

**Technical Support Document
for the
Development of the 2007
Emission Inventory
for Regional Air Quality Modeling
in the Northeast / Mid-Atlantic Region**

Prepared for:

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About MARAMA

The Mid-Atlantic Regional Air Management Association, Inc. is a voluntary, non-profit association of ten state and local air pollution control agencies. MARAMA's 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. MARAMA provides cost-effective approaches to regional collaboration by pooling resources to develop and analyze data, share ideas, and train staff to implement common requirements.

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Acronyms and Abbreviations

| Acronym | Description |
|-----------------------|--|
| CAMD | Clean Air Markets Division (USEPA) |
| CAP | Criteria Air Pollutant |
| CEM | Continuous Emission Monitoring |
| CMV | Commercial Marine Vessel |
| CO | Carbon Monoxide |
| EGU | Electric Generating Unit |
| ERTAC | Eastern Regional Technical Advisory Committee |
| FIPS | Federal Information Processing Standard |
| GSE | Ground Support Equipment |
| MANE-VU | Mid-Atlantic/Northeast Visibility Union |
| MANE-VU+VA | MANE-VU States plus Virginia |
| MAR | Marine, Airport, Rail |
| MARAMA | Mid-Atlantic Regional Air Management Association |
| MOBILE6 | USEPA model |
| MOVES | Motor Vehicle Emissions Simulator |
| NAICS | North American Industry Classification System code |
| NCD | National County Database |
| NEI | National Emission Inventory |
| NESCAUM | Northeast States for Coordinated Air Use Management |
| NH ₃ | Ammonia |
| NIF3.0 | National Emission Inventory Input Format Version 3.0 |
| NMIM | National Mobile Input Model |
| NOF3.0 | National Emission Inventory Output Format Version 3.0 |
| NONROAD | USEPA model |
| NO _x | Oxides of nitrogen |
| OAQPS | Office of Air Quality Planning and Standards (USEPA) |
| ORL | One-record-per-line (SMOKE Format) |
| OTAQ | Office of Transportation and Air Quality (USEPA) |
| PFC | Portable Fuel Container |
| PM-CON | Primary PM, Condensable portion only (all < 1 micron) |
| PM-FIL | Primary PM, Filterable portion only |
| PM-PRI | Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON |
| PM ₁₀ -FIL | Primary PM ₁₀ , Filterable portion only |
| PM ₁₀ -PRI | Primary PM ₁₀ , includes filterables and condensables, PM ₁₀ - PRI = PM ₁₀ -FIL + PM-CON |

| Acronym | Description |
|----------|---|
| PM25-FIL | Primary PM2.5, Filterable portion only |
| PM25-PRI | Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON |
| RWC | Residential Wood Combustion |
| SEMAP | Southeast Modeling, Analysis and Planning |
| SIC | Standard Industrial Classification code |
| SIP | State Implementation Plan |
| SCC | Source Classification Code |
| S/L | State/local |
| SMOKE | Sparse Matrix Operator Kernel Emissions |
| SO2 | Sulfur Dioxide |
| USEPA | U.S Environmental Protection Agency |
| VISTAS | Visibility Improvement State and Tribal Association of the Southeast |
| VMT | Vehicle Miles Traveled |
| VOC | Volatile Organic Compounds |

1.0 INTRODUCTION

This technical support document (TSD) explains the data sources, methods, and results for preparing the 2007 criteria air pollutant (CAP) and ammonia (NH₃) emission inventory for the Northeast and Mid-Atlantic/Northeast region. The region includes the Mid-Atlantic / Northeast Visibility Union (MANE-VU) area plus Virginia. In this document, this region will be referred to as the MANE-VU+VA region. The MANE-VU+VA region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. Local air planning agencies include Philadelphia and Allegheny County, Pennsylvania.

1.1 INVENTORY PURPOSE

The MANE-VU+VA regional inventory will be used to concurrently address national ambient air quality standard (NAAQS) requirements for the new ozone and fine particle ambient standards and to evaluate progress towards long-term regional haze goals. Similar pollutant emissions and atmospheric processes control chemical formation and transport of ozone, fine particles, and regional haze. Therefore, similar technical analyses are necessary to evaluate air quality benefits of emissions controls. The emissions inventory will support a single integrated, one-atmosphere air quality modeling platform to support State air quality attainment demonstrations.

The U.S. Environmental Protection Agency (USEPA) has provided guidance on developing emission inventories to be used with models and other analyses for demonstrating attainment of air quality goals for ozone, fine particles, and regional haze (USEPA 2007a). According to the USEPA guidance, there are potentially two different base year emissions inventories. One is the base case inventory which represents the actual emissions for the meteorological period that is being modeled. This inventory is generally used for model performance evaluations. The second potential base year inventory is called the baseline inventory, which is generally used as the basis for projecting emissions to the future. The base case inventory may include day specific information (e.g. hourly continuous emission monitoring data for point sources) that USEPA considers not appropriate for using in future year projections. Therefore, the baseline inventory may need to replace the day specific emissions with average or “typical” emissions (for certain types of sources). For the 2007 MANE-VU+VA inventory, the base case and baseline inventories are one in the same.

1.2 POLLUTANTS

The inventory includes annual emissions for carbon monoxide (CO), ammonia (NH₃), oxides of nitrogen (NO_x), particulate matter (PM), sulfur dioxide (SO₂), and volatile organic compounds (VOC). The PM species in the inventory are categorized as: filterable and condensable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM₁₀-PRI and PM₂₅-PRI); filterable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM₁₀-FIL and PM₂₅-FIL); and condensable particles (PM-CON). Note that PM₁₀-PRI equals the sum of PM₁₀-FIL and PM-CON, and PM₂₅-PRI equals the sum of PM₂₅-FIL and PM-CON.

1.3 SOURCE CATEGORIES

Emission inventory data from five general categories are needed to support air quality modeling: stationary point-sources, stationary area-sources, on-road mobile sources, nonroad mobile sources (including aircraft, railroad, and marine vessels), and biogenic/geogenic emissions. These sectors are described as follows:

- **Point Sources** are individual facilities and are further subdivided by stack, emission unit (“point”), and emission process (“segment”). The point source data include source-specific information on the location of sources (e.g., latitude/longitude coordinates); stack parameters (stack diameter and height, exit gas temperature and velocity); type of emission process (source classification code {SCC}); and annual emissions. Point sources were classified as electric generating units (EGUs) and non-electric generating units (nonEGUs). Most point source emissions data is directly certified by the facility and reported to the State agency or USEPA.
- **Stationary Area Sources** include sources that in and of themselves are quite small, but in aggregate may comprise significant emissions. Examples include emissions from small industrial/commercial facilities, residential heating furnaces, VOCs volatilizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application. Emissions were calculated using emission factors and activity data on a county and source category basis.
- **On-road Mobile Source** emissions include sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emissions were calculated by the Northeast States for Coordinated Air

Use Management (NESCAUM) using the USEPA Motor Vehicle Emission Simulator (MOVES) model in concert with vehicle miles traveled (VMT) data.

- **Non-road Mobile Sources** include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and locomotives, the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Since the NONROAD model does not include emissions from marine vessels, airplanes, and locomotives, these emissions were estimated using the latest USEPA guidance or by groups such as the Eastern Regional Technical Advisory Committee (ERTAC).
- **Biogenic** emissions are emitted by natural sources, such as plants, trees, and soils. The sharp scent of pine needles, for instance, is caused by monoterpenes, which are among the group of VOCs. The USEPA developed estimates of biogenic emissions from vegetation for natural areas, crops, and urban vegetation. The USEPA estimates take into account the geographic variations in vegetation land cover and species composition, as well as seasonal variations in leaf cover.

For all sectors, emissions data were compiled on an annual basis to represent 2007 actual emissions and meteorology. For certain large EGUs and nonEGUs, actual hourly 2007 emissions data were adapted for use in the inventory. For sources with emissions estimated by NONROAD model, emissions were compiled as monthly total emissions. For sources included in the MOVES model, emissions will be compiled on an hourly basis.

1.4 DATA FORMATS

The annual mass emissions inventory files were prepared in the National Emissions Inventory (NEI) Output Format Version 3.0 (NOF 3.0). These annual emission inventories will be converted (through the emissions modeling process) from their original resolution (e.g., annual, county level) to input files for air quality models. These input files generally require emissions to be specified by model grid cell, hour, and model chemical species. The emission modelers in the MANE-VU+VA region are using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system and data formats. Ancillary files (holding spatial, temporal, and speciation profile data) were prepared in SMOKE compatible format. Various spreadsheets summarizing emissions by county, sector, source classification code, and pollutant were also prepared.

1.5 SUMMARY OF INVENTORY DEVELOPMENT PROCESS

Work on Version 1 of the 2007 MANE-VU+VA inventory began in April 2009. Preparation of the consolidated inventory for point, area, onroad, and nonroad sources started with the inventories submitted by State and local (S/L) as well as input files needed by the NONROAD and MOVES models. For certain area and nonroad source categories, the S/L submittals were supplemented 2008 NEI data. In addition, the Carnegie Mellon Ammonia model was exercised to agricultural ammonia emissions. Work products developed by ERTAC were used including the USEPA wood smoke tool and the Area Source emission factor harmonization project.

The USEPA's format and content quality assurance (QA) programs (and other QA checks not included in USEPA's QA software) were run to identify format and/or data content issues (EPA, 2004). MACTEC Engineering and Consulting, Inc. (MACTEC) worked with the S/L agencies and the staff of the Mid-Atlantic Regional Air Management Association (MARAMA) to resolve QA issues and augment the inventories to fill data gaps in accordance with the Quality Assurance Project Plan prepared for this project.

Draft versions of the inventories and summary files for each were provided for stakeholder review between October 2009 and August 2010. Stakeholder comments were reviewed by the S/L agencies and revisions to the inventory files were made to incorporate stakeholder comments as approved by each S/L agency. The inventories were finalized in August 2010.

1.6 REPORT ORGANIZATION

Sections 2 and 3 of this TSD present the general and State-specific methods and data sources used to develop the MANE-VU+VA 2007 annual inventory for point sources and hourly emissions for large point sources, respectively. Sections 4 through 7 present the methods and data used to develop the inventory for area sources, nonroad marine vessel/airport/locomotive sources, nonroad sources included in the NONROAD model, and onroad sources included in the MOVES model. Section 8 documents the inventory, temporal allocation, speciation, and spatial allocation modeling input files used for the MANE-VU+VA 2007 inventory for all sectors. Section 9 identifies the file names for all final deliverable products. References for the TSD are provided in Section 10.

2.0 ANNUAL 2007 INVENTORY FOR POINT SOURCES

2.1 INITIAL DATA SOURCES AND QA REVIEW

The 2007 annual point source inventory was developed using the 2007 inventories that S/L agencies submitted to MARAMA and data from the USEPA's Clean Air Markets Division (CAMD) hourly emissions database.

2.1.1 Initial State NIF Submittals

State and local (S/L) agencies prepared and submitted emission inventory files in the National Emissions Inventory (NEI) Input Format Version 3.0 (NIF 3.0). The NIF format includes eight tables: Transmittal (TR), Site (SI), Emission Unit (EU), Emission Release Point (ER), Emission Process (EP), Emission Period (PE), Emission (EM), and Control Equipment (CE). States were requested to submitted 2007 data for those major sources that they would normally submit to USEPA during the 3-year requirements of the Consolidated Emission Reporting Rule. All 13 MANE-VU+VA agencies submitted point source inventories to MARAMA. In addition, Allegheny and Philadelphia Counties in Pennsylvania each submitted their own point source inventories.

Upon receipt of the NIF submittals, MACTEC performed an initial review of the S/L inventories with the following QA checks:

- EPA's Basic Format and Content Checker tool was used to verify format and check for referential integrity and duplicate record issues. Only very minor issues were identified and were resolved by MACTEC without the need for S/L assistance.
- Facility-level comparisons were made between the MANE-VU Version 3/VISTAS Best and Final 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2002 inventory but not in the 2007 inventory. For four S/L agencies (NY, PA, Allegheny and Philadelphia Counties), the number of facilities included in the 2007 were far less than the number of facilities reported in 2002. These S/L agencies provided revised files with a lower facility emission cutoff level to ensure that all major sources were included in the 2007 inventory. S/L agencies were asked to review this list and confirmed that facilities not in the 2007 inventory were either closed or included in the area source inventory.
- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2007 inventory but not in the 2002 inventory. S/L agencies verified the reasonableness of this list of sources.

- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities that were included in both the 2002 inventory and 2007 inventory. Facility-level emission changes were calculated, large differences between 2002 and 2007 emissions were flagged, and S/L agencies reviewed and confirmed the reasonableness of the emission changes between 2002 and 2007.
- Facility-level ammonia emissions were obtained from the USEPA 2007 Toxic Release Inventory (USEPA 2009a) and were compared to the ammonia emissions in the S/L agency submittal. S/L agencies reviewed the TRI data to ensure that any large (> 100 tons per year) ammonia sources were included in the 2007 MANE-VU+VA inventory.

Following this initial QA review, these individual inventory files were consolidated into a single NIF database. S/L responses and updates to the inventory files resulting from the initial QA review are discussed later in this document.

2.1.2 EPA CAMD Hourly Emissions Data

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. MARAMA downloaded the 2007 CAMD annual inventory containing NO_x and SO₂ emissions, heat input data and other information from the CAMD web site in May 2009.

MARAMA prepared an initial crosswalk file to match facilities and units in the CAMD inventory to facilities and units in the 2002 MANE-VU Version 3 inventory. In the CAMD inventory, the Office of Regulatory Information Systems (ORIS) identification (ID) code identifies unique facilities and the unit ID identifies unique boilers and internal combustion engines (i.e., turbines and reciprocating engines). MARAMA sent an Excel Workbook to each S/L agencies that contained an initial crosswalk with the ORIS ID and unit ID in the CAMD inventory matched to the state and county FIPS, state facility ID, and EU ID in the 2002 MANE-VU Version 3 inventory. The crosswalk contained the annual 2007 NO_x, SO₂, and heat input (except for those units that are required to report for only 6 months, wherein the data were for the 6 month period). The crosswalk also included other information from the 2002 MANVEU inventory, including stack and location coordinates.

Agencies reviewed and confirmed/corrected/supplemented the information in the crosswalk, provided annual 2007 emissions for the 6-month CAMD reporting units, and provided 2007 annual emissions for other CAPs and NH₃.

The crosswalk was provided to MACTEC who updated the crosswalk in the following ways:

- In most of the S/L inventories, the state and county FIPS and state facility ID together identify unique facilities and the EU ID identifies unique boilers or internal combustion engines. However, in some of the S/L inventories, the emissions for multiple EUs were summed and reported under the same EU ID. To provide a better linkage between the CAMD data and the S/L inventories, MACTEC worked with States to establish the crosswalk at the EU ID / EP ID / ER ID. This effort resulted in a much better linkage between the CAMD and S/L inventories.
- In several cases, the EU ID / EP ID / ER ID identifiers in the 2002 MANVU inventory were changed in the 2007 S/L agency submittals. MACTEC worked with the S/L agencies to correct these broken linkages by updating the EU ID / EP ID / ER ID identifiers as necessary.
- MACTEC downloaded the 2007 CAMD hourly inventory containing hourly NO_x and SO₂ emissions and heat input data from the CAMD website (USEPA 2009b). MACTEC summed the hourly emissions to the annual level (or 6-month level for 6-month reporting units) by emission unit. The summed hourly data was compared to the annual summary data, which matched in virtually all cases. This check was made because MARAMA is considering using the actual 2007 hourly data rather than average temporal profiles in the next round of regional air quality modeling.
- As another QA check, MACTEC compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the State NIF tables that could not be linked to the CAMD table. States reviewed this list and verified that there are no large EGUs missing from the CAMD to NIF crosswalk.

MACTEC prepared a CAMD-to-NIF crosswalk spreadsheet for each State. S/L agencies were asked to review this list and verify that (1) the linkages are correct, (2) there are no large sources missing from the CAMD-to-NIF crosswalk, and (3) there are not any large discrepancies between the emissions reported to CAMD and the emissions reported in the SEMAP database.

There are three types of possible linkages:

- CAMD facility has no match in NIF SI facility table. The emissions from these facilities reported to CAMD are small, and initially accounted for about 0.5% of the NO_x and 0.07% of the SO₂ emissions in the CAMD database.
- CAMD unit could not be matched in NIF. The emissions from these facilities reported to CAMD were small, accounting for about 0.9% of the NO_x and 0.007% of the SO₂ emissions in the CAMD database. Most of the units that could not be matched at the unit level are either peaking units or industrial sources such as paper mills or chemical plants. In addition, there were several instances where multiple CAMD units match to a single NIF record (i.e., units are grouped in the NIF tables but reported individually in the CAMD database).
- CAMD unit matches with a single NIF record or CAMD unit matches with multiple NIF records (in many cases, the NIF tables include multiple records for different fuel types). The emissions from these units reported to CAMD account for about 98.6% of the NO_x and 99.9% of the SO₂ emissions in the CAMD database. In most cases the sum of the emissions from the matching NIF records are generally very close to the CAMD unit level emissions; and S/L agencies verified that linkages were correct.

As another QA check, MACTEC compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the S/L agency NIF tables that could not be linked to the CAMD CEM table to help resolve some of the linkage issues noted above. S/L agencies made significant efforts to improve the crosswalk between the CAMD identifiers and the S/L agency identifiers. Appendix A contains the current version of the crosswalk.

2.2 PM AUGMENTATION

PM compounds may be reported in several forms, as identified in Exhibit 2.1. Exhibit 2.2 provides a count of the number of annual NIF EM table records in each agency's NIF Submittal by type of PM compound. The PM augmentations process was necessary to gap-fill missing PM pollutant complements. For example, if a S/L agency provided only PM₁₀-PRI emissions, the PM augmentation process filled in the PM₂₅-PRI emissions.

A second aspect of the PM augmentation process was to utilize improved condensable emission factors for EGUs. Condensable emissions were not calculated uniformly across all states in the MANE-VU region in the 2002 emissions inventory. Because of the need to model the effect of condensable emissions on regional haze and fine particles, MARAMA instructed MACTEC to use recently updated emission factors for condensable emissions from EGUs.

Exhibit 2.1 – PM Compound Descriptions

| Pollutant Code | Pollutant | Pollutant Description |
|-----------------------|---|--|
| PM-CON | Primary PM Condensable portion only (all < 1 micron) | Material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack. |
| PM-FIL | Primary PM, Filterable portion only | Particles that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train. |
| PM-PRI | Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON | Particles that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. |
| PM10-FIL | Primary PM10, Filterable portion only | Particles with an aerodynamic diameter equal to or less than 10 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train. |
| PM10-PRI | Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON | Particles with an aerodynamic diameter equal to or less than 10 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.) |
| PM25-FIL | Primary PM2.5, Filterable portion only | Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train. |
| PM25-PRI | Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON | Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.) |

Exhibit 2.2 – PM Compounds Reported in State Initial Submittals

| Agency | Number of Annual EM Records in Agency's Initial NIF Submittal | | | | | | |
|------------------------|---|--------|--------|----------|----------|----------|----------|
| | PM-CON | PM-FIL | PM-PRI | PM10-FIL | PM10-PRI | PM25-FIL | PM25-PRI |
| CT ¹ | --- | --- | --- | 122 | 1,300 | --- | 5 |
| DE | 449 | --- | --- | 886 | 756 | 734 | 699 |
| DC | 70 | --- | --- | 70 | 70 | 70 | 70 |
| ME | --- | 9 | --- | 1,150 | --- | 1,053 | --- |
| MD | 1,265 | --- | --- | 3,543 | 3,750 | 3,040 | 2,477 |
| MA | --- | --- | 6 | 6,614 | --- | 5,930 | --- |
| NH | --- | 463 | --- | 464 | --- | 461 | --- |
| NJ | --- | --- | 5,966 | --- | 5,848 | --- | --- |
| NY | --- | --- | 1,220 | --- | 1,201 | --- | --- |
| PA | --- | --- | --- | --- | 5,738 | --- | 3,949 |
| Allegheny ² | 434 | 881 | --- | 881 | --- | 836 | --- |
| Philadelphia | --- | --- | --- | 1,178 | 27 | 351 | 21 |
| RI | 12 | 12 | 105 | 12 | 46 | 12 | 48 |
| VT | --- | 64 | --- | --- | --- | --- | --- |
| VA ³ | --- | --- | --- | 5,204 | --- | 3,302 | --- |

After reviewing the initial draft inventory that was posted in October, 2009, three agencies provided the following changes to their initial submittals. These changes are reflected in the record counts in the above table. The PM augmentation routine was re-executed to account for these changes.

- 1) Connecticut indicated that the PM records in their original submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as PM10-PRI.
- 2) Allegheny County provided information on 31 additional facilities that were not included in their original submittal.
- 3) Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL.

The PM augmentation process was divided into two components – the first applying to EGUs and the second to all other point sources. EGUs were identified as those units that CEM data to USEPA's CAMD database. Because of the differences in the augmentation process for EGUs and nonEGUs, each process is discussed separately in the following sections. The EGU process uses the updated condensable emission factors, while the nonEGU process is essentially the same process used in developing the 2002 MANE-VU Version 3 inventory.

2.2.1 EGU PM Augmentation

The EGU PM augmentation process utilized the recently updated condensable emission factors for EGUs developed for MARAMA in 2008. Appendix B contains the technical memorandum describing how the emission factors were developed. The general process is to use the emission factors and heat input to calculate the PM-CON emissions, and then to perform the gap filling for any compounds missing from the S/L submittal.

2.2.1.1 EGU Condensable Emission Factors

As described in Appendix B, two sets of emission factors were developed by 6-digit SCC corresponding to equipment type (boiler or IC engine) and fuel type. The first set is based on all available source tests, while the second set includes only source tests where nitrogen purging occurred. As described in more detail in Appendix B, in measuring condensable PM from combustion of fuels containing sulfur, it has been shown by USEPA that SO₂ collected in the impingers can be oxidized to sulfate and produce a variable sulfate artifact that results in overestimation of condensable emissions. In this example, if impingers are not purged with nitrogen, errors associated with the sulfate artifact may be inflated resulting in an overestimation of condensable PM emissions.

Exhibit 2.3 shows the emission factors considered for use in estimating EGU condensable PM emissions. It shows the new emission factors developed using all available test data as well as the emission factors based only on those tests that utilized a nitrogen purge. In addition, emission factors are available from USEPA's AP-42 emission factor document. The emission factors actually used in the augmentation process are **highlighted in bold** in Exhibit 2.3. Emission factors based on purged test were used where available; otherwise the emission factors based on all tests were used. Since Appendix B did not provide a condensable PM emission factors for residual oil, we used the AP-42 condensable PM emission factor for residual oil.

Exhibit 2.3 - Emission Factors Used to Estimate EGU Condensable PM Emissions

| SCC (6-digit) | SCC (6-digit) Description | Emission Factor (lbs/mmBtu) | | |
|----------------------------------|---|-------------------------------|---------------------------------------|--|
| | | MARAMA ¹ All Tests | MARAMA ¹ Purged Tests Only | AP-42 ² |
| 1-01-001 1-02-001 | Boiler / EGU / Anthracite Coal Boiler / Industrial / Anthracite Coal | 0.0084 | --- | --- |
| 1-01-002 1-02-002 1-03-002 | Boiler / EGU / Bituminous/Sub-bituminous Coal Boiler / Industrial / Bituminous/Subbit. Coal Boiler / Commercial / Bituminous/Subbit. Coal | 0.022 | 0.013 | 0.04 to 0.37 ³ depending on sulfur content |
| 1-01-003 1-02-003 | Boiler / EGU / Lignite Boiler / Industrial / Lignite | 0.039 | --- | 0.014 |
| 1-01-004 1-02-004 | Boiler / EGU / #6 Fuel Oil Boiler / Industrial / #6 Fuel Oil | --- | --- | 0.01 |
| 1-01-005 1-02-005 1-03-005 | Boiler / Industrial / #2 Fuel Oil Boiler / Commercial / #2 Fuel Oil Boiler / EGU / #2 Fuel Oil | 0.014 | --- | 0.00928 |
| 1-01-006 1-02-006 1-03-006 | Boiler / EGU / Natural Gas Boiler / Industrial / Natural Gas Boiler / Commercial / Natural Gas | 0.00249 | --- | 0.00559 |
| 1-01-008 | Boiler / EGU / Petroleum Coke | 0.05 | --- | --- |
| 2-01-001 2-01-009 2-02-009 | IC Engine / EGU / Fuel Oil IC Engine / EGU / Kerosene IC Engine / Industrial / Kerosene | 0.013 | 0.01 | 0.0072 |
| 2-01-002 2-02-002 2-03-002 | IC Engine / EGU / Natural Gas IC Engine / Industrial / Natural Gas IC Engine / Commercial / Natural Gas | 0.005 | 0.0015 | 0.0047 |

- 1) Source: *Emissions Factors for Condensable Particulate Matter Emissions from Electric Generating Units*; memo dated August 20, 2008, from Arthur Werner (MACTEC) to Julie McDill (MARAMA). In accordance with USEPA guidance, CPM emissions determined from Method 202 tests that apply nitrogen purging are more reliable than results from tests where purging was not used.
- 2) Source: *AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*.
- 3) Based on typical bituminous sulfur content range of 0.7 to 4.0 % by weight.
- 4) Based on typical lignite sulfur content of 0.4 % by weight.
- 5) **Bolded** numbers are the emission factors actually used to calculate condensable emissions.

SCCs associated with CAMD units for which condensable emission factors were not available in the MARAMA report:

- 1-01-009 Boiler / EGU / Wood or Bark Waste
- 1-01-010 Boiler / EGU / LPG
- 1-01-012 Boiler / EGU / Solid Waste
- 1-01-013 Boiler / EGU / Liquid Waste
- 1-02-009 Boiler / Industrial / Wood or Bark Waste
- 1-02-010 Boiler / Industrial / LPG
- 1-02-014 Boiler / CO Boiler / Natural or Process Gas
- 3-05-007 Cement Manufacturing / Kilns
- 3-06-002 Petroleum Refining / Catalytic Cracking Units
- 3-06-012 Petroleum Refining / Fluid Coking Units
- 3-90-001 In-process Fuel / Anthracite Coal
- 3-90-012 In-process Fuel / Solid Waste
- 3-99-999 Misc. Industrial Processes

While Appendix B only provided emission factors for electric generation SCCs (e.g., 1-01-xxx-xx or 2-01-xxx-xx), a review of the S/L agency NIF submittals showed that several other SCCs were used by EGUs. These additional SCCs are *highlighted in italics* in Exhibit 3. Since these SCCs were associated with EGUs, it was assumed that emission factors would apply to these SCCs also.

Note also that there were several other SCCs associated with EGUs for which condensable PM emission factors were not available. These SCCs are listed at the bottom of Exhibit 2.3. No special effort was made to evaluate condensable emissions for these SCCs; rather, the State-supplied PM condensable emissions were used where available.

2.2.1.2 EGU Heat Input

In addition to the emission factors, the annual heat input in mmBtu/year by unit and fuel type is also needed to calculate condensable PM emissions. Heat input was available from two sources. The CAMD hourly database provides heat input, but there are two limitations for each use in this analysis. First, the heat input is reported at the unit level and does not provide a breakout of heat input for units using multiple fuels. Second, only a 6-month heat input value is provided for those units only required to report for six months.

As an alternative to the CAMD heat input, the S/L NIF tables usually provide a fuel process annual throughput which can be used to calculate the heat input using the heating value of the fuel. By calculating the heat input using the NIF annual throughput, the annual heat input is available by fuel type for both 6-month and 12-month reporting units. Where NIF annual throughput was available, it was used to calculate the annual heat input which was then used to calculate condensable PM emissions. In cases where the S/L NIF tables do not provide an annual throughput, the CAMD heat input was assigned to the primary fuel type and used in the condensable PM emission calculations.

2.2.1.3 EGU PM Emission Calculations

In addition to calculating the condensable PM emissions, the EGU PM augmentation also gap-fills missing PM compounds. The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.4 shows the various cases and the augmentation method that was applied.

Exhibit 2.4 – Cases and Required Steps to Augment EGU PM Emissions

| Case | PM Reported | Augmentation Methodology |
|------|--|--|
| 1 | --- | None required; all PM compounds = 0 |
| 2 | PM25-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ $PM25-PRI = PM-CON$ (only if $PM-CON > PM25-PRI$) $PM25-FIL = PM25-PRI - PM-CON$ $PM10-FIL = PM25-FIL * F10_F25 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ |
| 3 | PM10-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON$ (only if $PM-CON > PM10-PRI$) $PM10-FIL = PM10-PRI - PM-CON$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 4 | PM25-PRI PM10-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON$ (only if $PM-CON > PM10-PRI$) $PM25-PRI = PM-CON$ (only if $PM-CON > PM25-PRI$) $PM10-FIL = PM10-PRI - PM-CON$ $PM25-FIL = PM25-PRI - PM-CON$ |
| 5 | PM10-FIL | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 6 | PM10-FIL PM25-FIL | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 7 | PM10-FIL PM10-PRI PM25-FIL PM25-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ |
| 8 | PM-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ $PM-PRI = PM-CON$ (only if $PM-CON > PM-PRI$) $PM-FIL = PM-PRI - PM-CON$ $PM10-FIL = PM-FIL * F10_FIL \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 9 | PM-PRI PM10-PRI | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON$ (only if $PM-CON > PM10-PRI$) $PM10-FIL = PM10-PRI - PM-CON$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 10 | PM-PRI PM10-FIL | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |

| Case | PM Reported | Augmentation Methodology |
|------|--|--|
| 11 | PM-FIL | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-FIL = PM-FIL * F10_FIL \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 12 | PM-FIL PM10-FIL PM25-FIL | $PM-CON = HEAT_USED * EMIS_FACT$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 13 | PM-CON PM10-FIL PM25-FIL | $PM10-PRI = PM10-FIL + PM-CON$ $PM25-PRI = PM25-FIL + PM-CON$ |
| 14 | PM-CON PM10-FIL PM10-PRI | $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PMCON + PM25-FIL$ |
| 15 | PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI | None required; all PM compounds present |
| 16 | PM-CON PM-PRI | None required; only one occurrence and emissions were trivial |
| 17 | PM-CON PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI | None required; all PM compounds present |
| 18 | PM-CON PM-FIL PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI | None required; all PM compounds present |

2.2.2 NONEGU PM Augmentation

The nonEGU PM augmentation process utilized the methodology developed for MARAMA for the 2002 MANE-VU Version 3 inventory. The steps in the PM augmentation process were as follows:

- Step 1: Initial QA and remediation of S/L provided PM pollutants;
- Step 2: Updating of PM factor ratios previously developed for MARAMA based on factors from the Factor Information and Retrieval (FIRE) Data System and the USEPA PM Calculator (Appendix C provides the PM ratio table by SCC and control device);
- Step 3: Implementation of the ratios developed in step 2.; and
- Step 4: Presentation of PM augmentation results to S/L agencies for review and comment.

2.2.2.1 Initial QA and Remediation of PM Pollutants

Before we ran the nonEGU PM augmentation process, we first reviewed the data for inconsistencies. If values are found to be inconsistent, they were replaced. The consistency checks and replacement actions were as follows:

1. If $PM_{10-PRI} > 0$ and $PM_{25-PRI} > PM_{10-PRI}$ (and PM_{10-FIL} , PM_{25-FIL} and $PM-CON$ are null or 0), then set $PM_{25-PRI} = PM_{10-PRI}$.
2. If $PM_{10-FIL} > 0$ and $PM_{25-FIL} > PM_{10-FIL}$ (and PM_{10-PRI} , PM_{25-PRI} and $PM-CON$ are null or 0), then set $PM_{25-FIL} = PM_{10-FIL}$.
3. If $PM_{10-PRI} > 0$ and $PM_{10-FIL} > PM_{10-PRI}$ (and PM_{25-PRI} , PM_{25-FIL} and $PM-CON$ are null or 0), then set $PM_{10-FIL} = PM_{10-PRI}$.
4. If $PM_{25-PRI} > 0$ and $PM_{25-FIL} > PM_{25-PRI}$ (and PM_{10-PRI} , PM_{10-FIL} and $PM-CON$ are null or 0), then set $PM_{25-FIL} = PM_{25-PRI}$.

The consistency checks revealed very few occurrences of inconsistencies, and when inconsistencies did occur, the emission values were very small. As a result, S/L agencies were not asked to review this information and provide corrections because the inconsistencies did not involve significant emission sources. The replacement actions above were appropriate for an inventory used for regional air quality modeling.

2.2.2.2 Updating of PM Factor Ratios

The augmentation steps require the use of ratios developed from available emissions and particle size distribution data. These ratios are needed when only one PM term is available,

and two or more terms need to be augmented. Examples of how we used the PM ratios are shown below:

$$\text{PM-FIL} \times \text{RatioCON/FIL} = \text{PM-CON}$$

$$\text{PM-PRI} \times \text{RatioCON/PRI} = \text{PM-CON}$$

$$\text{PM-CON} \times \text{RatioFIL/CON} = \text{PM-FIL}$$

$$\text{PM-CON} \times \text{RatioPRI/CON} = \text{PM-PRI}$$

For the MANE-VU 2002 inventory, a table of PM compound ratios was developed. The development of this table is documented in the *TSD for the 2002 MANE-VU SIP Modeling Inventories, Version 3*. The primary deliverable of this step of the process was the development of a table keyed by SCC, primary control device, and secondary control device. This table is called the SCC Control Device Ratios table (Reference Tables MANE-VU_PMAugmentation.mdb). We updated this table to include SCC, primary control device, and secondary control device codes found in the 2007 inventory that were not contained in the 2002 MANE-VU inventory. Appendix C provides the PM ratio table by SCC and control device.

2.2.2.3 NonEGU PM Emission Calculations

The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.5 shows the various cases and the augmentation method that was applied.

After completing the calculations, the data was QA checked to ensure that the calculations resulted in consistent values for the PM complement. On a few occasions, the mix of ratio value and the pollutants and values provided by the S/L agency resulted in negative values when FIL was back-calculated. In this case the negative FIL value was set to zero and the PRI value was readjusted. In a few cases the appropriate combination of ratios, SCC, and control efficiencies were not available to calculate the PM10-PRI and PM25-PRI values. In these cases, PM10-PRI and PM25-PRI were set equal.

Exhibit 2.5 – Cases and Required Steps to Augment nonEGU PM Emissions

| Case | PM Reported | Augmentation Methodology |
|------|--|--|
| 1 | PM25-PRI | $PM-CON = PM25-PRI * CON_P25 \text{ ratio}$ $PM25-FIL = PM25-PRI - PM-CON$ $PM10-FIL = PM25-FIL * F10_F25 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ |
| 2 | PM10-PRI | $PM-CON = PM10-PRI * CON_P10 \text{ ratio}$ $PM10-FIL = PM10-PRI - PM-CON$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 3 | PM25-PRI PM10-PRI | $PM-CON = PM10-PRI * CON_P10 \text{ ratio}$ $PM10-FIL = PM10-PRI - PM-CON$ $PM25-FIL = PM25-PRI - PM-CON$ |
| 4 | PM10-FIL | $PM-CON = PM-CON * CON_F10 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 5 | PM10-FIL PM25-FIL | $PM-CON = PM10-FIL * CON_F10 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 6 | PM10-FIL PM10-PRI | $PM-CON = PM10-PRI - PM10-FIL$ $PM25-FIL = PM10-FIL * F25_F10 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 7 | PM25-FIL | $PM-CON = PM25-FIL * CON_F25 \text{ ratio}$ $PM10-FIL = PM25-FIL * F10_F25 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 8 | PM10-FIL PM10-PRI PM25-FIL PM25-PRI | $PM-CON = PM25-PRI - PM25-FIL$ |
| 9 | PM-PRI | $PM-CON = PM-PRI * CON_PRI \text{ ratio}$ $PM-FIL = PM-PRI - PM-CON$ $PM10-FIL = PM-FIL * F10_FIL \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ $PM25-FIL = PM10-FIL / F10_F25 \text{ ratio}$ $PM25-PRI = PM-CON + PM25-FIL$ |
| 10 | PM25-FIL PM25-PRI | $PMCON = PM25-PRI - PM25-FIL$ $PM10-FIL = PM25-FIL * F10_F25 \text{ ratio}$ $PM10-PRI = PM-CON + PM10-FIL$ |
| 11 | PM-CON PM10-FIL PM25-FIL | $PM10-PRI = PM-CON + PM10-FIL$ $PM25-PRI = PM-CON + PM25-FIL$ |

| Case | PM Reported | Augmentation Methodology |
|------|--|---|
| 12 | PM-CON | $PM_{10-FIL} = PM_{CON} * F_{10_CON} \text{ ratio}$ $PM_{25-FIL} = PM_{10-FIL} * F_{25_F10} \text{ ratio}$ $PM_{10-PRI} = PM_{CON} + PM_{10-FIL}$ $PM_{25-PRI} = PM_{CON} + PM_{25-FIL}$ |
| 13 | PM-CON PM10-FIL PM10-PRI | $PM_{25-FIL} = PM_{10-FIL} / F_{10_F25} \text{ ratio}$ $PM_{25-PRI} = PM_{CON} + PM_{25-FIL}$ |
| 14 | PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI | None required; all PM compounds present |
| 15 | PM-CON PM-FIL | $PM_{10-FIL} = PM_{CON} / CON_F_{10} \text{ ratio}$ $PM_{25-FIL} = PM_{10-FIL} / F_{10_F25} \text{ ratio}$ $PM_{10-PRI} = PM_{CON} + PM_{10-FIL}$ $PM_{25-PRI} = PM_{CON} + PM_{25-FIL}$ |
| 16 | PM-CON PM10-PRI PM25-PRI | $PM_{10-FIL} = PM_{10-PRI} - PM_{CON}$ $PM_{25-FIL} = PM_{25-PRI} - PM_{CON}$ |
| 17 | PM-FIL | $PM_{10-FIL} = PM_{FIL} * F_{10_FIL} \text{ ratio}$ $PM_{CON} = PM_{10-FIL} * CON_F_{10} \text{ ratio}$ $PM_{25-FIL} = PM_{10-FIL} / F_{10_F25} \text{ ratio}$ $PM_{10-PRI} = PM_{CON} + PM_{10-FIL}$ $PM_{25-PRI} = PM_{CON} + PM_{25-FIL}$ |

2.3 STAKEHOLDER REVIEW, COMMENT AND RESPONSE

On October 6, 2009, MARAMA provided a notice to stakeholders of the opportunity to review the initial draft of the 2007 point source inventory data and documentation. Stakeholders were invited to review and comment on the draft 2007 inventory of air emissions from point sources to be used for regional air quality modeling. On October 20, MARAMA hosted a conference call that provided an opportunity for stakeholders to ask questions about the draft 2007 point source modeling inventory. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

2.3.1 Connecticut Response to Stakeholder Comments

Sikorsky Aircraft provided comments on roughly ten sources regarding the SO₂, PM, and VOC emissions. All requested changes were very small (under a ton per year). Connecticut accepted all of Sikorsky Aircraft's comments.

Covanta Energy commented that the annual NO_x emissions for the Covanta Bristol Unit #1 (Facility ID 09003-0902, emission unit P0026) were abnormally low because of a temporary pilot test of a NO_x emission control technology. Covanta requested that 2005 emissions should be used since the 2007 actual emissions are not representative of previous or subsequent years. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than 2005 values as requested by Covanta. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

Hamilton Sundstrand commented that three emission units at its facility (Facility ID 09003-8602, emission units P0038, P0079, and R0097) were permanently shut down in 2008. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

NRG Energy provided very minor revisions to the SO₂, NO_x, CO, VOC, and NH₃ emissions data for the Montville (Facility ID 09011-1505) and Norwalk (Facility ID 09001-4214) facilities. Connecticut accepted these changes. NRG also requested minor revisions to the PM emissions data for these two facilities. Connecticut accepted these changes as well.

2.3.2 Maryland Response to Stakeholder Comments

NRG Energy requested a change to the VOC emissions for the Vienna Power Generating Station (Facility ID 019-0013, emission unit 4-0065). Maryland agreed to make the change, revising the VOC emissions from 0.9455 to 0.9641 tons per year.

Transcontinental Gas Pipe Line Company commented that the inventory for its facility in Howard County (Facility ID 027-0223) has 12 internal combustion engines represented by one grouped emission unit, which gives the impression that there is one large source when there are actually 12 smaller units. Maryland did not change the inventory based on this comment since the 12 engines are nearly identical and identifying each engine individually is not needed for the 2007 modeling inventory.

Covanta Energy requested changes to the stack parameters for the three units at the Montgomery County Resource Recovery Facility (Facility ID 031-1718). Maryland agreed to make those revisions.

2.3.3 Massachusetts Response to Stakeholder Comments

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Milford (Facility ID 25027-1200856). Massachusetts accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM_{2.5} emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide any revised estimates or suggestions for improving the estimates of condensable emissions. For any facility that did not report PM_{2.5} or condensable emissions, the PM_{2.5} or condensable emissions were calculated using the methodology described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM_{2.5} or condensable emissions.

Verallia formerly (Saint Gobain Containers) also indicated that stack flow rate data was missing for their plants in Massachusetts. The facilities did have stack velocity data. This data gap was filled by calculating the flow rate using the stack diameter and the stack exit velocity.

2.3.4 New Jersey Response to Stakeholder Comments

RRI Energy provided updated emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New Jersey agreed to make the revisions provided by RRI Energy.

BASF identified that its plant in East Newark (Facility ID 34017-10419) was permanently shut down and did not operate in 2007. New Jersey agreed and the 2007 emissions were set to zero.

Merck & Co., Inc indicated that its facility in Rahway, NJ (Facility ID 34039-41712) emitted 3.42 tons/yr of ammonia emissions from their boilers in 2007. New Jersey agreed and the ammonia emissions were added to the inventory.

Georgia Pacific Gypsum LLC submitted updates for its Camden facility (Facility ID 34007-51611) to correct the 2007 emissions based upon recent stack test data for board dryer U7 and process emissions factors from kettles U3, U4 and U5. Total PM_{2.5} emissions were also updated using current AP-42 factors for the Gypsum industry. In

addition, the ammonia emissions were missing from the inventory. New Jersey agreed to make the requested changes.

E.R. Squibb & Sons, LLC, requested changes to the ammonia and PM_{2.5} emissions for its facilities in Lawrenceville, NJ (Facility ID 34021-61052), New Brunswick, NJ (Facility ID 34023-17739), and Hopewell (Facility ID 34021-61053). New Jersey agreed to make the requested changes.

Schering Corporation supplied corrections to the ammonia emissions from its Kenilworth facility (Facility ID 34039-41806). New Jersey agreed to make the requested changes.

ConocoPhillips Company provided revisions to ammonia and VOC emissions for the Bayway Refinery (Facility ID 34039-41805). They also provided revisions to selected Source Classification Codes for certain heaters, sulfur recovery units, truck loading activities, marine vessel loading activities, and emergency flares. ConocoPhillips also requested that certain parts of the refinery be modeled as area sources rather than point sources, and provided rectangular grid coordinates to define the area sources. While this change would be appropriate for a fence line modeling study, it cannot not be accommodated in a multi-State regional air quality model since the SMOKE emission modeling system is not capable of handling area sources that are smaller than the air quality model grid cell.

Covanta Energy requested minor revisions to the ammonia and PM emissions at the Union County Resource Recovery Facility (Facility ID 34039-41814) and Warren Energy Resource Facility (Facility ID 34041-85455). New Jersey agreed to make those revisions.

Air Engineering submitted comments on behalf of EF Kenilworth LLC (Facility ID 34029-41741), requesting minor changes to PM emissions and revisions to stack parameters. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of Rowan University (Facility ID 34015-55779), requesting adding ammonia emissions for its sources. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of The College of New Jersey (Facility ID 34021-61008), requesting adding ammonia emissions for its sources and revisions to stack parameters. New Jersey agreed to make the requested changes.

Actavis requested the addition of 0.13 tons per year of ammonia for their facility (Facility ID 34039-40295). New Jersey agreed to make the addition.

PSEG Power LLC requested a few changes to Source Classification Codes and stack parameters, as well as numerous minor changes to emission estimates, for its facilities in New Jersey. New Jersey agreed to make the revisions. PSEG also requested the units classified as “insignificant units” be excluded from the modeling inventory. New Jersey elected to keep the emissions from insignificant units in the inventory because the purpose of the inventory is to model all of the emissions actually emitted in 2007.

MRPC/OEC-LES requested changes Source Classification Codes, ammonia and PM emissions, and stack parameters for its facility (Facility ID 34029-78901). New Jersey agreed to make the revisions.

2.3.5 New York Response to Stakeholder Comments

Covanta Energy provided updated PM emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New York agreed to make the revisions provided by Covanta Energy.

NRG Energy provided updated PM emissions and stack data for its facilities. NRG Energy also provided updated data for the individual turbine units at the Astoria Gas Turbine Power Plant (ORISID=55243). New York agreed to make the revisions provided by NRG Energy. NRG Energy also noted that baghouses are being installed at the Dunkirk and Huntley coal-fired plants. These changes were noted and will be accounted for in the future year inventories.

2.3.6 Pennsylvania Response to Stakeholder Comments

Covanta Energy requested changes to stack parameters at the Delaware Valley (Facility ID 420450059), Lancaster County (Facility ID 420710145), Plymouth (420910295) and Harrisburg (Facility ID 420430017) facilities. Covanta also requested minor changes to the emission estimates at the Plymouth facility. Pennsylvania agreed to make those revisions.

RRI Energy provided updated emissions and stack data for several of its facilities. The most notable change was a significant increase in PM emissions at several coal-fired units. Pennsylvania agreed to make the revisions provided by RRI Energy.

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Port Allegheny (Facility ID 420830006). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM_{2.5} emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide any revised estimates or suggestions for improving the estimates of condensable emissions. For any facility that did not report PM_{2.5} or condensable emissions, the PM_{2.5} or condensable emissions were calculated using the methodology described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM_{2.5} and condensable emissions.

The National Lime Association requested changes to the PM emissions for four of their member facilities: Mercer Lime & Stone (Facility ID 420190021), Graymont/Pleasant Gap (Facility ID 420270003), Carmeuse Lime/Millard Lime (Facility ID 420750016), and OWB Refractories (Facility ID 421330007). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Magnesita Refractories (formerly LWB Refractories) provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM_{2.5} emissions were small (about 20 tons per year) and that PM_{2.5} emissions of this magnitude should not adversely impact the results of any regional air quality modeling analyses using these inventories.

Carmeuse Lime provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM_{2.5} emissions were small (about 10 tons per year) and that PM_{2.5} emissions of this magnitude should not adversely impact the results of any regional air quality modeling analyses using these inventories.

2.3.7 Virginia Response to Stakeholder Comments

Virginia received comments from Covanta Energy and Transco requesting very minor changes to the emissions for their facilities (generally less than 0.1 ton change in emissions). Virginia decided not to make those changes because of the insignificant impact on the regional modeling inventory.

BASF identified that its plant in Virginia is permanently shut down. Since it did operate in 2007, the actual 2007 emissions will be used for the 2007 modeling. Emissions from the plant will be set to zero for future year inventories.

Michigan Cogen Systems requested minor changes to stack parameters for their facility. Virginia approved the requested changes.

Virginia received revised stack parameters for about 20 units at the Chemical Lime Company's Kimbalton Plant. Due to the location of this facility and the size of the emissions in 2007, Virginia determined that the recommended changes should not affect air quality modeling results for 2007. Virginia did use the revised data to update their 2009 inventory and the newer stack data will be used to represent facility impacts in any future modeling efforts that will use the 2009 inventory.

Virginia received comments from Carmeuse Natrual Chemicals regarding the PM_{2.5} emissions at two of its facilities in Virginia. Since the company did not provide PM_{2.5} emissions to Virginia, the PM_{2.5} emissions were calculated using the methodology described in Section 2.2.2. Virginia acknowledged that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM_{2.5} emissions. Virginia determined that no changes to the 2007 inventory were needed since the PM_{2.5} emissions from these two kilns were small (less than 20 tons per year) and that PM_{2.5} emissions of this magnitude should not adversely impact the results of any regional air quality modeling analyses using these inventories.

2.4 ADDITIONAL STATE-SPECIFIC UPDATES

Several States and local agencies provided revisions and updates following their review of the initial draft of the point source inventory posted in October, 2009. These changes are summarized in the following subsections.

2.4.1 Connecticut

During the review of the initial draft 2007 inventory, Connecticut identified several emission units with unexpectedly high emission values. Connecticut determined that its original submittal had emissions adjusted for rule effectiveness. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than values that had been artificially adjusted to account for rule effectiveness. MACTEC calculated the actual emissions for all units with a non-zero rule effectiveness value by backing out the rule effectiveness value. These actual emission values were supplied to Connecticut for review and approval. Connecticut recommended that the actual emissions calculated by MACTEC be used instead of the values originally supplied by Connecticut which included rule effectiveness.

Connecticut indicated that some of the PM records in their original submittal used incorrect pollutant codes. Connecticut indicated that the PM records in their original

submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as PM10-PRI. The PM augmentation routine described in Section 1.3 was re-executed for the coal- and oil-fired units.

2.4.2 Delaware

No revisions to the initial inventory were requested or made.

2.4.3 District of Columbia

The District of Columbia made revisions to the emission inventory for Benning Road (Facility ID 11001-0001). There are four emission units at the facility designated as Units 1, 2, 15, and 16. Units 15 and 16 report emissions to USEPA's CAMD CEM database, while units 1 and 2 do not. Units 1 and 2 were not included in the initial point source inventory. These two units were added to the inventory and increased facility-wide SO₂ emissions by about 100 tons per year and NO_x emissions by 50 tons per year. Smaller increases were added for the other pollutants.

2.4.4 Maine

Maine provided a small correction to the SO₂ emissions for the Maine Independence Station (Facility ID 2301900115).

Maine provided small corrections to the SO₂ and NO_x emissions for Westbrook Energy Center (Facility ID 2300500193). Also there was an error in the cross-reference between the USEPA CAMD database and the State's NIF database, which was corrected.

2.4.5 Maryland

No additional revisions beyond those requested by stakeholder were requested or made.

2.4.6 Massachusetts

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM₂₅-FIL values. MACTEC reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM₂₅-FIL and PM₂₅-PRI values. This error also affected numerous small sources in Massachusetts. The error was corrected and the State-reported PM₂₅-FIL values were retained during the PM augmentation process and that the PM₂₅-PRI values were correctly calculated using the State-reported PM₂₅-FIL value.

Massachusetts identified errors in the ammonia emissions for 2007 for the Stony Brook Energy Center (25013-0420001) and New Bedford Energy (25005-1200634).

Massachusetts provided corrected ammonia emission estimates for these two facilities. This change reduced ammonia emissions in Massachusetts by about 2,300 tons.

2.4.7 Maine

Maine identified an error in the PM augmentation routine that incorrectly replaced State-reported PM25-FIL values. MACTEC reviewed the PM augmentation routine and identified the error that affected “Case 5” nonEGU PM25-FIL and PM25-PRI values. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.4.8 New Hampshire

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM25-FIL values. MACTEC reviewed the PM augmentation routine and identified the error that affected “Case 5” nonEGU PM25-FIL and PM25-PRI values. This error also affected numerous small sources in New Hampshire. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.4.9 New Jersey

New Jersey identified numerous emission units that were inadvertently missing from their initial submittal. Most of these units were flagged as “insignificant units” or “non-source fugitive” sources in New Jersey’s data system and were excluded during the initial conversion to NIF tables. New Jersey subsequently identified these “unmatched” units and submitted pertinent data for inclusion in the 2007 modeling inventory. MACTEC added these units and emissions to the NIF database. The emissions added to the inventory from these units were about: 60 tpy of CO, 50 tpy of NOx, 672 tpy of PM10-PRI, 257 tpy of PM25-PRI, 5 tpy of SO2, and 1,477 tpy of VOC.

Ammonia emissions were missing from New Jersey’s initial submittal. New Jersey supplied the missing ammonia emissions, which added about 845 tpy of NH3 to the point source inventory.

2.4.10 Pennsylvania – Allegheny County

Allegheny County’s initial 2007 submittal included only the five “very large” sources that were submitted to USEPA for the 2007 NEI. After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with an

addition 31 facilities. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report.

2.4.11 Pennsylvania - Philadelphia

Philadelphia provided the following revisions to the initial draft inventory:

- Boiler #3 at Sunoco Chemical Frankford Plant (Facility ID 4210101551 and emission point 052) was linked to CAMD ORIS ID 880007 and boilerID 52.
- VOC emissions at Cardone Industries (Facility ID 4210103887) were increased from 75.96 to 143.98 tons per year.

2.4.12 Rhode Island

Rhode Island revised the emissions for Providence Metallizing Co. (Facility ID 44007AIR1230 and emission point 2). All emissions for this emission point were changed to zero for 2007.

2.4.13 Vermont

No revisions to the initial inventory posted in October 2009 were requested or made.

2.4.14 Virginia

After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with a number of additional distributed generation units. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report. A flag was added to the EP table to identify the distributed generation units for both the units in Virginia's original submittal as well as the new units.

Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL. The PM augmentation routine described in Section 1.3 was re-executed after changing all PM10-PRI to PM10-FIL and all PM25-PRI to PM25-FIL.

Virginia revised the PM data for the Mirant Potomac River Generating Station (SiteID: 51-510-00003) using 2007 condensable test data using the test method with the nitrogen purge to replace the emission factors previously applied by MACTEC.

Virginia requested that the plantID for the Dominion Leesburg Compressor Station be changed from 51-107-71978 to 51-107-01016.

Virginia requested that the plantID for the Transcontinental Gas Pipeline Station 175 be changed from 51-065-40789 to 51-065-00016.

Virginia's review of stack test data Greif Packaging LLC (51-009-00022) showed an incorrect emissions factor applied in 2007. The 2007 emissions factor for CO was 54 lbs CO/ton processed. The test factor was 5.6 lbs CO/ton processed. The 2007 data was corrected using the lower emissions factor.

2.5 EMISSION RELEASE POINT QA CHECKS

Stack parameters are an important component of an emission inventory used for regional air quality modeling. Careful QA is required to ensure that the point source emissions are properly located both horizontally and vertically on the modeling grid. This section describes the procedures used to quality assure, augment, and where necessary, revise, stack parameters using standardized procedures to identify and correct stack data errors. These procedures were implemented within the NIF file itself, and are based on the QA procedures built into SMOKE that are designed to catch missing or out-of-range stack parameters.

2.5.1 QA Checks and Gap-Filling for Location Coordinates

Because air quality modeling strives to replicate the actual physical and chemical processes that occur in an inventory domain, it is important that the physical location of emissions be determined as accurately as possible. The emission release (ER) point record is used to report the location and relevant physical attributes of the emission release point. Location coordinates must be reported to identify where emissions are released to the ambient air, via a stack or non-stack (e.g., fugitive release). If a non-stack, or fugitive release, coordinates may be reported for the general location of the emission release point.

In the ER record, location data may be reported as x and y coordinates from either of two coordinate systems - Latitude / Longitude (LATLON), or Universal TransMercator (UTM). X - Y coordinates reported as Latitude and Longitude must be reported in the decimal degree format specified. X - Y coordinates reported as UTM Easting and UTM Northing, must be reported in kilometers.

Any UTM data received in the MARAMA files was processed by the MACTEC Team and converted to, and stored as Latitude Measure and Longitude Measure in decimal degrees. All conversions of UTM to LATLON were conducting use a spreadsheet¹ developed by

¹ <http://www.uwgb.edu/dutchs/FieldMethods/UTMSystem.htm>

Professor Steven Dutch, School of Natural and Applied Sciences, University of Wisconsin - Green Bay. This spreadsheet tool allowed for batch conversion of UTM data to decimal degree format and was configured for WGS 84 DATUM. While errors using this spreadsheet are typically a few meters, rarely 10 or more, the accuracy of the conversion is limited to the accuracy of the initial UTM data.

Once all conversions were made to LATLON decimal degrees (also the requirement of the SMOKE emissions processing system), reasonableness checks were conducted on each release point relative to county centroids and min/max coordinates associated with the FIPS codes assigned to each stack. If a stack was found to exist outside of the western-, eastern-, northern- or southern-most boundary of the county (based on SMOKE's county lat/lon file), the point was flagged for additional review. These flagged sources were then mapped with GIS software to determine their placement relative to the FIPS County associated with the stack. If a source was found to be outside of the county boundaries, it was further identified and reported for review.

2.5.2 QA Checks and Gap-Filling for Emission Release Parameters

In preparing emissions for grid modeling, valid parameters for the physical characteristics of each release point (stack height, diameter, temperature, velocity, and flow) are necessary to correctly place facility release points and associated emissions into vertical layers for proper air quality modeling. The USEPA's QA guidance for diagnosing stack parameter issues was generally applied to identify QA issues in the S/L point source inventories. The QA guidance involved diagnosing the correct assignment of the ERP type (i.e., stack or fugitive), parameters with zero values, parameters not within the range of values specified in the USEPA's QA procedures, and consistency checks (i.e., comparing calculated values against the values reported in the inventory). In many cases errors were caused by missing or zero values.

The first step of our quality assurance (QA) involves review of the Emission Release Point Type. Using this type code, we used a routine to assess the validity of the stack parameters, to replace values if necessary, and to fill-in missing data points. We employed a routine that compared each emission release point parameter to a minimum and maximum range of values and when that parameter was missing or was found to exist outside of that range, we augmented the parameter. We also checked non-fugitive stack parameters for internal consistency between:

- stack height and diameter, and
- stack diameter, exit gas velocity, and exit gas flow rate.

When internal consistency was not met, we provided replacement values for the parameters.

The following steps summarize the process of finding and replacing missing, out-of-range, or internally inconsistent stack parameters.

Step 1: For fugitive emission release points, replace stack parameters

For fugitive emission release points (ERPTYPE=01), we first compared the existing fugitive emission height against the following range thought to be representative of the minimum and maximum values allowable for most fugitive emission release points.

Fugitive Release Height: 0.1 to 100 ft

In all but one case, the fugitive release height was valid. For that one case, we set the fugitive release height to 100 feet. For all other cases, we kept the fugitive release height and replaced all other stack parameters with the defaulted values listed below. In some cases, the fugitive release height was blank but the S/L agency provided a stack height and we retained the S/L supplied stack height. In other cases, the S/L agency provided a temperature for the fugitive emissions and we retained the S/L supplied temperature. The following summarizes the procedure for filling in stack parameters for fugitive emission release points:

Stack Height: use fugitive release height, if valid; if fugitive release height not present and stack height provided, use the stack height; if neither fugitive release height or stack height not present, use 10 feet as the default.

Stack Temperature: use temperature provided by S/L agency, if valid; otherwise used 72 °F.

Stack Diameter: use 0.003 feet for all fugitive sources

Stack Velocity: 0.0003 feet per second for all fugitive sources

Stack Flow: use 0.0 cubic feet per second for all fugitive sources

Step 2: For non-fugitive emission release points, find and replace out-of-range or missing stack heights and temperatures

For non-fugitive emission release points, we compared existing stack parameters against a set of the following ranges thought to be representative of the minimum and maximum values allowable for most emission release points.

Stack Height: 0.1 to 1000 feet

Stack Temperature: 50 to 1,800 °F

Stack Diameter: 0.1 to 50 feet

Missing or out-of range parameters were identified and evaluated to determine if they were realistic. If not realistic, missing or out-of range parameters were replaced using the procedures described below.

Stack Height: All stack heights were less than the maximum value of 1000 feet. Numerous stack heights were zero or missing, in which case the stack height was filled in using national default sets of physical parameter data based on the SCC. The stack parameter national default database is included as Appendix D.

Stack Temperature: There were 30 records where the stack temperature exceeded 1,800 °F. We reviewed the stack description table for these records, which indicated that most of these stacks were for flares or furnaces. We deemed the S/L supplied temperature data as plausible and retained the S/L provided value. There were 100 records where the stack temperature was less than 50 °F and not equal to 0 °F or missing. We reviewed the stack description table for these records, which indicated that many of these stacks were for refrigerated tanks or other sources where the S/L supplied temperature data was deemed plausible. For example, there is a nylon manufacturing facility in Virginia that emits thousands of tons of NO_x emissions per year. Most of the NO_x is emitted from a handful of fairly cold stacks, with exit gas temperatures generally ranging from 40-60 degrees. Rather than replace these S/L supplied values that seemed plausible with national defaults, we retained the S/L supplied data. Where the stack temperature was reported as 0 °F or missing, we replaced the stack temperature with the national default based on the SCC.

Step 3: For non-fugitive emission release points, find and replace out-of-range or missing stack diameters, velocities, and flow rates

First, we evaluated the stack diameter to determine if it was within the valid range of 0.1 to 50 feet. There were 200 records where the stack diameter exceeded 50 feet. We reviewed the stack description table for these records, which indicated that most of these were large storage tanks, cooling towers, wastewater treatment ponds or area-type sources such as process equipment leaks. Based on this review, we deemed the S/L supplied diameter data as plausible and retained the S/L provided value.

There were 66 records with missing stack diameters where both the velocity and flow rate were provided. For these records, the stack diameter was calculated using the following equation:

$$\text{Stack Diameter [ft]} = \text{SQRT} (4 * \text{Stack Flow [cu ft/sec]} / (\text{Stack Velocity [ft/sec]} * \pi [\text{Pi}]))$$

For the remaining cases where the stack diameter was reported as zero or missing, we replaced the stack diameter with the national default based on the SCC.

Next, the velocity and flow rate were evaluated. If the diameter, velocity and flow rate were all non-zero, we assessed internal consistency between diameter, velocity and flow rate using the following equation:

$$\text{Stack Flow [cu ft/sec]} = (\pi [\text{Pi}] * (\text{Stack Diameter [ft]} / 2) ^ 2) * \text{Stack Velocity [ft/sec]}$$

If the calculated and reported flow rates are within 10 % of one another, then internal consistency was assumed and no additional steps were taken. If the internal consistency was not met for velocity and flow rate, Exhibit 2.6 below provides details on the approach taken to correct missing, out-of-range values, or internally inconsistent values for velocity and flow rate based on different scenarios. Velocity and flow rate were augmented either by calculation or the use of national defaults by SCC when necessary.

Exhibit 2.6 - Stack Parameter Data Replacement Matrix (X = Data value present)

| Diameter | Velocity | Flow Rate | Action |
|----------|----------|-----------|---|
| - | X | X | 1. Calculate diameter using velocity and flow rate. 2. Check that calculated diameter is within range. |
| - | - | - | 1. Replace diameter, velocity, and flow rate with national SCC default values. |
| - | - | X | 1. Replace diameter, velocity, and flow rate with national SCC default values. |
| - | X | - | 1. Replace diameter, velocity, and flow rate with national SCC default values. |
| X | - | - | 1. Default velocity using national default sets. 2. Calculate flow rate using internal consistency formula. |
| X | - | X | 1. Calculate velocity using internal consistency formula. 2. Check that calculated velocity is within range (less than 150 ft/sec). A. If calculated velocity is not within range, then default all 3 parameters using national default sets. |

| | | | |
|----------|----------|----------|--|
| X | X | - | <p>1. Check that velocity is within range (less than 150 ft/sec).</p> <p>A. If velocity is within range, then:</p> <p>> Calculate flow rate using internal consistency formula.</p> <p>B. If velocity is not within range, then:</p> <p>> Default all 3 parameters using national default sets.</p> |
| X | X | X | <p>1. Check that velocity is within range (less than 150 ft/sec).</p> <p>A. If velocity is within range and flow rate does not meet internal consistency for diameter, velocity and flow rate, then:</p> <p>> Calculate flow rate using internal consistency formula.</p> <p>B. If velocity is not within range, then:</p> <p>> Calculate velocity using internal consistency formula.</p> <p>> Check that calculated velocity is within range. If so, then default to calculated velocity.</p> <p>> If calculated velocity is not within range, then default all 5 parameters using national default set.</p> |

2.6 IDENTIFICATION OF EGUs AND NONEGUs

In the past, point sources have been categorized as either EGUs or nonEGUs using a variety of schemes. The source classification code (SCC), standard industrial classification code (SIC), and North American Industry Classification System (NAICS) code have been used in the past to classify sources as either EGU or nonEGU. Another scheme that has been used is to classify as EGU any source that is required to report emissions to USEPA's CAMD hourly emission database. For consistency in both reporting emissions and projecting emissions to the future, the MANE-VU+VA inventory using the following scheme for classifying point sources:

- CAMD EGU – these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as EGUs;
- CAMD nonEGU - these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as EGUs; and
- OTHER – all other nonEGU point sources and small EGU point sources not included in the above categories.

Data elements were add to the NIF EP table to include the above classification scheme. This classification scheme was reviewed and approved by ERTAC.

2.7 ANNUAL 2007 POINT SOURCE EMISSION SUMMARY

Exhibits 2.7 to 2.20 present State-level summaries of 2002 and 2007 annual point source emissions by pollutant and compare 2007 annual emissions from CAMD EGUs, CAMD nonEGUs, and OTHER point sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia.

For most States and pollutants, point source emissions have decreased from 2002 to 2007. Notable exceptions are substantial increases in PM10-PRI and PM25-PRI emissions in Maryland, Pennsylvania, and Virginia. These increases are primarily due to a better representation of condensable emissions in the 2007 inventory, especially for coal-fired power plants. New data provided by these States confirm that condensable emissions were underreported in the 2002 inventory.

In 2007, CAMD EGUs accounted for about 88% of SO₂ emissions, 62% of NO_x, 51% of PM10-PRI, and 54% of PM25-PRI emissions. Non-CAMD reporting sources accounted for 94% of VOC and 82% of CO emissions in 2007.

Exhibit 2.7 – 2002 and 2007 Point Source CO Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 4,053 | 3,679 | -9% |
| Delaware | 9,766 | 7,753 | -21% |
| District of Columbia | 248 | 311 | 25% |
| Maine | 17,005 | 14,483 | -15% |
| Maryland | 99,032 | 81,770 | -17% |
| Massachusetts | 21,641 | 10,108 | -53% |
| New Hampshire | 2,725 | 3,164 | 16% |
| New Jersey | 12,300 | 10,548 | -14% |
| New York | 66,427 | 66,357 | 0% |
| Pennsylvania | 121,524 | 101,440 | -17% |
| Rhode Island | 2,234 | 1,653 | -26% |
| Vermont | 1,078 | 2,146 | 99% |
| Virginia | 70,688 | 72,029 | 2% |
| | 428,721 | 375,441 | -12% |

Exhibit 2.8 – EGU and nonEGU 2007 Point Source CO Emissions by State

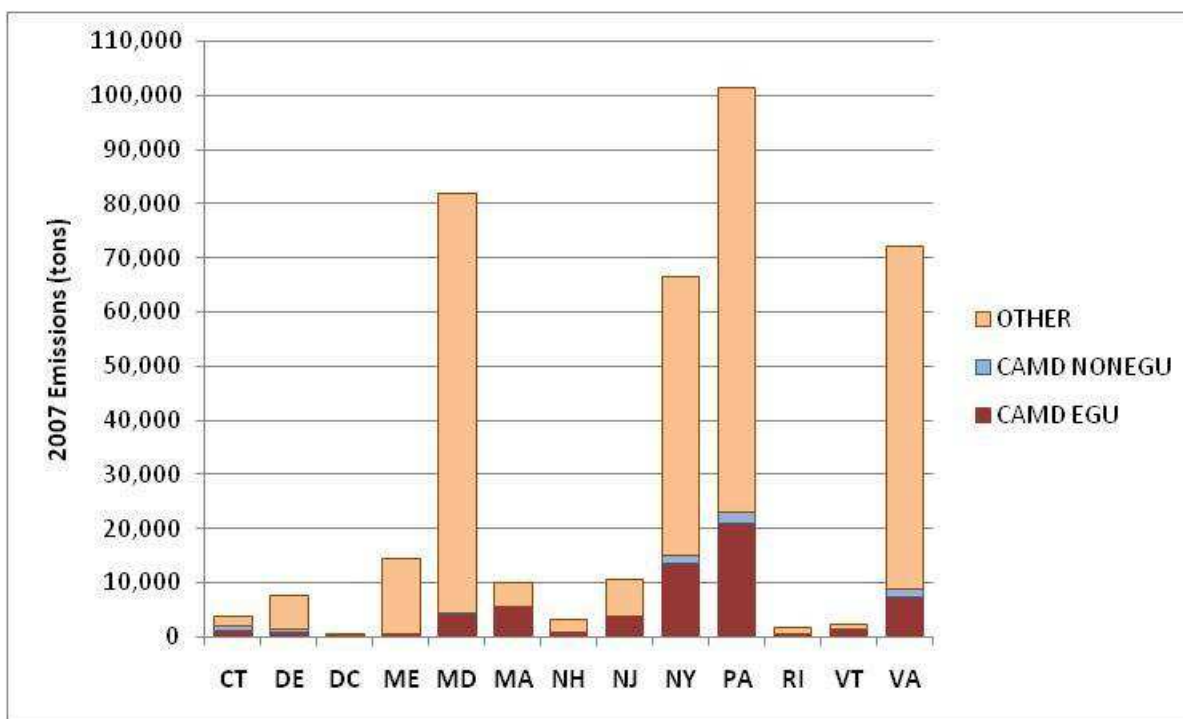


Exhibit 2.9 – 2002 and 2007 Point Source NH₃ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|--------------|--------------|------------|
| Connecticut | 0 | 0 | |
| Delaware | 196 | 94 | -52% |
| District of Columbia | 4 | 0 | -100% |
| Maine | 845 | 665 | -21% |
| Maryland | 305 | 137 | -55% |
| Massachusetts | 1,578 | 652 | -59% |
| New Hampshire | 74 | 128 | 73% |
| New Jersey | 0 | 918 | |
| New York | 1,861 | 2,417 | 30% |
| Pennsylvania | 1,388 | 2,379 | 71% |
| Rhode Island | 58 | 74 | 28% |
| Vermont | 0 | 0 | |
| Virginia | 3,230 | 1,830 | -43% |
| | 9,539 | 9,294 | -3% |

Exhibit 2.10 – EGU and nonEGU 2007 Point Source NH₃ Emissions by State

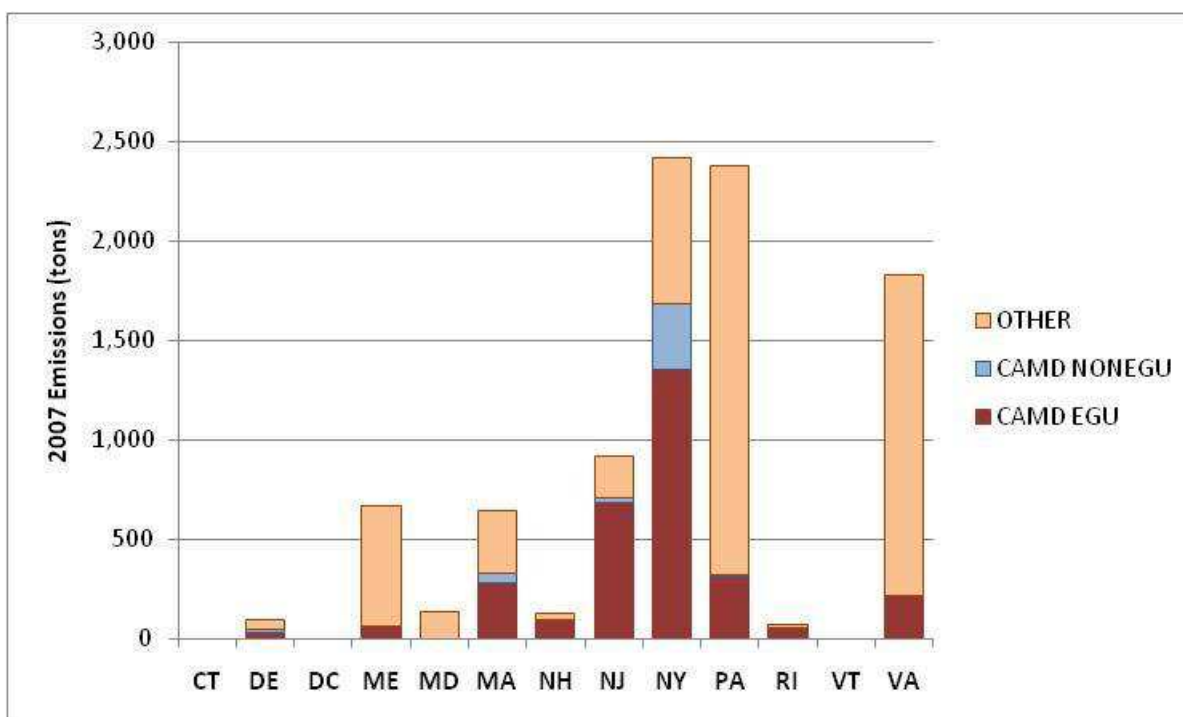


Exhibit 2.11 – 2002 and 2007 Point Source NOx Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 12,923 | 10,061 | -22% |
| Delaware | 16,345 | 15,628 | -4% |
| District of Columbia | 780 | 789 | 1% |
| Maine | 19,939 | 17,746 | -11% |
| Maryland | 95,369 | 74,890 | -21% |
| Massachusetts | 48,607 | 23,628 | -51% |
| New Hampshire | 9,759 | 7,441 | -24% |
| New Jersey | 51,593 | 30,088 | -42% |
| New York | 118,978 | 83,033 | -30% |
| Pennsylvania | 297,379 | 258,379 | -13% |
| Rhode Island | 2,764 | 1,444 | -48% |
| Vermont | 787 | 811 | 3% |
| Virginia | 147,300 | 112,938 | -23% |
| | 822,523 | 636,876 | -23% |

Exhibit 2.12 – EGU and nonEGU 2007 Point Source NOx Emissions by State

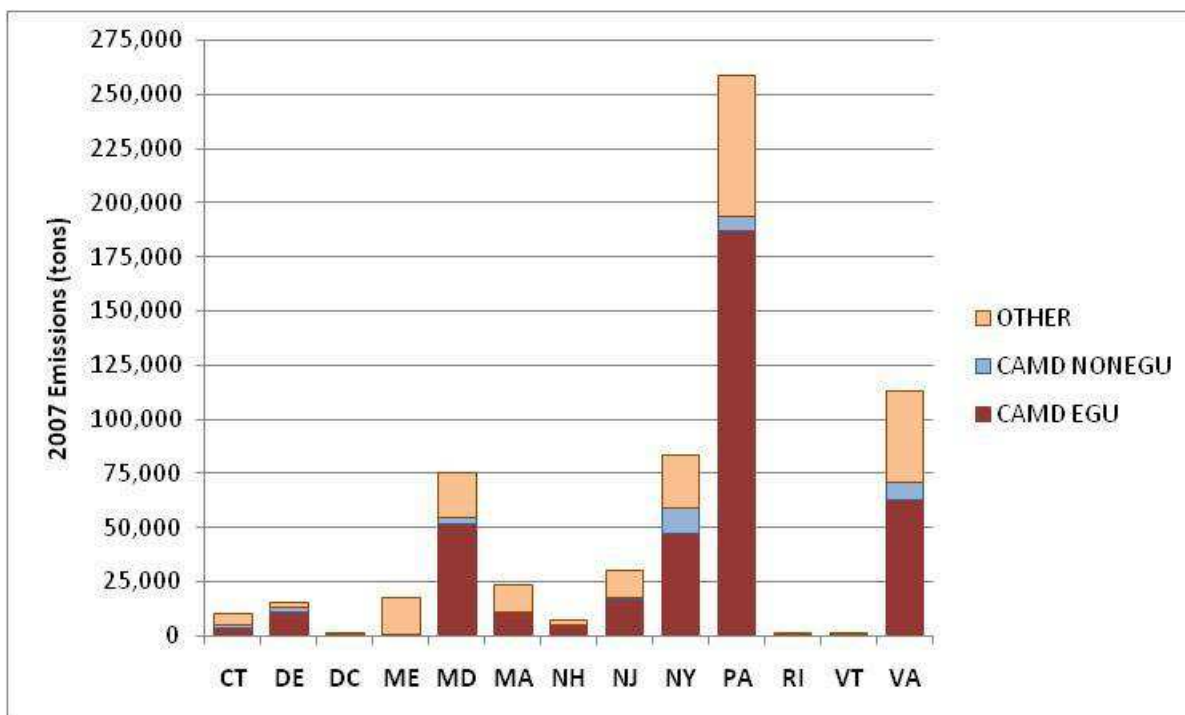


Exhibit 2.13 – 2002 and 2007 Point Source PM10-PRI Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|------------|
| Connecticut | 1,617 | 1,350 | -17% |
| Delaware | 4,217 | 3,465 | -18% |
| District of Columbia | 161 | 59 | -63% |
| Maine | 7,289 | 4,896 | -33% |
| Maryland | 9,046 | 19,322 | 114% |
| Massachusetts | 5,852 | 5,604 | -4% |
| New Hampshire | 3,332 | 1,925 | -42% |
| New Jersey | 6,072 | 7,642 | 26% |
| New York | 10,392 | 9,507 | -9% |
| Pennsylvania | 40,587 | 49,745 | 23% |
| Rhode Island | 300 | 189 | -37% |
| Vermont | 304 | 146 | -52% |
| Virginia | 17,211 | 19,203 | 12% |
| | 106,380 | 123,053 | 16% |

Exhibit 2.14 – EGU and nonEGU2007 Point Source PM10-PRI Emissions by State

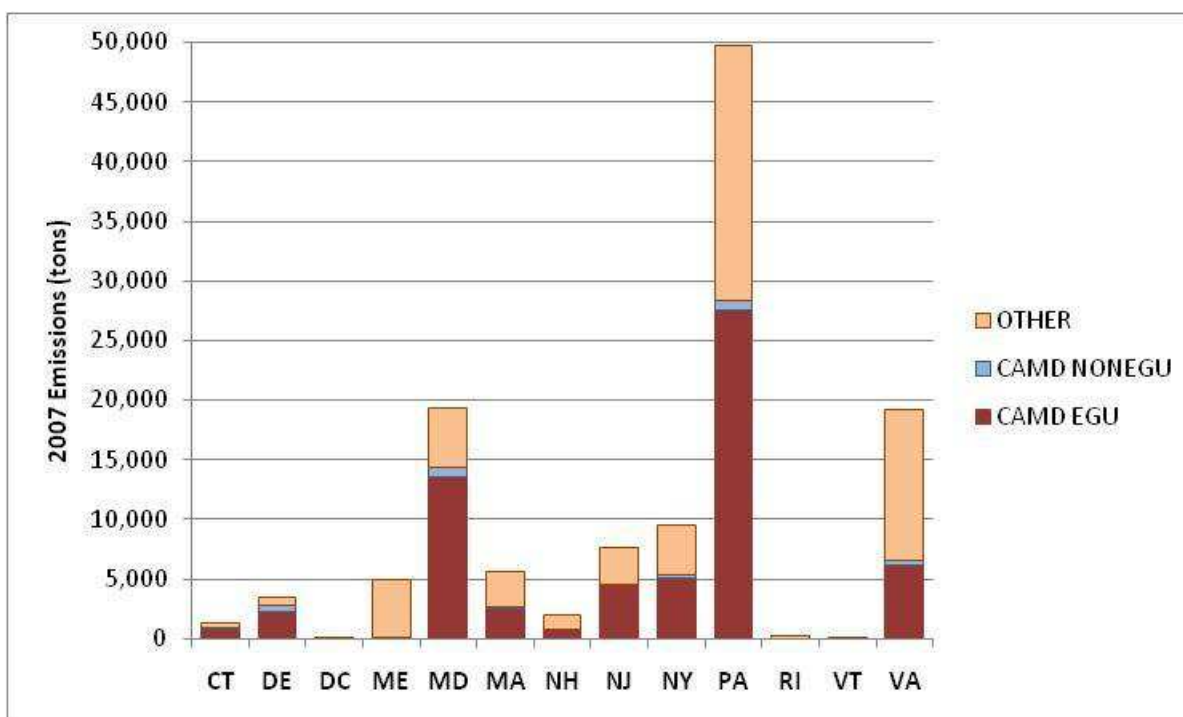


Exhibit 2.15 – 2002 and 2007 Point Source PM_{2.5}-PRI Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|---------------|---------------|------------|
| Connecticut | 1,283 | 1,242 | -3% |
| Delaware | 3,666 | 3,107 | -15% |
| District of Columbia | 132 | 53 | -60% |
| Maine | 5,787 | 3,852 | -33% |
| Maryland | 5,054 | 15,682 | 210% |
| Massachusetts | 4,161 | 4,864 | 17% |
| New Hampshire | 2,938 | 1,663 | -43% |
| New Jersey | 4,779 | 6,821 | 43% |
| New York | 7,080 | 5,999 | -15% |
| Pennsylvania | 20,116 | 32,460 | 61% |
| Rhode Island | 183 | 140 | -23% |
| Vermont | 267 | 114 | -57% |
| Virginia | 12,771 | 14,888 | 17% |
| | 68,217 | 90,885 | 33% |

Exhibit 2.16 – EGU and nonEGU 2007 Point Source PM_{2.5}-PRI Emissions by State

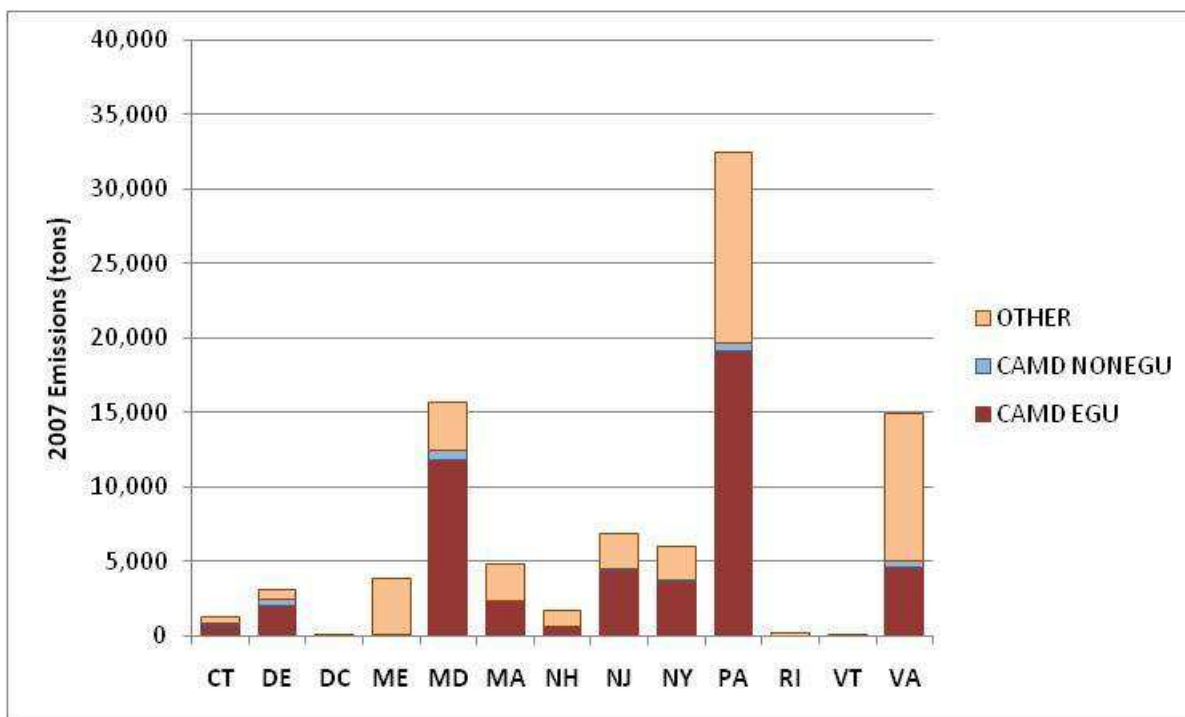


Exhibit 2.17 – 2002 and 2007 Point Source SO₂ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------------|------------------|-------------|
| Connecticut | 15,988 | 7,971 | -50% |
| Delaware | 73,744 | 43,088 | -42% |
| District of Columbia | 963 | 612 | -36% |
| Maine | 23,711 | 17,248 | -27% |
| Maryland | 290,929 | 305,383 | 5% |
| Massachusetts | 106,960 | 63,229 | -41% |
| New Hampshire | 46,560 | 45,258 | -3% |
| New Jersey | 61,217 | 40,703 | -34% |
| New York | 294,729 | 152,751 | -48% |
| Pennsylvania | 995,175 | 1,028,056 | 3% |
| Rhode Island | 2,666 | 1,516 | -43% |
| Vermont | 905 | 322 | -64% |
| Virginia | 305,106 | 243,048 | -20% |
| | 2,218,653 | 1,949,185 | -12% |

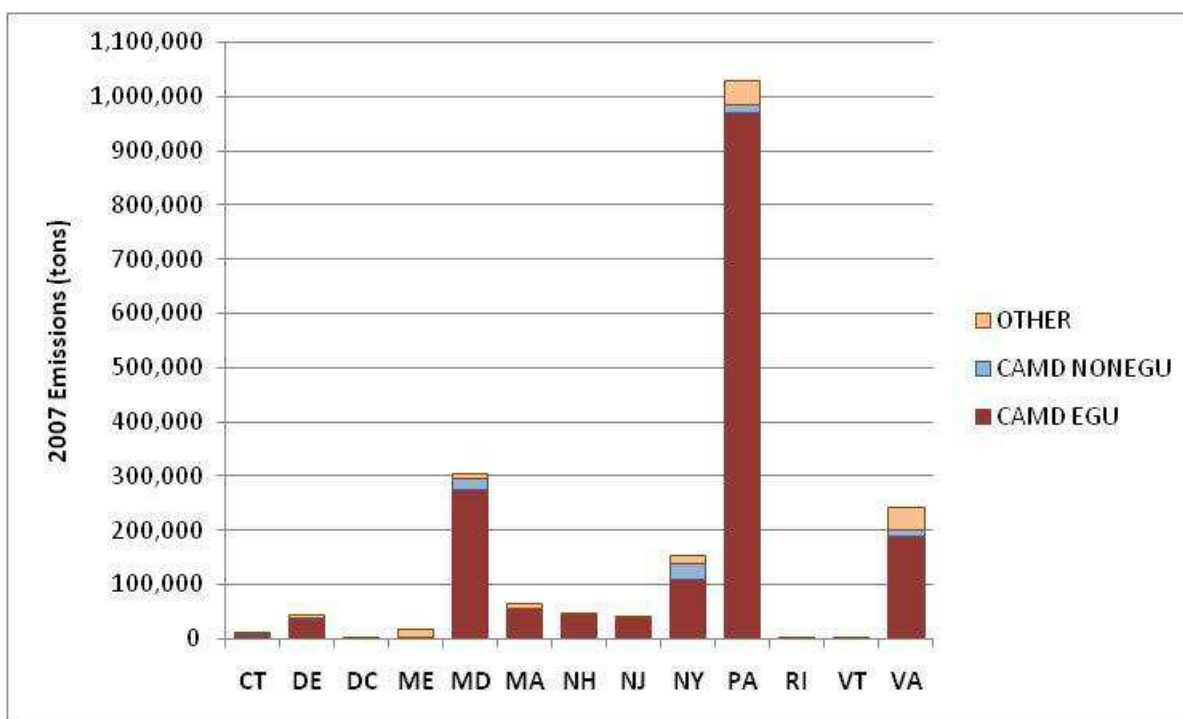
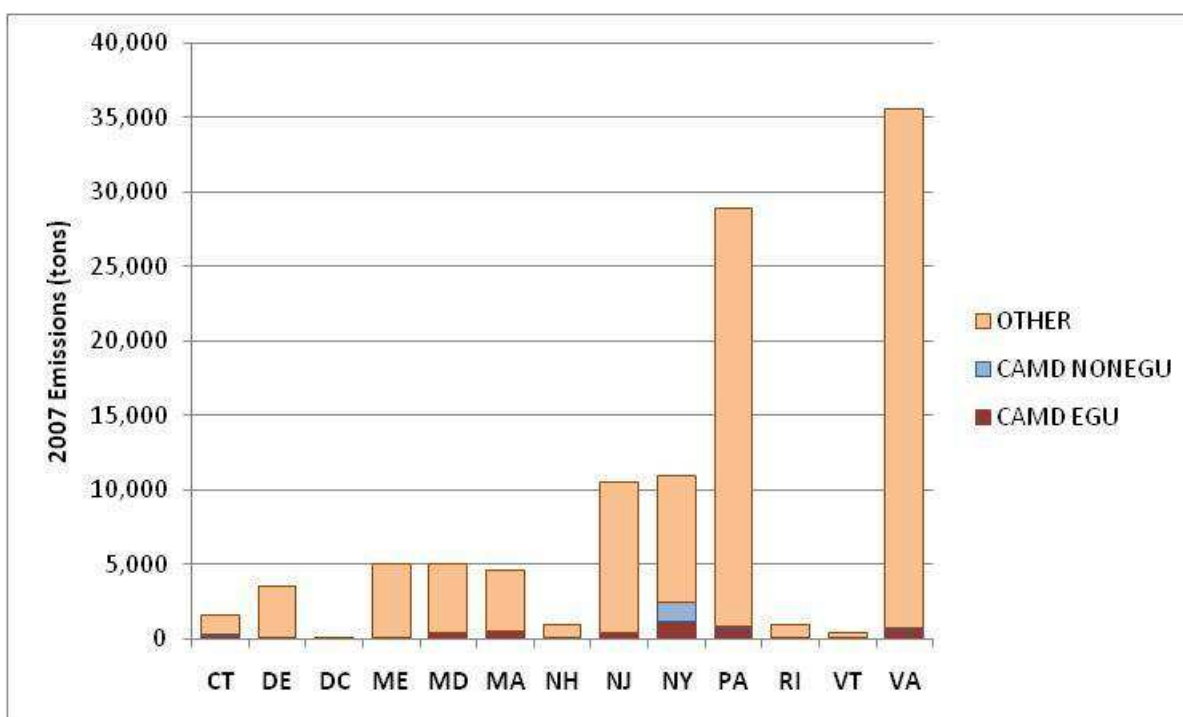
Exhibit 2.18 – EGU and nonEGU 2007 Point Source SO₂ Emissions by State

Exhibit 2.19 – 2002 and 2007 Point Source VOC Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 4,907 | 1,590 | -68% |
| Delaware | 4,755 | 3,489 | -27% |
| District of Columbia | 69 | 59 | -14% |
| Maine | 5,319 | 5,022 | -6% |
| Maryland | 6,187 | 4,986 | -19% |
| Massachusetts | 8,350 | 4,557 | -45% |
| New Hampshire | 1,599 | 916 | -43% |
| New Jersey | 16,547 | 10,526 | -36% |
| New York | 11,456 | 10,891 | -5% |
| Pennsylvania | 37,323 | 28,965 | -22% |
| Rhode Island | 1,928 | 970 | -50% |
| Vermont | 1,097 | 395 | -64% |
| Virginia | 43,906 | 35,618 | -19% |
| | 143,443 | 107,984 | -25% |

Exhibit 2.20 – EGU and nonEGU 2007 Point Source VOC Emissions by State



3.0 HOURLY 2007 INVENTORY FOR LARGE POINT SOURCES

The sources included in the hourly inventory include those that report hourly emissions to USEPA's CAMD database as required by market-based regulatory programs including the USEPA Acid Rain and NO_x Budget Trading Programs. In Virginia, the hourly inventory also includes distributed generation (DG) units. These Virginia units are mainly internal combustion engines that participate in some type of demand response program. The hourly SO₂, NO_x, and heat input data were used to prepare SMOKE files for modeling that used actual 2007 hourly emissions data.

3.1 DATA SOURCES FOR HOURLY EMISSIONS

The 2007 hourly point source inventory was developed using the 2007 annual emissions inventory developed discussed in Section 2 of this report, data from the USEPA's CAMD hourly emissions database, hourly emissions data provided by the Virginia Department of Environmental Quality (VDEQ), and hourly emissions data for 6-month reporting units provided by the Maryland Department of the Environment (MDE).

3.1.1 2007 Annual Emission Inventory

As described in Section 2 of this TSD, S/L agencies prepared and submitted emission inventory files in the NIF format. a crosswalk was developed to match facilities and units in the USEPA CAMD hourly database to units in the 2007 Version 1 annual inventory. This process is necessary because the data submitted by the S/L agencies and data submitted by companies to CAMD do not use the same facility or boiler/unit identifiers to identify a particular unit. The crosswalk matched a unit in the NIF annual inventory (using the State, County, PlantID, PointID, StackID and SegmentID) with its counterpart in the USEPA CAMD hourly database (using the ORISID and BoilerID). As previously discussed in Section 2, the final version of the crosswalk is included as Appendix A in this TSD. Complete documentation of the development of the annual inventory and crosswalk table can be found in Section 2 of this report.

3.1.2 EPA CAMD Hourly Database

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. Affected facilities are required to report hourly emissions of NO_x and SO₂, as well as other operational parameters such as hourly emission rate, gross load and heat input. Some units are required to submit hourly emissions data for both NO_x and SO₂ for the entire 12 month reporting period. Other units are required to submit hourly emissions data only for NO_x for the entire 12 month reporting period. Still other units are required to submit hourly emissions data only for

NO_x for the 6 month ozone season. Finally, there are a very small number of units that reported hourly emissions for a 9-month period. The USEPA CAMD hourly database is subjected to extensive QA/QC by both USEPA and the reporting facilities.

For this analysis, we used the “Part 75 Prepackaged Data Sets - hourly emissions data formatted for use with the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system”. The 2007 hourly data was obtained from the USEPA Clean Air Markets web site (USEPA 2009c).

3.1.3 Virginia Hourly Data for Distributed Generation Units

The third set of data came from VDEQ. Distributed generation units are mainly internal combustion engines that participate in some type of demand response program. These are small units, each usually no more than two or three megawatts in capacity, and they generally run on distillate fuel oil. These units are not required to report hourly emissions to USEPA’s CAMD. Most are permitted for well below 100 tons of NO_x emissions annually and do not run frequently. Annual emissions of NO_x are usually not very large from these units. However, ozone season daily emissions estimates from previous ozone SIPs show that facilities that have one or more of these types of units can be quite significant NO_x emitters when examined on an ozone season daily basis.

In past modeling efforts, these units were either not included in the emission inventory, or if they were included, were modeled using the SMOKE default temporal profile for the given SCC. To improve the hourly temporal allocation for these units, VADEQ undertook a substantial effort to develop hourly emission profiles using 2007 operations data obtained from Dominion VA Power for their demand response programs as well as other data. These data were used to create a 2007 profile for when these units generally operated. VDEQ used these generic profiles to prepare SMOKE PTHOUR files for each DG unit listed in the annual emissions inventory.

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc*.

3.1.4 Maryland Hourly Data for Six Month Reporters

The final set of data came from MDE. MDE filled in the non-ozone season hourly emissions data for certain units that only reported ozone season hourly emissions to USEPA CAMD. MDE identified which facilities only reported 6 months worth of data to CAMD and submitted requests to these facilities requesting data for the missing 6 months. MDE provided the values in a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format.

3.2 METHODOLOGY FOR DEVELOPING HOURLY SMOKE FILES

SMOKE requires two input files for processing hourly point source emissions:

- **PTINV File.** The first file contains annual emissions data, stack parameters, geographic coordinates, and other information. This file can be in Inventory Data Analyzer (IDA), Emission Modeling System-95 (EMS-95), or one-line-per record (ORL) format. The ORL format from SMOKE Version 2.6 was selected for this project and is shown in Exhibit 3.1.
- **PTHOUR File.** The second file contains the hour-specific data. This file can be in either EMS-95 format or Continuous Emissions Monitoring (CEM) format. The SMOKE Version 2.6 EMS-95 traditional format was selected for this project and is shown in Exhibit 3.2.

The following subsections describe how the PTINV ORL annual emissions file and the PTHOUR EMS-95 hour-specific emission files were created.

3.2.1 Conversion of Annual NIF Inventory to SMOKE ORL Format for PTINV

The 2007 annual inventory was developed in NIF format. Flags were added to the NIF EP table to indicate whether a unit was matched to a CAMD hourly unit or a Virginia DG unit. All matching units in the NIF file were converted to SMOKE PTINV ORL format. Six different ORL files were created (to facilitate QA of files and summarization of emissions. ORL files were created for the following types of sources:

- Annual emissions for units that reported hourly emissions to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported emissions to USEPA CAMD for the either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-zone season emissions for units that reported emissions to USEPA CAMD for the either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files; temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles.

The ORL were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions in the ORL files.

Exhibit 3.1 – SMOKE ORL Format for PTINV

| Position | Name | Type | Description |
|----------|---------|------|---|
| A | FIPS | Int | Five digit FIPS code for state and county (required) |
| B | PLANTID | Char | Plant Identification Code (15 characters maximum) (required; this is the same as the State Facility Identifier in the NIF) |
| C | POINTID | Char | Point Identification Code (15 characters maximum) (required; this is the same as the Emission Unit ID in the NIF) |
| D | STACKID | Char | Stack Identification Code (15 characters maximum) (recommended; this is the same as the Emissions Release Point ID in the NIF) |
| E | SEGMENT | Char | DOE Plant ID (15 characters maximum) (recommended; this is the same as the Process ID in the NIF) |
| F | PLANT | Char | Plant Name (40 characters maximum) (recommended) |
| G | SCC | Char | Ten character Source Classification Code (required) |
| H | ERPTYPE | Char | Emissions release point type (2 characters maximum); indicates type of stack (not used by SMOKE) <ul style="list-style-type: none"> • 01 = fugitive • 02 = vertical stack • 03 = horizontal stack • 04 = goose neck • 05 = vertical with rain cap • 06 = downward-facing vent |
| I | SRCTYPE | Char | Source type (not used) |
| J | STKHGT | Real | Stack Height (ft) (required) |
| K | STKDIAM | Real | Stack Diameter (ft) (required) |
| L | STKTEMP | Real | Stack Gas Exit Temperature (°F) (required) |
| M | STKFLOW | Real | Stack Gas Flow Rate (ft ³ /sec) (optional; automatically calculated by Smkinven from velocity and diameter if not given in file) |
| N | STKVEL | Real | Stack Gas Exit Velocity (ft/sec) (required) |
| O | SIC | Int | Standard Industrial Classification Code (recommended) |
| P | MACT | Char | Maximum Available Control Technology Code (6 characters maximum) (optional) |
| Q | NAICS | Char | North American Industrial Classification System Code (6 characters maximum) (optional) |

| Position | Name | Type | Description |
|----------|--------------------|------|--|
| R | CTYPE | Char | Coordinate system type (1 character maximum) (required) • L = Latitude/longitude |
| S | XLOC | Real | X location (required); Longitude (decimal degrees) |
| T | YLOC | Real | Y location (required); Latitude (decimal degrees) |
| U | UTMZ | Int | UTM zone (not used) |
| V | CAS | Char | Pollutant CAS number or other code (16 characters maximum) (required; this is called the pollutant code in the NIF) |
| W | ANN_EMIS | Real | Annual Emissions (tons/year) (required) |
| X | AVD_EMIS | Real | Average-day Emissions (tons/average day) (not used) |
| Y | CEFF | Real | Control Efficiency percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 0) |
| Z | REFF | Real | Rule Effectiveness percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 100) |
| AA | CPRI | Int | Primary Control Equipment Code (not used by SMOKE) |
| BB | CSEC | Int | Secondary Control Equipment Code (not used by SMOKE) |
| CC | NEI_UNIQUE_ID | Char | For units that report hourly emissions to CAMD, this field contains a code to indicate how frequently the unit operated in 2007 (i.e., <15%, 15-50%, or >50% of available hours) For Virginia DG units, this field contains the descriptor "VA DG". For units do not have an association in the PTHOUR file, this field contains the descriptor "NonHourly". |
| DD | ORIS_FACILITY_CODE | Char | DOE Plant ID (generally recommended, and required if matching to hour-specific CEM data) |
| EE | ORIS_BOILER_ID | Char | Boiler Identification Code (recommended) |

Note: Fields not currently used by SMOKE Version 2.6 after field position EE have been excluded from the ORL file to reduce the size of the files.

Exhibit 3.2 – SMOKE EMS-95 Traditional Format for Individual Hour-Specific Files

| Position | Name | Type | Description |
|----------|---------|-------|--|
| 1-2 | STID | Int | State FIPS Code (required) |
| 3-5 | CYID | Int | County FIPS Code (required) |
| 6-20 | FCID | Char | Facility ID (a.k.a. plant ID) (required) |
| 21-32 | SKID | Char | Point ID (required) |
| 33-44 | DVID | Char | Stack ID (required) |
| 45-56 | PRID | Char | Segment ID (required) |
| 57-61 | POLID | Char | Pollutant name (required) |
| 62-69 | DATE | Char | Date in MM/DD/YY format. Years less than 70 are treated as century 2000 (required) |
| 70-72 | TZONNAM | Char | Time zone name associated with emissions data. Valid entries are GMT, ADT, AST, EDT, EST, CDT, CST, MDT, MST, PDT, and PST. (required) |
| 73-79 | HRVAL1 | Real | Hourly emissions for hour 1 (short tons/hour) (required) |
| 80-86 | HRVAL2 | Real | Hourly emissions for hour 2 (short tons/hour) (required) |
| 87-93 | HRVAL3 | Real | Hourly emissions for hour 3 (short tons/hour) (required) |
| ... | | | |
| 234-240 | HRVAL24 | Real | Hourly emissions for hour 24 (short tons/hour) (required) |
| 241-248 | DAYTOT | Real | Daily emissions total (short tons/day) |
| 249 | Blank | Blank | Blank |
| 250-259 | SCC | Char | SCC (required). |
| 261-276 | DATNAM | Char | Blank |

3.2.2 PTHOUR Methodology for 12 Month Reporters

For units that reported hourly data to USEPA CAMD for the entire 12 months of 2007, the annual emissions in the PTINV ORL files were allocated to specific hours using the actual NO_x, SO₂, and heat input-based hour-specific data in the USEPA CAMD database. This ensured that the annual emission values provided by the S/L agencies were maintained and distributed to specific hours using actual 2007 hourly data.

The methodology for creating the PTHOUR files is as follows. First, hourly SO₂ and NO_x mass and heat input values in the USEPA CAMD database were summed for each unit to

create annual values. Next, annual emission records in the ORL file were matched to a corresponding hourly CAMD unit using the crosswalk file. The hourly values in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{annual ORL NOx emissions} * \text{hourly CAMD NOx emissions}}{\text{CAMD summed annual NOx emissions}}$$

Hourly SO2 emissions for units with non-zero SO2 emissions in the CAMD database

$$\text{Hourly PTHOUR SO2 emissions} = \frac{\text{annual ORL SO2 emissions} * \text{hourly CAMD SO2 emissions}}{\text{CAMD summed annual SO2 emissions}}$$

Hourly SO2 emissions for units with zero SO2 emissions in the CAMD database

$$\text{Hourly PTHOUR SO2 emissions} = \text{annual ORL SO2 emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly CAMD heat input} / \text{annual summed CAMD heat input}$$

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, VOC)

$$\text{Hourly PTHOUR POLL emissions} = \text{annual ORL POLL emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly CAMD heat input} / \text{annual summed CAMD heat input}$$

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.3 PTHOUR Methodology for 6 Month Reporters

About 15 percent of the units in the 2007 CAMD hourly database reported data only for the ozone season, i.e., the second and third quarters, as allowed by their reporting requirements. These units are referred to as 6-months units in this document. Two separate PTINV ORL files were created – one for the 6-month ozone season and one for the 6-month non-ozone season. The CAMD hourly data for these units were used to develop ozone season PTINV and PTHOUR files. For the non-ozone season, a PTINV file was created and was used with re-adjusted SMOKE temporal profiles to develop hourly emissions for the non-ozone season.

The CAMD hourly database for 6-month units contains for NOx emissions, heat input and other parameters for the 6 month period. The CAMD hourly data for April through September was used directly and was summed to calculate the ozone season NOx emissions. To calculate the non-ozone season NOx emissions, total CAMD NOx emissions for a 6-month unit was subtracted from the annual NOx emissions of the corresponding unit in the S/L supplied NIF database. In some cases, the 6-month NOx

emissions in the CAMD database were greater than the annual emissions in the S/L NIF database. For those cases, non-ozone season emissions were set to zero.

For other pollutants, ozone season emissions are not available. To calculate the ozone season emissions for these other pollutants, we calculated the ratio of ozone season NO_x emissions to annual NO_x emissions, and applied that ratio to the annual emissions from the NIF database. To calculate the non-ozone season emissions for the other pollutants, the total ozone season emissions for the 6-month unit was subtracted from the annual emissions of the corresponding unit in the S/L supplied NIF database. The methodology for creating the PTHOUR files for the ozone season is as follows. First, hourly NO_x mass and heat input values in the USEPA CAMD database were summed for each unit to create ozone season values. Next, ozone season emission records in the ORL file were matched to a corresponding hourly CAMD unit using the crosswalk file. The hourly values in the PTHOUR file were calculated using the following equations:

Hourly NO_x emissions

$$\text{Hourly PTHOUR NO}_x \text{ emissions} = \frac{\text{6-month ORL NO}_x \text{ emissions} * \text{hourly CAMD NO}_x \text{ emissions}}{\text{CAMD summed 6-month NO}_x \text{ emissions}}$$

Hourly emissions for other pollutants (CO, NH₃, PM₁₀-PRI, PM₂₅-PRI, SO₂, VOC)

$$\text{Hourly PTHOUR POLL emissions} = \text{annual ORL POLL emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly CAMD heat input} / \text{6-month summed CAMD heat input}$$

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

Hourly data for the non-ozone season was developed using the methodology discussed in Section 3.4 of this TSD.

3.2.4 PTHOUR Methodology for Maryland 6 Month Reporters

MDE identified which facilities only reported 6 months worth of data to CAMD and submitted requests to the identified facilities requesting data for the other 6 months outside of the ozone season. MDE manually entered hourly values into a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format for the following units.

| Plant Name | ORIS | UNITS |
|-------------------------|------|--------------------|
| Constellation Perryman | 1556 | CT1, CT2, CT3, CT4 |
| Constellation Riverside | 1559 | CT6 |
| Constellation Westport | 1560 | CT5 |
| Mirant Chalk Point | 1571 | GT2, SMECO |
| Mirant Morgantown | 1573 | GT3, GT4, GT5, GT6 |

The methodology for creating the PTHOUR files for the MD 6-month reporters is as follows. First, hourly SO₂ and NO_x mass and heat input values in the MDE hourly database were summed for each unit to create annual values. Next, annual emission records in the ORL file were matched to a corresponding hourly MDE unit using the crosswalk file. The hourly values in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NO_x emissions

$$\text{Hourly PTHOUR NO}_x \text{ emissions} = \frac{\text{annual ORL NO}_x \text{ emissions} * \text{hourly MDE NO}_x \text{ emissions}}{\text{MDE summed annual NO}_x \text{ emissions}}$$

Hourly SO₂ emissions for units with non-zero SO₂ emissions in the MDE database

$$\text{Hourly PTHOUR SO}_2 \text{ emissions} = \frac{\text{annual ORL SO}_2 \text{ emissions} * \text{hourly MDE SO}_2 \text{ emissions}}{\text{MDE summed annual SO}_2 \text{ emissions}}$$

Hourly SO₂ emissions for units with zero SO₂ emissions in the MDE database

$$\text{Hourly PTHOUR SO}_2 \text{ emissions} = \text{annual ORL SO}_2 \text{ emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly MDE heat input} / \text{annual summed MDE heat input}$$

Hourly emissions for other pollutants (CO, NH₃, PM₁₀-PRI, PM₂₅-PRI, VOC)

$$\text{Hourly PTHOUR POLL emissions} = \text{annual ORL POLL emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly MDE heat input} / \text{annual summed MDE heat input}$$

If MDE heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.5 PTHOUR Methodology for Virginia Distributed Generation Units

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc*.

3.2.6 QA of PTINV and PTHOUR Files

A number of QA activities were undertaken to ensure that the PTINV and PTHOUR files were complete, consistent with the 2007 NIF annual inventory, and did not double count any emission source. Specific QA steps included:

- The ORL annual emission files were quality assured to conform to the SMOKE PTINV ORL format and match the values reported in the original NIF file. Exhibit 3 compares the annual emissions by State and pollutant as reported in the original NIF file and the four ORL files listed above.

- The PTHOUR files were quality assured to conform to the SMOKE PTHOUR EMS-95 traditional format, the sum of emissions in the PTHOUR file equals the ORL annual emissions, the number of hourly data records equals 8760, the number of days equals 365, and that all pollutants were included in the PTHOUR file.

3.3 STATE AND STAKEHOLDER REVIEW

On March 15, 2010, MARAMA invited States and stakeholders to review and comment on the draft 2007 hourly inventory of air emissions from specific point sources. States and stakeholders were provided a 4-week comment period. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

3.3.1 Massachusetts

Massachusetts commented that the majority of the Massachusetts facilities reviewed the CAMD-to-NIF crosswalk and indicated they found no major errors. Some facilities expressed concern that several dual fuel units appeared to have their total NO_x emissions doubled, reported separately for both oil and gas. MACTEC reviewed the database and verified that no double counting of emissions occurs. For multiple-fuel units, the Appendix A spreadsheet matches each CAMD record to ALL fuel records in the NIF database, making it appear that the CAMD emissions are counted more than once. MARAMA will be using the NIF emissions from State database in regional modeling and the hourly data from the matching CAMD unit to allocate NIF emissions to hourly data for modeling. Emissions will not be double counted for units using multiple fuels.

3.3.2 New York

NRG Energy identified an issue with the hourly emissions for those units in the NIF database for the situation where multiple units exhaust from a common stack. In NY's database, multiple units are represented by a single emission unit, whereas in the CAMD database each unit is represented individually. That is why there is a CAMD BLR6ID with no equivalent NIF labels in Appendix A. MACTEC discussed the issue with NRG and devised a solution for the Huntley and Dunkirk Steam Generating Stations by adding emissions units to the NIF tables in cases where there are combined stacks. The annual emissions in the NIF database will be apportioned to each unit based on annual heat input from the USEPA CAMD database. This will allow a proper match to the hourly data for each Unit and ensure that the proper CAMD hourly emissions were used in developing the PTHOUR files for the units at these two facilities.

New York State also attempted to improve the linkages between the NIF annual emissions and the CAMD hourly emissions. Not all cases could be resolved, and New York is continuing to review the data.

3.3.3 Pennsylvania

RRI Energy commented that they agree with the approach for calculating hourly emissions as described in Section 3.3 of this report.

3.3.4 Virginia

Virginia reviewed the data in the hourly files and provided three updates that are needed for the VA cross reference between NIF and CAMD information. These updates do not affect large emission units, but these updates were made to make the cross reference as correct as possible, as follows:

- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB1 the NIF identifier Stack 1, Point 1, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB3 the NIF identifier Stack 3, Point 9, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 52089, NIF ID 51-071-00062, facility name Duke Energy Generation Services of Narrows was deleted for the NIF identifier Stack 1, Point 1, Segment 3 from CAMD Boiler ID BLR007. This stack point segment represents the emissions from the ash handling system for the boilers, and the emissions would be better represented by generic profiles rather than CAMD profiles.

Virginia also commented that some facilities have empty date stamps (i.e., MM/DD/YY field is listed as “xx/xx/xxEST” where x is blank space). For example, in 12 month units files, 51-033-00040 and 51-065-00021 combined have either 21 or 39 lines with empty date stamps. Similarly, in 6 month units files, 09-009-6614 (in New Haven, Connecticut) have 6 or 12 lines without date stamps. MACTEC identified a couple types of errors in the CAMD to NIF crosswalk that caused this situation to occur. Fixing the CAMD to NIF crosswalk resolved all occurrences of this problem.

3.4 DEVELOPMENT OF HOURLY PROFILES FOR 6-MONTH REPORTING UNITS

Since some CAMD units only report data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. The following subsections describe the steps taken by Alpine Geophysics in preparing this file.

3.4.1 Annual Profile Preparation

The 2007 hourly CEM data obtained from CAMD's "Data and Maps" website for each State in the MANE-VU+VA region. Using these data, we filtered the individual source list within each State to only those units reporting each hour of the year (i.e., 8,760 hours of data). This ensured that the resulting profiles are not weighted using units who may only report during summertime months for ozone season programs.

From this parsed list, we summed the total NO_x mass, SO₂ mass and heat input as reported in these hourly downloads at both a State monthly and a State total basis. These sums provided the State level totals from which the monthly distribution ratios were estimated.

For each of the three variables, monthly ratios were calculated by simply dividing each State's monthly sum by each State's total sum as shown in Equation 1 below.

Equation 1. Monthly ratio calculation.

$$\text{Monthly Ratio}_{\text{State, Var}} = \text{Monthly Sum}_{\text{State, Var}} / \text{Annual Sum}_{\text{State, Var}}$$

Where,

Var = CEM-based variable of SO₂, NO_x or heat input

Exhibit 3.3 provides an example calculation for this step, both in tabular and graphical format.

The resulting ratios will then be normalized for each variable in order to provide SMOKE with the monthly distribution factors necessary to process annual emissions into a monthly result. An example monthly profile using the data from Exhibit 3.3 is shown in Exhibit 3.4.

Exhibit 3.3 – Example Application of Calculated Ratios for Actual 2007 by Month

| | | Actual Reported Value Sums [2007] | | | Calculated Ratios | | |
|-----------|--------------|-----------------------------------|--------------------|--------------------|-------------------|---------------|---------------|
| State | Month | SO2 Mass | NOx Mass | Heat Input | SO2 | NOx | Heat Input |
| NY | Jan | 22,423,391 | 10,809,292 | 60,408,685 | 0.1046 | 0.0942 | 0.0809 |
| NY | Feb | 29,299,033 | 12,448,052 | 67,590,104 | 0.1366 | 0.1084 | 0.0905 |
| NY | Mar | 21,364,883 | 10,327,432 | 63,106,554 | 0.0996 | 0.0900 | 0.0845 |
| NY | Apr | 16,454,881 | 9,221,500 | 55,568,488 | 0.0767 | 0.0803 | 0.0744 |
| NY | May | 12,855,963 | 8,198,597 | 53,421,346 | 0.0600 | 0.0714 | 0.0715 |
| NY | Jun | 14,525,239 | 9,282,277 | 65,577,304 | 0.0677 | 0.0809 | 0.0878 |
| NY | Jul | 16,311,783 | 10,372,119 | 74,182,361 | 0.0761 | 0.0904 | 0.0993 |
| NY | Aug | 17,757,143 | 11,156,733 | 82,322,615 | 0.0828 | 0.0972 | 0.1102 |
| NY | Sep | 15,809,719 | 8,879,373 | 63,553,452 | 0.0737 | 0.0773 | 0.0851 |
| NY | Oct | 15,055,032 | 7,390,952 | 55,149,951 | 0.0702 | 0.0644 | 0.0738 |
| NY | Nov | 14,471,865 | 7,561,984 | 47,280,729 | 0.0675 | 0.0659 | 0.0633 |
| NY | Dec | 18,092,057 | 9,155,587 | 58,804,999 | 0.0844 | 0.0798 | 0.0787 |
| NY | Total | 214,420,988 | 114,803,899 | 746,966,587 | 1.0000 | 1.0000 | 1.0000 |

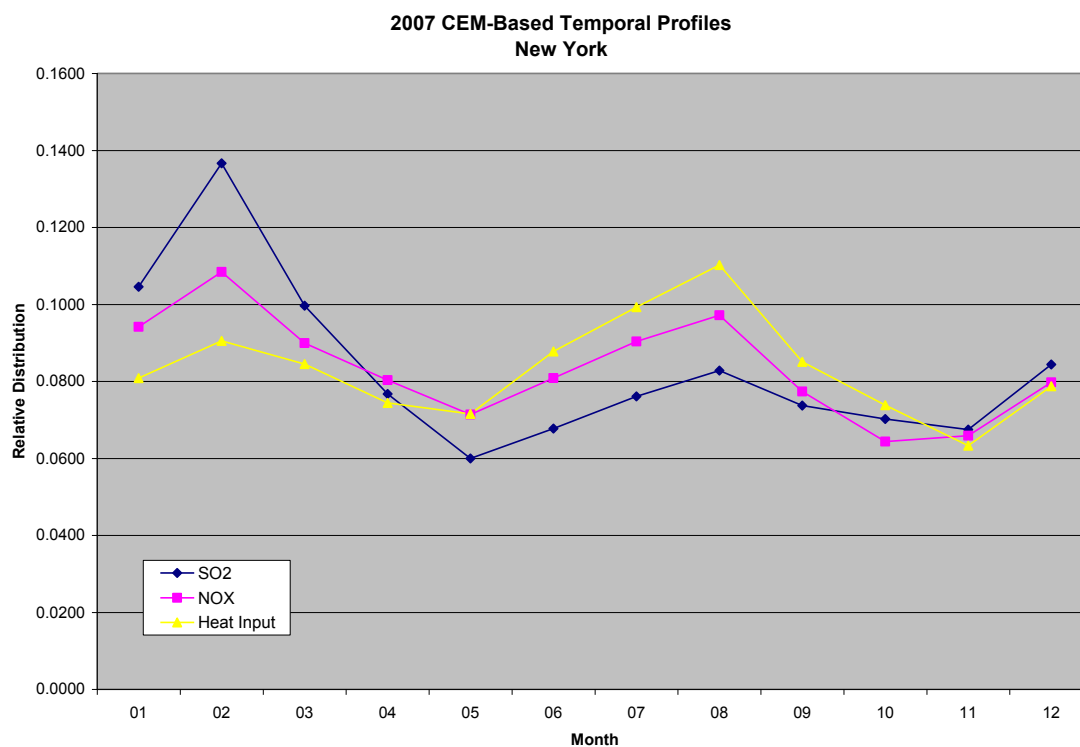


Exhibit 3.4 - Example SMOKE profile for monthly distribution of New York annual emissions using heat input.

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Monthly Ratio | 0.0809 | 0.0905 | 0.0845 | 0.0744 | 0.0715 | 0.0878 | 0.0993 | 0.1102 | 0.0851 | 0.0738 | 0.0633 | 0.0787 | 1.0000 |
| Monthly Profile | 809 | 905 | 845 | 744 | 716 | 878 | 994 | 1103 | 851 | 739 | 633 | 788 | 10005 |

The profile in the above table can then be associated to the profile cross-reference lookup either by State, State-SCC or some other combination allowing each non-CEM (PTHOUR) reporting unit to have annual emissions allocated using this method. Existing day of week and diurnal profiles were used to allocate emissions to finer time periods within each month.

3.4.2 Non-Annual Profile Development

A number of units have been identified which require monthly distribution for only timeframes outside of the ozone season (when these units are not required to report CEMs), the above calculated profiles were modified for use with these units. In order to appropriately account for emissions at these sources not included in prepared hourly (PTHOUR) SMOKE input files, the monthly profiles were zeroed out during the months when hourly CAMD emissions were reported. Concurrently, the TOTAL profile sum was adjusted to accurately reflect the ratio of month to total distribution. An example of this adjustment is shown with highlight in Exhibit 3.5.

Exhibit 3.5 - Example SMOKE profile for adjusted monthly distribution of New York seasonal emissions using heat input.

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Monthly Ratio | 0.0809 | 0.0905 | 0.0845 | 0.0744 | 0.0715 | 0.0878 | 0.0993 | 0.1102 | 0.0851 | 0.0738 | 0.0633 | 0.0787 | 1.0000 |
| Monthly Profile | 809 | 905 | 845 | 744 | 716 | 878 | 994 | 1103 | 851 | 739 | 633 | 788 | 10005 |
| Adjusted Profile | 809 | 905 | 845 | 0 | 0 | 0 | 0 | 0 | 0 | 739 | 633 | 788 | 4719 |

3.4.3 Issue for Consideration

While in many cases hourly data are available in six month segments to account for partial year operation of this equipment, emissions and heat input may not be reported for the entire six month period.

Looking at the hourly CAMD files available from USEPA, only a nominal number of sources and associated emissions from CAMD 6-month reporting units actually reported in April 2007. As a result, the April hourly CAMD data was not used in MARAMA's simulation. Instead, an adjusted profile adjusted profile for five month operation was prepared and used for these sources.

3.5 ANALYSIS OF HOURLY DATA

MARAMA's contract with MACTEC includes a task for various analyses of hourly point source data. These analyses will be used to show the variability of hourly emissions by time period (by season, episode, day, hour), type of fuel (coal, oil, natural gas) and type of unit (e.g., base-load, load-following). These analyses are documented in a separate report available on the MARAMA website.

4.0 ANNUAL 2007 INVENTORY FOR AREA SOURCES

4.1 AREA SOURCE CATEGORIES

Area sources are relatively small sources of air pollutants that are diffused over a wide geographical area. They include sources that in and of themselves are insignificant, but in aggregate may comprise significant emissions. Examples are emissions from home heating systems, house painting, consumer products usage, and small industrial/commercial operations that are not permitted as point sources. There are 356 individual area source categories in the MANE-VU+VA inventory, categorized by a 10-digit SCC. Major grouping (categories at the 7-digit SCC) included in the area source inventory are shown in Exhibit 4.1.

The USEPA has developed emission estimation methodologies and estimates for the National Emission Inventory (NEI). The NEI is developed on a three-year cycle, and inventories are available for 2002, 2005, and 2008.

For many categories, unless specifically instructed otherwise by the States, MACTEC used the most recent data from USEPA. These sources included ammonia emissions from livestock and fertilizers which came from a recent application of the Carnegie Mellon University (CMU) ammonia model to produce 2007 emissions and output from a version of the Residential Wood Combustion (RWC) model developed by USEPA and run with updated 2007 data to produce emission estimates for that source category. In addition, a number of States requested that MACTEC include USEPA data on wildfire emissions developed as part of USEPA's SMARTFIRE system.

In the following sections, we first describe the data that was available from USEPA and that was used for categories where States did not submit data. Next we describe the State data submittals that were used to override the USEPA data. We summarize the ultimate source of the area source data that each State decided to use for each source category. Finally, we present a State-level summary of emissions by pollutant.

Exhibit 4.1 – Area Source Category Definitions

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|---|
| 21-01-001 | Stationary Fuel; Electric Utility; Anthracite Coal |
| 21-01-002 | Stationary Fuel; Electric Utility; Bituminous/Sub-bituminous Coal |
| 21-01-004 | Stationary Fuel; Electric Utility; Distillate Oil |
| 21-01-005 | Stationary Fuel; Electric Utility; Residual Oil |
| 21-01-006 | Stationary Fuel; Electric Utility; Natural Gas |
| 21-02-001 | Stationary Fuel; Industrial; Anthracite Coal |

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|---|
| 21-02-002 | Stationary Fuel; Industrial; Bituminous/Sub-bituminous Coal |
| 21-02-004 | Stationary Fuel; Industrial; Distillate Oil |
| 21-02-005 | Stationary Fuel; Industrial; Residual Oil |
| 21-02-006 | Stationary Fuel; Industrial; Natural Gas |
| 21-02-007 | Stationary Fuel; Industrial; Liquefied Petroleum Gas (LPG) |
| 21-02-008 | Stationary Fuel; Industrial; Wood |
| 21-02-011 | Stationary Fuel; Industrial; Kerosene |
| 21-03-001 | Stationary Fuel; Commercial/Institutional; Anthracite Coal |
| 21-03-002 | Stationary Fuel; Commercial/Institutional; Bituminous/Sub-bituminous Coal |
| 21-03-004 | Stationary Fuel; Commercial/Institutional; Distillate Oil |
| 21-03-005 | Stationary Fuel; Commercial/Institutional; Residual Oil |
| 21-03-006 | Stationary Fuel; Commercial/Institutional; Natural Gas |
| 21-03-007 | Stationary Fuel; Commercial/Institutional; Liquefied Petroleum Gas (LPG) |
| 21-03-008 | Stationary Fuel; Commercial/Institutional; Wood |
| 21-03-011 | Stationary Fuel; Commercial/Institutional; Kerosene |
| 21-04-001 | Stationary Fuel; Residential; Anthracite Coal |
| 21-04-002 | Stationary Fuel; Residential; Bituminous/Sub-bituminous Coal |
| 21-04-004 | Stationary Fuel; Residential; Distillate Oil |
| 21-04-006 | Stationary Fuel; Residential; Natural Gas |
| 21-04-007 | Stationary Fuel; Residential; Liquefied Petroleum Gas (LPG) |
| 21-04-008 | Stationary Fuel; Residential; Wood |
| 21-04-009 | Stationary Fuel; Residential; Firelog |
| 21-04-011 | Stationary Fuel; Residential; Kerosene |
| 22-94-000 | Mobile Sources; Paved Roads; All Paved Roads |
| 22-96-000 | Mobile Sources; Unpaved Roads; All Unpaved Roads |
| 23-01-000 | Industrial Processes; Chemical Manufacturing: SIC 28; All Processes |
| 23-01-030 | Industrial Processes; Chemical Manufacturing: SIC 28; Process Emissions from Pharmaceutical |
| 23-02-002 | Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Charbroiling |
| 23-02-003 | Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Frying |
| 23-02-040 | Industrial Processes; Food and Kindred Products: SIC 20; Grain Mill Products |
| 23-02-050 | Industrial Processes; Food and Kindred Products: SIC 20; Bakery Products |
| 23-02-070 | Industrial Processes; Food and Kindred Products: SIC 20; Fermentation/Beverages |
| 23-02-080 | Industrial Processes; Food and Kindred Products: SIC 20; Miscellaneous Food and Kindred Prods |
| 23-07-030 | Industrial Processes; Wood Products: SIC 24; Millwork, Plywood, and Structural Members |
| 23-07-060 | Industrial Processes; Wood Products: SIC 24; Miscellaneous Wood Products |
| 23-08-000 | Industrial Processes; Rubber/Plastics: SIC 30; All Processes |
| 23-09-100 | Industrial Processes; Fabricated Metals: SIC 34; Coating, Engraving, and Allied Services |
| 23-11-010 | Industrial Processes; Construction: SIC 15 - 17; Residential |
| 23-11-020 | Industrial Processes; Construction: SIC 15 - 17; Industrial/Commercial/Institutional |
| 23-11-030 | Industrial Processes; Construction: SIC 15 - 17; Road Construction |
| 23-25-000 | Industrial Processes; Mining and Quarrying: SIC 14; All Processes |
| 23-25-020 | Industrial Processes; Mining and Quarrying: SIC 14; Crushed and Broken Stone |

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|---|
| 23-25-030 | Industrial Processes; Mining and Quarrying: SIC 14; Sand and Gravel |
| 23-90-008 | Industrial Processes; In-process Fuel Use; Wood |
| 23-99-000 | Industrial Processes; Industrial Processes: NEC; Industrial Processes: NEC |
| 23-99-010 | Industrial Processes; Industrial Refrigeration; Refrigerant Losses |
| 24-01-001 | Solvent Utilization; Surface Coating; Architectural Coatings |
| 24-01-002 | Solvent Utilization; Surface Coating; Architectural Coatings - Solvent-based |
| 24-01-003 | Solvent Utilization; Surface Coating; Architectural Coatings - Water-based |
| 24-01-005 | Solvent Utilization; Surface Coating; Auto Refinishing: SIC 7532 |
| 24-01-008 | Solvent Utilization; Surface Coating; Traffic Markings |
| 24-01-015 | Solvent Utilization; Surface Coating; Factory Finished Wood: SIC 2426 thru 242 |
| 24-01-020 | Solvent Utilization; Surface Coating; Wood Furniture: SIC 25 |
| 24-01-025 | Solvent Utilization; Surface Coating; Metal Furniture: SIC 25 |
| 24-01-030 | Solvent Utilization; Surface Coating; Paper: SIC 26 |
| 24-01-040 | Solvent Utilization; Surface Coating; Metal Cans: SIC 341 |
| 24-01-045 | Solvent Utilization; Surface Coating; Metal Coils: SIC 3498 |
| 24-01-050 | Solvent Utilization; Surface Coating; Miscellaneous Finished Metals: SIC 34 - (341 + 3498) |
| 24-01-055 | Solvent Utilization; Surface Coating; Machinery and Equipment: SIC 35 |
| 24-01-060 | Solvent Utilization; Surface Coating; Large Appliances: SIC 363 |
| 24-01-065 | Solvent Utilization; Surface Coating; Electronic and Other Electrical: SIC 36 - 363 |
| 24-01-070 | Solvent Utilization; Surface Coating; Motor Vehicles: SIC 371 |
| 24-01-075 | Solvent Utilization; Surface Coating; Aircraft: SIC 372 |
| 24-01-080 | Solvent Utilization; Surface Coating; Marine: SIC 373 |
| 24-01-085 | Solvent Utilization; Surface Coating; Railroad: SIC 374 |
| 24-01-090 | Solvent Utilization; Surface Coating; Miscellaneous Manufacturing |
| 24-01-100 | Solvent Utilization; Surface Coating; Industrial Maintenance Coatings |
| 24-01-102 | Solvent Utilization; Surface Coating; Industrial Maintenance Coatings |
| 24-01-103 | Solvent Utilization; Surface Coating; Industrial Maintenance Coatings |
| 24-01-200 | Solvent Utilization; Surface Coating; Other Special Purpose Coatings |
| 24-01-990 | Solvent Utilization; Surface Coating; All Surface Coating Categories |
| 24-15-000 | Solvent Utilization; Degreasing; All Processes/All Industries |
| 24-15-005 | Solvent Utilization; Degreasing; Furniture and Fixtures (SIC 25): All Processes |
| 24-15-010 | Solvent Utilization; Degreasing; Primary Metal Industries (SIC 33): All Processes |
| 24-15-020 | Solvent Utilization; Degreasing; Fabricated Metal Products (SIC 34): All Processes |
| 24-15-025 | Solvent Utilization; Degreasing; Industrial Machinery and Equipment (SIC 35): All Processes |
| 24-15-030 | Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): All Processes |
| 24-15-035 | Solvent Utilization; Degreasing; Transportation Equipment (SIC 37): All Processes |
| 24-15-040 | Solvent Utilization; Degreasing; Instruments and Related Products (SIC 38): All Processes |
| 24-15-045 | Solvent Utilization; Degreasing; Miscellaneous Manufacturing (SIC 39): All Processes |
| 24-15-050 | Solvent Utilization; Degreasing; Transportation Maintenance Facilities (SIC 40-45): All Processes |
| 24-15-055 | Solvent Utilization; Degreasing; Automotive Dealers (SIC 55): All Processes |
| 24-15-060 | Solvent Utilization; Degreasing; Miscellaneous Repair Services (SIC 76): All Processes |
| 24-15-065 | Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): All Processes |

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|--|
| 24-15-100 | Solvent Utilization; Degreasing; All Industries: Open Top Degreasing |
| 24-15-130 | Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Open Top Degreasing |
| 24-15-200 | Solvent Utilization; Degreasing; All Industries: Conveyerized Degreasing |
| 24-15-230 | Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Conveyerized Degreasing |
| 24-15-300 | Solvent Utilization; Degreasing; All Industries: Cold Cleaning |
| 24-15-360 | Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): Cold Cleaning |
| 24-20-000 | Solvent Utilization; Dry Cleaning; All Processes |
| 24-20-010 | Solvent Utilization; Dry Cleaning; Commercial/Industrial Cleaners |
| 24-25-000 | Solvent Utilization; Graphic Arts; All Processes |
| 24-25-010 | Solvent Utilization; Graphic Arts; Lithography |
| 24-25-020 | Solvent Utilization; Graphic Arts; Letterpress |
| 24-25-030 | Solvent Utilization; Graphic Arts; Rotogravure |
| 24-25-040 | Solvent Utilization; Graphic Arts; Flexography |
| 24-30-000 | Solvent Utilization; Rubber/Plastics; All Processes |
| 24-40-000 | Solvent Utilization; Misc. Industrial; All Processes |
| 24-40-020 | Solvent Utilization; Misc. Industrial; Adhesive (Industrial) Application |
| 24-60-000 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Processes |
| 24-60-100 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Personal Care Products |
| 24-60-200 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Household Products |
| 24-60-400 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Automotive Aftermarket |
| 24-60-500 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Coatings and Related |
| 24-60-600 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Adhesives and Sealants |
| 24-60-800 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All FIFRA Related Products |
| 24-60-900 | Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; Miscellaneous Products |
| 24-61-020 | Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Application: All Processes |
| 24-61-021 | Solvent Utilization; Misc. Non-industrial: Commercial; Cutback Asphalt |
| 24-61-022 | Solvent Utilization; Misc. Non-industrial: Commercial; Emulsified Asphalt |
| 24-61-023 | Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Roofing |
| 24-61-200 | Solvent Utilization; Misc. Non-industrial: Commercial; Adhesives and Sealants |
| 24-61-800 | Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: All Processes |
| 24-61-850 | Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Agricultural |
| 24-61-870 | Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Non-Agricultural |
| 24-65-000 | Solvent Utilization; Misc. Non-industrial: Consumer; All Products/Processes |
| 24-65-800 | Solvent Utilization; Misc. Non-industrial: Consumer; Pesticide Application |
| 25-01-011 | Storage and Transport; Petroleum and Petroleum Product Storage; Residential PFCs |
| 25-01-012 | Storage and Transport; Petroleum and Petroleum Product Storage; Commercial PFCs |
| 25-01-030 | Storage and Transport; Petroleum and Petroleum Product Storage; |
| 25-01-050 | Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Terminals |
| 25-01-055 | Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Plants |
| 25-01-060 | Storage and Transport; Petroleum and Petroleum Product Storage; Gasoline Service Stations |
| 25-01-080 | Storage and Transport; Petroleum and Petroleum Product Storage; Airports : Aviation Gasoline |
| 25-01-090 | Storage and Transport; Petroleum and Petroleum Product Storage; |

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|--|
| 25-01-995 | Storage and Transport; Petroleum and Petroleum Product Storage; All Storage Types |
| 25-05-020 | Storage and Transport; Petroleum and Petroleum Product Transport; Marine Vessel |
| 25-05-030 | Storage and Transport; Petroleum and Petroleum Product Transport; Truck |
| 25-05-040 | Storage and Transport; Petroleum and Petroleum Product Transport; Pipeline |
| 25-30-010 | Storage and Transport; Bulk Materials Storage; Commercial/Industrial |
| 26-01-000 | Waste Disposal; On-site Incineration; All Categories |
| 26-01-010 | Waste Disposal; On-site Incineration; Industrial |
| 26-01-020 | Waste Disposal; On-site Incineration; Commercial/Institutional |
| 26-01-030 | Waste Disposal; On-site Incineration; Residential |
| 26-10-000 | Waste Disposal; Open Burning; All Categories |
| 26-10-030 | Waste Disposal; Open Burning; Residential |
| 26-10-040 | Waste Disposal; Open Burning; Municipal (collected from residences, parks, other for central burn) |
| 26-20-000 | Waste Disposal; Landfills; All Categories |
| 26-20-030 | Waste Disposal; Landfills; Municipal |
| 26-30-010 | Waste Disposal; Wastewater Treatment; Industrial |
| 26-30-020 | Waste Disposal; Wastewater Treatment; Public Owned |
| 26-30-050 | Waste Disposal; Wastewater Treatment; Public Owned |
| 26-40-000 | Waste Disposal; TSDFs; All TSDF Types |
| 26-60-000 | Waste Disposal; Leaking Underground Storage Tanks; Leaking Underground Storage Tanks |
| 26-80-001 | Waste Disposal; Composting; 100% Biosolids (e.g., sewage sludge, manure, mixtures) |
| 26-80-002 | Waste Disposal; Composting; Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes) |
| 28-01-000 | Misc. Area Sources; Agriculture Production - Crops; Agriculture – Crops |
| 28-01-001 | Misc. Area Sources; Agriculture Production - Crops; |
| 28-01-002 | Misc. Area Sources; Agriculture Production - Crops; |
| 28-01-500 | Misc. Area Sources; Agriculture Production - Crops; Agricultural Field Burning - whole field |
| 28-01-700 | Misc. Area Sources; Agriculture Production - Crops; Fertilizer Application |
| 28-05-001 | Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / dry-lots |
| 28-05-002 | Misc. Area Sources; Agriculture Production - Livestock; Beef cattle production composite |
| 28-05-003 | Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / pasture/range |
| 28-05-007 | Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with dry mgmt |
| 28-05-008 | Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with wet mgmt |
| 28-05-009 | Misc. Area Sources; Agriculture Production - Livestock; Poultry production – broilers |
| 28-05-010 | Misc. Area Sources; Agriculture Production - Livestock; Poultry production – turkeys |
| 28-05-018 | Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle composite |
| 28-05-019 | Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - flush dairy |
| 28-05-020 | Misc. Area Sources; Agriculture Production - Livestock; Cattle and Calves Waste Emissions |
| 28-05-021 | Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - scrape dairy |
| 28-05-022 | Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - deep pit dairy |
| 28-05-023 | Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - dry-lot/pasture dairy |
| 28-05-024 | Misc. Area Sources; Agriculture Production - Livestock; |
| 28-05-025 | Misc. Area Sources; Agriculture Production - Livestock; Swine production composite |
| 28-05-026 | Misc. Area Sources; Agriculture Production - Livestock; |

| 7-Digit SCC | 7-Digit SCC Description |
|-------------|---|
| 28-05-027 | Misc. Area Sources; Agriculture Production - Livestock; |
| 28-05-028 | Misc. Area Sources; Agriculture Production - Livestock; |
| 28-05-030 | Misc. Area Sources; Agriculture Production - Livestock; Poultry Waste Emissions |
| 28-05-035 | Misc. Area Sources; Agriculture Production - Livestock; Horses and Ponies Waste Emissions |
| 28-05-039 | Misc. Area Sources; Agriculture Production - Livestock; Swine production - ops with lagoons |
| 28-05-040 | Misc. Area Sources; Agriculture Production - Livestock; Sheep and Lambs Waste Emissions |
| 28-05-045 | Misc. Area Sources; Agriculture Production - Livestock; Goats Waste Emissions |
| 28-05-047 | Misc. Area Sources; Agriculture Production - Livestock; Swine production - deep-pit house |
| 28-05-053 | Misc. Area Sources; Agriculture Production - Livestock; Swine production - outdoor |
| 28-06-010 | Misc. Area Sources; Domestic Animals Waste Emissions; Cats |
| 28-06-015 | Misc. Area Sources; Domestic Animals Waste Emissions; Dogs |
| 28-07-020 | Misc. Area Sources; Wild Animals Waste Emissions; Bears |
| 28-07-025 | Misc. Area Sources; Wild Animals Waste Emissions; Elk |
| 28-07-030 | Misc. Area Sources; Wild Animals Waste Emissions; Deer |
| 28-07-040 | Misc. Area Sources; Wild Animals Waste Emissions; Birds |
| 28-10-001 | Misc. Area Sources; Other Combustion; Forest Wildfires |
| 28-10-003 | Misc. Area Sources; Other Combustion; Cigarette Smoke |
| 28-10-005 | Misc. Area Sources; Other Combustion; Managed Burning, Slash (Logging Debris) |
| 28-10-010 | Misc. Area Sources; Other Combustion; Human Perspiration and Respiration |
| 28-10-014 | Misc. Area Sources; Other Combustion; Prescribed Burning |
| 28-10-015 | Misc. Area Sources; Other Combustion; Prescribed Forest Burning |
| 28-10-020 | Misc. Area Sources; Other Combustion; Prescribed Rangeland Burning |
| 28-10-025 | Misc. Area Sources; Other Combustion; Charcoal Grilling - Residential |
| 28-10-030 | Misc. Area Sources; Other Combustion; Structure Fires |
| 28-10-035 | Misc. Area Sources; Other Combustion; Firefighting Training |
| 28-10-050 | Misc. Area Sources; Other Combustion; Motor Vehicle Fires |
| 28-10-060 | Misc. Area Sources; Other Combustion; Cremation |
| 28-10-090 | Misc. Area Sources; Other Combustion; Open Fire |
| 28-30-000 | Misc. Area Sources; Catastrophic/Accidental Releases; All Catastrophic/Accidental Releases |
| 28-30-010 | Misc. Area Sources; Catastrophic/Accidental Releases; Transportation Accidents |
| 28-70-000 | Misc. Area Sources; ; |

4.2 EPA AREA SOURCE DATA

USEPA emissions inventories and emission estimation tools were used to create a preliminary version of the 2007 area source inventory. States reviewed the data available from USEPA and made a determination on a category by category basis of whether the USEPA data was acceptable for their State. This section describes the data and tools available from USEPA.

4.2.1 EPA 2008 National Emission Inventory

Prior to preparation of the 2008 inventory, USEPA, in consultation with ERTAC, revised the recommended emission factors and estimation methods for many area source categories. The goal was to provide standardized emission calculations and related documentation across states. These were then used by USEPA's contractor to develop 2008 emission estimates for fifteen area source categories to support development of the 2008 National Emission Inventory (NEI). In general, county-level criteria and HAP pollutant emissions were estimated at the SCC level. In most cases, activity data was collected for 2008. In cases where 2008 activity data did not exist, data from the most recent year available was used, as reported in the documentation.

- Agriculture Production - Livestock
- Asphalt Paving
- Aviation Gasoline Distribution
- Commercial Cooking
- Construction Dust
- Commercial/Institutional Fuel Combustion
- Fertilizer Application
- Gasoline Distribution
- Industrial Fuel Combustion
- Open Burning
- Road Dust
- Publicly Owned Treatment Works (POTW)
- Residential Heating
- Solvent Usage - Surface Coatings
- Solvent Usage - Other

The emission factors from the ERTAC process and the resulting 2008 emissions developed by USEPA were available for State use in this 2007 inventory development process (USEPA 2010a).

4.2.2 EPA Residential Wood Combustion (RWC) Tool

EPA worked with a group of State, local, and regional planning organization representatives to develop a new methodology for estimating RWC emissions (USEPA 2010b). USEPA developed a Microsoft Access Tool to allow S/L agencies to calculate annual emissions from RWC sources. The new methodology: 1) accounts for appliances not included in the old methodology (e.g., outdoor hydronic heaters); 2) makes the methodology easier for States to input location-specific knowledge; and 3) updates many of the assumptions made to calculate emissions (for example, the percent conventional versus USEPA certified wood stoves).

EPA updated the RWC tool with 2007 population data and it was provided it to States to review the input parameters, including county populations, appliance profiles, burn rates, density of cordwood by county, appliance populations, and emission factors by SCC. The only changes that we made to the model itself were for Vermont, which provided updated burn rates and other appliance populations. MACTEC reran the revised 2007 RWC tool for all states. The results of this run are included in the inventory with the exception of New Jersey. New Jersey revised certain model inputs, re-ran the RWC tool on their own, and provided MACTEC with the resulting NIF files.

4.2.3 EPA CMU Agricultural Ammonia Model

In preparation for the 2008 NEI, USEPA used the Carnegie Mellon University (CMU) Ammonia Model to generate an ammonia emission inventory for the continental United States based on 2007 activity levels. No significant change was made to the emission factors in the model. The primary sources of ammonia are two agricultural operations:

- Livestock refers to domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. The definition of livestock in this category includes beef cattle, dairy cattle, ducks, geese, goats, horses, poultry, sheep, and swine.
- Fertilizer refers to any nitrogen-based compound, or mixture containing such a compound, that is applied to land to improve plant fitness.

The CMU model also includes estimates for non-domestic animals (deer, bear, etc.) and domesticated pets (dogs and cats) as well as other things such as human perspiration. MACTEC obtained from USEPA a recent run of the CMU model for 2007 and provided it to the States for their review (USEPA 2010c).

4.2.4 EPA SMARTFIRE Emissions Database

SMARTFIRE is an algorithm and database system developed and built within a geographic information system (GIS) framework that combines multiple sources of fire information and reconciles them into a unified data set (SONOMA 2009). SMARTFIRE data sources include satellite fire detects and ground reports of fire incidents for various wild land management agencies. SMARTFIRE was developed by the USDA Forest Service AirFire Team and Sonoma Technology, Inc. under a grant from NASA. SMARTFIRE interfaces with the BlueSky framework to estimate daily, location-specific fire emissions.

MACTEC obtained from USEPA a file of 2007 annual, county-level emissions data for wild land fires as calculated using the SMARTFIRE methodology. MACTEC provided the inventory and documentation to States for their review and consideration.

4.3 STATE-SPECIFIC DATA

States reviewed the documentation and resulting emission files for each USEPA estimation methodology to better understand the method assumptions, data sources, emission factors and data limitations. Each State made a decision of whether to accept the USEPA inventory (NEI 2008, RWC tool results, CMU ammonia model results, SMARTFIRE results) or to develop their own emission estimates for these categories. Based on state choices, MACTEC initiated collection of the State supplied data. Generally states provided their data in NIF3.0 format; however some data was provided in spreadsheets in a State-specific format or in the new EIS Emissions format. Where necessary, data was converted to NIF format, filling in as many NIF fields as possible with state-supplied data.

State submitted emission files were augmented using USEPA data as directed by the States. Where 2008 NEI data were used to fill missing categories in the 2007 MANE VU+VA inventory, no growth adjustment was made to the emissions. This is because States felt that activity in 2008 to 2007 was similar due to the economic downturn.

The emissions data is house in NOF formatted files, which provides additional fields at the end of each table identify the source and revision date of the data. Those data elements provide a better understanding of the lineage of the data for each source category, thus improving the overall inventory quality assurance (QA). The values in the DATA_SOURCE field in the EM table are shown in Exhibit 4.2. Exhibit 4.3 summarizes the data sources finally used for each MARAMA State and major source category.

Exhibit 4.2 – Values Contained in the DATA_SOURCE Field of the EM Table

| EM Table DATA-SOURCE Value | Description of Data Source |
|-----------------------------------|---|
| 2005NEIv2 | All of the records are for CT, which used this value in their submittal to MACTEC – data taken directly by CT from the 2005 NEI version 2 |
| 2008NEI | Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD |
| EPA | Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD |
| EPA NEI05 | Emissions based on USEPA's 2005 NEI as a gap-filling measure where 2007 data were not available from State or USEPA |
| EPA RWC Mo | Emissions based on USEPA's Residential Wood Combustion model |
| EPA/Ratio | PM emissions were generated using USEPA-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants |
| EPA-CMU | Emissions based on USEPA's 2007 run of the CMU ammonia model |
| MARAMA02BY | Emissions based on MARAMA's 2002 Version 3 area source inventory as a gap-filling measure where 2007 data were not available from the State or USEPA |
| MARAMA2009 | Emissions based on MARAMA's 2009 Version 3 area source inventory as a gap-filling measure where 2007 data not available from State or USEPA |
| NEI0508INT | Emissions were linearly interpolated for 2007 based on values in the 2005 NEI and the 2008 NEI |
| NEI08CTMOD | All of the records are for CT, which used this value in their submittal to MACTEC – these records were based on the 2008 NEI data modified by CT air quality staff |
| SEMAP07 | Emissions for Virginia are based on SEMAPs 2007 area source inventory |
| State RWC | Emissions for New Jersey based on NJ-specific application of USEPA's Residential Wood Combustion model |
| State Supp | Emissions were provided directly by the State and represent actual 2007 emissions |
| StateRatio | PM emissions were generated using State-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants |

Exhibit 4.3 – Data Sources Generally Used by Each State for Each Area Source Category

| SCC4 Description | CT | DE | DC | ME | MD | MA | NH | NJ | NY | PA | RI | VT | VA |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|---------------|---------------|
| 2101 Fuel Comb. / Utility | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | State | n/a | n/a | n/a | n/a |
| 2102 Fuel Comb. / Industrial | State | State | State | n/a | n/a | State | State | State | State | State | State | State | State |
| 2103 Fuel Comb. / Commercial | State | State | State | State | State | State | State | State | State | State | State | State | State |
| 2104 Residential Other Fuels | State | State | State | State | State | State | State | State | State | State | EPA | State / USEPA | State |
| 2104 Residential Wood Comb. | EPA RWC | State | n/a | State | State | EPA RWC | State | State RWC | State | State | EPA RWC | EPA RWC | EPA RWC |
| 2294 Paved Road Dust | EPA | State | State | State | State | EPA | EPA | State | EPA | EPA | EPA | State | EPA |
| 2296 Unpaved Road Dust | EPA | n/a | State | State | State | EPA | EPA | State | EPA | EPA | EPA | State | EPA |
| 2302 Food & Kindred Products | EPA | State | State | State | State | State | EPA | State | State | State | EPA | EPA | State / USEPA |
| 2311 Construction | EPA | State | State | State | State | n/a | State / USEPA | State | EPA | EPA | EPA | EPA | EPA |
| 2325 Mining & Quarrying | State | n/a | n/a | State | n/a | EPA NEI05 | EPA NEI05 | State | MARAMA 09 | EPA NEI05 | n/a | EPA NEI05 | State |
| 2399 Industrial Refrigeration | State | n/a | n/a | n/a | n/a | n/a | n/a | State | n/a | n/a | n/a | n/a | n/a |
| 2401 Surface Coating | EPA | State | State | State | State | State | State | State | State | State | EPA | EPA | State |
| 2415 Degreasing | EPA | State | State | State | State | State | State | State | State | State | EPA | EPA | State |
| 2420 Dry Cleaning | EPA | State | State | n/a | State | State | EPA | State | n/a | State | EPA | EPA | State |
| 2425 Graphic Arts | EPA | State | State | State | State | State | State | State | State | State | EPA | EPA | State |

[illegible]

| SCC4 Description | CT | DE | DC | ME | MD | MA | NH | NJ | NY | PA | RI | VT | VA |
|----------------------------|------------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| 2805 Agriculture Livestock | EPA CMU | State | n/a | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU | EPA CMU |
| 2810 Forest Wildfires | n/a | State | n/a | State | State | State | n/a | State | State | EPA | n/a | State | SEMAP 07 |
| 2810 Prescribed Fires | n/a | State | State | State | State | n/a | n/a | State | State | n/a | n/a | n/a | SEMAP 07 |
| 2810 Structure Fires | State | State | State | State | State | State | State | State | State | n/a | n/a | State | State |

Note: this table provides a general indication of the data source used for each major source category. Refer to the NIF EM table for a comprehensive listing of the Data Source for each individual county/SCC/pollutant.

4.4 STATE AND STAKEHOLDER REVIEW AND COMMENT

The draft MS Access area source files were provided to States and stakeholders for review and comment. Within the Access database three queries were provided to allow the States to summarize emissions by State, county, SCC and pollutant to assist with the review. States and stakeholders provided comments and changes for incorporation and/or change. The following subsections describe the comments received and other QA activities performed that were ultimately incorporated into the final area source inventory.

4.4.1 National Park Service Comments

The only comments received from outside stakeholders came from the National Park Service (NPS). The NPS requested that the documentation be updated to more clearly identify the data sources used by each State for each category. Exhibits 4.2 and 4.3 were prepared in response to this request. Note that Exhibit 4.2 provides only a general indication of the data source used for each major source category. Reviewers are directed to the NOF EM table for a comprehensive listing of the Data Source used for each individual county/SCC/pollutant record. The NPS also commented on the large differences in emissions from some categories between 2002 and 2007. These differences were evaluated and are addressed in Section 4.4.3 and 4.5 of this TSD.

4.4.2 Removal of Stage II Emissions

During the review period, MACTEC confirmed that Stage II emissions are calculated by the MOVES model. Stage II emissions are the emissions that result from the refueling of motor vehicles at gasoline service stations. States confirmed that the Stage II emissions were best estimated by the MOVES model, and instructed MACTEC to remove these emissions from the area source inventory so that the emissions would not be double counted.

4.4.3 Checks for Missing Categories, Double Counting, Outliers, and Differences between 2002 and 2007 Inventories

As shown previously in Exhibit 4.3, a variety of data sources and methods are used by States to develop the 2007 inventory. The potential exists for categories to be inadvertently omitted, double counted (for example by including both State-specific and USEPA estimates), or to have a large per-capita or per-employee variation from State-to-State.

To guard against omission or double counting, MACTEC and MARAMA prepared a series of SCC level summary reports and manually reviewed them to determine potentially missing source categories. Among the reports were the following:

- “SCC in both 2002 and 2007” compares emissions by State and SCC for SCCs contained in both the 2002 and 2007 inventories.
- “2002 SCCs NOT in 2007” contains the SCCs that were in the 2002 inventory, but not in the first draft of the 2007 inventory.
- “2007 SCCs NOT in 2002” contains the SCCs that were in the 2007 inventory, but not in the 2002 inventory.

There are both increases and decreases in emissions between 2002 and 2007 depending upon the State and pollutant. In order to better understand these differences, we also prepared charts to graphically depict the major differences between the 2002 and 2007 area source inventories. Finally 4-digit SCC summaries were prepared to identify gaps.

States were asked to review these QA reports and provide responses to fill in gaps or address potentially anomalous emission estimates. Several instances were found where a State did not have emissions for a relatively important source category in the draft 2007 inventory. Examples are several SCCs related to PM emissions from construction, agricultural tilling and mining & quarrying operations. These gaps were brought to the attention of the affected States for resolution. In some cases, States provided data for the missing categories or advised MACTEC to fill in the gap using available data from existing USEPA or MARAMA inventories. In other cases, States indicated that emissions from the missing categories were small and determined that the effort to fill the missing category gap was not justified.

We reviewed SO₂ and NO_x emissions by State from industrial, commercial/institutional, and residential fuel combustion. Since the OTC is considering additional control measures for the industrial/commercial/institutional fuel combustion category, these values were closely scrutinized. Pennsylvania showed a dramatic increase in emissions from 2002 to 2007 for both SO₂ and NO_x for the industrial fuel combustion category. New York showed a substantial decrease in both the industrial and commercial/institutional categories from 2002 to 2007. Pennsylvania and New York did not provide any explanation of the possible reasons for the differences, and no changes to the 2007 values were made.

A comparison of 2002 and 2007 VOC emissions by State for three types of solvent evaporation categories revealed that two States – Maine and New York – appear to have double-counted VOC emissions for this category using two different SCCs (24-60-xxx-xx and 24-65-xxx-xx). Maine and New York reviewed the issue and provided updates to eliminate the double counting issue.

4.4.4 Consideration of New USEPA Road Dust Equation

EPA proposed a revision to the empirical equation used to estimate road dust emissions in AP-42 Section 13.2.1 “Paved Roads” in July of 2010. This revision was made as a result of the addition of emissions tests at seven locations. Four of these test locations involved vehicles traveling at lower speeds than the current data base.

MARAMA and several States reviewed the draft Section update and the supporting background report. A conference call was held with USEPA AP-42 personnel to discuss the proposed revisions. USEPA has received several comments which will be considered before finalizing revisions. These comments may result in further changes to the equation. As a result, MARAMA and the States decided to not use the proposed revision to the paved road dust equation.

4.5 ANNUAL 2007 AREA SOURCE EMISSION SUMMARY

Overall, estimated area source emissions decreased in the region for all pollutants. This is a result of the combined effect of the factors described in the previous section. Area source emissions are generally a product of both activity and emission factors. Changes in both activity and emission factors occurred between 2002 and 2007. This section describes changes for each pollutant estimated in the inventory.

Exhibit 4.4 summarizes 2002 and 2007 area source CO emissions by State. Exhibit 4.5 presents the 2007 CO emissions by State and major source category. Most States show a significant reduction in CO area source emissions between 2002 and 2007, except for Rhode Island and Vermont, which show substantial increases. Overall, area source emissions of CO in the region are estimated to be 36% lower in 2007 than was estimated in 2002. Most of the area source CO emissions result from residential wood combustion and open burning; therefore the substantial changes in CO emissions from 2002 to 2007 are most likely due to different emission estimation methodologies used for residential wood combustion and open burning.

Exhibit 4.6 summarizes 2002 and 2007 area source NH₃ emissions by State. Exhibit 4.7 presents the 2007 NH₃ emissions by State and major source category. Most States show a reduction in NH₃ area source emissions between 2002 and 2007, except for the District of Columbia, which show substantial percentage increase. It should be noted that the magnitude of NH₃ emissions in the District are very small in comparison to regional emissions, and the large percentage increase is insignificant in the context of regional air quality modeling. Overall, area source emissions of NH₃ in the region are estimated to be 17% lower in 2007 than was estimated in 2002. Nearly all area source NH₃ emissions

result from agricultural livestock and fertilizer categories which were calculated by USEPA using the CMU ammonia model.

Exhibit 4.8 summarizes 2002 and 2007 area source NO_x emissions by State. Exhibit 4.9 presents the 2007 NO_x emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Pennsylvania and Vermont, which show increases. Overall, area source emissions of NO_x in the region are estimated to be 24% lower in 2007 than was estimated in 2002. Nearly all area source NO_x emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.10 summarizes 2002 and 2007 area source PM₁₀-PRI emissions by State. Exhibit 4.11 presents the 2007 PM₁₀-PRI emissions by State and major source category. Overall, area source emissions of PM₁₀-PRI in the region are estimated to be 19% lower in 2007 than was estimated in 2002. PM₁₀-PRI emissions are attributable to the paved/unpaved road dust, construction activity, mining & quarrying, and agricultural tilling categories.

Exhibit 4.12 summarizes 2002 and 2007 area source PM₂₅-PRI emissions by State. Exhibit 4.13 presents the 2007 PM₂₅-PRI emissions by State and major source category. Overall, area source emissions of PM₂₅-PRI in the region are estimated to be 24% lower in 2007 than was estimated in 2002. PM₂₅-PRI emissions result from residential wood combustion, paved/unpaved road dust, construction activity, mining & quarrying, and open burning categories.

Exhibit 4.14 summarizes 2002 and 2007 area source SO₂ emissions by State. Exhibit 4.15 presents the 2007 SO₂ emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Connecticut and Pennsylvania, which show increases. Overall, area source emissions of SO₂ are estimated to be 28% lower in 2007 than was estimated in 2002. Nearly all area source SO₂ emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.16 summarizes 2002 and 2007 area source VOC emissions by State. Exhibit 4.17 presents the 2007 VOC emissions by State and major source category. All States show substantial reductions in VOC emissions from 2002 to 2007. Overall, area source emissions of VOC in the region are estimated to be 43% lower in 2007 than was estimated in 2002. Part of the difference can be explained by post-2002 control measures for architectural coatings, consumer products, degreasing and portable fuel containers. But, as was discussed for CO emissions, part of the difference is due to differences in the methodologies used to estimate emissions from residential wood combustion.

Exhibit 4.4 – 2002 and 2007 Area Source CO Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------------|----------------|-------------|
| Connecticut | 70,198 | 55,374 | -21% |
| Delaware | 14,052 | 8,273 | -41% |
| District of Columbia | 2,300 | 988 | -57% |
| Maine | 109,223 | 50,496 | -54% |
| Maryland | 141,179 | 74,188 | -47% |
| Massachusetts | 137,496 | 78,082 | -43% |
| New Hampshire | 79,647 | 22,836 | -71% |
| New Jersey | 97,657 | 77,687 | -20% |
| New York | 356,254 | 153,789 | -57% |
| Pennsylvania | 266,935 | 219,085 | -18% |
| Rhode Island | 8,007 | 13,032 | 63% |
| Vermont | 43,849 | 51,252 | 17% |
| Virginia | 155,873 | 140,592 | -10% |
| | 1,482,669 | 945,673 | -36% |

Exhibit 4.5 – 2007 Area Source CO Emissions by Category and State (tons/year)

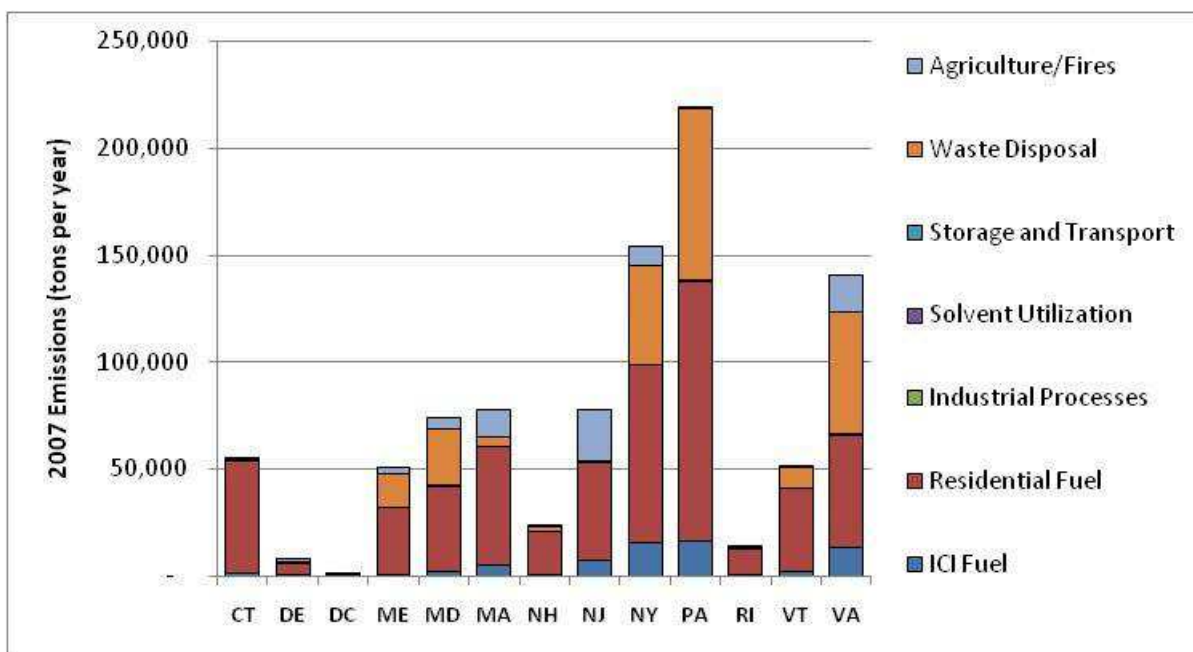


Exhibit 4.6 – 2002 and 2007 Area Source NH₃ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 5,318 | 4,430 | -17% |
| Delaware | 13,278 | 12,382 | -7% |
| District of Columbia | 14 | 145 | 920% |
| Maine | 8,747 | 5,736 | -34% |
| Maryland | 25,835 | 26,006 | 1% |
| Massachusetts | 18,809 | 8,820 | -53% |
| New Hampshire | 2,158 | 1,512 | -30% |
| New Jersey | 17,572 | 15,736 | -10% |
| New York | 67,422 | 45,693 | -32% |
| Pennsylvania | 79,911 | 72,598 | -9% |
| Rhode Island | 883 | 625 | -29% |
| Vermont | 9,848 | 8,013 | -19% |
| Virginia | 43,905 | 43,406 | -1% |
| | 293,699 | 245,102 | -17% |

Exhibit 4.7 – 2007 Area Source NH₃ Emissions by Category and State (tons/year)

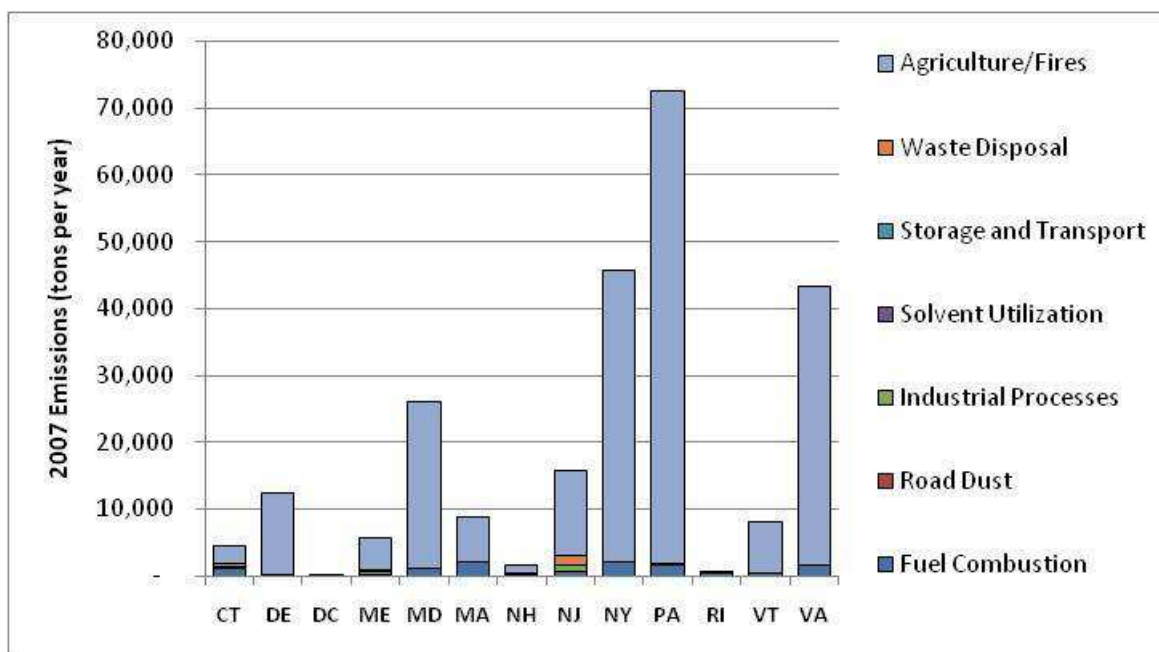


Exhibit 4.8 – 2002 and 2007 Area Source NO_x Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 12,689 | 12,641 | 0% |
| Delaware | 2,608 | 2,237 | -14% |
| District of Columbia | 1,644 | 1,477 | -10% |
| Maine | 7,360 | 6,656 | -10% |
| Maryland | 15,678 | 10,312 | -34% |
| Massachusetts | 34,281 | 20,214 | -41% |
| New Hampshire | 10,960 | 4,262 | -61% |
| New Jersey | 26,692 | 24,175 | -9% |
| New York | 98,803 | 72,053 | -27% |
| Pennsylvania | 47,591 | 56,921 | 20% |
| Rhode Island | 3,886 | 3,392 | -13% |
| Vermont | 3,208 | 4,003 | 25% |
| Virginia | 51,418 | 23,693 | -54% |
| | 316,817 | 242,035 | -24% |

Exhibit 4.9 – 2007 Area Source NO_x Emissions by Category and State (tons/year)

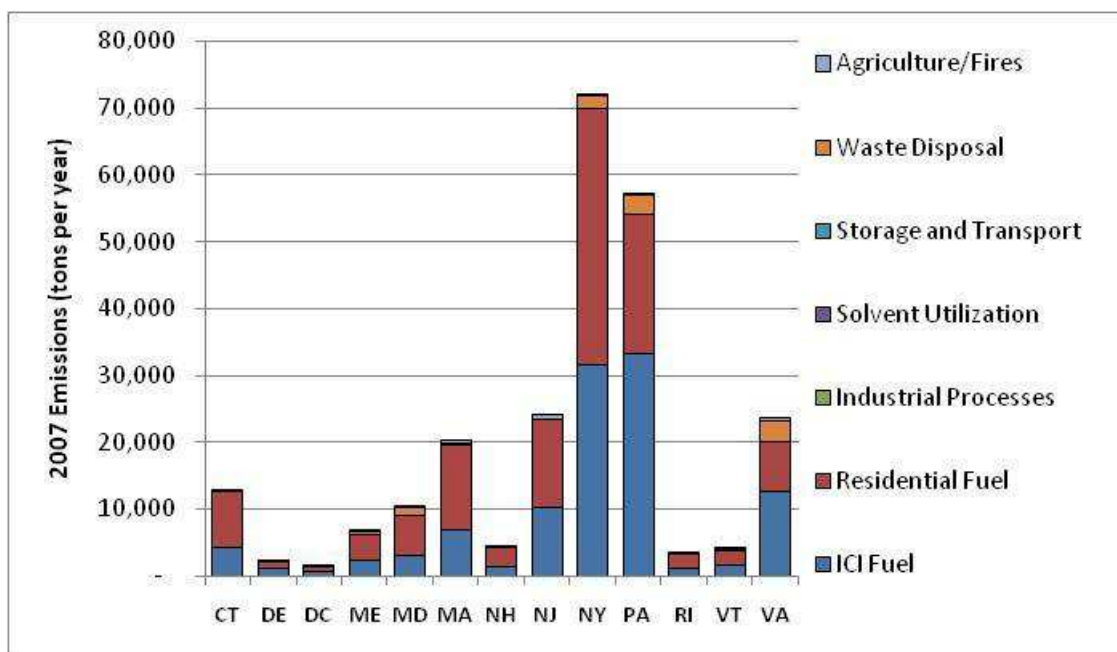


Exhibit 4.10 – 2002 and 2007 Area Source PM10-PRI Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------------|------------------|-------------|
| Connecticut | 48,281 | 40,106 | -17% |
| Delaware | 13,039 | 16,171 | 24% |
| District of Columbia | 3,269 | 5,242 | 60% |
| Maine | 168,953 | 54,445 | -68% |
| Maryland | 95,060 | 71,468 | -25% |
| Massachusetts | 192,860 | 152,198 | -21% |
| New Hampshire | 43,329 | 26,965 | -38% |
| New Jersey | 61,601 | 57,436 | -7% |
| New York | 369,595 | 321,402 | -13% |
| Pennsylvania | 391,897 | 347,579 | -11% |
| Rhode Island | 8,295 | 11,619 | 40% |
| Vermont | 56,131 | 53,684 | -4% |
| Virginia | 237,577 | 212,246 | -11% |
| | 1,689,886 | 1,370,561 | -19% |

Exhibit 4.11 – 2007 Area Source PM10-PRI Emissions by Category and State (tons/year)

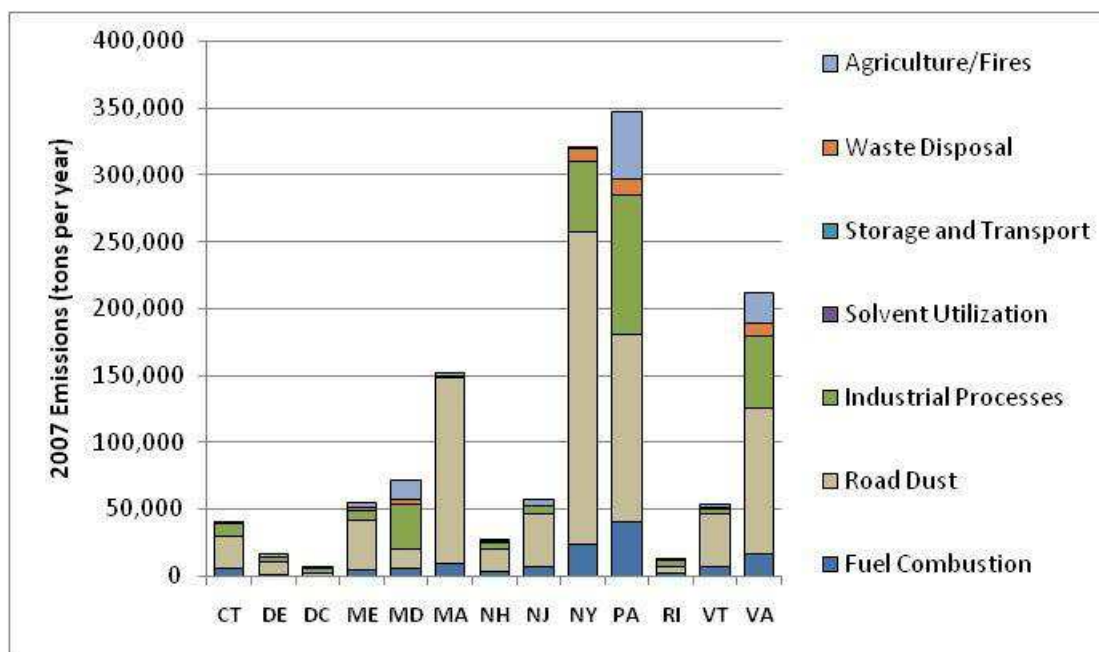


Exhibit 4.12 – 2002 and 2007 Area Source PM₂₅-PRI Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 14,247 | 9,682 | -32% |
| Delaware | 3,204 | 2,606 | -19% |
| District of Columbia | 805 | 758 | -6% |
| Maine | 32,774 | 12,526 | -62% |
| Maryland | 27,318 | 19,563 | -28% |
| Massachusetts | 42,083 | 23,535 | -44% |
| New Hampshire | 17,532 | 5,966 | -66% |
| New Jersey | 19,350 | 14,292 | -26% |
| New York | 87,155 | 58,348 | -33% |
| Pennsylvania | 74,925 | 72,808 | -3% |
| Rhode Island | 2,064 | 2,900 | 41% |
| Vermont | 11,065 | 12,912 | 17% |
| Virginia | 43,989 | 43,950 | 0% |
| | 376,510 | 279,847 | -26% |

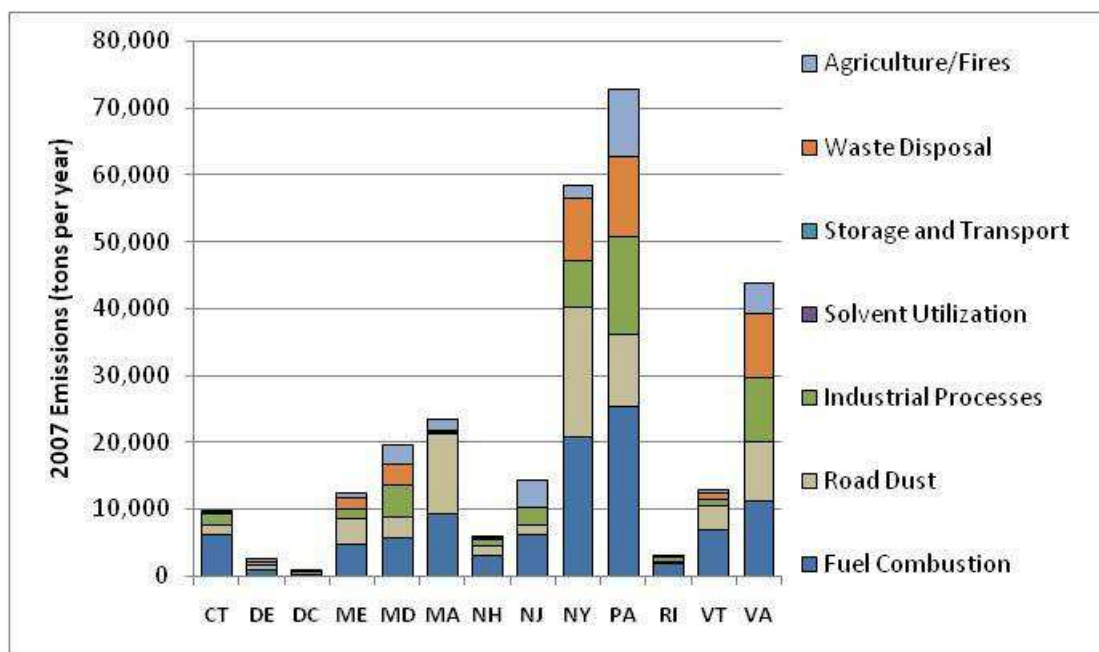
Exhibit 4.13 – 2007 Area Source PM₂₅-PRI Emissions by Category and State (tons/year)

Exhibit 4.14 – 2002 and 2007 Area Source SO₂ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 12,419 | 16,545 | 33% |
| Delaware | 1,588 | 1,144 | -28% |
| District of Columbia | 1,336 | 1,232 | -8% |
| Maine | 13,149 | 9,812 | -25% |
| Maryland | 12,393 | 5,960 | -52% |
| Massachusetts | 25,488 | 19,853 | -22% |
| New Hampshire | 7,072 | 5,287 | -25% |
| New Jersey | 10,744 | 8,811 | -18% |
| New York | 130,409 | 70,044 | -46% |
| Pennsylvania | 63,679 | 103,865 | 63% |
| Rhode Island | 4,557 | 3,895 | -15% |
| Vermont | 4,088 | 3,753 | -8% |
| Virginia | 105,890 | 34,403 | -68% |
| | 392,812 | 284,604 | -28% |

**Exhibit 4.15 – 2007 Area Source SO2 Emissions by Category and State
(tons/year)**

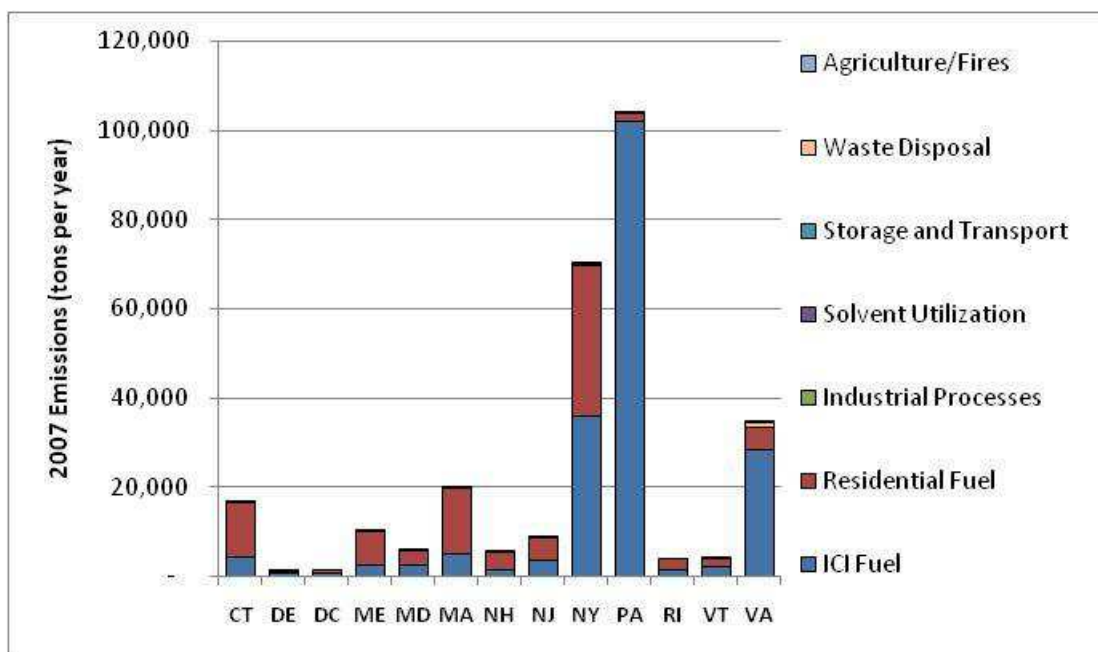
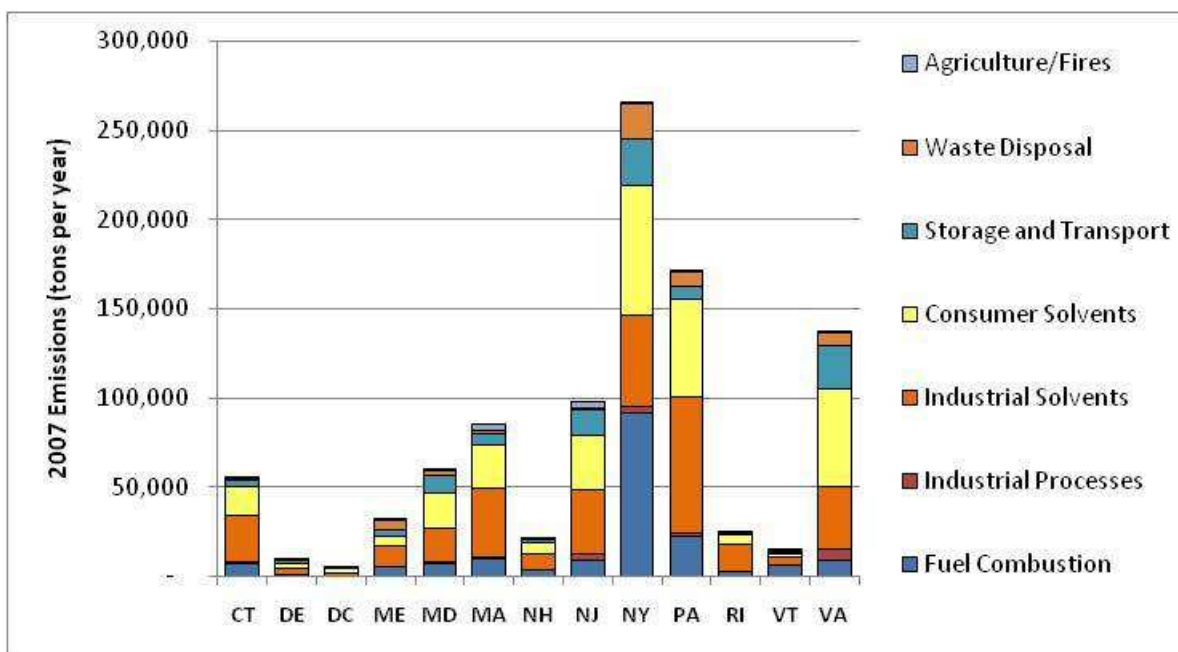


Exhibit 4.16 – 2002 and 2007 Area Source VOC Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------------|----------------|-------------|
| Connecticut | 87,302 | 54,885 | -37% |
| Delaware | 15,520 | 9,189 | -41% |
| District of Columbia | 6,432 | 4,687 | -27% |
| Maine | 100,621 | 31,257 | -69% |
| Maryland | 120,254 | 59,906 | -50% |
| Massachusetts | 155,557 | 84,779 | -45% |
| New Hampshire | 65,371 | 20,923 | -68% |
| New Jersey | 167,882 | 97,565 | -42% |
| New York | 507,291 | 265,582 | -48% |
| Pennsylvania | 240,785 | 170,411 | -29% |
| Rhode Island | 31,402 | 23,866 | -24% |
| Vermont | 23,266 | 14,013 | -40% |
| Virginia | 172,989 | 137,392 | -21% |
| | 1,694,670 | 974,455 | -43% |

Exhibit 4.17 – 2007 Area Source VOC Emissions by Category and State (tons/year)

5.0 ANNUAL AND MONTHLY 2007 INVENTORY FOR NONROAD SOURCES INCLUDED IN THE NONROAD MODEL

5.1 NONROAD MODEL CATEGORIES

The USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, and lawn and garden equipment. Aircraft ground support equipment (GSE) and rail maintenance equipment are also included in NONROAD. This equipment is powered by diesel, gasoline, compressed natural gas or liquefied petroleum gas engines.

The National Mobile Inventory Model (NMIM) was developed by USEPA to estimate county-level emissions for certain types of nonroad equipment. NMIM uses the current version the NONROAD model. The NMIM national county database contains monthly input data to reflect county specific fuel parameters and temperatures. Most of the work associated with executing NMIM involved updating the NMIM county database with State-specific information. For this analysis, we used the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point (USEPA 2009d). Changes were made to the NCD20090531 based on State review.

5.2 STATE REVIEW OF NMIM METEOROLOGY DATA AND FUEL CHARACTERISTICS

MACTEC obtained from USEPA the National County Database (NCD20090531) for use as a starting point for preparing the modeling data sets. NCD20090531 contains the 2007 year-specific meteorology data set that USEPA used to calculate 2007 emissions in addition to fuel revisions for years 2006-2011. These fuel values are updates to those in the 2007 USEPA NMIM run which used NCD20090327. It was decided to use NCD20090531 as a starting point for development of the NONROAD input files for the 2007 modeling inventory. NCD20090531 was made available for state comment.

Several States commented on fuel characteristics data and changes were made to the underlying MySQL database to incorporate those changes into the model. These included changes to Reid Vapor Pressure, sulfur and oxygenate fractions. Where changes were made, MACTEC created new gasoline types and IDs using the NMIM MySQL NCD database default entries as a starting point. Only information related to criteria pollutant emission calculations was changed. Information related to air toxics that was contained in the initial default fuel characteristic tables was not adjusted. Thus the fuel types created for the NMIM modeling should NOT be used for air toxics modeling. To further separate

the data in the fuel characteristics tables from other modeling efforts, MACTEC created a separate NCD for use exclusively for this modeling effort.

Exhibit 5.1 shows the number of added gasoline fuel record types added to the “gasoline” table in the MySQL NCD database. The total number of added fuel records was 118 new gasoline types. These records were given GasolineID values of 4462 to 4479 inclusive.

Exhibit 5.1 – Gasoline Fuel Record Types Add to MySQL NCD Database

| State | Number of revised gasoline records |
|--------------|---|
| CT | 10 |
| MD | 48 |
| NH | 15 |
| NJ | 20 |
| NY | 25 |

Although records were added for NY, they were not used since NY performed their own NONROAD modeling (see below).

5.3 UPDATE OF NMIM ALLOCATION FILES FOR POPULATION AND HOUSING

Several NONROAD categories use housing unit or population data to allocate the emissions to the county level from State calculations. States identified some discrepancies in the housing and population data contained in the NONROAD model and requested that MACTEC update the allocation files for those categories. As a consequence, MACTEC obtained 1 and 2 unit housing information and updated 2007 population estimates. Data were obtained from the sources listed in Exhibit 5.2. :

Exhibit 5.2 – Data Sources for Population and Housing Data

| Source Type | Data Source |
|----------------------------------|---|
| 2007 Population Data Source | http://www.census.gov/popest/counties/CO-EST2008-01.html |
| Total Housing Data Source | http://www.census.gov/popest/housing/HU-EST2007-CO.html |
| 1 yr - 1 and 2 Unit Housing Data | 2007 American Community Survey 1-Year Estimates |
| 3 yr - 1 and 2 Unit Housing Data | B25024. UNITS IN STRUCTURE - Universe: HOUSING UNITS Data Set: 2005-2007 American Community Survey 3-Year Estimates, Survey: American Community Survey |

Three sources for the housing unit data were required to evaluate all counties within the region. Census data are frequently withheld when the data reporting can lead to disclosure of confidential business information or due to incomplete survey response. For the 1 and 2 unit housing data, the predominant source was the 1 year 1 and 2 unit housing data. If that was unavailable due to either confidentiality issues or lack of survey response, then the 3 year data was used by determining an average value for the three year period. Finally if no data were available for the 3 year 1 and 2 unit housing information, total housing unit data were utilized. The revised housing unit data affected the allocation of residential lawn and garden equipment. Revised allocation files for all MARAMA States (except NY) were developed and utilized in the NMIM modeling for this category.

For the population data, the latest county estimates of population were obtained from the Census Bureau. These estimates were available for all counties within the MARAMA region. Again, revised allocation files were developed for all States within the MARAMA region with the exception of NY. These revised allocation files applied to railroad maintenance equipment and AC/refrigeration equipment.

A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008." Those data were used in lieu of the Census Bureau data.

In addition, Pennsylvania provided changes to the values for 1 and 2 unit housing for 2007. The source of these data was not cited.

5.4 STATE-SPECIFIC DATA INCORPORATION INTO NMIM

In addition to the global updates to the housing and population allocation files in the MARAMA region, several States submitted additional information used to update the underlying data used to calculate emissions from nonroad sources. The data submitted and the updates resulting from these submittals are discussed below by State.

5.4.1 Connecticut

Connecticut only provided updated information related to the gasoline characteristics. No additional changes were submitted.

5.4.2 Delaware

Delaware provided revised values for several additional allocation files beyond those for population and housing units. Data for 2005 were submitted and updated files were

developed for the following allocation categories: golf courses, recreational marine vessels, snow blowers, number of wholesale establishments, landscaping employees, and manufacturing employees. In addition, Delaware also submitted data on the engine populations for 2005 for the following recreational marine vessels:

| | |
|------------|----------------------------|
| 2282005010 | 2-Str Outboard |
| 2282005015 | 2-Str Personal Water Craft |
| 2282010005 | 4-Str Inboard/Sterndrive |
| 2282020005 | Dsl - Inboard |
| 2282020010 | Dsl - Outboard |

The updated population values for 2005 were added to the corresponding file for the NONROAD model and were used for the 2007 runs. Because of the way NONROAD handles missing data, if data for 2007 are not found, the most current data (in this case 2005) are used to assist in determining a 2007 value.

5.4.3 Maryland

Maryland only provided updated information to the gasoline characteristics. No additional changes were submitted.

5.4.4 New Hampshire

As indicated above, New Hampshire provided State-specific population data from their own data source for their counties for use in preparing the population allocation files. A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008." Those data were used in lieu of the Census Bureau data.

5.4.5 New Jersey

New Jersey provided revised gasoline characteristics values as well as NONROAD equipment population data with revised data on equipment population values for Airport Ground Support Equipment. In addition, NJ provided revised human population data for 2002, 2005, 2010, 2015 and 2020. These data (along with the 2007 data generated from the Census Bureau) were added to the NJ population allocation file.

5.4.6 New York

New York opted to not have MACTEC calculate emissions using NMIM for their State. Instead, NY calculated their own emissions for the nonroad category and submitted the

output files to MACTEC for post processing. The output files submitted by NY were monthly output runs from the NONROAD model for each county. MACTEC simply post-processed these files to combine emissions and throughput values for each county into an annual emissions number. Summary annual files were submitted to NY by MACTEC for approval. No other work on the NY emissions was performed by MACTEC.

5.4.7 Pennsylvania

Pennsylvania provided revised data for the 1 and 2 unit housing information for 2007. Those data were used in lieu of the Census Bureau data for 2007 in the allocation file. The source of these data was not cited.

5.5 NMIM RUN SPECIFICATIONS

The run specifications for each NMIM run were developed on a State-by-State basis. The settings for each specification panel within the NMIM model are detailed below.

- **Description:** A short descriptive term for the run was entered for each State specific run.
- **Geography:** The “county” option was selected for each State specific run. All counties within a State were selected for the run.
- **Time:** On the time panel, the year 2007 was selected in the drop down box and added to the year selections area. The Use Yearly Weather Data check box was also selected. Every month in the Months check box area was selected.
- **Vehicles/Equipment:** Only the nonroad vehicle/equipment area was selected. All fuels and all vehicle types were selected for each State run.
- **Fleet:** No selections or information was entered in this panel.
- **Pollutants:** All criteria pollutants (with HC reported as VOC) were selected except for CO₂. Exhaust PM₁₀ and PM_{2.5} were also selected.
- **Advanced features:** Only the server and database were selected in this panel.
- **Output:** Under the Geographic Representation panel the County selection was made. In the General Output area, a new database was selected on the server for the output.

All added external files for use in each State run were placed in the external files directory of the NCD. Entries for all external files included were added to the countynrfiles table of the NCD.

5.6 STATE AND STAKEHOLDER REVIEW AND COMMENT

MACTEC completed the NMIM modeling runs in October of 2009. The results were made available to States and Stakeholders for review and comment. Based on the comments received, the following issues were addressed, and in some cases, changes were made to the 2007 nonroad inventory for sources included in NMIM.

5.6.1 Connecticut

Connecticut requested several changes to the NMIM inputs, which were incorporated into a new 2007 NMIM run. Connecticut indicated that indicates that the RFG areas were not applied to counties correctly. RVP values were modified by a small amount to reflect USEPA RFG sample averages for the appropriate mapping of Connecticut counties to RFG areas. Connecticut identified discrepancies in the RFG average sulfur values for 2007 and provided updated values. Connecticut also provided updated values for the calculated oxygen weight percents for ethanol.

5.6.2 New Jersey

New Jersey identified a very minor issue with the fuels data used for the 2007 NMIM runs. After considering the insignificant impact it would have on the emission totals, they agreed the fuels data used in the original NMIM run were adequate.

5.6.3 Virginia

Virginia is considering the use of 2007 NMIM that were prepared by SEMAP. In the emission summary tables in the following section, we have included the original 2007 results from the MARAMA NMIM modeling runs. The Virginia data may be replaced with the SEMAP NMIM results at a later date.

5.6.4 Removal of Airport Ground Support Equipment Emissions

The NMIM/NONROAD model includes emissions from airport ground support equipment. As discussed in detail in Section 6 of this TSD, emissions from airport ground support equipment is also included in USEPA's aircraft inventory that was prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by NONROAD. For this reason, all

emissions calculated by NMIM/NONROAD for airport ground support equipment were removed from the inventory to avoid double counting emissions.

5.7 SUMMARY OF NMIM MODELING RESULTS FOR 2007

Exhibits 5.3 to 5.9 present State-level summaries that compare 2002 and 2007 annual emissions for NMIM/NONROAD sources (excluding airport ground support equipment). The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia. Note that Virginia is considering replacing the emissions from the MARAMA 2007 NMIM runs with the 2007 SEMAP NMIM results at a later date.

For most States and pollutants, emissions from NMIM/NONROAD sources decreased from 2002 to 2007. For SO₂, emissions decreased by 40-50% in all States except New York. SO₂ emissions decreased by 84% in New York, presumably because of a higher baseline sulfur content in 2002. Emissions of NO_x, VOC, PM₁₀-PRI, and PM₂₅-PRI generally decreased by 9-15% from 2002 to 2007, with some States showing slightly higher or slight lower decreases. CO emissions generally decreased by 15-30% in all States, in part due to turnover to newer, cleaner engines. In addition, the estimated decrease in emissions was due to differences the versions of the NONROAD model that were used to develop the 2002 and 2007 inventories. The new version of the model (NONROAD 2008a) used for the 2007 inventory accounts for new exhaust and evaporative emission controls, and predicts substantially less HC and CO, and somewhat less NO_x and PM emissions than earlier versions of NONROAD with use of comparable scenario inputs.

Note that the data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD CO Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------------|------------------|-------------|
| Connecticut | 274,388 | 196,122 | -29% |
| Delaware | 65,954 | 54,472 | -17% |
| District of Columbia | 18,775 | 14,895 | -21% |
| Maine | 148,555 | 131,319 | -12% |
| Maryland | 424,777 | 305,094 | -28% |
| Massachusetts | 448,399 | 349,166 | -22% |
| New Hampshire | 128,572 | 95,581 | -26% |
| New Jersey | 692,548 | 486,428 | -30% |
| New York | 1,219,168 | 971,035 | -20% |
| Pennsylvania | 903,168 | 725,786 | -20% |
| Rhode Island | 71,573 | 53,992 | -25% |
| Vermont | 61,732 | 52,497 | -15% |
| Virginia | 582,895 | 478,509 | -18% |
| | 5,040,503 | 3,914,897 | -22% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

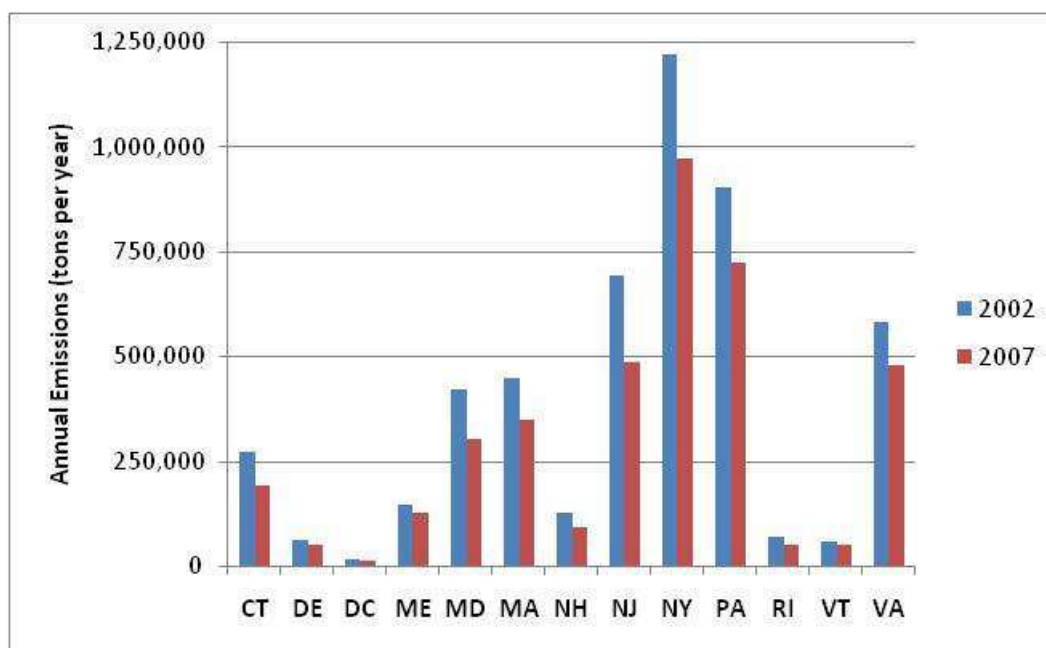


Exhibit 5.4 – 2002 and 2007 NMIM/NONROAD NH₃ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|------------|------------|------------|
| Connecticut | 17 | 18 | 7% |
| Delaware | 5 | 5 | 12% |
| District of Columbia | 2 | 3 | 10% |
| Maine | 11 | 13 | 11% |
| Maryland | 28 | 30 | 7% |
| Massachusetts | 28 | 30 | 7% |
| New Hampshire | 9 | 10 | 9% |
| New Jersey | 43 | 44 | 1% |
| New York | 79 | 100 | 27% |
| Pennsylvania | 55 | 60 | 9% |
| Rhode Island | 4 | 5 | 12% |
| Vermont | 5 | 5 | 12% |
| Virginia | 42 | 45 | 6% |
| | 328 | 366 | 12% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

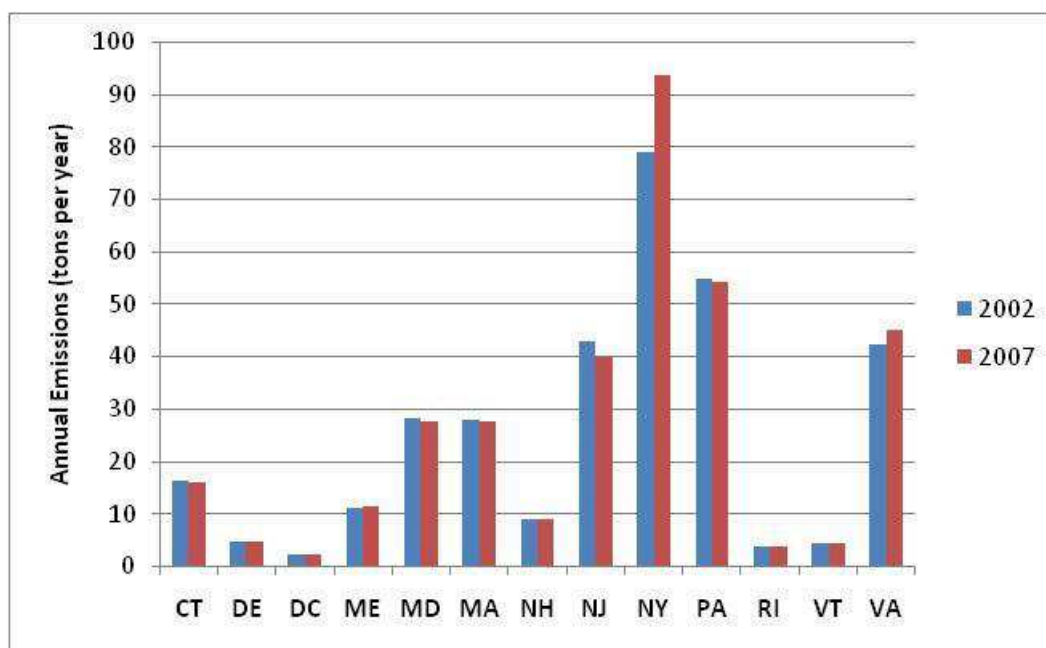


Exhibit 5.5 – 2002 and 2007 NMIM/NONROAD NO_x Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|------------|
| Connecticut | 17,897 | 16,445 | -8% |
| Delaware | 5,798 | 4,948 | -15% |
| District of Columbia | 3,066 | 2,760 | -10% |
| Maine | 8,229 | 7,439 | -10% |
| Maryland | 27,789 | 25,783 | -7% |
| Massachusetts | 30,047 | 26,960 | -10% |
| New Hampshire | 8,150 | 7,652 | -6% |
| New Jersey | 43,515 | 38,052 | -13% |
| New York | 78,601 | 71,489 | -9% |
| Pennsylvania | 62,265 | 54,783 | -12% |
| Rhode Island | 4,564 | 4,184 | -8% |
| Vermont | 4,170 | 3,743 | -10% |
| Virginia | 40,788 | 40,293 | -1% |
| | 334,878 | 304,531 | -9% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

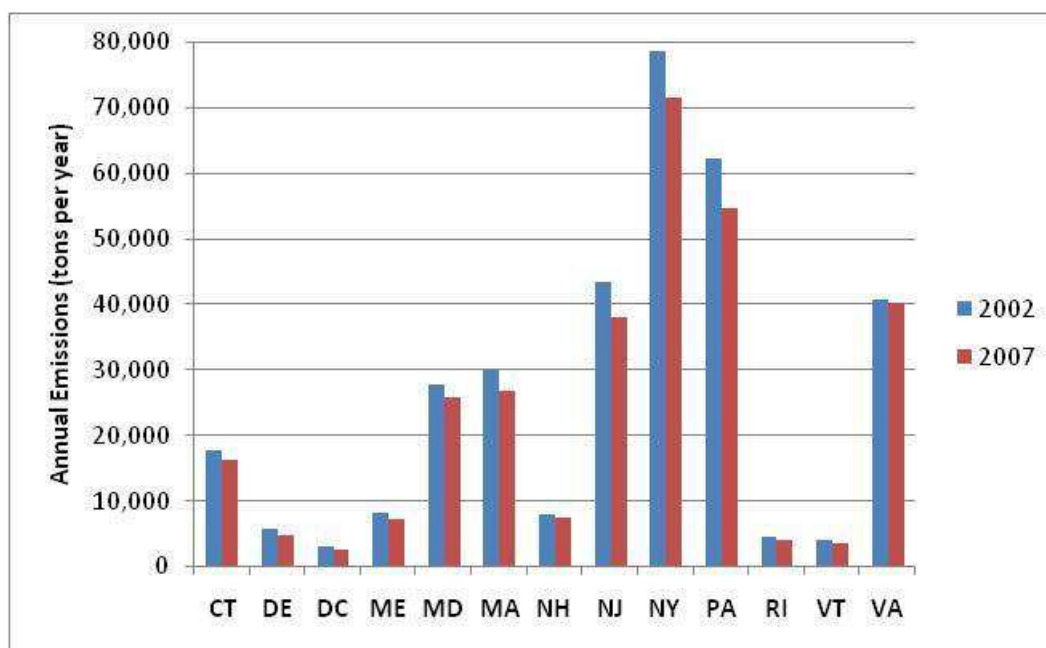
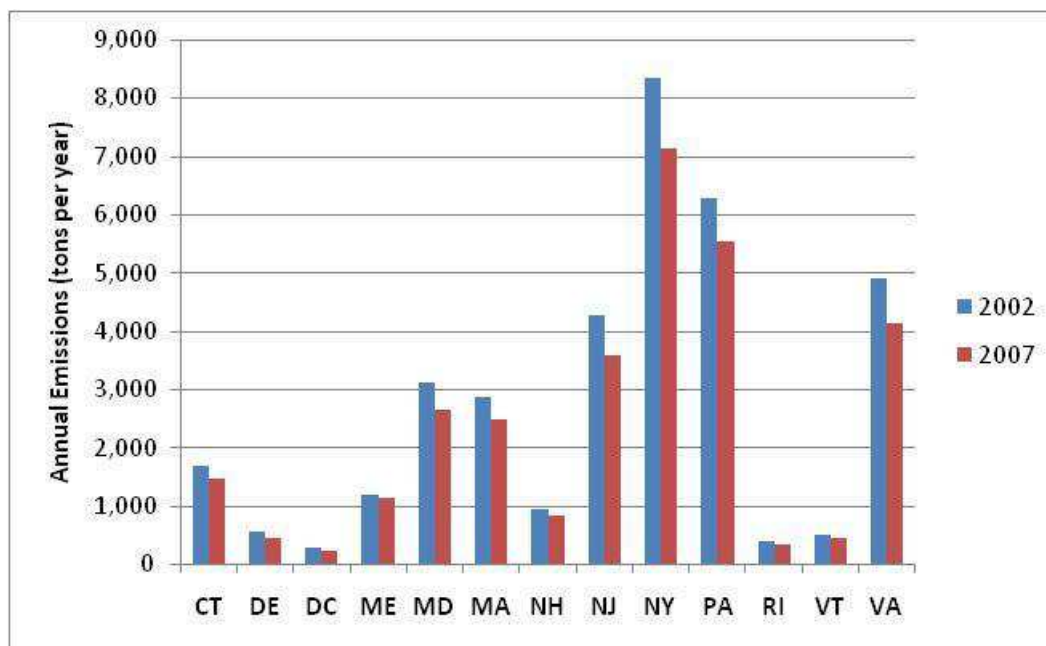


Exhibit 5.6 – 2002 and 2007 NMIM/NONROAD PM10-PRI Emissions by State
(tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|---------------|---------------|-------------|
| Connecticut | 1,713 | 1,486 | -13% |
| Delaware | 570 | 475 | -17% |
| District of Columbia | 298 | 245 | -18% |
| Maine | 1,204 | 1,151 | -4% |
| Maryland | 3,119 | 2,681 | -14% |
| Massachusetts | 2,887 | 2,499 | -13% |
| New Hampshire | 947 | 868 | -8% |
| New Jersey | 4,285 | 3,619 | -16% |
| New York | 8,332 | 7,167 | -14% |
| Pennsylvania | 6,281 | 5,569 | -11% |
| Rhode Island | 403 | 363 | -10% |
| Vermont | 518 | 482 | -7% |
| Virginia | 4,901 | 4,150 | -15% |
| | 35,459 | 30,755 | -13% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.



**Exhibit 5.7 – 2002 and 2007 NMIM/NONROAD PM25-PRI Emissions by State
(tons/year)**

| STATE | 2002 | 2007 | Change |
|----------------------|---------------|---------------|-------------|
| Connecticut | 1,578 | 1,411 | -11% |
| Delaware | 525 | 452 | -14% |
| District of Columbia | 288 | 236 | -18% |
| Maine | 1,135 | 1,080 | -5% |
| Maryland | 2,870 | 2,547 | -11% |
| Massachusetts | 2,659 | 2,373 | -11% |
| New Hampshire | 872 | 819 | -6% |
| New Jersey | 3,951 | 3,435 | -13% |
| New York | 7,670 | 6,806 | -11% |
| Pennsylvania | 5,784 | 5,295 | -8% |
| Rhode Island | 371 | 344 | -7% |
| Vermont | 477 | 455 | -5% |
| Virginia | 4,665 | 3,954 | -15% |
| | 32,844 | 29,208 | -11% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

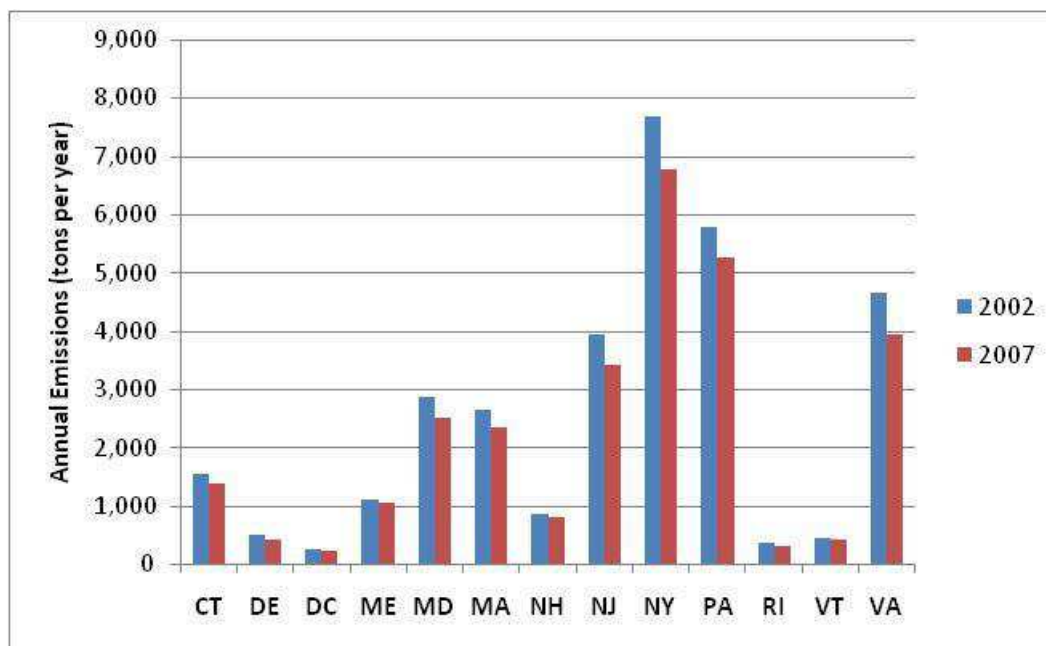


Exhibit 5.8 – 2002 and 2007 NMIM/NONROAD SO₂ Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|---------------|---------------|-------------|
| Connecticut | 1,377 | 771 | -44% |
| Delaware | 513 | 265 | -48% |
| District of Columbia | 341 | 193 | -43% |
| Maine | 772 | 416 | -46% |
| Maryland | 2,569 | 1,432 | -44% |
| Massachusetts | 2,428 | 1,329 | -45% |
| New Hampshire | 673 | 364 | -46% |
| New Jersey | 3,525 | 1,872 | -47% |
| New York | 6,961 | 1,138 | -84% |
| Pennsylvania | 5,292 | 2,884 | -45% |
| Rhode Island | 335 | 195 | -42% |
| Vermont | 368 | 202 | -45% |
| Virginia | 3,982 | 2,376 | -40% |
| | 29,136 | 13,437 | -54% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.

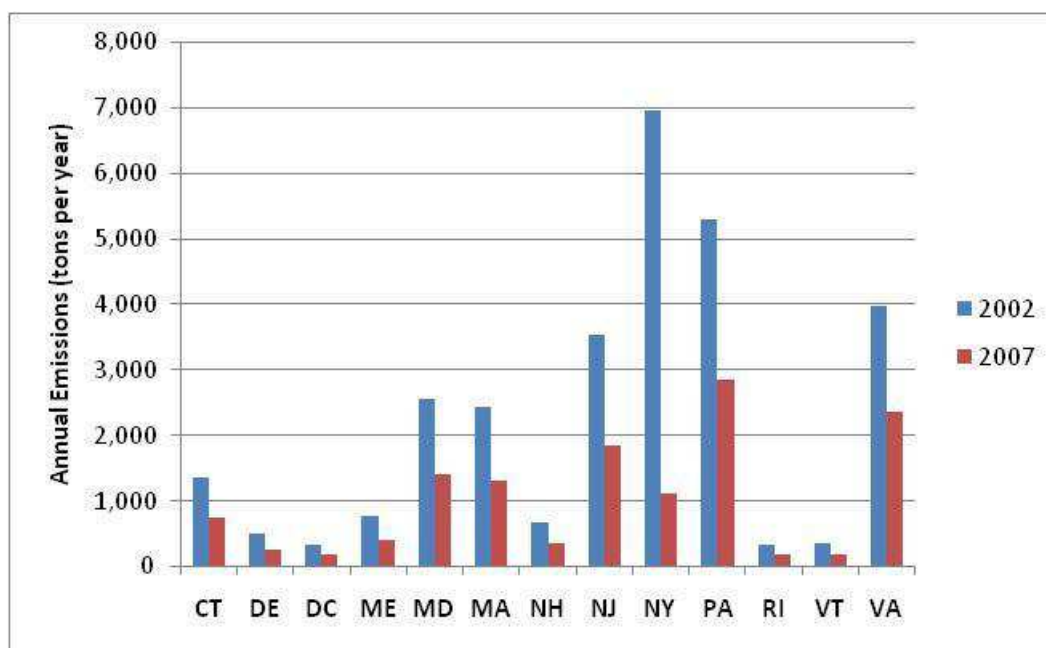
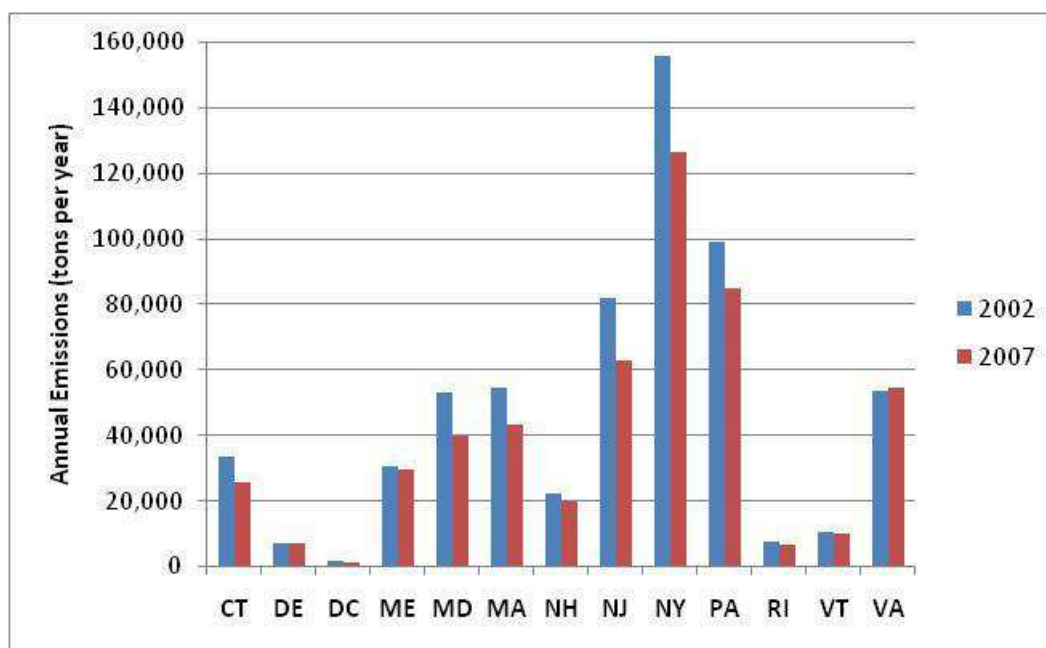


Exhibit 5.9 – 2002 and 2007 NMIM/NONROAD VOC Emissions by State (tons/year)

| STATE | 2002 | 2007 | Change |
|----------------------|----------------|----------------|-------------|
| Connecticut | 33,519 | 25,661 | -23% |
| Delaware | 7,531 | 7,088 | -6% |
| District of Columbia | 2,053 | 1,541 | -25% |
| Maine | 30,741 | 29,872 | -3% |
| Maryland | 53,035 | 40,142 | -24% |
| Massachusetts | 54,836 | 43,225 | -21% |
| New Hampshire | 22,238 | 19,875 | -11% |
| New Jersey | 81,900 | 62,813 | -23% |
| New York | 155,463 | 126,268 | -19% |
| Pennsylvania | 99,241 | 85,023 | -14% |
| Rhode Island | 7,699 | 6,704 | -13% |
| Vermont | 10,520 | 10,334 | -2% |
| Virginia | 53,487 | 54,503 | 2% |
| | 612,262 | 513,049 | -16% |

Note that the 2007 data for Virginia is based on the initial MARAMA 2007 NMIM runs. VADEQ has elected to use SEMAP NMIM results instead of the MARAMA 2007 NMIM runs. The SEMAP NMIM results are not yet available.



6.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES – MARINE VESSELS, AIRPORTS, AND RAIL

MACTEC estimated 2007 base year emissions for the Marine Vessel, Airports, and Rail (MAR) categories using USEPA/ERTAC data, USEPA/ERTAC data revised or augmented with state supplied data; or State supplied data. Data for each MAR category was obtained from USEPA and ERTAC for use as a default data set. The USEPA and ERTAC data, developed to support the 2008 inventory, was provided to states for review. State inventory personnel determined which of the above approaches was appropriate for their state. MARAMA coordinated the collection of supplemental or replacement data from states. The sections below describe the default data sources as well as the modifications received from states for each inventory segment.

6.1 COMMERCIAL MARINE VESSELS

For commercial marine vessels, data was obtained from USEPA 2008 NEI (USEPA 2010d). Initial draft database files were provided to MACTEC by USEPA for Category 1 and 2 CMV and for Category 3 CMV. The Category 1 and 2 emissions database contained emissions for both ports and underway vessels. The Category 3 database included tables containing approach emissions, interport emissions, port emissions and RSZ emissions. The emissions from these tables were generally matched to GIS ArcInfo shape files for use in plotting the emissions. These estimates include emissions from CMV operation generally within 12 nautical miles of shore. Emissions beyond the 12 nautical mile boundaries are not included in this inventory, but will be provided by USEPA to emission modelers in SMOKE format for inclusion in air quality modeling.

Several MARAMA States indicated that they had CMV emissions that they preferred to use over those provided by USEPA. However, these emissions were only available in NIF area source file format (county/SCC summary level) and not spatially allocated. Thus for consistency, MACTEC summarized the emissions from USEPA to the county/SCC level and input that data into a database format. In late December 2009, USEPA provided MACTEC with a final version of the CMV emissions summarized at the county/SCC level. The file provided was a Microsoft Access database (2008CMVCntySummary.mdb). That database contained a summary table containing the State/county FIPS code, the SCC, pollutant code and 2008 annual emissions (in tons). MACTEC used that database to update the NIF format database for those MARAMA States that had indicated that they wished to use the USEPA data. The USEPA 2008 NEI data was used directly for 2007. No changes were made to the 2008 data for 2007 (i.e., the 2007 emissions were assumed to be equal to 2008).

Five States (CT, DC, NJ, RI, VA) used the USEPA NEI data for all CMV categories. Virginia supplemented the USEPA CMV data by adding military vessels to the inventory. VT indicated that they wanted to use USEPA data but no CMV emissions were in the USEPA database for VT. Five States (DE, ME, MA, NH, and PA) supplied State specific data for all categories. Maryland used USEPA NEI data for diesel CMV and State-specific data for residual CMV. New York used State-specific data for diesel CMV and upstate residual CMV, and USEPA NEI data for seven counties in the New York City metro area.

Note that NY included VOC emissions from lightering operations in the CMV inventory using SCC 22-80-002-000. Delaware included VOC emissions from lightering operations in the point source inventory. No other State has significant lightering operations.

Exhibit 6.1 indicates the data source by State and SCC for the emissions in the MARAMA 2007 base year inventory for CMV. Once the initial draft inventory was prepared it was provided to the MARAMA States for review and comment. Only minor comments were received. Changes to the required records were made and the updated database was provided for full stakeholder review.

Exhibit 6.1 – Data Sources for Commercial Marine Vessel Inventory

| State | 22-80-002-100 Diesel Port | 22-80-002-200 Diesel Underway | 22-80-003-100 Residual Port | 22-80-003-200 Residual Underway | 22-83-000-000 All Fuels Military |
|--------------|--|--|--|--|---|
| CT | EPA | EPA | EPA | EPA | n/a |
| DE | State | State | State | State | n/a |
| DC | n/a | EPA | n/a | EPA | n/a |
| ME | State | State | State | State | n/a |
| MD | EPA | EPA | State | State | n/a |
| MA | State* | State* | State | State | n/a |
| NH | State | State | State | State | n/a |
| NJ | State | State | State | State | n/a |
| NY | State | State | State / EPA | State / EPA | n/a |
| PA | State | State | State | State | n/a |
| RI | EPA | EPA | EPA | EPA | n/a |
| VT | n/a | n/a | n/a | n/a | n/a |
| VA | EPA | EPA | EPA | EPA | State |

* MA used different SCCs than the other States for diesel CMV to identify Harbor vessels, fishing vessels, military vessels, port operations, and underway operation.

6.2 AIRPORTS (AIRCRAFT AND GROUND SUPPORT EQUIPMENT)

USEPA developed airport emissions on an airport by airport basis for use in the 2008 NEI (USEPA 2010e). Data provided in the database files provided included:

- EIS facility site ID
- State facility site ID Facility site name
- State and county FIPS code Source classification code
- Pollutant code
- Airport emissions and
- The sum of landing and take offs (LTOs).

In addition, a database containing geographic information on each facility (latitude and longitude) along with operational information related to LTOs but contained no emissions data.

The USEPA NEI airport data was summarized at the county/SCC level to provide a starting point for States that wanted to use the USEPA inventory. The remaining States provided NIF format county/SCC level files. Once the initial inventory was compiled it was formatted in NIF format and the resultant database was provided to the States for review and comment.

Changes resulting from the States comments on the inventory were made to the initial inventory. Exhibit 6.2 indicates by State and SCC which components of the inventory came from different data sources.

In those instances where the data source is listed as “EPA”, the data are taken directly from the 2008 NEI. 2008 data were used directly to represent 2007 emissions. No changes to the 2008 data were applied for the 2007 base year inventory. Exhibit 9 also indicates that for a number of States, the emission estimates represent blended sources. For example, several of the States that provided State data only provided emission estimates for aircraft emissions but did not provide emissions for ground support equipment (GSE) or auxiliary power units (APUs). For those States, 2008 USEPA NEI data were added to the inventory to provide those estimates. Those States were DE and ME. MD provided State supplied GSE/APU emissions but without a break down of the GSE emissions by fuel type. In addition, NY provided EDMS output files for all aircraft and GSE/APU emissions from each individual airport. Those emissions also had GSE emissions as a single value without an indication of the fuel type of the equipment. In both cases (NY and MD), the ratios for each fuel type used in the USEPA NEI were used to provide a breakdown of GSE emissions by fuel type. Those ratios were:

| SCC | SCC Level Two | Fraction |
|------------|--|----------|
| 2265008005 | Off-highway Vehicle Gasoline, 4-Stroke | 0.1686 |
| 2267008005 | LPG | 0.0165 |
| 2268008005 | CNG | 0.0131 |
| 2270008005 | Off-highway Vehicle Diesel | 0.8017 |

Finally, while Exhibit 6.2 indicates that most of VA's emissions were derived from USEPA data, there were a couple of military aircraft operations that were added to the USEPA data. However because these data were added as individual airports in counties where there were already emissions, when the data were summarized the data source was maintained as USEPA since the majority of emissions were derived from the USEPA inventory.

Exhibit 6.2 – Data Sources for Airport Operations Inventory

| State | 2265, 2267, 2268, 2270 GSE | 2275001xxx Military | 2275020xxx Commercial | 2275050xxx General Aviation | 2275060xxx Air Taxi | 2275070xxx APUs |
|-------|----------------------------------|------------------------|--------------------------|-----------------------------------|------------------------|--------------------|
| CT | State | State | State | State | State | State |
| DE | EPA | State | State | State | State | EPA |
| DC | n/a | n/a | n/a | State | n/a | n/a |
| ME | EPA | State | State | State | State | EPA |
| MD | State and EPA | State | State | State | State | State and EPA |
| MA | EPA | EPA | EPA | EPA | EPA | EPA |
| NH | State | State | State | State | State | n/a |
| NJ | State and EPA | State and EPA | State and EPA | State and EPA | State and EPA | State and EPA |
| NY | State | n/a | State | State | n/a | State |
| PA | EPA | EPA | EPA | EPA | EPA | EPA |
| RI | EPA | EPA | EPA | EPA | EPA | EPA |
| VT | EPA | EPA | EPA | EPA | EPA | EPA |
| VA | EPA | EPA | EPA | EPA | EPA | EPA |

6.3 RAILROAD LOCOMOTIVES AND RAILYARDS

The ERTAC 2008 inventory for railroad locomotives and rail yards was provided to all MANEVU+VA States for review to determine if the inventory should be included in the 2007 base year emission inventory (ERTAC 2010a, ERTAC 2010b). The ERTAC rail inventory included three categories of locomotive emissions: Class I line-haul, Class I rail yard switchers, and Class II/III short line and regional railroads. The original files provided to MACTEC for the ERTAC inventory included several spreadsheets. There spreadsheets were:

1. EmissionsByCounty_Round61.xls (county level Class I line haul emissions)
2. EmissionsByState_Round61.xls (State level Class I line haul emissions)
3. R-1 Fuel Use Data Summary 20072.xls (line haul fuel use data for 2007)
4. Rail-Class_II_III_revised 4-20-2010.xls (Class II and III county level emissions by rail line, along with link, mileage, and fuel usage information)

The data in the Class II and III spreadsheet was summarized by county and converted into NIF format. The Class I emissions were also converted into NIF format. Both Class I and Class II/III emissions were reported as hydrocarbons (HC). These emissions were assumed to equal VOC emissions. In addition, all 2008 emissions were assumed to equal 2007 emissions.

Three States (PA, VA and VT) used the ERTAC data directly without modification for the three categories included in the ERTAC inventory (Class I Line Haul, Class II/III Line Haul, Yard/Switcher Locomotives). New Jersey used the ERTAC Class I data and State-supplied data for Class II/III and Yard locomotives. New York used the ERTAC yard locomotive data and State-supplied data for Class I and Class II/III. All other States made changes to the 2008 ERTAC inventory, either to add/modify included sources or to revise emission values to 2007 values.

ERTAC did not develop emission estimates for Line Haul Passenger (AMTRAK) or Line Haul Commuter locomotives. Six States (CT, DC, MD, NY, PA, and VA) provided emission estimates for AMTRAK diesel locomotives. Note that the AMTRAK northeast corridor line uses electric powered locomotives, so there are no emissions from diesel AMTRAK locomotives in DE, NJ, RI, and MA. Seven States (CT, DC, MD, MA, NJ, NY, and PA) provided emission estimates for diesel commuter locomotives in their State.

Exhibit 6.3 provides a breakdown by State and SCC of the data sources for emissions from railroads and rail yards. Once the draft inventory was prepared the NIF database was

provided to the MARAMA States for review. Only minor corrections were made to the database prior to submittal for stakeholder review and comments.

Exhibit 6.3 – Data Sources for Railroad Locomotive and Railyard Inventory

| State | 2285002006 Line Haul Class I Ops | 2285002007 Line Haul Class II/III Ops | 2285002008 Line Haul Passenger | 2285002009 Line Haul Commuter | 2285002010 Yard Locomotives |
|--------------|---|--|---|--|--|
| CT | State | State | State | State | State |
| DE | State | State | n/a | n/a | State |
| DC | State | n/a | State | State | State |
| ME | n/a | State | n/a | n/a | State |
| MD | State | State | State | State | State |
| MA | State | State | n/a | State | State |
| NH | n/a | State | n/a | n/a | n/a |
| NJ | EPA / ERTAC | State | n/a | State | State |
| NY | State | State | State | State | EPA / ERTAC |
| PA | EPA / ERTAC | EPA / ERTAC | State | State | EPA / ERTAC |
| RI | State | State | n/a | n/a | State |
| VT | EPA / ERTAC | EPA / ERTAC | n/a | n/a | n/a |
| VA | EPA / ERTAC | EPA / ERTAC | State | n/a | EPA / ERTAC |

6.4 STAKEHOLDER REVIEW AND COMMENT

Draft inventory data files and documentation for MAR sources was posted on the MARAMA website in August 2010 for stakeholder review. No comments on the MAR inventory were received.

6.5 SUMMARY OF MAR INVENTORY FOR 2007

Exhibits 6.4 to 6.10 compare the 2002 and 2007 emissions by State and pollutant for MAR sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia.

Exhibit 6.4 – 2002 and 2007 MAR CO Emissions by State (tons/year)

| STATE | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|---------------|------------|----------------|----------------|------------|------------------|---------------|------------|
| | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 603 | 1,078 | 79% | 1,565 | 4,659 | 198% | 362 | 184 | -49% |
| DE | 1,138 | 554 | -51% | 1,575 | 1,625 | 3% | 144 | 75 | -48% |
| DC | 1 | 1 | 1% | 0 | 14 | n/a | 73 | 73 | 0% |
| ME | 376 | 522 | 39% | 4,487 | 32,879 | 633% | 69 | 188 | 173% |
| MD | 431 | 2,795 | 549% | 11,575 | 10,265 | -11% | 789 | 700 | -11% |
| MA | 1,231 | 1,473 | 20% | 11,294 | 15,495 | 37% | 748 | 646 | -14% |
| NH | 169 | 89 | -47% | 2,031 | 2,089 | 3% | 71 | 88 | 24% |
| NJ | 1,424 | 1,955 | 37% | 29,375 | 14,383 | -51% | 580 | 665 | 15% |
| NY | 1,790 | 3,476 | 94% | 11,895 | 17,403 | 46% | 1,551 | 3,061 | 97% |
| PA | 1,111 | 1,294 | 16% | 24,799 | 26,540 | 7% | 3,359 | 2,987 | -11% |
| RI | 0 | 522 | n/a | 1,424 | 1,739 | 22% | 55 | 15 | -73% |
| VT | 0 | 0 | n/a | 521 | 2,420 | 365% | 20 | 72 | 262% |
| VA | 1,082 | 3,735 | 245% | 11,873 | 22,009 | 85% | 1,186 | 2,701 | 128% |
| | 9,356 | 17,492 | 87% | 112,414 | 151,521 | 35% | 9,007 | 11,456 | 27% |

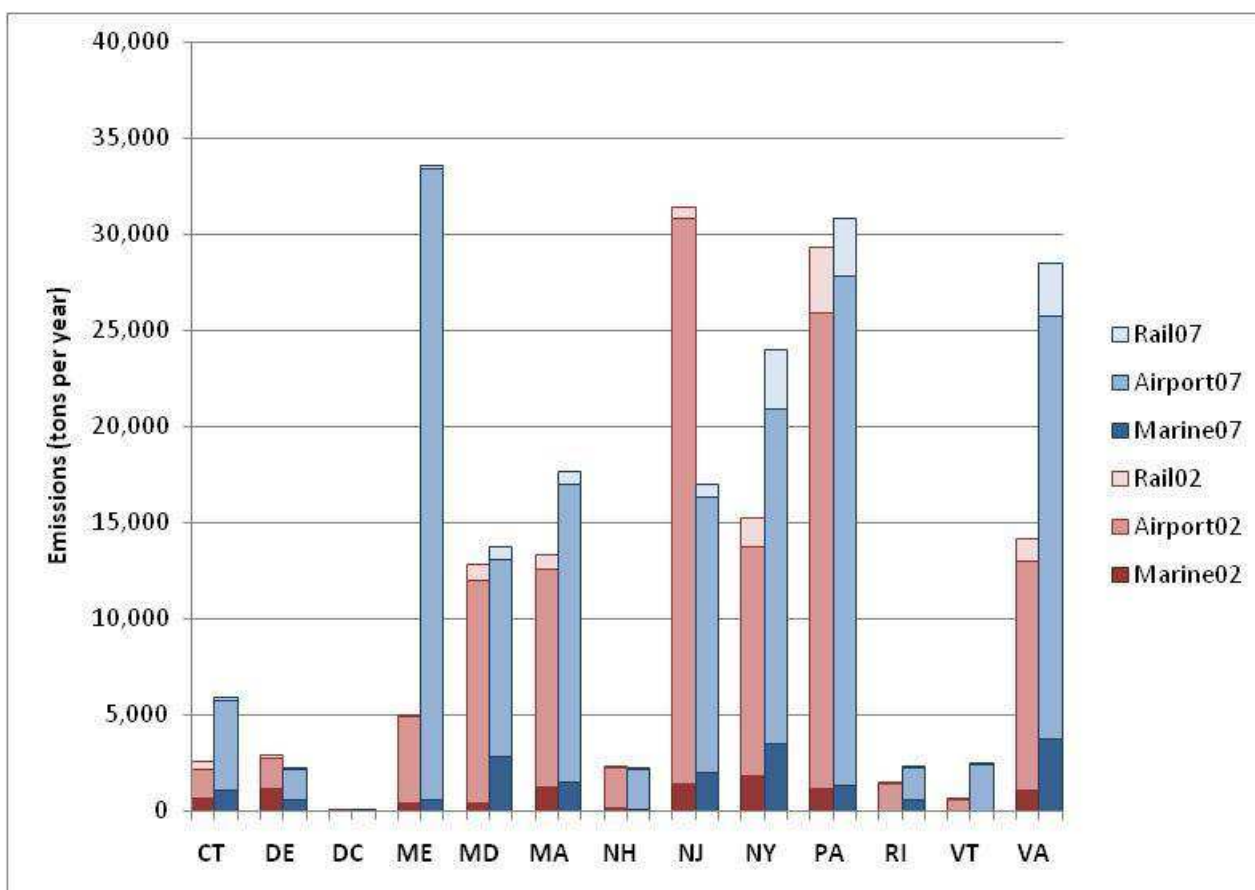


Exhibit 6.5 – 2002 and 2007 MAR NH₃ Emissions by State (tons/year)

| STATE | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|-----------|------------|----------|----------|------------|------------------|-----------|------------|
| | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 0 | 3 | n/a | 0 | 0 | n/a | 0 | 1 | n/a |
| DE | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| DC | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| ME | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| MD | 0 | 8 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| MA | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 2 | n/a |
| NH | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| NJ | 0 | 8 | n/a | 0 | 0 | n/a | 0 | 2 | n/a |
| NY | 0 | 2 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| PA | 0 | 13 | n/a | 0 | 0 | n/a | 0 | 9 | n/a |
| RI | 0 | 1 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| VT | 0 | 0 | n/a | 0 | 0 | n/a | 0 | 0 | n/a |
| VA | 0 | 9 | n/a | 0 | 0 | n/a | 0 | 8 | n/a |
| | 0 | 44 | n/a | 0 | 0 | n/a | 0 | 23 | n/a |

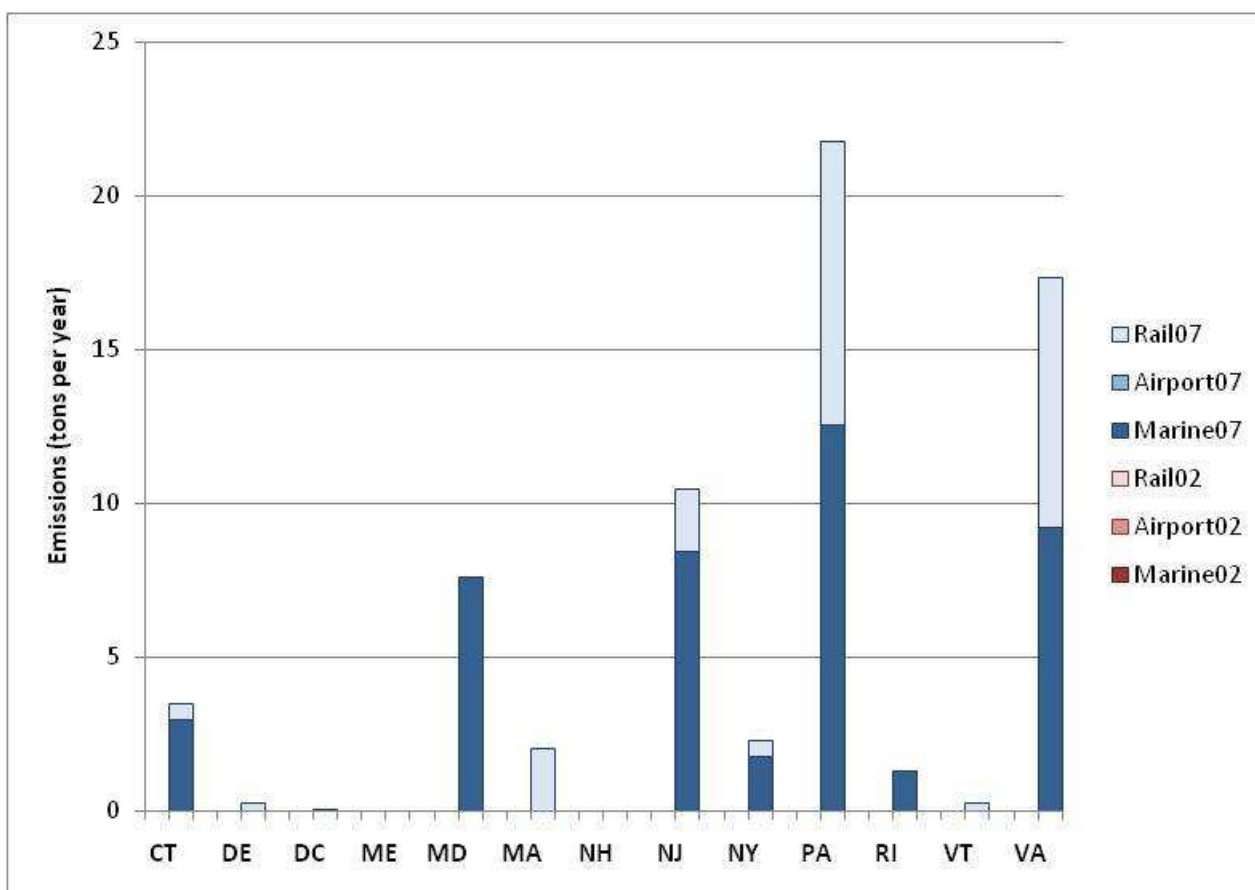


Exhibit 6.6 – 2002 and 2007 MAR NO_x Emissions by State (tons/year)

| STATE | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|----------------|------------|---------------|---------------|------------|------------------|---------------|-----------|
| | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 4,577 | 6,528 | 43% | 415 | 713 | 72% | 2,612 | 1,723 | -34% |
| DE | 8,362 | 5,095 | -39% | 970 | 805 | -17% | 1,105 | 384 | -65% |
| DC | 4 | 6 | 56% | 0 | 0 | n/a | 502 | 505 | 1% |
| ME | 1,154 | 1,659 | 44% | 184 | 134 | -27% | 269 | 1,369 | 409% |
| MD | 2,531 | 16,027 | 533% | 2,038 | 1,910 | -6% | 5,145 | 4,767 | -7% |
| MA | 2,590 | 3,246 | 25% | 2,988 | 3,190 | 7% | 7,161 | 6,133 | -14% |
| NH | 1,284 | 271 | -79% | 162 | 278 | 72% | 332 | 891 | 169% |
| NJ | 10,981 | 11,068 | 1% | 4,739 | 4,200 | -11% | 5,721 | 5,957 | 4% |
| NY | 12,266 | 28,180 | 130% | 4,880 | 6,998 | 43% | 14,162 | 20,675 | 46% |
| PA | 8,217 | 11,378 | 38% | 4,131 | 3,738 | -10% | 29,292 | 20,675 | -29% |
| RI | 1 | 2,829 | n/a | 263 | 289 | 10% | 186 | 144 | -22% |
| VT | 0 | 0 | n/a | 48 | 103 | 114% | 7 | 736 | 10416% |
| VA | 3,088 | 21,760 | 605% | 3,885 | 5,520 | 42% | 11,882 | 18,319 | 54% |
| | 55,055 | 108,046 | 96% | 24,703 | 27,878 | 13% | 78,376 | 82,279 | 5% |

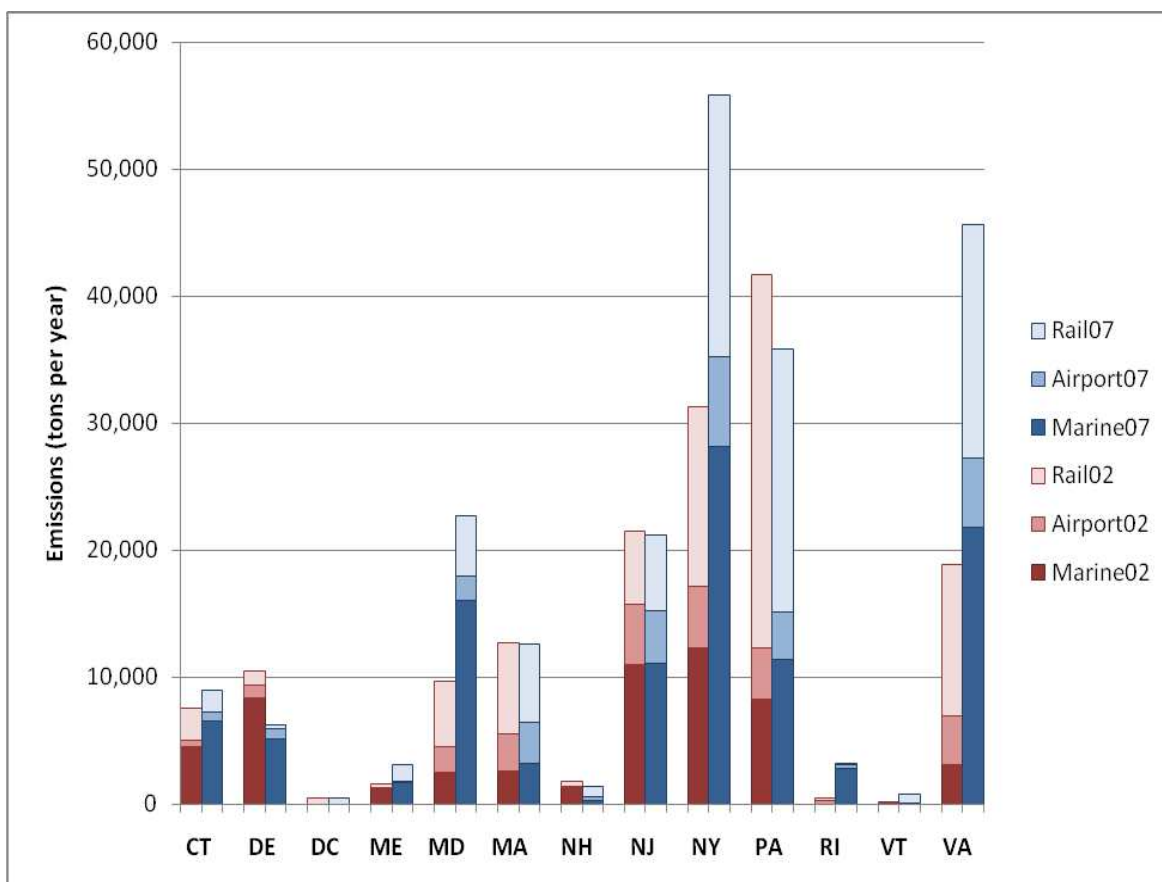


Exhibit 6.7 – 2002 and 2007 MAR PM10-PRI Emissions by State (tons/year)

| | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|--------------|------------|--------------|--------------|-------------|------------------|--------------|-------------|
| STATE | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 194 | 312 | 61% | 45 | 66 | 46% | 5 | 46 | 812% |
| DE | 393 | 327 | -17% | 28 | 27 | -5% | 31 | 15 | -50% |
| DC | 0 | 0 | n/a | 0 | 0 | n/a | 12 | 12 | -2% |
| ME | 129 | 395 | 206% | 97 | 83 | -15% | 8 | 28 | 246% |
| MD | 637 | 657 | 3% | 1,012 | 74 | -93% | 172 | 166 | -3% |
| MA | 217 | 316 | 45% | 246 | 295 | 20% | 183 | 159 | -13% |
| NH | 54 | 13 | -76% | 49 | 37 | -24% | 10 | 22 | 120% |
| NJ | 796 | 1,526 | 92% | 280 | 262 | -7% | 143 | 160 | 12% |
| NY | 506 | 1,671 | 230% | 409 | 140 | -66% | 358 | 608 | 70% |
| PA | 253 | 524 | 107% | 2,421 | 396 | -84% | 792 | 704 | -11% |
| RI | 0 | 112 | n/a | 93 | 22 | -76% | 6 | 4 | -40% |
| VT | 0 | 0 | n/a | 12 | 46 | 282% | 1 | 18 | 1712% |
| VA | 359 | 947 | 164% | 2,010 | 821 | -59% | 1,529 | 634 | -59% |
| | 3,538 | 6,801 | 92% | 6,702 | 2,268 | -66% | 3,250 | 2,574 | -21% |

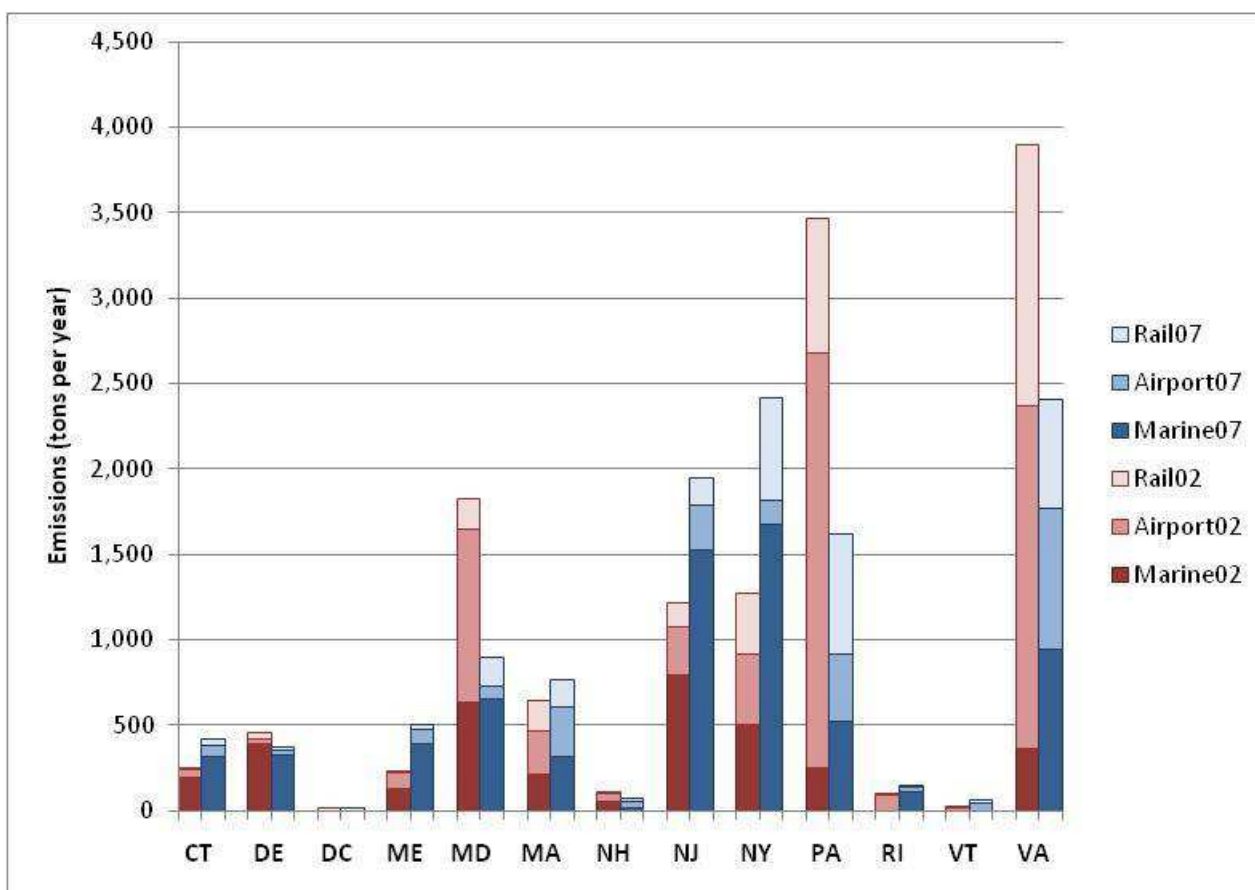


Exhibit 6.8 – 2002 and 2007 MAR PM25-PRI Emissions by State (tons/year)

| STATE | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|--------------|------------|--------------|--------------|-------------|------------------|--------------|-------------|
| | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 178 | 296 | 66% | 38 | 51 | 35% | 5 | 39 | 686% |
| DE | 354 | 305 | -14% | 20 | 19 | -7% | 28 | 15 | -47% |
| DC | 0 | 0 | n/a | 0 | 0 | n/a | 11 | 11 | 4% |
| ME | 119 | 364 | 206% | 69 | 61 | -11% | 8 | 25 | 218% |
| MD | 637 | 606 | -5% | 698 | 16 | -98% | 155 | 161 | 4% |
| MA | 200 | 290 | 45% | 226 | 215 | -5% | 143 | 145 | 2% |
| NH | 50 | 12 | -76% | 36 | 27 | -24% | 9 | 21 | 132% |
| NJ | 732 | 1,407 | 92% | 195 | 200 | 3% | 128 | 147 | 15% |
| NY | 466 | 1,541 | 231% | 362 | 139 | -62% | 323 | 572 | 77% |
| PA | 232 | 484 | 109% | 1,718 | 294 | -83% | 713 | 650 | -9% |
| RI | 0 | 108 | n/a | 68 | 17 | -75% | 5 | 3 | -34% |
| VT | 0 | 0 | n/a | 9 | 32 | 259% | 1 | 17 | 1567% |
| VA | 330 | 908 | 175% | 1,970 | 580 | -71% | 1,375 | 586 | -57% |
| | 3,298 | 6,323 | 92% | 5,409 | 1,652 | -69% | 2,904 | 2,395 | -18% |

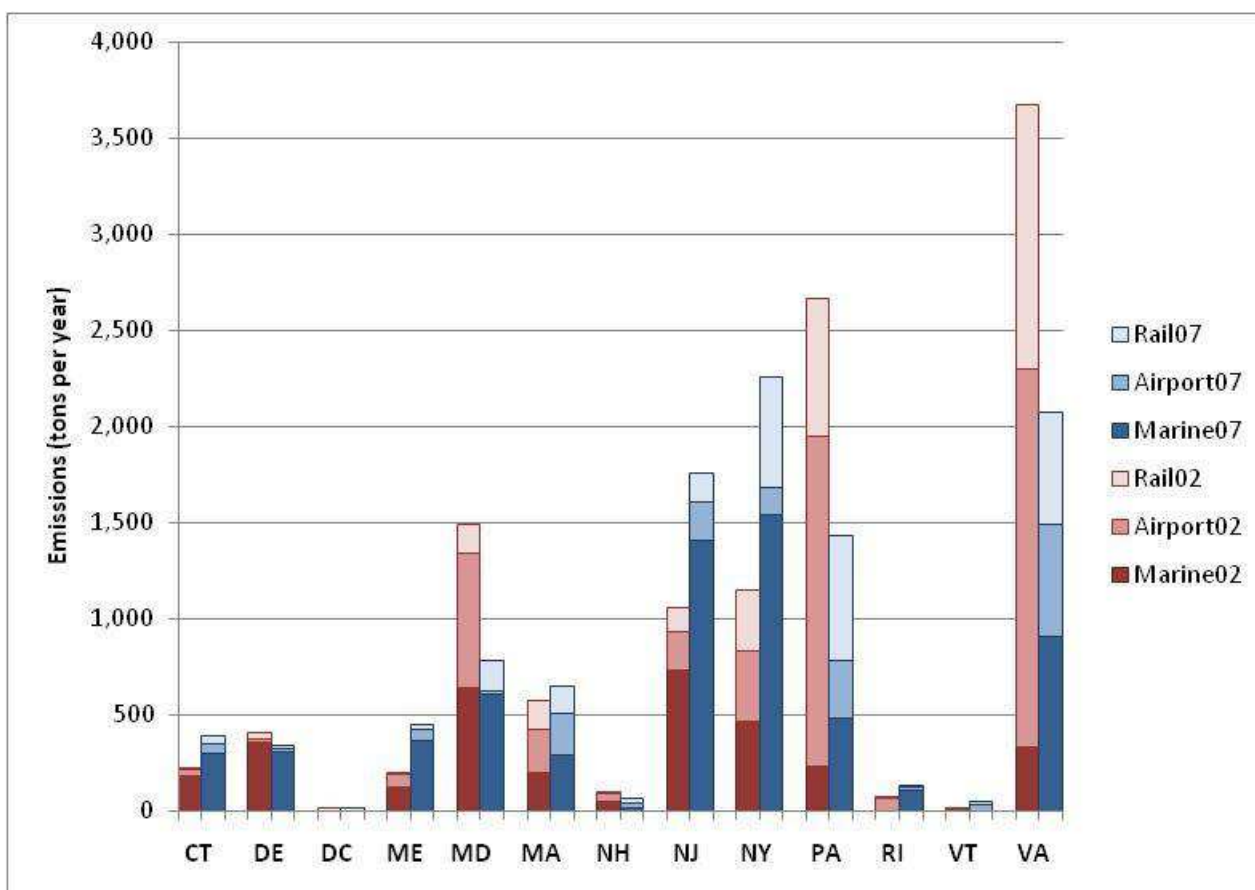


Exhibit 6.9 – 2002 and 2007 MAR SO₂ Emissions by State (tons/year)

| STATE | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|---------------|------------|--------------|--------------|------------|------------------|--------------|-------------|
| | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 671 | 1,386 | 107% | 39 | 96 | 145% | 4 | 57 | 1323% |
| DE | 3,377 | 2,079 | -38% | 30 | 55 | 84% | 64 | 5 | -92% |
| DC | 1 | 1 | 31% | 0 | 0 | n/a | 33 | 37 | 11% |
| ME | 128 | 189 | 48% | 3 | 14 | 376% | 15 | 92 | 514% |
| MD | 4,739 | 2,170 | -54% | 262 | 247 | -6% | 374 | 64 | -83% |
| MA | 489 | 698 | 43% | 284 | 218 | -23% | 591 | 66 | -89% |
| NH | 188 | 506 | 169% | 15 | 28 | 86% | 16 | 10 | -36% |
| NJ | 11,444 | 12,142 | 6% | 374 | 412 | 10% | 352 | 55 | -84% |
| NY | 4,753 | 9,321 | 96% | 440 | 699 | 59% | 765 | 616 | -19% |
| PA | 297 | 3,067 | 933% | 399 | 416 | 4% | 1,934 | 211 | -89% |
| RI | 0 | 632 | n/a | 29 | 30 | 3% | 14 | 5 | -61% |
| VT | 0 | 0 | n/a | 5 | 12 | 134% | 1 | 5 | 412% |
| VA | 386 | 4,058 | 951% | 272 | 424 | 56% | 3,641 | 192 | -95% |
| | 26,473 | 36,250 | 37% | 2,152 | 2,651 | 23% | 7,804 | 1,416 | -82% |

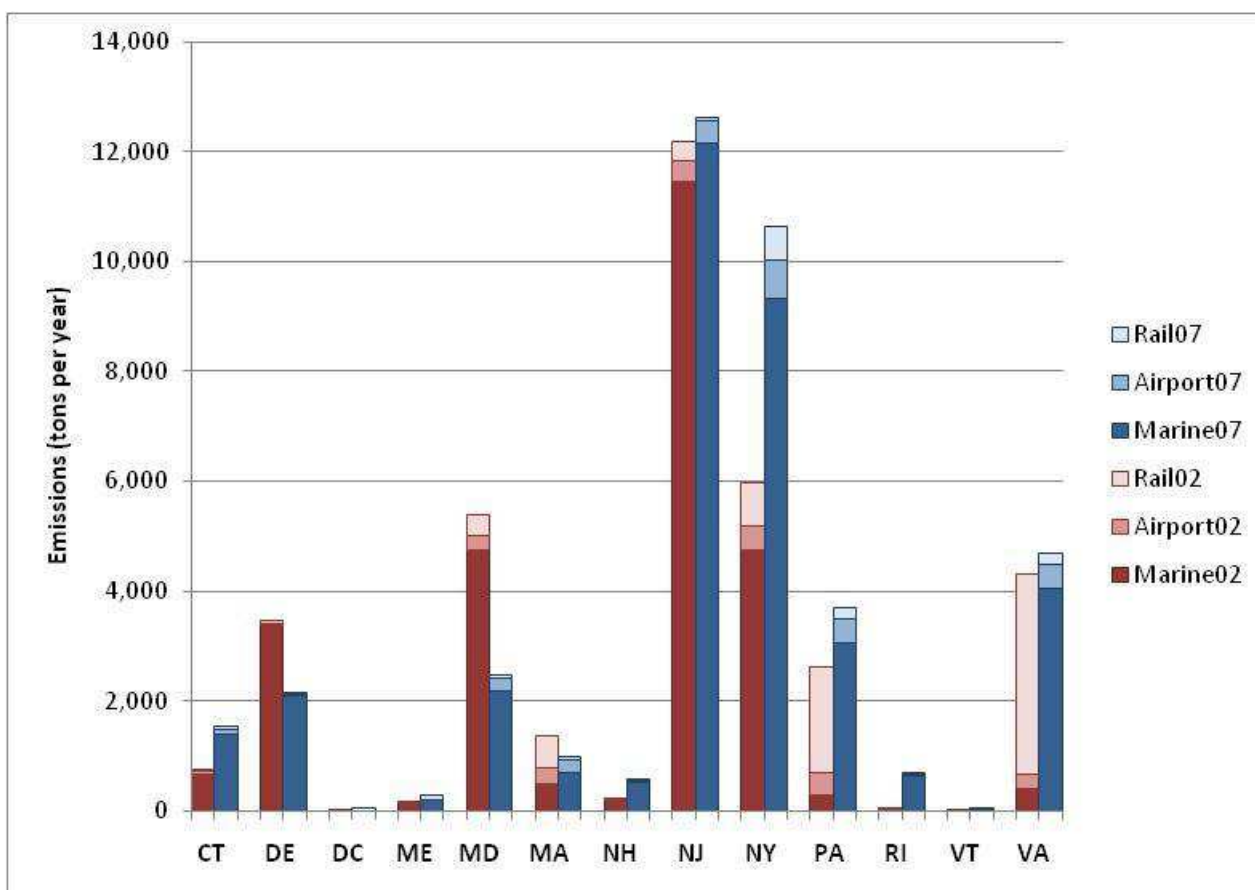
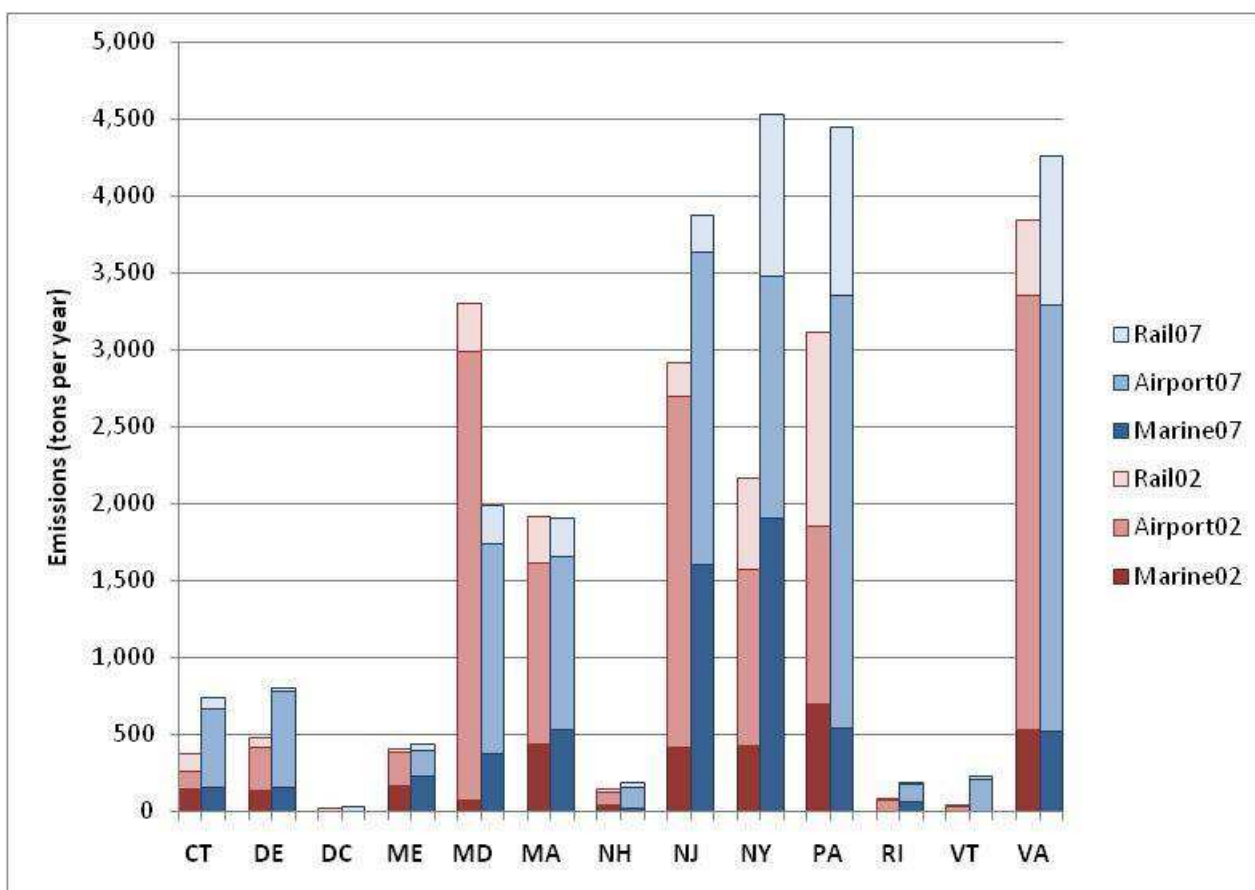


Exhibit 6.10 – 2002 and 2007 MAR VOC Emissions by State (tons/year)

| | Marine Vessels | | | Airports | | | Rail Locomotives | | |
|-------|----------------|--------------|-------------|---------------|---------------|-----------|------------------|--------------|------------|
| STATE | 2002 | 2007 | Change | 2002 | 2007 | Change | 2002 | 2007 | Change |
| CT | 143 | 161 | 13% | 115 | 509 | 343% | 114 | 70 | -39% |
| DE | 132 | 158 | 20% | 290 | 620 | 114% | 60 | 28 | -53% |
| DC | 0 | 0 | n/a | 0 | 1 | n/a | 20 | 32 | 61% |
| ME | 166 | 234 | 41% | 222 | 161 | -27% | 19 | 48 | 152% |
| MD | 74 | 371 | 401% | 2,920 | 1,365 | -53% | 312 | 259 | -17% |
| MA | 433 | 528 | 22% | 1,177 | 1,129 | -4% | 312 | 253 | -19% |
| NH | 40 | 23 | -43% | 88 | 134 | 53% | 15 | 35 | 136% |
| NJ | 413 | 1,601 | 288% | 2,281 | 2,030 | -11% | 221 | 245 | 11% |
| NY | 424 | 1,906 | 349% | 1,145 | 1,571 | 37% | 600 | 1,056 | 76% |
| PA | 703 | 538 | -23% | 1,155 | 2,813 | 144% | 1,260 | 1,095 | -13% |
| RI | 0 | 64 | n/a | 74 | 112 | 51% | 10 | 8 | -22% |
| VT | 0 | 0 | n/a | 27 | 204 | 655% | 2 | 27 | 1259% |
| VA | 531 | 523 | -2% | 2,825 | 2,764 | -2% | 492 | 973 | 98% |
| | 3,059 | 6,106 | 100% | 12,319 | 13,414 | 9% | 3,437 | 4,130 | 20% |



7.0 ANNUAL 2007 INVENTORY FOR ONROAD SOURCES

7.1 OVERALL PROCESS TO DEVELOP THE ONROAD INVENTORY

EPA's recently released MOVES2010 (**MO**tor **V**ehicle **E**mission **S**imulator) is now the official model for estimating air pollution emissions from onroad mobile sources including buses, cars, trucks and motorcycles. MOVES2010 replaces MOBILE6.2, the previous mobile source model. MOVES input files are somewhat more detailed than the MOBILE6.2 input files. To assist in the transition to the new model, USEPA developed software tools to convert MOBILE6.2 inputs for MOVES. In addition, the MOVES model includes a preprocessing tool called the County Data Manager (CDM) to convert spreadsheet based information to MySQL database files required by MOVES. In light of these possibilities, states were offered three options to provide input data for mobile source emission modeling as follows:

1. Provide MOVES input files in either spreadsheets or MySQL tables
2. Provide MOBILE6 inputs plus spreadsheets containing the additional information required by MOVES
3. Run MOVES and provide MOVES output

Exhibit 7.1 shows the approach selected by each state:

Exhibit 7.1 – MOVES Modeling Approach by State

| States Providing MOBILE6.2 Input Files to NESCAUM | States Providing MOVES Input Files to NESCAUM | States Performing MOVES Modeling Themselves |
|--|--|--|
| DC, ME, NH, RI | CT, DE, MD, MA NJ, VT, VA | NY, PA |

MACTEC reviewed either MOBILE6.2 or MOVES files (depending on the State) to ensure that the files were correctly formatted, contained all required information, and that the information conformed to standard codes or data entry types for each data element, and represents 2007 data.

Feedback and results from each QA review was provided to each MARAMA State for any data requiring change or clarification. Based on this feedback, final MOBILE6.2 and MOVES files were developed. NESCAUM was tasked with converting MOBILE6.2 input files to MOVES2010 format. The final MOBILE6.2 and MOVES input files were

provided to the Northeast States for Coordinated Air Use Management (NESCAUM), who is under contract to execute the MOVES model for the Northeast / Mid-Atlantic region.

Where States elected to run the MOVES model themselves no QA was completed by MACTEC and files were provided directly to NESCAUM by the state.

This section of the TSD focuses on MACTEC's work in reviewing the MOBILE6.2 and MOVES input files. The work done by NESCAUM and individual states running MOVES will be documented elsewhere.

7.2 QA OF MOBILE6.2 INPUT FILES

QA activities were performed on the submitted MOBILE6.2 files and the results of that review were to be provided to those States submitting MOBILE 6.2 data. Once the States complete their review, changes approved by the State were made to ensure that the files can be processed by the USEPA provided translators available for converting MOBILE6.2 files to MOVES2010 ready format.

7.2.1 Review of MOBILE6.2 to MOVES File Translators

MACTEC reviewed the MOBILE6.2 to MOVES translators available from USEPA's Office of Transportation and Air Quality (OTAQ). These translators to convert data from MOBILE 6.2 to MOVES format are generally in one of four categories:

- Meteorology Data converter (converts MOBILE6-formatted meteorological data - temperature and humidity - to the format needed by the MOVES County Data Manager to populate the ZoneMonthHour table)
- Registration Distribution converter (take a MOBILE6-formatted registration distribution file and converts it to the format needed by the MOVES SourceTypeAgeDistribution table)
- Average Speed Distribution converter (converts a MOBILE6-formatted speed distribution file to the format needed by the MOVES AvgSpeedDistribution table)
- VMT Converter (converts MOBILE6 VMT data to the format needed by the MOVES HPMSvTypeYear and SourceTypeAgeDistribution tables)

MACTEC evaluated whether there would be any issues associated with using these translators with the State-supplied MOBILE6.2 input files.

The meteorological data translator requires the following information:

- User selection of either hourly temperature data or minimum/maximum temperature data and either hourly relative humidity for each month being modeled or average monthly absolute humidity. No MOBILE6 files provide the information required to make the decision on which data will be provided. The minimal requirement is to choose the minimum/maximum temperature and the average absolute relative humidity.

For the registration distribution converter, the required information is:

- The year of the registration distribution must be entered by the user. This data is not available from within any standard MOBILE6 file.
- The MOBILE6 registration distribution by vehicle MUST be in the 10/10/5 format (ten years of data on the first and second rows, with the remaining five years of the twenty-five total on the last row). Vehicle type can occur in any order and any missing vehicle information will be drawn from the MOBILE6 default vehicle registration distribution.

For the average speed distribution converter the following information is required:

- The user needs to import rural and urban VMT by speed bin data into this worksheet. The data includes the road type code (either a "1" for freeways or a "2" for arterials), the hour, and each of fourteen columns that represent the fraction of VMT occurring in each of the corresponding MOBILE6 speed bins.

With respect to the VMT converter, there are two sets of converters that are designed to handle various vehicle and HPMS roadway type combinations. Set 1 (those with "RoadVMT" in the title) allows the user to enter total VMT data for each HPMS road type and assign vehicle type fractions to allocate VMT on the road type; Set 2 requires the user enter the specific VMT of a vehicle type on a road type. Within each set there are spreadsheets that handle the conversion of VMT for either the MOBILE6 8, 12, or 16 vehicle types and the 12 HPMS roadway classes.

For the VMT converters the following information is required:

- For the VMT converters that use total VMT data for each HPMS road type and assign vehicle type fractions to allocate VMT on the road type, the user must enter the Base Year, the total VMT by road type, and the fraction of total VMT associated with each vehicle type (either 8, 12 or 16 depending upon the translator), the fraction of all VMT (on any road type and vehicle type) per hour of the day (24 values), the fraction of VMT on ramps for the road types rural interstate, urban

interstate, and urban freeways and expressways, and the MOBILE6 registration distribution (same data required for the registration distribution converter).

- For the VMT converters that use vehicle specific VMT by road type, the user must enter the Base Year and the VMT by vehicle type and HPMS road type, the fraction of all VMT (on any road type and vehicle type) per hour of the day (24 values), the fraction of VMT on ramps for the road types rural interstate, urban interstate, and urban freeways and expressways, and the MOBILE6 registration distribution (same data required for the registration distribution converter).

OTAQ also provided an Annual Average Weekday Vehicles Miles Travelled (AADVMT) calculator at the HPMS level to calculate type of day, monthly and yearly VMT in terms of HPMS and/or MOVES source types. The converter generates the HPMSVTypeYear, monthVMTFraction, and dayVMTFraction tables from AADVMT and monthly/weekend-day adjustment factors. It also provides the user with default temporal allocation tables if local inputs are not known.

The AADVMT converter applies data developed by the other VMT converters. Thus one of the VMT converter spreadsheets should be run first before using this spreadsheet. The user provides values from the HPMSVTypeID, yearID, and HPMSBaseYearVMT columns from the HPMSVTypeYear worksheet of any of the VMT converters and pastes these values into the HPMSVTypeID, yearID, and AADVMT columns of the AADVMT worksheet, respectively.

The user must also input the monthly and weekend-day adjustment factors. The monthly adjustment factor is multiplied by the input AADVMT for that HPMSVTypeID to vary the weekday VMT within that month; the weekend-day adjustment factor is multiplied by the weekday VMT for that month. Default adjustment factors are provided if the user does not have local data. These inputs are required to create the MOVES HPMSvTypeYear, MonthVMTFraction, and DayVMTFraction tables. Data for this converter is not provided in any MOBILE6 input file.

Each of the converters must be run for a single county for a single year.

7.2.2 Review of MOBILE6.2 Input Files for the District of Columbia

The District of Columbia (DC) provided 27 MOBILE6 files for review:

- Eighteen of these files appear to be average speed distribution files for freeways and arterial roads. The file names are 1100105.YYX where YY is either AR (arterial) or FW (freeway). In addition, these files do not contain the normal header

found in a speed distribution file for MOBILE6 so it was not clear if these are definitively 2007 data or not.

- There appear to be one file for each of the following:
 - an LEV program external MOBILE file (no converter exists for this in the current MOVES list of translators);
 - an anti-tampering program external MOBILE file (no converter available);
 - a .dsf file (which may be a diesel sales fraction file);
 - an inspection and maintenance program external MOBILE file (no current converter);
 - a registration distribution file for 2005;
 - a Weekday Trip Length Distribution file (no current converter); and
 - an inspection and maintenance cut points data file.

In addition to these MOBILE external files, DC also provided two spreadsheets, one with 2005 to 2007 registration distribution data and one with annual VMT by highway class (HPMS) and speed bin.

The data provided by DC did not include any input data files nor did it provide any external hourly meteorology files. Thus, no meteorology data was provided. There is no data to use in the meteorological data converter.

Two sets of registration data were provided by DC. One is a properly formatted MOBILE6 registration data file for 2005 in the correct 10/10/5 format. The spreadsheet provided with the 2005 to 2007 registration distribution has the 2007 data in it but the format was not correct. It would not take a significant effort to reformat the data to the required format, but as it was delivered the format was incorrect.

As indicated there were separate files for speed distribution for DC. However, the files are currently separated into arterial and freeway components and would have to be put together to make a whole file. In addition, it was unclear if the files represent 2007. Finally because there are nine of the files it would be necessary for DC to clarify what each of the different files represents. Thus, while the data format is roughly correct (albeit for only one roadway type at a time) further clarification from DC was needed to process these files.

No data in the correct format for the VMT converters was provided. DC did provide a spreadsheet with VMT by functional (HPMS) class and speed bin, but the data are not broken down by vehicle type nor are fractions of VMT by vehicle type necessary to use the total VMT and fractional component by vehicle type provided.

MACTEC made the following observation and recommendations to DC for adjusting the MOBILE6.2 input files for use with MOVES:

- The MOBILE6.2 input files did not contain any meteorology data of any kind;
- The MOBILE6.2 input files did not contain sufficient information for use of the average speed converter, although it appears that the average speed data are provided in a different format;
- The MOBILE6.2 input files did provide data for the registration distribution that is in the correct format for 2005, but is not in the correct format for 2007 - the 2007 data could be formatted correctly with little effort and should be able to be used in the converter at that point; and
- The MOBILE 6.2 input files did not provide sufficient information for use of the VMT converters.

DC reviewed MACTEC's comments and provided updated MOBILE6.2 files to NESCAUM, who ran the MOBILE6.2 translators and interacted with DC on any remaining translator issues.

7.2.3 Review of MOBILE6.2 Input Files for Maine

Maine (ME) provided 10 MOBILE6 files for review:

- Five of these files were input files;
- A batch file to run the five input files
- Four LEV program external MOBILE6 data files.

The ME provided data did not include external hourly meteorological or humidity data. The input data files did include the minimum and maximum temperatures, but no humidity data. Thus it is likely that default values for humidity were used. The min/max temperatures are for 2005 and not 2007. Thus no 2007 meteorology data was provided that could be used with the meteorological data converter.

No MOBILE6 registration data file was provided with the data. The documentation report discusses runs using actual Maine data and with the MOBILE default data set. Thus, it is

likely that the data exists, but was not provided to MACTEC. It may or may not be in the correct 10/10/5 format. Since the study was for 2005, however the data are likely not to be 2007 data.

No speed distribution data was provided. Thus, there is no data to use in this converter.

No data in the correct format for the VMT converters was provided. Thus, there is no data to use in this converter.

MACTEC made the following observation and recommendations to Maine for adjusting the MOBILE6.2 input files for use with MOVES:

- The MOBILE6.2 files did contain temperature data for summer and winter months (January and July) but the data are for 2005, and no humidity data provided;
- The MOBILE6.2 files did not contain any information for use of the average speed converter;
- The MOBILE6.2 files did not provide data for the registration distribution, but did indicate that default MOBILE6.2 file was used as well as other Maine specific data. However each data set was for 2005. The data are likely in the correct format for the converter.
- The MOBILE6.2 files did not provide sufficient information for use of the VMT converters.

Maine reviewed MACTEC's comments and provided updated MOBILE6.2 files to NESCAUM, who ran the MOBILE6.2 translators and interacted with Maine on any remaining translator issues.

7.2.4 Review of MOBILE6.2 Input Files for New Hampshire

New Hampshire (NH) submitted 31 MOBILE model files for review:

- Ten of these files were MOBILE 6.2 “.in” files which are input files used to run the model and contain specifications for various input parameters.
- Another ten files were the corresponding “.out” files which are the output results of the ten .in model runs.
- An additional ten files were also included with “.pm” extensions. These were PM and related pollutant emission factor output files.

The meteorology data provided in the input files from NH includes the minimum and maximum temperatures data required for converter. Absolute humidity data are available

from the corresponding output file, but not found in the input file. These values may have been supplied in an external file not provided to MACTEC. Data for both evaluation months were supplied (January and July). However, individual monthly data was not provided (unless the data were provided in an external file not provided to MACTEC). Thus temperature and humidity data are not available for the other months of 2007, unless either an external file exists for an interpretation of the values was made.

Input files indicate that the runs were all made using MOBILE6.2 default registration distributions. Thus the default MOBILE6.2 registration distribution file could be used for input to the converter. This would fully satisfy the data requirement for this converter and would be guaranteed (as long as unedited and unaltered) to have the correct format.

No data for speed distribution was provided. This data is missing. NH may be using default data but not clearly identified in any files provided.

No data in the correct format for the VMT converters was provided. NH did provide a spreadsheet with VMT by functional (HPMS) class, but the data are not broken down by vehicle type nor are fractions of VMT by vehicle type necessary to use the total VMT and fractional component by vehicle type provided.

The input files do indicate (in the comment section at the top of the input files) that they are using “default VMT mix”. Thus it may be that the default VMT by HPMS data from MOBILE6 may be used by NH, but the files were not provided.

A spreadsheet provided information on speed by freeway and arterial roadways (similar to what is needed for the average speed distribution converter); however, the data is not divided into hourly values as required for that converter. Thus, the data is not sufficient for use in that converter.

MACTEC made the following observation and recommendations to NH for adjusting the MOBILE6.2 input files for use with MOVES:

- The MOBILE6.2 input files did not contain meteorology data for each month for the entire year - only data for January and July are available from the files provided
- The MOBILE6.2 input files did not contain sufficient information for use of the average speed converter;
- The MOBILE6.2 input files did not provide data for the registration distribution, but did indicate that default MOBILE6.2 file was used which is sufficient for use in that converter; and

- The MOBILE6.2 input files did not provide sufficient information for use of the VMT converters; if default MOBILE6 values were used, then the data from the default file should be sufficient to run one of the VMT converters.

NH reviewed MACTEC's comments and provided updated MOBILE6.2 files to NESCAUM, who ran the MOBILE6.2 translators and interacted with NH on any remaining translator issues.

7.2.5 Review of MOBILE6.2 Input Files for Rhode Island

Rhode Island (RI) provided five MOBILE6 files for review:

- A MOBILE6 file for the LEV program in New England
- Two additional files related to the inspection/maintenance program
- An input file for the MOBILE6 runs
- A registration distribution file.

RI also provided four spreadsheets containing various types of VMT and speed data

RI provided an input file for summer (July evaluation month) with minimum and maximum temperatures. However, it does not include humidity data. Without humidity data the meteorology converter cannot be used to develop MOVES data.

A correctly formatted 2007 registration data file was provided. This file should be able to be used in the converter.

There were no separate files for average speed. In the input file, there are AVERAGE SPEED command entries; however, that command is not the same as the data requested for the converter. There is a procedure for converting the single average speed covered in the AVERAGE SPEED command to create an average speed distribution (which is what the converter requires), but the data as provided are not usable by the converter. There is also a spreadsheet with average speed by functional class but not the hourly fraction by speed bin data required by the converter.

No data in the correct format for the VMT converters was provided. There are several spreadsheets with VMT (in particular daily VMT [DVMT]) but none of the data are in the correct format to be used by the converter. There is data on DVMT by functional class which is part of what is required by the converter but no data for the fraction assigned to each vehicle type.

MACTEC made the following observation and recommendations to RI for adjusting the MOBILE6.2 input files for use with MOVES:

- The MOBILE6.2 files contains only min/max temperatures for summer (July) in the input file;
- The MOBILE6.2 files did not contain sufficient information for use of the average speed converter; although it appears that the some average speed data are provided in the input file, the distribution of speeds was not provided;
- The MOBILE6.2 files did provide data for the registration distribution that is in the correct format; and
- The MOBILE6.2 files did not provide sufficient information for use of the VMT converters.

RI reviewed MACTEC's comments and provided updated MOBILE6.2 files to NESCAUM, who ran the MOBILE6.2 translators and interacted with RI on any remaining translator issues.

7.3 QA OF MOVES INPUT FILES

MACTEC reviewed MOVES input files from seven States. In general, the following items were checked:

- Completeness – were all of the data types needed there?
- Format – was the format of the data correct
- Did sums for fractional data sum to 1 – for those items that were fractions (speed distributions, hourly vmt fractions, etc) did the values sum to 1. Not every sum was checked, but we spot checked the files at random to make sure the sums were there
- Were the ID fields correct – where ID values were required by MOVES did the correct values get used
- Did the provided data correspond to guidance in the user's guide? – e.g., I/M programs in MOVES only apply to gasoline vehicles – thus the UseIMYN field should always be N for diesel fuels.
- Other issues – do values make logistical sense (sourcetypepopulation data entered as whole numbers since you can't really have a fraction of a vehicle), multiple years of data for the monthVMTFraction with the ISLeapYear field having two entries (Y and N).

Exhibit 7.2 indicates the suitability of each of the MOVES input files with respect to the checks listed above. For the columns where there is an “X” the data was determined to be complete. Where Exhibit 7.2 lists “see notes” an issue was found and brought to the attention of the State. The following subsections provide explanations for each issue on a state by state basis. States worked with NESCAUM in resolving these minor issues.

Exhibit 7.2 – Review of State-Supplied MOVES Input Files

| MOVES Input File | CT | DE | MD | MA | NJ1 | NJ2 | VT | VA |
|--------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| AgeDistribution | X | X | X | X | See Notes | X | X | X |
| AverageSpeedDistribution | See Notes | See Notes | X | X | X | X | See Notes | X |
| FuelSupply | X | X | X | X | X | X | See Notes | X |
| FuelFormulation | X | X | X | X | See Notes | X | X | X |
| MeteorologyData | --- | --- | X | X | See Notes | X | See Notes | X |
| RampFraction | X | X | X | See Notes | See Notes | X | X | X |
| RoadTypeDistribution | X | X | See Notes | X | See Notes | X | X | X |
| SourceTypePopulation | X | See Notes | X | X | See Notes | X | X | See Notes |
| HPMSVTypeYear | X | X | X | X | See Notes | X | X | X |
| MonthVMTFraction | X | See Notes | X | X | See Notes | See Notes | X | X |
| DayVMTFraction | X | --- | X | X | See Notes | See Notes | X | X |
| HourVMTFraction | X | --- | X | X | See Notes | X | X | X |
| I/M Coverage | 1 | 2 | X | See Notes | X | X | See Notes | X |
| All Counties? | X | X | X | X | See Notes | See Notes | X | X |

NJ1 - Burlington, Camden, Gloucester, Mercer counties only

NJ2 - All other New Jersey Counties

7.3.1 MOVES Input Files for Connecticut

The only issue for Connecticut was the AverageSpeedDistribution file, which includes annual, summer and winter values. No distributions were provided for the spring or fall.

7.3.2 MOVES Input Files for Delaware

The Delaware AverageSpeedDistribution file includes spring, summer, fall, and winter values, but no annual values.

The Delaware SourceTypePopulation file showed an inconsistency. While the values numbers for each source type (vehicle type) for New Castle and Sussex County were different, the total source type population for each county is identical. However, the actual human population for Sussex in 2008 is estimated to be 188,036 while that for New Castle was over 500,000. Thus, there is about one vehicle per person in New Castle County and about three vehicles per person Sussex County.

The Delaware Monthly VMT Fractions summed to exactly one for only one of three counties. The other two counties sum to 0.9998, which may cause problems for MOVES internal checks may require the monthly fractions to sum to exactly 1.0.

7.3.3 MOVES Input Files for Maryland

The Maryland Road Type Distribution file had fractions that do not sum to exactly 1.0. This may cause problems depending upon how accurate the check is within MOVES.

7.3.4 MOVES Input Files for Massachusetts

The Massachusetts Ramp Fraction format was incorrect. It should only have entries for two road type IDs - 2 and 4. The 15% ramp fraction for rural interstates appears to be high, as the default is 8% for either road type.

7.3.5 MOVES Input Files for New Jersey

New Jersey provided two sets of MOVES input files – one set for four counties (Burlington, Camden, Gloucester, Mercer) and a second set for all other counties. New Jersey resubmitted their inputs in the correct format directly to NESCAUM.

7.3.6 MOVES Input Files for Vermont

The Vermont Average Speed Distribution fractions did not sum exactly to 1.0. This may cause problems depending upon how accurate the check is within MOVES.

The Vermont Fuel Supply file fractions did not sum exactly to 1.0. This may cause problems depending upon how accurate the check is within MOVES.

The Vermont Meteorology Data file appears to use default MOVES data which is thirty year average data, rather than actual 2007 data.

The Vermont I/M Coverage file has “fuelTypeID = 5” (e.g., ethanol) and the “useIMyn field” set to “Y”. According to MOVES user’s guide, I/M programs can only be applied to gasoline vehicles (fuelTypeID = 1) (see page 67 of user’s guide).

7.3.7 MOVES Input Files for Virginia

The Virginia Source Type Population file has values with decimal fractions. These should be reported as whole numbers

7.4 MOVES MODEL RUN SPECIFICATIONS, DOCUMENTATION, AND RESULTS

The MOVES modeling by NESCAUM and the States was not completed at the time of publication of this report. The work done by NESCAUM and individual states running MOVES will be documented elsewhere.

8.0 PREPARATION OF SMOKE MODEL FILES

Air quality modelers in the Mid-Atlantic and Northeastern States use the SMOKE Modeling System to create gridded, speciated, hourly emissions for input into a variety of air quality models (). This section describes how the SMOKE inventory files were developed. It also describes how the SMOKE the temporal allocation, speciation, and spatial allocation profiles, respectively, were developed.

8.1 PREPARATION OF SMOKE EMISSION FILES

8.1.1 Point Source SMOKE Emission Files

Annual point source inventories were prepared in SMOKE PTINV ORL format. As previously discussed in Section 3.2.1, PTINV files were created for the following types of sources:

- Annual emissions for units that reported hourly emissions to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-zone season emissions for units that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files; temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles.

The ORL were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions in the ORL files.

EPA has developed a methodology to reduce fugitive dust emissions for use in air quality modeling analyses (USEPA 2007b). It is considered a logical step to account for the removal of particles near their emission source by vegetation and surface features. For the MANEVU+VA 2007 inventory the transport factors were NOT applied to the point source inventory because of the very small amount of fugitive particulate emissions in the point source inventory.

Hourly point source inventories were prepared for units that report hourly emissions to USEPA's Clean Air Markets Division in SMOKE PTHOUR EMS-95 format. Because of the large size of the PTHOUR files, separate files were prepared by month. As previously discussed in Section 3.2.1, the following PTHOUR files were created:

- 12 monthly PTHOUR files for units that reported hourly emissions to USEPA CAMD for the entire 12 months of 2007;
- 5 monthly PTHOUR files (May-September) for units that reported hourly emissions to USEPA CAMD only for the ozone season 2007;
- 12 monthly PTHOUR files for units in Maryland that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007; and
- 12 monthly PTHOUR files for units in Virginia that are classified as distributed generations units

Since some CAMD units only report hourly emissions data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. Section 3.4 of this TSD discusses the development of the SMOKE temporal profiles for the non-ozone season months for these units.

8.1.2 Area Source SMOKE Emission Files

Annual area source inventories were prepared in SMOKE ARINV ORL format. In developing the SMOKE ARINV ORL files for area sources, the USEPA "transport factor" was applied to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The transport factor was NOT applied to the NIF-formatted annual emissions, but only to the SMOKE ARINV ORL-formatted file.

The standard transport fractions and SCC assignments from the USEPA CHIEF website were used to reduce the PM10-PRI and PM25-PRI emissions in the MANEVU+VA 2007 area source inventory. Two files were used. The first file contains a list of SCCs for which the transport factor was applied. The major source categories included paved and unpaved roads, construction activity, agricultural crop land tilling, and agricultural livestock operations. The second file contains the transport factor which varies by county. For example, in Connecticut the transport factors ranges from 0.21 in Tolland County to 0.44 in New Haven County.

Applying the transport factor to area source fugitive dust emissions significantly reduces that amount of particulate matter included in the air quality modeling. Exhibit 8.1 compares the 2007 area source PM10-PRI and PM25-PRI emissions before and after the

application of the transport fraction. Region wide, PM10-PRI emissions are reduced by 54 percent and PM25-PRI emissions are reduced by 25 percent by applying the transport fraction. The percent reduction varies by State due to the relative importance of the area source fugitive dust emissions compared to non-fugitive dust source emissions. The bottom part of Exhibit 8.1 shows the key area source fugitive dust categories and the reductions applied by using the transport fraction.

Exhibit 8.1 – Comparison of 2007 Area Source Emissions With and Without the Application of the Fugitive Dust Transport Factor (tons/year)

| State/SCC | PM10-PRI | | | PM25-PRI | | |
|---|--------------------------|-----------------------|-------------------|--------------------------|-----------------------|-------------------|
| | Without Transport Factor | With Transport Factor | Percent Reduction | Without Transport Factor | With Transport Factor | Percent Reduction |
| Emissions by State for All SCCs | | | | | | |
| CT | 40,106 | 18,753 | 53% | 9,682 | 8,132 | 16% |
| DE | 16,171 | 10,471 | 35% | 2,606 | 2,173 | 17% |
| DC | 5,242 | 2,196 | 58% | 758 | 410 | 46% |
| ME | 54,445 | 20,227 | 63% | 12,526 | 8,744 | 30% |
| MD | 71,468 | 38,106 | 47% | 19,563 | 14,615 | 25% |
| MA | 152,198 | 58,091 | 62% | 23,535 | 15,212 | 35% |
| NH | 26,965 | 9,262 | 66% | 5,966 | 4,375 | 27% |
| NJ | 57,436 | 31,520 | 45% | 14,292 | 13,345 | 7% |
| NY | 321,402 | 162,418 | 49% | 58,348 | 44,430 | 24% |
| PA | 347,579 | 168,674 | 51% | 72,808 | 53,843 | 26% |
| RI | 11,619 | 5,369 | 54% | 2,900 | 2,428 | 16% |
| VT | 53,684 | 20,475 | 62% | 12,912 | 9,558 | 26% |
| VA | 212,246 | 90,788 | 57% | 43,950 | 32,599 | 26% |
| All States and SCCs | 1,370,561 | 636,352 | 54% | 279,847 | 209,863 | 25% |
| MANE-VU+VA Emissions for Selected SCCs | | | | | | |
| 2294000000 Paved Roads | 391,813 | 138,150 | 65% | 25,689 | 9,057 | 65% |
| 2296000000 Unpaved Roads | 417,949 | 129,150 | 69% | 41,525 | 12,837 | 69% |
| 2311xxxxxx Construction | 205,806 | 74,599 | 64% | 20,929 | 7,585 | 64% |
| 2801000003 Ag. Tilling | 94,443 | 33,949 | 64% | 17,789 | 6,511 | 64% |

8.1.3 Nonroad NMIM SMOKE Emission Files

As discussed in Section 5, the NMIM/NONROAD model was executed using specifications to generate monthly emission files. Monthly SMOKE ARINV ORL files were created. Average day emissions were calculated by dividing the NONROAD generated monthly emissions by the number of days in each month. Various summary reports were prepared to verify agreement between the average day, monthly, and annual emissions.

8.1.4 Nonroad MAR SMOKE Emission Files

Annual inventories for marine vessels, airport operations and railroad locomotives were prepared in SMOKE ARINV ORL format for each county in the region. Average day emissions were calculated by dividing the annual emissions by 365 days. The ORL files for Category 3 commercial marine vessels include only the emissions that occur in State waters (generally from the shoreline to 3–10 nautical miles from shore).

8.1.5 Onroad SMOKE Emission Files

Smoke emission files for the onroad sector are being developed by NESCAUM under a separate contract. Please contact NESCAUM for documentation and data files.

8.1.1 Biogenic SMOKE Emission Files

Smoke emission files for the biogenic sector are being developed by New Jersey and New York under separate efforts. Please contact MARAMA to obtain documentation and data files for biogenic sources.

8.1.1 SMOKE Emission Files for Areas Outside of the MANE-VU+VA Region

Smoke emission files for areas outside of the MANE-VU+VA are currently under development. Contact MARAMA for further information.

8.2 REVIEW OF SMOKE AUXILIARY FILES

The following activities were performed to quality assure and improve the SMOKE speciation, spatial and temporal profiles:

- QA checks were made to ensure that all SCCs in the annual emission inventory files are cross-referenced to SCCs in the SMOKE profiles. In cases where a proper cross-reference does not exist, the SMOKE files were updated using data for similar SCCs or as otherwise determined on a case-by-case basis.

- SMOKE temporal profiles were reviewed and documented for key categories. Recommendations for improving SMOKE temporal profiles were made for categories where improved data is available and are reasonable feasible to use.
- SMOKE spatial profiles were reviewed and documented for selected categories. Recommendations for improving SMOKE spatial profiles were made for categories where improved data is available and are reasonable feasible to use.

Each of these activities is documented in Appendix F of this TSD.

8.2.1 SMOKE Speciation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed MACTEC to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

GSREF Speciation Cross-Reference File

- Added records for SCC/pollutant code combinations in the 2007 inventory that needed to be added to the GSREF file

GSPRO Speciation Profiles

- No changes were needed

8.2.2 SMOKE Spatial Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed MACTEC to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

AMGREF Spatial Allocation Cross-Reference File

- Added records for SCCs in the 2007 inventory that needed to be added to the AMGREF file

SRGDESC Spatial Surrogate Code Descriptions

- No changes were needed

To spatially allocate county-level emissions from airports, SMOKE modelers will use the SMOKE ARTOPNT file to allocate county-level to specific point source airport locations instead of being assigned spatial surrogates. We reviewed this SMOKE file and confirmed the county-level commercial aircraft emissions are being allocated to the location of the

large airport in the county. The only adjustment to the SMOKE ARTOPNT file was as follows:

- Changed the allocation factors for commercial aircraft (SCCs 2275000000, 2275020000, and 2275070000) in Queens County NY to allocate county-level commercial aircraft emissions to JFK Airport and LaGuardia airport based on the 2008 LTO data from USEPA's 2008 emission inventory

Emissions for Category 3 commercial marine vessels will be spatially allocated using the following procedures:

- For operations from shoreline to roughly 3-10 nautical miles from the shore, the county-level Category 3 emissions prepared by States will be allocated to grid cells using the SMOKE spatial allocation files (profile 800 {Marine Ports} for port emissions, profile 810 {Navigable Waterway Activity} for underway emissions);
- For operations outside of State waters (generally 10-200 nautical miles from shore) Northeast / Mid-Atlantic emission modelers will use a Category C3 ORL files (ptinv_eca_imo_fixFIPS_US_caps_2005_19OCT2010_orl.txt) generated by EPA for 2005. The SMOKE modelers will zero out the emissions that have been assigned to counties to avoid double counting of emissions with the State-provided emissions discussed in the previous bullet.

See Appendix F for a further discussion of the Category 3 spatial allocation issue.

8.2.3 SMOKE Temporal Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed MACTEC to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

AMPTREF Temporal Cross-Reference File

- Added records for SCCs in the 2007 inventory that needed to be added to the AMPTREF file
- Changed the monthly allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 246 to 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)

- Changed the day-of-week allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 7 to 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Changed the hour-of-day allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 26 to 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)
- Changed the monthly allocation code for SCCs 22-80-003-100 (CMV/Residual/Port) and 22-80-003-200 (CMV/Residual/Underway) from 262 to 19531, which is the code the EPA recently developed for their C3 inventory

AMPTPRO Temporal Allocation Profiles

- Added the monthly allocation code of 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)
- Added the day-of-week allocation code of 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Added the hour-of-day allocation code of 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)

9.0 FINAL DELIVERABLES

Exhibits 9.1 to 9.4 identify all of the deliverable products for the 2007 MANE-VU+VA emission inventory developed by MACTEC under this contract. The exhibit also identifies deliverables associated with the 2007 MANE-VU+VA under development by other agencies.

All files are stored on MARAMA ftp site:

Address: [ftp.marama.org](ftp://marama.org)

Login ID: regionalei

Password: marama2007

Files are stored in the following directories:

\\Final 2007 Emission Inventory\\NIF_Files

\\Final 2007 Emission Inventory\\SMOKE_Files

\\Final 2007 Emission Inventory\\Supporting_Files

\\Final 2007 Emission Inventory\\Documentation

The contents of each folder are provided in Exhibits 9.1, 9.2, 9.3, and 9.4.

Exhibit 9.1 – NIF Data and Emission Summary Files for the 2007 MANE-VU+VA Emission Inventory

| File Description | File Name | Format | Notes |
|--|--|------------|--|
| Folder: \Final 2007 Emission Inventory\NIF_Files\Point | | | |
| 2007 Annual Point Source Emission Inventory in NOF format | MANEVU+VA_Point_2007_NOF.mdb | NOF ACCESS | EP table modified to include fields to (1) identify units as CAMD-EGU, CAMD-nonEGU, and OTHER; (2) include the CAMD ORIS and UNITID for CAMD units; and (3) identify the percent operating time classification for CAMD units. See file for Field Definitions |
| 2007 Annual Point Source Emission Inventory in a spreadsheet format to facilitate State and Stakeholder review | MANEVU+VA_Point_2007_Process_Emissions.xls | MS Excel | See file for Column Definitions |
| 2007 Annual Point Source Emission Inventory summaries by State and Source Classification Code (SCC) | MANEVU+VA_Point_2007_State_SCC_Summary.xls | MS Excel | See file for Column Definitions |
| Folder: \Final 2007 Emission Inventory\NIF_Files\Area | | | |
| 2007 Annual Area Source Emission Inventory in NOF format | MANEVU+VA_Area_2007_NOF.mdb | NOF ACCESS | See file for Field Definitions |
| 2007 Annual Area Source Emission Inventory summaries by State/SCC | MANEVU+VA_Area_2007_State_SCC_Summary.xls | MS Excel | See file for Column Definitions |
| Folder: \Final 2007 Emission Inventory\NIF_Files\Nonroad | | | |
| 2007 Annual NMIM/NONROAD Source Emission Inventory in NOF format | 2007MARAMANNRMIMv1_1.mdb | NOF ACCESS | See file for Field Definitions. Data for Virginia is not included – VADEQ elected to use SEMAP NMIM results which are not yet available. NMIM results for GSE have been stripped from this file – GSE emissions are accounted for in the MAR inventory. |

| File Description | File Name | Format | Notes |
|--|---|---------------|--|
| 2007 Annual NMIM/NONROAD Emission Inventory summaries by State and SCC | MANEVU+VA_NMIM_2007_State_SCC_Summary.xls | MS Excel | See file for Column Definitions. Data for Virginia is not included – VADEQ elected to use SEMAP NMIM results which are not yet available. NMIM results for GSE have been stripped from this file – GSE emissions are accounted for in the MAR inventory. |
| 2007 Annual Commercial Marine Vessel Emission Inventory in NOF format | MANEVU+VA_MAR_2007_CMV_v1_4.mdb | NOF ACCESS | See file for Field Definitions |
| 2007 Annual Commercial Marine Vessel Emission Inventory summaries by State and SCC | MANEVU+VA_MAR_CMV2007StateSCCSummaries.xls | MS Excel | See file for Column Definitions |
| 2007 Annual Airport Emission Inventory in NOF format | MANEVU+VA_MAR_2007_Aircraft_v1_2.mdb | NOF ACCESS | See file for Field Definitions |
| 2007 Annual Airport Emission Inventory summaries by State and SCC | MANEVU+VA_MAR_Aircraft2007StateSCCSummaries.xls | MS Excel | See file for Column Definitions |
| 2007 Annual Railroad Locomotive Emission Inventory in NOF format | MANEVU+VA_MAR_2007_Rail_v1_3.mdb | NOF ACCESS | See file for Field Definitions |
| 2007 Annual Railroad Locomotive Emission Inventory summaries by State and SCC | MANEVU+VA_MAR_Rail2007StateSCCSummaries.xls | MS Excel | See file for Column Definitions |

Exhibit 9.2 – SMOKE Files for the 2007 MANE-VU+VA Emission Inventory

| File Description | File Name | Format | Notes |
|---|--|---------------------------|---|
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Point | | | |
| 2007 Annual Point Source Emission Inventory in SMOKE ORL format | PTINV_2007_NonHourly_feb2011.orl PTINV_2007_12MonthUnits_feb2011.orl PTINV_2007_Ozone_5MonthUnits_feb2011.orl PTINV_2007_NonOzone_5MonthUnits_feb2011.orl PTINV_2007_VADGUnits_march2010.orl PTINV_2007_MD6MonthUnits_march2010.orl | SMOKE PTINV ORL | One file for all non-hourly units and five separate files for units with hourly emissions. See Section 3.2.1 for the TSD for discussion of the files and Exhibit 3.1 for the file format. |
| SMOKE PTHOUR EMS-95 zip files with hourly emissions for each month of 2007 for units that report hourly emissions to CAMD for the entire 12 months in 2007. The zip file contains 12 monthly files. | PTHOUR_EMS95_OTC_12MonthUnits_041610.zip pthour_2007_jan_12MonthUnits_april2010.ems pthour_2007_feb_12MonthUnits_april2010.ems pthour_2007_mar_12MonthUnits_april2010.ems pthour_2007_apr_12MonthUnits_april2010.ems pthour_2007_may_12MonthUnits_april2010.ems pthour_2007_jun_12MonthUnits_april2010.ems pthour_2007_jul_12MonthUnits_april2010.ems pthour_2007_aug_12MonthUnits_april2010.ems pthour_2007_sep_12MonthUnits_april2010.ems pthour_2007_oct_12MonthUnits_april2010.ems pthour_2007_nov_12MonthUnits_april2010.ems pthour_2007_dec_12MonthUnits_april2010.ems | SMOKE PTHOUR EMS-95 | See Exhibit 3.2 for file format |
| SMOKE PTHOUR EMS-95 files with hourly emissions for 5 months of 2007 for units classified as “5-month reporters” in all States except MD. The zip file contains 5 monthly files. | PTHOUR_EMS95_OTC_5MonthUnits_041610.zip pthour_2007_may_5MonthUnits_april2010.ems pthour_2007_jun_5MonthUnits_april2010.ems pthour_2007_jul_5MonthUnits_april2010.ems pthour_2007_aug_5MonthUnits_april2010.ems pthour_2007_sep_5MonthUnits_april2010.ems | SMOKE PTHOUR EMS-95 | See Exhibit 3.2 for file format |
| SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as “6-month reporters” in MD. The zip file contains 12 monthly files. | PTHOUR_EMS95_OTC_MD6MonthUnits_031510.zip pthour_2007_jan_MD6MonthUnits_march2010.ems pthour_2007_feb_MD6MonthUnits_march2010.ems pthour_2007_mar_MD6MonthUnits_march2010.ems pthour_2007_apr_MD6MonthUnits_march2010.ems pthour_2007_may_MD6MonthUnits_march2010.ems pthour_2007_jun_MD6MonthUnits_march2010.ems | SMOKE PTHOUR EMS-95 | See Exhibit 3.2 for file format |

| File Description | File Name | Format | Notes |
|--|---|---------------------------|---|
| | pthour_2007_jul_MD6MonthUnits_march2010.ems pthour_2007_aug_MD6MonthUnits_march2010.ems pthour_2007_sep_MD6MonthUnits_march2010.ems pthour_2007_oct_MD6MonthUnits_march2010.ems pthour_2007_nov_MD6MonthUnits_march2010.ems pthour_2007_dec_MD6MonthUnits_march2010.ems | | |
| SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as “distributed generation units” by the Virginia DEQ. The zip file contains 12 monthly files. | PTHOUR_EMS95_OTC_VADGUnits_040710.zip pthours_2007_jan_VADGunits_march2010.ems pthours_2007_feb_VADGunits_march2010.ems pthours_2007_mar_VADGunits_march2010.ems pthours_2007_apr_VADGunits_march2010.ems pthours_2007_may_VADGunits_march2010.ems pthours_2007_jun_VADGunits_march2010.ems pthours_2007_jul_VADGunits_march2010.ems pthours_2007_aug_VADGunits_march2010.ems pthours_2007_sep_VADGunits_march2010.ems pthours_2007_oct_VADGunits_march2010.ems pthours_2007_nov_VADGunits_march2010.ems pthours_2007_dec_VADGunits_march2010.ems | SMOKE PTHOUR EMS-95 | See Exhibit 3.2 for file format |
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Area | | | |
| 2007 Annual Area Source Emission Inventory in SMOKE ORL format | arinv_marama_2007_Feb2011_w_tf_orl.txt.gz | SMOKE ARINV ORL | This file has the PM transport factors by county applied to the NOF emissions. See section 8.1.2 for discussion. See http://www.smoke-model.org/version2.6/html/ for file format |
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Nonroad | | | |
| 2007 Annual MAR Emission Inventory in SMOKE ORL format | arinv_marama_2007_MAR_ORL_17Feb2011.txt | SMOKE ARINV ORL | See http://www.smoke-model.org/version2.6/html/ for file format; includes commercial marine vessels, airports (including GSE), and railroad locomotives |
| 2007 Monthly | arinv_nonroad_2007_jan_29sep2010_v1_orl.txt.gz | SMOKE | See http://www.smoke-model.org/version2.6/html/ |

| File Description | File Name | Format | Notes |
|--|--|------------------|---|
| NMIM/NONROAD Emission Inventory in SMOKE ORL format | arinv_nonroad_2007_feb_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_mar_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_apr_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_may_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jun_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jul_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_aug_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_sep_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_oct_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_nov_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_dec_29sep2010_v1_orl.txt.gz | ARINV ORL | model.org/version2.6/html/ for file format |
| 2007 Monthly NMIM summaries by County | arinv_nonroad_2007_monthly_29sep2010_v1_county_tot.xls | MS Excel | See file for Column Definitions |
| 2007 Monthly NMIM summaries by SCC | arinv_nonroad_2007_monthly_29sep2010_v1_scc_tot.xls | MS Excel | See file for Column Definitions |
| 2007 Monthly NMIM summaries by State | arinv_nonroad_2007_monthly_29sep2010_v1_state_tot.xls | MS Excel | See file for Column Definitions |
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Temporal | | | |
| SMOKE formatted temporal profiles for units that report to CAMD for only part of 2007. | ptpro_2007_marama_egu_13apr2010.txt | SMOKE PTPRO | See http://www.smoke-model.org/version2.6/html/ for file format and Section 3.4 of this TSD for discussion of these files |
| SMOKE formatted temporal cross-reference tables for annual time periods | ptref_2007_marama_egu_annual_13apr2010.txt | SMOKE PTREF | |
| SMOKE formatted temporal cross-reference tables for nonozone time periods | ptref_2007_marama_egu_nonozone_13apr2010.txt | SMOKE PTREF | |
| SMOKE formatted temporal profiles | MARAMA_amptref_v3_3_revised_10feb2011_v1.txt | SMOKE AMPTREF | Updated SMOKE temporal files based on EPA's 2005v4 modeling platform. See Section 8.2.3 of this TSD for discussion of the updates made. |
| SMOKE formatted temporal cross-reference tables | MARAMA_amptpro_2005_us_can_revised_10feb2011_v0.txt | SMOKE AMPTPRO | |

| File Description | File Name | Format | Notes |
|---|---|------------------|---|
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Spatial | | | |
| SMOKE formatted spatial fridding cross-reference file | MARAMA_amgref_us_can_mex_revised_17feb20110_v8.txt | SMOKE AMGREF | Updated SMOKE spatial files based on EPA’s 2005v4 modeling platform. See Section 8.2.2 of this TSD for discussion of the updates made. |
| SMOKE formatted spatial surrogate designation file | MARAMA_srgdesc_36km_revised_10feb2011_v1.txt | SMOKE SRGDESC | |
| SMOKE formatted area to point file for airports | MARAMA_artopnt_2002detroit_10feb2011_v0.txt | SMOKE ARTOPNT | |
| Folder: \Final 2007 Emission Inventory\SMOKE_Files\Speciation | | | |
| SMOKE formatted speciation profile | MARAMA_gspro_cmaq_cb05_soa_2005ck_05b_10feb2011.txt | SMOKE GSPRO | Updated SMOKE speciation files based on EPA’s 2005v4 modeling platform. See Section 8.2.1 of this TSD for discussion of the updates made. |
| SMOKE formatted speciation cross-reference file | MARAMA_gsref_cmaq_cb05_soa_2005ck_05b_17feb2011.txt | SMOKE GSREF | |

Exhibit 9.3 – Supporting Files for the 2007 MANE-VU+VA Emission Inventory

| File Description | File Name | Format | Notes |
|--|--|----------|--|
| Folder: \Final 2007 Emission Inventory\Supporting_Files\Point | | | |
| Supporting data and graphics for the 2007 CAMD-based temporal profiles | state_cem_monthly_ratios 13apr2010.xls | MS Excel | |
| Folder: \Final 2007 Emission Inventory\Supporting_Files\Area | | | |
| List of SCCs whose fugitive dust emissions were adjusted for near source capture | tf_scc_list2002nei_v2.xls | MS Excel | The transport factor was only applied to area source SCCs in the SMOKE ORL files. It was not applied in the NOF-formatted file. |
| Transport factor by county | transportfractions052506rev.xls | MS Excel | |
| Folder: \Final 2007 Emission Inventory\Supporting_Files\Nonroad | | | |
| NMIM run specifications for 2007 | MARAMANMIMRunSpecs2007.zip | NMIM | Contains all of the NMIM run specification files that are used to set up the runs for NMIM and specify the MySQL data base used to house the output from the runs) |
| National county database (NCD) modified for MARAMA 2007 inventory | NCD20090910MARAMA.zip | NMIM | The files in this zip MUST be unzipped with the directory structure intact. The external files used for NONROAD by NMIM are contained in the NCD zip file, that's why maintaining the directory structure is crucial for that zip file. The MySQL databases need to be placed in the data directory of the MySQL install directory unless the user has them somewhere else for their normal MySQL operation. |
| Initial 2007 NMIM runs for all MANE-VU+VA States | Marama2007.zip | NMIM | This file has the original runs for all States, including CT, which was rerun and replaced at a later date with the file below. |
| Revised 2007 NMIM run for CT | Ct07131720.zip – | NMIM | Contains the re-run of CT for 2007 plus all projection years for CT. |

Exhibit 9.4 – Documentation for the 2007 MANE-VU+VA Emission Inventory

| File Description | File Name | Format | Notes |
|---|--|-----------|-------|
| Quality Assurance Project Plan | MACTEC_final_QAPP_16sep2009.pdf | Adobe PDF | |
| Quality Assurance Project Plan – Signature Page | MACTEC_final_QAPP_16sep2009 SIGNED.pdf | Adobe PDF | |
| Work Plan | MARAMA Emission Inventory WP 22Nov2010.pdf | Adobe PDF | |
| Technical Support Document for the 2007 Emission Inventory for the Northeast / Mid-Atlantic Region | MANEVU_VA 2007 Inventory TSD 27FEB2011.pdf | Adobe PDF | |
| Appendix A – CAMD to NIF Crosswalk | Appendix A CAMD to NIF Crosswalk Aug12_2010.xls | MS EXCEL | |
| Appendix B – Technical Memorandum for Emission Factors for Condensable Particulate Matter from EGUs | Appendix B Technical Memorandum - EFs for CPM from EGUs.doc | MS WORD | |
| Appendix C – SCC and Control Device Particulate Matter Ratios | Appendix C SCC_Control_Device_PM_Ratios.xls | MS EXCEL | |
| Appendix D – Stack Default Parameters by SCC | Appendix D Stack_SCC_Defaults.xls | MS EXCEL | |
| Appendix E – VDEQ Conceptual Description for Distributed Generation Units | Appendix E VDEQ Conceptual Description for DG draft March 15, 2010.doc | MS WORD | |
| Appendix F – Technical Memorandum Documenting the Review of SMOKE Auxiliary Files | Appendix F MANEVU_VA SMOKE QA Memo 17Dec2010.doc | MS WORD | |

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