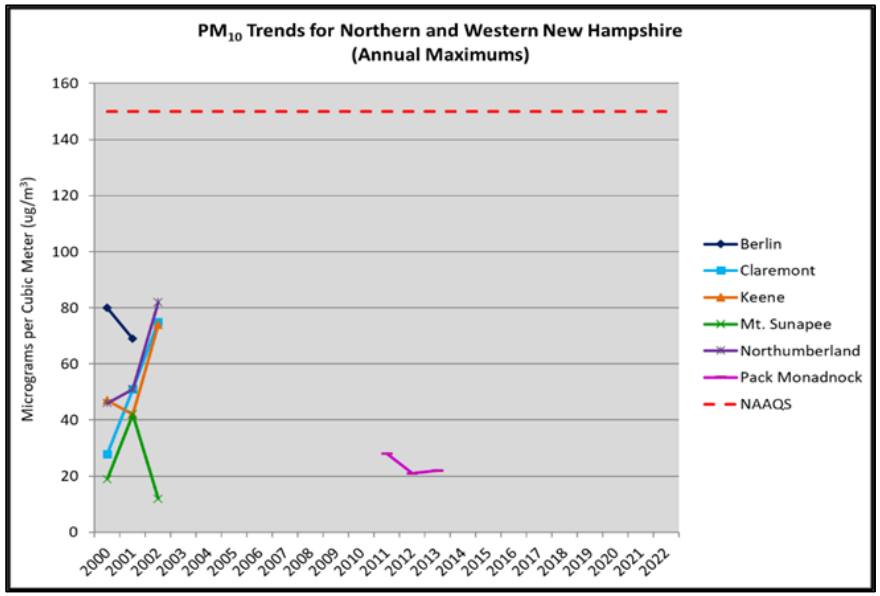


Table 1.12: Seasonal Maximum 24-hour Averages at Londonderry for Toxic PAMS Species Compared to the Ambient Air Limits (AALs), 2015-2022

PAMS Parameter	AAL ug/m3	Max 24 Hr. Avg. (ug/m3)								2022 Max % of AAL
		2015	2016	2017	2018	2019	2020	2021	2022	
PROPYLENE (43205)*	35,833	0.37	0.21	0.28	0.41	0.56	0.39	0.34	0.45	0.00%
CYCLOPENTANE (43242)*	25,595	0.11	0.15	0.07	0.13	0.17	0.03	0.02	0.01	0.00%
ISOPENTANE (43221)*	36,875	1.17	1.73	1.27	1.09	1.26	0.95	1.02	1.21	0.00%
PENTANE (43220)*	36,875	0.59	0.73	0.73	0.86	0.81	0.62	0.70	0.85	0.00%
2-METHYLPENTANE (43285)*	36,875	0.16	0.25	0.13	0.42	0.53	0.39	0.33	0.44	0.00%
3-METHYLPENTANE (43230)*	36,875	0.16	0.29	0.11	0.34	0.44	0.29	0.14	0.21	0.00%
HEXANE (43231)	885	0.44	0.64	0.50	0.52	0.54	0.60	0.33	0.29	0.03%
BENZENE (45201)	6	0.53	0.27	0.33	0.69	0.53	0.42	0.91	0.34	5.95%
CYCLOHEXANE (43248)	6,000	0.12	0.18	0.10	0.17	0.15	0.02	0.03	0.01	0.00%
HEPTANE (43232)	8,249	0.18	0.44	0.11	0.25	0.36	0.10	0.13	0.05	0.00%
METHYLCYCLOHEXANE (43261)*	23,958	0.12	0.24	0.07	0.15	0.16	0.02	0.03	0.01	0.00%
TOLUENE (45202)	5,000	1.11	1.65	1.17	1.07	1.10	1.14	0.93	0.95	0.02%
OCTANE (43233)	7,000	0.11	0.15	0.04	0.12	0.14	0.02	0.01	0.01	0.00%
ETHYLBENZENE (45203)	1,000	0.18	0.22	0.16	0.20	0.25	0.07	0.08	0.08	0.01%
M & P-XYLENES (45109)	1,550	0.51	0.61	0.53	0.52	0.47	0.28	0.38	0.27	0.02%
STYRENE (45220)	1,000	0.17	0.07	0.07	0.47	0.44	0.17	0.11	0.03	0.00%
O-XYLENE (45204)	1,550	0.20	0.21	0.21	0.23	0.29	0.09	0.15	0.09	0.01%
NONANE (43235)*	15,625	0.13	0.11	0.12	0.10	0.12	0.03	0.15	0.03	0.00%
1,3,5-TRIMETHYLBENZENE (45207)	619	0.10	0.12	0.07	0.07	0.03	0.01	0.06	0.14	0.02%
1,2,4-TRIMETHYLBENZENE (45208)	619	0.21	0.27	0.19	0.33	0.23	0.04	0.20	0.43	0.07%

*Although these species are no longer considered as New Hampshire regulated air toxics in Env-A 1400; their historical AALs have been retained in Table 1.12 for comparison purposes.

Table 1.13: Seasonal Maximum 24-hour Averages at Pack Monadnock in Miller State Park for Toxic PAMS Species Compared to the Ambient Air Limits (AALs), 2015-2022

PAMS Parameter	AAL ug/m3	Max 24 Hour Avg. (ug/m3)								2022 Max % of AAL
		2015	2016	2017	2018	2019	2020	2021	2022	
PROPYLENE (43205) *	35,833	0.28	0.29	0.23	0.61	0.47	0.29	0.21	0.64	0.00%
CYCLOPENTANE (43242)*	25,595	0.23	0.11	0.11	0.09	0.07	0.03	0.06	0.14	0.00%
ISOPENTANE (43221)*	36,875	0.96	0.68	1.34	0.74	0.50	0.54	0.94	0.89	0.00%
PENTANE (43220)*	36,875	0.51	0.38	0.69	0.55	0.41	0.19	0.60	0.59	0.00%
2-METHYLPENTANE (43285)*	36,875	0.12	0.07	0.09	0.07	0.04	0.04	0.19	0.19	0.00%
3-METHYLPENTANE (43230)*	36,875	0.05	0.03	0.02	0.02	0.00	0.01	0.52	0.05	0.00%
HEXANE (43231)	885	0.40	0.16	0.18	0.29	0.23	0.03	0.03	0.06	0.01%
BENZENE (45201)	6	0.64	0.18	0.45	0.32	0.48	0.23	1.54	0.13	2.37%
CYCLOHEXANE (43248)	6,000	0.09	0.01	0.06	0.03	0.04	0.00	0.03	0.01	0.00%
HEPTANE (43232)	8,249	0.14	0.04	0.04	0.03	0.03	0.00	0.01	0.03	0.00%
METHYLCYCLOHEXANE (43261)*	23,958	0.10	0.04	0.03	0.02	0.04	0.01	0.00	0.01	0.00%
TOLUENE (45202)	5,000	0.67	0.53	0.54	0.54	0.53	0.43	0.41	0.59	0.01%
OCTANE (43233)	7,000	0.02	0.02	0.02	0.01	0.03	0.00	0.00	0.00	0.00%
ETHYLBENZENE (45203)	1,000	0.08	0.05	0.09	0.04	0.02	0.00	0.00	0.03	0.00%
M & P-XYLENES (45109)	1,550	0.25	0.13	0.12	0.20	0.14	0.02	0.03	0.05	0.00%
STYRENE (45220) **	1,000	0.04	0.03	0.02	0.02	0.07	0.00	0.00	0.49	0.05%
O-XYLENE (45204)	1,550	0.06	0.04	0.04	0.06	0.04	0.00	0.00	0.04	0.00%
NONANE (43235)*	15,625	0.09	0.06	0.03	0.03	0.02	0.01	0.01	0.02	0.00%
1,3,5-TRIMETHYLBENZENE (45207)	619	0.09	0.01	0.02	0.04	0.02	0.01	0.02	0.04	0.01%
1,2,4-TRIMETHYLBENZENE (45208)	619	0.15	0.04	0.04	0.06	0.01	0.01	0.02	0.01	0.00%

*Although these species are no longer considered as New Hampshire regulated air toxics in Env-A 1400; their historical AALs have been retained in Table 1.12 for comparison purposes.

**Styrene maximum average affected by blank contamination- this data is flagged in AQS

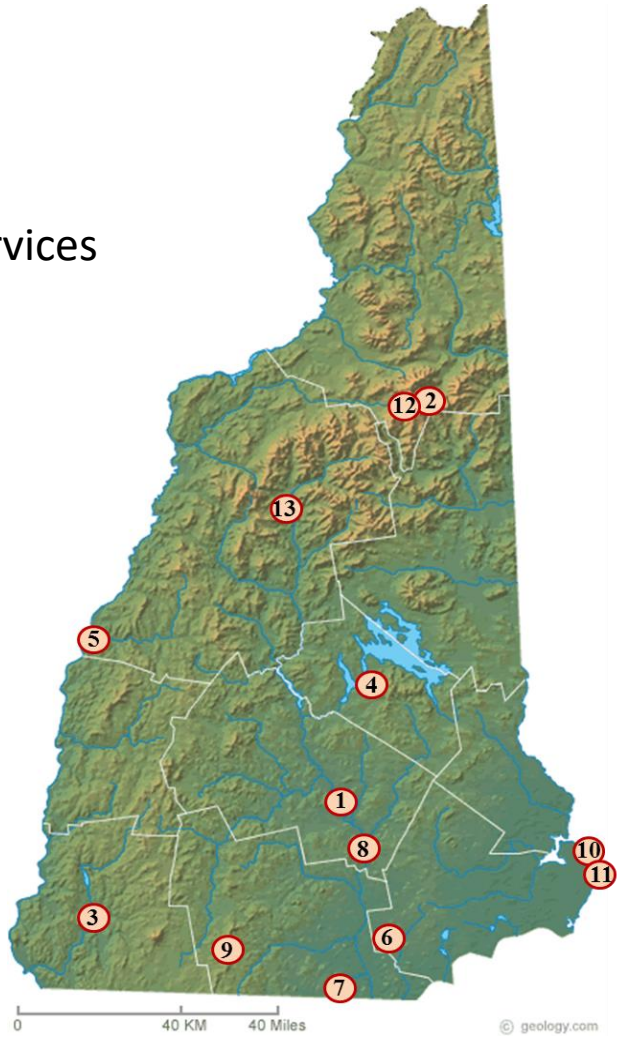
PART 2: Individual Station Information

New Hampshire
Department of Environmental Services

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Air Resources Division

2023 Air Quality Monitoring Stations



Summer 2023	Ncore	IMPROVE	CASTNET	NADP	PAMS	Laboratory	Carbon Monoxide (CO)	Nitrogen Dioxide (NO2)	Nitrogen Oxides (Noy)	Ozone (O3)	PM2.5	PM2.5 Co-Location	PM10	PMCoarse	Sulfur Dioxide (SO2)	Wind Direction (WD)	Wind Speed (WS)	External Temperature (ETP)	Barometric Pressure (BP)	Relative Humidity (RH)	Precipitation (RF)	Solar Radiation (SolRad)	UV Radiation (UVRad)
1. Concord						●				●						●	●	●					
2. Greens Grand -Camp Dodge		●								●								●					
3. Keene										●	●	●		●		●	●	●					
4. Laconia										●	●			●		●	●	●			●		
5. Lebanon										●	●			●		●	●	●					
6. Londonderry	●	●			●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
7. Nashua										●						●	●	●					
8. Pembroke															●	●	●	●					
9. Peterborough - Pack Monadnock	●	●					●		●	●	●	●		●	●	●	●	●	●	●	●		
10. Portsmouth										●	●		●	●		●	●	●					
11. Rye										●						●	●	●					
12. Sargents Purchase -Mt. Washington Summit										●													
13. Woodstock -Hubbard Brook				●																			

Camp Dodge, Greens Grant

General Information			
AQS ID:	33-007-4002	Latitude:	44.308132
Town:	Greens Grant	Longitude:	-71.217639
Address:	Route 16	Elevation (m):	449
County:	Coos	Year Est.:	1995
Spatial Scale:	Regional		

Site Description

This air monitoring station is in a rural forested area off Route 16 in Greens Grant. This wood-clad, stick-built shelter is approximately 7' wide by 10' long. This station is representative of a Class 1 Type Airshed. NHDES operates this station in cooperation with the Appalachian Mountain Club and the US Forest Service.

Pollutants/Parameters

Ozone – Temperature – IMPROVE. The US Forest Service operates the IMPROVE sampler.

Recent Changes

There have been no changes at this site since the 2018 relocation.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.

Mt. Washington Summit

General Information			
AQS ID:	33-007-4001	Latitude:	44.270093
Town:	Sargent's Purchase	Longitude:	-71.303821
		Elevation (m):	1,910
Address:	Yankee Bld.	Year Est.:	1990
County:	Coos		
Spatial Scale:	Regional		

Site Description
This air monitoring station is located at the top of Mt. Washington in the Yankee Building.

Pollutants/Parameters

Ozone

Recent Changes

NHDES installed a new inlet conduit and encased the window in the monitoring room in an effort to prevent inlet damage typical at this site. We also installed a blower and manifold system, as part of the inlet, in anticipation of installing a CO analyzer.

Proposed/Planned Changes

NHDES is planning to complete installation of trace level CO in 2023 as part of the PAMS EMP. NHDES completed planned manifold work during the Fall of 2022.

On the left, an image of the building housing the monitoring station and on the right a Google Earth map pinpointing the station's location.

Hubbard Brook, Woodstock

General Information			
AQS ID:	33-009-8001	Latitude:	43.944544
Town:	Woodstock	Longitude:	-71.700772
Address:	Mirror Lake Rd.	Elevation (m):	250
County:	Grafton	Year Est.:	1989
Spatial Scale:	Regional		

Site Description

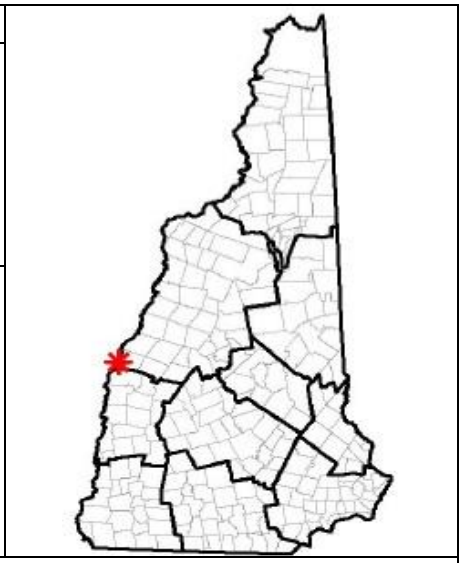
This air monitoring station is in a rural area in the White Mountain National Forest. This prefabricated structure is specifically designed for climate-controlled scientific operations. It measures approximately 8' wide by 10' long. NHDES is not involved in monitoring or data acquisition at this site. A USEPA Contractor operates this site.

Pollutants/Parameters
None -Currently shut down
Recent Changes
This site was shut down after 14 monitoring days in 2022
Proposed/Planned Changes

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.

Lebanon Airport, Lebanon

General Information			
AQS ID:	33-009-0010	Latitude:	43.629605
Town:	Lebanon	Longitude:	-72.309499
Address:	Airport Road	Elevation (m):	171
County:	Grafton	Year Est.:	2005
Spatial Scale:	Neighborhood		



Site Description
This 8’ wide by 10’ long insulated trailer is located at the northeast edge of the Lebanon Municipal Airport in a commercial area.

Pollutants/Parameters

Ozone - Continuous $PM_{2.5}$ PM-Course– Wind Speed - Wind Direction - Temperature

Recent Changes

There were no recent changes at this station.

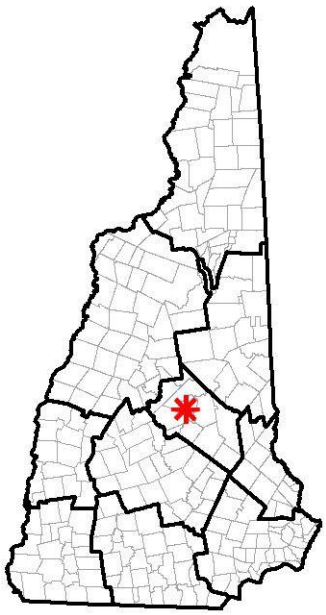
Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station’s location.

Green Street, Laconia

General Information			
AQS ID:	33-001-2004	Latitude:	43.566122
Town:	Laconia	Longitude:	-71.496335
Address:	Green Street	Elevation (m):	216
County:	Belknap	Year Est.:	2001
Spatial Scale:	Regional		



Site Description
This 10’ wide by 12’ long cedar-clad, stick-built air monitoring station is located in an open field in a rural residential area.

Pollutants/Parameters

Ozone – Continuous $PM_{2.5}$ PM-Course–Wind Speed – Wind Direction – Temperature - Precipitation

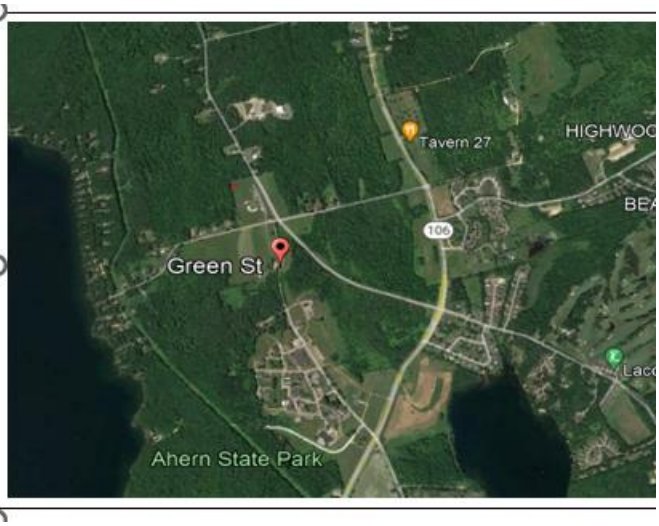
Recent Changes

NHDES installed an API T640 at this station in November 2022.

Proposed/Planned Changes

NHDES is planning relocation of Laconia PM and ozone monitoring to an in-town location to better capture winter wood smoke exposure. We are expecting to be evicted from this site in September 2023.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station’s location.



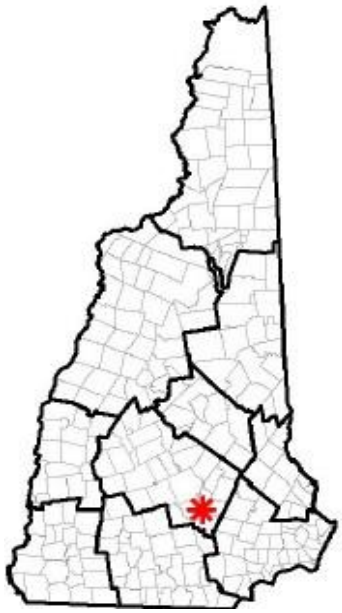
Hazen Station, Concord

General Information					
AQS ID: Town: Address: County: Spatial Scale:	33-013-1007 Concord 27 Hazen Dr. Merrimack Neighborhood		Latitude: Longitude: Elevation (m): Year Est.:	43.218470 -71.514525 107 2004	
	Site Description This site has the advantage of being near the NHDES main office, for both outreach opportunities and ease of maintenance. It is also in the proximity of residential neighborhoods, retirement communities and schools. The Station measures 8' wide by 18' long. Its insulated, box-type structure is specifically designed for climate-controlled scientific functions.				
	Pollutants/Parameters				
	Ozone – Temperature – Wind Speed – Wind Direction. NHDES also uses this station as an air monitoring laboratory and a staging area for field-ready equipment.				
	Recent Changes				
	NHDES did not make any significant changes to this station during this review period.				
	Proposed/Planned Changes				
	NHDES is not planning any significant changes to this station into the foreseeable future.				

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.

Exchange Street, Pembroke

General Information			
AQS ID:	33-013-1006	Latitude:	43.132460
Town:	Pembroke	Longitude:	-71.458246
Address:	Pleasant St.	Elevation (m):	74
County:	Merrimack	Year Est.:	2002
Spatial Scale:	Neighborhood		



Site Description
This station is in a suburban residential area southeast of the coal burning Merrimack station power plant. It is the ideal location for improving our understanding of near-field emissions from the Merrimack Station power plant. This insulated, box-type structure is specifically designed for climate-controlled scientific functions and measures approximately 8’ wide by 10’ long.

Pollutants/Parameters

Sulfur Dioxide – Temperature – Wind Speed – Wind Direction.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station’s location.

Peirce Island, Portsmouth

General Information			
AQS ID:	33-015-0014	Latitude:	43.075371
Town:	Portsmouth	Longitude:	-70.748017
Address:	Peirce Island	Elevation (m):	10
County:	Rockingham	Year Est.:	2001
Spatial Scale:	Neighborhood		

Site Description

This station is in an urban commercial/residential area. It is strategically positioned to capture air quality data from the Portsmouth Shipyard (northeast), the urban center of Portsmouth (southwest), the industrialized Piscataqua River (northwest) and ocean fetch-type events (southeast) depending on wind direction. The cedar-clad, stick-built shelter is approximately 10’ wide by 12’ long.

Pollutants/Parameters

Ozone – $PM_{2.5}$ Continuous (light scattering) – PM_{10} Continuous (light scattering) – PM-Coarse, Sulfur Dioxide – Temperature – Wind Speed – Wind Direction

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station’s location.

Seacoast Science Center, Rye

General Information			
AQS ID:	33-015-0016	Latitude:	43.045269
Town:	Rye	Longitude:	-70.713958
Address:	Seacoast Science Ctr.	Elevation (m):	10
		Year Est.:	2003
County:	Rockingham		
Spatial Scale:	Neighborhood		

Site Description

This station is in a rural neighborhood on the seacoast in direct exposure to the Atlantic Ocean. NHDES established this station to measure coastal ozone episodes as well as to promote public understanding of air pollution and monitoring.

Pollutants/Parameters

Ozone - Temperature – Wind Speed – Wind Direction.

Recent Changes

NHDES moved the air monitoring equipment away from the windows and into the central part of the building into a climate-controlled space approximately 15’ from the old area. We anticipate more stable temperatures in the new space.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the building housing the monitoring station and on the right a Google Earth map pinpointing the station’s location.

Water Street, Keene

General Information			
AQS ID:	33-005-0007	Latitude:	42.930521
Town:	Keene	Longitude:	-72.272332
Address:	Water Street	Elevation (m):	145
County:	Cheshire	Year Est.:	1989
Spatial Scale:	Neighborhood		

Site Description

This 8' wide by 10' long air monitoring station is situated in a commercial area, close to the center of the city of Keene. The filter-based $PM_{2.5}$ sampler is located on the rooftop deck.

Pollutants/Parameters

Ozone - $PM_{2.5}$ Continuous, PM-Coarse, filter based $PM_{2.5}$ (1 every 6 days) – Wind Speed - Wind Direction - Temperature

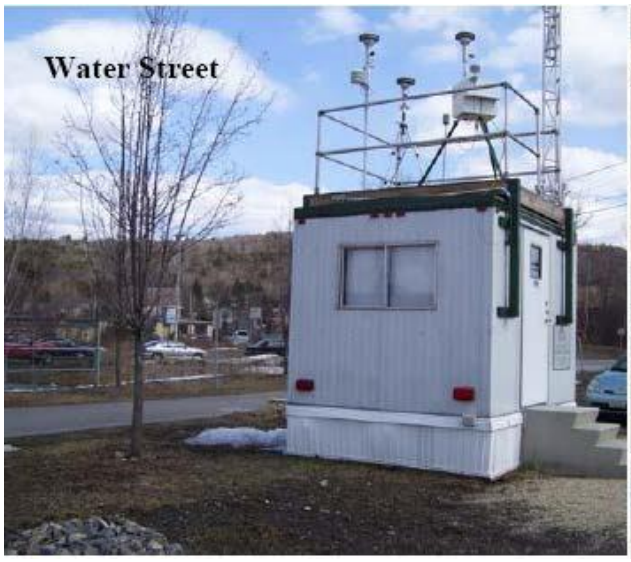
Recent Changes

NHDES replaced the BAM 1020 with an API T640 in February 2023.

Proposed/Planned Changes

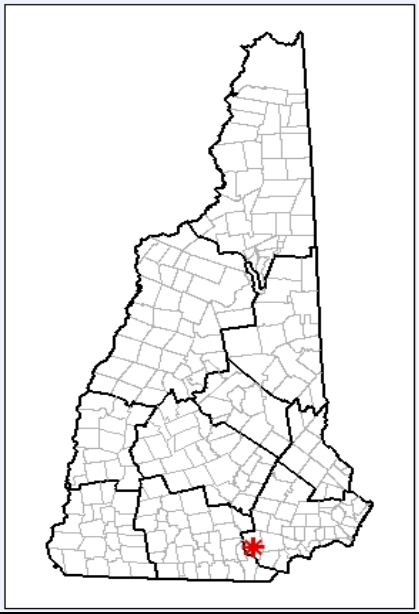
NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.



Moose Hill, Londonderry

General Information			
AQS ID:	33-015-0018	Latitude:	42.862522
Town:	Londonderry	Longitude:	-71.380153
Address:	Moose Hill Sch.	Elevation (m):	104
County:	Rockingham	Year Est.:	2009
Spatial Scale:	Neighborhood		



Site Description

This 12' wide by 16' long wood clad, stick-built air monitoring station is located in a very open field in the heart of suburban New Hampshire, approximately halfway between the state's two largest cities (Manchester and Nashua). It has virtually no local interferences from nearby pollution sources or obstructions, making it an ideal location to measure regional air quality. Filter-based $PM_{2.5}$ samplers are located on platforms approximately 15m from the structure.

Pollutants/Parameters

NCORE: $PM_{2.5}$ Continuous (light Scattering) – PM_{10} Continuous (Light Scattering) - filter based $PM_{2.5}$ (Speciation) (1 every 3 days) – IMPROVE – PM Coarse (Continuous) – Oxides of Nitrogen (NO_y) – Nitrogen Dioxide (NO_2) – Ozone – Sulfur Dioxide (trace) – Carbon Monoxide (trace) – Temperature – Wind Speed – Wind Direction – Relative Humidity – Precipitation – Barometric Pressure – Solar Radiation -UV Radiation - Ceilometer– Pandora - Photochemical Precursors.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left are images of the monitoring station building, solar panels, and platform equipment. On the right a Google Earth map pinpointing the station's location.

Pack Monadnock Mountain, Peterborough

General Information			
AQS ID:	33-011-5001	Latitude:	42.861830
Town:	Peterborough	Longitude:	-71.878626
Address:	Miller State Park	Elevation (m):	694
		Year Est.:	2002
County:	Hillsborough		
Spatial Scale:	Regional		

Site Description

This station is in an elevated forest environment on the summit of Pack Monadnock Mountain. The location of this station is scientifically significant because it is the highest accessible peak that lies directly within the primary air pollution transport corridor into the central part of the state. This allows this site to be the ideal location for improving our understanding of air pollution transport into the heavily populated Merrimack Valley and beyond. The filter-based $PM_{2.5}$ sampler is located on a deck on top of the structure.

Pollutants/Parameters

NCORE: $PM_{2.5}$ Continuous (light Scattering) – PM_{10} Continuous (light Scattering) - filter based $PM_{2.5}$ (Speciation) (1 every 3 days) – IMPROVE – PM Coarse (Continuous) – Oxides of Nitrogen (NO_y) – Ozone – Sulfur Dioxide (trace) – Carbon Monoxide (trace) – Temperature – Wind Speed – Wind Direction – Relative Humidity – Precipitation – Barometric Pressure– Photochemical Precursors.

Recent Changes

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.

Gilson Road, Nashua

General Information			
AQS ID:	33-011-1011	Latitude:	42.718656
Town:	Nashua	Longitude:	-71.522428
Address:	57 Gilson Rd.	Elevation (m):	59
County:	Hillsborough	Year Est.:	2003
Spatial Scale:	Neighborhood		

Site Description
This air monitoring station is in a suburban residential neighborhood near a Superfund site. NHDES requires two 8' wide by 16' long trailers to accommodate the equipment needed to measure ambient air parameters. NHDES collects meteorological data from a tower located on an adjacent building. Photochemical Assessment Monitoring (PAMS) was previously conducted at this station. NHDES moved PAMS to Londonderry in 2014. PAMS canister preparation still takes place at this station.

Pollutants/Parameters
Ozone – Temperature – Wind Speed – Wind Direction.
Recent Changes
NHDES did not make any significant changes to this station during this review period.
Proposed/Planned Changes
NHDES is not planning any significant changes to this station into the foreseeable future.

On the left, an image of the monitoring station and on the right a Google Earth map pinpointing the station's location.

APPENDIX A:
$PM_{2.5}$ Comparability Assessments

data Comparability Assessments

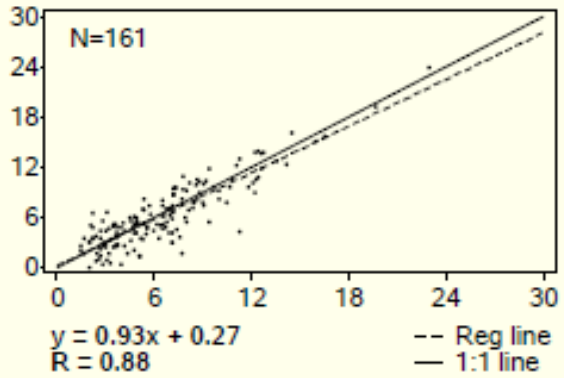
The image below compares FRM vs. BAM $PM_{2.5}$ sampling at the Keene Station

$PM_{2.5}$ Continuous Monitor Comparability Assessment

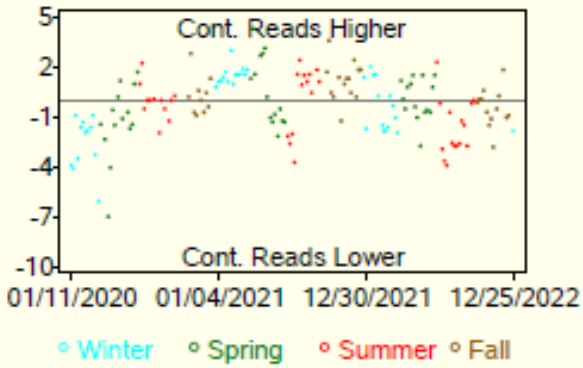
Site 33-005-0007: Keene, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (116,142), PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

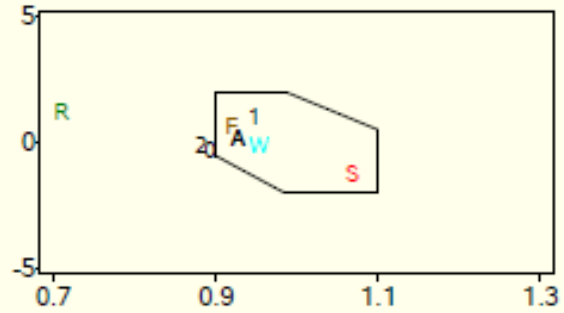
Cont. (y) vs. FRM (x) ($\mu g/m^3$)



Cont. minus FRM ($\mu g/m^3$)

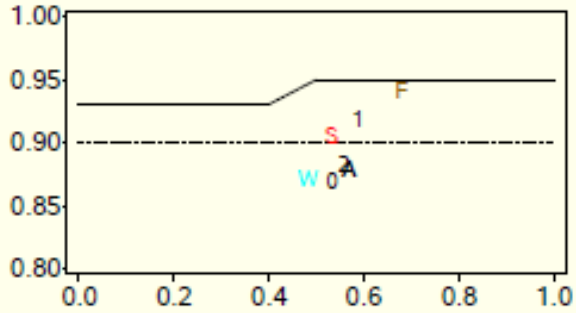


Additive (y) vs. Multiplicative (x) Bias



A=AllData, 0=2020, 1=2021, 2=2022
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)



A=AllData, 0=2020, 1=2021, 2=2022
W=Winter, R=Spring, S=Summer, F=Fall

Mean Concentration ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	**161**	**6.5**	**6.3**	**0.97**
Winter	41	8.0	7.7	0.95
Spring	43	5.3	5.1	0.97
Summer	40	6.9	6.3	0.91
Fall	37	5.8	6.1	1.06
2020	49	7.0	6.1	0.87
2021	56	6.9	7.7	1.12
2022	56	5.6	5.0	0.89

Appendix A Statistics

Dataset	N (all observations)	Bias	N (only >= 3 ug/m^3)	Bias
AllData	**161**	**0.9**	**120**	**1.4**
Winter	41	-0.8	33	-2.0
Spring	43	5.7	29	-3.4
Summer	40	-13	31	-0.5
Fall	37	11.5	27	12.9
2020	49	-12	41	-8.3
2021	56	20.9	44	15.6
2022	56	-7.9	35	-5.1

Data Source: EPA AQS Data Mart

Generated: April 17, 2023

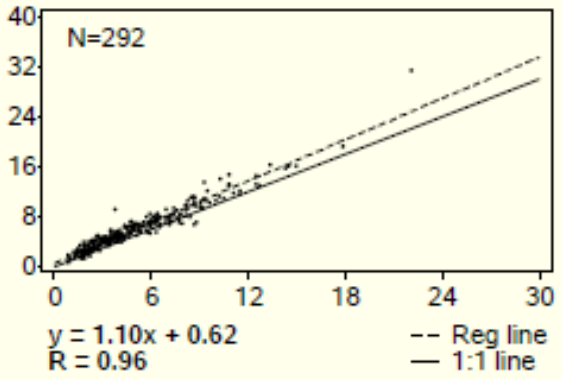
The image below compares FRM vs. T640x $PM_{2.5}$ sampling at the Londonderry Station

$PM_{2.5}$ Continuous Monitor Comparability Assessment

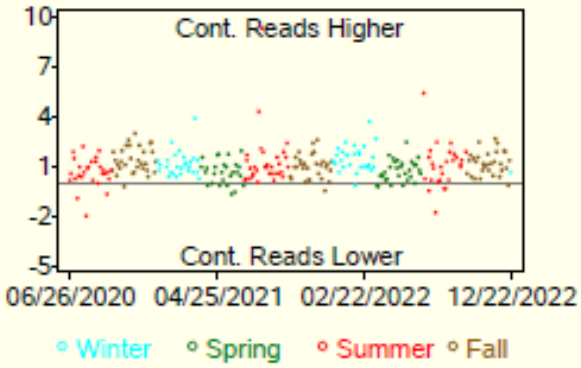
Site 33-015-0018: Londonderry, NH

FRM: R & P Model 2025 PM-2.5 Sequential Air Sampler w/VSCC - Gravimetric (118,142,145), PM2.5 - Local Conditions (88101), POC=1,2,4
Cont: Teledyne T640X at 16.67 LPM - Broadband spectroscopy (238), PM2.5 - Local Conditions (88101), POC=3

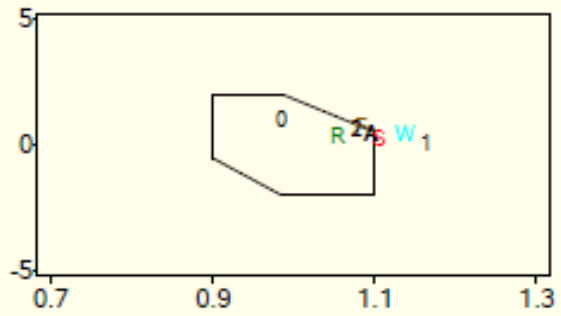
Cont. (y) vs. FRM (x) ($\mu g/m^3$)



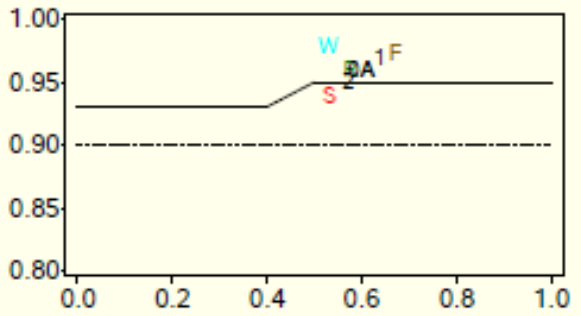
Cont. minus FRM ($\mu g/m^3$)



Additive (y) vs. Multiplicative (x) Bias



R (y) vs. FRM CCV (x)



Mean Concentration ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	**292**	**5.0**	**6.1**	**1.22**
Winter	57	5.5	6.8	1.24
Spring	58	3.8	4.6	1.19
Summer	87	6.2	7.3	1.17
Fall	90	4.2	5.4	1.29
2020	62	5.4	6.5	1.20
2021	116	5.2	6.3	1.21
2022	114	4.5	5.6	1.25

Appendix A Statistics

Dataset	N (all observations)	Bias	N (only >= 3 ug/m^3)	Bias
AllData	**292**	**27.6**	**213**	**22.3**
Winter	57	29.2	47	25.5
Spring	58	22.0	35	20.9
Summer	87	21.1	80	19.5
Fall	90	36.6	51	24.7
2020	62	28.2	47	18.6
2021	116	24.3	89	22.3
2022	114	30.8	77	24.7

Data Source: EPA AQS Data Mart

Generated: April 17, 2023

The image below compares FRM vs. T640 $PM_{2.5}$ sampling at the Peterborough Station