The State of New Jersey
Department of Environmental Protection

State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Fine Particulate Matter ($PM_{2.5}$) National Ambient Air Quality Standard

$PM_{2.5}$ Attainment Demonstration
Final

March 24, 2009

Preface

New Jersey is finalizing this revision to its State Implementation Plan to demonstrate how the State's two shared multi-state nonattainment areas will come into attainment with the 1997 health-based annual fine particulate matter ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS) by their attainment date of April 5, 2010. The plan for attainment contained in this document conforms to the United States Environmental Protection Agency's (USEPA's) guidance and rulemaking with respect to $PM_{2.5}$ attainment.

Acknowledgements

The New Jersey Department of Environmental Protection (NJDEP) acknowledges the efforts and assistance of the many agencies and individuals whose contributions were instrumental in the preparation of this State Implementation Plan (SIP) revision. First, the NJDEP would like to thank the many participants of the NJDEP's Reducing Air Pollution Together (RAPT) Initiative, whose insight into the prospective control measures and their implementation was most valuable.

The NJDEP would like to acknowledge the many individuals within the New Jersey Department of Transportation, the North Jersey Transportation Planning Authority, the Delaware Valley Regional Planning Commission, the United States Environmental Protection Agency Region 2, the Connecticut Department of Environmental Protection, the New York State Department of Environmental Conservation, the Pennsylvania Department of Environmental Protection, the Delaware Department of Natural Resources and Environmental Control, the Virginia Department of Environmental Protection, the New Hampshire Department of Environmental Quality, the Maryland Department of the Environment, the University of Maryland, the Ozone Transport Commission, the Mid-Atlantic Region for Air Management Association, Mid-Atlantic/Northeast Visibility Union, the Ozone Research Center at the University of Medicine and Dentistry of New Jersey/Rutgers University, Northeast States for Coordinated Air Use Management, and the staff within the NJDEP for their assistance and guidance.

Table of Contents

List of Tables

List of Figures

List of Appendices

***Note: These appendices and attachments are only available electronically**

***Note: These appendices and attachments are only available electronically**

Acronyms and Abbreviations

$\mu g/m^3$	Micrograms per meter cubed
ACT	Alternative Control Techniques
AEL	Alternative Emission Limit
AIM	Architectural and Industrial Maintenance
ANSI	American National Standards Institute
APA	Administrative Procedures Act
APCA	Air Pollution Control Act
AQPP	Air Quality Permitting Program
AQS	Air Quality System
ASHRAE	The American Society of Heating, Refrigerating and Air-Conditioning Engineers
ATPZEV	Advanced Tech Partial Zero Emission Vehicle
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All Terrain Vehicle
BACT	Best Available Control Technology
BAM	Bureau of Air Quality Monitoring
BART	Best Available Retrofit Technology
BMPs	Best Management Practices
BPU	New Jersey Board of Public Utilities
BOTW	Beyond on the Way
CAA	Clean Air Act
CAAAC	Clean Air Act Advisory Committee
CAEPA	California Environmental Protection Agency
CAIR	Clean Air Interstate Rule
CARB	California Air Resources Board
CASAC	Clean Air Scientific Advisory Committee
CERR	Consolidated Emissions Reporting Rule
CECA	Consumer Energy Council of America
C.F.R.	Code of Federal Regulations
CM	Control Measures
CMAQ	Congestion Mitigation and Air Quality
CO	Carbon monoxide
CO_2	Carbon dioxide
CPF	Conditional Probability Function
CT	Connecticut
CTGs	Control Technique Guidelines
DAQ	Division of Air Quality
DE	Delaware
DON	Degree of Neutralization
DV	Design Value
DV_{B-I}	Average Annual Baseline Design Value
DV_{F-I}	Projected 2009 Annual Design Value
DVMT	Daily Vehicle Miles Traveled
DVRPC	Delaware Valley Regional Planning Commission

ECPA	Energy Conservation and Production Act
EGAS	Economic Growth Analysis System
EGU	Electric Generating Unit
EMP	Energy Master Plan
FCC	Fluid Catalytic Cracking
FCCU	Fluid Catalytic Cracking Unit
FGR	Flue Gas Recirculation
FIP	Federal Implementation Plan
FMVCP	Federal Motor Vehicle Control Program
FNL	Federal Direct Final Rule
Fed. Reg.	Federal Register
FRM	Federal Reference Method
FSEL	Facility-Specific Emission Limit
GACT	Generally Available Control Technology
GHG	Greenhouse Gas
GMF	Glass Manufacturing Furnace
HAP	Hazardous Air Pollutant
HC	Hydrocarbon
HDDE	Heavy Duty Diesel Engine
HDDV	Heavy Duty Diesel Vehicle
HEDD	High Electrical Demand Day
hp	Horsepower
IAQR	Interstate Air Quality Rule
ICE	Internal Combustion Engine
ICI	Industrial/Commercial/Institutional
IECC	International Energy Conservation Code
IESNA	The Illuminating Engineering Society of North America
I/M	Inspection and Maintenance
kW	Kilowatt
LAER	Lowest Achievable Emission Rate
lbs	Pounds
LDAR	Leak Detection and Repair
LEV	Low Emission Vehicle
LNB	Low NO_x Burner
MACT	Maximum Available Control Technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MARAMA	Mid-Atlantic Regional Air Management Association
MATS	Modeled Attainment Test Software
MDH	Minnesota Department of Health
MERR	Mobile Equipment Repair and Refinishing
mg/m^3	Milligrams per meter cubed
MM5	Mesoscale Meteorological Model
MMBtu	Million British Thermal Units
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization

MSW	Municipal Solid Waste
MW	Megawatt
MWC	Municipal Waste Combustor
MWRPO	Midwest Regional Planning Organization
MY	Model Year
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NACAA	National Association of Clean Air Agencies
NEI	National Emissions Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NH_3	Ammonia
NJ	New Jersey
N.J.A.C.	New Jersey Administrative Code
NJBPU	New Jersey Board of Public Utilities
NJCEP	New Jersey Clean Energy Program
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NJDOA	New Jersey Department of Agriculture
NJDOT	New Jersey Department of Transportation
NJEMP	New Jersey Energy Master Plan
NJEMS	New Jersey Environmental Management System
NJLEV	New Jersey Low Emission Vehicle
N.J.R.	New Jersey Register
N.J.S.A.	New Jersey Statutes Annotated
NJTPA	North Jersey Transportation Planning Authority
NLEV	National Low Emission Vehicle Program
NMHC	Non-methane Hydrocarbon
NMOG	Non-methane Organic Gases
NNJ/NY/CT	Northern New Jersey/New York/Connecticut
NNSR	Nonattainment New Source Review
NO	Nitric oxide
N_2O	Nitrous oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of Nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
NTE	Not-To-Exceed
NY	New York
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
OBD	On-Board Diagnostics
OH	Hydroxyl radical
ORVR	Onboard Refueling Vapor Recovery
OTAG	Ozone Transport Assessment Group
OTB	On the Books

OTC	Ozone Transport Commission
OTR	Ozone Transport Region
OTW	On the Way
PA	Pennsylvania
PAMS	Photochemical Assessment Monitoring Station
PFC	Portable Fuel Container
PM	Particulate Matter
$PM_{2.5}$	Fine Particulate Matter (particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers)
PM_{10}	Particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PMF	Positive Matrix Factorization
POTW	Publicly Owned Treatment Works
PPAQ	Post Processor of Air Quality
Pb	Lead
ppb	Parts per billion
ppm	Parts per million
ppmvd	Parts per million by volume dry basis
PSCF	Potential Source Contribution Function
PSD	Prevention of Significant Deterioration
PSE&G	Public Service Electric and Gas Company
PTE	Potential to Emit
PZEV	Partial Zero Emission Vehicle
QA/QC	Quality Assurance/Quality Control
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
RFG	Reformulated Gasoline
RFP	Reasonable Further Progress
RGGI	Regional Greenhouse Gas Initiative
ROP	Rate of Progress
RPO	Regional Planning Organization
RRF	Resource Recovery Facility
RRF	Relative Reduction Factor
RRF	Relative Response Factor
SCC	Source Classification Code
SCR	Selective Catalytic Reduction
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SJTPO	South Jersey Transportation Planning Organization
SMAT	Speciated Modeled Attainment Test
SMOKE	Sparse Matrix Operator Kernel Emissions
SNCR	Selective Non-Catalytic Reduction
SNJ/Phila.	Southern New Jersey/Philadelphia
SO_2	Sulfur Dioxide
SO_4	Sulfate
SO_x	Oxides of Sulfur

SOA	Secondary Organic Aerosol
SOTA	State of the Art
STN	Speciation Trends Network
SUV	Sport Utility Vehicle
TBD	To Be Determined
TCM	Transportation Control Measure
TDM	Travel Demand Model
TEA-21	Transportation Equity Act for the Twenty-first Century
TEOM	Tapered Element Oscillating Microbalance
TEU	Twenty-foot Equivalent Container Units
TOC	Technical Oversight Committee
tpd	Tons per day
tpy	Tons per year
TSD	Technical Support Document
UCAMPP	Urban Community Air Toxics Monitoring Project in Paterson City, New Jersey
UMD	University of Maryland
UMDNJ/ORC	University of Medicine and Dentistry of New Jersey's Ozone Research Center
USEPA	United States Environmental Protection Agency
USDOE	United States Department of Energy
USDOT	United States Department of Transportation
U.S.C.	United States Code
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
WOE	Weight of Evidence
XRF	X-Ray Fluorescence
ZEV	Zero Emission Vehicle

Fine particulate matter ($PM_{2.5}$) is a serious health problem in New Jersey. Exposure to $PM_{2.5}$ can cause a variety of health problems, such as premature mortality, decreased lung function and difficulty breathing, and asthma attacks, and other effects, such as reduced visibility, loss of biodiversity, and damage to manmade structures, sensitive forests, and farm crops, and contributes to global warming and the formation of acid rain. $PM_{2.5}$ is referred to as "primary" if it is directly emitted into the air. $PM_{2.5}$ that is formed by chemical reactions of gases in the atmosphere is referred to as "secondary" $PM_{2.5}$. These $PM_{2.5}$ precursors can include sulfur dioxide (SO_2), oxides of nitrogen (NO_x), volatile organic compounds (VOCs),[1] and ammonia.

Figure ES.1: Northern New Jersey/New York/Connecticut Nonattainment Area Annual $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors in each Associated State, 2001-2006

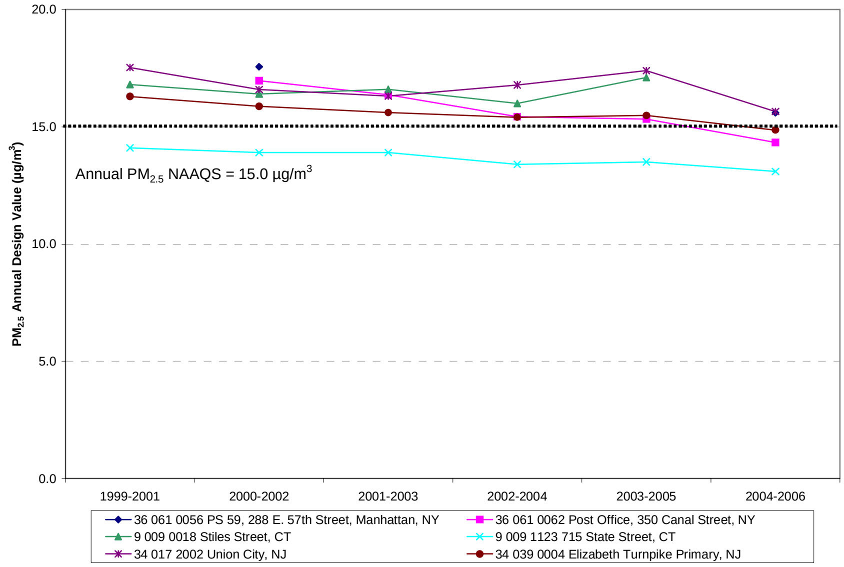
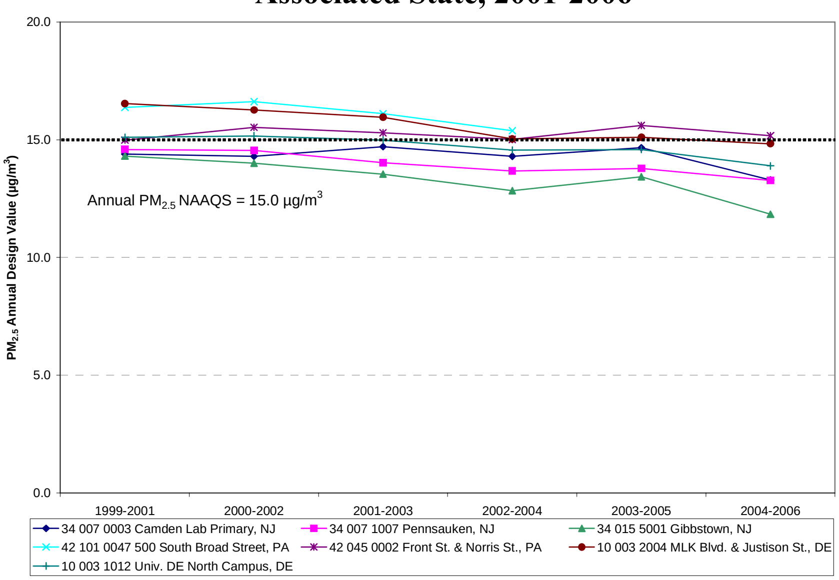


Figure ES.2: Southern New Jersey/Philadelphia Nonattainment Area Annual $PM_{2.5}$ Design Values for the Consistently Highest Monitors in each Associated State, 2001-2006



In 1997, the United States Environmental Protection Agency (USEPA) revised the national health-based standard for PM, establishing new health-based standards for $PM_{2.5}$ that were more protective of human health and welfare. Figures ES.1 and ES.2 show that New Jersey and its associated multi-state nonattainment areas are close to meeting the 1997 annual $PM_{2.5}$ standard even with its highest monitors. These figures

[1] According to the USEPA, the VOC policy in the implementation rule for $PM_{2.5}$ addresses volatile (the lightest organic molecules with fewer than 6 carbon atoms) and semivolatile (the intermediate organic molecules with 7 to 24 carbon atoms) organic compounds (72 Fed. Reg. 20592 (April 25, 2007)).

demonstrate that New Jersey and the multi-state nonattainment areas are on the right path toward cleaner air but still face the challenge of meeting the 1997 annual $PM_{2.5}$ standard.

Figure ES.3: Daily $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors in each Associated State in the Northern New Jersey/New York/Connecticut Area, 2001-2006

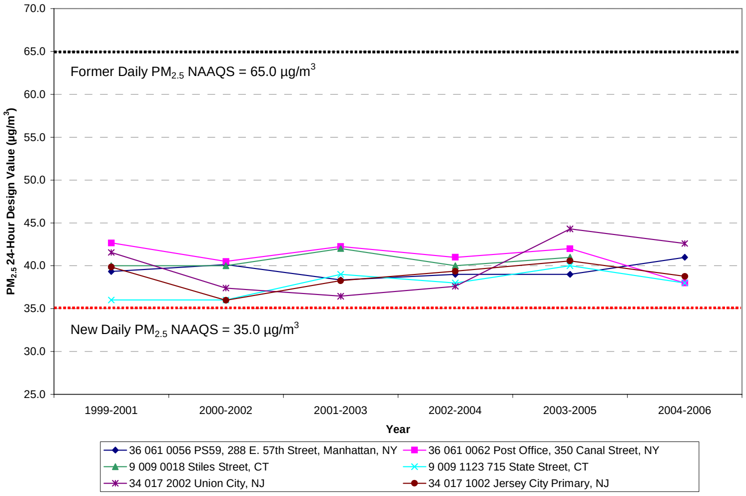
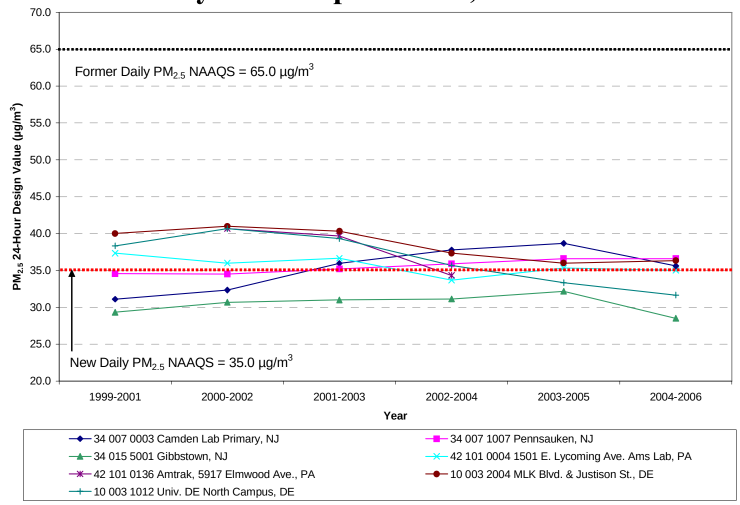


Figure ES.4: Daily $PM_{2.5}$ Design Values for the Consistently Highest Monitors in each Associated State in the Southern New Jersey/Philadelphia Area, 2001-2006

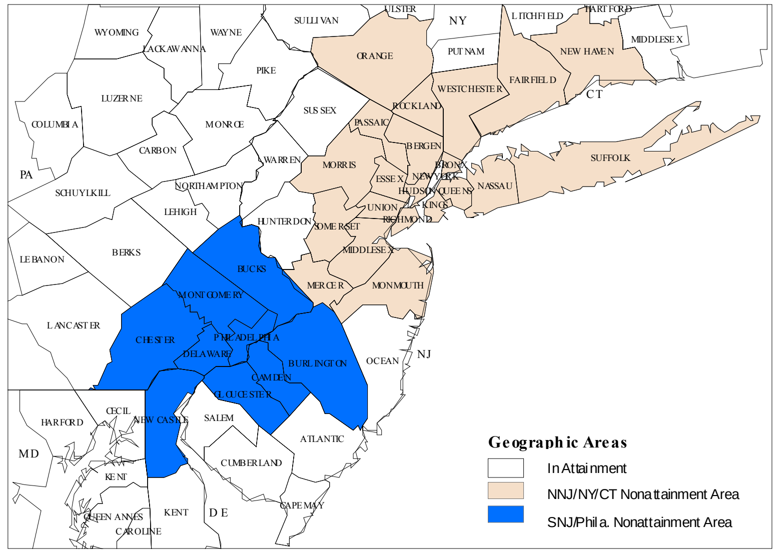


Although New Jersey and the other states that share New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas have always met the 1997 daily $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$, and the levels continue to decrease since 2001, New Jersey and the other states still face the challenge of meeting the new 2006 daily $PM_{2.5}$ standard of 35 $\mu g/m^3$, as seen by the monitoring trends at the consistently highest monitors in each nonattainment area shown in Figures ES.3 and ES.4. This State Implementation Plan (SIP) revision will simultaneously help the State meet a number of other particulate matter (PM)-related goals that compliment the efforts to not only attain the 1997 annual $PM_{2.5}$ national ambient air quality standards (NAAQS) by 2010 but improve air quality beyond these standards. These other goals include:

- Reducing Greenhouse Gas emissions in an effort to help New Jersey meet its obligations under the State's Global Warming Response Act;
- Continuing to reduce $PM_{2.5}$ emissions in an effort to meet the new 2006 daily $PM_{2.5}$ standard of 35 $\mu g/m^3$ and the State's internal annual goal of 12 $\mu g/m^3$;
- Supporting the State's efforts to meet the commitments in its 8-hour ozone attainment demonstration SIP, submitted to the United States Environmental Protection Agency (USEPA) in October 2007;
- Continuing the State's on-going efforts to reduce air toxic emissions throughout New Jersey;
- The submittal of a Regional Haze SIP to establish reasonable progress goals to address visibility in the State's only Class I area; and,
- Supporting the State's overarching Environmental Justice initiatives.

For the 1997 $PM_{2.5}$ standards, New Jersey is part of two multi-state nonattainment areas. Figure ES.5 shows New Jersey's two 1997 $PM_{2.5}$ multi-state nonattainment areas. Both of New Jersey's associated $PM_{2.5}$ nonattainment areas have an attainment date of April 5, 2010, requiring that their attainment demonstrations be submitted to the USEPA by April 5, 2008. The core of this SIP revision is New Jersey's demonstration that its two multi-state $PM_{2.5}$ nonattainment areas will attain the $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) by April 5, 2010. The remainder of the SIP revision addresses the other mandatory SIP elements for $PM_{2.5}$.

<u>Figure ES.5</u>: New Jersey-Associated 1997 $PM_{2.5}$ Nonattainment Areas



Specifically, the primary components of the SIP revision include:

<u>Attainment Demonstration</u>:

New Jersey and the other states that share New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas have always met and are in attainment with the 1997 daily $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$. According to the USEPA's modeling guidance,[2] since these levels are well below the standard and have continued to improve since 2001, the modeled attainment test for the 1997 daily $PM_{2.5}$ standard is not needed nor is included in this attainment demonstration. This SIP revision demonstrates that the two multi-state nonattainment areas for the 1997 $PM_{2.5}$ NAAQS associated with New Jersey will attain the annual health-based standard of 15.0 $\mu g/m^3$ by the required April 5, 2010 attainment date. The core of this attainment demonstration is the photochemical air quality simulation modeling relied upon for the State's 8-hour ozone attainment demonstration.[3] This ozone season (May 1 – September 30) photochemical modeling was supplemented by additional months of air quality modeling to predict attainment of

[2] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, pg. 56.

[3] NJDEP. State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard: 8-Hour Ozone Attainment Demonstration, Final. New Jersey Department of Environmental Protection, October 29, 2007.

the 1997 annual $PM_{2.5}$ NAAQS. This modeling is dependent upon the implementation of numerous additional control measures, referred to as Beyond on the Way (BOTW) measures, prior to 2009. Since this attainment demonstration will show attainment of the $PM_{2.5}$ standard within five years of the date of designation, the State is not required to submit a separate Reasonable Further Progress Plan.[4]

This modeling demonstration shows that all but one of the monitors in the two multi-state $PM_{2.5}$ nonattainment areas will be in attainment of the 1997 annual standard by April of 2010. Furthermore, the attainment demonstration projects that the one outstanding monitor in New York City will be within the Weight of Evidence (WOE) range as defined by the USEPA,[5] and provides additional analyses that show that the air quality is projected to attain the 1997 annual $PM_{2.5}$ NAAQS in New York City. Therefore, this attainment demonstration provides additional support that the outstanding New York City monitor, as well as the other monitors in both nonattainment areas, will attain the 1997 annual $PM_{2.5}$ standard by their required attainment date. These additional WOE analyses include:

- Ambient monitoring trends and emission inventory analyses;
- Additional control measures (with quantifiable and non-quantifiable benefits) not included in the attainment demonstration modeling that deliver air quality benefits; and,
- A discussion of the contribution of transport to nonattainment.

Although this attainment demonstration clearly shows that both of the multi-state nonattainment areas associated with New Jersey will attain the 1997 annual health standard of 15.0 $\mu g/m^3$, it does not show that the air quality at all the New Jersey monitors will meet New Jersey's internal annual $PM_{2.5}$ health-based goal of 12 $\mu g/m^3$ by the April 5, 2010 attainment date. Also, although all New Jersey's monitors currently, and will continue to, meet the 1997 24-hour health-based $PM_{2.5}$ standard of 65 $\mu g/m^3$, almost half of New Jersey's monitors are exceeding the 2006 24-hour health-based $PM_{2.5}$ standard of 35 $\mu g/m^3$. In order to meet New Jersey's internal annual $PM_{2.5}$ goal of 12 $\mu g/m^3$ as soon as possible and the 2006 24-hour $PM_{2.5}$ standard by April 2015, improvements in air quality are still needed. New Jersey is required to submit a SIP for the 2006 24-hour $PM_{2.5}$ standard three years after the effective date of designations. Currently, the USEPA is on track for an expected effective designation date of April 2009. The SIPs would then be due April 2012 (tentative and subject to change).

[4] 72 <u>Fed.</u> <u>Reg.</u> 20666 (April 25, 2007).
[5] The USEPA defines the WOE range for $PM_{2.5}$ as between 14.5 and 15.5 $\mu g/m^3$. See the USEPA Modeling Guidance for more information about WOE (USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.).

Analyses of Reasonable Measures:

42 U.S.C. § 7502(c)(1) (Section 172(c)(1) of the Clean Air Act) requires states with nonattainment areas to submit SIPs implementing all reasonably available control measures (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology, as expeditiously as practicable. In order to satisfy this requirement, New Jersey conducted two separate control measure analyses; a Reasonably Available Control Technology (RACT) analysis of emission control technologies for major stationary sources and a Reasonably Available Control Measures (RACM) analysis of emission control technologies from all other sources (mobile and area sources).

New Jersey's $PM_{2.5}$ RACT analysis demonstrates that reductions of direct $PM_{2.5}$ emissions and its precursors, SO_2 and NO_x, from certain major stationary source categories are reasonable. New Jersey also intends to implement a long-term regional strategy to reduce the sulfur content of fuel oil consistent with the Mid-Atlantic/Northeast Visibility Union (MANE-VU) statement.[6]

RACM measures, either alone or in combination, must advance the attainment date by at least one year. Following the USEPA's criteria, this SIP revision provides both a RACM and a RACT analysis for direct $PM_{2.5}$ and SO_2. The analyses completed for NO_x were submitted to the USEPA as part of the State's 8-hour ozone SIP submitted in 2007[7] and are included as attachments to this SIP revision. While New Jersey's RACM analysis did identify several "reasonable" measures, implementation of those measures would not advance the nonattainment areas' attainment date by one year, to April 5, 2009 (which would require demonstration of attainment by 2008). However, several of the measures identified as part of this analysis are being proposed for implementation by either New Jersey or the federal government to ensure the protection of public health.

Contingency Plans:

Pursuant to 42 U.S.C. §§ 7502(c)(9) and 7511a(c)(9), New Jersey developed contingency plans that in the event that New Jersey fails to attain the 1997 annual $PM_{2.5}$ NAAQS by April 5, 2010, control measures will be implemented to ensure attainment of the NAAQS. Each contingency plan must provide for actions to reduce one (1) year of the projected emission reductions from the 2002 base year to the attainment year. The USEPA does not require a separate Reasonable Further Progress (RFP) submittal for areas with 2010 attainment dates and a demonstration that shows attainment (72 Fed. Reg. 20633 (April 25, 2007). Thus, New Jersey does not need to submit a separate contingency plan related to RFP due to its submittal of an attainment demonstration that satisfies the 2010

[6] MANE-VU. Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Concerning a Course of Action within MANE-VU toward Assuring Reasonable Progress. Adopted June 20, 2007.
[7] NJDEP. State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard: 8-Hour Ozone Attainment Demonstration, Final. New Jersey Department of Environmental Protection, October 29, 2007.

deadline. To meet the 2009 attainment contingency milestone, New Jersey relies on those additional measures that were not included in the attainment demonstration modeling, but will result in emission reductions in 2009 and beyond.

Conformity:

The SIP revision addresses transportation conformity requirements for the 1997 annual $PM_{2.5}$ NAAQS. New Jersey establishes onroad vehicle emission budgets for use by the Metropolitan Planning Organizations. Each of the two Metropolitan Planning Organizations that have planning areas that include counties that are located within nonattainment areas[8] must meet these budgets (once they are approved by the USEPA) in order to ensure that their plans and programs are in conformance with the SIP.

New Source Review (NSR):

With respect to the $PM_{2.5}$ standard, New Jersey has both attainment and nonattainment areas throughout the State, necessitating both a Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR) program with respect to this pollutant. The USEPA finalized its implementation rule for the 1997 $PM_{2.5}$ NAAQS on April 25, 2007[9] No final $PM_{2.5}$ requirements for the NSR program were included. The USEPA issued a portion of the NNSR rule for $PM_{2.5}$ on May 16, 2008.[10]

Prior to the implementation of that rule, the USEPA issued interim guidance[11,12] calling for use of coarse particulate matter (PM_{10}) as a surrogate for $PM_{2.5}$ in the PSD and NNSR programs until NSR rules were finalized. However, because of the lack of NSR guidance, PM_{10} was used as a surrogate in both attainment and nonattainment areas. Under the surrogate approach, compliance with applicable requirements for PM_{10} was assumed to satisfy $PM_{2.5}$ requirements. Between July 15, 2008 and the effective date of New Jersey's NSR rules for $PM_{2.5}$ (expected in 2011), the USEPA's Appendix S (40 C.F.R. pt. 51) applies.

The $PM_{2.5}$ NSR rule allows up to three years for states to revise their regulations and SIP. New Jersey expects the three year clock to be triggered once the USEPA adopts the remaining components of its $PM_{2.5}$ NSR implementation rules, which are expected by the summer of 2009. The NJDEP expects to develop NNSR rule strategies in 2009, propose a NNSR rule revision in 2010, and adopt a revised NSR rule in 2011.

---

[8] The two Metropolitan Planning Areas affected are the North Jersey Transportation Planning Authority (NJTPA) and the Delaware Valley Regional Planning Commission (DVRPC).
[9] 72 Fed. Reg. 20586-667 (April 25, 2007).
[10] 73 Fed. Reg. 28321-350 (May 16, 2008).
[11] USEPA Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, to Regional Air Directors, "Implementation of New Source Review Requirements in PM-2.5 Nonattainment Areas," April 5, 2005.
[12] USEPA Memorandum from John S. Seitz, Director, Office of Air Quality Planning and Standards, to Regional Air Directors, "Interim Implementation of New Source Review for PM2.5," October 23, 1997.

The NJDEP also expects to adopt New Jersey specific PSD rules in the same timeframe. Currently, NJDEP implements most of the Federal PSD rules under a delegation agreement and will continue to do so until New Jersey PSD rules are effective.

<u>Other Components of the SIP Revision</u>:

- Background and introductory information on direct $PM_{2.5}$ and its precursors;
- How New Jersey's $PM_{2.5}$ initiatives support the State's other PM-related air quality challenges;
- A summary of $PM_{2.5}$ ambient air quality and inventory trends data for New Jersey and its associated multi-state nonattainment areas;
- Detailed descriptions of all the control measures used throughout the SIP revision;
- A reaffirmation of New Jersey's actions and commitments with respect to transported emissions, as required by Section 110 (a)(2)(D)(i) of the Clean Air Act (and commonly referred to as the transport SIP requirement); and,
- A summary of all New Jersey's commitments and requests of the USEPA.

1.0 INTRODUCTION AND BACKGROUND

The primary purpose of this state implementation plan (SIP) revision is to demonstrate that New Jersey and its associated multi-state nonattainment areas will attain the 1997 fine particulate matter ($PM_{2.5}$) national ambient air quality standards (NAAQS) by April 5, 2010. While New Jersey plans to fulfill its obligations under the Federal Clean Air Act and the State's Air Pollution Control Act with respect to both the 1997 and 2006 $PM_{2.5}$ standards (see discussions of these standards in this Section 1.1), the State faces several other air quality related challenges, including meeting other criteria pollutant NAAQS (such as 8-hour ozone), reducing diesel and other air toxic emissions, and improving visibility, that are interrelated with the $PM_{2.5}$ initiative. In determining air quality management plans, the State must not only meet federal and state requirements, it must also address the local needs and requirements. These needs and requirements are embodied in the State's Energy Master Plan, New Jersey Department of Environmental Protection (NJDEP) Action Plan, the State Development/Redevelopment Plan, and the State's Environmental Justice Plan, to name a few. See Section 1.3 for more information on how this $PM_{2.5}$ SIP revision helps meet these air quality related challenges. Significant progress has been made in improving New Jersey's air quality. Even more needs to be done to meet all of these requirements, and it is important that the State coordinate to work toward consistency in implementing the most efficient and effective emission reduction strategies. The remainder of this chapter includes:

- An explanation of $PM_{2.5}$ and its associated health standards
- A discussion of the health and welfare impacts associated with $PM_{2.5}$ and its likely precursors
- A discussion of how this SIP revision relates to the State's other air quality goals

1.1 Fine Particulate Matter and its Associated Health Standards

Fine particulate matter in the atmosphere is composed of a complex mixture of particles: sulfate, nitrate, and ammonium particles; particle-bound water; black carbon (also known as elemental carbon); a great variety of organic compounds (or volatile organic compounds (VOCs)); and crustal material. Fine particulate matter, also known as $PM_{2.5}$, is referred to as "primary" if it is directly emitted into the air as a solid or liquid particle and its chemical form is stable. $PM_{2.5}$ formed near its source by condensation processes in the atmosphere is also considered primary $PM_{2.5}$. Primary $PM_{2.5}$ includes soot from diesel engines, a wide variety of organic compounds condensed from incomplete combustion, and compounds such as arsenic, selenium, and zinc that condense from vapor formed during combustion or smelting. The concentration of primary $PM_{2.5}$ in the air depends on source emission rates, transport and dispersion, and removal rate from the atmosphere.

$PM_{2.5}$ that is formed by chemical reactions of gases in the atmosphere is referred to as "secondary" $PM_{2.5}$. These reactions form condensable matter that either form new particles or condense onto other particles in the air. Most of the sulfate and nitrate and a portion of the organic particles in the atmosphere are formed by such chemical reactions. As such, sulfur dioxide (SO_2), oxides of nitrogen (NO_x), some VOC,[13] and ammonia can be considered $PM_{2.5}$ precursors.[14] Secondary $PM_{2.5}$ formation depends on numerous factors including the concentrations of precursors; the concentrations of other gaseous reactive species such as ozone, hydroxyl radicals, peroxy radicals, or hydrogen peroxide; atmospheric conditions including solar radiation and relative humidity; and the interactions of the precursors and pre-existing particles with cloud or fog droplets or with the liquid film on solid particles. The United States Environmental Protection Agency (USEPA) recognizes that NO_x, SO_2, VOCs, and ammonia are precursors of $PM_{2.5}$ from a scientific perspective because these pollutants can contribute to the formation of $PM_{2.5}$ in the ambient air. The USEPA has established a policy regarding $PM_{2.5}$ precursors for planning and regulatory purposes in its $PM_{2.5}$ Implementation Rule,[15] which focuses on NO_x and SO_2 in the Eastern United States. For more information on this policy, see Chapter 3. The health and welfare impacts of $PM_{2.5}$ and its precursors are described in Section 1.2 of this Chapter.

The USEPA, under the authority of the Federal Clean Air Act, identified $PM_{2.5}$ as a criteria air pollutant, and established National Ambient Air Quality Standards (NAAQS), for $PM_{2.5}$. Specifically, the Clean Air Act (42 U.S.C. § 7409(b)(1) (Section 109(b)(1)) requires the USEPA to set primary NAAQS "the attainment and maintenance of which…, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health." The Clean Air Act (42 U.S.C. § 7409(b)(2) (Section 109(b)(2)) further requires the USEPA to set secondary NAAQS "requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air." When an area does not meet the established NAAQS for a criteria pollutant, the area is subject to a formal designation process by the USEPA, which establishes the area as nonattainment for that pollutant.

1997 $PM_{2.5}$ NAAQS:

On July 18, 1997, the USEPA established two new primary NAAQS for fine particles:

- an annual $PM_{2.5}$ health-based standard of 15 micrograms per cubic meter ($\mu g/m^3$) (annual arithmetic mean); and
- a daily (24-hour) $PM_{2.5}$ health-based standard of 65 micrograms per cubic meter ($\mu g/m^3$) (24-hour average).[16,17] (This has since been revised to 35 $\mu g/m^3$).

Simultaneously, the USEPA established secondary (welfare-based) $PM_{2.5}$ standards identical to the primary standards. These standards are hereafter referred to as the 1997 $PM_{2.5}$ standards.

---

[13] According to the USEPA, high molecular weight organic compounds (typically 25 carbon atoms or more) are emitted directly as primary organic particles and exist primarily in the condensed phase at ambient temperatures. Accordingly, high molecular weight organic compounds are considered a primary $PM_{2.5}$ emission for the purposes of the $PM_{2.5}$ implementation program (72 Fed. Reg. 20592 (April 25, 2007)).

[14] 72 Fed. Reg. 20586-667 (April 25, 2007).

[15] 72 Fed. Reg. 20586-667 (April 25, 2007).

[16] 62 Fed. Reg. 38652-760 (July 18, 1997).

[17] The USEPA also revised the PM_{10} NAAQS by revising the 24-hour form of the PM_{10} standard to the 99th percentile averaged over 3 years but retaining the 24-hour PM_{10} level (i.e., 150 mg/m^3) (62 Fed. Reg. 38652 (July 18, 1997)). In 2006, the USEPA revoked the annual PM_{10} standard (71 Fed. Reg. 61144 (October 17, 2006)). New Jersey was not designated in nonattainment of the PM_{10} NAAQS and continues to meet the revised PM_{10} standards.

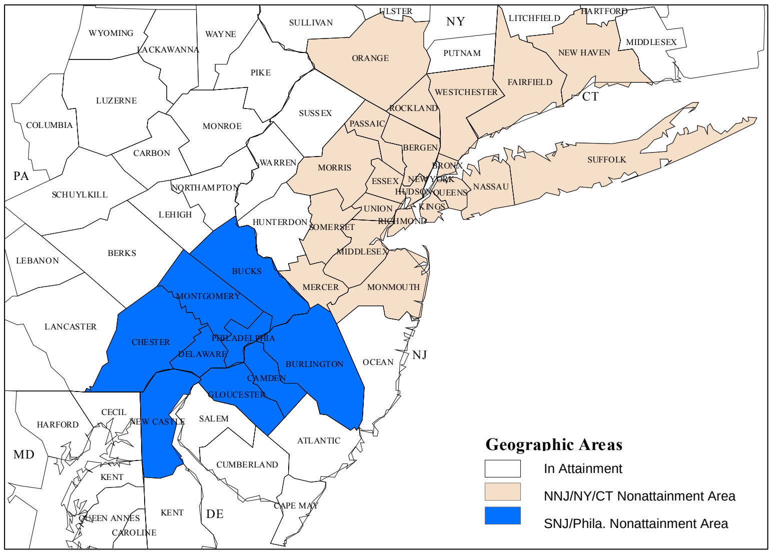
The USEPA set the $PM_{2.5}$ standards with 24-hour and annual averaging times to protect against effects from short- and long-term exposure identified by a number of published epidemiological studies.

A number of events delayed implementation of the 1997 $PM_{2.5}$ standard.[18] Specifically, the USEPA's 1997 standards were challenged by the American Trucking Association, the U.S. Chamber of Commerce, and other state and business groups. The Transportation Equity Act for the Twenty-first Century (TEA-21) revised the deadline to publish nonattainment designations in order to provide additional time to collect three years of air quality monitoring data. In February 2001, the Supreme Court upheld the USEPA's authority under the Clean Air Act to set NAAQS that protect the American public from the harmful effects of air pollution. The Supreme Court also sent the case back to the D.C. Circuit Court of Appeals to resolve several additional issues. In March 2002, the D.C. Circuit Court rejected all remaining legal challenges to the USEPA's 1997 ambient air quality standards for $PM_{2.5}$.

Clear of all legal challenges, on December 17, 2004, the USEPA finalized attainment/nonattainment designations for the 1997 $PM_{2.5}$ standards, which became effective on April 5, 2005.[19] Thirteen of New Jersey's 21 counties were designated as nonattainment for the 1997 $PM_{2.5}$ standards, and are associated with two multi-state nonattainment areas (the Northern New Jersey/New York/Connecticut (NNJ/NY/CT) $PM_{2.5}$ nonattainment area and the Southern New Jersey/Philadelphia (SNJ/Phila.) $PM_{2.5}$ nonattainment area). Figure 1.1 shows New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas.

[18] USEPA. Fact Sheet: Areas Designated Nonattainment for the Fine Particle National Air Quality Standards. United States Environmental Protection Agency, December 17, 2004, http://www.epa.gov/pmdesignations/documents/final/factsheet.htm, accessed June 28, 2007.
[19] 72 Fed. Reg. 20586-667 (April 25, 2007).

<u>Figure 1.1</u>: New Jersey-Associated 1997 $PM_{2.5}$ Nonattainment Areas



These designations triggered the Clean Air Act (CAA) requirement, 42 <u>U.S.C.</u> § 7410(a)(1) (Section 110(a)(1)), that states submit attainment demonstrations for their nonattainment areas to the USEPA by no later than three years after the promulgation of a NAAQS. However, given the delays in finalizing the implementation of the 1997 $PM_{2.5}$ standards, the USEPA provided supplemental guidance requiring states to submit attainment demonstrations for their 1997 $PM_{2.5}$ nonattainment areas to the USEPA by no later than three years from the effective date of designation (that is, April 5, 2008).[20] The primary purpose of this SIP revision is to meet that requirement for the 1997 annual $PM_{2.5}$ standard by presenting New Jersey's plan for attaining the annual $PM_{2.5}$ NAAQS by its attainment date of April 5, 2010.

<u>2006 $PM_{2.5}$ Standards</u>:

42 <u>U.S.C.</u> § 7409(d)[1] (Section 109(d)) requires the USEPA to review and, if appropriate, revise the NAAQS for each criteria air pollutant every five years. On October 16, 2006, the USEPA promulgated a revised $PM_{2.5}$ NAAQS, which became effective December 18, 2006.[21] This revised NAAQS did not result in any changes to the annual standard established in 1997 but resulted in a more stringent daily standard of 35 $\mu g/m^3$. The 2006 PM NAAQS retained the level of the annual standard of 15.0 $\mu g/m^3$. These standards are hereafter referred to as the 2006 $PM_{2.5}$ standards. Table 1.1 compares the 1997 and 2006 $PM_{2.5}$ standards.

---

[20] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.
[21] 71 <u>Fed.</u> <u>Reg.</u> 61144-233 (October 17, 2006).

Table 1.1: 1997 and 2006 $PM_{2.5}$ Standards

	1997 $PM_{2.5}$ Standards	2006 $PM_{2.5}$ Standards
Primary Annual	15 µg/m³	15 µg/m³ *
Primary Daily	65 µg/m³	35 µg/m³
Secondary Annual	15 µg/m³	15 µg/m³ *
Secondary Daily	65 µg/m³	35 µg/m³

*The form of the annual standards changed with respect to the criteria for spatial averaging.

Although fine particulate concentrations have improved since December 2004, New Jersey recommended that the annual nonattainment boundaries for the 2006 annual standard remain the same as previously designated for the 1997 annual standard since the State continued to either exceed the 2006 annual $PM_{2.5}$ standard (which remained the same as the 1997 annual $PM_{2.5}$ standard) or contribute to an exceedance of that standard in an upwind area at the time these recommendations were due (see Figure 1.1).

As with the 1997 $PM_{2.5}$ standards, the USEPA must designate areas that are not attaining the 2006 $PM_{2.5}$ standards. In accordance with 42 U.S.C. § 7407(d)(1)(A) (Section 107(d)(1)(A)), of the Clean Air Act, each state is allowed to make recommendations to the USEPA on which areas of their state should be designated nonattainment with respect to any new NAAQS. For the 2006 $PM_{2.5}$ standards, states were required to submit their attainment/nonattainment recommendations by December 18, 2007. Although fine particulate concentrations have improved since December 2004, the air quality in several areas of New Jersey does not meet the 2006 24-hour $PM_{2.5}$ NAAQS (see Chapter 2) or contribute to an exceedance of that standard in an upwind area at the time these recommendations were due (see Figure 1.1). New Jersey recommended that the nonattainment boundaries designated for the 1997 annual $PM_{2.5}$ standard also apply for the 2006 24-hour $PM_{2.5}$ standard with one addition.[22] The State requested Knowlton Township in Warren County be designated nonattainment and be associated with the Allentown-Bethlehem-Easton $PM_{2.5}$ nonattainment area in Pennsylvania (which Pennsylvania has recommended include Lehigh and Northampton counties).[23] The final daily $PM_{2.5}$ designations will be issued by the USEPA by the Spring of 2009.

As the USEPA goes through the process of officially designating these areas as nonattainment for that new standard, New Jersey need not wait for those designations to address that new standard, particularly since it is the State's obligation to meet NAAQS as expeditiously as practical to protect human health and welfare. Therefore, New Jersey considered its need to meet this additional 2006 Federal standard in the near future when developing the action plan included in this SIP revision to meet the 1997 $PM_{2.5}$ NAAQS. Hence, this SIP revision, while

[22] For more information on New Jersey's nonattainment area recommendations, see the letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 18, 2007. The letter is posted on the NJDEP's website at http://www.nj.gov/dep/baqp/pm25desig2007.pdf.
[23] PADEP. Recommendations to the U.S. EPA for 24-Hour Fine Particulate ($PM_{2.5}$) Attainment/Nonattainment Areas. Bureau of Air Quality, Pennsylvania Department of Environmental Protection, December 2007. Accessible at http://www.dep.state.pa.us/dep/deputate/airwaste/aq/attain/pm25des/2007_PM2.5_Attain-Non.pdf.

focused on achieving the annual $PM_{2.5}$ NAAQS, will also make progress toward achieving the 24-hour $PM_{2.5}$ NAAQS.

In addition to the USEPA, some states, including New Jersey, have the authority to establish air quality standards. These state standards must either be equivalent to or more stringent than those established by the USEPA. While New Jersey has not taken official steps to establish its own air quality standards for $PM_{2.5}$, the NJDEP's air quality goal for an annual $PM_{2.5}$ standard is 12 $\mu g/m^3$. A goal of 12 $\mu g/m^3$ is a 20 percent reduction from the Federal annual $PM_{2.5}$ NAAQS established in 1997. New Jersey, in commenting on the USEPA's proposal for revising the $PM_{2.5}$ standard, argued that, given the preponderance of health studies cited in the USEPA Staff Paper, peer-reviewed and supported by the Clean Air Scientific Advisory Committee (CASAC), that suggest that significant segments of the Unites States population are experiencing adverse health effects from exposures to ambient concentrations of $PM_{2.5}$, even at levels below the annual standard of 15 $\mu g/m^3$, the USEPA should act decisively on this critical public health issue by decreasing the annual $PM_{2.5}$ health standard to 12 $\mu g/m^3$.[24] The USEPA subsequently decided to retain the annual standard of 15 $\mu g/m^3$. This goal also acknowledges that the California Air Resources Board's (CARB) revised California's annual $PM_{2.5}$ standard to 12 $\mu g/m^3$ (annual mean), which is more stringent than the Federal NAAQS established in 1997, and retained in 2006.[25,26] The CARB's establishment of a more stringent annual $PM_{2.5}$ health-based standard to provide greater public health protection gives reason to re-evaluate whether or not the Federal standard of 15 $\mu g/m^3$ is protective enough, given that no threshold had been established below which there are no health effects from exposure to particulate emissions. Achieving the NJDEP's goal of 12 $\mu g/m^3$ will provide greater protection of its citizens than would be achieved at 15 $\mu g/m^3$ ambient levels. The implication of adopting such a goal requires that New Jersey take aggressive action to ensure that $PM_{2.5}$ health and welfare impacts are alleviated as soon as possible.

1.2 Health and Welfare Impacts of $PM_{2.5}$ and $PM_{2.5}$ Precursors

1.2.1 Fine Particulate Matter

The health effects associated with exposure to fine particles are significant, mainly due to the fact that particles of this size can easily reach into the deepest regions of the lungs. Significant health effects associated with fine particle exposure include:

- premature mortality;
- aggravation of respiratory and cardiovascular disease;
- decreased lung function and difficulty breathing;
- asthma attacks; and

[24] Letter dated December 16, 2005 from then NJDEP Commissioner Bradley M. Campbell to USEPA Region II Administrator Stephen L. Johnson.
[25] CAEPA. Staff Report: Public Hearing to Consider Amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. Prepared by the Staff of the Air Resources Board and the Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (CAEPA), May 3, 2002.
[26] Adopted in 2002, pursuant to the Children's Environmental Health Protection Act (Senate Bill 25, Senator Martha Escutia; Stats. 1999, Ch. 731, Sec. 3).

- serious cardiovascular problems, such as heart attacks and cardiac arrhythmia.[27,28,29]

The USEPA has estimated that attainment of the 1997 annual and daily $PM_{2.5}$ standards nationally would prolong tens of thousands of lives and prevent tens of thousands of hospital admissions each year.[30] In addition, attainment of these standards would prevent hundreds of thousands of doctor visits, absences from work and school, and respiratory illnesses in children. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children. The elderly have been shown to be particularly at risk for premature death from the effects of particulate matter. Health studies have shown that there is no clear threshold below which adverse effects are not experienced by at least certain segments of the population. Thus, some individuals particularly sensitive to fine particle exposure may be adversely affected by fine particle concentrations below those for even the revised 2006 annual and daily standards. Hence, the NJDEP intends to achieve cleaner air than the current NAAQS to increase health benefits.

Incorporating new scientific literature on premature mortality due to $PM_{2.5}$ exposure, an analysis of the relative risk of premature death in California attributed to $PM_{2.5}$ conducted by the California Air Resources Board demonstrated that 14,000 to 24,000 premature deaths (uncertainty range: 4,300 – 41,000) occur statewide each year.[31] These estimations were based upon the revised relative risk factor, a 10 percent increase in premature death per 10 mg/m^3 increase in $PM_{2.5}$ exposures (uncertainty interval: 3 to 20 percent), and the lowest threshold of ambient $PM_{2.5}$ which is associated with premature death, 7 mg/m^3 in a general population.

A particular concern for New Jersey with respect to $PM_{2.5}$ is its ability to aggravate asthma. The NJDEP has estimated that approximately 1,900 deaths and 53,000 cases of asthma in the State each year are attributable to exceedances of the $PM_{2.5}$ annual standard, with associated medical costs of approximately $15 billion.[32] According to the last Federal estimate (1998),[33] more than 600,000 New Jersey residents have asthma. In 2001, asthma sufferers in New Jersey accounted for nearly 14,000 hospital admissions, roughly one out of every one hundred hospitalizations. In 1999, the deaths of 80 New Jersey residents were attributed to asthma. The Centers for Disease Control and Prevention estimate that 4.5 million children in the United States have asthma. According to the Pediatric/Adult Asthma Coalition of New Jersey (Coalition), "approximately

---

[27] 62 Fed. Reg. 38652-690 (July 18, 1997).
[28] 72 Fed. Reg. 20586-87 (April 25, 2007).
[29] USEPA. Air Quality Criteria for Particulate Matter. United States Environmental Protection Agency, Research Triangle Park, North Carolina: National Center for Environmental Assessment—RTP, Office of Research and Development; report no. EPA/600/P–99/002aF and EPA/600/P–99/002bF. October 2004.
[30] 62 Fed. Reg. 38652-690 (July 18, 1997).
[31] CARB. Methodology for Estimating Premature Deaths Associated with Long-term Exposures to Fine Airborne Particulate Matter in California, Draft Staff Report. California Air Resources Board, May 22, 2008. Available at http://www.arb.ca.gov/research/health/pm-mort/pm-mortdraft.pdf.
[32] State of New Jersey. Diesel Retrofit Program Rule Proposal. New Jersey Department of Environmental Protection, Office of Air Quality Management, Motor Vehicle Commission, and Department of the Treasury, December 18, 2006. Proposal Number: PRN 2006-409, DEP Docket Number: 22-06-11/559. Available at http://www.nj.gov/dep/aqm/Diesel%20Retrofit%20Program%20Rule%20Proposal.pdf.
[33] NJDHSS. Asthma in New Jersey. New Jersey Department of Health and Senior Services, February 2003.

10-13% of New Jersey's students have asthma."[34] According to the New Jersey Department of Health and Senior Services, "children are more likely to be hospitalized with asthma than adults."[35] The risk of death from asthma increases considerably with age, with the 65-plus population having the highest rates.[36]

In addition to asthma, a recent report by the New Jersey Clean Air Council states that only smoking and obesity outrank particulate matter in the estimated number of premature deaths caused every year.[37] These statistics show that asthma is a significant health risk in the State but there are other serious health impacts from $PM_{2.5}$.

Although fine particulate matter generated from all sources can cause serious health impacts, particulate matter generated from diesel combustion is particularly harmful. The concern over diesel particulate matter is two-fold. First, while diesel engines collectively are large sources of NO_x and direct fine particle emissions, they also emit significant amounts of other toxic air pollutants.[38] Diesel exhaust contains many of the hazardous air pollutants that are prevalent in urban areas, such as acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde, and polycyclic aromatic hydrocarbons. The USEPA has recently identified diesel particulate matter and diesel exhaust organic gases as a Mobile Source Air Toxic and has classified diesel exhaust as a likely human carcinogen when inhaled at environmental exposures. The State of California also identified diesel particulate matter as a toxic air contaminant in 1998, based on its potential carcinogenicity and other health impacts.[39] Therefore, in addition to the premature mortality associated with the inhalation of fine particulate matter in general, diesel exhaust has an added cancer risk that makes exposure to it more detrimental to human health. In New Jersey, exposure to diesel PM poses the most cancer risk statewide by an order of magnitude; formaldehyde, which is also emitted by engines, poses the next most cancer risk.[40]

[34] State of New Jersey. Diesel Retrofit Program Rule Proposal. New Jersey Department of Environmental Protection, Office of Air Quality Management, Motor Vehicle Commission, and Department of the Treasury, December 18, 2006. Proposal Number: PRN 2006-409, DEP Docket Number: 22-06-11/559. Available at http://www.nj.gov/dep/aqm/Diesel%20Retrofit%20Program%20Rule%20Proposal.pdf.

[35] NJDHSS. Asthma in New Jersey Annual Update 2005. New Jersey Department of Health and Senior Services, September 2005. Available at http://www.state.nj.us/health/fhs/asthma/documents/asthma_update2005.pdf.

[36] State of New Jersey. Diesel Retrofit Program Rule Proposal. New Jersey Department of Environmental Protection, Office of Air Quality Management, Motor Vehicle Commission, and Department of the Treasury, December 18, 2006. Proposal Number: PRN 2006-409, DEP Docket Number: 22-06-11/559. Available at http://www.nj.gov/dep/aqm/Diesel%20Retrofit%20Program%20Rule%20Proposal.pdf.

[37] Clean Air Council of New Jersey. Public Hearing – Fine Particulate Matter in the Atmosphere: Health Impacts in NJ & Need for Control Measures, April 2004. Available at http://www.state.nj.us/dep/cleanair.

[38] USEPA. Health Assessment Document for Diesel Engine Exhaust. United States Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC, EPA/600/8-90/057F, May 1, 2002.

[39] CARB. Summary of Adverse Impacts of Diesel Particulate Matter. Air Resources Board, California Environmental Protection Agency, July 2005. http://www.arb.ca.gov/research/diesel/diesel_health_effects_summary_7-5-05-1.pdf, accessed December 19, 2007.

[40] NJDEP. New Jersey Statewide Average 1999 NATA Modeled Air Concentrations Compared to Health Benchmarks. New Jersey Department of Environmental Protection, November 21, 2006, http://www.nj.gov/dep/airtoxics/nj.htm, accessed January 18, 2008.

Second, the size of diesel particulate matter may add to its health impacts. Almost all of the particles produced by diesel exhaust are fine particulate matter (between 0 and 2.5 $\mu g/m^3$), much in the ultra-fine range (that is, particles with an aerodynamic diameter of less than 0.1 micrometer). Since both fine and ultra-fine particles are respirable, many of these particles are not captured by the human respiratory system's defense mechanisms and these small particles enter deeply into the lung. Studies have shown that ultra-fine particles are so small that they are capable of penetrating the lungs and other tissue all the way to a cellular level, where they may induce structural damage in the body's core building blocks.

In addition to health effects, particulate matter is the major cause of reduced visibility in many parts of the United States. Visibility impairment caused by the collection of air pollutants (primarily $PM_{2.5}$) emitted by sources over a broad geographic area is known as regional haze.[41] See Section 1.3.5 for more information on visibility and regional haze initiatives. Other welfare impacts from direct $PM_{2.5}$ pollution include harmful effects to vegetation and ecosystems (e.g., sedimentation and loss of biodiversity), contributions to the formation of acid rain (e.g., making soils, lakes and streams more acidic), aesthetic damage to manmade structures, and damages to sensitive forests and farm crops.[42] Excessive fine particles in the air also alter the amount of radiation that penetrates the Earth's atmosphere, affecting the Earth's climate.[43] Of special concern, black carbon increases global warming.

1.2.2 Sulfur Dioxide (SO_2)

Sulfur dioxide, or SO_2, contributes to the formation of fine particulates. SO_2 belongs to the family of sulfur oxide gases (SO_x). Sulfur is prevalent in raw materials such as crude oil, coal, and metal ores. SO_x gases are formed when fuels containing sulfur, such as coal and oil, are burned, when gasoline is extracted from oil, or when metals are extracted from ore. The sulfur is then oxidized and emitted as SO_x gases. SO_2 can be oxidized to form sulfuric acid in three ways: by the hydroxyl radical (OH) to form sulfuric acid, by dissolving in cloud water and oxidized by various oxidants to form sulfuric acid, or by the reactions that take place in the particle-bound water in the aerosol particles.[44] Sulfate can exist in particles as sulfuric acid, and sulfate is an important contributor to increased concentrations of $PM_{2.5}$ around the country.

SO_2 dissolves in water vapor to form acid and interacts with other gases and particles in the air to form sulfate particles and other products that can be harmful to people and the environment. SO_2 and the pollutants formed from SO_2, such as sulfate particles, can be transported over long distances and deposited far from the point of origin, contributing to air quality problems far beyond the areas where they were emitted. The associated health effects with exposure to SO_2 include increased respiratory disease, aggravated existing heart disease, and temporary breathing

---

[41] 64 Fed. Reg. 35714 (July 1, 1999).
[42] USEPA. Health and Environment, Particulate Matter. United States Environmental Protection Agency, http://www.epa.gov/air/particlepollution/health.html, accessed November 8, 2007.
[43] 71 Fed. Reg. 61203 (October 17, 2006).
[44] 72 Fed. Reg. 20594-20595 (April 25, 2007).

difficulty, particularly for people with asthma.[45] The elderly and children are at highest risk of health effects from exposure to SO_2.

With respect to environmental effects, SO_2 harms vegetation and ecosystems, contributes to the formation of acid rain (e.g., making soils, lakes, and streams more acidic), and damages trees, crops, buildings, and monuments.

1.2.3 Oxides of Nitrogen (NO_x)

NO_x is a gas-phase precursor that contributes to the formation of $PM_{2.5}$. Oxides of nitrogen consist of a mixture of gases comprised mostly of nitric oxide (NO) and nitrogen dioxide (NO_2).[46] These gases are emitted from the exhaust of motor vehicles, the burning of coal, oil or natural gas, and during industrial processes such as welding, electroplating, and dynamite blasting. Although most NO_x is emitted as NO, it is readily converted to NO_2 in the atmosphere. The primary processes developed in the past century that convert unreactive nitrogen to reactive nitrogen are the manufacture of fertilizer, the combustion of fossil fuels, and the planting of nitrogen-harnessing croplands.[47] The oxidation of atmospheric N_2 during combustion is the source of most of the atmospheric NO_x (i.e., NO, nitrous oxide (N_2O), and NO_2).[48] NO_2 is a reddish-brown, highly reactive gas that is formed in the air through the oxidation of NO. In the troposphere, near the Earth's surface, NO_2, provides the primary source of the oxygen atoms required for ozone formation.

In addition to contributing to the formation of $PM_{2.5}$ and ozone, NO_x is also harmful if directly inhaled. Long-term exposure to elevated levels of NO_x causes damage to the mechanisms that protect the human respiratory tract and can increase a person's susceptibility to, and the severity of, respiratory infections and asthma.[49] Long-term exposure to high levels of NO_x can cause chronic lung disease and may also affect sensory perception. Other health effects of exposure to NO_x include shortness of breath and chest pains.

In addition to harmful health impacts, NO_x is also harmful to the environment. It combines with other pollutants to form ozone and acid rain that harms vegetation and ecosystems.[50] Acid rain causes deterioration of cars, buildings, and historical monuments and causes lakes and streams to become acidic and unsuitable for many fish. NO_x contributes to nutrient overload that impairs

---

[45] USEPA. Health and Environmental Impacts of SO_2. United States Environmental Protection Agency, http://www.epa.gov/oar/urbanair/so2/hlth1.html, accessed November 9, 2007.
[46] NJDEP. 2005 Nitrogen Dioxide Summary, 2005 Air Quality Monitoring Report. New Jersey Department of Environmental Protection, Bureau of Air Monitoring, 2006.
[47] Aber et al. Nitrogen pollution: sources and consequences in the U.S. Northeast. High Beam Encyclopedia from Environment, September 1, 2003. Accessed at http://www.encyclopedia.com/doc/1G1-107217746.html.
[48] Hemond, H. F. and Fechner-Levy, E. J. Chemical Fate and Transport in the Environment, Second Edition. Academic Press: New York, 2000, pg. 292.
[49] Queensland Government EPA. Nitrogen Oxides. Queensland Government Environmental Protection Agency, Queensland Parks and Wildlife Service, December 31, 2006, http://www.epa.qld.gov.au/environmental_management/air/air_quality_monitoring/air_pollutants/nitrogen_oxides/, accessed January 2, 2007.
[50] USEPA. Health and Environmental Impacts of NO_x. United States Environmental Protection Agency, http://www.epa.gov/air/urbanair/nox/hlth.html, accessed November 8, 2007.

water quality, leads to oxygen depletion, and reduces fish and shellfish populations. It also contributes to global warming.

1.2.4 Other $PM_{2.5}$ Precursors – Volatile Organic Compounds and Ammonia

On April 25, 2007, the USEPA established a policy for which $PM_{2.5}$ precursors needed to be considered for $PM_{2.5}$ planning and regulatory purposes at this time. This policy specifically exempts volatile organic compounds (VOCs) and ammonia (NH_3) from consideration as precursors unless a state can make a compelling argument for including either of these precursors. For more information on the USEPA's precursor policy, see Chapter 3. Even though New Jersey and the states that share its associated nonattainment areas agree with the USEPA's precursor policy regarding VOC and ammonia, the NJDEP is providing a discussion of the health effects associated with VOCs and ammonia.

The NJDEP is already regulating VOC emissions as a precursor to ozone. Additionally, high molecular weight organic compounds (typically 25 carbon atoms or more) are emitted directly as primary organic particles and exist primarily in the condensed phase at ambient temperatures. Accordingly, high molecular weight organic compounds are not volatile in nature, and are regulated as primary $PM_{2.5}$ emissions for the purposes of the $PM_{2.5}$ implementation program. The low molecular weight organic compounds are VOCs, as they are chemicals or mixtures of chemicals that evaporate easily at room temperature. They include compounds known as hydrocarbons, which only contain carbon and hydrogen, and carbonyls, which contain a carbon atom double-bonded to an oxygen atom. VOCs can be found in both indoor and outdoor environments, and some VOCs are more harmful than others. Sources of VOCs include vehicle and industrial exhaust; the evaporation of gasoline; and a variety of consumer products from paints, solvents, and adhesives to carpeting, deodorants, cosmetics, hair products, and cleaning fluids; as well as biogenic (naturally occurring) emissions.

In addition to contributing to the formation of $PM_{2.5}$ and ozone, many VOCs are also considered air toxics and are harmful if directly inhaled, depending upon the concentration. Long-term exposure to low concentrations of some VOCs includes elevation of serum enzyme levels, mild cellular changes, and changes in lipid metabolism. At higher concentrations, breathing VOCs may cause irritation of the respiratory tract.[51] Acute effects include eye irritation/watering, nose irritation, throat irritation, headaches, nausea/vomiting, dizziness and asthma exacerbation. Chronic effects include cancer, liver damage, kidney damage and central nervous system damage.[52] In addition, some VOCs are substances that cause serious health effects, including

---

[51] CDPHE. Volatile Organic Compounds Health Effects Fact Sheet. Colorado Department of Public Health and Environment, November 2000, http://www.cdphe.state.co.us/hm/schlage/vocfactsheet.pdf.
[52] MDH. Volatile Organic Compounds – VOCs Fact Sheet. Minnesota Department of Health (MDH), http://www.health.state.mn.us/divs/eh/indoorair/voc/, September 2005.

cancer, birth defects, nervous system problems and death due to massive accidental releases.[53] See Section 1.3 for more information about New Jersey initiatives to address air toxics.

VOCs also negatively impact the environment. The most significant environmental impact of VOCs is their contribution to the formation of ozone. VOCs can also form PM (specifically, secondary organic aerosol (SOA)).[54] The significance of organic compounds to the formation of SOA depends upon emissions from local sources, atmospheric chemistry, and the season. Studies have shown that SOA can be a major component of carbonaceous PM in the summer due to the warmer temperatures increasing the chemical reaction rates. The environmental impacts of $PM_{2.5}$ are discussed earlier in this Section. In addition, vegetation is a source of biogenic VOCs, and these naturally occurring VOCs contribute to the haze aerosols formed over forested areas.[55] VOCs from emission sources can accumulate in plants and have detrimental impacts to protective mechanisms, which then can affect the entire ecosystem.

Ammonia (NH_3) is a gaseous pollutant that can also contribute to the formation of $PM_{2.5}$. Ammonia emissions come from natural and anthropogenic sources. Emission inventories for ammonia are considered to be among the most uncertain of any species related to PM. In addition, though recent studies have improved our understanding of the role of ammonia in aerosol formation, ongoing research is required to better describe the relationships between ammonia emissions, particulate matter concentrations, and related impacts. The control techniques for ammonia and the analytical tools to quantify the impacts of reducing ammonia emissions on atmospheric aerosol formation are both evolving. Area-specific data are needed to evaluate the effectiveness of reducing ammonia emissions on reducing $PM_{2.5}$ concentrations in different areas, and to determine where ammonia decreases may increase the acidity of particles and precipitation.[56] For instance, reducing ammonia emissions where sulfate concentrations are high may increase the acidity of particles and precipitation, which can be associated with adverse health effects and increased concentrations of secondary organic compounds.

Exposure to high levels of ammonia in the air may cause skin, eye, throat, and lung irritation, and may also cause burns and coughing.[57] Extremely high concentrations of ammonia may lead to lung disease and death. Individuals with asthma are more sensitive to ammonia exposure. Ammonia serves an important role in neutralizing acids in clouds, precipitation and particles. In particular, ammonia neutralizes sulfuric acid and nitric acid, the two key contributors to acid deposition (acid rain), forming sulfates and nitrates in the process. Deposited ammonia also can

---

[53] USEPA. The Plain English Guide to the Clean Air Act. United States Environmental Protection Agency, Air and Radiation (ANR-443), EPA 400-K-93-001, April 1993.
[54] 72 Fed. Reg. 20592-93 (April 25, 2007).
[55] USEPA. Air Quality Criteria for Particulate Matter, Volume I of II. United States Environmental Protection Agency, October 2004, EPA/600/P-99/002aF.
[56] 72 Fed. Reg. 20591 (April 25, 2007).
[57] ATSDR. ToxFAQs™: Ammonia. Agency for Toxic Substances and Disease Registry, September 2004, accessed June 27, 2007.

contribute to problems of eutrophication in water bodies, and deposition of ammonium particles may effectively result in acidification of soil as ammonia is taken up by plants.

1.3 Integrating $PM_{2.5}$ with Other Air Quality Goals

As discussed in Section 1.0, attaining and maintaining the 1997 $PM_{2.5}$ standards is one of many interrelated air quality goals that New Jersey is striving to achieve. The actions included in this SIP revision are part of the State's overall plan for reducing PM-related emissions. The remainder of this Section discusses in detail other PM-related actions anticipated in the near future or already in place that comprise the rest of the State's overall plan for reducing PM-related emissions.

1.3.1 Environmental Justice in New Jersey

While unhealthy air quality can negatively impact human health throughout the northeastern United States and New Jersey, these health risks are higher for populations living near roadways and in urban areas. Improving air pollution in these affected areas is one of the NJDEP's greater challenges, particularly since many of the areas that are currently targeted for redevelopment throughout the State are located in New Jersey's urban communities. New Jersey is committed to revitalizing these urban areas by mitigating a legacy of environmental degradation, including air pollution, and the resulting adverse consequences to public health and the environment to ensure that all people, regardless of race, color, national origin, or income, live in vibrant communities that are safe from environmental pollution. The actions outlined in this SIP revision will help New Jersey meet this commitment by working to reduce $PM_{2.5}$ emissions from the mobile and industrial sources impacting New Jersey's urban areas.

As stated in Section 1.2.1, the health effects associated with exposure to fine particulate matter are significant, and epidemiological studies have shown a significant correlation between elevated fine particle levels and premature mortality. Other significant health impacts include aggravating existing heart and lung diseases, increasing asthma attacks, and emergency room visits. Urban residents in particular are regularly exposed to greater amounts of $PM_{2.5}$ from multiple local sources, including heavy-duty diesel truck traffic, congested roads, industrial and commercial operations, airports, marine ports, trains, and, junk yards. These sources all contribute to the formation of localized high levels of air pollution.

New Jersey's 2009 Environmental Justice Executive Order (EO) #131[58] recognizes these significant health impacts, especially the disproportionate increase in childhood asthma for Black and Latino/Hispanic children in urban communities, and the link of this increase, in part, to poor air quality. Further, the Executive Order #131 charges the NJDEP and other state agencies "involved in decisions that affect environmental quality and public health to provide opportunities for input by representatives of low-income and minority groups." The NJDEP reviews and considers all recommendations submitted by the Advisory Council, in fulfillment of

[58] NJDEP. Environmental Justice Program. New Jersey Department of Environmental Protection, http://www.nj.gov/dep/ej/policy.html, accessed March 17, 2009. EO #131 replaced EO#96 (2004) as of February 17, 2009.

the Executive Order, including recommendations for policy and regulatory changes that the NJDEP can undertake to consider and incorporate cumulative impacts into its decision-making.

As discussed further in Section 1.3.2, the NJDEP is working with the USEPA on a number of national air toxic reduction programs. To address disproportionate impacts of air toxic hazards across urban areas on highly exposed population subgroups, and predominately minority and low-income communities,[59] the NJDEP is developing methods and strategies to assess air impacts from multiple sources at the community scale. These strategies build upon the pilot projects that were initiated in Camden and Paterson, two of New Jersey's most urbanized areas, which assessed community scale air impacts. The NJDEP is also committed to assessing technical and policy options to address the cumulative impact of multi media exposure (beyond air pollution exposure) at the local level. Reducing $PM_{2.5}$ concentrations in urban areas will help address environmental justice.

1.3.2 Air Toxics

The efforts to reduce $PM_{2.5}$ and its precursors in this SIP revision will benefit the efforts to reduce the concentrations of air toxics, e.g., diesel particulates, in the State. Sources of particulate air toxics are the same as some of the sources of $PM_{2.5}$ and $PM_{2.5}$ precursors, i.e., traditional industrial and utility sources, smaller manufacturing and commercial sources, mobile sources (e.g., cars, trucks, buses, and trains), residential activities (such as oil burning for home heating), and construction equipment.[60] Several State and federal initiatives to reduce the public's exposure to the health impacts of air toxics have multi-pollutant benefits. New Jersey is taking action in local communities to address severe air quality issues.

The NJDEP generally divides air pollutants that it regulates into two broad categories: criteria pollutants and air toxics. The USEPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide and lead). For the State's regulatory purposes, other air pollutants that are not criteria pollutants, and that are emitted into the air in quantities that may cause cancer or other adverse health effects, are classified as air toxics.[61] These broad categories are not mutually exclusive, as there is overlap between air toxics and criteria pollutants. For example, many of the VOCs that contribute to the formation of ozone and, as discussed later in this Section, can also contribute to the formation of $PM_{2.5}$, are also air toxics. Additionally, particulate matter can be air toxics or a "carrier" for certain air toxics that adhere to the particle itself, as is the case

[59] USEPA. Fact Sheet, The Air Toxics Strategy. United States Environmental Protection Agency, http://www.epa.gov/ttn/uatw/urban/strategyfs0303.pdf, accessed November 28, 2007.

[60] In addition to these sources, diesel engines emit a complex mixture of air pollutants, composed of both solid and gaseous material, the visible portion of which is known as particulate matter. Diesel particulate matter includes many carbon particles (also called soot), as well as gases that become visible as they cool. The major sources of diesel particulate matter are onroad and nonroad vehicles powered by diesel engines; however, diesel engines are also used in construction vehicles, agricultural equipment, trains, marine vessels, and stationary diesel electric generators.

[61] The USEPA also refers to air toxics as hazardous air pollutants (HAPS), which are listed under 42 U.S.C. § 7412 (Section 112). (USEPA. About Air Toxics. United States Environmental Protection Agency, June 6, 2007, http://www.epa.gov/ttn/atw/allabout.html, accessed January 4, 2008.)

with diesel emissions. Lead (Pb) is considered both an air toxic and a criteria pollutant. Given this overlap, efforts to reduce the concentrations of $PM_{2.5}$ and its precursors in this SIP revision will also benefit the efforts to reduce many air toxics.

Supporting the effort to achieve lower emissions of $PM_{2.5}$ and its precursors, the NJDEP has a multi-pronged approach to decreasing air toxic emissions, including PM and PM precursors in the State:

1. Permit Review: A combination of control technology (e.g., maximum achievable control technology (MACT) standards) and risk assessment requirements employed in the air permitting process.
2. Voluntary Reductions: Initiatives that encourage facilities to reduce air toxics emissions through Pollution Prevention opportunities, Right-to-Know, and similar disclosure and compliance assistance programs.
3. Traditional Pollutant Control Programs: Air toxics reductions that result from direct regulation or as a side-benefit of control programs that address ozone precursors, particulate matter, and other pollutants (e.g., point, area, and mobile source controls).
4. Air Toxics Initiatives: Risk assessments, dry cleaners, other projects.

Several of these programs address direct $PM_{2.5}$ and $PM_{2.5}$ precursors, and can be found in Chapter 4 (Control Measures); specifically, the National Low Emission Vehicle Program (NLEV), Nonroad Diesel Engine Standards, and New Jersey's Enhanced Inspection and Maintenance (I/M) Program. The projects conducted by the NJDEP Air Toxics Program also help to reduce $PM_{2.5}$ emission levels in New Jersey. The Camden Waterfront South Air Toxics Pilot Project, a project that began in 2002, was designed to develop tools to assess air quality problems in a community (with a focus on air toxics). In addition, the Urban Community Air Toxics Monitoring Project in Paterson City, New Jersey (UCAMPP) is a multi-faceted air quality monitoring and modeling project.

On a national level, under the Federal Clean Air Act Amendments of 1990, the USEPA is required to adopt a number of national air toxic reduction programs. The NJDEP works with USEPA to implement these programs in New Jersey. Two of these programs are the adoption of MACT standards for large sources (such as chemical manufacturing), and the Integrated Urban Air Toxics Strategy and generally available control technology (GACT) for small sources (such as hospital sterilizers). To date, the USEPA has promulgated 96 MACT emission standards, some of which were included in the photochemical modeling used to demonstrate attainment of the 1997 $PM_{2.5}$ NAAQS (See Chapter 5). The USEPA is under a court ordered schedule to promulgate standards for 50 area source categories by June 15, 2009, which will also help to reduce direct $PM_{2.5}$ and $PM_{2.5}$ precursor emissions. Released by the USEPA in July 1999 and discussed in Section 1.3.1, the Integrated Urban Air Toxics Strategy is a framework for addressing air toxics in urban areas from stationary, mobile, and indoor sources.[62] It complements the MACT and GACT standards and other aspects of national air toxics initiatives.

[62] USEPA. Urban Strategy. States Environmental Protection Agency, August 9, 2007, http://www.epa.gov/ttn/atw/urban/urbanpg.html, accessed January 4, 2008.

With respect to mobile sources, the USEPA finalized the rule "Control of Hazardous Air Pollutants from Mobile Sources in early 2007."[63] This program will lower emissions of air toxics by lowering the benzene (a potential ozone and $PM_{2.5}$ precursor) content of gasoline. The USEPA has required or proposed controls for new construction vehicles, agricultural equipment, trains, and marine vessels (see Chapter 4). The USEPA conducts voluntary programs for reduction of diesel emissions, which include Clean School Bus USA, the Voluntary Diesel Retrofit Program, and the National Clean Diesel Campaign.

1.3.3 Greenhouse Gases and Climate Change

New Jersey is planning to reduce New Jersey's carbon footprint and is pushing for mandatory federal action to combat global climate change. All of the measures currently planned to combat Global Warming (and discussed in this section) will not only reduce greenhouse gas emissions, but will also have supplemental benefits of reducing $PM_{2.5}$ and $PM_{2.5}$ precursor emissions, including NO_x and SO_2, as well as other air contaminants. Reducing atmospheric $PM_{2.5}$ levels could also help to slow global warming, because some particles result in darkening effects on snow and ice, which causes those areas to absorb sunlight rather than reflect it.

On February 13, 2007, Governor Jon S. Corzine signed an Executive Order to adopt proactive goals for the reduction of greenhouse gas emissions in New Jersey.[64] The order calls for reducing greenhouse gas emissions to 1990 levels by 2020, an approximately 20 percent reduction from 2006, followed by a further reduction of emissions to 80 percent below 2006 levels by 2050. These provisions were enacted into law under the Global Warming Response Act in New Jersey on July 6, 2007, making New Jersey the third state in the nation to make greenhouse gas reduction goals law.[65] On December 15, 2008, the State released the Draft Global Warming Response Act Recommendations Report for stakeholder input as required by the New Jersey Global Warming Response Act. On January 6, 2009, the State initiated a series of six stakeholder meetings to solicit input on the report.

New Jersey is playing a leadership role in the Regional Greenhouse Gas Initiative (RGGI), a ten-state cooperative effort to implement a regional mandatory cap-and-trade program in the Northeast and Mid-Atlantic, addressing CO_2 emissions from power plants. As the first mandatory market-based program to reduce carbon emissions in the U.S., the program will cap regional power plant CO_2 emissions.

Other New Jersey greenhouse gas initiatives include standards for new automobiles and light trucks, the implementation of renewable portfolio standards, and an Energy Master Plan. New Jersey is continuing its interagency planning process that will culminate in the Energy Master Plan, a long-term energy vision for the state that plans for the State's energy needs through

---

[63] USEPA. Mobile Source Air Toxics. United States Environmental Protection Agency, http://www.epa.gov/otaq/toxics.htm, accessed November 5, 2007.
[64] State of New Jersey Office of the Governor. Governor Calls for Sweeping Reduction of Greenhouse Gas Emissions in New Jersey. Available at http://www.nj.gov/governor/news/news/approved/20070213a.html. February 13, 2007.
[65] State of New Jersey Office of the Governor. Governor Signs Global Warming Response Act. Available at http://www.nj.gov/globalwarming/home/news/approved/070706.html. July 7, 2007.

2020.[66] Goals include 20 percent of the electricity used in the State to come from Class One renewable energy sources by the Year 2020 and to reduce future electricity consumption by 20 percent from projected 2020 consumption levels.

1.3.4 8-Hour Ozone

Given the fact that both NO_x and VOCs have the potential to generate ozone and $PM_{2.5}$,[67] the Northeastern states and associated regional agencies considered the impact on all four ozone and $PM_{2.5}$ related pollutants (NO_x, VOC, SO_2, and direct $PM_{2.5}$) in selecting control measures. These control measures were considered for inclusion in the modeling analysis used in New Jersey's (and the other states') attainment demonstration of the 8-hour ozone NAAQS,[68] anticipating the need for a comprehensive modeling analysis that could be used in both the 8-hour ozone and 1997 $PM_{2.5}$ attainment demonstrations. For example, a control measure that reduces NO_x will achieve the benefit of reducing both ozone and $PM_{2.5}$ concentrations since NO_x is a precursor for both pollutants. The control measures used in this modeling analysis are listed in Table 4.5, and discussed in detail in Chapter 4. For more information about the overlap and impact of the implementation of "ozone measures" on $PM_{2.5}$ levels throughout the region, see Chapter 5. For more information about New Jersey's efforts to attain the 8-hour ozone NAAQS, refer to its 8-Hour Ozone Attainment Demonstration SIP.[69]

1.3.5 Regional Haze

The Federal Clean Air Act protects Class I areas, which are usually large parks and wilderness areas,[70] from visibility impairment due to anthropogenic (manmade) sources (42 U.S.C. § 7491 (Section 169A)).[71] The Clean Air Act requires the USEPA to establish regulations to abate regional haze and increase visibility in those areas to protect the scenic vistas. Visibility impairment caused by the collection of air pollutants emitted by sources over a broad geographic area is known as regional haze. Some particles and gases can either absorb or scatter light causing an effect known as "light extinction." A hazy condition is created as a result of these

---

[66] State of New Jersey Office of the Governor. Governor Corzine Announces Initial Phase of Energy Master Plan. Available at http://www.nj.gov/governor/news/news/approved/20061003.html. October 3, 2006.

[67] Ozone is a highly reactive gas. In the troposphere, it is formed by complex chemical reactions involving oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Similar to the $PM_{2.5}$ precursors, NO_x and VOC are precursors to ozone.

[68] On October 29, 2007, New Jersey submitted its 8-hour ozone SIP revision to the USEPA for approval. Refer to the letter dated October 29, 2007 from then NJDEP Commissioner Lisa P. Jackson to USEPA Region II Administrator Alan J. Steinberg. Available at http://www.nj.gov/dep/baqp/8hrsip/commissioner's%20letter.pdf .

[69] NJDEP. State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard: 8-Hour Ozone Attainment Demonstration, Final. New Jersey Department of Environmental Protection, October 29, 2007.

[70] 64 Fed. Reg. 35715 (July 1, 1999): Areas designated as mandatory Class I Federal areas are those national parks exceeding 6,000 acres, wilderness areas and national memorial parks exceeding 5000 acres, and all international parks which were in existence on August 7, 1977.

[71] Other sections of the Federal Clean Air Act that are part of the visibility protection program include 42 U.S.C. §§ 7492 and 7410(a)(2)(J) (Sections 169B and 110(a)(2)(J)).

processes. The USEPA first promulgated regulations for regional haze in 1980. These regulations were updated and took effect on August 30, 1999.[72] The regional haze regulations were promulgated to accomplish the integration of air quality management planning for multiple pollutants, i.e., particulate matter (PM) and ozone,[73] recognizing that these pollutants have common precursors, emission sources, atmospheric processes, transport issues, and geographical areas of concern. The regional haze regulations require that states develop plans to protect 156 Class I areas. New Jersey is home to a federally protected Class I area, which is the Brigantine Wilderness Area of the Edwin B. Forsythe National Wildlife Refuge. The control measures contained within the State's regional air quality protection plan, designed to improve visibility in New Jersey's Class I area and other downwind Class I areas, will also help to reduce direct $PM_{2.5}$ and $PM_{2.5}$ precursors, since $PM_{2.5}$ is the primary component of regional haze.

The plans for regional haze occur in phases to achieve periodic goals. The first regional haze air quality protection plan for New Jersey will be completed this year. This first regional haze air quality protection plan must establish progress goals and control strategies through 2018. New Jersey must supplement its regional haze air quality protection plan to show reasonable progress every five years beginning in 2013. Beginning in 2018 and every 10 years thereafter, the State must reevaluate and revise its regional haze air quality protection plan and submit the revised plan to the USEPA. The final goal of the federal regional haze regulations is to achieve natural visibility conditions by 2064. New Jersey proposed its Regional Haze SIP on September 15, 2008. This proposal is based on control measures and modeling developed through the Mid-Atlantic/Northeast Visibility Union (MANE-VU) regional organization. The MANE-VU process and control measure development is discussed in detail in Chapters 4 and 5.

---

[72] On June 15, 2005, the USEPA published its final amendments to its July 1999 Regional Haze Rule (70 Fed. Reg. 39104-72 (July 6, 2005)).
[73] 64 Fed. Reg. 35714-74 (July 1, 1999).

2.0 AIR QUALITY AMBIENT AND EMISSION INVENTORY DATA

This chapter provides an analysis of the fine particulate matter and precursor ambient air quality data for the entire State of New Jersey, as well as for both the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas. The data was obtained from the United States Environmental Protection Agency's (USEPA's) online database, AirData,[74] which provides data summaries using the Air Quality System (AQS) data subsystem. AirData was also used to obtain data for the other states that share a nonattainment area with New Jersey. This USEPA data was updated with data provided by the other state agencies, where available.[75] In general, the pollutant concentrations presented in this chapter are expressed as micrograms per cubic meter ($\mu g/m^3$) unless otherwise stated.

2.1 Measuring Fine Particle Pollution in the Atmosphere – An Introduction to $PM_{2.5}$ Monitoring

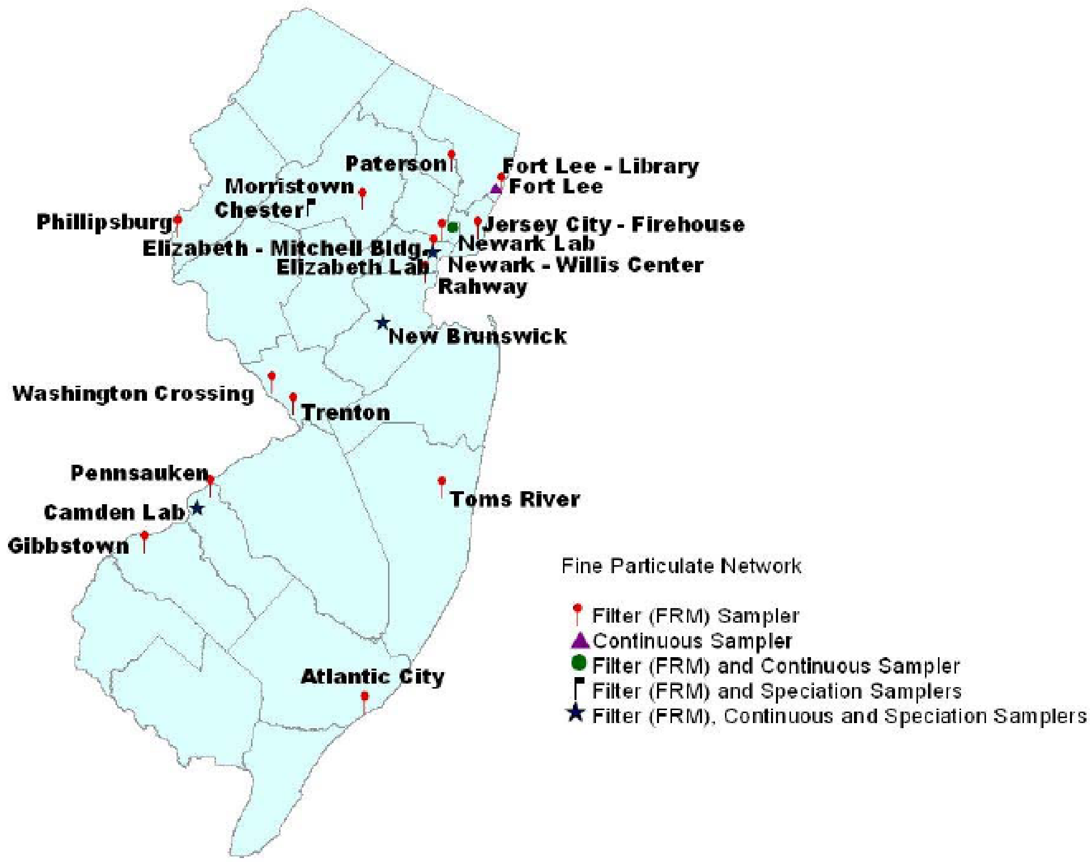
In order to monitor the levels of $PM_{2.5}$ and compare those levels to the National Ambient Air Quality Standards (NAAQS), the USEPA established criteria for ambient air quality networks for $PM_{2.5}$ at 40 C.F.R. Pt. 58. Figure 2.1 shows the New Jersey Fine Particulate Monitoring Network. Some locations have multiple samplers. There are 19 monitoring sites in New Jersey where the Federal Reference Method sampler (FRM) routinely collects 24-hour $PM_{2.5}$ samples. All sites collect a sample once every three days, with the exception of Elizabeth Lab which samples daily. Ambient air quality monitoring of $PM_{2.5}$ began in 1999. As of 2006, nine sites also continuously monitor fine particle concentrations and transmit the data every minute to the Bureau of Air Monitoring's (BAM's) central computer, where the data is made available on the BAM's public website (www.state.nj.us/dep/airmon). In addition, the NJDEP has a Speciation Network which consists of four sites at which filters are collected and analyzed to determine their chemical characteristics. Speciation monitoring is conducted to determine the chemical characteristics of the fine particles. Samples are collected once every three days concurrent with FRM sampling.

---

[74] USEPA. AirData: Access to Air Pollution Data, United States Environmental Protection Agency, http://www.epa.gov/air/data/index.html.

[75] The New Haven/Stiles St., CT monitor was designated as a "special purpose" monitor, and as such cannot be used to make an attainment or nonattainment designation. The site was found to be overly influenced by micro-scale phenomena, including heavy duty truck exhaust from trucks leaving the New Haven Terminal area and accelerating uphill on the Interstate-95 on-ramp. The monitor was less than twenty feet from the traffic lane. Following a special, multi-site monitoring study conducted by CTDEP, the Stiles Street monitor was deemed unrepresentative of population exposure in the City of New Haven. In 2006, it was shut down as part of the I-95 bridge reconstruction project. The information on this site, therefore, is for informational purposes only and should not be used to assess attainment of the standard.

<u>Figure 2.1</u>: Particulate Monitoring Network in New Jersey



2.2 USEPA NAAQS for Fine Particle Pollution: Annual $PM_{2.5}$

2.2.1 Annual $PM_{2.5}$ Mean Concentrations and Design Values

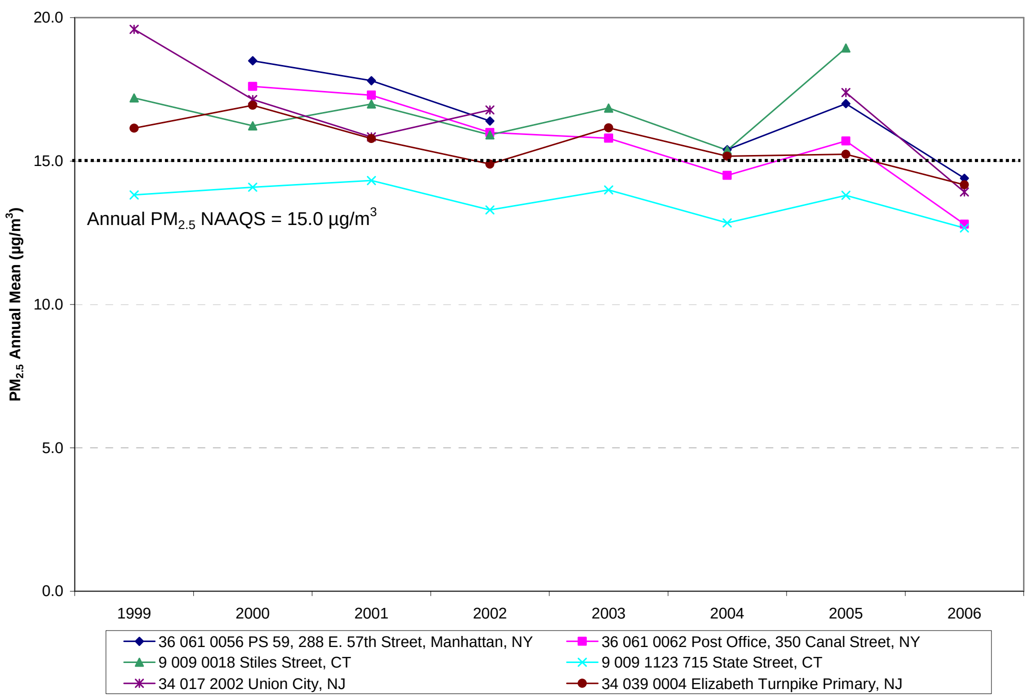
A nonattainment area demonstrates compliance with the 1997 annual $PM_{2.5}$ standard when the 3-year average of the exceeding sites' annual arithmetic mean $PM_{2.5}$ concentrations from a monitor is 15.0 $\mu g/m^3$ or less. Each 3-year average is commonly referred to as the design value for that monitoring site. The design value for the nonattainment area is the highest value from all the sites in the nonattainment area. A design value is only valid if minimum data completeness criteria for the monitoring site are met. With regard to the annual $PM_{2.5}$ standard, a site meets National Ambient Air Quality Standard (NAAQS) completeness criteria if it registered 75 percent or more data capture each quarter of the three year period in question.[76] $PM_{2.5}$ annual means are calculated from the four calendar quarterly averages at each monitoring site. Refer to the USEPA guidance issued in 1999 for more details on calculations and data handling for

[76] For the purposes of presenting the current state of air quality in New Jersey, data that did not meet the 75 percent completeness requirement were included in this chapter and should not be used to make formal determinations about meeting the NAAQS.

$PM_{2.5}$.[77] In the multi-state 1997 $PM_{2.5}$ Southern New Jersey/Philadelphia nonattainment area, there are three New Jersey monitors, and all are plotted in the figures for this section.

Figures 2.2 and 2.3 show the annual $PM_{2.5}$ mean concentrations for the two consistently highest monitoring sites in each of the states that make up the multi-state Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas.[78] In 2006, all the monitors in both annual $PM_{2.5}$ nonattainment areas were below the NAAQS level of 15.0 $\mu g/m^3$ in 2006,[79] as seen in Tables 2.1 and 2.2.

Figure 2.2: Northern New Jersey/New York/Connecticut Nonattainment Area Annual $PM_{2.5}$ Mean Concentrations for the Two Consistently Highest Monitors in Each Associated State, 1999-2006[80]



---

[77] USEPA. Guidance on Data Handling Conventions for the PM NAAQS. United States Environmental Protection Agency, Office of Air Quality, Planning and Standards, Research Triangle Park, NC, EPA-454/R-99-008, April 1999.

[78] The monitoring data used to develop this chapter include periods when the monitors were shut down. Monitoring problems that occurred with the monitor that was used to designate the Northern New Jersey/New York/Connecticut nonattainment area, monitor # 360610056, invalidated the data collected for 2003 and were not included in this analysis. Monitoring problems that occurred with the monitor that was used to designate the Southern New Jersey/Philadelphia nonattainment area, i.e., monitor # 421010047, invalidated the data collected for 2005 and 2006 and were not included in this analysis.

[79] 2007 data were undergoing quality assurance and not available for inclusion in this final SIP revision. The preliminary data indicates the ambient air quality data in the two multi-state nonattainment areas is below the NAAQS threshold of 15.0 $\mu g/m^3$.

[80] See note 76.

Figure 2.3: Southern New Jersey/Philadelphia Nonattainment Area Annual $PM_{2.5}$ Mean Concentrations for the Consistently Highest Monitors in Each Associated State, 1999-2006[81]

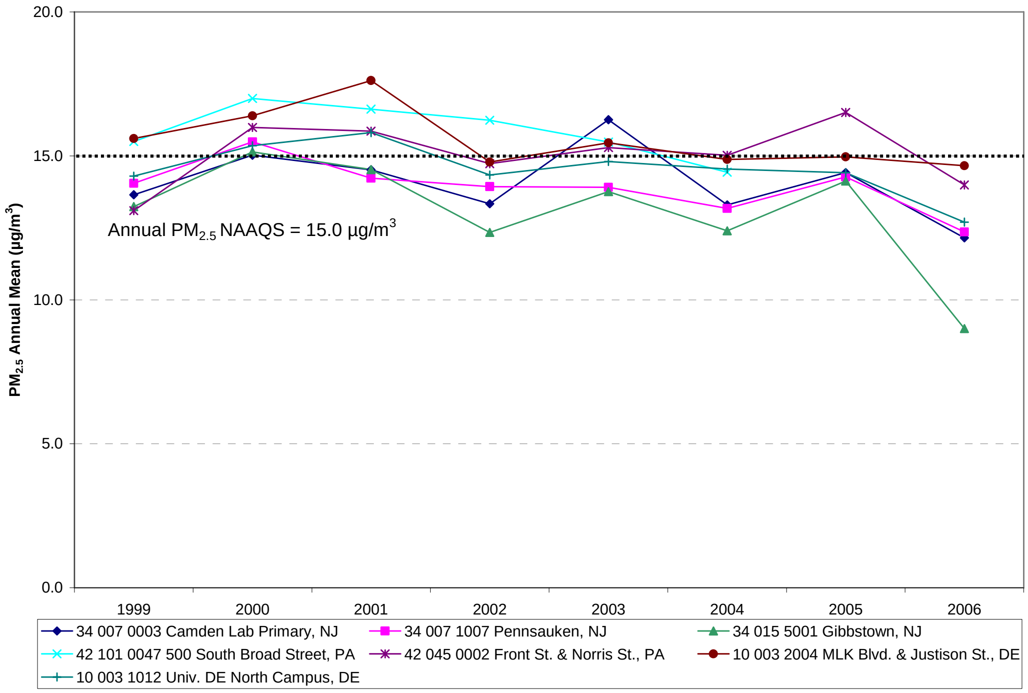


Table 2.1: Northern New Jersey/New York/Connecticut Nonattainment Area Annual $PM_{2.5}$ Means for the Two Consistently Highest Monitors by State, 1999-2006[82]

	New York		Connecticut		New Jersey	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	36-061-0056 PS 59, New York City	36-061-0062 Canal Street, New York City	9-009-0018 Stiles Street, New Haven	9-009-1123 715 State Street, New Haven	34-017-2002 Union City	34-039-0004 Elizabeth Turnpike Primary
Year of Highest	2000	2000	2005	2001	1999	2000
Concentration of Highest ($\mu g/m^3$)	18.5	17.6	18.9	14.3	19.6	16.9
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	No data available	Yes	Yes	Yes

[81] See note 76.
[82] See note 76.

<u>Table 2.2</u>: Southern New Jersey/Philadelphia Nonattainment Area Annual $PM_{2.5}$ Means for the Two Consistently Highest Monitors by State, 1999-2006

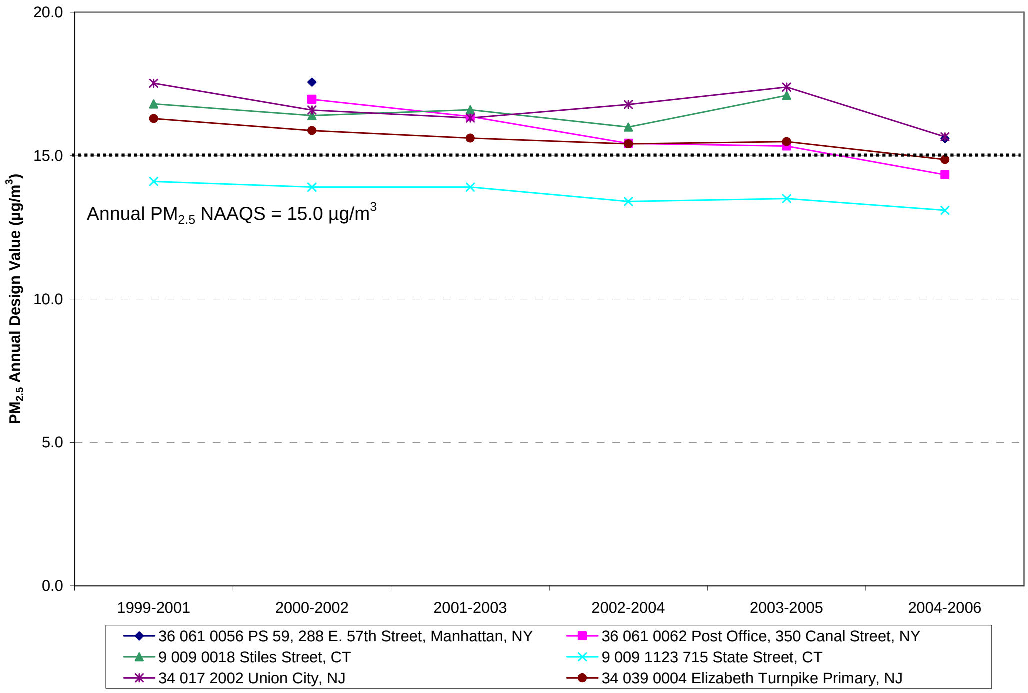
	New Jersey		Pennsylvania		Delaware	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	34-007-0003 Camden Lab Primary, Camden	34-007-1007 Pennsauken Township, Pennsauken	42-101-0047 500 South Broad Street, Philadelphia	42-045-0002 Front Street & Norris Street, Chester	10-003-2004 MLK Blvd. & Justison Street, Wilmington	10-003-1012 University of Delaware, Newark
Year of Highest	2003	2000	2000	2005	2001	2001
Concentration of Highest ($\mu g/m^3$)	16.3	15.5	17.0	16.5	17.6	15.8
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	No data available[a]	Yes	Yes	Yes

[a] Monitoring problems that occurred with the monitor that was used to designate the Southern New Jersey/Philadelphia nonattainment area, i.e., monitor # 421010047, invalidated the data collected for 2005 and 2006 and were not included in this analysis.

Three years of annual mean concentrations for $PM_{2.5}$ are used to calculate the design value at a monitor.[83] Figures 2.4 and 2.5 show the $PM_{2.5}$ design values for the two consistently highest monitoring sites in each of the states that make up the multi-state Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas.[84] They show much progress has been made to attain the 2007 annual $PM_{2.5}$ NAAQS, but more reductions are necessary to attain the NAAQS as some sites remain out of compliance. Tables 2.3 and 2.4 show the maximum $PM_{2.5}$ design values at these sites, which were included in Figures 2.4 and 2.5, respectively.

[83] The design value for a nonattainment area is the maximum monitor design value for all monitors for each 3-year period.
[84] See note 79.

<u>Figure 2.4</u>: Northern New Jersey/New York/Connecticut Nonattainment Area Annual $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors in each Associated State, 2001-2006[85]



[85] See note 76.

Figure 2.5: Southern New Jersey/Philadelphia Nonattainment Area Annual $PM_{2.5}$ Design Values for the Consistently Highest Monitors in each Associated State, 2001-2006

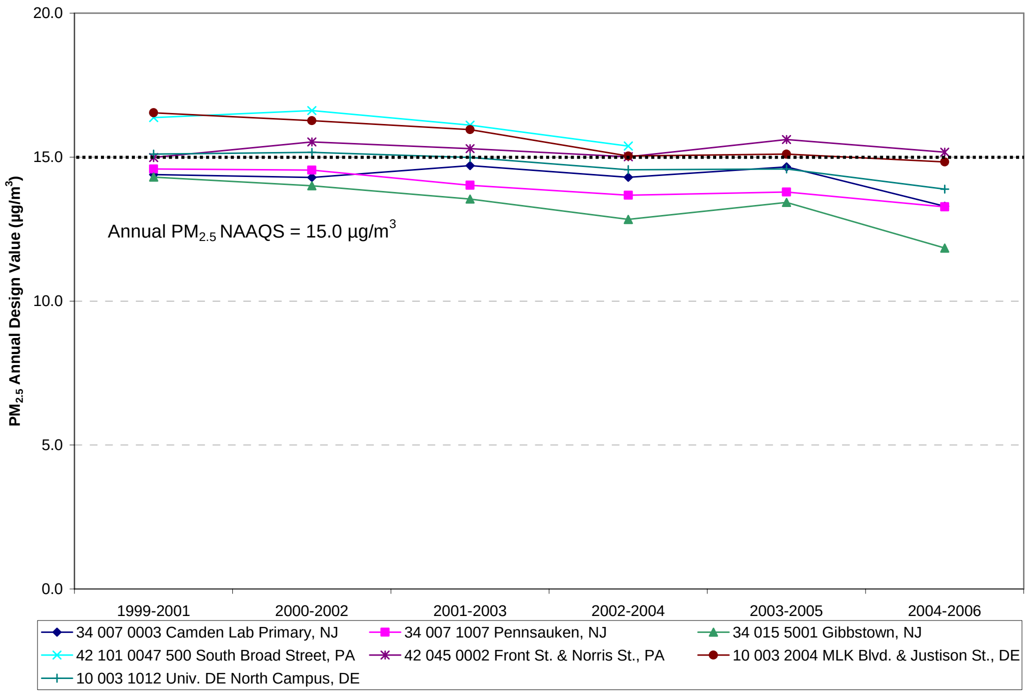


Table 2.3: Northern New Jersey/New York/Connecticut Nonattainment Area Annual $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors by State, 2001-2006[86]

	New York		Connecticut		New Jersey	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	36-061-0056 PS 59, New York City	36-061-0062 Canal Street, New York City	9-009-0018 Stiles Street, New Haven	9-009-1123 715 State Street, New Haven	34-017-2002 Union City	34-039-0004 Elizabeth Turnpike Primary
Year of Highest	2002	2002	2005	2001	2001	2001
Concentration of Highest (µg/m³)	17.6	17.0	17.1	14.1	17.5	16.3
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	No	Yes	2006 data not available	Yes	No	Yes

[86] See note 76.

Table 2.4: Southern New Jersey/Philadelphia Nonattainment Area Annual $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors by State, 2001-2006

	New Jersey		Pennsylvania		Delaware	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	34-007-0003 Camden Lab Primary, Camden	34-007-1007 Pennsauken Township, Pennsauken	42-101-0047 500 South Broad Street, Philadelphia	42-045-0002 Front Street & Norris Street, Chester	10-003-2004 MLK Blvd. & Justison Street, Wilmington	10-003-1012 University of Delaware, Newark
Year of Highest	2003 and 2005	2001	2002	2005	2001	2002
Concentration of Highest ($\mu g/m^3$)	14.7	14.6	16.6	15.6	16.5	15.2
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	Not available[a]	No	Yes	Yes

[a] Monitoring problems that occurred with the monitor that was used to designate the Southern New Jersey/Philadelphia nonattainment area, i.e., monitor # 421010047, invalidated the data collected for 2005 and 2006 and were not included in this analysis.

2.3 USEPA NAAQS for Fine Particle Pollution: Daily (24-Hour) $PM_{2.5}$

2.3.1 Daily $PM_{2.5}$ 98th Percentile Average Concentrations and Design Values

The former 24-hour (daily) NAAQS for $PM_{2.5}$ was 65 $\mu g/m^3$ and the current daily $PM_{2.5}$ standard is 35 $\mu g/m^3$. To attain these standards, the 3-year average of the 98th percentile of 24-hour concentrations at each monitor within an area must not exceed 65 $\mu g/m^3$ or 35 $\mu g/m^3$.[87] Refer to the USEPA guidance issued in 1999 for more details on calculations and data handling for $PM_{2.5}$.[88] In the Southern New Jersey/Philadelphia nonattainment area, there are three New Jersey monitors, and all are plotted in the figures for this section.

Figures 2.6 and 2.7 show that the concentrations in the multi-state nonattainment areas are well below the former 65 $\mu g/m^3$ standard, but near and above the newer 35 $\mu g/m^3$ NAAQS. New Jersey and the other states that share New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas have always met and are in attainment with the 1997 daily $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$.[89]

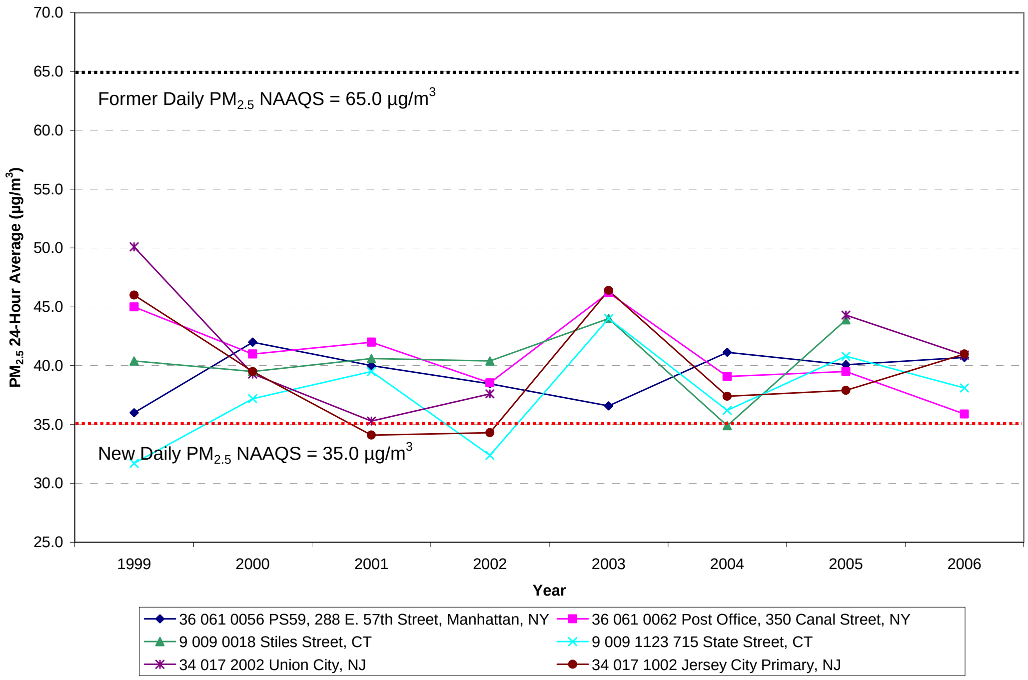
---

[87] The entire state of New Jersey was in attainment of the 24-hour $PM_{2.5}$ standard of 65 $\mu g/m^3$ in 2004 when USEPA finalized designations.

[88] USEPA. Guidance on Data Handling Conventions for the PM NAAQS. United States Environmental Protection Agency, Office of Air Quality, Planning and Standards, Research Triangle Park, NC, EPA-454/R-99-008, April 1999.

[89] The attainment demonstration in this final SIP revision addresses the 1997 annual $PM_{2.5}$ standard. According to the USEPA's modeling guidance (USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, pg. 56), since these levels are well below the standard

<u>Figure 2.6</u>: $PM_{2.5}$ 98th Percentile 24-Hour Averages for the Two Consistently Highest Monitors in each Associated State in the 1997 $PM_{2.5}$ Northern New Jersey/New York/Connecticut Nonattainment Area, 1999-2006[90]



---

and have continued to improve since 2001, the modeled attainment test for the 1997 daily $PM_{2.5}$ standard is not needed nor is included in the attainment demonstration.

[90] See note 76.

Figure 2.7: PM$_{2.5}$ 98th Percentile 24-Hour Averages for the Consistently Highest Monitors in each Associated State in the 1997 PM$_{2.5}$ Southern New Jersey/Philadelphia Nonattainment Area, 1999-2006

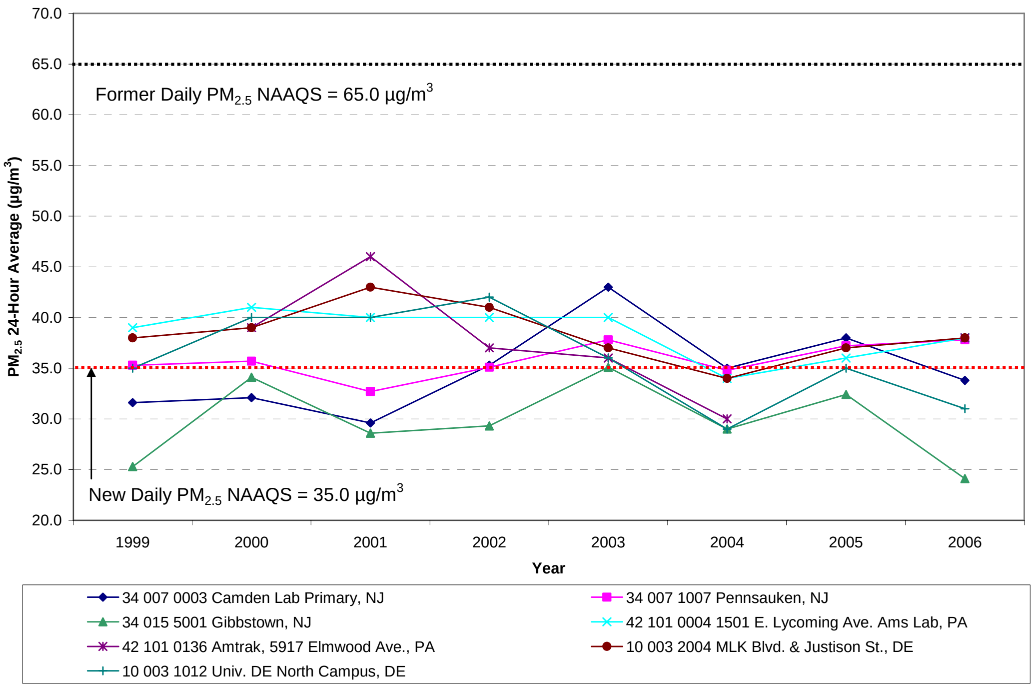


Table 2.5: PM$_{2.5}$ 98th Percentile 24-Hour Averages for the Two Consistently Highest Monitors in the 1997 PM$_{2.5}$ Northern New Jersey/New York/Connecticut Nonattainment Area, 1999-2006[91]

	New York		Connecticut		New Jersey	
	1st Highest	2nd Highest[a]	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	36-061-0056 PS 59, New York City	36-061-0062 Canal Street, New York City	9-009-0018 Stiles Street, New Haven	9-009-1123 715 State Street, New Haven	34-017-2002 Union City	34-017-1002 Jersey City Primary
Year of Highest	2000	2003	2003 and 2005	2003	1999	1999 and 2003
Concentration of Highest (µg/m^3)	42	46	44	44	50	46
Below 1997 Daily PM$_{2.5}$ NAAQS in 2006?	Yes	Yes	2006 data not available	Yes	Yes	Yes
Below 2006 Daily PM$_{2.5}$ NAAQS in 2006?	No	No	2006 data not available	No	No	No

[91] See note 76.

[a] Monitors #36-061-0010 and #36-085-0055 also had high 98th percentile 24-hour averages twice during the 1999-2006 time period but were not shown, as monitor #36-061-0062 had the highest average in 2006 and was chosen to be highlighted in this analysis.

Table 2.6: $PM_{2.5}$ 98th Percentile 24-Hour Averages for the Two Consistently Highest Monitors in the 1997 $PM_{2.5}$ Southern New Jersey/Philadelphia Nonattainment Area, 1999-2006

	New Jersey		**Pennsylvania**		**Delaware**	
	1st Highest	**2nd Highest**	**1st Highest**	**2nd Highest**	**1st Highest**	**2nd Highest**
AQS Monitor ID, Site Name and Location	34-007-0003 Camden Lab Primary, Camden	34-007-1007 Pennsauken Township, Pennsauken	42-101-0004 AMS Lab, Philadelphia	42-101-0136 Amtrak, Philadelphia	10-003-2004 MLK Blvd. & Justison Street, Wilmington	10-003-1012 University of Delaware, Newark
Year of Highest	2003	2006	2000	2001	2001	2002
Concentration of Highest ($\mu g/m^3$)	43	38	41	46	43	42
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	Yes	Yes	Yes	Yes
Below 2006 Daily $PM_{2.5}$ NAAQS in 2006?	No	No	No	No	No	No

The design value for the 24-hour NAAQS for a monitor is calculated by taking the three year average of the 98th percentile of 24-hour concentrations for $PM_{2.5}$.[92] Figures 2.8 and 2.9 show the multi-state nonattainment areas are well below the former 65 $\mu g/m^3$ NAAQS, and above the newer 35 $\mu g/m^3$ NAAQS. Tables 2.7 and 2.8 show the maximum daily $PM_{2.5}$ design values at these sites, which were included in Figures 2.8 and 2.9, respectively.

[92] The design value for a nonattainment area is the maximum monitor design value for all monitors for each 3-year period.

Figure 2.8: Daily $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors in each Associated State in the Northern New Jersey/New York/Connecticut Area, 2001-2006[93]

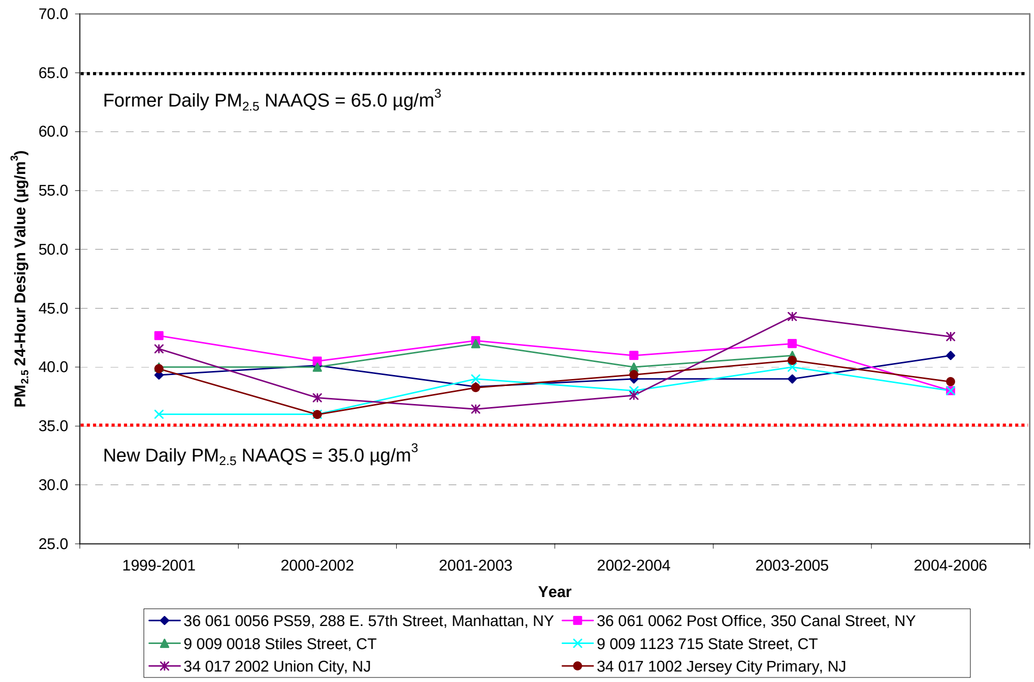
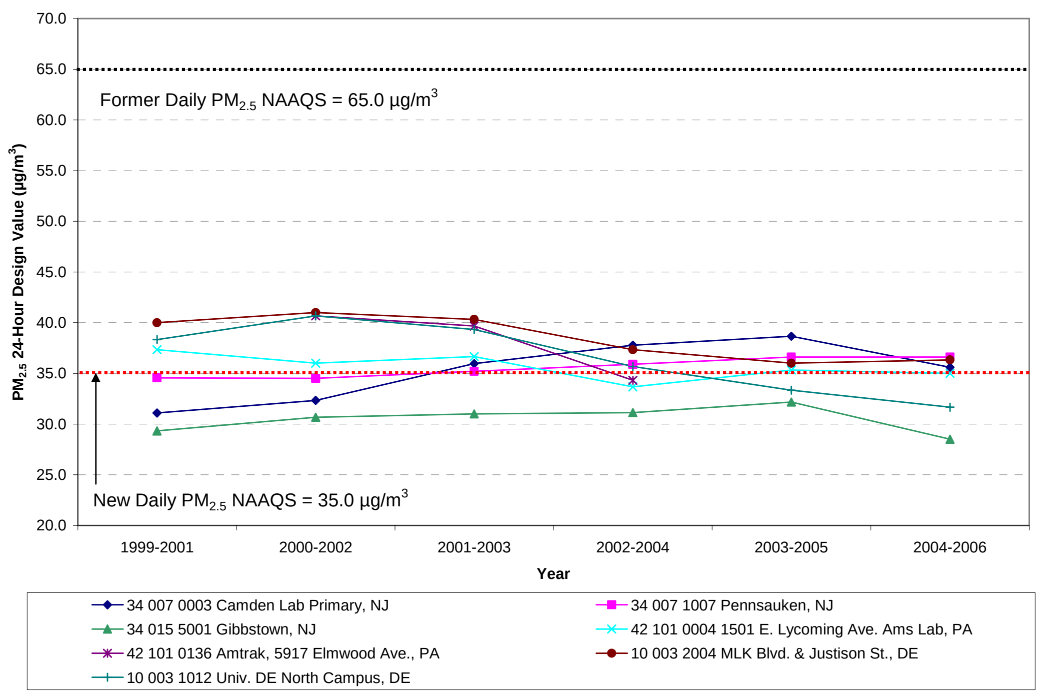


Figure 2.9: Daily $PM_{2.5}$ Design Values for the Consistently Highest Monitors in each Associated State in the Southern New Jersey/Philadelphia Area, 2001-2006



[93] See note 76.

Table 2.7: Northern New Jersey/New York/Connecticut Nonattainment Area Daily $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors by State, 2001-2006[94]

	New York		Connecticut		New Jersey	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	36-061-0056 PS 59, New York City	36-061-0062 Canal Street, New York City	9-009-0018 Stiles Street, New Haven	9-009-1123 715 State Street, New Haven	34-017-2002 Union City	34-017-1002 Jersey City Primary
Year of Highest	2006	2001	2003	2005	2005	2005
Concentration of Highest ($\mu g/m^3$)	41	43	42	40	44	41
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	2006 data not available	Yes	Yes	Yes
Below 2006 Daily $PM_{2.5}$ NAAQS in 2006?	No	No	2006 data not available	No	No	No

Table 2.8: Southern New Jersey/Philadelphia Nonattainment Area Daily $PM_{2.5}$ Design Values for the Two Consistently Highest Monitors by State, 2001-2006

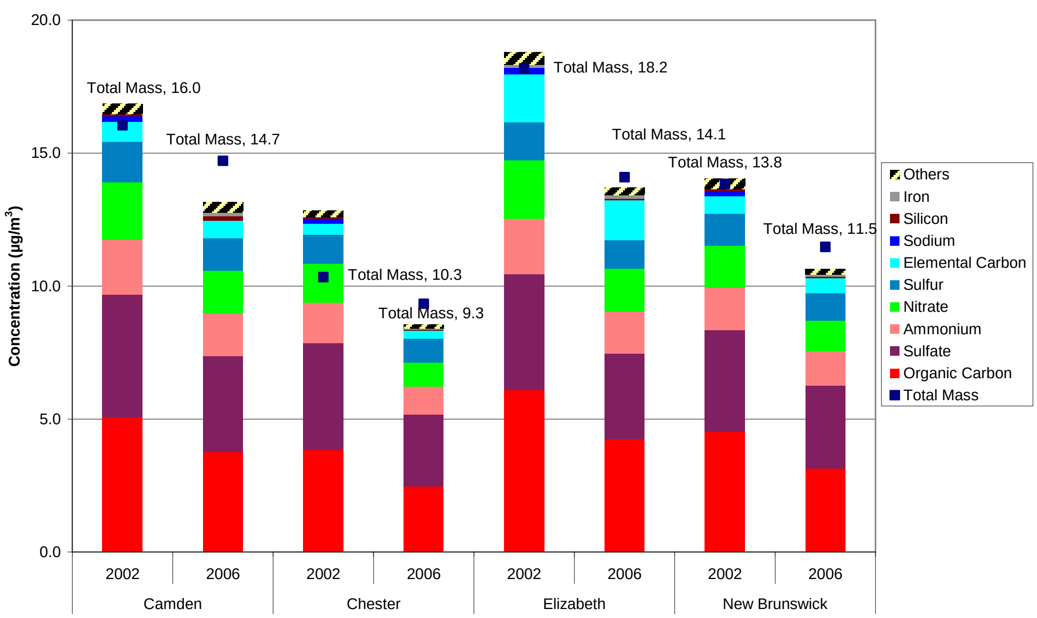
	New Jersey		Pennsylvania		Delaware	
	1st Highest	2nd Highest	1st Highest	2nd Highest	1st Highest	2nd Highest
AQS Monitor ID, Site Name and Location	34-007-0003 Camden Lab Primary, Camden	34-007-1007 Pennsauken Township, Pennsauken	42-101-0004 AMS Lab, Philadelphia	42-101-0136 Amtrak, Philadelphia	10-003-2004 MLK Blvd. & Justison Street, Wilmington	10-003-1012 University of Delaware, Newark
Year of Highest	2005	2005 and 2006	2001-2003	2002	2002	2002
Concentration of Highest ($\mu g/m^3$)	39	37	40	41	41	41
Below 1997 Annual $PM_{2.5}$ NAAQS in 2006?	Yes	Yes	Yes	2006 data not available	Yes	Yes
Below 2006 Daily $PM_{2.5}$ NAAQS in 2006?	No	No	No	2006 data not available	No	Yes

[94] See note 76.

2.4 Composition of Fine Particle Pollution – Speciated Monitoring Data and Trends

New Jersey has four monitoring sites that collect $PM_{2.5}$ speciated data. Speciation is the process of separating $PM_{2.5}$ particle mass into individual chemical species components or groups of species. These sites are located in Camden, Chester, Elizabeth, and New Brunswick, New Jersey. The first full year of speciated data collection was 2002. Data were collected in 2001 but only for part of the year. The data for each monitor, including each monitoring site's speciation profile for the eight highest $PM_{2.5}$ components from 2002 through 2006, is presented in Figures 2.10 through 2.14. The total mass is presented in the figures and does not equate to the sum of all of the components.[95] The trends for each monitor consistently show that sulfate, organic carbon, nitrate, ammonium, sulfur, and elemental carbon are the largest components of total $PM_{2.5}$ mass. These charts show that organic carbon and sulfate comprise the majority of the $PM_{2.5}$ mass measured at all four sites in both 2002 and 2006. Since the signatures of both organic carbon and sulfate are the highest compounds measured at each monitoring site from 2002 through 2006, the NJDEP is confident that these signatures are regional, rather than local, in nature.

Figure 2.10: $PM_{2.5}$ Species that Recorded the Highest Concentrations for 2002 and 2006 in New Jersey



95 Data are collected on three different filters that run independently of each another. The flow rates may vary slightly between the three sample channels. The total mass that is reported is measured from the Teflon filter. There are also some redundancies in data reporting. For example, sodium and potassium are measured both by X-Ray Fluorescence (XRF) and Ion Chromatography. The XRF results were used in this analysis. Carbon is reported as Elemental Carbon, Organic Carbon, and total Carbon (sum of organic and elemental). If redundancies are removed, the reported total mass and sum of all species are relatively close.

Figure 2.11: **Speciated Data from 2002-2006 with the Highest Concentrations at Camden, New Jersey**

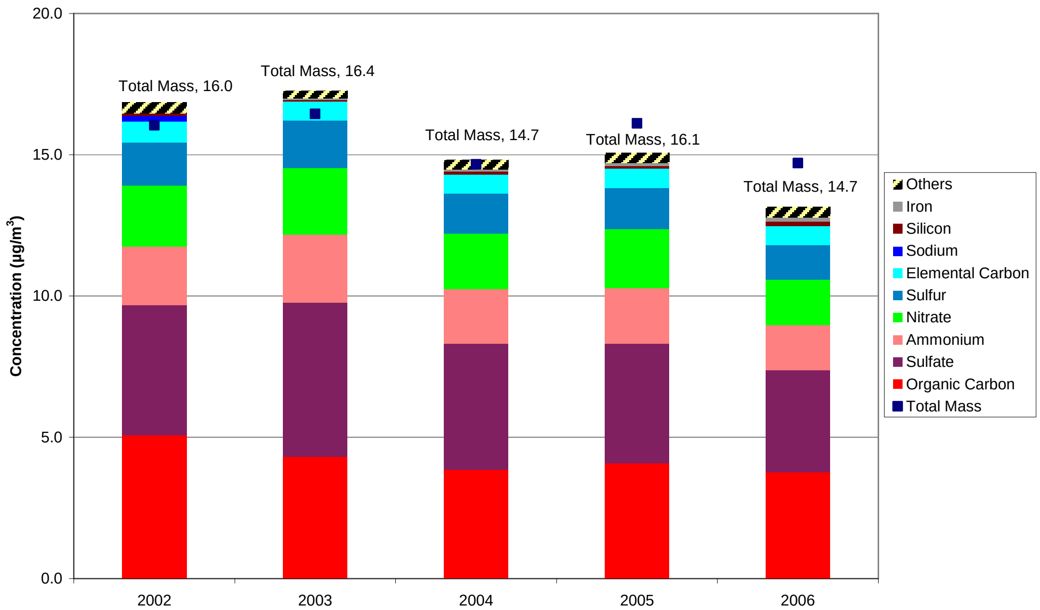


Figure 2.12: **Speciated Data from 2002-2006 with the Highest Concentrations at Chester, New Jersey**

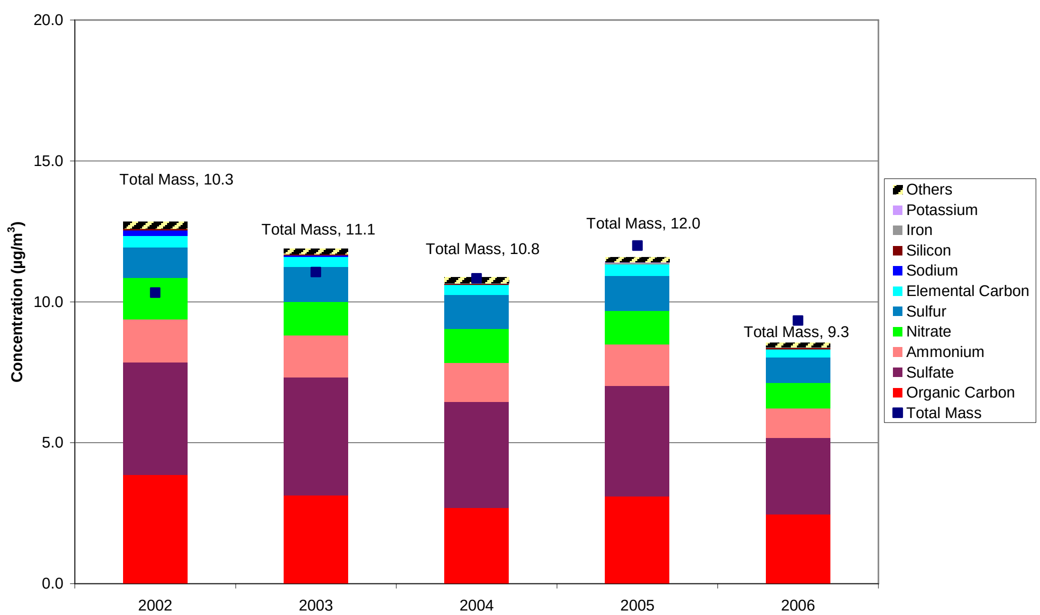


Figure 2.13: Speciated Data from 2002-2006 with the Highest Concentrations at Elizabeth, New Jersey

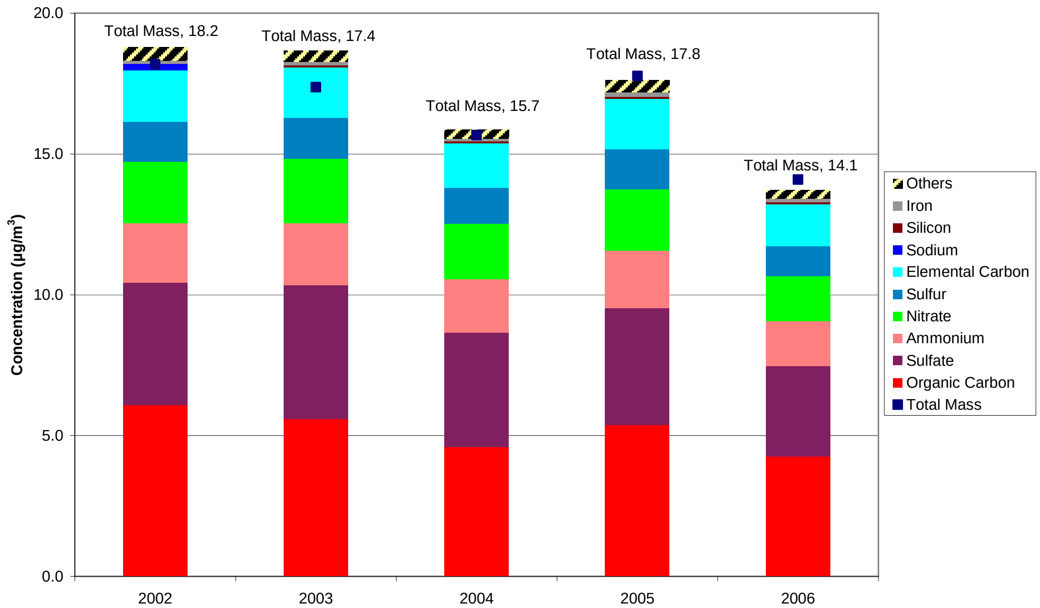
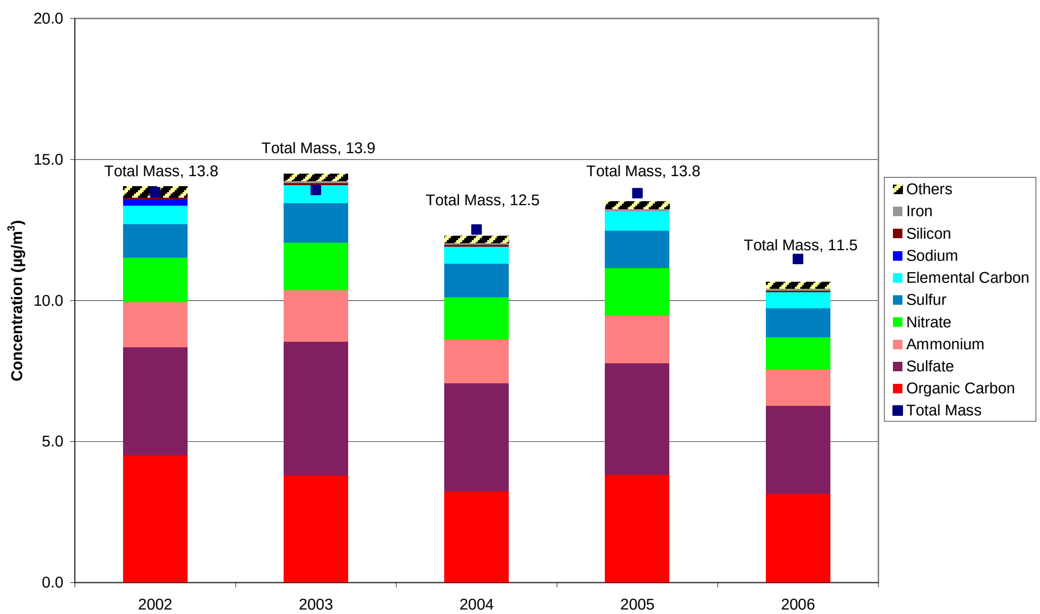


Figure 2.14: Speciated Data from 2002-2006 with the Highest Concentrations at New Brunswick, New Jersey



2.5 $PM_{2.5}$ Source Apportionment

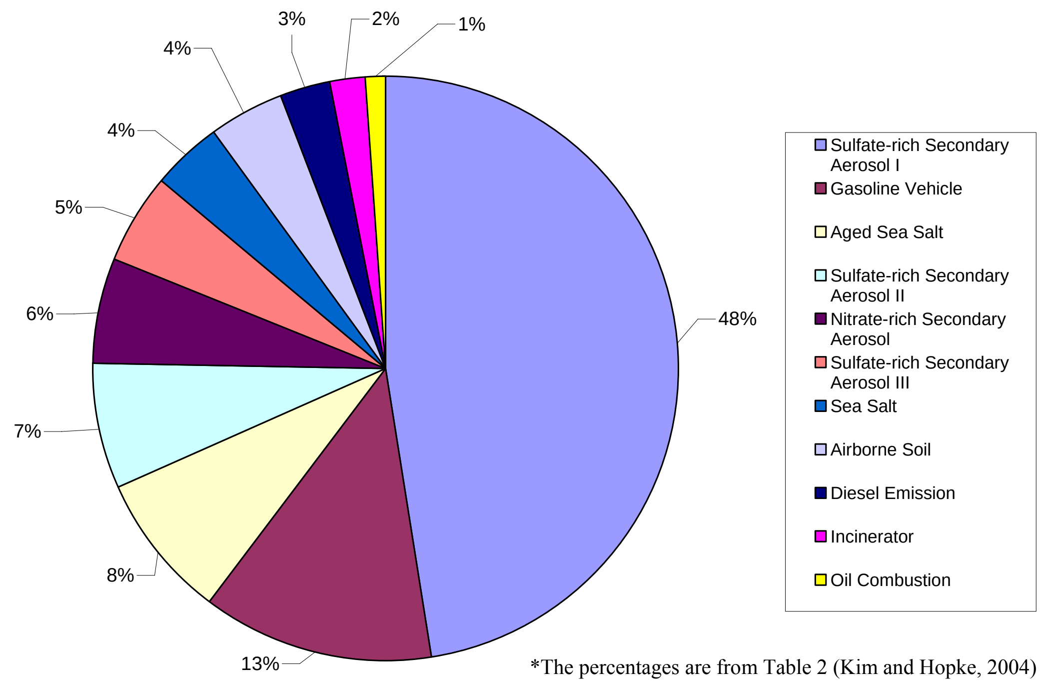
Another way to look at the data is to attribute the composition of the particle mass to its source. This is accomplished using "source apportionment" modeling.[96] For air quality management purposes, source apportionment is complimentary to photochemical modeling and other air quality analyses. In this SIP revision, one rural and one urban source apportionment study for New Jersey were selected to highlight major sources of $PM_{2.5}$.

Using the Brigantine monitoring site (a rural location and Class I area), Kim and Hopke (2004)[97,98] showed that over 60 percent of the $PM_{2.5}$ mass was associated with sulfate aerosol formation from electric generating units outside of New Jersey, 13 percent of the mass was from gasoline vehicles, and 4 percent was from diesel vehicles for sources in New Jersey or the nearby Philadelphia metropolitan area. Results are presented in Figure 2.15. Table 2.9 summarizes the results of additional analyses conducted in this study that provide an estimation of the geographic location/pathway and/or origin of the $PM_{2.5}$ sources identified through the positive matrix factorization (PMF) analysis.

---

[96] USEPA. Receptor Modeling, Air Quality Management Online Portal, United States Environmental Protection Agency, http://www.epa.gov/air/aqmportal/management/modeling/receptor.htm, accessed October 22, 2007.
[97] Kim, E. and Hopke, P. K. Improving Source Identification of Fine Particles in a Rural Northeastern U.S. Area Utilizing Temperature-resolved Carbon Fractions. *Journal of Geophysical Research*, 109, D09201, doi: 10.1029/2003JD004199, 2004.
[98] Data from March 1992 - May 2001 was used in the positive matrix factorization (PMF) model, conditional probability function (CPF), and potential source contribution function (PSCF) analyses to identify sources of $PM_{2.5}$ and their locations contributing to concentrations at the Brigantine monitoring site.

<u>Figure 2.15</u>: $PM_{2.5}$ Sources Identified at the Monitoring Site in Brigantine, New Jersey Contributing to the Mean Daily $PM_{2.5}$ Mass Concentrations Averaged over 1992 – 2001 using PMF*



Source: Kim and Hopke.

*The percentages are from Table 2 (Kim and Hopke, 2004) and are the estimated average source contribution (percent) to $PM_{2.5}$ mass (11.24 $\mu g/m^3$, measured over the 1992-2001 time period) using PMF. The relative contributions in $\mu g/m^3$ were not provided in the paper.

Table 2.9: Study Results from the Potential Source Contribution Function (PSCF) and Conditional Probability Function (CPF) Analyses, Kim and Hopke (2004)

Analysis	$PM_{2.5}$ Source(s) Identified[a]	Source Contributor(s)[b]	Source Location(s)/Pathway(s) (with respect to the Brigantine monitor)
PSCF[c]	Sulfate-rich secondary aerosols I and III	Coal-fired power plants	• Midwest (i.e., Ohio River Valley) • Southern Indiana • Northern Kentucky
		Petrochemical industry	• Louisiana
		Not identified	• Southern Mississippi
	Sulfate-rich secondary aerosol II	Biogenic emissions from Canadian forest fires	• Hudson Bay, Canada region
		Volatile organic carbon (VOC) emissions from biogenic sources	• Eastern Tennessee • Northeastern Georgia • Western South Carolina
		Sulfur emissions	• Southern Louisiana • Mississippi • Alabama
	Airborne soil	Dust storms	• Asia • Africa (Sahara)
CPF[d]	Organic carbon	Gasoline vehicles	North and southwest: close to Highway 9 in New Jersey
	Elemental carbon	Diesel vehicles	Northwest: an area containing Philadelphia, Pennsylvania and major highway traffic between Washington, D.C. and New York City.
	Nitrate-rich secondary aerosol	Not identified	West and Northwest – Philadelphia, Pennsylvania
	Aged and fresh sea salt	N/A	Atlantic Ocean
	Airborne soil	Crustal particles from onroad traffic	Northwest and southwest
		Dust storms	• Asia • Africa (Sahara)
	Municipal solid waste incinerator emissions	N/A	West and northwest
	Oil combustion	Utilities and industries	• New York City (north) • Atlantic City (southeast)
			• Northeastern urban corridor between Washington, D.C. and Boston, Massachusetts

[a] For clarification, researchers also sometimes refer to sources as factors and these terms may be used interchangeably in some instances. A factor could be associated with a source, source type, or source region (Lee, J. H., Poirot, R. L., Lioy, P. J., and Oxley, J. C. Identification of Sources Contributing to Mid-Atlantic Regional Aerosol. Journal of Air and Waste Management, 52, 1186-1205, 2002.).
[b] A 'source contributor' identifies the specific category or source type that is the assumed cause of the pollution.
[c] The PSCF analysis was performed only for the sulfate-rich secondary aerosols using the PMF estimations and backward trajectories using the HYSPLIT model.
[d] The CPF analysis combined the PMF results with wind direction values measured at the Brigantine monitoring site.

Building on the PMF analysis conducted in 2004,[99] Hopke and Gildemeister (2006) used PSCF and back trajectory analyses to determine the seasonal variation in source contributions to $PM_{2.5}$ mass measured at the four speciation monitors in New Jersey from 2001-2005.[100] These monitors are in urban areas compared to the rural location of the Brigantine monitor discussed in the previous study. Figure 2.16 shows the results of the study by monitor and by season. Significant findings of the study were as follows:

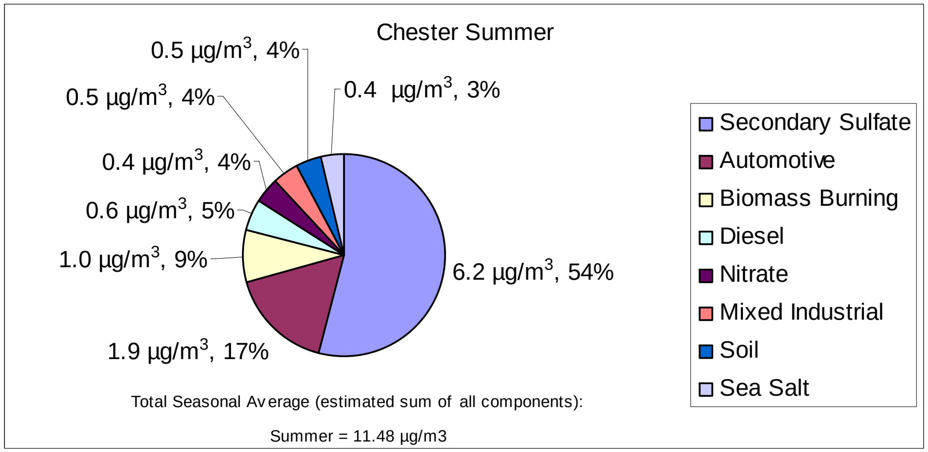
- Similar types of transported aerosols were seen amongst all four sites, notably, secondary sulfate and nitrate, biomass burning, and aged sea salt.
- Secondary sulfate was the largest contributor to $PM_{2.5}$, especially during the summer.
- Secondary nitrate concentrations reach their highest in the winter.
- Secondary sulfate and nitrate were transported from sources in other states.
- The sulfate factor was estimated to be from regions with large coal-fired power plants.
- Elevated nitrate concentrations were shown to be from areas with increased ammonia and some oxides of nitrogen (NO_x) emissions.
- Automotive emissions were the second highest contributor among most of the sites.
- Biomass burning was thought to be due to transport of wood smoke from Canadian boreal forest fires during the summers.
- Railroad traffic was estimated to be the source of iron and steel at New Brunswick.
- Compared to the summer source contributions, the automotive, nitrate, mixed industrial/Fe and steel, and sea salt factors increase during the winter.

[99] Hopke, P. K. and Kim, E. Application of Advanced Factor Analysis Modeling to Apportion $PM_{2.5}$ in New Jersey. Center for Air Resources Engineering and Science, Clarkson University, March 2005.

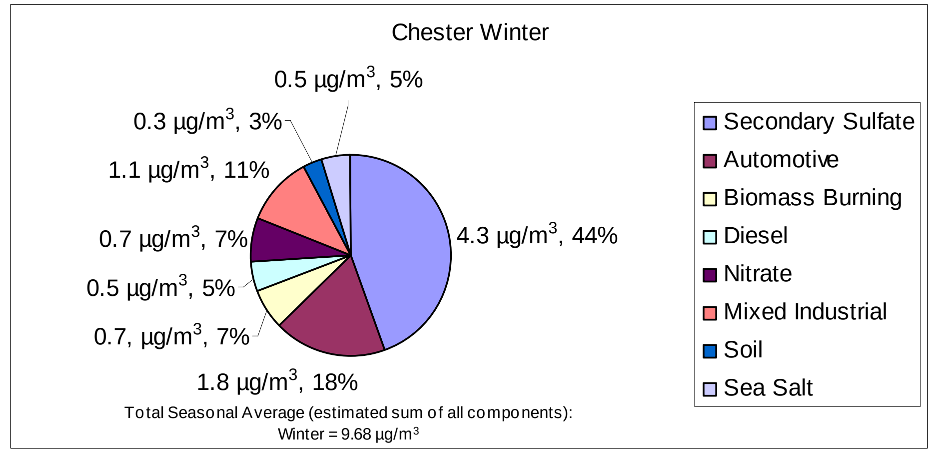
[100] Hopke, P. K. and Gildemeister, A. Application of Trajectory Ensemble Analysis to Locate $PM_{2.5}$ Sources. Center for Air Resources Engineering and Science, Clarkson University, November 2006.

Figure 2.16: Seasonal Variations in Source Contributions to Average Seasonal $PM_{2.5}$ Mass Concentrations from 2001-2004 at Four Speciation Monitors in New Jersey, Hopke and Gildemeister (2006)

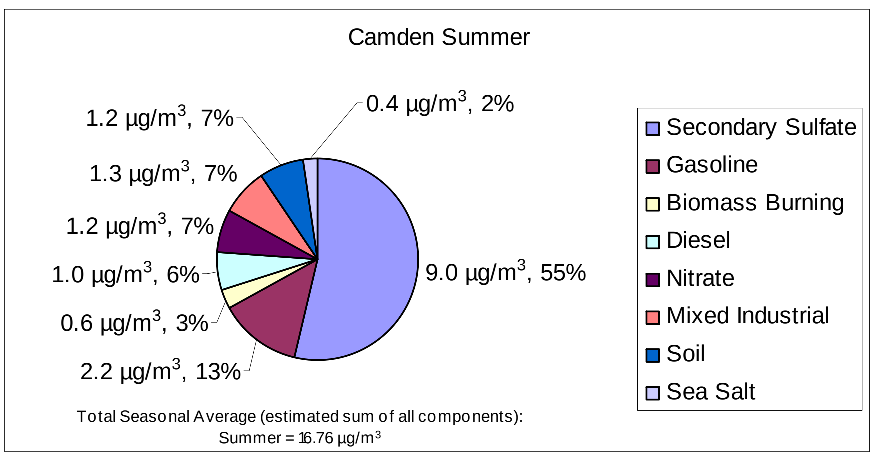
Chester, Summer



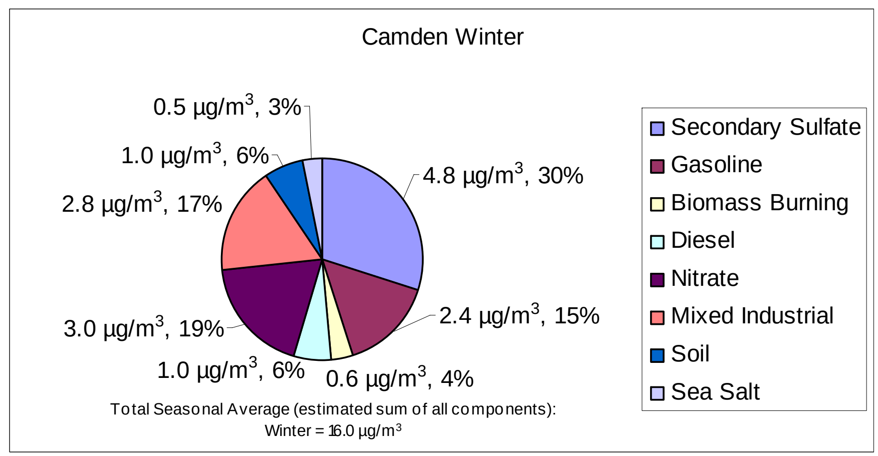
Chester, Winter



Camden, Summer

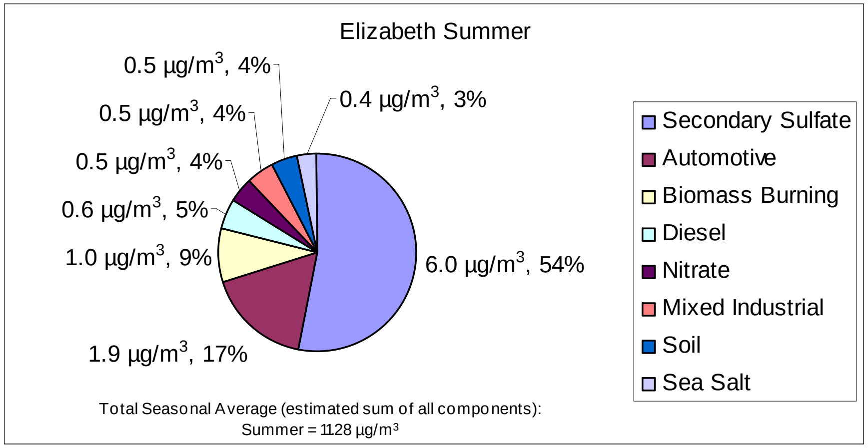


Camden, Winter

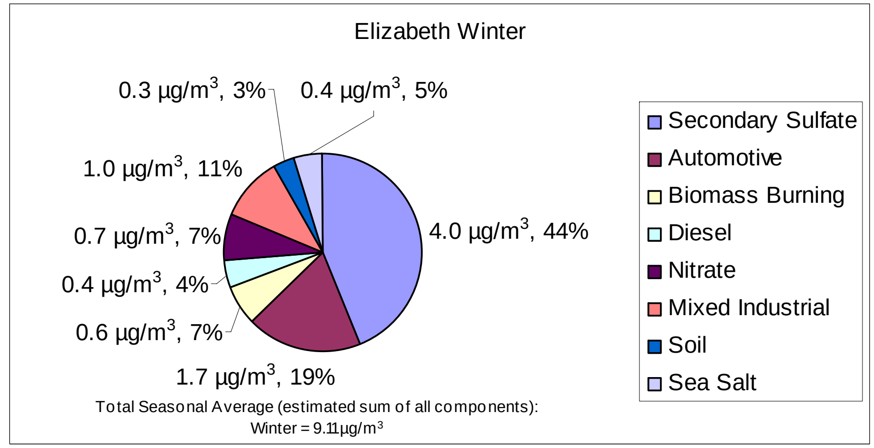


<u>(continued) Figure 2.16</u>: Seasonal Variations in Source Contributions to Average Seasonal $PM_{2.5}$ Mass Concentrations from 2001-2004 at Four Speciation Monitors in New Jersey, Hopke and Gildemeister (2006)

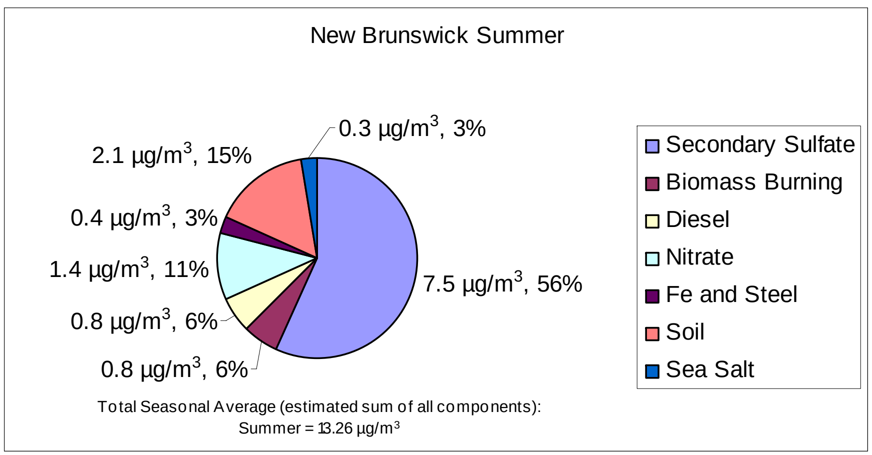
Elizabeth, Summer



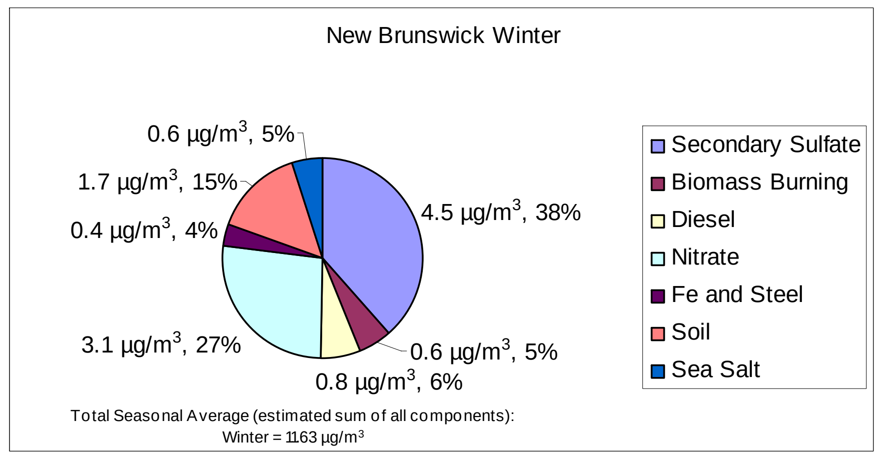
Elizabeth, Winter



New Brunswick, Summer

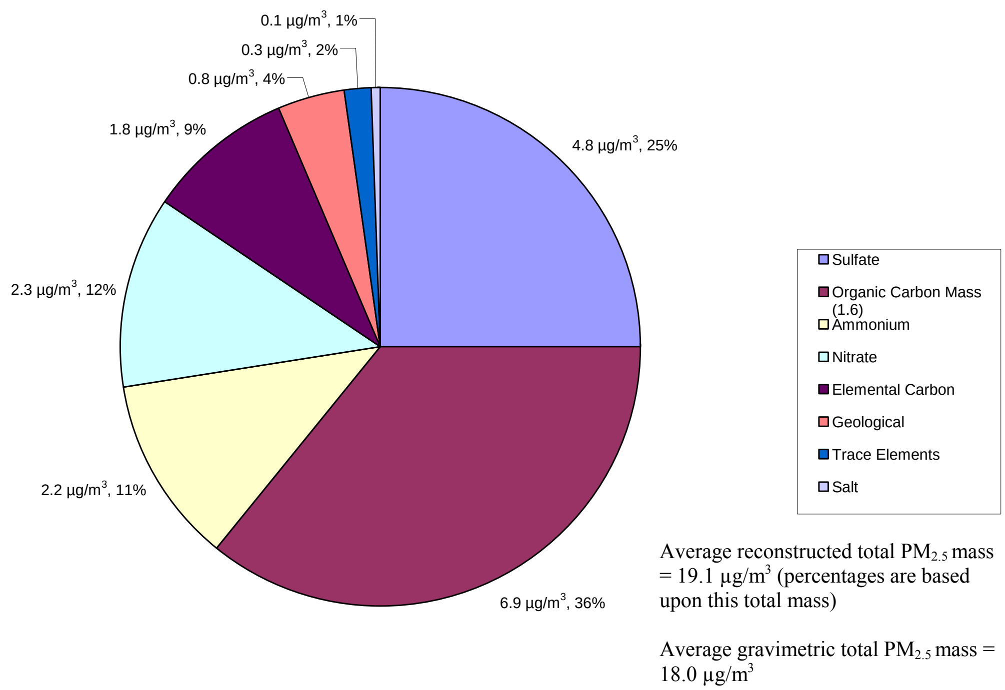


New Brunswick, Winter



In a regional analysis[101] of $PM_{2.5}$, the chemical composition measured at the monitor in Elizabeth, New Jersey is shown in Figure 2.17. This analysis was not a source apportionment study but an analysis of the ambient data, which also showed that organic carbon (identified as gasoline emissions in Hopke and Gildemeister (2006)) and sulfate were the largest contributors to the total $PM_{2.5}$ mass with sulfate concentrations significantly higher in the summer compared to the winter. Back trajectories used in the Mid-Atlantic Regional Air Management Association (MARAMA) (2006) analysis showed air parcels on the cleanest days (i.e., lowest $PM_{2.5}$ concentrations) originating from western Canada, Ontario, Canada, and the ocean. On the dirtiest days showed air trajectories mostly from U.S. regions in the South, Midwest, or Northeast and Mid-Atlantic states.

Figure 2.17: Major Constituents of $PM_{2.5}$ Mass at the Elizabeth, New Jersey Monitoring Site from 2001-2003[102]



The ambient data analyses consistently show a fairly large sulfate contribution to the $PM_{2.5}$ mass collected at the speciation monitors throughout New Jersey, demonstrating that these signatures are regional, rather than local, in nature. The source apportionment modeling studies demonstrate that the major source of this sulfate is primarily from coal-fired electric generating units in regions west of New Jersey. The contribution of local sources from gasoline and diesel-powered vehicles and industries in the area are also important contributors to the $PM_{2.5}$ mass in New Jersey.

---

[101] MARAMA. An Analysis of Speciated $PM_{2.5}$ Data in the MARAMA Region. Prepared by Gillepsie, W G. and Davis, P. of the Mid-Atlantic Regional Air Management Association, Baltimore, MD, May 31, 2006.

[102] Figure 5-65 modified from MARAMA, 2006 (see note 101).

2.6 Emission Inventory

An emission inventory is an estimate of the emissions from anthropogenic (human-made) and biogenic (natural) sources. New Jersey developed an emission inventory for 2002, which is defined as the base year for future attainment planning purposes with respect to 8-hour ozone, $PM_{2.5}$, and regional haze State Implementation Plans (SIPs), as required by the USEPA.[103] The 2002 base year inventory included the pollutants: VOC, NO_x, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), $PM_{2.5}$, sulfur dioxide (SO_2),[104] and ammonia (NH_3). The inventory divided the sources into five sectors, each making up one component of the inventory: point sources, area sources, onroad sources, nonroad sources, and biogenic sources. The emission inventories from all the states in the Northeastern and Mid-Atlantic states were compiled by the Mid-Atlantic/Northeast Visibility Union (MANE-VU), which then created a regional inventory. MANE-VU consists of the District of Columbia and 11 states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. This regional inventory was used to perform the regional modeling analysis used in the State's air quality management planning efforts to attain the 8-hour ozone NAAQS, the $PM_{2.5}$ NAAQS, and the regional haze plans. MANE-VU, through its contractor, MARAMA, projected the 2002 base year emission inventory to various future years. For the purposes of this $PM_{2.5}$ SIP revision, the 2009 future projections were used in the regional modeling exercises to demonstrate attainment of the 1997 annual $PM_{2.5}$ NAAQS.[105] The regional 2002 and 2009 emission inventories were used as the basis of this SIP revision.

Comparisons of the 2002 and 2009 $PM_{2.5}$, SO_2, and NO_x inventories developed by MANE-VU are discussed in this section. Detailed information about the emission inventories is included in the attainment demonstration summary in Chapter 5. Figures 2.18 and 2.19 compare the total emissions of direct $PM_{2.5,}$ NO_x, and SO_2 from 2002 and 2009 for each state in the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas, respectively. Figures 2.20 through 2.26 compare the direct $PM_{2.5,}$ NO_x, and SO_2 emissions from each sector (i.e., point, area, onroad, and nonroad) in all the states associated with New Jersey's $PM_{2.5}$ nonattainment areas from 2002 and 2009. The top 15 direct $PM_{2.5,}$ NO_x, and SO_2 emitting categories in the 2002 and 2009 inventories for the MANE-VU region are compared in Figures 2.27 through 2.31. In general, for both nonattaiment areas, total emissions for each pollutant are projected to decrease, with emissions from the area source sector increasing while emissions from the other sectors are projected to decrease. Stationary source emissions are projected to increase for direct $PM_{2.5}$. The 2009 projections assume the implementation of BOTW measures

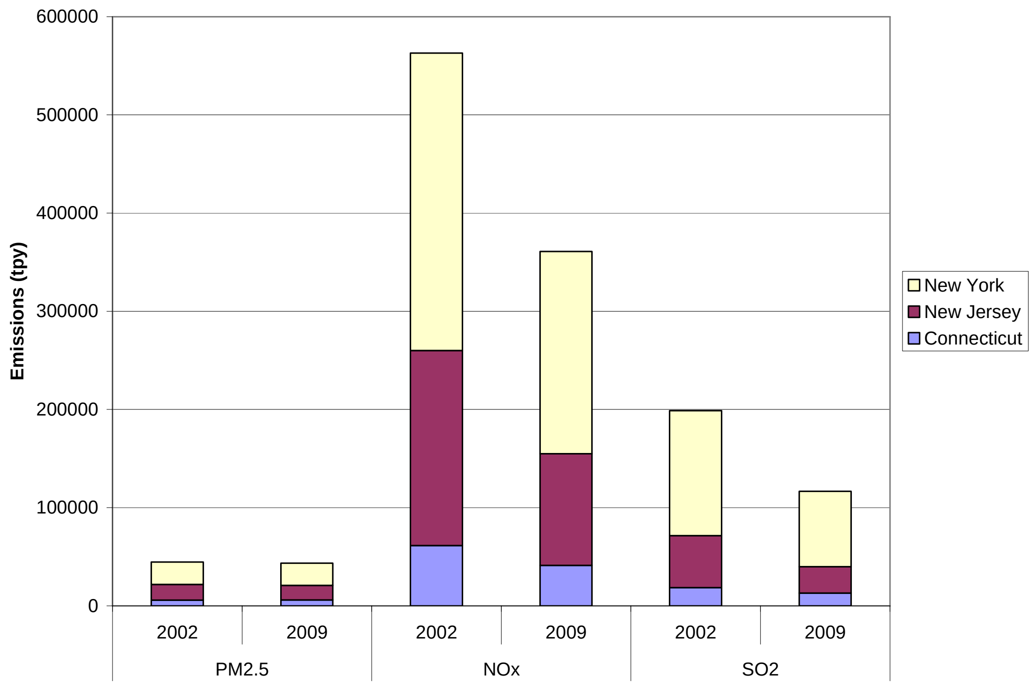
[103] NJDEP. State Implementation Plan (SIP) Revisions for the Attainment and Maintenance of the 8-Hour Carbon Monoxide National Ambient Air Quality Standard, 1-Hour Ozone National Ambient Air Quality Standard, and Fine Particulate Matter National Ambient Air Quality Standard; and the 2002 Periodic Emission Inventory. New Jersey Department of Environmental Protection, May 2006.

[104] SO_2 has been reported in the inventory instead of SO_x as required in the Consolidated Emissions Reporting Rule because the USEPA MOBILE and NON-ROAD models and the majority of USEPA guidance on emission factors is based on SO_2, not SO_x. In addition, the USEPA National Emissions Inventory reports SO_2.

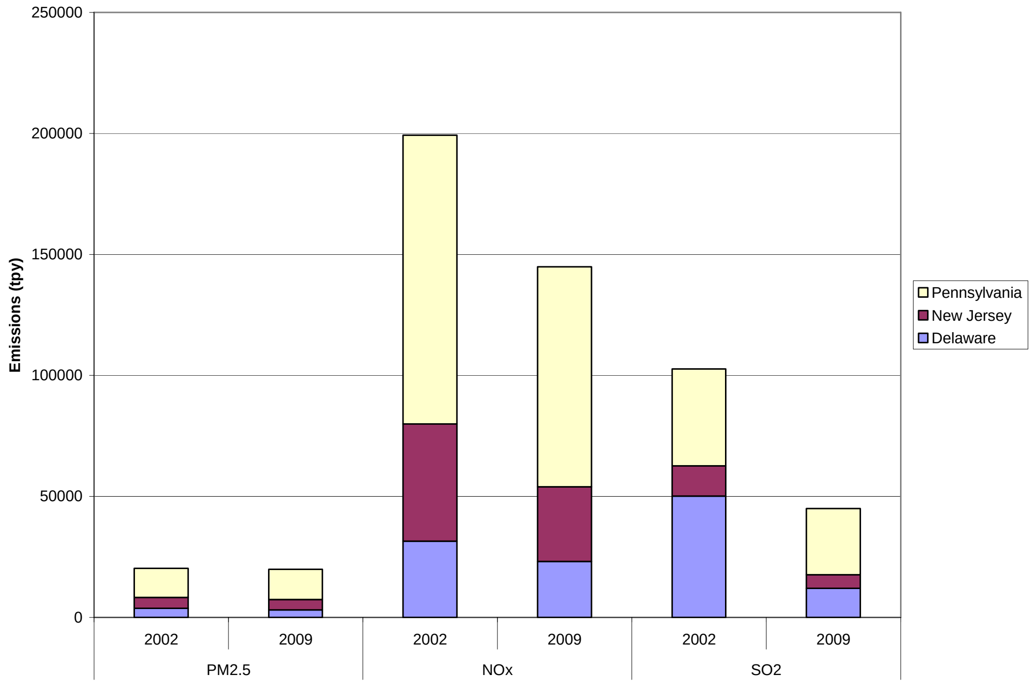
[105] While New Jersey did complete a state-specific 2002 inventory (submitted to the USEPA February 28, 2006, and approved by the USEPA May 2006), this inventory was not used for this analysis, as a comparable 2009 inventory was not grown in state.

(see Chapter 4).

Figure 2.18: Comparison of Total $PM_{2.5}$, NO_x, and SO_2 Emissions by State in the Northern New Jersey/New York/Connecticut Nonattainment Area 2002-2009



<u>Figure 2.19</u>: Comparison of Total $PM_{2.5}$, NO_x, and SO_2 Emissions by State in the Southern New Jersey/Philadelphia Nonattainment Area 2002-2009



<u>Figure 2.20</u>: Comparison of $PM_{2.5}$ Emissions by Sector in the Northern New Jersey/New York/Connecticut Nonattainment Area 2002-2009

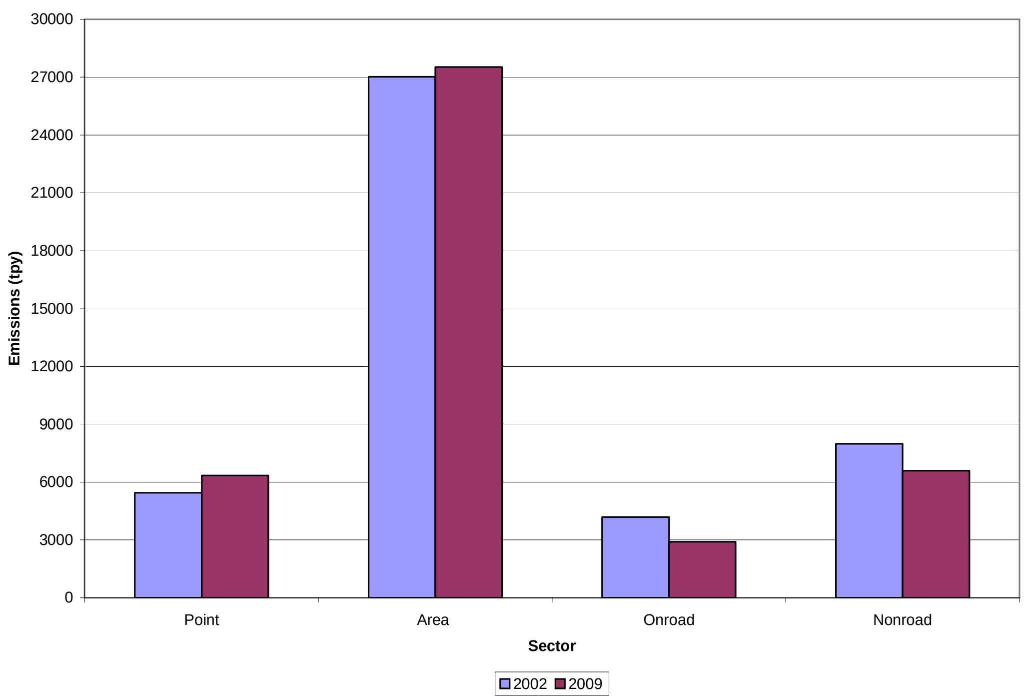


Figure 2.21: Comparison of $PM_{2.5}$ Emissions by Sector in the Southern New Jersey/Philadelphia Nonattainment Area 2002-2009

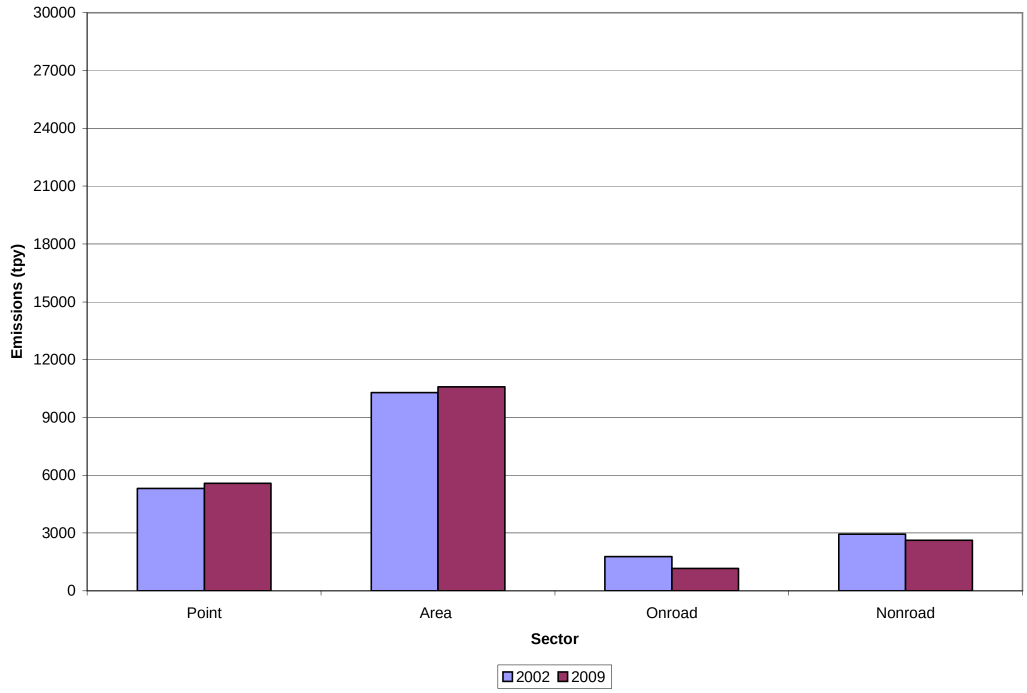


Figure 2.22: Comparison of NO_x Emissions by Sector in the Northern New Jersey/New York/Connecticut Nonattainment Area 2002-2009

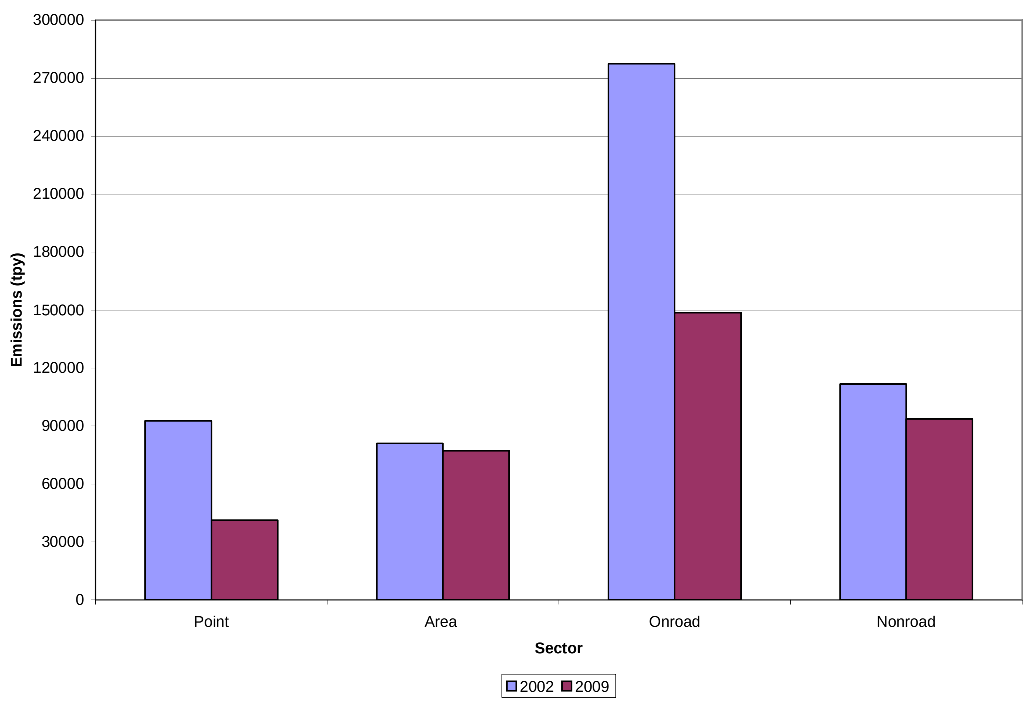


Figure 2.23: Comparison of NO_x Emissions by Sector in the Southern New Jersey/Philadelphia Nonattainment Area 2002-2009

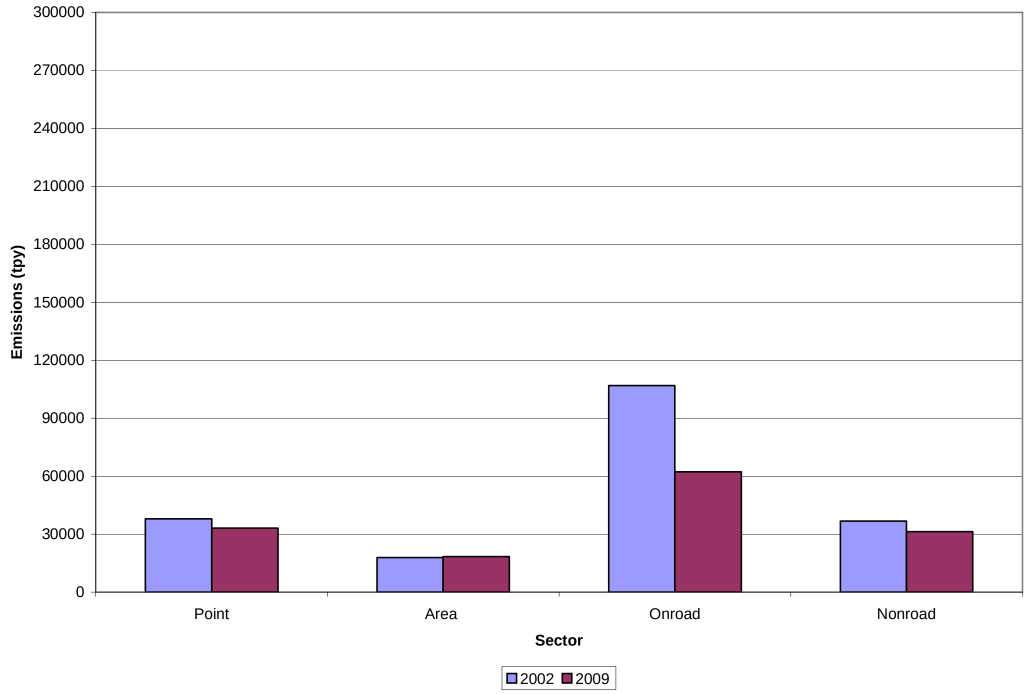


Figure 2.24: Comparison of SO_2 Emissions by Sector in the Northern New Jersey/New York/Connecticut Nonattainment Area 2002-2009

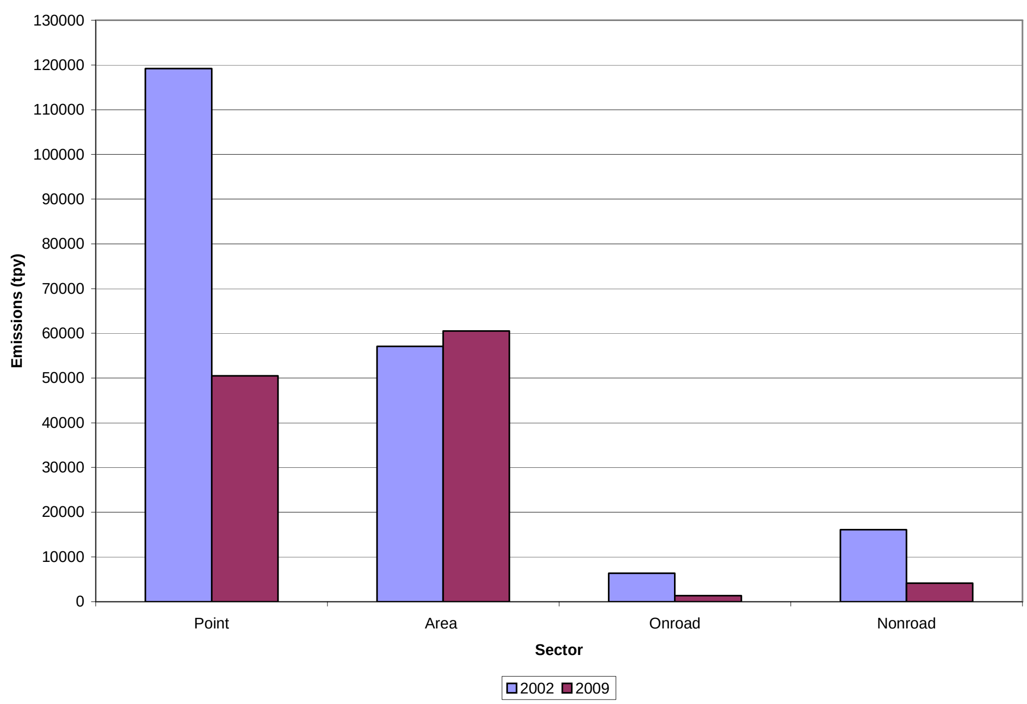


Figure 2.25: Comparison of SO_2 Emissions by Sector in the Southern New Jersey/Philadelphia Nonattainment Area 2002-2009

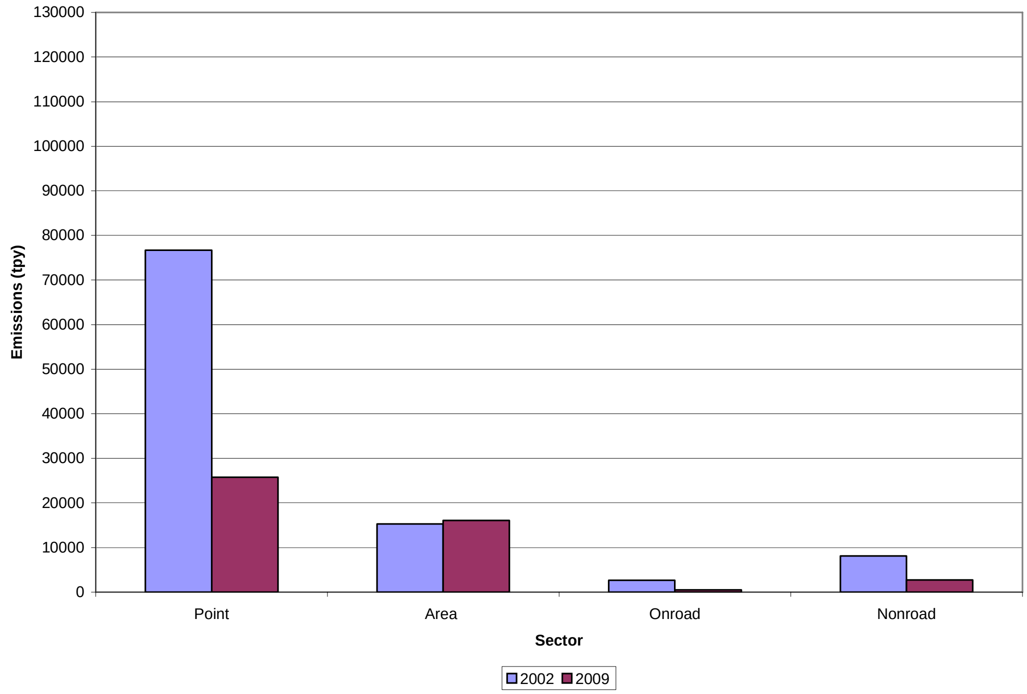


Figure 2.26: 2002 MANE-VU Region $PM_{2.5}$ Inventory Top 15

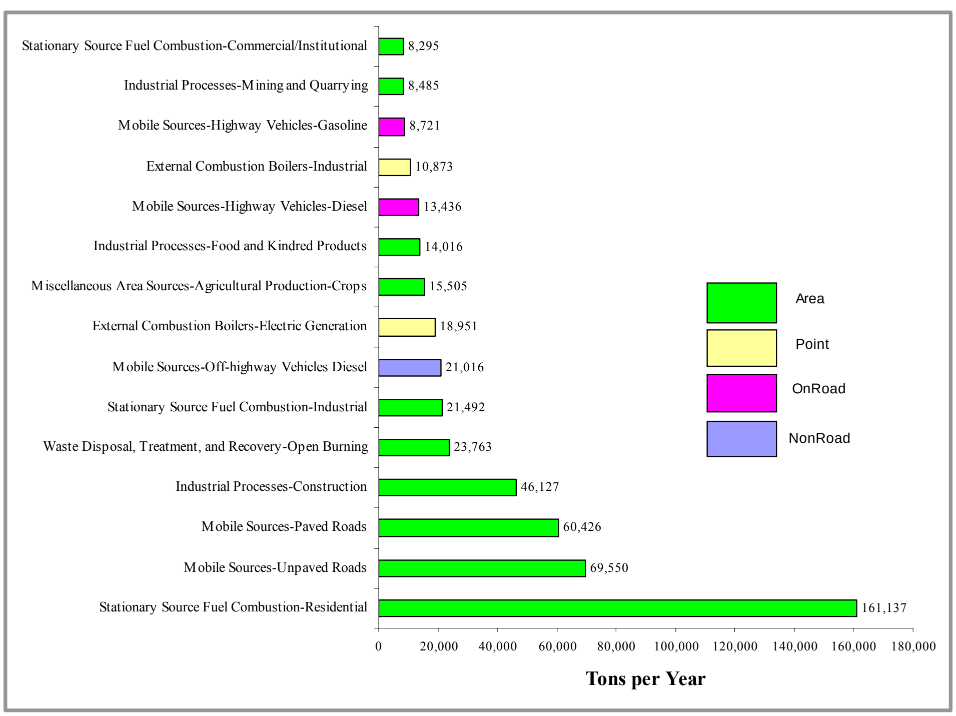


Figure 2.27: 2009 MANE-VU Region $PM_{2.5}$ Inventory Top 15

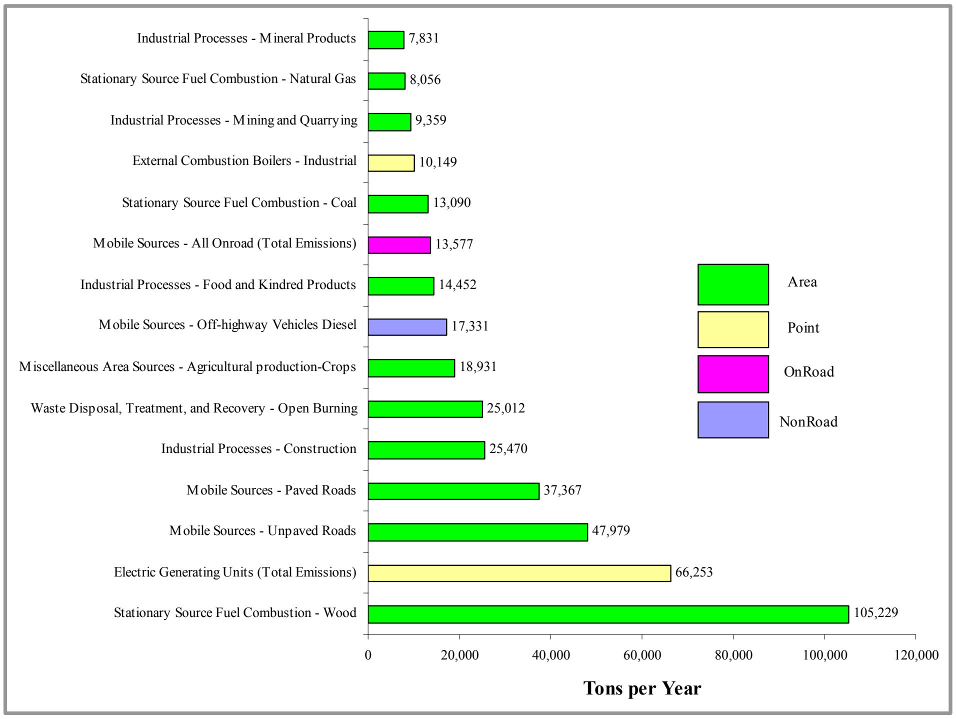


Figure 2.28: 2002 MANE-VU Region NO_x Inventory Top 15

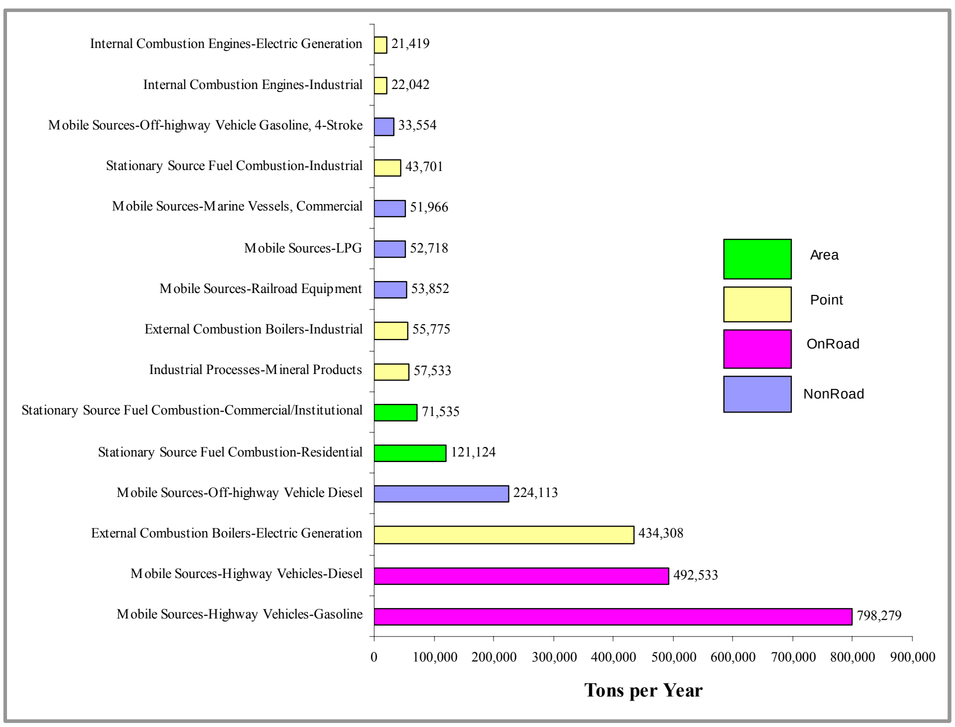


Figure 2.29: 2009 MANE-VU Region NO_x Inventory Top 15

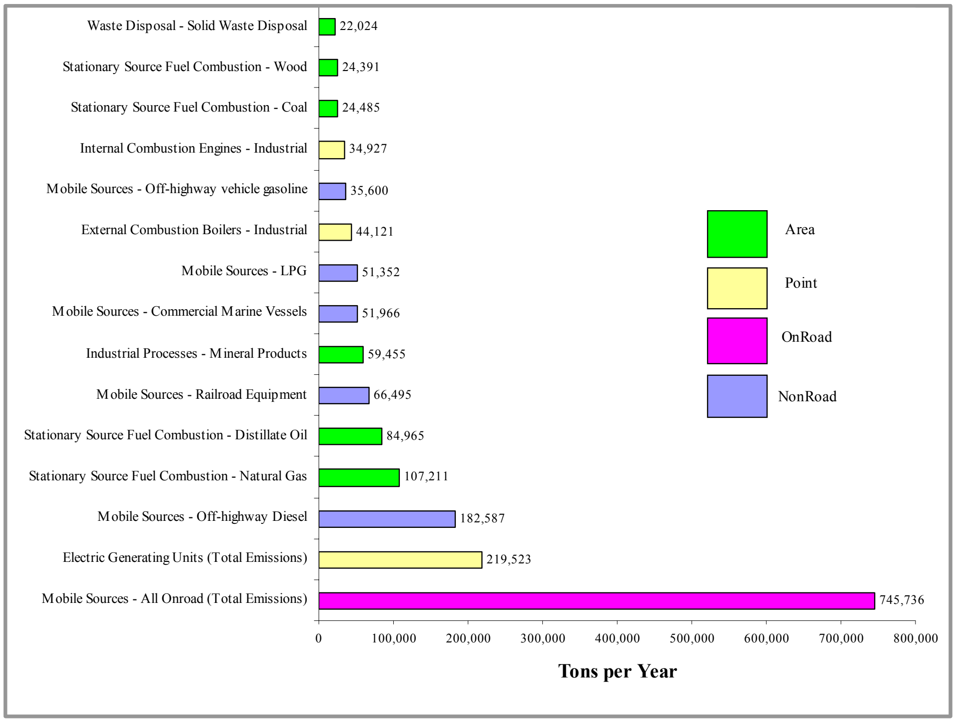
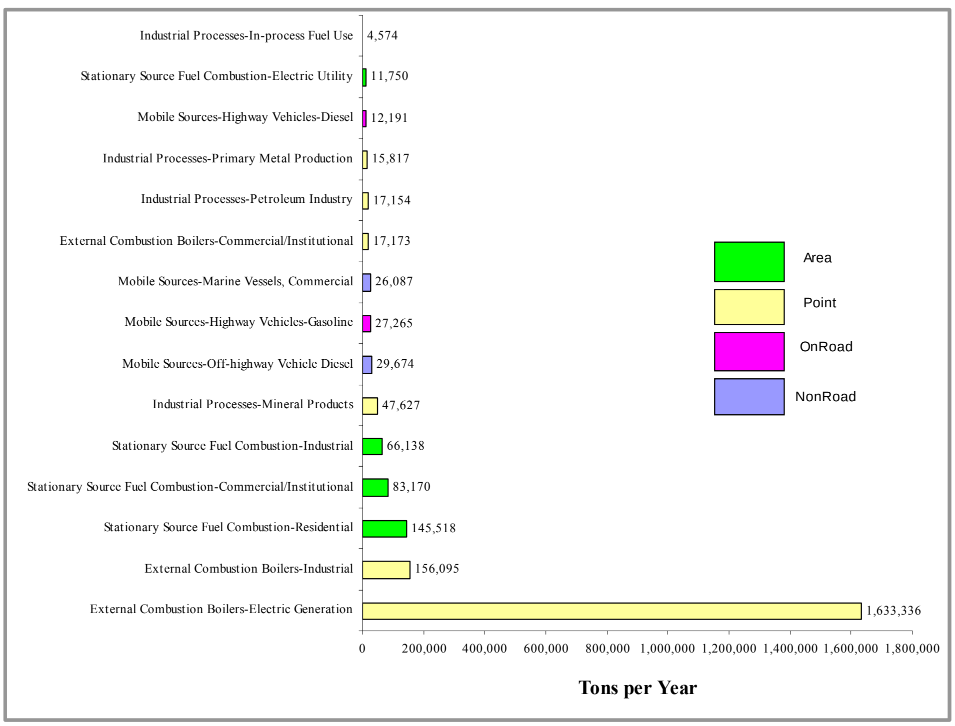
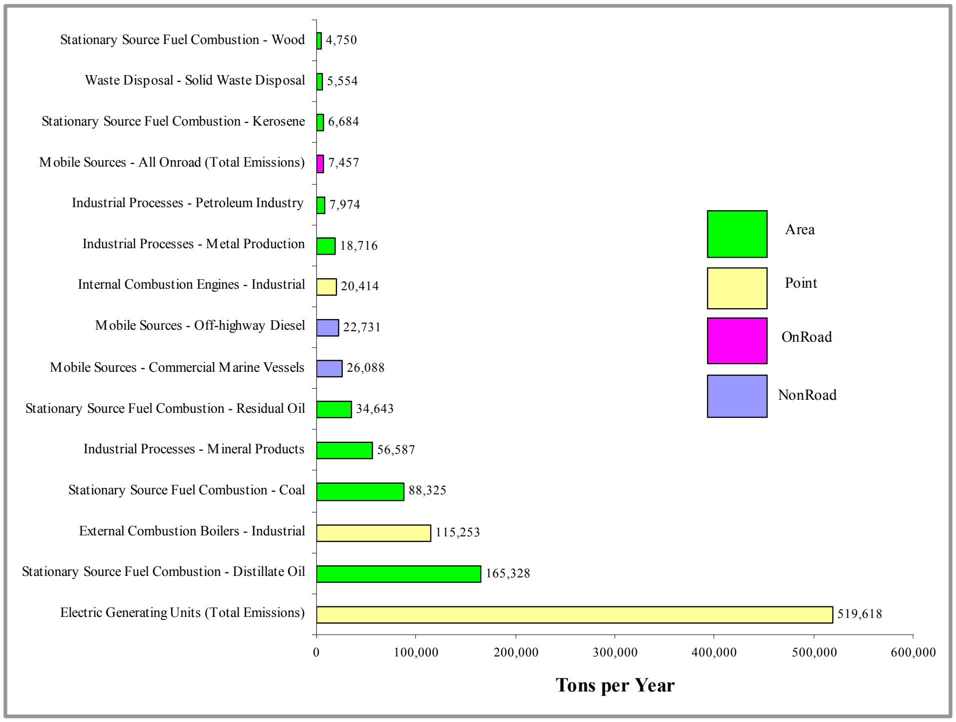


Figure 2.30: 2002 MANE-VU Region SO_2 Inventory Top 15



<u>Figure 2.31</u>: 2009 MANE-VU Region SO_2 Inventory Top 15



Addressing Condensables

Certain commercial or industrial activities involving high temperature processes (fuel combustion, metal processing, cooking operations, etc.) emit gaseous pollutants into the ambient air which rapidly condense into particle form. The constituents of these condensed particles include, but are not limited to, organic material, sulfuric acid, and metals.[106] States are required under the consolidated emissions reporting rule (CERR)[107] to report condensable emissions in each inventory revision. For New Jersey's 2002 $PM_{2.5}$ inventory, filterable $PM_{2.5}$ and condensable $PM_{2.5}$ emissions were calculated, and then these emissions were added together to produce the final $PM_{2.5}$ emissions.[108]

Addressing Fugitive Dust

There has been some controversy over state inventory estimates for fugitive dust sources, which primarily consist of dust from paved and unpaved roadways, stock/storage piles, landfill activity, quarry/mining activity, raw material handling, construction and agricultural tilling. Fugitive

---

[106] 72 <u>Fed.</u> <u>Reg.</u> 20586 (April 25, 2007).
[107] 67 <u>Fed.</u> <u>Reg.</u> 39602 (June 10, 2002).
[108] NJDEP. State Implementation Plan (SIP) Revisions for the Attainment and Maintenance of the 8-Hour Carbon Monoxide National Ambient Air Quality Standard, 1-Hour Ozone National Ambient Air Quality Standard, and Fine Particulate Matter National Ambient Air Quality Standard; and the 2002 Periodic Emission Inventory. New Jersey Department of Environmental Protection. May 2006.

dusts are directly released air contaminants that do not pass through an exhaust pipe, stack, flue, vent, or chimney. Specifically, the concern is that the estimated numbers are significantly higher than is evidenced by the ambient data. This discrepancy is supported by a study of fine particle matter near urban roadways which found that emissions of resuspended particulate matter near urban roads calculated using the prescribed guidance would result in fine particle levels 9 to 20 times higher than those observed.[109] Further, the USEPA and other regional air quality modeling work have found it necessary to reduce calculated dust-related emissions by 75-90 percent in order to have the modeling results match monitored $PM_{2.5}$ speciated data. In the regional inventory, the states each submitted unadjusted fugitive dust emission numbers to the National Emissions Inventory (NEI)/MARAMA. However, these numbers were adjusted prior to modeling, as documented in the inventory section of the Technical Support Document for modeling (see Appendix B4). In order for the calculated inventory values to more closely match the actual measured levels in New Jersey air quality monitors, and match their true proportional impacts to human health, New Jersey multiplied its estimated fugitive dust emissions by a dust adjustment factor of 20 percent in its State-generated base inventory (submitted to USEPA on February 28, 2006, and approved by the USEPA May 2006).[110]

2.7 Conclusions

Ambient air monitoring networks are in place to measure the levels of fine particulate matter in order to communicate the quality of the air to the public and to track the progress toward meeting the NAAQS. $PM_{2.5}$ has been measured in New Jersey and its associated multi-state nonattainment areas since 1999. A summary of the observations and conclusions from the analyses in this Chapter are as follows:

1) The air quality data in New Jersey and surrounding states indicates attainment of the former daily $PM_{2.5}$ standard (65 $\mu g/m^3$) and nonattainment of the new daily standard (35 $\mu g/m^3$).

2) $PM_{2.5}$ levels are decreasing.

3) Ambient $PM_{2.5}$ speciated data from the New Jersey speciation monitors in Camden, Chester, Elizabeth, and New Brunswick show that sulfate and organic carbon are the largest components of total $PM_{2.5}$ mass.

4) Analyses of the $PM_{2.5}$ speciated data collected at ambient monitors using source apportionment techniques demonstrate that common sources that contribute to $PM_{2.5}$ mass included a combination of local and regional sources and biogenic and anthropogenic sources, specifically coal-fired power plants in regions west of New Jersey, crustal matter, oil combustion sources in Northeast urban areas, sea salt, and motor vehicles (diesel/gasoline and local/highway).

---

[109] NJDEP. Attachment 2: Fugitive Dust Inventory Discussion and Summary, State Implementation Plan (SIP) Revisions for the Attainment and Maintenance of the 8-Hour Carbon Monoxide National Ambient Air Quality Standard, 1-Hour Ozone National Ambient Air Quality Standard, and Fine Particulate Matter National Ambient Air Quality Standard; and the 2002 Periodic Emission Inventory. New Jersey Department of Environmental Protection. May 2006.

[110] See note 108.

5) In addition to the ambient monitoring network, emission inventories quantify the sources of $PM_{2.5}$. In general, for both nonattaiment areas associated with New Jersey, total emissions for each pollutant are projected to decrease, with emissions from the area source sector increasing, direct $PM_{2.5}$ emissions from stationary sources are increasing, and emissions from the other sectors are decreasing by 2009.

3.0 REQUIREMENTS FOR THE 1997 $PM_{2.5}$ NAAQS

The primary purpose of this State Implementation Plan (SIP) revision is to demonstrate that New Jersey and its associated multi-state nonattainment areas will attain the 1997 annual fine particulate matter ($PM_{2.5}$) national ambient air quality standards (NAAQS) by April 5, 2010. New Jersey plans to fulfill its obligations under the federal Clean Air Act and the State's Air Pollution Control Act with respect to both the 1997 and 2006 $PM_{2.5}$ standards (see discussions of these standards in Section 1.1). The State faces several other air quality related challenges, including meeting other criteria pollutant NAAQS (such as 8-hour ozone), reducing air toxic emissions to reduce cumulative risk, and improving visibility, that are interrelated with the $PM_{2.5}$ initiatives. See Chapter 1 for more information on the $PM_{2.5}$ reductions from this SIP revision relate to the State's other air quality related challenges.

As required by 42 U.S.C. § 7410(a)(1) (Section 110(a)(1)), the states are required to demonstrate attainment of the NAAQS by submitting revised State Implementation Plans (SIPs). As discussed in Chapter 1, on July 18, 1997, the United States Environmental Protection Agency (USEPA) established two new primary NAAQS for fine particles:

- an annual fine particulate matter ($PM_{2.5}$) health-based standard of 15 micrograms per cubic meter ($\mu g/m^3$) (annual arithmetic mean) and
- a daily (24-hour) $PM_{2.5}$ health-based standard of 65 micrograms per cubic meter ($\mu g/m^3$) (24-hour average).[111,112]

On October 16, 2006, the USEPA promulgated a revised $PM_{2.5}$ NAAQS, which became effective December 18, 2006.[113] The USEPA retained the existing annual standard established in 1997 and established a more stringent daily standard of 35 $\mu g/m^3$. This SIP revision does not meet the requirements for the 2006 $PM_{2.5}$ NAAQS but provides progress toward attainment of the 35 $\mu g/m^3$ standard.

3.1 USEPA $PM_{2.5}$ Implementation Rule

The USEPA published its final rule to implement the 1997 $PM_{2.5}$ NAAQS on April 25, 2007.[114] A state or tribe must develop an implementation plan for any areas that are designated in nonattainment of a NAAQS. For the 1997 daily $PM_{2.5}$ standard, New Jersey continues to meet that level as demonstrated by the most current air monitoring data presented in Chapter 2. Thirteen of New Jersey's 21 counties were designated as nonattainment for the 1997 $PM_{2.5}$ standards, and are associated with two multi-state nonattainment areas (the Northern New Jersey/New York/Connecticut (NNJ/NY/CT) $PM_{2.5}$ nonattainment area and the Southern New Jersey/Philadelphia (SNJ/Phila.) $PM_{2.5}$ nonattainment area), as shown in Figure 1.1 (see Chapter 1).

---

[111] 62 Fed. Reg. 38652-760 (July 18, 1997).
[112] The USEPA also revised the PM_{10} NAAQS by revising the 24-hour form of the PM_{10} standard to the 99th percentile averaged over 3 years but retaining the 24-hour PM_{10} level (i.e., 150 mg/m^3) (62 Fed. Reg. 38652 (July 18, 1997)). In 2006, the USEPA revoked the annual PM_{10} standard (71 Fed. Reg. 61144 (October 17, 2006)). New Jersey was not designated in nonattainment of the PM_{10} NAAQS and continues to meet the revised PM_{10} standards.
[113] 71 Fed. Reg. 61144-233 (October 17, 2006).
[114] 72 Fed. Reg. 20586-667 (April 25, 2007).

The SIP requirements and elements of the implementation rule are described briefly in this section. Please refer to the associated SIP chapters for additional details.

$PM_{2.5}$ Precursor Policy

As discussed in Chapter 1, sulfur dioxide (SO_2), oxides of nitrogen (NO_x), volatile organic compounds (VOCs), and ammonia can all contribute to the formation of $PM_{2.5}$. Under the UESPA's final implementation rule for $PM_{2.5}$,[115] the precursor that nonattainment areas must evaluate for control measures to reduce $PM_{2.5}$ is SO_2. Sulfate has a significant regional impact on $PM_{2.5}$ concentrations and is a large component of air quality problems in all areas of the country. Studies show that sulfate is also the largest component of total $PM_{2.5}$ mass concentrations in New Jersey, as discussed in Section 2.5. There are presumptive policies for NO_x, ammonia, and VOC regarding whether or not these pollutants need to be addressed in SIPs; states have the option of reversing these policies for these precursors for an area but states must provide a technical demonstration to do so. The presumption is that NO_x should be evaluated in a SIP and for control measures, whereas ammonia and VOC are not required to be evaluated for strategies that will reduce $PM_{2.5}$ unless a state demonstrates that either or both of these pollutants are significant contributors to the $PM_{2.5}$ problem in an area. New Jersey and the states in its shared nonattainment areas agree with the USEPA's final policies for $PM_{2.5}$ precursors and did not conduct technical demonstrations to reverse these policies. Hence, New Jersey focuses on SO_2, NO_x, and direct emissions of $PM_{2.5}$ in this SIP revision.

The USEPA developed similar but not identical precursor policies for other PM-related programs under the federal Clean Air Act (e.g., New Source Review (NSR), regional haze, transportation conformity, and general conformity).[116] NSR and regional haze are discussed in Chapter 4 and transportation and general conformity are discussed in Chapter 7. For transportation conformity, a different approach for a precursor was adopted under the final regulation (i.e., 71 Fed. Reg. 12468). The federal Clean Air Act (42 U.S.C. § 7506(c) (Section 176(c))) requires transportation plans, programs, and projects to conform with a state's SIP. This requirement ensures that these activities will not contribute to or create any new air quality problems or delay the attainment of a NAAQS. For transportation conformity, four transportation related $PM_{2.5}$ precursors –NO_x, VOCs, SO_x, and ammonia – must be considered in the conformity process in $PM_{2.5}$ nonattainment areas.[117] The USEPA requirements for the consideration of $PM_{2.5}$ precursors are:

- Regional emissions analysis must include NO_x as a $PM_{2.5}$ precursor in all $PM_{2.5}$ nonattainment areas, unless the head of the state air agency and the USEPA Regional Administrator make a finding that NO_x is not a significant contributor to the $PM_{2.5}$ air quality problem in a given area.

- Regional emissions analyses are not required for VOC, SO_x, or NH_3 before an approved SIP budget for such precursors is established, unless the head of the state air agency or the USEPA Regional Administrator makes a finding that onroad emissions of any of

[115] 72 Fed. Reg. 20586-667 (April 25, 2007).
[116] 72 Fed. Reg. 20590 (April 25, 2007).
[117] 70 Fed. Reg. 24280-92 (May 6, 2005).

these precursors is a significant contributor.

Details of the criteria for the consideration of $PM_{2.5}$ precursors are explained in Chapter 7.

Reasonably Available Control Technology (RACT)
The Clean Air Act, the implementation plan must provide for the adoption of RACT, at a minimum, as expeditiously as practicable, in addition to any other plan provisions to attain the NAAQS. New Jersey determined that there are RACT measures that can be reasonably implemented, and expects these emission reduction strategies to also help with future attainment efforts for the more stringent 24-hour $PM_{2.5}$ standard, reduction of air toxics, and other air quality improvement purposes. Refer to Chapter 4 and Appendix A7 for additional details.

Reasonably Available Control Measures (RACM)
Control measures that would advance the attainment date are considered RACMs that must be included in the SIP. In accordance with 42 U.S.C. §7502(c)(1) (Section 172(c)(1) of the Clean Air Act), states, as part of their effort to attain the NAAQS, are required to implement all RACMs as expeditiously as practicable. Specifically, the Clean Air Act states:

> "In general – such plan provisions shall provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) and shall provide for attainment of the national primary ambient air quality standards."

The purpose of the RACM analysis is to determine whether or not reasonably available control measures for all mobile and non-RACT stationary sources exist that would advance the attainment date for nonattainment areas by one year. Refer to Chapter 4 and Appendix A8 for additional details.

Emission Inventory
Emission inventories for criteria pollutants, including $PM_{2.5}$, and their precursor pollutants are required by the USEPA through its authority under the federal Clean Air Act. The USEPA requirements are codified at 40 C.F.R. Pt. 51, Subpart Q. States need these emission inventories for demonstrating attainment and maintenance of NAAQS. New Jersey submitted its 2002 emission inventory to the USEPA in May 2006 and the USEPA approved it on July 10, 2006.[118] New Jersey's 2002 emission inventory was provided to the regional organizations for photochemical modeling exercises for the attainment demonstrations of the 8-hour ozone and 1997 annual $PM_{2.5}$ NAAQS and a regional 2002 baseline modeling emission inventory was developed for all of the states, incorporating the states' data, and projected to 2009. The regional 2002 and 2009 modeling emission inventories were used as the basis of this SIP revision. As

[118] "The State of New Jersey Department of Environmental Protection 2002 Periodic Emission Inventory May 2006" submitted to the USEPA as Appendix D of the "The State of New Jersey NJDEP of Environmental Protection State Implementation Plan (SIP) Revisions for the Attainment and Maintenance of the 8-Hour Carbon Monoxide National Ambient Air Quality Standard, 1-Hour Ozone National Ambient Air Quality Standard, and Fine Particulate Matter National Ambient Air Quality Standard; and the 2002 Periodic Emission Inventory May 2006." The USEPA approved the 2002 Emission Inventory effective July 10, 2006.

discussed in Chapter 2, Figures 2.20 and 2.21 show a comparison of $PM_{2.5}$ emissions by sector in the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas, respectively. Refer to Chapter 2 and Chapter 5 for additional details.

Reasonable Further Progress (RFP)
RFP is a requirement that ensures a nonattainment area is progressing toward attaining a standard in a timely fashion. For nonattainment areas with 2010 or earlier $PM_{2.5}$ attainment dates (like New Jersey's associated $PM_{2.5}$ nonattainment areas, which both have an attainment date of April 2010), no RFP submittal is necessary, as the due date of the SIP, April 5, 2008, is within two years of the attainment date.[119]

Attainment Demonstration
States with nonattainment areas are required to show through technical analyses that the standard will be met by the attainment date of April 5, 2010. Refer to Chapter 5 for additional details.

Contingency Measures
Contingency measures are required to further reduce emissions in the event an area fails to attain by its attainment date or meet a RFP milestone, as required by 42 U.S.C. § 7502(c)(9) of the Clean Air Act (Section 172(c)(9)). These contingency measures must be fully adopted rules or measures that are ready for implementation quickly without further action by the State or the USEPA upon failure to meet an RFP milestone or reach attainment.[120] By following the USEPA's guidance that encourages early implementation of contingency measures and relying on measures already implemented or under development, New Jersey is ensuring that no additional contingency measures will need to be developed and implemented beyond those identified, and is safeguarding itself against failure to meet attainment. Refer to Chapter 6 for additional details.

Section 110(a) Requirements
Under 42 U.S.C. § 7410(a)(1) and (2) (Section 110(a)(1) and (2) of the federal Clean Air Act), states are required to submit an implementation plan to the USEPA Administrator that demonstrates states' ability and authority to implement, maintain, and enforce the NAAQS. The USEPA refers to these plans as the infrastructure elements of the SIP. New Jersey submitted its proposed $PM_{2.5}$ infrastructure SIP to the USEPA on December 7, 2007.[121] 42 U.S.C. § 7410(a)(2) (Section 110(a)(2)) lists the elements that are to comprise the implementation plan. 42 U.S.C. § 7410(a)(2)(D)(i) (Section 110(a)(2)(D)(i)) (hereafter referred to as Section 110 (a)(2)(D)(i)) is commonly referred to as the transport State Implementation Plan (SIP) requirement. New Jersey submitted its transport SIP letter on December 22, 2006.[122] The public hearing on New Jersey's proposed Clean Air Interstate Rule (CAIR),[123] held on March 28, 2007, included a discussion of interstate transport as outlined in the December 22, 2006 NJDEP letter

---

[119] 72 Fed. Reg. 20633 (April 25, 2007).
[120] 72 Fed. Reg. 20642-43 (April 25, 2007).
[121] Letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 7, 2007. The letter is posted on the NJDEP's website at http://www.state.nj.us/dep/baqp/sip/siprevs.htm.
[122] Letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 22, 2006. The letter is posted on the NJDEP's website at http://www.state.nj.us/dep/baqp/sip/siprevs.htm.
[123] 39 N.J.R. 300(a) (February 5, 2007).

to the USEPA. New Jersey's CAIR was adopted on June 19, 2007, became effective on July 16, 2007, became operative on August 17, 2007,[124] and the USEPA approved these rules on October 1, 2007.[125] Refer to Chapter 8 for additional details.

Transportation Conformity and General Conformity
The Clean Air Act (42 U.S.C. § 7506) (Section 176) requires that federal actions conform to a state's SIP. To implement this requirement the Clean Air Act directed the USEPA to issue rules that governed how conformity determinations would be conducted for two categories of actions/activities; a) those dealing with transportation plans, programs, and projects (Transportation Conformity), and b) all other actions, e.g., projects requiring federal permits. This latter category is referred to as General Conformity. *De minimis* levels for $PM_{2.5}$ were published in 2006 (71 Fed. Reg. 40420 (July 17, 2006)). Projects whose direct and indirect emissions exceed the *de minimis* levels are required to offset their emissions. The Federal Transportation Conformity Rule (40 C.F.R. Sect. 93.100-160) provides the process by which the air quality impact of transportation plans, transportation improvement programs, and projects are analyzed. Refer to Chapter 7 for additional details.

Enforcement and Compliance
Enforceable SIP regulations must include specific elements. These elements include the sources or source types subject to the requirements, the requirements, (e.g., emission limits), time frames for compliance, recordkeeping and monitoring requirements, test methods for compliance,[126] and performance and ongoing monitoring of the control measures for those regulations with an applicable emissions limit. The State expects to propose and adopt measures it needs to attain the 1997 annual $PM_{2.5}$ standard in accordance with the New Jersey Administrative Procedures Act (APA) (N.J.S.A. 52:14B-1 et seq.) and the Air Pollution Control Act (APCA) (N.J.S.A. 26:2C-1 et seq.) (Refer to Chapter 8). Once adopted, these regulations will be fully enforceable by the State.

Ambient Monitoring
Federal $PM_{2.5}$ monitoring regulations at 40 C.F.R. Pt. 58 that apply to the states' ambient air quality monitoring programs were revised in 2006 with the revised PM NAAQS. No new requirements or revisions were promulgated with the final implementation rule.

Nonattainment New Source Review (NNSR)
The final 1997 implementation rule did not include final $PM_{2.5}$ requirements for the NNSR program. The USEPA issued a portion of its NNSR rule on May 16, 2008.[127] Refer to Chapter 4 for additional details on this program in New Jersey.

---

[124] 39 N.J.R. 2637(a) (July 16, 2007). Also, see N.J.A.C. 7:27-30.
[125] 72 Fed. Reg. 55666-72 (October 1, 2007).
[126] There is no final test method for direct $PM_{2.5}$ emissions at this time. The USEPA is collecting information from stakeholders on such test methods described in the implementation rule and established a period of transition for establishing $PM_{2.5}$ emission limits (72 Fed. Reg. 20651-55 (April 25, 2007)).
[127] 73 Fed. Reg. 28321-350 (May 16, 2008).

3.2 Summary of this SIP Revision

The remainder of this SIP revision includes the following:

- A discussion of control measures
- A demonstration of attainment for the year 2010 for both $PM_{2.5}$ nonattainment areas associated with New Jersey
- A Reasonably Available Control Technology (RACT) analysis
- A Reasonably Available Control Measures (RACM) analysis
- A discussion of contingency measures
- A discussion of the State's obligations in Section 110 of the Clean Air Act
- Transportation conformity budgets
- New Jersey specific declarations and commitments

4.0 CONTROL MEASURES

This chapter discusses the particulate matter related control measures implemented, or expected to be implemented in New Jersey, in the Northeast/Mid-Atlantic Regions, and nationally. As discussed in detail in Chapter 1, oxides of nitrogen (NO_x) and sulfur dioxide (SO_2), in addition to direct fine particulate matter ($PM_{2.5}$), are the precursors of concern for $PM_{2.5}$ SIP-related activity. This chapter focuses on those measures designed to decrease one or more of these pollutants specifically. This section explains the terminology related to control measures used throughout Chapter 5 (the $PM_{2.5}$ attainment demonstration chapter); provides a summary of how the control measures were identified; and gives a brief synopsis of each control measure considered in Chapter 5. A summary of the identified control measures is shown in Table 4.5. The benefits from the implementation of these measures, and the benefit calculations, are discussed in the State's attainment demonstration in Chapter 5, contingency plan in Chapter 6, and appendix to Chapter 6. Note that this chapter only provides a discussion of control measures not included in the baseline (2002) emission inventory. Existing controls, such as the New Jersey inspection and maintenance (I/M) program for gasoline vehicles prior to the initiation of mandatory on-board diagnostic inspections and pre-2002 reasonably available control technology (RACT) rules are not included in this chapter. Those controls are included in the 2002 baseline inventory. In addition to addressing $PM_{2.5}$ emissions, the measures discussed in this chapter are also expected to have an impact on controlling regional haze, the primary constituent of which is $PM_{2.5}$.

4.1 Terminology

On The Books (OTB) – "On the Books (OTB)" control measures (State or Federal) are control measures that were a) adopted before 2002, but have implementation dates after 2002, or obtain additional benefits after 2002, due to turnover of products, equipment, or vehicles (the benefits from these measures are not included in the State's 2002 base year emissions inventory); or b) adopted and implemented after 2002. An example of an OTB measure for New Jersey is the NO_x Budget Program, which went into effect May 1, 1999; a lower NO_x emission cap was required effective May 1, 2003.

Beyond On The Way (BOTW) – These control measures (state, regional, or Federal) are proposed by New Jersey as part of the effort to reach attainment by April 5, 2010.[128]

4.2 On the Books Controls

The following section provides descriptions of the New Jersey and Federal OTB measures that are included in the State's attainment demonstration.

[128] According to USEPA guidance, areas that have an attainment date of no later than April 5, 2010 must implement the emission reductions needed for attainment no later than 2009. Source: USEPA. Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone NAAQS, United States Environmental Protection Agency, October 2005.

4.2.1 New Jersey

Pre-2002 with benefits achieved Post-2002 – On the books

New Jersey NO_x Budget Program (SIP Call): On September 27, 1994, the Ozone Transport Commission (OTC) agreed to develop a regional program to achieve significant reductions in NO_x emissions from large combustion sources. This program called for the establishment of a NO_x cap and trade program, as well as the establishment of an emissions cap or "budget" for all affected sources that in total must not be exceeded during each control period, beginning in 1999. The NO_x SIP Call is a similar regional NO_x reduction measure designed by the USEPA, in part, as a result of the Ozone Transport Assessment Group's (OTAG) final recommendation report addressing ozone transport over the Eastern United States.[129] New Jersey adopted its NO_x Budget Program[130] in 1998. The base emission budget of 17,340 tons of NO_x was established for the years 1999-2002. This was approximately 65 percent less than 1990 emission levels and was termed Phase II. In 2003, the NO_x SIP Call replaced Phase III of the OTC's program with a reduction of the base emission budget to 8,200 tons. The NO_x SIP Call also expanded the geographical area beyond the Ozone Transport Region to the south and the west. The NO_x SIP Call will continue through the ozone season of 2008, at which point it will be superseded by the Clean Air Interstate Rule (CAIR). The NO_x Budget Program covers primarily electric generating units (EGUs) and some non-EGUs. The equipment covered by the NO_x Budget Program include fossil fuel fired indirect heat exchangers with a maximum rated heat input capacity of at least 250 million British thermal units (MMBtu) per hour and electric generating units with a rated output of at least 15 megawatts (MW). The USEPA approved the State's NO_x SIP Call program on May 22, 2001.[131]

Nonattainment New Source Review (NNSR): The Clean Air Act (CAA), 42 U.S.C. § 7503, requires new or modified major sources to install the Lowest Achievable Emission Rate (LAER) control equipment and obtain greater than one for one emission offsets in order to locate in a nonattainment area. Thus, the NNSR program provides for continual emission reductions to help improve the air quality in the nonattainment area and further downwind. In New Jersey, any significant new, reconstructed, or modified significant source is also required to install state of the art (SOTA) control technology (similar to Best Available Control Technology (BACT) or LAER for major sources). SOTA, which is a minor NSR program, also results in reductions in the actual emissions from the facilities. New Jersey's SOTA requirements, denominated in the New Jersey Air Pollution Control Act as "advances in the art of air pollution control," mandate BACT or LAER, as appropriate, if the equipment or control apparatus is subject to Prevention of Significant Deterioration (PSD) or Nonattainment New Source Review (NNSR) regulations.[132]

---

[129] USEPA. 1998 Ozone Transport Assessment Group (OTAG) Final Report. United States Environmental Protection Agency, Ozone Transport Assessment Group. Accessed from: http://www.epa.gov/ttn/naaqs/ozone/rto/otag/finalrpt/.
[130] N.J.A.C. 7:27-31
[131] 66 Fed. Reg. 28063-66 (May 22, 2001).
[132] New Jersey's Air Pollution Control Act (1954).

Post 2002 – On the books

New Jersey Measures Done Through a Regional Effort

NO_x RACT Rule (2006): The NJDEP adopted amendments to N.J.A.C. 7:27-19, Control and Prohibition of Air Pollution from NO_x, on September 8, 2005. The amendments were based on the OTC's March 6, 2001 model rules to control NO_x emissions tied to shortfall measures. The OTC model rules were created as the result of the agreement formally set forth in a "Memorandum of Understanding Among the States of the Ozone Transport Commission Regarding the Development of Specific Control Measures to Support Attainment and Maintenance of the Ozone National Ambient Air Quality Standards" (MOU), which was approved by the OTC on June 1, 2000. Specifically, the New Jersey amendments apply to owners and operators of certain stationary sources of NO_x emissions, including industrial/commercial/institutional (ICI) boilers, combustion turbines, and reciprocating engines. Owners and operators of such sources are required to achieve the emission limit specified in the rules or to comply instead with alternative requirements, such as an emission averaging plan, an alternative maximum allowable emission rate or a plan for phased compliance (repowering or use of innovative technology). The amendments also regulate distributed generation[133] of electricity, consistent with the OTC recommendation in its March 28, 2001 "Resolution of the States of the Ozone Transport Commission Concerning the Creation of incentives for Additional Distributed Generation of Electric Power." The USEPA issued final approval of the New Jersey SIP revision, including these rule amendments on July 31, 2007.[134] The rules became effective August 30, 2007.

New Jersey Only Measures

New Jersey Heavy Duty Diesel Rules, Including "Not-To-Exceed" (NTE) Requirements: The NJDEP adopted new rules and amendments on October 28, 2001 to N.J.A.C. 7:27-26 that added requirements for new heavy-duty diesel vehicles (HDDVs) equipped with model year 2005 and newer heavy-duty diesel engines (HDDEs) sold in New Jersey. Specifically, the rulemaking required these new HDDEs to be certified as meeting California's HDDE requirements. These requirements include both the federal emission standards applicable to all model year 2004 and newer HDDEs, plus a number of testing procedures which the USEPA required for model year 2007 and newer HDDEs. The NTE test procedure is so called because it is used to demonstrate that an engine does not exceed, under a wide variety of operating conditions, an emissions cap of 1.25 times the Federal Test Procedure emission standard. For this reason, the California requirements are often referred to as the NTE requirements. California promulgated these NTE requirements to address a temporal gap of two years between the end of the requirements set forth in the consent decrees entered into by seven major HDDE manufacturers and the effective date of equivalent federal testing requirements. It was anticipated that the adoption of the NTE

---

[133] Distributed generation is a system composed of generation located near the energy consumer's site that may be integrated with the electric grid to provide multiple benefits on both sides of the utility meter. Source: CECA. Distributed Generation Facts, Consumer Energy Council of America, http://www.cecarf.org/Programs/DG/DGFacts.html.

[134] 72 Fed. Reg. 41626-41629 (July 31, 2007).

requirements by states regulating the majority of HDDEs sold in the United States would encourage and provide incentive for engine manufacturers to produce only engines meeting the NTE requirements.

On October 25, 2005, the NJDEP adopted new rules, rule amendments, recodifications and repeals of rule provisions to clarify and supplement the existing requirements for the sale, for use or registration in New Jersey, of certain HDDVs and HDDEs, model years 2007 and later. The rulemaking did not impose any new standards for model year 2007 and later HDDEs per se; rather, it served to clarify the finer points of the application of CARB-certification requirements to model year 2007 and beyond, since CARB's standards for those model years are significantly different from the NTE requirements and standards for model years 2005 and 2006, and were not discussed in the NJDEP's 2001 rulemaking. In addition, a prohibition of the practice known as "stockpiling" was added. Stockpiling is the practice of purchasing vehicles and/or engines earlier than necessary in order to avoid more stringent emission standards. Finally, the NJDEP added provisions that would, in the event that the provisions of the Federal 2007 rule are not in effect, require recordkeeping and reporting of the sale, for use in New Jersey, of model year and later HDDEs. The Federal 2007 rule was promulgated by the USEPA on January 18, 2001 to take effect for model year 2007.

On-Board Diagnostics (I/M) Program for Gasoline Vehicles: A number of changes to New Jersey's I/M program for gasoline vehicles were implemented after 2002. The two program changes that materially impacted vehicle emissions were the extension for the new vehicle emission inspection from one inspection cycle (i.e., 2 years) to two inspection cycles (i.e., 4 years) and the initiation of mandatory on-board diagnostic (OBD) inspections for model year 1996 and newer vehicles. The OBD test largely replaced the dynamometer based Acceleration Simulation Mode (ASM5015) exhaust test for these newer vehicles. New Jersey submitted a SIP revision that contained the results of performance standard modeling for these I/M program changes on November 27, 2002.[135] The USEPA subsequently approved this SIP revision.[136]

4.2.2 Federal

Pre-2002 with benefits achieved Post 2002 – On the books

Residential Woodstove New Source Performance Standards (NSPS): The USEPA New Source Performance emission standards for new wood burning stoves[137] and fireplace inserts were implemented in 1992. These standards are 7.5 grams of particulate matter per hour for non-catalytic controlled units and 4.1 grams of particulate matter per hour for catalytic controlled

---

[135] NJDEP. Enhanced Inspection and Maintenance (I/M) Program for the State of New Jersey Revised Performance Standard Modeling SIP Revision. New Jersey Department of Environmental Protection. November 27, 2002. Available at http://www.state.nj.us/dep/baqp/sip/4year/4yrexempt_fin.doc.

[136] 68 Fed. Reg. 7704-06 (February 18, 2003).

[137] A wood burning stove is defined as a free standing enclosed wood-burning unit, vented to the atmosphere, and designed to provide heat to a home. In contrast, a fireplace insert is defined as a self-enclosed unit that sits within a masonry structure, vented to the atmosphere, that is not designed as a primary heating source for a home. The USEPA emission standards do not cover masonry-constructed fireplaces without fireplace inserts, but these unique fireplaces are thought to account for a very small segment of the wood burning conducted in the New Jersey.

units. There are no control requirements for fireplace inserts or wood stove units manufactured prior to 1992, and these units emit from 30 to 70 grams of particulate matter per hour. The USEPA indicates that they do not have any plans to update the NSPS anytime soon. Instead, the USEPA is choosing to focus on voluntary wood stove change-out programs, rather than new standards.

Acid Rain: Title IV of the Clean Air Act set a goal of reducing annual SO_2 emissions by 10 million tons below 1980 levels. To achieve these reductions, the law required a two-phase tightening of the restrictions placed on fossil fuel-fired power plants. Phase I began in 1995, and affected 263 units at 110 mostly coal-burning electric utility plants located in 21 eastern and mid-western states. An additional 182 units joined Phase I of the program as substitution or compensating units, bringing the total of Phase I affected units to 445. Phase II, which began in the year 2000, tightened the annual emissions limits imposed on these large, higher emitting plants and also set restrictions on smaller, cleaner plants fired by coal, oil, and gas, encompassing over 2,000 units in all. The program affects existing utility units serving generators with an output capacity of greater than 25 megawatts and all new utility units.

The Clean Air Act also called for a two million ton reduction in NO_x emissions by the year 2000. This has been superseded with the more stringent NO_x caps in CAIR, discussed below.

The Acid Rain Program utilizes an allowance trading system where affected utility units are allocated allowances based on their historic fuel consumption and a specific emissions rate. Each allowance permits a unit to emit one ton of SO_2 during or after a specified year. For each ton of SO_2 emitted in a given year, one allowance is retired, that is, it can no longer be used. Allowances may be bought, sold, or banked. Anyone may acquire allowances and participate in the trading system. However, regardless of the number of allowances a source holds, it may not emit at levels that would violate Federal or state limits set under Title I of the Clean Air Act to protect public health including limits set by SIPs, such as this SIP. During Phase II of the program (now in effect), the Clean Air Act set a ceiling (or cap) of 8.95 million SO_2 allowances for total annual allowance allocations to utilities.

Tier 1 Vehicle Program: Pursuant to 42 U.S.C. §7521, the USEPA promulgated regulations which revised the tailpipe standards of the Federal Motor Vehicle Control Program (FMVCP) for light duty vehicles and light duty trucks.[138] These standards, known as Tier 1, were implemented in phases beginning with the 1994 model year. The Tier 1 standards encompassed pollutants previously regulated (that is, carbon monoxide, nitrogen oxides, and particulate matter), as well as the addition of non-methane hydrocarbons (NMHC). The standards themselves are a function of vehicle class, pollutant, useful life, engine cycle, and fuel. The Tier 1 rulemaking also established new intermediate and full useful life[139] levels for air pollution control devices on light-duty vehicles and light-duty trucks, as well as new vehicle weight classes. The regulation affected petroleum and methanol-fueled motor vehicles.

[138] 56 Fed. Reg. 25724 (June 5, 1991).
[139] Useful life is the number of years that the vehicle is expected to be in use.

National Low Emission Vehicle Program (NLEV): The NLEV[140] program required automobile manufacturers to meet more stringent new car standards, starting with the 1999 model year in the OTC states and starting with the 2001 model year in the remainder of the nation, except for California. New Jersey participated in the NLEV program for the model year 2006, after which New Jersey came under the Federal Tier 2 program. New Jersey subsequently adopted the Low Emission Vehicle II (LEV II) program, which becomes effective for vehicles delivered for sale in New Jersey on and after January 1, 2009.

Tier 2 Vehicle Program/Low Sulfur Fuels: On February 10, 2000, the USEPA promulgated rules for its comprehensive Tier 2/Low Sulfur Gasoline program.[141] These regulations are designed to treat a vehicle and its fuel as a system, resulting in multiple efforts to reduce highway source emissions. In addition to requiring new tailpipe emissions standards for all passenger vehicles, sport utility vehicles (SUVs), minivans, vans and pick-up trucks, the USEPA simultaneously promulgated regulations to lower the sulfur standard in gasoline. These regulations phased in between 2004 and 2007.

Heavy Duty Diesel Vehicle (HDDV) Defeat Device Settlement: On October 22, 1998, the U.S. Department of Justice and the USEPA announced a settlement with seven major diesel engine manufacturers to resolve claims that they installed computer software on 1993 through 1998 model year heavy-duty diesel engines which was designed to disengage the engine's emission control system during highway driving.[142] The settlement, involving Caterpillar, Inc., Cummins Engine Company, Detroit Diesel Corporation, Mack Trucks, Inc., Navistar International Transportation Corporation, Renault Vehicles Industries, S.A., and Volvo Truck Corporation, included an $83.4 million total penalty. The settlement also required the manufacturers to offer software updates (chip reflash) at no cost to the truck owners at the time of engine rebuild.

Heavy Duty Diesel Vehicle (HDDV) Engine Standards:[143] On July 31, 2000, the USEPA issued a final rule for the first phase of its two-part strategy to significantly reduce harmful diesel emissions from heavy-duty trucks and buses. This rule finalized new diesel engine standards beginning in 2004, for all diesel vehicles over 8,500 pounds. Additional diesel standards and test procedures in this final rule began in 2007. This new rule required heavy-duty gasoline engines to meet new, more stringent standards starting no later than the 2005 model year. According to the USEPA, these new standards require gasoline trucks to emit 78 percent less NO_x and hydrocarbons, and diesel trucks to emit 40 percent less NO_x and hydrocarbons, than current models. The second phase of the program required cleaner diesel fuels and cleaner engines, reducing air pollution from trucks and buses by another 90 percent. The USEPA issued the final rule, to take effect in 2006-2007 on January 18, 2001.[144]

---

[140] For more information on NLEV, see USEPA website at http://www.epa.gov/otaq/lev-nlev.htm.
[141] 65 Fed. Reg. 6698-746 (February 10, 2000).
[142] For more information, see USEPA's web page on Heavy Duty Diesel Engine Consent Decree Documents at www.epa.gov/Compliance/resources/cases/civil/caa/diesel/condec.html.
[143] For more information, see the USEPA's Office of Transportation and Air Quality web site at http://www.epa.gov/otaq/hd-hwy.htm.
[144] 66 Fed. Reg. 5002-50 (January 18, 2001).

Nonroad Diesel Engines: In June 1994, the USEPA promulgated regulations to control volatile organic compounds (VOCs), NO_x and carbon monoxide (CO) emissions from diesel-powered compression ignition engines at or greater than 50 horsepower (hp), i.e., bulldozers.[145] These Tier 1 standards phased in from 1996 to 2000. In October 1998, the United States Environmental Protection Agency (USEPA) promulgated regulations to control VOC, NO_x and carbon monoxide emissions from diesel-powered compression ignition engines for all engine sizes.[146] This rule includes Tier 1 standards for engines under 50 horsepower (hp) (i.e., lawn tractors), Tier 2 standards for all engine sizes, and more stringent Tier 3 standards for engines rated over 50 hp. The new Tier 3 standards are expected to lead to control technologies similar to those that will be used by manufacturers of highway heavy-duty engines to comply with the 2004 highway engines standards.[147] The new Tier 1 standards were phased in between the years 1999 and 2000, Tier 2 standards between 2001 and 2006, and Tier 3 between 2006 and 2008.

Large Industrial Spark-Ignition Engines over 19 kilowatts: Spark-ignition nonroad engines are mostly powered by liquefied petroleum gas, with others operating on gasoline or compressed natural gas. These engines are used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications.

In September 2002, the USEPA adopted new standards to regulate these engines.[148] The emission standards are two-tiered. The Tier 1 standards, which started in 2004, are based on a simple laboratory measurement using steady-state procedures. The Tier 2 standards, starting in 2007, are based on transient testing in the laboratory, which ensures that the engines will control emissions when they operate under changing speeds and loads in the different kinds of equipment.

Also included is an option for manufacturers to certify their engines to different emission levels to reflect the fact that decreasing NO_x emissions tend to increase carbon monoxide emissions (and vice versa). In addition to these exhaust-emission controls, manufacturers must take steps starting in 2007 to reduce evaporative emissions, such as using pressurized fuel tanks. Tier 2 engines are also required to have engine diagnostic capabilities that alert the operator to malfunctions in the engine's emission-control system. The rule also includes special standards to allow for measuring emissions without removing engines from equipment.

Recreational Vehicles: Recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain-vehicles (ATVs). In September 2002, the USEPA adopted new standards to regulate nonroad recreational engines and vehicles.[149] The standards that affect $PM_{2.5}$ emissions are presented in Table 4.1. As shown by this table, only the new standards for off-highway motorcycles and ATVs will reduce NO_x, a $PM_{2.5}$ precursor.

[145] 59 Fed. Reg. 31306 (June 17, 1994).
[146] 63 Fed. Reg. 56968-7023 (October 23, 1998).
[147] USEPA. Regulatory Announcement: New Emission Standards for Nonroad Diesel Engines. United States Environmental Protection Agency Office of Mobile Sources, EPA420-F-98-034, August 1998.
[148] 67 Fed. Reg. 68242-447 (November 8, 2002).
[149] 67 Fed. Reg. 68242-447 (November 8, 2002).

<u>Table 4.1</u>: Summary of Emission Standards for Recreational Vehicles

Vehicle	Model year	Emission standards		Phase-in
		$HC^{*}+NO_x$ g/km	CO g/km	
Off-highway Motorcycle	2006	2.0	25.0	50%
	2007 and later	2.0	25.0	100%
ATV	2006	1.5	35.0	50%
	2007 and later	1.5	35.0	100%

*HC = Hydrocarbon

<u>Federal Compression Ignition Marine Engine Regulations (Commercial Marine Engines)</u>:[150,151] In 1999, the USEPA promulgated regulations for commercial marine diesel engines over 37 kilowatts (kW), including engines with per cylinder displacement up to 30 liters.[152] This rule established VOC and NO_x emission standards, starting in 2004, for new engines with per cylinder displacement up to 2.5 liters. This rule also established standards in 2007 for engines with per cylinder displacement between 2.5 and 30 liters.[153] The engines covered by this rule are divided into two categories: <u>Category 1</u>: rated power at or above 37 kW - specific displacement of less than 5 liters per cylinder. These engines are primarily found in fast ferries. <u>Category 2</u>: rated power at or above 37 kW - specific displacement greater than or equal to 5, but less than 30, liters per cylinder. These engines are primarily found in tug and towboats.

<u>Federal Small Spark Ignition Engine Regulations</u>: In July 1995, the USEPA promulgated the first phase of its regulations to control emissions from new nonroad spark ignition engines.[154] This regulation established VOC and carbon monoxide emission standards for all model year 1997[155] and newer nonroad spark ignition engines that have a gross power output at or below 19 kilowatts. These engines are used principally in lawn and garden equipment, including, but not limited to, lawn mowers, leaf blowers, trimmers, chainsaws, and generators. In March 1999, the USEPA promulgated Phase 2 regulations to control emissions from new nonroad spark ignition engines.[156] These regulations established tighter VOC and NO_x standards for non-handheld equipment such as lawn mowers and commercial turf equipment. The new standards were phased in between the years 2001 and 2007. In March 2000, the USEPA promulgated additional Phase 2 regulations to control emissions from new nonroad spark ignition engines.[157] This regulation established tighter VOC, NO_x, and carbon monoxide standards for handheld

[150] For more information, see the USEPA's regulatory announcement on Emission Standards for New Commercial Marine Diesel Engines at http://www.epa.gov/otaq/regs/nonroad/marine/ci/fr/f99043.pdf.
[151] The USEPA has not finalized Tier 2 standards for Category 3 commercial marine engines. The USEPA will promulgate final Tier 2 standards for Category 3 engines on or before December 17, 2009. ("Category 3" means relating to a marine engine with a specific engine displacement greater than or equal to 30 liters per cylinder). Source: 40 <u>C.F.R.</u> §§ 94.1, 94.8; 72 <u>Fed.</u> <u>Reg.</u> 20948-52 (April 27, 2007).
[152] 64 <u>Fed.</u> <u>Reg.</u> 73300-73 (December 29, 1999).
[153] USEPA. Technical Highlights: Organization of Gasoline and Diesel Marine Engine Emission Standards. United States Environmental Protection Agency Office of Mobile Sources, EPA420-F-99-046. December 1999.
[154] 60 <u>Fed.</u> <u>Reg.</u> 34582-657 (July 3, 1995).
[155] Ibid; Model year 1997 is defined as "The 1997 model year will run from January 2, 1996 to December 31, 1997."
[156] 64 <u>Fed.</u> <u>Reg.</u> 15208-55 (March 30, 1999).
[157] 65 <u>Fed.</u> <u>Reg.</u> 24268-314 (April 25, 2000).

equipment such as string trimmers (i.e., weed whackers), leaf blowers and chainsaws. The new standards were phased in between the years 2002 to 2007.

Post 2002 – Federal On the Books

Industrial Boiler/Process Heater MACT: On September 13, 2004, the USEPA established a Maximum Achievable Control Technology (MACT) that applies to industrial, commercial, and institutional units firing solid fuel (coal, wood, waste, biomass) which have a design capacity greater than 10 MMBtu/hr and are located at a major source of hazardous air pollutants (HAPs).[158] See the discussion on HAPs under USEPA MACT Standards. This rule was subsequently vacated by the courts, triggering the Section 112(j) provisions of the Clean Air Act. NJDEP is participating in the National Association of Clean Air Agencies' (NACAA) efforts to develop MACT guidance for use by states and expects to do case-by-case MACT in 2009.

Clean Air Interstate Rule (CAIR): The CAIR was the USEPA's attempt to address the interstate transport of ozone and fine particulate precursors by requiring emission reductions of SO_2 and NO_x. The U.S. Court of Appeals for the D.C. Circuit ruled (see Chapter 8) that the CAIR does not meet these objectives within and the requirements of the Federal Clean Air Act and remanded it to the USEPA. While the USEPA is working on a replacement program, the existing CAIR program remains in place.

The CAIR expects to obtain these reductions from large electric generating units (EGUs greater than 25 MW) through three cap-and-trade programs: ozone season NO_x, annual NO_x and annual SO_2. The CAIR ozone season NO_x cap and trade program essentially replaces the NO_x Budget Program with lower caps and an expanded geographical region to the south and west of the NO_x SIP Call region. The CAIR also creates new annual NO_x and SO_2 cap and trade programs. The annual NO_x trading program is modeled after the NO_x Budget Program, expanded for the entire year. New Jersey adopted the new rules for the CAIR NO_x Trading Program on July 16, 2007, and the USEPA approved these rules on October 1, 2007.[159] The new CAIR rules will allow New Jersey to allocate NO_x allowances to New Jersey sources beginning 2009.

New Jersey did not take any action on the SO_2 trading program. There is no allocation of SO_2 allowances for CAIR, but instead, CAIR uses the SO_2 allowances allocated under the Acid Rain Program. CAIR reduces the SO_2 emissions from the Acid Rain Phase II level by applying increased retirement ratios to the Acid Rain SO_2 allowances. Under the CAIR, pre-2010 vintage SO_2 allowances are worth 1.0 ton of SO_2 emission; 2010-2014 vintage SO_2 allowances are worth 0.5 ton of SO_2 emissions; and post-2014 vintage SO_2 allowances are worth 0.35 ton of SO_2 emissions. This effectively reduces SO_2 emissions further below the Title IV level without creating a new currency.

Refinery Enforcement Initiative, Consent Decrees (Sunoco, Valero and ConocoPhillips): The USEPA and various state and local agencies have negotiated Consent Decrees with the major refineries to elicit emission reductions from five major refinery processes. The processes are

[158] 69 Fed. Reg. 55218-86 (September 13, 2004).
[159] 72 Fed. Reg. 55666-72 (October 1, 2007).

Fluid Catalytic Cracking Units (FCCUs) and Fluid Coking Units (FCUs), Process Heaters and Boilers, Flare Gas Recovery, Leak Detection and Repair (LDAR), and Benzene/Wastewater. The New Jersey refineries with settlements as of March 2008 include Sunoco, Valero and ConocoPhillips.

For FCCUs/FCUs, the Consent Decree control requirements generally require the installation of wet gas scrubbers for SO_2 control, and selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), or other measures to reduce NO_x emissions.

For process boilers/heaters, the control requirements for SO_2 emissions generally require the elimination of burning solids/liquid fuels. For NO_x emissions, the control requirements generally apply to units greater than 40 MMBtu per hour capacity or larger. In many cases, the Consent Decrees establish NO_x emission reduction objectives across a number of refineries that are owned by the same firm. Therefore, the companies decide which individual boilers/heaters to control as well as the control techniques to apply.

The Consent Decrees also included enhanced leak detection and repair programs (e.g., reducing the defined leak concentration) and other VOC requirements. The settlements are expected to produce additional SO_2, NO_x, and VOC emissions reductions for flare gas recovery and wastewater operations. While the Consent Decrees have various phase-in dates, significant emission reductions are expected prior to the summer of 2009.

4.3 Beyond On The Way Controls

The following sections discuss how beyond on the way (BOTW) measures (both regional initiatives and state only) were identified and provides descriptions of the BOTW measures included in the State's attainment demonstration.

4.3.1 Identifying Measures

New Jersey participated in a wide variety of processes aimed at identifying viable control measures that could be implemented to help the State reach its $PM_{2.5}$ attainment goals. The following section briefly discusses those processes, and the measures identified as viable through those processes that the State is moving forward to propose.

4.3.1.1 Regional Activities

New Jersey is an active member of four regional organizations, each with a unique focus with respect to either geographic area, air pollution concern or both. These organizations include:

The Ozone Transport Commission (OTC), a multi-state organization created under the Clean Air Act to advise the USEPA on ozone transport issues and develop and implement regional solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic regions.

Mid-Atlantic Regional Air Management Association (MARAMA), a non-profit association of ten state and local air pollution control agencies whose mission is to strengthen the skills and capabilities of member agencies and to help them work together to prevent and reduce air pollution in the Mid-Atlantic Region.

Northeast States for Coordinated Air Use Management (NESCAUM), a nonprofit association of air quality agencies in the Northeast designed to provide scientific, technical, analytical, and policy support to the air quality programs of the eight Northeast states.

The Mid-Atlantic/Northeast Visibility Union (MANE-VU), which was formed by the Mid-Atlantic and Northeastern states, tribes, and Federal agencies to coordinate regional haze planning activities for the region.

All of these organizations had an active role in the technical support work associated with this SIP revision. MANE-VU supported the regional inventory work that was utilized in the regional attainment modeling effort (see Chapter 5) and was responsible for coordinating the Regional Haze effort, which resulted in control measures that will yield $PM_{2.5}$ reduction benefits (see Section 4.3.1.4). The efforts of the OTC and MARAMA identified control measures that would result in reductions of ozone, $PM_{2.5}$, and regional haze. The ozone control measures identified by these processes are expected to result in $PM_{2.5}$ and regional haze benefits due to either shared precursors (NO_x) or tangent reduction benefits (controls would also result in direct $PM_{2.5}$ and/or SO_2 emission reductions). NESCAUM focused on control measures more closely linked with $PM_{2.5}$ and regional haze reductions (mainly low sulfur fuel for industrial, commercial and residential facilities). The efforts of these regional organizations are summarized in the following sections.

4.3.1.2 Ozone Transport Commission (OTC)

New Jersey worked with other jurisdictions in the Ozone Transport Region to explore reasonable control measures for potentially significant emission reductions. To accomplish this, the OTC staff and member jurisdictions formed workgroups to: 1) review mobile, point, and area source categories, 2) identify candidate source categories, and 3) consider potential control strategies for those source categories to reduce NO_x, VOC, and SO_2 emissions.

Each OTC workgroup focused on a different sector (mobile/point/area) and compiled a list of viable control measures from sources published by the USEPA and various regional associations, OTC member state-specific control strategies already in place, and emission control initiatives from states outside the Ozone Transport Region, such as California. Then using 2002 emission inventories as the base year, the workgroups determined projected 2009 emission reductions based on currently existing controls, including Federal rules, adoption of previous OTC model rules by member jurisdictions, enforcement settlements, and other state-specific control measures, and estimated growth of inventories. Based on the review of the list of control measures and the emission inventories, the workgroups developed a preliminary list[160] of candidate control measures thought to be most effective in reducing emission levels throughout the Ozone Transport Region.

---

[160] To review the preliminary list of OTC-identified control measures that were further evaluated for potential emission reductions, see the OTC web site at http://www.otcair.org/document.asp?fview=Report.

From this preliminary list, the OTC workgroups developed white papers, summarizing key facts about the relevant control alternatives. The white papers provided information, such as descriptions of source categories and candidate control measures, 2002 base year emissions, 2009 projected emissions after implementation, preliminary cost estimates, current federal and state regulations, methods of implementation, applicability, and geographic impact. Some of the papers reflected inter-regional efforts, such as those by the MARAMA for refineries, by the NESCAUM for heating oil, and by the super-regional discussions with the Midwest Regional Planning Organization (MWRPO) regarding Industrial, Commercial and Institutional (ICI) boilers and Electric Generating Units (EGUs). Using a scale of recommendations from one (definitely recommended) to five (not recommended), the member jurisdictions ranked the relative importance of the source categories and control strategies based on a qualitative assessment of the information presented in the white papers. After consideration of the estimated costs and magnitude of reductions potentially achievable for the selected emission sources, the OTC member jurisdictions identified reasonable control measures for a variety of source categories. Both during and after the ranking process, the OTC received written comments from stakeholders, held public meetings, and interfaced with impacted industries to better understand the source categories and how to regulate them effectively. The final list of source categories recommended by OTC for member jurisdictions to consider for emission reductions are presented in Table 4.2.

The OTC efforts focused on VOC and NO_x reductions for the purpose of reducing ozone. New Jersey evaluated the control measures identified by the OTC for NO_x measures that would have a $PM_{2.5}$ reduction benefit. Although the OTC efforts did not have a primary focus on control strategies for direct $PM_{2.5}$, New Jersey evaluated related direct $PM_{2.5}$ reduction strategies through its Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM) analyses discussed in Sections 4.3.1.5.3 and 4.3.1.5.4, respectively.

Table 4.2: Final OTC Control Measure Source Categories[161, 162]

Sector	Source Category
Area	Adhesives, Sealants, Adhesive Primers, and Sealant Primers (Industrial)
Area	Cutback and Emulsified Asphalt Paving
Area	Consumer Products
Area	Portable Fuel Containers
Point	Asphalt Production Plants
Point	ICI Boilers 100 MMBtu/hour or greater
Area and Point	ICI Boilers <100 MMBtu/hour

[161] Measures that are shaded are expected to have a NO_x emission reduction benefit in New Jersey.
[162] The following programs that are listed in Table 4.3 are not discussed in New Jersey's proposed SIP document: 1) Regional Fuel based on Reformulated Gasoline Options is not discussed because there is already a mandatory program required by Section 211(k) of the Clean Air Act in New Jersey. 2) Cement Plants are not discussed because there are no cement plants in New Jersey. 3) Diesel Chip Reflash is not discussed because the OTC states, including New Jersey, are considering possible actions to increase the number of chip reflash installations of HDDVs in the Northeast.

Point	Glass Furnaces
Point	Cement Plants
Onroad Mobile	Diesel Truck Chip Reflash
Onroad Mobile	Regional Fuel based on Reformulated Gasoline Options

The shaded categories in Table 4.2 are the OTC measures that have a $PM_{2.5}$ precursor reduction benefit. NESCAUM developed a model rule for diesel chip reflash for state use, which was included in the OTC's final Technical Support Document. New Jersey is still evaluating this program and seeks comments on how to best achieve the Federal emission limits. For three of the OTC measures (adhesives and sealant, consumer products and portable fuel containers), the OTC drafted model rules which NJDEP is using to achieve VOC emission benefits. For the remaining measures shown in Table 4.2, the OTC developed emission limits and rule specification guidance. The OTC member states signed a Memorandum of Understanding (MOU) (Appendix A1) that addresses emissions associated with high electrical demand days (HEDD) to compliment already existing and future cap-and-trade programs with respect to electrical generation. This regional HEDD program will address the peak load emissions from the electrical generation sector on a daily basis.

New Jersey and other OTC member jurisdictions have resolved to pursue necessary and appropriate rulemakings to implement the emission reduction percentages, emission rates, or technologies for the categories listed in Table 4.2 that are consistent with guidelines found in OTC Resolution 06-02 adopted on June 7, 2006, and amended on November 15, 2006, found in Appendix A2, as well as the High Electrical Demand Days MOU found in Appendix A1. The NJDEP expects to implement most measures that are not already adopted starting May 1, 2009 or later. A brief summary of all the OTC-identified control measures that have a $PM_{2.5}$ emission reduction benefit is included in the following subsection. For more information about the OTC control measure identification process, or the control measures identified for implementation through this process, please see Appendix A3.

OTC Identified Beyond on the Way (BOTW) Measures:

Asphalt Production: The NJDEP proposed amendments to its rules at N.J.A.C. 7:27-19.9 in order to lower NO_x emissions from asphalt production facilities. The proposed amendments, based on an OTC model rule, would pursue control measures to achieve at least a 35 percent reduction of NO_x emissions from asphalt production plants from current levels, with the inclusion of emission limits based on type of fuel combusted and implementation of Best Management Practices (BMP) requirements. The OTC guidance is based on emission rates and percent reductions typically achieved from the installation of low NO_x burners (LNB) and flue gas recirculation (FGR) to reduce NO_x emissions from asphalt plants. A low NO_x burner reduces NO_x by staged combustion. In flue gas recirculation, the flue gas is used to assist in cooling the combustion temperature, which in turn reduces the NO_x generated. The implementation of Best Management Practices would allow for substantial reductions in fuel consumption and corresponding reductions in the products of combustion, including NO_x. Best Management Practices include annual combustor tune-ups, effective stockpile management to reduce aggregate moisture content, lowering mix temperature, and other maintenance and operational best practices. For more details on this future rulemaking, see Appendix A3.

Glass Manufacturing: New Jersey proposed amendments to its current glass manufacturing rules at N.J.A.C. 7:27-19.10. The proposed amendments, based on OTC guidance, would revise the NO_x emission rates to reduce emissions consistent with the installation of oxy-fuel firing, or equivalent measures, at the time of the next furnace re-build. Although several alternative NO_x control technologies exist, including combustion modifications (low NO_x burners, oxy-fuel firing, oxygen-enriched air staging), process modifications (fuel switching, batch preheat, electric boost), and post combustion modifications (fuel reburn, SNCR, SCR), oxyfiring is considered the most effective because it not only reduces NO_x emissions by as much as 85 percent, but also reduces energy consumption, increases production rates by 10-15 percent, and improves glass quality by reducing defects. In addition, oxyfiring is demonstrated technology for the glass industry. Of New Jersey's 25 glass manufacturing furnaces, five are already equipped with oxy-fuel firing and nine are electric. For more details on this future rulemaking, see Appendix A3.

Industrial/Commercial/Institutional (ICI) Boiler Rule 2009:[163] ICI boilers combust fuel to produce heat and process steam for a variety of applications, including chemical, metals, paper, petroleum, and food production industries, and for space heating in office buildings, hotels, apartment buildings, hospitals, and universities. Industrial boilers are generally smaller than boilers in the electric power industry, and typically have heat inputs in the 10-250 MMBtu/hr range; however, industrial boilers can be as large as 1,000 MMBtu/hr or smaller than 1 MMBtu/hr. Most commercial and institutional boilers have a heat input less than 100 MMBtu/hr. In New Jersey, 70 percent of the population is smaller than 50 MMBtu/hr.

Currently, New Jersey ICI boilers are regulated according to size, fuel and boiler type. New Jersey's existing NO_x limits generally apply only to ICI boilers at least 50 MMBtu/hr located at major sources (i.e., point sources). ICI boilers at minor sources (i.e., area sources) are not subject to the maximum allowable emission rates, but are required to adjust the combustion process annually in boilers as small as 5 MMBtu/hr, effective as of 2010.

New Jersey proposed amendments to its current ICI boiler rules at N.J.A.C. 7:27-19.7. The proposed amendments would revise the NO_x emission limits for both point and area source ICI boilers. Under the proposed amendments, owners and operators of any ICI boilers as small as 25 MMBtu/hr would be required to achieve emission limits specified in the rules. For more details on this future rulemaking, see Appendix A3.

4.3.1.3 Mid-Atlantic Regional Air Management Association (MARAMA)

The MARAMA states concentrated their efforts on identifying and analyzing emissions from all petroleum refinery processes to help states with refineries develop their SIPs for ozone, fine particles, and regional haze. The MARAMA Refinery Technical Oversight Committee (TOC), assisted by MACTEC Federal Programs, Inc., evaluated emissions and existing requirements for certain sources found at fourteen (14) petroleum refineries in the MARAMA area. Based on that preliminary review, the TOC selected catalytic and thermal cracking units, boilers and process

[163] Some categories have 2009 compliance dates; remainder have 2012 compliance dates.

heaters, flares, equipment leaks, wastewater treatment, storage tanks, and sulfur recovery plants for further consideration.

MARAMA evaluated emissions, existing requirements, including recent Consent Decrees from 10 of the 14 identified refineries, available control technology options, and typical installation costs for each category. As a result of this study, MARAMA, assisted by MACTEC Federal Programs, Inc., developed three Model Rules for fluid catalytic cracking units, flares and enhanced monitoring of equipment leaks at petroleum refineries. As part of its 8-hour ozone RACT committal SIP, the State of New Jersey proposed new rules based in part on MARAMA's model rules.[164] New Jersey expects that the NO_x, SO_2, PM, and VOC reductions from these measures will also result in $PM_{2.5}$ reduction benefits.

A brief summary of all the MARAMA-identified control measures is included in the following subsections. For more information about the MARAMA control measure identification process, or the control measures identified for implementation through this process, please see Appendix A4.

<u>MARAMA-Identified Beyond on the Way (BOTW) Measures</u>:

<u>Refineries - Fluid Catalytic Cracking Units (FCCUs)</u>: Catalytic cracking units convert middle distillate, gas oil and residuum into primarily gasoline, jet and diesel fuels by using a series of processing steps that literally "crack" large, heavy molecules into smaller, lighter ones. Heat and catalyst are used to convert the heavier oils to lighter products. With fluid catalytic cracking, a fluidized catalyst is used in the cracking process. Fluid catalytic cracking unit systems are the most widely used cracking process in the MARAMA region and are the largest air contaminant emission sources at the refinery. New Jersey has four gasoline-producing refineries with fluid catalytic cracking units. These refineries are major facilities with Title V Operating Permits, and all emit large quantities of criteria pollutants (SO_2, NO_x, VOCs, carbon monoxide, and coarse particulate matter (PM_{10})), as well as HAPs. New Jersey currently regulates NO_x emissions from fluid catalytic cracking units at N.J.A.C. 7:27-19.13.

MARAMA's model rule for FCCUs, includes emissions limits for particulate matter, SO_2, NO_x, and carbon monoxide. The MARAMA Technical Oversight Committee chose to recommend the most stringent limits in recent Consent Decrees or rules in other jurisdictions. Feasible control technologies are summarized in Table 2-6 of their Final Report.

<u>Refineries – Flares</u>: Petroleum refinery flares are intended to be last-resort control devices used to safely dispose of flammable waste gases from emergency process upsets, as well as during start-up, shutdown and turnaround operations. The combustion of these gases can emit large quantities of NO_x, SO_2, and carbon monoxide into the atmosphere and are believed to be underestimated. New Jersey currently regulates VOC emissions from refinery flares at N.J.A.C. 7:27-16.13.

[164] The MARAMA model rules are posted at http://www.marama.org for public review.

MARAMA's model rule for petroleum refinery flares includes the control measures designed to reduce NO_x, SO_2, VOC, and carbon monoxide emissions. Specifically, the model rule includes requirements for the owner/operators of refinery flares to operate and maintain a flare gas recovery system and to eliminate the flaring of routinely generated refinery fuel gases. Other items included in MARAMA's flare model rule include operational requirements, monitoring system requirements, and guidelines for calculating flare emissions. Control technology options for flares are summarized in Table 4-5 of the Final Report.

4.3.1.4 Mid-Atlantic/Northeast Visibility Union (MANE-VU)

The MANE-VU was tasked with identifying reasonable control measures that would reduce emissions from within the MANE-VU region contributing to visibility impairment at Class I areas by 2018 or earlier. To accomplish this task, beginning in 2005, the MANE-VU reviewed a wide range of potential control measures to reduce emissions from sources contributing to visibility impairment in affected Class I areas, including a "master list" of some 900 potential control measures, originally developed for 8-hour ozone initiative by the OTC. From this extensive list, the MANE-VU developed an interim list of Regional Haze control measures, which for regional haze included: beyond-CAIR sulfate reductions from EGUs, low-sulfur heating oil (residential and commercial), ICI boilers (both coal and oil-fired), lime and cement kilns, residential wood combustion, and outdoor burning (including outdoor wood boilers).

The next step in the regional haze control measure selection process was to further refine the interim list. The beyond-CAIR EGU strategy continued to stay on the list since EGU sulfate emissions have, by far, the largest impact on visibility in the MANE-VU Class I areas. Likewise, a low-sulfur oil strategy, combining low-sulfur heating oil (residential and commercial) and the oil-fired ICI boiler sector control measures for #2, #4, and #6 residual oils, remained on the list after a NESCAUM-initiated conference with refiners and fuel-oil suppliers concluded that such a strategy could realistically be implemented. During MANE-VU's internal consultation meeting in March 2007, member states reviewed the updated interim list of control measures to make further refinements. At that time, states determined, for example, that there may be too few coal-fired ICI boilers in the MANE-VU states for that to be considered as a "regional" strategy, but that could be a sector pursued by individual states. They also determined that lime and cement kilns, of which there are few in the MANE-VU region, would likely be handled via state BART determination processes. Residential wood burning and outdoor wood boilers remain on the list for those states where localized visibility impacts may be of concern.

The Commissioners of the environmental agencies of the northeastern States with Class I areas met on June 7, 2007 and agreed on a Statement of Principles to guide the direction of the future consultation process for Regional Haze Planning that occurred during the summer of 2007. This Statement of Principles was designed to guide the consultation process, set forth the importance of Regional Haze long-range planning for all states, and highlighted the critical role that air pollutant transport plays in regional haze and interstate air pollution. The principles that New Jersey and the other MANE-VU States laid out in this document are included in Appendix A5.

The Commissioners of the MANE-VU States also agree upon certain long-range goals for the control of specific source categories within MANE-VU and agreed on certain specific targets to "ask" of other States outside of the MANE-VU planning region and to "ask" of the USEPA. These planning agreements are included in Appendix A6, and summarized in Table 4.3. New Jersey included these targets in its Regional Haze air quality planning document.[165]

Table 4.3: Summary of MANE-VU Planning Targets

Controls Inside of the MANE-VU Region	Controls Outside of MANE-VU Region	National Controls (to "ask" of the USEPA)
Timely implementation of BART requirements	Timely implementation of BART requirements	The MANE-VU states and tribes request that the USEPA work with the eastern Regional Planning Organizations to develop a proposal for tightening the CAIR program to achieve an additional reduction in SO_2 by no later than 2018
A 90% or greater reduction in SO_2 emissions from EGUs identified by MANE-VU	A 90% or greater reduction in SO_2 emissions from EGUs identified by MANE-VU	
Ultra Low sulfur fuel strategy in the inner zone states	Application of reasonable controls on non-EGU sources	
Low sulfur fuel strategy in the outer zone states		
Continued evaluation of other control measures, including energy efficiency, alternative clean fuels, and other measures to reduce SO_2 and NO_x emissions from all coal burning facilities by 2018, and new source performance standards for wood combustion	Continued evaluation of other control measures, including energy efficiency, alternative clean fuels, and other measures to reduce SO_2 and NO_x emissions from all coal burning facilities by 2018, and new source performance standards for wood combustion	

Although emission reduction benefits from the MANE-VU efforts that are targeting $PM_{2.5}$ precursors (SO_2 and NO_x) will occur after the 1997 $PM_{2.5}$ NAAQS attainment date (April 5, 2010), the reductions from the measures listed in Table 4.3 will help the State attain the new 2006 24-hour $PM_{2.5}$ standard, as well as all the other $PM_{2.5}$-related air quality goals discussed in Chapter 1.

4.3.1.5 State Specific Efforts

In addition to New Jersey's participation in the regional control measure identification efforts, the State implemented its own outreach initiative, entitled "Reducing Air Pollution Together." "Reducing Air Pollution Together" was designed to gather control measure ideas and suggestions from the New Jersey public, regulated communities, and other interested parties. In addition, the NJDEP, as required by the Clean Air Act, completed its own internal RACT and Reasonably Available Control Measures (RACM) analyses, to identify viable controls for significant sources within the State. All of these efforts, as well as any control measures identified from them, are discussed in greater detail below.

[165] New Jersey proposed its Regional Haze SIP September 15, 2008.

4.3.1.5.1 New Jersey Workgroup Efforts

The NJDEP began a collaborative effort to discuss the air quality challenges facing New Jersey by hosting a public workshop on June 29, 2005. This workshop served to initiate a dialogue between the NJDEP and interested and affected parties about reducing emissions in order to improve air quality in New Jersey. Over 200 persons representing various industries, environmental and civic groups attended. As a result of the "Reducing Air Pollution Together" workshop, the following six air quality workgroups were formed and collaborated over several months to develop recommendations on how to reduce air emissions from their specific source categories:

- Diesel Initiatives
- Gasoline Cars and Trucks
- Homes and Restaurants
- Non-Automobile Gasoline Engines
- Stationary Combustion Sources
- Volatile Organic Compounds from Industrial Processes and Consumer Products

The workgroups identified potential control measures to reduce NO_x, VOC, $PM_{2.5}$, and SO_2 emissions for possible inclusion in the State's upcoming SIP revisions. Through the cooperative efforts of the NJDEP, federal agencies, industry, consultants, environmental groups, and other members of the regulated community, the workgroups evaluated available emission inventories, technical information and field data to develop lists of potential air emission control strategies related to their topic area. The criteria used by the workgroups to prioritize control measures included technical feasibility, economic feasibility, environmental benefits, and implementation feasibility. The air quality workgroups compiled their recommendations into reports that were submitted to the NJDEP for further consideration on October 31, 2005. The workgroups presented a summary of their recommendations to the NJDEP's Air Quality Management Team on November 14, 2005. This event was another opportunity for the NJDEP staff and workgroup members to discuss the workgroup recommendations.

The NJDEP's workgroup leaders and facilitators met with the NJDEP's Air Quality Management team to review the over 200 workgroup recommendations and identify those control strategies with significant potential emissions reductions. After culling that list down to 60 potential control measures, the NJDEP then generated white papers[166] for each measure. These white papers were posted on the NJDEP's website for public review and comment. The NJDEP made revisions to individual white paper where appropriate, based on comment and/or additional information. In addition, the NJDEP invited the public, representatives from local businesses, industry and environmental groups, and others to a follow-up workshop to discuss potential emission reduction strategies on May 17, 2006. The purpose of that workshop was for the NJDEP to provide an update on efforts during the past year to address air quality challenges

[166] A complete list of white papers, with links to the actual papers, can be found at www.nj.gov/dep/airworkgroups/docs/wp_summary_table_web.xls.

facing New Jersey and to share preliminary regulatory and nonregulatory plans to reduce air emissions. Following the May 17, 2006 workshop, the public was asked to provide feedback on the workshop, and on the 60 white papers drafted by the NJDEP and discussed at the workshop.[167]

Many of the white paper measures are the same as those identified through the OTC and MARAMA efforts, and the State's own RACT and RACM analyses for both ozone and $PM_{2.5}$. The $PM_{2.5}$ RACT and RACM analyses are discussed in more detail in Sections 4.3.1.5.4 and 4.3.1.5.5, respectively.

4.3.1.5.2 New Jersey Board of Public Utilities (NJBPU) Energy Master Plan Efforts

On October 3, 2006, Governor Jon S. Corzine announced the commencement of an interagency planning process that will culminate in an energy master plan, a long-term energy vision for the state that plans for the state's energy needs through 2020.[168]

The Energy Master Plan (EMP) will address three areas: security, safety, and reliability of prices of energy supply and services; economic impact of energy production, transportation, and end use; and environmental impact associated with the production of energy.[169] The main goal of the EMP is to reduce projected energy use by 20 percent by 2020 and meet 20 percent of the State's electricity needs with Class 1 renewable energy sources by 2020.[170] Other goals of the EMP are described below:

> **Goal 1: Secure, Safe, and Reasonably Priced Energy Supplies and Services** – To provide safe, secure, reasonably priced energy supplies and services to New Jersey's commercial, industrial, transportation, and residential customers, while reducing dependence on traditional fossil fuels and fossil fuel generation, decreasing electric and natural gas transmission congestion, utilizing efficiency and renewable resources to supplement the State's energy resources, proactively planning for in-state electricity generation retirements, and reducing the demand for energy.[171]
>
> **Goal 2: Economic Growth and Development** – To encourage and maintain economic growth prospects for the State by recognizing and fostering the multiple functions of energy in the economy.[172]
>
> **Goal 3: Environmental Protection and Impact** – To promote the achievement of Federal and State environmental requirements and objectives in an effective and low-cost manner and, where possible, provide market-based incentives to achieve those goals.[173]

---

[167] Comments received on the white papers are posted at www.nj.gov/dep/airworkgroups/comments.html.
[168] State of New Jersey Office of the Governor. *Governor Corzine Announces Initial Phase of Energy Master Plan*. Available at http://www.nj.gov/governor/news/news/approved/20061003.html. October 3, 2006.
[169] State of New Jersey Office of the Governor. *Governor Corzine Announces Initial Phase of Energy Master Plan*. Available at http://www.nj.gov/governor/news/news/approved/20061003.html. October 3, 2006.
[170] State of New Jersey Energy Master Plan. *Energy Master Plan Goals*. Available at: http://www.nj.gov/emp/about/goals.html.
[171] Ibid.
[172] Ibid.

Public participation began October 2006, with a series of stakeholder meetings held throughout the State; that continued with the formation of External Working Groups for energy categories. More than 500 people have attended EMP meetings, offered input and ideas, and joined the listserv. The draft EMP was released in April of 2008 with public hearings held in July of 2008. The final EMP was released on October 22, 2008.

4.3.1.5.3 Reasonably Available Control Technology (RACT)

New Jersey's $PM_{2.5}$ reasonably available control technology (RACT) analysis was conducted pursuant to 42 U.S.C. § 7502(c)(1) (Section 172(c)(1) of the Clean Air Act), which requires states with nonattainment areas to submit State Implementation Plans (SIPs) implementing all reasonably available control measures (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) as expeditiously as practicable to attain the NAAQS.

New Jersey's RACT analysis demonstrates that reductions of direct $PM_{2.5}$ emissions and its precursors, SO_2 and NO_x, from major stationary source categories are reasonable. New Jersey's full RACT analysis is included in Appendix A7.

4.3.1.5.4 Reasonably Available Control Measures (RACM) Analysis

A Reasonably Available Control Measure, or RACM, is defined by the USEPA as any potential control measure for application to point,[174] area, onroad, and nonroad emission source categories that meets the following criteria:

- The control measure is technologically feasible
- The control measure is economically feasible
- The control measure does not cause "substantial widespread and long-term adverse impacts"
- The control measure is not "absurd, unenforceable, or impracticable"
- The control measure can advance the attainment date by at least one year

New Jersey's 2007 $PM_{2.5}$ RACM analysis was conducted to fulfill the requirements of Section (c)(1) of the Clean Air Act. This analysis addressed the following $PM_{2.5}$ precursors: direct $PM_{2.5}$, SO_2, and NO_x. VOC and ammonia were not addressed, consistent with USEPA guidance.

---

[173] Ibid.
[174] RACM applies only to those point sources not already addressed as part of the Reasonably Available Control Technology (RACT) analysis. The USEPA's $PM_{2.5}$ Implementation Rule (72 Fed. Reg. 20585-667 (April 25, 2007)) considers RACT a part of RACM, and not an independent requirement, which is how RACT is considered in the Ozone Implementation Rule (70 Fed. Reg. 71611 - 71705). However, New Jersey determined to conduct these two analyses separately, consistent with how it addressed its RACT and RACM requirements for 8-hour ozone. New Jersey's separate RACT analysis for $PM_{2.5}$ is contained in Appendix A7.

A total of 628 potential non-transportation control measures[175] were compiled and reviewed to determine whether or not any of these measures could be considered a RACM that would advance the attainment date for the 1997 annual $PM_{2.5}$ NAAQS by at least one year. In order to advance the attainment date by one year, potential RACM measures would have to be implemented by 2008. After pre-screening, 61 potential non-transportation control measures (TCMs) were further evaluated using the RACM criteria. Seventeen (17) non-TCMs passed all RACM criteria, but would not be implemented by 2008.

The NJDOT conducted a separate $PM_{2.5}$ RACM analysis for TCMs. Twenty-six TCMs were identified and evaluated based on the RACM criteria. One TCM passed all RACM criteria, but would not be implemented by 2008.

It was determined that none of these 18 potential measures could be implemented by 2008. The RACM analysis did identify several promising measures that New Jersey will consider implementing at a later date, and confirmed other measures that New Jersey is already addressing.

New Jersey's full RACM analysis is included in Appendix A8.

4.3.1.5.5 Additional Measures

There are additional State measures that, while not identified specifically in any of the regional or state control measure initiatives, have been, or will be, implemented in time to provide quantitative $PM_{2.5}$ emission reductions prior to and during 2009. The remainder of this section discusses these measures:

Diesel Idling Rule Changes: Since diesel engines are significant contributors of ozone and fine particulate precursors in the State of New Jersey, any efforts to control and reduce those emissions contribute to the State's attainment of the ozone and fine particulate matter NAAQS. On September 18, 2006, the NJDEP proposed amendments to the existing diesel idling rules.[176] The rules became effective July 25, 2007. These rules address the allowable idling duration for diesel-powered motor vehicles, and exemptions to that maximum idling limit. The changes reduce the allowable exemptions to a three-minute diesel idling standard. There were exemptions to the idling limit which allowed qualified vehicles to idle for an unlimited length of time under certain conditions. The revisions to the rule modify these exemptions to further limit idling in cold weather; limit the idling time for vehicles that transport people; clarify the idling rules regarding trucks waiting in line; clarify the type of vehicle which would be considered an "emergency motor vehicle," and the times which would be considered "an emergency situation;" eliminate the exemption for idling while a vehicle is in for repairs that do not require the engine to be engaged to complete; eliminate the exemption for idling while attaching or detaching a

[175] Transportation Control Measures, or TCMs, are transportation strategies specific to onroad mobile sources, which reduce emissions by reducing the number and/or length of vehicle trips and/or improve traffic flow.
[176] Control and Prohibition of Air Pollution from Diesel-Powered Motor Vehicles Air Administrative Procedures and Penalties Proposed Amendments: N.J.A.C. 7:27-14.1, 14.3, 7:27A-3.10(m)14. New Jersey Department of Environmental Protection. September 18, 2006.

trailer, should it take longer than the allowed three consecutive minutes; and phase out the exemption for sleeper berths.

Diesel Smoke (I/M Cutpoint) Rule Changes: Like the diesel idling efforts, the NJDEP requirements for the inspection and maintenance (I/M) of diesel vehicles are designed to reduce the emissions from diesel engines, which are significant contributors to ozone, $PM_{2.5}$ and its precursors. The NJDEP is currently working to propose amendments to its existing diesel I/M rules to reduce the allowable smoke from heavy-duty diesel vehicles. Smoke opacity, which is used as a surrogate for particulate matter, is the degree to which a plume of smoke will obstruct transmission of visible light. Smoke opacity is used as an indicator for mal-maintenance.

Currently available technology allows diesel engines to emit smoke at rates much lower than the existing cutpoints, when operating in accordance with the manufacturers' specifications. Therefore, it is appropriate to revise the heavy-duty diesel vehicle inspection program standards to reflect the current diesel engine technology and ensure appropriate maintenance is performed. Although newer diesel-powered vehicles and equipment usually operate more cleanly and may contribute less to air quality problems than their predecessors, diesel-powered trucks and buses tend to remain in service for 20 years or more. Unless the excess emissions due to mal-maintenance or lack of repair are reduced, trucks and buses will continue to emit excess levels of exhaust particles and contribute to air pollution in the State for many years to come. Implementing stricter opacity cutpoints for diesel-powered vehicles will result in appropriate maintenance and reduce emissions.

Case-by-Case NO_x Limit Determinations (FSELs/AELs): Existing RACT rules set performance standards for many source categories. Major NO_x facilities with emission sources having a potential to emit more than 10 tons of NO_x per year where no previous NJDEP RACT limit has been established in the RACT Rules (N.J.A.C. 7:27-16 and N.J.A.C. 7:27-19), i.e., sources without performance standards, must apply to the NJDEP for a Facility-Specific Emission Limit (FSEL). When a performance standard exists and the source determines it is not reasonable, they apply to the NJDEP for an Alternative Emission Limit (AEL). FSELs and AELs are determined on a case-by-case basis.

Currently, New Jersey has about 40 of these case-by-case FSEL/AEL determinations for sources throughout the State. New Jersey's FSEL and AEL provisions for oxides of nitrogen are found at N.J.A.C. 7:27-19.13.

As part of its RACT analysis, the NJDEP reviewed all of its existing FSELs and AELs and found that many were approved as long ago as 1997. In many cases, control technologies have advanced sufficiently since that time, warranting the reevaluation of these case-by-case determinations. The NJDEP proposes to require all facilities with existing FSELs or AELs to either comply with the existing or revised RACT limits, where applicable, or demonstrate that a new FSEL/AEL is warranted. The NJDEP further proposes that the newly issued AELs will terminate after a certain number of years, requiring periodic re-evaluations and determinations, in an effort to keep these limits current until compliance with specific rule emission limits are achieved.

Municipal Waste Combustors (Incinerators) NO_x Rule: New Jersey has five resource recovery facilities (RRF) located in Essex, Union, Camden, Gloucester, and Warren Counties, respectively. There are 13 municipal waste combustors (MWC) at these five facilities. The NJDEP approved facility specific emission limits (FSELs) pursuant to N.J.A.C. 7:27-19.13 for each of these MWCs to meet the 1-hour ozone NAAQS, because these facilities qualified as major facilities (i.e., those facilities with the potential to emit more than 25 tons of NO_x per year containing a source operation that has the potential to emit greater than 10 tons per year) and the State did not establish specific RACT source requirements for MWCs. The USEPA has adopted Federal Plans for both large and small MWCs. New Jersey is the delegated state authorized to implement and enforce those plans, in accordance with Memoranda of Agreement (MOAs) between the State and the USEPA. The Federal standard for emissions of NO_x from MWCs, as reflected in the Federal rules dated May 10, 2006, and previous Federal plans, is 205 ppm.[177] Currently, all New Jersey MWCs are in compliance with the Federal standard.

As part of its ozone RACT analysis, the NJDEP reviewed the Municipal Waste Combustor FSELs and determined that, when equipped with selective non-catalytic reduction (SNCR), NO_x controls are capable of more NO_x reductions than are currently being achieved by some of the municipal solid waste facilities. The ozone RACT rulemaking proposal will eliminate the various MWC FSELs and set a more stringent source category NO_x emission limit, which will result in further NO_x emission reductions from this source category.

Refineries - Process Heaters and Boilers: Process heaters and boilers operating at petroleum refineries emit large amounts of NO_x, carbon monoxide, SO_2, and PM emissions. Boilers are designed to generate steam for use throughout the refinery, while process heaters burn fuels to transfer heat directly to process materials. Boilers and process heaters are similar in that they are indirect combustion devices that burn fuels such as natural gas, fuel oil, and refinery fuel gas. New Jersey currently regulates NO_x emissions from indirect heat exchangers at N.J.A.C. 7:27-19.7.

Available control technologies for controlling NO_x emissions from these units include Ultra Low NO_x Burners (LNB) and Selective Catalytic Reduction (SCR). These control technologies have been successfully applied to both types of equipment achieving emission reductions up to 90 percent. Recent enforcement settlements required some refineries to reduce NO_x emissions to 0.04 lbs NO_x/MMBtu.

New Jersey Low Emission Vehicle Program: The NJDEP's Low Emission Vehicle (LEV) program (or Clean Car Program) rule was adopted on November 28, 2005, with an operative date of January 27, 2006.[178] The rule requires all new vehicles delivered for sale in New Jersey to be California certified for emissions beginning January 1, 2009. This rule also establishes a zero emission vehicle (ZEV) sales requirement for New Jersey and requires that each auto manufacturer's sales fleet in New Jersey meet a declining fleet average non-methane organic gas (NMOG) emission standard.

---

[177] 70 Fed. Reg. 75348-69 (May 10, 2006).
[178] 38 N.J.R. 497(b) (January 17, 2006).

The rule is designed, in part, to encourage auto manufacturers to offer the ultra-low emitting California certified models in New Jersey prior to the 2009 mandatory compliance start date. Auto manufacturers delivering such vehicles to New Jersey can earn ZEV credits that can be used by manufacturers to help transition into the mandatory requirements in 2009 and beyond. Currently, 36 models are certified to the Partial ZEV (PZEV) or Advanced Tech PZEV (ATPZEV) standard, which will generate such credits if sold in New Jersey. There are 23,493 vehicles that have either received or are currently receiving ZEV credits in New Jersey.

Distillate and Residual Fuel Strategies: Lowering the sulfur content in fuel oil is a part of the long-term strategy established by the MANE-VU states to reduce and prevent regional haze. The MANE-VU states in the inner zone (New Jersey, New York, Delaware and Pennsylvania) plan to reduce the sulfur content of distillate oil to 0.05 percent sulfur by weight (500 ppm) by 2012, the sulfur content of No. 4 residual oil to 0.3 percent sulfur by weight by 2012, the sulfur content of No. 6 residual oil to 0.3 to 0.5 percent sulfur by weight by 2012, and to further reduce the sulfur content of distillate oil to 15 ppm by 2016. The MANE-VU states in the outer zone plan to reduce the sulfur content of distillate oil to 0.05 percent sulfur by weight by than 2014, the sulfur content of No. 4 residual oil to 0.25 to 0.5 percent sulfur by weight by 2018, the sulfur content of No. 6 residual oil to no greater than 0.5 percent sulfur by weight by 2018, and to further reduce the sulfur content of distillate oil to 15 ppm by 2018 (depending on supply availability).

The NJDEP is planning to propose to amend N.J.A.C. 7:27-9, Sulfur in Fuels, specifically section 9.2, which specifies sulfur content standards and maximum allowable sulfur dioxide emissions. The potential amendments will affect those who store, offer for sale, sell, deliver or exchange fuel for use in New Jersey, as well as the users of these fuels. The anticipated amendments will reduce the maximum allowable sulfur content in fuel and the maximum allowable SO_2 emissions from fuel combustion in order to reduce the emissions of SO_2 and other pollutants from the combustion of fuel in New Jersey.

Currently, maximum allowable sulfur levels in No. 2 and lighter fuel oil in New Jersey are either 2,000 parts per million (ppm) or 3,000 ppm. Maximum allowable sulfur levels in No. 4 fuel ranges from 3,000 ppm (0.3 percent) to 20,000 ppm (2.0 percent). Maximum allowable sulfur levels in No. 5 and No. 6 fuels also range from 3,000 to 20,000 ppm. The NJDEP is evaluating a proposal to reduce the maximum allowable sulfur content of No. 2 and lighter fuel oil to 500 ppm (0.05 percent), then 15 ppm (0.0015 percent) statewide; reduce the maximum allowable sulfur content of No. 4 fuel oil to 3,000 ppm (0.3 percent) statewide; and reduce the maximum allowable sulfur content of No. 5, No. 6 and heavier fuel oils to 5,000 ppm (0.5 percent) in Zones 1, 2, 3 and 5 (the standard will remain 3,000 ppm (0.3 percent) in Zones 4 and 6).

Fleet Turnover: The turnover of the onroad fleet of cars and trucks will result in additional NO_x and PM emission benefits in 2009 and beyond because the new vehicles have significantly lower emission standards than the vehicles they are replacing. The new vehicle emission standards are lower primarily because of a number of Federal rules such as the Tier 2 standards for automobiles and light trucks and the 2007 Heavy Duty Diesel standards for large diesel highway trucks. A number of post-2002 New Jersey rules also contribute to the fleet turnover emission benefits, such as the New Jersey Low Emission Vehicle (NJLEV) new vehicle program.

Controls from EGU Consent Decrees (PSE&G Mercer and Hudson): On November 30, 2006, the USEPA, U.S. Department of Justice, and the State of New Jersey reached a settlement with PSE&G related to failure to comply with a 2002 consent decree requiring installation of pollution controls at its coal-fired power plants in Jersey City (Hudson) and Hamilton (Mercer), New Jersey.[179,180] The settlement required additional air pollution controls, lower sulfur coal, lower emissions, and environmental projects. At the Hudson plant, PSE&G was required to take interim steps to reduce emissions of NO_x, SO_2, and PM until the required pollution control equipment was installed as required by the original consent decree or the unit was shut down. These interim measures included year-round operation of the existing NO_x control equipment utilizing selective non-catalytic reduction (SNCR) to reduce NO_x, use of ultra-low sulfur coal, compliance with interim annual emission caps for NO_x and SO_2, and operation of an electrostatic precipitator and a fly ash conditioning system to control PM. These additional emission control measures will improve air quality in the region. This agreement also included new fabric filters being installed on the PSE&G Mercer generating plant by December 31, 2008. For the period of the consent decree, PSE&G will significantly reduce its emissions of NO_x, SO_2, and PM in order to achieve the same reductions required under the 2002 Consent Decree.

4.3.1.5.6 Federal

The Federal government plans to implement several measures that will provide quantitative emission reductions prior to the summer of 2009. The remainder of this section discusses these measures.

Small Offroad Engine Rule: On May 18, 2007, the USEPA proposed new rules that would set stricter standards for most lawn and garden equipment and small recreational watercraft.[181,182] Specifically, the proposal would establish new exhaust emission standards that manufacturers are expected to meet using catalytic converters in many types of small watercraft, lawn, and garden equipment. This proposed rule also includes fuel evaporative standards for all the types of equipment and watercraft covered in the rulemaking. The new standards would apply as early as 2011 for most lawn and garden equipment (under 25 horsepower) and 2009 for watercraft.

Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder: On March 14, 2008, the USEPA adopted more stringent exhaust emission standards

---

[179] USEPA. United States and New Jersey Announce Clean Air Act Settlement with PSE&G Fossil LLC for Violations of 2002 Consent Decree; Utility Required to Pay Significantly Increased Penalties and Reduce Emissions. Accessed from: http://yosemite.epa.gov/opa/admpress.nsf/1ef7cd36224b565785257359003f533f/c59ece80a8a072d1852572360065c298!OpenDocument. November 30, 2006.

[180] State of New Jersey v. PSEG Fossil LLC, Amendment to Consent Decree, Newark Division, New Jersey, U.S. District Court (November 30, 2006). Accessible at http://www.epa.gov/compliance/resources/decrees/amended/psegfossil-amended-cd.pdf.

[181] 72 Fed. Reg. 28098-146 (May 18, 2007).

[182] For more information about the proposal, visit USEPA's websites at Lawn and Garden http://www.epa.gov/otaq/equip-ld.htm for lawn and garden equipment and http://www.epa.gov/otaq/marinesi.htm for gasoline boats and personal watercraft.

for locomotives and marine diesel engines.[183] The standards include: tightening emission standards for existing locomotives when they are remanufactured; setting near-term engine-out emission standards (Tier 3 standards) for newly-built locomotives and marine diesel engines; and setting longer-term standards (Tier 4 standards) for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology. The USEPA is also proposing provisions to eliminate emissions from unnecessary locomotive idling.

The standards for remanufactured locomotives will take effect as soon as certified remanufacture systems are available (as early as 2008). Tier 3 standards for newly-built locomotive and marine engines would phase in starting in 2009. Tier 4 standards for newly-built locomotives and marine diesel engines would phase in beginning in 2014 for marine diesel engines and 2015 for locomotives.

Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings: The United States Department of Energy (USDOE) has developed standards for all new Federal commercial and high-rise multi-family residential (over three stories in height above ground) buildings and all new low-rise residential buildings pursuant to the requirements of the Energy Conservation and Production Act (ECPA). The effective date of the rule is January 22, 2008. The rule establishes an energy efficiency baseline for new Federal commercial and multi-family high rise residential buildings based on referencing ASHRAE[184] Standard 90.1-2004 and the 2004 IECC.[185] The standards establish requirements for the structure and major systems of a building, and are mandatory for new Federal buildings. The rule establishes a requirement for new Federal buildings to achieve a level of energy efficiency 30 percent greater than that of the ANSI/ASHRAE/IESNA[186] or the 2004 IECC levels when life-cycle cost-effective. This rule is expected to reduce NO_x and SO_2 emissions.

4.3.1.5.7 Additional Actions

The State is also taking the following additional actions to reduce $PM_{2.5}$ emissions.

High Electrical Demand Days (HEDD) Program: In March 2007, following a year long process, six of the OTC states committed to pursue reductions in NO_x emissions from electrical generating units that primarily operate on high electrical demand days (HEDD) starting with the 2009 ozone season.[187] On these high electric demand days, increased power generation is needed, usually on short notice. In Connecticut, Delaware, Maryland and Pennsylvania, boilers and turbines that primarily run to follow electrical load needs supply HEDD power generation. In New Jersey and New York, combustion turbines primarily supply HEDD power generation.

[183] 73 Fed. Reg. 25097 (May 6, 2008).
[184] The American Society of Heating, Refrigerating and Air-Conditioning Engineers
[185] International Energy Conservation Code
[186] American National Standards Institute/ The American Society of Heating, Refrigerating and Air-Conditioning Engineers/ The Illuminating Engineering Society of North America
[187] Memorandum of Understanding Among the States of the Ozone Transport Commission Concerning the Incorporation of High Electrical Demand Day Emission Reduction Strategies into Ozone Attainment State Implementation Planning. Ozone Transport Commission, March 2, 2007.

The majority of the HEDD units in the six states are not controlled and produce significant NO_x emissions on HEDDs. For example, on a typical summer day (June 4, 2005), NO_x emissions for the six states for all Electric Generating Units (EGUs) were 551 tons per day (tpd). On a HEDD (July 26, 2005), NO_x emissions were 1,349 tpd. Most of this increase in emissions is due to power production from uncontrolled HEDD units.

As part of the HEDD initiative, New Jersey plans to reduce NO_x emissions by 19.8 tpd on the nominal high electrical demand days. Specifically, power generators in New Jersey will be responsible for securing these reductions and will be required to submit a plan on how they will reduce NO_x. The generators will have flexibility in securing the 2009 reductions. New Jersey also plans to require that all HEDD units meet performance standards that reflect modern low NO_x technology by May 1, 2015.

Ports: The Port of New York/New Jersey is the largest port complex on the East Coast of North America. It is located at the hub of the most concentrated and affluent consumer market in the world, with immediate access to the most extensive interstate highway and rail networks in the region. The Port Authority directly oversees the operation of seven privately owned cargo terminals in the New York-New Jersey region (landlord tenant relationship). Each year, more than 25 million tons of oceanborne general cargo moves through this port, including 4.5 million TEUs (twenty-foot equivalent container units) of containerized cargo. The Port Newark/Elizabeth-Port Authority Marine Terminal complex (NJ), the Port Authority Auto Marine Terminal (NJ), Brooklyn Piers and Red Hook Container Terminal (NY), and Howland Hook Marine Terminal (NY) handle most of the cargo. In addition, there are private operators, such as Global Marine Terminal and a number of marine terminals, operated by private bulk cargo operators. The Passenger Ship Terminal known as The New York Cruise Terminal is operated by P&O Ports North America for the City of New York.

Containerized cargo volumes in the Port of New York and New Jersey rose nearly 8 percent in 2006, to a new record high. The dollar value of all cargo moving through the port in 2006 exceeded $149 billion for the first time, up 13 percent from 2005. In the next 10 years, nearly $2 billion in infrastructure upgrades are planned for marine terminal facilities and for off-port roads and railways to improve the flow of cargo.

To minimize the impact that this tremendous growth has on our environment, the NJDEP Commissioner outlined the following action item in the document entitled "Priorities and Action Plan," January 2007. This goal is reiterated in the draft document entitled "Environmental Justice Priorities for the NJDEP – May 2007."

> "Target [NJ]DEP efforts to establish a coordinated effort on protecting the health of urban residents from environmental causes and ensure that [NJ]DEP's efforts to support economic growth and redevelopment in urban areas results in improved urban environmental health. Specifically, [NJ]DEP will coordinate its efforts at NJ's two major ports to deliver tangible environmental improvements."

The NJDEP is working closely with the Port Authority of NY/NJ, the USEPA Region 2, the South Jersey Port Corporation, and the Northeast Diesel Collaborative to develop and implement a comprehensive diesel risk reduction strategy for the port areas. Some possibilities include requiring cleaner fuel for oceangoing vessels while at dock or near the port; upgrading the cargo handling equipment; reducing idling emissions from ships, trains and trucks doing business at the port; and modernizing the drayage truck fleet that calls on the port.

At the South Jersey Port Corporation in Camden, New Jersey, several specific projects are underway at the terminals that they own and operate. First, as part of an enforcement settlement, nearly $400,000 was spent on retrofitting both on-road and off-road vehicles in the Camden Waterfront South area. Second, Clean Air Communities in partnership with NJDEP, the South Jersey Port Corporation, and others received a $250,000 grant from the USEPA titled "Community Action for a Renewed Environment." The grant will be used to work with the project partners to: establish a forum for dialogue with local businesses; and undertake community campaigns, such as publishing an environmental justice toolkit for high school students and educating children about environmental health. The NJDEP agreed to supplement the $250,000 grant with $500,000 from an enforcement settlement so that the South Jersey Port Corporation could undertake additional diesel emission reduction projects on the diesel equipment that they operate in Camden.

Open burning/Outdoor wood burning – Smoke Management Plans: New Jersey already has a regulation in place to control emissions from open burning at N.J.A.C. 7:27-2, Control and Prohibition of Open Burning,[188] and is considering changes to agricultural burning portion of these requirements. This source category is also addressed in the "Smoke Management" section of New Jersey's Regional Haze SIP (including the agricultural and forestry smoke management, prescribed burning, and agricultural management discussions in that SIP proposal).[189] One particulate control measure has already been implemented, namely to limit air pollution control permits to prevent open burning on days forecast to be of unhealthful air quality. This permit condition requires the permit holder to delay open burning until forecast meteorological conditions and air quality have improved so that forecasted unhealthful conditions for that day will not be made worse by this activity. Similarly, New Jersey is considering a seasonal home wood heating advisory program to further curtail wood smoke emissions, similar to the program adopted in Lane County, Oregon.[190] This program would advise homeowners when they could heat their homes with wood, according to the current air quality.

Change-out programs: Control measures might include wood stove and fireplace change-out programs, and lawn mower replacement programs. Financial incentives would be necessary to ensure a productive program. New Jersey would consider implementing a change-out program in the future if funds become available.

---

[188] Available at http://www.state.nj.us/dep/aqm/Sub%2002%20v1994-06-20.pdf (Accessed November 19, 2007).
[189] The first regional haze air quality protection plan for New Jersey will be completed in 2008 (see Chapter 1 for further details).
[190] LRAPA. Public Education: Home Wood Heating Programs. Lane Regional Air Protection Agency (LRAPA). http://www.lrapa.org/public_education/home_wood_heating_programs/, accessed May 14, 2008.

Fugitive dust emissions: New Jersey has a control strategy in place for the control of stormwater runoff from streets under the New Jersey Municipal Stormwater Regulation program[191] that also has air quality benefits by the removal of fugitive dust. The strategy includes both mandated and voluntary street sweeping. Some streets are required to be swept monthly.

New Jersey also has standards that reduce fugitive emissions from various sources such as tillage and construction. These standards have been adopted by the NJDOT and New Jersey Department of Agriculture (NJDOA) under the "Soil Erosion and Sediment Control Standards: Standards for Dust Control."

This source category has also been identified as a potential $PM_{2.5}$ RACT measure for certain facilities throughout the State. For more information, see the $PM_{2.5}$ RACT analysis in Appendix A7.

Energy conservation and "green building": New Jersey currently provides for rebates and other financial incentives to install energy-efficiency measures in a home. The New Jersey Department of Community Affairs (NJDCA) has minimum design standards for some appliances. The New Jersey Clean Energy Program (NJCEP) and the New Jersey Energy Master Plan (NJEMP) encourage energy conservation.

Train engines: As of January 1, 2008, New Jersey Transit (NJ Transit) has voluntarily implemented an "Idling Reduction Policy" to shut down their diesel passenger locomotives within one hour of stopping to reduce idling at train yards by 70 percent to 90 percent. NJ Transit has also agreed to move forward with a New Jersey Transportation Planning Authority (NJTPA) proposal to evaluate idling reduction technologies.

Truck Stop Electrification: On October 20, 2004, the first Electrified Truck Stop in New Jersey was opened at Paulsboro, New Jersey. The Truck stop has ninety-eight truck electrification bays equipped with IdleAire Service Modules. These modules mount on the cab's passenger window to provide heat, ventilation, air conditioning, power for the refrigeration unit and appliances as well as cable TV, telephone and Internet service. New Jersey encourages the use of this technology to reduce $PM_{2.5}$ emissions from diesel trucks. Discussions are underway for an electrification project at the Vince Lombardi Rest Area in Ridgefield, Bergen County, New Jersey. New Jersey is considering other locations for electrification, as well.

Medium Duty Motor Vehicle Inspection: New Jersey is evaluating an inspection program for medium duty vehicles with a gross weight between 8,501 – 17,999 pounds. The inspection program would be a combination of OBD and Smoke opacity inspections, and would help control particulate emissions.

---

[191] 2006 Annual Report summary on New Jersey's Stormwater Regulation program is available at http://www.state.nj.us/dep/dwq/pdf/2006msrpannualreportlong.pdf (Accessed November 19, 2007).

4.4 VOC Measures

The State is implementing several VOC control measures that were adopted as discussed in the 2007 8-hour Ozone Attainment Demonstration SIP.[192] Although the USEPA does not consider VOC as a $PM_{2.5}$ precursor for SIP and conformity purposes, New Jersey anticipates a $PM_{2.5}$ benefit from the implementation of these measures. The proposed VOC measures are listed in Table 4.4.

Table 4.4: VOC Control Measures

Control Measures	Sector
Pre-2002 with benefits achieved Post-2002 - On the Books	
Federal	
Onboard Refueling Vapor Recovery (ORVR) beyond Stage II	Area/Onroad
Post-2002 - On the Books	
New Jersey Measures Done Through a Regional Effort[a]	
Consumer Products 2005	Area
Architectural Coatings 2005	Area
Portable Fuel Containers 2005	Area and Nonroad
Mobile Equipment Repair and Refinishing	Area
Solvent Cleaning	Point and Area
New Jersey Only Measures	
Stage I and Stage II (Gasoline Transfer Operations)	Area
Federal	
USEPA MACT Standards	Point
Post-2002 - Beyond on the Way	
New Jersey Measures Done Through a Regional Effort	
Consumer Products 2009 Amendments	Area
Portable Fuel Containers 2009 Amendments	Area and Nonroad
Asphalt Paving	Area
Adhesives and Sealants	Area and Point
Refineries – Fugitive Equipment Leaks	Point
New Jersey Only Measures	

[192] NJDEP. State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard: 8-Hour Ozone Attainment Demonstration Proposal. June 15, 2007.

Control Measures	**Sector**
VOC Stationary Storage Tank Measures	Point and Area
USEPA CTGs (4 categories)	Point and Area

Note: a. The VOC measures include On the Way (OTW) measures. The six "shortfall" measures discussed in the definition of the OTB were developed by the Ozone Transport Commission (OTC) specifically to address United States Environmental Protection Agency (USEPA)-identified deficiencies in the 1-hour ozone attainment demonstrations of several OTC states. This terminology does not apply to New Jersey, as all of the OTC shortfall rules were adopted in New Jersey prior to the development of the modeling inventory.

4.5 Conclusions on Control Measures

The control measures discussed in this section make up the core of the State's $PM_{2.5}$ attainment demonstration and contingency measures. The use of these measures in each of those demonstrations, as well as how the benefits from the implementation of those measures were calculated, is discussed in Chapters 5 and 6, respectively. Many of the benefits were determined from the USEPA MOBILE6 model and the USEPA Nonroad model. Most of the control measure benefits (quantitatively) were included in the attainment modeling. Those that were not included in the attainment modeling are listed and discussed in Chapter 5.

There are a host of other measures that have been, or will be, implemented in and around New Jersey whose benefits cannot be accurately estimated or quantified. These measures are described in Chapter 5. These measures, while not quantified, are providing a benefit to the air quality in New Jersey, as well as its upwind states,[193] and increase the likelihood that the State will attain the $PM_{2.5}$ health standard by its attainment date of April 5, 2010.

Table 4.5 shows a summary of New Jersey's control measures and how they are being used to meet SIP requirements.

Table 4.5: $PM_{2.5}$ Control Measure Summary

Control Measures	Sector	Attainment 2009 Modeling	Control Measures Not Captured in the 2009 Regional Modeling	Attainment (2009) Contingency
Pre-2002 with benefits achieved Post-2002 – On the Books New Jersey				
NO_x Budget Program (SIP Call)	Point	X		
Nonattainment New Source Review (NNSR)	Point		X	
Pre-2002 with benefits achieved Post-2002 – On the Books Federal				
Residential Woodstove NSPS	Area	X		

[193] Please see Chapter 8 for a discussion of the impact of New Jersey control measures on upwind states.

Control Measures	Sector	Attainment 2009 Modeling	Control Measures Not Captured in the 2009 Regional Modeling	Attainment (2009) Contingency
Acid Rain	Point	X		
Onboard Refueling Vapor Recovery (ORVR) beyond Stage II*	Area/Onroad	X		
Tier 1 Vehicle Program	Onroad	X		
National Low Emission Vehicle Program (NLEV)	Onroad	X		
Tier 2 Vehicle Program/Low Sulfur Fuels	Onroad	X		
Heavy Duty Diesel Vehicle (HDDV) Defeat Device Settlement	Onroad	X		
Heavy Duty Diesel Vehicle (HDDV) Engine Standards	Onroad	X		
Nonroad Diesel Engines	Nonroad	X		
Large Industrial Spark-Ignition Engines over 19 kW	Nonroad	X		
Recreational Vehicles (includes snowmobiles, off-highway motorcycles, and all-terrain vehicles)	Nonroad	X		
Diesel Marine Engines over 37 kW	Nonroad	X		
Phase 2 Standards for Small Spark-Ignition Handheld Engines at or below 19 kW	Nonroad	X		
Phase 2 Standards for New Nonroad Spark-Ignition Nonhandheld Engines at or below 19 kW	Nonroad	X		
Post-2002 – On the Books New Jersey Measures Done Through a Regional Effort				
Consumer Products 2005*	Area	X		
Architectural Coatings 2005*	Area	X		
Portable Fuel Containers 2005*	Area and Nonroad	X (Area Only)		
Mobile Equipment Repair and Refinishing*	Area	X		
Solvent Cleaning*	Point and Area	X		
NO_x RACT Rule (2006)	Point and Area	X		
New Jersey Heavy Duty Diesel Rules Including "Not-To-Exceed" (NTE) Requirements	Onroad	X		
Post-2002 – On the Books New Jersey Only				
Stage I and Stage II (Gasoline Transfer Operations)*	Area	X		
On-Board Diagnostics (OBD) – (I/M) Program for Gasoline Vehicles	Onroad	X		

Control Measures	Sector	Attainment 2009 Modeling	Control Measures Not Captured in the 2009 Regional Modeling	Attainment (2009) Contingency
Post-2002 – On the Books Federal				
USEPA MACT Standards including Industrial Boiler/Process Heater MACT	Point	X		
Clean Air Interstate Rule (CAIR)	Point	X		
Refinery Consent Decrees (Sunoco, Valero, and ConocoPhillips)	Point	X		
Refinery Consent Decrees (Sunoco, Valero)	Point	X [a]		X [a]
Post-2002 – Beyond on the Way New Jersey Measures Done Through a Regional Effort				
Consumer Products 2009 Amendments*	Area	X		
Portable Fuel Containers 2009 Amendments*	Area and Nonroad	X (Area)		
Asphalt Paving*	Area	X		
Adhesives and Sealants*	Area and Point	X		
Asphalt Production Plants Rule	Point		X	X
Refineries – Fugitive Equipment Leaks*	Point		X	
Glass Manufacturing	Point		X	
ICI Boiler Rule 2009 [b]	Point	X		
High Electric Demand Day (HEDD) Program	Point		X	
Post-2002 - Beyond on the Way New Jersey Only				
Fugitive Dust at Stationary Sources	Point and Area		X	
#6 Fuel Oil-Fired Boilers	Point		X	
Stationary Diesel Engines	Point		X	
VOC Stationary Storage Tank Measures*	Point		X	
USEPA CTGs (4 categories)*	Point		X	
Case by Case NO_x Emission Limit Determinations (FSELs/AELs)	Point		X	
Municipal Waste Combustors (Incinerators) NO_x portion	Point		X	X
Municipal Waste Combustors (Incinerators) PM portion	Point		X	
Refinery Rules (FCCUs, Flares, Process Heaters, and Boilers)	Point		X	
New Jersey Low Emission Vehicle (LEV) Program	Onroad	X		
Diesel Idling Rule Changes	Onroad		X	X
Diesel Smoke (I/M Cutpoint) Rule Changes	Onroad		X	

Control Measures	Sector	Attainment 2009 Modeling	Control Measures Not Captured in the 2009 Regional Modeling	Attainment (2009) Contingency
Controls from EGU Consent Decrees (PSE&G Mercer)	Point	X		
Controls from EGU Consent Decrees (PSE&G Hudson NO_x)	Point	X		
Controls from EGU Consent Decrees (PSE&G Hudson SO_2)	Point		X	X
Post 2002 – Beyond on the Way Federal				
New Nonroad Engine Standards	Nonroad		X	
Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder	Nonroad		X	
Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings	Area		X	
Additional 2009 Benefits [c]				
Portable Fuel Containers – portion not modeled*	Area and Nonroad		X (Nonroad Only)	
NO_x RACT Rule 2006 (portion not modeled)	Point		X	X
ICI Boiler Rule 2009 (portion not modeled)	Point		X	X
Smoke Management	Area		X	
Low Sulfur Distillate and Residual Fuel Strategies	Point and Area		X	
Ports	Nonroad		X	
Onroad Motor Vehicle Control Programs (Fleet turnover 2010)	Onroad	X		X
Nonroad Motor Vehicle Control Programs (Fleet turnover 2010)	Nonroad	X		X

Notes: a. See modeling differential analysis in Appendix C
b. Some categories have 2009 compliance dates; remainder have 2012 compliance dates.
c. These measures are above and beyond what went into the modeling and do not necessarily constitute regulatory action, e.g., corrections to the modeling emissions inventory; these measures may also provide additional air quality benefits beyond the 2010 attainment date.

* = measures are VOC only measures

5.0 ATTAINMENT DEMONSTRATION

5.1 Introduction

As discussed in Section 1.0, states are required to submit State Implementation Plan (SIP) revisions that contain attainment demonstrations for their $PM_{2.5}$ nonattainment areas within three years after the effective date of the nonattainment designation. The designation date for both the Northern New Jersey/New York/Connecticut nonattainment area and the Southern New Jersey/Philadelphia nonattainment area was December 17, 2004, with an effective date of April 5, 2005.[194] Therefore, the $PM_{2.5}$ attainment demonstration SIP revision was due to the USEPA by April 5, 2008 (40 C.F.R. § 51.1002; 72 Fed. Reg. 20587, April 25, 2007). These SIPs must demonstrate that the measures and rules contained within them are adequate to provide for the timely attainment and maintenance of the $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS). In accordance with 40 C.F.R. § 51.112, each implementation plan must include:

- A summary of the computations, assumptions, and judgments used to determine the degree of reduction of emissions (or reductions in the growth of emissions) that will result from the implementation of the control strategy;

- A presentation of emission levels expected to result from implementation of each measure of the control strategy;

- A presentation of the air quality levels expected to result from implementation of the overall control strategy showing expected maximum pollutant concentration;

- A description of the dispersion models used to project air quality and to evaluate control strategies; and

- For interstate regions, the analysis from each constituent state must, where practicable, be based upon the same regional emission inventory and air quality baseline.

The attainment demonstration in this SIP revision addresses the 1997 annual $PM_{2.5}$ standard. New Jersey and the other states that share New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas have always met and are in attainment with the 1997 daily $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$. According to the USEPA's modeling guidance,[195] since these levels are well below the standard and have continued to improve since 2001 (see Chapter 2), the modeled attainment test for the 1997 daily $PM_{2.5}$ standard is not needed nor is included in this attainment demonstration.

---

[194] 70 Fed. Reg. 944 (January 5, 2005).
[195] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, page 56.

Chapter 4 discussed and summarized Federal, New Jersey and regional efforts to identify control measures. This chapter presents the State's analyses of the impact that the implementation of the control measures identified for attainment, in combination with existing and already on the way measures, have on the State's air quality by 2009. Since this attainment demonstration will show attainment of the $PM_{2.5}$ standard within five years of the date of designation, the State is not required to submit a separate Reasonable Further Progress Plan.[196] Chapter 6 provides for contingencies in the event that either of New Jersey's nonattainment areas fails to reach attainment.

5.2 Photochemical Modeling

5.2.1 Introduction

The USEPA modeling guidance suggests the use of a photochemical model to determine attainment of the fine particulate NAAQS and has created a model which will predict concentrations of both ozone and fine particulate levels within the same modeling run.[197] As such, New Jersey's attainment demonstrations for both the Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas include the same parameters in the photochemical grid modeling as were used in the modeling runs used to demonstrate attainment of the ozone NAAQS. This analysis is also supplemented by other information to demonstrate that all the monitors in both nonattainment areas are predicted by the photochemical modeling to be in attainment of the $PM_{2.5}$ annual health-based standard by 2010.

The objective of the photochemical modeling test is to enable New Jersey, to analyze the efficacy of various control strategies in reducing air pollution. The Ozone Transport Commission (OTC) on behalf of its member states (which include New Jersey, New York, Connecticut, Delaware, and Pennsylvania) undertook a photochemical modeling study to demonstrate compliance with the 8-hour ozone NAAQS for their multi-state nonattainment areas and built upon these efforts to demonstrate compliance with the annual $PM_{2.5}$ NAAQS. The OTC Modeling Committee directed the 8-hour ozone attainment modeling study. The OTC Modeling Committee consisted of the following workgroups: OTC Photochemical Workgroup, OTC Meteorological Modeling Workgroup, OTC Emissions Inventory Development Workgroup, and the OTC Control Strategy Workgroup. The emissions inventory work was performed in conjunction with the Mid-Atlantic/Northeast Visibility Union (MANE-VU). The OTC Air Directors served on the OTC Oversight Committee and provided oversight of the process. Since the 8-hour ozone modeling was limited to the ozone season (May 1 through September 30), additional modeling was needed to demonstrate attainment of the annual $PM_{2.5}$ NAAQS. This additional modeling was performed by the University of Medicine and Dentistry of New Jersey's Ozone Research Center (UMDNJ/ORC), the Northeast States for Coordinated Air Use Management (NESCAUM) and the University of Maryland (UMD).

---

[196] 72 Fed. Reg. 20666 (April 25, 2007).

[197] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.

The remainder of this section discusses the model used in this regional modeling analysis, the specific modeling parameters, including inventory development, and the results of that modeling exercise.

5.2.2 "One-Atmosphere" Air Quality Model

The photochemical model selected for the attainment modeling demonstration was the USEPA's Models-3/Community Multi-scale Air Quality (CMAQ) modeling system. The CMAQ modeling system was selected for the attainment demonstration primarily because it is a photochemical grid model capable of modeling a variety of pollutants over a range of time and space scales, i.e., a "one-atmosphere" photochemical grid model. Not only was CMAQ used to model ozone formation, but also was used to model the components that make up the particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) and Regional Haze in the Northeast. The model is capable of calculating the formation of secondary aerosols which are a prime component of fine particulate matter in the northeastern United States. The model is also recommended in the USEPA's Modeling Guidance.[198] All of the regional modeling was conducted in accordance with the USEPA's Modeling Guidance.

Under the direction of the OTC Modeling Committee, several states and modeling centers performed the regional modeling runs and/or contributed to the preparation of technical information for the regional modeling effort. Those organizations included:

1) New York State Department of Environmental Conservation (NYSDEC),
2) Ozone Research Center at University of Medicine & Dentistry of NJ/Rutgers University (ORC),
3) University of Maryland (UMD),
4) Virginia Department of Environmental Quality,
5) Northeast States for Coordinated Air Use Management (NESCAUM)
6) Maryland Department of the Environment,
7) New Hampshire Department of Environmental Services, and
8) Mid-Atlantic Regional Air Management Agency (MARAMA).

The lead agency for coordinating the running of the CMAQ model and performing the modeling runs for the OTC was the NYSDEC.[199] The NYSDEC ran the CMAQ model using the protocol in Appendix B1 for the May 1 through September 30 ozone season, which was supplemented by modeling runs performed by the UMDNJ/ORC (March and April), NESCAUM (October, November, December), and the University of Maryland (January, February) for the purposes of determining $PM_{2.5}$ attainment. The four regional modeling centers were, therefore, able to model an entire year of meteorology and emissions. The NYSDEC was responsible for post-processing

---

[198] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.

[199] New Jersey wishes to thank the NYSDEC for its leadership in the regional modeling effort.

the results for the Northern New Jersey/New York/Connecticut nonattainment area, including calculating the projected $PM_{2.5}$ concentrations using the relative response factor (RRF) method specified in the USEPA's Modeling Guidance, included in Appendix B2. The projected $PM_{2.5}$ concentrations for the Southern New Jersey/Philadelphia nonattainment area were calculated by the UMDNJ/ORC.

The CMAQ model requires specific inputs, including meteorological information and emissions information. The remainder of this section discusses, in general, the needed data inputs for the CMAQ model, the particular parameters of the CMAQ model chosen for the $PM_{2.5}$ modeling runs, and the validation of the CMAQ model for use in the regional modeling effort. For more specific information, see Appendices B3, B4, B5, B6, and B7.

5.2.2.1 Meteorology Data

As explained in the USEPA's Emission Inventory Guidance,[200] 2002 was designated as the base year for 8-hour ozone SIPs, $PM_{2.5}$ SIPs, and regional haze plans; therefore, wherever possible, 2002 was used for baseline modeling for the $PM_{2.5}$ standard. The Pennsylvania State University/National Center for Atmospheric Research Mesoscale Meteorological Model (MM5) version 3.6 was used to generate the annual 2002 meteorology for the modeling analysis. The MM5 model is a non-hydrostatic, prognostic meteorological model routinely used for urban- and regional-scale photochemical regulatory modeling studies. Professor Da-Lin Zhang (University of Maryland) performed the MM5 modeling in consultation with the NYSDEC and Maryland Department of the Environment staff. The analyses showed that in general, the performance of the MM5 is reasonable both at the surface and in the vertical, thereby providing confidence in the use of these data in the CMAQ simulations. The documents supporting the MM5 modeling analysis are provided in Appendix B3. Based on model validation and sensitivity testing, the model results met the evaluation criteria and the MM5 configurations were used for the regional modeling effort.

5.2.2.2 Regional Emission Inventories

Both the nonattainment areas associated with New Jersey have an attainment date of no later than April 5, 2010. Since January through April represents only part of the year, attainment must be demonstrated for the last full year prior to the attainment date; in this case 2009.[201] Emission reductions included in the regional modeling, therefore, should be implemented no later than the beginning of 2009 for the air quality benefits to have the greatest likelihood of improving air quality throughout the entire year and showing attainment of the annual standard. As such, the attainment modeling run is designed to show the incremental emission reductions associated with the implementation of control measures between the base year (2002) and the "attainment" year (2009).

---

[200] USEPA. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. United States Environmental Protection Agency, Emissions Inventory Group, Emissions, Monitoring, and Analysis Division, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-05-001, August 2005, updated November 2005.

[201] Success will be judged by three years of data, i.e., 2007, 2008, and 2009, to calculate the 2009 design value.

To complete this modeling exercise, two regional emission inventories were developed to represent the 2002 base case (see Appendix B4) and the 2009 control case (see Appendix B5). In addition, two other future control case emission inventories (for 2012 and 2018, respectively) were developed simultaneous with the 2009 control case emission inventory to allow for additional modeling exercises. These future year emission inventories were developed by projecting the 2002 base year emissions inventory using standard emissions projection techniques discussed in Appendix B5. These future year emission inventories include emissions growth due to projected increases in economic activity, as well as the emission reductions due to the implementation of control measures. All of the regional emission inventories in this chapter are hereafter referred to as the modeling inventories.

The 2002 emissions were first generated by the individual Ozone Transport Region states. MARAMA then coordinated and quality assured the 2002 inventory data, and projected it for the relevant control years. The 2002 emissions for non-Ozone Transport Region areas within the modeling domain were obtained from other Regional Planning Organizations for their corresponding areas. These Regional Planning Organizations included the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), the Midwest Regional Planning Organization, and the Central Regional Air Planning Association. The documentation for the OTC base and control modeling inventories are presented in Appendices B4 and B5-1, respectively. The use of emission inventory data from the non-MANE-VU states is documented in Appendix B6.

As discussed in Chapter 4, the OTC member states selected several control strategies for inclusion in the attainment demonstration modeling. These strategies were selected from groups of measures developed by the technical subcommittees responsible for identifying and developing the regulations and/or control measures to attain the ozone health standard. Consideration was given to maintaining consistency with control measures likely to be implemented in other Regional Planning Organizations. Emission reduction requirements mandated by the Clean Air Act were also included in projecting future year emissions. Additional information on the emissions used in future year modeling is provided in Appendix B6. The following sections provide a more detailed discussion of base and control inventories used in the regional modeling.

5.2.2.2.1 Base Emission Inventory

Version 3 of the 2002 base year emission inventory was used in the regional modeling exercises. The technical support document for this inventory, which is included in Appendix B4, explains the data sources, methods, and results for preparing this version of the 2002 base year criteria air pollutant and ammonia emissions inventories for point, area, onroad, nonroad, and biogenic sources for the MANE-VU Regional Planning Organization. In addition to relying on this base inventory for $PM_{2.5}$ SIP-related activities, the MANE-VU states will use this base inventory to support air quality modeling, control measure development, and implementation activities for the Regional Haze SIP.

The inventory and supporting data include the following:

1) Comprehensive, county-level modeling inventories for 2002 emissions for criteria air pollutants and ammonia for the State and Local agencies included in the MANE-VU region;
2) The temporal, speciation, and spatial allocation profiles for the MANE-VU region inventories;
3) Inventories for wildfires, prescribed burning, and agricultural field burning for the southeastern provinces of Canada; and
4) Inventories for other Regional Planning Organizations, Canada, and Mexico.

The mass emissions inventory files were converted to the National Emissions Inventory Input Format Version 3.0. As discussed in greater detail in Section 5.2.2.3, the modeling inventory files were processed in Sparse Matrix Operator Kernel Emissions (SMOKE) /Inventory Data Analyzer.

The inventories include annual emissions for oxides of nitrogen (NO_x), volatile organic compounds (VOC), carbon monoxide, sulfur dioxide (SO_2), ammonia, particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}) and, particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$). The inventories also included summer day, winter day, and average day emissions. However, not all states included daily emissions in their inventories. In these instances, temporal profiles prepared for this project were used to calculate daily emissions.

Work on Version 1 of the 2002 MANE-VU inventory began in April 2004. The consolidated inventory for point, area, onroad, and nonroad sources was prepared by starting with the inventories that the MANE-VU state/local agencies submitted to the USEPA from May through July of 2004 as a requirement of the Consolidated Emissions Reporting Rule (CERR). This version of the final inventory and SMOKE input files were finalized during January 2005.

Work on Version 2 (covering the period from April through September 2005) involved incorporating revisions requested by some MANE-VU state/local agencies on the point, area, and onroad inventories. Work on Version 3 (covering the period from December 2005 through April 2006) included additional revisions to the point, area, and onroad inventories as requested by some states. Thus, the Version 3 inventory for point, area, and onroad sources were built upon Versions 1 and 2. This work also included development of the biogenics inventory. In version 3, the nonroad inventory was completely redone because of changes that the USEPA made to the NONROAD2005 model.

Addressing Woodsmoke Emissions

There are differences between the 2002 base case inventory that was developed by New Jersey and the 2002 alternative wood burning emissions inventory that was developed regionally for modeling (fractional reduction from the base case). Both NO_x and VOC emissions are different in the base case and the modeling case, too.

The reason for this difference is that the regional modeling was conducted by starting with a ton per year value, not ton per day emissions as was used by the State's emission inventory. The Sparse Matrix Operator Kernel Emissions (SMOKE) model takes those tons per year emissions and breaks them into hourly emissions using the temporal profiles built into the SMOKE model. Using this SMOKE temporal profile fewer residential wood burning emissions are placed into the model in the summer months, as most residential wood burning is not done in the summer. This would also be consistent with how the New Jersey Department of Environmental Protection (NJDEP) developed emissions in its inventory. However, SMOKE further speciates the tons of VOC from woodsmoke into specific species, so that it is not possible from the SMOKE output to see where that ton of emissions went. The ton of VOC disappears into the sum of all component species.

5.2.2.2.2 Emission Control Inventories

The following is a summary of the future year inventories that were developed:

- Three projection years: 2009, 2012, and 2018;

- Three source sectors: non-Electric Generating Units (non-EGUs) point sources, area sources, and nonroad mobile sources. Under separate efforts, MANE-VU prepared EGU projections using the Integrated Planning Model and onroad mobile source projections using the SMOKE emission modeling system. The documentation for those efforts is included in Appendix B5-1.

The two emission control scenarios are:

1) A combined "on-the-books/on-the-way" (OTB/OTW) control strategy accounting for emission control regulations already in place, as well as some emission control regulations that are not yet finalized but are likely to achieve additional reductions by 2009 (i.e., adoption of the six shortfall measures by states outside the core Ozone Transport Region states); and

2) A beyond on the way (BOTW) scenario to account for controls from potential new regulations that may be necessary to meet attainment and other regional air quality goals.

The inventories were developed for seven pollutants, which are SO_2, NO_x, VOCs, carbon monoxide, PM_{10}-$_{Primary}$ (sum of the filterable and condensable components), $PM_{2.5}$-$_{Primary}$ (sum of the filterable and condensable components), and ammonia.

The states included in the emission inventory are those that comprise the MANE-VU region. In addition to the District of Columbia, the 11 MANE-VU states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

An inventory technical support document for these future inventories is included in Appendices B5-1 and B5-2 and explains the data sources, methods, and results for future year emission forecasts for three years; three emission sectors; two emission control scenarios; seven pollutants; and eleven states plus the District of Columbia.

5.2.2.3 Emissions Processor Selection and Configuration

The SMOKE Processing System was selected for the modeling analysis. SMOKE is principally an emissions processing system; this means that, with the exception of mobile and biogenic sources, its purpose is to provide an efficient, modern tool for converting emissions inventory data into the formatted emissions files required for a photochemical air quality model.

Inside the Ozone Transport Region, the modeling inventories were processed by the NYSDEC and NESCAUM using the SMOKE (Version 2.1) processor to provide inputs for the CMAQ model. A detailed description of all SMOKE input files such as area, mobile, fire, point, and biogenic emissions files and the SMOKE model configuration are provided in Appendices B6, B7, and B8.

5.2.2.4 Regional Modeling Coordination

The CMAQ model was installed at all participating modeling centers and diagnostic tests were run to insure that the model was operating as designed. In addition, the CMAQ model was benchmarked against other modeling platforms to ensure similar results. The OTC modeling committee oversaw the modeling effort and reported to the OTC Oversight Committee. The NJDEP participated as a member of the various OTC committees. While the focus of this modeling effort was to develop estimates of ozone formation, care was taken during the process to ensure that the data developed could be useful for future particulate SIP efforts.

5.2.2.5 Domain and Data Base Issues

5.2.2.5.1 Episode Selection

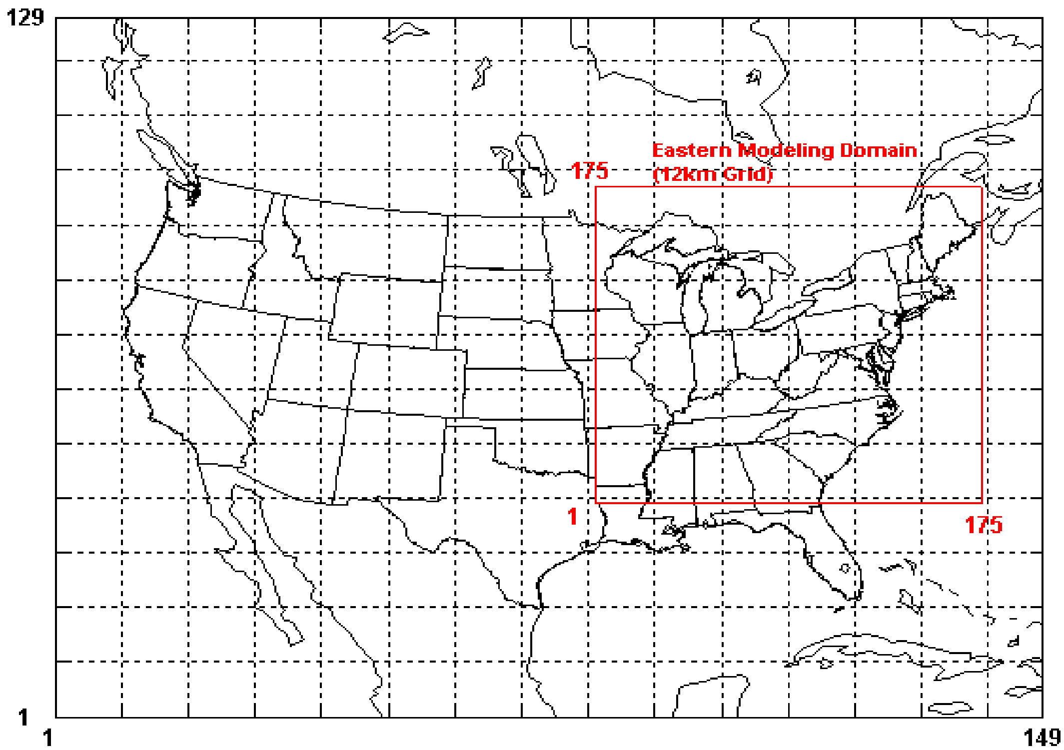
The entire 2002 base case and 2009 future case years were simulated with 2002 meteorological conditions for $PM_{2.5}$ modeling. This complete year of modeling provides a more robust analysis of the seasonal variations in $PM_{2.5}$ levels due to secondary aerosol formation, an important pathway to understanding the transport of particulate matter from out-of-state sources.

5.2.2.5.2 Size of the Modeling Domain

In defining the modeling domain, the location of the local urban area, the downwind extent of the elevated $PM_{2.5}$ levels, the location of large emission sources, and the availability of meteorological and air quality data need to be considered. The domain or spatial extent to be modeled includes as its core the nonattainment area. Beyond this, the domain includes enough of the surrounding area such that major upwind sources fall within the domain and the emissions produced in the nonattainment area remain within the domain throughout the day.

Figure 5.1 shows the OTC modeling boundaries. This domain covers the Northeast region, including the Northeastern, Central and Southeastern United States as well as Southeastern Canada. The final SIP modeling analysis utilized this modeling domain. Further discussion of the modeling domain selection is provided in Appendices B1 and B3.

<u>Figure 5.1</u>: Mid-Atlantic/Northeast Visibility Union 12-Kilometer CMAQ Modeling Domain



5.2.2.5.3 Horizontal Grid Size

The basic CMAQ modeling platform utilized a two-way nested domain consisting of a course 36 km horizontal grid resolution for the continental United States domain and a fine 12-km grid over the eastern United States. A larger domain was selected for the MM5 simulations to provide a buffer of several grid cells around each boundary of the CMAQ 36 km domain. This was designed to minimize any errors in the meteorology from boundary effects. A 12 km inner domain was selected to better characterize air quality in the Ozone Transport Region and surrounding Regional Planning Organization regions. The horizontal grid definitions for the CMAQ and MM5 modeling domains are contained in Appendices B1 and B3.

5.2.2.5.4 Vertical Resolution

The vertical grid used in the CMAQ modeling was primarily defined by the MM5 vertical structure. The MM5 model employed a terrain following coordinate system defined by atmospheric pressure. The layer averaging scheme adopted for CMAQ was designed to reduce the computational demands of the CMAQ simulations, therefore only the uppermost layers of the CMAQ domain were coalesced. All layers in the planetary boundary layer were unchanged between the MM5 and the CMAQ simulation. This ensures that the near-surface processes that affect air pollution the most are represented realistically in CMAQ, while the meteorological systems that are driven by upper level winds are allowed to develop properly in MM5. The effects of layer averaging have a relatively minor effect on the model performance metrics when compared to ambient monitoring data. The vertical layer definitions and other details related to the MM5 and CMAQ modeling domains are contained in Appendices B1 and B3.

5.2.2.5.5 Initial and Boundary Conditions

The objective of a photochemical grid model is to estimate the air quality given a set of meteorological and emissions conditions. When initializing a modeling simulation, the exact concentration fields are not known in every grid cell for the start time. Therefore, typically photochemical grid models begin with clean conditions within the domain and are allowed to stabilize before the period of interest is simulated. In practice this is accomplished by starting the model several days prior to the period of interest; this is called spin-up time.

The winds move pollutants into, out of, and within the domain. The model handles the movement of pollutants within the domain and out of the domain. An estimate of the concentration of pollutants at the edge of the domain, and therefore the quantity of pollutants moving into the domain, is needed as an input to the model. These are called boundary conditions. The 12 km grid boundary conditions were extracted from the 36 km CMAQ simulation. To estimate the boundary conditions for the modeling study, boundary conditions for the inner OTR 12-km grid used hour by hour boundary conditions extracted from the continental 36 km CMAQ run results by researchers at Harvard University using the GEOS-CHEM global chemical transport model.[202,203]

The influence of initial conditions was minimized by using a 15-day spin-up period, which is sufficient to establish pollutant levels that are encountered in the eastern United States. Additionally, the predominant winds flow from west to east, thus New Jersey is not influenced by nearby boundary conditions as the boundary begins in the states west of the Mississippi River. Additional information on the extraction of boundary conditions is provided in Appendix B1.

5.2.2.6 Quality Assurance

All the air quality, emissions, and meteorological data within the MANE-VU Regional Planning Organization used in the regional modeling effort were reviewed to ensure completeness, accuracy, and consistency before proceeding with modeling. Any errors, missing data or inconsistencies, were addressed using appropriate methods that are consistent with standard practices. All modeling was benchmarked through the duplication of a set of standard modeling results across different modeling centers using different computer platforms to calculate results. Emissions inventories obtained from the other Regional Planning Organizations were examined

[202] Moo, N. and Byun, D. A Simple User's Guide For "geos2cmaq" Code: Linking CMAQ with GEOS-CHEM. Version 1.0. Institute for Multidimensional Air Quality Studies (IMAQS). University of Houston, Houston, Texas, 2004.

[203] Baker, K. Model Performance for Ozone in the Upper Midwest over 3 Summers. Presentation given at the Lake Michigan Air Directors Consortium, 2005 AWMA Annual Conference, Minneapolis, MN, June 24, 2005.

to check for errors in the emissions estimates. When such errors were discovered, the problems in the input data files were corrected, and the models were run again.

The CMAQ air quality model inputs and outputs were plotted and examined to ensure sufficiently accurate representation of the observed data in the model ready fields, and temporal and spatial consistency and reasonableness. The output of the CMAQ model results for the 2002 period underwent operational and scientific evaluations of the meteorological and air quality modeling data used and is discussed in greater detail in Section 5.2.2.7.

5.2.2.7 Model Performance Evaluation

The first step in the modeling process is to verify the model's performance in terms of its ability to predict particulate concentration fields in the right locations and at the right levels. To do this, model predictions for the base year simulation are compared to the actual ambient data observed in the historical episode. This verification is a combination of statistical and graphical evaluations. If the model appears to be predicting particulate matter in the right locations for the right reasons, then the model can be used as a predictive tool to evaluate various control strategies and their effects on particulate formation. The purpose of the model performance evaluation is to assess how accurately the model predicts particulate levels observed in the historical episode and to use the knowledge of CMAQ's performance to put CMAQ's predictions of future year air quality in the appropriate context so that future policy decisions are informed by CMAQ's predictions and its performance.

The results of a model performance evaluation were examined prior to using CMAQ's results to support the attainment demonstration. The performance of CMAQ was evaluated using both operational and diagnostic methods. Operational evaluation refers to the model's ability to replicate observed concentrations of particulate matter and/or its precursors (surface and aloft), whereas diagnostic evaluation assesses the model's accuracy with respect to characterizing the sensitivity of particulate formation to changes in emissions (i.e., relative response factors).

The NYSDEC conducted a performance evaluation of the 2002 base case CMAQ simulation for $PM_{2.5}$ on behalf of the Ozone Transport Region member states. Appendix B9 provides comprehensive operational and diagnostic evaluation results, including spreadsheets containing the assumptions made to compute statistics. Highlights of this evaluation are summarized in Section 5.2.2.7.1.

5.2.2.7.1 Summary of Model Performance

The CMAQ model was employed to simulate $PM_{2.5}$ for the entire year of 2002. A comparison of the temporal and spatial distributions of $PM_{2.5}$ and its precursors was conducted for the study domain, with additional focus placed on performance in both the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas.

The model performance for both Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas averaged over all stations and all days met the guidelines in the USEPA Modeling Guidance. Applying those criteria to individual days is a much more stringent test that is not required by the USEPA. In general, the CMAQ model results were best for daily maximum ozone and daily average $PM_{2.5}$ and sulfate (SO_4) mass.

No significant differences in model performance for particulate matter and its precursors were encountered across different areas of the Ozone Transport Region. While there are some differences in the spatial data among sub-regions, there is nothing to suggest a tendency for the model to respond in a systematically different manner between regions. Examination of the statistical metrics by sub-region confirms the absence of significant performance problems arising in one area but not in another, building confidence that the CMAQ modeling system is operating consistently across the full Ozone Transport Region domain.

Also, the USEPA Modeling Guidance suggests the use of the concentrations estimated from the mean of the nearby grid cells where the ambient monitor is located unless large concentration gradients are encountered within the adjoining grid cells. If the modeling shows that large concentration gradients exist then the USEPA guidance suggests using only the concentration from the grid cell containing the monitor. An analysis of the Relative Reduction Factors (RRFs) in the grid cell containing the monitor and the average of the nine grid cells surrounding the monitor shows that large concentration gradients do not exist in the modeling conducted. This analysis is presented in Appendix B10 of this SIP and shows relatively consistent results whether the concentrations of the one cell or concentrations of the average of nine cells are used. The attainment demonstration will, therefore, present the RRFs for the nine cell mean or average of the grid cells as this is consistent with USEPA guidance.[204]

As stated previously, the model performance for the 2002 annual run meets all USEPA guidelines and thus demonstrates that the modeling platform is appropriate for modeling emissions control scenarios for the Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas. The CMAQ model has been evaluated by using measures that reflect its ability to represent average conditions instead of its ability to respond to changes in emissions. Therefore, although CMAQ has met the traditional performance measures as stated in the USEPA Modeling Guidance, it may in fact under or over predict the magnitude of secondary aerosol formation changes due to the various control measures being modeled. This means future year (i.e., 2009) modeling results should not be viewed as exact, but should be utilized in a relative manner (see Section 5.2.4). Additional discussion on the uncertainty associated with the CMAQ model results is provided in Section 5.3.

5.2.3 Control Measures Modeled

As previously stated, the objective of the photochemical modeling analysis is to enable state air agencies to analyze the efficacy of various control strategies, and to demonstrate that the measures included as part of the SIP will result in attainment of the $PM_{2.5}$ standard by 2009.

---

[204] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, page 28.

New Jersey's attainment demonstration relies on the Beyond-on-the-Way (BOTW) 2009 modeling run, which predicts future 2009 air quality conditions, after accounting for all air pollution controls that have been implemented since the base year of 2002 (OTB/OTW measures), and applying new control measures (BOTW measures) that will be implemented in time to reduce emissions in 2009. Table 5.1 lists all of the control measures included for New Jersey in the projected 2009 BOTW CMAQ modeling run. Each of these control measures is discussed in detail in Chapter 4.

While Table 5.1 shows all the OTB/OTW and BOTW measures that New Jersey took into account within the 2009 attainment demonstration model run, the overall attainment demonstration is reliant upon all the states' in the Ozone Transport Region implementing measures to reduce the amount of their emissions in order for New Jersey to achieve its goals. Table 5.2 shows which BOTW measures each state in the Ozone Transport Region believed would be implemented in time to achieve benefits in 2009. These were the measures included in the BOTW model run for each state.

Table 5.1: Modeled Control Measures Included in the 2009 BOTW Model Run

Pre-2002 with benefits achieved Post-2002 - On the Books
Federal
Residential Woodstove NSPS
Onboard Refueling Vapor Recovery (ORVR) beyond Stage II
Tier 1 Vehicle Program
National Low Emission Vehicle Program (NLEV)
Tier 2 Vehicle Program/Low Sulfur Fuels
HDDV Defeat Device Settlement
HDDV Engine Standards
Nonroad Diesel Engines
Large Industrial Spark-Ignition Engines over 19 kilowatts
Recreational Vehicles (includes snowmobiles, off-highway motorcycles, and all-terrain vehicles)
Diesel Marine Engines over 37 kilowatts
Phase 2 Standards for Small Spark-Ignition Handheld Engines at or below 19 kilowatts
Phase 2 Standards for New Nonroad Spark-Ignition Non-Handheld Engines at or below 19 kilowatts
Post-2002 - On the Books
New Jersey Measures Done Through a Regional Effort
Consumer Products 2005
Architectural Coatings 2005
Portable Fuel Containers 2005 (Area Source Only)
Mobile Equipment Repair and Refinishing
Solvent Cleaning
NO_x RACT Rule (2006)
New Jersey Heavy Duty Diesel Rules Including "Not-To-Exceed" (NTE) Requirements
New Jersey Only
Stage I and Stage II (Gasoline Transfer Operations)
On-Board Diagnostics (OBD) – (I/M) Program for Gasoline Vehicles
Federal
USEPA MACT Standards
Acid Rain
CAIR (NO_x Controls in 2009 Only)
Refinery Consent Decrees (Sunoco, Valero, and ConocoPhillips)
Post-2002 - Beyond on the Way
New Jersey Measures Done Through a Regional Effort
Consumer Products 2009 Amendments
Portable Fuel Containers 2009 Amendments (Area Source Only)
Asphalt Paving

Adhesives and Sealants
Industrial/Commercial/Institutional (ICI) Boiler Rule 2009
Controls from EGU Consent Decrees (PSE&G Mercer)
Controls from EGU Consent Decrees (PSE&G Hudson NO_x)
New Jersey Only
New Jersey Low Emission Vehicle (LEV) Program

Table 5.2: Ozone Transport Region-Wide Modeling Assumptions for the 2009 BOTW Model Run

	Consumer Products 2005/2009	PFC 2005/ 2009	Asphalt Paving	Adhesives & Sealants	ICI Boilers - Area Sources			ICI Boilers - Non-EGU Point Sources					Cement Kilns	Glass Furnances	Asphalt Plants
					< 25 mmBtu/ hr	25-50 mmBtu/ hr	50-100 mmBtu/ hr	< 25 mmBtu/ hr	25-50 mmBtu/ hr	50-100 mmBtu/ hr	100-250 mmBtu/ hr	>250 mmBtu/ hr			
NY NAA															
Connecticut	x	x	x	x	x	x	x	x	x	x	x				x
New Jersey	x	x	x	x		x	x	x			x				
New York	x	x	x	x	x	x	x	x	x	x	x		x	x	x
Phila. NAA															
Delaware	x	x		x							x				
Maryland	x	x	x	x							x		x	x	
New Jersey	x	x	x	x		x	x	x			x				
Pennsylvania	x	x		x										x	
Other States															
Maine	x	x		x									x		
New Hampshire	x	x	x						x	x	x				
Vermont															
Massachusetts	x		x	x										x	
Rhode Island	x	x	x	x											
DC	x	x	x	x											x

*Source: MACTEC. Development of Emission Projections for 2009, 2012, and 2018 for NonEGU Point, Area, and Nonroad Sources in the MANE-VU Region, Final TSD. Prepared for the Mid-Atlantic Regional Air Management Association by MACTEC Federal Programs, Inc., February 28, 2007.

It is also important to note that the 2009 BOTW modeling did not contain the first round of Clean Air Interstate Rule (CAIR) controls for SO_2 expected to occur in 2010. If these lowered emissions were modeled, the modeling results would show lower predicted levels of $PM_{2.5}$ than are presented in this attainment demonstration. Implementation of the CAIR SO_2 controls is expected to provide a more assurance that the annual $PM_{2.5}$ standard of 15.0 $\mu g/m^3$ will be attained by 2010.

5.2.4 Photochemical Modeling Results

The USEPA recommends using the regional photochemical model estimates in a "relative" rather than "absolute" sense, due to the uncertainties and biases in the modeling system. Thus, the assumption is that the change between the modeled base year (2002) and the modeled future year (2009) reflects the impact of growth and control over time and is an appropriate use of the results. The "absolute" modeled results are used in a "relative" sense by applying the ratios of the model's future to current (baseline) predictions at each $PM_{2.5}$ monitor to the actual 2002 design values, thereby grounding the future design value to the monitored results. These ratios are termed the "relative reduction factor" (RRF). An RRF is defined by the USEPA as the ratio of a future maximum concentration predicted "near a monitor" to a baseline maximum concentration predicted "near the monitor" averaged over selected days.[205,206] More simply put, the RRF is the ratio of average future concentrations over average baseline concentrations for each monitoring site.

The baseline design values used in the modeling application were calculated differently from the monitored design values although both are based on monitored ambient air quality data. The monitoring design values are calculated as the three-year average of the one-year annual average values where the one-year annual average value for a given year is first calculated using the quarterly average of the daily values at each monitoring site. In other words, the quarterly average mass is calculated first, and then the average annual mass is calculated from the quarterly values for a given year. For modeling purposes, the baseline design value is calculated by averaging three three-year design value periods, centered on the base inventory year of 2002. Specifically, the modeling baseline design value was calculated using the 2000-2002, 2001-2003, and 2002-2004 periods. For more information about the modeling design values and how they were calculated, see Appendices B11-1 and B11-2. The average annual base line design value (DV_{B-I}) as shown in Table 5.3 and Table 5.4 was calculated using the three, three-year average design values centered around the 2002 base year. These values, calculated using the five years of monitoring data from 2000 to 2004, were then applied to the modeling output using the relative reductions as determined by the future year modeling.

Four monitoring sites located in New Jersey contain monitors that measure the component species of $PM_{2.5}$ and are designated as Speciation Trends Network (STN) monitors. These monitors are located in Camden, Chester, Elizabeth, and New Brunswick. The STN monitoring program provides for the concentration of major ions, carbon compounds, and trace elements

---

[205] ibid.

[206] "Near a monitor" was determined by using an average of the concentration predicted within a 3x3 array of grid cells surrounding each monitor, as recommended by the USEPA for 12-km grid resolution modeling.

which constitute the bulk of the $PM_{2.5}$ mass. The STN samplers operate on a one-in-three day sampling schedule. It is important to note that only one of the STN samplers, the Camden monitor, is located in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area; the other three (Chester, Elizabeth, and New Brunswick) are located in the Northern New Jersey/New York/Connecticut nonattainment area.

Most of the samples from the $PM_{2.5}$ monitoring sites in New Jersey are collected and analyzed according to the Federal Reference Method (FRM). The FRM for fine particulate matter requires a 24-hour collection period using a filter-based collection method to measure fine particulate mass. The FRM samplers, like the STN samplers, operate on a one-in-three day schedule. Also, as per the network design requirements, several FRM sites have collocated duplicate samplers or measure fine particulate matter by other means than the Federal Reference Method (e.g., Tapered Element Oscillating Microbalance (TEOM) sampling).

It is important to understand the unique aspects of measuring and modeling particulate matter as it relates to determining attainment. The $PM_{2.5}$ attainment test uses both the total $PM_{2.5}$ mass results from the FRM monitors as well as the individual components of $PM_{2.5}$ as measured at the STN sites. Therefore, the modeled attainment test for $PM_{2.5}$ is called the Speciated Modeled Attainment Test (SMAT). In order to perform the recommended modeled attainment, the observed total mass concentrations of $PM_{2.5}$ as measured at the FRM monitoring sites need to be first partitioned into seven components (plus passive mass).[207] These components are:

- Mass associated with sulfates
- Mass associated with nitrates
- Mass associated with ammonium
- Mass associated with organic carbon
- Mass associated with elemental carbon
- Mass associated with particle bound water
- Mass associated with "other" primary inorganic particulate matter, and
- Passively collected mass.

A separate site specific calculation of the quantity of the component species was performed for each of these $PM_{2.5}$ components (except passive mass) for each FRM monitoring site. This calculation applied the same ratio of each species collected from the "nearest" STN site, to the total $PM_{2.5}$ mass measured at the FRM site. Each of these site-specific ratios is called a component-specific design value.

Future $PM_{2.5}$ design values were estimated at each existing FRM monitoring site by multiplying the modeled RRF "near" each monitor times the observed "component specific design value." Future total $PM_{2.5}$ design values at a site were then estimated by summing the future year design values of the seven $PM_{2.5}$ components. If the total of all future species-specific $PM_{2.5}$ annual

[207] The monitors are located either within the boundaries of the nonattainment area, or in close proximity to the nonattainment area.

design values for each site was less than or equal to 15.0 µg/m^3, the annual $PM_{2.5}$ NAAQS, the test for attainment of the standard, is passed.

Since the USEPA Speciated Modeled Attainment Test software is not available for the states to use for their attainment demonstrations, the following procedure was performed by the NYSDEC and the UMDNJ/ORC (see Appendices B2, B11-1, B11-2, and B12), following the USEPA guidance for modeling attainment of the $PM_{2.5}$ health standard, to analyze the 2009 BOTW modeling results.

1. Using the data provided by the USEPA Region 2[208] on the monitored levels of particulate matter through the USEPA's Air Quality System (AQS) database, the quarterly averages of Federal Reference Method (FRM) mass for each monitor were determined.

2. The average quarterly STN speciation ratio for the years 2002 to 2004 (using the Camden, Chester, Elizabeth, and New Brunswick, New Jersey and the four New York-sited STN monitors to determine the fraction of each species that would be present in the total $PM_{2.5}$ mass measured at the FRM monitoring sites) was determined. (Note: In order to ensure that comparable mass measurements between STN and FRM measurement techniques were used, an adjustment for a blank correction was made to remove the blank mass).

3. The quarterly RRF values from the modeling results for all the species using the 2002 Base B1 and 2009 BOTW B4 were calculated (Note: nine cell averages of the grid cells surrounding each monitoring site were used to calculate the RRF.)

4. The measured FRM mass at each monitoring site was divided by the total mass into the individual species using the ratio from Step 2.

5. Computed future values of species other than water and ammonia through RRF scaling using the Degree of Neutralization (DON) and future sulfate, retained nitrate to estimate the ammonia concentration, and a polynomial approximation from the NYSDEC to estimate water within the total $PM_{2.5}$ mass.[209]

6. The blank mass was then added back to the total mass to determine the total measured $PM_{2.5}$ mass so that the predicted modeled results could be directly compared to measured concentrations.

The following equation illustrates how New Jersey calculated the future design values for each monitoring site (i):

$(RRF)_{ij}$ for each species = $([C_{j,\text{projected of species x}}]/[C_{j,\text{current of species x}}])_i$

---

[208] Personal communication by e-mail, entitled "Fw: Re: Files from MATS," between Kenneth Fradkin, USEPA, Region 2 and Ray Papalski, NJDEP, August 17, 2007.
[209] See Appendix B12.

Where:

$C_{j,current}$ is the quarterly mean concentration of species x predicted at or near the monitoring site (i) with emissions characteristic of the period used to calculate the baseline design value for annual $PM_{2.5}$

$C_{j,projected}$ is the future year quarterly mean concentration of species x predicted at or near the monitoring site (i) from a representative STN monitoring location.

The design value for each species or component was then calculated as follows:

$DV_{F\text{-}I}$ for each species = ($RRF_I * DV_{B\text{-}I}$)

Where:

$DV_{B\text{-}I}$ = the average base concentration (design value) of each component monitored at site I, in micrograms per cubic meter ($\mu g/m^3$)

RRF_I = the relative response factor calculated for each component at site (i)

$DV_{F\text{-}I}$ = the estimated future design value for the time attainment is required, in $\mu g/m^3$

The quarterly mean of each component was then summed to get quarterly mean $PM_{2.5}$ values. Then the quarterly mean $PM_{2.5}$ concentrations were averaged to get a future year annual average $PM_{2.5}$ estimate for each FRM monitoring site.

Table 5.3 shows the $PM_{2.5}$ modeling results using the 2009 BOTW run for all monitors located within the Northern New Jersey /New York/Connecticut nonattainment area.

Table 5.3: 2009 Modeled $PM_{2.5}$ Design Values for the Northern New Jersey/New York/Connecticut Nonattainment Areas (Bold Type indicates Values over the Annual Standard of 15.0 µg/m^3)

Site ID	Monitoring Site Name	State Name	Average Annual Baseline Design Value (DV_{B-I}) (µg/m^3)	Projected 2009 Annual Design Value (DV_{F-I}) (µg/m^3)
90010010	Bridgeport - Roosevelt School	Connecticut	13.1	11.5
90010113	Bridgeport - Congress Street	Connecticut	12.6	11.2
90011123	Danbury	Connecticut	12.8	11.2
90012124	Stamford	Connecticut	12.9	11.4
90013005	Norwalk	Connecticut	12.9	11.3
90019003	Westport	Connecticut	11.8	10.4
90090018	New Haven - Stiles Street[210]	Connecticut	**16.3**	14.4
90091123	New Haven- 715 State St	Connecticut	13.7	11.7
90092123	Waterbury	Connecticut	13.1	11.2
90099005	Hamden	Connecticut	11.6	9.9
340030003	Fort Lee Library	New Jersey	13.7	12.1
340130015	Newark Cultural Center	New Jersey	13.9	11.8
340130016	Newark Lab	New Jersey	14.7	12.5
340171003	Jersey City Primary	New Jersey	14.9	13.3
340172002	Union City	New Jersey	**16.0**	14.3
340210008	Trenton	New Jersey	13.9	11.8
340218001	Washington Crossing	New Jersey	11.9	10.1
340230006	New Brunswick	New Jersey	12.5	10.4
340270004	Morristown	New Jersey	12.4	10.4
340273001	Chester	New Jersey	11.1	9.3
340310005	Paterson	New Jersey	13.2	11.4
340390004	Elizabeth	New Jersey	**15.7**	13.5
340390006	Elizabeth Downtown	New Jersey	13.5	11.8
340392003	Rahway	New Jersey	13.1	11.4
360050080	Morrisania Center -Gerard Ave.	New York	**15.8**	14.2
360050083	Botanical Gardens	New York	13.8	12.4
360050110	East 156 Street	New York	14.7	13.3
360470052	PS 314-60th St and GawanusExp.	New York	**15.2**	13.4
360470076	PS 321- 180 7th Ave.	New York	14.4	12.7
360470122	JHS 126 424 Leonard St	New York	14.7	13.0

[210] The New Haven/Stiles St. monitor was designated as a "special purpose" monitor, and as such cannot be used to make an attainment or nonattainment designation. The site was found to be overly influenced by micro-scale phenomena, including heavy duty truck exhaust from trucks leaving the New Haven Terminal area and accelerating uphill on the Interstate-95 on-ramp. The monitor was less than twenty feet from the traffic lane. Following a special, multi-site monitoring study conducted by CTDEP, the Stiles Street monitor was deemed unrepresentative of population exposure in the City of New Haven. In 2006, it was shut down as part of the I-95 bridge reconstruction project. The information on this site, therefore, is for informational purposes only and should not be used to assess attainment of the standard.

Site ID	Monitoring Site Name	State Name	Average Annual Baseline Design Value (DV_{B-I}) (µg/m³)	Projected 2009 Annual Design Value (DV_{F-I}) (µg/m³)
360590012	East Hills Elementary School	New York	11.9	10.5
360590013	1055 Stewart Place	New York	12.0	10.6
360610056	PS 59, 288 E. 57th St., Manhattan	New York	**17.4**	**15.3**
360610062	Post Office, 350 Canal St.	New York	**16.3**	14.1
360610079	School IS 45, 2351 1st Ave.	New York	14.7	12.9
360610128	PS 19, 185 1st Avenue	New York	**15.9**	14.0
360710002	NYC- 55 Broadway	New York	11.5	10.2
360810094	NYC- PS 29 125-10 23rd Avenue	New York	13.7	12.1
360810096	NYC- 3115 140th Street	New York	13.7	12.1
360810124	NYC- 14439 Gravett Road	New York	13.3	11.8
360850055	Post Office, 364 Port Richmond	New York	14.0	12.0
360850067	Susan Wagner	New York	12.1	10.4
361030001	East Farmingdale Water Plant	New York	12.1	10.6
361191002	5th Avenue & Madison, Thruway Exit 9	New York	12.3	10.8

As can be seen from this table, the only site with a projected 2009 design value greater than the annual fine particulate standard of 15.0 µg/m³ is the P.S. 59 site located in Manhattan, New York City. This is also illustrated in Figure 5.2. All other sites are below the annual fine particulate standard. The projected 2009 value for the P.S. 59 site is within the weight-of-evidence range of values defined in the $PM_{2.5}$ modeling guidance as 14.5 µg/m³ through 15.5 µg/m³.[211] Further justification to explain why New Jersey, New York, and Connecticut believe that fine particulate levels at this site as well as all other sites, will be lower than predicted in 2009 and why this site will achieve the annual standard by 2009 is presented in Section 5.3

Table 5.4 shows the $PM_{2.5}$ modeling results using the 2009 BOTW run for all monitors located within the Southern New Jersey/Philadelphia nonattainment area.

[211] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, page 105.

Figure 5.2: **Map of the 1997 $PM_{2.5}$ Northern New Jersey/New York/Connecticut Nonattainment Area**

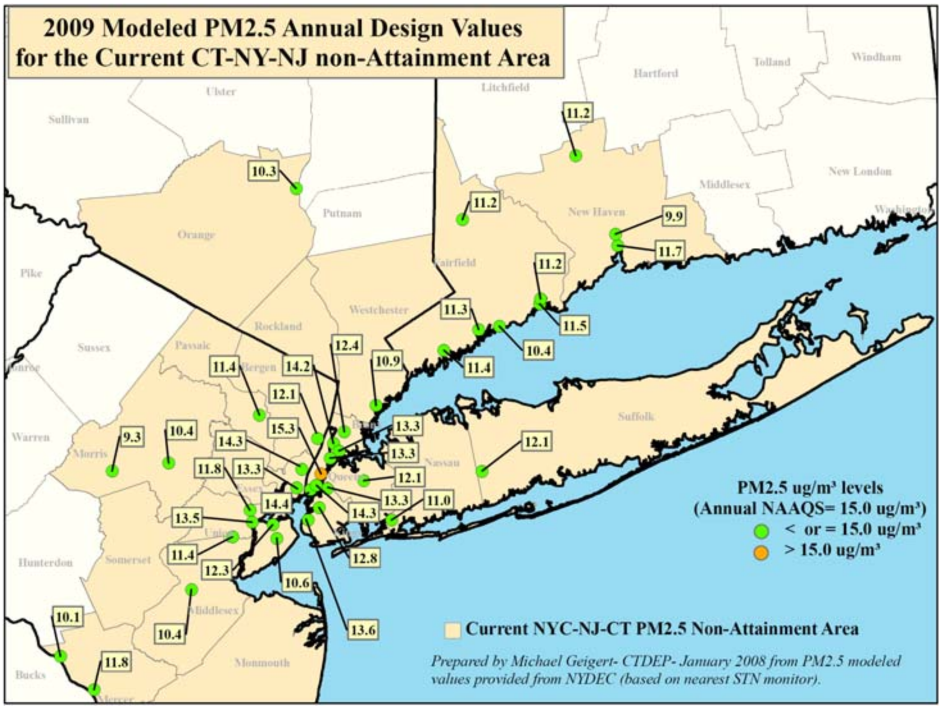


Table 5.4: **2009 Modeled $PM_{2.5}$ Design Values for the Southern New Jersey/Philadelphia/Delaware Nonattainment Area (Bold Type indicates Values over the Annual Standard of 15.0 µg/m^3)**

Site ID	Monitoring Site Name	State Name	Average Annual Baseline Design Value (DV_{B-I}) (µg/m^3)	Projected 2009 Annual Design Value(DV_{F-I}) (µg/m^3)
100031003	Bellefonte	Delaware	14.7	12.6
100031007	Lums2	Delaware	13.6	11.4
100031012	Newark-Univ. Del. No. Campus	Delaware	**15.0**	12.8
100032004	Wilmington	Delaware	**16.0**	13.7
340070003	Camden	New Jersey	14.3	12.3
340071007	Pennsauken	New Jersey	14.3	12.4
340155001	Clarksboro	New Jersey	13.7	11.8
420170012	Bristol	Pennsylvania	14.1	12.0
420290100	New Garden (Airport)	Pennsylvania	14.9	12.5
420450002	Chester	Pennsylvania	**15.3**	13.3
420910013	Norristown	Pennsylvania	13.7	11.9
421010004	Frankford (Lab	Pennsylvania	14.9	12.9
421010014	Philadelphia- Roxy Water Pump Station	Pennsylvania	13.6	11.8
421010020	Philadelphia- Belmont Avenue Water Plant	Pennsylvania	14.2	12.4

Site ID	Monitoring Site Name	State Name	Average Annual Baseline Design Value (DV_{B-I}) ($\mu g/m^3$)	Projected 2009 Annual Design Value(DV_{F-I}) ($\mu g/m^3$)
421010024	Philadelphia - Northeast Airport	Pennsylvania	13.8	11.8
421010047	Philadelphia- 500 South Broad Street[212]	Pennsylvania	**16.1**	13.9
421010052	Philadelphia- 1439 East Passyunk Avenue	Pennsylvania	13.1	11.4
421010136	Philadelphia- Southwest (Elm)	Pennsylvania	14.5	12.6

As can be seen from this table, all sites in the Southern New Jersey/Philadelphia nonattainment area are projected to be below the annual fine particulate standard of 15.0 $\mu g/m^3$ and below the weight of evidence range of values.

5.3 Demonstrations

5.3.1 Introduction

A modeled attainment demonstration consists of:

- Analyses which estimate whether selected emission reductions will result in ambient concentrations that meet the NAAQS, and

- An identified set of control measures which will result in the required emission reductions.

An analysis of the selected emission reductions which will result in ambient concentrations that meet the annual $PM_{2.5}$ NAAQS is discussed in Section 5.2.4. The measures included in the photochemical modeling, the 2009 BOTW modeling run, are listed in Table 5.1. Table 5.3 and Table 5.4 provide 2002 modeling baseline design value concentrations and projected 2009 annual $PM_{2.5}$ concentrations, by nonattainment area. These tables show that all but one monitor in the Northern New Jersey/New York/Connecticut nonattainment area and all the monitors in the New Jersey/Philadelphia nonattainment area are predicted to be in attainment of the annual $PM_{2.5}$ NAAQS by the attainment date of April 5, 2010.

In the Northern New Jersey/ New York/Connecticut nonattainment area, one monitor is predicted to be above the annual $PM_{2.5}$ standard of 15.0 $\mu g/m^3$ in 2009. This monitor is located at P.S. 59 in Manhattan, New York City. This monitor is predicted to be at a value of 15.3

[212] The site at 500 South Broad St. was the design value monitoring site for the City of Philadelphia for $PM_{2.5}$ NAAQS, and had been an area of focus for the USEPA-Region 3 due to the need to find a suitable location for this monitoring site as a result of the pending closure of the 500 South Broad Street office. Additionally, data from the fourth quarter of 2005 have not been quality assured but had been reported to AIRS-AQS. The NJDEP expects that the City of Philadelphia and the State of Pennsylvania will resolve the data quality issues with this site in the near future and address them in their own State's SIP. It is not expected that this site will be over the annual standard of 15 $\mu g/m^3$ using the latest, quality-assured monitoring data.

$\mu g/m^3$. This value is within the weight-of-evidence range that is defined in USEPA guidance: 14.5 $\mu g/m^3$ to 15.5 $\mu g/m^3$.[213] Additional emission reductions of $PM_{2.5}$ and precursors will occur between now and 2009 and are discussed in Section 5.3.2.6.

In the Southern New Jersey/Philadelphia nonattainment area, the monitors located in New Jersey, Pennsylvania (Philadelphia area), and Delaware are predicted to come into attainment by 2009 (see Table 5.4). The highest value predicted in this nonattainment area is located on Broad Street in Philadelphia, PA, and the value is predicted to be 13.9 $\mu g/m^3$. This value is below the weight-of-evidence range that is defined in the USEPA guidance: 14.5 $\mu g/m^3$ to 15.5 $\mu g/m^3$. Additional emission reductions of $PM_{2.5}$ and precursors will occur between now and 2010 and are discussed in Section 5.3.2.5.

5.3.2 Supplemental Analysis/Weight-of-Evidence

While the USEPA attainment demonstration guidance emphasizes a single design value from a single modeling simulation as the core of any attainment demonstration,[214] it also supports, in conjunction with the Clean Air Act Advisory Committee (CAAAC), states utilizing a multi-analysis approach to their $PM_{2.5}$ attainment demonstrations.[215] This is because the principles of atmospheric science acknowledge that, in using models, all of the uncertainties and biases need to be considered. Uncertainties associated with emission inventories, meteorological data, and the representation of photochemistry in the model can result in over or under predictions in design values. The CAAAC also recommends that states decrease reliance on modeling results to demonstrate attainment and rather focus more on ambient air monitoring data.

5.3.2.1 Monitoring Data Shows Trend toward Attainment of the Annual $PM_{2.5}$ NAAQS and a Downward Trend in Ambient Air Concentrations

Tables 5.5 and 5.6 present the annual average monitoring results and design values, respectively, from the Northern New Jersey/New York/Connecticut nonattainment area $PM_{2.5}$ monitors from 2000 through 2006. These monitoring results show that the measured values at the monitors in the nonattainment area have generally been decreasing since 2000, and that the monitored values in 2006 were all below the lower range of values for the weight-of-evidence range for annual $PM_{2.5}$ (14.5 $\mu g/m^3$ to 15.5 $\mu g/m^3$). During the period of 2000 to 2006, two New Jersey monitors in the Northern New Jersey/New York/Connecticut nonattainment area were not operating for part of the time: Union City and Newark Lab. The site located in Union City, New Jersey had the highest annual $PM_{2.5}$ results in 2000 within the State, although not the highest values within the nonattainment area. The annual $PM_{2.5}$ result at the Union City monitor in 2006 was 13.9

[213] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, page 17.
[214] USEPA. Guidance on the Use of Models and Other Related Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Air Quality Modeling Group, Research Triangle Park, North Carolina, EPA-454/R-05-002, October 2005.
[215] ibid.

μg/m^3; preliminary results for 2007 show that this value is the same at this monitor and below the weight of evidence range of values. The downward trends in these values are consistent with the annual $PM_{2.5}$ results seen in Chapter 2.

Table 5.6 contains the design values for the monitors in the Northern New Jersey/New York/Connecticut nonattainment area. Despite slightly elevated $PM_{2.5}$ values in 2005, the 2006 design values are also showing a decreasing trend. These results further reinforce that the New Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area will attain the annual $PM_{2.5}$ standard in 2009.

Tables 5.7 and 5.8 present the annual average monitoring results and design values, respectively, from the Southern New Jersey/Philadelphia $PM_{2.5}$ monitors from 2000 through 2006. These monitoring results show that the measured values at the monitors in the nonattainment area have been decreasing, and that the monitored values in 2006 were all below the lower range of values for the weight-of-evidence range for annual $PM_{2.5}$ (14.5 μg/m^3 to 15.5 μg/m^3). The design values in Table 5.8 show that the air quality in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area is in attainment of the annual $PM_{2.5}$ NAAQS.

These results further reinforce that the New Jersey portion of the Southern New Jersey/Philadelphia will attain the annual $PM_{2.5}$ standard in 2009.

5.3.2.2 Monitoring Data Shows Progress towards Attainment of the New Daily $PM_{2.5}$ NAAQS of 35 μg/m^3

While the monitoring data shows a consistent downward trend in fine particulate concentrations, the monitored values are still above the new 2006 Federal 24-hour NAAQS of 35 μg/m^3. Tables 5.9 and 5.10 show the monitored fine particulate levels associated with New Jersey's Northern New Jersey/New York/Connecticut nonattainment area and the Southern New Jersey/Philadelphia nonattainment, respectively. For 2006, several sites (shown in bold and shaded) are above the 35 μg/m^3 daily standard but it should be noted that all sites are well below the former daily standard of 65 μg/m^3.

Table 5.5: Annual Ambient $PM_{2.5}$ Levels in the Northern New Jersey/New York/Connecticut Nonattainment Area

State	County	Monitor Site Address	2000	2001	2002	2003	2004	2005	2006
NJ	Bergen	Fort Lee	14.6	14.5	13.0	13.3	12.0	14.5	11.8
	Essex	Newark Cultural Center	15.6	13.5	13.2	14.1	13.2	14.3	12.1
	Essex	Newark Lab		15.3	14.1	13.1			
	Hudson	Jersey City Primary	16.8	14.1	14.3	14.8	13.8	15.2	13.3
	Hudson	Union City	17.1	15.8	16.8			17.4	13.9
	Mercer	Trenton	14.7	14.9	13.0	13.5	12.5	13.0	12.5
	Mercer	Washington Crossing	12.1	12.2	11.5	12.0	11.0	12.1	10.0
	Middlesex	New Brunswick	13.1	13.2	11.1	13.0	11.2	13.4	10.8
	Morris	Chester	11.1	11.8	10.5	10.7	10.1	10.9	9.0
	Morris	Morristown	12.9	13.4	11.5	12.2	11.1	12.5	10.1
	Passaic	Paterson	13.7	13.1	12.9	13.3	12.6	13.4	12.0
	Union	Elizabeth Turnpike Primary	16.9	15.8	14.9	16.2	15.2	15.2	14.2
	Union	Elizabeth Downtown	15.2	13.4	13.1	14.0	12.6	14.3	12.4
	Union	Rahway	14.2	12.8	12.4	13.3	12.6	14.0	11.9
NY	Bronx	Morrisania Center, 1225-57 Gerard Ave.	16.6	15.9	15.4	15.7	14.6	16.9	13.9
	Bronx	200th St. And Southern Blvd.		14.4	13.5	13.4	12.7	13.9	12.0
	Bronx	E 156th St. Bet Dawson and Kelly	15.3	14.6	15.0	14.8	13.5	14.8	12.8
	Kings	Jhs 126 424 Leonard St.		15.3	14.0	14.8	13.8	15.3	12.8
	Nassau	Lawrence High School, Arlington Place	12.2	12.9	11.4	12.4	11.4	12.4	10.8
	New York	Ps 59, 288 E. 57th Street	18.5	17.8	16.4		15.4	17.0	14.4
	New York	Post Office, 350 Canal St.	17.6	17.3	16.0	15.8	14.5	15.7	12.8
	New York	School Is 45, 2351 1st Ave.	15.5	15.2	14.7	14.5	13.2	14.3	12.7
	Orange	55 Broadway		11.6	11.0	11.8	10.4	12.1	9.7
	Orange	14439 Gravett Rd.		14.2	12.7	13.5	12.2	12.4	11.6
	Richmond	Post Office, 364 Port Richmond Ave.	14.3	14.5	13.8		13.3	14.5	12.2
	Richmond	Susan Wagner HS, Brielle Ave. & Manor Rd.	12.4	13.1	11.5		11.6	12.5	10.4
	Suffolk	East Farmingdale Water Plant		13.0	11.4	11.9	10.7	12.0	
	Westchester	5th Ave. & Madison, Thruway Exit 9		12.9	11.8	12.1	11.3	12.4	11.0
CT	Fairfield	Roosevelt School Park Ave.	14.0	13.7	12.8	12.8	12.7	14.4	12.5

State	County	Monitor Site Address	2000	2001	2002	2003	2004	2005	2006
	Fairfield	Trailer, W. Connecticut State University	12.7	13.2	12.6	13.3	11.2	13.4	12.3
	Fairfield	Hillandale Ave.	12.9	13.0	12.7	13.5	11.8		
	Fairfield	Norwalk Health Dept., 137 East Ave.		13.4	12.6	13.1	12.4	13.2	11.7
	Fairfield	Sherwood Island State Park	13.0	12.1	11.5	11.7	11.1	12.2	10.7
	New Haven	Stiles St.	16.2	17.0	15.9	16.8	15.4	18.9	
	New Haven	Woodward Ave.				11.9	11.5	13.1	11.7
	New Haven	1 James St.					12.2	13.3	12.2
	New Haven	715 State St.	14.1	14.3	13.3	14.0	12.8	13.8	12.7
	New Haven	Agri. Expr. Sta. Huntington St.				11.9	11.1	11.8	10.8
	New Haven	Shed Meadow and Bank St.	13.7	13.9	13.1	12.6	12.1	14.1	11.9

Table 5.6: Ambient $PM_{2.5}$ Design Values in the Northern New Jersey/New York Connecticut Nonattainment Area[216]

State	County	Monitor Site Address	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006
NJ	Bergen	Fort Lee	14.0	13.6	12.8	13.3	12.8
	Essex	Newark Cultural Center	14.1	13.6	13.5	13.9	13.2
	Essex	Newark Lab	14.7	14.2	13.6	13.1	
	Hudson	Jersey City Primary	15.1	14.4	14.3	14.6	14.1
	Hudson	Union City	16.6	16.3	16.8	17.4	15.7
	Mercer	Trenton	14.2	13.8	13.0	13.0	12.7
	Mercer	Washington Crossing	11.9	11.9	11.5	11.7	11.0
	Middlesex	New Brunswick	12.5	12.4	11.8	12.5	11.8
	Morris	Chester	11.1	11.0	10.5	10.6	10.0
	Morris	Morristown	12.6	12.4	11.6	11.9	11.2
	Passaic	Paterson	13.2	13.1	12.9	13.1	12.7
	Union	Elizabeth Turnpike Primary	15.9	15.6	15.4	15.5	14.9
	Union	Elizabeth Downtown	13.9	13.5	13.2	13.6	13.1
	Union	Rahway	13.1	12.8	12.8	13.3	12.8
NY	Bronx	Morrisania Center, 1225-57 Gerard Ave.	16.0	15.7	15.2	15.7	15.1
	Bronx	200th St. And Southern Blvd.	14.2	13.9	13.4	13.3	12.9
	Bronx	E 156th St. Bet Dawson and Kelly	15.0	14.8	14.4	14.4	13.7
	Kings	Jhs 126 424 Leonard St.		14.9	14.4	14.6	14.0
	Nassau	Lawrence High School, Arlington Place	12.3	12.4			
	New York	Ps 59, 288 E. 57th Street	17.6	17.6	16.8	17.0	15.6
	New York	Post Office, 350 Canal St.	17.0	16.4	15.4	15.3	14.3
	New York	School Is 45, 2351 1st Ave.	15.1	14.8	14.1	14.0	13.4
	New York	55 Broadway		15.7	15.8	15.8	15.2
	Orange	14439 Gravett Rd.	11.7	11.6	11.2	11.4	10.7
	Queens	Post Office, 364 Port Richmond Ave.		13.6	12.9	12.7	12.1
	Richmond	Susan Wagner HS, Brielle Ave. & Manor Rd.	14.4	14.0	13.7	13.7	13.4

[216] Monitoring sites with only two or less three-year average values are not shown as no discernable trends can be seen due to a lack of sufficient data points. Also, only one monitoring value is shown at some sites that have duplicate monitoring performed to avoid confusion. In these limited cases, the higher value of the two monitors is shown.

State	County	Monitor Site Address	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006
	Richmond	East Farmingdale Water Plant	12.5	12.2	11.7	11.9	11.5
	Suffolk	5th Ave. & Madison, Thruway Exit 9	12.5	12.3	11.5	11.5	
	Westchester	Morrisania Center, 1225-57 Gerard Ave.		12.5	11.9	12.0	11.6
CT	Fairfield	Roosevelt School Park Ave.	13.4	13.1	12.7	13.3	13.2
	Fairfield	Trailer, W. Connecticut State University	12.8	13.1	12.4	12.7	12.3
	Fairfield	Hillandale Avenue	12.9	13.1	12.7		
	Fairfield	Norwalk Health Dept., 137 East Avenue	12.9	13.0	12.7	12.9	12.4
	Fairfield	Sherwood Island State Park	12.2	11.8	11.4	11.7	11.3
	New Haven	Stiles Street [217]	16.4	16.6	16.1	17.1	
	New Haven	715 State Street	13.8	13.7	13.1	13.4	13.1
	New Haven	Shed Meadow And Bank Street	13.8	13.7	12.9	13.4	12.9
	New Haven	Mill Rock Basin	11.5	11.8			

[217] See Footnote 211 for explanation of the Stiles Street monitor.

Table 5.7: Annual Ambient $PM_{2.5}$ Levels in the Southern New Jersey/Philadelphia Nonattainment Area

State	County	Monitor Site Address	2000	2001	2002	2003	2004	2005	2006
NJ	Camden	Pennsauken	15.5	14.2	13.9	13.9	13.2	14.3	12.4
	Camden	Camden Lab Primary	15.0	14.5	13.3	16.3	13.3	14.4	12.2
	Gloucester	Gibbstown	15.1	14.5	12.3	13.8	12.4	14.1	9.0
PA	Bucks	Rockview Lane	13.6	14.5	14.2	14.4	13.0	14.3	12.2
	Chester	New Garden Airport - Toughkenamon			14.6	15.6	14.3	15.9	12.6
	Delaware	Front St. & Norris St.	16.0	15.9	14.7	15.3	15.0	16.5	14.0
	Montgomery	State Armory - 1046 Belvoir Rd.	13.5	14.9	13.6	13.9	12.0	12.5	12.1
	Philadelphia	1501 E. Lycoming Ave. Ams Lab	14.9	16.5	14.8	14.8	13.9	14.3	13.5
	Philadelphia	Ford Rd.-Belmont Ave. Water Treat Plant	14.7	15.4	13.8	13.7	13.9		
	Philadelphia	Grant-Ashton Roads, Phila. NE Airport	14.4	14.6	13.9	13.0	12.8	13.0	12.4
	Philadelphia	500 South Broad St. - Parking Lot (Chs)	17.0	16.6	16.2	15.5	14.4		
	Philadelphia	Amtrak, 5917 Elmwood Ave.	14.8	16.7	14.4	14.1	12.8	14.3	13.2
DE	New Castle	River Road Park, Bellefonte	15.4	15.6	14.0	14.8	13.9	14.3	12.3
	New Castle	Lums Pond State Park	14.2	14.5	13.0	13.3	13.2	13.8	11.4
	New Castle	Univ. Del. North Campus	15.4	15.8	14.3	14.8	14.5	14.4	12.7
	New Castle	MLK Blvd. and Justison St.	16.4	17.6	14.8	15.5	14.9	15.0	14.7

Table 5.8: Ambient $PM_{2.5}$ Design Values in the Southern New Jersey/Philadelphia Nonattainment Area[218]

State	County	Monitor Site Address	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006
NJ	Camden	Pennsauken	14.5	14.0	13.7	13.8	13.3
	Camden	Camden Lab Primary	14.3	14.7	14.3	14.7	13.3
	Gloucester	Gibbstown	14.0	13.5	12.8	13.4	11.8
PA	Bucks	Rockview Lane	14.1	14.3	13.9	13.9	13.2
	Chester	New Garden Airport - Toughkenamon			14.8	15.2	14.2
	Delaware	Front St. & Norris St.	15.5	15.3	15.0	15.6	15.2
	Montgomery	State Armory - 1046 Belvoir Rd.	14.0	14.1	13.2	12.8	12.2
	Philadelphia	1501 E. Lycoming Ave. Ams Lab	15.4	15.4	14.5	14.3	13.9
	Philadelphia	Ford Rd.-Belmont Ave. Water Treat Plant	14.6	14.3	13.8		
	Philadelphia	Grant-Ashton Roads, Phila. NE Airport	14.3	13.8	13.2	12.9	12.7
	Philadelphia	500 South Broad St. - Parking Lot	16.6	16.1	15.4		
	Philadelphia	Amtrak, 5917 Elmwood Ave.	15.3	15.0	13.7	13.7	13.4
DE	New Castle	River Road Park, Bellefonte	15.0	14.8	14.2	14.3	13.5
	New Castle	Lums Pond State Park	13.9	13.6	13.2	13.4	12.8
	New Castle	Univ. Del. North Campus	15.2	15.0	14.6	14.6	13.9
	New Castle	MLK Blvd. and Justison St.	16.6	16.7	15.7	15.8	15.5

[218] Monitoring sites with only two or less three-year average values are not shown as no discernable trends can be seen due to a lack of sufficient data points. Also, only one monitoring value is shown at some sites that have duplicate monitoring performed to avoid confusion. In these limited cases, the higher value of the two monitors is shown.

Table 5.9: Averaged Daily $PM_{2.5}$ Ambient Levels in the Northern New Jersey/New York/Connecticut Nonattainment Area ($\mu g/m^3$)

			98th Percentile 24-Hour Average ($\mu g/m^3$)								3-Year Average 98th Percentile 24-Hour Average ($\mu g/m^3$)					
State	County	Monitor Site Address	1999	2000	2001	2002	2003	2004	2005	2006	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006
NJ	Bergen	Fort Lee	39	36	30	33	39	31	41	38	35	33	34	34	37	**37**
	Essex	Newark Cultural Center	44	42	29	32	40	35	40	40	38	34	34	36	38	**38**
	Hudson	Jersey City Primary	46	40	34	34	46	37	38	41	40	36	38	39	41	**39**
	Hudson	Union City	50	39	35	38			44	41	42	37	36	38	44	**43**
	Mercer	Trenton	33	43	31	35	41	33	34	36	35	36	35	36	36	34
	Mercer	Washington Crossing	28	32	26	32	35	28	33	30	29	30	31	32	32	30
	Middlesex	New Brunswick	31	35	27	26	45	36	34	33	31	29	33	36	38	34
	Morris	Chester	30	29	31	30	36	30	33	28	30	30	32	32	33	31
	Morris	Morristown	35	30	27	30	37	31	33	30	31	29	31	33	34	31
	Passaic	Paterson	41	35	30	35	40	31	41	33	35	33	35	35	37	**35**
	Union	Elizabeth Turnpike Primary	41	39	38	42	37	41	43	40	39	40	39	40	40	**41**
	Union	Elizabeth Downtown	43	36	26	30	41	33	39	39	35	31	32	35	38	**37**
	Union	Rahway	17	38	29	31	35	37	38	38	28	33	32	34	37	**37**
NY	Bronx	Morrisania Center, 1225-57 Gerard Ave.	45	40	37	35	45	38	38	40	41	37	39	39	40	**39**
	Bronx	200th St. And Southern Blvd.	35	39	35	33	38	31	37	35	36	36	36	34	35	34
	Bronx	E 156th St. Bet Dawson and Kelly	34	41	39	41	38	29	37	38	38	40	39	36	34	**35**
	Kings	PS 321 180 7th Av	38	42	35	32	33				38	36	33			
	Kings	Jhs 126 424 Leonard St.			35	36	41	37	36	38			37	38	38	**37**
	Nassau	Lawrence High School, Arlington Place		32	31	32	39	31	35	33	32	32	34	34	35	33
	New York	PS 59, 288 E. 57th St. (monitor 2)	47	42	40	38	37	41	39		43	40	38	39	39	
	New York	PS 59, 288 E. 57th St. (monitor 1)	36	42	40	38	37	41	40	41	39	40	38	39	39	**41**
	New York	Post Office, 350 Canal St. (monitor 1)	45	41	42	39	46	39	40	36	43	41	42	41	42	**38**
	New York	School Is 45, 2351 1st Ave. (monitor 1)		41	36	36	46	38	37	38		38	39	40	40	**37**
	New York	PS 19 185 1st Ave.			38	38	48	39	38	38			42	42	42	**38**
	New York	55 Broadway		30	28	32	31	27	30	28		30	30	30	29	28
	Queens	14439 Gravett Rd.			36	39	39	33	34	34			38	37	36	34
	Richmond	Post Office, 364 Port Richmond Ave.		40	32	40	46	31	33	36		37	39	39	37	34
	Richmond	Susan Wagner HS, Brielle Ave.& Manor Rd.		33	31	28	32	34	33	32	32	31	30	31	33	33

			98th Percentile 24-Hour Average ($\mu g/m^3$)								3-Year Average 98th Percentile 24-Hour Average ($\mu g/m^3$)					
State	**County**	**Monitor Site Address**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**1999-2001**	**2000-2002**	**2001-2003**	**2002-2004**	**2003-2005**	**2004-2006**
	Suffolk	East Farmingdale Water Plant		32	34	36	39	31	34		33	34	36	35	35	
	Suffolk	East Farmingdale Water Dist.,Gazza Blvd.				36	39	31	34	32				35	35	32
	Westchester	5th Ave. & Madison, Thruway Exit 9			34	33	37	34	33	34			35	34	34	34
CT	Fairfield	Roosevelt School Park Ave.	31	42	40	35	40	34	38	37	38	39	38	36	37	**36**
	Fairfield	Trailer, W. Connecticut State University		33	35	31	37	28	33	34		33	34	32	33	32
	Fairfield	Hillandale Ave.		36	37	35	42	32				36	38	36		
	Fairfield	Norwalk Health Dept., 137 East Ave.			36	34	43	35	35	36			38	37	38	35
	Fairfield	Sherwood Island State Park		33	35	31	44	31	35	31		33	36	35	37	32
	New Haven	Stiles St.	40	40	41	40	44	35	44		40	40	42	40	41	
	New Haven	Woodward Ave.					46	32	36	37					38	35
	New Haven	1 James St.						37	38	37						**37**
	New Haven	715 State St.	32	37	40	32	44	36	41	38	36	36	39	38	40	**38**
	New Haven	Agri. Expr. Sta. Huntington St.					44	32	33	34					36	33
	New Haven	Shed Meadow and Bank St. (USEPA, monitor 1)	38	34	35	33	13	30	34	36	36	34	27	25	26	33
	New Haven	Shed Meadow and Bank St. (CTDEP)	38	34	35	33	38	30	36	36	36	34	35	34	35	34
	New Haven	Mill Rock Basin	28	35	32	29	44				32	32	35			

Table 5.10: Averaged Daily $PM_{2.5}$ Ambient Levels in the Southern New Jersey/Philadelphia Nonattainment Area ($\mu g/m^3$)

			98th Percentile 24-Hour Average (µg/m3)								3-Year Average 98th Percentile 24-Hour Average (µg/m3)					
State	**County**	**Monitor Site Address**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**1999-2001**	**2000-2002**	**2001-2003**	**2002-2004**	**2003-2005**	**2004-2006**
NJ	Camden	Pennsauken	35	36	33	35	38	35	37	38	35	35	35	36	37	**37**
	Camden	Camden Lab Primary	32	32	30	35	43	35	38	34	31	32	36	38	39	**36**
	Gloucester	Gibbstown	25	34	29	29	35	29	32	24	29	31	31	31	32	29
PA	Bucks	Rockview Lane		38	39	37	40	30	35	34		38	39	36	35	33
	Chester	New Garden Airport - Toughkenamon				34	39	33	34	38				35	35	35
	Delaware	Front St. & Norris St.	36	36	40	32	38	31	37	37	37	36	37	34	35	35
	Delaware	State Armory - 1046 Belvoir Rd.		32	48	37	38	29		36		39	41	35		
	Philadelphia	1501 E. Lycoming Ave. Ams Lab	39	41	40	40	40	34	36	38	40	40	40	38	37	**36**
	Philadelphia	Ford Rd-Belmont Ave. Water Treat Plant		32	36	34	39	29				34	37	34		
	Philadelphia	Grant-Ashton Roads Phila. NE Airport		38	37	34	39	33	36	35		36	37	35	36	35
	Philadelphia	500 South Broad St.		39	40	36	42	32				38	39	37		
	Philadelphia	Amtrak, 5917 Elmwood Ave.		39	46	37	36	30		38		41	40	34		
DE	New Castle	River Road Park, Bellefonte	33	38	41	34	36	33	35		37	38	37	34	34	33
	New Castle	Lums Pond State Park		36	36		37	31	36	29	35	34	34	33	35	32
	New Castle	Univ. Del. - North Campus	35	40	40	42	36	29	35	31	38	41	39	36	33	32
	New Castle	MLK Blvd. and Justison St.	38	39	43	41	37	34	37	38	40	41	40	37	36	**36**

5.3.2.3 Discussion of Monitoring Results Collected at P.S. 59, Manhattan, New York

One monitor associated with New Jersey's Northern New Jersey/New York/Connecticut nonattainment area is projected to have fine particulate levels slightly above the annual fine particulate standard of 15.0 $\mu g/m^3$ in 2009. The annual $PM_{2.5}$ design value at this monitor located at P.S. 59 in New York City is predicted to be 15.3 $\mu g/m^3$ in 2009. This predicted value is within the USEPA weight-of-evidence range of values.

New York has prepared a weight-of-evidence demonstration for the P.S. 59 monitor to point out the factors unique to this site that need to be considered when determining that the site will attain the annual $PM_{2.5}$ NAAQS by April 5, 2010. First, the monitoring data is lacking complete information for the third quarter of 2003. During this period, construction work was occurring at the site location that potentially invalidated a number of samples during the quarter and unfairly biased the collected fine particulate levels to the high side (see Appendix B2-1, Attachment 1); the construction work was the sole reason for the incomplete dataset. Also, analysis of the monitoring data suggests that lack of collocated speciation monitors and use of speciation information from the nearest neighborhood monitor may have contributed to the estimate of $PM_{2.5}$ being above the level of NAAQS at the P.S.59 monitor. Examining the trends in precursors as well as measured $PM_{2.5}$ at P.S.59 suggests a downward path and that coupled with the observation that the contribution to the secondary species is from upwind regions rather than local, favors strongly that this monitor will also be in attainment similar to the rest of them in the region. A more detailed discussion of these measures is included in Appendix B12.

In addition, New York lists the following programs in the process of being adopted or implemented in their state, that are not represented in the projection inventories for 2009, and that will contribute to attainment at the P.S. 59 monitor (refer to Appendix B12 for a comprehensive discussion of each of these measures):

- Part 222, Distributed Generation
- Part 227-2, NO_x RACT (High Electric Demand Day Units)
- Parts 243, 244, and 245, Clean Air Interstate Rule
- Diesel Emissions Reduction Act of 2006
- Existing and New/Revised State VOC Reduction Measures
- Federal Rules for VOC Reductions
- Proposed Federal Rules for VOC, NO_x, and PM Reductions
- Canadian Air Quality Efforts
- Governor Spitzer's "15 by 15" Initiative
- New York State Energy Research and Development Authority (NYSERDA) Programs

New Jersey agrees with this demonstration and further believes that additional control measures not included in the 2009 modeling, like those that will occur in New Jersey (see Section 5.3.2.5) and the early implementation of CAIR SO_2 controls prior to 2010, will lower ambient concentrations even further than the levels needed to demonstrate attainment of the annual fine particulate standard. New York's weight-of-evidence discussion for the P.S. 59 monitor is included in Appendix B12.

5.3.2.4 The Contribution of Transport to Nonattainment

Representing the amount of transported particulates, and the components that contribute to secondary aerosol formation, accurately in the regional modeling not only affects the accuracy of the modeling results but also the contribution of regional sources to nonattainment at a particular location. This information ultimately helps to inform the process on what sources to control to reduce precursor pollutants and thus fine particulate matter.

Fine particulate pollution apportionment modeling analyses show that transport from states outside the State are significant contributors to nonattainment in New Jersey. Recent modeling conducted in 2005 by the USEPA to support the implementation of the CAIR indicates that out-of-state contributions of sulfate and nitrate to Union County, New Jersey from just the Electric Generating Units in other states will contribute at least 3.4 $\mu g/m^3$ to the projected 2010 levels and at least 4.8 $\mu g/m^3$ (or about 30 percent) to the P.S. 59 monitor in New York City.[219]

Chapter 2 describes several studies that analyzed the sources of fine particulate matter in New Jersey's air. Secondary sulfate appears as the largest portion of the fine particulate mass in both urban and rural areas of New Jersey. Transported sulfate concentrations from upwind electric power plants appears to be the largest contributor to these sulfate levels. Implementation of SO_2 controls under the first phase of CAIR in 2010 is anticipated to provide additional benefits as explained in Section 5.3.2.5. The implementation of the second phase of CAIR in 2015 will also have an air quality benefit on New Jersey.

5.3.2.5 SO_2 CAIR Reductions May Provide Early Reductions in $PM_{2.5}$

The effects of the SO_2 reductions from implementation of the Clean Air Interstate Rule in 2010 on air quality in the Northern New Jersey/New York/Connecticut nonattainment area were not evaluated as part of the 2009 modeling. As the focus of that modeling was to gauge attainment of the ozone and fine particulate matter standards in 2009, adding SO_2 emission reductions which had not yet occurred, but would appear a year later in 2010, would not be appropriate for the 2009 modeling year. It is anticipated that these additional SO_2 reductions through CAIR will further lower fine particulate levels in 2010, and these reductions may occur sooner.

A substantial amount of technical information was provided by the USEPA when it promulgated the CAIR. Part of this information included an analysis of the contributions from upwind states to downwind states fine particulate levels in the outside air. The USEPA defined the states listed in Table 5.12 as significantly contributing to fine particulate or ozone levels in New Jersey and quantified the contribution that these states were having on the county containing the monitor of concern for the Northern New Jersey/New York/Connecticut nonattainment area in this SIP revision (i.e., New York, New York). Table 5.12 shows the 2003 emissions of SO_2 and additional SO_2 reductions through CAIR implementation in the states identified by the USEPA

[219] USEPA. Technical Support Document for the Final Clean Air Interstate Rule: Air Quality Modeling Analyses, Appendix H: $PM_{2.5}$ Contributions to Each Nonattainment County in 2010. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2005.

as significantly contributing and the modeled contribution that these states were having prior to implementation of CAIR.

Table 5.11: Reductions from CAIR in 2010 in States that Significantly Contribute to Ozone or Fine Particulate Levels in New Jersey and the Modeled Contribution to NYC from those States

State	2003 SO_2 Emissions (thousand tons per year)	2010 SO_2 Emissions (thousand tons per year)	SO_2 Emission Reductions by 2010 (thousand tons per year)	Modeled $PM_{2.5}$ Contribution to NY, NY ($\mu g/m^3$)
New Jersey	51	27	24	0.45
New York	254	66	188	2.00
Pennsylvania	967	235	732	0.95
Delaware	37	28	9	0.09
Maryland	269	62	207	0.22
West Virginia	540	250	290	0.17
Virginia	216	136	80	0.21
Massachusetts	0	0	0	0.12
Ohio	1,176	298	878	0.41
Michigan	351	381	-30*	0.21
District of Columbia	51	27	24	NA (w/ Maryland)
Total	3,912	1,510	2,403	4.83

Source: USEPA at http://www.epa.gov/oar/interstateairquality/where.html
* A negative number indicates an increase

Regional modeling results for 2009, presented in Table 5.3 predicts that the annual $PM_{2.5}$ design value in 2009 at the P.S. 59 monitor (i.e., the design value monitor) will be 15.3 $\mu g/m^3$ after implementation of the first phase of the CAIR for additional NO_x (but not SO_2) controls. The USEPA analysis used a starting concentration without CAIR implementation (i.e., a 2010 Base Case) of 16.29 $\mu g/m^3$ and determined that 4.83 $\mu g/m^3$ of this fine particulate level came from the states that significantly contribute. As the effects of the first phase of the NO_x reductions were already accounted for in the OTC modeling to obtain the predicted concentration of 15.3 $\mu g/m^3$, it would not be appropriate to again account for this effect on air quality. Holding the emissions of NO_x constant, and adjusting for the emission reductions from SO_2 in 2010, a 48 percent additional reduction in the total amount of SO_2 will occur (USEPA estimate) as a result of the first phase of CAIR SO_2 reductions in 2010 in the states significantly contributing to New Jersey's air quality.[220] A 48 percent reduction of the 4.83 $\mu g/m^3$ that these states contributed in 2003 would then also be expected due to the additional SO_2 controls. Using the data presented from the USEPA modeling, an additional 2.31 $\mu g/m^3$ reduction will occur at the P.S. 59 monitor

[220] The 48 percent is determined by (1 minus (1,118 thousand tons of NO_x in 2003 + 1,510 thousand tons of SO_2 predicted to be emitted in 2010) divided by (1,118 thousand tons of NO_x held constant + 3,912 thousand tons of SO_2 emitted in 2003)) times 100 to get percent.

as a result of CAIR SO_2 controls.[221] The predicted concentration in 2010, or earlier, at the P.S. 59 monitor due to the CAIR SO_2 reductions would be 13.0 µg/m^3,[222] well below the weight-of-evidence range of values for the annual $PM_{2.5}$ NAAQS. This estimate of SO_2 reductions provides further assurance that the P.S. 59 monitor will be in attainment by 2010.

5.3.2.6 Additional Measures Not Included in the 2009 BOTW Attainment Modeling

5.3.2.6.1 Introduction

New Jersey is working to propose and implement a number of additional control measures by 2010 that were not included in the attainment demonstration modeling. In addition, some Federal measures are expected to become effective by 2010 that will provide air quality benefits. All these additional measures were the result of the efforts by the USEPA, the OTC, New Jersey's Reasonably Available Control Technology (RACT) analysis, or other New Jersey initiatives to identify measures that would improve air quality.

While there are numerous reasons why certain emission control measures were not included in a modeling scenario, the two most significant are:

- The preparatory work needed to run these models is resource-intensive, making it neither practical nor reasonable to model every possible control measure, and

- The uncertainty in calculating emission reduction benefits from certain types of control measures is acknowledged by the USEPA in its guidance for emerging measures, or measures that are difficult to accurately quantify.[223] Examples of these types of measures include tree planting or replacing roofs with reflective material, both of which help to decrease the high temperatures in an urban area that result from the 'heat island effect' that indirectly impacts ozone and $PM_{2.5}$ concentrations.

Although these additional measures and refinements were finalized too late to be included in the 2009 BOTW modeling, they will provide additional emission reductions by 2009 or by 2010, the attainment year for the annual fine particulate standard. As such, they provide additional evidence to support New Jersey's conclusion that both of its associated nonattainment areas will attain the annual $PM_{2.5}$ standard by their required attainment dates in addition to the continued monitored attainment of the areas. These measures will also bring us closer to attaining New Jersey's goal of a 12 µg/m^3 annual standard and closer to attaining the 2006 24-hour $PM_{2.5}$ standard of 35 µg/m^3.

---

[221] 4.83 µg/m^3 times 48 percent = 2.3 µg/m^3

[222] 15.3 µg/m^3 predicted – 2.3 µg/m^3 reduction from first round SO2 reductions = 13.0 µg/m^3

[223] USEPA. Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP). United States Environmental Protection Agency (USEPA), Office of Air and Radiation, Air Quality Strategies and Standards Division, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2004.

5.3.2.6.2 Additional Measures to Improve Air Quality

Even though it is not yet possible to determine the associated emission reductions from certain types of programs with the precision necessary for full Federal approval and for SIP credit toward attainment of the $PM_{2.5}$ NAAQS, the programs discussed in this section provide a cumulative effect of reducing air emissions, which will help bring New Jersey and its associated nonattainment areas into attainment. For example, some of the measures listed in this section will result in reductions of VOC emissions, and although New Jersey has not identified VOCs as a $PM_{2.5}$ precursor, New Jersey expects that these measures will also result in improved air quality. However, emission reductions of these air pollution control strategies were not included in the scenarios utilized in the modeling analysis, as a quantified benefit is needed for each control measure that is used in photochemical modeling.

New Jersey is aware that the control measures in this section do and will continue to improve the State's overall air quality by indirectly decreasing fine particulate matter concentrations. As such, these strategies will result in actual air quality benefits that will be reflected in the monitoring data in both the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas in the years leading up to 2010. New Jersey promotes and supports these measures, but is not relying upon them to demonstrate attainment.

The control measures and strategies that will further improve air quality can be grouped into 11 categories:

1) <u>Contingency Measures</u>

Contingency measures are additional controls needed to further reduce emissions in the event a nonattainment area fails to attain by its attainment date. These contingency measures must be fully adopted rules or measures that are ready for implementation quickly without further action by the State or the USEPA upon failure to reach attainment. New Jersey contingency measures have been identified and quantified and are discussed in Chapter 6, Chapter 9, and in Appendix C. A more detailed explanation of these control measures is included in Chapter 4.

a) Diesel idling,
b) Municipal Waste Combustors (Incinerators) NO_x rule,
c) Onroad Motor Vehicle Control Programs (Fleet turnover 2010),
d) Nonroad Motor Vehicle Control Programs (Fleet turnover 2010),
e) ICI Boiler Rule 2009 (portion not modeled),
f) NO_x RACT Rule 2006 (portion not modeled)
g) Asphalt Production Plants Rule
h) Controls from EGU Consent Decree (PSE&G Hudson SO_2).
i) Refinery Consent Decrees (Sunoco and Valero)

2) <u>Point Source Related Measures</u>

The NJDEP Air Quality Permitting Program (AQPP) is responsible for permitting and testing stationary sources of air pollution to ensure they do not adversely affect air quality in the State.

Most old sources (those already constructed) and newer facilities are permitted. To accomplish this, the AQPP reviews air pollution control permit applications, evaluates air quality impact and health risks, and ensures stack emissions are measured properly. Some examples of point source related measures that improve air quality that were not included in the 2009 BOTW attainment modeling, but are expected to result in $PM_{2.5}$ benefits, include enhanced controls for glass furnaces and Nonattainment New Source Review (NNSR).

New Jersey proposed amendments to its current glass manufacturing rules at N.J.A.C. 7:27-19.10. The proposed amendments, based on OTC guidance, would revise the NO_x emission rates to reduce emissions consistent with the installation of oxy-fuel firing at the time of the next furnace re-build. Of New Jersey's 25 glass manufacturing furnaces, five are already equipped with oxy-fuel firing and nine are electric. In addition to demonstrated nitrogen reduction at a reasonable cost, oxy-firing may result in reduced $PM_{2.5}$ emissions, lowered energy consumption, and increased glass production.

The Clean Air Act (CAA), 42 U.S.C. § 7503, requires new or modified major sources to install the Lowest Achievable Emission Rate (LAER) control equipment and obtain a one for one emission offsets in order to locate in a nonattainment area. Thus, the NNSR program provides for continual emission reductions to help improve the air quality in the nonattainment area and further downwind.

For more information on the enhanced controls for glass furnaces and NNSR, see Chapter 4.

3) VOC Measures

The State is implementing several VOC control measures that were adopted as discussed in the 2007 8-hour Ozone Attainment Demonstration SIP.[224] Although the USEPA does not consider VOC as a $PM_{2.5}$ precursor for SIP and conformity purposes, New Jersey anticipates some $PM_{2.5}$ benefit from the implementation of these measures. The VOC measures that were not included in the 2009 BOTW attainment modeling, but are still expected to result in a $PM_{2.5}$ benefit, are shown in Table 4.5.

4) Federal Measures

The Federal government plans to implement several measures that will provide emission reductions prior to the summer of 2009. These Federal measures included the Small Offroad Engine Standards rule and a rule for Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder.

The Small Offroad Engine Standards rule[225] was adopted by the USEPA on May 18, 2007 and will set stricter standards for most lawn and garden equipment and small recreational watercraft.

---

[224] NJDEP. State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard: 8-Hour Ozone Attainment Demonstration Proposal. New Jersey Department of Environmental Protection, June 15, 2007.
[225] 72 Fed. Reg. 28098-146 (May 18, 2007).

The USEPA has indicated that states can claim the benefits from its proposed Small Offroad Engine Standards rule for contingency.[226] However, the USEPA has not released official guidance on the credit that states can claim for this proposed rulemaking.

The Locomotive Engines and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder rule,[227] adopted by the USEPA on March 14, 2008, requires more stringent exhaust emission standards for locomotives and marine diesel engines. This rule will result in reduced direct $PM_{2.5}$ and NO_x emissions. As stated in Chapter 4, the standards for remanufactured locomotives will take effect as soon as certified remanufacture systems are available (as early as 2008). Tier 3 standards for newly-built locomotive and marine engines would phase in starting in 2009. Tier 4 standards for newly-built locomotives and marine diesel engines would phase in beginning in 2014 for marine diesel engines and 2015 for locomotives.

All of these actions, while not quantified, will provide continued reductions toward attaining the annual and daily revisions to the $PM_{2.5}$ NAAQS, and added public health and environmental protection to address adverse impacts of $PM_{2.5}$ below the current NAAQS. Detailed discussions of these measures are included in Chapter 4.

5) $PM_{2.5}$ RACT measures

New Jersey conducted a Reasonably Available Control Technology (RACT) analysis which demonstrates that additional reductions of direct $PM_{2.5}$ emissions and its precursors, SO_2 and NO_x are reasonable. New Jersey's $PM_{2.5}$ RACT analysis is discussed in detail in Appendix A7.

6) Voluntary Strategies

The strategies in this category are/will be implemented on a voluntary basis. Companies and organizations commit to various initiatives that reduce fine particulate and the secondary aerosol precursors. Examples of these strategies include: state-level programs for days with high levels of particulate; a Federal campaign that targets reducing raw material usage; reusing waste products, and decreasing waste production; and a tool to help permit writers, enforcement officers, and the regulated community identify and employ pollution prevention methods to reduce or eliminate releases of hazardous materials to the environment.

7) Energy Savings and Alternative Energy Strategies

The strategies in this category are specific to reducing energy consumption and utilizing alternative energy sources. Examples of strategies in this category include New Jersey's Clean Energy Program and USEPA's Green Power Partnership. Energy efficiency measures have a lasting "cumulative" effect on electric demand. The savings in the installation year of an energy efficiency measure continue for the duration of its life. Therefore, the efficiency savings installed one year can be added to the measures included in all of the preceding years within its

[226] Personal email communication from Paul Truchan, USEPA Region 2 to Christine Schell, NJDEP, May 16, 2007.
[227] 73 Fed. Reg. 25097 (May 6, 2008).

life. These energy efficiency and renewable energy programs are designed to lower the growth of electricity demand and avoid emissions associated with such growth.

The United States Department of Energy (USDOE), USEPA, NJDEP, and New Jersey Board of Public Utilities (NJBPU) collaborated on efforts to estimate emission reductions from energy efficiency.[228] The scenarios analyzed by this effort may be utilized in the future to determine SIP credit when the environmental benefits from the Clean Energy Program might be realized with the retirement of NO_x allowances issued for the Clean Energy Program by the NJBPU. The NJDEP may take SIP credit for the environmental benefits of the Clean Energy Program after 2009.

8) High Electrical Demand Day Program (HEDD)

As discussed in Chapter 4, the regional High Electrical Demand Day (HEDD) program will address peak load emissions from the electrical generation sector on a seasonal basis on days when the demand for electricity is high. Therefore, the High Electrical Demand Day program provides reductions only on the days that are categorized with a high electrical demand, not on a daily basis. The High Electrical Demand Day measure is expected to provide significant NO_x emission reductions on the days they are most needed.

In March 2007, following a year long process, six of the OTC states committed to pursue reductions in NO_x emissions from electrical generating units that primarily operate on high electrical demand days (HEDD) starting with the 2009 ozone season.[229] On these high electric demand days, increased power generation is needed, usually on short notice.

As part of the HEDD initiative, New Jersey plans to reduce NO_x emissions by 19.8 tpd on these high electrical demand days starting in 2009. Specifically, power generators in New Jersey will be responsible for securing these reductions and will be required to submit a plan on how they will reduce NO_x. The generators will have flexibility in securing the 2009 to 2015 reductions. New Jersey also plans to require that all HEDD units meet performance standards that reflect modern low NO_x technology by May 1, 2015. This will result in greater reductions on HEDD and throughout the year for NO_x, with co-benefits for $PM_{2.5}$ and SO_2.

9) Mobile Strategies

The strategies in this category focus on reducing vehicle miles traveled and fuel consumption, and increasing the use of alternative fuel sources. Mobile strategies target onroad and nonroad vehicles and equipment. Examples of strategies in this category include Carpool Makes $ense Program (Governor Corzine's Initiative), the USEPA's SmartWay Transport Partnership, and the Northeast Diesel Collaborative.

---

[228] USDOE. Final Report on the Clean Energy/Air Quality Integration Initiative Pilot Project of the U.S. Department of Energy's Mid-Atlantic Regional Office. United States Department of Energy, Office of Energy Efficiency and Renewable Energy, Philadelphia, PA, May 2006.

[229] OTC. Memorandum of Understanding among the States of the Ozone Transport Commission Concerning the Incorporation of High Electrical Demand Day Emission Reduction Strategies into Ozone Attainment State Implementation Planning. Ozone Transport Commission, March 2, 2007.

10) New Jersey Diesel Strategies

The NJDEP has an active Diesel Risk Reduction Program. This effort includes both Federal and State retrofit programs, including the USEPA's Voluntary Diesel Retrofit Program and projects under New Jersey's Diesel Risk Reduction Program. In New Jersey, the Diesel Retrofit Law in 2005 was passed by the Legislature to clean up emissions from certain onroad, diesel-powered motor vehicles and nonroad vehicles/equipment through the use of retrofit emission control technology. The benefits of this law and the subsequent regulations adopted by the NJDEP are a reduction of the harmful diesel exhaust that New Jersey citizens are exposed to every day. The regulations require a variety of vehicles and equipment to install "retrofits" by established deadlines at State expense. The mandatory installation of this technology will decrease emissions of particulate matter by 150 tons per year.[230] Additional information on this effort may be found at http://www.state.nj.us/dep/stopthesoot/retrofit.htm.

In addition to the mandatory diesel retrofit law, the Diesel Risk Reduction Program is involved in voluntary projects that also result in improved air quality. One of these projects includes the reduction of diesel emissions from ports.

With respect to emissions from train engines, New Jersey Transit (NJ Transit) has voluntarily implemented an "Idling Reduction Policy" to shut down their diesel passenger locomotives within one hour of idling when the temperature is above zero degrees. The NJ Transit has also agreed to move forward with a New Jersey Transportation Planning Authority (NJTPA) proposal to install idling reduction technologies and is seeking funding. Benefits from this voluntary action at one train station are estimated to be 1.5 tons per year, based on an 82 percent emissions reduction from implementing this policy.[231] However, New Jersey is not claiming these benefits in this SIP revision.

Additional diesel reductions from trucks may be realized from truck stop electrification projects where trucks are encouraged to turn off their engines and instead use electricity provided. New Jersey is also working on establishing an inspection program for medium duty vehicles with a gross weight between 8,501 – 17,999 pounds. The inspection program will be a combination of on-board diagnostic (OBD) and smoke opacity inspections, and would help control particulate emissions.

Diesel Smoke (I/M Cutpoint) Rule Changes: Like the diesel idling efforts, the NJDEP requirements for the inspection and maintenance (I/M) of diesel vehicles are designed to reduce the emissions from diesel engines, which are significant contributors to ozone, $PM_{2.5}$, and its precursors. The NJDEP proposed amendments on June 16, 2008 to its existing diesel I/M rules to reduce the allowable smoke from heavy-duty diesel vehicles. Smoke opacity, which is used as a surrogate for particulate matter, is the degree to which a plume of smoke will obstruct transmission of visible light. Smoke opacity is used as an indicator for mal-maintenance. The NJDEP expects the benefit of these rule changes to be 13 tpy $PM_{2.5}$ and 29.9 tpy NO_x in the New

[230] 38 N.J.R. 5244(a) (December 18, 2006).

[231] Data are not available to calculate emission benefits from all NJ Transit locomotives but an assumption could be made that an 82 percent reduction in idling is occurring from its 100 locomotives.

Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area and 3 tpy $PM_{2.5}$ and 6.9 tpy NO_x in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area.

New Jersey's diesel initiatives are described further in Chapter 4.

11) Wood Burning Strategies

Several wood burning strategies to lower emissions from the burning of wood have been investigated. In order to provide information on wood burning, New Jersey has developed an informational webpage regarding techniques for proper wood burning, health effects of wood burning, and links to other useful web pages.[232]

This source category is also addressed in the "Smoke Management" section of the proposed Regional Haze SIP (including the agricultural and forestry smoke management, prescribed burning, and agricultural management discussions in that SIP proposal). One particulate control measure has already been implemented, namely to limit air pollution control permits to prevent open burning on days forecast to be of unhealthful air quality. This permit condition requires the permit holder to delay open burning until forecast meteorological conditions and air quality have improved so that forecasted unhealthful conditions for that day will not be made worse by this activity. Similarly, New Jersey is considering a seasonal home wood heating advisory program to further curtail wood smoke emissions, similar to the program adopted in Lane County, Oregon.[233] This program would advise homeowners when they could heat their homes with wood, according to the current air quality. Additionally, New Jersey will propose changes to New Jersey's open burning regulation (N.J.A.C. 7:27-2 et seq.) to limit the types of eligible open burning activities, and to increase fees for the activity; these changes are included in Chapter 4. Other control measures might include wood stove and fireplace change-out programs. Financial incentives would be necessary to ensure a productive program. New Jersey would consider implementing a change-out program in the future if funds become available. New Jersey expects to include additional wood burning strategies in the proposed SIP for the 2006 24-hour $PM_{2.5}$ NAAQS.

5.4 Emission Reduction Credits from Shutdowns and Curtailments

Section IV.C.3 (Emission Reduction Credits from Shutdowns and Curtailments) of Appendix S to 40 C.F.R. pt. 51, states that emissions reductions achieved by shutting down an existing source or curtailing production or operating hours may be credited for offsets if such reductions are surplus, permanent, quantifiable, and federally enforceable and the shutdown or curtailment occurred after the last day of the base year (12/31/2002) for the SIP planning process. Appendix S allows the use of pre-2002 shutdown and curtailment credits of $PM_{2.5}$, and its precursors (SO_2 and NO_x), emissions for offsets, provided the projected emissions inventory used to develop the

[232] NJDEP. Wood Burning in New Jersey. New Jersey Department of Environmental Protection, Bureau of Air Quality Planning. http://www.state.nj.us/dep/baqp/woodburning.html, April 15, 2008.
[233] LRAPA. Public Education: Home Wood Heating Programs. Lane Regional Air Protection Agency (LRAPA). http://www.lrapa.org/public_education/home_wood_heating_programs/, accessed May 14, 2008.

attainment demonstration explicitly includes emissions for offsets from such previously shutdown or curtailed emission units.

The banked emissions from pre-2002 facility or equipment shutdowns were not included in the 2002 modeling inventory. However, as discussed in detail in Appendix C, there is a modeled differential between the modeled design values for 2009 and the $PM_{2.5}$ annual NAAQS of 15.0 $\mu g/m^3$, which has been used to allow banked credits in the future. In this SIP revision, New Jersey has assigned 268 tpy of $PM_{2.5}$, 1,227 tpy of SO_2, and 573 tpy of NO_x from the estimated modeled differential for potential use as emission offset credits from the bank. For more details regarding this assignment, see Appendix B13.

5.5 Results

When added together, all the control measures and refinements discussed in Section 5.3.2.6.2 will result in emission reductions of direct $PM_{2.5}$, NO_x, and SO_2 in the Northern New Jersey/New York/Connecticut nonattainment area and in the Southern New Jersey/Philadelphia nonattainment area.[234] These reductions will occur in addition to those included in the regional modeling and will further reduce the uncertainty associated with the 2009 modeled design values and supports New Jersey's demonstration of attainment of the $PM_{2.5}$ NAAQS in its two multi-state nonattainment areas.

The regional modeling assessment discussed in Section 5.2 demonstrates that the New Jersey-associated nonattainment areas have attained the $PM_{2.5}$ NAAQS by their designated attainment date. New Jersey is not directly relying on these additional measures to demonstrate attainment of the annual $PM_{2.5}$ NAAQS. These measures will help attain the new 24-hour $PM_{2.5}$ NAAQS and the New Jersey annual goal of 12 $\mu g/m^3$. These control measures and refinements are not being considered as "bundled measures" for this SIP revision.[235] Rather, this evaluation of emission reductions expected from these additional control measures and refinements provides further confidence that New Jersey will attain the $PM_{2.5}$ standard by 2010, and gives the State an abundance of additional emission reductions to rely upon in the event of exceedance. The benefits of these measures and refinements will be reflected in the ambient air monitors. These measures are discussed further as part of the State's contingency measure strategy for attainment in Chapter 6.

---

[234] These are approximate emission reduction totals as the additional control measures and refinements to be proposed and adopted by May 2008, in accordance with New Jersey Administrative Procedures Act (N.J.S.A. 52:14B-1 et. seq.) and the Air Pollution Control Act (N.J.S.A. 26:2C-1 et. seq.).

[235] USEPA. Incorporating Bundled Measures in a State Implementation Plan (SIP). United States Environmental Protection Agency (USEPA), Office of Air and Radiation, Air Quality Strategies and Standards Division, Office of Air Quality Planning and Standards, and Office of Transportation and Air Quality, Transportation and Regional Programs Division, Research Triangle Park, NC, August 2005.

5.6 Unmonitored Area Analysis

The USEPA's modeling guidance[236] requires an unmonitored area analysis:

> "The unmonitored area analysis for a particular nonattainment area is intended to address potential problems within or near that nonattainment area. The analysis should include, at a minimum, all nonattainment counties and counties surrounding the nonattainment area (located within the State)."[237]

The USEPA has developed a software package called "Modeled Attainment Test Software" (MATS)[238] which will spatially interpolate data, adjust the spatial fields based on model output gradients and multiply the fields by model calculated RRFs. The MATS software for $PM_{2.5}$ was not available at the time of SIP development. Therefore, New Jersey performed its own unmonitored area analysis and was unable to verify the results of this analysis using the MATS software.

Thirteen New Jersey counties are designated as nonattainment of the annual $PM_{2.5}$ standard. Ten of those counties are associated with the Northern New Jersey/New York/Connecticut nonattainment area and three with the Southern New Jersey/Philadelphia nonattainment area. New Jersey's monitoring program and the use of the modeling results from a 9-cell average provide adequate coverage of the State to determine attainment of the fine particulate standard. All modeling grid cells containing a monitor and the eight (8) adjoining grid cells were analyzed in New Jersey's attainment demonstrations to get a nine cell average of grid cells. By using this technique, a large area of the State is included in the analysis and is represented by the monitoring program. Therefore, New Jersey does not have any areas that would be considered unmonitored. Figure 5.3 shows the coverage that is afforded by the current NJDEP monitoring network and the surrounding grid cells included in the modeling analysis. Note, on this map, areas covered solely by New Jersey's monitoring stations are colored in orange (in black & white - lightly shaded) and areas covered by either New Jersey's monitoring stations or by those in another bordering state are shaded in red (in black & white - darker shaded).

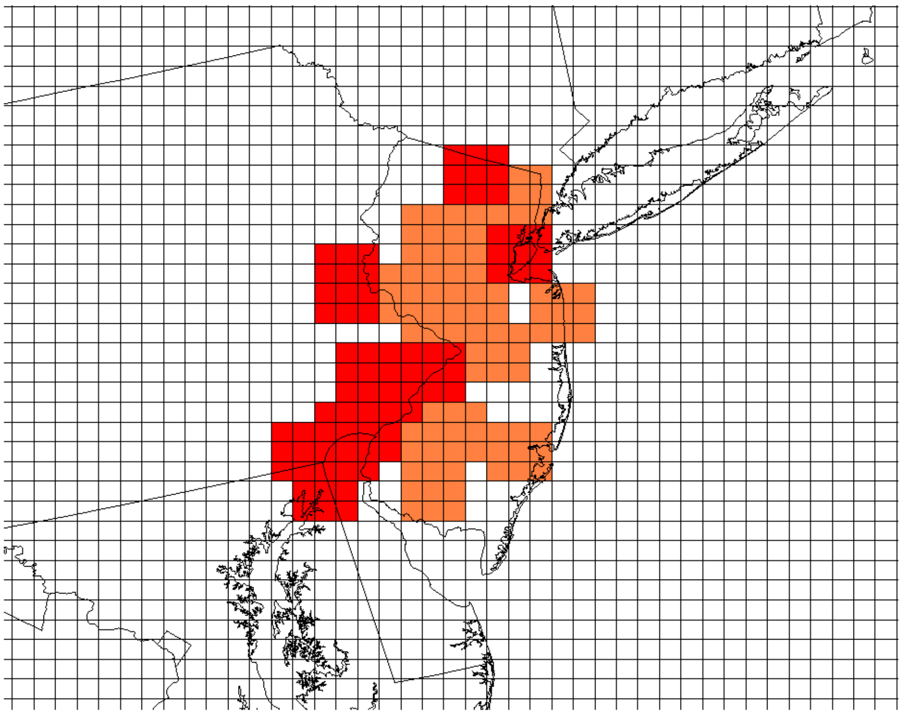
---

[236] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.

[237] USEPA. Guidance on the Use of Models and Other Related Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/R-05-002, October 2005.

[238] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007.

<u>Figure 5.3</u>: Map of Grid Cells Used in Photochemical Modeling Associated With New Jersey Fine Particulate Matter Monitors



<u>Legend</u>

*Orange (in black & white - lightly shaded): Areas covered solely by New Jersey's monitoring stations.

*Red (in black & white - darker shaded): Areas covered by either New Jersey's monitoring stations or by those in another bordering State.

5.7 Conclusions

The current air quality data (2006) demonstrates that the New Jersey monitors are currently in attainment of the annual $PM_{2.5}$ NAAQS. With the exception of the Union City monitor, the design values at all New Jersey monitors are in attainment of the annual $PM_{2.5}$ NAAQS, and are below the weight-of-evidence range of values (14.5 $\mu g/m^3$ through 15.5 $\mu g/m^3$. The regional air quality modeling demonstrates the two multi-state nonattainment areas which include New Jersey will be in attainment of the annual $PM_{2.5}$ NAAQS by 2009. The only site with a projected 2009 design value greater than the annual fine particulate standard of 15.0 $\mu g/m^3$ is the P.S. 59 site located in Manhattan, New York City. All other sites are below the annual fine particulate standard and lower bound of the weight-of-evidence range. The projected 2009 value for the P.S. 59 site is within the weight-of-evidence range of values defined in the $PM_{2.5}$ modeling guidance as 14.5 $\mu g/m^3$ through 15.5 $\mu g/m^3$.[239]

[239] USEPA. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. United States Environmental Protection Agency, Office of Air Quality

Additional air quality benefits associated with the control measures not included in the modeling reduces the uncertainty of the demonstration and thus supports New Jersey's demonstration of attainment of the $PM_{2.5}$ standard by 2010 in the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas. Additional support for this conclusion includes those additional measures being implemented in New York City to provide emission reductions. All areas of the two nonattainment areas are expected to be in attainment by April 5, 2010.

The 2006 design value data show that more emission reductions are necessary to attain the State's internal goal for annual $PM_{2.5}$ of 12 $\mu g/m^3$ and to meet the 2006 24-hour $PM_{2.5}$ NAAQS. Only four of the 13 New Jersey monitors in the Northern New Jersey/New York/ Connecticut nonattainment area are currently below the annual $PM_{2.5}$ goal of 12 $\mu g/m^3$ and only eight of the 13 New Jersey monitors in the Northern New Jersey/New York/ Connecticut nonattainment area are above the 2006 24-hour $PM_{2.5}$ NAAQS.

Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/B-07-002, April 2007, page 105.

6.0 CONTINGENCY MEASURES

6.1 Background

42 U.S.C. § 7502(c)(9) of the Clean Air Act (Section 172(c)(9)) and the United States Environmental Protection Agency's (USEPA's) final fine particulate matter ($PM_{2.5}$) implementation rule[240] require that the State Implementation Plans (SIPs) for all $PM_{2.5}$ nonattainment areas include contingency measures. Contingency measures are additional controls needed to further reduce emissions in the event an area fails to meet a Reasonable Further Progress (RFP)[241] milestone or fails to attain by its attainment date. These contingency measures must be fully adopted rules or measures that are ready for implementation quickly without further action by the State or the USEPA upon failure to meet an RFP milestone or reach attainment. The USEPA does not require a separate RFP submittal for areas with 2010 attainment dates and a demonstration that shows attainment (72 Fed. Reg. 20633 (April 25, 2007)). Thus, New Jersey does not need to submit a separate contingency plan related to RFP due to its submittal of an attainment demonstration that satisfies the 2010 deadline. There are separate RFP requirements for those nonattainment areas with attainment dates beyond 2010. The $PM_{2.5}$ attainment milestone for New Jersey's associated annual $PM_{2.5}$ nonattainment areas is defined as 2009 (to achieve reductions by the April 2010 attainment goal). Therefore, no RFP and no RFP contingency is required for this standard. Contingency measures must provide for one year of reductions needed for RFP, based on the overall level of reductions needed to demonstrate attainment divided by the number of years from the 2002 base year to the attainment year.[242] There is no percent reduction associated with the RFP requirement for $PM_{2.5}$ as there is with the Rate of Progress (ROP) requirement under Subpart 2 for ozone.[243] Federal or local measures that are adopted and/or implemented prior to the milestone year and provide emission reductions in excess of those needed to meet an RFP or attainment milestone may be used as contingency measures.[244] The USEPA's guidance encourages this early implementation of contingency measures and relying on measures already implemented or under development.[245]

The remainder of this chapter:

- discusses the contingency targets (needed total emission reductions) associated with attainment of the 1997 annual $PM_{2.5}$ NAAQS;
- lists contingency measures associated with attainment of the 1997 annual $PM_{2.5}$ NAAQS; and
- demonstrates that the reductions expected from the contingency measures listed meet the attainment contingency requirement.

---

[240] 72 Fed. Reg. 20586-667 (April 25, 2007).
[241] In general, the USEPA uses the term Reasonable Further Progress (RFP) as the more generic progress requirement under Subpart 1, whereas it uses the term rate of progress (ROP) to denote the specific Subpart 2 (ozone specific) progress requirements that are defined as specific percent reductions from a baseline emissions inventory.
[242] 72 Fed. Reg. 20643 (April 25, 2007).
[243] USEPA Memorandum from Lydia N. Wegman and Peter Tsirigotis to Regional Air Division Directors, "2002 Base Year Emission Inventory SIP Planning: 8-hr Ozone, $PM_{2.5}$, and Regional Haze Programs," November 18, 2002.
[244] 72 Fed. Reg. 20642 (April 25, 2007).
[245] 72 Fed. Reg. 20642-43 (April 25, 2007).

The measures included here as contingency measures are described in detail in Chapter 4. The calculation methodologies used to quantify these measures are included in Appendix C.

6.2 Contingency Measures for the Attainment Demonstration

As discussed above, the Clean Air Act requires New Jersey to identify contingency measures to be implemented in the event that the State does not attain the 1997 annual $PM_{2.5}$ standard by 2010. Attainment of this standard is determined based upon the 2009 annual $PM_{2.5}$ design values from the air quality monitors. Table 6.1 shows the contingency measure calculations for attainment on April 5, 2010, as well as the contingency measures and their associated emission reductions, for both the New Jersey portions of its $PM_{2.5}$ multi-state nonattainment areas. Contingency measures need to achieve the one year of RFP emission reductions for direct $PM_{2.5}$ and its precursors (oxides of nitrogen (NO_x), and sulfur dioxide (SO_2)). This amount was calculated using the 2002 adjusted baseline inventory from Version 3 of the modeling inventory and the projected 2009 modeling inventory (refer to Chapter 5 for additional information on the emission inventories used for this SIP revision). Following the USEPA guidance outlined in Section 6.1, the State has estimated the contingency requirement to be 15,993 tons per year (tpy) of direct $PM_{2.5}$, NO_x, and SO_2 in the New Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area and 3,489 tpy of direct $PM_{2.5}$, NO_x, and SO_2 in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area.

New Jersey has identified eight control measures not included in the regional attainment demonstration modeling for the 1997 annual $PM_{2.5}$ NAAQS to fulfill the contingency requirement should either of the nonattainment areas associated with New Jersey fail to demonstrate attainment by 2010. In addition, New Jersey has identified one control measure included in the regional attainment demonstration modeling for the 1997 annual $PM_{2.5}$ NAAQS to fulfill the contingency requirement for the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area. The contingency requirements for the New Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area are satisfied through the eight measures not included in the regional attainment demonstration modeling. The refinery consent decrees for Sunoco, Valero, and ConocoPhillips were included in the attainment demonstration photochemical modeling for $PM_{2.5}$. As discussed in detail in Appendix C, there is a "modeled differential" between the modeled design values for 2009 and the $PM_{2.5}$ annual NAAQS of 15.0 $\mu g/m^3$. For the purposes of satisfying the contingency requirements, New Jersey is allocating 738 tpy of the emission reductions provided by the refinery consent decrees in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area from the modeling differential.

The attainment demonstration discussed in Chapter 5 projects both nonattainment areas associated with New Jersey to attain by 2010. If both areas reach attainment based upon the ambient air quality data from 2007-2009, the measures identified for New Jersey's contingency plan will still be implemented and will provide additional air quality benefits beyond the benefits projected by the annual $PM_{2.5}$ attainment demonstration modeling. The State and Federal contingency measures are:

1) Diesel idling,

2) Municipal Waste Combustors (Incinerators) NO_x Rule,
3) Onroad Motor Vehicle Control Programs (Fleet turnover 2010),
4) Nonroad Motor Vehicle Control Programs (Fleet turnover 2010),
5) Industrial/Commercial/Institutional (ICI) Boiler Rule 2009 (portion not modeled),
6) NO_x RACT Rule 2006 (portion not modeled),
7) Asphalt production plants rule, and
8) Controls from EGU Consent Decrees (Hudson SO_2), and
9) Refinery Consent Decrees (Sunoco and Valero).

Table 6.1
$PM_{2.5}$ Attainment Contingency Measures for 2009
New Jersey Portion of the Northern New Jersey/New York/Connecticut Nonattainment Area (tons per year)

	Direct $PM_{2.5}$	NO_x	SO_2	TOTAL
1. Calculations for the Contingency Requirement				
2002 Baseline Modeling Emissions Inventory (tpy)	15,797	198,518	52,889	267,205
2009 Predicted Modeling Emissions Inventory (tpy)	14,752	113,690	26,811	155,254
Difference Between 2009-2002 Emission Inventories (tpy)	1,045	84,828	26,078	111,951
Contingency Requirement (1/7) (tpy)	149	12,118	3,725	15,993
2. New Jersey Contingency Measures (tpy)				
Diesel Idling Rule Changes	4	218		222
Municipal Waste Combustors (Incinerators) NO_x Rule		0		0
Onroad Fleet Turnover (2010)	51	5,613		5,664
Nonroad Fleet Turnover (2010)	34	1,065	185	1,284
ICI Boiler Rule 2009 (portion not modeled)		681		681
NO_x RACT Rule 2006 (portion not modeled)		548		548
Asphalt Production Plants Rule		50		50
Controls from EGU Consent Decrees (PSEG Hudson SO_2)			51,124	51,124
Total Reductions Available for Contingency by Pollutant (tpy)	89	8,175	51,309	**59,573**

A. Total Reductions from New Jersey's Contingency Measures (tpy)	59,573
B. Total Emissions Target for the Contingency Requirement (tpy)	15,993
C. Difference (A-B)	43,580
Requirement Met?	**YES**

Table 6.2
$PM_{2.5}$ Attainment Contingency Measures for 2009
New Jersey Portion of the Southern New Jersey/Philadelphia Nonattainment Area
(tons per year)

	Direct $PM_{2.5}$	NO_x	SO_2	TOTAL
1. Calculations for the Contingency Requirement				
2002 Baseline Modeling Emissions Inventory (tpy)	4,485	48,409	12,506	65,400
2009 Predicted Modeling Emissions Inventory (tpy)	4,336	30,928	5,712	40,976
Difference Between 2009-2002 Emission Inventories (tpy)	149	17,481	6,794	24,424
Contingency Requirement (1/7) (tpy)	21	2,497	971	3,489
2. New Jersey Contingency Measures (tpy)				
Diesel Idling Rule Changes	2	112		114
Municipal Waste Combustor (Incinerators) NO_x Rule		309		309
Onroad Fleet Turnover (2010)	25	1,808		1,833
Nonroad Fleet Turnover (2010)	7	166	32	205
ICI Boiler Rule 2009 (portion not modeled)		193		193
NO_x RACT Rule 2006 (portion not modeled)		82		82
Asphalt Production Plants Rule		15		15
Refinery Consent Decrees (Sunoco and Valero)			738	738
Total Reductions Available for Contingency by Pollutant (tpy)	34	2,685	770	**3,489**

A. Total Reductions from New Jersey's Contingency Measures (tpy)	3,489
B. Total Emissions Target for the Contingency Requirement (tpy)	3,489
C. Difference (A-B) (tpy)	0
Requirement Met?	**YES**

New Jersey is meeting its contingency requirement in the Northern New Jersey/New York/Connecticut and Southern New Jersey/Philadelphia nonattainment areas with the control measures and emission benefits shown in Tables 6.1 and 6.2, respectively.

6.3 Contingency Measure Implementation Schedule

The required implementation schedule of contingency measures, should the USEPA make a finding of failure to attain the $PM_{2.5}$ NAAQS, is one year. The earliest that contingency reductions would need to be in place would be September 2010. The measures in Tables 6.1 and 6.2 will achieve even greater emission reductions than demonstrated, due to additional requirements within the rules that phase-in after 2009 that will achieve additional benefits.

The status of the control measures identified for contingency is included in Table 9.1. The dates provided in Table 9.1 indicate that all of the measures will be implemented in time for contingency if failure to meet the attainment date occurs. By following the USEPA's guidance that encourages early implementation of contingency measures and relying on measures already implemented or under development,[246] New Jersey is ensuring that no additional contingency measures will need to be developed and implemented beyond those identified, and is safeguarding itself against failure to attain. Since the contingency measures relied upon in this SIP revision will be implemented by the specified dates, which are before the time when the contingency measures would be required, there is no need for a trigger mechanism if the attainment goal is not reached.

Since New Jersey relied upon its attainment demonstration to satisfy RFP, New Jersey would need to modify its attainment demonstration so that it meets the standard if New Jersey does not achieve attainment, thereby also satisfying the RFP requirements.[247]

6.4 Conclusions

New Jersey has demonstrated that it met its contingency requirements for attainment. It is possible that the emission benefits estimated for New Jersey's rule proposals may be amended in response to comments. If this does occur, there are sufficient modeling differential and associated control measures as shown in this SIP revision to satisfy contingency requirements and requirements for attainment of the 1997 annual $PM_{2.5}$ NAAQS. In addition, recent preliminary monitoring results indicate that the monitors are currently in compliance with the NAAQS of 15.0 $\mu g/m^3$ in the regional Southern New Jersey/Philadelphia nonattainment area and in the New Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area. Therefore, the data indicates that the contingency measures will not be necessary to show attainment of the NAAQS of 15.0 $\mu g/m^3$.

---

[246] 72 Fed. Reg. 20642-43 (April 25, 2007).
[247] 72 Fed. Reg. 20633 (April 25, 2007).

7.0 TRANSPORTATION CONFORMITY

7.1 Introduction

The Clean Air Act[248] requires that Federal actions conform to a State's State Implementation Plan (SIP). Specifically the Clean Air Act requires the action/activity will not:

- Cause or contribute to any new violation of any National Ambient Air Quality Standard (NAAQS) in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or,
- Delay timely attainment of any NAAQS or any required interim emission reductions or any other milestones in any area.

To implement this requirement, the Clean Air Act directed[249] the United States Environmental Protection Agency (USEPA) to issue rules that governed how conformity determinations would be conducted for two categories of actions/activities: 1) those dealing with transportation plans, programs and projects (Transportation Conformity), and 2) all other actions, e.g., projects requiring Federal permits. This latter category is referred to as General Conformity.

The Federal Transportation Conformity Rule (40 C.F.R. § 93.100-129) provides the process by which the air quality impact of transportation plans, transportation improvement programs, and projects are analyzed. The agency preparing transportation plans (projections of twenty or more years), transportation improvement programs (projections of at least four years), or approving a transportation project must analyze the emissions expected from such a proposal in accordance with the Transportation Conformity Rule.[250]

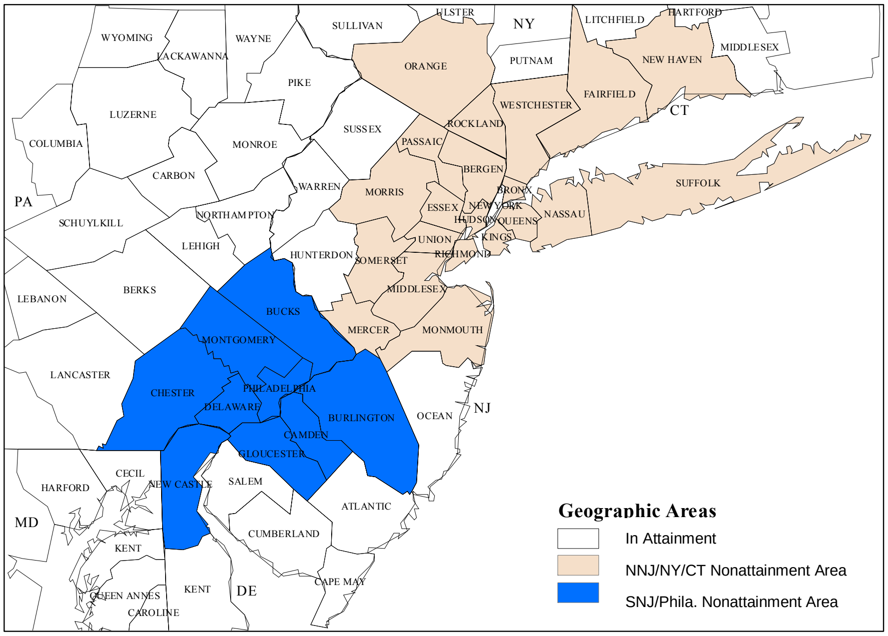
For the purposes of transportation conformity, the emission budget is essentially a cap on the total emissions allocated to onroad vehicles. The projected regional emissions calculated based on a transportation plan, transportation improvement program, or project, may not exceed the motor vehicle emissions budget or cap contained in the appropriate SIP. Emissions in years for which no motor vehicle emissions budgets are specifically established must be less than or equal to the motor vehicle emissions budget established for the most recent prior year.

Emission budgets in New Jersey are established by nonattainment area and Metropolitan Planning Organization boundary. New Jersey is part of two nonattainment areas as shown in Figure 7.1: ten counties in Northern New Jersey associated with New York City and three counties in Southern New Jersey associated with Philadelphia.

---

[248] 42 U.S.C. § 7506.
[249] 42 U.S.C. § 7506.
[250] For New Jersey, such plans are prepared by three Metropolitan Planning Organizations (North Jersey Transportation Planning Authority, South Jersey Transportation Planning Organization, and Delaware Valley Regional Planning Commission).

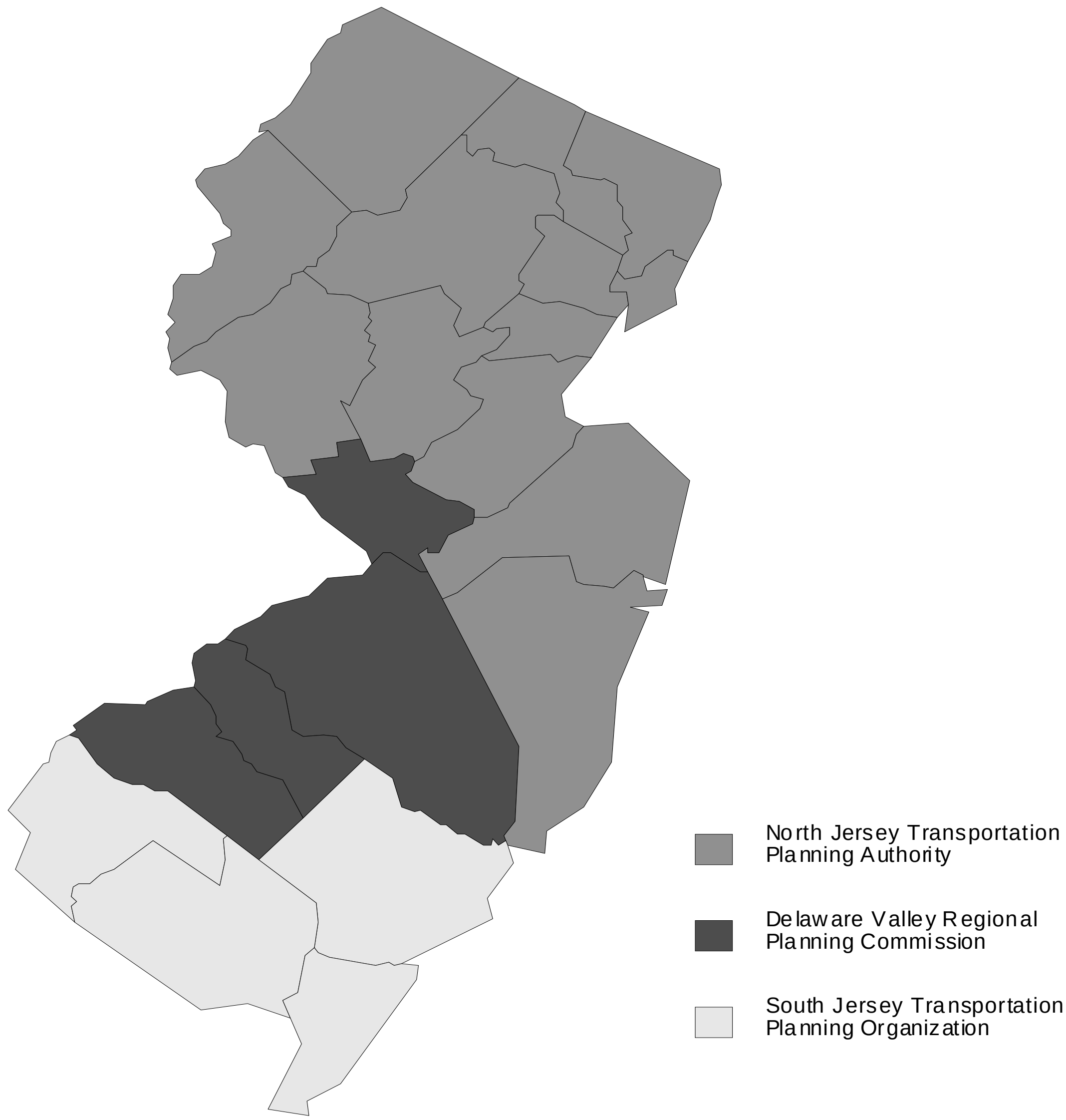
Figure 7.1: USEPA Designations of Nonattainment Areas for the $PM_{2.5}$ National Ambient Air Quality Standard



There are three Metropolitan Planning Organizations (MPOs) in New Jersey that cover the geographic areas shown in Figure 7.2. These are the North Jersey Transportation Planning Authority (NJTPA), the Delaware Valley Regional Planning Commission (DVRPC), and the South Jersey Transportation Planning Organization. Each MPO is responsible for the transportation plans and transportation improvement programs for its designated area. The MPOs each work in consultation with the Federal Highway Administration, the New Jersey Department of Transportation (NJDOT), the USEPA, and the New Jersey Department of Environmental Protection (NJDEP) to remain at or under established transportation emission budgets for their area. Transportation conformity budgets for $PM_{2.5}$ are developed for each MPO by adding the onroad emissions from individual counties within each MPO planning area located within the New Jersey portions of the $PM_{2.5}$ nonattainment areas. This results in the formation of the following three areas for budget development:

- Nine counties located in the NJTPA MPO planning area and the New Jersey portion of the Northern New Jersey/New York/Connecticut (NNJ/NY/CT) $PM_{2.5}$ nonattainment area (Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties),
- Mercer County located in the DVRPC MPO geographic area and the Northern New Jersey/New York/Connecticut nonattainment area, and
- Three counties included in the DVRPC MPO geographic area and the New Jersey portion of the Southern New Jersey/Philadelphia (SNJ/Phila.) $PM_{2.5}$ nonattainment area (Burlington, Camden, and Gloucester Counties).

Figure 7.2: Metropolitan Planning Organizations in New Jersey



The South Jersey Transportation Planning Organization does not have to perform transportation conformity for $PM_{2.5}$ because the counties within their planning area are in attainment of the $PM_{2.5}$ annual NAAQS.

7.2 Transportation Conformity for $PM_{2.5}$

7.2.1 Interim Tests to be used Prior to the Establishment of Budgets

The Transportation Conformity Rules that established the criteria and procedures relating to Transportation Conformity for $PM_{2.5}$ were promulgated by the USEPA on July 1, 2004.[251] Transportation Conformity for $PM_{2.5}$ became effective on April 5, 2006; the effective date is based on a one-year grace period from the effective date of designations, April 5, 2005.

Before a SIP budget is available, either through an adequacy finding or approval by the USEPA, conformity of the transportation plan, transportation improvement program, or project not from a conforming plan is demonstrated with the interim emissions tests.[252] The interim emissions tests for $PM_{2.5}$ are either the baseline year test or the build/no-greater-than-no-build test. The baseline year test is passed when the emissions from the proposed transportation system are either less than or no greater than the baseline year (2002) motor vehicle emissions in a given nonattainment area. With the build/no-greater-than-no-build test conformity is demonstrated if emissions from the proposed transportation system ("build" or "action" scenario) are less than or equal to the emissions in the same future analysis year from the existing transportation system ("no-build" or "baseline" scenario). The MPOs performing planning in $PM_{2.5}$ nonattainment areas were required to utilize either the baseline year test or the build/no-greater-than-no-build test until emission budgets are approved or found adequate by the USEPA. Currently, the NJTPA and the DVRPC are using early budgets that have been approved by the USEPA for the counties in the Northern New Jersey/New York/Connecticut nonattainment area. The DVRPC is currently using interim tests for the counties in the Southern New Jersey/Philadelphia nonattainment area.

7.2.2 $PM_{2.5}$ Precursors

For transportation conformity, four $PM_{2.5}$ precursors – oxides of nitrogen (NO_x), volatile organic compounds (VOCs), sulfur dioxide (SO_2), and ammonia (NH_3) – are considered in the conformity process in $PM_{2.5}$ nonattainment areas,[253] pursuant to the following USEPA requirements:

- Regional emissions analysis must include NO_x as a $PM_{2.5}$ precursor in all $PM_{2.5}$ nonattainment areas, unless the head of the state air agency and the USEPA Regional Administrator make a finding that NO_x is not a significant contributor to the $PM_{2.5}$ air quality problem in a given area.

[251] 69 Fed. Reg. 40004-81 (July 1, 2004).
[252] 40 C.F.R. § 93.119.
[253] 70 Fed. Reg. 24280-92 (May 6, 2005).

- Regional emissions analyses are not required for VOC, SO_2, or NH_3 before an approved SIP budget for such precursors is established, unless the head of the state air agency or the USEPA Regional Administrator makes a finding that onroad emissions of any of these precursors is a significant contributor.

The following criteria are considered in making significance or insignificance findings for $PM_{2.5}$ precursors:

- The contribution of onroad emissions of the precursor to the total 2002 baseline SIP inventory;
- The current state of air quality for the area;
- The results of speciation monitoring for the area;
- The likelihood that future motor vehicle control measures will be implemented for a given precursor; and,
- Projections of future onroad emissions of the precursor.

After reviewing the USEPA requirements and the criteria regarding significance, the New Jersey transportation conformity budgets for $PM_{2.5}$ precursors will only include the establishment of an annual NO_x budget for the two $PM_{2.5}$ nonattainment areas addressed by this attainment demonstration SIP revision.

7.2.3 Road Dust and Construction Related Fugitive Dust

The Federal Transportation Conformity Rule specifies that re-entrained road dust is to be included as a component of direct $PM_{2.5}$ for transportation conformity regional emissions analysis only if the USEPA Regional Administrator or the director of the State air agency has made a finding that emissions from re-entrained road dust within the area are a significant contributor to the $PM_{2.5}$ nonattainment problem and has so notified the MPO and NJDOT.[254] Also, for $PM_{2.5}$ areas in which the implementation plan does not identify construction-related fugitive $PM_{2.5}$ as a significant contributor to the nonattainment problem, the fugitive $PM_{2.5}$ emissions associated with highway and transit project construction are not required to be considered in the regional emissions analysis.[255]

The USEPA has indicated that a finding of significance for re-entrained road dust would be based on a case-by-case review of the following factors: the contribution of road dust to current and future $PM_{2.5}$ nonattainment; an area's current design value for the $PM_{2.5}$ standard; whether control of road dust appears necessary to reach attainment; and whether increases in re-entrained dust emissions may interfere with attainment. Such a review would include consideration of local air quality data and/or air quality or emissions modeling results.[256]

---

[254] 40 C.F.R. § 93.119(f)(8).
[255] 40 C.F.R. § 93.122(f)(1).
[256] 69 Fed. Reg. 40033 (July 1, 2004).

Findings of significance have not been made for either re-entrained road dust or construction-related fugitive dust for the New Jersey portions of the Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas. As described in Chapter 2, a number of source apportionment studies have concluded that the primary components of the $PM_{2.5}$ mass measured in New Jersey monitors are: secondary sulfate from large-coal fired power plants located primarily in other states, automotive emissions and biomass burning. Re-entrained road dust and fugitive dust from road construction projects would be monitored as a component of soil material. Soil material makes up a relatively small percentage of the $PM_{2.5}$ mass measured in New Jersey monitors.[257] Therefore, neither re-entrained road dust emissions or fugitive dust emissions from highway and transit project construction have been included in the $PM_{2.5}$ transportation conformity budgets.

7.2.4 Early Budgets for $PM_{2.5}$

In a 2006 SIP revision[258] (referred to hereafter as the "2006 SIP Revision"), New Jersey established early $PM_{2.5}$ transportation conformity emission budgets including documentation of the justification for the early budgets. Early budgets were established for directly emitted fine particulate matter (direct $PM_{2.5}$) and annual NO_x (a $PM_{2.5}$ precursor) for the New Jersey portion of the Northern New Jersey/New York/Connecticut nonattainment area. This nonattainment area includes one county in the DVRPC MPO planning area (Mercer County), with the other nine counties in the NJTPA MPO planning area. These early budgets for New Jersey were approved by the USEPA on July 10, 2006.[259] Once approved by the USEPA, these early budgets became the existing attainment budgets that must be used for transportation conformity determinations made by the NJTPA and the DVRPC.

In the recent 8-hour ozone attainment demonstration SIP, the Division of Air Quality (DAQ) updated the planning assumptions that were used in the transportation conformity analyses. The distribution of vehicle miles traveled (VMT) between vehicle types was updated to reflect a greater fraction of the total VMT attributed to the heaviest class of diesel trucks (trucks greater than 60,000 lbs. Gross Vehicle Weight Rating). When the updated VMT/vehicle type mix is used, the predicted emissions of direct $PM_{2.5}$ and annual NO_x increase. The higher predictions result in values that are significantly higher than the existing budgets.

The amount of the budget exceedance for Mercer County was much greater than the emission reductions that could be achieved by changes to transportation projects by 2009. Therefore, an update to the existing budget for Mercer County was proposed on December 17, 2007 as a SIP

[257] Hopke, P. K. and Kim, E. Application of Advanced Factor Analysis Modeling to Apportion $PM_{2.5}$ in New Jersey. Center for Air Resources Engineering and Science, Clarkson University, March 2005.
[258] NJDEP. State Implementation Plan (SIP) Revisions for the Attainment and Maintenance of the 8-Hour Carbon Monoxide National Ambient Air Quality Standard, 1-Hour Ozone National Ambient Air Quality Standard, and Fine Particulate Matter National Ambient Air Quality Standard; and the 2002 Periodic Emission Inventory. New Jersey Department of Environmental Protection, May 2006.
[259] 71 Fed. Reg. 38770-72 (July 10, 2006).

revision.[260] This SIP revision was approved by the USEPA, effective June 5, 2008.[261] This will enable the DVRPC MPO to meet its transportation conformity requirements when it conducts its regional analysis this spring. Updates to the existing budget established for the NJTPA MPO are provided in Section 7.3.

7.3 Budgets for Attainment of the Annual $PM_{2.5}$ NAAQS

The existing and updated attainment transportation conformity emission budgets for directly emitted fine particulate matter (direct $PM_{2.5}$) and annual NO_x (a $PM_{2.5}$ precursor), by MPO planning area for the New Jersey portions of the Northern New Jersey/New York/Connecticut and the Southern New Jersey/Philadelphia nonattainment areas, are provided in Table 7.1. The attainment budgets are based on the latest planning assumptions, including those for vehicle age distribution, VMT by vehicle type fraction, diesel sulfur level (43 ppm),[262] and the 2009 projected vehicle activity data.

Each MPO used their Travel Demand Models (TDM) to estimate the 2009 projected vehicle activity data. Both MPOs used the monthly approach outlined in the USEPA guidance[263] to calculate annual average emissions. This approach involves twelve sets of MOBILE6.2 modeling runs using monthly average input conditions. The 12 months of results were then averaged together to compute the annual emissions used to estimate the attainment budgets.

Once approved by the USEPA, the attainment budgets must be used for future transportation conformity determinations by the NJTPA and the DVRPC. Computer files that document the calculation of the attainment budgets are provided in Appendix D.

---

[260] NJDEP. Proposed State Implementation Plan Revision For Attainment of the Fine Particulate Matter National Ambient Air Quality Standard, Update of Early Transportation Conformity Budgets for Mercer County. New Jersey Department of Environmental Protection, December 17, 2007.
[261] 73 Fed. Reg. 24868 (May 6, 2008).
[262] USEPA. Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation. United States Environmental Protection Agency, EPA420-R-04-013, Section 5.5.3, page 64, August 2004.
[263] USEPA. Guidance for Creating Annual On-Road Mobile Source Emission Inventories for $PM_{2.5}$ Nonattainment Areas for Use in SIPs and Conformity. United States Environmental Protection Agency, EPA420-B-05-008, page 7, August 2005.

Table 7.1: Existing and Updated Transportation Conformity Emission Budgets for $PM_{2.5}$ Attainment

	Direct $PM_{2.5}$ Emissions[(a)] (tons per year)		NO_x Emissions (tons per year)	
Type of Budget	**Existing**	**Updated**	**Existing**	**Updated**
NJTPA and NNJ/NY/CT Nonattainment Area[(b)]	**1,207**	**842**	**61,676**	**44,321**
DVRPC and NNJ/NY/CT Nonattainment Area[(c)]	**105**	**105**	**5,323**	**5,323**
DVRPC and SNJ/Phila. Nonattainment Area[(d)]	**No Existing Budget**	**341**	**No Existing Budget**	**17,319**

Notes: (a) Direct $PM_{2.5}$ consists of the sum of: SO_4, organic carbon, elemental carbon, particulate matter from gasoline vehicles, lead, brake particles, and tire particles.
(b) This area consists of Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset and Union Counties (New Jersey portion of the NNJ/NY/CT nonattainment area also located in the NJTPA planning area).
(c) This area consists of Mercer County.
(d) This area consists of Burlington, Camden and Gloucester Counties (New Jersey portion of the SNJ/Phila. nonattainment area).

Table 7.1 indicates that the updated attainment budgets for direct $PM_{2.5}$ and NO_x for NJTPA are 365 and 17,355 tons per year less, respectively, than the early budgets set forth in the 2006 SIP Revision. These new attainment budgets incorporate the latest planning assumptions, including recent updates to the NJTPA TDM. The update of the TDM results in reductions in emission predictions that more than compensated for the increases from the update to the VMT by vehicle type fractions.

The Mercer County budget was proposed on December 17, 2007 in a separate Transportation Conformity SIP and proposed for approval by the USEPA on May 6, 2008, as discussed in Section 7.2.4. Thus, the updated budget in Table 7.1 is the same as the budget that was proposed in December 2007 in the Transportation Conformity SIP. Regarding the updated budget established for the DVRPC MPO for its three counties included in the New Jersey portion of the Southern New Jersey/Philadelphia nonattainment area, this represents the first time that a $PM_{2.5}$ budget has been established for these counties.

8.0 SECTION 110 INFRASTRUCTURE REQUIREMENTS

8.1 Introduction and Background

42 U.S.C. § 7410(a)(1) and (2) (Sections 110(a)(1) and (2)) of the Federal Clean Air Act), hereafter referred to as the "Infrastructure" State Implementation Plan (SIP) requirements, requires states to submit an implementation plan to the United States Environmental Protection Agency (USEPA) Administrator that demonstrates their ability and authority to implement, maintain, and enforce each National Ambient Air Quality Standard (NAAQS). Section 110(a)(1) of the Clean Air Act addresses the timing requirement for the submissions of any Infrastructure SIP revisions, while Section 110(a)(2) of the Clean Air Act lists the required elements that a state needs to demonstrate its authority for implementing. These elements including, but are not limited to, air quality monitoring, data analysis, and reporting; enforcement; resources; consultation; emergency procedures; and reductions in transported air pollution.

On August 15, 2006, the USEPA issued guidance[264] on what states should submit in order to comply with Section 110(a)(2)(D)(i) of the Clean Air Act concerning transported air pollution. Subsequently, on October 2, 2007, the USEPA issued guidance[265] on what states should submit in order to comply with the remaining non-transport-related requirements of Section 110(a)(2) for both the 1997 8-hour ozone and fine particulate matter ($PM_{2.5}$) NAAQS.

New Jersey has complied with both of the USEPA's guidance documents to address its Infrastructure SIP requirements for the 1997 8-hour ozone and $PM_{2.5}$ NAAQS in two parts:

- On February 25, 2008, the NJDEP submitted an Infrastructure SIP[266,267] which addressed all the non-transport-related elements of Section 110(a)(2) with respect to the 1997 8-hour ozone and $PM_{2.5}$ NAAQS.[268] (See Appendix E)
- On December 22, 2006, the New Jersey Department of Environmental Protection (NJDEP) sent the USEPA a letter[269] describing New Jersey's plan for addressing the transported emission requirements prescribed in Section 110(a)(2)(D)(i) of the Clean Air Act with respect to the 1997 8-hour ozone and $PM_{2.5}$ NAAQS. As described in this letter, the transported emissions related actions would be part of various SIP proposals, which would all go through a public comment process prior to being finalized for submission to the USEPA. To date, the NJDEP has held public hearings on New Jersey's 8-hour ozone

---

264 USEPA. Guidance for State Plan Submission to Meet Current Outstanding Obligations Under Section 110(a)(2)(D)(i) for the 8-Hour Ozone and $PM_{2.5}$ National Ambient Air Quality Standards. United States Environmental Protection Agency, August 15, 2006.

265 USEPA. Guidance on SIP Elements Required Under Sections 110(a)(1) and (2) for the 1997 8-Hour Ozone and $PM_{2.5}$ National Ambient Air Quality Standards. United States Environmental Protection Agency, October 2, 2007.

266 Letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated February 25, 2008. (See Appendix E)

267 NJDEP. State Implementation Plan Revision For Meeting the Infrastructure Requirements of the Clean Air Act. New Jersey Department of Environmental Protection, February 2008.

268 The infrastructure SIP proposal was submitted in December 2007: NJDEP. Proposed State Implementation Plan Revision For Meeting the Infrastructure Requirements of the Clean Air Act. New Jersey Department of Environmental Protection, December 2007. Available at http://www.state.nj.us/dep/baqp/infrastructure.pdf.

269 Letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 22, 2006. The letter is posted on the NJDEP's website at http://www.state.nj.us/dep/baqp/sip/siprevs.htm.

reasonably available control technology (RACT) SIP and its Clean Air Interstate Rule (CAIR), both of which included a discussion of interstate transport as outlined in the December 22, 2006 NJDEP letter to the USEPA.

Through these two efforts, New Jersey demonstrated that it has the authority to implement its Infrastructure SIP requirements outlined in the USEPA's guidance documents with respect to both the 1997 8-hour ozone and $PM_{2.5}$ NAAQS. Furthermore, these actions by the State satisfied the timing requirement under the Consent Decree for the Section 110(a)(2) elements for the 1997 8-hour ozone and $PM_{2.5}$ NAAQS.

On October 22, 2008, the USEPA determined that the State's Infrastructure SIP did not include two elements:

- A plan pertaining to the Part C Prevention of Significant Deterioration (PSD) permit program, and
- A $PM_{2.5}$ significant harm level (SHL) in a plan that addresses the infrastructure element concerning emergency powers and adequate contingency plans.[270]

New Jersey addresses the plan for the PSD program in Section 8.2.2 of this SIP.[271] Pertaining to the SHL for $PM_{2.5}$ emergency episodes, New Jersey is waiting for further guidance from the USEPA.[272]

As with 8-hour ozone, addressing transported emissions of $PM_{2.5}$ and its precursors, both to and from the State, is critical for New Jersey's multi-state nonattainment areas to attain and maintain the health-based ambient air quality standards. To emphasize this importance, the remainder of this Chapter reiterates the State's plan as outlined in its transport letter, submitted to the USEPA on December 22, 2006,[273] as it pertains to the $PM_{2.5}$ NAAQS, and provides updates on the State's progress in addressing interstate transport of $PM_{2.5}$-related emissions. The public hearing on New Jersey's proposed CAIR,[274] held on March 28, 2007, included a discussion of interstate transport as outlined in the December 22, 2006 NJDEP letter to the USEPA. New Jersey's CAIR allocation rule was adopted on June 19, 2007, became effective on July 16, 2007, became operative on August 17, 2007,[275] and the USEPA approved these rules on October 1, 2007.[276]

---

[270] 73 Fed. Reg. 62904 (October 22, 2008).
[271] The USEPA stated that the requirement was already addressed by a Federal Implementation Plan (FIP) and no further FIP actions were required. (73 Fed. Reg. 62904 (October 22, 2008)).
[272] The USEPA proposed the Significant Harm Level (SHL) for $PM_{2.5}$ at 500 $\mu g/m^3$ on January 19, 2009. At the time of this SIP revision, this proposal was not published in the Federal Register and is currently under review by the new Federal Administration.
[273] Letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 22, 2006. The letter is posted on the NJDEP's website at http://www.state.nj.us/dep/baqp/sip/siprevs.htm.
[274] 39 N.J.R. 300(a) (February 5, 2007).
[275] 39 N.J.R. 2637(a) (July 16, 2007). Also, see N.J.A.C. 7:27-30.
[276] 72 Fed. Reg. 55666-72 (October 1, 2007).

8.2 Interstate Transport (§ 110(a)(2)(D))

Section 110(a)(2)(D)(i) of the Clean Air Act

Each state's SIP must contain adequate provisions prohibiting any source, or other type of emissions activity, within the State from emitting any air pollutants in amounts that will:

1) Contribute significantly to nonattainment of the NAAQS for areas in another state or interfere with the maintenance of the NAAQS by another state;
2) Interfere with measures required to meet the implementation plan for any other state related to Regional Haze and Visibility; or,
3) Interfere with measures required to meet the implementation plan for any other state related to prevention of signification deterioration (PSD).

8.2.1 Significant Contribution to Nonattainment, or Interference with Maintenance, of a NAAQS in Another State

The USEPA's analysis in support of the CAIR[277] shows that New Jersey is not a significant contributor to $PM_{2.5}$ nonattainment in any other state (because its transported contribution is less than 0.2 $\mu g/m^3$). However, that same USEPA analysis indicates that the following upwind states significantly contribute to $PM_{2.5}$ nonattainment in Union County, New Jersey:[278]

- Maryland/Washington, D.C.,
- Michigan,
- New York,
- Ohio,
- Pennsylvania, and
- West Virginia.

Further, the USEPA's analysis in support of the CAIR indicates that the following states significantly contribute to $PM_{2.5}$ nonattainment in New Jersey's associated $PM_{2.5}$ multi-state nonattainment areas:

- Maryland/Washington, D.C.,
- Michigan,
- New York,
- Ohio,
- Pennsylvania,
- West Virginia, and
- Virginia.

[277] USEPA. Technical Support Document for the Final Clean Air Interstate Rule Air Quality Modeling, Air Quality Modeling Analyses – VII: Modeling to Assess Interstate $PM_{2.5}$ Contributions. United States Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2005.
[278] Union County was the only New Jersey county identified in nonattainment by the USEPA's CAIR analysis.

The USEPA's transport guidance allows states that are subject to requirements of the CAIR to satisfy the requirements of Section 110 (a)(2)(D)(i) through submittal of a CAIR SIP or reliance of the CAIR Federal Implementation Plan (FIP). New Jersey finalized an abbreviated CAIR SIP on June 19, 2007 that complies with CAIR requirements.[279] As part of this submittal, New Jersey stated that the CAIR SIP also served to partially address the transport requirement, and took that action through the public process. Based on the USEPA's transport guidance, this action by New Jersey satisfies the first of the requirements of Section 110 (a)(2)(D)(i). However, the implementation of CAIR alone will not be sufficient to address interstate transport issues, especially for the Northeastern and Mid-Atlantic United States. The U.S. Court of Appeals for the D.C. Circuit identified six major problems in the CAIR in its July 11, 2008 opinion (*State of North Carolina v. Environmental Protection Agency*, 531 *F.3d* 896 (D.C. Cir. 2008)), which included:

- CAIR trading programs are flawed because the region wide focus on emission reductions did not factor in each state's contribution to air pollution issues;
- The USEPA did not give independent significance to the "interfere with maintenance" language in Section 110(a)(2)(D) and thus did not provide enough protection to downwind areas;
- The 2015 compliance date for Phase 2 of CAIR is inconsistent with downwind states' 2010 attainment deadlines for $PM_{2.5}$ and ozone NAAQS;
- Both SO_2 and NO_x budgets (i.e., the allowances states were given in their trading programs) were not based on the objectives of section 110(a)(2)(D).

In addition, CAIR focuses solely on Electric Generating Units (EGUs), and does not address interstate transport of emissions from other sectors (non-EGU, mobile, area). In light of these concerns, New Jersey commits to implement additional strategies to address the transport of $PM_{2.5}$ and $PM_{2.5}$ precursor emissions, as discussed in Section 8.2.2.

8.2.2 The Regional Haze and Visibility Interference Requirement

$PM_{2.5}$ is the main component of regional haze. Therefore, the $PM_{2.5}$ SIP is relevant to the visibility requirements of Section 110(a)(2)(D)(i).

Regional Haze is visibility impairment caused by air pollutant emissions from numerous sources over a wide geographic area. In 1977, Section 169A of the Clean Air Act set forth a national goal for visibility which is the "prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution." Class I areas are defined as any national park larger than 6,000 acres in size, national wilderness areas or memorial parks greater than 5,000 acres in size, and all international parks which were in existence on August 7, 1977. There are 156 Class I areas across the United States, including the Brigantine Wilderness Area of the Edwin B. Forsythe National Wildlife Refuge in New Jersey.

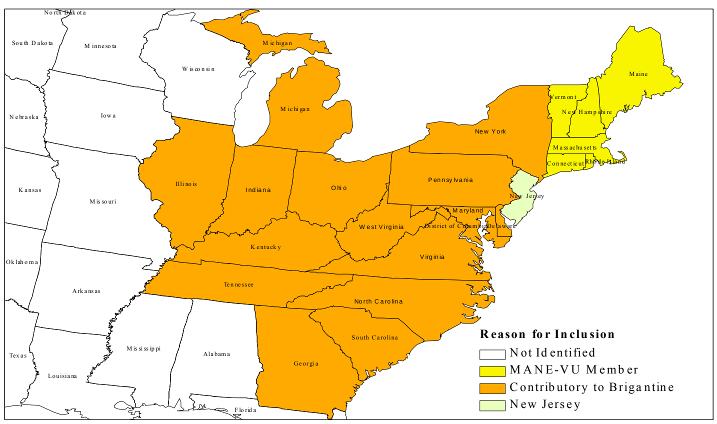
In the 1990 Clean Air Act Amendments, Congress added Section 169B requiring the states to achieve 'reasonable progress' toward the national goal of removing any visibility impairment

[279] 39 N.J.R. 2637(a) (July 16, 2007). Also, see N.J.A.C. 7:27-30.

from manmade air pollution to the designated Class I area. The Brigantine Wilderness Area of the Edwin B. Forsythe National Wildlife Refuge in New Jersey is afforded the same visibility protection as the Grand Canyon. The goal of the USEPA Regional Haze Rule is to improve visibility to natural background levels by the year 2064 in all federally designated Class I areas. States with Class I areas are required to establish Reasonable Progress Goals for Class I areas within their borders, and compare their projected rate of improvement with the Uniform Rate of Progress, with 10-year incremental mid-term goals to be attained along the way. All states are required to periodically conduct an analysis of available reasonable measures and implement those measures. The analysis and measures must be included in a SIP.

New Jersey proposed its Regional Haze SIP on September 15, 2008. This plan proposes to establish the baseline and natural visibility conditions, identifies the states which contribute to visibility impairment at the Brigantine Wilderness Area, and establishes the 2018 Reasonable Progress Goal. Based on a variety of technical methods, including the USEPA's CAIR analysis discussed is Section 8.2.1, New Jersey identified 22 states which contributed to visibility impairment at the Brigantine Wilderness Area with respect to the 2018 Reasonable Progress Goal, as pictured in Figure 8.1.

Figure 8.1: States Identified as Contributing to Visibility Impairment in New Jersey's Class I Area



Additionally, New Jersey contributes to visibility impairment at the Brigantine Wilderness Area. Maine, New Hampshire, and Vermont determined that New Jersey contributed to their Class I areas, Acadia National Park and Moosehorn Wilderness Area, Great Gulf Wilderness Area and Presidential Range/Dry River Wilderness Area, and Lyebrook Wilderness Area, respectively.

To achieve the 2018 Reasonable Progress Goal, the proposed plan relies upon the identified contributing states implementing the reasonable measures identified by New Jersey and the Mid-Atlantic/Northeast Visibility Union (MANE-VU) states. Based on the modeling results and other analysis performed by MANE-VU, the MANE-VU states developed "Asks", which are "emission management" strategies. These strategies served as the basis for the consultation with the other states.[280] The State consulted with the other Regional Planning Organizations and the contributing states within MANE-VU regarding the reasonableness of the identified measures. The contributing states within MANE-VU agreed to adopt and implement reasonable measures. The measures used to set the 2018 Reasonable Progress Goal are:

- Timely implementation of the Clean Air Act requirement to install Best Available Retrofit Technology (BART) on eligible sources;
- At least 90% SO_2 emission reductions from 2002 levels at the top 100 electric generating unit (EGU) sources that impact the Brigantine Wilderness Area (for the six MANE-VU visibility protected areas; there are 167 different EGU stacks that impact one or more of these areas);
- For the MANE-VU states, reducing the level of sulfur in fuel oil.
- For the contributing states outside of MANE-VU, a 28% emission reduction from non-electric generating unit sources is sought;[281]
- Continued evaluation of other measures, including Energy Efficiency, Alternative Clean Fuels and other measures to reduce SO_2, PM, and NO_x from all coal-burning facilities by 2018, and new source performance standards for wood combustion.

These regional reductions in air pollutant emissions will improve air quality in New Jersey.

New Jersey commits to implement additional strategies to address the transport of direct $PM_{2.5}$ and $PM_{2.5}$ precursor emissions both to and from New Jersey. As part of a regional effort, New Jersey commits to:

- Continue to meet its obligations under the oxides of nitrogen (NO_x) SIP Call, including an allocation mechanism that encourages energy efficiency for New Jersey sources in the Federal CAIR program;
- Adopt multi-pollutant (NO_x, sulfur dioxide (SO_2), and particulate matter (PM)) performance standards providing additional emission reductions for coal-fired Electric Generating Units (EGUs);
- Update its RACT rules to address the $PM_{2.5}$ precursors (see Table 9.1);
- Continue to implement the Low Emission Vehicle (LEV) program;
- Adopt rules and/or other measures to address emissions from oil and gas EGUs on High Electrical Demand Days (HEDD); and
- Propose rules to implement long-term, regional strategies, consistent with the MANE-VU statement (see Appendix A6), affecting the sulfur content and corresponding emission limits of No. 2, 4, and 6 fuel oil.

The emission reductions from large stationary sources through the NO_x SIP Call have achieved significant progress in reducing the transport of $PM_{2.5}$ and its precursors in the eastern United

[280] The regulations at 40 C.F.R. 51.308 (d)(1)(iv) requires states with Class I areas to develop reasonable progress goals in consultation with any state that may reasonably cause or contribute to visibility impairment in the Class I area.
[281] New Jersey and the other MANE-VU Class I states are recommending that contributing states determine the best way to achieve this level of emission reduction. The 28% represents an estimate of the benefits from the MANE-VU fuel oil strategy.

States. The demonstration of attainment in Chapter 5 relies on the implementation of additional control measures by upwind states. These $PM_{2.5}$ measures include new or additional regulations on asphalt production, cement kilns, glass furnaces, and Industrial/Commercial/Institutional (ICI) boilers. Because New Jersey has demonstrated that it needs the emissions reductions from these other states in order to meet its attainment obligations, the State requests (see Chapter 9) that the USEPA, in reviewing the SIP revisions from other states, take into consideration the other states' impact on New Jersey's attainment obligations, and ensure that other states are doing what is needed for New Jersey's associated multi-state nonattainment areas to reach attainment as soon as practicable.

All actions which New Jersey determines are necessary to attain and maintain the $PM_{2.5}$ NAAQS in New Jersey, and to maintain the $PM_{2.5}$ NAAQS in neighboring states, will be proposed and included as a revision to New Jersey's SIP. In accordance with the New Jersey Administrative Procedures Act (APA) (N.J.S.A. 52:14B-1 et seq.) and the Air Pollution Control Act (APCA) (N.J.S.A. 26:2C-1 et seq.), these proposals will be taken through public process at that time.

8.2.3 Prevention of Significant Deterioration/Nonattainment New Source Review (PSD/NNSR) Requirement

With respect to the $PM_{2.5}$ standard, New Jersey has both attainment and nonattainment areas throughout the State, necessitating both a PSD and NNSR program with respect to this pollutant. This section explains how the separate regulatory actions the USEPA has taken to implement these programs and how New Jersey plans to implement its programs for the $PM_{2.5}$ health-based standard.

On April 25, 2007, the USEPA finalized its implementation rule for the 1997 $PM_{2.5}$ NAAQS.[282] No final $PM_{2.5}$ requirements for the NSR program were included. Prior to the implementation of that rule, the USEPA issued interim guidance[283,284] calling for use of coarse particulate matter (PM_{10}) as a surrogate for $PM_{2.5}$ in the PSD and NNSR programs until NSR rules were finalized. Due to the lack of $PM_{2.5}$ NSR rules, PM_{10} was used as a surrogate in both attainment and nonattainment areas. Under the surrogate approach, compliance with applicable requirements for PM_{10} was assumed to satisfy $PM_{2.5}$ requirements.

On September 21, 2007, the USEPA proposed a rule on increments, significant impact levels (SIL), and significant monitoring concentrations (SMC).[285] The proposal has not been finalized as of this SIP revision. The final rule is anticipated in the summer of 2009.

[282] 72 Fed. Reg. 20586-667 (April 25, 2007).
[283] USEPA Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, to Regional Air Directors, "Implementation of New Source Review Requirements in PM-2.5 Nonattainment Areas," April 5, 2005.
[284] USEPA Memorandum from John S. Seitz, Director, Office of Air Quality Planning and Standards, to Regional Air Directors, "Interim Implementation of New Source Review for PM2.5," October 23, 1997.
[285] 72 Fed. Reg. 54112-156 (September 21, 2007).

On May 16, 2008, the USEPA issued a portion of the NSR rule for $PM_{2.5}$.[286] That rule changed the Federal rule for PSD, Appendix S of 40 C.F.R. pt. 51 for nonattainment areas, and the Federal guidance for state PSD and nonattainment NSR SIPs.

PSD Requirements in New Jersey's Attainment Counties:

For attainment areas implementing the Federal $PM_{2.5}$ PSD program through delegation, where the Federal government or a delegated state issues PSD permits, the $PM_{2.5}$ PSD rule changes published on May 16, 2008 are effective as of July 15, 2008.[287] New Jersey is a PSD delegated state. According to that rule, the changes for New Jersey's attainment counties implementing the Federal PSD program through delegation were effective as of July 15, 2008. The PM_{10} surrogate policy no longer applied after July 15, 2008.

Nonattainment NSR (NNSR) Requirements in New Jersey's Nonattainment Counties:

Between July 15, 2008 and the effective date of New Jersey's NSR rules for $PM_{2.5}$ (expected in 2011), the USEPA's Appendix S (40 C.F.R. pt. 51) applies.

The $PM_{2.5}$ NSR rule allows up to three years for states to revise their regulations and SIP. New Jersey expects the three year clock to be triggered once the USEPA adopts the remaining components of its $PM_{2.5}$ NSR implementation rules, which are expected by the summer of 2009. The NJDEP expects to develop NNSR rule strategies in 2009, propose a NNSR rule revision in 2010, and adopt a revised NSR rule in 2011.

The NJDEP also expects to adopt New Jersey specific PSD rules in the same timeframe. Currently, NJDEP implements most of the Federal PSD rules under a delegation agreement and will continue to do so until New Jersey PSD rules are effective.

8.3 Conclusion

New Jersey complied with the USEPA's guidance in determining that it has the authority to implement its Infrastructure SIP requirements with respect to both the 1997 8-hour ozone and $PM_{2.5}$ NAAQS. Furthermore, the State has satisfied the timing requirement under the Consent Decree for the Section 110(a)(2) elements for the 1997 8-hour ozone and $PM_{2.5}$ NAAQS.

Addressing transported emissions, both to and from the State, is critical for New Jersey's $PM_{2.5}$ multi-state nonattainment areas to attain and maintain the health-based ambient air quality standards. New Jersey is complying with the USEPA's guidance regarding interstate transport as it relates to the $PM_{2.5}$ NAAQS and is doing more to ensure that it is not inferring with the ability of its neighboring states to attain and maintain that standard. While many of New Jersey's existing requirements are already more stringent than the existing pollution control requirements in the neighboring upwind states, New Jersey will consider any additional measures, beyond those already in place, implemented by the neighboring upwind states, if they are more stringent

[286] 73 Fed. Reg. 28321-350 (May 16, 2008).
[287] 73 Fed. Reg. 28321-350 (May 16, 2008).

than New Jersey's current actions. New Jersey also encourages the USEPA to take action where states are preempted from action. New Jersey relies on the USEPA to ensure sufficient progress in securing upwind emission reductions to provide for expeditious attainment of the $PM_{2.5}$ NAAQS.

9.0 COMMITMENTS AND REQUESTS FOR FUTURE ACTION

As discussed in Chapter 5, the two multi-state annual fine particulate matter ($PM_{2.5}$) nonattainment areas associated with New Jersey are projected to reach attainment of the 1997 annual $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) by their attainment date (i.e., April 5, 2010). This demonstration is contingent upon the continued implementation and enforcement of existing control measures, as well as the implementation of a number of new State and Federal control measures. The measures that were included in the attainment demonstration modeling are referred to as either on the books/on the way (OTB/OTW), or measures that are beyond on the way (BOTW). These control measures are outlined in Chapter 4.

In addition, although not outlined specifically in Chapter 4, other State and Federal measures were implemented, and achieved benefits, prior to the 2002 base year. For example, control measures such as the on-board diagnostics (OBD) enhanced Inspection and Maintenance (I/M) program, the federal Reformulated Gasoline (RFG) program, and all New Jersey's existing stationary source control measures achieved pre-2002 benefits, and these programs, as well as numerous others, are incorporated into the 2002 inventory, from which the future inventories are projected.

Chapter 5 also discusses other measures, in addition to those OTB/OTW and BOTW measures included in the attainment modeling, that both New Jersey and the United States Environmental Protection Agency (USEPA) are implementing that are expected to provide benefits in time to help the 1997 $PM_{2.5}$ multi-state nonattainment areas reach their attainment goals. These measures provide additional assurance that New Jersey's associated multi-state nonattainment areas will attain the 1997 annual $PM_{2.5}$ standard by April 5, 2010. In addition, a portion of these measures are relied upon as contingency measures. Additional non-modeled measures provide for additional emission reductions that not only will help the State attain both the 1997 8-hour ozone and annual $PM_{2.5}$ NAAQS, but will help the State attain the 2006 daily $PM_{2.5}$ standard of 35 $\mu g/m^3$, address regional haze at New Jersey's Class I area and other downwind Class I areas, reduce air toxic emissions, advance the State's Greenhouse Gas Initiative, and ultimately help the State meet its own $PM_{2.5}$ goal of goal of 12 $\mu g/m^3$. See Chapter 1 for more information on these other air quality goals.

The remainder of this chapter summarizes New Jersey's control measures and other commitments, as well as New Jersey's requests of the USEPA with respect to $PM_{2.5}$ implementation.

9.1 Control Measure Commitments

Because the Ozone Transport Region conducted one-atmospheric modeling to satisfy both the 8-hour and $PM_{2.5}$ attainment demonstration obligations, all of measures included in the State's $PM_{2.5}$ attainment demonstration modeling are also in the State's 8-hour ozone attainment demonstration. The 8-hour ozone attainment demonstration was submitted to the USEPA for approval on October 29, 2007,[288] and since its submittal, the State of New Jersey has been working to implement those measures needed for attainment. Table 9.1 provides a status on those control measures committed to in the State's 8-hour ozone state implementation plan (SIP) that will also provide the emission reductions needed to bring about $PM_{2.5}$ attainment.

The State commits to propose and adopt those measures in Table 9.1 in accordance with the New Jersey Administrative Procedures Act (APA) (N.J.S.A. 52:14B-1 et seq.) and the Air Pollution Control Act (APCA) (N.J.S.A. 26:2C-1 et seq.). For a detailed explanation of each of these control measures, see Chapter 4.

Table 9.1: $PM_{2.5}$ State Control Measure Commitments Not Yet Adopted and Contingency Measures

Control Measures	Status	Notes
BOTW Measures Included in Regional $PM_{2.5}$ Attainment Modeling *		
Industrial/Commercial/Institutional (ICI) Boiler Rule 2009[289]	Proposed 8/4/08	NO_x reduction measure; for 8-hour ozone attainment
Contingency Measures		
Refinery Consent Decrees (Sunoco and Valero)	Filed (Final), See Appendix C, Attachments 3, 4 and 5	See Modeling Differential Analysis in Appendix C
Diesel Idling	Promulgated 8/6/07; operative 9/8/2007	$PM_{2.5}$ and NO_x reductions
Municipal Waste Combustor (Incinerator) NO_x Rule	Proposed 8/4/08	NO_x reductions
Asphalt Production Plants	Proposed 8/4/08	NO_x reductions
ICI Boiler Rule 2009 (portion not modeled)	Proposed 8/4/08	NO_x reduction measure
NO_x RACT Rule (2006)	Adopted September 8, 2005	NO_x reduction measure
Onroad Motor Vehicle Control Programs (Federal) (Fleet turnover 2010)	New Federal vehicle standards are already adopted to provide for these benefits	Direct $PM_{2.5}$ and NO_x reductions
Onroad New Jersey Low Emission Vehicle (LEV) Program (Fleet turnover)	Adopted November 28, 2005	VOC, NO_x, SO_2, and direct $PM_{2.5}$ reductions
Nonroad Motor Vehicle Control Programs (Federal) (Fleet turnover 2010)	New Federal equipment and vehicle standards are already adopted to provide for these benefits	Direct $PM_{2.5}$, SO_2, and NO_x reductions
Controls from EGU Consent Decrees (PSE&G Hudson SO_2)	Filed July 26, 2002; amended November 30, 2006	SO_2 reductions
Additional Measures that Support Attainment		
Diesel Smoke (I/M Cutpoint) Rule Changes	Proposed 6/16/08	$PM_{2.5}$ and NO_x reductions

* "Beyond On the Way (BOTW)" control measures (state, regional, or federal) that have been or will be proposed by New Jersey and will include those measures that were identified as part of the effort to reach attainment by April 5, 2010.

[288] Letter dated October 29, 2007 from then NJDEP Commissioner Lisa P. Jackson to USEPA Region II Administrator Alan J. Steinberg. Available at http://www.nj.gov/dep/baqp/8hrsip/commissioner's%20letter.pdf.
[289] Some categories have 2010 compliance dates; remainder have 2011 and 2012 compliance dates.

The Department has proposed additional control measures as part of the effort to reduce ozone which will also have $PM_{2.5}$ emission reduction benefits. These additional control measures are included in Table 9.2.

Table 9.2: Additional Control Measures

Control Measures	Status	Notes
Additional Measures that Support Attainment Ozone and $PM_{2.5}$ RACT Commitments**		
Oil and Gas Fired Electric generating units (EGUs)	Proposed 8/4/08	NO_x reduction measure
Coal-fired boilers serving EGUs	Proposed 8/4/08	NO_x, SO_2, and direct $PM_{2.5}$ reductions
Sewage sludge incinerators	Proposed 8/4/08	NO_x reduction measure
Case by Case NO_x Emission Limit Determinations (FSELs/AELs)	Proposed 8/4/08	NO_x reduction measure
High Electric Demand Day (HEDD) Program	Proposed 8/4/08	NO_x reduction measure
Glass Manufacturing	Proposed 8/4/08	NO_x reductions but most benefits will occur post-2010
Additional Measures that Support Attainment BOTW VOC Measures		
Consumer Products 2009 Amendments	Adopted 10/30/08	VOC reduction measure; primarily for 8-hour ozone attainment
Portable Fuel Containers 2009 Amendments	Adopted 10/30/08	VOC reduction measure; primarily for 8-hour ozone attainment
Adhesives and Sealants	Adopted 10/30/08	VOC reduction measure; primarily for 8-hour ozone attainment
Additional Measures that Support Attainment Ozone RACT VOC Measures		
VOC stationary storage tanks	Proposed 8/4/08	VOC reduction measure
2006 Control Techniques Guidelines	Proposed 8/4/08	VOC reduction measure
Asphalt Paving (emulsified and cutback)	Proposed 8/4/08	VOC reduction measure
Case by Case VOC Emission Limit Determinations (FSELs/AELs)	Proposed 8/4/08	VOC reduction measure

** These measures were not included in the regional attainment modeling for 2009.

Additionally, New Jersey is implementing the Nonattainment New Source Review (NNSR) rule revisions (see Chapter 8). The Clean Air Act (CAA), 42 U.S.C. § 7503, requires new or modified major sources to install the Lowest Achievable Emission Rate (LAER) control equipment and obtain greater than one for one emission offsets in order to locate in a nonattainment area. Thus, the NNSR program provides for continual emission reductions to help improve the air quality in the nonattainment area and further downwind. See Chapter 4 for further discussion on NNSR.

The USEPA has also committed to implement additional emission control measures not listed in Tables 9.1 and 9.2. Specifically, the USEPA has proposed new, small offroad engine standards, and adopted more stringent exhaust emission standards for locomotives and marine diesel engines, as well as adopted a second phase of its Federal Clean Air Interstate Rule (CAIR) Program that will result in SO_2 reductions (refer to Chapter 4 for details). All of these efforts should provide additional emission reductions for 2009 and beyond. While New Jersey's $PM_{2.5}$ attainment demonstration does not rely on further emission reductions from these measures, the implementation of these measures will help support New Jersey's demonstration of attainment and will benefit air quality. New Jersey expects the USEPA to promulgate these measures in a timely fashion so that emission reductions can be achieved by 2009 and beyond.

New Jersey commits, as part of this State Implementation Plan (SIP) revision, to implement a number of future control measures that will result in emission reductions post-2010. These longer-term measures will provide:

1. additional public health protection in view of health effects below the NAAQS, consistent with the NJDEP's internal goal of meeting an annual $PM_{2.5}$ level of 12 $\mu g/m^3$;
2. progress toward the new 2006 24-hour $PM_{2.5}$ NAAQS;
3. additional reductions, which would be relied upon should the State not attain by 2010;
4. additional benefits toward meeting the State's other PM-related air quality goals outlined in Chapter 1 (e.g., Greenhouse Gas Initiative, Air Toxics, etc.); and,
5. the regulated community with certainty and time to identify the necessary funding to install control equipment, modify their products or usage patterns, and/or take other actions to implement pollution prevention strategies.

9.2 Transport-Related Requirements

Chapter 8 of this SIP revision: 1) reiterates the State's compliance with the USEPA's guidance in determining that it has the authority to implement its Infrastructure SIP requirements, and has met all timing requirements associated with those requirements, with respect to the $PM_{2.5}$ NAAQS, and 2) provides updates on the State's progress in meeting its requirements under Section 110(a)(2)(D)(i) of the Clean Air Act with respect to the 1997 $PM_{2.5}$ NAAQS. The remainder of this Section reiterates the State's $PM_{2.5}$-related transport commitments.

New Jersey commits to implement strategies to address the transport of direct $PM_{2.5}$ and $PM_{2.5}$ precursor emissions from New Jersey, particularly in light of the State's concerns that the implementation of CAIR alone does not resolve interstate transport issues.[290] New Jersey will also address interstate transport by relying upon its Regional Haze SIP to address visibility requirements in New Jersey's Class I area. New Jersey proposed its Regional Haze SIP on September 15, 2008. New Jersey commits to consider any additional measures, beyond those already in place, implemented by the neighboring upwind states, if they are more stringent than our current actions.

[290] See letter from NJDEP Commissioner Lisa P. Jackson to USEPA Regional Administrator Steinberg dated December 22, 2006. The letter is posted on the NJDEP's website at http://www.state.nj.us/dep/baqp/sip/siprevs.htm.

9.3 State Requests of the USEPA

New Jersey's Reliance on the USEPA and Other State Actions for Attainment

As discussed in Chapter 4, New Jersey based its demonstration of attainment for its two multi-state nonattainment areas on the 2009 BOTW modeling exercise. This modeling demonstration relies not only on New Jersey working to meet its commitments to implement certain measures by 2009, but also on its neighboring states doing the same. Further, the implementation of measures by states upwind than New Jersey's immediate neighbors is relied upon to reduce the transport of $PM_{2.5}$ and its precursors into the Mid-Atlantic/Northeast Visibility Union (MANE-VU) region, including New Jersey. Additional cost effective controls on the largest upwind sources are still needed to reduce the $PM_{2.5}$ and $PM_{2.5}$ precursors being transported into the MANE-VU region. New Jersey requests that the USEPA, in reviewing the SIP revisions from other states, take into consideration the impact on New Jersey's attainment obligations, and ensure that upwind states are doing all that is needed to bring New Jersey's associated multi-state nonattainment areas into attainment as soon as practicable. In addition, New Jersey expects that the USEPA will adopt all federal measures in a timely fashion so that the state can benefit from the emission reductions from these measures.

10.0 CONCLUSION

The health effects associated with fine particulate matter ($PM_{2.5}$) are significant, due in part to its small size, which allows it to reach deep in the recesses of the lungs, as well as its ability to be a "carrier" for other toxic air contaminants. New Jersey and the other states that share New Jersey's 1997 $PM_{2.5}$ multi-state nonattainment areas are faced with the challenge of meeting the 1997 annual $PM_{2.5}$ standard. Although New Jersey and the other states that share the 1997 $PM_{2.5}$ multi-state nonattainment areas have always met the 1997 daily $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$, and these levels have continued to improve since 2001, New Jersey and the other states also face the challenge of meeting the new 2006 daily $PM_{2.5}$ standard of 35 $\mu g/m^3$. Given the significance of the health concerns associated with fine particulate matter, New Jersey approached the requirements to meet the 1997 $PM_{2.5}$ national ambient air quality standards (NAAQS) not as a finite goal, but instead as the first step in a comprehensive plan to address $PM_{2.5}$ emissions, as well as the precursor emissions that can form $PM_{2.5}$, which can include sulfur dioxide (SO_2), oxides of nitrogen (NO_x), volatile organic compounds (VOCs),[291] and ammonia. The actions taken in this state implementation plan (SIP) revision, therefore, will ensure that New Jersey and its shared nonattainment areas will come into compliance with the 1997 annual health-based $PM_{2.5}$ NAAQS by their attainment date of 2010, and will also help the State meet a number of other particulate matter (PM)-related goals with deadlines beyond the attainment of the 1997 annual $PM_{2.5}$ NAAQS by 2010. The following other PM-related actions, that are anticipated in the near future or are already in place, comprise the rest of the State's overall plan for reducing PM-related emissions:

- Reducing Greenhouse Gas emissions in an effort to help New Jersey meet its obligations under the State's Global Warming Response Act;
- Continuing to reduce $PM_{2.5}$ emissions in an effort to meet the new 2006 daily $PM_{2.5}$ standard of 35 $\mu g/m^3$ and State's annual goal of 12 $\mu g/m^3$;
- Supporting the State's efforts to meet the commitments in its 8-hour ozone attainment demonstration SIP, submitted to the United States Environmental Protection Agency (USEPA) in October 2007;
- Continuing the State's on-going efforts to reduce air toxic emissions throughout New Jersey;
- Establishing reasonable progress goals to address visibility in the State's Class I area; and,
- Supporting the State's overarching Environmental Justice initiatives.

To meet the requirements of 42 U.S.C. § 7502(c)(1) (Section 172(c)(1) of the Clean Air Act) for the 1997 annual $PM_{2.5}$ NAAQS, New Jersey conducted two separate analyses designed to determine what additional actions the State could take to reduce $PM_{2.5}$ and $PM_{2.5}$ precursor emissions; a Reasonably Available Control Technology (RACT) analysis of emission control technologies for major stationary sources and a Reasonably Available Control Measures

[291] According to the USEPA, high molecular weight organic compounds (typically 25 carbon atoms or more) are emitted directly as primary organic particles and exist primarily in the condensed phase at ambient temperatures. Accordingly, high molecular weight organic compounds are considered a primary $PM_{2.5}$ emission for the purposes of the $PM_{2.5}$ implementation program (72 Fed. Reg. 20592 (April 25, 2007)).

(RACM) analysis of emission control technologies from all other sources (mobile and area sources). New Jersey's RACM analysis identified several "reasonable" measures. However, the implementation of those measures would not advance the nonattainment areas' attainment date by one year, to April 5, 2009 (which would require demonstration of attainment by the end of 2008). The State and the Federal government are acting to implement several of the measures identified as part of this analysis already to ensure the protection of public health and, for New Jersey, to move the State further toward meeting its other PM-related goals. New Jersey's RACT analysis demonstrates that reductions of direct $PM_{2.5}$ emissions and its precursors, SO_2 and NO_x, from several major stationary source categories, are reasonable. In addition to these NJDEP analyses, the State hosted its own, and participated in several regional, stakeholder processes designed to select viable control measures. These efforts identified the remainder of the control measures relied upon in either the attainment demonstration or the contingency plans. New Jersey's "Reducing Air Pollution Together" Outreach Initiative and the State's participation in regional efforts are discussed in detail in Chapter 4.

As part of this SIP revision, New Jersey is proposing, in accordance with the New Jersey Administrative Procedures Act (N.J.S.A. 52:14B-1 et seq.) and the New Jersey Air Pollution Control Act, (N.J.S.A. 26:2C-1 et seq.), all the beyond all the way (BOTW) measures included in the 2009 attainment photochemical modeling. In addition, New Jersey is proposing, pursuant to the New Jersey Administrative Procedures Act (N.J.S.A. 52:14B-1 et seq.) and the New Jersey Air Pollution Control Act (N.J.S.A. 26:2C-1 et seq.), a number of other control measures that were not included in the 2009 BOTW modeling, but will result in emission reductions by 2009, as well as future measures that will result in emission reductions post-2010. These additional measures, in addition to providing additional evidence for this proposed attainment demonstration, will also provide:

- additional public health protection in view of health effects below the NAAQS, consistent with the NJDEP's internal goal of meeting an annual $PM_{2.5}$ level of 12 $\mu g/m^3$;
- progress toward the new 2006 24-hour $PM_{2.5}$ NAAQS;
- additional reductions, which would be relied upon should the State not attain by 2010;
- additional benefits toward meeting the State's other PM-related air quality goals outlined in Chapter 1 (e.g., Greenhouse Gas Initiative, Air Toxics, etc.); and,
- the regulated community with certainty and time to identify the necessary funding to install control equipment, modify their products or usage patterns, and/or take other actions to implement pollution prevention strategies.

The State's status on its regulatory commitments for this SIP revision is discussed in Chapter 9.

The implementation of all of these measures will serve to help ensure that New Jersey's associated nonattainment areas meet their mandatory attainment date, and will ensure that New Jersey is not negatively impacting any other area's ability to meet the NAAQS through transported emissions of $PM_{2.5}$ and its precursors (see Chapter 8). The State's attainment demonstration is not only based on New Jersey's actions, but on the actions of all the other states in the region. Other states' failure to address their contribution to the New Jersey associated multi-state nonattainment areas' air quality problems could result in New Jersey's associated multi-state nonattainment areas' inability to meet their attainment goal. Therefore, New Jersey requests that the USEPA evaluate the impact of transported emissions as it reviews the SIPs, particularly those from the upwind states. In addition to meeting the interstate transport requirements in Section 110 of the Clean Air Act, the SIP revision updates the State's progress in meeting the 1997 $PM_{2.5}$ Infrastructure SIP requirements (see Chapter 8).

New Jersey has included, as part of this SIP revision (see Chapter 7), onroad vehicle emission budgets to ensure that the plans and programs implemented by the Metropolitan Planning Organizations conform with the requirements of the SIP.

In conclusion, this SIP revision provides a comprehensive plan that:

- highlights the successes of the past, demonstrates attainment of the 1997 annual $PM_{2.5}$ standard, and directs the State beyond that standard toward its other PM-related goals;
- identifies all the control measures necessary in order for New Jersey, and its associated multi-state nonattainment areas, to attain the 1997 annual $PM_{2.5}$ NAAQS by the April 5, 2010 attainment date and address transport in and out of the State;
- identifies reasonably available control technology measures for $PM_{2.5}$;
- outlines the State's authority to meet Section 110 (of the Clean Air Act) requirements for the 1997 $PM_{2.5}$ NAAQS;
- provides a safety net of contingency measures in the event that the State fails to attain the 1997 annual $PM_{2.5}$ NAAQS on time; and
- sets transportation conformity budgets that allow for growth without negatively impacting the attainment of the 1997 annual $PM_{2.5}$ NAAQS in the multi-state nonattainment areas.