Appendix A: MOBILE6 Documentation from Baker for the Baltimore Region

The Baltimore Ozone Non-Attainment Area

An Explanation of Methodology for Developing Mobile Source Emissions Budgets using MOBILE6

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The Baltimore Ozone Non-Attainment Area
State Implementation Plan Revision Using MOBILE6
An Explanation of Methodology
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OVERVIEW

This document reflects the highway mobile sources emission estimations for 2005 Baltimore Ozone Non-Attainment Area using EPA's recently approved MOBILE6 emission model that will revise the interim MOBILE5-based (Tier 2) motor vehicle emissions budget. The latest version of MOBILE is a major revision based on new test data and accounts for changes in vehicle technology and regulations. In addition, the model includes an improved understanding of in-use emission levels and the factors that influence them resulting in significantly more detailed input data. The revised motor vehicle emissions budgets using MOBILE6 are presented in the following table.

Table 1 Baltimore Area MOBILE6 Motor Vehicle Emissions Summary

Year	VOC (tons per day)	NO_x (tons per day)
2005	55.3	146.9

As compared to previous MOBILE versions, MOBILE6 has a significant impact on the emission factors, benefits of available control strategies, effects of new regulations and corrections to basic emission rates. As a result, the emissions rates are different and it is difficult to compare the results directly to previous runs conducted with MOBILE5. For this reason, 1990 emission totals are reanalyzed using MOBILE6 and its available input parameters.

Guidance documents from EPA were used to develop the inventory for the Baltimore Non-Attainment area. They include:

- *Policy Guidance on the Use of MOBILE6 for SIP Development and Transportation Conformity*, US EPA Office of Air and Radiation, dated January 18, 2002.
- *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation*, US EPA Office of Air and Radiation, and Office of Transportation and Air Quality, dated January 2002.
- *User's Guide to MOBILE6.0, Mobile Source Emission Factor Model*, EPA420-R-02-001, dated January 2002.

The methodologies used to produce the MOBILE6 emission results conform to the recommendations provided in EPA's Technical Guidance. A mix of local data and national default input data (internal to MOBILE6) has been used for this submission. Local data has been used for the primary data items that have a significant impact on emissions. This includes VMT, speeds, vehicle mixes, age distributions, diesel sales fractions, hourly distributions, temperatures, and inspection/maintenance and fuel program characteristics.

Some of the planning assumptions and modeling tools have been updated for this inventory effort. The key elements to the modeling protocol which have been updated are outlined below:

Baltimore Regional Travel Demand Model

The roadway data input to the emissions calculations for the Baltimore (5-counties and Baltimore City) ozone non-attainment region is based on the Baltimore Metropolitan Council's (BMC's) latest travel demand model upgrade. The new model utilizes the TP+ software platform and incorporates the following:

- Produces volumes by 5 time periods.
- Calibrated/validated to year 2000 traffic count data. The travel model is validated to 2000, but it was calibrated on 1993 HTS and 1996 transit survey. Truck model was calibrated with 2000 data.
- Contains a truck model calibrated to State Highway Administration (SHA) 2002 vehicle class counts.
- Utilizes BMC's latest land use assumptions and forecasts, Round 6.
- Contains mode choice and transit components to represent the impacts of the region's bus and rail networks.

PPSUITE Post Processor

PPSUITE was used for the first time in Maryland for this SIP. PPSUITE represents an enhanced version of the Post Processor for Air Quality (PPAQ) software system that has been used for previous inventory and conformity submissions in Pennsylvania, Virginia, New Jersey, and the New York City Metropolitan Area. The software has gone through a significant revision to ensure consistency with the MOBILE6 emissions model. PPSUITE is used to process the outputs from the regional travel demand model runs for 1990 and 2005 including the development of roadway speed estimates, which are supplied as input to the MOBILE6 model. The software is also used to prepare and run the MOBILE6 input files and to process the MOBILE6 outputs.

Baltimore Regional Inspection/Maintenance Program

The 1990 analysis runs assume an idle test on post-1977 gas vehicles up to 26,000 pounds. In addition, an anti-tampering program is included which includes 2 inspections applied to all subject vehicles. The 2005 analysis runs assume a more robust inspection program including the following key elements:

- An OBDII computer check for 1996 and newer model year gas vehicles up to 8,500 pounds.
- An IM240 tail pipe test for 1984 to 1995 gas vehicles and trucks up to 10,000 pounds.
- An Idle test for 1977 to 1983 vehicles up to 10,000 pounds and all gas trucks 10,000 to 26,000 pounds.
- A gas cap test for all vehicles tested.
- An anti-tampering program with 3 inspections for all vehicles receiving an idle test.

I. Regional Fuel Program

For 2005, the Baltimore ozone non-attainment region is required to have federal reformulated gasoline (RFG). Like conventional gasoline, RFG must meet fuel volatility requirements that vary by geographic region. The Baltimore region was modeled using the RFG requirements of the Southern region in summer time. Based on EPA's guidance and using the monthly fuel laboratory data (Source: Motor Fuel Tax Division, Office of the Comptroller), the 1990 analysis year runs for the Baltimore region utilized a computed Reid Vapor Pressure (RVP) value of 8.2.

Vehicle Age/Diesel Sales Distributions

Vehicle age distributions are input to MOBILE for the region based on registered vehicles that reflect July 1 summer conditions. These distributions reflect the percentage of vehicles in the fleet up to 25 years old and are listed by the 16 MOBILE6 vehicle types. As in previous SIP submissions, 1990 information is used in the development of the data input for the 1990 analysis year based on Maryland Motor Vehicle Administration's (MVA's) vehicle registration database download. Updated 2002 vehicle age distributions have been downloaded from the registration database and are used for the 2005 analysis year run. The analysis utilizes light-duty diesel sales fraction data acquired from state registration data for both 1990 and 2002.

Vehicle Mix Patterns

Vehicle mix patterns were developed from a combination of sources. Truck totals for 2005 were determined from the Baltimore regional truck model, which was calibrated against 2002 local count data. 1990 truck estimates were adjusted to reflect regional toll data from the Maryland Transportation Authority (MDTA). Regional vehicle mix patterns, developed by facility type from local count data, were used to split the autos into light-duty vehicles and motorcycles; and the trucks into heavy-duty trucks and buses. MOBILE6 defaults were then used to split the above 4 vehicle categories into the required 16 MOBILE6 vehicle classes. Defaults were used specific to the year being analyzed (1990, 2005). Thus, more sport utility vehicles are assumed in the year 2005 as compared to 1990.

Weather Data

Minimum and maximum daily temperatures were developed following USEPA guidance using information collected from the National Weather's Service BWI monitoring station. The 1990 temperatures used are the same that were used and documented in the official 1990 inventory for the Baltimore area. The 2005 temperatures are those used and documented in the 1999 inventory for the Baltimore area.

Federal Program: Low Emission Vehicle (NLEV), Tier 2/Low Sulfur Fuel, and 2004 Heavy Duty Engine (HDE) Rule

Federal new vehicle emissions control and fuel programs that were modeled separately using MOBILE5 are now incorporated into MOBILE6. The NLEV program had a three-year phase-in starting with 1999 model years. The Tier 2 / Low Sulfur Fuel Program takes effect in 2004 and provides benefit for subsequent years.

Other Changes incorporated into MOBILE6

In addition to the new regulations, a number of improvements (corrections) were incorporated into MOBILE6 that have a significant impact on emission calculations, in particular NO_x emissions. These changes may increase or decrease emissions depending on the pollutant, calendar year, fuel program and locally specified speeds and facility class driving activities. As a result, a MOBILE6 comparison to MOBILE5 emission estimates will be significantly different.

Below is a list of the most important quantitative changes to emissions incorporated into MOBILE6:

- Basic Emission Rates (BER) for light-duty cars and trucks are lower from late 1980s and early 1990 model year vehicles due to new data that shows pollution control devices are more durable than expected. This change generally lowers emissions from vehicles of model years in the late 1980's and early 1990's.
- Real world driving factors that influence emissions like air conditioning and high acceleration effects.
- Fuel content corrections to account for damage inflicted by high levels of sulfur in gasoline in vehicles with advanced catalysts. This leads to increased emissions in the late 1990s and early 2000s. This effect declines as the Tier 2 regulations phase in lower sulfur fuel.
- Speed data shows that vehicle emissions are generally less sensitive to speed changes than previously thought. This has a variable effect on emissions.
- For heavy-duty trucks, MOBILE6 includes lower base-rate emissions, but excess NO_x emissions under steady state driving conditions can occur due to pollution control defeat devices included in these vehicles in the 1990's. MOBILE6 includes, though, a reduction in these NO_x emissions expected in future years as the result of a consent decree with engine manufacturers. Thus, MOBILE6 heavy-duty truck emissions are significantly higher than MOBILE5 for some model years and pollutants and significantly lower for others.
- Heavy-duty diesel vehicle NO_x off-cycle emissions effects are incorporated into MOBILE6. These effects include the Defeat Device, NO_x Pull Ahead, Rebuild Mitigation Program, and Rebuild program effectiveness.
- MOBILE6 includes new data for evaporative emissions because this data has indicated a small fraction of older vehicles with leaks in their fuel systems contribute a large quantity of evaporative emissions. MOBILE6 also accounts for the new tests and new regulations that require lower emissions and more durable fuel systems. This has a variable effect on emissions.

INTRODUCTION

The purpose of this document is to explain how Baltimore estimates emissions from highway vehicles for inclusion in its emission inventories and State Implementation Plan.

Highway vehicles contribute significantly to air pollution, particularly to ground-level ozone. Ozone is not created directly but formed in sunlight from VOCs and NO_x. Both VOCs and NO_x are emitted from highway vehicles. Baltimore's ozone-related emission inventory efforts have been focused on these pollutants.

In order to estimate both the rate at which emissions are being generated and to calculate vehicle miles traveled (activity level), Baltimore examines its road network and fleet to estimate vehicle activity. For ozone-related inventories, this is done for a typical summer (July) weekday. Not only must this be done for a baseline year, but it must also be projected into the future. This process involves a large quantity of data and is extremely complex.

Computer models have been developed to perform these calculations by simulating the travel of vehicles on the region's roadway system. These models then generate emission rates (also called emission factors) for different vehicle types for area-specific conditions and then combine them in summary form. The "area-specific conditions" include vehicle and highway data, plus control measure characteristics and future year projections of all variables.

MOBILE. The heart of the highway vehicle emission calculation procedure is EPA's highway vehicle emission factor model, MOBILE. This is a FORTRAN program that calculates **average** in-use fleet emission factors for ozone precursors for each of twenty-eight categories of vehicles under various conditions affecting in-use emission levels (e.g., ambient temperatures, average traffic speeds, gasoline volatility) as specified by the model user. MOBILE produces the "emission rates" referred to in the previous section.

The model was first developed as MOBILE1 in the late 1970s, and has been periodically updated to reflect the collection and analysis of additional emission factor data over the years, as well as changes in vehicle, engine and emission control system technologies, changes in applicable regulations, emission standards and test procedures, and improved understanding of in-use emission levels and the factors that influence them. For this inventory effort, Baltimore utilizes MOBILE6 as approved by EPA.

PPSUITE. The Baltimore region is now using a post processor named PPSUITE (formerly named PPAQ - Post Processor for Air Quality), which consists of a set of programs that perform the following functions:

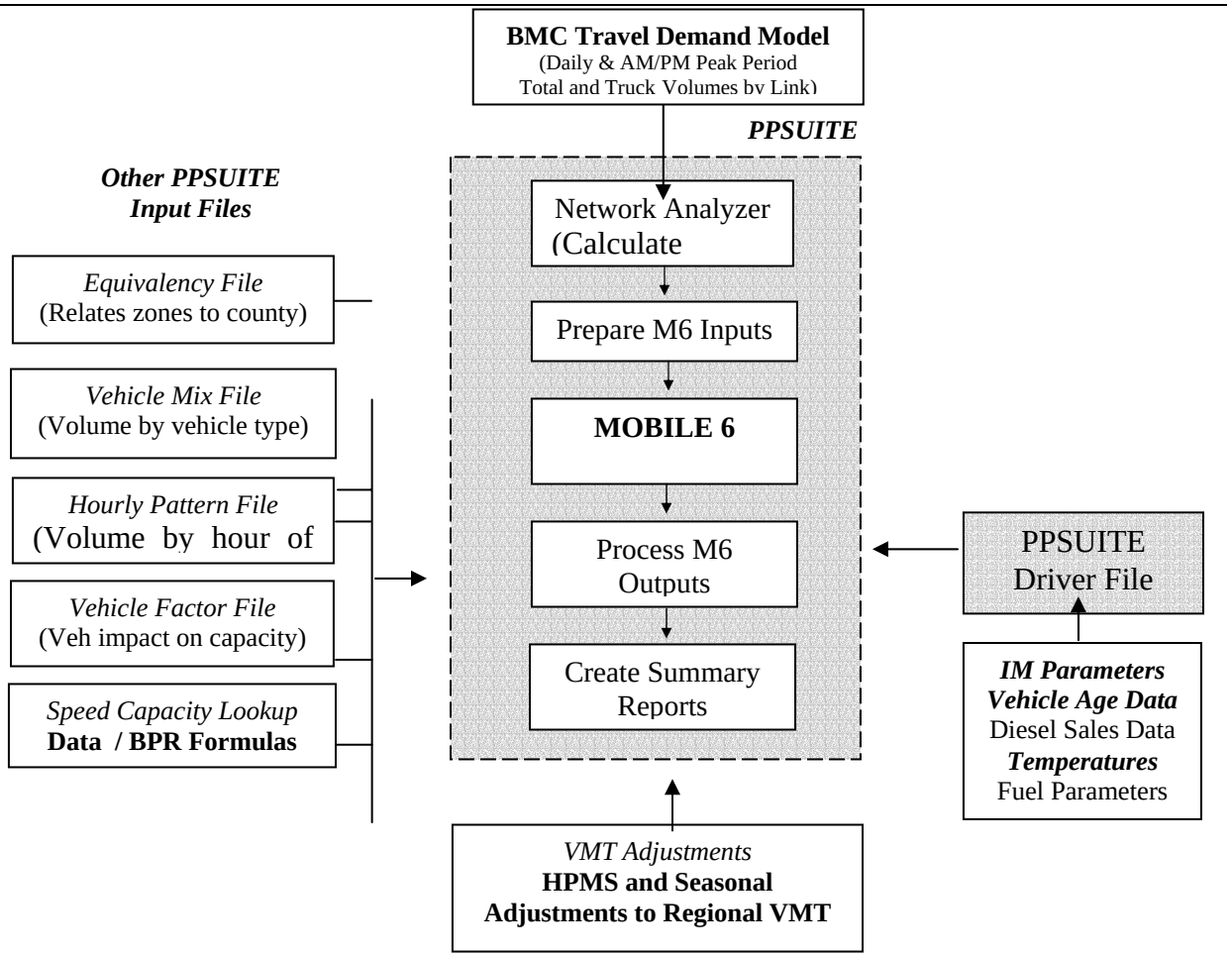
- Analyzes highway operating conditions
- Calculates highway speeds
- Compiles vehicle miles of travel (VMT) and vehicle type mix data
- Prepares MOBILE6 runs
- Calculates emissions from output MOBILE6 emission rates and accumulated highway VMT.

PPSUITE has become a widely used and accepted tool for estimating speeds and processing MOBILE emission rates. It is currently being used throughout Pennsylvania, for the New York City region, for the north and south New Jersey regions, and in other states including Louisiana, Virginia, and Indiana. The software is based upon accepted transportation engineering methodologies. For example, PPSUITE utilizes speed and delay estimation procedures based on planning methods provided in the 2000 Highway

Capacity Manual, a report prepared by the Transportation Research Board (TRB) summarizing current knowledge and analysis techniques for capacity and level-of-service analyses of the transportation system.

These two computer programs interact as shown in Exhibit 1. PPSUITE replaces the prior MDE-developed post processor, which could not accommodate MOBILE6 requirements without significant revision. In addition, PPSUITE enhances and adds new capabilities regarding the calculation of speed, the preparation of those speeds for input to MOBILE6, and allows for an organized input data storage format.

Exhibit 1 Emission Calculation Process for the Baltimore Region

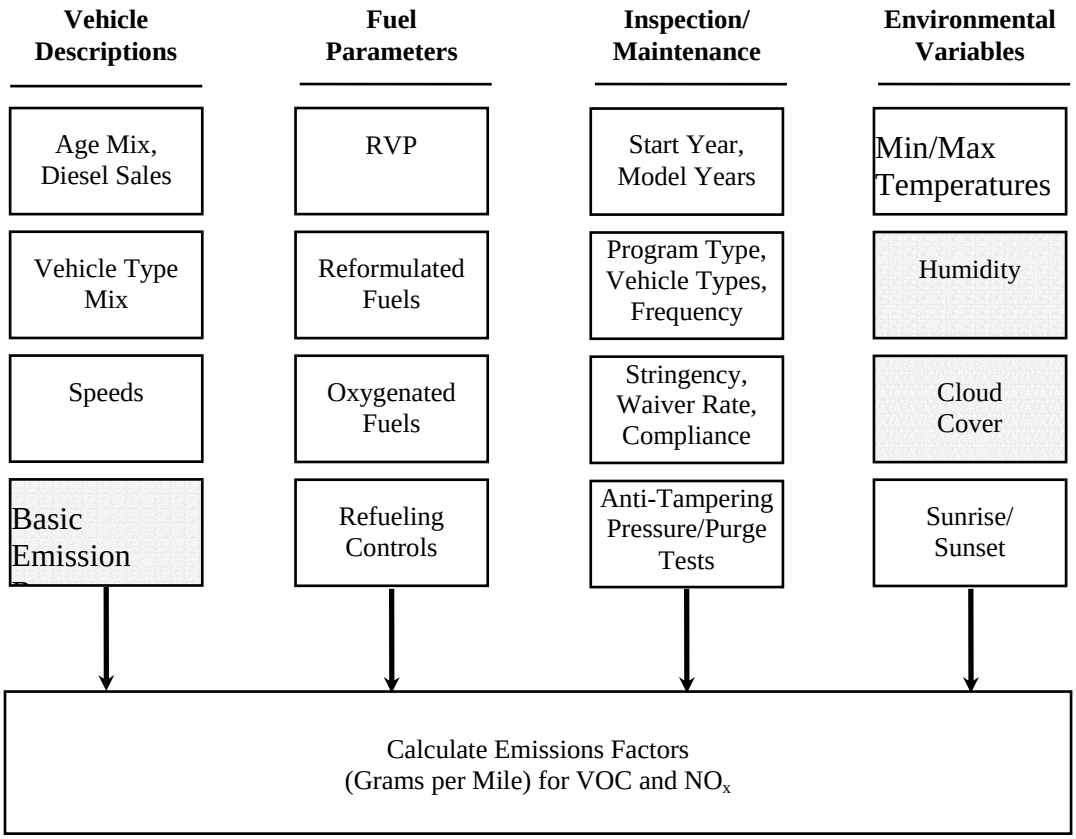


OVERVIEW OF INPUT DATA

Data Inputs to MOBILE

A large number of inputs to MOBILE are needed to fully account for the numerous vehicle and environmental parameters that affect emissions including traffic flow characteristics, vehicle descriptions, fuel parameters, inspection/maintenance program parameters, and environmental variables as shown in Exhibit 2. With some input parameters, MOBILE allows the user to choose default values, while others require area-specific inputs.

Exhibit 2 MOBILE Inputs



For an emissions inventory, area specific inputs are used for all of the items shown in Exhibit 2 except for the basic emission rates, humidity and cloud cover, which are MOBILE defaults. In addition, Baltimore uses the MOBILE6 default starts-per-day data and soak distributions that are used to calculate the number of starts in cold and hot start modes. EPA requires that the number of starts occurring per vehicle be determined from instrumented vehicle counts. Since such local data is not available, the MOBILE6 national defaults are used for the Baltimore region analyses. A vehicle will generate more emissions when it is first operated (cold start). It generates emissions at a different rate when it is stopped and then started again within a short period of time (hot start). Soak distributions are used to determine the time between when an engine is turned off to the next time it is restarted.

Vehicle Descriptions. Vehicle age distributions are input to MOBILE representing the distribution for the MOBILE6 16-vehicle types in the Baltimore region. This data is based on registered vehicles from the Maryland Motor Vehicle Administration's vehicle registration database reflecting July 1 summer conditions. As in previous SIP submissions, 1990 information is used in the development of the data input for the 1990 analysis year for non-trucks. Updated 2002 age data has been prepared and used for the forecast 2005 analysis year.

Vehicle Type Mix is calculated from algorithms using a combination of BMC travel demand model truck assignments, collected 1999-2002 State Highway Administration vehicle class counts, and MOBILE6

default percentages. (See also the discussion of Vehicle Type Pattern Data in the next section.) Speeds are discussed extensively in the next section.

Significant changes have occurred in the MOBILE6 model as compared to previous releases. Some of the information previously applied by post processor routines can now be input directly to the MOBILE6 model run. This includes information on the hourly distribution of VMT and the hourly speeds that occur during the day. Another important change in MOBILE6 is the influence of facility type on output emission factors. For example, MOBILE6 assumes that an average speed on a freeway results in a different emission factor than the same speed on an arterial roadway. Thus MOBILE6 is indirectly accounting for the accelerations and decelerations that typically occur on such roadways. MOBILE6 has four distinct facility types: Freeway, Arterial, Local, and Ramp. For any emission run, the input functional classes analyzed must be mapped to the above facility types. The following mapping scheme is used for the Baltimore runs:

BMC Model Facility Types	***MOBILE6 Facility Type***
1,2 (Interstate/Freeways)	Freeway
3,4 (Major/Minor Arterial)	Arterial
5,11 (Collector/Locals)	Local
6-10 (Ramps)	Ramp

Since ramps are directly represented within the travel demand model, they are mapped directly to the MOBILE6 Ramp category. Since the travel model does not contain all collector and local roadways, the volumes carried by such roadways may not represent the actual travel conditions. As a result, these facilities are mapped to the MOBILE6 Local category, which has a set speed used for all hours of the day. The above assumptions are consistent with the recommendations provided in EPA's Technical Guidance on the Use of MOBILE6 for Emissions Inventory Preparation.

Fuel Parameters. The same vehicle will produce different emissions using a different type of gasoline. Fuel control strategies can be powerful emission reduction mechanisms. An important variable in fuels for VOC emissions is its evaporability, measured by Reid Vapor Pressure.

MOBILE allows the user to choose among conventional, federal reformulated (used in the Baltimore region), oxygenated and low Reid Vapor Pressure (RVP) gasoline. Baltimore chooses the MOBILE inputs appropriate to the year and control strategy for the area being modeled. For 2005 Baltimore region uses Southern region summertime reformulated gasoline, and for 1990 conventional gasoline with an RVP of 8.2.

MOBILE also allows users to calculate refueling emissions - the emissions created when vehicles are refueled at service stations. Baltimore includes refueling emissions in its area source inventory and not in its highway vehicle inventory.

Vehicle Emission Inspection/Maintenance (I/M) Parameters. MOBILE allows users to vary inputs depending on the I/M program in place for the particular analysis year. For the Baltimore Region, the following tables describe the I/M program and anti-tampering program in place for the 1990 and 2005 analysis years.

Table 2 Baltimore Region I/M Program Parameters

Program Parameters	**1990**	**2005**						
Program Name	Idle Test	Idle older LDGV, LDGT	Idle HDGT	IM240	OBD	Gas Cap for older LDGV, LDGT	Gas Cap for HDGT	Gas Cap for OBD Vehicles
Test Type	Test Only	Test Only	Test Only	Test Only	Test Only	Test Only	Test Only	Test Only
I/M Program Start Year	1984	1984	1984	1984	2003	2003	2003	2003
Test Frequency	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial
Program Type	Idle	Idle	Idle	IM240	OBD I/M	GC	GC	EVAP OBD & GC
Model Years	77-50	77-83	77-83	84-95	96-50	77-95	77-50	96-50
Stringency Rate (%)	23	20	20	20	20	N/A	N/A	N/A
Compliance Rate (%)	96	96	96	96	96	96	96	96
Waiver Rate (%)	21 / 23	3	3	3	3	3	3	3
Grace Period	0	2	2	2	2	2	2	2
Vehicle Types								
LDGV	Yes	Yes	No	Yes	Yes	Yes	No	Yes
LDGT1	Yes	Yes	No	Yes	Yes	Yes	No	Yes
LDGT2	Yes	Yes	No	Yes	Yes	Yes	No	Yes
LDGT3	Yes	Yes	No	Yes	Yes	Yes	No	Yes
LDGT4	Yes	Yes	No	Yes	Yes	Yes	No	Yes
HDGV2B	Yes	No	Yes	No	No	No	Yes	No
HDGV3	Yes	No	Yes	No	No	No	Yes	No
HDGV4	Yes	No	Yes	No	No	No	Yes	No
HDGV5	Yes	No	Yes	No	No	No	Yes	No
HDGV6	Yes	No	Yes	No	No	No	Yes	No
HDGV7	No	No	No	No	No	No	No	No
HDGV8A	No	No	No	No	No	No	No	No
HDGV8B	No	No	No	No	No	No	No	No
GAS BUS	No	No	No	No	No	No	No	No

Table 3 Baltimore Region Anti-tampering Program Parameters

Program Element	Baltimore Region	
Analysis Year	**1990**	**2005**
Program Start Year	1989	1989
First Model Year	1977	1977
Last Model Year	2050	2050
LDGV	Yes	Yes
LDGT1	Yes	Yes
LDGT2	Yes	Yes
LDGT3	Yes	Yes
LDGT4	Yes	Yes
HDGV2B	Yes	Yes
HDGV3	Yes	No
HDGV4	Yes	No
HDGV5	Yes	No
HDGV6	Yes	No
HDGV7	No	No
HDGV8A	No	No
HDGV8B	No	No
GAS BUS	No	No
Program Type	Test Only	Test Only
Inspection Frequency	Biennial	Biennial
Compliance Rate (%)	96	96
Inspections Performed		
Air pump system disablement	No	No
Catalyst removal	Yes	Yes
Fuel inlet restrictor disablement	Yes	Yes
Tailpipe lead deposit test	No	No
EGR disablement	No	No
Evaporative system disablement	No	No
PCV system disablement	No	No
Missing gas cap	No	Yes

Weather Data. Minimum and maximum daily temperatures were developed following USEPA guidance using information collected from the National Weather's Service BWI monitoring station. The 1990 temperatures used are the same that were used and documented in the official 1990 inventory for the Baltimore area. The 2005 temperatures are those used and documented in the 1999 inventory for the Baltimore area.

Emission and Speed Relationships

Of all the user-supplied input parameters, perhaps the most important is vehicle speed (except for local and ramp roadway types where a constant MOBILE6 speed is assumed).

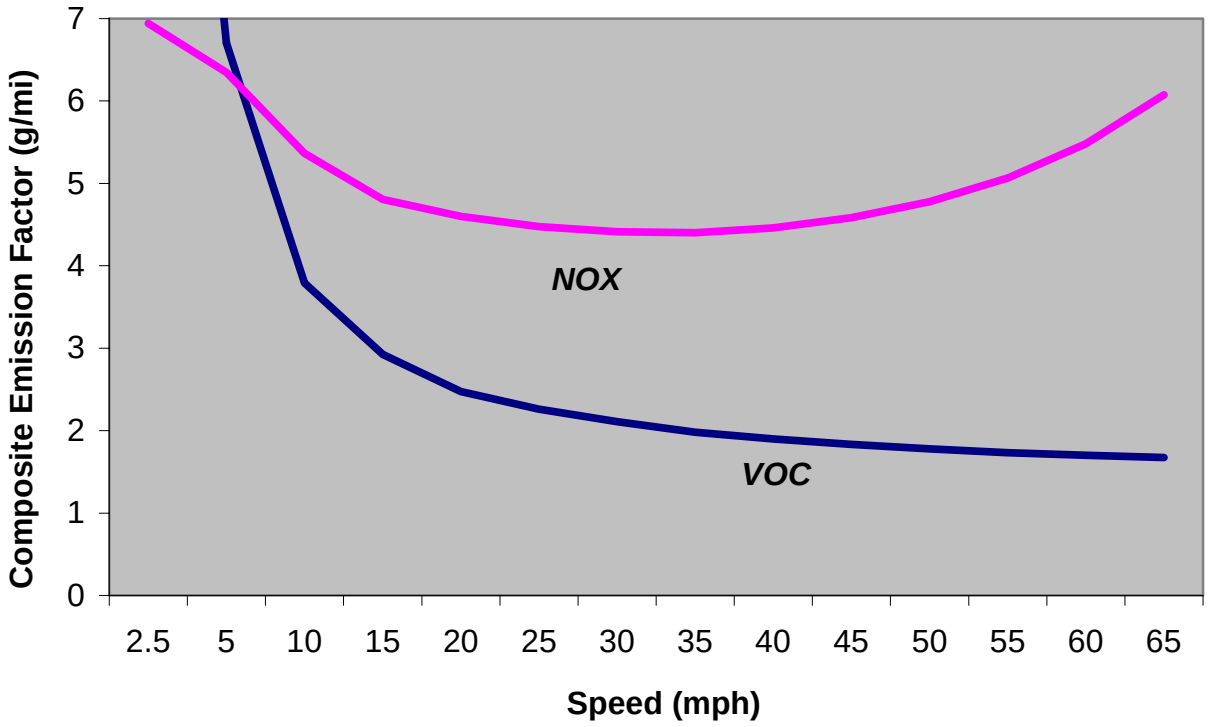
To obtain the best estimate of vehicle speeds, Baltimore uses the PPSUITE set of programs, whose primary function is to calculate speeds and to organize and simplify the handling of large amounts of data needed for calculating speeds and for preparing MOBILE input files. MOBILE6 uses hourly speeds that are grouped into 14 speed bins. The shares are calculated from accumulating hourly link VMT for speeds estimated using an update to the BPR curve. Two separate equations, one for interstates/freeways and non- interstates/freeways are used. The equations are as follows:

$$traveltime = speed * \left(1 + 0.2 * \left(\frac{v}{c}\right)^{10}\right) \text{ for interstates/freeways}$$

$$traveltime = speed * \left(1 + 0.05 * \left(\frac{v}{c}\right)^{10}\right) \text{ for non-interstates/freeways}$$

Emissions of both VOC and NO_x vary significantly with speed, but the relationships are not linear, as shown in Exhibit 3. While VOCs generally decrease as speed increases, NO_x decreases only at the low speed range and increases steeply at higher speeds.

Exhibit 3 MOBILE6 VOC and NO_x Speed vs. Emissions



Roadway Data

The roadway data input to the emissions calculations for the Baltimore ozone non-attainment region is based on the Baltimore Metropolitan Council's (BMC's) latest travel demand model upgrade. The new model utilizes the TP+ software platform and incorporates the following:

- Produces volumes by 5 time periods.
- Calibrated/validated to year 2000 traffic count data. The travel model is validated to 2000, but was calibrated on 1993 HTS and 1996 transit survey. Truck model was calibrated with 2000 data.
- Contains a truck model calibrated to State Highway Administration (SHA) 2002 vehicle class counts.
- Utilizes BMC's latest land use assumptions and forecasts (Round6).
- Contains mode choice and transit components to represent the impacts of the region's bus and rail networks.

The travel model contains all state highways and arterials, most of the major collectors, and some minor collector and local roadways divided into links of varying lengths. Each of these link segments contains descriptive data that is used in the calculation of the congested speeds input to the MOBILE emissions model. The PPSUITE post processor calculates the congested speeds based on the following model network fields:

- Number of Lanes

- Distances
- Daily, AM/PM Peak Period Volumes
- Daily, AM/PM Peak Period Truck Volumes
- Facility Type
- Area Type (Urban/Rural)
- Link capacity which includes impact of signals and other intersection controls
- Link free-flow speeds
- Zones to relate each link to the county in which it belongs

The model volumes and distances are used in calculating highway VMT totals for each county. As discussed in the next section, adjustments are needed to convert the volumes to an average July weekday. Lane and capacity values are an important input for determining the congestion and speeds for individual highway segments. Truck volumes are used in the speed determination process and are used to split volumes to the individual vehicle types used by the MOBILE software.

The travel demand model classifies its road segments by function, in addition to whether it is located in an urban or rural area, as indicated below in Exhibit 4. The facility types are important indicators of the type and function of each roadway segment. The variables provide insights into other characteristics not contained in the model network fields that are used for speed and emission calculations. In addition, VMT and emission quantities are aggregated and reported using both facility types and urban/rural codes.

Exhibit 4 Baltimore Model Classification Scheme: Urban/Rural and Facility Type Codes

Urban/Rural Code	1 = Urban	
	2 = Rural	
Facility Type Class	1 = Interstate	7 = Ramp 2
	2 = Freeway	8 = Ramp 3
	3 = Primary Arterial	9 = Ramp 4
	4 = Minor Arterial	10 = Ramp5
	5 = Collector	11 = Local
	6 = Ramp 1	

Additions and Adjustments to Roadway Data

Before the travel model data can be used by PPSUITE for speed and emission calculations, several adjustments and additions must be made to the roadway data.

HPMS Adjustments. According to EPA guidance, baseline inventory VMT computed from the travel demand model must be adjusted to be consistent with Highway Performance Monitoring System (HPMS) VMT totals. Although it has some limitations, the HPMS system is currently in use in all 50 states and is being improved under FHWA direction.

A transportation model must be validated against real world observations to be an accurate predictor of total area VMT. Since the USEPA has designated HPMS as the "official" VMT estimation methodology for air quality purposes, the Baltimore regional travel model outputs were compared to 1990 and 2000 HPMS totals.

Adjustment factors are calculated which adjust the 1990 Model VMT to be consistent with 1990 HPMS totals. In addition, the travel model is also run for the 2000 analysis year and compared to 2000 HPMS reported VMT totals. 2000 HPMS adjustments are calculated as factors and are carried forward to the 2005 analysis year run. These factors are developed for each county, urban/rural code, and facility group combination. "Lower" classes (e.g. local roads) require greater adjustment since a large part of the local system is not contained within the travel demand model. Local roadways require no adjustments since they are not in the travel model. HPMS data is used to estimate the amount of local VMT, which is added to the travel model database.

Seasonal Adjustments to Volumes. The Baltimore travel demand model produces volumes that represent an average weekday. An ozone emission analysis, however, is based on a typical July weekday. Therefore, those volumes must be seasonally adjusted. A seasonal factor of 1.04 was developed from SHA count data and is applied to all link volumes in the network before the calculation of speeds for 2005. The 1990 factor was estimated at 1.05.

24-hour Pattern Data. Speeds and emissions vary considerably depending on the time of day (because of temperature) and congestion. Therefore, it is important to estimate the pattern by which roadway volume varies by hour of the day. The 24-hour pattern data provides PPSUITE with information used to split the daily roadway segment volumes to each of the 24 hours in a day. Pattern data is in the form of a percentage of the daily volumes for each hour. Distributions are provided for each county and functional class grouping. This data was developed from SHA 24-hour count data between 1999 and 2002.

Vehicle Type Pattern Data. Basic emission rates may differ by vehicle type. These types are listed below in Exhibit 5.

Exhibit 5 MOBILE6 Input Composite Vehicle Classes

1. LDV - Light-Duty Vehicles (Passenger Cars)
2. LDT1 - Light-Duty Trucks 1 (<6,000 lbs)
3. LDT2 - Light-Duty Trucks 2 (<6,000 lbs, LVW=3,751-5,750)
4. LDT3 - Light-Duty Trucks 3 (6,001-8,500 lbs)
5. LDT4 - Light-Duty Trucks 4 (6,001-8,500 lbs, LVW>5,751)
6. HDV2B - Class 2b Heavy Duty Vehicles
7. HDV3 - Class 3 Heavy Duty Vehicles
8. HDV4 - Class 4 Heavy Duty Vehicles
9. HDV5 - Class 5 Heavy Duty Vehicles
10. HDV6 - Class 6 Heavy Duty Vehicles
11. HDV7 - Class 7 Heavy Duty Vehicles
12. HDV8A - Class 8a Heavy Duty Vehicles
13. HDV8B - Class 8b Heavy Duty Vehicles
14. HDBS - School Buses
15. HDBT - Transit and Urban Buses
16. MC - Motorcycles

MOBILE summary reports by vehicle type are also useful in knowing what kinds of vehicles generate emissions. The vehicle type pattern data is supplied to MOBILE for each run (county, urban/rural combination) and scenario (facility type) within the MOBILE6 input file. The data is generated by PPSUITE based on the following sources:

- Vehicle Mix Patterns for light-duty vehicles, heavy-duty vehicles, buses, and motorcycles based on SHA vehicle class counts taken between 1999 and 2002.
- Baltimore travel demand truck model results for 2005
- MOBILE6 default vehicle type breakdowns for the analysis year
- MDTA Statement of Annual Traffic Volume and Toll Income and Resulting Percentages 1990 through 2000 data.

The vehicle type pattern percentages are developed for each county and functional class combination and are input to MOBILE using the VMT FRACTIONS keyword. First, the travel model truck volumes are used to divide individual link volumes to auto and truck categories. PPSUITE uses the input vehicle mix pattern data based on SHA counts to calculate the number of motorcycles and buses within each of those categories. Finally, MOBILE6 defaults, specific to the analysis year being run, are used to divide the 4 vehicle groupings into the 16 MOBILE6 vehicle types. PPSUITE then aggregates this link specific information to the area, facility scenario groupings input to the MOBILE model. Note that the MOBILE6 defaults used vary by analysis year; as a result, each forecast year utilizes a unique vehicle mix distribution. The VMT mixes used for 1990 and 2005 are provided in Tables 4 and 5.

Vehicle Type Capacity Analysis Factors. Vehicle type percentages are provided to the capacity analysis section of PPSUITE to adjust the speeds in response to trucks. That is, a given number of larger trucks take up more roadway space than a given number of cars, and this must be accounted for in the model. Capacity is adjusted based on the factors provided in this data. Values are developed from information in the 2000 Highway Capacity Manual and are specific to the various facility types.

Table 4 2005 Vehicle Mix Inputs to MOBILE6

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
Baltimore City (Urban)	Interstate	41.98%	7.69%	25.57%	7.88%	3.63%	4.03%	0.40%	0.32%	0.24%	0.89%	1.06%	1.15%	4.11%	0.60%	0.27%	0.19%
	Freeway	43.51%	7.96%	26.50%	8.16%	3.76%	3.05%	0.30%	0.24%	0.18%	0.68%	0.81%	0.88%	3.12%	0.46%	0.20%	0.19%
	Principal Arterial	44.57%	8.16%	27.15%	8.36%	3.85%	2.27%	0.22%	0.18%	0.14%	0.51%	0.60%	0.65%	2.32%	0.59%	0.27%	0.16%
	Minor Arterial	44.49%	8.14%	27.10%	8.35%	3.84%	2.25%	0.22%	0.18%	0.13%	0.50%	0.59%	0.64%	2.30%	0.70%	0.31%	0.25%
	Collector	44.34%	8.12%	27.01%	8.32%	3.83%	2.35%	0.23%	0.19%	0.14%	0.52%	0.62%	0.67%	2.40%	0.67%	0.30%	0.29%
	Ramp 1	43.30%	7.93%	26.37%	8.12%	3.74%	3.19%	0.31%	0.25%	0.19%	0.71%	0.84%	0.91%	3.25%	0.47%	0.21%	0.20%
	Ramp 2	43.11%	7.89%	26.26%	8.09%	3.72%	3.31%	0.32%	0.26%	0.20%	0.73%	0.87%	0.95%	3.38%	0.47%	0.21%	0.22%
	Ramp 3	41.71%	7.64%	25.40%	7.82%	3.60%	4.20%	0.41%	0.34%	0.25%	0.93%	1.11%	1.20%	4.29%	0.61%	0.27%	0.21%
	Ramp 4	42.48%	7.77%	25.85%	7.96%	3.66%	3.74%	0.37%	0.29%	0.21%	0.83%	0.99%	1.07%	3.82%	0.48%	0.21%	0.27%
	Ramp 5	42.98%	7.86%	26.19%	8.07%	3.69%	3.21%	0.32%	0.27%	0.21%	0.69%	0.86%	0.91%	3.31%	0.80%	0.37%	0.27%
	Local	46.36%	8.49%	28.24%	8.70%	4.00%	1.02%	0.10%	0.08%	0.06%	0.23%	0.27%	0.29%	1.04%	0.56%	0.25%	0.31%
Anne Arundel County (Urban)	Interstate	42.35%	7.75%	25.80%	7.95%	3.66%	3.79%	0.37%	0.30%	0.23%	0.84%	1.00%	1.09%	3.87%	0.57%	0.26%	0.19%
	Freeway	44.73%	8.19%	27.25%	8.39%	3.86%	2.27%	0.22%	0.18%	0.14%	0.50%	0.60%	0.65%	2.32%	0.34%	0.15%	0.20%
	Principal Arterial	44.80%	8.20%	27.29%	8.40%	3.87%	2.13%	0.21%	0.17%	0.13%	0.47%	0.56%	0.61%	2.18%	0.56%	0.25%	0.15%
	Minor Arterial	45.40%	8.31%	27.65%	8.52%	3.92%	1.70%	0.17%	0.14%	0.10%	0.38%	0.45%	0.49%	1.73%	0.55%	0.25%	0.26%
	Collector	45.77%	8.38%	27.88%	8.59%	3.95%	1.47%	0.14%	0.12%	0.09%	0.33%	0.39%	0.42%	1.51%	0.44%	0.20%	0.33%
	Ramp 1	42.91%	7.85%	26.13%	8.05%	3.71%	3.44%	0.34%	0.28%	0.20%	0.76%	0.91%	0.99%	3.51%	0.50%	0.22%	0.20%
	Ramp 2	44.61%	8.17%	27.17%	8.37%	3.85%	2.35%	0.23%	0.19%	0.14%	0.52%	0.62%	0.67%	2.40%	0.32%	0.15%	0.24%
	Ramp 3	44.57%	8.16%	27.15%	8.36%	3.85%	2.38%	0.23%	0.19%	0.14%	0.53%	0.63%	0.68%	2.43%	0.32%	0.15%	0.24%
	Ramp 4	45.94%	8.41%	27.99%	8.62%	3.97%	1.50%	0.15%	0.12%	0.09%	0.33%	0.39%	0.43%	1.53%	0.20%	0.09%	0.24%
	Ramp 5	45.31%	8.29%	27.59%	8.50%	3.91%	1.83%	0.18%	0.15%	0.11%	0.41%	0.48%	0.52%	1.87%	0.45%	0.20%	0.18%
	Local	46.36%	8.49%	28.24%	8.70%	4.00%	1.02%	0.10%	0.08%	0.06%	0.23%	0.27%	0.29%	1.04%	0.56%	0.25%	0.31%
Anne Arundel County (Rural)	Interstate	41.93%	7.67%	25.54%	7.87%	3.62%	4.11%	0.40%	0.33%	0.24%	0.91%	1.08%	1.18%	4.20%	0.50%	0.23%	0.18%
	Principal Arterial	43.02%	7.88%	26.20%	8.07%	3.72%	3.42%	0.34%	0.27%	0.20%	0.76%	0.90%	0.98%	3.49%	0.39%	0.18%	0.16%
	Minor Arterial	43.06%	7.88%	26.23%	8.08%	3.72%	2.91%	0.29%	0.23%	0.17%	0.65%	0.77%	0.84%	2.97%	0.97%	0.44%	0.80%

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
	Collector	44.97%	8.23%	27.39%	8.44%	3.88%	2.11%	0.21%	0.17%	0.13%	0.47%	0.56%	0.60%	2.15%	0.29%	0.13%	0.28%
	Ramp 1	43.52%	7.97%	26.51%	8.17%	3.76%	3.11%	0.30%	0.25%	0.19%	0.69%	0.82%	0.89%	3.17%	0.32%	0.15%	0.20%
	Ramp 2	43.61%	7.98%	26.56%	8.18%	3.77%	3.03%	0.30%	0.24%	0.18%	0.67%	0.80%	0.87%	3.10%	0.35%	0.16%	0.19%
	Ramp 4	41.81%	7.67%	25.36%	7.78%	3.62%	4.26%	0.43%	0.32%	0.21%	0.96%	1.17%	1.17%	4.37%	0.43%	0.21%	0.21%
	Ramp 5	45.28%	8.28%	27.56%	8.50%	3.92%	1.96%	0.19%	0.16%	0.13%	0.44%	0.51%	0.57%	2.02%	0.19%	0.09%	0.19%
	Local	46.21%	8.46%	28.14%	8.67%	3.99%	1.09%	0.11%	0.09%	0.06%	0.24%	0.29%	0.31%	1.11%	0.41%	0.18%	0.63%
Baltimore County (Urban)	Interstate	42.63%	7.80%	25.96%	8.00%	3.68%	3.61%	0.35%	0.29%	0.21%	0.80%	0.95%	1.04%	3.69%	0.54%	0.24%	0.19%
	Freeway	44.16%	8.08%	26.90%	8.28%	3.81%	2.64%	0.26%	0.21%	0.16%	0.59%	0.70%	0.76%	2.70%	0.39%	0.18%	0.20%
	Principal Arterial	45.29%	8.29%	27.59%	8.50%	3.91%	1.84%	0.18%	0.15%	0.11%	0.41%	0.48%	0.53%	1.88%	0.48%	0.22%	0.16%
	Minor Arterial	45.72%	8.37%	27.85%	8.58%	3.95%	1.50%	0.15%	0.12%	0.09%	0.33%	0.40%	0.43%	1.54%	0.49%	0.22%	0.27%
	Collector	45.50%	8.33%	27.71%	8.54%	3.93%	1.63%	0.16%	0.13%	0.10%	0.36%	0.43%	0.47%	1.66%	0.48%	0.22%	0.35%
	Ramp 1	43.24%	7.92%	26.34%	8.11%	3.73%	3.22%	0.32%	0.26%	0.19%	0.72%	0.85%	0.92%	3.29%	0.47%	0.21%	0.21%
	Ramp 2	43.79%	8.02%	26.67%	8.21%	3.78%	2.88%	0.28%	0.23%	0.17%	0.64%	0.76%	0.82%	2.93%	0.40%	0.18%	0.23%
	Ramp 3	45.27%	8.29%	27.57%	8.49%	3.91%	1.94%	0.19%	0.15%	0.11%	0.43%	0.51%	0.56%	1.98%	0.25%	0.11%	0.24%
	Ramp 4	44.38%	8.12%	27.03%	8.32%	3.83%	2.50%	0.24%	0.20%	0.15%	0.56%	0.66%	0.72%	2.55%	0.34%	0.15%	0.24%
	Ramp 5	43.40%	7.95%	26.45%	8.14%	3.75%	2.98%	0.30%	0.25%	0.18%	0.67%	0.79%	0.86%	3.05%	0.72%	0.32%	0.19%
	Local	46.36%	8.49%	28.24%	8.70%	4.00%	1.02%	0.10%	0.08%	0.06%	0.23%	0.27%	0.29%	1.04%	0.56%	0.25%	0.30%
Baltimore County (Rural)	Interstate	42.30%	7.74%	25.76%	7.94%	3.65%	3.89%	0.38%	0.31%	0.23%	0.86%	1.02%	1.11%	3.97%	0.44%	0.20%	0.19%
	Principal Arterial	43.26%	7.92%	26.35%	8.12%	3.74%	3.27%	0.32%	0.26%	0.19%	0.73%	0.86%	0.94%	3.34%	0.37%	0.17%	0.17%
	Minor Arterial	43.85%	8.03%	26.71%	8.23%	3.79%	2.45%	0.24%	0.20%	0.15%	0.54%	0.65%	0.70%	2.50%	0.81%	0.36%	0.81%
	Collector	44.49%	8.14%	27.10%	8.35%	3.84%	2.40%	0.24%	0.19%	0.14%	0.53%	0.63%	0.69%	2.45%	0.32%	0.15%	0.33%
	Ramp 1	42.26%	7.74%	25.75%	7.93%	3.65%	3.89%	0.38%	0.31%	0.23%	0.87%	1.03%	1.12%	3.98%	0.47%	0.21%	0.18%
	Ramp 2	42.80%	7.83%	26.06%	8.03%	3.70%	3.56%	0.34%	0.28%	0.22%	0.80%	0.94%	1.02%	3.64%	0.34%	0.16%	0.28%
	Ramp 3	43.87%	8.02%	26.71%	8.22%	3.79%	2.88%	0.28%	0.23%	0.17%	0.64%	0.76%	0.83%	2.94%	0.25%	0.11%	0.30%
	Local	46.21%	8.46%	28.15%	8.67%	3.99%	1.09%	0.11%	0.09%	0.06%	0.24%	0.29%	0.31%	1.12%	0.40%	0.18%	0.63%
Carroll County	Principal Arterial	43.90%	8.04%	26.74%	8.24%	3.79%	2.68%	0.26%	0.21%	0.16%	0.60%	0.71%	0.77%	2.74%	0.70%	0.31%	0.15%

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
(Urban)	Minor Arterial	44.60%	8.16%	27.16%	8.37%	3.85%	2.17%	0.21%	0.17%	0.13%	0.48%	0.57%	0.62%	2.21%	0.71%	0.32%	0.25%
	Collector	44.60%	8.16%	27.17%	8.37%	3.85%	2.16%	0.21%	0.17%	0.13%	0.48%	0.57%	0.62%	2.21%	0.63%	0.28%	0.38%
	Ramp 2	44.40%	8.13%	26.90%	8.25%	3.83%	2.63%	0.24%	0.24%	0.12%	0.60%	0.72%	0.72%	2.63%	0.36%	0.12%	0.12%
	Ramp 5	43.12%	7.89%	26.27%	8.09%	3.73%	3.15%	0.32%	0.25%	0.19%	0.70%	0.84%	0.91%	3.22%	0.80%	0.36%	0.18%
	Local	46.36%	8.48%	28.24%	8.70%	4.00%	1.04%	0.10%	0.08%	0.06%	0.23%	0.28%	0.30%	1.06%	0.52%	0.23%	0.32%
Carroll County	Interstate	38.64%	7.07%	23.53%	7.25%	3.34%	6.22%	0.61%	0.50%	0.37%	1.38%	1.64%	1.79%	6.35%	0.78%	0.35%	0.17%
(Rural)	Principal Arterial	41.52%	7.60%	25.29%	7.79%	3.59%	4.39%	0.43%	0.35%	0.26%	0.98%	1.16%	1.26%	4.49%	0.49%	0.22%	0.17%
	Minor Arterial	43.54%	7.97%	26.52%	8.17%	3.76%	2.63%	0.26%	0.21%	0.16%	0.58%	0.69%	0.75%	2.68%	0.88%	0.40%	0.81%
	Collector	43.95%	8.05%	26.77%	8.25%	3.80%	2.75%	0.27%	0.22%	0.16%	0.61%	0.72%	0.79%	2.80%	0.32%	0.14%	0.40%
	Ramp 2	43.12%	7.89%	26.24%	8.07%	3.72%	3.37%	0.33%	0.27%	0.21%	0.74%	0.89%	0.95%	3.42%	0.36%	0.15%	0.27%
	Ramp 5	44.74%	8.32%	27.33%	8.32%	3.86%	2.08%	0.30%	0.30%	0.00%	0.59%	0.59%	0.59%	2.08%	0.00%	0.00%	0.89%
	Local	46.21%	8.46%	28.14%	8.67%	3.99%	1.09%	0.11%	0.09%	0.06%	0.24%	0.29%	0.31%	1.11%	0.41%	0.19%	0.64%
Harford County	Interstate	40.79%	7.47%	24.85%	7.65%	3.52%	4.78%	0.47%	0.38%	0.28%	1.06%	1.26%	1.37%	4.88%	0.72%	0.32%	0.19%
(Urban)	Freeway	44.42%	8.13%	27.06%	8.33%	3.84%	2.48%	0.24%	0.20%	0.15%	0.55%	0.65%	0.71%	2.53%	0.36%	0.16%	0.20%
	Principal Arterial	43.82%	8.02%	26.69%	8.22%	3.78%	2.73%	0.27%	0.22%	0.16%	0.61%	0.72%	0.78%	2.79%	0.71%	0.32%	0.16%
	Minor Arterial	44.40%	8.13%	27.04%	8.33%	3.83%	2.28%	0.22%	0.18%	0.14%	0.51%	0.60%	0.65%	2.33%	0.75%	0.34%	0.26%
	Collector	45.15%	8.27%	27.50%	8.47%	3.90%	1.83%	0.18%	0.15%	0.11%	0.41%	0.48%	0.53%	1.87%	0.55%	0.25%	0.35%
	Ramp 2	43.26%	7.92%	26.35%	8.11%	3.74%	3.21%	0.32%	0.26%	0.19%	0.71%	0.85%	0.92%	3.28%	0.48%	0.21%	0.20%
	Ramp 3	42.57%	7.74%	25.97%	7.98%	3.69%	3.69%	0.36%	0.24%	0.24%	0.83%	0.95%	1.07%	3.69%	0.48%	0.24%	0.24%
	Ramp 4	43.87%	8.04%	26.74%	8.24%	3.79%	2.79%	0.28%	0.23%	0.16%	0.63%	0.74%	0.81%	2.85%	0.31%	0.15%	0.36%
	Ramp 5	52.11%	7.98%	27.94%	7.98%	3.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Local	46.36%	8.49%	28.24%	8.70%	4.00%	1.02%	0.10%	0.08%	0.06%	0.23%	0.27%	0.29%	1.04%	0.56%	0.25%	0.32%
Harford County	Interstate	40.75%	7.46%	24.82%	7.64%	3.52%	4.87%	0.48%	0.39%	0.29%	1.08%	1.28%	1.40%	4.97%	0.60%	0.27%	0.18%
(Rural)	Principal Arterial	44.00%	8.05%	26.80%	8.25%	3.80%	2.79%	0.27%	0.22%	0.17%	0.62%	0.74%	0.80%	2.85%	0.30%	0.14%	0.19%
	Minor Arterial	43.15%	7.90%	26.28%	8.10%	3.73%	2.86%	0.28%	0.23%	0.17%	0.63%	0.75%	0.82%	2.92%	0.96%	0.43%	0.79%
	Collector	43.55%	7.97%	26.53%	8.17%	3.76%	3.00%	0.29%	0.24%	0.18%	0.67%	0.79%	0.86%	3.06%	0.42%	0.19%	0.33%

Run Area	Facility Scenario	*MOBILE6 VEHICLE TYPES*															
		LDV	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
	Ramp 2	42.33%	7.76%	25.79%	7.94%	3.66%	3.84%	0.38%	0.31%	0.24%	0.86%	1.02%	1.11%	3.93%	0.46%	0.20%	0.16%
	Ramp 3	41.43%	7.59%	25.24%	7.77%	3.58%	4.44%	0.44%	0.36%	0.26%	0.98%	1.17%	1.27%	4.53%	0.51%	0.23%	0.20%
	Local	46.20%	8.46%	28.14%	8.67%	3.99%	1.09%	0.11%	0.09%	0.06%	0.24%	0.29%	0.31%	1.11%	0.41%	0.18%	0.65%
Howard County (Urban)	Interstate	40.10%	7.34%	24.42%	7.52%	3.46%	5.23%	0.51%	0.42%	0.31%	1.16%	1.38%	1.50%	5.34%	0.78%	0.35%	0.18%
	Freeway	44.64%	8.17%	27.19%	8.38%	3.86%	2.33%	0.23%	0.19%	0.14%	0.52%	0.61%	0.67%	2.38%	0.35%	0.16%	0.19%
	Principal Arterial	43.12%	7.89%	26.26%	8.09%	3.72%	3.15%	0.31%	0.25%	0.19%	0.70%	0.83%	0.90%	3.22%	0.84%	0.38%	0.15%
	Minor Arterial	45.87%	8.40%	27.94%	8.61%	3.96%	1.41%	0.14%	0.11%	0.08%	0.31%	0.37%	0.41%	1.44%	0.47%	0.21%	0.26%
	Collector	45.46%	8.32%	27.69%	8.53%	3.93%	1.65%	0.16%	0.13%	0.10%	0.37%	0.44%	0.47%	1.69%	0.48%	0.22%	0.38%
	Ramp 1	44.10%	8.07%	26.86%	8.27%	3.81%	2.67%	0.26%	0.21%	0.16%	0.59%	0.70%	0.77%	2.73%	0.39%	0.17%	0.21%
	Ramp 2	44.41%	8.13%	27.05%	8.33%	3.84%	2.48%	0.24%	0.20%	0.15%	0.55%	0.65%	0.71%	2.53%	0.34%	0.15%	0.24%
	Ramp 3	45.19%	8.27%	27.53%	8.48%	3.90%	1.99%	0.19%	0.16%	0.12%	0.44%	0.52%	0.57%	2.03%	0.25%	0.12%	0.24%
	Ramp 4	44.27%	8.10%	26.97%	8.31%	3.83%	2.56%	0.25%	0.20%	0.15%	0.57%	0.68%	0.73%	2.61%	0.36%	0.16%	0.25%
	Ramp 5	45.68%	8.36%	27.83%	8.57%	3.94%	1.60%	0.16%	0.13%	0.09%	0.35%	0.42%	0.46%	1.64%	0.40%	0.18%	0.19%
	Local	46.36%	8.49%	28.24%	8.70%	4.00%	1.02%	0.10%	0.08%	0.06%	0.23%	0.27%	0.29%	1.04%	0.56%	0.25%	0.30%
Howard County (Rural)	Interstate	39.50%	7.23%	24.06%	7.41%	3.41%	5.67%	0.56%	0.45%	0.34%	1.26%	1.50%	1.63%	5.79%	0.71%	0.32%	0.17%
	Principal Arterial	44.06%	8.06%	26.83%	8.26%	3.80%	2.77%	0.27%	0.22%	0.16%	0.61%	0.73%	0.79%	2.82%	0.29%	0.13%	0.18%
	Minor Arterial	44.02%	8.06%	26.82%	8.26%	3.80%	2.34%	0.23%	0.19%	0.14%	0.52%	0.62%	0.67%	2.38%	0.79%	0.36%	0.81%
	Collector	44.98%	8.23%	27.40%	8.44%	3.88%	2.09%	0.21%	0.17%	0.12%	0.46%	0.55%	0.60%	2.13%	0.28%	0.13%	0.32%
	Ramp 1	44.27%	8.11%	26.97%	8.30%	3.83%	2.58%	0.25%	0.21%	0.15%	0.57%	0.68%	0.74%	2.63%	0.30%	0.13%	0.27%
	Ramp 2	44.64%	8.18%	27.20%	8.38%	3.86%	2.38%	0.23%	0.18%	0.14%	0.53%	0.62%	0.68%	2.42%	0.21%	0.08%	0.27%
	Ramp 3	44.16%	8.08%	26.90%	8.28%	3.82%	2.67%	0.27%	0.21%	0.16%	0.59%	0.70%	0.76%	2.72%	0.29%	0.13%	0.27%
	Ramp 4	44.12%	8.14%	27.01%	8.33%	3.89%	2.41%	0.19%	0.19%	0.19%	0.56%	0.74%	0.74%	2.59%	0.19%	0.00%	0.74%
	Local	46.22%	8.46%	28.15%	8.67%	3.99%	1.09%	0.11%	0.09%	0.06%	0.24%	0.29%	0.31%	1.11%	0.41%	0.19%	0.62%

Table 5 1990 Vehicle Mix Inputs to MOBILE6

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
Baltimore City	Interstate	60.81%	4.07%	13.52%	5.48%	2.51%	4.19%	0.43%	0.25%	0.20%	0.81%	1.00%	1.19%	4.25%	0.77%	0.36%	0.17%
(Urban)	Freeway	63.10%	4.22%	14.03%	5.68%	2.61%	3.18%	0.33%	0.19%	0.15%	0.61%	0.76%	0.90%	3.22%	0.55%	0.26%	0.21%
	Principal Arterial	64.53%	4.32%	14.35%	5.81%	2.67%	2.44%	0.25%	0.15%	0.12%	0.47%	0.58%	0.69%	2.48%	0.70%	0.33%	0.11%
	Minor Arterial	64.79%	4.34%	14.40%	5.84%	2.68%	2.29%	0.23%	0.14%	0.11%	0.44%	0.54%	0.65%	2.33%	0.67%	0.32%	0.24%
	Collector	64.41%	4.31%	14.32%	5.80%	2.66%	2.48%	0.25%	0.15%	0.12%	0.48%	0.59%	0.70%	2.52%	0.64%	0.30%	0.25%
	Ramp 1	62.87%	4.21%	13.98%	5.66%	2.60%	3.26%	0.33%	0.20%	0.16%	0.63%	0.78%	0.92%	3.31%	0.61%	0.29%	0.19%
	Ramp 2	62.53%	4.18%	13.90%	5.63%	2.59%	3.41%	0.35%	0.20%	0.17%	0.66%	0.81%	0.97%	3.46%	0.60%	0.28%	0.25%
	Ramp 3	62.19%	4.16%	13.82%	5.60%	2.57%	3.57%	0.36%	0.21%	0.17%	0.69%	0.85%	1.01%	3.62%	0.62%	0.29%	0.25%
	Ramp 4	61.55%	4.15%	13.72%	5.53%	2.57%	3.80%	0.39%	0.25%	0.20%	0.74%	0.89%	1.09%	3.85%	0.49%	0.25%	0.54%
	Ramp 5	62.43%	4.16%	13.86%	5.68%	2.63%	3.33%	0.28%	0.14%	0.14%	0.69%	0.83%	0.97%	3.33%	0.83%	0.42%	0.28%
	Local	67.22%	4.50%	14.95%	6.05%	2.78%	1.16%	0.12%	0.07%	0.06%	0.22%	0.28%	0.33%	1.18%	0.55%	0.26%	0.27%
Anne Arundel County	Interstate	61.35%	4.10%	13.64%	5.53%	2.54%	3.95%	0.40%	0.24%	0.19%	0.76%	0.94%	1.12%	4.01%	0.72%	0.34%	0.17%
(Urban)	Freeway	63.79%	4.27%	14.18%	5.75%	2.64%	2.87%	0.29%	0.17%	0.14%	0.55%	0.68%	0.81%	2.91%	0.51%	0.24%	0.19%
	Principal Arterial	64.95%	4.35%	14.44%	5.85%	2.69%	2.26%	0.23%	0.14%	0.11%	0.44%	0.54%	0.64%	2.29%	0.66%	0.31%	0.11%
	Minor Arterial	65.69%	4.40%	14.61%	5.92%	2.72%	1.91%	0.20%	0.11%	0.09%	0.37%	0.45%	0.54%	1.94%	0.56%	0.27%	0.24%
	Collector	66.03%	4.42%	14.68%	5.95%	2.73%	1.77%	0.18%	0.11%	0.09%	0.34%	0.42%	0.50%	1.80%	0.46%	0.22%	0.31%
	Ramp 1	61.95%	4.15%	13.77%	5.58%	2.56%	3.67%	0.38%	0.22%	0.18%	0.71%	0.87%	1.04%	3.73%	0.69%	0.32%	0.18%
	Ramp 2	64.66%	4.33%	14.38%	5.82%	2.67%	2.48%	0.25%	0.15%	0.12%	0.48%	0.59%	0.70%	2.52%	0.44%	0.21%	0.21%
	Ramp 3	64.63%	4.33%	14.37%	5.82%	2.67%	2.48%	0.26%	0.15%	0.12%	0.48%	0.59%	0.70%	2.52%	0.44%	0.21%	0.23%
	Ramp 4	65.29%	4.37%	14.52%	5.88%	2.70%	2.19%	0.23%	0.13%	0.11%	0.42%	0.52%	0.62%	2.23%	0.27%	0.13%	0.38%
	Ramp 5	65.15%	4.36%	14.49%	5.87%	2.69%	2.18%	0.22%	0.13%	0.11%	0.42%	0.52%	0.62%	2.22%	0.55%	0.25%	0.23%
	Local	67.22%	4.50%	14.95%	6.05%	2.78%	1.16%	0.12%	0.07%	0.06%	0.22%	0.28%	0.33%	1.18%	0.55%	0.26%	0.27%
Anne Arundel County	Interstate	60.76%	4.07%	13.51%	5.47%	2.51%	4.31%	0.44%	0.26%	0.21%	0.83%	1.03%	1.22%	4.38%	0.58%	0.27%	0.14%
(Rural)	Principal Arterial	62.38%	4.17%	13.87%	5.62%	2.58%	3.54%	0.36%	0.21%	0.17%	0.68%	0.84%	1.00%	3.59%	0.58%	0.27%	0.13%
	Minor Arterial	62.53%	4.18%	13.90%	5.63%	2.59%	3.01%	0.31%	0.18%	0.15%	0.58%	0.72%	0.85%	3.06%	1.10%	0.52%	0.69%
	Collector	65.11%	4.36%	14.48%	5.86%	2.69%	2.21%	0.23%	0.13%	0.11%	0.43%	0.53%	0.63%	2.25%	0.47%	0.22%	0.30%
	Ramp 1	63.08%	4.22%	14.02%	5.68%	2.60%	3.27%	0.33%	0.20%	0.16%	0.63%	0.78%	0.92%	3.32%	0.41%	0.19%	0.19%

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
	Ramp 2	63.14%	4.23%	14.04%	5.69%	2.61%	3.25%	0.33%	0.19%	0.16%	0.63%	0.77%	0.92%	3.29%	0.40%	0.19%	0.17%
	Ramp 4	60.25%	4.05%	13.42%	5.44%	2.53%	4.43%	0.51%	0.25%	0.25%	0.89%	1.01%	1.27%	4.56%	0.63%	0.25%	0.25%
	Ramp 5	65.72%	4.40%	14.57%	5.89%	2.70%	2.08%	0.21%	0.12%	0.08%	0.42%	0.50%	0.58%	2.12%	0.29%	0.12%	0.21%
	Local	67.02%	4.48%	14.90%	6.04%	2.77%	1.24%	0.13%	0.07%	0.06%	0.24%	0.29%	0.35%	1.25%	0.40%	0.19%	0.56%
Baltimore County	Interstate	61.81%	4.14%	13.74%	5.57%	2.56%	3.75%	0.38%	0.23%	0.18%	0.72%	0.89%	1.06%	3.80%	0.68%	0.32%	0.17%
(Urban)	Freeway	63.90%	4.28%	14.21%	5.76%	2.64%	2.83%	0.29%	0.17%	0.14%	0.54%	0.67%	0.80%	2.87%	0.49%	0.23%	0.20%
	Principal Arterial	65.56%	4.39%	14.58%	5.90%	2.71%	2.01%	0.21%	0.12%	0.10%	0.39%	0.48%	0.57%	2.04%	0.58%	0.27%	0.11%
	Minor Arterial	66.08%	4.42%	14.69%	5.95%	2.73%	1.74%	0.18%	0.11%	0.08%	0.34%	0.41%	0.49%	1.77%	0.50%	0.24%	0.26%
	Collector	66.13%	4.42%	14.70%	5.96%	2.73%	1.73%	0.18%	0.10%	0.08%	0.33%	0.41%	0.49%	1.76%	0.46%	0.22%	0.30%
	Ramp 1	62.68%	4.19%	13.94%	5.65%	2.59%	3.35%	0.34%	0.20%	0.16%	0.65%	0.80%	0.95%	3.40%	0.62%	0.29%	0.19%
	Ramp 2	63.44%	4.24%	14.10%	5.71%	2.62%	3.02%	0.31%	0.18%	0.15%	0.58%	0.72%	0.85%	3.06%	0.53%	0.25%	0.22%
	Ramp 3	65.52%	4.38%	14.57%	5.90%	2.71%	2.10%	0.22%	0.13%	0.10%	0.40%	0.50%	0.59%	2.13%	0.35%	0.17%	0.24%
	Ramp 4	64.22%	4.30%	14.28%	5.79%	2.65%	2.68%	0.28%	0.16%	0.13%	0.52%	0.63%	0.76%	2.72%	0.47%	0.22%	0.20%
	Ramp 5	61.30%	4.08%	13.61%	5.52%	2.51%	3.83%	0.38%	0.25%	0.19%	0.75%	0.88%	1.07%	3.83%	0.88%	0.44%	0.50%
	Local	67.22%	4.50%	14.95%	6.05%	2.78%	1.16%	0.12%	0.07%	0.06%	0.22%	0.28%	0.33%	1.18%	0.55%	0.26%	0.27%
Baltimore County	Interstate	61.27%	4.10%	13.62%	5.52%	2.53%	4.09%	0.42%	0.25%	0.20%	0.79%	0.97%	1.16%	4.15%	0.53%	0.25%	0.16%
(Rural)	Principal Arterial	62.82%	4.20%	13.97%	5.66%	2.60%	3.33%	0.34%	0.20%	0.16%	0.64%	0.79%	0.94%	3.38%	0.56%	0.26%	0.15%
	Minor Arterial	63.56%	4.25%	14.13%	5.72%	2.63%	2.59%	0.26%	0.16%	0.12%	0.50%	0.62%	0.73%	2.62%	0.95%	0.45%	0.70%
	Collector	64.44%	4.31%	14.33%	5.80%	2.66%	2.51%	0.26%	0.15%	0.12%	0.48%	0.60%	0.71%	2.54%	0.47%	0.22%	0.39%
	Ramp 1	61.28%	4.10%	13.62%	5.51%	2.53%	4.09%	0.42%	0.24%	0.20%	0.79%	0.98%	1.16%	4.15%	0.53%	0.25%	0.16%
	Ramp 2	61.74%	4.13%	13.74%	5.57%	2.56%	3.86%	0.40%	0.24%	0.18%	0.75%	0.91%	1.10%	3.91%	0.44%	0.20%	0.26%
	Ramp 3	63.70%	4.26%	14.17%	5.74%	2.64%	2.98%	0.31%	0.18%	0.15%	0.57%	0.71%	0.84%	3.03%	0.28%	0.14%	0.32%
	Local	67.06%	4.49%	14.91%	6.04%	2.77%	1.24%	0.13%	0.07%	0.06%	0.24%	0.29%	0.35%	1.26%	0.40%	0.19%	0.51%
Carroll County	Principal Arterial	63.57%	4.25%	14.13%	5.73%	2.63%	2.84%	0.29%	0.17%	0.14%	0.55%	0.68%	0.80%	2.89%	0.82%	0.39%	0.13%
(Urban)	Minor Arterial	64.52%	4.32%	14.34%	5.81%	2.67%	2.39%	0.24%	0.14%	0.12%	0.46%	0.57%	0.68%	2.43%	0.70%	0.33%	0.29%
	Collector	65.04%	4.35%	14.46%	5.86%	2.69%	2.18%	0.22%	0.13%	0.11%	0.42%	0.52%	0.62%	2.21%	0.43%	0.20%	0.57%
	Ramp 2	64.06%	4.24%	14.32%	5.84%	2.63%	2.78%	0.29%	0.15%	0.15%	0.58%	0.58%	0.73%	2.78%	0.58%	0.29%	0.00%
	Ramp 5	62.43%	4.17%	13.87%	5.63%	2.59%	3.33%	0.35%	0.20%	0.15%	0.63%	0.78%	0.94%	3.37%	0.96%	0.46%	0.15%
	Local	67.16%	4.49%	14.93%	6.05%	2.78%	1.18%	0.12%	0.07%	0.06%	0.23%	0.28%	0.34%	1.20%	0.51%	0.24%	0.36%
Carroll County	Interstate	55.97%	3.75%	12.44%	5.04%	2.31%	6.49%	0.66%	0.39%	0.31%	1.25%	1.54%	1.84%	6.59%	0.88%	0.41%	0.13%

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
(Rural)	Principal Arterial	60.25%	4.03%	13.40%	5.43%	2.49%	4.48%	0.46%	0.27%	0.22%	0.86%	1.07%	1.27%	4.55%	0.61%	0.29%	0.33%
	Minor Arterial	63.27%	4.23%	14.07%	5.70%	2.62%	2.70%	0.28%	0.16%	0.13%	0.52%	0.64%	0.77%	2.74%	1.00%	0.47%	0.69%
	Collector	63.69%	4.26%	14.16%	5.74%	2.63%	2.84%	0.29%	0.17%	0.14%	0.55%	0.67%	0.80%	2.88%	0.48%	0.23%	0.48%
	Ramp 2	62.62%	4.19%	13.96%	5.68%	2.59%	3.39%	0.40%	0.20%	0.20%	0.70%	0.80%	1.00%	3.49%	0.30%	0.10%	0.40%
	Ramp 5	66.22%	4.05%	14.19%	6.08%	2.70%	2.03%	0.00%	0.00%	0.00%	0.68%	0.68%	0.68%	2.03%	0.00%	0.00%	0.68%
	Local	67.06%	4.49%	14.91%	6.04%	2.77%	1.23%	0.13%	0.07%	0.06%	0.24%	0.29%	0.35%	1.25%	0.41%	0.19%	0.51%
Harford County	Interstate	59.10%	3.96%	13.14%	5.32%	2.44%	4.95%	0.51%	0.30%	0.24%	0.95%	1.18%	1.40%	5.02%	0.90%	0.43%	0.17%
(Urban)	Freeway	65.00%	4.35%	14.45%	5.85%	2.69%	2.33%	0.24%	0.14%	0.11%	0.45%	0.56%	0.66%	2.37%	0.41%	0.19%	0.19%
	Principal Arterial	63.29%	4.24%	14.07%	5.70%	2.62%	2.96%	0.30%	0.18%	0.14%	0.57%	0.70%	0.84%	3.00%	0.87%	0.41%	0.11%
	Minor Arterial	64.42%	4.31%	14.32%	5.80%	2.66%	2.44%	0.25%	0.15%	0.12%	0.47%	0.58%	0.69%	2.48%	0.71%	0.34%	0.26%
	Collector	65.33%	4.37%	14.52%	5.88%	2.70%	2.07%	0.21%	0.12%	0.10%	0.40%	0.49%	0.59%	2.10%	0.54%	0.25%	0.31%
	Ramp 2	62.96%	4.21%	14.00%	5.67%	2.60%	3.22%	0.33%	0.19%	0.15%	0.62%	0.77%	0.91%	3.27%	0.59%	0.28%	0.21%
	Ramp 3	61.63%	4.18%	13.73%	5.52%	2.54%	3.73%	0.45%	0.30%	0.15%	0.75%	0.90%	1.05%	3.88%	0.60%	0.30%	0.30%
	Ramp 4	63.55%	4.26%	14.13%	5.73%	2.62%	2.96%	0.31%	0.18%	0.14%	0.57%	0.70%	0.84%	3.01%	0.49%	0.23%	0.27%
	Ramp 5	62.72%	4.66%	13.98%	4.66%	4.66%	4.66%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.66%	0.00%	0.00%	0.00%
	Local	67.19%	4.50%	14.94%	6.05%	2.78%	1.16%	0.12%	0.07%	0.06%	0.22%	0.28%	0.33%	1.18%	0.56%	0.26%	0.32%
Harford County	Interstate	59.10%	3.95%	13.14%	5.32%	2.44%	5.06%	0.52%	0.31%	0.24%	0.98%	1.20%	1.43%	5.14%	0.68%	0.32%	0.14%
(Rural)	Principal Arterial	63.81%	4.27%	14.19%	5.75%	2.64%	2.89%	0.30%	0.17%	0.14%	0.56%	0.69%	0.82%	2.93%	0.49%	0.23%	0.15%
	Minor Arterial	62.48%	4.18%	13.89%	5.63%	2.58%	3.03%	0.31%	0.18%	0.15%	0.58%	0.72%	0.86%	3.07%	1.11%	0.52%	0.71%
	Collector	63.06%	4.22%	14.02%	5.68%	2.61%	3.11%	0.32%	0.19%	0.15%	0.60%	0.74%	0.88%	3.15%	0.62%	0.29%	0.37%
	Ramp 2	61.34%	4.10%	13.63%	5.52%	2.54%	4.05%	0.42%	0.25%	0.20%	0.78%	0.96%	1.16%	4.12%	0.51%	0.25%	0.18%
	Ramp 3	60.11%	4.02%	13.36%	5.41%	2.49%	4.61%	0.47%	0.28%	0.22%	0.89%	1.10%	1.31%	4.68%	0.59%	0.28%	0.18%
	Local	67.05%	4.49%	14.91%	6.04%	2.77%	1.24%	0.13%	0.07%	0.06%	0.24%	0.29%	0.35%	1.25%	0.40%	0.19%	0.51%
Howard County	Interstate	58.10%	3.89%	12.92%	5.23%	2.40%	5.39%	0.55%	0.33%	0.26%	1.04%	1.28%	1.53%	5.47%	0.98%	0.46%	0.16%
(Urban)	Freeway	64.88%	4.34%	14.42%	5.84%	2.68%	2.39%	0.24%	0.14%	0.12%	0.46%	0.57%	0.68%	2.42%	0.42%	0.20%	0.19%
	Principal Arterial	63.27%	4.23%	14.07%	5.70%	2.62%	2.97%	0.30%	0.18%	0.14%	0.57%	0.71%	0.84%	3.01%	0.88%	0.41%	0.10%
	Minor Arterial	66.68%	4.46%	14.83%	6.01%	2.76%	1.49%	0.15%	0.09%	0.07%	0.29%	0.36%	0.42%	1.52%	0.44%	0.21%	0.23%
	Collector	65.90%	4.41%	14.65%	5.94%	2.72%	1.81%	0.19%	0.11%	0.09%	0.35%	0.43%	0.51%	1.83%	0.36%	0.17%	0.53%
	Ramp 1	63.95%	4.28%	14.22%	5.76%	2.64%	2.79%	0.28%	0.17%	0.13%	0.54%	0.67%	0.79%	2.84%	0.50%	0.24%	0.21%

		MOBILE6 VEHICLE TYPES															
Run Area	**Facility Scenario**	**LDV**	**LDT1**	**LDT2**	**LDT3**	**LDT4**	**HDV2B**	**HDV3**	**HDV4**	**HDV5**	**HDV6**	**HDV7**	**HDV8A**	**HDV8B**	**HDBS**	**HDBT**	**MC**
	Ramp 2	64.18%	4.29%	14.27%	5.78%	2.65%	2.69%	0.28%	0.16%	0.13%	0.52%	0.64%	0.76%	2.73%	0.45%	0.21%	0.25%
	Ramp 3	64.91%	4.34%	14.43%	5.85%	2.68%	2.38%	0.24%	0.14%	0.11%	0.46%	0.56%	0.67%	2.41%	0.40%	0.19%	0.23%
	Ramp 4	63.87%	4.27%	14.19%	5.76%	2.65%	2.81%	0.30%	0.16%	0.14%	0.55%	0.66%	0.80%	2.86%	0.41%	0.18%	0.39%
	Ramp 5	66.24%	4.43%	14.75%	5.98%	2.75%	1.72%	0.17%	0.09%	0.09%	0.34%	0.39%	0.47%	1.72%	0.43%	0.22%	0.22%
	Local	67.20%	4.50%	14.94%	6.05%	2.78%	1.16%	0.12%	0.07%	0.06%	0.22%	0.28%	0.33%	1.18%	0.56%	0.26%	0.30%
Howard County	Interstate	57.17%	3.83%	12.71%	5.15%	2.36%	5.94%	0.61%	0.36%	0.29%	1.15%	1.41%	1.68%	6.03%	0.81%	0.38%	0.14%
(Rural)	Principal Arterial	63.85%	4.27%	14.20%	5.75%	2.64%	2.86%	0.29%	0.17%	0.14%	0.55%	0.68%	0.81%	2.90%	0.48%	0.22%	0.17%
	Minor Arterial	63.45%	4.25%	14.11%	5.71%	2.62%	2.62%	0.27%	0.16%	0.13%	0.51%	0.62%	0.74%	2.66%	0.96%	0.45%	0.73%
	Collector	65.15%	4.36%	14.49%	5.87%	2.69%	2.18%	0.22%	0.13%	0.11%	0.42%	0.52%	0.62%	2.22%	0.40%	0.19%	0.42%
	Ramp 1	64.23%	4.31%	14.29%	5.79%	2.67%	2.71%	0.28%	0.16%	0.12%	0.52%	0.64%	0.76%	2.75%	0.36%	0.16%	0.26%
	Ramp 2	64.67%	4.31%	14.39%	5.81%	2.66%	2.59%	0.26%	0.15%	0.11%	0.49%	0.60%	0.75%	2.62%	0.22%	0.11%	0.26%
	Ramp 3	63.60%	4.26%	14.15%	5.74%	2.63%	3.03%	0.30%	0.18%	0.14%	0.59%	0.73%	0.85%	3.07%	0.32%	0.16%	0.24%
	Local	67.04%	4.49%	14.90%	6.04%	2.77%	1.24%	0.13%	0.07%	0.06%	0.24%	0.29%	0.35%	1.25%	0.40%	0.19%	0.55%

SPEED/EMISSION ESTIMATION PROCEDURE

The previous sections have summarized the input data used for computing speeds and emission rates for the Baltimore Non-Attainment region. This section explains how PPSUITE and MOBILE use that input data to produce emission estimates. Exhibit 6 on the following page summarizes PPSUITE's analysis procedure used for each of the nearly 15,000 roadway links contained in the travel demand model.

Producing an emissions inventory with PPSUITE requires a process of disaggregation and aggregation. Data is available and used on a very small scale - individual ½ mile roadway segments 24 hours of the day. This data needs to first be aggregated into categories so that a reasonable number of MOBILE scenarios can be run, and then further aggregated and/or re-sorted into summary information that is useful for emission inventory reporting.

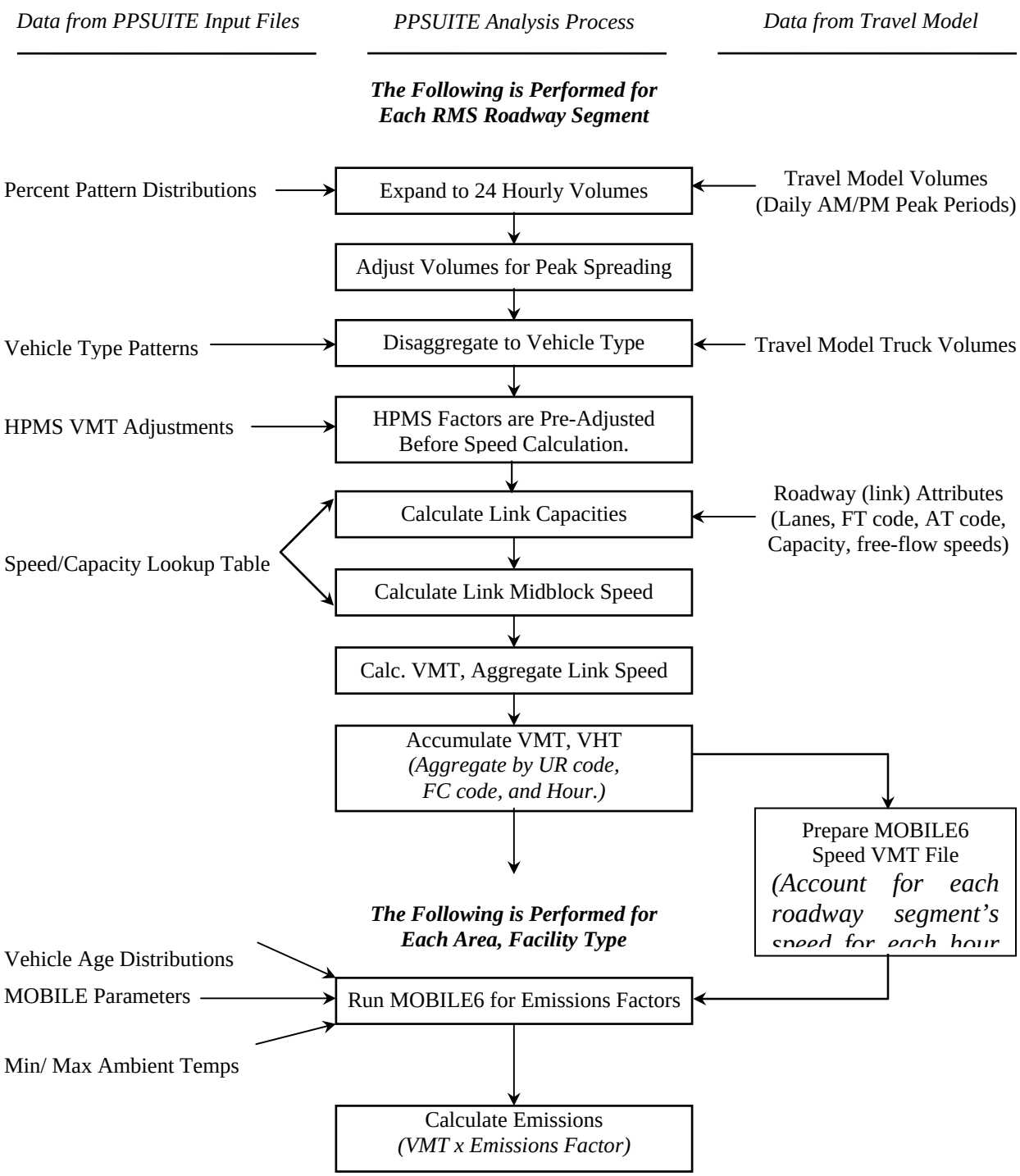
One of the major enhancements of MOBILE6 is the increased detail of traffic speed data that can be input to the emissions model. The PPSUITE post processor calculates hourly speeds for each roadway segment. Since previous versions of MOBILE only allowed one average speed as input for each scenario, a lookup table was created for speeds from 2.5 to 65 MPH in 0.1 MPH increments. MOBILE6 allows for direct input of the 24 hourly speeds as well as options to account for each link's speed separately. These added features utilize the full extent of the information output from the speed processing programs and provide for more accurate emission estimates of the available traffic data.

Volume/VMT Development

Before speeds can be calculated and MOBILE run, volumes acquired from the travel demand model must be adjusted and disaggregated. Such adjustments include factoring to HPMS VMT, seasonal adjustments, and disaggregating daily volumes to each hour of the day and to each of the sixteen MOBILE6 vehicle types.

Future Year Volumes. Future year volumes are based on projected land use files that the Baltimore Regional Transportation Board (BRTB) endorse and expected changes to the future transportation network. The model is run using the future year inputs and assigned volumes are produced for each roadway link contained within the model network.

Exhibit 6 PPSUITE Speed/Emission Estimation Procedure



Seasonal Adjustments. PPSUITE takes the 24 hr model volumes from the travel demand model, which represents an average annual weekday that has been adjusted for seasonal variance to represent an average summer weekday. A comprehensive adjustment factor of 1.04 is applied to the entire region. Using the adjusted weekday volumes, VMT is calculated for each model link.

Example:

Assume a sample Baltimore Arterial link: The average annual weekday traffic for this link in 2005 is 13,355 vehicles/day.

A seasonal factor of 1.04 is then applied.
Average Weekday summer Volume = 13,355 x 1.04 = 13,889 vehicles/day

Total VMT (daily) for this link is calculated as volume x distance. The distance of this link as obtained from the model is 0.296 miles.

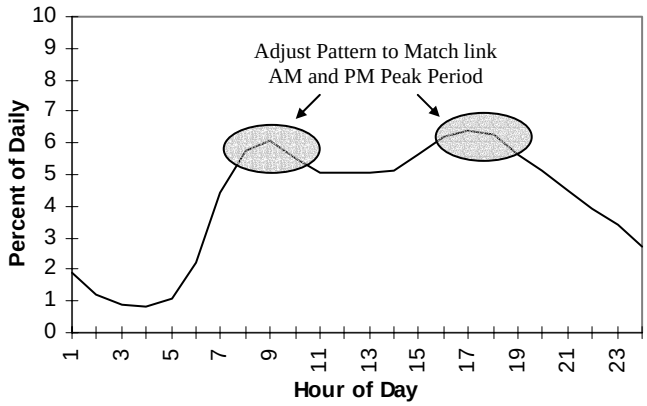
2005 VMT = 13,889 vehicles/day x 0.286 miles = 4,111 vehicle-miles / day

---

Disaggregation to 24 Hours. After seasonally adjusting the link volume, the volume is split to each hour of the day. This allows for more accurate speed calculations (effects of congested hours) and allows PPSUITE to prepare the hourly VMT and speeds for input to the MOBILE6 model.

Example:

To support speed calculations and emission estimates by time of day, the summer weekday volume is disaggregated to 24 hourly volumes. Temporal patterns by facility type were previously developed from SHA 1999-2001 count data and input to PPSUITE. A sample distribution is illustrated below and can be applied to the daily link volume to produce hourly volumes. Additional features within PPSUITE allow for the input pattern to be adjusted ensuring peak period volumes for the AM and PM are consistent with values supplied for each link.



Using the sample link, the resulting typical hourly volumes include:

8-9 a.m.	6.0 % x	(4,111 vehicle miles/ 0.296mi.)	= 833 vehicles/hour (vph)
12-1 p.m.	5.0 % x	(4,111 vehicle miles/ 0.296mi.)	= 694 vph
5-6 p.m.	6.3 % x	(4,111 vehicle miles/ 0.296mi.)	= 875 vph

After dividing the daily volumes to each hour of the day, PPSUITE identifies hours that are unreasonably congested. For those hours, PPSUITE then spreads a portion of the volume to other hours within the same peak period, thereby approximating the "peak spreading" that normally occurs in such over-capacity conditions.

Disaggregation to Vehicle Type. EPA requires VMT estimates to be prepared by vehicle type, reflecting specific local characteristics. As a result, for Baltimore's emission inventory runs, the hourly volumes are disaggregated to the sixteen MOBILE6 vehicle types based on a combination of model truck volume assignments, SHA count pattern data, and MOBILE6 defaults.

Example:

Disaggregation of the total sample link volume (by hour) to the various vehicle types would include the following:

Total Model Volume 8-9 am = 833 vph; Model Truck Volume 8-9 am = 90 vph
From above, Auto Volume 8-9 am = 833-90 = 743 vph

From the SHA counts for hour 8-9am (Based on Facility Type):
Light-duty vehicles (LDV) = 89.52%
Motorcycles (MC) = 00.17%
Heavy-duty vehicles (HDV) = 09.52%
Bus = 00.79%

The above is renormalized into Auto and Truck groupings:
AUTO: LDV = 99.8%, MC = 0.2%
TRUCK: HDV = 92.3%, Bus = 7.7%

Using the above information, the following vehicle type volumes are calculated for 8-9 am:
LDV = 743 x 99.8% = 741 vph
MC = 743 x 00.2% = 2 vph
HDV = 90 x 92.3% = 83 vph
BUS = 90 x 7.7% = 7 vph

Finally, MOBILE6 defaults are used to break the above categories into the 16 input vehicle types. Defaults vary by the analysis year being run. For example, the following factors have been developed from 2005 MOBILE6 defaults:

LDV	0.4840 of LDV Group	=	359 vph
LDT1	0.0885 of LDV Group	=	66 vph
LDT2	0.2948 of LDV Group	=	218 vph
LDT3	0.0908 of LDV Group	=	67 vph
LDT4	0.0418 of LDV Group	=	31 vph
HDV2B	0.3299 of HDV Group	=	27 vph
HDV3	0.0324 of HDV Group	=	3 vph
HDV4	0.0264 of HDV Group	=	2 vph
HDV5	0.0196 of HDV Group	=	2 vph
HDV6	0.0733 of HDV Group	=	6 vph
HDV7	0.0870 of HDV Group	=	7 vph
HDV8A	0.0946 of HDV Group	=	8 vph
HDV8B	0.3367 of HDV Group	=	28 vph
HDBS	0.6897 of BUS Group	=	5 vph
HDBT	0.3103 of BUS Group	=	2 vph
MC	1.0000 of MC Group	=	2 vph

Speed/Delay Determination

EPA recognizes that the estimation of vehicle speeds is a difficult and complex process. Because emissions are so sensitive to speeds, it recommends special attention be given to developing reasonable and consistent speed estimates; it also recommends that VMT be disaggregated into subsets that have roughly equal speed, with separate emission factors for each subset. At a minimum, speeds should be estimated separately according to roadway facility class.

The computational framework used for this analysis meets and exceeds that recommendation. Speeds are individually calculated for each roadway segment and hour based on the physical characteristics of the roadway and the assigned capacities to each model link. Rather than accumulating the roadway segments into area/functional groupings and calculating an average speed, each individual link hourly speed is represented in the MOBILE6 speed VMT file. This represents a significant enhancement in the MOBILE model since past versions only allowed input of one average speed for each scenario. MOBILE6 allows the input of a distribution of hourly speeds. For example, if 5% of a county's arterial VMT operate at 5 mph during the AM peak hour and the remaining 95% operate at 65mph, this can be represented in the MOBILE6 speed input file. For the Baltimore runs, distributions of speeds are input to MOBILE6 for separate scenarios representing county/area and facility type groupings; VMT is accumulated by the same groupings for the application of the emission factors to produce resulting emission totals.

To calculate speeds, PPSUITE first obtains initial capacities (how much volume the roadway can serve before heavy congestion) and free-flow speeds (speeds assuming no congestion) from the travel demand model data. Other data needed for the speed calculations including the BPR parameters (speed – congestion relationships) are obtained from a lookup table input to PPSUITE. This lookup data contains default roadway information indexed by the urban/rural code and facility type.

Example:

For the sample arterial link, the free-flow speeds and capacity is obtained from the travel demand model:

free flow speed = 65 mph
capacity = 1800 vph per lane

This information is used along with the physical characteristics of the roadway to calculate the delay (including congestion) to travel this link during each hour of the day:

For example: The sample link is calculated to have a travel time, including delay of 17.76 seconds for the 8-9am hour

Total travel time, in vehicle hours, for the 8-9am hour is calculated as:

VHT (8-9am) = 17.76 seconds x 833vph / 3600 sec/hr = 4.12 vehicle hours

---

The result of this process is an estimated average travel time for each hour of the day for each highway segment. The average time multiplied by the volume produces vehicle hours of travel (VHT).

HPMS and VMT Adjustments

Link volumes from the traffic model assignment must also be adjusted to account for differences with the HPMS VMT totals, as described previously. VMT adjustment factors are provided as input to PPSUITE, and are applied to each of the roadway segment volumes. These factors were developed from 1990 and 2000 HPMS data; however, the 2000 factors are also applied to any future year runs. The VMT added or subtracted to the travel model links are applied before the calculation of speeds. Therefore, the final congested speed that is used by MOBILE6 accounts for the HPMS VMT adjustments. However, for "local" facility, a constant speed is assumed within MOBILE6 for the calculation of emission factors and the HPMS adjustments will not impact its speeds.

Example:

Assuming the sample arterial link example is in Harford County, the daily assigned volume is adjusted to account for reconciliation with the HPMS VMT. HPMS VMT for Harford County urban arterials is 721,411 vehicle miles in 1990. The total VMT for all urban arterial model links in Harford County is 744,471 vehicle miles. A factor is developed by dividing the HPMS VMT by the travel model link VMT:

HPMS adjustment factor = 721,411 / 744,471 = 0.969

This factor is applied in the 1990 run. Separate factors are calculated for the year 2000 and carried forward to all future years.

Thus for the sample link:

VMT (8-9am) = 833 vph x 0.296 miles x 0.969 = 239 vehicle miles

VMT and Speed Aggregation

As discussed in previous sections, MOBILE6's ability to handle input distributions of hourly speeds has eliminated the need to aggregate speed data. For the Baltimore runs, PPSUITE has been set up to automatically accumulate VMT and VHT by geographic areas and highway facility type. The speed files input to MOBILE6 for each scenario contain the actual distribution of roadway speeds for that aggregation group. Exhibit 7 illustrates the scenario aggregation scheme used with MOBILE6.

Exhibit 7 VMT/VHT Aggregation Scheme

County -	1 = Baltimore City 3 = Baltimore County 5 = Harford County	2 = Anne Arundel County 4 = Carroll County 6 = Howard County	6 entries
Urban/Rural Code -	1=Urban 2=Rural		2 entries
Facility Type -	1 = Interstate 2 = Freeway 3 = Principal Arterial 4 = Minor Arterial	5 = Collector 6-10 = Ramps 11= Local	11 entries
			132 potential combinations

Geographic aggregation is performed according to urban and rural areas of each county. Facility class aggregation is according to the facility types contained in the travel demand model. For an individual county, this creates a potential for 22 possible combinations, each of which becomes an input MOBILE6 scenario. This allows each MOBILE6 scenario to represent the actual VMT mix and speed for that geographic/highway combination. Altogether then, there are potentially 132 combinations for which speeds and VMT are computed and emissions are calculated with MOBILE.

MOBILE Emissions Run

After computing speeds and aggregating VMT and VHT, PPSUITE prepares input files to be run in EPA's MOBILE6 program, which is used to produce VOC and NO_x emission factors in grams of pollutant per vehicle mile.

The MOBILE input file prepared by PPSUITE contains the following:

- MOBILE template containing appropriate parameters and program flags
- Temperature data specific to the Baltimore region.
- Vehicle age and diesel sales fraction data for the Baltimore region.
- Scenario data - contains VMT mix, speed distributions specific to scenario as produced by PPSUITE

Example:

A MOBILE input file is created by PPSUITE for each county in the Baltimore region. This file contains separate scenarios for each urban/rural code, facility type. A scenario represents a separate MOBILE run with different emission factors calculated and output for each run.

For this example, Harford County arterials will be run as a scenario with a specific VMT mix file and a speed distribution file accounting for all the roadway speeds within the grouping.

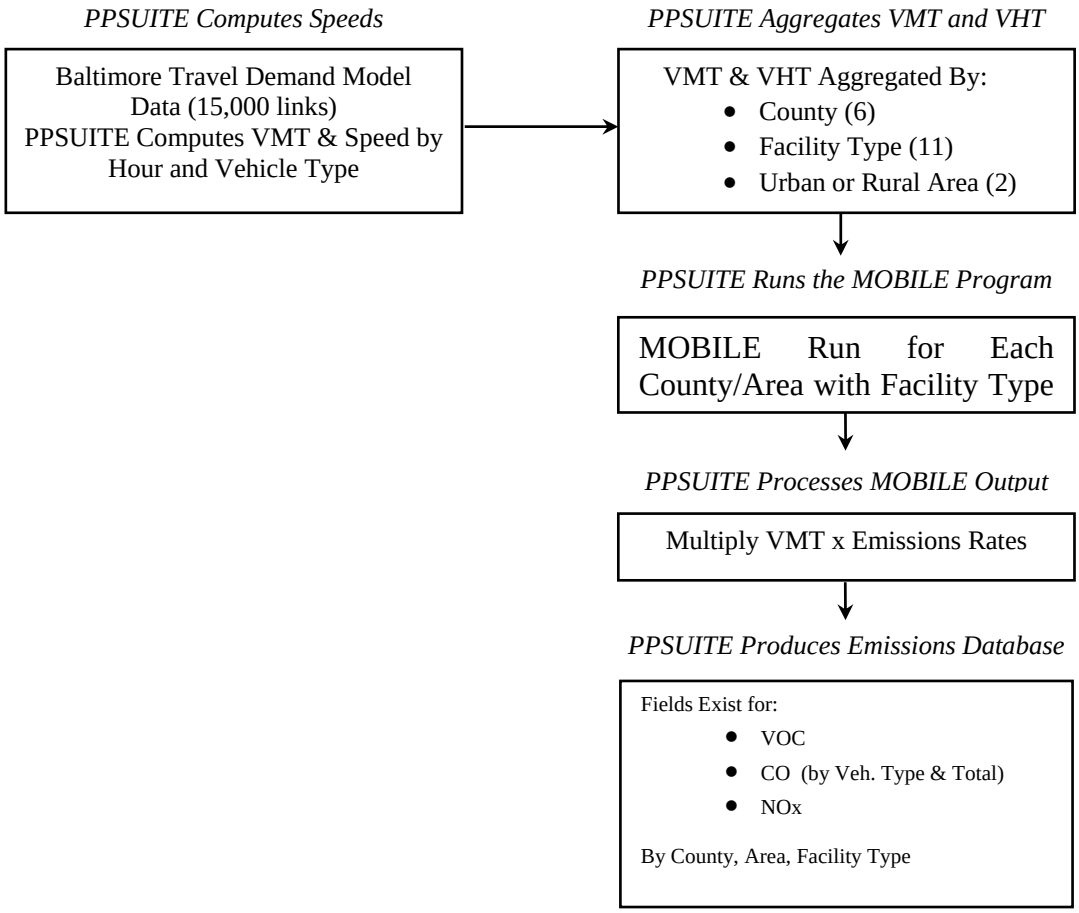
Time of Day Emissions

Unlike in the past using MOBILE5, VMT and speeds are no longer aggregated as separate scenarios representing time periods. This was done in the past to account for the unique speeds encountered during each time period in the day. Diurnal emissions were estimated on a daily period. Since MOBILE6 allows for hourly roadway speeds to be represented in the speed VMT file, such a process is no longer needed. MOBILE6 will internally account for the emissions during each hour in the day and make the necessary calculations.

MOBILE Output Post-Processing

After MOBILE has been run, PPSUITE processes the MOBILE output files and compiles the emission factors for each scenario. Using the MOBILE emission factors, PPSUITE calculates emission quantities by multiplying the emission factors by the aggregated VMT totals. PPSUITE then produces an emissions database summarizing VMT, VHT, VOC, and NO_x emissions as shown in Exhibit 8.

Exhibit 8 Summary of PPSUITE's Methodology in Producing Emissions Summary



Example:

Harford County urban arterials were run as a scenario in MOBILE. Based on the input information, MOBILE6 outputs emission factors by vehicle type for this scenario as shown below:

Composite Emission Factors (grams/mile) from MOBILE6 output

Vehicle Type:	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDDV	For all 28 M6 types
VOC:	1.22	1.86	2.42	3.68	0.36	1.13	
NO_X:	2.41	3.16	3.66	7.14	1.84	5.84	

PPSUITE reads these emission factors from the MOBILE6 output file and multiplies them by the Harford County urban arterial VMT to obtain emission totals for this scenario. (Note: emissions shown in kg/day, which is converted to tons/day in SIP narratives)

PPSUITE computes emissions as follows for this scenario:

		Emission Factors (g/mi)				Emissions (kg/day)	
Veh Type	**VMT**		**VOC**	**NOX**		**VOC**	**NOX**
LDGV	84,344	x	1.22	2.41	=	102.9	203.3
LDGT1	30,713	x	1.86	3.16	=	57.1	97.1
LDGT2	21,515	x	2.42	3.66	=	52.1	78.7
LDGT3	4,209	x	3.68	7.14	=	15.5	30.1
LDGT4	3,586	x	0.36	1.84	=	1.3	6.6
HDDV7	7,483	x	1.13	5.84	=	8.5	43.7
….. Repeated for all 28 MOBILE6 vehicle types							
Total	155,903					244.6	482.0

The emissions for this scenario are reported and stored in an output database file that contains a record for each scenario with fields containing VMT, VHT, VOC emissions, and NO_x emissions. Fields exist for each vehicle type and for the total of all vehicle types as shown below.

Reported by Vehicle Type 1-28 and Total --- Repeated for VHT,HC,NOX

Cnty	**UR**	**FC**	**VMT1**	**VMT2**	**VMT3**	**VMT4**	**VMT5**	**VMT6**	**VMT7**	**VMT8**	**VMT28**
Harf	1	3	84,344	30,713	21,515	4,209	3,586	2,806	7,483	1,248	
			VHT1	**VHT2**	**VHT3**	**VHT4**	**VHT5**	**VHT6**	**VHT7**	**VHT8**	**VHT28**
			1,298	473	331	65	55	43	115	19	
			VOC1	**VOC2**	**VOC3**	**VOC4**	**VOC5**	**VOC6**	**VOC7**	**VOC8**	**VOC28**
			102.9	57.1	52.1	15.5	1.3	1.5	8.5	5.7	
			NO_x1	**NO_x2**	**NO_x3**	**NO_x4**	**NO_x5**	**NO_x6**	**NO_x7**	**NO_x8**	**NO_x28**
			203.3	97.1	78.7	30.1	6.6	11.6	43.7	10.9	

RESOURCES

MOBILE Model

EPA – OTAQ - Modeling and Inventories. Feb. 12, 2003. U. S. Environmental Protection Agency. April 3, 2003. <http://www.epa.gov/omswww/models.htm>

This site contains a downloadable model, MOBILE users guide, and other information.

U.S. Environmental Protection Agency. *User's Guide to MOBILE6.0 (Mobile Source Emission Factor Model).* Office of Mobile Sources. January 2002.

U.S. Environmental Protection Agency. *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation.* Office of Transportation and Air Quality. January 2002.

U.S. Environmental Protection Agency. *Policy Guidance on the Use of MOBILE6 for Emission Inventory Preparation.* Office of Air and Radiation. January 18, 2002.

Traffic Engineering

Transportation Research Board. *2000 Highway Capacity Manual.* Committee on Highway Capacity and Quality of Service. 2000.

This manual presents current knowledge and techniques for analyzing the transportation system.

Appendix A – BMC Memorandum – included as Appendix A of SIP Revision

Appendix B – Baker – Baltimore Mobile6 Input Files

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2005 MOBILE6 INPUT File Script for the Baltimore Region

MOBILE6 INPUT FILE

REPORT FILE        :  C:\pptemp\m6output.out       REPLACE
DATABASE OUTPUT    :
WITH FIELDNAMES    :
EMISSIONS TABLE    :  d:\BALTAQ\RUN\m6data\M6OUTPUT.TB1    REPLACE
POLLUTANTS         :  HC CO NOX
AGGREGATED OUTPUT  :
RUN DATA           : 0011

MIN/MAX TEMPERATURE: 67.9 96.5
FUEL RVP           : 7.0
EXPRESS HC AS VOC  :
EXPAND EXHAUST     :
EXPAND EVAPORATIVE :
NO REFUELING       :
ANTI-TAMP PROGRAM  :
89 77 50 22222 21111111 1 12  96. 12211112
I/M DESC FILE      : d:\BALTAQ\M6_Data\im2005.d
94+ LDG IMP        : d:\BALTAQ\M6_Data\nlevne.d
REG DISTRIBUTION   : d:\BALTAQ\M6_Data\regdat02.bal
DIESEL FRACTIONS   :
0.0001 0.0002 0.0006 0.0022 0.0014 0.0015 0.0020 0.0014 0.0015 0.0012
0.0017 0.0032 0.0013 0.0010 0.0005 0.0107 0.0078 0.0361 0.0508 0.0766
0.1184 0.1215 0.0962 0.0370 0.0046
0.0010 0.0010 0.0032 0.0136 0.0048 0.0172 0.0165 0.0153 0.0106 0.0151
0.0163 0.0169 0.0175 0.0250 0.0183 0.0256 0.0553 0.0651 0.0748 0.0877
0.2434 0.1723 0.1120 0.0614 0.0160
0.0010 0.0010 0.0032 0.0136 0.0048 0.0172 0.0165 0.0153 0.0106 0.0151
0.0163 0.0169 0.0175 0.0250 0.0183 0.0256 0.0553 0.0651 0.0748 0.0877
0.2434 0.1723 0.1120 0.0614 0.0160
0.0126 0.0126 0.0126 0.0126 0.0126 0.0126 0.0126 0.0115 0.0111 0.0145
0.0115 0.0129 0.0096 0.0083 0.0072 0.0082 0.0124 0.0135 0.0169 0.0209
0.0256 0.0013 0.0006 0.0011 0.0001
0.0126 0.0126 0.0126 0.0126 0.0126 0.0126 0.0126 0.0115 0.0111 0.0145
0.0115 0.0129 0.0096 0.0083 0.0072 0.0082 0.0124 0.0135 0.0169 0.0209
0.0256 0.0013 0.0006 0.0011 0.0001
0.1998 0.1998 0.1998 0.1998 0.1998 0.1998 0.1998 0.2578 0.2515 0.3263
0.2784 0.2963 0.2384 0.2058 0.1756 0.1958 0.2726 0.2743 0.3004 0.2918
0.2859 0.0138 0.0000 0.0000 0.0000
0.6774 0.6774 0.6774 0.6774 0.6774 0.6774 0.6774 0.7715 0.7910 0.8105
0.8068 0.8280 0.8477 0.7940 0.7488 0.7789 0.7842 0.6145 0.5139 0.5032
0.4277 0.0079 0.0000 0.0000 0.0001
0.8606 0.8606 0.8606 0.8606 0.8606 0.8606 0.8606 0.8473 0.8048 0.8331
0.7901 0.7316 0.7275 0.7158 0.5647 0.3178 0.2207 0.1968 0.1570 0.0738
0.0341 0.0414 0.0003 0.0000 0.0000
0.4647 0.4647 0.4647 0.4647 0.4647 0.4647 0.4647 0.4384 0.3670 0.4125
0.3462 0.2771 0.2730 0.2616 0.1543 0.0615 0.0383 0.0333 0.0255 0.0111
0.0049 0.0060 0.0000 0.0000 0.0000
0.6300 0.6300 0.6300 0.6300 0.6300 0.6300 0.6300 0.6078 0.5246 0.5767
0.5289 0.5788 0.5617 0.4537 0.4216 0.4734 0.4705 0.4525 0.4310 0.3569
0.3690 0.4413 0.3094 0.1679 0.1390
0.8563 0.8563 0.8563 0.8563 0.8563 0.8563 0.8563 0.8443 0.7943 0.8266
0.7972 0.8279 0.8177 0.7440 0.7184 0.7588 0.7567 0.7431 0.7261 0.6602
0.6717 0.7344 0.6107 0.4140 0.3610
0.9992 0.9992 0.9992 0.9992 0.9992 0.9992 0.9992 0.9989 0.9987 0.9989
0.9977 0.9984 0.9982 0.9979 0.9969 0.9978 0.9980 0.9979 0.9976 0.9969
0.9978 0.9982 0.9974 0.9965 0.9964
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
0.9585 0.9585 0.9585 0.9585 0.9585 0.9585 0.9585 0.8857 0.8525 0.8795
0.9900 0.9105 0.8760 0.7710 0.7502 0.7345 0.6733 0.5155 0.3845 0.3238
0.3260 0.2639 0.0594 0.0460 0.0291
```

```
SCENARIO RECORD    :[01 0011]  1

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          2581303
*                    1083679  198376  660060  203302   93591  103898   10204    8314
*                       6173   23085   27400   29793  106071   15544    6993    4820
VMT FRACTIONS      :
                     .419820 .076851 .255708 .078759 .036257 .040250 .003953 .003221
                     .002391 .008943 .010615 .011542 .041092 .006022 .002709 .001867
VMT BY FACILITY    :V001101F.def
VMT BY HOUR        :V001101H.def
SPEED VMT          :V001101S.def


SCENARIO RECORD    :[02 0011]  2

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           430271
*                     187190   34267  114016   35118   16167   13142    1291    1052
*                        781    2920    3466    3768   13416    1959     881     837
VMT FRACTIONS      :
                     .435054 .079640 .264986 .081618 .037574 .030544 .003000 .002445
                     .001815 .006786 .008055 .008757 .031180 .004553 .002048 .001945
VMT BY FACILITY    :V001102F.def
VMT BY HOUR        :V001102H.def
SPEED VMT          :V001102S.def


SCENARIO RECORD    :[03 0011]  3

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          3471070
*                    1547152  283219  942357  290251  133618   78916    7751    6315
*                       4689   17534   20812   22630   80567   20570    9255    5434
VMT FRACTIONS      :
                     .445728 .081594 .271489 .083620 .038495 .022735 .002233 .001819
                     .001351 .005051 .005996 .006520 .023211 .005926 .002666 .001566
VMT BY FACILITY    :V001103F.def
VMT BY HOUR        :V001103H.def
SPEED VMT          :V001103S.def


SCENARIO RECORD    :[04 0011]  4

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          2387720
*                    1062297  194462  647035  199290   91744   53675    5271    4295
*                       3189   11926   14155   15391   54797   16677    7503    6013
VMT FRACTIONS      :
                     .444899 .081443 .270984 .083465 .038423 .022480 .002208 .001799
```

```
                    .001336 .004995 .005928 .006446 .022950 .006984 .003142 .002518
VMT BY FACILITY    :V001104F.def
VMT BY HOUR        :V001104H.def
SPEED VMT          :V001104S.def


SCENARIO RECORD    :[05 0011]  5

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          684233
*                    303369   55534  184779   56913   26200   16104    1582    1289
*                       957    3578    4247    4618   16441    4563    2053    2007
VMT FRACTIONS      :
                    .443370 .081162 .270053 .083178 .038291 .023536 .002312 .001884
                    .001399 .005229 .006207 .006749 .024028 .006669 .003000 .002933
VMT BY FACILITY    :V001105F.def
VMT BY HOUR        :V001105H.def
SPEED VMT          :V001105S.def


SCENARIO RECORD    :[06 0011]  6

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          215347
*                     93241   17068   56792   17492    8053    6865     674     549
*                       408    1525    1811    1969    7009    1003     451     437
VMT FRACTIONS      :
                    .432981 .079258 .263723 .081227 .037395 .031879 .003130 .002549
                    .001895 .007082 .008410 .009143 .032547 .004658 .002094 .002029
VMT BY FACILITY    :V001106F.def
VMT BY HOUR        :V001106H.def
SPEED VMT          :V001106S.def


SCENARIO RECORD    :[07 0011]  7

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           85325
*                     36781    6734   22405    6901    3177    2821     277     226
*                       168     627     744     809    2880     403     181     191
VMT FRACTIONS      :
                    .431070 .078922 .262584 .080879 .037234 .033062 .003246 .002649
                    .001969 .007348 .008720 .009481 .033753 .004723 .002121 .002239
VMT BY FACILITY    :V001107F.def
VMT BY HOUR        :V001107H.def
SPEED VMT          :V001107S.def


SCENARIO RECORD    :[08 0011]  8

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
```

```
*VMT TOTALS            42277
*                      17634    3228   10740    3308    1523    1776     174     142
*                        105     395     468     509    1813     257     115      90
VMT FRACTIONS      :
                      .417103 .076354 .254040 .078246 .036024 .042009 .004116 .003359
                      .002484 .009343 .011070 .012040 .042884 .006079 .002720 .002129
VMT BY FACILITY    :V001108F.def
VMT BY HOUR        :V001108H.def
SPEED VMT          :V001108S.def


SCENARIO RECORD    :[09 0011]  9

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS             3745
*                       1591     291     968     298     137     140      14      11
*                          8      31      37      40     143      18       8      10
VMT FRACTIONS      :
                      .424769 .077712 .258507 .079582 .036586 .037387 .003739 .002938
                      .002136 .008279 .009881 .010682 .038188 .004807 .002136 .002671
VMT BY FACILITY    :V001109F.def
VMT BY HOUR        :V001109H.def
SPEED VMT          :V001109S.def


SCENARIO RECORD    :[10 0011] 10

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS             1871
*                        804     147     490     151      69      60       6       5
*                          4      13      16      17      62      15       7       5
VMT FRACTIONS      :
                      .429799 .078556 .261854 .080694 .036873 .032064 .003206 .002672
                      .002138 .006947 .008550 .009085 .033133 .008016 .003741 .002672
VMT BY FACILITY    :V001110F.def
VMT BY HOUR        :V001110H.def
SPEED VMT          :V001110S.def


SCENARIO RECORD    :[11 0011] 15

CALENDAR YEAR      :2005
EVALUATION MONTH   : 7
FUEL PROGRAM       : 2 S
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           1076490
*                      499105   91365  304001   93634   43105   10969    1077     878
*                         652    2437    2893    3145   11199    6021    2709    3300
VMT FRACTIONS      :
                      .463640 .084873 .282400 .086981 .040042 .010190 .001000 .000816
                      .000606 .002264 .002687 .002922 .010403 .005593 .002517 .003066
VMT BY FACILITY    :V001111F.def
VMT BY HOUR        :V001111H.def
SPEED VMT          :V001111S.def


END OF RUN         : 0021
```

INPUT SCRIPTS CONTINUE FOR EVERY COUNTY AREA TYPE COMBINATION……

Attachment 1 to Appendix C

2005 I/M Input File to MOBILE6 for the Baltimore Region

```
*IM Program 2005.  Idle, IM240, and OBD.
*IM240  Final Cutpoints.
*HDGT1 receives IM240, but is modeled as idle test to allow single run.
*Describes IM emissions program beginning Summer 2004.
*Includes gas cap testing, which will be advisory until summer 2003, and
*should become pass/fail then.
*Waiver rates are based on the assumption that a $450 waiver expenditure will
*result in a  3% waiver rate.
*Gas Cap for OBD Vehicles
*
I/M PROGRAM        : 7 2003 2050 2 T/O EVAP OBD & GC
I/M MODEL YEARS    : 7 1996 2050
I/M VEHICLES       : 7 22222 11111111 1
I/M COMPLIANCE     : 7 96.0
I/M WAIVER RATES   : 7  3.0  3.0
I/M GRACE PERIOD   : 7 2
*Gas Cap for HDGT
I/M PROGRAM        : 6 2003 2050 2 T/O GC
I/M MODEL YEARS    : 6 1977 2050
I/M VEHICLES       : 6 11111 22222111 1
I/M COMPLIANCE     : 6 96.0
I/M WAIVER RATES   : 6  3.0  3.0
I/M GRACE PERIOD   : 6 2
*Gas Cap for older LDGV, LDGT
I/M PROGRAM        : 5 2003 2050 2 T/O GC
I/M MODEL YEARS    : 5 1977 1995
I/M VEHICLES       : 5 22222 11111111 1
I/M COMPLIANCE     : 5 96.0
I/M WAIVER RATES   : 5  3.0  3.0
I/M GRACE PERIOD   : 5 2
*OBD
I/M PROGRAM        : 4 2003 2050 2 T/O OBD I/M
I/M MODEL YEARS    : 4 1996 2050
I/M VEHICLES       : 4 22222 11111111 1
I/M STRINGENCY     : 4 20.0
I/M COMPLIANCE     : 4 96.0
I/M WAIVER RATES   : 4  3.0  3.0
I/M GRACE PERIOD   : 4 2
*IM240
I/M PROGRAM        : 3 1984 2050 2 T/O IM240
I/M MODEL YEARS    : 3 1984 1995
I/M VEHICLES       : 3 22222 11111111 1
I/M STRINGENCY     : 3 20.0
I/M COMPLIANCE     : 3 96.0
I/M WAIVER RATES   : 3  3.0  3.0
I/M CUTPOINTS      : 3 d:\BALTAQ\M6_Data\cutpnt05.d
I/M GRACE PERIOD   : 3 2
*Idle HDGT
I/M PROGRAM        : 2 1984 2050 2 T/O Idle
I/M MODEL YEARS    : 2 1977 2050
I/M VEHICLES       : 2 11111 22222111 1
I/M STRINGENCY     : 2 20.0
I/M COMPLIANCE     : 2 96.0
I/M WAIVER RATES   : 2  3.0  3.0
I/M GRACE PERIOD   : 2 2
*Idle older LDGV, LDGT
I/M PROGRAM        : 1 1984 2050 2 T/O Idle
I/M MODEL YEARS    : 1 1977 1983
I/M VEHICLES       : 1 22222 11111111 1
I/M STRINGENCY     : 1 20.0
I/M COMPLIANCE     : 1 96.0
```

```
I/M WAIVER RATES   : 1  3.0  3.0
I/M GRACE PERIOD   : 1 2
Attachment 2 to Appendix C

2002 Vehicle Age Distribution Inputs to MOBILE6 for the Baltimore Region

REG DIST
* This file contains the default MOBILE6 values for the distribution of
* vehicles by age for July of any calendar year.  There are sixteeen (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 28 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.
*
* Based on the 2002 MVA Data received during July 2002
* LDV
 1 0.0646 0.0842 0.0867 0.0750 0.0732 0.0740 0.0664 0.0726 0.0600 0.0530
   0.0451 0.0401 0.0381 0.0329 0.0281 0.0232 0.0174 0.0116 0.0080 0.0044
   0.0026 0.0021 0.0019 0.0024 0.0324
* LDT1
 2 0.0909 0.1057 0.1137 0.1007 0.0968 0.0874 0.0735 0.0687 0.0538 0.0408
   0.0307 0.0246 0.0229 0.0224 0.0191 0.0145 0.0095 0.0071 0.0049 0.0026
   0.0015 0.0010 0.0009 0.0019 0.0046
* LDT2
 3 0.0909 0.1057 0.1137 0.1007 0.0968 0.0874 0.0735 0.0687 0.0538 0.0408
   0.0307 0.0246 0.0229 0.0224 0.0191 0.0145 0.0095 0.0071 0.0049 0.0026
   0.0015 0.0010 0.0009 0.0019 0.0046
* LDT3
 4 0.0560 0.0815 0.0826 0.0707 0.0654 0.0702 0.0574 0.0628 0.0628 0.0418
   0.0353 0.0340 0.0367 0.0414 0.0406 0.0361 0.0343 0.0204 0.0167 0.0095
   0.0066 0.0053 0.0043 0.0077 0.0201
* LDT4
 5 0.0560 0.0815 0.0826 0.0707 0.0654 0.0702 0.0574 0.0628 0.0628 0.0418
   0.0353 0.0340 0.0367 0.0414 0.0406 0.0361 0.0343 0.0204 0.0167 0.0095
   0.0066 0.0053 0.0043 0.0077 0.0201
```

```
* HDV2B
 6 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV3
 7 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV4
 8 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV5
 9 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV6
10 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV7
11 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV8a
12 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDV8b
13 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDBS
14 0.0503 0.0815 0.0989 0.0959 0.0546 0.0757 0.0505 0.0712 0.0421 0.0327
   0.0263 0.0293 0.0395 0.0401 0.0381 0.0328 0.0293 0.0222 0.0145 0.0090
   0.0081 0.0064 0.0069 0.0083 0.0360
* HDBT
15 0.0255 0.0410 0.0624 0.1022 0.0548 0.0826 0.0626 0.0911 0.0484 0.0434
   0.0363 0.0392 0.0476 0.0481 0.0440 0.0429 0.0355 0.0269 0.0152 0.0097
   0.0097 0.0063 0.0064 0.0068 0.0115
* Motorcycles
16 0.0852 0.1120 0.0907 0.0738 0.0526 0.0448 0.0457 0.0373 0.0309 0.0334
   0.0243 0.3692 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
```

Appendix C – Baker – 1990 Baltimore Mobile6 Input Files

```
1990 MOBILE6 INPUT File Script for the Baltimore Region

MOBILE6 INPUT FILE

REPORT FILE        :  C:\pptemp\m6output.out       REPLACE
DATABASE OUTPUT    :
WITH FIELDNAMES    :
EMISSIONS TABLE    :  d:\SIP1990.M6\RUN90\m6data\M6OUTPUT.TB1    REPLACE
POLLUTANTS         :  HC CO NOX
AGGREGATED OUTPUT  :
RUN DATA           : 0011

MIN/MAX TEMPERATURE: 69.1  98.4
FUEL RVP       : 8.2
EXPRESS HC AS VOC  :
EXPAND EXHAUST     :
EXPAND EVAPORATIVE :
NO CLEAN AIR ACT   :
NO REFUELING       :
ANTI-TAMP PROGRAM  :
89 77 50 22222 22222111 1 12  96. 12211111
I/M DESC FILE      : d:\SIP1990.M6\M6_Data\MDIm1990.d
REG DISTRIBUTION   : d:\SIP1990.M6\M6_Data\MD90.reg
DIESEL FRACTIONS   :
0.0004 0.0005 0.0003 0.0033 0.0043 0.0136 0.0178 0.0206 0.0396 0.0546
0.0479 0.0230 0.0111 0.0078 0.0102 0.0142 0.0067 0.0032 0.0044 0.0014
0.0019 0.0016 0.0003 0.0003 0.0007
0.0022 0.0128 0.0113 0.0150 0.0316 0.0370 0.0637 0.0867 0.2519 0.2094
0.1066 0.0391 0.0181 0.0038 0.0019 0.0023 0.0054 0.0000 0.0017 0.0025
0.0000 0.0000 0.0120 0.0000 0.0209
0.0022 0.0128 0.0113 0.0150 0.0316 0.0370 0.0637 0.0867 0.2519 0.2094
0.1066 0.0391 0.0181 0.0038 0.0019 0.0023 0.0054 0.0000 0.0017 0.0025
0.0000 0.0000 0.0120 0.0000 0.0209
0.0096 0.0083 0.0072 0.0082 0.0124 0.0135 0.0169 0.0209 0.0256 0.0013
0.0006 0.0011 0.0001 0.0000 0.0000 0.0000 0.0001 0.0001 0.0001 0.0001
0.0001 0.0001 0.0001 0.0001 0.0001
0.0096 0.0083 0.0072 0.0082 0.0124 0.0135 0.0169 0.0209 0.0256 0.0013
0.0006 0.0011 0.0001 0.0000 0.0000 0.0000 0.0001 0.0001 0.0001 0.0001
0.0001 0.0001 0.0001 0.0001 0.0001
0.2384 0.2058 0.1756 0.1958 0.2726 0.2743 0.3004 0.2918 0.2859 0.0138
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 0.0000 0.0000
0.8477 0.7940 0.7488 0.7789 0.7842 0.6145 0.5139 0.5032 0.4277 0.0079
0.0000 0.0000 0.0001 0.0003 0.0010 0.0028 0.0248 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
0.7275 0.7158 0.5647 0.3178 0.2207 0.1968 0.1570 0.0738 0.0341 0.0414
0.0003 0.0000 0.0000 0.0000 0.0259 0.0078 0.0004 0.0090 0.0112 0.0112
0.0112 0.0112 0.0112 0.0112 0.0112
0.2730 0.2616 0.1543 0.0615 0.0383 0.0333 0.0255 0.0111 0.0049 0.0060
0.0000 0.0000 0.0000 0.0000 0.0037 0.0011 0.0001 0.0013 0.0016 0.0016
0.0016 0.0016 0.0016 0.0016 0.0016
0.5617 0.4537 0.4216 0.4734 0.4705 0.4525 0.4310 0.3569 0.3690 0.4413
0.3094 0.1679 0.1390 0.0808 0.0476 0.0365 0.0288 0.0274 0.0297 0.0297
0.0297 0.0297 0.0297 0.0297 0.0297
0.8177 0.7440 0.7184 0.7588 0.7567 0.7431 0.7261 0.6602 0.6717 0.7344
0.6107 0.4140 0.3610 0.2353 0.1489 0.1170 0.0940 0.0897 0.0966 0.0966
0.0966 0.0966 0.0966 0.0966 0.0966
0.9982 0.9979 0.9969 0.9978 0.9980 0.9979 0.9976 0.9969 0.9978 0.9982
0.9974 0.9965 0.9964 0.9949 0.9920 0.9936 0.9819 0.9812 0.9720 0.9720
0.9720 0.9720 0.9720 0.9720 0.9720
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
0.8760 0.7710 0.7502 0.7345 0.6733 0.5155 0.3845 0.3238 0.3260 0.2639
0.0594 0.0460 0.0291 0.0240 0.0086 0.0087 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
```

```
SCENARIO RECORD    :[01 0011]  1

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          2185899
*                    1329189   88940  295522  119720   54950   91581    9368    5519
*                       4415   17659   21778   25924   92954   16812    7911    3657
VMT FRACTIONS      :
                     .608074 .040688 .135195 .054769 .025138 .041896 .004286 .002525
                     .002020 .008079 .009963 .011860 .042524 .007691 .003619 .001673
VMT BY FACILITY    :V001101F.def
VMT BY HOUR        :V001101H.def
SPEED VMT          :V001101S.def


SCENARIO RECORD    :[02 0011]  2

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           160915
*                     101540    6794   22575    9146    4198    5109     523     308
*                        246     985    1215    1446    5185     889     419     337
VMT FRACTIONS      :
                     .631015 .042221 .140292 .056838 .026088 .031750 .003250 .001914
                     .001529 .006121 .007551 .008986 .032222 .005525 .002604 .002094
VMT BY FACILITY    :V001102F.def
VMT BY HOUR        :V001102H.def
SPEED VMT          :V001102S.def


SCENARIO RECORD    :[03 0011]  3

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          3991427
*                    2575687  172347  572660  231991  106482   97473    9971    5874
*                       4699   18796   23179   27592   98934   28068   13208    4466
VMT FRACTIONS      :
                     .645305 .043179 .143472 .058122 .026678 .024421 .002498 .001472
                     .001177 .004709 .005807 .006913 .024787 .007032 .003309 .001119
VMT BY FACILITY    :V001103F.def
VMT BY HOUR        :V001103H.def
SPEED VMT          :V001103S.def


SCENARIO RECORD    :[04 0011]  4

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          1638649
*                    1061606   71035  236030   95618   43888   37547    3841    2263
*                       1810    7240    8929   10628   38110   11011    5182    3911
VMT FRACTIONS      :
                     .647854 .043350 .144039 .058352 .026783 .022913 .002344 .001381
```

```
                    .001105 .004418 .005449 .006486 .023257 .006720 .003162 .002387
VMT BY FACILITY    :V001104F.def
VMT BY HOUR        :V001104H.def
SPEED VMT          :V001104S.def


SCENARIO RECORD    :[05 0011]  5

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS          652180
*                    420057   28107   93393   37834   17366   16201    1657     976
*                       781    3124    3853    4586   16444    4180    1967    1654
VMT FRACTIONS      :
                    .644080 .043097 .143201 .058012 .026628 .024841 .002541 .001497
                    .001198 .004790 .005908 .007032 .025214 .006409 .003016 .002536
VMT BY FACILITY    :V001105F.def
VMT BY HOUR        :V001105H.def
SPEED VMT          :V001105S.def


SCENARIO RECORD    :[06 0011]  6

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           83201
*                     52312    3500   11631    4712    2163    2714     278     164
*                       131     523     645     768    2755     508     239     158
VMT FRACTIONS      :
                    .628742 .042067 .139794 .056634 .025997 .032620 .003341 .001971
                    .001574 .006286 .007752 .009231 .033113 .006106 .002873 .001899
VMT BY FACILITY    :V001106F.def
VMT BY HOUR        :V001106H.def
SPEED VMT          :V001106S.def


SCENARIO RECORD    :[07 0011]  7

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           40538
*                     25350    1696    5636    2283    1048    1383     141      83
*                        67     267     329     392    1404     244     115     100
VMT FRACTIONS      :
                    .625342 .041837 .139029 .056317 .025852 .034116 .003478 .002047
                    .001653 .006586 .008116 .009670 .034634 .006019 .002837 .002467
VMT BY FACILITY    :V001107F.def
VMT BY HOUR        :V001107H.def
SPEED VMT          :V001107S.def


SCENARIO RECORD    :[08 0011]  8

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
```

```
*VMT TOTALS            17317
*                      10769     721    2394     970     445     618      63      37
*                         30     119     147     175     627     108      51      43
VMT FRACTIONS      :
                     .621869 .041636 .138247 .056015 .025698 .035688 .003638 .002137
                     .001732 .006872 .008489 .010106 .036208 .006237 .002945 .002483
VMT BY FACILITY    :V001108F.def
VMT BY HOUR        :V001108H.def
SPEED VMT          :V001108S.def


SCENARIO RECORD    :[09 0011]  9

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS             2026
*                       1247      84     278     112      52      77       8       5
*                          4      15      18      22      78      10       5      11
VMT FRACTIONS      :
                     .615461 .041465 .137230 .055287 .025669 .038010 .003949 .002468
                     .001975 .007404 .008885 .010860 .038503 .004936 .002468 .005430
VMT BY FACILITY    :V001109F.def
VMT BY HOUR        :V001109H.def
SPEED VMT          :V001109S.def


SCENARIO RECORD    :[10 0011] 10

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS              721
*                        450      30     100      41      19      24       2       1
*                          1       5       6       7      24       6       3       2
VMT FRACTIONS      :
                     .624314 .041589 .138629 .056838 .026340 .033271 .002773 .001386
                     .001386 .006931 .008318 .009704 .033271 .008318 .004159 .002773
VMT BY FACILITY    :V001110F.def
VMT BY HOUR        :V001110H.def
SPEED VMT          :V001110S.def


SCENARIO RECORD    :[11 0011] 15

CALENDAR YEAR      :1990
EVALUATION MONTH   : 7
FUEL PROGRAM       : 1
SEASON             : 1
SUNRISE/SUNSET     : 6 8
CLOUD COVER        : 0.35
*VMT TOTALS           892600
*                     600005   40148  133401   54042   24805   10380    1062     625
*                        500    2001    2468    2938   10535    4930    2320    2440
VMT FRACTIONS      :
                     .672198 .044979 .149452 .060544 .027790 .011629 .001190 .000700
                     .000560 .002242 .002765 .003292 .011803 .005523 .002599 .002734
VMT BY FACILITY    :V001111F.def
VMT BY HOUR        :V001111H.def
SPEED VMT          :V001111S.def


END OF RUN         : 0021
```

INPUT SCRIPTS CONTINUE FOR EVERY COUNTY AREA TYPE COMBINATION……

Attachment 1 to Appendix D

1990 I/M Input File to MOBILE6 for the Baltimore Region

```
*MD IM Program for 1990.  Idle Test All Vehicles
*Idle for all vehicles
I/M PROGRAM        : 1 1984 2050 2 T/O Idle
I/M MODEL YEARS    : 1 1977 2050
I/M VEHICLES       : 1 22222 22222111 1
I/M STRINGENCY     : 1 23.0
I/M COMPLIANCE     : 1 96.0
I/M WAIVER RATES   : 1 21.0 23.0
```

Attachment 2 to Appendix D

1990 Vehicle Age Distribution Inputs to MOBILE6 for the Baltimore Region

```
REG DIST
*
* This file contains the default MOBILE6 values for the distribution of
* vehicles by age for July of any calendar year.  There are sixteeen (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 28 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.
*
* LDV
 1 0.0690 0.0776 0.0771 0.0739 0.0873 0.0747 0.0693 0.0616 0.0586 0.0580
```

```
   0.0544 0.0510 0.0450 0.0356 0.0247 0.0174 0.0098 0.0056 0.0044 0.0037
   0.0044 0.0034 0.0025 0.0018 0.0293
* LDT1
 2 0.0995 0.1223 0.1073 0.0994 0.1017 0.0812 0.0663 0.0504 0.0434 0.0411
   0.0403 0.0363 0.0300 0.0206 0.0168 0.0122 0.0069 0.0041 0.0034 0.0025
   0.0042 0.0031 0.0021 0.0016 0.0035
* LDT2
 3 0.0995 0.1223 0.1073 0.0994 0.1017 0.0812 0.0663 0.0504 0.0434 0.0411
   0.0403 0.0363 0.0300 0.0206 0.0168 0.0122 0.0069 0.0041 0.0034 0.0025
   0.0042 0.0031 0.0021 0.0016 0.0035
* LDT3
 4 0.0626 0.0748 0.0805 0.0688 0.0763 0.0769 0.0522 0.0452 0.0451 0.0477
   0.0559 0.0577 0.0540 0.0528 0.0326 0.0265 0.0156 0.0106 0.0085 0.0073
   0.0127 0.0101 0.0076 0.0044 0.0137
* LDT4
 5 0.0626 0.0748 0.0805 0.0688 0.0763 0.0769 0.0522 0.0452 0.0451 0.0477
   0.0559 0.0577 0.0540 0.0528 0.0326 0.0265 0.0156 0.0106 0.0085 0.0073
   0.0127 0.0101 0.0076 0.0044 0.0137
* HDV2B
 6 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV3
 7 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV4
 8 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV5
 9 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV6
10 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV7
11 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV8a
12 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDV8b
13 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDBS
14 0.0924 0.0690 0.0955 0.0648 0.0969 0.0599 0.0443 0.0318 0.0336 0.0504
   0.0542 0.0550 0.0451 0.0406 0.0327 0.0227 0.0128 0.0104 0.0103 0.0116
   0.0140 0.0097 0.0072 0.0050 0.0305
* HDBT
15 0.0483 0.0434 0.0882 0.0813 0.1221 0.0698 0.0619 0.0404 0.0395 0.0543
   0.0580 0.0602 0.0539 0.0447 0.0361 0.0224 0.0131 0.0106 0.0105 0.0109
   0.0102 0.0059 0.0041 0.0014 0.0087
* Motorcycles
16 0.0799 0.0780 0.0674 0.0638 0.0535 0.0441 0.0414 0.0348 0.0249 0.0235
   0.0267 0.4620 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
```