

# Commonwealth of Pennsylvania



## Pennsylvania Department of Environmental Protection

**FINAL**

### **DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM<sub>2.5</sub>) NATIONAL AMBIENT AIR QUALITY STANDARD**

**MARCH 2025**

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## **Acronyms and Terms**

|                   |                                                       |
|-------------------|-------------------------------------------------------|
| CAA               | Clean Air Act                                         |
| CBSA              | Core Based Statistical Area                           |
| CSA               | Combined Statistical Area                             |
| DEP               | Department of Environmental Protection (Pennsylvania) |
| EPA               | Environmental Protection Agency (United States)       |
| FR                | Federal Register                                      |
| µg/m <sup>3</sup> | Micrograms per cubic meter (of air)                   |
| MSA               | Metropolitan Statistical Area                         |
| NAAQS             | National Ambient Air Quality Standards                |
| NEI               | National Emissions Inventory                          |
| NH <sub>3</sub>   | Ammonia (chemical formula)                            |
| NO <sub>x</sub>   | Oxides of nitrogen                                    |
| OMB               | Office of Management and Budget (United States)       |
| PM                | Particulate matter                                    |
| PM <sub>2.5</sub> | Particulate matter under 2.5 microns in size          |
| PM <sub>10</sub>  | Particulate matter under 10 microns in size           |
| SIP               | State Implementation Plan                             |
| SO <sub>2</sub>   | Sulfur dioxide (chemical formula)                     |
| USDOT             | United States Department of Transportation            |
| U.S.C.            | United States Code                                    |
| VOC               | Volatile Organic Compounds                            |

## **Purpose and Background**

In this document, the Pennsylvania Department of Environmental Protection (DEP) is making recommendations to the U.S. Environmental Protection Agency (EPA) concerning the designation of attainment and nonattainment areas in Pennsylvania for the revised annual fine particulate matter NAAQS (89 FR 16202; March 06, 2024). DEP’s designation recommendations are based on air quality monitoring data for 2021-2023 and other available information, including particulate-forming emissions, meteorology, geography, topography, jurisdictional boundaries and demographics. Since EPA anticipates making final designations in February 2026, using air quality monitoring data for 2022-2024, the DEP will continue to work with EPA during the process leading to EPA’s promulgation of the final designations.

The EPA sets National Ambient Air Quality Standards (NAAQS) based on its review of existing scientific knowledge about the adverse health and welfare effects. Clean Air Act (CAA) Section 109(d) (42 U.S.C. § 7409(d)) requires EPA to review and update periodically, if necessary, every NAAQS to “protect public health with an adequate margin of safety” based on the latest, best-available science.

Prior to 1997, particulate standards had been based on total suspended particulates and then particles less than 10 micrometers in diameter (PM10). In 1997, EPA revised the NAAQS to reflect the growing body of scientific knowledge that links serious health effects to fine particles. On July 18, 1997, EPA promulgated two new fine particulate matter (PM2.5) standards – a primary annual average of 15 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), and a 24-hour daily average of 65  $\mu\text{g}/\text{m}^3$  (The PM10 standards were retained as an indicator for coarse PM; all areas of Pennsylvania meet this standard.). EPA designated attainment and nonattainment areas for the 1997 standards in December 2004 and published the designations in the *Federal Register* on January 5, 2005, effective on April 5, 2005 (70 FR 944).

On October 17, 2006, EPA published a revised 24-hour standard for PM2.5, lowering the standard from 65  $\mu\text{g}/\text{m}^3$  to 35  $\mu\text{g}/\text{m}^3$ . EPA retained the primary annual standard for PM2.5 of 15  $\mu\text{g}/\text{m}^3$ . EPA also retained the daily standard for PM10 of 150  $\mu\text{g}/\text{m}^3$  but revoked the annual standard of 50  $\mu\text{g}/\text{m}^3$  (No area in Pennsylvania violates the PM10 standard.). On November 13, 2009, EPA published the PM2.5 nonattainment areas designations for the 2006 PM2.5 standards, with an effective date of December 14, 2009 (74 FR 58688).

On December 14, 2012, EPA revised the PM2.5 NAAQS annual health-based standard (the “primary” standard), lowering the existing standard from 15  $\mu\text{g}/\text{m}^3$  to 12  $\mu\text{g}/\text{m}^3$ , with an effective date of March 18, 2013 (78 FR 3086). EPA retained the PM2.5 24-hour standard of 35  $\mu\text{g}/\text{m}^3$ , as well as the existing PM10 24-hour standard of 150  $\mu\text{g}/\text{m}^3$ . EPA retained the secondary annual standard of 15  $\mu\text{g}/\text{m}^3$  and the secondary 24-hour standard of 35  $\mu\text{g}/\text{m}^3$ , though EPA revised the form of the secondary annual standard to remove the option for spatial averaging to be consistent with the primary annual standard. EPA had proposed to set a separate secondary 24-hour standard for PM-related visibility effects, but after further review, determined that the existing 24-hour secondary standard of 35  $\mu\text{g}/\text{m}^3$  provides adequate protection of public welfare regarding visual air quality.

On February 7, 2024, EPA strengthened the Primary Annual 2024 PM2.5 standard from 12  $\mu\text{g}/\text{m}^3$  to 9.0  $\mu\text{g}/\text{m}^3$  (See 9 FR 16202; March 06, 2024). EPA did not make changes to other particulate matter air quality standards that include the primary 24-hour PM2.5 standard, the primary 24-hour PM10 standard, and the secondary PM2.5 and PM10 standards.

CAA Section 107(d) (42 U.S.C. § 7407(d)) indicates that states are required to submit designation recommendations to the EPA no later than one year after the EPA’s promulgation of the new or revised

NAAQS. In accordance with the CAA, EPA will determine which areas meet the standards and will make initial attainment/nonattainment designations within two years after new or revised ambient air standards are issued.

## **1.1 Effects of Particulate Matter**

Fine particles generally pose greater health risks than larger particles. Because of their small size (less than one-seventh the average width of a human hair), fine particles can lodge deeply into the lungs. Health studies have shown a significant association between exposure to PM<sub>2.5</sub> and premature mortality. Studies have also linked exposure to PM<sub>2.5</sub> with other significant health problems, including aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma attacks, increases in respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to PM<sub>2.5</sub> exposure include older adults, people with heart and lung disease, and children.

Fine particles are also a major cause of reduced visibility (haze) in certain parts of the United States, including many national parks. Fine particles cause visibility impairment by scattering and absorbing light before it reaches an observer. In the Eastern United States, haze has reduced the average visual range from approximately 90 miles in the absence of manmade pollution to 15 to 25 miles. Additionally, components of PM<sub>2.5</sub>, such as nitrates and sulfates, contribute to acid rain formation. Acid rain makes lakes, rivers, and streams unsuitable for many fish, and erodes buildings, historical monuments, and paint on cars. PM<sub>2.5</sub> and its precursor (SO<sub>2</sub>, NO<sub>x</sub>, VOC and NH<sub>3</sub>) pollutants can be transported long distances by wind and then settle on ground or water. This alters the nutrient balance in coastal waters and large river basins, contributing to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay. The settling of PM<sub>2.5</sub> also depletes the nutrients in soil, damages sensitive forests and farm crops, and affects the diversity of ecosystems. Soot, a type of PM<sub>2.5</sub>, stains and damages stone and other materials.

## **2.0. Designating Areas Process**

Section 107 (d)(1)(B) of the CAA (42 U.S.C. § 7407(d)(1)(B)) requires EPA to designate areas after promulgating a new NAAQS. Following promulgation of new or revised air standards, Governors are given the opportunity to submit recommendations for attainment and nonattainment areas, supported by the most recent quality -assured monitoring data. EPA provides criteria for states' recommendations for designating areas.

Governors' designation recommendations for the revised 2024 primary annual PM<sub>2.5</sub> standard must be submitted to EPA by February 07, 2025. EPA may make modifications and promulgate all or part of a Governor's recommendations. If EPA determines that a modification to the recommendation is necessary, EPA will notify the state no later than 120 days prior to promulgating the designations. This provides an opportunity for the state to work with EPA, if the state believes EPA's decisions are not appropriate.

This document contains Pennsylvania's designation recommendations for the revised 2024 Primary Annual PM<sub>2.5</sub> health-based standard. The recommendations are based on 2021-2023 air quality monitoring data, because 2023 is the most recent full-year of quality-assured and quality-controlled data available. EPA is required to make final PM<sub>2.5</sub> designations by February 2026. EPA's final designations will most likely be based on 2022-2024 air quality monitoring data.

Section 189(a)(2)(B) of the CAA (42 U.S.C. § 7513a(a)(2)(B)) requires that the PM<sub>2.5</sub> attainment demonstration State Implementation Plan (SIP) revisions will be due to EPA in August 2027, 18 months after final designations are expected to be effective. As provided in Section 188(c)(1) of the CAA (42 U.S.C. § 7513(c)(1)), the attainment date for each nonattainment area classified moderate for the revised 2024 Primary Annual PM<sub>2.5</sub> Standard shall be as met as expeditiously as practicable, but no later than the end of the sixth calendar year after the area was designated nonattainment, or by December 2032. EPA will initially classify all nonattainment areas as 'moderate' nonattainment areas, consistent with the CAA Section 188(a) (42 U.S.C. § 7513(a)).

## **2.1 Methodology**

On February 7, 2024, EPA issued a guidance memorandum, "Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard"<sup>1</sup> (Designations Guidance). EPA explains in the Designations Guidance that nonattainment area boundaries will encompass the area(s) that violate(s) the standard and the nearby areas that contribute to the violations. EPA intends to begin its analysis of what areas contribute to a violating area by considering those counties in the entire metropolitan area (for instance, the Core Based Statistical Area (CBSA) or Combined Statistical Areas (CSA)) in which the violating monitor(s) is (are) located; and to evaluate any adjacent counties to the CBSA or CSA that have the potential to contribute to the violations. EPA explains that it does not presume that the CBSA or CSA constitutes the nonattainment area boundary, however. EPA describes criteria that states should examine when recommending nonattainment area boundaries. The factors include the following:

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<sup>1</sup> Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard, February 7, 2024  
[https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo\\_2.7.2024-jg-signed.pdf](https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-jg-signed.pdf)

- 1.) Air quality data,
- 2.) Emissions and emissions related data,
- 3.) Meteorology
- 4.) Geography and topography
- 5.) Jurisdictional boundaries.

DEP used this Designations Guidance, as described below, when developing designation recommendations for the 2024 primary annual PM2.5 standard.

The DEP's approach provides continuity of existing air quality planning efforts in its recommendations for the 2024 Primary Annual PM2.5 standard, wherever appropriate.

In central and eastern Pennsylvania, previous designations generally followed county boundaries and, in part, the U.S. Office of Management and Budget's (OMB) boundaries for Metropolitan Statistical Areas (MSA) and CSAs. The OMB-defined areas are defined primarily by having a high degree of social and economic integration measured by commuting ties with outlying counties. In instances where EPA's designations did not follow these boundaries in the past, EPA tended to make the nonattainment area smaller than the MSA, CBSA or CSA. DEP's recommendations for the 2024 Primary Annual PM2.5 Standard use existing nonattainment area boundaries, where appropriate.

The DEP has also considered the five factors recommended by EPA in its Designations Guidance, and other sources of information relevant to PM2.5 designations. In some cases, an analysis of these factors suggested that one or more counties in the MSA, CBSA or CSA should be recommended as attainment or unclassifiable/nonattainment.

## **2.2 Public Participation**

Requirements for a public participation process including a public hearing are set forth in Section 110(a)(2) of the CAA (42 U.S.C. § 7410(a)(2)), 40 CFR Section 51.102(d) and Section 7.5 of the Air Pollution Control Act, 35 P.S. § 4007.5. On December 21, 2024, the DEP provided notice of a public comment period, and of three scheduled public hearings on the proposed Designation Recommendations scheduled on January 21 and January 23, 2025 (54 Pa. B. 8350). Two public hearings were held on January 21 (Pittsburgh and Norristown). A third public hearing was held on January 23 (Harrisburg). DEP received comments from 24 individuals. Testimony was provided at the January 21, 2025, Pittsburgh hearing. DEP's responses are provided in an accompanying Comment and Response document.

### 3.0 Designation Recommendations for the 2024 Primary Annual PM2.5 Standard

DEP analyzed the data based on five factors detailed in the EPA Designation Guidance document<sup>2</sup>. Based on the analysis, DEP recommend the areas in Pennsylvania to be designated as Attainment, Nonattainment, or Unclassifiable/Attainment Areas. DEP's designation recommendations are detailed in the remaining subsections.

#### 3.1 Attainment Areas

Of the 47 network monitors in Pennsylvania, 36 monitors in 32 counties did not show exceedances of the 2024 Primary Annual PM2.5 Standard. The design values for the 2024 Primary Annual PM2.5 Standard for each monitor in Pennsylvania attaining the standard are listed in Table 1 below. A design value for the 2023 Annual PM2.5 Standard is the 3-year average (in this case, 2021 to 2023) of the annual average concentration for each monitor. Sites with design values below 9.0 µg/m<sup>3</sup> are identified as attaining the 2024 Primary Annual PM2.5 Standard.

**Table 1: 2023 Primary Annual PM2.5 Design Values for Monitors Attaining the 2024 Primary Annual PM2.5 Standard**

| AQS Site Code | Site              | County       | Design Value (in µg/m3) |
|---------------|-------------------|--------------|-------------------------|
| 42-117-4000   | Tioga County      | Tioga        | 5.6*                    |
| 42-131-0010   | Tunkhannock       | Wyoming      | 5.7*                    |
| 42-115-0215   | New Milford       | Susquehanna  | 5.9*                    |
| 42-015-0011   | Towanda           | Bradford     | 6.4*                    |
| 42-081-0419   | Salladasburg      | Lycoming     | 6.6*                    |
| 42-051-0524   | Uniontown         | Fayette      | 6.9*                    |
| 42-059-0002   | Holbrook          | Greene       | 6.9*                    |
| 42-085-0100   | Farrell           | Mercer       | 7.0*                    |
| 42-049-0003   | Erie              | Erie         | 7.1*                    |
| 42-063-0004   | Strongstown       | Indiana      | 7.3                     |
| 42-125-5001   | Florence          | Washington   | 7.4                     |
| 42-003-0067   | South Fayette     | Allegheny    | 7.5                     |
| 42-069-2006   | Scranton          | Lackawanna   | 7.5                     |
| 42-027-0100   | State College     | Centre       | 7.6                     |
| 42-129-0008   | Greensburg        | Westmoreland | 7.6*                    |
| 42-013-0801   | Altoona           | Blair        | 7.9                     |
| 42-041-0101   | Carlisle          | Cumberland   | 7.9                     |
| 42-003-1008   | Harrison Township | Allegheny    | 8.1                     |
| 42-029-0100   | New Garden        | Chester      | 8.1                     |
| 42-091-0013   | Norristown        | Montgomery   | 8.1                     |
| 42-005-0001   | Kittanning        | Armstrong    | 8.3                     |
| 42-095-0025   | Freemansburg      | Northampton  | 8.3                     |
| 42-003-3007   | Clairton          | Allegheny    | 8.4                     |
| 42-011-0011   | Reading Airport   | Berks        | 8.4                     |

<sup>2</sup> Internal Area Designation for the 2024 Revised Primary Annual Fine Particulate National Ambient Air Quality Standards, February 7, 2024

| AQS Site Code | Site              | County       | Design Value<br>(in µg/m <sup>3</sup> ) |
|---------------|-------------------|--------------|-----------------------------------------|
| 42-075-0101   | Lebanon           | Lebanon      | 8.4                                     |
| 42-077-0004   | Allentown         | Lehigh       | 8.4*                                    |
| 42-045-0002   | Chester           | Delaware     | 8.5                                     |
| 42-045-0109   | Marcus Hook       | Delaware     | 8.5*                                    |
| 42-101-0076   | Montgomery        | Philadelphia | 8.5                                     |
| 42-001-0001   | Arendtsville      | Adams        | 8.7                                     |
| 42-003-0008   | Lawrenceville     | Allegheny    | 8.7                                     |
| 42-021-0011   | Johnstown         | Cambria      | 8.8                                     |
| 42-071-0007   | Lancaster         | Lancaster    | 8.8                                     |
| 42-101-0057   | Fire Admin. Bldg. | Philadelphia | 8.8*                                    |
| 42-007-0014   | Beaver Falls      | Beaver       | 8.9                                     |
| 42-125-0005   | Charleroi         | Washington   | 9.0                                     |

\*The 2023 Primary Annual PM<sub>2.5</sub> design value is not valid due to incomplete data periods.

### 3.2 Nonattainment Areas

There are 11 monitors in five counties that exceed the 2024 Primary Annual PM<sub>2.5</sub> Standard: the counties are Allegheny, Dauphin, Lancaster, Philadelphia, and York Counties. The design values for each monitor showing nonattainment of 2024 Primary PM<sub>2.5</sub> Standard in Pennsylvania are listed in Table 2 below.

**Table 2: 2023 Primary Annual PM<sub>2.5</sub> Design Values for Monitors Exceeding the 2024 Primary Annual PM<sub>2.5</sub> Standard**

| AQS Site Code | Site               | County       | Design Value<br>(in µg/m <sup>3</sup> ) |
|---------------|--------------------|--------------|-----------------------------------------|
| 42-003-0002   | Avalon             | Allegheny    | 9.2                                     |
| 42-101-0055   | Ritner             | Philadelphia | 9.3                                     |
| 42-133-0008   | York               | York         | 9.3                                     |
| 42-003-1376   | Parkway East       | Allegheny    | 9.5                                     |
| 42-071-0012   | Lancaster Downwind | Lancaster    | 9.5                                     |
| 42-101-0004   | AMS Lab            | Philadelphia | 9.6*                                    |
| 42-101-0048   | Northeast Waste    | Philadelphia | 9.7                                     |
| 42-043-0401   | Harrisburg         | Dauphin      | 9.8                                     |
| 42-003-1301   | North Braddock     | Allegheny    | 10.0                                    |
| 42-101-0075   | Torresdale         | Philadelphia | 10.0                                    |
| 42-003-0064   | Liberty            | Allegheny    | 11.6                                    |

\*The 2023 Primary Annual PM<sub>2.5</sub> design value is not valid due to incomplete data periods.

### 3.3 Unclassifiable/Attainment Areas

DEP submitted a 2023 Annual Ambient Air Quality Monitoring Network Plan (network plan) to EPA on November 27, 2023, in accordance with the regulatory requirements of 40 CFR Part 58 (relating to Standards for Ambient Air Quality Surveillance). As revised in March 2016, pursuant to 40 CFR Sections 58.10(a) and 58.10(b), network plans must include the following for existing and proposed monitoring sites:

- A statement of whether the operation of each monitor meets the requirements of 40 CFR Part 58, Appendices A, B, C, D, and E, where applicable;
- The Air Quality System (AQS) site identification number;
- The location, including street address and geographical coordinates;
- The sampling and analysis method(s) for each measured parameter;
- The operating schedules for each monitor;
- Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal;
- The monitoring objective and spatial scale of representativeness for each monitor;
- The identification of any sites that are suitable and sites that are not suitable for comparison against the Annual PM<sub>2.5</sub> NAAQS, as described in 40 CFR § 58.30;
- The Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA), or other area represented by the monitor;
- The designation of lead monitors as source-oriented or non-source-oriented;
- Any lead monitor for which a waiver has been requested or granted by EPA to use Pb-PM<sub>10</sub> monitoring in lieu of Pb-TSP monitoring; and
- The identification of NO<sub>2</sub> monitors as near-road, area-wide or vulnerable or susceptible population monitors in accordance with 40 CFR Appendix D, § 4.3 "Nitrogen Dioxide (NO<sub>2</sub>) Design Criteria.

On March 7, 2024, EPA approved the network plan submitted by DEP on the basis that the network plan meets the requirements of 40 CFR Part 58.

At this time, DEP is recommending that all other counties in Pennsylvania that do not have ambient air monitoring data be designated as unclassifiable/attainment. Where monitors are not sited and operated in accordance with the regulatory requirements of 40 CFR Part 58, this recommendation reflects that there is no evidence of PM<sub>2.5</sub> exceedances.

## **4.0 Discussion of Related Factors**

As stated in the Initial Area Designations for the 2024 Revised Primary Annual Fine Particulate National Ambient Air Quality Standard Memo, J. Goffman, February 7, 2024, EPA recommends that states look at several factors in making their recommendations for the 2024 Primary Annual PM<sub>2.5</sub> Standard designations. Attachment 3 of EPA's Designations Guidance<sup>3</sup> suggests using a five-factor approach, which includes the consideration of the following factors: (1) air quality data; (2) emission and emissions-related data; (3) meteorology; (4) geography and topography; and (5) jurisdictional boundaries. Using a weight-of-evidence approach ensures for practical boundaries and effective air quality management in determining which areas should be included or excluded. DEP has considered these factors and sources of information relevant to PM<sub>2.5</sub> designations, and provides a general discussion of this information as follows:

### **4.1 Air Quality Data**

DEP recommendations are based on the 2023 PM<sub>2.5</sub> design values using the 2021, 2022 and 2023 monitored data. Table 1 lists these design values by monitor site, in ascending order of design value. Information pertaining to monitors with design values exceeding the 2024 Primary Annual PM<sub>2.5</sub> Standard is identified in Table 2.

Monitors exceeding the Primary Annual PM<sub>2.5</sub> Standard are in the southwest, eastern and southcentral areas of the Commonwealth; specifically, Allegheny, Dauphin, Lancaster, Philadelphia and York counties.

A map showing the 2023 Annual PM<sub>2.5</sub> design values across Pennsylvania is attached in Appendix B, Figure B-1. The monitors exceeding the 9.0  $\mu\text{g}/\text{m}^3$  standard are displayed in red (with rounding, design values of 9.05 are exceeding the standard). The DEP is recommending that all these areas be designated nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> standard.

### **4.2. Emissions and Emissions Related Data**

#### **4.2.1 Stationary (Point) & Area Sources**

DEP prepares an emission inventory for all criteria pollutants from all sources (Point, area and mobile) every three years. Point source data is available every year; the most recent full inventory was for the year 2020 which was submitted to EPA for review and input for the 2020 National Emissions Inventory (NEI).

Since the latest available complete NEI is from 2020, DEP used and analyzed 2022-point source data from the Pennsylvania Air Information Management System (AIMS). This data is used to generate Figures B-2 through B-5 and Figures B-21 through B-24 as shown in Appendix B. Stationary point sources include manufacturing operations and power plants.

Figures B-6 through B-10 (Emission Density for Area Sources) in Appendix B show PM<sub>2.5</sub> and PM<sub>2.5</sub> precursor emissions per square mile, including emissions resulting from:

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<sup>3</sup> Memorandum: "Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard", February 7, 2024.  
[https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo\\_2.7.2024--jg-signed.pdf](https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024--jg-signed.pdf)

Area sources, which are the industrial, commercial, and residential sources too small or too numerous to be handled individually, such as commercial and residential open burning, architectural and industrial maintenance coatings application and clean-up, consumer product use, and vehicle refueling at service stations.

Emissions of NH<sub>3</sub> are primarily in the areas with high concentrations of agriculture, including areas of animal and crop operations. Emissions of the other PM<sub>2.5</sub> precursors tend to be more concentrated in populated areas because of combustion sources.

#### **4.2.2 On-Road & Non-Road Sources**

Figures B-11 through B-15 in Appendix B show the on-road emission density by County for PM<sub>2.5</sub> and PM<sub>2.5</sub> precursors. Figures B-16 through B-20 in Appendix B show emission density for the non-road emission density by County for PM<sub>2.5</sub> and PM<sub>2.5</sub> precursors.

On-road sources include passenger cars and light-duty trucks, other trucks, buses and motorcycles. Non-road sources consist of a diverse collection of engines, including engines in outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, industrial equipment, recreational marine vessels, commercial marine vessels, locomotives, ships, aircraft and many other such sources.

On-road and non-road emissions of NO<sub>x</sub>, direct PM<sub>2.5</sub> and VOC have been declining and will continue to do so, as national and state controls on new highway vehicles, non-road equipment and motor vehicle fuels come into effect, and older vehicles are replaced. Population, urbanization, traffic, commuting, and growth factors are the primary determinants of the OMB's designation of metropolitan and micropolitan statistical areas and were used extensively by Pennsylvania in its recommendations, and to a lesser extent, by EPA in its final designations, for the 1997 PM<sub>2.5</sub> standard. For the 2006 24-hour standard, EPA explicitly stated that these area boundaries would no longer be presumed to define nonattainment areas. DEP, however, has emphasized continuity of planning for attainment of the 2024 Primary Annual PM<sub>2.5</sub> standard. Consequently, DEP's recommended boundaries take these factors into account. Figure B-25 shows population density by county and Figure B-26 shows population growth between 2010 and 2020.

### **4.3 Meteorology, Geography, and Topography**

Many regions across the Commonwealth have weather that is influenced by topography. There are many areas of river valleys and higher terrain across western Pennsylvania that influence the way wind flows across the region. Topography also enhances the strength of morning inversions when they form. Morning inversions are a key meteorological feature that contributes to higher daily levels of PM<sub>2.5</sub> across a region. Various areas contend with the influences of the Appalachian Mountains, as well. The changes in local elevation become less drastic in

southcentral and southeastern portions of the Commonwealth. The Philadelphia area, by contrast, has relatively few topographic features that restrict airflow.

Wind direction and speed are important meteorological factors to consider. Wind can weaken or improve air quality conditions. Strong winds can transport PM emissions or their precursors regionally, while weak winds can lead to the accumulation of emissions on a local basis. Wind roses for the western and eastern portions of Pennsylvania are presented in Appendix C, Figures C-1-5.2 and Figure C-2.4.2, respectively.

DEP conducted meteorological, geographical and topographical analysis for the monitors in the recommended nonattainment areas. These analyses are contained in Appendix C (relating to Meteorological, Geographical and Topographical Analysis for Recommended Nonattainment Areas).

#### **4.4 Jurisdictional Boundaries**

DEP recommends the use of county boundaries because these are the same boundaries used by the Commonwealth’s regional transportation planning organizations (which are also often economic planning organizations as well). Inventory data for nonpoint sources is also more accurate and available on the county level, which is useful in meeting the requirements in nonattainment areas for emission inventory information and for reasonable further progress (incremental emission reductions). While EPA does not presume that the CBSA or CSA should be the nonattainment boundary for the areas, EPA considers the CBSA or CSA as a reasonable starting point for analysis of what nearby areas may be contributing to the violation of the NAAQS at a given monitor. Having considered the relevant data, the Department is recommending that the boundaries of nonattainment areas associated with monitors violating the Annual PM<sub>2.5</sub> Standard follow the county boundaries. In some cases, the nonattainment area is being recommended to be limited to one whole county, while in other cases the nonattainment areas are recommended as a small multi-county area combining two or three counties within a regional transportation planning organization.

##### **4.4.1 Environmental Justice concerns**

As part of the designation request, DEP considered the areas with overburdened communities with high PM concentration which were above the 2024 primary annual PM<sub>2.5</sub> standard. DEP considered the possibility of environmental justice concerns in these areas using the EPA EJScreen tool described in EPA’s PM NAAQS implementation guidance (80 FR 58010, 58136, August 24, 2016). As stated in this rule “The tool may help users identify areas with minority and / or low-income populations, potential environmental quality issues, a combination of environmental and demographic indicators that is greater than usual, and other factors that may be of interest”.

DEP considered the vicinity of at-risk populations within the boundaries of designation request for each of the counties that are exceeding the 2024 Primary Annual PM<sub>2.5</sub> Standard.

## 5.0 Discussion of Designation Recommendations

DEP is recommending the following nonattainment area designations for the 2024 Primary Annual PM<sub>2.5</sub> Standard based upon air quality monitoring data for 2021-2023, the other information described above regarding the factors in EPA's Designations Guidance, and any additional information described below and in the applicable Appendix C. Each of the following descriptions for a recommended area references a corresponding Appendix C that contains a more detailed analysis of the recommended nonattainment area. An overview map of the recommended nonattainment areas with respect to all 67 counties in PA can be found in Appendix A.

### 5.1 Southwest Pennsylvania

**Allegheny County Nonattainment Area:** DEP recommends the nonattainment area for the 2024 Primary Annual PM<sub>2.5</sub> Standard be limited to Allegheny County.

An analysis of the PM<sub>2.5</sub> data monitored at the Liberty, North Braddock, Parkway East, and Avalon monitors in Allegheny County illustrate that these monitors see greater concentrations in the 9-27  $\mu\text{g}/\text{m}^3$  range than the regional concentrations in the same range. A further examination into the monitoring data demonstrates that the high concentrations are coming out of the southwest. These wind profiles travel over local point source emissions, further illustrating the local issue at the Liberty, North Braddock, Parkway East, and Avalon monitors. An analysis of the speciated data at ACHD's Lawrenceville and Liberty monitors and DEP's Florence, Greensburg, and Johnstown monitors illustrate the excess major constituents of PM<sub>2.5</sub> emissions to be local in nature. The urban and localized excess is most evident in Allegheny County, which contributes to the violating design values.

The Liberty, North Braddock, Parkway East, and Avalon monitors in Allegheny County have a 2023 annual design value that exceeds the 2024 Primary Annual PM<sub>2.5</sub> Standard. The other monitors in the Pittsburgh MSA, namely four monitors in Allegheny County (Lawrenceville, Clairton, Harrison, and South Fayette), two monitors in Washington County (Charleroi and Florence monitors), one monitor in Beaver County (Beaver Falls monitor) and one monitor in Armstrong County (Kittanning monitor) are monitoring attainment of the 2024 standard, are continuing to have a general decline in the annual average and are not contributing to excess emissions elsewhere.

Therefore, DEP is recommending Allegheny County be designated nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard. A map of the nonattainment area is provided in Figure C-1.8. Details of the Allegheny County nonattainment area recommendation can be found in Appendix C-1.

### 5.2 Southeast Pennsylvania

**Greater Philadelphia Nonattainment Area:** DEP is recommending Delaware, Montgomery and Philadelphia Counties be designated as nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard.

An analysis of the PM<sub>2.5</sub> data monitored at the Torresdale, Northeast Waste, and Ritner monitors in Philadelphia County illustrates that these monitors measure greater concentrations in the 9-27  $\mu\text{g}/\text{m}^3$  than the regional concentrations in the same range. Looking further, the largest sources along the I-95 corridor continue southwest from Philadelphia County into Delaware County.

Most PM<sub>2.5</sub>, SO<sub>2</sub> precursor, NO<sub>x</sub> precursor, and VOC precursor point and area source emissions are in Philadelphia, Delaware, and Montgomery Counties, with substantially less emissions in Chester and Bucks Counties. For example:

- The greatest VOC precursor point source emission density is in Delaware and Montgomery Counties.
- The greatest PM<sub>2.5</sub>, SO<sub>2</sub> precursor and NO<sub>x</sub> precursor area source emission density is in Philadelphia County, followed by Delaware and Montgomery Counties.
- The greatest VOC precursor area source emission density is in Philadelphia County, followed by Delaware County.

Further meteorological examination demonstrates that the predominant winds travel northeast directly over local point sources towards these monitors. A comparison of the speciated data collected in the greater Philadelphia area and Arendtsville (background) monitors indicate PM<sub>2.5</sub> constituent compounds attributable to industrial emission influences, and therefore are local in nature, during worst-case meteorological or poor dispersion conditions.

Therefore, DEP is recommending Delaware, Montgomery, and Philadelphia Counties in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA in Pennsylvania (consisting of Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties) be designated nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard. A map of the nonattainment area is provided in Figure C-2.7. Details of the Greater Philadelphia Nonattainment Area can be found in Appendix C-2.

### **5.3 Southcentral Pennsylvania**

**Harrisburg-Carlisle-York Nonattainment Area:** DEP recommends Harrisburg-Carlisle-York area be designated as nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard. This nonattainment area consists of Cumberland, Dauphin, and York Counties.

An analysis of the PM<sub>2.5</sub> data monitored at the Harrisburg monitor in Dauphin County and the York monitor in York County illustrates that the Harrisburg and York monitors see greater concentrations in the 9-27 µg/m<sup>3</sup> range than the regional concentrations in the same range. A further examination into the monitoring data demonstrates that the predominant winds travel directly over local point sources, further illustrating the local issue at the Harrisburg and York monitors. There are multiple point sources clustered along the Cumberland/Dauphin County border. The Harrisburg monitor in Dauphin County and York monitor in York County have a 2023 annual design value that exceeds the 2024 Primary Annual PM<sub>2.5</sub> Standard. The Lebanon monitor in Lebanon County has been monitoring in attainment of the 2024 standard for several years and is not contributing to excess emissions elsewhere.

Therefore, DEP is recommending the Harrisburg-Carlisle-York nonattainment area encompassing Cumberland, Dauphin, and York counties in Pennsylvania be designated nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard. A map of the nonattainment area is provided in Figure C-3.5. Details of Harrisburg-Carlisle-York Nonattainment Areas can be found in Appendix C-3.

**Lancaster County Nonattainment Area:** DEP recommends Lancaster County be designated as a nonattainment area for the 2024 Primary Annual PM<sub>2.5</sub> Standard.

An analysis of the PM<sub>2.5</sub> data monitored at the Lancaster Downwind monitor in Lancaster County illustrates that the Lancaster Downwind monitor sees greater concentrations in the 9-27 µg/m<sup>3</sup> range than the regional concentrations in the same range. Lancaster County has the largest ammonia area source emission density (in tons per year per square mile) in Pennsylvania. A further examination into the monitoring data demonstrates that the high concentrations are coming out of two primary directions: northwesterly and easterly. These wind profiles travel over local farms, further illustrating the local issue at the Lancaster Downwind monitor. An analysis of the speciated data at the Lancaster Downwind and Arendtsville monitors illustrates the excess nitrate, ammonium, and organic and elemental carbon at the Lancaster Downwind monitor. The excess ammonium is likely a function of the high number of farms in the immediate vicinity of the Lancaster Downwind monitor. The excess ammonium, when in contact with excess nitrate, forms ammonium nitrate, a large constituent of PM<sub>2.5</sub> during the cold season.

Therefore, DEP is recommending the Lancaster County nonattainment area encompassing Lancaster County in Pennsylvania be designated nonattainment for the 2024 Primary Annual PM<sub>2.5</sub> Standard. A map of the final nonattainment area is provided in Figure C-4.8. Details of the Lancaster County Nonattainment Area can be found in Appendix C-4.

#### **5.4 Recommended Attainment Areas**

DEP recommends that EPA designate the following counties as attainment areas, as these counties have monitors showing attainment of the 2024 Primary Annual PM<sub>2.5</sub> Standard and they are not contributing to nonattainment of the standard in another area: Adams, Armstrong, Beaver, Berks, Blair, Cambria, Centre, Chester, Indiana, Lackawanna, Lebanon, Northampton and Washington counties. Refer to Appendix A, Table A-1.

#### **5.5 Recommended Unclassifiable/Attainment Areas**

Areas that do not have monitors are defined as unclassifiable / attainment under Section 107(d) of the CAA (42 U.S.C. § 7407(d)). DEP recommends that EPA designate the counties set forth below as unclassifiable/attainment areas because they do not have monitors showing attainment or nonattainment of the 2024 Primary Annual PM<sub>2.5</sub> Standard. Where monitors are not sited and operated in accordance with the regulatory requirements of 40 CFR Part 58, this designation reflects that there is no evidence of PM<sub>2.5</sub> exceedances.

The recommended “unclassifiable/attainment areas” counties are provided as follows: Bedford, Bradford, Bucks, Butler, Cameron, Carbon, Clarion, Clearfield, Clinton, Columbia, Crawford, Elk, Erie, Fayette, Forest, Franklin, Fulton, Greene, Huntingdon, Jefferson, Juniata, Lawrence, Lehigh, Luzerne, Lycoming, McKean, Mercer, Mifflin, Monroe, Montour, Northumberland, Perry, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Venango, Warren, Wayne, Westmoreland and Wyoming.

## **6.0 Conclusion**

DEP is making recommendations to the EPA, on behalf of the Commonwealth, concerning the designation of attainment, unclassifiable/attainment, and nonattainment areas in Pennsylvania for the 2024 Primary Annual PM2.5 Standard. The designation recommendations are based on air quality monitoring data for 2021-2023 and other available information, including particulate-forming emissions, meteorology, geography, topography, jurisdictional boundaries and demographics.

DEP is recommending the following eight counties be classified nonattainment areas as previously discussed and described in Appendix C: Allegheny, Cumberland, Dauphin, Delaware, Lancaster, Montgomery, Philadelphia and York.

DEP is recommending that counties monitoring attainment of the 2024 Primary Annual PM2.5 Standard be designated as attainment, except Cumberland, Delaware, and Montgomery Counties. As previously discussed, these three counties are included in the recommended nonattainment areas due to possible emission impacts from these counties in Southcentral and Southeast Pennsylvania.

DEP is recommending that all other counties in Pennsylvania be designated as either attainment or unclassifiable/attainment. A complete breakdown of designation recommendations for Pennsylvania can be found in Appendix A, Table A-1.