Houston/Galveston One-Hour Ozone Nonattainment Area Rate-of-Progress On-Road Mobile Source Emissions Inventories Revisions

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INTRODUCTION

As part of the Houston-Galveston One-Hour Ozone Nonattainment Area (HGA) State Implementation Plan (SIP), the Texas Commission on Environmental Quality (TCEQ) agreed to update the SIP with the official release of MOBILE6. A part of the HGA SIP is the Rate-of-Progress (ROP) demonstration, which includes on-road mobile source emissions inventories (EIs) requiring update with MOBILE6.

This Technical Note documents the methods that the Texas Transportation Institute (TTI) used to develop the HGA (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties) ROP on-road mobile source EIs using the latest official release of MOBILE6 (September 2003). This task required the development of the following 15 on-road mobile source ROP EIs: 1990 base-year EI; 1996, 1999, 2002, 2005 and 2007 adjusted base-year EIs (ABYEI); 2002, 2005, and 2007 pre-1990 control EIs (Pre-90CEI); 2002, 2005 and 2007 control strategy EIs (CSEI); additional 2005 and 2007 CSEIs (except with no new inspection and maintenance (I/M) program for the rural counties); and the 1996 Harris County ABYEI, except with the EPA basic I/M program modeled (for the I/M correction analysis).

These ROP EIs were developed following the general SIP EI methodology (i.e., detailed time-of-day, directional link-based method), except that modifications were made as required in the application of MOBILE6 emissions factors and to accommodate use of the current state-of-the-practice on-road mobile source EI development procedures. The U.S. Environmental Protection Agency (EPA) guidance used for these EIs can be found in the document: *Guidance*

on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans, EPA, 1993, and *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration,* EPA, 1994. These on-road mobile source EIs are for use with the ROP EIs from the other major source categories to calculate milestone year ROP emissions target levels, required emissions reductions, and to estimate control strategy performance in relation to these target levels. The results may also be used to develop Motor Vehicle Emissions Budgets (MVEB) for transportation conformity determinations.

Emissions of volatile organic compounds (VOC), carbon monoxide (CO), and oxides of nitrogen (NOx) were estimated for each county on an hourly basis. The estimates were computed by the Houston-Galveston Area Council (HGAC) travel demand model (TDM) network links, and summarized by county, network functional classification (or road type), and 28 vehicle types.

The emissions estimates are characteristic of HGA peak ozone season (July through September) weekday (average Monday through Friday) travel. The HGA peak ozone season was defined based on the EPA guidance (*Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA 1992) for developing temperature inputs for the ROP base year on-road mobile source EIs. The temperatures, relative humidity and barometric pressure inputs to MOBILE6 were developed consistent with this guidance.

This document provides the ROP EI summaries and descriptions with corresponding lists of controls modeled. It includes the methods used for developing the vehicle miles traveled (VMT) adjustment factors, link-based VMT and speed estimates, speeds, VMT mix, MOBILE6 emissions factors, and the emissions estimates.

ACKNOWLEDGMENTS
Mary McGarry-Barber and Chris Kite, with TCEQ, and Martin Boardman and L.D. White, of TTI, contributed to the development of the MOBILE6 emissions factors input data parameter values. Boardman produced the MOBILE6 model set-ups, and performed the emissions factors and emissions analyses. Chris van Slyke of HGAC provided the Houston/Galveston area network traffic assignments and intrazonal trips. Dennis Perkinson, Ph.D., of TTI, developed seasonal VMT factors, VMT hourly allocation factors and VMT mix. White developed the HPMS-consistency factors and other VMT factors, as well as post-processed the HGAC TDM data sets to develop the VMT and operational speeds estimates. Each member of the assigned TTI staff contributed to the quality assurance of the emissions inventory elements. Dr. Perkinson was the principle investigator for this project. This work was performed by TTI under contract to TCEQ. Mary McGarry-Barber was the TCEQ project technical manager.

Deliverables
Interim deliverables are an informal Technical Note (a narrative in memorandum format that explains the task, the approaches used, and the findings) provided to the Project Manager in WordPerfect 6/7/8 format, which is supported by electronic document files. All pertinent data are being submitted in specified electronic format. (There is no FORTRAN source code or executable files developed under this task.) CD-ROM is used to record the final data and

supporting documentation. TTI is providing five copies of the final report. One copy is an unbound original suitable for copying. Electronic copies of all materials related to the task report, to document results and conclusions (e.g., data, work files), or developed as work products under this contract are provided as requested by the TCEQ staff.

The ROP EI data sets were previously submitted to TCEQ on CD-ROM. Appendix A lists the data set file names and descriptions. The data sets provided include:

- hourly and 24-hour, county and region-level, functional classification and vehicle class-specific data summaries for each ROP EI evaluation, including estimates of weekday VMT mix, ozone season weekday VMT, average speed, and composite emissions for each pollutant; and

- MOBILE6 emissions factor inputs, adjustment factors, and the resulting county level, hourly, day-specific emissions factor tables.

EMISSIONS INVENTORY SUMMARIES AND DESCRIPTIONS

Table 1 summarizes the results of each HGA ROP EI, excluding the Harris County 1996 adjusted base year with EPA basic I/M emissions estimates (for the I/M correction analysis), which is presented in Table 2 as a part of the 1996 milestone year I/M correction estimate.

Table 1
HGA All Counties One-Hour Rate-of-Progress Ozone Season Weekday
On-Road Mobile Source VMT, Average Speed (mph), and Emissions (tons per day)

Emissions Inventory	VMT	Speed*	VOC	CO	NOx
1990 Base Year	98,710,454	35.4	321.7	4,200.4	391.1
1996 Adjusted Base Year (ABY)	98,710,454	35.4	182.4	2,430.6	319.6
1999 ABY	98,710,454	35.4	156.1	2,056.7	303.1
2002 ABY	98,710,454	35.4	141.2	1,896.2	286.9
2005 ABY	98,710,454	35.4	130.2	1,764.5	253.9
2007 ABY	98,710,454	35.4	129.3	1,748.4	247.6
2002 Pre-1990 Control (Pre90C)	131,839,614	36.0	187.8	2,541.4	383.6
2005 Pre90C	142,067,256	36.2	186.2	2,553.5	366.9
2007 Pre90C	148,552,482	36.3	193.1	2,651.3	374.3
2002 Control Strategy (CS)	131,839,614	36.0	132.0	1,777.5	326.6
2005 CS	142,067,256	36.2	103.6	1,377.3	249.0
2005 CS, no new Rural County I/M	142,067,256	36.2	104.2	1,392.8	249.3
2007 CS	148,552,482	36.3	89.4	1,076.1	203.2
2007 CS, no new Rural County I/M	148,552,482	36.3	90.0	1,091.4	203.6

* VMT divided by TDM vehicle hours traveled (VHT).

Table 2
Harris County One-Hour Rate-of-Progress 1996 I/M Correction Estimate (tons per day)

Emissions Inventory	VOC	CO	NOx
1996 Harris County ABY	133.4	1,684.3	240.2
1996 Harris County ABY w/ EPA Basic I/M	138.7	1,787.3	239.1
1996 ABY (-) 1996 ABY w/ EPA Basic I/M	-5.4	-103.0	1.1

There were four activity data sets and 12 emissions factor data sets used to develop these 15 ROP emissions inventories. Table 3 correlates activity and emissions factor elements as they were applied to develop each of the 15 EIs.

Table 3
HGA ROP Emissions Inventories - Activity and Emissions Factor Element Associations

VMT/ Speeds	VMT Mix	Emissions Inventory	Emissions Factors*
1990	1990	1990 Base Year EI	1990 Base Year
	1996	1996 ABYEI	1996 pre-1990 Control (Pre-90C)
		1996 Harris ABYEI with EPA Basic I/M	
	1999	1999 ABYEI	1999 Pre-90C
2002	2002	2002 ABYEI	2002 Pre-90C
		2002 Pre-90CEI	
		2002 CSEI	2002 Control Strategy (CS)
1990	2005	2005 ABYEI	2005 Pre-90C
2005		2005 Pre-90CEI	
		2005 CSEI	2005 CS
		2005 CSEI, no new Rural County I/M	2005 CS, no new Rural County I/M
1990	2007	2007 ABYEI	2007 Pre-90C
2007		2007 Pre-90CEI	
		2007 CSEI	2007 CS
		2007 CSEI, no new Rural County I/M	2007 CS, no new Rural County I/M

* "Pre-1990 Control" emissions factors model the milestone year fleet with pre-1990 controls. Pre-1990 Control emissions factors were thus modeled with 1990 base year emissions factors inputs except: 1) calendar year input is evaluation year; 2) "no clean air act" command was used; 3) summer 1992 RVP limit (promulgated prior to 1990 CAAA) was used; 4) diesel fractions input correspond to calendar year input; and 5) TCEQ's actual "rebuild program" effectiveness rate was used for 2002 (affects HDDV standards promulgated prior to 1990 CAAA). "Control Strategy" emissions factors model the actual 2002 controls, and the controls to be in effect for 2005 and 2007.

The HGA EIs, as shown in Table 3, fall into four main ROP on-road mobile source EI categories: 1) Base Year; 2) Adjusted Base Year; 3) Pre-1990 Controls with Growth; and 4) Control Strategy. As the HGA ROP plan also requires an I/M correction for Harris County for the 1996 milestone, the additional Harris County 1996 ABYEI with EPA basic I/M was developed for producing the I/M correction estimate. Further definition and application of these emissions estimates for ROP planning purposes may be found in the pertinent EPA guidance.

The control programs, as modeled in the emissions factors, are summarized in Table 4.

Table 4
Emissions Factor Modeled Control Programs For ROP Emissions Inventories

Emissions Factor Analysis	Controls Modeled
1990 Base Year	Pre-90 Federal Motor Vehicle Control Program (FMVCP), 1990 State program (Anti-Tampering Program [ATP], Harris County), (estimated actual Reid Vapor Pressure [RVP] applied).
1996 Pre-90 Control	Pre-90 FMVCP[1], Federal 1992 Summertime RVP limit, 1990 State programs (ATP, Harris County).
1999 Pre-90 Control	
2002 Pre-90 Control	
2005 Pre-90 Control	
2007 Pre-90 Control	
1996 Pre-90 Control, Harris I/M Correction	Pre-90 FMVCP, Federal 1992 Summertime RVP limit, EPA Basic I/M (replaces 1990 Harris County ATP).
2002 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2002 State programs (I/M and ATP: Harris County; gas cap pressure test: all other counties).
2005 Control Strategy[2]	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2005 State programs (I/M, ATP and low-emissions diesel [LED]: all counties).
2007 Control Strategy[2]	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline (RFG), 2007 State programs (I/M, ATP and LED: all counties).

[1] The HDDV defeat device and mitigation programs (i.e., 2004 HDDV standard pull-ahead and HDDV rebuild programs) are viewed as affecting HDDV FMVCP promulgated prior to 1990, thus these features are modeled in the Pre-90 Control emissions factors as included in Pre-90 FMVCP.

[2] One additional set of Control Strategy emissions factors were developed each for 2005 and 2007; these emissions factors exclude the new I/M program for rural counties (Chambers, Liberty, and Waller).

OVERVIEW OF METHODOLOGY

To develop the HGA ROP EIs, the directional link-based, hourly methodology was applied. For each of the 15 evaluations, the emissions estimates were calculated at the roadway network link level for each hour of the HGA peak ozone season.

The MOBILE6 model (EPA, September 2003) was used to develop hourly emissions factors by MOBILE6 road type (or drive cycle) and 28 vehicle types. The speed sensitive freeway and arterial emissions factors, and the fixed-speed ramp emissions factors were used. The freeway emissions factors were applied to links with interstate, freeway, and toll roads functional classification codes; the ramp emissions factors were used with links coded as ramp (for freeway, toll roads, and frontage roads); and arterial emissions factors were applied to all other links.

The activity basis were the 1990, 2002, 2005, and 2007 Houston/Galveston directional TDM link-based and intrazonal VMT (or total TDM VMT estimate) developed from HGAC's newly structured TDMs, adjusted to ozone season weekday activity and for consistency with Highway Performance Monitoring System (HPMS) VMT, and allocated to each hour of the day. The 1990 total TDM VMT estimate for each county was adjusted to the original 1990 base-year ROP SIP EI county VMT totals (HGAC 1993). The 2002, 2005, and 2007 total TDM VMT estimates were seasonally adjusted with ATR-based ozone season weekday adjustment factors, adjusted to consistency with HPMS. As shown in Table 3, the ABYEIs all use 1990 VMT, thus the milestone year VMT for 1996 and 1999 were not required. All analysis year seasonally adjusted, HPMS consistent VMT were allocated to each hour of the day with regional, ATR-based, ozone season weekday hourly VMT fractions. Hourly, directional, average operational speeds were modeled by link. Vehicle classification data were used to estimate time-of-day VMT mixes for apportioning fleetwide link VMT for three road type groups to the 28 EPA vehicle types. Link-level emissions by vehicle type were calculated for each hour.

TTI previously developed a series of computer programs to develop detailed on-road mobile source emissions inventories. These computer programs were used to produce and apply the major emissions inventory elements (adjusted operational time-of-day link VMT by vehicle type, operational link-speeds, VMT mix, and MOBILE6 emissions factors) to calculate the emissions estimates. Appendix B describes these programs and their application.

ESTIMATION OF VMT

The outputs of the VMT estimation process are estimates of HPMS consistent, hourly link VMT by average peak ozone season weekday for the HGAC 1990, 2002, 2005, and 2007 TDM networks (each consisting of an AM Peak assignment, Mid-Day assignment, PM Peak assignment and an Overnight assignment) and for each of the added intrazonal links. See Table 9 for hours associated with each assignment period. The TRANSVMTHSPDWKD program was used to produce these VMT estimates (and to estimate operational link speeds, discussed in a following section). Appendix B includes a description of this program.

Data Sources

The TDMs were provided by HGAC for the following years: 1990 (model date March 2004), 2002 (model date January 2004), 2005 (model date March 2004), and 2007 (model date January 2004). Each HGAC travel model consists of four directional, time-of-day period assignments. HGAC also provided trip tables for each travel model year (one for each time-of-day assignment for each travel model year or 16 total trip tables). Since the intrazonal trips are not included in the TDM, the trip tables were used (along with a calculated zonal radii) to estimate the intrazonal VMT. To adjust the TDM VMT to consistency with HPMS VMT and from average non-summer weekday traffic (ANSWT) form to ozone season weekday VMT, as well as to allocate it to ozone season weekday hourly proportions, several other sources of data were needed.

HPMS VMT estimates are based on traffic count data collected according to a statistical sampling procedure specified by the Federal Highway Administration (FHWA) designed to estimate VMT. A wide range of traffic data is collected under the HPMS program. For this study, county total HPMS Annual Average Daily Traffic (AADT) VMT were used to ensure the travel model VMT were consistent with the HPMS VMT estimates. (EPA and FHWA have endorsed HPMS as the appropriate source of VMT and require that VMT used to construct on-road mobile source emissions inventories be made consistent with that reported through HPMS.)

ATR vehicle counts are collected by the Texas Department of Transportation (TxDOT) at selected locations on a continuous basis throughout Texas. These counts are available by season, month, and weekday, as well as on an annual average daily basis (i.e., AADT). Since they are continuous, they are especially well suited for making seasonal and time-period comparisons (e.g., for seasonal adjustments and hourly allocations), even though there may be relatively few ATR data collection locations in any given area. For VMT adjustment factors requiring season and day-type specificity, multi-year (1999 through 2002) day-type-specific (average Monday through Friday) ATR data for the HGA peak ozone season period (July through September) were grouped from all active ATR stations in the HGA eight-county area. ATR count data were used in developing the HPMS adjustment factor, peak ozone season weekday adjustment factors and ozone season weekday hourly travel factors.

VMT Adjustments

The TDM VMT were adjusted for consistency with HPMS and to ozone season weekday travel. For historical years (1990 and 2002), VMT control totals were used. For future years (2005 and 2007), the HPMS factor and an ozone season weekday factor were used. Hourly travel factors were also applied to distribute the 24-hr HPMS consistent, seasonally adjusted VMT to each hour of the ozone season weekday.

1990 Historical Year VMT Adjustment

To maintain consistency with the original 1990 ROP SIP base year EI ozone season weekday VMT (HGAC 1993), the 1990 TDM county-level VMT were adjusted to match that of the original 1990 ROP base year EI ozone season weekday VMT (i.e., the original county-level 1990 ROP base year EI ozone season weekday VMT were used as control totals). For each county, the VMT total (TDM VMT plus intrazonal VMT) was divided into the county's respective control total; thus producing eight county-level VMT adjustment factors. For each

link in the TDM, the volume was multiplied by the corresponding VMT adjustment factor (based on the county in which the link is located). The seasonally adjusted link-volumes were then multiplied by the associated link lengths to produce the 1990 link-level ozone season weekday VMT estimates. Table 5 shows the TDM VMT for each county and their respective control totals.

Table 5
HGA County 1990 Travel Model VMT and Ozone Season Weekday Control Totals[1]

County	Travel Model VMT[2]	Ozone Season Weekday Control Total[3]
Brazoria	4,456,568	4,565,964
Chambers	2,016,690	1,615,624
Fort Bend	4,588,705	4,462,693
Galveston	3,839,627	5,165,706
Harris	72,035,515	75,360,458
Liberty	1,670,086	1,639,720
Montgomery	5,320,206	4,860,970
Waller	1,157,378	1,039,331
HGA	95,084,775	98,710,466

[1] Rounded to whole numbers.
[2] These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.
[3] Weekday activity is average Monday through Friday. The 1990 control totals are the original 1990 ROP base year EI ozone season weekday county-level VMT.

2002 Historical Year VMT Adjustment
To adjust the 2002 travel model VMT to HPMS-consistent, county-level, ozone season weekday VMT estimates, VMT control totals were used. These control totals were calculated using the HPMS AADT VMT (reported by TxDOT in the 2002 Roadway Inventory Functional Classification Record [RIFCREC] Report) for each county and an ATR-based ozone season weekday (July through September, Monday through Friday) adjustment factor.

The ozone season weekday factor was developed using aggregated ATR data from the latest available years (1999 through 2002) from active ATR stations within HGA. This regional factor was calculated by dividing the average Weekday count by the AADT traffic count. The 2002 evaluation year ozone season weekday factor is 1.07333.

The HPMS AADT VMT for each county was then multiplied by the ozone season weekday factor to produce eight VMT control totals (one for each county). For each county, the TDM

total VMT (TDM assignment VMT plus intrazonal VMT estimate) was divided into the county's respective control total, thus producing eight county-level VMT adjustment factors. For each link in the TDM, the volume was multiplied by the corresponding VMT adjustment factor (based on the county in which the link is located). The seasonally adjusted link-volumes were then multiplied by the associated link lengths to produce the 2002 link-level ozone season weekday VMT estimates. Table 6 shows the TDM VMT, HPMS AADT VMT, and ozone season weekday control total for each county.

Table 6
HGA 2002Travel Model VMT, AADT VMT, and Ozone Season Weekday Control Totals[1]

County	Travel Model VMT[2]	AADT VMT[2]	Ozone Season Weekday Control Total[3]
Brazoria	5,254,686	5,342,213	5,733,958
Chambers	2,325,564	2,081,091	2,233,698
Fort Bend	7,735,030	7,429,601	7,974,414
Galveston	4,823,745	5,504,313	5,907,944
Harris	91,426,586	89,650,361	96,224,422
Liberty	2,032,348	2,111,462	2,266,295
Montgomery	8,579,616	8,922,173	9,576,436
Waller	1,911,274	1,791,114	1,922,456
HGA	124,088,850	122,832,328	131,839,623

[1] Rounded to whole numbers.
[2] These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.
[3] Weekday activity is average Monday through Friday.

2005 and 2007 Future Year VMT Adjustment

The 2005 and 2007 TDM VMT were adjusted for consistency with HPMS (using an HPMS factor) and to ozone season weekday travel (using an ozone season weekday factor). The HPMS factor and the ozone season weekday factor are discussed in the two following sections. For each link in the travel model, the link volume was multiplied by the HPMS factor and the ozone season weekday factor. These seasonally adjusted and HPMS consistent link volumes were then multiplied by their respective link lengths to estimate the link level ozone season weekday VMT estimates for each year. Table 7 and Table 8 shows the unadjusted TDM VMT and the TDM VMT adjusted to ozone season weekday, HPMS consistent VMT for 2005 and 2007, respectively.

Table 7
HGA County 2005 Travel Model and Ozone Season Weekday VMT[1]

County	Travel Model VMT[2]	Ozone Season Weekday VMT[3]
Brazoria	5,831,168	6,157,662
Chambers	2,570,672	2,714,607
Fort Bend	8,914,944	9,414,101
Galveston	5,193,087	5,483,853
Harris	97,813,862	103,290,559
Liberty	2,217,141	2,341,280
Montgomery	9,831,848	10,382,344
Waller	2,161,810	2,282,851
HGA	134,534,533	142,067,256

[1] Rounded to whole numbers.
[2] These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.
[3] Also adjusted to consistency with HPMS. Weekday activity is average Monday through Friday.

Table 8
HGA County 2007 Travel Model and Ozone Season Weekday VMT[1]

County	Travel Model VMT[2]	Ozone Season Weekday VMT[3]
Brazoria	5,988,850	6,324,172
Chambers	2,591,256	2,736,343
Fort Bend	9,740,650	10,286,039
Galveston	5,625,799	5,940,793
Harris	101,836,550	107,538,478
Liberty	2,310,600	2,439,973
Montgomery	10,349,389	10,928,862
Waller	2,232,806	2,357,823
HGA	140,675,899	148,552,482

[1] Rounded to whole numbers.
[2] These are unadjusted 24-hour VMT totals from time-of-day traffic assignments including intrazonal VMT.
[3] Also adjusted to consistency with HPMS. Weekday activity is average Monday through Friday.

HPMS Factor for Future Analysis Years
The HPMS adjustment factor was used to adjust the 2005 and 2007 TDMs for HPMS consistency. This factor was developed using the 2002 TDM (HGAC, January 2004), the estimated intrazonal VMT for the 2002 TDM, and the 2002 HPMS VMT reported by TxDOT.

The HPMS factor is calculated as:

HPMS VMT (AADT) × ANSWT Adjustment Factor = HPMS VMT (ANSWT)

HPMS VMT (ANSWT) / Model VMT (ANSWT) = HPMS Factor

The HPMS VMT (AADT) component was the eight-county total 2002 HPMS VMT (reported by TxDOT in the 2002 RIFCREC Report). The ANSWT adjustment factor (i.e, used to convert AADT to ANSWT) was based on ATR data aggregated from all ATR stations within the HGA eight-county TDM network area. The model VMT (ANSWT) was produced from the 2002 travel model assignments and estimated intrazonal VMT. The actual values for the HPMS factor calculation are:

122,832,328 × 1.0558338 = 129,690,523.6

129,690,523.6 / 124,088,850.0 =1.045142441

Ozone Season Weekday Factor for Future Analysis Years
The HGA regional ATR-based ozone season weekday factor adjusts the travel model and estimated intrazonal VMT to VMT estimates to that of a typical ozone season weekday. The regional factor is the average ozone season weekday traffic count divided by the ANSWT traffic count. The ozone season weekday adjustment factor, applied for both 2005 and 2007, is 1.01038.

Hourly Travel Factors
The adjusted VMT for a given analysis year must be allocated to each hour of the 24-hour period. To accomplish this, hourly travel factors were applied to the link level VMT estimates. These hourly travel factors were developed using the multi-year, eight-county region, ozone season weekday ATR data. One HGA region-level set of 24 hourly factors were developed and applied for all analysis years. To maintain the analysis year VMT proportions within each of the four assignment time periods, the hourly fractions were normalized within each time period for each analysis year. Table 9 shows the assignment time periods, their respective hours of the day and corresponding hourly travel factors.

Table 9
HGA Hourly Ozone Season Weekday Time Period Volume Factors

Assignment	Hour	Weekday
AM Peak	6:00 a.m.	0.311896
	7:00 a.m.	0.377297
	8:00 a.m.	0.310807
Mid-Day	9:00 a.m.	0.159733
	10:00 a.m.	0.155910
	11:00 a.m..	0.163345
	12:00 p.m..	0.168248
	1:00 p.m.	0.171479
	2:00 p.m.	0.181285
PM Peak	3:00 p.m.	0.236153
	4:00 p.m.	0.259677
	5:00 p.m.	0.277245
	6:00 p.m.	0.226925
Overnight	7:00 p.m.	0.212531
	8:00 p.m.	0.166099
	9:00 p.m.	0.147345
	10:00 p.m..	0.117460
	11:00 p.m.	0.080191
	12:00 a.m.	0.043776
	1:00 a.m.	0.027944
	2:00 a.m.	0.025288
	3:00 a.m.	0.022565
	4:00 a.m.	0.037842
	5:00 a.m.	0.118959

ESTIMATION OF LINK SPEEDS

The operational speeds for each link, excluding centroid connectors and the special intrazonal links, were calculated using the Houston speed model. The Houston speed model calculates these speeds using the travel model speed, speed factors (consisting of a freeflow speed factor and level of service [LOS] E speed factor) and a volume-to-capacity (v/c) ratio-based speed reduction factor (SRF), and the v/c ratio for each link. For the centroid connector links, the travel model speed was used as the operational speed. For the intrazonal links, the centroid connector speeds within each zone were averaged to determine the operational speed for each zone.

The speed factors were used to convert the travel model speed to a freeflow speed and an LOS E speed (i.e., application of these factors results in two speeds). These factors were grouped into seven functional groups. Appendix C shows the speed factors and the network functional class and functional group relationship.

The link specific v/c ratio is calculated as the time period (hourly) volume divided by the time period capacity. The v/c ratio is expressed as:

$$\text{v/c ratio} = Vh / Ch$$

Where:

Vh = the hourly link volume (travel model assignment period ANSWT link volume × HPMS factor × seasonal weekday adjustment factor × hourly time period factor); and

Ch = the hourly link capacity (travel model assignment period link capacity × hourly capacity factor). Appendix C shows the hourly capacity factors.

After the v/c ratio was calculated, the link specific SRF was determined using the v/c ratio and the link-coded SRF area type and SRF functional class. The SRFs are for v/c ratios of 0.00 to 1.00 in 0.05 increments (i.e., 0, 0.05, 0.10, ... , 0.95, 1.00). Appendix C shows the SRFs. The link specific SRF was calculated using linear interpolation. For v/c ratios greater than 1.0, an SRF is not required.

The speed model (for v/c ratios from 0.00 to 1.00) is expressed as:

$$S_{V/C} = S_{0.0} - SRF_{V/C} \times (S_{0.0} - S_{1.0})$$

Where:

$S_{V/C}$ = estimated directional speed for the forecast v/c ratio on the link in the subject direction;

$S_{0.0}$ = estimated freeflow speed for v/c ratio equal to 0.0;

$S_{1.0}$ = estimated LOS E speed for v/c ratio equal to 1.0; and

$SRF_{V/C}$ = speed reduction factor for the v/c ratio on the link. The v/c ratio can be 0.0 to 1.0. See four SRF plots in Appendix C.

For v/c ratios greater than 1.0 and less than 1.5, the model extension discussed below was used. The speed model extension is:

$$S_{V/C} = S_{1.0} \times (1.15/(1.0 + (0.15 \times (v/c)^4)))$$

Where:

$S_{v/c}$ = estimated directional speed for the forecast v/c ratio on the link in the subject direction;

$S_{1.0}$ = estimated LOS E speed for the v/c ratio equal to 1.0; and

v/c = the forecast v/c ratio on the link. The v/c ratio can be 1.0 to 1.5.

For v/c ratios greater than 1.5, the speed was computed using the speed model extension shown above, except the v/c ratio was set to 1.5.

These speed models were applied to all functional classes excluding the centroid connector and intrazonal functional classes. The centroid connector travel model input speeds were used as the centroid connector operational speeds estimates. Operational speeds for the intrazonal functional class were estimated by zone as the average of the zone's centroid connector speeds.

The hourly and 24-hour VMT weighted speed summaries by county and road type were provided electronically to TCEQ (see Appendix A for electronic data descriptions).

ESTIMATION OF VMT MIX

VMT mix was estimated using TxDOT 1997 - 2002 vehicle classification data (1997 - 1999 data for 1990, 1996 and 1999, and all data for 2002 and future analysis years), TxDOT registrations data (latest available, i.e., 2003) and MOBILE6 default diesel fractions where necessary. There were four time-of-day (TDM assignment) period VMT mix estimates developed by three functional classification groups for each of the four day types. The eight-county area data were aggregated.

TxDOT classification counts classify vehicles into the standard FHWA vehicle classifications (based on vehicle length/number of axles) using best practice vehicle classification count methods:

C - Passenger vehicles;
P - Two-axle, four-tire single-unit trucks;
B - Buses;
SU2 - Six-tire, two-axle single-unit vehicles;
SU3 - Three-axle single-unit vehicles;
SU4 - Four or more axle single-unit vehicles;

SE4 - Three or four axle single-trailer vehicles;
SE5 - Five-axle single-trailer vehicles;
SE6 - Six or more axle single-trailer vehicles;
SD5 - Five or less axle multi-trailer vehicles;
SD6 - Six-axle multi-trailer vehicles; and
SD7 - Seven or more axle multi-trailer vehicles.

EPA and MOBILE use a different vehicle classification scheme than the FHWA categories. The 28 EPA vehicle categories are defined as a function of gross vehicle weight rating (GVWR) and fuel type (see Table 10). The FHWA axle/vehicle length-based classification categories must be converted into 28 MOBILE GVWR/fuel type-based categories.

The FHWA vehicle classification counts were first aggregated into three intermediate groups:

Passenger Vehicles (PV) - C + P;
Heavy-Duty Vehicles (HDV) - SU2 + SU3 + SU4 + SE4; and
HDDV8b (HDX) - SE5 + SE6 + SD5 + SD6 + SD7.

This was followed by a second intermediate allocation that separates light-duty vehicles (LDV) into PVs and light-duty trucks (LDT) based on TxDOT registration data:

LDV - 0.695 × PV (by county, 2002 Harris registration data shown); and
LDT - 0.305 × PV (by county, 2002 Harris registration data shown).

A third intermediate allocation further separates LDTs into LDT1 and HLDT (note that LDT1 is itself intermediate and is further divided into LDGT1 and LDDT):

LDT1 - 0.813 × LDT (by county, 2002 Harris registration data shown); and
HLDT - 0.187 × LDT (by county, 2002 Harris registration data shown).

Next, the remaining FHWA categories were disaggregated into EPA vehicle groups, as shown. Note that TxDOT vehicle classification count procedures do not distinguish between gasoline and diesel LDTs. Consequently, MOBILE defaults for the year of interest were used. As before, actual TxDOT vehicle registration data were used to separate gasoline from diesel heavy-duty trucks. Note also that motorcycles were not counted separately and were included as a default (subtracted from LDGV):

LDGV - 0.9989987 × LDV (MOBILE6 default for 2007 shown);
LDDV - 0.0010013 × LDV (MOBILE6 default for 2007 shown);
LLDT - 0.9947975 × LDT1 (MOBILE6 default for 2007 shown);
LDDT - 0.0052025 × LDT1 (MOBILE6 default for 2007 shown);
HDGV - 0.358 × HDV (by county, 2002 Harris County registration data shown);

HDDV - 0.642 × HDV (by county, 2002 Harris County registration data shown); and
MC - 0.001 of total (subtracted from LDGV).

This converts the FHWA axle count-based categories into GVWR categories. Table 11 schematically shows this part of the conversion procedure. Starting with the TxDOT vehicle classification data, these data themselves provide sufficient information to complete the first step in the conversion process, the allocation of vehicles into PVs, HDVs, HDDV8bs, and buses (B). Steps 2 and 3 further allocate these categories using TxDOT registration data. Finally, Step 4 allocates light-duty vehicles by fuel type using EPA MOBILE diesel fractions and motorcycles are separated from light-duty gasoline vehicles using a nominal constant.

The MOBILE6 28-category typology is a subset of this typology. A combination of EPA MOBILE6 defaults and area vehicle registration data were used to expand these intermediate categories.

For the 28-category EPA scheme, heavy-duty vehicles (HDV) — HDGV and HDDV — were separated into eight and seven categories respectively. HDDV8b vehicles were counted directly. The 15 HDV categories were separated from total HDV, which have been separated by fuel type using TxDOT registration data by county. Each HDV category (HDGV and HDDV) was then divided into sub-categories based on TxDOT area vehicle registration data. Buses were treated separately.

The 28-category EPA scheme also further divided the two LDT categories based in part on assumed loading. The previous LDGT1 and LDGT2 categories (previously defined as GVWR $\leq$ 6,000 and GVWR > 6,000 to 8,500, respectively) were separated into subcategories in terms of adjusted loaded vehicle weight (ALVW). ALVW is the average of vehicle curb weight and GVWR. Thus, two new intermediate categories are introduced. These are light light-duty trucks (LLDT) and heavy light-duty trucks (HLDT), which are defined as:

LLDT - any light-duty truck rated through 6,000 pounds GVWR; and
HLDT - any light-duty truck rated greater than 6,000 pounds GVWR.

These two new intermediate categories were then used to define the four LDT categories using EPA MOBILE6 defaults for the year of interest. The four LDT categories are:

LDGT1 - light light-duty trucks through 3,750 pounds loaded vehicle weight (LVW);
LDGT2 - light light-duty trucks greater than 3,750 pounds LVW;
LDGT3 - heavy light-duty trucks to 5,750 pounds ALVW; and
LDGT4 - heavy light-duty trucks greater than 5,750 pounds ALVW.

Similarly, the LDDT category was sub-divided into two categories based on GVWR (less than or equal to 6,000 GVWR and 6,000 to 8,500 GVWR). This was accomplished using EPA MOBILE6 default values for the year of interest.

Finally the three bus categories were separated from the TxDOT classification count bus category using EPA MOBILE6 default values. (Under MOBILE6 the HDV category does not include buses.)

Vehicle classification data were not forecast. For future VMT mix estimates, MOBILE6 default values consistent with the future years were used (i.e., 2005 and 2007). For historical VMT mix estimates (i.e., 1990 and 2002), the MOBILE6 default values consistent with the historical years were used. No other adjustments were made to alter the count data and conversion procedure to accommodate future years or historical years. Table 12 shows the VMT mix estimation procedure summary followed by explanatory notes. For this analysis, VMT mix estimates were developed for three functional classification groups (see Table 34 in Emissions Calculations section) and the four HGAC TDM time-of-day assignment periods (See Table 9). Appendix D shows the VMT mixes.

Table 10
EPA Vehicle Types - 28 Categories

Category	Description	GVWR
LDGV	Light-duty gasoline vehicle	≤ 6,000
LDGT1	Light-duty gasoline truck	≤ 6,000
LDGT2	Light-duty gasoline truck	≤ 6,000
LDGT3	Light-duty gasoline truck	6,001 - 8,500
LDGT4	Light-duty gasoline truck	6,001 - 8,500
HDGV2b	Heavy-duty gasoline vehicle	8,501 - 10,000
HDGV3	Heavy-duty gasoline vehicle	10,001 - 14,000
HDGV4	Heavy-duty gasoline vehicle	14,001 - 16,000
HDGV5	Heavy-duty gasoline vehicle	16,001 - 19,500
HDGV6	Heavy-duty gasoline vehicle	19,501 - 26,000
HDGV7	Heavy-duty gasoline vehicle	26,001 - 33,000
HDGV8a	Heavy-duty gasoline vehicle	33,001 - 60,000
HDGV8b	Heavy-duty gasoline vehicle	> 60,000
HDGB	Heavy-duty gasoline bus	all
LDDV	Light-duty diesel vehicle	≤ 6,000
LDDT12	Light-duty diesel truck	≤ 6,000
LDDT34	Light-duty diesel truck	6,001 - 8,500
HDDV2b	Heavy-duty diesel vehicle	8,501 - 10,000
HDDV3	Heavy-duty diesel vehicle	10,001 - 14,000
HDDV4	Heavy-duty diesel vehicle	14,001 - 16,000
HDDV5	Heavy-duty diesel vehicle	16,001 - 19,500
HDDV6	Heavy-duty diesel vehicle	19,501 - 26,000
HDDV7	Heavy-duty diesel vehicle	26,001 - 33,000
HDDV8a	Heavy-duty diesel vehicle	33,001 - 60,000
HDDV8b	Heavy-duty diesel vehicle	> 60,000
HDDBS	Heavy-duty diesel school bus	all
HDDBT	Heavy-duty diesel transit bus	all
MC	Motorcycle	all

Table 11
Initial Vehicle Classification Conversion Procedure

<table>
<tr><th>Start</th><th>Step 1</th><th>Step 2</th><th>Step 3</th><th>Step 4</th></tr>
<tr><td rowspan="8">Total Vehicles</td><td rowspan="5">PV</td><td rowspan="3">LDV</td><td rowspan="2">LDGV</td><td>MC</td></tr>
<tr><td>LDGV</td></tr>
<tr><td colspan="2">LDDV</td></tr>
<tr><td rowspan="3">LDT</td><td rowspan="2">LDT1</td><td>LLDT</td></tr>
<tr><td>LDDT</td></tr>
<tr><td colspan="2">HLDT</td></tr>
<tr><td rowspan="2">HDV</td><td colspan="3">HDGV</td></tr>
<tr><td colspan="3">HDDV</td></tr>
<tr><td colspan="4">HDDV8b</td></tr>
<tr><td colspan="4">B</td></tr>
</table>

Table 12
VMT Mix Estimation Procedure Summary

EPA-8	EPA-28	Conversion
LDGV	LDGV	.9990 × LDV
LDGT1	LDGT1	.2310 × LLDT
	LDGT2	.7690 × LLDT
LDGT2	LDGT3	.6850 × HLDT
	LDGT4	.3150 × HLDT
HDGV	HDGV2b	.519 × HDGV
	HDGV3	.194 × HDGV
	HDGV4	.094 × HDGV
	HDGV5	.034 × HDGV
	HDGV6	.091 × HDGV
	HDGV7	.032 × HDGV
	HDGV8a	.032 × HDGV
	HDGV8b	.004 × HDGV
	HDGB	.0931 × B
LDDV	LDDV	.0010 × LDV
LDDT	LDDT12	.0337 × LDDT
	LDDT34	.9663 × LDDT
HDDV	HDDV2b	.278 × HDDV
	HDDV3	.134 × HDDV
	HDDV4	.081 × HDDV
	HDDV5	.053 × HDDV
	HDDV6	.168 × HDDV
	HDDV7	.102 × HDDV
	HDDV8a	.184 × HDDV
	HDDV8b	HDX
	HDDBT	.3239 × B
	HDDBS	.5830 × B
MC	MC	MC

Notes to VMT Mix Estimation Procedure Summary

Intermediate category factors and sources:

LDV	.695 × PV (by county, 2002 Harris County registration data shown)
LDT	.305 × PV (by county, 2002 Harris County registration data shown)
LDT1	.813 × LDT (by county, 2002 Harris County registration data shown)
HLDT	.187 × LDT (by county, 2002 Harris County registration data shown)
LLDT	.9948 × LDT1 (EPA MOBILE6 default, 2007 shown)
LDDT	.0052 × LDT1 (EPA MOBILE6 default, 2007 shown)
HDV	SU2+SU3+SU4+SE3+SE4
HDX	SE5+SE6+SD5+SD6+SD7
HDGV	.358 × HDV (by county, 2002 Harris County registration data shown)
HDDV	.642 × HDV (by county, 2002 Harris County registration data shown)

Category conversion factors and sources:

LDGV	.9990 × LDV (EPA MOBILE6 default, 2007 shown)
LDGT1	.2310 × LLDT (EPA MOBILE6 default, 2007 shown)
LDGT2	.7690 × LLDT (EPA MOBILE6 default, 2007 shown)
LDGT3	.6850 × HLDT (EPA MOBILE6 default, 2007 shown)
LDGT4	.3150 × HLDT (EPA MOBILE6 default, 2007 shown)
HDGV2a	.519 × HDGV (HGAC area registration data)
HDGV3	.194 × HDGV (HGAC area registration data)
HDGV4	.094 × HDGV (HGAC area registration data)
HDGV5	.034 × HDGV (HGAC area registration data)
HDGV6	.091 × HDGV (HGAC area registration data)
HDGV7	.032 × HDGV (HGAC area registration data)
HDGV8a	.032 × HDGV (HGAC area registration data)
HDGV8b	.004 × HDGV (HGAC area registration data)
HDGB	.0931 × B (EPA MOBILE6 default, 2007 shown)
LDDV	.0010 × LDV (EPA MOBILE6 default, 2007 shown)
LDDT12	.0337 × LDDT (EPA MOBILE6 default, 2007 shown)
LDDT34	.9663 × LDDT (EPA MOBILE6 default, 2007 shown)
HDDV2b	.278 × HDDV (HGAC area registration data)
HDDV3	.134 × HDDV (HGAC area registration data)
HDDV4	.081 × HDDV (HGAC area registration data)
HDDV5	.053 × HDDV (HGAC area registration data)
HDDV6	.168 × HDDV (HGAC area registration data)
HDDV7	.102 × HDDV (HGAC area registration data)
HDDV8a	.184 × HDDV (HGAC area registration data)
HDDV8b	HDX (TxDOT classification counts)
HDDBT	.3239 × B (EPA MOBILE6 default, 2007 shown)
HDDBS	.5830 × B (EPA MOBILE6 default, 2007 shown)
MC	MC (default subtracted from LDGV, no conversion)

ESTIMATION OF EMISSIONS FACTORS

The MOBILE6 model (September 2003) was applied for each county and ROP evaluation to calculate the emissions factors (in grams per mile [g/mi]) of VOC, CO, and NOx. Pollutant composite emissions factors were estimated by speed, hour, MOBILE6 road type (or drive cycle), and average vehicle class. Emissions factor post-processing was required to properly model the vehicle ATP and I/M Program, as well as to model the impacts of the Texas LED Fuel Program.

The MOBILE6 model is equipped with national (or EPA) default modeling values for a wide range of conditions that affect emissions factors. Many MOBILE6 default modeling parameters may be overridden through the use of MOBILE6 commands and their associated inputs and options. For this analysis, particular MOBILE6 defaults were replaced by local input values that were developed to yield emissions factors characteristic of the HGA peak ozone season climatic conditions, and vehicle fleets, activity, and emissions control programs particular to each HGA ROP evaluation.

The following emissions factors documentation discusses the MOBILE6 input/output files, summarizes the control programs modeled, details the aggregation level of the applied MOBILE6 emissions factors, and briefly describes all of the MOBILE6 commands that may affect emissions factor calculations. It also identifies the commands that were applied, explains the development of the locality-specific inputs, and describes the emissions factor post-processing procedures and MOBILE6 inputs for the Harris County I/M correction analysis.

MOBILE6 Input and Output Files

The POLFAC62_3 program (see program descriptions in Appendix B) was applied to run MOBILE6 with the associated MOBILE6 command and external data input files to produce the VOC, CO, and NOx emissions factor output tables. (The emissions factor post-processing utilities, RATEADJ62 and RATEADJV62, were applied to POLFAC62_3 output where post-processing of emissions factors was required, discussed later.)

The final product of the emissions factor modeling was 79 emissions factor files (i.e., one table of hourly emissions factors for each county for the1990 base year analysis, the pre-1990 control analysis for each of the five milestone years, the control strategy analysis for 2002, 2005, and 2007; and for the three rural counties, the additional control strategy analyses for 2005 and 2007; and for Harris County 1996, the emissions factors for the I/M correction). A corresponding set of average 24-hour emissions factors was also produced for quality assurance use.

All of the MOBILE6 input files and output files (MOBILE6 emissions factor tables developed with POLFAC62_3 and post-processed with the RATEADJ programs) were previously provided to TCEQ on CD-ROM. Appendix A lists the MOBILE6 input and output file names.

Control Programs Modeled

Table 13 summarizes the controls modeled for each emissions factor analysis and identifies the control programs where post-processing was required to model the impacts.

Table 13
Control Programs Modeled in HGA ROP MOBILE6 Emissions Factors

Emissions Factor Analysis	Controls Modeled	Emissions Factor Post-Processing for:
1990 Base Year	Pre-90 FMVCP, 1990 State Program (Harris County ATP), (Estimated actual RVP was applied).	Two-part ATP.
1996 Pre-90 Control	Pre-90 FMVCP[1], Federal 1992 Summertime RVP limit, 1990 State program (Harris County ATP).	Two-part ATP.
1999 Pre-90 Control		
2002 Pre-90 Control		
2005 Pre-90 Control		
2007 Pre-90 Control		
1996 Pre-90 Control, Harris I/M Correction	Pre-90 FMVCP, Federal 1992 Summertime RVP limit, EPA Basic I/M.	None.
2002 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline (RFG), 2002 State programs (I/M and ATP: particular to county).	Two-part ATP, Harris I/M May 1st I/M test type change.
2005 Control Strategy[2]	Pre-90 FMVCP, Post-1990 FMVCP, Summer RFG, 2005 State programs (I/M, ATP and LED: all counties).	Two-part ATP, May 1st I/M start (non-Harris counties), LED.
2007 Control Strategy[2]	Pre-90 FMVCP, Post-1990 FMVCP, Summer RFG, 2007 State programs (I/M, ATP and LED: all counties).	Two-part ATP, May 1st I/M start (non-Harris counties), LED.

[1] The HDDV defeat device and mitigation programs (i.e., 2004 HDDV standards pull-ahead and HDDV eebuild programs) are viewed as affecting HDDV FMVCP promulgated prior to 1990, thus these features are modeled in the Pre-90 Control emissions factors as included in Pre-90 FMVCP.
[2] Additional 2005 and 2007 control strategy emissions factor analyses, which exclude the new I/M program, were included for the eural counties.

All FMVCPs were modeled (this is the MOBILE6 default), except for the Pre-90 Control scenarios (for which the NO CLEAN AIR ACT command was applied, as discussed later). Also modeled were the federal programs to offset heavy-duty diesel (HDDV) defeat device effects—the low emissions rebuild program, and the HDDV 2004 standard pull-ahead program

(this is the MOBILE6 default). The RFG program, I/M programs, ATP, and Texas LED program were modeled as well.

As Table 13 shows, post-processing of MOBILE6 emissions factors was required for particular analyses to properly model the ATP and I/M programs, as well as to model the impacts of Texas LED. The limits of MOBILE6 as related to the ATP, I/M, and diesel fuel modeling requirements for this analysis, and the post-processing procedures applied to overcome these limits are discussed in more detail later.

Aggregation Level of MOBILE6 Emissions Factors

The by-model-year (or age-specific) emissions factors from the MOBILE6 detailed database output were condensed into average fleet emissions factors by vehicle class. POLFAC62_3 performed this function for each vehicle type by weighting (multiplying) each of its age-specific emissions factors by their corresponding travel fractions (developed from the MOBILE6 database output age-specific registration fractions and miles traveled fractions) and summing the resulting products. Each emissions factor table provides the MOBILE6 emissions factors by:

- 28 vehicle types;
- 4 road types;
- 14 speeds (except for two MOBILE6 road types, each with one average speed);
- 15 pollutant-specific emissions types; and
- 24 hourly time periods.

Tables 14 through 16 describe the MOBILE6 vehicle type, emissions type (pertaining to VOC, CO, and NOx pollutants), and roadway type classifications. Tables 17 and 18 show the speeds and the sequence for hourly time periods, respectively.

Table 14 shows the 28 MOBILE6 vehicle types as defined by fuel-type (gasoline or diesel) and GVWR category, in sequence by MOBILE6 vehicle type number.

Table 14
Complete MOBILE6 Vehicle Classifications

Number	Abbreviation	Description
1	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
2	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)
3	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)
4	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW*)
5	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)
6	HDGV2b	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs. GVWR)
7	HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
8	HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
9	HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
10	HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
11	HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
12	HDGV8a	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
13	HDGV8b	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
14	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
15	LDDT12	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
16	HDDV2b	Class 2b Heavy-Duty Diesel Vehicles (8,501-10,000 lbs. GVWR)
17	HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
18	HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
19	HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
20	HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
21	HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
22	HDDV8a	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
23	HDDV8b	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs. GVWR)
24	MC	Motorcycles (Gasoline)
25	HDGB	Gasoline Buses (School, Transit, and Urban)
26	HDDBT	Diesel Transit and Urban Buses
27	HDDBS	Diesel School Buses
28	LDDT34	Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs. GVWR)

* The ALVW is the numerical average of the vehicle curb weight and the GVWR.

Source: *MOBILE6 User's Guide* (EPA, January 2002).

Table 15 shows the eight MOBILE6 emissions type classifications (excluding the non-pertinent pollutants, e.g., particulates and toxics). Expanding these emissions types by individual pollutant yields 12 pollutant-specific emissions types. In addition to these 12 pollutant-specific emissions types shown in Table 15, POLFAC62_3 emissions factor tables contain the three composite emissions factors (i.e., one for each pollutant). Thus, POLFAC62_3 calculates MOBILE6 emissions factors for up to 15 pollutant-specific emissions types. For this analysis, MOBILE6 emissions factors were calculated for 14 pollutant-specific emissions types — the refueling emissions type is excluded since refueling emissions are classified as an area source emissions category.

Table 15
MOBILE6 Emission Type Classifications

Number	Abbreviation	Description	Pollutants	Vehicle Classes
1	Running	Exhaust Running Emissions	Hydrocarbon (HC), CO, NOx	All
2	Start	Exhaust Engine Start Emissions (trip start)	HC, CO, NOx	All light-duty vehicles plus MC
3	Hot Soak	Evaporative Hot Soak Emissions (trip end)	HC	Gas, including MC
4	Diurnal	Evaporative Diurnal Emissions (heat rise)	HC	Gas, including MC
5	Resting	Evaporative Resting Loss Emissions (leaks and seepage)	HC	Gas, including MC
6	Run Loss	Evaporative Running Loss Emissions	HC	Gas, less MC
7	Crankcase	Evaporative Crankcase Emissions (blow-by)	HC	Gas, including MC
8	Refueling	Evaporative Refueling Emissions (fuel displacement and spillage)	HC	Gas, less MC

Source: *MOBILE6 User's Guide* (EPA, January 2002).

MOBILE6 calculates emissions factors reflective of driving cycles observed on four roadway types, as well as emissions factors for those emissions types that are not directly applicable to the driving cycles (e.g., start and the evaporative components excluding running losses). Table 16 shows the driving cycle (or roadway type) descriptions. The fifth roadway type, according to MOBILE6 is "None." None, or roadway type number 5, is the index for the emissions types that do not apply to the driving cycles, and thus are not sensitive to, or do not vary by, roadway type or speed.

POLFAC62_3, however, categorizes all of the pollutant-specific emissions types by MOBILE6 roadway types one through four — Freeway, Arterial, Local, and Ramp. That is, in POLFAC62_3 tables, the MOBILE6 g/mi emissions factors corresponding to the "None" roadway type are tabulated as emissions factors under each of the four actual roadway types. This allocation of the MOBILE6 "None" road type emissions factors to the Freeway, Arterial, Local, and Ramp MOBILE6 road types is performed in POLFAC62_3 so that all emissions, regardless of "type," may be spatially allocated to the functional class (or roadway type)-coded network links.

Table 16
MOBILE6 Roadway Classifications

Number	Abbreviation	Description
1	Freeway	High-speed, limited-access roadways
2	Arterial	Arterial and collector roadways
3	Local	Urban local roadways
4	Fwy Ramp	Freeway on and off ramps
5	None	Not applicable (for start and some evaporative emissions)

Source: *MOBILE6 User's Guide* (EPA, January 2002).

Table 17 shows the 14 speeds for which the MOBILE6 freeway and arterial emissions factors were calculated and tabulated. Later in the emissions estimation process, emissions factors for average operational speeds that are not represented in the 14 speeds as tabulated, were calculated by interpolation (except for those speeds higher than the MOBILE6 maximum speed) and those lower than the MOBILE6 minimum speed, in which case the emissions factors corresponding to these bounding speeds were used, respectively). The MOBILE6 Local and Ramp road type emissions factors are not speed sensitive and were each characterized by one average speed.

Table 17
Speeds for POLFAC62_3 Tabulated MOBILE6 Freeway and Arterial Emissions Factors*

Number	Speed
1	2.5 mph
2	5 mph
3	10 mph
4	15 mph
5	20 mph
6	25 mph
7	30 mph
8	35 mph
9	40 mph
10	45 mph
11	50 mph
12	55 mph
13	60 mph
14	65 mph

* The MOBILE6 Local and Ramp drive cycle emissions factor's fixed speeds are 12.9 and 34.6 mph, respectively.

MOBILE6 uses several hourly input parameters (e.g., hourly temperatures, hourly VMT fractions, etc.) to model hourly emissions factors. MOBILE6 requires that hourly input parameters be sequenced starting from the 6 a.m. hour. In some cases, however, particular overnight hours are grouped together as a single time period. Table 18 shows the MOBILE6 sequence for hourly inputs.

Table 18
General Sequence for Calendar Day Hourly* Inputs to MOBILE6

Input Sequence Number	Abbreviation	Description
1	6 a.m.	6 a.m. through 6:59 a.m.
2	7 a.m.	7 a.m. through 7:59 a.m.
3	8 a.m	8 a.m. through 8:59 a.m.
4	9 a.m.	9 a.m. through 9:59 a.m.
5	10 a.m.	10 a.m. through 10:59 a.m.
6	11 a.m.	11 a.m. through 11:59 a.m.
7	12 Noon	12 p.m. through 12:59 p.m.
8	1 p.m.	1 p.m. through 1:59 p.m.
9	2 p.m.	2 p.m. through 2:59 p.m.
10	3 p.m.	3 p.m. through 3:59 p.m.
11	4 p.m.	4 p.m. through 4:59 p.m.
12	5 p.m.	5 p.m. through 5:59 p.m.
13	6 p.m.	6 p.m. through 6:59 p.m.
14	7 p.m.	7 p.m. through 7:59 p.m.
15	8 p.m.	8 p.m. through 8:59 p.m.
16	9 p.m.	9 p.m. through 9:59 p.m.
17	10 p.m.	10 p.m. through 10:59 p.m.
18	11 p.m.	11 p.m. through 11:59 p.m.
19	12 Midnight	12 a.m. through 12:59 a.m.
20	1 a.m.	1 a.m. through 1:59 a.m.
21	2 a.m.	2 a.m. through 2:59 a.m.
22	3 a.m.	3 a.m. through 3:59 a.m.
23	4 a.m.	4 a.m. through 4:59 a.m.
24	5 a.m.	5 a.m. through 5:59 a.m.

* For some MOBILE6 hourly input parameters, overnight hours are grouped. Each hourly inputs data set is representative of the same day or day type, with the hourly data reordered for input to MOBILE6 to start at 6 a.m.

Application of MOBILE6 Commands and Associated Input Parameters

Tables 19 through 25 list and describe all of the MOBILE6 commands that may affect emissions factor calculations (and some commands that affect only the output format or content). Respectively, these seven tables are: MOBILE6 Pollutants and Emission Rates, MOBILE6

External Conditions, MOBILE6 Vehicle Fleet Characteristics, MOBILE6 Activity, MOBILE6 State Programs, MOBILE6 Fuels, and MOBILE6 Alternative Emissions Regulations and Control Measures. These tables identify the combinations of MOBILE6 commands and parameters used.

Parameters associated with each MOBILE6 command are in general labeled as either EPA default, locality- (or county- or region-) specific, or NOT APPLIED. References to MOBILE6 technical reports (found at the EPA MOBILE website [http://www.epa.gov/otaq/models/mobile6/m6tech.htm]) pertaining to particular commands/input parameters are provided in the tables. Unless otherwise stated, the tabulated commands and input parameters were applied for all counties and evaluations.

The procedures used to develop the locality-specific inputs to MOBILE6, as well as the detailed MOBILE6 I/M and ATP inputs, are described following the seven MOBILE6 input category tables. Next, the emissions factor post-processing procedures required due to limitations of the MOBILE6 model, and the inputs pertaining to the 1996 I/M correction procedure are provided.

Table 19
MOBILE6 Pollutants and Emission Rates

Command	Function/Description	Input Parameter Source/Value
POLLUTANTS	Defines the basic set of pollutants to report.	NOT APPLIED. (The MOBILE6 default is assumed: HC, CO, NOx.)
PARTICULATES	Enables computation of particulate matter (PM) and related emissions factors.	NOT APPLIED.
PARTICULATE EF	Specifies location of files that contain the particulate emissions factors when PARTICULATES command is used.	NOT APPLIED.
PARTICLE SIZE	Allows user to specify the maximum particulate size cutoff used by MOBILE6.	NOT APPLIED.
EXPRESS HC AS VOC	One of five possible commands which allow the user to specify the particular HC species (non-methane HC, non-methane organic gases, total HC, total organic gases, and VOC) to report in the exhaust emissions output.	APPLIED. Only the command is required.
NO REFUELING	Directs MOBILE6 not to calculate refueling emissions factors.	APPLIED. Only the command is required.
AIR TOXICS	Enables the computation of air toxic emissions factors (six explicit pollutants) and specifies which to calculate.	NOT APPLIED.
ADDITIONAL HAPS	Allows entry of emissions factors or air toxic ratios for calculation of additional user-defined air toxic pollutant emissions factors.	NOT APPLIED.
MPG ESTIMATES	Allows entry of alternate fuel economy performance data by vehicle class and model year.	NOT APPLIED. (The MOBILE6 default values are assumed.)

Table 20
MOBILE6 External Conditions

Command	Function/Description	Input Parameter Source/Value
CALENDAR YEAR	Identifies calendar year for which emissions factors are to be calculated. (Required to run model).	Base Year: 1990; Pre-90 Controls: 1996, 1999, 2002, 2005, 2007; Control Strategy: 2002, 2005, 2007.
EVALUATION MONTH	Provides option of calculating January 1 or July 1 emissions factors for calendar year of evaluation.	7 (for July).
MIN/MAX TEMPERATURE	Sets minimum and maximum daily temperatures. (Required to run model if the HOURLY TEMPERATURES command is not used.)	NOT APPLIED. (See HOURLY TEMPERATURES.)
HOURLY TEMPERATURES	Allows temperatures input for each hour of day. (Required to run model if MIN/ MAX TEMPERATURE command is not used.)	Region specific ozone season weekday values (provided by TCEQ, see Table 26).
ALTITUDE	Specifies high- or low-altitude for modeling area.	NOT APPLIED. (EPA default, low altitude, is assumed).
ABSOLUTE HUMIDITY	Used to specify daily average humidity. Affects HC, CO, and NOx emissions for the portion of the fleet that MOBILE6 determines is using air conditioning.	NOT APPLIED. (See RELATIVE HUMIDITY.)
Environmental Effects on Air Conditioning:	Commands used to model the extent of vehicle air-conditioning usage.	
CLOUD COVER	Defines average percent cloud cover for given day.	NOT APPLIED. (EPA default assumed.)
PEAK SUN	Specifies Mid-Day hours with peak sun intensity.	NOT APPLIED. (EPA default assumed.)
SUNRISE/SUNSET	Allows user to specify time of sunrise and sunset.	Region-specific values (provided by TCEQ), 7 a.m. and 8 p.m.
RELATIVE HUMIDITY	Specifies use of 24 hourly relative humidity values entered by user. MOBILE6 will perform hour-specific calculations with hourly values rather than use daily default absolute humidity value.	Region-specific ozone season weekday values (provided by TCEQ, see Table 26).
BAROMETRIC PRES	Specifies use of user input daily average barometric pressure for use with hourly relative humidity to calculate hourly absolute humidity values.	Region-specific ozone season weekday values (provided by TCEQ, see Table 26).

Table 21
MOBILE6 Vehicle Fleet Characteristics

Command	Function/Description	Input Parameter Source/Value
REG DIST	Allows the user to supply registration distributions by age for any of the 16 composite (combined gasoline and diesel) vehicle types.	Locality-Specific/EPA default. TTI developed age distributions using the latest available local registrations data (2003) for future years and 2002 registrations for 2002 and earlier analysis years. Mid-year TxDOT county-level registrations data were applied for LDV, LDT and MC; HGA eight-county regional data were applied for HDV; MOBILE6 default was used for buses. See Appendix E.
DIESEL FRACTIONS	Permits user to supply locality-specific diesel fractions for 14 of the 16 composite vehicle categories by age.	Locality-Specific/EPA default. TTI developed the evaluation year-specific local diesel fractions with the latest available registrations data (2003) for future years and 2002 registrations data for 2002 and earlier evaluations (i.e., base year 1990; pre-1990 controls: 1996, 1999 and 2002; control strategy 2002). Mid-year TxDOT HGA eight-county regional gasoline/ diesel registrations data were used for HDV; LDV, LDT, Bus fractions are MOBILE6 defaults. The latest diesel fractions (2003) were assumed as the values for each model year up to future year of evaluation (e.g., 2004, 2005.... 2007). For historical years, diesel fractions later than the evaluation year were dropped from the input data set and the earliest model year fractions were assumed for earlier model years where data were not available. See Appendix E.
MILE ACCUM RATE	Allows the user to supply the annual mileage accumulation rates by vehicle type and age.	NOT APPLIED. (EPA defaults assumed.)
NGV FRACTION	Lets user specify percent of natural gas vehicles (NGV) in the fleet by type and age certified to operate on either compressed or liquefied natural gas.	NOT APPLIED. (The EPA default percentage of NGV vehicles in the fleet, zero, is assumed.)
NGV EF	Permits the user to enter alternate NGV emissions factors for each of the 28 vehicle types, for running and start emissions.	NOT APPLIED. (The EPA default, none, was assumed.)

Table 22
MOBILE6 Activity

Command	Function/Description	Input Parameter Source/Value
VMT FRACTIONS	Used in MOBILE6 to weight the emissions of various vehicle types into average rates for groupings of vehicle classes.	NOT APPLIED. (EPA default assumed, used for aggregate results which do not apply to this analysis.)
VMT BY FACILITY	VMT fractions by MOBILE6 road type combine the four road type rates into "all road types" emissions factors.	NOT APPLIED. (EPA default assumed, used for aggregate results with no impact on this analysis.)
VMT BY HOUR	Allows VMT fractions allocation by hour-of-day; applied in conversion of grams per hour (g/hr) to g/mi, as well as in weighting of hourly g/mi rates to obtain daily emissions factors.	Control strategy analyses are year-specific, Pre-1990 analyses used 1990 values. TTI developed hourly VMT fractions as county hourly total VMT divided by county 24-hour total VMT. See Appendix F.
SPEED VMT	Allows user to allocate VMT by average speed (14 pre-selected: 2.5 and 5 through 65 at 5 mph increments) for arterials and freeways for each hour of the day.	Generic input for all counties. Inputs are set up to calculate emissions factors by 14 MOBILE6 speed bin speed scenarios for MOBILE6 freeway and arterial road types.
AVERAGE SPEED	Allows a single average speed for combined freeways and arterials for the entire day.	NOT APPLIED.
STARTS PER DAY	Lets user specify the average number of engine starts per vehicle per day by vehicle types for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday defaults assumed.)
START DIST	Allows user to allocate engine starts by hour for weekend days and weekdays.	NOT APPLIED. (MOBILE6 weekday defaults assumed.)
SOAK DISTRIBUTION	Allows alternate weekend day and weekday vehicle soak duration distributions.	NOT APPLIED. (MOBILE6 weekday defaults assumed.)
HOT SOAK ACTIVITY	Allows users to specify a hot soak duration distribution for each of 14 daily time periods for weekend days and for weekdays.	NOT APPLIED. (MOBILE6 weekday defaults assumed.)
DIURN SOAK ACTIVITY	Allows user set diurnal soak time distributions for 18 daily time periods.	NOT APPLIED. (MOBILE6 defaults assumed.)
WE DA TRI LEN DI	Specifies alternate fractions of VMT that occur during trips of various durations at each hour of the average weekday.	Control strategy analyses are year-specific, Pre-1990 analyses used 1990 distributions. HGA regional TDM-based weekday distributions developed by HGAC were used. See Appendix G.
WE EN TRI LEN DI	Specifies hourly alternate fractions of VMT for trips of various lengths for weekend days.	NOT APPLIED.
WE VEH US	Directs MOBILE6 to use weekend activity data for calculating emissions factors.	NOT APPLIED.

Table 23
MOBILE6 State Programs

Command	Function/Description	Input Parameter Source/Value
STAGE II REFUELING	Allows modeling of at-the-pump refueling emissions.	NOT APPLIED. Accounted for as an area source category.
ANTI-TAMP PROG	Allows user to model impacts of an ATP.	Harris County: 1) 1990 ATP for 1990 and Pre-90 Control analyses; and 2) current ATP for 2002 through 2007 control strategy analyses. Other seven counties: current ATP for 2005 and 2007 control strategy analyses. See Table 29.
I/M Commands: I/M PROGRAM I/M MODEL YEARS I/M VEHICLES I/M STRINGENCY I/M COMPLIANCE I/M WAIVER RATES I/M CUTPOINTS I/M EXEMPTION AGE I/M GRACE PERIOD NO I/M TTC CREDITS I/M EFFECTIVENESS I/M DESC FILE	 Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust/evaporative I/M programs. Required for exhaust. Do not use for evaporative. Required for exhaust. Optional for evaporative. Required for exhaust. Optional for evaporative. Optional for exhaust (but required for IM240). Do not use with evaporative. Optional for both exhaust and evaporative. Optional for both exhaust and evaporative. Optional for exhaust. Do not use with evaporative. Optional for exhaust. Do not use with evaporative. Optional for both.	Locality Specific, by program design. No I/M modeled for 1990 and Pre-1990 control evaluations. For control strategy evaluations, the I/M programs were modeled per program design particular to evaluation year, as specified in I/M SIP. See Tables 30 -32. The additional set of 2005 and 2007 control strategy emissions factors was developed for the Rural county group to exclude the new I/M program for those counties.

Table 24
MOBILE6 Fuels

Command	Function/Description	Input Parameter Source/Value
FUEL PROGRAM	Allows specification of one of four options: 1) Conventional Gasoline East Tier2 sulfur phase-in schedule (includes Texas); 2) RFG; 3) Conventional Gasoline West Tier2 sulfur geographical phase-in area schedule; or 4) Sulfur content for gasoline after 1999.	Option 1: Applied for 1990 base year and all pre-90 control evaluations. Option 2: Applied for control strategy evaluation years (2002, 2005, 2007).
SULFUR CONTENT	Allows alternate sulfur content for conventional gasoline through calendar year 1999.	NOT APPLIED. (MOBILE6 default assumed.)
DIESEL SULFUR	Allows alternate diesel sulfur levels for all calendar years, for PARTICULATES. No affect on HC, CO, NOx, air toxics (except if calculated as ratio to PM).	NOT APPLIED.
OXYGENATED FUELS	Allows modeling of oxygenated gasoline effects on exhaust for all gasoline-fueled vehicle types. Not for use with AIR TOXICS command.	NOT APPLIED.
FUEL RVP	Allows user to specify fuel RVP for area being modeled (required to run model).	1990 base year: 8.3 psi, pre-90 control: 7.8 psi, 2002 CS: 6.7 psi, 2005, 2007 CS: 6.8 psi. 1990 base year RVP is actual estimate from original 1990 EI. Pre-90 control RVP is the pre-1990 federal summer volatility limit. The control strategy RVPs are the MOBILE6 default RFG values.
SEASON	Identifies effective season for RFG calculation regardless of month modeled.	NOT APPLIED.
GAS AROMATIC%	Only when AIR TOXICS command is used.	NOT APPLIED.
GAS OLEFIN%	Only when AIR TOXICS command is used.	NOT APPLIED.
GAS BENZENE%	Only when AIR TOXICS command is used.	NOT APPLIED.
E200	Only when AIR TOXICS command is used.	NOT APPLIED.
E300	Only when AIR TOXICS command is used.	NOT APPLIED.
OXYGENATE	Only when AIR TOXICS command is used.	NOT APPLIED.
RVP OXY WAIVER	Only when AIR TOXICS command is used.	NOT APPLIED.

Table 25
MOBILE6 Alternative Emissions Regulations and Control Measures

Command	Function/Description	Input Parameter Source/Value
NO CLEAN AIR ACT	Models vehicle emissions as if the Federal Clean Air Act Amendments of 1990 had not been implemented.	APPLIED for pre-1990 control analyses. NOT APPLIED for 1990 base year and control strategy analyses.
HDDV NOx Off-Cycle Emissions Effects:		
NO DEFEAT DEVICE	Turns off effects of HDD vehicle NOx off-cycle emissions effects (defeat device emissions).	NOT APPLIED.
NO NOX PULL AHEAD	Turns off HDD NOx emissions reduction effects of pull- ahead program.	NOT APPLIED.
NO REBUILD	Turns off HDD NOx emissions reduction effects of rebuild program.	NOT APPLIED.
REBUILD EFFECTS	Allows user change rebuild program effectiveness rate.	Applied TCEQ estimate (0.01) for 2002 control strategy, 2002 pre-1990 control analyses. MOBILE6 default (0.90) was assumed for other affected analyses (i.e., 2005 and 2007 pre-1990 control and control strategy analyses).
Tier 2 Emission Standards and Fuel Requirements:	Allow the overriding of the default Tier 2 emissions standards and fuel requirements settings.	
NO TIER2	Disables Tier 2 requirements.	
T2 EXH PHASE-IN	Allows alternate Tier 2 exhaust standard phase-in schedules.	NOT APPLIED.
T2 EVAP PHASE-IN	Allows alternate Tier 2 evaporative standard phase-in schedules.	
T2 CERT	Allows user to specify alternate Tier 2 50,000-mile certification standards.	
94+ LDG IMPLEMENTATION	Allows use of alternate 1994 and later fleet penetration fractions for LDGVs under the Tier 1, NLEV (or California LEV 1), and Tier 2 emissions standard programs.	NOT APPLIED.
NO 2007 HDDV RULE	Disables 2007 HDV emissions standards.	NOT APPLIED.

External Conditions
TCEQ developed new local inputs for hourly temperatures, hourly relative humidity, and average daily barometric pressure based on the pertinent EPA guidance for developing the peak ozone season temperature inputs for 1990 ROP base-year emissions inventories (*Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources*, EPA 1992). More recent weather station data were used (2000 through 2003) as required for developing the hourly relative humidity values (hourly relative humidity data were not available in the original 1990 base-year weather data). The sunrise/sunset time inputs developed by TCEQ were taken from the most recent MOBILE6-based episode (August-September) on-road mobile source modeling emissions inventories. These climate inputs to MOBILE6 were applied for all of the HGA ROP on-road mobile source emissions factor analyses.

The consecutive three-month period with the highest frequency of one-hour ozone exceedence days was determined from the maximum daily one-hour average ozone concentrations data from all HGA ozone monitors, aggregated by month, over the period 2000 through 2003. The three-month period with the highest frequency of one-hour ozone exceedences as defined by these data is July through September (with 79 exceedences). The 10 days from the July through September, 2000 through 2003 data, with the maximum ozone concentrations were then determined. Hourly weather data from the George Bush-Houston Intercontinental Airport (IAH) for these 10 days were used to develop the peak ozone season average hourly temperature, average hourly relative humidity and average daily barometric pressure inputs to MOBILE6. These inputs were developed based on local time (i.e., Central Daylight Time [CDT] to be consistent with the time system for which the activity inputs were developed.

Temperatures (HOURLY TEMPERATURES Command)
The HOURLY TEMPERATURES command was used to specify the hourly average temperature values. TCEQ averaged the IAH weather station hourly temperatures within each hour, from the selected 10 ozone exceedence days (as specified above, from HGA 2000 through 2003, July through September one-hour ozone exceedence data). The hourly average temperatures were sequenced starting with 6 a.m. through 11:59 p.m. followed by 12 a.m. through 5:59 a.m. for input to MOBILE6. See Table 26.

Humidity (RELATIVE HUMIDITY Command)
The RELATIVE HUMIDITY command was used to specify the hourly percent relative humidity. TCEQ averaged the IAH weather station hourly relative humidity values within each hour, from the selected 10 ozone exceedence days (as specified above, from HGA 2000 through 2002, July through September one-hour ozone exceedence data). The hourly average relative humidity values were sequenced starting with 6 a.m. through 11:59 p.m. followed by 12 a.m. through 5:59 a.m. for input to MOBILE6. See Table 26.

Barometric Pressure (BAROMETRIC PRES Command)
The BAROMETRIC PRES command was used to specify the 24-hour average barometric pressure value (in units of inches of Mercury). TCEQ averaged the IAH weather station hourly barometric pressure values for all hours and days from the selected 10 ozone exceedence days

(as specified above, from HGA 2000 through 2002, July through September one-hour ozone exceedence data), to produce the average peak ozone season daily barometric pressure input value to MOBILE6. See Table 26.

Sunrise and Sunset Times (SUNRISE/SUNSET Command)
The SUNRISE/SUNSET Command allows the user to specify the time of sunrise and sunset. TCEQ provided the sunrise and sunset times (initially for the HGA August-September ozone episode modeling emissions inventories). The times are 7 a.m. and 8 p.m. CDT.

Table 26
HGA Peak Ozone Season Average Hourly Temperature, Hourly Relative Humidity, and Daily Barometric Pressure Inputs to MOBILE6

Hour (CDT)	Temperature	Relative Humidity	Barometric Pressure
6 a.m.	70.1	92.6	29.89
7 a.m.	72.0	90.4	29.90
8 a.m	76.5	79.7	29.91
9 a.m.	81.4	66.6	29.91
10 a.m.	84.9	57.5	29.91
11 a.m.	87.9	50.2	29.90
12 p.m.	90.4	44.6	29.88
1 p.m.	92.5	40.0	29.86
2 p.m.	93.9	36.9	29.83
3 p.m.	94.6	35.7	29.81
4 p.m.	94.2	35.9	29.79
5 p.m.	93.5	37.8	29.79
6 p.m.	91.3	42.5	29.78
7 p.m.	87.3	51.4	29.79
8 p.m.	83.8	61.0	29.80
9 p.m.	81.9	67.2	29.82
10 p.m.	80.6	70.4	29.83
11 p.m.	78.7	74.7	29.83
12 a.m.	73.6	84.6	29.87
1 a.m.	72.1	89.4	29.86
2 a.m.	72.0	89.3	29.86
3 a.m.	71.4	90.3	29.86
4 a.m.	70.8	90.6	29.87
5 a.m.	70.2	91.3	29.87
24-Hour Average			29.85

Vehicle Fleet Characteristics

Vehicle registration (age) distributions and diesel fractions inputs to MOBILE6 were developed from TxDOT county vehicle registration data for those vehicle types where TxDOT registration data were available. To develop these inputs, two data sets were used: mid-year 2002 county

vehicle registration data and mid-year 2003 county vehicle registration data. Since the 2002 data were the initial data set to include the HDVs by the eight MOBILE6 HDV weight class subcategories for each fuel type (gasoline and diesel), the 2002 data were used to develop the age distributions and diesel fractions inputs for the 2002 and earlier evaluation years. The 2003 data (latest available) were used to develop the age distributions and diesel fractions inputs for the 2005 and 2007 future year evaluations. EPA defaults were used where necessary. Due to sparse registration data for some of the HDV vehicle classes resulting from the increased disaggregation level of the vehicle classes in MOBILE6, the registration data were aggregated for the eight-county region for the HDV vehicle classes.

Vehicle Registration Distributions (REG DIST Command)

Table 27 shows the 16 composite (combined gasoline and diesel) vehicle types for which user-supplied vehicle age distributions may be input to MOBILE6. EPA default distributions were internally applied by MOBILE6 for vehicle classes for which the analyst did not provide alternate values. The input values for each vehicle class were 25 age fractions representing the fraction of vehicles by age for that particular vehicle class as of July of the evaluation year. These age fractions start with the evaluation year as the 1st age fraction and work back in annual increments to end with the 25th fraction, which represents the fraction of vehicles of age 25 years and older. The fractions were calculated as the model year-specific registrations in a class divided by the total vehicles registered in that class. Table 27 also identifies the sources of the age distributions used for each composite vehicle class.

Table 27
Composite Vehicle Classes and Data Sources for Vehicle Age Distributions
(REG DIST Command)

Number[1]	Abbreviation	Description	Source of Distributions
1	LDV	Light-Duty Vehicles	TxDOT July[2] HGA County Registrations
2	LDT1	Light-Duty Trucks 1	TxDOT July[2] HGA County Registrations
3	LDT2	Light-Duty Trucks 2	TxDOT July[2] HGA County Registrations
4	LDT3	Light-Duty Trucks 3	TxDOT July[2] HGA County Registrations
5	LDT4	Light-Duty Trucks 4	TxDOT July[2] HGA County Registrations
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
14	HDBS	School Buses	MOBILE6 Default
15	HDBT	Transit and Urban Buses	MOBILE6 Default
16	MC	Motorcycles	TxDOT July[2] HGA County Registrations

1. MOBILE6 input sequence.
2. 2002 data for 2002 and earlier evaluation years, and 2003 for 2005 and 2007 future years.

TTI developed MOBILE6 age distributions fractions input from TxDOT mid-year registrations data for all vehicle types except for the two bus categories. EPA defaults were used for the two bus categories. To develop these distributions, TTI used two county-level data sets each for 2002 (for the 2002 and earlier year evaluations) and for 2003 (for the 2005 and 2007 evaluations) provided by TxDOT. The TxDOT registrations are summarized as:

- July registrations for:
  gasoline and diesel: LDV, LDT12, LDT34, MC, HDGT, HDDT.
- July registrations for:
  gasoline: HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDV8B;
  diesel: HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDV8B.

The LDT12 and LDT34 classes of the combined gasoline and diesel registrations data set correspond to the MOBILE6 classes LDT1 and LDT2, and LDT3 and LDT4, respectively. The aggregate HDGTs and HDDTs were not used.

For each year, the HGA county-level TxDOT registrations data for each of the eight HDV weight classes were first summed to the HGA eight-county-region level and also across fuel types within each model year. There were then three steps to developing the TxDOT registrations-based MOBILE6 age distributions input for the 14 non-bus vehicle classes. The first step in the process developed the July registrations by the 25 age groups (as required by MOBILE6) for 12 of the 16 composite (by fuel) vehicle classes (the eight HDV classes at the regional level, and the LDV, LDT12, LDT34, and MC classes at the county level). The second step converted the registrations for each of the 25 model years from numbers of vehicles registered, to fractions registered by age for each of these 12 classes. The registrations were then expanded from 12 to 14 vehicle classes.

The eight original HDV class registrations (fuel type composites) were combined with the four light-duty vehicle class county-level registrations to yield one data set for the 12 vehicle classes of composite-by-fuel vehicle class registrations by age (i.e., the eight HDV classes and LDV, LDT12, LDT34, and MC). The 25-year and older registrations were combined for each vehicle class to produce the "25 years and older" category.

The conversion of the registrations from numbers of vehicles to fractions of vehicles by age was made for each vehicle class by dividing its registrations for each age by its total registrations. In some cases the age distributions fractions do not sum to one due to insignificant rounding error. In such cases, MOBILE6 normalizes the input age distribution fractions.

The resulting mid-year (July) estimated age distribution fractions for the 12 composite classes were then expanded to 14 classes. This was accomplished by using the LDT12 age fractions for both the MOBILE6 LDT1 and LDT2 classes, and then by using the LDT34 age fractions for both the MOBILE6 LDT3 and LDT4 classes. This procedure was performed for both the mid-year 2002 and 2003 registrations.

The age distributions external data input files to MOBILE6 were provided to TCEQ on CD-ROM. Appendix A lists the data files submitted. Appendix E provides the registration distributions input values.

Diesel Fractions (DIESEL FRACTIONS Command)

The DIESEL FRACTIONS command allows the user to specify diesel fractions for 14 of the 16 composite (gasoline and diesel) vehicle categories by vehicle age. MOBILE6 assumes that urban/transit buses are 100 percent diesel, and that motorcycles are all gasoline fueled, so these two categories do not require diesel fractions. The diesel fraction represents the portion of diesels in a composite (gasoline and diesel) vehicle class for any vehicle age. When the analyst enters diesel fractions, all 14 sets of fractions are required. Each set of fractions contains the diesel fractions for 25 vehicle ages from the evaluation year back through the 25th fraction, which represents vehicle ages of 25 years and older.

The MOBILE6 default fractions vary by age for model years 1972 through 1996. MOBILE6 thus assumes that the diesel fractions for 1971 and earlier model years are the same as the 1972

model year fractions, and that the diesel fractions for the 1997 and later model years (through the calendar year of evaluation) are the same as its latest model year (1996) fraction.

TTI developed the diesel fractions input data set for each evaluation year using a combination of estimated TxDOT HGA HDV regional fractions (based on 2002 mid-year registrations for 2002 and earlier evaluation years, and 2003 mid-year registrations for 2005 and 2007 evaluation years) and EPA default diesel fractions for the remaining vehicle classes. Table 28 shows the MOBILE6 diesel fractions input sequence and categories with corresponding data sources.

For each year of the TxDOT registrations data (mid-year 2002 and mid-year 2003), the HGA regional diesel fractions estimates through the latest available model year registrations (2002 or 2003 model year) were calculated using individual diesel and gasoline vehicle HGA eight-county-region registrations data for the eight HDV (HDV2b through HDV8b) weight classes. To produce the individual HDV diesel fractions by model year, the model-year-specific individual HDV-vehicle class registrations were divided by the sum of the gasoline and diesel registrations for that vehicle class and model year. This procedure was performed for each HDV vehicle class and model year.

To produce the diesel fractions input data sets specific to the 2005 and 2007 evaluation years, the latest available fractions (2003 for HGA data and 1996 for MOBILE6 default data) were assumed for each later year through the year of evaluation. Earlier model year diesel fractions that exceeded the 25 model year input data set requirement were removed from each of the future evaluation year input data sets. The estimated evaluation-year-specific HDV diesel fractions were combined with the corresponding evaluation-year-specific EPA default diesel fractions for the remaining vehicle classes (LDV, LDT1, LDT2, LDT3, LDT4, and HDBS) to produce the complete 14 vehicle class input data sets for 2005 and 2007.

To produce the diesel fractions input data sets specific to the 2002 evaluation year, latest available MOBILE6 default fractions (1996) were assumed for each later year through 2002. Earlier model-year diesel fractions that exceeded the 25 model-year input data set requirement were removed from both the TxDOT HDV diesel fractions (based on TxDOT 2002 registrations) and MOBILE6 default-based diesel fractions. The estimated 2002 HDV diesel fractions were combined with the estimated 2002 diesel fractions for the remaining vehicle classes (LDV, LDT1, LDT2, LDT3, LDT4, and HDBS) to produce the complete 14-vehicle class input data set for 2002.

The same methodology was applied to produce the estimates for the diesel fractions input data sets specific to the 1999, 1996, and 1990 evaluation years. For 1999, the latest available MOBILE6 default fractions (1996) were assumed for each later year through 1999, and the TxDOT-based HDV diesel fractions for the model years later than 1999 were removed from the data set. For 1996 and 1990 evaluation years, the model-year diesel fractions later than each evaluation year were removed from each evaluation-year data sets. For all three evaluation years, the earliest model year fractions, where necessary, were either assumed for each earlier model year back to the 25th model-year fraction, or fractions for model years earlier than the 25th model-

year were removed. The estimated diesel fractions for each evaluation year from the TxDOT data (for HDVs) and from the MOBILE6 data (LDV, LDT1, LDT2, LDT3, LDT4, and HDBS) were then combined to produce the complete 14-vehicle class input data set for each evaluation year.

The MOBILE6 command files, which include the diesel fractions inputs, were provided on CD-ROM. Appendix A describes the input data files provided. Appendix E lists the diesel fractions input for each evaluation year.

Table 28
Source of Diesel Fractions for Composite Vehicle Types
(DIESEL FRACTIONS Command)

Number[1]	Abbreviation	Description	Source of Fractions
1	LDV	Light-Duty Vehicles	EPA MOBILE6 Evaluation Year Default
2	LDT1	Light-Duty Trucks 1	EPA MOBILE6 Evaluation Year Default
3	LDT2	Light-Duty Trucks 2	EPA MOBILE6 Evaluation Year Default
4	LDT3	Light-Duty Trucks 3	EPA MOBILE6 Evaluation Year Default
5	LDT4	Light-Duty Trucks 4	EPA MOBILE6 Evaluation Year Default
6	HDV2B	Class 2b Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
7	HDV3	Class 3 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
8	HDV4	Class 4 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
9	HDV5	Class 5 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
10	HDV6	Class 6 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
11	HDV7	Class 7 Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
12	HDV8A	Class 8a Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
13	HDV8B	Class 8b Heavy-Duty Vehicles	TxDOT July[2] HGA Region Registrations
14	HDBS	School Buses	EPA MOBILE6 Evaluation Year Default

[1]. MOBILE6 input sequence.
[2]. 2002 data for 2002 and earlier evaluation years, and 2003 for 2005 and 2007 future years.

Activity

The locality-specific activity inputs applied to develop the ozone season weekday MOBILE6 hourly emissions factors were the county-level, fleet total hourly VMT fractions, and HGA TDM-based regional average hourly weekday trip length distributions (TLDs). Additionally, non-default, but generic activity inputs used in the modeling were hourly fractions of VMT by the 14 speeds for arterials and freeways.

VMT Fractions (Also Known as VMT Mix)

These sets of fractions (VMT fractions attributable to individual vehicle classes) were an input to MOBILE6, however, the method for this study calls for the application of the VMT mix (or

mixes) later in the emissions calculation process. VMT mix development was discussed previously in this documentation.

Total VMT by Hour (VMT BY HOUR Command)
Hourly fleet total VMT distributions were input to MOBILE6 by using the VMT BY HOUR command. These fractions are used by MOBILE6 to convert the units of the non-travel-related hourly emissions factors (e.g., hot soak, diurnal, start, etc.) to units of g/mi. (The VMT by hour fractions were also used to produce the daily emissions factors as composites of the hourly emissions factors.)

The hourly ozone season weekday link-VMT estimates (discussed previously in the "Estimation of VMT" section) were used to develop the MOBILE6 fleet hourly VMT input. One set of 24 fractions was developed for each county for the 1990, 2002, 2005, and 2007 evaluations. For each year, the fractions were calculated by dividing the county fleet total VMT for each hour by the county fleet total 24-hour VMT.

The MOBILE6 hourly VMT fractions external data input files for each county and evaluation year were provided on CD-ROM, as described in Appendix A. These fractions are also tabulated in Appendix F.

VMT Distribution by Average Speed on Freeways and Arterials (SPEED VMT Command)
The VMT distributions by average speed inputs are called by the SPEED VMT command, but are accommodated internally by the POLFAC62_3 program (that is, no user speed input commands or data parameter values were required when producing MOBILE6 emissions factors tables with POLFAC62_3). POLFAC62_3 uses the SPEED VMT inputs to produce the individual Freeway and Arterial emissions factors indexed by the 14 MOBILE6 speed bin speeds.

There are 14 scenarios, each with 100 percent of Freeway and Arterial VMT set to one of the 14 MOBILE speed bin speeds. Each scenario produced a set of Arterial and Freeway emissions factors corresponding to one of the 14 speeds.

Hourly Trip Length Distributions (WE DA TRI LEN DI Command)
The weekday TLDs input to MOBILE6 is called by the WE DA TRI LEN DI command. The weekday TLDs specify the percentage of average weekday VMT that occurs during trips of different durations at each hour of the day.

The VMT distributions were entered as percentages of VMT for six trip length ranges, and must sum to 100 percent. The percentage values correspond to VMT accumulated within the following trip duration ranges:

- Under 10 minutes,
- 11-20 minutes,
- 21-30 minutes,
- 31-40 minutes,

- 41-50 minutes, and
- 51 minutes and longer.

There are 14 MOBILE6 average TLD distributions inputs required, one each for 13 hours of the day (the 6 a.m. hour and up through the 6 p.m. hour) and one for the overnight period of 7 p.m. through 5 a.m.

The HGA regional TLDs for 1990 2002, 2005, and 2007 evaluation years were developed by HGAC based on the HGAC 1990, 2002, 2005, and 2007 four-period, time-of-day TDMs. TTI applied the HGAC TLDs for the TDM AM Peak, Midday, and PM Peak assignment periods to the individual hours corresponding to each of those time periods (i.e., 6 a.m. through the hour of 6 p.m.); and the TDM Overnight assignment period TLDs were applied to the MOBILE6 7 p.m. through 5 a.m. period, which corresponds exactly to the HGAC Overnight assignment period. The hourly TLD external data input files to MOBILE6 for each of the four evaluation years were provided on CD-ROM. Appendix G shows the inputs.

State Programs

The state programs inputs to MOBILE6 model the effects of vehicle ATPs and exhaust and evaporative I/M programs that apply to the gasoline-fueled vehicle classes, except motorcycles. To develop the MOBILE6 ATP and I/M program set-ups and post-processing procedures (discussed in a later section) particular to each ROP analysis, the eight HGA counties were grouped according to their exhaust I/M program start dates as:

- Harris (1997);
- Urban (2003: Brazoria, Fort Bend, Galveston, Montgomery); and
- Rural (2004: Chambers, Liberty, and Waller).

For the Urban and Rural county categories, it is assumed that the ATP start dates coincide with the exhaust I/M program start dates for those counties. The I/M and ATP modeling set-ups were developed with information from the I/M SIP (TCEQ, December 2002) and based on discussions with the TCEQ Technical Analysis Division.

Vehicle ATP (ANTI-TAMP PROG Command)

Table 29 describes the HGA ATP set-ups for each ROP evaluation. For all counties, the ATP was composed of two sub-programs each comprised of a set of checks for each of two model year ranges — 1983 and earlier (ATP1), and 1984 and later (ATP2). The difference is that beginning with 1984 model years (ATP2), the catalyst is checked. The post-processing procedures required to account for the full effects of the two-part ATP are discussed in the "Emissions Factor Post-Processing Requirements and Procedures" section.

Table 29
HGA MOBILE6 ATP Commands and Data Parameter Values

Evaluations: 1990 base year; Pre-1990 controls: 1996, 1999, 2002, 2005, and 2007 **Geographic Coverage**: Harris County	
ATP1	ANTI-TAMP PROG 84 68 79 22222 11111111 1 11 085. 21112222
ATP2	ANTI-TAMP PROG 84 80 50 22222 11111111 1 11 085. 22222222
Evaluations: Control strategy: 2002, 2005, and 2007 **Geographic Coverage**: All counties **Start Year (YY)**: Harris: 84; Urban: 03; Rural: 04 **First Model Year Covered (AA)**: 2002: 78; 2005: 81; 2007: 83 **Last Model Year Covered (BB)**: 2002: 00; 2005: 03; 2007: 05	
ATP1	ANTI-TAMP PROG **YY AA** 83 22222 22222222 2 11 096. 21112222
ATP2	ANTI-TAMP PROG **YY** 84 **BB** 22222 22222222 2 11 096. 22112222

*** Data parameter value definitions for ATP**:

- The first number is the last two digits of the program start year.
- The second number is the last two digits of oldest model year covered by the program.
- The third number is the newest model year covered by the program.
- The next 14 values are toggles for vehicle types covered (1 = no, 2 = yes). Order is: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.
- The next entry must be one (added credit for test only program no longer available).
- The next data parameter is the program inspection frequency (1 = annual).
- The next number is the program compliance rate in percent.
- The last eight values are checks performed toggles (1 = no, 2 = yes), in the following order: 1) air pump disablement; 2) catalyst removal; 3) fuel inlet restrictor removal; 4) tailpipe lead deposit; 5) exhaust gas recirculation disablement; 6) evaporative system disablement; 7) positive crankcase ventilation system disablement; and 8) missing gas cap.

I/M Programs

Tables 30 through 32 describe the HGA I/M set-ups required to model the I/M programs for each ROP control strategy evaluation. Note that for the additional 2005 and 2007 control strategy evaluations, the new I/M program is not modeled for the Rural County group counties (for these additional analyses, only the gas cap pressure test is modeled for the Rural County group counties). The emissions factor post-processing procedure necessary to model the effects of the Harris County May 1st 2002 I/M test type change and the May 1st I/M start date for the Urban and Rural counties is described in the "Emissions Factor Post-Processing Requirements and Procedures" section.

Table 30
MOBILE6 2002 I/M Inputs: Non-Harris Counties
Harris County – January Through April

Geographic Coverage: Harris County: Programs 1 and 2; other seven counties: Program 3.

MOBILE6 Inputs: The commands (in bold) with their corresponding data parameters values as defined by program design, are described below. Except for the I/M EFFECTIVENESS command, the first data value following each command identifies the program number (i.e., 1 through 3) to which the command and its associated parameters apply. Compliance and Waiver Rates apply to all I/M programs (thus "#" takes values 1 through 3).

I/M STRINGENCY: 1 20 (percent stringency level for pre-1981 automobiles and light trucks)
I/M COMPLIANCE: # 96 (percent compliance)
I/M WAIVER RATES: # 3 3 (pre-1981 and post-1980 waiver rates in percent)
I/M EFFECTIVENESS: 1 1 1 (fractional exhaust I/M effectiveness for HC, CO, and NOx)

I/M PROGRAM	I/M MODEL YEARS	I/M VEHICLES
1 1997 2050 1 TRC 2500/IDLE	1 1978 2000	1 22222 22222222 2
2 1997 2050 1 TRC GC	2 1978 2000	2 22222 22222222 2
3 2000 2050 1 TRC GC	3 1978 2000	3 22222 22222222 2

Explanation of command data parameters:
I/M PROGRAM command*:*
The parameters, by numerical order, are defined as:

1st value is program number; programs 1 and 2 apply to Harris County, and program 3 applies to the seven non-Harris counties;
2nd and 3rd are the program start and end years, respectively;
4th is the program frequency (1 = annual, 2 = biennial);
5th is the program type (TRC = test and repair computerized); and
6th is inspection type (2500/IDLE = test at idle and at 2,500 rpm = TSI; GC = gas cap pressure check).

I/M MODEL YEARS command:
After the program number, the first field is the first model year covered, and the second field is the last model year covered. By program design, vehicles less than two years old and greater than or equal to 25 years old are exempt from testing.
I/M VEHICLES command:
The14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 corresponding vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.

Table 31
MOBILE6 I/M Inputs
Harris County – May Through December 2002

Geographic Coverage: Harris County.

MOBILE6 inputs: The commands (in bold) with their corresponding data parameters values as defined by program design, are described below. Except for the I/M EFFECTIVENESS command, the first data value following each command identifies the program number (i.e., 1 through 6) to which the command and its associated parameters apply. Stringency applies only to exhaust I/M programs (thus "$" takes the values 1, 2, and 3). Compliance and Waiver Rates applies to all I/M programs (thus "#" takes values 1 through 6).

I/M STRINGENCY: $ 20 (percent stringency level for pre-1981 automobiles and light trucks)
I/M COMPLIANCE: # 96 (percent compliance)
I/M WAIVER RATES: # 3 3 (pre-1981 and post-1980 waiver rates in percent)
I/M EFFECTIVENESS: 1 1 1 (fractional exhaust I/M effectiveness for HC, CO, and NOx)

I/M PROGRAM	I/M MODEL YEARS	I/M VEHICLES
1 1997 2050 1 TRC 2500/IDLE	1 1978 2000	1 11111 22222222 2
2 1997 2050 1 TRC ASM 2525/5015 PHASE-IN	2 1978 1995	2 22222 11111111 1
3 1997 2050 1 TRC OBD I/M	3 1996 2000	3 22222 11111111 1
4 1997 2050 1 TRC GC	4 1978 2000	4 11111 22222222 2
5 1997 2050 1 TRC GC	5 1978 1995	5 22222 11111111 1
6 1997 2050 1 TRC EVAP OBD & GC	6 1996 2000	6 22222 11111111 1

Explanation of command data parameters:

I/M PROGRAM command*:*
The parameters, by numerical order, are defined as:
2nd and 3rd are the program start (for overall program, not the new test types) and end years, respectively;
4th is the program frequency (1 = annual, 2 = biennial);
5th is the program type (TRC = test and repair computerized); and
6th is inspection type (2500/IDLE = test at idle, 2,500 rpm; ASM 2525/5015 PHASE-IN = Acceleration Simulated Mode-2 Test with phase-in cut points; OBD I/M and EVAP OBD and GC are on-board diagnostic exhaust and evaporative I/M [with GC], respectively, and GC = gas cap pressure check).

I/M MODEL YEARS command:
After the program number, the first field is the first model year covered, and the second field is the last model year covered. By program design, vehicles less than two years old and greater than or equal to 25 years old are exempt from testing.

I/M VEHICLES command:
The14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 corresponding vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.

Table 32
MOBILE6 I/M Inputs
HGA 2005 and 2007

Geographic Coverage: All eight counties.
Evaluation Year: 2005, 2007 (Note that the only differences in inputs between evaluation years are the "model years covered" values associated with the I/M MODEL YEARS command (with parenthetical values for 2007).

MOBILE6 Inputs: The commands (in bold) with corresponding data parameters values as defined by program design, are described below. The first data value following each command (excluding I/M EFFECTIVENESS) is the program number (i.e., 1 through 6) to which the command and its associated parameters apply. STRINGENCY applies only to exhaust I/M programs, thus "$" takes the values 1, 2, and 3 (see I/M PROGRAM command descriptions 1 through 6, below). COMPLIANCE and WAIVER RATES applies to all I/M programs (thus "#" takes values 1 through 6).

I/M STRINGENCY: $ 20 (percent stringency level for pre-1981 cars and light trucks)
I/M COMPLIANCE: # 96 (percent compliance)
I/M WAIVER RATES: # 3 3 (pre-1981 and post-1980 waiver rates in percent)
I/M EFFECTIVENESS: 1 1 1 (fractional exhaust I/M effectiveness for HC, CO, and NOx)

I/M PROGRAM	I/M MODEL YEARS	I/M VEHICLES
1 YYYY 2050 1 TRC 2500/IDLE	1 1981 2003 (1983 2005)	1 11111 22222222 2
2 YYYY 2050 1 TRC ASM 2525/5015 PHASE-IN	2 1981 1995 (1983 1995)	2 22222 11111111 1
3 YYYY 2050 1 TRC OBD I/M	3 1996 2003 (1996 2005)	3 22222 11111111 1
4 YYYY 2050 1 TRC GC	4 1981 2003 (1983 2005)	4 11111 22222222 2
5 YYYY 2050 1 TRC GC	5 1981 1995 (1983 1995)	5 22222 11111111 1
6 YYYY 2050 1 TRC EVAP OBD & GC	6 1996 2003 (1996 2005)	6 22222 11111111 1

Explanation of command data parameters:
I/M PROGRAM command*:*
The parameters, by numerical order, are defined as:
2nd and 3rd are the I/M program start year (see "YYYY" explanation, below) and end year, respectively;
4th is the program frequency (1 = annual, 2 = biennial);
5th is the program type (TRC = test and repair computerized); and
6th is inspection type (2500/IDLE = test at idle, 2,500 rpm; ASM 2525/5015 PHASE-IN = Acceleration Simulated Mode-2 Test with phase-in cut points; OBD I/M and EVAP OBD and GC are on-board diagnostic exhaust and evaporative I/M [with GC], respectively, and GC = gas cap pressure check).
The start year field, "YYYY", varies by county grouping and by I/M program emission type as follows:
1, 2, and 3 are exhaust programs for the county/start year: Harris, 1997; Urban, 2003; Rural, 2004; and
4, 5, and 6 are evaporative programs for the county/start year: Harris, 1997; Urban and Rural, 2000.
I/M MODEL YEARS command:
After program number, first field is the first model year covered, second field is the last model year covered. By program design, vehicles less than two years old and greater than or equal to 25 years old are exempt from testing.
I/M VEHICLES command:
The14 data parameters are on/off toggles (1 = no, 2 = yes) indicating which vehicle types are subject to inspection. The 14 corresponding vehicle types, in input order are: LDGV, LDGT1, LDGT2, LDGT3, and LDGT4; HDGV2B, HDGV3, HDGV4, HDGV5, HDGV6, HDGV7, HDGV8A, and HDGV8B; and GAS BUS.

Fuels
User input for fuel effects modeling are for the eight-county group for each ROP evaluation year. The fuel effects are modeled using the FUELS PROGRAM, FUEL RVP, and EVALUATION MONTH commands and associated input parameters and options. Additionally, the NO CLEAN AIR ACT command, which was applied for the Pre-90 Control emissions factor analyses, changes particular fuel parameter inputs.

The RVP of gasoline is a required input to run MOBILE6, but is not used in the MOBILE6 calculations when the MOBILE6 default summer RFG option is modeled. The FUEL RVP input is overridden when the MOBILE6 default RFG option is selected.

The emissions factors for the 1990 base year, and for each of the Pre-90 Control evaluations (modeled with NO CLEAN AIR ACT command which affects particular fuel parameter inputs) were modeled with conventional gasoline. The Control Strategy evaluation emissions factors were modeled with the summer RFG (season was determined setting evaluation month to July, which was the case for all of the ROP emissions factor analyses).

Fuel Program (FUEL PROGRAM Command)
The MOBILE6 FUEL PROGRAM command provides the user four options for modeling fuels effects. For this analysis, two of the options were used, summer RFG southern region, and the conventional gasoline east option.

The second option, RFG (with the southern volatility region indicated), was modeled for all Control Strategy analyses. This option directed MOBILE6 to model the effects of RFG as defined by the MOBILE6 default summer (as specified by July for evaluation month) RFG parameters for the southern volatility region. The MOBILE6 default summer RFG, southern region parameter values are:

- 2002 RVP, southern region — 6.7 pounds per square inch (psi);
- 2005, 2007 RVP, southern region — 6.8 psi;
- Ether Oxygen Content —- 2.1 percent by weight;
- Ether Market Share — 100 percent;
- Sulfur content, 2002 average — 129 parts per million (ppm);
- Sulfur content, 2005 average — 90 ppm;
- Sulfur content, 2007 average —30 ppm; and
- Sulfur content, and maximum sulfur experienced by model year:
  2006, 2007 — 87 ppm;
  2004, 2005 — 303 ppm;
  2000 through 2003 — 1000 ppm; and
  1999 and older — N/A.

The first option, conventional gasoline east, which is also the MOBILE6 default, was modeled for the 1990 base year and for all Pre-90 Control emissions factors, but in combination with the NO CLEAN AIR ACT command. The NO CLEAN AIR ACT command sets the fuel sulfur level to 300 ppm for all model years greater than 1993 (i.e., pre-Tier 2 rule levels). In the

absence of the NO CLEAN AIR ACT command, the conventional gasoline east option supplies post-1999 gasoline sulfur levels by year under the Tier 2 rule phase-in schedule for most states (including Texas).

Gasoline RVP (FUEL RVP Command)
The RVP values as applied through use of the FUEL RVP command are listed below for each evaluation.

- 1990 Base Year — 8.3 estimated actual;
- 2005 Pre-90 Control — 7.8 federal limit;
- 2005 Control Strategy — 6.8 (RFG overrides);
- 2007 Pre-90 Control — 7.8 federal limit; and
- 2007 Control Strategy — 6.8 (RFG overrides).

The 1990 base year emissions factors use the estimated actual gasoline RVP value of 8.3 psi. Appendix G shows the EPA procedure and 1990 gasoline survey data used to estimate this input value. The Pre-90 Control analyses emissions factors used an RVP of 7.8 psi, the HGA limit from the federal fuel volatility regulations (summertime gasoline RVP limits beginning in 1992) promulgated in July of 1990 (pre-CAAA). The 2002, and 2005 and 2007 Control Strategy emissions factor analyses used RVP inputs values of 6.7 and 6.8 (MOBILE6 defaults for summertime RFG option), respectively.

MOBILE6 Alternative Emissions Regulations and Control Measures Commands
There were two commands used from this section of MOBILE6 model commands: NO CLEAN AIR ACT and REBUILD EFFECTS. The NO CLEAN AIR ACT command allows the modeling of vehicle emissions as if the Federal Clean Air Act Amendments of 1990 had not been implemented. The REBUILDS EFFECTS command (related to the HDDV NOx off-cycle emissions effects) allows the use of alternate effectiveness rates for the program to mitigate HDDV NOx off-cycle emissions effects via low emissions rebuilds of existing engines.

NO CLEAN AIR ACT command
As previously discussed, the ROP plans may not take credit for emissions reductions from pre-90 CAAA FMVCP. To estimate the "noncreditable" emissions reductions from pre-90 CAAA FMVCP, the ABYEIs for each milestone year are needed. The ABYEIs used the Pre-90 Control emissions factors which were developed, in part, using the NO CLEAN AIR ACT command.

Use of this command disables the following effects in MOBILE6 (from *User's Guide to MOBILE6.1 and MOBILE6.2, Mobile Source Emission Factor Model,* EPA, August 2003):

- The effect of all federal exhaust tailpipe standards after Tier 0 standards or the 1993 model year will be shut off. All model years subsequent to the 1993 model year will be assigned the 1993 model year emissions factor. The 1993 model year was selected because it is the last year that was unaffected by the CAA amendments.

- The evaporative emissions benefits from the Enhanced Evaporative Test procedure will be eliminated. This affects running loss, diurnal, hot soak, resting loss, and refueling emissions factors.

- The emissions benefits from the Supplemental Federal Test Procedure for both off-cycle and air-conditioning emissions effects will be eliminated if the command is issued.

- The effects of on-board diagnostics (OBD) will be eliminated, and an OBD I/M program will not be allowed. Evaporative OBD I/M programs are also not allowed when this command is used. Only Exhaust and Evaporative I/M programs that existed in calendar year 1990 can be modeled, and they can be modeled for model years 1996 and later.

- The fuel sulfur level is set to 300 ppm for all model years greater than 1993.

- The detergent gas emissions effect is eliminated.

- The 1995 model year tampering rates are extended past the 1995 model year/calendar year. For these years, the rates that prevailed in the 1995 model year are used.

- Cold temperature CO effects are affected. These will be set to 1993 model year rates.

The following effects are not affected by the NO CLEAN AIR ACT command.

- Heavy-duty vehicle off-cycle effects (defeat device), and heavy-duty vehicle conversion factors are unaffected by this command.

- The MOBILE6 correction factors for average speed are unaffected by this command.

- Facility cycle or roadway effects are unaffected by this command.

- Fleet effects such as fleet turnover, changes in VMT between classes, mileage accumulation effects, and registration distributions are unaffected by this command.

REBUILD EFFECTS command
In the late 1980s and most of the 1990s, HDDV engines were built with "defeat devices" allowing in-use engine emissions to be higher than emissions as specified under Federal Test Procedure conditions. MOBILE6 includes estimates of these excess HDDV emissions as well as the emissions offsetting effects of two programs — early pull-ahead of 2004 HDDV emissions standards, and low emissions rebuilds of existing engines.

TCEQ estimated a 1.0 percent effectiveness rate for the low-NOx emissions rebuilds program for heavy-duty diesels. This is the latest available estimate. The basis of TCEQ's estimates was information provided by EPA showing that the number of low-NOx-rebuild kits supplied (as of January, 2002) to the affected population was 0.97 percent.

For the 2002 Control Strategy and 2002 Pre-90 Control evaluation emissions factors, the MOBILE6 effectiveness rate for the low NOx emissions rebuild program was set at 1.0 percent through use of the REBUILD EFFECTS command.

Emissions Factor Post-Processing Requirements and Procedures

There are three limitations of the MOBILE6 model that result in the emissions factors post-processing requirements. MOBILE6: 1) models only one ATP per run; 2) assumes a January 1 start for I/M and ATP start year; and 3) does not allow user-specified alternate diesel fuel parameters effects on NOx.

All evaluations require emissions factor post-processing to account for the full effects of the two-part ATP (i.e., ATP1: checks for pre-1984 model year vehicles; and ATP2: checks for 1984 and later model year vehicles).

All control strategy evaluations required emissions factor post-processing to account for the effects of the May 1st I/M start dates (or in the case of Harris County, the May 1st I/M test type switch). The Harris, Urban, and Rural county groupings by I/M start date are used for the May 1st I/M post-processing procedures. For the Urban and Rural county categories, it is assumed that the ATP start dates coincide with the exhaust I/M program start dates for those counties.

The 2005 and 2007 control strategy evaluations require emissions factor post-processing to account for the Texas LED effects on Nox. The three post-processing steps for producing the final emissions factor inputs to the emissions estimation process are described below.

Step 1: Two-Part ATP Post-processing – All Evaluations

To model the credits of both parts of the ATP (ATP1 and ATP2 as described in Table 29), the following emissions factor post-processing calculation (taken from the HGA original 1990 base-year EI as developed and documented by HGAC, 1992) is performed:

$$EF_{ATP1} + EF_{ATP2} - EF_{NO\ ATP} = EF_{FINAL}$$

Where:

EF_{ATP1} = emissions factor with ATP1 credits;

EF_{ATP2} = emissions factor with ATP2 credits;

$EF_{NO\ ATP}$ = emissions factor with no ATP credits; and

EF_{FINAL} = emissions factor with including estimated credits for both ATP1 and ATP2.

This calculation is performed for each county and evaluation. The calculation is also performed on a second set of runs, which is required to develop emissions factor input for the May 1st post-processing step (see $EF_{Start\ Year+1}$ definition in Step 2b). The resulting emissions factors after this step include the full effects of the two-part ATP.

There are two different procedures for emissions factor post-processing due to I/M: 1) Harris County May 1st 2002 I/M test type switch; and 2) Urban and Rural counties May 1st I/M start date. In each procedure, ratio calculations are performed on two sets of emissions factors and the results are summed to achieve one set of emissions factors with the desired I/M program effects. Each procedure is described below in Step 2a and Step 2b, respectively.

Step 2a: May 1st I/M Post-Processing – Harris 2002 Control Strategy Evaluation
To model the 2002 Harris County emissions factors, post-processing is required to account for the proportions of the vehicles in I/M-subject fleets assumed to have been tested by the evaluation date (July 1, 2002) under each of the two I/M test types (e.g., pre-May TSI I/M test type and May 1st ASM-2 and OBD I/M test types). The assumption is that for annual cycle I/M programs with a test-type change within one year of the evaluation date, the proportion of vehicles in the subject fleet that have been tested by the evaluation date under the new test is equal to the ratio of the number of months from the test type change to the evaluation date divided by the number of years in the I/M cycle, or 12 months. Conversely, the proportion of the vehicles tested under the old program by the evaluation date is 1.0 minus the proportion of the subject fleet tested under the new program. For the 2002 Harris County analysis, the number of months for the test-type change to the evaluation date is two months (i.e., May 1st test type switch to the July 1st evaluation date). Thus, the proportions used are: 1) 2/12, or 0.1667 , under the new test, and 2) 10/12, or 0.8333 under the old test. After first performing post-processing to account for the full effects of the two-part ATP (as described in Step 1, above), the resulting emissions factors (one set with new I/M test benefit and one with old I/M tests benefit) are combined using these proportions.

Step 2b: May 1st I/M Post-Processing – 2005 and 2007 Non-Harris Control Strategy Evaluations
To model the Urban and Rural county ATP and exhaust I/M program May 1 start date, ratio calculations (procedure from the *Technical Supplement* to the October 2001 I/M SIP) are performed on the Urban and Rural county emissions factors. The Rural and Urban county group counties evaporative I/M start date is January 2000, thus no start date post-processing is required for evaporative I/M for these counties. For each evaluation year, there are two emissions factors sets required for the calculation, the difference between them being exhaust I/M and ATP start year input: 1) actual start year; and 2) one year after actual start year. The emissions factors from these two sets are combined as:

$$\frac{((N-1)12+8)\times EF_{Act.\ Start\ Year}}{12\times N}+\frac{4\times EF_{Start\ Year+1}}{12\times N}=EF_{FINAL}$$

Where:

N = evaluation year - start year;

$EF_{Act.\ Start\ Year}$ = emissions factor for actual exhaust I/M start year (assumed for ATP also);

$EF_{Start\ Year+1}$ = emissions factor with exhaust I/M and ATP start year one year later; and

EF_{FINAL} = emissions factor with the estimated May 1 start date of the actual I/M start year.

For 2005 (Urban: N = 2, Rural: N = 1), county ratio formulae are:

Urban Counties: $(0.8333)\ EF_{Act.\ Start\ Year} + (0.1667)\ EF_{Start\ Year+1} = EF_{FINAL}$; and
Rural Counties: $(0.6667)\ EF_{Act.\ Start\ Year} + (0.3333)\ EF_{Start\ Year+1} = EF_{FINAL}$.

For 2007 (Urban: N = 4, Rural: N = 3), county ratio formulae are:

Urban Counties: $(0.9167)\ EF_{Act.\ Start\ Year} + (0.0833)\ EF_{Start\ Year+1} = EF_{FINAL}$; and
Rural Counties: $(0.8889)\ EF_{Act.\ Start\ Year} + (0.1111)\ EF_{Start\ Year+1} = EF_{FINAL}$.

After performing these post-processing steps, the LED post-processing step was then performed.

Step 3: LED Post-processing – 2005, 2007 Control Strategy
TCEQ provided the HGA regional LED NOx adjustment factors sets (developed with the TxDOT HGA region mid-year 2003 registrations data) that TTI applied to the NOx emissions factors specific to each average diesel vehicle class and evaluation year for all counties. The NOx adjustment factors are within the range 0.952 through 0.938 depending on the vehicle class and evaluation year. These factors correspond to the LED NOx benefit range of from 4.8 to 6.2 percent (where 4.8 percent applies to 2002 and later, and 6.2 percent applies to 2001 and earlier model years), as estimated by EPA and documented in *Texas Low Emissions Diesel Fuel Benefits,* EPA Memorandum, September 27, 2001. Tables 33 and 34 show the applied factors and associated benefits. On an eight-county fleet basis, application of these factors produced NOx reductions of 3.11 percent for 2005 and 3.07 percent for 2007.

Table 33
2005 Texas LED Program NOx Adjustment Factors* Applied To Diesel Vehicle Emissions Factors

Diesel Vehicle Type	NOx Reduction	NOx Adjustment Factor
LDDV	6.15%	0.9385
LDDT12	6.20%	0.9380
LDDT34	5.52%	0.9448
HDDV2b	5.22%	0.9478
HDDV3	5.51%	0.9449
HDDV4	5.59%	0.9441
HDDV5	5.55%	0.9445
HDDV6	5.69%	0.9431
HDDV7	5.76%	0.9424
HDDV8a	5.97%	0.9403
HDDV8b	5.87%	0.9413
HDDBT	5.94%	0.9406
HDDBS	5.92%	0.9408

* Analysis provided by TCEQ, April 2004. Based on latest age distributions and diesel fraction estimates.

Table 34
2007 Texas LED Program NOx Adjustment Factors* Applied To Diesel Vehicle Emissions Factors

Diesel Vehicle Type	NOx Reduction	NOx Adjustment Factor
LDDV	6.09%	0.9391
LDDT12	6.20%	0.9380
LDDT34	5.40%	0.9460
HDDV2b	5.09%	0.9491
HDDV3	5.29%	0.9471
HDDV4	5.37%	0.9463
HDDV5	5.27%	0.9473
HDDV6	5.43%	0.9457
HDDV7	5.53%	0.9447
HDDV8a	5.84%	0.9416
HDDV8b	5.61%	0.9439
HDDBT	5.81%	0.9419
HDDBS	5.82%	0.9418

* Analysis provided by TCEQ, January 2004. Based on latest age distributions and diesel fraction estimates.

Upon completion of this third and last step of the emissions factor post-processing procedures, the emissions factors were ready for input to the IMPSUM62 program to calculate estimated emissions. The modeled emissions factors were provided to TCEQ on CD-ROM. See Appendix A for file names and descriptions. One additional set of emissions factors were required, however, to estimate the Harris County I/M correction.

I/M Correction Procedure

The I/M correction was required for the 1996 milestone year for Harris County. The requirement and procedure for calculating the correction is described in the guidance on EIs for the *1996 15 Percent Rate of Progress Plans,* EPA, 1993. The I/M correction for Harris County was originally calculated as part of the 15 percent ROP plan using MOBILE5a (HGAC 1993).

For this task, the previous methodology was generally followed, except that the latest EI data, procedures and models were applied. The Harris County 1996 adjusted base-year EI (which includes the pre-1990 ATP) was compared with the Harris County 1996 adjusted base-year EI, modified to model the EPA basic I/M program (performance standard) effects in place of the Pre-1990 Harris County ATP (the assumed deficient Harris County I/M program). (The results

of this comparison were shown in Table 2.) Table 35 shows the EPA basic I/M program inputs used in MOBILE6 — the inputs for the pre-1990 Harris County ATP were previously provided in Table 29.

Table 35
EPA Basic I/M Program Performance Standard
MOBILE6 I/M Inputs
for Harris County 1996 I/M Correction

Geographic Coverage: Harris County
Evaluation: 1996 Adjusted Base Year

MOBILE6 Inputs: The commands (in bold) with their corresponding data parameters values as defined by the Basic I/M Performance Standard (40 CFR 51.352), are described below (first data value, "1", following each command signifies is the program number).

I/M STRINGENCY: 1 20	(percent, for pre-1981)
I/M COMPLIANCE: 1 96	(percent compliance)
I/M WAIVER RATES: 1 3 3	(percent, for pre-1981 and post-1980)
I/M PROGRAM: 1 1983 2050 1 T/O IDLE	(start year, end year, annual frequency, test only, idle test type)
I/M MODEL YEARS: 1 1968 2020	(first and last model year covered)
I/M VEHICLES : 1 21111 11111111 1	(LDGV only subject to program)
NO I/M TTC CREDITS: 1	(excludes I/M credit for technician training program)

EMISSIONS CALCULATIONS

Hourly emissions were calculated at the network link level using the IMPSUM62 program (Appendix B). Generally, for each hour the ozone season weekday link-VMT estimates were multiplied by the ozone season weekday emissions factors (g/mi) to produce hourly emissions estimates for each of the 28 vehicle types and each pollutant on each network link (the MOBILE6 Freeway, Arterial, or Ramp emissions factors were used depending on the link facility type code). Table 3 shows the particular activity and emissions factor elements associated with each ROP EI. For each of the 15 ROP EI evaluations, three files were output from the emissions calculations: a summary file of county-level and area total hourly and 24-hour emissions estimates cross-classified by vehicle type and road type, a tab-delimited version of the emissions summary file; and the emissions calculation programs execution log. These files were provided on CD-ROM (see Appendix A).

Hourly Link Emissions

For ROP EI evaluation, the emissions were calculated by hour for each network and intrazonal link (indexed to county and road type) using the following basic inputs:

- MOBILE6 emissions factors indexed by pollutant, speed, emission type, hour, road type and vehicle type, as developed with POLFAC62_3 (and RATEADJ utilities for post-processed emissions factors);

- records associating the MOBILE6 drive-cycle-specific emissions factors with the appropriate functional classification codes (or facility type codes) used in the network links;

- link data from the TDM assignment results as developed (for each hour) using the TRANSVMTHSPDWKD or TRANSVMTHSPDWKE program (depending on day type) including: county number, functional classification (or facility type) number, VMT on link, operational link-speed estimate, link node (end point) numbers, and link distance; and

- VMT mix (to allocate link VMT by each of the 28 vehicle types) by time period and roadway type.

For each evaluation, county and hour, the emissions estimates were computed by vehicle type for each link. The emissions factors input were tabulated by pollutant, emissions type, hour, road type (drive cycle), vehicle type, and 14 speeds (2.5 mph and 5 mph to 65 mph at 5 mph intervals) for each county. The county coded hourly fleet total link VMT estimates were first stratified by vehicle type; the time period and functional classification group-specific VMT mixes were correlated to the appropriate links (by functional classification code and hour of day) and were multiplied by the fleet total link VMT to produce the hourly link VMT estimates by the 28 vehicle types. The emissions factors for each pollutant were then matched with appropriate link-level VMT based on road type drive cycle, vehicle class and speed. Freeway, Arterial, and Ramp drive cycle emissions factors were applied to the appropriate links depending on the link functional classification code (local drive cycle emissions factors were not used). Emissions factors for link speeds that were not represented in the set of 14 speed indexes were calculated by interpolation (see example calculation, Appendix B), except for Ramp links where the emissions factors use a single speed (34.6 mph). For link speeds outside of the MOBILE6 model speed range, emissions factors corresponding to the appropriate bounding speeds were applied. The link VMT were then multiplied by the emissions factors to produce the link-level emissions estimates.

Table 36 shows the HGA TDM network functional classification groupings used to allocate the MOBILE6 drive-cycle-specific emissions factors and VMT mix to the appropriate links based on functional class code. The four-period, time-of-day-specific VMT mixes were applied by peak and off-peak periods (see Table 9 for the definition of time-of-day periods).

Table 36
HGAC TDM Functional Classification Groupings
for Application of VMT Mix and MOBILE6 Drive Cycle Emissions Factors

MOBILE6 Drive Cycle	TDM Functional Classification	VMT Mix
Freeway	Urban Interstate	Freeway
	Urban Other Freeway	
	Rural Interstate	
	Rural Other Freeway	
	Toll Roads	
Ramp	Ramps (Freeway, Toll Roads, Frontage)	Arterial
Arterial	Urban Principal Arterial	
	Urban Other Arterial	
	Rural Principal Arterial	
	Rural Other Arterial	
	Urban Collector	Collector
	Rural Major Collector	
	Rural Collector	
	Local (Centroid Connector)	
	Local (Intrazonal)	

Hourly and 24-hour Emissions Summaries
For each ROP EI evaluation, by individual county and for all counties, the link-emissions estimates were summed for each hour, and the hourly emissions were summed for the day. The resulting composite VOC, CO, and NOx emissions estimates were summarized by vehicle type, road-type, and for each vehicle-type and road-type cross-classification. VMT mix, VMT, VHT, and VMT-weighted speeds were included with the emissions summaries. These emissions summary files were provided on CD-ROM (see Appendix A).

APPENDIX A
ELECTRONIC SUBMITTAL DATA SET NAMES AND DESCRIPTIONS

HGA ROP ELECTRONIC DATA SUBMITTAL FILE NAMES/DESCRIPTIONS
This appendix describes the HGA ROP EI electronic data submittal. The HGA ROP EI data files (emissions summaries, emissions factor input/output and post-processing factors, and a copy of this data description) are contained on one CD-ROM (named HGAROP_EMS).

EMISSIONS
The compressed file "hgaROP_ems.zip" contains three EI output files for each of the 15 EI evaluations:

- county-level and regional hourly and 24-hour EI summaries to include VMT mix, VMT, VHT, average speed, and emissions cross-classified by vehicle type and road type (*.LST file);
- a tab-delimited version of first bullet above (*.TAB file); and
- a log of the emissions estimation program runs (*.LOG extension).

The emissions file names (where "*" is file extensions LST, TAB, LOG) are:

1990BY_hga_ems.*;
1996ABY_HarrBasicIM_ems.*;
1996ABY_hga_ems.*;
1999ABY_hga_ems.*;
2002ABY_hga_ems.*;
2005ABY_hga_ems.*;
2007ABY_hga_ems.*;
2002p90growth_hga_ems.*;
2005p90growth_hga_ems.*;
2007p90growth_hga_ems.*;
2002CS_hga_ems.*;
2005CS_hga_ems.*;
2007CS_hga_ems.*;
2005CS_RurNoExIM_hga_ems.*; and
2007CS_RurNoExIM_hga_ems.*.

Where:

"BY" is base year;

"ABY" is adjusted base year;

"p90growth" is pre-1990 controls with VMT growth;

"CS" is control strategy; and

"CS_RurNoExIM" is CS except Rural Counties have only gas cap pressure test for I/M.

EMISSIONS FACTORS

The zip file "hgaROP_efs.zip" contains emissions factor input/output files for the 12 emissions factor scenarios used to develop the HGA ROP EIs. In some cases multiple input files were needed to produce the interim emissions factors (needed to overcome MOBILE6 control program modeling limits) that were then post-processed to produce the final emissions factors, with the desired control program effects. Where ***CCCC*** and ***RRRR*** are the first four letters of each county name for all counties and for Rural County group counties, respectively, input/output files are:

- MOBILE6 command input files (170):

1990BY***CCCC#***.in	1990 Base Year files (10): "#" (A0, A1, A2) is used for Harris County only to designate inputs for two-part ATP modeling;
1996p90HarrBASICIM.in	Pre-1990 Controls for 1996 fleet (one): Harris County only with EPA basic I/M inputs for I/M correction analysis;
YYYYp90***CCCC***#.in	Pre-1990 Controls (50): ***YYYY***: 1996, 1999, 2002, 2005, and 2007; "#" (A0, A1, A2) is used for Harris County only to designate inputs for two-part ATP modeling;
2002CS***CCCC***$.in	2002 Control Strategy (13): "$" (I1A0, I1A1, I1A2, I2A0, I2A1, and I2A2) is used for Harris County only to designate inputs for two-part ATP and May 1st I/M test type switch modeling;
YYYYCS***CCCC***$.in	Control Strategy (90): ***YYYY***: 2005 and 2007; for non-Harris counties, "$" (I1A0, I1A1, I1A2, I2A0, I2A1, and I2A2) designates inputs for two-part ATP and May 1st I/M start modeling; for Harris County, "$" (A0, A1, and A2) designates inputs for two-part ATP modeling; and
YYYYCS***RRRR***NoExIM.in	Control Strategy Rural Counties (six): Rural County I/M is Gas Cap check only, ***YYYY***: 2005 and 2007.

- MOBILE6 external data input files (68):

  *.rgd (16 county-level age distributions files, eight each based on mid-year 2002 and 2003 data);

  *.im (16 I/M files by county group [Harris, Urban, Rural] and analysis year);

*.tld (four region-level trip length distributions files, one each for 1990, 2002, 2005, and 2007); and

*.vhr (32 county-level, hourly VMT fraction files, eight each for 1990, 2002, 2005, and 2007).

- I/M, ATP, LED factor files (eight) for post-processing interim emissions factors (***YYYY*** is 2005, and 2007):

  ATPfull.fc (one file for combining effects of two-part ATP);

  Harr02May1_IMchg.fc (one file for Harris County 2002 May IM test type change);

  YYYYRur_IMstrt.fc (two files for May IM start effects for Rural counties);

  YYYYUrb_IMstrt.fc (two files for May IM start effects for Rural counties); and

  LED_hga***YYYY***_nox.fc (two files for modeling LED effects for all counties).

- MOBILE6 final hourly emissions factor output files (79):

1990BY***CCCC***.rat	1990 Base Year (eight);
1996p90HarrBASICIM.rat	Pre-1990 Controls for 1996 fleet (one), Harris County only with EPA basic I/M inputs for I/M correction analysis;
YYYYp90***CCCC***.rat	Pre-1990 Controls (40): ***YYYY***: 1996, 1999, 2002, 2005, and 2007;
2002CS***CCCC***.rat	2002 Control Strategy (eight);
YYYYCS***CCCC***_LED.rat	Control Strategy (16): ***YYYY***: 2005 and 2007; and

  YYYYCS***RRRR***NoExIM_LED.ratAdditional Rural Counties Control Strategy Scenario (six): Rural County I/M is Gas Cap check only, ***YYYY***: 2005 and 2007.

- MOBILE6 interim hourly emissions factor output files (166):

YYYYEECCCC*.rat	interim output for post-processing IM/ATP effects for various analysis years (***YYYY***) and scenarios (***EE***, i.e., BY, p90, CS), where "*" represents the labels designating the different IM/ATP input options used to produce the resulting interim rates.

- MOBILE6 daily emissions factor output files[1] (245):

  Idetical file set/file names as for hourly rate files except with ".rtd" (daily) extension.

- Program run LOG and LST files[2] for the 12 ROP emissions factor scenarios (24):

hga_1990BY_rat.*	(two files);
hga_***YYYY***p90_rat.*	(10 files, ***YYYY***: 1996, 1999, 2002, 2005, and 2007);
hga_1996p90BasicIM_rat.*	(two files, EPA basic I/M run for I/M correction analysis);
hga_***YYYY***CS_rat.*	(Six files, ***YYYY***: 2002, 2005, and 2007); and
hga_***YYYY***CS_noExIMrat.*	(four files for Rural County I/M gas cap only check, ***YYYY***: 2005 and 2007).

1. MOBILE6 Daily Emissions Factors Files:
The set of 24-hour average emissions factor files (*.rtd) have no impact on the analysis. The "daily all roads" emissions factors (i.e., composites based on MOBILE6 default VMT by facility values) in the *.rtd files are invalid. The individual MOBILE6 road type (Freeway, Arterial, Local, and Ramp) emissions factors are valid.

2. Emissions Factor Log (*.LOG) and MOBILE6 Descriptive Output (*.LST) files:
The log files recorded the emissions factor (POLFAC and RATEADJ) runs (one file with .log extension). The MOBILE6 descriptive output (LST) is a record of MOBILE6 descriptive output for each POLFAC62 run/scenario, which lists user-inputs to the MOBILE6 scenarios; MOBILE6 descriptive output emissions factors, however, are "daily all road types" values composed using MOBILE6 default VMT BY FACILITY values, and thus are not valid.

TDM Network Link Emissions Data File Format

Abbreviation	Columns	Format Type	Description
A Node	1 - 6	I6	A-Node of link
B Node	7 - 12	I6	B-Node of link
FC	13 - 15	I3	Functional Classification Code of Link (see subsequent table)
EMISS	17 - 26	A3	“VOC,” or “CO,” or “NOx”
ETYPE	28 - 40	A11	Emissions Sub-Component Type (see second subsequent table)
LDGV	41 - 50	F10.?*	LDGV link emissions in grams
LDGT1	51 - 60	F10.?	LDGT1 link emissions in grams
LDGT2	61 - 70	F10.?	LDGT2 link emissions in grams
LDGT3	71 - 80	F10.?	LDGT3 link emissions in grams
LDGT4	81 - 90	F10.?	LDGT4 link emissions in grams
HDGV2B	91 - 100	F10.?	HDGV2B link emissions in grams
HDGV3	101 - 110	F10.?	HDGV3 link emissions in grams
HDGV4	111 - 120	F10.?	HDGV4 link emissions in grams
HDGV5	121 - 130	F10.?	HDGV5 link emissions in grams
HDGV6	131 - 140	F10.?	HDGV6 link emissions in grams
HDGV7	141 - 150	F10.?	HDGV7 link emissions in grams
HDGV8A	151 - 160	F10.?	HDGV8A link emissions in grams
HDGV8B	161 - 170	F10.?	HDGV8B link emissions in grams
LDDV	171 - 180	F10.?	LDDV link emissions in grams
LDDT12	181 - 190	F10.?	LDDT12 link emissions in grams
HDDV2B	191 - 200	F10.?	HDDV2B link emissions in grams
HDDV3	201 - 210	F10.?	HDDV3 link emissions in grams
HDDV4	211 - 220	F10.?	HDDV4 link emissions in grams
HDDV5	221 - 230	F10.?	HDDV5 link emissions in grams
HDDV6	231 - 240	F10.?	HDDV6 link emissions in grams
HDDV7	241 - 250	F10.?	HDDV7 link emissions in grams
HDDV8A	251 - 260	F10.?	HDDV8A link emissions in grams
HDDV8B	261 - 270	F10.?	HDDV8B link emissions in grams
MC	271 - 280	F10.?	MC link emissions in grams
HDGB	281 - 290	F10.?	HDGB link emissions in grams
HDDBT	291 - 300	F10.?	HDDBT link emissions in grams
HDDBS	301 - 310	F10.?	HDDBS link emissions in grams
LDDT34	311 - 320	F10.?	LDDT34 link emissions in grams

***** The F10? format is either F10.0, F10.1, F10.2, F10.3, or F10.4. The format selected for a field is based on the value of the field.

HGA Travel Model Network Functional Classification Names and Codes

1	Urban Interstate Freeways
2	Urban Other Freeways
3	Toll Roads
4	Ramps (Frwy/Toll/Frontage)
5	Urban Principal Arterials
6	Urban Other Arterials
7	Urban Collectors
8	Locals (Centroid Connectors)
10	Rural Interstate Freeways
11	Rural Other Freeways
12	Rural Principal Arterials
13	Rural Other Arterials
14	Rural Major Collectors
15	Rural Collectors
40	Local (Intrazonals)

Emissions Sub-Component Type

Sub-Component Abbreviation	Comments
COMPOSITE	Total emissions
EXH_RUNNING	Exhaust running emissions
START	Start emissions
Hot_Soak	Hot soak VOC emissions
Diurnal	Diurnal VOC emissions
Rest_Loss	Resting loss VOC emissions
Run_Loss	Running loss VOC emissions
Crankcase	Crankcase VOC emissions
Refueling	Refueling loss VOC emissions

APPENDIX B
EMISSIONS ESTIMATION PROGRAMS

TTI EMISSIONS ESTIMATION PROGRAMS

The following is a summary of the series of programs developed by TTI for developing link-based, time-of-day, on-road mobile source emissions estimates for air quality analyses.

These programs produce emissions factors with the latest version of EPA's MOBILE emissions factor model, and apply them to travel model-based activity estimates to calculate emissions at user-specified temporal and spatial scales. The location of emissions by grid, or travel network link coordinates, may also be specified.

The emissions estimation programs are: TRANSVMTHSPDWKD and TRANSVMTHSPDWKE, POLFAC62_3, RATEADJ62, RATEADJV62, IMPSUM62, and SUMALL62. TRANSVMTHSPDWKD and TRANSVMTHSPDWKE prepare activity input for weekday and weekdend day types, respectively, POLFAC62_3 prepares emissions factor input, the RATEADJ programs make special adjustments to emissions factors when required, IMPSUM62 calculates emissions by time period, and SUMALL62 summarizes emissions at various levels by 24-hour period.

TRANSVMTHSPDWKD and TRANSVMTHSPDWKE

The TRANSVMTHSPDWKD and TRANSVMTHSPDWKE programs are TRANSCAD-based utilities that post-process TDMs to produce time-of-day specific, on-road vehicle, link VMT and speed estimates. The TRANSVMTHSPDWKD program processes a TDM traffic assignment consisting of four time-of-day assignments by scaling the link volumes by the appropriate HPMS, seasonal, or other VMT factors. Time-of-day factors are then applied to distribute the link VMT to each hour in the day. The Houston speed model is used to estimate the operational time-of-day speeds for each link (or by direction if the assignment is not directional). Since intrazonal links are not included in the TDMs, special intrazonal links are created and the VMT and speeds for these special links are estimated. The TRANSVMTHSPDWKD program is specifically designed for estimating VMT and speeds for Weekdays (day types Weekdays and Friday). The TRANSVMTHSPDWKE program operates in a similar manner as the TRANSVMTHSPDWKD program except that it allows for an extra VMT factor that can be used to estimate VMT and speeds for Weekends (day types Saturday and Sunday). The link VMT and speeds produced by these programs are subsequently input to the IMPSUM62 program for the application of MOBILE6 emission factors.

POLFAC62_3

The POLFAC62_3 program is used to apply the EPA's MOBILE6 program (September 2003 version with additional pollutant capabilities) to calculate the on-road mobile emissions factors. The MOBILE6 emissions factors may be produced for each of the pollutant-specific emissions types (e.g., depending on the pollutant and vehicle type, the total composite, exhaust running, exhaust start, plus the six sub-component evaporative rates), 28 vehicle types, four MOBILE6 functional classifications (or drive cycles, i.e., Freeway, Arterial/Collector, Local, and Ramp), 14 speeds (i.e., 2.5 mph, and 5 mph through 65 mph at 5 mph increments for Freeway and Arterial functional classifications — MOBILE6 Local and Ramp functional classification rates are single speed only, 12.9 mph, and 34.6 mph, respectively), and each of the 24 hours of the day. The POLFAC62_3 emissions factors are average vehicle class rates calculated from the MOBILE6

database output by weighting the by-model-year emissions rates within each vehicle class by its corresponding travel fraction. These emissions factors are tabulated individually by geographical area (county or county group) and analysis day for the evaluation year. These emissions factors are output to an ASCII file for subsequent input to the IMPSUM62 program. The IMPSUM62 program is then used to apply the hourly emissions factors to hourly VMT estimates by link. (POLFAC62_3 also optionally produces a set of daily emissions factors.) POLFAC62_3 also calculates the additional pollutant emissions factors provided by the MOBILE6 October 2002 version.

RATEADJ62
RATEADJ62 is a special utility program that produces a new set of emissions factors by linearly combining the emissions factors from multiple applications of POLFAC62_3. There is one set of linear factors. Each factor is applied to all emissions rates in a single data set.

A practical application of the RATEADJ62 program is the combining of two sets of emissions factors, where each set has different control program credits, into one set including the combined credits. For example, this program may be used to combine different ATP credits from two separate POLFAC62_3 runs into one set of emissions factors that includes the credits for both ATPs.

RATEADJV62
RATEADJV62 is a special utility program that produces a new set of emissions factors by linearly combining the emissions factors from multiple applications of POLFAC62_3 or RATEADJ62. There is a separate set of factors (that may be different for each pollutant-specific emissions type and vehicle type combination) for each of the input emissions factor data sets.

A practical application of RATEADJV62 is the application of emissions factor credits by individual vehicle class and/or individual pollutant. For example, for analyses requiring the effects of the Texas LED Fuel Program in MOBILE6 emissions factors, RATEADJV62 is used to apply reduction factors to only the NOx emissions factors for diesel-fueled vehicle classes only.

IMPSUM62
The IMPSUM62 program applies the emissions factors obtained from POLFAC62_3 (or from one of the RATEADJ programs, when used) and VMT mixes (fractions of fleet VMT attributable to each vehicle classification in the study) to the time-of-day fleet VMT and speed estimates to calculate emissions by the specified time periods. The five primary inputs to IMPSUM62 are:

- MOBILE6 emissions factors developed with POLFAC62_3 (or a RATEADJ6, if used);
- link-based hourly VMT and speeds developed using the TRANSVMTHSPDWKD or TRANSVMTHSPDWKE program. For each link, the following information is input to IMPSUM62: county number, roadway type number, VMT on link, operational link-speed estimate, and link distance;

- VMT mix by time period, county and roadway type;

- X-Y coordinates (optional for gridded emissions); and

- data records associating the MOBILE6 drive cycle (Freeway, Arterial, Local, and Ramp) emissions factors (or percentages thereof) to specific travel model functional classifications. These MOBILE6 drive cycle emissions factor percentages (valid from zero to 100) must sum to 100 percent for each travel model functional classification.

Using these input data, the VMT for each link is stratified by MOBILE6 drive cycle and the 28 vehicle types. The MOBILE6 emissions factors are matched to link VMT by drive cycle, speed, and vehicle type and are interpolated (for the speed that falls between the 14 MOBILE6 speeds, see the MOBILE6 interpolation methodology below) and multiplied by the link VMT to estimate the mobile source emissions for that link. Emissions factors for 65 mph are used for links with speeds greater than 65 mph and emissions factors for 2.5 mph are used for links with speeds lower than 2.5 mph. The emissions for the county and emissions type are reported by both roadway type and vehicle type for each of the subject time periods. A data set is produced for subsequent input to the SUMALL62 program. Also, link emissions may be written by county at the pollutant-specific emissions type sub-component level and 28 vehicle types level.

A tab-delimited output is optionally produced. This output includes all 28 vehicle types (or eight vehicle types in the compressed format) across a single output line. Each field in the output is separated by a tab character.

Example Emissions Factor Interpolation
To calculate emissions factors for average operational speeds that fall between two of the 14 MOBILE6 speed bin speeds, MOBILE6 interpolates each emissions factor using a factor developed from the inverse link speed and the inverse high and low bounding speed bin speeds (Section 5.3.4, *MOBILE6 User's Guide*, January 2002).

Using the MOBILE6 emissions factors tabulated by the 14 speeds, the IMPSUM62 program uses the MOBILE6 method to interpolate emissions factors as shown in the following example. This example interpolates an emissions factor corresponding to an average speed of 41.2 mph.

The interpolated emissions factor (EF_{Interp}) is expressed as:

$$EF_{Interp} = EF_{LowSpeed} - FAC_{Interp} \times (EF_{LowSpeed} - EF_{HighSpeed})$$

Where:

$EF_{LowSpeed}$ = emission factor (EF) corresponding to tabulated speed below the average link speed;

$EF_{HighSpeed}$ = EF corresponding to tabulated speed above the average link speed; and

$$FAC_{Interp} = \left(\frac{1}{Speed_{link}} - \frac{1}{Speed_{low}}\right) \Big/ \left(\frac{1}{Speed_{high}} - \frac{1}{Speed_{low}}\right)$$

Given that:

$EF_{LowSpeed}$ = 0.7413 g/mi;
$EF_{HighSpeed}$ = 0.7274 g/mi;
$Speed_{lnk}$ = 41.2 mph;
$Speed_{low}$ = 40 mph; and
$Speed_{high}$ = 45 mph.

$$FAC_{Interp} = \left(\frac{1}{41.2mph} - \frac{1}{40mph}\right) \Big/ \left(\frac{1}{45mph} - \frac{1}{40mph}\right) = \frac{-0.00073}{-0.00278} = 0.26214,$$

EF_{Interp} = 0.7413 g/mi - (0.26214) × (0.7413 g/mi - 0.7274 g/mi)

= 0.7377 g/mi

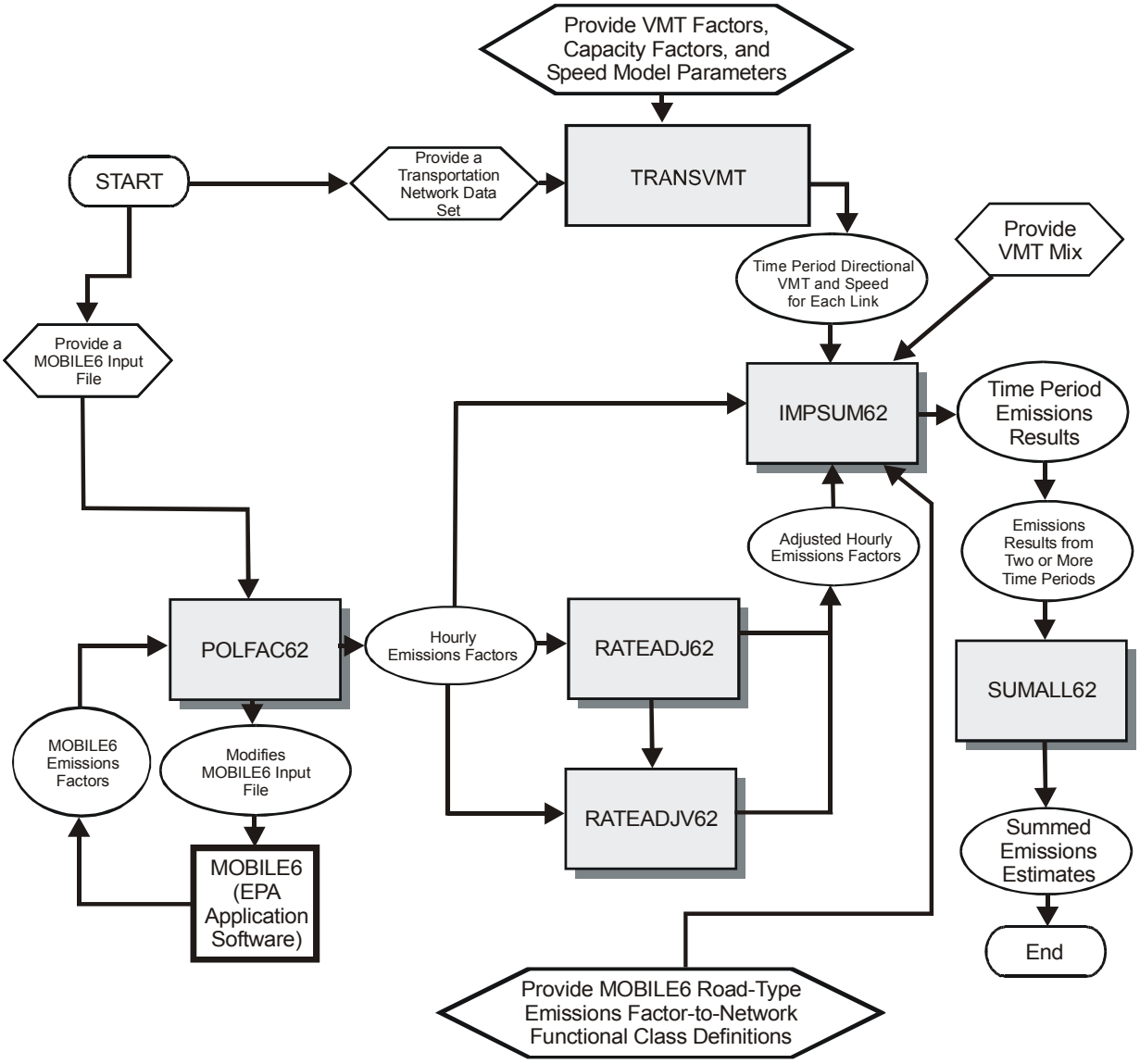
SUMALL62
The SUMALL62 program is used to sum the emissions estimates for the time-of-day periods (e.g., 24 periods in the case of hourly analyses) to develop 24-hour emissions estimates. The emissions by pollutant type are reported by roadway type and 28 vehicle types (or optionally condensed to eight vehicle types).

A tab-delimited output is optionally produced. This output includes all 28 vehicle types (or eight vehicle types in the compressed format) across a single output line. Each field in the output is separated by a tab character.

The overall emissions estimate process flow is shown in the diagram below.

General Process Flow

Travel Demand Model Network Link-Based Hourly MOBILE6 Emissions Estimates with Texas Mobile Source Emissions Software



APPENDIX C
CAPACITY FACTORS, SPEED FACTORS, AND SPEED REDUCTION FACTORS

Capacity Factors

Time of Day Assignment	Capacity Factor[1]
AM Peak	0.3333333
Mid-Day	0.1666667
PM Peak	0.25
Overnight	0.0909091

[1] To obtain hourly capacities, a single capacity factor for each time-of-day assignment is used for all area types and function classes.

Freeflow (Volume = 1) Speed Factors for Houston/Galveston Speed Model

Functional Group	Area Type				
	CBD	Urban	Urban Fringe	Suburban	Rural
Freeways, Interstates	1.19818	1.158839	1.063315	1.168733	1.192189
Principal Arterials	1.15403	0.827978	0.890652	1.102505	1.176415
Other Arterials, Major Collectors	1.14595	0.811634	0.81318	0.81318	1.290531
Collectors	1.23845	0.895662	0.89064	1.199254	1.192486
Toll Roads	1.05455	1.054545	0.997586	0.950484	1.083538
Ramps	1.23845	0.895662	0.89064	1.199254	1.192486
Locals	1	1	1	1	1

LOS E (V/C = 1.0) Speed Factors for Houston/Galveston Speed Model

Functional Group	Area Type				
	CBD	Urban	Urban Fringe	Suburban	Rural
Freeways, Interstates	0.80252	0.768691	0.757099	0.901573	0.809269
Principal Arterials	0.64236	0.560208	0.668272	0.822853	0.955472
Other Arterials, Major Collectors	0.68108	0.562673	0.616082	0.865193	1.118835
Collectors	0.75046	0.636429	0.662149	0.913293	1.006409
Toll Roads	0.63636	0.636364	0.689655	0.806452	0.769231
Ramps	0.75046	0.636429	0.662149	0.913293	1.006409
Locals	1	1	1	1	1

Functional Classification to Functional Group Relationship for the Application of and Speed Factors

Functional Group	Corresponding Network Functional Classifications
Freeways, Interstates	1. Urban Interstate Freeways 2. Urban Other Freeways 10. Rural Interstate Freeways 11. Rural Other Freeways
Principal Arterials	5. Urban Principal Arterials 12. Rural Principal Arterials
Other Arterials, Major Collectors	6. Urban Other Arterials 13. Rural Other Arterials 14. Rural Major Collectors
Collectors	7. Urban Collectors 15. Rural Collectors
Toll Roads	3. Toll Roads
Ramps	4. Ramps
Locals	8. Locals (Centroid Connectors) 16. Locals (Intrazonals)

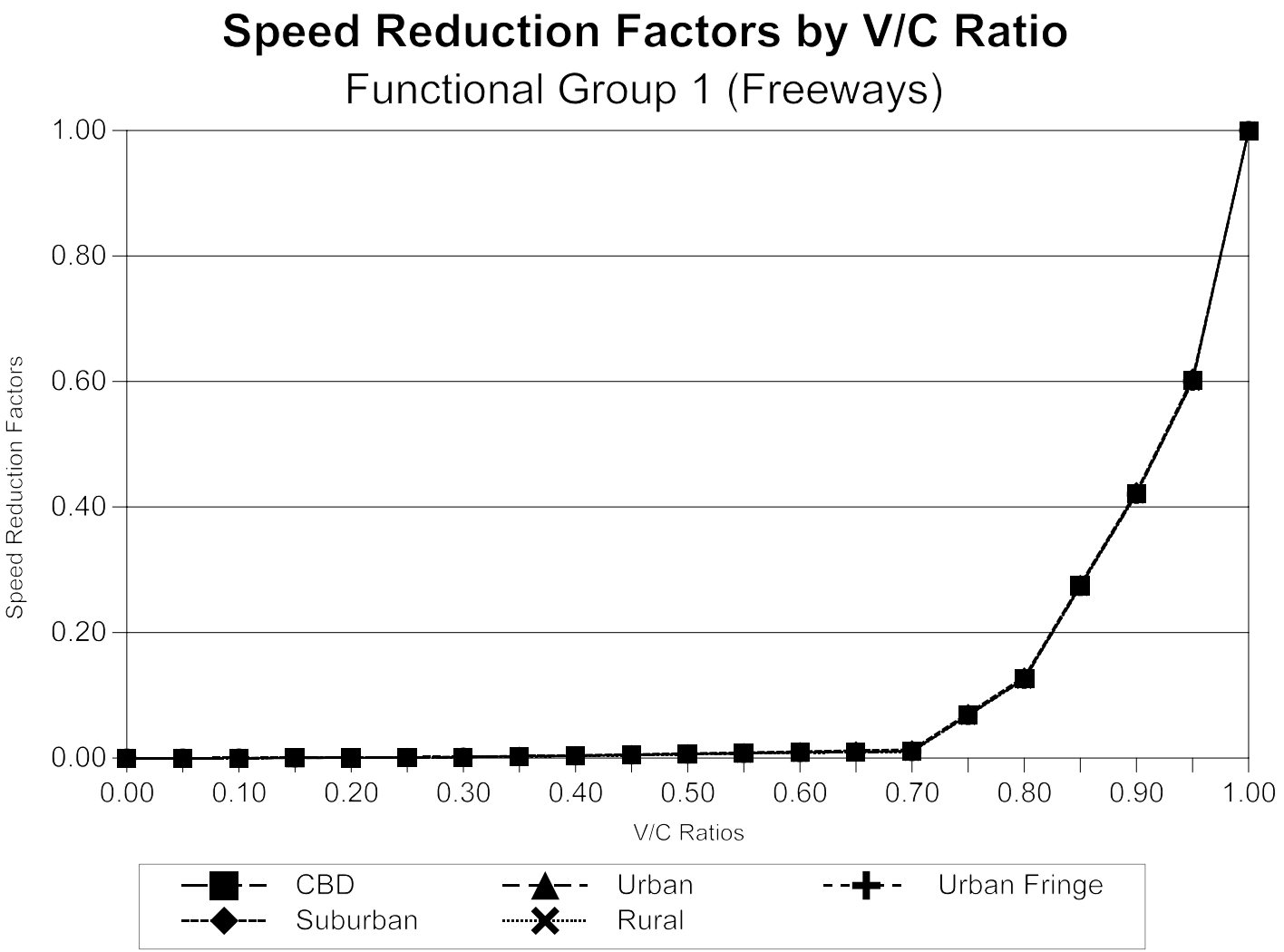


Figure 1. Freeway Reduction Factors by V/C Ratio.

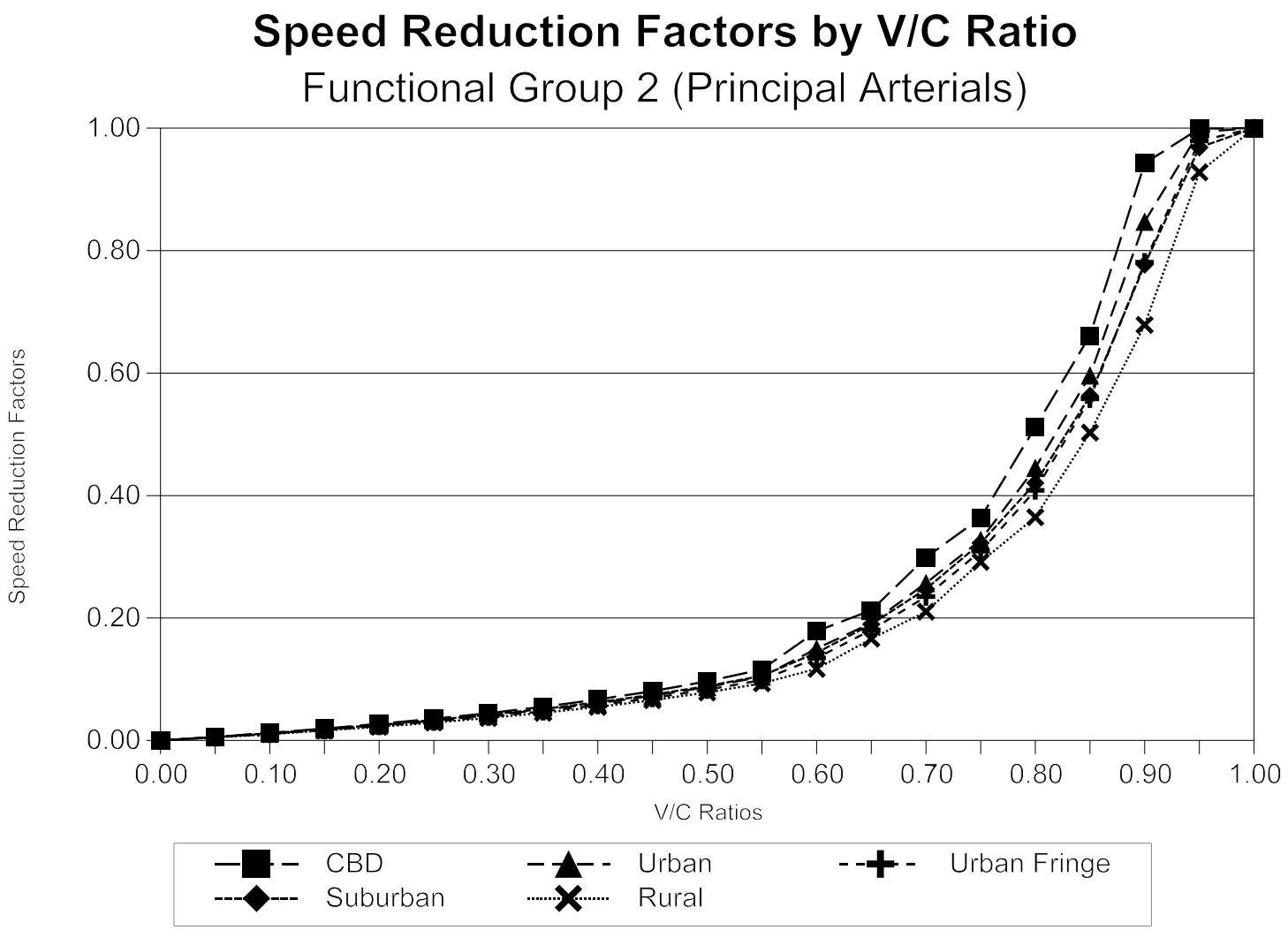


Figure 2. Principal Arterial Speed Reduction Factors by V/C Ratio.

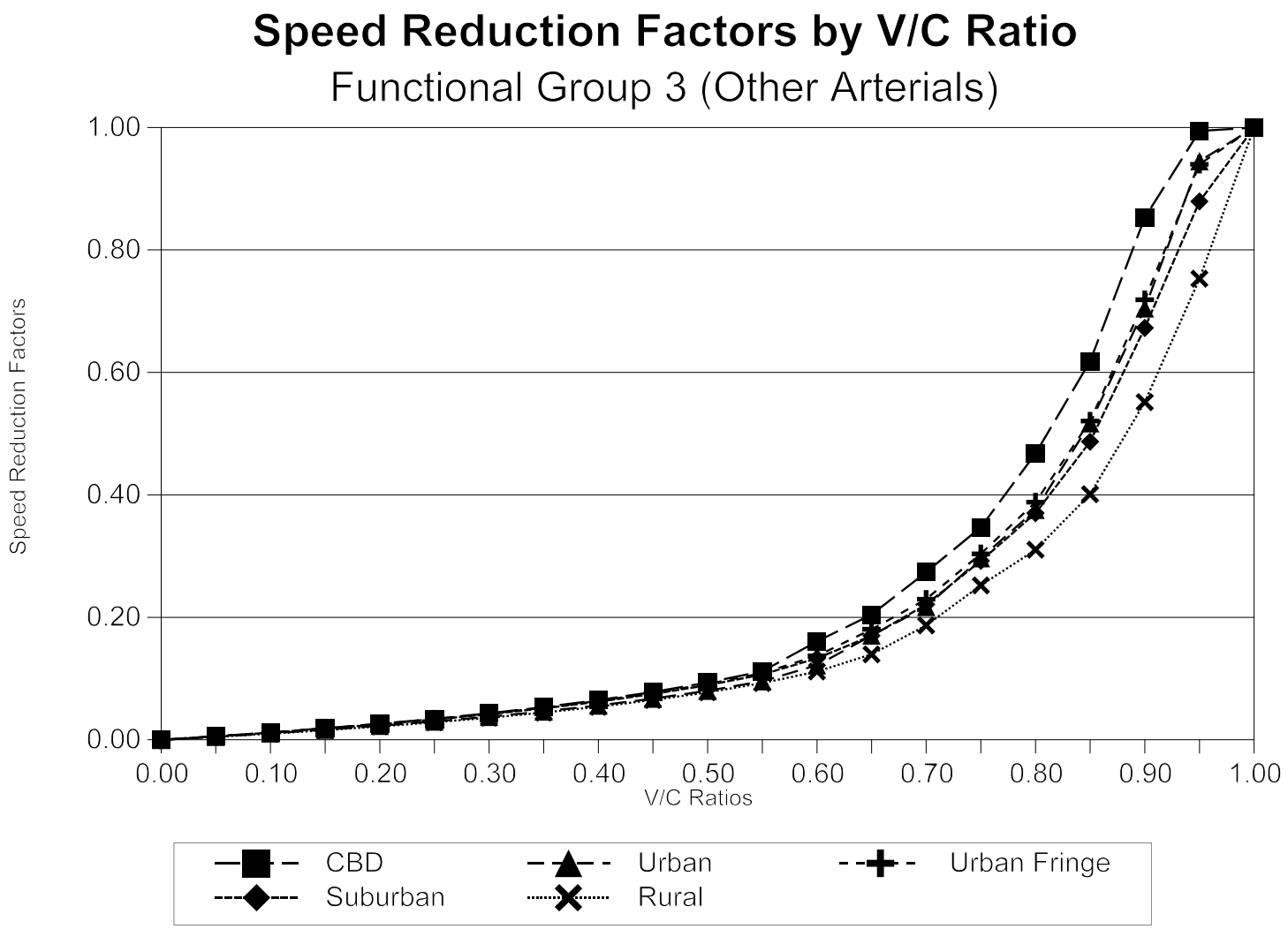


Figure 3. Other Arterial Speed Reduction Factors by V/C Ratio.

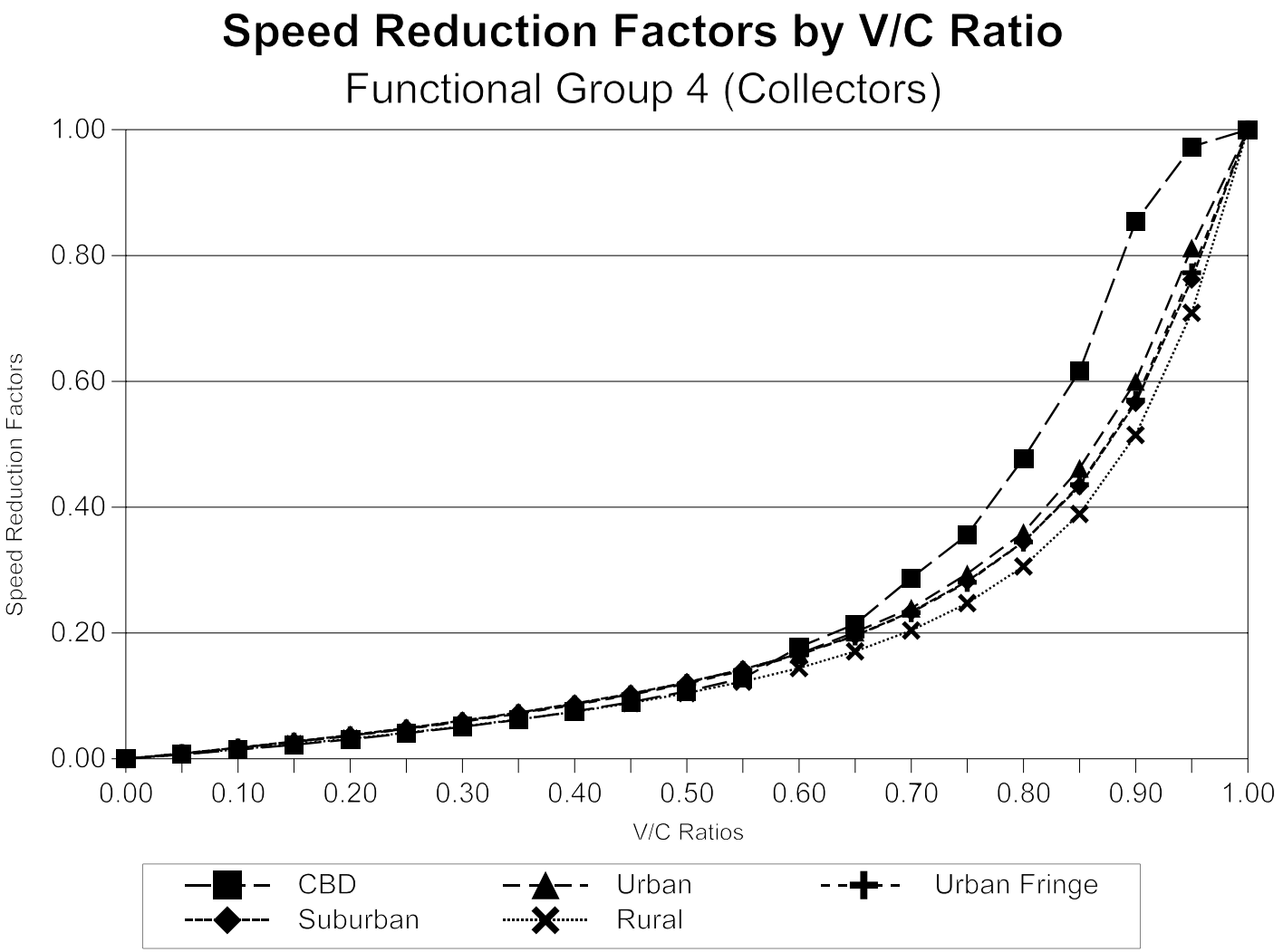


Figure 4. Collector Speed Reduction Factors by V/C Ratio.

Functional Classification to Functional Group Relationship for the Application of Speed Reduction Factors

Functional Group	Corresponding Network Functional Classifications
1. Freeways, Interstates	1. Urban Interstate Freeways 2. Urban Other Freeways 3. Toll Roads 10. Rural Interstate Freeways 11. Rural Other Freeways
2. Principal Arterials	5. Urban Principal Arterials 12. Rural Principal Arterials
3. Other Arterials, Major Collectors	6. Urban Other Arterials 13. Rural Other Arterials 14. Rural Major Collectors
4. Collectors	4. Ramps 7. Urban Collectors 15. Rural Collectors

APPENDIX D
VMT MIX ESTIMATES

HGA 1990 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6226506	0.0563403	0.1875537	0.0343129	0.0157790	0.0068689	0.0025842	0.0011917	0.0005088
2	AM_Peak	Col	0.5329614	0.0676040	0.2250497	0.0459150	0.0211142	0.0107084	0.0040287	0.0018578	0.0007932
3	AM_Peak	Fway	0.6436926	0.0522611	0.1739742	0.0306094	0.0140759	0.0069152	0.0026016	0.0011997	0.0005122
4	Mid_Day	Art	0.5858578	0.0530566	0.1766221	0.0322673	0.0148383	0.0128171	0.0048220	0.0022236	0.0009494
5	Mid_Day	Col	0.5043979	0.0636695	0.2119519	0.0432479	0.0198878	0.0200045	0.0075261	0.0034706	0.0014818
6	Mid_Day	Fway	0.6101140	0.0497186	0.1655104	0.0292040	0.0134296	0.0112317	0.0042256	0.0019486	0.0008320
7	Ovr_Nite	Art	0.6210864	0.0563687	0.1876479	0.0342624	0.0157557	0.0050739	0.0019089	0.0008803	0.0003758
8	Ovr_Nite	Col	0.5497346	0.0696854	0.2319785	0.0473293	0.0217646	0.0075850	0.0028536	0.0013159	0.0005619
9	Ovr_Nite	Fway	0.6297849	0.0511204	0.1701767	0.0299616	0.0137780	0.0052155	0.0019622	0.0009048	0.0003863
10	PM_Peak	Art	0.6217428	0.0565610	0.1882881	0.0344534	0.0158435	0.0075375	0.0028358	0.0013077	0.0005583
11	PM_Peak	Col	0.5341206	0.0677429	0.2255121	0.0460095	0.0211577	0.0128200	0.0048231	0.0022241	0.0009496
12	PM_Peak	Fway	0.6438744	0.0525804	0.1750371	0.0309351	0.0142256	0.0065493	0.0024640	0.0011362	0.0004851

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012318	0.0004954	0.0004552	0.0000536	0.0100557	0.0044591	0.0064292	0.0033480	0.0019651	0.0012616
2	0.0019204	0.0007723	0.0007097	0.0000835	0.0086096	0.0053505	0.0095091	0.0049519	0.0029065	0.0018659
3	0.0012401	0.0004988	0.0004583	0.0000539	0.0103950	0.0041362	0.0062257	0.0032421	0.0019030	0.0012216
4	0.0022986	0.0009244	0.0008495	0.0000999	0.0094625	0.0041992	0.0119760	0.0062365	0.0036606	0.0023500
5	0.0035876	0.0014428	0.0013258	0.0001560	0.0081490	0.0050391	0.0180231	0.0093856	0.0055090	0.0035366
6	0.0020143	0.0008101	0.0007444	0.0000876	0.0098536	0.0039350	0.0100909	0.0052549	0.0030844	0.0019801
7	0.0009099	0.0003660	0.0003363	0.0000396	0.0100305	0.0044613	0.0047872	0.0024930	0.0014633	0.0009394
8	0.0013603	0.0005471	0.0005027	0.0000591	0.0088800	0.0055153	0.0067998	0.0035410	0.0020784	0.0013343
9	0.0009353	0.0003762	0.0003457	0.0000407	0.0101707	0.0040459	0.0047113	0.0024534	0.0014400	0.0009245
10	0.0013518	0.0005436	0.0004996	0.0000588	0.0100411	0.0044765	0.0070503	0.0036715	0.0021550	0.0013835
11	0.0022991	0.0009246	0.0008497	0.0001000	0.0086283	0.0053615	0.0115315	0.0060051	0.0035247	0.0022628
12	0.0011745	0.0004724	0.0004341	0.0000511	0.0103979	0.0041615	0.0058974	0.0030711	0.0018026	0.0011572

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0040516	0.0026687	0.0045368	0.0250255	0.0010000	0.0018361	0.0013026	0.0008925	0.0011414
2	0.0059925	0.0039472	0.0067102	0.0278432	0.0010000	0.0029265	0.0020762	0.0014226	0.0013696
3	0.0039234	0.0025843	0.0043932	0.0278198	0.0010000	0.0018237	0.0012938	0.0008865	0.0010588
4	0.0075471	0.0049712	0.0084510	0.0493261	0.0010000	0.0009648	0.0006845	0.0004690	0.0010749
5	0.0113580	0.0074813	0.0127182	0.0326420	0.0010000	0.0007825	0.0005551	0.0003804	0.0012899
6	0.0063592	0.0041887	0.0071208	0.0538664	0.0010000	0.0010877	0.0007717	0.0005287	0.0010073
7	0.0030169	0.0019872	0.0033782	0.0388640	0.0010000	0.0006491	0.0004605	0.0003155	0.0011420
8	0.0042851	0.0028225	0.0047983	0.0203296	0.0010000	0.0008772	0.0006223	0.0004264	0.0014118
9	0.0029690	0.0019556	0.0033246	0.0584521	0.0010000	0.0011518	0.0008171	0.0005599	0.0010357
10	0.0044430	0.0029265	0.0049751	0.0224062	0.0010000	0.0012497	0.0008866	0.0006075	0.0011459
11	0.0072670	0.0047867	0.0081373	0.0146162	0.0010000	0.0027208	0.0019303	0.0013226	0.0013724
12	0.0037165	0.0024480	0.0041616	0.0287595	0.0010000	0.0013400	0.0009507	0.0006514	0.0010652

HGA 1996 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6293048	0.0571419	0.1902299	0.0343120	0.0157799	0.0068689	0.0025842	0.0011917	0.0005088
2	AM_Peak	Col	0.5386586	0.0685658	0.2282610	0.0459137	0.0211155	0.0107084	0.0040287	0.0018578	0.0007932
3	AM_Peak	Fway	0.6505712	0.0530046	0.1764567	0.0306086	0.0140767	0.0069152	0.0026016	0.0011997	0.0005122
4	Mid_Day	Art	0.5921194	0.0538114	0.1791424	0.0322664	0.0148392	0.0128171	0.0048220	0.0022236	0.0009494
5	Mid_Day	Col	0.5097904	0.0645753	0.2149763	0.0432467	0.0198890	0.0200045	0.0075261	0.0034706	0.0014818
6	Mid_Day	Fway	0.6166344	0.0504260	0.1678721	0.0292032	0.0134304	0.0112317	0.0042256	0.0019486	0.0008320
7	Ovr_Nite	Art	0.6277239	0.0571706	0.1903255	0.0342615	0.0157567	0.0050739	0.0019089	0.0008803	0.0003758
8	Ovr_Nite	Col	0.5556108	0.0706768	0.2352886	0.0473280	0.0217659	0.0075850	0.0028536	0.0013159	0.0005619
9	Ovr_Nite	Fway	0.6365152	0.0518477	0.1726051	0.0299608	0.0137788	0.0052155	0.0019622	0.0009048	0.0003863
10	PM_Peak	Art	0.6283873	0.0573657	0.1909748	0.0344524	0.0158445	0.0075375	0.0028358	0.0013077	0.0005583
11	PM_Peak	Col	0.5398302	0.0687067	0.2287300	0.0460082	0.0211590	0.0128200	0.0048231	0.0022241	0.0009496
12	PM_Peak	Fway	0.6507551	0.0533285	0.1775348	0.0309342	0.0142265	0.0065493	0.0024640	0.0011362	0.0004851

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012318	0.0004954	0.0004552	0.0000536	0.0034015	0.0010346	0.0064292	0.0033480	0.0019651	0.0012616
2	0.0019204	0.0007723	0.0007097	0.0000835	0.0029124	0.0012414	0.0095091	0.0049519	0.0029065	0.0018659
3	0.0012401	0.0004988	0.0004583	0.0000539	0.0035163	0.0009597	0.0062257	0.0032421	0.0019030	0.0012216
4	0.0022986	0.0009244	0.0008495	0.0000999	0.0032009	0.0009743	0.0119760	0.0062365	0.0036606	0.0023500
5	0.0035876	0.0014428	0.0013258	0.0001560	0.0027566	0.0011692	0.0180231	0.0093856	0.0055090	0.0035366
6	0.0020143	0.0008101	0.0007444	0.0000876	0.0033332	0.0009130	0.0100909	0.0052549	0.0030844	0.0019801
7	0.0009099	0.0003660	0.0003363	0.0000396	0.0033930	0.0010351	0.0047872	0.0024930	0.0014633	0.0009394
8	0.0013603	0.0005471	0.0005027	0.0000591	0.0030038	0.0012796	0.0067998	0.0035410	0.0020784	0.0013343
9	0.0009353	0.0003762	0.0003457	0.0000407	0.0034405	0.0009387	0.0047113	0.0024534	0.0014400	0.0009245
10	0.0013518	0.0005436	0.0004996	0.0000588	0.0033966	0.0010386	0.0070503	0.0036715	0.0021550	0.0013835
11	0.0022991	0.0009246	0.0008497	0.0001000	0.0029187	0.0012440	0.0115315	0.0060051	0.0035247	0.0022628
12	0.0011745	0.0004724	0.0004341	0.0000511	0.0035173	0.0009655	0.0058974	0.0030711	0.0018026	0.0011572

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0040516	0.0026687	0.0045368	0.0250255	0.0010000	0.0011753	0.0013105	0.0015454	0.0010881
2	0.0059925	0.0039472	0.0067102	0.0278432	0.0010000	0.0018734	0.0020888	0.0024632	0.0013056
3	0.0039234	0.0025843	0.0043932	0.0278198	0.0010000	0.0011674	0.0013016	0.0015349	0.0010093
4	0.0075471	0.0049712	0.0084510	0.0493261	0.0010000	0.0006176	0.0006886	0.0008121	0.0010247
5	0.0113580	0.0074813	0.0127182	0.0326420	0.0010000	0.0005009	0.0005585	0.0006586	0.0012296
6	0.0063592	0.0041887	0.0071208	0.0538664	0.0010000	0.0006963	0.0007763	0.0009155	0.0009602
7	0.0030169	0.0019872	0.0033782	0.0388640	0.0010000	0.0004155	0.0004633	0.0005464	0.0010886
8	0.0042851	0.0028225	0.0047983	0.0203296	0.0010000	0.0005615	0.0006261	0.0007383	0.0013458
9	0.0029690	0.0019556	0.0033246	0.0584521	0.0010000	0.0007373	0.0008221	0.0009694	0.0009873
10	0.0044430	0.0029265	0.0049751	0.0224062	0.0010000	0.0008000	0.0008919	0.0010518	0.0010923
11	0.0072670	0.0047867	0.0081373	0.0146162	0.0010000	0.0017417	0.0019419	0.0022900	0.0013083
12	0.0037165	0.0024480	0.0041616	0.0287595	0.0010000	0.0008578	0.0009564	0.0011278	0.0010155

HGA 1999 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6309225	0.0572710	0.1906522	0.0343144	0.0157799	0.0068692	0.0025843	0.0011917	0.0005088
2	AM_Peak	Col	0.5400399	0.0687203	0.2287661	0.0459167	0.0211154	0.0107088	0.0040289	0.0018579	0.0007932
3	AM_Peak	Fway	0.6522447	0.0531245	0.1768486	0.0306108	0.0140768	0.0069155	0.0026017	0.0011998	0.0005123
4	Mid_Day	Art	0.5936400	0.0539328	0.1795395	0.0322686	0.0148391	0.0128177	0.0048223	0.0022237	0.0009495
5	Mid_Day	Col	0.5110966	0.0647206	0.2154514	0.0432494	0.0198888	0.0200053	0.0075264	0.0034707	0.0014819
6	Mid_Day	Fway	0.6182190	0.0505399	0.1682445	0.0292052	0.0134304	0.0112322	0.0042258	0.0019487	0.0008320
7	Ovr_Nite	Art	0.6293375	0.0572998	0.1907480	0.0342639	0.0157567	0.0050742	0.0019090	0.0008803	0.0003759
8	Ovr_Nite	Col	0.5570362	0.0708361	0.2358095	0.0473311	0.0217658	0.0075853	0.0028537	0.0013160	0.0005619
9	Ovr_Nite	Fway	0.6381518	0.0519649	0.1729883	0.0299629	0.0137789	0.0052158	0.0019623	0.0009049	0.0003864
10	PM_Peak	Art	0.6300026	0.0574953	0.1913987	0.0344548	0.0158445	0.0075379	0.0028359	0.0013077	0.0005584
11	PM_Peak	Col	0.5412145	0.0688615	0.2292361	0.0460111	0.0211588	0.0128205	0.0048233	0.0022242	0.0009497
12	PM_Peak	Fway	0.6524289	0.0534491	0.1779291	0.0309365	0.0142265	0.0065497	0.0024641	0.0011363	0.0004852

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012319	0.0004954	0.0004553	0.0000536	0.0017658	0.0004312	0.0064295	0.0033482	0.0019652	0.0012616
2	0.0019205	0.0007724	0.0007097	0.0000835	0.0015119	0.0005174	0.0095095	0.0049521	0.0029067	0.0018660
3	0.0012402	0.0004988	0.0004583	0.0000539	0.0018254	0.0004000	0.0062260	0.0032422	0.0019031	0.0012217
4	0.0022987	0.0009245	0.0008495	0.0000999	0.0016617	0.0004061	0.0119765	0.0062368	0.0036607	0.0023501
5	0.0035877	0.0014429	0.0013259	0.0001560	0.0014310	0.0004873	0.0180238	0.0093860	0.0055092	0.0035368
6	0.0020144	0.0008101	0.0007444	0.0000876	0.0017303	0.0003805	0.0100914	0.0052552	0.0030845	0.0019802
7	0.0009100	0.0003660	0.0003363	0.0000396	0.0017614	0.0004314	0.0047875	0.0024931	0.0014633	0.0009394
8	0.0013603	0.0005471	0.0005027	0.0000591	0.0015594	0.0005334	0.0068001	0.0035412	0.0020785	0.0013344
9	0.0009354	0.0003762	0.0003457	0.0000407	0.0017860	0.0003913	0.0047115	0.0024535	0.0014401	0.0009245
10	0.0013518	0.0005437	0.0004996	0.0000588	0.0017633	0.0004329	0.0070506	0.0036716	0.0021551	0.0013835
11	0.0022992	0.0009247	0.0008497	0.0001000	0.0015152	0.0005185	0.0115320	0.0060053	0.0035249	0.0022629
12	0.0011746	0.0004724	0.0004341	0.0000511	0.0018259	0.0004025	0.0058977	0.0030713	0.0018027	0.0011573

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0040518	0.0026688	0.0045370	0.0250267	0.0010000	0.0009043	0.0013063	0.0018208	0.0011523
2	0.0059928	0.0039473	0.0067105	0.0278444	0.0010000	0.0014414	0.0020821	0.0029021	0.0013826
3	0.0039236	0.0025844	0.0043935	0.0278212	0.0010000	0.0008982	0.0012975	0.0018085	0.0010689
4	0.0075475	0.0049714	0.0084514	0.0493283	0.0010000	0.0004752	0.0006864	0.0009568	0.0010851
5	0.0113584	0.0074816	0.0127187	0.0326433	0.0010000	0.0003854	0.0005567	0.0007760	0.0013022
6	0.0063595	0.0041889	0.0071211	0.0538690	0.0010000	0.0005357	0.0007739	0.0010786	0.0010169
7	0.0030170	0.0019873	0.0033783	0.0388659	0.0010000	0.0003197	0.0004618	0.0006437	0.0011529
8	0.0042853	0.0028227	0.0047985	0.0203304	0.0010000	0.0004321	0.0006241	0.0008699	0.0014252
9	0.0029691	0.0019557	0.0033247	0.0584550	0.0010000	0.0005673	0.0008194	0.0011422	0.0010455
10	0.0044432	0.0029267	0.0049753	0.0224073	0.0010000	0.0006155	0.0008891	0.0012393	0.0011568
11	0.0072673	0.0047869	0.0081377	0.0146168	0.0010000	0.0013401	0.0019357	0.0026981	0.0013855
12	0.0037167	0.0024481	0.0041618	0.0287609	0.0010000	0.0006600	0.0009533	0.0013288	0.0010754

HGA 2002 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6119708	0.0575962	0.1917437	0.0423707	0.0194851	0.0072073	0.0026941	0.0013054	0.0004722
2	AM_Peak	Col	0.5260401	0.0670801	0.2233166	0.0546828	0.0251472	0.0105142	0.0039302	0.0019043	0.0006888
3	AM_Peak	Fway	0.6392528	0.0540923	0.1800791	0.0380305	0.0174892	0.0066781	0.0024962	0.0012095	0.0004375
4	Mid_Day	Art	0.5753095	0.0543791	0.1810338	0.0399901	0.0183904	0.0124925	0.0046696	0.0022626	0.0008184
5	Mid_Day	Col	0.5043144	0.0639919	0.2130359	0.0521862	0.0239990	0.0165846	0.0061993	0.0030038	0.0010865
6	Mid_Day	Fway	0.6070768	0.0514572	0.1713064	0.0362500	0.0166704	0.0108722	0.0040640	0.0019691	0.0007122
7	Ovr_Nite	Art	0.6113248	0.0580245	0.1931697	0.0426432	0.0196105	0.0051843	0.0019379	0.0009390	0.0003396
8	Ovr_Nite	Col	0.5450845	0.0698298	0.2324709	0.0569034	0.0261683	0.0071514	0.0026731	0.0012952	0.0004685
9	Ovr_Nite	Fway	0.6269239	0.0529772	0.1763666	0.0372530	0.0171317	0.0050887	0.0019021	0.0009216	0.0003334
10	PM_Peak	Art	0.6126511	0.0581154	0.1934722	0.0427911	0.0196785	0.0073561	0.0027497	0.0013323	0.0004819
11	PM_Peak	Col	0.5341359	0.0682776	0.2273035	0.0556483	0.0255911	0.0101361	0.0037888	0.0018358	0.0006640
12	PM_Peak	Fway	0.6399947	0.0543666	0.1809921	0.0383689	0.0176448	0.0063659	0.0023795	0.0011530	0.0004170

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012637	0.0004444	0.0004444	0.0000555	0.0010082	0.0001669	0.0079770	0.0038450	0.0023242	0.0015208
2	0.0018435	0.0006483	0.0006483	0.0000810	0.0008669	0.0001944	0.0118599	0.0057167	0.0034556	0.0022611
3	0.0011709	0.0004118	0.0004118	0.0000515	0.0010531	0.0001567	0.0067461	0.0032517	0.0019656	0.0012861
4	0.0021904	0.0007702	0.0007702	0.0000963	0.0009479	0.0001576	0.0137108	0.0066088	0.0039949	0.0026139
5	0.0029079	0.0010226	0.0010226	0.0001278	0.0008311	0.0001854	0.0188863	0.0091035	0.0055028	0.0036006
6	0.0019063	0.0006703	0.0006703	0.0000838	0.0010002	0.0001491	0.0109317	0.0052692	0.0031851	0.0020841
7	0.0009090	0.0003197	0.0003197	0.0000400	0.0010072	0.0001681	0.0057442	0.0027688	0.0016737	0.0010951
8	0.0012539	0.0004409	0.0004409	0.0000551	0.0008982	0.0002023	0.0081688	0.0039375	0.0023801	0.0015574
9	0.0008922	0.0003138	0.0003138	0.0000392	0.0010328	0.0001535	0.0051637	0.0024890	0.0015045	0.0009844
10	0.0012898	0.0004536	0.0004536	0.0000567	0.0010093	0.0001684	0.0081296	0.0039186	0.0023687	0.0015499
11	0.0017772	0.0006250	0.0006250	0.0000781	0.0008802	0.0001978	0.0116743	0.0056272	0.0034015	0.0022257
12	0.0011162	0.0003925	0.0003925	0.0000491	0.0010543	0.0001575	0.0064215	0.0030953	0.0018710	0.0012243

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0048206	0.0029268	0.0052797	0.0262273	0.0010000	0.0007854	0.0015094	0.0023563	0.0011991
2	0.0071671	0.0043515	0.0078497	0.0299725	0.0010000	0.0012467	0.0023960	0.0037403	0.0013966
3	0.0040768	0.0024752	0.0044650	0.0265124	0.0010000	0.0006879	0.0013221	0.0020639	0.0011262
4	0.0082857	0.0050306	0.0090748	0.0522103	0.0010000	0.0003477	0.0006683	0.0010433	0.0011322
5	0.0114133	0.0069295	0.0125003	0.0365162	0.0010000	0.0004586	0.0008814	0.0013760	0.0013323
6	0.0066062	0.0040109	0.0072354	0.0513383	0.0010000	0.0004068	0.0007819	0.0012206	0.0010713
7	0.0034713	0.0021076	0.0038019	0.0395785	0.0010000	0.0002725	0.0005238	0.0008177	0.0012080
8	0.0049365	0.0029972	0.0054067	0.0208784	0.0010000	0.0003288	0.0006319	0.0009865	0.0014538
9	0.0031205	0.0018946	0.0034177	0.0550760	0.0010000	0.0004395	0.0008448	0.0013187	0.0011030
10	0.0049128	0.0029828	0.0053807	0.0233649	0.0010000	0.0005272	0.0010133	0.0015818	0.0012099
11	0.0070550	0.0042834	0.0077269	0.0172468	0.0010000	0.0011437	0.0021981	0.0034314	0.0014215
12	0.0038806	0.0023561	0.0042502	0.0267151	0.0010000	0.0005419	0.0010416	0.0016259	0.0011319

HGA 2005 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6121574	0.0575973	0.1917404	0.0423705	0.0194853	0.0072073	0.0026941	0.0013054	0.0004722
2	AM_Peak	Col	0.5262006	0.0670814	0.2233127	0.0546825	0.0251474	0.0105142	0.0039302	0.0019043	0.0006888
3	AM_Peak	Fway	0.6394478	0.0540934	0.1800760	0.0380303	0.0174894	0.0066781	0.0024962	0.0012095	0.0004375
4	Mid_Day	Art	0.5754850	0.0543802	0.1810307	0.0399899	0.0183906	0.0124925	0.0046696	0.0022626	0.0008184
5	Mid_Day	Col	0.5044683	0.0639932	0.2130322	0.0521860	0.0239993	0.0165846	0.0061993	0.0030038	0.0010865
6	Mid_Day	Fway	0.6072620	0.0514582	0.1713034	0.0362498	0.0166706	0.0108722	0.0040640	0.0019691	0.0007122
7	Ovr_Nite	Art	0.6115112	0.0580257	0.1931664	0.0426430	0.0196107	0.0051843	0.0019379	0.0009390	0.0003396
8	Ovr_Nite	Col	0.5452508	0.0698313	0.2324669	0.0569031	0.0261686	0.0071514	0.0026731	0.0012952	0.0004685
9	Ovr_Nite	Fway	0.6271151	0.0529783	0.1763636	0.0372528	0.0171318	0.0050887	0.0019021	0.0009216	0.0003334
10	PM_Peak	Art	0.6128379	0.0581166	0.1934689	0.0427909	0.0196787	0.0073561	0.0027497	0.0013323	0.0004819
11	PM_Peak	Col	0.5342988	0.0682790	0.2272996	0.0556480	0.0255914	0.0101361	0.0037888	0.0018358	0.0006640
12	PM_Peak	Fway	0.6401899	0.0543677	0.1809890	0.0383688	0.0176450	0.0063659	0.0023795	0.0011530	0.0004170

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012637	0.0004444	0.0004444	0.0000555	0.0008216	0.0001416	0.0079770	0.0038450	0.0023242	0.0015208
2	0.0018435	0.0006483	0.0006483	0.0000810	0.0007064	0.0001649	0.0118599	0.0057167	0.0034556	0.0022611
3	0.0011709	0.0004118	0.0004118	0.0000515	0.0008581	0.0001329	0.0067461	0.0032517	0.0019656	0.0012861
4	0.0021904	0.0007702	0.0007702	0.0000963	0.0007724	0.0001337	0.0137108	0.0066088	0.0039949	0.0026139
5	0.0029079	0.0010226	0.0010226	0.0001278	0.0006773	0.0001573	0.0188863	0.0091035	0.0055028	0.0036006
6	0.0019063	0.0006703	0.0006703	0.0000838	0.0008150	0.0001265	0.0109317	0.0052692	0.0031851	0.0020841
7	0.0009090	0.0003197	0.0003197	0.0000400	0.0008207	0.0001426	0.0057442	0.0027688	0.0016737	0.0010951
8	0.0012539	0.0004409	0.0004409	0.0000551	0.0007319	0.0001716	0.0081688	0.0039375	0.0023801	0.0015574
9	0.0008922	0.0003138	0.0003138	0.0000392	0.0008416	0.0001302	0.0051637	0.0024890	0.0015045	0.0009844
10	0.0012898	0.0004536	0.0004536	0.0000567	0.0008225	0.0001428	0.0081296	0.0039186	0.0023687	0.0015499
11	0.0017772	0.0006250	0.0006250	0.0000781	0.0007172	0.0001678	0.0116743	0.0056272	0.0034015	0.0022257
12	0.0011162	0.0003925	0.0003925	0.0000491	0.0008591	0.0001336	0.0064215	0.0030953	0.0018710	0.0012243

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0048206	0.0029268	0.0052797	0.0262273	0.0010000	0.0005373	0.0015048	0.0026089	0.0012266
2	0.0071671	0.0043515	0.0078497	0.0299725	0.0010000	0.0008529	0.0023887	0.0041413	0.0014285
3	0.0040768	0.0024752	0.0044650	0.0265124	0.0010000	0.0004706	0.0013181	0.0022852	0.0011519
4	0.0082857	0.0050306	0.0090748	0.0522103	0.0010000	0.0002379	0.0006663	0.0011551	0.0011581
5	0.0114133	0.0069295	0.0125003	0.0365162	0.0010000	0.0003138	0.0008788	0.0015235	0.0013628
6	0.0066062	0.0040109	0.0072354	0.0513383	0.0010000	0.0002783	0.0007795	0.0013514	0.0010958
7	0.0034713	0.0021076	0.0038019	0.0395785	0.0010000	0.0001865	0.0005222	0.0009053	0.0012357
8	0.0049365	0.0029972	0.0054067	0.0208784	0.0010000	0.0002250	0.0006300	0.0010922	0.0014871
9	0.0031205	0.0018946	0.0034177	0.0550760	0.0010000	0.0003007	0.0008422	0.0014601	0.0011282
10	0.0049128	0.0029828	0.0053807	0.0233649	0.0010000	0.0003607	0.0010102	0.0017514	0.0012376
11	0.0070550	0.0042834	0.0077269	0.0172468	0.0010000	0.0007825	0.0021915	0.0037993	0.0014540
12	0.0038806	0.0023561	0.0042502	0.0267151	0.0010000	0.0003708	0.0010384	0.0018002	0.0011578

HGA 2007 Weekday VMT Mix by Time Period and Roadway Functional Classification Group

Obs	TP	FC	P_LDGV	P_LDGT1	P_LDGT2	P_LDGT3	P_LDGT4	P_HDGV2b	P_HDGV_3	P_HDGV_4	P_HDGV_5
1	AM_Peak	Art	0.6123642	0.0576128	0.1917888	0.0423706	0.0194852	0.0072073	0.0026941	0.0013054	0.0004722
2	AM_Peak	Col	0.5263784	0.0670994	0.2233691	0.0546828	0.0251472	0.0105142	0.0039302	0.0019043	0.0006888
3	AM_Peak	Fway	0.6396638	0.0541079	0.1801214	0.0380305	0.0174892	0.0066781	0.0024962	0.0012095	0.0004375
4	Mid_Day	Art	0.5756795	0.0543948	0.1810764	0.0399901	0.0183904	0.0124925	0.0046696	0.0022626	0.0008184
5	Mid_Day	Col	0.5046388	0.0640104	0.2130860	0.0521862	0.0239991	0.0165846	0.0061993	0.0030038	0.0010865
6	Mid_Day	Fway	0.6074671	0.0514720	0.1713467	0.0362499	0.0166704	0.0108722	0.0040640	0.0019691	0.0007122
7	Ovr_Nite	Art	0.6117178	0.0580412	0.1932151	0.0426431	0.0196105	0.0051843	0.0019379	0.0009390	0.0003396
8	Ovr_Nite	Col	0.5454350	0.0698500	0.2325256	0.0569033	0.0261684	0.0071514	0.0026731	0.0012952	0.0004685
9	Ovr_Nite	Fway	0.6273270	0.0529925	0.1764081	0.0372530	0.0171317	0.0050887	0.0019021	0.0009216	0.0003334
10	PM_Peak	Art	0.6130449	0.0581321	0.1935177	0.0427911	0.0196785	0.0073561	0.0027497	0.0013323	0.0004819
11	PM_Peak	Col	0.5344793	0.0682973	0.2273570	0.0556482	0.0255912	0.0101361	0.0037888	0.0018358	0.0006640
12	PM_Peak	Fway	0.6404061	0.0543822	0.1810347	0.0383689	0.0176449	0.0063659	0.0023795	0.0011530	0.0004170

Obs	P_HDGV_6	P_HDGV_7	P_HDGV8a	P_HDGV8b	P_LDDV	P_LDDT12	P_HDDV2b	P_HDDV_3	P_HDDV_4	P_HDDV_5
1	0.0012637	0.0004444	0.0004444	0.0000555	0.0006148	0.0000439	0.0079770	0.0038450	0.0023242	0.0015208
2	0.0018435	0.0006483	0.0006483	0.0000810	0.0005286	0.0000512	0.0118599	0.0057167	0.0034556	0.0022611
3	0.0011709	0.0004118	0.0004118	0.0000515	0.0006421	0.0000413	0.0067461	0.0032517	0.0019656	0.0012861
4	0.0021904	0.0007702	0.0007702	0.0000963	0.0005780	0.0000415	0.0137108	0.0066088	0.0039949	0.0026139
5	0.0029079	0.0010226	0.0010226	0.0001278	0.0005068	0.0000488	0.0188863	0.0091035	0.0055028	0.0036006
6	0.0019063	0.0006703	0.0006703	0.0000838	0.0006099	0.0000392	0.0109317	0.0052692	0.0031851	0.0020841
7	0.0009090	0.0003197	0.0003197	0.0000400	0.0006141	0.0000443	0.0057442	0.0027688	0.0016737	0.0010951
8	0.0012539	0.0004409	0.0004409	0.0000551	0.0005477	0.0000533	0.0081688	0.0039375	0.0023801	0.0015574
9	0.0008922	0.0003138	0.0003138	0.0000392	0.0006298	0.0000404	0.0051637	0.0024890	0.0015045	0.0009844
10	0.0012898	0.0004536	0.0004536	0.0000567	0.0006155	0.0000443	0.0081296	0.0039186	0.0023687	0.0015499
11	0.0017772	0.0006250	0.0006250	0.0000781	0.0005367	0.0000521	0.0116743	0.0056272	0.0034015	0.0022257
12	0.0011162	0.0003925	0.0003925	0.0000491	0.0006429	0.0000415	0.0064215	0.0030953	0.0018710	0.0012243

Obs	P_HDDV_6	P_HDDV_7	P_HDDV8a	P_HDDV8b	P_MC	P_HDGB	P_HDDBT	P_HDDBS	P_LDDT34
1	0.0048206	0.0029268	0.0052797	0.0262273	0.0010000	0.0004332	0.0015065	0.0027113	0.0012604
2	0.0071671	0.0043515	0.0078497	0.0299725	0.0010000	0.0006876	0.0023914	0.0043039	0.0014679
3	0.0040768	0.0024752	0.0044650	0.0265124	0.0010000	0.0003794	0.0013196	0.0023749	0.0011837
4	0.0082857	0.0050306	0.0090748	0.0522103	0.0010000	0.0001918	0.0006670	0.0012005	0.0011900
5	0.0114133	0.0069295	0.0125003	0.0365162	0.0010000	0.0002530	0.0008798	0.0015833	0.0014003
6	0.0066062	0.0040109	0.0072354	0.0513383	0.0010000	0.0002244	0.0007804	0.0014045	0.0011260
7	0.0034713	0.0021076	0.0038019	0.0395785	0.0010000	0.0001503	0.0005228	0.0009409	0.0012697
8	0.0049365	0.0029972	0.0054067	0.0208784	0.0010000	0.0001814	0.0006307	0.0011351	0.0015281
9	0.0031205	0.0018946	0.0034177	0.0550760	0.0010000	0.0002424	0.0008432	0.0015174	0.0011593
10	0.0049128	0.0029828	0.0053807	0.0233649	0.0010000	0.0002908	0.0010114	0.0018202	0.0012717
11	0.0070550	0.0042834	0.0077269	0.0172468	0.0010000	0.0006309	0.0021939	0.0039485	0.0014941
12	0.0038806	0.0023561	0.0042502	0.0267151	0.0010000	0.0002989	0.0010396	0.0018709	0.0011897

APPENDIX E
MOBILE6 REGISTRATION DISTRIBUTIONS AND DIESEL FRACTIONS INPUT

Brazoria County July 2002 Registration Distributions

```
* LDV
       1 0.05692 0.08330 0.09762 0.08624 0.07802 0.07438 0.06549 0.07075 0.05858 0.05588 0.04479
0.04224 0.03488 0.03343 0.02372 0.01807 0.01552 0.01322 0.01002 0.00597 0.00407 0.00362 0.00262
0.00295 0.01771
* LDT1
       2 0.06766 0.09415 0.08536 0.07439 0.07124 0.07221 0.05732 0.06306 0.06362 0.04889 0.04209
0.04052 0.03613 0.03447 0.02783 0.01899 0.02015 0.01603 0.01514 0.00814 0.00857 0.00694 0.00315
0.00401 0.01994
* LDT2
       3 0.06766 0.09415 0.08536 0.07439 0.07124 0.07221 0.05732 0.06306 0.06362 0.04889 0.04209
0.04052 0.03613 0.03447 0.02783 0.01899 0.02015 0.01603 0.01514 0.00814 0.00857 0.00694 0.00315
0.00401 0.01994
* LDT3
       4 0.11380 0.15439 0.11567 0.14052 0.05244 0.08493 0.06129 0.05050 0.03711 0.03081 0.02492
0.02291 0.01695 0.01735 0.01259 0.00750 0.01105 0.01025 0.00770 0.00516 0.00610 0.00268 0.00241
0.00234 0.00864
* LDT4
       5 0.11380 0.15439 0.11567 0.14052 0.05244 0.08493 0.06129 0.05050 0.03711 0.03081 0.02492
0.02291 0.01695 0.01735 0.01259 0.00750 0.01105 0.01025 0.00770 0.00516 0.00610 0.00268 0.00241
0.00234 0.00864
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.11023 0.13916 0.10445 0.08191 0.06090 0.05512 0.05024 0.03593 0.03745 0.03015 0.02284
0.01583 0.01675 0.01705 0.01248 0.01340 0.02467 0.02284 0.01340 0.01340 0.02375 0.01523 0.01797
0.01248 0.05238
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Chambers County July 2002 Registration Distributions

```
* LDV
       1 0.03525 0.06987 0.09984 0.09127 0.08052 0.07618 0.06832 0.07235 0.05778 0.05736 0.04630
0.04124 0.03359 0.03607 0.02739 0.01902 0.01592 0.01509 0.01261 0.00724 0.00548 0.00465 0.00279
0.00382 0.02005
* LDT1
       2 0.04175 0.08415 0.08945 0.07497 0.08260 0.07898 0.05701 0.06476 0.06761 0.04977 0.04498
0.04240 0.03775 0.03051 0.02650 0.01823 0.01745 0.01680 0.01732 0.00995 0.00995 0.00892 0.00375
0.00465 0.01978
* LDT2
       3 0.04175 0.08415 0.08945 0.07497 0.08260 0.07898 0.05701 0.06476 0.06761 0.04977 0.04498
0.04240 0.03775 0.03051 0.02650 0.01823 0.01745 0.01680 0.01732 0.00995 0.00995 0.00892 0.00375
0.00465 0.01978
* LDT3
       4 0.08050 0.15215 0.12782 0.14640 0.05705 0.09686 0.06900 0.06103 0.03892 0.03450 0.02875
0.01902 0.01460 0.01194 0.01150 0.00265 0.01194 0.00929 0.00663 0.00531 0.00310 0.00133 0.00088
0.00265 0.00619
* LDT4
       5 0.08050 0.15215 0.12782 0.14640 0.05705 0.09686 0.06900 0.06103 0.03892 0.03450 0.02875
0.01902 0.01460 0.01194 0.01150 0.00265 0.01194 0.00929 0.00663 0.00531 0.00310 0.00133 0.00088
0.00265 0.00619
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.11833 0.13921 0.14617 0.09049 0.07889 0.04408 0.06265 0.04176 0.02784 0.03480 0.02088
0.00928 0.01160 0.01392 0.01160 0.00000 0.00928 0.02088 0.01392 0.01160 0.02320 0.01392 0.00928
0.01624 0.03016
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Fort Bend County July 2002 Registration Distributions

```
* LDV
       1 0.06039 0.09244 0.11074 0.09468 0.08593 0.07829 0.07126 0.07266 0.05683 0.05155 0.04237
0.03857 0.03227 0.02394 0.01864 0.01380 0.01108 0.00993 0.00744 0.00438 0.00342 0.00243 0.00183
0.00217 0.01299
* LDT1
       2 0.08257 0.10718 0.10682 0.08561 0.08232 0.07434 0.05470 0.05934 0.05788 0.04452 0.03598
0.03256 0.02856 0.02518 0.02084 0.01492 0.01500 0.01380 0.01204 0.00638 0.00751 0.00626 0.00323
0.00449 0.01796
* LDT2
       3 0.08257 0.10718 0.10682 0.08561 0.08232 0.07434 0.05470 0.05934 0.05788 0.04452 0.03598
0.03256 0.02856 0.02518 0.02084 0.01492 0.01500 0.01380 0.01204 0.00638 0.00751 0.00626 0.00323
0.00449 0.01796
* LDT3
       4 0.13641 0.18885 0.13110 0.15918 0.05389 0.07845 0.04961 0.04561 0.02870 0.02532 0.01932
0.01207 0.00959 0.01097 0.00787 0.00317 0.00738 0.00690 0.00607 0.00304 0.00428 0.00159 0.00172
0.00297 0.00593
* LDT4
       5 0.13641 0.18885 0.13110 0.15918 0.05389 0.07845 0.04961 0.04561 0.02870 0.02532 0.01932
0.01207 0.00959 0.01097 0.00787 0.00317 0.00738 0.00690 0.00607 0.00304 0.00428 0.00159 0.00172
0.00297 0.00593
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.15191 0.14145 0.10763 0.09102 0.06919 0.04674 0.04551 0.03721 0.03659 0.03106 0.01907
0.01476 0.01199 0.01353 0.01046 0.01169 0.01753 0.01384 0.01107 0.01630 0.01814 0.01261 0.01015
0.00830 0.05228
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Galveston County July 2002 Registration Distributions

```
* LDV
       1 0.05907 0.08244 0.09060 0.08452 0.07640 0.07128 0.06550 0.07049 0.05810 0.05554 0.04622
0.04305 0.03724 0.03320 0.02459 0.01927 0.01665 0.01458 0.01185 0.00626 0.00461 0.00338 0.00286
0.00345 0.01886
* LDT1
       2 0.07892 0.09503 0.08227 0.07526 0.07242 0.07031 0.05323 0.06084 0.06129 0.04913 0.04237
0.03820 0.03495 0.03361 0.02616 0.01909 0.01900 0.01683 0.01638 0.00906 0.00962 0.00694 0.00343
0.00475 0.02088
* LDT2
       3 0.07892 0.09503 0.08227 0.07526 0.07242 0.07031 0.05323 0.06084 0.06129 0.04913 0.04237
0.03820 0.03495 0.03361 0.02616 0.01909 0.01900 0.01683 0.01638 0.00906 0.00962 0.00694 0.00343
0.00475 0.02088
* LDT3
       4 0.12174 0.16515 0.11558 0.14461 0.04993 0.08074 0.05725 0.05377 0.03680 0.03099 0.02528
0.01885 0.01429 0.01447 0.01125 0.00634 0.00857 0.00884 0.00947 0.00438 0.00420 0.00277 0.00143
0.00366 0.00965
* LDT4
       5 0.12174 0.16515 0.11558 0.14461 0.04993 0.08074 0.05725 0.05377 0.03680 0.03099 0.02528
0.01885 0.01429 0.01447 0.01125 0.00634 0.00857 0.00884 0.00947 0.00438 0.00420 0.00277 0.00143
0.00366 0.00965
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.11853 0.12716 0.10254 0.09162 0.06117 0.04188 0.05254 0.03934 0.03426 0.02716 0.01574
0.01345 0.01980 0.01396 0.01396 0.01472 0.02487 0.02132 0.01675 0.02030 0.01904 0.01371 0.01802
0.01168 0.06650
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Harris County July 2002 Registration Distributions

```
* LDV
       1 0.07627 0.09319 0.09265 0.08016 0.07495 0.07056 0.06405 0.06924 0.05598 0.05293 0.04619
0.04286 0.03761 0.03116 0.02468 0.01822 0.01479 0.01283 0.00962 0.00557 0.00414 0.00301 0.00224
0.00283 0.01426
* LDT1
       2 0.08992 0.09874 0.08913 0.07863 0.07599 0.07446 0.05400 0.06141 0.06026 0.04917 0.04024
0.03446 0.02894 0.02839 0.02315 0.01653 0.01649 0.01535 0.01317 0.00749 0.00886 0.00667 0.00338
0.00457 0.02062
* LDT2
       3 0.08992 0.09874 0.08913 0.07863 0.07599 0.07446 0.05400 0.06141 0.06026 0.04917 0.04024
0.03446 0.02894 0.02839 0.02315 0.01653 0.01649 0.01535 0.01317 0.00749 0.00886 0.00667 0.00338
0.00457 0.02062
* LDT3
       4 0.14705 0.18228 0.12654 0.14564 0.05791 0.07428 0.04776 0.04732 0.02870 0.02556 0.01903
0.01517 0.01247 0.01181 0.00922 0.00512 0.00687 0.00692 0.00667 0.00370 0.00445 0.00225 0.00184
0.00314 0.00831
* LDT4
       5 0.14705 0.18228 0.12654 0.14564 0.05791 0.07428 0.04776 0.04732 0.02870 0.02556 0.01903
0.01517 0.01247 0.01181 0.00922 0.00512 0.00687 0.00692 0.00667 0.00370 0.00445 0.00225 0.00184
0.00314 0.00831
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.13399 0.14592 0.11404 0.09350 0.06670 0.05159 0.04948 0.04329 0.03351 0.03109 0.01874
0.01266 0.01314 0.01224 0.01245 0.01069 0.02026 0.01566 0.01279 0.01407 0.01781 0.01151 0.01117
0.00927 0.04440
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Liberty County July 2002 Registration Distributions

```
* LDV
       1 0.04244 0.07366 0.08724 0.07812 0.07058 0.06553 0.05996 0.06793 0.05585 0.05688 0.04724
0.04908 0.04261 0.04056 0.03062 0.02544 0.02163 0.02069 0.01503 0.00942 0.00647 0.00441 0.00304
0.00510 0.02047
* LDT1
       2 0.06862 0.08873 0.07710 0.06902 0.06952 0.07289 0.05178 0.06014 0.05857 0.04515 0.04274
0.03982 0.03392 0.03510 0.03010 0.01893 0.02106 0.02061 0.01915 0.01297 0.01303 0.01005 0.00438
0.00826 0.02836
* LDT2
       3 0.06862 0.08873 0.07710 0.06902 0.06952 0.07289 0.05178 0.06014 0.05857 0.04515 0.04274
0.03982 0.03392 0.03510 0.03010 0.01893 0.02106 0.02061 0.01915 0.01297 0.01303 0.01005 0.00438
0.00826 0.02836
* LDT3
       4 0.12003 0.15912 0.10500 0.12712 0.05991 0.08417 0.06356 0.05411 0.03629 0.03607 0.02040
0.01782 0.01439 0.01589 0.01181 0.00601 0.01245 0.01310 0.01202 0.00623 0.00623 0.00429 0.00236
0.00429 0.00730
* LDT4
       5 0.12003 0.15912 0.10500 0.12712 0.05991 0.08417 0.06356 0.05411 0.03629 0.03607 0.02040
0.01782 0.01439 0.01589 0.01181 0.00601 0.01245 0.01310 0.01202 0.00623 0.00623 0.00429 0.00236
0.00429 0.00730
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09639 0.12985 0.11513 0.10040 0.06560 0.04819 0.05890 0.04819 0.03882 0.02945 0.02008
0.01071 0.00937 0.01071 0.01473 0.01473 0.02276 0.02142 0.01071 0.01874 0.02008 0.02142 0.01606
0.00402 0.05355
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Montgomery County July 2002 Registration Distributions

```
* LDV
       1 0.05880 0.09185 0.10237 0.08808 0.07964 0.07432 0.06595 0.07031 0.05664 0.05235 0.04295
0.03922 0.03393 0.02926 0.02300 0.01737 0.01400 0.01284 0.00956 0.00591 0.00426 0.00314 0.00251
0.00318 0.01858
* LDT1
       2 0.07928 0.10346 0.09150 0.07901 0.07596 0.07352 0.05397 0.06193 0.05729 0.04635 0.03844
0.03500 0.03009 0.02705 0.02265 0.01582 0.01734 0.01659 0.01546 0.00841 0.00950 0.00750 0.00327
0.00606 0.02454
* LDT2
       3 0.07928 0.10346 0.09150 0.07901 0.07596 0.07352 0.05397 0.06193 0.05729 0.04635 0.03844
0.03500 0.03009 0.02705 0.02265 0.01582 0.01734 0.01659 0.01546 0.00841 0.00950 0.00750 0.00327
0.00606 0.02454
* LDT3
       4 0.12172 0.18209 0.12673 0.14447 0.05659 0.07242 0.05580 0.04876 0.03373 0.03144 0.01913
0.01604 0.01268 0.01252 0.00911 0.00549 0.00842 0.00767 0.00906 0.00528 0.00501 0.00213 0.00176
0.00325 0.00869
* LDT4
       5 0.12172 0.18209 0.12673 0.14447 0.05659 0.07242 0.05580 0.04876 0.03373 0.03144 0.01913
0.01604 0.01268 0.01252 0.00911 0.00549 0.00842 0.00767 0.00906 0.00528 0.00501 0.00213 0.00176
0.00325 0.00869
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.10041 0.14590 0.12630 0.09848 0.07210 0.04912 0.04960 0.04234 0.03533 0.02758 0.01549
0.01210 0.01573 0.01476 0.01089 0.01428 0.02008 0.01911 0.01621 0.01645 0.01887 0.01355 0.01210
0.01113 0.04210
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Waller County July 2002 Registration Distributions

```
* LDV
       1 0.04159 0.06836 0.08629 0.07061 0.07139 0.06723 0.06160 0.06143 0.05562 0.05476 0.04583
0.04696 0.04627 0.03561 0.03648 0.02833 0.02088 0.02045 0.01785 0.01109 0.00797 0.00537 0.00529
0.00658 0.02617
* LDT1
       2 0.06535 0.08317 0.07657 0.06931 0.07076 0.06455 0.05637 0.05954 0.06297 0.04884 0.04040
0.03802 0.03314 0.03168 0.02917 0.02191 0.01980 0.01875 0.02020 0.01320 0.01452 0.01083 0.00568
0.00858 0.03670
* LDT2
       3 0.06535 0.08317 0.07657 0.06931 0.07076 0.06455 0.05637 0.05954 0.06297 0.04884 0.04040
0.03802 0.03314 0.03168 0.02917 0.02191 0.01980 0.01875 0.02020 0.01320 0.01452 0.01083 0.00568
0.00858 0.03670
* LDT3
       4 0.10125 0.14410 0.10732 0.13349 0.05575 0.09177 0.06333 0.06560 0.03527 0.03527 0.02503
0.01858 0.01593 0.01669 0.00948 0.00910 0.00986 0.01138 0.01327 0.00721 0.00569 0.00683 0.00341
0.00531 0.00910
* LDT4
       5 0.10125 0.14410 0.10732 0.13349 0.05575 0.09177 0.06333 0.06560 0.03527 0.03527 0.02503
0.01858 0.01593 0.01669 0.00948 0.00910 0.00986 0.01138 0.01327 0.00721 0.00569 0.00683 0.00341
0.00531 0.00910
* HDV2b
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.08150 0.11599 0.09404 0.09091 0.05643 0.06270 0.05329 0.05329 0.03135 0.04389 0.00627
0.01881 0.02194 0.02508 0.02821 0.01567 0.01254 0.03135 0.02821 0.01881 0.01567 0.01254 0.01567
0.01567 0.05016
```

***** Based on TxDOT mid-year 2002 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Brazoria County July 2003 Registration Distributions

```
* LDV
       1 0.05188 0.08423 0.08577 0.09478 0.08372 0.07391 0.07080 0.06130 0.06506 0.05375 0.05032
0.03874 0.03629 0.02932 0.02722 0.01940 0.01420 0.01197 0.01020 0.00796 0.00428 0.00327 0.00275
0.00191 0.01698
* LDT1
       2 0.04986 0.09227 0.09340 0.08295 0.07223 0.06812 0.06903 0.05397 0.06033 0.06045 0.04474
0.03674 0.03468 0.03140 0.02978 0.02292 0.01499 0.01623 0.01316 0.01155 0.00643 0.00719 0.00526
0.00255 0.01977
* LDT2
       3 0.04986 0.09227 0.09340 0.08295 0.07223 0.06812 0.06903 0.05397 0.06033 0.06045 0.04474
0.03674 0.03468 0.03140 0.02978 0.02292 0.01499 0.01623 0.01316 0.01155 0.00643 0.00719 0.00526
0.00255 0.01977
* LDT3
       4 0.10294 0.13209 0.14142 0.10355 0.12130 0.04514 0.07477 0.05284 0.04478 0.03169 0.02721
0.02151 0.01897 0.01278 0.01351 0.00951 0.00515 0.00866 0.00739 0.00576 0.00357 0.00436 0.00164
0.00182 0.00763
* LDT4
       5 0.10294 0.13209 0.14142 0.10355 0.12130 0.04514 0.07477 0.05284 0.04478 0.03169 0.02721
0.02151 0.01897 0.01278 0.01351 0.00951 0.00515 0.00866 0.00739 0.00576 0.00357 0.00436 0.00164
0.00182 0.00763
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09538 0.15516 0.12065 0.08832 0.07663 0.05272 0.04212 0.04511 0.02989 0.03478 0.02826
0.01821 0.01223 0.01114 0.01168 0.01033 0.01196 0.01793 0.01957 0.00815 0.01141 0.01821 0.00978
0.01332 0.05707
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Chambers County July 2003 Registration Distributions

```
* LDV
       1 0.03007 0.07901 0.08586 0.09350 0.08983 0.07514 0.07077 0.06184 0.06422 0.05052 0.05141
0.04238 0.03772 0.02898 0.02998 0.02342 0.01390 0.01310 0.01290 0.01072 0.00586 0.00417 0.00318
0.00288 0.01866
* LDT1
       2 0.03771 0.08347 0.09076 0.08410 0.06989 0.07731 0.07379 0.05317 0.05783 0.06336 0.04651
0.03909 0.03570 0.03206 0.02728 0.02212 0.01471 0.01559 0.01584 0.01320 0.00805 0.00792 0.00679
0.00289 0.02087
* LDT2
       3 0.03771 0.08347 0.09076 0.08410 0.06989 0.07731 0.07379 0.05317 0.05783 0.06336 0.04651
0.03909 0.03570 0.03206 0.02728 0.02212 0.01471 0.01559 0.01584 0.01320 0.00805 0.00792 0.00679
0.00289 0.02087
* LDT3
       4 0.07199 0.14752 0.14713 0.11448 0.12589 0.04485 0.07592 0.05389 0.04996 0.03226 0.03344
0.02242 0.01456 0.00747 0.01101 0.01141 0.00275 0.00826 0.00708 0.00393 0.00275 0.00275 0.00118
0.00079 0.00629
* LDT4
       5 0.07199 0.14752 0.14713 0.11448 0.12589 0.04485 0.07592 0.05389 0.04996 0.03226 0.03344
0.02242 0.01456 0.00747 0.01101 0.01141 0.00275 0.00826 0.00708 0.00393 0.00275 0.00275 0.00118
0.00079 0.00629
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.10331 0.14620 0.12865 0.10136 0.10526 0.06823 0.04483 0.04678 0.04678 0.01949 0.02339
0.02144 0.00780 0.00975 0.01559 0.00390 0.00195 0.00390 0.02144 0.00390 0.01365 0.01365 0.00975
0.00195 0.03704
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Fort Bend County July 2003 Registration Distributions

```
* LDV
       1 0.05385 0.09118 0.09778 0.10522 0.08840 0.08148 0.07320 0.06519 0.06567 0.05066 0.04419
0.03615 0.03218 0.02595 0.01916 0.01451 0.01058 0.00859 0.00731 0.00584 0.00331 0.00272 0.00191
0.00142 0.01356
* LDT1
       2 0.05109 0.11488 0.10739 0.09946 0.07885 0.07648 0.06841 0.05099 0.05490 0.05317 0.03997
0.03148 0.02668 0.02425 0.02092 0.01702 0.01241 0.01208 0.01109 0.01028 0.00487 0.00664 0.00494
0.00239 0.01935
* LDT2
       3 0.05109 0.11488 0.10739 0.09946 0.07885 0.07648 0.06841 0.05099 0.05490 0.05317 0.03997
0.03148 0.02668 0.02425 0.02092 0.01702 0.01241 0.01208 0.01109 0.01028 0.00487 0.00664 0.00494
0.00239 0.01935
* LDT3
       4 0.14406 0.16356 0.16117 0.10330 0.12199 0.04391 0.06342 0.03982 0.03866 0.02126 0.02032
0.01582 0.00934 0.00736 0.00870 0.00666 0.00274 0.00491 0.00566 0.00362 0.00274 0.00292 0.00111
0.00117 0.00578
* LDT4
       5 0.14406 0.16356 0.16117 0.10330 0.12199 0.04391 0.06342 0.03982 0.03866 0.02126 0.02032
0.01582 0.00934 0.00736 0.00870 0.00666 0.00274 0.00491 0.00566 0.00362 0.00274 0.00292 0.00111
0.00117 0.00578
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.09547 0.15431 0.13585 0.09605 0.08451 0.05798 0.04211 0.04009 0.03404 0.02855 0.02596
0.01673 0.01327 0.01038 0.01240 0.01038 0.01010 0.01327 0.01183 0.01038 0.01269 0.01788 0.01183
0.00808 0.04586
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Galveston County July 2003 Registration Distributions

```
* LDV
       1 0.05374 0.08574 0.08415 0.08891 0.08126 0.07348 0.06738 0.06130 0.06471 0.05375 0.04951
0.04031 0.03671 0.03110 0.02675 0.01970 0.01546 0.01275 0.01141 0.00867 0.00485 0.00389 0.00261
0.00231 0.01956
* LDT1
       2 0.05385 0.10536 0.09331 0.07961 0.07185 0.07077 0.06815 0.05159 0.05586 0.05803 0.04492
0.03486 0.03179 0.02909 0.02681 0.02077 0.01550 0.01573 0.01391 0.01303 0.00753 0.00757 0.00565
0.00286 0.02158
* LDT2
       3 0.05385 0.10536 0.09331 0.07961 0.07185 0.07077 0.06815 0.05159 0.05586 0.05803 0.04492
0.03486 0.03179 0.02909 0.02681 0.02077 0.01550 0.01573 0.01391 0.01303 0.00753 0.00757 0.00565
0.00286 0.02158
* LDT3
       4 0.12906 0.14434 0.14297 0.09979 0.12279 0.04371 0.06938 0.04585 0.04417 0.02850 0.02499
0.01933 0.01383 0.01039 0.01077 0.00879 0.00489 0.00604 0.00619 0.00581 0.00336 0.00329 0.00176
0.00084 0.00917
* LDT4
       5 0.12906 0.14434 0.14297 0.09979 0.12279 0.04371 0.06938 0.04585 0.04417 0.02850 0.02499
0.01933 0.01383 0.01039 0.01077 0.00879 0.00489 0.00604 0.00619 0.00581 0.00336 0.00329 0.00176
0.00084 0.00917
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07586 0.15430 0.11648 0.08917 0.08100 0.05509 0.03548 0.04575 0.03315 0.02684 0.02404
0.01424 0.01190 0.01821 0.01494 0.01377 0.01261 0.01937 0.01821 0.01377 0.01657 0.01751 0.01120
0.01331 0.06723
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Harris County July 2003 Registration Distributions

```
* LDV
       1 0.06868 0.08662 0.08645 0.08932 0.07736 0.07207 0.06821 0.06166 0.06590 0.05274 0.04859
0.04170 0.03746 0.03176 0.02527 0.01930 0.01388 0.01101 0.00948 0.00693 0.00419 0.00304 0.00217
0.00172 0.01447
* LDT1
       2 0.06381 0.10601 0.09473 0.08399 0.07436 0.07243 0.07139 0.05186 0.05891 0.05757 0.04475
0.03420 0.02856 0.02440 0.02364 0.01881 0.01338 0.01311 0.01186 0.01058 0.00580 0.00691 0.00534
0.00269 0.02091
* LDT2
       3 0.06381 0.10601 0.09473 0.08399 0.07436 0.07243 0.07139 0.05186 0.05891 0.05757 0.04475
0.03420 0.02856 0.02440 0.02364 0.01881 0.01338 0.01311 0.01186 0.01058 0.00580 0.00691 0.00534
0.00269 0.02091
* LDT3
       4 0.14142 0.15832 0.15437 0.10480 0.11909 0.04697 0.06084 0.04007 0.03917 0.02465 0.02095
0.01571 0.01193 0.00979 0.00896 0.00682 0.00360 0.00515 0.00517 0.00485 0.00276 0.00312 0.00159
0.00144 0.00846
* LDT4
       5 0.14142 0.15832 0.15437 0.10480 0.11909 0.04697 0.06084 0.04007 0.03917 0.02465 0.02095
0.01571 0.01193 0.00979 0.00896 0.00682 0.00360 0.00515 0.00517 0.00485 0.00276 0.00312 0.00159
0.00144 0.00846
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.12231 0.15074 0.12324 0.09745 0.07996 0.05813 0.04258 0.04184 0.03588 0.02814 0.02572
0.01507 0.01058 0.01112 0.00988 0.01074 0.00896 0.01644 0.01310 0.00985 0.01029 0.01485 0.00864
0.00911 0.04538
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Liberty County July 2003 Registration Distributions

```
* LDV
       1 0.03811 0.06644 0.07765 0.08464 0.07593 0.06683 0.06437 0.06066 0.06618 0.05204 0.05523
0.04458 0.04355 0.03626 0.03540 0.02531 0.02057 0.01785 0.01630 0.01181 0.00780 0.00504 0.00354
0.00250 0.02139
* LDT1
       2 0.05384 0.08583 0.08544 0.07508 0.06326 0.06460 0.06928 0.05150 0.05841 0.05707 0.04275
0.03729 0.03478 0.03088 0.03121 0.02664 0.01616 0.01778 0.01700 0.01611 0.01070 0.01265 0.00886
0.00379 0.02909
* LDT2
       3 0.05384 0.08583 0.08544 0.07508 0.06326 0.06460 0.06928 0.05150 0.05841 0.05707 0.04275
0.03729 0.03478 0.03088 0.03121 0.02664 0.01616 0.01778 0.01700 0.01611 0.01070 0.01265 0.00886
0.00379 0.02909
* LDT3
       4 0.10733 0.13765 0.13923 0.09137 0.10713 0.05238 0.07621 0.05061 0.04647 0.03013 0.03269
0.01831 0.01575 0.01201 0.01398 0.00847 0.00610 0.00906 0.01083 0.00866 0.00492 0.00551 0.00492
0.00098 0.00926
* LDT4
       5 0.10733 0.13765 0.13923 0.09137 0.10713 0.05238 0.07621 0.05061 0.04647 0.03013 0.03269
0.01831 0.01575 0.01201 0.01398 0.00847 0.00610 0.00906 0.01083 0.00866 0.00492 0.00551 0.00492
0.00098 0.00926
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.07358 0.14047 0.12152 0.09253 0.07915 0.06243 0.05463 0.05017 0.03790 0.03679 0.02787
0.01449 0.01003 0.00557 0.00780 0.01003 0.01003 0.01895 0.01449 0.00557 0.02230 0.01561 0.01226
0.01672 0.05909
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Montgomery County July 2003 Registration Distributions

```
* LDV
       1 0.05011 0.08835 0.09339 0.09756 0.08339 0.07518 0.06968 0.06105 0.06450 0.05132 0.04681
0.03839 0.03412 0.02900 0.02418 0.01835 0.01415 0.01107 0.01020 0.00751 0.00459 0.00342 0.00244
0.00208 0.01918
* LDT1
       2 0.05666 0.10793 0.10183 0.08529 0.07262 0.07163 0.06820 0.05106 0.05831 0.05258 0.04126
0.03264 0.02972 0.02495 0.02328 0.01963 0.01285 0.01451 0.01377 0.01256 0.00667 0.00795 0.00623
0.00295 0.02493
* LDT2
       3 0.05666 0.10793 0.10183 0.08529 0.07262 0.07163 0.06820 0.05106 0.05831 0.05258 0.04126
0.03264 0.02972 0.02495 0.02328 0.01963 0.01285 0.01451 0.01377 0.01256 0.00667 0.00795 0.00623
0.00295 0.02493
* LDT3
       4 0.12379 0.14948 0.15864 0.10413 0.11677 0.04837 0.05999 0.04577 0.04140 0.02821 0.02658
0.01538 0.01334 0.00994 0.01022 0.00716 0.00437 0.00609 0.00534 0.00688 0.00321 0.00344 0.00121
0.00139 0.00892
* LDT4
       5 0.12379 0.14948 0.15864 0.10413 0.11677 0.04837 0.05999 0.04577 0.04140 0.02821 0.02658
0.01538 0.01334 0.00994 0.01022 0.00716 0.00437 0.00609 0.00534 0.00688 0.00321 0.00344 0.00121
0.00139 0.00892
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.10124 0.12755 0.13997 0.10419 0.08083 0.06293 0.04378 0.04189 0.03347 0.02694 0.02021
0.01326 0.00968 0.01263 0.01179 0.00926 0.01179 0.01747 0.01621 0.01305 0.01473 0.01642 0.01179
0.01052 0.04841
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

Waller County July 2003 Registration Distributions

```
* LDV
       1 0.03817 0.05975 0.07117 0.08201 0.07109 0.06667 0.06409 0.05850 0.06234 0.05567 0.05392
0.04517 0.04234 0.04225 0.03084 0.03142 0.02259 0.01808 0.01775 0.01425 0.00900 0.00642 0.00458
0.00450 0.02742
* LDT1
       2 0.04904 0.08662 0.08637 0.07414 0.06318 0.06522 0.06102 0.05096 0.05529 0.05745 0.04637
0.03911 0.03248 0.03083 0.02879 0.02650 0.01924 0.01567 0.01720 0.01745 0.01045 0.01490 0.00930
0.00484 0.03758
* LDT2
       3 0.04904 0.08662 0.08637 0.07414 0.06318 0.06522 0.06102 0.05096 0.05529 0.05745 0.04637
0.03911 0.03248 0.03083 0.02879 0.02650 0.01924 0.01567 0.01720 0.01745 0.01045 0.01490 0.00930
0.00484 0.03758
* LDT3
       4 0.09241 0.13034 0.13517 0.09483 0.11276 0.05034 0.08310 0.05241 0.05000 0.03379 0.03241
0.01897 0.01552 0.01310 0.01241 0.00897 0.00724 0.00793 0.01069 0.01034 0.00276 0.00310 0.00448
0.00241 0.01448
* LDT4
       5 0.09241 0.13034 0.13517 0.09483 0.11276 0.05034 0.08310 0.05241 0.05000 0.03379 0.03241
0.01897 0.01552 0.01310 0.01241 0.00897 0.00724 0.00793 0.01069 0.01034 0.00276 0.00310 0.00448
0.00241 0.01448
* HDV2
       6 0.12549 0.14885 0.14233 0.12668 0.08635 0.05306 0.07035 0.03391 0.04193 0.02309 0.02385
0.01715 0.01441 0.01259 0.01113 0.01082 0.00656 0.00771 0.00700 0.00749 0.00359 0.00660 0.00448
0.00310 0.01148
* HDV3
       7 0.04688 0.07526 0.10778 0.11846 0.12478 0.03849 0.07928 0.04102 0.07687 0.06182 0.04171
0.03194 0.02631 0.02792 0.01999 0.01666 0.00770 0.00804 0.00965 0.00609 0.00264 0.00437 0.00345
0.00218 0.02068
* HDV4
       8 0.06016 0.09553 0.10019 0.14277 0.12434 0.04914 0.08685 0.06397 0.07626 0.03919 0.02881
0.02288 0.01758 0.01695 0.01440 0.00932 0.00551 0.00360 0.00424 0.00466 0.00212 0.00424 0.00339
0.00191 0.02203
* HDV5
       9 0.06186 0.09005 0.10650 0.13665 0.15857 0.04542 0.04307 0.03054 0.04150 0.02819 0.02193
0.02467 0.02153 0.02075 0.01879 0.02193 0.01684 0.01410 0.01135 0.01175 0.00901 0.00979 0.01096
0.00783 0.03641
* HDV6
      10 0.03500 0.05167 0.08642 0.10604 0.11463 0.07886 0.05334 0.04924 0.07334 0.03590 0.04334
0.02847 0.03398 0.03654 0.02500 0.02090 0.01949 0.01693 0.01641 0.01334 0.00769 0.01244 0.00962
0.00487 0.02654
*HDV7
      11 0.04494 0.04805 0.06479 0.08941 0.09897 0.06933 0.06503 0.06240 0.09037 0.04279 0.03514
0.03705 0.05570 0.04375 0.02606 0.02247 0.01721 0.01387 0.01458 0.01458 0.00669 0.00693 0.00837
0.00478 0.01673
*HDV8a
      12 0.02072 0.03495 0.03827 0.05153 0.04808 0.04490 0.03468 0.05001 0.07267 0.06314 0.05982
0.04615 0.05443 0.05665 0.06148 0.05057 0.03426 0.02404 0.03081 0.02445 0.00746 0.01534 0.01644
0.01603 0.04311
*HDV8b
      13 0.05676 0.04757 0.08054 0.09135 0.13243 0.07351 0.06595 0.03676 0.08973 0.06595 0.05568
0.01892 0.02973 0.02649 0.05405 0.01622 0.01459 0.00865 0.00649 0.00919 0.00162 0.00378 0.00324
0.00162 0.00919
*   HDBS is MOBILE6 default
*   HDBT is MOBILE6 default
* MC
      16 0.05691 0.13008 0.11653 0.08672 0.06775 0.04607 0.05420 0.04065 0.04607 0.02710 0.04336
0.01355 0.01355 0.01897 0.02710 0.02439 0.01355 0.01626 0.02168 0.02439 0.01084 0.02710 0.01626
0.01084 0.04607
```

***** Based on TxDOT mid-year 2003 eight-county regional data for HDVs and county registration data otherwise (except where MOBILE6 defaults are used).

1990 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
0.00040 0.00040 0.00010 0.00270 0.00320 0.00970 0.01620 0.02410 0.05100 0.07060 0.03900 0.02690
0.01140 0.00930 0.01370 0.01550 0.00670 0.00670 0.00670 0.00670 0.00670 0.00670 0.00670 0.00670
0.00670
0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160
0.02590 0.00000 0.01870 0.10380 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700
0.11700
0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160
0.02590 0.00000 0.01870 0.10380 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700 0.11700
0.11700
0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110
0.00010 0.00000 0.00000 0.00000 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010
0.00010
0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110
0.00010 0.00000 0.00000 0.00000 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010
0.00010
0.25287 0.21405 0.14583 0.11443 0.23881 0.16585 0.21244 0.16667 0.15244 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000
0.53307 0.51813 0.39683 0.36842 0.30588 0.26042 0.37500 0.30556 0.04444 0.00000 0.00000 0.00000
0.00000 0.03571 0.00893 0.00893 0.00893 0.00893 0.00893 0.00893 0.00893 0.00893 0.00893 0.00893
0.00893
0.62000 0.46575 0.30189 0.54167 0.16667 0.23077 0.16000 0.13333 0.21053 0.12500 0.25000 0.04348
0.06667 0.04000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000
0.64615 0.67308 0.50980 0.42623 0.32653 0.21875 0.44118 0.08696 0.19355 0.24242 0.25000 0.11538
0.08000 0.20000 0.01667 0.01667 0.01667 0.01667 0.01667 0.01667 0.01667 0.01667 0.01667 0.01667
0.01667
0.78549 0.73364 0.71348 0.71856 0.65248 0.57971 0.51754 0.41667 0.32381 0.45349 0.28000 0.22222
0.06667 0.09375 0.06000 0.06000 0.06000 0.06000 0.06000 0.06000 0.06000 0.06000 0.06000 0.06000
0.06000
0.90000 0.91367 0.84314 0.84337 0.86486 0.83784 0.83562 0.72727 0.51852 0.70213 0.32143 0.19444
0.31250 0.50000 0.19444 0.19444 0.19444 0.19444 0.19444 0.19444 0.19444 0.19444 0.19444 0.19444
0.19444
0.92910 0.97025 0.96143 0.94466 0.94845 0.94444 0.94884 0.89706 0.95349 0.89928 0.63830 0.67153
0.67925 0.68000 0.72449 0.72449 0.72449 0.72449 0.72449 0.72449 0.72449 0.72449 0.72449 0.72449
0.72449
0.96610 0.98462 0.92105 0.92593 0.93333 1.00000 1.00000 1.00000 0.90000 1.00000 0.66667 1.00000
0.00000 1.00000 0.80000 0.80000 0.80000 0.80000 0.80000 0.80000 0.80000 0.80000 0.80000 0.80000
0.80000
0.87600 0.77100 0.75020 0.73450 0.67330 0.51550 0.38450 0.32380 0.32600 0.26390 0.05940 0.04600
0.02910 0.02400 0.00860 0.00870 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000
```

* Based on TxDOT HGA regional level mid-year 2002 county registration data except EPA fractions are used for LDV, LDT and Bus.

1996 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
0.00090 0.00060 0.00010 0.00030 0.00060 0.00130 0.00040 0.00040 0.00010 0.00270 0.00320 0.00970
0.01620 0.02410 0.05100 0.07060 0.03900 0.02690 0.01140 0.00930 0.01370 0.01550 0.00670 0.00670
0.00670
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480
0.01200 0.02230 0.06560 0.06160 0.04390 0.03160 0.02590 0.00000 0.01870 0.10380 0.11700 0.11700
0.11700
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480
0.01200 0.02230 0.06560 0.06160 0.04390 0.03160 0.02590 0.00000 0.01870 0.10380 0.11700 0.11700
0.11700
0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350
0.01690 0.02090 0.02560 0.00130 0.00060 0.00110 0.00010 0.00000 0.00000 0.00000 0.00010 0.00010
0.00010
0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350
0.01690 0.02090 0.02560 0.00130 0.00060 0.00110 0.00010 0.00000 0.00000 0.00000 0.00010 0.00010
0.00010
0.42931 0.13422 0.34401 0.27273 0.22973 0.33333 0.25287 0.21405 0.14583 0.11443 0.23881 0.16585
0.21244 0.16667 0.15244 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000
0.60207 0.32138 0.54992 0.58794 0.62295 0.57692 0.53307 0.51813 0.39683 0.36842 0.30588 0.26042
0.37500 0.30556 0.04444 0.00000 0.00000 0.00000 0.00000 0.03571 0.00893 0.00893 0.00893 0.00893
0.00893
0.59189 0.41463 0.73000 0.68831 0.65574 0.63736 0.62000 0.46575 0.30189 0.54167 0.16667 0.23077
0.16000 0.13333 0.21053 0.12500 0.25000 0.04348 0.06667 0.04000 0.00000 0.00000 0.00000 0.00000
0.00000
0.76087 0.44828 0.78481 0.86207 0.71642 0.58730 0.64615 0.67308 0.50980 0.42623 0.32653 0.21875
0.44118 0.08696 0.19355 0.24242 0.25000 0.11538 0.08000 0.20000 0.01667 0.01667 0.01667 0.01667
0.01667
0.82808 0.62312 0.86301 0.87466 0.66667 0.77037 0.78549 0.73364 0.71348 0.71856 0.65248 0.57971
0.51754 0.41667 0.32381 0.45349 0.28000 0.22222 0.06667 0.09375 0.06000 0.06000 0.06000 0.06000
0.06000
0.87814 0.54167 0.90909 0.93865 0.97175 0.93004 0.90000 0.91367 0.84314 0.84337 0.86486 0.83784
0.83562 0.72727 0.51852 0.70213 0.32143 0.19444 0.31250 0.50000 0.19444 0.19444 0.19444 0.19444
0.19444
0.90625 0.71959 0.97279 0.96977 0.95770 0.95050 0.92910 0.97025 0.96143 0.94466 0.94845 0.94444
0.94884 0.89706 0.95349 0.89928 0.63830 0.67153 0.67925 0.68000 0.72449 0.72449 0.72449 0.72449
0.72449
1.00000 0.79630 0.91525 0.98214 1.00000 1.00000 0.96610 0.98462 0.92105 0.92593 0.93333 1.00000
1.00000 1.00000 0.90000 1.00000 0.66667 1.00000 0.00000 1.00000 0.80000 0.80000 0.80000 0.80000
0.80000
0.95850 0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100 0.75020 0.73450 0.67330 0.51550
0.38450 0.32380 0.32600 0.26390 0.05940 0.04600 0.02910 0.02400 0.00860 0.00870 0.00000 0.00000
0.00000
```

* Based on TxDOT HGA regional level mid-year 2002 county registration data except EPA fractions are used for LDV, LDT and Bus.

1999 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
0.00090 0.00090 0.00090 0.00090 0.00060 0.00010 0.00030 0.00060 0.00130 0.00040 0.00040 0.00010
0.00270 0.00320 0.00970 0.01620 0.02410 0.05100 0.07060 0.03900 0.02690 0.01140 0.00930 0.01370
0.01550
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160 0.02590 0.00000 0.01870
0.10380
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160 0.02590 0.00000 0.01870
0.10380
0.01260 0.01260 0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720
0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110 0.00010 0.00000 0.00000
0.00000
0.01260 0.01260 0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720
0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110 0.00010 0.00000 0.00000
0.00000
0.58305 0.43346 0.42967 0.42931 0.13422 0.34401 0.27273 0.22973 0.33333 0.25287 0.21405 0.14583
0.11443 0.23881 0.16585 0.21244 0.16667 0.15244 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000
0.67731 0.60568 0.62256 0.60207 0.32138 0.54992 0.58794 0.62295 0.57692 0.53307 0.51813 0.39683
0.36842 0.30588 0.26042 0.37500 0.30556 0.04444 0.00000 0.00000 0.00000 0.00000 0.03571 0.00893
0.00893
0.63307 0.71084 0.75682 0.59189 0.41463 0.73000 0.68831 0.65574 0.63736 0.62000 0.46575 0.30189
0.54167 0.16667 0.23077 0.16000 0.13333 0.21053 0.12500 0.25000 0.04348 0.06667 0.04000 0.00000
0.00000
0.90431 0.86667 0.83088 0.76087 0.44828 0.78481 0.86207 0.71642 0.58730 0.64615 0.67308 0.50980
0.42623 0.32653 0.21875 0.44118 0.08696 0.19355 0.24242 0.25000 0.11538 0.08000 0.20000 0.01667
0.01667
0.89150 0.90650 0.69014 0.82808 0.62312 0.86301 0.87466 0.66667 0.77037 0.78549 0.73364 0.71348
0.71856 0.65248 0.57971 0.51754 0.41667 0.32381 0.45349 0.28000 0.22222 0.06667 0.09375 0.06000
0.06000
0.91898 0.94481 0.82986 0.87814 0.54167 0.90909 0.93865 0.97175 0.93004 0.90000 0.91367 0.84314
0.84337 0.86486 0.83784 0.83562 0.72727 0.51852 0.70213 0.32143 0.19444 0.31250 0.50000 0.19444
0.19444
0.93817 0.97436 0.87444 0.90625 0.71959 0.97279 0.96977 0.95770 0.95050 0.92910 0.97025 0.96143
0.94466 0.94845 0.94444 0.94884 0.89706 0.95349 0.89928 0.63830 0.67153 0.67925 0.68000 0.72449
0.72449
0.98198 0.99237 0.90476 1.00000 0.79630 0.91525 0.98214 1.00000 1.00000 0.96610 0.98462 0.92105
0.92593 0.93333 1.00000 1.00000 1.00000 0.90000 1.00000 0.66667 1.00000 0.00000 1.00000 0.80000
0.80000
0.95850 0.95850 0.95850 0.95850 0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100 0.75020
0.73450 0.67330 0.51550 0.38450 0.32380 0.32600 0.26390 0.05940 0.04600 0.02910 0.02400 0.00860
0.00870
```

* Based on TxDOT HGA regional level mid-year 2003 county registration data except EPA fractions are used for LDV, LDT and Bus.

2002 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00060 0.00010 0.00030 0.00060 0.00130
0.00040 0.00040 0.00010 0.00270 0.00320 0.00970 0.01620 0.02410 0.05100 0.07060 0.03900 0.02690
0.01140
 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160
0.02590
 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560 0.06160 0.04390 0.03160
0.02590
 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290
0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110
0.00010
 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01150 0.01110 0.01450 0.01150 0.01290
0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560 0.00130 0.00060 0.00110
0.00010
 0.76290 0.69101 0.55931 0.58305 0.43346 0.42967 0.42931 0.13422 0.34401 0.27273 0.22973 0.33333
0.25287 0.21405 0.14583 0.11443 0.23881 0.16585 0.21244 0.16667 0.15244 0.00000 0.00000 0.00000
0.00000
 0.61826 0.66848 0.65945 0.67731 0.60568 0.62256 0.60207 0.32138 0.54992 0.58794 0.62295 0.57692
0.53307 0.51813 0.39683 0.36842 0.30588 0.26042 0.37500 0.30556 0.04444 0.00000 0.00000 0.00000
0.01124
 0.69419 0.71976 0.71550 0.63307 0.71084 0.75682 0.59189 0.41463 0.73000 0.68831 0.65574 0.63736
0.62000 0.46575 0.30189 0.54167 0.16667 0.23077 0.16000 0.13333 0.21053 0.12500 0.25000 0.04348
0.02000
 0.95954 0.92568 0.92391 0.90431 0.86667 0.83088 0.76087 0.44828 0.78481 0.86207 0.71642 0.58730
0.64615 0.67308 0.50980 0.42623 0.32653 0.21875 0.44118 0.08696 0.19355 0.24242 0.25000 0.11538
0.05263
 0.95886 0.91458 0.91375 0.89150 0.90650 0.69014 0.82808 0.62312 0.86301 0.87466 0.66667 0.77037
0.78549 0.73364 0.71348 0.71856 0.65248 0.57971 0.51754 0.41667 0.32381 0.45349 0.28000 0.22222
0.06780
 0.94857 0.90311 0.92188 0.91898 0.94481 0.82986 0.87814 0.54167 0.90909 0.93865 0.97175 0.93004
0.90000 0.91367 0.84314 0.84337 0.86486 0.83784 0.83562 0.72727 0.51852 0.70213 0.32143 0.19444
0.28125
 0.95299 0.95167 0.94330 0.93817 0.97436 0.87444 0.90625 0.71959 0.97279 0.96977 0.95770 0.95050
0.92910 0.97025 0.96143 0.94466 0.94845 0.94444 0.94884 0.89706 0.95349 0.89928 0.63830 0.67153
0.69685
 1.00000 0.99390 1.00000 0.98198 0.99237 0.90476 1.00000 0.79630 0.91525 0.98214 1.00000 1.00000
0.96610 0.98462 0.92105 0.92593 0.93333 1.00000 1.00000 1.00000 0.90000 1.00000 0.66667 1.00000
0.85714
 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.88570 0.85250 0.87950 0.99000 0.91050
0.87600 0.77100 0.75020 0.73450 0.67330 0.51550 0.38450 0.32380 0.32600 0.26390 0.05940 0.04600
0.02910
```

* Based on TxDOT HGA regional level mid-year 2002 county registration data except EPA fractions are used for LDV, LDT and Bus.

2005 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00060 0.00010
0.00030 0.00060 0.00130 0.00040 0.00040 0.00010 0.00270 0.00320 0.00970 0.01620 0.02410 0.05100
0.07060
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560
0.06160
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200 0.02230 0.06560
0.06160
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01150 0.01110
0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560
0.00130
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01150 0.01110
0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690 0.02090 0.02560
0.00130
0.74320 0.74320 0.74320 0.72722 0.66739 0.53919 0.57598 0.41855 0.42974 0.40654 0.15116 0.33205
0.27881 0.23514 0.34462 0.26056 0.22311 0.13115 0.14189 0.27586 0.17089 0.24852 0.13580 0.18121
0.00000
0.70343 0.70343 0.70343 0.61527 0.65352 0.65082 0.67772 0.54328 0.64638 0.57703 0.33034 0.58550
0.58678 0.61151 0.54585 0.54733 0.54598 0.43448 0.37313 0.35714 0.23810 0.32075 0.30435 0.05263
0.00000
0.70775 0.70775 0.70775 0.67184 0.73362 0.69881 0.64395 0.71983 0.76585 0.63245 0.40000 0.71351
0.68382 0.63889 0.67470 0.68750 0.44118 0.27273 0.50000 0.29412 0.30000 0.31818 0.10000 0.20000
0.12500
0.86709 0.86709 0.86709 0.95652 0.93015 0.91404 0.90370 0.83621 0.74545 0.73077 0.46226 0.79167
0.85714 0.76190 0.67273 0.69811 0.58333 0.48214 0.51163 0.30556 0.20690 0.46667 0.08696 0.12000
0.35714
0.91941 0.91941 0.91941 0.95533 0.90950 0.87183 0.88031 0.89756 0.72115 0.84375 0.63112 0.85000
0.87574 0.67568 0.77736 0.78596 0.76410 0.68712 0.73026 0.65152 0.57813 0.54808 0.45000 0.35052
0.49333
0.98404 0.98404 0.98404 0.96020 0.91513 0.91979 0.92271 0.94138 0.83456 0.87739 0.55026 0.92737
0.93878 0.97419 0.90987 0.90164 0.92661 0.79787 0.84722 0.87931 0.85246 0.83607 0.64286 0.58621
0.74286
0.96667 0.96667 0.96667 0.95652 0.96390 0.95442 0.96839 0.97846 0.90040 0.90055 0.75856 0.96937
0.96536 0.95509 0.95431 0.93171 0.96854 0.97541 0.94758 0.94828 0.92825 0.96045 0.85185 0.92793
0.87395
1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 0.97143 0.99265 0.90984 1.00000 0.79518 0.91803
0.97087 0.97143 0.98182 0.93878 0.99000 0.90000 0.88889 0.87500 1.00000 1.00000 1.00000 0.85714
1.00000
0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.88570 0.85250
0.87950 0.99000 0.91050 0.87600 0.77100 0.75020 0.73450 0.67330 0.51550 0.38450 0.32380 0.32600
0.26390
```

* Based on TxDOT HGA regional level mid-year 2003 county registration data except EPA fractions are used for LDV, LDT and Bus.

2007 Houston Eight-County Region Diesel Fractions Estimates

```
* One record per vehicle type.  The order of vehicle types is: LDV, LDT1, LDT2, LDT3, LDT4,
HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
DIESEL FRACTIONS:
0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090
0.00060 0.00010 0.00030 0.00060 0.00130 0.00040 0.00040 0.00010 0.00270 0.00320 0.00970 0.01620
0.02410
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200
0.02230
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070 0.00330 0.00480 0.01200
0.02230
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690
0.02090
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820 0.01240 0.01350 0.01690
0.02090
0.74320 0.74320 0.74320 0.74320 0.74320 0.72722 0.66739 0.53919 0.57598 0.41855 0.42974 0.40654
0.15116 0.33205 0.27881 0.23514 0.34462 0.26056 0.22311 0.13115 0.14189 0.27586 0.17089 0.24852
0.13580
0.70343 0.70343 0.70343 0.70343 0.70343 0.61527 0.65352 0.65082 0.67772 0.54328 0.64638 0.57703
0.33034 0.58550 0.58678 0.61151 0.54585 0.54733 0.54598 0.43448 0.37313 0.35714 0.23810 0.32075
0.30435
0.70775 0.70775 0.70775 0.70775 0.70775 0.67184 0.73362 0.69881 0.64395 0.71983 0.76585 0.63245
0.40000 0.71351 0.68382 0.63889 0.67470 0.68750 0.44118 0.27273 0.50000 0.29412 0.30000 0.31818
0.10000
0.86709 0.86709 0.86709 0.86709 0.86709 0.95652 0.93015 0.91404 0.90370 0.83621 0.74545 0.73077
0.46226 0.79167 0.85714 0.76190 0.67273 0.69811 0.58333 0.48214 0.51163 0.30556 0.20690 0.46667
0.08696
0.91941 0.91941 0.91941 0.91941 0.91941 0.95533 0.90950 0.87183 0.88031 0.89756 0.72115 0.84375
0.63112 0.85000 0.87574 0.67568 0.77736 0.78596 0.76410 0.68712 0.73026 0.65152 0.57813 0.54808
0.45000
0.98404 0.98404 0.98404 0.98404 0.98404 0.96020 0.91513 0.91979 0.92271 0.94138 0.83456 0.87739
0.55026 0.92737 0.93878 0.97419 0.90987 0.90164 0.92661 0.79787 0.84722 0.87931 0.85246 0.83607
0.64286
0.96667 0.96667 0.96667 0.96667 0.96667 0.95652 0.96390 0.95442 0.96839 0.97846 0.90040 0.90055
0.75856 0.96937 0.96536 0.95509 0.95431 0.93171 0.96854 0.97541 0.94758 0.94828 0.92825 0.96045
0.85185
1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 0.97143 0.99265 0.90984 1.00000
0.79518 0.91803 0.97087 0.97143 0.98182 0.93878 0.99000 0.90000 0.88889 0.87500 1.00000 1.00000
1.00000
0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850
0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100 0.75020 0.73450 0.67330 0.51550 0.38450
0.32380
```

* Based on TxDOT HGA regional level mid-year 2003 county registration data except EPA fractions are used for LDV, LDT and Bus.

APPENDIX F
MOBILE6 VMT BY HOUR INPUT

County-Level, Ozone Season Weekday 1990 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from Ozone Season Weekday 1990
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.07142	0.07086	0.06622	0.05273	0.06505	0.06136	0.05263	0.06891
8	0.08640	0.08572	0.08011	0.06378	0.07869	0.07422	0.06366	0.08336
9	0.07117	0.07062	0.06599	0.05254	0.06482	0.06114	0.05245	0.06867
10	0.05211	0.05063	0.05090	0.05505	0.05108	0.05167	0.05461	0.05329
11	0.05087	0.04942	0.04968	0.05373	0.04985	0.05043	0.05331	0.05202
12	0.05329	0.05177	0.05205	0.05630	0.05223	0.05284	0.05585	0.05450
1	0.05489	0.05333	0.05361	0.05799	0.05380	0.05443	0.05753	0.05614
2	0.05594	0.05435	0.05464	0.05910	0.05483	0.05547	0.05863	0.05721
3	0.05914	0.05746	0.05777	0.06248	0.05797	0.05864	0.06198	0.06049
4	0.07415	0.07573	0.07457	0.07177	0.07450	0.07346	0.07139	0.07452
5	0.08154	0.08328	0.08199	0.07892	0.08192	0.08078	0.07850	0.08195
6	0.08705	0.08891	0.08754	0.08426	0.08746	0.08624	0.08381	0.08749
7	0.07125	0.07277	0.07165	0.06896	0.07159	0.07059	0.06860	0.07161
8	0.02779	0.02872	0.03258	0.03877	0.03320	0.03586	0.03975	0.02760
9	0.02172	0.02245	0.02546	0.03030	0.02595	0.02803	0.03107	0.02157
10	0.01927	0.01991	0.02259	0.02688	0.02302	0.02486	0.02756	0.01913
11	0.01536	0.01588	0.01801	0.02142	0.01835	0.01982	0.02197	0.01525
12	0.01049	0.01084	0.01229	0.01463	0.01253	0.01353	0.01500	0.01041
1	0.00572	0.00592	0.00671	0.00798	0.00684	0.00739	0.00819	0.00568
2	0.00365	0.00378	0.00428	0.00510	0.00437	0.00471	0.00523	0.00363
3	0.00331	0.00342	0.00388	0.00461	0.00395	0.00427	0.00473	0.00328
4	0.00295	0.00305	0.00346	0.00412	0.00353	0.00381	0.00422	0.00293
5	0.00495	0.00511	0.00580	0.00690	0.00591	0.00639	0.00708	0.00491
6	0.01556	0.01608	0.01824	0.02170	0.01858	0.02007	0.02225	0.01545
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1

County-Level, Ozone Season Weekday 2002 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from Ozone Season Weekday 2002
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.07158	0.07150	0.06694	0.05185	0.06725	0.06243	0.05350	0.06709
8	0.08659	0.08650	0.08097	0.06272	0.08136	0.07552	0.06472	0.08116
9	0.07133	0.07125	0.06670	0.05167	0.06702	0.06221	0.05332	0.06685
10	0.05213	0.05074	0.05169	0.05508	0.05093	0.05132	0.05449	0.05485
11	0.05088	0.04952	0.05045	0.05376	0.04971	0.05009	0.05319	0.05353
12	0.05331	0.05188	0.05286	0.05632	0.05208	0.05248	0.05573	0.05609
1	0.05491	0.05344	0.05444	0.05801	0.05365	0.05405	0.05740	0.05777
2	0.05597	0.05447	0.05549	0.05913	0.05468	0.05509	0.05850	0.05888
3	0.05917	0.05758	0.05866	0.06251	0.05780	0.05824	0.06185	0.06225
4	0.07414	0.07451	0.07422	0.07172	0.07422	0.07386	0.07168	0.07416
5	0.08153	0.08193	0.08162	0.07886	0.08162	0.08121	0.07882	0.08155
6	0.08704	0.08748	0.08714	0.08420	0.08714	0.08671	0.08415	0.08707
7	0.07125	0.07160	0.07132	0.06891	0.07132	0.07097	0.06888	0.07126
8	0.02767	0.02924	0.03135	0.03938	0.03214	0.03524	0.03906	0.02710
9	0.02162	0.02286	0.02450	0.03077	0.02512	0.02754	0.03053	0.02118
10	0.01918	0.02027	0.02173	0.02730	0.02228	0.02443	0.02708	0.01879
11	0.01529	0.01616	0.01732	0.02176	0.01776	0.01948	0.02159	0.01498
12	0.01044	0.01103	0.01183	0.01486	0.01213	0.01330	0.01474	0.01022
1	0.00570	0.00602	0.00646	0.00811	0.00662	0.00726	0.00805	0.00558
2	0.00364	0.00385	0.00412	0.00518	0.00423	0.00463	0.00514	0.00356
3	0.00329	0.00348	0.00373	0.00469	0.00382	0.00419	0.00465	0.00322
4	0.00294	0.00310	0.00333	0.00418	0.00341	0.00374	0.00415	0.00288
5	0.00493	0.00521	0.00558	0.00701	0.00572	0.00628	0.00695	0.00482
6	0.01549	0.01637	0.01755	0.02204	0.01799	0.01973	0.02186	0.01517
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1

County-Level, Ozone Season Weekday 2005 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from Ozone Season Weekday 2005
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.07108	0.07033	0.06703	0.05159	0.06714	0.06182	0.05269	0.06666
8	0.08599	0.08508	0.08108	0.06241	0.08122	0.07478	0.06374	0.08064
9	0.07083	0.07009	0.06680	0.05141	0.06691	0.06160	0.05251	0.06643
10	0.05254	0.05105	0.05178	0.05532	0.05095	0.05165	0.05479	0.05522
11	0.05128	0.04983	0.05054	0.05400	0.04973	0.05041	0.05348	0.05390
12	0.05373	0.05221	0.05295	0.05657	0.05211	0.05281	0.05603	0.05647
1	0.05534	0.05377	0.05454	0.05827	0.05367	0.05440	0.05771	0.05816
2	0.05640	0.05481	0.05559	0.05939	0.05470	0.05544	0.05882	0.05928
3	0.05963	0.05794	0.05877	0.06279	0.05783	0.05862	0.06219	0.06267
4	0.07402	0.07489	0.07431	0.07161	0.07429	0.07373	0.07154	0.07404
5	0.08140	0.08235	0.08172	0.07875	0.08169	0.08107	0.07867	0.08141
6	0.08690	0.08792	0.08725	0.08407	0.08721	0.08656	0.08399	0.08692
7	0.07113	0.07196	0.07141	0.06881	0.07138	0.07085	0.06875	0.07115
8	0.02757	0.02928	0.03108	0.03932	0.03213	0.03534	0.03933	0.02700
9	0.02155	0.02288	0.02429	0.03073	0.02511	0.02762	0.03074	0.02110
10	0.01911	0.02030	0.02155	0.02726	0.02228	0.02450	0.02727	0.01872
11	0.01524	0.01618	0.01718	0.02173	0.01776	0.01953	0.02174	0.01492
12	0.01040	0.01105	0.01173	0.01484	0.01212	0.01333	0.01484	0.01019
1	0.00568	0.00603	0.00640	0.00810	0.00662	0.00728	0.00810	0.00556
2	0.00363	0.00385	0.00409	0.00517	0.00422	0.00465	0.00517	0.00355
3	0.00328	0.00348	0.00370	0.00468	0.00382	0.00420	0.00468	0.00321
4	0.00293	0.00311	0.00330	0.00417	0.00341	0.00375	0.00418	0.00287
5	0.00491	0.00521	0.00553	0.00700	0.00572	0.00629	0.00700	0.00481
6	0.01543	0.01639	0.01740	0.02201	0.01798	0.01978	0.02202	0.01511
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

County-Level, Ozone Season Weekday 2007 Hourly VMT Fractions Input to MOBILE6

Fleetwide VMT Fractions by Hour-of-Day;
Based on Hourly VMT Totals from Ozone Season Weekday 2007
First Hour is 6 a.m. to 7 a.m.

Hour	Harris	Brazoria	Fort Bend	Waller	Montgomery	Liberty	Chambers	Galveston
7	0.07163	0.07067	0.06782	0.05214	0.06760	0.06223	0.05276	0.06650
8	0.08665	0.08549	0.08205	0.06307	0.08178	0.07528	0.06383	0.08045
9	0.07138	0.07043	0.06759	0.05196	0.06737	0.06201	0.05258	0.06627
10	0.05220	0.05100	0.05143	0.05539	0.05086	0.05221	0.05488	0.05537
11	0.05095	0.04978	0.05020	0.05407	0.04964	0.05097	0.05357	0.05404
12	0.05338	0.05215	0.05259	0.05664	0.05201	0.05340	0.05612	0.05662
1	0.05499	0.05372	0.05417	0.05834	0.05357	0.05500	0.05780	0.05832
2	0.05604	0.05475	0.05521	0.05946	0.05460	0.05605	0.05892	0.05944
3	0.05925	0.05788	0.05837	0.06286	0.05772	0.05926	0.06228	0.06284
4	0.07408	0.07464	0.07444	0.07172	0.07436	0.07340	0.07153	0.07393
5	0.08146	0.08208	0.08185	0.07886	0.08176	0.08071	0.07865	0.08130
6	0.08697	0.08763	0.08739	0.08420	0.08730	0.08617	0.08397	0.08680
7	0.07118	0.07173	0.07153	0.06891	0.07145	0.07053	0.06873	0.07104
8	0.02759	0.02934	0.03089	0.03876	0.03188	0.03460	0.03919	0.02701
9	0.02157	0.02293	0.02414	0.03029	0.02491	0.02704	0.03063	0.02111
10	0.01913	0.02034	0.02142	0.02687	0.02210	0.02398	0.02717	0.01873
11	0.01525	0.01622	0.01707	0.02142	0.01762	0.01912	0.02166	0.01493
12	0.01041	0.01107	0.01166	0.01462	0.01203	0.01305	0.01479	0.01019
1	0.00568	0.00604	0.00636	0.00798	0.00657	0.00713	0.00807	0.00556
2	0.00363	0.00386	0.00406	0.00510	0.00419	0.00455	0.00515	0.00355
3	0.00328	0.00349	0.00368	0.00461	0.00379	0.00412	0.00466	0.00321
4	0.00293	0.00312	0.00328	0.00412	0.00338	0.00367	0.00416	0.00287
5	0.00491	0.00522	0.00550	0.00690	0.00568	0.00616	0.00698	0.00481
6	0.01544	0.01642	0.01729	0.02170	0.01784	0.01936	0.02193	0.01512
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1

APPENDIX G
MOBILE6 TRIP LENGTH DISTRIBUTIONS INPUT

HGA 1990 Hourly Percent of VMT by Trip Length Input to MOBILE6

Hour	Trip Length Ranges (minutes)					
	< 10	37214	21-30	31-40	41-50	>51
6 a.m.	11.95	27.31	24.89	16.97	8.95	9.93
7 a.m.	11.95	27.31	24.89	16.97	8.95	9.93
8 a.m.	11.95	27.31	24.89	16.97	8.95	9.93
9 a.m.	16.09	31.03	22.47	12.91	6.87	10.63
10 a.m.	16.09	31.03	22.47	12.91	6.87	10.63
11 a.m.	16.09	31.03	22.47	12.91	6.87	10.63
12 p.m.	16.09	31.03	22.47	12.91	6.87	10.63
1 p.m.	16.09	31.03	22.47	12.91	6.87	10.63
2 p.m.	16.09	31.03	22.47	12.91	6.87	10.63
3 p.m.	14.51	29.59	23.46	14.45	7.66	10.33
4 p.m.	14.51	29.59	23.46	14.45	7.66	10.33
5 p.m.	14.51	29.59	23.46	14.45	7.66	10.33
6 p.m.	14.51	29.59	23.46	14.45	7.66	10.33
7 p.m. through 5 a.m.	15.06	29.57	22.14	13.38	7.41	12.4

* Based on HGAC 1990 TDMs (HGAC, January 2004).

HGA 2002 Hourly Percent of VMT by Trip Length Input to MOBILE6

Hour	Trip Length Ranges (minutes)					
	< 10	37214	21-30	31-40	41-50	>51
6 a.m.	11.79	26.95	25.01	17.37	9.30	9.58
7 a.m.	11.79	26.95	25.01	17.37	9.30	9.58
8 a.m.	11.79	26.95	25.01	17.37	9.30	9.58
9 a.m.	15.89	30.59	22.98	13.67	7.15	9.72
10 a.m.	15.89	30.59	22.98	13.67	7.15	9.72
11 a.m.	15.89	30.59	22.98	13.67	7.15	9.72
12 p.m.	15.89	30.59	22.98	13.67	7.15	9.72
1 p.m.	15.89	30.59	22.98	13.67	7.15	9.72
2 p.m.	15.89	30.59	22.98	13.67	7.15	9.72
3 p.m.	14.39	29.31	23.71	15.02	7.93	9.64
4 p.m.	14.39	29.31	23.71	15.02	7.93	9.64
5 p.m.	14.39	29.31	23.71	15.02	7.93	9.64
6 p.m.	14.39	29.31	23.71	15.02	7.93	9.64
7 p.m. through 5 a.m.	15.04	29.58	22.56	13.89	7.61	11.3

* Based on HGAC 2002 TDMs (HGAC, March 2004).

HGA 2005 Hourly Percent of VMT by Trip Length Input to MOBILE6

Hour	Trip Length Ranges (minutes)					
	< 10	37214	21-30	31-40	41-50	>51
6 a.m.	11.63	27.04	25.04	17.45	9.37	9.47
7 a.m.	11.63	27.04	25.04	17.45	9.37	9.47
8 a.m.	11.63	27.04	25.04	17.45	9.37	9.47
9 a.m.	15.64	30.66	23.06	13.72	7.22	9.70
10 a.m.	15.64	30.66	23.06	13.72	7.22	9.70
11 a.m.	15.64	30.66	23.06	13.72	7.22	9.70
12 p.m.	15.64	30.66	23.06	13.72	7.22	9.70
1 p.m.	15.64	30.66	23.06	13.72	7.22	9.70
2 p.m.	15.64	30.66	23.06	13.72	7.22	9.70
3 p.m.	14.17	29.36	23.83	15.05	8.00	9.59
4 p.m.	14.17	29.36	23.83	15.05	8.00	9.59
5 p.m.	14.17	29.36	23.83	15.05	8.00	9.59
6 p.m.	14.17	29.36	23.83	15.05	8.00	9.59
7 p.m. through 5 a.m.	14.81	29.62	22.63	13.93	7.70	11.3

* Based on HGAC 2005 TDMs (HGAC, March 2004).

HGA 2007 Hourly Percent of VMT by Trip Length Input to MOBILE6

Hour	Trip Length Ranges (minutes)					
	< 10	**37214**	**21-30**	**31-40**	**41-50**	**>51**
6 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
7 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
8 a.m.	11.43	26.84	25.13	17.77	9.65	9.18
9 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
10 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
11 a.m.	15.41	30.51	23.34	14.10	7.36	9.28
12 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
1 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
2 p.m.	15.41	30.51	23.34	14.10	7.36	9.28
3 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
4 p.m.	13.95	29.23	24.04	15.44	8.18	9.16
5 p.m.	14	29.23	24.04	15.44	8.18	9.16
6 p.m.	14	29.23	24.04	15.44	8.18	9.16
7 p.m. through 5 a.m.	14.7	29.66	22.95	14.34	7.79	10.6

* Based on HGAC 2007 TDMs (HGAC, January 2004).