

APPENDIX D

Documentation of Emission Factor Development

Memorandum

Date: December 12, 2007
To: Michael Clifford, TPB
From: Sunil Kumar, MWAQC
Subject: MOBILE6 Input Documentation for 2002, 2008, 2009, 2010, 2020, and 2030 (Ozone Season Day) and 2002, 2009, 2010, 2020, and 2030 (Annual) Inventories for 2007 CLRP & 2008-2013 TIP

The purpose of this memorandum is to document the MOBILE6 inputs for developing the onroad emission inventories for calendar years 2002, 2008, 2009, 2010, 2020, and 2030 for the ozone season day analysis and for calendar years 2002, 2009, 2010, 2020, and 2030 for the annual analysis. Separate sets of input files were created to model emission factors corresponding to travel in the COG region for each of these calendar years 1) on network and local roadways, 2) during auto access to transit, and 3) by diesel transit and school buses.

MOBILE6 inputs for the calendar year 2002 for ozone season day analysis are described in details in the Appendix B (Base Year 2002 Emissions Inventory Document) of the Washington, DC-MD-VA 8-Hour Ozone Nonattainment Area SIP submitted to EPA in June 2007. MOBILE6 inputs for calendar years 2008 and 2009 for the ozone season day analysis are described in details in the Appendix E1 (Mob6.2.03 Inventories and Documentation) of this document. MOBILE6 inputs for calendar years 2002 annual analysis are described in details in the Appendix B (Base Year 2002 Emissions Inventory and Documentation) of the Washington, DC-MD-VA Annual PM2.5 Nonattainment Area SIP. MOBILE6 inputs for the calendar year 2009 annual analysis are described in details in the Appendix E1 (2009 Onroad Mobile Source Emissions Inventories and Documentation) of this document.

Most of the inputs used for 2008 and 2009 ozone season day analyses are also used for calendar years 2008, 2009, 2010, 2020, and 2030 except for oxygenated fuel parameters and Maryland's I/M programs, which were revised since the submittal of 8-Hour Ozone SIP in June 2007 and are being presented in Tables A-1 and A-2 respectively. Maryland's cut-point files for calendar years 2010, 2020, and 2030 used in 2007 ozone season day and annual 2007 CLRP analyses are also being provided below in Tables A-3 and A-4.

Table A-1 Oxygenated Fuel Parameters

Details of the format for the oxygenated fuel parameters listed here can found in the Mobile6 model user guide.

*** Oxygenated fuel from Spring 2006 onwards.**

OXYGENATED FUELS : 0.00 1.000 0.000 0.035 1

Table A-2
I/M Program Parameters for Maryland
(2008 and Beyond)

Montgomery and Prince George's

>IM Program. Idle, IM240, and OBD.
>Waiver rates based on July - December 2004 initial tests results through 18 months after testing.

*Idle older LDGV, LDGT

I/M PROGRAM : 1 1984 2050 2 T/O Idle
I/M MODEL YEARS : 1 1977 1983
I/M VEHICLES : 1 22222 11111111 1
I/M STRINGENCY : 1 20.0
I/M COMPLIANCE : 1 96.0
I/M WAIVER RATES : 1 13.8 13.8
I/M GRACE PERIOD : 1 2

*Idle HDGT

I/M PROGRAM : 2 1984 2050 2 T/O Idle
I/M MODEL YEARS : 2 1977 2050
I/M VEHICLES : 2 11111 22222111 1
I/M STRINGENCY : 2 20.0
I/M COMPLIANCE : 2 96.0
I/M WAIVER RATES : 2 13.8 13.8
I/M GRACE PERIOD : 2 2

*IM240

I/M PROGRAM : 3 1984 2050 2 T/O IM240
I/M MODEL YEARS : 3 1984 1995
I/M VEHICLES : 3 22222 11111111 1
I/M STRINGENCY : 3 20.0
I/M COMPLIANCE : 3 96.0
I/M WAIVER RATES : 3 13.8 13.8
I/M CUTPOINTS : 3 IM_ATP\Maryland Model Year Specific Cut-point File
I/M GRACE PERIOD : 3 2

*OBD

I/M PROGRAM : 4 1984 2050 2 T/O OBD I/M
I/M MODEL YEARS : 4 1996 2050
I/M VEHICLES : 4 22222 11111111 1
I/M STRINGENCY : 4 20.0
I/M COMPLIANCE : 4 96.0
I/M WAIVER RATES : 4 5.4 5.4
I/M GRACE PERIOD : 4 2

*OBD Evap (Actual Start Year: July 2002)

I/M PROGRAM : 5 2002 2050 2 T/O EVAP OBD
I/M MODEL YEARS : 5 1996 2050
I/M VEHICLES : 5 22222 11111111 1
I/M COMPLIANCE : 5 96.0
I/M WAIVER RATES : 5 5.4 5.4
I/M GRACE PERIOD : 5 2

Calvert, Charles, Fredrick

>IM Program. Idle, IM240, and OBD.

>Waiver rates based on July - December 2004 initial tests results through 18 months after testing.

*Idle older LDGV, LDGT

I/M PROGRAM : 1 1995 2050 2 T/O Idle
I/M MODEL YEARS : 1 1977 1983
I/M VEHICLES : 1 22222 11111111 1
I/M STRINGENCY : 1 20.0
I/M COMPLIANCE : 1 96.0
I/M WAIVER RATES : 1 13.8 13.8
I/M GRACE PERIOD : 1 2

*Idle HDGT

I/M PROGRAM : 2 1995 2050 2 T/O Idle
I/M MODEL YEARS : 2 1977 2050
I/M VEHICLES : 2 11111 22222111 1
I/M STRINGENCY : 2 20.0
I/M COMPLIANCE : 2 96.0
I/M WAIVER RATES : 2 13.8 13.8
I/M GRACE PERIOD : 2 2

*IM240

I/M PROGRAM : 3 1995 2050 2 T/O IM240
I/M MODEL YEARS : 3 1984 1995
I/M VEHICLES : 3 22222 11111111 1
I/M STRINGENCY : 3 20.0
I/M COMPLIANCE : 3 96.0
I/M WAIVER RATES : 3 13.8 13.8
I/M CUTPOINTS : 3 IM_ATP\ Maryland Model Year Specific Cut-point File
I/M GRACE PERIOD : 3 2

*OBD

I/M PROGRAM : 4 1995 2050 2 T/O OBD I/M
I/M MODEL YEARS : 4 1996 2050
I/M VEHICLES : 4 22222 11111111 1
I/M STRINGENCY : 4 20.0
I/M COMPLIANCE : 4 96.0
I/M WAIVER RATES : 4 5.4 5.4
I/M GRACE PERIOD : 4 2

*OBD Evap (Actual Start Year: July 2002)

I/M PROGRAM : 5 2002 2050 2 T/O EVAP OBD
I/M MODEL YEARS : 5 1996 2050
I/M VEHICLES : 5 22222 11111111 1
I/M COMPLIANCE : 5 96.0
I/M WAIVER RATES : 5 5.4 5.4
I/M GRACE PERIOD : 5 2

Table A-2
2010 Cut-Point Parameters for Maryland

Details of the format for the cut-point parameters listed in Tables A-2 through A-4 can found in the Mobile6 model user guide.

* (SEE P. 16&17 OF EPA REPORT M6.IM.001)

> CY 10

> CUTPOINTS 75% TO FINAL for 1994 and 1995. IMPLEMENTED May 2005.

I/M CUTPOINTS

* Model Years

* 10 09 08 07 06 05 04 03 02 01

* 00 99 98 97 96 95 94 93 92 91
 * 90 89 88 87 86

* Block 1 (LDGV, Light LDGT1(EPA LD1))

0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900
 0.900 0.900 0.900 0.900 0.900 0.900 0.900 1.000 1.000 1.000
 1.400 1.400 1.400 1.800 1.800
 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000
 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000
 30.000 30.000 30.000 30.000 30.000
 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100
 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.200 2.200 2.200
 2.500 2.500 2.500 2.800 2.800

* Block 2 (Heavy LDGT1, Light LDGT2 (EPA LD2&3))

1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800
 1.800 1.800 1.800 1.800 1.800 1.800 1.800 2.000 2.000 2.000
 2.400 2.400 2.400 2.800 2.800
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 80.000 80.000 80.000 80.000 80.000
 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600
 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.700 2.700 2.700
 3.000 3.000 3.000 5.800 5.800

* 10 09 08 07 06 05 04 03 02 01
 * 00 99 98 97 96 95 94 93 92 91
 * 90 89 88 87 86

* Block 3 (Heavy LDGT2(EPA LD4))

1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800
 1.800 1.800 1.800 1.800 1.800 1.800 1.800 2.000 2.000 2.000
 2.400 2.400 2.400 2.900 2.900
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 80.000 80.000 80.000 80.000 80.000
 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700
 3.700 3.700 3.700 3.700 3.700 3.700 3.700 4.000 4.000 4.000
 4.200 4.200 4.200 6.600 6.600

* 10 09 08 07 06 05 04 03 02 01
 * 00 99 98 97 96 95 94 93 92 91
 * 90 89 88 87 86

* Block 4 (HDGV)(Idle Tested)

2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200
 2.200 2.200 2.200 2.500 2.500 2.500 2.500 2.500 2.500 2.500
 2.600 2.600 2.600 3.000 4.700
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 80.000 80.000 80.000 80.000 80.000
 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000
 4.000 4.000 4.000 5.500 5.500 5.500 5.500 5.500 5.500 5.500
 7.000 7.000 7.000 7.700 7.700

Table A-3
2020 & 2030 Cut-Point Parameters for Maryland

* (SEE P. 16&17 OF EPA REPORT M6.IM.001)

> CY 18 and subsequent years.

> CUTPOINTS 75% TO FINAL FOR 1994 AND 1995. IMPLEMENTED MAY 2005.

I/M CUTPOINTS

* Model Years

* 18	17	16	15	14	13	12	11	10	09
* 08	07	06	05	04	03	02	01	00	99
* 98	97	96	95	94					

* Block 1 (LDGV, Light LDGT1(EPA LD1))

0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
0.900	0.900	0.900	0.900	0.900					
20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000
20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000
20.000	20.000	20.000	20.000	20.000					
2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100
2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100	2.100
2.100	2.100	2.100	2.100	2.100					

* Block 2 (Heavy LDGT1, Light LDGT2 (EPA LD2&3))

1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800
1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800
1.800	1.800	1.800	1.800	1.800					
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	60.000	60.000	60.000					
2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600
2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600
2.600	2.600	2.600	2.600	2.600					

* 18	17	16	15	14	13	12	11	10	09
* 08	07	06	05	04	03	02	01	00	99
* 98	97	96	95	94					

* Block 3 (Heavy LDGT2(EPA LD4))

1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800
1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800
1.800	1.800	1.800	1.800	1.800					
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	60.000	60.000	60.000					
3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700
3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700	3.700
3.700	3.700	3.700	3.700	3.700					

* 18	17	16	15	14	13	12	11	10	09
* 08	07	06	05	04	03	02	01	00	99

* 98 97 96 95 94

* Block 4 (HDGV)(Idle Tested)

2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200
2.200	2.200	2.200	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
2.600	2.600	2.600	3.000	4.700						
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
80.000	80.000	80.000	80.000	80.000						
4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
4.000	4.000	4.000	5.500	5.500	5.500	5.500	5.500	5.500	5.500	5.500
7.000	7.000	7.000	7.700	7.700						

Table 1

**MOBILE6 Run Information Common to All COG Counties
For Ozone day and Annual Runs**

Command	Input	Description
MOBILE6 INPUT FILE	No input required.	Specific to Jurisdiction
REPORT FILE	No input required.	Specifies name for descriptive output file(s).
EMISSIONS TABLE	User-supplied	Specifies a file name for the database output file.
SPREADSHEET	User-supplied	Instructs MOBILE6 to output the average calendar year emission factors in a form suitable for direct input into a spreadsheet program.
POLLUTANTS*	Specific to seasonal runs	Controls which HC, CO, and NOx pollutants will be calculated and output to the database report and descriptive output.
PARTICULATE EF ⁺	PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV	Used for seasonal runs particulate matter (PM2.5) and NOx as a precursor for PM2.5.
EXPRESS HC AS VOC ⁺	No input required.	Directs MOBILE6 to output exhaust HC as volatile organic compounds.
EXPAND EVAPORATIVE ⁺	No input required.	Six evaporative emission types in descriptive output.
EXPAND EXHAUST ⁺	No input required.	Start, running and total exhaust EFs displayed in descriptive output.
NO REFUELING ⁺	No input required.	Used "zero " for refueling (Stage 2) emissions.
WE DA TRI LEN DI	User-supplied	See Table 2
94+ LDG IMP	User-supplied	Used 1994 and later fleet penetration fractions for light-duty gasoline vehicles under the Tier 1, NLEV (or California LEV 1), and Tier 2 standards.
REBUILD EFFECTS	Values supplied by state air agency staff.	Rebuild program effectiveness rate used to reduce heavy-duty diesel vehicle NOx off-cycle emissions. Vary by state: DC 11%,MD 90%, VA 25%
REG DIST	Vary by jurisdiction	2005 Vehicle Registration specific to jurisdiction for 16 composite vehicles types. Reference # 36
ANTI-TAMP PROG	Vary by state	See Table 9
I/M DESC FILE [#]	User-supplied	See Tables 4, 6, and 8
FUEL PROGRAM	Fuel program 4	See Table 18 for values
OXYGENATED FUELS	Regional Values	See Table 18 for values
TEMPERATURE	Ozone season	68.50 min 95.0 max
	Seasonal	24 hourly temperatures. See Table 17 for values.
DIESEL FRACTIONS	Vary by jurisdiction	See Reference # 36

FUEL RVP	Vary by jurisdiction Ozone season	DC 6.80, MD 6.9, VA 6.7
	Seasonal	See Table 18
HUMIDITY	Ozone season	Default values.
	Seasonal	See Table 17
SCENARIO RECORD	Automatically generated.	Allows user to label individual scenario results. Marks start of new scenario.
CALENDAR YEAR	Varies.	Calendar year of scenario evaluated.
EVALUATION MONTH	Varies.	Specifies January 1 (1) or July 1 (7) for calendar year of interest.
ALTITUDE	1	High or low altitude of area evaluated.
BAROMETRIC PRES*	User-supplied	Varies by season. See Table 17
AVERAGE SPEED	Varies.	See Table 10
SOAK DISTRIBUTION	Varies.	See Table 11
VMT FRACTIONS	Varies. User-supplied.	See Tables 12, 13, 14
VMT BY FACILITY	FV4.FV for freeway ramp; FV3.FV for local roads	MOBILE6 defaults for each scenario.
DIESEL SULFUR*	Varies. User-supplied.	See Reference #36
PARTICLE SIZE*	User-supplied	2.5

+ - Does not apply to PM_{2.5} analysis (Annual runs).

* - Applies only when modeling PM_{2.5}.

- Used when an ATP or I/M control programs are in effect.

Table 2

Trip Length Distributions

Length of Trip	MWCOG Regional Percentage of VMT (%)	MOBILE6 Default Percentage of VMT (%)
< 10 Minutes	10.86	6.74
11 - 20 Minutes	24.98	18.51
21 - 30 Minutes	19.71	16.78
31 - 40 Minutes	13.44	13.11
41 - 50 Minutes	9.29	8.33
> 50 Minutes	21.72	36.53

Table 3

LEV Implementation Schedule for MWCOG Region

Model Year	Percentage of New Vehicle Sales			
	Tier 1	Transitional LEV	LEV	Tier 2
1999	30	40	30	0
2000	0	40	60	0
2001	0	0	100	0
2002	0	0	100	0
2003	0	0	100	0
2004+	0	0	0	100

Table 4

2010 I/M Program Parameters for DC

Test Type	IDLE	IM240	OBD I/M	FP & GC	EVAP OBD & GC	HDGV IDLE
I/M Program Years	1983-2050	1983-2050	1983-2050	1999-2050	1999-2050	1983-2050
Test Frequency	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial
Program Type	T/O	T/O	T/O	T/O	T/O	T/O
Model Years	1968-1983	1984-1995	1996-2050	1972-1995	1996-2050	1972-2050
Stringency Rate (%)	20	20	20	N/A	20	20
Compliance Rate (%)	96	96	96	96	96	96
Waiver Rate (%)	3	3	3	N/A	3	3
Exemption Age	25	25	25	25	25	25
Cutpoint File	N/A	DC_C02	N/A	N/A	N/A	N/A
Vehicles Tested						
LDGV	Yes	Yes	Yes	Yes	Yes	No
LDGT1	Yes	Yes	Yes	Yes	Yes	No
LDGT2	Yes	Yes	Yes	Yes	Yes	No
LDGT3	Yes	Yes	Yes	Yes	Yes	No
LDGT4	Yes	Yes	Yes	Yes	Yes	No
HDGV2B	Yes	Yes	No	Yes	No	Yes
HDGV3	Yes	Yes	No	Yes	No	Yes
HDGV4	Yes	Yes	No	Yes	No	Yes
HDGV5	Yes	Yes	No	Yes	No	Yes
HDGV6	No	No	No	No	No	No
HDGV7	No	No	No	No	No	No
HDGV8A	No	No	No	No	No	No
HDGV8B	No	No	No	No	No	No
GAS BUS	No	No	No	No	No	No

Table 5

* District of Columbia IM240 cutpoints - applies to year 2002 and later

*

>

I/M CUTPOINTS

* Block 1 (LDGV, Light LDGT1(EPA LD1))

0.800	0.800	0.800	0.800	0.800	0.800	0.800	1.200	1.200	1.200
1.200	1.200	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
2.000	2.000	2.200	2.000	2.000					
15.000	15.000	15.000	15.000	15.000	15.000	15.000	20.000	20.000	20.000
20.000	20.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
30.000	30.000	30.000	30.000	30.000					
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.500	2.500	2.500
2.500	2.500	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
3.000	3.000	3.000	3.000	3.000					

* Block 2 (Heavy LDGT1, Light LDGT2 (EPA LD2&3))

1.000	1.000	1.000	1.000	1.000	1.000	1.000	2.400	2.400	2.400
2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
3.200	3.200	3.200	3.200	3.200					
20.000	20.000	20.000	20.000	20.000	20.000	20.000	60.000	60.000	60.000
60.000	60.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000
80.000	80.000	80.000	80.000	80.000					
2.500	2.500	2.500	2.500	2.500	2.500	2.500	3.000	3.000	3.000
3.000	3.000	3.500	3.500	3.500	7.000	7.000	7.000	7.000	7.000
7.000	7.000	7.000	7.000	7.000					

* Block 3 (Heavy LDGT2(EPA LD4))

2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400
2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
3.200	3.200	3.200	3.200	3.200					
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000
80.000	80.000	80.000	80.000	80.000					
4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.500	4.500	4.500
4.500	4.500	5.000	5.000	5.000	7.000	7.000	7.000	7.000	7.000
7.000	7.000	7.000	7.000	7.000					

* Block 4 (HDGV)

2.400	2.400	2.400	2.400	2.400	3.000	3.000	3.000	3.000	3.000
3.000	3.000	3.200	3.200	3.200	3.200	5.000	5.000	6.000	6.000
6.000	6.000	6.000	6.000	6.000					
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
60.000	60.000	80.000	80.000	80.000	80.000	80.000	80.000	100.000	100.000
100.000	100.000	100.000	100.000	100.000					
4.000	4.000	4.000	4.000	4.000	6.000	6.000	6.000	6.000	6.000
6.000	6.000	8.000	8.000	8.000	8.000	8.000	8.0		

Table 6

2010 I/M Program Parameters for Maryland

Test Type	IDLE	IM240	OBD I/M	EVAP OBD	IDLE
I/M Program Years	1984-2050	1984-2050	1984-2050	2002-2050	1984-2050
Test Frequency	Biennial	Biennial	Biennial	Biennial	Biennial
Program Type	T/O	T/O	T/O	T/O	T/O
Model Years	1977-1983	1984-1995	1996-2050	1996-2050	1977-2050
Stringency Rate (%)	20	20	20	N/A	20
Compliance Rate (%)	96	96	96	96	96
Waiver Rate (%)	13.8	13.8	13.8	5.4	13.8
Grace Period (years)	2	2	2	2	2
Cutpoint File	N/A	MD_C10	N/A	N/A	N/A
Vehicle Types					
LDGV	Yes	Yes	Yes	Yes	No
LDGT1	Yes	Yes	Yes	Yes	No
LDGT2	Yes	Yes	Yes	Yes	No
LDGT3	Yes	Yes	Yes	Yes	No
LDGT4	Yes	Yes	Yes	Yes	No
HDGV2B	No	No	No	No	Yes
HDGV3	No	No	No	No	Yes
HDGV4	No	No	No	No	Yes
HDGV5	No	No	No	No	Yes
HDGV6	No	No	No	No	Yes
HDGV7	No	No	No	No	No
HDGV8A	No	No	No	No	No
HDGV8B	No	No	No	No	No
GAS BUS	No	No	No	No	No

Table 7

IM240 Cutpoint File (MD_C10) for Maryland

* (SEE P. 16&17 OF EPA REPORT M6.IM.001)

> CY 10

> CUTPOINTS 75% TO FINAL for 1994 and 1995. IMPLEMENTED May 2005.

I/M CUTPOINTS

* Model Years

* 10 09 08 07 06 05 04 03 02 01

* 00 99 98 97 96 95 94 93 92 91

* 90 89 88 87 86

* Block 1 (LDGV, Light LDGT1(EPA LD1))

0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900 0.900
 0.900 0.900 0.900 0.900 0.900 0.900 0.900 1.000 1.000 1.000
 1.400 1.400 1.400 1.800 1.800
 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000
 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000 20.000
 30.000 30.000 30.000 30.000 30.000
 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.100
 2.100 2.100 2.100 2.100 2.100 2.100 2.100 2.200 2.200 2.200
 2.500 2.500 2.500 2.800 2.800

* Block 2 (Heavy LDGT1, Light LDGT2 (EPA LD2&3))

1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800
 1.800 1.800 1.800 1.800 1.800 1.800 1.800 2.000 2.000 2.000
 2.400 2.400 2.400 2.800 2.800
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 80.000 80.000 80.000 80.000 80.000
 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.600
 2.600 2.600 2.600 2.600 2.600 2.600 2.600 2.700 2.700 2.700
 3.000 3.000 3.000 5.800 5.800

* 10 09 08 07 06 05 04 03 02 01

* 00 99 98 97 96 95 94 93 92 91

* 90 89 88 87 86

* Block 3 (Heavy LDGT2(EPA LD4))

1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800 1.800
 1.800 1.800 1.800 1.800 1.800 1.800 1.800 2.000 2.000 2.000
 2.400 2.400 2.400 2.900 2.900
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
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 80.000 80.000 80.000 80.000 80.000
 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700 3.700
 3.700 3.700 3.700 3.700 3.700 3.700 3.700 4.000 4.000 4.000
 4.200 4.200 4.200 6.600 6.600

* 10 09 08 07 06 05 04 03 02 01

* 00 99 98 97 96 95 94 93 92 91

* 90 89 88 87 86

* Block 4 (HDGV)(Idle Tested)

2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200 2.200
 2.200 2.200 2.200 2.500 2.500 2.500 2.500 2.500 2.500 2.500
 2.600 2.600 2.600 3.000 4.700
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000 60.000
 80.000 80.000 80.000 80.000 80.000
 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000 4.000
 4.000 4.000 4.000 5.500 5.500 5.500 5.500 5.500 5.500 5.500
 7.000 7.000 7.000 7.700 7.700

Table 8

2010 I/M Program Parameters for Virginia

Test Type	2500/IDLE	ASM 2525/5015 FINAL	OBD I/M	EVAP OBD & GC	GC	2500/ILDE	GC
I/M Program Years	1983-2050	1983-2050	1983-2050	1998-2050	1998-2050	1983-2050	1998-2050
Test Frequency	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial	Biennial
Program Type	TRC	TRC	TRC	TRC	TRC	TRC	TRC
Model Years	1968-1980	1981-1995	1996-2050	1996-2050	1973-1995	1981-2050	1973-2050
Stringency Rate (%)	35	35	35	N/A	N/A	35	N/A
Compliance Rate (%)	98	98	98	98	98	98	98
Waiver Rate (%)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Exemption Age	24	24	24	24	24	24	24
I/M Effectiveness (%)	N/A	N/A	94	N/A	N/A	N/A	N/A
Grace Period	N/A	N/A	4	4	N/A	4	4
Vehicle Types							
LDGV	Yes	Yes	Yes	Yes	Yes	No	No
LDGT1	Yes	Yes	Yes	Yes	Yes	No	No
LDGT2	Yes	Yes	Yes	Yes	Yes	No	No
LDGT3	Yes	Yes	Yes	Yes	Yes	No	No
LDGT4	Yes	Yes	Yes	Yes	Yes	No	No
HDGV2B	Yes	No	No	No	No	Yes	Yes
HDGV3	No	No	No	No	No	No	No
HDGV4	No	No	No	No	No	No	No
HDGV5	No	No	No	No	No	No	No
HDGV6	No	No	No	No	No	No	No
HDGV7	No	No	No	No	No	No	No
HDGV8A	No	No	No	No	No	No	No
HDGV8B	No	No	No	No	No	No	No
GAS BUS	No	No	No	No	No	No	No

Table 9**Anti-tampering Program Parameters for 2010**

Program Element	DC	MD	VA
Program Start Year	1982	1989	1983
First Model Year	1984	1977	1973
Last Model Year	2050	2050	2050
Program Type	Test Only	Test Only	Test Only
Inspection Frequency	Biennial	Biennial	Biennial
Compliance Rate (%)	96	98	98
Vehicle Types			
LDGV	Yes	Yes	Yes
LDGT1	Yes	Yes	Yes
LDGT2	Yes	Yes	Yes
LDGT3	Yes	Yes	Yes
LDGT4	Yes	Yes	Yes
HDGV2B	Yes	Yes	Yes
HDGV3	Yes	Yes	No
HDGV4	Yes	Yes	No
HDGV5	Yes	Yes	No
HDGV6	Yes	Yes	No
HDGV7	Yes	Yes	No
HDGV8A	Yes	Yes	No
HDGV8B	Yes	Yes	No
GAS BUS	Yes	Yes	No
Inspections Performed			
Air pump system disablement	No	No	Yes
Catalyst removal	Yes	Yes	Yes
Fuel inlet restrictor disablement	Yes	Yes	No
Tailpipe lead deposit test	No	No	No
EGR disablement	No	No	Yes
Evaporative system disablement	No	No	Yes
PCV system disablement	No	No	Yes
Missing gas cap	Yes	Yes	Yes

Table 10

**Summary of Scenarios Modeled in Each MOBILE6 Input File
For Network or Auto Access to Transit Analysis
For ozone season day and annual runs**

Scenario Number	Operating Mode	Facility Type	Average Speed	VMT Fractions	Month\Season Sequence
Ozone\Winter Analysis					
1-65	Stabilized	Arterial\Collectors	1-65 mph	Network or Auto Access	
66-130	Stabilized	Freeways excluding Ramps	1-65 mph	Network or Auto Access	
131	Stabilized	Freeway Ramps	34.6 mph	Network or Auto Access	
132	Cold	Local Roadways	12.9 mph	Network or Auto Access	
133	Hot	Local Roadways	12.9 mph	Network or Auto Access	
134	Stabilized	Local Roadways	12.9 mph	Network or Auto Access	
135-179*	Stabilized	Local Roadways as Arterial	1-45 mph	Local	
Seasonal Analysis					
1-195	Stabilized	Arterial\Collectors	1-65 mph	Network or Auto Access	I-3
196-390	Stabilized	Freeways excluding Ramps	1-65 mph	Network or Auto Access	I-4
391-393	Stabilized	Freeway Ramps	34.6 mph	Network or Auto Access	I-3
394-402	Cold	Local Roadways	12.9 mph	Network or Auto Access	I-3 (for each season, data sequence is as follow: cold, hot, then stabilized)
	Hot	Local Roadways	12.9 mph	Network or Auto Access	
	Stabilized	Local Roadways	12.9 mph	Local or Auto Access	
403-537*	Stabilized	Local Roadways as Arterial	1-45 mph	Local	
Notes:					
1. Season: 1 – January thru April; 2 – May thru September; 3 – October thru December					
2. * - Applies to network and local road types only.					

24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00
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24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*1.00
24*0.00 24*0.00

Hot Start Operating Mode

SOAK DISTRIBUTION

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24*0.00 24*1.00
24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00 24*0.00
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24*0.00 24*0.00

Table 12

2010 Summer VMT Mix Fractions
For Network Analysis

Vehicle Type	2010 Summer VMT Mix Fractions											
	DC	Maryland Counties					Virginia Counties					
		Calvert	Charles	Frederick	Montgomery	Prince George's	Alexandria	Arlington	Fairfax	Loudoun	Prince William	Stafford
LDV	0.344 1	0.3517	0.3512	0.3419	0.3406	0.3474	0.3434	0.3433	0.3411	0.3418	0.3461	0.3539
LDT1	0.090 7	0.0824	0.0815	0.0863	0.088	0.0851	0.0841	0.088	0.0876	0.0858	0.0843	0.0941
LDT2	0.317 2	0.3139	0.3145	0.3202	0.3205	0.3156	0.3219	0.3198	0.3191	0.3208	0.3169	0.3132
LDT3	0.107 3	0.1089	0.1094	0.1097	0.1101	0.1092	0.1106	0.1089	0.1101	0.1097	0.1099	0.1033
LDT4	0.052 5	0.0548	0.0551	0.0539	0.053	0.0544	0.0521	0.052	0.054	0.0539	0.0546	0.0475
HDV2B	0.028 8	0.0264	0.029	0.0262	0.0272	0.0266	0.0274	0.0294	0.026	0.0262	0.0251	0.0253
HDV3	0.002 9	0.0027	0.003	0.0027	0.0026	0.0026	0.0025	0.003	0.0025	0.0027	0.0027	0.0025
HDV4	0.002 3	0.0019	0.0022	0.0022	0.0022	0.0022	0.0022	0.0024	0.0021	0.0022	0.0021	0.0023
HDV5	0.002 6	0.0023	0.0025	0.0024	0.0025	0.0024	0.0022	0.0024	0.0023	0.0024	0.0023	0.0017
HDV6	0.006 8	0.0078	0.008	0.0073	0.0073	0.0083	0.0082	0.008	0.0071	0.0072	0.0071	0.0064
HDV7	0.006 8	0.0048	0.0064	0.0056	0.0059	0.0059	0.0048	0.0051	0.0056	0.0056	0.0059	0.0076
HDV8A	0.009 5	0.007	0.0083	0.0073	0.0071	0.0083	0.0074	0.0092	0.0075	0.0073	0.0075	0.0083
HDV8B	0.023 6	0.0305	0.024	0.0297	0.0285	0.027	0.0286	0.0238	0.0304	0.0298	0.0306	0.0292
HDBS	0	0	0	0	0	0	0	0	0	0	0	0
HDBT	0	0	0	0	0	0	0	0	0	0	0	0
MC	0.004 9	0.0049	0.0049	0.0046	0.0045	0.005	0.0046	0.0047	0.0046	0.0046	0.0049	0.0047

Table 13

2010 Summer VMT Mix Fractions
For Local Analysis

Vehicle Type	2010 Summer VMT Mix Fractions											
	DC	Maryland Counties					Virginia Counties					
		Calvert	Charles	Frederick	Montgomery	Prince George's	Alexandria	Arlington	Fairfax	Loudoun	Prince William	Stafford
LDV	0.3685	0.3767	0.3762	0.3662	0.3648	0.3721	0.3678	0.3677	0.3654	0.3661	0.3707	0.379
LDT1	0.0972	0.0882	0.0873	0.0925	0.0942	0.0911	0.0901	0.0943	0.0939	0.0919	0.0902	0.1008
LDT2	0.3398	0.3362	0.3368	0.3429	0.3433	0.3381	0.3448	0.3425	0.3418	0.3436	0.3394	0.3355
LDT3	0.1149	0.1167	0.1172	0.1175	0.118	0.1169	0.1185	0.1166	0.118	0.1175	0.1178	0.1106
LDT4	0.0562	0.0587	0.059	0.0577	0.0567	0.0583	0.0558	0.0557	0.0578	0.0577	0.0585	0.0509
HDV2B	0.0063	0.0058	0.0063	0.0057	0.0059	0.0058	0.0060	0.0064	0.0057	0.0057	0.0055	0.0055
HDV3	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0005	0.0007	0.0005	0.0006	0.0006	0.0006
HDV4	0.0005	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0005
HDV5	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004
HDV6	0.0015	0.0017	0.0017	0.0016	0.0016	0.0018	0.0018	0.0017	0.0016	0.0016	0.0016	0.0014
HDV7	0.0015	0.0011	0.0014	0.0012	0.0013	0.0013	0.0011	0.0011	0.0012	0.0012	0.0013	0.0016
HDV8A	0.0021	0.0015	0.0018	0.0016	0.0015	0.0018	0.0016	0.002	0.0016	0.0016	0.0016	0.0018
HDV8B	0.005	0.0066	0.0053	0.0065	0.0062	0.0059	0.0062	0.0053	0.0065	0.0065	0.0067	0.0063
HDBS	0	0	0	0	0	0	0	0	0	0	0	0
HDBT	0	0	0	0	0	0	0	0	0	0	0	0
MC	0.0053	0.0053	0.0053	0.005	0.0049	0.0053	0.0049	0.005	0.005	0.005	0.0052	0.0051

Table 14

2010 Summer VMT Mix Fractions
For Auto Access to Transit Analysis

Vehicle Type	2010 Summer VMT Mix Fractions											
	DC	Maryland Counties					Virginia Counties					
		Calvert	Charles	Frederick	Montgomery	Prince George's	Alexandria	Arlington	Fairfax	Loudoun	Prince William	Stafford
LDV	0.3754	0.3837	0.3831	0.373	0.3715	0.3789	0.3746	0.3745	0.3721	0.3729	0.3775	0.386
LDT1	0.099	0.0899	0.089	0.0942	0.096	0.0928	0.0918	0.096	0.0956	0.0936	0.0919	0.1026
LDT2	0.3461	0.3424	0.3431	0.3493	0.3496	0.3443	0.3512	0.3489	0.3482	0.3499	0.3457	0.3417
LDT3	0.117	0.1188	0.1194	0.1197	0.1201	0.1191	0.1207	0.1188	0.1202	0.1197	0.1199	0.1127
LDT4	0.0571	0.0598	0.06	0.0587	0.0578	0.0595	0.0567	0.0567	0.0588	0.0588	0.0597	0.0518
HDV2B	0	0	0	0	0	0	0	0	0	0	0	0
HDV3	0	0	0	0	0	0	0	0	0	0	0	0
HDV4	0	0	0	0	0	0	0	0	0	0	0	0
HDV5	0	0	0	0	0	0	0	0	0	0	0	0
HDV6	0	0	0	0	0	0	0	0	0	0	0	0
HDV7	0	0	0	0	0	0	0	0	0	0	0	0
HDV8A	0	0	0	0	0	0	0	0	0	0	0	0
HDV8B	0	0	0	0	0	0	0	0	0	0	0	0
HDBS	0	0	0	0	0	0	0	0	0	0	0	0
HDBT	0	0	0	0	0	0	0	0	0	0	0	0
MC	0.0054	0.0054	0.0054	0.0051	0.005	0.0054	0.005	0.0051	0.0051	0.0051	0.0053	0.0052

Table 15

**2010 VMT Mix Fractions
For School Bus and Transit Bus Analysis**

Vehicle Type	VMT Mix Fractions	
	School Bus	Transit Bus
LDV	0.0000	0.0000
LDT1	0.0000	0.0000
LDT2	0.0000	0.0000
LDT3	0.0000	0.0000
LDT4	0.0000	0.0000
HDV2B	0.0000	0.0000
HDV3	0.0000	0.0000
HDV4	0.0000	0.0000
HDV5	0.0000	0.0000
HDV6	0.0000	0.0000
HDV7	0.0000	0.0000
HDV8A	0.0000	0.0000
HDV8B	0.0000	0.0000
HDBS	1.0000	0.0000
HDBT	0.0000	1.0000
MC	0.0000	0.0000

Table 16

**Summary of Scenarios Modeled in Each MOBILE6 Input File
For School Bus or Transit Bus Analysis**

Scenario Number	Operating Mode	Facility Type	Speed
1-65	Stabilized	Arterial/Collectors	1-65 mph
66	Stabilized	Freeway Ramps	34.6 mph
67	Stabilized	Local Road	12.9 mph

Table 17a

**Hourly Temperatures and Humidity Values and Barometric Pressure
Season 1**

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	39.8	29.5	66.5	69.1	29.9
2	39.0	29.3	68.0	70.2	29.9
3	38.2	29.1	69.3	71.5	29.9
4	37.6	29.1	71.0	72.8	29.9
5	37.2	29.0	72.0	73.9	29.9
6	36.9	28.9	72.4	74.3	29.9
7	37.4	29.1	71.7	73.7	29.9
8	38.9	29.3	68.2	70.7	29.9
9	41.2	29.7	63.4	66.3	29.9
10	43.4	29.7	58.1	61.2	29.9
11	45.5	29.9	54.2	57.8	29.9
12	47.2	30.0	50.7	54.7	29.9
13	48.6	29.9	48.1	52.4	29.9
14	49.7	30.1	46.5	51.1	29.8
15	50.2	30.0	45.5	50.3	29.8
16	50.2	30.0	45.5	50.4	29.8
17	49.3	30.0	47.1	51.7	29.8
18	47.5	29.8	49.9	54.3	29.8
19	45.8	29.8	53.4	57.2	29.9
20	44.3	30.0	56.9	60.3	29.9
21	43.1	30.0	59.4	62.5	29.9
22	42.3	29.7	60.8	63.9	29.9
23	41.4	29.8	63.0	65.8	29.9
24	40.6	29.8	65.0	67.6	29.9

Table 17b
Season 2

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	67.3	61.9	82.5	83.5	29.8
2	66.6	61.5	83.5	84.5	29.8
3	66.2	61.4	84.3	85.5	29.8
4	65.8	61.1	84.7	86.2	29.8
5	65.3	60.9	85.5	86.6	29.8
6	65.7	61.1	85.1	85.9	29.8
7	67.6	61.7	81.0	82.3	29.8
8	69.9	62.2	76.0	77.2	29.9
9	72.3	62.3	70.4	72.2	29.9
10	74.5	62.2	65.1	67.3	29.9
11	76.3	62.0	60.6	63.1	29.8
12	77.9	62.0	57.6	60.1	29.8
13	78.9	61.8	55.2	57.8	29.8
14	79.5	61.6	53.6	56.7	29.8
15	79.5	61.6	53.6	56.9	29.8
16	79.1	61.7	54.5	57.6	29.8
17	78.4	61.7	55.9	59.2	29.8
18	76.9	61.8	59.2	62.1	29.8
19	74.7	62.0	64.2	66.8	29.8
20	72.5	62.3	69.8	71.8	29.8
21	71.2	62.5	73.5	75.6	29.8
22	69.9	62.4	76.7	78.7	29.8
23	68.9	62.3	79.2	80.6	29.8
24	68.0	62.1	81.1	82.2	29.8

**Table 17c
Season 3**

Hour	Temp	DPT	Cal. RH	NCDC RH	Station Pressure
1	44.61	37.50	75.82	77.56	29.87
2	44.06	37.28	76.78	78.44	29.87
3	43.56	37.22	78.10	79.39	29.87
4	43.17	36.83	78.07	80.33	29.87
5	42.67	36.67	79.07	80.28	29.88
6	42.44	36.39	78.88	80.56	29.88
7	42.56	36.44	78.71	80.39	29.89
8	43.89	37.22	77.10	78.89	29.90
9	46.33	37.72	71.61	73.61	29.91
10	48.83	38.00	65.85	68.22	29.91
11	50.67	37.72	60.79	63.33	29.90
12	52.39	37.56	56.63	59.78	29.88
13	53.56	37.39	53.87	57.17	29.86
14	54.22	37.44	52.68	56.28	29.85
15	54.33	37.50	52.57	56.22	29.84
16	53.72	37.56	53.89	57.56	29.84
17	52.00	37.44	57.20	60.44	29.85
18	50.11	37.56	61.66	64.56	29.86
19	48.78	37.67	65.12	67.83	29.87
20	47.72	37.56	67.48	70.06	29.87
21	46.94	37.89	70.42	72.44	29.88
22	46.33	37.72	71.61	74.00	29.88
23	45.56	37.61	73.44	75.50	29.88
24	45.00	37.56	74.86	76.56	29.88

Table 18

Fuel Parameters

	DC			MD			MD Non-RFG	VA Diesel			VA Non-RFG
	Gas S	Diesel S	RVP	Gas S	Diesel S	RVP	RVP	Gas S	S	RVP	RVP
Season 1	197.0	325.0	10.2	279.0	480.5	12.4	12.4	279.0	337.0	12.9	12.9
Season 2/OS	159.0	327.8	6.8	129.0	476.0	6.9	7.9	129.0	351.8	6.7	8.4
Season 3	196.2	325.3	10.1	279.0	481.3	11.2	11.2	279.0	339.3	12.9	12.9
	Ether Oxy. Content (% by wt)			Ether Market Share (%)			Ethanol Oxy. Content (% by wt.)			Ethanol Market Share (%)	
		1.5			70.0			3.5		30.0	
		2.1			100.0			0.0		0.0	
		1.5			70.0			3.5		30.0	