Appendix C.2

Area Source Emissions Inventory Documentation

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List of Acronyms

Acronym	Definition
BTS	Bureau of Transportation Statistics
BTU	British Thermal Units
CNG	Compressed Natural Gas
EF	Emission Factor
EGAS 5.0	Economic Growth Analysis System version 5.0
EIA	Energy Information Administration
EIIP	Emissions Inventory Improvement Program
GF	Growth Factor
LPG	Liquid Petroleum Gas
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NCDAQ	North Carolina Division of Air Quality
NCDFR	North Carolina Division of Forest Resources
NCDOT	North Carolina Department of Transportation
NCSU	North Carolina State University
NEI	National Emissions Inventory
NG	Natural Gas
NH_3	Ammonia
NOx	Nitrogen Oxides
PM	Particulate Matter
QA	Quality Assurance
SCC	Source Classification Code
SIC	Standard Industrial Classification
SO_2	Sulfur dioxide
USEPA	U.S. Environmental Protection Agency
USFA	U.S. Fire Administration
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1. INTRODUCTION AND SCOPE

Area sources represent a collection of many small, unidentified points of air pollution emissions within a specified geographical area, emitting less than the minimum level prescribed for permitted point sources. Because these sources are too small and/or too numerous to be surveyed and characterized individually, all area source activities are collectively estimated. The county is usually the geographic area for which emissions from area sources are compiled, primarily because counties are the smallest areas for which data used for estimating emissions is readily available.

The area source inventories detailed in this section have been developed for the Hickory and Greensboro/Winston-Salem/High Point (referred to as the Triad area) annual fine particulate matter ($PM_{2.5}$) nonattainment areas as part of the process of redesignating the areas from nonattainment to attainment/maintenance for the annual $PM_{2.5}$ standard. The Hickory nonattainment area consists of Catawba County and the Triad nonattainment area consists of Davidson and Guilford Counties. Table 1-1 and 1-2 below shows a summary of the area source total emissions for each nonattainment area. All emissions are calculated on a ton per year basis.

Table 1-1 Hickory Nonattainment Area Source Emissions

	2008	2011	2014	2017	2021
NOx	662	614	566	520	454
SO_2	2,263	2,037	1,808	1,580	1,277
$PM_{2.5}$	682	658	629	606	559

Table 1-2 Triad Nonattainment Area Source Emissions

	2008	2011	2014	2017	2021
NOx	1,826	1,761	1,693	1,632	1,537
SO_2	5,112	4,743	4,375	4,008	3,517
$PM_{2.5}$	1,769	1,692	1,603	1,528	1,382

2.0 OVERALL METHODOLOGY

2.1 Source Category Identification

The area source categories were identified from U. S. Environmental Protection Agency's (USEPA's) guidance document EPA-450/4-91-016, *Procedures for the Preparation of Emission Inventories of Carbon Monoxide and Precursors of Ozone, Vol. 1*, from this point on this document will be referred to as the Procedures document; the USEPA guidance document EPA-454/R-05-001, *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulation*; the *Emissions Inventory Improvement Program (EIIP) Technical Reports, Volume 3, Area Sources* as of December 2002 (the most current version at the time of the inventory development), from this point on this document will be referred to as EIIP Tech Reports.

2.2 Area Source Emission Estimation Approach

Area source emissions are estimated by multiplying an emission factor by some known indicator of collective activity for each source category within the inventory area. An indicator is any parameter associated with the activity level of a source that can be correlated with the air pollutant emissions from that source, such as production, number of employees, or population.

In general, one of the following emissions estimation approaches is used to calculate the area source emissions: per capita emission factors, employment-related emission factors, commodity consumption-related emission factors, and level of activity based emission factors. The emission factors used were obtained from the EIIP Tech. Reports, the Procedures document or the USEPA's *AP-42 Compilation of Air Pollutant Emission Factors, Fifth Edition*, referred to as AP-42.

There are several methods for estimating the activity level for a specific area source category. These are: treating area sources as point sources, surveying local activity levels, apportioning national or statewide activity totals to local inventory areas, using population or employment data. All of these methods were used to estimate area source emissions. For some source categories, 2007 activity data was the latest data available so it was used to estimate the emissions inventory.

Some of the area source categories utilize population for the emissions estimation. The base year (2008) and future year population projections, for years 2011, 2014, 2017 and 2021, were

obtained from the NC Office of State Budget and Management (OSBM) website (www.osbm.state.us.nc). The population for each county is shown in Table 2.2-1 below.

Table 2.2-1 Total County Population

Year	Catawba	Davidson	Guilford
2008	154,972	158,897	468,439
2011	161,146	166,082	493,237
2014	167,351	173,813	518,129
2017	173,556	181,519	543,021
2021	181,829	191,758	576,210

There are a few categories that utilize the rural portion of the total county population. The rural population was determined by multiplying the rural population percentage as reported in the 2000 census, by the total county population (Table 2.2-1). Table 2.2-2 below shows the rural population percentage and Table 2.2-3 shows the rural portion of the county total.

Table 2.2-2 2000 Census Rural Population Percentages

COUNTY	Rural Population Percentage
Catawba	35.1%
Davidson	56.9%
Guilford	16.2%

Table 2.2-3 2008 Rural Population

COUNTY	Rural Population
Catawba	54,395
Davidson	90,412
Guilford	75,887

There are a number of categories where emissions were calculated with emission factors based on employment. The employment numbers were obtained from the on-line U.S. Census Bureau County Business Patterns at the county level for North Carolina.

Certain emission categories were adjusted for such things as rule effectiveness and rule penetration. These are discussed in the particular source categories descriptions.

For creating future year emission estimates for many source categories, the base year emissions inventory was projected with a source category specific growth factor generated with the USEPA's Economic Growth Analysis System version 5.0 (E-GAS 5.0) program.

For certain categories, there can be overlap between the point source emissions and the area source emissions calculated with emission factors. The point source emissions in these categories were identified so that they could be subtracted where appropriate.

3. QUALITY ASSURANCE OF EMISSIONS INVENTORY

Many emission estimation methods are based on AP-42 factors, located on the USEPA website at http://www.epa.gov/ttn/chief/ap42/, factors given in the Procedures document, and factors given in the documents of the Emission Inventory Improvement Program website located at http://www.epa.gov/ttn/chief/eiip/. Sources of error would primarily be associated with multiplier values, data entry errors, and the accuracy of formulas.

Under the direction of the quality assurance coordinator, emission sources whose contribution was either at the high or low end of the range of estimates were scrutinized more closely for reasonableness. The accuracy was addressed by performing independent checks of the calculations. In addition, the raw data used in the calculations were verified to make sure transference to the spreadsheets was accomplished accurately. Furthermore, the formulas used to calculate the emissions were reviewed and checked for correctness. Random independent checks of the calculations were also performed to ensure the accuracy of the inventory.

4. DISCUSSION OF AREA SOURCE CATEGORIES

Area sources represent a collection of many small, unidentified points of air pollution emissions within a specified geographical area, emitting less than the minimum level prescribed for permitted point sources. Because these sources are too small and/or too numerous to be surveyed and characterized individually, all area source activities are collectively estimated. The county is the geographic area for which emissions from area sources are compiled, primarily because counties are the smallest areas for which data used for estimating emissions is readily available. Volatile organic compounds (VOC) and ammonia (NH_3) emissions have been deemed insignificant for the Hickory and Triad nonattainment areas therefore, only the source categories that emit $PM_{2.5}$, nitrogen oxides (NOx) and sulfur dioxide (SO_2) emissions were calculated. Emissions are calculated on an annual basis in tons per year.

4.1 Forest Fires

There are two types of forest fires; wild fires, which are accidental or felonious fires and prescribed burns, which are intentionally set for the purpose of forest and/or grassland management practice. The number of acres burned in 2008 for wild fires were ascertained from the North Carolina Division of Forest Resources (NCDFR) and are listed in Table 4.1-1.

Table 4.1-1 Acres of Land Burned by Wild Fires

	Total Number of Wild Fires
Catawba	2,378
Davidson	680
Guilford	1,114

The makeup of the plant life burned in each fire can vary from woodland to brush to grassland. The emission factors for the southern region of the United States from AP-42, Section 13.1, were used to estimate the emissions from forest burns. The emission factors are 17 pounds per ton for total particulate matter per unit mass of forest fuel consumed and 4 pounds per ton NOx per unit mass of forest fuel consumed. According to AP-42, the SO_2 emissions for wild fires are negligible. The fuel loading consumed (mass of forest fuel per unit land are burned) for the southern region is 9 tons per acre.

For the base year 2008 and future year emission inventories, it is assumed that the number of acres burned remains relatively constant and therefore the emissions do not change from year to year.

The emissions for 2008 were calculated using Equation 4.1-1.

$$EM_P = (\text{\# acres burned}) \times EF_P \times L \qquad 4.1\text{-}1$$

where EM_P = emissions for source category for pollutant (P)
EF_P = emission factor for pollutant (P)
L = fuel loading consumed = 9 ton/acre

The $PM_{2.5}$ and NOx emission estimates, in tons/year, from wildfires for the Hickory and Triad nonattainment area are listed in Table 4.1-2.

Table 4.1-2 Emissions from Wildfires

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	43	43	43	43	43
Triad Area					
Davidson	12	12	12	12	12
Guilford	20	20	20	20	20
Triad Total	32	32	32	32	32
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	182	182	182	182	182
Triad Area					
Davidson	52	52	52	52	52
Guilford	85	85	85	85	85
Triad Total	137	137	137	137	137

The US Forest Service provided prescribed fires emissions for the federally owned lands in Davidson County. The U.S. Forest Service used the CONSUME 3.0 model to calculate the prescribed fires emissions for $PM_{2.5}$ emissions. The CONSUME 3.0 model does not calculate NOx emissions therefore, NOx emission factor outlined in AP-42, Section 13.1 was used to determine the NOx emissions.

The NCDFR had 5 prescribed burns in Davidson County and 1 prescribed burn in Guilford County. There were no prescribed burns in Catawba County. The NCDFR supplied the number of acres and tons burned in Davidson and Guilford Counties for these prescribed fires as shown in Table 4.1-3 below. The emissions for the prescribed burns were determined using equation 4.1-1. The following table illustrates the number of acres and tons burned per county.

Table 4.1-3 Acres and Tons Burned from the NCDFR Prescribed Fires

County	Acres Burned	Tons Burned
Davidson	362	1,823
Guilford	25	125

The emissions for Davidson and Guilford Counties from prescribed fires are shown in Table 4.1-4 below.

Table 4.1-4 Emissions from Prescribed Fires

Pollutant/County	**2008**	**2011**	**2014**	**2017**	**2021**
NOx Emissions (tons/year) Triad Area					
Davidson	155	155	155	155	155
Guilford	0	0	0	0	0
Triad Total	155	155	155	155	155
Total $PM_{2.5}$ Emissions (tons/year) Triad Area					
Davidson	380	380	380	380	380
Guilford	1	1	1	1	1
Triad Total	381	381	381	381	381

4.2 Structure Fires

Burning fires can produce short term emissions of organic compounds and NOx. The U.S. Fire Administration (USFA) of the Department of Homeland Security maintains statistics on the number of fires nationally. The number of fires per person per year was derived from 2008 national population statistics and 2008 USFA national fire statistics. The USFA 2008 fire

structures statistics were obtained from the USFA website at http://www.USFA.DHS.gov/statistics/. A fires per person per year factor was calculated based on the number of national structure fires and U.S. population equating to 0.00133 fires/person/year. The 2008 county population values are shown in Table 2.2-1. The 0.00133 fires per person per year was applied to the 2008 population for each county to determine the number of fires in each county for 2008.

The emission factors and fuel loading factors were obtained from the EIIP Tech. Reports, Table 18.4-1 and Table 18.4-2, respectively. The emission factors are 11 pounds of VOC per ton burned, 1.4 pounds of NOx per ton burned, and 10.8 pounds $PM_{2.5}$ per tons burned. The emission factor used for $PM_{2.5}$ is a conservative estimate based on the total particulate matter. The loading factor is 1.15 tons of material burned per structural fire.

The base year emissions were projected using E-GAS 5.0 growth factors, listed in Table 4.2-1, to calculate the future year inventories.

Table 4.2-1 Growth Factors for Structure Fires

2011	2014	2017	2120
0.988	1.017	1.080	1.171

The emissions for the 2008 base year emissions inventory and future emissions projections were calculated using Equations 4.2-1 and 4.2-2, respectively.

$$EM_P = \frac{(\text{2008 County population}) \times (FPP) \times (CF) \times (EF_P)}{(\text{2000 lb/tons})} \qquad 4.2\text{-}1$$

$$PJ_bEM_a = EM_a \times GF_{ab} \qquad 4.2\text{-}2$$

where EM_P = emissions for structure fires for pollutant (P)
FPP = fires per person in 2008, 0.00133 fires/person/year
CF = Conversion factor, 1.15 tons burned/structure fire
EF_P = emission factor for pollutant (P)
PJ_bEM_a = projected future year (b) emissions for county in redesignation area ton/year
GF_{ab} = growth factor for base year (a) to future year (b)

The NOx and $PM_{2.5}$ emissions estimates, in tons/year, from structure fires are listed in Table 4.2-2.

Table 4.2-2 Emissions from Structure Fire

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	1	1	1	1	1
Triad Total	1	1	1	1	1
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	3	3	3	3	3
Triad Area					
Davidson	2	2	2	2	2
Guilford	6	6	6	6	7
Triad Total	8	8	8	8	9

4.3 Open Burning – Municipal Solid Waste and Yard Trimmings

This subsection describes the combined emission inventory methodology for residential open burning and open burning – yard trimmings. Open burning is treated as a means of waste disposal in rural areas. Materials burned generally include agricultural refuse, landscaping refuse, or scrap wood. In North Carolina, it is illegal to burn municipal solid waste anywhere in the state. However, the North Carolina Division of Air Quality (NCDAQ) realizes that this type of burning occurs, so it is included in the emissions inventory. However, rule effectiveness, rule penetration and control efficiency factors are applied to the emission estimates.

It was assumed that all municipal solid waste (MSW) and yard trimmings were burned in the open for solid waste generated outside the municipal corporate limits. According to the EIIP Tech. Reports, Table 16.5-1, it is estimated that 3.77 pounds of MSW is generated per person per day and 0.64 pounds of yard trimmings are generated per person per day. The 2008 rural population per county (see Table 2.2-3) was used to apportion the emissions to the county level.

NOx and SO_2 emission factors for open burning of MSW were obtained from EIIP Tech. Reports, Table 16.4-1, Open Burning of Municipal Refuse. The emission factors are 34.8 pounds $PM_{2.5}$ per ton MSW burned, 6 pounds NOx per ton MSW burned and 1 pound SO_2 per ton MSW burned.

The $PM_{2.5}$ emission factor, 38 pounds $PM_{2.5}$ per ton yard trimming, for open burning of yard trimmings was obtained from EIIP Tech. Reports, Chapter 16, Table 16.4-7.

The future year emissions inventories were calculated from the base year projections using E-GAS 5.0 growth factors, listed in Table 4.3-2, to calculate the future year emission inventories.

Table 4.3-2 Growth Factors for Open Burning

2011	2014	2017	2120
1.042	1.086	1.130	1.188

The emissions from the burning of municipal solid waste and yard trimmings for the base year 2008 inventory were calculated using equations 4.3-1 and 4.3-2. The future year emissions projections were calculated using equation 4.3-3.

$$EM_{P,MSW} = \frac{(\text{Rural Population in 2008}) \times (CF_{MSW}) \times (EF_P) \times (365 \text{ days/year})}{(2000 \text{ lb/tons})} \quad 4.3\text{-}1$$

$$EM_{P,YT} = \frac{(\text{Rural Population in 2008}) \times (CF_{YT}) \times (EF_P) \times (365 \text{ days/year})}{(2000 \text{ lb/tons})} \quad 4.3\text{-}2$$

$$PJ_aEM = EM_P \times GF_a \quad 4.3\text{-}3$$

where $EM_{P,MSW}$ = emissions from burning MSW for pollutant (P)
$EM_{P,YT}$ = emissions from burning yard trimmings for pollutant (P)
CF_{MSW} = conversion factor, 3.77 lb MSW/person/day
= 0.001885 ton MSW/person/day
CF_{YT} = conversion factor, 0.64 lb yard trimmings/person/day
= 0.00032 ton yard trimmings/person/day
EF_P = emission factor for pollutant (P)
PJ_aEM = projected future year (a) emissions for county
GF_a = growth factor for future year (a)

Since the NCDAQ has an open burning regulation that prohibits the burning of man-made materials, the emissions estimated for MSW were reduced to account for this rule. The control efficiency is 100% since no burning yields no emissions. The rule penetration is also 100% since the regulation prohibits the burning of man-made materials statewide. Finally the rule effectiveness was set to a conservative 50% for the base year since the NCDAQ know that burning of man-made materials does occur. The NCDAQ has started an aggressive campaign to make the public aware that it is illegal to burn man-made materials. The NCDAQ has sponsored radio ads as well as billboard signs in an effort to educate the public. Additionally, the NCDAQ has developed an educational video discussing open burning and the State's regulation. This video has been distributed to the fire departments across the State. Finally, at the 2009 North Carolina State Fair, the NCDAQ had a booth that allowed staff to talk with the general public about the open burning regulations and provide hand outs that discussed what was legal to burn. The NCDAQ expects that as the public becomes more aware of the open burning regulations, the rule effective will increase to 75% by 2021. A gradual increase in the rule effectiveness for the interim years was applied. The table below displays the rule effective numbers used in calculating the emissions.

Table 4.3-3 Rule Effectiveness for MSW Open Burning

2008	2011	2014	2017	2120
0.50	0.56	0.62	0.67	0.75

The formula used to apply these factors to the emissions estimates is shown below in equations 4.3-4 and 4.3-5.

$$EM_{P,MSW,Controlled} = (EM_{P,MSW}) \times (1 - (CE \times RP \times RE)) \quad 4.3\text{-}4$$

$$PJ_aEM_{Controlled} = PJ_aEM \times (1 - (CE \times RP \times RE)) \quad 4.3\text{-}5$$

where $EM_{P,MSW,Controlled}$ = controlled emissions from burning MSW for pollutant (P)
$EM_{P,MSW}$ = emissions from burning MSW for pollutant (P)
CE = control efficiency (1)
RP = rule penetration
RE = rule effectiveness
$PJ_aEM_{Controlled}$ = controlled projected future year (a) emissions for county
PJ_aEM = projected future year (a) emissions for county

The open burning emissions from municipal solid waste and yard trimmings, in tons/year, are listed in Table 4.3-4 and Table 4.3-5, respectively.

Table 4.3-4 Emissions from Municipal Solid Waste

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	56	51	46	42	33
Triad Area					
Davidson	94	86	77	70	56
Guilford	79	72	65	58	47
Triad Total	173	158	142	128	103
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	10	9	8	7	6
Triad Area					
Davidson	16	14	13	12	9
Guilford	13	12	11	10	8
Triad Total	29	26	24	22	17
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	326	299	269	243	194
Triad Area					
Davidson	541	497	447	404	322
Guilford	454	417	375	339	270
Triad Total	995	914	822	743	592

Table 4.3-5 Emissions from Yard Trimmings

Pollutant/County	2008	2011	2014	2017	2021
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	121	126	131	136	143
Triad Area					
Davidson	63	65	68	71	75
Guilford	73	76	79	82	86
Triad Total	136	141	147	153	161

4.4 On-Site Incineration

On-site incineration is the confined burning of waste leaves, landscape refuse and other refuse or rubbish. In North Carolina, commercial/institutional and industrial incinerators are required to have an Air Quality Permit in order to operate. Therefore, all industrial incinerators are identified in the point source inventory. There may be small commercial/institutional incinerators that have not been identified in the point source inventory and as a result emissions were calculated for commercial on-site incinerators.

No data was available to determine the amount of waste burned in on-site incinerators. Therefore, the amount of solid waste burned was estimated with the fuel loading factor given in Table 4.6-1 of the Procedures document. The commercial fuel loading factor is 0.023 tons of refuse/year. The yield for commercial incineration was obtained from several sources. The yield of NOx, SO_2 and $PM_{2.5}$ were obtained from AP-42, Table 3.4.7-1 and are listed in Table 4.4-1. The yield values used are from the uncontrolled emission factors for refuse combustors other than municipal waste. The average value is calculated from the single and multiple chambers combustors.

Table 4.4-1 Yield of Pollutant Values for Uncontrolled Refuse Combustors

Pollutant	Multiple Chamber Combustor Yield Value (lb pollutant/ton refuse burned)	Single Chamber Combustor Yield Value (lb pollutant/ton refuse burned)	Average Yield Value (lb pollutant/ton refuse burned)
NOx	3	2	2.5
SO_2	2.5	2.5	2.5
$PM_{2.5}$	7	15	11

The future year emissions inventories were calculated from the base year projections using E-GAS 5.0 growth factors, listed in Table 4.4-2, to calculate the future year inventories. The growth factors for on-site incineration are the same as the open burning growth factors.

Table 4.4-2 Growth Factors for On-Site Incineration

2011	2014	2017	2120
1.042	1.086	1.130	1.188

The emissions for 2008 were calculated using equation 4.4-1 and the emissions for the future years were calculated using equation 4.4-2.

$$EM_P = \frac{(\text{2008 rural population}) \times (LF) \times (EF_P)}{(\text{2000 lb/tons})} \qquad 4.4\text{-}1$$

$$PJ_aEM = EM_P \times GF_a \qquad 4.4\text{-}2$$

where EM_P = emissions for on-site incineration for pollutant (P)
LF = Fuel loading Factory, 0.023 tons refuse burned/person/year
EF_P = emission factor for pollutant (P)
PJ_aEM = projected future year (a) emissions for county in nonattainment area
GF_a = growth factor for future year (a)

The rural population was calculated using the 2000 census data rural population percentage and applying the percentage to the total 2008 population, see Table 2.2-2. According to the Procedures document, on-site incineration occurs uniformly year round and operates 7 days per week. Point source emissions with SCC 5-xx-xxx-xx identified waste incineration emissions. The point source emissions in tons per year were subtracted from the on-site incineration source emissions.

The NOx, SO_2 and $PM_{2.5}$ emissions estimates, in tons/year, from on-site incineration for the Hickory and Triad nonattainment areas are listed in Table 4.4-3 below.

Table 4.4-3 Emissions from On-Site Incineration

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	2	2	2	2	2
Triad Area					
Davidson	3	3	3	3	3
Guilford	2	2	2	2	3
Triad Total	5	5	5	5	6
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	2	2	2	2	2
Triad Area					
Davidson	3	3	3	3	3
Guilford	2	2	2	2	3
Triad Total	5	5	5	5	6
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	7	7	7	8	8
Triad Area					
Davidson	11	12	12	13	14
Guilford	10	10	10	11	11
Triad Total	21	22	22	24	25

4.5 Vehicle Fires

Vehicle fire emissions are estimated by considering the estimated number vehicles burned in the state, the amount of material burned (the fuel loading) in a vehicle fire and the emission factors for the open burning of automobile components. The assumptions for amount of material burned and the emission factors were based on the USEPA's AP-42, Section 2.5 Open Burning.

The estimated number of vehicle fires was determined by apportioning a national fire statistic to a county level. The USFA of the Department of Homeland Security maintains national-level fire statistics. The number of vehicle fires nationwide in 2008 was 236,000 and was available from the USFA website at http://www.USFA.DHS.gov/statistics. The number of national-level vehicle fires was then apportioned to a state-level. The ratio of North Carolina vehicle miles

traveled (VMT) to national VMT (103,598,000,000 VMT / 3,029,822,000,000 VMT) was applied to the number of national-level vehicle fires to obtain the number of North Carolina vehicle fires. The latest VMT information available for both the U.S. and the state is 2007. The U.S. and state VMT statistics were obtained from the U.S. Department of Transportation, Federal Highway Administration website at http://www.fhwa.dot.gov/policy/ohim/hs02/vm2.htm/. The number of state-level vehicle fires was then apportioned to a county level based on the 2008 VMT per county as shown in Table 4.5-1 through 4.5-3. The 2008 county level VMT was obtained from the NC Department of Transportation. The future year VMT was projected using the E-GAS 5.0 model.

Table 4.5-1 Catawba County Vehicle Miles Traveled

Functional Class	2008	2011	2014	2017	2021
Urban Interstate	1,205,670	1,308,253	1,411,432	1,500,373	1,582,047
Urban Freeway or Expressway	380,969	409,388	438,016	486,265	544,270
Urban Other Principal Arterial	1,011,546	1,065,527	1,120,100	1,169,246	1,215,533
Urban Minor Arterial	1,034,709	1,091,506	1,148,770	1,203,608	1,257,116
Urban Collector	321,682	349,200	376,848	402,304	426,633
Urban Local	345,449	374,445	403,850	434,283	465,128
Rural Interstate	74,268	80,041	85,894	92,054	98,345
Rural Other Principal Arterial	237,359	259,937	282,672	305,641	328,686
Rural Minor Arterial	173,455	186,022	198,828	212,146	225,658
Rural Major Collector	124,618	136,729	148,958	160,789	172,393
Rural Minor Collector	250,040	274,203	298,590	321,380	343,315
Rural Local	112,023	120,945	129,990	139,866	150,126
County Total	5,271,788	5,656,196	6,043,948	6,427,955	6,809,250

Table 4.5-2 Davidson County Vehicle Miles Traveled

Functional Class	2008	2011	2014	2017	2021
Urban Interstate	738,564	792,268	829,522	867,483	896,320
Urban Freeway or Expressway	605,434	642,240	701,206	747,071	774,221
Urban Other Principal Arterial	672,579	702,058	717,232	746,199	775,827
Urban Minor Arterial	559,623	588,731	611,477	638,368	660,838
Urban Collector	268,511	295,687	315,138	329,927	338,628
Urban Local	359,726	380,817	400,646	418,693	433,307
Rural Interstate	461,013	472,863	495,240	517,551	532,790
Rural Other Principal Arterial	152,576	149,062	153,229	157,698	157,735
Rural Minor Arterial	408,314	422,673	443,420	476,148	508,971
Rural Major Collector	405,273	413,706	430,398	447,189	458,056
Rural Minor Collector	295,215	310,307	324,936	336,649	342,295
Rural Local	377,797	400,311	420,952	435,963	446,836
County Total	5,304,625	5,570,723	5,843,396	6,118,939	6,325,824

Table 4.5-3 Guilford County Vehicle Miles Traveled

Functional Class	2008	2011	2014	2017	2021
Urban Interstate	3,985,564	4,419,157	4,865,961	5,227,576	5,571,494
Urban Freeway or Expressway	2,251,352	2,452,593	2,613,197	2,905,078	3,275,829
Urban Other Principal Arterial	2,368,151	2,477,254	2,591,662	2,679,083	2,747,293
Urban Minor Arterial	2,727,044	2,837,423	3,012,805	3,147,788	3,247,375
Urban Collector	1,368,123	1,452,017	1,570,260	1,645,148	1,686,518
Urban Local	780,183	815,646	847,770	878,533	907,949
Rural Interstate	989,050	1,090,492	1,229,196	1,351,896	1,457,378
Rural Other Principal Arterial	513,834	545,289	546,548	567,373	595,658
Rural Minor Arterial	244,663	273,514	278,683	287,233	300,400
Rural Major Collector	776,249	838,619	898,783	941,639	980,181
Rural Minor Collector	360,879	393,534	420,122	448,880	480,975
Rural Local	411,379	435,206	655,193	721,391	663,260
County Total	16,776,471	18,030,744	19,530,180	20,801,618	21,914,310

The amount of vehicle material burned (the fuel loading) in a vehicle fire was estimated by assuming that an average vehicle has 500 pounds of components (0.25 tons) that can burn in a fire, based on a 3,700 pounds average vehicle weight (CARB, 1995).

The emission factors were obtained from AP-42, Section 2.5 Open Burning, Table 2.5-1, Emission Factors for Open Burning of Municipal Refuse for automobile components. The emission factors are 100 pounds of $PM_{2.5}$ per ton burned and 4 pounds of NOx per ton burned. The emission factor for $PM_{2.5}$ is a conservative estimate based on the total particulate matter.

The future year inventories were grown from the 2008 base year emissions using growth factors generated by the E-GAS 5.0 model. These growth factors are listed in Table 4.5-4 below.

Table 4.5-4 Growth Factors for Vehicle Fires

2011	2014	2017	2021
0.988	1.017	1.080	1.171

The emissions for the base inventory and future year projections were calculated using equation 4.5-1 and 4.5-2, respectively.

$$EM_P = \frac{(\text{\# of Vehicle Fires per year}) \times (CF) \times (EF_P)}{(2000 \text{ lb/tons})} \qquad 4.5\text{-}1$$

$$PJ_aEM = EM_P \times GF_a \qquad 4.5\text{-}2$$

where EM_P = annual emissions for structure fires for pollutant (P)
CF = Conversion factor, 0.25 tons burned/vehicle fire
EF_P = emission factor for pollutant (P)
PJ_aEM = projected future year (a) emissions per county
GF_a = growth factor for future year (a)

The $PM_{2.5}$ and NOx emission estimates, in tons/year, from vehicle fires for the Hickory and Triad nonattainment areas are listed in Table 4.5-3.

Table 4.5-5 Emissions from Vehicle Fires

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0

The emissions generated from vehicle fires are negligible for both of the nonattainment areas.

4.6 Small Stationary Source Fossil Fuel Use

This source category covers NOx, SO_2, and $PM_{2.5}$, emissions from natural gas (NG) and liquid petroleum gas (LPG), oil, coal, and wood combustion in the residential, commercial/institutional (referred to as commercial) and industrial sectors.

The "demand for energy" for these fuel types is known as fuel usage. Fuel usage data for North Carolina was obtained from the U.S. Department of Energy, Energy Information Administration (EIA) website for fuel consumption. The latest fuel usage data available from EIA is 2007. The

emissions estimates for 2008 are conservative because of the current economic downturn resulting in commercial and industrial sources closing. This is further substantiated by the decrease in the manufacturing employment (Table 4.6-6) as reported by the U.S. Census Bureau.

The following table shows the fuel usage for the residential, commercial and industrial sectors.

Table 4.6-1 2007 Fuel Use in North Carolina

Fuel	Units	Residential	Commercial	Industrial
Natural Gas	10^6 ft^3	58,909	45,861	89,289
LPG	gallons	239,256,678	41,811,847	184,668,990
Oil	gallons	117,527,897	66,949,824	295,999,749
Coal	tons	4,447	40,020	0
Wood	tons	1,466,667	233,333	6,633,333

The emission factors used to calculate the fuel oil, NG, LPG and coal combustion emissions were obtained from the NCDAQ permits emissions calculations spreadsheets found on-line at http://daq.state.nc.us/permits/spreadsheets/. The emission factors used in the permits emissions calculations were derived from AP-42.

For the coal combustion commercial source sector, an average for the spreader stoker, overfeed stoker and underfeed stoker emission factors were calculated and the average emission factor was used to calculate the commercial coal combustion emissions. The emissions factors used for commercial and industrial source categories for natural gas are for uncontrolled emissions of small boilers (<100 MMBtu/hr). For the residential source category for natural gas, the emission factors for uncontrolled residential furnaces were used for the emissions calculations. The emission factors for commercial propane were used for the LPG residential source category because the AP-42 does not list a separate emission factor for residential LPG combustion. Propane and butane emission factors were averaged for the LPG commercial and industrial source categories.

The only source sector that contains emissions for wood combustion is residential. The emission factors for the residential source category were derived from EIIP Tech. Reports, Table 2.4-1.

The emission factors used are shown in Table 4.6-2 below.

Table 4.6-2 Fuel Combustion Emission Factors

Fuel	Units	NOx	SO_2	$PM_{2.5}$
Residential				
NG	lb/10^6 ft^3	94	0.6	7.6
LPG	lb/gal	0.013	0.00002	0.0007
Oil	lb/gal	0.018	0.298	0.000168
Coal	lb/ton	9.1	34.1	3.8
Wood	lb/ton	2.6	0.4	0
Commercial				
NG	lb/10^6 ft^3	100	0.6	7.6
LPG	lb/gal	0.014	0.000017	0.00075
Oil	lb/gal	0.033875	0.31605	0.002761
Coal	lb/ton	9.3	39.2	3.5
Industrial				
NG	lb/10^6 ft^3	100	0.6	7.6
LPG	lb/gal	0.014	0.000017	0.00075
Oil	lb/gal	0.033875	0.31605	0.002761

The residential source category for all of the small stationary combustion sources fuel usage for the Hickory and Triad nonattainment areas were calculated by apportioning the state total fuel usage to a county level. Fuel usage was apportioned by applying the ratio of the number of households heated with the appropriate fuel type in a county to the total households in the state heated with the appropriate fuel type, see equation 4.6-1 below.

$$\text{\# gal. fuel per County} = (\text{\# gal. fuel for State}) \times \frac{(\text{\# housing units heated by fuel per County})}{(\text{\# housing units heated by fuel in State})} \qquad 4.6\text{-}1$$

The number of households heated with fuel oil, coal, NG, LPG and wood was obtained from the U.S. Census Bureau. The latest fuel use data available was 2007. The number of households heated per fuel type is shown in Table 4.6-3.

Table 4.6-3 Residential Fuel Apportionment

	Number of Households per Fuel Type				
County	Fuel Oil	Coal	Natural Gas	LPG	Wood
Catawba	5,223	0	12,831	3,012	1,047
Davidson	9,255	0	8,672	4,064	1,551
Guilford	7,529	0	82,862	8,964	1,561
North Carolina	271,482	406	890,790	383,823	70,715

Commercial and industrial fuel usage was apportioned according to the number of employees in the commercial/industrial business establishments in the state and nonattainment counties. The employment data was obtained from the County Business Patterns for the source industrial classification (SIC) codes 31 (manufacturing), 42 (wholesale trade) and 44 (retail trade) for 2007, the latest employment data available. The number of employees for these establishments was used to represent the commercial and industrial source categories. The apportionment numbers are shown in Table 4.6-4 below.

Table 4.6-4 Commercial and Industrial Fuel Apportionment

	Total Employees
Catawba	45,510
Davidson	19,221
Guilford	88,712
North Carolina	1,167,586

To yield more accurate emissions projections for these categories, the future emissions estimates were apportioned using county population for the residential source sector and manufacturing employment data for the commercial and industrial source sectors.

For the residential source sectors, the growth factors are based upon the population for each county. The population for each county is shown in Table 2.2-2. The growth factors were developed based on the ratio of the base year (2008) population to the future years (2011, 2014, 2017 and 2021) population, see equation 4.6-2 below.

$$\text{Residential Growth Factors} = \frac{FY_{pop}}{BY_{pop}} \qquad 4.6\text{-}2$$

where BY_{pop} = 2008 population per county

FY_{pop} = future year population per county

Table 4.6-5 below shows the residential growth factors for each county.

Table 4.6-5 Residential Growth Factors for Fuel Combustion

Source Category	2011	2014	2017	2021
Catawba	1.040	1.080	1.120	1.174
Davidson	1.045	1.094	1.143	1.207
Guilford	1.053	1.106	1.159	1.230

The manufacturing (SIC 31), wholesale trade (SIC 42) and retail trade (SIC 44) establishments were used to represent the employment data for the commercial and industrial source sectors. The same methodology used to develop the future year population data, using the FORECAST function in Microsoft EXCEL, was employed to calculate the future year employment data. The table below shows the employment data.

Table 4.6-6 Manufacturing Employment per County

Year	Catawba	Davidson	Guilford
2003	52,160	22,519	93,653
2004	49,738	22,313	94,958
2005	48,449	20,839	91,400
2006	48,072	19,689	89,121
2007	45,510	19,221	88,712
2008	44,296	18,150	86,853
2011	39,806	15,384	82,137
2014	35,316	12,618	77,422
2017	30,827	9,852	72,706
2021	24,840	6,164	66,418

The growth factors were developed based on the ratio of the base year (2008) employment to the future years (2011, 2014, 2017 and 2021) employment, see equation 4.6-3 below.

$$\text{Commercial/Industrial Growth Factors} = \frac{FY_{emp}}{BY_{emp}} \qquad 4.6\text{-}3$$

where BY_{emp} = 2008 employment per county

FY_{emp} = future year employment per county

Based on the manufacturing employment data in Table 4.6-6 above, the commercial and industrial growth factors for each county are shown in Table 4.6-7 below.

Table 4.6-7 Commercial/Industrial Growth Factors for Fuel Combustion

Source Category	2011	2014	2017	2021
Catawba	0.8986	0.7973	0.6959	0.5608
Davidson	0.8476	0.6952	0.5428	0.3396
Guilford	0.9457	0.8914	0.8371	0.7647

The emissions for the 2008 base year emissions inventory for each small stationary combustion source were calculated using Equations 4.6-4 – 4.6-8.

$$\text{Coal } EM_P = \frac{(\text{\# tons/year Coal}) \times EF_{Coal(P)}}{(2000 \text{ pounds/ton})} \quad 4.6\text{-}4$$

$$\text{NG } EM_P = \frac{(\text{\# } ft^3\text{/year NG}) \times EF_{NG(P)}}{(2000 \text{ pounds/ton})} \quad 4.6\text{-}5$$

$$\text{LPG } EM_P = \frac{(\text{\# gal/year LPG}) \times EF_{LPG(P)}}{(2000 \text{ pounds/ton})} \quad 4.6\text{-}6$$

$$\text{Fuel Oil } EM_P = \frac{(\text{\# gal/year Fuel Oil}) \times EF_{Oil(P)}}{(2000 \text{ pounds/ton})} \quad 4.6\text{-}7$$

$$\text{Wood } EM_P = \frac{(\text{\# ton/year Wood}) \times EF_{Wood(P)}}{(2000 \text{ pounds/ton})} \quad 4.6\text{-}8$$

where
- $\text{Coal } EM_P$ = annual emissions for coal combustion for pollutant (P)
- $\text{NG } EM_P$ = annual emissions for NG combustion for pollutant (P)
- $\text{LP } EM_P$ = annual emissions for LPG combustion for pollutant (P)
- $\text{Fuel Oil } EM_P$ = annual emissions for fuel oil combustion for pollutant (P)
- $\text{Wood } EM_P$ = annual emissions for wood combustion for pollutant (P)
- $EF_{(Coal)P}$ = emission factor for coal combustion for pollutant (P)
- $EF_{(NG)P}$ = emission factor for NG combustion for pollutant (P)
- $EF_{(LPG)P}$ = emission factor for LPG combustion for pollutant (P)
- $EF_{(Oil)P}$ = emission factor for fuel oil combustion for pollutant (P)
- $EF_{(Wood)P}$ = emission factor for wood combustion for pollutant (P)

The emissions for the future year projections for each small stationary combustion source were calculated using Equation 4.6-9.

$$PJ_bEM_a = EM_a \times GF_{ab} \quad 4.6\text{-}9$$

where PJ_bEM = projected future year (b) emissions per county
GF_{ab} = growth factor for base year (a) to future year (b)

The NOx, SO_2 and $PM_{2.5}$ emissions estimates for each fuel combustion source, in tons/year, for the residential source sector are listed in Tables 4.6-8 through 4.6-11. Based on U.S. Census Bureau data, Catawba, Davidson and Guilford Counties do not use coal as a means of residential heating therefore, there are no emissions estimates for coal combustion in the residential source sector. There are no $PM_{2.5}$ emissions for wood combustion because the EIIP Tech. Reports, Table 2.4-1 does not have an emission factor for $PM_{2.5}$ for residential wood combustion.

Table 4.6-8 Residential Source Sector Fuel Oil Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	20	21	22	23	24
Triad Area					
Davidson	36	38	39	41	44
Guilford	29	31	32	34	36
Triad Total	65	69	71	75	80
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	5	5	5	5	6
Triad Area					
Davidson	9	9	9	10	10
Guilford	7	7	8	8	9
Triad Total	16	16	17	18	19
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	2	2	2	2	2
Triad Area					
Davidson	3	3	3	3	3
Guilford	2	2	3	3	3
Triad Total	5	5	6	6	6

Table 4.6-9 Residential Source Sector LPG Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	9	10	10	10	11
Triad Area					
Davidson	15	16	17	17	18
Guilford	5	5	5	6	6
Triad Total	20	21	22	23	24
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	0	1	1	1	1
Triad Area					
Davidson	1	1	1	1	1
Guilford	0	0	0	0	0
Triad Total	1	1	1	1	1

Table 4.6-10 Residential Source Sector NG Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	40	41	43	45	47
Triad Area					
Davidson	27	28	29	31	33
Guilford	258	271	285	299	317
Triad Total	285	299	314	330	350
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	2	2	2	2	2
Triad Total	2	2	2	2	2
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	3	3	3	4	4
Triad Area					
Davidson	2	2	2	2	3
Guilford	21	22	23	24	26
Triad Total	23	24	25	26	29

Table 4.6-11 Residential Source Sector Wood Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	28	29	30	32	33
Triad Area					
Davidson	42	44	46	48	50
Guilford	42	44	47	49	52
Triad Total	84	88	93	97	102
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	4	5	5	5	5
Triad Area					
Davidson	6	7	7	7	8
Guilford	6	7	7	8	8
Triad Total	12	14	14	15	16
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0

The NOx, SO_2 and $PM_{2.5}$ emissions estimates for each fuel combustion source, in tons/year, for the commercial and industrial source sectors are listed in Tables 4.6-12 through 4.6-18. There are no wood combustion emissions estimates for the commercial and industrial source sectors because the only emission factors for wood combustion is residential furnaces which are captured in the emissions estimates in the residential source sector. Additionally, there are no coal combustion emissions for the industrial source sector because the emissions generated from coal are accounted for in the point sources inventory.

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 CO, NO_x, PM, SO_2 and/or VOC

from a single facility. Point source emissions with SCC 1-03-002-XXX are identified as commercial coal combustion sources and were deducted from the commercial source sector emissions. Additionally, NG point sources with SCC 1-03-006-XXX and 1-02-006-XXX, commercial and industrial NG combustion sources, respectively, were deducted from the commercial and industrial source sectors emissions. The latest available point source emissions data is 2007. Tables 4.6-20 – 4.6-23 illustrates the point source emissions that were deducted from the commercial coal, commercial fuel oil and commercial NG sources as well as the industrial fuel oil and industrial NG sources.

Table 4.6-12 Commercial Coal Combustion Emissions

Pollutant/County	**2008**	**2011**	**2014**	**2017**	**2021**
NOx Emissions (tons/year) Hickory Area					
Catawba	6	6	5	5	4
Triad Area					
Davidson	3	3	2	2	1
Guilford	14	13	13	12	11
Triad Total	17	16	15	14	12
SO_2 Emissions (tons/year) Hickory Area					
Catawba	28	26	23	20	16
Triad Area					
Davidson	13	11	9	7	4
Guilford	60	56	53	50	46
Triad Total	73	67	62	57	50
$PM_{2.5}$ Emissions (tons/year) Hickory Area					
Catawba	2	2	2	2	1
Triad Area					
Davidson	1	1	1	1	0
Guilford	5	5	5	5	4
Triad Total	6	6	6	6	4

Table 4.6-13 Commercial Fuel Oil Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	43	38	34	30	24
Triad Area					
Davidson	16	14	11	9	5
Guilford	84	80	75	71	65
Triad Total	100	94	86	80	70
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	407	366	324	283	228
Triad Area					
Davidson	172	146	120	94	59
Guilford	800	756	713	669	611
Triad Total	972	902	833	763	670
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	4	3	3	2	2
Triad Area					
Davidson	1	1	1	1	0
Guilford	7	7	6	6	5
Triad Total	8	8	7	7	5

Table 4.6-14 Commercial LPG Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	2	1	1	1	1
Guilford	0	0	0	0	0
Triad Total	2	1	1	1	1
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0

Table 4.6-15 Commercial NG Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	69	62	55	48	39
Triad Area					
Davidson	31	26	22	17	11
Guilford	131	124	117	110	100
Triad Total	162	150	139	127	111
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	1	1	1	1	1
Triad Total	1	1	1	1	1
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	5	5	4	4	3
Triad Area					
Davidson	2	2	2	1	1
Guilford	11	11	10	9	9
Triad Total	13	13	12	10	10

Table 4.6-16 Industrial Fuel Oil Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	190	171	152	132	107
Triad Area					
Davidson	81	69	56	44	27
Guilford	321	304	286	269	245
Triad Total	402	373	342	313	272
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	1,806	1,623	1,440	1,257	1,013
Triad Area					
Davidson	764	648	531	415	260
Guilford	3,236	3,060	2,885	2,709	2,475
Triad Total	4,000	3,708	3,416	3,124	2,735
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	15	14	12	11	9
Triad Area					
Davidson	7	6	5	4	2
Guilford	0	0	0	0	0
Triad Total	7	6	5	4	2

Table 4.6-17 Industrial LPG Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	7	6	5	4	2
Guilford	0	0	0	0	0
Triad Total	7	6	5	4	2
SO2 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0
PM2.5 Emissions (tons/year)					
Hickory Area					
Catawba	0	0	0	0	0
Triad Area					
Davidson	0	0	0	0	0
Guilford	0	0	0	0	0
Triad Total	0	0	0	0	0

Table 4.6-18 Industrial NG Combustion Emissions

Pollutant/County	2008	2011	2014	2017	2021
NOx Emissions (tons/year)					
Hickory Area					
Catawba	156	140	124	108	87
Triad Area					
Davidson	59	50	41	32	20
Guilford	257	243	229	215	196
Triad Total	316	293	270	247	216
SO_2 Emissions (tons/year)					
Hickory Area					
Catawba	1	1	1	1	1
Triad Area					
Davidson	0	0	0	0	0
Guilford	2	2	1	1	1
Triad Total	2	2	1	1	1
$PM_{2.5}$ Emissions (tons/year)					
Hickory Area					
Catawba	12	11	10	8	7
Triad Area					
Davidson	5	4	3	2	2
Guilford	22	21	20	19	17
Triad Total	27	25	23	21	19

Table 4.6-19 Point Source Commercial Coal Combustion Emissions

Hickory Area	NOx	$PM_{2.5}$	SO_2
Catawba	1	0	2
Triad Area			
Davidson	0	0	0
Guilford	0	0	0
Triad Total	0	0	0
Total	1	0	2

Table 4.6-20 Point Source Commercial Fuel Oil Combustion Emissions

Hickory Area	NOx	$PM_{2.5}$	SO_2
Catawba	2	0	5
Triad Area			
Davidson	3	0	2
Guilford	2	0	4
Triad Total	5	0	6
Total	7	0	11

Table 4.6-21 Point Source Commercial Natural Gas Combustion Emissions

Hickory Area	NOx	$PM_{2.5}$	SO_2
Catawba	21	1	0
Triad Area			
Davidson	7	1	2
Guilford	43	2	0
Triad Total	50	3	2
Total	71	4	2

Table 4.6-22 Point Source Industrial Fuel Oil Combustion Emissions

Hickory Area	NOx	$PM_{2.5}$	SO_2
Catawba	5	0	17
Triad Area			
Davidson	2	0	6
Guilford	60	148	318
Triad Total	62	148	324
Total	67	148	341

Table 4.6-23 Point Source Industrial Natural Gas Combustion Emissions

Hickory Area	NOx	$PM_{2.5}$	SO_2
Catawba	18	1	0
Triad Area			
Davidson	15	1	0
Guilford	83	3	0
Triad Total	98	4	0
Total	116	5	0