Pre-Hearing Draft~~FINAL~~

Appendix A

On-road Mobile Source Emissions

Inventory Documentation

Style Definition: TOC 1

Style Definition: TOC 3

(This page intentionally left blank)

TABLE OF CONTENTS

Formatted: Default Paragraph Font, Check spelling and grammar

Formatted: Default Paragraph Font, Check spelling and grammar

Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: TOC 3, Left, Line spacing: single
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar
Formatted: Default Paragraph Font, Check spelling and grammar

LIST OF TABLES

Formatted: Default Paragraph Font, Check spelling and grammar

Formatted ...

LIST OF FIGURES

1.0 INTRODUCTION AND SCOPE

This appendix documents revisions to the motor vehicle emissions budgets (MVEBs) presented in the maintenance plan for the Charlotte-Gastonia-Salisbury 2008 8-hour ozone marginal nonattainment area (hereinafter referred to as the "Charlotte area"). The MVEBs being revised were previously approved as recorded in the "Air Plan Approval; North Carolina; Revision to Approved Motor Vehicle Emissions Budgets~~Air Plan Approval; NC: Revision to I/M Program & Update to Charlotte Maintenance Plan~~" (8~~6~~4 FR ~~47889~~47387, ~~September 11~~August 25, ~~2019~~2021). The MVEBs ~~were~~ are revised to be compatible with the latest EPA approved mobile source emissions model, MOVES3, which was released on January 7, 2021, and was updated to MOVES3.0.3 on January 11, 2022. Revised MVEBs were developed by 1) creating new 2026 on-road and nonroad mobile source emissions estimates with MOVES3, 2) recalculating the available safety margin based on the updated 2026 mobile source emissions, and 3)~~simply through~~ allocating sufficient ~~ion of additional available~~ safety margin emissions to the MVEBs.~~, and r~~Revisions to the maintenance plan emissions inventories for other source sectors were not required.

This appendix covers the process of calculating the revised MVEBs and available safety margin emissions. ~~Although the emissions inventories were not revised for this process, documentation~~ Documentation is included for the on-road mobile source emissions modeling procedures and resulting oxides of nitrogen (NO_x) and volatile organic compound (VOC) emissions inventories for the Charlotte area. Documentation for nonroad mobile source emissions modeling and inventory development is included in Appendix B.

2.0 OVERALL METHODOLOGY

2.1 INTERAGENCY CONSULTATION

Interagency consultation meetings with all involved transportation partners, coordinated by the North Carolina Division of Air Quality (DAQ), were held to develop the emissions inventory development project plan and schedule. The primary transportation partners involved in the Charlotte area redesignation interagency consultation process included the North Carolina Department of Transportation (NCDOT), EPA, the Federal Highway Administration (FHWA), the Charlotte Regional Transportation Planning Organization (CRTPO), the Cabarrus-Rowan Metropolitan Planning Organization (CRMPO), the Gaston-Cleveland-Lincoln Metropolitan Planning Organization (GCLMPO), the Rocky River Rural Planning Organization (RRRPO), and the Charlotte Department of Transportation (CDOT). CDOT agreed to perform travel demand modeling (TDM) using the latest version of the Metrolina Regional Model (MRM) ~~(MRM14v1.0)~~ to provide the speed and vehicle miles traveled (VMT) data for the areas within the Charlotte area. All planning organizations coordinated with CDOT to ensure that all planned transportation projects were accurately represented in the TDM modeling. The NCDOT also provided vehicle registration data and vehicle mix data for all Charlotte area counties.

The transportation partners agreed to the following general specifications for the inventory development process.

2.2 EMISSIONS INVENTORY YEARS

The following emission inventory years were selected: 2014, 2015[1], 2018, 2022, and 2026. MVEBs were developed for 2014 and 2026.

[1] The 2015 emissions inventories were developed to support the DAQ's CAA Section 110(l) noninterference demonstration for relaxing the Federal Reid vapor pressure (RVP) requirement from 7.8 pound per square inch (psi) to 9.0 psi applicable to gasoline introduced into commerce from June 1 to September 15 of each year in Mecklenburg and Gaston Counties. The EPA subsequently issued a direct final rule (80 FR 49164) on August 17, 2015, approving revisions to the rule (effective on October 16, 2015) to relax the summertime RVP requirement in the two counties.

2.3 MOTOR VEHICLE EMISSIONS BUDGET AREAS

The transportation partners unanimously agreed to the development of MVEBs for areas consistent with the jurisdictional boundaries of the metropolitan planning organizations and the rural planning organizations (MPOs/RPOs) as shown in the Table 2.3-1.

Table 2.3-1. Motor Vehicle Emissions Budget Area Boundaries

MPO/RPO	County Areas Included
CRTPO/RRRPO	Iredell*, Mecklenburg, Union*
GCLMPO	Gaston*, Lincoln*
CRMPO	Cabarrus*, Rowan*

* Includes only the maintenance area portions of the county.

2.4 EMISSIONS MODELING APPROACH

Mobile source emissions were estimated by the methodologies suggested in the following EPA guidance documents: draft Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, (EPA encourages states to follow the recommendations in this draft guidance until an updated version is released), Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes (EPA-420-B-14-008, July 2014), and Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity (EPA-420-B-10-023, April 2010).

The EPA guidance requires the use of the latest approved mobile source emissions model. To model emissions for years 2014, 2015, 2018, and 2022, t~~T~~he DAQ used the ~~latest~~ MOVES2014 version of the MOtor Vehicle Emissions Simulator (MOVES) ~~model (MOVES2014),~~ which was released on October 23, 2014. To model the current updates to the 2026 emissions, the DAQ used the latest version of MOVES3, MOVES3.0.3, released on January 11, 2022. The guidance also recommends using local input data in lieu of the MOVES~~2014~~ default data to more accurately represent local vehicle fleet and emissions characteristics. The DAQ used local data wherever possible as described in Section 4.2 of this appendix.

MOVES-based emission inventories were developed for the maintenance plan base year (2014), the plan interim years (2018, 2022), and the plan future year (2026). As previously noted in footnote 1, emission inventories for 2015 were also generated. Each inventory represents the estimated emissions for a typical summer day, specifically a July weekday.

Formatted: Header

3.0 QUALITY ASSURANCE MEASURES

The detailed quality assurance and quality control procedures and measures, as outlined in the DAQ's Emissions Inventory Quality Assurance Project Plan (QAPP) and approved by EPA, were applied to ensure the data meets specific data indicator goals and objectives. All raw data used to generate MOVES model inputs, such as speed and VMT values, were checked for reasonableness against historical data from the same data category and geographic area (county or state). All manual data entries were checked by a second party. All automated calculations and data processing operations performed by spreadsheet macros and database queries were validated by comparison to hand calculated results. All MOVES input file development and quality assurance activities were logged in a project design spreadsheet.

Formatted: Header

4.0 DISCUSSION OF MOBILE SOURCE EMISSIONS MODELING

On-road mobile sources produce NOx, and VOC, along with a host of other pollutants. Emissions of these two pollutants are estimated in the on-road mobile source inventory for the maintenance plan. The objective of the following section is to describe the source category, the input files, and the emissions estimation procedures. This section also includes tables summarizing the estimated emissions for the projection years by county.

4.1 INTRODUCTION AND SCOPE

On-road mobile sources are defined as those vehicles that travel on public roadways. Emissions from motor vehicles occur throughout the day while the vehicle is in motion, at idle, parked, and during refueling. All of these emissions processes need to be estimated in order to properly reflect the total emissions from this source category.

4.2 MOVES MODEL INPUTS

All input data for MOVES~~2014~~ modeling is first compiled into county-level MySQL databases which include separate tables for each type of input data needed. Output data from MOVES~~2014~~ modeling runs are also created as MySQL databases. Due to their size and complexity, the MOVES~~2014~~ input and output database files will be provided electronically.

4.2.1 ON-ROAD VEHICLE SPEED DATA

Emissions modeling using MOVES~~2014~~ requires vehicle speed input data formatted as fractions of vehicle hours traveled (VHT) in each of 16 speed ranges, called "speed bins", for each combination of clock hour/day type (week day or weekend day), vehicle type, and road type. Speed Bin 1 represents speeds from 0 to 2.5 miles per hour (mph), and Speed Bin 16 represents speeds of 72.5 mph and greater. Speed Bins 2 through 15 each represent 5 mph speed ranges between 2.5 mph and 72.5 mph. The fractions for each combination of vehicle type, road type, and hour/day type sum to one. To generate these average speed distribution input tables, the DAQ used spreadsheet-based data converters developed by EPA to process the speed and VMT data provided by CDOT.

Raw Speed Data

CDOT provided the speed and VMT data covering all of Mecklenburg County and the portions of the Charlotte non-attainment area within Cabarrus, Gaston, Iredell, Lincoln, Rowan and Union counties. The data were categorized by roadway functional class as defined in the FHWA

Formatted: Header

Highway Performance Monitoring System (HPMS). The data are also categorized by the four travel periods used in the MRM, which are described in Table 4.2.1-1.

Table 4.2.1-1. Metrolina Regional Model Travel Periods

Travel Period	Start Time	Duration
AM Peak	6:00 AM – 9:00AM	3 hours
Midday	9:00 AM – 3:00PM	6 hours
PM Peak	3:00 PM - 6:00 PM	3 hours
Night	6:00 PM - 6:00 AM	12 hours

Tables 4.2.1-2 through 4.2.1-8 provide a summary of the MRM speed data.

Table 4.2.1-2. Cabarrus County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	28.9	27.8	27.0	25.4	45.8~~26.0~~
	Rural Minor Arterial	30.2	29.3	28.9	27.1	52.7~~26.9~~
	Rural Major Collector	29.8	31.0	33.6	31.8	38.3~~32.9~~
	Rural Minor Collector	32.8	32.6	30.4	29.4	40.9~~30.2~~
	Rural Local	29.2	29.0	28.7	28.5	28.6~~28.2~~
	Urban Interstate	48.1	47.4	45.5	46.2	59.4~~46.6~~
	Urban Other Freeway/Xprway	51.1	54.5	53.1	51.7	0.0~~52.6~~
	Urban HOT/HOV	62.8	63.3	59.0	64.1	0.0~~57.4~~
	Urban Principal Arterial	24.4	24.8	23.8	22.7	30.4~~23.7~~
	Urban Minor Arterial	24.4	24.6	23.8	22.9	30.7~~23.4~~
	Urban collector	22.1	22.3	21.8	20.5	27.3~~20.2~~
	Urban Local	22.2	22.1	21.9	21.6	24.2~~21.4~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	38.3	39.2	37.4	35.8	45.8~~35.7~~
	Rural Minor Arterial	38.5	37.8	35.6	34.5	53.5~~34.0~~
	Rural Major Collector	37.1	35.9	39.7	38.7	40.1~~37.9~~
	Rural Minor Collector	37.1	37.2	34.9	33.4	40.7~~34.0~~
	Rural Local	29.0	28.8	28.7	28.5	28.0~~28.4~~
	Urban Interstate	58.1	56.4	55.1	55.2	66.2~~55.0~~
	Urban Other Freeway/Xprway	55.6	58.0	57.9	57.0	0.0~~56.7~~
	Urban HOT/HOV	65.4	65.1	55.7	63.6	0.0~~57.0~~
	Urban Principal Arterial	26.9	26.9	26.1	24.9	31.9~~25.8~~
	Urban Minor Arterial	26.5	26.5	25.9	24.7	31.3~~25.4~~
	Urban collector	25.7	25.5	24.8	23.6	29.1~~23.2~~
	Urban Local	22.4	22.3	22.1	21.9	23.1~~21.7~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	30.7	30.0	28.4	27.1	44.0~~26.8~~
	Rural Minor Arterial	35.5	34.7	33.5	32.1	51.5~~31.3~~
	Rural Major Collector	29.9	28.4	31.9	32.0	35.6~~31.5~~
	Rural Minor Collector	31.5	31.9	30.1	28.1	39.1~~28.3~~
	Rural Local	29.1	29.1	28.8	28.4	28.4~~28.2~~
	Urban Interstate	43.8	45.3	43.6	45.3	57.5~~42.4~~
	Urban Other Freeway/Xprway	48.2	52.1	50.6	48.3	0.0~~49.5~~
	Urban HOT/HOV	65.1	64.7	51.7	59.8	0.0~~55.1~~
	Urban Principal Arterial	22.1	22.3	21.4	20.4	26.8~~21.4~~
	Urban Minor Arterial	22.4	22.7	21.9	20.9	27.2~~21.5~~
	Urban collector	21.1	21.3	20.7	19.3	24.5~~19.0~~
	Urban Local	20.9	20.9	20.7	20.4	23.4~~20.1~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	47.2	48.0	47.4	46.7	50.9~~46.0~~
	Rural Minor Arterial	45.5	45.4	44.4	45.1	54.2~~44.7~~
	Rural Major Collector	47.4	47.1	46.9	46.8	46.8~~46.8~~
	Rural Minor Collector	43.1	43.3	42.7	42.2	45.3~~42.1~~
	Rural Local	28.9	28.8	28.7	28.8	28.3~~28.7~~
	Urban Interstate	60.6	60.7	62.5	60.0	66.4~~60.8~~
	Urban Other Freeway/Xprway	59.5	61.2	61.4	61.4	0.0~~61.4~~
	Urban HOT/HOV	0.0	66.4	48.9	52.7	0.0~~55.6~~
	Urban Principal Arterial	37.6	37.6	37.1	36.6	41.0~~36.8~~
	Urban Minor Arterial	36.7	36.8	36.4	35.8	38.8~~36.2~~
	Urban collector	35.9	36.3	36.1	35.5	38.5~~35.2~~
	Urban Local	24.7	24.5	24.6	24.6	25.2~~24.6~~

Formatted ...

Table 4.2.1-3. Gaston County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	61.5	61.4	60.5	58.9	60.955.2
	Rural Principal Arterial	57.2	57.1	57.1	56.9	62.758.6
	Rural Minor Arterial	38.9	36.5	35.4	33.3	34.834.9
	Rural Major Collector	41.6	41.0	40.5	38.7	41.639.6
	Rural Minor Collector	39.7	39.6	39.4	39.1	44.539.0
	Rural Local	27.4	27.4	27.4	27.4	29.527.3
	Urban Interstate	42.9	42.2	41.9	39.6	43.550.1
	Urban Other Freeway/Xprway	42.6	42.9	42.4	42.0	38.540.2
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.000.0
	Urban Principal Arterial	30.2	29.8	29.5	28.5	30.429.0
	Urban Minor Arterial	30.5	30.3	29.5	28.5	31.429.5
	Urban collector	26.9	27.4	27.1	26.6	27.226.7
	Urban Local	24.4	24.5	24.5	24.5	24.524.3
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	62.9	62.8	62.7	62.4	61.461.9
	Rural Principal Arterial	57.7	57.7	57.7	57.7	62.859.2
	Rural Minor Arterial	50.5	49.5	48.3	47.1	45.748.2
	Rural Major Collector	47.3	46.9	46.6	45.7	47.545.5
	Rural Minor Collector	40.6	40.7	40.6	40.6	46.340.3
	Rural Local	27.0	27.0	27.0	27.1	28.527.0
	Urban Interstate	60.9	60.6	59.7	57.9	59.862.1
	Urban Other Freeway/Xprway	48.0	47.7	47.3	46.8	44.946.1
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.000.0
	Urban Principal Arterial	33.3	33.3	32.9	32.1	32.432.1
	Urban Minor Arterial	34.5	34.4	33.9	33.1	34.233.3
	Urban collector	28.1	27.4	28.1	27.3	27.926.4
	Urban Local	24.2	24.3	24.2	24.2	23.724.0
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	57.2	56.7	54.6	51.0	60.945.1
	Rural Principal Arterial	57.3	57.3	57.3	57.2	62.658.8
	Rural Minor Arterial	40.2	38.1	36.4	34.7	33.435.2
	Rural Major Collector	41.3	40.7	40.1	39.2	40.638.5
	Rural Minor Collector	39.3	39.1	38.8	38.4	44.438.5
	Rural Local	27.9	28.0	28.0	28.1	29.427.9
	Urban Interstate	40.9	39.6	39.3	36.5	40.547.0
	Urban Other Freeway/Xprway	47.1	47.5	47.2	46.5	38.645.4
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.000.0
	Urban Principal Arterial	28.1	28.0	27.6	26.2	28.226.8
	Urban Minor Arterial	30.5	30.2	29.7	28.7	29.429.3
	Urban collector	25.5	25.2	25.5	25.2	25.823.8
	Urban Local	24.3	24.3	24.2	24.1	24.323.9
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	63.0	63.0	63.0	63.0	61.463.0
	Rural Principal Arterial	57.7	57.7	57.7	57.7	62.759.1
	Rural Minor Arterial	56.1	55.7	55.4	54.8	58.655.0
	Rural Major Collector	50.5	50.4	50.5	50.6	49.250.8
	Rural Minor Collector	41.0	41.0	41.1	41.1	46.340.8
	Rural Local	27.0	27.0	27.0	27.0	28.126.9
	Urban Interstate	63.0	63.0	63.0	63.0	61.263.1
	Urban Other Freeway/Xprway	53.0	53.0	52.9	52.7	52.952.5
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.000.0
	Urban Principal Arterial	39.3	39.2	39.0	38.6	36.938.4
	Urban Minor Arterial	40.1	40.1	39.9	39.5	37.939.7
	Urban collector	31.9	31.3	33.4	33.1	33.731.8
	Urban Local	24.4	24.5	24.4	24.4	24.524.4

Formatted ...

Table 4.2.1-4. Iredell County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	63.2	62.3	60.1	55.2	46.951.8
	Rural Principal Arterial	0.0	0.0	0.0	0.0	0.00.0
	Rural Minor Arterial	12.2	11.9	11.6	11.3	14.019.9
	Rural Major Collector	36.0	35.8	34.4	33.6	33.634.2
	Rural Minor Collector	30.5	30.4	28.9	28.0	25.829.7
	Rural Local	28.6	28.6	28.5	28.3	28.928.0
	Urban Interstate	55.6	53.4	50.1	53.9	53.551.0
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	68.6	66.668.5
	Urban Principal Arterial	28.1	28.4	27.2	25.9	22.827.5
	Urban Minor Arterial	28.9	28.6	27.8	27.0	28.126.0
	Urban collector	30.0	30.0	29.3	28.3	24.430.7
	Urban Local	24.7	24.7	24.4	24.2	24.224.2
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	68.0	67.9	67.6	67.1	65.666.2
	Rural Principal Arterial	0.0	0.0	0.0	0.0	0.00.0
	Rural Minor Arterial	12.7	12.5	12.1	11.7	13.325.6
	Rural Major Collector	39.4	39.2	37.7	35.7	35.236.9
	Rural Minor Collector	31.2	31.2	29.2	28.9	25.229.9
	Rural Local	28.5	28.5	28.4	28.3	26.828.3
	Urban Interstate	65.4	64.4	62.5	62.0	62.959.5
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	68.8	67.168.8
	Urban Principal Arterial	29.3	29.2	28.3	27.0	23.129.0
	Urban Minor Arterial	30.8	29.8	29.4	28.3	29.427.6
	Urban collector	31.9	31.7	30.7	29.5	26.432.4
	Urban Local	24.6	24.4	24.3	24.0	23.723.9
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	60.6	59.2	56.2	49.1	47.845.7
	Rural Principal Arterial	0.0	0.0	0.0	0.0	0.00.0
	Rural Minor Arterial	10.8	10.4	9.9	9.5	13.120.8
	Rural Major Collector	31.9	31.9	30.4	29.6	31.229.6
	Rural Minor Collector	26.4	26.2	25.8	24.9	23.225.7
	Rural Local	28.4	28.4	28.2	28.0	28.028.2
	Urban Interstate	51.4	49.7	46.0	50.1	53.846.5
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	68.1	65.968.2
	Urban Principal Arterial	25.5	25.3	24.4	23.3	20.925.3
	Urban Minor Arterial	27.5	28.0	26.7	26.1	25.925.1
	Urban collector	27.6	27.4	26.9	25.7	20.328.6
	Urban Local	23.8	23.7	23.5	23.1	23.723.1
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	68.2	68.2	68.2	68.2	66.568.2
	Rural Principal Arterial	0.0	0.0	0.0	0.0	0.00.0
	Rural Minor Arterial	25.1	24.7	23.2	21.9	21.840.4
	Rural Major Collector	47.7	47.6	47.4	47.0	43.847.0
	Rural Minor Collector	44.2	44.1	43.9	43.9	40.343.5
	Rural Local	28.9	28.8	28.8	28.9	29.528.9
	Urban Interstate	68.2	68.2	68.2	68.2	66.368.2
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	68.8	67.268.8
	Urban Principal Arterial	37.4	37.5	37.0	36.4	34.736.8
	Urban Minor Arterial	37.7	37.7	37.5	37.0	35.835.9
	Urban collector	41.6	41.5	41.0	40.0	39.641.5
	Urban Local	26.2	26.2	26.1	26.1	25.826.1

Formatted ...

Table 4.2.1-5. Lincoln County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	45.0	45.4	45.3	45.1	42.845.0
	Rural Minor Arterial	39.2	38.6	37.1	36.5	41.634.5
	Rural Major Collector	50.0	49.8	49.7	49.4	55.249.6
	Rural Minor Collector	36.9	36.6	35.4	33.9	37.635.8
	Rural Local	28.7	28.8	28.8	28.7	30.328.6
	Urban Interstate	0.0	0.0	0.0	0.0	0.00.0
	Urban Other Freeway/Xprway	68.2	68.2	68.2	68.2	66.568.2
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	37.0	36.3	35.0	34.3	38.433.9
	Urban Minor Arterial	33.5	33.1	32.2	31.3	32.930.5
	Urban collector	35.0	34.7	34.3	33.5	34.433.4
	Urban Local	26.0	26.0	26.0	25.9	26.525.8
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	51.1	51.6	51.1	50.9	50.850.6
	Rural Minor Arterial	40.4	40.4	39.5	38.5	43.836.1
	Rural Major Collector	51.2	51.1	51.0	50.9	55.150.9
	Rural Minor Collector	41.6	41.2	40.4	39.2	39.439.9
	Rural Local	28.7	28.7	28.7	28.6	29.128.6
	Urban Interstate	0.0	0.0	0.0	0.0	0.00.0
	Urban Other Freeway/Xprway	68.2	68.2	68.2	68.2	66.568.2
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	39.5	39.4	38.1	38.1	42.636.9
	Urban Minor Arterial	36.7	36.7	36.1	35.3	34.334.4
	Urban collector	36.6	36.6	36.5	36.3	36.936.0
	Urban Local	26.1	26.1	26.1	26.0	25.926.0
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	45.0	45.7	44.9	44.9	48.444.9
	Rural Minor Arterial	36.2	35.2	34.1	33.5	40.332.0
	Rural Major Collector	49.9	49.7	49.3	49.1	55.349.1
	Rural Minor Collector	39.4	38.7	37.9	37.2	38.537.1
	Rural Local	29.0	28.9	28.7	28.6	30.028.4
	Urban Interstate	0.0	0.0	0.0	0.0	0.00.0
	Urban Other Freeway/Xprway	68.2	68.2	68.2	68.2	66.568.2
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	36.0	36.0	34.3	33.4	38.733.3
	Urban Minor Arterial	33.2	33.2	32.5	31.7	31.830.9
	Urban collector	34.2	34.0	33.7	33.2	35.733.3
	Urban Local	25.7	25.7	25.7	25.6	26.325.6
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	59.6	59.7	59.6	59.8	59.759.5
	Rural Minor Arterial	47.7	47.6	47.0	46.4	50.744.3
	Rural Major Collector	52.2	52.2	52.2	52.3	54.852.3
	Rural Minor Collector	45.7	45.8	45.5	45.0	44.045.4
	Rural Local	28.9	28.8	28.8	28.8	29.628.8
	Urban Interstate	0.0	0.0	0.0	0.0	0.00.0
	Urban Other Freeway/Xprway	68.2	68.2	68.2	68.2	66.568.2
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	45.6	45.4	43.9	43.3	45.743.4
	Urban Minor Arterial	43.8	43.9	43.7	43.2	43.142.8
	Urban collector	39.1	39.1	39.1	39.0	38.239.0
	Urban Local	26.9	27.0	27.0	27.0	26.427.1

Formatted ...

Table 4.2.1-6. Mecklenburg County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	28.9	27.8	27.0	25.4	19.8~~26.0~~
	Rural Minor Arterial	30.2	29.3	28.9	27.1	30.2~~26.9~~
	Rural Major Collector	29.8	31.0	33.6	31.8	36.5~~32.9~~
	Rural Minor Collector	32.8	32.6	30.4	29.4	30.8~~30.2~~
	Rural Local	29.2	29.0	28.7	28.5	27.0~~28.2~~
	Urban Interstate	48.1	47.4	45.5	46.2	44.4~~46.6~~
	Urban Other Freeway/Xprway	51.1	54.5	53.1	51.7	44.9~~52.6~~
	Urban HOT/HOV	62.8	63.3	59.0	64.1	61.8~~57.4~~
	Urban Principal Arterial	24.4	24.8	23.8	22.7	19.4~~23.7~~
	Urban Minor Arterial	24.4	24.6	23.8	22.9	20.0~~23.4~~
	Urban collector	22.1	22.3	21.8	20.5	18.7~~20.2~~
	Urban Local	22.2	22.1	21.9	21.6	21.6~~21.4~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	38.3	39.2	37.4	35.8	31.8~~35.7~~
	Rural Minor Arterial	38.5	37.8	35.6	34.5	38.4~~34.0~~
	Rural Major Collector	37.1	35.9	39.7	38.7	41.6~~37.9~~
	Rural Minor Collector	37.1	37.2	34.9	33.4	30.8~~34.0~~
	Rural Local	29.0	28.8	28.7	28.5	26.7~~28.4~~
	Urban Interstate	58.1	56.4	55.1	55.2	52.3~~55.0~~
	Urban Other Freeway/Xprway	55.6	58.0	57.9	57.0	55.4~~56.7~~
	Urban HOT/HOV	65.4	65.1	55.7	63.6	63.2~~57.0~~
	Urban Principal Arterial	26.9	26.9	26.1	24.9	20.3~~25.8~~
	Urban Minor Arterial	26.5	26.5	25.9	24.7	21.3~~25.4~~
	Urban collector	25.7	25.5	24.8	23.6	20.5~~23.2~~
	Urban Local	22.4	22.3	22.1	21.9	21.0~~21.7~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	30.7	30.0	28.4	27.1	19.1~~26.8~~
	Rural Minor Arterial	35.5	34.7	33.5	32.1	27.4~~31.3~~
	Rural Major Collector	29.9	28.4	31.9	32.0	33.0~~31.5~~
	Rural Minor Collector	31.5	31.9	30.1	28.1	27.2~~28.3~~
	Rural Local	29.1	29.1	28.8	28.4	25.5~~28.2~~
	Urban Interstate	43.8	45.3	43.6	45.3	39.1~~42.4~~
	Urban Other Freeway/Xprway	48.2	52.1	50.6	48.3	37.4~~49.5~~
	Urban HOT/HOV	65.1	64.7	51.7	59.8	54.6~~55.1~~
	Urban Principal Arterial	22.1	22.3	21.4	20.4	16.1~~21.4~~
	Urban Minor Arterial	22.4	22.7	21.9	20.9	16.6~~21.5~~
	Urban collector	21.1	21.3	20.7	19.3	15.9~~19.0~~
	Urban Local	20.9	20.9	20.7	20.4	20.2~~20.1~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	47.2	48.0	47.4	46.7	46.2~~46.0~~
	Rural Minor Arterial	45.5	45.4	44.4	45.1	44.9~~44.7~~
	Rural Major Collector	47.4	47.1	46.9	46.8	45.4~~46.8~~
	Rural Minor Collector	43.1	43.3	42.7	42.2	38.4~~42.1~~
	Rural Local	28.9	28.8	28.7	28.8	28.6~~28.7~~
	Urban Interstate	60.6	60.7	62.5	60.0	60.0~~60.8~~
	Urban Other Freeway/Xprway	59.5	61.2	61.4	61.4	64.4~~61.4~~
	Urban HOT/HOV	0.0	66.4	48.9	52.7	64.9~~55.6~~
	Urban Principal Arterial	37.6	37.6	37.1	36.6	33.0~~36.8~~
	Urban Minor Arterial	36.7	36.8	36.4	35.8	32.1~~36.2~~
	Urban collector	35.9	36.3	36.1	35.5	32.9~~35.2~~
	Urban Local	24.7	24.5	24.6	24.6	24.5~~24.6~~

Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...

Table 4.2.1-7. Rowan County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	56.5	56.7	56.5	56.3	57.956.1
	Rural Minor Arterial	54.9	54.9	54.7	54.2	58.953.3
	Rural Major Collector	52.1	52.2	51.3	51.9	54.551.6
	Rural Minor Collector	48.8	49.0	48.6	48.2	51.747.9
	Rural Local	29.1	29.1	29.1	29.0	30.329.1
	Urban Interstate	64.0	63.8	58.3	67.0	65.166.8
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	41.4	41.4	41.2	40.8	41.140.4
	Urban Minor Arterial	37.0	37.0	36.5	36.4	36.835.7
	Urban collector	36.1	36.1	36.0	35.7	36.635.3
	Urban Local	25.8	25.8	25.9	25.9	26.425.9
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	58.7	58.7	58.6	58.5	57.658.4
	Rural Minor Arterial	57.0	56.9	56.6	56.0	59.855.4
	Rural Major Collector	54.3	54.2	53.8	53.7	55.353.5
	Rural Minor Collector	50.1	50.1	50.1	50.0	52.249.7
	Rural Local	28.8	28.8	28.8	28.8	28.928.8
	Urban Interstate	66.7	66.6	66.2	67.1	65.167.1
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	42.1	42.0	41.7	41.5	41.041.2
	Urban Minor Arterial	37.7	37.5	37.4	37.1	37.136.6
	Urban collector	36.4	36.4	36.4	36.1	37.135.9
	Urban Local	25.5	25.5	25.5	25.6	25.225.6
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	56.5	56.6	56.6	56.4	57.856.2
	Rural Minor Arterial	53.7	53.7	53.6	53.0	58.751.9
	Rural Major Collector	51.2	51.0	49.9	51.0	54.650.7
	Rural Minor Collector	48.5	48.4	47.7	47.6	51.447.1
	Rural Local	29.1	29.1	29.1	29.1	30.229.1
	Urban Interstate	62.1	61.6	53.7	66.5	65.366.3
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	39.8	39.6	39.3	39.3	40.938.7
	Urban Minor Arterial	35.9	35.9	35.5	34.9	36.434.3
	Urban collector	34.7	34.7	34.7	34.1	36.533.7
	Urban Local	25.6	25.6	25.7	25.7	26.125.7
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.00.0
	Rural Principal Arterial	59.8	59.8	59.8	59.7	57.859.6
	Rural Minor Arterial	60.1	60.2	60.1	60.0	60.459.5
	Rural Major Collector	56.8	56.8	56.7	56.6	56.756.5
	Rural Minor Collector	50.9	50.9	50.9	51.1	52.451.0
	Rural Local	29.1	29.1	29.0	29.1	29.529.1
	Urban Interstate	67.0	67.0	67.0	67.1	65.267.1
	Urban Other Freeway/Xprway	0.0	0.0	0.0	0.0	0.00.0
	Urban HOT/HOV	0.0	0.0	0.0	0.0	0.00.0
	Urban Principal Arterial	46.2	46.2	46.1	45.9	43.545.8
	Urban Minor Arterial	43.2	43.2	43.2	43.0	41.242.7
	Urban collector	39.9	39.9	39.8	39.8	39.539.6
	Urban Local	25.8	25.8	25.8	26.0	26.426.0

Formatted ...

Table 4.2.1-8. Union County Speeds from Metrolina Regional Model

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	51.6	51.6	53.8	53.4	60.3~~52.8~~
	Rural Minor Arterial	44.0	44.1	44.6	42.0	39.0~~40.6~~
	Rural Major Collector	39.3	39.2	38.6	37.2	39.2~~38.6~~
	Rural Minor Collector	42.4	42.1	41.2	40.0	37.0~~40.8~~
	Rural Local	30.6	30.6	30.3	29.6	30.5~~30.2~~
	Urban Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Urban Other Freeway/Xprway	31.9	31.3	44.7	42.7	58.6~~44.9~~
	Urban HOT/HOV	0.0	0.0	22.5	22.5	0.0~~50.0~~
	Urban Principal Arterial	30.4	30.4	34.8	34.0	35.5~~33.1~~
	Urban Minor Arterial	24.8	24.4	23.6	22.1	27.1~~24.4~~
	Urban collector	26.7	26.0	25.9	24.5	28.0~~25.1~~
	Urban Local	24.9	25.1	25.3	24.8	26.3~~24.5~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	53.0	52.8	54.2	54.1	59.8~~54.0~~
	Rural Minor Arterial	47.7	46.3	48.7	45.6	41.8~~44.7~~
	Rural Major Collector	43.0	42.8	42.2	40.8	40.8~~42.2~~
	Rural Minor Collector	44.2	43.9	43.0	42.1	38.4~~42.4~~
	Rural Local	30.9	30.9	30.9	30.4	29.8~~30.4~~
	Urban Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Urban Other Freeway/Xprway	35.3	34.2	51.7	51.1	57.9~~52.7~~
	Urban HOT/HOV	0.0	0.0	22.5	22.5	0.0~~46.3~~
	Urban Principal Arterial	33.4	33.0	37.0	36.2	37.7~~35.7~~
	Urban Minor Arterial	27.2	26.7	25.9	24.8	28.2~~26.8~~
	Urban collector	29.4	28.5	28.2	27.0	29.6~~27.4~~
	Urban Local	25.8	25.8	26.1	25.7	26.5~~25.2~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	51.9	51.8	53.6	53.1	60.6~~52.3~~
	Rural Minor Arterial	42.4	42.1	45.5	43.3	36.9~~41.9~~
	Rural Major Collector	39.3	39.0	38.8	37.2	36.8~~38.7~~
	Rural Minor Collector	41.4	41.0	39.3	38.6	33.7~~37.9~~
	Rural Local	30.8	30.8	30.5	29.8	29.4~~30.2~~
	Urban Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Urban Other Freeway/Xprway	25.9	25.1	45.9	43.5	57.8~~44.9~~
	Urban HOT/HOV	0.0	0.0	22.5	22.5	0.0~~50.4~~
	Urban Principal Arterial	28.6	28.6	32.5	31.6	33.0~~30.6~~
	Urban Minor Arterial	22.5	22.3	21.1	19.7	23.9~~21.9~~
	Urban collector	24.1	23.5	23.5	22.3	24.8~~22.4~~
	Urban Local	24.8	24.9	25.2	24.6	25.4~~24.5~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Rural Principal Arterial	54.6	54.7	54.8	54.7	60.0~~54.6~~
	Rural Minor Arterial	53.1	53.0	51.8	48.9	46.8~~48.6~~
	Rural Major Collector	48.5	48.3	48.2	47.8	47.6~~48.5~~
	Rural Minor Collector	49.3	49.1	48.3	48.0	44.9~~48.3~~
	Rural Local	32.0	32.1	32.8	32.7	32.4~~32.4~~
	Urban Interstate	0.0	0.0	0.0	0.0	0.0~~0.0~~
	Urban Other Freeway/Xprway	49.6	49.1	54.4	54.3	61.0~~54.6~~
	Urban HOT/HOV	0.0	0.0	22.5	22.5	0.0~~48.0~~
	Urban Principal Arterial	41.3	41.4	42.9	42.5	41.6~~42.1~~
	Urban Minor Arterial	38.6	38.9	37.9	37.4	37.6~~38.1~~
	Urban collector	41.2	40.8	40.7	40.3	39.5~~39.9~~
	Urban Local	28.0	28.1	28.0	27.9	27.7~~27.7~~

Formatted ...

Formatted: Header

Average Speed Distribution Calculations

To generate the MOVES average speed distribution tables from the speed and VMT data provided, the DAQ used spreadsheet-based tools (developed by the DAQ and EPA) to perform the calculation procedures described below.

MOVES uses four different roadway type categories that are affected by the average speed distribution input: rural restricted access, rural unrestricted access, urban restricted access, and urban unrestricted access (these road types are discussed in more detail in Section 4.2.6). In MOVES, local roadways are included with arterials and collectors in the urban and rural unrestricted access roads category. In MOVES, EPA recommends that the average speed distribution for local roadway activity be included as part of a weighted distribution of average speed across all unrestricted roads along with the distribution of average speeds for arterials and connectors.

When only a single average speed is available for a specific road type and that average speed is not identical to the average speed in a particular speed bin, MOVES guidance stipulates that users should apply the following formula for creating the appropriate speed distribution among two adjacent speed bins.

The general formula is:

VHT Fraction A in Speed Bin with closest average speed lower than observed average speed + VHT Fraction B in Speed Bin with closest average speed higher that observed average speed = 1

VHT Fraction $A_{(low\ bin)}$ = 1 – [(observed average speed – average speed of lower speed bin) / (average speed of higher speed bin – average speed of lower speed bin)]

VHT Fraction $B_{(high\ bin)}$ = 1- [(average speed of higher speed bin – observed average speed) / (average speed of higher speed bin – average speed of lower speed bin)]

Or more simply: VHT Fraction B = 1 – VHT fraction A

The following is an example of applying the above equations. If the single average speed for a roadway is 58 mph, the average speed distribution will be split between the 55 and 60 mph speed bins. The appropriate VHT fractions are found with the following equations:

Formatted: Header

VHT fraction $A_{(low\ bin)}$ = 1 – [(58 mph Avg. Speed – 55 mph (Bin Speed)) / (60 mph (Bin Speed) – 55 mph (Bin Speed)] = 0.4

VHT fraction $B_{(high\ bin)}$ = 1 – [(60 mph (Bin Speed) – 58 mph Avg. Speed) / (60 mph (Bin Speed) – 55 mph (Bin Speed)] = 0.6

VHT Fraction $A_{(low\ bin)}$ + VHT Fraction $B_{(high\ bin)}$ = 1

0.4 + 0.6 = 1

As stated above, MOVES uses only four different roadway types: rural restricted access, rural unrestricted access, urban restricted access and urban unrestricted access. This means that the speeds for multiple roadway types need to be combined into the appropriate speed bins. To create the speed bin fractions for combined roadways, the VMT for each roadway is used to weight the speed bin fraction. For example, below are speeds and VMT for urban restricted access road types:

Road type	Speed (mph)	VMT (hourly miles)
Urban Interstate	63	250,000
Urban Freeway	56	100,000

The first step is to determine the speed bin fractions for each road type separately. For the urban interstate road type, the speed 63 is split between the MOVES speed bins of 60 and 65 as described above, which results in the VHT fractions of 0.4 and 0.6 for speed bins 60 and 65, respectively. Similarly, the speed for the urban freeway road type (56 mph) is split between the MOVES speed bins of 55 and 60 and results in the VHT fractions of 0.8 and 0.2, respectively.

The next step requires road type VMT to weigh the VHT fractions so that the final MOVES speed bin fractions can be developed. The VHT fractions, specific to the road type and speed bin, are multiplied by the corresponding hourly VMT. These hourly totals are divided by the total VMT for that hour for the road type category (in this example, urban restricted access includes urban interstate and urban freeway). The following equation is used to calculate the combined speed bin fractions:

$$VHT_{(Speed\ Bin\ X)} = \left[\sum (VHT\ Fraction_{(RT)} \times hourly\ VMT_{(RT)})\right] \div \left[\sum hourly\ VMT_{(RT)}\right]$$

where:

RT = the HPMS road type

In this example, the HPMS road types are urban interstate (UI) and urban freeway (UF) and the speed bins are 55, 60 and 65. Table 4.2.1-9 summarizes the speed bin fractions for this example.

Table 4.2.1-9. Example Speed Bin Fractions

HPMS Road Type	Speed Bin 55	Speed Bin 60	Speed Bin 65
Urban Interstate	0.0	0.4	0.6
Urban Freeway	0.8	0.2	0.0

Using the equation below, the final MOVES speed bin fractions are calculated for the urban restricted access road type.

$$VHT_{(Speed\ Bin\ X)} = \frac{[(VHT\ Fraction_{(UI)} * hourly\ VMT_{(UI)}) + (VHT\ Fraction_{(UF)} * hourly\ VMT_{(UF)})]}{(hourly\ VMT_{(UI)} + hourly\ VMT_{(UF)})}$$

$$VHT_{(Speed\ Bin\ 55)} = \frac{[(0.0 * 250{,}000) + (0.8 * 100{,}000)]}{(250{,}000 + 100{,}000)}$$

$$VHT_{(Speed\ Bin\ 55)} = 0.2286$$

$$VHT_{(Speed\ Bin\ 60)} = \frac{[(0.4 * 250{,}000) + (0.2 * 100{,}000)]}{(250{,}000 + 100{,}000)}$$

$$VHT_{(Speed\ Bin\ 60)} = 0.3428$$

$$VHT_{(Speed\ Bin\ 65)} = \frac{[(0.6 * 250{,}000) + (0.0 * 100{,}000)]}{(250{,}000 + 100{,}000)}$$

$$VHT_{(Speed\ Bin\ 65)} = 0.4286$$

The sum of the VHT fractions for all speed bins within a road type category must add up to 1.0. The hourly VHT fractions by speed bin and road type are then processed through a MOVES supplied converter to develop the speed distribution file by hour and road type.

4.2.2 VEHICLE AGE DISTRIBUTION

Local vehicle age distributions were developed from county-level annual registration data obtained from the NCDOT. For this analysis, the age distribution was generated based on 2013 data. The data includes the number of registered vehicles categorized by nine vehicle types and by model year, with individual model years listed from 2013 through 1974 and a combined listing for all vehicles of model year 1973 and older. The vehicle count information is provided for nine vehicle types; light duty gas vehicles (LDGV), light duty diesel vehicles (LDDV), light duty gas trucks 1 (LDGT1), light duty gas trucks 2 (LDGT2), light duty diesel trucks 1 (LDDT1), light duty diesel trucks 2 (LDDT2), heavy duty gas vehicles (HDGV), heavy duty

diesel vehicles (HDDV) and motorcycles (MC). LDDT1 and LDDT2 are combined and labeled as light duty diesel trucks (LDDT). The DAQ used a customized version of an EPA vehicle age distribution data converter tool to convert the local county-level data to the appropriate age distribution input tables for MOVES.

4.2.3 VEHICLE MIX DATA

Vehicle mix or VMT mix is used by MOVES to convert annual VMT to VMT by HPMS class, VMT fractions by hour, and VMT by road type distribution. The vehicle mix is developed by the same method used in MOBILE6.2, as outlined below. The resulting file is then used in a MOVES supplied converter to develop the VMT by HPMS class, VMT fractions by hour, and VMT by road type distribution.

The vehicle mix refers to the percentage of different vehicle types on each of the 12 FHWA road types. These road types are listed above in the speed assumptions section. It is critical for estimating on-road mobile emissions in an area to use data that accurately reflects the vehicles types traveling on each of these different road types.

In August 2004, EPA released the guidance document EPA420-R-04-013, Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation, which outlines how to convert HPMS traffic count data to MOBILE6.2 vehicle mix data. Outlined below is the methodology used to convert the 13 HPMS vehicle types count data reported to FHWA and generate a state specific vehicle mix.

The North Carolina HPMS data used to generate the statewide vehicle mix was based on 2013 for the 2014, 2015, 2018, 2022 and 2026 modeling years. Table 4.2.3-1 shows the percent of VMT per vehicle type for each of the 12 road classes.

Formatted: Header

Table 4.2.3-1. North Carolina Vehicle Activity Summary by Functional Classification - 2013

Road Type Categories			Vehicle Type Categories*												
FC Code	Functional Classification	Samples	MC	Cars	2A4T	Bus	2ASU	3ASU	4ASU	4AST	5AST	6AST	5AMT	6AMT	7AMT
1	Rural Principal Arterial – Interstate	24	0.0038	0.6953	0.1464	0.0059	0.0211	0.0062	0.0003	0.0095	0.1067	0.0019	0.0019	0.0008	0.0002
2	Rural Principal Arterial – Other	247	0.0065	0.6968	0.1914	0.0064	0.0278	0.0071	0.0007	0.0106	0.0493	0.0018	0.0009	0.0004	0.0003
6	Rural Minor Arterial	322	0.0058	0.7111	0.2005	0.0055	0.0267	0.0056	0.0005	0.0087	0.0335	0.0016	0.0001	0.0000	0.0003
7	Rural Major Collector	677	0.0072	0.6992	0.2142	0.0058	0.0286	0.0065	0.0006	0.0083	0.0282	0.0013	0.0000	0.0000	0.0002
8	Rural Minor Collector	15	0.0118	0.6818	0.2436	0.0040	0.0261	0.0062	0.0004	0.0057	0.0187	0.0015	0.0000	0.0000	0.0000
9	Rural Local System	49	0.0086	0.7178	0.2046	0.0090	0.0351	0.0103	0.0010	0.0055	0.0069	0.0011	0.0000	0.0000	0.0000
11	Urban Principal Arterial - Interstate	38	0.0042	0.7577	0.1567	0.0047	0.0176	0.0055	0.0003	0.0041	0.0471	0.0005	0.0010	0.0005	0.0001
12	Urban Principal Arterial - Other Freeways or Expressways	104	0.0054	0.7418	0.1722	0.0054	0.0214	0.0066	0.0007	0.0092	0.0348	0.0012	0.0008	0.0003	0.0002
14	Urban Principal Arterial - Other	430	0.0054	0.7719	0.1685	0.0048	0.0208	0.0057	0.0009	0.0054	0.0145	0.0015	0.0002	0.0001	0.0003
16	Urban Minor Arterial	305	0.0057	0.7736	0.1756	0.0042	0.0215	0.0044	0.0006	0.0049	0.0085	0.0008	0.0001	0.0000	0.0002
17	Urban Collector	28	0.0050	0.7878	0.1674	0.0049	0.0194	0.0052	0.0003	0.0044	0.0051	0.0004	0.0000	0.0000	0.0001
19	Urban Local System	20	0.0108	0.7175	0.1976	0.0099	0.0296	0.0130	0.0003	0.0055	0.0151	0.0006	0.0000	0.0002	0.0001

*MC - motorcycles
Cars – passenger cars
2A4T – trucks with two axles, 4 tires
Bus – intercity, transit, and school buses
2ASU – two axle single unit trucks
2ASU – three axle single unit trucks
4ASU – four axle single unit trucks
4AST – four axle single trailer truck
5AST – five axle single trailer truck
6AST – six axle single trailer truck
5MST – five axle multi-trailer truck
6AMT – six axle multi-trailer truck
7AMT – seven axle multi-trailer truck

Table 4.2.3-2. North Carolina Vehicle Activity Summary by Functional Classification - 2019

Road Type Categories			Vehicle Type Categories*												
FC Code	Functional Classification	Samples	MC	Cars	2A4T	Bus	2ASU	3ASU	4ASU	4AST	5AST	6AST	5AMT	6AMT	7AMT
1	Rural Principal Arterial – Interstate	47	0.0040	0.6865	0.1415	0.0054	0.0201	0.0063	0.0003	0.0102	0.1205	0.0013	0.0026	0.0012	0.0003
2	Rural Principal Arterial – Other	299	0.0047	0.6713	0.2142	0.0078	0.0330	0.0073	0.0008	0.0134	0.0434	0.0022	0.0009	0.0003	0.0005
6	Rural Minor Arterial	365	0.0056	0.6850	0.2191	0.0066	0.0323	0.0064	0.0006	0.0112	0.0312	0.0015	0.0001	0.0000	0.0003
7	Rural Major Collector	816	0.0065	0.6667	0.2370	0.0071	0.0343	0.0071	0.0008	0.0111	0.0277	0.0015	0.0000	0.0000	0.0002
8	Rural Minor Collector	22	0.0130	0.6525	0.2435	0.0067	0.0339	0.0066	0.0003	0.0087	0.0320	0.0020	0.0000	0.0000	0.0009
9	Rural Local System	55	0.0087	0.6771	0.2305	0.0111	0.0388	0.0097	0.0012	0.0072	0.0141	0.0013	0.0000	0.0000	0.0003
11	Urban Principal Arterial - Interstate	92	0.0044	0.7516	0.1551	0.0047	0.0174	0.0054	0.0003	0.0046	0.0544	0.0006	0.0010	0.0005	0.0001
12	Urban Principal Arterial - Other Freeways or Expressways	141	0.0050	0.7336	0.1818	0.0057	0.0231	0.0061	0.0006	0.0081	0.0332	0.0014	0.0007	0.0003	0.0003
14	Urban Principal Arterial - Other	568	0.0052	0.7635	0.1760	0.0057	0.0231	0.0058	0.0010	0.0057	0.0119	0.0016	0.0002	0.0001	0.0004
16	Urban Minor Arterial	342	0.0055	0.7566	0.1853	0.0051	0.0249	0.0056	0.0006	0.0057	0.0090	0.0012	0.0001	0.0000	0.0003
17	Urban Collector	33	0.0036	0.7828	0.1725	0.0049	0.0210	0.0041	0.0005	0.0045	0.0047	0.0011	0.0000	0.0000	0.0002
19	Urban Local System	24	0.0095	0.7343	0.1786	0.0155	0.0294	0.0101	0.0006	0.0057	0.0130	0.0023	0.0001	0.0001	0.0008

*MC - motorcycles
Cars – passenger cars
2A4T – trucks with two axles, 4 tires
Bus – intercity, transit, and school buses
2ASU – two axle single unit trucks
2ASU – three axle single unit trucks
4ASU – four axle single unit trucks
4AST – four axle single trailer truck
5AST – five axle single trailer truck
6AST – six axle single trailer truck
5MST – five axle multi-trailer truck
6AMT – six axle multi-trailer truck
7AMT – seven axle multi-trailer truck

Formatted ...

Formatted: Header

4.2.4 DISAGGREGATING STATE SPECIFIC VEHICLE MIX DATA FOR MOVES

The procedures in Section 4.1.4 and 4.1.5 of the Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation were used to create vehicle mix tables used as inputs for VMT converter applications provided by EPA. The procedures map the vehicle mixes shown in Section 4.2.3 (12 roadway functional classes, 13 vehicle types) to the mix matrix required for the VMT converter applications (12 roadway functional classes, 16 vehicle types). The process also provides calculation of projected mixes for future years.

The resulting vehicle mix tables are presented in Section 5.1.

4.2.5 VEHICLES/EQUIPMENT: ON-ROAD VEHICLE EQUIPMENT

For MOVES emissions modeling, vehicle fleet characteristics must be specified from among 13 source use types and five different fuel types (gasoline, diesel, compressed natural gas (CNG), ethanol, and electricity).

As per EPA guidance for state implementation plans (SIPs) and regional conformity analyses, the DAQ selected the appropriate fuel and vehicle type combinations that reflect the full range of vehicles that will operate in each county. All valid diesel, gasoline, CNG, ethanol, and electric vehicle and fuel combinations were selected.

4.2.6 ROAD TYPE

The MOVES model defines five different road types to categorize the roadways used in a particular MOVES modeling run. The five road types are:

- Off-Network (road type 1) – all locations where the predominant activity is vehicle starts, parking and idling (parking lots, truck stops, rest areas, freight or bus terminals)
- Rural Restricted Access (2) – rural highways that can only be accessed by an on-ramp
- Rural Unrestricted Access (3) – all other rural roads (arterials, connectors, and local streets)
- Urban Restricted Access (4) – urban highways or freeways that can only be accessed by an on-ramp
- Urban Unrestricted Access (5) – all other urban roads (arterials, connectors, and local streets).

The DAQ included all five road types in each modeling run as per EPA guidance. Including the off-network road type was necessary in order to account for NOx and VOC exhaust emissions from vehicle starts and extended idle activity, and VOC emissions from evaporative processes.

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

4.2.7 POLLUTANTS AND PROCESSES

County-level emissions for a typical summer day, specifically a July weekday, were modeled for each year of interest. Emissions from all processes that generate NOx or VOC, such as running exhaust, start exhaust, and evaporative processes, were included to ensure that all emissions of these pollutants from on-road sources were accounted for as required for SIPs or regional conformity analyses.

4.2.8 TEMPERATURE AND RELATIVE HUMIDITY DATA

Local temperature and humidity data are required inputs for SIP and regional conformity analyses with MOVES. For the Charlotte area on-road mobile source emission estimates, the DAQ used the average July 2014 24-hour temperature profile from the Automated Surface Observing System at the Charlotte Douglas International Airport. The temperature and relative humidity profiles used in the MOVES input files are listed in section 5.2.

4.2.9 SOURCE TYPE POPULATION

Source type (i.e., vehicle type) population data are used within MOVES to calculate off-network emissions, which include exhaust emissions from vehicle starts and evaporative emissions from parked vehicles. Off-network emissions are based on both the number and type of vehicles in the modeling domain. MOVES source type population input data consists of the number of each of 13 types of vehicles within the modeled area, which is typically a single county. Descriptions of the categories, which are subsets of the six HPMS vehicle classes, are shown in Table 4.2.9-1. The DAQ developed source type population input tables from the latest available (2013) county-level vehicle registration dataset described in Section 4.2.2. The original data was processed in three steps to provide source type population data to accurately represent the correct source types, geographic areas, and future years as described below.

Converting Source Type Categories

The DAQ used a customized spreadsheet tool, based on EPA source type distribution tools and data, to convert the local county-level source type population data from nine vehicle types to the required 13 MOVES source types. This is the same process that was used for the source type age distribution data processing described in Section 4.2.2

Formatted: Tab stops: 6.5", Right + Not at 9.75"

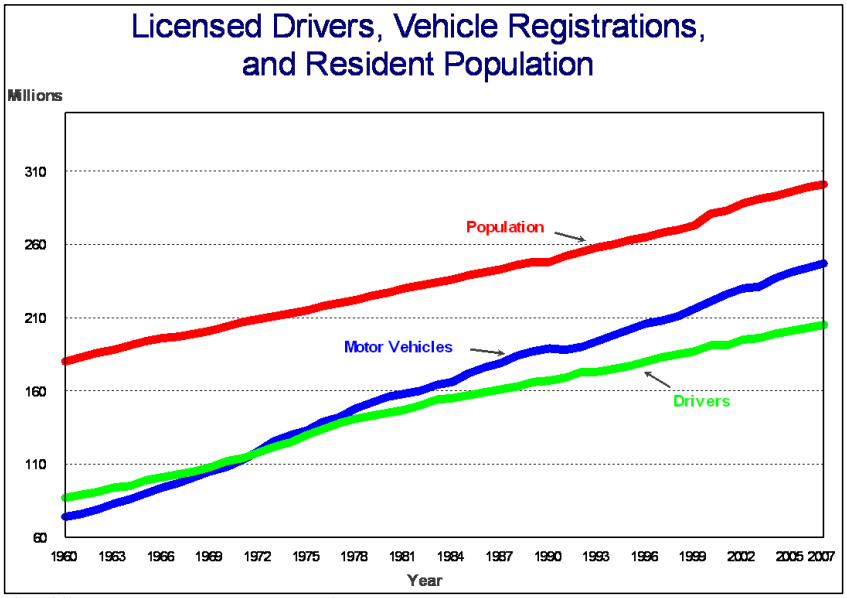
Table 4.2.9-1. MOVES Source Types and HPMS Vehicle Types

Source Type ID	Source Types used in MOVES	HPMS Vehicle Class
11	Motorcycle	Motorcycles
21	Passenger Car	Passenger Cars
31	Passenger Truck	Other 2 axle-4 tire vehicles
32	Light Commercial Truck	Other 2 axle-4 tire vehicles
41	Intercity Bus	Buses
42	Transit Bus	Buses
43	School Bus	Buses
51	Refuse Truck	Single Unit Trucks
52	Single Unit Short-haul Truck	Single Unit Trucks
53	Single Unit Long-haul Truck	Single Unit Trucks
54	Motor Home	Single Unit Trucks
61	Combination Short-haul Truck	Combination Trucks
62	Combination Long-haul Truck	Combination Trucks

Projecting Source Type Population Data to Future Years

For future year MOVES runs, it was necessary to project the source type population data for each county. The DAQ has determined that growth in human population is a suitable indicator of growth in vehicle ownership. This is illustrated in the FHWA Highway Statistics graph of Licensed Drivers, Vehicle Registrations, and Resident Population shown in Figure 4.2.9-1.

Figure 4.2.9-1. Federal Highway Association Statistics Graph



Formatted: Tab stops: 6.5", Right + Not at 9.75"

The EPA has also indicated that using human population growth as a surrogate to project vehicle population growth is acceptable. To forecast future year vehicle populations, a reliable source of county population was needed. To ensure consistency, the same future year human population estimates used in the MRM TDM modeling were used to project county-level source type population data. An example of how a 2013 vehicle population was grown to 2018 based on this surrogate of projected county population follows:

$$\text{Vehicle Pop}_{2018} = \text{Vehicle Pop}_{2013} * (\text{Human Pop}_{2018} / \text{Human Pop}_{2013})$$

Scaling Source Type Population Data to Partial County Areas

The maintenance area only partially covers six of the seven Charlotte area counties. To accurately reflect the source type populations in these partial county areas, the total county source type populations were scaled based on the ratio of the human population within the maintenance area of the county to the whole county population, as shown in the following equation:

$$\text{Vehicle Pop}_{\text{partial county}} = \text{Vehicle Pop}_{\text{whole county}} * (\text{Human Pop}_{\text{partial county}} / \text{Human Pop}_{\text{whole county}})$$

The human population data from the MRM TDM modeling was also used for these calculations.

4.2.10 VEHICLE INSPECTION AND MAINTENANCE PROGRAM PARAMETERS

In 2002, North Carolina implemented a vehicle emissions inspection and maintenance (I&M) program based on vehicle onboard diagnostics (OBDII). This program initially covered all light duty gasoline powered vehicles (designated in MOVES as source type IDs 21, 31, and 32) that are model year 1996 and newer. The program was initially implemented in 9 counties and was expanded to include a total of 48 counties between July 2002 and January 2006. Cabarrus, Gaston, Mecklenburg, and Union were phased-in July 1, 2002 followed by Iredell and Rowan Counties in July 1, 2003 and Lincoln County in January 1, 2004.

All MOVES modeling runs were executed with the appropriate I&M program parameters to properly account for the emissions reductions resulting from implementation of the program. The magnitude of the reductions is scaled by the I&M compliance factor parameters, which are calculated based on I&M compliance rates and waiver rates. The vehicle model years covered by the program must also be specified, as well as the number of latest model years of vehicles to exclude from the I&M program testing requirements. These four parameters (I&M compliance rate, waiver rate, model years covered, and number of model years excluded) are defined in the North Carolina I&M SIP. North Carolina state law has dictated changes to the I&M program

Formatted: Header

model year exemptions and model year coverage in recent years. Table 4.2.10-1 lists the I&M program parameters applicable for specific emissions inventory years.

Table 4.2.10-1. Inspection and Maintenance Program Parameters

Inventory Year	Compliance Rate	Waiver Rate	Vehicle Model Years Covered	Number of Latest Model Years Exempted
2014	95%	5%	1996 and newer	1
2015	96%	5%	1996 and newer	3*
2018 - 2026	96%	5%	20 latest model years	3*

* Vehicles from the 3 latest model years with 70,000 or more odometer miles are not exempted

4.2.11 REID VAPOR PRESSURE SPECIFICATIONS

Reid vapor pressure (RVP) is a measurement of gasoline volatility. The use of lower RVP gasoline leads to lower VOC emissions from gasoline handling and evaporative VOC emissions from motor vehicles. Gasoline with an RVP of 9.0 psi is required during May through September 15 for all North Carolina counties.

4.2.12 DIESEL SULFUR CONTENT

All diesel fuel formulations used the default diesel fuel sulfur content values, which are within the ultra-low sulfur diesel limit of 15 parts per million (ppm).

4.2.13 FUEL SUPPLY AND FUEL FORMULATION

MOVES default fuel supply and fuel formulation data are categorized by fuel region ID – counties with the same fuel region ID have the same fuel supply and formulation for a given year. All North Carolina counties are covered by a single fuel region ID – 100000000. The default fuel supply and fuel formulations for fuel region 100000000 were used for all model runs.

4.2.14 VMT DATA

The ~~MRM~~ Charlotte area VMT data for years ~~the~~2014, 2015, 2018, and 2022 ~~Charlotte area~~ were generated by CDOT using the MRM14v1.0 travel demand model and were provided to the DAQ on November 11, 2014. VMT data for 2026 were generated using MRM22v1.0. The MRM modeling incorporated the latest available socioeconomic, population and highway planning data.

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Tables 4.2.14-1 through 4.2.14-7 list the VMT data for all Charlotte area counties. The values represent the average annual daily vehicle miles traveled (AADVMT) for the specified county/road type/travel period designation.

Formatted: Header

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Table 4.2.14-1. Daily Vehicle Miles Traveled for Cabarrus County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	30,008	29,864	30,750	32,178	31,123~~34,331~~
	Rural Minor Arterial	53,118	55,011	57,188	63,727	68,616~~65,990~~
	Rural Major Collector	92,043	91,499	95,597	98,566	105,803~~104,956~~
	Rural Minor Collector	59,330	58,208	60,731	67,815	78,982~~74,757~~
	Rural Local	106,084	110,564	126,516	149,925	147,583~~172,359~~
	Urban Interstate	345,872	357,449	437,117	479,242	478,652~~496,575~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	183,464	187,467	190,147	201,121	188,248~~212,150~~
	Urban Minor Arterial	183,378	183,274	200,855	219,417	210,386~~234,138~~
	Urban collector	137,484	138,991	142,514	153,838	174,224~~166,802~~
	Urban Local	197,979	197,570	212,227	235,814	240,733~~258,865~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	42,414	42,156	44,354	47,607	39,788~~51,224~~
	Rural Minor Arterial	68,160	70,479	76,395	87,753	82,679~~92,415~~
	Rural Major Collector	125,806	124,420	134,128	143,923	137,282~~155,508~~
	Rural Minor Collector	75,727	77,004	83,925	97,184	101,275~~107,791~~
	Rural Local	161,780	167,062	193,033	232,174	237,497~~266,438~~
	Urban Interstate	482,789	500,843	568,102	624,432	510,206~~663,134~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	282,066	287,837	295,533	316,604	294,349~~337,244~~
	Urban Minor Arterial	287,258	288,602	323,528	356,053	333,395~~381,688~~
	Urban collector	214,619	215,466	229,017	252,104	285,351~~275,769~~
	Urban Local	328,160	327,740	353,409	395,075	429,912~~436,347~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	33,563	33,478	34,234	35,589	32,228~~38,218~~
	Rural Minor Arterial	58,307	59,635	61,666	68,925	73,473~~71,453~~
	Rural Major Collector	103,080	103,294	107,437	108,659	117,377~~115,752~~
	Rural Minor Collector	69,840	70,084	73,070	79,288	97,567~~86,~~

Formatted: Header

Formatted: Not Highlight

Formatted: Not Highlight

Formatted Table

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

						~~224~~
	Rural Local	120,351	124,505	142,497	168,525	175,619~~194,231~~
	Urban Interstate	372,341	386,810	479,352	531,181	493,661~~551,105~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	205,647	210,525	211,939	222,977	204,058~~236,628~~
	Urban Minor Arterial	203,243	205,522	224,043	245,511	239,511~~262,873~~
	Urban collector	160,911	164,529	168,384	179,906	203,011~~193,529~~
	Urban Local	222,875	222,971	239,499	266,665	283,533~~293,025~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	25,061	25,364	27,354	29,827	29,876~~32,089~~
	Rural Minor Arterial	39,010	40,755	44,138	49,840	53,295~~52,787~~
	Rural Major Collector	66,717	65,232	71,202	76,230	81,209~~83,048~~
	Rural Minor Collector	37,782	37,702	41,297	47,693	57,552~~52,238~~
	Rural Local	73,280	76,047	88,025	105,869	125,430~~121,859~~
	Urban Interstate	296,483	305,261	342,581	375,607	330,357~~391,624~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	153,257	157,148	164,745	175,099	184,385~~185,434~~
	Urban Minor Arterial	143,993	145,701	163,798	179,798	183,937~~193,569~~
	Urban collector	92,107	92,081	97,799	108,516	137,927~~119,270~~
	Urban Local	144,598	143,697	155,250	173,277	204,910~~190,831~~
Cabarrus County Total VMT		**6,079,985**	**6,181,845**	**6,793,375**	**7,483,533**	**7~~8~~,485~~054~~,001~~269~~**

Table 4.2.14-2. Daily Vehicle Miles Traveled for Gaston County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	34,557	34,791	36,407	38,406	33,019~~42,346~~
	Rural Principal Arterial	56,698	56,294	57,057	58,961	73,850~~76,909~~
	Rural Minor Arterial	49,584	52,515	54,292	57,248	59,737~~57,198~~
	Rural Major Collector	57,437	58,479	61,440	65,665	79,091~~69,209~~
	Rural Minor Collector	35,053	35,729	37,416	40,509	47,959~~38,954~~
	Rural Local	48,567	49,224	50,953	53,551	48,201~~53,888~~
	Urban Interstate	436,046	437,339	446,003	461,082	472,748~~575,954~~

Formatted: Header
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Tab stops: 6.5", Right + Not at 9.75"

	Urban Other Freeway/Xprway	21,663	21,528	21,866	22,631	25,879~~23,756~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	265,284	267,431	276,673	289,583	303,913~~281,076~~
	Urban Minor Arterial	218,618	219,640	226,223	235,902	257,263~~230,713~~
	Urban collector	54,786	55,788	58,269	61,507	71,657~~63,659~~
	Urban Local	198,034	199,636	207,542	216,977	213,515~~219,904~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	45,132	45,643	48,402	51,905	34,562~~55,832~~
	Rural Principal Arterial	73,074	73,989	75,553	80,501	83,444~~102,972~~
	Rural Minor Arterial	64,203	66,699	70,525	74,628	85,401~~73,284~~
	Rural Major Collector	78,383	80,365	84,677	90,360	96,815~~97,029~~
	Rural Minor Collector	44,351	44,393	46,451	49,312	52,126~~48,591~~
	Rural Local	71,618	72,188	75,099	78,830	72,200~~80,629~~
	Urban Interstate	602,056	612,551	635,969	670,339	556,290~~786,468~~
	Urban Other Freeway/Xprway	29,883	30,461	30,913	32,267	36,051~~33,754~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	387,650	385,689	401,882	421,132	430,664~~421,371~~
	Urban Minor Arterial	325,365	327,459	337,113	352,394	366,482~~351,716~~
	Urban collector	80,364	81,105	84,367	88,919	108,238~~94,756~~
	Urban Local	318,714	319,254	330,231	345,077	387,964~~356,457~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	36,997	37,332	38,873	40,828	31,651~~43,361~~
	Rural Principal Arterial	62,197	61,427	62,332	64,750	72,085~~85,607~~
	Rural Minor Arterial	53,694	57,115	59,482	63,606	61,974~~62,883~~
	Rural Major Collector	64,742	66,414	69,995	73,711	85,144~~79,085~~
	Rural Minor Collector	41,839	42,618	44,802	48,311	53,136~~46,434~~
	Rural Local	56,042	56,930	59,331	62,762	54,093~~63,191~~
	Urban Interstate	467,545	470,125	479,219	493,477	482,634~~620,388~~
	Urban Other Freeway/Xprway	23,373	23,071	23,297	24,224	25,835~~25,579~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	299,562	300,198	312,069	328,838	332,909~~319,391~~
	Urban Minor Arterial	247,314	248,666	255,345	267,193	287,891~~262,626~~

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

	Urban collector	65,018	66,307	68,361	71,382	79,667~~75,451~~
	Urban Local	219,679	220,893	228,882	239,541	244,503~~244,985~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	28,188	28,391	29,863	31,909	22,100~~34,835~~
	Rural Principal Arterial	44,897	45,371	45,318	47,524	50,420~~60,446~~
	Rural Minor Arterial	33,835	35,889	37,705	40,048	48,667~~40,690~~
	Rural Major Collector	41,860	42,450	44,159	46,176	56,039~~49,762~~
	Rural Minor Collector	20,275	20,227	20,978	22,000	27,466~~21,547~~
	Rural Local	34,791	35,046	36,185	37,587	38,081~~38,313~~
	Urban Interstate	372,145	378,212	388,098	410,332	377,099~~471,578~~
	Urban Other Freeway/Xprway	19,393	19,561	19,192	20,086	25,338~~21,159~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	203,671	203,198	209,249	215,140	222,779~~219,332~~
	Urban Minor Arterial	160,734	160,840	165,877	173,423	193,537~~173,656~~
	Urban collector	36,548	36,876	38,195	39,890	59,198~~43,194~~
	Urban Local	143,492	143,962	148,794	154,485	189,486~~159,845~~
Gaston County Total VMT		**6,374,953**	**6,429,308**	**6,640,924**	**6,954,907**	**7,~~499,76~~118,8034**

Table 4.2.14-3. Daily Vehicle Miles Traveled for Iredell County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	51,536	52,851	54,784	56,753	63,624~~58,172~~
	Rural Principal Arterial	0	0	0	0	0~~0~~
	Rural Minor Arterial	21,644	22,172	22,995	23,669	23,192~~35,449~~
	Rural Major Collector	27,050	27,608	29,066	29,455	32,771~~29,711~~
	Rural Minor Collector	36,330	36,732	38,477	40,630	49,104~~43,553~~
	Rural Local	81,741	82,007	86,569	93,063	108,302~~99,769~~
	Urban Interstate	143,299	147,038	152,069	142,783	160,551~~144,523~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	27,544	31,861~~27,026~~
	Urban Principal Arterial	27,848	27,574	28,992	30,549	31,033~~32,687~~
	Urban Minor Arterial	31,082	31,719	32,875	33,976	38,786~~34,993~~
	Urban collector	50,284	50,358	52,481	54,694	60,796~~62,685~~
	Urban Local	83,436	85,283	91,897	99,540	103,079~~10~~

Formatted: Header
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Tab stops: 6.5", Right + Not at 9.75"

						~~5,684~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	65,269	66,977	70,689	74,873	74,188~~78,952~~
	Rural Principal Arterial	0	0	0	0	0~~0~~
	Rural Minor Arterial	35,445	36,406	37,931	39,372	40,289~~55,749~~
	Rural Major Collector	40,059	40,423	42,973	45,688	50,964~~45,084~~
	Rural Minor Collector	54,701	55,547	58,714	62,408	70,864~~64,467~~
	Rural Local	124,389	125,068	132,301	143,837	178,695~~154,980~~
	Urban Interstate	196,973	201,953	213,241	216,070	215,518~~222,562~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	15,370	25,269~~16,843~~
	Urban Principal Arterial	44,789	44,950	47,015	49,640	49,955~~52,610~~
	Urban Minor Arterial	48,671	50,572	52,322	54,600	60,811~~56,173~~
	Urban collector	77,202	78,123	81,948	86,449	98,269~~98,524~~
	Urban Local	139,343	142,373	154,154	167,996	185,285~~178,550~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	55,379	56,498	58,395	60,629	63,238~~61,660~~
	Rural Principal Arterial	0	0	0	0	0~~0~~
	Rural Minor Arterial	24,932	25,517	26,651	27,221	24,372~~39,094~~
	Rural Major Collector	30,134	30,558	32,132	31,866	34,394~~32,322~~
	Rural Minor Collector	41,746	42,461	44,368	46,468	53,620~~49,790~~
	Rural Local	92,450	93,092	98,078	105,012	123,159~~112,456~~
	Urban Interstate	153,424	155,989	160,687	149,106	159,663~~150,935~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	34,702	34,041~~35,493~~
	Urban Principal Arterial	30,642	30,864	32,080	33,627	33,511~~35,811~~
	Urban Minor Arterial	34,589	34,698	36,620	37,610	42,640~~38,938~~
	Urban collector	55,442	56,123	58,688	61,373	67,362~~71,013~~
	Urban Local	94,471	96,698	104,453	112,915	117,135~~118,760~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	38,675	39,714	41,557	44,428	48,969~~46,887~~
	Rural Principal Arterial	0	0	0	0	0~~0~~
	Rural Minor Arterial	23,273	23,768	24,856	25,865	29,654~~31,964~~
	Rural Major Collector	20,856	20,528	21,603	23,241	29,155~~24,780~~
	Rural Minor Collector	24,974	25,591	27,042	29,002	36,090~~31,~~

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

						~~154~~
	Rural Local	56,979	57,673	60,542	65,537	91,362~~70,825~~
	Urban Interstate	113,535	116,493	121,676	129,046	147,987~~134,819~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	59	916~~28~~
	Urban Principal Arterial	26,187	26,132	27,303	28,738	31,904~~29,783~~
	Urban Minor Arterial	28,450	28,639	29,421	29,741	37,105~~33,560~~
	Urban collector	38,110	38,618	40,888	43,448	54,632~~45,740~~
	Urban Local	62,174	63,708	68,706	75,126	91,319~~78,758~~
Iredell County Total VMT		**2,427,512**	**2,469,099**	**2,597,237**	**2,783,719**	**~~2,973,318~~** **3,105,435**

Table 4.2.14-4. Daily Vehicle Miles Traveled for Lincoln County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	20,747	21,302	22,113	23,204	32,571~~24,269~~
	Rural Minor Arterial	106,015	111,442	115,565	121,946	135,248~~119,240~~
	Rural Major Collector	15,137	15,428	15,873	16,432	18,888~~16,570~~
	Rural Minor Collector	35,505	37,785	40,045	42,683	37,782~~44,328~~
	Rural Local	122,885	129,385	138,443	150,164	161,052~~161,440~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	51,424	50,774	51,790	54,257	73,990~~58,004~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	26,628	27,287	27,606	28,891	36,916~~27,941~~
	Urban Minor Arterial	64,140	64,940	66,664	68,430	75,102~~69,803~~
	Urban collector	16,735	16,830	17,333	18,066	17,519~~18,554~~
	Urban Local	37,516	37,130	37,853	38,868	37,841~~40,461~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	30,037	30,756	32,021	33,679	40,885~~35,354~~
	Rural Minor Arterial	154,693	160,725	166,779	175,251	194,974~~171,729~~
	Rural Major Collector	21,288	21,601	22,493	23,498	24,700~~24,138~~
	Rural Minor Collector	45,051	47,468	51,742	55,544	41,465~~59,619~~
	Rural Local	181,400	189,208	201,397	217,935	248,835~~236,665~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	71,264	72,217	74,231	79,712	84,079~~84,240~~

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	38,013	39,291	40,129	42,228	53,470~~41,293~~
	Urban Minor Arterial	97,271	97,808	100,721	103,346	115,179~~106,771~~
	Urban collector	25,140	24,922	25,575	26,423	23,240~~27,172~~
	Urban Local	61,596	60,559	61,592	63,368	66,095~~65,998~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	22,945	23,518	24,490	25,740	27,491~~26,993~~
	Rural Minor Arterial	114,529	119,884	124,569	132,228	134,839~~129,692~~
	Rural Major Collector	16,451	16,899	17,517	18,146	18,451~~18,622~~
	Rural Minor Collector	40,019	43,456	45,638	48,397	37,070~~49,714~~
	Rural Local	138,147	145,362	153,872	166,221	169,717~~178,211~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	57,012	55,809	57,655	60,810	65,714~~66,309~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	29,134	30,029	30,765	32,389	37,448~~31,685~~
	Urban Minor Arterial	68,665	69,333	71,310	73,330	76,649~~75,479~~
	Urban collector	19,418	19,478	20,046	20,829	17,700~~21,081~~
	Urban Local	42,441	41,888	42,720	43,879	40,276~~45,330~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	19,257	19,735	20,549	21,580	23,451~~22,620~~
	Rural Minor Arterial	94,300	98,688	102,312	106,624	128,736~~111,963~~
	Rural Major Collector	12,006	12,192	12,566	12,998	13,445~~13,368~~
	Rural Minor Collector	20,333	22,103	24,166	26,980	23,631~~26,470~~
	Rural Local	89,534	92,567	98,993	107,078	131,685~~115,438~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	41,522	42,006	42,237	44,915	47,294~~47,669~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	21,600	22,233	23,043	24,446	30,980~~24,607~~
	Urban Minor Arterial	58,150	58,442	60,392	61,750	70,068~~64,543~~
	Urban collector	11,982	11,916	12,175	12,584	11,604~~12,840~~
	Urban Local	29,402	29,028	29,687	30,498	34,371~~31,598~~
Lincoln County Total VMT		**2,169,332**	**2,231,424**	**2,324,665**	**2,455,347**	~~**2,547,819**~~ **2,660,450**

Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Not Highlight
Formatted: Tab stops: 6.5", Right + Not at 9.75"

Table 4.2.14-5. Daily Vehicle Miles Traveled for Mecklenburg County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	39,142	40,081	41,967	44,610	42,388~~44,575~~
	Rural Minor Arterial	18,649	19,429	20,122	21,912	22,342~~22,824~~
	Rural Major Collector	16,663	16,328	16,369	16,835	18,336~~17,028~~
	Rural Minor Collector	38,457	37,484	41,891	45,338	53,303~~48,636~~
	Rural Local	72,753	75,940	84,349	97,493	113,826~~108,370~~
	Urban Interstate	1,712,350	1,741,446	1,806,898	1,844,014	2,230,102~~1,865,541~~
	Urban Other Freeway/Xprway	1,218,723	1,401,052	1,481,278	1,559,147	2,001,948~~1,584,809~~
	Urban HOT/HOV	9,771	13,473	25,411	113,677	380,114~~241,747~~
	Urban Principal Arterial	1,119,879	1,123,704	1,173,209	1,237,075	1,248,275~~1,301,167~~
	Urban Minor Arterial	1,029,914	1,042,665	1,105,579	1,161,820	1,186,291~~1,256,719~~
	Urban collector	855,507	876,125	919,921	971,245	1,069,633~~1,007,015~~
	Urban Local	1,523,084	1,520,243	1,608,305	1,721,836	1,933,136~~1,811,854~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	53,167	53,274	57,259	60,932	65,415~~60,553~~
	Rural Minor Arterial	25,167	26,240	28,378	31,187	33,314~~32,653~~
	Rural Major Collector	23,769	23,862	23,478	25,184	27,290~~25,998~~
	Rural Minor Collector	54,897	52,791	60,308	67,600	81,321~~72,332~~
	Rural Local	109,035	112,469	129,258	151,825	182,648~~170,994~~
	Urban Interstate	2,373,626	2,399,912	2,516,822	2,637,032	2,927,088~~2,705,939~~
	Urban Other Freeway/Xprway	1,641,842	1,849,310	1,966,306	2,114,328	2,755,858~~2,182,373~~
	Urban HOT/HOV	276	2,415	13,145	57,451	331,182~~156,283~~
	Urban Principal Arterial	1,741,760	1,763,075	1,840,528	1,948,288	1,977,170~~2,070,574~~
	Urban Minor Arterial	1,621,168	1,654,018	1,751,761	1,853,379	1,878,409~~2,004,222~~
	Urban collector	1,333,408	1,377,762	1,452,204	1,548,207	1,693,673~~1,608,140~~
	Urban Local	2,493,329	2,497,214	2,650,182	2,850,365	3,350,287~~3,013,290~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	43,084	44,625	47,114	50,265	45,042~~49,883~~
	Rural Minor Arterial	20,893	21,689	22,460	24,145	23,432~~25,11~~

Formatted: Header

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

						~~2~~
	Rural Major Collector	19,334	19,728	19,044	18,654	21,441~~19,011~~
	Rural Minor Collector	45,858	44,655	49,567	53,851	63,126~~56,917~~
	Rural Local	83,421	86,811	96,558	111,298	134,310~~123,575~~
	Urban Interstate	1,844,732	1,892,027	1,957,367	1,984,843	2,365,161~~2,017,139~~
	Urban Other Freeway/Xprway	1,332,109	1,541,594	1,624,970	1,715,431	2,141,638~~1,723,638~~
	Urban HOT/HOV	5,581	9,495	28,522	142,141	461,820~~290,341~~
	Urban Principal Arterial	1,270,179	1,273,364	1,332,888	1,402,008	1,410,040~~1,481,671~~
	Urban Minor Arterial	1,176,178	1,179,788	1,250,922	1,312,842	1,363,616~~1,423,634~~
	Urban collector	969,863	990,977	1,041,673	1,098,217	1,215,088~~1,132,442~~
	Urban Local	1,725,788	1,724,962	1,824,047	1,952,156	2,297,232~~2,055,716~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	29,912	29,998	31,885	34,015	40,330~~35,030~~
	Rural Minor Arterial	15,130	15,751	16,706	17,883	20,726~~18,680~~
	Rural Major Collector	8,895	9,247	10,049	11,003	11,037~~11,612~~
	Rural Minor Collector	24,520	23,086	25,768	28,784	35,970~~31,843~~
	Rural Local	46,172	48,042	54,918	64,804	91,165~~74,080~~
	Urban Interstate	1,358,620	1,388,068	1,440,938	1,530,519	1,929,610~~1,605,435~~
	Urban Other Freeway/Xprway	821,025	931,904	979,734	1,048,590	1,652,989~~1,091,384~~
	Urban HOT/HOV	0	6	1,001	1,781	33,264~~8,250~~
	Urban Principal Arterial	903,995	916,814	958,343	1,000,464	1,088,287~~1,046,253~~
	Urban Minor Arterial	812,462	821,302	872,001	908,603	929,494~~972,613~~
	Urban collector	663,371	677,554	718,074	763,964	884,745~~809,193~~
	Urban Local	1,096,389	1,093,310	1,153,493	1,234,070	1,488,415~~1,311,922~~
Mecklenburg County Total VMT		**33,443,846**	**34,505,105**	**36,372,971**	**38,691,112**	**45~~0~~,351~~829~~,329~~007~~**

Table 4.2.14-6. Daily Vehicle Miles Traveled for Rowan County

Travel Period	**Road Type**	**2014**	**2015**	**2018**	**2022**	**2026**
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	23,100	22,675	22,580	23,008	27,510~~23,872~~
	Rural Minor Arterial	22,291	22,378	22,761	23,457	27,260~~24,409~~
	Rural Major Collector	88,676	88,895	92,791	93,090	99,674~~98,097~~

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Font: 10 pt

Formatted Table

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

	Rural Minor Collector	53,513	52,629	57,987	61,480	83,891~~64,495~~
	Rural Local	88,943	89,078	92,428	95,856	88,616~~100,290~~
	Urban Interstate	358,483	363,727	392,138	446,964	454,914~~473,365~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	100,256	101,019	102,884	99,741	93,436~~102,063~~
	Urban Minor Arterial	111,703	112,071	114,193	116,587	116,808~~120,808~~
	Urban collector	106,139	106,578	109,893	112,467	124,038~~117,983~~
	Urban Local	139,933	141,019	146,626	153,692	154,345~~159,956~~
Midday Period (9:00 AM - 3:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	26,948	26,673	27,386	28,341	29,099~~29,170~~
	Rural Minor Arterial	32,663	32,993	33,812	35,253	38,339~~36,654~~
	Rural Major Collector	115,588	116,132	120,521	124,355	117,755~~131,168~~
	Rural Minor Collector	67,040	67,794	72,862	77,937	80,845~~83,093~~
	Rural Local	137,045	137,814	142,376	148,927	135,763~~155,524~~
	Urban Interstate	505,430	514,529	549,931	602,709	493,092~~640,988~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	147,044	147,470	151,977	151,669	139,232~~154,857~~
	Urban Minor Arterial	175,026	175,293	179,715	184,725	176,717~~190,773~~
	Urban collector	155,604	156,767	161,742	170,250	176,302~~178,225~~
	Urban Local	225,909	227,007	234,657	248,167	262,005~~258,448~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	23,812	23,677	23,778	24,198	27,352~~24,687~~
	Rural Minor Arterial	24,068	24,236	24,597	25,348	27,155~~26,574~~
	Rural Major Collector	97,536	98,299	102,509	101,776	104,513~~106,907~~
	Rural Minor Collector	60,238	60,778	67,253	69,370	90,542~~73,400~~
	Rural Local	98,924	99,746	103,859	107,134	96,734~~111,949~~
	Urban Interstate	395,947	400,799	430,537	498,798	418,021~~528,853~~
	Urban Other Freeway/Xprway	0	0	0	0	0~~0~~
	Urban HOT/HOV	0	0	0	0	0~~0~~
	Urban Principal Arterial	111,993	113,202	115,914	109,729	99,080~~112,933~~
	Urban Minor Arterial	123,022	123,773	126,204	129,696	123,078~~13~~

Formatted: Header
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Right
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Right
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Tab stops: 6.5", Right + Not at 9.75"

						3,443
	Urban collector	121,416	122,731	128,026	127,636	134,84413 3,787
	Urban Local	155,574	156,876	164,093	171,213	168,75717 8,574
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0	0	0	0	00
	Rural Principal Arterial	17,889	17,998	18,284	18,765	20,34619,5 60
	Rural Minor Arterial	21,294	21,190	21,566	22,303	25,09524,0 61
	Rural Major Collector	67,270	67,768	70,527	73,465	76,19376,9 15
	Rural Minor Collector	31,480	31,485	33,123	35,214	43,04936,4 60
	Rural Local	65,546	65,962	67,924	70,880	74,28573,5 47
	Urban Interstate	319,627	324,714	348,768	380,915	312,74040 3,819
	Urban Other Freeway/Xprway	0	0	0	0	00
	Urban HOT/HOV	0	0	0	0	00
	Urban Principal Arterial	76,175	76,305	78,250	78,158	80,28580,6 04
	Urban Minor Arterial	91,821	92,290	94,576	97,101	96,584101, 221
	Urban collector	74,746	75,192	77,521	82,502	96,19285,0 64
	Urban Local	102,778	103,621	106,234	112,495	133,95111 6,521
Rowan County Total VMT		**4,762,488**	**4,803,184**	**5,032,805**	**5,335,370**	**5,593168,1 19436**

Table 4.2.14-7. Daily Vehicle Miles Traveled for Union County

Travel Period	Road Type	2014	2015	2018	2022	2026
AM Peak (6:00 AM - 9:00 AM)	Rural Interstate	0	0	0	0	00
	Rural Principal Arterial	38,290	38,679	139,766	148,143	121,78115 8,399
	Rural Minor Arterial	18,961	19,326	19,935	20,923	25,11222,2 35
	Rural Major Collector	155,974	160,654	152,780	162,080	183,50118 1,636
	Rural Minor Collector	64,746	65,986	70,773	76,110	74,17878,4 08
	Rural Local	221,303	229,487	245,198	266,676	272,67428 4,359
	Urban Interstate	0	0	0	0	00
	Urban Other Freeway/Xprway	30,292	30,913	71,946	75,440	128,06475, 942
	Urban HOT/HOV	0	0	108	146	02,612
	Urban Principal Arterial	135,690	136,533	109,726	115,602	118,88312 2,692
	Urban Minor Arterial	108,002	109,907	111,932	118,098	127,72613 3,332
	Urban collector	138,490	141,502	141,864	149,959	181,86015 1,695
	Urban Local	257,504	262,820	262,640	280,569	306,64729 5,374
Midday	Rural Interstate	0	0	0	0	00

Formatted: Header
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Right
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Not Highlight
Formatted: Font: 10 pt
Formatted Table
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Font: 10 pt
Formatted: Tab stops: 6.5", Right + Not at 9.75"

Period (9:00 AM - 3:00 PM)	Rural Principal Arterial	56,512	58,081	171,518	183,038	132,999~~20~~ ~~0,322~~
	Rural Minor Arterial	24,025	25,021	28,703	30,045	24,892~~31,8~~ ~~98~~
	Rural Major Collector	230,210	234,685	223,069	237,483	242,526~~26~~ ~~4,712~~
	Rural Minor Collector	94,961	97,221	103,096	109,701	104,167~~11~~ ~~4,075~~
	Rural Local	335,317	344,216	373,410	406,264	411,591~~43~~ ~~4,065~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	44,856	46,389	93,399	99,438	166,422~~10~~ ~~0,386~~
	Urban HOT/HOV	0	0	66	77	0~~709~~
	Urban Principal Arterial	207,596	213,330	170,096	180,427	178,450~~18~~ ~~9,617~~
	Urban Minor Arterial	168,170	171,581	173,196	182,470	196,107~~20~~ ~~6,596~~
	Urban collector	215,973	220,204	220,333	231,856	277,361~~23~~ ~~7,866~~
	Urban Local	415,153	426,404	425,307	452,481	520,489~~48~~ ~~6,631~~
PM Peak (3:00PM - 6:00 PM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	41,428	42,297	151,983	162,490	115,692~~17~~ ~~5,563~~
	Rural Minor Arterial	23,049	24,002	24,252	24,099	28,708~~25,6~~ ~~75~~
	Rural Major Collector	172,819	177,379	167,850	177,517	195,946~~19~~ ~~7,487~~
	Rural Minor Collector	71,464	73,251	78,926	84,655	79,827~~88,6~~ ~~83~~
	Rural Local	248,217	258,196	270,282	295,671	307,033~~31~~ ~~5,088~~
	Urban Interstate	0	0	0	0	0~~0~~
	Urban Other Freeway/Xprway	33,384	34,283	78,151	82,843	138,857~~83,~~ ~~599~~
	Urban HOT/HOV	0	0	57	62	0~~2,719~~
	Urban Principal Arterial	149,007	150,385	123,310	130,315	128,021~~13~~ ~~6,921~~
	Urban Minor Arterial	120,278	121,548	123,674	130,083	141,950~~14~~ ~~7,022~~
	Urban collector	155,137	157,147	158,134	166,948	202,130~~17~~ ~~1,032~~
	Urban Local	289,540	295,051	295,573	313,897	351,635~~33~~ ~~2,288~~
Night Period (6:00 PM - 6:00 AM)	Rural Interstate	0	0	0	0	0~~0~~
	Rural Principal Arterial	35,847	36,089	89,237	93,190	81,693~~99,1~~ ~~03~~
	Rural Minor Arterial	12,087	12,353	13,470	13,621	14,431~~15,6~~ ~~54~~
	Rural Major Collector	120,528	126,124	125,457	133,429	145,296~~14~~ ~~6,674~~
	Rural Minor Collector	47,795	49,080	52,182	55,497	57,203~~57,1~~ ~~52~~
	Rural Local	152,161	158,002	179,880	195,251	213,467~~20~~ ~~9,048~~
	Urban Interstate	0	0	0	0	0~~0~~

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted Table

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Tab stops: 6.5", Right + Not at 9.75"

	Urban Other Freeway/Xprway	23,640	23,960	45,799	48,288	97,41448,726
	Urban HOT/HOV	0	0	13	16	0134
	Urban Principal Arterial	114,838	114,656	91,096	97,317	89,518104,515
	Urban Minor Arterial	91,292	92,401	96,738	99,934	115,62911 0,465
	Urban collector	107,641	110,417	108,770	115,651	152,03111 9,824
	Urban Local	187,438	192,581	196,320	209,411	252,39722 3,547
Union County Total VMT		**5,159,614**	**5,282,143**	**5,780,015**	**6,157,210**	**6,584704,478309**

Formatted: Header

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Formatted: Not Highlight

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

4.3 ESTIMATED EMISSIONS FROM ON-ROAD MOBILE SOURCES

Tables 4.3-1 and 4.3-2 summarize the on-road mobile source NO_x and VOC emissions modeling results for the Charlotte area.

Table 4.3-1. On-road Mobile Source NOx Emissions by County

Formatted: Not Highlight

County	2014	2015	2018	2022	2026	2014	2015	2018	2022	2026
	kg/day					tons/day				
Cabarrus*	5,989	5,378	3,636	2,619	~~1,810~~2,208	6.60	5.93	4.01	2.89	~~2.00~~2.43
Gaston*	7,356	6,588	4,266	2,861	~~1,924~~2,224	8.11	7.26	4.70	3.15	~~2.12~~2.45
Iredell*	3,045	2,765	1,888	1,324	~~903~~1,171	3.36	3.05	2.08	1.46	~~1.00~~1.29
Lincoln*	2,723	2,495	1,697	1,160	~~757~~963	3.00	2.75	1.87	1.28	~~0.83~~1.06
Mecklenburg	24,488	21,952	13,261	9,006	~~6,501~~10,957	26.99	24.20	14.62	9.93	~~7.17~~12.08
Rowan*	5,825	5,221	3,452	2,417	~~1,571~~1,757	6.42	5.76	3.81	2.66	~~1.73~~1.94
Union*	5,146	4,659	3,145	2,142	~~1,466~~2,074	5.67	5.14	3.47	2.36	~~1.62~~2.29
Area Total	54,572	49,058	31,345	21,529	~~14,932~~21,354	60.15	54.09	34.56	23.73	~~16.47~~23.54

*Emissions are for the portion of the county in the maintenance area

Table 4.3-2. On-road Mobile Source VOC Emissions by County

Formatted: Not Highlight

County	2014	2015	2018	2022	2026	2014	2015	2018	2022	2026
	kg/day					tons/day				
Cabarrus*	3,765	3,525	2,790	2,390	~~1,982~~1,600	4.15	3.89	3.08	2.63	~~2.19~~1.76
Gaston*	4,179	3,893	2,858	2,200	~~1,689~~1,524	4.61	4.29	3.15	2.42	~~1.86~~1.68
Iredell*	1,768	1,655	1,297	1,042	~~801~~782	1.95	1.82	1.43	1.15	~~0.88~~0.86
Lincoln*	1,737	1,642	1,272	1,021	~~779~~688	1.91	1.81	1.40	1.13	~~0.86~~0.76

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

Mecklenburg	13,060	12,167	9,316	7,702	~~6,334~~6,476	14.40	13.41	10.27	8.49	~~6.98~~7.14
Rowan*	3,408	3,156	2,380	1,835	~~1,389~~1,246	3.76	3.48	2.62	2.02	~~1.53~~1.37
Union*	3,210	2,996	2,347	1,928	~~1,520~~1,471	3.54	3.30	2.59	2.13	~~1.68~~1.62
Area Total	31,127	29,034	22,260	18,118	~~14,494~~13,787	34.32	32.00	24.54	19.97	~~15.98~~15.19

*Emissions are for the portion of the county in the maintenance area.

4.4 MOTOR VEHICLE EMISSIONS BUDGETS FOR CONFORMITY

Transportation Conformity

The purpose of transportation conformity is to ensure that federal transportation actions occurring in the Charlotte area do not interfere with the area maintaining compliance with the 2008 8-hour ozone standard. This means that the level of emissions estimated by the NCDOT or the MPOs for the Transportation Improvement Program and Metropolitan Transportation Plan must not exceed the MVEBs as defined in this maintenance plan.

Safety Margin

A safety margin is the difference between the attainment level of emissions from all source categories (i.e., point, area, nonroad mobile and on-road mobile) and the projected level of emissions from all source categories. The State may choose to allocate some of the safety margin to the MVEBs, for transportation conformity purposes, so long as the total level of emissions from all source categories remains below the attainment level of emissions for 2014.

The DAQ has decided to allocate a portion of the safety margin to the MVEBs to allow for unanticipated growth in VMT, changes to vehicle mix assumptions and model uncertainty that will influence the emission estimations. The DAQ has developed and implemented a five-step approach for determining the amount of safety margin to apply to the MVEBs.

Step 1 Percentage below the standard

When EPA approved redesignation of the Charlotte area from nonattainment to maintenance for the 2008 8-hour ozone standard, the ozone design value for the area was 0.073 ppm (based on certified ambient air monitoring data for 2012-2014) or 2.6% below the standard of 0.075 ppm. In Step 1, 2% of the safety margin was allocated to the MVEB for 2026 for each county. This allocation remains the same for the revised maintenance plan even though the ozone design value

Formatted: Tab stops: 6.5", Right + Not at 9.75"

for the Charlotte area has declined to 0.070 ppm (based on certified ambient air monitoring data for 2014-2016).

Step 2 Account for unanticipated model input data changes

For the original maintenance plan, all counties received an additional 5% allocation of safety margin emissions to the 2026 MVEB to account for model input data changes that can impact the emissions. The potential model input changes include, but are not limited to, changes in vehicle activity data (VMT, speeds, etc.) and vehicle fleet characteristics (vehicle population, vehicle mix assumptions, and vehicle age distribution). Additionally, there are occasional updates to the MOVES~~2014~~ model and the Metrolina Regional Model's travel demand model which may impact emissions. For this revision, the allocation was increased from 25% to ~~25~~45% to provide flexibility in using the best available model input data and the latest model versions for future transportation conformity determinations.

Step 3 Provide flexibility and account for rapid growth for counties that are determined to be medium to small contributors to the on-road mobile NOx emissions inventory

- Counties with <8% of total on-road mobile source NOx and VOC emissions received an additional 5% of their emissions allocated to MVEB in 2026 (Iredell and Lincoln)
- Counties with 8% to 25% of total on-road mobile source NOx and VOC emissions received an additional 3% of their emissions allocated to MVEB in 2026 (Cabarrus, Gaston, Rowan and Union)
- These allocations are the same as the allocations included in the 2026 MVEBs in the original maintenance plan.

Step 4 Account for input uncertainty in final year of the maintenance plan

For the original maintenance plan, an additional increase of 10% was applied to the 2026 MVEBs to account for potential changes in VMT, vehicle mix and vehicle age distribution. This additional percentage is added to the current percentages outlined in the steps above. The DAQ believes this additional 10% is appropriate for the 2026 MVEBs because ozone values will continue to drop as NOx levels in 2026 are projected to be less than half of the 2014 base year emissions for the maintenance area. For Gaston, Iredell, Lincoln, Mecklenburg, and Union Counties, this allocation is the same as the allocation included in the 2026 MVEBs for these counties in the original maintenance plan.

An additional increase of 5% is applied to the 2026 MVEBs for Cabarrus and Rowan Counties to account for travel demand growth that has exceeded the levels modeled for the original version of the maintenance and redesignation plan. This additional percentage is added to the current percentages outlined in the steps above. Interagency consultation partners recommended and

Formatted: Header

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Tab stops: 6.5", Right + Not at 9.75"

agreed to the additional allocation based on a review of recent transportation conformity determination results. The DAQ believes this additional 5% is appropriate for the 2026 MVEBs due to the high population growth rates expected for these counties, especially for Cabarrus county, which is predicted to grow by around 49% between 2013 and 2026.

Step 5 Ensure the sum of the safety margins applied to the MVEB does not exceed 50% of the total safety margin available

The DAQ will implement a cap to the safety margin applied to the MVEBs. The sum of the safety margins applied to the MVEBs in the entire maintenance area cannot exceed 50% of the total safety margin available. In this analysis, steps 1-4 accounted for ~~9.4~~21.4% of the total NOx safety margin and ~~37.4~~49.7% of the total VOC safety margin.

Table 4.4-1 summarizes the percent increase to the MVEB for purposes of transportation conformity for each county in the Charlotte area.

Table 4.4-1. Percent Increase to MVEB

County	2026
Cabarrus	~~45~~65%
Gaston	~~40~~60%
Iredell	~~42~~62%
Lincoln	~~42~~62%
Mecklenburg	~~37~~57%
Rowan	~~45~~65%
Union	~~40~~60%

Motor Vehicle Emissions Budgets

Tables 4.4-2 and 4.4-3 show the counties with their highway mobile NOx and VOC emissions expressed in tons per day and the corresponding kilograms per day values for 2014 and 2026.

Table 4.4-2. On-road Mobile Source NOx Emissions

County	2014			2026	
	tons/day	kg/day		tons/day	kg/day
Cabarrus*	6.60	5,989		~~2.00~~2.43	~~1,810~~2,208
Gaston*	8.11	7,356		~~2.12~~2.45	~~1,924~~2,224
Iredell*	3.36	3,045		~~1.00~~1.29	~~903~~1,17

Formatted: Header

Formatted: Not Highlight

Formatted: Tab stops: 6.5", Right + Not at 9.75"

					1
Lincoln*	3.00	2,723		0.831.06	757963
Mecklenburg	26.99	24,488		7.1712.08	6,50110,957
Rowan*	6.42	5,825		1.731.94	1,5711,757
Union*	5.67	5,146		1.622.29	1,4662,074
Total	**60.15**	**54,572**		**16.4723.54**	**14,93221,354**

* Emissions for portion of county included in maintenance area.

Table 4.4-3. On-road Mobile Source VOC Emissions

County	**2014**			**2026**	
	tons/day	kg/day		tons/day	kg/day
Cabarrus*	4.15	3,765		2.191.76	1,9821,600
Gaston*	4.61	4,179		1.861.68	1,6891,524
Iredell*	1.95	1,768		0.880.86	801782
Lincoln*	1.91	1,737		0.860.76	779688
Mecklenburg	14.40	13,060		6.987.14	6,3346,476
Rowan*	3.76	3,408		1.531.37	1,3891,246
Union*	3.54	3,210		1.681.62	1,5201,471
Total	**34.32**	**31,127**		**15.9815.19**	**14,49413,787**

* Emissions for portion of county included in maintenance area.

The DAQ established 2014 and 2026 MVEBs for transportation conformity purposes based on the jurisdictional boundaries of the MPOs and/or RPOs within the Charlotte maintenance area. Tables 4.4-4 through 4.4-6 list the NOx and VOC MVEBs. Upon EPA's affirmative adequacy finding for these MVEBs, these MVEBs will become the applicable MVEBs for each MPO/RPO county grouping.

Formatted: Header

Formatted: Not Highlight

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Table 4.4-4. Cabarrus-Rowan MPO MVEB*

	2014		2026	
	NOx (kg/day)	VOC (kg/day)	NOx (kg/day)	VOC (kg/day)
Base Emissions	11,814	7,173	~~3,381~~3,965	~~3,371~~2,846
Safety Margin Allocated to MVEB	-	-	~~1,522~~2,578	~~1,517~~1,907
Conformity MVEB	**11,814**	**7,173**	**~~4,903~~6,543**	**~~4,888~~4,753**

*Includes the portions of Cabarrus and Rowan Counties in the maintenance area.

Table 4.4-5. Gaston-Cleveland-Lincoln MPO MVEB*

	2014		2026	
	NOx (kg/day)	VOC (kg/day)	NOx (kg/day)	VOC (kg/day)
Base Emissions	10,079	5,916	~~2,681~~3,187	~~2,468~~2,212
Safety Margin Allocated to MVEB	-	-	~~1,087~~1,930	~~1,004~~1,371
Conformity MVEB	**10,079**	**5,916**	**~~3,768~~5,117**	**~~3,472~~3,583**

* Includes the portions of Gaston and Lincoln Counties in the maintenance area.

Table 4.4-6. Charlotte Regional TPO – Rocky River RPO MVEB*

	2014		2026	
	NOx (kg/day)	VOC (kg/day)	NOx (kg/day)	VOC (kg/day)
Base Emissions	32,679	18,038	~~8,870~~14,202	~~8,655~~8,729
Safety Margin Allocated to MVEB	-	-	~~3,371~~8,215	~~3,288~~5,089
Conformity MVEB	**32,679**	**18,038**	**~~12,241~~22,417**	**~~11,943~~13,818**

*Includes all of Mecklenburg County and the portions of Iredell and Union Counties in the maintenance area.

Formatted: Header

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Not Highlight

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

5.0 MOVES INPUT DATA

5.1 VEHICLE MIX DATA

Tables 5.1-1 through 5.1-2 show definitions of the vehicle types and facility (roadway) types referred to in the vehicle mix tables. Tables 5.1-3 through 5.1-6 list the vehicle mix data for each inventory year modeled.

Table 5.1-1. Vehicle Type Descriptions

ID#	Vehicle Type	Description
1	LDV	Light-Duty Vehicles (Passenger Cars)
2	LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
3	LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
4	LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)
5	LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)
6	HDV2	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)
7	HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)
8	HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)
9	HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)
10	HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)
11	HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)
12	HDV8A	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)
13	HDV8B	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)
14	HDBS	School Buses
15	HDBT	Transit and Urban Buses
16	MC	Motorcycles

Table 5.1-2. Facility (Roadway) Type Descriptions

Facility Type	Description	Facility Type	Description
11	Rural Interstate	23	Urban Interstate
13	Rural Other Principal Arterial	25	Urban Other Freeways and Expressways
15	Rural Minor Arterial	27	Urban Other Principal Arterial
17	Rural Major Collector	29	Urban Minor Arterial
19	Rural Minor Collector	31	Urban Collector
21	Rural Local	33	Urban Local

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

Table 5.1-3. 2014 North Carolina Vehicle Mix Data

	Fraction of VMT on Facility Type by Vehicle Type (each column should sum to 1)											
Vehicle Type	**11**	**13**	**15**	**17**	**19**	**21**	**23**	**25**	**27**	**29**	**31**	**33**
1	0.3008	0.3205	0.3284	0.3296	0.3358	0.3336	0.3288	0.3295	0.3387	0.3421	0.3437	0.3316
2	0.0917	0.0977	0.1002	0.1005	0.1024	0.1017	0.1003	0.1004	0.1033	0.1043	0.1049	0.1011
3	0.3052	0.3252	0.3334	0.3345	0.3406	0.3383	0.3336	0.3341	0.3436	0.347	0.3489	0.3364
4	0.094	0.1002	0.1027	0.103	0.1049	0.1042	0.1028	0.1029	0.1059	0.1069	0.1075	0.1036
5	0.0432	0.0461	0.0472	0.0474	0.0482	0.0479	0.0473	0.0473	0.0487	0.0492	0.0494	0.0477
6	0.0514	0.0337	0.0265	0.0255	0.0201	0.0221	0.0263	0.0258	0.0174	0.0144	0.0128	0.0238
7	0.005	0.0033	0.0026	0.0025	0.002	0.0021	0.0026	0.0025	0.0017	0.0014	0.0012	0.0023
8	0.0042	0.0028	0.0022	0.0021	0.0016	0.0018	0.0021	0.0021	0.0014	0.0012	0.001	0.0019
9	0.0032	0.0021	0.0016	0.0016	0.0012	0.0014	0.0016	0.0016	0.0011	0.0009	0.0008	0.0015
10	0.0116	0.0076	0.006	0.0057	0.0045	0.005	0.0059	0.0058	0.0039	0.0032	0.0029	0.0054
11	0.0135	0.0089	0.007	0.0067	0.0053	0.0058	0.0069	0.0068	0.0046	0.0038	0.0034	0.0063
12	0.0147	0.0096	0.0076	0.0073	0.0058	0.0063	0.0075	0.0074	0.005	0.0041	0.0037	0.0068
13	0.0526	0.0344	0.0271	0.0261	0.0206	0.0226	0.0269	0.0264	0.0178	0.0147	0.0131	0.0243
14	0.0026	0.0017	0.0014	0.0013	0.001	0.0011	0.0013	0.0013	0.0009	0.0007	0.0007	0.0012
15	0.0013	0.0009	0.0007	0.0007	0.0005	0.0006	0.0007	0.0007	0.0004	0.0004	0.0003	0.0006
16	0.005	0.0053	0.0054	0.0055	0.0055	0.0055	0.0054	0.0054	0.0056	0.0057	0.0057	0.0055
Sum	1	1	1	1	1	1	1	1	1	1	1	1

Formatted: Centered

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

Table 5.1-4. 2015 North Carolina Vehicle Mix Data

	Fraction of VMT on Facility Type by Vehicle Type (each column should sum to 1)											
Vehicle Type	**11**	**13**	**15**	**17**	**19**	**21**	**23**	**25**	**27**	**29**	**31**	**33**
1	0.2939	0.3129	0.3208	0.3218	0.3279	0.3255	0.3213	0.3214	0.3308	0.3342	0.3357	0.3239
2	0.0929	0.099	0.1015	0.1018	0.1036	0.103	0.1015	0.1017	0.1046	0.1056	0.1062	0.1024
3	0.3092	0.3296	0.3378	0.3389	0.3451	0.3428	0.3381	0.3386	0.3482	0.3516	0.3535	0.3409
4	0.0953	0.1015	0.1041	0.1044	0.1063	0.1056	0.1041	0.1043	0.1073	0.1083	0.1089	0.105
5	0.0438	0.0467	0.0479	0.048	0.0489	0.0486	0.0479	0.048	0.0493	0.0498	0.0501	0.0483
6	0.0513	0.0336	0.0264	0.0255	0.0201	0.0221	0.0262	0.0258	0.0174	0.0144	0.0128	0.0237
7	0.0051	0.0034	0.0026	0.0025	0.002	0.0022	0.0026	0.0026	0.0017	0.0014	0.0013	0.0024
8	0.0042	0.0028	0.0022	0.0021	0.0016	0.0018	0.0021	0.0021	0.0014	0.0012	0.001	0.0019
9	0.0031	0.0021	0.0016	0.0016	0.0012	0.0014	0.0016	0.0016	0.0011	0.0009	0.0008	0.0015
10	0.0115	0.0076	0.006	0.0057	0.0045	0.005	0.0059	0.0058	0.0039	0.0032	0.0029	0.0053
11	0.0136	0.0089	0.007	0.0068	0.0053	0.0059	0.007	0.0069	0.0046	0.0038	0.0034	0.0063
12	0.0147	0.0096	0.0076	0.0073	0.0058	0.0063	0.0075	0.0074	0.005	0.0041	0.0037	0.0068
13	0.0525	0.0344	0.027	0.0261	0.0206	0.0226	0.0268	0.0264	0.0178	0.0147	0.013	0.0243
14	0.0026	0.0017	0.0014	0.0013	0.001	0.0011	0.0013	0.0013	0.0009	0.0007	0.0007	0.0012
15	0.0013	0.0009	0.0007	0.0007	0.0005	0.0006	0.0007	0.0007	0.0004	0.0004	0.0003	0.0006
16	0.005	0.0053	0.0054	0.0055	0.0056	0.0055	0.0054	0.0054	0.0056	0.0057	0.0057	0.0055
Sum	1	1	1	1	1	1	1	1	1	1	1	1

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

Table 5.1-5. 2018 North Carolina Vehicle Mix Data

	Fraction of VMT on Facility Type by Vehicle Type (each column should sum to 1)											
Vehicle Type	**11**	**13**	**15**	**17**	**19**	**21**	**23**	**25**	**27**	**29**	**31**	**33**
1	0.2768	0.295	0.3024	0.3036	0.309	0.3068	0.3027	0.3029	0.3116	0.3147	0.3163	0.305
2	0.0958	0.1021	0.1047	0.105	0.1069	0.1062	0.1047	0.1049	0.1079	0.109	0.1095	0.1056
3	0.3189	0.3399	0.3484	0.3495	0.3559	0.3536	0.3487	0.3492	0.3591	0.3627	0.3646	0.3516
4	0.0983	0.1048	0.1074	0.1077	0.1097	0.109	0.1075	0.1076	0.1107	0.1118	0.1124	0.1084
5	0.0452	0.0481	0.0494	0.0495	0.0504	0.0501	0.0494	0.0495	0.0509	0.0514	0.0516	0.0498
6	0.0513	0.0336	0.0264	0.0255	0.0201	0.0221	0.0262	0.0258	0.0174	0.0144	0.0128	0.0238
7	0.0051	0.0033	0.0026	0.0025	0.002	0.0022	0.0026	0.0026	0.0017	0.0014	0.0013	0.0024
8	0.0043	0.0028	0.0022	0.0021	0.0017	0.0019	0.0022	0.0022	0.0015	0.0012	0.0011	0.0020
9	0.0031	0.0021	0.0016	0.0016	0.0012	0.0013	0.0016	0.0016	0.0011	0.0009	0.0008	0.0015
10	0.0115	0.0075	0.0059	0.0057	0.0045	0.0049	0.0059	0.0058	0.0039	0.0032	0.0029	0.0053
11	0.0136	0.0089	0.007	0.0067	0.0053	0.0058	0.0069	0.0068	0.0046	0.0038	0.0034	0.0063
12	0.0148	0.0097	0.0076	0.0073	0.0058	0.0064	0.0075	0.0074	0.005	0.0041	0.0037	0.0068
13	0.0525	0.0344	0.0271	0.0261	0.0206	0.0226	0.0268	0.0264	0.0178	0.0147	0.0131	0.0243
14	0.0026	0.0017	0.0013	0.0013	0.001	0.0011	0.0013	0.0013	0.0009	0.0007	0.0006	0.0012
15	0.0013	0.0009	0.0007	0.0006	0.0005	0.0006	0.0007	0.0007	0.0004	0.0004	0.0003	0.0006
16	0.0049	0.0052	0.0053	0.0053	0.0054	0.0054	0.0053	0.0053	0.0055	0.0056	0.0056	0.0054
Sum	1	1	1	1	1	1	1	1	1	1	1	1

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Table 5.1-6. 2020 and beyond North Carolina Vehicle Mix Data

	Fraction of VMT on Facility Type by Vehicle Type (each column should sum to 1)											
Vehicle Type	**11**	**13**	**15**	**17**	**19**	**21**	**23**	**25**	**27**	**29**	**31**	**33**
1	0.2651 ~~0.2674~~	0.2837 ~~0.2851~~	0.2896 ~~0.2925~~	0.2895 ~~0.2932~~	0.2874 ~~0.2986~~	0.2908 ~~0.2963~~	0.2905 ~~0.2925~~	0.2933 ~~0.2931~~	0.3010 ~~0.3013~~	0.3018 ~~0.3043~~	0.3062 ~~0.3057~~	0.2923 ~~0.2950~~
2	0.0966 ~~0.0974~~	0.1033 ~~0.1038~~	0.1055 ~~0.1064~~	0.1054 ~~0.1068~~	0.1045 ~~0.1087~~	0.1059 ~~0.108~~	0.1058 ~~0.1065~~	0.1068 ~~0.1067~~	0.1096 ~~0.1097~~	0.1099 ~~0.1108~~	0.1115 ~~0.1114~~	0.1065 ~~0.1074~~
3	0.3214 ~~0.3242~~	0.3438 ~~0.3455~~	0.3510 ~~0.3541~~	0.3508 ~~0.3553~~	0.3478 ~~0.3617~~	0.3523 ~~0.3594~~	0.3520 ~~0.3544~~	0.3554 ~~0.3549~~	0.3647 ~~0.365~~	0.3657 ~~0.3686~~	0.3709 ~~0.3706~~	0.3544 ~~0.3574~~
4	0.0991 ~~0.0999~~	0.1060 ~~0.1065~~	0.1082 ~~0.1091~~	0.1081 ~~0.1095~~	0.1072 ~~0.1115~~	0.1086 ~~0.1108~~	0.1085 ~~0.1092~~	0.1095 ~~0.1094~~	0.1124 ~~0.1125~~	0.1127 ~~0.1136~~	0.1143 ~~0.1142~~	0.1092 ~~0.1101~~
5	0.0456 ~~0.046~~	0.0488 ~~0.049~~	0.0498 ~~0.0502~~	0.0498 ~~0.0504~~	0.0493 ~~0.0513~~	0.0500 ~~0.051~~	0.0499 ~~0.0503~~	0.0504 ~~0.0503~~	0.0517 ~~0.0518~~	0.0519 ~~0.0523~~	0.0526 ~~0.0526~~	0.0503 ~~0.0507~~
6	0.0534 ~~0.0513~~	0.0335 ~~0.0336~~	0.0275 ~~0.0264~~	0.0272 ~~0.0255~~	0.0277 ~~0.0201~~	0.0238 ~~0.0221~~	0.0277 ~~0.0262~~	0.0243 ~~0.0258~~	0.0163 ~~0.0174~~	0.0156 ~~0.0144~~	0.0119 ~~0.0128~~	0.0204 ~~0.0237~~
7	0.0053 ~~0.0051~~	0.0033 ~~0.0033~~	0.0027 ~~0.0026~~	0.0027 ~~0.0025~~	0.0027 ~~0.002~~	0.0023 ~~0.0022~~	0.0027 ~~0.0026~~	0.0024 ~~0.0025~~	0.0016 ~~0.0017~~	0.0015 ~~0.0014~~	0.0012 ~~0.0013~~	0.0020 ~~0.0023~~
8	0.0045 ~~0.0043~~	0.0028 ~~0.0028~~	0.0023 ~~0.0022~~	0.0023 ~~0.0021~~	0.0023 ~~0.0017~~	0.0020 ~~0.0018~~	0.0023 ~~0.0022~~	0.0020 ~~0.0021~~	0.0014 ~~0.0014~~	0.0013 ~~0.0012~~	0.0010 ~~0.0011~~	0.0017 ~~0.002~~
9	0.0034 ~~0.0032~~	0.0021 ~~0.0021~~	0.0017 ~~0.0017~~	0.0017 ~~0.0016~~	0.0017 ~~0.0013~~	0.0015 ~~0.0014~~	0.0017 ~~0.0017~~	0.0015 ~~0.0016~~	0.0010 ~~0.0011~~	0.0010 ~~0.0009~~	0.0007 ~~0.0008~~	0.0013 ~~0.0015~~
10	0.0120 ~~0.0115~~	0.0075 ~~0.0076~~	0.0062 ~~0.0059~~	0.0061 ~~0.0057~~	0.0062 ~~0.0045~~	0.0054 ~~0.005~~	0.0062 ~~0.0059~~	0.0055 ~~0.0058~~	0.0037 ~~0.0039~~	0.0035 ~~0.0032~~	0.0027 ~~0.0029~~	0.0046 ~~0.0053~~
11	0.0142 ~~0.0136~~	0.0089 ~~0.0089~~	0.0073 ~~0.007~~	0.0072 ~~0.0068~~	0.0073 ~~0.0053~~	0.0063 ~~0.0059~~	0.0073 ~~0.0069~~	0.0064 ~~0.0068~~	0.0043 ~~0.0046~~	0.0041 ~~0.0038~~	0.0031 ~~0.0034~~	0.0054 ~~0.0063~~
12	0.0154 ~~0.0148~~	0.0096 ~~0.0097~~	0.0079 ~~0.0076~~	0.0078 ~~0.0073~~	0.0080 ~~0.0058~~	0.0069 ~~0.0064~~	0.0080 ~~0.0075~~	0.0070 ~~0.0074~~	0.0047 ~~0.005~~	0.0045 ~~0.0041~~	0.0034 ~~0.0037~~	0.0059 ~~0.0068~~
13	0.0546 ~~0.0525~~	0.0342 ~~0.0344~~	0.0281 ~~0.027~~	0.0278 ~~0.026~~	0.0283 ~~0.0205~~	0.0244 ~~0.0226~~	0.0283 ~~0.0268~~	0.0248 ~~0.0263~~	0.0167 ~~0.0178~~	0.0159 ~~0.0147~~	0.0121 ~~0.013~~	0.0209 ~~0.0243~~
14	0.0036 ~~0.0026~~	0.0052 ~~0.0017~~	0.0044 ~~0.0013~~	0.0047 ~~0.0013~~	0.0044 ~~0.001~~	0.0074 ~~0.0011~~	0.0031 ~~0.0013~~	0.0038 ~~0.0013~~	0.0038 ~~0.0009~~	0.0034 ~~0.0007~~	0.0032 ~~0.0006~~	0.0104 ~~0.0012~~
15	0.0018 ~~0.0013~~	0.0026 ~~0.0008~~	0.0022 ~~0.0007~~	0.0024 ~~0.0006~~	0.0022 ~~0.0005~~	0.0037 ~~0.0006~~	0.0016 ~~0.0007~~	0.0019 ~~0.0007~~	0.0019 ~~0.0004~~	0.0017 ~~0.0004~~	0.0016 ~~0.0003~~	0.0052 ~~0.0006~~
16	0.0040 ~~0.0049~~	0.0047 ~~0.0052~~	0.0056 ~~0.0053~~	0.0065 ~~0.0054~~	0.0130 ~~0.0055~~	0.0087 ~~0.0054~~	0.0044 ~~0.0053~~	0.0050 ~~0.0053~~	0.0052 ~~0.0055~~	0.0055 ~~0.0056~~	0.0036 ~~0.0056~~	0.0095 ~~0.0054~~
Sum	1	1	1	1	1	1	1	1	1	1	1	1

Formatted ...
Formatted ...
Formatted Table ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted ...
Formatted

Formatted: Header

5.2 METEOROLOGICAL DATA

Table 5.2-1 lists the meteorological data used for all counties. Data were based on July 2014 24-hour temperature and relative humidity observations from Charlotte Douglas International Airport. Each record represents the temperature and relative humidity reading for a specific clock hour, averaged over all days of the month. For example, the first record shows the average temperature and relative humidity observed between midnight and 1:00AM during July 2014.

Table 5.2-1. Meteorological Data - KCLT Weather Station– July 2014

monthID	zoneID	hourID	temperature	relHumidity
7	371190	1	72.3	78
7	371190	2	71.9	78
7	371190	3	70.9	81
7	371190	4	70.4	82
7	371190	5	69.5	84
7	371190	6	69.6	84
7	371190	7	72.1	80
7	371190	8	74.6	74
7	371190	9	76.6	69
7	371190	10	79.5	63
7	371190	11	81.2	57
7	371190	12	82.7	55
7	371190	13	84	52
7	371190	14	84.5	51
7	371190	15	84.8	51
7	371190	16	84.6	51
7	371190	17	83.7	52
7	371190	18	82.1	55
7	371190	19	79.8	61
7	371190	20	77.7	66
7	371190	21	76.2	69
7	371190	22	75.1	72
7	371190	23	73.9	74
7	371190	24	73	75

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Formatted: Header

5.3 MOVES MODELING DATA FILES

For this revision, ~~no~~ changes were only made to the 2026 onroad mobile source emissions inventories that serve as the basis for this maintenance SIP. The MOVEs modeling data files are provided to fully document the on-road mobile source emissions inventories in the SIP.

Due to their size, format, and complexity, all MOVES data files were provided in electronic format. Three types of files are included:

- MOVES run specification (RunSpec) files – flat text files named in the format <cFIPSyYYYY_Project_I&M_RVP>.mrs
- MOVES input databases – compressed archives of MOVES MySQL input databases with file names in the format < cFIPSyYYYY_Project_I&M_RVP >_cdb.zip
- MOVES output databases – compressed archives of MOVES MySQL output databases with file names in the format < cFIPSyYYYY_Project_I&M_RVP >_out.zip,

Formatted: Space After: 0 pt

The file name < cFIPSyYYYY_Project_I&M_RVP > describes the county, year modeled, modeling project name, I&M parameters, and gasoline RVP used for the MOVES model run as follows:

- FIPS – the 5-digit state-county Federal Information Processing Standard (FIPS) number for the county modeled
- YYYY – calendar year modeled
- Project – the name of the MOVES modeling project assigned by DAQ for project management purposes
- I&M – the I&M compliance rate, waiver rate, and number of latest model years exempted, or if no I&M program is modeled
- RVP – indicates the gasoline RVP specification used in the modeling

Formatted: Normal, No bullets or numbering

Files for the 2026 model runs were named in a slightly different format, <Project_cFIPSyYYYY_TDM_I&M>, with RVP omitted and optionally replaced with TDM to signify VMT inputs from travel demand modeling.

For example, "c37025y2014_CGS2014SIP_9551_90" specifies a model run for Cabarrus County, NC (FIPS 37025) for 2014 as part of the "CGS2014SIP" MOVES modeling project with 95% I&M compliance rate, 5% waiver rate, and 1 latest model year vehicles exempted from I&M requirements and 9.0 psi RVP gasoline. A file name that includes "c37071y2018_CGSSIPRev2017_9653_90" specifies a model run for Gaston County, NC (FIPS 37071) for 2018 as part of the "CGSSIPRev2017" MOVES modeling project with 96% I&M compliance rate, 5% waiver rate, and the 3 latest model year vehicles exempted from I&M requirements and 9.0 psi RVP gasoline. Table 5.3-1 lists the files provided.

Formatted: Tab stops: 6.5", Right + Not at 9.75"

Table 5.3-1. MOVES Modeling Files Provided~~— No files were changed from the prior approved version of the SIP~~

County	Run Spec File	MOVES Input and ~~Database~~ ~~MOVES~~ Output Database~~s~~
Cabarrus	c37025y2014_CGS2014SIP_9551_90.mrs	c37025y2014_CGS2014SIP_9551_90_cdb.zip c37025y2014_CGS2014SIP_9551_90_out.zip
Cabarrus	c37025y2015_CGS2014SIP_9653_90.mrs	c37025y2015_CGS2014SIP_9653_90_cdb.zip c37025y2015_CGS2014SIP_9653_90_out.zip
Cabarrus	c37025y2018_CGSSIPRev2017_9653_90.mrs	c37025y2018_CGSSIPRev2017_9653_90_cdb.zip c37025y2018_CGSSIPRev2017_9653_90_out.zip
Cabarrus	c37025y2022_CGSSIPRev2017_9653_90.mrs	c37025y2022_CGSSIPRev2017_9653_90_cdb.zip c37025y2022_CGSSIPRev2017_9653_90_out.zip
Cabarrus	MetrolinaMOVES3MVEB_c37025y2026_TDM_9653_20MY.mrs ~~c37025y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37025y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37025y2026_tdm_9653_20my_out.zip~~e~~ ~~37025y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37025y2026_CGSSIPRev2017_9653_90_out.zip~~
Gaston	c37071y2014_CGS2014SIP_9551_90.mrs	c37071y2014_CGS2014SIP_9551_90_cdb.zip c37071y2014_CGS2014SIP_9551_90_out.zip
Gaston	c37071y2015_CGS2014SIP_9653_90.mrs	c37071y2015_CGS2014SIP_9653_90_cdb.zip c37071y2015_CGS2014SIP_9653_90_out.zip
Gaston	c37071y2018_CGSSIPRev2017_9653_90.mrs	c37071y2018_CGSSIPRev2017_9653_90_cdb.zip c37071y2018_CGSSIPRev2017_9653_90_out.zip
Gaston	c37071y2022_CGSSIPRev2017_9653_90.mrs	c37071y2022_CGSSIPRev2017_9653_90_cdb.zip c37071y2022_CGSSIPRev2017_9653_90_out.zip
Gaston	MetrolinaMOVES3MVEB_c37071y2026_TDM_9653_20MY.mrs ~~c37071y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37071y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37071y2026_tdm_9653_20my_out.zip~~e~~ ~~37071y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37071y2026_CGSSIPRev2017_9653_90_out.zip~~
Iredell	c37097y2014_CGS2014SIP_9551_90.mrs	c37097y2014_CGS2014SIP_9551_90_cdb.zip c37097y2014_CGS2014SIP_9551_90_out.zip
Iredell	c37097y2015_CGS2014SIP_9653_90.mrs	c37097y2015_CGS2014SIP_9653_90_cdb.zip c37097y2015_CGS2014SIP_9653_90_out.zip
Iredell	c37097y2018_CGSSIPRev2017_9653_90.mrs	c37097y2018_CGSSIPRev2017_9653_90_cdb.zip c37097y2018_CGSSIPRev2017_9653_90_out.zip
Iredell	c37097y2022_CGSSIPRev2017_9653_90.mrs	c37097y2022_CGSSIPRev2017_9653_90_cdb.zip c37097y2022_CGSSIPRev2017_9653_90_out.zip
Iredell	MetrolinaMOVES3MVEB_c37097y2026_TDM_9653_20MY.mrs ~~c37097y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37097y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37097y2026_tdm_9653_20my_out.zip~~e~~ ~~37097y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37097y2026_CGSSIPRev2017_9653_90_out.zip~~
Lincoln	c37109y2014_CGS2014SIP_9551_90.mrs	c37109y2014_CGS2014SIP_9551_90_cdb.zip c37109y2014_CGS2014SIP_9551_90_out.zip
Lincoln	c37109y2015_CGS2014SIP_9653_90.mrs	c37109y2015_CGS2014SIP_9653_90_cdb.zip

County	Run Spec File	MOVES Input and ~~Database~~ ~~MOVES~~ Output Databases
		c37109y2015_CGS2014SIP_9653_90_out.zip
Lincoln	c37109y2018_CGSSIPRev2017_9653_90.mrs	c37109y2018_CGSSIPRev2017_9653_90_cdb.zip c37109y2018_CGSSIPRev2017_9653_90_out.zip
Lincoln	c37109y2022_CGSSIPRev2017_9653_90.mrs	c37109y2022_CGSSIPRev2017_9653_90_cdb.zip c37109y2022_CGSSIPRev2017_9653_90_out.zip
Lincoln	MetrolinaMOVES3MVEB_c37109y2026_TDM_9653_20MY.mrs ~~c37109y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37109y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37109y2026_tdm_9653_20my_out.zip~~e~~ ~~37109y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37109y2026_CGSSIPRev2017_9653_90_out.zip~~
Mecklenburg	c37119y2014_CGS2014SIP_9551_90.mrs	c37119y2014_CGS2014SIP_9551_90_cdb.zip c37119y2014_CGS2014SIP_9551_90_out.zip
Mecklenburg	c37119y2015_CGS2014SIP_9653_90.mrs	c37119y2015_CGS2014SIP_9653_90_cdb.zip c37119y2015_CGS2014SIP_9653_90_out.zip
Mecklenburg	c37119y2018_CGSSIPRev2017_9653_90.mrs	c37119y2018_CGSSIPRev2017_9653_90_cdb.zip c37119y2018_CGSSIPRev2017_9653_90_out.zip
Mecklenburg	c37119y2022_CGSSIPRev2017_9653_90.mrs	c37119y2022_CGSSIPRev2017_9653_90_cdb.zip c37119y2022_CGSSIPRev2017_9653_90_out.zip
Mecklenburg	MetrolinaMOVES3MVEB_c37119y2026_TDM_9653_20MY.mrs ~~c37119y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37119y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37119y2026_tdm_9653_20my_out.zip~~e~~ ~~37119y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37119y2026_CGSSIPRev2017_9653_90_out.zip~~
Rowan	c37159y2014_CGS2014SIP_9551_90.mrs	c37159y2014_CGS2014SIP_9551_90_cdb.zip c37159y2014_CGS2014SIP_9551_90_out.zip
Rowan	c37159y2015_CGS2014SIP_9653_90.mrs	c37159y2015_CGS2014SIP_9653_90_cdb.zip c37159y2015_CGS2014SIP_9653_90_out.zip
Rowan	c37159y2018_CGSSIPRev2017_9653_90.mrs	c37159y2018_CGSSIPRev2017_9653_90_cdb.zip c37159y2018_CGSSIPRev2017_9653_90_out.zip
Rowan	c37159y2022_CGSSIPRev2017_9653_90.mrs	c37159y2022_CGSSIPRev2017_9653_90_cdb.zip c37159y2022_CGSSIPRev2017_9653_90_out.zip
Rowan	MetrolinaMOVES3MVEB_c37159y2026_TDM_9653_20MY.mrs ~~c37159y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37159y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37159y2026_tdm_9653_20my_out.zip~~e~~ ~~37159y2026_CGSSIPRev2017_9653_90_cdb.zip~~ ~~c37159y2026_CGSSIPRev2017_9653_90_out.zip~~
Union	c37179y2014_CGS2014SIP_9551_90.mrs	c37179y2014_CGS2014SIP_9551_90_cdb.zip c37179y2014_CGS2014SIP_9551_90_out.zip
Union	c37179y2015_CGS2014SIP_9653_90.mrs	c37179y2015_CGS2014SIP_9653_90_cdb.zip c37179y2015_CGS2014SIP_9653_90_out.zip
Union	c37179y2018_CGSSIPRev2017_9653_90.mrs	c37179y2018_CGSSIPRev2017_9653_90_cdb.zip c37179y2018_CGSSIPRev2017_9653_90_out.zip
Union	c37179y2022_CGSSIPRev2017_9653_90.mrs	c37179y2022_CGSSIPRev2017_9653_90_cdb.zip

County	Run Spec File	MOVES Input and ~~Database~~ ~~MOVES~~ Output Databases
		c37179y2022_CGSSIPRev2017_9653_90_out.zip
Union	MetrolinaMOVES3MVEB_c37179y2026_TDM_9653_20MY.mrs ~~c37179y2026_CGSSIPRev2017_9653_90.mrs~~	metrolinamoves3mveb_c37179y2026_9653_20my_cdb.zip metrolinamoves3mveb_c37179y2026_tdm_9653_20my_out.zip~~c37179y2026_CGSSIPRev2017_9653_90_cdb.zip c37179y2026_CGSSIPRev2017_9653_90_out.zip~~