**Modeling Inputs for the Development of the 2016 Atlanta Ozone Maintenance Plan**

**General Methods and Assumptions**

1. Modeling Methodology: Use the MOVES model in inventory mode to determine the total NOx and VOC emissions in the 15-county nonattainment area. For the emissions inventory section of the SIP, the MOVES Custom Domain approach was used in order to provide county by county emissions values along with the other sectors.
2. Analysis Years: 2014, 2030, 2050 (this last year initially for safety margin allocation determination, but 2030 proved adequate)
3. Modeling Start Date: December 2015.

**Travel Demand Modeling Assumptions**

1. ARC’s Activity-Based Travel Model (ABM) is the basis for these runs. For more details, see both the “ABM Development 1 Pager.docx” and the folder titled “ARC Travel Model Postprocessing” located in this Appendix.
2. Calibration Year: 2010 (with some 2015 interim validations and benchmarking thereafter)
   1. Model validated to the year 2010 using a comparison between estimated volumes and observed counts
3. Social/Economic Data: Same as used for the Atlanta Region’s Plan update (for more details, go to ARC’s webpage under Atlanta Region’s Plan). Back casting to 2014 and projecting to 2050

**Emissions Modeling Assumptions**

1. Emissions Model: MOVES2014a – Database: movesdb20151028
   1. Emissions Process – use MOVES in inventory mode for a July weekday
      1. For the years 2014, 2030 and 2050 modeled travel data is used to calculate emissions. For more details on the travel data, see both the “ABM Development 1 Pager.docx” and the folder titled “ARC Travel Model Postprocessing” located in this Appendix.
   2. Run separately for the 13-county and 2-county portions of the nonattainment area[[1]](#footnote-1)
      1. 13-county area activity, vehicle population and other inputs area assigned to Fulton County while running MOVES. For details on inputs, locate the appropriate subfolders within the “MOVESrunspecs\_inputs\_outputs” folder located in this Appendix (within “MOVESINPUTANDOUTPUTDATABASES” subfolder for input database, “XLS\_CSV&RUNSPECFILES” subfolder for input files).
      2. 2-county area activity, vehicle population and other inputs are assigned to Bartow County while running MOVES. For details on inputs, locate the appropriate subfolders within the “MOVESrunspecs\_inputs\_outputs” folder located in this Appendix (within “MOVESINPUTANDOUTPUTDATABASES” subfolder for input database, “XLS\_CSV&RUNSPECFILES” subfolder for input files).
2. MOVES Inputs (details within the “MOVESrunspecs\_inputs\_outputs” folder in this Appendix, within “MOVESINPUTANDOUTPUTDATABASES” subfolder for input database, “XLS\_CSV&RUNSPECFILES” subfolder for input files).
   1. 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 2 counties separately.
   2. Source Type Population
      1. Started with 2014 Polk/IHS. registration data for the Atlanta nonattainment counties
      2. Future analysis year data is grown from 2014 based on the ratio of MPO population estimates
      3. 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
   3. Vehicle Type VMT
      1. 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.
      2. Month VMT Fraction: MOVES defaults
      3. Day VMT Fraction: MOVES defaults
      4. Hour VMT Fraction: Derived from the travel demand model by source and road type. The fractions are determined separately for the 13 and 2 county areas.
   4. I/M Programs– Applied to the 13-county area only
   5. Age Distribution – Age data was derived from 2014 R.L. Polk & Co. registration data for the 13 and 2 counties separately for all vehicle types, except for combination long-haul trucks (source type 62), where national MOVES defaults were used (for same reasons as source type population). Further explanation on local data use is at end of this document.
   6. 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 2 county areas.
   7. Ramp Fraction – Processed from the travel demand model. Calculates VHT by freeway and ramps by area type. The fraction is determined separately for the 13 and 2 county areas.
   8. Fuel – MOVES2014 defaults after 2015 do not match local fuel due to the removal/modification of Georgia summer fuel in the 45 county Atlanta region effective Oct 1, 2015
      1. Tier 3 Low Sulfur fuel (10ppm, 80ppm refinery gate and 95ppm downstream cap) for all counties
      2. Summer Fuel reclassification
         1. 13 counties –
            1. Low Federal RVP summer requirements (June 1-Sept 15) for “designated volatility nonattainment areas” (40 CFR 80.27(a)(2)(ii))
            2. Fuel region ID 170000000 kept but fuel formulations reflect region 178000000 for any model years after 2015
         2. 2 counties –
            1. Standard Federal RVP summer requirements (June 1-Sept 15) for “designated volatility attainment areas” (40 CFR 80.27(a)(2)(i))
            2. Fuel region ID 170000000 kept but fuel formulations reflect region 100000000 for any model years after 2015
      3. Ethanol – The current assumption is an increasing percentage of ethanol fuel
         1. 2% in 2014, 28% in 2030 and 21% in 2040
         2. The rest of the gasoline blends with a larger percent of E15 with time:
            1. 0.8% in 2014, 19% in 2030 and 23% in 2050
         3. Remainder is E10
      4. Volatility waiver for E10 allows 1.0 psi RVP increase, but not in E15
   9. Meteorology – July 2014 weather for Hartsfield-Jackson Atlanta International Airport was used for this analysis
   10. Starts – Processed from the travel model. Determines the number of trip starts in each of the 13 and 2 county areas. Applies only to the trips per day input. Defaults used for the rest of the start inputs. Processed from Travel Demand Model (for more details on this model, see both the “ABM Development 1 Pager.docx” and the folder titled “ARC Travel Model Postprocessing” located in this Appendix).
   11. Hotelling – MOVES defaults
3. VMT HPMS Adjustment Factors
   1. Calculated for the year 2010
   2. 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
   3. Summer (seasonal) adjustment to convert from average annual VMT to summer-season VMT[[2]](#footnote-2)
   4. Factors applied to VMT estimates generated by ARC travel demand model for 13-county portion and 2-county portion of 20-county modeling domain, separately
   5. Factors aggregated up to MOVES road types from base HPMS functional classifications
4. Off-Model Calculations
   1. Senior I/M Exemption (emissions debit)
      1. 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 – No additional credit is taken in the emissions modeling process for SIP TCMs

Quick Explanation of Using Local Data for Vehicle Types 52, 53, 54, and 61 in Atlanta

Vehicle type 52/53 (single unit trucks): Of the approximately 67,000 vehicles in this group, over 40,000 appear to be from vehicles 19,000 GVWR are less, many which were considered "commercial trucks" (vehicle type 32) in MOVES2010b but are now "52/53". It has never been been questioned whether local data be applied to vehicle type 32 past or present so these vehicles should have local data applied to them. In fact in the industry vehicles 14,000 GVWR and less are considered "light duty" of which up to 30,000 of these 67,000 vehicles are cited in the Polk/IHS VIN data.

In addition, vehicle type 52 would be defined as "short haul single unit trucks" which means short trips, less than 200 miles total trip distance. The end and start point is typically the same (like UPS, and FedEx, or other commercial local trucks (e.g., plumbers, mechanics, service vehicles etc.)), acting like commercial truck vehicle type 32 except heavier. With the end and start point the same, and the size of the Atlanta area (15 counties in total), the trips with few exceptions would stay in Atlanta. Atlanta is also a major hub for industries using these vehicles. The local age distribution would capture these vehicles better than a national default distribution, especially considering a portion of these vehicles are local industries like FedEx or UPS where there have been recent purchases. As for vehicle type 53, "long haul single unit trucks", one could surmise this to mean a unique fleet of single unit trucks that make long trips like "combination trucks". However, that is not the case in reality, especially in Atlanta, where the same single unit vehicles are used, but just 4-5% (the national default split of 52/53) of the time they might take a trip that exceeds 200 miles (a long delivery day). So whatever age distribution applies to vehicle type 52 should apply to vehicle type 53. In fact, technical guidance for MOVES2014 with regards to SIPs and conformity (page 34) specifically mentions the use of identical age distributions between vehicle types in the same HPMS class if there is a lack of data to differentiate or identify age distributions for a source type. In this case, GA EPD applies this to vehicle types 52 and 53. Local data is available for single unit trucks, but not available to split them into type 52 and 53. National defaults not capture the local character of the single unit trucks in the Atlanta area. It is known that single unit trucks traverse within the Atlanta area (like delivery trucks while traveling sometimes as much as 300 miles in a day). The 15 county Atlanta area covers a lot of territory and most travel by single unit trucks would be within this area. Lastly, this data is brand new and has been heavily vetted by Polk/IHS, GA EPD and even the multi-jurisdictional MOVES group (MJO MOVES). Therefore, GA EPD strongly believes in using this local data for single unit trucks.

Vehicle type 61 (short haul combination trucks): By definition, vehicle type 61 was separated out from vehicle type 62 by Polk/IHS in our registration data acquisition by the presence of a sleeper cab. No sleeper cab or configuration indicating any need for being away from home was defined as "short haul combination". So, the end and start part of these trucks, which travel less than 200 miles in a trip (usually with intermediate local stops) for a day, is predominately the same. So, considering the size of that Atlanta area of concern (up to 15 counties), a grand majority of trips by short haul combination trucks would be within the area they are registered, which is the Atlanta area in this case. While this study includes refuse trucks, school buses, and transit buses as short haul, they also include combination (and single unit) trucks for short haul uses and define them as "staying in the same metropolitan area" (link: <http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/TTI-2009-9.pdf>. Also, there are a variety of sources, including job sites that specify how short -haul operations typically operate within the same city or metro area such as this site (this can also be applied to single unit trucks too, although these sites usually look at freight, combo trucks: <http://www.vault.com/industries-professions/professions/t/truck-drivers.aspx>. Therefore, for vehicle type 61, GA EPD strongly believes that short haul combination trucks age distributions are best characterized in Atlanta with local data as opposed to long-haul combination trucks where they travel country-wide with vehicles usually registered not only not in the Atlanta area, but not in Georgia either.

Vehicle type 54 (motor homes): In this case, motor home data in the past was based on loose assumptions and behavior based on buses. The motor home data in the national database is based on such data which is as much as 17 years old. In contrast to the above, GA EPD has acquired just in the last year vocational data that specifically grabs motor home data from a motor home database accessed by Polk/IHS, the vendor who provided the GA local vehicle registration data (see pdf and ppt file discussing their methods and vast experience with this). It is accurate that some RVs and other motor homes travel across the country and that some on Atlanta roads would be from elsewhere on the interstate; however there are many that travel locally on local roads to camp in local parks (e.g., Stone Mountain, Red Top Mountain, etc.). RVs are usually personally owned like light duty vehicles (unless rented) and spend much time at their home base. Also, RVs and motor homes are small in number so emissions impacts are insignificant whatever is decided. To reiterate, many in Atlanta use RVs to stay at parks near their home and in the nearby GA mountains, so there would be many RVs on Atlanta roads that would be locally registered. Like stated above, the Atlanta area covers a large area and captures most of these vehicles. This is certainly the case of RVs on local roads. Due to these reasons among others (heavily vetted data by Polk/IHS, GA EPD, and even MJO MOVES group), GA EPD uses local data for this vehicle type.

1. 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 2 remaining ring counties (out of the 7 used for 20-county conformity) [↑](#footnote-ref-1)
2. *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. [↑](#footnote-ref-2)