State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF THE COMMISSIONER
401 East State Street
P.O. Box 402, Mail Code 401-07
Trenton, New Jersey 08625-0402
Tel. (609) 292-2885 • Fax (609) 292-7695
www.nj.gov/dep

PHILIP D. MURPHY
Governor

TAHESHA L. WAY
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

February 6, 2025

Via eSIP
Michael Martucci, Regional Administrator
U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Re: New Jersey Area Designation Recommendation for 2024 Revised Primary Annual Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standard

Dear Regional Administrator Martucci,

I was glad to make your acquaintance on February 4, 2025 and look forward to working together to build upon the strong relationship that the New Jersey Department of Environmental Protection (NJDEP) and Region 2 of the U.S. Environmental Protection Agency (USEPA) have developed over many years of partnership. As I mentioned briefly during our initial meeting, the State of New Jersey is proud of its efforts to reduce fine particulate matter ($PM_{2.5}$) pollution and is pleased to submit the within National Ambient Air Quality Standard (NAAQS) attainment recommendation for USEPA consideration.

On February 7, 2024, USEPA promulgated a revised primary annual $PM_{2.5}$ NAAQS of 9.0 micrograms per cubic meter (µg/m3). Section 107(d)(1)(A) of the federal Clean Air Act requires that each state submit its recommendations for areas to be designated attainment, nonattainment, or unclassifiable, no later than one year after USEPA promulgates a new or revised NAAQS.

In accordance with the Clear Air Act, the State of New Jersey hereby recommends that the entire State be designated as in attainment of the revised primary annual $PM_{2.5}$ NAAQS of 9.0$\mu g/m^3$ and that all New Jersey counties be excluded from any potential nonattainment counties in their combined statistical areas (CSAs) and core based statistical area (CBSA). New Jersey makes these recommendations because it is expected that all monitors in New Jersey will demonstrate attainment and meet the revised annual primary $PM_{2.5}$ NAAQS of 9.0 $\mu g/m^3$ with certified, ambient air quality monitoring data from 2022 to 2024. At this time, the 2024 data is preliminary until the data undergoes quality assurance review and is submitted to USEPA.

New Jersey conducted its $PM_{2.5}$ NAAQS analysis in accordance with USEPA guidance and based on certified monitoring data up to 2023. The State's analysis is attached to this letter.

New Jersey is part of the New York-Newark (NY-NJ-CT-PA) CSA, the Philadelphia-Reading-Camden (PA-NJ-DE-MD) CSA, and the Allentown-Bethlehem-East Stroudsburg (PA-NJ) CSA. Notably, current monitoring data is not representative of New Jersey's ambient air quality due to the transport of wildfire smoke from Canada and the western United States during 2021 and 2023. Due to the influence of these wildfires, two monitoring sites in New Jersey measured above the standard in 2023 at Camden County (Camden Spruce Street monitor) and Union County (Elizabeth Lab monitor). New Jersey has submitted an Exceptional Event Analysis to USEPA for the 2023 Canadian wildfires and is awaiting concurrence to exclude the data from design value calculations for compliance with the 2024 $PM_{2.5}$ NAAQS. While the 2021 monitoring data is incorporated into New Jersey's analysis as part of the 2023 certified design values, the 2021 monitoring data and impacts from the 2021 wildfires are not relevant with respect to determining compliance with the standard based on 2024 design values, which are calculated with data from 2022, 2023 and 2024.

Importantly, New Jersey has implemented significant multi-pollutant air quality control measures across the state that have reduced and will continue to reduce emissions of $PM_{2.5}$ and its precursors. Furthermore, the last coal-fired power plants in New Jersey (Logan Generating Plant and Carneys Point Generating Plant) ceased operations in 2022, which will have a significant beneficial impact on future air quality. New Jersey's actions have resulted in a historical decreasing trend of fine particulate matter air pollution that is anticipated to continue into the future, which benefits human health and the environment.

Should USEPA wish to discuss New Jersey's $PM_{2.5}$ recommendations, we invite you to contact Francis C. Steitz, Director of the NJDEP Division of Air Quality at (609) 940-5707 or francis.steitz@dep.nj.gov.

Sincerely,

Shawn M. LaTourette
Commissioner

Attachment

c: *via email (letter only)*
Matthew Laurita, Acting Director, Air and Radiation Division, USEPA Region 2
Kirk Wieber, Chief, Air Programs Branch, USEPA Region 2
Ken Fradkin, Supervisor, Air Planning, USEPA Region 2
Paul Baldauf, Assistant Commissioner for Air, Energy & Materials Sustainability, NJDEP
Francis C. Steitz, Director, Division of Air Quality, NJDEP-AEMS
Kenneth Ratzman, Assistant Director, Division of Air Quality, NJDEP-AEMS
Kristina Miles, Esq., Deputy Attorney General, NJ Dept. of Law & Public Safety, Division of Law

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Designation Recommendations and Supporting Data

for the

State of New Jersey

for the

2024 $PM_{2.5}$ National Ambient Air Quality Standards

February 2025

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ACRONYMS AND ABBREVIATIONS

CAA	Clean Air Act
CAP	Criteria Air Pollutant
CBSA	Core Based Statistical Area
CCMUA	Camden County Municipal Utilities Authority
CSA	Combined Statistical Area
CSN	Chemical Speciation Network
EC	Elemental Carbon
EGU	Electric Generating Unit
EMP	Emissions Modeling Platform
FR	Federal Register
HYSPLIT	Hybrid Single-Particle Lagrangian Integrated Trajectory
IMPROVE	Interagency Monitoring of Protected Visual Environments
MSA	Metropolitan/Micropolitan Statistical Areas
NAAQS	National Ambient Air Quality Standard
NH_3	Ammonia
NJDEP	New Jersey Department of Environmental Protection
NO_3	Nitrate
NO_X	Nitrogen Oxides
OC	Organic Carbon
OM	Organic Matter
PM2.5	Fine Particulate Matter
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_4	Sulfate
tpy	Tons per year
USEPA	United States Environmental Protection Agency
$\mu g/m^3$	Micrograms per Cubic Meter
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound

INTRODUCTION AND SUMMARY

The purpose of this document is to make recommendations to the United States Environmental Protection Agency (USEPA) regarding designation of New Jersey's counties for the revised, primary, annual fine particulate matter (PM2.5) National Ambient Air Quality Standard (NAAQS) of 9 micrograms per cubic meter (μg/m^3) in accordance with Clean Air Act (CAA) Section 107(d)(1)(A).

USEPA promulgated a revised, annual PM2.5 NAAQS on February 7, 2024, lowering the standard from 12.0 μg/m^3 to 9.0 μg/m^3.[1] According to Section 107(d)(1)(A), states have one year from the revised standard's promulgation to submit a recommendation to USEPA for designating areas as attainment or nonattainment. USEPA then has one year to decide final designations and, if necessary, the size of nonattainment area boundaries.

Under the previous 12 μg/m^3 PM2.5 NAAQS, USEPA designated New Jersey as unclassifiable/attainment based on air quality monitoring data from 2011-2013.[2] New Jersey continues to measure attainment of the former annual PM2.5 NAAQS, as well as the secondary annual standard of 15 μg/m^3 and the primary and secondary 24-hour standard of 35 μg/m^3.

The USEPA issued a memorandum, dated February 7, 2024, that provides guidance to states and Tribes for determining initial area designations for the 2024 annual PM2.5 NAAQS.[3] The USEPA intends to use a framework for area-specific analyses relevant to five factors and recommends that states and Tribes base their nonattainment area boundary recommendations on an evaluation of information relevant to these factors. The five factors are: 1) air quality data, 2) emissions and emissions-related data, 3) meteorology, 4) geography/topography, and 5) jurisdictional boundaries. States and Tribes may optionally include other information to support their recommendations.

USEPA recommends using the Combined Statistical Area (CSA) or the Core Based Statistical Area (CBSA) as a starting point for the analysis because the monitored PM2.5 concentrations across an urbanized area tend to be correlated and violations are usually resultant from emissions across the metropolitan area.[4] The five-factor analysis then identifies the portions of the CSA or CBSA that contribute to the violation and thus the portions that should be included or excluded for the nonattainment area recommendation.

The New Jersey CSAs and CBSAs are based on the 2022 Economic Census.[5] New Jersey is part of three Combined Statistical Areas (CSAs): the New York-Newark (NY-NJ-CT-PA) CSA in northern New Jersey, the Philadelphia-Reading-Camden (PA-NJ-DE-MD) CSA in southern New Jersey, and the Allentown-Bethlehem-East Stroudsburg (PA-NJ) CSA in Warren County, NJ. The NY-NJ-CT-PA CSA is shared with New York, Connecticut, and Pennsylvania and includes the New Jersey counties of Bergen, Essex, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, and Union. The PA-NJ-DE-MD CSA is shared with Pennsylvania, Delaware, and Maryland and includes the New Jersey counties of Atlantic,

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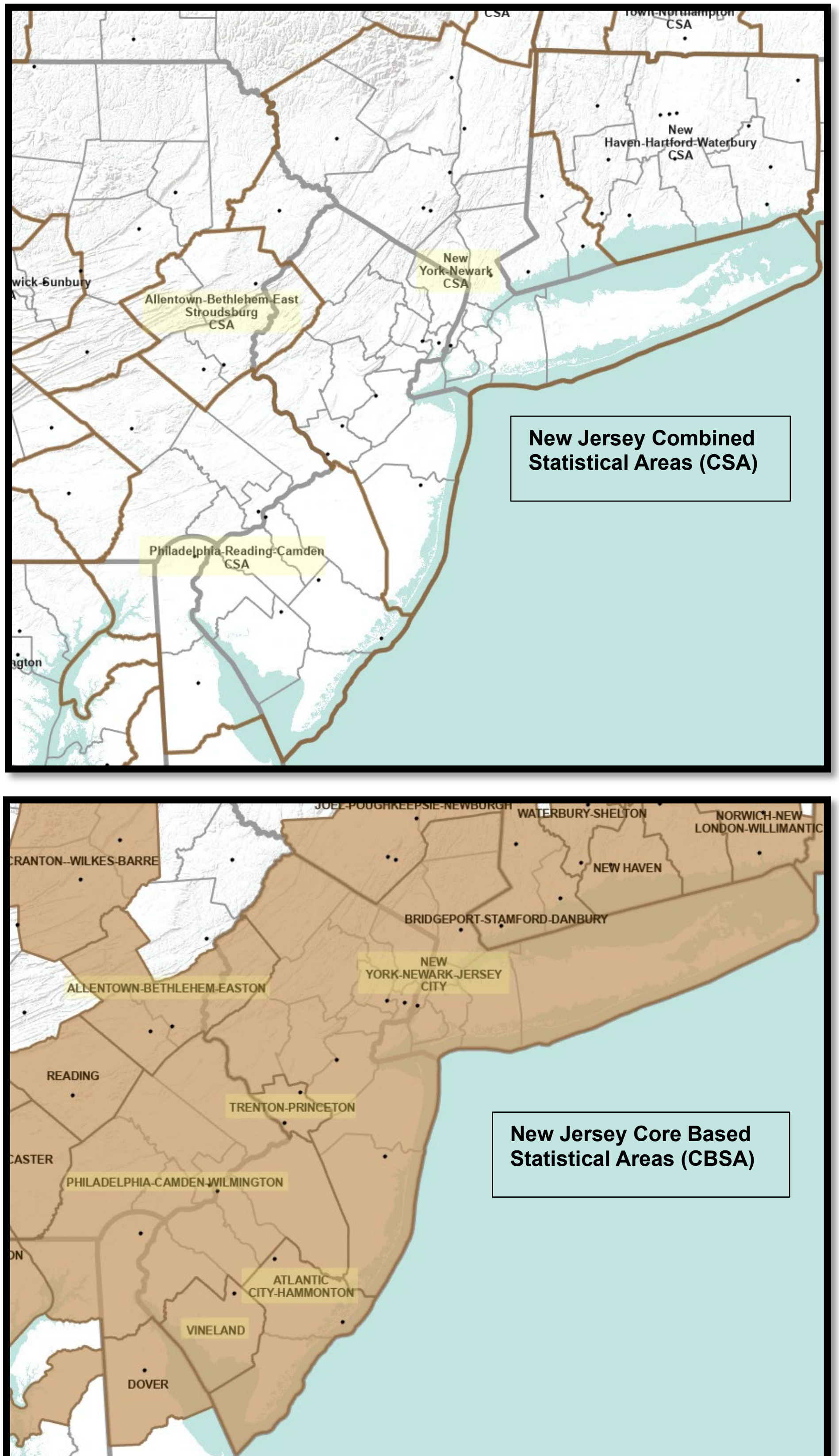
[1] 89 FR 16202, March 6, 2024
[2] 80 FR 2206, January 15, 2015
[3] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf
[4] Ibid.
[5] United States Census Bureau. 2022 Geographic Levels, February 26, 2024. https://www.census.gov/programs-surveys/economic-census/geographies/levels/2022-levels.html

Burlington, Camden, Cape May, Cumberland, Gloucester, and Salem. The PA-NJ CSA is shared with Pennsylvania and includes New Jersey's Warren County.

New Jersey also has six Core Based Statistical Areas (CBSAs): the Allentown-Bethlehem-Easton CBSA, the New York-Newark-Jersey City CBSA, the Trenton-Princeton CBSA, the Atlantic City-Hammonton, the Philadelphia-Camden-Wilmington CBSA, and the Vineland CBSA. A map of the current CBSAs and CSAs for New Jersey is shown in Figure 1.

Figure 1: All CSAs (top) and CBSAs (bottom) within New Jersey[6]



[6] United States Census Bureau. TIGERweb Economic. Retrieved on 9/18/2024 from https://tigerweb.geo.census.gov/tigerwebecon/

New Jersey has 20 monitoring sites throughout the state that measure PM2.5 for compliance with the NAAQS. Two monitors in New Jersey measure above the 2024 PM2.5 Annual NAAQS of 9.0 μg/m^3 based on the 2021-2023 design value. The two monitors include the Elizabeth Lab monitor, located in Union County in the NY-NJ-CT-PA CSA, and the Camden Spruce Street monitor located in Camden County in the PA-NJ-DE-MD CSA.

The 2023 design value for the Elizabeth Lab and Camden Spruce Street monitors are 9.4 μg/m^3 and 9.8 μg/m^3, respectively. However, these design values include elevated monitoring data that was influenced by smoke from upwind wildfires in both 2021 and 2023. For the 2023 wildfires, New Jersey submitted an exceptional event demonstration to USEPA on December 11, 2024, for the Elizabeth Lab and Camden Spruce Street monitors.[7] With the 2023 exceptional event data excluded (pending USEPA concurrence), the 2023 design value at Elizabeth Lab is 9.1 μg/m^3 and at Camden Spruce Street is 9.4 μg/m^3. Please note, these elevated values include the wildfire smoke-influenced data from 2021.

In June 2024, the Camden Spruce Street monitor closed due to the termination of its lease agreement. In advance of the closure, the New Jersey Department of Environmental Protection (NJDEP) identified a site at the Camden County Municipal Utilities Authority (CCMUA) for a new monitor, South Camden, to replace the Camden Spruce Street monitor. Monitoring began at the South Camden site in June 2024. New Jersey intends to request from USEPA that the 2024 monitoring data from the Camden Spruce Street site and the new South Camden site be combined and used to ensure valid, comprehensive, and continuous monitoring data for the final 2024 PM2.5 Area Designations.

Once the New Jersey 2024 monitoring data is certified, the 2024 annual averages are expected to be below 9.0 μg/m^3 for both the Elizabeth and Camden sites and all of the monitors in New Jersey are anticipated to have 2024 design values in compliance with the 2024 9.0 μg/m^3 PM2.5 NAAQS. The preliminary 2024 monitoring data is still being evaluated for quality assurance purposes and therefore is not included in this document; however, once certified, it will be submitted to USEPA for use in their final designation review.

Based on the certified 2023 and preliminary 2024 monitoring data, in addition to the five-factor analysis presented below per USEPA guidance, New Jersey recommends designating all of the New Jersey counties in the NY-NJ-CT-PA CSA, the PA-NJ-DE-MD CSA and the PA-NJ CSA (which covers all of the counties in New Jersey) as attainment. Also based on the data and discussions provided in this document, New Jersey recommends that if an area in another state is not in compliance with the standard based on 2024 certified data, New Jersey should not be included in any multi-state nonattainment areas.

This document provides two five-factor analyses, one for the NY-NJ-CT-PA CSA and one for the PA-NJ-DE-MD CSA, to support New Jersey's recommendation to designate all of New Jersey as attainment. One county in New Jersey, Warren County, does not require a five-factor analysis due to its CSA not having any violating monitors and the county not otherwise being close to any violating monitors.

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[7] NJDEP. Exceptional Event Demonstration for PM2.5 June 6, 7, and 8, 2023 June 29 and 30, 2023, December 2024. https://dep.nj.gov/wp-content/uploads/airplanning/exceptional-events/final-pm2.5-exceptional-event-12-11-24.pdf

NORTHERN NEW JERSEY CSA (NY-NJ-CT-PA)

Factor 1: Air Quality Data

1.1 Current Design Values

PM2.5 annual design values are calculated based on the air quality monitoring data for the most recent three-year period. For New Jersey's 2024 PM2.5 area designation recommendation, this includes the years 2021, 2022, and 2023, while for USEPA's final area designations, this will include the years 2022, 2023, and 2024.

Figure 2 shows the valid 2021-2023 design values for the NY-NJ-CT-PA CSA, and Table 1 shows the 2021-2023 design values and annual means at New Jersey monitors in the NY-NJ-CT-PA CSA. While some monitors in New Jersey show elevated annual means in 2023, most likely due to the influence of smoke from the Canadian wildfires, the Elizabeth Lab monitor is the only valid design value in 2021-2023 to exceed the NAAQS. The Elizabeth Lab monitor is located in Union County next to the New Jersey Turnpike and I-278, and near the Goethals Bridge, which connects New Jersey to Staten Island, New York. Specifically, it is located on the NJ Turnpike at the Interchange 13 Toll Plaza. The purpose of the site is to be a comprehensive air monitoring site for the northeast metropolitan region of New Jersey.[8] The Elizabeth Lab design value in the graph does not exclude the 2023 exceptional event data since USEPA has not made a final determination on the exclusion of the data; however, if the exceptional event data is excluded, the design value at Elizabeth Lab is 9.1 μg/m^3.

Once the 2024 monitoring data is certified, the annual average is expected to be below 9.0 μg/m^3 and, when combined with the annual averages from 2022 and 2023, will result in a 2024 design value at the Elizabeth Lab monitor that demonstrates attainment of the 2024 PM2.5 NAAQS.

[8] NJDEP Bureau of Air Monitoring. New Jersey Ambient Air Monitoring Network Plan 2023, August 2023. https://dep.nj.gov/wp-content/uploads/airmon/network-reports/nj-network-plan-2023.pdf

Figure 2: 2021-2023 PM2.5 Annual Design Values Including Exceptional Event Data in the NY-NJ-CT-PA CSA

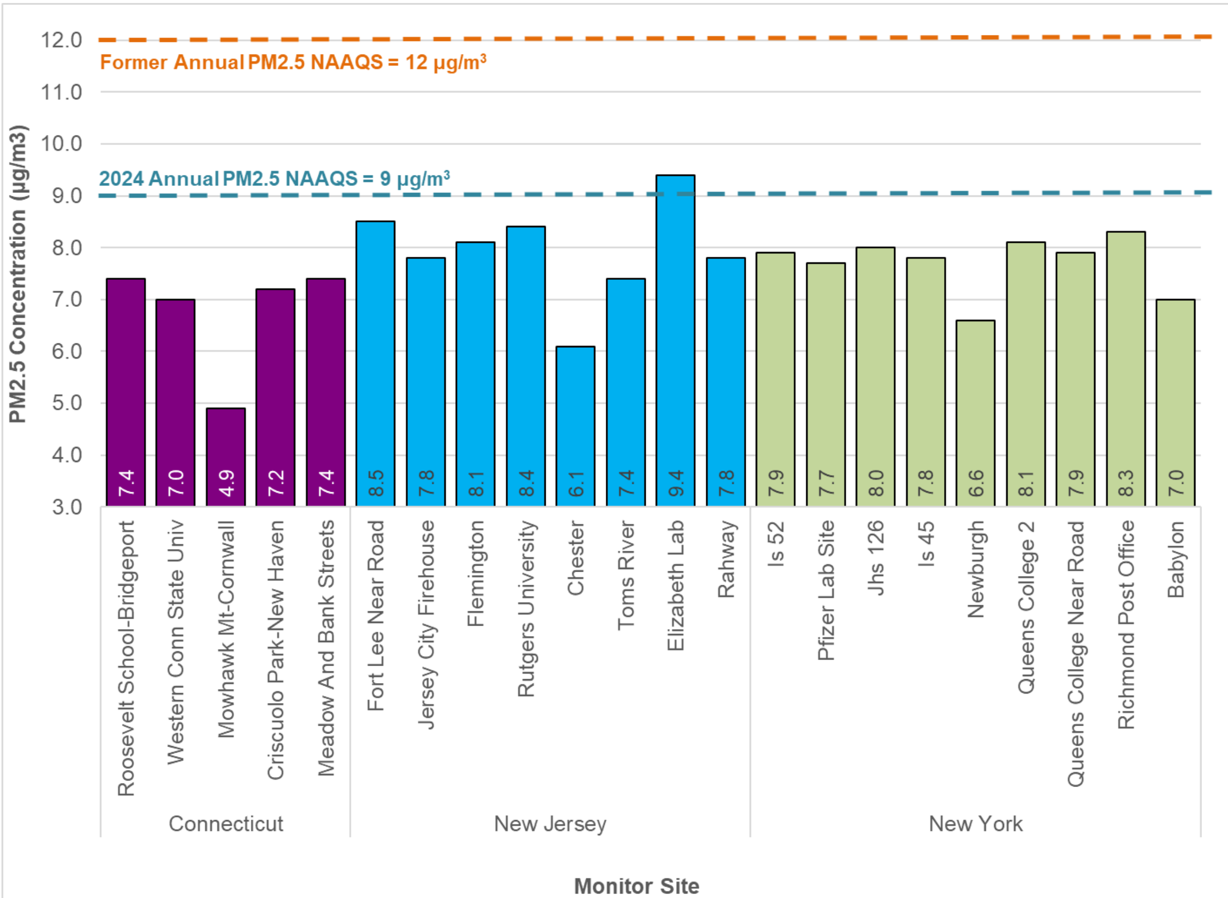


Table 1: 2021-2023 Annual Means and Design Values at New Jersey Monitors in the NY-NJ-CT-PA CSA[1, 2, 3]

Local Site Name / Site ID	2021 Annual Mean (µg/m³)	2022 Annual Mean (µg/m³)	2023 Annual Mean (µg/m³)	Valid 2021-2023 Design Value (µg/m³)	Invalid 2021-2023 Design Value (µg/m³)
Fort Lee Near Road / 34-003-0010	8.33	6.89	10.22	8.5	
Newark Firehouse[4] / 34-013-0003	8.79	7.85			8.3
Union City High School / 34-017-0008		6.07	7.87		7.0
Jersey City Firehouse / 34-017-1003	7.42	7.37	8.58	7.8	
Flemington / 34-019-0001	7.77	7.19	9.21	8.1	
Rider University / 34-021-0005	8.71	7.77	9.79		8.8
Trenton / 34-021-0008	8.96	7.38	10.03		8.8
Rutgers University / 34-023-0011	8.33	7.35	9.48	8.4	
Chester / 34-027-3001	6.28	5.11	6.93	6.1	
Toms River / 34-029-2002	7.68	5.95	8.48	7.4	
Paterson / 34-031-0005		7.34	8.45		7.9
Elizabeth Lab / 34-039-0004	9.81	8.75	~~9.71~~ 8.82	~~9.4~~ 9.1	
Rahway / 34-039-2003	7.53	6.76	9.22	7.8	
Columbia[5] / 34-041-0007	8.22	8.16	8.68	8.4	

[1] Data source: USEPA 2023 Design Value Reports, June 2024. Retrieved at https://www.epa.gov/air-trends/air-quality-design-values.

[2] Red text indicates a value larger than the 2024 9 µg/m³ PM2.5 NAAQS (most likely due to wildfire smoke)

[3] ~~Strikethrough~~ indicates the value before the exclusion of exceptional event data

[4] The Newark Firehouse monitor was shut down in September 2022, resulting in incomplete data for the period 2021-2023 and thus an invalid design value. NJDEP is in the process of establishing and operating a new monitoring station in the area.[9]

[5] As of the 2022 CSAs, the Columbia monitor is in the PA-NJ CSA, not the NY-NJ-CT-PA CSA; however, there is no five-factor analysis for the PA-NJ CSA, so it has been included in this table because it is regionally in North Jersey.

1.2 Design Value Trends

Figure 3a and Figure 3b show the historical design value trend at the Elizabeth Lab monitor excluding and including the 2023 exceptional event data, respectively. Figure 4a and Figure 4b show the historical annual mean values at the Elizabeth Lab monitor excluding and including the 2023 exceptional event data, respectively. As shown in the figures, there is a significant

[9] NJDEP Bureau of Air Monitoring. New Jersey Ambient Air Monitoring Network Plan 2023, August 2023. https://dep.nj.gov/wp-content/uploads/airmon/network-reports/nj-network-plan-2023.pdf

decreasing trend in PM2.5 data at the Elizabeth Lab monitor. Excluding the most recent 2023 design value, the last design value at Elizabeth Lab that exceeded the revised 9.0 µg/m^3 standard was 2017-2019.

The annual mean at Elizabeth Lab has been below 9.0 µg/m^3 since 2018, except in 2021 and 2023 due to wildfire smoke and exceptional events. As previously noted, there were multiple PM2.5 exceedances in 2021 due to smoke across New Jersey caused by wildfires from the western United States and Canada. These events increased the annual mean at Elizabeth Lab in 2021 to the largest it has been since 2015. Although these wildfire smoke events increased the annual mean in 2021 to levels which do not reflect the actual PM2.5 ambient air quality in New Jersey, these events lacked regulatory significance for an official exceptional event demonstration because the monitor was not violating the 12 µg/m^3 PM2.5 annual NAAQS at the time. Additionally, USEPA will use 2022-2024 PM2.5 annual means to calculate the design values for the final area designations. The inflated annual mean in 2021 consequently made the last three design values larger than they otherwise would have been. Overall, the design value and annual mean trends indicate that PM2.5 design values are anticipated to be below 9.0 µg/m^3 for the 2022-2024 design values.

Figure 3a: PM2.5 Annual Design Value Trend at Elizabeth Lab from 2001 to 2023 Excluding Exceptional Event Data

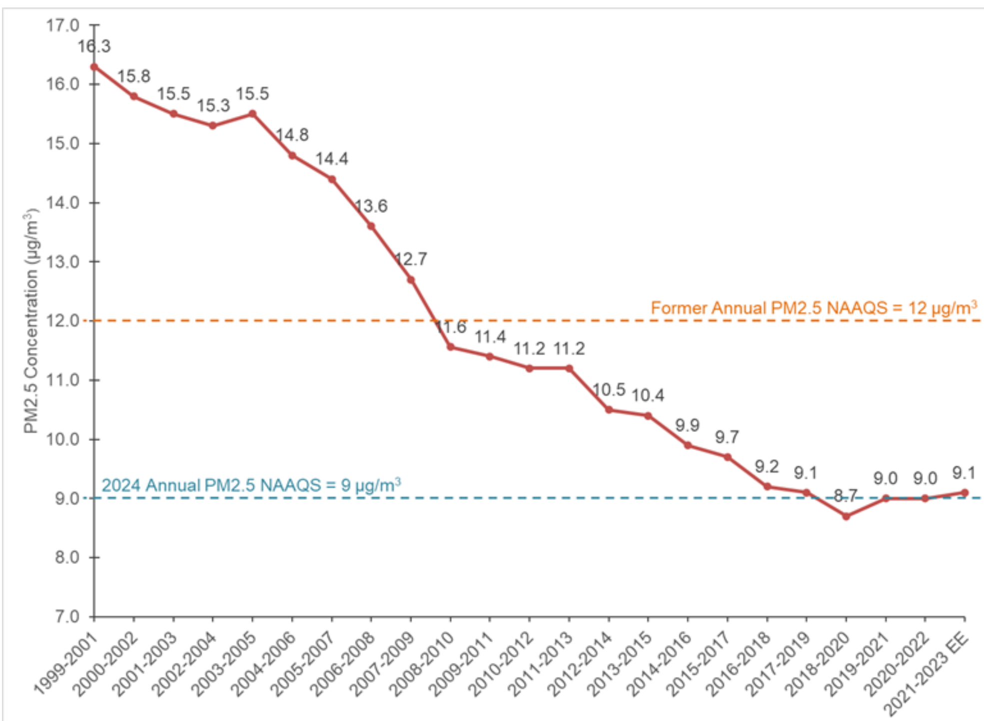


Figure 3b: PM2.5 Annual Design Value Trend at Elizabeth Lab from 2001 to 2023 Including Exceptional Event Data

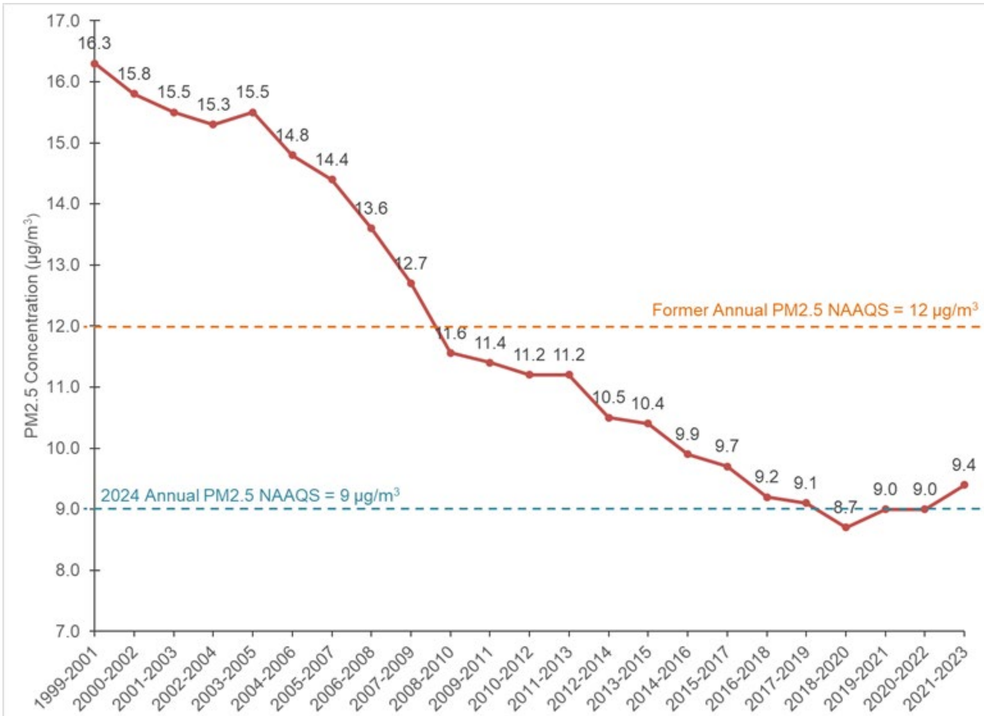


Figure 4a: PM2.5 Annual Mean Trend at Elizabeth Lab from 2010 to 2023 Excluding Exceptional Event Data

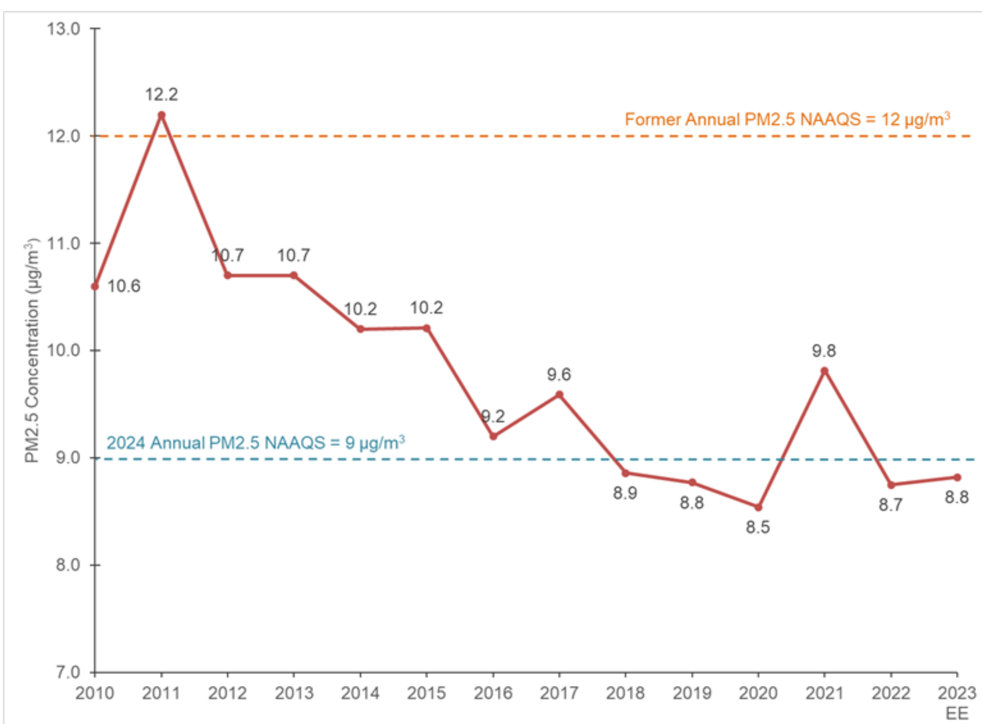
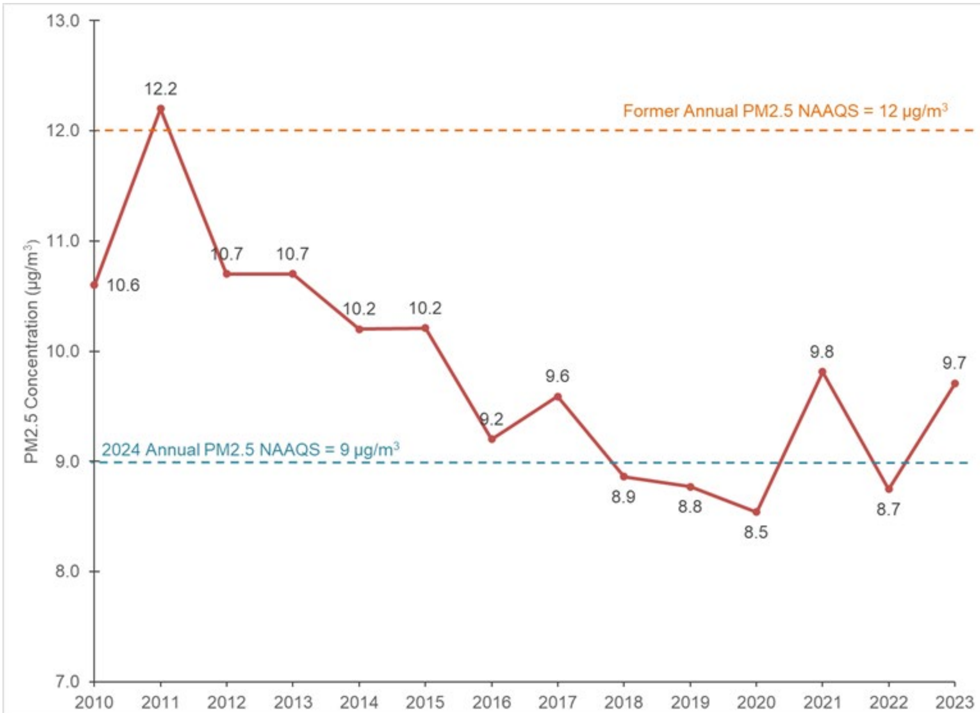


Figure 4b: PM2.5 Annual Mean Trend at Elizabeth Lab from 2010 to 2023 Including Exceptional Event Data



The significant decreasing trend in combination with the preliminary 2024 monitoring data supports the recommendation that the area including Elizabeth Lab should be designated attainment. With USEPA concurrence of New Jersey's 2023 Exceptional Event demonstration, Elizabeth Lab would need an annual mean of 9.6 µg/m^3 in 2024 for the 2022-2024 design value to be within the standard, which is very likely given that the last time it was larger than 9.6 µg/m^3, excluding 2021, was in 2015. Without USEPA concurrence on New Jersey's 2023 Exceptional Event demonstration, Elizabeth Lab would need an annual mean of 8.7 µg/m^3 in 2024 for the 2022-2024 design value to be within the standard. This is also likely given the annual mean trends.

1.3 Compositional Analysis

PM2.5 is composed of many different chemical compounds. An evaluation of the components of PM2.5 provides insight into the contributing pollution sources and the effect of existing control measures.

Speciation is the process of disaggregating pollutants into groups of species or into individual chemical species or components. New Jersey collects data on the components of PM2.5 at monitoring sites across the State. The two main networks of speciation monitors are the Chemical Speciation Network (CSN) and the Interagency Monitoring of Protected Visual Environments (IMPROVE). Typically, CSN monitors are located in more urban areas. The IMPROVE monitors are located in national parks and wilderness areas to monitor visibility conditions to address regional haze at Class I areas. The prevalent compounds measured in New Jersey's fine particles covered in this analysis are ammonium sulfate, organic matter (OM), ammonium nitrate, elemental carbon (EC), and crustal material. The organic matter portion in PM2.5 is frequently measured as organic carbon (OC), which does not include the other elements such as hydrogen and oxygen that make up organic molecules. Speciation data is relevant for this analysis because it aids in defining the larger components that make up PM2.5 at a particular site and, therefore, the potential sources that may be affecting the PM2.5 levels at the monitor.

New Jersey has four speciation monitors: Camden Spruce Street, Chester, Elizabeth Lab, and Rutgers University. Prior to September 2022, there was a fifth speciation monitor at Newark Firehouse. Since the Elizabeth Lab speciation monitor is in the CSN and co-located with the Elizabeth Lab PM2.5 monitor, this monitor is used in the following compositional analysis.

The PM2.5 components can have many sources, as described below.[10,11,12] The primary source of OC and EC is from combustion of fuels, such as from onroad and nonroad vehicles, nonroad machinery, and for heating purposes and local wood burning. A source of EC is from incomplete combustion of fuels, most notably from diesel engines. Comparing sources of OC to EC, a high OC to EC ratio can indicate biomass burning while a high EC to OC ratio can indicate diesel combustion. While EC is generally emitted directly from sources, OM can be divided into primary and secondary, where primary comes from direct source emissions and secondary forms through atmospheric processes mainly involving VOCs.[13] Nitrate and sulfate are primarily formed through chemical reactions in the atmosphere involving nitrogen and sulfur. Sources of sulfate mainly include large stationary sources such as coal burning and burning other fuels containing sulfur such as heating oils. Nitrate sources also include fuel and wood combustion, as well as onroad and nonroad mobile sources and electric generating unit (EGU) emissions.

Speciation data from 2021-2023 were used to find the trends in the composition of PM2.5 at Elizabeth Lab. Figure 5 shows the average of the annual averages from 2021-2023 and the average of the calendar quarters from 2021-2023. The largest category was OM, comprising approximately 58% over the three-year period of 2021-2023. Ammonium sulfate comprised about 17%, EC about 12%, crustal material about 8%, and ammonium nitrate about 5%.

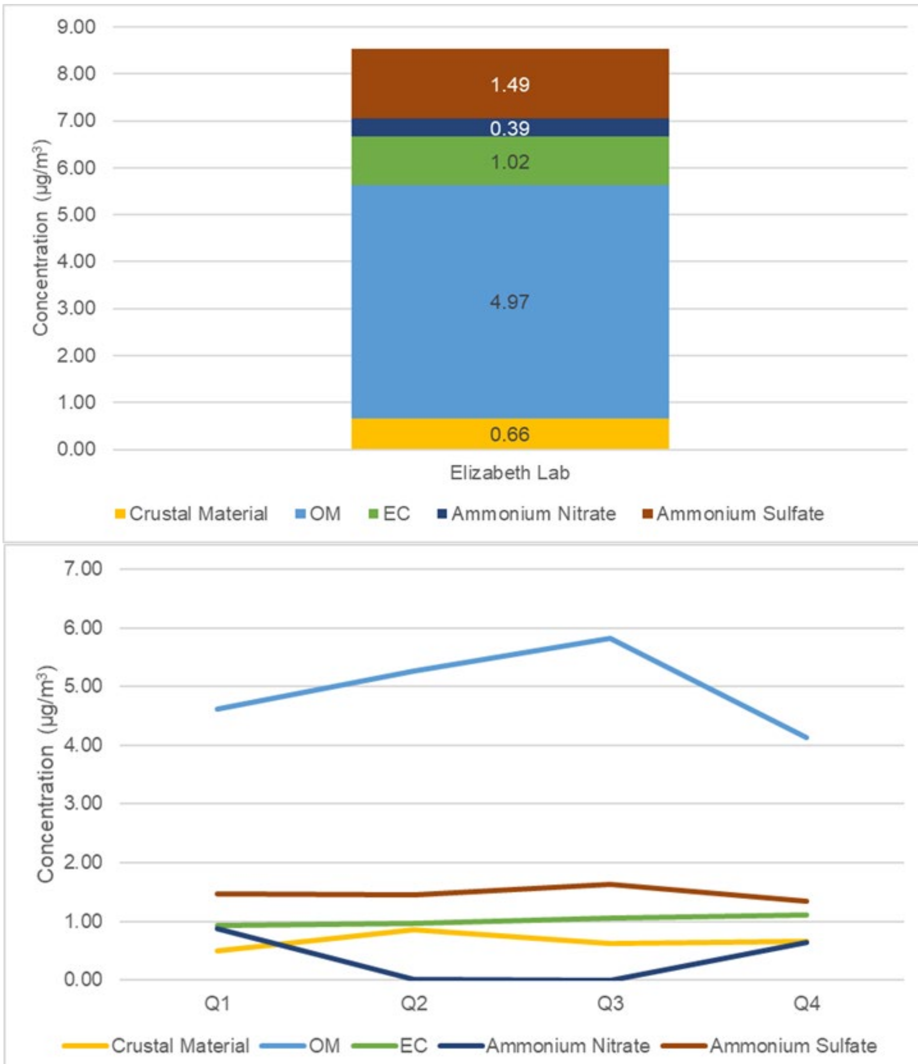
Nitrate showed a strong seasonal trend where the concentration was largest in the wintertime, quarters one and four. OM's quarterly trend showed that quarter three was the largest. Quarter two was the second largest for OM, which may have been affected by the June 2023 wildfire impacts noted in New Jersey's PM2.5 Exceptional Event. Crustal material showed a trend where quarter two concentrations were slightly elevated. Elemental carbon and sulfate did not display a clear or consistent quarterly trend in concentrations.

Elizabeth Lab presents a significant success in lowering PM2.5 components over the years, especially for sulfates. Sulfates used to be one of the two largest components in PM2.5 but now comprise a much smaller proportion of the total PM2.5. The concentration of sulfates has been reduced to an annual concentration about five times smaller than two decades ago. These improvements in lowering the State's sulfur emissions can be attributed to New Jersey's control measures to reduce the sulfur content in fuel oil and closure of New Jersey coal power plants (discussed in more detail in the Southern New Jersey CSA Section 2.1). For example, the New

[10] NJDEP. Technical Basis for Designating New Jersey Attainment for the Annual PM2.5 National Ambient Air Quality Standard of 12 μg/m^3, February 24, 2014.
[11] NJDEP. Appendix B: 2022 Fine Particulate Speciation Summary in 2022 New Jersey Air Quality Report, August 2023. Retrieved from https://www.nj.gov/dep/airmon/pdf/2022-nj-aq-report.pdf
[12] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf
[13] USEPA. Memorandum on the Fine Particulate Matter (PM2.5) Precursor Demonstration Guidance, May 30, 2019. Retrieved from transmittal_memo_and_pm25_precursor_demo_guidance_5_30_19.pdf

Jersey Sulfur in Fuels rule, N.J.A.C 7:27-9 et seq., lowered the sulfur fuel content of all distillate fuel oils (#2 fuel oil and lighter) to 15 ppm beginning on July 1, 2016. The sulfur content of #4 fuel oil was lowered to 2,500 ppm and for #6 fuel oil to a range of 3,000 ppm to 5,000 ppm sulfur content beginning July 1, 2014.[14] On December 2, 2022, New Jersey also adopted the Control and Prohibition of Carbon Dioxide Emissions rules at 7:27F-3 that ban #4 and #6 fuel oil, with a compliance date in 2025 and a two year sell through period.

Figure 5: PM2.5 Compositional Analysis at Elizabeth Lab from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)



1.4 Urban Increment Analysis

An urban increment analysis is conducted to determine the amount of particulate matter that is emitted locally in urban areas and that may impact PM2.5 levels at an air monitor. Typical urban

[14] The maximum sulfur content of #6 fuel oil varies depending on the county where the fuel oil is burned. The northern part of New Jersey has a lower maximum sulfur content for residual fuel oil at 3,000 ppm while the southern part of New Jersey has a maximum sulfur content of 5,000 ppm. See N.J.A.C. 7:27-9 et seq. https://www.nj.gov/dep/aqm/rules27.html

sources of PM2.5 that are considered to be local in nature include nearby vehicular traffic, local industry, construction activity, pesticide use, and wood burning. As stated in USEPA's area designation guidance memo, "… the urban increment model generally predicts that sulfate originates mainly from regional sources; organic carbon and nitrate from a mix of regional and local sources; and black carbon and crustal material from local sources".[15]

The urban increment at a monitor can help compare the amount of each pollutant that can be attributed to regional sources or to local sources. It is the difference between the speciation levels at the nearest urban (CSN) monitor and nearby rural (IMPROVE) monitor(s) within 150 miles, respectively representing total and regional contributions. Since it is the rural (regional) speciation data subtracted from the urban (local plus regional) speciation, the urban increment estimates the local contribution.

The closest CSN monitor to Elizabeth Lab is co-located at Elizabeth Lab, and there are two IMPROVE monitors within 150 miles of Elizabeth Lab: Brigantine located at the Edwin B. Forsythe National Wildlife Refuge in New Jersey and Mohawk Mt-Cornwall in Connecticut. Therefore, the urban increment is calculated by subtracting the average of the annual average speciation data at the rural Brigantine and Mohawk Mt-Cornwall IMPROVE monitors from the urban Elizabeth Lab CSN monitor. The species analyzed are organic matter (OM), elemental carbon (EC), ammonium sulfate, ammonium nitrate, and crustal material.

Figure 6 shows the annual and quarterly urban increment at Elizabeth Lab, specifically the average of the annual averages from 2021-2023 and the average of the calendar quarters from 2021-2023. The largest proportion by far is OM. The second largest is EC, then ammonium sulfate, crustal matter, and ammonium nitrate. However, ammonium nitrate displays a seasonal trend where the urban increment is largest in the winter, quarters one and four, and essentially zero in quarters two and three. This matches the trend shown in the compositional analysis from Section 1.3 and indicates that local sources contribute more to the ammonium nitrate concentrations at Elizabeth Lab in quarters one and four. EC, ammonium sulfate, and crustal material do not indicate strong quarterly trends. OM's quarterly trends show that quarters one and two are generally larger than quarters three and four. This contrasts with the trend in OM's compositional analysis from Section 1.3, which showed that OM tended to be largest in quarter three.

Figure 7 shows the comparison of the annual local and regional contributions to the speciation data at Elizabeth Lab. The value for the local portion in the graph is the urban increment, and the value for the regional portion in the graph is the IMPROVE monitoring data used in the urban increment calculation. This comparison shows that most OM, EC, crustal material, and ammonium nitrate is local, while most ammonium sulfate is regional. 67% of OM and crustal material are local. 82% of EC is local. 92% of ammonium nitrate is local. 37% of ammonium sulfate is local. Although most ammonium sulfate is regional, the local amount is not insignificant, so local sources do contribute, which will be discussed in Factor 2. The current small local contribution of ammonium sulfate likely is due to the significant success New Jersey has had in lowering the amount of sulfate, attributable to New Jersey's control measures. Overall, the local contribution of PM2.5 species is larger than the regional contribution.

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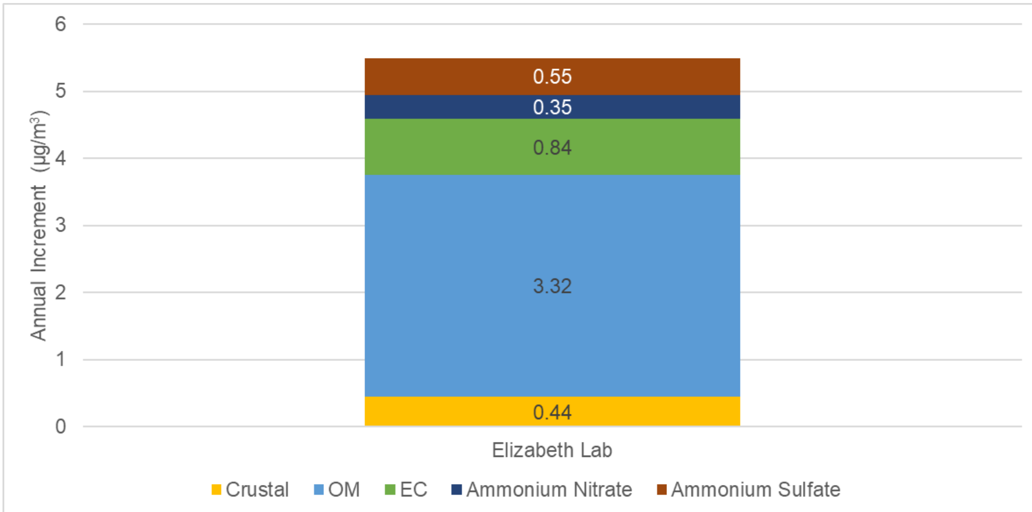
[15] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard. February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

Figure 6: PM2.5 Urban Increment at Elizabeth Lab from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)



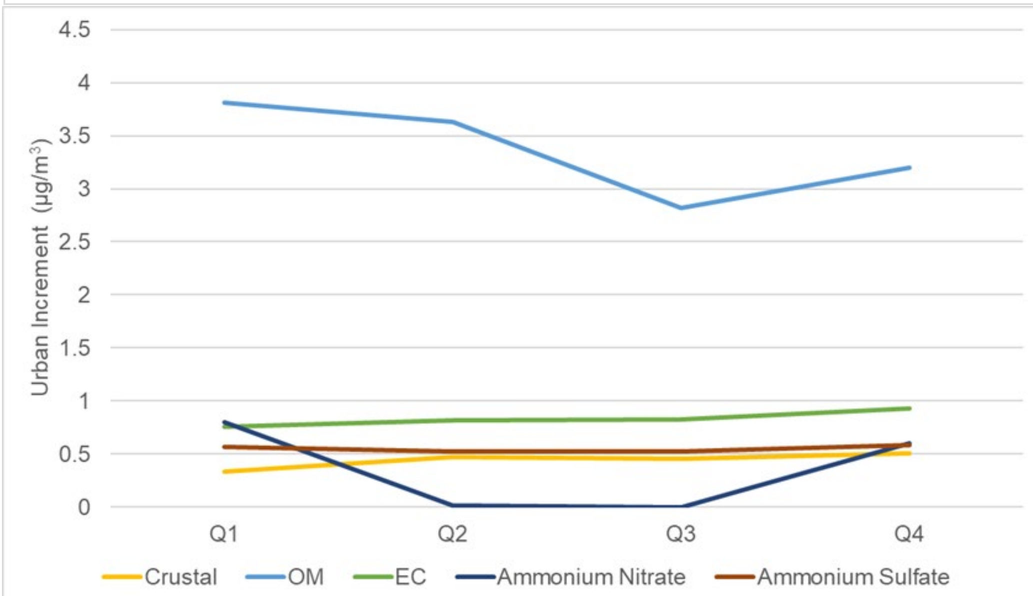
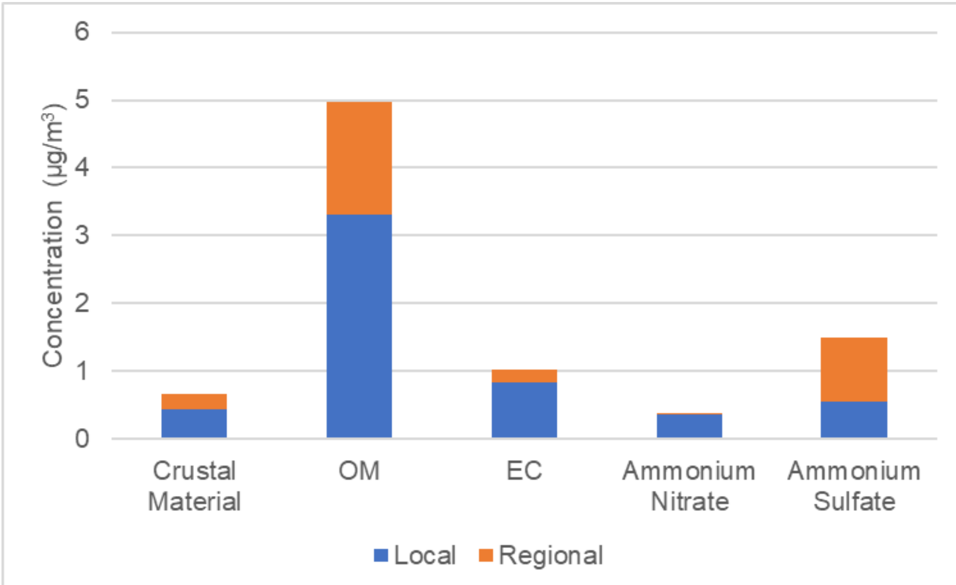


Figure 7: PM2.5 Species Comparison of the Average Annual Concentrations' Local Portion and the Regional Portion from 2021-2023*



* The urban increment is calculated by subtracting the annual average measured at the rural IMPROVE monitor from the annual average measured at the urban Elizabeth Lab CSN monitor. The urban increment is considered the contribution of local pollution to the monitor. The regional portion is the concentrations measured at the IMPROVE monitor(s).

Factor 2: Emissions and Emission-Related Data

This section evaluates the estimated emissions by county[16] from primary PM2.5, its components, and its precursors; the emission-related data in a county like population density and traffic; and the effect of these emissions on the concentrations at the violating monitor. The emission data is from the most recent comprehensive inventory, the USEPA Emissions Modeling Platform (EMP) 2022v1. This inventory was developed as a collaborative between USEPA, States, and Regional Organizations. See 2022v1 Emissions Modeling Platform | US EPA. The inventory data from the modeling platform was provided by USEPA for use in the PM2.5 designations and posted on the PM2.5 Designation website at: https://www.epa.gov/particle-pollution-designations/particle-pollution-designations-memorandum-and-data-2024-revised. The data provided by USEPA was summarized into the sectors below. Note, certain mobile source emissions are combined with the stationary source emissions as described below.

Point sources are large stationary facilities that generally report their emissions directly via state and/or Federal permitting and reporting programs. Point sources include larger facilities such as electric generating units (EGUs), manufacturing facilities, and heating units for large schools and universities. In the data provided to States, USEPA also included mobile source nonroad emissions from airports and railroad switch yards as point sources.

Nonpoint sources are stationary area sources and some mobile sources. Area sources are those emissions categories that are too small, widespread, or numerous to

[16] Prior to 2022, the northern CSA included Connecticut as counties instead of planning regions, including Fairfield County, Litchfield County, and New Haven County. Some data may not be available for the most current planning regions, and in those cases, these three counties will be used.

be inventoried individually. Therefore, emissions are estimated for these categories using activity data such as population, employment, and fuel use. There is a wide range of area source categories, but examples include residential fuel combustion, consumer product use, paints and any stationary source emissions not included in the point source sector. In the data provided to States, the USEPA also included emissions from the mobile source nonroad categories for commercial marine vessels and underway rail emissions as nonpoint.

Nonroad mobile sources are vehicles and equipment that are not designed to operate on roadways. Examples include construction equipment, industrial equipment such as forklifts, recreational boats and vehicles, and lawn & garden equipment. In the data provided by USEPA, nonroad emissions from airports and railroad switch yards are included as point sources and emissions from other railroad activities and commercial marine vessels are included as nonpoint sources.

Onroad mobile sources are vehicles that operate on roadways, including cars, trucks, buses, and motorcycles. In the data provided by USEPA stationary nonpoint area source vehicle refueling emissions at gasoline service stations are included in the onroad sector.

Biogenic sources are emission from natural sources such as trees, vegetation and soil.

Wildfires are unplanned, uncontrolled and unpredictable fire in an area of combustible vegetation.

Other fires include prescribed burning, agricultural burning and open burning.

The inventory data provided to states also includes emissions by Facility.

The speciation components include OC, EC, nitrate (NO_3), sulfate (SO_4), and remaining fine particulate matter, and the precursors include sulfur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs), and ammonia (NH_3). Although emissions that transport from far away may affect the monitor, nonattainment areas only include nearby regions. USEPA notes in particular that “sulfate and nitrate are formed through atmospheric processes and can be transported many hundreds of miles”, “direct PM2.5 emissions sources will generally be local”, and “the gaseous precursors… will generally be more regional in nature (although the EPA also expects some local NO_X and VOC emissions contributions from mobile and stationary sources)”.[17]

Figure 8 shows the 2022 annual estimated anthropogenic emissions of PM2.5 and its precursors in the CSA from the Emission Modeling Platform (EMP) 2022v1, excluding wildfires. Table 2 shows a summary of 2022 annual anthropogenic (excluding fires), biogenic, wildfire, and “other fire” emissions in tons per year (tpy) and emission density in tpy/mi^2 by state. Emission density was calculated by dividing the state emissions by the state area. The most significant precursors in the formation of PM2.5 in order are SO_2 and NO_X, with VOC and NH_3 following that are less contributory to PM2.5 formation. Although SO_2 is one of the most significant precursors, it has the lowest emissions in the 2022 inventory due to significant federal and State rules to reduce SO_2. However, as shown in Table 2, New York’s anthropogenic

[17] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

direct PM2.5 and SO_2 emission densities are significantly higher than the other states. As shown in Figure 8, the highest anthropogenic emissions, excluding fire emissions, in the CSA are from VOCs, followed by NO_X, PM2.5, NH_3, and SO_2. As shown in Table 2, for PM2.5, SO_2, NO_X, and NH_3, the state with the highest emission density is New York, followed by New Jersey, Connecticut, and Pennsylvania. New Jersey has an emission density slightly higher than New York for VOCs, then followed by Connecticut and Pennsylvania; however, VOC is a less significant precursor.

Figure 8: 2022 Annual Anthropogenic Emissions of PM2.5 and its Precursors in the NY-NJ-CT-PA CSA by County, Excluding Wildfires

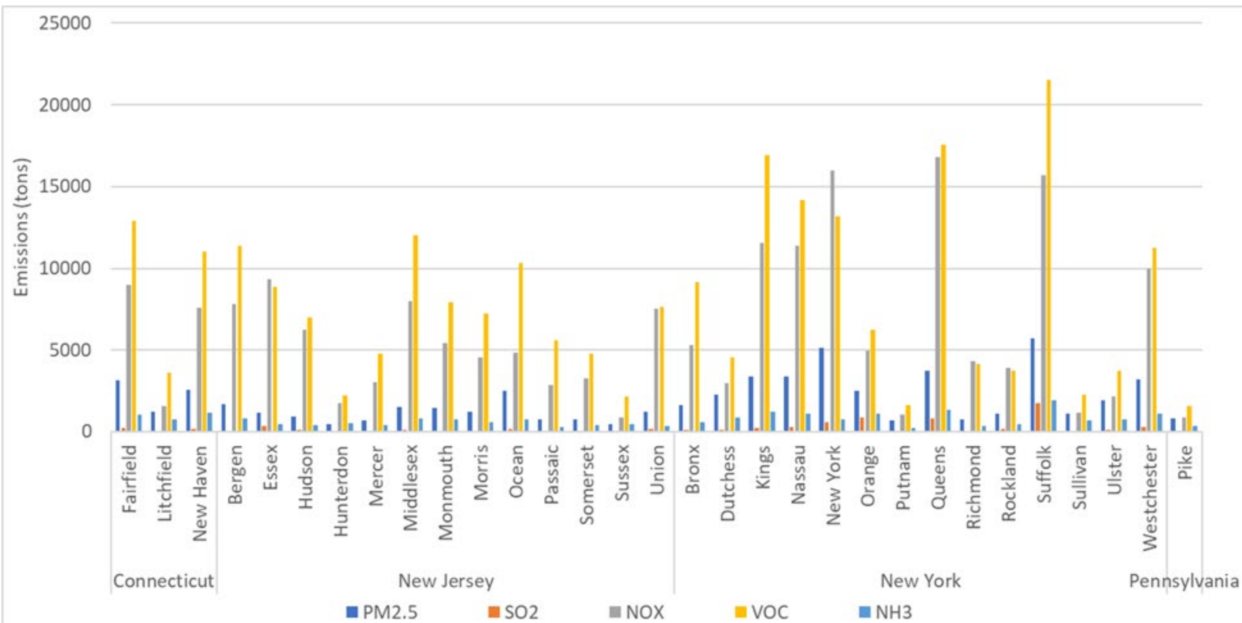


Table 2: 2022 Annual State Emissions of PM2.5 and its Precursors in the NY-NJ-CT-PA CSA

PM2.5								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)
CT	6,874	3.20	54	0.0253	33	0.0152	0	0
NJ	13,186	3.27	1,634	0.405	310	0.0767	0	0
NY	33,865	5.62	2,674	0.443	34	0.00569	0	0
PA	659	1.21	156	0.286	11	0.0193	0	0

SO_2								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)
CT	441	0.205	3	0.00121	2	0.000837	0	0
NJ	1,174	0.291	101	0.0250	18	0.00444	0	0
NY	5,298	0.879	185	0.0306	2	0.000381	0	0
PA	21	0.0384	10	0.0180	1	0.00110	0	0

NO_X								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)
CT	18,117	8.43	7	0.00312	4	0.00186	245	0.114
NJ	65,300	16.2	138	0.0341	27	0.00674	1,077	0.267
NY	106,748	17.7	498	0.0826	4	0.000713	982	0.163
PA	864	1.58	31	0.0573	1	0.00257	31	0.0576

VOC								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)
CT	27,409	12.7	77	0.0359	46	0.0212	28,691	13.3
NJ	89,429	22.2	2,471	0.613	458	0.114	58,631	14.5
NY	128,200	21.3	1,893	0.314	43	0.00705	75,028	12.4
PA	1,472	2.70	88	0.161	12	0.0220	8,235	15.1

NH_3								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)	Total (tpy)	Density (tpy/mi²)
CT	2,937	1.37	6	0.00265	1	0.000605	0	0
NJ	6,818	1.69	141	0.0350	19	0.00479	0	0
NY	11,521	1.91	931	0.154	2	0.000282	0	0
PA	292	0.536	46	0.0837	0	0.000551	0	0

Figure 9 and Table 3 show the 2022 annual emissions of PM2.5 species in the CSA. The PM2.5 species are the organic carbon, elemental carbon, nitrate, sulfate, and remaining fine particulate matter. The largest anthropogenic emissions, excluding fire emissions, in the CSA in order are OC, remaining fine particulate matter, EC, sulfate, and nitrate. Similar to PM2.5 and its precursors, the largest emission density of all PM2.5 species' emissions in the CSA in order is New York, New Jersey, Connecticut, and Pennsylvania, as shown in Table 3.

As mentioned in Section 1.4, the urban increment analysis shows that most EC and nitrate at the Elizabeth Lab monitor are local, most OM and crustal material are local although there is a moderate regional amount, and most sulfate is regional although there is a moderate local amount. Applying this analysis to the emissions described here can help in interpreting the impact of local emissions such as those from Union County compared to the more regional emissions. For example, as will be described in Section 2.1, most of the sulfate emissions are due to point sources. The sulfate emissions in Union County were larger compared to the emissions in other New Jersey counties; however, Elizabeth Lab is also close to New York, which has the largest density of sulfate emissions in the CSA.

Figure 9: 2022 Annual Emissions of PM2.5 Species in the NY-NJ-CT-PA CSA by County, Excluding Wildfires

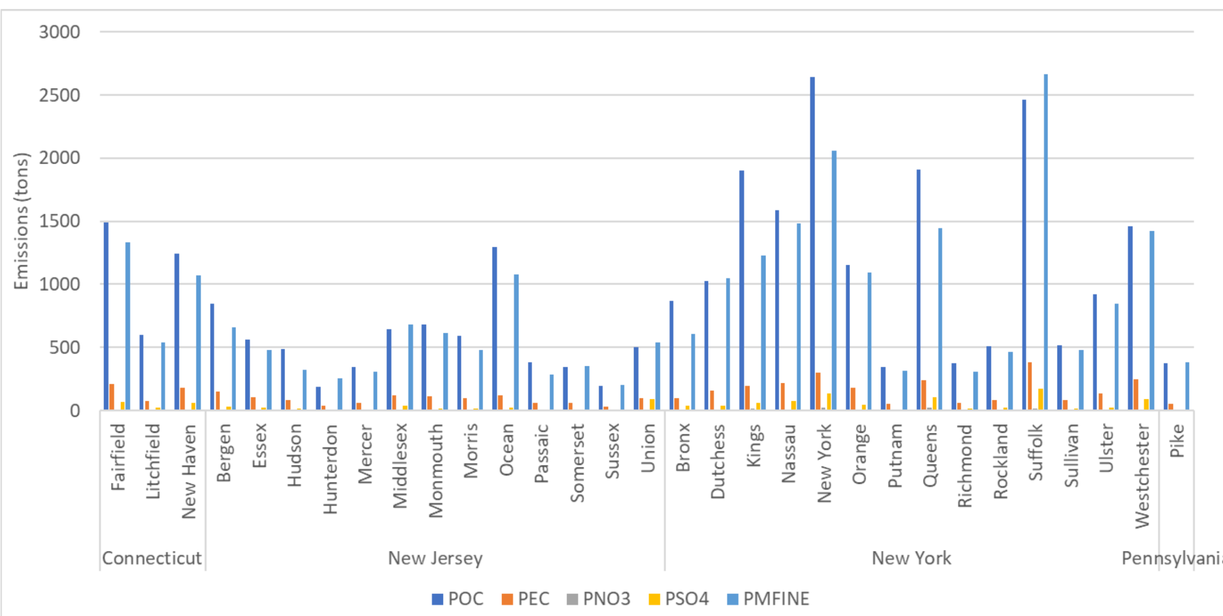


Table 3: 2022 Annual State Emissions of PM2.5 Species in the NY-NJ-CT-PA CSA

Particulate Organic Carbon								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
CT	3,309	1.54	30	0.0139	18	0.00847	0	0
NJ	6,174	1.53	905	0.224	173	0.0429	0	0
NY	16,532	2.74	1,150	0.191	19	0.00317	0	0
PA	306	0.562	65	0.119	6	0.0106	0	0

Particulate Elemental Carbon								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
CT	471	0.219	2	0.000977	1	0.000558	0	0
NJ	1,089	0.270	45	0.0112	9	0.00218	0	0
NY	2,172	0.360	242	0.0401	1	0.000199	0	0
PA	40	0.0738	15	0.0279	0	0.000734	0	0

Particulate Nitrate								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
CT	21	0.00995	0	0	0	0	0	0
NJ	58	0.0143	2	0.000397	0	0.0000496	0	0
NY	124	0.0206	8	0.00128	0	0	0	0
PA	1	0.00239	1	0.000918	0	0	0	0

Particulate Sulfate								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
CT	149	0.0693	0	0.000140	0	0.0000465	0	0
NJ	282	0.0698	5	0.00134	1	0.000174	0	0
NY	812	0.135	36	0.00589	0	0.0000166	0	0
PA	5	0.00954	2	0.00422	0	0	0	0

Remaining Fine Particulate Matter								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
CT	2,923	1.36	22	0.0103	13	0.00609	0	0
NJ	5,584	1.38	676	0.168	127	0.0314	0	0
NY	14,225	2.36	1,239	0.205	14	0.00229	0	0
PA	306	0.561	73	0.134	4	0.00771	0	0

Figures 10a through 10e show the 2022 annual emissions by emission sector and county in the CSA.

Figure 10a: 2022 Annual Emissions of PM2.5 in the NY-NJ-CT-PA CSA by County

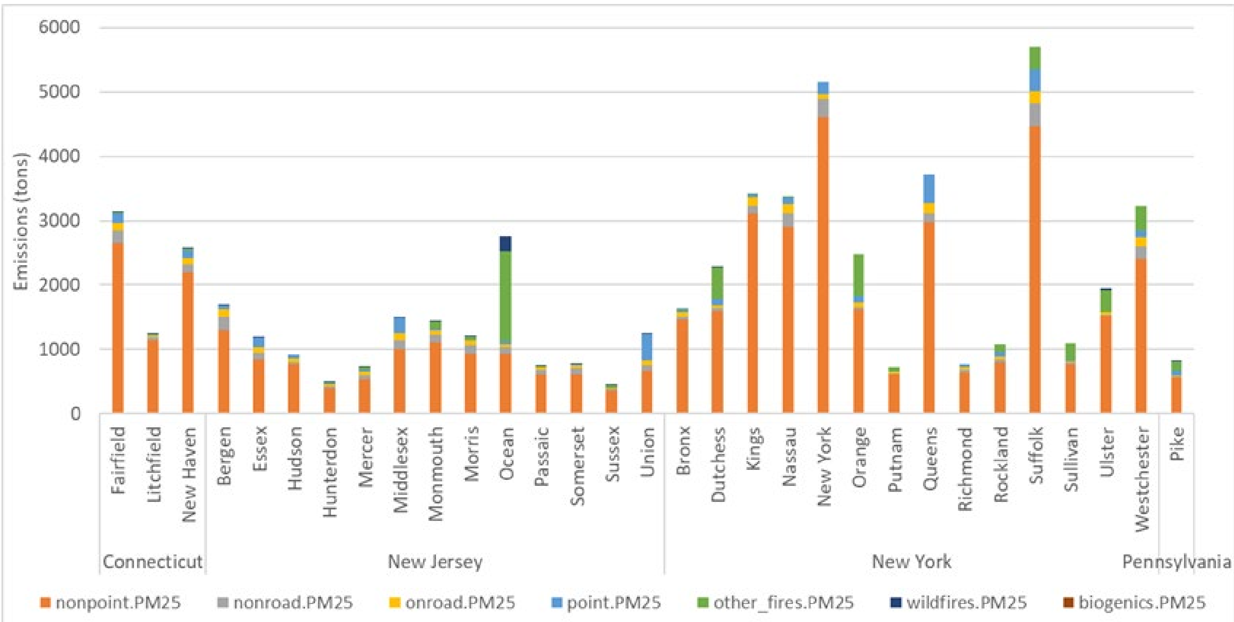


Figure 10b: 2022 Annual Emissions of SO_2 in the NY-NJ-CT-PA CSA by County

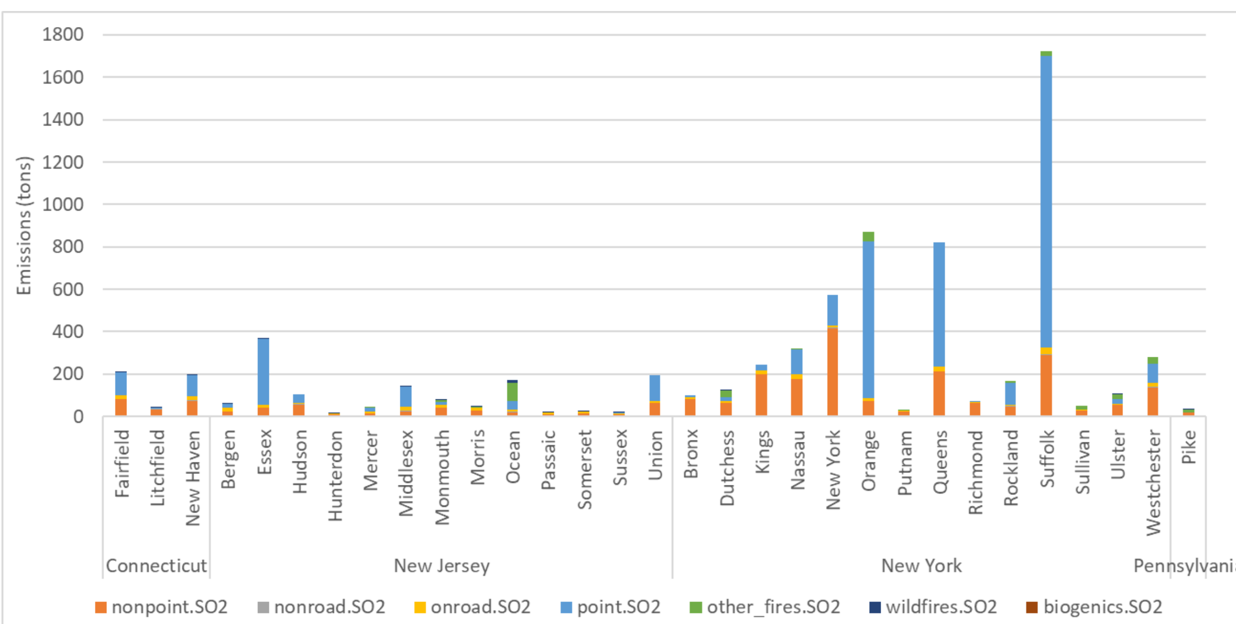


Figure 10c: 2022 Annual Emissions of NO_X in the NY-NJ-CT-PA CSA by County

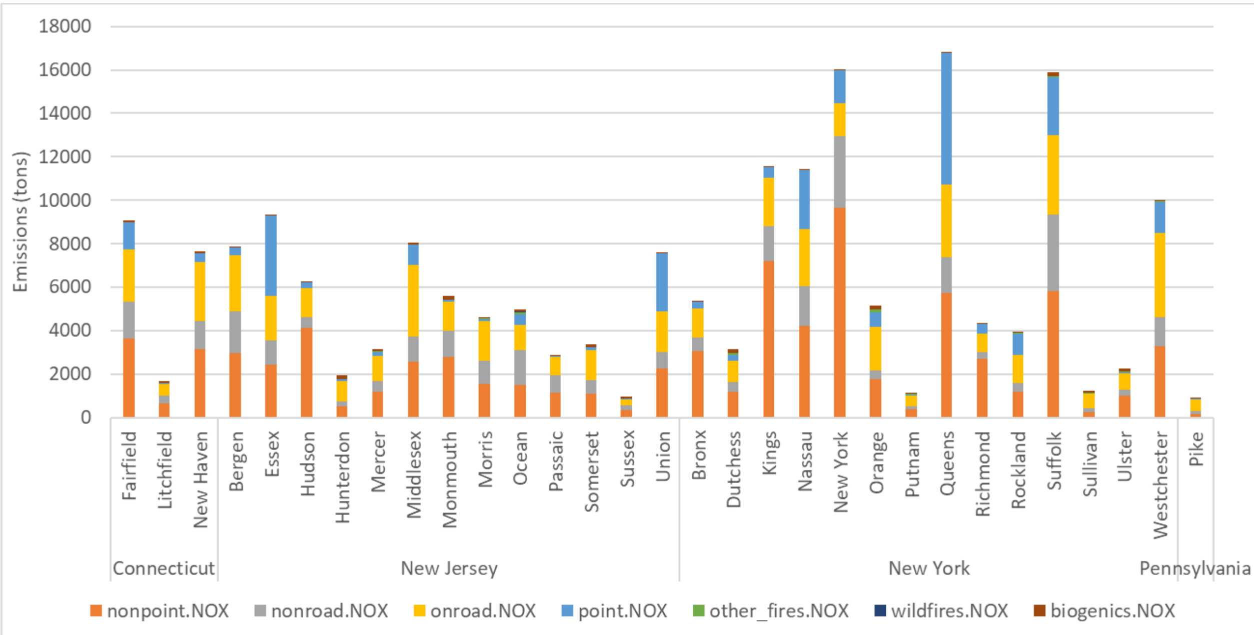


Figure 10d: 2022 Annual Emissions of VOCs in the NY-NJ-CT-PA CSA by County

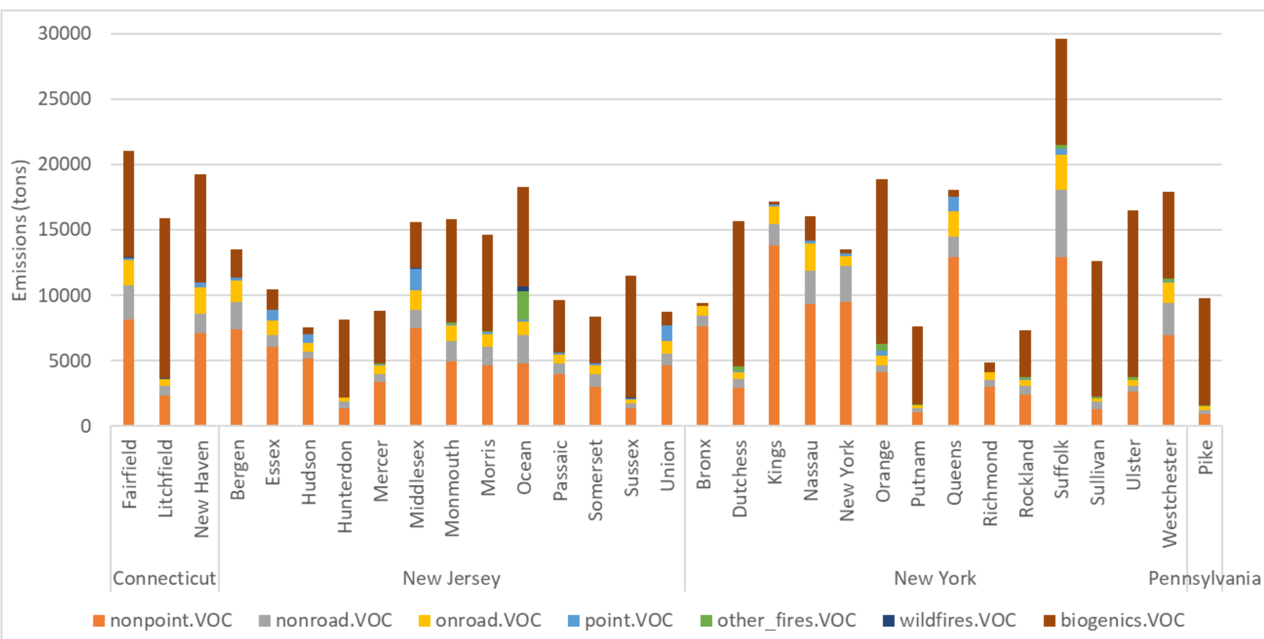
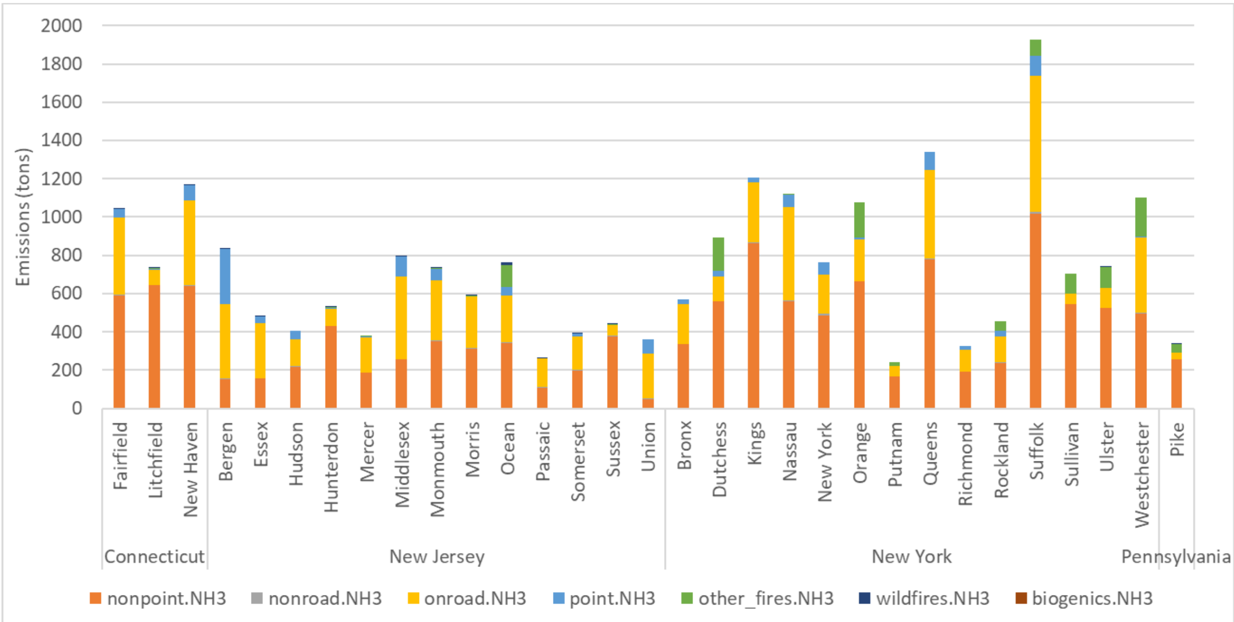


Figure 10e: 2022 Annual Emissions of NH_3 in the NY-NJ-CT-PA CSA by County



2.1 Point Source Emissions

As shown in Figure 10a through 10e above, NJ's point source emissions for all pollutants are overall significantly lower than the other state emissions and other sector emissions. There are several counties in NY with significant SO_2 emissions.

Point source emissions of PM2.5 are minimal across most counties in the CSA. Point sources are not the largest source of PM2.5 emissions for counties in the CSA. As USEPA notes, direct PM2.5 emissions generally contribute locally with less long-range transport.[18] The counties with the largest point source PM2.5 emission density in the CSA in order are New York County, NY at 8.4 tpy/mi^2, Queens County, NY at 4.1 tpy/mi^2, Union County, NJ at 4.0 tpy/mi^2, Hudson County, NJ at 1.3 tpy/mi^2, and Essex County, NJ at 1.2 tpy/mi^2.

The largest proportion of SO_2 emissions compared to the other sectors was from point sources in many counties in the CSA. The majority of SO_2 point source emissions in the CSA come from New York with 3240 tpy of point source SO_2 emissions, comprising 79% of the total point source SO_2 emissions in the CSA. The next largest proportion by state is New Jersey at 16%, then Connecticut at 6%, and then Pennsylvania at 0%. The counties with the largest SO_2 point source emission density are New York County, NY (6.3 tpy/mi^2), Queens County, NY (5.4 tpy/mi^2), Essex County, NJ (2.5 tpy/mi^2), Suffolk County, NY (1.5 tpy/mi^2), and Union County, NJ (1.2 tpy/mi^2).

Point sources were not the largest source of NO_X emissions for most counties in the CSA. The counties with the largest NO_X point source emission density are New York County, NY (67 tpy/mi^2), Queens County, NY (56 tpy/mi^2), Essex County, NJ (29 tpy/mi^2), Union County, NJ (26 tpy/mi^2), and Nassau County, NY (10 tpy/mi^2).

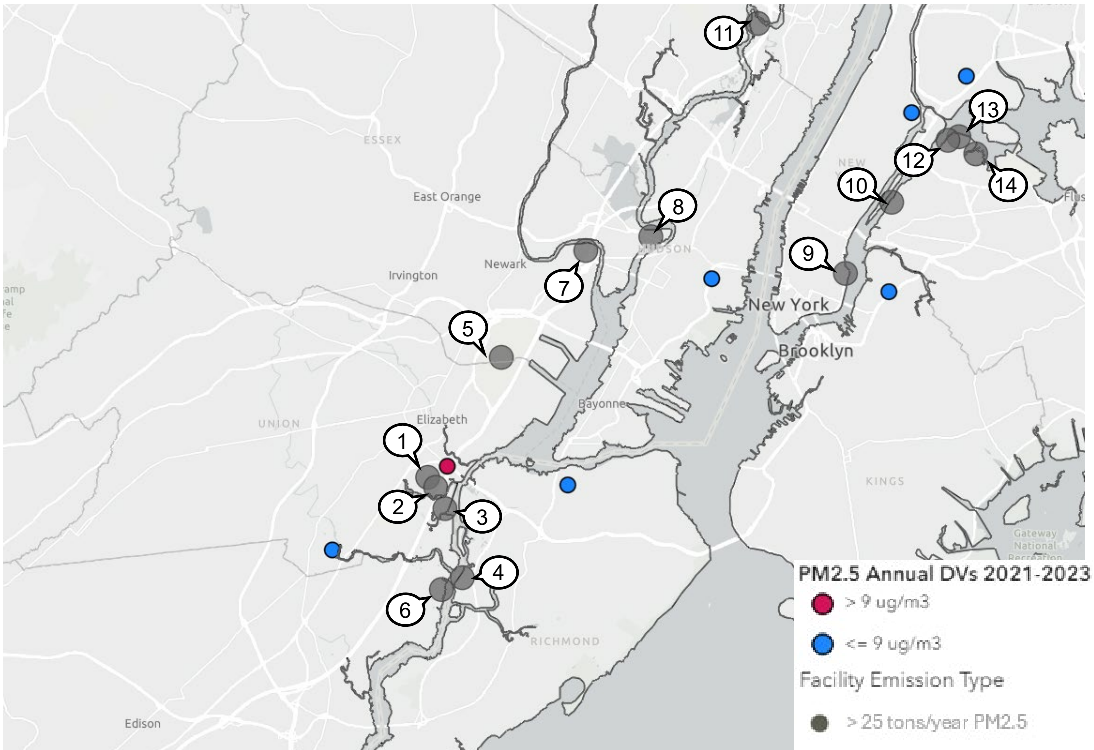
[18] Ibid.

Point source emissions for VOCs were minimal in most counties, averaging only 2% of all VOC emissions in a county and never making up more than 14% of the total VOC emissions in a county.

For most counties, point source emissions of NH_3 were also minimal, but some counties did have relatively larger proportion of NH_3 emissions coming from point sources. Bergen county, NJ had the highest ammonia emissions in the CSA. However, total emissions of NH_3 in the CSA remain low.

Figure 11a below shows point source facilities near New Jersey's Elizabeth Lab monitor with PM2.5 emissions greater than 25 tpy.

Figure 11a: Facilities Near Elizabeth Lab Monitor in New Jersey with 2022 PM2.5 Emissions Greater than 25 TPY[19]



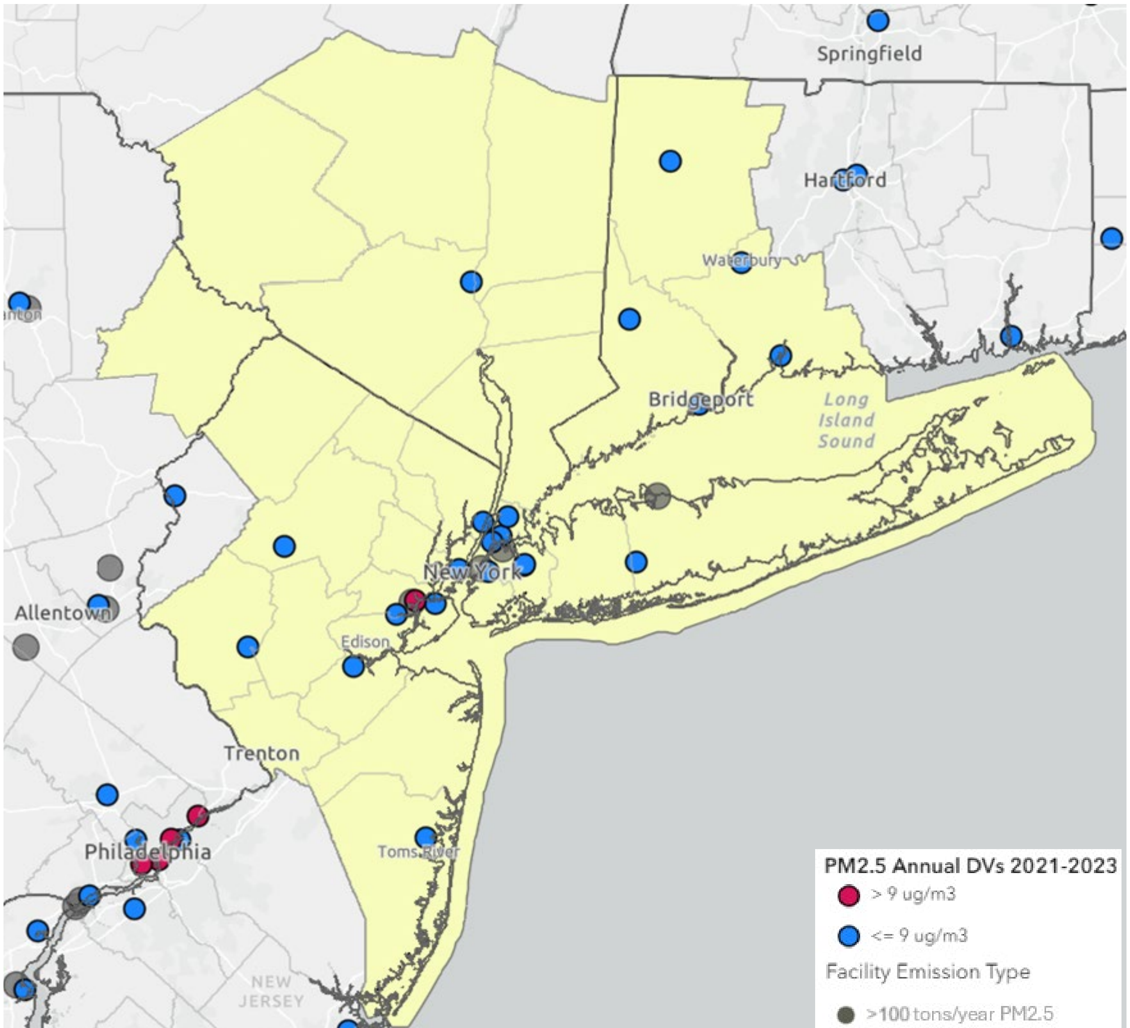
#	Facility Name	State	PM2.5 Emissions (tpy)	Distance from Monitor (mi)
1	Phillips 66 Bayway Refinery	NJ	213.7	0.7
2	Cogen Technologies Linden Venture, L.P.	NJ	95.8	0.7
3	Parkway Gen Operating LLC Linden Gen Station	NJ	48.6	1.3
4	Arthur Kill Generation Station	NY	39.8	3.5
5	Newark Liberty Intl	NJ	35.0	3.8
6	Kinder Morgan Liquids Terminals LLC	NJ	47.0	3.8
7	Covanta Essex Company	NJ	65.6	7.9
8	Owens Corning Kearny Plant	NJ	27.4	9.5
9	Con Ed-East River Generating Station	NY	121.8	13.7
10	Ravenswood Generating Station	NY	78.0	16.0
11	Bergen Generating Station	NJ	41.2	16.7
12	Astoria Generating Station	NY	38.1	18.5
13	Poletti Power Project	NY	57.7	18.8
14	Astoria Energy LLC & Astoria Energy II LLC	NY	159.5	19.0

As shown in Figure 11a, there are 14 facilities near the Elizabeth Lab, NJ monitor with PM2.5 emissions over 25 tpy, eight in NJ and six in NY.

Figures 11b through Figure 11f show the facilities in the NY-NJ-CT-PA CSA with emissions greater than 100 tpy for PM2.5, SO_2, NO_X, VOC, and ammonia.

[19] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/10/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

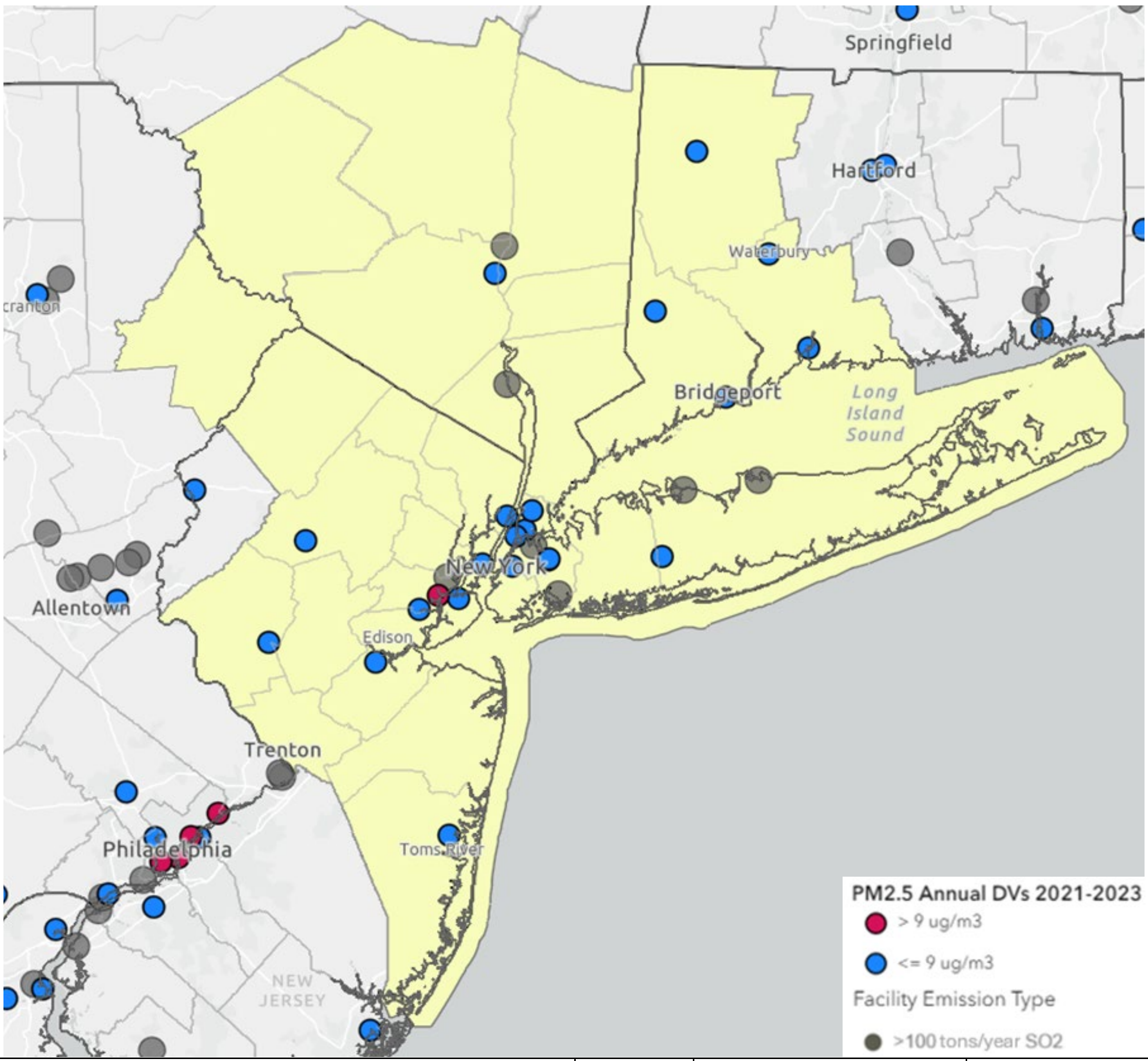
Figure 11b: Facilities in the NY-NJ-CT-PA CSA with 2022 PM2.5 Emissions Greater than 100 TPY [20]



Facility Name	State	PM2.5 Emissions (tpy)	Distance from NJ Monitor(mi)
Phillips 66 Bayway Refinery	NJ	213.7	0.7
Con Ed-East River Generating Station	NY	121.8	13.7
Astoria Energy LLC & Astoria Energy II LLC	NY	159.5	19.0
Northport Power Station	NY	205.6	49.3

[20] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/17/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

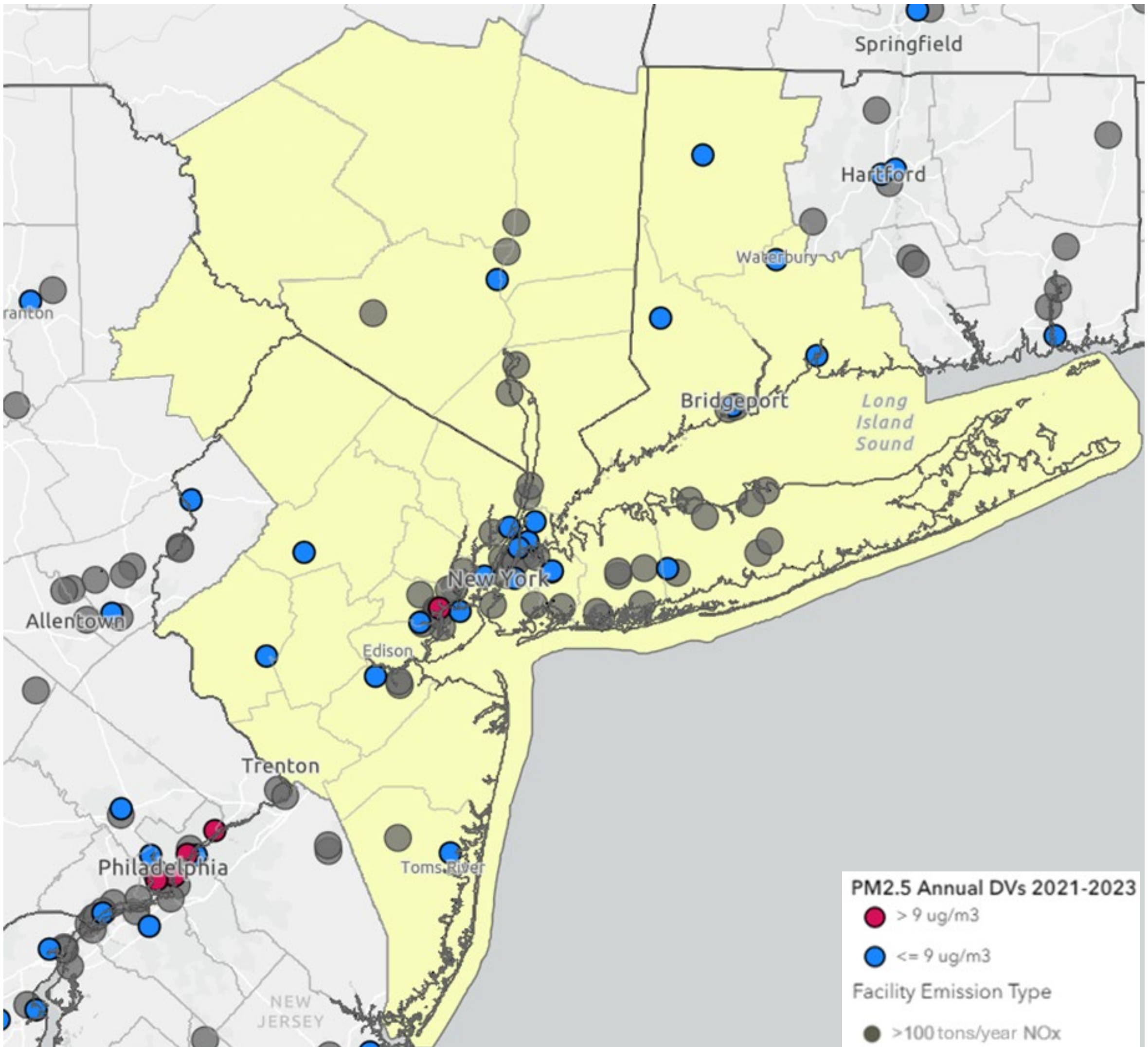
Figure 11c: Facilities in the NY-NJ-CT-PA CSA with 2022 SO_2 Emissions Greater than 100 TPY[21]



Facility Name	State	SO_2 Emissions (tpy)	Distance from NJ Monitor(mi)
Newark Liberty Intl	NJ	257.0	3.8
La Guardia	NY	154.3	19.9
John F Kennedy Intl	NY	374.4	22.2
Bowline Point Generating Station	NY	101.1	41.0
Northport Power Station	NY	994.6	49.3
Port Jefferson Power Station	NY	252.5	62.8
Roseton Generating Station	NY	719.2	65.4

[21] Ibid.

Figure 11d: Facilities in the NY-NJ-CT-PA CSA with 2022 NO_X Emissions Greater than 100 TPY[22]

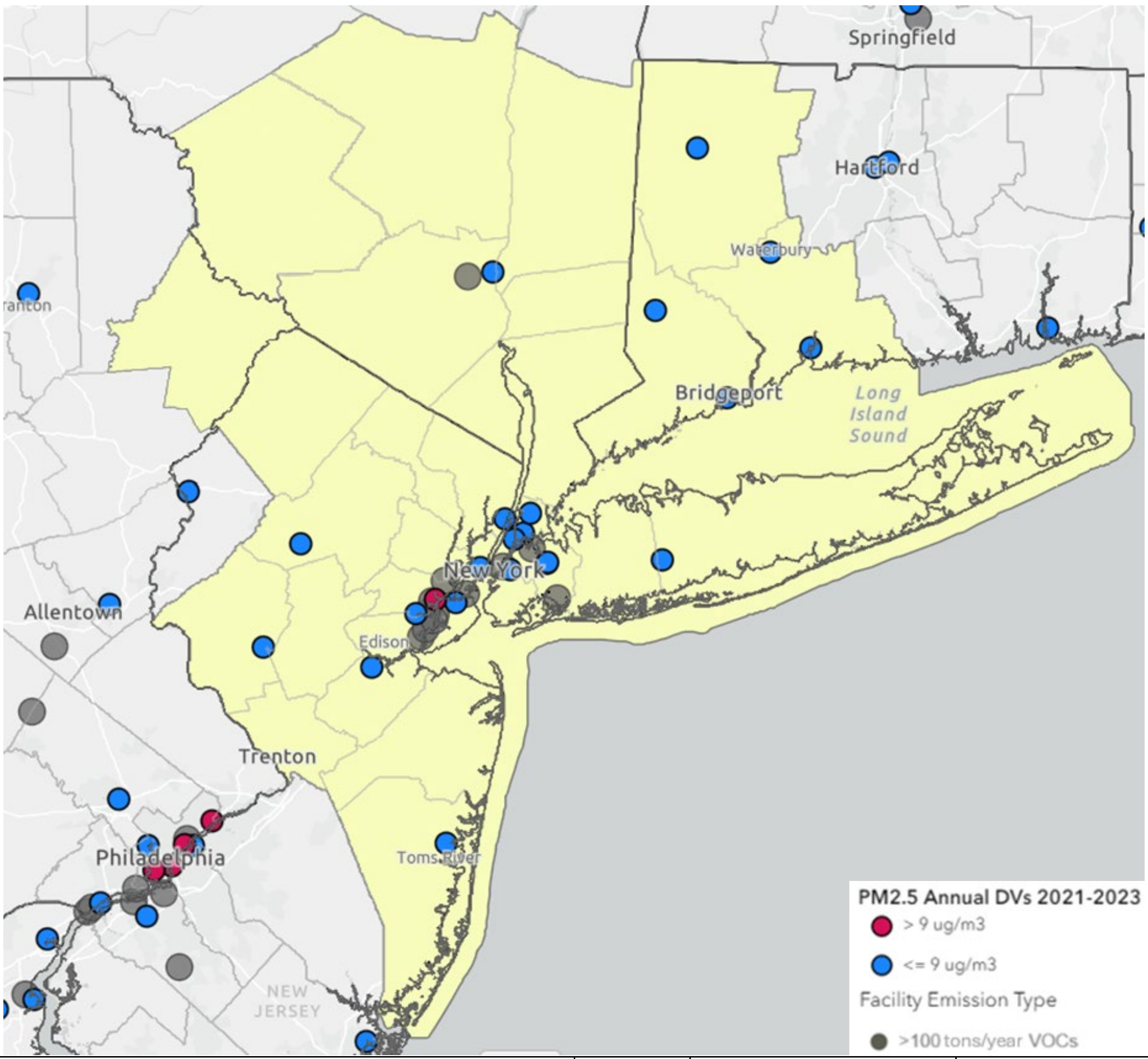


Facility Name	State	NO_X Emissions (tpy)	Distance from NJ Monitor(mi)
Phillips 66 Bayway Refinery	NJ	1007.3	0.7
Cogen Technologies Linden Venture, L.P.	NJ	466.2	0.7
Parkway Gen Operating LLC Linden Gen Station	NJ	190.5	1.3
Arthur Kill Generating Station	NY	433.4	3.5
Newark Liberty Intl	NJ	2366.4	3.8
Union County Resource Recovery Facility	NJ	658.6	4.1
EF Kenilworth LLC	NJ	119.0	4.3
Expressrail Newark	NJ	100.8	4.6
Covanta Essex Company	NJ	795.2	7.9
Narrows Generating Station	NY	152.8	9.7
Con Ed-East River Generating Station	NY	848.6	13.7
Con Ed-59th St Sta	NY	221.1	14.5
Red Oak Power LLC	NJ	121.8	15.2

22 Ibid.

Sayreville Power LP	NJ	228.8	15.7
Figure 11d (continued)			
Ravenswood Generating Station	NY	311.1	16.0
Con Ed-74th Street Sta	NY	172.4	16.1
Bergen Generating Station	NJ	179.7	16.7
Starrett City Power Plant	NY	104.5	17.2
Astoria Generating Station	NY	249.2	18.5
Astoria Energy LLC & Astoria Energy II LLC	NY	176.6	19.0
La Guardia	NY	1281.5	19.9
John F Kennedy Intl	NY	3641.8	22.2
American Sugar Refining Company Inc	NY	195.1	25.7
Saint Johns Riverside Hospital	NY	166.7	27.6
Nassau County Sd 2 Bay Park Stp	NY	172.7	28.6
Ef Barrett Power Station	NY	1063.3	29.4
Trigen Centrl Utility Plt - Mitchl Field	NY	155.5	33.0
Hempstead Resource Recovery Facility	NY	1035.9	33.1
Cedar Creek Wpcp	NY	138.8	36.8
TBG Cogen Facility	NY	118.9	37.9
Bowline Point Generating Station	NY	876.4	41.0
Lakehurst Naes /Maxfield Field	NJ	317.7	42.6
Babylon Resource Recovery Facility	NY	205.0	43.5
Wheelabrator Westchester LP	NY	911.4	46.1
Northport Power Station	NY	1019.2	49.3
Huntington Resource Recovery Facility	NY	364.5	50.9
CPV Valley Energy Center	NY	106.5	54.6
Islip Mcarthur Resource Recovery Facil	NY	143.0	58.6
Nissequogue Cogen Partners Plant	NY	122.2	59.6
Holtsville Gt Facility	NY	141.1	61.0
Port Jefferson Power Station	NY	157.2	62.8
Wheelabrator Bridgeport LP	CT	960.6	63.4
Bridgeport Energy LLC	CT	174.7	64.7
Roseton Generating Station	NY	450.2	65.4
Dutchess Co Resource Recovery Facility	NY	141.0	70.9

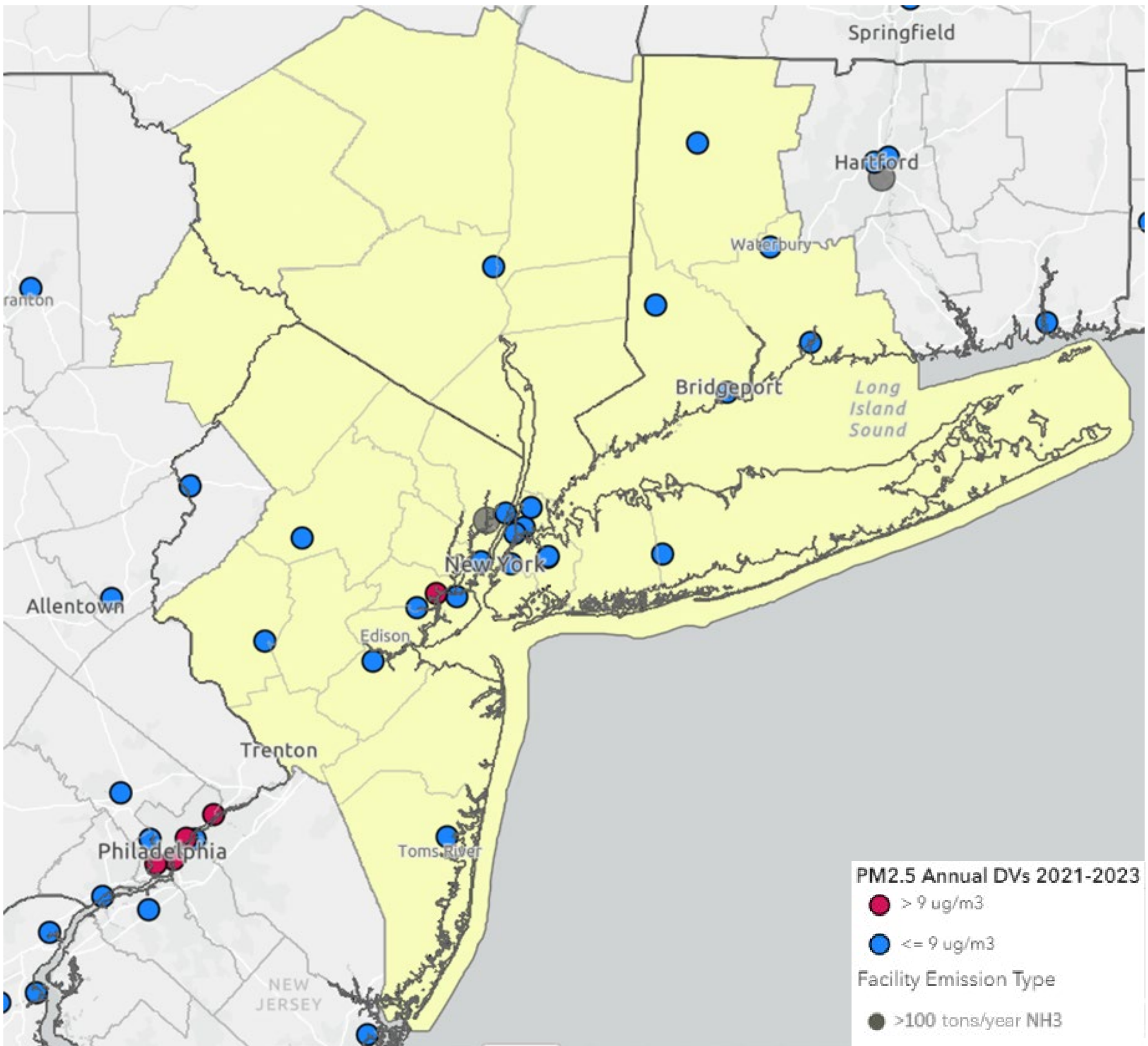
Figure 11e: Facilities in the NY-NJ-CT-PA CSA with 2022 VOC Emissions Greater than 100 TPY[23]



Facility Name	State	VOC Emissions (tpy)	Distance from NJ Monitor(mi)
Phillips 66 Bayway Refinery	NJ	534.6	0.7
Citgo Petroleum Corp Linden Terminal	NJ	102.5	2.8
Linden Station - Buckeye Pipe Line Co., L.P.	NJ	142.9	2.9
Newark Liberty Intl	NJ	460.5	3.8
Kinder Morgan Liquids Terminals LLC	NJ	308.1	3.8
Imtt-Bayonne LLC	NJ	545.9	5.7
Buckeye Port Reading Terminal LLC	NJ	228.0	5.7
Sewaren Terminal	NJ	201.8	7.3
Con Ed-East River Generating Station	NY	117.7	13.7
La Guardia	NY	194.7	19.9
John F Kennedy Intl	NY	720.7	22.2
Metal Container Corp	NY	135.6	58.8

23 Ibid.

Figure 11f: Facilities Near in the NY-NJ-CT-PA CSA with 2022 NH_3 Emissions Greater than 100 TPY[24]



Facility Name	State	NH_3 Emissions (tpy)	Distance from NJ Monitor(mi)
Bergen Cnty Util Auth Waste Water Trtmt Plant	NJ	273.2	16.2

As shown in figures 11b through 11f, there are four facilities in the CSA with PM2.5 emissions over 100 tpy, one in NJ and three in NY. There are seven facilities in the CSA with SO_2 emissions over 100 tpy, one in NJ and six in NY. Two of the facilities in NY are over 500 tpy. There are 45 facilities in the CSA with NO_X emissions over 100 tpy, two in CT, 12 in NJ, and 31 in NY. There are 12 facilities in the CSA with VOC emissions over 100 tpy, four in NY and eight in NJ. There is one facility in in the CSA with ammonia emission over 100 tpy in NJ.

[24] Ibid.

2.2 Nonpoint Emissions

As shown in Figure 10a through 10e, nonpoint emissions (area, commercial marine vessel, and underway rail) are the largest anthropogenic source of 2022 annual emissions in most counties for all of the PM2.5 pollutants except SO_2 and NO_X in some counties.

The nonpoint sector is the largest source of PM2.5 emissions compared to the other sectors in 30 of the 31 CSA counties. The largest nonpoint categories in New Jersey include residential wood burning, commercial cooking, paved road emissions, and construction equipment. Please note, these pre-modeling paved fugitive dust road emissions represent very localized emissions and are reduced significantly in the modeling to adjust for lack of transport of fugitive dust emissions. The high level of fugitive dust emissions does not correlate to the crustal component in the monitoring data, which is significantly smaller. Ocean County, NJ is the only county where the nonpoint sector is the second largest source of PM2.5 emissions, and that is due to the large, “other fire” sector (fires other than wildfires including prescribed and agricultural), which is discussed below in Section 2.4.

The nonpoint sector is the largest source of SO_2 emissions in 20 of the 31 CSA counties, as shown in Figure 10b. The largest nonpoint categories in New Jersey include commercial marine vessels, incineration residential gas combustion in New Jersey. In the 10 counties where the nonpoint sector is the second largest source of SO_2 emissions, the largest sector is point and the total SO_2 emissions are generally larger. These 10 counties include Fairfield County, CT; New Haven County, CT; Essex County, NJ; Mercer County, NJ; Middlesex County, NJ; Union County, NJ; Orange County, NY; Queens County, NY; Rockland County, NY; and Suffolk County, NY. Although there are more counties with larger nonpoint source SO_2 emissions than point source, the large point source emissions in these counties result in the total point source SO_2 emissions in the CSA to be larger than the total nonpoint source. Ocean County, NJ is the only county where nonpoint is the third largest sector, which is due to the large, “other fire” sector. All of the states in the area have adopted a low sulfur fuel oil rule.

The nonpoint sector is also a large source for NO_X emissions, as shown in Figure 10c. The largest nonpoint categories in New Jersey include residential and commercial natural gas and distillate combustion. The nonpoint sector is the largest source of NO_X emissions in 16 of the 31 CSA counties; however, when nonroad and onroad are grouped together as mobile sources, nonpoint is larger than the mobile sector in only seven of the 31 CSA counties. There are also three counties where the largest sector is point source, including Essex County, NJ; Union County, NJ; and Queens County, NY. In these counties, nonpoint is the second largest source of NO_X emissions.

The nonpoint sector is the largest source of anthropogenic VOC emissions in all 31 CSA counties, as shown in Figure 10d. This is due to many sources of annual emissions including consumer products, paints and coatings, solvent degreasing, graphic arts, gasoline evaporation at gas stations, and residential wood burning.

The nonpoint sector is the largest source of NH_3 emissions in 26 of the 31 CSA counties, as shown in Figure 10e. This is due primarily to emissions from animals and fertilizer. Nonpoint was either the second largest or third largest sector in the five other counties. It was the second largest behind onroad in Essex County, NJ; Middlesex County, NJ; and Passaic County, NJ. It was the third largest behind onroad and point in Bergen County, NJ and Union County, NJ.

The nonpoint sector is also usually the largest source of emissions for all of the PM2.5 speciated components. It is the largest source of OC in all of the CSA counties except for Ocean

County, NJ, where it ranks second to other fires. It is the largest source of EC in 29 of the 31 counties; Bergen County, NJ has a larger nonroad EC sector, and Middlesex County, NJ has a larger onroad EC sector. However, the combined mobile sector EC emissions are larger than the nonpoint sector emissions in 11 of the 31 counties. Nonpoint nitrate emissions were the largest sector in 30 of the 31 counties. Point source nitrate emissions were larger in only Union County, NJ, where the nonpoint sector ranked the second largest sector. Nonpoint source sulfate emissions were the largest sector in 28 of the 31 counties. Point source sulfate emissions were larger in Essex County, NJ; Middlesex County, NJ; and Union County, NJ. Nonpoint is the largest sector for the remaining fine particulates in all of the CSA counties except for Ocean County, NJ, where it ranks second to other fires.

Population is evaluated below, as it is used to estimate emissions for many of the nonpoint sources.

2.2.1 Population Density and Degree of Urbanization

Population, population density, and estimated population change based on the 2020 Census are included in Table 4, Figure 12, and Figure 13 below. The largest county populations and population densities within the CSA are in New York, with the New York City counties as the largest by far. The top seven most populated counties are in New York and make up over half of the total population in the CSA. The counties with the largest population density in the CSA are New York County, NY (74,781 people/mi^2), Kings County, NY (39,438 people/mi^2), Bronx County, NY (34,920 people/mi^2), Queens County, NY (22,125 people/mi^2), and Hudson County, NJ (15,692 people/mi^2).

Union County has the 15th largest population and 8th densest population out of the 30 counties and planning regions in the CSA, which corresponds to 2.6% of the total population in the CSA. Many nearby New Jersey counties have a similar population, ranging from around half a million to around a million.

The 2023 population estimates compared to the 2020 Census population decreased slightly or remained mostly the same in most counties. Six New Jersey counties were estimated to decrease and four were estimated to increase one percent or less. Only two of the New Jersey counties, Ocean and Sussex, showed an estimated increase greater than 1%. Sussex County has a low population and population density, while Ocean County has a moderate population and low population density. Both have a low percent urban area, as shown in Table 5, with Sussex County at 9% and Ocean County at 40%. Similarly, New York only has two counties, Orange and Sullivan, with estimated increases in population from 2020 to 2023 greater than one percent, and both have a low to moderate population and low population density. The densest New York counties were estimated to have some of the largest percent decreases from 2020 to 2023 in population, with Bronx at -9%, Kings at -7%, New York at -6%, and Queens at -7%.

Table 4: 2020 Census Population, Population Density, and Estimated Population Change to 2023 in the NY-NJ-CT-PA CSA[25]

State	County	2020 Census Population Density (pop/mi^2)	2020 Census Population	2023 Population Estimates, July 1[26]	Change 2020-2023	Percent Change 2020-2023
Connecticut	Greater Bridgeport PR**	2,324	325,778	327,651	1,873	0.57%
Connecticut	Western Connecticut PR**	1,166	620,549	623,907	3,358	0.54%
New Jersey	Bergen*	4,106	955,732	957,736	2,004	0.21%
New Jersey	Essex*	6,850	863,728	851,117	-12,611	-1.48%
New Jersey	Hudson*	15,692	724,854	705,472	-19,382	-2.75%
New Jersey	Hunterdon	301	128,947	130,183	1,236	0.95%
New Jersey	Mercer*	1,726	387,340	381,671	-5,669	-1.49%
New Jersey	Middlesex*	2,791	863,162	863,623	461	0.05%
New Jersey	Monmouth*	1,375	643,615	642,799	-816	-0.13%
New Jersey	Morris*	1,105	509,285	514,423	5,138	1.00%
New Jersey	Ocean	1,014	637,229	659,197	21,968	3.33%
New Jersey	Passaic*	2,818	524,118	513,395	-10,723	-2.09%
New Jersey	Somerset*	1,144	345,361	348,842	3,481	1.00%
New Jersey	Sussex	278	144,221	146,132	1,911	1.31%
New Jersey	Union*	5,599	575,345	572,726	-2,619	-0.46%
New York	Bronx*	34,920	1,472,654	1,356,476	-116,178	-8.56%
New York	Dutchess	372	295,911	297,150	1,239	0.42%
New York	Kings*	39,438	2,736,074	2,561,225	-174,849	-6.83%
New York	Nassau*	4,905	1,395,774	1,381,715	-14,059	-1.02%
New York	New York*	74,781	1,694,251	1,597,451	-96,800	-6.06%
New York	Orange*	494	401,310	407,470	6,160	1.51%
New York	Putnam	424	97,668	98,060	392	0.40%
New York	Queens*	22,125	2,405,464	2,252,196	-153,268	-6.81%
New York	Richmond*	8,618	495,747	490,687	-5,060	-1.03%
New York	Rockland*	1,951	338,329	340,807	2,478	0.73%
New York	Suffolk*	1,675	1,525,920	1,523,170	-2,750	-0.18%
New York	Sullivan	81	78,624	79,920	1,296	1.62%
New York	Ulster	162	181,851	182,333	482	0.26%
New York	Westchester*	2,332	1,004,457	990,817	-13,640	-1.38%
Pennsylvania	Pike	107	58,535	61,247	2,712	4.43%

* Counties previously in nonattainment for the 1997 PM2.5 NAAQS of 15 µg/m^3.
** This table lists Connecticut Planning Regions, but the 1997 PM2.5 NAAQS area used counties, specifically Fairfield County, CT and New Haven County, CT. The two planning regions in the table include most of Fairfield County, CT and a small portion of Litchfield County, CT.

[25] United States Census Bureau. Urban and Rural: County-level Urban and Rural information for the 2020 Census, September 2023. Retrieved 3/11/2024 from https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html
[26] United States Census Bureau. QuickFacts. https://www.census.gov/quickfacts/fact/table

Figure 12: County Population in the NY-NJ-CT-PA CSA

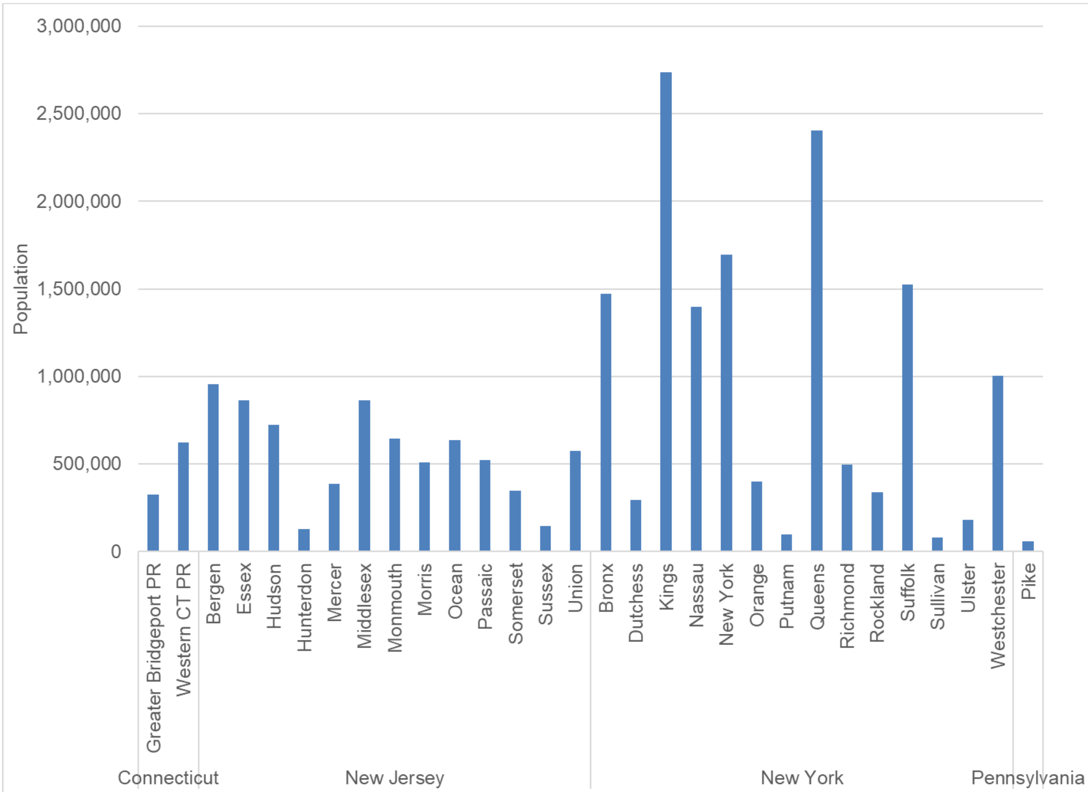
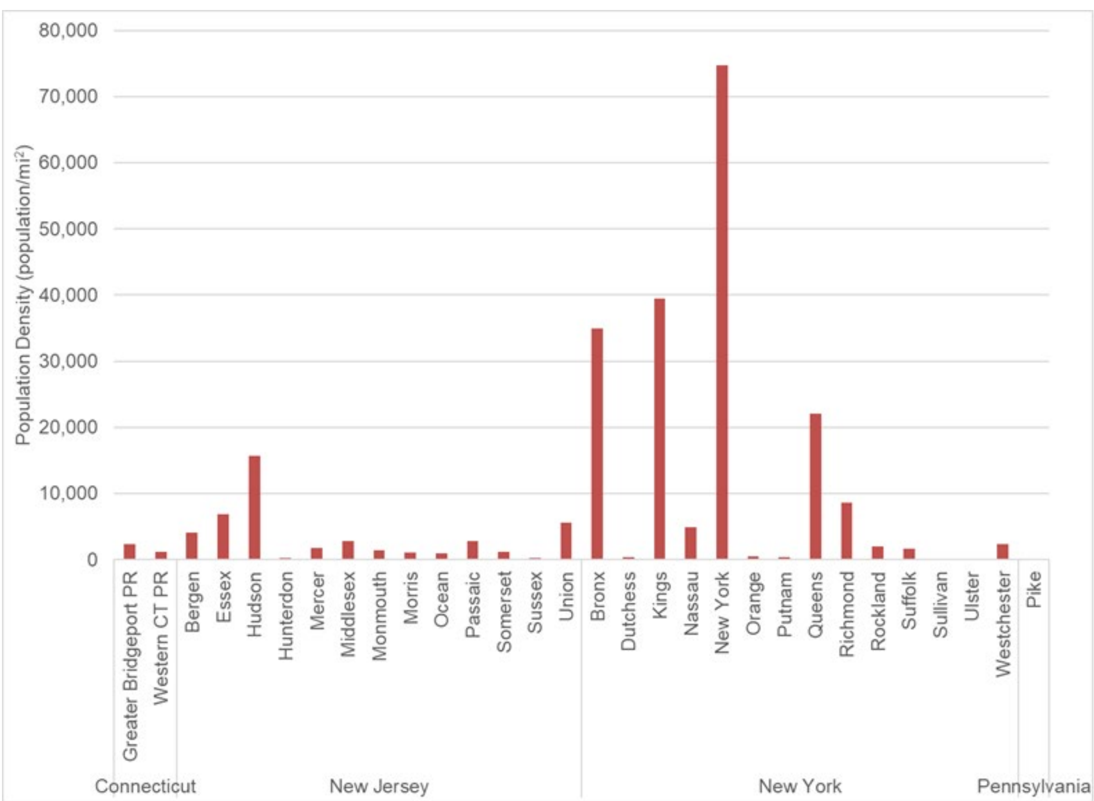


Figure 13: County Population Density in the NY-NJ-CT-PA CSA



As shown in Table 5, many of the counties in the northern CSA have a large percentage of urban land. In 21 of the 30 counties/planning regions in the CSA, at least 50% of the county's land area is urban. Union County is 100% urban, and the counties directly surrounding it are also heavily urban. The counties with the highest percent urban land area are Hudson County, NJ (100%), Union County, NJ (100%), New York County, NY (100%), Richmond County, NY (99%), and Essex County, NJ (97%). The counties with the largest urban population density are New York County, NY; Kings County, NY; Bronx County, NY; Queens County, NY; and Hudson County, NJ.

Table 5: Population, Land Area, and Degree of Urbanization in the NY-NJ-CT-PA CSA[27]

State	County/ Planning Region (PR)	2020 Population	Land Area (mi^2)	2020 Urban Population Density	Percent Urban Land Area	Percent County Population within Urban Blocks
Connecticut	Greater Bridgeport PR	325,778	140	3,143	71.8%	97%
Connecticut	Western Connecticut PR	620,549	532	1,840	58.0%	92%
New Jersey	Bergen	955,732	233	4,402	93%	100%
New Jersey	Essex	863,728	126	7,047	97%	100%
New Jersey	Hudson	724,854	46	15,692	100%	100%
New Jersey	Hunterdon	128,947	428	1,412	9%	42%
New Jersey	Mercer	387,340	224	2,942	56%	95%
New Jersey	Middlesex	863,162	309	3,470	80%	99%
New Jersey	Monmouth	643,615	468	2,209	59%	95%
New Jersey	Morris	509,285	461	1,933	52%	91%
New Jersey	Ocean	637,229	628	2,472	40%	96%
New Jersey	Passaic	524,118	186	5,522	50%	97%
New Jersey	Somerset	345,361	302	1,890	56%	92%
New Jersey	Sussex	144,221	519	1,616	9%	51%
New Jersey	Union	575,345	103	5,599	100%	100%
New York	Bronx	1,472,654	42	37,103	94%	100%
New York	Dutchess	295,911	796	1,481	17%	68%
New York	Kings	2,736,074	69	40,750	97%	100%
New York	Nassau	1,395,774	285	5,671	86%	100%
New York	New York	1,694,251	23	74,781	100%	100%
New York	Orange	401,310	812	1,974	18%	72%
New York	Putnam	97,668	230	1,234	22%	65%
New York	Queens	2,405,464	109	23,174	95%	100%
New York	Richmond	495,747	58	8,743	99%	100%
New York	Rockland	338,329	173	2,774	70%	100%
New York	Suffolk	1,525,920	911	2,309	71%	98%
New York	Sullivan	78,624	968	1,518	1%	25%
New York	Ulster	181,851	1,124	1,556	5%	44%
New York	Westchester	1,004,457	431	3,769	59%	95%
Pennsylvania	Pike	58,535	545	719	2%	13%

[27] United States Census Bureau Urban and Rural: County-level Urban and Rural information for the 2020 Census, September 2023. Retrieved 3/11/2024 from https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html, https://www2.census.gov/geo/docs/reference/ua/2020_UA_COUNTY.xlsx

2.3 Mobile Emissions

Please note, the nonroad mobile emissions in this dataset do not include commercial marine vessel, aircraft or railroad emissions. Nonroad emissions are those from USEPA's MOVES/Nonroad model only.

Mobile sources (onroad and nonroad model combined) emit 83,144 tpy of NO_X, 70,766 tpy of VOC, 7,607 tpy of NH_3, 5,433 tpy of PM2.5 and 394 tpy of SO_2 in the CSA in the estimated 2022 annual inventory. Mobile emissions account for 43% of the total NO_X emissions in the CSA, 33% of the total NH_3 emissions in the CSA, 17% of the total VOC emissions in the CSA, 9% of the total PM2.5 emissions in the CSA, and 5% of the total SO_2 emissions in the CSA. Specifically, onroad sources emit 51,968 tpy of NO_X, 30,658 tpy of VOC, 7,512 tpy of NH_3, 2,291 tpy of PM2.5, and 354 tpy of SO_2. Nonroad sources emit 40,108 tpy of VOC, 31,176 tpy of NO_X, 3,142 tpy of PM2.5, 94 tpy of NH_3, and 41 tpy of SO_2.

Onroad and nonroad model mobile emissions combined are the largest source of NO_X emissions in the estimated 2022 annual inventory for 24 of the 31 CSA counties. The seven other counties are Hudson County, NJ; Monmouth County, NJ; Bronx County, NY; Kings County, NY; New York County, NY; Queens County, NY; and Richmond County, NY. Onroad NO_X emissions are larger than nonroad for all counties in the CSA except Ocean County, NJ and New York County, NY. Onroad is the largest source of NO_X emissions in 12 of the 31 counties, including in Hunterdon County, NJ; Mercer County, NJ; Middlesex County, NJ; Morris County, NJ; Ocean County, NJ; Somerset County, NJ; Orange County, NY; Putnam County, NY; Rockland County, NY; Sullivan County, NY; Westchester County, NY; and Pike County, PA. The counties with the densest mobile source NO_X emissions in the CSA are New York County, NY (212 tpy/mi^2), Kings County, NY (55 tpy/mi^2), Bronx County, NY (47 tpy/mi^2), Queens County, NY (46 tpy/mi^2), and Hudson County, NJ (39 tpy/mi^2).

Mobile emissions are the second largest sector of anthropogenic VOC emissions for all counties in the CSA. The counties with the largest proportion of total VOC emissions attributable to the combined mobile sector are Nassau County, NY (29%), Bergen County, NJ (28%), Suffolk County, NY (26%), New York County, NY (26%), and Richmond County, NY (23%). The counties with the largest proportion of anthropogenic VOC emissions attributable to the combined mobile sector are Pike County, PA (37%), Sullivan County, NY (37%), Suffolk County, NY (36%), Westchester County, NY (35%), and Fairfield County, CT (35%). The counties with the densest mobile source VOC emissions in the CSA are New York County, NY (153 tpy/mi^2), Kings County, NY (42 tpy/mi^2), Bronx County, NY (37 tpy/mi^2), Queens County, NY (32 tpy/mi^2), and Hudson County, NJ (27 tpy/mi^2). 22 of the 31 counties in the CSA had larger nonroad VOC emissions than onroad VOC emissions.

Onroad NH_3 emissions are the second largest sector of emissions for 22 of the 31 counties in the CSA. Onroad NH_3 emissions are the largest sector for five of the 31 counties, including Bergen County, NJ; Essex County, NJ; Middlesex County, NJ; Passaic County, NJ; and Union County, NJ. Onroad emissions are the third largest sector, behind nonpoint and other fires, in Dutchess County, NY; Sullivan County, NY; Ulster County, NY; and Pike County, PA. Nonroad emissions are a small sector for NH_3 emissions, making up only 0% or 1% of the county NH_3 emissions for all counties in the CSA. The counties with the densest mobile source NH_3 emissions in the CSA are New York County, NY (9.5 tpy/mi^2), Bronx County, NY (4.9 tpy/mi^2), Kings County, NY (4.6 tpy/mi^2), Queens County, NY (4.3 tpy/mi^2), and Hudson County, NJ (3.1 tpy/mi^2).

Mobile sources were the second largest sector of PM2.5 emissions in 20 of the 31 CSA counties. Mobile sources were the third largest in eight counties, including Union County, NJ; Orange County, NY; Putnam County, NY; Queens County, NY; Rockland County, NY; Sullivan County, NY; Ulster County, NY; and Westchester County, NY. In Union County and Queens County, the PM2.5 mobile source emissions were less than the point source emissions. For the other six counties, the second largest sector was other fires. Mobile sources were fourth largest in three counties, including Ocean County, NJ; Dutchess County, NY; and Pike County, PA. Point sources and other fire emissions were larger in Dutchess County and Pike County, while other fire and wildfire were larger in Ocean County. In 20 of the 31 CSA counties, nonroad PM2.5 emissions were larger than onroad. However, most of the New York counties in the CSA do not follow this trend, with nine of the 14 New York counties having larger onroad PM2.5 emissions than nonroad. The counties in the CSA with larger onroad PM2.5 emissions than nonroad are Hudson County, NJ; Bronx County, NY; Kings County, NY; Orange County, NY; Putnam County, NY; Queens County, NY; Richmond County, NY; Rockland County, NY; Sullivan County, NY; Ulster County, NY; and Pike County, PA. The counties with the densest mobile source PM2.5 emissions in the CSA are New York County, NY (15.5 tpy/mi^2), Kings County, NY (3.6 tpy/mi^2), Bronx County, NY (2.9 tpy/mi^2), Queens County, NY (2.8 tpy/mi^2), and Hudson County, NJ (2.1 tpy/mi^2).

Mobile source emissions of SO_2 are not large in the CSA overall. Mobile sources are the second largest sector in nine of the 31 counties, the third largest sector of SO_2 emissions in 16 of the counties, the fourth largest in five counties, and the fifth largest in one county. Onroad SO_2 emissions are larger than nonroad SO_2 emissions in all of the counties in the CSA. The counties with the densest mobile source SO_2 emissions in the CSA are New York County, NY (0.6 tpy/mi^2), Bronx County, NY (0.3 tpy/mi^2), Kings County, NY (0.3 tpy/mi^2), Queens County, NY (0.2 tpy/mi^2), and Hudson County, NJ (0.2 tpy/mi^2).

As previously mentioned, mobile source emissions of PM2.5 were relatively minor, accounting for only 9% of the total PM2.5 emissions in the CSA even though they are the second largest sector of PM2.5 emissions for most counties in the CSA. Similarly, mobile sources were usually not the largest source of emissions for PM2.5 species. Overall, in the CSA, mobile sources account for 37% of EC emissions, 11% of SO_4 emissions, 9% of NO_3 emissions, 7% of OC emissions, and 3% of remaining fine particulate emissions.

As previously mentioned, the Elizabeth Lab monitor is located in Union County next to the New Jersey Turnpike and I-278, and near the Goethals Bridge, which goes from New Jersey to Staten Island, NY. Considering the monitor's proximity to a major roadway, mobile source emissions are especially impactful.

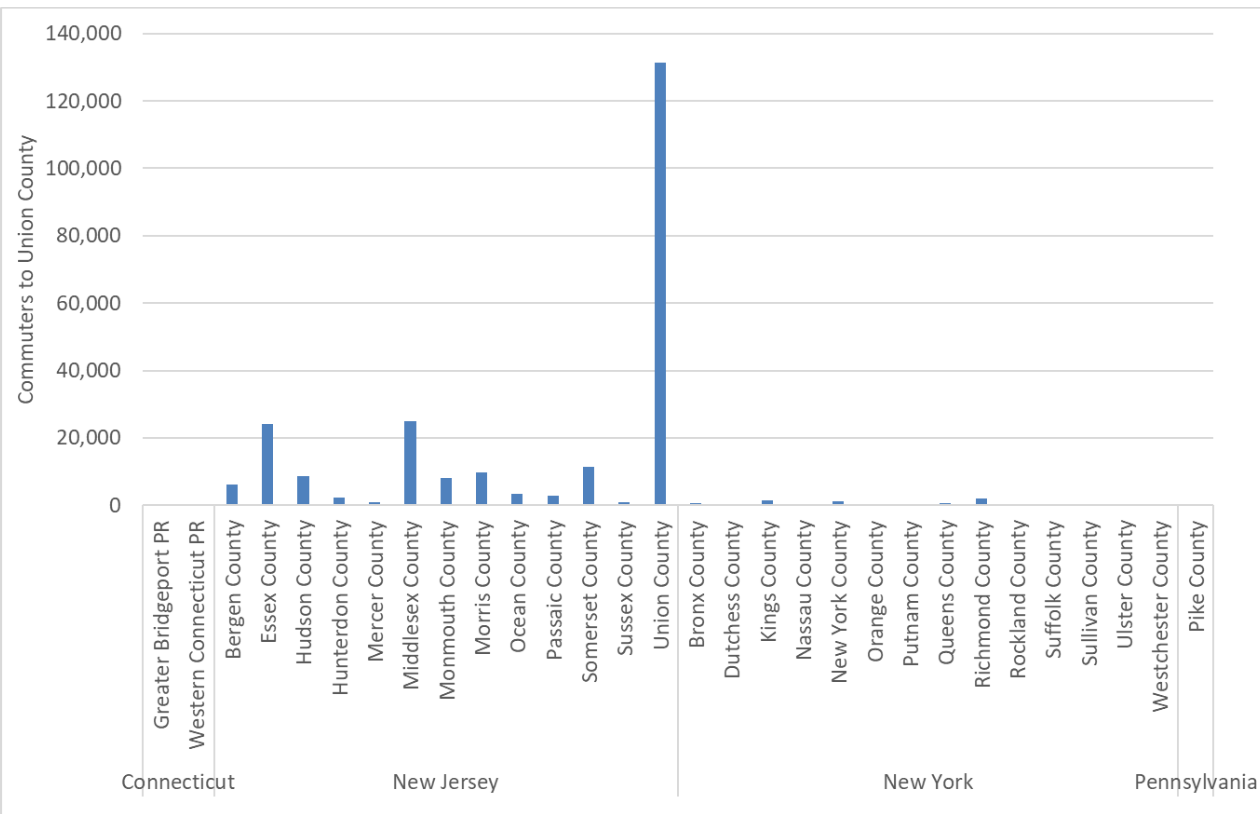
2.3.1 Motor Vehicle Traffic Levels and Commuting Patterns

Table 6 and Figure 14 show the total number of commuters to Union County from residence counties within the NY-NJ-CT-PA CSA. The table also shows the number of total vehicle miles traveled (VMT) in millions for each county as well as the VMT density. The commuting data was collected from the five-year American Community Survey (2016-2020) and shows the average value over the period. The 2022 VMT data for New Jersey was obtained from New Jersey's Metropolitan Planning Organizations and submitted to USEPA as part of the inventory process. The VMT data for other states was obtained from the modeling platform inventory data. Note that the commuting data for Connecticut was provided for planning regions while the VMT was provided for counties.

Most commuters to Union County come from within the county. The second greatest number of commuters come from Middlesex County, NJ and Essex County, NJ. By far, most commuters to Union County within the CSA come from within the state, totaling 97%, with only 8,032 of the 243,661 commuters coming from other states in the CSA. When comparing the percent of total commuters in a county that commute to Union County, less than one percent of the county's commuters commute to Union County for all counties in every state except New Jersey.

As shown in Table 6, the counties with the largest VMT density in the CSA are New York County, NY (120 million/mi^2), Bronx County, NY (75 million/mi^2), Queens County, NY (68 million/mi^2), Kings County, NY (63 million/mi^2), and Hudson County, NJ (47 million/mi^2). These counties mirror the counties with the densest mobile emissions, as explained in the previous section. Union County has the sixth largest VMT density in the CSA at 40 million/mi^2.

Figure 14: Commuters to Union County from Residence Counties in the NY-NJ-CT-PA CSA[28]



[28] United Statues Census Bureau. 2016-2020 5-Year ACS Commuting Flows, June 30, 2023. Retrieved 3/6/2024 from https://www.census.gov/data/tables/2020/demo/metro-micro/commuting-flows-2020.html.

Table 6: Commuters to Union County from the 2016-2020 American Community Survey[29] and VMT for Counties in the NY-NJ-CT-PA CSA

State	County/ Planning Region	2022 VMT (Millions)	2022 VMT Density (Millions/ mi^2)	Commuters to Union County	Total Commuters	Percentage who Commute to Union County
CT	Greater Bridgeport Planning Region	-	-	0	151,908	0.00%
	Western Connecticut Planning Region	-	-	78	310,496	0.03%
	Fairfield County	7,418.7	11.87	-	-	-
	Litchfield County	1,421.4	1.54	-	-	-
	New Haven County	7,788.6	12.89	-	-	-
CT CSA Total		16,628.6	7.74	78	462,404	0.02%
NJ	Bergen County	7,367.3	31.65	6,261	469,738	1.33%
	Essex County	4,796.4	38.04	24,250	368,427	6.58%
	Hudson County	2,163.6	46.84	8,626	353,155	2.44%
	Hunterdon County	1,808.9	4.23	2,445	64,177	3.81%
	Mercer County	3,487.9	15.54	933	174,502	0.53%
	Middlesex County	8,284.9	26.79	24,956	399,124	6.25%
	Monmouth County	6,324.6	13.51	8,112	313,209	2.59%
	Morris County	5,275.7	11.44	9,731	253,838	3.83%
	Ocean County	4,910.4	7.82	3,480	254,913	1.37%
	Passaic County	2,902.3	15.60	3,001	239,308	1.25%
	Somerset County	3,412.0	11.30	11,464	171,566	6.68%
	Sussex County	1,176.9	2.27	983	73,512	1.34%
	Union County	4,110.8	40.00	131,387	275,971	47.61%
NJ CSA Total		56,021.7	13.89	235,629	3,411,440	6.91%
NY	Bronx County	3,164.2	75.03	657	571,796	0.11%
	Dutchess County	2,589.3	3.25		143,623	0.00%
	Kings County	4,349.7	62.70	1,614	1,181,076	0.14%
	Nassau County	8,941.4	31.42	149	670,314	0.02%
	New York County	2,728.0	120.41	1,242	874,997	0.14%
	Orange County	4,234.7	5.21	263	175,734	0.15%
	Putnam County	1,128.6	4.90	14	49,590	0.03%
	Queens County	7,405.1	68.11	710	1,083,207	0.07%
	Richmond County	1,987.8	34.56	1,994	213,137	0.94%
	Rockland County	2,676.9	15.43	279	142,968	0.20%
	Suffolk County	13,736.4	15.08	247	738,501	0.03%
	Sullivan County	950.5	0.98	43	32,051	0.13%
	Ulster County	2,011.2	1.79	6	83,539	0.01%
	Westchester County	7,428.1	17.25	263	469,568	0.06%
NY CSA Total		63,331.9	10.50	7,481	6,430,101	0.12%
PA	Pike County	518.7	0.95	89	24,462	0.36%
PA CSA Total		518.7	0.95	89	103,055	0.09%

[29] Ibid.

2.4 Fires

Fire emissions are not an extremely large source of emissions in any county in the CSA except Ocean County, NJ. The large emissions from fires in Ocean County, NJ can be seen especially in the PM2.5 emissions but also in emissions from the precursors, especially VOCs, SO_2, and NH_3. Over half of the PM2.5 emissions and SO_2 emissions in Ocean County from the estimated 2022 annual inventory are due to the fires sector. Some New York counties like Dutchess County, Orange County, Sullivan County, Ulster County, and Westchester County also show moderate emissions from the other fires sector, but in general not to the degree of Ocean County. These counties with larger emissions from the other fires sector are generally more rural.

2.5 Control Measures

New Jersey has adopted several significant multi-pollutant control measures historically and recently that reduce emissions of PM2.5 and its precursors. Most specifically are New Jersey's rules for:

Power Plants

New Jersey has enforceable, short term, performance standards for NO_x and VOC emissions from power plants (or EGUs) that are among the most stringent and effective air pollution control regulations in the country. Most recently, on December 2, 2022, NJDEP adopted rules which set new Electric Generating Unit (EGU) emission limits starting June 1, 2024. Due to NJ's rules, the final three coal EGUs in New Jersey ceased operation in 2022. Carneys Point Unit 2 and Logan Generating Plant Unit 1 last operated on May 31, 2022, and Carneys Point Unit 1 last operated on June 7, 2022. The Carneys Point operating permit for the coal-fired Units 1 and 2 was terminated on September 15, 2022. The operating permit for Logan Generating Plant Unit 1 was terminated on December 2, 2022.

Distributed Generation/Demand Response (DG/DR)

New Jersey's rules for stationary reciprocating internal combustion engines (RICE) do not allow the use of uncontrolled engines for the purpose of distributed electric generation or demand response in non-emergency situations. However, in some states contributing to nonattainment these engines are uncontrolled and used to assist the electric grid during high electric demand periods.

New Jersey Mobile Source Controls

New Jersey is addressing emissions from mobile sources to the extent that state action on mobile source control measures is not pre-empted by the Clean Air Act. New Jersey has adopted several significant mobile source control measures and implemented several significant voluntary programs. Adopted measures include NJLEV, Vehicle Idling, Heavy Duty Inspection and Maintenance (I/M) OBD, Advanced Clean Trucks (ACT), Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards, Heavy Duty New Engine Standards (Omnibus), Medium Duty Diesel Vehicles (MDDVs) I/M and Advanced Clean Cars II. Other states have not adopted some or all of these rules.

Area Source VOC Rules

New Jersey has implemented several area source VOC control measures, which are more stringent than Federal standards, many based on stringent California standards. These include rules for consumer products including hairspray, insecticides, household cleaners, air fresheners, automotive brake cleaners, carpet and upholstery cleaners and household adhesives, paints, stains and varnishes, automotive refinishing, industrial and commercial adhesives, asphalt paving and solvent degreasing.

State of the art (SOTA)

SOTA air pollution control must be implemented for significant equipment at major and minor facilities for new or modified VOC and NO_x sources of air pollution.

Petroleum Storage

New Jersey has implemented one of the most stringent petroleum storage rules in the country, which established requirements to reduce VOC emissions from bulk petroleum storage facilities.

Additional Control Measures and Initiatives

Clean Energy

New Jersey is a national leader in reducing emissions from the electric power sector. In addition to its adopted air pollution rules, New Jersey has recently implemented several actions that will increase renewable energy, thereby resulting in further reductions in ozone and PM precursor emissions from the New Jersey electric power sector. These measures include:

- Offshore Wind Goals: Governor Murphy signed three Executive Orders[30,31,32] that direct all New Jersey state agencies with responsibilities under the Offshore Wind Economic Development Act to fully implement it. The Orders also established goals to increase New Jersey's offshore wind power to 11,000 megawatts by 2040.

- Regional Greenhouse Gas Initiative (RGGI): RGGI is the first mandatory market-based program in the United States to reduce greenhouse gas emissions from the power sector. New Jersey's participation in RGGI is part of Governor Murphy's goal to achieve 100% clean energy by 2050. On June 17, 2019, New Jersey formally rejoined RGGI when the Department adopted two rules.[33] While GHG reductions are outside the scope of this area designation, it has been shown that GHG reductions will have a co-benefit of NO_X/VOC reductions.

- Clean Energy Act: On May 23, 2018, Governor Murphy signed the New Jersey Clean Energy Act (P.L.2018, c.17). The Act strengthened New Jersey's Renewable Portfolio Standard by requiring 35% renewable power by 2025 and 50% renewable power by 2030. It also requires energy efficiency measures to reduce annual electricity usage by 2% and annual natural gas usage by 0.75% and codifies goals for offshore wind and

[30] Executive Order #8, January 31, 2018. https://nj.gov/infobank/eo/056murphy/pdf/EO-8.pdf
[31] Executive Order #92, November 21, 2019. https://nj.gov/infobank/eo/056murphy/pdf/EO-92.pdf
[32] Executive Order #307, September 21, 2022. https://nj.gov/infobank/eo/056murphy/pdf/EO-307.pdf
[33] The Carbon Dioxide Budget Trading Rule and the Global Warming Solutions Fund rule, June 17, 2019.

energy storage.

New Jersey Protecting Against Climate Threats (NJPACT) Rules

On January 27, 2020, Governor Murphy signed Executive Order Number 100 (EO 100) that initiated a targeted regulatory reform effort that will modernize New Jersey environmental laws. EO 100 is referred to as Protecting Against Climate Threats (NJ PACT). NJ PACT will usher in systemic change, modernizing air quality and environmental land use regulations, that will enable governments, businesses, and residents to effectively respond to current climate threats and reduce future climate damages.

As a national leader in environmental protection, the NJDEP has and will continue to create a regulatory roadmap to reduce emissions, build resilience, and adapt to a changing climate. This includes the enactment of new air pollution regulations that achieve critically needed reductions in carbon dioxide and short-lived climate pollutants (e.g., methane and black carbon) including technology-forcing measures that pave the way for a clean-energy economy.

Based on this EO, New Jersey has adopted several rules including Advanced Clean Trucks (ACT), new EGU Emission Limits, a #4 and #6 Fuel Oil Ban, regulations for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards, Heavy Duty New Engine Standards (Omnibus), Medium Duty Diesel Vehicles (MDDVs) I/M and Advanced Clean Cars II.

Electric Vehicles

In addition to the control measures discussed above, New Jersey continues to implement several initiatives towards its goal of transitioning from fossil fuel-powered vehicles to electric vehicles. New Jersey will continue to develop sufficient electric vehicle (EV) infrastructure, conduct education outreach, and provide incentives through funding and grant programs. On January 17, 2020, Governor Murphy signed landmark legislation that established goals and incentives for the increased use of plug-in electric vehicles in New Jersey. This legislation establishes New Jersey as a leader in attracting electric vehicles to the state thereby making significant contributions to the attainment of existing air pollution and energy goals. In 2011, only 338 electric vehicles were registered in the State. As of June 2023, 123,551 electric vehicles, including battery electric vehicles and plug-in hybrid electric vehicles, are registered in the State, marking a significant increase over the ten-year period. The NJDEP Electric School Bus Grant program is designed to encourage and monitor the transition to electric school buses throughout the state.

Building Electrification

Decarbonization of buildings is a priority for the state of New Jersey. Building decarbonization is a critical component of the 2019 New Jersey Energy Master Plan and the 2020 Global Warming Response Act 80x50 Report. Both reports identify the need to transition to electric buildings and call for a modernization of building codes, incentive programs and state policy to achieve this transformation.

Building upon this work, Governor Murphy's Executive Order 316 set a target to install zero-carbon-emission space heating and cooling systems in 400,000 homes and 20,000 commercial properties and make 10% of all low-to-medium income (LMI) properties electrification ready by 2030. NJ further committed as part of the United States Climate Alliance agreement to collectively install 20 million heat pumps across participating states by 2030, with the aim of ensuring at least 40% of benefits flow to disadvantaged communities. In addition, the NJDEP's

Commissioner signed a memorandum of understanding (MOU) with states within the Northeast States for Coordinated Air Use Management (NESCAUM) to transition 65% of residential heating and cooling equipment sales to zero emission heat pumps by 2030 and 90% by 2040 .

Beyond setting targets, the State is actively participating in two planning processes to inform its building decarbonization strategy. The Governor's Office is currently creating a strategic building decarbonization roadmap that will identify critical near-term actions to enable the transition of existing building stock away from fossil fuels. Additionally, through the NESCAUM MOU, the signatory states will create a State Action Plan for decarbonizing buildings. Combined, these plans will provide detailed pathways for NJ to electrify its building stock and will reap air quality benefits across the state.

Work is also underway to bring federal home energy rebates to New Jersey. The New Jersey Board of Public Utilities (NJBPU) held a technical conference related to federal home energy rebates in 2023 and released a request for information in 2024 regarding the design of the incentives using HOMES/HER and HEEHR/HEAR funding. NJ submitted an application for federal Home Energy Rebates on August 1, 2024 . The US Department of Energy (DOE) is reviewing the application to confirm the programs are designed to maximize the benefits to consumers. The rebate programs New Jersey applied for include Home Efficiency Rebates and Home Electrification and Appliance Rebates. The State applied for a funding amount of $182,962,089.

Factor 3: Meteorology

Figure 15 shows wind roses near the Elizabeth Lab monitor using wind data from 2021-2023. Wind roses are a visual representation of wind direction and wind speed over a specified period. The length of each spoke around the circle shows how frequently the wind blew from that direction over the specified period, and each spoke is divided into sections that show its wind speed ranges. Although there is no wind rose directly at the Elizabeth Lab monitor, there are many other monitors nearby which can provide insight into the wind direction and speed of the area and thus into the fate and transport of pollutants. The wind predominately comes from the west and northwest in this area. This means that emissions in the CSA originating from New Jersey sources are more likely to transport to the Elizabeth Lab monitor and affect its particulate level concentrations. New Jersey's emissions are relatively small, and based on the local wind roses, the larger emissions in New York are not frequently transported to affect the Elizabeth Lab monitor.

Figure 16 shows the USEPA's Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model trajectory density maps at Elizabeth Lab for the design value period from 2021-2023. The USEPA trajectory density map represents how frequently an air parcel passed through each location during a specified time period. In Figure 16, USEPA initiated two 24-hour backward trajectories, one starting at 8AM and the other at 10PM, with a starting elevation of 500 meters above ground level for each day from 2021-2023. The hourly coordinates during the trajectories were used to create the density map. Similar to the wind roses, the density map shows that the air typically comes from the west. The densest regions are mostly in New Jersey to the west. Please note that the AM and PM density maps have different numerical ranges for the density scale.

Figure 15: 2021-2023 Wind Roses Near the Elizabeth Lab Monitor[34]

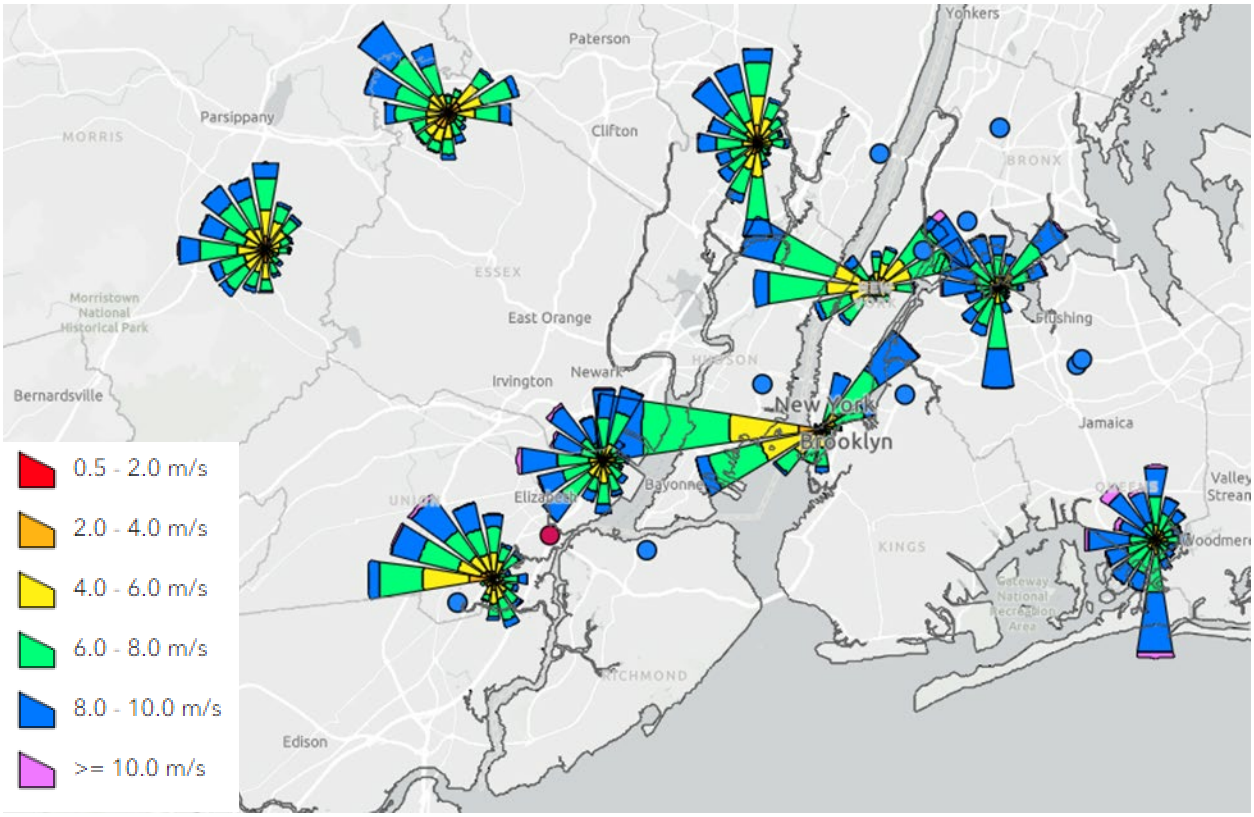
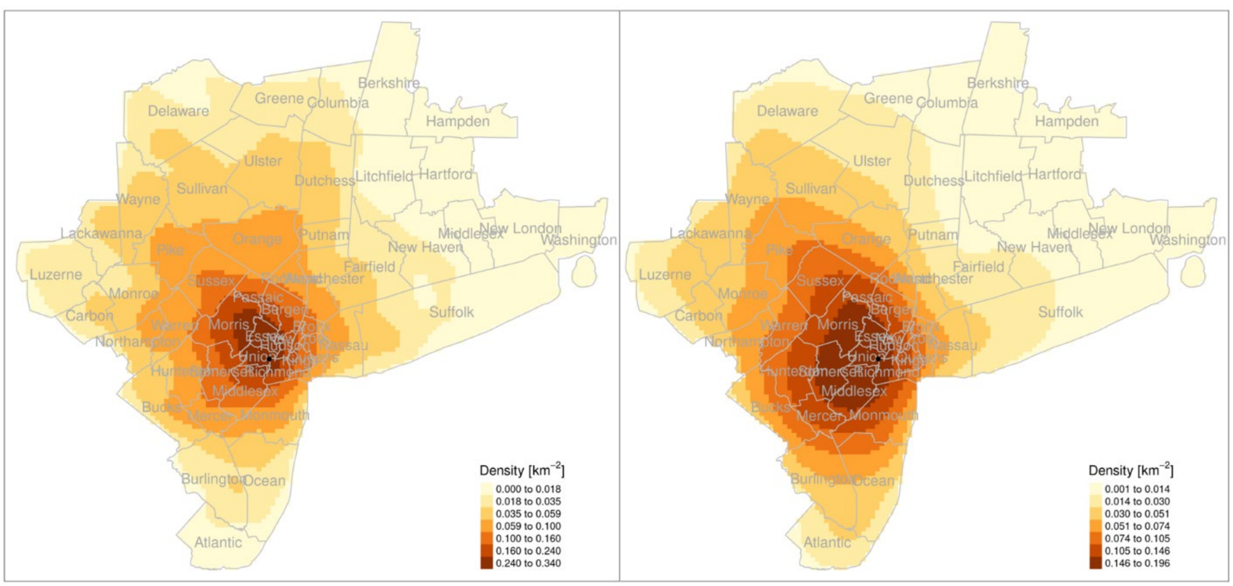


Figure 16: HYSPLIT Density Map at Elizabeth Lab at 8AM (Left) and 10PM (right)



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34 USEPA. PM2.5 Designations Mapping Tool. Retrieved 11/19/2024 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab

Factor 4: Geography and Topography

New Jersey is separated from New York City by the Hudson River. South of that area are a series of bays, which open into the Atlantic Ocean. The Delaware River runs along the western part of New Jersey between New Jersey and Pennsylvania. In northwestern New Jersey, there are mountain ranges, the largest of which are the Kittatinny Mountains.

The mountain ranges to the west may block some of the long-range transport. Also, Elizabeth Lab is located near a major road, the Hudson River, and Newark Bay. There could potentially be some channeling of emissions along the waterways. However, as mentioned in Factor 3, the wind typically travels from the west and northwest.

Factor 5: Jurisdictional Boundaries

The NY-NJ-CT-PA CSA consists of four states and 30 counties/planning regions, as listed in the previous factors. If using Connecticut's counties that were previously in the CSA, there are 31 counties in the CSA.

The CSA covers three EPA regions: Region 1 with Connecticut, Region 2 with New Jersey and New York, and Region 3 with Pennsylvania.

The CSA consists of six CBSAs or Metropolitan/Micropolitan Statistical Areas (MSA): Bridgeport-Stamford-Danbury, Hemlock Farms, Kingston, Kiryas Jowel-Poughkeepsie-Newburgh, Monticello, New York-Newark-Jersey City (NY-NJ CBSA), and Trenton-Princeton. [35] The violating monitor is in the NY-NJ CBSA, and this metro area consists of four metropolitan area divisions: Lakewood-New Brunswick, Nassau County-Suffolk County, Newark, and New Jersey-Jersey City-White Plains. The Elizabeth Lab violating monitor is in the Newark Metropolitan Division, which has Essex County, Hunterdon County, Morris County, Sussex County, and Union County.

Summary and Recommendation

Elizabeth Lab is the only monitor in the NY-NJ-CT-PA CSA that is violating the 9.0 μg/m^3 NAAQS, having a design value of 9.4 μg/m^3 based on 2021 to 2023 monitoring data that includes data influenced by wildfire exceptional events. With USEPA concurrence on excluding wildfire exceptional event data in 2023, the 2021-2023 design value at Elizabeth Lab is 9.1 μg/m^3. USEPA will be using 2022 to 2024 monitoring data to determine final designations.

The main findings from the five-factor analysis are as follows:

- Elizabeth Lab's annual means and design values have been demonstrating a decreasing trend. The previous three design values have met the revised NAAQS, and the annual means have been below 9.0 μg/m^3 since 2018, except in 2021 likely due to impacts from wildfire smoke.

[35] United States Census Bureau. 2022 Geographic Levels, February 26, 2024. https://www.census.gov/programs-surveys/economic-census/geographies/levels/2022-levels.html

Once the 2024 monitoring data is certified, the annual average is expected to be below 9.0 μg/m^3 and, when combined with the annual averages from 2022 and 2023, will result in a 2024 design value at the Elizabeth Lab monitor that demonstrates attainment of the 2024 PM2.5 NAAQS.

- Although 2021 lacks regulatory significance, there were indications that wildfire smoke increased the annual mean in 2021 to the largest it has been since 2015. The final designations will be based on 2022-2024 design values, therefore, the large annual mean in 2021 may not be relevant.

- Most commuters to Union County come from within the county. Furthermore, most commuters to Union County within the CSA come from within the state, totaling 97%, with only 8,032 of the 243,661 commuters coming from other states in the CSA. For all out-of-state counties, less than one percent of the total county commuters commute to Union County.

- New Jersey has also implemented significant control measures across the state lowering PM2.5 and precursor emissions, in some cases more stringent than neighboring states. The results of these measures are shown in the monitoring data decreasing trends and data below the standard. These control measures are especially important because the urban increment analysis found that a large proportion of most of the PM2.5 species were from local sources.

- The air typically travels from the west, so the relatively larger emissions in New York are not frequently transported to affect the New Jersey monitors. Additionally, due to New Jersey's significant controls measures including measures for EGUs, stationary generators and low sulfur fuel, New Jersey's emissions have less of an impact on New York and Connecticut than each state's own emissions.

New Jersey believes that Elizabeth Lab will be in compliance with the 2024 annual PM2.5 standard based on 2022 to 2024 monitoring data. New Jersey recognizes that the 2021-2023 design value at Elizabeth Lab is violating the 2024 PM2.5 annual NAAQS; however, due to wildfire events in 2021 and 2023, the 2021-2023 design value is not representative of the actual ambient air quality in New Jersey. New Jersey believes that the 2022-2024 design value will be more representative of the actual ambient air quality in New Jersey with the exclusion of the exceptional event data in 2023 and show compliance with the standard. Also based on the data and discussions, New Jersey does not significantly contribute PM2.5 concentrations outside of its borders.

New Jersey recommends designating all of the New Jersey counties in the NY-NJ-CT-PA CSA as attainment. New Jersey should also not be included in any multi-state nonattainment areas if a county in another state is not in compliance with the standard when 2024 data is certified.

SOUTHERN NEW JERSEY CSA (PA-NJ-DE-MD)

Factor 1: Air Quality Data

1.1 Current Design Values

PM2.5 annual design values are calculated based on the air quality monitoring data for the most recent three-year period. For New Jersey's 2024 PM2.5 area designation recommendation, this includes the years 2021, 2022, and 2023, while for USEPA's final area designations, this will include the years 2022, 2023, and 2024.

Figure 17 shows the valid 2021-2023 design values for the PA-NJ-DE-MD CSA, and Table 7 shows the 2021-2023 design values and annual means at New Jersey monitors in the PA-NJ-DE-MD CSA. While some monitors in New Jersey show elevated annual means in 2023, most likely due to the influence of smoke from the Canadian wildfires, the NJ Camden Spruce Street monitor and PA North East Waste (NEW), Ritner (Rit), and Torresdale Station monitors are the only valid design values in 2021-2023 to exceed the NAAQS in the CSA. The Camden Spruce Street monitor is located in Camden County, NJ, and its purpose is to be a comprehensive air monitoring station in the Philadelphia-Camden metro area of southern New Jersey.[36] It is east of the Delaware River and south of the Benjamin Franklin Bridge, which connects Camden to Philadelphia. The North East Waste (NEW), Ritner (Rit), and Torresdale Station monitors are all in Philadelphia County, PA. North East Waste is near I-95, Frankford Creek, the Delaware River, and the Betsy Ross Bridge. Ritner is located more inland, near the Schuylkill Expressway (I-76) and to the east of the Schuylkill River. Torresdale Station is the farthest to the north of the four monitors, located west of the Delaware River and right next to I-95, and is designated as a near-road monitor by USEPA.[37]

The Camden Spruce Street design value in the graph does not exclude the 2023 exceptional event data since USEPA has not made a final determination on the exclusion of the data; however, if the exceptional event data is excluded, the design value at Camden Spruce Street is 9.4 μg/m^3. Although the three violating monitors in Pennsylvania show elevated annual means in 2023, Pennsylvania is not submitting an Exceptional Event demonstration for these three monitors. Their design values are 9.7 μg/m^3 at North East Waste, 9.3 μg/m^3 at Ritner, and 10.0 μg/m^3 at Torresdale Station.

It is important to note that the lease for the Camden Spruce Street monitoring site was terminated as of June 30, 2024.[38] After being notified of this termination in February 2023, NJDEP's Bureau of Air Monitoring identified a replacement site located near the corner of Ferry Street and Jackson Street and in the parking lot of the Camden County Municipal Utilities Authority (CCMUA).[39] New Jersey is requesting from USEPA in a separate document that the combined monitoring data in 2024 from the former Camden Spruce Street and the new South

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[36] NJDEP Bureau of Air Monitoring. New Jersey Ambient Air Monitoring Network Plan 2023, August 2023. https://dep.nj.gov/wp-content/uploads/airmon/network-reports/nj-network-plan-2023.pdf

[37] USEPA. Near Road Monitoring, March 8, 2024. https://www.epa.gov/amtic/near-road-monitoring. See USEPA's April 2022 Near-road Site List: https://www.epa.gov/system/files/other-files/2022-04/april-2022-near-road-site-list_public.xlsx

[38] NJDEP Bureau of Air Monitoring. New Jersey Ambient Air Monitoring Network Plan 2023, August 2023. Accessed November 7, 2024 at https://dep.nj.gov/wp-content/uploads/airmon/network-reports/nj-network-plan-2023.pdf.

[39] NJDEP Bureau of Air Monitoring. New Jersey Ambient Air Monitoring Network Plan 2024: Draft, July 2024. Accessed November 7, 2024 at https://dep.nj.gov/wp-content/uploads/airmon/network-reports/nj-network-plan-2024-draft.pdf.

Camden monitors be used to ensure that there is valid, comprehensive, and continuous monitoring data for the final 2024 PM2.5 Area Designation.

Once the 2024 monitoring data is certified for the combined sites, the annual average is expected to be below 9.0 µg/m^3 and, when combined with the annual averages from 2022 and 2023, will result in a 2024 design value at the combined Camden Spruce Street/South Camden monitors that demonstrates attainment of the 2024 PM2.5 NAAQS.

Figure 17: 2021-2023 PM2.5 Annual Design Values Including Exceptional Event Data in the PA-NJ-DE-MD CSA

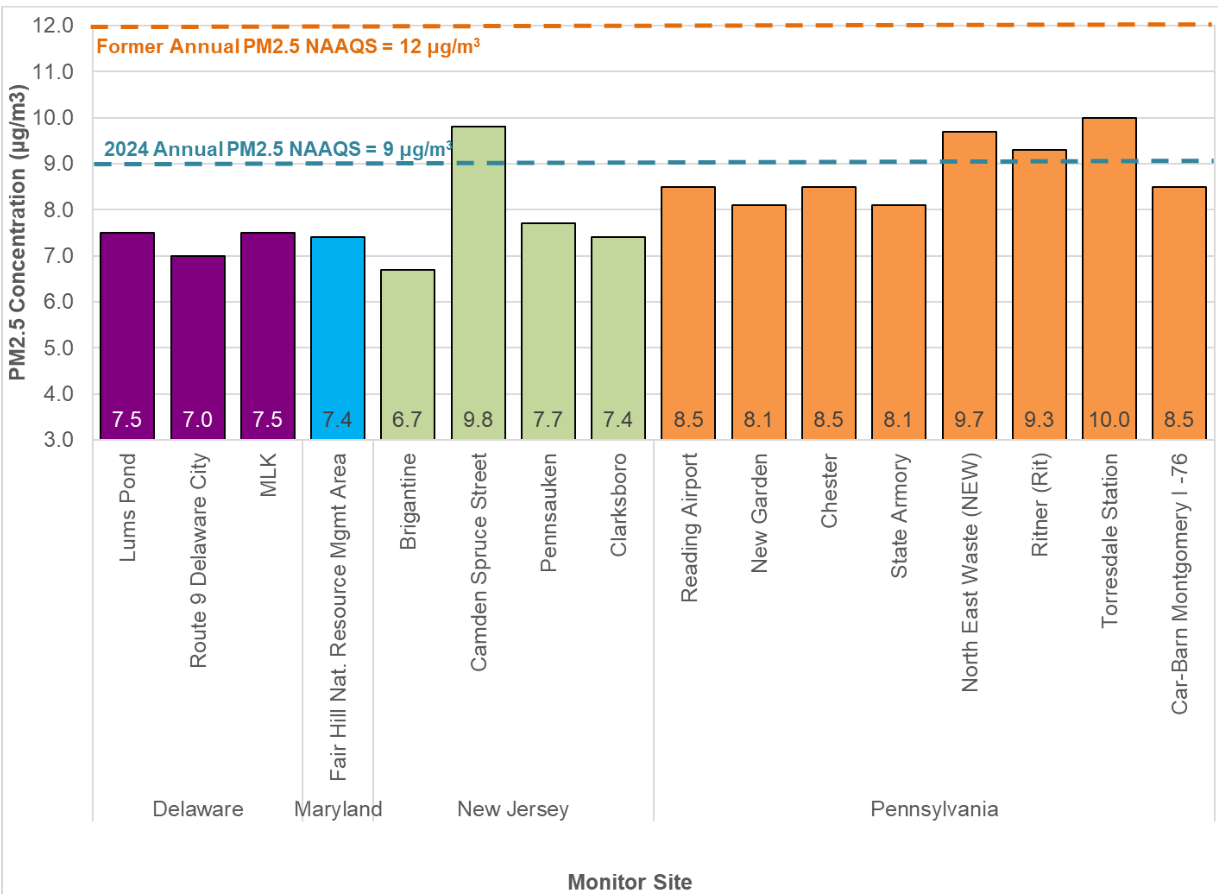


Table 7: 2021-2023 Annual Means and Design Values at New Jersey Monitors in the PA-NJ-DE-MD CSA[1, 2, 3]

Local Site Name / Site ID	2021 Annual Mean ($\mu g/m^3$)	2022 Annual Mean ($\mu g/m^3$)	2023 Annual Mean ($\mu g/m^3$)	Valid 2021-2023 Design Value ($\mu g/m^3$)	Invalid 2021-2023 Design Value ($\mu g/m^3$)
Brigantine / 34-001-0006	6.39	5.85	7.92	6.7	
Atlantic City / 34-001-1006	8.53	6.11	7.00		7.2
Camden Spruce Street / 34-007-0002	9.93	8.89	~~10.50~~ 9.47	~~9.8~~ 9.4	
Pennsauken / 34-007-1007	8.55	6.45	8.20	7.7	
Millville / 34-011-0007	7.03	5.76	8.33		7.0
Clarksboro / 34-015-0002	7.78	6.22	8.32	7.4	

[1] Data source: USEPA 2023 Design Value Reports, June 2024. Retrieved at https://www.epa.gov/air-trends/air-quality-design-values.
[2] Red text indicates a value larger than the 2024 9 $\mu g/m^3$ PM2.5 NAAQS (most likely due to wildfire smoke)
[3] ~~Strikethrough~~ indicates the value before the exclusion of exceptional event data

1.2 Design Value Trends

Figure 18a and Figure 18b show the historical design value trend at the Camden Spruce Street monitor in New Jersey excluding and including the 2023 exceptional event data, respectively. Figure 19a and Figure 19b show the historical annual mean values at the Camden Spruce Street monitor in New Jersey excluding and including the 2023 exceptional event data, respectively. As shown in the figures, there is a decreasing trend in PM2.5 data at the Camden Spruce Street monitor. In two of the past four years, the annual mean has been below 9.0 $\mu g/m^3$. As previously mentioned, the other two years, 2021 and 2023, likely were influenced by wildfire events, and an Exceptional Event demonstration was submitted for 2023. Without the Exceptional Event demonstration, the annual mean in 2023 was 10.5 $\mu g/m^3$, the largest it has been since 2017 and secondarily since 2014. As previously noted, there were multiple PM2.5 exceedances in 2021 due to smoke across New Jersey caused by wildfires from the western United States and Canada. These events caused the annual mean at Camden Spruce Street in 2021 to be unusually large compared to the surrounding years, however, the monitor continued to attain the PM2.5 annual NAAQS at that time of 12 $\mu g/m^3$. Although the wildfire smoke events increased the annual mean in 2021 to levels that do not reflect the actual PM2.5 ambient air quality in New Jersey, the events lacked regulatory significance for an official exceptional event demonstration because the monitor was not violating the 12 $\mu g/m^3$ PM2.5 annual NAAQS at the time. Additionally, USEPA will use 2022-2024 PM2.5 annual means to calculate the design values for the final area designations. The inflated annual mean in 2021 consequently made the last three design values larger than they otherwise would have been.

Figure 18a: PM2.5 Annual Design Value Trend at Camden Spruce Street from 2014 to 2023 Excluding Exceptional Event Data

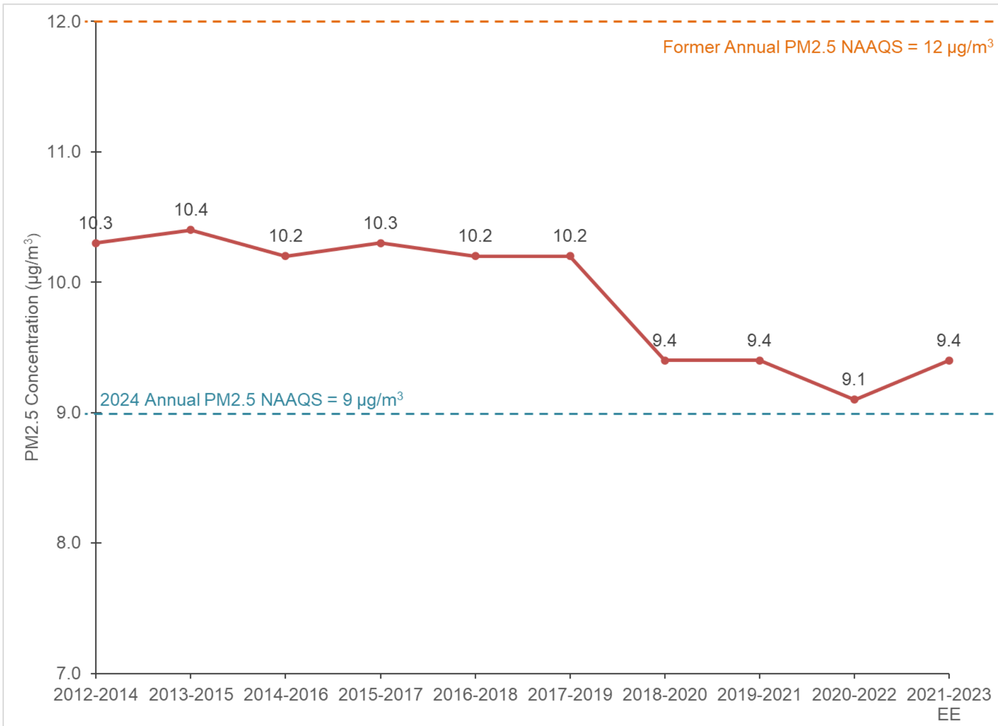


Figure 18b: PM2.5 Annual Design Value Trend at Camden Spruce Street from 2014 to 2023 Including Exceptional Event Data

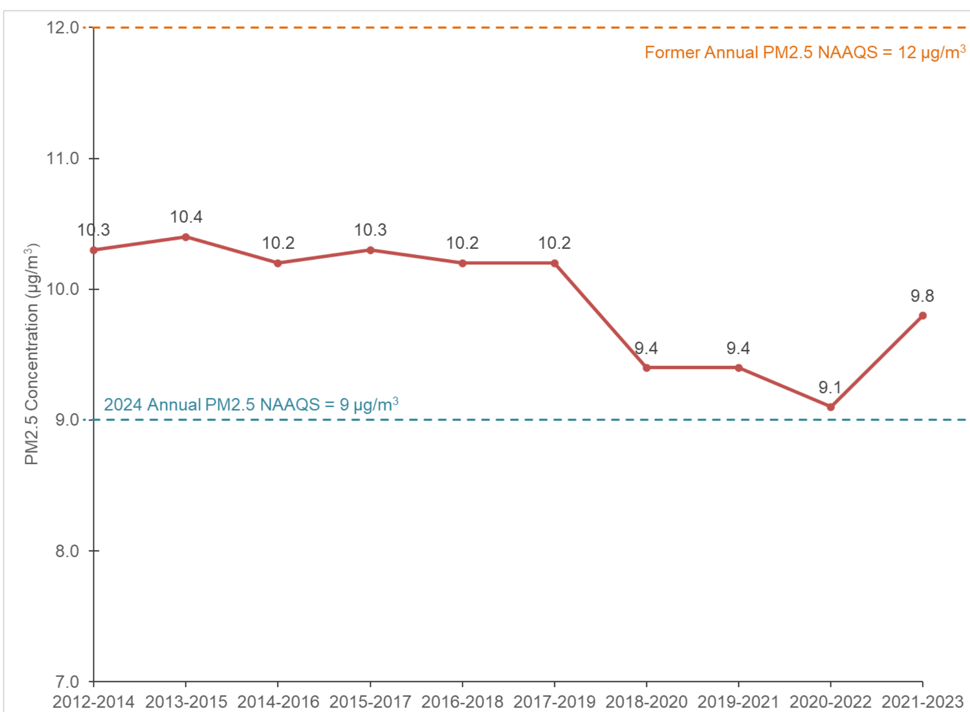


Figure 19a: PM2.5 Annual Mean Trend at Camden Spruce Street from 2012 to 2023 Excluding Exceptional Event Data

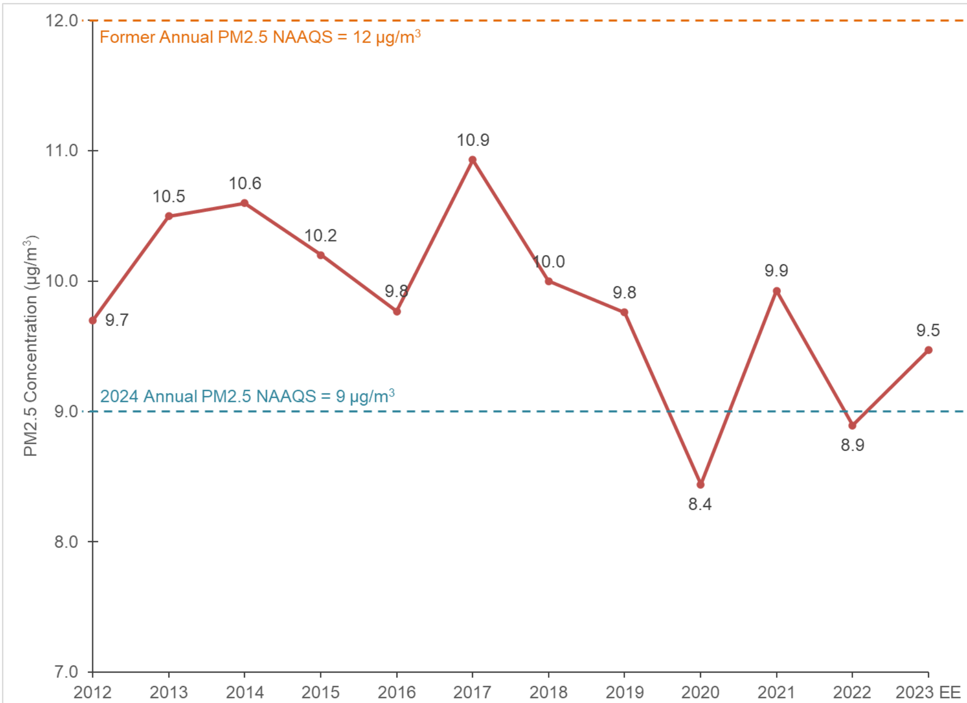
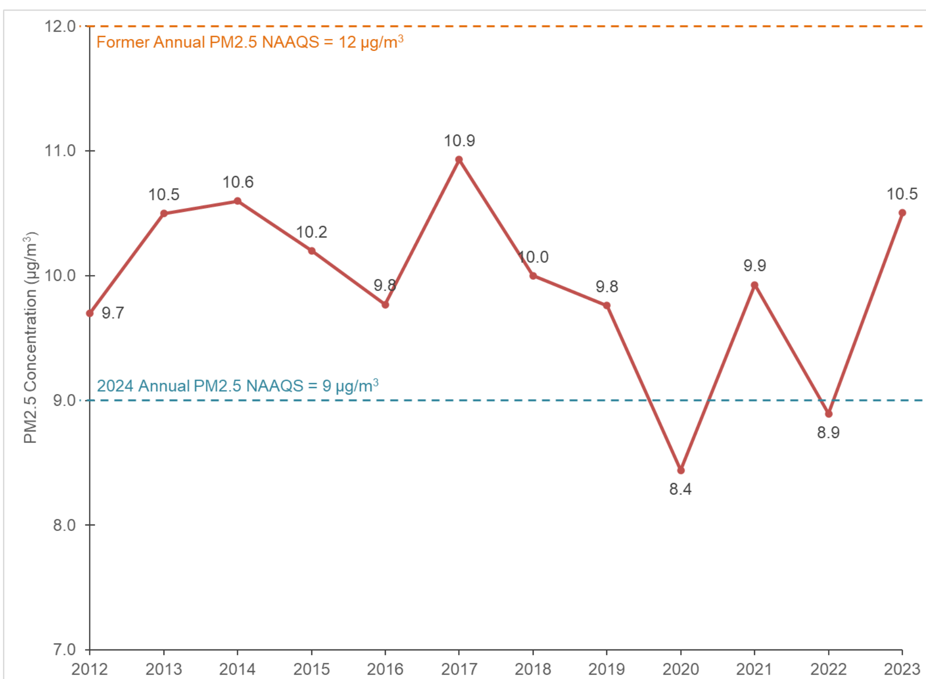


Figure 19b: PM2.5 Annual Mean Trend at Camden Spruce Street from 2012 to 2023 Including Exceptional Event Data



This decreasing trend supports the recommendation that the area including Camden County where Camden Spruce Street is located should be designated attainment. Furthermore, it is expected that the certified 2024 monitoring data will continue to reflect the decreasing trend based on the combined monitoring sites of Camden Spruce Street and South Camden. With USEPA concurrence on New Jersey's 2023 Exceptional Event demonstration, Camden Spruce Street/South Camden would need an annual mean of 8.8 µg/m^3 in 2024 for the 2022-2024 design value to be within the standard. Without USEPA concurrence on New Jersey's 2023 Exceptional Event demonstration, Camden Spruce Street/South Camden would need an annual mean of 7.7 µg/m^3 in 2024 for the 2022-2024 design value to be within the standard.

There are also three monitors in Pennsylvania that are above the 9.0 µg/m^3 standard in 2021-2023: North East Waste, Ritner, and Torresdale Station. Figure 20 and Figure 21 show the historical trends for the design values and annual means, respectively, at the three monitors. There is a significant decreasing trend in the design values and annual means at these three monitors. The design values, excluding 2021-2023, have been below the standard since 2018-2020 at Ritner and Torresdale Station and since 2017-2019 at North East Waste. Excluding 2023, the annual means at these monitors have also been around or below 9.0 µg/m^3 at Ritner and Torresdale Station since 2019 and at North East Waste since 2017.

Although Pennsylvania is not submitting an Exceptional Event demonstration for the PM2.5 monitoring data at these three monitors in 2023, the year had some very high PM2.5 days due to Canadian wildfires. The 2023 annual mean and design values are clearly much larger than other recent years at all three Pennsylvania monitors, do not follow the previously established trends at the monitors, and are not indicative of the trend at these three monitors.

Overall, the decreasing trend in combination with the upcoming combined-site preliminary 2024 monitoring data supports the recommendation that the area including New Jersey should be designated attainment and New Jersey should not be in any out-of-state nonattainment areas.

Figure 20: PM2.5 Annual Design Value Trend at Pennsylvania North East Waste, Ritner, and Torresdale Station from 2008 to 2023

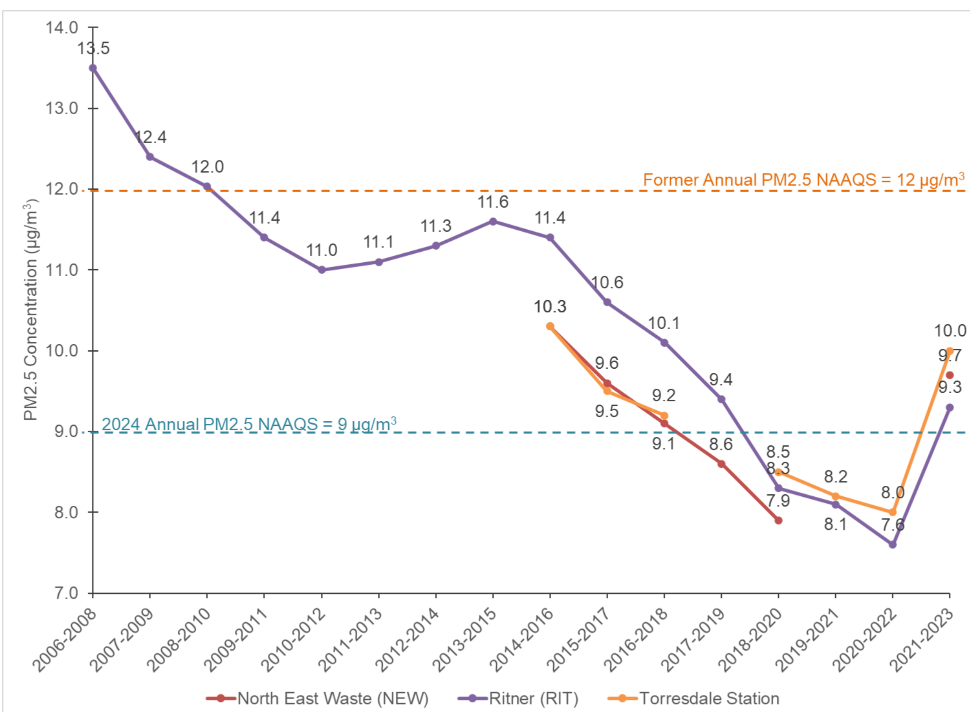
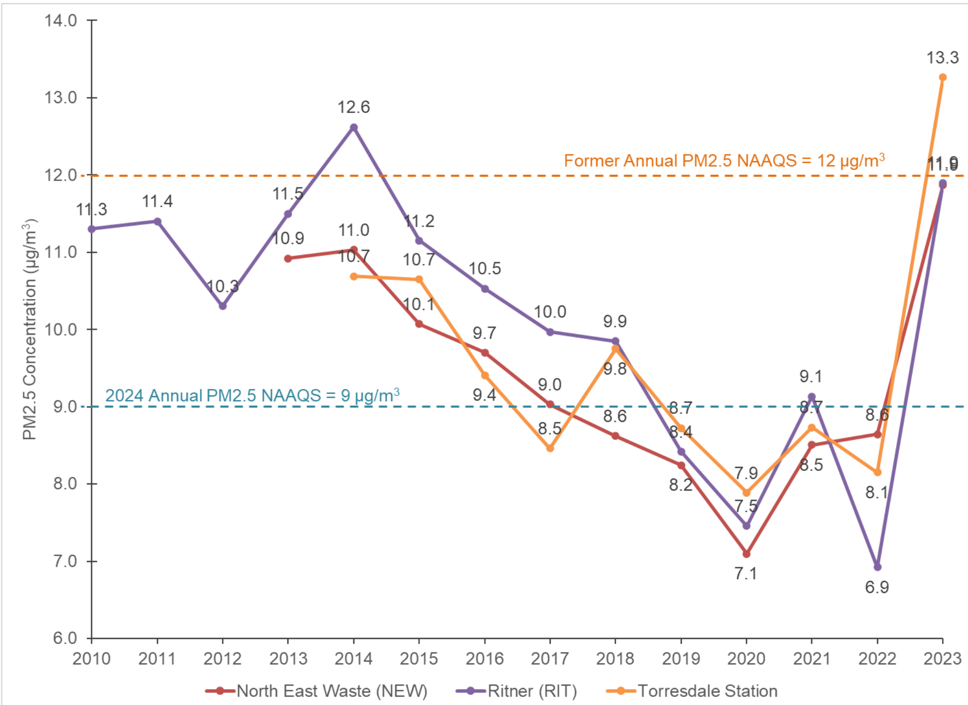


Figure 21: PM2.5 Annual Mean Trend at Pennsylvania North East Waste, Ritner, and Torresdale Station from 2010 to 2023



1.3 Compositional Analysis

PM2.5 is composed of many different chemical compounds. An evaluation of the components of PM2.5 provides insight into the contributing pollution sources and the effect of existing control measures.

Speciation is the process of disaggregating pollutants into groups of species or into individual chemical species or components. New Jersey collects data on the components of PM2.5 at monitoring sites across the State. The two main networks of speciation monitors are the Chemical Speciation Network (CSN) and the Interagency Monitoring of Protected Visual Environments (IMPROVE). Typically, CSN monitors are located in more urban areas. The IMPROVE monitors are located in national parks and wilderness areas to monitor visibility conditions to address regional haze at Class I areas. The prevalent compounds measured in New Jersey’s fine particles covered in this analysis are ammonium sulfate, organic matter (OM), ammonium nitrate, elemental carbon (EC), and crustal material. The organic matter portion in PM2.5 is frequently measured as organic carbon (OC), which does not include the other elements such as hydrogen and oxygen that make up organic molecules. Speciation data is relevant for this analysis because it aids in defining the larger components that make up PM2.5 at a particular site and, therefore, the potential sources that may be affecting the PM2.5 levels at the monitor.

New Jersey has four speciation monitors: Camden Spruce Street, Chester, Elizabeth Lab, and Rutgers University. Prior to September 2022, there was a fifth speciation monitor at Newark Firehouse. Since the Camden Spruce Street speciation monitor is in the CSN and co-located with the Camden Spruce Street PM2.5 monitor, this monitor is used in the following compositional analysis.

The PM2.5 components can have many sources, as described below.[40,41,42] The primary source of OC and EC is from combustion of fuels, such as from onroad and nonroad vehicles, nonroad machinery, and for heating purposes and local wood burning. A source of EC is from incomplete combustion of fuels, most notably from diesel engines. Comparing sources of OC to EC, a high OC to EC ratio can indicate biomass burning while a high EC to OC ratio can indicate diesel combustion. While EC is generally emitted directly from sources, OM can be divided into primary and secondary, where primary comes from direct source emissions and secondary forms through atmospheric processes mainly involving VOCs.[43] Nitrate and sulfate are primarily formed through chemical reactions in the atmosphere involving nitrogen and sulfur. Sources of sulfate mainly include large stationary sources such as coal burning and burning other fuels containing sulfur such as heating oils. Nitrate sources also include fuel and wood combustion, as well as onroad and nonroad mobile sources and electric generating unit (EGU) emissions.

Speciation data from 2021-2023 were used to find the trends in the composition of PM2.5 at Camden Spruce Street. Figure 22 shows the average of the annual averages from 2021-2023 and the average of the calendar quarters from 2021-2023. The largest category was OM, comprising approximately 63% over the three-year period of 2021-2023. Ammonium sulfate comprised about 17%, EC about 9%, crustal material about 8%, and ammonium nitrate about 3%.

Nitrate showed a strong seasonal trend where the concentration was largest in the wintertime, quarters one and then four, while in quarters two and three, the ammonium nitrate concentration was zero. OM's quarterly trend showed that quarters two and three were larger than quarters one and two. OM's quarter two may have been affected by the June 2023 wildfire impacts noted in New Jersey's PM2.5 Exceptional Event, and quarter three may have been affected by the PM2.5 exceedances in July 2021 from wildfire smoke. Ammonium sulfate displays a slight trend where quarter three is the largest, and crustal material displays a slight trend where quarter one is the smallest. EC did not display a strong or consistent quarterly trend in concentrations.

Camden Spruce Street presents a significant success in lowering PM2.5 components over the years, especially for sulfates. Sulfates used to be one of the two largest components in PM2.5 but now comprise a much smaller proportion of the total PM2.5. The concentration of sulfates has been reduced to an annual concentration about five times smaller than two decades ago. These improvements in lowering the State's sulfur emissions can be attributed to New Jersey's control measures to reduce the sulfur content in fuel oil and closure of New Jersey coal power plants (discussed in more detail in Section 2.1). For example, the New Jersey Sulfur in Fuels rule, N.J.A.C 7:27-9 et seq., lowered the sulfur fuel content of all distillate fuel oils (#2 fuel oil and lighter) to 15 ppm beginning on July 1, 2016. The sulfur content of #4 fuel oil was lowered to 2,500 ppm and for #6 fuel oil to a range of 3,000 ppm to 5,000 ppm sulfur content beginning July 1, 2014.[44] On December 2, 2022, New Jersey also adopted the Control and Prohibition of

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[40] NJDEP. Technical Basis for Designating New Jersey Attainment for the Annual PM2.5 National Ambient Air Quality Standard of 12 µg/m^3, February 24, 2014.

[41] NJDEP. Appendix B: 2022 Fine Particulate Speciation Summary in 2022 New Jersey Air Quality Report, August 2023. Retrieved from https://www.nj.gov/dep/airmon/pdf/2022-nj-aq-report.pdf

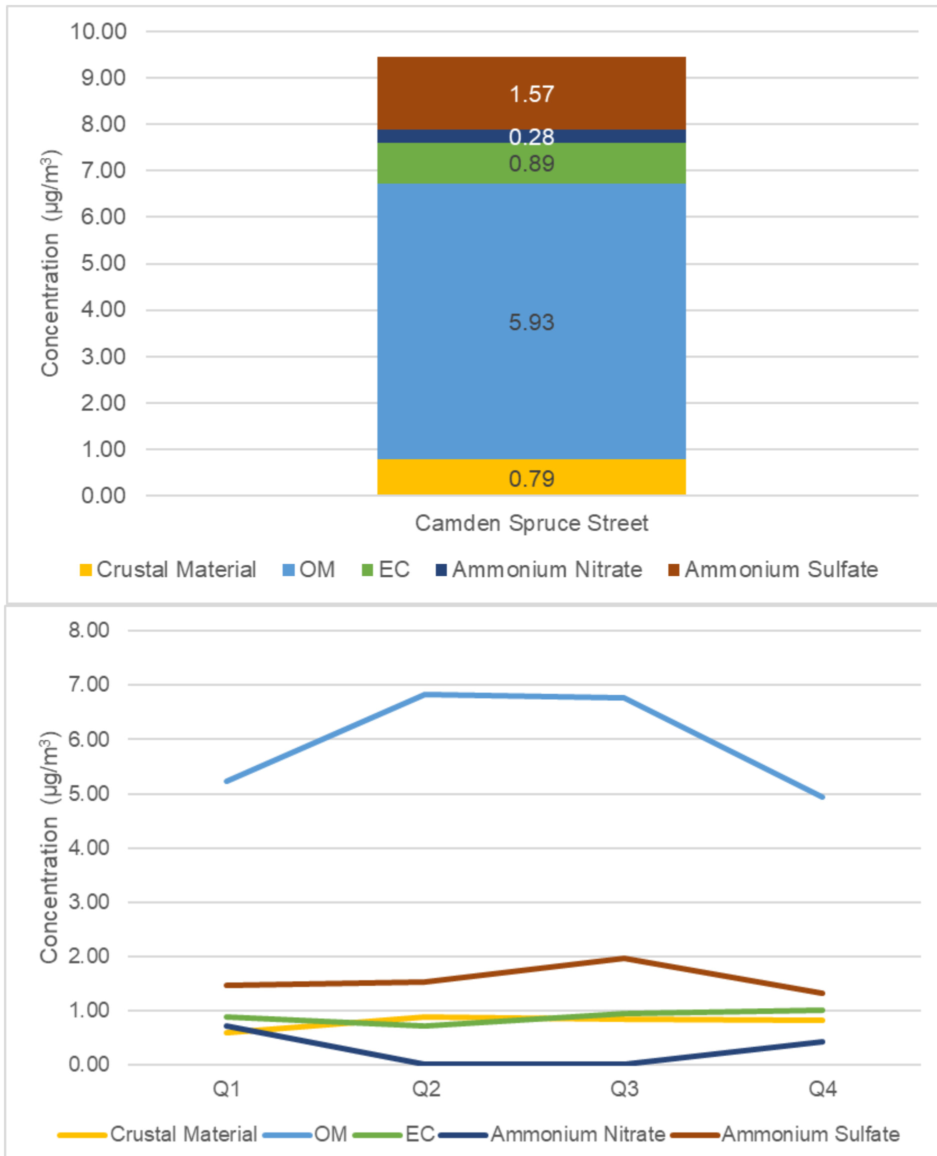
[42] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

[43] USEPA. Memorandum on the Fine Particulate Matter (PM2.5) Precursor Demonstration Guidance, May 30, 2019. Retrieved from transmittal_memo_and_pm25_precursor_demo_guidance_5_30_19.pdf

[44] The maximum sulfur content of #6 fuel oil varies depending on the county where the fuel oil is burned. The northern part of New Jersey has a lower maximum sulfur content for residual fuel oil at 3,000 ppm while the southern part of New Jersey has a maximum sulfur content of 5,000 ppm. See N.J.A.C. 7:27-9

Carbon Dioxide Emissions rules at 7:27F-3 that ban #4 and #6 fuel oil, with a compliance date in 2025 and a two year sell through period.

Figure 22: PM2.5 Compositional Analysis at Camden Spruce Street from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)



Two of the three violating monitors in Pennsylvania have CSN monitors on-site: Ritner and North East Waste. See Figure 23 and Figure 24 for their respective compositional analysis graphs, which show the average of the annual averages from 2021-2023 and the average of the calendar quarters from 2021-2023. The closest monitor to Torresdale Station is at North East Waste, located 6.7 miles away. Therefore, the compositional analysis for Torresdale Station uses the North East Waste speciation monitor and matches the analysis for North East Waste.

Similar to Camden Spruce Street, OM is the largest of the species at Ritner and North East Waste over the three-year period of 2021-2023, comprising 65% at Ritner and 63% at North

et seq. https://www.nj.gov/dep/aqm/rules27.html

East Waste. The next largest is ammonium sulfate, comprising 16% at both Ritner and North East Waste. The third largest is elemental carbon, comprising 9% at Ritner and 8% at North East Waste. Fourth is crustal, comprising 6% at Ritner and 8% at North East Waste, and last is ammonium nitrate, comprising 4% at both Ritner and North East Waste.

Nitrate showed a strong seasonal trend where the concentration was largest in the winter time, quarters one and then four; in quarters two and three, the ammonium nitrate concentration was zero. OM's quarterly trend showed that quarters two and three were larger than quarters one and two. At Ritner, quarter two was the largest, while at North East Waste, quarter three was the largest. OM's quarter two may have been affected by the June 2023 wildfire impacts noted in New Jersey's PM2.5 Exceptional Event. Ammonium sulfate displays a slight trend where quarter three is the largest; however, this trend was less apparent at North East Waste. Crustal material displays a slight trend where quarter one is the smallest at North East Waste. At Ritner, crustal material was also the smallest in quarter one, but this difference was less apparent than at other monitors. There, quarter two was also the largest quarter for crustal material. EC did not display a strong or consistent quarterly trend in concentrations.

Figure 23: PM2.5 Compositional Analysis at Pennsylvania Ritner from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)

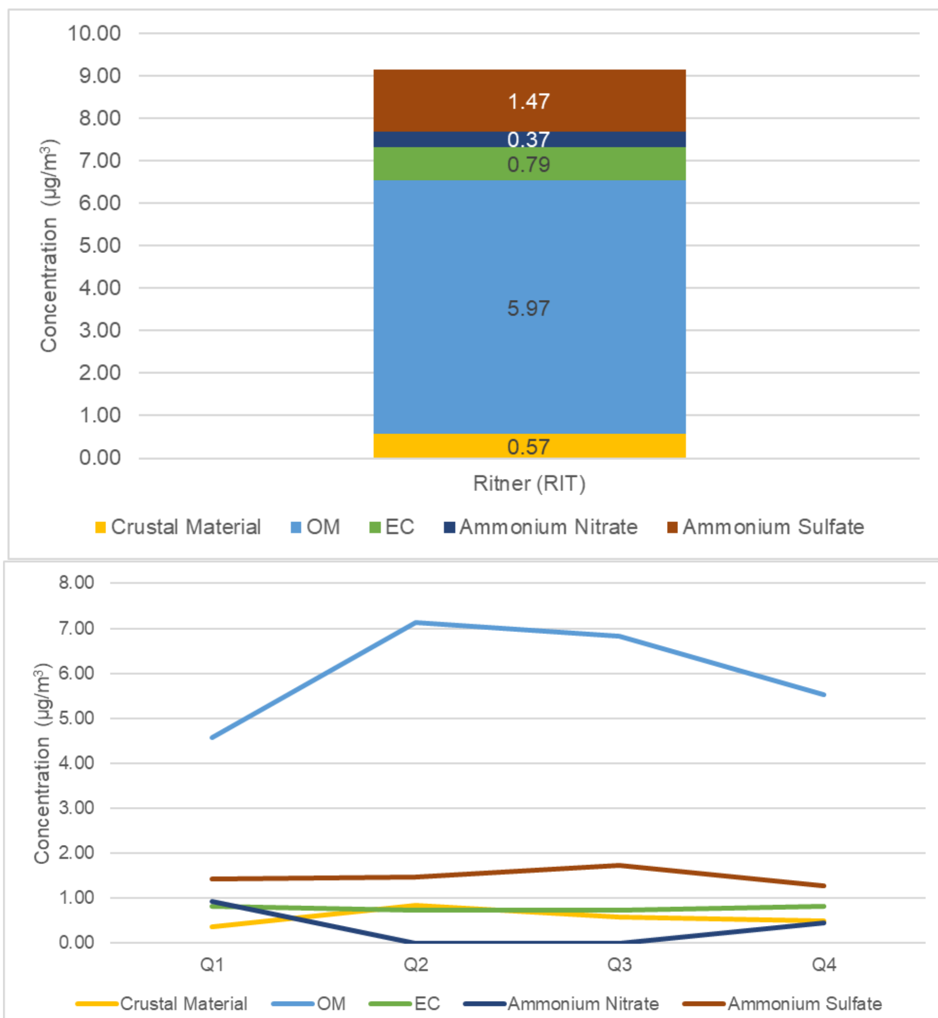
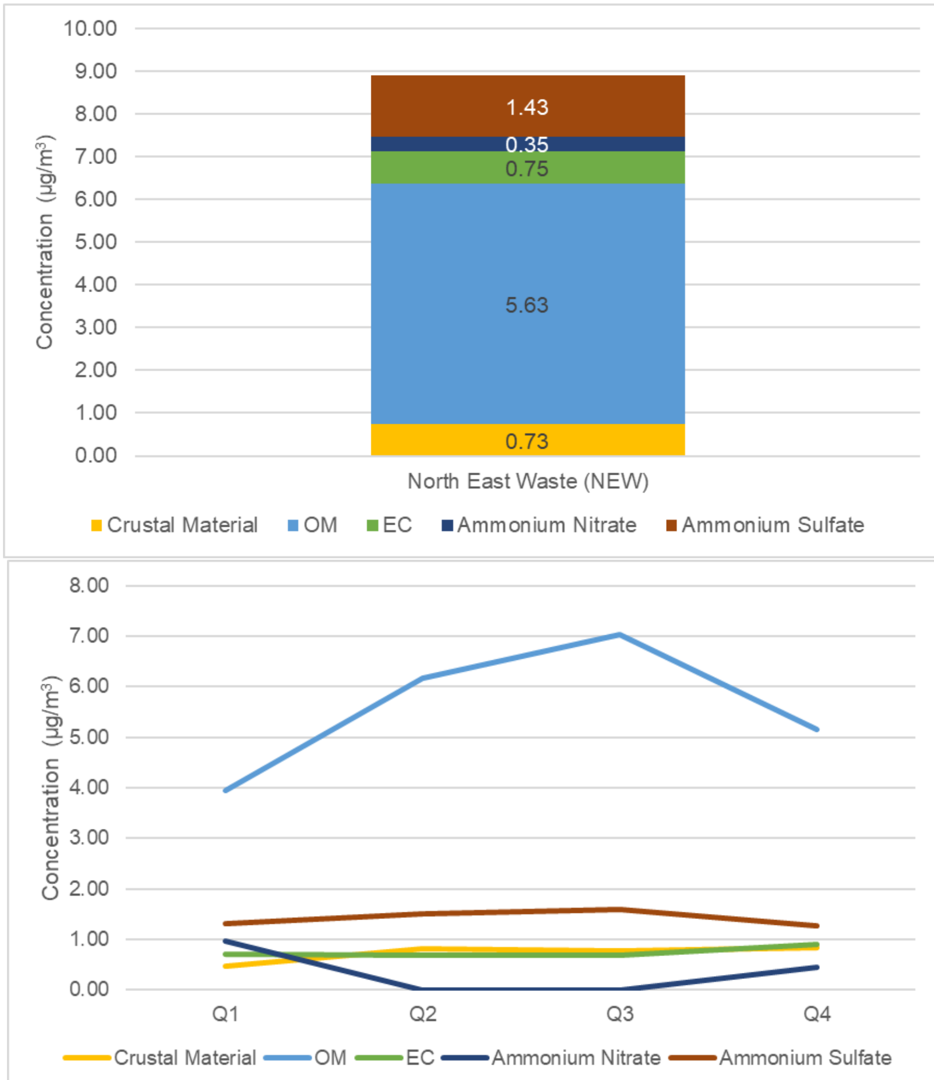


Figure 24: PM2.5 Compositional Analysis at Pennsylvania North East Waste from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)



1.4 Urban Increment Analysis

An urban increment analysis is conducted to determine the amount of particulate matter that is emitted locally in urban areas. Typical urban sources of PM2.5 that are considered to be local in nature and that may impact PM2.5 levels at an air monitor include nearby vehicular traffic, local industry, construction activity, pesticide use, and wood burning. As stated in USEPA's area designation guidance memo, "… the urban increment model generally predicts that sulfate originates mainly from regional sources; organic carbon and nitrate from a mix of regional and local sources; and black carbon and crustal material from local sources".[45]

The urban increment at a monitor can help compare the amount of each pollutant that can be attributed to regional sources or to local sources. It is the difference between the speciation

[45] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

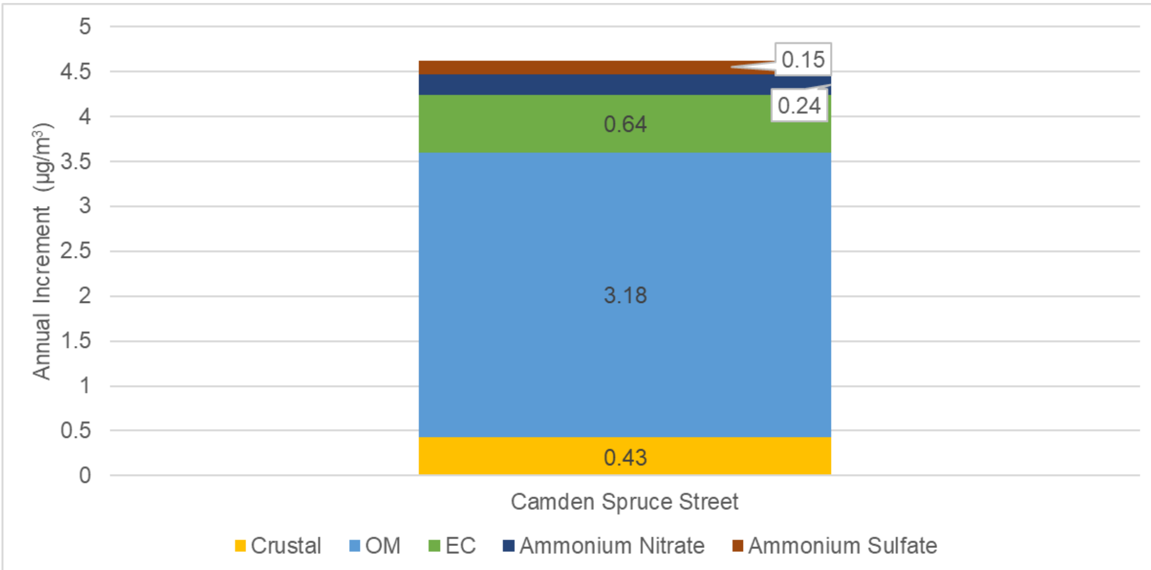
levels at the nearest urban (CSN) monitor and nearby rural (IMPROVE) monitor(s) within 150 miles, respectively representing total and regional contributions. Since it is the rural (regional) speciation data subtracted from the urban (local plus regional) speciation, the urban increment estimates the local contribution.

The closest CSN monitor to Camden Spruce Street is co-located at Camden Spruce Street, and there is one IMPROVE monitor within 150 miles of Camden Spruce Street: Brigantine located at the Edwin B. Forsythe National Wildlife Refuge in New Jersey. Therefore, the urban increment is calculated by subtracting the annual average speciation data at the rural Brigantine IMPROVE monitor from the urban Camden Spruce Street CSN monitor. The species analyzed are organic matter (OM), elemental carbon (EC), ammonium sulfate, ammonium nitrate, and crustal material.

Figure 25 shows the annual and quarterly urban increment at Camden Spruce Street, specifically the average of the annual averages from 2021-2023 and the average of the calendar quarters from 2021-2023. The largest proportion by far is OM, indicating that a large amount of OM is from local sources. The second largest is EC, then crustal matter, ammonium nitrate, and ammonium sulfate. However, ammonium nitrate displays a seasonal trend where the urban increment is largest in the winter, quarters one and four, and zero in quarters two and three. This matches the trend shown in the compositional analysis from Section 1.3 and indicates that local sources contribute to the ammonium nitrate concentrations at Camden Spruce Street in quarters one and four but not in quarters two and three. EC's smallest quarter is quarter two and largest quarter is quarter four. Ammonium sulfate is slightly smaller in quarters two and three. Crustal material is slightly larger in quarter four. OM's quarterly trends show quarter two being the largest and quarter four being the smallest.

Figure 26 shows the comparison of the annual local and regional contributions to the speciation data at Camden Spruce Street. The value for the local portion in the graph is the urban increment, and the value for the regional portion in the graph is the IMPROVE monitoring data used in the urban increment calculation. This comparison shows that most OM, EC, crustal material, and ammonium nitrate is local, while most ammonium sulfate is regional. 54% of OM and crustal material are local. 72% of EC is local. 85% of ammonium nitrate is local. 10% of ammonium sulfate is local. The urban increment showed that the amount of OM at the monitor from local and regional sources was fairly even; however, there was widespread wildfire smoke across the region in 2021 and 2023 that could have impacted the data. The current small local contribution of ammonium sulfate likely is due to the significant success New Jersey has had in lowering the amount of sulfate, attributable to New Jersey's control measures.

Figure 25: PM2.5 Urban Increment at Camden Spruce Street from 2021-2023 Yearly Average (top) and Calendar Quarterly Average (bottom)



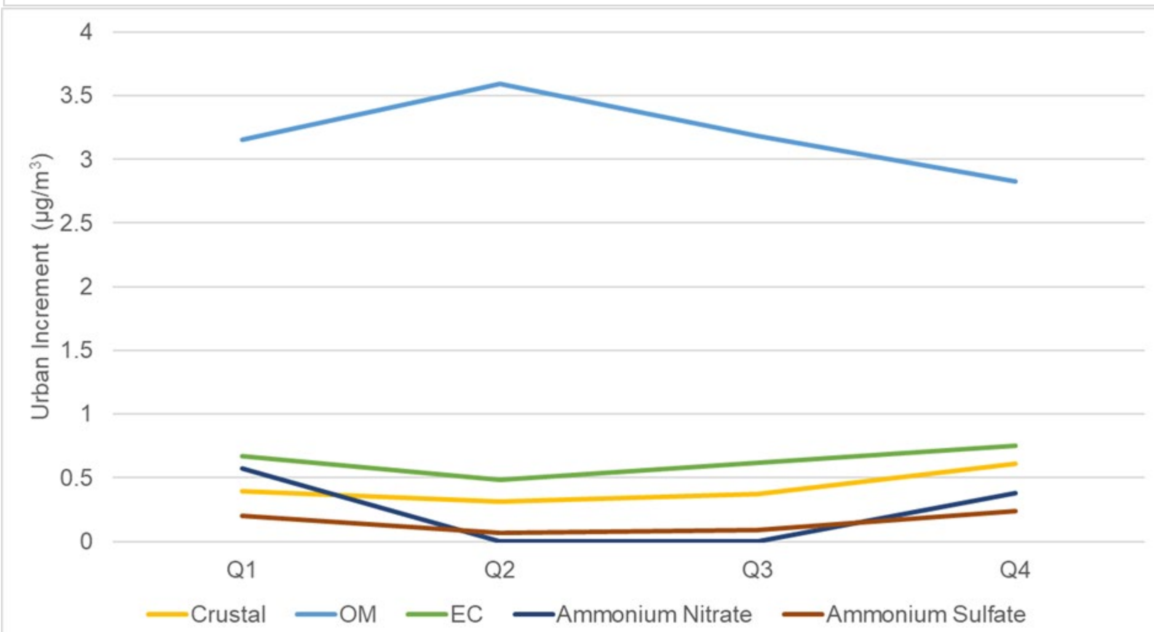
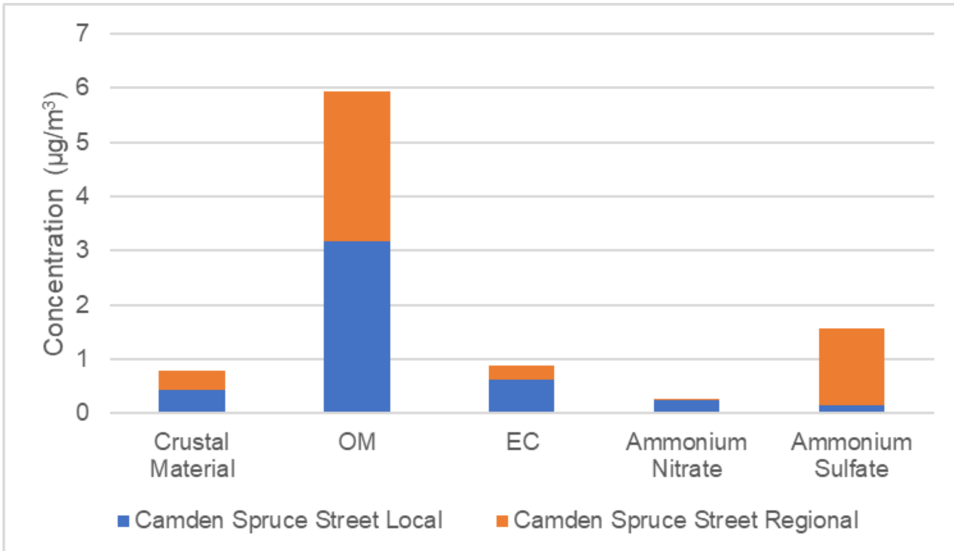


Figure 26: Species Comparison of the Average Annual Concentrations' Local Portion and the Regional Portion from 2021-2023 at Camden Spruce Street*



* The urban increment is calculated by subtracting the annual average measured at the rural IMPROVE monitor from the annual average measured at the urban Elizabeth Lab CSN monitor. The urban increment is considered the contribution of local pollution to the monitor. The regional portion is the concentrations measured at the IMPROVE monitor(s).

The closest CSN monitor to Ritner is co-located at Ritner. The closest CSN monitor to North East Waste is co-located at North East Waste. The closest CSN monitor to Torresdale Station is located at North East Waste. There is one IMPROVE monitor within 150 miles of all three Pennsylvanian monitors: Brigantine in New Jersey. Because North East Waste and Torresdale Station use the same CSN and IMPROVE monitor, their urban increment analyses are the same.

Figure 27 shows the annual urban increment at the Ritner, North East Waste, and Torresdale Station monitor sites in Pennsylvania, specifically the average of the annual averages from 2021-2023. The largest proportion by far for the Pennsylvanian monitors is OM. The second largest for all increments is EC. At North East Waste and Torresdale Station, the third largest was crustal material. The third largest at Ritner was ammonium nitrate; however, it was only slightly larger than the fourth largest which was crustal material. Ammonium nitrate was the next largest at the North East Waste and Torresdale Station monitors. The smallest increment by far was ammonium sulfate. The increment and therefore the local sources of ammonium sulfate measured at Ritner, North East Waste, and Torresdale Station were insignificant, being essentially zero.

The quarterly trend graphs in Figure 28 show a seasonal trend in the increment of ammonium nitrate, where it is essentially zero in quarters two and three with some influence from local sources in quarters one and four. This mirrors the compositional analyses in Section 1.3, which also indicate a quarterly trend where nitrate is larger in quarters one and four and essentially zero in quarters two and three. EC does not display a strong quarterly trend at Ritner, but there is a slight quarterly trend at North East Waste where quarter two is the smallest and quarter four is the largest. Ammonium sulfate is very low in all quarters, but it is essentially zero is quarters two and three. Crustal material at Ritner displays a slight trend where it is largest in quarters two and four. At North East Waste, crustal material displays a slight trend where quarter four is the largest. OM at Ritner is smallest in quarter one and then quarter three and largest in quarters two and four. OM at North East Waste is smallest in quarter two, slightly larger in quarter one, much larger in quarter four, and largest in quarter three.

Figure 29 shows the comparison of the annual local and regional contributions to the speciation data at the Ritner and North East Waste monitor sites in Pennsylvania. The value for the local portion in the graph is the urban increment, and the value for the regional portion in the graph is the IMPROVE monitoring data used in the urban increment calculation. At Ritner, this comparison shows that most OM, EC, and ammonium nitrate is local, while most crustal material and ammonium sulfate is regional. 55% of OM is local. 68% of EC is local. 79% of ammonium nitrate is local. 36% of crustal material is local. 5% of ammonium sulfate is local. At North East Waste, this comparison shows that most crustal material, EC, and ammonium nitrate is local; most OM is regional; and all ammonium sulfate is regional. 54% of crustal material is local. 59% of EC is local. 74% of ammonium nitrate is local. 45% of OM is local. 0% of ammonium sulfate is local. Similar to at Camden Spruce Street, the urban increment shows around half of the OM from the compositional analysis was from regional sources. Again, there may have been impact from the widespread wildfires, but there likely were still regional sources of OM.

Figure 27: Average Annual PM2.5 Urban Increment at Pennsylvania Ritner, North East Waste, and Torresdale Station from 2021-2023

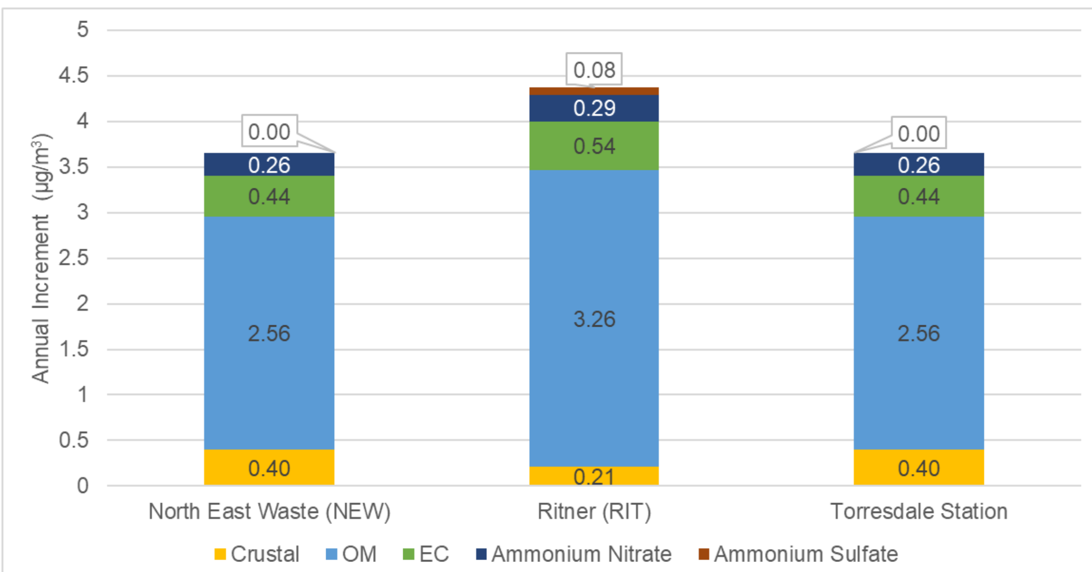


Figure 28: Calendar Quarterly Average PM2.5 Urban Increment at Pennsylvania Ritner (Top) and North East Waste (Bottom) from 2021-2023

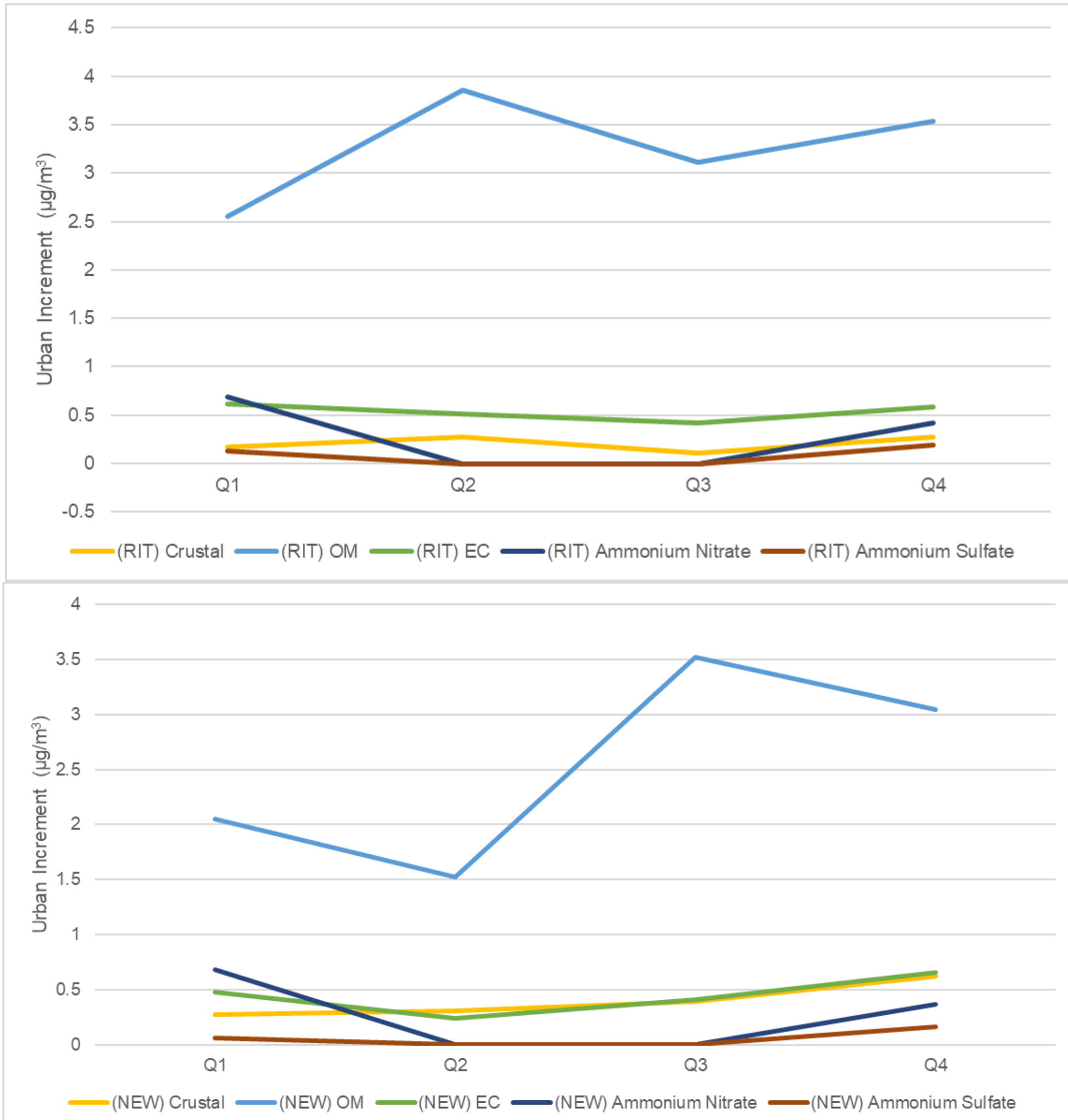
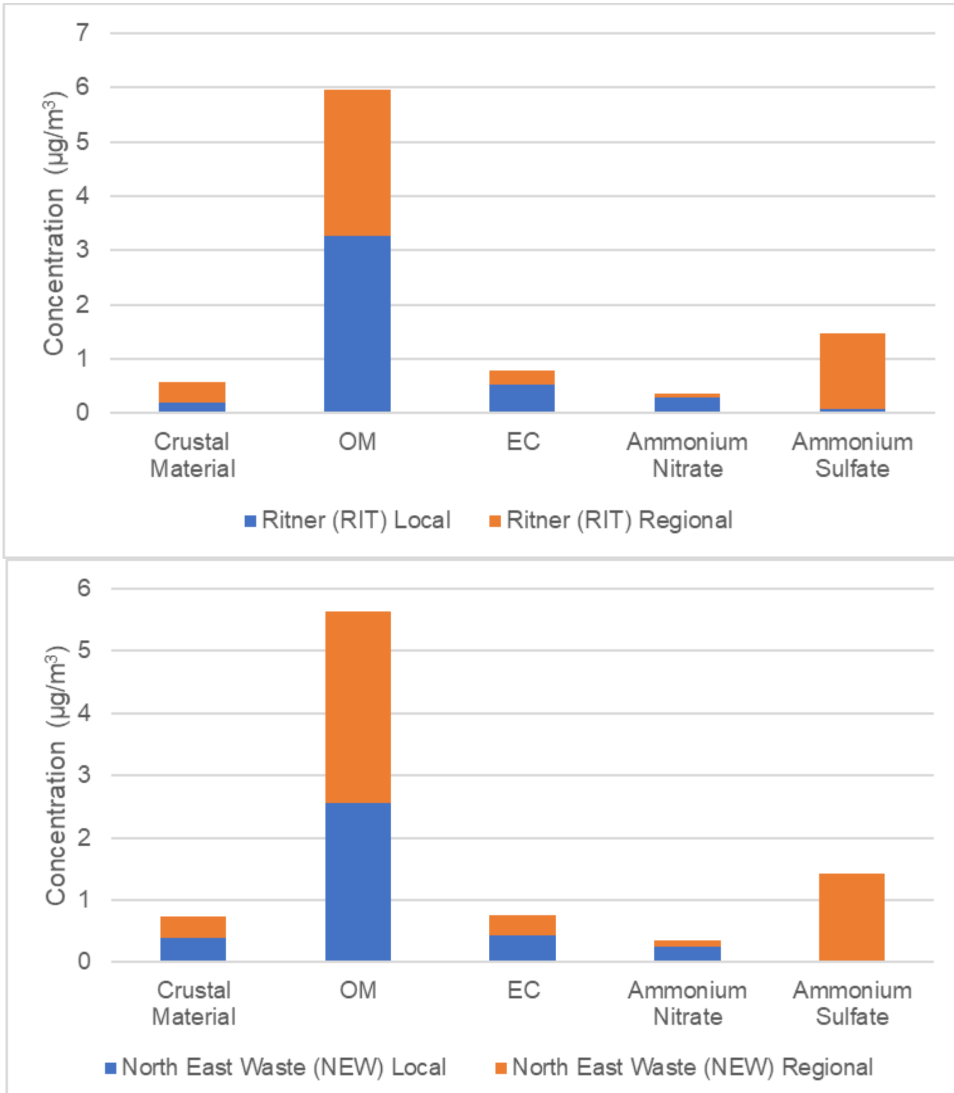


Figure 29: Species Comparison of the Average Annual Concentrations' Local Portion and the Regional Portion from 2021-2023 at Pennsylvania Ritner (Top) and North East Waste (Bottom)*



* The urban increment is calculated by subtracting the annual average measured at the rural IMPROVE monitor from the annual average measured at the urban Elizabeth Lab CSN monitor. The urban increment is considered the contribution of local pollution to the monitor. The regional portion is the concentrations measured at the IMPROVE monitor(s).

Factor 2: Emissions and Emission-Related Data

This section evaluates the estimated emissions by county from primary PM2.5, its components, and its precursors; and the emission-related data in a county like population density and traffic. The emission data is from the most recent comprehensive inventory, the USEPA Emissions Modeling Platform (EMP) 2022v1. This inventory was developed as a collaborative between USEPA, States and Regional Organizations. See 2022v1 Emissions Modeling Platform | US EPA. The inventory data from the modeling platform was provided by USEPA for use in the PM2.5 designations and posted on the PM2.5 Designation website at: https://www.epa.gov/particle-pollution-designations/particle-pollution-designations-memorandum-and-data-2024-revised

The data provided by USEPA was summarized into the sectors below. Note, certain mobile source emissions are combined with the stationary source emissions as described below.

Point sources are large stationary facilities that generally report their emissions directly via state and/or Federal permitting and reporting programs. Point sources include larger facilities such as electric generating units (EGUs), manufacturing facilities, and heating units for large schools and universities. In the data provided to States, USEPA also included mobile source nonroad emissions from airports and railroad switch yards as point sources.

Nonpoint sources are stationary area sources and some mobile sources. Area sources are those emissions categories that are too small, widespread, or numerous to be inventoried individually. Therefore, emissions are estimated for these categories using activity data such as population, employment, and fuel use. There is a wide range of area source categories, but examples include residential fuel combustion, consumer product use, paints and any stationary source emissions not included in the point source sector. In the data provided to States, the USEPA also included emissions from the mobile source nonroad categories for commercial marine vessels and underway rail emissions as nonpoint.

Nonroad mobile sources are vehicles and equipment that are not designed to operate on roadways. Examples include construction equipment, industrial equipment such as forklifts, recreational boats and vehicles, and lawn & garden equipment. In the data provided by USEPA, nonroad emissions from airports and railroad switch yards are included as point sources and emissions from other railroad activities and commercial marine vessels are included as nonpoint sources.

Onroad mobile sources are vehicles that operate on roadways, including cars, trucks, buses, and motorcycles. In the data provided by USEPA stationary nonpoint area source vehicle refueling emissions at gasoline service stations are included in the onroad sector.

Biogenic sources are emission from natural sources such as trees, vegetation and soil.

Wildfires are unplanned, uncontrolled and unpredictable fire in an area of combustible vegetation.

Other fires include prescribed burning, agricultural burning and open burning.

The inventory data provided to states also includes emissions by Facility.

The speciation components include OC, EC, nitrate (NO_3), sulfate (SO_4), and remaining fine particulate matter, and the precursors include sulfur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs), and ammonia (NH_3). Although emissions that transport from far away may affect the monitor, nonattainment areas only include nearby regions. USEPA notes in particular that “sulfate and nitrate are formed through atmospheric processes and can be transported many hundreds of miles”, “direct PM2.5 emissions sources will generally be local”, and “the gaseous precursors… will generally be more regional in nature (although the EPA also expects some local NO_X and VOC emissions contributions from mobile and stationary sources)”.[46]

[46] Ibid.

Figure 30 shows the 2022 annual estimated anthropogenic emissions of PM2.5 and its precursors in the CSA from the Emission Modeling Platform (EMP) 2022v1, excluding wildfires. Table 8 shows a summary of 2022 annual anthropogenic (excluding fires), biogenic, wildfire, and "other fire" emissions in tons per year (tpy) and emission density in tpy/mi^2 by state. Emission density was calculated by dividing the state emissions by the state area. The most significant precursors in the formation of PM2.5 in order are SO_2 and NO_X, with VOC and NH_3 following that are less contributory to PM2.5 formation. Although SO_2 is one of the most significant precursors, it has the lowest emissions in the 2022 inventory due to significant federal and State rules to reduce SO_2. However, as shown in Table 8, Pennsylvania's anthropogenic direct PM2.5 and SO_2 emission densities are significantly higher than the other states.

As shown in Table 8, the highest anthropogenic emissions, excluding fire emissions, in the CSA are from VOCs, followed by NO_X, PM2.5, NH_3, and SO_2 for New Jersey and Pennsylvania. The highest anthropogenic emissions, excluding fire emissions, in the CSA are from NO_X, followed by VOCs, NH_3, PM2.5, and SO_2 for Delaware and Maryland. Of the four states, New Jersey has the lowest anthropogenic (excluding fires) emissions density for PM2.5, SO_2, and NH_3. The state with the highest emissions density for PM2.5 and SO_2 is Pennsylvania, followed by Delaware, Maryland, and New Jersey. The state with the highest emissions density for NH_3 is Delaware, followed by Pennsylvania, Maryland, and New Jersey. New Jersey has the second lowest anthropogenic (excluding fires) emissions densities for NO_X and VOCs. The state with the highest emission densities for NO_X and VOCs is Pennsylvania, followed by Delaware, New Jersey, and Maryland.

Figure 30: 2022 Annual Anthropogenic Emissions of PM2.5 and its Precursors in the PA-NJ-DE-MD CSA by County, Excluding Wildfires

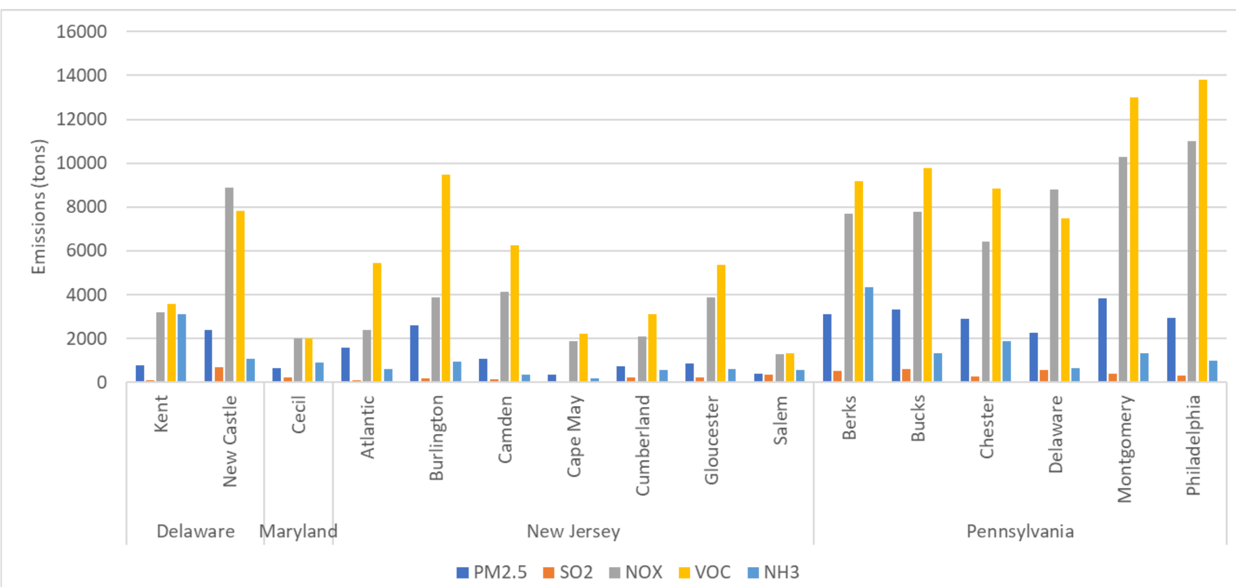


Table 8: 2022 Annual State Emissions of PM2.5 and its Precursors in the PA-NJ-DE-MD CSA

PM2.5

State	Emissions Other Total (tpy)	Emissions Other Density (tpy/mi^2)	Other Fire Total (tpy)	Other Fire Density (tpy/mi^2)	Wildfire Total (tpy)	Wildfire Density (tpy/mi^2)	Biogenic Total (tpy)	Biogenic Density (tpy/mi^2)
DE	2,785	2.75	366	0.36	0	0.00	0	0.00
MD	505	1.46	137	0.40	1	0.00	0	0.00
NJ	4,232	1.43	3,360	1.13	6,802	2.29	0	0.00
PA	16,727	5.55	1,681	0.56	8	0.00	0	0.00

SO_2

State	Emissions Other Total (tpy)	Emissions Other Density (tpy/mi^2)	Other Fire Total (tpy)	Other Fire Density (tpy/mi^2)	Wildfire Total (tpy)	Wildfire Density (tpy/mi^2)	Biogenic Total (tpy)	Biogenic Density (tpy/mi^2)
DE	755	0.75	42	0.04	0	0.00	0	0.00
MD	210	0.61	10	0.03	0	0.00	0	0.00
NJ	1,040	0.35	199	0.07	345	0.12	0	0.00
PA	2,542	0.84	126	0.04	0	0.00	0	0.00

NO_X

State	Emissions Other Total (tpy)	Emissions Other Density (tpy/mi^2)	Other Fire Total (tpy)	Other Fire Density (tpy/mi^2)	Wildfire Total (tpy)	Wildfire Density (tpy/mi^2)	Biogenic Total (tpy)	Biogenic Density (tpy/mi^2)
DE	12,057	11.91	31	0.03	0	0.00	612	0.60
MD	1,997	5.77	31	0.09	0	0.00	230	0.66
NJ	19,343	6.52	250	0.08	372	0.13	973	0.33
PA	51,678	17.15	348	0.12	1	0.00	1,304	0.43

VOC

State	Emissions Other Total (tpy)	Emissions Other Density (tpy/mi^2)	Other Fire Total (tpy)	Other Fire Density (tpy/mi^2)	Wildfire Total (tpy)	Wildfire Density (tpy/mi^2)	Biogenic Total (tpy)	Biogenic Density (tpy/mi^2)
DE	10,807	10.67	591	0.58	0	0.00	20,333	20.08
MD	1,903	5.49	94	0.27	1	0.00	9,074	26.20
NJ	27,956	9.43	5,312	1.79	10,868	3.67	50,772	17.12
PA	61,061	20.27	1,047	0.35	10	0.00	44,989	14.93

NH_3

State	Emissions Other Total (tpy)	Emissions Other Density (tpy/mi^2)	Other Fire Total (tpy)	Other Fire Density (tpy/mi^2)	Wildfire Total (tpy)	Wildfire Density (tpy/mi^2)	Biogenic Total (tpy)	Biogenic Density (tpy/mi^2)
DE	4,017	3.97	162	0.16	0	0.00	0	0.00
MD	869	2.51	22	0.06	0	0.00	0	0.00
NJ	3,568	1.20	265	0.09	503	0.17	0	0.00
PA	9,870	3.28	704	0.23	0	0.00	0	0.00

Figure 31 and Table 9 show the 2022 annual emissions of PM2.5 species in the CSA. The PM2.5 species are the organic carbon, elemental carbon, nitrate, sulfate, and remaining fine particulate matter. The largest anthropogenic emissions, excluding fire emissions, in the CSA in order are remaining fine particulate matter, OC, EC, sulfate, and nitrate. The largest emission density of EC, nitrate, sulfate, and remaining fine particulates in order is Pennsylvania, Delaware, Maryland, and New Jersey. The largest emission density of OC in order is Pennsylvania, Delaware, New Jersey, and Maryland.

As mentioned in Section 1.4, the urban increment analysis shows the proportion of each species that can be attributed to local sources compared to regional sources. See the analysis for the monitor specifics. Applying this analysis to the emissions described here can help in interpreting the impact of local emissions compared to the more regional emissions.

Figure 31: 2022 Annual Emissions of PM2.5 Species in the PA-NJ-DE-MD CSA by County Excluding Wildfires

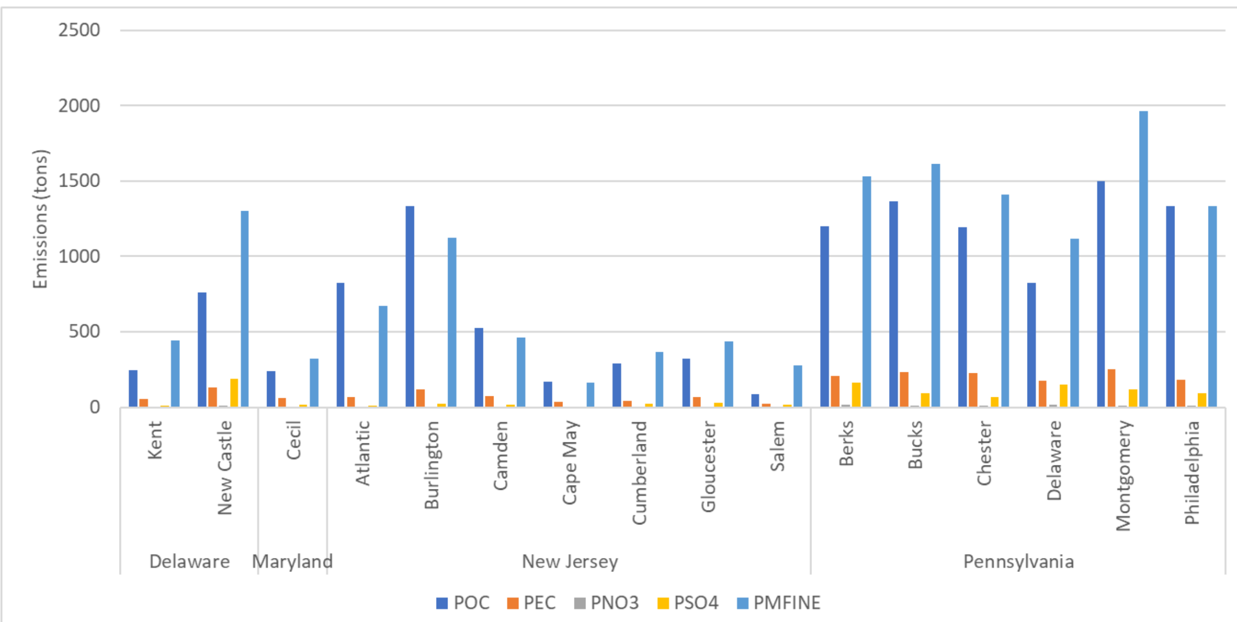


Table 9: 2022 Annual State Emissions of PM2.5 Species in the PA-NJ-DE-MD CSA

Particulate Organic Carbon								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
DE	811	0.80	199	0.20	0	0.00	0	0.00
MD	184	0.53	58	0.17	1	0.00	0	0.00
NJ	1,680	0.57	1,867	0.63	3,811	1.29	0	0.00
PA	6,725	2.23	685	0.23	5	0.00	0	0.00

Particulate Elemental Carbon								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
DE	171	0.17	11	0.01	0	0.00	0	0.00
MD	47	0.13	13	0.04	0	0.00	0	0.00
NJ	329	0.11	84	0.03	134	0.05	0	0.00
PA	1,103	0.37	169	0.06	0	0.00	0	0.00

Particulate Nitrate								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
DE	11	0.01	0	0.00	0	0.00	0	0.00
MD	3	0.01	0	0.00	0	0.00	0	0.00
NJ	16	0.01	3	0.00	6	0.00	0	0.00
PA	71	0.02	5	0.00	0	0.00	0	0.00

Particulate Sulfate								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
DE	201	0.20	2	0.00	0	0.00	0	0.00
MD	14	0.04	2	0.01	0	0.00	0	0.00
NJ	103	0.03	10	0.00	17	0.01	0	0.00
PA	657	0.22	25	0.01	0	0.00	0	0.00

Remaining Fine Particulate Matter								
State	Emissions Other		Other Fire		Wildfire		Biogenic	
	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)	Total (tpy)	Density (tpy/mi^2)
DE	1,591	1.57	154	0.15	0	0.00	0	0.00
MD	258	0.74	64	0.18	1	0.00	0	0.00
NJ	2,103	0.71	1,396	0.47	2,834	0.96	0	0.00
PA	8,171	2.71	796	0.26	3	0.00	0	0.00

Figures 32a through Figure 32e and Figure 33 show the 2022 annual emissions by emission sector and county in the CSA.

Figure 32a: 2022 Annual Emissions of PM2.5 in the PA-NJ-DE-MD CSA by County

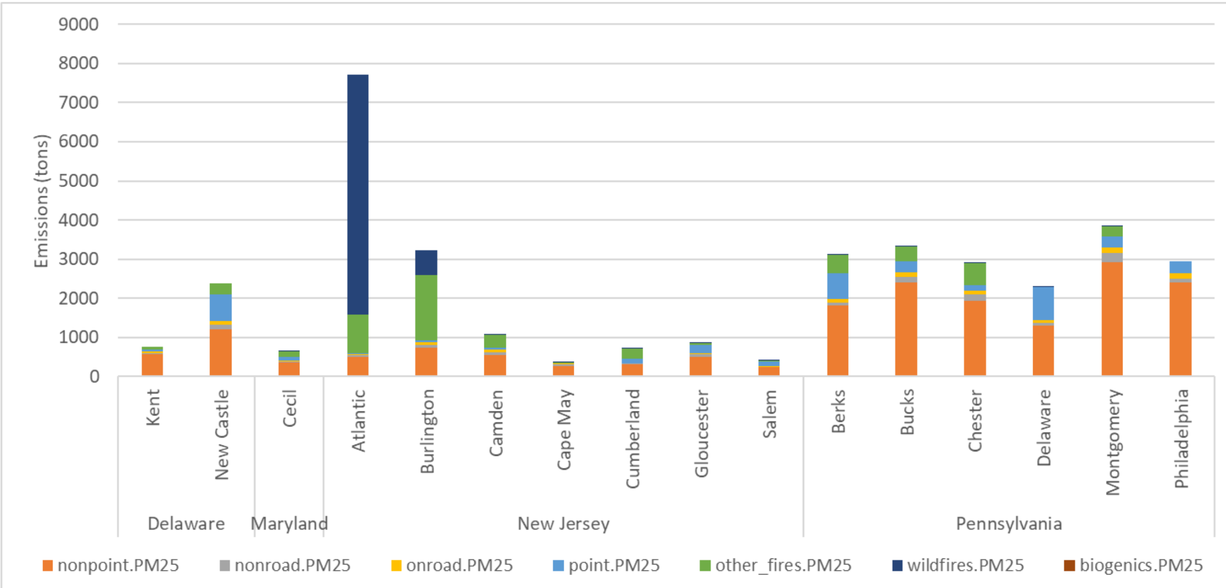


Figure 32b: 2022 Annual Emissions of SO_2 in the PA-NJ-DE-MD CSA by County

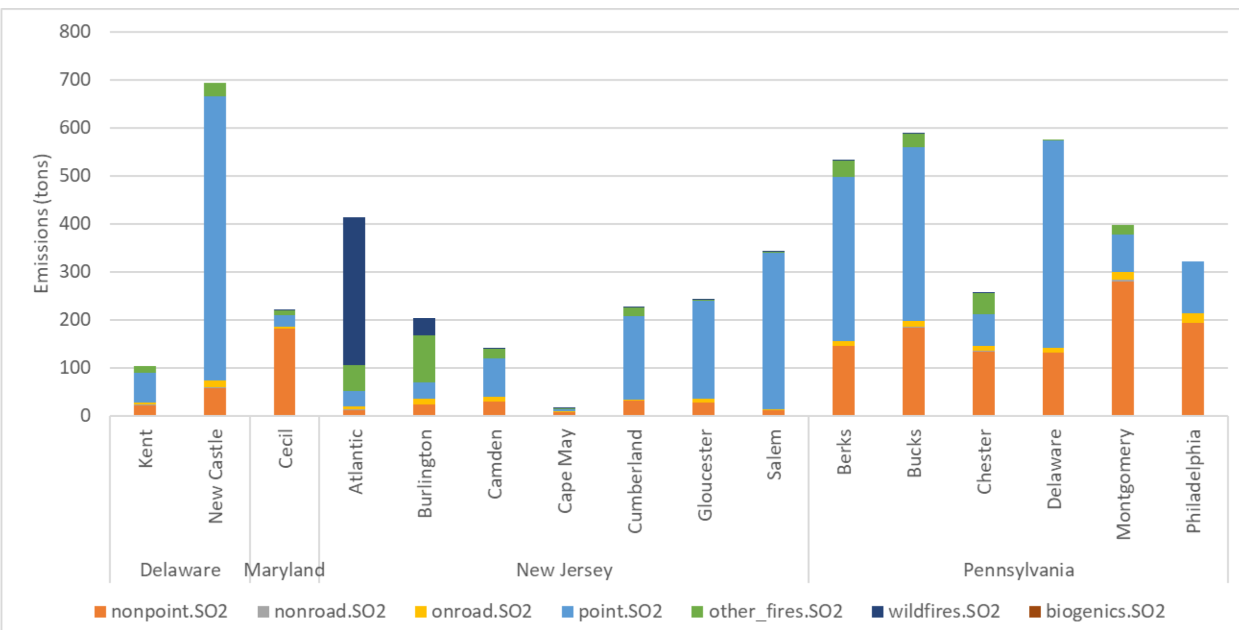


Figure 32c: 2022 Annual Emissions of NO_X in the PA-NJ-DE-MD CSA by County

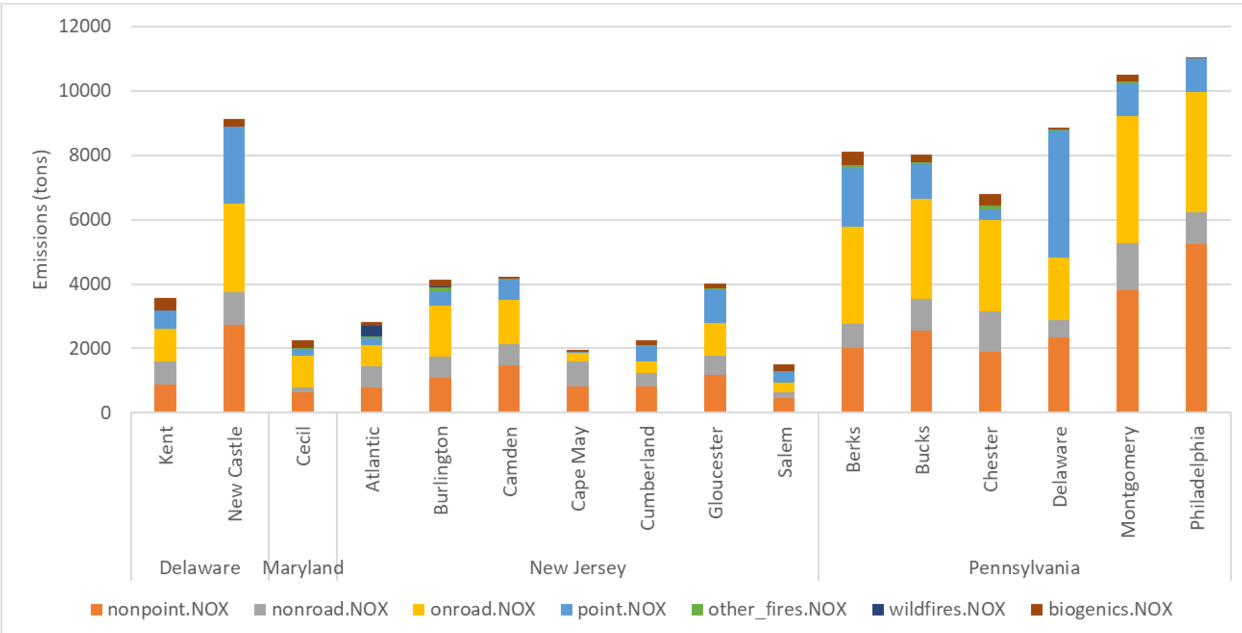


Figure 32d: 2022 Annual Emissions of VOCs in the PA-NJ-DE-MD CSA by County

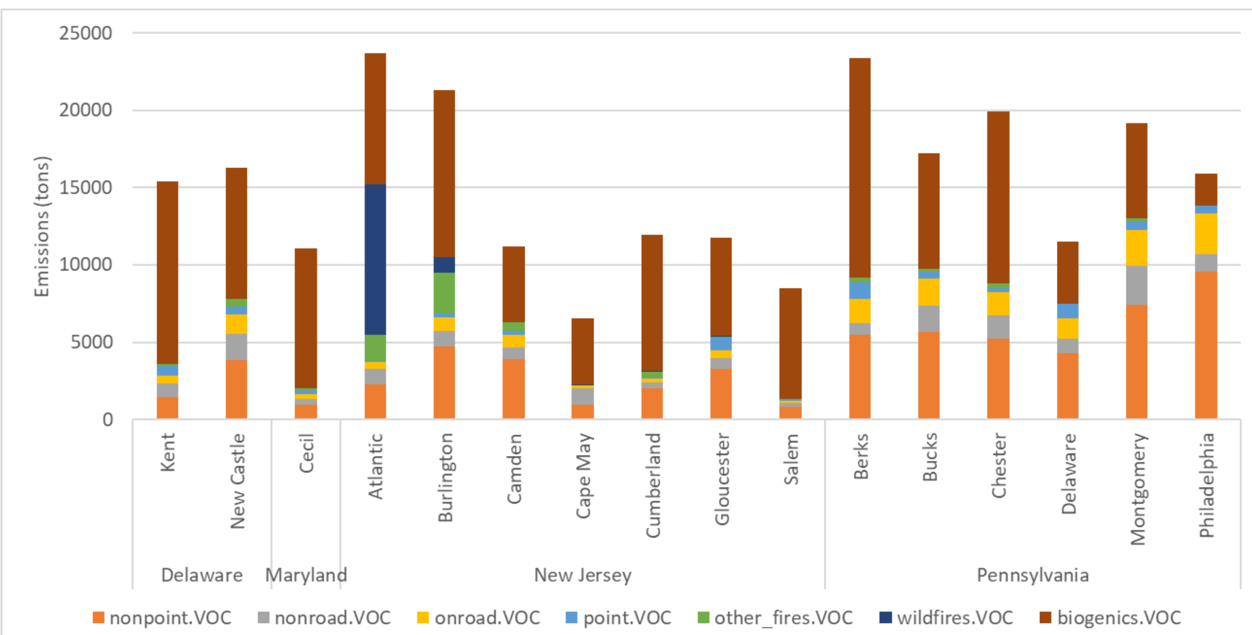


Figure 32e: 2022 Annual Emissions of NH_3 in the PA-NJ-DE-MD CSA by County

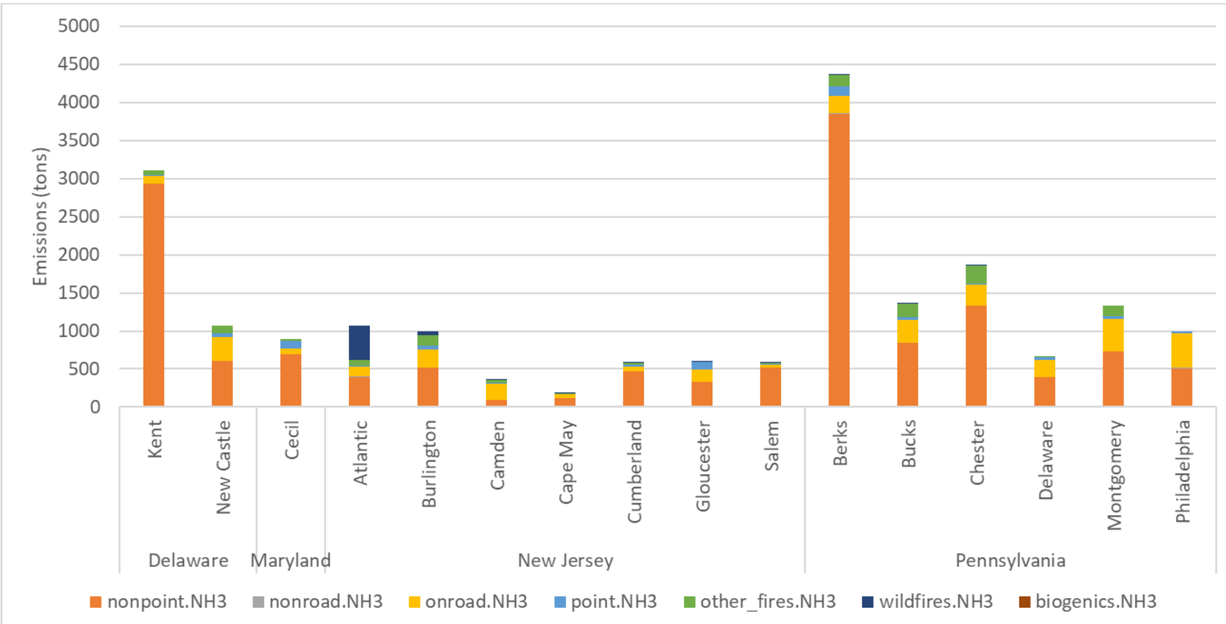
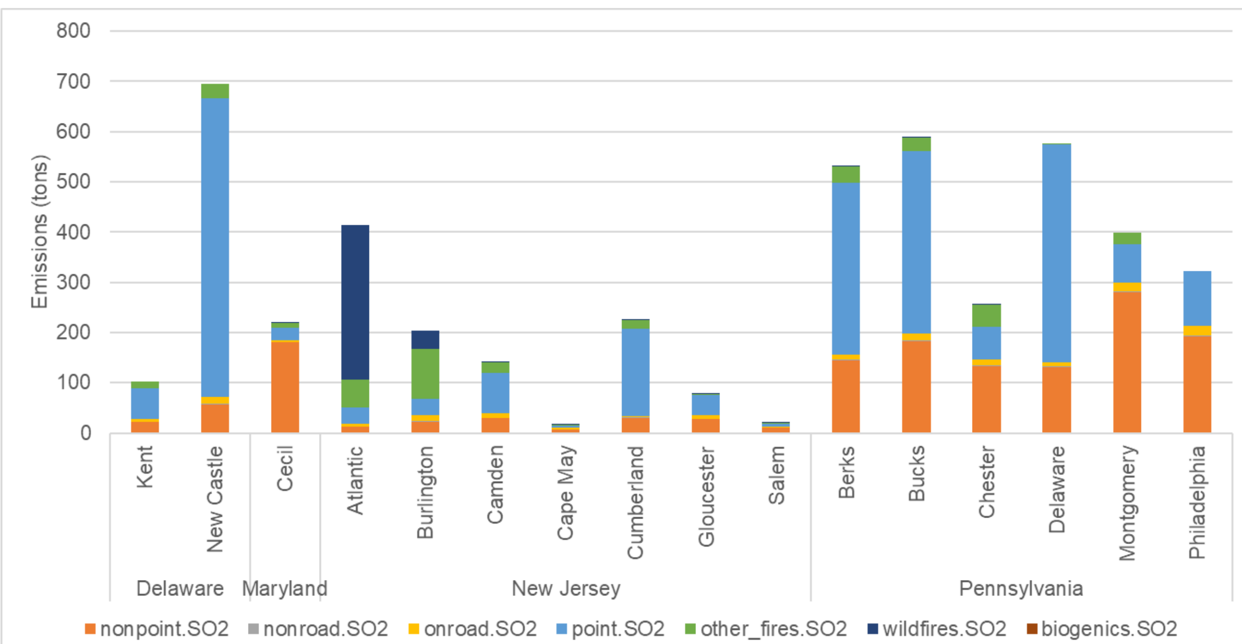


Figure 33: 2022 Annual Emissions of SO_2 in the PA-NJ-DE-MD CSA by County After Excluding Point Source Emissions from the Terminated Coal Power Plants Carney's Point in Salem County and Logan in Gloucester County



As USEPA notes, direct PM2.5 emissions generally contribute locally with less long-range transport.[47] As shown in Figure 32a, Camden County does not have a large amount of direct PM2.5 emissions comparatively in the CSA. Philadelphia County, however, has one of the largest amounts of direct PM2.5 emissions in the CSA, meaning that there is a large local source of PM2.5 emissions in Philadelphia County that influences the violations at the three

[47] Ibid.

Philadelphia monitors. Philadelphia County has the largest PM2.5 emission density in the CSA as well, with an anthropogenic (excluding fires) emission density for PM2.5 of 22 tpy/mi^2. In comparison, Camden County has the sixth largest emission density out of the 16 CSA counties, with an anthropogenic (excluding fires) emission density for PM2.5 of 3.3 tpy/mi^2.

Furthermore, even if the consideration of local emissions is expanded to the counties surrounding Philadelphia County, the PM2.5 emissions from three Pennsylvania counties that border Philadelphia County greatly outweigh those from the three closest New Jersey counties. Specifically, the sum of PM2.5 emissions from Bucks, Delaware, and Montgomery County, PA is 82% larger than the sum from Burlington, Camden, and Gloucester County, NJ. Bucks, Delaware, and Montgomery Counties are also in the top five densest counties for anthropogenic (excluding fires) emission density, each respectively having an emission density of 4.9 tpy/mi^2, 12 tpy/mi^2, and 7.4 tpy/mi^2. Burlington and Gloucester are in the lower half of the CSA for anthropogenic (excluding fires) emission density, ranked 9 (2.5 tpy/mi^2) and 14 (1.2 tpy/mi^2) out of the 16 CSA counties, respectively.

2.1 Point Source Emissions

As shown in Figure 32a through 32e and Figure 33, NJ's point source emissions for all pollutants are overall lower than the other state emissions and other sector emissions.

Point source emissions of PM2.5 are minimal across most counties in the CSA. NJ has the lowest point source emission density for PM2.5 out of the states in the CSA. Pennsylvania has the largest point source PM2.5 emission density in the CSA at 0.8 tpy/mi^2, followed by Delaware at 0.7 ton/mi^2, Maryland at 0.3 tpy/mi^2, and New Jersey at 0.2 tpy/mi^2. As USEPA notes, direct PM2.5 emissions generally contribute locally with less long-range transport.[48] The counties with the largest point source PM2.5 emission density in the 2022 annual inventory are Delaware County, PA (4.5 tpy/mi^2), Philadelphia County, PA (2.3 tpy/mi^2), New Castle County, DE (1.6 tpy/mi^2), Berks County, PA (0.8 tpy/mi^2), and Gloucester County, NJ (0.6 tpy/mi^2).

The PM2.5 reductions from the 2022 closures of the Logan Generating Plant in Gloucester County, NJ and the Carneys Point Generating Plant in Salem County, NJ are not reflected in the figures. The Logan Generating Plant emitted 16 tpy of PM2.5, and the Carneys Point Generating Plant emitted 23 tpy of PM2.5. This resulted in an 8% reduction in point source emissions and a 2% reduction in total PM2.5 emissions in Gloucester County after the closures. Salem County's point source emissions were reduced by 18%, and the total PM2.5 emissions were reduced by 6%.

The largest proportion of SO_2 emissions in many counties were from point sources, including Kent County, DE; New Castle County, DE, Camden County, NJ; Cumberland County, NJ; Gloucester County, NJ; Salem County, NJ; Berks County, PA; Bucks County, PA; and Delaware County, PA. The counties with the largest SO_2 point source emission density are Delaware County, PA (2.4 tpy/mi^2), New Castle County, DE (1.4 tpy/mi^2), Salem County, NJ (1.0 tpy/mi^2), Philadelphia County, PA (0.8 tpy/mi^2), and Gloucester County, NJ (0.6 tpy/mi^2).

The SO_2 reductions from the 2022 closures of the Logan Generating Plant in Gloucester County, NJ and the Carneys Point Generating Plant in Salem County, NJ are not reflected in Figure 32b and are reflected in Figure 33. The largest source of 2022 SO_2 emissions in Gloucester County, NJ was the Logan Generating Plant at 164 tpy. This plant ceased operating, and the permit was terminated in 2022. In Salem County, the largest SO_2 source at 321 tpy was the Carneys Point Generating Plant, and this plant also ceased operating, and the permit was

[48] Ibid.

terminated in 2022. This makes a 68% and 94% reduction in total SO_2 emissions in Gloucester County and Salem County, respectively, and an 81% and 99% reduction in point source SO_2 emissions in the counties, respectively. This in turn changes the emission density of SO_2 in New Jersey, reducing it from 0.35 tpy/mi^2 to 0.19 tpy/mi^2.

In addition to the coal power plants that closed in New Jersey in the PA-NJ-DE-MD CSA, there will be reductions in emissions due to coal power plants in Pennsylvania closing or transitioning to natural gas. For example, the largest coal power plant in Pennsylvania, Homer City Generating Station, located near Pittsburgh, closed in July 2023. There have been reports of plans to restart the facility after converting it to natural gas.[49] The Keystone and Conemaugh coal plants near Pittsburgh plan to close in 2028, mainly due to USEPA wastewater regulations.[50] The Montour power plant and Brunner Island Steam Electric Station plant are expected to transition to natural gas by 2025 and 2028, respectively,[51] Although none of these coal power plants are in the PA-NJ-DE-MD CSA, there will be a reduction in the gaseous precursor emissions that can have a more regional effect due to emissions transport.

Point sources were not the largest source of NO_X emissions for most counties in the CSA with the exception of Delaware County, PA. The counties with the largest NO_X point source emission density are Delaware County, PA (22 tpy/mi^2), Philadelphia County, PA (7.7 tpy/mi^2), New Castle County, DE (5.6 tpy/mi^2), Gloucester County, NJ (3.3 tpy/mi^2), and Camden County, NJ (2.8 tpy/mi^2).

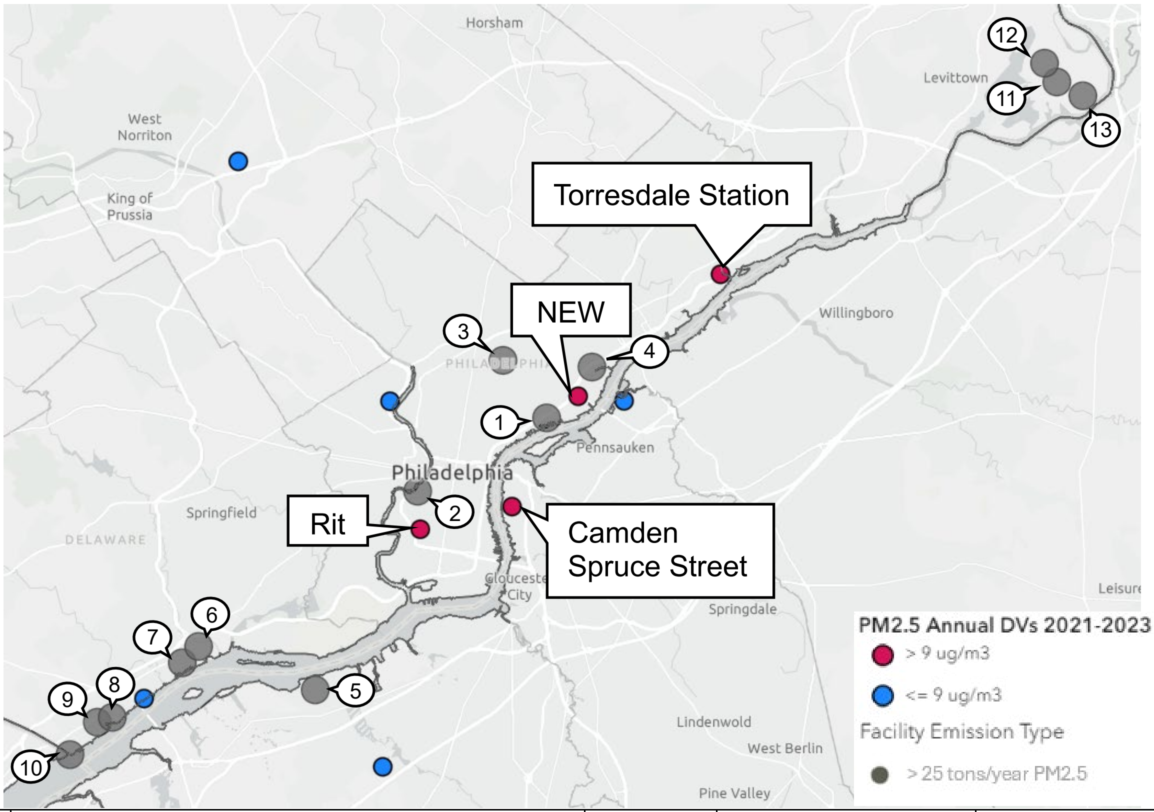
The NO_x reductions from the closure of the Logan Generating Plant and the Carneys Point Generating Plant are also not reflected in the figures. The Logan Generating Plant emitted 158 tpy of NO_X, and the Carneys Point Generating Plant emitted 289 tpy of NO_X in 2022. This resulted in a 15% reduction in point source emissions and a 4% reduction in total NO_X emissions in Gloucester County after the closures. Salem County's point source emissions were reduced by 79%, and the total NO_X emissions were reduced by 19%.

Point source emissions for VOCs and NH_3 are minimal in most counties and the counties did not have large point source VOC or NH_3 emissions compared to the other emission sectors.

Figure 34a below shows point source facilities with PM2.5 emissions greater than 25 tpy near the monitors in the CSA that are violating for PM2.5 based on 2023 Design Values.

[49] https://www.powermag.com/largest-pennsylvania-coal-fired-plant-will-convert-to-natural-gas/
[50] https://penncapital-star.com/energy-environment/epa-ruling-could-shutter-w-pa-power-plant-ahead-of-schedule/
[51] https://www.eenews.net/articles/pa-coal-plants-keep-closing-does-the-state-need-carbon-trading/

Figure 34a: Facilities with 2022 PM2.5 Emissions over 25 TPY Near the PM2.5 Violating Monitors in the CSA based on 2023 Design Values[52]



#	Facility Name	State	PM2.5 Emissions (tpy)	Distance from NJ Monitor (mi)
1	Riverside Materials Inc/Asphalt Plt	PA	45.9	3.4
2	Grays Ferry Cogen Partnership/Phila	PA	58.2	3.4
3	Tdps Materials Inc/Asphalt Plt	PA	48.0	5.2
4	Advansix Inc	PA	69.5	5.7
5	Paulsboro Refining Company LLC	NJ	54.9	9.6
6	Liberty Elec Power LLC/Eddystone Plt	PA	94.9	12.2
7	Barry Callebaut Usa LLC/Eddystone	PA	67.5	13.0
8	Covanta Delaware Valley LP/Delaware Valley Res Rec	PA	57.2	16.1
9	Monroe Energy LLC/Trainer	PA	137.3	16.7
10	Marcus Hook Energy LP/750 Mw	PA	363.5	18.1
11	Waste Mgmt Of Fairless/Fairless Ldfl	PA	54.5	24.6
12	Wheelabrator Falls Inc/Falls Twp	PA	41.3	24.7
13	Fairless Energy LLC/Falls Twp	PA	66.2	25.0

As shown in Figure 34a, the 2023 violating monitors are, from north to south, Torresdale Station (PA), North East Waste (PA), Camden Spruce Street (NJ), and Ritner (PA). There are 13 facilities near the monitors with PM2.5 emissions over 25 tpy, one in NJ and 12 in PA.

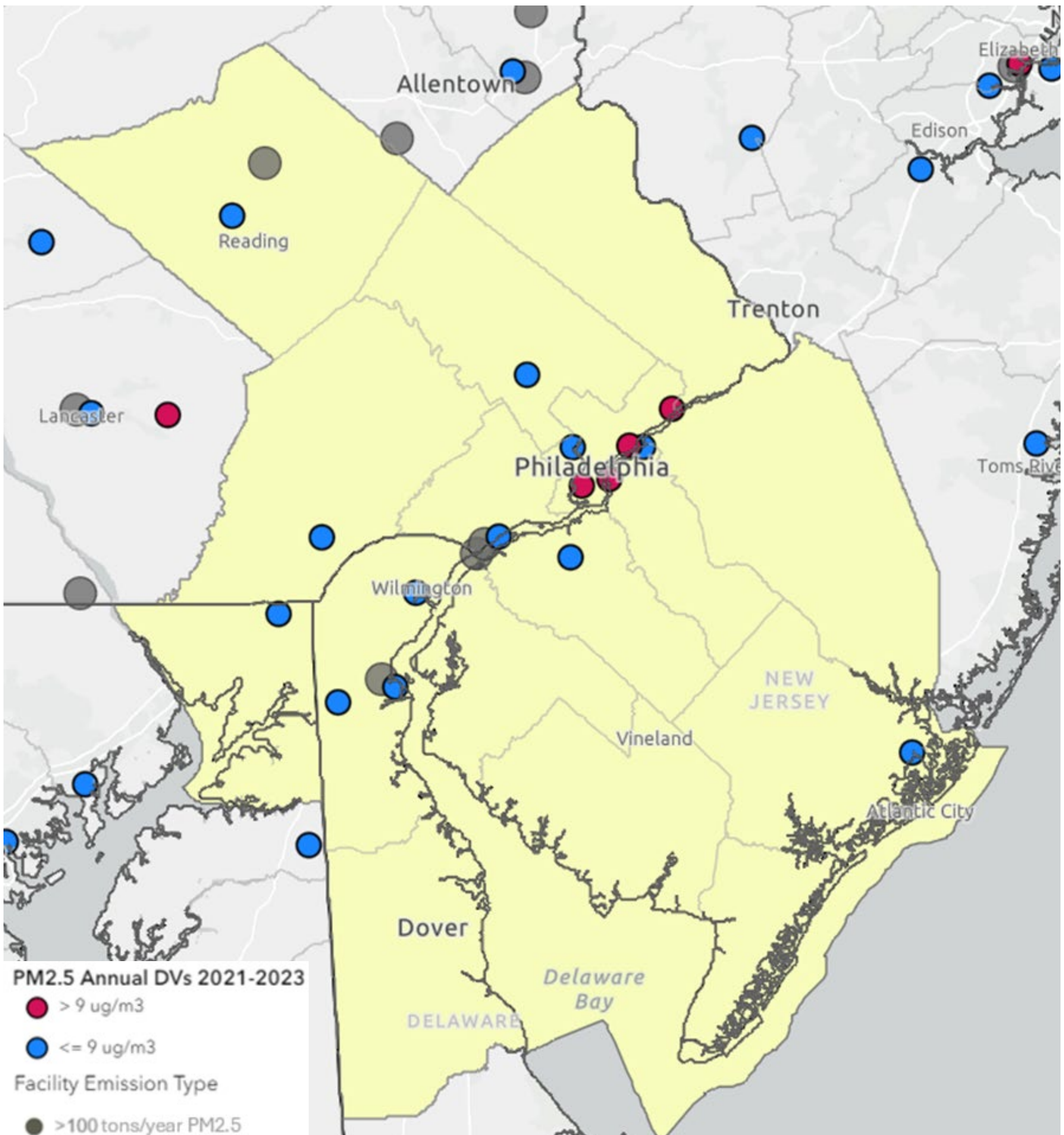
[52] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/10/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

As USEPA described in their guidance memo, direct emissions of PM2.5 tend to have more of a local impact.[53] As can be seen, there are four facilities near the Philadelphia monitors with PM2.5 emissions greater than 25 tpy. Two of these PA facilities (#1 and #4 on the map) are under two miles away from the North East Waste (PA) monitor, emitting 46 tpy and 70 tpy of PM2.5, and a third in PA (#3) is under three miles from the facility, emitting 48 tpy of PM2.5. One in PA (#2) is under two miles from the Ritner (PA) monitor, emitting 58 tpy of PM2.5. Not marked on the map, Camden County Energy Recovery Associates L.P. in NJ is 1.8 miles from Camden Spruce Street with PM2.5 emissions just under 25 tpy, emitting 24.4 tpy of PM2.5. All but one of the large point sources shown in Figure 34a are in Pennsylvania and are separated from New Jersey by the Delaware River, as will be mentioned in Factor 4.

Figures 34b through Figure 34e show the facilities with emissions greater than 100 tpy within the CSA for PM2.5, SO_2, NO_X, and VOC. Note that there were no facilities in the PA-NJ-DE-MD CSA with ammonia emissions greater than 100 tpy.

[53] USEPA. Memorandum on the Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024. Retrieved from https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

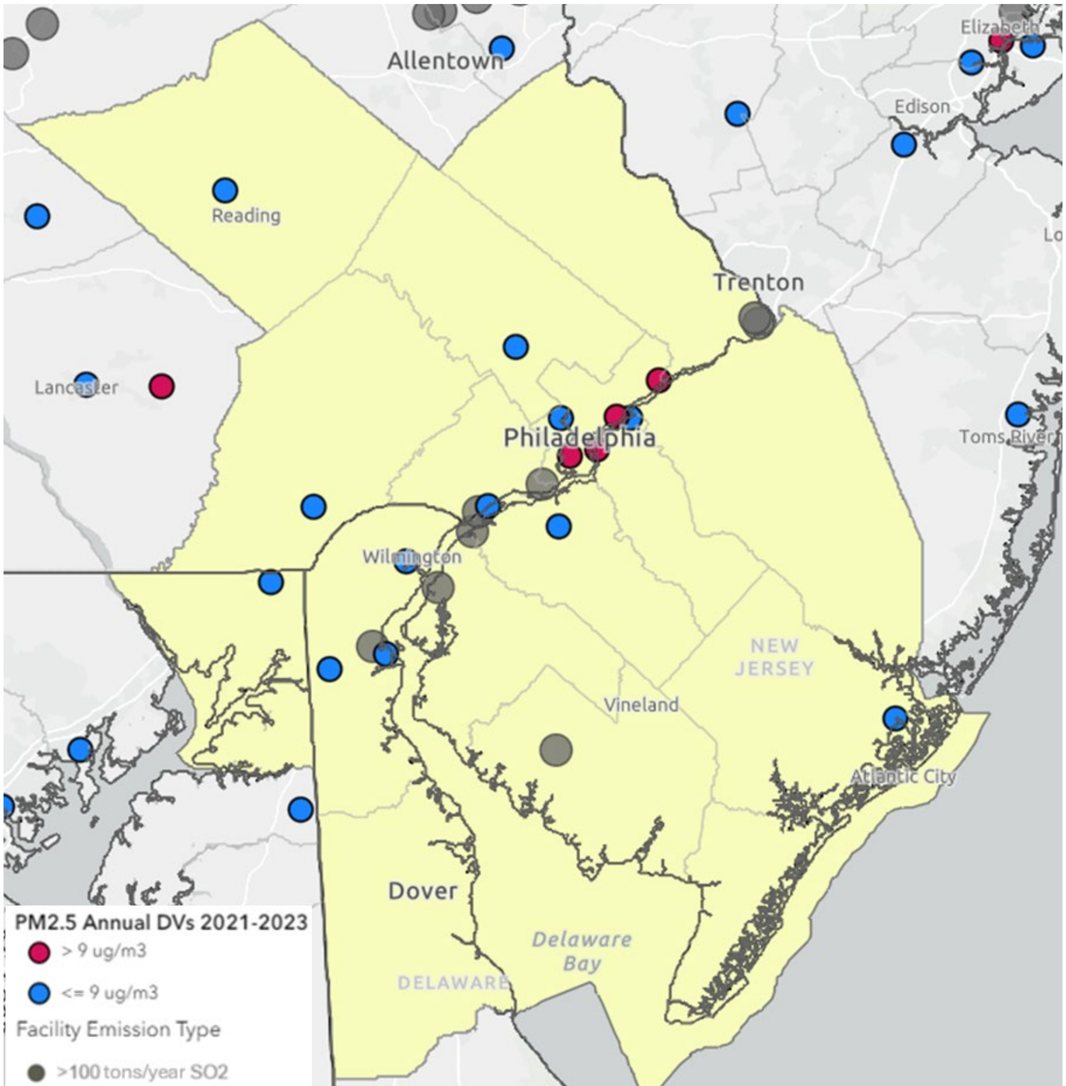
Figure 34b: Facilities in the PA-NJ-DE-MD CSA with 2022 PM2.5 Emissions over 100 TPY [54]



Facility Name	State	PM2.5 Emissions (tpy)	Distance from NJ Monitor(mi)
Monroe Energy LLC/Trainer	PA	137.3	16.7
Marcus Hook Energy LP/750 Mw	PA	363.5	18.1
Delaware City Refinery	DE	557.0	36.0
Heidelberg Materials Us Cement LLC/Evansville Cement Plt & Q	PA	115.1	55.1

[54] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/17/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

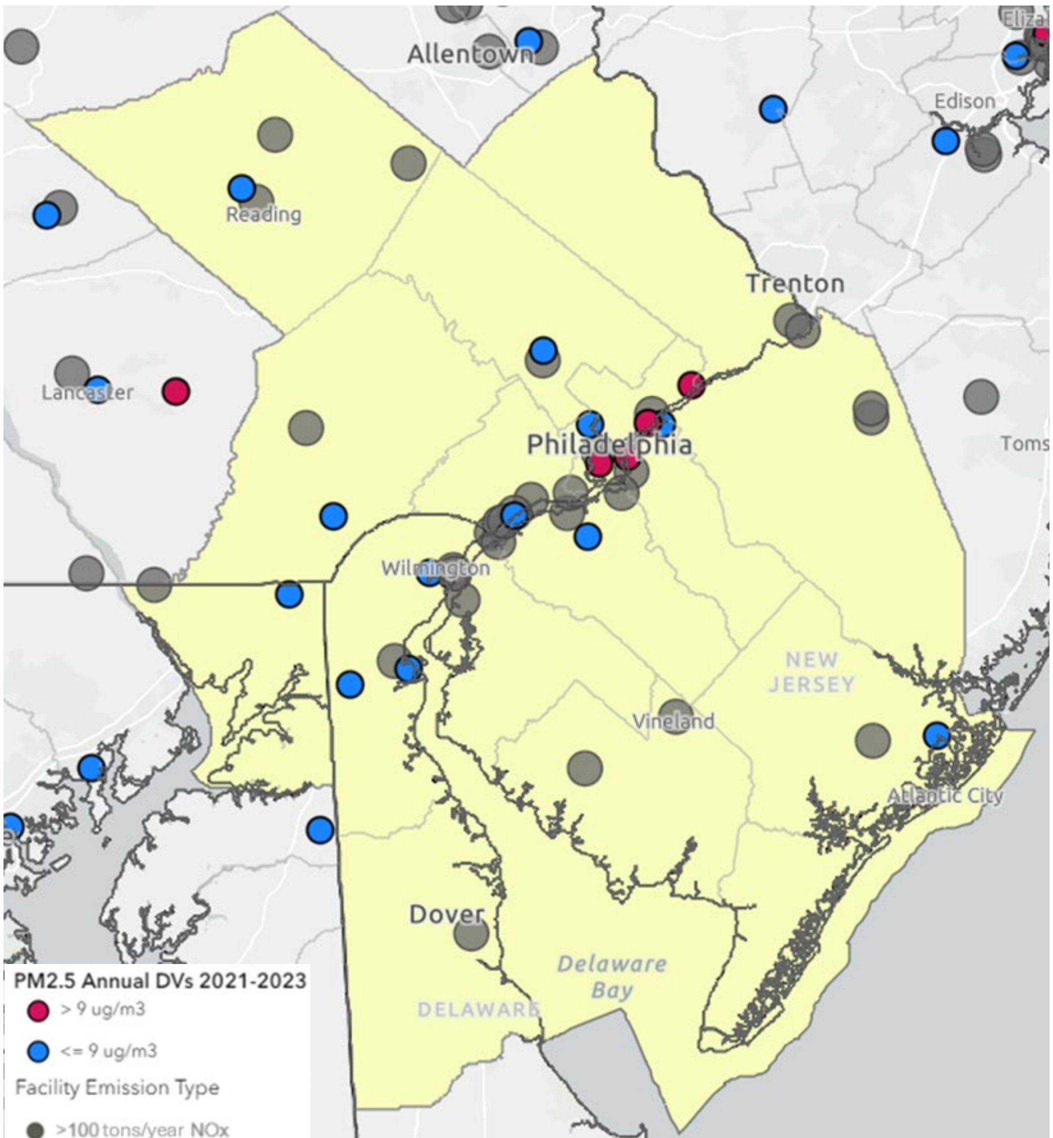
Figure 34c: Facilities in the PA-NJ-DE-MD CSA with 2022 SO_2 Emissions over 100 TPY [55]



Facility Name	State	SO_2 Emissions (tpy)	Distance from NJ Monitor(mi)
Philadelphia Intl	PA	135.7	7.8
Covanta Delaware Valley LP/Delaware Valley Res Rec	PA	196.4	16.1
Logan Generating Plant*	NJ	164.3	17.9
Waste Mgmt Of Fairless/Fairless Ldfl	PA	171.1	24.6
Wheelabrator Falls Inc/Falls Twp	PA	104.2	24.6
Carneys Point Generating Plant*	NJ	320.8	25.4
Delaware City Refinery	DE	361.6	36.0
Ardagh Glass Inc.	NJ	130.3	36.6
* Logan Generating Plant and Carneys Point Generating Plant ceased operation in 2022.			

[55] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/17/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

Figure 34d: Facilities in the PA-NJ-DE-MD CSA with 2022 NO_X Emissions over 100 TPY [56]

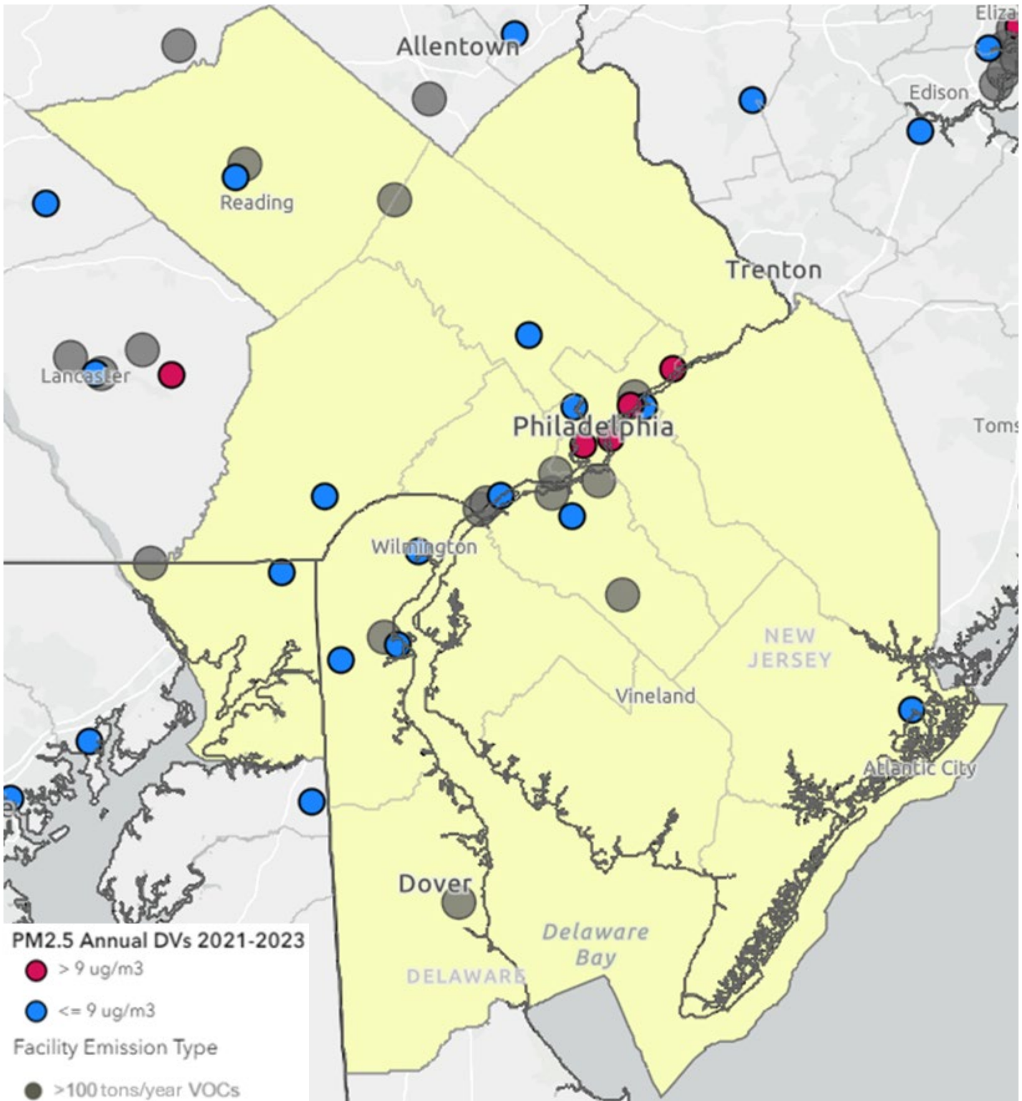


Facility Name	State	NO_X Emissions (tpy)	Distance from NJ Monitor(mi)
Camden County Energy Recovery Associates L.P.	NJ	461.4	1.8
Grays Ferry Cogen Partnership/Phila	PA	229.1	3.4
Wheelabrator Gloucester Company L P	NJ	225.6	4.3
Advansix Inc	PA	236.7	5.7
Philadelphia Intl	PA	1331.9	7.8
Paulsboro Refining Company LLC	NJ	461.4	9.6
Liberty Elec Power LLC/Eddystone Plt	PA	110.3	12.2
PQ LLC/Chester	PA	177.9	14.6
Covanta Plymouth Renewable Energy/ Plymouth	PA	530.0	14.8

[56] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/17/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

Figure 34d (continued)			
Covanta Delaware Valley LP/Delaware Valley Res Rec	PA	1154.0	16.1
Monroe Energy LLC/Trainer	PA	695.4	16.7
Logan Generating Plant*	NJ	158.4	17.9
Marcus Hook Energy LP/750 Mw	PA	194.1	18.1
Hay Road Energy Center	DE	331.3	24.1
Edge Moor Energy Center	DE	137.8	24.2
Wheelabrator Falls Inc/Falls Twp	PA	541.1	24.6
Fairless Energy LLC/Falls Twp	PA	217.8	25.0
Carneys Point Generating Plant*	NJ	288.9	25.4
Joint Base Mcguire-Dix-Lakehurst: Dix Area	NJ	193.5	28.6
Mcguire AFB Airport	NJ	119.6	28.7
Corning Pharmaceutical Glass LLC	NJ	107.0	30.7
Delaware City Refinery	DE	1496.3	36.0
Ardagh Glass Inc.	NJ	147.0	36.6
Cleveland Cliffs Plate/Coatesville	PA	171.0	37.4
Texas Eastern Trans LP/Bechtelsville	PA	132.7	42.3
Atlantic City International Airport	NJ	142.1	43.7
Carpenter Tech Corp/Reading Plt	PA	207.4	52.0
Heidelberg Materials Us Cement LLC/Evansville Cement Plt & Q	PA	972.6	55.1
Wildcat Point Generation Facility	MD	105.1	56.9
Dover AFB Airport	DE	424.7	58.5
* Logan Generating Plant and Carneys Point Generating Plant ceased operation in 2022.			

Figure 34e: Facilities in the PA-NJ-DE-MD CSA with 2022 VOC Emissions over 100 TPY [57]



Facility Name	State	VOC Emissions (tpy)	Distance from NJ Monitor(mi)
Eagle Point Tank Farm and Dock	NJ	159.2	5.2
ADVANSIX INC	PA	111.9	5.7
Philadelphia Intl	PA	199.3	7.8
Paulsboro Refining Company LLC	NJ	230.0	9.6
Monroe Energy LLC/Trainer	PA	196.6	16.7
Energy Transf Mkt & Term LP/Marcus Hook Term	PA	164.8	17.7
Aleris Rolled Products, Inc	NJ	155.0	18.7
Delaware City Refinery	DE	236.1	36.0
Global Advanced Metals USA/Boyertown	PA	137.6	38.2
NPX One/Reading	PA	502.0	54.3
Wildcat Point Generation Facility	MD	158.8	56.9
Dover AFB Airport	DE	584.9	58.5

[57] USEPA. PM2.5 Designations Mapping Tool. Retrieved 1/17/2025 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab.

As shown in Figures 34b through Figure 34e, there are four facilities in the CSA with PM2.5 emissions over 100 tpy, one in DE and three in PA. There are eight facilities in the CSA with SO_2 emissions over 100 tpy, one in DE, three in NJ (two were terminated in 2022), and four in PA. There are 30 facilities in the CSA with NO_X emissions over 100 tpy, one in MD, four in DE, 10 in NJ (two were terminated in 2022), and 15 in PA. There are 12 facilities in the CSA with VOC emissions over 100 tpy, one in MD, two in DE, three in NJ, and six in PA. There are no facilities in the CSA with ammonia emissions over 100 tpy.

2.2 Nonpoint Emissions

As shown in Figure 32a through 32e and Figure 33, nonpoint emissions (area, commercial marine vessel, and underway rail), are the largest anthropogenic source of 2022 annual emissions in most counties for all of the PM2.5 pollutants except SO_2 and NO_X in some counties.

The nonpoint sector is the largest source of PM2.5 emissions compared to the other sectors in 14 of the 16 CSA counties. The largest nonpoint categories in New Jersey include residential wood burning, commercial cooking, paved road emissions, and construction equipment. Please note, these pre-modeling paved road fugitive dust emissions represent very localized emissions and are reduced significantly in the modeling to adjust for lack of transport of fugitive dust emissions. The high level of fugitive dust emissions does not correlate to the crustal component in the monitoring data, which is significantly smaller. The two counties in which nonfire nonpoint sources are not the largest source are Atlantic County, NJ where wildfire and “other fire” (fires other than wildfires including prescribed and agricultural) emissions are larger and Burlington County, NJ where “other fire” emissions are larger. Both of these counties had very large emissions from fires in the 2022 inventory, which is discussed below in Section 2.4.

The nonpoint sector is generally the second largest source of SO_2 emissions, as shown in Figure 32b. The largest nonpoint categories in New Jersey include commercial marine vessels, incineration and residential gas combustion. It is the largest in five of the 16 CSA counties, including Cecil County, MD; Cape May County, NJ; Chester County, PA; Montgomery County, PA; and Philadelphia County, PA. As described in Section 2.1, the point sector is the largest source of SO_2 emissions in nine of the CSA counties, including Camden County. For all nine of these counties, the nonpoint sector is the second largest source of SO_2 emissions. All of the states in the area have adopted a low sulfur fuel rule.

The nonpoint sector is also a large source for NO_X emissions, as shown in Figure 32c. The largest nonpoint categories in New Jersey include residential and commercial natural gas and distillate combustion. The nonpoint sector is the largest source of NO_X emissions in seven of the 16 CSA counties, including Atlantic County, NJ; Camden County, NJ; Cape May County, NJ; Cumberland County, NJ; Gloucester County, NJ; Salem County, NJ; and Philadelphia County, PA. The onroad sector is the largest source of NO_X emissions in eight of the 16 CSA counties. When nonroad and onroad are grouped together as mobile sources, nonpoint is larger than the mobile sector in only three of the 16 CSA counties, including Cumberland County, NJ; Salem County, NJ; and Philadelphia County, PA. Delaware County, PA is the only county where the point sector is the largest source of NO_X emissions.

The nonpoint sector is the largest source of anthropogenic VOC emissions in 14 of the 16 CSA counties, as shown in Figure 32d. This is due to many sources of annual emissions including consumer products, paints and coatings, solvent degreasing, graphic arts, gasoline evaporation at gas stations, and residential wood burning. The two counties in which nonpoint sources are not the largest source of VOC emissions are Atlantic County, NJ because of wildfires and Cape May County, NJ because of nonroad sources (highest being pleasure craft and recreational vehicles).

The nonpoint sector is the largest source of NH_3 emissions in 14 of the 16 CSA counties, as shown in Figure 32e. This is due primarily to emissions from animals and fertilizer. Atlantic County, NJ has larger wildfire emissions, and Camden County, NJ has larger onroad NH_3 emissions.

The nonpoint sector is also usually the largest source of emissions for all of the PM2.5 speciated components. It is the largest source of OC in 13 of the 16 CSA counties, the exceptions being Atlantic County, NJ; Burlington County, NJ; and Cumberland County, NJ due to fires. It is the largest source of EC in 13 of the 16 counties; Atlantic County, NJ has larger wildfires and other fires, Burlington County, NJ has larger other fires, and Delaware County, PA has larger point sources. However, the combined mobile sector EC emissions are larger than the nonpoint sector emissions in seven of the 16 counties, including Camden County but not Philadelphia County. Nonpoint nitrate emissions are the largest sector in 10 of the 16 counties, including Camden County and Philadelphia County. In five of the other counties, the largest source of nitrate is from point sources. Nonpoint source sulfate emissions are the largest sector in seven of the 16 counties, including Camden County and Philadelphia County. For all the other counties, nonpoint is the second largest source of sulfate emissions. The largest sector for sulfate emissions in eight of the 16 CSA counties is from point sources. Nonpoint is the largest sector for the remaining fine particulates in 14 of the 16 CSA counties, with the exceptions being Atlantic County and Burlington County because of fires.

Population is evaluated below, as it is used to estimate emissions for many of the nonpoint sources.

2.2.1 Population Density and Degree of Urbanization

Population, population density, and estimated population change based on the 2020 Census are included in Table 10, Figure 35, and Figure 36 below. The largest population and population density in the CSA are in Philadelphia County. Camden County ranks in the middle at seventh largest population in the CSA's 16 counties; New Castle County and five of the six Pennsylvanian counties in the CSA have a larger population than Camden County. In terms of population density, Camden County has the third largest in the CSA with Delaware County and Philadelphia County being larger. The counties with the largest population density in the CSA are Philadelphia County, PA (11,937 people/mi^2), Delaware County, PA (3,138 people/mi^2), Camden County, NJ (2,365 people/mi^2), Montgomery County, PA (1,774 people/mi^2), and New Castle County, DE (1,339 people/mi^2).

Most counties in New Jersey have a lower population and population density than counties in Pennsylvania within the CSA. The larger half of population densities in the CSA includes five of the six Pennsylvanian counties, two New Jersey counties (Camden and Gloucester), and one Delaware county (New Castle). Five of the seven New Jersey counties are within the smaller half of the population densities in the CSA. Additionally, the total population in the CSA by state is 4,646,980 (63.0%) in Pennsylvania; 1,876,425 (25.4%) in New Jersey; 752,570 (10.2%) in Delaware; and 103,724 (1.4%) in Maryland.

The 2023 population estimates compared to the 2020 Census population decreased slightly, increased slightly, or remained mostly the same in most counties. Most counties in the CSA were estimated to have a slight increase in population. No New Jersey counties were expected to increase more than two percent. Philadelphia County's population was estimated to decrease by 3.3% from 2020 to 2023, but even with that decrease, it still has the largest population by a significant margin. Camden County was estimated to increase in population only very slightly, 0.7% from 2020 to 2023.

Table 10: 2020 Census Population, Population Density, and Estimated Population Change to 2023 in the PA-NJ-DE-MD CSA[58]

State	County	2020 Census Population Density (pop/mi^2)	2020 Census Population	2023 Population Estimates, July 1[59]	Change 2020-2023	Percent Change 2020-2023
Delaware	Kent	310.30	181,851	189,789	7,938	4.37%
Delaware	New Castle*	1,338.67	570,719	578,592	7,873	1.38%
Maryland	Cecil	299.53	103,725	105,672	1,947	1.88%
New Jersey	Atlantic	494.20	274,534	275,213	679	0.25%
New Jersey	Burlington*	577.84	461,860	469,167	7,307	1.58%
New Jersey	Camden*	2,364.89	523,485	527,196	3,711	0.71%
New Jersey	Cape May	378.75	95,263	94,610	-653	-0.69%
New Jersey	Cumberland	318.92	154,152	152,326	-1,826	-1.18%
New Jersey	Gloucester*	938.81	302,294	308,423	6,129	2.03%
New Jersey	Salem	195.37	64,837	65,338	501	0.77%
Pennsylvania	Berks	500.76	428,849	432,821	3,972	0.93%
Pennsylvania	Bucks*	1,069.78	646,538	645,984	-554	-0.09%
Pennsylvania	Chester*	712.04	534,413	549,784	15,371	2.88%
Pennsylvania	Delaware*	3,138.12	576,830	576,720	-110	-0.02%
Pennsylvania	Montgomery*	1,773.52	856,553	868,742	12,189	1.42%
Pennsylvania	Philadelphia*	11,936.95	1,603,797	1,550,542	-53,255	-3.32%

* Counties previously in nonattainment for the 1997 PM2.5 NAAQS of 15 μg/m^3.

[58] United States Census Bureau. Urban and Rural: County-level Urban and Rural information for the 2020 Census, September 2023. Retrieved 3/11/2024 from https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html.
[59] United States Census Bureau. QuickFacts. https://www.census.gov/quickfacts/fact/table

Figure 35: County Population in the PA-NJ-DE-MD CSA

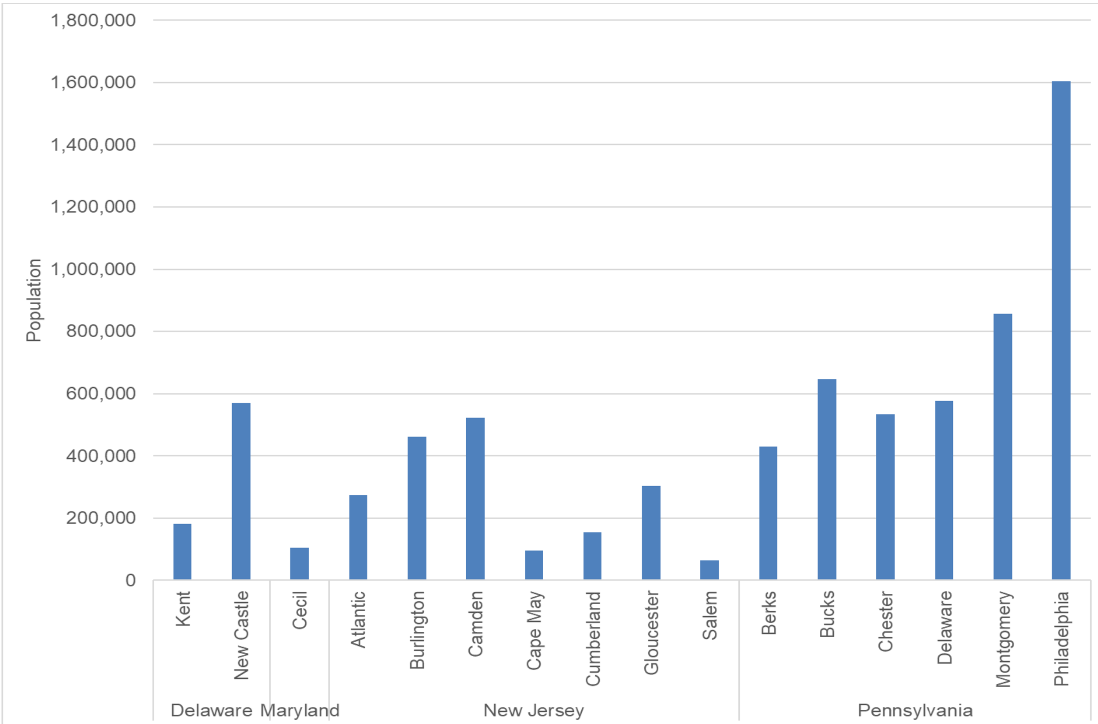
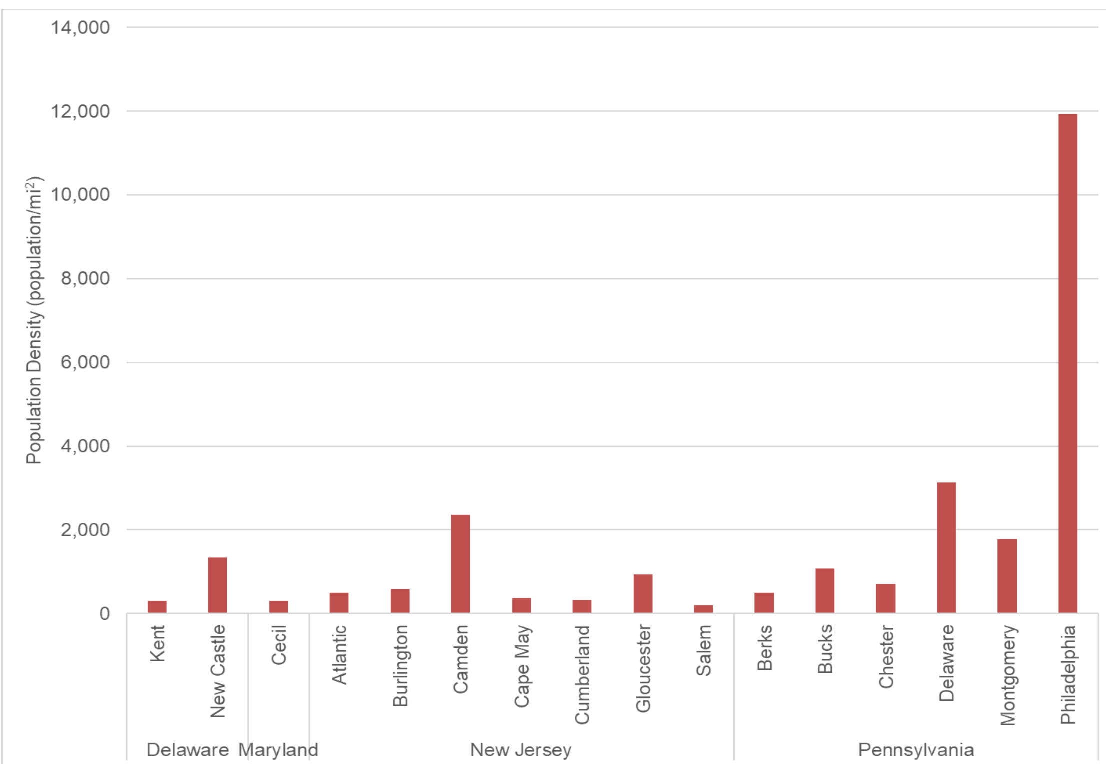


Figure 36: County Population Density in the PA-NJ-DE-MD CSA



As shown in Table 11, the counties in the CSA with the largest percentage of land area classified as urban are Philadelphia County (100%), Delaware County (89%), Montogomery County (76%), Camden County (70%), and New Castle County (50%). However, many of these counties do not have the largest overall urban land area. Camden County ranks seventh and Philadelphia County ranks ninth in most urban land area within the CSA. Overall, many counties in the CSA do not have a large percent urban area. The counties with the largest urban population density are Philadelphia County (11,937 people/mi^2), Delaware County (3,513 people/mi^2), Camden County (3,323 people/mi^2), Berks County (2,655 people/mi^2) and New Castle County (2,500 people/mi^2). The counties with the largest percent of the population living within urban blocks are Philadelphia County, Delaware County, Camden County, Montgomery County, and New Castle County.

Table 11: Population, Land Area, and Degree of Urbanization in the PA-NJ-DE-MD CSA[60]

State	County	2020 Population	Land Area (mi^2)	2020 Urban Population Density	Percent Urban Land Area	Percent County Population within Urban Blocks
Delaware	Kent	181,851	586	1,660	14%	74%
Delaware	New Castle	570,719	426	2,500	50%	94%
Maryland	Cecil	103,725	346	1,229	13%	52%
New Jersey	Atlantic	274,534	556	2,022	21%	85%
New Jersey	Burlington	461,860	799	2,113	25%	90%
New Jersey	Camden	523,485	221	3,323	70%	99%
New Jersey	Cape May	95,263	252	1,323	23%	81%
New Jersey	Cumberland	154,152	483	1,836	13%	76%
New Jersey	Gloucester	302,294	322	1,960	42%	89%
New Jersey	Salem	64,837	332	1,555	6%	47%
Pennsylvania	Berks	428,849	856	2,655	14%	73%
Pennsylvania	Bucks	646,538	604	2,185	44%	90%
Pennsylvania	Chester	534,413	751	1,513	38%	81%
Pennsylvania	Delaware	576,830	184	3,513	89%	99%
Pennsylvania	Montgomery	856,553	483	2,252	76%	97%
Pennsylvania	Philadelphia	1,603,797	134	11,937	100%	100%

2.3 Mobile Emissions

Please note, the nonroad mobile emissions in this dataset do not include commercial marine vessel, aircraft, or railroad emissions. Nonroad emissions are those from USEPA's MOVES/Nonroad model only.

Mobile sources (onroad and nonroad model combined) emit 40,741 tpy of NO_X, 33,097 tpy of VOC, 3,298 tpy of NH_3, 2,308 tpy of PM2.5 and 158 tpy of SO_2 in the CSA in the estimated 2022 annual inventory. Mobile emissions account for 46% of the total NO_X emissions in the CSA, 17% of the total NH_3 emissions in the CSA, 14% of the total VOC emissions in the CSA, 6% of the total PM2.5 emissions in the CSA, and 3% of the total SO_2 emissions in the CSA. Specifically,

[60] United States Census Bureau. Urban and Rural: County-level Urban and Rural information for the 2020 Census, September 2023. Retrieved 3/11/2024 from https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html.

onroad sources emit 28,896 tpy of NO_X, 16,418 tpy of VOC, 3,262 tpy of NH_3, 1,042 tpy of PM2.5, and 143 tpy of SO_2. Nonroad sources emit 16,678 tpy of VOC, 11,846 tpy of NO_X, 1,266 tpy of PM2.5, 35 tpy of NH_3, and 15 tpy of SO_2.

Onroad and nonroad model mobile emissions combined are the largest source of NO_X emissions in the estimated 2022 annual inventory for 12 of the 16 CSA counties. Three of the other counties have larger nonpoint emissions than mobile, including Cumberland County, NJ; Salem County, NJ; and Philadelphia County, PA. Point source NO_X emissions are larger than mobile emissions in Delaware County, PA. Onroad NO_X emissions are larger than nonroad for all counties in the CSA except Cape May County, NJ and Cumberland County, NJ. Onroad is the largest source of NO_X emissions in eight of the 16 counties, including in Kent County, DE; New Castle County, DE; Cecil County, MD; Burlington County, NJ; Berks County, PA; Bucks County, PA; Chester County, PA; and Montgomery County, PA. The counties with the densest mobile source NO_X emissions in the CSA are Philadelphia County, PA (35 tpy/mi^2), Delaware County, PA (14 tpy/mi^2), Montgomery County, PA (11 tpy/mi^2), Camden County, NJ (9.2 tpy/mi^2), and New Castle County, DE (8.8 tpy/mi^2).

Mobile emissions are the second largest sector of anthropogenic VOC emissions for 13 of the 16 CSA counties and the largest sector for one of the 16 counties. The counties with the densest mobile source VOC emissions in the CSA are Philadelphia County, PA (28 tpy/mi^2), Delaware County, PA (12 tpy/mi^2), Montgomery County, PA (10 tpy/mi^2), Camden County, NJ (7.0 tpy/mi^2), and New Castle County, DE (7.0 tpy/mi^2). 11 of the 16 counties in the CSA had larger nonroad VOC emissions than onroad VOC emissions.

Onroad NH_3 emissions are the second largest sector of emissions for 13 of the 16 counties in the CSA, and it is the largest sector for Camden County, NJ. Nonroad emissions are a small sector for NH_3 emissions, making up only 0% or 1% of the county NH_3 emissions for all counties in the CSA. The counties with the densest mobile source NH_3 emissions in the CSA are Philadelphia County, PA (3.4 tpy/mi^2), Delaware County, PA (1.2 tpy/mi^2), Camden County, NJ (0.9 tpy/mi^2), Montgomery County, PA (0.9 tpy/mi^2), and New Castle County, DE (0.7 tpy/mi^2).

Mobile sources were the second largest sector of PM2.5 emissions in three of the 16 CSA counties, third largest in six, and fourth largest in seven. In Camden County, mobile was the third largest source of PM2.5 emissions, behind nonpoint and other fires. In Philadelphia County, mobile was the third largest source of PM2.5 emissions, behind nonpoint and point. In 12 of the 16 CSA counties, nonroad PM2.5 emissions were larger than onroad. The counties in the CSA with larger onroad PM2.5 emissions than nonroad are Kent County, DE; Cecil County, MD; Berk County, PA; and Philadelphia County, PA. The counties with the densest mobile source PM2.5 emissions in the CSA are Philadelphia County, PA (1.9 tpy/mi^2), Delaware County, PA (0.8 tpy/mi^2), Montgomery County, PA (0.7 tpy/mi^2), Camden County, NJ (0.6 tpy/mi^2), and New Castle County, DE (0.5 tpy/mi^2).

Mobile source emissions of SO_2 are very small in the CSA overall. Mobile sources are the third largest sector of SO_2 emissions in five of the 16 CSA counties, the fourth largest in nine of the counties, and the fifth largest in two counties. Onroad SO_2 emissions are larger than nonroad SO_2 emissions in all of the counties in the CSA. The counties with the densest mobile source SO_2 emissions in the CSA are Philadelphia County, PA (0.15 tpy/mi^2), Delaware County, PA (0.05 tpy/mi^2), Camden County, NJ (0.05 tpy/mi^2), Montgomery County, PA (0.04 tpy/mi^2), and New Castle County, DE (0.04 tpy/mi^2).

As previously mentioned, mobile source emissions of PM2.5 were relatively minor, accounting for only 6% of the total PM2.5 emissions in the CSA. Similarly, mobile sources were usually not the largest source of emissions for PM2.5 species. Overall, in the CSA, mobile sources account for 33% of EC emissions, 7% of NO_3 emissions, 6% of SO_4 emissions, 5% of OC emissions, and 2% of remaining fine particulate emissions.

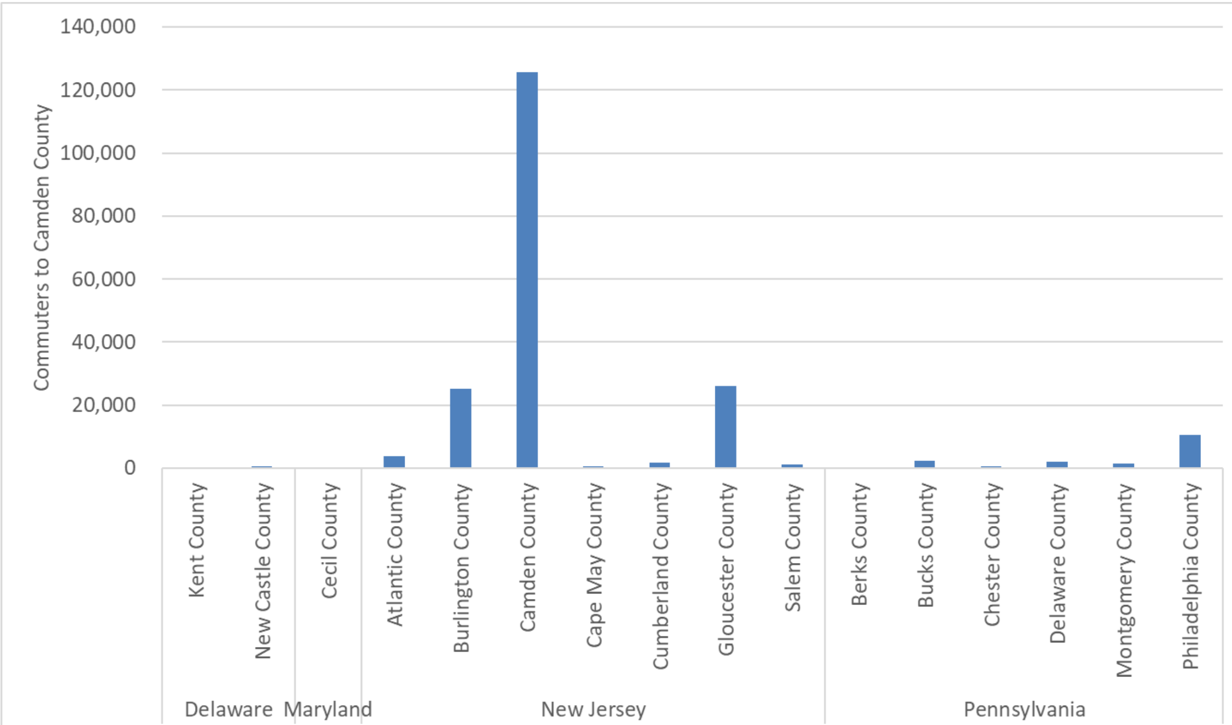
2.3.1 Motor Vehicle Traffic Levels and Commuting Patterns

Table 12 and Figure 37 show the total number of commuters to Camden County, NJ from residence counties within the PA-NJ-DE-MD CSA, and the table also shows the number of total vehicle miles traveled (VMT) in millions for each county as well as the VMT density. The commuting data was collected from the five-year American Community Survey (2016-2020) and shows the average value over the period. The 2022 VMT data for New Jersey was obtained from New Jersey's Metropolitan Planning Organizations and submitted to USEPA as part of the inventory process. The VMT data for other states was obtained from the modeling platform inventory data.

As shown in Table 12 and Table 13, the counties with the largest VMT density in the CSA are Philadelphia County, PA (45 million/mi^2), Camden County, NJ (18 million/mi^2), Delaware County, PA (17 million/mi^2), Montgomery County, PA (13 million/mi^2), and New Castle County, DE (13 million/mi^2). Camden County has the second largest VMT density in the CSA, and Philadelphia County has the largest VMT density in the CSA. However, Camden County only has the seventh largest VMT out of the 16 counties, while Philadelphia County has the second largest VMT out of the 17 counties. Montogomery County, which is located directly west of Philadelphia County, has the largest VMT in the CSA.

Most commuters to Camden County, NJ come from within the county. The second largest group of commuters come from Burlington County, NJ and Gloucester County, NJ. By far, most commuters to Camden County within the CSA come from within the state, totaling 91%, with only 17,876 of the 202,307 commuters coming from other states in the CSA. The largest number of commuters from an out-of-state county was Philadelphia County, but this was still a very small percentage of the commuters, accounting for only 5% of the total commuters to Camden County in the CSA. Most commuters in out-of-state counties do not commute to Camden County, with the largest out-of-state percentage being only 1.53% of all Philadelphia County commuters commuting to Camden County. In comparison, a much larger percentage of commuters in each New Jersey county commute to Camden County, as shown Table 12. Similarly, few out-of-state commuters in the CSA commute to Camden County when categorized by state. In this case, less than one percent of the total CSA commuters in a state commute to Camden County except in New Jersey. In New Jersey, 21% of the state's commuters in the CSA commute to Camden County.

Figure 37: Commuters to Camden County from Residence Counties in the PA-NJ-DE-MD CSA[61]



[61] United Statues Census Bureau. 2016-2020 5-Year ACS Commuting Flows, June 30, 2023. Retrieved 3/6/2024 from https://www.census.gov/data/tables/2020/demo/metro-micro/commuting-flows-2020.html.

Table 12: Commuters to Camden County from the 2016-2020 American Community Survey[62] and VMT for Counties in the PA-NJ-DE-MD CSA

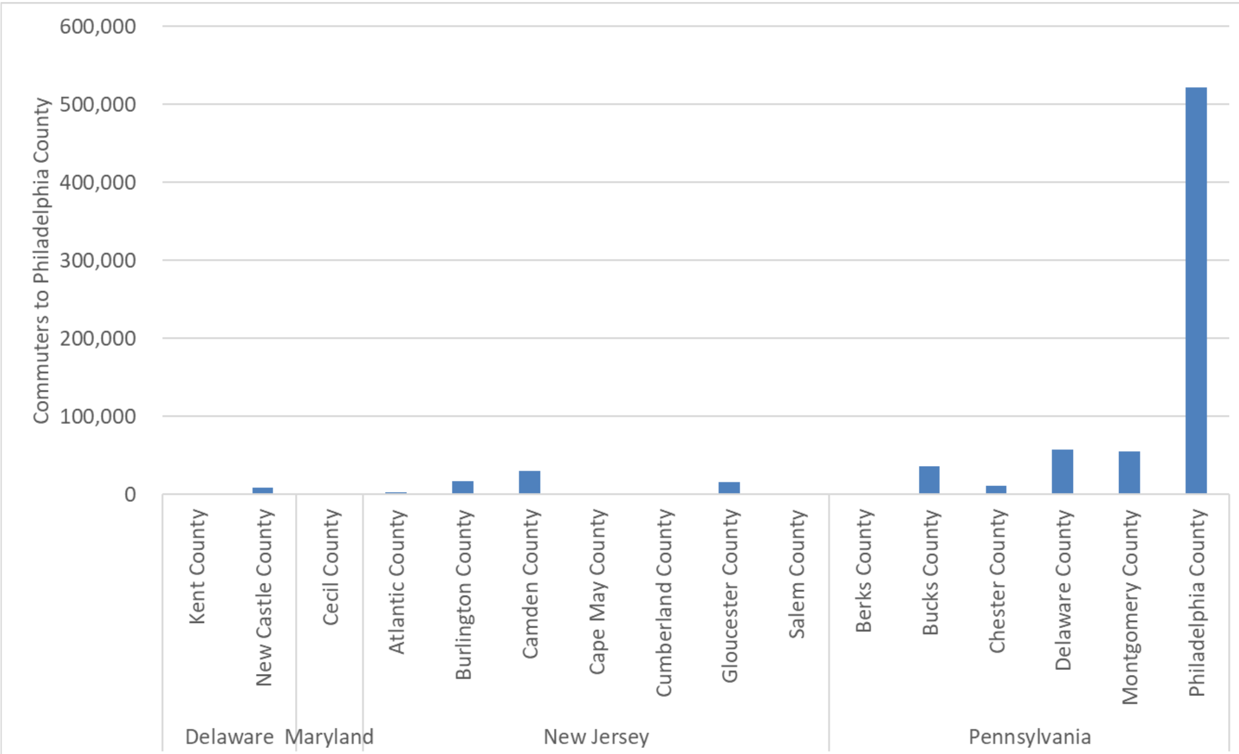
State	County	2022 VMT (Millions)	2022 VMT Density (Millions/ mi^2)	Commuters to Camden County	Total Commuters	Percentage who Commute to Camden County
DE	Kent County	1,779.3	3.04	34	80,399	0.04%
	New Castle County	5,529.1	12.97	572	272,148	0.21%
DE CSA Total		7,308.4	7.22	606	352,547	0.17%
MD	Cecil County	1,300.0	3.75	0	49,939	0.00%
MD CSA Total		1,300.0	3.75	0	49,939	0.00%
NJ	Atlantic County	2,658.3	4.79	3,765	122,536	3.07%
	Burlington County	4,850.7	6.07	25,073	225,167	11.14%
	Camden County	4,021.0	18.17	125,657	243,358	51.63%
	Cape May County	1,122.6	4.46	730	41,421	1.76%
	Cumberland County	1,211.5	2.51	1,837	58,816	3.12%
	Gloucester County	3,103.4	9.64	26,129	147,883	17.67%
	Salem County	833.6	2.51	1,240	27,950	4.44%
NJ CSA Total		17,801.0	6.00	184,431	867,131	21.27%
PA	Berks County	3,488.9	4.07	9	201,725	0.00%
	Bucks County	4,634.0	7.67	2,496	327,344	0.76%
	Chester County	4,236.8	5.64	558	268,364	0.21%
	Delaware County	3,200.4	17.41	1,951	273,915	0.71%
	Montgomery County	6,394.5	13.24	1,615	426,887	0.38%
	Philadelphia County	6,060.8	45.11	10,641	693,490	1.53%
PA CSA Total		28,015.3	9.30	17,270	2,191,725	0.79%

Table 13 and Figure 38 show the total number of commuters to Philadelphia County, PA from residence counties within the PA-NJ-DE-MD CSA, and the table also shows the number of total vehicle miles traveled (VMT) in millions for each county as well as the VMT density. The commuting data was collected from the five-year American Community Survey (2016-2020) and shows the average value over the period. The 2022 VMT data for New Jersey was obtained from New Jersey's Metropolitan Planning Organizations and submitted to USEPA as part of the inventory process. The VMT data for other states was obtained from the modeling platform inventory data.

Most commuters to Philadelphia County, PA come from within the county. By far, most commuters to Philadelphia County within the CSA also come from within the state, totaling 90%, with only 77,346 of the 761,473 commuters coming from other states in the CSA. Of that, 9% or 67,493 were from New Jersey counties. Camden County only accounted for 4% of the total commuters to Philadelphia County in the CSA. Figure 39 clearly shows in map form how relatively few commuters to Philadelphia County are from out-of-state.

[62] Ibid.

Figure 38: Commuters to Philadelphia County from Residence Counties in the PA-NJ-DE-MD CSA[63]



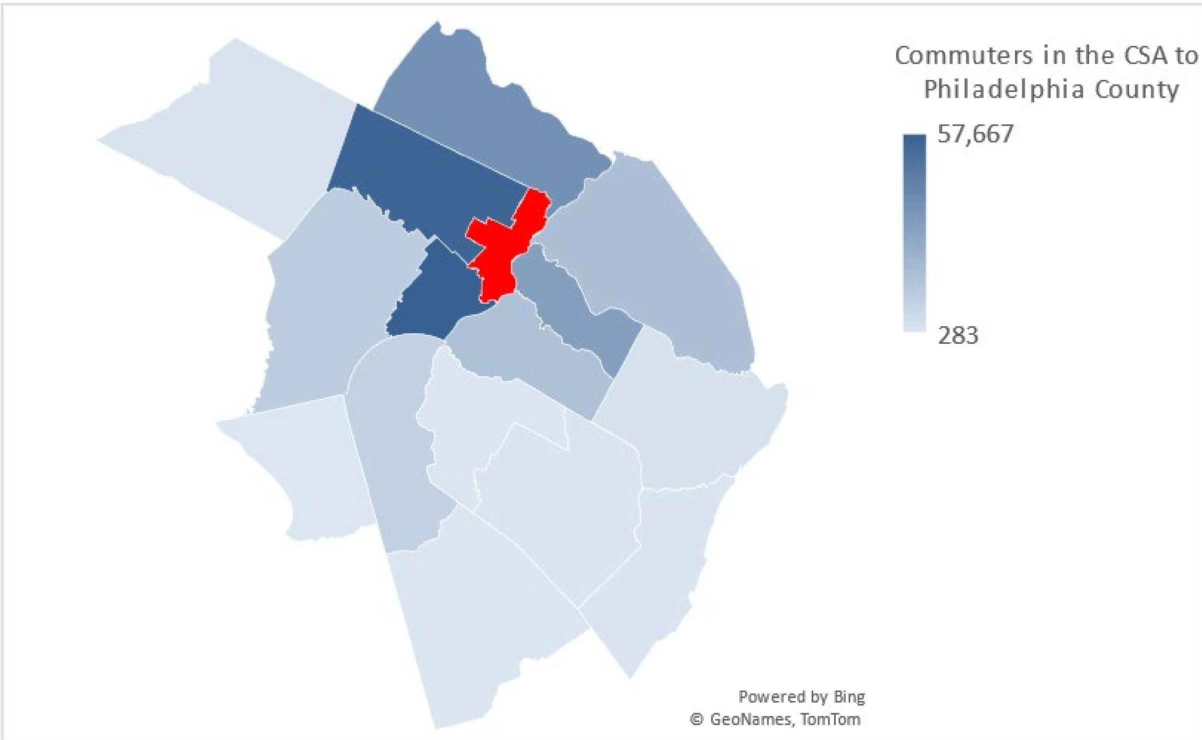
63 Ibid.

Table 13: Commuters to Philadelphia County from the 2016-2020 American Community Survey[64] and VMT for Counties in the PA-NJ-DE-MD CSA

State	County	2022 VMT (Millions)	2022 VMT Density (Millions/ mi^2)	Commuters to Philadelphia County	Total Commuters	Percentage of Commuters to Philadelphia County
DE	Kent County	1,779.3	3.04	360	80,399	0.45%
	New Castle County	5,529.1	12.97	9,210	272,148	3.38%
DE CSA Total		7,308.4	7.22	9,570	352,547	2.71%
MD	Cecil County	1,300.0	3.75	283	49,939	0.57%
MD CSA Total		1,300.0	3.75	283	49,939	0.57%
NJ	Atlantic County	2,658.3	4.79	2,301	122,536	1.88%
	Burlington County	4,850.7	6.07	16,604	225,167	7.37%
	Camden County	4,021.0	18.17	30,496	243,358	12.53%
	Cape May County	1,122.6	4.46	744	41,421	1.80%
	Cumberland County	1,211.5	2.51	749	58,816	1.27%
	Gloucester County	3,103.4	9.64	16,053	147,883	10.86%
	Salem County	833.6	2.51	546	27,950	1.95%
NJ CSA Total		17,801.0	6.00	67,493	867,131	7.78%
PA	Berks County	3,488.9	4.07	1,613	201,725	0.80%
	Bucks County	4,634.0	7.67	36,475	327,344	11.14%
	Chester County	4,236.8	5.64	11,388	268,364	4.24%
	Delaware County	3,200.4	17.41	57,667	273,915	21.05%
	Montgomery County	6,394.5	13.24	55,506	426,887	13.00%
	Philadelphia County	6,060.8	45.11	521,478	693,490	75.20%
PA CSA Total		28,015.3	9.30	684,127	2,191,725	31.21%

[64] Ibid.

Figure 39: Map of Commuters from Residence Counties in the PA-NJ-DE-MD CSA to Philadelphia County, PA, Excluding Philadelphia County Residents



2.4 Fires

In 2022, wildfire fire emissions were not a large proportion of emissions for all of the counties in the CSA, except for Atlantic County, NJ which had significant wildfire emissions and, to a lesser extent, Burlington County, NJ. Other fires, which include prescribed burning, agricultural burning, and open burning, were the second largest source of PM2.5 in Cecil County, MD; Atlantic County, NJ; Camden County, NJ; Cumberland County, NJ; Bucks County, PA; and Chester County, PA and were the largest source of PM2.5 in Burlington Counties.

In Atlantic County, NJ, the largest proportion of PM2.5, SO_2, VOCs, and NH_3 emissions are from wildfires. Specifically, 80% of the PM2.5 emissions, 74% of the SO_2 emissions, 64% of the anthropogenic VOC emissions, and 42% of the NH_3 emissions in Atlantic County are due to wildfires. For NO_X, no county has a large proportion of emissions due to fires with most having 0% due to wildfires; however, Atlantic County does have a larger proportion of NO_X due to wildfires (12%) compared to other counties. This very large amount of fire emissions in Atlantic County unusually increases the total amount of emissions in Atlantic County in the 2022 inventory.

In Burlington County, 52% of the PM2.5 emissions were due to other fires, while 20% were due to wildfires. 49% of the SO_2 emissions in Burlington County were due to other fires, while 17% were due to wildfires. 25% of the anthropogenic VOC emissions in Burlington County were due to other fires, while 10% were due to wildfires. 14% of the NH_3 emissions in Burlington County were due to other fires, while 5% were due to wildfires.

2.5 Control Measures

A complete summary of statewide control measures can be found in Section 2.5 from the NY-NJ-CT-PA CSA section.

Factor 3: Meteorology

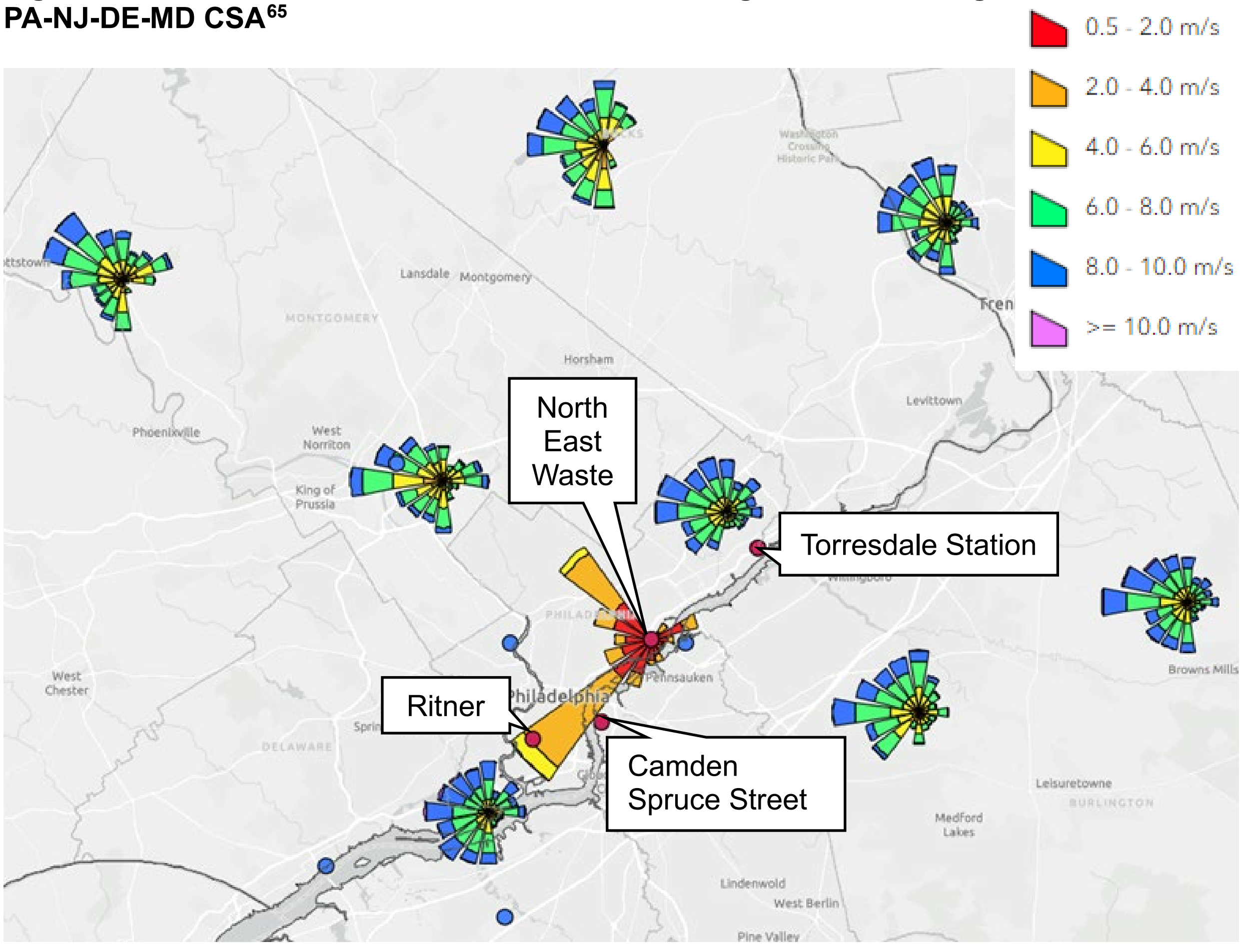
Figure 40 shows wind roses near the four violating monitors in the PA-NJ-DE-MD CSA using wind data from 2021-2023. Wind roses are a visual representation of wind direction and wind speed over a specified period. The length of each spoke around the circle shows how frequently the wind blew from that direction over the specified period, and each spoke is divided into sections that show its wind speed ranges. Only North East Waste (PA) has a wind rose at the monitor, but there are many other monitors nearby which can provide insight into the wind direction and speed of the area and thus into the fate and transport of pollutants. The wind predominately comes from the west in this area, meaning that the air at the violating monitors travels over Pennsylvania during most times of the year and transports those pollutants to the monitor. Therefore, New Jersey sources of emissions are unlikely to affect particulate level concentrations at the violating monitors.

Of particular note are the slow wind speeds and large wind direction trends shown in the wind rose at the North East Waste (PA) monitor. While most wind comes from the southwest and northwest, a westerly flow is also present. In general, the monitors demonstrate that the wind most often originates from the west and not from the direction of New Jersey.

Figure 41 through Figure 44 shows the USEPA's Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model trajectory density maps at Camden Spruce Street (NJ), North East Waste (PA), Ritner (PA), and Torresdale Station (PA), respectively, for the design value period from 2021-2023. The USEPA trajectory density map represents how frequently an air parcel passed through each location during a specified time period. In the figures, USEPA initiated two 24-hour backward trajectories, one starting at 8AM and the other at 10PM, with a starting elevation of 500 meters above ground level for each day from 2021-2023. The hourly coordinates during the trajectories were used to create the density map.

Similar to the wind roses, the density map shows that the air typically comes from the west. At the 8AM starting time, the air originates more commonly from the northwest, and at the 10PM starting time, the air originates more commonly from the southwest. Please note that the density maps have different numerical ranges for the density scale.

Figure 40: 2021-2023 Wind Roses Near the 2023 Design Value Violating Monitors in the PA-NJ-DE-MD CSA[65]



[65] USEPA. PM2.5 Designations Mapping Tool. Retrieved 11/19/2024 from https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab

Figure 41: HYSPLIT Density Map at Camden Spruce Street at 8AM (Left) and 10PM (Right)

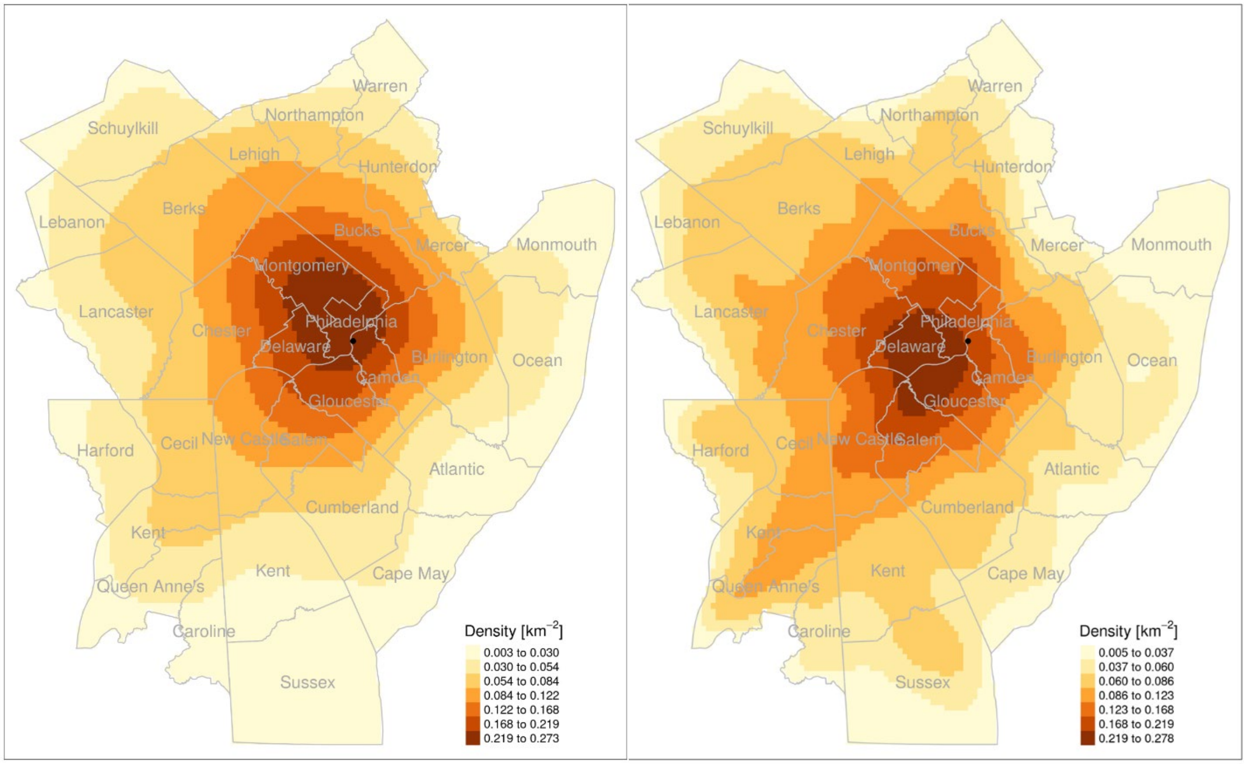


Figure 42: HYSPLIT Density Map at North East Waste at 8AM (Left) and 10PM (Right)

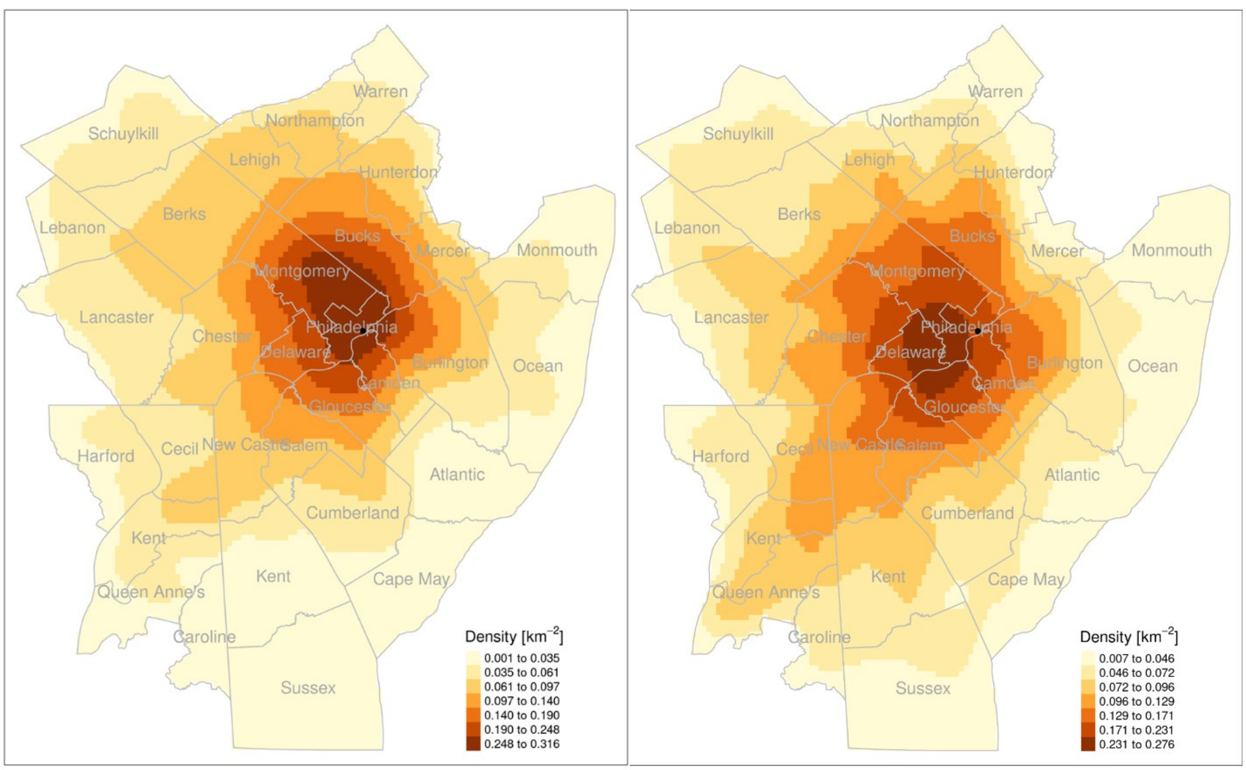


Figure 43: HYSPLIT Density Map at Ritner at 8AM (Left) and 10PM (Right)

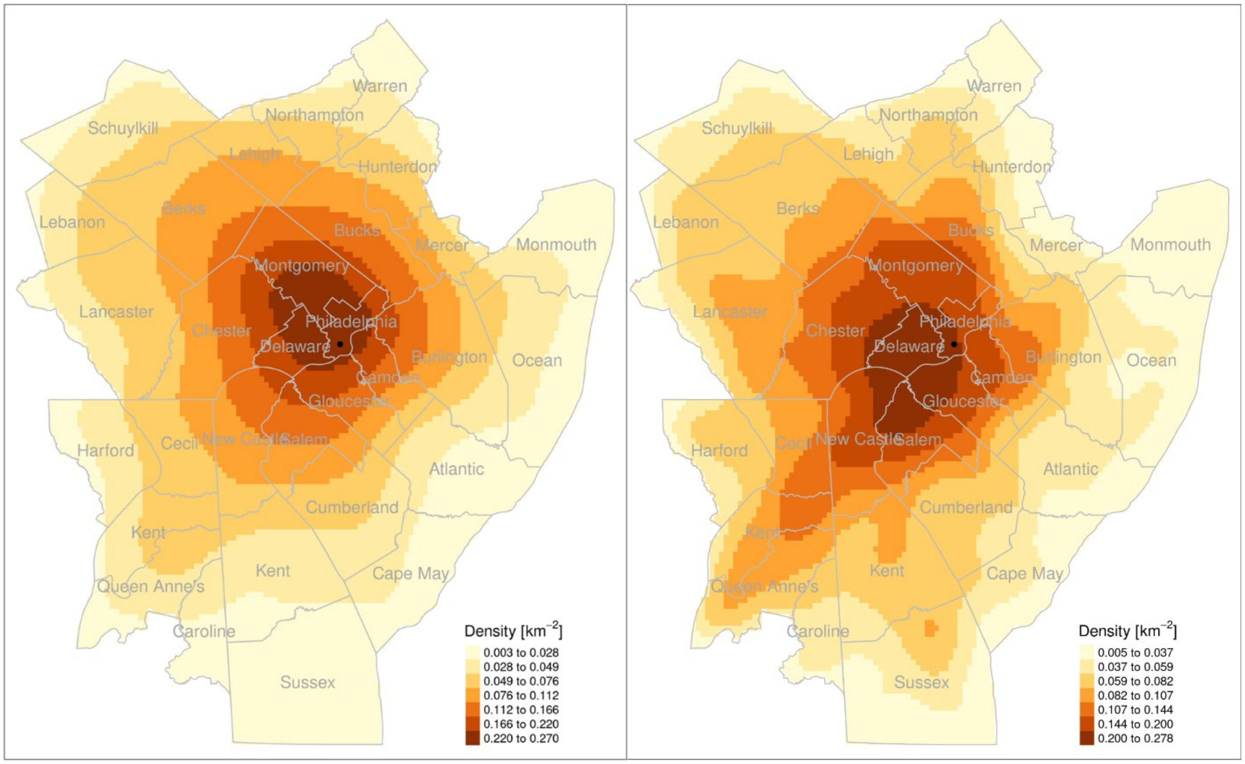
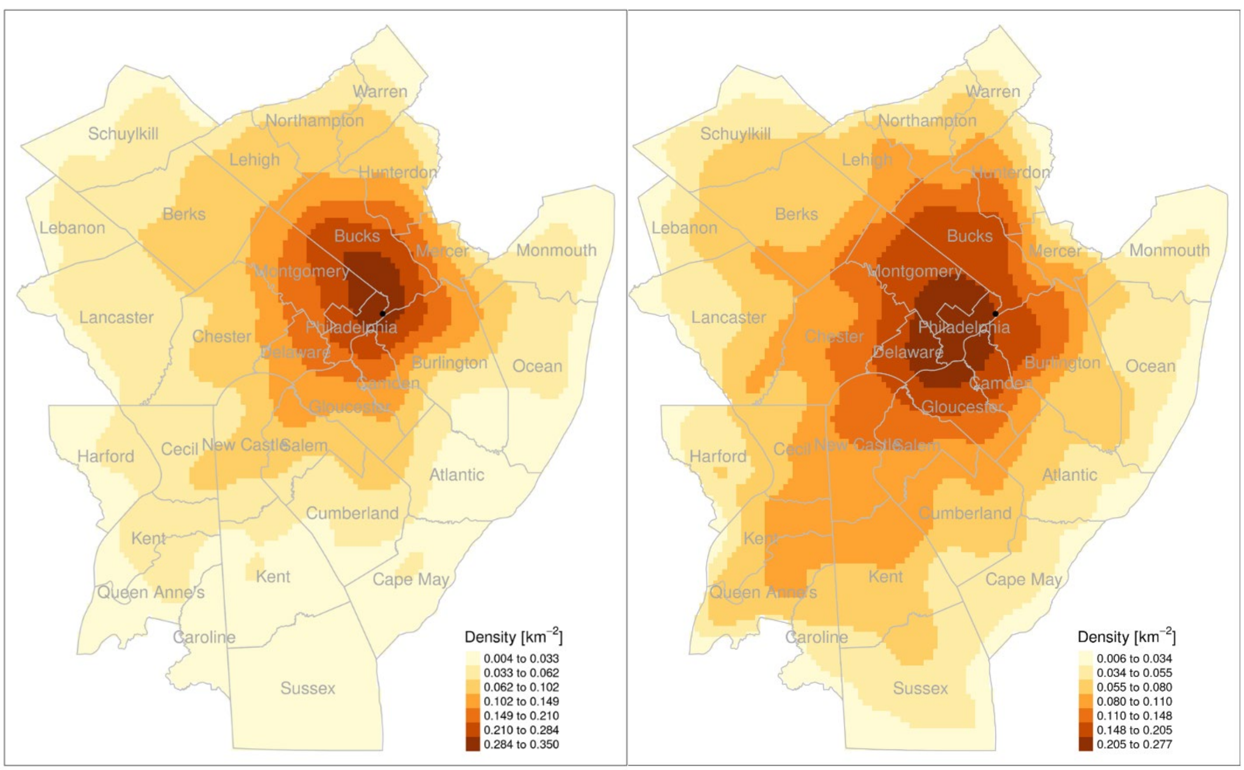


Figure 44: HYSPLIT Density Map at Torresdale Station at 8AM (Left) and 10PM (Right)



Factor 4: Geography and Topography

New Jersey is bordered on the west by the Delaware River, which separates New Jersey from Pennsylvania and Delaware. To the south, the Delaware River opens into the Delaware Bay and then into the Atlantic Ocean. The Delaware Bay further separates New Jersey from Delaware.

All of the violating monitors in the CSA are located nearby or along the Delaware River. There could be some channeling of emissions along the river. However, there are other monitors located along the Delaware River which are not in violation of the NAAQS. For example, the Pennsauken monitor in New Jersey is located right across the river from the North East Waste monitor in Pennsylvania, but the Pennsauken monitor is well below the standard at a design value of 7.7 μg/m^3. This indicates that the Delaware River may further separate emissions.

Factor 5: Jurisdictional Boundaries

The PA-NJ-DE-MD CSA consists of four states and 16 counties, as listed in the previous factors.

The CSA covers two EPA regions: Region 2 with New Jersey and Region 3 with Pennsylvania, Delaware, and Maryland.

The CSA consists of five CBSAs or Metropolitan/Micropolitan Statistical Areas (MSA): Atlantic City-Hammonton, Dover, Philadelphia-Camden-Wilmington (PA-NJ-DE-MD CBSA), Reading, and Vineland.[66] The violating monitors are in the PA-NJ-DE-MD CBSA, and the metro area consists of four metropolitan area divisions: Camden, Montgomery County-Bucks County-Chester County, Philadelphia, and Wilmington. The two divisions with violating monitors are Camden which has Burlington County, Camden County, and Gloucester County, and Philadelphia which has Delaware County and Philadelphia County.

Summary and Recommendation

There are four monitors violating the 9.0 μg/m^3 NAAQS in the PA-NJ-DE-MD CSA: Camden Spruce Street, North East Waste, Ritner, and Torresdale Station. Camden Spruce Street is located in Camden County, NJ, and the other three monitors are located in Philadelphia County, PA.

The design value at Camden Spruce Street is 9.8 μg/m^3 based on 2021 to 2023 monitoring data that includes data influenced by wildfire exceptional events. With USEPA concurrence on excluding wildfire exceptional event data in 2023, the 2021-2023 design value at Camden Spruce Street is 9.4 μg/m^3. The design values at the other three monitors are 9.7 μg/m^3 at North East Waste, 9.3 μg/m^3 at Ritner, and 10.0 μg/m^3 at Torresdale Station. USEPA will be using 2022 to 2024 monitoring data to determine final designations

The main findings from the five-factor analysis are as follows:

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[66] United States Census Bureau. 2022 Geographic Levels, February 26, 2024. https://www.census.gov/programs-surveys/economic-census/geographies/levels/2022-levels.html
There previously was a sixth MSA, Ocean City, which included Cape May County, but that was moved to the Atlantic City-Hammonton Metro Area as of 2022.

- All four monitors' annual means and design values have been demonstrating a decreasing trend. Two of the past four years' (2020-2023) annual means at Camden Spruce Street have met the standard, and the other two years were impacted by smoke. Similarly, while nearby monitors in Pennsylvania (Ritner, Torresdale Station, and North East Waste) have 2023 design values above the standard, these monitors have measured below the standard since around 2019 and 2020.

- Although 2021 lacks regulatory significance, there were indications that wildfire smoke significantly increased the annual mean in 2021 thus impacting the design value. The final designations are based on 2022-2024 design values, so the large annual mean in 2021 is not a factor. Also, the 2024 design value will be more reflective of New Jersey's air quality.

- Most commuters travel within their county and furthermore within their state. Most commuters to Camden County are from New Jersey counties, and most commuters to Philadelphia County are from Pennsylvania counties.

- New Jersey has also implemented significant control measures across the state lowering PM2.5 and precursor emissions, in some cases more stringent than neighboring states. The results of these measures are shown in the monitoring data decreasing trends and data below the standard. These control measures are especially important because the urban increment analysis found that a large amount of many of the PM2.5 species were from local sources.

- Additionally, the closure of the Logan Generating Plant and the Carneys Point Generating Plant in 2022 resulted in significant reductions of PM2.5 and its precursor emissions, including NO_X and SO_2. The improvement in air quality due to the closure of these plants was overshadowed in 2023 by the significant pollution from the Canadian wildfires. The air quality benefit from these closures is expected to be reflected in the 2024 annual average and more representative of New Jersey's air quality. Once the 2024 monitoring data is certified for the combined sites, the annual average is expected to be below 9.0 μg/m^3 and, when combined with the annual averages from 2022 and 2023, will result in a 2024 design value at the Camden Spruce Street/South Camden monitor that demonstrates attainment of the 2024 PM2.5 NAAQS.

- The air typically travels from the west, so emissions from New Jersey should not typically transport to Pennsylvania. Additionally, due to New Jersey's significant control measures including measures for EGUs, stationary generators and low sulfur fuel, New Jersey's emissions have less of an impact than each state's own emissions.

New Jersey recognizes that the current 2023 design value of 9.4 μg/m^3 for the Camden Spruce Street monitor excluding data on 2023 exceptional event days is measuring above the 2024 PM2.5 NAAQS of 9.0 μg/m^3. Additionally, the Camden Spruce Street monitor closed on June 18, 2024, because the lease for the property where the monitoring shelter was located ended on June 30, 2024, and a renewal was not offered. A replacement location was obtained on the property of the Camden County Municipal Utilities Authority (CCMUA), located at 1645 Ferry Avenue in Camden. An intended collocated monitor began operating at the CCMUA on June 3, 2024, and the monitoring shelter was relocated to the CCMUA on August 1, 2024, and designated the South Camden station. In accordance with 40 CFR 50 Appendix N, NJDEP is requesting in a separate document approval from USEPA to combine the data from these two nearby sites into a single record for the purpose of calculating a valid 2024 design value to use in their final designations of New Jersey's counties for the 2024 PM2.5 NAAQS.

Unlike 2021 and 2023, New Jersey's air quality during 2024 was not significantly impacted by wildfire smoke. Additionally, the closure of the Logan Generating Plant and the Carneys Point Generating Plant in 2022 resulted in significant reductions of PM2.5 and its precursor emissions, including NO_X and SO_2. The improvement in air quality due to the closure of these plants is expected to be reflected in the 2024 annual average and more representative of New Jersey's air quality. Therefore, the annual average for 2024 is expected to be below 9.0 $\mu g/m^3$ and, when combined with the annual averages from 2022 and 2023, will result in a 2024 design value at Camden Spruce Street/South Camden that demonstrates attainment of the 2024 PM2.5 NAAQS. At this time, the 2024 monitoring data is preliminary and has not been certified and submitted to USEPA. Also based on the data and discussions, New Jersey does not significantly contribute to PM2.5 concentrations outside of its borders.

New Jersey recommends designating all of the New Jersey counties in the PA-NJ-DE-MD CSA as attainment. New Jersey should also not be included in any multi-state nonattainment areas if a county in another state is not in compliance with the standard when 2024 data is certified.