Redesignation Demonstration

and

Maintenance Plan

for

The Raleigh-Durham-Chapel Hill, North Carolina 8-Hour Ozone Nonattainment Area

Prepared by

North Carolina Department of Environment and Natural Resources

Division of Air Quality

June 7, 2007

Preface: This document contains the technical support for North Carolina's Division of Air Quality to request the Raleigh-Durham-Chapel Hill 8-hour ozone nonattainment area be redesignated as attainment for the 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 8-hour ozone national ambient air quality standard (NAAQS) is 0.08 parts per million (ppm). An exceedance of the 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.

Raleigh-Durham-Chapel Hill Nonattainment Designation

The area surrounding Raleigh-Durham-Chapel Hill, North Carolina, called the Triangle area, was designated nonattainment for the 8-hour ozone NAAQS on April 30, 2004 (69 Federal Register 23858). The Triangle nonattainment area includes Durham, Franklin, Granville, Johnston, Orange, Person and Wake Counties and Baldwin, Center, New Hope and Williams Townships in Chatham County. 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 Triangle area was 0.094 ppm.

Current Air Quality

There are currently eight ozone monitors located throughout the Triangle nonattainment area. The latest design value for the nonattainment area is 0.080 ppm based on the data from 2004-2006, and is therefore in attainment of the 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 Triangle 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, off-road engine standards.

This combination of State and Federal actions have resulted in cleaner air in the Triangle area, and the anticipated future benefits from these programs are expected to result in continued maintenance of the 8-hour ozone NAAQS in this region. A baseline year emissions inventory for NOx and VOC's was developed for 2005, since the design value for the 2004-2006 period showed attainment of the 8-hour ozone NAAQS. Future year emissions inventories were also developed for the interim years 2008, 2011, 2014, and a final year emission inventory was developed for 2017. The future year emissions were lower than the 2005 emissions in all cases. This demonstrates that the Triangle area is expected to maintain the 8-hour ozone NAAQS through 2017, 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 Raleigh-Durham-Chapel Hill nonattainment area to attainment. The monitoring data clearly shows that the region has attained the 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 listed above.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

Acronym	Definition
^{o}F	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 only 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 8-hour standards. An exceedance of the 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’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 RALEIGH-DURHAM-CHAPEL HILL AIR QUALITY HISTORY

On April 15, 2004, the USEPA designated the Raleigh-Durham-Chapel Hill, North Carolina area (referred to as the Triangle area) as “basic” nonattainment for the 8-hour ozone standard (Figure 1) based on the ambient data from 2001-2003. At that time, the design value for the

Triangle area was 0.094 ppm. The Triangle nonattainment area includes Durham, Franklin, Granville, Johnston, Orange, Person and Wake Counties and Baldwin, Center, New Hope and Williams Townships in Chatham County. 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 new 8-hour ozone standard, this area had been maintenance for the 1-hour ozone standard.

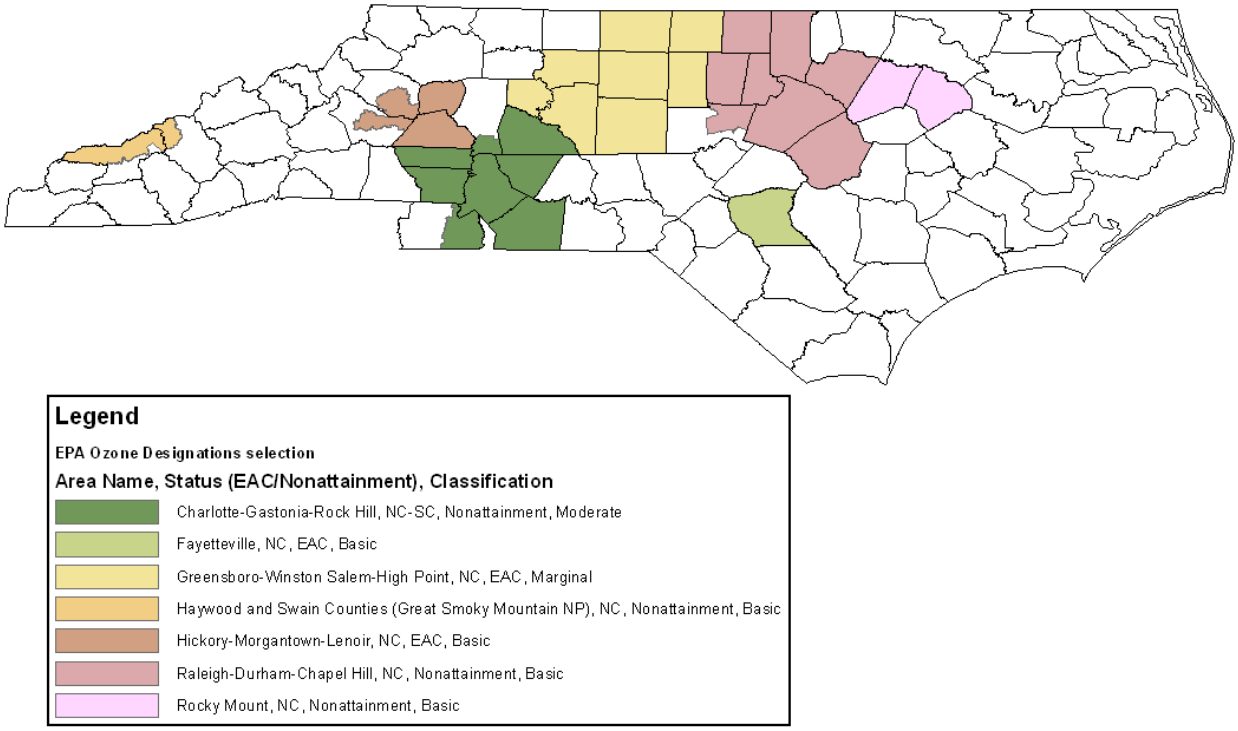

Figure 1. USEPA Designated 8-Hour Ozone Nonattainment Areas in North Carolina

There are currently eight ozone monitors in the Triangle nonattainment area, located in seven counties. In 2005, all but one monitor, Butner located in Granville County, came into attainment of the 8-hour ozone NAAQS. With the completion of the 2006 ozone season, this monitor attained the standard as well. The 2004-2006 design value for Triangle nonattainment area is 0.080 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 North Carolina Department of Environment and Natural Resources, Division of Air Quality (NCDAQ) will provide the technical data necessary to show that the Raleigh-Durham-Chapel Hill nonattainment area has attained and is expected to maintain the 8-hour ozone standard, and has met the requirements for redesignation set forth above.

2.0 AIR QUALITY

2.1 HISTORIC AIR QUALITY (1997 – 2005)

The NCDAQ has collected ambient monitoring data for the Triangle area since the late seventies. At the time of the 8-hour ozone designations, there were ten ozone monitors throughout the Triangle area (Figure 2). These monitors were installed in accordance with the Code of Federal Regulations (CFR) 40 CFR 58. Since then, two of the monitors have been shut down.

In 2004, the St. Augustine monitor, at St. Augustine College in Wake County, was shut down because the college planned to build on the land where the monitor was located. Since the Triangle area has more monitors than what was required, and the Milbrook site in Wake County is located in close proximity to the former St. Augustine site, a new monitoring site will not be established. In 2005, the WRAL tower monitor was shut down due to painting of the tower. This site was a research site with monitors located at different elevations of the tower. The painting of the tower was completed in 2006, at which time NCDAQ had discussions with WRAL to resume monitoring. WRAL increased the rental cost to use the tower to $50,000 per year, double what it had previously been. NCDAQ does not have the resources to cover this cost, therefore this monitoring site will not be re-established at this time. The remaining eight ozone monitors provide adequate coverage of the entire nonattainment area.

Figure 2. Ozone Monitor Locations in the Triangle Nonattainment Area

Tables 2-1 and 2-2 below show the air quality data and corresponding design values for the monitors in the Triangle nonattainment area, respectively, from 1997 to 2005. As you can see from Table 2-2, most of these monitors were in violation of the 8-hour ozone NAAQS for much of this period.

Table 2-1 Triangle Area's Historic 4th Highest 8-hour Ozone Values (1997-2005)

Monitor	4th Highest 8-hour Ozone Values (ppm)								
	1997	1998	1999	2000	2001	2002	2003	2004	2005
Pittsboro AIRS ID #37-037-0004 Chatham County	0.089	0.088	0.088	0.080	0.077	0.094	0.075	0.068	0.079
Duke Street AIRS ID #37-063-0013 Durham County	0.080	0.095	0.089	0.089	0.084	0.100	0.084	0.074	0.076
Franklinton AIRS ID #37-069-0001 Franklin County	0.097	0.097	0.085	0.088	0.085	0.100	0.087	0.077	0.080
Butner AIRS ID #37-077-0001 Granville County	0.099	0.098	0.080	0.091	0.094	0.098	0.090	0.081	0.085
West Johnston AIRS ID #37-101-0002 Johnston County	0.092	0.092	0.101	0.082	0.078	0.097	0.080	0.074	0.083
Bushy Fork AIRS ID #37-145-0003 Person County	-----	0.093	0.098	0.082	0.088	0.102	0.083	0.076	0.079
Millbrook AIRS ID #37-183-0014 Wake County	0.097	0.099	0.108	0.087	0.089	0.100	0.089	0.075	0.082
St. Augustine AIRS ID #37-183-0015 Wake County	0.095	0.096	0.102	0.089	0.088	0.107	0.079	-----	-----
Fuquay-Varina AIRS ID #37-183-0016 Wake County	0.075	0.099	0.092	0.086	0.082	0.095	0.089	0.077	0.085
WRAL Tower AIRS ID #37-183-0017 Wake County	0.095	0.097	0.105	0.082	0.077	0.096	0.084	0.079	-----

Table 2-2 Triangle Area's Historic Design Values (1997 - 2005)

Monitor	Design Value (ppm)						
	97-99	98-00	99-01	00-02	01-03	02-04	03-05
Pittsboro AIRS ID #37-037-0004 Chatham County	**0.088**	**0.085**	0.081	0.083	0.082	0.079	0.074
Duke Street AIRS ID #37-063-0013 Durham County	**0.088**	**0.091**	**0.087**	**0.091**	**0.089**	**0.086**	0.078
Franklinton AIRS ID #37-069-0001 Franklin County	**0.093**	**0.090**	**0.086**	**0.091**	**0.090**	**0.088**	0.081
Butner AIRS ID #37-077-0001 Granville County	**0.098**	**0.094**	**0.092**	**0.094**	**0.094**	**0.089**	**0.085**
West Johnston AIRS ID #37-101-0002 Johnston County	**0.095**	**0.091**	**0.087**	**0.085**	**0.085**	0.083	0.079
Bushy Fork AIRS ID #37-145-0003 Person County	-----	**0.091**	**0.089**	**0.090**	**0.091**	**0.087**	0.079
Millbrook AIRS ID #37-183-0014 Wake County	**0.101**	**0.098**	**0.094**	**0.092**	**0.092**	**0.088**	0.082
St. Augustine AIRS ID #37-183-0015 Wake County	**0.097**	**0.095**	**0.093**	**0.094**	**0.091**	-----	-----
Fuquay-Varina AIRS ID #37-183-0016 Wake County	**0.088**	**0.092**	**0.086**	**0.087**	**0.088**	**0.087**	0.083
WRAL Tower AIRS ID #37-183-0017 Wake County	**0.099**	**0.094**	**0.088**	**0.085**	**0.085**	**0.086**	-----

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

2.2 RECENT AIR QUALITY VALUES (2004 –2006)

The most recent three years of ozone monitoring data (2004-2006) for the Raleigh-Durham-Chapel Hill, North Carolina nonattainment area demonstrate compliance with the 8-hour ozone NAAQS. Table 2-3 is a summary of the fourth highest 8-hour average at the monitors in the nonattainment area for 2004-2006 and the design value.

Table 2-3 Triangle Area's Current Air Quality Data (2004 -2006)

Monitor	Year	4th Highest 8-hour ozone values (ppm)	Design Value (ppm) 2004-2006
Pittsboro AIRS ID #37-037-0004 Chatham County	2004	0.068	0.071
	2005	0.079	
	2006	0.066	
Duke Street AIRS ID #37-063-0013 Durham County	2004	0.074	0.075
	2005	0.076	
	2006	0.075	
Franklinton AIRS ID #37-069-0001 Franklin County	2004	0.077	0.077
	2005	0.080	
	2006	0.074	
Butner AIRS ID #37-077-0001 Granville County	2004	0.081	0.080
	2005	0.085	
	2006	0.075	
West Johnston AIRS ID #37-101-0002 Johnston County	2004	0.074	0.076
	2005	0.083	
	2006	0.072	
Bushy Fork AIRS ID #37-145-0003 Person County	2004	0.076	0.075
	2005	0.079	
	2006	0.071	
Millbrook AIRS ID #37-183-0014 Wake County	2004	0.075	0.078
	2005	0.082	
	2006	0.078	
Fuquay-Varina AIRS ID #37-183-0016 Wake County	2004	0.077	0.078
	2005	0.085	
	2006	0.072	

The 2006 8-hour ozone monitoring data for the Triangle area has been fully quality assured (QA'ed) and was officially submitted to the USEPA on June 4, 2007.

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 will require 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 will assist in lowering the NOx emissions.

- Heavy-duty gasoline and diesel highway vehicle standards: Began to take effect in 2004 and is designed to reduce NOx and VOC emissions.

- Nonroad spark-ignition engines and recreational engines standards: Began to take effect in 2003 and will reduce NOx and HC emissions.

The state measures that have been implemented include:

- Clean Air Bill: Expanded the inspection and maintenance (I/M) program from 9 counties to 48. It was phased-in in the Triangle nonattainment area from July 1, 2002 through July 1, 2004.

- Open burning ban: The rule prohibits open burning in areas that NCDAQ forecasts ozone and will reduce NOx and VOC emissions, as well as CO and fine particulate matter.

- Air toxics control program: The rule was effective in 1990 and reduce VOC emissions across the state.

- Heavy duty diesel engine gap filling rule: This rule requires engine manufacturers to perform the supplemental testing requirements for heavy duty diesel engines for model years 2005 and 2006 due to delays in the USEPA's rule. It was estimated to reduce the 2005 emissions in North Carolina by 5.3 tons per day and 10.9 tons per day in 2006.

- NOx State Implementation Plan (SIP) Call rule: This rule will result in a 68 percent reduction in NOx emissions from the State's large stationary combustion sources by 2006.

A recent review of the NOx emissions in the USEPA's acid rain database shows a reduction in over 36,000 tons of NOx from the utilities subject to the NOx SIP call between 2002 and 2005. Table 2-4 presents the annual emissions for the North Carolina sources in the USEPA acid rain database.

Table 2-4. NOx Emissions from NC Sources in USEPA Acid Rain Database

Year	Annual NOx Emissions from NC Sources (Tons)
2002	142,564.7
2003	129,461.2
2004	115,422.7
2005	106,386.8

Table 2-5 displays the NOx emission reductions, as the result of the NOx SIP call rule, from power plants in the Triangle nonattainment area, as well as the largest power plant just due west of the Triangle area that may be impacting the nonattainment area. There are three facilities located within the Triangle area located in Person and Chatham Counties, however the Chatham County facility is not within the nonattainment area. The facility west of the Triangle area is Belews Creek, located in Stokes County. This data is also from the USEPA acid rain 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 almost 26,000 tons of NOx reduction in the 2005 ozone season compared to 2002. This is a 71% reduction in utility NOx emissions that are permanent and enforceable.

Table 2-5. April – September NOx Emissions for Utilities Effecting Triangle Area (tons/period)

Facility	County	2002	2003	2004	2005
Roxboro	Person	10,045	6,801	7,245	4,371
Mayo	Person	4,703	4,595	1,630	1,165
Cape Fear	Chatham	1,089	998	1,052	1,113
Belews Creek	Stokes	20,632	13,446	7,042	3,852
Total	-----	36,469	25,840	16,969	10,501

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 4th 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 3 shows the relationship of exceedance days to high temperature days from 1996 through 2005 for the Triangle monitors. The relationship between the maximum 4th highest ozone value to high temperature days from 1996 through 2005 is displayed in Figure 4.

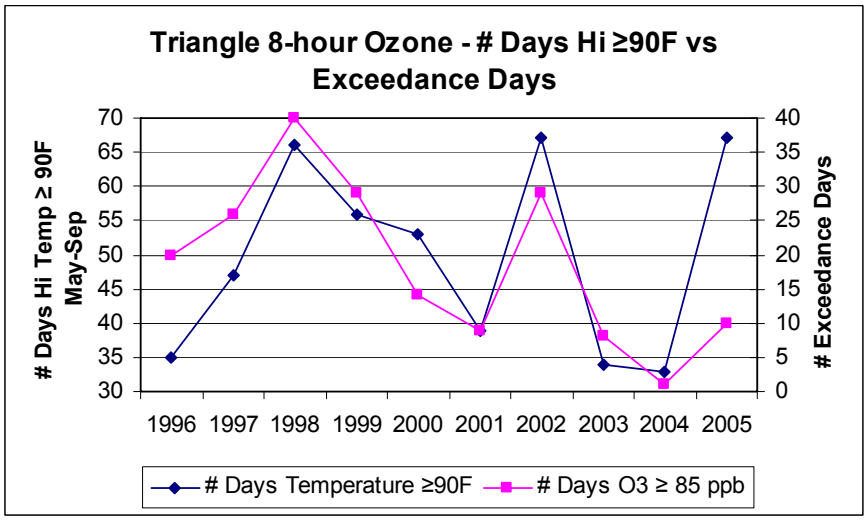

Figure 3. Relationship Between High Temperature Days and Number of Exceedance Days in the Triangle Area

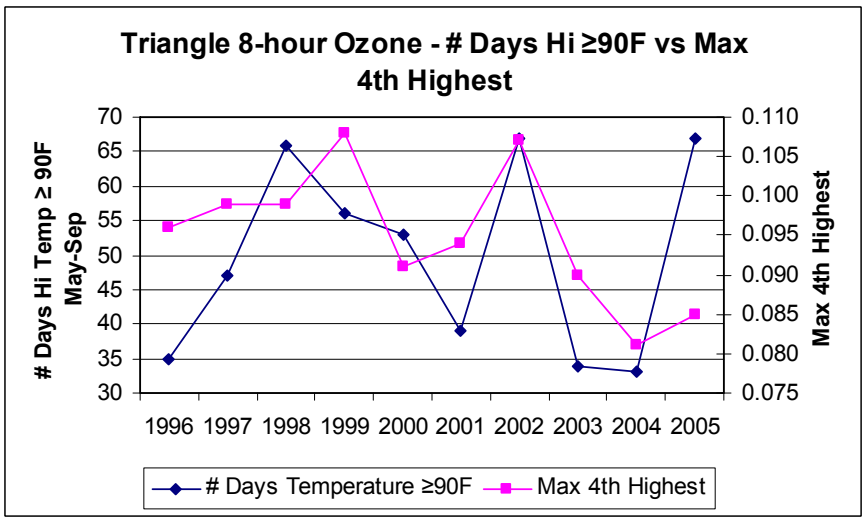

Figure 4. Relationship Between High Temperature Days and Maximum 4th Highest Ozone Value in the Triangle Area

It is important to see how the ozone levels have changed between 2002 and 2005 in response to lower NOx emissions in the State. In 2002, there were 67 days when the temperature was 90 ºF or greater, and the Triangle monitors observed 29 exceedance days of the 8-hour ozone NAAQS with the maximum 4th highest value being 0.107 ppm. In 2005, there were the same number of hot days, 67, but only ten exceedance days occurred during the ozone season with the maximum 4th highest value being 0.085 ppm. North Carolina believes that this represents compelling evidence that the improvement in air quality is due to the real, permanent and enforceable reduction 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 8-hour ozone in the Raleigh-Durham-Chapel 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, cleaner engine programs, and low sulfur gasoline and low sulfur diesel fuel programs.

The NCDAQ has implemented programs that will remain enforceable and are hereby submitted as the plan to ensure that maintenance of the 8-hour ozone standard will continue. Sources are prohibited from reducing emission controls (anti-backsliding) 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 2005 was chosen since it is a year that falls within the attaining design value period of 2004-2006 and some emissions inventory data was already developed for this year. The interim years chosen were: 2008, 2011, and 2014 since the USEPA recommends three-year increments for interim years. The final year of the maintenance demonstration is 2017, since the CAA requires maintenance for at least ten years after redesignation. The maintenance demonstration consists of a comparison between the 2005 baseline emissions inventory and the projected emissions inventories (for 2008, 2011, 2014 and 2017), which consider economic and population growth. The comparison shows that the total emissions in each of the interim years and the final year will be lower than in the base year, which demonstrates maintenance of the 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 8-hour ozone. The secondary trigger will be a monitored air quality pattern that suggests an actual 8-hour ozone NAAQS violation may be imminent.

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 air toxics 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 will require all passenger vehicles in a manufacturer's fleet, including light-duty trucks and Sports Utility Vehicles (SUVs), to meet an average standard of 0.07 grams of NOx per mile. Implementation began in 2004, and most vehicles will be phased in by 2007. Tier 2 standards will also cover passenger vehicles over 8,500 pounds gross vehicle weight rating (the larger pickup trucks and SUVs), which are not covered by current Tier 1 regulations. For these vehicles, the standards will be phased in beginning in 2008, with full compliance in 2009. The new standards require vehicles to be 77% to 95% cleaner than those on the road today. Tier 2 rule also reduces 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 but interferes with the operation of catalytic converters on vehicles resulting in higher NOx emissions. Lower-sulfur gasoline is necessary to achieve Tier 2 vehicle emission standards.

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, beginning in 2007, will reduce particulate matter from heavy-duty highway engines, and will also 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 existing engines using higher-content sulfur diesel.

Large Nonroad Diesel Engines Rule

The USEPA promulgated in May 2004 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%. Nonroad diesel fuel currently averages about 3,400 ppm sulfur. The proposed rules limit nonroad diesel sulfur content to 500 ppm in late 2006 and 15 ppm in 2010. The combined engine and fuel rules would reduce NOx and PM emissions from large nonroad diesel engines by over 90 %, compared to current nonroad engines using higher-content sulfur diesel.

Nonroad Spark-Ignition Engines and Recreational Engines Standard

The new standard, effective in July 2003, regulates NOx, HC and carbon monoxide (CO) for groups of previously unregulated nonroad engines. The new standard will apply to all new engines sold in the United States and imported after these standards begin and will apply 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 CO and PM levels in urban areas. Tier 1 of this standard was implemented in 2004 and Tier 2 is scheduled to start in 2007. Like the large spark-ignition, recreational vehicles contribute to ozone formation and ambient CO and PM levels. They can also be a factor in regional haze and other visibility problems in both state and national parks. For the off-highway motorcycles and all-terrain-vehicles, model year 2006, the new exhaust emissions standard will be phased-in by 50% and for model years 2007 and later at 100%. 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 PM levels, especially in marinas. Depending on the size of the engine, the standard for will begin phase-in in 2006.

When all of the nonroad spark-ignition engines and recreational engines standards are fully implemented, an overall 72% reduction in HC, 80% reduction in NOx, and 56% reduction in CO emissions are expected by 2020. These controls will help reduce ambient concentrations of ozone, CO, and fine PM.

3.2.2 State Control Measures

North Carolina has adopted a number or regulations and legislation 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 from 9 counties to 48, phased in between July 1, 2002 through January 1, 2006 (see Figure 5). Vehicles will be tested using the onboard diagnostic system, an improved method of testing, which will indicate NOx emissions, among other pollutants. The previously used tailpipe test did not measure NOx. The effective dates for the counties in the Triangle nonattainment area are listed below.

County	Date
Chatham	January 1, 2004
Durham	July 1, 2002
Franklin	January 1, 2004
Granville	July 1, 2004

County	Date
Johnston	July 1, 2003
Orange	July 1, 2002
Wake	July 1, 2002

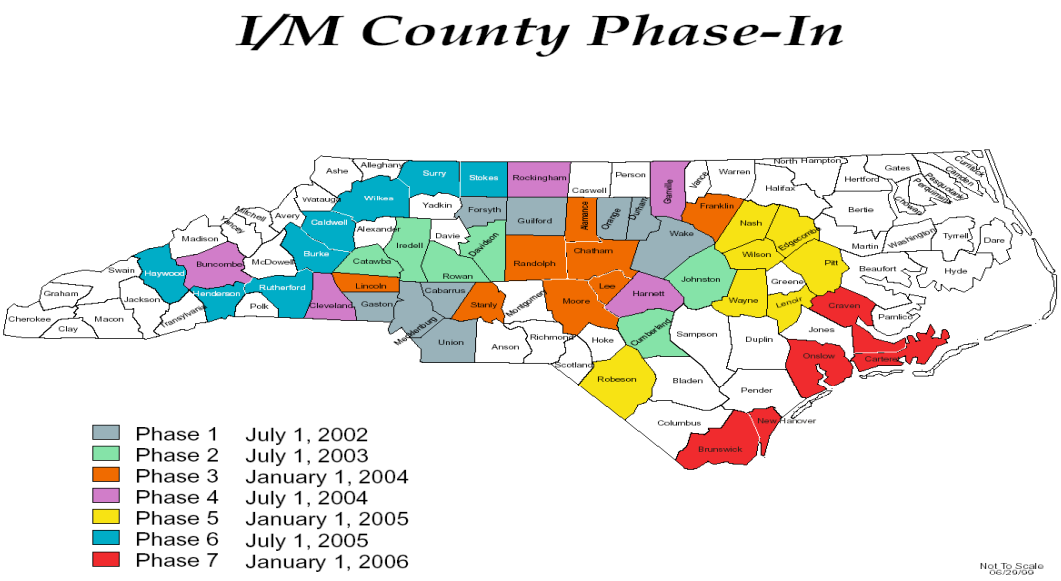

Figure 5. North Carolina's NOx Inspection & Maintenance (I/M) Phase-In Map

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 electrical 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.

Besides amending existing NOx rules and adopting new NOx rules specifically to address the USEPA NOx SIP call, the North Carolina rules also require new sources to control emissions of NOx. The objective of this requirement is (1) to aid in meeting the NOx budget for North Carolina for minor sources and (2) to aid in attaining and maintaining the ambient air quality standard for ozone in North Carolina.

North Carolina's NOx SIP Call rule will reduce summertime NOx emissions from power plants and other industries by 68% by 2006. The North Carolina Environmental Management Commission adopted rules requiring the reductions in October 2000.

Clean Smokestacks Act

In June 2002, the North Carolina General Assembly enacted the Clean Smokestacks Act, requiring coal-fired power plants to reduce annual NOx emissions by 78% by 2009. These power plants must also reduce annual sulfur dioxide emissions by 49% by 2009 and by 74% by 2013. 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, this legislation provides a model for other states in controlling multiple air pollutants from old coal-fired power plants.

Open Burning Bans

The Environmental Management Commission approved revisions to the open burning regulation banning open burning during the ozone season on forecasted code orange and code red ozone action days for those counties that the NCDAQ forecasts ozone. Since 1998, the NCDAQ has forecasted ozone in the Triangle area; therefore, the following counties in the Triangle area are subject to this rule: Chatham, Durham, Franklin, Granville, Johnston, Orange, Person, Vance, and Wake Counties.

Air Toxics Control Program

Although the purpose of North Carolina's air toxic program is to control toxic air pollutants rather than volatile organic compounds, it will also reduce emissions of volatile organic compounds because many toxic air pollutants are also volatile organic compounds. The air toxic program was effective May 1, 1990. All new facilities are required to comply with the air toxic rules before beginning operation. Existing facilities that are modified such that there are additional emissions of toxic air pollutants are required to comply with the air toxic rules.

Prevention of Significant Deterioration

All new major sources of volatile organic compounds and nitrogen dioxide will be evaluated under the prevention of significant deterioration program and are required to use best available control technology.

Heavy Duty Diesel Engine Gap Filling Requirements

In October of 2001, the Environmental Management Commission adopted a rule to fill a gap in federal requirements for improved heavy duty diesel engine emissions testing in order to prevent excess NOx emissions from occurring over the lengthy life of such vehicles. Without the rule, estimated excess NOx emissions of 5.3 tons per day would occur in 2005 and 10.91 tons per day in 2006 from heavy-duty diesels registered in North Carolina. The rule requires that all model year 2005 and 2006 heavy-duty diesel engines sold, leased, or registered in North Carolina to be of the type which have been certified by the California Air Resources Board as meeting supplemental test procedures that are more representative of actual on-road operating conditions than the federal test procedures for those model years. On January 1, 2002, the rule became effective.

3.2.3 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 ozone forecast. The NCDAQ produces the 8-hour ozone forecasts and corresponding air quality index for the Triangle 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 emissions analyses in the ozone conformity determinations.

The public and interested parties will be 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) and the CAA as amended.

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 dispersion modeling. The approach used by the NCDAQ is the comparison of emissions inventories for the years 2005 and 2017.

For the maintenance demonstration, the base year of 2005 was chosen since it is a year that falls within the attaining design value period of 2004-2006 and some emissions inventory data was already developed for this year. The maintenance demonstration is made by comparing the 2005 baseline emissions inventory to the 2017 projected emissions inventory. The baseline emissions inventory represents an emission level for a period when the ambient air quality standard was not violated, 2004-2006. 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 2005 baseline to demonstrate that these years are also expected to show continued maintenance of the 8-hour ozone standard.

The emissions inventories are comprised of four major types of sources: point, area, highway mobile and off-road mobile. The projected emissions 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.

3.3.2 Emission Inventories

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

Point sources are those stationary sources that emit more than 10 tons per year VOC or 100 tons per year of NOx 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. 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 year's inventory, point sources are adjusted by growth factors based on Standard Industrial Classification codes. The growth factors are generated using the USEPA's Economic Growth Analysis System version 5.0 (E-GAS 5.0) program.

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 when applicable, by E-GAS 5.0 growth factors.

For highway mobile sources, the USEPA's MOBILE6.2 mobile model is run to generate the twelve functional road class (i.e. urban interstate, rural interstate, rural local, etc.) emission factors. The emissions are calculated by multiplying the road class vehicle miles traveled (VMT) by the road class emission factor and summed to the county level. For the projected years' inventories, the highway mobile sources emissions are calculated by running the MOBILE6.2 mobile model for the future year to generate emission factors that take into consideration expected Federal tailpipe standards, fleet turnover and new fuels. The new emission factors are multiplied by the projected VMT.

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 NONROAD2005c nonroad mobile model, with the exception of the railroad locomotives and aircraft engine. The railroad locomotive and aircraft engine emissions are estimated by taking an activity 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 NONROAD2005c nonroad mobile model, E-GAS 5.0 growth factors or projected landing and take off data for aircraft.

A complete description of how these inventories were developed is discussed in detail in Appendix C.

3.3.3 Summary of Emissions

The tables below contain the estimated emissions from all of the emission source sectors, i.e., point, area, highway mobile and off-road mobile. Additionally, the sum total of these man-made emissions for the Triangle nonattainment area is tabulated in Table 3-5.

Table 3-1 Point Source Emissions for the Triangle Nonattainment Area

County	2005	2008	2011	2014	2017
VOC Emissions (tons/day)					
Chatham*	0.00	0.00	0.00	0.00	0.00
Durham	1.18	1.29	1.47	1.53	1.65
Franklin	1.59	1.74	1.86	2.02	2.2
Granville	1.93	2.15	2.35	2.55	2.78
Johnston	2.36	2.58	2.84	3.1	3.37
Orange	0.28	0.31	0.35	0.38	0.42
Person	0.95	1.03	1.08	1.18	1.25
Wake	3.99	4.14	4.5	4.85	5.27
Total	12.28	13.24	14.45	15.61	16.94
NOx Emissions (tons/day)					
Chatham*	0.02	0.02	0.02	0.03	0.03
Durham	1.86	2.05	2.17	2.34	2.49
Franklin	0.16	0.18	0.18	0.2	0.23
Granville	0.28	0.32	0.33	0.34	0.37
Johnston	0.62	0.67	0.71	0.81	0.89
Orange	1.55	1.63	1.64	1.65	1.65
Person	32.43	27.12	27.79	28.26	27.41
Wake	1.45	1.56	1.66	1.8	1.97
Total	38.37	33.55	34.50	35.43	35.04

* Includes only those sources within the nonattainment area of Chatham County

Table 3-2 Area Source Emissions for the Triangle Nonattainment Area

County	2005	2008	2011	2014	2017
VOC Emissions (tons/day)					
Chatham*	2.42	2.91	3.05	3.19	3.33
Durham	7.05	7.41	7.78	8.10	8.50
Franklin	5.17	5.62	6.00	6.36	6.71
Granville	5.30	5.67	6.05	6.39	6.72
Johnston	12.20	13.28	14.42	15.39	16.38
Orange	5.01	5.27	5.50	5.74	6.00
Person	4.01	4.29	4.55	4.76	4.98
Wake	26.10	28.49	30.66	32.87	35.18
Total	67.26	72.94	78.01	82.80	87.80
NOx Emissions (tons/day)					
Chatham*	0.37	0.39	0.41	0.42	0.45
Durham	2.04	2.13	2.22	2.30	2.38
Franklin	0.55	0.57	0.62	0.67	0.69
Granville	0.47	0.49	0.50	0.51	0.55
Johnston	1.35	1.43	1.50	1.59	1.73
Orange	1.15	1.21	1.24	1.29	1.34
Person	0.34	0.36	0.38	0.39	0.39
Wake	6.75	7.07	7.37	7.70	8.02
Total	13.02	13.65	14.24	14.87	15.55

* Chatham County emissions adjusted for nonattainment area only.

Table 3-3 Highway Mobile Source Emissions for the Triangle Nonattainment Area

County	2005	2008	2011	2014	2017
VOC Emissions (tons/day)					
Chatham*	1.03	1.01	0.98	0.85	0.76
Durham	8.26	6.73	5.80	4.85	4.23
Franklin	1.90	1.68	1.55	1.31	1.13
Granville	1.82	1.50	1.27	1.06	0.95
Johnston	6.27	5.54	5.01	4.21	3.65
Orange	3.95	3.24	2.80	2.36	2.09
Person	1.43	1.21	1.05	0.90	0.80
Wake	22.81	18.80	16.67	14.70	13.57
Total	47.47	39.71	35.130	30.24	27.18
NOx Emissions (tons/day)					
Chatham*	1.62	1.50	1.22	1.02	0.84
Durham	16.72	13.11	9.04	6.21	4.55
Franklin	2.41	2.05	1.68	1.29	1.03
Granville	5.76	4.44	3.12	2.10	1.50
Johnston	14.84	12.61	9.72	7.11	5.47
Orange	12.84	9.97	6.98	4.78	3.45
Person	1.60	1.29	1.05	0.85	0.70
Wake	45.89	36.69	26.19	19.42	15.05
Total	101.68	81.66	59.00	42.78	32.59

* Chatham County emissions for nonattainment area only.

Table 3-4 Non-Road Mobile Source Emissions for the Triangle Nonattainment Area

County	2005	2008	2011	2014	2017
VOC Emissions (tons/day)					
Chatham*	0.79	0.67	0.58	0.55	0.52
Durham	4.72	4.02	3.63	3.44	3.34
Franklin	0.87	0.72	0.63	0.61	0.61
Granville	0.82	0.68	0.62	0.60	0.62
Johnston	2.74	2.41	2.23	2.13	2.05
Orange	3.39	3.25	3.06	2.86	2.58
Person	0.98	0.83	0.72	0.68	0.67
Wake	16.47	13.66	12.52	12.41	12.62
Total	30.78	26.24	23.99	23.28	23.01
NOx Emissions (tons/day)					
Chatham*	0.79	0.69	0.62	0.51	0.41
Durham	7.11	6.26	5.33	4.32	3.42
Franklin	1.60	1.42	1.19	0.97	0.77
Granville	0.85	0.75	0.66	0.55	0.46
Johnston	4.78	4.34	3.88	3.39	2.95
Orange	2.86	2.60	2.34	1.99	1.62
Person	0.80	0.71	0.63	0.52	0.44
Wake	19.63	18.13	16.44	14.27	12.18
Total	38.42	34.90	31.09	26.52	22.25

* Chatham County emissions adjusted for nonattainment area only.

Table 3-5 Total Man-Made Emissions for the Triangle Nonattainment Area

County	2005	2008	2011	2014	2017
VOC Emissions (tons/day)					
Chatham*	4.24	4.59	4.61	4.59	4.61
Durham	21.21	19.45	18.68	17.92	17.72
Franklin	9.53	9.76	10.04	10.30	10.65
Granville	9.87	10.00	10.29	10.60	11.07
Johnston	23.57	23.81	24.50	24.83	25.45
Orange	12.63	12.07	11.71	11.34	11.09
Person	7.37	7.36	7.40	7.52	7.70
Wake	69.37	65.09	64.35	64.83	66.64
Total	157.79	152.13	151.58	151.93	154.93
NOx Emissions (tons/day)					
Chatham*	2.80	2.60	2.27	1.98	1.73
Durham	27.73	23.55	18.76	15.17	12.84
Franklin	4.72	4.22	3.67	3.13	2.72
Granville	7.36	6.00	4.61	3.50	2.88
Johnston	21.59	19.05	15.81	12.90	11.04
Orange	18.40	15.41	12.20	9.71	8.06
Person	35.17	29.48	29.85	30.02	28.94
Wake	73.72	63.45	51.66	43.19	37.22
Total	191.49	163.76	138.83	119.60	105.43

* Chatham 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 2005 baseline emissions. The following table summarized the VOC and NOx emissions for the entire Triangle nonattainment area. The difference between the base year and the final year of the plan illustrates that the continued maintenance of the 8-hour ozone NAAQS is expected.

Although there is a slight increase in VOC emissions between 2014 and 2017, the NCDAQ does not believe this is inconsistent with the maintenance demonstration. First, the 2017 emissions are still below the baseline emissions for 2005. Secondly, the Triangle area is considered a NOx limited area 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. Approximately 90% of the VOC emissions come from biogenic, or natural, sources, which cannot be controlled. Therefore a slight increase in man-made VOC emissions in 2017 will not result in an increase in ozone formation.

Table 3-6 Maintenance Demonstration for Raleigh-Durham-Chapel Hill

Year	VOC TPD	NOx TPD
2005	157.79	191.49
2008	152.13	163.76
2011	151.58	138.83
2014	151.93	119.60
2017	154.93	105.43
Difference from 2005 to 2017	-2.86	-86.06

The difference between the attainment level of emissions (2005) from all man-made sources and the 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 is listed below in Table 3-7.

Table 3-7 Safety Margin for Raleigh-Durham-Chapel Hill

Year	VOC TPD	NOx TPD
2005	N/A	N/A
2008	-5.66	-27.73
2011	-6.21	-52.66
2014	-5.86	-71.89
2017	-2.86	-86.06

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 8-hour ozone NAAQS at any of the Triangle area monitors. The secondary trigger will be a monitored air quality pattern that suggests an actual 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 will commence analyses to determine what additional measures, if any, will be necessary to attain or maintain the 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. Each adopted rule will include a schedule that will require compliance with the rule no later than 3 years after adoption of the rule. 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) to the projected inventory, and to the attainment year inventory contained in this maintenance plan. The CERR reporting years coincide with 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 8-hour ozone standard, or when the three-year average of the 4th highest values is equal to or greater than 0.085 ppm at a monitor in the Triangle nonattainment area. The trigger date will be 60 days from the date that the State observes a 4th 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 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 4th highest values are 0.085 ppm or greater at a single monitor within the Triangle 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 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 Triangle 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 oberserves 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 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 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 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 in the Triangle nonattainment area counties, diesel inspection and maintenance program, implementation of diesel retrofit programs, including incentives for performing retrofits, and additional controls in upwind areas.

Once the tertiary trigger is activated, the Planning Section of the NCDAQ 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 is completed, the NCDAQ will work with the local air awareness program and develop an outreach plan to identify 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 the local air awareness coordinator to implement the plan for the following ozone season.

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. The NCDAQ will commit to review these emissions inventories to determine if an unexpected growth in NOx emissions in the Triangle area may endanger the maintenance of the 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 8-hour ozone standard.

Additionally, under the CERR the NCDAQ is required to develop a comprehensive, annual, statewide emissions inventory every three years and is due eighteen months after the completion of the inventory year. The CERR inventory years coincide with the baseline, interim and final years of the maintenance plan. Therefore, the NCDAQ commits to compare the CERR

inventories as they are developed with the maintenance plan to determine if additional steps are necessary for continued maintenance of the 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 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.

4.2 HIGHWAY MOBILE SOURCE VOC INSIGNIFICANCE

Section 93.109(k) in the Transportation Conformity Rule Amendments for the new 8-hour ozone and fine particulate matter NAAQS addresses areas with insignificant motor vehicle emissions. The rule suggests that such a finding would be based on a number of factors, including the percentage of motor vehicle emissions in the context of the total SIP inventory, the current state of air quality as determined by monitoring data for that NAAQS, the absence of SIP motor vehicle control measures, and historical trends and future projections of the growth of motor vehicle emissions. Although there is a vehicle control measure in place in the Triangle area, an inspection and maintenance program, the current program was established for additional reductions in NOx emissions. There are incidental VOC emissions reductions as a result of this program, approximately 2 tons per day in 2005, however it is not believed the reduction of VOC emissions resulted in decreased ozone levels.

The NCDAQ has examined the sources of VOC emissions and their contribution to ozone formation in North Carolina. Because of the generally warm and moist climate of North Carolina, vegetation abounds in many forms, and forested lands naturally cover much of the state. The biogenic sector is the most abundant source of VOC emissions in North Carolina and accounts for approximately 90% of the total VOC emissions statewide. The overwhelming abundance of biogenic VOC emissions makes the majority of North Carolina a NO_x limited environment for the formation of ozone. This holds true in the Triangle area.

Also noteworthy are the projected decreases in highway mobile VOC emissions through the year 2017 despite projected VMT increases. These reductions are due mainly to the retirement of older vehicles and the growing fleet of Tier 2 vehicles on the roads in future years. Some additional reductions are attributable to North Carolina's inspection and maintenance program.

Additionally, the NCDAQ has performed a number of modeling sensitivities to determine the impact of highway mobile source VOCs on ozone formation in the Triangle area. The results of these sensitivities indicate no change in future ozone concentrations in the Triangle area when highway mobile VOCs are significantly changed. These sensitivities are discussed in more detail in Appendix C.3.

The NCDAQ believes highway mobile VOCs are insignificant contributors to ozone formation in the Triangle nonattainment area. Emission estimates indicate highway mobile VOC is a small percentage of the total VOC emissions inventory. Highway mobile VOC emissions are projected to decrease into the future, notwithstanding VMT increases. The area is currently well below the NAAQS and emission sensitivity modeling indicates no change in future ozone concentrations when VOC emissions are significantly changed. For these reasons, the NCDAQ will not be setting MVEB for VOC for the Triangle nonattainment area. NCDAQ will revisit the setting of MVEB for VOC if there is indication that the Triangle area has become VOC sensitive for ozone formation.

4.3 SAFETY MARGIN

As stated in Section 3.3.4, a safety margin is the difference between the attainment level of emissions from all source categories (i.e., point, area, and mobile) and the projected level of emissions from all source categories. The safety margins for the Triangle area are listed in Table 3-7 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 to vehicle mix assumptions, etc. that will influence the emission estimations. The NCDAQ has developed and implemented a four-step approach for determining a percentage factor to use to calculate the amount of safety margin to apply to the MVEB and it is outlined in Appendix C.3. The percent increase to the MVEBs for the Triangle nonattainment area are listed in the table below.

Table 4-1 Percent Increase To Mobile Vehicle Emissions Budget

County	2008	2017
Chatham	15%	25%
Durham	10%	20%
Franklin	10%	20%
Granville	15%	25%
Johnston	10%	20%
Orange	10%	20%
Person	15%	25%
Wake	10%	20%

Motor Vehicle Emission Budgets

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

The NCDAQ received comments from several of the transportation partners regarding the geographic extent of the MVEBs. Some of the partners wanted county-by-county budgets; others wanted regional budgets. Copies of the letters received can be found in Appendix B. Upon careful consideration of all arguments, NCDAQ decided to move forward with setting county-by-county MVEBs. NCDAQ believes that the concerns raised in the requests for regional budgets can be addressed by adding to the safety margins for the areas of concern.

Additionally, there was discussion through the interagency consultation process on the years to set MVEBs for the Triangle 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, 2017). Through the interagency consultation process, it was decided that another MVEBs would be set for the year 2008 in the Triangle maintenance plan.

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 how the emission factors used to calculate mobile emissions are created. The MOBILE model generates the emission factors in grams per mile. In past conformity exercises, there have been some issues with conversion to tons per day, as well as concerns with how the MVEBs were rounded to the hundredth place. Setting MVEBs in kilograms per day will avoid these issues in future conformity determinations.

The table below shows the counties with their highway mobile NOx emissions expressed in tons per day and the corresponding kilograms per day values for 2008 and 2017.

Table 4-2 Highway Mobile Source NOx Emissions Triangle Nonattainment Area

County	2008			2017	
	Tons/day	Kg/day		Tons/day	Kg/day
Chatham*	1.50	1,361		0.84	758
Durham	13.11	11,915		4.55	4,133
Franklin	2.05	1,862		1.03	949
Granville	4.44	4,043		1.50	1,371
Johnston	12.61	11,439		5.47	4,965
Orange	9.97	9,030		3.45	3,118
Person	1.29	1,182		0.70	633
Wake	36.69	33,286		15.05	13,627
Total	81.66	74,118		32.59	29,554

* Chatham County emissions for nonattainment area only.

The NCDAQ will set MVEB, for transportation conformity purposes, as county budgets within the Triangle maintenance area for 2008 and 2017. Tables 4-3 through 4-10 below list out the NOx MVEBs in kilograms per day, for transportation conformity purposes, by county for the years 2008 and 2017. Upon the USEPA's affirmative adequacy finding for these county level sub-area MVEBs, these MVEBs will become the applicable MVEBs for each county.

Table 4-3 Chatham County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	1,361	758
Safety Margin Allocated to MVEB	204	190
NOx Conformity MVEB	**1,565**	**948**

Table 4-4 Durham County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	11,915	4,133
Safety Margin Allocated to MVEB	1,191	827
NOx Conformity MVEB	**13,106**	**4,960**

Table 4-5 Franklin County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	1,862	949
Safety Margin Allocated to MVEB	186	190
NOx Conformity MVEB	**2,048**	**1,139**

Table 4-6 Granville County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	4,043	1,371
Safety Margin Allocated to MVEB	606	343
NOx Conformity MVEB	**4,649**	**1,714**

Table 4-7 Johnston County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	11,439	4,965
Safety Margin Allocated to MVEB	1,144	993
NOx Conformity MVEB	**12,583**	**5,958**

Table 4-8 Orange County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	9,030	3,118
Safety Margin Allocated to MVEB	903	624
NOx Conformity MVEB	**9,933**	**3,742**

Table 4-9 Person County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	1,182	633
Safety Margin Allocated to MVEB	177	158
NOx Conformity MVEB	**1,359**	**791**

Table 4-10 Wake County MVEB in kilograms per day

	2008	2017
NOx Emissions (kg/day)		
Base Emissions	33,286	13,627
Safety Margin Allocated to MVEB	3,329	2,725
NOx Conformity MVEB	**36,615**	**16,352**

New Safety Margins

A total of 7,741 kg/day (8.53 tons/day) and 6,049 kg/day (6.67 tons/day) of 2008 and 2017 NOx safety margin, respectively, were added to the MVEB for the Triangle 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 4-11.

Table 4-11 New Safety Margins for the Triangle Area

Year	VOC TPD	NOx TPD
2005	N/A	N/A
2008	-5.66	-19.20
2011	-6.21	-52.66
2014	-5.86	-71.89
2017	-2.86	-79.39

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 Raleigh-Durham-Chapel Hill 8-hour ozone nonattainment area.

5.2 EVIDENCE OF COMPLIANCE

Three counties in the Triangle area (Durham, Wake and part of Granville 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 Triangle as prescribed by the 1990 CAA. Therefore, North Carolina has fully approved SIPs for this area.

Additionally, the following rules regulating emissions of VOCs and/or NOx in Triangle 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

Although 15A NCAC 2D .0925, .0926, .0927, .0928, .0932, and .0933, have been approved as part of the SIP, their applicability to these counties has not been submitted to the USEPA for approval as part of the federally-approved state implementation plan. These rules are, however, state enforceable in these counties. The extension of these rules to these counties was part of the State's air toxic program and not part of any federally mandated program.

Section 15A NCAC 2D .1000 also regulates emissions from motor vehicles in the counties near the Raleigh-Durham-Chapel Hill 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 1st through September 30th, 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.

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 meeting 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 Triangle 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.

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 Raleigh-Durham-Chapel Hill nonattainment area demonstrate compliance with the NAAQS for 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 Triangle area. Additionally, the maintenance plan demonstrates that the projected emissions inventories for 2017, 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 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.