The State of Connecticut
Department of Environmental Protection

Proposed
State Implementation Plan Revision
Establishment of Interim Progress
for the
Fine Particle National Ambient Air Quality Standard

Technical Support Document
Early $PM_{2.5}$ Transportation Conformity
Emission Budgets
for the Connecticut Portion of the
New York-New Jersey-Long Island-Connecticut
$PM_{2.5}$ Nonattainment Area

February 7, 2007

Table of Contents

i. Definitions and Abbreviations .....(i)
ii. Executive Summary ..... (ii)
I. BACKGROUND 1
II. METHODOLOGY..... 4
III. EMISSION ESTIMATES AND 2009 CONFORMITY BUDGETS 6

ATTACHMENT A: Growth Factor Selection Table
ATTACHMENT B: Modeling Inputs Table
ATTACHMENT C: Weight of Evidence

i. Definitions and Abbreviations

"CT DEP" – The State of Connecticut Department of Environmental Protection.

"CT DOL" – The State of Connecticut Department of Labor.

"ConnDOT" – The State of Connecticut Department of Transportation.

"EPA" – The United States Environmental Protection Agency.

"FHWA" – The United States Department of Transportation Federal Highway Administration.

"MANE-VU" – Mid-Atlantic/Northeast Visibility Union.

"MARAMA" – Mid-Atlantic Regional Air Management Association.

"NAAQS" – National Ambient Air Quality Standards.

"NEI" – EPA's National Emissions Inventory.

"NO_x" – Oxides of Nitrogen.

"$PM_{2.5}$" – Fine Particulate Matter or particles equal to or less than 2.5 micrometers in diameter.

"SCC" – Standard Classification Code.

"SIP" – State Implementation Plan.

"US DOE, EIA" – The United States Department of Energy, Energy Information Administration.

"VMT" – Vehicle Miles Traveled.

ii. Executive Summary

This technical support document (TSD) provides the basis for establishing early $PM_{2.5}$ transportation conformity budgets for the Connecticut portion of the New York-Northern New Jersey-Long Island, NY-NJ-CT $PM_{2.5}$ Nonattainment Area.

Connecticut's Fairfield and New Haven Counties were judged by the United States Environmental Protection Agency (EPA) as contributing to measured violations of the annual $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) in New York City, thus were included in the above mentioned Nonattainment Area. However, there were no monitored violations to EPA's 1997 annual $PM_{2.5}$ standards in Fairfield and New Haven counties in 2002, and any reduction in the overall inventory, for the two county area, below 2002 levels should help ensure that this level of air quality is maintained or improved in the future.

EPA established a $PM_{2.5}$ transportation conformity rule (69 FR 40028; July 1, 2004) indicating that states with $PM_{2.5}$ Nonattainment Areas can elect to submit a State Implementation Plan (SIP) revision containing early motor vehicle emission budgets that address the NAAQS in advance of a complete SIP attainment demonstration. Early budget submittals do not need to demonstrate attainment, but must achieve some progress towards attainment, consistent with adopted control measures and projected emissions. Progress is demonstrated if projected emissions in the 2009 attainment year are less than emissions in the 2002 base year.

EPA finalized $PM_{2.5}$ precursor requirements for transportation conformity in a May 6, 2005, final rule (70 FR 24280). The final rule also identified NO_x, VOCs, SO_x, and NH_3 as potential transportation-related $PM_{2.5}$ precursors; however, the only precursor found to be significant at this time for onroad mobile sources is NO_x.

This TSD demonstrates a very large percent reduction for onroad emissions in both direct $PM_{2.5}$ and NO_x (31% and 46%, respectively). Also, this document demonstrates a decrease in overall $PM_{2.5}$ and NO_x emissions by 2009. By 2009 emissions of direct $PM_{2.5}$ will be reduced by 168 tons or 2.5%, and NO_x emissions will be reduced by 16,766 tons or 27% compared to 2002 base year levels.

The annual reductions of 2.5% for direct $PM_{2.5}$ emissions and of 27% for NO_x emissions are demonstrated as the basis for establishing the early budgets. The early budget established for annual direct $PM_{2.5}$ emissions is 360 tons per year and for annual NO_x emissions is 18,279 tons per year.

Summary of Results

Table 1 compares calculated 2002 and 2009 direct $PM_{2.5}$ inventories by source type for the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area. Although direct $PM_{2.5}$ emissions from area and point sources are projected to increase by two and eight percent, respectively, emissions from nonroad and onroad sources are projected to decrease by 13 and 31 percent, respectively. Overall this represents a 2.5% reduction in direct $PM_{2.5}$ emissions.

TABLE 1

	DIRECT ANNUAL $PM_{2.5}$ EMISSIONS (tons/year)											
	AREA			**NONROAD**			**POINT**			**ONROAD**		
COUNTY	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**
Fairfield	2,349	2,388		526	454		190	202		269	185	
New Haven	2,427	2,476		448	395		202	220		252	175	
Total for CT portion of NY-NJ-CT NAA	4,776	4,864	+88 (+2%)	974	849	-125 (-13%)	392	422	+30 (+8%)	521	**360**	-161 (-31%)
Overall Comparison of Direct PM2.5 Emissions for the CT Portion of the NY/NJ/CT PM2.5 Nonattainment Area 2002: 6,663 tpy 2009: 6,495 tpy Difference: -168 tpy (-2.5%)												

Table 2 compares calculated 2002 and 2009 annual NO_x inventories by source type for the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area. Although NO_x emissions from area and point sources are projected to increase by four and seven percent, respectively, emissions from nonroad and onroad sources are projected to decrease by 12 and 46 percent, respectively. Overall this represents a 27% reduction in annual NO_x emissions.

TABLE 2

	ANNUAL NO_x EMISSIONS (tons/year)											
	AREA			**NONROAD**			**POINT**			**ONROAD**		
COUNTY	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**	**2002**	**2009**	**Dif.**
Fairfield	3,134	3,269		7,150	6,104		3,892	4,183		17,411	9,314	
New Haven	2,937	3,061		7,935	7,108		2,305	2,429		16,435	8,965	
Total for CT portion of NY-NJ-CT NAA	6,071	6,330	+259 (+4%)	15,085	13,212	-1,873 (-12%)	6,197	6,612	+415 (+7%)	33,846	**18,279**	-15,567 (-46%)
Overall Comparison of NOx Emissions for the CT Portion of the NY/NJ/CT PM2.5 Nonattainment Area 2002: 61,199 tpy 2009: 44,433 tpy Difference: -16,766 tpy (-27%)												

The early direct $PM_{2.5}$ and annual NO_x motor vehicle emissions budgets being established are the on-road portion of the 2009 projections illustrated in Table 3; that is, 360 tons per

year for direct $PM_{2.5}$ and 18,279 tons per year for NO_x. The State of Connecticut Department of Transportation (ConnDOT), and Metropolitan Planning Organizations within the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area, shall use these budgets for future transportation conformity determinations once EPA finds them adequate or approves them for transportation conformity purposes.

TABLE 3

2009 Transportation Conformity Emission Budgets		
CT portion of the NY-NJ-Long Island-CT $PM_{2.5}$ Nonattainment Area	Annual Direct $PM_{2.5}$ Emissions (tons per year)	Annual NO_x Emissions (tons per year)
	360	**18,279**

Documentation of methodologies and a more complete summary of projections and calculations are provided in this TSD.

It should be noted that if the fraction of road dust and residential wood-burning emission estimates were decreased, to be consistent with observed monitoring data and wood-burning control analyses, the net result in overall direct $PM_{2.5}$ emission reductions between 2002 and 2009 would be much greater than the 2.5% demonstrated in this TSD.

I. BACKGROUND

Fine particulate matter is a mixture of microscopic solids and liquid droplets suspended in air, where the size of the particles is equal to or less than 2.5 micrometers, which is about one-thirtieth the diameter of a human hair. Fine particles can be emitted directly, such as smoke from a fire or as a component of motor vehicle exhaust, or be formed indirectly in the air from power plant, industrial and mobile source emissions of gases such as sulfur dioxide (SO_2) and NO_x.

The health effects associated with exposure to fine particles are serious. Scientific studies have shown significant associations between elevated fine particle levels and premature death. Effects associated with $PM_{2.5}$ exposure include aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma episodes, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. While fine particles are unhealthy for anyone to breathe, people with heart or lung disease, asthmatics, older adults, and children are especially at risk.

In 1997, EPA promulgated National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$. After prolonged litigation and deployment of a monitoring network, EPA finalized air quality designations for $PM_{2.5}$ in April 2005. Those areas not meeting the $PM_{2.5}$ NAAQS were designated as $PM_{2.5}$ Nonattainment Areas. Connecticut's Fairfield and New Haven Counties, judged by EPA as contributing to measured violations of the 1997 annual $PM_{2.5}$ NAAQS in New York City, were included in a Nonattainment Area that also includes the northern New Jersey and New York counties of the New York City metropolitan area, known as the NY-NJ-CT $PM_{2.5}$ Nonattainment Area. See Figure 1 for a map of this area.

The Clean Air Act Amendments of 1990 require states to submit State Implementation Plans (SIPs) to EPA within three years after designations to demonstrate how they will improve air quality and attain the standard. Nonattainment Areas are also subject to a federal rule known as "transportation conformity," which requires local and state transportation and air quality officials to coordinate planning efforts to ensure that transportation projects, such as road construction, do not hinder an area's ability to reach its clean air goals. Transportation conformity requirements become effective one year after an area is designated as nonattainment.

During the period after conformity requirements have been triggered, but final transportation conformity budgets have not yet been established as part of the attainment SIP process, interim emission tests must be passed to show conformity. Alternative interim tests include:

1) Demonstrating that planned build scenarios for key years of transportation plans do not result in increased emissions when compared to the corresponding no-build scenario for each year;
2) Comparing area wide on-road emission estimates for key years in transportation plans to the 2002 base year emission levels to ensure transportation plans do not increase emissions; or

3) Establishing state and/or local "early" conformity budgets at a level consistent with progress toward attainment and demonstrating that transportation plans do not exceed those budgets.

In April 2006, affected transportation and air quality agencies in the NY-NJ-CT $PM_{2.5}$ Nonattainment Area met the initial one year deadline for demonstrating conformity through a complex multi-state interagency consultation process that showed future year transportation-related emissions throughout the multi-state Nonattainment Area would not exceed base year emission levels from 2002 using the second optional test above. The State of New Jersey subsequently proposed local early conformity budgets that were approved by EPA on July 10, 2006 for use in that state's future conformity determinations until final budgets are in place through the $PM_{2.5}$ attainment SIP process. With early budgets now in place for its portion of the Nonattainment Area, New Jersey is no longer obligated to take part in the multi-state consultation process.

As described in this TSD, the Connecticut Department of Environmental Protection (CT DEP) has also decided to pursue adoption of early $PM_{2.5}$ conformity budgets for the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area, also referred to as the CT portion of the NY-NJ-CT NAA. The early budgets will not only simplify the administrative process for demonstrating conformity, but also will ensure interim progress will be made toward achieving the 1997 annual $PM_{2.5}$ NAAQS by limiting transportation plans to emission levels more restrictive than allowed by the current 2002 baseline year interim emissions test.

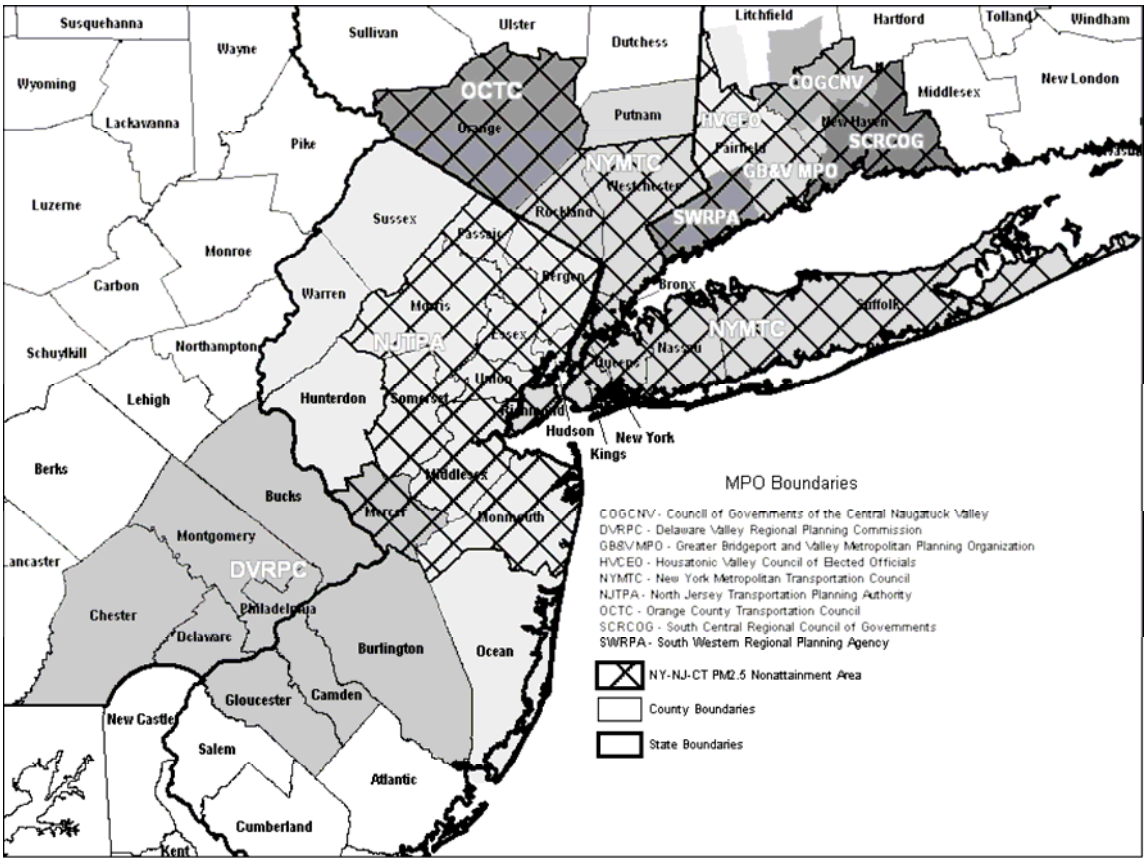

Figure 1: The New York-New Jersey-Connecticut $PM_{2.5}$ Nonattainment Area (in cross-hatch)

II. METHODOLOGY

EPA's $PM_{2.5}$ transportation conformity rule (69 FR 40028; July 1, 2004) indicates that states with $PM_{2.5}$ Nonattainment Areas can elect to submit a SIP revision containing early motor vehicle emission budgets that address the new NAAQS in advance of a complete SIP attainment demonstration. Early budget submittals do not need to demonstrate attainment, but must achieve some progress towards attainment, consistent with adopted control measures and projected emissions. Specifically, if total projected emissions from all source categories in the required attainment year of 2009 are shown to be less than in the baseline year of 2002, then the on-road portion of the projected attainment year inventory can be used as the early transportation conformity budget.

In addition to direct $PM_{2.5}$ emissions, EPA's May 6, 2005 conformity rule amendment (70 FR 24282) requires that NOx emissions be considered for $PM_{2.5}$ conformity, unless the state air agency and EPA administrator make a finding that NO_x is not a significant $PM_{2.5}$ contributor. Conversely, VOC, SO_x and ammonia are only to be considered for $PM_{2.5}$ conformity analyses if the state air agency or EPA administrator finds that on-road emissions of these precursors significantly contribute to $PM_{2.5}$ levels. Neither CT DEP nor EPA have made such findings at this point; therefore, NO_x is the only $PM_{2.5}$ precursor considered in the development of early budgets.

This section documents the development of $PM_{2.5}$ and NO_x emission estimates for the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area. Annual $PM_{2.5}$ and NO_x point and area source emission estimates for 2002 were obtained from the 2002 Mid-Atlantic/Northeast Visibility Union (MANE-VU) Emissions Inventory (version 3). Projected point and area source emissions for 2009 were developed by applying growth factors to the 2002 emission estimates. For non-road and on-road sources, 2002 and 2009 emission estimates were developed using EPA's NONROAD2005 and MOBILE6.2 models, respectively. Details on how 2009 emission projections were developed are provided below. Growth factors and local modeling inputs used in the EPA models are attached as Attachment A and Attachment B, respectively.

Area and Point Sources

Forecasted employment data from the Connecticut Department of Labor (CT DOL) were used to develop growth projections for the period from 2002 to 2009 for all area and point source categories, except as noted below.

- United States Census Bureau statewide population[1] projections for 2009 were used to determine growth for area source residential categories, as well as for paved and unpaved road dust emissions.
- Growth factors for all fuel combustion area and point source categories were derived from the United States Department of Energy (US DOE), Energy Information Administration's (EIA's) Annual Energy Outlook 2005 report[2]. The

[1] http://www.census.gov/popest/datasets.html
[2] US DOE, EIA. Annual Energy Outlook 2005, February 2005.

growth factors were determined using 2009 projected energy consumption data for the New England region, as compared to data for the 2002 base year.

- Growth factors for structural fires and forest wildfires were computed using information from the National Fire Safety Association's "Fire Loss in the United States During 2002" and "Fire Loss in the United States During 2004" reports[3]. The number of fires in the northeast region per thousand population are fairly close to the national numbers. However, it was recognized that wildfire activity in the western/southwestern part of the country may increase the growth factor derived from projected values. Using growth factors derived from national data extrapolated for 2009 is not a solid indicator of fire activity in Connecticut. However, fire activity growth factors were derived from the referenced National Fire Safety Association's reports because these growth factors have very little effect on overall emissions inventory totals.

Using a conservative approach, for the purpose of this analysis, CT DEP assumed that no additional emission controls would be applied to area and point sources in the period between 2002 and 2009. This approach is conservative because it does not include $PM_{2.5}$ or $PM_{2.5}$ precursor reductions expected between 2002 and 2009 from recent state regulations which limit SO_2 (i.e., RCSA Section 22a-174-19a) and NO_x (i.e., RCSA Section 22a-174-22) or federal requirements (i.e., CAIR ozone season NO_x program).

Non-Road Sources

Non-road emissions in 2002 and 2009 were developed, for all categories except aircraft, locomotive and commercial marine vessels, using the default growth and control assumptions built into EPA's NONROAD2005 model, with appropriate local inputs for temperatures and fuel composition. The 2002 MANE-VU Emissions Inventory was used as the basis for aircraft, locomotive and commercial marine vessels. Growth factors for aircraft activity were calculated from aircraft operational count data at Bradley International Airport[4]. Airport activity was extrapolated for 2009, assuming the same growth witnessed in airport activity of years prior to the events of September 11, 2001. Growth factors for marine activity were obtained from CT DOL employment data for water transportation. Growth factors for locomotive activity were obtained from locomotive fuel sales data from EIA[5].

On-Road Sources

On-road motor vehicle emission estimates, for 2002 and 2009, were compiled by applying MOBILE6.2 modeled emission factors to the State of Connecticut Department of Transportation's (ConnDOT's) Travel Demand Model for those years. This approach, including data and assumptions, is similar to that employed in ConnDOT's most recent transportation conformity analysis[6]. The interagency consultation process was used to

[3] National Fire Protection Association. *Fire Loss in the United States During 2002,* September 2003. *Fire Loss in the United States During 2004,* September 2005.
[4] http://www.bradleyairport.com/news/news.php.
[5] http://www.eia.doe.gov/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/foks.html.
[6] Connecticut Department of Transportation. PM2.5 Air Quality Conformity Determination of the 2004 Regional Transportation Plans and the FY 2007-2011 Transportation Improvement Programs for the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area, June 2006.

develop the proper procedures and methodologies for estimating annual $PM_{2.5}$ and NO_x emissions. CT DEP provided some of the MOBILE6.2 model inputs, such as the motor vehicle inspection and maintenance program input file and vehicle age distributions, while ConnDOT used up-to-date vehicle miles traveled (VMT) data to produce the appropriate VMT distribution files. MOBILE6.2 output emission factors and VMT data were used in the post-processing efforts to develop emission projections.

Similar to transportation budgets established previously for ozone precursors, a modeling uncertainty factor was added to the on-road emission projections and included in the resulting budgets for 2009 to avoid unnecessary complications in future conformity determinations due to minor changes to EPA or the United States Department of Transportation Federal Highway Administration (FHWA) modeling procedures. The modeling uncertainty factor used was 2%, which is a reduction from the previously used uncertainty factor of 3%. The 3% value has historically been used by Connecticut for planning purposes.

III. EMISSION ESTIMATES AND 2009 CONFORMITY BUDGETS

Table 1 compares 2002 $PM_{2.5}$ emission estimates to 2009 $PM_{2.5}$ emission projections. Annual direct $PM_{2.5}$ emissions from area and point sources are projected to increase by 2% and 8% percent, respectively. However, emissions from nonroad and onroad sources are projected to decrease by 13% and 31%, respectively. Overall this represents a 2.5%, or 168 tons per year, reduction in direct $PM_{2.5}$ emissions between 2002 and 2009.

CT DEP considers that the estimated direct $PM_{2.5}$ emission reduction of 2.5% is understated due to likely overestimations of $PM_{2.5}$ emissions resulting from two area source categories, namely re-entrained road dust and residential wood-burning activities. This determination for re-entrained road dust is based on examination of local speciated $PM_{2.5}$ monitoring data, as documented in Attachment C. Attachment C also contains material indicative of overestimations in residential wood-burning activity.

If the fraction of road dust and residential wood-burning emission estimates were decreased, to be consistent with observed monitoring data and wood-burning control analyses, the nonroad and onroad sectors would become a larger proportion of total $PM_{2.5}$ emissions. Therefore, the net result in overall direct $PM_{2.5}$ emission reductions between 2002 and 2009 would be much greater than the 2.5% reflected in this TSD.

TABLE 1

	DIRECT ANNUAL $PM_{2.5}$ EMISSIONS (tons/year)											
	AREA			NONROAD			POINT			ONROAD		
COUNTY	2002	2009	Dif.	2002	2009	Dif.	2002	2009	Dif.	2002	2009	Dif.
Fairfield	2,349	2,388		526	454		190	202		269	185	
New Haven	2,427	2,476		448	395		202	220		252	175	
Total for CT portion of NY-NJ-CT NAA	4,776	4,864	+88 (+2%)	974	849	-125 (-13%)	392	422	+30 (+8%)	521	**360**	-161 (-31%)

Overall Comparison of Direct PM2.5 Emissions for the CT Portion of the NY/NJ/CT PM2.5 Nonattainment Area

2002: 6,663 tpy 2009: 6,495 tpy Difference: -168 tpy (-2.5%)

Table 2 compares 2002 NO_x emission estimates to 2009 NO_x emission projections. Annual NO_x emissions from area and point sources are projected to increase by 4% and 7% percent, respectively. However, emissions from nonroad and onroad sources are projected to decrease by 12% and 46%, respectively. Overall this represents a 27%, or 16,766 tons per year, reduction in NO_x emissions between 2002 and 2009.

TABLE 2

	ANNUAL NO_x EMISSIONS (tons/year)											
	AREA			NONROAD			POINT			ONROAD		
COUNTY	2002	2009	Dif.	2002	2009	Dif.	2002	2009	Dif.	2002	2009	Dif.
Fairfield	3,134	3,269		7,150	6,104		3,892	4,183		17,411	9,314	
New Haven	2,937	3,061		7,935	7,108		2,305	2,429		16,435	8,965	
Total for CT portion of NY-NJ-CT NAA	6,071	6,330	+259 (+4%)	15,085	13,212	-1,873 (-12%)	6,197	6,612	+415 (+7%)	33,846	**18,279**	-15,567 (-46%)

Overall Comparison of NOx Emissions for the CT Portion of the NY/NJ/CT PM2.5 Nonattainment Area

2002: 61,199 tpy 2009: 44,433 tpy Difference: -16,766 tpy (-27%)

The overall projected reductions in annual direct $PM_{2.5}$ and NO_x emissions demonstrate that adopted control programs will ensure progress between 2002 and 2009 toward attaining the $PM_{2.5}$ NAAQS, thus meeting EPA's criteria for establishing early $PM_{2.5}$ and NO_x transportation conformity budgets. The 2009 annual budgets for Connecticut's portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area, as summarized in Table 3, are 360 tons per year of direct $PM_{2.5}$ and 18,279 tons per year of NO_x. These values represent the onroad portion of the 2009 emissions projections. ConnDOT and affected Metropolitan Planning Organizations must use these transportation conformity budgets for future transportation conformity determinations once EPA finds them adequate or approves them for transportation conformity purposes.

TABLE 3

2009 Transportation Conformity Emission Budgets		
CT portion of the NY-NJ-Long Island-CT $PM_{2.5}$ Nonattainment Area	Direct $PM_{2.5}$ Emissions (tons per year)	Annual NO_x Emissions (tons per year)
	360	**18,279**

ATTACHMENT A:

Growth Factor Selection Table

ATTACHMENT A

SECTOR	SOURCE CATEGORY	GROWTH FACTOR	GROWTH FACTOR SOURCE
AREA	Stationary Source Fuel Combustion: Residential	1.0305	Population Growth
	Mobile Sources: Paved and Unpaved Roads	1.0305	Population Growth
	Stationary Source Fuel Combustion: Industrial-Distillate	1.0588	Fuel Data: Industrial-Distillate
	Stationary Source Fuel Combustion: Industrial-Natural Gas	1	Fuel Data: Industrial-Natural Gas
	Stationary Source Fuel Combustion: Industrial-LPG	1	Fuel Data: Industrial-LPG
	Stationary Source Fuel Combustion: Commercial-Distillate	1.0921	Fuel Data: Commercial-Distillate
	Industrial Process: Food	0.9355	Employment Data: Food Manufacturing
	Industrial Process: Construction-Residential	1.0618	Employment Data: Construction of Buildings
	Industrial Process: Construction-Industrial/Commercial/Road	0.9705	Employment Data: Heavy Construction
	Industrial Process: Mining and Quarrying	0.94	Employment Data: Mining
	Waste Disposal: Open Burning	1.0179	CT Open Burning Data (’03 to ’04 change)
	Miscellaneous Area Sources: Forest Fires	0.964	Fire Data (’01 to ’02 change)
	Miscellaneous Area Sources: Structural Fires	1.091	Fire Data ('03 to '04 change from '02 to '09)
	Miscellaneous Area Sources: Agriculture-Crops	1.0019	Employment Data: Crop Production
POINT	External Combustion Boilers: Electric Generation-Coal	1.1282	Fuel Data: Electric Power-Steam Coal
	External Combustion Boilers: Electric Generation-Residual	1.0198	Fuel Data: Electric Power-Residual
	External Combustion Boilers: Electric Generation-Distillate	0.8571	Fuel Data: Electric Power-Distillate
	External Combustion Boilers: Electric Generation-Natural Gas	1.1063	Fuel Data: Electric Power-Natural Gas
	External Combustion Boilers: Industrial-Residual	1.3654	Fuel Data: Industrial-Residual
	External Combustion Boilers: Industrial-Distillate	1.0588	Fuel Data: Industrial-Distillate
	External Combustion Boilers: Industrial-Natural Gas	1	Fuel Data: Industrial-Natural Gas
	External Combustion Boilers: Industrial-Liquid Waste	1.1511	Fuel Data: Industrial-Renewable
	External Combustion Boilers: Industrial-Space Heaters-LPG	1	Fuel Data: Industrial-LPG
	External Combustion Boilers: Industrial-Space Heaters-Natural Gas	1	Fuel Data: Industrial-Natural Gas
	External Combustion Boilers: Commercial-Residual	1.0921	Fuel Data: Commercial-Distillate
	External Combustion Boilers: Commercial-Distillate	1.125	Fuel Data: Commercial-Residual
	External Combustion Boilers: Commercial-Natural Gas	1.0657	Fuel Data: Commercial-Natural Gas
	External Combustion Boilers: Commercial-LPG	1	Fuel Data: Commercial-LPG
	Internal Combustion Engines: Electric Generation-Distillate	0.8571	Fuel Data: Electric Power-Distillate
	Internal Combustion Engines: Electric Generation-Natural Gas	1.1063	Fuel Data: Electric Power-Natural Gas
	Internal Combustion Engines: Electric Generation-Kerosene	1.1618	Fuel Data: Delivered Energy-Jet Fuel
	Internal Combustion Engines: Industrial-Distillate	1.0588	Fuel Data: Industrial-Distillate

	Internal Combustion Engines: Commercial-Distillate	1.0921	Fuel Data: Commercial-Distillate
	Internal Combustion Engines: Commercial-Natural Gas	1.0657	Fuel Data: Commercial-Natural Gas
	Internal Combustion Engines: Commercial-LPG	1	Fuel Data: Commercial-LPG
	Internal Combustion Engines: Engine Testing-Gasoline	1	Fuel Data: Commercial-Motor Gasoline
	Industrial Process: Chemical Manufacturing	1.1024	Employment Data: Chemical Manufacturing
	Industrial Process: Chemical Manufacturing-Plastics Production	0.9591	Employment Data: Plastics and Rubber
	Industrial Process: Food and Agriculture-Bakeries	0.9355	Employment Data: Food Manufacturing
	Industrial Process: Food and Agriculture-Tobacco Processing	1.1556	Employment Data: Beverage and Tobacco
	Industrial Process: Primary Metal Production	0.8713	Employment Data: Primary Metal Manufac.
	Industrial Process: Secondary Metal Production	0.915	Employment Data: Fabricated Metal Product
	Industrial Process: Mineral Products	0.8982	Employment Data: Nonmetallic mineral
	Industrial Process: Petroleum Industry	0.9591	Employment Data: Plastics and Rubber
	Industrial Process: Plastics and Rubber	1.0204	Fuel Data: Industrial-Other Petroleum
	Industrial Process: Textile Products	0.9254	Textile Product Mills
	Industrial Process: Fabricated Metal Products	0.915	Employment Data: Fabricated Metal Product
	Industrial Process: Health Care-Hospitals	1.0709	Employment Data: Health and Personal Care
	Industrial Process: In-process Fuel Use-Natural Gas	1	Fuel Data: Industrial-Natural Gas
	Industrial Process: In-process Fuel Use-Distillate	1.0588	Fuel Data: Industrial-Distillate
	Industrial Process: In-process Fuel Use-LPG	1	Fuel Data: Industrial-LPG
	Industrial Process: Miscellaneous Manufacturing	0.9841	Employment Data: Miscellaneous Manufac.
	Petroleum and Solvent Evaporation: Organic Solvent Evaporation	1.1024	Employment Data: Chemical Manufacturing
	Petroleum and Solvent Evaporation: Surface Coating Operations	1.1024	Employment Data: Chemical Manufacturing
	Petroleum and Solvent Evaporation: Surface Coating Operations-Printing	0.8386	Employment Data: Printing and Related
	Petroleum and Solvent Evaporation: Surface Coating Operations-Metal	1.0435	Employment Data: Furniture and Related
	Petroleum and Solvent Evaporation: Surface Coating Operations-Wood	1.0679	Employment Data: Wood Product Manufac.
	Petroleum and Solvent Evaporation: Surface Coating Operations-Aircraft	0.9929	Employment Data: Air Transportation
	Petroleum and Solvent Evaporation: Petroleum Storage	1.0921	Employment Data: Warehousing/Storage
	Petroleum and Solvent Evaporation: Printing/Publishing	1.0503	Employment Data: Publishing Industries
	Petroleum and Solvent Evaporation: Petroleum Product Transportation	1.1252	Fuel Data: Delivered Energy-Petroleum
NON-ROAD	Mobile Sources: Aircraft	1.2923	Aircraft Operation
	Mobile Sources: Marine Vessels	1.1021	Employment Data: Water Transportation
	Mobile Sources: Railroad Equipment	0.529	EIA Locomotive Fuel Data

ATTACHMENT B:

Modeling Inputs Table

ATTACHMENT B

SECTOR	ON-ROAD	NON-ROAD
MODEL	*MOBILE6.2*	*NONROAD2005*
INPUTS	Temperature Data	Temperature Data
	Diesel Sulfur	Diesel Sulfur
	Registration Distribution	
	Inspection & Maintenance Program	
	VMT Data	

MOBILE6.2 Temperature Data:

Two Season	Max Temp (F)	Min Temp (F)
Summer (Apr-Sep)	74.9	51.9
Winter (Oct-Mar)	45.4	26.2

NONROAD2005 Temperature Data:

Four Season	Max Temp (F)	Min Temp (F)	Average Min Temp + 2/3(Max-Min)
Summer (Jun-Aug)	81.6	58.7	74
Fall (Sep-Nov)	61.2	40.3	54.2
Winter (Dec-Feb)	37.5	19.5	31.5
Spring (Mar-May)	60.3	37.5	52.7

MOBILE6.2 Diesel Sulfur:

	2002	2009
Summer Diesel Sulfur	367 ppm	43 ppm
Winter Diesel Sulfur	340 ppm	43 ppm

NONROAD2005 Diesel Sulfur:

	2002*	2009
Diesel Sulfur %	0.2284	0.0351
Marine Diesel Sulfur %	0.2637	0.0435

*Model Default Value

MOBILE6.2 VMT Data:

	2002	2009
Total Summer VMT	7,886,520,325	8,447,294,463
Total Winter VMT	7,098,094,593	7,601,533,618

MOBILE6.2 Inspection & Maintenance Program (2002):

```
> 2002 CT I/M PROGRAMS    Revised 12/13/04
> File has been updated w/2002 stringency/compliance/waiver rates.
> 12/13/04 draft of I/M File.  Current Name CTIM02.d

> Annual I/M test for the pre-81 CARS
> Idle test started 1983 was upgraded to an ASM 2525 test in 1998.
I/M PROGRAM        : 1 1998 2050 1 T/O ASM 2525 PHASE-IN
I/M MODEL YEARS    : 1 1978 1980
I/M VEHICLES       : 1 22222 11111111 1
I/M EXEMPTION AGE  : 1 25
I/M STRINGENCY     : 1 22.0
I/M COMPLIANCE     : 1 94.9
I/M WAIVER RATES   : 1 5.55 3.83

> Biennial I/M for the post-80 CARS
> Idle test started 1983 was upgraded to an ASM 2525 test in 1998.
I/M PROGRAM        : 2 1998 2050 2 T/O ASM 2525 PHASE-IN
I/M MODEL YEARS    : 2 1981 2050
I/M VEHICLES       : 2 22222 11111111 1
I/M EXEMPTION AGE  : 2 25
I/M STRINGENCY     : 2 22.0
I/M COMPLIANCE     : 2 94.9
I/M WAIVER RATES   : 2 5.55 3.83

> Annual Evap test for the pre-81 cars
I/M PROGRAM        : 3 1983 2050 1 T/O GC
I/M MODEL YEARS    : 3 1978 1980
I/M VEHICLES       : 3 22222 21111111 1
I/M EXEMPTION AGE  : 3 25
I/M COMPLIANCE     : 3 94.9
I/M WAIVER RATES   : 3 0.00 0.00

> Biennial Evap test for the post-81 cars
I/M PROGRAM        : 4 1983 2050 2 T/O GC
I/M MODEL YEARS    : 4 1981 2050
I/M VEHICLES       : 4 22222 21111111 1
I/M EXEMPTION AGE  : 4 25
I/M COMPLIANCE     : 4 94.9
I/M WAIVER RATES   : 4 0.00 0.00

> Annual I/M test for the pre-81 Trucks (GVWR 8,501-10,000lb)
I/M PROGRAM        : 5 1983 2050 1 T/O IDLE
I/M MODEL YEARS    : 5 1978 1980
I/M VEHICLES       : 5 11111 21111111 1
I/M EXEMPTION AGE  : 5 25
```

```
I/M STRINGENCY     : 5 22.0
I/M COMPLIANCE     : 5 94.9
I/M WAIVER RATES   : 5 5.55 3.83

> Biennial I/M test for the post-80 Trucks (GVWR 8,501-10,000lb)
I/M PROGRAM        : 6 1983 2050 2 T/O IDLE
I/M MODEL YEARS    : 6 1981 2050
I/M VEHICLES       : 6 11111 21111111 1
I/M EXEMPTION AGE  : 6 25
I/M STRINGENCY     : 6 22.0
I/M COMPLIANCE     : 6 94.9
I/M WAIVER RATES   : 6 5.55 3.83
```

MOBILE6.2 Inspection & Maintenance Program (2009):

```
>CT I/M PROGRAMS for all years 2005 and later (modified Jun 05
PMB/AG to reflect DMV info that 8,501-10,000 lb get TSI & GC (no
OBD)
>Biennial OBDII I/M "tailpipe" test for post-MY1995 gasoline
vehicles up to 8,500 lbs GVWR. Program start year reflects OBD test
that replaced the ASM test (in operation since 1998) which in turn
replaced the Idle test (in operation since 1983) per agreement with
EPA.
I/M PROGRAM        : 1 1983 2050 2 TRC OBD I/M
I/M MODEL YEARS    : 1 1996 2050
I/M GRACE PERIOD   : 1 4
I/M EXEMPTION AGE  : 1 25
I/M VEHICLES       : 1 22222 11111111 1
I/M STRINGENCY     : 1 22.0
I/M COMPLIANCE     : 1 96.0
I/M WAIVER RATES   : 1 1.0 1.0

>Biennial OBDII evaporative "test" for post-MY1995 gasoline
vehicles up to 8,500 lbs GVWR
I/M PROGRAM        : 2 1983 2050 2 TRC EVAP OBD
I/M MODEL YEARS    : 2 1996 2050
I/M GRACE PERIOD   : 2 4
I/M EXEMPTION AGE  : 2 25
I/M VEHICLES       : 2 22222 11111111 1
I/M COMPLIANCE     : 2 96.0
I/M WAIVER RATES   : 2 1.0 1.0

>Biennial 2500/IDLE I/M tailpipe test for all HDGT 8,501 - 10,000
lbs GVWR (per above comment)
I/M PROGRAM        : 3 1983 2050 2 TRC 2500/IDLE
I/M MODEL YEARS    : 3 1981 2050
I/M GRACE PERIOD   : 3 4
```

```
I/M EXEMPTION AGE  : 3 25
I/M VEHICLES       : 3 11111 21111111 1
I/M STRINGENCY     : 3 22.0
I/M COMPLIANCE     : 3 96.0
I/M WAIVER RATES   : 3 1.0 1.0

>Biennial GC evaporative "test" for all HDGT 8,501 - 10,000 lbs
(per above comment)
I/M PROGRAM        : 4 1983 2050 2 TRC GC
I/M MODEL YEARS    : 4 1981 2050
I/M GRACE PERIOD   : 4 4
I/M EXEMPTION AGE  : 4 25
I/M VEHICLES       : 4 11111 21111111 1
I/M COMPLIANCE     : 4 96.0
I/M WAIVER RATES   : 4 1.0 1.0

>Biennial ASM I/M tailpipe test for pre-96 gasoline vehicles up to
8,500 lbs GVWR
I/M PROGRAM        : 5 1983 2050 2 TRC ASM 2525 FINAL
I/M MODEL YEARS    : 5 1981 1995
I/M GRACE PERIOD   : 5 4
I/M EXEMPTION AGE  : 5 25
I/M VEHICLES       : 5 22222 11111111 1
I/M STRINGENCY     : 5 22.0
I/M COMPLIANCE     : 5 96.0
I/M WAIVER RATES   : 5 1.0 1.0

>Biennial Gas Cap evaporative test for pre-96 gasoline vehicles up
to 8,500 lbs GVWR
I/M PROGRAM        : 6 1983 2050 2 TRC GC
I/M MODEL YEARS    : 6 1981 1995
I/M GRACE PERIOD   : 6 4
I/M EXEMPTION AGE  : 6 25
I/M VEHICLES       : 6 22222 11111111 1
I/M COMPLIANCE     : 6 96.0
I/M WAIVER RATES   : 6 1.0 1.0
```

MOBILE6.2 Registration Distribution:

```
* SWP 12/07/2002:  2002 CT Registration Data provided by Klausmeier and ERG to
* be processed via a VIN Decoder and matched to a light duty vehicle class.
* Motorcycles were analyzed separately by the Connecticut Department of Environmental
* Protection.  Light duty vehicle results were specified to or modified to:
* 1) exclude Model Year 2003 data;
* 2) include all Model Year 2002 vehicles (no fraction was eliminated);
* 3) include all pre-1972 data, as well as all other data excluded by ERG that
*    could be matched up with a Mobile 6 vehicle type and model year;
* Note that CT data were used for only LDV, LDT1, LDT2, LDT3, and LDT4 vehicles
* and Motorcycles; all others age distributions used were MOBILE6 default values.
*
* Calendar Year:         2002.000User-Input
* This file contains some CT specific and some default MOBILE6 values for
* the distribution of vehicles by age for July of any calendar year. Data was
* pulled from the DMV Grand List 10/1/2002, but should correspond to July considering
* that all the distribution excludes any model year 2003 vehicles.
* There are sixteen (16) sets of values representing 16 combined gasoline/diesel vehicle
* class distributions.  These distributions are split for gasoline and diesel
* using the separate input (or default) values for diesel sales fractions.
* Each distribution contains 25 values, which represent the fraction of
* all vehicles in that class (gasoline and diesel) of that age in July.
* The first number is for age 1 (calendar year minus model year plus one)
* and the last number is for age 25.  The last age includes all vehicles
* of age 25 or older.  The first number in each distribution is an integer
* which indicates which of the 16 vehicle classes are represented by the
* distribution.  The sixteen vehicle classes are:
*
*  1  LDV    Light-Duty Vehicles (Passenger Cars)
*  2  LDT1   Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
*  3  LDT2   Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
*  4  LDT3   Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
*  5  LDT4   Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
*  6  HDV2B  Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)
*  7  HDV3   Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)
*  8  HDV4   Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)
*  9  HDV5   Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)
* 10  HDV6   Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)
* 11  HDV7   Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)
* 12  HDV8A  Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)
* 13  HDV8B  Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)
```

```
* 14  HDBS   School Busses
* 15  HDBT   Transit and Urban Busses
* 16  MC     Motorcycles (All)
*
* The 25 age values are arranged in two rows of 10 values followed by a row
* with the last 5 values.  Comments (such as this one) are indicated by
* an asterisk in the first column. Empty rows are ignored.  Values are
* read "free format," meaning any number may appear in any row with as
* many characters as needed (including a decimal) as long as 25 values
* follow the initial integer value separated by a space.
*
* If all 28 vehicle classes do not need to be altered from the default
* values, then only the vehicle classes that need to be changed need to
* be included in this file.  The order in which the vehicle classes are
* read does not matter, however each vehicle class set must contain 25
* values and be in the proper age order.
*
REG DIST
* RESULTING MOBILE6-BASED REGISTRATION FRACTIONS LDV, LDT1, LDT2, LDT3,
LDT4 and MC CT Specific
*
* MOBILE6 REGISTRATION FRACTIONS BY VEHICLE CLASS AND AGE
* LDV  - Connecticut Specific 2002 Combined Diesel and Gas Vehicle Data
 1 0.0700 0.0803 0.0851 0.0757 0.0708 0.0714 0.0618 0.0705 0.0593 0.0569
   0.0490 0.0427 0.0416 0.0396 0.0331 0.0280 0.0198 0.0131 0.0087 0.0047
   0.0027 0.0021 0.0016 0.0023 0.0092
* LDT1  - Connecticut Specific 2002 Combined Diesel and Gas Vehicle Data
 2 0.0745 0.0458 0.0350 0.0342 0.0412 0.0415 0.0594 0.0691 0.0708 0.0544
   0.0404 0.0505 0.0555 0.0705 0.0639 0.0713 0.0489 0.0278 0.0169 0.0081
   0.006 0.0053 0.0008 0.001 0.0072
* LDT2  - Connecticut Specific 2002 Combined Diesel and Gas Vehicle Data
 3 0.1051 0.1115 0.1209 0.1029 0.1030 0.0930 0.0697 0.0677 0.0586 0.0453
   0.0311 0.0218 0.0128 0.0144 0.0191 0.0053 0.0046 0.0033 0.0026 0.0018
   0.0007 0.0006 0.0006 0.0009 0.0027
* LDT3  - Connecticut Specific 2002 Combined Diesel and Gas Vehicle Data
 4 0.0824 0.0993 0.0875 0.0994 0.0632 0.0586 0.0497 0.0643 0.0526 0.0378
   0.0273 0.0204 0.0280 0.0418 0.0451 0.0321 0.0269 0.0201 0.0128 0.0081
   0.0036 0.0024 0.0019 0.0051 0.0296
* LDT4  - Connecticut Specific 2002 Combined Diesel and Gas Vehicle Data
 5 0.1580 0.1399 0.1159 0.1244 0.0929 0.0778 0.0489 0.0589 0.0397 0.0181
   0.0119 0.0071 0.0135 0.0113 0.0164 0.0098 0.0083 0.0077 0.0044 0.0022
   0.0017 0.0005 0.0002 0.0069 0.0236
* HDV2B - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
 6 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV3 - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
```

7 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
0.0152 0.0138 0.0126 0.0114 0.0499
* HDV4 - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
8 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDV5 - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
9 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDV6 - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
10 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDV7 - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
11 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8a - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
12 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8b - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
13 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
0.0204 0.0191 0.0178 0.0167 0.0797
* HDBS - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
14 0.0393 0.0734 0.0686 0.0641 0.0599 0.0559 0.0522 0.0488 0.0456 0.0426
0.0398 0.0372 0.0347 0.0324 0.0303 0.0283 0.0264 0.0247 0.0231 0.0216
0.0201 0.0188 0.0176 0.0165 0.0781
* HDBT - EPA MOBILE 6 Default Combined Diesel and Gas Vehicle Data
15 0.0307 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0613
0.0611 0.0607 0.0595 0.0568 0.0511 0.0406 0.0254 0.0121 0.0099 0.0081
0.0066 0.0054 0.0044 0.0037 0.0114
* Motorcycles - Connecticut Specific 2002 Data
16 0.0975 0.0943 0.0744 0.0676 0.0500 0.0425 0.0401 0.0357 0.0290 0.0285
0.0215 0.0170 0.0182 0.0189 0.0181 0.0231 0.0308 0.0298 0.0217 0.0257
0.0351 0.0302 0.0263 0.0183 0.1057

ATTACHMENT C:

Weight of Evidence

ATTACHMENT C

WEIGHT OF EVIDENCE

The emission inventory projections described in the main body of this document demonstrate that adopted control programs will ensure progress toward attaining the 1997 annual $PM_{2.5}$ NAAQS, with an overall reduction between 2002 and 2009 of 27% for NOx emissions and 2.5% for direct $PM_{2.5}$ emissions. As discussed below, monitored $PM_{2.5}$ levels and a soon-to-be-released review of wood burning sources indicate that current direct $PM_{2.5}$ inventory estimates of re-entrained road dust and residential wood burning emissions may be significantly overestimated. This information provides additional weight of evidence that even greater progress towards $PM_{2.5}$ attainment will occur.

Re-entrained Road Dust Emissions

The 2002 MANE-VU Emissions Inventory Version 3 road dust emissions used in this report reflect revised emission estimation methods released be EPA in March 2006. The road dust emissions from the 2002 MANE-VU Emissions Inventory Version 3 are identical to those contained in EPA's 2002 Final NEI Version 2.0 which was released on October 23, 2006. Although the revised methods provide lower emission estimates than previous procedures, comparison to available speciated $PM_{2.5}$ monitoring data indicates that road dust emissions may still be overestimated. This can be shown by comparing emission inventory estimates and monitored levels for combustion-related sources to those for road dust sources.

The 2002 MANE-VU inventory estimates Connecticut combustion-related carbonaceous $PM_{2.5}$ emissions as about 14,500 tons per year. Statewide dust-related $PM_{2.5}$ emissions in Connecticut are estimated as about 4,807 tons per year, or about 33% of the carbonaceous emissions. However, using Connecticut speciated monitoring data (see Table C-1), the actual measured ratio of the natural dust component to the carbonaceous component is about 6.5%. Assuming the inventory estimates of carbonaceous $PM_{2.5}$ emissions is correct and the monitoring data is representative of statewide conditions, statewide dust-related emissions are more likely on the order of 943 tons per year (6.5% of 14,500 tons/year). Therefore, MANE-VU $PM_{2.5}$ fugitive dust inventory emissions are likely over-estimated by about a factor of five (4,807 tons per year divided by 943 tons/year). Although these are statewide calculations, the level of overestimation would be comparable when applied to Fairfield and New Haven counties, which comprise the Connecticut portion of the NY-NJ-CT $PM_{2.5}$ Nonattainment Area.

Table C-1
Connecticut Speciated PM2.5 Data

Site	Dates	Carbonaceous (%)	Natural Dust (%)	Ratio (Natural to Carbonaceous) %
Westport	Apr-02 to May-03	51.38	3.38	6.58
New Haven (State Street)	Jun-03 to Feb-04	45.43	2.90	6.39
New Haven (Criscuolo Park)	Feb-04 to Mar-06	48.41	3.23	6.66
Average		48.41	3.17	6.54

Residential Wood Burning Emissions

In addition, a recent study conducted by OMNI Environmental Services, Inc, for the Mid-Atlantic Regional Air Management Association (MARAMA) indicates that residential wood burning emission inventory estimates are likely over-estimated[7]. OMNI concludes that statewide residential wood $PM_{2.5}$ emissions in Connecticut are actually about 4,400 tons per year. Both the 2002 MANE_VU inventory and EPA's 2002 NEI estimate statewide residential wood $PM_{2.5}$ emissions are about 8,000 tons per year. Therefore, MANE-VU and NEI emission inventory estimates of $PM_{2.5}$ emissions from residential wood burning in Connecticut are about 80% higher than the values reported by OMNI.

Conclusion

If the area source emissions of Table 1 in Section III of the TSD were adjusted downward to reflect the overestimations of dust and wood burning emissions, overall reductions in direct $PM_{2.5}$ emissions between 2002 and 2009 would be even greater than the 2.5% cited in this report. Based on this weight of evidence analysis, CT DEP is confident that current programs will ensure progress towards attainment through 2009.

[7] OMNI Environmental Services, Inc. Prepared for: MARAMA. *Task 4, Technical Memorandum 2 (Emission Inventory): Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region.* June 9, 2006. Table 5.2, Emission Inventory Summary.