4.0   Analyses of Individual Nonattainment Areas

4.2   Region 2 Nonattainment Areas

4.2.1   New Jersey

<u>**Attachment 1**</u>

NEW JERSEY
Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standards

The table below identifies the counties in New Jersey that EPA has designated as not attaining the 2006 24-hour fine particle ($PM_{2.5}$) national ambient air quality standards (NAAQS).[1] A county (or part thereof) is designated as nonattainment if it has an air quality monitor that is violating the NAAQS or if the county is determined to be contributing to the violation of the NAAQS.

Area	New Jersey Recommended Nonattainment Counties	EPA's Designated Nonattainment Counties
Allentown-Bethlehem-Easton PA-NJ area	Warren County (partial) - Knowlton Township	None
New York-Northern New Jersey-Long Island, NY-NJ-CT area	Bergen County Essex County Hudson County Mercer County Middlesex County Monmouth County Morris County Passaic County Somerset County Union County	Bergen County Essex County Hudson County Mercer County Middlesex County Monmouth County Morris County Passaic County Somerset County Union County

Philadelphia-Wilmington, PA-NJ-DE area	Burlington County Camden County Gloucester County	Burlington County Camden County Gloucester County

EPA has designated the remaining counties in the state as "attainment/unclassifiable".

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[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the primary and secondary 24-hour $PM_{2.5}$ standards were revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the primary and secondary annual standards for $PM_{2.5}$ remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

EPA Technical Analysis for the Allentown-Bethlehem-Easton PA-NJ area

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to violations. This technical analysis for the Allentown-Bethlehem-Easton PA-NJ (Allentown, PA-NJ) area identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

We also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas. (See additional discussion of the CES under factor 1 below.)

Figure 1 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.
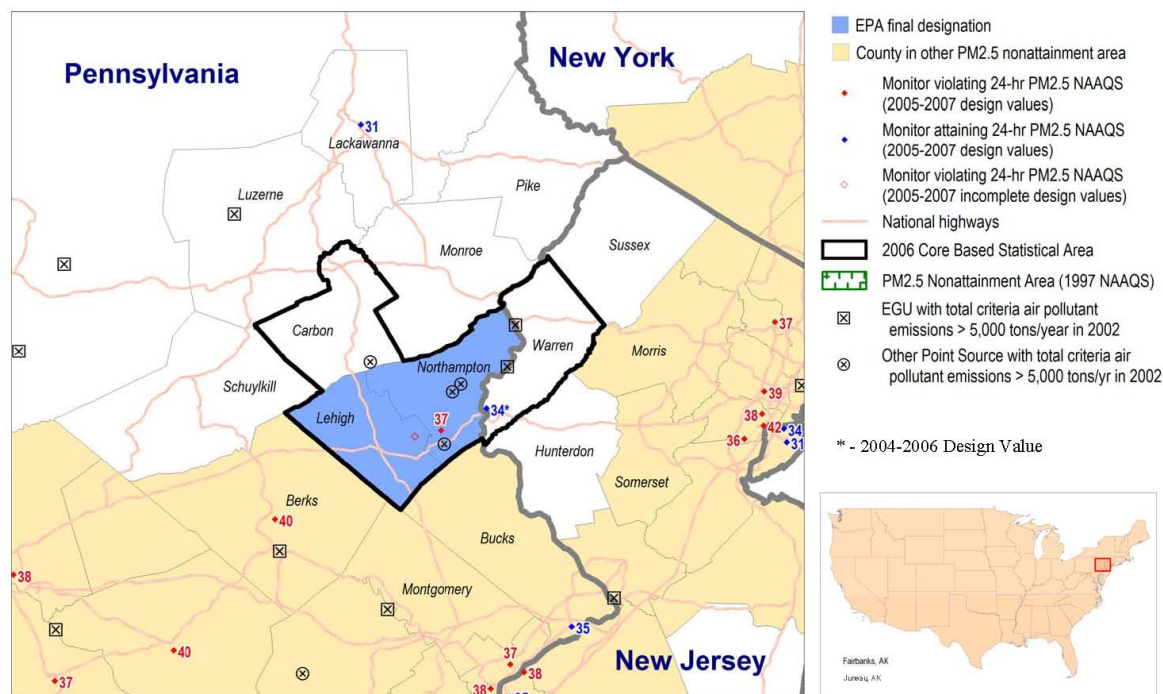
Allentown, PA 24-hr PM2.5 Nonattainment Area

Figure 1. Map of Allentown, PA area that includes Warren County, NJ

In December 2007, New Jersey recommended that Knowlton Township in Warren County be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality modeling, which indicated modeled air quality violations.

In August 2008, EPA notified New Jersey of its intended designations. EPA indicated that it did not intend to include any part of Warren County in the Allentown nonattainment area.   In this letter, EPA also requested that if New Jersey wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information provided by the state in making final decisions on the designations.

New Jersey has provided comments and submitted additional air modeling data to be considered by EPA in letters to Ray Werner, dated September 17, 2008, and Regional Administrator Alan Steinberg, dated October 20, 2008. EPA has fully addressed New Jersey comments in the Response to State Comments Document for this rule making. EPA has considered the additional information, including additional air quality modeling information, provided by New Jersey to support the state's request to designate Knowlton Township in Warren County as "nonattainment".   However, current regulations for

determining violations of the fine particle NAAQS[2] require that violations of the $PM_{2.5}$ standards be determined on the basis of complete, quality-assured ambient air quality monitoring data at a monitor in the area. These regulations do not provide for $PM_{2.5}$ violations to be determined through means other than ambient air quality monitoring. Thus, EPA finds that the information provided by the State does not adequately support a partial county nonattainment designation. In the State Response to Comments Document EPA explains in detail why the agency did not rely on modeling data that conflicted with available monitoring data for Warren County and why EPA could not designate Warren County nonattainment without evidence indicating either that Warren County was violating the NAAQS or contributing to the violation at the monitor in Northampton County.

Based on EPA's technical analysis described below, EPA has designated Warren County in New Jersey, in its entirety, as "attainment/ unclassifiable".

Allentown, PA-NJ area	State-Recommended Nonattainment Counties	EPA-Final Designated Nonattainment Counties
New Jersey	Warren County (Partial) - Knowlton Township	None

The following is a technical analysis for the EPA Region 2 portion of the Allentown, PA-NJ area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," and "NO_x". "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

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[2] See the regulations on the revised standard at 40 CFR 50.13(c); 71 FR 61224, October 17, 2006. See also monitoring regulations at 40 CFR Part 58, as revised on
October 17, 2006 (see 71 FR 61236); and procedures for using these data to determine whether a violation has occurred in 40 CFR Part 50 Appendix N, as revised on October 17, 2006
(see 71 FR 61144).

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for considering data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Allentown, PA-NJ area. Counties that are currently designated nonattainment for the 1997 $PM_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

County	State Recommended Non-attainment?	CES	PM2.5 emissions total (tpy)	PM2.5 emissions carbon (tpy)	PM2.5 emissions other (tpy)	SO2 (tpy)	NOx (tpy)
Northampton, PA	Yes	100	5,222	665	4,556	60,396	24,620
Lehigh, PA	Yes	35	1,328	501	828	3,749	11,503
Berks, PA	**Yes-other**	**25**	**3,378**	**922**	**2,456**	**18,874**	**18,086**
Montgomery, PA	**Yes-other**	**23**	**2,597**	**1,118**	**1,477**	**5,411**	**23,306**
Bucks, PA	**Yes-other**	**19**	**2,022**	**876**	**1,146**	**3,951**	**16,792**
Warren, NJ	Yes-Partial	12	1,105	588	517	563	5,088
Monroe, PA	No	12	1,153	590	563	1,022	5,245
Hunterdon, NJ	No	10	769	454	316	556	3,882
Schuylkill, PA	No	10	1,247	547	700	7,239	6,219
Carbon, PA	No	9	649	313	336	1,432	2,913
Morris, NJ	**Yes-other**	**5**	**1,498**	**953**	**545**	**1,177**	**13,774**
Sussex, NJ	No	3	1,270	744	526	669	2,726
Pike, PA	No	1	802	419	384	266	2,353

Table 1. PM2.5 Related Emissions and Contributing Emissions Scores

Generally, New Jersey Counties have lower emissions than the other potentially contributing counties. CES scores were generally low for the New Jersey counties, which is indicative of low impact on the violating monitors in the area.

Hunterdon County, NJ has especially low emissions in comparison to the other counties in the area. Hunterdon, NJ emissions account for slightly over three percent of the total $PM_{2.5}$ emissions, four percent of the carbon emissions, and about half of one percent of the total SO_2 emissions for the area. The CES score of 10 was consistent with low contribution.

Warren County, NJ also has relatively lower emissions than most of the other counties in the area. Carbon emissions for 2005 were 588 tons, which represents about six percent of the total emissions for the area under consideration. In comparison, other counties in the area, including Montgomery, PA (i.e. 1,118 tons), and Berks, PA (i.e. 922 tons), had

much higher carbon emissions. The CES score of 12 was consistent with lower contribution.

Morris County, NJ also had relatively higher carbon emissions (i.e. 953 tons) than most of the other counties in the area. Total $PM_{2.5}$ emissions were 1,498 tons, which was mid-range when compared to the other counties. However, the CES score was very low (5 on a scale of 100), and Morris County is being included in the Northern New Jersey-Long Island, NY-NJ-CT 24-hour $PM_{2.5}$ nonattainment area. Morris County is already included in the existing nonattainment area for the 1997 annual $PM_{2.5}$ NAAQS, and EPA believes that it is appropriate to keep Morris County in the Northern New Jersey-Long Island, NY-NJ-CT nonattainment area. Detailed information regarding the inclusion of Morris County into the Northern New Jersey-Long Island, NY-NJ-CT nonattainment area can be found in EPA's Technical Analysis for the New York-Northern New Jersey-Long Island, NY-NJ-CT area.

Sussex County, NJ has very low SO_2 emissions in comparison to the other counties (less than 1% of the total SO_2 emissions). Carbon emissions were 744 tons, and total $PM_{2.5}$ emissions were 1,270 tons, which was mid-range when compared to the other counties. However, the CES score was 3 on a scale of 100 indicating minimal contribution to the county with the violating monitor.

In their December 2007 recommendation to EPA, New Jersey used 2002 emissions and projected 2009 emissions from the 2002 MANE-VU Modeling Inventory. New Jersey evaluated the same New Jersey Counties in their analysis (i.e. Warren, Hunterdon, Sussex, and Morris). New Jersey also showed relatively lower emissions than the other counties in the area. Based on emissions data, as well as the CES, no counties in NJ would be included in the NA area.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Allentown, PA-NJ based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of a monitor's 98th percentile's value is 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Allentown, PA-NJ area are shown in Table 2. The counties that are currently designated nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

County	State Recommended Non-attainment?	Design Values 2005-07 ($\mu g/m^3$)
Northampton, PA	Yes	37
Lehigh, PA	Yes	No monitor
Berks, PA	Yes-other	40

Montgomery, PA	Yes-other	No monitor
Bucks, PA	Yes-other	35
Warren, NJ	Partial	34
Monroe, PA	No	No monitor
Hunterdon, NJ	No	No monitor
Schuylkill, PA	No	No monitor
Carbon, PA	No	No monitor
Morris, NJ	Yes-other	32
Sussex, NJ	No	No monitor
Pike, PA	No	No monitor

Table 2. Air Quality Data

In EPA Region 2, there are no New Jersey counties in the Allentown, PA-NJ area that show a violation of the 24-hour $PM_{2.5}$ standard as determined by air monitoring. The 2005-2007 design values for Warren and Morris counties are 34 $\mu g/m^3$ and 32 $\mu g/m^3$, respectively. The counties of Hunterdon, and Sussex, do not have monitors.

Under this factor, we also consider fine particle composition monitoring data. Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicate that the days with the highest fine particle concentrations in the Allentown area occur about 70% in the warm season and 30% in the cool season. In the warm season, the average chemical composition of the highest days is 61% sulfate, 38% carbon, 1% crustal, and 0% nitrate. In the cool season, the average chemical composition of the highest days is 39% carbon, 35% sulfate, 24% nitrate, and 2% crustal. These data indicate that sources of SO2, NOx, and direct $PM_{2.5}$ emissions contribute to violations in the area.

Northampton and Berks Counties in Pennsylvania, which are located in Region 3, violate the 24-hour $PM_{2.5}$ standards. The proximity of Northampton, PA and Warren County, NJ is presented in Figure 2. Figure 3 shows the results of New Jersey's modeling analysis. Figures 4 and 5 show the similarity between the data collected from the monitors located in Northampton County, PA and Warren County, NJ. However, even though the data are similar, the monitor in the southern part of Warren County shows attainment.
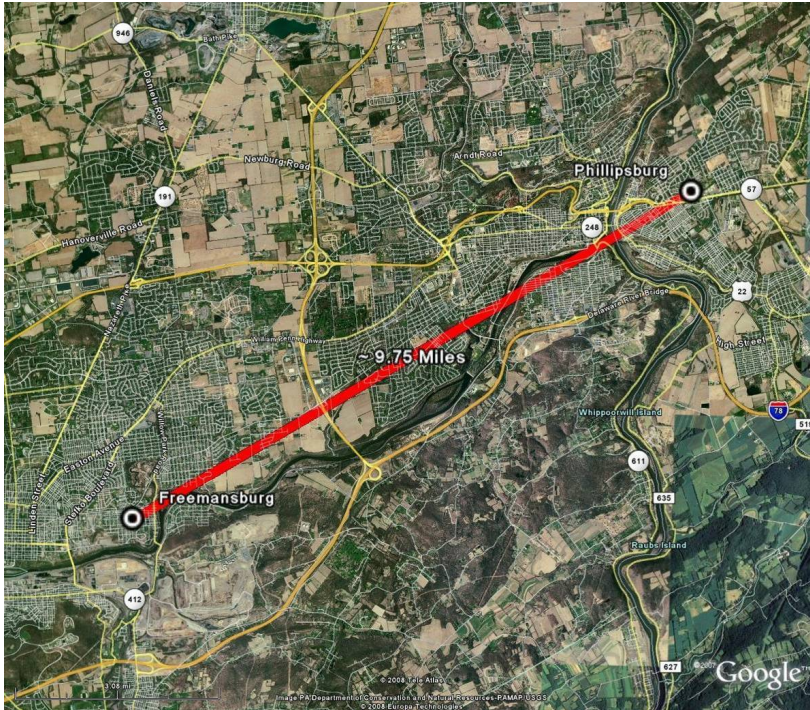
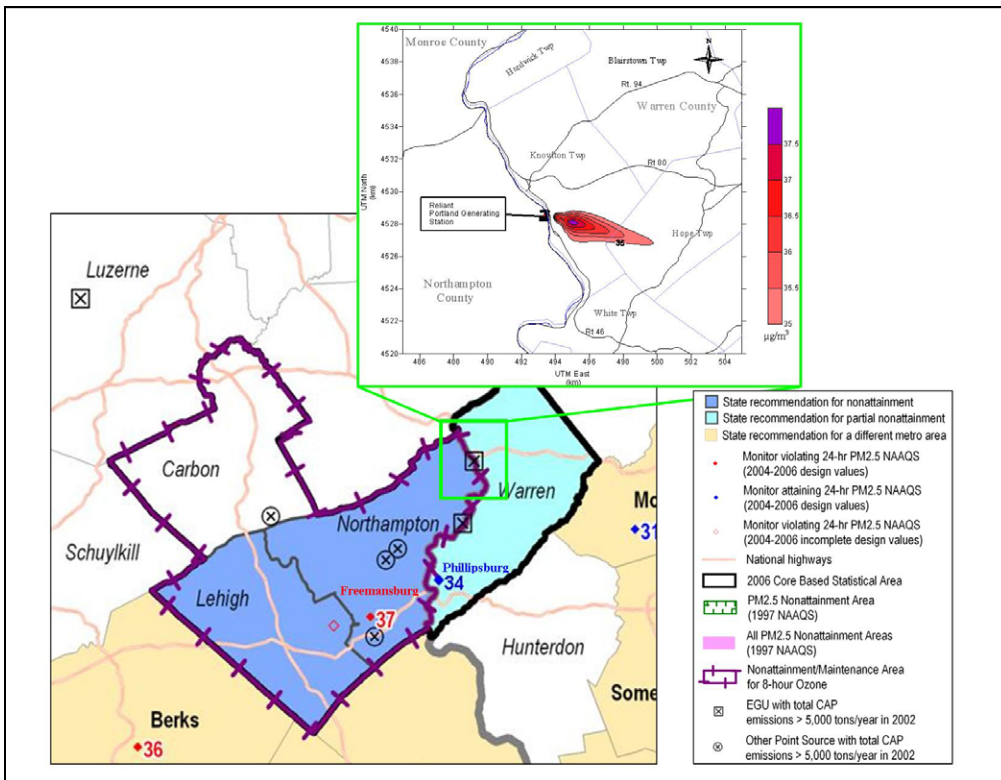**Figure 2. Map showing Freemansburg, PA and Phillipsburg, NJ.**

Figure 3. Map of the Allentown-Bethlehem-Easton PA-NJ area. The map insert shows modeling results provided by New Jersey, which the State identifies as information indicating a violation in Warren County.

2004 PM2.5 Data
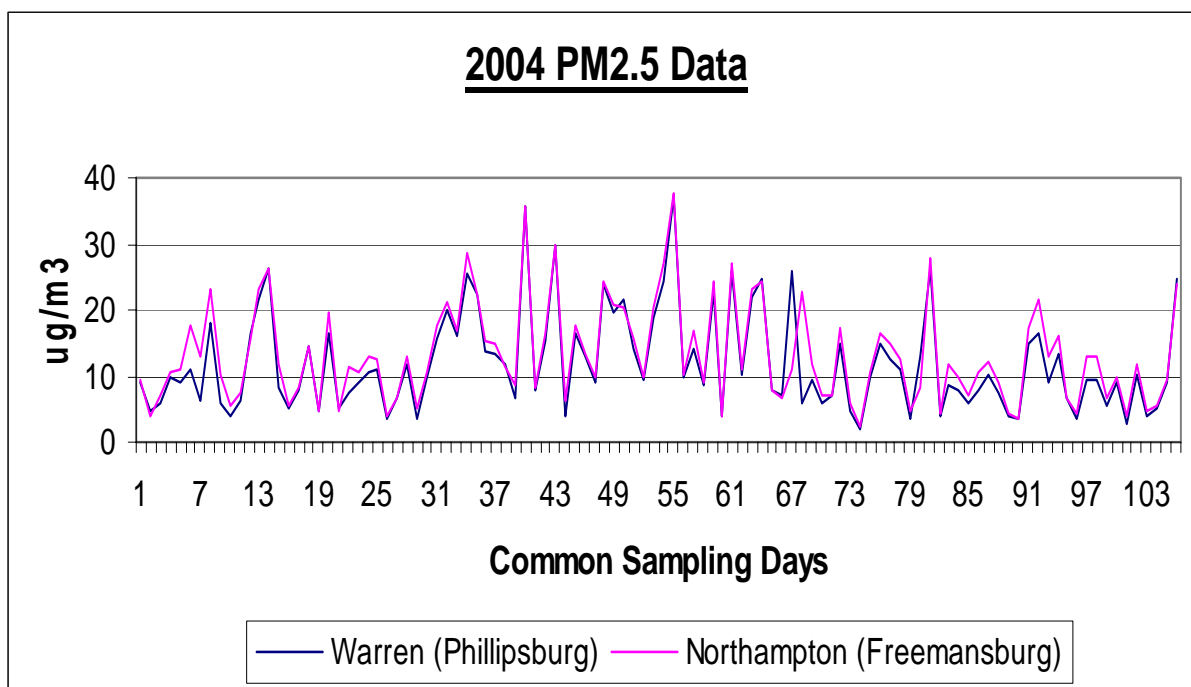
Figure 4. Comparison of 2004 Phillipsburg and Freemansburg Monitoring data
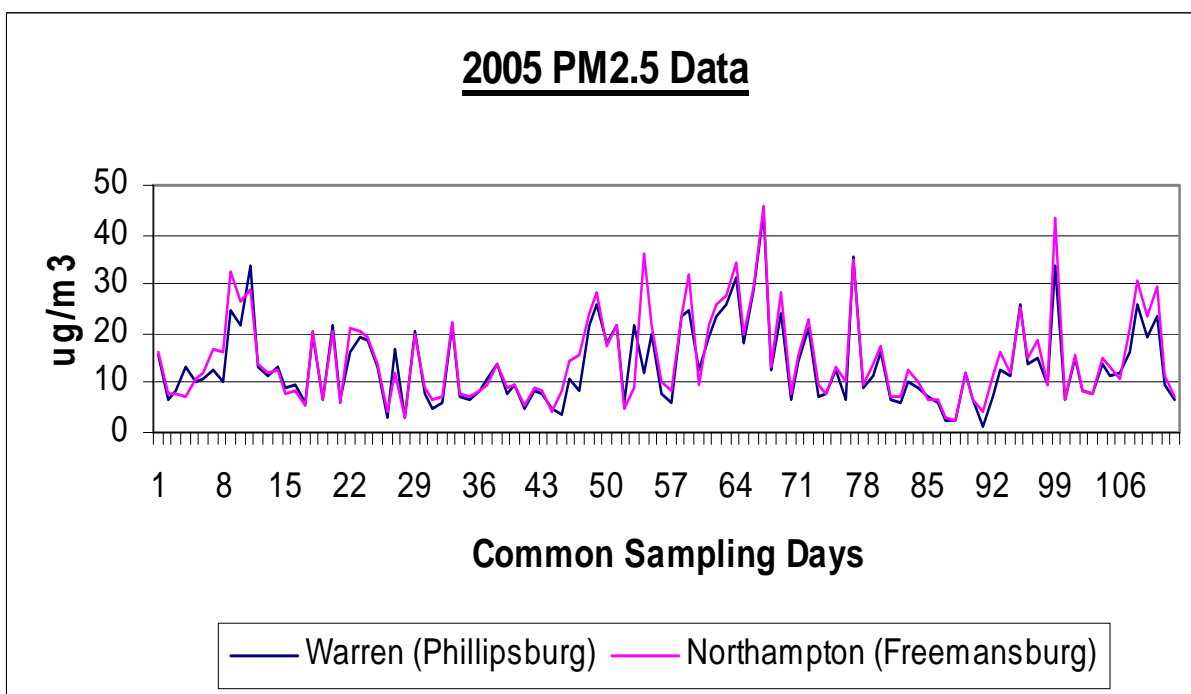
2005 PM2.5 Data

Figure 5. Comparison of 2005 Phillipsburg and Freemansburg Monitoring data

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for

comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each County in the area being evaluated, as well as the population density for each County in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Morris County ranks high in population and population density in comparison to other counties in the Allentown, PA-NJ Area. However, Morris County has been included in the Northern New Jersey-Long Island, NY-NJ-CT nonattainment area, and proximity to NY indicates that it is more likely that Morris County is contributing to violations in the Northern New Jersey-Long Island, NY-NJ-CT nonattainment area.

Hunterdon and Sussex County rank low in population and population density in comparison to other counties in the area. Hunterdon County has less than half the population and population density of the violating county of Northampton, PA. Sussex County also has less than half the population density and approximately half (53%) the population of Northampton, PA.

Warren County ranks low in terms of population and in population density in comparison to counties located near the violating monitor in Northampton. In comparison to the two counties that have been recommend as nonattainment for the Allentown, PA-NJ area, Warren County's population and population density are below 50% that of Lehigh and Northampton counties.

Population density and degree of urbanization for Hunterdon, Sussex, and Warren counties are low for the area of analysis.

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Montgomery, PA	**Yes-other**	**774,666**	**1591**
Bucks, PA	**Yes-other**	**619,772**	**998**
Morris, NJ	**Yes-other**	**490,084**	**1019**

County	State Recommended Non-attainment?	Population	(col4)
Berks, PA	**Yes-other**	**396,236**	**458**
Lehigh, PA	Yes	330,168	948
Northampton, PA	Yes	287,334	762
Monroe, PA	No	162,415	264
Sussex, NJ	No	152,726	285
Schuylkill, PA	No	146,996	188
Hunterdon, NJ	No	130,042	297
Warren, NJ	Yes-Partial	110,317	305
Carbon, PA	No	61,876	160
Pike, PA	No	56,180	99

The counties that are currently designated nonattainment for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 3. Population

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Allentown-Bethlehem-Easton CBSA; the percent of total commuters in each county who commute to other counties within the Allentown, PA-NJ area; and also the total Vehicle Miles Traveled (VMT) for each county, in millions of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area, and and is likely contributing to fine particle concentrations in the area.

County	State Recommended Non-attainment?	2005 VMT (millions of miles)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into and within statistical area	Percent Commuting into and within statistical area
Berks, PA	**Yes-other**	**3,320**	**147,990**	**83**	**7,250**	**4**
Lehigh, PA	Yes	3,374	131,610	89	129,570	88
Northampton, PA	Yes	2,399	99,230	79	106,210	85

Schuylkill, PA	No	1,353	7,790	12	3,030	5
Carbon, PA	No	699	6,900	27	19,070	74
Montgomery, PA	**Yes-other**	**7,527**	**6,660**	**2**	**2,480**	**1**
Monroe, PA	No	1,556	5,140	8	7,060	11
Bucks, PA	**Yes-other**	**5,250**	**3,980**	**1**	**3,870**	**1**
Warren, NJ	Yes-Partial	1,342	2,410	5	23,440	47
Hunterdon, NJ	No	929	520	1	1,630	3
Pike, PA	No	584	200	1	360	2
Morris, NJ	**Yes-other**	**5,398**	**130**	**0**	**1,760**	**1**
Sussex, NJ	No	889	40	0	1,440	2

The counties that are in the currently designated nonattainment for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 4. Traffic and Commuting Patterns

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other violating counties.

The VMT for the residents of Warren County is low relative to other counties in the area. Only 47% of the commuters from Warren County commute into the statistical area. The total number of Warren County commuters into the statistical area and into violating counties is in the middle range of all of the counties considered for contribution to the Allentown, PA-NJ area. Based on this factor, Warren County, NJ does not rank high for traffic and commuting patterns.

For other counties in the Allentown, PA area, Morris, Hunterdon, and Sussex counties rank in the lower third for the number of commuters into the statistical area, and into the violating counties. Sussex and Hunterdon counties also have low VMT. Morris County, which is included as part of the New York City Metropolitan nonattainment area, has a high amount of VMT, but the low number of commuters into the Allentown-Bethlehem-Easton CBSA precludes the inclusion of Morris into the Allentown, PA nonattainment area.

Projections from the Federal Highway Administration show that average annual daily truck traffic is projected to increase in the area through 2020 for two roads that run though Warren County (Interstate 78 and Interstate 80). Morris, Hunterdon, and Sussex counties are also projected to have increases in truck traffic. The projected increase for

all of the counties considered was not significant enough to play a role in the designation of the counties. Figure 6 shows projected 2020 annual average daily truck traffic.
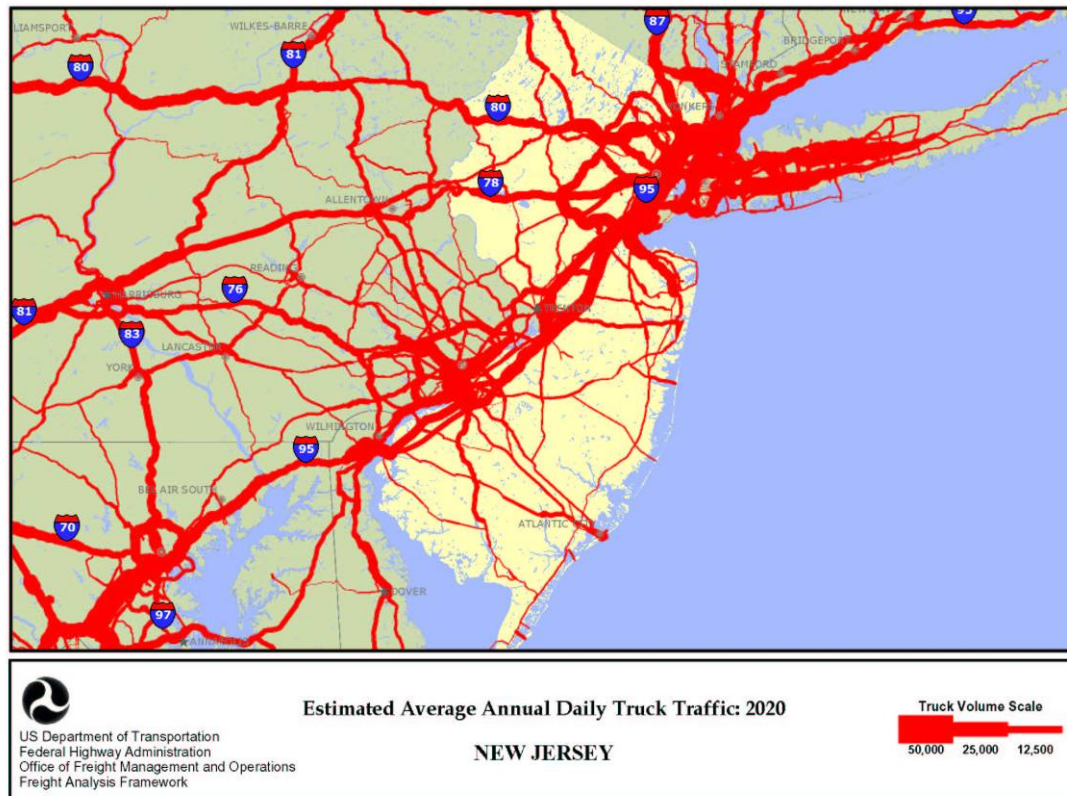

Figure 6. Estimated Average Annual Daily Truck Traffic in 2020

Note: The 2005 VMT data used for table 4 and 5 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Allentown, PA-NJ area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Allentown, PA-NJ area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

County	2005 Population	2005 Population Density (people/sq mi)	Percent Population Change (2000-05)	Vehicle Miles Traveled in 2005 (millions annually)	Percent VMT Growth (1996-2005)
Montgomery, PA	**774,666**	1591	**3**	**7,527**	**73**
Morris, NJ	**490,084**	1019	**4**	**5,398**	**56**
Bucks, PA	**619,772**	998	**3**	**5,250**	**49**
Lehigh, PA	330,168	**948**	6	3,374	34
Northampton, PA	287,334	**762**	7	2,399	21
Monroe, PA	162,415	264	16	1,556	19
Berks, PA	**396,236**	458	**6**	**3,320**	**11**
Warren, NJ	110,317	**305**	7	1,342	2
Carbon, PA	61,876	160	5	699	0
Schuylkill, PA	146,996	188	-2	1,353	-1
Pike, PA	56,180	99	20	584	-8
Sussex, NJ	152,726	285	6	889	-22
Hunterdon, NJ	130,042	297	6	929	-42

The counties that are currently designated nonattainment in Table 5 for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 5. Population, VMT Growth, and Percent VMT Growth Change

Warren County experienced 7% growth from 2000-2005. The growth rate for Warren County is average in comparison to other counties in the area and equivalent to Northampton and Lehigh. However, on a per person basis, the growth in the number of people residing in Warren County is lower than Northampton and Lehigh. Montgomery, Berks, and Monroe County had the largest growth in population from 2000-2005.

VMT by the residents of Warren County are low in comparison with other counties in the area. The growth in VMT from 1996-2005 for Warren County is low in comparison with Northampton and Lehigh (21% and 34%, respectively). Hunterdon and Sussex counties had low population and negative VMT growth. The counties of Morris, Montgomery, and Bucks, had the highest percentage of growth from 1996-2005. Morris County is being included in the New York City Metropolitan nonattainment area and, as noted, proximity indicates that it is more likely contributing to that area. Based on this factor, no New Jersey Counties are recommended for inclusion in the Allentown area.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments and other meteorological monitoring sites in the area. Wind direction and wind speed data for 2005-2007 were analyzed, with an emphasis on "high PM$_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour PM$_{2.5}$ concentrations above 95% on a frequency distribution curve of PM$_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. Figures 7, 8, and 9 identify 24-hour PM$_{2.5}$ values by color; days exceeding 35 ug/m^3 are denoted with a red or black icon. A dot indicates that the day occurred in the warm season; a triangle indicates that the day occurred in the cool season. The center of the figure represents the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.
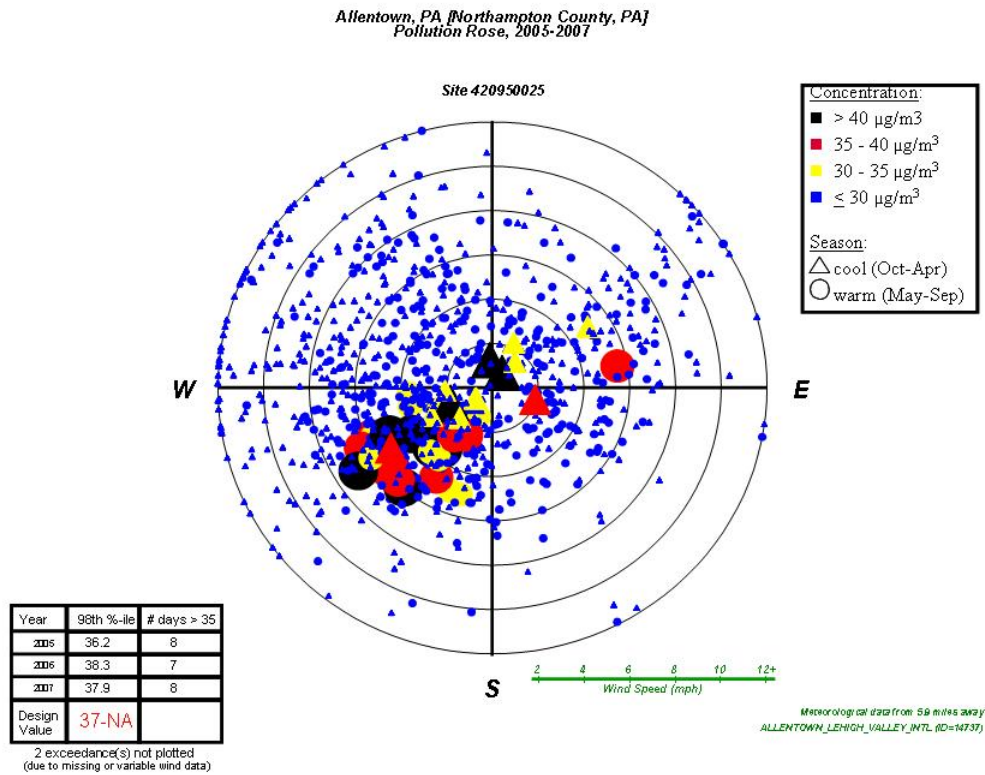
Figure 7. Pollution Rose for Northampton County, PA
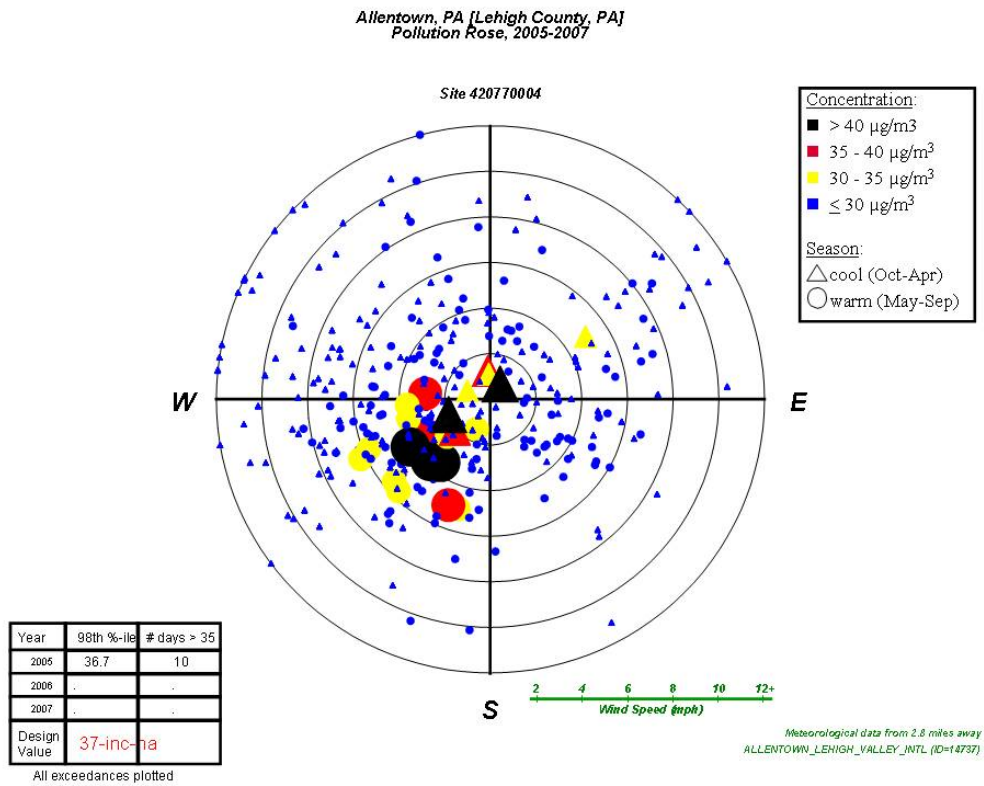
Figure 8. Pollution Rose for Lehigh County, PA
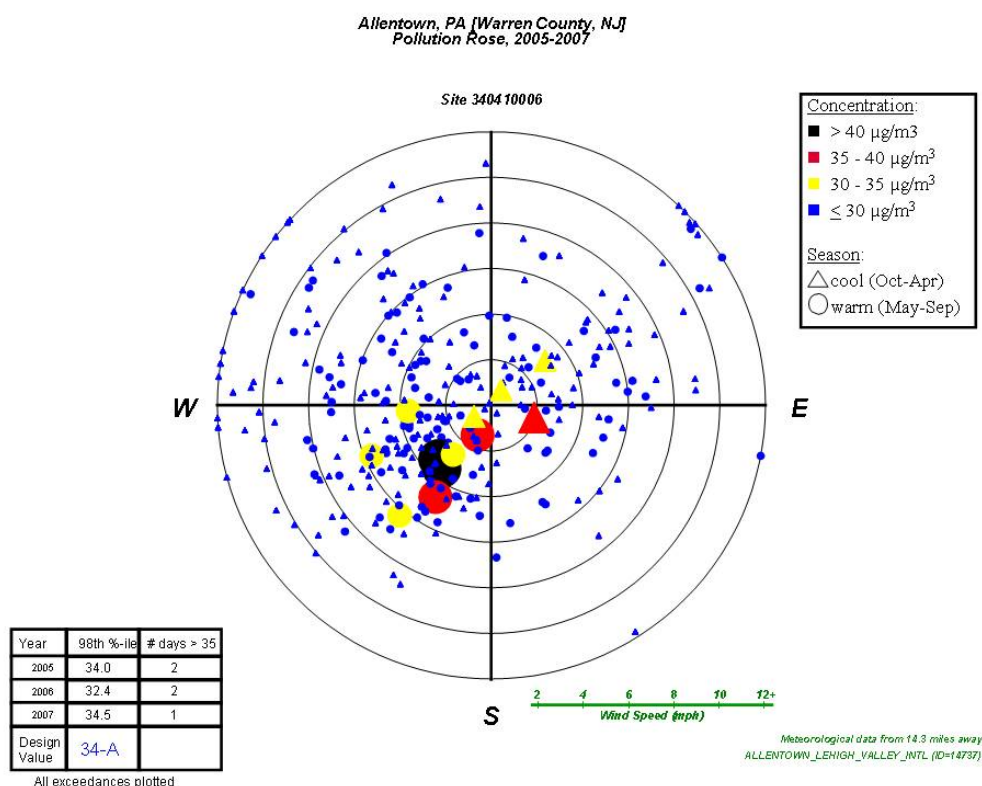
Figure 9. Pollution Rose for Warren County, NJ

Table 6 shows the average prevailing surface wind directions for high PM$_{2.5}$ days by quadrant for the proposed nonattaining counties in the Allentown, PA-NJ area, as well as Warren County, NJ. The data shows that 24-hour PM$_{2.5}$ concentrations are influenced by emissions in any direction at various times and the data also suggest that emissions in some directions relative to the violation are more likely to contribute than emissions in other directions.

County	Prevailing Wind Direction (%)			
	NW	SW	SE	NE
Northampton County, PA	4%	75%	4%	17%
Lehigh County, PA	21%	68%	0%	11%
Warren County, NJ	0%	79%	7%	14%

Table 6. Prevailing Wind Directions for High PM$_{2.5}$ Days.

EPA's analysis of meteorology shows that $PM_{2.5}$ emissions during high $PM_{2.5}$ days in 2005-2007 primarily originated and/or passed through locations from a southwesterly direction. This is also evident upon examination of the pollution rose for Northampton County (see Figure 9). Since the winds are seldom from the Northeast, the emissions from Morris, Hunterdon, Sussex and Warren counties would have little or no impact on the PA counties.

Based on our analysis, this factor does not support including Morris, Hunterdon, Sussex and Warren County in the Allentown, PA-NJ nonattainment area.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric includes an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Allentown, PA-NJ area.

The Allentown, PA-NJ area does not have any geographical or topographical barriers significantly limiting air pollution transport within its airshed. The Delaware River separates Hunterdon and Warren counties from the other counties in the Allentown, PA-NJ area; however, this is not a significant barrier that would influence the airshed. Morris and Sussex counties do not have any geographical or topographical barriers that could significantly limit air pollution transport. This factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM area)

In evaluating the jurisdictional boundary factor, EPA gave special consideration to areas that were already designated nonattainment in 2005 for violating the 1997 fine particle standards. Analysis of chemical composition data in these areas indicates that the same components that make up most of the $PM_{2.5}$ mass in the area on an annual average basis (such as sulfate and direct $PM_{2.5}$ carbon in many eastern areas) also are key contributors to the $PM_{2.5}$ mass on days exceeding the 24-hour $PM_{2.5}$ standard. These data indicate that in many cities, the same source categories that contribute to violations of the annual standard also contribute to exceedances of the 24-hour standard.

Most areas that were originally designated nonattainment for the $PM_{2.5}$ standards still have not attained the standards. Thus, EPA has generally concluded that counties that were designated as having emissions sources contributing to fine particle concentrations which continue to exceed the 1997 standards (all areas violated the annual standard, three also violated the previous 24-hour standard) also contribute to fine particle concentrations on the highest days. For this reason, EPA believes that for most existing nonattainment areas, the nonattainment area for the 2006 24-hour standard should be the same.

Consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

To the degree appropriate, based upon violations and contributions to violations of the ozone and PM2.5 NAAQS in a particular area, EPA believes it may be helpful for air planning purposes and for attainment of both NAAQS, for there to be some consistency between ozone and PM2.5 nonattainment area boundaries.

The Allentown, PA-NJ area is not an existing nonattainment area for the 1997 $PM_{2.5}$ NAAQS. Major jurisdictional boundaries for consideration in the area surrounding the violating monitor in Northampton include the county boundaries, the core-based statistical area (CBSA), and the State line between Pennsylvania and New Jersey. If any New Jersey counties were contributing to the violating monitor, the fact that they lie in different states would not indicate that they should be excluded from the nonattainment area; however, EPA did not find that any counties were contributing.

Although EPA considered this information regarding jurisdictional boundaries, the jurisdictional boundaries factor did not heavily influence decision-making for the area.

Factor 9: Level of control of emission sources

Under this factor, the existing level of control of emission sources is taken into consideration. The emissions data used by EPA in this technical analysis and provided in Table 1 (under Factor 1) represent emissions levels taking into account any control strategies implemented in the Allentown, PA-NJ area before 2005 on stationary, mobile, and area sources. Data are presented for $PM_{2.5}$ components that are directly emitted (carbonaceous $PM_{2.5}$ and crustal $PM_{2.5}$) and for pollutants which react in the atmosphere to form fine particles (e.g. SO_2, NOx, VOC, and ammonia).

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory version 1, the most current version of the national inventory available at the beginning of the designations process in late 2007. However, EPA recognized that for certain counties, emissions may have changed since 2005. For example, certain power plants or large sources of emissions in or near an area may have installed emission controls or otherwise significantly reduced emissions since 2005. Some States provided updated information on emissions and emission controls in their comments to EPA. EPA considered such additional information in making final designation decisions.

With regard to nearby power plants, EPA considered information about whether a specific plant installed federally enforceable emission controls by December 2008 resulting in significant emissions reductions. A control requirement is considered to be federally-enforceable if it is required by a State regulation adopted in a State implementation plan, if it is included in a federally-enforceable Title V operating permit,

or if it is required by a consent decree which also requires the controls to be included in federally enforceable permit upon termination of the consent decree. In making final decisions, EPA also considered whether a facility would continue to emit pollutants which contribute to $PM_{2.5}$ exceedances even after emission controls are operational.

Since we believe that the emissions listed in Table 1 have not changed significantly since 2005, this factor does not influence heavily in our decision-making.

Conclusion

Morris County has been designated by EPA as nonattainment for the 2006 24-hour fine particle ($PM_{2.5}$) standards. Morris County was included in the 24-hour $PM_{2.5}$ Northern New Jersey-Long Island, NY-NJ-CT nonattainment area, since the county is contributing to the violations at one or more monitors in that nonattainment area. Detailed information regarding the inclusion of Morris County into the Northern New Jersey-Long Island, NY-NJ-CT nonattainment area can be found in EPA's Technical Analysis for the New York-Northern New Jersey-Long Island, NY-NJ-CT nonattainment area.

EPA is designating the entire county of Warren as unclassifiable/attainment for the 2006 24-hour $PM_{2.5}$ standards.

The New Jersey Department of Environmental Protection (DEP) has performed an analysis using the CALPUFF, and later AERMOD, air quality models, which indicate modeled violations in the Knowlton Township area of Warren County. The DEP analysis concluded that the Reliant power plant in Northampton County, PA is the cause of this modeled violation. New Jersey seeks to have part of Warren County, NJ, the area including only Knowlton Township, designated as nonattainment.

While the analysis indicates an impact in the Knowlton Township area, EPA does not identify violations of the $PM_{2.5}$ NAAQS using modeling. Current regulations require that violations of the $PM_{2.5}$ standards be determined on the basis of complete, quality-assured ambient air quality monitoring data at an eligible monitor in the area. Regulations and policy do not provide for $PM_{2.5}$ violations to be determined through means other than ambient air quality monitoring. Currently there is no violating monitor present in Warren County and the existing monitor in Warren County is attaining the 2006 24-hour $PM_{2.5}$ NAAQS based on 2005-2007 data.

EPA strongly advises that New Jersey place an air quality monitor in the vicinity of Knowlton Township, which is downwind of the Reliant power plant in Northampton County, to support the state's determination that Warren County (or portions thereof) is violating the 24-hour $PM_{2.5}$ standard.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at http://www.epa.gov/pmdesignations/2006standards/tech.htm.

EPA Technical Analysis for the New York-Northern New Jersey-Long Island, NY-NJ-CT area

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for New York-Northern New Jersey-Long Island, NY-NJ-CT area (New York City Metropolitan area) identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

We also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas. (See additional discussion of the CES under factor 1 below.)

Figure 10 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

New York-N. New Jersey-Long Island, NY-NJ-CT 24-hr PM2.5 Nonattainment Area
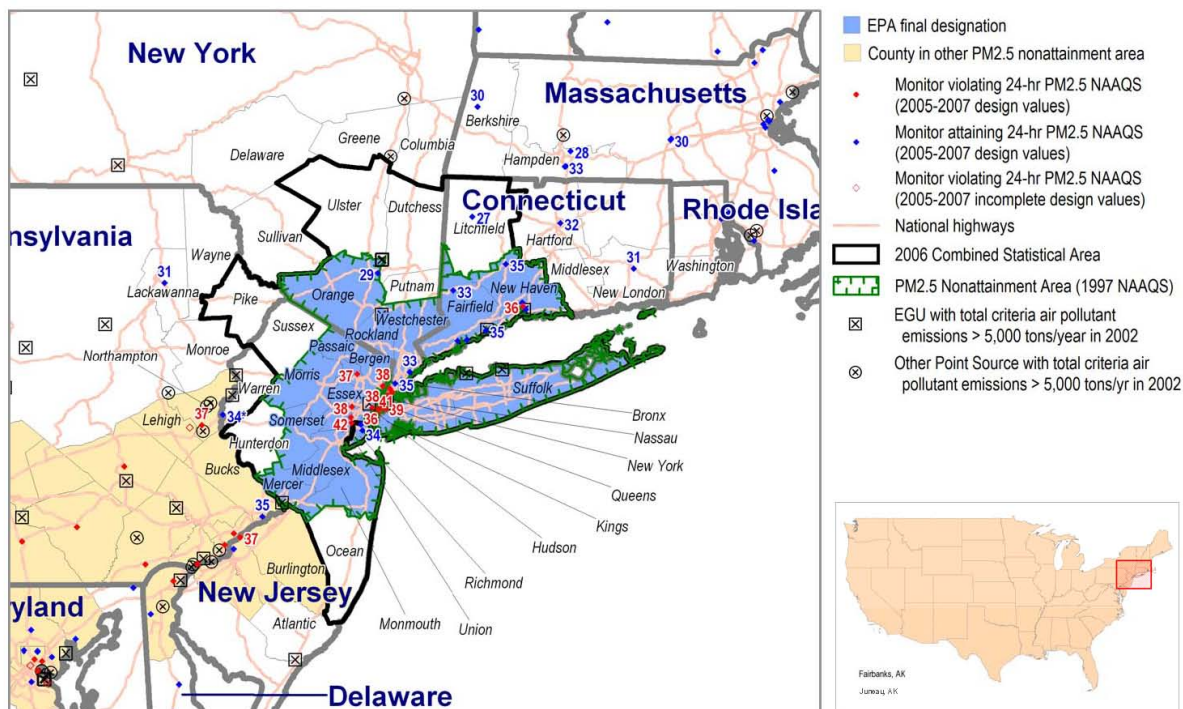
Figure10. New York-Northern New Jersey-Long Island, NY-NJ-CT area

For this area, EPA previously established $PM_{2.5}$ nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included ten full counties located in New York.

In a letter received on December 18, 2007, New York recommended that Bronx, Kings, Nassau, New York, Orange, Queens, Richmond, Rockland, Suffolk and Westchester counties be designated as nonattainment for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified New York State of its intended designations. In this letter, EPA also requested that if New York State wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Based on EPA's technical analysis described below, EPA has designated 10 counties in New York State, the same counties as previously designated for $PM_{2.5}$, nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the New York City Metropolitan nonattainment area, based upon currently available information. These counties are listed in the table below.

New York City Metropolitan area	State-Recommended Nonattainment Counties	EPA-Final Designated Nonattainment Counties
New York-Northern New Jersey-Long Island, NY-NJ-CT area	Bronx County Kings County Nassau County New York County Orange County Queens County Richmond County Rockland County Suffolk County Westchester County	Bronx County Kings County Nassau County New York County Orange County Queens County Richmond County Rockland County Suffolk County Westchester County

The following is a summary of the technical analysis for the EPA Region 2 portion of the New York City Metropolitan area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," and "NO_x". "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. .

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for consideration of data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 7 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the New York City Metropolitan area. Counties that are part of the New York City Metropolitan

nonattainment area for the 1997 PM$_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

County	State Recommended Nonattainment?	CES	PM$_{2.5}$ emissions total (tpy)	PM$_{2.5}$ emissions carbon (tpy)	PM$_{2.5}$ emissions other (tpy)	SO2 (tpy)	NOx (tpy)
Kings, NY	**Yes**	**100**	**2,230**	**1,053**	**1,176**	**8,274**	**27,886**
New York, NY	**Yes**	**100**	**3,522**	**1,864**	**1,658**	**13,060**	**36,742**
Hudson, NJ	**Yes**	**100**	**2,933**	**671**	**2,261**	**27,305**	**26,889**
Suffolk, NY	**Yes**	**100**	**4,408**	**1,836**	**2,572**	**47,134**	**54,932**
Fairfield, CT	**Yes**	**100**	**3,056**	**1,630**	**1,426**	**9,533**	**26,382**
Union, NJ	**Yes**	**100**	**1,092**	**603**	**488**	**3,806**	**20,040**
New Haven, CT	**Yes**	**97**	**2,871**	**1,642**	**1,230**	**8,250**	**21,693**
Queens, NY	**Yes**	**78**	**2,976**	**1,430**	**1,545**	**18,460**	**40,922**
Essex, NJ	**Yes**	**77**	**942**	**637**	**304**	**4,647**	**22,221**
Bronx, NY	**Yes**	**58**	**1,106**	**535**	**571**	**3,703**	**14,362**
Richmond, NY	**Yes**	**Not Available**	**790**	**307**	**483**	**2,623**	**9,466**
Bergen, NJ	**Yes**	**48**	**1,219**	**886**	**333**	**1,691**	**23,827**
Westchester, NY	**Yes**	**43**	**1,751**	**947**	**805**	**4,770**	**24,755**
Middlesex, NJ	**Yes**	**42**	**1,549**	**951**	**598**	**3,129**	**29,172**
Nassau, NY	**Yes**	**41**	**2,149**	**1,091**	**1,058**	**6,203**	**31,877**
Morris, NJ	**Yes**	**24**	**1,498**	**953**	**545**	**1,177**	**13,774**
Monmouth, NJ	**Yes**	**21**	**1,506**	**989**	**517**	**1,789**	**16,771**
Rockland, NY	**Yes**	**20**	**1,296**	**327**	**968**	**12,711**	**12,777**
Orange, NY	**Yes**	**19**	**2,637**	**934**	**1,704**	**32,973**	**18,631**
Mercer, NJ	**Yes**	**16**	**1,658**	**579**	**1,079**	**17,891**	**17,640**
Middlesex, CT	No	15	1,173	641	533	2,684	6,941
Somerset, NJ	**Yes**	**15**	**801**	**451**	**349**	**577**	**7,886**

Hartford, CT	No	14	2,713	1528	1,185	5,301	24,631
Passaic, NJ	**Yes**	**12**	**755**	**471**	**284**	**733**	**8,770**
Putnam, NY	No	9	636	306	329	1,116	5,367
Litchfield, CT	No	8	1,671	949	721	1,234	4,400
Dutchess, NY	No	7	1,711	783	929	4,637	7,955
Ocean, NJ	No	6	1,540	993	547	1,060	9,578
Hunterdon, NJ	No	6	769	454	316	556	3,882
Sussex, NJ	No	5	1,270	744	526	669	2,726
Warren, NJ	Yes, Partial - Allentown-Bethlehem-Easton PA-NJ	5	1,105	588	517	563	5,088
Ulster, NY	No	3	1,891	903	988	3,167	6,054
Sullivan, NY	No	1	1,096	561	535	922	2,203
Pike, PA	No	1	802	419	384	266	2,353

Table 7. PM$_{2.5}$ Related Emissions and Contributing Emissions Score

Generally, New York and New Jersey Counties that are in the existing 1997 PM$_{2.5}$ NAAQS nonattainment area for the New York City metropolitan area have much higher emissions than the adjacent counties. CES scores were generally low for the adjacent counties as well, which is indicative of low impact on the violating monitors that violate the 2006 PM$_{2.5}$ NAAQS in the area.

In New York State, the counties with relatively high emissions include Suffolk, Queens, Nassau, Kings, New York, Westchester, and Orange Counties. Dutchess, Ulster, the Bronx, Richmond, and Rockland emissions were generally mid-range when compared to the other counties in the New York Metropolitan area. CES values were indicative of emissions levels, with the exception of Dutchess and Ulster Counties. CES scores were 7 and 3 respectively for Dutchess and Ulster, which are indicative of minimal contribution to violating monitors from Dutchess and Ulster emissions. Please see Factor 6, Meteorology, for further discussion on impact of emissions from Dutchess and Ulster County.

Putnam and Sullivan Counties in New York have low emissions in comparison to the other counties in the area. Putnam, NY emissions account for about one percent (i.e. 636 tons) of the total PM$_{2.5}$, one percent carbon emissions (i.e. 306 tons), less than half a percent of total SO$_2$ (1,116 tons), and one percent of NO$_2$ emissions (i.e. 5,367 tons) for the area under consideration. Sullivan County emissions represent about two percent of the total PM$_{2.5}$ (1,096 tons), two percent of the carbon emissions (i.e. 561 tons), less than half a percent each of total SO$_2$ (922 tons) and NO$_2$ emissions (i.e. 2,203 tons) for the area under consideration. CES scores were 9 and 1 on a scale of 100 for Putnam and

Sullivan, respectively, indicating minimal contribution to counties with violating monitors.

In their December 2007 recommendation to EPA, New York used the 2005 emission inventory from EPA. New York included data for $PM_{2.5}$ direct, NOx, SOx, ammonia, organic carbon, elemental carbon, and crustal emissions. New York also showed relatively higher emissions for Suffolk, Queens, Nassau, Kings, New York, Westchester, and Orange Counties, and lower emissions for Dutchess, the Bronx, Richmond, Rockland, and Putnam. New York did not include emissions data for Ulster or Sullivan Counties.

Putnam and Sullivan Counties have low emissions, and very low CES scores. Based on high emission levels and high CES values, Suffolk, Nassau, Kings, New York, Westchester, Bronx, Richmond, Queens, Orange, Rockland, Dutchess, and Ulster counties are candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

In New Jersey, the counties with relatively high emissions include Hudson, Middlesex, Bergen, Essex, Union, and Monmouth. Mercer, Morris, and Ocean were generally mid-range when compared to the other counties in the New York Metropolitan area. Somerset, Passaic, Hunterdon, Warren, and Sussex had low emissions in comparison to the other counties in the area. CES values were generally consistent with these emissions levels, with the exception of Ocean County. The Ocean County CES score was 6 on a scale of 100, which is indicative of minimal contribution to violating monitors from Ocean County emissions. Please see factor 6, Meteorology, for further discussion on impact of emissions from Ocean County.

Hunterdon, NJ emissions account for slightly over one percent (i.e. 769 tons) of the total $PM_{2.5}$ emissions, one and half percent of the carbon emissions (i.e. 454 tons), and less than one percent of the total SO_2 emissions (i.e. 556 tons) and NOx emissions (i.e. 3,882 tons) for the area. The CES score of 6 was consistent with minimal impact.

Warren County, NJ also has relatively lower emissions than most of the other counties in the area. 2005 total $PM_{2.5}$ and carbon emissions were 1,105 tons and 588 tons, respectively, which represents about two percent of the total and carbon emissions for the area under consideration. SO_2 emissions (i.e. 563 tons) and NO_x emissions (i.e. 5,088 tons) were less than one percent of area emissions. The CES score of 5 was consistent with low contribution.

Sussex County, NJ had low total $PM_{2.5}$ (1,270 tons), carbon (744 tons), SO_2 (669 tons), and NOx emissions (2,726 tons). The CES score was 5 on a scale of 100 indicating minimal contribution to the county with the violating monitor.

Passaic and Somerset County emissions were also lower than many of the other counties in the area. For Passaic total $PM_{2.5}$ was 755 tons, carbon emissions were 471 tons, SO_2 was 733 tons, and NO_x emissions were 8,770 tons. Somerset emissions were 801 tons for

total PM$_{2.5}$, 451 tons for carbon emissions, 577 tons for SO$_2$, and 7,886 for NO$_x$ emissions.

In its December 2007 recommendation to EPA, New Jersey used 2002 emissions and projected 2009 emissions from the 2002 MANE-VU Modeling Inventory. New Jersey also showed relatively lower emissions from Hunterdon, Warren, Sussex, Passaic, and Somerset Counties than the other counties in the area.

Based on emission levels and CES values, Hudson, Middlesex, Bergen, Essex, Union, Monmouth, Mercer, and Morris are candidates for a 24-hour PM$_{2.5}$ nonattainment designation. Passaic and Somerset Counties had CES scores of 12 and 15, respectively, and had relatively low emissions as shown in Table 7.

Factor 2: Air quality data

This factor considers the 24-hour PM$_{2.5}$ design values (in µg/m^3) for air quality monitors in counties in the New York City Metropolitan based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour PM$_{2.5}$ standard is met when the 3-year average of a monitor's 98th percentile's value is 35 µg/m^3 or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour PM$_{2.5}$ design values for counties in the New York City Metropolitan area are shown in Table 8.

County	State Recommended Nonattainment	Design Values 2005-07 (µg/m3)
Bronx, NY	**Yes**	**39**
Kings, NY	**Yes**	**36**
Nassau, NY	**Yes**	**33**
New York, NY	**Yes**	**39**
Orange, NY	**Yes**	**29**
Queens, NY	**Yes**	**33**
Richmond, NY	**Yes**	**34**
Rockland, NY	**Yes**	**No monitor**
Suffolk, NY	**Yes**	**30**
Westchester, NY	**Yes**	**33**

Bergen, NJ	**Yes**	**38**
Middlesex, NJ	**Yes**	**32**
Monmouth, NJ	**Yes**	**No monitor**
Essex, NJ	**Yes**	**39**
Mercer, NJ	**Yes**	**34**
Hudson, NJ	**Yes**	**42**
Union, NJ	**Yes**	**42**
Morris, NJ	**Yes**	**32**
Passaic, NJ	**Yes**	**37**
Somerset, NJ	**Yes**	**No monitor**
Fairfield, CT	**Yes**	**35**
New Haven, CT	**Yes**	**36**
Hunterdon, NJ	No	No monitor
Ocean, NJ	No	30
Sussex, NJ	No	No monitor
Warren, NJ	Yes, Partial - Allentown-Bethlehem-Easton PA-NJ	34
Pike, PA	No	No monitor
Litchfield, CT	No	27
Sullivan, NY	No	No monitor
Ulster, NY	No	No monitor
Dutchess, NY	No	No monitor
Putnam, NY	No	No monitor
Hartford, CT	No	32
Middlesex, CT	No	No monitor

Table 8. Air Quality Data

In EPA Region 2, the Bronx, Kings, and New York Counties in New York; and Union, Essex, Hudson, Passaic, and Bergen Counties in New Jersey show a violation of the 24-hour $PM_{2.5}$ standard. Fairfield and New Haven Counties in CT, which are located in Region 1, also violate the 24-hour $PM_{2.5}$ standard. Therefore, these counties are included in the New York City Metropolitan area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment

status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

Under this factor, we also consider fine particle composition monitoring data. Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations in the New York-Northern New Jersey-Long Island, NY-NJ-CT area occur about 60% in the warm season and 40% in the cool season. In the warm season, the average chemical composition of the highest days is 64% sulfate, 32% carbon, 3% crustal, and 0% nitrate.   In the cool season, the average chemical composition of the highest days is 52% carbon, 28% sulfate, 17% nitrate, and 3% crustal material. These data indicate that sources of SO2, NOx, and direct PM2.5 emissions contribute to violations in the area.

In their December 2007 letter, New York also submitted $PM_{2.5}$ speciation data, from urban and rural monitoring site in the New York City vicinity. The speciation data was dominated mostly by organic carbon and sulfates - over 50 percent of total mass for both urban and rural monitoring sites.   Elemental carbon, organic carbon, sulfates, and nitrates were higher at the urban location, indicating some local source contribution.

Many of the violating monitors are near major transportation routes, which is an indication of a significant mobile source contribution. Counties in the New York Metropolitan area with large populations, and large number of commuters in the New York metropolitan area (see discussion in Factors 3 and 4 below) and limited transportation routes for goods and service delivery are relevant considerations when determining the counties to include in the nonattainment area. Figures 11 and 12 show the New York Metropolitan area, including monitor locations, and major roadways.
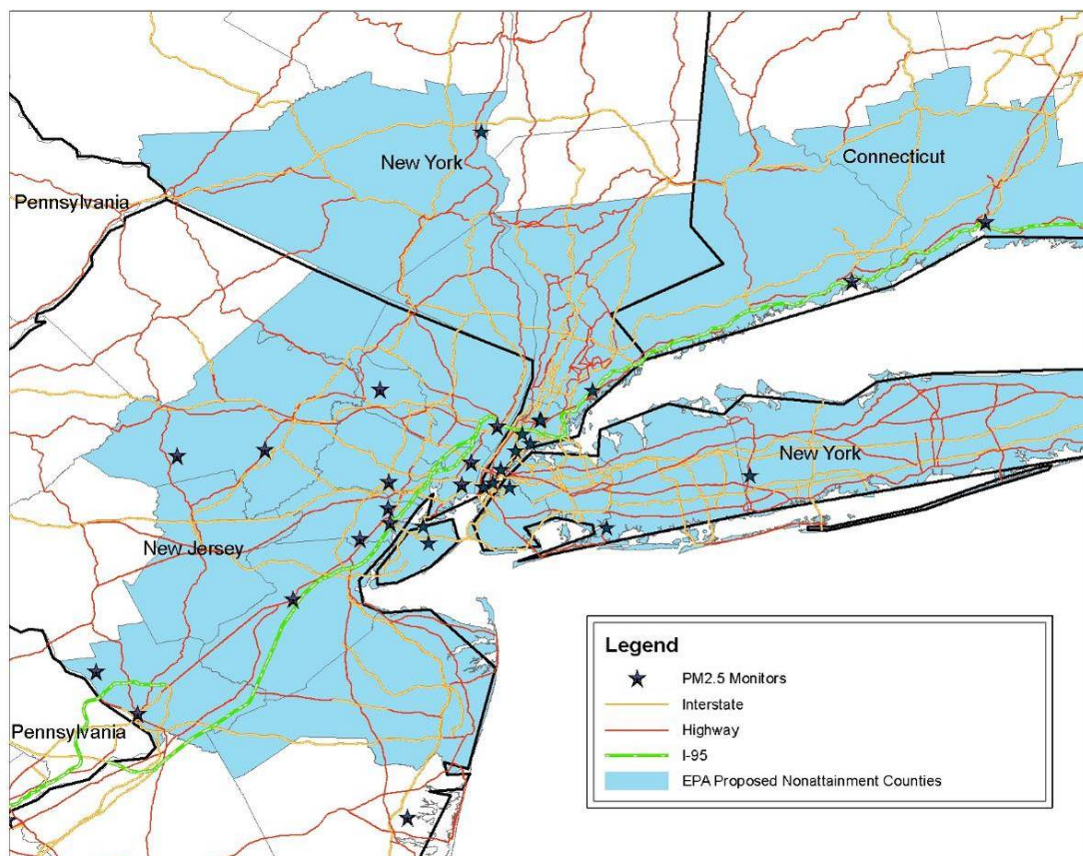
Figure 11. Map of the New York metropolitan area
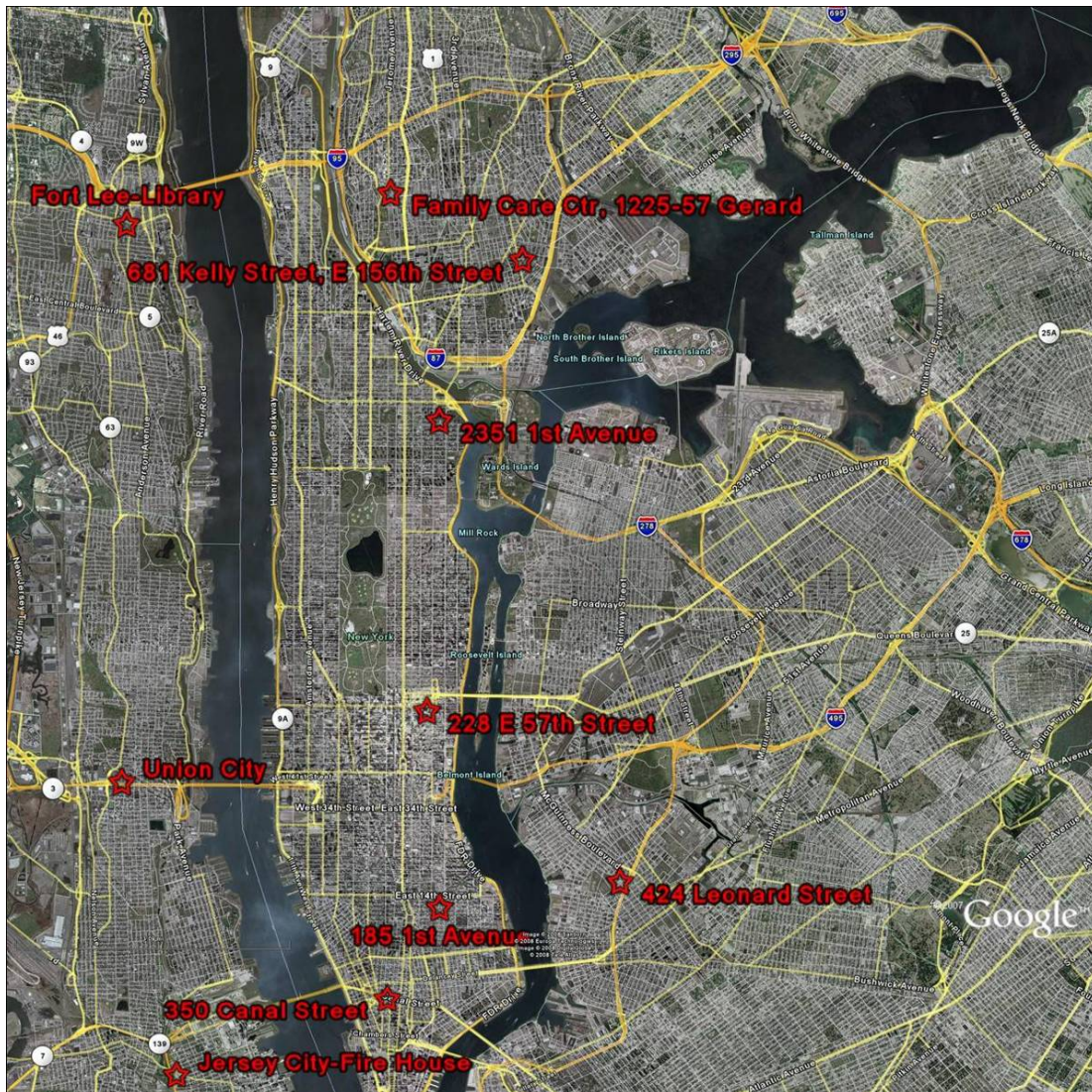
Figure 12. Detailed view of the New York City area. Red stars show the location of PM$_{2.5}$ monitors.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM$_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 9 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in the New York City Metropolitan area. Population data give an indication of whether it is likely that population-based emissions

might contribute to violations of the 24-hour PM$_{2.5}$ standards. Table 9 is sorted by 2005 population.

Due to their large concentrated population and relative land area size, the counties within New York City (i.e., New York, Bronx, Kings, Queens, and Richmond counties) have high population densities and high population relative to the remainder of the area. Suffolk, Nassau, Westchester, Orange, and Rockland counties in New York; and Middlesex, Essex, Monmouth, Hudson, Ocean, Union, Passaic, Morris, Mercer, and Somerset counties in New Jersey, also scored high in population and/or population density.

Of the counties listed in Table 9, most of the counties designated as nonattainment have a CES score of greater than 10, with the exception of Hartford, CT. These high CES counties have high populations and high population densities indicating possible population-based emissions contribution.

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Kings, NY	**Yes**	**2,511,408**	**37206**
Queens, NY	**Yes**	**2,256,576**	**20477**
New York, NY	**Yes**	**1,606,275**	**70451**
Suffolk, NY	**Yes**	**1,472,086**	**1369**
Bronx, NY	**Yes**	**1,364,566**	**31882**
Nassau, NY	**Yes**	**1,331,620**	**4289**
Westchester, NY	**Yes**	**947,719**	**1989**
Bergen, NJ	**Yes**	**902,308**	**3718**
Fairfield, CT	**Yes**	**901,086**	**1385**
Hartford, CT	No	875,422	1168
New Haven, CT	**Yes**	**844,510**	**1358**
Middlesex, NJ	**Yes**	**789,283**	**2487**
Essex, NJ	**Yes**	**789,166**	**6099**
Monmouth, NJ	**Yes**	**634,841**	**1308**
Hudson, NJ	**Yes**	**602,970**	**11208**
Ocean, NJ	No	558,170	738
Union, NJ	**Yes**	**530,710**	**5035**

Passaic, NJ	**Yes**	**496,985**	**2525**
Morris, NJ	**Yes**	**490,084**	**1019**
Richmond, NY	**Yes**	**475,014**	**7625**
Orange, NY	**Yes**	**372,750**	**445**
Mercer, NJ	**Yes**	**366,070**	**1601**
Somerset, NJ	**Yes**	**319,830**	**1049**
Rockland, NY	**Yes**	**294,636**	**1479**
Dutchess, NY	No	294,509	357
Ulster, NY	No	182,433	157
Sussex, NJ	No	152,726	285
Hunterdon, NJ	No	130,042	297
Warren, NJ	Yes, Partial - Allentown-Bethlehem-Easton PA-NJ	110,317	305
Putnam, NY	No	100,528	409
Sullivan, NY	No	76,155	77

Note: The counties that are in the nonattainment area for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 9. Population

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the New York City Metropolitan area, the percent of total commuters in each county who commute to violating counties within the New York City Metropolitan area, as well as the total Vehicle Miles Traveled (VMT) for each County in millions of miles (see Table 10). A county with numerous commuters is generally an integral part of an urban area. and is likely contributing to fine particle concentrations in the area.

The listing of counties in Table 10 reflects a ranking based on the number of people commuting to any violating county.

County	State Recommended Non-attainment?	2005 VMT (millions of miles)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into and within statistical area	Percent Commuting into and within statistical area
Kings, NY	**Yes**	**4,899**	**861,160**	**96**	**895,130**	**99**

Queens, NY	Yes	7,839	833,770	90	925,290	99
New York, NY	Yes	4,378	718,530	95	742,870	99
Bergen, NJ	Yes	9,124	394,140	92	424,530	99
Fairfield, CT	Yes	7,649	387,340	93	413,090	99
Bronx, NY	Yes	4,721	374,820	90	412,900	100
New Haven, CT	Yes	6,948	343,410	89	353,820	91
Essex, NJ	Yes	5,611	281,290	86	325,570	99
Hudson, NJ	Yes	2,543	244,470	93	262,640	99
Nassau, NY	Yes	11,920	201,260	33	616,330	100
Passaic, NJ	Yes	3,302	186,060	89	208,770	99
Union, NJ	Yes	4,704	181,030	76	237,010	100
Westchester, NY	Yes	9,166	141,680	33	421,720	99
Richmond, NY	Yes	2,002	97,040	51	190,220	100
Middlesex, NJ	Yes	8,014	90,710	25	358,740	99
Suffolk, NY	Yes	19,815	81,780	12	667,130	100
Morris, NJ	Yes	5,398	77,050	32	236,040	99
Monmouth, NJ	Yes	6,230	55,040	19	287,550	99
Rockland, NY	Yes	2,731	43,780	33	131,200	99
Somerset, NJ	Yes	2,702	32,080	21	148,750	99
Orange, NY	Yes	4,696	24,190	16	150,080	99
Hartford, CT	No	7,951	20,400	5	24,380	6
Sussex, NJ	No	889	17,000	23	70,640	97
Ocean, NJ	No	3,367	16,910	8	197,230	94
Putnam, NY	No	3,085	11,330	24	47,860	100
Mercer, NJ	Yes	2,668	11,130	7	150,970	93
Dutchess, NY	No	3,180	8,720	7	126,440	99
Hunterdon, NJ	No	929	8,150	13	58,450	94
Warren, NJ	Yes, Partial - Allentown-Bethlehem-	1,342	7,160	14	26,220	52

		Easton PA-NJ					
Ulster, NY	No	2,208	2,770	3	78,640	97
Sullivan, NY	No	784	1,720	6	9,090	31

Note: The counties that are in the nonattainment area for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.

Table 10. Traffic and Commuting Patterns

The largest number of commuters to counties with violating monitors in New York and New Jersey are from Kings, Queens, and New York. The New York counties of the Bronx, Nassau, Westchester, Richmond, Suffolk, Rockland, Orange; and the New Jersey counties of Bergen, Essex, Hudson, Passaic, Union, Middlesex, Morris, Monmouth, and Somerset, have about 25,000 commuters into a violating area.

Data provided by New Jersey indicates that only 7,647 commuters from Ocean County go to New York (2,964), Bronx (115), and Union County (4,567), which reduces the impact of this factor for Ocean County on the CSA.

The New York metro area has a large amount of truck traffic. The Federal Highway Administration projection of 2020 shows an increase of annual average daily traffic, which played a role in including counties for designation. Figure 13 shows projected 2020 annual average daily truck traffic.

Estimated Average Annual Daily Truck Traffic: 2020

NEW YORK

US Department of Transportation
Federal Highway Administration
Office of Freight Management and Operations
Freight Analysis Framework

Truck Volume Scale
50,000   25,000   12,500

Figure 13. Estimated Average Annual Daily Truck Traffic in 2020

This factor played a role in our decision making process by highlighting the contributing role that counties with high numbers of commuters have toward violating areas.

The 2005 VMT data used for table 10 and 11 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the New York metropolitan area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Table 11 below shows population, population growth, VMT and VMT growth for counties that are included in the New York metropolitan area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

County	2005 Population	2005 Population Density (people/sq mi)	Percent Population Change (2000-05)	Vehicle Miles Traveled in 2005 (millions annually)	Percent VMT Growth (1996-2005)
Putnam, NY	100,528	409	4	3,085	347
Suffolk, NY	1,472,086	1369	3	19,815	191
Westchester, NY	947,719	1989	2	9,166	123
Rockland, NY	294,636	1479	2	2,731	111
Nassau, NY	1,331,620	4289		11,920	89
Morris, NJ	490,084	1019	4	5,398	56
Middlesex, NJ	789,283	2487	5	8,014	56
Greene, NY	49,559	75	3	811	53
Bergen, NJ	902,308	3718	2	9,124	52
Somerset, NJ	319,830	1049	7	2,702	39
Orange, NY	372,750	445	9	4,696	39
Monmouth, NJ	634,841	1308	3	6,230	37
Ulster, NY	182,433	157	3	2,208	37
Columbia, NY	63,327	98		848	34
Delaware, NY	47,360	32	(1)	564	33
Sullivan, NY	76,155	77	3	784	33
Union, NJ	530,710	5035	1	4,704	31
New London, CT	264,265	380	2	3,181	21
Dutchess, NY	294,509	357	5	3,180	21
New Haven, CT	844,510	1358	2	6,948	10
Fairfield, CT	901,086	1385	2	7,649	9
Hartford, CT	875,422	1168	2	7,951	8
Richmond, NY	475,014	7625	7	2,002	8
Ocean, NJ	558,170	738	9	3,367	5
Passaic, NJ	496,985	2525	1	3,302	3
Warren, NJ	110,317	305	7	1,342	2
Essex, NJ	789,166	6099		5,611	(1)
Queens, NY	2,256,576	20477	1	7,839	(18)
Bronx, NY	1,364,566	31882	2	4,721	(20)
Mercer, NJ	366,070	1601	4	2,668	(22)
Sussex, NJ	152,726	285	6	889	(22)
Hudson, NJ	602,970	11208	(1)	2,543	(37)
New York, NY	1,606,275	70451	4	4,378	(40)

Hunterdon, NJ	130,042	297	6	929	(42)
Kings, NY	**2,511,408**	**37206**	**2**	**4,899**	**(57)**

Note: The counties that are in the nonattainment area for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 11. Population and VMT Growth and Percent Change

In New York, the counties of the Bronx, Kings, New York, Orange, Queens, Richmond, Rockland, Suffolk, Westchester, Dutchess, Putnam, Ulster, and Sullivan all exhibited growth. New York projects that the population in Bronx, Kings, New York, Orange, Queens, Richmond, Rockland, Suffolk, Westchester, Dutchess, and Putnam will continue to grow through 2015. In New Jersey, Middlesex, Monmouth, Hudson, Morris, Warren, Hunterdon, Sussex, and Ocean counties are experiencing growth. Somerset County is experiencing significant growth percentage-wise and in absolute numbers.

The VMT growth for Putnam, Suffolk, Westchester, and Rockland more than doubled from 1996-2005. Other areas in NY that had significant VMT growth were: Orange, Dutchess, Sullivan and Ulster. In NJ, Somerset, Middlesex, Morris, Monmouth, Bergen, and Union had notable VMT growth from 1996-2005.

This factor played a role in our decision process as it showed that in most of the counties in the proposed New York City Metropolitan nonattainment area there is continued growth in both population and VMT.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments and other meteorological monitoring sites in the area. Wind direction and wind speed data for 2005-2007 were analyzed, with an emphasis on "high PM$_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour PM$_{2.5}$ concentrations above 95% on a frequency distribution curve of PM$_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM$_{2.5}$ values by color; days exceeding 35 ug/m^3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figures 14, 15, and 16 show pollution roses for the New York Metropolitan Area.
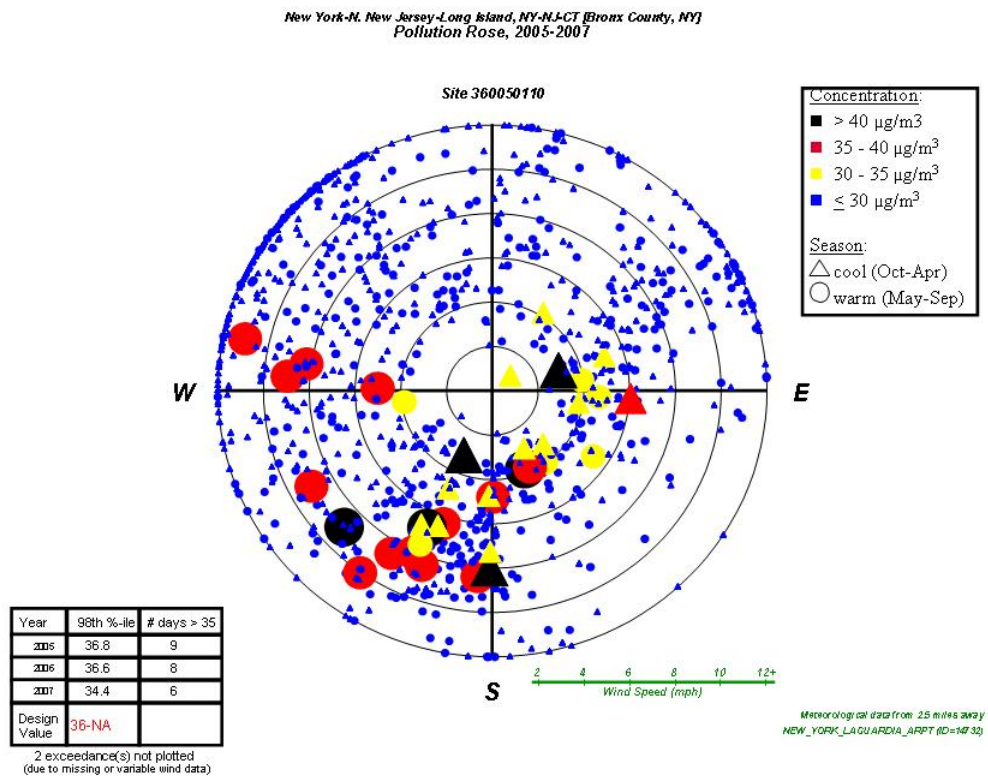

Figure 14. Pollution Rose for Bronx County, NY
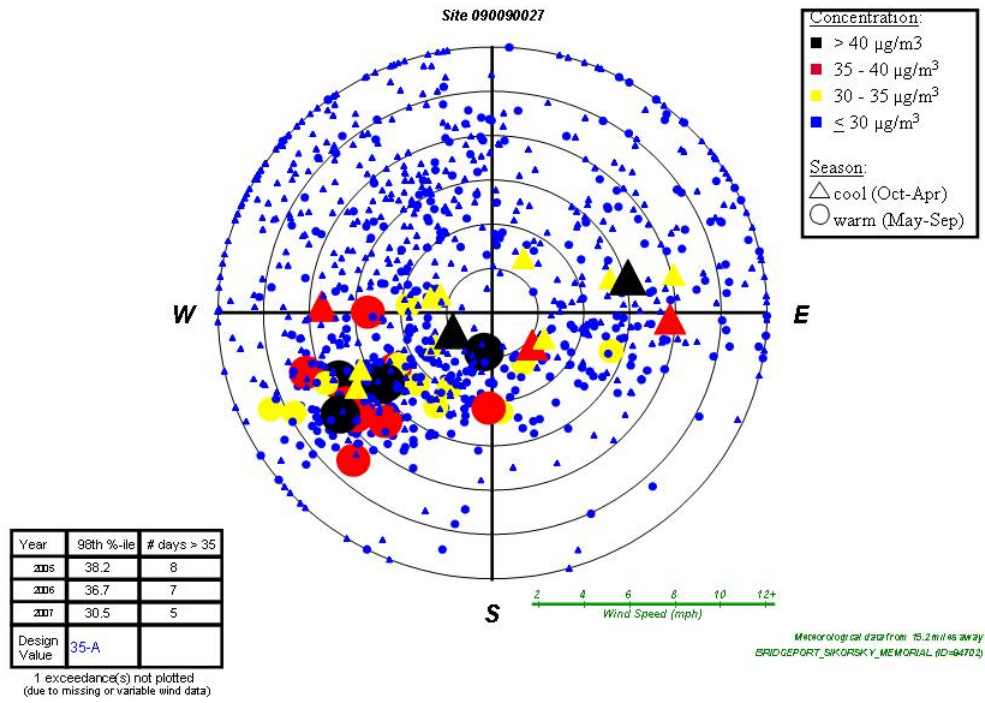
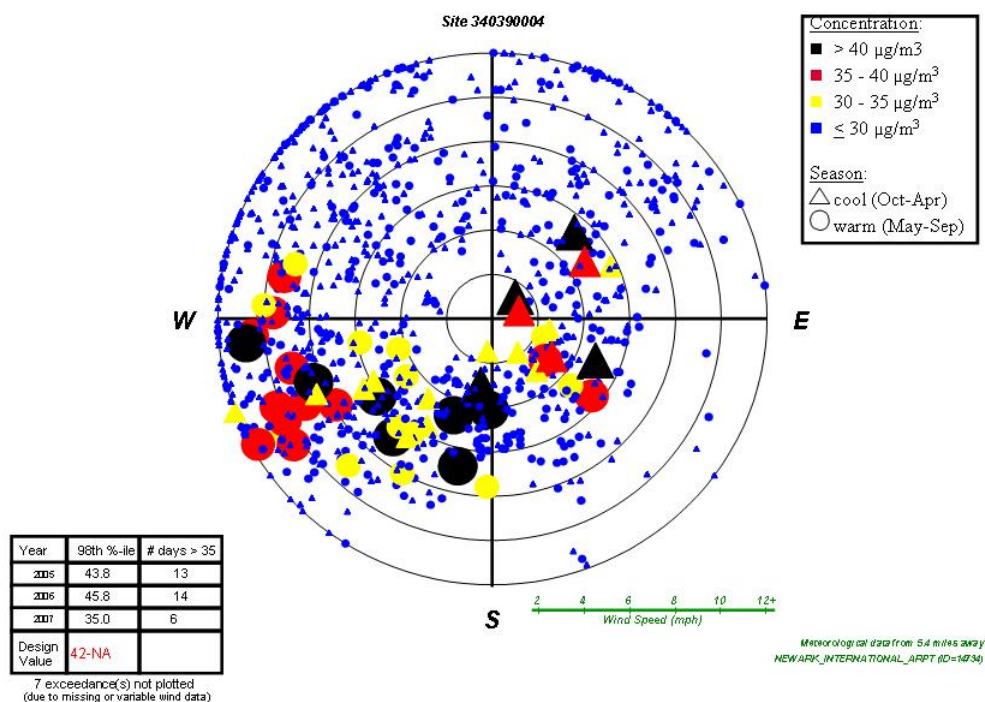**Figure 15. Pollution Rose for New Haven County, CT**

Figure 16. Pollution Rose for Union County, NJ

Generally, the analysis of prevailing wind directions and pollution roses show that the counties that are in the current 1997 $PM_{2.5}$ NAAQS nonattainment area for New York City rank high for this factor. The counties outside the 1997 $PM_{2.5}$ NAAQS nonattainment area generally ranked lower.

Table 12 shows the average prevailing surface wind directions for high $PM_{2.5}$ days by quadrant for representative counties with violating monitors in the New York City Metropolitan area. These data show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions in any direction at various times, but these data also suggest that emissions in some directions relative to the violation are more likely to contribute than emissions in other directions.

County	Prevailing Wind Direction (%)			
	NW	SW	SE	NE
Union County, NJ	9%	61%	22%	8%
Bronx County, NY	11%	49%	31%	9%
New Haven County, CT	8%	60%	25%	7%

Table 12. Prevailing Wind Directions for High PM$_{2.5}$ Days

EPA's analysis of meteorology shows that PM$_{2.5}$ emissions during high PM$_{2.5}$ days in 2005-2007 primarily originated and/or passed through locations from a southerly to a southwesterly direction. This is also evident upon examination of the pollution roses (see Figures 14, 15, and 16) for the New York City Metropolitan area. In addition, the pollution roses also show that some component of elevated PM$_{2.5}$ measured at the nonattainment monitors may originate from a northerly direction. The roses, therefore, show the need to consider the contribution of all surrounding counties to the violating monitors in the New York City Metropolitan area. This ensures that the nonattainment area is sufficiently large enough to include both the areas that violate and the areas that contribute.

In New York State, the counties that ranked high for this factor are Queens, Bronx, Richmond, Nassau, Kings, New York, Rockland, Westchester, and Orange. Suffolk County ranked slightly lower for this factor.

Ulster and Dutchess Counties were not shown to contribute significantly based on the analysis of meteorology. Ulster County is north to northwest of violating monitors in New York, New Jersey and Connecticut. Pollution roses and the prevailing wind direction did not indicate a high impact from this area. The CES score was very low (i.e. 3 on a scale of 100). Dutchess County is northwest of violating monitors in Connecticut, and northeast of violating monitors in New York and New Jersey. Pollution roses and the prevailing wind direction did not indicate a high impact from this area either.

In New Jersey, the counties that rank high for this factor are Union, Bergen, Essex, Hudson, Mercer, Middlesex, Monmouth, Morris, Passaic, and Somerset Counties.

Ocean County is generally south of violating monitors in New Jersey and New York, and southwest of violating monitors in CT. The Ocean County CES score was very low (6), and pollution roses did not indicate a high impact from Ocean County to areas that violate.

Based on our analysis, this factor supported including the Counties of New York, Bronx, Queens, Kings, Richmond, Nassau, Suffolk, Westchester, Orange, and Rockland Counties in New York; and Union, Bergen, Essex, Hudson, Mercer, Middlesex, Monmouth, Morris, Passaic, and Somerset in New Jersey in the New York City metropolitan nonattainment area.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high PM$_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of PM$_{2.5}$ over the New York Metropolitan area.

The New York City Metropolitan area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM area)

In evaluating the jurisdictional boundary factor, EPA gave special consideration to areas that were already designated nonattainment in 2005 for violating the 1997 fine particle standards. Analysis of chemical composition data in these areas indicates that the same components that make up most of the PM$_{2.5}$ mass in the area on an annual average basis (such as sulfate and direct PM$_{2.5}$ carbon in many eastern areas) also are key contributors to the PM$_{2.5}$ mass on days exceeding the 24-hour PM$_{2.5}$ standard. These data indicate that in many cities, the same source categories that contribute to violations of the annual standard also contribute to exceedances of the 24-hour standard.

Most areas that were originally designated nonattainment for the PM$_{2.5}$ standards still have not attained the standards. Thus, EPA has generally concluded that counties that were designated as having emissions sources contributing to fine particle concentrations which continue to exceed the 1997 standards (all areas violated the annual standard, three also violated the previous 24-hour standard) also contribute to fine particle concentrations on the highest days. For this reason, EPA believes that for most existing nonattainment areas, the nonattainment area for the 2006 24-hour standard should be the same. Consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

In EPA's June 2007 Guidance for Area Designations for the 24-hr PM$_{2.5}$ NAAQS, EPA had indicated that we expected that the boundaries for the existing 1997 PM$_{2.5}$ nonattainment areas would have been appropriate for the boundaries of the new nonattainment areas for the 2006 PM$_{2.5}$ NAAQS. The following counties were included in the EPA Region 2 portion of the 1997 PM$_{2.5}$ NAAQS nonattainment area for the New York City metropolitan area: New York, Bronx, Queens, Kings, Richmond, Nassau, Suffolk, Westchester, Orange, and Rockland Counties in New York; and Union, Bergen, Essex, Hudson, Mercer, Middlesex, Monmouth, Morris, Passaic, and Somerset Counties in New Jersey. Dutchess and Ulster Counties in New York; and Ocean County in New Jersey were not included in the 1997 PM$_{2.5}$ NAAQS nonattainment area for the New York City metropolitan area.

To the degree appropriate, based upon violations and contributions to violations of the ozone and PM2.5 NAAQS in a particular area, EPA believes it may be helpful for air

planning purposes and for attainment of both NAAQS, for there to be some consistency between ozone and PM2.5 nonattainment area boundaries.

The major jurisdictional boundaries in the New York City Metropolitan nonattainment area are the State lines between New York, New Jersey, and Connecticut.

New York has recommended the same boundaries for the 24-hour $PM_{2.5}$ NAAQS that were previously delineated by EPA for the 1997 $PM_{2.5}$ nonattainment area. In their December 2007 letter New York has noted that although they disagreed with those boundaries and chose to litigate the issue, they do not expect the possible change in those boundaries as a result of the litigation to affect their recommendation, given the more local impacts associated with the 24-hour standard, the 24-hour averaging basis for the NAAQS that is the subject of this submittal, the larger number of monitors exceeding the 24-hour standard in the New York City counties, and the values close to the 24-hour standard in the counties surrounding New York City.

Factor 9: Level of control of emission sources

Under this factor, the existing level of control of emission sources is taken into consideration. The emissions data used by EPA in this technical analysis and provided in Table 7 (under Factor 1) represent emissions levels taking into account any control strategies implemented in the New York City area before 2005 on stationary, mobile, and area sources. Data are presented for $PM_{2.5}$ components that are directly emitted (carbonaceous $PM_{2.5}$ and crustal $PM_{2.5}$) and for pollutants which react in the atmosphere to form fine particles (e.g. SO_2, NOx, VOC, and ammonia).

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory, the most updated version of the national inventory available at the beginning of the designations process in late 2007. However, EPA recognized that for certain counties, emissions may have changed since 2005. For example, certain power plants or large sources of emissions in or near this area may have installed emission controls or otherwise significantly reduced emissions since 2005. Some States provided updated information on emissions and emission controls in their comments to EPA. EPA considered such additional information in making final designation decisions.

With regard to nearby power plants, EPA considered information about whether a specific plant installed federally enforceable emission controls by December 2008 resulting in significant emissions reductions. A control requirement is considered to be federally-enforceable if it is required by a State regulation adopted in a State implementation plan, if it is included in a federally-enforceable Title V operating permit, or if it is required by a consent decree which also requires the controls to be included in federally enforceable permit upon termination of the consent decree. In making final decisions, EPA also considered whether a facility would continue to emit pollutants which contribute to $PM_{2.5}$ exceedances even after emission controls are operational.

Since we believe that the emissions listed in Table 7 have not changed significantly since 2005, this factor does not influence heavily in our decision-making.

Conclusion

Hudson, Union, Essex, Bergen, Middlesex, Morris, Monmouth, Mercer, Somerset, and Passaic have been designated by EPA as nonattainment for the 2006 24-hour fine particle ($PM_{2.5}$) standard.

Hudson County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. In addition to violating the standard, the County has high emissions in comparison to the other counties in the New York Metropolitan area; high CES value, high total population/ population density, and a large number of commuters into a violating county. The population of Hudson County has also exhibited growth. Hudson County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate the Hudson County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Union County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. In addition to violating the standard, the County has high emissions, a high CES value, high total population/ population density, and a large number of commuters into a violating county. Union County has also exhibited high VMT growth. Union County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Union County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Essex County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. The county has high emissions, high CES value, high population/ population density, a large number of commuters into a violating county, and high VMT. Essex County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Essex County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Bergen County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. In addition to violating the standard, the County has high emissions, high CES value, high total population/ population density, high VMT growth, high VMT, and a large number of commuters into a violating county. Bergen County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Bergen County as nonattainment for the 24-hour $PM_{2.5}$standard.

Passaic County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. The county also has high total population/ population density, and a large number of commuters into a violating county. Passaic County was also designated nonattainment in

2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Passaic County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Middlesex County has high emissions, a high CES value, high population/ population density, high population growth, high VMT and VMT growth, and a large number of commuters into a violating county. Middlesex County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Middlesex County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Monmouth County has high emissions in comparison to the other counties in the New York Metropolitan area; high total population/ population density, high VMT and VMT growth, high population growth, and a large number of commuters into a violating county. Monmouth County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Monmouth County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Morris County has mid-range emissions and CES value, high population/ population density, high VMT and VMT growth, and a large number of commuters into a violating county. Morris County has also exhibited population growth. Morris County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Morris County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Mercer County has mid-range emissions and CES value in comparison to the other counties in the New York Metropolitan area; and a high population/population density. Mercer County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Mercer County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Somerset County has high total population/ population density, VMT, a large number of commuters into a violating county, and high VMT growth. Somerset County has also exhibited high population growth. Somerset County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Somerset County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at http://www.epa.gov/pmdesignations/2006standards/tech.htm.

EPA Technical Analysis for the Philadelphia-Wilmington, PA-NJ-DE area

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the New Jersey portion of the Philadelphia-Wilmington, PA-NJ-DE (Philadelphia Metropolitan) area identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

We also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas. (See additional discussion of the CES under factor 1 below.)

Figure 17 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

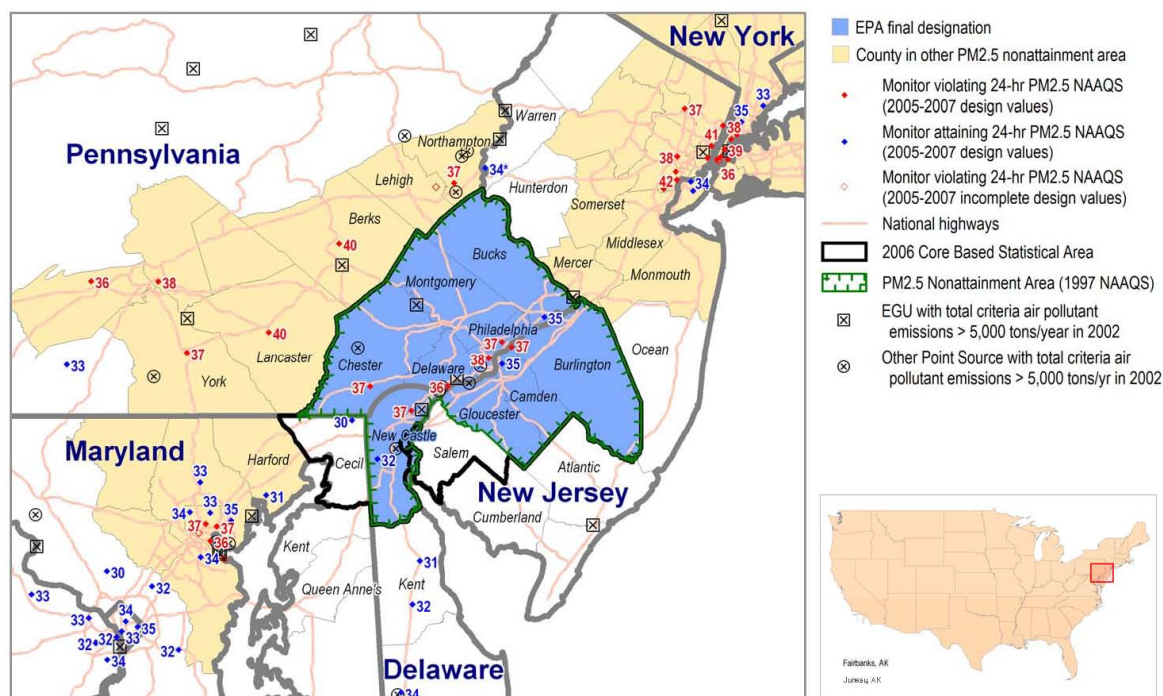Philadelphia-Wilmington, PA-NJ-DE 24-hr PM2.5 Nonattainment Area

Figure 17. Philadelphia Metropolitan area

For this area, EPA previously established PM$_{2.5}$ nonattainment boundaries for the 1997 PM$_{2.5}$ NAAQS that included three full counties located in New Jersey.

In the state's December 2007 letter to EPA, New Jersey recommended that the same counties be designated as "nonattainment" for the 2006 24-hour PM$_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified New Jersey of its intended designations. In this letter, EPA also requested that if New Jersey wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Based on EPA's technical analysis described below, EPA has designated the same counties as previously designated for PM$_{2.5}$ as nonattainment for the 24-hour PM$_{2.5}$ air-quality standard as part of the Philadelphia Metropolitan nonattainment area, based upon currently available information. These counties are listed in the table below.

Philadelphia Metropolitan nonattainment area	State-Recommended Nonattainment Counties	EPA-Final Designated Nonattainment Counties
New Jersey	Burlington County Camden County Gloucester County	Burlington County Camden County Gloucester County

The following is a summary of the technical analysis for the EPA Region 2 portion of the Philadelphia Metropolitan area.
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Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," and "NO_x". "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 13 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Philadelphia Metropolitan area. Counties are listed in descending order by CES. The counties that are currently designated nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

County	State Recommended Nonattainment	CES	PM$_{2.5}$ emissions total (tpy)	PM$_{2.5}$ emissions carbon (tpy)	PM$_{2.5}$ emissions other (tpy)	SO2 (tpy)	NOx (tpy)
New Castle, DE	**Yes**	**100**	**2,394**	**891**	**1,504**	**50,955**	**28,291**
Philadelphia, PA	**Yes**	**100**	**2,506**	**1,248**	**1,258**	**11,293**	**38,733**
Delaware, PA	**Yes**	**89**	**2,454**	**865**	**1,589**	**20,356**	**32,904**
Gloucester, NJ	**Yes**	**85**	**1,607**	**677**	**930**	**7,116**	**12,711**
Camden, NJ	**Yes**	**68**	**971**	**597**	**374**	**1,839**	**13,852**
Burlington, NJ	**Yes**	**32**	**1,960**	**1,137**	**822**	**3,368**	**15,570**
Chester, PA	**Yes**	**26**	**2,124**	**799**	**1,325**	**7,990**	**16,507**
Montgomery, PA	**Yes**	**24**	**2,597**	**1,118**	**1,477**	**5,411**	**23,306**
Bucks, PA	**Yes**	**11**	**2,022**	**876**	**1,146**	**3,951**	**16,792**
York, PA	Yes- other	33	7,614	1,217	6,396	118,621	32,214
Salem, NJ	No	28	1,233	314	919	5,947	7,241
Atlantic, NJ	No	14	1,664	1,045	619	752	7,310
Cecil, MD	No	13	870	446	425	1,298	3,962
Cumberland, NJ	No	12	952	440	513	3,196	6,526
Lancaster, PA	Yes – other	11	3,258	1,159	2,099	4,017	16,396
Mercer, NJ	Yes – other	10	1,658	579	1,079	17,891	17,640
Berks, PA	Yes – other	9	3,378	922	2,456	18,874	18,086
Harford, MD	Yes – other	9	1,769	879	890	2,307	7,310
Kent, DE	No	7	1,014	435	580	4,478	9,088
Ocean, NJ	No	5	1,540	993	547	1,060	9,578
Northampton, PA	Yes- other	4	5,222	665	4,556	60,396	24,620
Middlesex, NJ	Yes- other	3	1,549	951	598	3,129	29,172
Kent, MD		2	443	162	282	471	1,002
Lehigh, PA	Yes – other	2	1,328	501	828	3,749	11,503
Monmouth, NJ	Yes – other	2	1,506	989	517	1,789	16,771
Queen Anne's, MD	No	2	659	261	398	479	2,076
Hunterdon, NJ	No	1	769	454	316	556	3,882
Somerset, NJ	Yes – other	1	801	451	349	577	7,886
Warren, NJ	Yes – other	0	1,105	588	517	563	5,088

Table 13. PM$_{2.5}$ Related Emissions and Contributing Emissions Score

In the New Jersey portion of the Philadelphia Metropolitan Area the counties with relatively high emissions compared to the remainder of the area are Burlington, Mercer, and Monmouth Counties. Gloucester, Camden, Atlantic, and Ocean Counties were mid-range when compared to the other counties in the Philadelphia Metropolitan area. Salem

was moderate for SO_2, but was low for carbon and NO_x. Cumberland, Hunterdon, and Warren Counties had low emissions when compared to other potentially contributing counties in the area.

As New Jersey pointed out in their analysis, Gloucester, Camden, Burlington, and Salem Counties in New Jersey have multiple large point sources which are concentrated along the border of Philadelphia, Delaware, and New Castle Counties. Figure 18 shows the New Jersey point sources concentrated along that area.
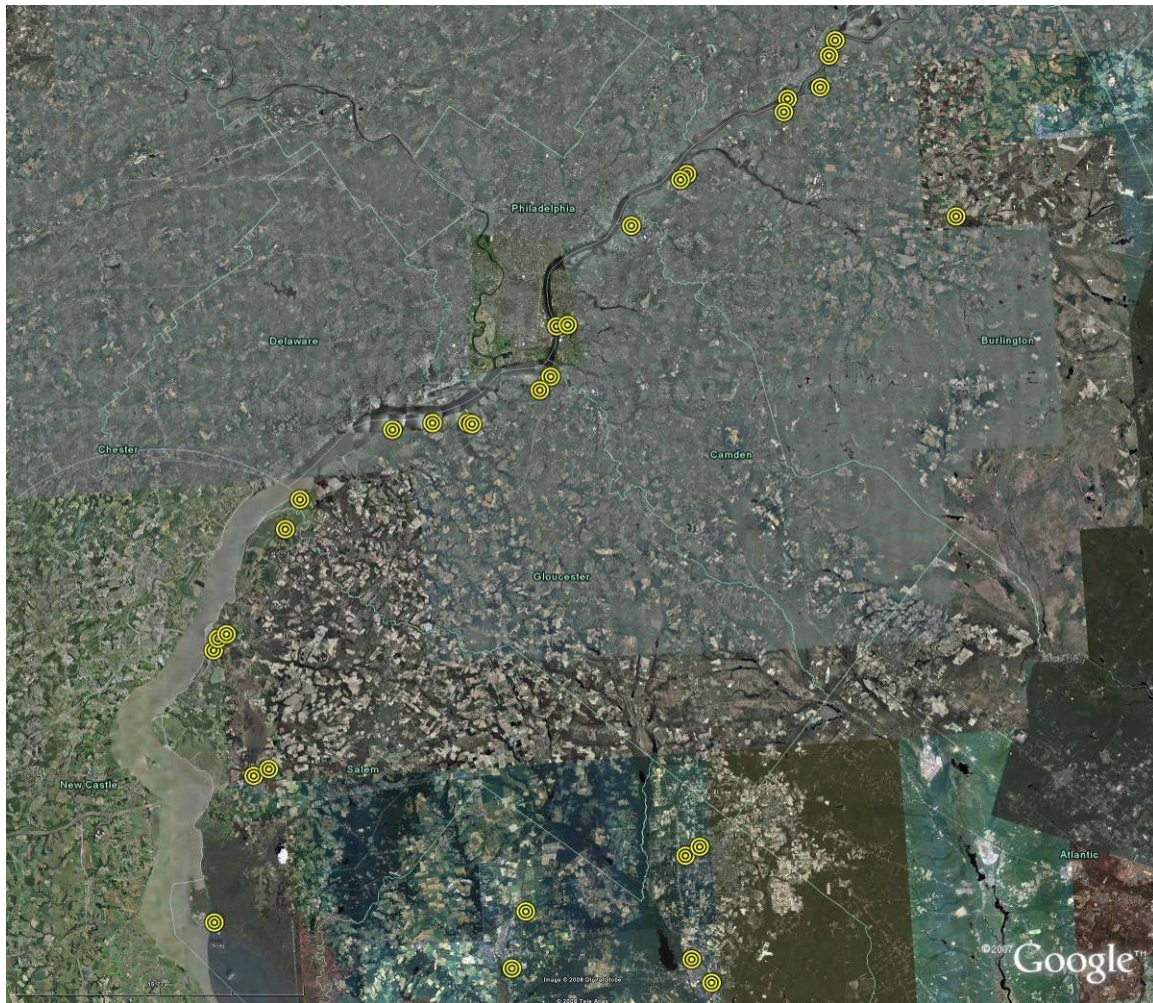
Figure 18. New Jersey Point Sources (50 tpy or more) along the Philadelphia, PA and New Castle, DE borders

CES scores were high for Gloucester, and Camden, but were lower for the remaining New Jersey counties. CES scores were very low for Ocean (i.e. 5 on a scale of 100), Monmouth (2), Hunterdon (1), and Warren (0) Counties, which is indicative of minimal contribution.

Hunterdon, NJ emissions account for slightly over one percent (i.e. 769 tons) of the total $PM_{2.5}$ emissions, two percent of the carbon emissions (i.e. 454 tons), and less than one percent of the total SO_2 emissions (i.e. 556 tons) and NOx emissions (i.e. 3,882 tons) for

the area. Crustal components were also low at 316 tons, which represented less than one percent.

Warren County, NJ also has relatively lower emissions than most of the other counties in the area. 2005 total $PM_{2.5}$ and carbon emissions were 1,105 tons and 588 tons, respectively, which represents about two percent of the total $PM_{2.5}$ and two and a half percent of the carbon emissions for the area under consideration. SO_2 emissions (i.e. 563 tons) were below a half a percent, and NO_x emissions (i.e. 5,088 tons) were slightly above one percent of the areas emissions. Crustal components were also low at 517 tons, which represented one and a half percent of emissions.

In their December 2007 recommendation to EPA, New Jersey used 2002 emissions and projected 2009 emissions from the 2002 MANE-VU Modeling Inventory. New Jersey also showed relatively lower emissions from Hunterdon and Warren Counties than the other counties in the area.

Monmouth, Middlesex and Mercer counties have been included in the Northern New Jersey-Long Island, NY-NJ-CT (New York City metropolitan) nonattainment area. Monmouth, Middlesex and Mercer Counties have been included in the New York City metropolitan area for the current 1997 $PM_{2.5}$ standard and EPA believes that it is appropriate to keep the counties in the current nonattainment area (see Factor 7).

Camden, Gloucester, Burlington, Cumberland, Atlantic, Salem, and Ocean counties are candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Philadelphia Metropolitan area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of a monitor's 98th percentile's value is 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Philadelphia Metropolitan area are shown in Table 14.

County	State Recommended Nonattainment	Design Values 2005-07 ($\mu g/m3$)
New Castle, DE	Yes	37
Philadelphia, PA	Yes	38
Delaware, PA	Yes	36

Gloucester, NJ	**Yes**	**29**
Camden, NJ	**Yes**	**38**
Burlington, NJ	**Yes**	**No monitor**
Chester, PA	**Yes**	**37**
Montgomery, PA	**Yes**	**No monitor**
Bucks, PA	**Yes**	**35**
York, PA	Yes- other	37
Salem, NJ	No	No monitor
Atlantic, NJ	No	29
Cecil, MD	No	30
Cumberland, NJ	No	No monitor
Lancaster, PA	Yes	40
Mercer, NJ	Yes	34
Berks, PA	Yes- other	40
Harford, MD	Yes- other	31
Kent, DE	No	32
Ocean, NJ	No	30
Northampton, PA	Yes- other	37
Middlesex, NJ	Yes- other	32
Kent, MD		No monitor
Lehigh, PA	Yes	No monitor
Monmouth, NJ	Yes	No monitor
Queen Anne's, MD	No	No monitor
Hunterdon, NJ	No	No monitor
Somerset, NJ	Yes- other	No monitor
Warren, NJ	Yes- other	34

Table 14. Air Quality Data

The only violating county in the New Jersey portion of the Philadelphia Metropolitan
area is Camden, NJ. Philadelphia, Delaware, and Chester Counties in Pennsylvania; and
New Castle County, DE also violate the 24-hour PM$_{2.5}$ standard, however these additional

counties in the Philadelphia Metropolitan area, and other counties not in New Jersey, that violate the PM$_{2.5}$ NAAQS, are not discussed here in EPA Region 2's analysis.

Warren, Atlantic, Gloucester, and Ocean counties have monitors meeting the 24-hour PM$_{2.5}$ standard. Burlington, Cumberland, Hunterdon, and Salem counties do not have monitors.

Under this factor, we also consider fine particle composition monitoring data. Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations in the Philadelphia-Wilmington, PA-NJ-DE area occur about 60% of the time in the warm season and 40% of the time in the cool season. In the warm season, the average chemical composition of the highest days is 74% sulfate, 24% carbon, 2% crustal, and 1% nitrate. In the cool season, the average chemical composition of the highest days is 39% sulfate, 35% carbon, 20% nitrate, and 5% crustal material. These data indicate that sources of SO2, NOx, and direct PM2.5 emissions contribute to violations in the area.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM$_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 15 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data give an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour PM$_{2.5}$ standards. Table 15 is sorted by 2005 population.

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Philadelphia, PA	**Yes**	**1,456,350**	**10220**
Middlesex, NJ	**Yes-Other**	**789,283**	**2487**
Montgomery, PA	**Yes**	**774,666**	**1591**
Monmouth, NJ	**Yes-Other**	**634,841**	**1308**
Bucks, PA	**Yes**	**619,772**	**998**

Ocean, NJ	No	558,170	738
Delaware, PA	**Yes**	**554,393**	**2910**
New Castle, DE	**Yes**	**522,094**	**1077**
Camden, NJ	**Yes**	**515,381**	**2272**
Lancaster, PA	**Yes-Other**	**489,936**	**499**
Chester, PA	**Yes**	**473,723**	**624**
Burlington, NJ	**Yes**	**449,148**	**548**
York, PA	**Yes-Other**	**408,182**	**449**
Berks, PA	**Yes-Other**	**396,236**	**458**
Mercer, NJ	**Yes-Other**	**366,070**	**1601**
Lehigh, PA	Yes-Other	330,168	948
Somerset, NJ	**Yes-Other**	**319,830**	**1049**
Northampton, PA	Yes-Other	287,334	762
Gloucester, NJ	**Yes**	**277,037**	**823**
Atlantic, NJ	No	270,318	444
Harford, MD	**Yes-Other**	**238,850**	**519**
Cumberland, NJ	No	152,905	304
Kent, DE	No	143,462	240
Hunterdon, NJ	No	130,042	297
Warren, NJ	Yes-Other	110,317	305
Cecil, MD	No	97,474	257
Salem, NJ	No	66,054	190
Queen Anne's, MD	No	45,469	115
Kent, MD	No	19,908	67

Note: The counties that are currently designated nonattainment for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 15. Population

Philadelphia is the most highly populated and dense county in the area and overshadows other counties in the area. Camden County has high population density and is relatively more urbanized than other NJ counties in the area. The population of Gloucester,

Camden, and Burlington are concentrated along the border of Philadelphia and Delaware counties.

The population of Ocean County is mainly concentrated in the northeastern portion of the county, which makes Ocean County's population impact on the Philadelphia Metropolitan area minimal. Warren, Hunterdon, Atlantic, Cumberland, and Salem counties have low populations and population densities in comparison to the Philadelphia and Camden. The location and density of populations played a role in decision making for the counties of Camden, Gloucester, and Burlington, as they are highly populated and/or located near Philadelphia.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another County within the Philadelphia Metropolitan area; the percent of total commuters in each County who commute to violating counties within the Philadelphia Metropolitan area, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles annually (see Table 16). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

County	State Recommended Non-attainment?	2005 VMT (millions of miles)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into and within statistical area	Percent Commuting into and within statistical area
Philadelphia, PA	**Yes**	**6,499**	**469,300**	**82**	**558,270**	**98**
New Castle, DE	**Yes**	**5,674**	**228,630**	**93**	**237,010**	**97**
Lancaster, PA	**Yes-Other**	**4,392**	**217,820**	**94**	**9,110**	**4**
Delaware, PA	**Yes**	**4,011**	**216,560**	**85**	**249,130**	**98**
Chester, PA	**Yes**	**4,414**	**184,920**	**85**	**207,990**	**96**
Camden, NJ	**Yes**	**4,669**	**162,290**	**71**	**215,780**	**94**
Berks, PA	**Yes-Other**	**3,320**	**159,000**	**90**	**20,450**	**12**
York, PA	**Yes-Other**	**3,333**	**148,290**	**77**	**730**	**0**
Lehigh, PA	Yes-Other	3,374	133,030	90	10,210	7
Montgomery, PA	**Yes**	**7,527**	**101,460**	**27**	**365,750**	**96**
Northampton, PA	Yes-Other	2,399	99,860	80	3,730	3
Burlington, NJ	**Yes**	**4,902**	**46,850**	**23**	**174,000**	**84**

County	Nonattainment					
Bucks, PA	**Yes**	**5,250**	**44,390**	**15**	**261,390**	**86**
Gloucester, NJ	**Yes**	**2,621**	**42,160**	**35**	**111,620**	**92**
Cecil, MD	No	1,193	15,970	38	34,590	83
Kent, DE	No	1,435	6,370	11	6,710	11
Salem, NJ	No	1,013	5,450	19	24,900	87
Atlantic, NJ	No	3,234	4,700	4	8,310	7
Mercer, NJ	**Yes-Other**	**2,668**	**2,700**	**2**	**11,100**	**7**
Warren, NJ	Yes-Other	1,342	2,450	5	230	1
Cumberland, NJ	No	1,264	2,020	4	6,820	12
Harford, MD	**Yes-Other**	**2,068**	**1,920**	**2**	**3,030**	**3**
Ocean, NJ	No	3,367	1,460	1	5,520	3
Monmouth, NJ	**Yes-Other**	**6,230**	**1,190**	**0**	**2,410**	**1**
Middlesex, NJ	**Yes-Other**	**8,014**	**970**	**0**	**2,250**	**1**
Hunterdon, NJ	No	929	840	1	1,710	3
Kent, MD	No	219	680	8	970	11
Somerset, NJ	**Yes-Other**	**2,702**	**450**	**0**	**1,050**	**1**
Queen Anne's, MD	No	758	230	1	260	1

Note: The counties that are currently designated nonattainment for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 16. Traffic and Commuting Patterns

The listing of counties on Table 16 reflects a ranking based on the number of people commuting to any violating county.

The largest numbers of commuters come from Pennsylvania and Delaware. Camden, Gloucester, and Burlington each have over 100,000 commuters into the statistical area. Warren, Hunterdon, Salem, Cumberland, Ocean, and Atlantic Counties each have less than 25,000 commuters into the statistical area and less than 5,500 commuters into any violating area. New Jersey provided information in their recommendation showing that Camden, Gloucester, and Burlington each have over 10,000 commuters into Philadelphia, which is approximately 10 times more than other southern NJ counties. VMT, number of commuters into the statistical area, and violating area, for Camden, Gloucester, and Burlington, played a role in our decision making process.

The Philadelphia area has a large amount of truck traffic. The Federal Highway Administration projection of 2020 (Figure 19) shows an increase in the annual average

daily truck traffic through Camden, Gloucester, and Burlington, which played a role in including counties for designation. Warren, Hunterdon, and Salem County are projected to have increased truck traffic. Atlantic, Ocean, and Cumberland counties are projected to have lower increases in truck traffic. The projected increase for all of the counties considered was not significant enough to play a role in the designation of the counties.
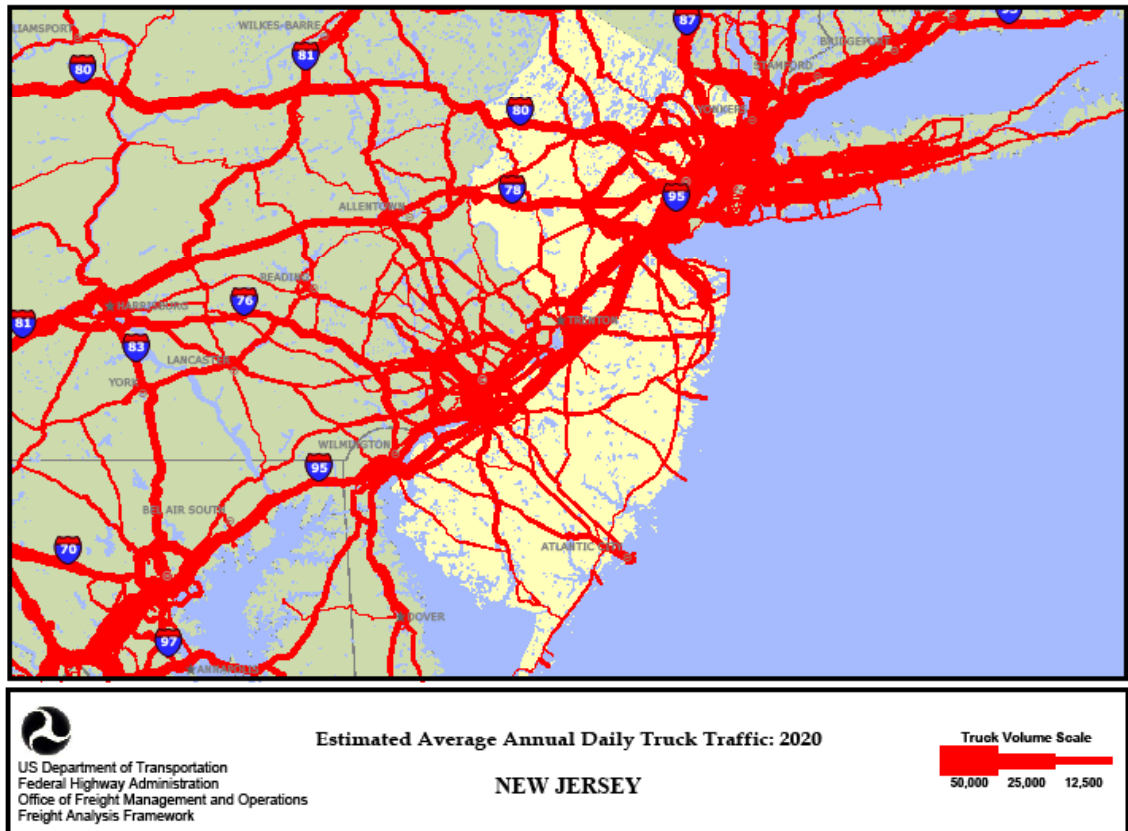

Figure 19. Estimated Average Annual Daily Truck Traffic in 2020

The 2005 VMT data used for table 16 and 17 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor looks at population (2005), expected population change (2000-2005), VMT (2005), and VMT growth (1996-2005) for Counties in the Philadelphia Metropolitan

area. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Table 17 below shows population, population growth, VMT and VMT growth for counties that are included in the Philadelphia Metropolitan area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

County	2005 Population	Population Density (2005)	Percent Population Change (2000-05)	Vehicle Miles Traveled in 2005 (millions annually)	Percent VMT Growth (1996-2005)
Queen Anne's, MD	45,469	115	11	758	81
Montgomery, PA	**774,666**	**1591**	**3**	**7,527**	**73**
Middlesex, NJ	**789,283**	**2487**	**5**	**8,014**	**56**
Chester, PA	**473,723**	624	**9**	**4,414**	**54**
Atlantic, NJ	270,318	**444**	7	3,234	54
Salem, NJ	66,054	190	3	1,013	50
Bucks, PA	**619,772**	**998**	**3**	**5,250**	**49**
Burlington, NJ	**449,148**	**548**	**6**	**4,902**	**43**
Kent, MD	19,908	67	3	219	42
Somerset, NJ	**319,830**	**1049**	**7**	**2,702**	**39**
Monmouth, NJ	**634,841**	**1308**	**3**	**6,230**	37
Lehigh, PA	330,168	948	6	3,374	34
Gloucester, NJ	**277,037**	**823**	**8**	**2,621**	**26**
New Castle, DE	**522,094**	**1077**	**4**	**5,674**	**25**
Cumberland, NJ	152,905	304	4	1,264	24
Delaware, PA	**554,393**	**2910**	**0**	**4,011**	**24**
Northampton, PA	287,334	762	7	2,399	21
Lancaster, PA	**489,936**	**499**	**4**	**4,392**	**21**
Camden, NJ	**515,381**	**2272**	**1**	**4,669**	**17**
Berks, PA	**396,236**	**458**	**6**	**3,320**	**11**
Cecil, MD	97,474	257	13	1,193	10
York, PA	**408,182**	**449**	**7**	**3,333**	**6**
Kent, DE	143,462	240	13	1,435	5
Ocean, NJ	558,170	738	9	3,367	5
Warren, NJ	110,317	305	7	1,342	2
Harford, MD	**238,850**	**519**	**9**	**2,068**	**0**
Mercer, NJ	**366,070**	**1601**	**4**	**2,668**	-22
Philadelphia, PA	**1,456,350**	**10220**	**-4**	**6,499**	**-31**
Hunterdon, NJ	130,042	297	6	929	-42

Note: The counties that are currently designated nonattainment for the 1997 annual PM$_{2.5}$ NAAQS are shown in boldface.
Table 17. Population and VMT Growth and Percent Change.

The population of Philadelphia is by far the largest in the area. The population growth for Camden, Cumberland, Gloucester, Ocean, Atlantic, and Salem were low. VMT for these respective counties (with the exception of Ocean) has increased by over 10% from 1996-2005. Burlington County had moderate population growth and high VMT growth. Warren and Hunterdon counties had low population growth and VMT growth. The growth in VMT in conjunction with commuting patterns in Factor 4 provided additional information on the influence of Camden, Gloucester, and Burlington on the Philadelphia

Metropolitan area. These counties experienced VMT growth and have a moderate number of commuters into violating areas.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments and other meteorological monitoring sites in the area. Wind direction and wind speed data for 2005-2007 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. Figures 20 and 21 identify 24-hour $PM_{2.5}$ values by color; days exceeding 35 ug/m^3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figures 20 and 21 show pollution roses for the Philadelphia and Camden Counties.

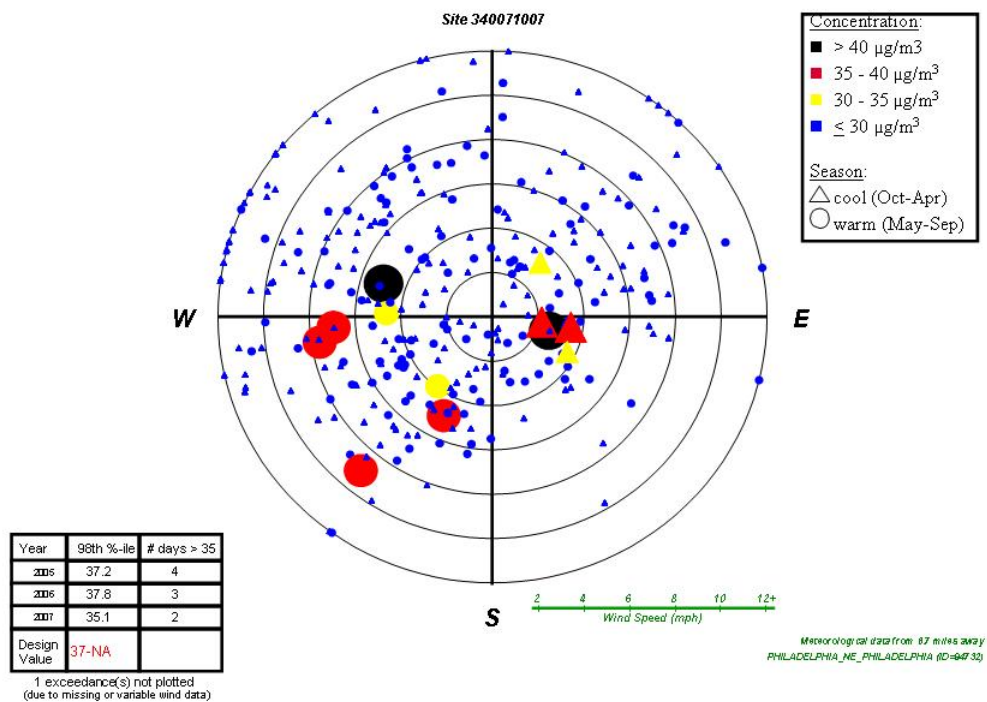Philadelphia-Wilmington, PA-NJ-DE [Camden County, NJ]
Pollution Rose, 2005-2007

Site 340071007

Concentration:
■ > 40 μg/m3
■ 35 - 40 μg/m³
■ 30 - 35 μg/m³
■ ≤ 30 μg/m³

Season:
△ cool (Oct-Apr)
○ warm (May-Sep)

W

E

S

2   4   6   8   10   12+
Wind Speed (mph)

Year	98th %-ile	# days > 35
2005	37.2	4
2006	37.8	3
2007	35.1	2
Design Value	37-NA	

1 exceedance(s) not plotted
(due to missing or variable wind data)

Meteorological data from 87 miles away
PHILADELPHIA_NE_PHILADELPHIA (ID=94732)

Figure 20. Pollution Rose for Camden County, NJ

Figure 21. Pollution Rose for Philadelphia County, PA

For this factor, EPA also considered each County's CES, which includes an analysis of trajectories of air masses for high PM$_{2.5}$ days, as well as pollution roses for the Philadelphia metropolitan area.

Table 18 shows the average prevailing surface wind directions for high PM$_{2.5}$ days by quadrant for representative counties with violating monitors in the Philadelphia Metropolitan area. These data show that 24-hour PM$_{2.5}$ concentrations are influenced by emissions in any direction at various times, but these data also suggest that emissions in some directions relative to the violation are more likely to contribute than emissions in other directions.

County	Prevailing Wind Direction (%)			
	NW	SW	SE	NE
Camden County, NJ	15%	46%	31%	8%
Philadelphia County, PA	24%	66%	10%	0%

Table 18. Prevailing Wind Directions for High PM$_{2.5}$ Days

EPA's analysis of meteorology shows that PM$_{2.5}$ emissions during high PM$_{2.5}$ days in 2004-2007 primarily originated and/or passed through locations from a southwesterly

direction. This is also evident upon examination of the pollution roses (see Figures 20 and 21) for the Philadelphia Metropolitan area.

Generally, the analysis of prevailing wind directions and pollution roses show that the counties that are in the New Jersey portion of the current 1997 PM$_{2.5}$ NAAQS nonattainment area for Philadelphia do not rank high for this factor. In addition, the counties outside the 1997 PM$_{2.5}$ NAAQS nonattainment area do not rank high either.

Since the prevailing wind direction is from the southwest, the New Jersey Counties rank low for this factor. Pollution roses and the prevailing wind direction did not indicate a high impact from New Jersey Counties.

Based on our analysis, this factor does not support including additional Counties in New Jersey.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high PM$_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of PM$_{2.5}$ over the Philadelphia Metropolitan area.

The Philadelphia Metropolitan area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM areas)

In evaluating the jurisdictional boundary factor, EPA gave special consideration to areas that were already designated nonattainment in 2005 for violating the 1997 fine particle standards. Analysis of chemical composition data in these areas indicates that the same components that make up most of the PM$_{2.5}$ mass in the area on an annual average basis (such as sulfate and direct PM$_{2.5}$ carbon in many eastern areas) also are key contributors to the PM$_{2.5}$ mass on days exceeding the 24-hour PM$_{2.5}$ standard. These data indicate that in many cities, the same source categories that contribute to violations of the annual standard also contribute to exceedances of the 24-hour standard.

Most areas that were originally designated nonattainment for the PM$_{2.5}$ standards still have not attained the standards. Thus, EPA has generally concluded that counties that were designated as having emissions sources contributing to fine particle concentrations which continue to exceed the 1997 standards (all areas violated the annual standard, three also violated the previous 24-hour standard) also contribute to fine particle concentrations

on the highest days. For this reason, EPA believes that for most existing nonattainment areas, the nonattainment area for the 2006 24-hour standard should be the same. Consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

In EPA's June 2007 Guidance for Area Designations for the 24-hour $PM_{2.5}$ NAAQS, EPA had indicated that we expected that the boundaries for the existing 1997 $PM_{2.5}$ nonattainment areas would have been appropriate for the boundaries of the new nonattainment areas for the 2006 $PM_{2.5}$ NAAQS. The following counties were included in the EPA Region 2 portion of the 1997 $PM_{2.5}$ NAAQS nonattainment area for the Philadelphia metropolitan area: Burlington, Camden, and Gloucester Counties. Warren, Hunterdon, Ocean, Salem, Atlantic, and Cumberland Counties in New Jersey were not included in the 1997 $PM_{2.5}$ NAAQS nonattainment area for the Philadelphia metropolitan area.

To the degree appropriate, based upon violations and contributions to violations of the ozone and PM2.5 NAAQS in a particular area, EPA believes it may be helpful for air planning purposes and for attainment of both NAAQS, for there to be some consistency between ozone and PM2.5 nonattainment area boundaries.

The major jurisdictional boundaries in the Philadelphia metropolitan nonattainment area are the State lines between New Jersey, Pennsylvania, and Delaware.

Factor 9: Level of control of emission sources

Under this factor, the existing level of control of emission sources is taken into consideration. The emissions data used by EPA in this technical analysis and provided in Table 13 (under Factor 1) represent emissions levels taking into account any control strategies implemented in the New York City area before 2005 on stationary, mobile, and area sources. Data are presented for $PM_{2.5}$ components that are directly emitted (carbonaceous $PM_{2.5}$ and crustal $PM_{2.5}$) and for pollutants which react in the atmosphere to form fine particles (e.g. SO_2, NOx, VOC, and ammonia).

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory, the most updated version of the national inventory available at the beginning of the designations process in late 2007. However, EPA recognized that for certain counties, emissions may have changed since 2005. For example, certain power plants or large sources of emissions in or near this area may have installed emission controls or otherwise significantly reduced emissions since 2005. Some States provided updated information on emissions and emission controls in their comments to EPA. EPA considered such additional information in making final designation decisions.

With regard to nearby power plants, EPA considered information about whether a specific plant installed federally enforceable emission controls by December 2008 resulting in significant emissions reductions. A control requirement is considered to be federally-enforceable if it is required by a State regulation adopted in a State implementation plan, if it is included in a federally-enforceable Title V operating permit, or if it is required by a consent decree which also requires the controls to be included in federally enforceable permit upon termination of the consent decree. In making final decisions, EPA also considered whether a facility would continue to emit pollutants which contribute to $PM_{2.5}$ exceedances even after emission controls are operational.

Since we believe that the emissions listed in Table 13 have not changed significantly since 2005, this factor does not influence heavily in our decision-making.

Conclusion

Camden, Gloucester, and Burlington Counties have been designated by EPA as nonattainment for the 2006 24-hour fine particle ($PM_{2.5}$) standard.

Camden County has a monitor that is in violation of the 24-hour $PM_{2.5}$ standard. In addition to violating the standard, the County has a high CES value; multiple point sources and population concentrated along the border of a violating county; moderate emissions in comparison to the other counties in the Philadelphia Metropolitan area; high population density, and a large number of commuters into a violating county. Camden County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Camden County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Burlington County has a high CES value; multiple point sources and population concentrated along the border of a violating county; high emissions in comparison to the other counties in the Philadelphia Metropolitan area; high VMT growth, and a large number of commuters into a violating county. Burlington County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Burlington County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Gloucester County has a high CES value; multiple point sources and population concentrated along the border of a violating county; moderate emissions in comparison to the other counties in the Philadelphia Metropolitan area; and a large number of commuters into a violating county. Gloucester County was also designated nonattainment in 2005 for violating the 1997 fine particle standards. All these factors have lead EPA to designate Gloucester County as nonattainment for the 24-hour $PM_{2.5}$ standard.

Attachment 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- PM2.5 emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at
http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.