# The North Carolina 8-Hour Ozone Reasonable Further Progress Demonstration for the Charlotte-Gastonia-Rock Hill, NC-SC 8-Hour Ozone Nonattainment Area (Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union Counties and Coddle Creek and Davidson Townships in Iredell County)


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# 1 INTRODUCTION

Section 182(b)(1) of the Clean Air Act Amendments (CAAA) mandates a 15 percent volatile organic compounds (VOC) emission reduction, accounting for growth, in the first six years after the baseline year (2002) for Moderate and above ozone nonattainment areas. Thus, for the Charlotte-Gastonia-Rock Hill, NC-SC 8-hour ozone nonattainment area (referred to as the Metrolina area), a reasonable further progress (RFP) analysis between 2002 and 2008 is required. Although the Charlotte-Gastonia 1-hour ozone nonattainment area (comprised of Mecklenburg and Gaston Counties) was designated as Moderate following the 1990 CAAA, the area had measured attainment of the 1-hour standard prior to the 15 percent Rate of Progress (ROP) requirement coming due on November 15, 1993. Therefore, this area did not implement a 15 percent ROP plan under the 1-hour standard, and the RFP requirement must be met through VOC reductions only, consistent with the CAAA.

# 2 CALCULATION METHOD FOR THE RFP TARGET

The methodology the North Carolina Division of Air Quality (NCDAQ) used to calculate the RFP target levels of VOC emissions is based on the method developed in the CAAA, while taking into account the restrictions on creditable emissions and the need to use the 2002 inventory as a baseline. The CAAA specified four types of measures that were not creditable toward the 15 percent RFP requirement. These were:

(1) Any measure relating to motor vehicle exhaust or evaporative emissions promulgated by the Administrator by January 1, 1990.

(2) Regulations concerning Reid Vapor Pressure (RVP) promulgated after 1990 or required under section 211(h).

(3) Measures required under section 182(a)(2)(A) to correct deficiencies in State Implementation Plans (SIPs) regarding VOC Reasonably Available Control Technology (RACT) regulations required prior to enactment of the CAAA.

(4) State regulations submitted to correct deficiencies in vehicle inspection and maintenance (I/M) existing or required programs.

These four types of measures were all expected to result in a decrease in emissions between 1990 and 1996. Of these four types of measures, RACT and I/M program corrections and the 1992 RVP requirements were completely in place by 1996 and therefore are already accounted for in the 2002 baseline. As a result, these measures would produce no additional reductions between 2002 and 2008 or later milestone years.

However, the pre-1990 Federal Motor Vehicle Control Program (FMVCP) will continue to provide additional benefits during the first two decades of the 21st century until all remaining vehicles meeting pre-1990 standards are removed from the vehicle fleet. Since these benefits are not creditable for RFP demonstration purposes, the reductions that would occur over these future

years as a result of the pre-1990 FMVCP must be calculated so that the target level of emissions for future RFP milestone year can be determined. The United States Environmental Protection Agency (USEPA) provided guidance on calculating the RFP targets for several kinds of areas in Appendix A (70 FR 71696) of the Phase 2 8-hour ozone implementation rule. Four methods were outlined in this guidance.

The NCDAQ used Method 1 to account for non-creditable reductions when calculating RFP targets for the 2008 milestone year. It is consistent with requirements of Sections 182(b)(1)(C) and (D) and 182(c)(2)(B) of the CAAA. Only the on-road mobile source sector required an estimation of non-creditable emissions since all other controls would have been in place by 2002 and no further reductions would have been expected between 2002 and 2008.

Method 1: For areas that must meet a 15 percent VOC reduction requirement by 2008:

(A) Estimate the actual anthropogenic base year VOC inventory in 2002 with all 2002 control programs in place for all sources.

(B) Using the same highway vehicle activity inputs used to calculate the actual 2002 inventory, run the appropriate motor vehicle emissions model for 2002 and for 2008 with all post-1990 Clean Air Act (CAA) measures turned off. Any other local inputs for vehicle I/M programs should be set according to the program that was required to be in place in 1990. Fuel RVP should be set at 9.0 or 7.8 pounds per square inch depending on the level required in the local area as a result of fuel RVP regulations promulgated in June 1990.

(C) Calculate the difference between the 2002 and 2008 VOC emission factors calculated in Step B and multiply by 2002 vehicle miles traveled (VMT). The result is the VOC emissions reductions that will occur between 2002 and 2008 without the benefits of any post-1990 CAA measures. These are the non-creditable reductions that occur over this period.

(D) Subtract the non-creditable reductions calculated in Step C from the actual anthropogenic 2002 inventory estimated in Step A. This adjusted VOC inventory is the basis for calculating the target level of emissions in 2008.

(E) Reduce the adjusted VOC inventory calculated in Step D by 15 percent. The result is the target level of VOC emissions in 2008 in order to meet the 2008 RFP requirement. The actual projected 2008 inventory for all sources with all control measures in place and including projected 2008 growth in activity must be at or lower than this target level of emissions.

# 3 EMISSIONS INVENTORY

There are four different anthropogenic emission inventory source classifications: stationary point and area sources, and off-road and on-road mobile sources. Stationary point sources are those

sources that emit greater than a specified tonnage per year and the data is provided at the facility level. Stationary area sources are those sources whose emissions are relatively small but due to the large number of these sources, the collective emissions could be significant (i.e., dry cleaners, service stations, etc.). These types of emissions are estimated at the county level. Off-road mobile sources include equipment that can move but do not use the roadways, i.e., lawn mowers, construction equipment, railroad locomotives, aircraft, etc. The emissions from these sources, like stationary area sources, are estimated at the county level. On-road mobile sources are automobiles, trucks, and motorcycles that use the roadway system. The emissions from these sources are estimated by vehicle type and road type and are summed to the county level.

For these sources of emissions, the 2002 base year and the 2008 milestone year emission inventories were developed. The 2002 base year emissions were from the 2002 modeling attainment demonstration. The 2008 milestone year emissions were either developed by applying growth and control factors to the 2002 base year emissions or using 2008 specific data. The 2008 inventory was processed through the Sparse Matrix Operator Kernel Emissions (SMOKE) pre-processing model so that the emissions would be comparable to the 2002 attainment demonstration emissions inventory.

In the sections that follow, a synopsis of the inventories used for each source classification is discussed. The detailed discussions of the emissions inventory development can be found in Appendices B through E.

### 3.1 Stationary Point Sources

Point source emissions are emissions from individual sources having a fixed location. Generally, these sources must have permits to operate and their emissions are inventoried on a regular schedule. Large sources having emissions of 100 tons per year (tpy) of a criteria pollutant, 10 tpy of a single hazardous air pollutant (HAP), or 25 tpy total HAP are inventoried annually. Smaller sources have been inventoried less frequently. The point source emissions data can be grouped into the electric generating unit (EGU) sources and the other point sources, i.e., non-EGUs. Appendix B documents the point source inventory development in more detail.

The 2002 base year inventory for the EGU sources used 2002 continuous emissions monitoring (CEM) data reported to the USEPA's Acid Rain program. This data provides hourly emissions profiles that can be used in the modeling of these large sources of nitrogen oxides (NOx) emissions and helps to provide more accurate modeling of these sources. The 2008 milestone year EGU emissions inventory was provided by Duke Power. This inventory provided the company's estimated emissions taking into consideration their compliance plan for the North Carolina Clean Smokestacks Act.

For the non-EGU sources, the annual emissions as reported for the Consolidated Emissions Reporting Rule (CERR) for the year 2002 were used. These emissions were temporally allocated to month, day, and hour using source category code (SCC) based allocation factors using the SMOKE emissions pre-processing model. For the 2008 inventory, the general approach was to use recently updated growth and control data consistent with the USEPA's Clean Air Interstate Rule (CAIR) analyses. The growth and control factors were applied

utilizing the SMOKE emissions pre-processing model, which also temporally allocated the emissions similar to the base year emissions inventory.

### 3.2 Stationary Area Sources

Stationary area sources include sources whose emissions are relatively small but due to the large number of these sources, the collective emissions could be significant (i.e., combustion of fuels for heating, structure fires, service stations, etc.). Emissions are estimated by multiplying an emission factor by some known indicator of collective activity, such as fuel usage, number of households, number of employees, or population. Stationary area source emissions are estimated on the county level.

The NCDAQ developed the 2002 base year emissions inventory by collecting 2002 activity data for the various source subcategories and applying the USEPA developed emission factors. Growth factors supplied from the USEPA's CAIR emission projections were applied to project the controlled emissions to the 2008 milestone year. In some cases, the USEPA's Economic Growth and Analysis System Version 5 growth factors were used if no growth factor was available from the CAIR growth factor files. The growth and control factors were applied utilizing the SMOKE emissions pre-processing model, which also temporally allocated the emissions similar to the base year emissions inventory.

Appendix C provides a detailed discussion of the area source inventory.

### 3.3 Off-Road Mobile Sources

Off-road mobile sources, also referred to as non-road mobile sources, include equipment that can move but does not use the roadways, such as construction equipment, aircraft, railroad locomotives, lawn and garden equipment, etc. For the majority of the non-road mobile sources, the emissions were estimated using the USEPA's NONROAD2005c model. For two of the three source categories not included in the NONROAD model, i.e., aircraft engines and railroad locomotives, more traditional methods of estimating the emissions were used. There are no emissions in the Metrolina area for commercial marine emissions, the third category not included in the NONROAD model.

For the source categories estimated using the USEPA's NONROAD model, the model was used to create the 2008 milestone year inventory. The NONROAD model takes into consideration rules that are in effect that could impact the emissions from these source categories. For the large airport in the Metrolina area, the Federal Aviation Administration's (FAA's) Terminal Area Forecast was used to project growth in aircraft emissions. For the railroad locomotives and the remaining airport emissions, the 2008 emissions were grown using detailed inventory data (both before and after controls) for 1996 and 2010 obtained from the USEPA's CAIR Technical Support Document.

Appendix D provides a detailed discussion of the non-road mobile source inventory.

### 3.4 Highway Mobile Sources

In order to accurately model the mobile source emissions in the Metrolina nonattainment area, the latest version of the MOBILE model, MOBILE6.2, was used. Key inputs for the MOBILE model include information on the age of vehicles on the roads, the average speed on the roads, the mix of vehicles on the roads, any control technologies in place in an area to reduce emissions for motor vehicles (e.g., emissions inspection programs), and temperature. The MOBILE model inputs were developed through interagency consultation with the transportation partners for this area.

The MOBILE model takes into consideration rules in effect that impact the emissions from this source sector. The same model then is run for the milestone year emissions inventory using input data reflective of 2008. The 2002 and 2008 vehicle age and vehicle mix data were obtained from the North Carolina Department of Transportation (NCDOT). The vehicle miles traveled and speed data were provided by the Charlotte Department of Transportation (CDOT) and came from the Metrolina regional travel demand model.

For a detailed discussion about the on-road mobile source inventory development and the data used in the RFP demonstration, please refer to Appendix E.

### 3.5 Emissions Inventory Summary

The NCDAQ's 2002 baseline VOC emissions for the Metrolina area are presented in Table 3-1. The 2008 VOC emission estimates are presented in Table 3-2. Since the only portion of Iredell County designated as nonattainment are the townships of Coddle Creek and Davidson, the emissions for Iredell County have been adjusted to reflect this. For point sources, only the facilities located within the nonattainment area were used to estimate the emissions. For area sources and non-road mobile sources, these emissions are estimated at the county level. To estimate the emissions for the nonattainment area, the fraction of the County's population in the two nonattainment townships (32.6% based upon the U.S. Census data) was used to apportion the emissions. For on-road mobile sources, the VMT and speeds for the nonattainment portion of the County were used to estimate the emissions. This information was provided by CDOT.

**Table 3-1 Metrolina Nonattainment Area 2002 Baseline VOC Emissions (tons/day)**

| County | Point | Area | Non-Road Mobile | On-Road Mobile | Total |
|---|---|---|---|---|---|
| Cabarrus | 2.2 | 6.0 | 2.7 | 20.5 | 31.4 |
| Gaston | 2.5 | 8.9 | 2.9 | 13.3 | 27.6 |
| Iredell (partial) | 0.9 | 1.9 | 0.9 | 6.6 | 10.3 |
| Lincoln | 2.1 | 3.1 | 1.3 | 6.7 | 13.2 |
| Mecklenburg | 5.7 | 29.4 | 24.1 | 66.1 | 125.3 |
| Rowan | 6.3 | 5.6 | 2.3 | 14.2 | 28.4 |
| Union | 1.0 | 6.4 | 4.7 | 12.3 | 24.4 |
| Total | 20.7 | 61.3 | 38.9 | 139.7 | 260.6 |

**Table 3-2 Metrolina Nonattainment Area 2008 Baseline VOC Emissions (tons/day)**

| County | Point | Area | Non-Road Mobile | On-Road Mobile | Total |
|---|---|---|---|---|---|
| Cabarrus | 2.3 | 5.9 | 1.5 | 10.4 | 20.1 |
| Gaston | 2.7 | 9.4 | 2.0 | 7.5 | 21.6 |
| Iredell (partial) | 0.7 | 1.8 | 0.5 | 5.4 | 8.4 |
| Lincoln | 2.1 | 2.9 | 0.8 | 4.2 | 10.0 |
| Mecklenburg | 5.9 | 30.1 | 13.0 | 38.0 | 87.0 |
| Rowan | 6.0 | 5.6 | 1.5 | 9.2 | 22.3 |
| Union | 1.2 | 5.7 | 1.7 | 9.9 | 18.5 |
| Total | 20.9 | 61.4 | 21.0 | 84.6 | 187.9 |

# 4 ESTIMATION OF NON-CREDITABLE REDUCTIONS

As discussed in Section 2, the non-creditable emissions must be estimated and subtracted from the 2002 base year inventory. To calculate these emissions the USEPA's MOBILE6.2 model is run for both years with the "NO CLEAN AIR ACT" flag set.

The average daily speeds for 2002 and 2008 were used for the purpose of estimating the non-creditable emissions. The year specific vehicle age distribution and vehicle mix data were used as well. The fuel RVPs were set to the appropriate June 1990 requirements. Since the Metrolina area did not have an ozone I/M program in place in 1990, no I/M program was modeled in accordance with the USEPA guidance for determining non-creditable emissions.

There were two instances in Iredell County where road types were reclassified between 2002 and 2008, resulting in a mismatch between 2002 and 2008 emission factors. The NCDAQ needed to make some adjustments so that the non-creditable emissions could be calculated correctly. First, the 2008 urban principal arterial emission factor was used for the rural principal arterial emission factor since there were no longer any rural principal arterial road classes in the 2008 data. Similarly, there were no longer any rural interstate road classes in the 2008 data for the nonattainment portion of Iredell County. In this case, the urban interstate emission factor was used in place of the rural interstate emission factor.

The difference between the 2002 and 2008 VOC emission factors was multiplied by the 2002 VMT. The result is the VOC emission reductions that occurred between 2002 and 2008 without the benefits of any post-1990 CAA measures. These are the non-creditable emission reductions that have occurred over this period.

The following table displays the results from the non-creditable emission estimates including the emission factors established through the MOBILE6.2 runs. The input and output files from these runs can be found in Appendix A.

## Table 4-1 Cabarrus County Non-Creditable VOC Emission Estimates

| Cabarrus County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | | | | 0.000 | 0.000 |
| Rural principle arterial | 324,349 | 2.093 | 1.734 | 0.359 | 0.128 |
| Rural minor arterial | 211,964 | 2.118 | 1.741 | 0.377 | 0.088 |
| Rural major collector | 385,957 | 2.184 | 1.889 | 0.295 | 0.126 |
| Rural minor collector | 299,131 | 2.235 | 1.901 | 0.334 | 0.110 |
| Rural local | 488,675 | 2.413 | 2.136 | 0.277 | 0.149 |
| | | | | | |
| Urban interstate | 1,246,972 | 2.049 | 1.719 | 0.33 | 0.454 |
| Urban freeway | - | | | 0.000 | 0.000 |
| Urban principle arterial | 670,359 | 2.445 | 2.123 | 0.322 | 0.238 |
| Urban minor arterial | 583,244 | 2.416 | 2.148 | 0.268 | 0.172 |
| Urban collector | 298,966 | 2.367 | 2.151 | 0.216 | 0.071 |
| Urban local | 805,910 | 2.449 | 2.278 | 0.171 | 0.152 |
| | | | | | **1.688** |

## Table 4-2 Gaston County Non-Creditable VOC Emission Estimates

| Gaston County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | 202,517 | 1.506 | 1.185 | 0.321 | 0.072 |
| Rural principle arterial | 227,278 | 1.364 | 1.292 | 0.072 | 0.018 |
| Rural minor arterial | 317,040 | 1.537 | 1.382 | 0.155 | 0.054 |
| Rural major collector | 460,235 | 1.523 | 1.423 | 0.100 | 0.051 |
| Rural minor collector | 219,603 | 1.517 | 1.447 | 0.070 | 0.017 |
| Rural local | 413,826 | 1.684 | 1.578 | 0.106 | 0.048 |
| | | | | | |
| Urban interstate | 2,020,626 | 1.404 | 1.29 | 0.114 | 0.254 |
| Urban freeway | 102,101 | 1.398 | 1.321 | 0.077 | 0.009 |
| Urban principle arterial | 1,091,841 | 1.749 | 1.543 | 0.206 | 0.248 |
| Urban minor arterial | 778,751 | 1.674 | 1.529 | 0.145 | 0.124 |
| Urban collector | 75,464 | 1.768 | 1.686 | 0.082 | 0.007 |
| Urban local | 801,096 | 1.713 | 1.702 | 0.011 | 0.010 |
| | | | | | **0.912** |

## Table 4-3 Nonattainment Portion of Iredell County Non-Creditable VOC Emission Estimates

| Iredell County (NA portion) | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | 968,000 | 1.8 | 1.541 | 0.259 | 0.276 |
| Rural principle arterial | 5,000 | 1.96 | 2.252 | -0.292 | -0.002 |
| Rural minor arterial | 176,000 | 2.978 | 2.348 | 0.63 | 0.122 |
| Rural major collector | 194,000 | 2.364 | 2.039 | 0.325 | 0.07 |
| Rural minor collector | 143,000 | 2.5 | 2.255 | 0.245 | 0.039 |
| Rural local | 354,000 | 2.5 | 2.193 | 0.307 | 0.12 |
| | | | | | |
| Urban interstate | 8,000 | 1.914 | 1.541 | 0.373 | 0.003 |
| Urban freeway | - | | | 0 | 0 |
| Urban principle arterial | 78,000 | 2.679 | 2.252 | 0.427 | 0.037 |
| Urban minor arterial | 130,000 | 2.53 | 2.224 | 0.306 | 0.044 |
| Urban collector | 43,000 | 2.567 | 2.361 | 0.206 | 0.01 |
| Urban local | 153,000 | 2.922 | 2.314 | 0.608 | 0.103 |
| | | | | | **0.822** |

## Table 4-4 Lincoln County Non-Creditable VOC Emission Estimates

| Lincoln County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | - | | | 0.000 | 0.000 |
| Rural principle arterial | 252,752 | 1.897 | 1.688 | 0.209 | 0.058 |
| Rural minor arterial | 556,376 | 2.242 | 1.94 | 0.302 | 0.185 |
| Rural major collector | 175,958 | 2.065 | 1.782 | 0.283 | 0.055 |
| Rural minor collector | 214,940 | 2.101 | 1.878 | 0.223 | 0.053 |
| Rural local | 487,396 | 2.413 | 2.111 | 0.302 | 0.162 |
| | | | | | |
| Urban interstate | - | | | 0.000 | 0.000 |
| Urban freeway | - | | | 0.000 | 0.000 |
| Urban principle arterial | 127,620 | 2.188 | 1.931 | 0.257 | 0.036 |
| Urban minor arterial | 50,780 | 2.726 | 2.32 | 0.406 | 0.023 |
| Urban collector | 24,699 | 2.641 | 2.151 | 0.490 | 0.013 |
| Urban local | 254,959 | 2.449 | 2.278 | 0.171 | 0.048 |
| | | | | | **0.633** |

## Table 4-5 Mecklenburg County Non-Creditable VOC Emission Estimates

| Mecklenburg County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | | | | 0.000 | 0.000 |
| Rural principle arterial | 862,659 | 1.583 | 1.379 | 0.204 | 0.194 |
| Rural minor arterial | 889,625 | 1.716 | 1.568 | 0.148 | 0.145 |
| Rural major collector | 102,926 | 1.473 | 1.576 | -0.103 | -0.012 |
| Rural minor collector | 676,325 | 1.579 | 1.447 | 0.132 | 0.098 |
| Rural local | 1,407,138 | 1.684 | 1.543 | 0.141 | 0.219 |
| | | | | | |
| Urban interstate | 6,526,862 | 1.449 | 1.302 | 0.147 | 1.058 |
| Urban freeway | 2,601,924 | 1.51 | 1.326 | 0.184 | 0.528 |
| Urban principle arterial | 4,120,914 | 1.79 | 1.643 | 0.147 | 0.668 |
| Urban minor arterial | 3,836,035 | 1.788 | 1.642 | 0.146 | 0.617 |
| Urban collector | 1,675,106 | 1.813 | 1.686 | 0.127 | 0.235 |
| Urban local | 2,961,152 | 1.713 | 1.825 | -0.112 | -0.366 |
| | | | | | **3.384** |

## Table 4-6 Rowan County Non-Creditable VOC Emission Estimates

| Rowan County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | | | | 0.000 | 0.000 |
| Rural principle arterial | 301,122 | 2.106 | 1.806 | 0.300 | 0.100 |
| Rural minor arterial | 138,870 | 2.04 | 1.741 | 0.299 | 0.046 |
| Rural major collector | 557,888 | 2.055 | 1.806 | 0.249 | 0.153 |
| Rural minor collector | 230,904 | 2.058 | 1.844 | 0.214 | 0.054 |
| Rural local | 647,760 | 2.413 | 2.136 | 0.277 | 0.198 |
| | | | | | |
| Urban interstate | 1,365,153 | 1.907 | 1.649 | 0.258 | 0.388 |
| Urban freeway | - | | | 0.000 | 0.000 |
| Urban principle arterial | 290,314 | 2.242 | 2.009 | 0.233 | 0.075 |
| Urban minor arterial | 443,688 | 2.24 | 1.981 | 0.259 | 0.127 |
| Urban collector | 196,149 | 2.321 | 2.127 | 0.194 | 0.042 |
| Urban local | 698,343 | 2.449 | 2.278 | 0.171 | 0.132 |
| | | | | | **1.315** |

**Table 4-7 Union County Non-Creditable VOC Emission Estimates**

| Union County | 2002 Average Daily VMT | 2002 w/o CAA (gram/mile) | 2008 w/o CAA (gram/mile) | 2002w/o CAA EF-2008w/o CAA EF (gram/mile) | Non Creditable Emissions (tons/day) |
|---|---|---|---|---|---|
| Rural Interstate | - | | | 0.000 | 0.000 |
| Rural principle arterial | 879,771 | 2.068 | 1.794 | 0.274 | 0.266 |
| Rural minor arterial | 225,913 | 2.082 | 1.781 | 0.301 | 0.075 |
| Rural major collector | 723,540 | 2.133 | 1.877 | 0.256 | 0.204 |
| Rural minor collector | 247,019 | 2.125 | 1.878 | 0.247 | 0.067 |
| Rural local | 1,267,433 | 2.413 | 2.087 | 0.326 | 0.455 |
| Urban interstate | - | | | 0.000 | 0.000 |
| Urban freeway | - | | | 0.000 | 0.000 |
| Urban principle arterial | 85,523 | 2.341 | 2.009 | 0.332 | 0.031 |
| Urban minor arterial | 221,132 | 2.318 | 2.123 | 0.195 | 0.048 |
| Urban collector | 44,271 | 2.272 | 2.026 | 0.246 | 0.012 |
| Urban local | 279,986 | 2.449 | 2.217 | 0.232 | 0.072 |
| | | | | | **1.230** |

The total non-creditable emissions for the Metrolina RFP demonstration are summarized in Table 4-8.

**Table 4-8 Total Metrolina Nonattainment Area Non-Creditable VOC Emission Estimates**

| County | Non-Creditable VOC Emissions (tons/day) |
|---|---|
| Cabarrus | 1.688 |
| Gaston | 0.912 |
| Iredell | 0.822 |
| Lincoln | 0.633 |
| Mecklenburg | 3.384 |
| Rowan | 1.315 |
| Union | 1.230 |
| Total | 9.984 |

# 5 REASONABLE FURTHER PROGRESS DEMONSTRATION

To determine if reasonable further progress is demonstrated, the steps as outlined in Method 1 of the USEPA's guidance are followed.

- Step A is the actual anthropogenic base year VOC emissions inventory in 2002. This value comes from Table 3-1.

- Step C are the non-creditable emissions which can be found in Table 4-8.

- Step D is the 2002 base year emissions (Step A) minus the non-creditable emissions (Step C).

- Step E is the 2008 target level VOC emissions which is calculated by reducing the emissions from Step D by 15 percent.

- Finally, the estimated 2008 VOC emissions (Table 3-2) are compared to the 2008 target level VOC emissions (Step E).

Since the 2008 VOC emissions are well below the target level, RFP is demonstrated for the Metrolina nonattainment area. Table 5-1 below provides the summary 15 percent RFP analysis showing the projected 2008 VOC emissions for the area, 187.9 tons/day, are well below the target level of emissions, 213.0 tons/day, as calculated using Method 1.

**Table 5-1 Metrolina Nonattainment Area 15 Percent RFP Analysis**

| Metrolina 15% RFP Analysis | VOC (tons/day) | Step from Method 1 |
|---|---|---|
| Total 2002 Base year anthropogenic VOC emissions | 260.6 | Step A |
| Non-creditable VOC reductions | 10.0 | Step C |
| 2002 base year minus the non-creditable emissions | 250.6 | Step D |
| 2008 target level of VOC emissions | 213.0 | Step E |
| 2008 projected VOC emissions | 187.9 | Projection < Target RFP goal met |

The NCDAQ must show continued progress from 2008 through the attainment date. To do so, the NCDAQ calculated the expected benefits from the fleet turnover for the on-road and off-road mobile sectors. Based on modeling emissions for 2009 and 2011, the NCDAQ expects approximately 14 tons per day of nitrogen oxides (NOx) emissions reductions from fleet turnover. Since the CAAA allows an area to focus on NOx emission reductions once the first RFP demonstration is approved, the NCDAQ did not calculate future expected VOC emissions reductions in these years due to the region being NOx limited. However, additional VOC reductions are expected from the fleet turnover of the on-road mobile sector. The NCDAQ believes these additional reductions demonstrate continued reasonable further progress toward attainment beyond 2008.

# 6 MOTOR VEHICLE EMISSION BUDGETS

## 6.1 Transportation Conformity

Another requirement of the RFP demonstration is that VOC motor vehicle emission budgets (MVEBs), for transportation conformity purposes, need to be set for the RFP milestone year 2008. The purpose of transportation conformity is to ensure that Federal transportation actions

occurring in nonattainment and maintenance areas do not hinder the area from attaining and maintaining the 8-hour ozone standard. This means that the level of emissions estimated by the NCDOT or the metropolitan planning organizations for the Transportation Improvement Program and Long Range Transportation Plan must not exceed the MVEBs as defined in this RFP demonstration.

Since the State is NOx limited with respect to ozone formation, as a SIP strengthening measure the NCDAQ has elected to also set NOx MVEBs. In order to establish NOx MVEBs, the USEPA requires the SIP to include the NOx emissions from all source sectors. Table 6-1 summarizes the 2008 NOx emissions from all source sectors. The development of these emissions is discussed in Appendices B through E.

**Table 6-1 Metrolina Nonattainment Area 2008 NOx Emissions (tons/day)**

| County | Point | Area | Non-Road Mobile | On-Road Mobile | Total |
|---|---|---|---|---|---|
| Cabarrus | 2.6 | 1.5 | 4.1 | 9.6 | 17.8 |
| Gaston | 32.8 | 2.2 | 4.8 | 10.0 | 49.8 |
| Iredell (partial) | 0.5 | 0.4 | 0.9 | 6.9 | 8.7 |
| Lincoln | 9.3 | 0.7 | 1.4 | 3.7 | 15.1 |
| Mecklenburg | 2.0 | 11.3 | 20.9 | 45.6 | 79.8 |
| Rowan | 22.4 | 1.3 | 4.6 | 9.5 | 37.8 |
| Union | 0.2 | 1.5 | 3.3 | 7.4 | 12.4 |
| Total | 69.8 | 18.9 | 40.0 | 92.7 | 221.4 |

## 6.2 Motor Vehicle Emission Budgets

As part of the consultation process on setting MVEBs, the NCDAQ sent out a request for comment on setting the geographic extent of the MVEBs to all of the transportation partners. A copy of the letter can be found in Appendix F. In the letter, the NCDAQ expressed its preference for setting county level budgets and the reasons why the NCDAQ believed county level budgets were appropriate.

The NCDAQ received comments from several of the transportation partners regarding the geographic extent of the MVEBs. Some of the partners wanted county-by-county budgets; others wanted regional budgets. Those transportation partners preferring a regional budget stated in their letter that they would agree to county-by-county MVEBs for those areas wanting county level MVEBs and a single budget for the remainder of the North Carolina portion of the Metrolina nonattainment area. Copies of the letters received can be found in Appendix F. Upon careful consideration of all arguments, the NCDAQ decided to move forward with setting county level MVEBs. The NCDAQ believes that since mobile source NOx emissions play a significant role in the ozone formation in the Metrolina area, it is important that the large counties in the area meet the county level MVEBs that closely represent the emissions that were modeled for the attainment demonstration.

The MVEBs will be set for the RFP milestone year 2008. Although the emissions are usually expressed in terms of tons per day, the MVEBs will be set in terms of kilograms (kg) per day. The reason for the change is because the MOBILE model generates the emissions factors in grams per mile. In past conformity exercises, there have been some issues with conversion to tons per day, as well as concerns with how the MVEBs were rounded to the hundredth place. Setting MVEBs in kilograms per day will avoid these issues in future conformity determinations.

The mobile inputs used to develop the MVEBs were developed through interagency consultation with the transportation partners for this area. These inputs were consistent with what was used in the RFP demonstration, and do not represent a significant change to the emissions.

The table below shows the North Carolina counties with their on-road mobile source emissions expressed in kilograms per day and the corresponding tons per day values for 2008.

**Table 6-2 On-Road Mobile Source 2008 Emissions Metrolina Nonattainment Area**

| County | NOx | | VOC | |
|---|---|---|---|---|
| | Kg/day | Tons/day | Kg/day | Tons/day |
| Cabarrus | 7,324 | 8.07 | 6,941 | 7.65 |
| Gaston | 7,647 | 8.43 | 5,132 | 5.66 |
| Iredell* | 5,637 | 6.21 | 3,601 | 3.97 |
| Lincoln | 2,948 | 3.25 | 2,726 | 3.01 |
| Mecklenburg | 34,526 | 38.06 | 26,368 | 29.07 |
| Rowan | 7,193 | 7.93 | 6,149 | 6.78 |
| Union | 5,660 | 6.24 | 6,299 | 6.94 |
| Total | 70,935 | 78.19 | 57,216 | 63.08 |

* Iredell County emissions for nonattainment area only.

The NCDAQ is setting MVEB, for transportation conformity purposes, as county budgets within the Metrolina nonattainment area for 2008. Table 6-3 below lists out the MVEBs in kilograms per day, for transportation conformity purposes, by county. Upon the USEPA's affirmative adequacy finding for these county level sub-area MVEBs, these MVEBs will become the applicable MVEBs for each county.

**Table 6-3 County Level MVEB for 2008**

| County | NOx MVEB (Kilograms/day) | VOC MVEB (Kilograms/day) |
|---|---|---|
| Cabarrus | 7,324 | 6,941 |
| | | |
| Gaston | 7,647 | 5,132 |
| | | |
| Iredell* | 5,637 | 3,601 |
| | | |
| Lincoln | 2,948 | 2,726 |
| | | |
| Mecklenburg | 34,526 | 26,368 |
| | | |
| Rowan | 7,193 | 6,149 |
| | | |
| Union | 5,660 | 6,299 |

* Iredell County MVEB for nonattainment area only

# 7 CONCLUSIONS

The NCDAQ has demonstrated that reasonable further progress has been made from the base year 2002 to the milestone year 2008. For purposes of SIP strengthening, the NCDAQ has established NOx MVEBs in addition to the required VOC MVEBs for 2008.