

Exhibit 1A

1997 EIGHT-HOUR OZONE STANDARD MAINTENANCE PLANNING ASSUMPTIONS & MODELING INPUTS

General Methods and Assumptions

- 1) Modeling Methodology: Use the MOVES model in inventory mode to determine the total NO_x and VOC emissions in the 20-county nonattainment area.
- 2) Analysis Years: 2008, 2024
- 3) Modeling Start Date: July 2011. This start date is defined by the ARC as the initiation of the first model run for the support of SIP development.

Travel Demand Modeling Assumptions

- 1) Calibration Year: 2000 (with some 2005 interim validations and benchmarking thereafter)
- 2) Social/Economic Data: Produced as part of PLAN 2040
- 3) All other modeling assumptions consistent with those approved in the PLAN 2040 documentation

Emissions Modeling Assumptions

- 1) Emissions Model: MOVES2010a – Database: MOVES20100830
 - a. Emissions Process – use MOVES in inventory mode for a July day
 - i. For the attainment inventory and maintenance inventory
 - ii. As the basis¹ for the 2024 motor vehicle emissions budget
 - b. Run separately for the 13-county and 7-county portions of the nonattainment area²
 - i. 13-county area activity, vehicle population and other inputs area assigned to Fulton County while running MOVES
 - ii. 7-county area activity, vehicle population and other inputs are assigned to Bartow County while running MOVES

¹ The total motor vehicle emissions budgets will be comprised of the on-road motor vehicle inventories for NO_x and VOC plus any safety margins decided upon, at a later date, through interagency consultation.

² For the eight-hour ozone standard there are two sets of MOVES input files, one for the 13 counties that make up the former one-hour ozone nonattainment area in which a specific set of emission control measures is in place and one for the seven ring counties.

2) MOVES Inputs

- a. Road Type Distribution – Processed from the travel demand model, GDOT HPMS counts and MOVES defaults. Summarizes VMT fraction by road type and source type for the 13 and 7 counties separately.
- b. Source Type Population
 - i. Started with 2002 R.L. Polk & Co. registration data for the Atlanta nonattainment counties, as well as the Georgia Department of Revenue's registration data for 2003 and 2007.
 - ii. Vehicles by type were grown from 2002 to 2007 using different growth factors by vehicle type based on either Census person population estimates or on Georgia 2007 registration data. Methodology developed by EPD for inputs to the SMOKE-MOVES Integration Tool.
 - iii. 2024 data grown from 2007 based on the ratio of MPO future year people population estimates
 - iv. Since the population of vehicle type 62 (combination long-haul trucks) can easily be underrepresented in areas with lots of through traffic, the vehicle population for MOVES source type 62 was revised using MOVES default VMT/VPOP ratios and VMT for HPMS type 60 data
- c. Vehicle Type VMT
 - i. HPMS VTypeYear - Processed from the travel demand model, GDOT HPMS Counts, and an EPA daily to annual VMT converter. Assigns total annual VMT by HPMS vehicle type.
 - ii. Month VMT Fraction: MOVES defaults
 - iii. Day VMT Fraction: MOVES defaults
 - iv. Hour VMT Fraction: Derived from the travel demand model by source and road type. The fractions are determined separately for the 13 and 7 county areas.
- d. I/M Programs and Stage II Refueling Vapor Recovery – Applied to the 13-county area only (See Appendix A)
- e. Age Distribution – MOBILE6 age distributions converted to MOVES format using the EPA converter. MOBILE6 distributions were derived from 2002 R.L. Polk & Co. registration data for the 13 and 7 county areas separately for all vehicle types, except for HDV8B where MOBILE6 defaults were used.

- f. Average Speed Distribution – Processed from the travel demand model with HPMS VMT Adjustment factors applied. Calculates VHT by hour by speed bin by source. The distribution is determined separately for the 13 and 7 county areas.
 - g. Ramp Fraction – Processed from the travel demand model. Calculates VMT by freeway and ramps by area type. The fraction is determined separately for the 13 and 7 county areas.
 - h. Fuel – MOVES defaults for a July weekday for Fulton (13-county) and Bartow (7-county)
 - i. Meteorology – 2008 data
- 3) VMT HPMS Adjustment Factors
- a. Calculated for the year 2000 (See Appendix B)
 - b. 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 VMT³
 - d. Factors applied to VMT estimates generated by ARC travel demand model for 13-county portion and 7-county portion of 20-county modeling domain, separately
 - a. Factors aggregated up to MOVES road types from base HPMS functional classifications
- 4) 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
- 5) TCMs
- a. No additional credit is taken in the emissions modeling process for SIP TCMs

³ *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, Section 3.4.2.6, EPA420-R-92-009, USEPA Office of Air and Radiation, Office of Mobile Sources, 1992.

APPENDIX A – I/M Program

- 1) Exhaust and Evaporative (OBD and gas cap pressure test) for 1996 and newer vehicles
 - a. Began in 1982
 - b. Annual inspection required
 - c. Computerized test and repair OBD – Exhaust
 - d. Computerized test and repair OBD & GC - Evaporative
 - e. Applies to all LDG vehicle types
 - f. Three year grace period
 - g. 3% waiver rate for all vehicles – Exhaust test
 - h. 0% waiver rate for all vehicles – Evaporative test
 - i. 97% compliance
- 2) Exhaust and Evaporative test for 1975 – 1995 vehicles
 - a. Began in 1982
 - b. Annual inspection required
 - c. Computerized test and repair ASM 2525/5015 Phase-in – Exhaust
 - d. Computerized test and repair GC – Evaporative
 - e. Applies to all LDG vehicle types
 - f. 3% waiver rate for all vehicles – Exhaust
 - g. 0% waiver rate for all vehicles – Evaporative
 - h. 97% compliance
 - i. 25 year and older model years are exempt
- 3) Stage II Refueling and Vapor Recovery
 - a. Started in 1992
 - b. Three phase in years
 - c. 81% efficiency

Appendix B – VMT Adjustment Factors

Ozone VMT Adjustment Factors

Functional Class Name	Functional Classifications	Factor for 13 County Area	Factor for 7 County Area
Interstates / Freeways	1, 11, 12	1.05	0.89
Arterials	2, 6, 14, 16	0.98	0.99
Collectors	7, 8, 17	1.07	1.81
Local	9, 19	0.87	1.10

Exhibit 1B

1997 ANNUAL PM_{2.5} STANDARD MAINTENANCE PLANNING ASSUMPTIONS & MODELING INPUTS

General Methods and Assumptions

- 1) Modeling Methodology
 - a. 20-County Portion – Use the MOVES model in inventory mode to determine the total NO_x and PM_{2.5} emissions
 - b. Putnam Partial County Portion – Use an off-travel model technique to determine emissions in MOVES
- 2) Conformity Test
 - a. No Greater than Base Year interim emissions test for analysis years prior to 2024
 - i. 2002 base year
 - ii. Base year emissions to be developed as part of the conformity analysis provided in preamble to the eight-hour ozone and PM_{2.5} Transportation Conformity Rule⁴. Base year emissions will be established using the same modeling methodology presented above.
- 3) Conformity Analysis Years: 2002, 2008, 2024
- 4) Modeling Start Date: July 2011. This start date is defined by the ARC as the initiation of the first model run for the support of SIP development.

Travel Demand Modeling Assumptions

- 1) Calibration Year: 2000 (with some 2005 interim validations and benchmarking thereafter)
- 2) Social/Economic Data: Produced as part of PLAN 2040
- 3) All other modeling assumptions consistent with those approved in the PLAN 2040 documentation

Emissions Modeling Assumptions

- 1) Emissions Model: MOVES2010a – Database: MOVES20100830

⁴ Federal Register, Vol. 69, No.126, July 1, 2004, p. 40015, first column.

- a. Emissions Process – using MOVES in Inventory mode
 - i. Run an entire year
 - ii. Run an annualized average day, which is used as the basis⁵ for the 2024 motor vehicle emission budget
- b. Run separately for the 13-county and 7-county portions of the nonattainment area⁶
 - i. 13-county area activity, vehicle population, and other inputs are assigned to Fulton County while running MOVES
 - ii. 7-county area activity, vehicle population, and other inputs are assigned to Bartow County while running MOVES

2) MOVES Inputs

- a. Road Type Distribution – Processed from the travel demand model, GDOT HPMS counts and MOVES defaults. Summarizes VMT fraction by road type and source type for the 13 and 7 counties separately.
- b. Source Type Population
 - i. Started with 2002 R.L. Polk & Co. registration data for the Atlanta nonattainment counties, as well as the Georgia Department of Revenue’s registration data for 2003 and 2007
 - ii. Vehicles by type were grown from 2002 to 2007 using different growth factors by vehicle type based on either Census person population estimates or on Georgia 2007 registration data. Methodology developed by EPD for inputs to the SMOKE-MOVES Integration Tool
 - iii. 2024 data grown from 2007 based on the ratio of MPO future year people population estimates
 - iv. Since the population of vehicle type 62 (combination long-haul trucks) can easily be underrepresented in areas with lots of through traffic, the vehicle population for MOVES source type 62 was revised using MOVES default VMT/VPOP ratios and VMT for HPMS type 60 data

⁵ The total motor vehicle emissions budgets will be comprised of the on-road motor vehicle inventories for PM_{2.5} and NO_x plus any safety margins decided upon, at a later date, through interagency consultation.

⁶ For the annual PM_{2.5} standard there are two sets of MOVES input files, one for the 13 counties that make up the former one-hour ozone nonattainment area in which a specific set of emission control measures is in place and one for the seven “ring” counties.

- v. 2024 Putnam County data grown from 2007 based on the ratio of Georgia Office of Planning and Budget future people population estimates
 - c. Vehicle Type VMT
 - i. HPMS VTypeYear - Processed from the travel demand model, GDOT HPMS Counts, and an EPA daily to annual VMT converter. Assigns total annual VMT by HPMS vehicle type
 - ii. Month VMT Fraction: MOVES defaults
 - iii. Day VMT Fraction: MOVES defaults
 - iv. Hour VMT Fraction: Derived from the travel demand model by source and road type. Determined separately for the 13 and 7 county areas.
 - d. I/M Programs and Stage II Refueling Vapor Recovery – Applied to 13 county area only (See Appendix A)
 - e. Age Distribution – MOBILE6 age distributions converted to MOVES format using EPA converter. MOBILE6 distributions were derived from 2002 R.L. Polk & Co. registration data for the 13 and 7 county areas separately for all vehicle types, except for HDV8B where MOBILE6 defaults were used.
 - f. Average Speed Distribution – Processed from the travel demand model with HPMS VMT Adjustment factors applied. Calculates VHT by hour by speed bin by source. Determined separately for the 13 and 7 county areas.
 - g. Ramp Fraction – Processed from the travel demand model. Calculates VMT by freeway and ramps by area type. Determined separately for the 13 and 7 county areas.
 - h. Fuel – Annualized MOVES defaults for Fulton (13-county) and Bartow (7-county)
 - i. Meteorology – 2008 data
- 3) VMT HPMS Adjustment Factors
 - a. Calculated for year 2000 (See Appendix B)
 - b. 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. Factors applied to VMT estimates generated by ARC travel demand model for 13-county portion and 7-county portion of 20-county modeling domain, separately.
 - d. Factors aggregated up to MOVES road types from base HPMS functional classifications
- 4) 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.
 - b. Putnam Partial Nonattainment Area
 - i. Total MOVES inventory-mode derived emissions in Putnam County were scaled down to the nonattainment area's contribution based on the ratio of human population in the nonattainment area to the entire county.
 - ii. VMT in Putnam County is estimated using historical VMT estimates from GDOT's 445 Reports
 - iii. Congested flow speeds for Putnam County are taken from the 7-county portion of the ARC travel demand model for each analysis year
- 5) TCMs
- a. No additional credit is taken in the emissions modeling process for SIP TCMs

APPENDIX A – I/M Program

- 4) Exhaust and Evaporative (OBD and gas cap pressure test) for 1996 and newer vehicles
 - a. Began in 1982
 - b. Annual inspection required
 - c. Computerized test and repair OBD – Exhaust
 - d. Computerized test and repair OBD & GC - Evaporative
 - e. Applies to all LDG vehicle types
 - f. Three year grace period
 - g. 3% waiver rate for all vehicles – Exhaust test
 - h. 0% waiver rate for all vehicles – Evaporative test
 - i. 97% compliance
- 5) Exhaust and Evaporative test for 1975 – 1995 vehicles
 - a. Began in 1982
 - b. Annual inspection required
 - c. Computerized test and repair ASM 2525/5015 Phase-in – Exhaust
 - d. Computerized test and repair GC – Evaporative
 - e. Applies to all LDG vehicle types
 - f. 3% waiver rate for all vehicles – Exhaust
 - g. 0% waiver rate for all vehicles – Evaporative
 - h. 97% compliance
 - i. 25 year and older model years are exempt
- 6) Stage II Refueling and Vapor Recovery
 - a. Started in 1992
 - b. Three phase in years
 - c. 81% efficiency

Appendix B – VMT Adjustment Factors

PM_{2.5} VMT Adjustment Factors

Functional Class Name	Functional Classifications	Factor for 13 County Area	Factor for 7 County Area
Interstates / Freeways	1, 11, 12	1.02	0.85
Arterials	2, 6, 14, 16	0.99	0.97
Collectors	7, 8, 17	1.09	1.80
Local	9, 19	0.89	1.09

Exhibit 1C

PLAN2040 Population and Employment Planning Assumptions

The ARC will be conducting a conformity analysis under the PM_{2.5} standard as part of the conformity determination for the PLAN 2040 RTP / FY 2012-2017 TIP for the 20 county nonattainment area.

Below is a detailed listing of the procedures and planning assumptions for the upcoming conformity analysis of the PLAN 2040 RTP.

ARC periodically revises its population and employment forecasts based on best available current information. Each revision is a two-step process. First, new region-level forecasts are produced. These then become region-level controls for census tract and traffic analysis zone (TAZ) forecasts.

The most current region-level control forecasts (PLAN 2040) were completed in spring of 2009. The accompanying table summarizes the new population and employment controls for the updated, 20-county study area.

ARC staff was assisted in the development of these regional forecasts by a Technical Advisory Committee (TAC) of nationally known, local experts on the Atlanta Regional Economy. Chair of the Committee was Dr. Donald Ratajczak, Regents Professor Emeritus of Economics at Georgia State University. Dr. Ratajczak served as director of the Economic Forecasting Center in the J. Mack Robinson College of Business at Georgia State University from 1973 until June 2000 and as a professor of economics in the Andrew Young School of Policy Studies until he retired in 2000. The committee recommended the final adopted forecasts for use by the Commission in 2009.

The second step in the forecasting process uses mathematical models to disaggregate the region-level control population and employment forecasts to “small areas”: the Superdistrict, census tract and traffic analysis zone (TAZ) level. TAZs are nested within census tracts. Census tracts nest within superdistricts. The mathematical models underlying the region-level controls have evolved and become more complex, but ARC’s basic approach is the same today as in 1975.

The TAZ Disaggregator (TAZ-D) model has been used in Plan2040 to disaggregate the regional controls to small areas. This model runs annually and iteratively (unlike the five-year iterative sequence of the previous model small area model, DRAM/EMPAL). The process is fully integrated with the ARC travel demand model, as impedances (travel costs) from the travel model are a significant influence layer for spatial allocation of population and job growth.

Population and job levels from each successive single-year forecast become the base for forecasts in the next model year. First, the Cube/TP+ model analyze base year traffic patterns and produces accessibility measures (impedances or travel costs) within the 20-county forecasted area. Then, the TAZ-D model uses the composite impedances; Superdistrict-level distribution of base-year population, employment and land use; and other spatial influence layers (e.g. like land use, interchange locations, major arterials, transit stations, etc.) to develop grid-level forecasts one year into the future. The size of the grid areas in

the TAZ-D model vary by geographic area of the region, as do the weights assigned to various spatial influence factors for growth. The Unified Growth Policy Map (UGPM) was used by the TAZ-D as the baseline source to generate household and job density and/or intensity levels to allocate future growth. The grid-level forecasts are then aggregated back up to the TAZ, tract, and superdistrict levels. The TAZ-level forecasts then become the input used by the Cube/TP+ model to produce the impedances measure that drives the next iteration of the integrated model run.

All these models are carefully calibrated based on the best and most current data available. Data used in the current effort include 2000 United States Census results, ARC annual estimates of population (using the building permit method from 2000 Census base) for superdistricts and census tracts, ARC annual estimates of employment by industry for superdistricts, tracts and TAZs from the state of Georgia unemployment insurance base file. National forecasts of employment and population were derived from the REMI Policy Insight+ model. The results of ARC travel surveys included the SMARTRAQ household travel survey, transit on-board survey, Hartsfield air passenger survey, travel time studies, speed studies, and others. Highway projects and the schedule for their completion (primary inputs to the Cube/TP+ model) are developed as part of an extensive discussion between ARC staff, local planners, Georgia Department of Transportation and various federal agencies.

The area modeled by ARC for transportation/air quality purposes expanded from ten (10) to twenty (20) counties over the last 15 years. The 2010 Census and federal conformity analysis requirements may result in further expansion of the nonattainment area. To meet current and future data needs, ARC produced employment estimates by county and census block group for the state of Georgia beginning in 2008, and continues to produce these estimates annually. The counties covered by land-use data produced in the LandPro program is expanded as needed. ARC's population estimates' program area will be expanded as required, from the current 20 counties, using the 2010 Census as a data baseline.

ARC produced tract-level 2010 estimates of population and 2009 small-area estimates of employment for the 20-county study area to support initial iterations of the TAZ-D model. Development of the annual estimates and of the year 2000 calibration database for the nonmember counties was coordinated with the affected county governments and the Regional Development Centers of which they are members.

Post processing adjustments are made to the ARC forecasts to account for expected large scale changes and policy priorities that would not be reflected in historical data. Events such as expected construction of a new highway or policy input restricting development within the region are accounted for directly in the models with the spatial influence layers or density limitations. Factors such as expected job and household growth from the completion of a major development project (i.e. Atlantic Station) or transit-oriented development are incorporated as post processing adjustments to the model output.

The forecasts will be used as part of the 2011 RTP (Plan2040/FY 2012-2017 TIP), scheduled for adoption in August 2011.

**Chart 1. ARC's Population and Employment Forecasts
1990 - 2040**

