

Appendix J

Mobile Source Emissions Modeling for Floyd County PM_{2.5} Attainment Demonstration Motor Vehicle Emissions Budgets

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1.0 Overview

The Georgia Environmental Protection Division (EPD) worked with the Georgia Department of Transportation (GDOT) and the Floyd-Rome Urban Transportation Study (FRUTS), the Metropolitan Planning Organization (MPO) for Rome, to develop link-level mobile¹ source emissions inventories for the purpose of establishing a motor vehicle emissions budget (MVEB) for the 2009 attainment year for the Rome PM2.5 Attainment State Implementation Plan (SIP) revision, hereinafter called the Rome PM2.5 Attainment Plan. The 2009 emission factors used were based on the single-run, annual-average-conditions approach described in EPA's August 9, 2005, *Guidance for Creating Annual On-Road Mobile Source Emission Inventories for PM2.5 Nonattainment Areas for Use in SIPs and Conformity*.² Consistent with that guidance, once this budget is found adequate or approved by EPA, subsequent emissions analyses for transportation conformity will also use the single-run, annual-average-conditions approach used to establish the MVEB. These inventories reflect the most recent planning assumptions and emission factor model available, and the use of an updated travel demand model. The GDOT travel demand and emissions estimation modeling process was employed to estimate mobile source emission inventories to establish the MVEB for the Rome PM2.5 Attainment Plan in a manner consistent with federal regulations for performing regional emissions analyses used in transportation conformity determinations. The alignment of methodologies for MVEB and transportation conformity emissions analyses reduces the possibility of spurious differences between motor vehicle emission budgets and transportation conformity analyses that must conform to those budgets.

Effective April 5, 2005, the U.S. Environmental Protection Agency (EPA) designated Floyd County as nonattainment for the annual fine particulate (PM2.5) National Ambient Air Quality Standard. The PM2.5 standard is subject to Subpart 1 of the Clean Air Act., the more general nonattainment area planning and control requirements of the Act. The designation also defined the year 2010 as the deadline for the Rome area to attain the PM2.5 standard; thus requiring 2007 - 2009 air quality modeling to demonstrate attainment of the standard.

1.1 Planning Boundaries

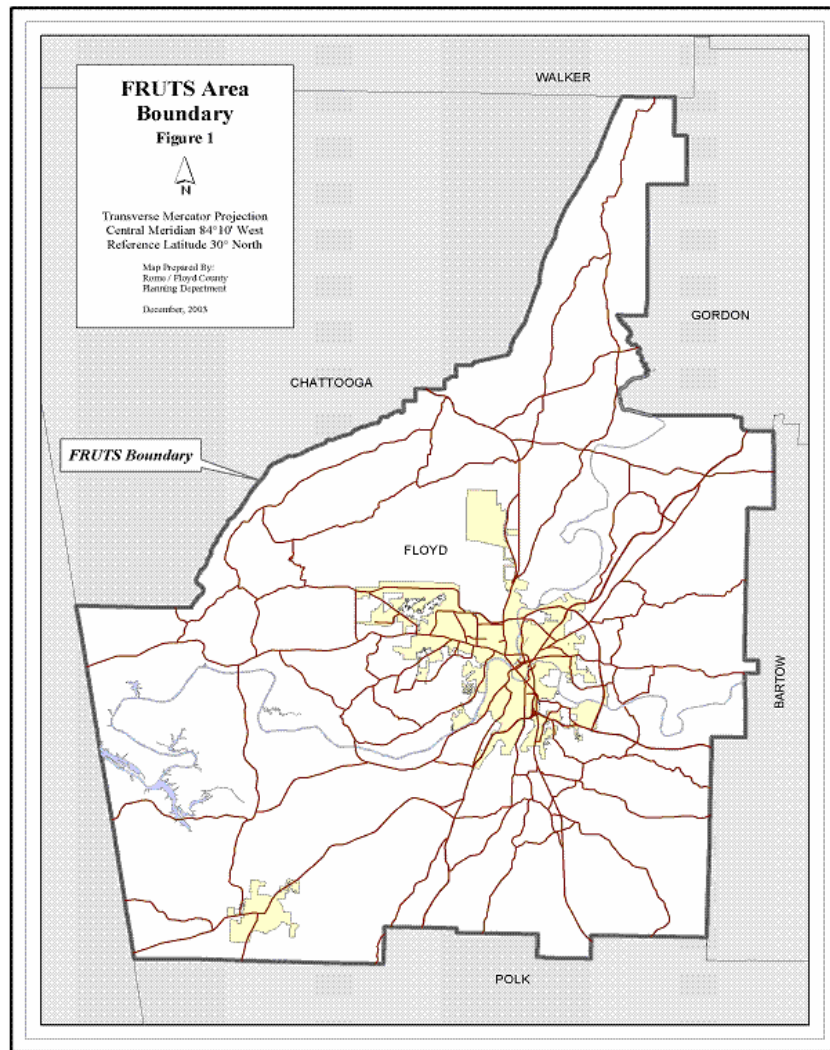
As the MPO for the Rome urbanized area, FRUTS is responsible for the continuing, cooperative,

¹ The term "mobile" is used to describe emissions from on-road motor vehicles.

² <http://epa.gov/otaq/stateresources/transconf/policy/420b05008.pdf>

and comprehensive metropolitan planning process required by Title 23 U.S.C. 134. Based on the 2000 Census, the Rome MPO defined their planning boundary as all of Floyd County; which is consistent with the PM2.5 nonattainment boundary. Figure 1.1-1 illustrates the effective boundary.

Figure 1.1-1
Rome-Floyd County and Nonattainment Area



1.2 Emissions Analysis – Models and Assumptions

In accordance with Section 93.105(b) of the Transportation Conformity Rule and Sections 106(g) and 106(h) of Georgia's transportation conformity SIP, all of which require interagency consultation for SIP development, a detailed listing of the procedures and planning assumptions used for the regional emissions analysis supporting development of the MVEB was distributed to the interagency consultation committee for review on March 18, 2008. The assumptions used to develop Rome's conforming Long Range Transportation Plan and Transportation Improvement Program were also used to develop the network and emissions for the Rome PM2.5 Attainment Plan MVEB, which required emissions for the year 2009.

The MOBILE6.2 input files reflect all federal and state motor vehicle emission control programs. In addition, the input files were customized to reflect the specific weather conditions and vehicle registration data for the Rome nonattainment area. MOBILE6.2 input files and emission factors for PM2.5 are shown in Exhibits 2 and 3.

2.0 Travel Demand Modeling Procedures

Georgia DOT is responsible for the development and application of the travel demand models for the urban areas outside of Atlanta. This section summarizes the Rome model's key travel demand modeling attributes, listed below, as they relate to the most important factors in estimating emissions.

1. Socio-economic data based on best available information
2. Consistency between transportation alternatives and land use scenarios
3. Modeled volumes validated against observed counts
4. Reasonable agreement between travel times used for trip-distribution and trip assignment
5. Reasonable sensitivity to time, cost and other factors affecting travel choices
6. Capacity-sensitive traffic assignment methodology

Model Attributes 1 & 2 (Socio-Economic Data)

The primary data inputs to travel demand models are socio-economic data, such as population and employment, and transportation networks. Modeling attributes one and two deal specifically with the socio-economic data inputs to the travel demand modeling process.

The first modeling attribute is that the socio-economic data be based on the best available information. In Georgia, each MPO has the responsibility of preparing socio-economic data. Georgia DOT reviews the socio-economic data for reasonableness and accuracy. The data development process and accuracy checks rely on the best available information, such as US Census data, aerial photography, land use maps, knowledge of proposed new developments and site visits (local knowledge). Other reasonableness and logic checks are made for data at the traffic zone level, such as calculating statistics including population per household, population density and employment density. The MPOs and GDOT work cooperatively, using the best available data, to insure that the data inputs to travel demand models are accurate and reasonable.

The second modeling attribute is that socio-economic data reflect the transportation alternatives being considered. This relates to the fact that improved transportation accessibility can alter land use patterns. However, it is generally accepted that significant improvements in transportation accessibility are necessary to bring about relatively small changes in land use. Due to their complexity, land use models are generally utilized in only a few large metropolitan areas in the United States. Georgia's MPOs, with the exception of Atlanta, do not use land use models. Instead, usually a single forecast for future socio-economic data is made that takes into consideration planned major transportation improvements. Future forecasts are generally made by first developing regional control totals for expected growth. Allocation of expected growth is then done using known development patterns and proposals as the basis, taking into consideration planned infrastructure improvements (new highways, sewer extensions, etc.). If unanticipated major projects are evaluated during the plan update process, a revised forecast may be developed with guidance from the MPO's Technical Coordinating Committee. The population and employment forecasts for the FRUTS area are listed in Table 2.0-1.

**Table 2.0-1
Population and Employment Forecasts for FRUTS Area
2002 and 2009**

	2002	2009
Total Population	91,474	96,982
Number of Households	34,966	36,731
Employment	38,506	40,982

Model Attribute 3 (Model Validation)

The next attribute involves the validation of travel demand models against observed traffic counts. Model validation is the process of insuring travel models produce results that reasonably replicate observed travel patterns. Properly validated models not only replicate observed conditions, but they also use accurate inputs and apply reasonable calculations to do so.

Georgia DOT applied multiple validation checks to each of the major steps in the Rome travel demand modeling process. In addition to socio-economic data checks, both the inputs to and outputs from the models were checked for accuracy and reasonableness during each step of the process. These inputs and outputs include transportation network attributes, trip generation parameters and results, trip distribution parameters and average trip lengths by purpose, auto occupancy rates, and speed-volume relationships.

Highway Networks – Air Quality Attributes

Georgia DOT develops and maintains highway networks with FRUTS review and assistance. Highway network attributes are reviewed for accuracy using the state roadway characteristics database, aerial photography and site visits / local knowledge. Network link attributes include the HPMS functional classification, so that modeled and observed Vehicle Miles Traveled (VMT) can be compared by county. Networks also include GDOT traffic count station numbers, so counts for the base year model can be included in output networks for validation purposes.

Highway Networks - Speed

Since speeds can be highly important³ for mobile emissions estimation, GDOT uses reasonable inputs and validates each of the factors that influence speed estimation; particularly the following:

- Roadway capacities
- Free-flow speeds
- Modeled volumes
- Speed-volume relationships

Link Capacities

Georgia DOT's link capacities were developed using the latest Highway Capacity Manual Software with typical parameters for various roadway classes and area types. The density of population and employment is used to classify the intensity of development patterns throughout the study area. The Rome model uses the following seven area types to classify land use.

- (1) - Central Business District (CBD) / High Density Urban
- (2) - Urban Commercial
- (3) - Urban Residential
- (4) - Suburban Commercial
- (5) - Suburban Residential
- (6) - Exurban
- (7) - Rural

Table 2.0-2 displays the hourly capacities per lane utilized in the Rome travel demand model.

**Table 2.0-2
Rome Model Hourly Per Lane Capacity Matrix**

Per Lane Hourly Capacities by Facility Type (FT) and Area Type (AT)								
AT	1	2	3	4	5	6	7	Facility Description
FT								
1	1900	1900	2000	2000	2200	2200	2000	Interstate
2	1800	1800	1900	1900	2000	2000	1900	Freeway
3	1300	1300	1400	1400	1500	1500	1400	Expressway
4	1200	1200	1300	1300	1400	1400	1300	Parkway
6	1600	1600	1800	1800	1900	1900	1800	Freeway-to-Freeway Ramp
7	1400	1400	1700	1700	1800	1800	1700	Entrance Ramp
8	1200	1200	1400	1400	1600	1600	1400	Exit Ramp
11	1000	1000	1200	1200	1400	1400	1200	Principal Arterial - Class I
12	900	900	1000	1000	1100	1100	1000	Principal Arterial - Class II
13	800	800	900	900	1000	1000	900	Minor Arterial - Class I
14	700	700	800	800	900	900	800	Minor Arterial - Class II
15	750	750	850	850	950	950	850	One-Way Arterial
21	600	600	700	700	800	800	700	Major Collector
22	500	500	600	600	700	700	600	Minor Collector
23	550	550	650	650	750	750	650	One-way Collector
30	400	400	500	500	600	600	500	Local Roads
32	0	0	0	0	0	0	0	Centroids

³ PM2.5 emission factors from MOBILE6 do not vary significantly by speed.

Free-flow Speeds

Assumed free-flow speeds are approximately 5 mph faster than typical speed limits for the various roadway classes and area types, taking into consideration control for delay (i.e., traffic signals) if applicable. Peak and off-peak free-flow speeds were evaluated using observed speeds obtained from a travel time study conducted in the Augusta area. An analysis of the Augusta data indicated that Augusta’s characteristics and data results are appropriate for use as a base in the Rome model since the travel dynamics for these urban areas are very similar. Through the process of model calibration and validation, the speeds were revised slightly for a couple of facilities to more accurately represent travel conditions in the Rome area. Table 2.0-3 displays the free-flow speeds utilized in the Rome travel demand model.

**Table 2.0-3
Rome Model Free-flow Speed Matrix**

Speeds by Facility Type (FT) and Area Type (AT)								
AT	1	2	3	4	5	6	7	Facility Description
FT								
1	55	60	60	60	60	70	70	Interstate
2	50	55	55	55	55	60	60	Freeway
3	50	50	50	50	55	55	55	Expressway
4	45	50	50	50	50	55	55	Parkway
6	55	55	55	55	55	55	55	Freeway-to-Freeway Ramp
7	45	50	50	50	50	55	55	Entrance Ramp
8	22	23	30	31	34	40	47	Exit Ramp
11	28	32	35	37	40	47	52	Principal Arterial - Class I
12	26	28	33	34	37	45	49	Principal Arterial - Class II
13	22	23	30	31	34	40	47	Minor Arterial - Class I
14	21	22	27	30	32	38	45	Minor Arterial - Class II
15	23	26	30	32	35	42	48	One-Way Arterial
21	17	18	21	27	29	34	42	Major Collector
22	14	15	18	24	26	30	40	Minor Collector
23	17	18	21	27	29	34	42	One-way Collector
30	14	14	17	18	22	28	35	Local Roads
32	14	14	17	18	22	28	35	Centroids

Modeled Volumes

Output modeled volumes are validated against traffic counts at several levels – regional, corridors and link-by-link. Regional evaluations include VMT, Root Mean Squared Error and R-Squared calculations. Corridor evaluations are primarily screenline and cutline comparisons. Nationally recognized maximum desirable deviation standards are applied to analyze model performance at the link level.

Base year external station volumes are based directly on observed traffic counts at each location. Future year external station volumes are estimated from historical trends in traffic counts at each location. Extrapolated future external station volumes are refined to insure use of reasonable annual compounded growth rates.

Speed-Volume Relationships

Georgia DOT uses speed-volume relationships that are different for various roadway types and area types. The speed-volume curves are calibrated to accurately reflect observed traffic volumes, while retaining sensible shapes to insure reasonable congested speeds. Peak-period speed data obtained from the GDOT travel time study was used as a reasonableness check in calibrating GDOT speed-volume curves.

Trip Generation

The GDOT trip generation process primarily uses parameters from the Augusta household survey, the Quick Response Freight Manual and US Census data. Minor adjustments are made to GDOT standard procedures to reflect unique characteristics in each area being modeled (e.g., port, military bases, etc.). Various validation checks are made to insure that trip generation results are reasonable. National data sources are used as reasonableness checks for trip generation results.

Trip Distribution

Trip distribution parameters are calibrated to produce reasonable average trip lengths. Expected average trip lengths are estimated from Census Journey-to-Work data and the population and geographic size of the modeled area. Travel times from trip assignment are used as input to trip distribution (i.e., feedback), which strengthens the validity of the modeled trip lengths.

Model Attribute 4 (Feedback of Travel Times)

The Rome model insures that there is reasonable agreement between travel times used for trip distribution and trip assignment by implementing a feedback loop. Within the feedback loop, all model steps from trip distribution to trip assignment are repeated until trip tables and link volumes change very little from one loop to the next. The Rome model includes a closure criterion for determining whether there is “reasonable agreement” in travel times for trip distribution and trip assignment. Closure is obtained if the following criterion is met:

- Maximum link volume change $\leq 1,000$

The Method of Successive Averages is used to insure that the model reaches stable conditions.

Model Attribute 5 (Mode Choice)

The fifth modeling attribute calls for mode choice models to be reasonably sensitive to changes in travel times and costs. The Rome travel demand model utilizes a trip-end based procedure that determines transit-oriented person trips before the region’s person trips are converted to vehicle trips. This trip-end model estimates transit patronage based on socio-economic characteristics such as income or auto-ownership, rather than transportation system characteristics.

Model Attribute 6 (Traffic Assignment)

The sixth modeling attribute calls for the use of capacity sensitive assignment procedures. The Rome model uses a 24-hour equilibrium assignment algorithm. The Rome model was validated using 24-hour counts and modeled volumes.

2.1 Travel Demand Modeling Post-Processing Procedures

The Rome regional travel demand model produces daily estimates of VMT and vehicle hours traveled (VHT) and a peak hour speed for each link in the highway network. In order to account for travel conditions throughout the day, VMT estimates and speeds by the four time-of-day periods listed below were produced. This is to ensure that the procedures used in estimating emissions for the Rome model area are consistent with the procedures used for emissions modeling (including conformity analyses) in the other nonattainment areas in Georgia.

- AM Period – (6:00 am – 10:00 am) – 4 hours
- Midday Period – (10:00 am – 3:00 pm) – 5 hours
- PM Period – (3:00 pm – 7:00 pm) – 4 hours
- Night Period – (7:00 pm – 6:00 am) – 11 hours

The stratification of the VMT and speeds by time-of-day provides more detailed information to use in estimating emissions. The following sections describe the procedures used to produce VMT and speeds by the four time-of-day periods from the daily assignment for input to the emissions modeling.

VMT Estimation By Time-of-Day

In order to develop the information necessary to perform time-of-day emissions modeling, post-processing of the output from the travel demand model was required. Factors derived from the National Cooperative Highway Research Program (NCHRP) Report 187 – *Quick Response Urban Travel Estimation Techniques and Transferable Parameters – User's Guide* were used to develop VMT estimates by time of day from the daily estimates. The factors in Table 2.1-1 below, from NCHRP Report 187 Table 22 – Hourly Distribution on Internal Auto Driver Travel by Trip Purpose: Urbanized Area Population, 100,000 – 250,000, were used.

**Table 2.1-1
Hourly Distribution on Internal Auto Driver Travel**

Hour #	Hour	All Trip Purposes
0	Midnight	0.80
1	1 AM	0.40
2	2 AM	0.20
3	3 AM	0.10
4	4 AM	0.40
5	5 AM	1.00
6	6 AM	4.30
7	7 AM	8.20
8	8 AM	4.60
9	9 AM	4.10
10	10 AM	4.70
11	11 AM	4.90
12	Noon	6.30
13	1 PM	5.40
14	2 PM	5.80
15	3 PM	7.20
16	4 PM	9.90
17	5 PM	9.50
18	6 PM	5.70
19	7 PM	5.40
20	8 PM	4.10
21	9 PM	3.00
22	10 PM	2.20
23	11 PM	1.80
		100.00

Source: NCHRP Report 187, Table 22

The percent of trips occurring in each time period was estimated from Table 2.1-1 by summing the appropriate hourly values. This results in the following factors:

- AM Period – 21.2%
- Midday Period – 27.1%
- PM Period – 32.3%
- Night Period – 19.4%

Time-of-day volumes were estimated by multiplying the daily volumes by these factors. VMT by time-of-day could then be derived from the time period volumes and link distances.

Speed By Time-of-Day

Since highway speeds vary over the course of a day (due to changes in traffic volume), it is necessary to estimate traffic peaking patterns before speeds by time-of-day can be estimated from a daily travel demand model. To represent peaking characteristics within each period either

volumes or capacities must be adjusted. In this case, capacities were adjusted. Time period capacity factors were derived using the factors in Table 2.1-1. Capacity factors for each period were estimated as:

$$\text{Peaking Factor} = \% \text{ Trips in Period} / (\text{Maximum Hourly \% in Period} * \text{Hours in Period})$$

A period Capacity Factor was then calculated as:

$$\text{Capacity Factor} = \text{Hours in Period} * \text{Peaking Factor}$$

A capacity for each period could then be calculated as:

$$\text{Period Capacity} = \text{Hourly Capacity} * \text{Capacity Factor}$$

Table 2.1-2 shows the capacity factors that were derived from the hourly factors in Table 2.1-1.

**Table 2.1-2
Time of Day Capacity Factors**

Period	Hours of Period	Max Percentage per Period	Peaking Factor	Capacity Factors	% of Capacity
AM	4	8.2	0.6463	2.6	18.8
MD	5	6.3	0.8603	4.3	31.3
PM	4	9.9	0.8157	3.3	23.7
NT	11	5.4	0.3266	3.6	26.1

Link volume-capacity ratios were calculated for each period using the estimated volumes by time period and the capacity by time period. Congested speeds by period were then estimated using the speed-delay curves from the Rome travel demand model.

The VMT from the travel demand model was then adjusted based on the VMT estimates that GDOT develops for the Highway Performance Monitoring System (HPMS). According to Section 3.4.2.4 of EPA's "Volume IV" guidance,⁴ "[T]he detailed VMT estimates produced by the transportation planning process should be made consistent in the aggregate with HPMS." Consistent with this long-standing SIP guidance, Section 93.122(b)(3) of the Transportation Conformity Rule, Procedures for Determining Regional Transportation Related Emissions, says:

"Highway Performance Monitoring System (HPMS) estimates of vehicle miles traveled (VMT) shall be considered the primary measure of VMT within the portion of the nonattainment or maintenance area and for the functional classes of roadways included in HPMS.... For areas with network-based travel models, a factor (or factors) may be developed to reconcile and calibrate the network-based travel model estimates of VMT in the base year of its validation to the HPMS estimates for the same period. These factors may then be applied to model estimates of future VMT."

⁴ *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-420-R-92-009, US EPA, Office of Air and Radiation, Office of Mobile Sources, 1992, <http://www.epa.gov/otaq/invntory/r92009.pdf>.

There has been a history in Georgia of adjusting the VMT from the regional travel demand model with the HPMS VMT by functional classification rather than "in the aggregate." This procedure is used in the preparation of mobile source emissions for SIPs and conformity determinations in Georgia nonattainment areas.

The EPA guidance issued in August 2005, *Guidance for Creating Annual On-Road Mobile Source Emission Inventories for PM2.5 Nonattainment Areas for Use in SIPs and Conformity*, identified several approaches for preparing PM2.5 emissions. The guidance also specified that the interagency consultation process should be used to determine which approach is most appropriate for the area. The Rome interagency consultation group agreed to the *Single-Run Approach* recommended by EPD and GDOT for establishing the MVEB and performing subsequent conformity analyses. This methodology involves a single set of modeling runs using MOBILE6.2 emission factors for each scenario year and annual average VMT. HPMS adjustment factors were developed based on the average annual daily HPMS VMT for the years 2002 and 2006⁵ for the Rome travel demand model area. The HPMS adjustment reconciles the travel demand model link-based VMT to the average annual daily travel conditions at the functional class level. The following equation was used to calculate the 2002 HPMS adjustment factors (2006 factors were calculated the same way but with 2006 HPMS and model VMT):

$$HPMS\ Adjustment\ Factor_i = (2002\ HPMS\ VMT_i / 2002\ Model\ VMT_i)$$

where i = HPMS functional class)

To determine the "2002 HPMS VMT" adjustment factors, the average annual daily Floyd County VMT for the year 2002 was summarized by the 12 HPMS functional classifications from the Georgia Department of Transportation's Office of Transportation Data "445 Report." The data was summarized for the Rome MPO area which consists of all of Floyd County. The 445 Report summarizes the mileage and VMT by function classification by county.

Table 2.1-3 lists the adjustment factors based on the comparison between the HPMS VMT and the VMT from the regional travel demand model. The 2002 factors were applied to the VMT on each link in the highway network based on the functional classification for the year 2002, while the 2006 factors were applied to 2009 VMT.

⁵ (the base years of validation for the previous and current versions of the regional travel model -- see Appendix C)

**Table 2.1-3
HPMS VMT Adjustment Factors for Rome MPO Area
(from the FRUTS travel demand model)**

Functional Class Name	Functional Class No.	2002 HPMS VMT	2002 Model VMT	2002 Adjustment Factors	2006 HPMS VMT	2006 Model VMT	2006 Adjustment Factors
Rural Interstate	1	0	0	0.00	0	0	0
Rural Prin. Arterial	2	206,675	201,281	1.03	210,053	202,359	1.04
Rural Min. Arterial	6	213,286	282,969	0.75	211,704	249,217	0.85
Rural Major Collector	7	174,269	264,553	0.66	162,592	215,238	0.76
Rural Minor Collector	8	90,311	67,074	1.35	72,272	58,882	1.23
Rural Local	9	233,396	196,274	1.19	183,133	129,105	1.42
Urb. Interstate	11	0	0	0.00	0	0	0
Urb. Other Fwy	12	34,086	31,556	1.08	27,444	31,775	0.86
Urb. Prin. Arterial	14	917,750	870,900	1.05	942,729	909,272	1.04
Urb. Min. Arterial	16	444,628	397,076	1.12	436,101	450,538	0.97
Urbanized Collector	17	192,605	182,777	1.05	209,054	166,969	1.21
Urbanized Local	19	444,233	170,422	2.61	543,532	161,277	3.37
	Grand Total	2,951,239	2,664,882	1.11	2,998,614	2,574,632	1.16

The HPMS adjustment factors were developed for the vehicular travel within Floyd County and used in the preparations of emissions. The 2006 factors were applied to the VMT on each link in the highway network based on the functional classification for the year 2009.

Table 2.1-4 shows the adjusted modeled VMT for Floyd County used in the emissions modeling procedures.

**Table 2.1-4
Average Annual Daily Modeled VMT for Floyd County
(As adjusted per Table 2.1-3)**

Year	VMT
2009	3,339,325

2.2 Development of Mobile Source Emission Factors

The mobile source emission factors used for the Rome emissions analysis reflect all federal and state mobile source control rules, including federal tailpipe standards and gasoline sulfur and volatility limits.

To prevent transportation conformity problems, the emission rates used in preparation of emission inventories for SIP MVEB development and transportation conformity analysis must be consistent. Interagency consultation helps to assure consistency between the two procedures. The MOBILE6 input parameters for the Rome PM2.5 Attainment Plan mobile source emissions modeling were established through interagency consultation and are listed below:

- Emission Factor Model: MOBILE6.2.03
- Single-Run Approach, per EPA's *Guidance for Creating Annual On-Road Mobile Source Emission Inventories for PM2.5 Nonattainment Areas for Use in SIPs and Conformity*, dated August 9, 2005
- MOBILE6 Inputs
 - Temperature and relative humidity
 - Annual averages of the hourly averages for each hour of each month for the years 2000-2002
 - Barometric pressure
 - Annual average of the daily average for each month for the years 2000-2002
 - Fuel RVP⁶ and sulfur: For each year, average of monthly values for Floyd County in a National Mobile Inventory Model database modified for EPD by Eastern Research Group, Inc., in May 2007 to reflect updated gasoline survey data
 - 2002 regional fleet age distribution⁷
 - Derived from R.L. Polk & Co. registration data for Rome metropolitan statistical area: Floyd County
 - Applied to 15 of the 16 MOBILE6.2.03 composite vehicle classifications - LDV, LDT1, LDT2, LDT3, LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDBS, HDBT, MC
 - Default for HDV8B
 - Default VMT fractions

The regional fleet age distribution is documented in more detail in Exhibit 1. MOBILE6.2.03 is the latest version of EPA's motor vehicle emissions model. MOBILE6 produces emissions for four types of "driving cycles" – arterials/collectors, freeways/interstates, ramps, and local roads. It is assumed that all VMT by highway motor vehicles will occur in one of these four driving cycles. In MOBILE6, each driving cycle reflects different assumptions about vehicle activity and different emission estimates. The definitions of the different driving cycles from EPA's *Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation*⁸ are provided

⁶ Reid vapor pressure, a measure of gasoline volatility

⁷ Registration data was from R. L. Polk & Co.'s National Vehicle Population Profile ® current as of October 2002 and from R.L. Polk & Co.'s TIPNet ® current as of March 2003. See Exhibit 1 for more details on this registration distribution by age.

⁸ <http://www.epa.gov/otaq/models/mobile6/420r04013.pdf>

below.

Freeway Driving Cycle

In MOBILE6, “freeway” VMT refers to driving that occurs on roadways that do not have traffic signals, that usually have limited access (via converging ramps) and have free flow speeds greater than 50 miles per hour. These roadways are usually divided and have more than one lane in each direction. This definition does not include short sections (less than two miles) of a roadway between signals, but could include longer roadway segments that effectively act as freeways.

Arterials/Collector Driving Cycle

In MOBILE6, “arterial/collector” VMT refers to driving that occurs on roadways that have signalized traffic control. These roadways are not freeways, because they have traffic signals, but they may be divided, multiple-lane, one-way, and have high free-flow speeds. However, traffic will be stopped periodically by traffic signals and will be further affected by access to the roadway by driveways and un-signalized intersections. Even in free flow, the driving on arterial/collector roadways will be characterized by cruising periods interrupted by traffic signals.

Local Roadway Driving Cycle

In MOBILE6, “local roadway” VMT refers to driving on roadways that are not normally considered as part of the traffic network. These roadways rarely have traffic lights or more than one lane in each direction. They usually allow vehicle parking on the roadway surface and traffic control is handled via stop/yield signs. Speed limits are normally 30 miles per hour or less. The driving cycle used in MOBILE6 to model local roadways is fixed at an average speed of 12.9 miles per hour. Driving on local roadways is characterized by extremely low speeds and frequent stops at intersections.

Freeway Ramp

In MOBILE6, “freeway ramp” VMT refer to the access roadways for freeways. It includes both traffic movements entering and exiting the freeway. Driving on freeway ramps is characterized by rapid acceleration from stop or low speeds to freeway speeds and decelerations from freeway speeds to low speeds or stop. Freeway ramp activity is not included in the MOBILE6 freeway roadway definition. Therefore, all freeway activity must include a corresponding freeway ramp activity to account for acceleration and deceleration to and from freeway speeds.

Many areas do not explicitly account for freeway ramps as a separate roadway type so EPA developed a default fraction in MOBILE6 to account for this. This procedure does not need to be utilized for Georgia’s emission estimates because freeway ramps are explicitly modeled in GDOT’s highway networks. Freeway ramps are defined as separate facilities stratified by the type of design and speed, high, medium, and low. High speed ramps are those that connect freeway to freeway travel, while the lower speed ramps are for access to a freeway from an arterial or egress from a freeway to an arterial. High speed ramps have significantly higher free-flow speeds than the lower speed ramps and are not characterized by rapid acceleration, or deceleration from freeway speeds to low speeds or stops. Based on guidance from EPA,

emissions for high speed freeway ramps are estimated using the freeway emission factors while emissions for lower speed freeway ramps are estimated using the freeway ramp emission factors.

In MOBILE6, only emissions for arterials/collectors and freeways/interstates are speed sensitive.⁹ Emission factors are produced for 2.5 miles per hour and in one mile per hour increments between 3 and 65 for these two roadway types. The emission factors estimated for ramps are based on a default average speed of 34.6 mph, and for local roads on a default average speed of 12.9 mph.

The mapping of FHWA highway functional system classifications to the appropriate MOBILE6 driving cycle used for this modeling is listed in Table 2.2-1.

**Table 2.2-1
Listing of FHWA Highway Functional Classifications
Mapped to MOBILE6 Driving Cycles**

FHWA Highway Functional System	MOBILE6 Driving Cycle
Rural interstate	Freeway and freeway ramp
Rural other principal arterial	Freeway and freeway ramp
Rural minor arterial	Arterial/collector
Rural major collector	Arterial/collector
Rural minor collector	Arterial/collector
Rural local	Local
Urban interstate	Freeway and freeway ramp
Urban other freeways	Freeway and freeway ramp
Urban other principal arterial	Arterial/collector
Urban minor arterial	Arterial/collector
Urban collector	Arterial/collector
Urban local	Local

EPA believes that facilities with the HPMS classification of Rural Other Principal Arterial (HPMS code 2) should use a combination of the freeway and ramp emission factors. Per section 4.2.3 of *Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation*, “By default in MOBILE6.2, 8% of VMT in any freeway and freeway ramp category will be the freeway ramp VMT.” The remaining 92% is freeway VMT. These default assumptions were used in calculating emissions for Rural Other Principal Arterials. This is the only case in the Rome emissions modeling where a combination of emission factors by type is used for the same functional classification.

Exhibit 2 contains abbreviated¹⁰ MOBILE6 inputs for calculating the 2009 Floyd County emission factors at 2.5 mph. The emission factors by driving cycle and speed are listed in Exhibit 3.

⁹ PM2.5 emission factors from MOBILE6 do not vary significantly by speed

¹⁰ Complete MOBILE6.2 input, output, and supporting files are available on request.

2.3 Procedures for Estimating Regional Emissions Using the Travel Demand Model

Highway mobile emissions for the Rome nonattainment area were developed using the MOBILE6.2 emission factors and the link-based emissions estimation procedure. Highway mobile activity and emissions were prepared for the year 2009.

Link-Based Emissions Estimation Procedure

The link-based estimation procedure uses the links from the daily highway assignment, which contain a variety of attributes such as the number of lanes, speed, capacities and daily volumes. The daily VMT is determined by multiplying the daily volume by the distance for each link. The next step in the emissions procedure is to determine the VMT and speed by time-of-day from the daily assignment by link as described in Section 2.1. The VMT by time-of-day is then adjusted by the VMT adjustment factor by HPMS functional classification to reconcile the model VMT to the average annual daily travel conditions.

Once emission factors have been produced using the MOBILE6.2 model, the factors are then applied to the VMT estimates by time-of-day. Emission factors are applied at the link level, based on the driving cycle and the congested speed. The emission factors for a particular driving cycle and speed are multiplied by the VMT for the link for each time-of-day period and summed for Floyd County to derive estimates of daily levels of emissions. The daily emissions are then multiplied by 365 to get annual emissions.

2.4 Nonattainment Area Emissions Analysis Summary

Table 2.4-1 lists the results from the regional emissions analysis produced using the travel demand model.

Table 2.4-1
Summary of Mobile Source Emissions Rome Nonattainment Area
(in Annual Tons)

Year	Travel Model Emissions	
	PM2.5	NOx
2009	41.8290	2,532.5458

Exhibit 1: Vehicle Registration Data

Georgia's Revised MOBILE6 Registration Distribution by Age

Overview

R.L. Polk & Co. (Polk) maintains databases encompassing all registered vehicles in operation by state. Polk acquires the source registration data from the states and then processes and enhances the data. Key data elements Polk used for grouping vehicle registered in Georgia by their appropriate composite (i.e., gasoline and diesel) MOBILE6 vehicle types were: vehicle make, vehicle model, engine make, engine model, fuel type, cab type, bed length, wheel configuration, vehicle type, gross vehicle weight rating (GVWR)¹¹ class, model year, and registration geography (i.e., county).

Vehicle characteristic data elements used by Polk are derived from the unique 17 position vehicle identification number (VIN) assigned to every vehicle. Vehicle geography is assigned based on the registration address linked to each VIN.

In order to assign a MOBILE6 category to all registered vehicles, Polk constructed a master vehicle workfile using data from Polk's TIPNet and NVPP databases. This master vehicle workfile accounts for all registered vehicles, including: cars, vans, sport utility vehicles, trucks, buses, school buses, and motorcycles (GVWR classes 1-8 + motorcycle). The GVWR classes are:

Class 1	0 - 6,000 lbs.
Class 2	6,001 - 10,000 lbs.
Class 3	10,001 - 14,000 lbs.
Class 4	14,001 - 16,000 lbs.
Class 5	16,001 - 19,500 lbs.
Class 6	19,501 - 26,000 lbs.
Class 7	26,001 - 33,000 lbs.
Class 8	33,001 - 150,000 lbs.

The TIPNet database contains vehicles from full-size pickups/vans through class 8 (GVWR classes 1c-8), and is structured to serve the commercial vehicle market. The NVPP database contains vehicles GVWR classes 1-3 and is designed to serve the car, light truck/van, and motorcycle aftermarket.

¹¹ The GVWR is the maximum weight of the vehicle when it is fully loaded, as specified by the manufacturer.

Using the data elements listed above, Polk assigned one of the 16 MOBILE6 categories to each of the vehicles in the workfile. Care was taken to assure that no makes and models are duplicated between the two databases. Note that the unit volume for same make/model vehicles can be divided among two or more MOBILE6 categories due to varying vehicle types and GVWR classes within a specific make/model. TIPNet data supplies GVWR classes 1c-8 (full-size pickups/vans & heavier), while NVPP data provides passenger car, motorcycle, light truck, and light vans from GVWR class 1.

The 16 composite MOBILE6 vehicle types are listed and defined below, with examples of the types of vehicles they include.

<u>Number</u>	<u>Abbreviation</u>	<u>Description</u>
1	LDV	Light-Duty (LD) Vehicles (Passenger Cars)
	-	Class 1 GVWR
	-	Include: Passenger Cars
	-	Fuel: All Types
	-	Source: R.L. Polk NVPP as of October 2002
2	LDT1 LVW¹²)	LD Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs.
	-	Class 1 GVWR
	-	Trucks, SUVs, & Vans
	-	Exclude Full-Size Pickups & Vans
	-	Fuel: All Types
	-	Source: R.L. Polk NVPP as of October 2002
3	LDT2 LVW)	LD Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs.
	-	Class 1 GVWR
	-	Trucks, SUVs, & Vans
	-	Fuel: All Types
	-	Include all Full-Size Pickups & Vans (e.g. 150/1500 series vehicles: F150, C/K 1500, E150, Ram 1500 etc.)
	-	Include Vehicle Types: Incomplete Pickup + Cab Chassis
	-	Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
	-	Source: R.L. Polk TIPNet as of March 2003 & NVPP as of October 2002
4	LDT3 ALVW¹³)	LD Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs.
	-	Class 2 GVWR
	-	Trucks, SUVs, & Vans

¹² Loaded vehicle weight, the weight of vehicle sitting empty (curb weight) plus 300 pounds.

¹³ Adjusted loaded vehicle weight, average of the gross vehicle weight and the curb weight.

- GVWR: 6,001-8,000 for Ford, Chevy, Dodge, plus all Toyota Tundra Models
- Fuel: All Types
- Exclude: Pickups with Long Bed or Vans with Extended Length (Except Tundra)
- Exclude Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck + School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003 & NVPP as of October 2002

<u>Number</u>	<u>Abbreviation</u>	<u>Description</u>
5	LDT4 ALVW)	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, >5,750 lbs.
		<ul style="list-style-type: none"> - Class 2 GVWR - Trucks, SUVs, & Vans - GVWR: 6,001-8,000 for Ford, Chevy, & Dodge - Exclude: all Toyota Tundra Models - Fuel: All Types - Include: Pickups with Long Bed or Vans with Extended Length - Include Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck - Exclude Vehicle Types: School Bus + Bus Non-School (Coach) - Source: R.L. Polk TIPNet as of March 2003
6	HDV2B GVWR)	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs.
		<ul style="list-style-type: none"> - Class 2 GVWR - Trucks, SUVs, & Vans - GVWR: 8,001-10,000 for Ford, Chevy, & Dodge - Exclude: All Toyota Tundra Models - Fuel: All Types - Include: Pickups with Long Bed or Vans with Extended Length - Include Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck - Exclude Vehicle Types: School Bus + Bus Non-School (Coach) - Source: R.L. Polk TIPNet as of March 2003
7	HDV3 GVWR)	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs.
		<ul style="list-style-type: none"> - Class 3 GVWR - Trucks, SUVs, & Vans - Fuel: All Types - Exclude Vehicle Types: School Bus + Bus Non-School (Coach) - Source: R.L. Polk TIPNet as of March 2003
<u>Number</u>	<u>Abbreviation</u>	<u>Description</u>

- 8** **HDV4** **Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)**
- Class 4 GVWR
 - Trucks, SUVs, & Vans
 - Fuel: All Types
 - Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
 - Source: R.L. Polk TIPNet as of March 2003
- 9** **HDV5** **Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)**
- Class 5 GVWR
 - Trucks, SUVs, & Vans
 - Fuel: All Types
 - Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
 - Source: R.L. Polk TIPNet as of March 2003
- 10** **HDV6** **Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)**
- Class 6 GVWR
 - Trucks, SUVs, & Vans
 - Fuel: All Types
 - Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
 - Source: R.L. Polk TIPNet as of March 2003
- 11** **HDV7** **Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)**
- Class 7 GVWR
 - Trucks, SUVs, & Vans
 - Fuel: All Types
 - Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
 - Source: R.L. Polk TIPNet as of March 2003
- 12** **HDV8A** **Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)**
- Class 8 GVWR
 - Trucks, SUVs, & Vans
 - Fuel: All Types
 - Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
 - Include Vehicle Types: 4x2 Non-Tractor Vehicles + All Tractors + Motor Home Chassis
 - Source: R.L. Polk TIPNet as of March 2003
- 13** **HDV8B** **Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)**
- Class 8 GVWR

- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: All Tractors + School Bus + Bus Non-School (Coach)
- Exclude Wheels: 4x2
- Source: R.L. Polk TIPNet as of March 2003

14 HDBS School Buses

- Include Vehicle Type: School Bus
- Fuel: All Types
- Source: R.L. Polk TIPNet as of March 2003

Number Abbreviation Description

15 HDBT Transit & Urban Buses

- Include Vehicle Type: Bus Non-School (Coach)
- Fuel: All Types
- Source: R.L. Polk TIPNet as of March 2003

16 MC Motorcycles (All)

- Fuel: All Types
- Source: R.L. Polk NVPP as of October 2002

The data acquired from Polk was queried to determine the number of vehicles registered in the Rome-Floyd metropolitan statistical area by age and MOBILE6 vehicle type. Results of this query were used to develop MOBILE6 registration distribution by age inputs. For each of the 16 composite MOBILE6 vehicle types, the fraction of all vehicles of that type which are zero-to-one model year old, two model years old, three model years old, etc., up to the oldest category, 25-model-years-and-older, was determined. The resulting MOBILE6 input data is shown on the following two pages. Note that the Polk-derived distribution for Class 8b vehicles (MOBILE6 vehicle type 13) is commented out; in accordance with EPA guidance, MOBILE6 defaults were used for this vehicle type.

REG DIST

*
 * The file REGDATA.D contains the default MOBILE6 values for the distribution of
 * vehicles by age for July of any calendar year. There are sixteen (16)
 * sets of values representing 16 combined gasoline/diesel vehicle class
 * distributions. These distributions are split for gasoline and diesel
 * using the separate input (or default) values for diesel sales fractions.
 * Each distribution contains 25 values which represent the fraction of
 * all vehicles in that class (gasoline and diesel) of that age in July.
 * The first number is for age 1 (calendar year minus model year plus one)
 * and the last number is for age 25. The last age includes all vehicles
 * of age 25 or older. The first number in each distribution is an integer
 * which indicates which of the 16 vehicle classes are represented by the
 * distribution. The sixteen vehicle classes are:

- * 1 LDV Light-Duty Vehicles (Passenger Cars)
- * 2 LDT1 Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
- * 3 LDT2 Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
- * 4 LDT3 Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
- * 5 LDT4 Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
- * 6 HDV2B Class 2b Heavy Duty Vehicles (8501-10,000 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 Busses
- * 15 HDBT Transit and Urban Busses
- * 16 MC Motorcycles (All)

*
 * The 25 age values are arranged in two rows of 10 values followed by a row
 * with the last 5 values. Comments (such as this one) are indicated by
 * an asterisk in the first column. Empty rows are ignored. Values are
 * read "free format," meaning any number may appear in any row with as
 * many characters as needed (including a decimal) as long as 25 values
 * follow the initial integer value separated by a space.

*
 * If all 16 vehicle classes do not need to be altered from the default
 * values, then only the vehicle classes that need to be changed need to
 * be included in this file. The order in which the vehicle classes are
 * read does not matter, however each vehicle class set must contain 25
 * values and be in the proper age order.

* This file specifies the local registration distribution by age(MOBILE6 defaults for heavy-
 heavy-duties) for the Rome-Floyd metropolitan statistical area:

* Floyd.

* Sources of registration data: R. L. Polk & Co.'s National Vehicle
 * Population Profile (R) as of October 2002 and R. L. Polk & Co.'s
 * TIPNet (R) as of March 2003.

* LDV
 1 0.0094 0.0410 0.0470 0.0561 0.0545 0.0534 0.0608 0.0578 0.0723 0.0639
 0.0622 0.0542 0.0493 0.0456 0.0453 0.0406 0.0329 0.0266 0.0244 0.0190
 0.0114 0.0062 0.0056 0.0055 0.0548

* LDT1
 2 0.0123 0.0787 0.0755 0.0848 0.0663 0.0675 0.0662 0.0608 0.0671 0.0632
 0.0549 0.0379 0.0342 0.0242 0.0332 0.0317 0.0292 0.0237 0.0158 0.0136

	0.0078	0.0054	0.0026	0.0023	0.0413					
* LDT2										
3	0.0011	0.0022	0.0195	0.0122	0.0170	0.0514	0.0819	0.0000	0.0149	0.0305
	0.0422	0.0419	0.0389	0.0662	0.0776	0.0716	0.0481	0.0765	0.0816	0.0732
	0.0486	0.0405	0.0624	0.0000	0.0000					
* LDT3										
4	0.0312	0.1022	0.0953	0.0873	0.0932	0.0609	0.0585	0.0654	0.0727	0.0589
	0.0367	0.0269	0.0170	0.0203	0.0198	0.0182	0.0241	0.0278	0.0275	0.0233
	0.0132	0.0116	0.0080	0.0000	0.0000					
* LDT4										
5	0.0116	0.0298	0.0621	0.0555	0.0663	0.0431	0.0439	0.0356	0.0522	0.0613
	0.0646	0.0580	0.0389	0.0638	0.0737	0.0638	0.0290	0.0406	0.0323	0.0389
	0.0182	0.0099	0.0066	0.0000	0.0000					
* HDV2B										
6	0.0455	0.0637	0.0735	0.0735	0.0721	0.0301	0.0763	0.0497	0.0497	0.0483
	0.0371	0.0301	0.0196	0.0231	0.0364	0.0455	0.0322	0.0427	0.0539	0.0420
	0.0224	0.0168	0.0133	0.0007	0.0021					
* HDV3										
7	0.0406	0.0769	0.0923	0.0769	0.1091	0.0462	0.0462	0.0406	0.0601	0.0490
	0.0336	0.0266	0.0336	0.0238	0.0322	0.0448	0.0308	0.0224	0.0322	0.0210
	0.0140	0.0084	0.0098	0.0028	0.0266					
* HDV4										
8	0.0185	0.0630	0.0593	0.0704	0.0778	0.0259	0.1222	0.0333	0.0630	0.0519
	0.0444	0.0333	0.0741	0.0519	0.0370	0.0593	0.0185	0.0148	0.0222	0.0259
	0.0111	0.0000	0.0000	0.0000	0.0222					
* HDV5										
9	0.0423	0.0423	0.0211	0.0704	0.0845	0.0423	0.0704	0.0915	0.0352	0.0282
	0.0282	0.0211	0.0000	0.0352	0.0141	0.0282	0.0000	0.0000	0.0211	0.0211
	0.0000	0.0000	0.0211	0.0000	0.2817					
* HDV6										
10	0.0056	0.0278	0.0204	0.0445	0.0371	0.0315	0.0427	0.0334	0.0427	0.0223
	0.0223	0.0056	0.0260	0.0297	0.0093	0.0334	0.0260	0.0408	0.0241	0.0204
	0.0260	0.0148	0.0130	0.0111	0.3896					
* HDV7										
11	0.0249	0.0373	0.0597	0.0473	0.0249	0.0249	0.0373	0.0547	0.0622	0.0522
	0.0323	0.0522	0.0348	0.0697	0.0448	0.0473	0.0373	0.0597	0.0373	0.0473
	0.0274	0.0075	0.0249	0.0174	0.0348					
* HDV8A										
12	0.0114	0.0179	0.0228	0.0505	0.0440	0.0326	0.0700	0.0961	0.0554	0.0717
	0.1042	0.0277	0.0228	0.0423	0.0554	0.0375	0.0489	0.0277	0.0440	0.0456
	0.0179	0.0081	0.0081	0.0065	0.0309					
* HDV8B										
*13	0.0144	0.0253	0.0217	0.0397	0.0361	0.0361	0.0505	0.0578	0.0903	0.0253
*	0.0217	0.0108	0.0144	0.0217	0.0542	0.0650	0.0253	0.0361	0.0361	0.0289
*	0.0144	0.0144	0.0072	0.0433	0.2094					
* HDBS										
14	0.0000	0.0433	0.0721	0.0913	0.0240	0.1010	0.0625	0.0529	0.1010	0.0337
	0.0769	0.0481	0.0529	0.0144	0.0144	0.0240	0.0096	0.0337	0.0048	0.0240
	0.0144	0.0240	0.0000	0.0048	0.0721					
* HDBT										

15	0.0769	0.3846	0.0000	0.0000	0.0000	0.0769	0.0000	0.0000	0.0000	0.0000
	0.0769	0.0000	0.0000	0.0769	0.0000	0.2308	0.0000	0.0769	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000					
* MC										
16	0.0048	0.1432	0.1183	0.0934	0.0719	0.0505	0.0463	0.0477	0.0367	0.0373
	0.0284	0.3216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000					

Exhibit 2: Abbreviated MOBILE6 Input Files for Floyd County Emissions for PM2.5 SIP Budget

Year 2009 Arterials/Collectors, Ramps and Local Roads *

```

*
* 7-1-09, Rome arterials/collectors, '02 Rome MSA reg. dist.
(default for Class 8b), default VMT mix (09arromp.in)
*
MOBILE6 INPUT FILE :

POLLUTANTS          : NOx
PARTICULATES        :

RUN DATA

* next lines show annual average hourly temp. for Floyd county from 11-04
* Nat'l Mobile Inventory Model (NMIM) database's CountyMonthHour table;
* see 2002_nmim_floyd_county_met.xls
HOURLY TEMPERATURES: 48  49  51  55  60  63  66  68  70  71  70  69
                    66  63  59  57  55  54  52  51  50  49  48  48

* the Reid vapor pressure (RVP) below is the annual average of the RVP values
* for Floyd county in an NMIM database modified for EPD by Eastern Research
* Group, Inc., (ERG) in May 2007 to reflect updated gasoline survey data;
* see rome_average_annual_sulfur_and_rvp_w_ERG_NMIM_updates.xls
FUEL RVP              : 9.3

* the average sulfur values (ppm) in the matrix below are annual
* averages of the sulfur values in ERG-modified NMIM database;
* see rome_average_annual_sulfur_and_rvp_w_ERG_NMIM_updates.xls
FUEL PROGRAM          : 4
  263.9  263.9  263.9  138.2  30.0  30.0  30.0  30.0
  30.0   30.0   30.0   30.0   30.0   30.0   30.0   30.0
 1000.0 1000.0 1000.0 1000.0  150.0  150.0   87.0   87.0
   80.0   80.0   80.0   80.0   80.0   80.0   80.0   80.0

REG DIST              : 02rommsa.d
*
*
SCENARIO REC          : arterial, Rome, 2009, 2.5 mph
> 7-1-09, '02 Rome MSA reg. dist. (default for Class 8b), default VMT mix (09arromp.in)
CALENDAR YEAR         : 2009
EVALUATION MONTH     : 7
ALTITUDE              : 1
* next lines show annual average hourly rel. humidity from 11-04 NMIM database's
* CountyMonthHour table; see 2002_nmim_floyd_county_met.xls
RELATIVE HUMIDITY    : 85  83  79  72  66  60  55  52  50  49  49  51
                    54  60  65  70  73  75  77  79  81  82  83  84

* next line shows annual avg. of the avg. monthly station pressure for Rome's Richard
B. Russell
  airport, 2000-2002
BAROMETRIC PRES       : 29.37
PARTICLE SIZE         : 2.5
PARTICULATE EF        : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV

```

DIESEL SULFUR : 43.0
AVERAGE SPEED : 2.5 Arterial 0.0 100.0 0.0 0.0

*
*

[other scenarios not shown]

END OF RUN

Year 2009 Freeways *

*

* 7-1-09, Rome freeways, '02 Rome MSA reg. dist. (default for Class 8b),
default VMT mix (09fwromp.in)

*

MOBILE6 INPUT FILE :

POLLUTANTS : NOx
PARTICULATES :

RUN DATA

* next lines show annual average hourly temp. for Floyd county from 11-04
* Nat'l Mobile Inventory Model (NMIM) database's CountyMonthHour table;
* see 2002_nmim_floyd_county_met.xls

HOURLY TEMPERATURES: 48 49 51 55 60 63 66 68 70 71 70 69
66 63 59 57 55 54 52 51 50 49 48 48

* the Reid vapor pressure (RVP) below is the annual average of the RVP values
* for Floyd county in an NMIM database modified for EPD by Eastern Research
* Group, Inc., (ERG) in May 2007 to reflect updated gasoline survey data;
* see rome_average_annual_sulfur_and_rvp_w_ERG_NMIM_updates.xls

FUEL RVP : 9.3

* the average sulfur values (ppm) in the matrix below are annual
* averages of the sulfur values in ERG-modified NMIM database;
* see rome_average_annual_sulfur_and_rvp_w_ERG_NMIM_updates.xls

FUEL PROGRAM : 4
263.9 263.9 263.9 138.2 30.0 30.0 30.0 30.0
30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0
1000.0 1000.0 1000.0 1000.0 150.0 150.0 87.0 87.0
80.0 80.0 80.0 80.0 80.0 80.0 80.0 80.0

REG DIST : 02rommsa.d

*
*

SCENARIO REC : freeway, Rome, 2009, 2.5 mph
> 7-1-09, '02 Rome MSA reg. dist. (default for Class 8b), default VMT mix (09fwromp.in)

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

* next lines show annual average hourly rel. humidity from 11-04 NMIM database's
* CountyMonthHour table; see 2002_nmim_floyd_county_met.xls

RELATIVE HUMIDITY : 85 83 79 72 66 60 55 52 50 49 51
54 60 65 70 73 75 77 79 81 82 83 84

* next line shows annual avg. of the avg. monthly station pressure for Rome's Richard
B. Russell
airport, 2000-2002

BAROMETRIC PRES : 29.37
PARTICLE SIZE : 2.5
PARTICULATE EF : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR : 43.0
AVERAGE SPEED : 2.5 Non-Ramp 100.0 0.0 0.0 0.0

*

*

[other scenarios not shown]

END OF RUN

**Exhibit 3: MOBILE6 Composite 2009 Emission Factors (gm/mi) for
Floyd County by Speed and Driving Cycle**

Speed	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
2.50	0.0312	3.2400	0.0312	3.3250	0.0312	1.9230	0.0311	1.9510
3.00	0.0312	3.1230	0.0312	3.2090	0.0312	1.9230	0.0311	1.9510
4.00	0.0312	2.9770	0.0312	3.0630	0.0312	1.9230	0.0311	1.9510
5.00	0.0312	2.8900	0.0312	2.9750	0.0312	1.9230	0.0311	1.9510
6.00	0.0312	2.7380	0.0312	2.7670	0.0312	1.9230	0.0311	1.9510
7.00	0.0312	2.6290	0.0312	2.6190	0.0312	1.9230	0.0311	1.9510
8.00	0.0312	2.5480	0.0312	2.5080	0.0312	1.9230	0.0311	1.9510
9.00	0.0312	2.4840	0.0312	2.4210	0.0312	1.9230	0.0311	1.9510
10.00	0.0312	2.4340	0.0312	2.3520	0.0312	1.9230	0.0311	1.9510
11.00	0.0312	2.3540	0.0312	2.2610	0.0312	1.9230	0.0311	1.9510
12.00	0.0312	2.2880	0.0312	2.1860	0.0312	1.9230	0.0311	1.9510
13.00	0.0312	2.2320	0.0312	2.1220	0.0312	1.9230	0.0311	1.9510
14.00	0.0312	2.1840	0.0312	2.0680	0.0312	1.9230	0.0311	1.9510
15.00	0.0312	2.1420	0.0312	2.0200	0.0312	1.9230	0.0311	1.9510
16.00	0.0312	2.1010	0.0312	2.0030	0.0312	1.9230	0.0311	1.9510
17.00	0.0312	2.0650	0.0312	1.9890	0.0312	1.9230	0.0311	1.9510
18.00	0.0312	2.0330	0.0312	1.9750	0.0312	1.9230	0.0311	1.9510
19.00	0.0312	2.0040	0.0312	1.9630	0.0312	1.9230	0.0311	1.9510
20.00	0.0312	1.9780	0.0312	1.9530	0.0312	1.9230	0.0311	1.9510
21.00	0.0312	1.9540	0.0312	1.9430	0.0312	1.9230	0.0311	1.9510
22.00	0.0312	1.9330	0.0312	1.9340	0.0312	1.9230	0.0311	1.9510
23.00	0.0312	1.9130	0.0312	1.9260	0.0312	1.9230	0.0311	1.9510
24.00	0.0312	1.8950	0.0312	1.9190	0.0312	1.9230	0.0311	1.9510
25.00	0.0312	1.8790	0.0312	1.9120	0.0312	1.9230	0.0311	1.9510
26.00	0.0312	1.8650	0.0312	1.9080	0.0312	1.9230	0.0311	1.9510
27.00	0.0312	1.8530	0.0312	1.9040	0.0312	1.9230	0.0311	1.9510
28.00	0.0312	1.8420	0.0312	1.9000	0.0312	1.9230	0.0311	1.9510
29.00	0.0312	1.8310	0.0312	1.8970	0.0312	1.9230	0.0311	1.9510
30.00	0.0312	1.8220	0.0312	1.8940	0.0312	1.9230	0.0311	1.9510
31.00	0.0312	1.8180	0.0312	1.8930	0.0312	1.9230	0.0311	1.9510
32.00	0.0311	1.8150	0.0311	1.8930	0.0312	1.9230	0.0311	1.9510
33.00	0.0311	1.8130	0.0311	1.8930	0.0312	1.9230	0.0311	1.9510
34.00	0.0311	1.8100	0.0311	1.8930	0.0312	1.9230	0.0311	1.9510
35.00	0.0311	1.8080	0.0311	1.8930	0.0312	1.9230	0.0311	1.9510
36.00	0.0311	1.8150	0.0311	1.9000	0.0312	1.9230	0.0311	1.9510
37.00	0.0311	1.8210	0.0311	1.9060	0.0312	1.9230	0.0311	1.9510
38.00	0.0311	1.8270	0.0311	1.9130	0.0312	1.9230	0.0311	1.9510
39.00	0.0311	1.8330	0.0311	1.9190	0.0312	1.9230	0.0311	1.9510
40.00	0.0311	1.8390	0.0311	1.9240	0.0312	1.9230	0.0311	1.9510
41.00	0.0311	1.8520	0.0311	1.9370	0.0312	1.9230	0.0311	1.9510
42.00	0.0311	1.8640	0.0311	1.9500	0.0312	1.9230	0.0311	1.9510
43.00	0.0311	1.8760	0.0311	1.9610	0.0312	1.9230	0.0311	1.9510
44.00	0.0311	1.8880	0.0311	1.9730	0.0312	1.9230	0.0311	1.9510
45.00	0.0311	1.8980	0.0311	1.9830	0.0312	1.9230	0.0311	1.9510
46.00	0.0311	1.9170	0.0311	2.0020	0.0312	1.9230	0.0311	1.9510
47.00	0.0311	1.9350	0.0311	2.0210	0.0312	1.9230	0.0311	1.9510
48.00	0.0311	1.9530	0.0311	2.0380	0.0312	1.9230	0.0311	1.9510
49.00	0.0311	1.9700	0.0311	2.0550	0.0312	1.9230	0.0311	1.9510
50.00	0.0311	1.9860	0.0311	2.0710	0.0312	1.9230	0.0311	1.9510
51.00	0.0311	2.0130	0.0311	2.0980	0.0312	1.9230	0.0311	1.9510
52.00	0.0311	2.0390	0.0311	2.1240	0.0312	1.9230	0.0311	1.9510
53.00	0.0311	2.0640	0.0311	2.1490	0.0312	1.9230	0.0311	1.9510
54.00	0.0311	2.0880	0.0311	2.1730	0.0312	1.9230	0.0311	1.9510
55.00	0.0311	2.1110	0.0311	2.1960	0.0312	1.9230	0.0311	1.9510
56.00	0.0311	2.1480	0.0311	2.2330	0.0312	1.9230	0.0311	1.9510
57.00	0.0311	2.1840	0.0311	2.2690	0.0312	1.9230	0.0311	1.9510
58.00	0.0311	2.2190	0.0311	2.3040	0.0312	1.9230	0.0311	1.9510
59.00	0.0311	2.2530	0.0311	2.3380	0.0312	1.9230	0.0311	1.9510
60.00	0.0311	2.2850	0.0311	2.3710	0.0312	1.9230	0.0311	1.9510
61.00	0.0311	2.3380	0.0311	2.4230	0.0312	1.9230	0.0311	1.9510
62.00	0.0311	2.3880	0.0311	2.4730	0.0312	1.9230	0.0311	1.9510
63.00	0.0311	2.4370	0.0311	2.5220	0.0312	1.9230	0.0311	1.9510
64.00	0.0311	2.4840	0.0311	2.5690	0.0312	1.9230	0.0311	1.9510
65.00	0.0311	2.5300	0.0311	2.6150	0.0312	1.9230	0.0311	1.9510