

2030 LRTP Update

Appendix F ***Air Quality Modeling Methodology***



Appendix F – Planning Assumptions and Modeling Methodology for Eight-Hour Ozone and Particulate Matter 2.5 Pollutants

The Clean Air Act authorizes the USEPA to set criteria and procedures ensuring that transportation plans are compatible with air quality standards under the Transportation Conformity Rule. The conformity rule mandates interagency consultation among federal, state and regional agencies tasked with environmental and transportation issues. The interagency consultation group is comprised of ARC, GHMPO, GDOT, MARTA, Georgia EPD, FHWA, FTA and USEPA plus representation from local transit and GRTA. Transportation projects that are regionally significant, regardless of funding source, must be included in the regional emissions analysis in accordance with the conformity rule. As agreed to by the interagency partners, ARC's policy is that all regional facilities that are functionally classified as minor arterial or above must be included in the travel demand model and regional emissions analysis.

The Georgia EPD developed two different tests to demonstrate conformity of transportation plans for the two pollutants, ozone and PM 2.5. For the eight-hour ozone conformity analysis the Motor Vehicle Emission Budget (MVEB) test is required for the entire 20-county region. For the PM2.5 conformity analysis, a No Greater Than Base Year emissions test is used to demonstrate conformity of the LRTP and TIP. The base year in this case was 2002. This test, chosen through interagency consultation, is used as an interim emissions testing requirement until motor vehicle emissions budgets (MVEB) are developed as part of the PM2.5 attainment SIP which is required by April 2008. The current allowable SIP emissions budget for the ozone components, Nitrogen Oxide (NOx) and Volatile Organic Compounds (VOC) are 306.75 tons per day and 172.27 tons per day respectively. The PM 2.5 standard is based on the emissions for the base year of 2002 which was 8.22 average annual tons per day direct PM 2.5 and 432.83 average annual tons per day of NOx.

In addition to designating Hall County within the ARC as part of the nonattainment area for ozone, a second pollutant, particulate matter (PM 2.5), exceeded limits set by USEPA in April, 2005. Particulate matter, or PM, is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. The primary source of concern in air quality emissions analysis is direct motor vehicle PM emissions, both from the combustion process and from tire and brake wear; and a precursor to PM formation in the atmosphere, NOx. Particles less than 2.5 micrometers in diameter (PM2.5) are referred to as "fine" particles and are believed to pose the greatest health risks. The PM2.5 nonattainment area encompasses the previous 13-county one-hour ozone maintenance area plus seven additional "ring" counties including Hall County.

Under the PM2.5 standard, there is no classification system to determine stringency of emission control measures or attainment year. PM2.5 nonattainment areas must attain as soon as possible, but no later than April 2010, with an additional five years provided if the state can demonstrate that it is warranted. The PM2.5 attainment SIP is due by April 2008. This SIP will establish MVEB needed for transportation conformity for direct PM2.5 as well as any precursors that are found to be a significant contributor to the PM2.5 pollution problem by the state air agency and/or the EPA Regional Administrator. Until that time an interim emissions methodology is used to determine conformity of the RTP and TIP.



Eight-Hour Ozone Planning Assumptions and Modeling Methodology

In coordination with the Interagency partners, GDOT and ARC replaced the interim travel demand model in April, 2007 to calculate ozone emissions. The interim travel demand model existed as a short-term solution to estimate the ozone emissions for the additional 7 counties within the ARC. In order to avoid a disconnect between travel model VMT in the 7 counties coded with 2000 Census urban/rural designations and 2000 HPMS VMT that reflects the 1990 definition, the urban and rural VMT are combined by functional class before the factors are calculated.

Section 1: General Methods and Assumptions

- 1) Modeling Methodology: Estimate link-level VMT and congested flow speeds using ARC 20-county travel demand model that corresponds to the 20-county eight-hour ozone nonattainment area
- 2) Conformity Test
 - a) Nonattainment Classification - Marginal / Pending Reclassification to Moderate
 - b) Motor Vehicle Emission Budget (MVEB) Test
 - i) NOx: 306.75 tpd
 - ii) VOC: 172.27 tpd
- 3) Conformity Analysis Years: 2010, 2020, 2030
- 4) Modeling Start Date: April 2007. This start date is defined by the ARC as the initiation of the first model run for the 2030 RTP Update and FY 2008-2013 TIP, begun when all datasets needed for the model run were completed.
- 5) Interagency Consensus on Planning Assumptions: April 24, 2007

Section 2: Travel Demand Modeling Assumptions

- 1) Calibration Year: 2000
- 2) Project Listing: See proposed project list for 2030 LRTP.
- 3) Demographic Data: See section on socio-economic context for 2030 LRTP.
- 4) Speed Data: Free-flow Speed by Area Type and Facility Type. See table below.

Note: Within the ARC travel demand and emission modeling process, free flow speeds are adjusted to reflect the increase in delay and travel time on a roadway segment as traffic volumes build and congestion levels increase. Link-level congested flow speeds are used to estimate NOx and VOC emissions as required by Sections 93.122(b)(i)(iv) and 93.122(b)(2) of the Transportation Conformity Rule.



	Facility Type	Urban Very High Density	Urban High Density	Urban Medium Density	Urban Low Density	Sub-urban	Exurban	Rural	Metered Ramps
0	Zone Centroid Connectors	7	11	11	11	11	14	14	
1	Interstate / Freeway Free Flow	55	58	58	61	61	63	65	
2	Parkway	50	50	55	55	57	60	60	
3	HOV Buffer Separated	55	58	58	61	61	63	65	
4	HOV Barrier Separated	55	58	58	61	61	63	65	
5	High Speed Ramp / CD Road	50	50	55	55	57	60	60	15
6	Medium Speed Ramp	50	50	50	50	50	50	50	10
7	Low Speed Ramp	40	40	40	40	40	40	40	10
8	Loop Ramp	30	30	30	30	30	30	30	10
9	Off Ramp w/ Intersection	25	25	25	25	25	25	25	
10	On Ramp w/ Intersection	40	40	40	40	40	40	40	5
11	Expressway	40	42	45	48	52	55	60	
12	Principal Arterial - Class I	26	30	33	36	42	46	55	
13	Principal Arterial - Class II	24	27	30	34	40	44	48	
14	Minor Arterial - Class I	22	25	28	31	38	42	45	
15	Minor Arterial - Class II	20	23	26	29	34	38	42	
16	HOV - Arterial (all classes)	20	27	30	33	36	39	42	
17	Major Collector	18	22	25	28	31	34	38	
18	Minor Collector	15	18	21	24	27	30	35	
19	Planned Ramps w/ Intersections	30	30	30	30	30	30	30	5
20	Planned Directional Ramps	45	45	45	45	45	45	45	10

Section 3: Emissions Modeling Assumptions

- 1) Emissions Factor Model: MOBILE6.2.03
- 2) Eight Hour Ozone Standard MOBILE6.2.03 Inputs (7-county portion)
 - a) Average hourly temperature and relative humidity and average daily barometric pressure for the 10 highest ozone days, 2000 – 2002
 - b) No Stage II refueling
 - c) No anti-tampering program
 - d) No I/M program
 - e) Fuel - Phase 2 Low Sulfur, Low RVP Georgia Gasoline
 - f) 2002 regional fleet age distribution
 - i) Derived from R.L. Polk & Co. registration data for 7 county area
 - ii) Applied to 15 of the 16 MOBILE6.2.03 composite vehicle classifications – LDV, LDT1, LDT2, LDT3, LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8, HDBS, HDBT, MC



- (1) Default for HDV8B
- g) Default VMT fractions
- 3) VMT adjustment factors
 - a) Calculated for year 2000
 - b) Highway Performance Monitoring System (HPMS) adjustment in base year of calibration in accordance with Section 93.122(b)(3) of the Transportation Conformity Rule which recommends that HPMS adjustment factors be developed to reconcile travel model estimates of VMT in base year of validation to HPMS estimates for the same period
 - c) Summer (seasonal) adjustment to convert from average annual VMT to summer-season VMT.

VMT Adjustment Factors – 7 County Area

Functional Class Name	Factor
Rural Interstate	0.89
Rural Prin. Arterial	0.99
Rural Min. Arterial	0.98
Rural Major Collector	1.81
Rural Minor Collector	1.81
Rural Local	1.10
Urb. Interstate	0.86
Urb. Other Fwy	0.85
Urb. Prin. Arterial	0.97
Urb. Min. Arterial	0.96
Urbanized Collector	1.80
Urbanized Local	1.06

- 5) Off-Model Calculations
 - a) Senior I/M Exemption (emissions debit)
 - i) The Senior I/M Exemption calculated for year 2002 is conservatively high and will be added to the regional emission inventories for each analysis year.
- 6) TCMs
 - No additional credit is taken in the emissions modeling process for SIP TCMs

PM 2.5 Planning Assumptions and Modeling Methodology

Since the 20 county nonattainment area for PM 2.5 and eight hour ozone are identical, the planning assumptions and modeling methodology for PM 2.5 are similar to those used for eight hour ozone. Measurements for PM 2.5 are averaged annually; therefore, no summer adjustments were applied unlike estimates for eight hour ozone.

Section 1: General Methods and Assumptions

- 1) Modeling Methodology
 - Estimate link-level VMT and congested flow speeds using ARC 20-county travel demand model that corresponds to the 20-county full-county portion of the PM 2.5 nonattainment area
- 2) Conformity Test



- a) Nonattainment Classification - Basic
 - i) No-Greater-Than-Base-Year interim emissions test
 - (1) 2002 base year
 - (2) Base year emissions to be developed as part of conformity analysis as provided for in preamble to the eight-hour ozone and PM_{2.5} Transportation Conformity Rule. Base year emissions will be established using the same modeling methodology presented above.
- 3) Conformity Analysis Years: 2010, 2020, 2030
- 4) Modeling Start Date: April 2007.
- 5) Interagency Consensus on Planning Assumptions: April 24, 2007

Section 2: Travel Demand Modeling Assumptions

- 1) Calibration Year: 2000
- 2) Project Listing: See proposed project list for 2030 LRTP.
- 3) Demographic Data: See section on socio-economic context for 2030 LRTP

Section 3: Emissions Modeling Assumptions

- 1) Emissions Factor Model: MOBILE6.2.03
- 2) PM_{2.5} Standard MOBILE6.2.03 Inputs (7-county portion, partial-county portions)
 - a) Annual averages of the hourly average temperature and relative humidity for each hour of each month; and annual average of the daily average barometric pressure for each month; 2000 – 2002
 - b) No Stage II refueling
 - c) No anti-tampering program
 - d) No I/M program
 - e) Fuel
 - i) 2002 Base Year: Annual average sulfur and RVP based on caps in Georgia's Low Sulfur, Low RVP gasoline marketing rule (June – September) and on the monthly sulfur and RVP values in USEPA's NMIM database (October – May)
 - ii) 2010 and later: Phase 2 Low Sulfur (30ppm) Georgia Gasoline year-round; annual average RVP based on caps in Georgia's gasoline marketing rule (June-September) and on the monthly RVP values in the NMIM database (October-May)
 - iii) Diesel sulfur: average of the monthly values in USEPA's NMIM database for each analysis year
 - f) 2002 regional fleet age distribution
Derived from R.L. Polk & Co. registration data for 9 counties (Carroll, Bartow, Hall, Barrow, Walton, Newton, Spalding, Heard, and Putnam).
- 3) VMT adjustment factors
Calculated for year 2000. Same VMT adjustment factors as eight hour ozone but without the summer seasonal adjustment.



VMT Adjustment Factors – 7 County Area

Functional Class Name	Factor
Rural Interstate	0.85
Rural Prin. Arterial	0.97
Rural Min. Arterial	0.97
Rural Major Collector	1.80
Rural Minor Collector	1.80
Rural Local	1.09
Urb. Interstate	0.85
Urb. Other Fwy	0.85
Urb. Prin. Arterial	0.97
Urb. Min. Arterial	0.97
Urbanized Collector	1.80
Urbanized Local	1.09

- 6) Off-Model Calculations
Senior I/M Exemption (emissions debit).

- 7) TCMs
No additional credit is taken in the emissions modeling process for SIP TCMs

Source: Atlanta Regional Commission, June, 2007