# Supplement to the

# Redesignation Demonstration

# and

# Maintenance Plan

## for

## The Charlotte-Gastonia-Rock Hill, NC-SC 1997 8-Hour Ozone Nonattainment Area

**Prepared by**

**North Carolina Department of Environment and Natural Resources**

**Division of Air Quality**

**March 28, 2013**

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**Preface:** This document is a supplement to the technical support document dated November 2, 2011 that was previously submitted to US EPA. It contains the technical information and data to support North Carolina's Division of Air Quality request to redesignate Charlotte-Gastonia-Rock Hill 1997 8-hour ozone nonattainment area be redesignated as attainment for the 1997 8-hour ozone national ambient air quality standard pursuant to §§107(d)(3)(D) and (E) of the Clean Air Act, as amended.

# EXECUTIVE SUMMARY

## Introduction

Ozone is formed by a complex set of chemical reactions involving volatile organic compounds (VOCs), nitrogen oxides (NOx) and to a lesser extent carbon monoxide. These gases are generated by utilities, combustion processes, certain industrial processes and even by natural sources such as trees. Tailpipe emissions from mobile sources (vehicles) are also significant sources of these pollutants. Even the emissions from such sources as boat engines, lawn mowers and construction equipment contribute to the formation of ozone. Ozone formation is promoted by strong sunlight, warm temperatures and light winds and is hence a problem predominantly during the hot summer months.

The 1997 8-hour ozone national ambient air quality standard (NAAQS) is 0.08 parts per million (ppm). An exceedance of the 1997 8-hour ozone NAAQS occurs when a monitor measures ozone above 0.084 ppm on average for an eight-hour period. A violation of this NAAQS occurs when the average of the annual fourth highest daily maximum 8-hour ozone values over three consecutive years is greater than or equal to 0.085 ppm. This three-year average is termed the "design value" for the monitor. The design value for a nonattainment area is the highest monitor design value in the area.

## Charlotte-Gastonia-Rock Hill Nonattainment Designation

The area surrounding Charlotte-Gastonia-Rock Hill, North Carolina-South Carolina, called the Metrolina area, was designated nonattainment for the 1997 8-hour ozone NAAQS on April 30, 2004 (69 Federal Register 23858). The Metrolina nonattainment area includes the North Carolina counties of Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan and Union; Coddle Creek and Davidson Townships in Iredell County, North Carolina; and the Rock Hill Metropolitan Planning Organization boundary in York County, South Carolina. The nonattainment designation was an action taken by the U. S. Environmental Protection Agency (USEPA) under Section 107(d) of the Clean Air Act (CAA). The CAA requires that some area be designated as nonattainment if a monitor is found to be in violation of a NAAQS. The USEPA took designation action in 2004 based on the ambient data from 2001-2003. At that time, the design value for the Metrolina area was 0.100 ppm.

## Current Air Quality

There are currently seven ozone monitors located throughout the Metrolina nonattainment area and one monitor located in York County, South Carolina, just outside of the nonattainment area. The latest design value for the nonattainment area is 0.083 ppm based on the data from 2010-

2012, and is therefore in attainment of the 1997 8-hour ozone NAAQS, and the area is eligible to be considered for redesignation to attainment.

**Maintenance Plan Requirements**

The State of North Carolina has implemented permanent and enforceable reductions in ozone precursor emissions in the North Carolina portion of the Metrolina nonattainment area. These actions include implementing the on-board diagnostic vehicle inspection and maintenance program that began on July 1, 2002, and an open burning ban during ozone action days. In addition, there have been several State rules that have resulted in reductions in emissions within and surrounding the nonattainment area. These State actions include the NOx SIP Call, the Clean Smokestacks Act legislation, and heavy-duty engine stop-gap rule for model years 2005 and 2006. Finally, several actions at the Federal level by the USEPA have resulted in lower emissions throughout the eastern portion of the country. These Federal actions include the Tier 2 engine standards for light and medium duty vehicles, heavy-duty engine standards, the low sulfur gasoline and diesel requirements, and off-road engine standards.

This combination of State and Federal actions have resulted in cleaner air in the Metrolina area, and the anticipated future benefits from these programs are expected to result in continued maintenance of the 1997 8-hour ozone NAAQS in this region. A baseline year emissions inventory for NOx and VOC's was developed for 2010, since the design value for the 2008-2010 period showed attainment of the 1997 8-hour ozone NAAQS. Future year emissions inventories were also developed for the interim years 2013, 2016, 2019, 2022 and a final year emission inventory was developed for 2025. The future year emissions were lower than the 2010 emissions in all cases. This demonstrates that the Metrolina area is expected to maintain the 1997 8-hour ozone NAAQS through 2025, since in no future year are the emissions expected to be greater than they were in the baseline year. The area is also in compliance with Section 110 and Part D requirements of the CAA.

**Conclusion and Request for Redesignation**

Based on the information above and criteria established in Section 107(d)(3)(E) of the CAA, North Carolina is requesting that the USEPA redesignate the Charlotte-Gastonia-Rock Hill nonattainment area to attainment. The monitoring data clearly shows that the region has attained the 1997 8-hour ozone standard, and the maintenance demonstration shows that the future emission inventories are expected to be lower than the attainment year inventory through the implementation of the various control measures discussed above.

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LIST OF ACRONYMS

| Acronym | Definition |
|---|---|
| ºF | Degrees Fahrenheit |
| CAA | Clean Air Act |
| CERR | Consolidated Emissions Reporting Rule |
| CFR | Code of Federal Regulations |
| CO | Carbon Monoxide |
| E-GAS 5.0 | Economic Growth Analysis System version 5.0 |
| FR | Federal Register |
| HC | Hydrocarbons |
| I/M | Inspection and Maintenance |
| MVEB | Motor Vehicle Emission Budget |
| NAAQS | National Ambient Air Quality Standard |
| NCDAQ | North Carolina Division of Air Quality |
| NCDENR | North Carolina Department of Natural Resources |
| NCDOT | North Carolina Department of Transportation |
| NOx | Nitrogen Oxides |
| PM | Particulate Matter |
| ppm | Parts per million |
| QA | Quality Assure |
| SIP | State Implementation Plan |
| SUV | Sports Utility Vehicle |
| TIP | Transportation Improvement Program |
| USEPA | U.S. Environmental Protection Agency |
| VMT | Vehicle Miles Traveled |
| VOC | Volatile Organic Compounds |

# 1.0 INTRODUCTION

## 1.1 WHAT IS TROPOSPHERIC OZONE?

Ozone, a strong chemical oxidant, adversely impacts human health through effects on respiratory function and can also damage forests and crops. Ozone is not emitted directly by the utilities, industrial sources or motor vehicles but instead, is formed in the lower atmosphere, the troposphere, by a complex series of chemical reactions involving nitrogen oxides (NOx), resulting from the utilities, combustion processes and motor vehicles, and reactive volatile organic compounds (VOCs). VOCs include many industrial solvents, toluene, xylene and hexane as well as the various hydrocarbons (HC) that are evaporated from the gasoline used by motor vehicles or emitted through the tailpipe following combustion.

Ozone formation is promoted by strong sunlight, warm temperatures, and light winds. High concentrations tend to be a problem in the eastern United States only during the hot summer months when these conditions frequently occur. Therefore, the U. S. Environmental Protection Agency (USEPA) mandates seasonal monitoring of ambient ozone concentrations in North Carolina from April 1 through October 31 (40 CFR 58 App. D, 2.5).

In 1997, the USEPA revised the primary (health) and secondary (welfare) national ambient air quality standards (NAAQS) for ozone by establishing 1997 8-hour standards. An exceedance of the 1997 8-hour ozone NAAQS occurs when a monitor measures ozone above 0.084 parts per million (ppm) on average for an eight-hour period. A violation of this NAAQS occurs when the average of the annual fourth highest daily maximum 8-hour ozone values over three consecutive years is greater than or equal to 0.085 ppm. This three-year average is termed the "design value" for the monitor. The design value for a nonattainment area is the highest monitor's design value in the area.

## 1.2 CLEAN AIR ACT OF 1990

Since the 1977 amendments to the Clean Air Act (CAA), areas of the country that had not attained the ambient standard for a particular pollutant were formally designated as nonattainment for that pollutant. This formal designation concept was retained in the 1990 CAA Amendments.

## 1.3 CHARLOTTE-GASTONIA-ROCK HILL AIR QUALITY HISTORY

On April 15, 2004, the USEPA designated the Charlotte-Gastonia-Rock Hill, North Carolina-South Carolina area (referred to as the Metrolina area) as "moderate" nonattainment for the 1997

8-hour ozone standard (Figure 1-1) based on the ambient data from 2001-2003. At that time, the design value for the Metrolina area was 0.100 ppm. The Metrolina nonattainment area includes the North Carolina counties of Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan and Union; Coddle Creek and Davidson Townships in Iredell County, North Carolina; and the Rock Hill Metropolitan Planning Organization boundary in York County, South Carolina. The official designation and classification was published in the Federal Register (FR) on April 30, 2004 (69 FR 23858). The designation became effective on June 15, 2004. Prior to the implementation of the 1997 8-hour ozone standard, Gaston and Mecklenburg Counties had been maintenance for the 1-hour ozone standard.

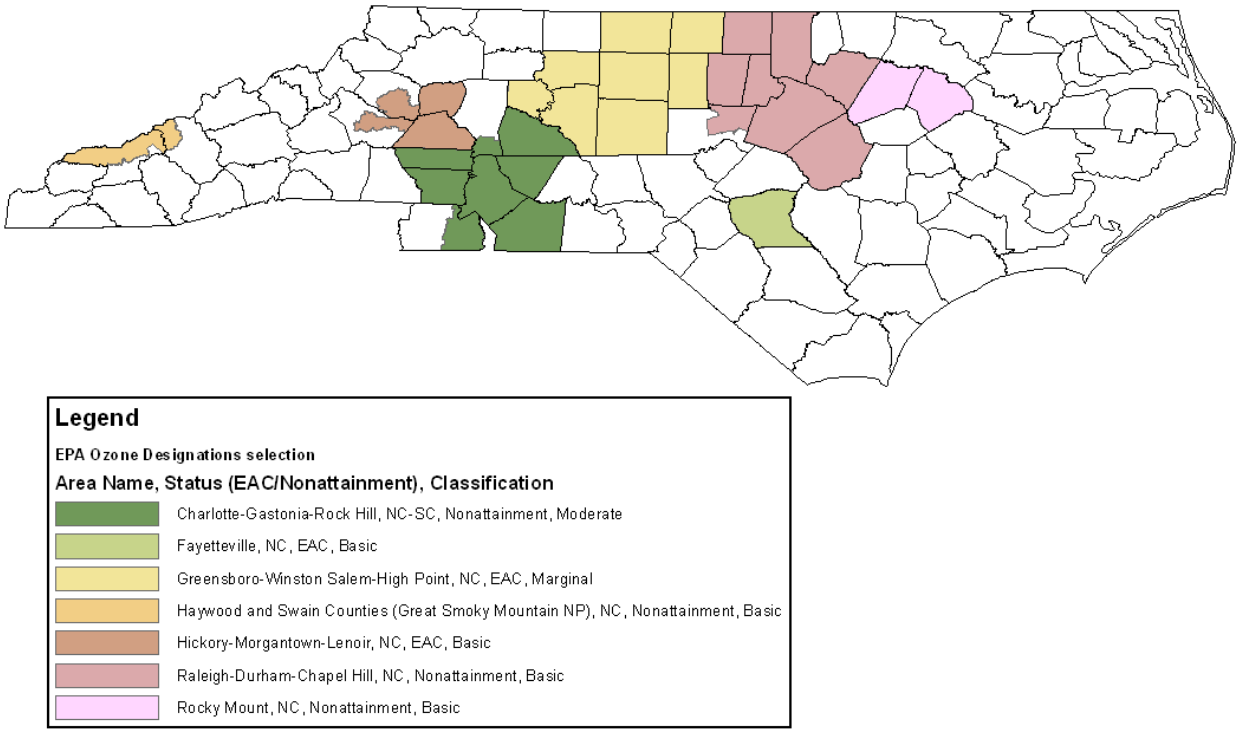


**Figure 1-1. USEPA Designated 1997 8-hour Ozone Nonattainment Areas in North Carolina**

There are currently seven ozone monitors located throughout the Metrolina nonattainment area and one monitor located in York County, South Carolina, just outside of the nonattainment area. The North Carolina Division of Air Quality (NCDAQ) operates four of the monitors in the Metrolina area, the Mecklenburg County Air Quality (MCAQ) operates three of the monitors in the Mecklenburg County, and South Carolina Department of Health and Environmental Control (SCDHEC) operates the York County monitor.

In 2009, all but one monitor, County Line located in Mecklenburg County, came into attainment of the 1997 8-hour ozone NAAQS. With the completion of the 2010 ozone season, this monitor attained the standard as well. The 2010-2012 design value for Metrolina nonattainment area is 0.083 ppm.

## 1.4 CLEAN AIR ACT REDESIGNATION CRITERIA

Section 107(d)(3)(E) of the CAA, as amended, states an area can be redesignated to attainment if the following conditions are met:

1. The USEPA has determined that the NAAQS have been attained. For ozone, the areas must show that the average of the fourth highest 8-hour ozone values from three (3) complete, consecutive calendar years of quality-assured air quality monitoring data must be below 0.085 ppm.

2. The applicable implementation plan has been fully approved by the USEPA under section 110(k).

3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions. To demonstrate this, the State should estimate the percent reduction (from the year used to determine the design value for designation and classification) achieved from Federal, State, and local measures.

4. The State has met all applicable requirements for the area under section 110 and Part D.

5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the areas under section 175A.

In the sections to follow, the NCDAQ will provide the technical data necessary to show that the Charlotte-Gastonia-Rock Hill nonattainment area has attained and is expected to maintain the 1997 8-hour ozone standard, and has met the requirements for redesignation set forth above. This document discusses the North Carolina portion of the nonattainment area. The SCDHEC have developed a maintenance plan for the South Carolina portion of the nonattainment area which is available upon request.

# 2.0 AIR QUALITY

## 2.1 HISTORIC AIR QUALITY (2001 – 2012)

The NCDAQ and MCAQ have collected ambient monitoring data for the Metrolina area since the late seventies. At the time of the 1997 8-hour ozone designations, there were seven ozone monitors throughout the Metrolina nonattainment area and one monitor located in York County, South Carolina just outside of the nonattainment area (Figure 2-1). These monitors were installed in accordance with the Code of Federal Regulations (CFR) 40 CFR 58.

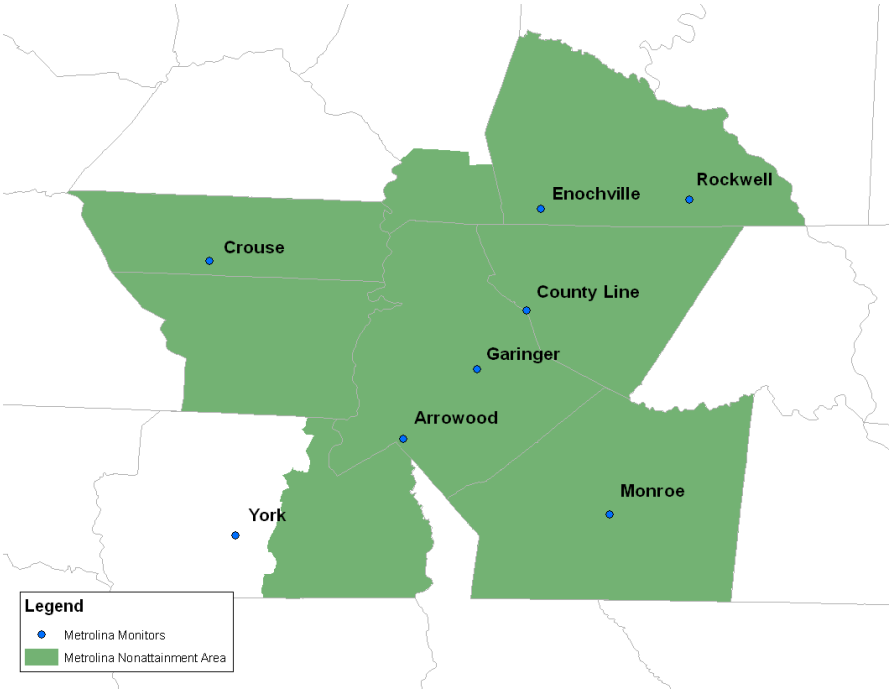


**Figure 2-1. Ozone Monitor Locations in the Metrolina Nonattainment Area**

Tables 2-1 and 2-2 show the air quality data and corresponding design values for the monitors in the Metrolina region, respectively, from 2001 to 2012. As you can see from Table 2-2, most of the monitors near and downwind of Charlotte were in violation of the 1997 8-hour ozone NAAQS for the first two-thirds of the period, but have consistently met the 1997 8-hour ozone NAAQS over the last three years.

**Table 2-1. Metrolina Area's Historic 4th Highest 8-hour Ozone Values (2001-2012)**

| Monitor | 4th Highest 8-hour Ozone Values (ppm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012*** |
| Crouse AIRS ID # 37-109-0004 Lincoln County | 0.094 | 0.095 | 0.089 | 0.074 | 0.082 | 0.082 | 0.085 | 0.079 | 0.065 | 0.072 | 0.077 | 0.076 |
| Garinger AIRS ID # 37-119-0041 Mecklenburg County | 0.099 | 0.103 | 0.086 | 0.085 | 0.088 | 0.091 | 0.093 | 0.085 | 0.069 | 0.082 | 0.088 | 0.080 |
| Arrowood AIRS ID # 37-119-1005 Mecklenburg County | 0.086 | 0.094 | 0.073 | 0.077 | 0.085 | 0.078 | 0.087 | 0.073 | 0.068 | 0.078 | 0.082 | 0.073 |
| County Line AIRS ID # 37-119-1009 Mecklenburg County | 0.099 | 0.107 | 0.088 | 0.083 | 0.090 | 0.093 | 0.096 | 0.093 | 0.071 | 0.082 | 0.083 | 0.085 |
| Rockwell AIRS ID # 37-159-0021 Rowan County | 0.097 | 0.106 | 0.098 | 0.080 | 0.086 | 0.085 | 0.096 | 0.084 | 0.071 | 0.077 | 0.077 | 0.080 |
| Enochville AIRS ID # 37-159-0022 Rowan County | 0.103 | 0.108 | 0.087 | 0.080 | 0.088 | 0.089 | 0.095 | 0.082 | 0.073 | 0.078 | 0.078 | 0.077 |
| Monroe AIRS ID # 37-179-0003 Union County | 0.081 | 0.100 | 0.083 | 0.074 | 0.082 | 0.080 | 0.082 | 0.08 | 0.067 | 0.071 | 0.073 | 0.075 |

* 2012 monitoring data has not been submitted to USEPA at this time.

**Table 2-2. Metrolina Area's Historic Design Values (2001 -2012)**

| Monitor | Design Value (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **01-03** | **02-04** | **03-05** | **04-06** | **05-07** | **06-08** | **07-09** | **08-10** | **09-11** | **10-12*** |
| Crouse AIRS ID # 37-109-0004 Lincoln County | **0.092** | **0.086** | 0.081 | 0.079 | 0.083 | 0.082 | 0.076 | 0.072 | 0.071 | 0.075 |
| Garinger AIRS ID # 37-119-0041 Mecklenburg County | **0.096** | **0.091** | **0.086** | **0.088** | **0.090** | **0.089** | 0.082 | 0.078 | 0.079 | 0.083 |
| Arrowood AIRS ID # 37-119-1005 Mecklenburg County | 0.084 | 0.081 | 0.078 | 0.080 | 0.083 | 0.079 | 0.076 | 0.073 | 0.076 | 0.077 |
| County Line AIRS ID # 37-119-1009 Mecklenburg County | **0.098** | **0.092** | **0.087** | **0.088** | **0.093** | **0.094** | **0.086** | 0.082 | 0.078 | 0.083 |
| Rockwell AIRS ID # 37-159-0021 Rowan County | **0.100** | **0.094** | **0.088** | 0.083 | **0.089** | **0.088** | 0.083 | 0.077 | 0.075 | 0.078 |
| Enochville AIRS ID # 37-159-0022 Rowan County | **0.099** | **0.091** | **0.085** | **0.085** | **0.090** | **0.088** | 0.083 | 0.077 | 0.076 | 0.077 |
| Monroe AIRS ID # 37-179-0003 Union County | **0.088** | **0.085** | 0.079 | 0.078 | 0.081 | 0.080 | 0.076 | 0.072 | 0.070 | 0.073 |

Note: Bolded values represent violations of the 1997 8-hour ozone standard.

* 2012 monitoring data has not been submitted to USEPA at this time.

## 2.2 RECENT AIR QUALITY VALUES (2008 –2012)

The most recent three years of ozone monitoring data for the Charlotte-Gastonia-Rock Hill nonattainment area that were available at the time the original redesignation plan was submitted in November 2011 was from years 2008-2010. These data demonstrate compliance with the 1997 8-hour ozone NAAQS. Table 2-3a given on the following page is a summary of the fourth highest 8-hour average ozone concentration at the monitors in the Metrolina region for years 2008-2010 and the corresponding design value. The 2010 8-hour ozone monitoring data for the Metrolina area has undergone full quality assurance checks and was officially submitted to the USEPA in March 2011.

**Table 2-3a. Metrolina Area's Current Air Quality Data (2008 -2010)**

| Monitor | Year | 4th Highest 8-hour ozone values (ppm) | Design Value (ppm) 2008-2010 |
|---|---|---|---|
| Crouse<br>AIRS ID #37-109-0004<br>Lincoln County | 2008 | 0.079 | 0.072 |
| | 2009 | 0.065 | |
| | 2010 | 0.072 | |
| Garinger<br>AIRS ID #37-119-0041<br>Mecklenburg County | 2008 | 0.085 | 0.078 |
| | 2009 | 0.069 | |
| | 2010 | 0.082 | |
| Arrowood<br>AIRS ID #37-119-1005<br>Mecklenburg County | 2008 | 0.073 | 0.073 |
| | 2009 | 0.068 | |
| | 2010 | 0.078 | |
| County Line<br>AIRS ID #37-119-1009<br>Mecklenburg County | 2008 | 0.093 | 0.082 |
| | 2009 | 0.071 | |
| | 2010 | 0.082 | |
| Rockwell<br>AIRS ID #37-159-0021<br>Rowan County | 2008 | 0.084 | 0.077 |
| | 2009 | 0.071 | |
| | 2010 | 0.077 | |
| Enochville<br>AIRS ID #37-159-0022<br>Rowan County | 2008 | 0.082 | 0.077 |
| | 2009 | 0.073 | |
| | 2010 | 0.078 | |
| Monroe<br>AIRS ID #37-179-0003<br>Union County | 2008 | 0.080 | 0.072 |
| | 2009 | 0.067 | |
| | 2010 | 0.071 | |
| York<br>AIRS ID #45-091-0006<br>York County | 2008 | 0.075 | 0.067 |
| | 2009 | 0.062 | |
| | 2010 | 0.066 | |

This supplement is updating the monitoring data contained in Table 2-3a to include data for years 2011 and 2012 which was not available at the time the original document was submitted. Table 2.3b is a summary of the fourth highest 8-hour average ozone concentration at the monitors in the Metrolina region for 2010-2012 and the corresponding design value. This more recent data also demonstrates compliance with the 1997 8-hour ozone NAAQS. The 2011 8-hour ozone monitoring data for the Metrolina area has been fully quality assured and was officially submitted to the USEPA in early 2012. The 2012 8-hour ozone monitoring data is being quality-assured at this time, and will be submitted to the USEPA in the spring of 2013.

**Table 2-3b. Metrolina Area's Current Air Quality Data (2010 -2012)**

| Monitor | Year | 4th Highest 8-hour ozone values (ppm) | Design Value (ppm) 2010-2012 |
|---|---|---|---|
| Crouse<br>AIRS ID #37-109-0004<br>Lincoln County | 2010 | 0.072 | 0.075 |
| | 2011 | 0.077 | |
| | 2012* | 0.076 | |
| Garinger<br>AIRS ID #37-119-0041<br>Mecklenburg County | 2010 | 0.082 | 0.083 |
| | 2011 | 0.088 | |
| | 2012* | 0.080 | |
| Arrowood<br>AIRS ID #37-119-1005<br>Mecklenburg County | 2010 | 0.078 | 0.077 |
| | 2011 | 0.082 | |
| | 2012* | 0.073 | |
| County Line<br>AIRS ID #37-119-1009<br>Mecklenburg County | 2010 | 0.082 | 0.083 |
| | 2011 | 0.083 | |
| | 2012* | 0.085 | |
| Rockwell<br>AIRS ID #37-159-0021<br>Rowan County | 2010 | 0.077 | 0.078 |
| | 2011 | 0.077 | |
| | 2012* | 0.080 | |
| Enochville<br>AIRS ID #37-159-0022<br>Rowan County | 2010 | 0.078 | 0.077 |
| | 2011 | 0.078 | |
| | 2012* | 0.077 | |
| Monroe<br>AIRS ID #37-179-0003<br>Union County | 2010 | 0.071 | 0.073 |
| | 2011 | 0.073 | |
| | 2012* | 0.075 | |

* 2012 monitoring data has not been submitted to USEPA at this time.

## 2.3 PERMANENT AND ENFORCEABLE EMISSIONS REDUCTIONS

There are several State and Federal measures that have been enacted in recent years that are resulting in permanent and enforceable emissions reductions. A list of those measures that contributed to the permanent and enforceable emission reductions are listed below and are more fully described in Section 3.2.

The federal measures that have been implemented include:

- Tier 2 vehicle standards: Began implementation in 2004 and requires all passenger vehicles in the manufactures fleet to meet an average standard of 0.07 grams of NOx

per mile. Additionally, in January 2006 the sulfur content of gasoline was required to be on average 30 ppm which assists in lowering the NOx emissions. Most gasoline sold in North Carolina prior to January 2006 had a sulfur content of about 300 ppm. These emission reductions are federally enforceable.

- Heavy-duty gasoline and diesel highway vehicle standards: Began to take effect in 2004 and is designed to reduce NOx and VOC emissions. These emission reductions are federally enforceable.

- Nonroad spark-ignition engines and recreational engines standards: Tier 1 of this standard was implemented in 2004 and Tier 2 started in 2007. These standards reduce NOx, HC and carbon monoxide emissions. These emission reductions are federally enforceable.

- Large nonroad diesel engine standards: Promulgated in 2004, this rule is being phased in between 2008 through 2014. This rule will also reduce the sulfur content in the nonroad diesel fuel. When fully implemented, this rule will reduce NOx, VOC, particulate matter and carbon monoxide. These emission reductions are federally enforceable.

The state measures that have been implemented include:

- Clean Air Bill: This State legislation expanded the inspection and maintenance (I/M) program from 9 counties to 48. It was phased-in in the Metrolina nonattainment area from July 1, 2002 through January 1, 2004. This program reduces NOx, VOC and carbon monoxide emissions. The rule for the I/M program was submitted to the USEPA for adoption into the SIP in August 2002 and was federally approved in October 2002. Therefore, these emission reductions are both state and federally enforceable.

- Open burning ban: This regulation prohibits open burning of man-made materials throughout the State. Additionally, this regulation prohibits open burning of yard waste in areas that the NCDAQ forecasts air quality action days. The open burning regulation reduces NOx and VOC emissions, as well as CO and fine particulate matter. This rule was submitted to the USEPA for adoption into the SIP in March 2006, however, the USEPA has not yet approved the adoption of this rule into the SIP. These emission reductions are currently state enforceable, however, once the

USEPA has federally approved the rule into the SIP, these emission reductions will be federally enforceable as well.

- NOx State Implementation Plan (SIP) Call rule: This rule was predicted to reduce summertime NOx emissions from power plants and other industries by 68%. These emission reductions are state and federally enforceable.

- Clean Smokestacks Act: This State law requires coal-fired power plants to reduce annual NOx emissions by 77% by 2009 and to reduce annual sulfur dioxide emissions by 49% by 2009 and 73% by 2013. This law set a NOx emissions cap of 56,000 tons/year for 2009 and sulfur dioxide emissions caps of 250,000 tons/year and 130,000 tons/year for 2009 and 2013, respectively. The public utilities cannot meet these emission caps by purchasing emission credits. USEPA approved this law as part of the Metrolina SIP on September 26, 2011. These emission reductions are enforceable at both the federal and state level. In 2009, the power plants subject to this law had combined NOx emissions of 37,691 tons/year, well below the 56,000 tons/year cap. The emissions cap has been met in all subsequent years as well.

- Diesel Emissions Reduction Act (DERA): DERA provides new diesel emissions reduction grant authority for the USEPA. This funding is used to achieve significant reductions in diesel emissions that improve air quality and protect public health. The DERA funds that the NCDAQ have received have been used to repower or replace existing diesel engines from on-road and nonroad mobile source vehicles/equipment. This program will reduce particulate matter, NOx, and VOC emissions. Even though these emission reductions are voluntary and not enforceable, they are still considered permanent reductions.

Local Program measures that have been implemented include:

- Open Burning Prohibition: The MCAQ prohibits open burning of any kind year round. This prohibition is more stringent than the State's open burning rule and therefore enhances this control measure's overall benefit to the region. The open burning rule reduces NOx and VOC emissions as well as CO and fine particulate matter.

- Diesel Engine Emission Reductions: The MCAQ has also received DERA funding as well as American Recovery and Reinvestment Act (ARRA) and Congestion Mitigation and Air Quality Improvement (CMAQ) funding. These funds have been

used to repower or replace existing diesel engines from on-road and nonroad mobile source vehicles/equipment. This program will reduce particulate matter, NOx and VOC emissions. Even though these emission reductions are voluntary and not enforceable, they are still considered permanent reductions.

A recent review of the NOx emissions in the USEPA's Clean Air Markets database shows a NOx reduction of over 96,000 tons annually from the reporting sources between 2002 and 2011. Table 2-4 presents the annual emissions for the North Carolina sources in the USEPA Clean Air Markets database.

**Table 2-4. NOx Emissions from NC Sources in USEPA's Clean Air Markets Database**

| Year | Annual NOx Emissions from NC Sources (Tons) |
|---|---|
| 2002 | 145,706 |
| 2003 | 135,879 |
| 2004 | 124,079 |
| 2005 | 114,300 |
| 2006 | 108,584 |
| 2007 | 64,770 |
| 2008 | 61,669 |
| 2009 | 44,506 |
| 2010 | 57,305 |
| 2011 | 48,889 |

Table 2-5 displays the NOx emission reductions, as the result of the NOx SIP call rule, from North Carolina power plants in the Metrolina nonattainment area, as well as the power plants located directly north and west of the Metrolina region that may impact the nonattainment area. There are four facilities located within the North Carolina portion of the Metrolina nonattainment area located in Gaston, Lincoln and Rowan Counties. The facility west of the Metrolina region is Cliffside, located in Cleveland County and the facility north of the Metrolina region is Marshall located in Catawba County. This data is also from the USEPA Clean Air Markets Division's database and represents the second and third quarters of the year (April through September), the period during which ozone levels are the highest. It is clearly demonstrated that the emissions from these facilities have significantly decreased during the ozone season since 2002, with over 12,000 tons of NOx reduction in the 2012 ozone season compared to 2002. Some of these NOx reductions shown in Table 2-5 are due to the NC Clean Smokestacks Act for coal-fired utilities (discussed later). Two coal-fired power plants (Buck and Riverbend) are currently scheduled for retirement in April 2013, and will result in additional emissions reductions. The NOx SIP Call emission reductions are permanent and enforceable.

**Table 2-5. April – September NOx Emissions for Utilities near Metrolina Area (tons/ozone season)**

| Facility | County | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allen | Gaston | 5,011 | 3,643 | 4,002 | 3,589 | 3,001 | 3,053 | 3,082 | 2,188 | 2,925 | 2,378 | 1,676 |
| Riverbend | Gaston | 2,556 | 2,703 | 1,844 | 1,379 | 1,417 | 1,296 | 1,256 | 304 | 1,063 | 884 | 109 |
| Lincoln | Lincoln | 44 | 20 | 50 | 20 | 52 | 81 | 33 | 6 | 40 | 46 | 10 |
| Buck | Rowan | 1,084 | 1,468 | 1,089 | 1,286 | 1,262 | 870 | 832 | 197 | 783 | 477 | 196 |
| Marshall | Catawba | 9,283 | 9,101 | 8,243 | 7,558 | 6,370 | 7,253 | 7,151 | 4,481 | 4,861 | 5,443 | 5,128 |
| Cliffside | Cleveland | 1,944 | 2,149 | 1,738 | 1,782 | 1,540 | 1,311 | 1,173 | 561 | 357 | 487 | 267 |
| **Total** | **-----** | **19,922** | **19,084** | **16,966** | **15,614** | **13,642** | **13,864** | **13,527** | **7,737** | **10,029** | **9,715** | **7,388** |

A couple of measures to consider in determining how all of the emissions reductions have impacted air quality is whether the relationship of exceedance days or the maximum 4$^{th}$ highest ozone value with respect to high temperature days has changed over this time period. Temperature is one of the key meteorological factors that determines the ozone production potential of a given day. In North Carolina, many exceedances occur when the maximum daily temperature is 90 degrees Fahrenheit (ºF) or greater. Figure 2-2 shows the relationship of exceedance days to high temperature days from 2000 through 2012 for the Metrolina region monitors. The relationship between the maximum 4$^{th}$ highest ozone value to high temperature days from 2000 through 2012 is displayed in Figure 2-3.

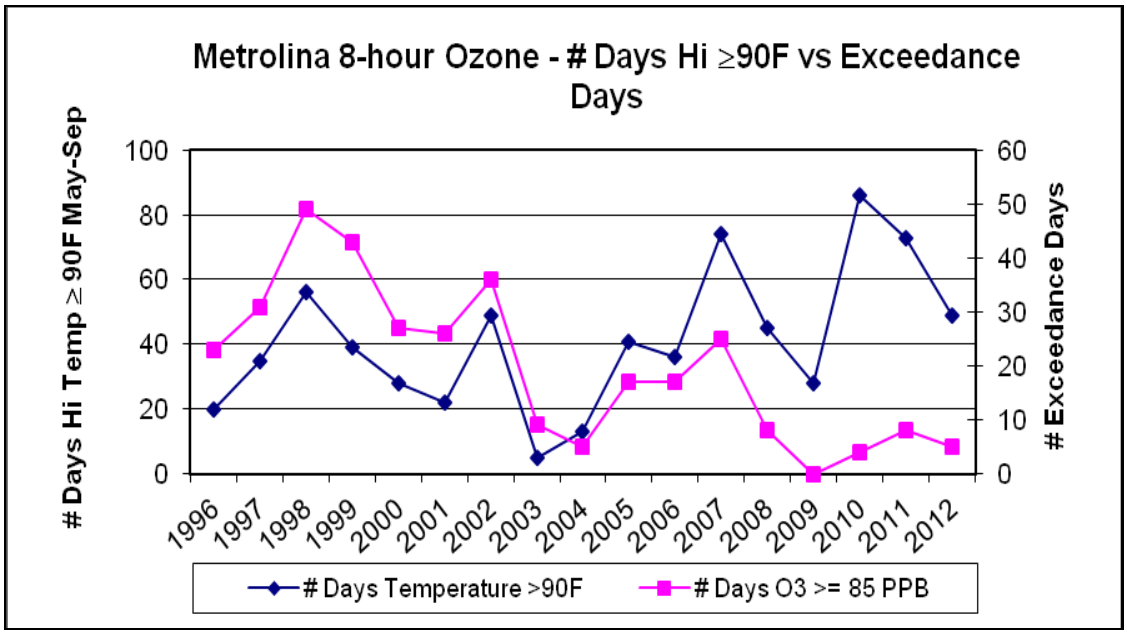


**Figure 2-2. Relationship between high temperature days and number of exceedance days in the Metrolina Area**

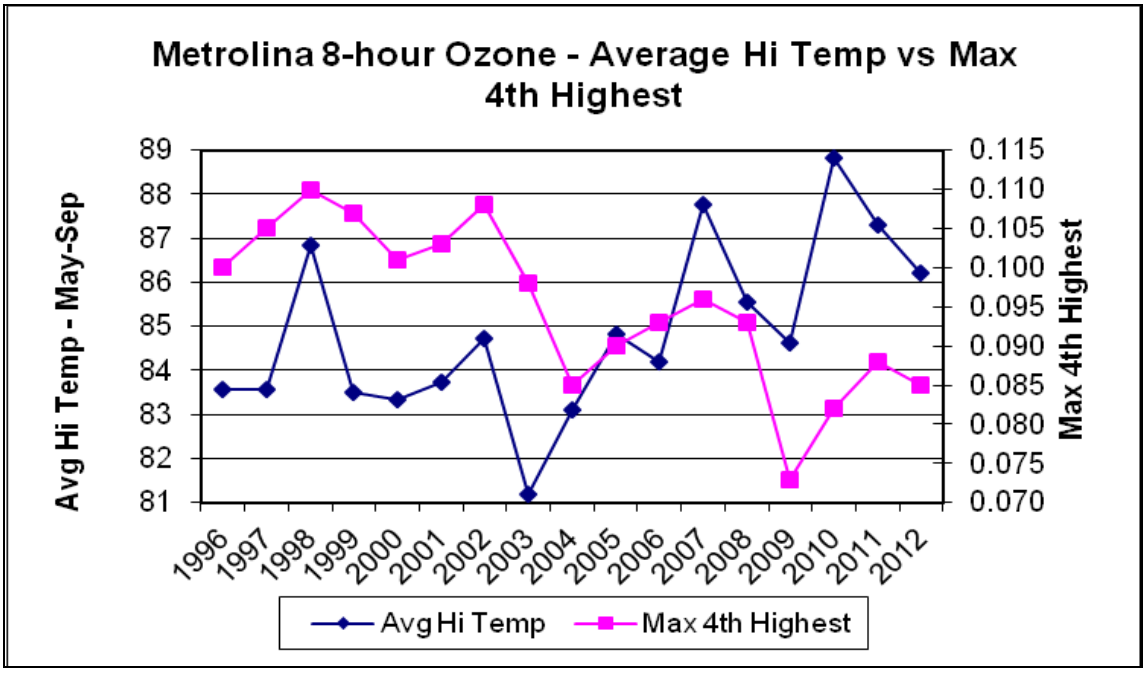


**Figure 2-3. Relationship between high temperature days and maximum 4th highest ozone value in the Metrolina Area**

It is important to see how the ozone levels have changed over the last decade in response to lower NOx emissions in the State. The worst summer in terms of the number of exceedance days and observed 4$^{th}$ highest ozone concentrations was 2002, with 36 exceedance days in the Metrolina region and a maximum 4$^{th}$ highest concentration of 0.108 ppm. That summer there were 49 days when the temperature was 90 ºF or greater in the Metrolina region. The next highest number of exceedance days occurred in 2007 with 25 days and 74 days with temperatures at or above 90 °F, yet the maximum 4$^{th}$ highest concentration was significantly lower than 2002 at 0.096 ppm.

The most compelling evidence that the reduction in ozone concentrations is due to emission reductions and not just good weather conditions is the summer of 2010. In 2010, the Metrolina area experienced the hottest summer over the last decade with 86 days at or above 90 °F. However, the Metrolina area only observed four exceedance days and the maximum 4$^{th}$ highest concentration was only 0.082 ppm. Hot summers have continued to be observed over the Metrolina area in 2011 and 2012, with fewer exceedance days and lower maximum 4$^{th}$-highest concentrations observed when compared to similar summers in prior years (e.g., 2011 vs. 2007 and 2012 vs. 2008 or 2002). North Carolina believes that these matrices clearly indicate real, long-term and significant progress in the reduction of ozone concentrations in the Metrolina region due to the real, permanent and enforceable reductions in NOx emissions in the State.

# 3.0 MAINTENANCE PLAN

## 3.1 CONCEPT OF NORTH CAROLINA'S MAINTENANCE PLAN

The State's plan for maintaining compliance with the ambient air quality standard for the 1997 8-hour ozone in the Charlotte-Gastonia-Rock Hill nonattainment area consists of three major parts: a foundation control program, a maintenance demonstration, and a contingency plan. The foundation control program consists of the current Federal and State control measures already in effect, as well as the future benefits of the federal Clean Air Interstate Rule (CAIR), Federal Transport Rule (FTR), cleaner engine programs, and low sulfur gasoline and low sulfur diesel fuel programs. Although North Carolina did not rely on the emission reductions from CAIR or the FTR for maintenance of the 1997 8-hour ozone standard, these regulations will result in additional reductions in NOx emissions regionally.

The NCDAQ has implemented programs and submitted rules and laws to be adopted into the SIP. Once these rules and laws have been approved into the SIP by the USEPA, these programs will remain enforceable and are hereby submitted as the plan to ensure that maintenance of the 1997 8-hour ozone standard will continue. Sources are prohibited from reducing emission controls (anti-backsliding), for controls due to rules or laws that have been submitted to the USEPA for adoption into the SIP, following the redesignation of the area unless such a change is first approved by the USEPA as a revision to the North Carolina SIP that is consistent with Section 110(l) of the Clean Air Act.

For the maintenance demonstration, the base year of 2010 was chosen since it is a year that falls within the attaining design value period of 2008-2010. The interim years chosen were: 2013, 2016, and 2019 and 2022 since the USEPA recommends three-year increments for interim years. The final year of the maintenance demonstration is 2025, since the CAA requires maintenance for at least ten years after redesignation. The maintenance demonstration consists of a comparison between the 2010 baseline emissions inventory and the projected emissions inventories (for 2013, 2016, 2019, 2022 and 2025), which consider economic and population growth. The comparison shows that the total emissions in each of the interim years and the final year is estimated to be lower than in the base year, which demonstrates maintenance of the 1997 8-hour ozone standard. The reductions in emissions are due to the foundation control programs outlined below.

The North Carolina contingency plan involves tracking and triggering mechanisms to determine when contingency measures are needed and a process of implementing appropriate control measures. The primary trigger of the contingency plan will be a violation of the ambient air

quality standard for 1997 8-hour ozone standard. The secondary trigger will be a monitored air quality pattern that suggests an actual 1997 8-hour ozone NAAQS violation may be imminent.

The SCDHEC has developed a maintenance plan for the South Carolina portion of the nonattainment area. A copy of the South Carolina redesignation demonstration and maintenance plan is available upon request.

## 3.2 FOUNDATION CONTROL PROGRAM

The main element of the maintenance plan is the foundation control program. The foundation control program contains the controls necessary to maintain the ambient air quality standards. The purpose of the foundation control program is to prevent the ambient air quality standards from being violated and thereby eliminate the need for more costly controls being imposed on industry and the general public. Each component of the State's foundation control program is essential in demonstrating maintenance of the air quality standards.

The foundation control program consists of Federal and State measures. The Federal measures include the cleaner fuel programs and the federal highway motor vehicle and off-road equipment control program. State measures include the I/M program, the NOx SIP Call rule, the Clean Smokestacks Act, heavy duty diesel engine gap filling requirements and an open burning regulation. All of these programs have already been implemented or are in the process of being implemented.

### 3.2.1 Federal Control Measures

Tier 2 Vehicle Standards

Federal Tier 2 vehicle standards require all passenger vehicles in a manufacturer's fleet, including light-duty trucks and Sport Utility Vehicles (SUVs), to meet an average standard of 0.07 grams of NOx per mile. Implementation began in 2004, with full compliance required by 2007. The Tier 2 standards also cover passenger vehicles over 8,500 pounds gross vehicle weight rating (the larger pickup trucks and SUVs), which are not covered by the Tier 1 regulations. For these vehicles, the standards were phased in beginning in 2008, with full compliance required by 2009. The new standards require vehicles to be 77% to 95% cleaner. The Tier 2 rule also reduced the sulfur content of gasoline to 30 ppm starting in January of 2006. Most gasoline sold in North Carolina prior to January 2006 had a sulfur content of about 300 ppm. Sulfur occurs naturally in gasoline and interferes with the operation of catalytic converters on vehicles, which results in higher NOx emissions. Lower-sulfur gasoline is necessary to achieve the Tier 2 vehicle emission standards. These emission reductions are federally enforceable.

Heavy-Duty Gasoline and Diesel Highway Vehicles Standards

New USEPA standards designed to reduce NOx and VOC emissions from heavy-duty gasoline and diesel highway vehicles began to take effect in 2004. A second phase of standards and testing procedures, began in 2007 and will reduce particulate matter from heavy-duty highway engines, and reduce highway diesel fuel sulfur content to 15 ppm since the sulfur damages emission control devices. The total program is expected to achieve a 90% reduction in particulate matter (PM) emissions and a 95% reduction in NOx emissions for these new engines using low sulfur diesel, compared to engines using higher-content sulfur diesel. These emission reductions are federally enforceable.

Large Nonroad Diesel Engines Rule

In May 2004, the USEPA promulgated new rules for large nonroad diesel engines, such as those used in construction, agricultural, and industrial equipment, to be phased in between 2008 and 2014. The nonroad diesel rules also reduce the allowable sulfur in nonroad diesel fuel by over 99%. Prior to the fuel standard change, nonroad diesel fuel averaged about 3,400 ppm sulfur. The rule limits nonroad diesel sulfur content to 500 ppm by 2006 and 15 ppm by 2010. The combined engine and fuel rules is expected to reduce NOx and particulate matter emissions from large nonroad diesel engines by over 90%, compared to nonroad engines using higher-content sulfur diesel. These emission reductions are federally enforceable.

Nonroad Spark-Ignition Engines and Recreational Engines Standard

The nonroad spark-ignition and recreational engine standards, effective in July 2003, regulates NOx, hydrocarbons and carbon monoxide for groups of previously unregulated nonroad engines. These engine standards apply to all new engines sold in the United States and imported after these standards began and applies to large spark-ignition engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all-terrain-vehicles), and recreational marine diesel engines. The regulation varies based upon the type of engine or vehicle.

The large spark-ignition engines contribute to ozone formation and ambient carbon monoxide and particulate matter levels in urban areas. Tier 1 of this standard was implemented in 2004 and Tier 2 started in 2007. Like the large spark-ignition, recreational vehicles contribute to ozone formation and ambient carbon monoxide and particulate matter levels. For the off-highway motorcycles and all-terrain-vehicles, the exhaust emissions standard was phased-in. Fifty percent of model year 2006 engines had to meet the standard and for model years 2007 and later, all engines must meet the standard. Recreational marine diesel engines over 37 kilowatts are used in yachts, cruisers, and other types of pleasure craft. Recreational marine engines contribute to

ozone formation and particulate matter levels, especially in marinas. Depending on the size of the engine, the standard began phasing-in in 2006.

When all of the nonroad spark-ignition and recreational engine standards are fully implemented, an overall 72% reduction in hydrocarbons, 80% reduction in NOx, and 56% reduction in carbon monoxide emissions are expected by 2020. These controls will help reduce ambient concentrations of ozone, carbon monoxide, and fine particulate matter. These emission reductions are federally enforceable.

NOx SIP Call in Surrounding States

In October 1998, the USEPA made a finding of significant contribution of NOx emissions from certain states and published a rule that set ozone season (May to September) NOx budgets for the purpose of reducing regional transport of ozone (63 FR 57356). This rule, referred to as the NOx SIP Call, required ozone season controls to be put on utility and industrial boilers, as well as internal combustion engines, in 22 states in the Eastern United States. A NOx emissions budget was set for each state and the states were required to develop rules that would assure that each state met its budget. A NOx trading program was established, allowing sources to buy credits to meet their NOx budget as opposed to actually installing controls. The emission budgets were to be met by the beginning of 2004. Even with the trading program, the amount of ozone season NOx emissions has decreased significantly in and around North Carolina. These emission reductions are federally enforceable.

Clean Air Interstate Rule and Federal Transport Rule

On May 12, 2005, the USEPA promulgated the "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Revisions to Acid Rain Program; Revisions to the NOx SIP Call", referred to as CAIR. This rule established the requirement for states to adopt rules limiting the emissions of NOx and sulfur dioxide and a model rule for the states to use in developing their rules. The purpose of the CAIR is to reduce interstate transport of precursors of fine particulate and ozone.

This rule provides annual state caps for NOx and sulfur dioxide for large fossil-fuel-fired electric generating units in two phases, with the Phase I caps for NOx and sulfur dioxide starting in 2009 and 2010, respectively. Phase II caps become effective in 2015. The USEPA is allowing the caps to be met through a cap and trade program if a state so chooses to participate in the program. These emission reductions are federally enforceable.

Due to court challenges of CAIR in 2008, the USEPA will be making changes to the program; however, the existing CAIR rules will remain in place until the USEPA promulgates changes to the program. A new cross-state air pollution rule was promulgated by USEPA but was vacated by the U.S. Court of Appeals in August 2012. The USEPA has filed a petition for rehearing of the court's decision. Until a decision is made, CAIR remains in effect. Although North Carolina did not rely on the emission reductions from CAIR for maintenance of the 1997 8-hour ozone standard, these regulations will result in additional reductions in NOx emissions regionally. These new emission reductions will be federally enforceable.

### 3.2.2 State Control Measures

North Carolina has adopted a number of regulations, legislation and voluntary programs to address pollution issues across the State. These are summarized below.

Clean Air Bill

The 1999 Clean Air Bill expanded the vehicle emissions I/M program in North Carolina from 9 counties to 48 counties, between July 1, 2002 through January 1, 2006 (See Figure 3-1 on the following page). Vehicles are tested using the onboard diagnostic system (OBDII), an improved method of testing, which ensures proper emission system operation for vehicles and light trucks during their lifetime by monitoring emission-related components and systems for malfunction and/or deterioration. An important aspect of OBDII is its ability to notify the driver of malfunction and/or deterioration by illuminating the "check engine light". If the vehicle is taken to a repair shop in a timely fashion, it can be properly repaired before any significant and prolonged emission increase occurs. The previously used tailpipe test (i.e., idle test) did not measure NOx emissions; it only tested for VOC and carbon monoxide emissions. By utilizing the OBDII test method, the NOx emissions as well as other pollutants from motor vehicles are reduced. The effective dates for the counties in the North Carolina portion of the Metrolina nonattainment area are listed below.

| County | Date |
|---|---|
| Cabarrus | July 1, 2002 |
| Gaston | July 1, 2002 |
| Iredell | July 1, 2003 |
| Lincoln | January 1, 2004 |

| County | Date |
|---|---|
| Mecklenburg | July 1, 2002 |
| Rowan | July 1, 2003 |
| Union | July 1, 2002 |

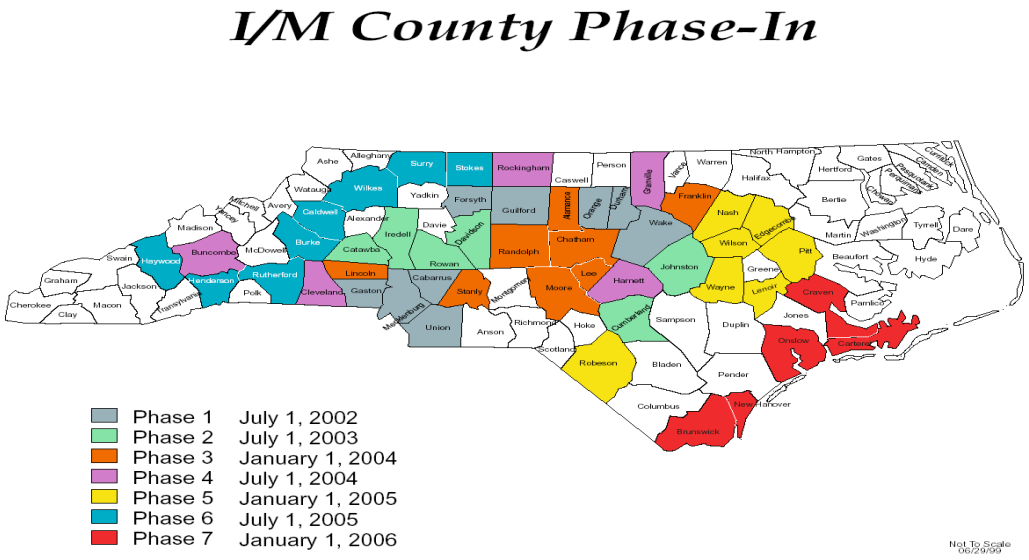


**Figure 3-1. North Carolina's NOx Inspection & Maintenance (I/M) Phase-In Map**

The rule for the I/M program was submitted to the USEPA for adoption into the SIP in August 2002 and was federally approved in October 2002. Therefore, these emission reductions are both state and federally enforceable. The expected NOx and VOC emission benefits for the base year 2010 and the final year 2025 are listed in Table 3-1. The expected NOx and VOC emission benefits for the interim years are expected to be along the same as those seen in 2010 and 2025.

**Table 3-1. NOx and VOC Emission Benefits from I/M Program (tons/day)**

| County | 2010 | | 2025 | |
|---|---|---|---|---|
| | NOx | VOC | NOx | VOC |
| Cabarrus | 0.61 | 0.31 | 0.35 | 0.29 |
| Gaston | 0.64 | 0.32 | 0.30 | 0.23 |
| Iredell* | 0.38 | 0.25 | 0.22 | 0.22 |
| Lincoln | 0.24 | 0.14 | 0.14 | 0.12 |
| Mecklenburg | 3.31 | 1.48 | 1.48 | 1.03 |
| Rowan | 0.54 | 0.27 | 0.28 | 0.2 |
| Union | 0.56 | 0.32 | 0.35 | 0.3 |
| Total | 6.28 | 3.09 | 3.12 | 2.39 |

* Nonattainment portion of county

NOx SIP Call Rule

In response to the USEPA's NOx SIP call, North Carolina adopted rules to control the emissions of NOx from large stationary combustion sources. These rules cover (1) fossil fuel-fired stationary boilers, combustion turbines, and combined cycle systems serving a generator with a nameplate capacity greater than 25 megawatts and selling any amount of electricity, (2) fossil

fuel-fired stationary boilers, combustion turbines, and combined cycle systems having a maximum design heat input greater than 250 million British thermal units per hour, and (3) reciprocating stationary internal combustion engines rated at equal or greater than 2400 brake horsepower (3000 brake horsepower for diesel engines and 4400 brake horsepower for dual fuel engines). As part of the NOx SIP call, the USEPA rules established a NOx budget for sources in North Carolina and other states. North Carolina has a Phase II budget (i.e., emissions allowance) of 165,022 tons of NOx per ozone season.

North Carolina's NOx SIP Call rule was predicted to reduce summertime NOx emissions from power plants and other industries by 68% by 2006. In October 2000, the North Carolina Environmental Management Commission (EMC) adopted rules requiring the reductions.

In 2009, the NOx SIP Call program was replaced with the CAIR, a cap-and-trade program that will achieve reductions of emissions of sulfur dioxide and NOx in the eastern United States. NOx sources that were regulated under the NOx SIP Call are now regulated under the CAIR program. North Carolina adopted the CAIR rules in 2006 (amended in 2008). North Carolina's CAIR rules set annual sulfur dioxide allowances as well as both ozone season and annual NOx allowances for coal-fired electric generating units and other large combustion sources. These regulations are due to a Federal program and thus are both state and federally enforceable.

As stated previously, the USEPA will be making changes to this program in the future. However, the existing CAIR rules will remain in place until the USEPA promulgates changes to the program.

Clean Smokestacks Act

In June 2002, the North Carolina General Assembly enacted the North Carolina Clean Smokestacks Act, which requires coal-fired power plants in North Carolina to reduce annual NOx emissions by 78% by 2009. These power plants must also reduce annual sulfur dioxide emissions by 49% by 2009 and 74% by 2013. This State law set a NOx emission cap for 2009 of 56,000 tons/year and a sulfur dioxide emissions cap of 250,000 tons/year and 130,000 tons/year for 2009 and 2013, respectively. It is significant to note that these emissions caps set in this legislation cannot be met by purchasing credits from sources outside of North Carolina, but rather must be real emission reductions at the power plants subject to the legislation. The graph on the following page gives the annual NOx emissions from power plants subject to this law. The combined annual NOx emissions were well below the 56,000 tons/year cap set for 2009.

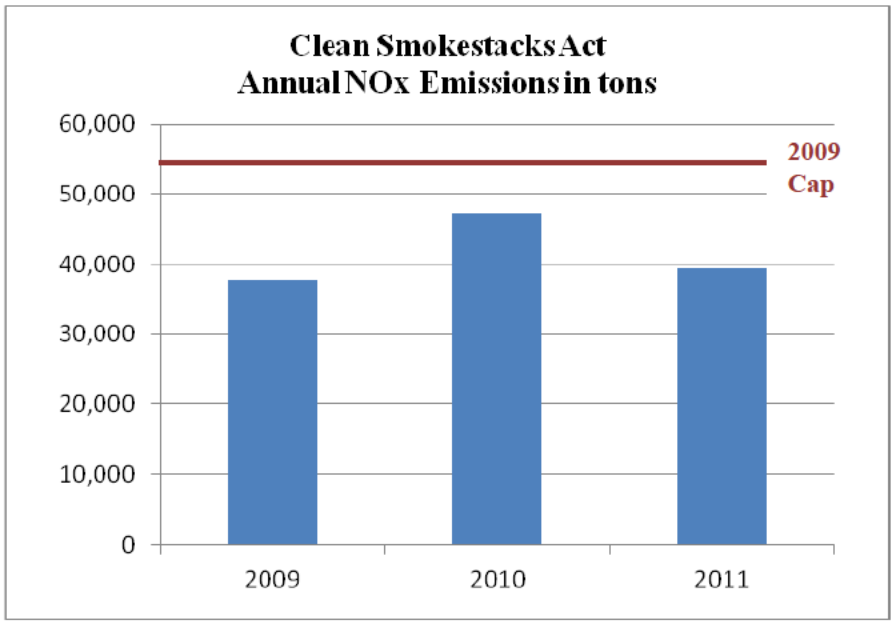


**Figure 3-2 Total Annual NOx Emissions for Power Plants Subject to North Carolina Clean Smokestacks Act**

With requiring year-round NOx controls and not allowing the purchase of NOx credits to meet the caps, the Clean Smokestacks Act reduces NOx emissions beyond the requirements of the NOx SIP Call Rule. One of the first state laws of its kind in the nation, it provides a model for other states in controlling multiple air pollutants from older coal-fired power plants. The NOx emissions cap in this law was adopted by USEPA into the SIP on September 26, 2011. The emission cap is enforceable at both the federal and state level.

Open Burning Bans

The North Carolina open burning regulation prohibits the burning of man-made materials statewide. In June 2004, the EMC approved revisions to the open burning regulation banning open burning of yard waste and land clearing debris on forecasted Code Orange or higher "air quality action days," for those counties that the NCDAQ or local air programs forecast ozone or fine particulate matter. The following counties in the Metrolina area are subject to this rule: Cabarrus, Gaston, Southern Iredell, Lincoln, Mecklenburg, Rowan and Union.

The open burning regulation reduces particulate matter, sulfur dioxide, carbon monoxide, NOx, and VOC emissions. The estimated emission reductions for the base year and the final year of

the maintenance plan are presented in Table 3-2a. For a full explanation of how these emission reductions were estimated, please refer to Appendix B.2, the Area Source Emissions Inventory Documentation.

**Table 3-2a. Estimated NOx and VOC Emission Reductions from Open Burning Regulation (tons/day)**

| County | 2010 | | 2025 | |
|---|---|---|---|---|
| | NOx | VOC | NOx | VOC |
| Cabarrus | 0.14 | 0.15 | 0.26 | 0.29 |
| Gaston | 0.13 | 0.15 | 0.25 | 0.28 |
| Iredell | 0.07 | 0.08 | 0.14 | 0.15 |
| Lincoln | 0.13 | 0.15 | 0.25 | 0.28 |
| Mecklenburg | 0.10 | 0.11 | 0.19 | 0.21 |
| Rowan | 0.17 | 0.19 | 0.32 | 0.35 |
| Union | 0.27 | 0.30 | 0.51 | 0.57 |
| **Total** | **1.01** | **1.13** | **1.92** | **2.13** |

The open burning rule was submitted to the USEPA for adoption into the SIP in March 2006, however, the USEPA has not yet approved the adoption of this rule into the SIP. These emission reductions are currently state enforceable, however, once the USEPA has federally approved the rule into the SIP, these emission reductions will be federally enforceable as well.

Idle Reduction Regulation

The EMC adopted the Heavy-Duty Vehicle Idling Restrictions rule to reduce unnecessary idling of heavy-duty trucks on July 9, 2009 and the rule became effective on July 10, 2010. This rule is state enforceable and generally prevents any person who operates a heavy-duty vehicle to cause, let, permit, suffer or allow idling for a period of time in excess of 5 consecutive minutes in any 60 minute period. The expected emission reductions from this regulation were not included in the mobile source emissions estimated for this maintenance plan because the MOVES model does not incorporate such a program.

Prevention of Significant Deterioration

All new major sources of VOCs and NOx will be evaluated under the prevention of significant deterioration program and are required to use best available control technology. These emission reductions are state enforceable.

### 3.2.3 Local Program Control Measures

The MCAQ operates a state certified local air pollution program pursuant to North Carolina General Statue 143-215.122 and administers SIP rules throughout Mecklenburg County, including incorporated areas. The MCAQ prohibits open burning of any kind year round. This prohibition is more stringent than the State's open burning rule and therefore enhances this control measure's overall benefit to the region.

### 3.2.4 Additional Programs Supporting Maintenance

Air Awareness Program

The North Carolina Air Awareness Program is a public outreach and education program of the NCDAQ. The goal of the program is to reduce air pollution though voluntary actions by individuals and organizations. The program seeks to educate individuals about (1) the sources of air pollution; (2) the health effects of air pollution and how these effects can be mitigated by modification of outdoor activities on ozone action days; and (3) simple "action tips", such as carpooling, vehicle maintenance, and energy conservation, that reduce individual contributions to air pollution. One of the major program components is the year round daily air quality forecast. The NCDAQ produces the 8-hour ozone forecasts and corresponding air quality index for the Metrolina forecast area from May 1 through September 30 of each year.

Transportation Conformity

The NCDAQ will work closely with the North Carolina Department of Transportation (NCDOT) and local transportation agencies to assure that Transportation Improvement Programs (TIPs) in the nonattainment area are consistent with and conform to the State's air quality program, including the SIP, and meet the Federal requirements on conformity. This conformity review shall be performed for all federally funded and all other major projects contained in TIPs, regardless of source of funding. Technical analysis of transportation plans, programs, and projects for conformity will be done cooperatively by the Statewide Planning Branch of the NCDOT and the NCDAQ. In the event that the NCDAQ disagrees with the NCDOT on a conformity determination or issue, the NCDAQ and the NCDOT will present the issue to the Governor for resolution. Additionally, the State will prepare NOx and VOC emissions analyses in the ozone conformity determinations.

The public and interested parties are given an early and reasonable opportunity to comment on transportation plans, programs, projects and proposed conformity determinations in accordance with procedures adopted by metropolitan planning organizations pursuant to the requirements of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (and

any updated transportation legislation), as well as any updated transportation legislation, and the CAA as amended.

Mobile Source Emission Reduction Grants

The Diesel Emissions Reduction Act (DERA) provides new diesel emissions reduction grant authority for the USEPA. This funding is used to achieve significant reductions in diesel emissions that improve air quality and protect public health. In response to DERA, the USEPA created grant and funding programs under the National Clean Diesel Campaign to build on the success of its regulatory and voluntary efforts to reduce emissions from diesel engines. The DERA funds, as well as the American Recovery and Reinvestment Act (ARRA) funding that the NCDAQ have received have been used to repower or replace existing diesel engines from on-road and nonroad mobile source vehicles/equipment. Additionally, the MCAQ has received DERA, ARRA and CMAQ funding that have been used to repower or replace existing diesel engines from on-road and nonroad mobile source vehicles/equipment.

Table 3-2b lists the number of engine repowers and replacements that have been performed in the Metrolina area since 2009. These projects will result in $NO_X$ and VOC emissions reductions. The types of equipment that received the engine repowers or replacements include construction equipment, airport ground equipment, and Class 8 trucks including refuse trucks.

**Table 3-2b. Number of Engine Repowers and Replacements in Metrolina Area that Result in $NO_X$ Emissions Reductions**

| Project | Nonroad Engines | Onroad Engines |
|---|---|---|
| Replacements | 41 | 14 |
| Repowers | 58 | 4 |
| **Total** | **99** | **18** |

## 3.3 EMISSIONS INVENTORIES AND MAINTENANCE DEMONSTRATION

### 3.3.1 Theory of Approach

There are two basic approaches used to demonstrate continued maintenance. The first is the comparison of a projected emissions inventory with a baseline emissions inventory. The second approach involves complex analysis using gridded photochemical modeling. The approach used by the NCDAQ is the comparison of emissions inventories for the years 2010 and 2025.

For the maintenance demonstration, the base year of 2010 was chosen since it is a year that falls within the attaining design value period of 2008-2010. The maintenance demonstration is made by comparing the 2010 baseline summer day emissions inventory to the 2025 projected summer day emissions inventory. The baseline summer day emissions inventory represents an emission level for a period when the ambient air quality standard was not violated, 2008-2010. If the projected emissions remain at or below the baseline emissions, continued maintenance is demonstrated and it then follows, if the projected emissions remain at or below the baseline emissions, then the ambient air quality standard should not be violated in the future. In addition to comparing the final year of the plan, all of the interim years are compared to the 2010 baseline to demonstrate that these years are also expected to show continued maintenance of the 1997 8-hour ozone standard.

The emissions inventories are comprised of four major types of sources: point, area, on-road mobile and nonroad mobile. The projected summer day emission inventories have been estimated using projected rates of growth in population, traffic, economic activity, and other parameters. Naturally occurring, or biogenic, emissions are not included in the emissions inventory comparison, as these emissions are outside the State's span of control.

The SCDHEC has developed a maintenance plan for the South Carolina portion of the nonattainment area. A copy of the South Carolina redesignation demonstration and maintenance plan is available upon request.

### 3.3.2 Emission Inventories

There are four different man-made emission inventory source classifications: (1) stationary point, (2) area, (3) on-road mobile and (4). nonroad mobile sources.

Point sources are those stationary sources that require an air permit to operate. In general, these sources have a potential to emit more than 5 tons per year of a criteria pollutant or its precursors from a single facility. The source emissions are tabulated from data collected by direct on-site measurements of emissions or mass balance calculations utilizing emission factors from the USEPA's AP-42 or stack test results. There are usually several emission sources for each facility. Emission data is collected for each point source at a facility and the data is entered into an in-house database system. For the projected years' inventory, point sources are adjusted by growth factors based on Standard Industrial Classification codes generated using growth patterns obtained from County Business Patterns. For the electric generating utility sources, the estimated projected future year emissions were based on information provided by the utility company. For the sources that report to the USEPA's Clean Air Markets Division, the actual 2010 average summer day emissions were used. For the other Title V sources, the 2009 data was

used which was the latest data available. For the small sources that only report emissions every 5 years, the most recently reported data was used and assumed to be equivalent to 2009 emissions since these sources do not vary much from year to year. The 2009 emissions data was grown to 2010 using the USEPA's EGAS model. The NCDAQ believes the estimated 2010 emissions are representative of what was emitted in 2010.

For detailed discussion on how the point sources emission inventory was developed, see Appendix B.1. One modification in this supplement consists of accounting for emissions associated with plants that have recently rescinded their operating permits. NCDAQ has included these emissions in this supplement as some of these plants may resume operation when the economy improves. A summary of the point source emissions are presented in Table 3-3 and Table 3-4. The emissions are presented in a ton per summer day basis.

**Table 3-3. Point Source NOx Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 1.93 | 2.08 | 2.23 | 2.38 | 2.53 | 2.7 |
| Gaston | 23.75 | 8.87 | 8.08 | 8.29 | 6.41 | 6.34 |
| Iredell* | 3.28 | 3.54 | 3.8 | 4.05 | 4.29 | 4.57 |
| Lincoln | 0.61 | 0.67 | 0.72 | 0.78 | 0.84 | 0.9 |
| Mecklenburg | 1.29 | 1.39 | 1.48 | 1.57 | 1.67 | 1.78 |
| Rowan | 6.69 | 3.03 | 2.5 | 2.7 | 2.9 | 3.14 |
| Union | 0.42 | 0.45 | 0.48 | 0.51 | 0.55 | 0.59 |
| **Total** | 37.97 | 20.03 | 19.29 | 20.28 | 19.19 | 20.02 |

*Iredell County emissions for nonattainment area only

**Table 3-4. Point Source VOC Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 2.17 | 2.23 | 2.29 | 2.36 | 2.43 | 2.51 |
| Gaston | 2.14 | 2.14 | 2.39 | 2.61 | 2.76 | 2.94 |
| Iredell* | 0.88 | 0.95 | 1.03 | 1.1 | 1.16 | 1.24 |
| Lincoln | 1.19 | 1.3 | 1.42 | 1.53 | 1.64 | 1.77 |
| Mecklenburg | 3.24 | 3.51 | 3.77 | 4.04 | 4.31 | 4.62 |
| Rowan | 3.76 | 4.12 | 4.5 | 4.91 | 5.31 | 5.78 |
| Union | 1.4 | 1.53 | 1.64 | 1.77 | 1.89 | 2.01 |
| **Total** | 14.78 | 15.78 | 17.04 | 18.32 | 19.5 | 20.87 |

*Iredell County emissions for nonattainment area only

Area sources are those stationary 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.). For area sources, emissions are estimated by multiplying an emission factor by some known indicator of collective activity such as production, number of employees, or population. These types of emissions are estimated on the county level. For the projected year's inventory, area source emissions are changed by population growth, projected production growth, or estimated employment growth.

For detailed discussion on how the area source emission inventory was developed, see Appendix B.2. The area source VOC emissions in this supplement vary slightly from the VOC emissions data submitted under the original redesignation plan due to typographical errors that were discovered during the preparation of this supplement. A summary of the area source emissions are presented in Table 3-5 and Table 3-6. The emissions are presented in a ton per summer day basis.

**Table 3-5. Area Source NOx Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 0.59 | 0.6 | 0.61 | 0.62 | 0.63 | 0.65 |
| Gaston | 0.73 | 0.75 | 0.77 | 0.79 | 0.8 | 0.83 |
| Iredell* | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.21 |
| Lincoln | 0.23 | 0.23 | 0.22 | 0.22 | 0.22 | 0.22 |
| Mecklenburg | 5.25 | 5.31 | 5.37 | 5.44 | 5.5 | 5.58 |
| Rowan | 0.5 | 0.5 | 0.5 | 0.51 | 0.51 | 0.53 |
| Union | 0.66 | 0.65 | 0.64 | 0.64 | 0.63 | 0.65 |
| **Total** | 8.16 | 8.24 | 8.31 | 8.42 | 8.49 | 8.67 |

*Iredell County emissions for nonattainment area only

**Table 3-6. Area Source VOC Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 5.12 | 5.07 | 5.09 | 5.24 | 5.39 | 5.67 |
| Gaston | 6.32 | 6.27 | 6.28 | 6.41 | 6.51 | 6.92 |
| Iredell* | 2.14 | 2.15 | 2.18 | 2.25 | 2.31 | 2.43 |
| Lincoln | 2.89 | 2.9 | 2.93 | 3.02 | 3.1 | 3.31 |
| Mecklenburg | 27.02 | 25.88 | 25.21 | 25.57 | 25.88 | 27.86 |
| Rowan | 5.1 | 5.12 | 5.19 | 5.32 | 5.44 | 5.83 |
| Union | 9.08 | 9.22 | 9.48 | 9.97 | 10.43 | 11.24 |
| **Total** | 57.67 | 56.61 | 56.36 | 57.78 | 59.06 | 63.26 |

*Iredell County emissions for nonattainment area only

For highway mobile sources, the USEPA's Motor Vehicle Emission Simulator (MOVES) mobile model is run to generate emissions. The MOVES model includes the road class vehicle miles traveled (VMT) as an input file and can directly output the estimated emissions. For the projected years' inventories, the highway mobile sources emissions are calculated by running the MOVES mobile model for the future year with the projected VMT to generate emissions that take into consideration expected Federal tailpipe standards, fleet turnover and new fuels.

For detailed discussion on how the on-road mobile emission inventory was developed, see Appendix B.3. A summary of the on-road mobile source emissions are presented in Table 3-7 and Table 3-8. The emissions are presented in a ton per summer day basis.

**Table 3-7. On-road Mobile Source NOx Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 14.48 | 11.81 | 9.79 | 7.90 | 6.95 | 6.17 |
| Gaston | 13.64 | 10.18 | 8.10 | 6.61 | 5.76 | 5.37 |
| Iredell* | 8.91 | 7.09 | 5.75 | 4.69 | 4.00 | 3.63 |
| Lincoln | 5.80 | 4.73 | 3.85 | 3.16 | 2.69 | 2.42 |
| Mecklenburg | 69.21 | 52.08 | 41.47 | 33.82 | 32.00 | 27.24 |
| Rowan | 12.96 | 10.06 | 8.03 | 6.41 | 5.46 | 4.81 |
| Union | 13.26 | 10.97 | 9.44 | 7.90 | 6.81 | 6.26 |
| **Total** | **138.26** | **106.92** | **86.43** | **70.49** | **63.67** | **55.90** |

*Iredell County emissions for nonattainment area only

**Table 3-8. On-road Mobile Source VOC Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 7.54 | 6.05 | 5.04 | 4.18 | 3.63 | 3.53 |
| Gaston | 6.24 | 4.67 | 3.72 | 3.08 | 2.69 | 2.57 |
| Iredell* | 5.51 | 4.32 | 3.55 | 2.95 | 2.53 | 2.45 |
| Lincoln | 3.21 | 2.52 | 2.05 | 1.69 | 1.44 | 1.39 |
| Mecklenburg | 30.42 | 22.91 | 18.32 | 15.20 | 13.65 | 12.64 |
| Rowan | 6.32 | 4.82 | 3.84 | 3.10 | 2.60 | 2.45 |
| Union | 7.46 | 6.03 | 5.06 | 4.27 | 3.67 | 3.64 |
| **Total** | **66.70** | **51.32** | **41.58** | **34.47** | **30.21** | **28.67** |

*Iredell County emissions for nonattainment area only

Nonroad mobile sources, also referred to as off-road mobile sources, are equipment that can move but do not use the roadways, i.e., lawn mowers, construction equipment, railroad locomotives, aircraft, etc. The emissions from this category are calculated using the USEPA's NONROAD2008a model, with the exception of the railroad locomotives and aircraft engine. The railroad locomotive and aircraft engine emissions are estimated by taking activity data, such as landings and takeoffs, and multiply by an emission factor. These emissions are also estimated at the county level. For the projected years' inventories, the emissions are estimated using the

USEPA's NONROAD2008a model, projected landing and takeoff data for aircraft and national fuel use from the Energy Information Administration for locomotives.

For detailed discussion on how the nonroad mobile emission inventory was developed, see Appendix B.4. The nonroad emissions in this supplement vary slightly from the emissions data submitted under the original resdesignation plan due to more recent fuel properties data that were applied to the models. A summary of the nonroad mobile source emissions are presented in Table 3-9 and Table 3-10. The emissions are presented in a ton per summer day basis.

**Table 3-9. Nonroad Mobile Source NOx Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 2.87 | 2.38 | 1.92 | 1.59 | 1.38 | 1.23 |
| Gaston | 2.81 | 2.30 | 1.84 | 1.54 | 1.35 | 1.22 |
| Iredell* | 0.9 | 0.73 | 0.58 | 0.47 | 0.41 | 0.37 |
| Lincoln | 1.21 | 1.00 | 0.82 | 0.69 | 0.60 | 0.54 |
| Mecklenburg | 25.43 | 22.65 | 19.85 | 17.89 | 16.69 | 16.11 |
| Rowan | 2.52 | 2.13 | 1.80 | 1.55 | 1.36 | 1.23 |
| Union | 5.34 | 4.52 | 3.69 | 3.06 | 2.62 | 2.32 |
| **Total** | **41.31** | **35.90** | **30.64** | **26.89** | **24.50** | **23.09** |

*Iredell County emissions for nonattainment area only

**Table 3-10. Nonroad Mobile Source VOC Emissions (tons per day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 1.71 | 1.39 | 1.24 | 1.21 | 1.23 | 1.27 |
| Gaston | 1.92 | 1.54 | 1.3 | 1.22 | 1.19 | 1.21 |
| Iredell* | 0.6 | 0.48 | 0.41 | 0.37 | 0.35 | 0.37 |
| Lincoln | 0.93 | 0.77 | 0.65 | 0.6 | 0.57 | 0.55 |
| Mecklenburg | 16.13 | 13.44 | 12.05 | 11.88 | 12.07 | 12.38 |
| Rowan | 1.9 | 1.57 | 1.33 | 1.17 | 1.1 | 1.1 |
| Union | 3.1 | 2.58 | 2.3 | 2.24 | 2.26 | 2.32 |
| **Total** | **26.47** | **21.92** | **19.4** | **18.79** | **18.86** | **19.26** |

*Iredell County emissions for nonattainment area only

### 3.3.3 Summary of Emissions

The sum totals of the man-made emissions for the Metrolina nonattainment area are tabulated in Tables 3-11 though 3-12.

**Table 3-11. Total Man-Made NOx Emissions for the North Carolina Portion of the Metrolina Nonattainment Area (tons/day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 19.87 | 16.87 | 14.55 | 12.49 | 11.49 | 10.75 |
| Gaston | 40.93 | 22.10 | 18.79 | 17.23 | 14.32 | 13.76 |
| Iredell* | 13.29 | 11.56 | 10.33 | 9.41 | 8.90 | 8.78 |
| Lincoln | 7.85 | 6.63 | 5.61 | 4.85 | 4.35 | 4.08 |
| Mecklenburg | 101.18 | 81.43 | 68.17 | 58.72 | 55.86 | 50.71 |
| Rowan | 22.67 | 15.72 | 12.83 | 11.17 | 10.23 | 9.71 |
| Union | 19.68 | 16.59 | 14.25 | 12.11 | 10.61 | 9.82 |
| **Total** | **225.47** | **170.90** | **144.53** | **125.98** | **115.76** | **107.61** |

*Iredell County emissions for nonattainment area only

**Table 3-12. Total Man-Made VOC Emissions for the North Carolina Portion of the Metrolina Nonattainment Area (tons/day)**

| County | 2010 | 2013 | 2016 | 2019 | 2022 | 2025 |
|---|---|---|---|---|---|---|
| Cabarrus | 16.54 | 14.74 | 13.66 | 12.99 | 12.68 | 12.98 |
| Gaston | 16.62 | 14.62 | 13.69 | 13.32 | 13.15 | 13.64 |
| Iredell* | 9.13 | 7.90 | 7.17 | 6.67 | 6.35 | 6.49 |
| Lincoln | 8.22 | 7.49 | 7.05 | 6.84 | 6.75 | 7.02 |
| Mecklenburg | 76.81 | 65.74 | 59.35 | 56.69 | 55.91 | 57.50 |
| Rowan | 17.08 | 15.63 | 14.86 | 14.50 | 14.45 | 15.16 |
| Union | 21.04 | 19.36 | 18.48 | 18.25 | 18.25 | 19.21 |
| **Total** | **165.44** | **145.48** | **134.26** | **129.26** | **127.63** | **132.06** |

* Iredell County emissions for nonattainment area only

### 3.3.4 Maintenance Demonstration

As discussed above, maintenance is demonstrated when the future years total man-made emissions are less than the 2010 baseline emissions. The following table summarizes the VOC and NOx emissions for the North Carolina portion of the Metrolina Nonattainment Area. The difference between the base year and the final year illustrates that the continued maintenance of the 1997 8-hour ozone NAAQS is expected.

**Table 3-13. Maintenance Demonstration for North Carolina Portion of the Metrolina Nonattainment Area**

| Year | NOx (tons/day) | VOC (tons/day) |
|---|---|---|
| 2010 | 225.47 | 165.44 |
| 2013 | 170.90 | 145.48 |
| 2016 | 144.53 | 134.26 |
| 2019 | 125.98 | 129.26 |
| 2022 | 115.76 | 127.63 |
| 2025 | 107.61 | 132.06 |
| Difference from 2010 to 2025 | -117.86 | -33.38 |

The portion of the Metrolina Nonattainment Area that is located in York County, South Carolina was redesignated to an attainment area by USEPA on December 26, 2012. The final rule was published in the Federal Resister under *Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; South Carolina; Redesignation of the Charlotte-Gastonia-Rock Hill, North Carolina-South Carolina 1997 8-Hour Ozone Moderate Nonattainment Area to Attainment* (FR December 26, 2012, Volume 77, No. 247, pp. 75862-75865). The York County data submitted under the Further Reasonable Progress Plan shows a downward trend in the emissions data when projected to the maintenance year 2022.

The difference between the attainment level of emissions (2010) from all man-made sources and the 2025 projected level of emissions from all man-made sources in the nonattainment area is considered the "safety margin". The safety margin for each projected year for the North Carolina portion of the Metrolina Nonattainment Area is listed in Table 3-14.

**Table 3-14. Safety Margin for North Carolina Portion of the Metrolina Nonattainment Area**

| Year | NOx (tons/day) | VOC (tons/day) |
|---|---|---|
| 2010 | N/A | N/A |
| 2013 | -54.57 | -19.96 |
| 2016 | -80.94 | -31.18 |
| 2019 | -99.49 | -36.18 |
| 2022 | -109.71 | -37.81 |
| 2025 | -117.86 | -33.38 |

## 3.4 CONTINGENCY PLAN

### 3.4.1 Overview

The two main elements of the North Carolina contingency plan are tracking and triggering mechanisms to determine when contingency measures are needed and a process of developing and adopting appropriate control measures. There will be three potential triggers for the contingency plan. The primary trigger of the contingency plan will be a violation of the 1997 8-hour ozone NAAQS at any of the Metrolina area monitors. The secondary trigger will be a monitored air quality pattern that suggests an actual 1997 8-hour ozone NAAQS violation may be imminent. The tertiary trigger will be a monitored fourth high exceedance of the NAAQS. Upon either the primary or secondary triggers being activated, the NCDAQ, working in consultation with the SCDHEC and the Mecklenburg County Air Quality (MCAQ) local program, will commence analyses to determine what additional measures, if any, will be necessary to attain or maintain the 1997 8-hour ozone standard. If activation of either the primary or secondary triggers occurs, this plan provides a regulatory adoption process for revising emission control strategies. Activation of the tertiary trigger will result in an analysis to understand the cause of the exceedance and to identify voluntary measures if needed.

In addition, there will be a tracking mechanism that requires a comparison of the actual emissions inventory submitted under the Consolidated Emissions Reporting Rule (CERR) and Air Emission Reporting Rule (AERR) to the projected inventory, and to the attainment year inventory contained in this maintenance plan. The CERR and AERR reporting years are within a year of the baseline, interim and final years of the emission inventory in this maintenance demonstration.

### 3.4.2 Primary and Secondary Triggers

The primary trigger of the contingency plan will be a violation of the 1997 8-hour ozone standard, or when the three-year average of the 4$^{th}$ highest values is equal to or greater than 0.085 ppm at a monitor in the Metrolina nonattainment area. The trigger date will be 60 days from the date that the State observes a 4$^{th}$ highest value that, when averaged with the two previous ozone seasons' fourth highest values, would result in a three-year average equal to or greater than 0.085 ppm.

The secondary trigger will apply where no actual violation of the 1997 8-hour ozone standard has occurred, but where the State finds monitored ozone levels indicating that an actual ozone NAAQS violation may be imminent. A pattern will be deemed to exist when there are two consecutive ozone seasons in which the 4$^{th}$ highest values are 0.085 ppm or greater at a single monitor within the Metrolina nonattainment area. The trigger date will be 60 days from the date

that the State observes a 4th highest value of 0.085 ppm or greater at a monitor for which the previous season had a 4th highest value of 0.085 ppm or greater.

Similarly, the tertiary trigger will not be an actual violation of the 1997 8-hour ozone standard. This trigger will be a first alert as to a potential air quality problem on the horizon. The trigger will be activated when a monitor in the Metrolina nonattainment area has a 4th highest value of 0.085 ppm or greater, starting the first year after the maintenance plan has been approved. The trigger date will be 60 days from the date that the State observes a 4th highest value of 0.085 ppm or greater at any monitor.

### 3.4.3 Action Resulting From Trigger Activation

Once the primary or secondary trigger is activated, the Planning Section of the NCDAQ, in consultation with the SCDHEC and MCAQ, shall commence analyses including trajectory analyses of high ozone days, and emissions inventory assessment to determine those emission control measures that will be required for attaining or maintaining the 1997 8-hour ozone standard. By May 1 of the year following the ozone season in which the primary or secondary trigger has been activated, North Carolina will complete sufficient analyses to begin adoption of necessary rules for ensuring attainment and maintenance of the 1997 8-hour ozone NAAQS. The rules would become State effective by the following January 1, unless legislative review is required.

The measures that will be considered for adoption upon a trigger of the contingency plan include: NOx Reasonably Available Control Technology on stationary sources with a potential to emit less than 100 tons per year in the North Carolina portion of the Metrolina nonattainment area, diesel inspection and maintenance program, implementation of diesel engine repowering/replacement programs, including incentives for performing retrofits, and additional controls in upwind areas.

The NCDAQ commits to implement within 24 months of a primary or secondary trigger, or as expeditiously as practicable, at least one of the control measures listed above or other contingency measures that is determined to be more appropriate based on the analyses performed.

Once the tertiary trigger is activated, the Planning Section of the NCDAQ, in consultation with the SCDHEC and MCAQ, shall commence analyses including meteorological evaluation, trajectory analyses of high ozone days, and emissions inventory assessment to understand why a 4th highest exceedance of the standard has occurred. Once the analyses are completed, the NCDAQ will work with SCDHEC, MCAQ and the local air awareness program to develop an outreach plan identifying any additional voluntary measures that can be implemented. If the 4th highest exceedance occurs early in the season, the NCDAQ will work with entities identified in

the outreach plan to determine if the measures can be implemented during the current season, otherwise, NCDAQ will work with SCDHEC, MCAQ and the local air awareness coordinator to implement the plan for the following ozone season.

The Metrolina area is considered NOx limited with respect to ozone formation. This means that there are significantly more VOC emissions in the atmosphere and that reductions in man-made VOC emissions will not result in reductions of ozone formation. Approximately 90% of the VOC emissions come from biogenic or natural sources, which cannot be controlled; therefore, control measures requiring small VOC emitting sources to reduce man-made VOC emissions will not result in a reduction in ozone formation. Nevertheless, if a violation of the 1997 ambient air quality standard for ozone occurs in the Metrolina maintenance area, NC VOC Reasonable Achievement Control Technology rules (currently being amended) are triggered. This requires the NCDAQ Director to initiate technical analysis to determine control measures needed to attain and maintain the air quality standard for ozone. By the following May 1 of a violation, the Director is required to implement specific stationary source control measures as part of a comprehensive control strategy necessary to bring the area into compliance and to maintain compliance with the 1997 8-hour ozone standard. Although additional VOC control requirements are not expected to be required, North Carolina rules specify the process for notifying affected permitted facilities and the timeline for complying with rule requirements, if deemed necessary by the Director.

### 3.4.4 Tracking Program for Ongoing Maintenance

In addition to the measures listed above, emissions inventory comparisons will be carried out. The large stationary sources are required to submit an emissions inventory annually to the NCDAQ or MCAQ. The NCDAQ will commit to review these emissions inventories to determine if an unexpected growth in NOx emissions in the Metrolina area may endanger the maintenance of the 1997 8-hour ozone standard. Additionally, as new VMT data is provided by the North Carolina Department of Transportation (NCDOT), the NCDAQ commits to review this data and determine if any unexpected growth in VMT may endanger the maintenance of the 1997 8-hour ozone standard.

Additionally, under the CERR and AERR the NCDAQ is required to develop a comprehensive, annual, statewide emissions inventory every three years and is due twelve to eighteen months after the completion of the inventory year. The CERR and AERR inventory years are within a year of the baseline, interim and final years of the maintenance plan. Therefore, the NCDAQ commits to compare the CERR and AERR inventories as they are developed with the maintenance plan to determine if additional steps are necessary for continued maintenance of the 1997 8-hour ozone standard in this area.

# 4.0 MOTOR VEHICLE EMISSIONS BUDGET FOR CONFORMITY

## 4.1 TRANSPORTATION CONFORMITY

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 1997 8-hour ozone standard. This means that the level of emissions estimated by the NCDOT or the metropolitan planning organizations for the Transportation Implementation Plan (TIP) and Long Range Transportation Plan must not exceed the motor vehicle emission budgets (MVEBs) as defined in this maintenance plan.

Through the interagency consultation process, there was discussion on the years to set MVEBs for the Metrolina maintenance plan. According to Section 93.118 of the transportation conformity rule, a maintenance plan must establish MVEBs for the last year of the maintenance plan (in this case, 2025). The consensus during the interagency consultation process was that another MVEB should be set for the year 2013 in the Metrolina maintenance plan.

## 4.2 SAFETY MARGIN

As stated in Section 3.3.4, a safety margin is the difference between the 2010 attainment level of emissions from all source categories (i.e., point, area, on-road and nonroad mobile) and the 2025 projected level of emissions from all source categories. The safety margins for the North Carolina portion of the Metrolina nonattainment area are listed in Table 3-14 above. The State may choose to allocate some of the safety margin to the MVEB, for transportation conformity purposes, so long as the total level of emissions from all source categories remains below the attainment level of emissions.

The NCDAQ has decided to allocate a portion of the safety margin to the MVEB to allow for unanticipated growth in VMT, changes and uncertainty in vehicle mix assumptions, etc. that will influence the emission estimations. The NCDAQ has developed and implemented a four-step approach for determining a factor to use to calculate the amount of safety margin to apply to the MVEB and it is outlined in Appendix B.3. The percent increase to the MVEBs for the North Carolina counties in the Metrolina nonattainment area are listed in the Table 4-1.

**Table 4-1. Percent Increase to Mobile Vehicle Emissions Budget**

| County | 2013 | 2025 |
|---|---|---|
| Cabarrus | 10% | 20% |
| Gaston | 10% | 20% |
| Iredell | 12% | 22% |
| Lincoln | 12% | 22% |
| Mecklenburg | 7% | 17% |
| Rowan | 10% | 20% |
| Union | 10% | 20% |

## 4.3 MOTOR VEHICLE EMISSION BUDGETS

Although the emissions up to this point have been 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 so that the MVEBs will be defined in a smaller unit of measurement. Additionally, in past conformity determinations there have been concerns with how the tons per day MVEBs were rounded to the hundredth place. Setting the MVEBs in kilograms per day will avoid these concerns in future conformity determinations. The MOVES model reports emissions out several decimal places and for this plan the emissions have been rounded to the second decimal place. The conversion to kilograms used the actual emissions reported in the MOVES model. The conversion was done utilizing the "CONVERT" function in an EXCEL spreadsheet.

The tables below shows the counties with their highway mobile NOx and VOC emissions expressed in tons per day and the corresponding kilograms per day values for 2013 and 2025.

**Table 4-2. Highway Mobile Source NOx Emissions North Carolina Portion of the Metrolina Nonattainment Area**

| County | 2013 | | 2025 | |
|---|---|---|---|---|
| | NOx (tons/day) | NOx (kg/day) | NOx (tons/day) | NOx (kg/day) |
| Cabarrus | 11.81 | 10,711 | 6.17 | 5,597 |
| Gaston | 10.18 | 9,235 | 5.37 | 4,872 |
| Iredell* | 7.09 | 6,433 | 3.63 | 3,293 |
| Lincoln | 4.73 | 4,289 | 2.42 | 2,195 |
| Mecklenburg | 52.08 | 47,243 | 27.24 | 24,712 |
| Rowan | 10.06 | 9,127 | 4.81 | 4,364 |
| Union | 10.97 | 9,955 | 6.26 | 5,679 |
| **Total** | **106.92** | **96,993** | **55.90** | **50,712** |

*Iredell County emissions for nonattainment area only

**Table 4-3. Highway Mobile Source VOC Emissions North Carolina Portion of the Metrolina Nonattainment Area**

| County | 2013 | | 2025 | |
|---|---|---|---|---|
| | VOC (tons/day) | VOC (kg/day) | VOC (tons/day) | VOC (kg/day) |
| Cabarrus | 6.05 | 5,491 | 3.53 | 3,202 |
| Gaston | 4.67 | 4,240 | 2.57 | 2,331 |
| Iredell* | 4.32 | 3,920 | 2.45 | 2,223 |
| Lincoln | 2.52 | 2,282 | 1.39 | 1,261 |
| Mecklenburg | 22.91 | 20,783 | 12.64 | 11,467 |
| Rowan | 4.82 | 4,372 | 2.45 | 2,223 |
| Union | 6.03 | 5,467 | 3.64 | 3,302 |
| **Total** | **51.32** | **46,555** | **28.67** | **26,009** |

*Iredell County emissions for nonattainment area only

As part of the consultation process on setting MVEBs, the NCDAQ discussed several options for setting the geographic extent of the MVEBs with the transportation partners. The NCDAQ requested feedback on these options or other alternatives for consideration from the transportation partners. The NCDAQ received feedback from only two of the transportation partners. Therefore, as part of the public comment process, the NCDAQ provided several options for establishing the MVEBs. The options included:

- Option A – county level MVEBs;
- Option B – MVEBs set as grouped counties based on counties that contain a Metropolitan Planning Organization (MPO) and/or Rural Planning Organization (RPO) and a sub-MPO budget for Mecklenburg County;
- Option C – MVEBs set as grouped counties based on counties that contain a Metropolitan Planning Organization (MPO) and/or Rural Planning Organization (RPO);
- Option D – MVEBs set for Cabarrus Rowan MPO (CRMPO), one MVEB for the remaining MPOs and RPOs and a sub-MPO budget for Mecklenburg County.

During the public comment period, comments regarding geographical extent for the MVEBs were received from the USEPA, CRMPO and the Mecklenburg Union MPO (MUMPO). The USEPA preferred Option A and CRMPO preferred Options B or C. MUMPO requested that Mecklenburg County not have separate sub-MPO budget, that county level MVEBs not be set and that NCDAQ consider an alternative option similar to Option D without the sub-MPO budget for Mecklenburg County.

After considering the comments received, the NCDAQ has chosen to establish MVEBs based on Option C. This option is consistent with the CRMPO request and takes into consideration two of the comments from MUMPO. The NCDAQ believes that this option is a good compromise between how MVEBs have been established in the past, addressing the NCDAQ's concern with Mecklenburg County's on-road mobile source emissions and the preferences of the transportation partners. Further, the NCDAQ believes this approach provides additional flexibility to the transportation partners while providing adequate assurance that the ozone standard will be maintained in the region.

Therefore, MVEBs are set for the CRMPO (Cabarrus and Rowan Counties), for the Gaston Urban Area MPO and Lake Norman RPO (Gaston, Iredell, and Lincoln Counties), and for the MUMPO and Rocky River RPO (Mecklenburg and Union Counties). Tables 4-4 through 4-6 below provide the NOx and VOC MVEBs in kilograms per day, for transportation conformity purposes, for 2013 and 2025. Upon the USEPA's affirmative adequacy finding for these sub-area MVEBs, they will become the applicable MVEBs for transportation conformity.

**Table 4-4. Cabarrus-Rowan MPO MVEB in kilograms per day**

| | 2013 | | | | 2025 | | | |
|---|---|---|---|---|---|---|---|---|
| | NOx | | VOC | | NOx | | VOC | |
| | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day |
| Base Emissions | 19,838 | 21.87 | 9,863 | 10.87 | 9,961 | 10.98 | 5,425 | 5.98 |
| Safety Margin Allocated to MVEB | 1,984 | 2.19 | 986 | 1.09 | 1,992 | 2.20 | 1,085 | 1.20 |
| **Conformity MVEB** | **21,822** | **24.05** | **10,849** | **11.96** | **11,953** | **13.18** | **6,510** | **7.18** |

Includes all of Cabarrus and Rowan Counties

**Table 4-5. Gaston Urban Area MPO/Lake Norman RPO MVEB in kilograms per day**

| | 2013 | | | | 2025 | | | |
|---|---|---|---|---|---|---|---|---|
| | NOx | | VOC | | NOx | | VOC | |
| | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day |
| Base Emissions | 19,957 | 22.00 | 10,442 | 11.51 | 10,360 | 11.42 | 5,815 | 6.41 |
| Safety Margin Allocated to MVEB | 2,211 | 2.44 | 1,168 | 1.29 | 2,181 | 2.40 | 1,232 | 1.36 |
| **Conformity MVEB** | **22,168** | **24.44** | **11,610** | **12.80** | **12,541** | **13.82** | **7,047** | **7.77** |

Includes all of Gaston and Lincoln Counties and the nonattainment area of Iredell Co

**Table 4-6. Mecklenburg-Union MPO/Rocky River RPO MVEB in kilograms per day**

| | 2013 | | | | 2025 | | | |
|---|---|---|---|---|---|---|---|---|
| | NOx | | VOC | | NOx | | VOC | |
| | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day | kg/day | ton/day |
| Base Emissions | 57,198 | 63.05 | 26,250 | 28.93 | 30,391 | 33.50 | 14,769 | 16.28 |
| Safety Margin Allocated to MVEB | 4,303 | 4.74 | 2,002 | 2.21 | 5,337 | 5.88 | 2,609 | 2.88 |
| **Conformity MVEB** | **61,501** | **69.79** | **28,252** | **31.14** | **35,728** | **39.38** | **17,378** | **19.16** |

Includes all of Mecklenburg and Union Counties

New Safety Margins

A total of 8,498 kg/day (9.37 tons/day) and 9,510 kg/day (10.48 tons/day) of 2013 and 2025 NOx safety margin, respectively, were added to the MVEB for the Metrolina area. A total of 4,156 kg/day (4.58 tons/day) and 4,926 kg/day (5.43 tons/day) of the 2013 and 2025 VOC safety margin, respectively, were added to the MVEB for the Metrolina area. The revised safety margins, which take into consideration the portion of the safety margin applied to the MVEB, for each projected year is listed below in Table 4-7.

**Table 4-7. New Safety Margins for the North Carolina Portion of the Metrolina Nonattainment Area**

| Year | Original Safety Margin | | Calculated Increase in MVEB | | New Safety Margins | |
|---|---|---|---|---|---|---|
| | NOx (TPD) | VOC (TPD) | NOX (TPD) | VOC (TPD) | NOx (TPD) | VOC (TPD) |
| 2013 | -54.57 | -19.96 | 9.37 | 4.58 | -45.20 | -15.38 |
| 2016 | -80.94 | -31.18 | | | -80.94 | -31.18 |
| 2019 | -99.49 | -36.18 | | | -99.49 | -36.18 |
| 2022 | -109.71 | -37.81 | | | -109.71 | -37.81 |
| 2025 | -117.86 | -33.38 | 10.48 | 5.43 | -107.38 | -27.95 |

# 5.0 STATE IMPLEMENTATION PLAN APPROVAL

## 5.1 INTRODUCTION

For an area to be redesignated and have an approved maintenance plan, the SIP must include evidence of compliance with the rules relied on to show maintenance of the standard. This section provides the evidence of compliance with such rules for the Charlotte-Gastonia-Rock Hill 1997 8-hour ozone nonattainment area.

## 5.2 EVIDENCE OF COMPLIANCE

Two counties in the Metrolina area (Gaston and Mecklenburg Counties) were designated as moderate nonattainment for 1-hour ozone effective January 1992. Since a redesignation demonstration and maintenance plan was submitted for this area prior to November 15, 1992, the CAA requirements for moderate areas were not required with the exception of the inspection and maintenance program. An inspection and maintenance program was established in the Metrolina area as prescribed by the 1990 CAA. Therefore, North Carolina has a fully approved SIP for this area.

For the 1997 8-hour ozone standard, the NCDAQ submitted to the USEPA for approval the Metrolina Attainment Demonstration SIP on June 15, 2007 and a Supplement to the Attainment Demonstration SIP on April 5, 2010. The Reasonable Further Progress (RFP) SIP was submitted to the USEPA for approval on June 15, 2007 and a Revised RFP SIP was submitted on November 30, 2009.

Additionally, the following rules regulating emissions of VOCs and/or NOx in Metrolina nonattainment area counties have been approved, or have been submitted with a request to be approved, as part of the SIP:

15A NCAC 2D .0958, Work Practices For Sources of Volatile Organic Compounds,
15A NCAC 2D .0530, Prevention of Significant Deterioration,
15A NCAC 2D .0925, Petroleum Liquid Storage in Fixed Roof Tanks,
15A NCAC 2D .0926, Bulk Gasoline Plants,
15A NCAC 2D .0927, Bulk Gasoline Terminals,
15A NCAC 2D .0928, Gasoline Service Stations Stage I,
15A NCAC 2D .0932, Gasoline Truck Tanks and Vapor Collection Systems,
15A NCAC 2D .0933 Petroleum Liquid Storage in External Floating Roof Tanks
15A NCAC 2D .1000, Motor Vehicle Emission Control Standards.
15A NCAC 2D .1200, Control and Emissions from Incinerators
15A NCAC 2D .1409(b), Stationary Internal Combustion Engines
15A NCAC 2D .1416 - .1423, NOx SIP rules

15A NCAC 2D .1600, General Conformity
15A NCAC 2D .1700, Municipal Solid Waste Landfills, and
15A NCAC 2D .1900, Open Burning
15A NCAC 2D .2000, Transportation Conformity
15A NCAC 2D .2400 Clean Air Interstate Rules

Rules 15A NCAC 2D .0925, .0926, .0927, .0928, .0932, .0933, .0948, .0949, and .0958 have been approved as part of the SIP and are applicable across the state regardless of the size of the source.

Section 15A NCAC 2D .1000 also regulates emissions from motor vehicles in the North Carolina counties in and around the Metrolina nonattainment area and requires the use of the on board diagnostic system, which will indicate NOx emissions as well as other pollutants.

Section 15A NCAC 2D .1200 regulates the controls and emissions from incinerators. Part of this rule has been submitted as part of the SIP, while .1205, .1206 and .1210 are part of the CAA Section 111(d) plans.

Two rules are conformity related, 15A NCAC 2D .1600 and .2000. General conformity related projects are covered under Section .1600, while transportation conformity related projects are covered under Section .2000. Although neither of these rules require reduction in emissions, they do ensure that federal actions do not hinder attainment or maintenance of the NAAQS.

North Carolina has adopted an open burning rule, 15A NCAC 2D .1900, that prohibits open burning of vegetative material during Air Quality Action Days of Code Orange or higher in forecasted areas of the State. Ozone forecasts are issued for the Raleigh-Durham-Chapel Hill area from May 1$^{st}$ through September 30$^{th}$, therefore this area is covered by this rule.

Section 15A NCAC 2D .2400 regulates nitrogen oxide emissions from electric generating units with a nameplate capacity of 25 megawatts or more producing electricity for sale. Section 15A NCAC 2D .2400 also covers industrial boilers that are covered under the NOx SIP rules. This Section replaces the NOx SIP rules beginning January 1, 2009. Although North Carolina did not rely on the emission reductions from CAIR for maintenance of the 1997 8-hour ozone standard, these regulations will result in additional reductions in NOx emissions regionally.

Another important set of rules that control volatile organic compound emissions in these counties is Section 15A NCAC 2D .1100, Control of Toxic Air Pollutants. These rules, however, have not been submitted to the USEPA to be approved as part of the SIP.

There are two other rules that control emissions of volatile organic compounds in these areas. They are 15A NCAC 2D .0524, New Source Performance Standards, and 2D.1110, National Emission Standards for Hazardous Air Pollutants. Also, rule 2D.1111, Maximum Achievable Control Technology applies to control of emissions of volatile organic compounds. They are not part of the SIP, but the USEPA has delegated the State enforcement authority for standards that have been adopted by the State. (The standards adopted by the State are state-enforceable regardless of the USEPA delegation.)

## 6.0 STATE COMPLIANCE WITH CLEAN AIR ACT REQUIREMENTS

Section 107(d)(3)(E)(v) of the CAA requires that the provisions of Section 110 and part D of the Act be met within the area to be redesignated. This means that North Carolina must meet all requirements, if any, that had come due as of the date of the redesignation request.

The USEPA, in its latest guidance on redesignation requirements (as contained in a memorandum from John Calcagni, Director, Air Quality Management Division, Office of Air Quality Planning and Standards to the USEPA Regional Offices dated September 4, 1992, see Appendix A), states that "For the purposes of redesignation, a State must meet all requirements of Section 110 and Part D that were applicable prior to submittal of the complete redesignation request. When evaluating a redesignation request, Regions should not consider whether the State has met requirements that come due under the Act after submittal of a complete redesignation request."

Monitoring is one of the requirements of Section 110. The NCDAQ commits to continue operating the current ozone monitors in the North Carolina portion of the Metrolina 1997 8-hour ozone nonattainment area, providing sufficient funding is available for continued operation. Any monitor shutdowns or relocations will only be made with the approval of USEPA. No plans are underway to discontinue operation, relocation or otherwise affect the integrity of the ambient monitoring network in place. The current monitors are operated consistent with 40 CFR Part 58 and any changes will only be made if they are consistent with 40 CFR Part 58.

The NCDAQ has submitted to the USEPA for adoption into the SIP: an attainment demonstration SIP; a reasonable further progress SIP; and a reasonable available control technology SIP. The NCDAQ believes that North Carolina has met all of the requirements of Section 110 and Part D.

## 7.0 CONCLUSION

The most recent three years of ozone monitoring data for the Charlotte-Gastonia-Rock Hill nonattainment area demonstrate compliance with the NAAQS for 1997 8-hour ozone. Since the 1990's, there have been many major programs enacted in North Carolina that have led to significant actual, enforceable emissions reductions, which have led to improvements in the air quality in the Metrolina area. Additionally, the maintenance plan demonstrates that the projected emissions inventories for 2025, the final year of the maintenance plan and ten years beyond the expected redesignation year, as well as the interim years, are all less than the base year emissions inventory. Therefore, maintenance of the 1997 8-hour ozone NAAQS has also been demonstrated.

This redesignation demonstration and maintenance plan has been prepared to meet the requirements of the 1990 Clean Air Act Amendments.