CRC Report No. E-80

EXHAUST AND EVAPORATIVE EMISSIONS TESTING OF FLEXIBLE-FUEL VEHICLES

August 2011

COORDINATING RESEARCH COUNCIL, INC.
3650 MANSELL ROAD·SUITE 140·ALPHARETTA, GA 30022

The Coordinating Research Council, Inc. (CRC) is a non-profit corporation supported by the petroleum and automotive equipment industries. CRC operates through the committees made up of technical experts from industry and government who voluntarily participate. The four main areas of research within CRC are: air pollution (atmospheric and engineering studies); aviation fuels, lubricants, and equipment performance, heavy-duty vehicle fuels, lubricants, and equipment performance (e.g., diesel trucks); and light-duty vehicle fuels, lubricants, and equipment performance (e.g., passenger cars). CRC's function is to provide the mechanism for joint research conducted by the two industries that will help in determining the optimum combination of petroleum products and automotive equipment. CRC's work is limited to research that is mutually beneficial to the two industries involved, and all information is available to the public.

CRC makes no warranty expressed or implied on the application of information contained in this report. In formulating and approving reports, the appropriate committee of the Coordinating Research Council, Inc. has not investigated or considered patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents.

CRC Report No. E-80

Exhaust and Evaporative Emissions Testing of Flexible-Fuel Vehicles

August 2011

Final
Report

Submitted to
Coordinating Research Council, Inc.
3650 Mansell Road, Suite 140
Alpharetta, GA 30022

By
Harold M. Haskew, P.E.
Thomas F. Liberty

Harold Haskew & Associates, Inc.
425 W. Huron, Suite 230
Milford, MI 48381

Table of Contents

Page

List of Figures ii
List of Tables iii
List of Acronyms iv
Executive Summary v

Introduction
Background 1
Program Design, Scope and Limitations 2
Contract History and Period of Performance 2
Order of the Report 3

Test Program Overview
Vehicle Selection 5
Test Fuels 6
The Fuel Change Procedure 25

The Pilot Test Program
Overview. 34
Test Procedure. 34
Results. 36

The Main Test Program
Overview. 43
Test Procedure. 45
Exhaust Emission Results 46
Criteria Emissions (NMHC, CO and NOx) 47
Exhaust Speciation and Reactivity Analysis 53
NMOG Analysis 55
Ozone Forming Potential (Reactivity) Methodology 64
Fuel Economy on the Various Fuels and Cycles 71
Carbon Balance FE Calculation 72
Evaporative Emission Results 79
Running Loss... 80
Hot Soak 81
Two Day Diurnal. 82
Evaporative Speciation and Reactivity Analysis. 84

Conclusions and Summary of Results 91

Appendix I – Pilot Program Individual Data ..... I-1 through I-18
Appendix II – Main Program Individual Exhaust and Evaporative Data ..... II-1 through II-83
Appendix III – Main Program Individual Speciation Data ..... III-1 through III-258
Appendix IV – Miscellaneous ..... IV-1 through IV-5
Appendix V – Statistical Analysis of Main Program Data .. V-1 through V-4

List of Figures

Figure No.	Description	Page No.
1	Program Overview	4
2	Fuel Distillation	11
3	Liquid Fuel Speciation - Mass Percent by Carbon Number	24
4	Liquid Fuel Speciation - Cumulative Mass Percent by Carbon Number	24
5	Vehicle Rocking	26
6	Fuel Change Procedure	27
7	Pilot Program Test Procedure: E85-E6 Transition	28
8	Pilot Program Test Procedure: 50/50 Blend Transition	29
9	Main Program Test Procedure – E6 Fuel	30
10	Main Program Test Procedure – E85 Fuel	31
11	Main Program Test Procedure – E32 Blend Fuel	32
12	Main Program Test Procedure – E59 Blend Fuel	33
13	Unified Driving Cycle (LA92)	35
14	Pilot Program Emissions Result – Example	36
15	Normalized NMHC Emissions – Fuel Transitions	37
16	Normalized CO Emissions – Fuel Transitions	38
17	Normalized NOx Emissions – Fuel Transitions	39
18	Cumulative Emissions – Example	40
19	Converter Efficiency Response	42
20	Main Program Test Procedure	45
21	Criteria Emissions – FTP Tests	47
22	Criteria Emissions – US06 Tests	49
23	Criteria Emissions – UC Tests	51
24	NMOG – FTP Phase 1	55
25	NMOG – Composite FTP	57
26	NMOG – US06	59
27	NMOG – UC	61
28	NMOG – Seven Vehicle Averages	63
29	GC Species Identified – Exhaust	69
30	FTP Reactivity Results	69
31	US06 Reactivity Results	70
32	UC Reactivity Results	70
33	Fuel Economy vs. Fuel – FTP	71
34	Fuel Economy vs. Fuel – US06	71
35	Fuel Economy vs. Fuel – UC	72
36	Heating Value Effect – E32 FTP	74
37	Heating Value Effect – E59 FTP	75
38	Heating Value Effect – E85 FTP	75
39	Heating Value Effect – E32 US06	76
40	Heating Value Effect – E59 US06	76
41	Heating Value Effect – E85 US06	77
42	Heating Value Effect – E32 UC	77
43	Heating Value Effect – E59 UC	78
44	Heating Value Effect – E85 UC	78
45	Running Loss Emissions	81

List of Figures (cont.)

Figure No.	Description	Page No.
46	Hot Soak Emissions	81
47	Two Day Diurnal Emissions	82
48	GC Species Identified – Evaporative	85
49	Cold Running Loss Reactivity	85
50	Total Running Loss Reactivity	86
51	Hot Soak Reactivity	86
52	Day 1 Diurnal Reactivity	87
53	Total Diurnal Reactivity	87

List of Tables

Table No.	Description	Page No.
1	Test Vehicle Purchase Dates	2
2	Test Fleet Specifications	6
3	Fuel Inspections	8
4	Fuel Properties	10
5	Detailed Hydrocarbon Analysis – E6 Fuel	12
6	Detailed Hydrocarbon Analysis – E32 Fuel	15
7	Detailed Hydrocarbon Analysis – E59 Fuel	18
8	Detailed Hydrocarbon Analysis – E85 Fuel	21
9	Estimated Net Heat of Combustion of Gasoline-Ethanol Blends	23
10	Mass Percent by Carbon Number	25
11	Emission Results – Example	41
12	FTP Tests Data	48
13	US06 Tests Data	50
14	UC Tests Data	52
15	Exhaust Speciation Data File Example	53
16	Exhaust Reactivity Example	64
17	Summary – Exhaust Reactivity	66
18	Aldehyde List	67
19	Aldehyde Effect – Reactivity	68
20	Average Fuel Economy	73
21	Summary – Evaporative Reactivity	84
22a	California Certification Exhaust Emission Standards Part a	89
22b	California Certification Exhaust Emission Standards Part b	89
22c	California Certification Exhaust Emission Standards Part c	90
22d	California Certification Exhaust Emission Standards Part d	90

List of Acronyms

ATL	Automotive Testing Laboratories, Inc.
CAFE	Corporate Average Fuel Economy
CARB	California Air Resources Board
CAS	Chemical Abstracts Service
CBFE	Carbon Balance Fuel Economy
CFR	Code of Federal Regulations
CFV	Critical Flow Venturi
CO	Carbon Monoxide
CRC	Coordinating Research Council, Inc.
DHA	Detailed Hydrocarbon Analysis
DNPH	2,4-Dinitrophenylhydrazine (Brady's reagent)
DVPE	dry vapor pressure equivalent
EISA	Energy Independence & Security Act
EPA	Environmental Protection Agency
FFV	Flex-Fuel Vehicle
FID	Flame Ionization Detector
FTP	Federal Test Procedure
GC	Gas Chromatograph
HC	Hydrocarbon
HH&A	Harold Haskew & Associates, Inc.
LA92	Unified Driving Cycle
LC	Liquid Chromatograph
MIR	Maximum Incremental Reactivity
MY	Model Year
NMHC	Non-Methane Hydrocarbon Emissions
NMOG	Non-Methane Organic Gases
NOx	Oxides of Nitrogen
OBD	On Board Diagnostic
ppm	parts per million
psi	Pounds per square inch
RFA	Renewable Fuels Association
RFS	Renewable Fuels Standard
RL-SHED	Running Loss Sealed Housing for Evaporative Determination
RVP	Reid Vapor Pressure
SFTP	Supplemental Federal Test Procedure
SHED	Sealed Housing for Evaporative Determination
THC	Total Hydrocarbons
TP CO	Tail Pipe Carbon Monoxide
TP HC	Tail Pipe Hydrocarbons
TP NOx	Tail Pipe Oxides of Nitrogen
UC	Unified Driving Cycle
US06	High Speed/Load Driving Cycle (EPA)
VIN	Vehicle Identification Number
VOC	Volatile Organic Compounds
VT-SHED	Variable Temperature Sealed Housing for Evaporative Determination

Executive Summary

This report describes an investigation into the evaporative and tailpipe emissions of FFVs using fuel blends of E6, E85 and intermediate blends of the two. The impetus for this program (CRC's E-80) started with discussions involving the California Air Resources Board (CARB), the U.S. Environmental Protection Agency (EPA) and the Coordinating Research Council (CRC) concerning questions about the emissions inventory impact that these vehicles might have, namely:

1. Is there a trend in emissions as fuels change in concentration from low ethanol content to high ethanol content?
2. Given that these vehicles are calibrated for and certified on the endpoint fuels (E6 and E85 in this Program), are emissions for a mixture of the two fuels, creating intermediate blends (for example, E32 and E59) consistent with those of the endpoint fuels?

The program was designed to cover a wide range of tests and conditions, and represented a major investment in emission testing. It covered both exhaust and evaporative emission measurements, over a range of driving cycles and emission experiences. Each vehicle, fuel, and test condition was measured only once, with the Main Program allowing the vehicles to fully adapt using a series of preparatory driving with each fuel. Trends, however, if present were to be identified. Testing was conducted at the Automotive Testing Laboratories, Inc. (ATL) in Mesa, AZ.

Two types of commercial fuel intended for summer-time sale in Southern California were provided by Chevron for use in this program. The first fuel was a California Phase 3 compliant road gasoline with a nominal 5.7 Volume % level of ethanol (E6). The alternative fuel, containing up to 85% ethanol (E85), complied with California regulations for such fuel. Both base fuels were stored in underground tanks at the ATL facility. Intermediate mixtures of these two fuels were prepared by blending quantities of the base stock fuels in nominal ratios such as 1:1 for the Pilot Test Program, and 2:1 and 1:2 for the Main Test Program. The intermediate blends were created in the vehicle's tank by adding appropriate volumes of the E6 and E85 fuels as required.

For this particular program, the sponsors selected seven "Flex-Fuel" vehicles for evaluation on four specified gasoline-ethanol blends (E6, E32, E59, and E85). Vehicles were purchased from in-use sources. California-certified models were preferred, but two of the vehicles were federally certified; however, later versions of these models were made available in California. The vehicles and their specifications used were:

Test Vehicles

Veh.No.	Year	Make	Model	VIN	Engine Family	Evap Family
8001	2007	Dodge	Grand Caravan	1D4GP24E27B172513	7CRXT03.3NHP	7CRXR0177XHA
8002	2007	Ford	F-150 XLT	1FTPW12V37KD27356	7FMXT05.44HF	7FMXR0240NBR
8003	2007	Ford	Crown Victoria	2FAFP74V67X143735	7FMXV04.6VEF	7FMXR0115GAK
8004	2007	Chevrolet	Tahoe LS	1GNFC13017R226984	7GMXT05.3381	7GMXR0176820
8005	2007	Chevrolet	Silverado LT	2GCEC13Z271121690	7GMXT05.3373	7GMXR0176820
8006	2007	Chevrolet	Uplander LS	1GNDU23W97D176217	7GMXT03.9140	7GMXR0170956
8007	2006	Chevrolet	Monte Carlo	2G1WM15K069191523	6GMXV03.5051	6GMXR0133810

The Pilot Program

The objective of the Pilot Program was to measure the exhaust emissions' response to an abrupt change in fuel composition, as if a vehicle had operated for a period on E6 and been refueled with E85. The questions concerned the ability of the vehicle's fuel system to sense the change in fuel composition and to make the correct emission control adjustments. The pilot program test fleet selected three vehicles that were thought to represent the technologies currently being utilized in late model FFVs. The driving cycle for the pilot program was the Unified Cycle (UC, also known as the LA92). Three vehicles were identified, one from each of the three domestic manufacturers, for this investigation.

Program ID	Model Year, Make, Model	Odo at Start of Test (mi)
8001	2007 Dodge Grand Caravan	30,514
8003	2007 Ford Crown Victoria	16,345
8004	2007 Chevrolet Tahoe LS	18,555

Pilot Program Summary - Emission system control was well maintained on all three vehicles during all of the fuel changes performed.

The Main Program

The Main Program was focused on measuring the exhaust and evaporative levels of seven selected vehicles on a variety of driving conditions and evaporative emission modes. The driving conditions included the Cold Start Federal Test Procedure (FTP), the Hot Start High Speed/Load Driving Cycle (US06), and the Cold Start Unified Driving Cycle (LA92 or UC)

Exhaust Emissions Summary – The average emissions for the seven vehicles tested did not indicate an emission trend with increasing ethanol level on the cold start FTP emission evaluation**.** The US06 high speed/load driving schedule indicated a statistically significant[1] trend of decreasing non-methane hydrocarbon emissions (NMHC) with increasing ethanol content in

[1] The statistical analysis supporting statements such as these can be found in Appendix V. The analysis was performed by Jim Uihlein of Chevron, and his contributions to this report are gratefully acknowledged.

the fuel. The average NMHC value decreased from 0.047 g/mile with the E6 fuel to 0.020 g/mile with E85. The CO and NOx emissions, on average, did not indicate a trend with ethanol level. The cold start Unified Driving Cycle test results did not show a trend with increasing ethanol level for the NMHC, CO or NOx.

Carbon balance fuel economy was calculated for the various driving cycles during the exhaust emission tests**.** Fuel economy indicated a statistically significant decrease as the ethanol fraction of the fuel increased. While every measurement showed lower fuel economy with increased ethanol content, the correlation with the net heating value correction factor applied was very good.

Evaporative Emissions - Four vehicles (8001, 8003, 8004 and 8007) were used to complete the evaporative emission test procedures on the four evaluation fuels. Three modes of vehicle operation were evaluated for evaporative emissions:

1. Running Losses during two UC drives
2. A one hour "Hot Soak" following a FTP drive, and
3. A Two-Day Diurnal (65-105-65ºF)

The diurnal test data suggested that the higher ethanol blends (E59 and E85) result in higher diurnal emission levels. This is a different conclusion than was observed for the FFV tested in CRC Program E-65-3. The prevailing thought had been that ethanol, unlike "gasoline", was polar, and when present in high concentrations tended to "link" together and act more like a larger molecule than the C_2 that it was. Permeation, the majority component of the diurnal emissions in this test program, was principally diffusion, and the "large" high concentration ethanol molecules were expected to permeate at a lower rate than the less concentrated ethanol fuels. This effect was not seen in these more extensive E-80 program results. The emission levels, roughly 300 mg per day, were not significantly different between the two test programs.

Speciation and Reactivity - A total of 504 speciation tests was made, including the aldehydes. These individual test results are contained in Appendix III. The most prevalent aldehyde was the expected acetaldehyde (CAS # 75-07-0). Acetaldehyde indicated a statistically significant increase with increasing ethanol content for all three driving cycles. Formaldehyde indicated a statistically significant increase with increasing ethanol content for the FTP and Unified cycles, but not for the US06. The hot start tests (FTP bags 2 & 3, and US06) had low emission levels and fewer species identified. The average Carter Reactivity of the exhaust samples decreased with increasing ethanol content of the fuels on the cold start FTP. There were mixed results on the US06 and Unified Cycle tests.

Consistency Between Endpoint and Intermediate Fuels – The exhaust emissions (THC, NMHC, NMOG, NO_X, CO, acetaldehyde and formaldehyde) for all driving cycles, the evaporative emissions (running loss, hot soak and each day of the two-day diurnal) and fuel economy were all analyzed to determine if there was any inconsistency between the endpoint ethanol contents (i.e., the ones for which the vehicles were calibrated) and the intermediate ethanol contents. None of these effects were determined to be significant at the 95% confidence level, although some were significant at 90%.

Exhaust and Evaporative Emissions Testing of Flexible-Fuel Vehicles

CRC E-80

INTRODUCTION

Background – There are a significant number of vehicles in current use today[2] that are capable of operating on gasoline or high level blends of ethanol, up to 85% by volume, known as E85. While E85 is not commonly available (1900 of 170,000 stations offered it in 2009 according to published sources), the number of E-85 fueling stations is increasing nationwide. These "Flex-Fuel" vehicles (FFVs) were offered to consumers by the vehicle manufacturers, usually at no cost increase, to take advantage of a Corporate Average Fuel Economy (CAFE) credit offered by Congress starting as far back as model year 1993.

The Energy Independence and Security Act of 2007 (H.R. 6) (EISA) was signed into law on December 19, 2007, and amended the Renewable Fuels Standard (RFS)[3] with a new phase-in for renewable fuel volumes (ethanol is one of several renewable fuels) beginning with 9 billion gallons in 2008 and ending at 36 billion gallons in 2022. One way to create a demand for these alternative fuels is to encourage the use of high ethanol content (E85) fuels. There are a significant number of vehicles on the road today that are capable of operating on E85, and more could be built.

This report describes an investigation into the evaporative and tailpipe emissions of FFVs using fuel blends of E6, E85 and intermediate blends of the two. The impetus for this program (CRC's E-80) started with discussions involving the California Air Resources Board (CARB), the U.S. Environmental Protection Agency (EPA) and the Coordinating Research Council (CRC) concerning questions about the emissions inventory impact that these vehicles might have. FFVs allow customers to fill their tanks with any amount of either fuel, and the vehicles will adapt to the actual gasoline/alcohol blend within the tank. Therefore, the program was concerned with determining the emissions impact both in terms of any overall trend with increasing ethanol content and any inconsistency among the fuels upon which the vehicles were certified (the endpoint fuels) and intermediate mixtures. The CRC E-80 program used test procedures and insight borrowed from other CRC test programs. Also, all of these test programs, including CRC Project E-80, were conducted at the Automotive Testing Laboratories, Inc. (ATL) in Mesa, AZ, which provided unique experiences and facilities to perform the emissions tests of this program.

For this particular program, the sponsors selected seven "Flex-Fuel" vehicles for evaluation on four specified gasoline-ethanol blends (E6, E32, E59, and E85). Vehicles were purchased from in-use sources. California-certified models were preferred. Two of the vehicles were federally certified; however, later versions of these models were made available in California. Baseline emission testing on E6 and E85 was performed to create data for comparison on all seven vehicles, and to verify that the vehicles were in compliance with the emissions standards. Three

---

[2] The Renewable Fuels Association web-site (www.rfa.org) offered that the number of flex-fuel vehicles on the road as of February 2010 was over 7 million vehicles.

[3] The Renewable Fuel Standard (RFS) program was signed by the EPA Administrator on April 10, 2007 and published in the *Federal Register* on May 1, 2007 [72 FR 23900]. This RFS required a phase- in for renewable fuel volumes over 7 years, beginning with 4 billion gallons by 2006 and ending at 7.5 billion gallons in 2012.

of the vehicles were selected from the seven and were subjected to a Fuel Change Response (Pilot) Test Program.

Program Design, Scope and Limitations - The program was designed to cover a wide range of tests and conditions, and represented a major investment in emission testing. It covered both exhaust and evaporative emission measurements, over a range of driving cycles and emission experiences. Each vehicle, fuel, and test condition was measured only once, so rigorous statistical conclusions were not expected. Trends, however, were to be identified.

Only recent model year vehicles were selected, representing the latest technology, and, hopefully, the future contribution to inventory. The vehicles were purchased from the in-use population, and odometers at the start of test ranged from 13 to 49 thousand miles. This avoided the "green vehicle" effect. A decision was made to fit the vehicles with fully aged, "end-of-useful-life" catalytic converters for the main test program. The as-received oxygen sensors were maintained as fully aged sensors; they were not thought to have a significant contribution to the emission performance.

Testing with intermediate blends of the two base fuels (E6 and E85) offered a challenge to testers, as the vehicle diagnostic systems may use the refueling experience to validate the performance of various system components. Readers are cautioned to read the sections on refueling carefully. Refueling a drained tank with an intermediate blend may cause an on-board diagnostic (OBDII) system alert.

This report approaches 500 pages of printed content, but still does not offer all of the extensive data files that represent the totality of the program. The reader is directed to the CRC website[4] for a complete public listing of the E-80 data set in Microsoft™ EXCEL format.

Contract History and Period of Performance - An initial Request for Proposal (RFP), published by CRC on November 16, 2006, outlined the research program scope and content. A Comprehensive Program Overview (19 pages) was submitted to CRC by HH&A and ATL on October 25, 2007 for final approval. The Final Contract was signed on December 5, 2007, and testing started in January of 2008. The last vehicle test was completed in October of 2009. The analysis of the aldehydes by Desert Research Institute (DRI) was not completed until late May, 2010.

Table 1 – Test Vehicle Purchase Dates

Purchase Date	Program ID	Model Year, Make, Model
1/18/08	8003	2007 Ford Crown Victoria
1/21/08	8001	2007 Dodge Grand Caravan
1/21/08	8004	2007 Chevrolet Tahoe LS
4/24/08	8005	2007 Chevrolet Silverado LT Pick-up
4/25/08	8002	2007 Ford F-150 Pick-Up
6/3/08	8006	2007 Chevrolet Uplander LS
6/3/08	8007	2006 Chevrolet Monte Carlo

[4] www.crcao.org

Order of the Report - This report is organized in the following sections:

- Test Program Overview
- Vehicle Selection
- Test Fuels
- The Fuel Change Procedure
- The Pilot Test Program
  - Overview
  - Test Procedure
  - Results
- The Main Test Program
  - Overview
  - Test Procedure
  - Exhaust Emission Results
    - Criteria Emissions (NMHC, CO and NOx) by Driving Cycle
  - Exhaust Speciation and Reactivity Analysis
  - Fuel Economy on the Various Fuels
  - Evaporative Emission Results
    - Running Loss
    - Hot Soak
    - Two Day Diurnal
    - Evaporative Speciation and Reactivity Analysis
- Conclusions and Summary of Results
- Appendix I – Pilot Program Individual Data
- Appendix II – Main Program Individual Exhaust and Evaporative Data
- Appendix III – Main Program Speciation Data
- Appendix IV – Miscellaneous
- Appendix V -- Statistical Analysis of Main Program Data

TEST PROGRAM OVERVIEW

There were two basic components included in the CRC E-80 program:

The Pilot Program – Exhaust Emissions Response to a Fuel Change, and
The Main Program – Exhaust and Evaporative Emissions on E6, E32, E59 and E85

Figure 1 gives a quick overview of the entire program.

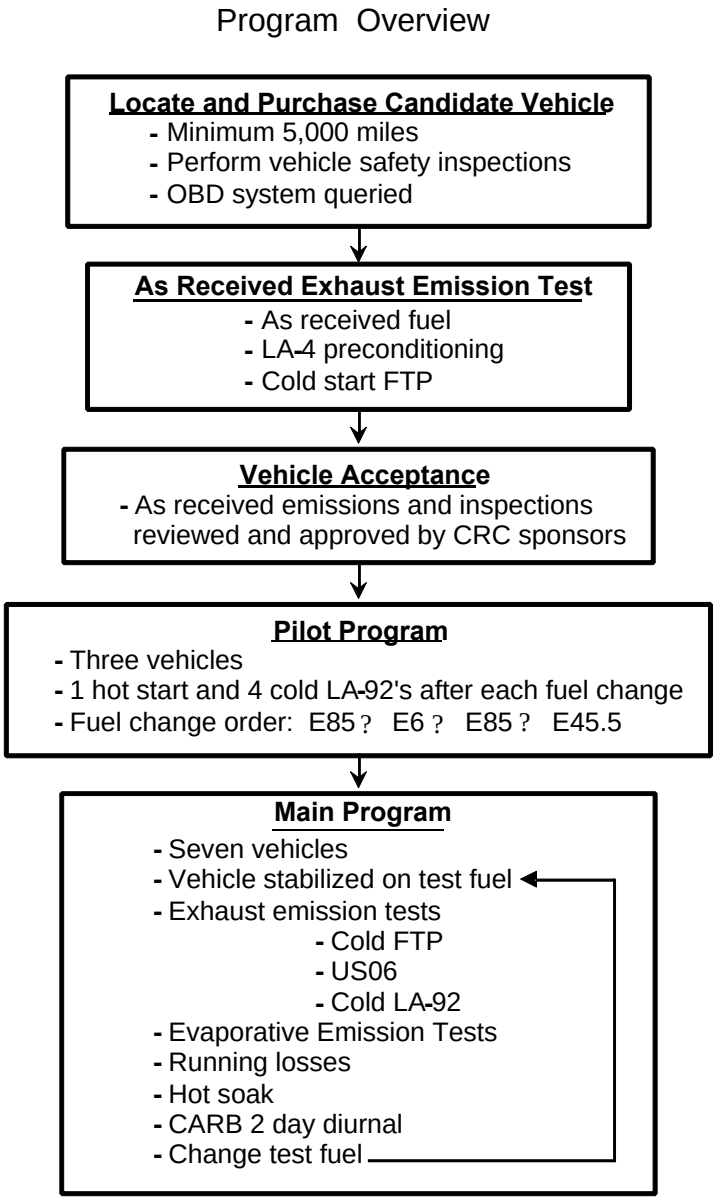


Figure 1. Program Overview

The objective of the Pilot Program was to measure the exhaust emissions' response to an abrupt change in fuel composition, as if a vehicle had operated for a period on E6 and been refueled with E85. The questions concerned the vehicle's fuel system's ability to sense the change in fuel composition and to make the correct emission control adjustments. The pilot program test fleet was comprised of three vehicles thought to represent the technologies currently being utilized in late model FFVs. The driving cycle for the pilot program was the Unified Cycle (UC, also known as the LA92).

The Main Program focused on measuring the exhaust and evaporative levels of seven selected vehicles in a variety of driving conditions and evaporative emission modes. The driving conditions included the Cold Start Federal Test Procedure (FTP), the Hot Start High Speed/Load Driving Cycle (US06), and the Cold Start Unified Driving Cycle (LA92 or UC)

Exhaust emissions were measured in a test cell equipped with an AVL 48" all wheel drive electric dynamometer, including the additional instrumentation required for undiluted modal exhaust emissions and aldehyde sample collection.

Running loss emissions were measured in ATL's running loss cell[5], including the FTP and UC driving cycles. A Hot Soak and a two-day Diurnal test followed the Running Loss test. The INNOVA analyzers used by ATL for ethanol analysis were additionally equipped to measure R134a refrigerant and methanol. Each evaporative emission test sample received analysis for R134a and methanol, and their masses subtracted from the test total. This is an important addition to any evaporative testing performed on whole vehicles used on the road.

Vehicle Selection

The Statement of Work specified that the test vehicles be late model California-certified FFVs. While a number of very high volume US vehicles were available as FFVs, the variety of current technology vehicles was limited. Both Chevrolet and Ford, for example, produce California-certified FFVs in their popular pick-up truck lines. Foreign manufacturers, however, had only recently started to announce such vehicles. It was assumed that 5 – 15 year old FFVs were not to be included in this program, and the program focused on late model vehicles, hopefully gaining the latest technologies available. Furthermore, duplicate vehicles were not selected, even if such selection would be more representative of market penetration. The vehicle test fleet, therefore, reflected an attempt to include a variety of different manufacturer/control strategies, while conforming to the remaining program requirements. Due to the length of the test program, these vehicles were purchased, and then sold at the end of the program.

Each candidate vehicle was identified and proposed to the test sponsor prior to procurement. The under hood emission sticker was examined to verify certification to California and/or 50 state levels. The vehicle VIN and Test Class data were recorded. Candidates were visually inspected to verify suitability for test. The vehicles had accumulated at least 5,000 miles to stabilize emission levels. They were inspected for signs of damage or tampering that could make emission levels unrepresentative, and the OBD system was queried with a scan tool to verify

[5] See SAE 1999-01-1464, "Running Loss Emissions from In-Use Vehicles," H. Haskew, et al. May 1999.

proper system operation. Several vehicles were taken to the manufacturer's local dealership for updating to the most recent calibration. A road drivability test was also performed to avoid potential testability problems.

Candidate vehicles were transported to ATL's emission laboratory for an as-received test. The as-received fuel was used for the test. The test included an LA-4 dynamometer preconditioning, overnight soak, a bag-only FTP exhaust emission test, a one hour Hot Soak test, and a one-day California Diurnal test. The results of all inspections and tests were then presented to the steering committee for final review and acceptance of the vehicle.

Table 2. Test Fleet Specifications

VIN and Family Identification

Veh.No.	Year	Make	Model	VIN	Engine Family	Evap Family
8001	2007	Dodge	Grand Caravan	1D4GP24E27B172513	7CRXT03.3NHP	7CRXR0177XHA
8002	2007	Ford	F-150 XLT	1FTPW12V37KD27356	7FMXT05.44HF	7FMXR0240NBR
8003	2007	Ford	Crown Victoria	2FAFP74V67X143735	7FMXV04.6VEF	7FMXR0115GAK
8004	2007	Chevrolet	Tahoe LS	1GNFC13017R226984	7GMXT05.3381	7GMXR0176820
8005	2007	Chevrolet	Silverado LT	2GCEC13Z271121690	7GMXT05.3373	7GMXR0176820
8006	2007	Chevrolet	Uplander LS	1GNDU23W97D176217	7GMXT03.9140	7GMXR0170956
8007	2006	Chevrolet	Monte Carlo	2G1WM15K069191523	6GMXV03.5051	6GMXR0133810

Odometer at Purchase, Powertrain and Fuel System Details

Veh No.	Yr	Make	Model	Odo.	Eng. Size	Trans	Fuel Sys.	Fuel Tank	Tank Size	40% Fill
8001	2007	Dodge	Grand Caravan	30,514	3.3	Auto	PFI	Plastic	20.0	8.0
8002	2007	Ford	F-150 XLT	12,646	5.4	Auto	PFI	Plastic	35.0	14.0
8003	2007	Ford	Crown Victoria LX	16,345	4.6	Auto	PFI	Metal	19.0	7.6
8004	2007	Chevrolet	Tahoe LS	18,555	5.3	Auto	PFI	Plastic	26.0	10.4
8005	2007	Chevrolet	Silverado LT	22,008	5.3	Auto	PFI	Plastic	27.0	10.8
8006	2007	Chevrolet	Uplander LS	17,898	3.9	Auto	PFI	Plastic	25.1	10.0
8007	2006	Chevrolet	Monte Carlo	48,761	3.5	Auto	PFI	Plastic	17.0	6.8

Test Fuels

E85 Background - The Federal CAFE law provides for special treatment of vehicle fuel economy calculations for dedicated alternative fuel vehicles and dual-fuel vehicles. This has made offering a "Flex-Fuel" vehicle attractive to manufacturers who need help meeting the CAFE requirements. The fuel economy of a dedicated E85 alternative fuel vehicle is determined by dividing its fuel economy in equivalent miles per gallon of gasoline or diesel fuel by 0.15[6].

[6] Title 40: Protection of Environment; PART 600—FUEL ECONOMY OF MOTOR VEHICLES; Subpart F—Fuel Economy Regulations for Model Year 1978 Passenger Automobiles and for 1979 and Later Model Year Automobiles (Light Trucks and Passenger Automobiles)—Procedures for Determining Manufacturer's Average Fuel Economy; § 600.510-08 Calculation of average fuel economy (c)(2)(v)(B); (B) The combined model type fuel economy value for operation on alcohol fuel as determined in §600.208(b)(5)(ii) divided by 0.15 provided the requirements of §600.510(g) are met…

Thus, a 15 mpg dedicated alternative fuel vehicle would be rated as 100 mpg. For dual-fuel vehicles (vehicles that can use the alternative fuel and gasoline or diesel interchangeably), the rating is the harmonic average of the fuel economy on gasoline or diesel and the fuel economy on the alternative fuel vehicle divided by 0.15. For example, this calculation procedure turns a dual fuel vehicle that averages 25 mpg on gasoline or diesel with the above 100 mpg alternative fuel to attain the 40 mpg value for CAFE purposes. Several limitations are established for CAFE credits for dual fuel vehicles. For model years 1993-2014, the maximum CAFE increase for flex-fuel vehicles in a manufacturer's passenger car or light truck fleet is 1.2 mpg.

E-80 Project Fuels - Two types of commercial fuel intended for summer-time sale in Southern California were provided by Chevron for use in this program. The first fuel was a California Phase 3 compliant road gasoline with a nominal 5.7 Volume % level of ethanol (E6). The alternative fuel, containing up to 85% ethanol (E85), complied with California regulations for such fuel. Later speciation of the E85 base fuel indicated that the 15% non-ethanol was made up of gasoline and extra iso-pentane to create the 7 psi volatility needed. Both base fuels were stored in underground tanks at the ATL facility.

Intermediate mixtures of these two fuels were prepared by blending quantities of the base stock fuels in nominal ratios such as 1:1 for the Pilot Test Program, and 2:1 and 1:2 for the Main Test Program. The intermediate blends were created in the vehicle's tank by adding appropriate volumes of the E6 and E85 fuels as required. See the following section of this report for a discussion of the procedures used to add the intermediate blends.

Table 3. Fuel Inspections

CRC E-80 E85 and Fuel Component Inspections

Fuel Description			CARB Phase 3				E85			
Property	**Method**	**Units**	**A**	**B**	**C**	**Average**	**A**	**B**	**C**	**Average**
Gravity	ASTM D4052	°API	64.3	64.40	64.4	64.4	51.2	53.98	51.32	52.2
Relative Density		60/60°F	0.7227	0.7216	0.7223	0.7222	0.7745	0.7621	0.7740	0.7702
Uncorrected Ethanol	ASTM D5501	wt %	6.5		6.54	6.5	82.0	84.70	85.48	84.1
Ethanol	ASTM D5501	vol %	5.92	6.07	5.92	5.97	79.66	81.39	82.99	81.35
Methanol	ASTM D5501	vol %	0	0	0	0.0	0	0	0	0.0
Water	ASTM E203	wt. %	0.17	0.147	0.168	0.16	0.55	0.541	0.534	0.54
Water	ASTM E203	vol %	-	-	-	-	0.43	0.412	0.413	0.42
Estimated Hydrocarbon		vol %	-	-	-	-	19.9	18.62	16.59	18.4
DVPE	ASTM D5191	psi	7.33	7.15	7.43	7.30	7.31	7.28	7.38	7.32
Distillation	ASTM D86									
Initial Boiling Point		°F	111.5	111.0	101.7	108.1	112.4	108.7	99.4	106.8
5% Evaporated		°F	129	128.1	127.5	128.2	135.8	133.0	132.8	133.9
10% Evaporated		°F	133.3	132.1	131.4	132.3	150	147.7	149.9	149.2
20% Evaporated		°F	139.6	138.4	139.0	139.0	165.2	164.1	166.5	165.3
30% Evaporated		°F	146.3	147.7	147.7	147.2	169.7	168.4	170.3	169.5
40% Evaporated		°F	182.1	182.3	177.5	180.6	171.1	169.7	171.5	170.8
50% Evaporated		°F	204.9	205.3	202.4	204.2	171.6	170.2	172.1	171.3
60% Evaporated		°F	223.3	223.3	221.8	222.8	172.0	170.6	172.4	171.7
70% Evaporated		°F	241.5	241.3	238.0	240.3	172.4	170.8	172.6	171.9
80% Evaporated		°F	264	264.4	263.2	263.9	172.5	171.1	172.9	172.2
90% Evaporated		°F	309.3	308.1	306.0	307.8	172.7	171.5	173.3	172.5
95% Evaporated		°F	347.3	350.1	347.5	348.3	173.1	172.2	173.9	173.1
End Point		°F	398.6	400.1	381.0	393.2	174.3	180.7	176.2	177.1
Recovery		vol %	97.9	98.4	98.3	98.2	96.7	98.1	99.0	97.9
Residue		vol %	1.4	0.6	1.5	1.2	1.4	1.2	0.9	1.2
Loss		vol %	2.1	1.0	0.3	1.1	1.9	0.7	0.3	1.0
Acidity	ASTM D1613	ppm	-	-	-	-	23	-	-	-
pHe	ASTM D6423		-	-	-	-	8.5	-	-	-
Copper	Mod D1688	ppb	-	-	-	-	10.6	-	-	-
Inorganic Chlorides	IC DI	ppm	-	-	-	-	<1	-	-	-
Sulfates	IC DI	ppm	-	-	-	-	<1	-	-	-
Sulfur	ASTM D5453	ppm	24.4	26	24	24.8	<6	7	8	7.5
Benzene	ASTM D3606	vol %	0.43	-	-	0.4	0.1	-	-	0.1
Ethanol	DHA	vol %	6.0	-	-	6.0	82.86	-	-	82.86
Methanol	DHA	vol %	0.0	-	-	0.0	0	-	-	0.0
Hydrocarbon	DHA	vol %	93.97	-	-	94.0	17.14	-	-	17.14
Aromatics	DHA	vol %	11.93	-	-	11.9	2.03	-	-	2.03
Olefins	DHA	vol %	4.41	-	-	4.4	0.73	-	-	0.73
Saturates	DHA	vol %	74.80	-	-	74.8	14.23	-	-	14.23

Fuel Properties - Three member companies (referred to as A, B, and C in Table 3) made complete analyses of the base fuels, and average properties were calculated. Table 3 above presents the three laboratories' inspection data and the average of the three values.

Blend Fuel Property Comparison with the Base Fuels – A more complete chart of the fuel properties, comparing the properties of not only the base fuels, but also the blends, was thought desirable. One gallon samples of the 2:1 and the 1:2 ratio blends were prepared at ATL, using laboratory glassware to insure accurate volumes and hazardous-material packaging for shipment to a commercial laboratory[7] for analysis. The blend results were combined with the base fuel industry tests to make a "hybrid" chart comparing all four fuels. Table 4 combines the program fuel properties into a single table. It uses the average data for the three industry laboratories for the base fuels, (E6 and E85), and the yellow highlights are used to indicate the blend fuel analysis performed by Paragon Laboratories.

It was also agreed to perform a speciation (DHA) of all four test fuels. This was to be done at ATL so the tests were all performed using the same techniques and equipment. The DHA for the four fuels appears on later pages in this section.

[7] Paragon Laboratories, Inc., 12649 Richfield Ct., Livonia, MI 48150, www.paragonlaboratories.com

Table 4 – Fuel Properties

CRC E-80 Program Fuel Component Inspections

(Note: The E32 and E59 blends are 2:1 and 1:2 Vol mixtures of the E6 and E85 Fuels)

The yellow highlighted rows are data from Paragon Laboratories - the other two are from Figure 3.

Fuel Description			**E6**	**E32**	**E59**	**E85**
Property	**Method**	**Units**	**Result**	**Result**	**Result**	**Result**
Gravity	ASTM D4052	°API	64.4	61.1	56.7	52.2
Water	ASTM E203	wt. %	0.168	0.20	0.35	0.54
Water	ASTM E203	vol %	-	1973	3542	0.42
DVPE	ASTM D5191	psi	7.30	7.32	7.44	7.32
Distillation	ASTM D86					
Initial Boiling Point		°F	108.1	103.3	101.7	106.8
5% Evaporated		°F	128.2	129.4	129.3	133.9
10% Evaporated		°F	132.3	135.9	137.8	149.2
20% Evaporated		°F	139.0	143.7	149.3	165.3
30% Evaporated		°F	147.2	150.9	158.3	169.5
40% Evaporated		°F	180.6	156.6	163.4	170.8
50% Evaporated		°F	204.2	161.1	166.7	171.3
60% Evaporated		°F	222.8	164.4	168.8	171.7
70% Evaporated		°F	240.3	167.6	170.3	171.9
80% Evaporated		°F	263.9	246.2	171.7	172.2
90% Evaporated		°F	307.8	293.9	173.4	172.5
95% Evaporated		°F	348.3	337.3	308.2	173.1
End Point		°F	393.2	388.0	364.6	177.1
Recovery		vol %	98.2	97.8	97.9	97.9
Residue		vol %	1.2	1.1	0.9	1.2
Loss		vol %	1.1	1.1	1.2	1.0
Sulfur	ASTM D5453	ppm	24.8	18.0	14.0	7.5
Net Heat of Combustion	Gibbs-Chevron	BTU/lb	18,457			12,807
Net Heat of Combustion	Furey-SAE	BTU/lb	18,320	**16,800**	14,910	12,710

The vapor pressures for the base fuels were matched (7.3 psi DVPE), as one would expect in a commercial retail summer fuel. The distillation properties of the four fuels are presented in Figure 2 on the following page. The sulfur levels were at the expected range. The net heat of combustion as calculated by Chevron for the base fuels, and by Dr. Furey for the four fuels, are added at the bottom of the table. Both the Chevron and the SAE methods gave similar results.

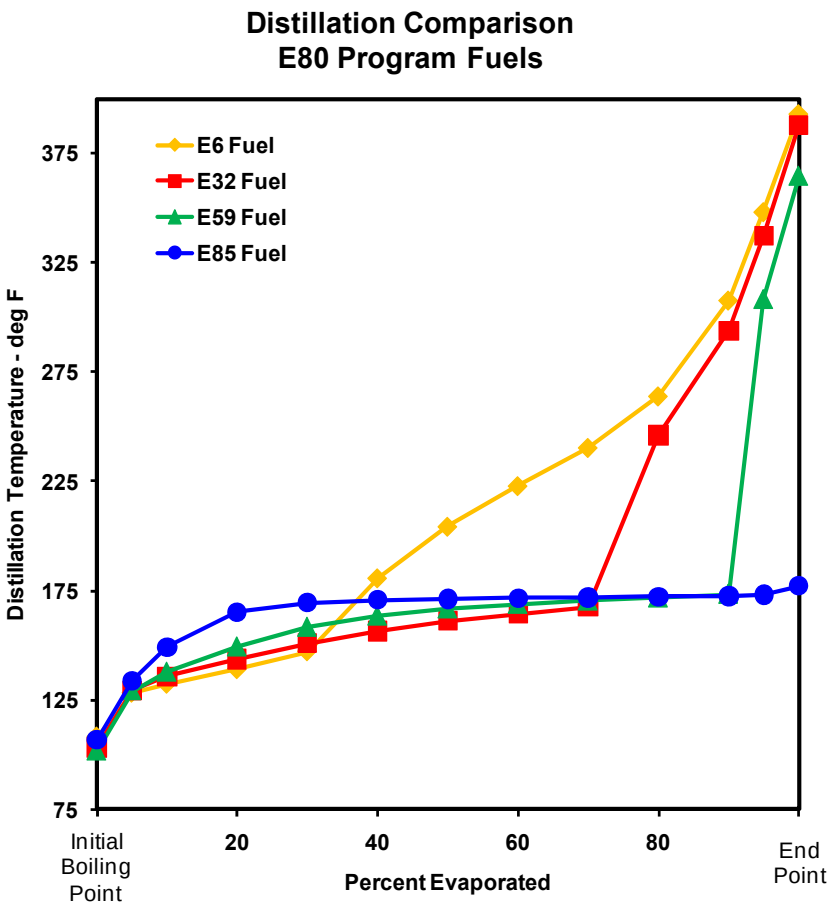


Figure 2. Fuel Distillation

Figure 2, above, compares the distillation performance (ASTM D86) for the four fuels listed in the previous Table 4. The boiling point of ethanol (172°F) is clearly evident in the blue E85 trace and, to a lesser degree, in the blends.

Detailed Hydrocarbon Analysis - Four tables follow that present the detailed hydrocarbon analysis data from the speciation results made in July, 2010 at ATL. Where liquid chromatography would have been the usual technique to speciate the liquid fuels, a modified technique was used to characterize the liquid fuel using a gas chromatograph. This technique involves filling a well-purged sample bag with 100 liters of dry nitrogen, and then introducing 40 micro liters (µL) of room temperature liquid fuel through a septum in the bag. After a one-hour soak, and several cycles of bag agitation, the bag contents were analyzed using the laboratory's gas speciation procedures (see the last two pages of Appendix III).

Table 5 - Detailed Hydrocarbon Analysis - E6 Base Fuel

	E6		Test Date 7/1/2010			
			E6			
			Net mass	Net conc.	%total	
Elution #	Species Name	CAS #	(mg)	(ppmC)	(mg)	(ppmC)
63	2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.563	27.954	9.57%	9.62%
18	2-Methylbutane (Isopentane)	00078-78-4	1.465	25.924	8.97%	8.93%
81	Toluene	00108-88-3	1.058	20.511	6.48%	7.06%
36	2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	0.935	16.623	5.72%	5.72%
90	2,2,5-Trimethylhexane	03522-94-9	0.861	15.427	5.27%	5.31%
	Ethanol	00064-17-5	0.829	9.179	5.08%	3.16%
111	meta- & para-Xylenes	00108-38-3+00106-42-3	0.591	11.373	3.62%	3.92%
79	2,3,4-Trimethylpentane	00565-75-3	0.587	10.487	3.59%	3.61%
38	3-Methylpentane	00096-14-0	0.539	9.584	3.30%	3.30%
21	n-Pentane	00109-66-0	0.462	8.171	2.83%	2.81%
34	2,3-Dimethylbutane	00079-29-8	0.461	8.199	2.82%	2.82%
49	Methylcyclopentane	00096-37-7	0.316	5.755	1.94%	1.98%
40	n-Hexane	00110-54-3	0.315	5.596	1.93%	1.93%
77	2,4-Dimethylhexane	00589-43-5	0.287	5.138	1.76%	1.77%
50	2,4-Dimethylpentane	00108-08-7	0.286	5.103	1.75%	1.76%
29	2,2-Dimethylbutane	00075-83-2	0.281	4.993	1.72%	1.72%
57	2-Methylhexane	00591-76-4	0.275	4.897	1.68%	1.69%
58	2,3-Dimethylpentane	00565-59-3	0.270	4.814	1.65%	1.66%
59	Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	0.251	4.481	1.54%	1.54%
76	2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	0.196	3.512	1.20%	1.21%
74	Methylcyclohexane	00108-87-2	0.194	3.530	1.19%	1.22%
117	ortho-Xylene	00095-47-6	0.168	3.222	1.03%	1.11%
56	Cyclohexane	00110-82-7	0.162	2.952	0.99%	1.02%
82	2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	0.155	2.769	0.95%	0.95%
135	1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	0.145	2.771	0.89%	0.95%
100	2,3,5-Trimethylhexane	01069-53-0	0.141	2.520	0.86%	0.87%
86	3-Methylheptane	00589-81-1	0.134	2.397	0.82%	0.83%
109	Ethylbenzene	00100-41-4	0.130	2.506	0.80%	0.86%
83	2-Methylheptane	00592-27-8	0.130	2.323	0.80%	0.80%
66	n-Heptane	00142-82-5	0.125	2.236	0.77%	0.77%
129	1-Methyl-4-Ethylbenzene	00622-96-8	0.120	2.294	0.73%	0.79%
131	Unknown #16		0.106	1.936	0.65%	0.67%
96	n-Octane	00111-65-9	0.101	1.799	0.62%	0.62%
105	3,5-Dimethylheptane	00926-82-9	0.093	1.674	0.57%	0.58%
118	1-Nonene	00124-11-8	0.091	1.658	0.56%	0.57%

Table 5 (cont) - Detailed Hydrocarbon Analysis - E6 Base Fuel

			Net mass	Net conc.	%total	
Elution #	**Species Name**	**CAS #**	(mg)	(ppmC)	(mg)	(ppmC)
112	4-Methyloctane	02216-34-4	0.089	1.593	0.54%	0.55%
53	Benzene	00071-43-2	0.088	1.724	0.54%	0.59%
116	Unknown #13		0.087	1.581	0.53%	0.54%
62	t-1,2-Dimethylcyclopentane	00822-50-4	0.079	1.437	0.48%	0.49%
130	1,3,5-Trimethylbenzene	00108-67-8	0.075	1.431	0.46%	0.49%
61	c-1,3-Dimethylcyclopentane	02532-58-3	0.064	1.162	0.39%	0.40%
113	3-Methyloctane	02216-33-3	0.061	1.091	0.37%	0.38%
88	c-1,3-Dimethylcyclohexane	00638-04-0	0.058	1.060	0.36%	0.37%
136	n-Decane	00124-18-5	0.056	1.013	0.35%	0.35%
110	2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.054	0.973	0.33%	0.34%
133	1-Ethyl-2-Methylbenzene	00611-14-3	0.054	1.038	0.33%	0.36%
26	2-Methyl-2-butene	00513-35-9	0.052	0.939	0.32%	0.32%
144	1-Methyl-3-Propylbenzene	01074-43-7	0.051	0.964	0.31%	0.33%
121	t-2-Nonene	06434-78-2	0.049	0.889	0.30%	0.31%
84	1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	0.045	0.797	0.27%	0.27%
120	n-Nonane	00111-84-2	0.044	0.797	0.27%	0.27%
98	t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	0.044	0.803	0.27%	0.28%
148	1-Methyl-2-Propylbenzene	01074-17-5	0.044	0.836	0.27%	0.29%
67	2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	0.044	0.795	0.27%	0.27%
39	2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	0.042	0.771	0.26%	0.27%
42	t-2-Hexene	04050-45-7	0.042	0.760	0.26%	0.26%
47	3-Methyl-c-2-pentene	00922-62-3	0.041	0.752	0.25%	0.26%
123	2,2-Dimethyloctane	15869-87-1	0.041	0.735	0.25%	0.25%
92	1,1-Dimethylcyclohexane	00590-66-9	0.040	0.737	0.25%	0.25%
43	3-Methyl-t-2-pentene	00616-12-6	0.039	0.718	0.24%	0.25%
85	Unknown #5		0.037	0.666	0.22%	0.23%
102	Unknown #8		0.034	0.611	0.21%	0.21%
145	1,4-Diethylbenzene	00105-05-5	0.034	0.637	0.21%	0.22%
44	2-Methyl-2-pentene	00625-27-4	0.033	0.608	0.20%	0.21%
152	1,3-Dimethyl-2-Ethylbenzene	02870-04-4	0.033	0.629	0.20%	0.22%
142	Indan	00496-11-7	0.032	0.631	0.20%	0.22%
101	2,4-Dimethylheptane	02213-23-2	0.032	0.578	0.20%	0.20%
23	t-2-Pentene	00646-04-8	0.032	0.587	0.20%	0.20%
94	t-4-Octene	14850-23-8	0.032	0.578	0.19%	0.20%
52	1-Methylcyclopentene	00693-89-0	0.031	0.577	0.19%	0.20%
127	n-Propylbenzene	00103-65-1	0.030	0.579	0.19%	0.20%
141	4-Isopropyltoluene (p-Cymene)	00099-87-6	0.029	0.559	0.18%	0.19%
119	c- & t-4-Nonene	02198-23-4	0.027	0.491	0.17%	0.17%
134	3-Methylnonane		0.026	0.464	0.16%	0.16%
45	c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	0.026	0.467	0.16%	0.16%
99	c-2-Octene	07642-04-8	0.023	0.424	0.14%	0.15%
78	3,3-Dimethylhexane	00563-16-6	0.023	0.415	0.14%	0.14%
93	Unknown #6	.	0.023	0.422	0.14%	0.15%
89	t-1,4-Dimethylcyclohexane	02207-04-7	0.022	0.400	0.13%	0.14%
103	c-1,2-Dimethylcyclohexane	02207-01-4	0.021	0.389	0.13%	0.13%
125	2,4-DiMeOctane+AlBenz+PrCyHexane	04032-94-4+00300-57-2+01678-92-8	0.021	0.381	0.13%	0.13%
25	c-2-Pentene	00627-20-3	0.021	0.377	0.13%	0.13%
71	c-2-Heptene	06443-92-1	0.019	0.348	0.12%	0.12%
20	2-Methyl-1-butene	00563-46-2	0.019	0.346	0.12%	0.12%
12	n-Butane	00106-97-8	0.018	0.322	0.11%	0.11%
124	Unknown #14		0.017	0.308	0.10%	0.11%
149	1,4-Dimethyl-2-Ethylbenzene	01758-88-9	0.017	0.316	0.10%	0.11%
106	Unknown #9		0.016	0.297	0.10%	0.10%

Table 5 (cont) - Detailed Hydrocarbon Analysis - E6 Base Fuel

			Net mass	Net conc.	%total	
Elution #	**Species Name**	**CAS #**	(mg)	(ppmC)	(mg)	(ppmC)
115	Styrene	00100-42-5	0.016	0.318	0.10%	0.11%
143	1,3-Diethylbenzene	00141-93-5	0.016	0.308	0.10%	0.11%
65	t-3-Heptene	14686-14-7	0.016	0.293	0.10%	0.10%
51	2,2,3-Trimethylbutane	00464-06-2	0.016	0.282	0.10%	0.10%
150	1,3-Dimethyl-4-Ethylbenzene	00874-41-9	0.015	0.288	0.09%	0.10%
163	1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	0.015	0.287	0.09%	0.10%
95	Unknown #7		0.015	0.272	0.09%	0.09%
107	Unknown #10		0.015	0.271	0.09%	0.09%
122	Isopropylbenzene (Cumene)	00098-82-8	0.014	0.267	0.09%	0.09%
70	2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	0.014	0.253	0.08%	0.09%
68	3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	0.014	0.250	0.08%	0.09%
31	3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	0.014	0.249	0.08%	0.09%
138	sec-Butylbenzene	00135-98-8	0.014	0.260	0.08%	0.09%
54	3,3-Dimethylpentane	00562-49-2	0.012	0.219	0.08%	0.08%
158	1,2,3,5-Tetramethylbenzene	00527-53-7	0.012	0.234	0.08%	0.08%
97	t-2-Octene & t-1,2-DiMeCyHexane	13389-42-9+06876-23-9	0.011	0.200	0.07%	0.07%
64	1-Heptene	00592-76-7	0.011	0.198	0.07%	0.07%
75	2,4,4-Trimethyl-2-Pentene	00107-40-4	0.011	0.197	0.07%	0.07%
19	1-Pentene & 2-Butyne	00109-67-1+00503-17-3	0.011	0.201	0.07%	0.07%
48	2,2-Dimethylpentane	00590-35-2	0.010	0.183	0.06%	0.06%
159	Unknown #20		0.009	0.177	0.06%	0.06%
126	Unknown #15		0.009	0.167	0.06%	0.06%
139	1-Methyl-4-Isobutylbenzene	05161-04-6	0.008	0.153	0.05%	0.05%
30	Cyclopentene	00142-29-0	0.008	0.150	0.05%	0.05%
108	Unknown #11		0.008	0.145	0.05%	0.05%
155	Unknown #18		0.008	0.145	0.05%	0.05%
161	Methylindan	27133-93-3	0.007	0.125	0.04%	0.04%
154	n-Undecane	01120-21-4	0.006	0.112	0.04%	0.04%
69	3-Ethyl-c-2-Pentene	00816-79-5	0.006	0.114	0.04%	0.04%
168	Naphthalene	00091-20-3	0.006	0.122	0.04%	0.04%
164	Unknown #22	.	0.006	0.114	0.04%	0.04%
147	n-Butylbenzene	00104-51-8	0.005	0.101	0.03%	0.03%
60	Unknown #3		0.005	0.090	0.03%	0.03%
132	Unknown #17		0.005	0.090	0.03%	0.03%
137	Isobutylbenzene	00538-93-2	0.004	0.071	0.02%	0.02%
128	1-Methyl-3-Ethylbenzene	00620-14-4	0.004	0.071	0.02%	0.02%
140	1,2,3-Trimethylbenzene	00526-73-8	0.004	0.070	0.02%	0.02%
153	1-Undecene	00821-95-4	0.003	0.063	0.02%	0.02%
151	1,2-Dimethyl-4-Ethylbenzene	00934-80-5	0.003	0.053	0.02%	0.02%
22	2-Methyl-1,3-butadiene	00078-79-5	0.002	0.045	0.01%	0.02%
27	Unknown #1		0.001	0.026	0.01%	0.01%
73	2,2-DiMeHexane	00590-73-8	0.001	0.025	0.01%	0.01%
72	Unknown #4		0.001	0.024	0.01%	0.01%
160	Unknown #21		0.001	0.022	0.01%	0.01%
14	t-2-Butene	00624-64-6	0.001	0.015	0.00%	0.01%
	Total		16.331	290.431	100%	100%

Table 6 - Detailed Hydrocarbon Analysis – E32 Blend

	E32		Test Date 7/6/2010			
			E32			
			Net mass	Net conc.	%total	
Elution #	Species Name	CAS #	(mg)	(ppmC)	(mg)	(ppmC)
	Ethanol	00064-17-5	2.028	22.448	**29.50%**	**20.28%**
18	2-Methylbutane (Isopentane)	00078-78-4	0.591	10.449	8.59%	9.44%
63	2,2,4-TriMePentane (IsoOctane)	00540-84-1	0.388	6.941	5.65%	6.27%
81	Toluene	00108-88-3	0.308	5.964	4.48%	5.39%
36	2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	0.266	4.726	3.87%	4.27%
90	2,2,5-Trimethylhexane	03522-94-9	0.207	3.710	3.01%	3.35%
111	meta- & para-Xylenes	00108-38-3+00106-42-3	0.176	3.376	2.55%	3.05%
21	n-Pentane	00109-66-0	0.162	2.866	2.36%	2.59%
142	Indan	00496-11-7	0.158	3.061	2.29%	2.77%
38	3-Methylpentane	00096-14-0	0.154	2.732	2.24%	2.47%
79	2,3,4-Trimethylpentane	00565-75-3	0.150	2.689	2.19%	2.43%
34	2,3-Dimethylbutane	00079-29-8	0.134	2.375	1.94%	2.15%
40	n-Hexane	00110-54-3	0.097	1.723	1.41%	1.56%
49	Methylcyclopentane	00096-37-7	0.091	1.658	1.33%	1.50%
29	2,2-Dimethylbutane	00075-83-2	0.081	1.434	1.17%	1.30%
50	2,4-Dimethylpentane	00108-08-7	0.076	1.348	1.10%	1.22%
77	2,4-Dimethylhexane	00589-43-5	0.074	1.315	1.07%	1.19%
135	1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	0.073	1.399	1.06%	1.26%
57	2-Methylhexane	00591-76-4	0.071	1.268	1.03%	1.15%
58	2,3-Dimethylpentane	00565-59-3	0.071	1.257	1.03%	1.14%
59	Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	0.066	1.180	0.96%	1.07%
74	Methylcyclohexane	00108-87-2	0.056	1.026	0.82%	0.93%
128	1-Methyl-3-Ethylbenzene	00620-14-4	0.051	0.970	0.74%	0.88%
117	ortho-Xylene	00095-47-6	0.050	0.959	0.73%	0.87%
76	2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	0.049	0.875	0.71%	0.79%
56	Cyclohexane	00110-82-7	0.048	0.869	0.69%	0.78%
82	2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	0.041	0.734	0.60%	0.66%
109	Ethylbenzene	00100-41-4	0.036	0.694	0.52%	0.63%
66	n-Heptane	00142-82-5	0.036	0.640	0.52%	0.58%
86	3-Methylheptane	00589-81-1	0.036	0.641	0.52%	0.58%
100	2,3,5-Trimethylhexane	01069-53-0	0.035	0.623	0.51%	0.56%
131	Unknown #16		0.035	0.631	0.50%	0.57%
130	1,3,5-Trimethylbenzene	00108-67-8	0.033	0.628	0.48%	0.57%
83	2-Methylheptane	00592-27-8	0.031	0.562	0.46%	0.51%
96	n-Octane	00111-65-9	0.029	0.513	0.42%	0.46%
53	Benzene	00071-43-2	0.028	0.554	0.41%	0.50%
129	1-Methyl-4-Ethylbenzene	00622-96-8	0.026	0.500	0.38%	0.45%
105	3,5-Dimethylheptane	00926-82-9	0.025	0.442	0.36%	0.40%
133	1-Ethyl-2-Methylbenzene	00611-14-3	0.024	0.460	0.35%	0.42%
145	1,4-Diethylbenzene	00105-05-5	0.023	0.446	0.34%	0.40%
144	1-Methyl-3-Propylbenzene	01074-43-7	0.023	0.438	0.33%	0.40%
148	1-Methyl-2-Propylbenzene	01074-17-5	0.023	0.438	0.33%	0.40%
118	1-Nonene	00124-11-8	0.022	0.401	0.32%	0.36%
112	4-Methyloctane	02216-34-4	0.022	0.394	0.32%	0.36%
62	t-1,2-Dimethylcyclopentane	00822-50-4	0.021	0.381	0.30%	0.34%
116	Unknown #13		0.020	0.372	0.30%	0.34%
26	2-Methyl-2-butene	00513-35-9	0.020	0.368	0.29%	0.33%
149	1,4-Dimethyl-2-Ethylbenzene	01758-88-9	0.019	0.358	0.27%	0.32%

Table 6 (cont.) - Detailed Hydrocarbon Analysis – E32 Blend

Elution #	Species Name	CAS #	Net mass (mg)	Net conc. (ppmC)	% total (mg)	% total (ppmC)
136	n-Decane	00124-18-5	0.018	0.330	0.27%	0.30%
61	c-1,3-Dimethylcyclopentane	02532-58-3	0.017	0.311	0.25%	0.28%
88	c-1,3-Dimethylcyclohexane	00638-04-0	0.016	0.289	0.23%	0.26%
140	1,2,3-Trimethylbenzene	00526-73-8	0.015	0.295	0.22%	0.27%
113	3-Methyloctane	02216-33-3	0.014	0.256	0.21%	0.23%
12	n-Butane	00106-97-8	0.014	0.249	0.21%	0.23%
39	2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	0.014	0.253	0.20%	0.23%
23	t-2-Pentene	00646-04-8	0.013	0.240	0.19%	0.22%
151	1,2-Dimethyl-4-Ethylbenzene	00934-80-5	0.013	0.250	0.19%	0.23%
110	2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.013	0.234	0.19%	0.21%
42	t-2-Hexene	04050-45-7	0.013	0.237	0.19%	0.21%
98	t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	0.013	0.231	0.18%	0.21%
152	1,3-Dimethyl-2-Ethylbenzene	02870-04-4	0.013	0.239	0.18%	0.22%
84	1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	0.012	0.219	0.18%	0.20%
121	t-2-Nonene	06434-78-2	0.012	0.222	0.18%	0.20%
123	2,2-Dimethyloctane	15869-87-1	0.012	0.218	0.18%	0.20%
43	3-Methyl-t-2-pentene	00616-12-6	0.012	0.221	0.18%	0.20%
120	n-Nonane	00111-84-2	0.012	0.218	0.18%	0.20%
47	3-Methyl-c-2-pentene	00922-62-3	0.012	0.218	0.17%	0.20%
67	2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	0.012	0.216	0.17%	0.20%
127	n-Propylbenzene	00103-65-1	0.012	0.221	0.17%	0.20%
44	2-Methyl-2-pentene	00625-27-4	0.011	0.192	0.15%	0.17%
143	1,3-Diethylbenzene	00141-93-5	0.010	0.199	0.15%	0.18%
92	1,1-Dimethylcyclohexane	00590-66-9	0.010	0.189	0.15%	0.17%
85	Unknown #5		0.010	0.187	0.15%	0.17%
101	2,4-Dimethylheptane	02213-23-2	0.010	0.177	0.14%	0.16%
20	2-Methyl-1-butene	00563-46-2	0.009	0.169	0.13%	0.15%
102	Unknown #8		0.009	0.164	0.13%	0.15%
158	1,2,3,5-Tetramethylbenzene	00527-53-7	0.009	0.167	0.13%	0.15%
94	t-4-Octene	14850-23-8	0.009	0.157	0.13%	0.14%
25	c-2-Pentene	00627-20-3	0.009	0.156	0.12%	0.14%
78	3,3-Dimethylhexane	00563-16-6	0.008	0.148	0.12%	0.13%
45	c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	0.008	0.147	0.12%	0.13%
52	1-Methylcyclopentene	00693-89-0	0.008	0.149	0.12%	0.13%
159	Unknown #20		0.008	0.151	0.12%	0.14%
19	1-Pentene & 2-Butyne	00109-67-1+00503-17-3	0.008	0.149	0.11%	0.13%
150	1,3-Dimethyl-4-Ethylbenzene	00874-41-9	0.008	0.143	0.11%	0.13%
134	3-Methylnonane		0.007	0.123	0.10%	0.11%
138	sec-Butylbenzene	00135-98-8	0.007	0.130	0.10%	0.12%
161	Methylindan	27133-93-3	0.006	0.117	0.09%	0.11%
89	t-1,4-Dimethylcyclohexane	02207-04-7	0.006	0.110	0.09%	0.10%
93	Unknown #6	.	0.006	0.110	0.09%	0.10%
125	2,4-DiMeOctane+AlBenz+PrCyHexane	04032-94-4+00300-57-2+01678-92-8	0.006	0.108	0.09%	0.10%
163	1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	0.006	0.111	0.09%	0.10%
103	c-1,2-Dimethylcyclohexane	02207-01-4	0.006	0.106	0.08%	0.10%
122	Isopropylbenzene (Cumene)	00098-82-8	0.006	0.106	0.08%	0.10%
169	1-Dodecene	00112-41-4	0.005	0.095	0.08%	0.09%
51	2,2,3-Trimethylbutane	00464-06-2	0.005	0.091	0.07%	0.08%
71	c-2-Heptene	06443-92-1	0.005	0.090	0.07%	0.08%
154	n-Undecane	01120-21-4	0.005	0.087	0.07%	0.08%

Table 6 (cont.) - Detailed Hydrocarbon Analysis – E32 Blend

Elution #	Species Name	CAS #	Net mass (mg)	Net conc. (ppmC)	% total (mg)	% total (ppmC)
157	1,2,4,5-Tetramethylbenzene	00095-93-2	0.005	0.092	0.07%	0.08%
168	Naphthalene	00091-20-3	0.005	0.096	0.07%	0.09%
119	c- & t-4-Nonene	02198-23-4	0.005	0.087	0.07%	0.08%
65	t-3-Heptene	14686-14-7	0.005	0.086	0.07%	0.08%
31	3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	0.005	0.082	0.07%	0.07%
106	Unknown #9		0.004	0.076	0.06%	0.07%
95	Unknown #7		0.004	0.075	0.06%	0.07%
107	Unknown #10		0.004	0.067	0.05%	0.06%
64	1-Heptene	00592-76-7	0.004	0.066	0.05%	0.06%
68	3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	0.004	0.066	0.05%	0.06%
70	2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	0.004	0.064	0.05%	0.06%
155	Unknown #18		0.003	0.066	0.05%	0.06%
75	2,4,4-Trimethyl-2-Pentene	00107-40-4	0.003	0.063	0.05%	0.06%
54	3,3-Dimethylpentane	00562-49-2	0.003	0.059	0.05%	0.05%
30	Cyclopentene	00142-29-0	0.003	0.061	0.05%	0.06%
48	2,2-Dimethylpentane	00590-35-2	0.003	0.055	0.04%	0.05%
147	n-Butylbenzene	00104-51-8	0.003	0.057	0.04%	0.05%
146	1,2-Diethylbenzene	00135-01-3	0.003	0.051	0.04%	0.05%
99	c-2-Octene	07642-04-8	0.003	0.048	0.04%	0.04%
139	1-Methyl-4-Isobutylbenzene	05161-04-6	0.003	0.048	0.04%	0.04%
97	t-2-Octene & t-1,2-DiMeCyHexane	13389-42-9+06876-23-9	0.002	0.044	0.04%	0.04%
124	Unknown #14		0.002	0.043	0.03%	0.04%
114	Unknown #12		0.002	0.040	0.03%	0.04%
108	Unknown #11		0.002	0.031	0.03%	0.03%
69	3-Ethyl-c-2-Pentene	00816-79-5	0.002	0.030	0.02%	0.03%
9	2-Methylpropane	00075-28-5	0.002	0.027	0.02%	0.02%
126	Unknown #15		0.001	0.025	0.02%	0.02%
60	Unknown #3		0.001	0.024	0.02%	0.02%
22	2-Methyl-1,3-butadiene	00078-79-5	0.001	0.023	0.02%	0.02%
14	t-2-Butene	00624-64-6	0.001	0.020	0.02%	0.02%
	Total		6.873	110.700	100%	100%

Table 7 - Detailed Hydrocarbon Analysis – E59 Blend

	E59		Test Date 7/8/2010			
			E59			
			Net mass	Net conc.	%total	
Elution #	Species Name	CAS #	(mg)	(ppmC)	(mg)	(ppmC)
	Ethanol	00064-17-5	6.055	67.035	52.82%	40.57%
18	2-Methylbutane (Isopentane)	00078-78-4	0.812	14.365	7.08%	8.69%
63	2,2,4-TriMePentane (IsoOctane)	00540-84-1	0.439	7.844	3.83%	4.75%
81	Toluene	00108-88-3	0.348	6.753	3.04%	4.09%
36	2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	0.282	5.010	2.46%	3.03%
90	2,2,5-Trimethylhexane	03522-94-9	0.237	4.249	2.07%	2.57%
21	n-Pentane	00109-66-0	0.206	3.650	1.80%	2.21%
111	meta- & para-Xylenes	00108-38-3+00106-42-3	0.192	3.686	1.67%	2.23%
79	2,3,4-Trimethylpentane	00565-75-3	0.169	3.025	1.48%	1.83%
38	3-Methylpentane	00096-14-0	0.164	2.922	1.43%	1.77%
34	2,3-Dimethylbutane	00079-29-8	0.139	2.466	1.21%	1.49%
40	n-Hexane	00110-54-3	0.120	2.130	1.04%	1.29%
49	Methylcyclopentane	00096-37-7	0.101	1.832	0.88%	1.11%
135	1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	0.087	1.665	0.76%	1.01%
50	2,4-Dimethylpentane	00108-08-7	0.083	1.475	0.72%	0.89%
57	2-Methylhexane	00591-76-4	0.083	1.475	0.72%	0.89%
77	2,4-Dimethylhexane	00589-43-5	0.083	1.478	0.72%	0.89%
29	2,2-Dimethylbutane	00075-83-2	0.081	1.437	0.70%	0.87%
58	2,3-Dimethylpentane	00565-59-3	0.078	1.384	0.68%	0.84%
59	Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	0.076	1.350	0.66%	0.82%
74	Methylcyclohexane	00108-87-2	0.068	1.243	0.60%	0.75%
128	1-Methyl-3-Ethylbenzene	00620-14-4	0.060	1.143	0.52%	0.69%
56	Cyclohexane	00110-82-7	0.058	1.050	0.50%	0.64%
117	ortho-Xylene	00095-47-6	0.056	1.070	0.49%	0.65%
76	2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	0.055	0.992	0.48%	0.60%
82	2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	0.045	0.813	0.40%	0.49%
66	n-Heptane	00142-82-5	0.044	0.784	0.38%	0.47%
86	3-Methylheptane	00589-81-1	0.040	0.718	0.35%	0.43%
100	2,3,5-Trimethylhexane	01069-53-0	0.039	0.705	0.34%	0.43%
109	Ethylbenzene	00100-41-4	0.036	0.693	0.31%	0.42%
83	2-Methylheptane	00592-27-8	0.036	0.642	0.31%	0.39%
131	Unknown #16		0.035	0.645	0.31%	0.39%
130	1,3,5-Trimethylbenzene	00108-67-8	0.035	0.675	0.31%	0.41%
96	n-Octane	00111-65-9	0.034	0.610	0.30%	0.37%
53	Benzene	00071-43-2	0.032	0.620	0.28%	0.38%
129	1-Methyl-4-Ethylbenzene	00622-96-8	0.030	0.569	0.26%	0.34%
105	3,5-Dimethylheptane	00926-82-9	0.026	0.474	0.23%	0.29%
133	1-Ethyl-2-Methylbenzene	00611-14-3	0.026	0.502	0.23%	0.30%
145	1,4-Diethylbenzene	00105-05-5	0.026	0.488	0.22%	0.30%
118	1-Nonene	00124-11-8	0.026	0.467	0.22%	0.28%
112	4-Methyloctane	02216-34-4	0.025	0.452	0.22%	0.27%
144	1-Methyl-3-Propylbenzene	01074-43-7	0.025	0.469	0.22%	0.28%
116	Unknown #13		0.024	0.438	0.21%	0.26%
62	t-1,2-Dimethylcyclopentane	00822-50-4	0.024	0.428	0.21%	0.26%
12	n-Butane	00106-97-8	0.023	0.398	0.20%	0.24%
26	2-Methyl-2-butene	00513-35-9	0.021	0.388	0.19%	0.23%
23	t-2-Pentene	00646-04-8	0.021	0.388	0.19%	0.23%

Table 7 (cont.) - Detailed Hydrocarbon Analysis – E59 Blend

			Net mass	Net conc.	% total	
Elution #	Species Name	CAS #	(mg)	(ppmC)	(mg)	(ppmC)
136	n-Decane	00124-18-5	0.021	0.382	0.19%	0.23%
149	1,4-Dimethyl-2-Ethylbenzene	01758-88-9	0.021	0.405	0.19%	0.25%
61	c-1,3-Dimethylcyclopentane	02532-58-3	0.019	0.349	0.17%	0.21%
88	c-1,3-Dimethylcyclohexane	00638-04-0	0.018	0.337	0.16%	0.20%
19	1-Pentene & 2-Butyne	00109-67-1+00503-17-3	0.017	0.321	0.15%	0.19%
113	3-Methyloctane	02216-33-3	0.016	0.293	0.14%	0.18%
140	1,2,3-Trimethylbenzene	00526-73-8	0.016	0.310	0.14%	0.19%
47	3-Methyl-c-2-pentene	00922-62-3	0.015	0.267	0.13%	0.16%
142	Indan	00496-11-7	0.015	0.283	0.13%	0.17%
120	n-Nonane	00111-84-2	0.015	0.261	0.13%	0.16%
110	2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.014	0.258	0.13%	0.16%
121	t-2-Nonene	06434-78-2	0.014	0.256	0.12%	0.15%
152	1,3-Dimethyl-2-Ethylbenzene	02870-04-4	0.014	0.265	0.12%	0.16%
42	t-2-Hexene	04050-45-7	0.014	0.251	0.12%	0.15%
84	1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	0.014	0.243	0.12%	0.15%
123	2,2-Dimethyloctane	15869-87-1	0.014	0.244	0.12%	0.15%
127	n-Propylbenzene	00103-65-1	0.013	0.256	0.12%	0.15%
43	3-Methyl-t-2-pentene	00616-12-6	0.013	0.240	0.12%	0.15%
98	t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	0.013	0.240	0.12%	0.15%
39	2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	0.013	0.235	0.11%	0.14%
67	2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	0.013	0.230	0.11%	0.14%
20	2-Methyl-1-butene	00563-46-2	0.013	0.228	0.11%	0.14%
148	1-Methyl-2-Propylbenzene	01074-17-5	0.012	0.230	0.11%	0.14%
92	1,1-Dimethylcyclohexane	00590-66-9	0.012	0.215	0.10%	0.13%
158	1,2,3,5-Tetramethylbenzene	00527-53-7	0.012	0.219	0.10%	0.13%
44	2-Methyl-2-pentene	00625-27-4	0.011	0.207	0.10%	0.13%
85	Unknown #5		0.011	0.201	0.10%	0.12%
151	1,2-Dimethyl-4-Ethylbenzene	00934-80-5	0.011	0.210	0.10%	0.13%
25	c-2-Pentene	00627-20-3	0.010	0.178	0.09%	0.11%
101	2,4-Dimethylheptane	02213-23-2	0.009	0.169	0.08%	0.10%
94	t-4-Octene	14850-23-8	0.009	0.171	0.08%	0.10%
102	Unknown #8		0.009	0.171	0.08%	0.10%
169	1-Dodecene	00112-41-4	0.009	0.165	0.08%	0.10%
52	1-Methylcyclopentene	00693-89-0	0.009	0.168	0.08%	0.10%
150	1,3-Dimethyl-4-Ethylbenzene	00874-41-9	0.009	0.167	0.08%	0.10%
163	1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	0.009	0.165	0.08%	0.10%
45	c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	0.009	0.155	0.07%	0.09%
78	3,3-Dimethylhexane	00563-16-6	0.008	0.151	0.07%	0.09%
143	1,3-Diethylbenzene	00141-93-5	0.008	0.151	0.07%	0.09%
168	Naphthalene	00091-20-3	0.007	0.144	0.06%	0.09%
138	sec-Butylbenzene	00135-98-8	0.007	0.134	0.06%	0.08%
89	t-1,4-Dimethylcyclohexane	02207-04-7	0.007	0.128	0.06%	0.08%
134	3-Methylnonane		0.007	0.124	0.06%	0.08%
93	Unknown #6	.	0.007	0.120	0.06%	0.07%
125	2,4-DiMeOctane+AlBenz+PrCyHexane	04032-94-4+00300-57-2+01678-92-8	0.007	0.118	0.06%	0.07%
119	c- & t-4-Nonene	02198-23-4	0.007	0.119	0.06%	0.07%
159	Unknown #20		0.006	0.123	0.06%	0.07%
154	n-Undecane	01120-21-4	0.006	0.109	0.05%	0.07%
122	Isopropylbenzene (Cumene)	00098-82-8	0.006	0.114	0.05%	0.07%
157	1,2,4,5-Tetramethylbenzene	00095-93-2	0.006	0.109	0.05%	0.07%
71	c-2-Heptene	06443-92-1	0.006	0.103	0.05%	0.06%

Table 7 (cont.) - Detailed Hydrocarbon Analysis – E59 Blend

Elution #	Species Name	CAS #	Net mass (mg)	Net conc. (ppmC)	% total (mg)	% total (ppmC)
51	2,2,3-Trimethylbutane	00464-06-2	0.006	0.100	0.05%	0.06%
103	c-1,2-Dimethylcyclohexane	02207-01-4	0.005	0.098	0.05%	0.06%
155	Unknown #18		0.005	0.095	0.04%	0.06%
65	t-3-Heptene	14686-14-7	0.005	0.086	0.04%	0.05%
31	3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	0.005	0.085	0.04%	0.05%
95	Unknown #7		0.005	0.084	0.04%	0.05%
48	2,2-Dimethylpentane	00590-35-2	0.005	0.081	0.04%	0.05%
75	2,4,4-Trimethyl-2-Pentene	00107-40-4	0.004	0.076	0.04%	0.05%
54	3,3-Dimethylpentane	00562-49-2	0.004	0.073	0.04%	0.04%
68	3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	0.004	0.072	0.03%	0.04%
70	2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	0.004	0.070	0.03%	0.04%
30	Cyclopentene	00142-29-0	0.004	0.067	0.03%	0.04%
97	t-2-Octene & t-1,2-DiMeCyHexane	13389-42-9+06876-23-9	0.004	0.065	0.03%	0.04%
64	1-Heptene	00592-76-7	0.004	0.064	0.03%	0.04%
106	Unknown #9		0.003	0.061	0.03%	0.04%
99	c-2-Octene	07642-04-8	0.003	0.048	0.02%	0.03%
114	Unknown #12		0.003	0.048	0.02%	0.03%
9	2-Methylpropane	00075-28-5	0.003	0.045	0.02%	0.03%
107	Unknown #10		0.003	0.046	0.02%	0.03%
124	Unknown #14		0.002	0.039	0.02%	0.02%
69	3-Ethyl-c-2-Pentene	00816-79-5	0.002	0.035	0.02%	0.02%
60	Unknown #3		0.001	0.020	0.01%	0.01%
	Total		11.464	165.244	100.00%	100.00%

Table 8 - Detailed Hydrocarbon Analysis – E85 Base Fuel

Elution #	Species Name	CAS #	Net mass (mg)	Net conc. (ppmC)	%total (mg)	%total (ppmC)
	Ethanol	00064-17-5	5.938	65.273	83.31%	75.36%
18	2-Methylbutane (Isopentane)	00078-78-4	0.350	6.152	4.91%	7.10%
21	n-Pentane	00109-66-0	0.070	1.234	0.99%	1.42%
81	Toluene	00108-88-3	0.068	1.308	0.95%	1.51%
63	2,2,4-TriMePentane (IsoOctane)	00540-84-1	0.064	1.144	0.90%	1.32%
36	2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	0.047	0.836	0.66%	0.96%
40	n-Hexane	00110-54-3	0.038	0.665	0.53%	0.77%
90	2,2,5-Trimethylhexane	03522-94-9	0.033	0.583	0.46%	0.67%
38	3-Methylpentane	00096-14-0	0.029	0.514	0.41%	0.59%
111	meta- & para-Xylenes	00108-38-3+00106-42-3	0.028	0.533	0.39%	0.62%
79	2,3,4-Trimethylpentane	00565-75-3	0.025	0.437	0.35%	0.50%
34	2,3-Dimethylbutane	00079-29-8	0.022	0.391	0.31%	0.45%
49	Methylcyclopentane	00096-37-7	0.021	0.378	0.29%	0.44%
74	Methylcyclohexane	00108-87-2	0.021	0.373	0.29%	0.43%
135	1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	0.019	0.363	0.27%	0.42%
56	Cyclohexane	00110-82-7	0.016	0.291	0.23%	0.34%
128	1-Methyl-3-Ethylbenzene	00620-14-4	0.015	0.288	0.21%	0.33%
57	2-Methylhexane	00591-76-4	0.015	0.261	0.21%	0.30%
59	Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	0.014	0.252	0.20%	0.29%
12	n-Butane	00106-97-8	0.013	0.235	0.19%	0.27%
50	2,4-Dimethylpentane	00108-08-7	0.013	0.230	0.18%	0.27%
77	2,4-Dimethylhexane	00589-43-5	0.013	0.226	0.18%	0.26%
58	2,3-Dimethylpentane	00565-59-3	0.012	0.211	0.17%	0.24%
66	n-Heptane	00142-82-5	0.012	0.208	0.16%	0.24%
29	2,2-Dimethylbutane	00075-83-2	0.010	0.171	0.14%	0.20%
19	1-Pentene & 2-Butyne	00109-67-1+00503-17-3	0.009	0.169	0.13%	0.20%
117	ortho-Xylene	00095-47-6	0.009	0.168	0.12%	0.19%
76	2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	0.009	0.153	0.12%	0.18%
20	2-Methyl-1-butene	00563-46-2	0.009	0.155	0.12%	0.18%
130	1,3,5-Trimethylbenzene	00108-67-8	0.009	0.162	0.12%	0.19%
53	Benzene	00071-43-2	0.008	0.152	0.11%	0.18%
129	1-Methyl-4-Ethylbenzene	00622-96-8	0.008	0.144	0.11%	0.17%
82	2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	0.007	0.133	0.11%	0.15%
96	n-Octane	00111-65-9	0.007	0.131	0.10%	0.15%
86	3-Methylheptane	00589-81-1	0.007	0.118	0.09%	0.14%
23	t-2-Pentene	00646-04-8	0.007	0.118	0.09%	0.14%
83	2-Methylheptane	00592-27-8	0.006	0.113	0.09%	0.13%
142	Indan	00496-11-7	0.006	0.114	0.08%	0.13%
105	3,5-Dimethylheptane	00926-82-9	0.006	0.104	0.08%	0.12%
133	1-Ethyl-2-Methylbenzene	00611-14-3	0.006	0.104	0.08%	0.12%
100	2,3,5-Trimethylhexane	01069-53-0	0.005	0.098	0.08%	0.11%
109	Ethylbenzene	00100-41-4	0.005	0.098	0.07%	0.11%
131	Unknown #16		0.005	0.088	0.07%	0.10%
25	c-2-Pentene	00627-20-3	0.004	0.080	0.06%	0.09%
62	t-1,2-Dimethylcyclopentane	00822-50-4	0.004	0.077	0.06%	0.09%
26	2-Methyl-2-butene	00513-35-9	0.004	0.074	0.06%	0.09%
61	c-1,3-Dimethylcyclopentane	02532-58-3	0.004	0.071	0.06%	0.08%
141	4-Isopropyltoluene (p-Cymene)	00099-87-6	0.004	0.074	0.06%	0.09%
88	c-1,3-Dimethylcyclohexane	00638-04-0	0.004	0.070	0.05%	0.08%
47	3-Methyl-c-2-pentene	00922-62-3	0.004	0.068	0.05%	0.08%
116	Unknown #13		0.004	0.066	0.05%	0.08%

Table 8 (cont.) - Detailed Hydrocarbon Analysis – E85 Base Fuel

			Net mass	Net conc.	% total	
Elution #	Species Name	CAS #	(mg)	(ppmC)	(mg)	(ppmC)
118	1-Nonene	00124-11-8	0.003	0.062	0.05%	0.07%
112	4-Methyloctane	02216-34-4	0.003	0.056	0.04%	0.06%
113	3-Methyloctane	02216-33-3	0.003	0.051	0.04%	0.06%
127	n-Propylbenzene	00103-65-1	0.003	0.054	0.04%	0.06%
39	2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	0.003	0.048	0.04%	0.06%
42	t-2-Hexene	04050-45-7	0.002	0.045	0.03%	0.05%
43	3-Methyl-t-2-pentene	00616-12-6	0.002	0.042	0.03%	0.05%
144	1-Methyl-3-Propylbenzene	01074-43-7	0.002	0.043	0.03%	0.05%
44	2-Methyl-2-pentene	00625-27-4	0.002	0.040	0.03%	0.05%
120	n-Nonane	00111-84-2	0.002	0.038	0.03%	0.04%
48	2,2-Dimethylpentane	00590-35-2	0.002	0.038	0.03%	0.04%
84	1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	0.002	0.037	0.03%	0.04%
16	c-2-Butene	00590-18-1	0.002	0.033	0.03%	0.04%
52	1-Methylcyclopentene	00693-89-0	0.002	0.032	0.02%	0.04%
85	Unknown #5		0.002	0.031	0.02%	0.04%
78	3,3-Dimethylhexane	00563-16-6	0.002	0.029	0.02%	0.03%
101	2,4-Dimethylheptane	02213-23-2	0.002	0.029	0.02%	0.03%
102	Unknown #8		0.002	0.029	0.02%	0.03%
121	t-2-Nonene	06434-78-2	0.002	0.029	0.02%	0.03%
98	t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	0.002	0.028	0.02%	0.03%
145	1,4-Diethylbenzene	00105-05-5	0.002	0.029	0.02%	0.03%
89	t-1,4-Dimethylcyclohexane	02207-04-7	0.001	0.027	0.02%	0.03%
150	1,3-Dimethyl-4-Ethylbenzene	00874-41-9	0.001	0.027	0.02%	0.03%
45	c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	0.001	0.025	0.02%	0.03%
151	1,2-Dimethyl-4-Ethylbenzene	00934-80-5	0.001	0.026	0.02%	0.03%
67	2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	0.001	0.024	0.02%	0.03%
65	t-3-Heptene	14686-14-7	0.001	0.024	0.02%	0.03%
54	3,3-Dimethylpentane	00562-49-2	0.001	0.021	0.02%	0.02%
134	3-Methylnonane		0.001	0.020	0.02%	0.02%
110	2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.001	0.018	0.01%	0.02%
123	2,2-Dimethyloctane	15869-87-1	0.001	0.018	0.01%	0.02%
149	1,4-Dimethyl-2-Ethylbenzene	01758-88-9	0.001	0.019	0.01%	0.02%
136	n-Decane	00124-18-5	0.001	0.016	0.01%	0.02%
94	t-4-Octene	14850-23-8	0.001	0.016	0.01%	0.02%
51	2,2,3-Trimethylbutane	00464-06-2	0.001	0.016	0.01%	0.02%
148	1-Methyl-2-Propylbenzene	01074-17-5	0.001	0.013	0.01%	0.01%
9	2-Methylpropane	00075-28-5	0.001	0.011	0.01%	0.01%
30	Cyclopentene	00142-29-0	0.001	0.010	0.01%	0.01%
	Total		7.127	86.616	100%	100%

Net Heating Value of the Test Fuels - It was expected that the fuel economy would decrease with increasing ethanol content of the fuels due to the lower energy content of ethanol on a volume basis. The authors asked Dr. Furey, of Furey and Associates, LLC[8] to calculate the net heating value of the blends using the measured ethanol content and the recently published calculation value. Table 9 summarizes the calculations.

Table 9.

Estimated Net Heat of Combustion of Gasoline-Ethanol Blends

Fuel ID	BTU/lb	BTU/gal	MJ/kg	MJ/m^3
E6	18320	110300	42.58	30720
E32	16800	102850	39.04	28650
E59	14910	89340	34.66	24880
E85	12710	81510	29.54	22700

(Calculated by Dr. Robert Furey using the methodology described in: P. Geng, R. L. Furey, and A. Konzack, "Calculation of Heating Value for Gasoline Containing Ethanol," SAE Paper 10SFL-0201, June 2010.)

The authors have used the values calculated by Dr. Furey for the comparisons in a later fuel economy section of this report.

Liquid Fuel Speciation by Carbon Number – Figures 3 and 4 offer plots of the test fuels' content by carbon number. The carbon number for each of the species identified was obtained by looking up the molecular description by CAS number. The unknown masses were not included for this analysis as the carbon number could not be established. The omission is evident in Figure 4 where the cumulative mass identified only reached 94% for the E6 fuel (6% unidentified).

Table 10 summarizes the data used for Figures 3 and 4.

[8] Robert L. Furey, PhD, Furey and Associates, LLC, 1196 Maple Leaf Drive, Rochester Hills, Michigan 48309

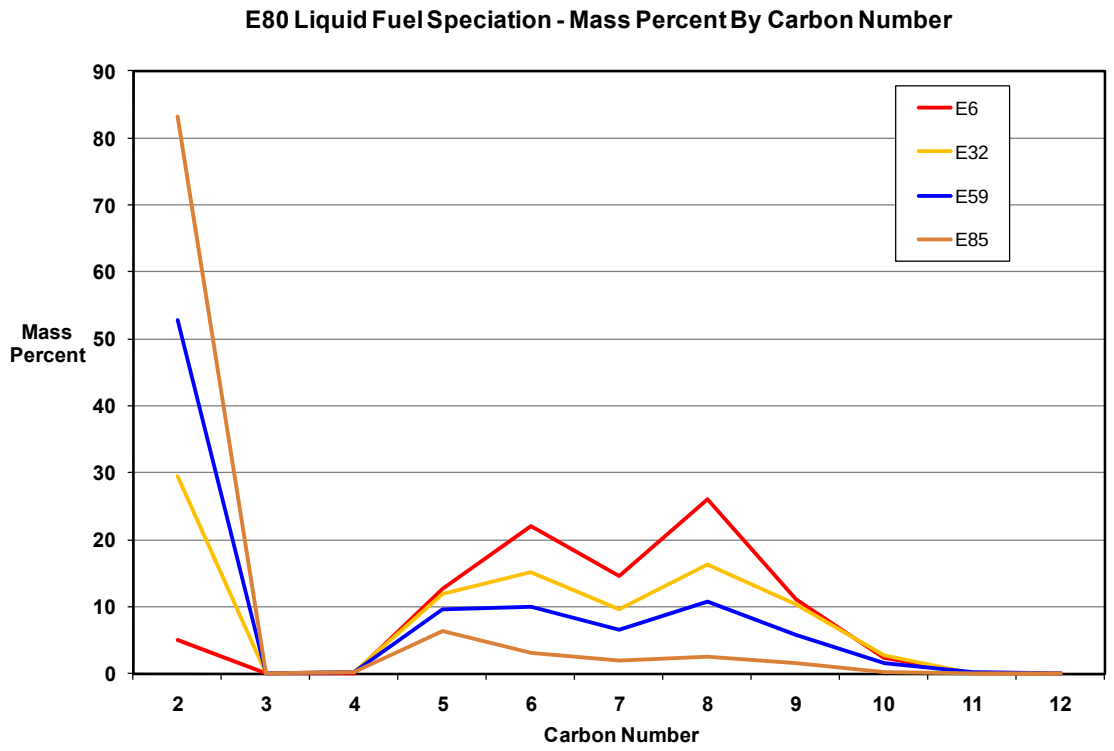


Figure 3. – Mass Percent by Carbon Number

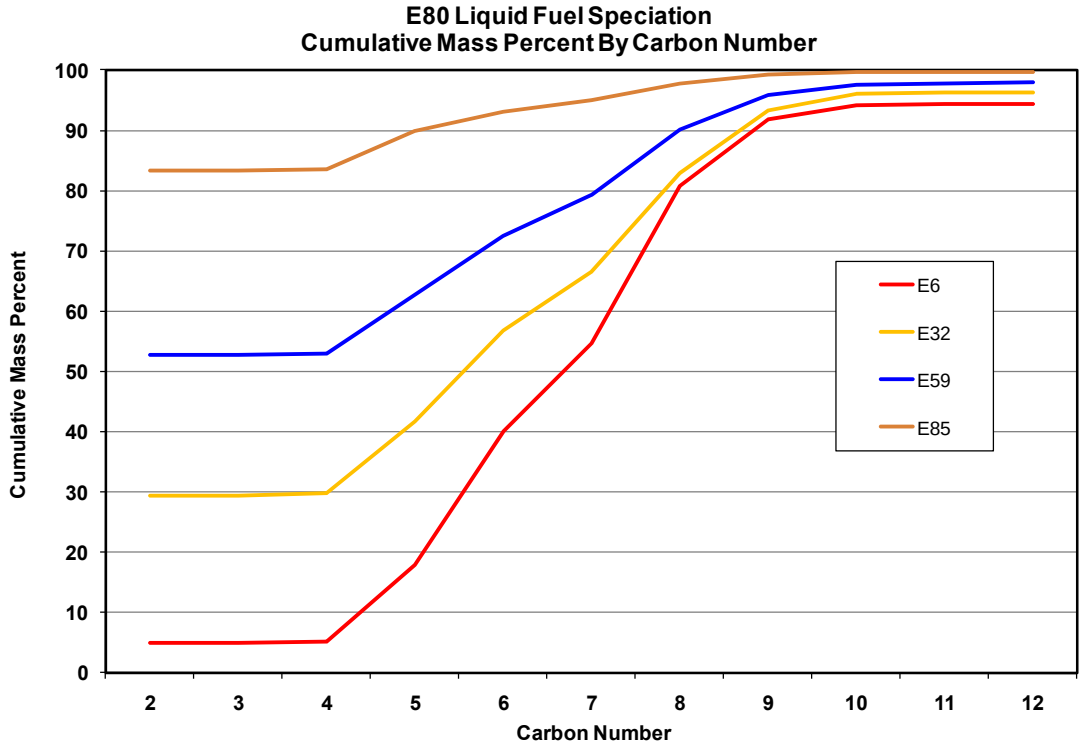


Figure 4. – Cumulative Mass Percent

Table 10.

Mass Percent by Carbon Number

Carbon Number	Fuel E6	E32	E59	E85
2	5.08	29.50	52.82	83.31
3	0.00	0.00	0.00	0.00
4	0.12	0.24	0.22	0.22
5	12.68	11.87	9.63	6.36
6	22.15	15.22	9.94	3.11
7	14.62	9.71	6.63	2.09
8	26.11	16.26	10.86	2.62
9	11.13	10.50	5.79	1.65
10	2.35	2.82	1.69	0.21
11	0.06	0.07	0.26	0.00
12	0.00	0.08	0.08	0.00
Unidentified	5.71	3.72	2.09	0.42

The Fuel Change Procedure

The design of the test program illuminated a control system sensitivity that has important implications. It involves a reality that the current in-use "Flex-Fuel" vehicles may use the refueling event to check the function and validity of critical system sensors. As a result, these systems might signal a system error if the vehicle is refueled with an intermediate blend.

Refueling Error Problem Description - The engine control system knows the fuel tank at "key-off", (e.g., 3/8th of a tank). It also has an estimation of the ethanol content of the fuel in the tank at shut-off. It knows the new level in the tank when the vehicle is re-started. Perhaps it is the same, but it might also indicate that a refueling event has occurred. If a significant fuel addition has occurred, say more than three gallons was added, a new mixture with possible new ethanol content is indicated. There are only two ethanol levels that are thought to be legal for sale in the United States:

Low level ethanol – Zero to 10% ethanol
High level ethanol – 70 to 85% ethanol

The diagnostic system can set targets for the new ethanol level in the tank based on two possibilities. One: that low level ethanol fuel was added, or two: that high level fuel was added. If the system recalculates the new ethanol content of the fuel, and it is significantly different from what it should have been (two possibilities), then perhaps the sensors or techniques that are used to estimate the ethanol content are suspect. The system can be calibrated to illuminate the "Service Engine Soon" light and alert the operator to a system problem.

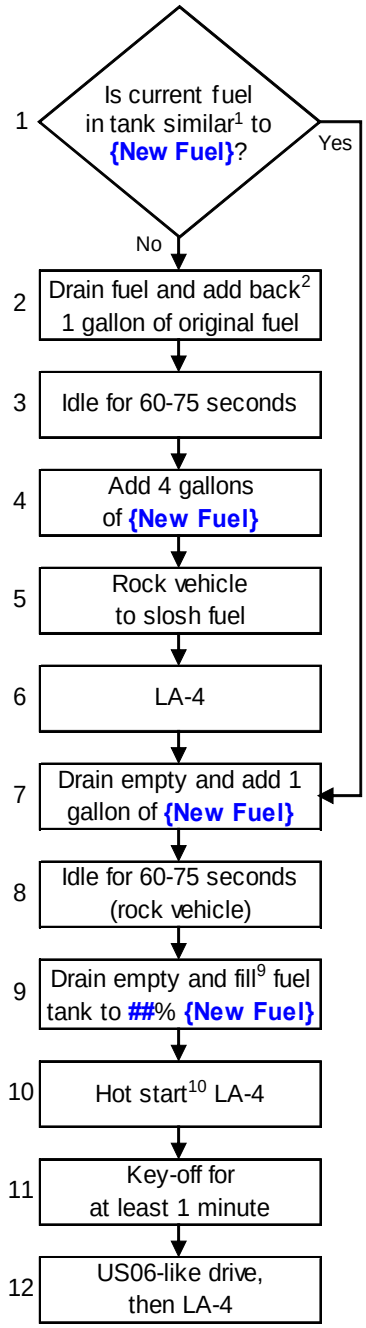
The Refueling Procedures - There was no problem created for the E-80 test program when only E6 or E85 were added, but the tests using blends (E32 or E59, for example) require special treatment. Whenever blends were mixed in the tank, the lab personnel would rock the vehicle violently (Figure 5) to insure in-tank mixing.

Seven charts follow to illustrate the refueling procedure:

- Basic Fuel Change Procedure
- Pilot Program E6 or E85 Fuel Change
- Pilot Program Blend Fuel Change
- Main Program E6 Fuel Change
- Main Program E85 Fuel Change
- Main Program E32 Blend Change
- Main Program E59 Blend Change

Figure 5. Vehicle Rocking

Fuel Change Procedure



Test Fuel	Step 9 Fill
E6	90% E6
E32	33% E6
E59	33% E85
E85	90%E85

Notes:

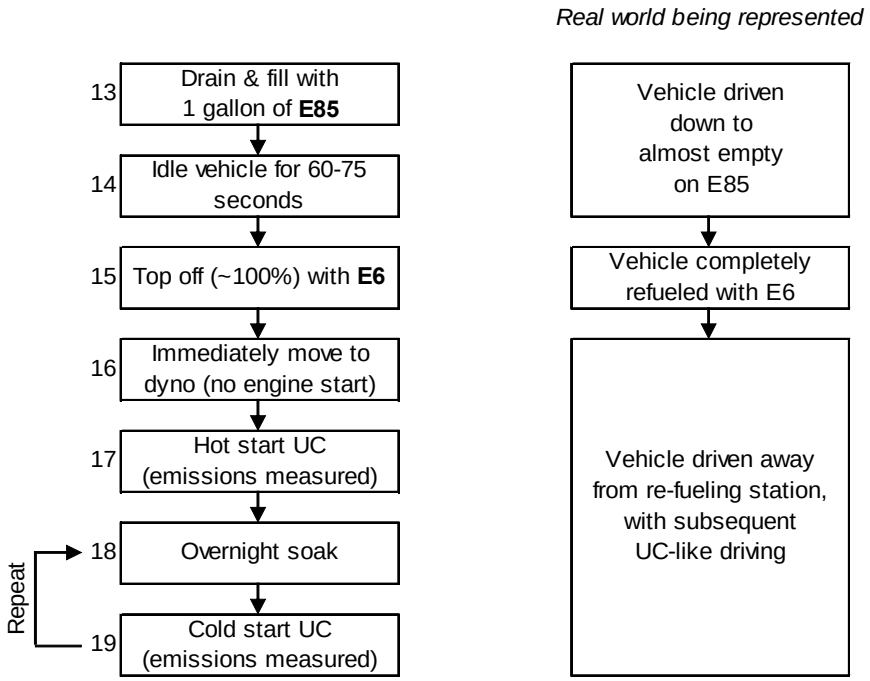
- All driving can be done on road (as proposed)
- [1] Fuel is similar if within 10% EtOH by volume
- [2] Recycled from vehicle's fuel tank
- [9] Fill level will depend on the subsequent procedure
- [10] Hot start here means no soak between Steps 8 through 10

Figure 6. Fuel Change Procedure

Pilot Study -- E85 to E6

A) Run Fuel Change Procedure: New Fuel = **E85**; Step 9 fill level = **4 gallons**

B) Immediately after the Fuel Change Procedure (while the vehicle is still warmed-up), run steps below.



C) Repeat steps 18 & 19 until Committee approval of stabilization

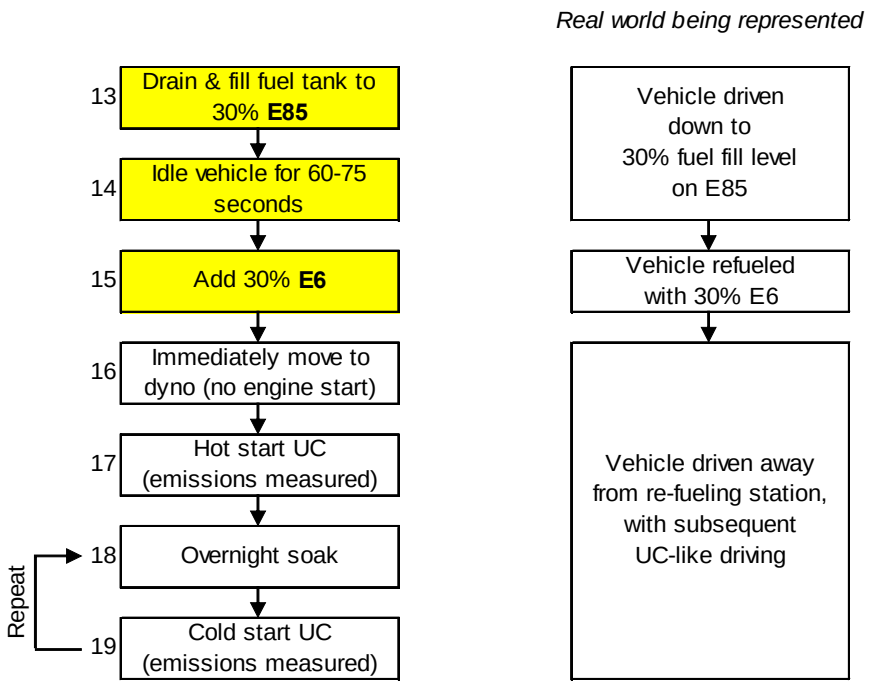
Figure 7. Pilot Program Test Procedure: E85-E6 Transition

The Pilot Program started with the vehicle allowed to stabilize the emission control system on E85, then a refill with E6 and emissions measured on the "drive-away" from the refueling, and then four overnight cold start emission tests. The tank was filled to capacity to allow for five LA92 drives without any fuel change or addition in between. The E6 to E85 transition was performed in a similar fashion with the E85 replacing the E6 in Figure 7 above.

Pilot Study -- 50/50 blend of E85/E6

A) Run Fuel Change Procedure: New Fuel = **E85**; Step 9 fill level = **40%**

B) Immediately after the Fuel Change Procedure (while the vehicle is still warmed-up), run steps below.



C) Repeat steps 18 & 19 until Committee approval of stabilization

Figure 8. Pilot Program Test Procedure: 50/50 Blend

The yellow highlights were added to indicate that the vehicle's blend level was achieved by adding E6 and E85 with vehicle rocking and operation between the fills. This was done to insure that the vehicle's diagnostic system did not detect and report a "false error."

Main Program -- E6

A) Run Fuel Change Procedure:
New Fuel = **E6**; Step 12 fill level = **90%**

B) Exhaust Emissions Testing begins
(No drain & fills, no canister loading)

16 Cold start FTP (tailpipe measured)
↓
17 Hot start US06 (tailpipe measured)
↓
18 Cold start UC (tailpipe measured)

D) Run steps below to prepare for fuel system stabilization

19 Top off with E6

E) Fuel system stablization: Run steps below weekly, repeating for 3 weeks.

Repeat Weekly

20 Vehicle parked (key off) for at least 18 hours
↓
21 Cold start LA-4, Hot start LA-4
↓
22 Vehicle parked (key off) for at least 18 hours
↓
23 Cold start LA-4, Hot start LA-4
↓
24 Static Evap test

F) Evap Emissions Testing begins

25 Drain & 45% fill with E6
↓
26 Precondition Canister
↓
27 Cold start FTP (running loss measured)
↓
28 Drain & fill to existing level[28] with E6 fuel
↓
29 Precondition Canister
↓
30 Cold start UC (running loss measured)
↓
31 Drain & fill to existing level[31] with E6 fuel
↓
32 Precondition Canister
↓
33 FTP cold start & hot start (no bags)
↓
34 Hot Soak + Diurnal (SHED measured)

Notes:

28, 31 Measure fuel removed to determine existing fuel level

Figure 9. Main Program – Test Procedure – E6 Fuel

Main Program -- E85

A) Run Fuel Change Procedure:
New Fuel = **E85**; Step 12 fill level = **90%**

B) Exhaust Emissions Testing begins
(No drain & fills, no canister loading)

16 Cold start FTP (tailpipe measured)
↓
17 Hot start US06 (tailpipe measured)
↓
18 Cold start UC (tailpipe measured)

D) Run steps below to prepare for fuel system stabilization

19 Top off with E85

E) Fuel system stablization: Run steps below weekly, repeating for 3 weeks.

Repeat Weekly

20 Vehicle parked (key off) for at least 18 hours
↓
21 Cold start LA-4, Hot start LA-4
↓
22 Vehicle parked (key off) for at least 18 hrs
↓
23 Cold start LA-4, Hot start LA-4
↓
24 Static Evap test

F) Evap Emissions Testing begins

25 Drain & 45% fill with E85
↓
26 Precondition Canister
↓
27 Cold start FTP (running loss measured)
↓
28 Drain & fill to existing level[28] with E85 fuel
↓
29 Precondition Canister
↓
30 Cold start UC (running loss measured)
↓
31 Drain & fill to existing level[31] with E85 fuel
↓
32 Precondition Canister
↓
33 FTP cold start & hot start (no bags)
↓
34 Hot Soak + Diurnal (SHED measured)

Notes:

28, 31 Measure fuel removed to determine existing fuel level

Figure 10. Main Program – Test Procedure – E85 Fuel

Main Program -- 1:2 E85:E6 mix (~E32)

A) Run Fuel Change Procedure:
New Fuel = **E6**; Step 12 fill level = **25%**

B) Run steps below to prepare for exhaust emissions testing

16 Drain & fill fuel tank to 66**%** E6
↓
17 Start & idle engine for 60-75 seconds
↓
18 Add 33**%** E85
↓
19 Hot start[19] LA-4
↓
20 Key off for at least 1 minute
↓
21 US06-like drive, then LA-4

C) Exhaust Emissions Testing begins
(No drain & fills, no canister loading)

22 Cold start FTP (tailpipe measured)
↓
23 Hot start US06 (tailpipe measured)
↓
24 Cold start UC (tailpipe measured)

Notes:
[19] Hot start here means no soaks between Steps 17 through 19

D) Run steps below to prepare for fuel system stabilization

25 Drain & fill fuel tank to 66**%** E6
↓
26 Start & idle engine for 60-75 seconds
↓
27 Add 33**%** E85
↓
28 Rock vehicle, LA-4

E) Fuel system stablization: Run steps below weekly, repeating for 3 weeks.

Repeat Weekly

29 Vehicle parked (key off) for at least 18 hrs
↓
30 Cold start LA-4, Hot start LA-4
↓
31 Vehicle parked (key off) for at least 18 hours
↓
32 Cold start LA-4, Hot start LA-4
↓
33 Static Evap test

F) Evap Emissions Testing begins

34 Drain & 45% fill with premixed fuel
↓
35 Precondition Canister
↓
36 Cold start FTP (running loss measured)
↓
37 Drain & fill to existing level[37] with premixed fuel
↓
38 Precondition Canister
↓
39 Cold start UC (running loss measured)
↓
40 Drain & fill to existing level[40] with premixed fuel
↓
41 Precondition Canister
↓
42 FTP cold start & hot start (no bags)
↓
43 Hot Soak + Diurnal (SHED measured)

Notes:
[37, 40] Measure fuel removed to determine existing fuel level

Figure 11. Main Program – Test Procedure – E32 Blend Fuel

Main Program -- 2:1 E85:E6 mix (~E59)

A) Run Fuel Change Procedure:
New Fuel = **E85**; Step 12 fill level = **25%**

B) Run steps below to prepare for exhaust emissions testing

16 Drain & fill fuel tank to 66**%** E85
↓
17 Start & idle engine for 60-75 seconds
↓
18 Add 33**%** E6
↓
19 Hot start[19] LA-4
↓
20 Key off for at least 1 minute
↓
21 US06-like drive, then LA-4

C) Exhaust Emissions Testing begins
(No drain & fills, no canister loading)

22 Cold start FTP (tailpipe measured)
↓
23 Hot start US06 (tailpipe measured)
↓
24 Cold start UC (tailpipe measured)

Notes:
[19] Hot start here means no soaks between Steps 17 through 19

D) Run steps below to prepare for fuel system stabilization

25 Drain & fill fuel tank to 66**%** E85
↓
26 Start & idle engine for 60-75 seconds
↓
27 Add 33**%** E6
↓
28 Rock vehicle, LA-4

E) Fuel system stablization: Run steps below weekly, repeating for 3 weeks.

Repeat Weekly

29 Vehicle parked (key off) for at least 18 hrs
↓
30 Cold start LA-4, Hot start LA-4
↓
31 Vehicle parked (key off) for at least 18 hours
↓
32 Cold start LA-4, Hot start LA-4
↓
33 Static Evap test

F) Evap Emissions Testing begins

34 Drain & 45% fill with premixed fuel
↓
35 Precondition Canister
↓
36 Cold start FTP (running loss measured)
↓
37 Drain & fill to existing level[37] with premixed fuel
↓
38 Precondition Canister
↓
39 Cold start UC (running loss measured)
↓
40 Drain & fill to existing level[40] with premixed fuel
↓
41 Precondition Canister
↓
42 FTP cold start & hot start (no bags)
↓
43 Hot Soak + Diurnal (SHED measured)

Notes:
[37, 40] Measure fuel removed to determine existing fuel level

Figure 12. Main Program – Test Procedure – E59 Blend Fuel

THE PILOT TEST PROGRAM

Overview - "Flex-Fuel" vehicles are expected to operate properly using either fuel type. It is likely, and also expected, that the owner of a "Flex-Fuel" vehicle will switch from one type to the other. When this switch occurs, the residual fuel from previous operation will combine with the new fuel, resulting in a mixture between the two extremes. The fuel control system is required to dynamically identify and adapt to different fuel blends and to control exhaust emission levels while maintaining good drivability. Discussions with representatives from Chrysler, Ford and GM indicated that the systems would adapt easily within one urban driving cycle.

The Pilot Test Program was designed to establish how long it took the "Flex-Fuel" systems to adjust to a new fuel composition after a refueling event. The situation-in-question was that a vehicle could have been operating (for example) on a low ethanol fuel for a number of days, and then, while the tank was almost empty, been refueled with E85 (or the reverse situation). How long would it take for the vehicle's control system to recognize the new fuel composition and make the appropriate adjustments? What, if any, excess emissions would result while the system was "adjusting?"

Three vehicles were identified, one from each of the three domestic manufacturers, for this investigation.

Program ID	Model Year, Make, Model	Odo at Start of Test (mi)
8001	2007 Dodge Grand Caravan	30,514
8003	2007 Ford Crown Victoria	16,345
8004	2007 Chevrolet Tahoe LS	18,555

While the design of the Main Test Program required the fitting of fully aged catalytic systems, the Pilot Program was performed with the as-received catalytic converter(s), and the as-received oxygen sensors[9].

The Pilot Program Test Procedure - The content of the test program included sudden fuel changes from:

E85 to E6
E6 to E85
E85 to E45.5

The first transition test followed operation of each vehicle on E85, then a tank drain and a refill to 40% tank capacity with the E6 fuel. The vehicle was pushed to the emission test cell, the appropriate connections and restraints made, and a "hot re-start drive-away," using the LA92 driving cycle (a.k.a. the "Unified Cycle"). The vehicle emissions were measured, pre- and post-catalyst, dilute tailpipe, and CFV bag for the 10 mile drive. All but the CFV bag were measured

[9] A factor involved in the decision to perform the Pilot Program with the as-received catalysts was the inherent delay in preparing and fitting the vehicles with the manufacturer supplied aged catalysts.

and recorded each second in concentration and mass-per-second using established laboratory procedures and calculation methods.

The first step in the baseline testing was the same as for the fuel switch procedure. The vehicles were stabilized on each fuel and then the new fuel was added. To change from fuel to fuel, the level of fuel in the tank was reduced to a gallon. This was accomplished by using the vehicle's fuel pump to empty the tank through the fuel pressure service port, or a disconnection at the chassis connection to the fuel rail. The vehicle's fuel pump was remotely energized by a lab-implanted switch at the chassis fuse panel. The engine was not run during the drain. The removed fuel was collected in an external fuel can, and one gallon returned to the tank. The fuel pump was then again energized to re-prime the fuel system. The tank was then filled to capacity with the new fuel.

As soon as the tank was filled, the laboratory staff pushed the vehicle to the emission test site, made the appropriate connections, and started a hot "drive-away" emissions test, following the refueling event. No more than 45 minutes were allowed to elapse from the key-off and fuel change to the start of the hot start drive-away emission test. During these changes, the exhaust emissions were collected and analyzed. To gather the test samples, the three vehicles underwent one hot Unified Cycle (representing the drive-away from the fuel station) and four cold Unified Cycles. "Cold" indicates that the emissions are measured after an 18 to 36 hour park at 68° to 86°F in the laboratory soak area.

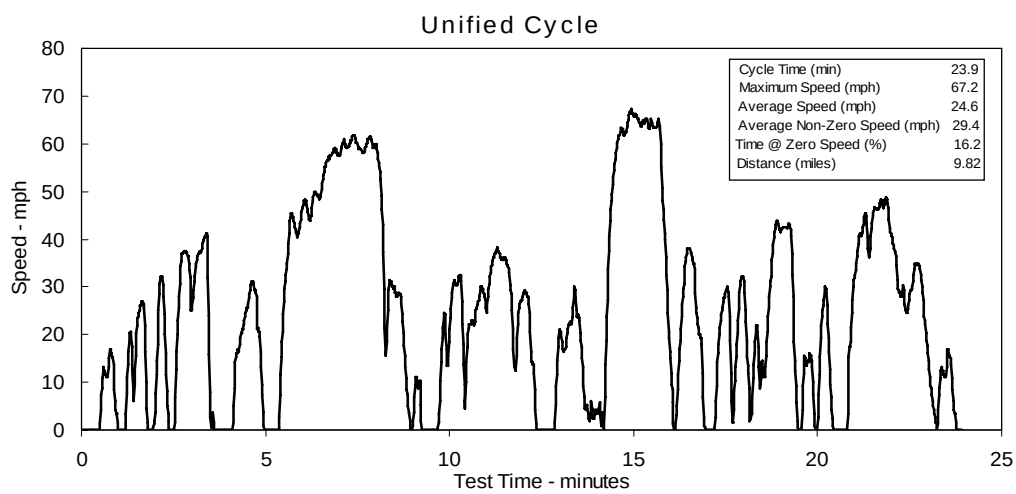


Figure 13 – Unified Driving Cycle (LA92 or UC)

Pilot Program Results – Figure 14 at the right shows a bar chart presentation of the emission data for one of the three vehicles, in this case Vehicle 8003. Additional example plots are presented in Appendix I to show the other vehicles and driving cycles.

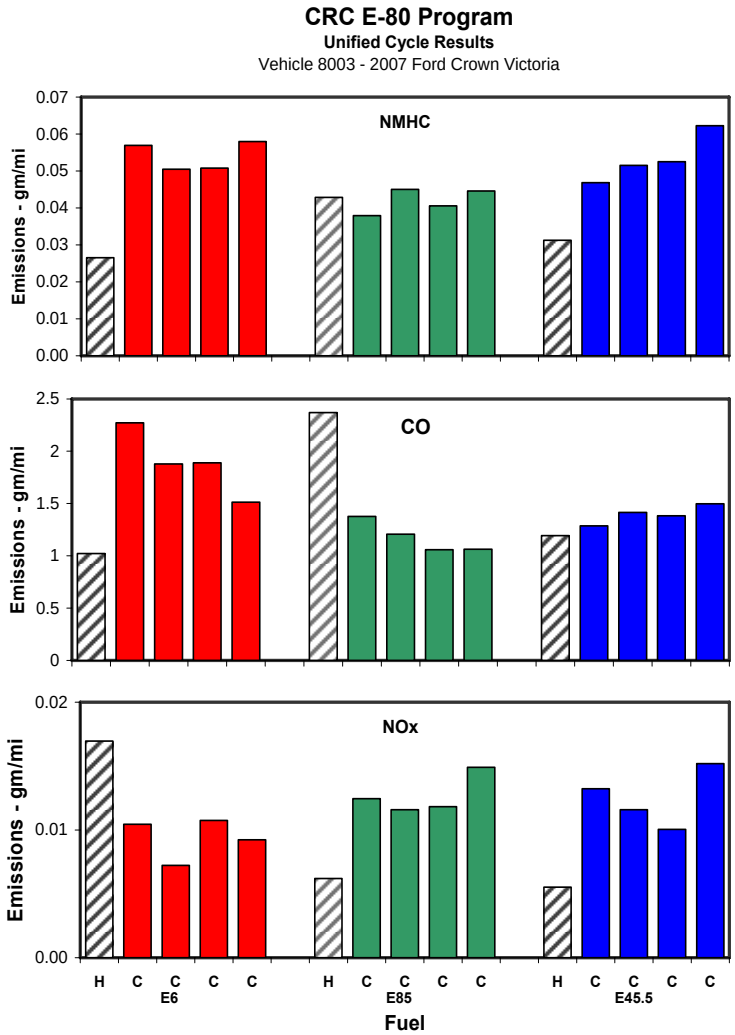


Figure 14. Pilot Program Emission Results - Example

The three panels in Figure 14 show the NMHC, CO and NOx test results for the five emission tests on each of the three fuels (E6, E85 and E45.5). The left shaded bar represents the emission measure during the "hot-start" drive-away after the refueling event with the new fuel. The four colored bars represent the following four days cold-start emission results.

The blue bars in the NMHC panel perhaps show a trend with test order, possibly indicating that the NMHC increased with each test following the E45.5 fuel replacement. The range of the data was from 0.04 to 0.06 g/mile, ± 20% of the 0.05 level. Before one would conclude that this performance shows a "learning trend" for the E45.5 swap, a value for the reproducibility of the test measurements would be needed. Is the difference between the tests just an artifact of inherent test variation? The needed repeatability data were not available, so an attempt was made to combine all four vehicles' performance into an average performance metric.

This analysis normalized each emission test level to the averages for the three vehicle fleet. The next three figures (15-17) are one way of viewing this same data. Figure 15 is a three panel presentation of NMHC normalized to the average of the four Cold UC tests, for all three vehicles on the three fuel change transitions conducted. Generally, the average normalized value approached unity by the first Cold UC test.

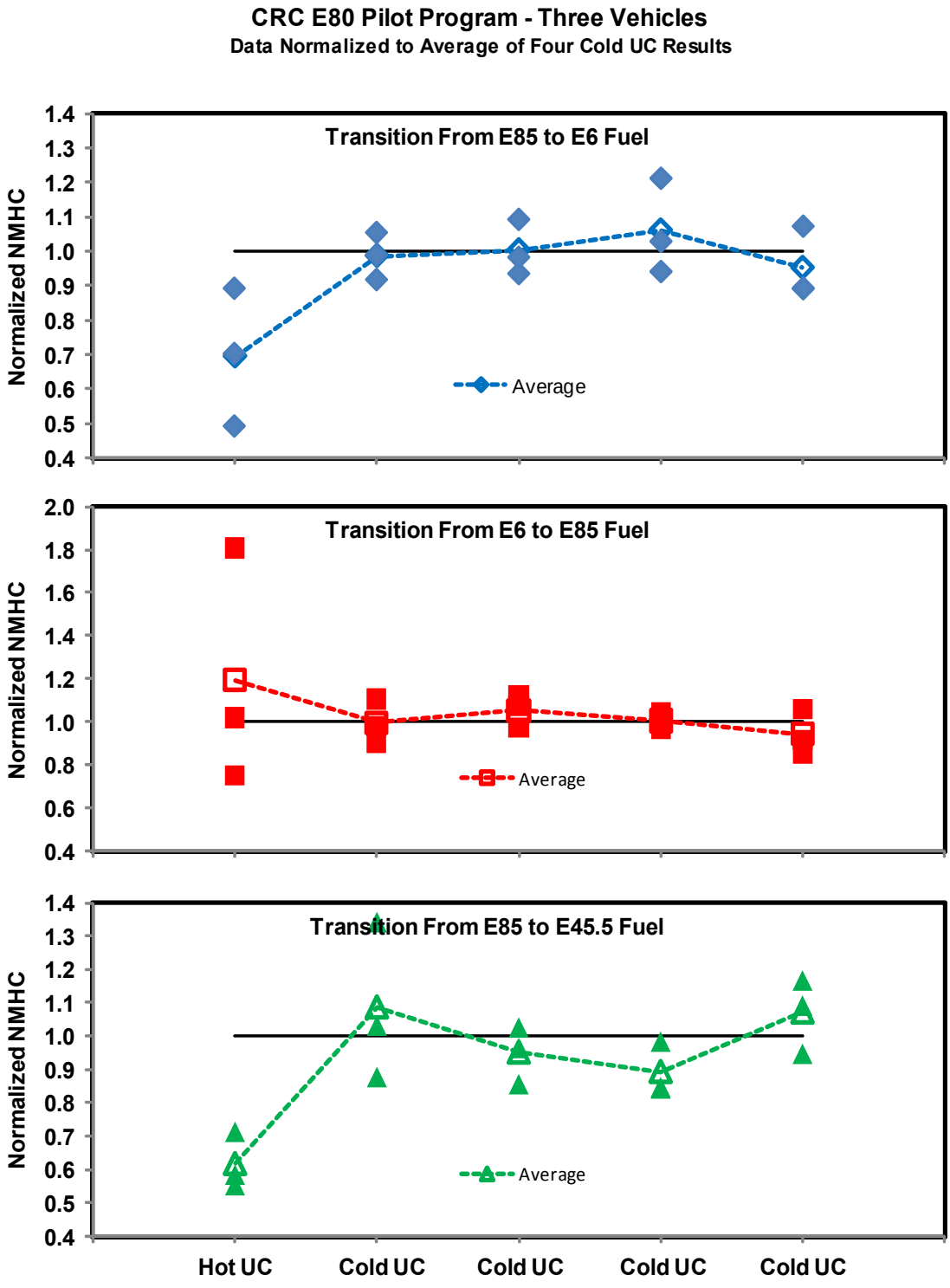


Figure 15. Normalized NMHC Emissions: Fuel Transitions

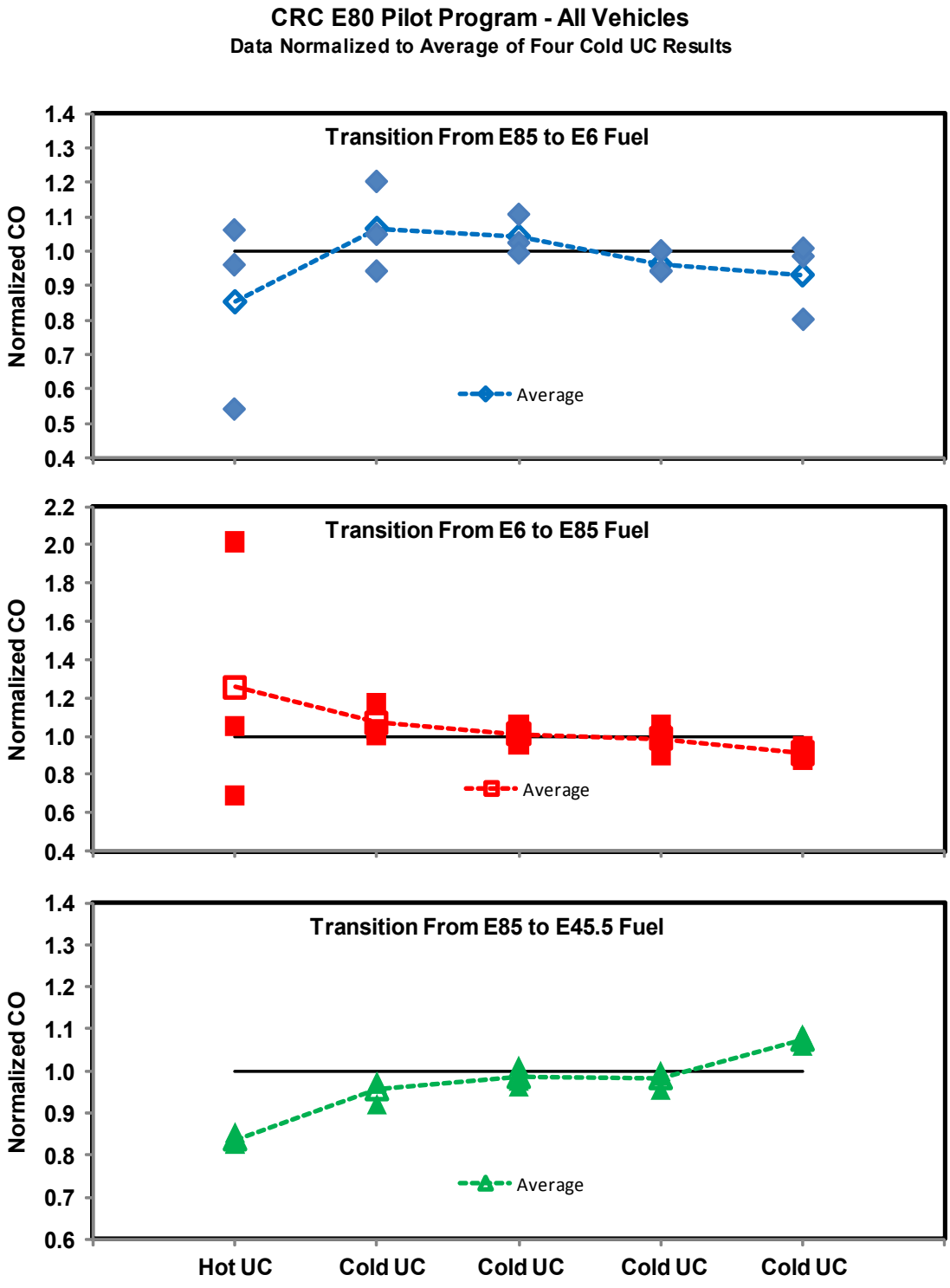


Figure 16. Normalized CO Emissions: Fuel Transitions

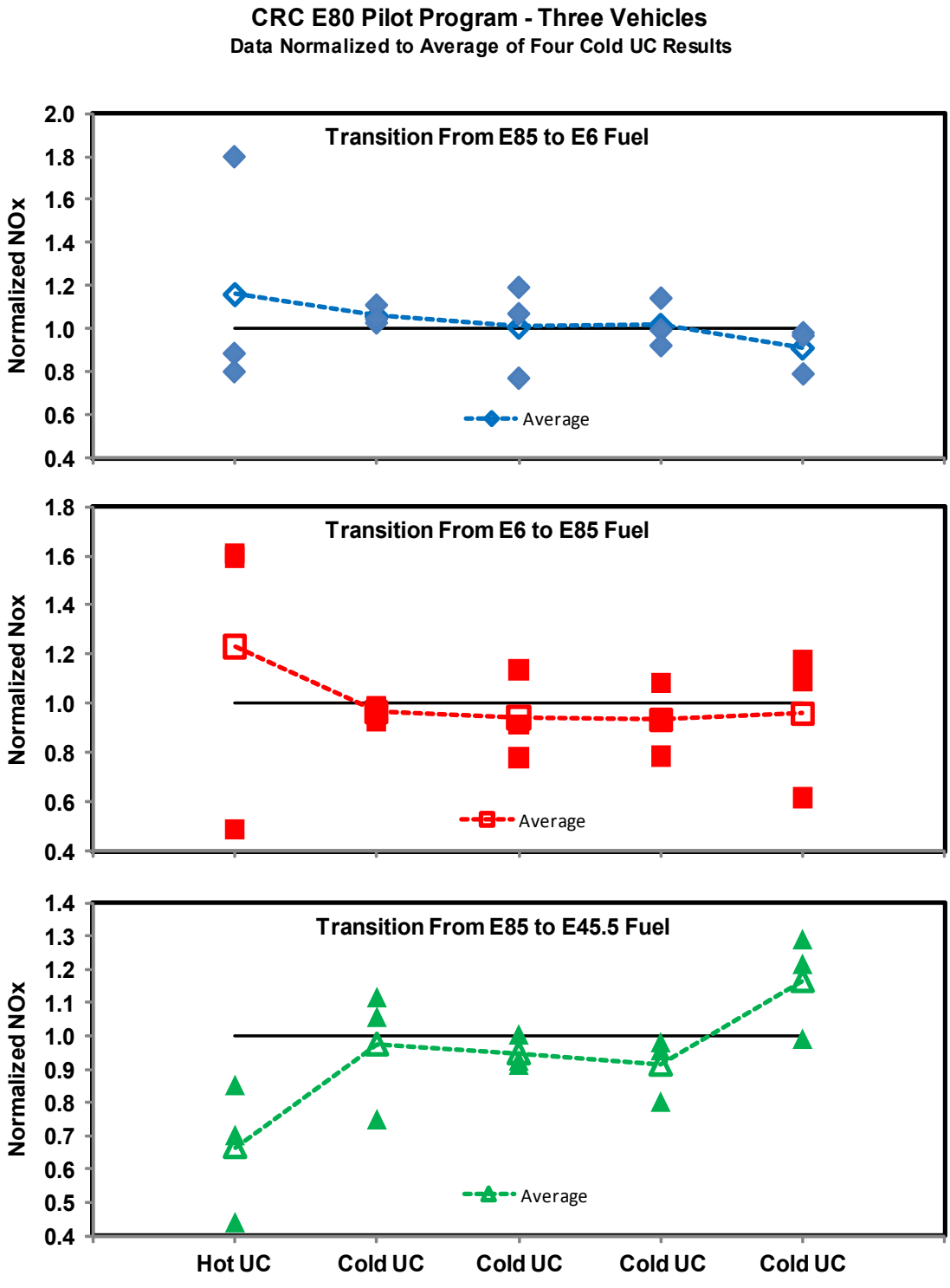


Figure 17. Normalized NOx Emissions: Fuel Transitions

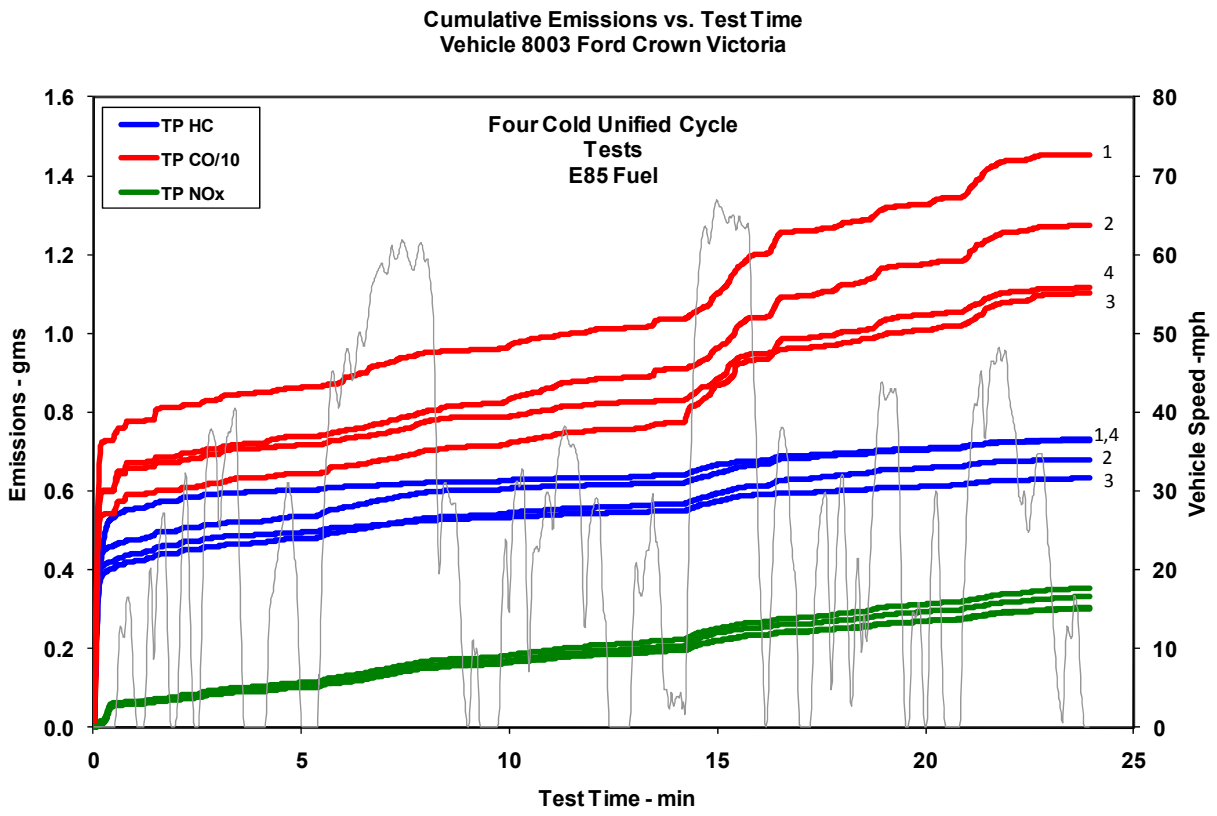


Figure 18. Cumulative Emissions Example

Another way of presenting the test data for analysis is shown in Figure 18. The cumulative tail-pipe (TP) emissions are plotted over the time basis for the cold start LA92 drive cycles. The TP NOx is shown with the green traces. The blue traces represent the TP HC, and the red traces represent the TP CO divided by 10 to keep the traces on the same plot. The numbers at the ends of the HC and CO traces indicate the chronological testing order for the four tests.

That the emission traces are relatively similar after an initial off-set (especially for CO and HC) is an artifact of the catalytic converter's "light-off". The data suggest that the differences in the overall emission levels occur in the first minute of the vehicle operation. While the NOx values for this plot are very repeatable, the other two, especially the CO, indicate the high early emission rate followed then by similar day-to-day levels. Similar plots for the other vehicles and driving cycles are presented in Appendix I.

A "Walk-Through" Data Example - Consider the HC performance of the Caravan (8001) when tested on E6, highlighted in Table 11. The hot start emission level for the first test (#5616) was 69 mg/mile. This is the emissions that were created during a 10 mile drive "after leaving the fuel station" with a completely different fuel (E6 replacing the previous experience with E85). The HC converter efficiency was over 90% on this test.

A cold start on the next day produced 77 mg/mile, and a test on the day following was also 77 mg/mile. The remaining two tests were 73 and 68 mg/mile. From these data, it is concluded that the system did not lose control.

Table 11. Emission Results Example

				Unified Cycle Results (grams/mile)						
Fuel	Test Type	Date	Test#	NMHC	CH4	HC	CO	NOX	CO2	MPG
E6	Hot UC	4/21/08	5616	0.050	0.016	0.069	1.40	0.04	501	16.48
	Cold UC	4/22/08	5620	0.055	0.019	0.077	1.38	0.04	487	16.94
	Cold UC	4/23/08	5623	0.061	0.013	0.077	1.35	0.05	496	16.64
	Cold UC	4/24/08	5626	0.057	0.012	0.073	1.24	0.04	496	16.64
	Cold UC	4/25/08	5629	0.050	0.015	0.068	1.30	0.03	498	16.58
E85	Hot UC	4/28/08	5630	0.054	0.016	0.074	1.14	0.04	481	12.64
	Cold UC	4/29/08	5633	0.033	0.016	0.052	1.12	0.02	484	12.56
	Cold UC	4/30/08	5637	0.029	0.015	0.046	1.03	0.02	482	12.61
	Cold UC	5/1/08	5643	0.030	0.014	0.047	1.08	0.03	485	12.53
	Cold UC	5/2/08	5646	0.028	0.018	0.047	1.02	0.02	485	12.54
E45.5	Hot UC	5/5/08	5649	0.034	0.015	0.051	1.08	0.02	490	14.71
	Cold UC	5/6/08	5650	0.063	0.012	0.080	1.26	0.02	487	14.80
	Cold UC	5/7/08	5651	0.063	0.014	0.081	1.26	0.03	485	14.87
	Cold UC	5/8/08	5652	0.052	0.015	0.070	1.30	0.03	485	14.87
	Cold UC	5/9/08	5653	0.067	0.013	0.084	1.38	0.04	481	14.98

Look at the emission performance when the fuel was switched from E6 to E85. The hot start E85 drive-away HC emission level was measured at 74 mg/mile, then decreased to 50 mg or less.

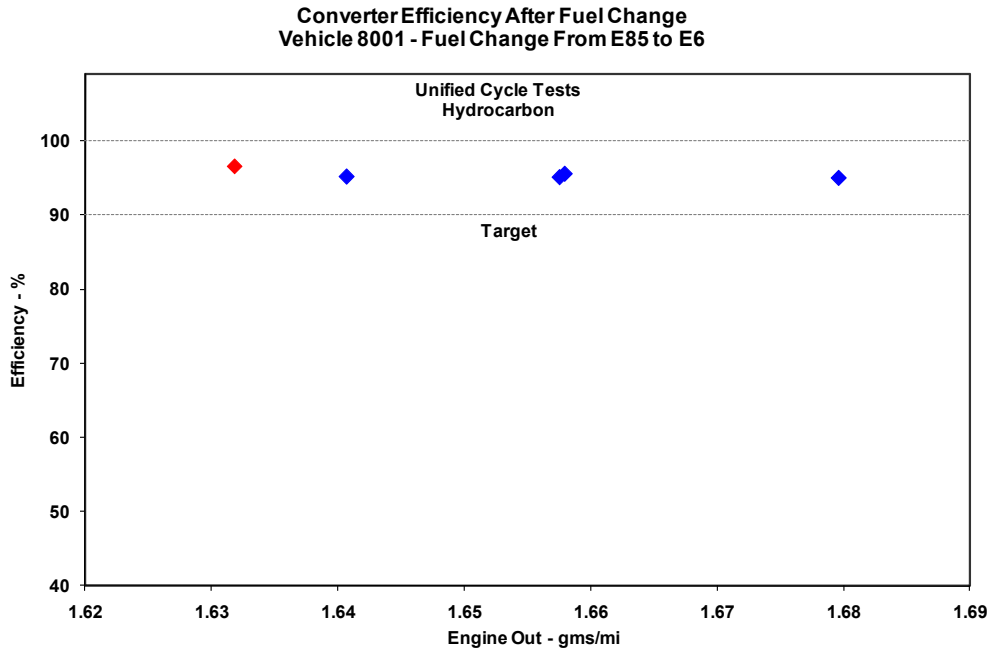


Figure 19. Converter Efficiency Response

Figure 19 shows a plot of the conversion efficiency for HC for the E85 to E6 transition tests, and illustrates that while the engine out HC emission levels ranged from 1.63 to 1.68+ g/mile, the converter efficiency was over 90% for all the tests. Similar relationships exist for the other vehicles, fuels and emissions. The expanded dataset is contained in Appendix I.

Some Thoughts Concerning the "No Loss of Control" Conclusion - Contemporary vehicles in good repair have very low levels of regulated exhaust emissions (HC, CO and NOx). Repeated measurements of exhaust emissions will have a central tendency with some variation due to random test error. An appropriate measure of the variance from data on these new low emission level vehicles is not known, but it might be 10% of level (one standard deviation).

These low emission levels are achieved by aggressive after-treatment of the combustion products with a catalytic converter. Feedback control hardware and adaptive learning techniques are used to optimize the converter performance and maintain these low emission levels.

While the input levels of combustion HC emissions might be in the order of 1700 mg/mile, the post-catalytic emissions (tailpipe) may be reduced by 96% to 70 mg/mile. The "conversion efficiency" is 96%, and, expressed a different way, the "breakthrough emissions" are just 4% of the engine out levels. Conversion efficiencies, even for CO and NOx, of 90 to 98% are not unusual in today's vehicles.

Pilot Program Summary - Emission system control was well maintained on all three vehicles during all of the fuel changes performed.

THE MAIN TEST PROGRAM

Overview - The Main Program part of the E-80 test program was a significant effort to characterize the exhaust and evaporative emissions of the "Flex-Fuel" fleet in several driving and evaporative modes and with four different fuel ethanol levels. There are two listings offered below that attempt to summarize the scope of the experimental program, and indicate the size of the data record involved.

Exhaust Emissions

- 7 Vehicles x 4 Fuel Blends x 3 Driving Cycles = 84 vehicle/fuel/driving cycle combos

- Modal Results (FTP = 3 phases, US06 and Unified Cycle = 1 phase)
    - Pre-Converter
    - Post Converter
    - Dilute Tail-pipe
    - CFV Bag

- Second-by-Second Measurements (Exhaust Flow Rate per second)
- Concentration and Mass for HC, CO, NOx and CO_2
    - Pre-Converter
    - Post Converter
    - Dilute Tail-pipe

- Speciation by GC (504 files)
    - 84 Vehicle/Fuel/Driving Cycles times
        - 3 Phases per FTP and Composite
        - 1 Phase per US06 and Unified Cycle

- Speciation by LC (Aldehydes) (504 files)
    - 84 Vehicle/Fuel/Driving Cycles times
    - 3 Phases per FTP and Composite
    - 1 Phase per US06 and Unified Cycle

Evaporative Emissions

- 4 Vehicles x 4 Fuels x 3 Test Sequences = 48 Vehicle/Fuel/Test combos

- Test Sequences
  - Running Loss @ 86°F
  - Hot Soak @ 75°F
  - Two Day Diurnal @ (65°F to 105°F to 65°F)

- Modal Measurements (96 Files)
  - Running Loss = 1 Bag (2 LA92 Driving Cycles)
  - Hot Soak = 1 bag (I Hour following FTP Drive Cycle)
  - Diurnal = 2 Bag (Day 1 and Day 2)

- Time Sequence Data (96 Files)
  - Running Loss – Every half second for 48 minutes of HC, EtOH, R-134a
  - Hot Soak - Every half second for 60 minutes of HC, EtOH, R-134a
  - Two Day Diurnal - Every 10 minutes for 48 hours of HC, EtOH, R-134a

- Speciation by GC (96 Files)
  - Running Loss @ 86°F
  - Hot Soak @ 75°F
  - Two Day Diurnal (65°F to 105°F to 65°F)

A statistical analysis was performed on the data to determine whether observed changes are significant. Details of the analysis are included in Appendix V. Conclusions as to the statistical significance of individual trends are included in the discussion of the individual emissions.

Main Program Test Procedure

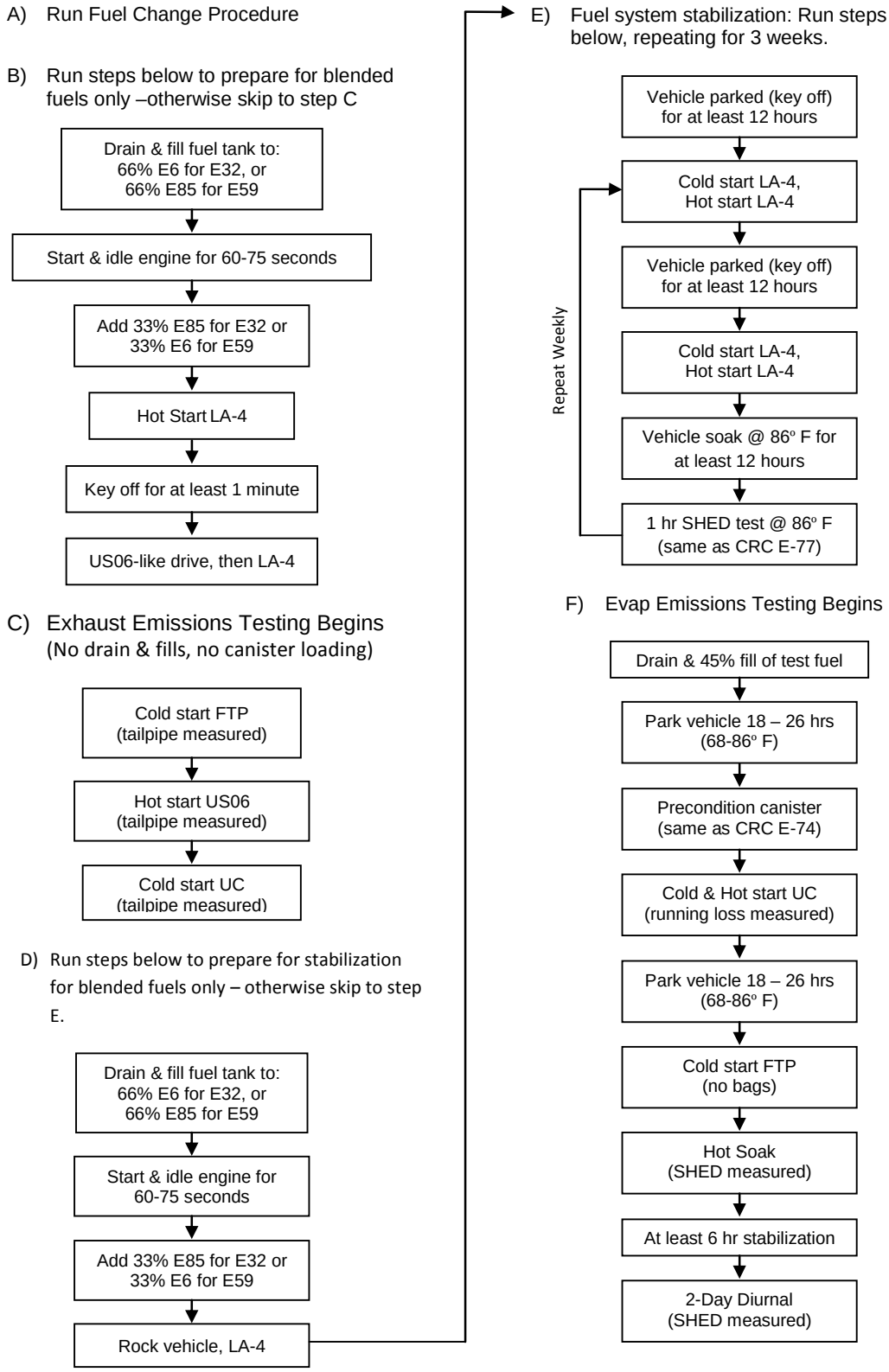


Figure 20. Main Program Test Procedure

Exhaust Emission Results

Each vehicle was evaluated for exhaust emissions with the four fuels in random order. The exhaust emission procedure consists of the following steps:

1. Run the fuel change procedure as shown in Figure 3 to stabilize the vehicle on the evaluation fuel (e.g., E6).
2. Drain and fill the tank to 90% of rated level with the evaluation fuel.
3. Perform a Cold Start FTP Test
    a. Park vehicle at 68-86ºF for 18-36 hours
    b. Cold start drive
    c. Measure pre- and post-catalyst mass emissions on a second-by-second basis
    d. Collect and measure mass emissions in bags per California Test procedure
    e. Collect six[10] bags and analyze using gas chromatography
    f. Collect aldehyde samples on DNPH impregnated cartridges for off-site analysis
4. Perform a hot-start US06 Test
    a. Drive the US06 cycle
    b. Measure pre and post catalyst mass emissions on a second-by-second basis
    c. Collect and measure mass emissions in bags per FTP
    d. Collect two bags and analyze using gas chromatography
    e. Collect aldehyde sample on DNPH impregnated cartridge for off-site analysis
5. Perform a cold start Unified Cycle Test
    a. Park vehicle at 68-86ºF for 18-36 hours
    b. Cold start drive
    c. Measure pre- and post-catalyst mass emissions on a second-by-second basis
    d. Collect and measure mass emissions in bags per California Test procedure
    e. Collect two bags and analyze using gas chromatography
    f. Collect aldehyde sample on DNPH impregnated cartridge for off-site analysis
6. If the vehicle is to be evaluated for evaporative emissions, proceed to the evaporative emissions procedure for this evaluation fuel; otherwise, proceed to the next evaluation fuel and repeat the exhaust emission procedure above.

[10] Three sample bags and three dilution air bags

Criteria Emissions by Driving Cycle

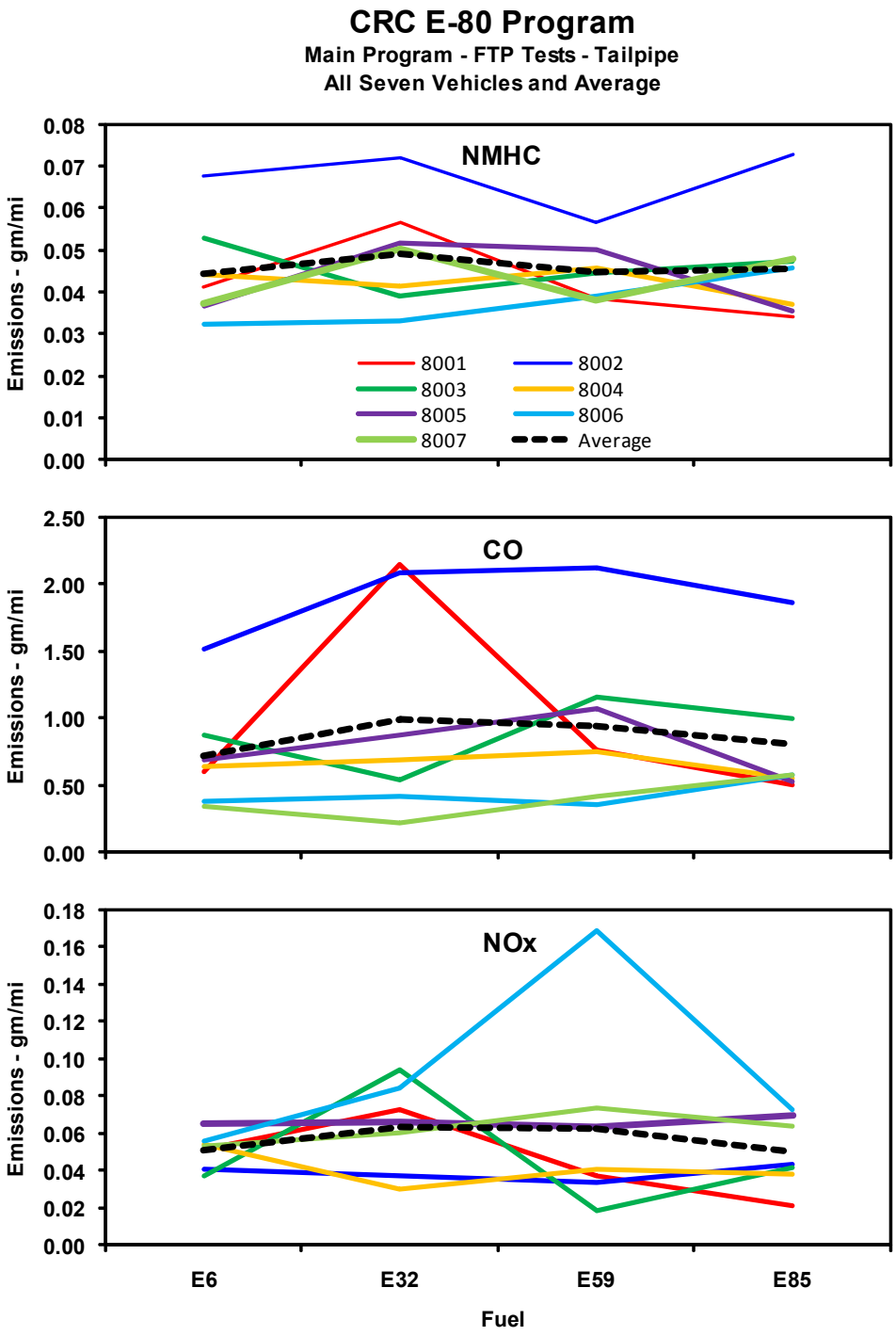


Figure 21. Criteria Emissions – FTP Tests

Table 12
Data for Figure 21 – FTP Tests

NMHC - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	FTP	0.0411	0.0678	0.0527	0.0441	0.0365	0.0325	0.0372	0.0445
E32	FTP	0.0567	0.0719	0.0390	0.0413	0.0516	0.0330	0.0502	0.0491
E59	FTP	0.0383	0.0566	0.0447	0.0458	0.0502	0.0391	0.0381	0.0447
E85	FTP	0.0339	0.0730	0.0471	0.0369	0.0353	0.0457	0.0479	0.0457
CO - gms/mi		**Vehicle No.**							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	FTP	0.599	1.521	0.873	0.638	0.690	0.384	0.348	0.722
E32	FTP	2.146	2.086	0.537	0.684	0.870	0.413	0.219	0.994
E59	FTP	0.764	2.120	1.151	0.752	1.070	0.353	0.420	0.947
E85	FTP	0.499	1.864	0.996	0.553	0.528	0.581	0.579	0.800
NOx - gms/mi		**Vehicle No.**							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	FTP	0.051	0.041	0.037	0.054	0.065	0.056	0.053	0.051
E32	FTP	0.073	0.037	0.094	0.030	0.066	0.085	0.061	0.064
E59	FTP	0.037	0.033	0.018	0.040	0.063	0.169	0.073	0.062
E85	FTP	0.021	0.043	0.041	0.038	0.070	0.072	0.064	0.050

Figure 21 and Table 12 above show the emission performance for the seven vehicles on four fuels using the Federal Test Procedure[11] (FTP). The values shown are the "composite" values, using the hot/cold weighting technique.

[11] 40 CFR 86.127-00 Test Procedures; Overview

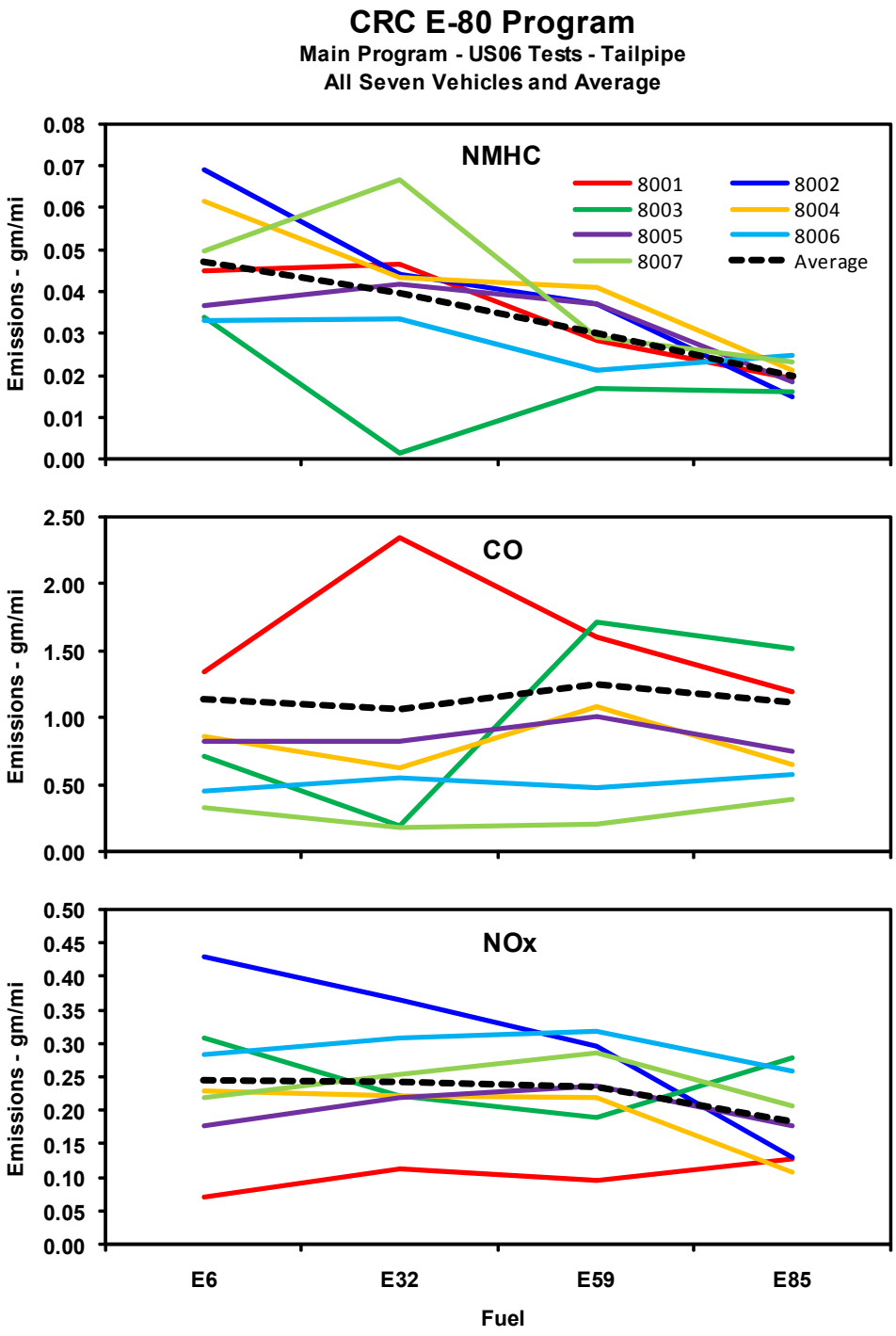


Figure 22. Criteria Emissions – US06 Tests

Table 13
Data for Figure 22 – US06 Tests

NMHC - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	US06	0.0448	0.0692	0.0338	0.0617	0.0365	0.0332	0.0499	0.0470
E32	US06	0.0467	0.0443	0.0014	0.0432	0.0417	0.0335	0.0667	0.0397
E59	US06	0.0284	0.0372	0.0170	0.0411	0.0369	0.0214	0.0292	0.0302
E85	US06	0.0191	0.0150	0.0161	0.0213	0.0184	0.0250	0.0232	0.0197

CO - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	US06	1.341	3.492	0.715	0.862	0.824	0.450	0.328	1.144
E32	US06	2.344	2.763	0.190	0.630	0.819	0.553	0.177	1.068
E59	US06	1.605	2.626	1.712	1.086	1.006	0.475	0.205	1.245
E85	US06	1.198	2.679	1.520	0.650	0.753	0.574	0.397	1.110

NOx - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	US06	0.071	0.429	0.307	0.230	0.177	0.284	0.219	0.245
E32	US06	0.113	0.365	0.221	0.223	0.219	0.309	0.253	0.243
E59	US06	0.094	0.297	0.188	0.218	0.236	0.319	0.286	0.234
E85	US06	0.128	0.130	0.280	0.108	0.177	0.260	0.206	0.184

Figure 22 and Table 13 above show the emission performance for the seven vehicles on four fuels using the “High Speed/Load” (US06) test procedures as described at 40 CFR 86.159-00. This is a “hot start” test and represents vehicle speeds up to 80 miles per hour and acceleration rates not included in the FTP.

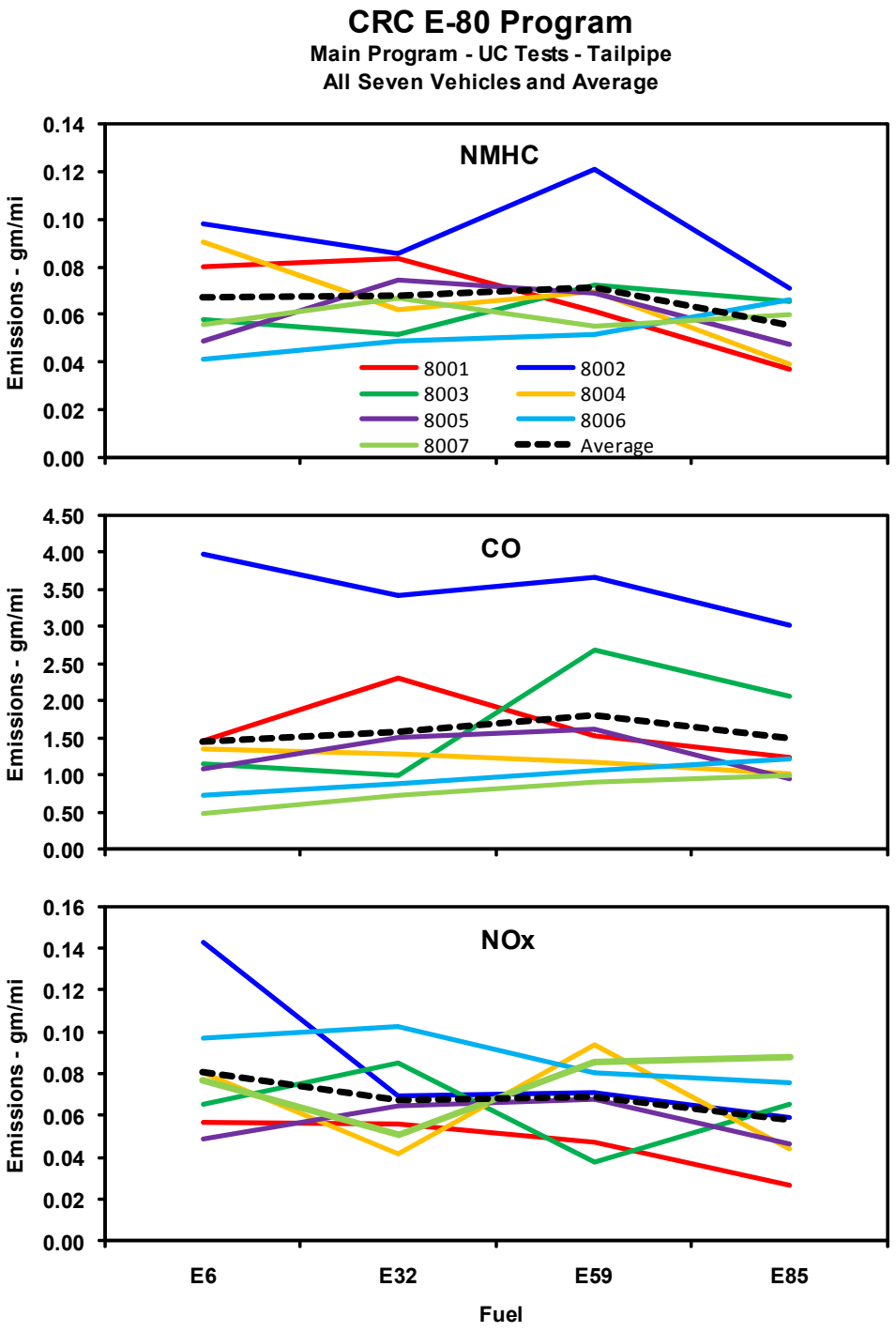


Figure 23. Criteria Emissions – UC Tests

Table 14
Data for Figure 23 – UC Tests

NMHC - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	Cold UC	0.0803	0.0984	0.0578	0.0905	0.0487	0.0412	0.0559	0.0675
E32	Cold UC	0.0838	0.0857	0.0519	0.0621	0.0748	0.0490	0.0667	0.0677
E59	Cold UC	0.0613	0.1212	0.0724	0.0697	0.0690	0.0518	0.0551	0.0715
E85	Cold UC	0.0374	0.0711	0.0653	0.0393	0.0474	0.0664	0.0602	0.0553

CO - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	Cold UC	1.450	3.983	1.145	1.338	1.093	0.724	0.487	1.460
E32	Cold UC	2.300	3.416	1.004	1.274	1.505	0.879	0.735	1.588
E59	Cold UC	1.522	3.653	2.686	1.173	1.611	1.071	0.906	1.803
E85	Cold UC	1.233	3.013	2.064	1.010	0.957	1.220	0.996	1.499

NOx - gms/mi		Vehicle No.							
		8001	8002	8003	8004	8005	8006	8007	Average
E6	Cold UC	0.056	0.143	0.065	0.081	0.048	0.097	0.077	0.081
E32	Cold UC	0.056	0.069	0.085	0.042	0.064	0.102	0.051	0.067
E59	Cold UC	0.047	0.071	0.038	0.094	0.068	0.080	0.086	0.069
E85	Cold UC	0.027	0.059	0.065	0.044	0.046	0.075	0.088	0.058

Figure 23 and Table 14 show the emission performance for the seven vehicles on four fuels using the "Unified Cycle" (LA92) procedures. The Unified Cycle is an urban driving cycle similar to the Los Angeles Route Four (LA4) driving cycle used in the FTP. For an expanded discussion see http://www.arb.ca.gov/msei/onroad/briefs/Publication3.pdf.

Summary – The average emissions for the seven vehicles tested did not indicate a statistically significant emission trend with increasing ethanol level on the cold start FTP emission evaluation.

The US06 high speed/load driving schedule indicated a statistically significant trend of decreasing non-methane hydrocarbon emissions (NMHC) with increasing ethanol content in the fuel. The average NMHC value decreased for 0.047 with the E6 fuel to 0.020 with E85. The CO and NOx emissions, on average, did not indicate a trend with ethanol level.

The cold start Unified Driving Cycle test results did not show a trend with increasing ethanol level for the NMHC, CO or NOx, although the NOx trend was nearly statistically significant ($p = 0.0642$).

Plots and tables of individual vehicles exhaust results are contained in Appendix II.

Exhaust Speciation and Reactivity Analysis

The E-80 scope of work request included chromatographic speciation of all the vehicle tests and generated a sizable file of test results. The detailed speciation summaries are presented in Appendix III. The next few pages explain the project's file structure and the calculations used to speciate and calculate the reactivity of the various tests.

Basic Speciation File Example - Table 15 is a truncated example of the basic speciation file that is generated by the laboratory (ATL). While it has been cut off after elution number 26, there are 172 species in the total report, plus methanol, ethanol and R-134a (refrigerant)[12]. This selected file exists as one of the tabs in the project data file set identified as "8001cgSum.xls." This example summarizes the results for the FTP test on vehicle 8001– test number 5825.

Table 15. Exhaust Speciation Data File Example

Vehicle 8001
Type: FTP
Test# 5825

			ppmC			gm			gm/mile			
	Species Name	CAS #	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	Composite
1	Methane	00074-82-8	2.23	0.24	0.64	0.121	0.022	0.035	0.034	0.006	0.010	0.013
2	Ethylene	00074-85-1	1.01	0.00	0.00	0.048	0.000	0.000	0.013	0.000	0.000	0.003
3	Acetylene (Ethyne)	00074-86-2	0.34	0.00	0.00	0.015	0.000	0.000	0.004	0.000	0.000	0.001
4	Ethane	00074-84-0	0.19	0.00	0.00	0.010	0.000	0.000	0.003	0.000	0.000	0.001
5	Propene	00115-07-1	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	Propane	00074-98-6	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7	Allene (Propadiene)	00463-49-0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	Propyne	00074-99-7	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	2-Methylpropane	00075-28-5	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	2-Methylpropene & 1-Butene	00115-11-7+0(	0.11	0.00	0.00	0.005	0.000	0.000	0.001	0.000	0.000	0.000
11	1,3-Butadiene	00106-99-0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	n-Butane	00106-97-8	0.61	0.00	0.00	0.030	0.000	0.000	0.008	0.000	0.000	0.002
13	2,2-Dimethylpropane	00463-82-1	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	t-2-Butene	00624-64-6	0.07	0.00	0.00	0.003	0.000	0.000	0.001	0.000	0.000	0.000
15	1-Butyne	00107-00-6	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	c-2-Butene	00590-18-1	0.54	0.23	0.11	0.026	0.019	0.005	0.007	0.005	0.001	0.004
17	3-Methyl-1-butene	00563-45-1	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	2-Methylbutane (Isopentane)	00078-78-4	1.86	0.00	0.28	0.090	0.000	0.013	0.025	0.000	0.004	0.006
19	1-Pentene & 2-Butyne	00109-67-1+0(	0.06	0.00	0.00	0.003	0.000	0.000	0.001	0.000	0.000	0.000
20	2-Methyl-1-butene	00563-46-2	0.06	0.00	0.00	0.003	0.000	0.000	0.001	0.000	0.000	0.000
21	n-Pentane	00109-66-0	0.09	0.00	0.00	0.004	0.000	0.000	0.001	0.000	0.000	0.000
22	2-Methyl-1,3-butadiene	00078-79-5	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	t-2-Pentene	00646-04-8	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24	3,3-Dimethyl-1-butene	00558-37-2	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25	c-2-Pentene	00627-20-3	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	2-Methyl-2-butene	00513-35-9	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000

[12] Stating again, the permeation performance values used in this report have corrected the FID's misidentification of the ethanol molecule, and the identified non-fuel components, methanol and refrigerant (R-134a), have been subtracted from the totals.

The file is organized in the following fashion: the first column is the elution number, the second column is the species name, and the third is the Chemical Abstract Services (CAS) Number (with leading zeros as necessary to maintain a 10 digit format). The CAS number is a unique number created and maintained by the CAS Registry® (http://www.cas.org/index.html) that provides a name and property resource for recognized substances.

The next three sets of columns in the table are the test results expressed in various terms. The EXCEL™ file contains six or more digits of precision, but the figure has the precision reduced for clarity. The net concentration in ppmC is calculated by subtracting (for each species) the start of test concentrations (T_0) from the final results, yielding the net increase in concentration for the test. The net mass for each of the species is calculated by using appropriate volume, concentration and density values

Total VOC, NMOG, Acetaldehyde, Formaldehyde, and Aldehydes as a % of the NMOG -
The inclusion of the aldehyde analysis in the E-80 scope of work allowed a more comprehensive review of the exhaust emission levels. It was expected that the higher ethanol blends would produce higher acetaldehyde and perhaps formaldehyde levels in the exhaust emissions. A series of plots have been made to present the results.

For this report, it is defined that the *total volatile organic compounds* (total VOC) are the sum of non-oxygenated and oxygenated hydrocarbons identified in the collected gas sample, including all identified alkanes, alkenes, alkynes, and aromatics containing 12 or fewer carbon atoms, the alcohols (methanol and ethanol), and the aldehydes.

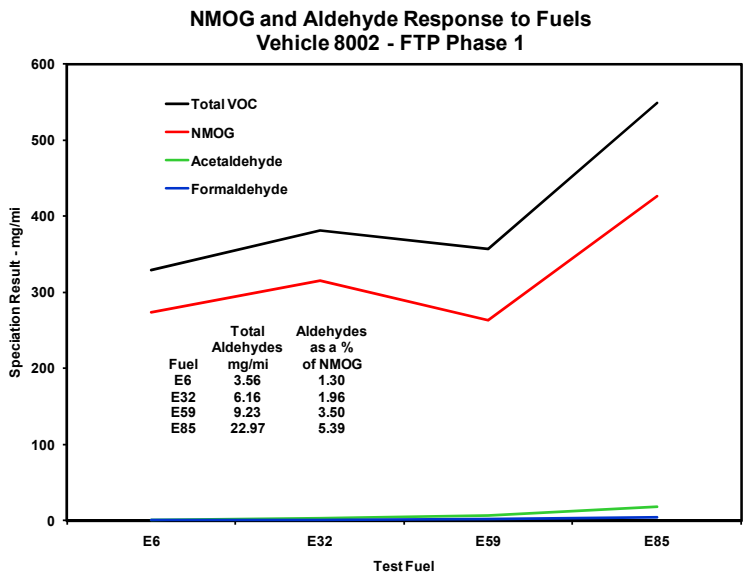
The non-methane organic gases (NMOG) are the total VOC as defined above minus the mass of the methane (CH_4).

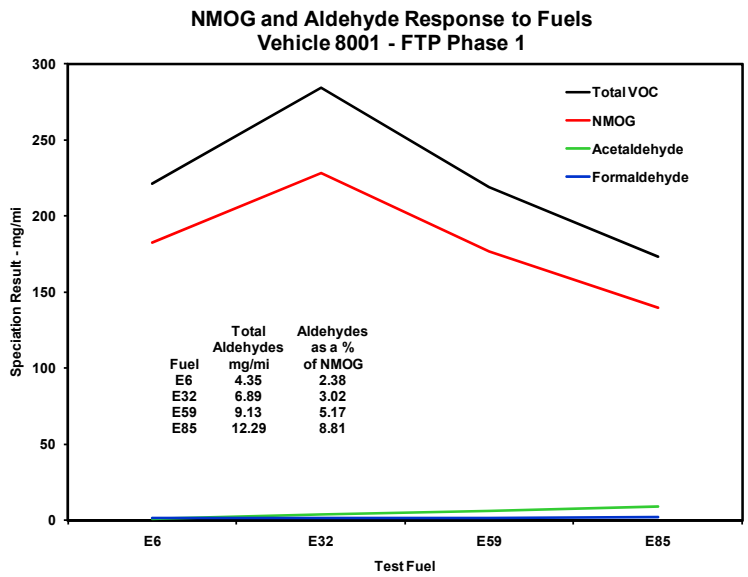
The seven vehicle**'s** NMOG test results are presented in the following pages in four sets of groupings:

1. The FTP Phase One (Bag 1)
2. Composite FTP
3. High Speed/Load (US06)
4. Unified Cycle

NMOG Analysis by Vehicle and Cycle – FTP Phase 1: The following seven plots (Figure 24) show the NMOG results measured on the E-80 vehicles while driving the Federal Test Procedure (FTP) Phase 1. The FTP is a principal component of the emission certification performance requirements (see 40 CFR 86.130-00). Phase 1 is the first 505 seconds of the emission test driven after an overnight park at 68-86°F. Phase 1 is isolated here because this is the source of the majority of the emissions measured during a test.

Vehicles 8002, 8003, 8006 and 8007 may suggest an increasing trend with increasing ethanol levels that were not shown by the other three vehicles. The aldehydes increase as a percentage of NMOG with increasing ethanol on all seven vehicles tested.





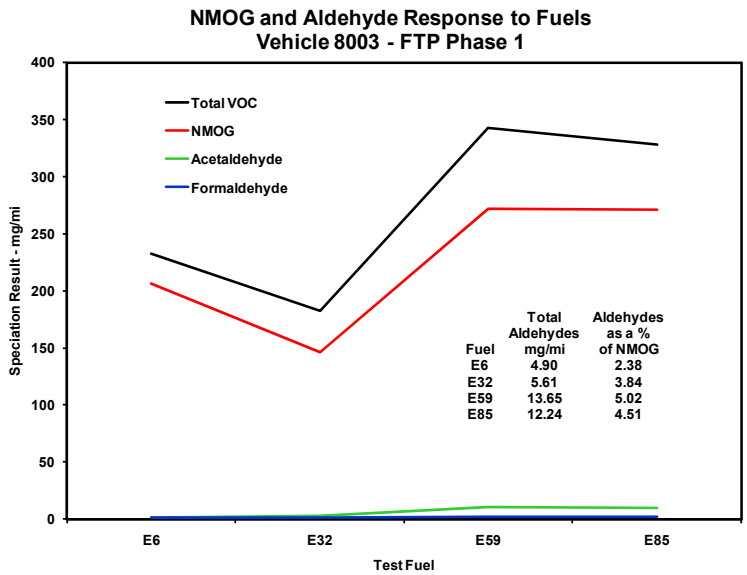
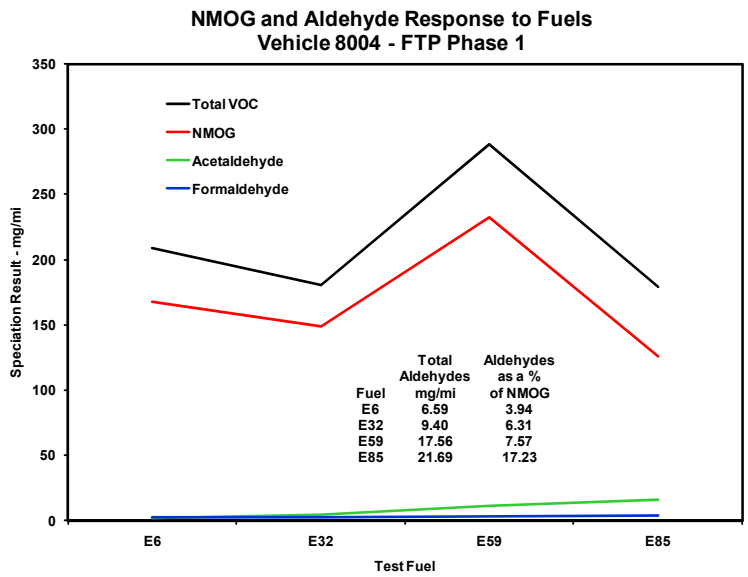
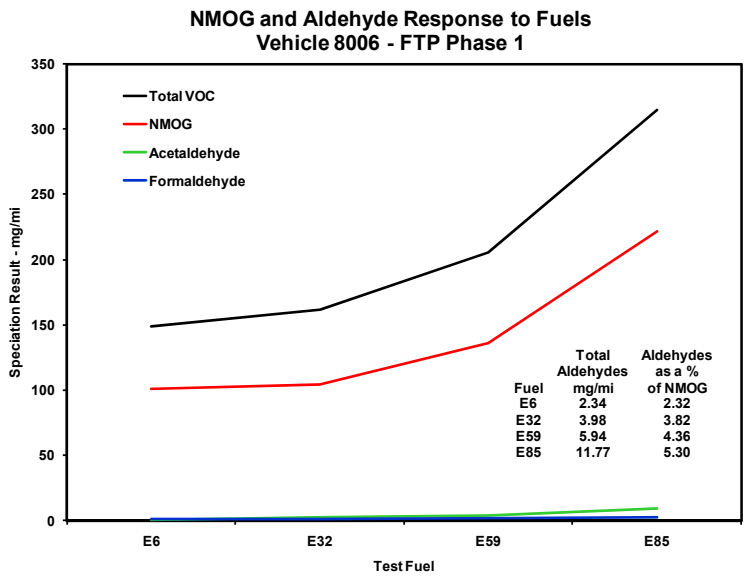
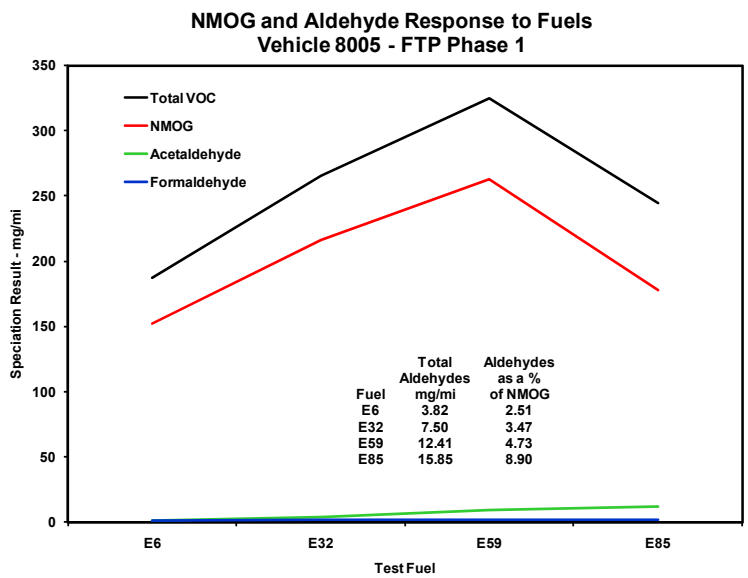


Figure 24.







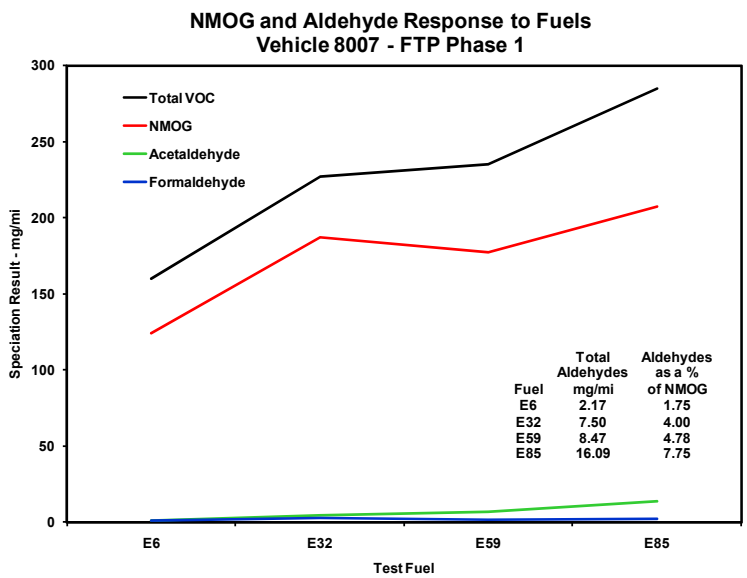
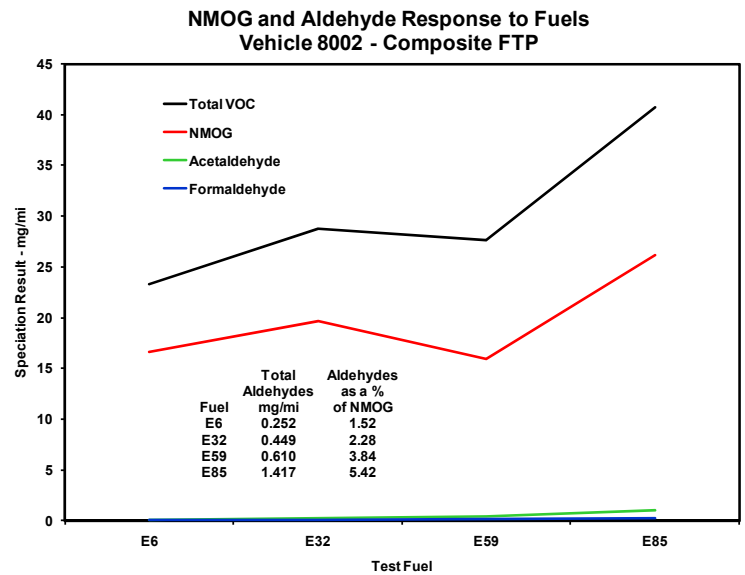
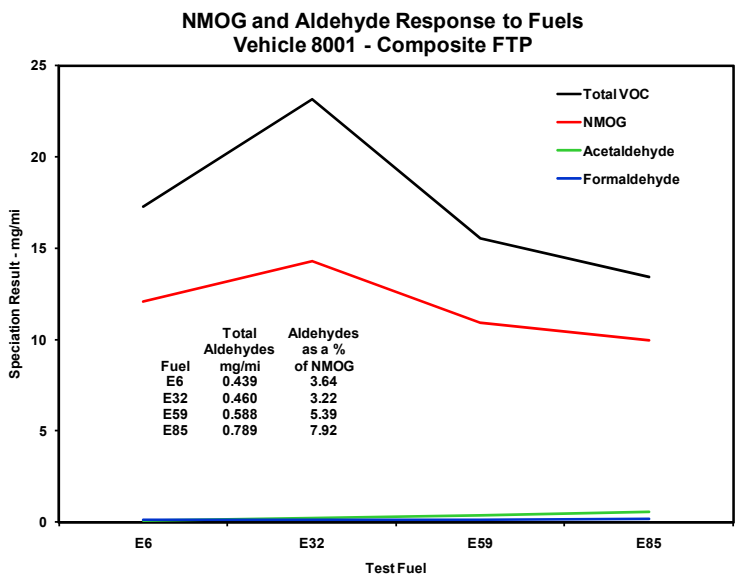


Figure 24 (continued).

NMOG and Aldehyde Analysis by Vehicle and Cycle – Composite FTP: The following seven plots (Figure 25) show the Composite NMOG results measured on the E-80 vehicles while driving the Federal Test Procedure (FTP). The FTP is a principal component of the emission certification performance requirements (see 40 CFR 86.130-00). The composite result is a weighted average of the three phases of the FTP: Phase 1 – the cold start, Phase 2 – the warm stabilized and Phase 3 – the hot restart.

Data trends are much the same as was seen in the Phase 1 analysis, but at much lower levels than observed for Phase 1, as one would expect. The variations in the average acetaldehyde and formaldehyde emissions for the seven vehicles were statistically significant for the Composite FTP. The aldehydes increase as a percentage of NMOG with increasing ethanol.





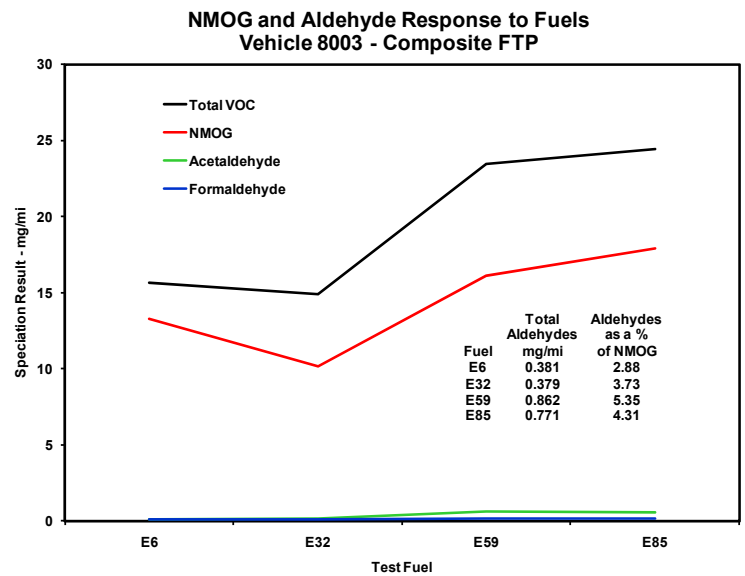
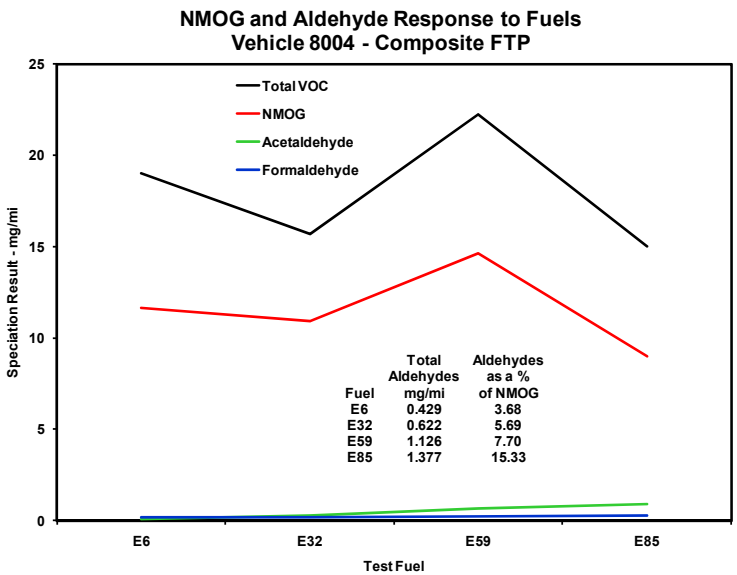
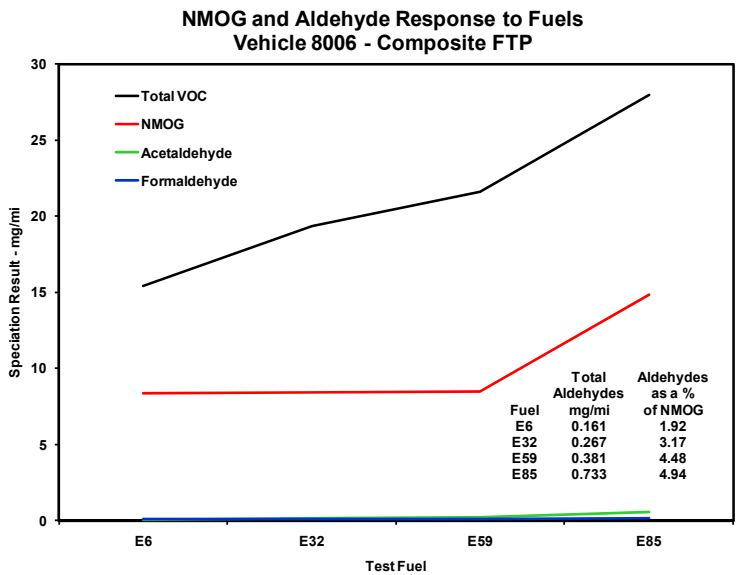
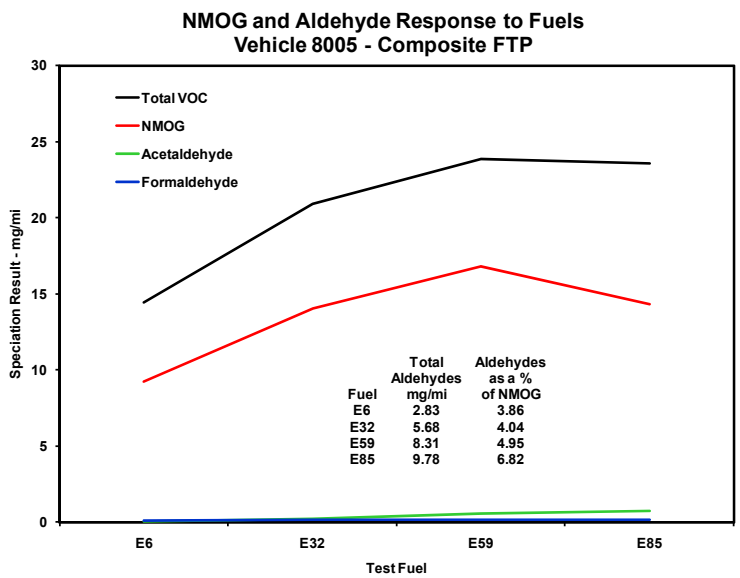


Figure 25.







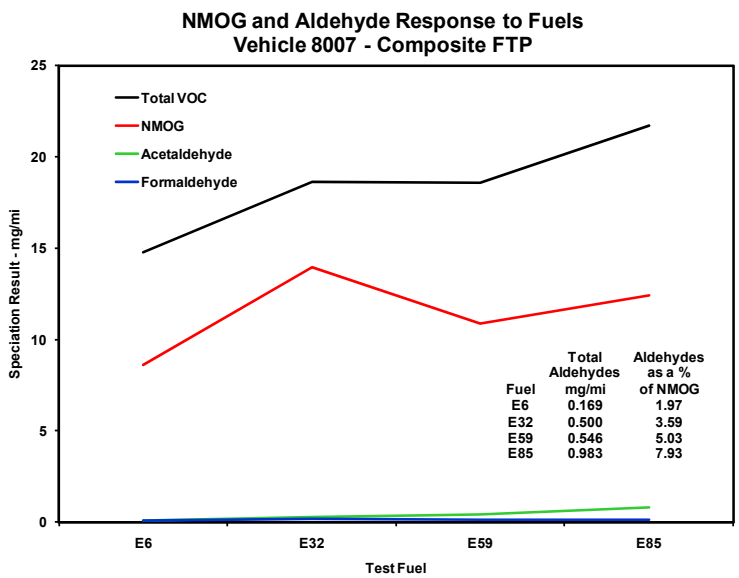
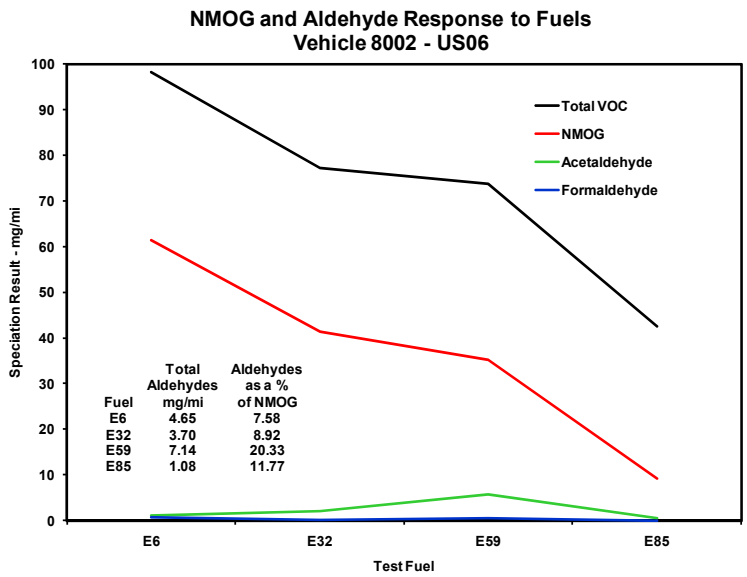
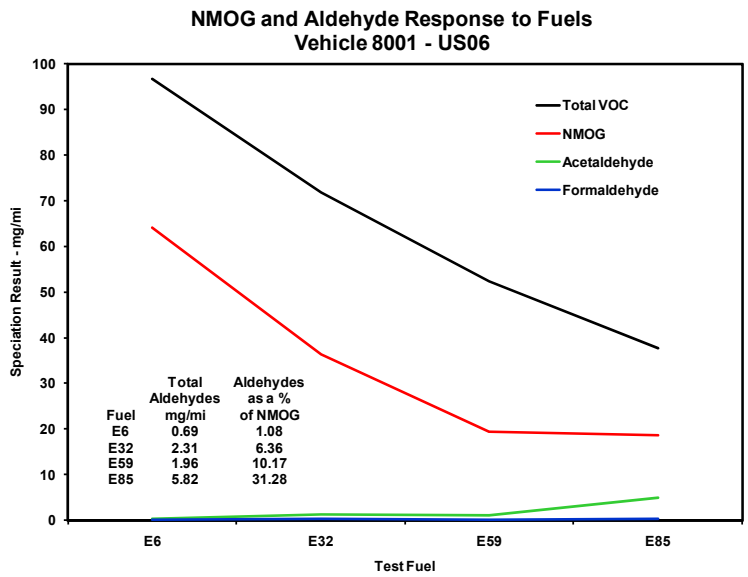


Figure 25 (continued).

NMOG and Aldehyde Analysis by Vehicle and Cycle – US06: The next seven plots (Figure 26) summarize the VOC emissions measured during the High Speed/Load driving cycle (US06). The US06 test is performed on a warmed-up vehicle and is used to characterize the extreme-driving emission performance of current vehicles. Whereas the cold start FTP plots were scaled on the vertical axis at 300 to 800 mg/mile, the US06 plots have scales of 80 to 120 mg/mile, even though the driving represents more extreme operation. The variations in the average Total VOC, NMOG and acetaldehyde emissions for the seven vehicles were statistically significant for the US06 cycle.





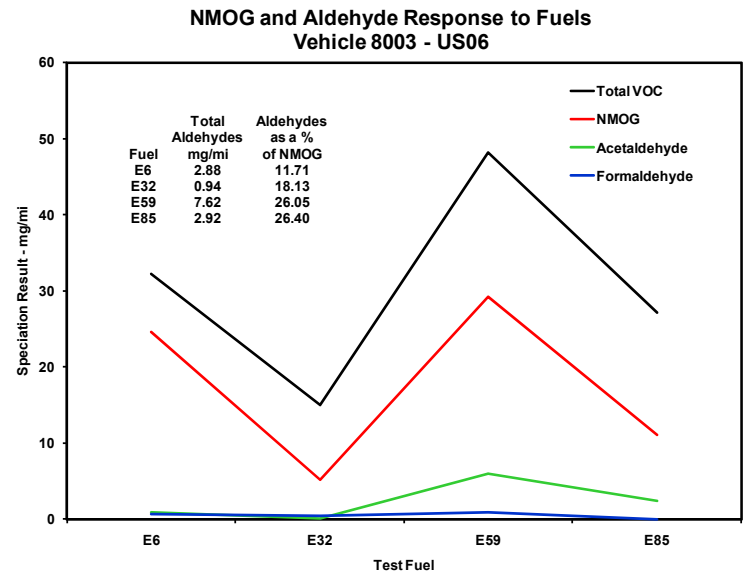
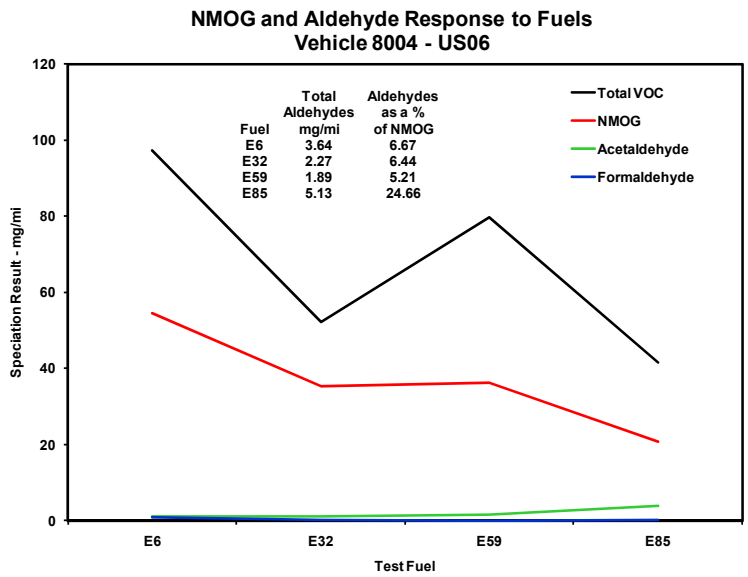
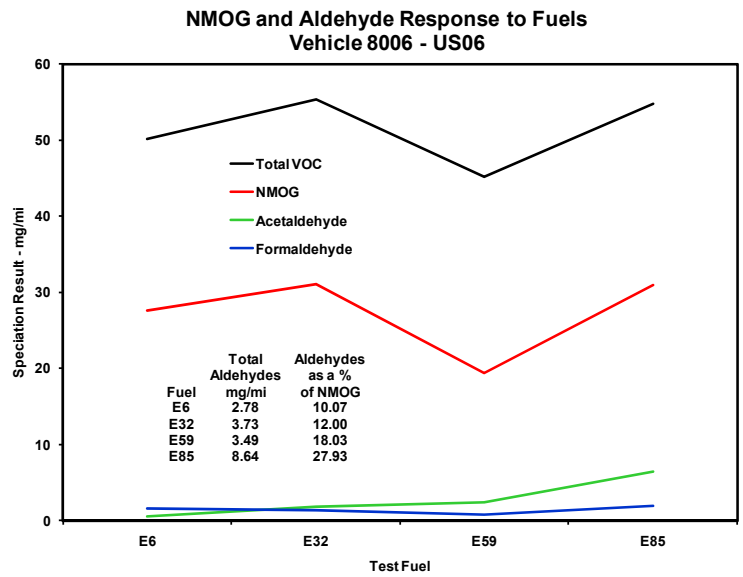
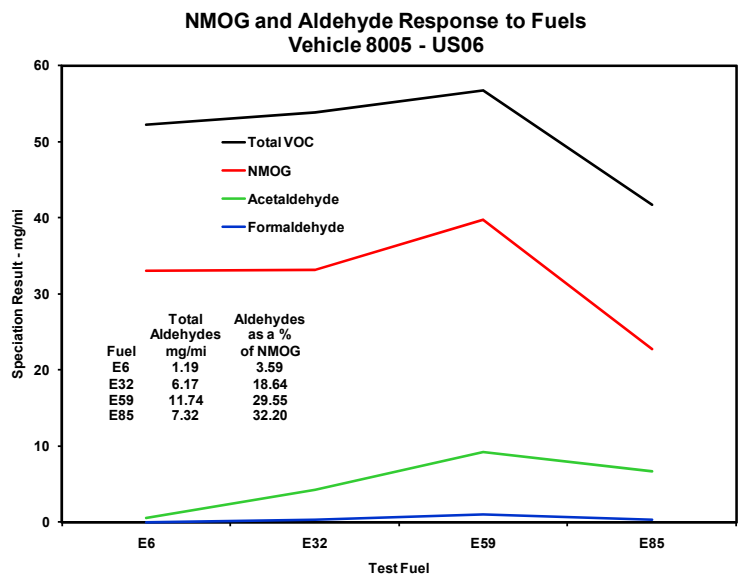


Figure 26.







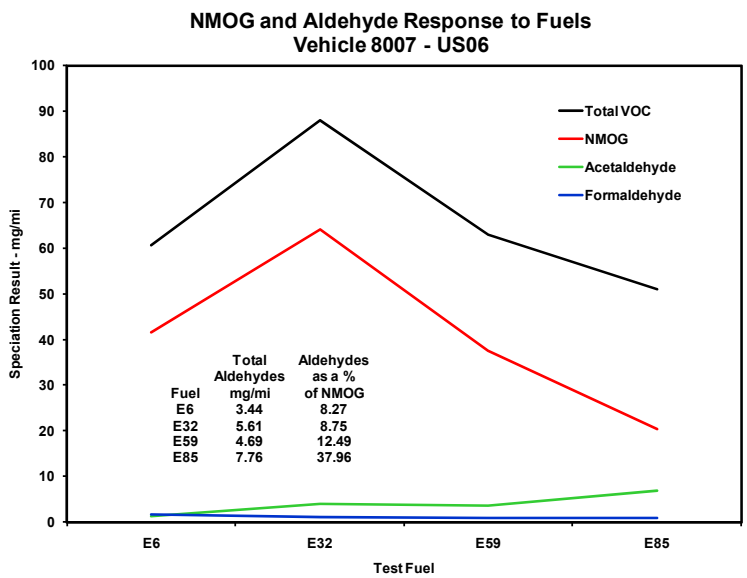
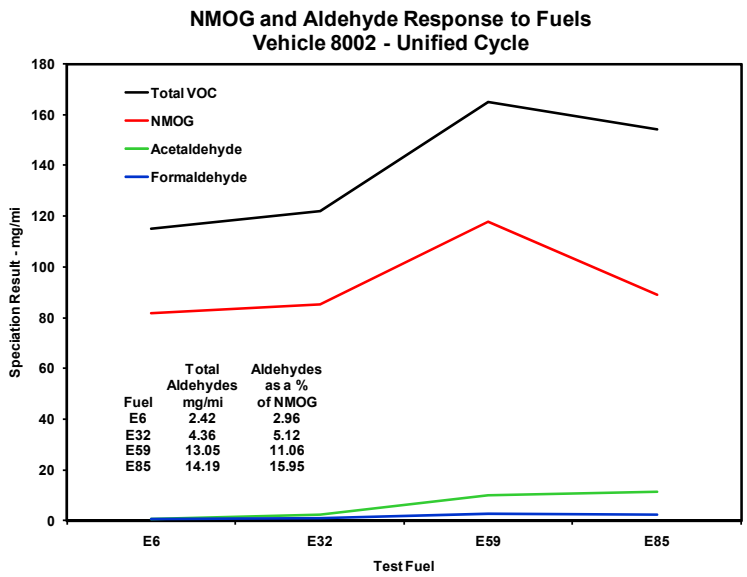
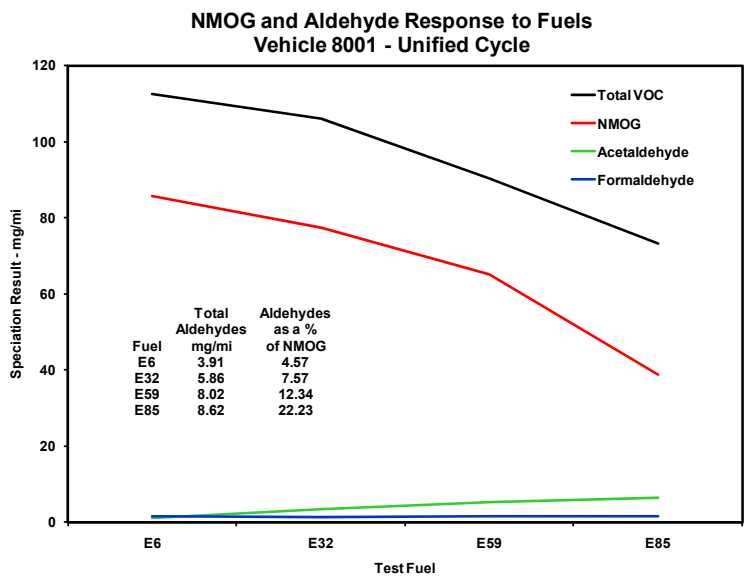


Figure 26 (continued).

NMOG and Aldehyde Analysis by Vehicle and Cycle – Unified Cycle: The next seven plots (Figure 27) present the analysis of the test results while driven on the Unified Cycle (LA92). The Unified Cycle was driven following an overnight park at 68-86°F. One sample was collected during the 23.9 minute, 9.82 mile test, and while it includes a cold start component, the content is diluted by the operation after the catalyst is fully operational. The extended warm operation (compared to the Bag 1 FTP first 505 seconds results) results in low mass levels in the sample and mixed trends in emission changes at the various ethanol levels in the blends. . The variations in the average acetaldehyde and formaldehyde emissions for the seven vehicles were statistically significant for the Unified cycle.





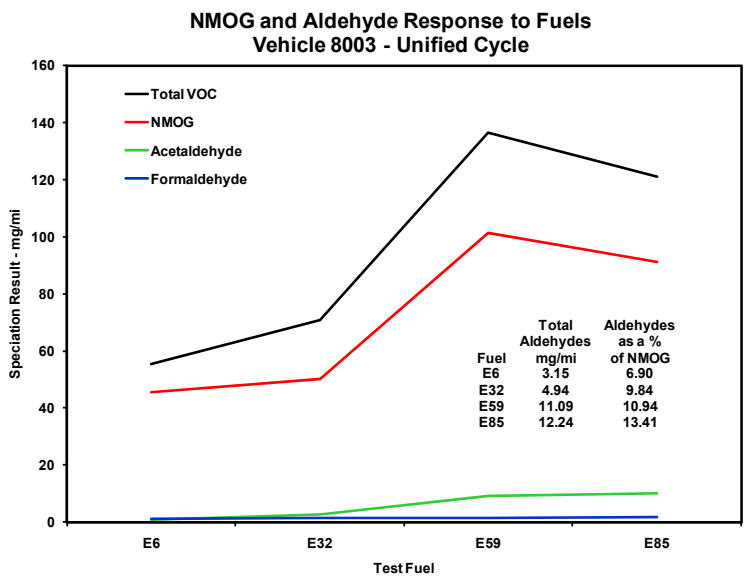
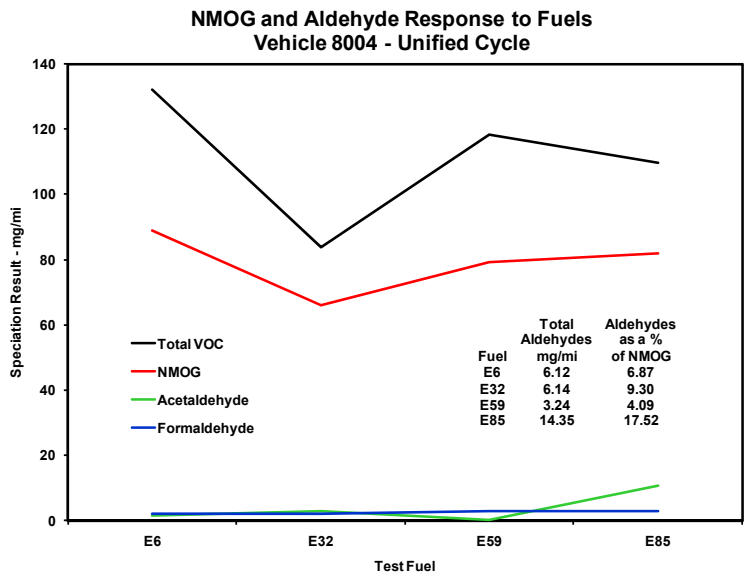
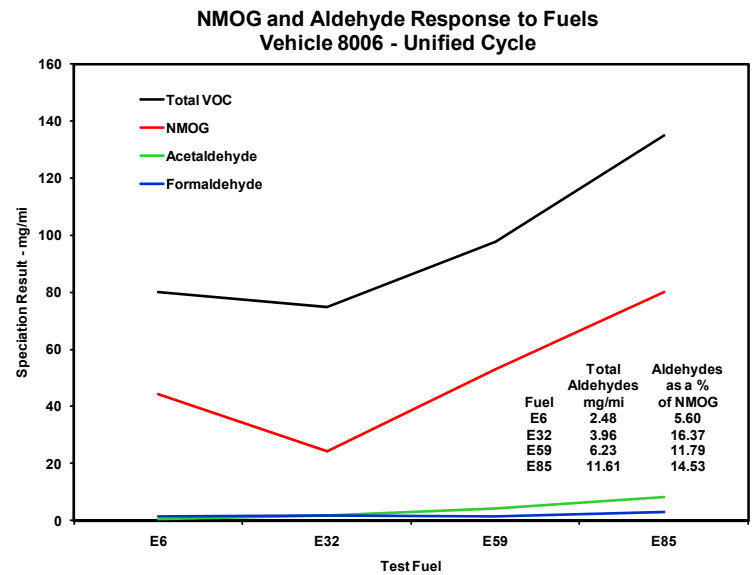
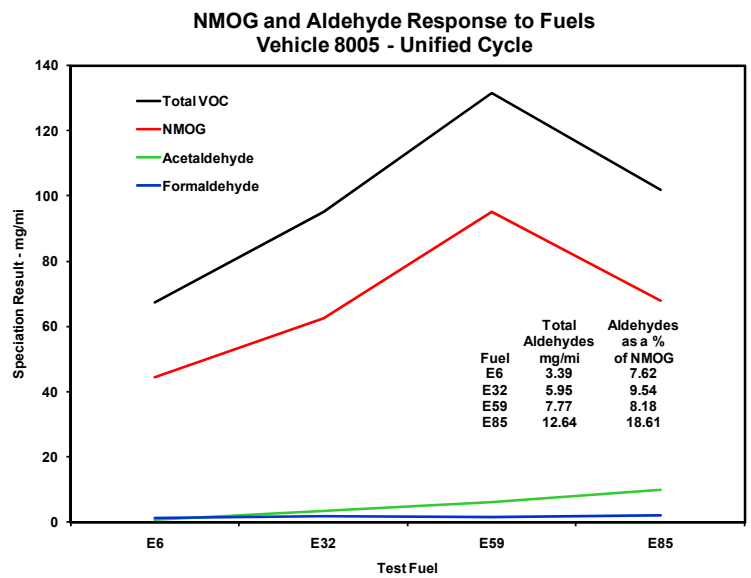


Figure 27.







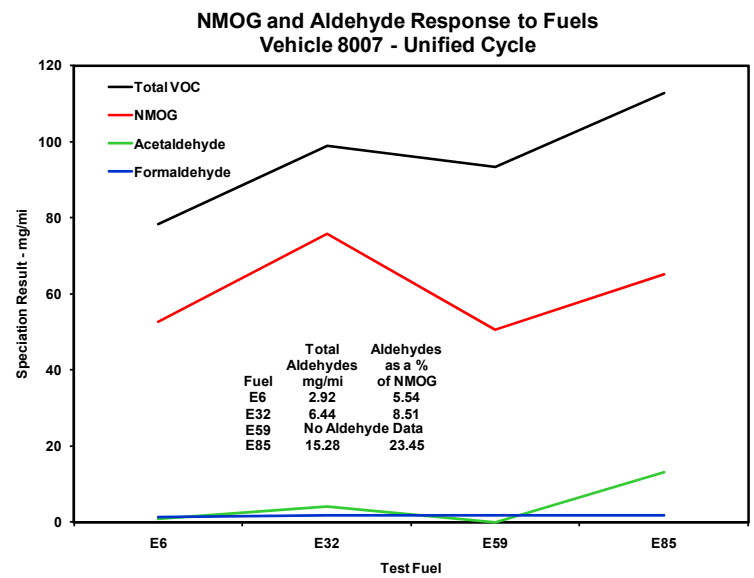


Figure 27 (continued).

The following four plots (Figure 28) display the seven vehicle average NMOG and Aldehyde results for the FTP, US06 and UC test cycles using the four test fuels (E6, E32, E59 and E85).

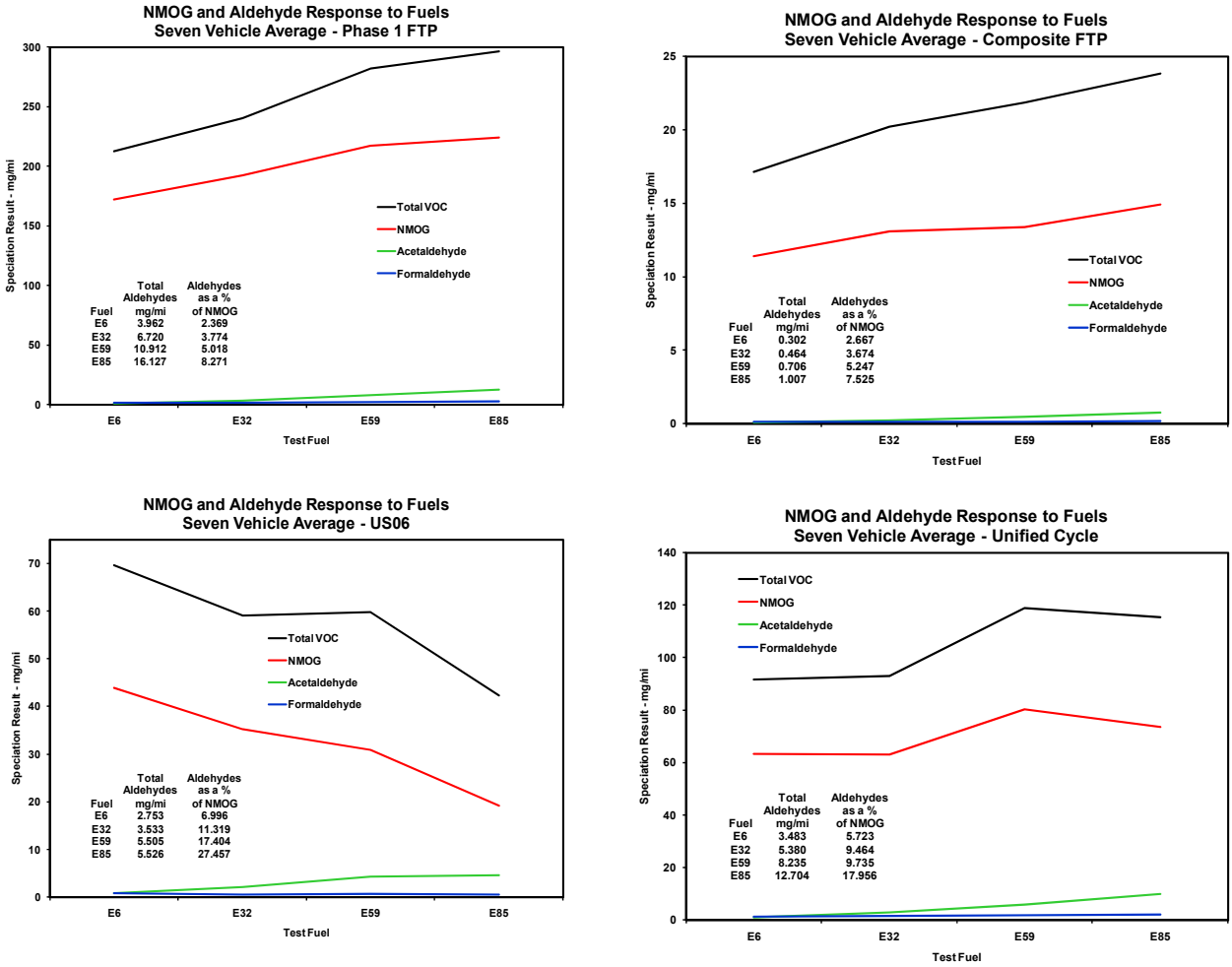


Figure 28. NMOG - Seven Vehicle Averages

Ozone Forming Potential (Reactivity) Methodology - The speciation information is further analyzed by calculating the composite ozone forming potential of the speciate. Table 16 below illustrates the concept. The order of presenting the individual species has been changed by

Table 16. Exhaust Reactivity Example

Vehicle 8001 - Fuel E85 - FTP Phase 1 - Test 5825					
Non Zero Mass Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Ethanol	00064-17-5	1.45	49.8264	72.197	
Methane	00074-82-8	0.01	33.7232	0.467	
2-Methylbutane (Isopentane)	00078-78-4	1.35	25.1664	34.098	
Ethylene	00074-85-1	8.88	13.2706	117.900	
acetaldehyde	00075-07-0	6.46	9.2969	60.092	
n-Butane	00106-97-8	1.08	8.3555	8.998	
c-2-Butene	00590-18-1	14.26	7.1120	101.416	
Acetylene (Ethyne)	00074-86-2	0.95	4.1152	3.892	
Ethane	00074-84-0	0.26	2.6920	0.708	
Formaldehyde	00050-00-0	9.59	1.9735	18.934	
2,3,3-Trimethylpentane	00560-21-4	0.95	1.8677	1.766	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.5642	1.336	
3-Methylnonane		0.66	1.4529	0.953	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.4437	11.464	
n-Pentane	00109-66-0	1.21	1.1759	1.429	
t-1,2-Dimethylcyclopentane	00822-50-4	2.50	1.0823	2.705	
Benzene	00071-43-2	0.69	1.0550	0.733	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9560	7.061	
t-2-Butene	00624-64-6	15.20	0.8621	13.101	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.7933	3.486	
3-Methylpentane	00096-14-0	1.69	0.7784	1.316	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.7519	8.801	
2-Methyl-1-butene	00563-46-2	6.38	0.7511	4.791	
Unknown #13		2.50	0.7231	1.807	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7145	0.678	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.6798	0.950	
acetone	00067-64-1	0.35	0.5776	0.204	
Acrolein	00107-02-8	7.37	0.2054	1.513	
2-Butanone (MEK)	00078-93-3	1.45	0.1036	0.150	
Propionaldehyde	00123-38-6	6.96	0.0559	0.389	
Hexaldehyde	00066-25-1	4.26	0.0213	0.091	
benzaldehyde	00100-52-7	-0.71	0.0207	-0.015	
n-butyraldehyde	00123-72-8	5.85	0.0174	0.102	
Valeraldehyde	000110-62-3	4.98	0.0111	0.055	
Glyoxal	00107-22-2	12.59	0.0043	0.054	
		Total	173.2006	483.6197	2.792

listing the species by decreasing mass in the sample. In Table 16, the ethanol species has the highest mass in the sample, and thus appears as the first data line. The next largest mass is methane, and so on. The second column in the table lists the CAS number and the third column is the MIR value for that species. The Maximum Incremental Reactivity scale (MIR) scale[13], created by William Carter and adopted by CARB, has been used to estimate the equivalent ozone that would be produced by the various species found in this measurement. The report listed in the footnote contains the following quote:

[13] UPDATED MAXIMUM INCREMENTAL REACTIVITY SCALE FOR REGULATORY APPLICATIONS, William P. L. Carter, College of Engineering Center for Environmental Research and Technology, University of California, Riverside, CA 92521, March 23, 2009, available at http://citeseerx.ist.psu.edu

> The methods and procedure used to derive the MIR scale presented in this report are comprehensively documented by Carter (2009a) and references therein, and those reports should be consulted for details. Briefly, the reactivity scale is based on calculations of relative ozone impacts, expressed as mass of additional ozone formed per mass VOC added to the emissions, for various compounds under various atmospheric conditions, given a chemical mechanism for the compounds and other relevant atmospheric species, models for various atmospheric conditions, and a modeling and reactivity assessment procedure. The methods, atmospheric scenarios, and modeling and reactivity assessment procedures were the same as employed in previous calculations of the MIR scale (Carter, 1994a, 2000, 2003), and are based on those first developed by Carter (1994a,b), with a few modifications as described by Carter (2000). The only difference between this updated scale and the previous MIR scales of Carter (2000, 2003) concern the chemical mechanism used and the number and types of VOCs whose ozone impacts are calculated.

Multiplying the mass (VOC) of the individual species by the MIR factor yields the last column, the mass of ozone that might be produced by that mass of speciate. The “average reactivity” of the sample is calculated (and shown at the bottom of each file) by summing up the speciated mass, and the estimated ozone mass, and dividing the total ozone value by the total VOC (fuel) mass. In this example, the average reactivity is 2.499 (in grams of ozone per gram of volatile organic compound).

Table 17 summarizes the Reactivity values obtained from the exhaust emission testing of all vehicles on the four fuels being studied.

Table 17. Summary – Exhaust Reactivity

Summary - Exhaust Reactivity Results
All CRC E80 Test Vehicles, All Fuels

		Vehicle 8001				Vehicle 8002				Vehicle 8003				Vehicle 8004			
Test	Fuel	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity
FTP	E6	5741	221.2	891.3	4.028	5901	329.6	992.2	3.011	5831	232.2	923.3	3.976	5997	209.1	662.6	3.169
Phase 1	E32	5927	290.9	830.6	2.856	5889	380.8	1118.7	2.938	5758	182.3	591.7	3.246	5854	180.5	530.4	2.938
	E59	6043	218.7	583.8	2.670	5828	356.9	878.4	2.461	5914	342.8	769.8	2.246	6036	288.3	769.4	2.669
	E85	5825	173.2	483.6	2.792	5907	548.1	1314.4	2.398	6010	328.2	716.7	2.184	5861	179.4	434.0	2.419
FTP	E6	5741	16.0	24.8	1.549	5901	11.9	10.4	0.875	5831	12.2	48.4	3.964	5997	26.0	13.4	0.513
Phase 2	E32	5927	32.5	13.3	0.408	5889	26.4	23.8	0.903	5758	18.3	27.1	1.475	5854	26.6	21.5	0.806
	E59	6043	9.8	25.5	2.591	5828	24.1	2.5	0.105	5914	15.4	20.7	1.346	6036	22.0	27.4	1.243
	E85	5825	15.1	81.6	5.411	5907	39.8	21.2	0.532	6010	30.4	26.5	0.872	5861	10.6	3.4	0.316
FTP	E6	5741	30.6	20.7	0.678	5901	34.7	10.8	0.312	5831	8.1	10.0	1.232	5997	45.1	66.2	1.467
Phase 3	E32	5927	30.4	7.1	0.235	5889	43.5	26.3	0.606	5758	25.3	28.9	1.143	5854	22.3	23.1	1.037
	E59	6043	20.9	29.2	1.394	5828	50.4	30.4	0.604	5914	20.5	2.7	0.131	6036	34.9	25.6	0.735
	E85	5825	18.1	49.5	2.738	5907	48.5	15.1	0.311	6010	32.6	24.6	0.755	5861	42.5	33.8	0.797
US06	E6	5743	96.7	223.5	2.311	5902	98.1	261.0	2.660	5832	32.2	86.4	2.679	5998	97.3	143.9	1.480
	E32	5928	69.4	116.5	1.678	5890	77.2	156.6	2.029	5760	14.9	18.1	1.213	5855	52.1	97.0	1.862
	E59	6044	52.4	61.5	1.173	5829	73.8	139.8	1.896	5915	48.1	133.6	2.776	6029	79.7	107.1	1.343
	E85	5826	37.6	70.1	1.863	5908	42.5	18.4	0.434	6011	27.2	48.9	1.801	5862	41.6	65.9	1.585
UC	E6	5750	112.4	391.5	3.482	5903	115.1	297.3	2.582	5837	55.3	170.5	3.082	5999	132.0	297.6	2.254
	E32	5929	106.1	290.4	2.738	5891	122.1	307.1	2.515	5767	70.7	214.9	3.040	5856	83.7	178.3	2.131
	E59	6045	90.2	224.2	2.485	5830	164.9	460.1	2.790	5916	136.4	315.0	2.310	6030	118.4	240.4	2.030
	E85	5835	73.2	133.1	1.818	5911	154.1	340.4	2.209	6014	120.9	309.6	2.560	5868	109.7	288.1	2.628

		Vehicle 8005				Vehicle 8006				Vehicle 8007			
Test	Fuel	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity
FTP	E6	5884	187.1	716.2	3.828	5988	148.6	420.4	2.829	5945	159.7	567.6	3.554
Phase 1	E32	5842	265.6	802.0	3.019	6016	161.6	331.4	2.050	6094	227.2	579.0	2.549
	E59	5816	324.5	965.9	2.977	6052	205.8	465.9	2.265	6040	234.9	559.0	2.379
	E85	5892	244.7	638.4	2.609	5937	314.9	715.5	2.272	6064	284.6	604.0	2.122
FTP	E6	5884	14.9	1.9	0.130	5988	31.0	39.2	1.265	5945	25.7	8.7	0.337
Phase 2	E32	5842	25.1	39.8	1.582	6016	49.2	42.4	0.860	6094	24.2	52.6	2.174
	E59	5816	18.4	10.3	0.561	6052	45.1	2.3	0.052	6040	18.8	1.515	0.080
	E85	5892	45.8	40.6	0.886	5937	44.2	30.7	0.695	6064	21.7	1.545	0.071
FTP	E6	5884	20.7	4.0	0.194	5988	34.9	43.9	1.259	5945	27.0	22.5	0.834
Phase 3	E32	5842	28.6	12.9	0.451	6016	43.5	62.9	1.446	6094	28.4	42.6	1.502
	E59	5816	24.6	63.0	2.560	6052	47.3	9.6	0.203	6040	32.1	14.3	0.444
	E85	5892	43.8	25.8	0.589	5937	50.8	36.9	0.726	6064	30.6	19.9	0.651
US06	E6	5885	52.2	107.3	2.055	5989	50.1	101.0	2.018	5946	60.7	156.1	2.573
	E32	5843	53.9	122.5	2.274	6017	55.3	103.7	1.874	6095	87.9	188.0	2.139
	E59	5817	56.7	177.0	3.124	6053	45.2	86.0	1.904	6041	62.9	128.5	2.042
	E85	5893	41.7	101.7	2.441	5938	54.7	150.1	2.745	6065	50.9	101.6	1.995
UC	E6	5886	67.4	183.8	2.729	5992	80.0	118.9	1.487	5976	78.2	153.5	1.963
	E32	5844	95.2	253.9	2.668	6019	74.9	63.6	0.849	6098	99.0	263.3	2.660
	E59	5818	131.4	371.2	2.825	6056	97.8	202.2	2.068	6042	93.4	201.1	2.153
	E85	5895	101.9	280.4	2.752	5942	134.8	299.8	2.224	6069	112.7	252.9	2.244

Aldehydes – The E-80 test program included the measurement of aldehydes[14] in the exhaust products for the FTP, US06, and the LA92 Driving cycles. In organic chemistry, a carbonyl group is a functional group composed of a carbon atom double-bonded to an oxygen atom: C=O.

Table 18 lists the names, CAS numbers and MIR values that were used in this program.

Table 18. Aldehyde List

Compound	CAS No.	MIR
formaldehyde	00050-00-0	9.5937
hexaldehyde	00066-25-1	4.2603
acetone	00067-64-1	0.3525
acetaldehyde	00075-07-0	6.4636
methacrolein	00078-85-3	5.9556
2-butanone (MEK)	00078-93-3	1.4498
benzaldehyde	00100-52-7	-0.7119
acrolein	00107-02-8	7.3662
glyoxal	00107-22-2	12.5908
valeraldehyde	00110-62-3	4.9821
propionaldehyde	00123-38-6	6.9593
n-butyraldehyde	00123-72-8	5.8529
m-tolualdehyde	00620-23-5	-0.5500
crotonaldehyde	04170-30-3	9.3437

[14] http://en.wikipedia.org/wiki/Aldehyde; An aldehyde is an organic compound containing a formyl group. This functional group, with the structure R-CHO, consists of a carbonyl centre bonded to hydrogen and an R group. The group without R is called the aldehyde group or formyl group. Aldehydes differ from ketones in that the carbonyl is placed at the end of a carbon skeleton rather than between two carbon atoms. Aldehydes are common in organic chemistry.

Table 15 from page 53 is repeated here as Table 19 to point out the aldehydes present in the Phase I portion of the FTP test on vehicle 8001 running on E85 fuel. The aldehydes are shown by the green shading, and are led in the ranking by acetaldehyde.

Table 19. Aldehyde Effect - Reactivity

Vehicle 8001 - Fuel E85 - FTP Phase 1 - Test 5825					
Non Zero Mass Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Ethanol	00064-17-5	1.45	49.8264	72.197	
Methane	00074-82-8	0.01	33.7232	0.467	
2-Methylbutane (Isopentane)	00078-78-4	1.35	25.1664	34.098	
Ethylene	00074-85-1	8.88	13.2706	117.900	
acetaldehyde	00075-07-0	6.46	9.2969	60.092	
n-Butane	00106-97-8	1.08	8.3555	8.998	
c-2-Butene	00590-18-1	14.26	7.1120	101.416	
Acetylene (Ethyne)	00074-86-2	0.95	4.1152	3.892	
Ethane	00074-84-0	0.26	2.6920	0.708	
Formaldehyde	00050-00-0	9.59	1.9735	18.934	
2,3,3-Trimethylpentane	00560-21-4	0.95	1.8677	1.766	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.5642	1.336	
3-Methylnonane		0.66	1.4529	0.953	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.4437	11.464	
n-Pentane	00109-66-0	1.21	1.1759	1.429	
t-1,2-Dimethylcyclopentane	00822-50-4	2.50	1.0823	2.705	
Benzene	00071-43-2	0.69	1.0550	0.733	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9560	7.061	
t-2-Butene	00624-64-6	15.20	0.8621	13.101	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.7933	3.486	
3-Methylpentane	00096-14-0	1.69	0.7784	1.316	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.7519	8.801	
2-Methyl-1-butene	00563-46-2	6.38	0.7511	4.791	
Unknown #13		2.50	0.7231	1.807	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7145	0.678	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.6798	0.950	
acetone	00067-64-1	0.35	0.5776	0.204	
Acrolein	00107-02-8	7.37	0.2054	1.513	
2-Butanone (MEK)	00078-93-3	1.45	0.1036	0.150	
Propionaldehyde	00123-38-6	6.96	0.0559	0.389	
Hexaldehyde	00066-25-1	4.26	0.0213	0.091	
benzaldehyde	00100-52-7	-0.71	0.0207	-0.015	
n-butyraldehyde	00123-72-8	5.85	0.0174	0.102	
Valeraldehyde	000110-62-3	4.98	0.0111	0.055	
Glyoxal	00107-22-2	12.59	0.0043	0.054	
		Total	173.2006	483.6197	2.792
No MIR available, use weighted average of 2.4992			160.9129	402.0519	2.499

Detailed and voluminous speciation data are available in the Appendix III.

The series of four Figures (29 – 32) that follow present the species identified during testing as well as the reactivity generated by each vehicle on each fuel over the exhaust tests conducted.

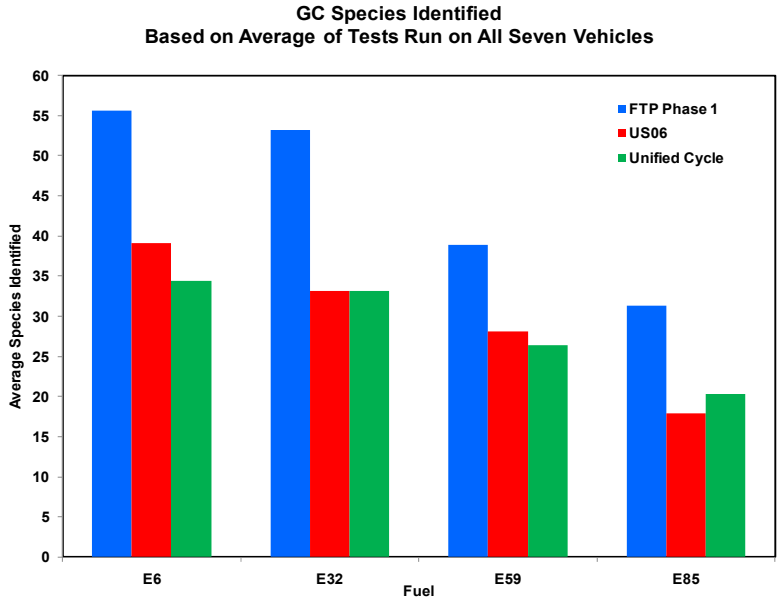


Figure 29. GC Species Identified - Exhaust

Figure 29 illustrates that the number of species identified tend to decrease with increasing ethanol levels, and that more species are identified in Phase 1 on the FTP compared to the other two driving cycles.

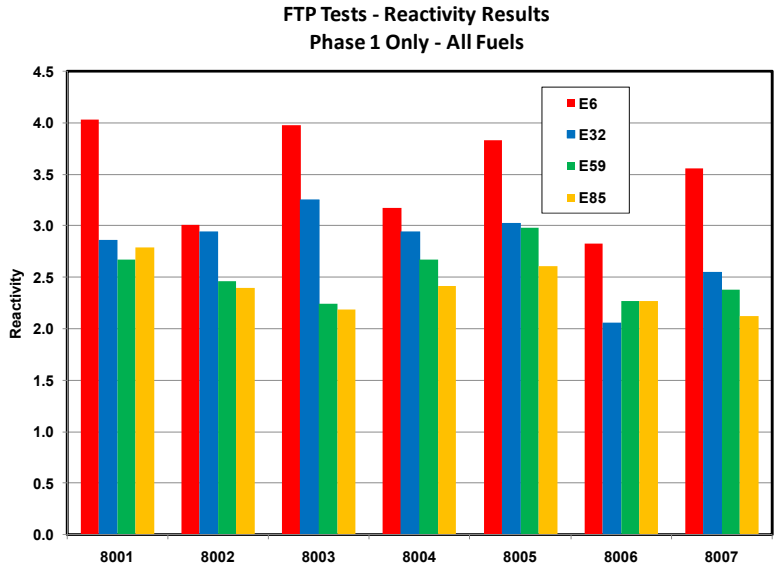


Figure 30. FTP Reactivity Results

Figure 30 indicates a general trend that the reactivity of the FTP Phase 1 results may decrease with increasing ethanol level.

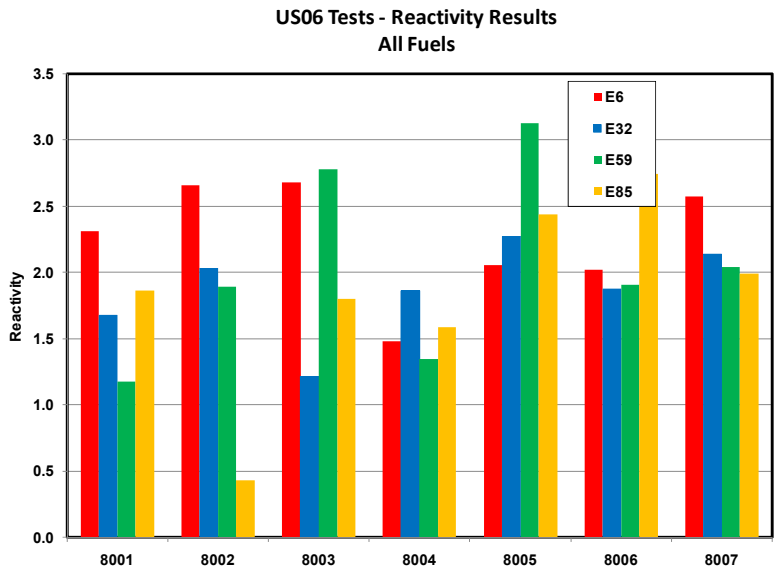


Figure 31. US06 Reactivity Results

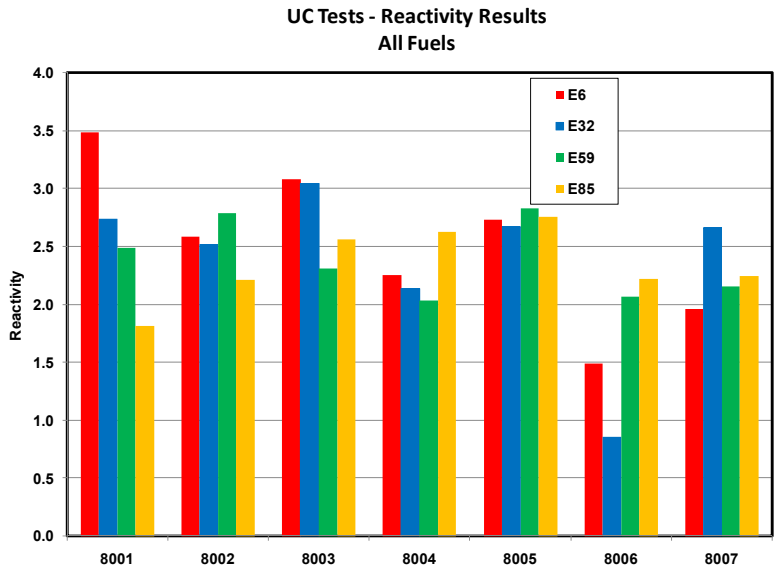


Figure 32. UC Reactivity Results

Figures 31 and 32 show no clear trend in reactivity with increasing ethanol level on either the US06 or the UC test results.

Fuel Economy on the Various Fuels and Cycles

Carbon balance fuel economy was calculated for the various driving cycles during the exhaust emission tests, and the results presented in Figures 33 through 35. Each vehicle's results are shown as a colored line, and the average of the seven vehicles is shown in the dashed black line. The fuel economy decrease as the ethanol fraction of the fuel increased was statistically significant for all three driving cycles.

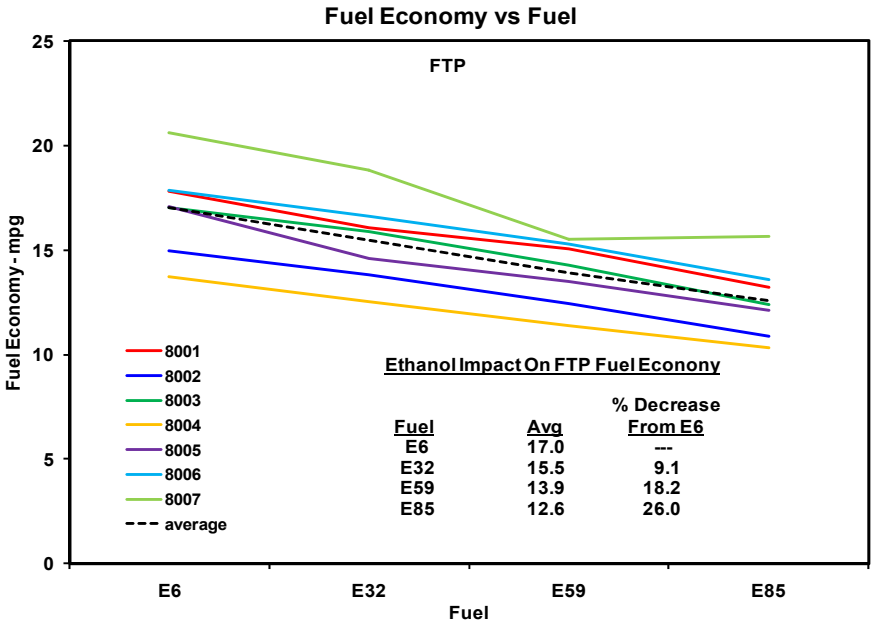


Figure 33. Fuel Economy vs. Fuel - FTP

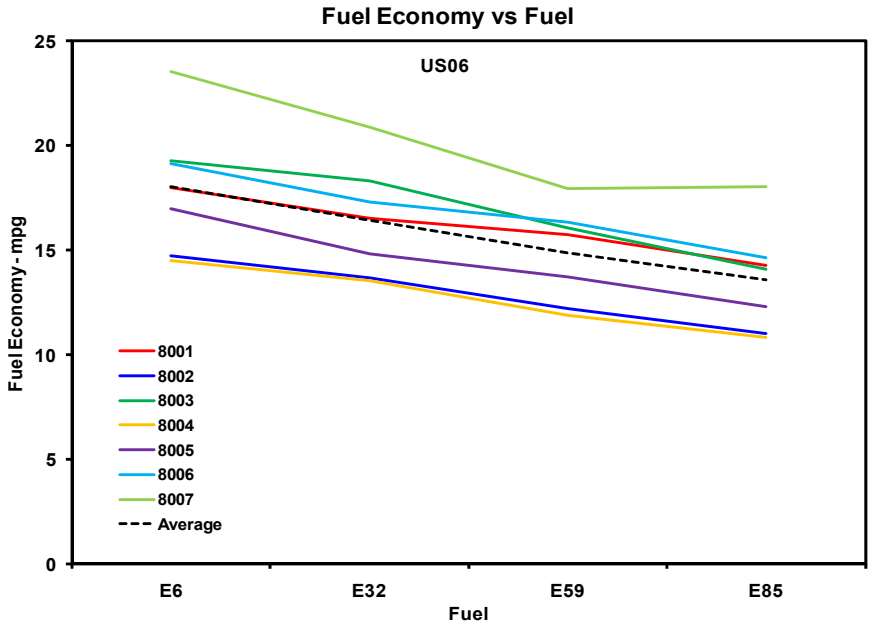


Figure 34. Fuel Economy vs. Fuel – US06

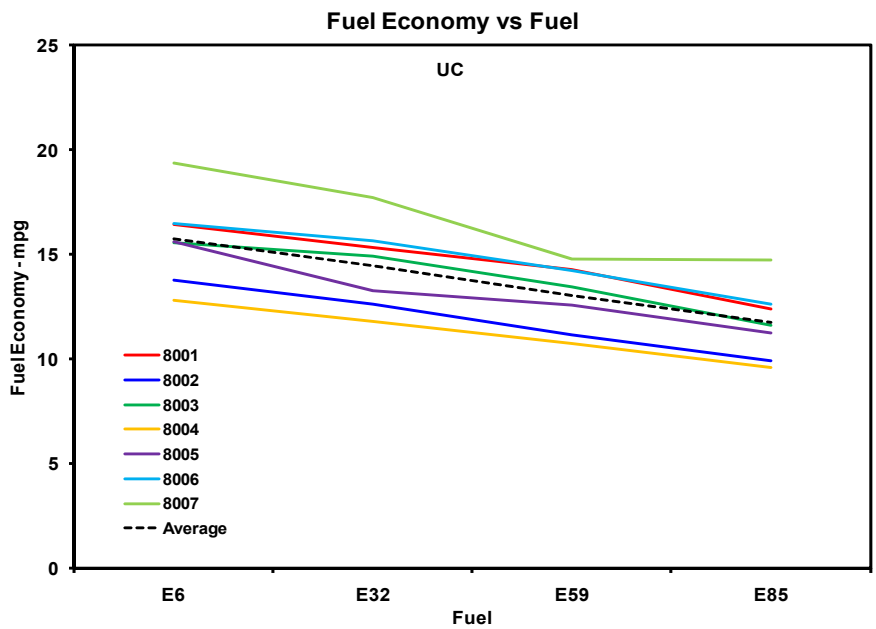


Figure 35. Fuel Economy vs. Fuel - UC

Carbon Balance Fuel Economy Calculation for E-80 Data - "Carbon Balance" describes the theory behind the technique used to estimate the volume of fuel consumed, and the resulting fuel economy in miles per gallon of fuel, during an emission test. It assumes that the emission test system is accurately measuring all the carbon containing compounds in the vehicle exhaust, and that this carbon had to come from the fuel consumed during the test. The three major carbon-containing gases are carbon dioxide, carbon monoxide, and unburned hydrocarbons.

The table below expresses the methods used to calculate the carbon balance fuel economy (CBFE) for the CRC E-80 emission tests, both Unified Cycle (LA92) and FTP tests.

$$\text{CBFE (miles per gallon)} = \frac{\text{Grams of Carbon per Gallon of Fuel}}{\text{Grams of Carbon per Mile Driven in the Exhaust}}$$

The numerator value is =

$$\text{Test Fuel Specific Gravity} \times \text{Density of Water}_{60F}\text{(g/gal)} \times \text{Fuel Carbon Fraction}$$

Where the density of water at 60°F is (8.3304 lbs/gal x 453.6 g/lb)

The denominator is = (Fuel Carbon fraction x HC) + (.429 x CO) + (.273 x CO_2), where HC, CO and CO_2 are expressed in grams per mile. The fuel carbon fraction comes from detailed hydrocarbon analysis (speciation) of the actual test fuel.

Sample Calculation

For E6 the carbon balance fuel economy is calculated as follows:

$$\text{CBFE (miles per gallon)} = \frac{2264}{.8297 \times HC + .429 \times CO + .273 \times CO_2}$$

The seven vehicle average fuel economy correlated well with the net heating value of the fuel. Table 5 is repeated here from the earlier fuel section of this report.

Estimated Net Heat of Combustion of Gasoline-Ethanol Blends

Fuel ID	BTU/lb	BTU/gal	MJ/kg	MJ/m^3
E6	18320	110300	42.58	30720
E32	16800	102850	39.04	28650
E59	14910	89340	34.66	24880
E85	12710	81510	29.54	22700

The average fuel economy values for the seven vehicles tested on the four fuels are presented in the table below.

Table 20. Average Fuel Economy

Fuel	FTP Avg. Fuel Economy in mpg	Net Heating Value in BTU per Gal	Correction Factor for Heating Value	Corrected Fuel Economy in mpg
E6	17.0	110,300	1	17.0
E32	15.5	102,850	1.072	16.6
E59	13.9	89,340	1.235	17.2
E85	12.6	81,510	1.353	17.1

The following nine plots (Figures 36-44) show the effect of applying the Heating Value correction to the measured fuel economy of the E32, E59 and E85 fuels compared to the E6 fuel economy measured on the three test cycles (FTP, US06 and UC) used. The agreement between the E6 and the corrected fuel economy of the higher ethanol fuels (red vs. green lines) is quite good.

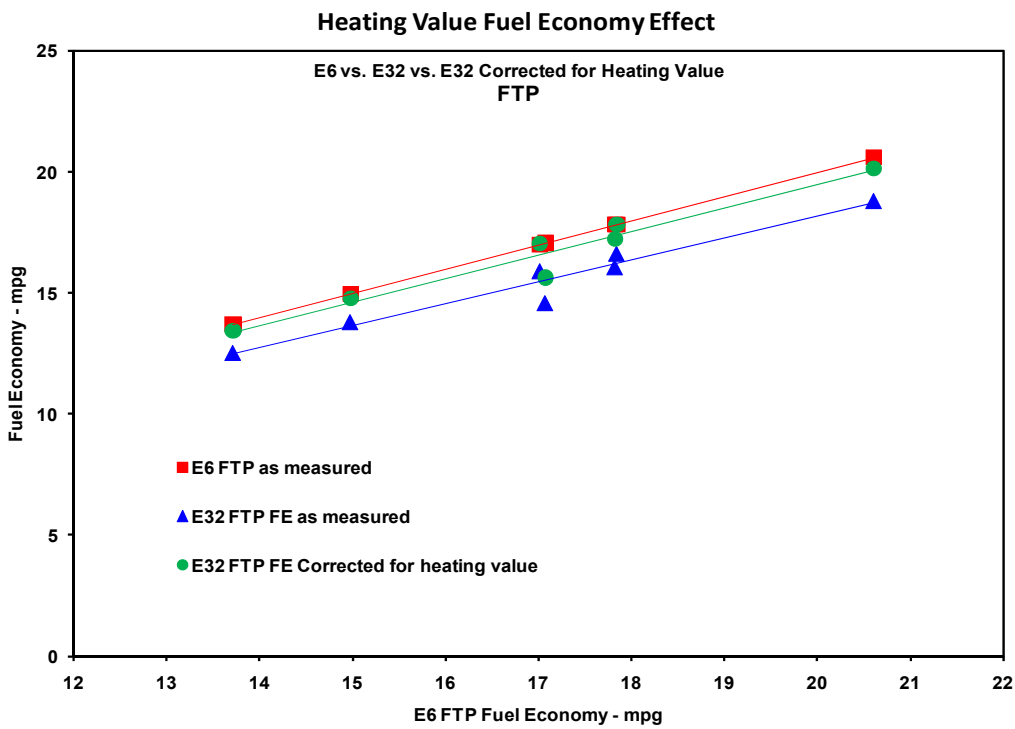


Figure 36. Heating Value Effect – E32 FTP

Figures 36 to 44 Explained - Examine the three colored lines in Figure 36, above. The blue triangles and the blue regression line represent the data for the seven vehicles tested using the E32 fuel on the FTP cycle. The horizontal scale is the FTP fuel economy measured for each vehicle on the E6 fuel. The vertical scale shows the values measured using the E32 fuel (X scale = FE on E6, Y scale = FE on E32). The red squares and line use the same E6 test Fuel Economy (FE) on both scales, and establish a 1:1 relationship between the horizontal and vertical scales. The vertical height differences between the red and blue values indicate the value of the FE decrease that resulted when the higher ethanol E32 fuel was used. The green circles and line represent the E32 FE test values corrected for the ratio of the net heat of combustion values for the fuels. Stated differently, green vertical scale FE = E32 measured value times (NHV_{E6}/NHV_{E32}).

While every measurement showed lower fuel economy with increased ethanol content, the correlation with the net heating value correction factor applied was very good.

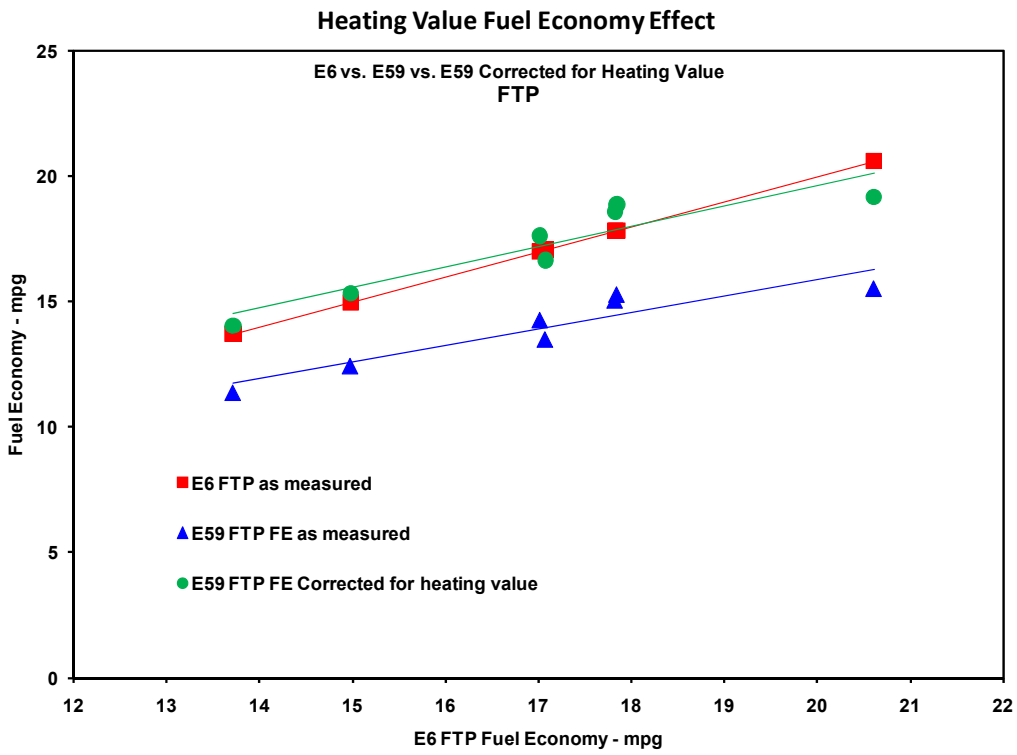


Figure 37. Heating Value Effect – E59 FTP

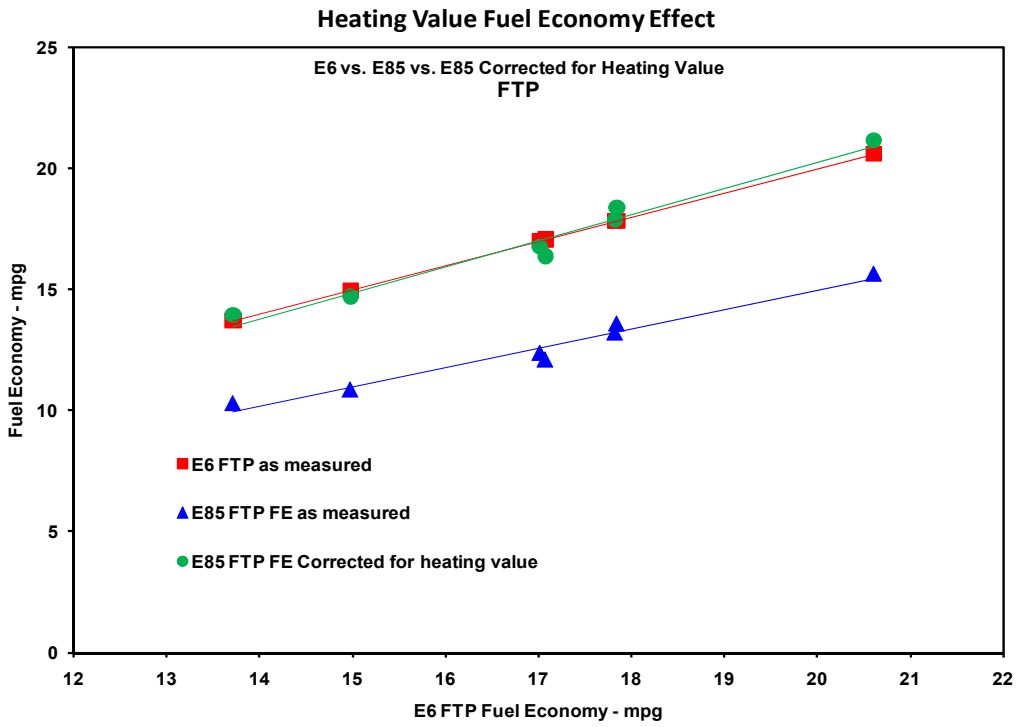


Figure 38. Heating Value Effect – E85 FTP

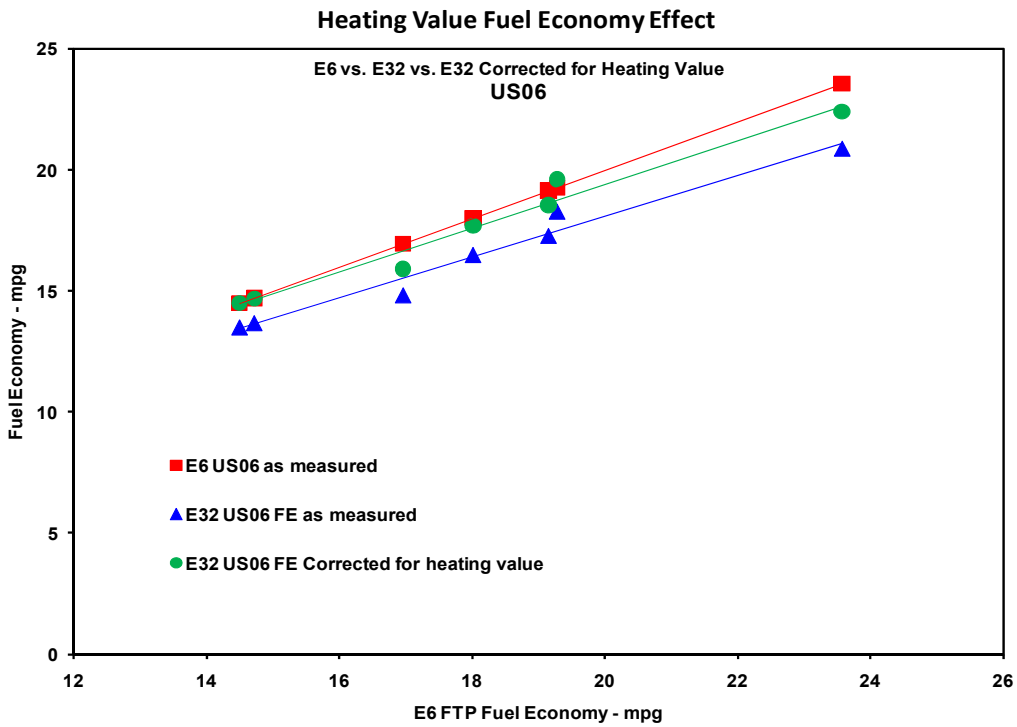


Figure 39. Heating Value Effect – E32 US06

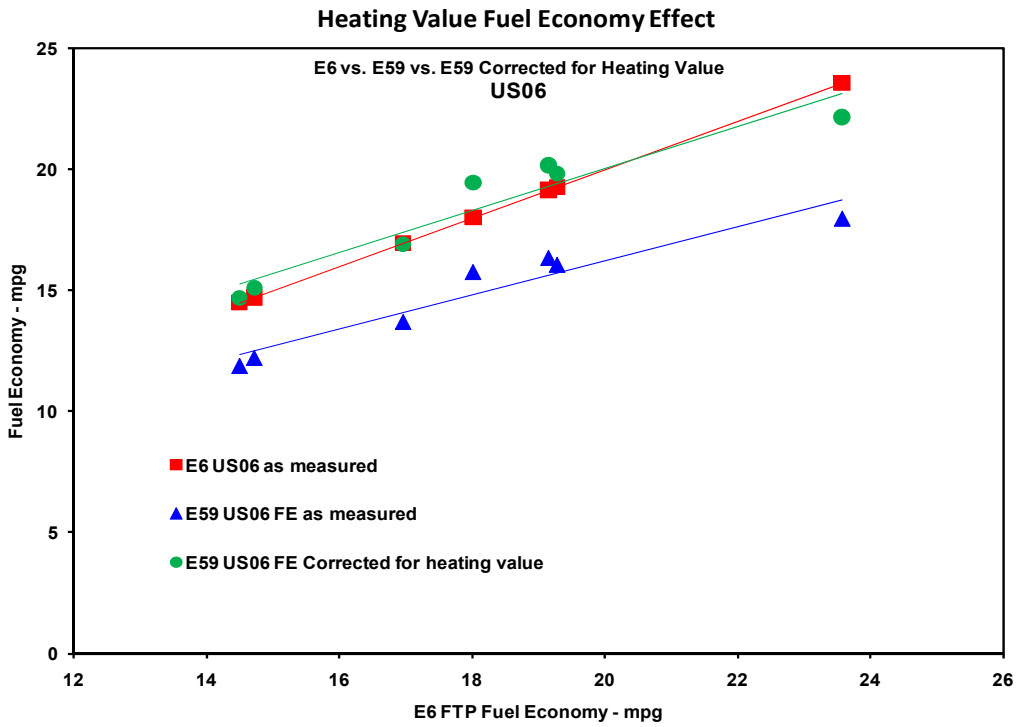


Figure 40. Heating Value Effect – E59 US06

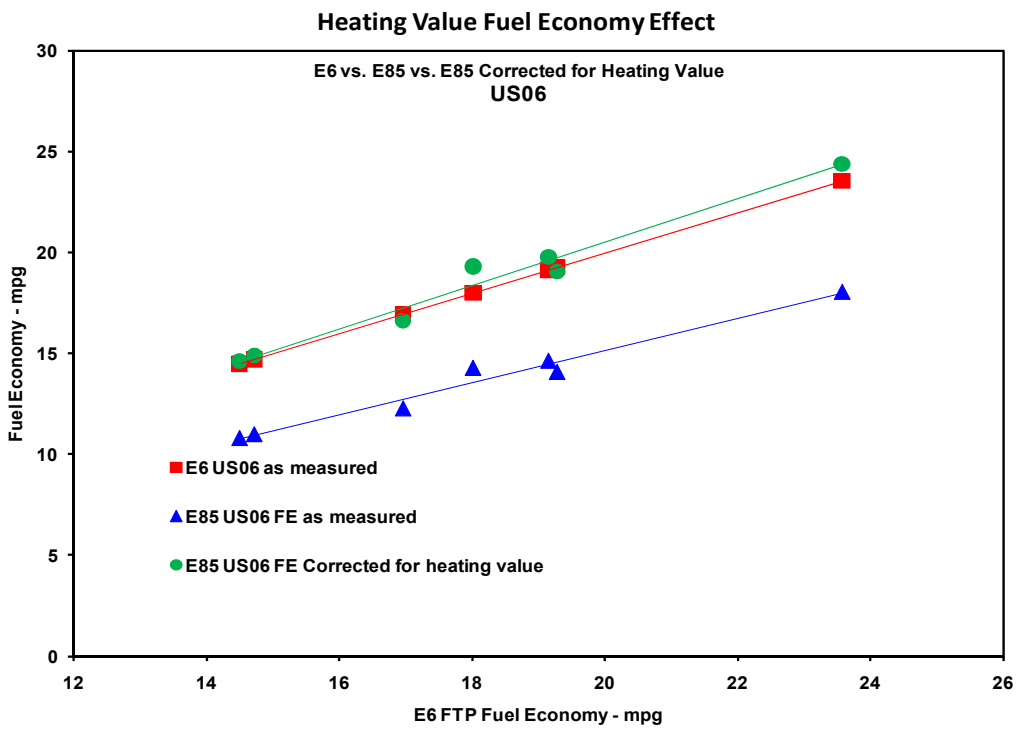


Figure 41. Heating Value Effect – E85 US06

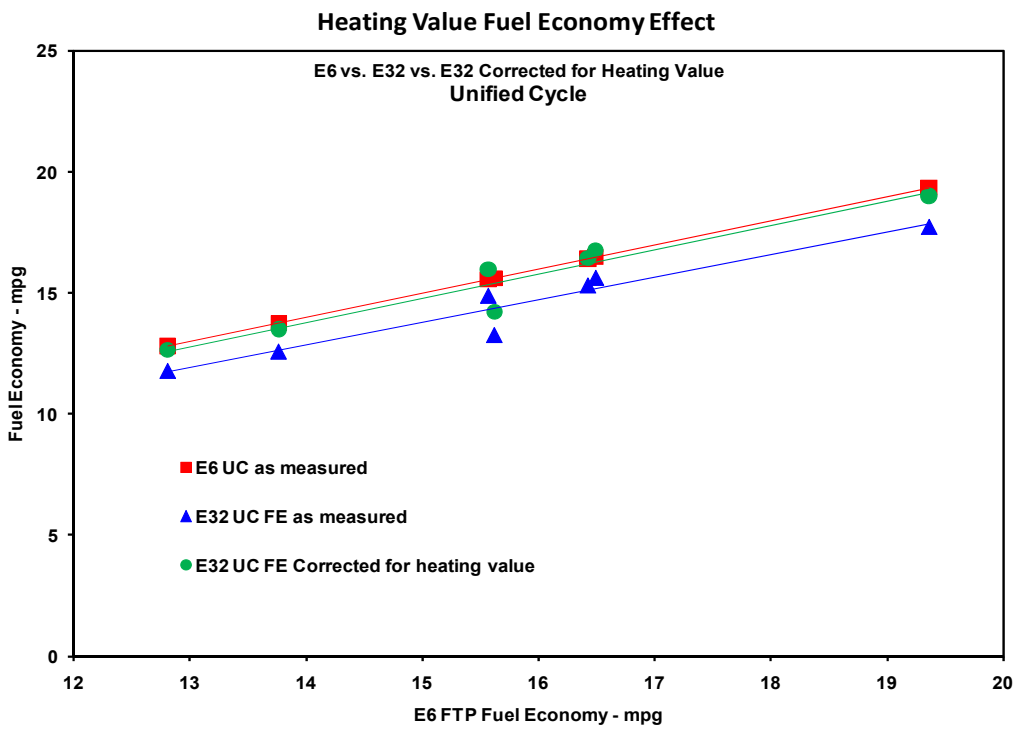


Figure 42. Heating Value Effect – E32 UC

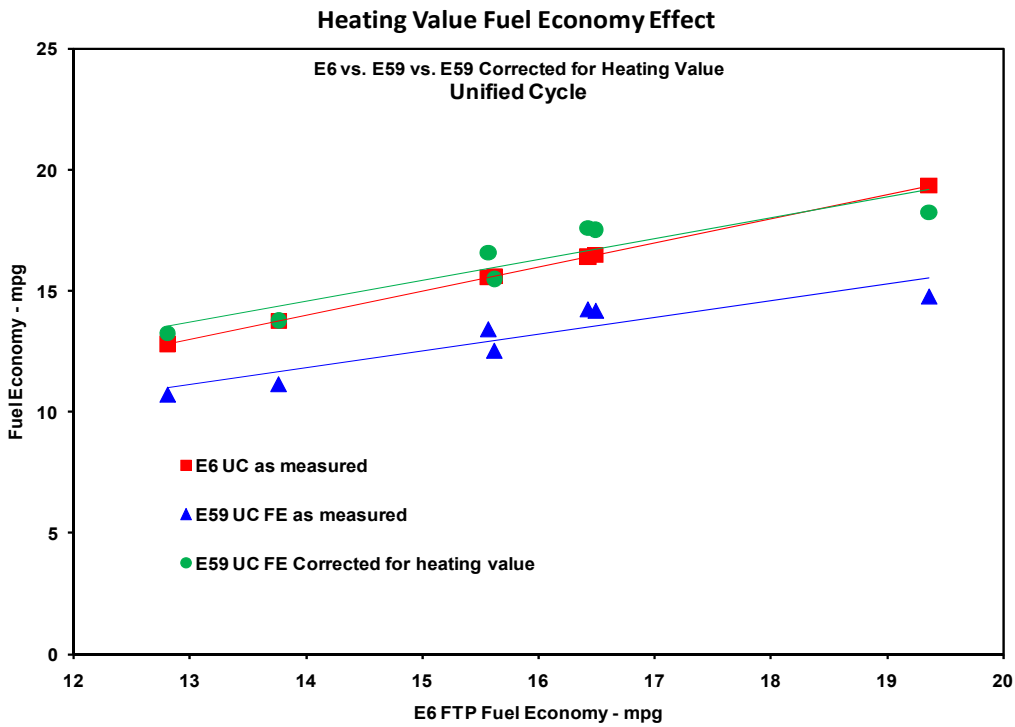


Figure 43. Heating Value Effect – E59 UC

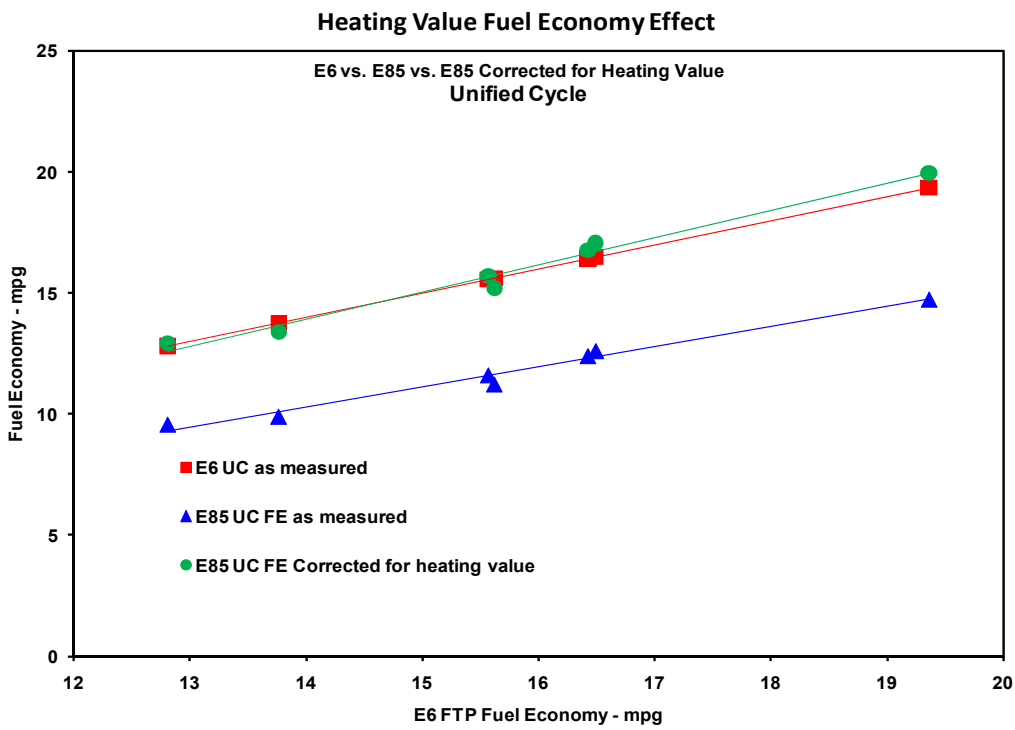


Figure 44. Heating Value Effect – E85 UC

Evaporative Emission Results

Four vehicles (8001, 8003, 8004 and 8007) were used to complete the evaporative emission test procedures on the four evaluation fuels. Three modes of vehicle operation were evaluated for evaporative emissions:

1. Running Losses during two Unified Cycle drives
2. A one-hour "Hot Soak" following a FTP drive, and
3. A Two-Day Diurnal (65-105-65ºF)

The evaporative emission test procedure used for this program required that the vehicle have the evaluation fuel in the system for a minimum of four weeks in an attempt to stabilize the fuel permeation rate. It is assumed that the exhaust emission procedure would require a minimum of one week, so the preconditioning procedure was targeted to be at least three weeks in duration. The evaporative emission test procedure consisted of pre-conditioning followed by the emission test procedures.

Pre-conditioning Procedure:

1. Top the vehicle to 90 to 100% of capacity with the evaluation fuel.
2. Drive the vehicle twice each week for the three week pre-conditioning period for the equivalent of two LA-4s, one from a cold start, and then a following hot drive.
3. Once each week soak the vehicle for a minimum of 12 hours at 86ºF, and conduct a one hour permeation test at 86ºF to determine the basic permeation rate.
4. If, after three weeks, the 86ºF permeation rate is judged to be stable, proceed to the evaporative emission test procedure. If the vehicle's permeation rate is judged to have not stabilized, repeat steps 2 and 3 above until stable.

Evaporative Test Procedure:

1. Drain and fill the vehicle fuel tank to 45% of rated capacity with the evaluation fuel.
2. Park the vehicle for 18 to 36 hours at 68º-86ºF.
3. During the park interval, perform the CRC E-74b canister loading procedure (300 bed volume purge and 25% load with evaluation fuel vapor).
4. Position the vehicle in the Running Loss SHED. Connect tail-pipe and induction air hose apparatus. Stabilize for a minimum of 4 hours at 86ºF.
5. Drive a cold start and a following hot start Unified Cycle while measuring the mass in the running loss SHED. A 30 second idle period occurs between the end of the cold start UC and the start of the hot start UC. This will take approximately 48 minutes and 20 miles of driving. In addition to the second-by-second FID measurement of HC concentration, every ten seconds measure the methanol, ethanol, and refrigerant (R134a) concentrations in the SHED using the INNOVA instrument. Collect sample bags at the start and end of the two Unified Cycles for the gas chromatographic (GC) analysis. (Aldehydes are not produced by evaporative emission mechanisms, and therefore are not measured in this part of the program.)
6. After the Unified Cycle drives, disconnect the vehicle from the test system and park the vehicle in the soak area (68º-86ºF) for 18 to 36 hours.

7. To precondition the vehicle for the "hot soak" measurement, move the vehicle to the chassis dynamometer and drive the complete FTP cycle (44 minutes, an LA-4, 10 minute soak, and hot 505) at 72ºF. No emission measurements are required during this preconditioning drive.
8. Immediately move the vehicle to the Hot Soak SHED for a one hour hot soak measurement. In addition to the second-by-second FID measurement of HC concentration during the hot soak, also measure the methanol, ethanol, and refrigerant (R134a) concentrations in the SHED using the INNOVA instrument, again, on a second-by-second basis. Collect sample bags at the start and end of the Hot Soak for the GC analysis.
9. Move the vehicle to the variable temperature SHED (VT-SHED) and stabilize for a minimum of 6 hours (overnight preferred) at 65ºF as prep for the diurnal test.
10. Conduct the California 2-day diurnal test (65-105-65ºF) measuring the enclosure concentration every ten seconds for the 48 hour period. Collect sample bags for GC analysis at the start, and at the end of each daily period. Also measure the methanol, ethanol, and refrigerant (R134a) concentrations in the SHED using the INNOVA instrument every two minutes.
11. Submit the data summaries to the Project Leader for approval. When approved, continue on to the next evaluation fuel.

The **Running Loss** test was patterned after the Federal Test (40 CFR §86.134-96) except the ambient temperature was 86°F, and the driving cycle was two Unified Cycles separated by a 30 second idle. Vehicle running loss emissions were measured in a special version of a "SHED" known as the "Running Loss SHED," (RL-SHED), which included a chassis dynamometer for simulating the vehicle driving loads. The vehicle was operated inside this sealed enclosure over a chosen driving cycle. The increase in HC emissions inside the enclosure was measured and calculated as mass emissions (40 CFR §86.163-96). The execution was complicated by several factors, including the:

1. Engine must be supplied with external induction air.
2. Exhaust must be conducted externally without any leaks.
3. Load supplied to the vehicle through the chassis dynamometer must not create or allow external leaks.
4. Internal SHED temperature must be maintained while sizable heat is rejected to the ambient by the running engine and exhaust.
5. Cooling air supplied to the radiator must be modulated to represent the vehicle's road speed.
6. Underbody (and especially the fuel system) temperature should represent the rate of rise experienced by a real road-drive.
7. Total volume of the ATL RL-SHED was over 8,000 cubic feet, about 4 times the volume of a conventional diurnal SHED. Concentrations are therefore lower in the enclosure by a factor of four, and very low on "clean" cars.

The Running Loss SHED used was previously described in SAE 1999-01-1424 and CRC Report Number 612. The **Hot Soak** test was preceded by the FTP driving cycle on the chassis dynamometer.

Evaporative Emission Results

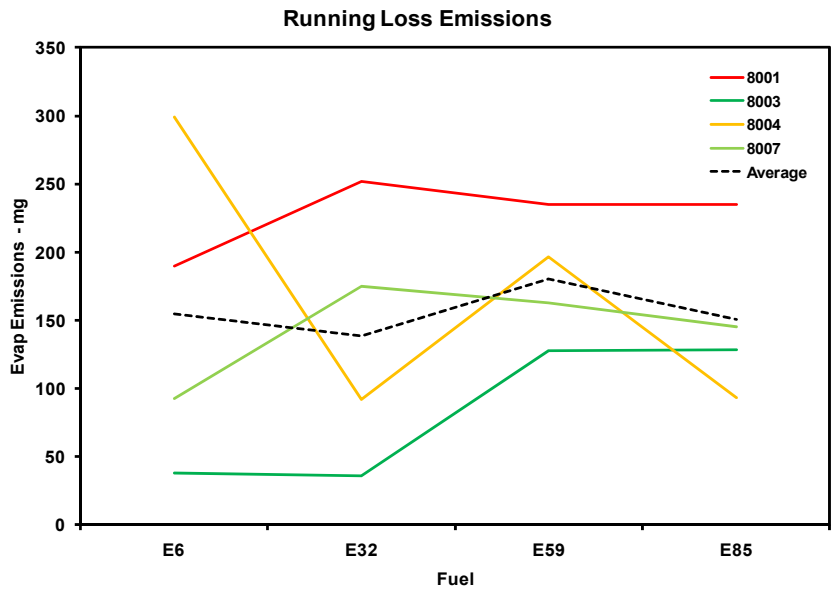


Figure 45. Running Loss Emissions

Figure 45 plots the Running Loss results in mg for the four vehicles in colors and the average results in the dashed black line. The average results do not indicate any trend with increasing ethanol level.

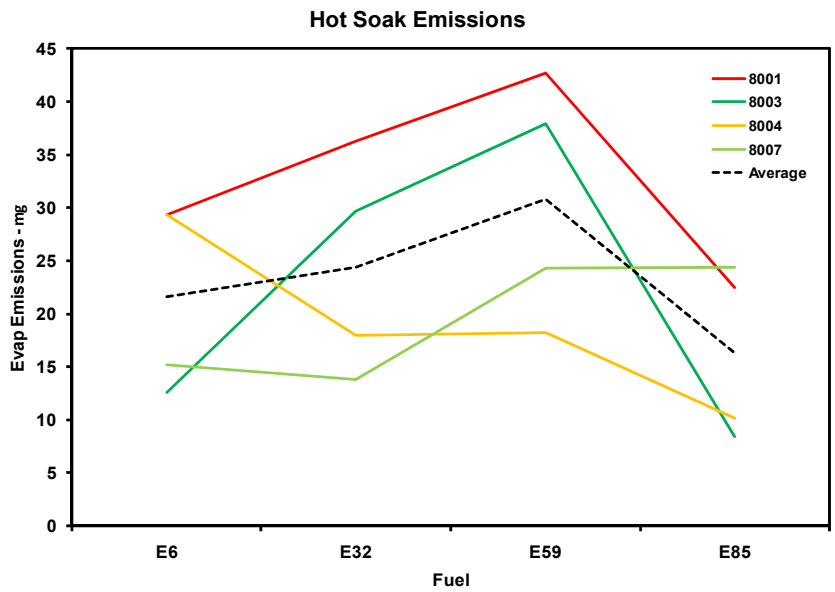


Figure 46. Hot Soak Emissions

Figure 46 plots the one hour Hot Soak results in mg for the four vehicles in colors and the average results in the dashed black line. The average results do not indicate any trend with increasing ethanol level.

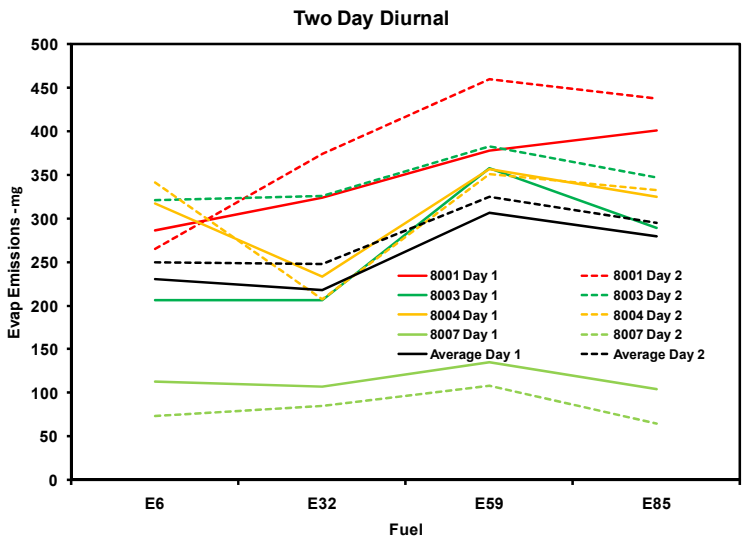


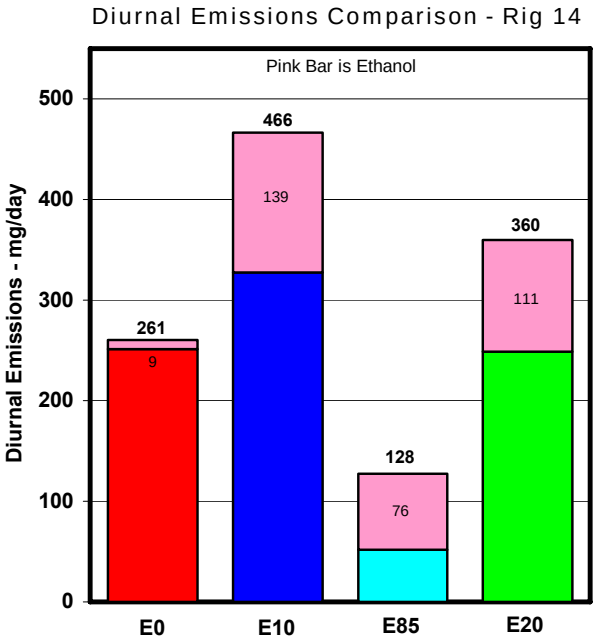
Figure 47. Two Day Diurnal Emissions

Figure 47 compares the Diurnal Test Results for the four vehicles tested on the four fuels. The results for Day 1 and Day 2 are indicated separately. The average of all the data (eight readings for each ethanol blend level) is shown by the black dashed line. There was a statistically significant increase in the Day 1 emissions as ethanol content increased, but the Day 2 effect was not statistically significant.

Diurnal Differences from Previous Results -The figure to the right is taken from the CRC E-65-3 report, "Fuel Permeation from Automotive Systems: E0, E6, E10, E20 and E85, Final Report December 2006." The pink part of the bar identifies the ethanol portion of the total measured diurnal emissions

The E-65-3 report had created an expectation that E85 would have lower diurnal emission results than similar tests run with lower ethanol level fuels on an FFV. The E-80 results did not bear this out.

There were differences in the test procedures and methods. The E-65-3 program was run using isolated fuel systems mounted on aluminum carriers, or "rigs" as shown in the photo on the following page, rather than whole vehicle tests. Only one "Flex-Fuel" fuel system was tested, and it was tested just once.



Source: CRC E-65-3 Report

Source: CRC E-65-3 Report

Typical E-65-3 Test Rig

The prevailing thought had been that ethanol, unlike “gasoline”, was polar, and when present in high concentrations tended to “link” together and act more like a larger molecule than the C_2 that it was. Permeation, the majority component of the diurnal emissions in this test program, was principally diffusion, and the “large” high concentration ethanol molecules were expected to permeate at a lower rate than the less concentrated ethanol fuels. This effect was not seen in these more extensive E-80 program results. The emission levels, roughly 300 mg per day, were not significantly different between the two test programs.

Evaporative Speciation and Reactivity Analysis - The earlier discussion (Exhaust Speciation and Reactivity Analysis – pg 53) explained the file structures. The calculations used to speciate and calculate the reactivity of the various tests also apply to the evaporative emission testing performed. Table 20 summarizes the evaporative testing reactivity generated in this program.

Table 21. Summary – Evaporative Reactivity

Evaporative Emissions Reactivity Results
All CRC E80 Evap Test Vehicles, All Fuels

		Vehicle 8001				Vehicle 8003				Vehicle 8004				Vehicle 8007			
Test	Fuel	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity	Test No.	VOC	Ozone	Reactivity
RL Cold	E6	25716	58.9	126.3	2.144	25728	22.3	84.4	3.783	25743	168.4	578.4	3.434	25739	31.4	140.2	4.469
	E32	25751	--	--	--	25719	36.1	206.8	5.728	25720	30.3	55.9	1.845	25800	113.0	553.8	4.899
	E59	25770	112.5	267.7	2.380	25747	24.3	95.7	3.945	25765	76.9	237.8	3.093	25772	68.0	197.7	2.907
	E85	25722	85.9	338.8	3.943	25762	25.0	55.8	2.232	25731	88.8	286.1	3.222	25786	71.9	183.3	2.549
	E85-Rpt	25733	169.6	442.0	2.606												
RL Total	E6	25716	117.3	433.6	3.697	25728	41.5	138.0	3.325	25743	204.1	677.6	3.319	25739	43.9	211.6	4.816
	E32	25751	173.2	723.0	4.173	25719	54.2	302.8	5.590	25720	36.8	75.8	2.059	25800	148.5	683.1	4.599
	E59	25770	207.0	705.5	3.409	25747	51.3	289.1	5.638	25765	134.6	430.0	3.196	25772	130.6	478.0	3.660
	E85	25722	158.6	464.8	2.931	25762	40.7	177.2	4.357	25731	129.5	504.5	3.896	25786	93.1	264.4	2.841
	E85-Rpt	25733	269.6	656.7	2.436												
HS	E6	7298	26.5	44.7	1.688	7369	12.3	39.1	3.177	7444	17.2	41.6	2.426	7404	9.4	14.5	1.538
	E32	7457	42.0	102.0	2.429	7306	7.0	21.6	3.097	7320	11.3	49.2	4.354	7706	39.4	207.5	5.272
	E59	7534	39.0	139.4	3.575	7453	34.9	57.7	1.652	7518	18.5	36.0	1.949	7542	31.9	68.8	2.157
	E85	7355	28.2	68.0	2.410	7510	16.0	67.7	4.220	7376	12.3	26.0	2.115	7592	11.5	46.0	4.006
	E85-Rpt	7383	28.9	49.0	1.694												
DHB Day 1	E6	7301	233.8	518.5	2.218	7371	230.4	516.3	2.241	7445	343.1	803.2	2.341	7405	107.2	276.9	2.583
	E32	7460	279.5	498.5	1.783	7308	156.2	333.6	2.136	7322	193.7	448.2	2.314	7709	85.9	235.3	2.740
	E59	7535	281.1	531.7	1.892	7454	241.9	553.4	2.287	7520	300.8	646.4	2.149	7543	113.2	218.2	1.927
	E85	7357	371.7	706.2	1.900	7513	240.4	500.7	2.082	7377	322.0	602.7	1.872	7594	86.1	221.5	2.574
	E85-Rpt	7386	320.6	599.3	1.869												
DHB Total	E6	7301	494.1	1145.8	2.319	7371	555.6	1132.5	2.038	7445	659.0	1497.2	2.272	7405	194.7	491.8	2.526
	E32	7460	659.6	1320.8	2.003	7308	441.2	933.6	2.116	7322	372.0	861.0	2.315	7709	171.6	429.6	2.504
	E59	7535	620.9	1182.4	1.904	7454	692.9	1516.3	2.188	7520	534.2	994.9	1.862	7543	174.8	329.6	1.886
	E85	7357	709.5	1344.1	1.894	7513	538.3	1076.8	2.000	7377	621.4	1159.7	1.866	7594	158.9	334.1	2.103
	E85-Rpt	7386	659.5	1189.9	1.804												

Detailed and voluminous speciation data are available in Appendix III.

Plots of the species identified for each test and the reactivities generated by the evaporative testing on the four subject fuels are shown on the following three pages (Figures 48 - 53).

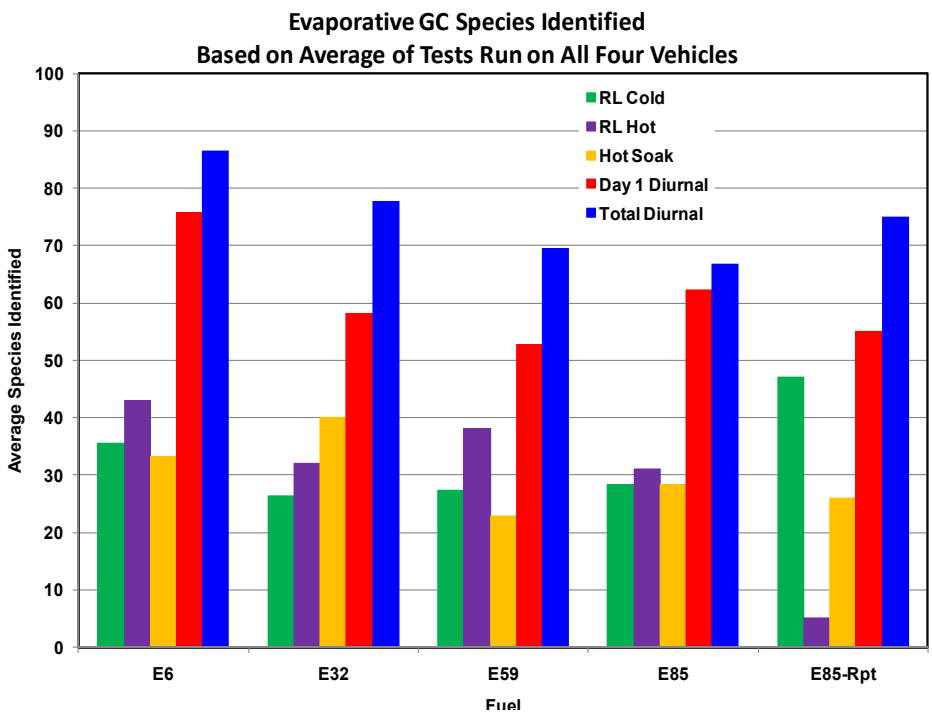


Figure 48. GC Species Identified - Evaporative

Figure 48 indicates the average number of species identified in the evaporative test series.

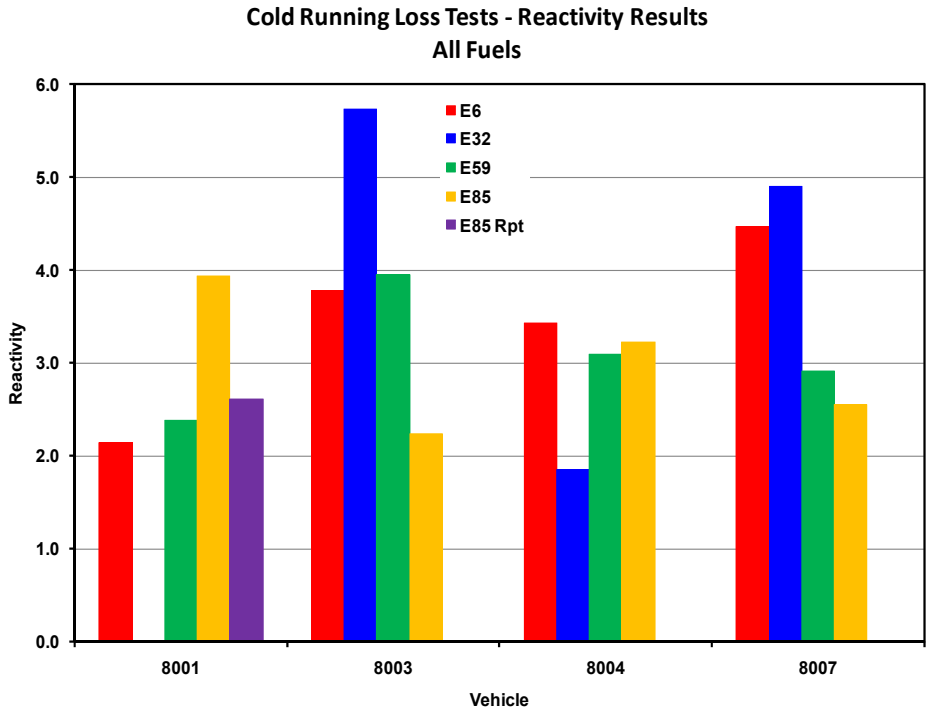


Figure 49. Cold Running Loss Reactivity

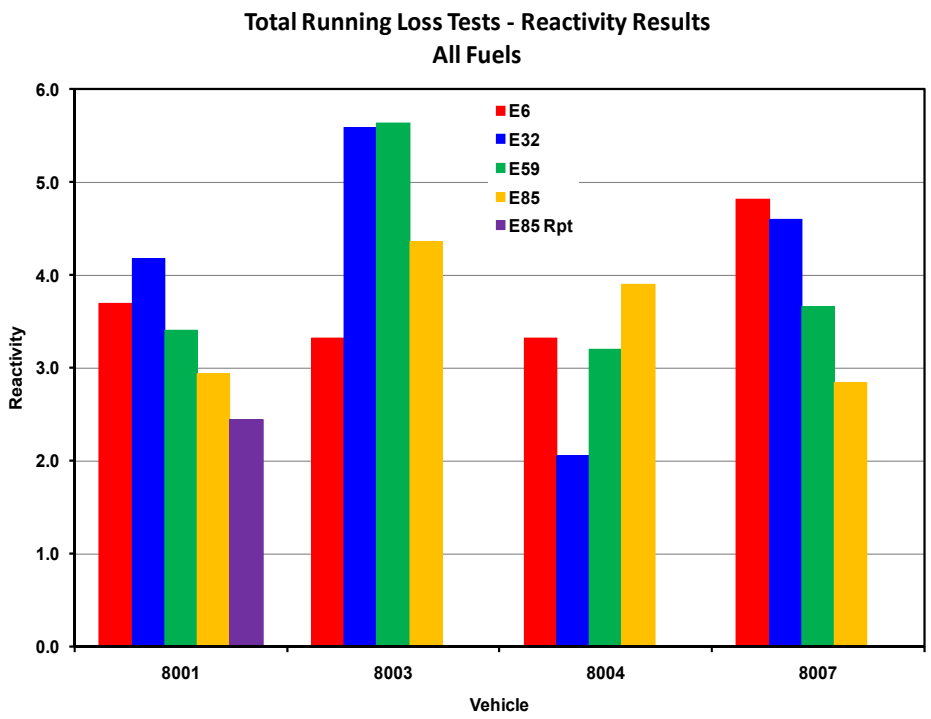


Figure 50. Total Running Loss Reactivity

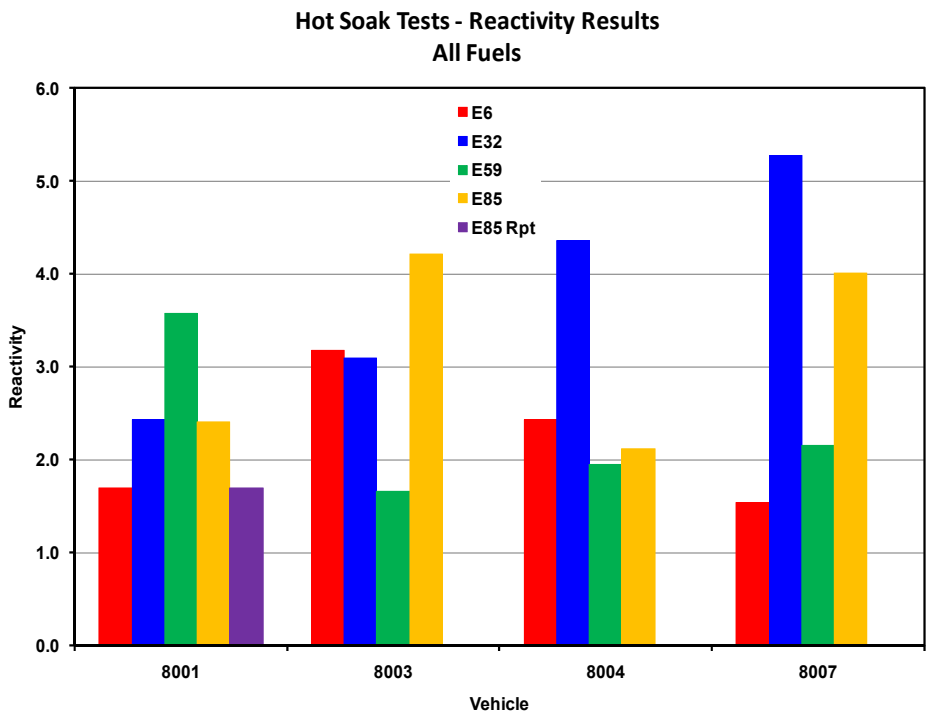


Figure 51. Hot Soak Reactivity

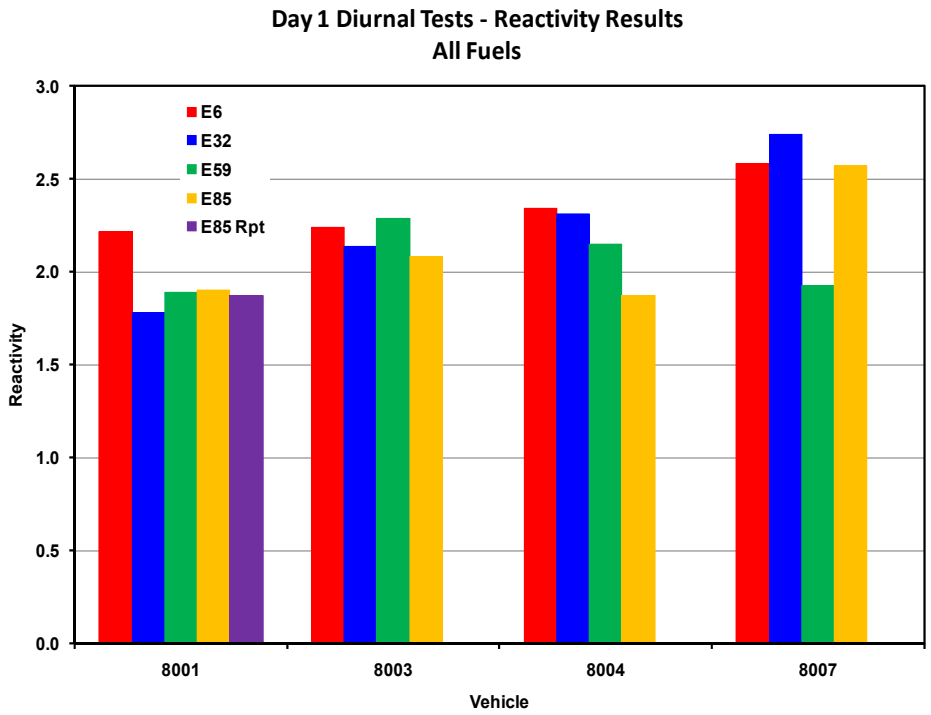


Figure 52. Day 1 Diurnal Reactivity

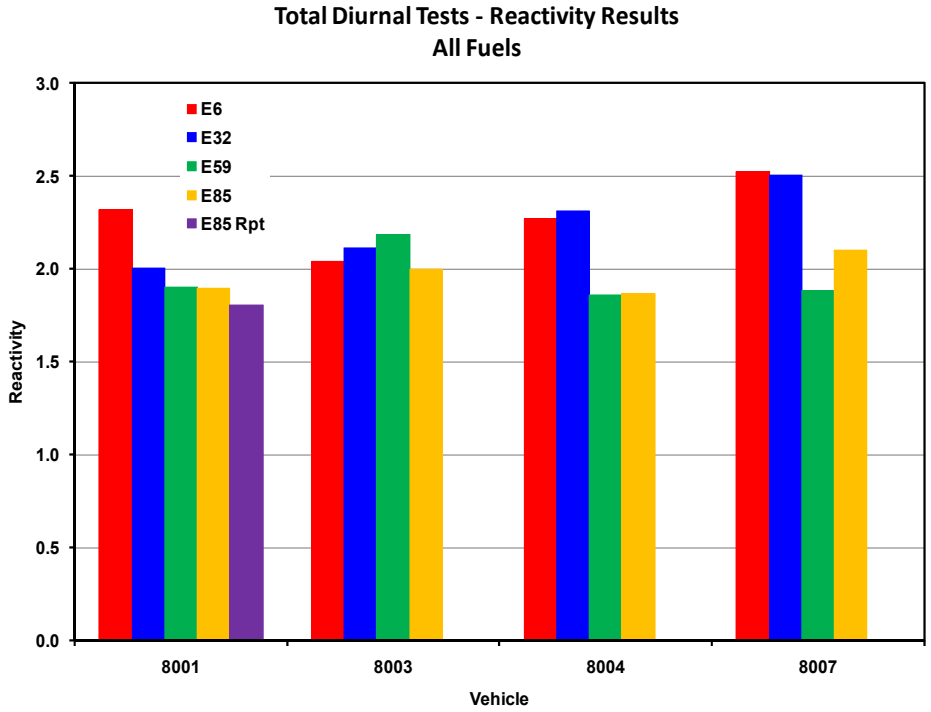


Figure 53. Total Diurnal Reactivity

California certification exhaust emission standards are shown on the Executive Order for each of the vehicles. These standards are presented in Table 21. Vehicle nos. 8001 and 8002 are Federally-certified only, not California-certified.

In order to demonstrate compliance with applicable emissions regulations, vehicle manufacturers submit weighted FTP results of NMOG, CO, NO_x, and formaldehyde from testing on certification fuel. Applicable emissions standards on FFVs are the same on both gasoline and E85. In addition, SC03 and US06 (SFTP) results of NMHC + NO_x and CO from testing on gasoline certification fuel only are submitted. The results of the vehicle emissions testing may serve as a spot check of the data submitted by the vehicle manufacturers. The testing did not incorporate all of the procedures normally employed during compliance testing. The results are not intended to be used to demonstrate compliance or non-compliance with the applicable emissions standards.

Table 22a
California Certification Exhaust Emission Standards[1]

FTP (g/mi)	Vehicle No.						
	8001[2]	**8002[2]**	**8003**	**8004**	**8005**	**8006**	**8007**
	At 50K Miles						
NMOG	0.100	0.14 gas 0.125 E85	0.075	-	0.075	0.075	0.100
CO	3.4	3.4	3.4	-	3.4	3.4	3.4
NO_x	0.14	0.14	0.05	-	0.05	0.05	0.14
Formaldehyde	0.015 E85	0.015 E85	0.015	-	0.015	0.015	0.015
PM	-	-	-	-	-	-	-
Hwy NO_x	0.19	0.19	0.07	-	0.07	0.07	0.19
Cold CO	12.5 gas	12.5 gas	-	-	-	-	-
	At Useful Life						
NMOG	0.125	0.18 gas 0.156 E85	0.090	0.070	0.090	0.090	0.125
CO	4.2	4.2	4.2	2.1	4.2	4.2	4.2
NO_x	0.20	0.20	0.07	0.04	0.07	0.07	0.20
Formaldehyde	0.018 E85	0.018 E85	0.018	0.011	0.018	0.018	0.018
PM	-	-	0.01	-	-	-	-
Hwy NO_x	0.27	0.27	0.09	0.05	0.09	0.09	0.27

Notes:
1. Except as indicated, certification standards are the same for gasoline and E85.
2. Federally certified only, not California-certified.

Table 22b
California Certification Exhaust Emission Standards[1]

SFTP Composite (g/mi)	Vehicle No.						
	8001[2]	**8002[2]**	**8003**	**8004**	**8005**	**8006**	**8007**
	At 50K Miles						
NMHC + NO_x	-	-	-	-	-	-	-
CO	-	-	-	-	-	-	-
	At Useful Life						
NMHC + NO_x	1.00	-	0.65	0.97	0.99	0.95	0.71
CO	-	-	-	-	-	-	-

Notes:
1. Certification standards are for gasoline only.
2. Federally certified only, not California-certified.

Table 22c
California Certification Exhaust Emission Standards[1]

SFTP US06 (g/mi)	**Vehicle No.**						
	8001[2]	**8002[2]**	**8003**	**8004**	**8005**	**8006**	**8007**
	At 4K Miles[3]						
NMHC + NO_x	0.25	-	0.14	0.4	0.4	0.25	0.14
CO	10.5	13.2	8.0	10.5	10.5	10.5	8.0
	At Useful Life						
NMHC + NO_x	-	-	-	-	-	-	-
CO	14.6	19.3	11.1	16.9	16.9	14.6	11.1

Notes:
1. Certification standards are for gasoline only.
2. Federally certified only, not California-certified.
3. Vehicle no. 8002 is 50K miles.

Table 22d
California Certification Exhaust Emission Standards[1]

SFTP SC03 (g/mi)	**Vehicle No.**						
	8001[2]	**8002[2]**	**8003**	**8004**	**8005**	**8006**	**8007**
	At 4K Miles[3]						
NMHC + NO_x	0.27	-	0.20	0.31	0.31	0.27	0.20
CO	2.7	4.4	2.7	3.5	3.5	3.5	2.7
	At Useful Life						
NMHC + NO_x	-	-	-	-	-	-	-
CO	4.9	6.4	3.7	5.6	5.6	4.9	3.7

Notes:
1. Certification standards are for gasoline only.
2. Federally certified only, not California-certified.
3. Vehicle no. 8002 is 50K miles.

Conclusions and Summary of Results

The objectives of this project were to procure and test a small sample of late model California-certified FFVs to determine the exhaust and evaporative emissions impact of varying ethanol-gasoline blends. This included determining the mileage required to adjust the engine fuel control system in order to aid in the understanding of the effect of switching fuels on emissions. In addition, chemical speciation of the exhaust and evaporative emissions was also a project objective. While all observations were analyzed for statistical significance, only those that were significant at the 95% confidence level are noted here.

Consistency Between Endpoint and Intermediate Fuels – The exhaust emissions (THC, NMHC, NMOG, NOx, CO, acetaldehyde and formaldehyde) for all driving cycles, the evaporative emissions (running loss, hot soak and each day of the two-day diurnal) and fuel economy were all analyzed to determine if there was any inconsistency between the endpoint ethanol contents (i.e., the ones for which the vehicles were calibrated) and the intermediate ethanol contents. None of these effects was determined to be significant at the 95% confidence level, although some were significant at 90%.

The testing conducted during this program leads to the following conclusions and findings, subject to the constraints and limitations of the program, and consideration for the small amount of samples and limited tests conducted:

Fuel Switching – The three vehicles tested adapted within the first ten miles of driving to the new fuel when switching from E85 to E6, E6 to E85, and E85 to E45.5. While the results from the limited sample of three vehicles evaluated does not prove that all "Flex-Fuel" systems will give similar results, it does show that the 2007 MY technology is capable of adapting quickly.

FTP Exhaust Emission Results on E6, E85 and Blends – The average emissions for the seven vehicles tested did not indicate a statistically significant emission trend with increasing ethanol level on the cold start FTP emission evaluation.

US06 Exhaust Emission Results on E6, E85 and Blends – The US06 high speed/load driving schedule indicated a statistically significant trend of decreasing non-methane hydrocarbon emissions (NMHC) with increasing ethanol content in the fuel. The average NMHC value decreased from 0.047 g/mile with the E6 fuel to 0.020 g/mile with E85. The CO and NOx emissions, on average, did not indicate a trend with ethanol level.

Unified Cycle Exhaust Emission Results on E6, E85 and Blends – The cold start Unified Driving Cycle test results did not show a trend with increasing ethanol level for the NMHC, CO or NOx, although the NOx trend was nearly statistically significant (P=0.0642)

Exhaust Speciation and Reactivity Analysis – A total of 504 speciation tests were made, including the aldehydes which showed a statistically significant increase with increasing ethanol content. These individual test results are contained in Appendix III. The most prevalent aldehyde was the expected acetaldehyde (CAS # 75-07-0). The hot start tests (FTP bags 2 & 3, and US06) had low emission levels and fewer species identified.

The average Carter Reactivity of the exhaust samples decreased with increasing ethanol content of the fuels on the cold start FTP. There were mixed results on the US06 and Unified Cycle tests.

Fuel Economy - While every measurement showed a statistically significant lower fuel economy with increased ethanol content, when the fuel economy values were adjusted using the ratios of the net heating value, the correlation was very good. It appears that the fuel economy (or consumption) changes with increased ethanol level are due to the volumetric energy content of the fuel.

Evaporative Emissions – The Running Loss results on the four vehicles tested did not show a trend with ethanol content in the fuel. In a similar fashion, the Hot Soak results did not show a trend. The Diurnal results suggested an increasing trend with increasing ethanol content on Day 1 that was statistically significant, but was not significant on Day 2. This is different from earlier CRC studies (E-65 and E-65-3) that suggested that diurnal permeation decreased with increasing ethanol content for the FFV that was tested.

Reactivity results were mixed on the four vehicles and the four fuels evaluated.

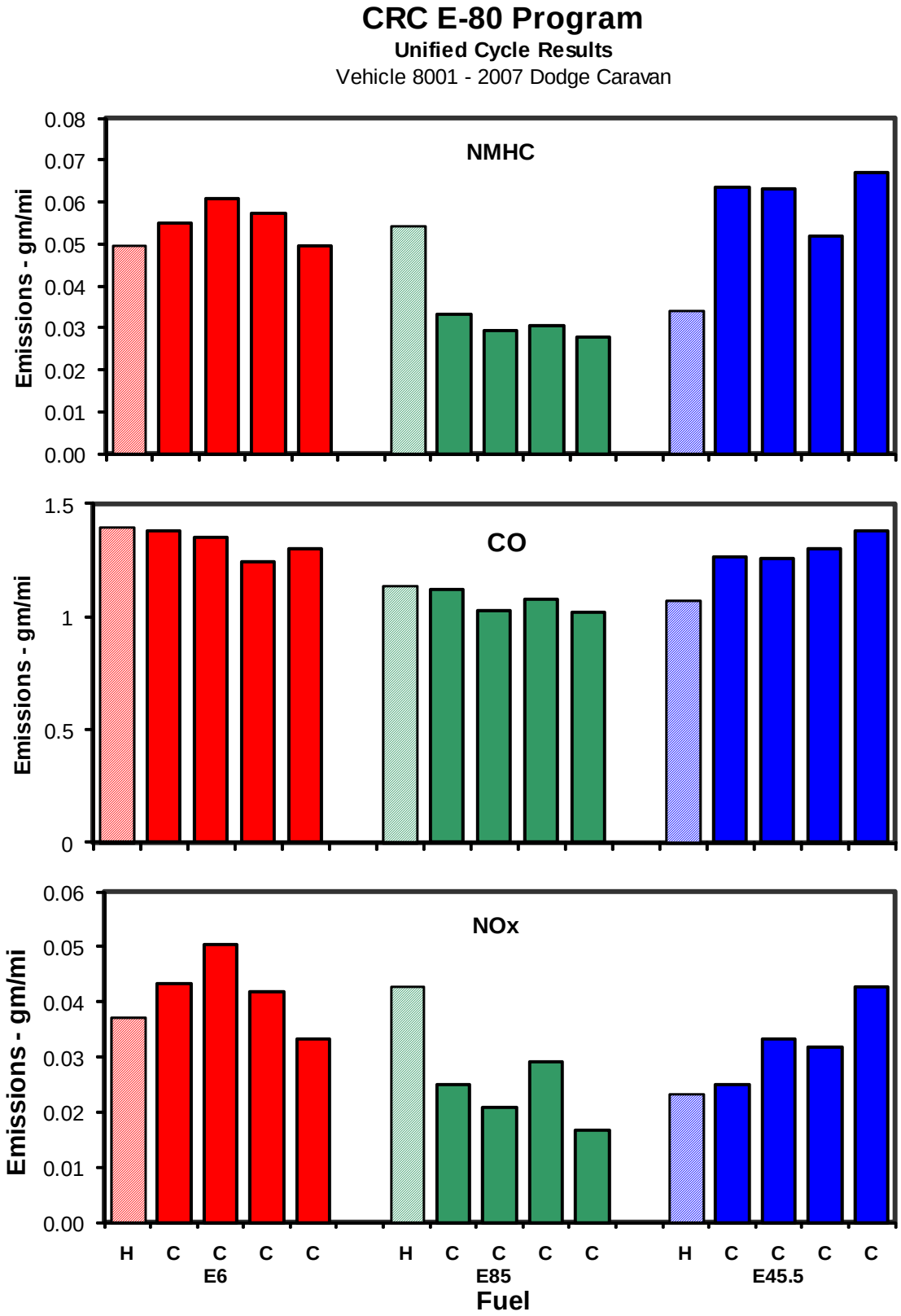
Appendix I – Pilot Study Individual Data & Statistical Analysis

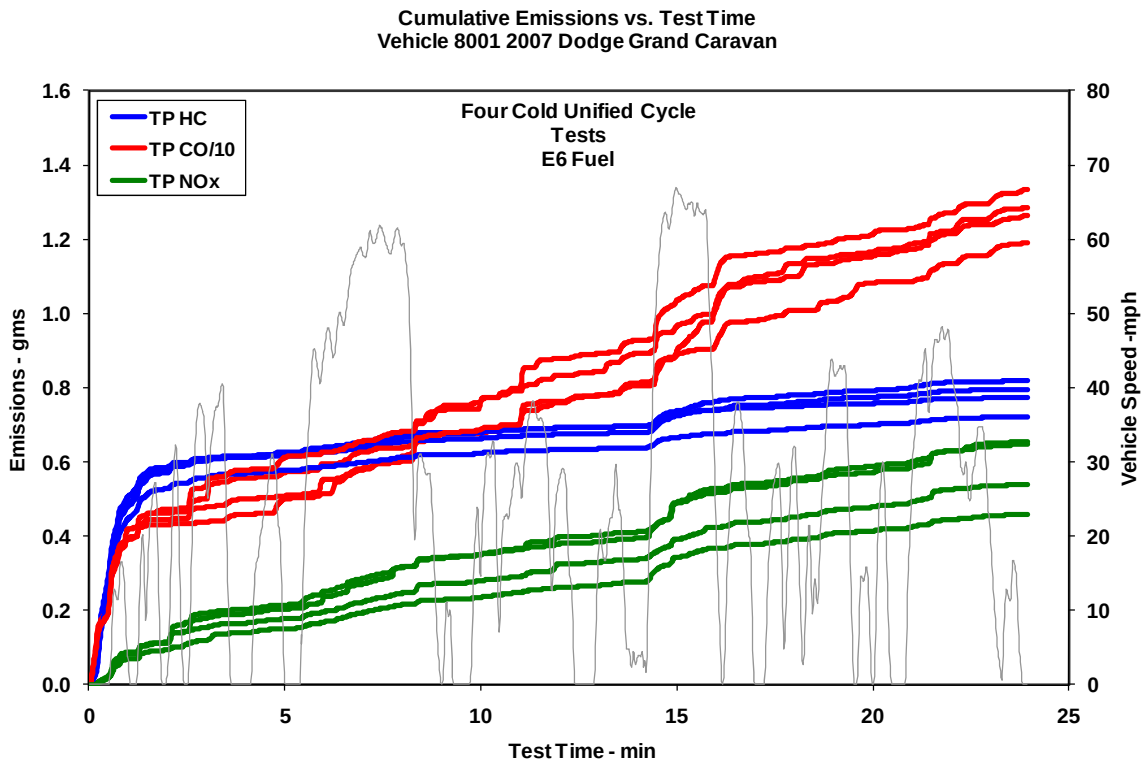
Appendix I contains a series of plots of the individual Pilot Study test data for reference. These plots are organized as follows, for each of the three vehicles;

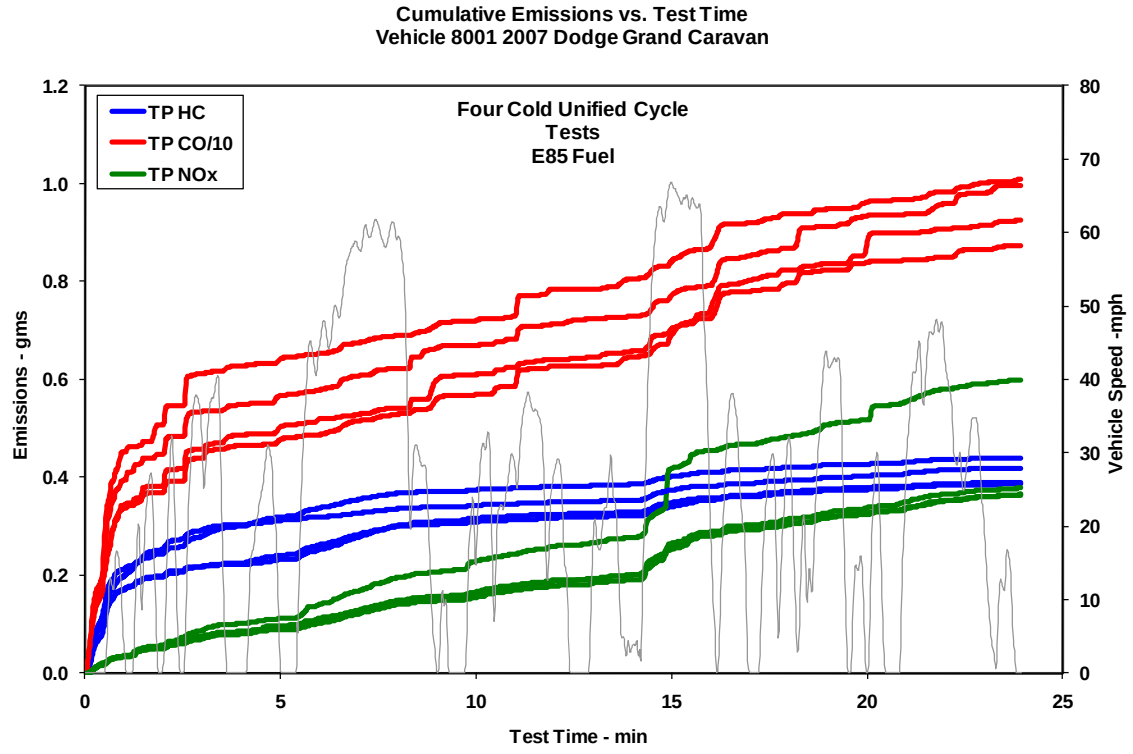
- A three panel bar chart displaying the hot start and four cold FTP tests on each fuel
- A line chart of cumulative THC, CO and NOx for each fuel tested
- A plot of converter efficiency vs. pre-catalyst HC for each fuel change
- A table of all the UC tests data
- A brief description of the statistical analysis of the pilot study data.
- A summary table from the statistical analysis of the pilot study data.

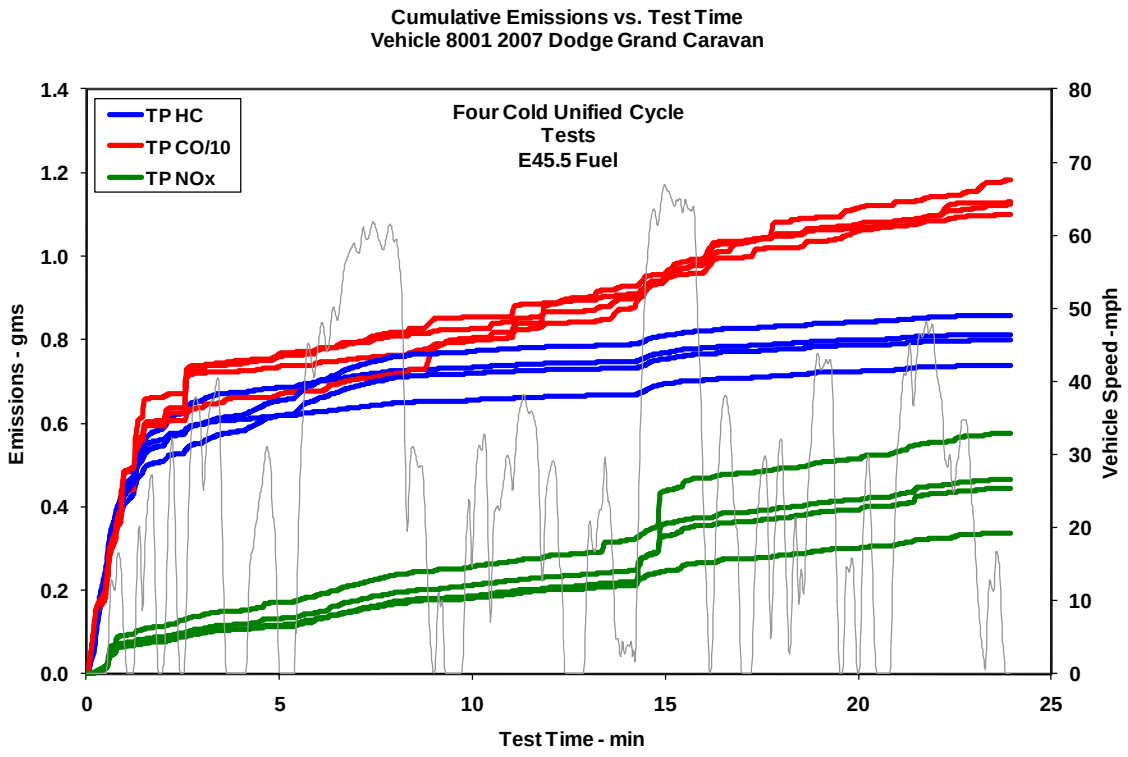
There are a total of 18 pages in Appendix I.

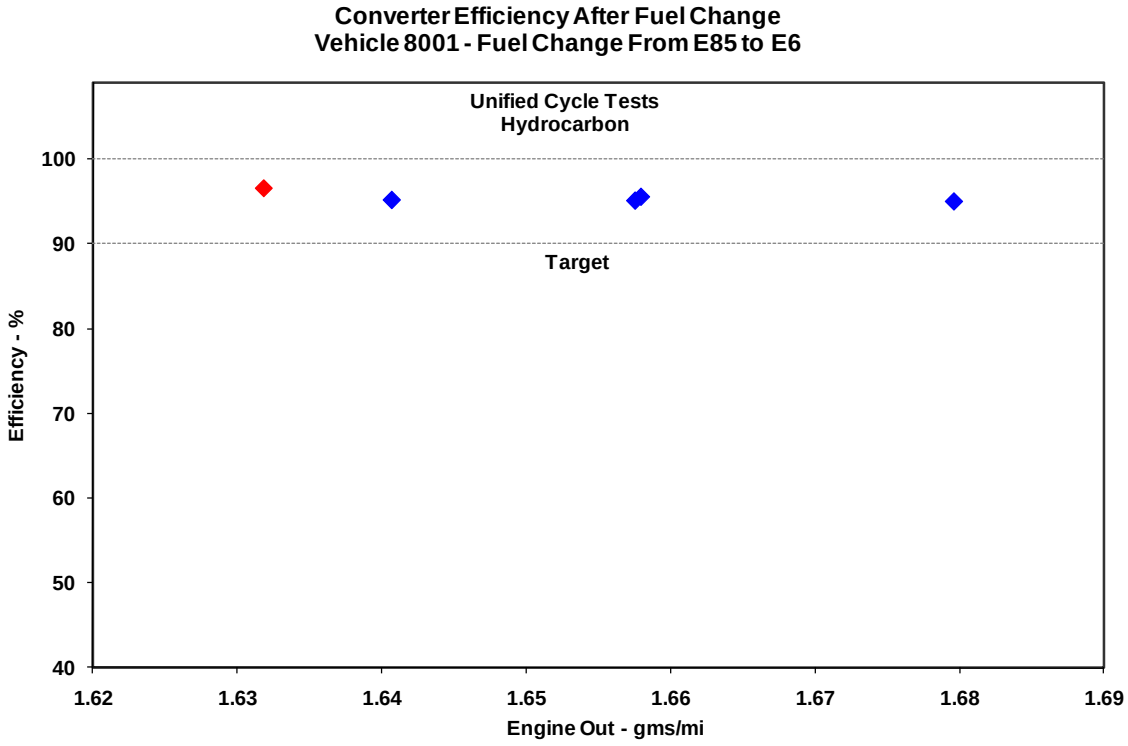
Vehicle 8001

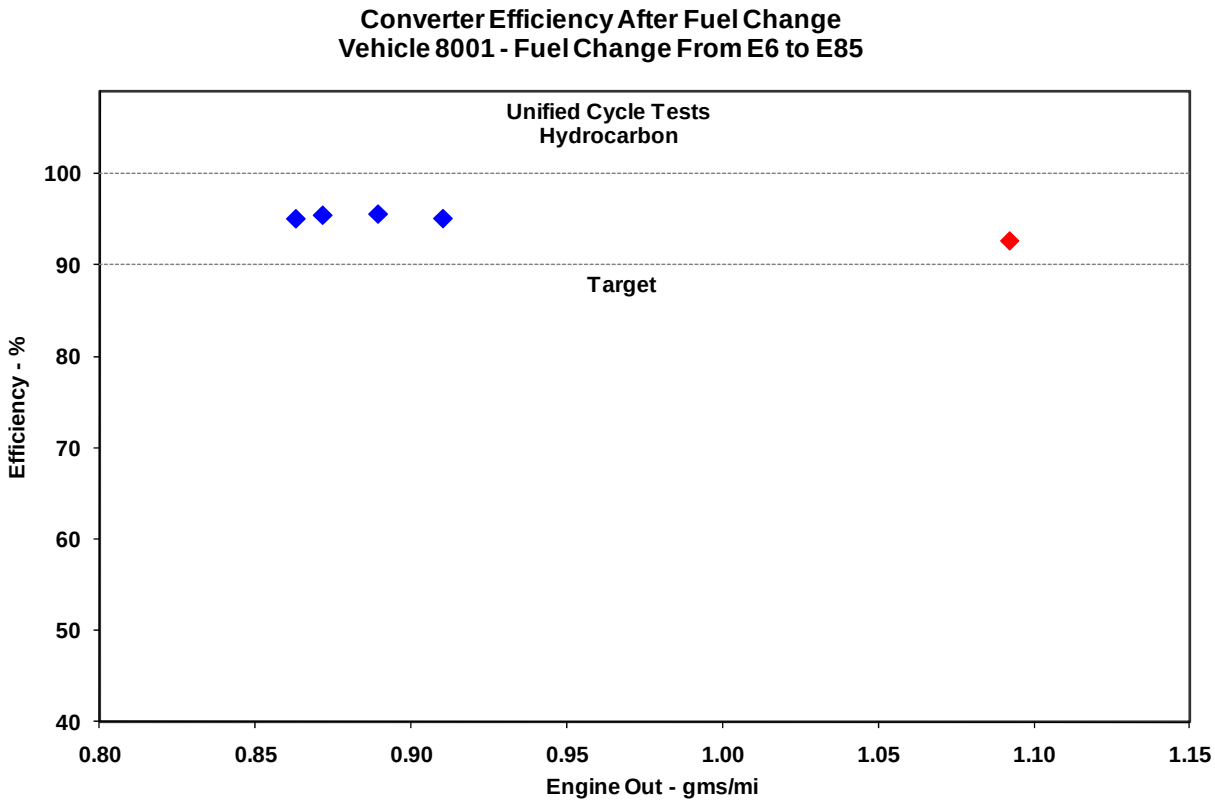


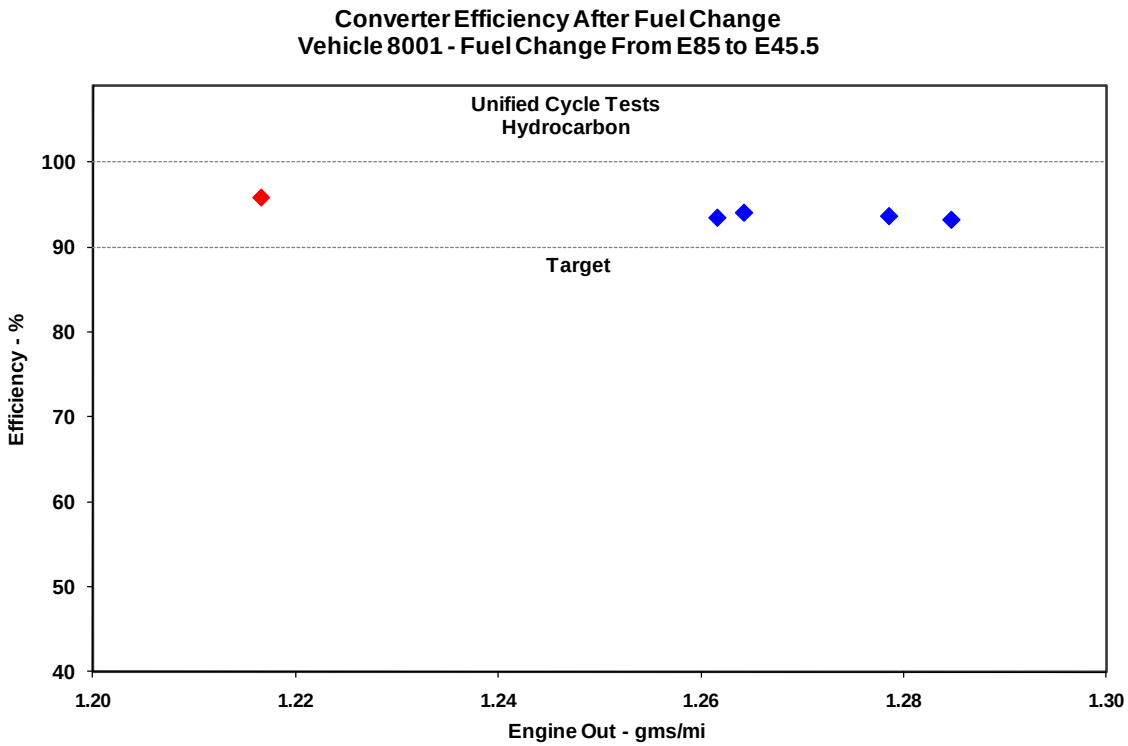

Cumulative Emissions vs. Test Time
Vehicle 8001 2007 Dodge Grand Caravan
Four Cold Unified Cycle
Tests
E6 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8001 2007 Dodge Grand Caravan
Four Cold Unified Cycle
Tests
E85 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8001 2007 Dodge Grand Caravan
TP HC
TP CO/10
TP NOx
Four Cold Unified Cycle
Tests
E45.5 Fuel
Emissions - gms
Vehicle Speed -mph
Test Time - min
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25

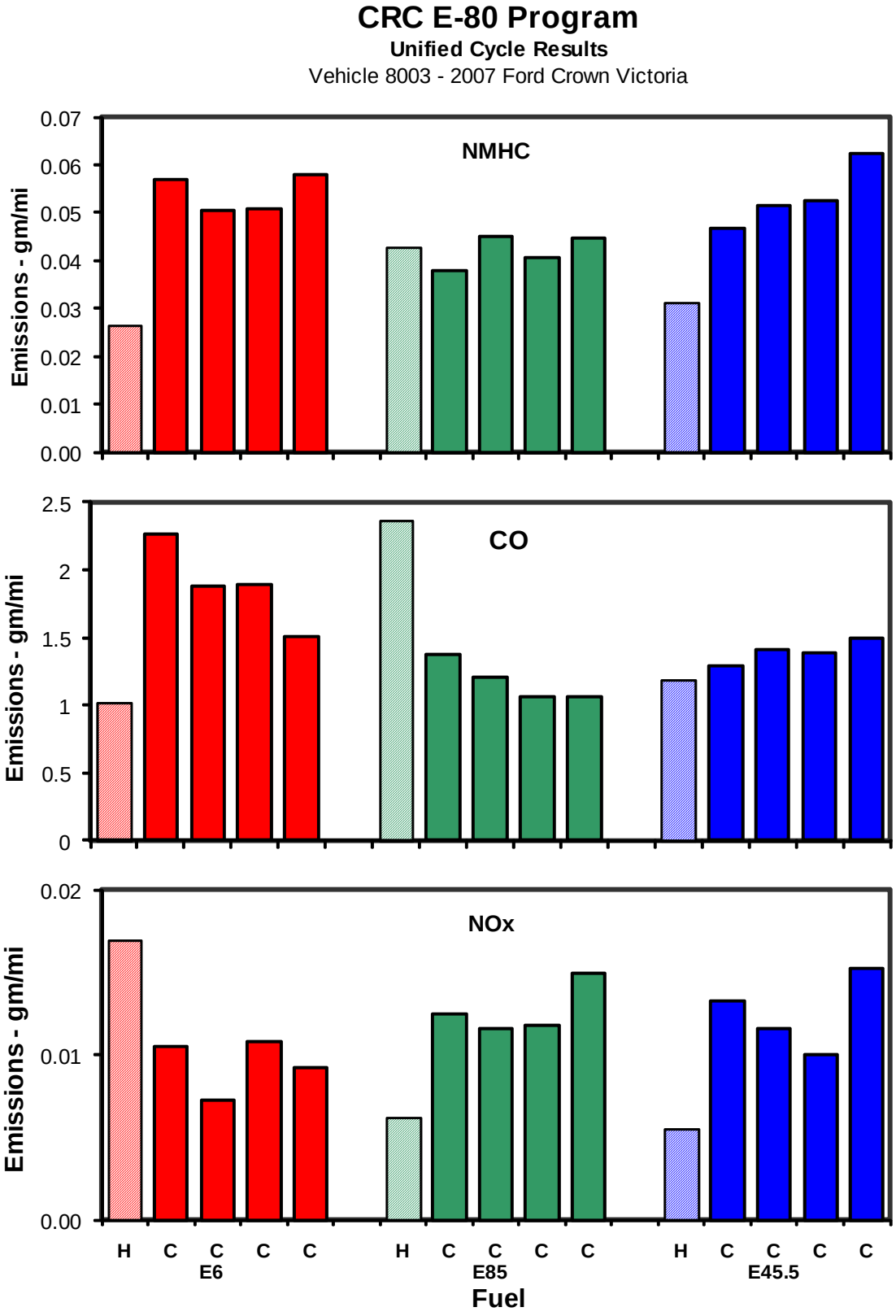

Converter Efficiency After Fuel Change
Vehicle 8001 - Fuel Change From E85 to E6
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
Engine Out - gms/mi
100
90
80
70
60
50
40
1.62
1.63
1.64
1.65
1.66
1.67
1.68
1.69

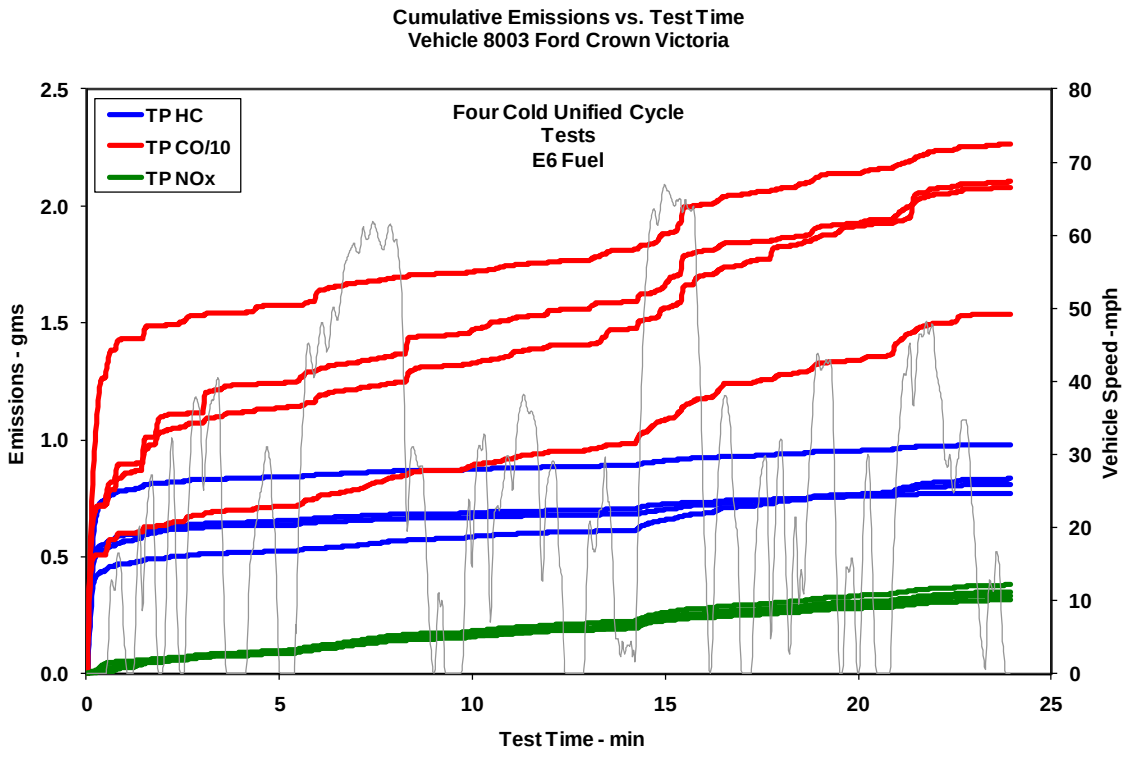

Converter Efficiency After Fuel Change
Vehicle 8001 - Fuel Change From E6 to E85
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
0.80
0.85
0.90
0.95
1.00
1.05
1.10
1.15
Engine Out - gms/mi

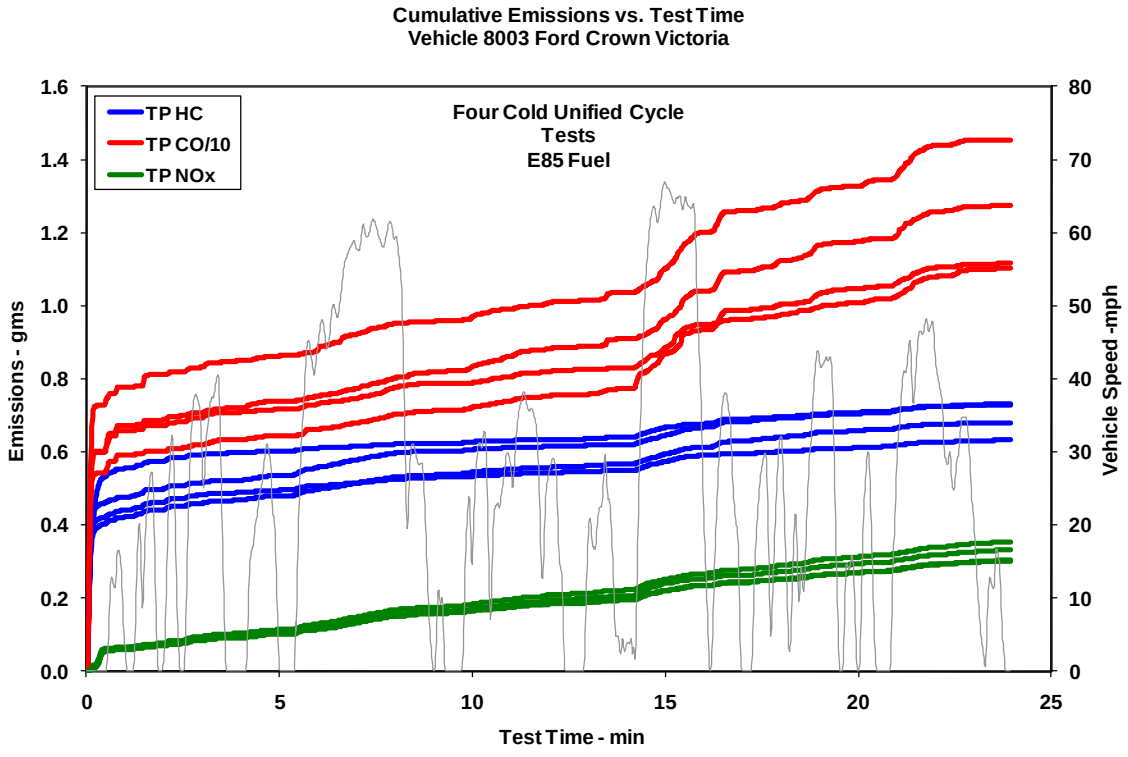

Converter Efficiency After Fuel Change
Vehicle 8001 - Fuel Change From E85 to E45.5
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
1.20
1.22
1.24
1.26
1.28
1.30
Engine Out - gms/mi

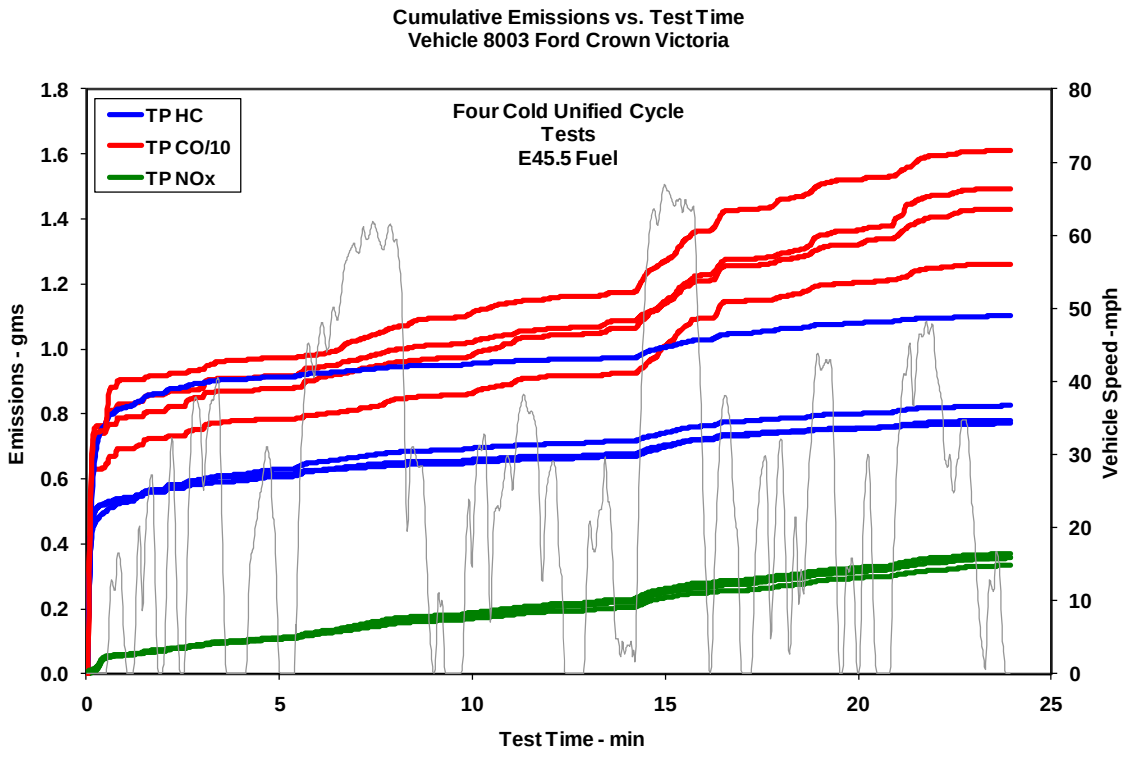
Vehicle	UC Test	Fuel	Test Temp	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg
8001	5616	E6	Hot	**0.050**	**0.016**	**0.069**	**1.401**	**0.037**	**500.7**	**16.5**
2007	5620		Cold 1	**0.055**	**0.019**	**0.077**	**1.384**	**0.043**	**487.1**	**16.9**
Dodge	5623		Cold 2	**0.061**	**0.013**	**0.077**	**1.352**	**0.050**	**496.1**	**16.6**
Grand	5626		Cold 3	**0.057**	**0.012**	**0.073**	**1.242**	**0.042**	**496.2**	**16.6**
Caravan	5629		Cold 4	**0.050**	**0.015**	**0.068**	**1.300**	**0.033**	**497.9**	**16.6**
30,522										
	5630	E85	Hot	**0.054**	**0.016**	**0.074**	**1.136**	**0.043**	**480.7**	**12.6**
	5633		Cold 1	**0.033**	**0.016**	**0.052**	**1.119**	**0.025**	**483.8**	**12.6**
	5637		Cold 2	**0.029**	**0.015**	**0.046**	**1.027**	**0.021**	**482.1**	**12.6**
	5643		Cold 3	**0.030**	**0.014**	**0.047**	**1.081**	**0.029**	**484.8**	**12.5**
	5646		Cold 4	**0.028**	**0.018**	**0.047**	**1.021**	**0.017**	**484.7**	**12.5**
	5649	E45.5	Hot	**0.034**	**0.015**	**0.051**	**1.077**	**0.023**	**490.3**	**14.6**
	5650		Cold 1	**0.063**	**0.012**	**0.080**	**1.264**	**0.025**	**486.9**	**14.7**
	5651		Cold 2	**0.063**	**0.014**	**0.081**	**1.255**	**0.033**	**484.7**	**14.8**
	5652		Cold 3	**0.052**	**0.015**	**0.070**	**1.303**	**0.032**	**484.5**	**14.8**
	4653		Cold 4	**0.067**	**0.013**	**0.084**	**1.381**	**0.043**	**481.0**	**14.9**

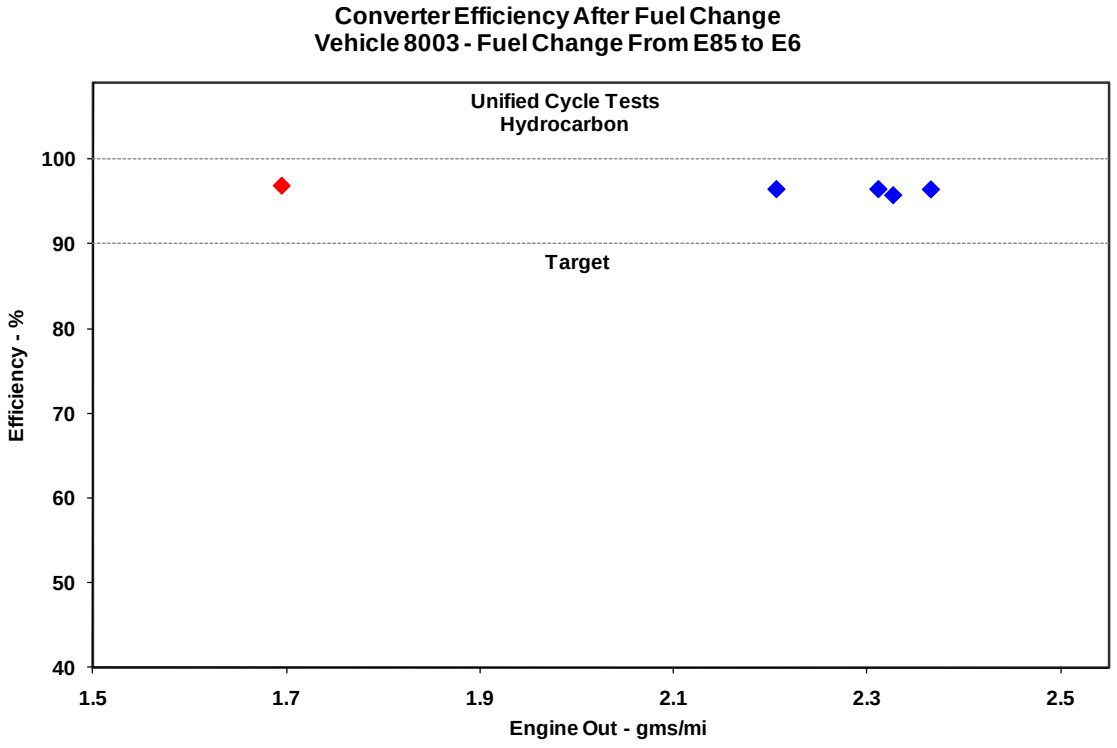
Vehicle 8003

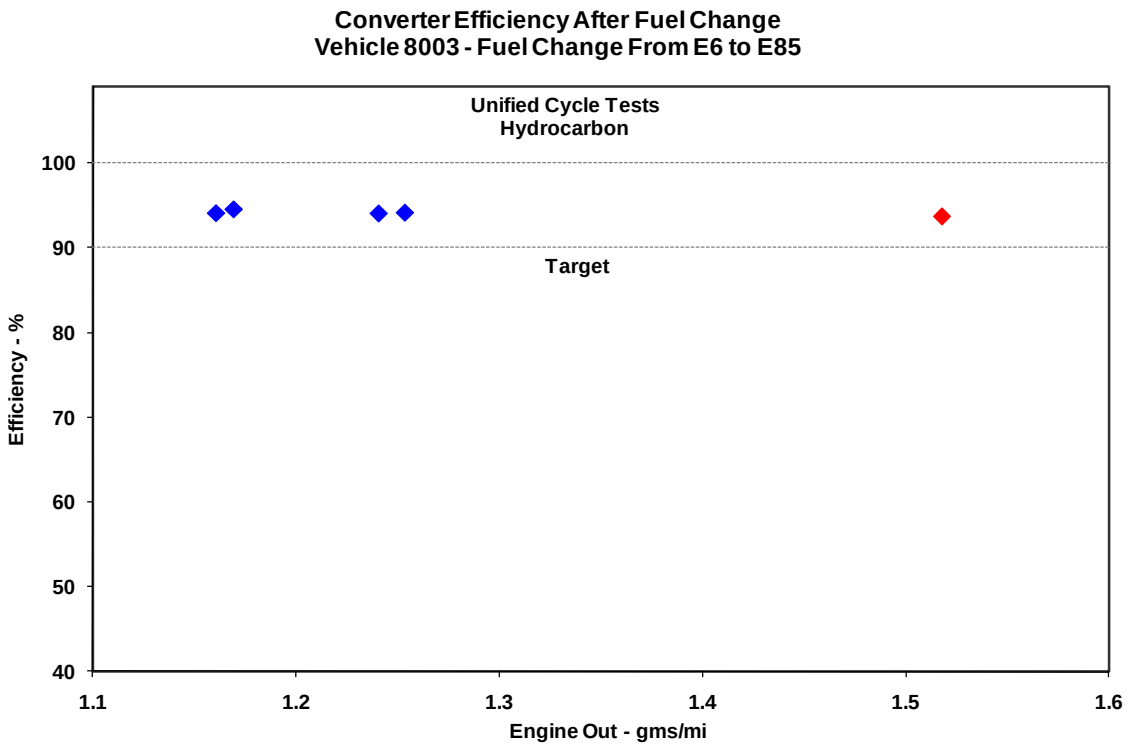


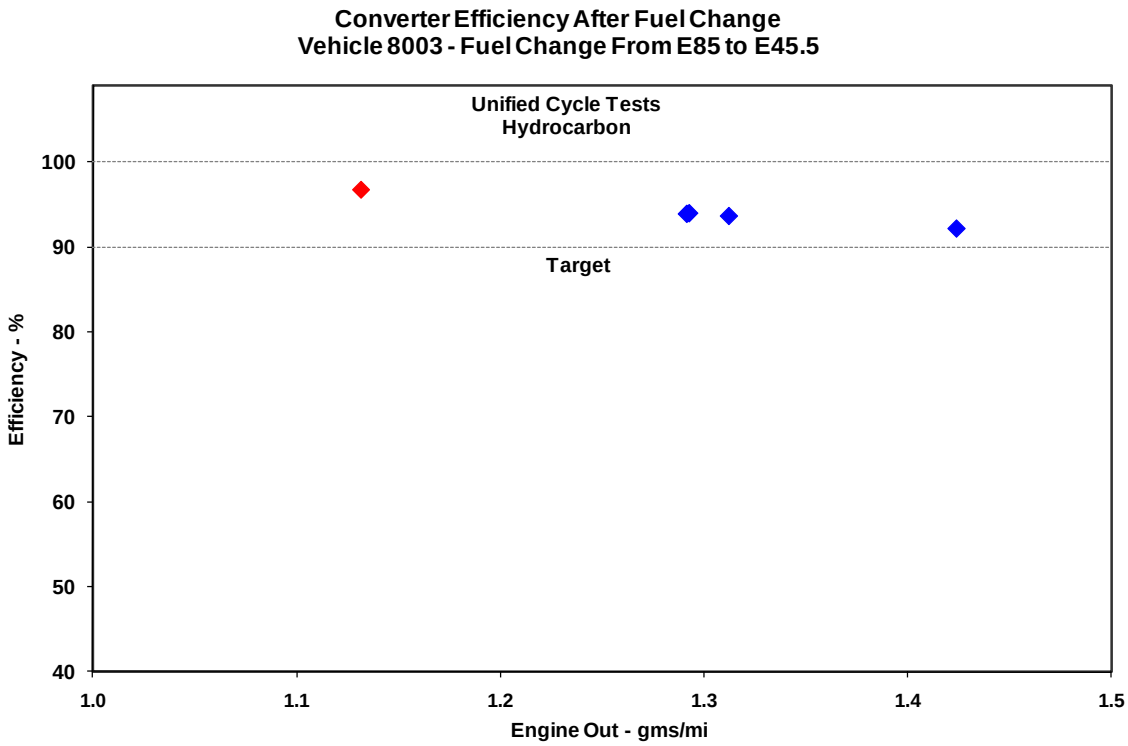

Cumulative Emissions vs. Test Time
Vehicle 8003 Ford Crown Victoria
Four Cold Unified Cycle
Tests
E6 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.5
1.0
1.5
2.0
2.5
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8003 Ford Crown Victoria
Four Cold Unified Cycle
Tests
E85 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8003 Ford Crown Victoria
Four Cold Unified Cycle
Tests
E45.5 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25

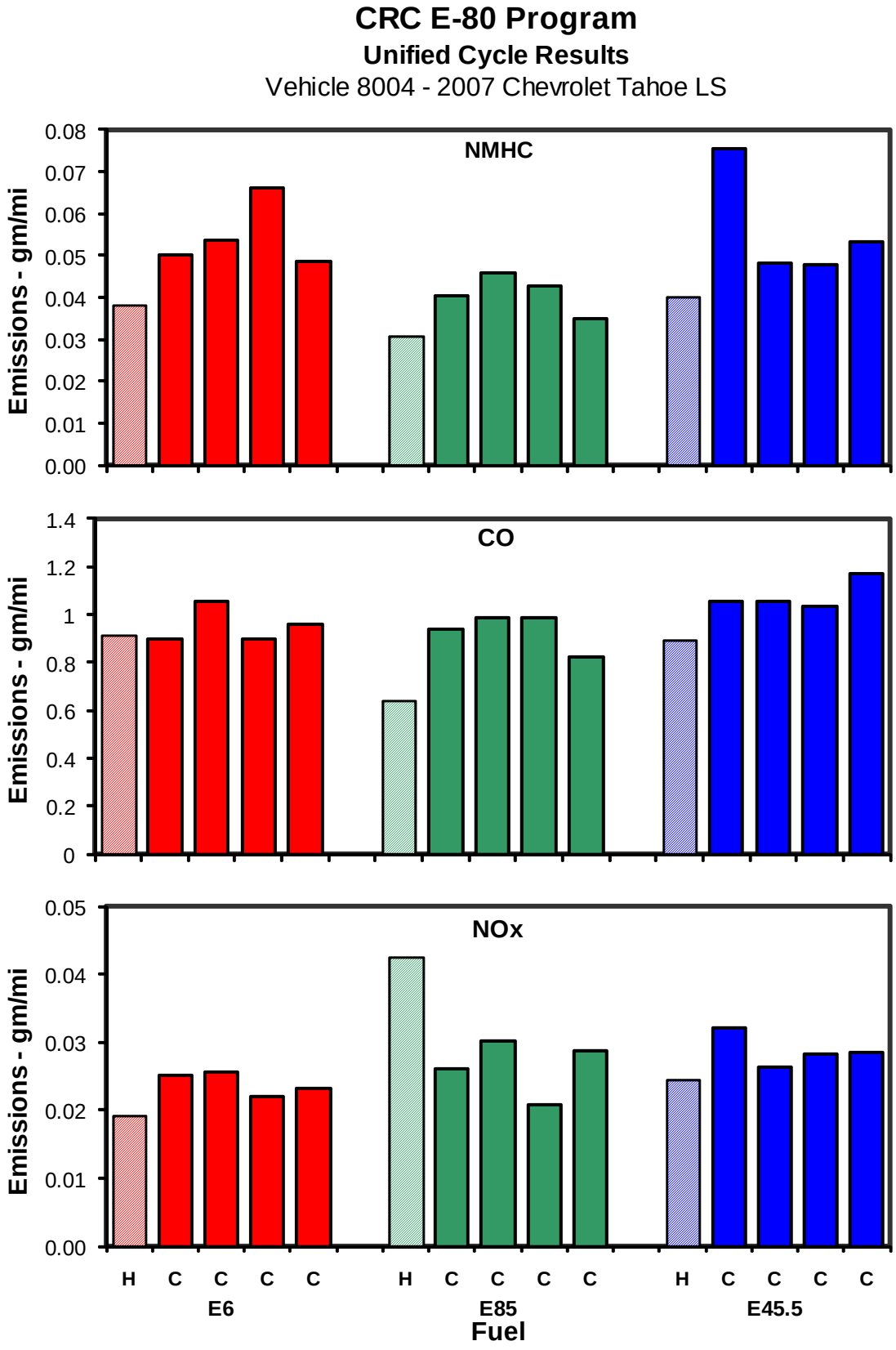

Converter Efficiency After Fuel Change
Vehicle 8003 - Fuel Change From E85 to E6
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
Engine Out - gms/mi
40
50
60
70
80
90
100
1.5
1.7
1.9
2.1
2.3
2.5

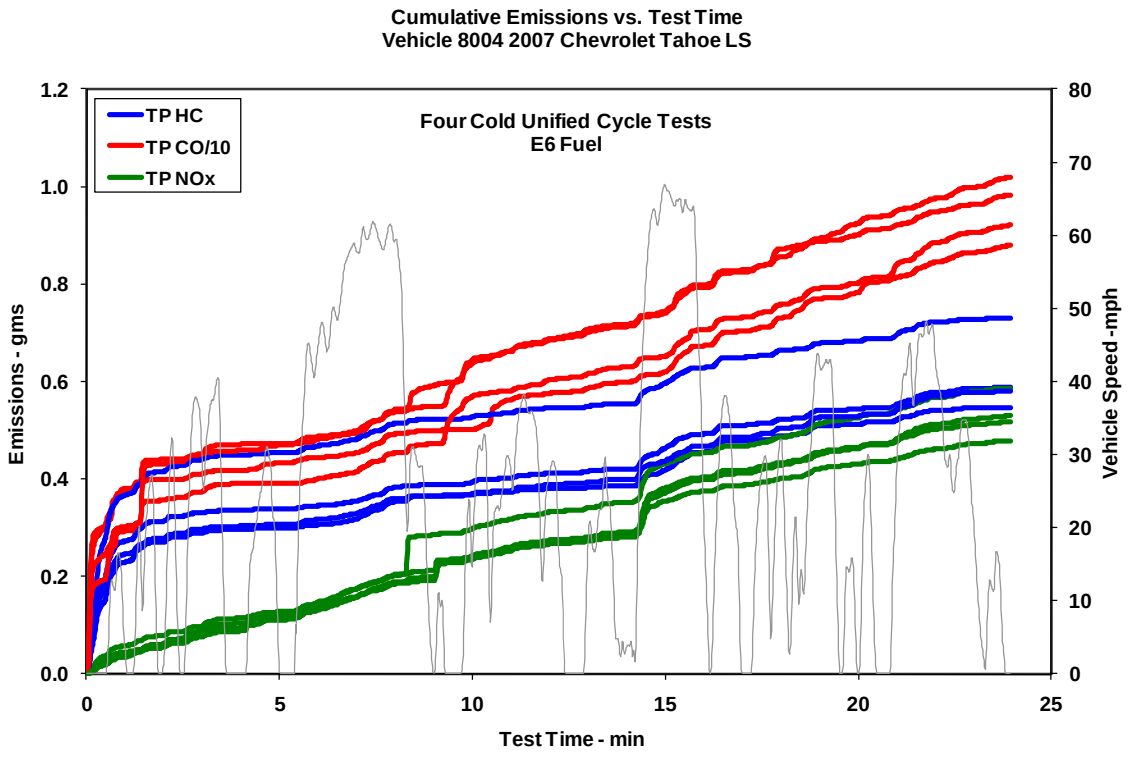

Converter Efficiency After Fuel Change
Vehicle 8003 - Fuel Change From E6 to E85
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
1.1
1.2
1.3
1.4
1.5
1.6
Engine Out - gms/mi

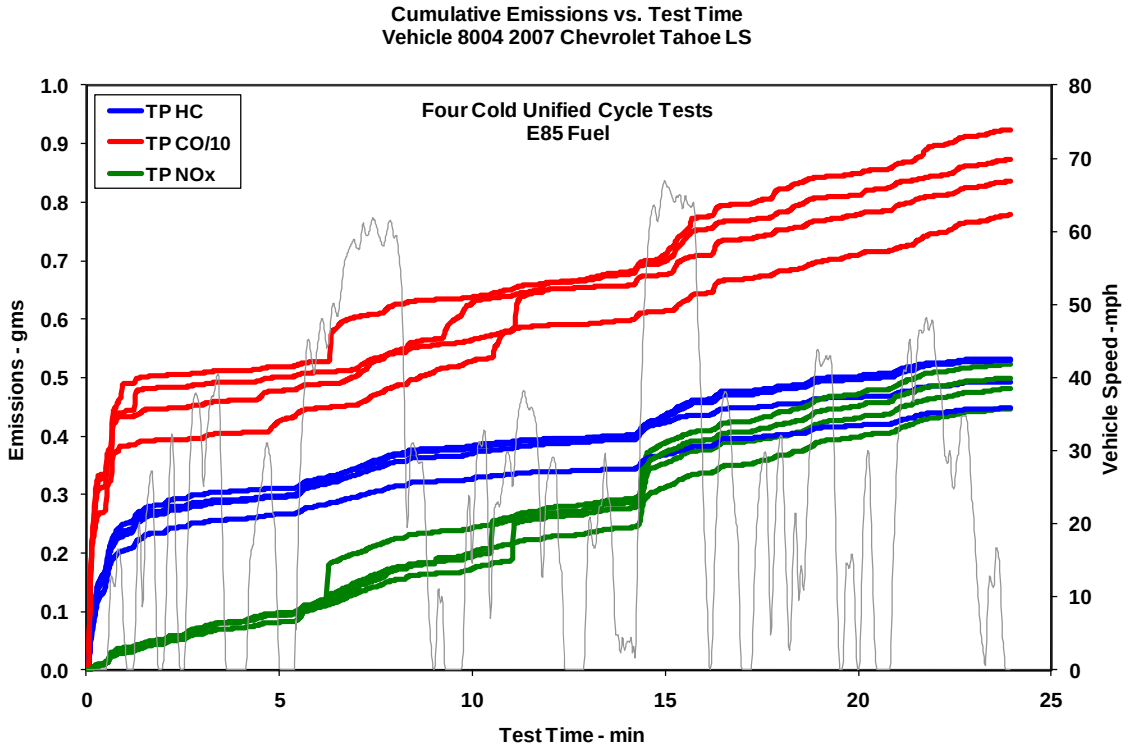

Converter Efficiency After Fuel Change
Vehicle 8003 - Fuel Change From E85 to E45.5
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
1.0
1.1
1.2
1.3
1.4
1.5
Engine Out - gms/mi

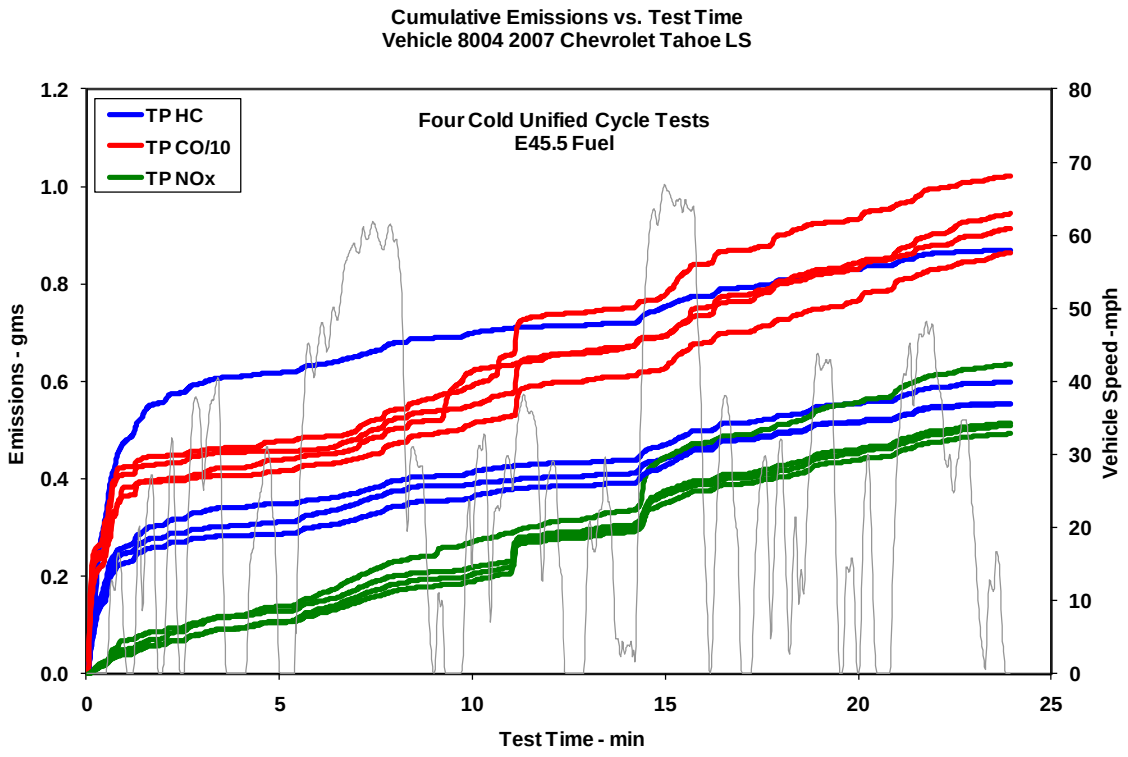
Vehicle	UC Test	Fuel	Test Temp	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg
8003	5582	E6	Hot	**0.027**	**0.016**	**0.045**	**1.021**	**0.017**	**483.8**	**17.1**
2007	5585		Cold 1	**0.057**	**0.021**	**0.082**	**2.271**	**0.010**	**492.6**	**16.7**
Ford	5591		Cold 2	**0.050**	**0.014**	**0.068**	**1.878**	**0.007**	**490.9**	**16.8**
Crown	5594		Cold 3	**0.051**	**0.016**	**0.070**	**1.889**	**0.011**	**491.1**	**16.8**
Victoria	5595		Cold 4	**0.058**	**0.018**	**0.080**	**1.513**	**0.009**	**486.6**	**17.0**
16,352										
	5598	E85	Hot	**0.043**	**0.026**	**0.071**	**2.370**	**0.006**	**482.7**	**12.5**
	5601		Cold 1	**0.038**	**0.026**	**0.066**	**1.376**	**0.012**	**483.9**	**12.5**
	5604		Cold 2	**0.045**	**0.022**	**0.070**	**1.207**	**0.012**	**484.4**	**12.5**
	5608		Cold 3	**0.041**	**0.019**	**0.062**	**1.058**	**0.012**	**490.4**	**12.4**
	5613		Cold 4	**0.045**	**0.017**	**0.065**	**1.063**	**0.015**	**488.0**	**12.5**
	5617	E45.5	Hot	**0.031**	**0.021**	**0.054**	**1.194**	**0.006**	**484.8**	**14.8**
	5619		Cold 1	**0.047**	**0.024**	**0.074**	**1.287**	**0.0**	**489.3**	**14.6**
	5624		Cold 2	**0.051**	**0.022**	**0.076**	**1.414**	**0.0**	**494.0**	**14.5**
	5627		Cold 3	**0.053**	**0.020**	**0.075**	**1.382**	**0.0**	**491.3**	**14.6**
	5628		Cold 4	**0.062**	**0.024**	**0.090**	**1.497**	**0.0**	**486.9**	**14.7**

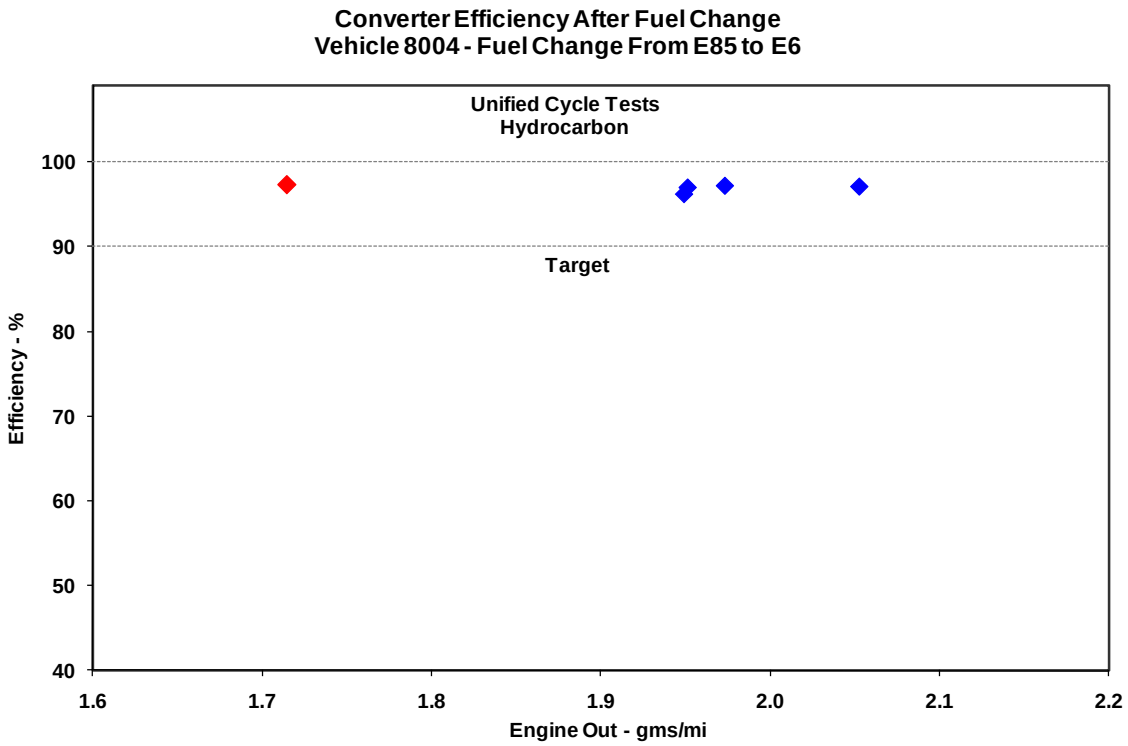
Vehicle 8003

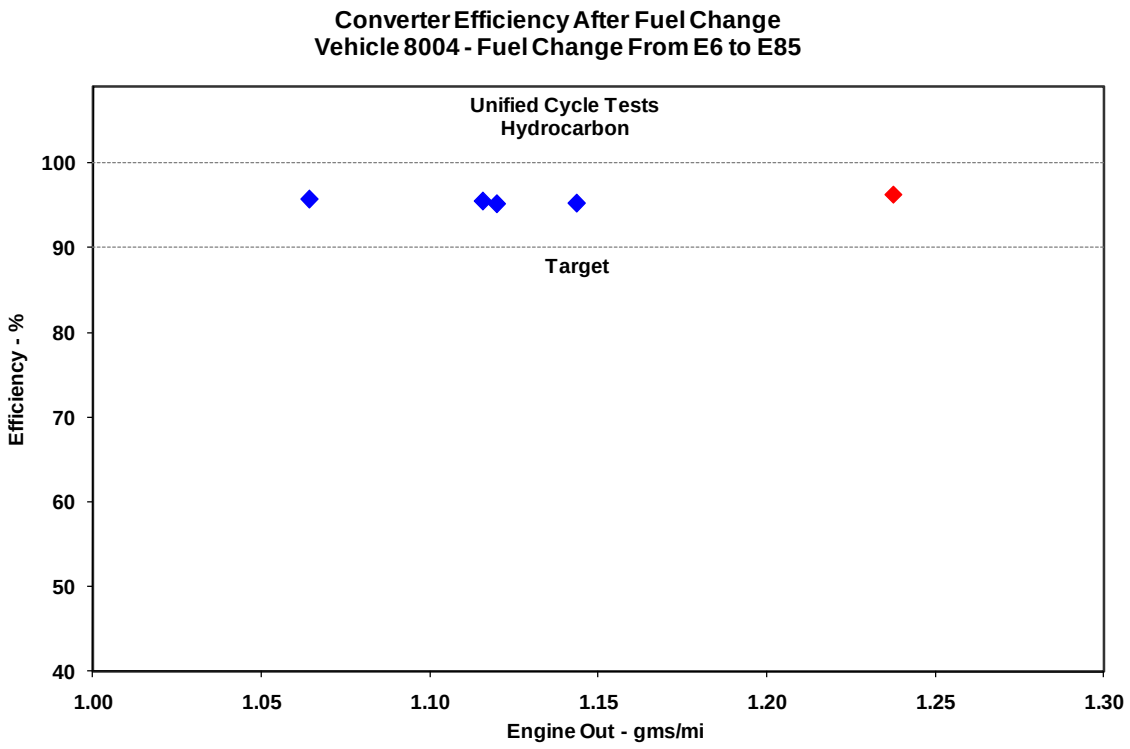


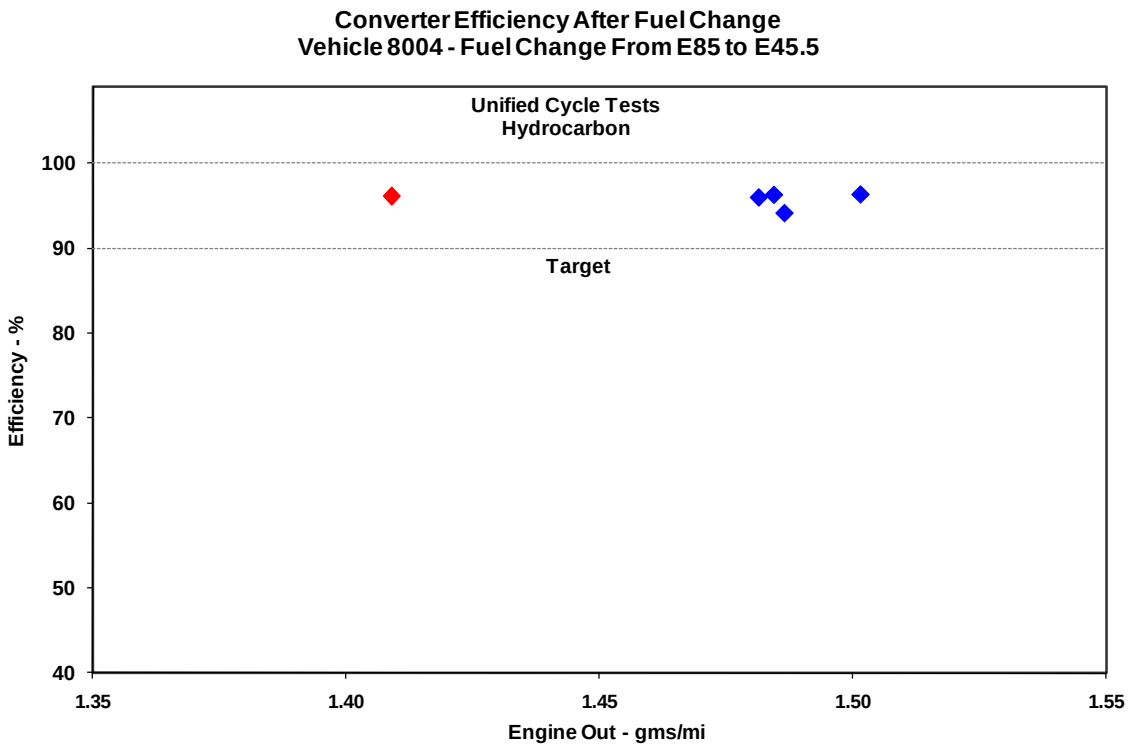

Cumulative Emissions vs. Test Time
Vehicle 8004 2007 Chevrolet Tahoe LS
Four Cold Unified Cycle Tests
E6 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8004 2007 Chevrolet Tahoe LS
Four Cold Unified Cycle Tests
E85 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Cumulative Emissions vs. Test Time
Vehicle 8004 2007 Chevrolet Tahoe LS
Four Cold Unified Cycle Tests
E45.5 Fuel
TP HC
TP CO/10
TP NOx
Emissions - gms
Vehicle Speed -mph
Test Time - min
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25


Converter Efficiency After Fuel Change
Vehicle 8004 - Fuel Change From E85 to E6
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
Engine Out - gms/mi
40
50
60
70
80
90
100
1.6
1.7
1.8
1.9
2.0
2.1
2.2


Converter Efficiency After Fuel Change
Vehicle 8004 - Fuel Change From E6 to E85
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
1.00
1.05
1.10
1.15
1.20
1.25
1.30
Engine Out - gms/mi


Converter Efficiency After Fuel Change
Vehicle 8004 - Fuel Change From E85 to E45.5
Unified Cycle Tests
Hydrocarbon
Target
Efficiency - %
100
90
80
70
60
50
40
1.35
1.40
1.45
1.50
1.55
Engine Out - gms/mi

Vehicle	UC Test	Fuel	Test Temp	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg
8004	5581	E6	Hot	**0.038**	**0.013**	**0.053**	**0.914**	**0.019**	**631.9**	**13.1**
2007	5586		Cold 1	**0.050**	**0.019**	**0.071**	**0.896**	**0.025**	**638.9**	**12.9**
Chevrolet	5592		Cold 2	**0.054**	**0.018**	**0.074**	**1.054**	**0.026**	**642.4**	**12.9**
Tahoe	5593		Cold 3	**0.066**	**0.015**	**0.085**	**0.897**	**0.022**	**636.1**	**13.0**
18,704	5596		Cold 4	**0.049**	**0.017**	**0.067**	**0.960**	**0.023**	**640.7**	**12.9**
	5597	E85	Hot	**0.031**	**0.019**	**0.052**	**0.645**	**0.043**	**630.5**	**9.7**
	5602		Cold 1	**0.040**	**0.022**	**0.064**	**0.936**	**0.026**	**623.8**	**9.8**
	5605		Cold 2	**0.046**	**0.022**	**0.070**	**0.984**	**0.030**	**627.4**	**9.7**
	5609		Cold 3	**0.043**	**0.023**	**0.068**	**0.985**	**0.021**	**630.2**	**9.7**
	5614		Cold 4	**0.035**	**0.020**	**0.057**	**0.820**	**0.029**	**621.9**	**9.8**
	5631	E45.5	Hot	**0.040**	**0.022**	**0.064**	**0.894**	**0.025**	**637.3**	**11.3**
	5632		Cold 1	**0.075**	**0.018**	**0.097**	**1.052**	**0.032**	**631.1**	**11.4**
	5636		Cold 2	**0.048**	**0.019**	**0.069**	**1.055**	**0.026**	**633.3**	**11.3**
	5642		Cold 3	**0.048**	**0.021**	**0.071**	**1.032**	**0.028**	**632.6**	**11.3**
	5647		Cold 4	**0.053**	**0.018**	**0.074**	**1.173**	**0.029**	**640.1**	**11.2**

Statistical Analysis of the E-80 Pilot Study Data: Summary

Findings:
The transition effect was not significant for any of the individual vehicles or for the group for NMHC or NOx emissions. The group of three vehicles demonstrated a statistically significant ($p < 0.05$) transition effect for CO emissions for all three fuel transitions; however, the CO effects were inconsistent across transitions and vehicles (detailed below). Overall, there was no compelling trend that would have justified expansion of the pilot testing.

There are several noteworthy observations about the CO transition effect:

- While the group effect was statistically significant for all three transitions, the two decreasing ethanol transitions (E85 to E6 and E85 to E45.5) had opposite signs (i.e., E85 to E6 showed a CO emissions decrease, while E85 to E45.5 showed an increase). This difference in sign for the two decreases in ethanol content was consistent across all three vehicles, although some of the individual vehicle results were not statistically significant.
- There was some inconsistency in the significance of the individual vehicle responses to fuel transitions. Two vehicles demonstrated statistically significant transition effects for an ethanol decrease from E85 to E45.5, but not for an ethanol decrease from E85 to E6. The third vehicle demonstrated a statistically significant transition effect for an ethanol decrease from E85 to E6, but not for E85 to E45.5; this vehicle was also the only one to exhibit a statistically significant transition effect for an ethanol increase from E6 to E85.
- The individual vehicle responses were generally consistent in sign (the only exception was when one vehicle had an effect that differed in sign but was essentially zero).

As a supplement to the analysis based on the bag samples, the pre-catalyst continuous results were also analyzed. While these results turned up a greater number of statistically significant transitions, they were less consistent than the bag sample results.

Details of the Analysis:
The four cold start bag sample results for each vehicle/fuel combination were analyzed. Natural logs of NMHC, NOx and CO were analyzed, using a model that incorporated vehicle and fuel as discrete variables and test order as a continuous variable. All two-way interactions between variables (no squared terms) were included. Statistical significance was determined based on the slope of the test order variable being sufficiently different than zero ($p < 0.05$, although cases were noted when $0.05 < p < 0.10$).

The above analysis was repeated for the pre-catalyst continuous emissions measurements, with total HC emissions used in place of NMHC emissions.

The following pages include plots of the four cold start bag sample results for each vehicle/fuel combination, as well as for the average results for the three vehicles (Overall) for each fuel. Statistical significance based on the bag samples is indicated on each plot, with notations on the bottom of the plot if the pre-catalyst statistical significance result differed from that of the bag sample.

Statistical Analysis of the E-80 Pilot Study Data: Summary Chart

Statistical Significance Observations				
	Tailpipe Results			
	Overall	8001	8003	8004
NMHC/HC	None	None	None	None
NOx	None	None	None	None
CO	E85 to E6 E6 to E85 E85 to E46	E85 to E46	E85 to E6 E6 to E85	E85 to E46
	Pre-Cat Results			
	Overall	8001	8003	8004
NMHC/HC	E85 to E46	E6 to E85	E85 to E46	E6 to E85
NOx	E85 to E6	(E85 to E6)	E85 to E6	E85 to E6
CO	E85 to E6 (E85 to E46)	(E85 to E46)	(E85 to E6)	None

Parenthetical transitions represent $0.05 < p < 0.10$

Backgrounds distinguish increasing ethanol transitions from decreasing transitions and mixed results.

Increasing emissions

Decreasing emissions

Note: E46 is rounded from E45.5

Appendix II – Main Program Individual Exhaust and Evaporative Data

Appendix II contains a series of plots of the individual test data for reference. These plots are organized as follows, for each vehicle;

Exhaust Emissions – Seven Vehicles

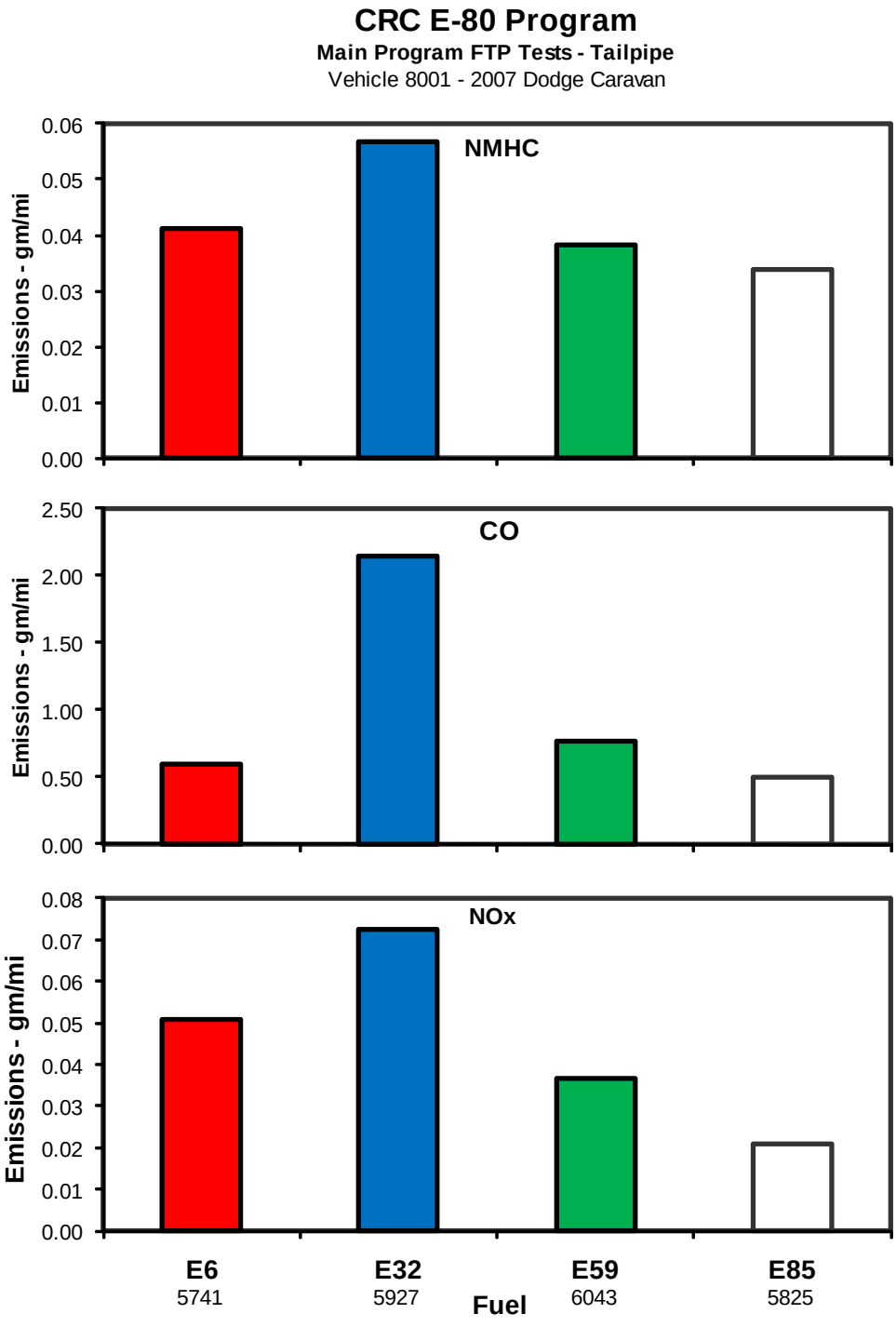
- A three panel bar chart of the tailpipe, engine out and converter breakthrough for each fuel tested for the FTP, US06 and UC cycles
- A table of all the FTP, US06 and UC test data

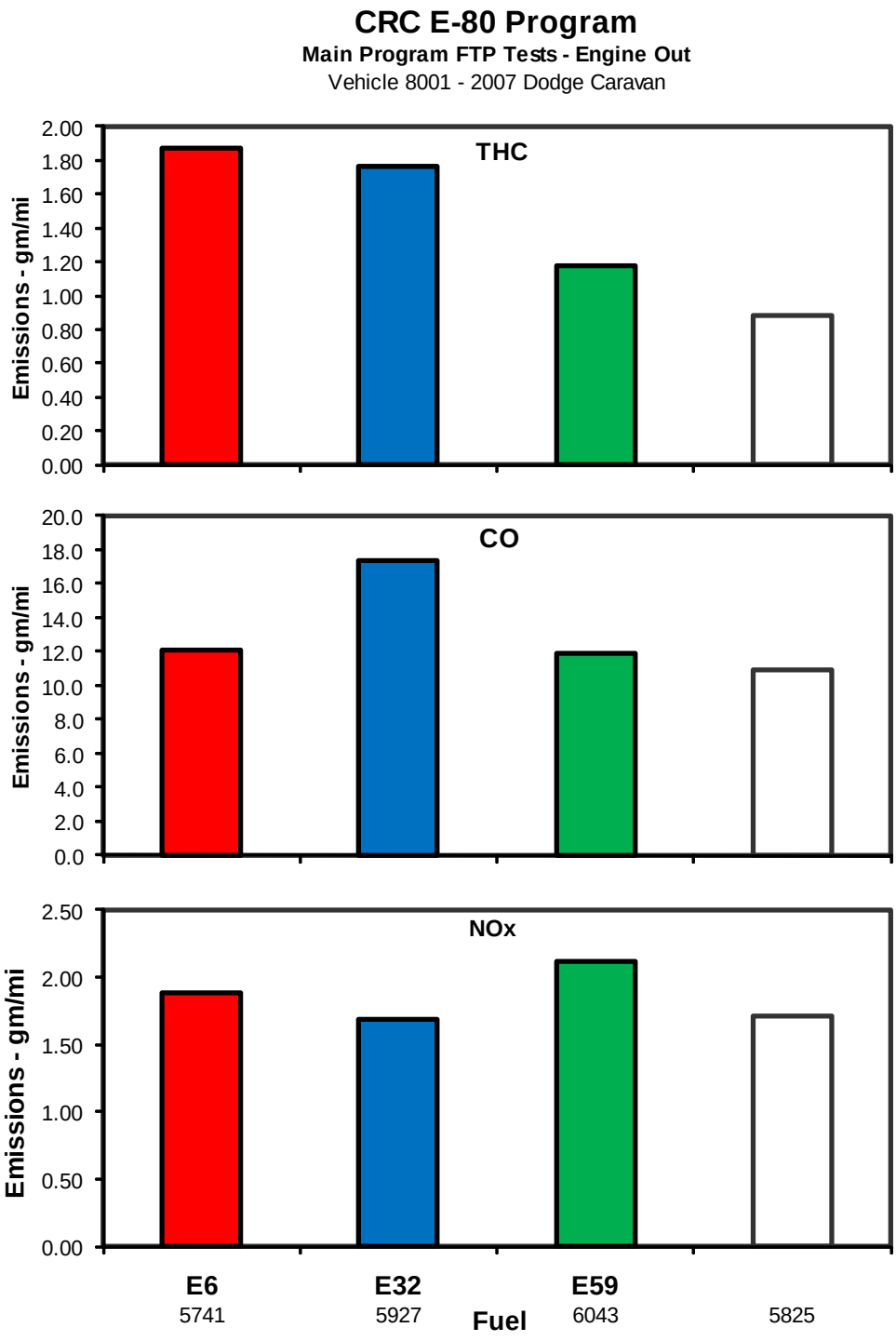
Evaporative Emissions – Four Vehicles

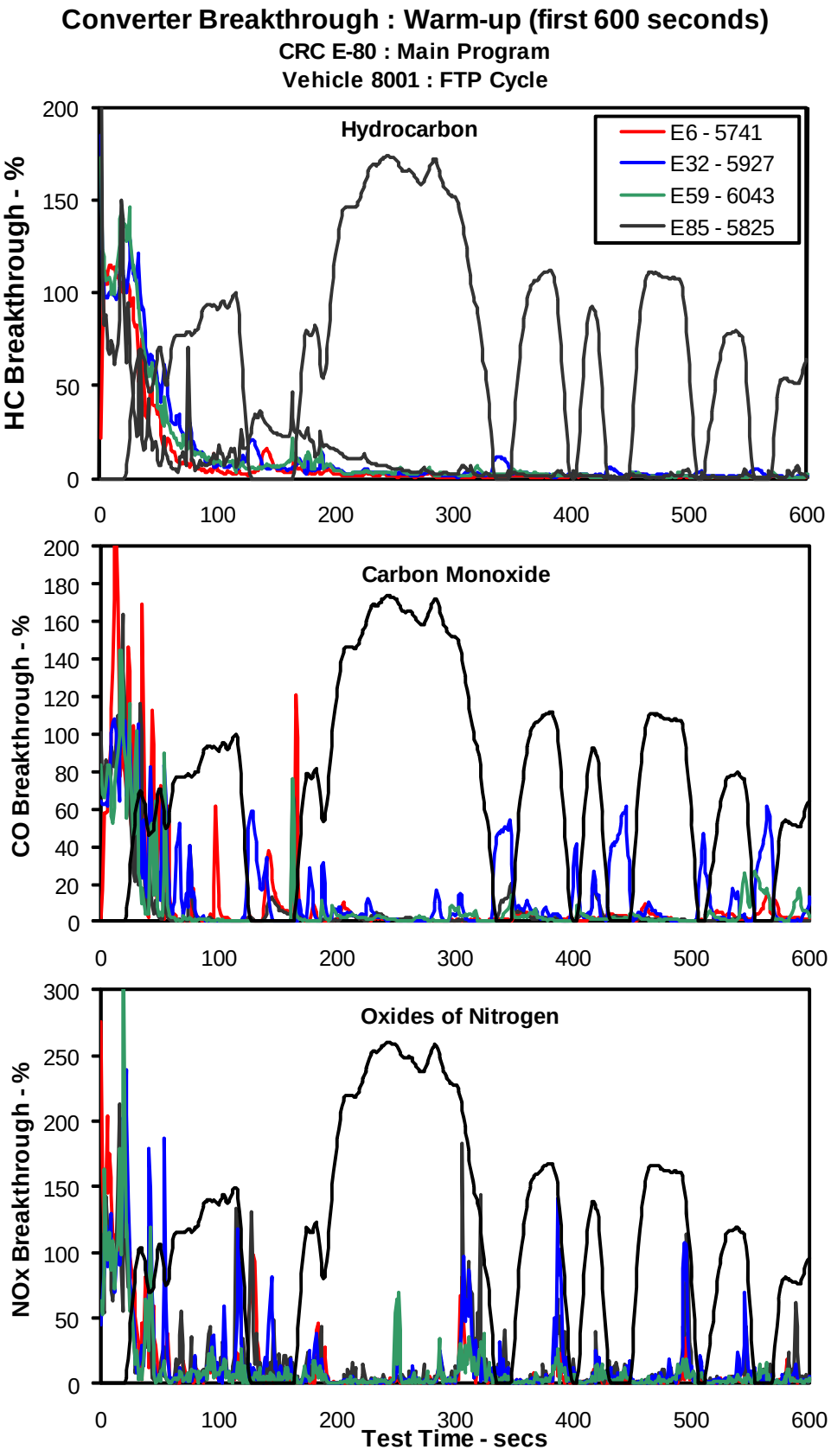
- A bar chart of final emissions (with EtOH portion shown) for the Running Loss, Hot Soak and Two Day Diurnal tests on all four fuels
- A line chart showing second-by-second cumulative permeation for the running Loss, Hot
- Soak and Two Day Diurnal tests on all four fuels
- A table of all Running Loss, Hot Soak and Two Day Diurnal test data

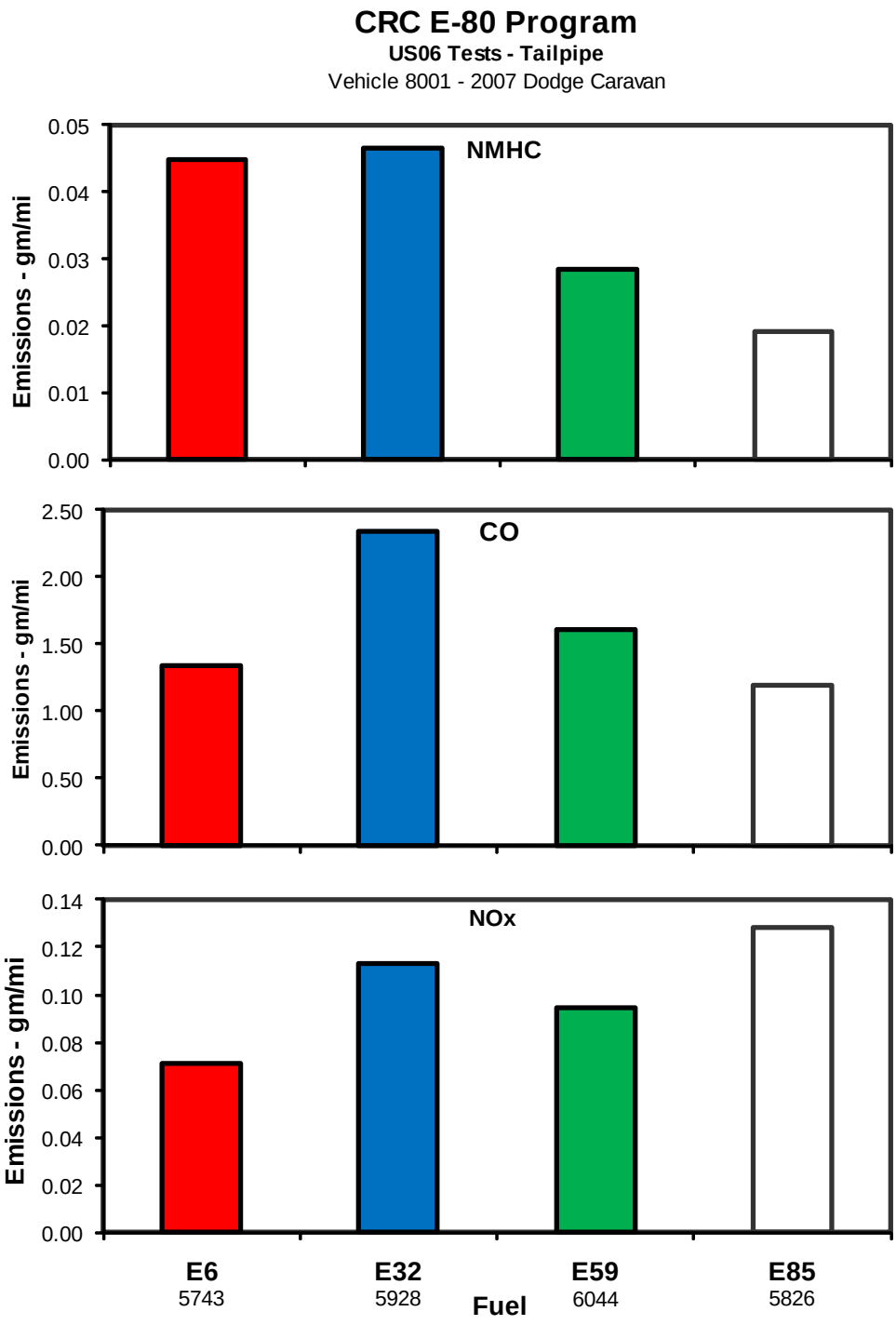
There are a total of 83 pages in this appendix.

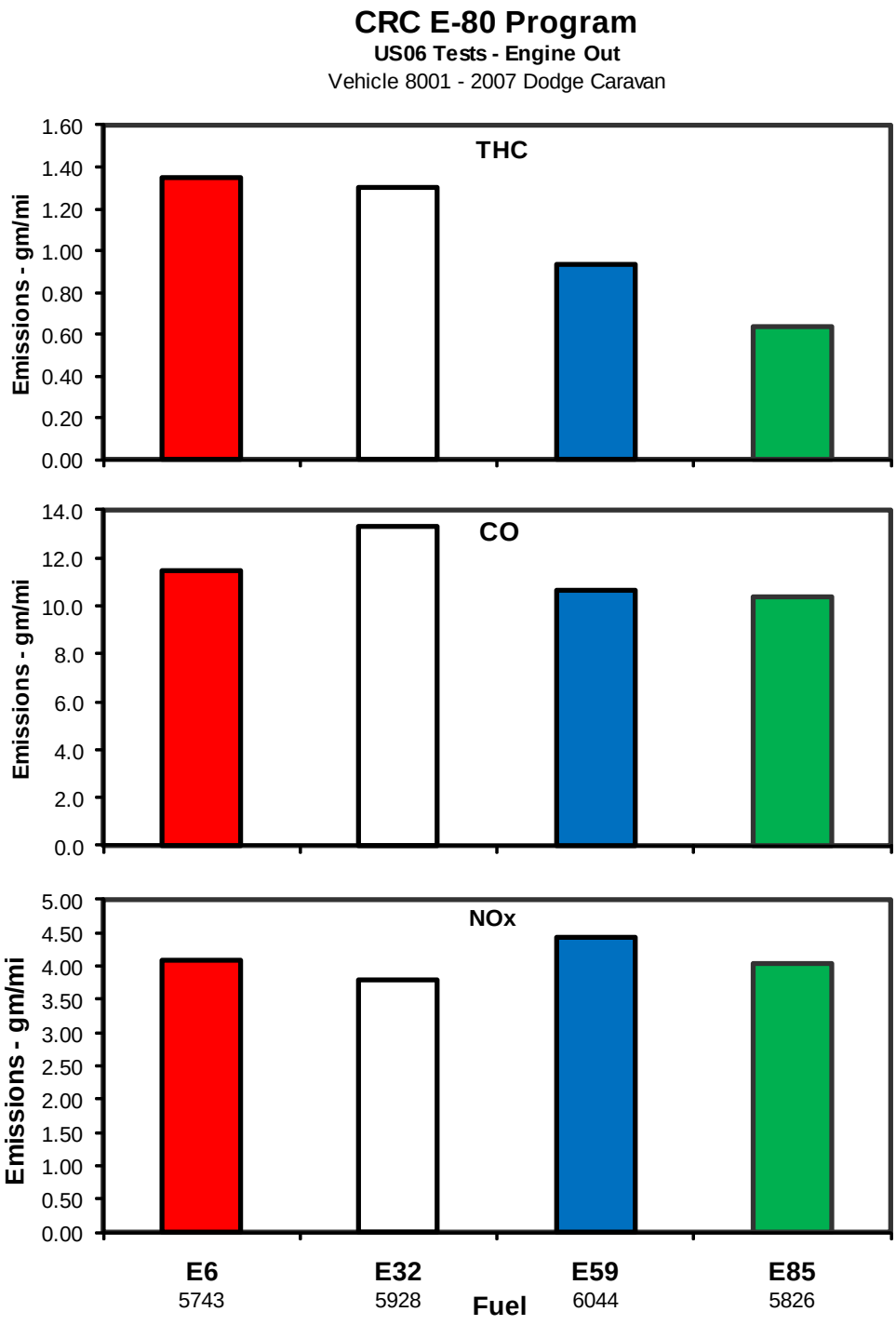
Exhaust Emission Results

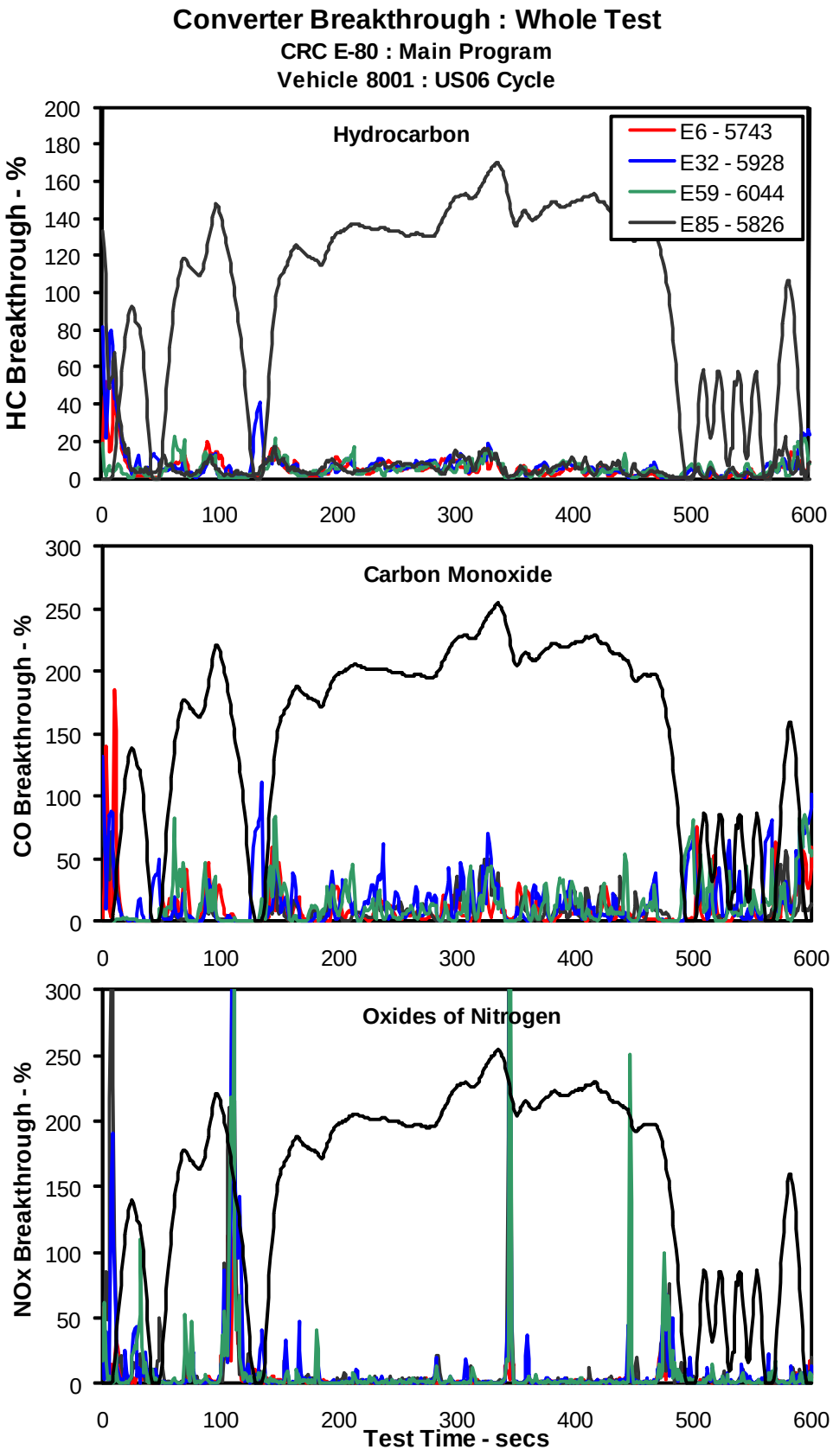


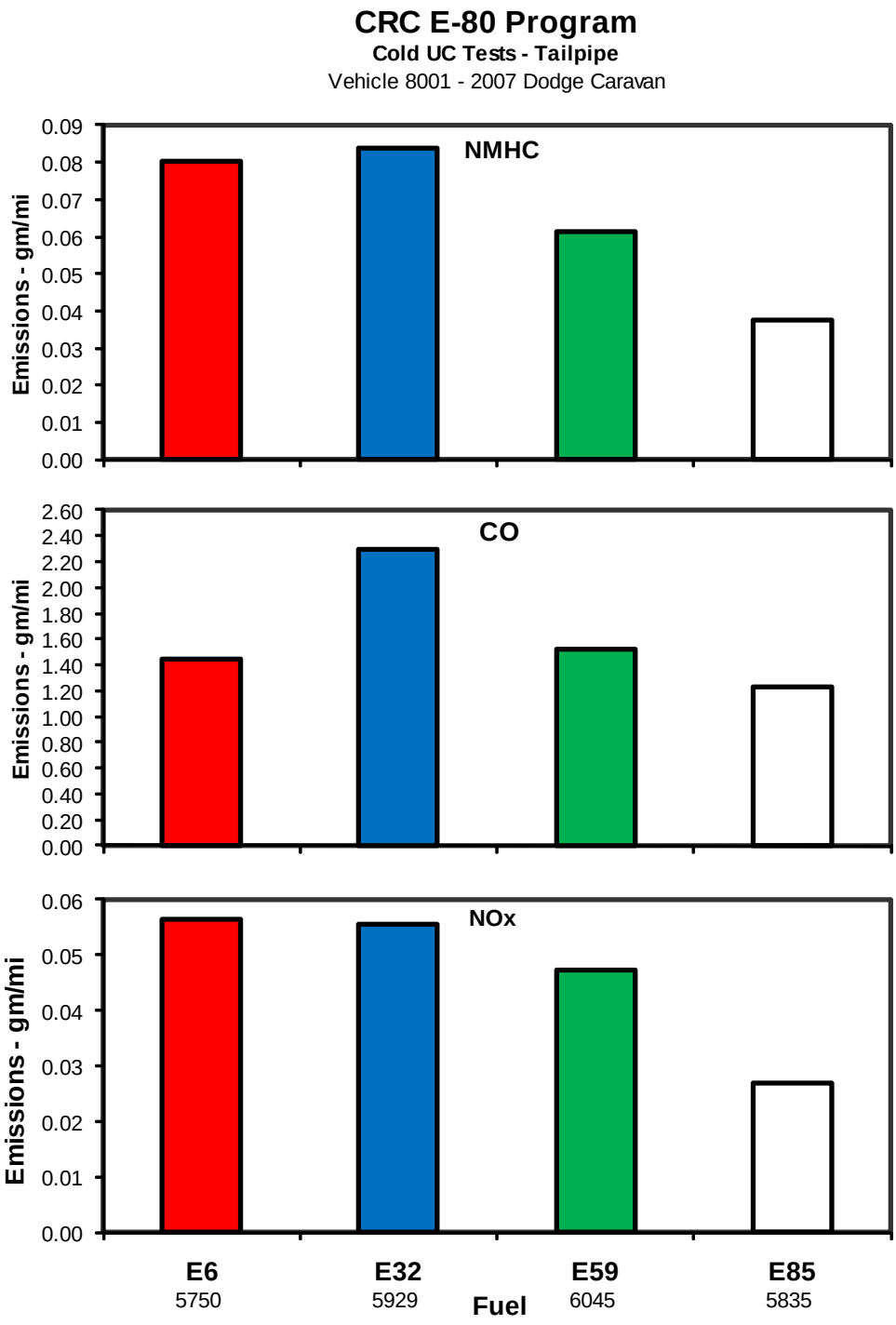

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8001 - 2007 Dodge Caravan
THC
CO
NOx
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2.50
2.00
1.50
1.00
0.50
0.00
E6
5741
E32
5927
E59
6043
5825
Fuel

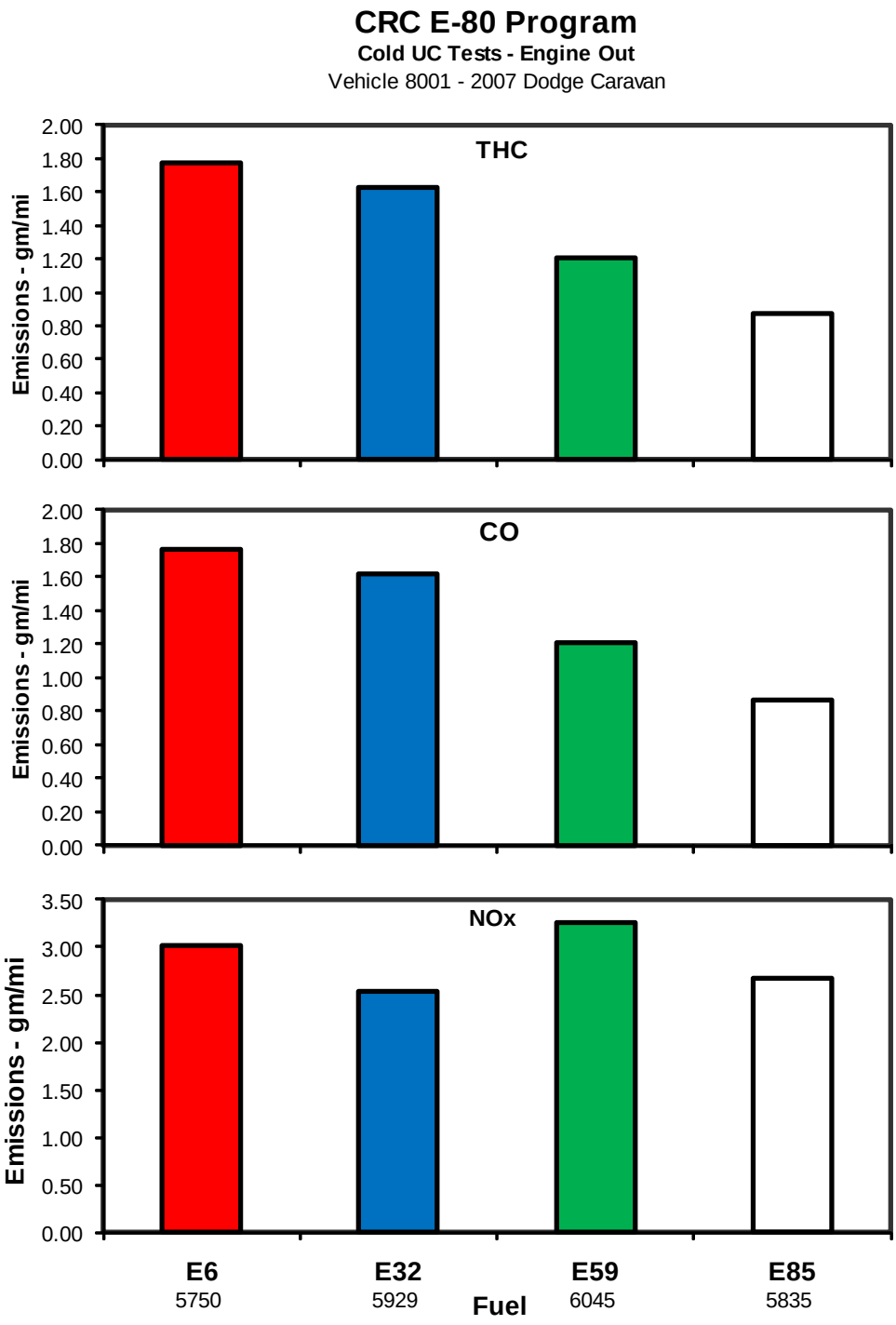

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8001 : FTP Cycle
Hydrocarbon
E6 - 5741
E32 - 5927
E59 - 6043
E85 - 5825
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

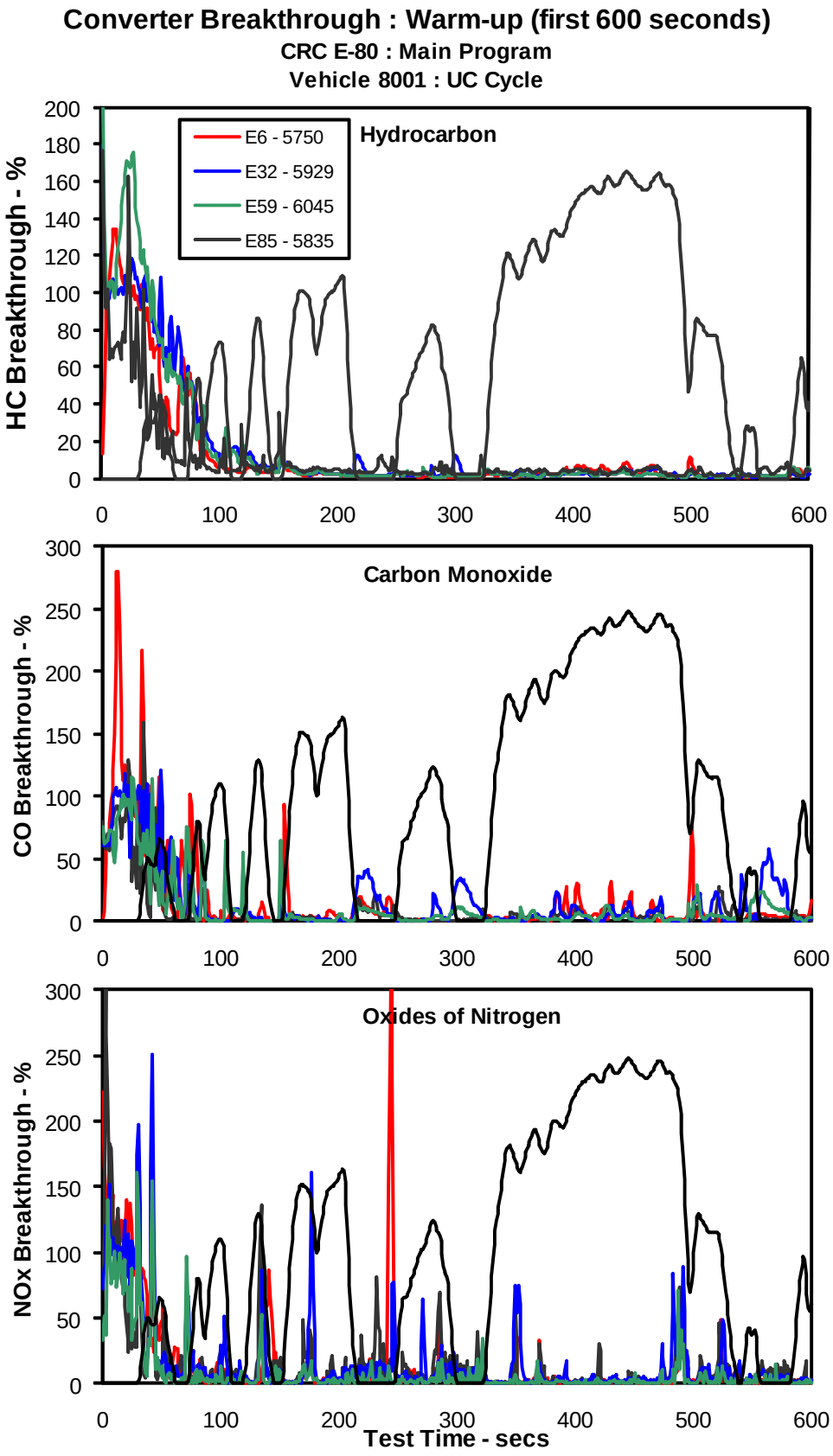

CRC E-80 Program
US06 Tests - Tailpipe
Vehicle 8001 - 2007 Dodge Caravan
NMHC
CO
NOx
Emissions - gm/mi
0.05
0.04
0.03
0.02
0.01
0.00
2.50
2.00
1.50
1.00
0.50
0.00
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
E6
5743
E32
5928
E59
6044
E85
5826
Fuel


CRC E-80 Program
US06 Tests - Engine Out
Vehicle 8001 - 2007 Dodge Caravan
THC
CO
NOx
Emissions - gm/mi
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5743
E32
5928
E59
6044
E85
5826
Fuel

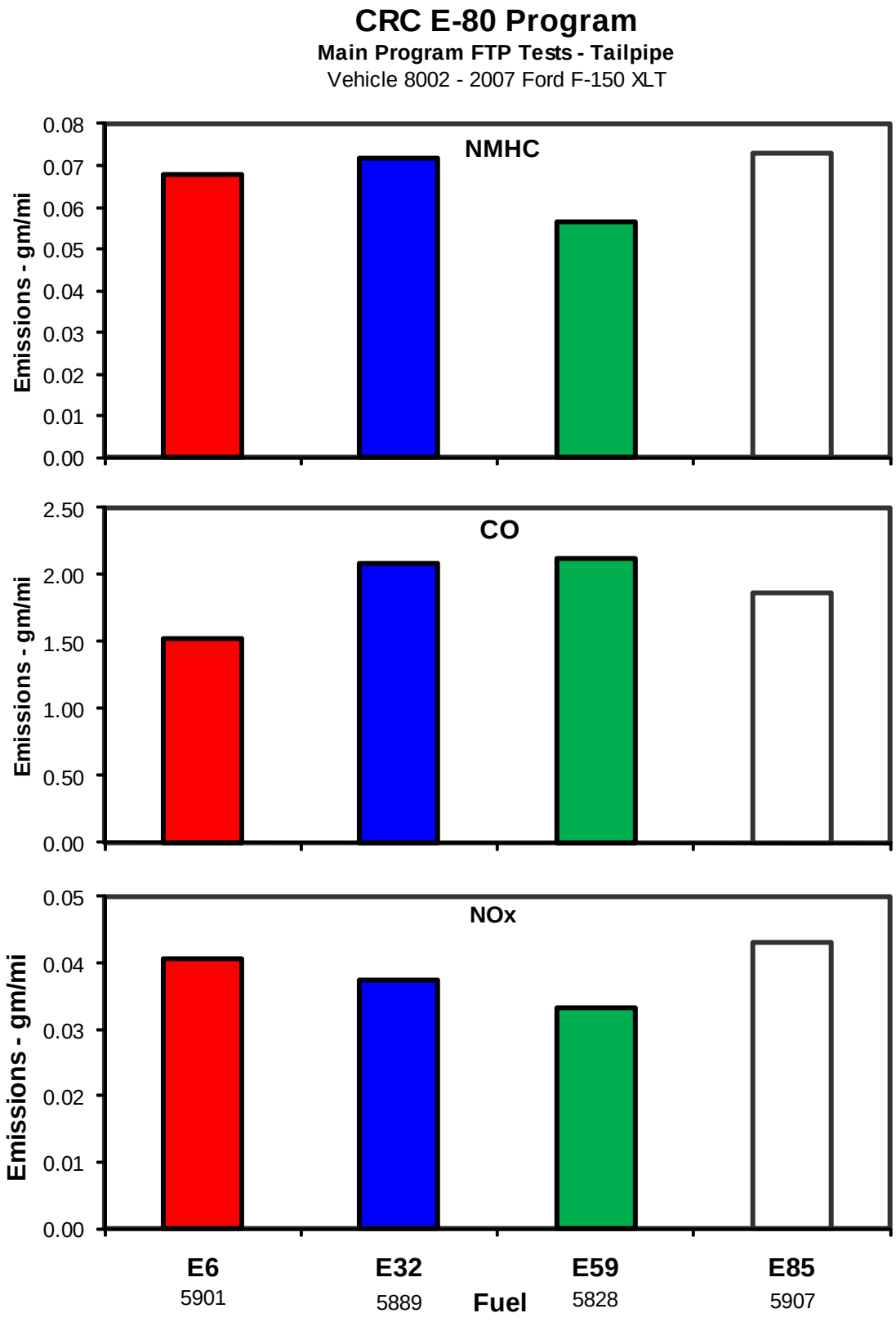

Converter Breakthrough : Whole Test
CRC E-80 : Main Program
Vehicle 8001 : US06 Cycle
Hydrocarbon
E6 - 5743
E32 - 5928
E59 - 6044
E85 - 5826
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

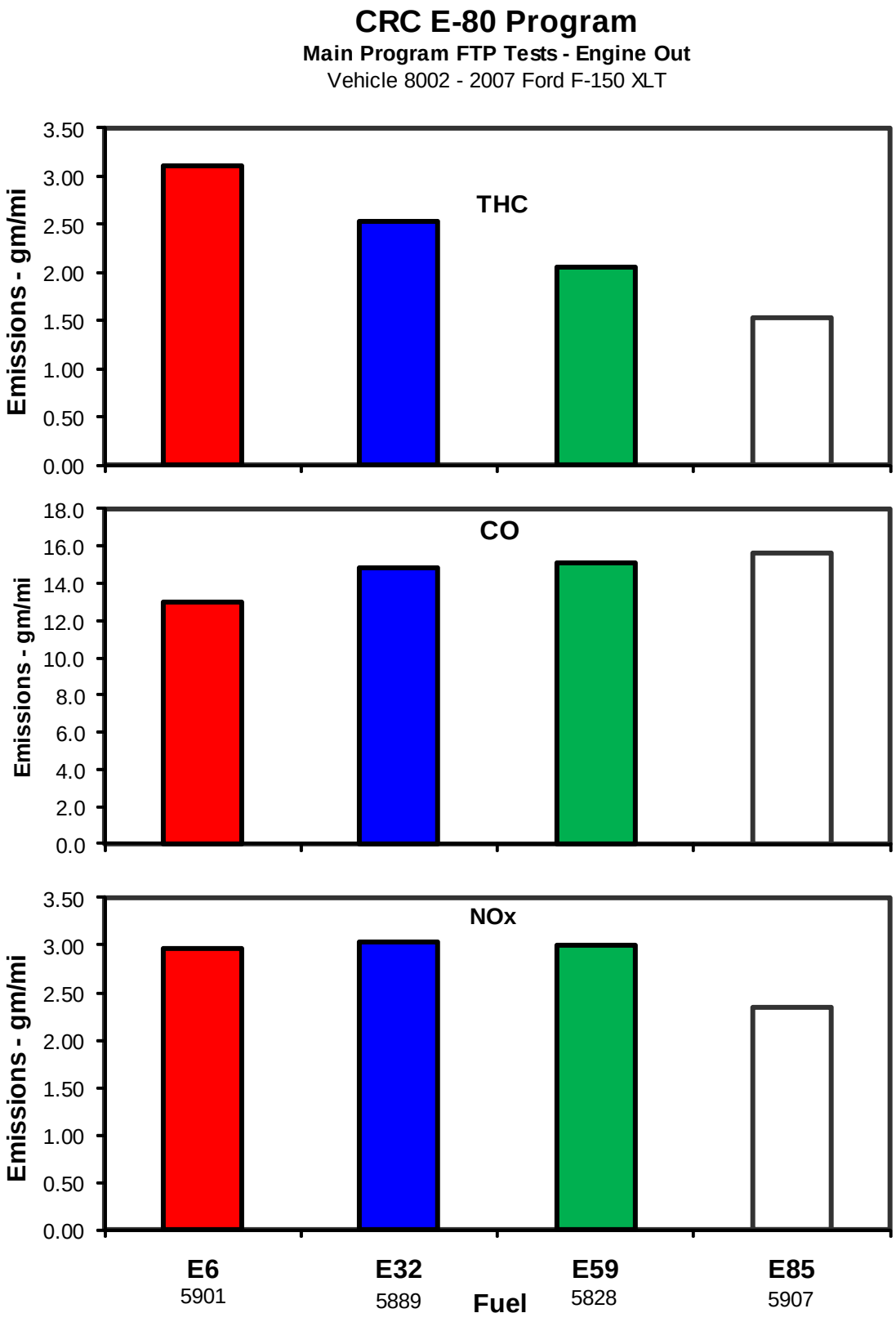

CRC E-80 Program
Cold UC Tests - Tailpipe
Vehicle 8001 - 2007 Dodge Caravan
NMHC
CO
NOx
Emissions - gm/mi
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.06
0.05
0.04
0.03
0.02
0.01
0.00
E6
5750
E32
5929
E59
6045
E85
5835
Fuel

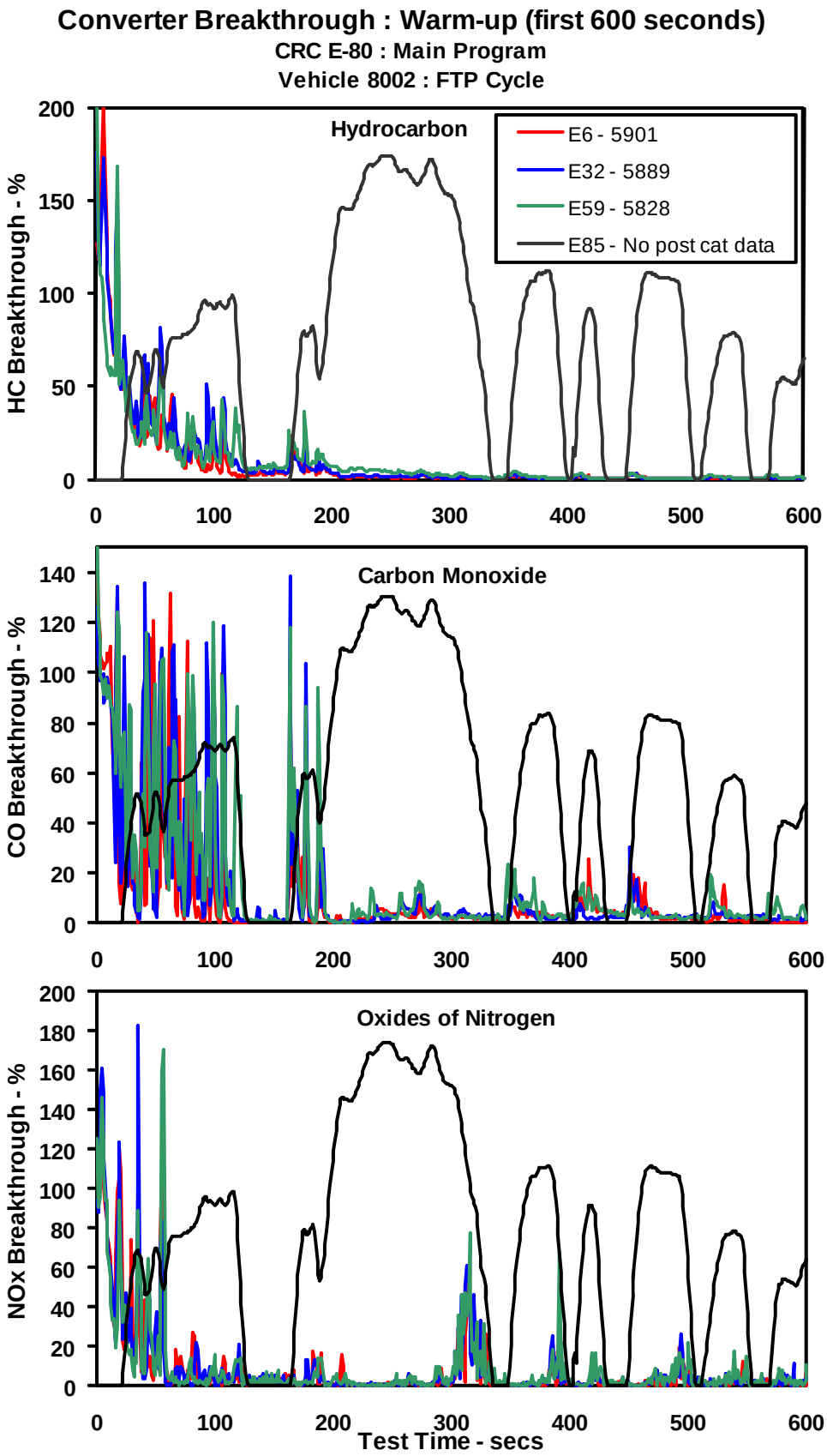

CRC E-80 Program
Cold UC Tests - Engine Out
Vehicle 8001 - 2007 Dodge Caravan
THC
CO
NOx
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5750
E32
5929
E59
6045
E85
5835
Fuel

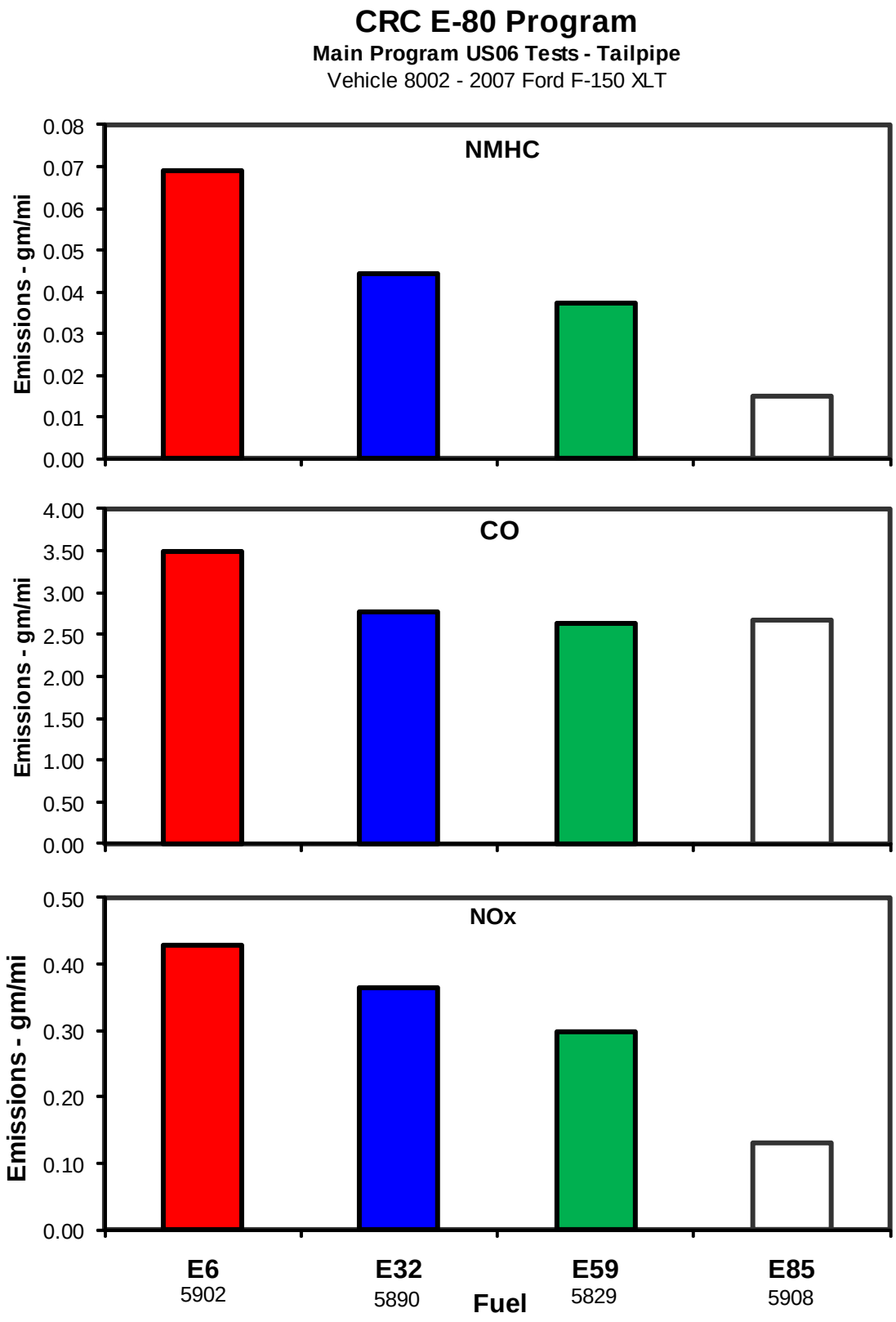

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8001 : UC Cycle
Hydrocarbon
E6 - 5750
E32 - 5929
E59 - 6045
E85 - 5835
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

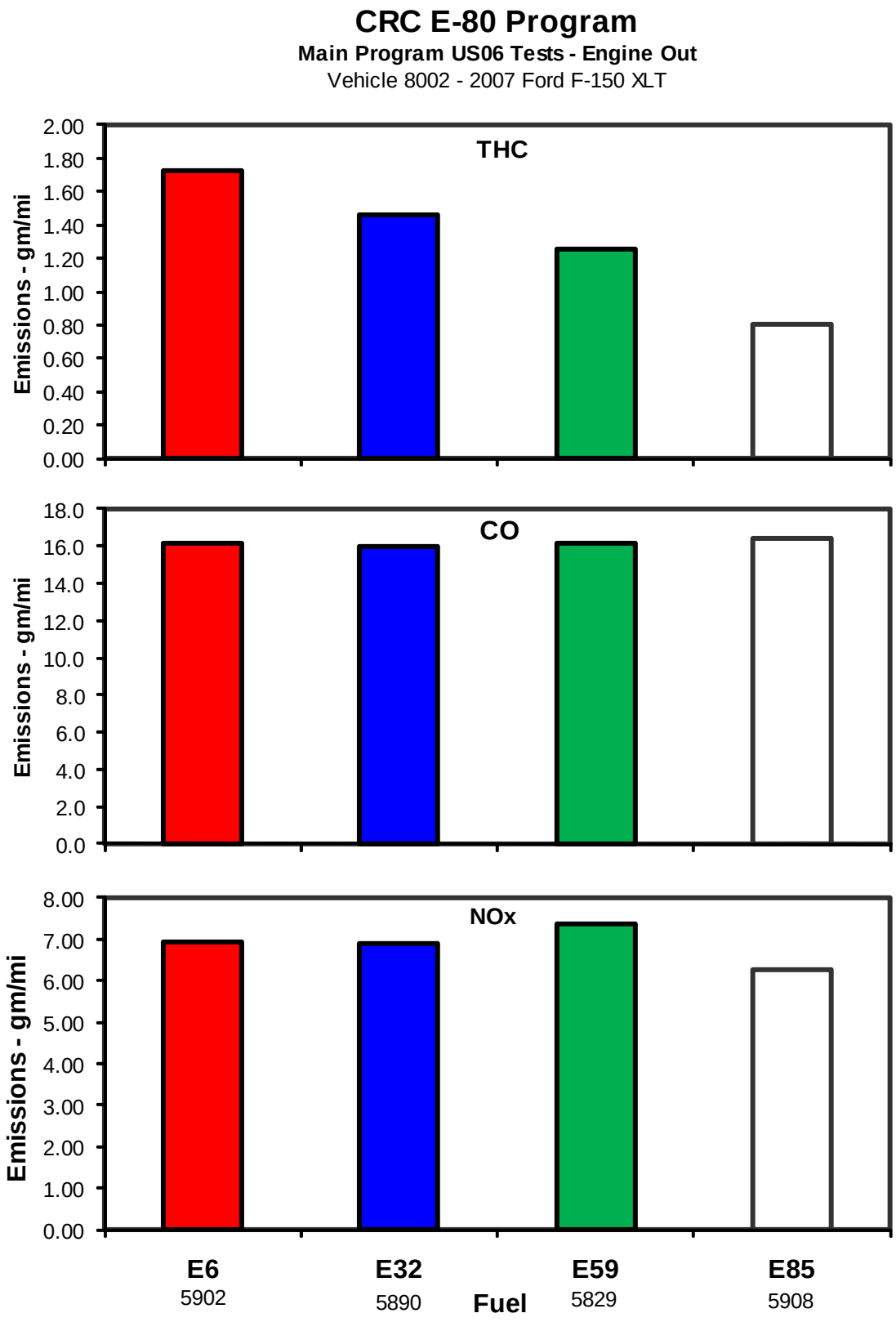
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8001	FTP	E6	5741	0.041	0.020	0.064	0.60	0.05	464	17.82	1.875	12.09	1.890	448
2007		E85	5825	0.034	0.015	0.051	0.50	0.02	460	13.22	0.879	10.92	1.707	444
Dodge		E32	5927	0.057	0.030	0.091	2.15	0.07	470	16.06	1.765	17.40	1.683	441
Grand		E59	6043	0.038	0.016	0.057	0.76	0.04	455	15.06	1.179	11.94	2.112	432
Caravan														
w/ 120K	US06	E6	5743	0.045	0.033	0.080	1.34	0.07	458	18.01	1.351	11.45	4.091	422
Catalyst		E85	5826	0.019	0.027	0.047	1.20	0.13	425	14.28	0.636	10.40	4.045	407
		E32	5928	0.047	0.033	0.081	2.34	0.11	457	16.50	1.305	13.31	3.798	412
		E59	6044	0.028	0.027	0.056	1.60	0.09	433	15.76	0.937	10.65	4.434	405
	UC	E6	5750	0.080	0.031	0.116	1.45	0.06	502	16.42	1.770	12.88	3.018	481
		E85	5835	0.037	0.024	0.064	1.23	0.03	490	12.40	0.868	13.09	2.676	470
		E32	5929	0.084	0.028	0.117	2.30	0.06	492	15.32	1.624	15.81	2.540	473
		E59	6045	0.061	0.024	0.089	1.52	0.05	479	14.26	1.210	14.11	3.255	477

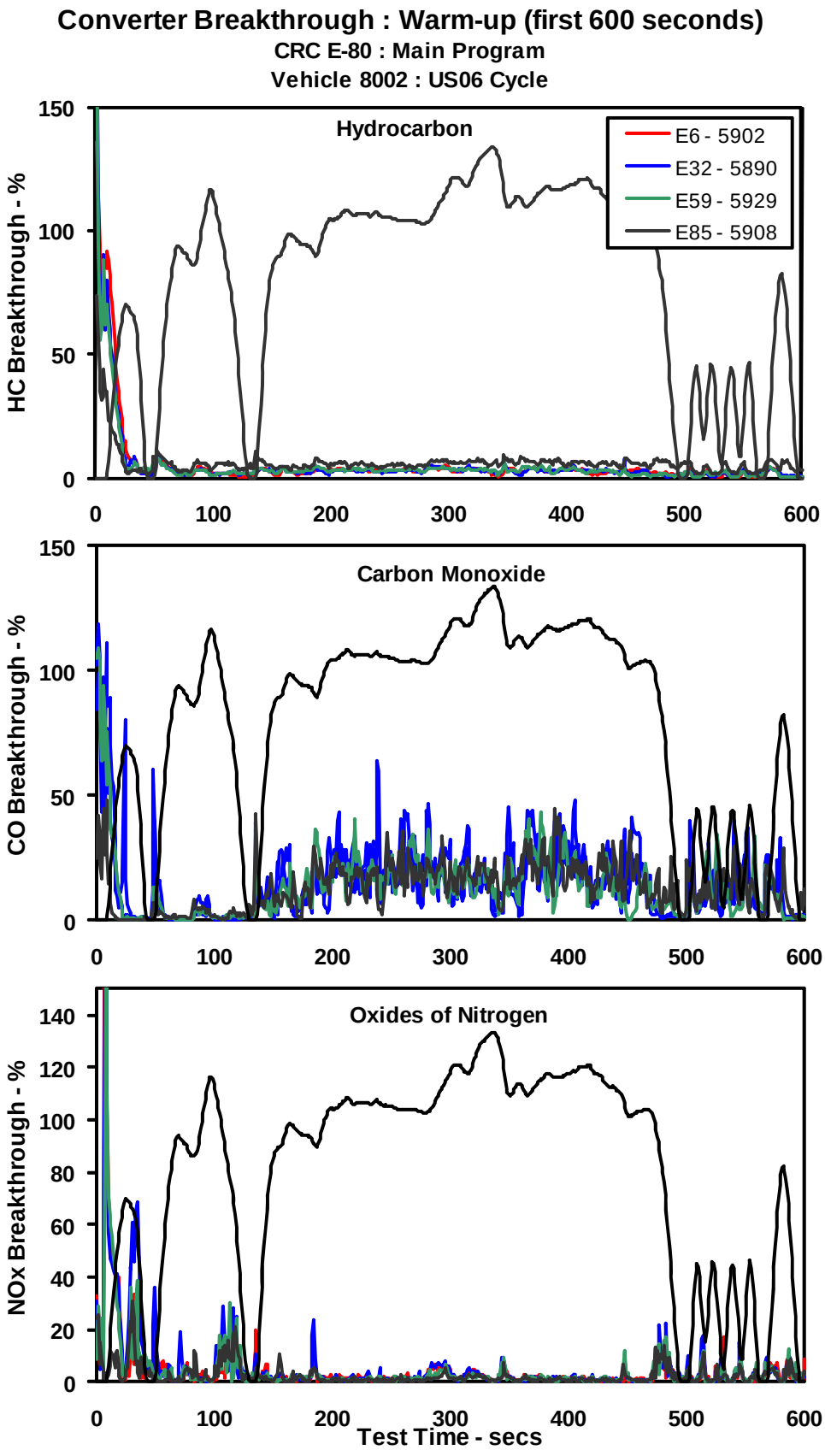

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8002 - 2007 Ford F-150 XLT
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
2.50
2.00
1.50
1.00
0.50
0.00
0.05
0.04
0.03
0.02
0.01
0.00
E6
5901
E32
5889
E59
5828
E85
5907
Fuel

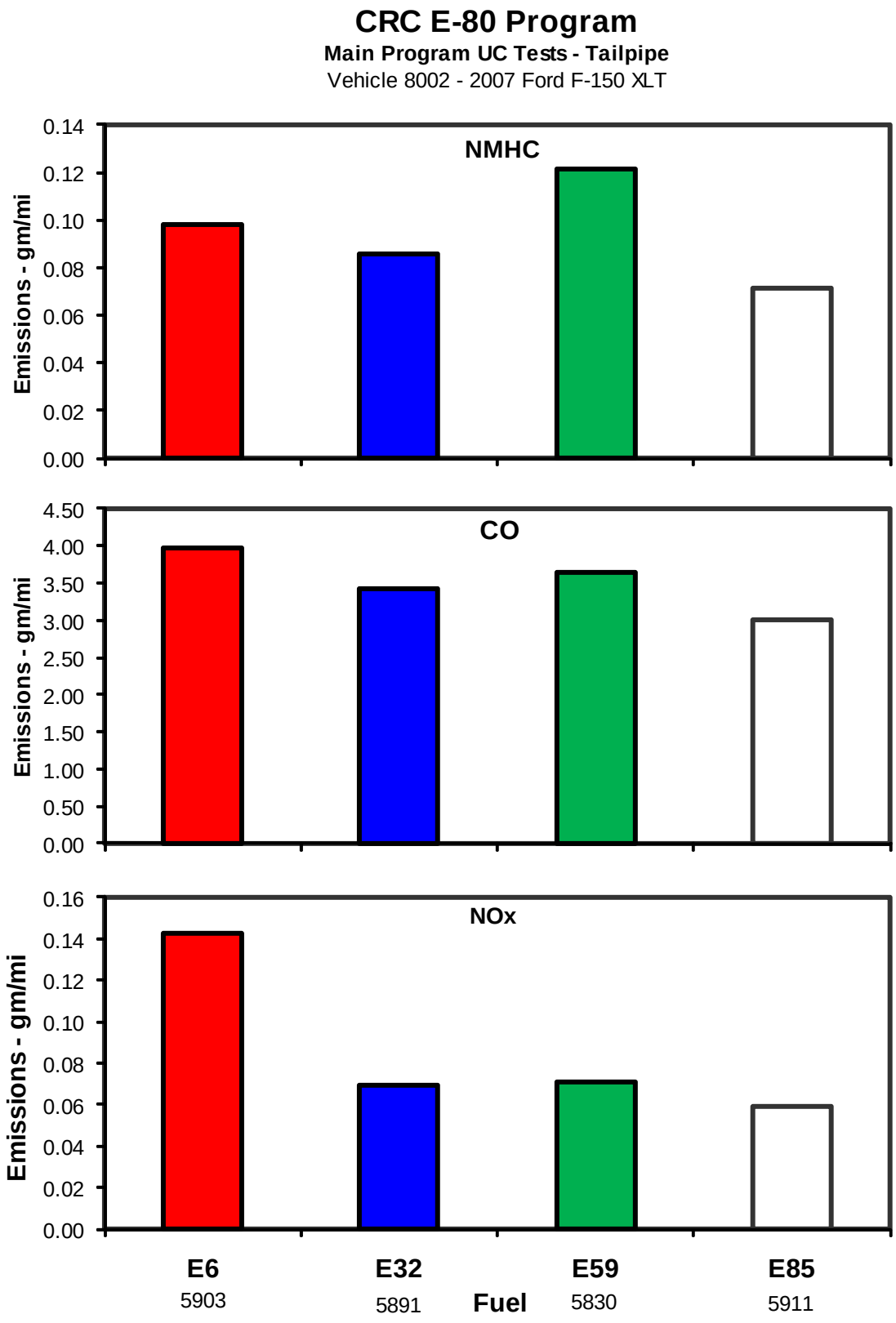

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8002 - 2007 Ford F-150 XLT
THC
CO
NOx
Emissions - gm/mi
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
E6
5901
E32
5889
E59
5828
E85
5907
Fuel

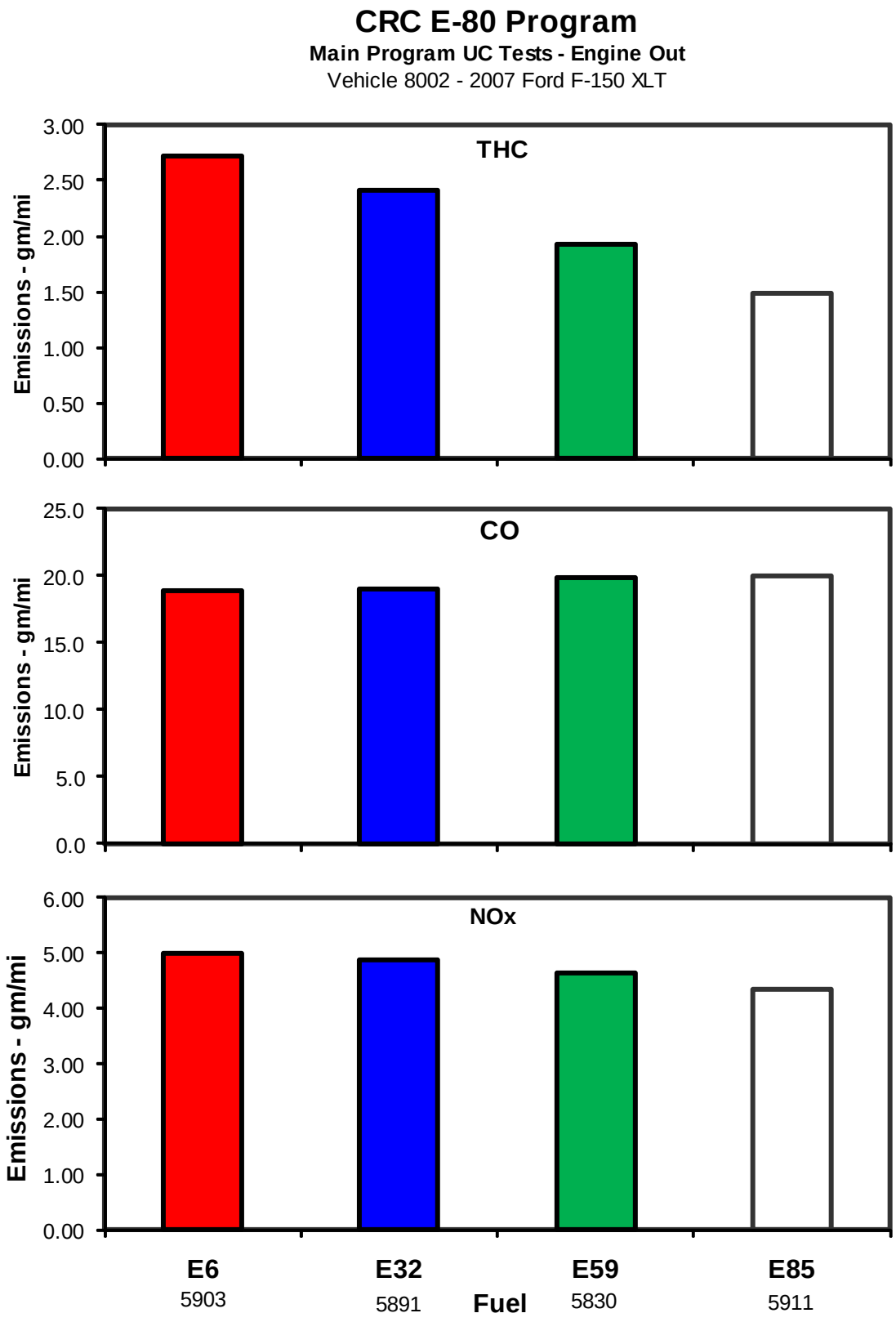

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8002 : FTP Cycle
Hydrocarbon
E6 - 5901
E32 - 5889
E59 - 5828
E85 - No post cat data
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

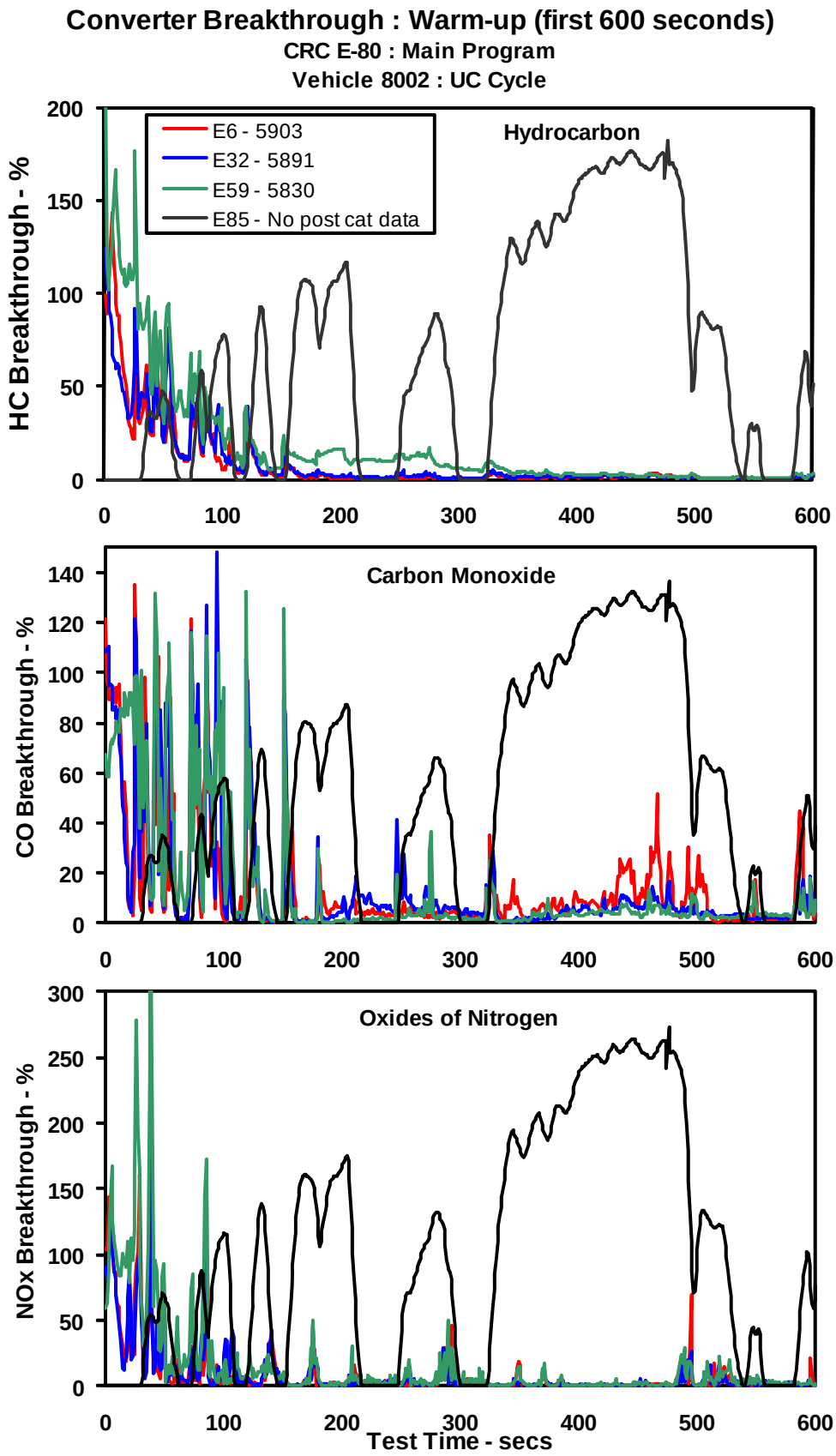

CRC E-80 Program
Main Program US06 Tests - Tailpipe
Vehicle 8002 - 2007 Ford F-150 XLT
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.50
0.40
0.30
0.20
0.10
0.00
E6
5902
E32
5890
E59
5829
E85
5908
Fuel


CRC E-80 Program
Main Program US06 Tests - Engine Out
Vehicle 8002 - 2007 Ford F-150 XLT
THC
CO
NOx
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
E6
5902
E32
5890
E59
5829
E85
5908
Fuel

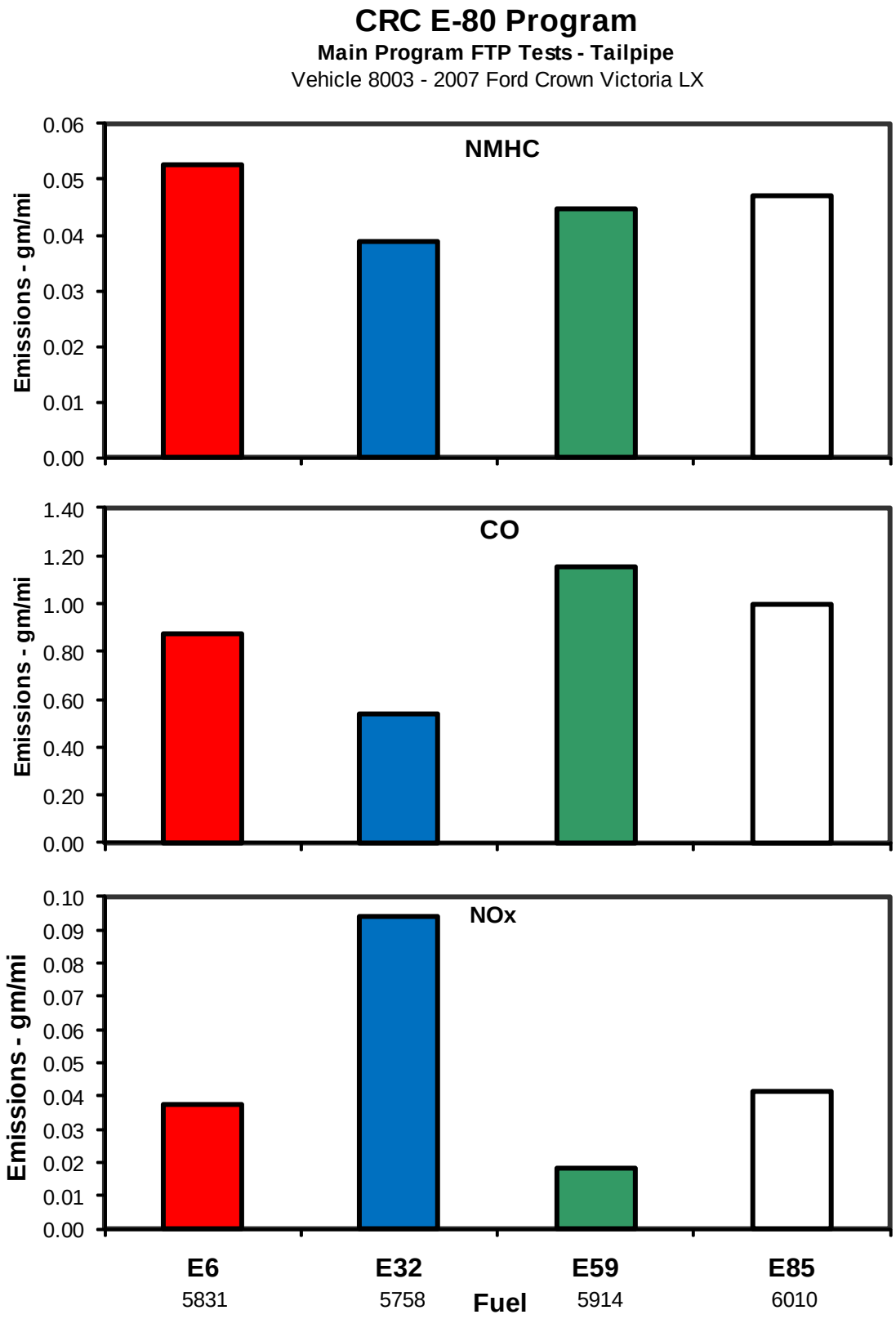

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8002 : US06 Cycle
Hydrocarbon
E6 - 5902
E32 - 5890
E59 - 5929
E85 - 5908
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

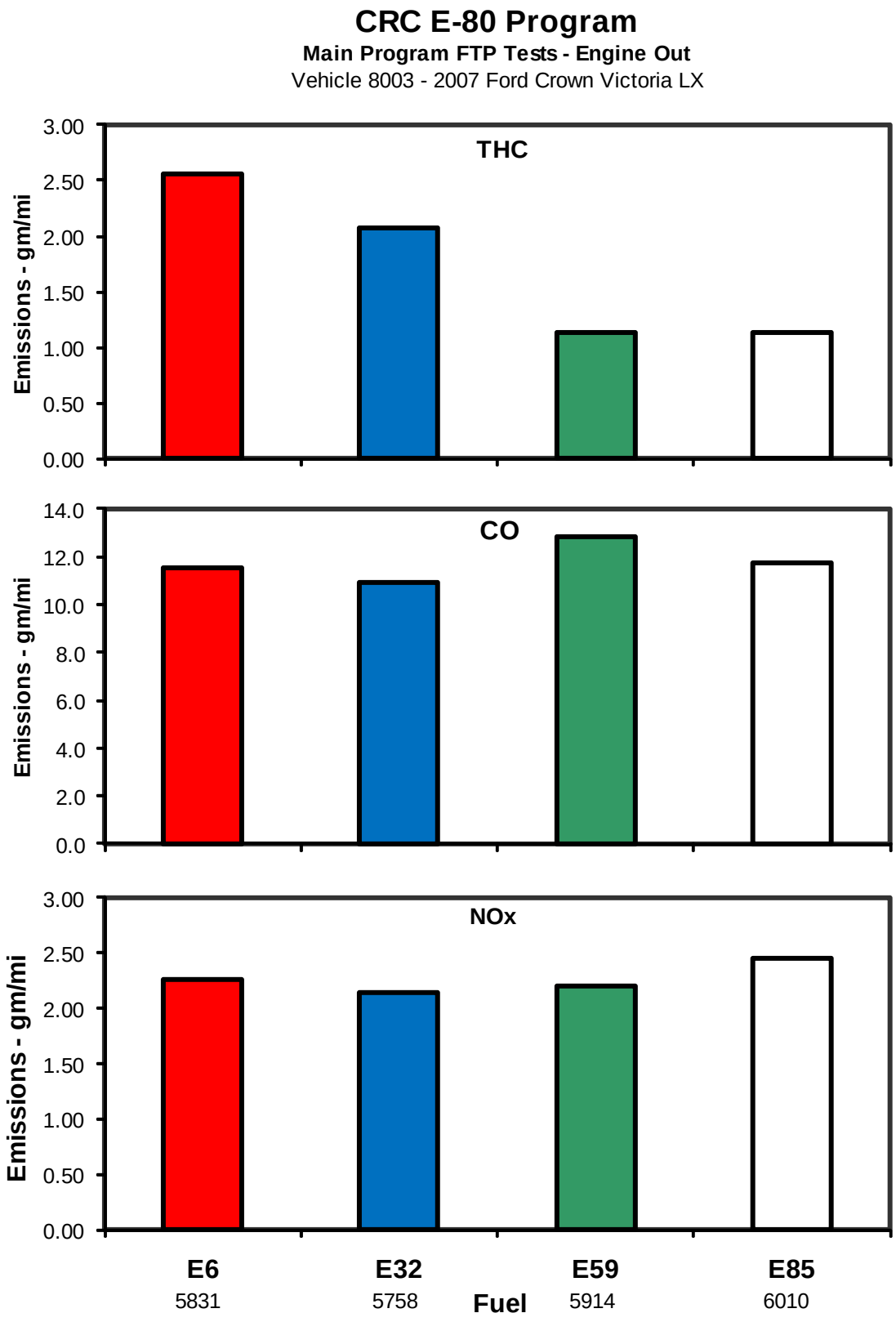

CRC E-80 Program
Main Program UC Tests - Tailpipe
Vehicle 8002 - 2007 Ford F-150 XLT
NMHC
CO
NOx
Emissions - gm/mi
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.16
E6
5903
E32
5891
E59
5830
E85
5911
Fuel

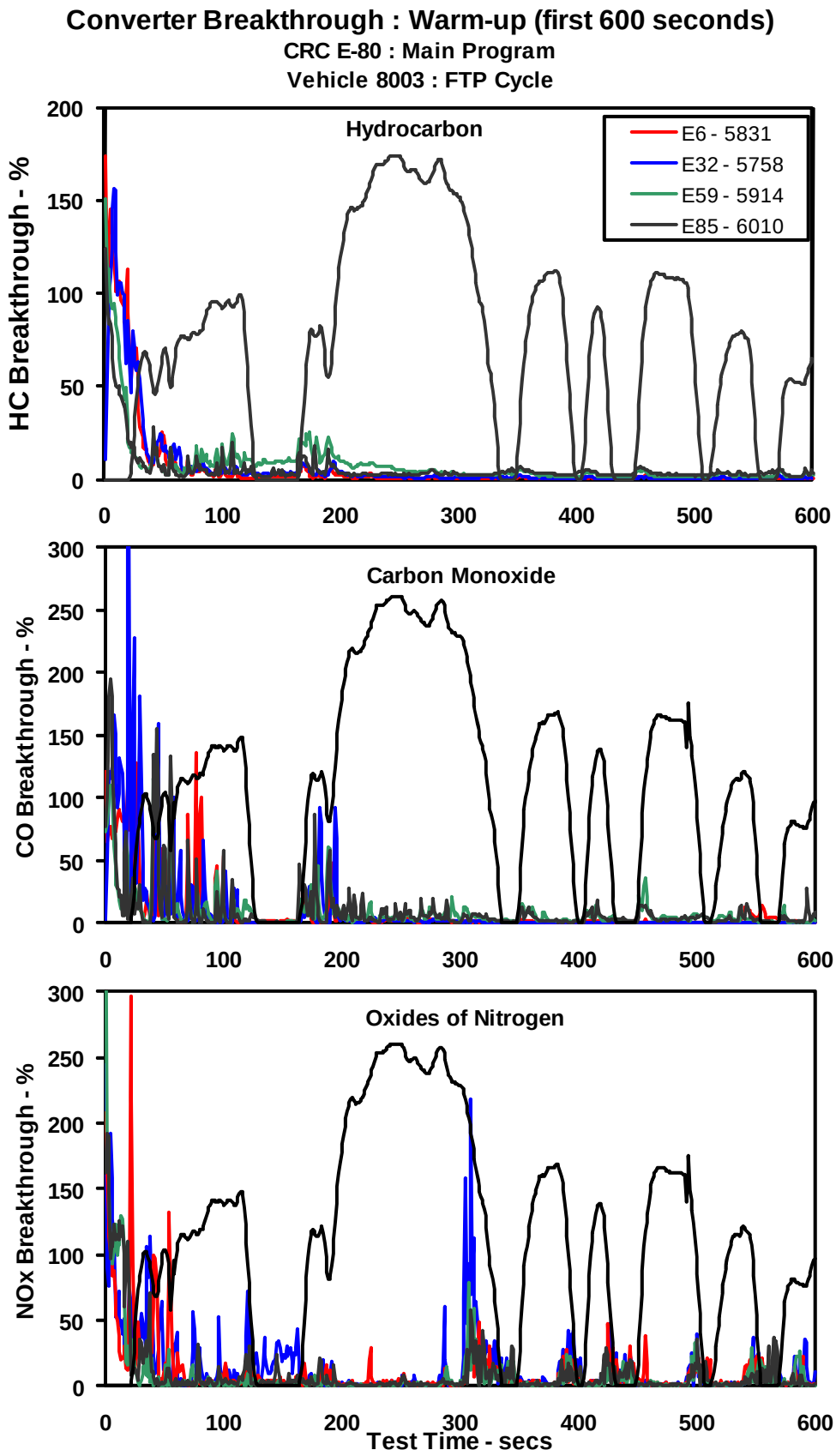

CRC E-80 Program
Main Program UC Tests - Engine Out
Vehicle 8002 - 2007 Ford F-150 XLT
THC
CO
NOx
Emissions - gm/mi
3.00
2.50
2.00
1.50
1.00
0.50
0.00
25.0
20.0
15.0
10.0
5.0
0.0
6.00
5.00
4.00
3.00
2.00
1.00
0.00
E6
5903
E32
5891
E59
5830
E85
5911
Fuel

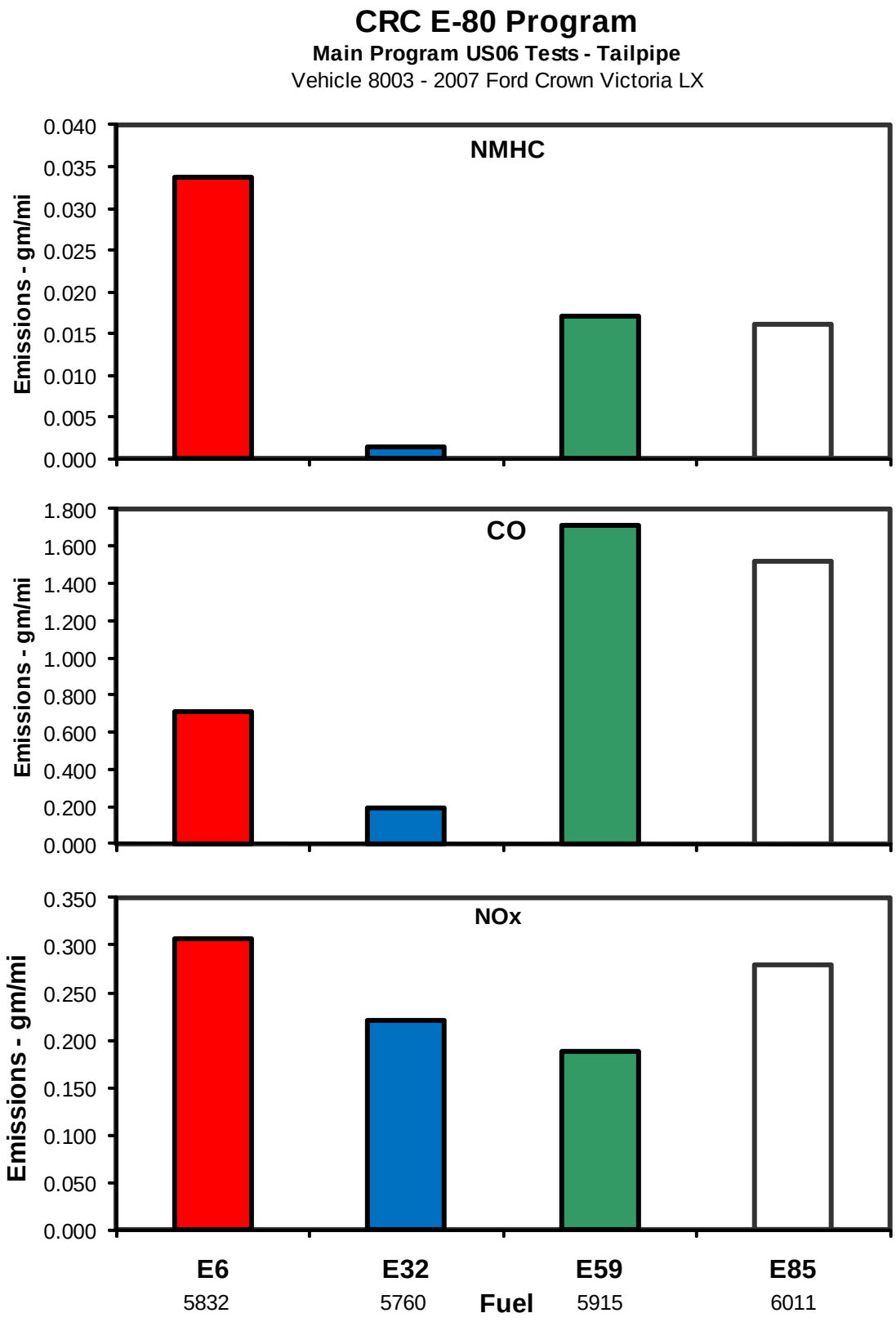

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8002 : UC Cycle
E6 - 5903
E32 - 5891
E59 - 5830
E85 - No post cat data
Hydrocarbon
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

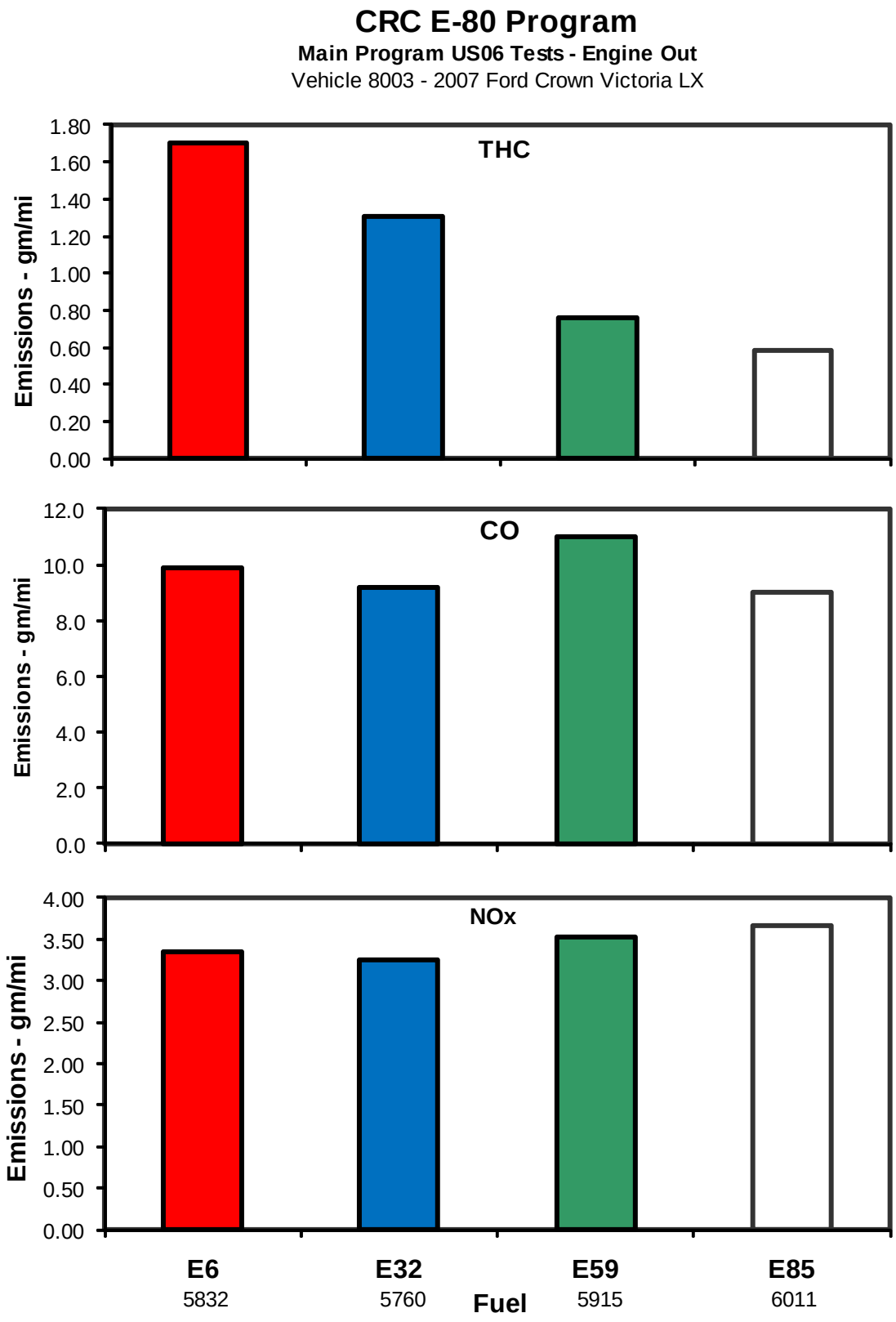
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8002		E59	5828	0.057	0.039	0.099	2.12	0.03	549	12.43	2.050	15.10	3.001	536
2007	FTP	E32	5889	0.072	0.033	0.109	2.09	0.04	547	13.79	2.536	14.86	3.041	518
Ford		E6	5901	0.068	0.026	0.098	1.52	0.04	551	14.98	3.103	13.03	2.958	517
F150		E85	5907	0.073	0.057	0.134	1.86	0.04	558	10.87	1.529	15.62	2.337	538
XLT														
w/ 120K		E59	5829	0.037	0.035	0.073	2.63	0.30	557	12.23	1.253	16.17	7.366	497
Catalyst	US06	E32	5890	0.044	0.032	0.078	2.76	0.36	550	13.69	1.460	15.94	6.907	488
		E6	5902	0.069	0.033	0.104	3.49	0.43	558	14.72	1.728	16.15	6.930	488
		E85	5908	0.015	0.031	0.047	2.68	0.13	550	11.01	0.805	16.38	6.276	478
		E59	5830	0.121	0.044	0.171	3.65	0.07	609	11.16	1.930	19.92	4.648	561
	UC	E32	5891	0.086	0.038	0.128	3.42	0.07	598	12.60	2.413	19.04	4.891	569
		E6	5903	0.098	0.038	0.141	3.98	0.14	596	13.76	2.716	18.87	4.991	563
		E85	5911	0.071	0.063	0.138	3.01	0.06	611	9.89	1.485	20.04	4.346	609

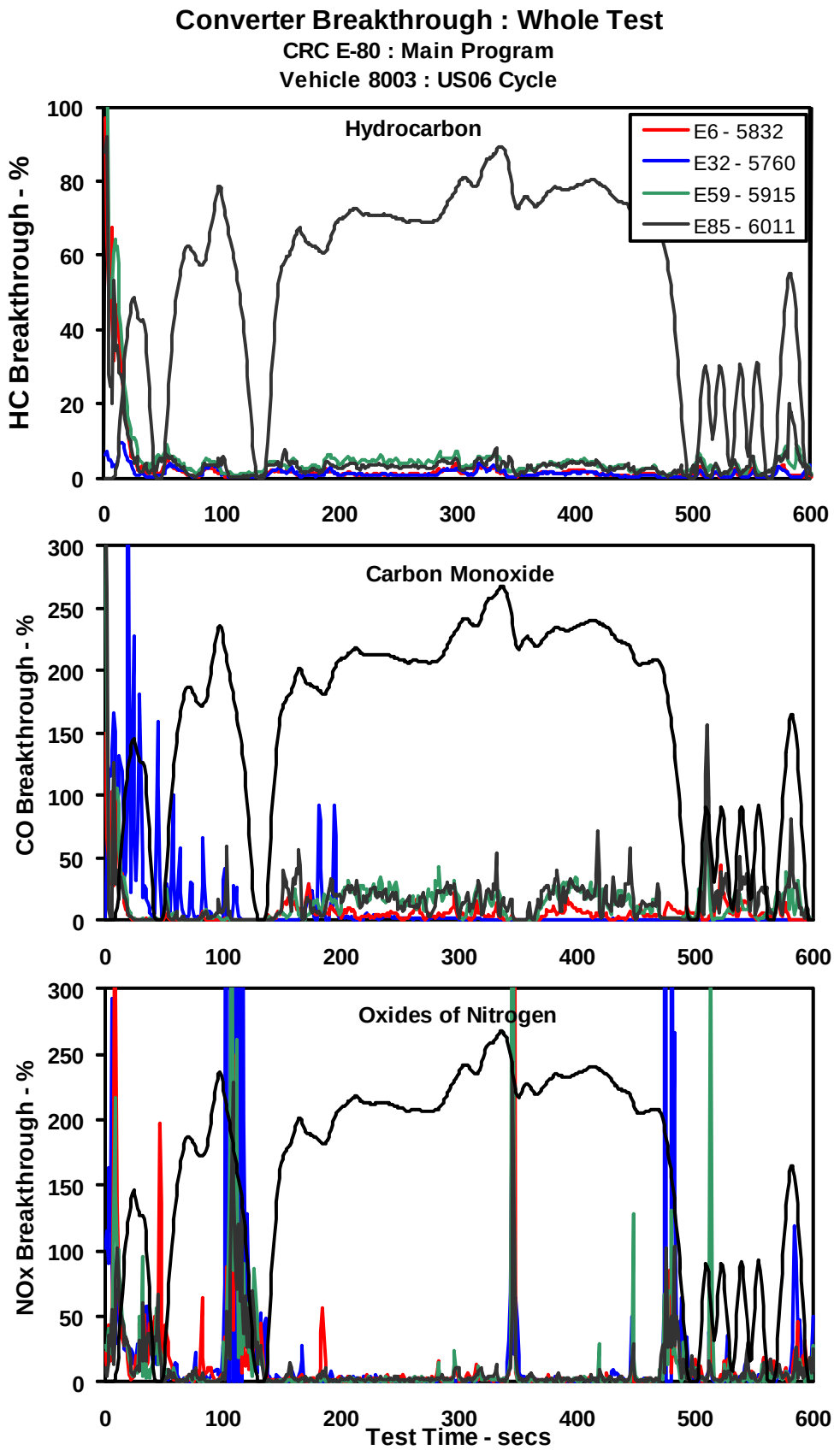

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8003 - 2007 Ford Crown Victoria LX
NMHC
CO
NOx
Emissions - gm/mi
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.10
0.09
0.08
0.07
E6
5831
E32
5758
E59
5914
E85
6010
Fuel

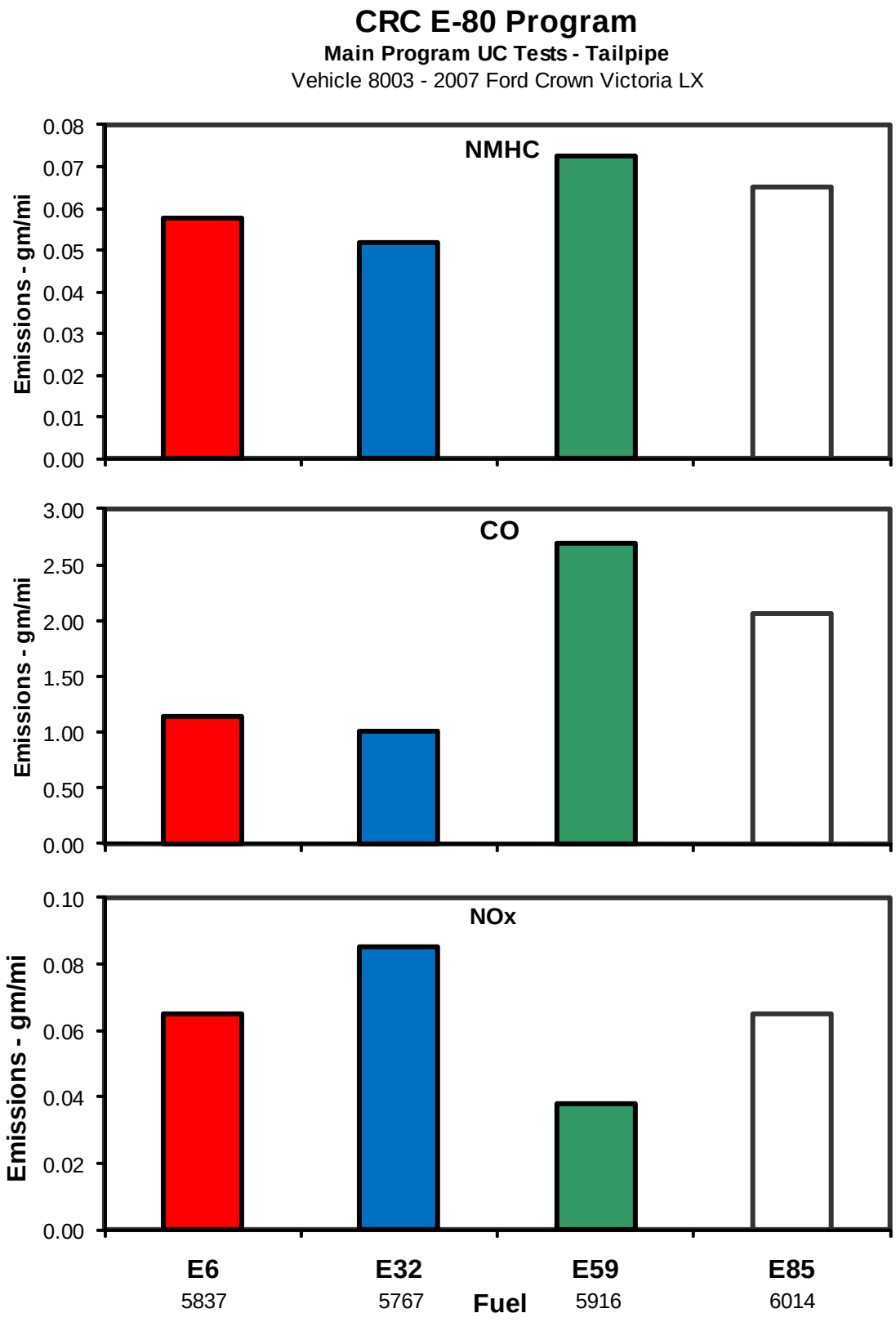

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8003 - 2007 Ford Crown Victoria LX
THC
CO
NOx
Emissions - gm/mi
3.00
2.50
2.00
1.50
1.00
0.50
0.00
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
E6
5831
E32
5758
E59
5914
E85
6010
Fuel

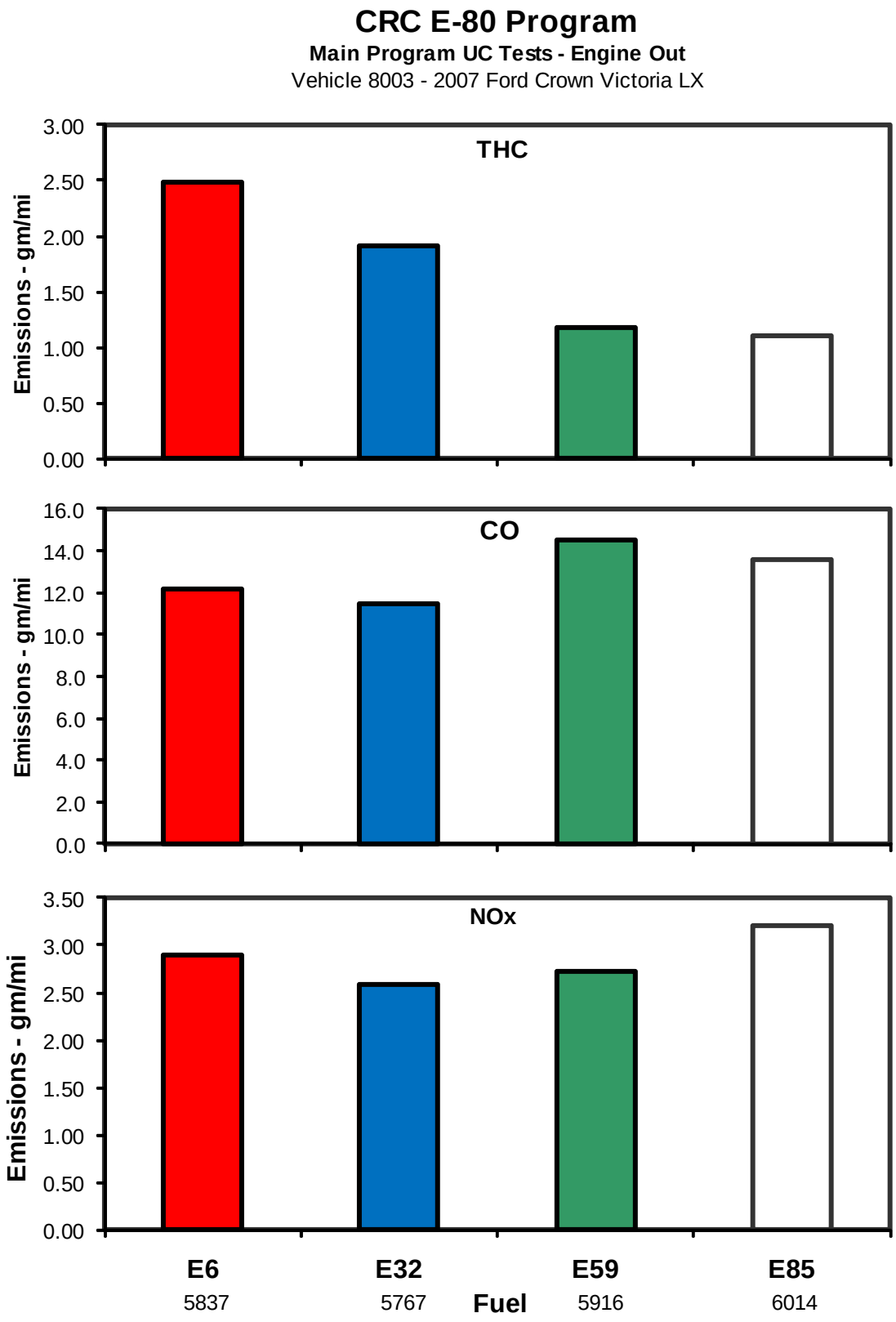

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8003 : FTP Cycle
Hydrocarbon
E6 - 5831
E32 - 5758
E59 - 5914
E85 - 6010
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs
0
50
100
150
200
250
300
400
500
600

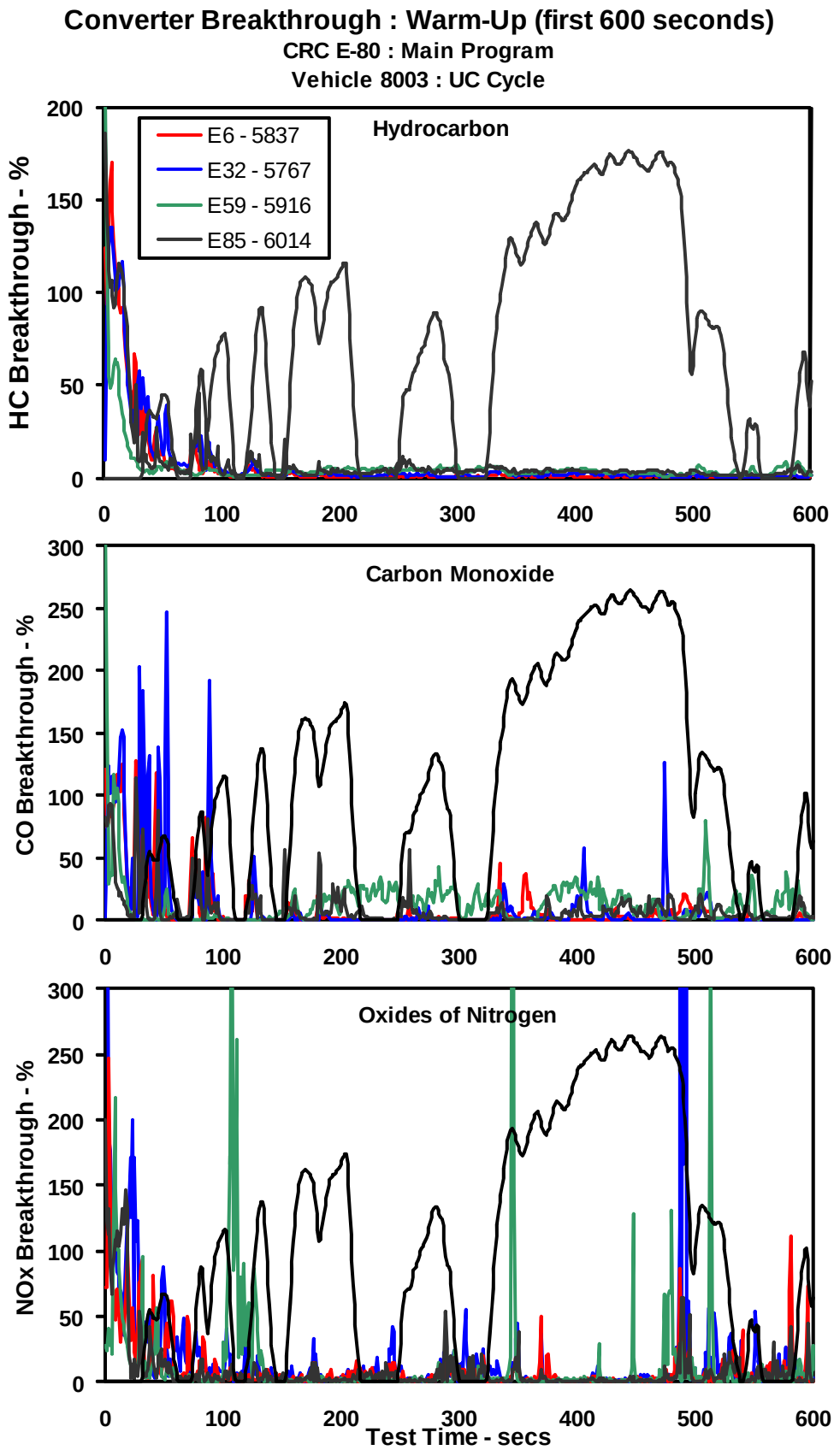

CRC E-80 Program
Main Program US06 Tests - Tailpipe
Vehicle 8003 - 2007 Ford Crown Victoria LX
NMHC
CO
NOx
Emissions - gm/mi
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.350
0.300
0.250
0.150
0.100
0.050
E6
5832
E32
5760
E59
5915
E85
6011
Fuel


CRC E-80 Program
Main Program US06 Tests - Engine Out
Vehicle 8003 - 2007 Ford Crown Victoria LX
THC
CO
NOx
Emissions - gm/mi
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
12.0
10.0
8.0
6.0
4.0
2.0
0.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5832
E32
5760
E59
5915
E85
6011
Fuel

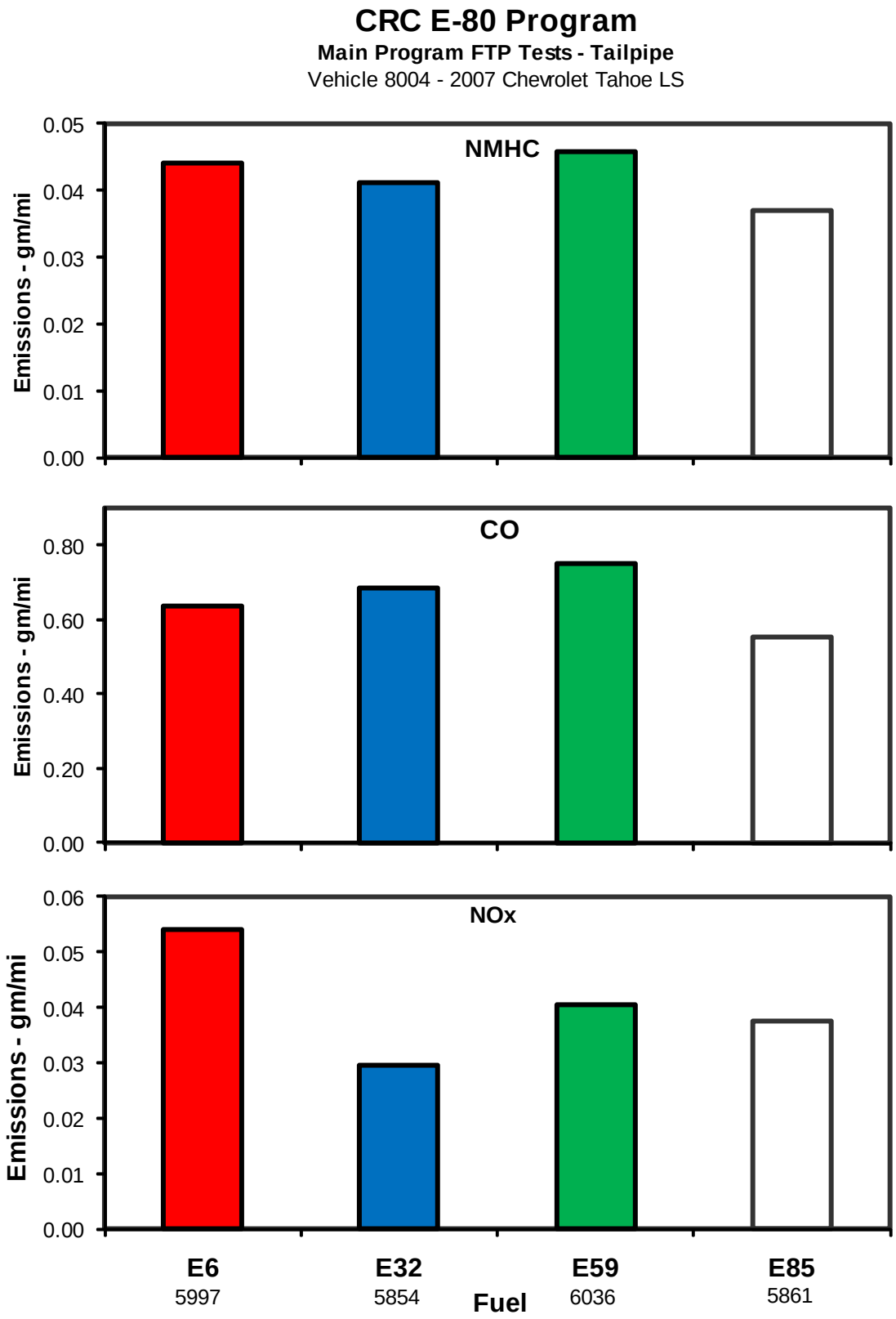

Converter Breakthrough : Whole Test
CRC E-80 : Main Program
Vehicle 8003 : US06 Cycle
Hydrocarbon
E6 - 5832
E32 - 5760
E59 - 5915
E85 - 6011
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

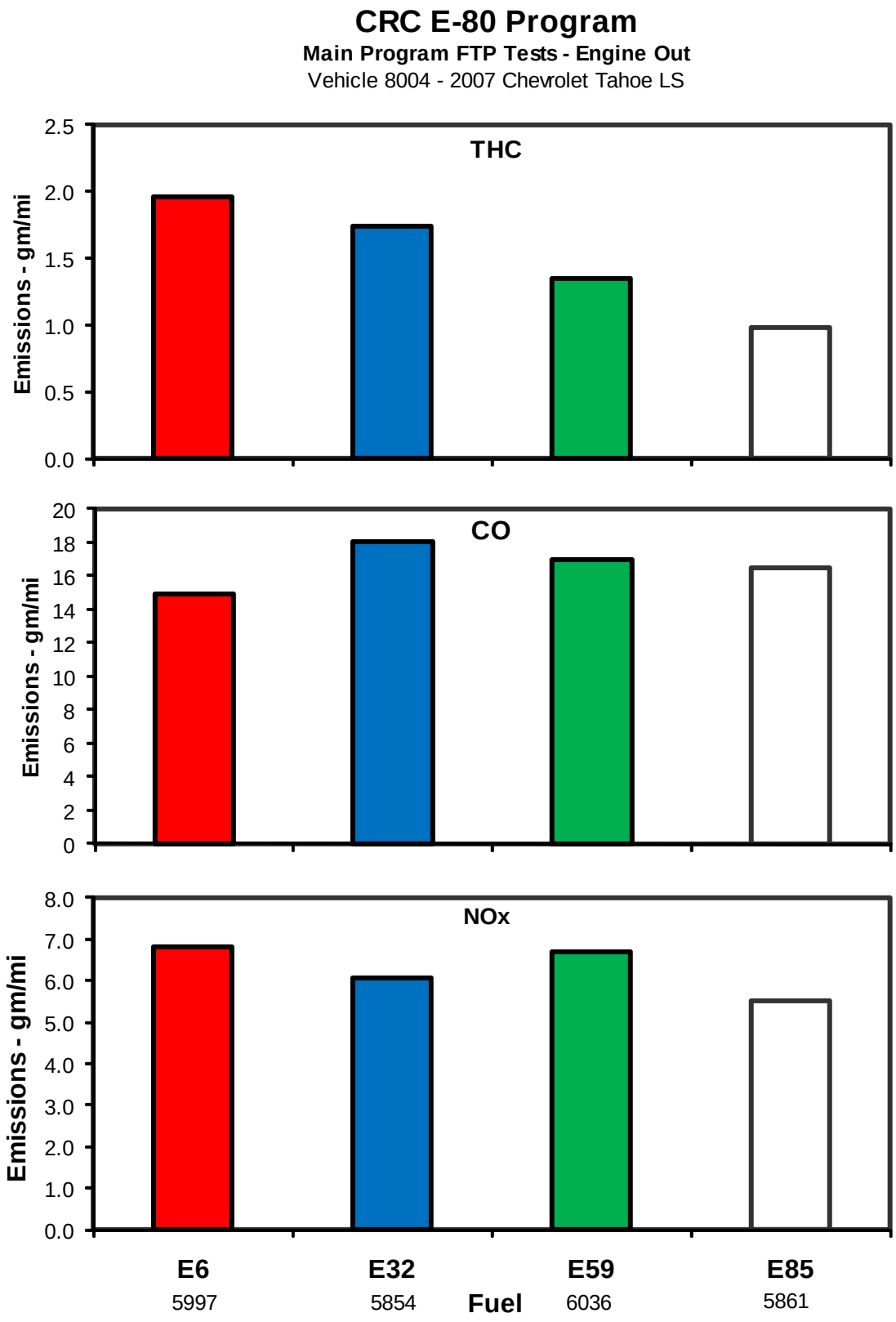

CRC E-80 Program
Main Program UC Tests - Tailpipe
Vehicle 8003 - 2007 Ford Crown Victoria LX
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
3.00
2.50
2.00
1.50
1.00
0.50
0.10
E6
5837
E32
5767
E59
5916
E85
6014
Fuel

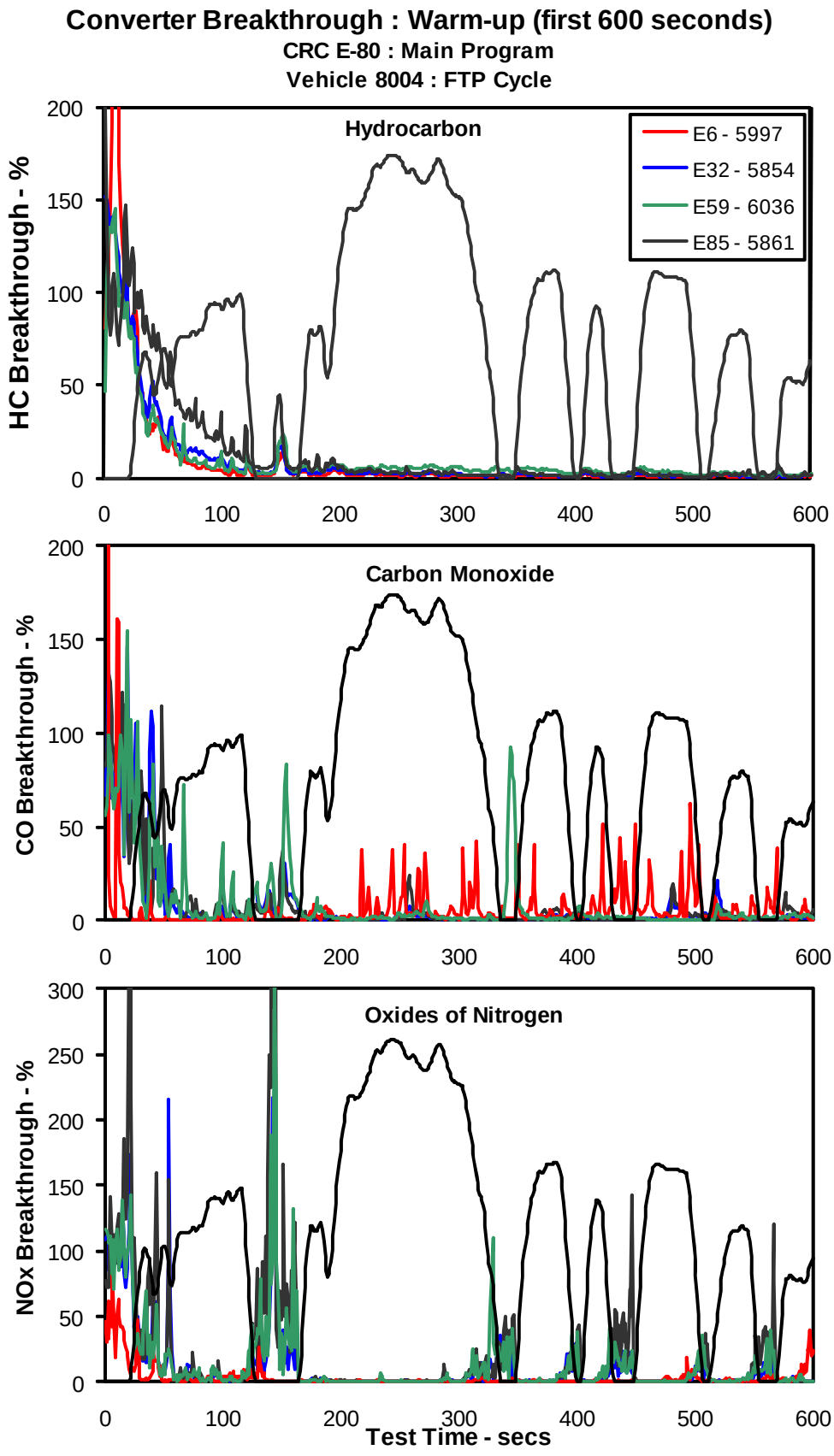

CRC E-80 Program
Main Program UC Tests - Engine Out
Vehicle 8003 - 2007 Ford Crown Victoria LX
THC
CO
NOx
Emissions - gm/mi
3.00
2.50
2.00
1.50
1.00
0.50
0.00
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
3.50
E6
5837
E32
5767
E59
5916
E85
6014
Fuel

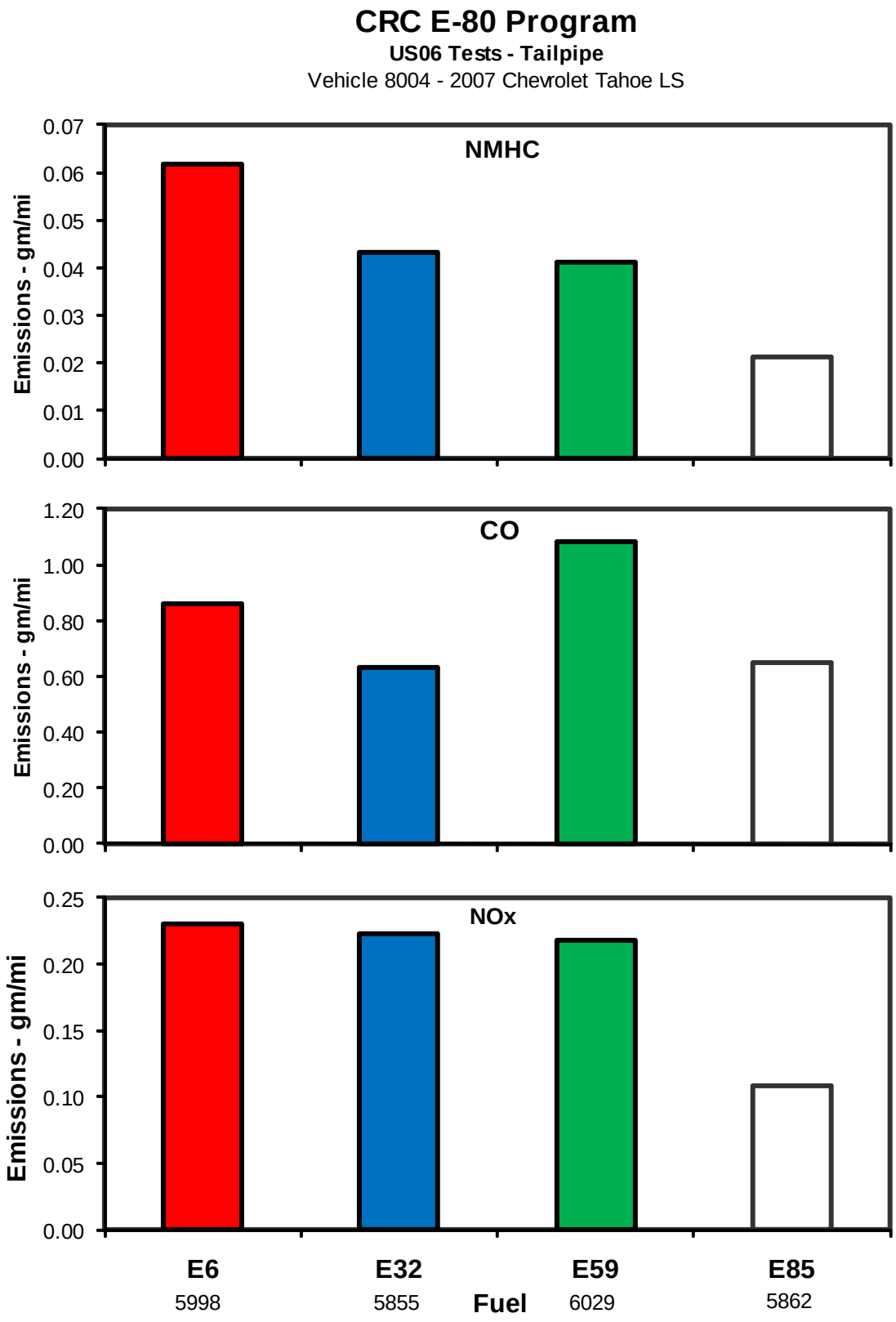

Converter Breakthrough : Warm-Up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8003 : UC Cycle
Hydrocarbon
E6 - 5837
E32 - 5767
E59 - 5916
E85 - 6014
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

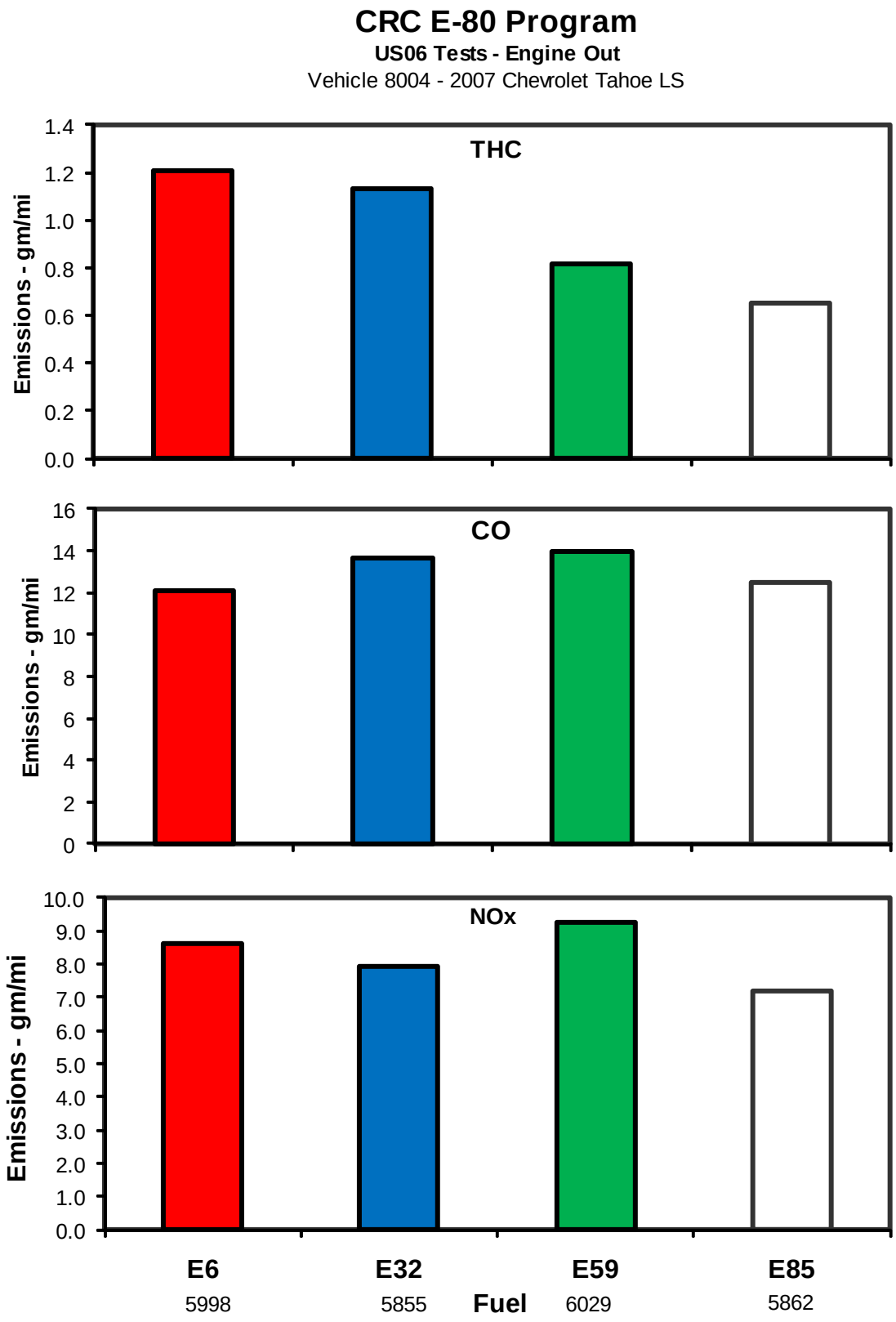
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8003		E32	5758	0.039	0.017	0.058	0.54	0.09	477	15.90	2.072	10.95	2.145	447
2007	FTP	E6	5831	0.053	0.016	0.068	0.87	0.04	486	17.02	2.552	11.56	2.268	464
Ford		E59	5914	0.045	0.027	0.074	1.15	0.02	479	14.27	1.132	12.81	2.195	459
Crown		E85	6010	0.047	0.025	0.075	1.00	0.04	491	12.38	1.139	11.73	2.453	466
Victoria														
w/ 120K		E32	5760	0.001	0.010	0.011	0.19	0.22	415	18.29	1.304	9.19	3.247	378
Catalyst	US06	E6	5832	0.034	0.011	0.046	0.72	0.31	429	19.28	1.701	9.87	3.349	385
		E59	5915	0.017	0.016	0.034	1.71	0.19	425	16.05	0.758	11.03	3.524	391
		E85	6011	0.016	0.012	0.029	1.52	0.28	431	14.09	0.586	8.99	3.675	347
		E32	5767	0.052	0.018	0.073	1.00	0.09	508	14.90	1.910	11.45	2.591	468
	UC	E6	5837	0.058	0.017	0.078	1.145	0.065	531	15.57	2.487	12.14	2.897	508
		E59	5916	0.072	0.031	0.108	2.69	0.04	507	13.44	1.175	14.49	2.716	521
		E85	6014	0.065	0.026	0.095	2.06	0.07	522	11.61	1.108	13.61	3.210	500

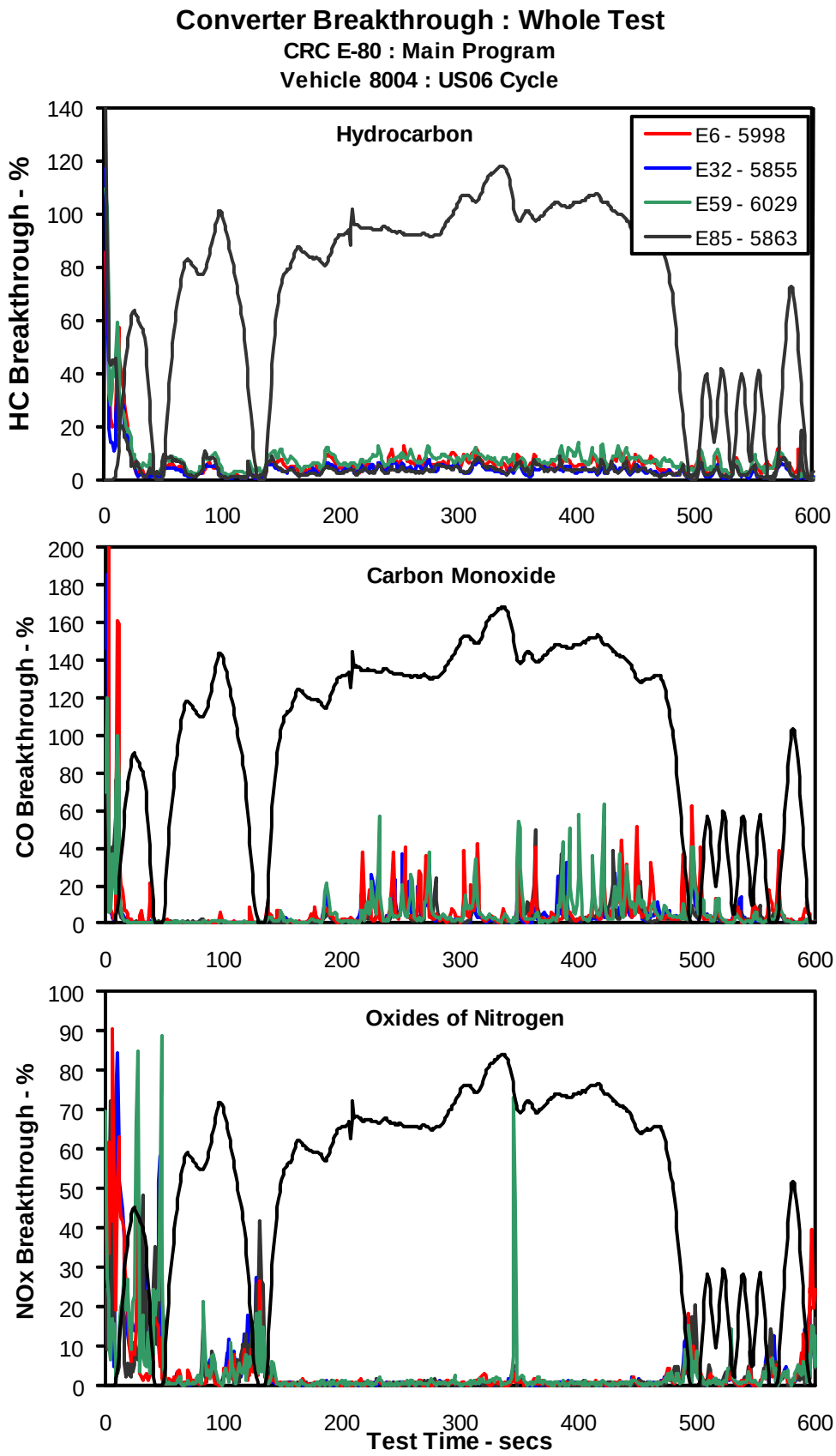

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8004 - 2007 Chevrolet Tahoe LS
NMHC
CO
NOx
Emissions - gm/mi
0.05
0.04
0.03
0.02
0.01
0.00
0.80
0.60
0.40
0.20
0.06
E6
5997
E32
5854
E59
6036
E85
5861
Fuel

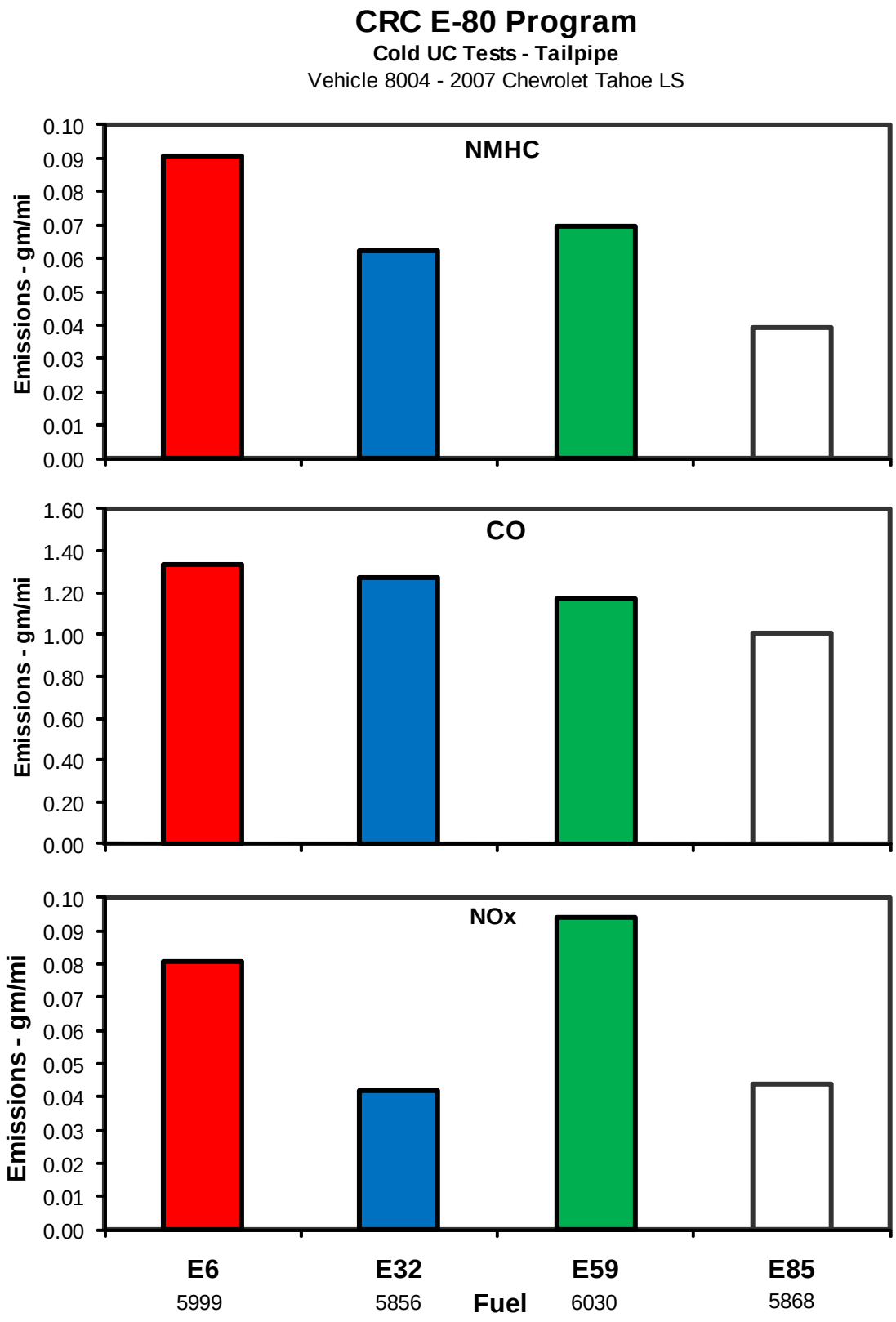

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8004 - 2007 Chevrolet Tahoe LS
THC
CO
NOx
Emissions - gm/mi
2.5
2.0
1.5
1.0
0.5
0.0
20
18
16
14
12
10
8
6
4
2
0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
E6
5997
E32
5854
E59
6036
E85
5861
Fuel

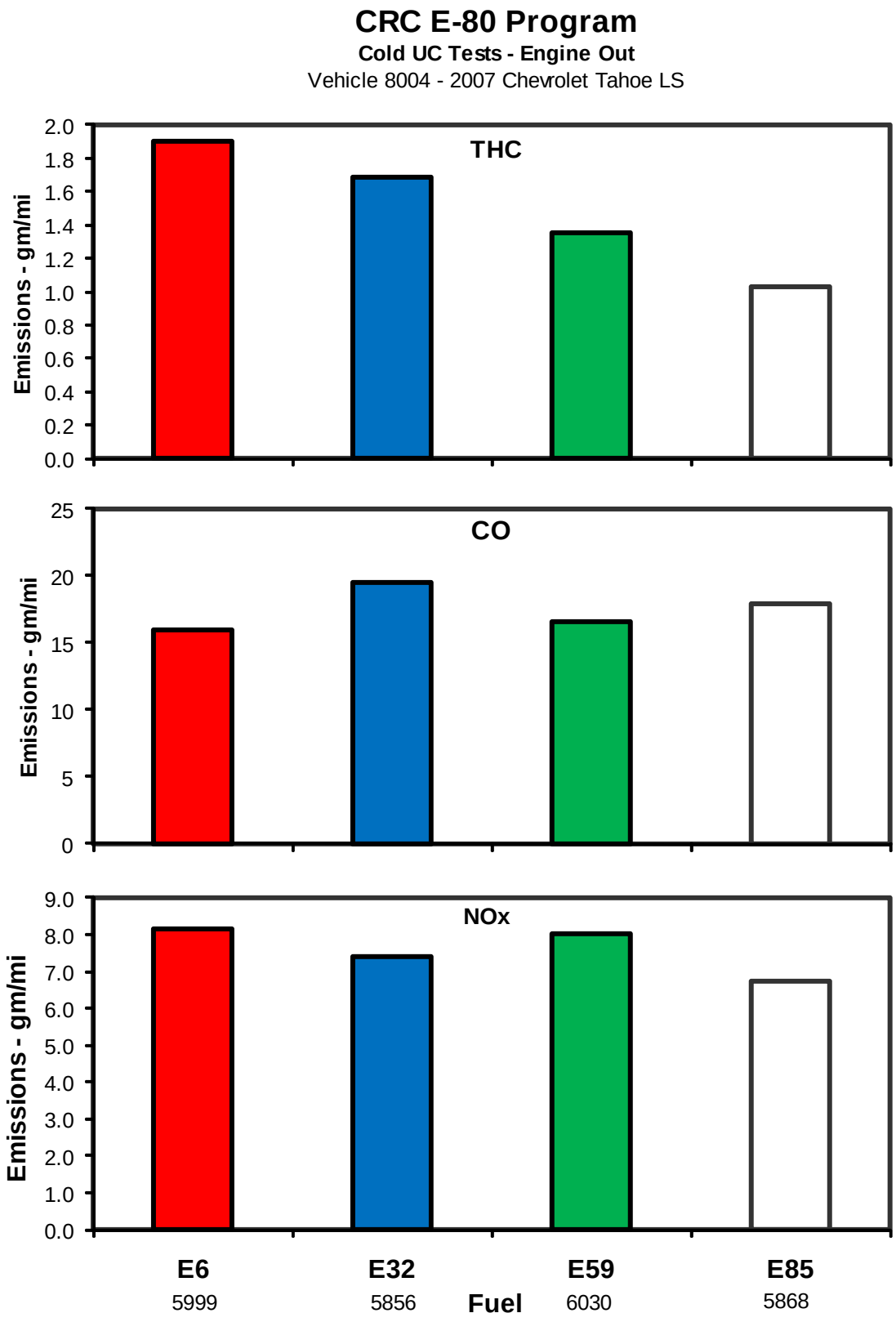

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8004 : FTP Cycle
Hydrocarbon
E6 - 5997
E32 - 5854
E59 - 6036
E85 - 5861
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

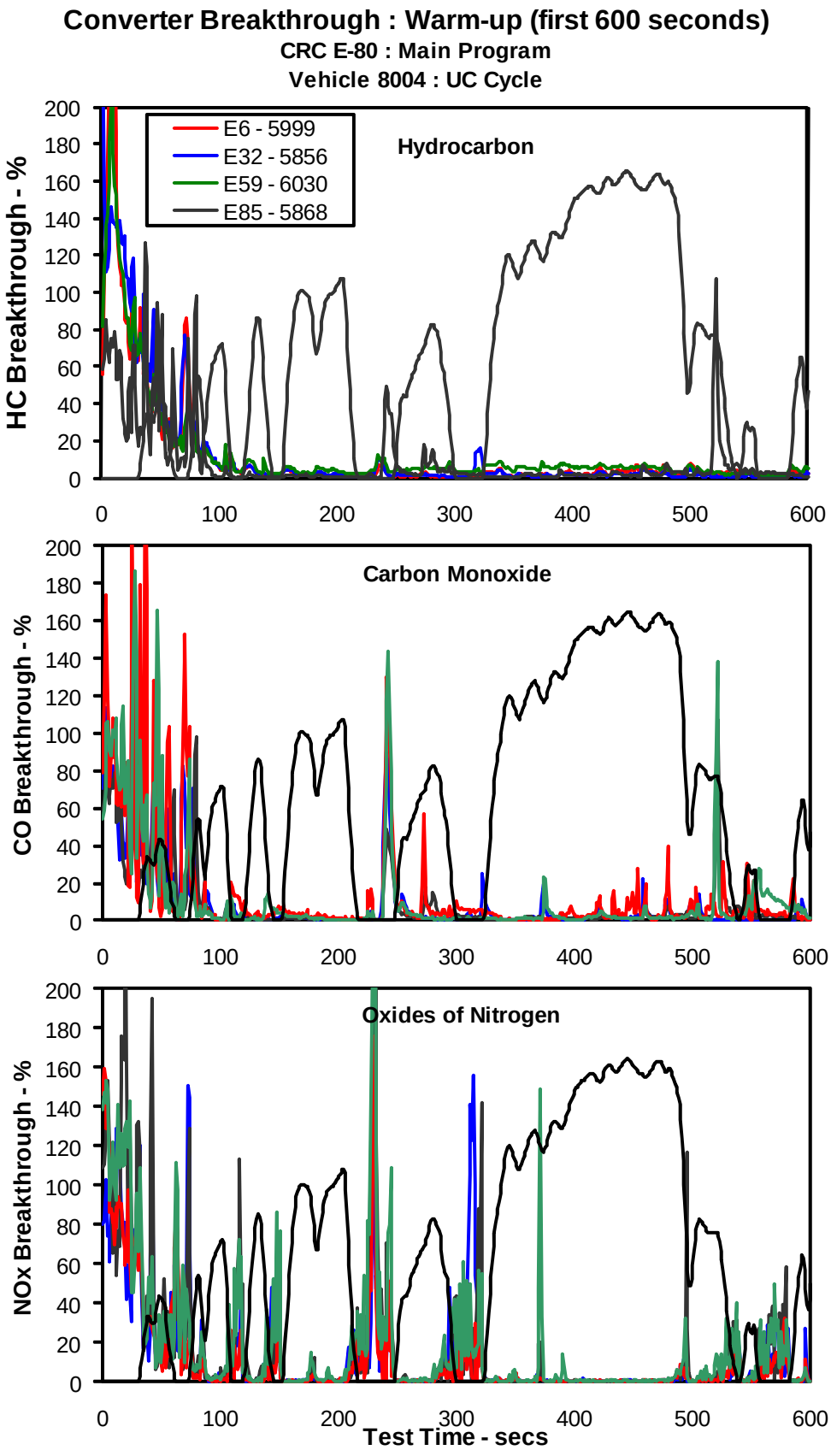

CRC E-80 Program
US06 Tests - Tailpipe
Vehicle 8004 - 2007 Chevrolet Tahoe LS
NMHC
CO
NOx
Emissions - gm/mi
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.20
1.00
0.80
0.60
0.40
0.20
0.25
0.15
0.10
E6
5998
E32
5855
E59
6029
E85
5862
Fuel


CRC E-80 Program
US06 Tests - Engine Out
Vehicle 8004 - 2007 Chevrolet Tahoe LS
THC
Emissions - gm/mi
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
CO
Emissions - gm/mi
16
14
12
10
8
6
4
2
0
NOx
Emissions - gm/mi
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
E6
5998
E32
5855
Fuel
E59
6029
E85
5862

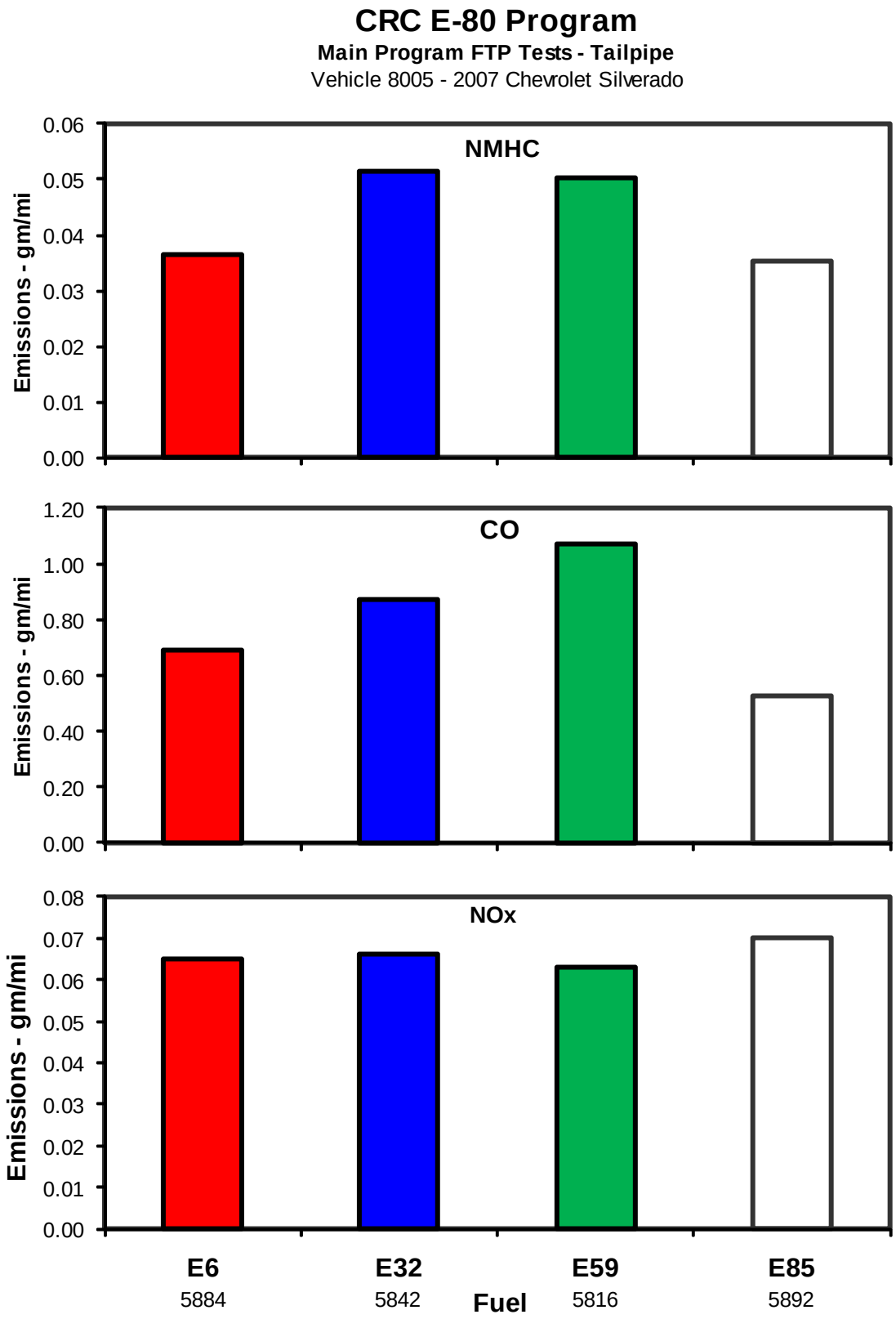

Converter Breakthrough : Whole Test
CRC E-80 : Main Program
Vehicle 8004 : US06 Cycle
Hydrocarbon
E6 - 5998
E32 - 5855
E59 - 6029
E85 - 5863
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

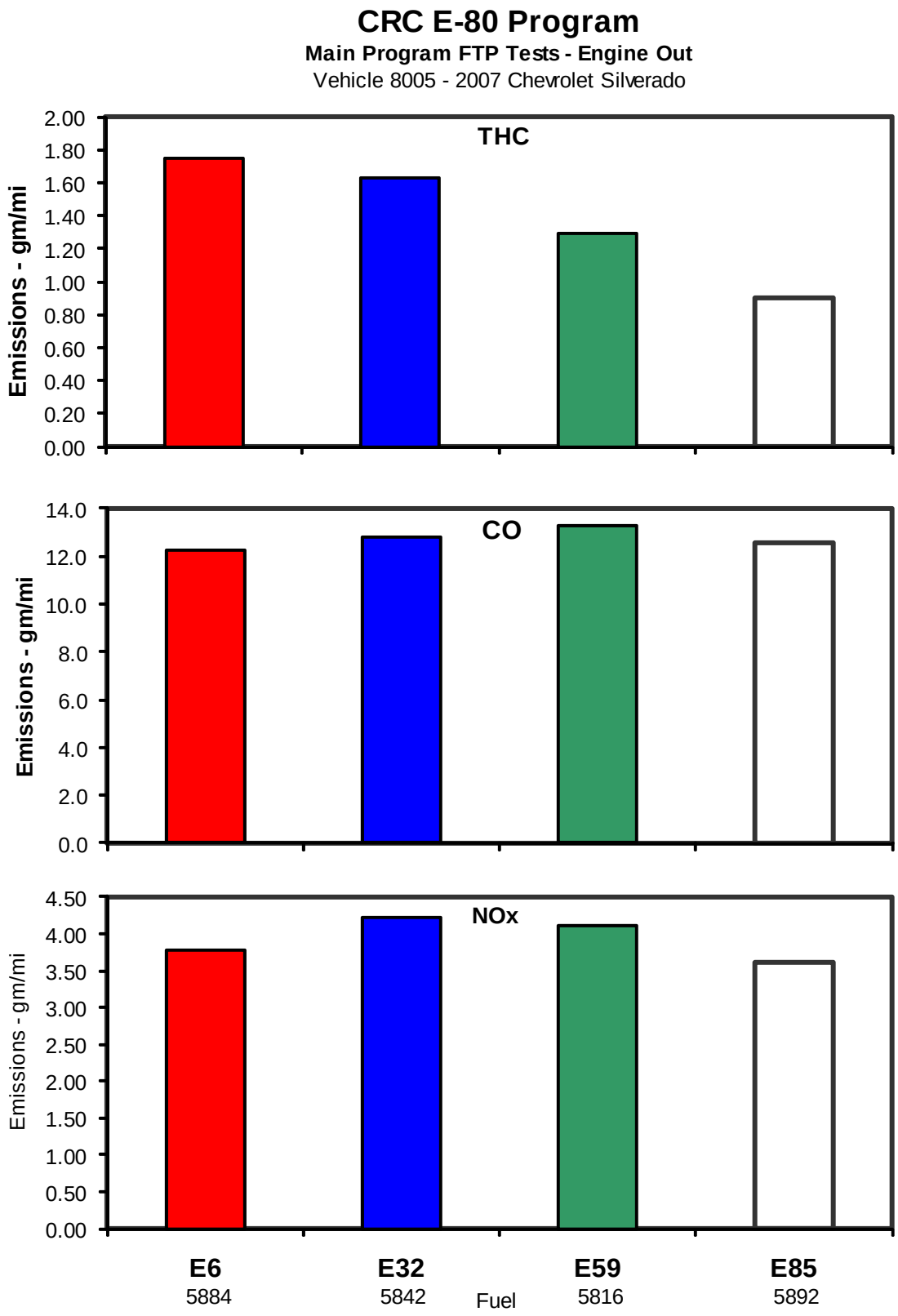

CRC E-80 Program
Cold UC Tests - Tailpipe
Vehicle 8004 - 2007 Chevrolet Tahoe LS
NMHC
CO
NOx
Emissions - gm/mi
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
E6
5999
E32
5856
E59
6030
E85
5868
Fuel

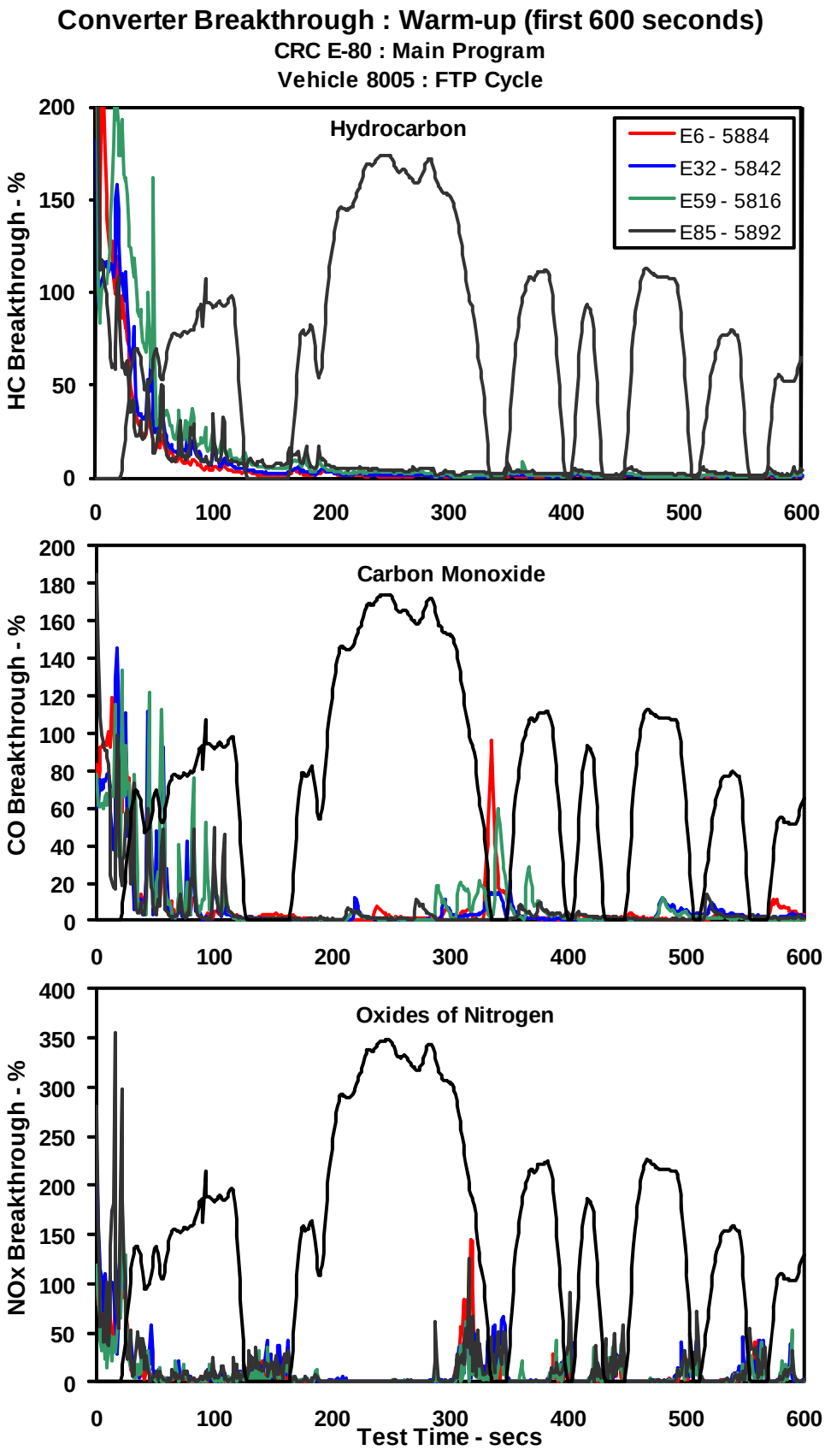

CRC E-80 Program
Cold UC Tests - Engine Out
Vehicle 8004 - 2007 Chevrolet Tahoe LS
THC
CO
NOx
Emissions - gm/mi
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
25
20
15
10
5
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
E6
5999
E32
5856
E59
6030
E85
5868
Fuel

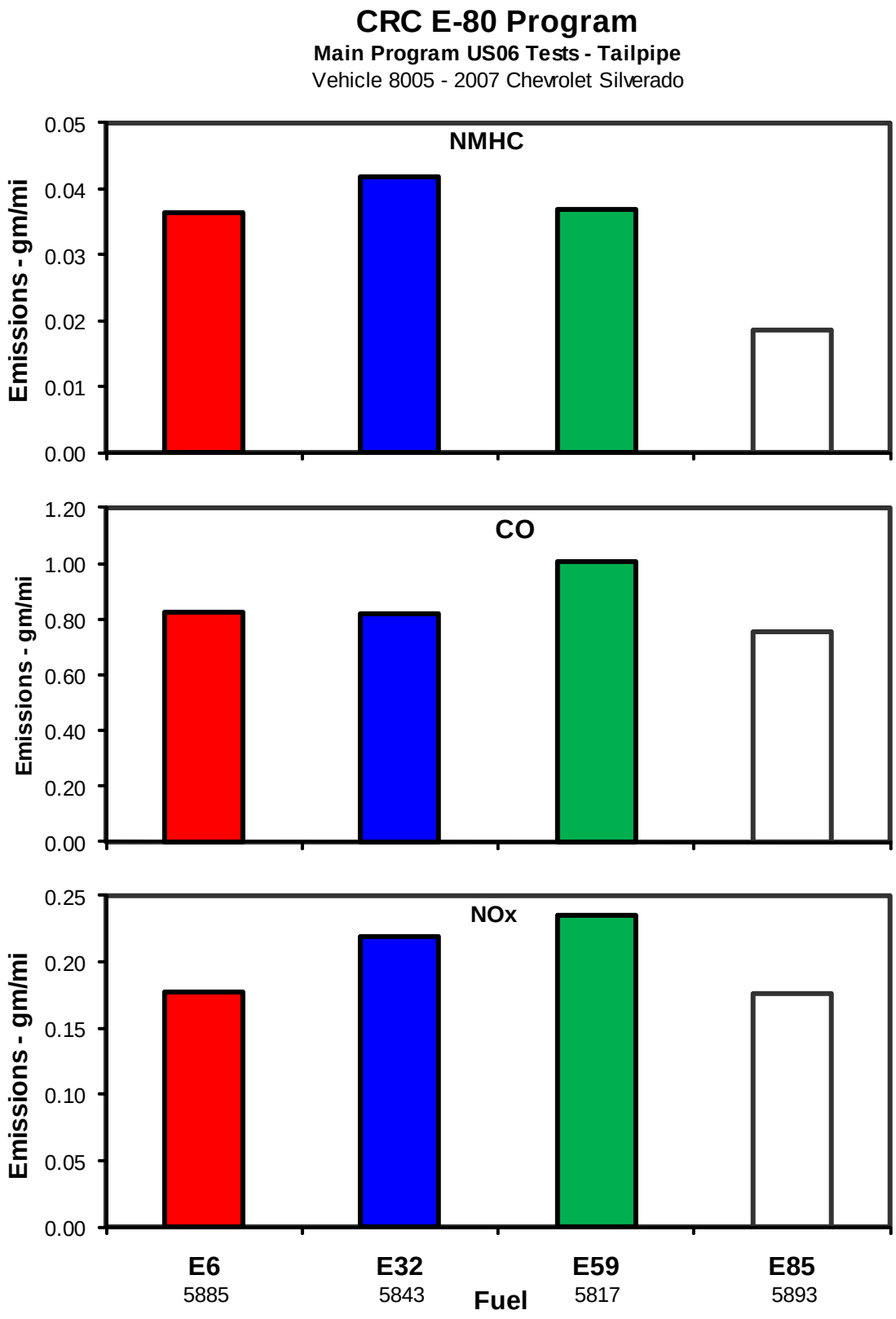

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8004 : UC Cycle
E6 - 5999
E32 - 5856
E59 - 6030
E85 - 5868
Hydrocarbon
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

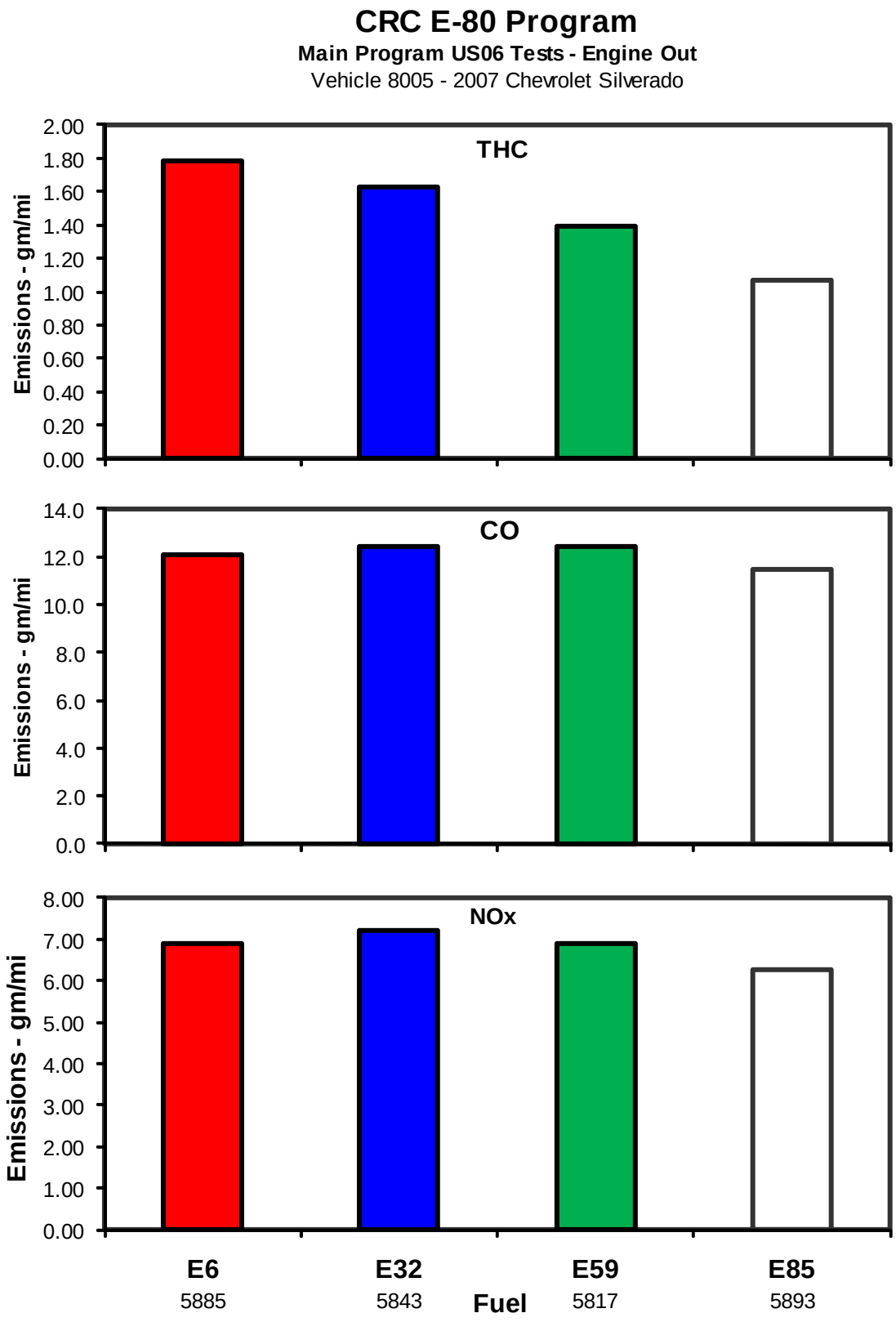
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8004		E32	5854	0.041	0.022	0.065	0.68	0.03	606	12.52	1.740	18.05	6.080	581
2007	FTP	E85	5861	0.037	0.031	0.071	0.55	0.04	591	10.31	0.982	16.51	5.511	576
Chevrolet		E6	5997	0.044	0.020	0.066	0.64	0.05	604	13.71	1.966	14.96	6.833	574
Tahoe		E59	6036	0.046	0.019	0.067	0.75	0.04	603	11.37	1.349	16.95	6.707	579
w/ 120K														
Catalyst		E32	5855	0.043	0.022	0.067	0.63	0.22	561	13.52	1.130	13.65	7.918	502
	US06	E85	5862	0.021	0.026	0.048	0.65	0.11	563	10.82	0.649	12.45	7.193	499
		E6	5998	0.062	0.036	0.100	0.86	0.23	570	14.50	1.207	12.11	8.605	492
		E59	6029	0.041	0.040	0.082	1.09	0.22	576	11.90	0.815	13.95	9.280	526
		E32	5856	0.062	0.026	0.091	1.27	0.04	642	11.80	1.687	19.50	7.424	609
	UC	E85	5868	0.039	0.041	0.083	1.01	0.04	636	9.57	1.029	17.98	6.732	605
		E6	5999	0.091	0.037	0.132	1.34	0.08	645	12.81	1.900	16.00	8.164	609
		E59	6030	0.070	0.037	0.110	1.17	0.09	638	10.73	1.354	16.56	8.006	608

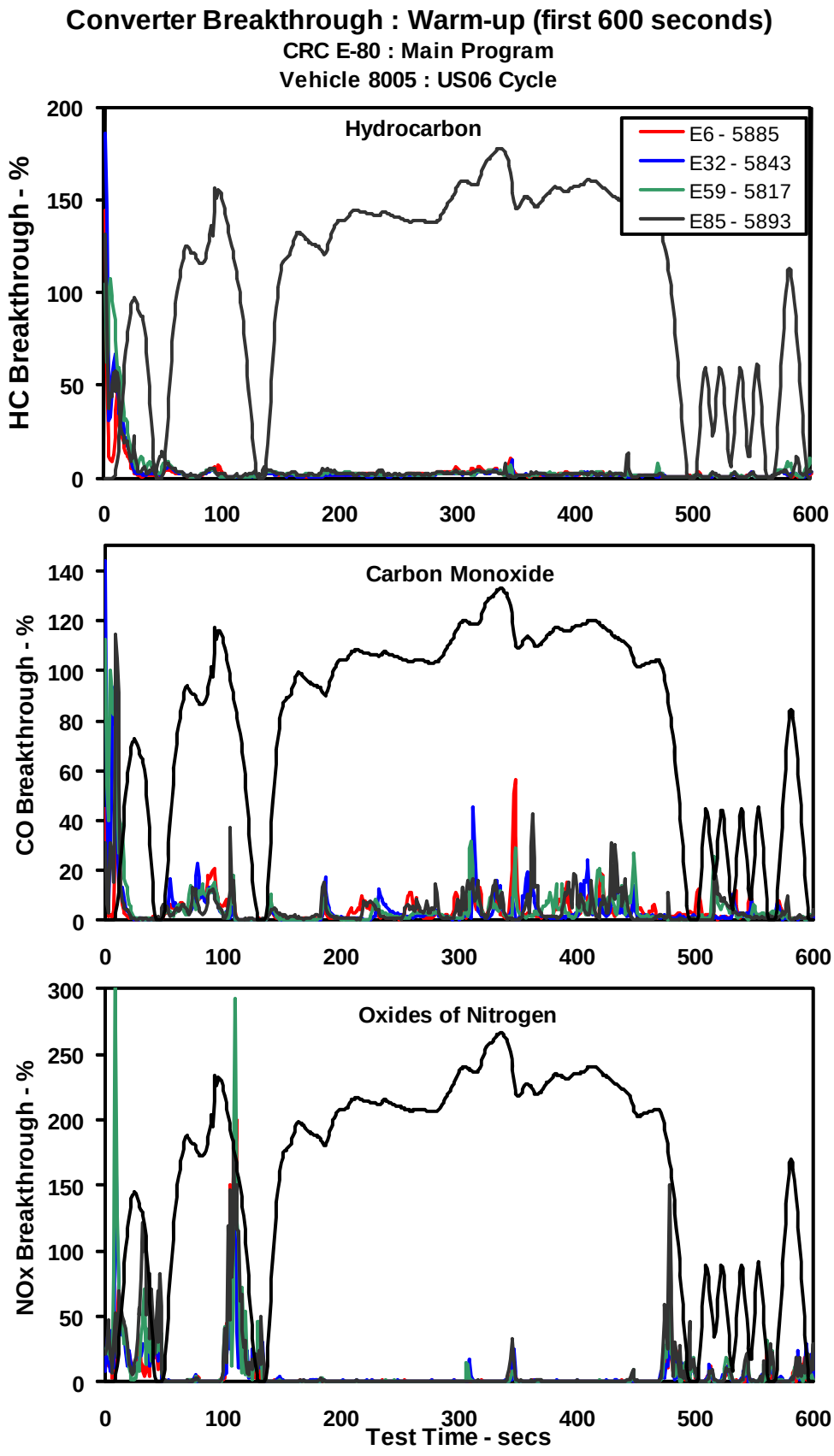

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8005 - 2007 Chevrolet Silverado
NMHC
CO
NOx
Emissions - gm/mi
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.20
1.00
0.80
0.60
0.40
0.20
0.08
0.07
E6
5884
E32
5842
E59
5816
E85
5892
Fuel

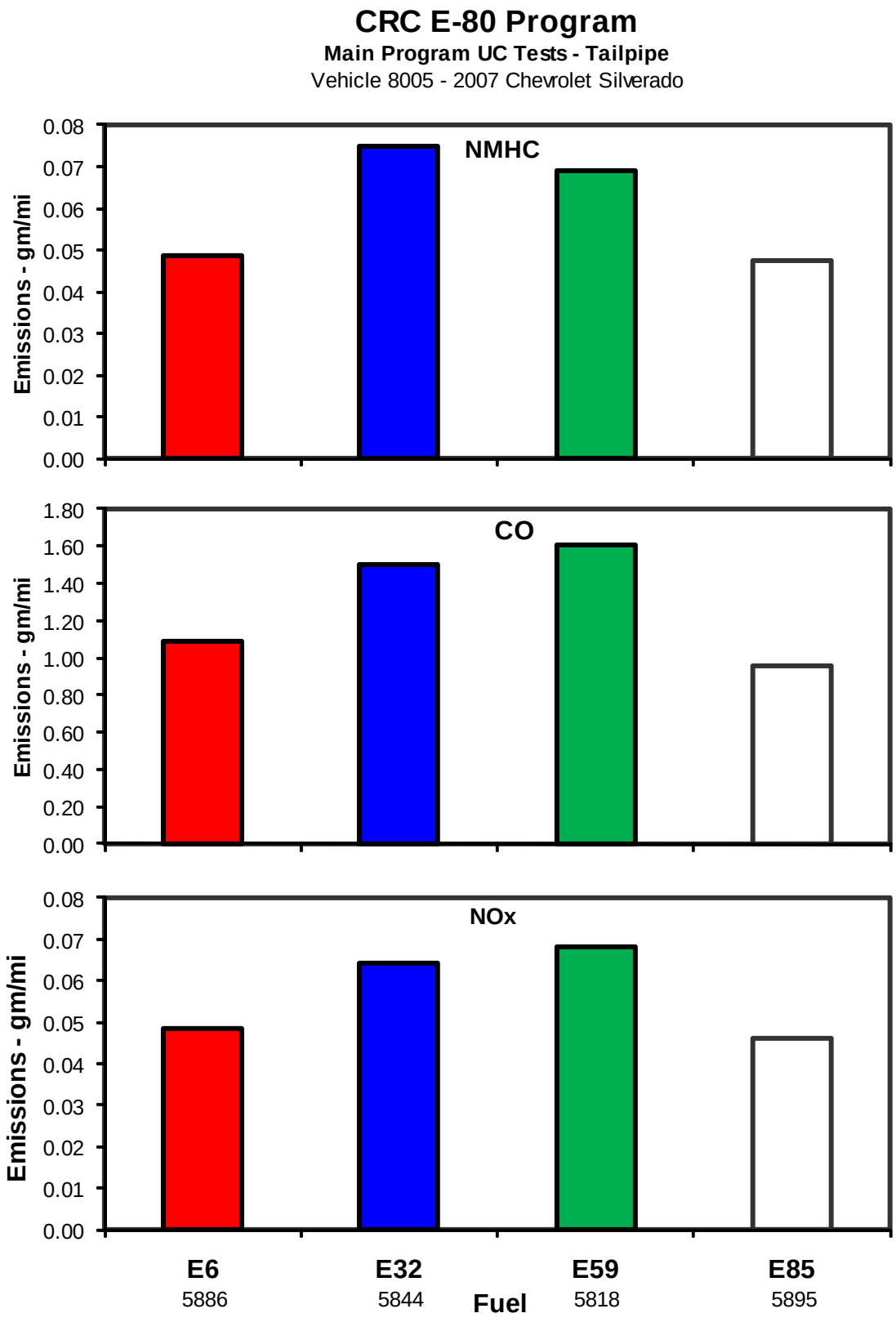

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8005 - 2007 Chevrolet Silverado
THC
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
CO
Emissions - gm/mi
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
NOx
Emissions - gm/mi
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5884
E32
5842
E59
5816
E85
5892
Fuel

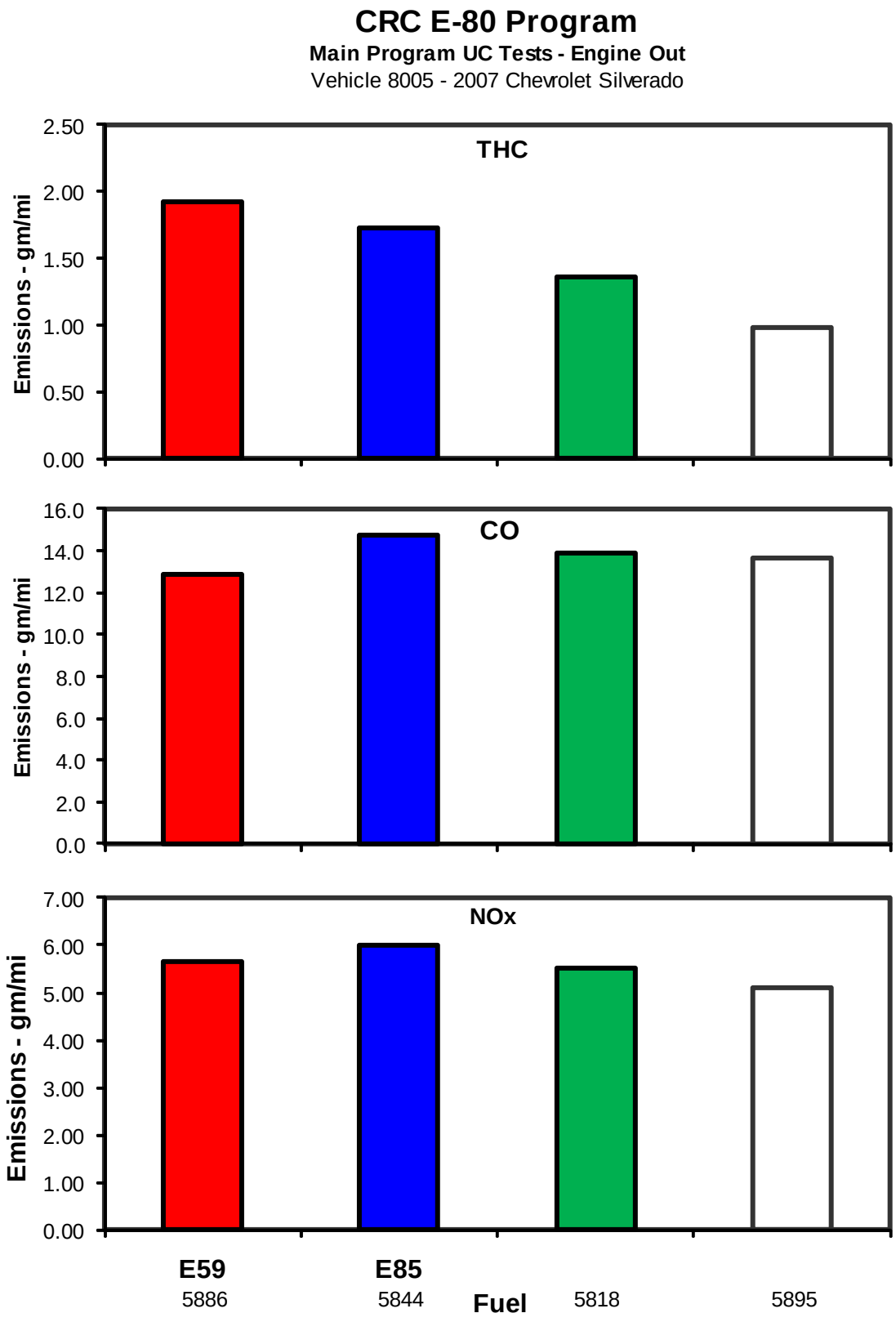

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8005 : FTP Cycle
Hydrocarbon
E6 - 5884
E32 - 5842
E59 - 5816
E85 - 5892
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

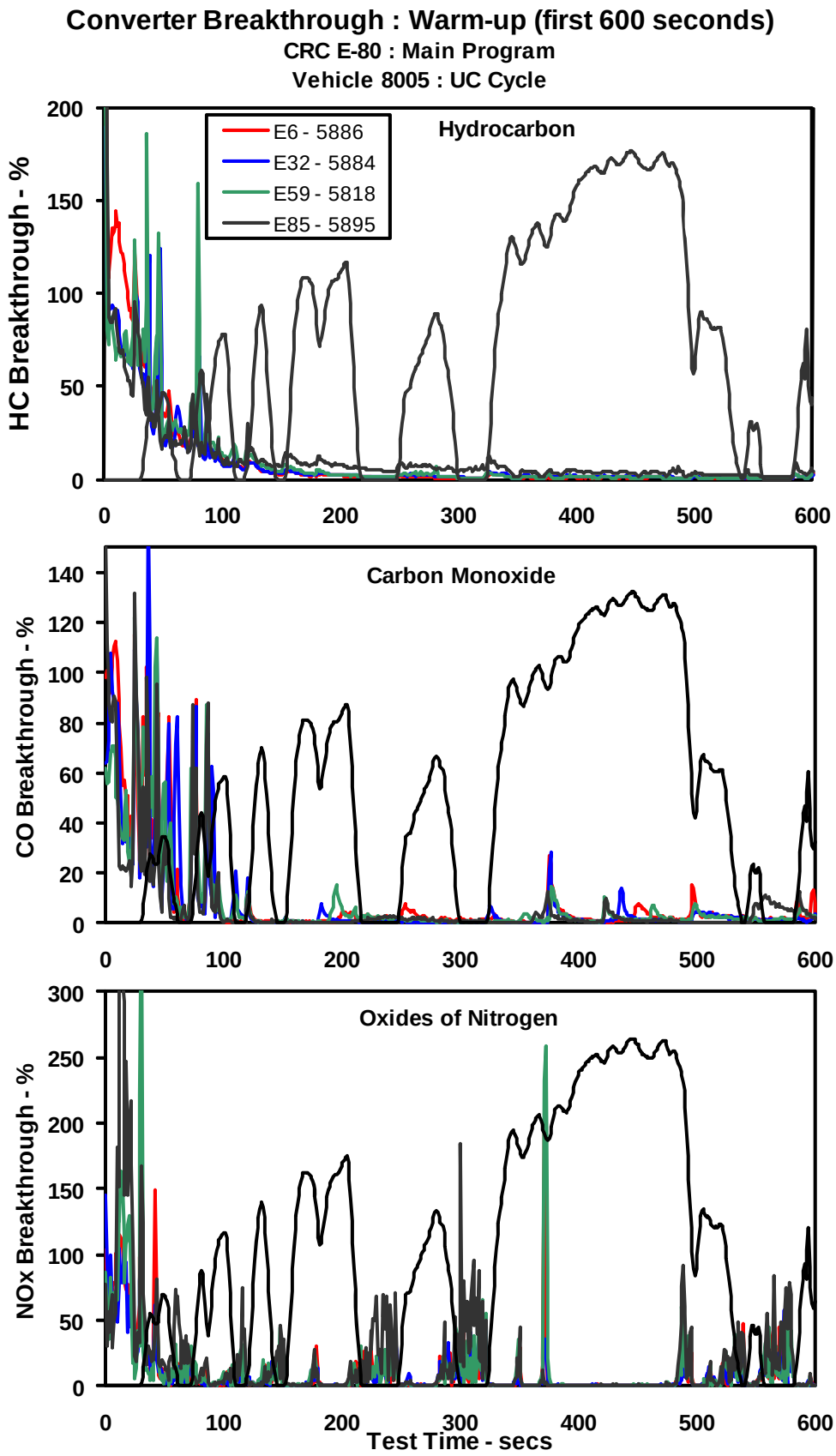

CRC E-80 Program
Main Program US06 Tests - Tailpipe
Vehicle 8005 - 2007 Chevrolet Silverado
NMHC
CO
NOx
Emissions - gm/mi
0.05
0.04
0.03
0.02
0.01
0.00
1.20
1.00
0.80
0.60
0.40
0.20
0.25
0.15
0.10
E6
5885
E32
5843
E59
5817
E85
5893
Fuel


CRC E-80 Program
Main Program US06 Tests - Engine Out
Vehicle 8005 - 2007 Chevrolet Silverado
THC
CO
NOx
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
E6
5885
E32
5843
E59
5817
E85
5893
Fuel

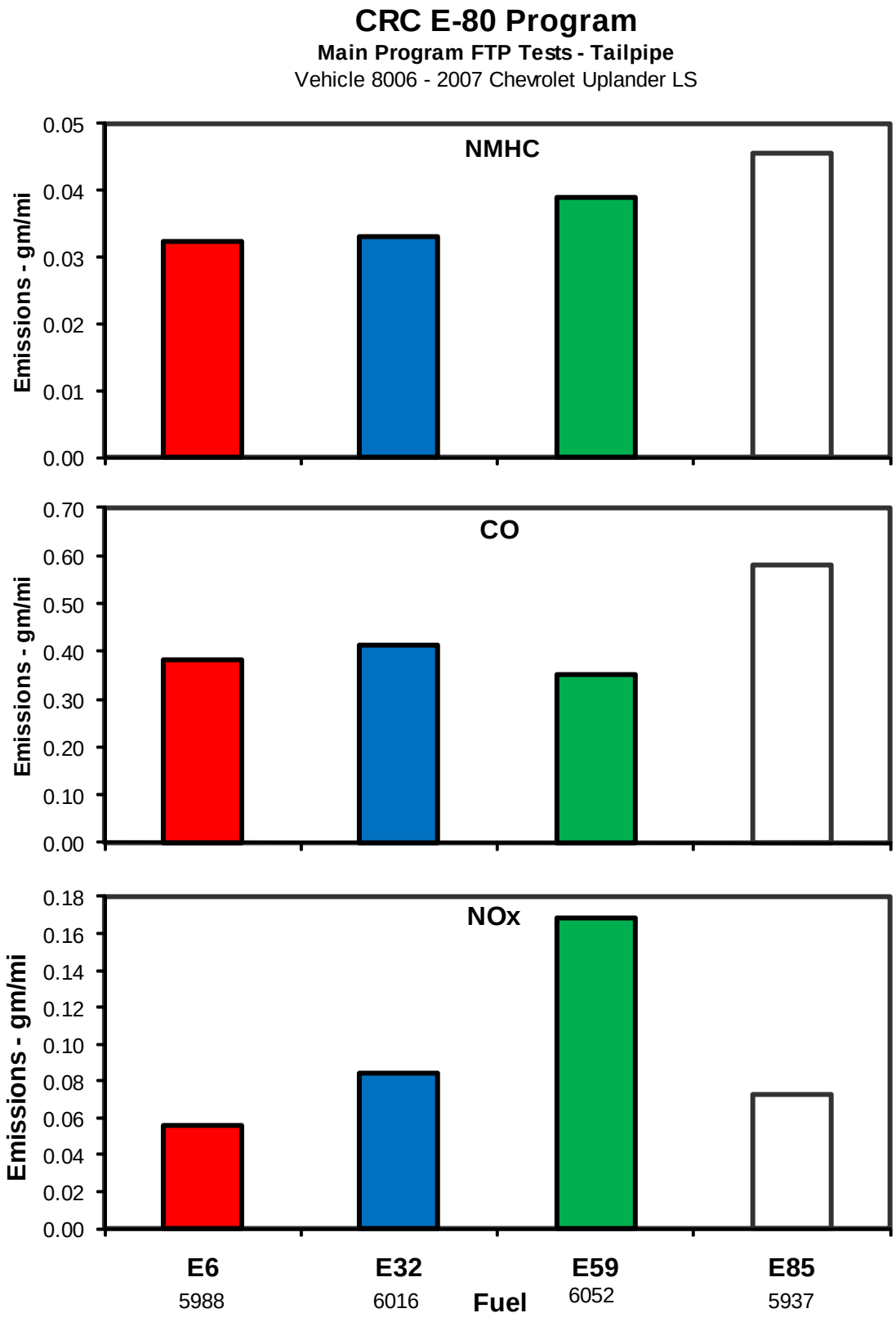

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8005 : US06 Cycle
Hydrocarbon
E6 - 5885
E32 - 5843
E59 - 5817
E85 - 5893
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

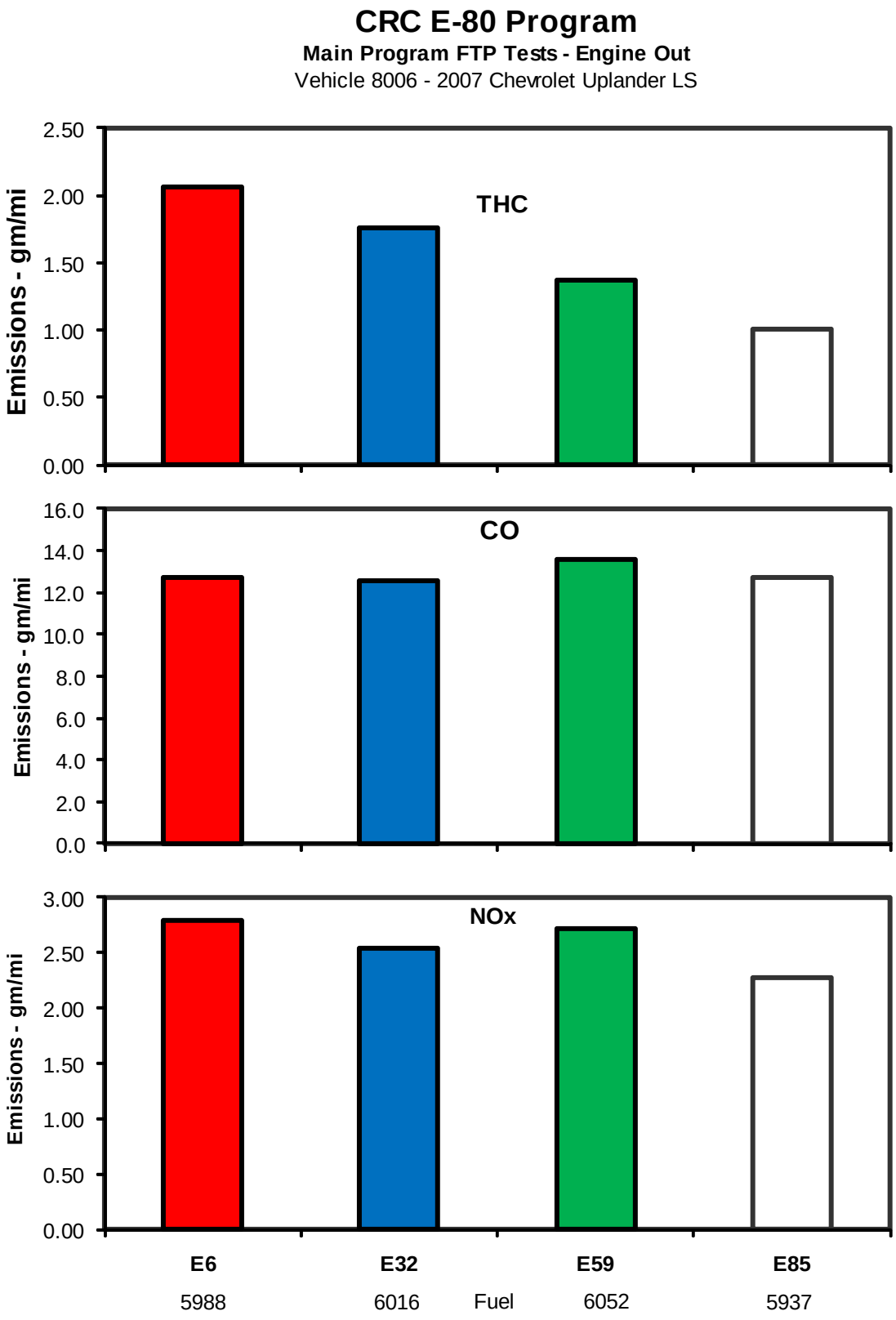

CRC E-80 Program
Main Program UC Tests - Tailpipe
Vehicle 8005 - 2007 Chevrolet Silverado
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
E6
5886
E32
5844
E59
5818
E85
5895
Fuel

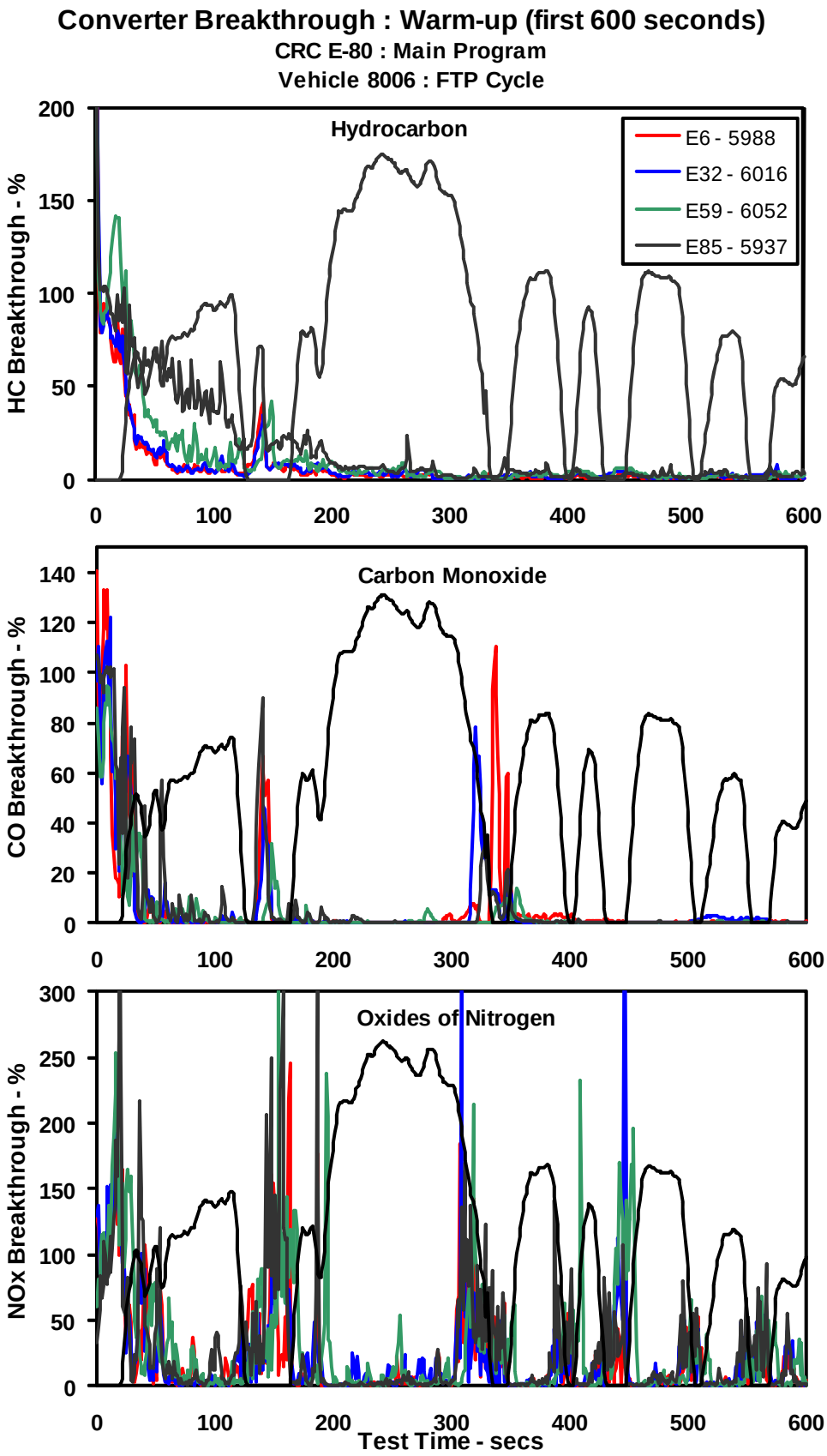

CRC E-80 Program
Main Program UC Tests - Engine Out
Vehicle 8005 - 2007 Chevrolet Silverado
THC
CO
NOx
Emissions - gm/mi
2.50
2.00
1.50
1.00
0.50
0.00
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
E59
5886
E85
5844
5818
5895
Fuel

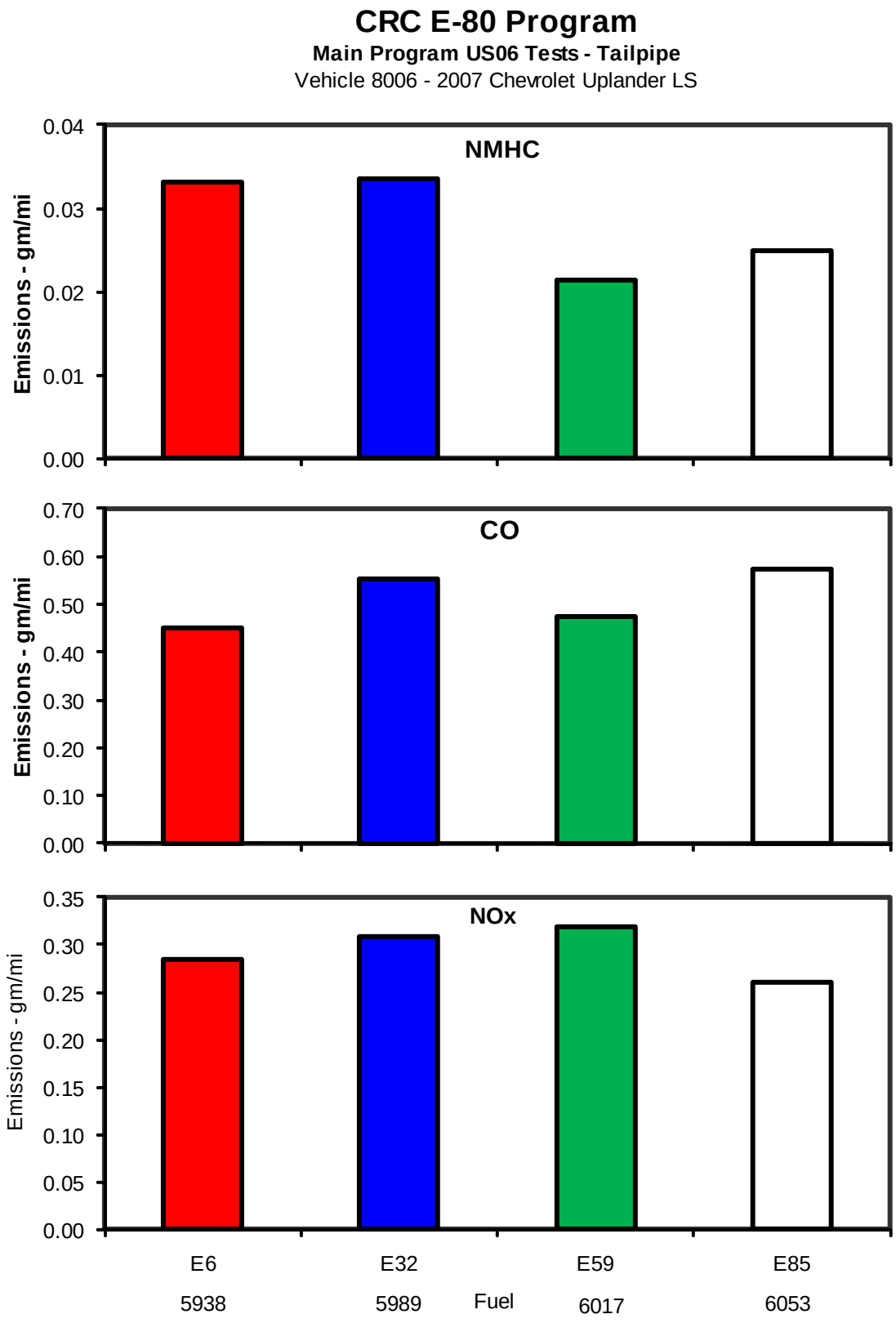

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8005 : UC Cycle
Hydrocarbon
E6 - 5886
E32 - 5884
E59 - 5818
E85 - 5895
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

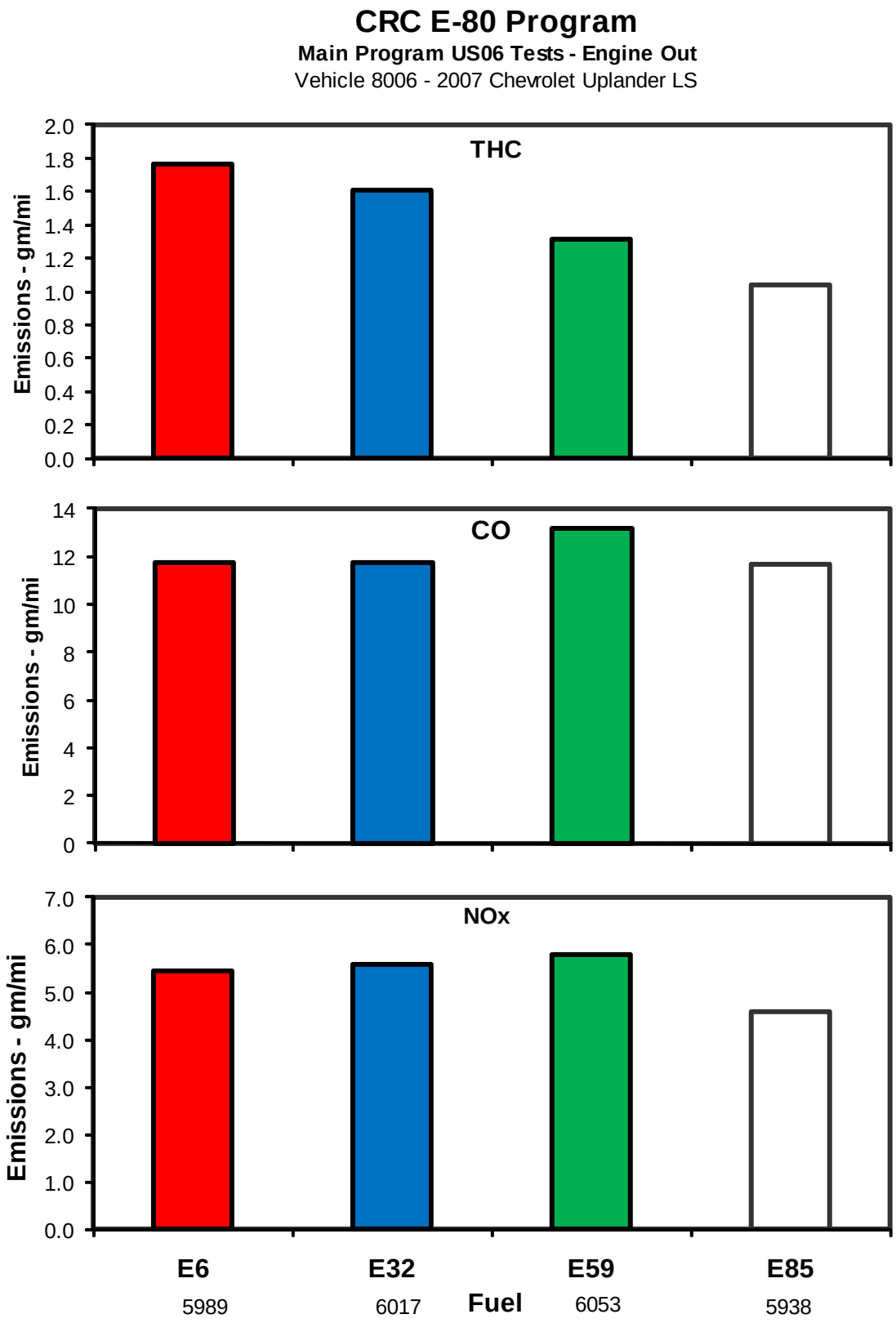
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8005		E59	5816	0.050	0.029	0.082	1.07	0.06	507	13.50	1.287	13.29	4.102	432
2007	FTP	E32	5842	0.052	0.022	0.077	0.87	0.07	520	14.58	1.628	12.78	4.212	494
Chevrolet		E6	5884	0.036	0.021	0.060	0.69	0.06	484	17.07	1.750	12.25	3.770	463
Silverado		E85	5892	0.035	0.036	0.073	0.53	0.07	503	12.11	0.900	12.54	3.615	477
w/ 120K														
Catalyst		E59	5817	0.037	0.021	0.059	1.01	0.24	499	13.70	1.393	12.41	6.898	455
	US06	E32	5843	0.042	0.018	0.061	0.82	0.22	511	14.84	1.630	12.40	7.192	458
		E6	5885	0.037	0.018	0.056	0.82	0.18	487	16.96	1.784	12.07	6.916	448
		E85	5893	0.018	0.022	0.041	0.75	0.18	495	12.29	1.065	11.48	6.247	446
		E59	5818	0.069	0.033	0.105	1.61	0.07	545	12.55	1.364	13.90	5.530	468
	UC	E32	5844	0.075	0.022	0.101	1.51	0.06	570	13.28	1.726	14.75	6.014	542
		E6	5886	0.049	0.022	0.073	1.09	0.05	529	15.62	1.930	12.88	5.657	506
		E85	5895	0.047	0.030	0.080	0.96	0.05	541	11.23	0.982	13.64	5.088	515

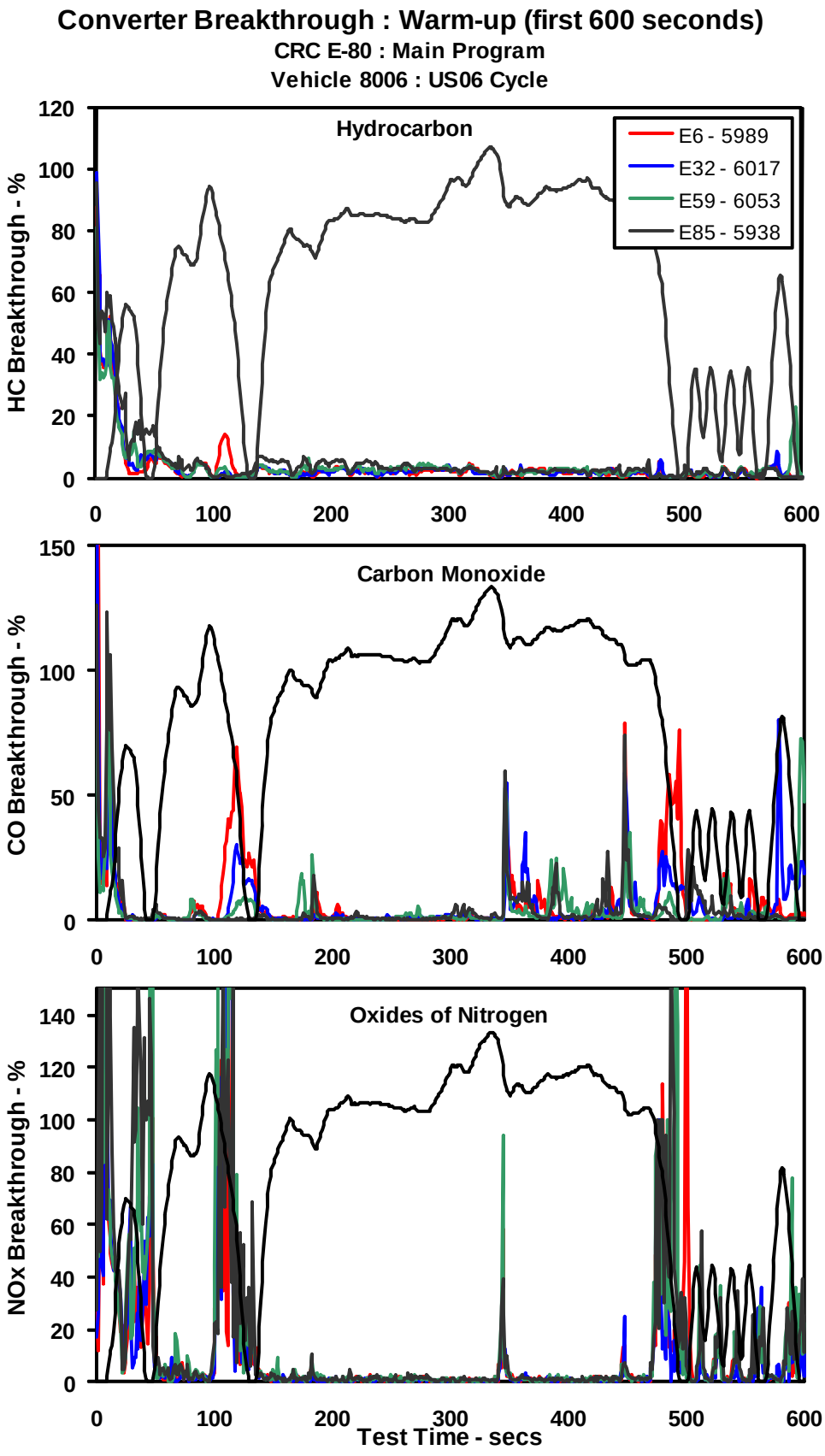

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8006 - 2007 Chevrolet Uplander LS
NMHC
CO
NOx
Emissions - gm/mi
0.05
0.04
0.03
0.02
0.01
0.00
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.18
0.16
0.14
0.12
0.08
0.06
E6
5988
E32
6016
E59
6052
E85
5937
Fuel

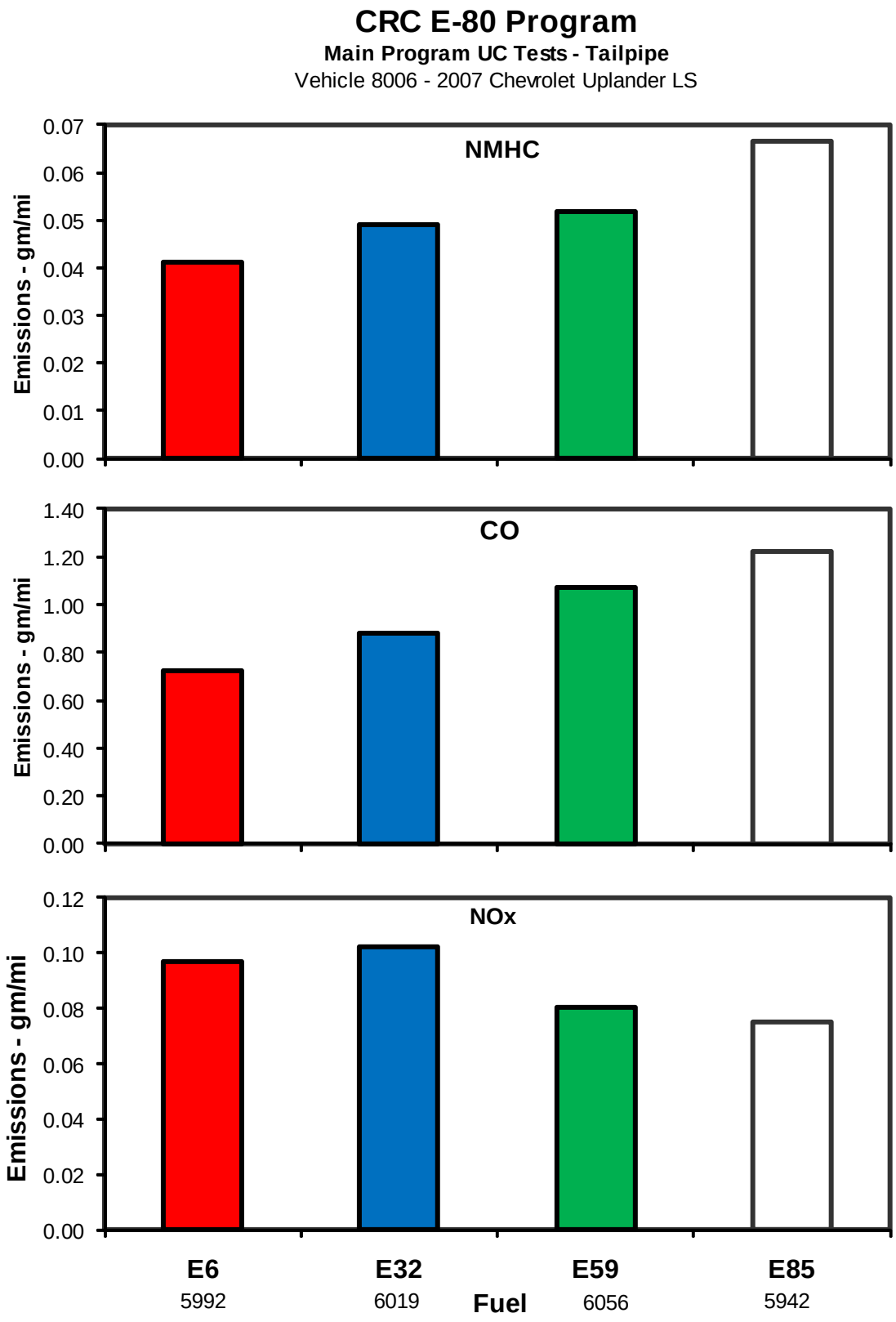

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8006 - 2007 Chevrolet Uplander LS
THC
CO
NOx
Emissions - gm/mi
2.50
2.00
1.50
1.00
0.50
0.00
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
3.00
E6
E32
E59
E85
5988
6016
Fuel
6052
5937

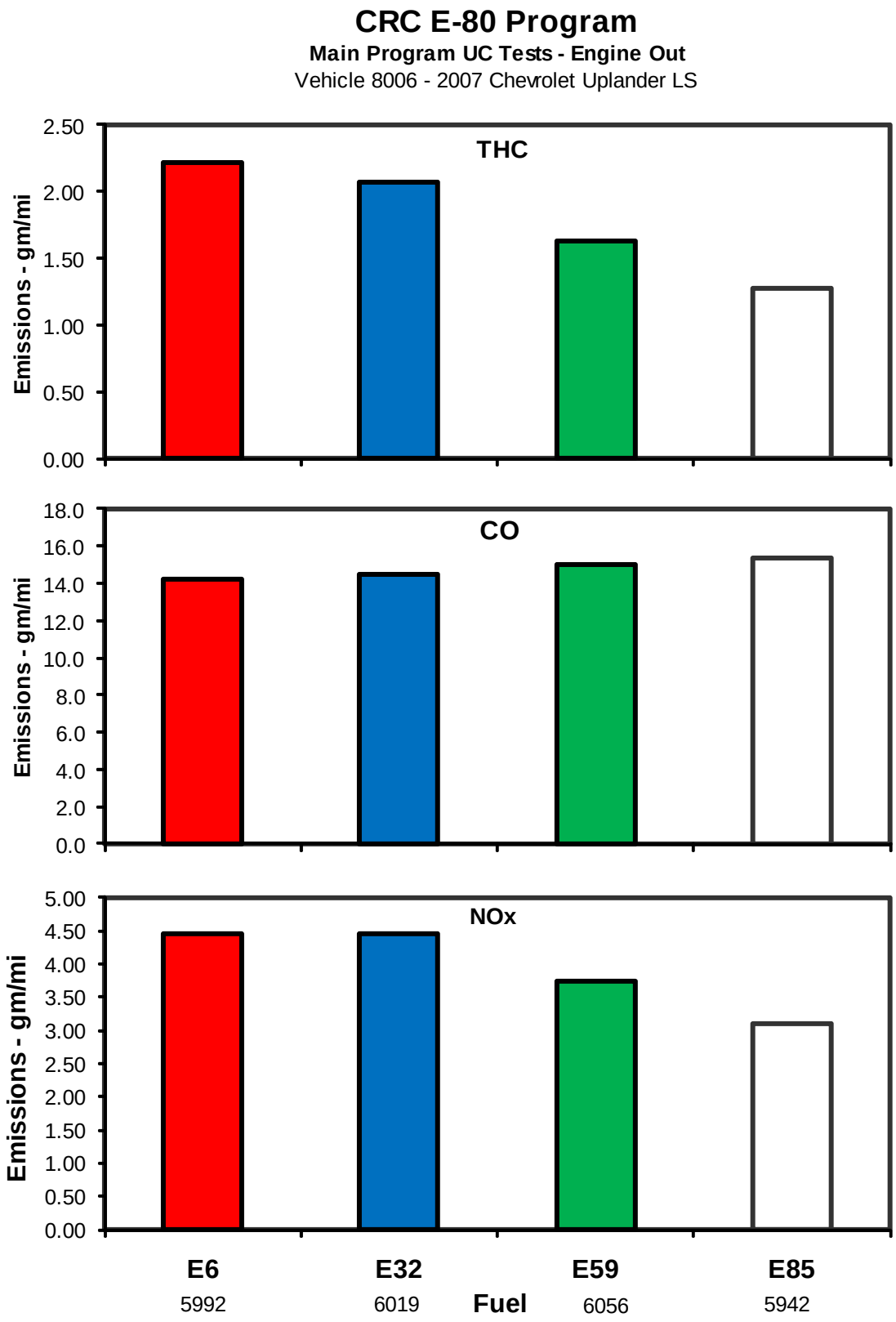

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8006 : FTP Cycle
Hydrocarbon
E6 - 5988
E32 - 6016
E59 - 6052
E85 - 5937
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

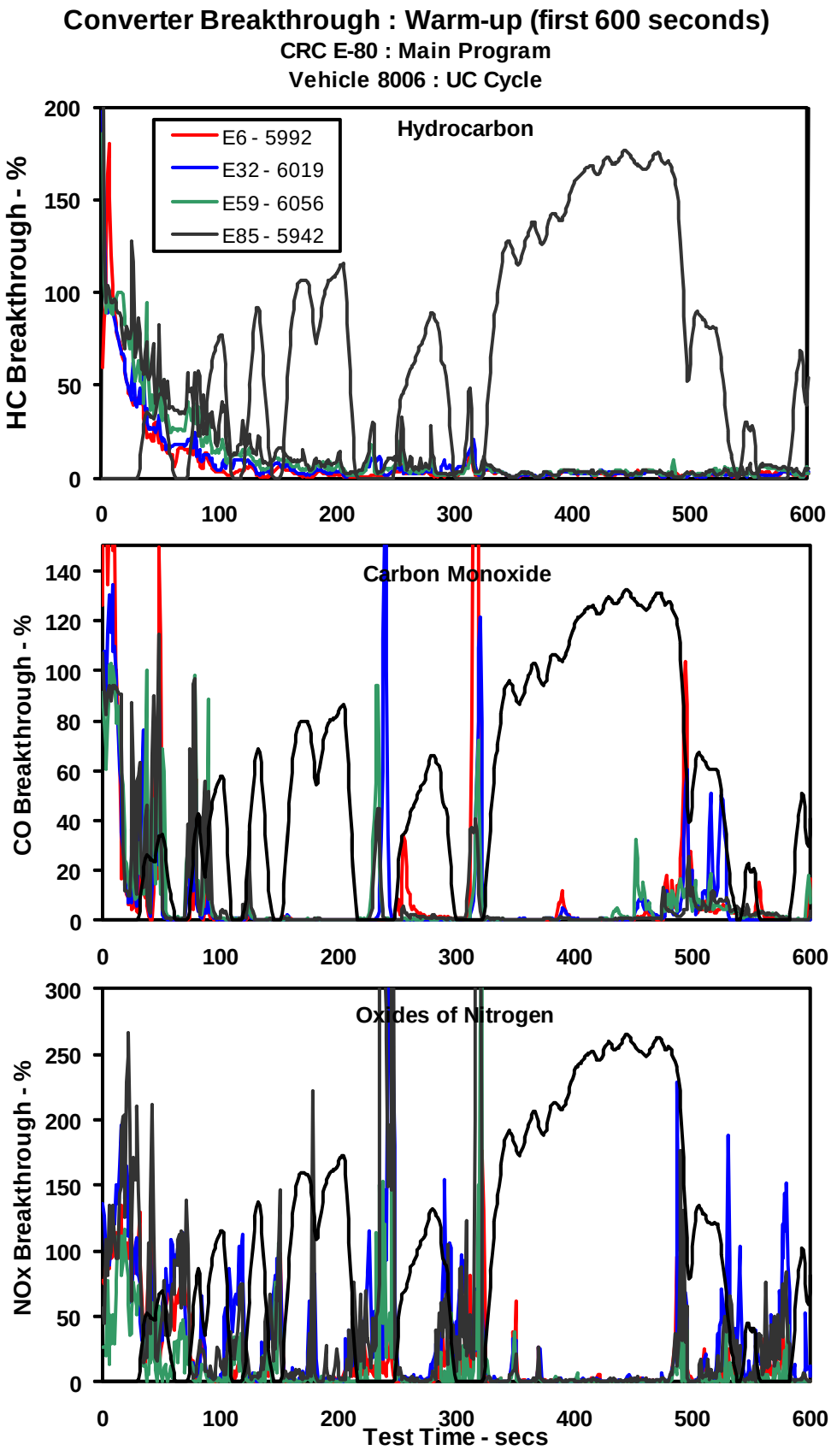

CRC E-80 Program
Main Program US06 Tests - Tailpipe
Vehicle 8006 - 2007 Chevrolet Uplander LS
NMHC
CO
NOx
Emissions - gm/mi
0.04
0.03
0.02
0.01
0.00
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
E6
5938
E32
5989
E59
6017
E85
6053
Fuel


CRC E-80 Program
Main Program US06 Tests - Engine Out
Vehicle 8006 - 2007 Chevrolet Uplander LS
THC
CO
NOx
Emissions - gm/mi
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
14
12
10
8
6
4
2
0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
E6
5989
E32
6017
E59
6053
E85
5938
Fuel

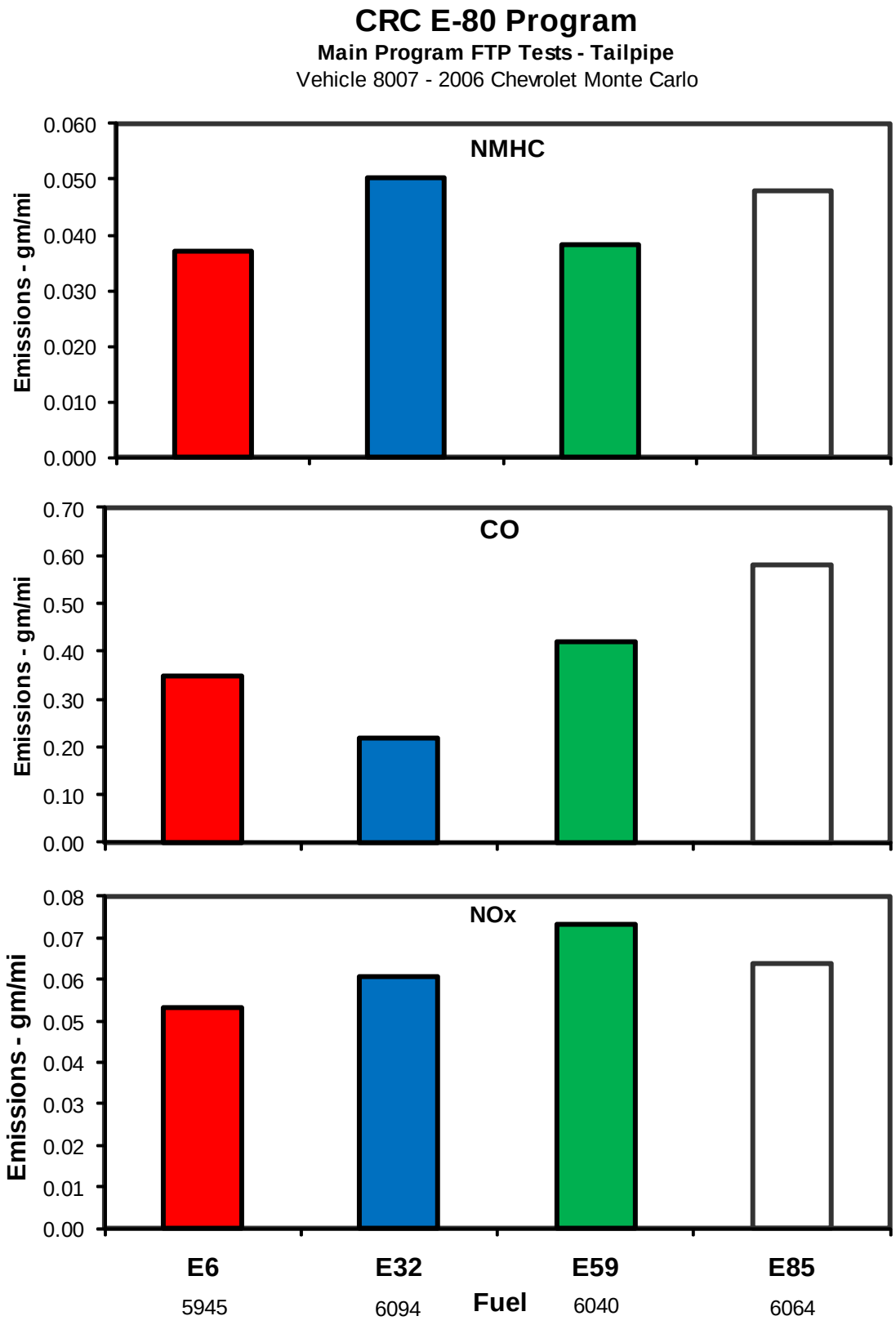

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8006 : US06 Cycle
Hydrocarbon
E6 - 5989
E32 - 6017
E59 - 6053
E85 - 5938
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

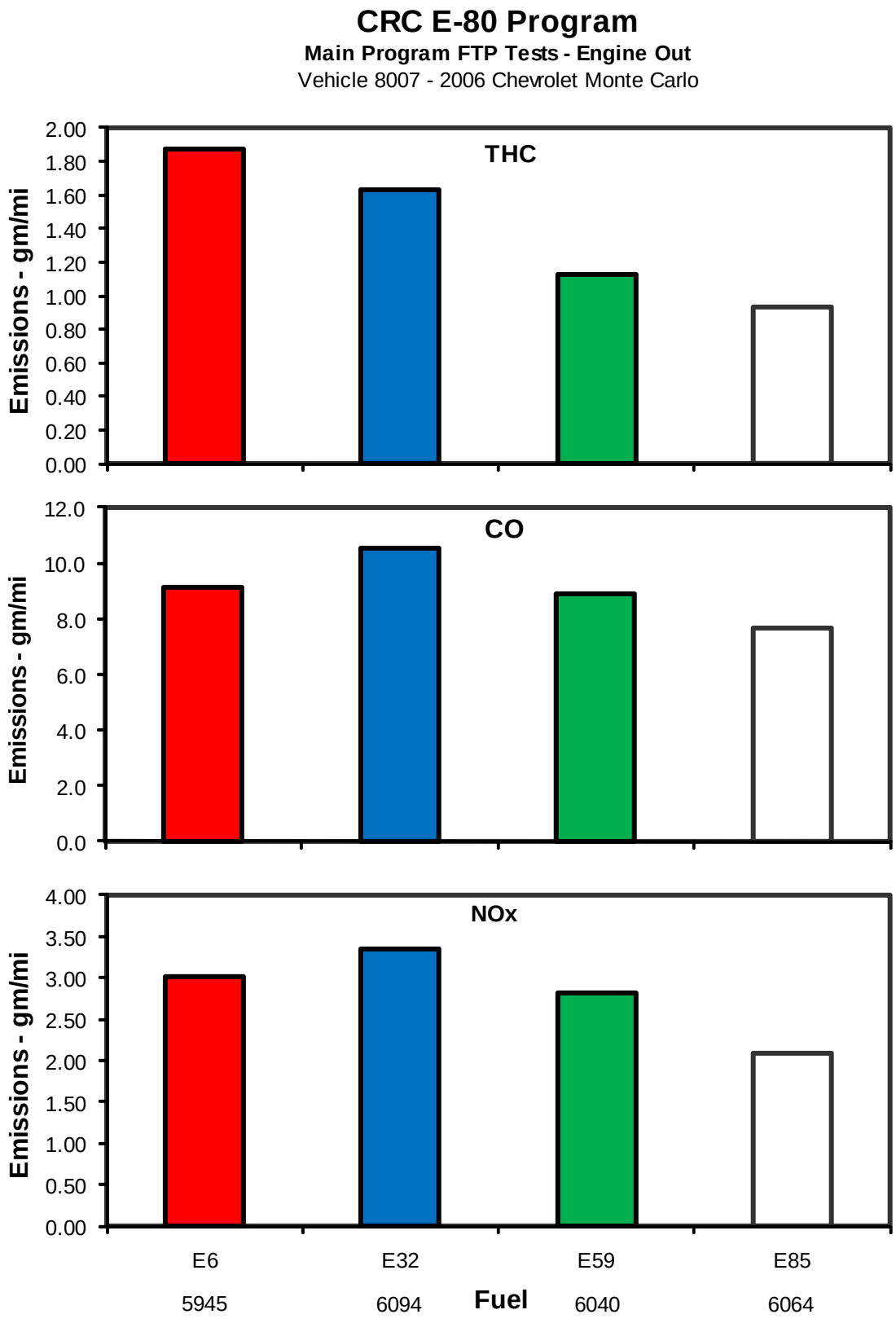

CRC E-80 Program
Main Program UC Tests - Tailpipe
Vehicle 8006 - 2007 Chevrolet Uplander LS
NMHC
CO
NOx
Emissions - gm/mi
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.12
0.10
0.08
E6
5992
E32
6019
E59
6056
E85
5942
Fuel

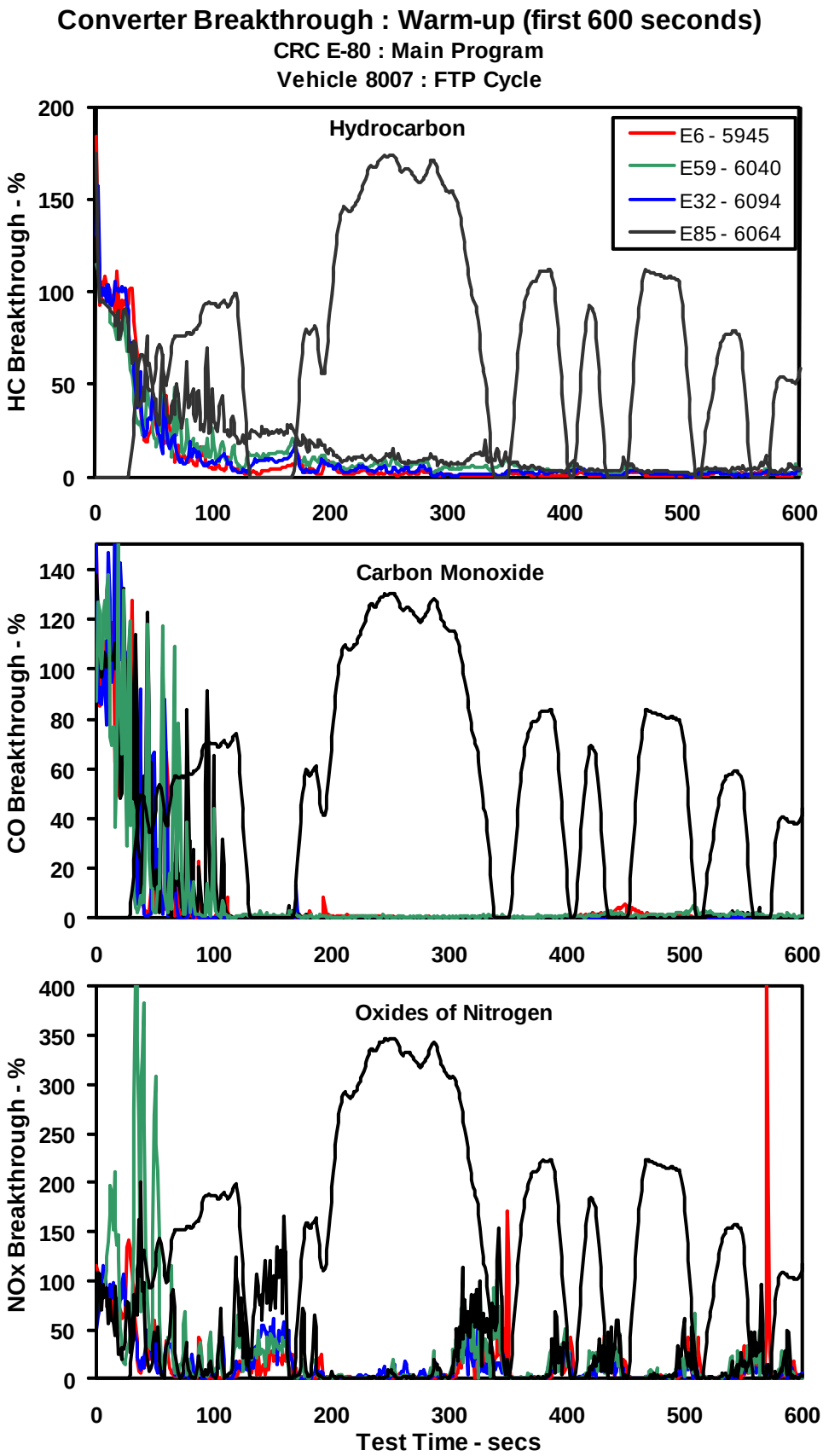

CRC E-80 Program
Main Program UC Tests - Engine Out
Vehicle 8006 - 2007 Chevrolet Uplander LS
THC
CO
NOx
Emissions - gm/mi
2.50
2.00
1.50
1.00
0.50
0.00
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5992
E32
6019
E59
6056
E85
5942
Fuel

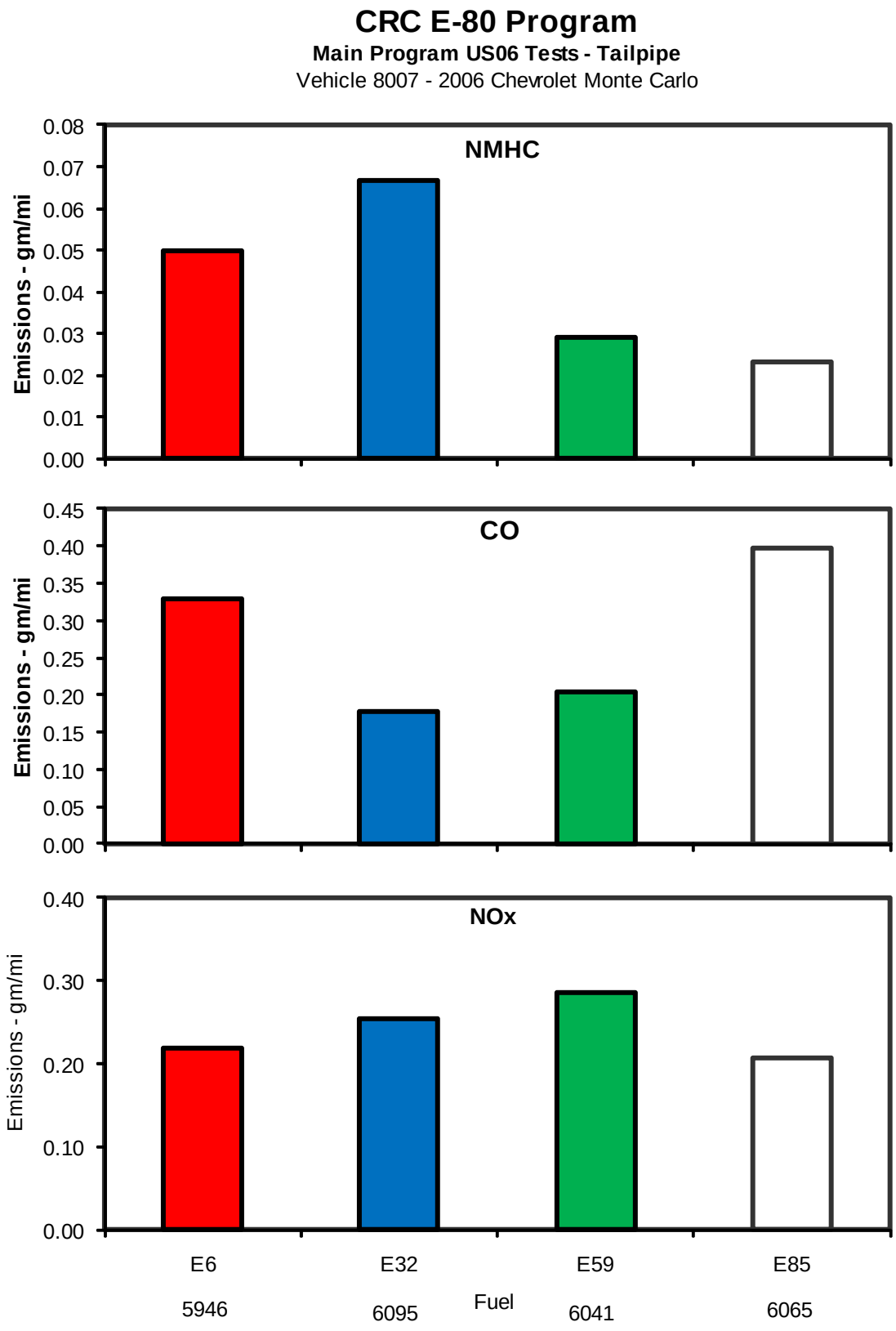

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8006 : UC Cycle
Hydrocarbon
E6 - 5992
E32 - 6019
E59 - 6056
E85 - 5942
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

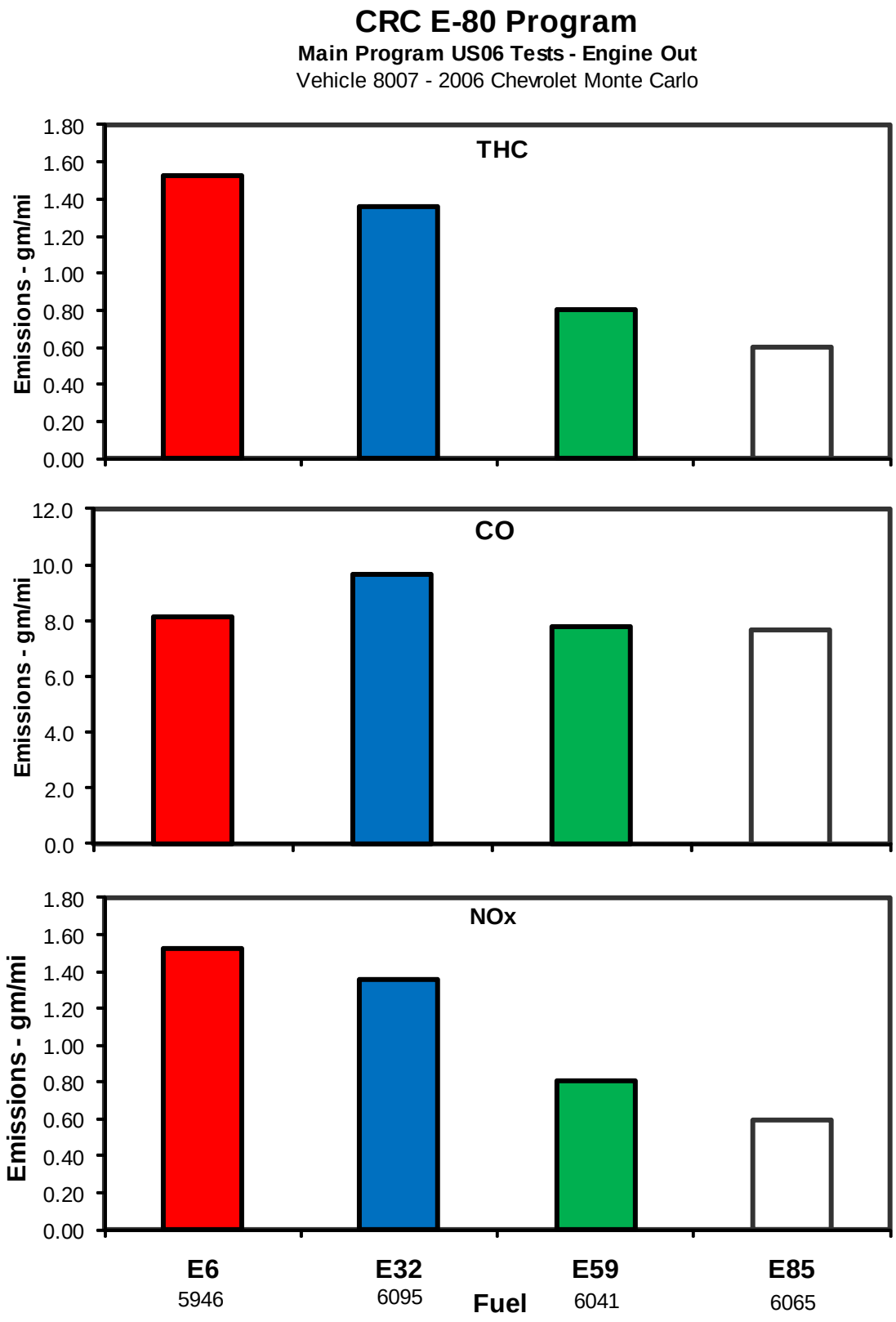
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8006		E85	5937	0.046	0.050	0.099	0.58	0.07	448	13.59	1.005	12.75	2.279	420
2007	FTP	E6	5988	0.032	0.023	0.058	0.38	0.06	464	17.84	2.058	12.71	2.792	439
Chevrolet		E32	6016	0.033	0.031	0.066	0.41	0.08	457	16.62	1.760	12.59	2.539	432
Uplander		E59	6052	0.039	0.042	0.084	0.35	0.17	448	15.29	1.365	13.57	2.720	420
LS														
w/ 120K		E85	5938	0.025	0.022	0.049	0.57	0.26	416	14.63	1.040	11.69	4.601	375
Catalyst	US06	E6	5989	0.033	0.021	0.055	0.45	0.28	432	19.15	1.761	11.76	5.433	385
		E32	6017	0.034	0.020	0.055	0.55	0.31	438	17.29	1.609	11.74	5.582	385
		E59	6053	0.021	0.022	0.045	0.48	0.32	420	16.34	1.314	13.17	5.777	376
		E85	5942	0.066	0.050	0.121	1.22	0.08	481	12.61	1.269	15.34	3.092	453
	UC	E6	5992	0.041	0.033	0.077	0.72	0.10	501	16.49	2.220	14.22	4.446	473
		E32	6019	0.049	0.038	0.090	0.88	0.10	484	15.64	2.076	14.48	4.452	461
		E59	6056	0.052	0.042	0.097	1.07	0.08	482	14.21	1.624	15.01	3.732	455

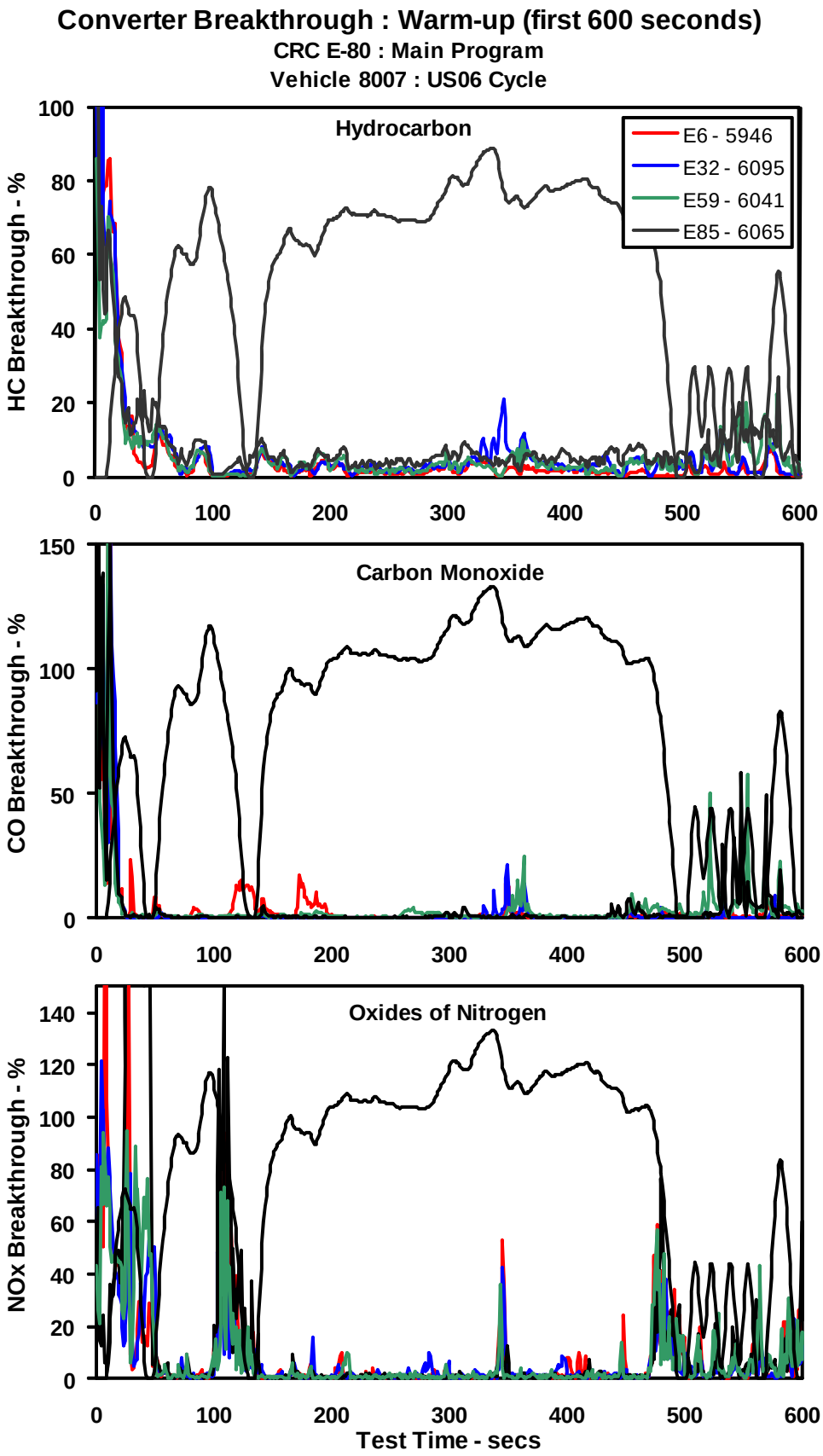

CRC E-80 Program
Main Program FTP Tests - Tailpipe
Vehicle 8007 - 2006 Chevrolet Monte Carlo
NMHC
Emissions - gm/mi
0.060
0.050
0.040
0.030
0.020
0.010
0.000
CO
Emissions - gm/mi
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
E6
5945
E32
6094
E59
6040
E85
6064
Fuel

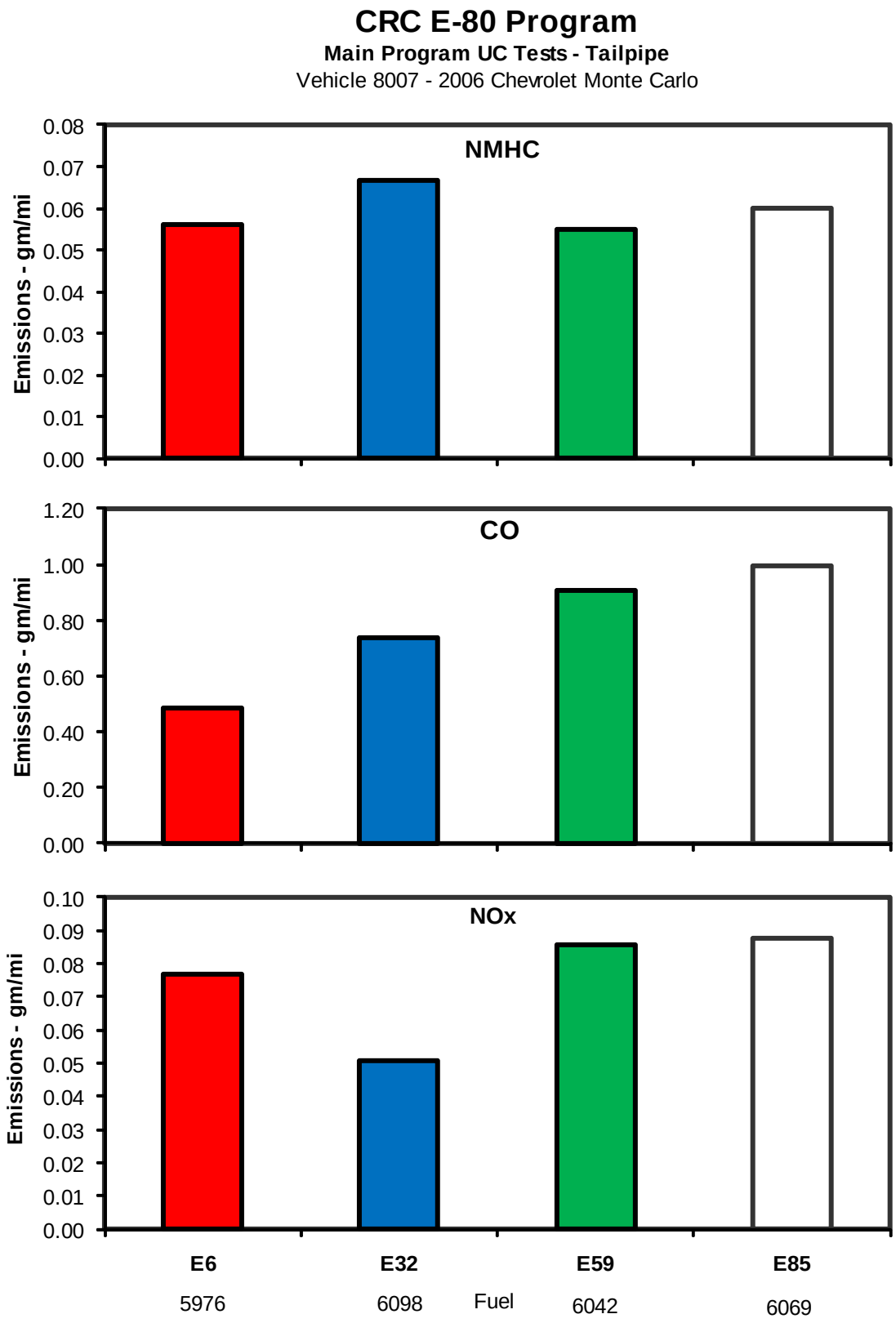

CRC E-80 Program
Main Program FTP Tests - Engine Out
Vehicle 8007 - 2006 Chevrolet Monte Carlo
THC
CO
NOx
Emissions - gm/mi
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
12.0
10.0
8.0
6.0
4.0
2.0
0.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
E32
E59
E85
5945
6094
6040
6064
Fuel

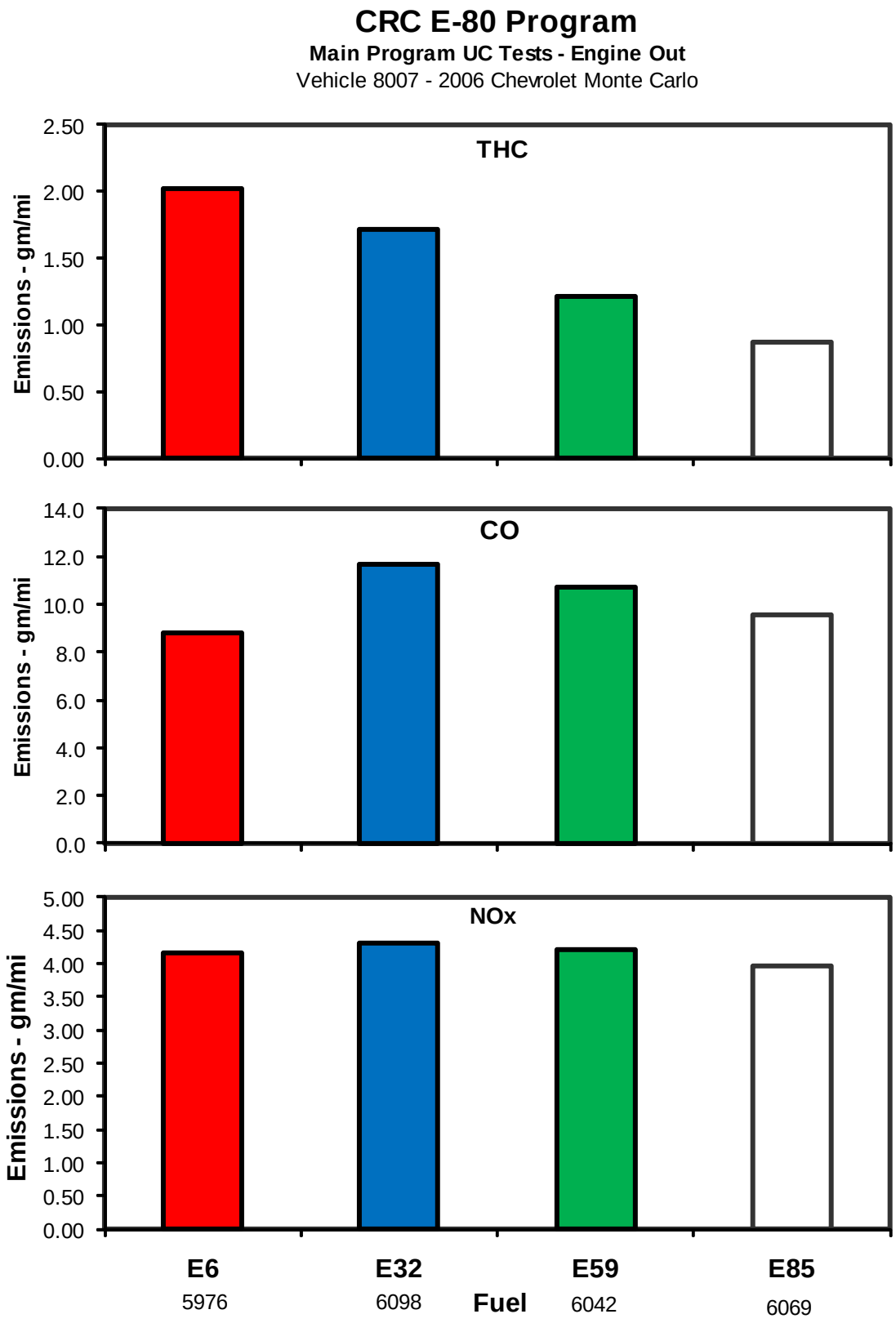

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8007 : FTP Cycle
Hydrocarbon
E6 - 5945
E59 - 6040
E32 - 6094
E85 - 6064
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

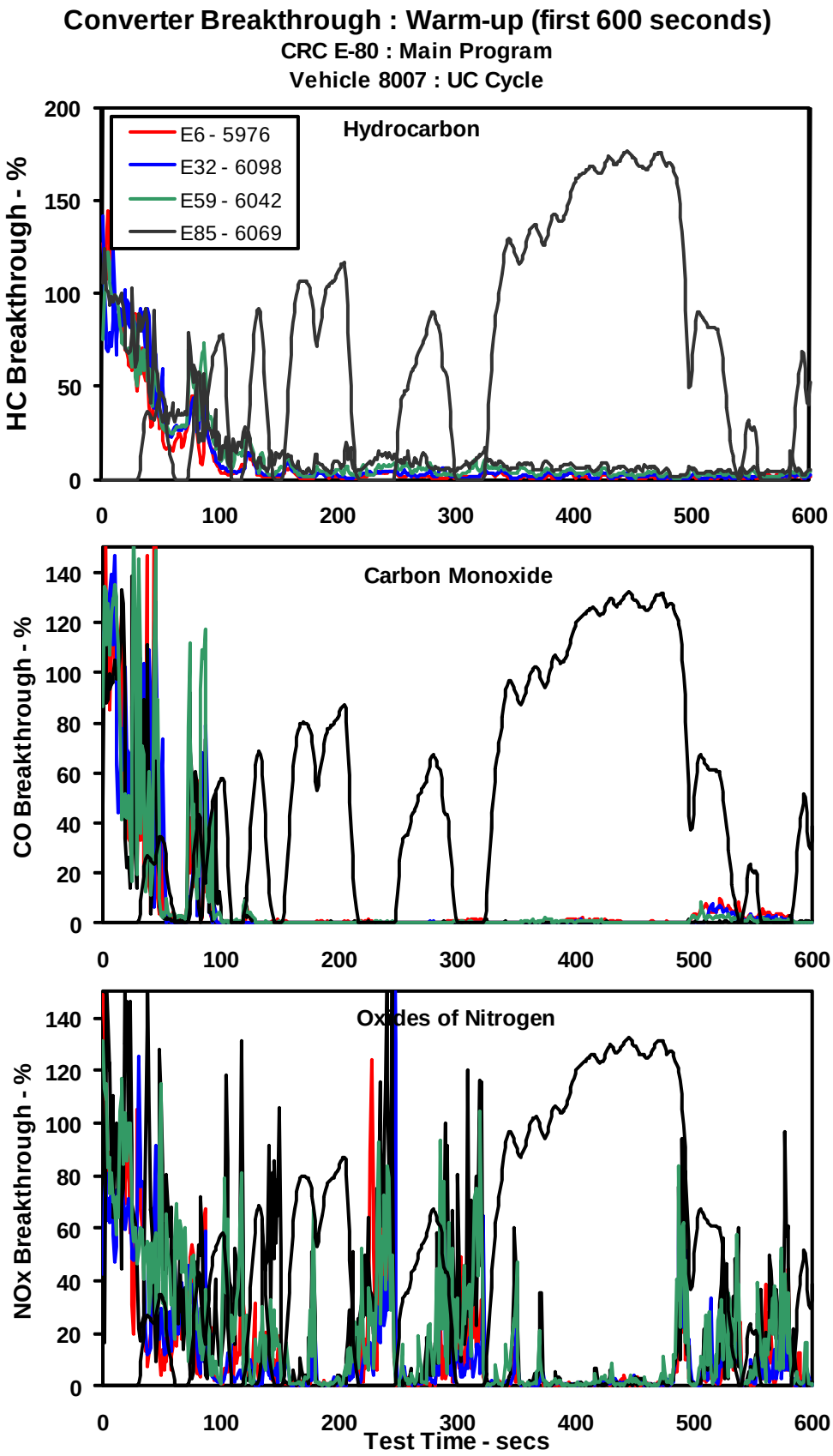

CRC E-80 Program
Main Program US06 Tests - Tailpipe
Vehicle 8007 - 2006 Chevrolet Monte Carlo
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.40
0.30
0.20
0.10
0.00
E6
E32
E59
E85
5946
6095
6041
6065
Fuel


CRC E-80 Program
Main Program US06 Tests - Engine Out
Vehicle 8007 - 2006 Chevrolet Monte Carlo
THC
CO
NOx
Emissions - gm/mi
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
12.0
10.0
8.0
6.0
4.0
2.0
0.0
E6
5946
E32
6095
E59
6041
E85
6065
Fuel


Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8007 : US06 Cycle
Hydrocarbon
E6 - 5946
E32 - 6095
E59 - 6041
E85 - 6065
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

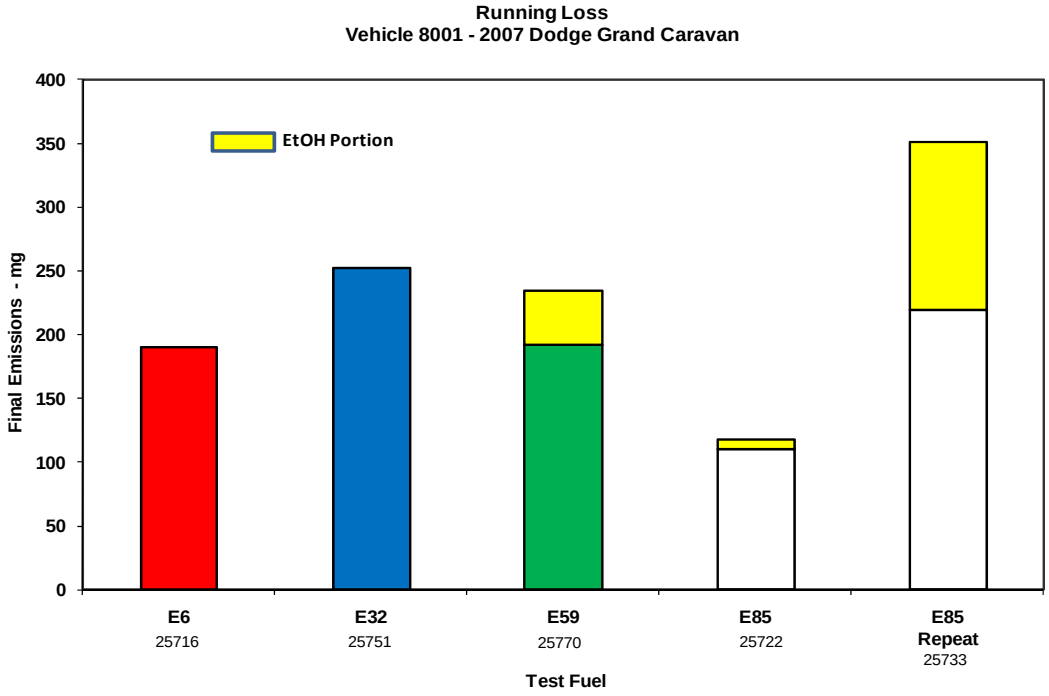

CRC E-80 Program
Main Program UC Tests - Tailpipe
Vehicle 8007 - 2006 Chevrolet Monte Carlo
NMHC
CO
NOx
Emissions - gm/mi
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1.20
1.00
0.80
0.60
0.40
0.20
0.10
0.09
E6
E32
E59
E85
5976
6098
6042
6069
Fuel

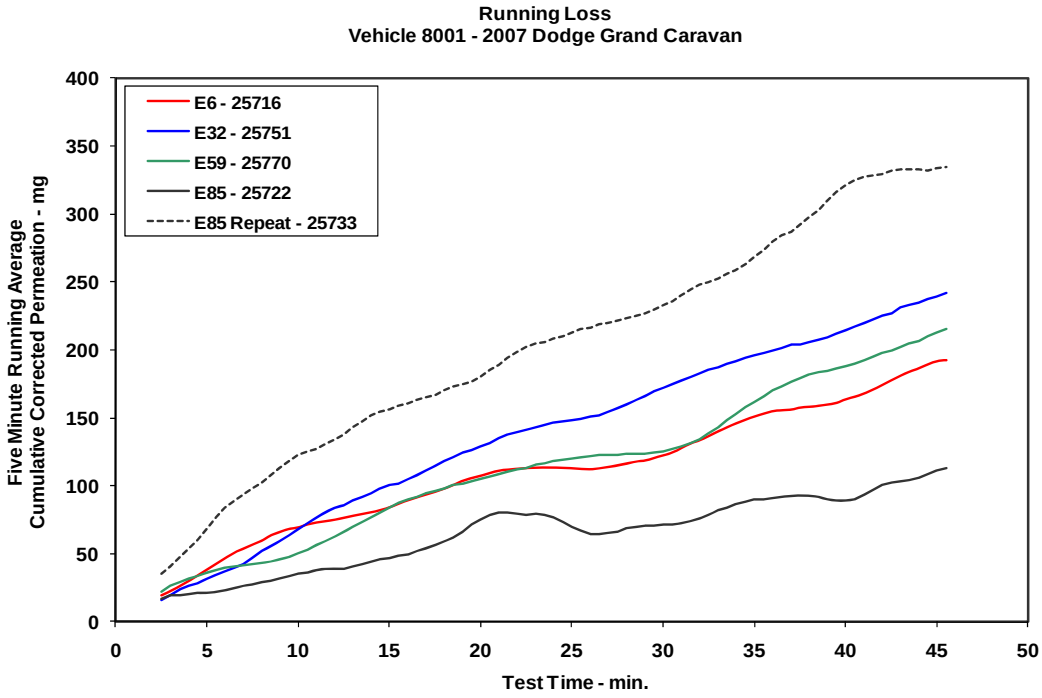

CRC E-80 Program
Main Program UC Tests - Engine Out
Vehicle 8007 - 2006 Chevrolet Monte Carlo
THC
CO
NOx
Emissions - gm/mi
2.50
2.00
1.50
1.00
0.50
0.00
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
E6
5976
E32
6098
E59
6042
E85
6069
Fuel

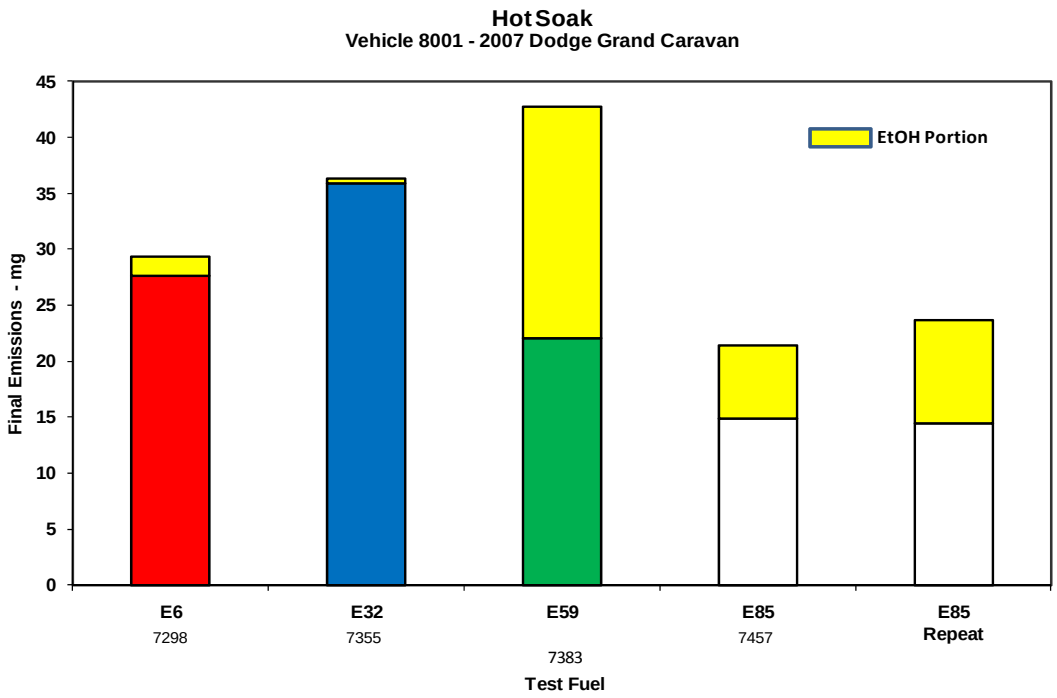

Converter Breakthrough : Warm-up (first 600 seconds)
CRC E-80 : Main Program
Vehicle 8007 : UC Cycle
Hydrocarbon
E6 - 5976
E32 - 6098
E59 - 6042
E85 - 6069
HC Breakthrough - %
Carbon Monoxide
CO Breakthrough - %
Oxides of Nitrogen
NOx Breakthrough - %
Test Time - secs

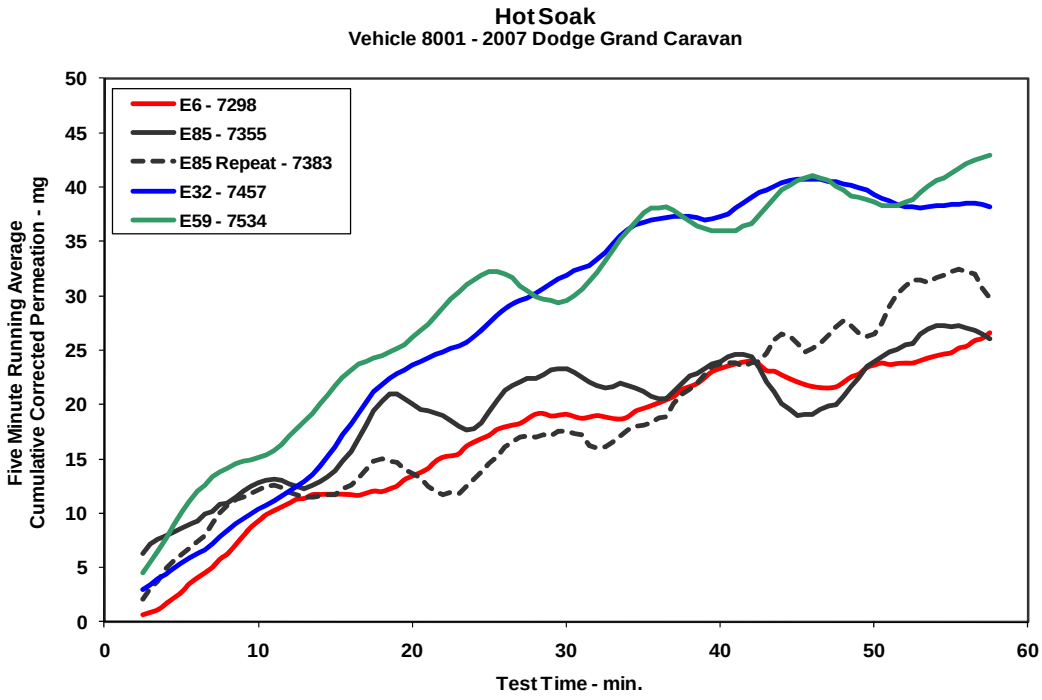
				Tailpipe Emissions							Engine Out			
Vehicle	Test	Fuel	Test ID	NMHC gm/mi	CH4 gm/mi	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi	FE mpg	HC gm/mi	CO gm/mi	NOX gm/mi	CO2 gm/mi
8007		E6	5945	0.037	0.018	0.058	0.35	0.05	402	20.61	1.873	9.12	3.020	381
2006	FTP	E59	6040	0.038	0.026	0.067	0.42	0.07	392	15.53	1.127	8.91	2.810	369
Chevrolet		E85	6064	0.048	0.035	0.087	0.58	0.06	389	15.65	0.931	7.66	2.085	373
Monte		E32	6094	0.050	0.026	0.080	0.22	0.06	404	18.80	1.636	10.52	3.356	390
Carlo														
w/ 120K		E6	5946	0.050	0.017	0.069	0.33	0.22	351	23.57	1.527	8.12	4.913	333
Catalyst	US06	E59	6041	0.029	0.021	0.051	0.20	0.29	339	17.95	0.806	7.77	4.948	327
		E85	6065	0.023	0.027	0.051	0.40	0.21	337	18.04	0.598	7.68	4.741	336
		E32	6095	0.067	0.025	0.095	0.18	0.25	363	20.89	1.360	9.66	5.267	355
		E6	5976	0.056	0.023	0.083	0.49	0.08	427	19.36	2.018	8.83	4.169	406
	UC	E59	6042	0.055	0.035	0.094	0.91	0.09	411	14.80	1.214	10.70	4.218	416
		E85	6069	0.060	0.042	0.107	1.00	0.09	412	14.75	0.870	9.54	3.974	407
		E32	6098	0.067	0.032	0.104	0.73	0.05	427	17.74	1.713	11.70	4.309	444

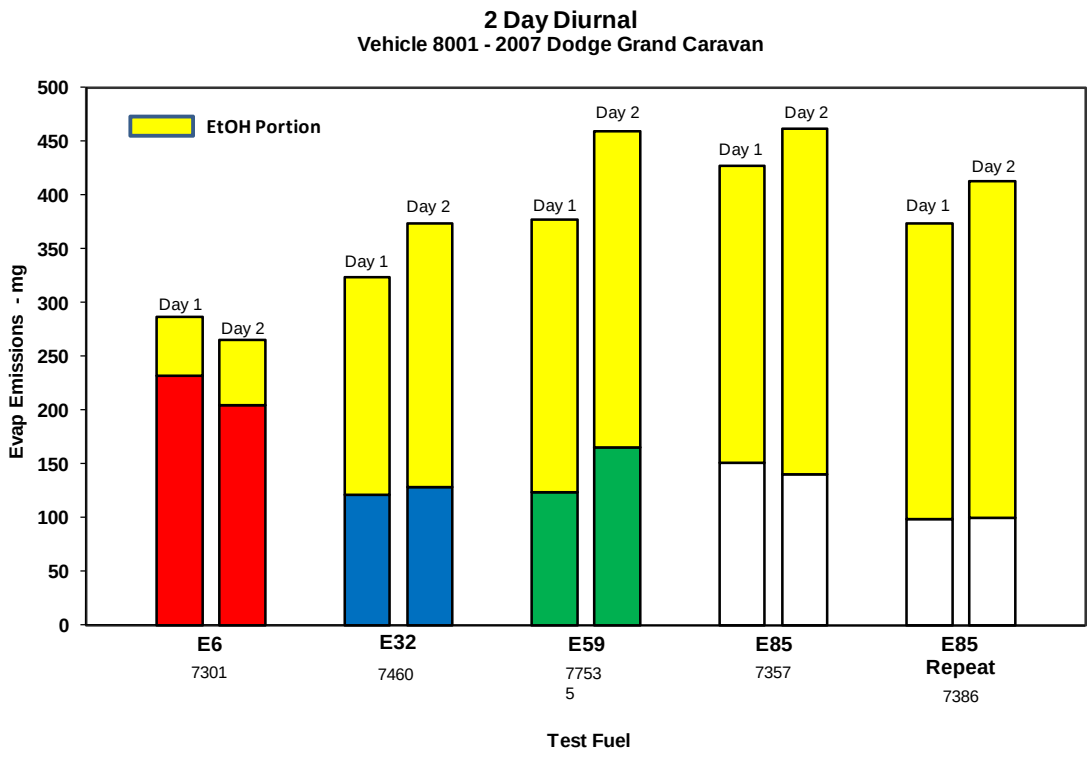
Evaporative Emissions Results

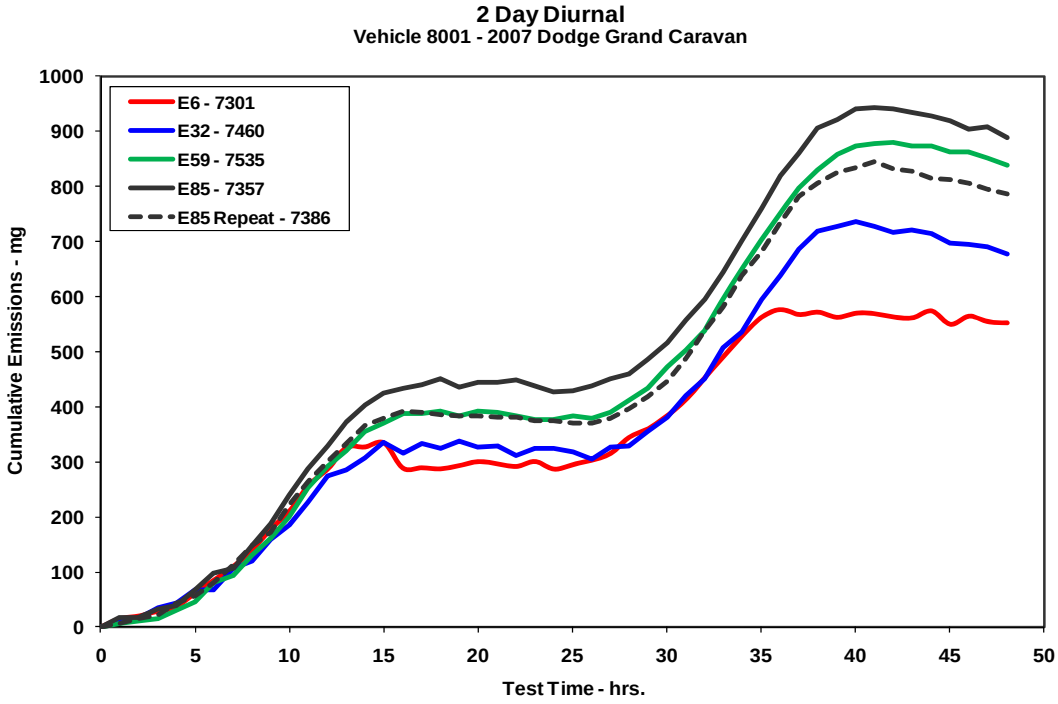


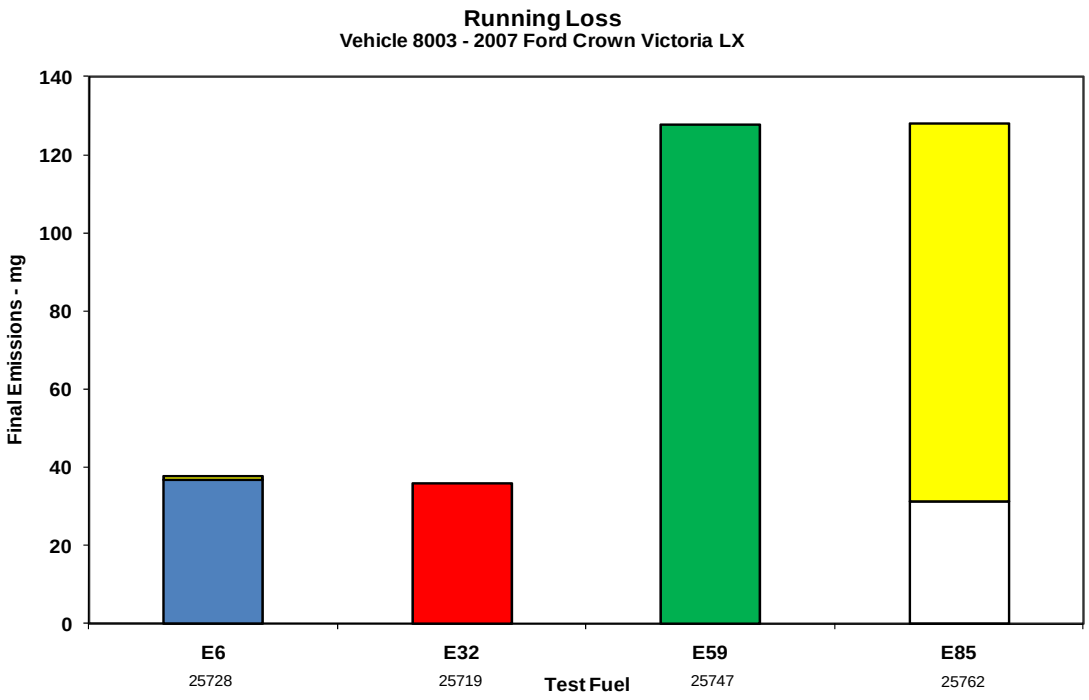


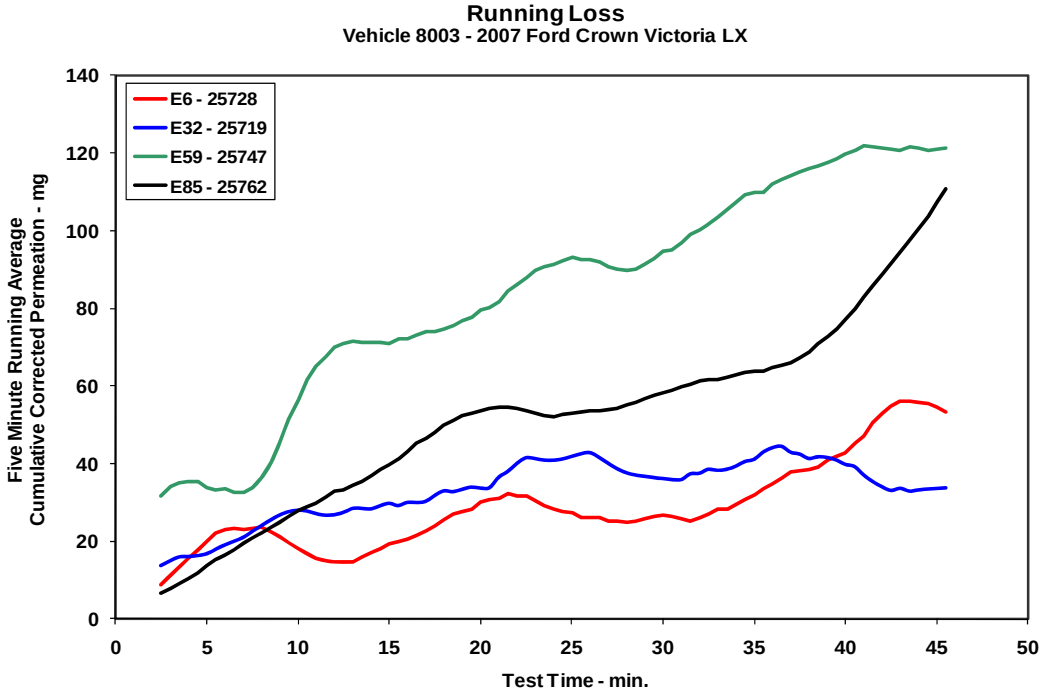

Hot Soak
Vehicle 8001 - 2007 Dodge Grand Caravan
EtOH Portion
Final Emissions - mg
0
5
10
15
20
25
30
35
40
45
E6
7298
E32
7355
E59
7383
E85
7457
E85
Repeat
Test Fuel

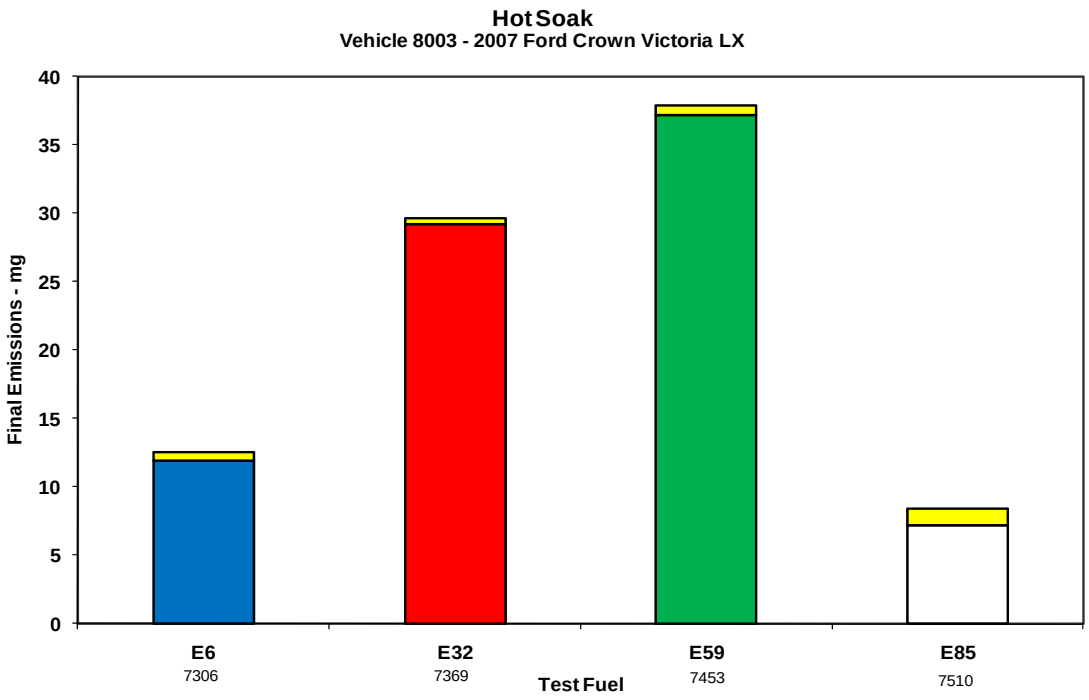

Hot Soak
Vehicle 8001 - 2007 Dodge Grand Caravan
E6 - 7298
E85 - 7355
E85 Repeat - 7383
E32 - 7457
E59 - 7534
Five Minute Running Average
Cumulative Corrected Permeation - mg
0
5
10
15
20
25
30
35
40
45
50
0
10
20
30
40
50
60
Test Time - min.

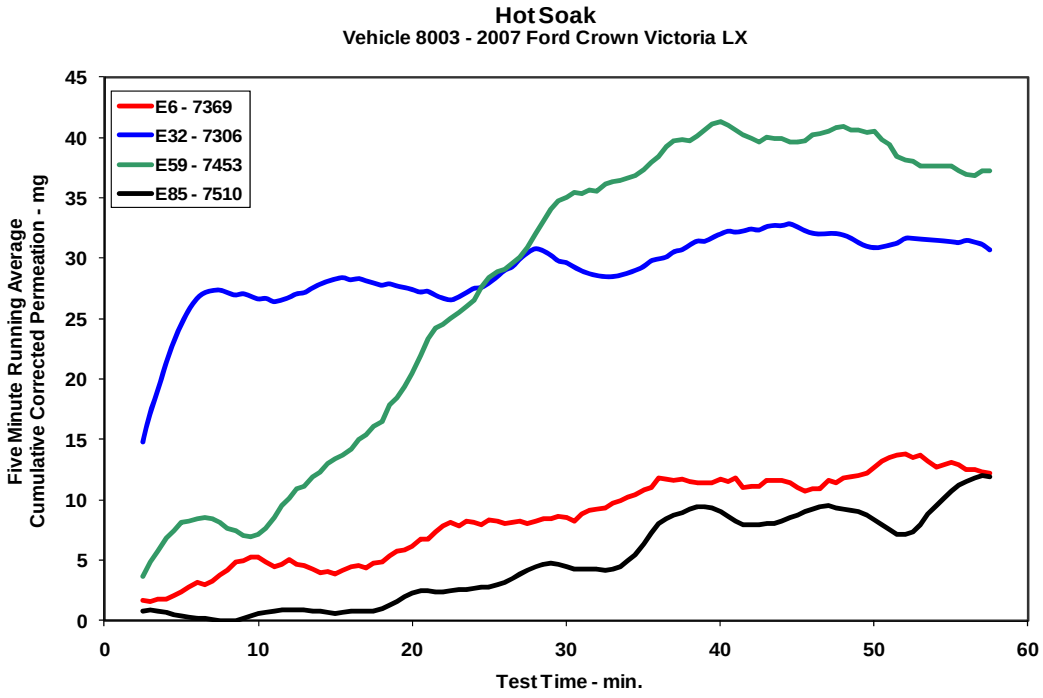

2 Day Diurnal
Vehicle 8001 - 2007 Dodge Grand Caravan
EtOH Portion
Evap Emissions - mg
Day 1
Day 2
E6
7301
E32
7460
E59
7753
5
E85
7357
E85
Repeat
7386
Test Fuel

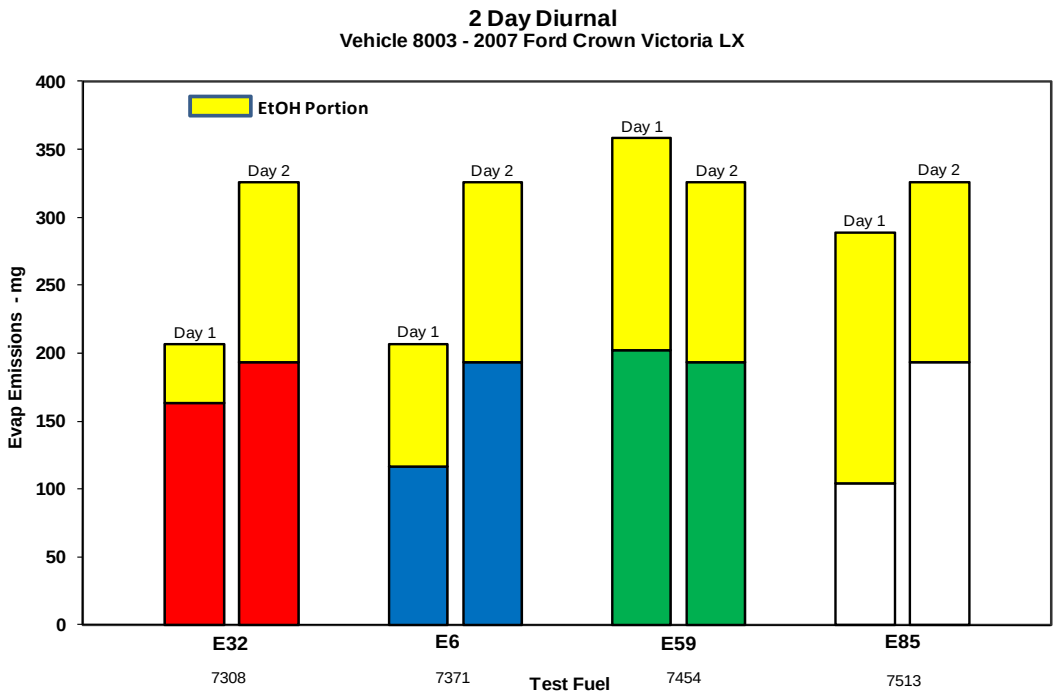

2 Day Diurnal
Vehicle 8001 - 2007 Dodge Grand Caravan
E6 - 7301
E32 - 7460
E59 - 7535
E85 - 7357
E85 Repeat - 7386
Cumulative Emissions - mg
Test Time - hrs.

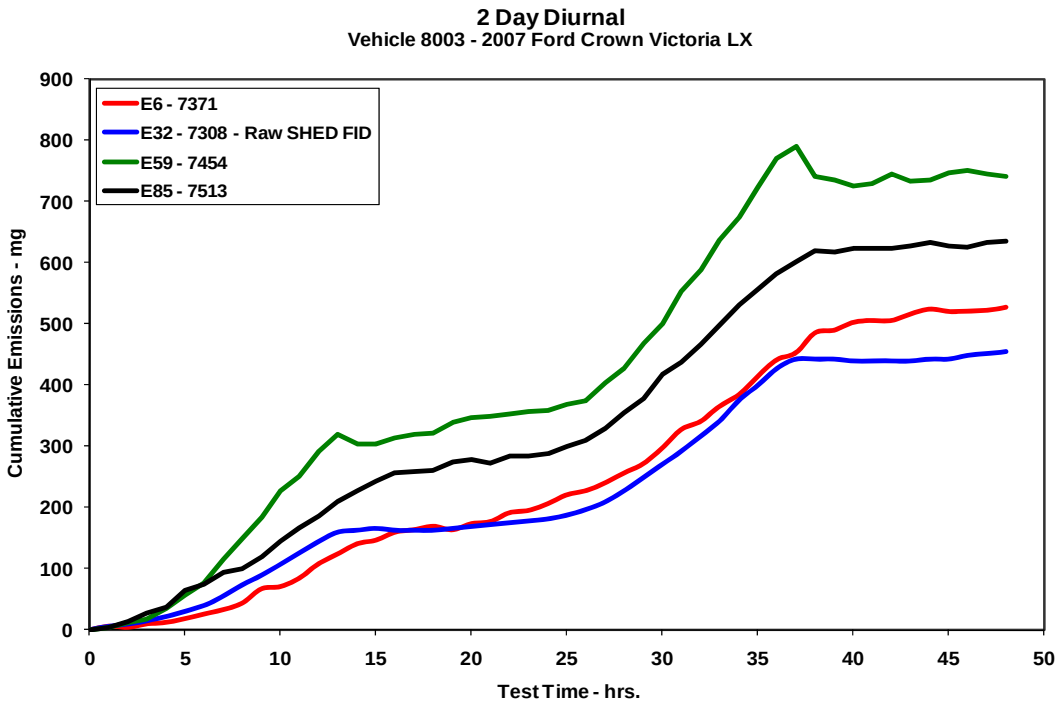

Running Loss
Vehicle 8003 - 2007 Ford Crown Victoria LX
Final Emissions - mg
140
120
100
80
60
40
20
0
E6
25728
E32
25719
E59
25747
E85
25762
Test Fuel

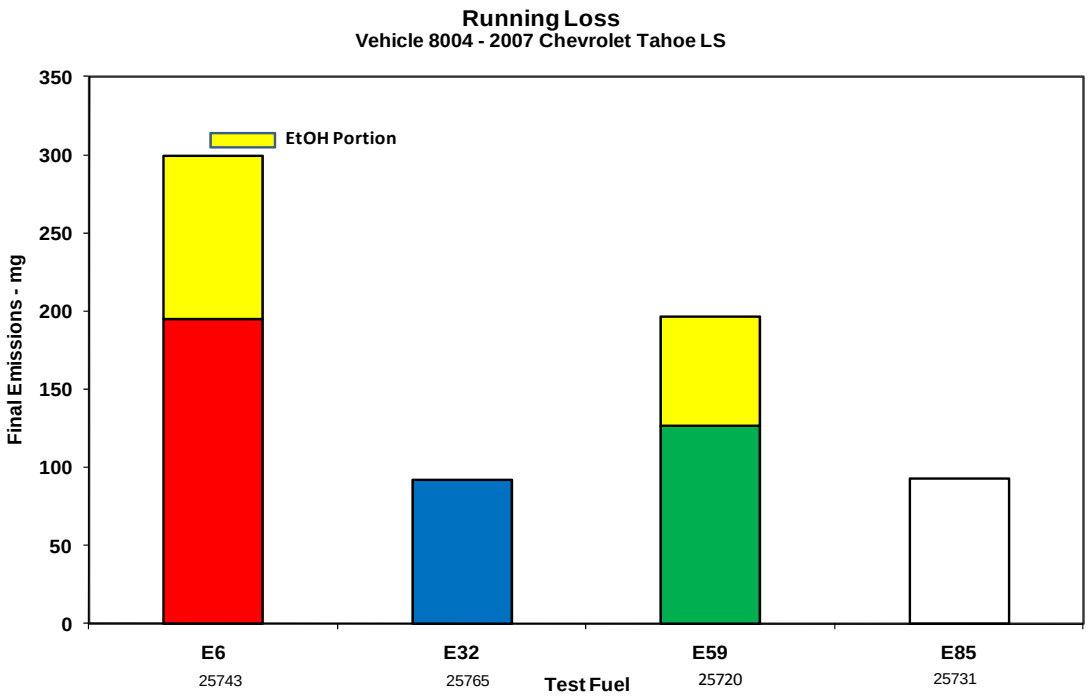

Running Loss
Vehicle 8003 - 2007 Ford Crown Victoria LX
E6 - 25728
E32 - 25719
E59 - 25747
E85 - 25762
Five Minute Running Average
Cumulative Corrected Permeation - mg
140
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
45
50
Test Time - min.

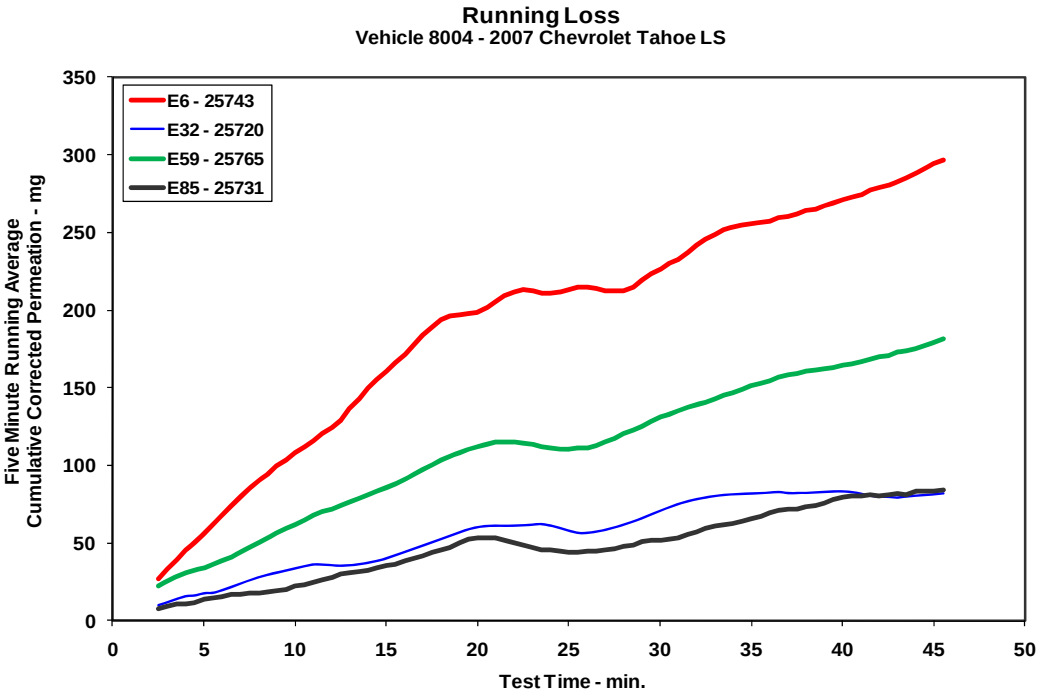

Hot Soak
Vehicle 8003 - 2007 Ford Crown Victoria LX
Final Emissions - mg
0
5
10
15
20
25
30
35
40
E6
7306
E32
7369
E59
7453
E85
7510
Test Fuel

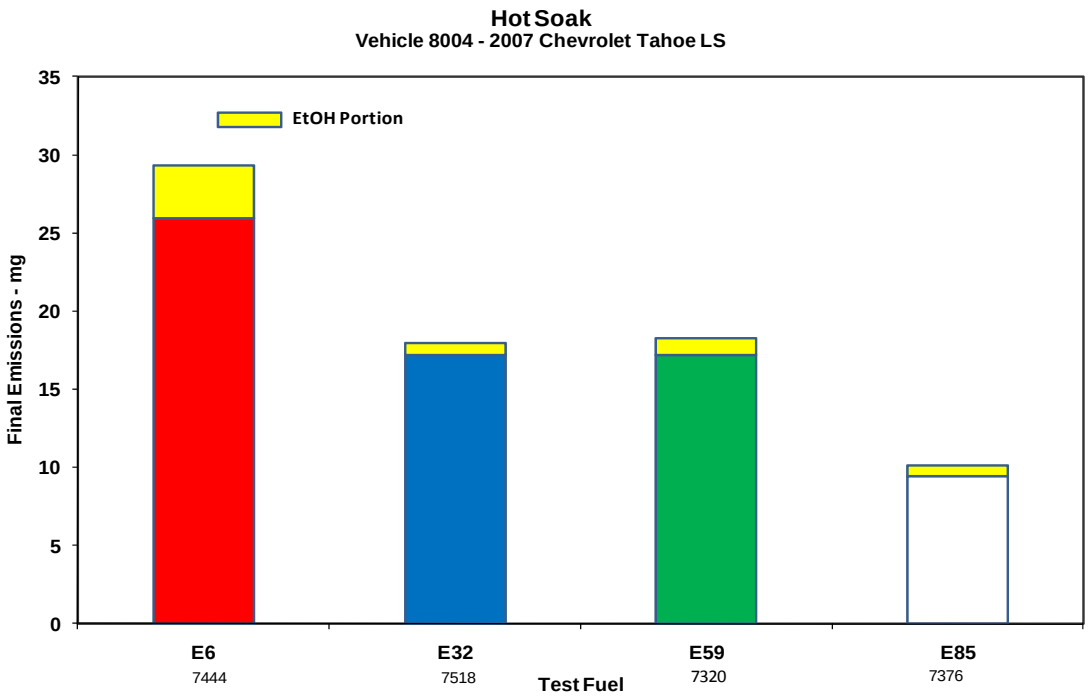

Hot Soak
Vehicle 8003 - 2007 Ford Crown Victoria LX
E6 - 7369
E32 - 7306
E59 - 7453
E85 - 7510
Five Minute Running Average
Cumulative Corrected Permeation - mg
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
Test Time - min.

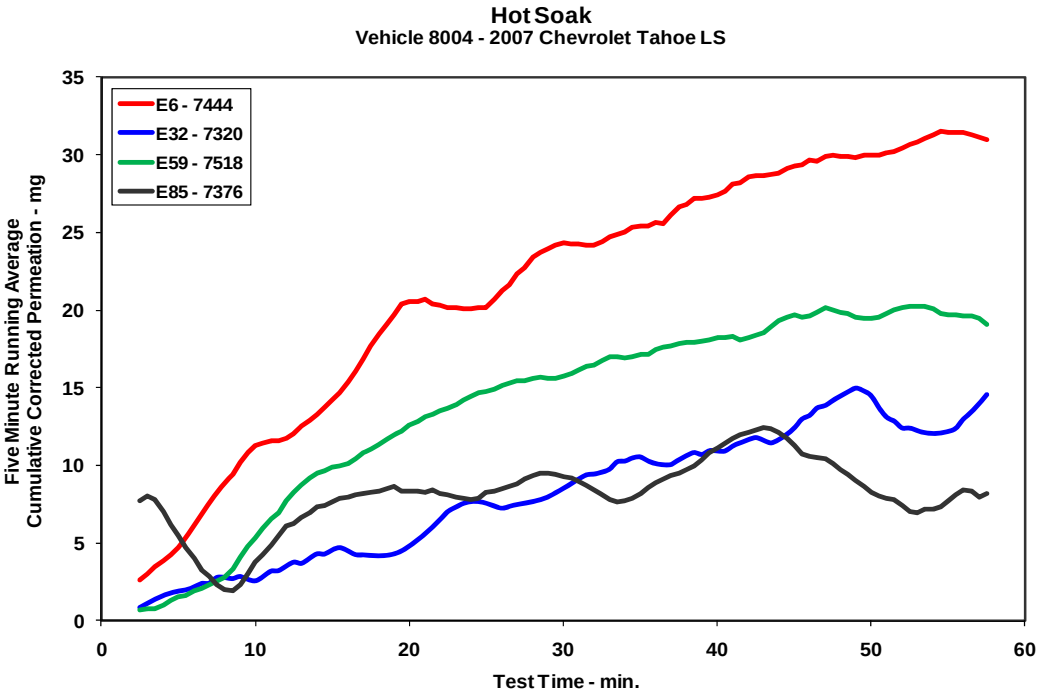

2 Day Diurnal
Vehicle 8003 - 2007 Ford Crown Victoria LX
EtOH Portion
Day 1
Day 2
Evap Emissions - mg
0
50
100
150
200
250
300
350
400
E32
7308
E6
7371
E59
7454
E85
7513
Test Fuel

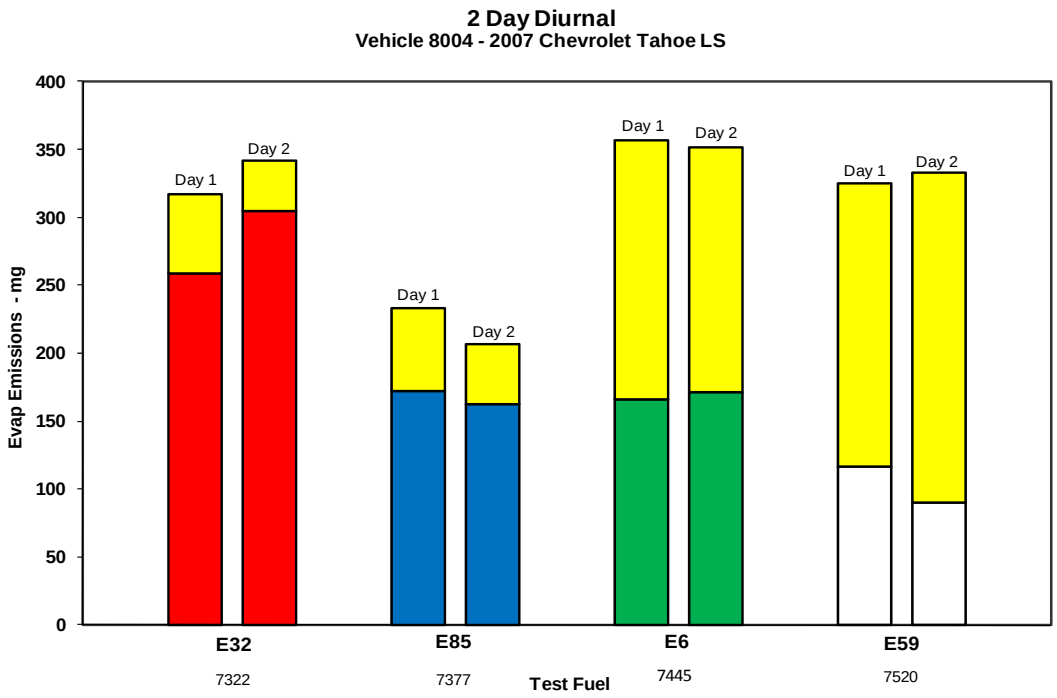

2 Day Diurnal
Vehicle 8003 - 2007 Ford Crown Victoria LX
E6 - 7371
E32 - 7308 - Raw SHED FID
E59 - 7454
E85 - 7513
Cumulative Emissions - mg
0
100
200
300
400
500
600
700
800
900
0
5
10
15
20
25
30
35
40
45
50
Test Time - hrs.

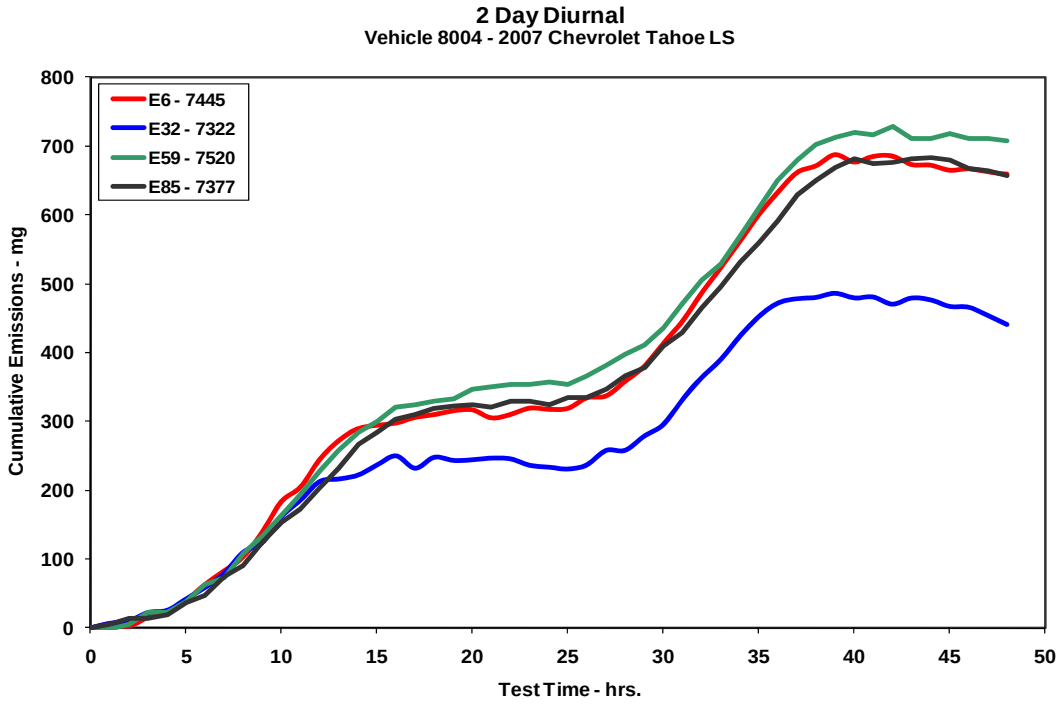

Running Loss
Vehicle 8004 - 2007 Chevrolet Tahoe LS
EtOH Portion
Final Emissions - mg
350
300
250
200
150
100
50
0
E6
25743
E32
25765
E59
25720
E85
25731
Test Fuel

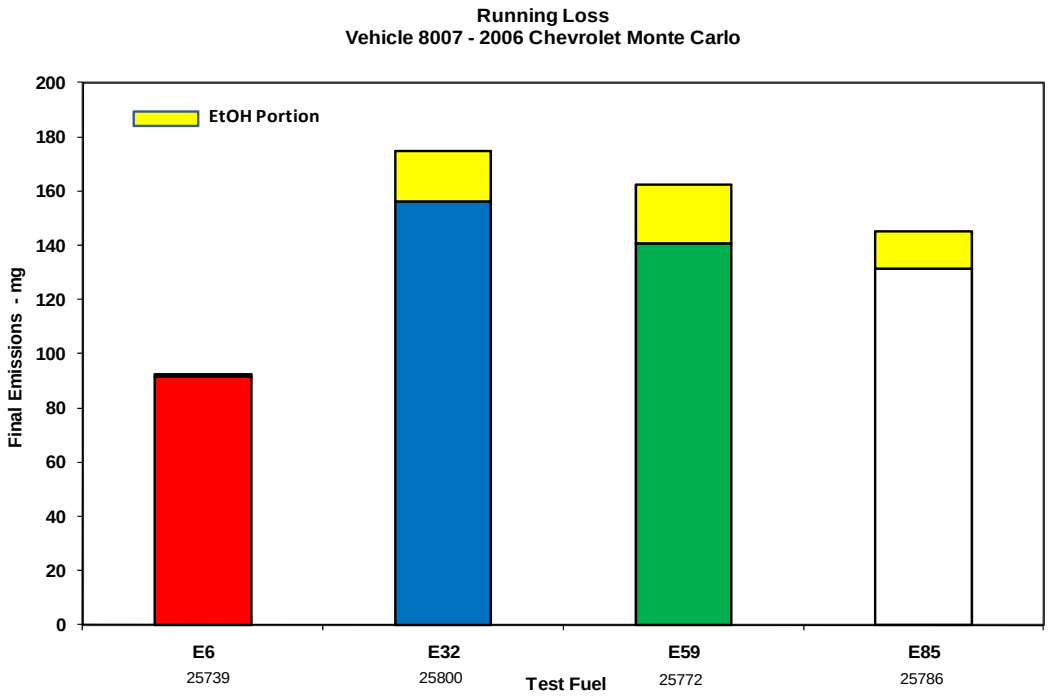

Running Loss
Vehicle 8004 - 2007 Chevrolet Tahoe LS
E6 - 25743
E32 - 25720
E59 - 25765
E85 - 25731
Five Minute Running Average
Cumulative Corrected Permeation - mg
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
50
Test Time - min.

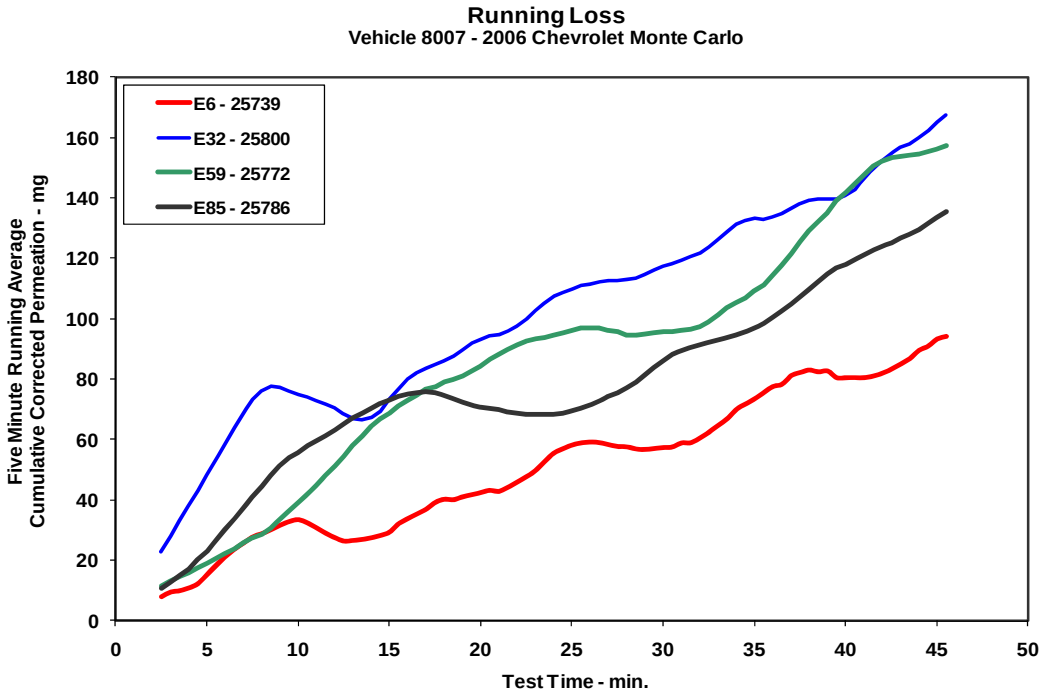

Hot Soak
Vehicle 8004 - 2007 Chevrolet Tahoe LS
EtOH Portion
Final Emissions - mg
35
30
25
20
15
10
5
0
E6
7444
E32
7518
E59
7320
E85
7376
Test Fuel

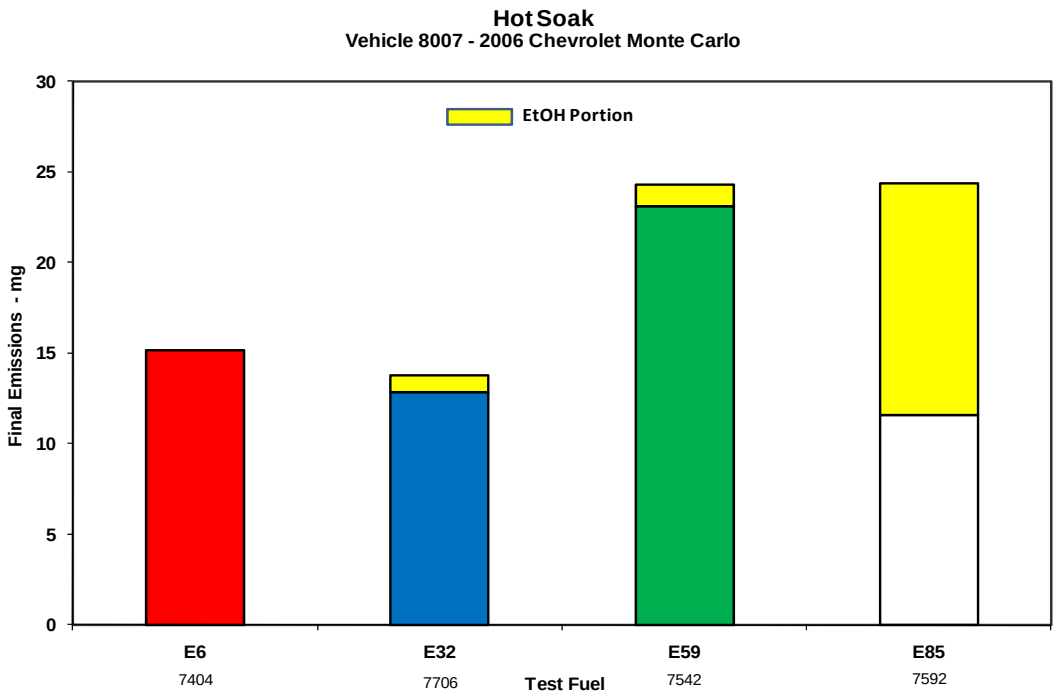

Hot Soak
Vehicle 8004 - 2007 Chevrolet Tahoe LS
E6 - 7444
E32 - 7320
E59 - 7518
E85 - 7376
Five Minute Running Average
Cumulative Corrected Permeation - mg
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Test Time - min.

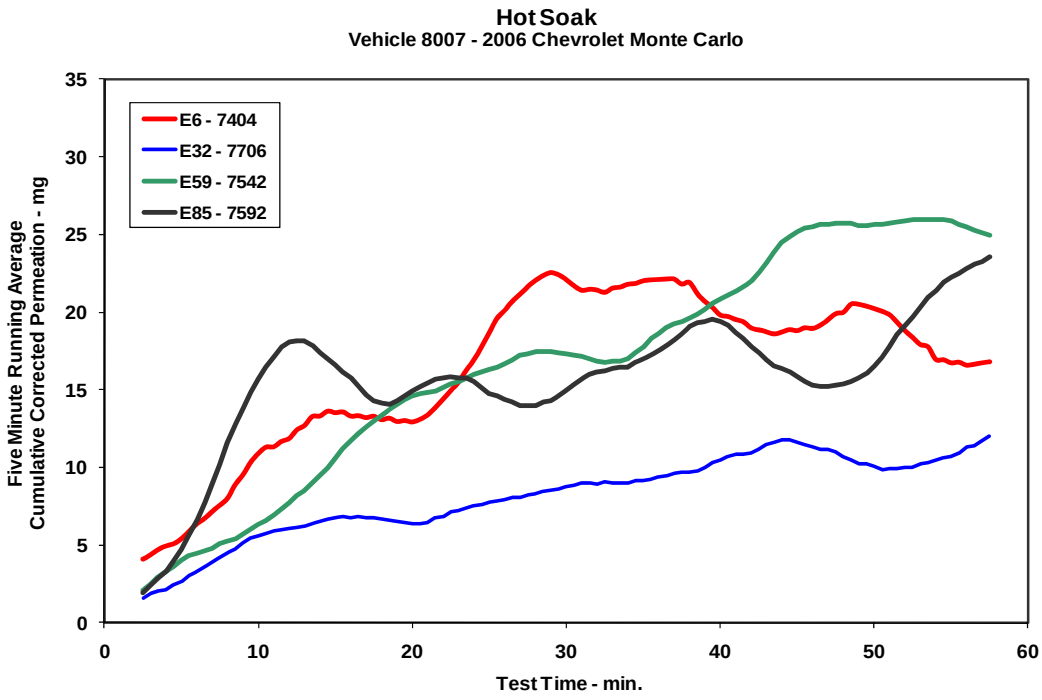

2 Day Diurnal
Vehicle 8004 - 2007 Chevrolet Tahoe LS
Evap Emissions - mg
400
350
300
250
200
150
100
50
0
Day 1
Day 2
Day 1
Day 2
Day 1
Day 2
Day 1
Day 2
E32
7322
E85
7377
E6
7445
E59
7520
Test Fuel

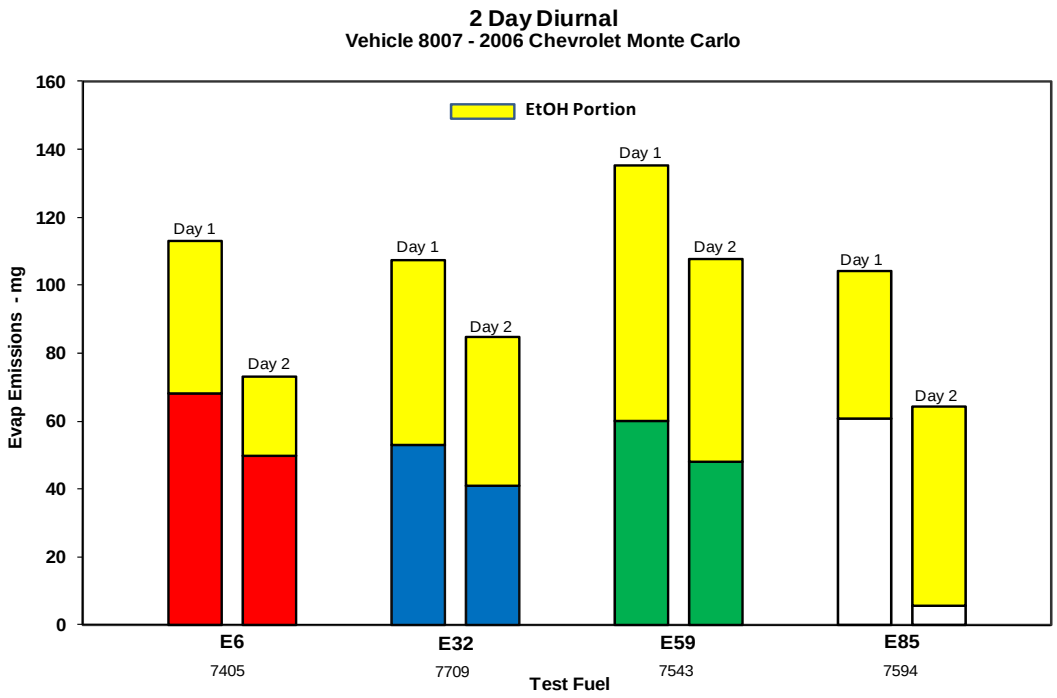

2 Day Diurnal
Vehicle 8004 - 2007 Chevrolet Tahoe LS
E6 - 7445
E32 - 7322
E59 - 7520
E85 - 7377
Cumulative Emissions - mg
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
35
40
45
50
Test Time - hrs.

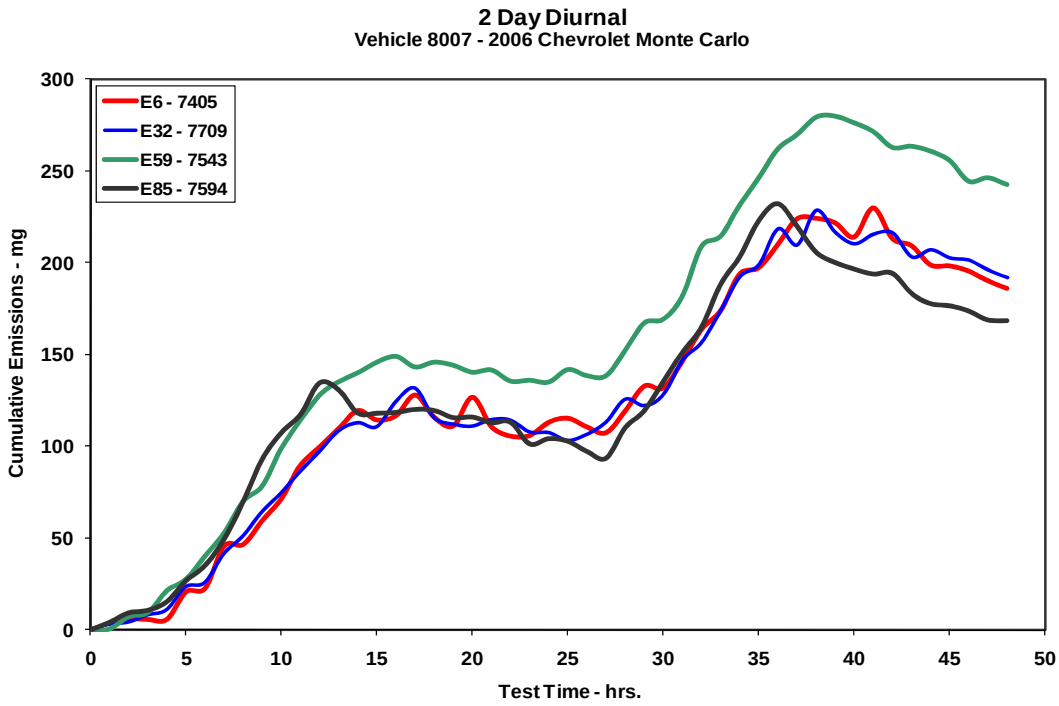

Running Loss
Vehicle 8007 - 2006 Chevrolet Monte Carlo
EtOH Portion
Final Emissions - mg
200
180
160
140
120
100
80
60
40
20
0
E6
25739
E32
25800
E59
25772
E85
25786
Test Fuel


Running Loss
Vehicle 8007 - 2006 Chevrolet Monte Carlo
E6 - 25739
E32 - 25800
E59 - 25772
E85 - 25786
Five Minute Running Average
Cumulative Corrected Permeation - mg
180
160
140
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
45
50
Test Time - min.


Hot Soak
Vehicle 8007 - 2006 Chevrolet Monte Carlo
EtOH Portion
Final Emissions - mg
30
25
20
15
10
5
0
E6
7404
E32
7706
E59
7542
E85
7592
Test Fuel


Hot Soak
Vehicle 8007 - 2006 Chevrolet Monte Carlo
E6 - 7404
E32 - 7706
E59 - 7542
E85 - 7592
Five Minute Running Average
Cumulative Corrected Permeation - mg
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Test Time - min.


2 Day Diurnal
Vehicle 8007 - 2006 Chevrolet Monte Carlo
EtOH Portion
Evap Emissions - mg
Day 1
Day 2
E6
7405
E32
7709
E59
7543
E85
7594
Test Fuel


2 Day Diurnal
Vehicle 8007 - 2006 Chevrolet Monte Carlo
E6 - 7405
E32 - 7709
E59 - 7543
E85 - 7594
Cumulative Emissions - mg
Test Time - hrs.

Appendix III – Main Program Individual Speciation Data

Appendix III contains a series of tables of the individual speciation test data for reference. These tables are organized as follows, for each of the seven vehicles;

- A summary table of reactivity for the Phase 1, 2 and 3 of the FTP, the US06 and the UC tests for all seven vehicles. For the four evaporative tested vehicles, reactivity values are included for the running loss, hot soak and diurnal tests.

- For each test, a table of the species identified, their MIR values and calculated ozone are displayed, sorted by descending mass VOC. The resulting reactivity is also shown.

There are a total of 258 pages in this appendix.

Vehicle 8001

Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present	
FTP	E6	5741	219.2	100.9	221.2	891.3	4.028	56	
Phase 1	E32	5927	288.2	100.9	290.9	830.6	2.856	60	
	E59	6043	203.1	107.7	218.7	583.8	2.670	36	
	E85	5825	181.4	95.5	173.2	483.6	2.792	35	
FTP	E6	5741	17.2	92.9	16.0	24.8	1.549	18	
Phase 2	E32	5927	39.8	81.7	32.5	13.3	0.408	8	
	E59	6043	16.4	59.9	9.8	25.5	2.591	9	
	E85	5825	14.8	101.9	15.1	81.6	5.411	10	
FTP	E6	5741	33.3	91.9	30.6	20.7	0.678	12	
Phase 3	E32	5927	40.0	75.9	30.4	7.1	0.235	14	Includes aldehydes
	E59	6043	23.0	90.9	20.9	29.2	1.394	16	
	E85	5825	22.7	79.6	18.1	49.5	2.738	16	
US06	E6	5743	79.9	121.0	96.7	223.5	2.311	50	
	E32	5928	81.1	85.6	69.4	116.5	1.678	34	
	E59	6044	56.4	92.9	52.4	61.5	1.173	24	
	E85	5826	47.4	79.4	37.6	70.1	1.863	21	
UC	E6	5750	115.8	93.7	112.4	391.5	3.482	41	
	E32	5929	116.8	90.8	106.1	290.4	2.738	35	
	E59	6045	88.7	101.7	90.2	224.2	2.485	25	
	E85	5835	64.0	114.4	73.2	133.1	1.818	20	
			mg		mg	mg			
RL Cold	E6	25716	113.8	51.8	58.9	126.3	2.144	31	
	E32	25751	149.6	--	--	--	--	--	
	E59	25770	117.6	95.6	112.5	267.7	2.380	32	
	E85	25722	51.4	167.1	85.9	338.8	3.943	33	
	E85-Rpt	25733	224.2	75.6	169.6	442.0	2.606	47	
RL Total	E6	25716	189.5	61.9	117.3	433.6	3.697	46	
	E32	25751	251.7	68.8	173.2	723.0	4.173	48	
	E59	25770	234.9	88.1	207.0	705.5	3.409	58	
	E85	25722	118.3	134.1	158.6	464.8	2.931	37	
	E85-Rpt	25733	351.4	76.7	269.6	656.7	2.436	5	
HS	E6	7298	29.3	90.3	26.5	44.7	1.688	42	
	E32	7457	36.3	115.7	42.0	102.0	2.429	46	
	E59	7534	42.7	91.3	39.0	139.4	3.575	26	
	E85	7355	21.5	131.3	28.2	68.0	2.410	32	
	E85-Rpt	7383	23.6	122.5	28.9	49.0	1.694	26	
DHB Day 1	E6	7301	286.6	81.6	233.8	518.5	2.218	72	
	E32	7460	324.4	86.2	279.5	498.5	1.783	63	
	E59	7535	377.9	74.4	281.1	531.7	1.892	54	
	E85	7357	427.6	86.9	371.7	706.2	1.900	66	
	E85-Rpt	7386	374.2	85.7	320.6	599.3	1.869	55	
DHB Total	E6	7301	552.0	89.5	494.1	1145.8	2.319	83	
	E32	7460	677.5	97.4	659.6	1320.8	2.003	81	
	E59	7535	839.3	74.0	620.9	1182.4	1.904	67	
	E85	7357	889.9	79.7	709.5	1344.1	1.894	74	
	E85-Rpt	7386	786.8	83.8	659.5	1189.9	1.804	75	

Vehicle 8001 - Fuel E6 - FTP Phase 1 - Test 5741							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg	Ozone mg/mi			
Methane	00074-82-8	0.01	38.6561	0.535			
Ethylene	00074-85-1	8.88	24.5071	217.729			
Propene	00115-07-1	11.57	15.2870	176.930			
2-Methylbutane (Isopentane)	00078-78-4	1.35	12.4465	16.864			
Toluene	00108-88-3	3.93	11.0893	43.526			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	10.4275	12.504			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	9.9858	79.299			
Acetylene (Ethyne)	00074-86-2	0.95	9.7902	9.260			
Ethane	00074-84-0	0.26	7.6535	2.012			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	7.2232	56.019			
Unknown #2		4.00	5.7672	23.053			
2,2,5-Trimethylhexane	03522-94-9	1.05	5.7642	6.070			
Benzene	00071-43-2	0.69	4.9097	3.409			
Methylcyclopentane	00096-37-7	2.05	3.8875	7.968			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	3.3938	5.448			
2,3,4-Trimethylpentane	00565-75-3	0.95	3.0992	2.941			
Cyclopentane	00287-92-3	2.24	3.0268	6.773			
3-Methylpentane	00096-14-0	1.69	2.9701	5.022			
2,2-Dimethylbutane	00075-83-2	1.11	2.7383	3.043			
n-Pentane	00109-66-0	1.21	2.6718	3.246			
1,3-Butadiene	00106-99-0	12.45	2.4000	29.891			
n-Hexane	00110-54-3	1.13	2.1023	2.385			
t-2-Butene	00624-64-6	15.20	1.8539	28.174			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.8525	9.946			
ortho-Xylene	00095-47-6	7.58	1.7912	13.570			
2-Methylhexane	00591-76-4	1.09	1.6431	1.783			
Formaldehyde	00050-00-0	9.59	1.4638	14.043			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.4609	4.661			
2,2-DiMeHexane	00590-73-8	0.94	1.4407	1.356			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.3800	10.192			
Ethylbenzene	00100-41-4	2.96	1.3678	4.052			
acetone	00067-64-1	0.35	1.2354	0.436			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.2077	1.319			
2-Methyl-1,3-butadiene	00078-79-5	10.48	1.1541	12.098			
3-Me-1-Hexene	03404-61-3	4.27	1.1215	4.793			
2-Methyl-2-butene	00513-35-9	14.20	1.1116	15.779			
Styrene	00100-42-5	1.66	1.0579	1.758			
acetaldehyde	00075-07-0	6.46	1.0371	6.703			
2-Methylheptane	00592-27-8	0.97	1.0297	0.996			
3-Methylheptane	00589-81-1	1.12	1.0181	1.145			
t-3-Heptene	14686-14-7	6.17	1.0179	6.281			
2-Methyl-1-butene	00563-46-2	6.38	0.9261	5.907			
c-2-Butene	00590-18-1	14.26	0.8988	12.816			
2,2-Dimethylpropane	00463-82-1	0.65	0.8260	0.534			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.7986	9.388			
Unknown #16		4.00	0.7782	3.111			
n-Octane	00111-65-9	0.80	0.7239	0.576			

Vehicle 8001 - Fuel E6 - FTP Phase 1 - Test 5741 Continued...

Non Zero Mass Species Sorted By VOC

Exhaust Speciation

Species	CAS No.	MIR	Composite VOC mg	Ozone mg/mi			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.6364	2.796			
Acrolein	00107-02-8	7.37	0.2571	1.894			
2-Butanone (MEK)	00078-93-3	1.45	0.1408	0.204			
Propionaldehyde	00123-38-6	6.96	0.0888	0.618			
benzaldehyde	00100-52-7	-0.71	0.0530	-0.038			
n-butyraldehyde	00123-72-8	5.85	0.0274	0.160			
Hexaldehyde	00066-25-1	4.26	0.0250	0.106			
Glyoxal	00107-22-2	12.59	0.0102	0.129			
Valeraldehyde	000110-62-3	4.98	0.0089	0.044			
		Total	221.24	891.26	4.028		
No MIR available, use weighted average of 3.9972			216.89	866.96	3.997	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E6 - FTP Phase 2 - Test 5741

Non Zero Mass Species Sorted By VOC

Exhaust Speciation

Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	9.6336	0.133			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.4593	13.205			
Unknown #2		1.34	1.4081	1.887			
Toluene	00108-88-3	3.93	1.1081	4.349			
acetone	00067-64-1	0.35	0.6800	0.240			
Formaldehyde	00050-00-0	9.59	0.3159	3.031			
acetaldehyde	00075-07-0	6.46	0.1667	1.077			
2-Butanone (MEK)	00078-93-3	1.45	0.0745	0.108			
Propionaldehyde	00123-38-6	6.96	0.0277	0.193			
benzaldehyde	00100-52-7	-0.71	0.0212	-0.015			
Acrolein	00107-02-8	7.37	0.0200	0.148			
n-butyraldehyde	00123-72-8	5.85	0.0186	0.109			
Valeraldehyde	000110-62-3	4.98	0.0181	0.090			
Hexaldehyde	00066-25-1	4.26	0.0170	0.072			
Glyoxal	00107-22-2	12.59	0.0100	0.125			
Formaldehyde	00050-00-0	9.59	0.0001	0.001			
benzaldehyde	00100-52-7	-0.71	0.0000	0.000			
Acrolein	00107-02-8	7.37	0.0000	0.000			
		Total	15.9788	24.7527	1.549		
No MIR available, use weighted average of 1.3399			14.6090	19.5739	1.340	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E6 - FTP Phase 3 - Test 5741							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	21.9106	0.304			
Unknown #2		0.66	1.6394	1.088			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.3455	1.613			
Toluene	00108-88-3	3.93	1.1338	4.450			
t-1,4-Dimethylcyclohexane	02207-04-7	0.66	0.9189	0.610			
Cyclopentane	00287-92-3	2.24	0.8669	1.940			
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.7019	0.951			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.6951	5.391			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.6905	1.108			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.6395	2.810			
Formaldehyde	00050-00-0	9.59	0.0486	0.467			
Acrolein	00107-02-8	7.37	0.0003	0.002			
		Total	30.5911	20.7335	0.678		
			30.5421	20.2648	0.664	w/o aldehydes	
No MIR available, use weighted average of 0.6636							
	aldehydes						

Vehicle 8001 - Fuel E32 - FTP Phase 1 - Test 5927						
Non Zero Mass Species Sorted By VOC						
Exhaust Speciation						
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi		
Methane	00074-82-8	0.01	56.0068	0.776		
Ethanol	00064-17-5	1.45	52.6637	76.308		
Ethylene	00074-85-1	8.88	21.7552	193.281		
2-Methylbutane (Isopentane)	00078-78-4	1.35	12.6439	17.131		
Acetylene (Ethyne)	00074-86-2	0.95	11.9680	11.320		
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	11.5000	13.790		
Toluene	00108-88-3	3.93	9.8149	38.524		
Propene	00115-07-1	11.57	9.1016	105.341		
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	8.9986	71.459		
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	6.7228	9.397		
Ethane	00074-84-0	0.26	6.6051	1.736		
2,2,5-Trimethylhexane	03522-94-9	1.05	5.4105	5.698		
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.0515	39.177		
n-Propylbenzene	00103-65-1	1.96	4.3558	8.536		
Benzene	00071-43-2	0.69	4.1172	2.859		
3-Methylpentane	00096-14-0	1.69	3.9331	6.650		
n-Pentane	00109-66-0	1.21	3.8925	4.729		
acetaldehyde	00075-07-0	6.46	3.7201	24.045		
2,3-Dimethylbutane	00079-29-8	0.90	3.4112	3.066		
2,3,4-Trimethylpentane	00565-75-3	0.95	3.3250	3.155		
n-Hexane	00110-54-3	1.13	2.5470	2.890		
2,2-Dimethylbutane	00075-83-2	1.11	2.3955	2.662		
1,3-Butadiene	00106-99-0	12.45	2.2810	28.409		
2,4-Dimethylpentane	00108-08-7	1.46	2.2156	3.233		
Methylcyclopentane	00096-37-7	2.05	2.1875	4.484		
2,4-Dimethylhexane	00589-43-5	1.61	2.1001	3.372		
2-Methylhexane	00591-76-4	1.09	2.0211	2.193		

Vehicle 8001 - Fuel E32 - FTP Phase 1 - Test 5927			Continued...			
Non Zero Mass Species Sorted By VOC						
Exhaust Speciation						
Propyne	00074-99-7	6.67	1.9173	12.787		
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.9014	6.067		
2,3-Dimethylpentane	00565-59-3	1.25	1.8925	2.362		
Formaldehyde	00050-00-0	9.59	1.5951	15.303		
Methylcyclohexane	00108-87-2	1.56	1.4854	2.310		
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.4095	7.568		
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.3649	2.191		
ortho-Xylene	00095-47-6	7.58	1.2718	9.635		
t-2-Butene	00624-64-6	15.20	1.2527	19.038		
Cyclohexane	00110-82-7	1.14	1.2257	1.394		
2,3,5-Trimethylhexane	01069-53-0	1.12	1.2011	1.346		
2-Methyl-2-butene	00513-35-9	14.20	1.1308	16.052		
Propane	00074-98-6	0.46	1.0972	0.502		
Ethylbenzene	00100-41-4	2.96	1.0046	2.976		
c-2-Butene	00590-18-1	14.26	1.0045	14.325		
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.9278	1.013		
acetone	00067-64-1	0.35	0.9245	0.326		
n-Octane	00111-65-9	0.80	0.8346	0.665		
3-Methylheptane	00589-81-1	1.12	0.8247	0.927		
n-Heptane	00142-82-5	0.97	0.8223	0.794		
Cyclopentene	00142-29-0	6.69	0.8024	5.365		
2-Methyl-1-butene	00563-46-2	6.38	0.7858	5.012		
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.7446	7.805		
2-Methylheptane	00592-27-8	0.97	0.7039	0.681		
Cyclopentadiene	00542-92-7	6.89	0.6907	4.759		
t-1,2-Dimethylcyclopentane	00822-50-4	2.77	0.6692	1.856		
Acrolein	00107-02-8	7.37	0.2932	2.159		
2-Butanone (MEK)	00078-93-3	1.45	0.1515	0.220		
Propionaldehyde	00123-38-6	6.96	0.0934	0.650		
benzaldehyde	00100-52-7	-0.71	0.0544	-0.039		
n-butyraldehyde	00123-72-8	5.85	0.0237	0.138		
Hexaldehyde	00066-25-1	4.26	0.0226	0.096		
Glyoxal	00107-22-2	12.59	0.0078	0.098		
		Total	290.8768	830.6034	2.856	
No MIR available, use weighted average of 2.7735			283.9908	787.6066	2.773	w/o aldehydes
	aldehydes					

Vehicle 8001 - Fuel E32 - FTP Phase 2 - Test 5927							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	26.3764	0.365			
n-Propylbenzene	00103-65-1	1.96	6.0069	11.771			
Formaldehyde	00050-00-0	9.59	0.1133	1.087			
benzaldehyde	00100-52-7	-0.71	0.0131	-0.009			
acetone	00067-64-1	0.35	0.0077	0.003			
2-Butanone (MEK)	00078-93-3	1.45	0.0055	0.008			
acetaldehyde	00075-07-0	6.46	0.0030	0.020			
Acrolein	00107-02-8	7.37	0.0028	0.021			
		Total	32.5288	13.2655	0.408		
			32.3833	12.1367	0.375	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E32 - FTP Phase 3 - Test 5927							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	27.0863	0.375			
Ethane	00074-84-0	0.26	1.0368	0.273			
Toluene	00108-88-3	3.93	0.8942	3.510			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.8037	0.964			
acetone	00067-64-1	0.35	0.2427	0.086			
Formaldehyde	00050-00-0	9.59	0.1264	1.212			
acetaldehyde	00075-07-0	6.46	0.0744	0.481			
2-Butanone (MEK)	00078-93-3	1.45	0.0653	0.095			
benzaldehyde	00100-52-7	-0.71	0.0130	-0.009			
Acrolein	00107-02-8	7.37	0.0070	0.052			
Propionaldehyde	00123-38-6	6.96	0.0067	0.047			
Hexaldehyde	00066-25-1	4.26	0.0049	0.021			
Glyoxal	00107-22-2	12.59	0.0024	0.030			
n-butyraldehyde	00123-72-8	5.85	0.0014	0.008			
		Total	30.3654	7.1437	0.235		
			29.8211	5.1214	0.172	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E59 - FTP Phase 1 - Test 6043							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	81.7650	118.475			
Methane	00074-82-8	0.01	42.1442	0.584			
Ethylene	00074-85-1	8.88	19.6698	174.753			
Acetylene (Ethyne)	00074-86-2	0.95	7.1895	6.800			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.9035	54.822			
acetaldehyde	00075-07-0	6.46	6.0898	39.362			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.8640	7.945			
Toluene	00108-88-3	3.93	5.7612	22.613			
Propene	00115-07-1	11.57	5.0764	58.754			
Ethane	00074-84-0	0.26	4.9200	1.293			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.8702	5.840			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.8332	21.973			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.6550	2.796			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.6242	3.668			
n-Pentane	00109-66-0	1.21	1.9202	2.333			
2-Methylhexane	00591-76-4	1.09	1.7209	1.867			
Formaldehyde	00050-00-0	9.59	1.6897	16.211			
Benzene	00071-43-2	0.69	1.6857	1.170			
1,3-Butadiene	00106-99-0	12.45	1.6637	20.721			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5964	1.515			
3-Methylpentane	00096-14-0	1.69	1.5119	2.556			
n-Hexane	00110-54-3	1.13	1.3463	1.528			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3103	7.035			
n-Butane	00106-97-8	1.08	1.0374	1.117			
2,3-Dimethylbutane	00079-29-8	0.90	0.9943	0.894			
Methylcyclopentane	00096-37-7	2.05	0.8734	1.790			
2,4-Dimethylpentane	00108-08-7	1.46	0.8630	1.259			
acetone	00067-64-1	0.35	0.7709	0.272			
2,2-Dimethylbutane	00075-83-2	1.11	0.7419	0.824			
Acrolein	00107-02-8	7.37	0.2731	2.012			
2-Butanone (MEK)	00078-93-3	1.45	0.1474	0.214			
Propionaldehyde	00123-38-6	6.96	0.0811	0.565			
benzaldehyde	00100-52-7	-0.71	0.0337	-0.024			
Hexaldehyde	00066-25-1	4.26	0.0215	0.091			
n-butyraldehyde	00123-72-8	5.85	0.0179	0.105			
Glyoxal	00107-22-2	12.59	0.0048	0.061			
		Total	218.6720	583.7955	2.670		
			209.5420	524.9275	2.505	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E59 - FTP Phase 2 - Test 6043							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	1.45	7.9237	11.481			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.7010	12.563			
Formaldehyde	00050-00-0	9.59	0.1261	1.210			
acetone	00067-64-1	0.35	0.0309	0.011			
acetaldehyde	00075-07-0	6.46	0.0221	0.143			
benzaldehyde	00100-52-7	-0.71	0.0097	-0.007			
2-Butanone (MEK)	00078-93-3	1.45	0.0082	0.012			
Acrolein	00107-02-8	7.37	0.0050	0.037			
Propionaldehyde	00123-38-6	6.96	0.0021	0.015			
		Total	9.8289	25.4651	2.591		
			9.6248	24.0448	2.498	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E59 - FTP Phase 3 - Test 6043							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	14.7177	0.204			
Toluene	00108-88-3	3.93	1.9550	7.673			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.1779	8.700			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.0683	5.736			
Ethane	00074-84-0	0.26	0.9195	0.242			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.6320	4.902			
acetone	00067-64-1	0.35	0.2091	0.074			
Formaldehyde	00050-00-0	9.59	0.1124	1.079			
acetaldehyde	00075-07-0	6.46	0.0618	0.399			
2-Butanone (MEK)	00078-93-3	1.45	0.0350	0.051			
Hexaldehyde	00066-25-1	4.26	0.0064	0.027			
Propionaldehyde	00123-38-6	6.96	0.0063	0.044			
benzaldehyde	00100-52-7	-0.71	0.0054	-0.004			
Acrolein	00107-02-8	7.37	0.0023	0.017			
n-butyraldehyde	00123-72-8	5.85	0.0021	0.013			
Glyoxal	00107-22-2	12.59	0.0002	0.002			
		Total	20.9114	29.1575	1.394		
			20.4704	27.4565	1.341	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E85 - FTP Phase 1 - Test 5825							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	49.8264	72.197			
Methane	00074-82-8	0.01	33.7232	0.467			
2-Methylbutane (Isopentane)	00078-78-4	1.35	25.1664	34.098			
Ethylene	00074-85-1	8.88	13.2706	117.900			
acetaldehyde	00075-07-0	6.46	9.2969	60.092			
n-Butane	00106-97-8	1.08	8.3555	8.998			
c-2-Butene	00590-18-1	14.26	7.1120	101.416			
Acetylene (Ethyne)	00074-86-2	0.95	4.1152	3.892			
Ethane	00074-84-0	0.26	2.6920	0.708			
Formaldehyde	00050-00-0	9.59	1.9735	18.934			
2,3,3-Trimethylpentane	00560-21-4	0.95	1.8677	1.766			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.5642	1.336			
3-Methylnonane		0.66	1.4529	0.953			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.4437	11.464			
n-Pentane	00109-66-0	1.21	1.1759	1.429			
t-1,2-Dimethylcyclopentane	00822-50-4	2.50	1.0823	2.705			
Benzene	00071-43-2	0.69	1.0550	0.733			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9560	7.061			
t-2-Butene	00624-64-6	15.20	0.8621	13.101			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.7933	3.486			
3-Methylpentane	00096-14-0	1.69	0.7784	1.316			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.7519	8.801			
2-Methyl-1-butene	00563-46-2	6.38	0.7511	4.791			
Unknown #13		2.50	0.7231	1.807			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7145	0.678			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.6798	0.950			
acetone	00067-64-1	0.35	0.5776	0.204			
Acrolein	00107-02-8	7.37	0.2054	1.513			
2-Butanone (MEK)	00078-93-3	1.45	0.1036	0.150			
Propionaldehyde	00123-38-6	6.96	0.0559	0.389			
Hexaldehyde	00066-25-1	4.26	0.0213	0.091			
benzaldehyde	00100-52-7	-0.71	0.0207	-0.015			
n-butyraldehyde	00123-72-8	5.85	0.0174	0.102			
Valeraldehyde	000110-62-3	4.98	0.0111	0.055			
Glyoxal	00107-22-2	12.59	0.0043	0.054			
		Total	173.2006	483.6197	2.792		
No MIR available, use weighted average of 2.4992			160.9129	402.0519	2.499	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E85 - FTP Phase 2 - Test 5825							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	5.6686	0.079			
c-2-Butene	00590-18-1	14.26	4.8001	68.449			
3-Methylnonane	05911-04-6	0.66	1.7609	1.155			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.4648	1.251			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.1260	8.316			
Formaldehyde	00050-00-0	9.59	0.2191	2.102			
acetaldehyde	00075-07-0	6.46	0.0233	0.150			
Valeraldehyde	000110-62-3	4.98	0.0128	0.064			
Acrolein	00107-02-8	7.37	0.0080	0.059			
Hexaldehyde	00066-25-1	4.26	0.0024	0.010			
		Total	15.0859	81.6349	5.411		
			14.8204	79.2495	5.347	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E85 - FTP Phase 3 - Test 5825							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	9.6892	0.134			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.7326	5.057			
c-2-Butene	00590-18-1	14.26	1.4088	20.089			
3-Methylnonane	05911-04-6	14.26	1.0569	15.072			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.66	0.9053	0.594			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6973	5.150			
Formaldehyde	00050-00-0	9.59	0.2259	2.168			
acetone	00067-64-1	0.35	0.1360	0.048			
acetaldehyde	00075-07-0	6.46	0.1307	0.845			
2-Butanone (MEK)	00078-93-3	1.45	0.0272	0.039			
n-butyraldehyde	00123-72-8	5.85	0.0128	0.075			
Hexaldehyde	00066-25-1	4.26	0.0119	0.051			
Propionaldehyde	00123-38-6	6.96	0.0106	0.073			
benzaldehyde	00100-52-7	-0.71	0.0098	-0.007			
Acrolein	00107-02-8	7.37	0.0062	0.046			
Glyoxal	00107-22-2	12.59	0.0019	0.024			
		Total	18.0629	49.4570	2.738		
			17.4900	46.0957	2.636	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E6 - US06 - Test 5743							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	32.6897	0.453			
Ethylene	00074-85-1	8.88	5.6988	50.630			
Ethane	00074-84-0	0.26	5.3821	1.415			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.2693	6.319			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.0728	5.693			
Toluene	00108-88-3	3.93	3.7814	14.842			
Propene	00115-07-1	11.57	2.4572	28.439			
3-Methylpentane	00096-14-0	1.69	2.3848	4.032			
2,3-Dimethylbutane	00079-29-8	0.90	2.3386	2.102			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.2349	2.353			
Benzene	00071-43-2	0.69	1.9197	1.333			
2,2-Dimethylbutane	00075-83-2	1.11	1.7430	1.937			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.7317	1.940			
Cyclopentene	00142-29-0	6.69	1.6925	11.316			
2-Methylhexane	00591-76-4	1.09	1.6864	1.830			
n-Decane	00124-18-5	0.59	1.5757	0.931			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.5181	12.055			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.3791	2.214			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.3784	10.690			
n-Butane	00106-97-8	1.08	1.3615	1.466			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.3454	1.277			
n-Hexane	00110-54-3	1.13	1.3073	1.483			
n-Pentane	00109-66-0	1.21	1.1394	1.384			
Methylcyclopentane	00096-37-7	2.05	1.1369	2.330			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.8227	2.625			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.7194	3.161			
c-2-Butene	00590-18-1	14.26	0.6655	9.489			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.6506	3.493			
acetone	00067-64-1	0.35	0.5625	0.198			
3-Me-1-Hexene	03404-61-3	4.27	0.5594	2.391			
2,2-DiMeHexane	00590-73-8	0.94	0.5385	0.507			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.4747	0.518			
2-Methylheptane	00592-27-8	0.97	0.4716	0.456			
t-2-Butene	00624-64-6	15.20	0.4705	7.151			
t-3-Heptene	14686-14-7	6.17	0.4703	2.902			
1,3-Butadiene	00106-99-0	12.45	0.4669	5.815			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.4236	3.128			
Unknown #22	.	2.29	0.4109	0.942			
ortho-Xylene	00095-47-6	7.58	0.3698	2.801			
Unknown #16		2.29	0.3669	0.841			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.3493	4.106			
acetaldehyde	00075-07-0	6.46	0.3136	2.027			
Formaldehyde	00050-00-0	9.59	0.1458	1.399			
n-butyraldehyde	00123-72-8	5.85	0.0489	0.286			
benzaldehyde	00100-52-7	-0.71	0.0471	-0.034			
Propionaldehyde	00123-38-6	6.96	0.0390	0.271			
Methacrolein	000078-85-3	5.96	0.0312	0.186			
Hexaldehyde	00066-25-1	4.26	0.0312	0.133			
Valeraldehyde	000110-62-3	4.98	0.0217	0.108			
Acrolein	00107-02-8	7.37	0.0136	0.100			
		Total	96.7097	223.4662	2.311		
			95.4552	218.7915	2.292	w/o aldehydes	
No MIR available, use weighted average of 2.2921							
	aldehydes						

Vehicle 8001 - Fuel E32 - US06 - Test 5928							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	35.4165	0.491			
Ethylene	00074-85-1	8.88	4.8555	43.138			
Ethane	00074-84-0	0.26	4.0539	1.066			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.4871	4.725			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.9893	3.584			
Toluene	00108-88-3	3.93	2.0332	7.980			
Propene	00115-07-1	11.57	1.6526	19.127			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.4573	2.037			
Benzene	00071-43-2	0.69	1.4286	0.992			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.4182	1.493			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.2514	9.937			
acetaldehyde	00075-07-0	6.46	1.2384	8.004			
n-Pentane	00109-66-0	1.21	0.9607	1.167			
3-Methylpentane	00096-14-0	1.69	0.8175	1.382			
2,3-Dimethylbutane	00079-29-8	0.90	0.8114	0.729			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7561	0.717			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.7248	5.621			
2,2-Dimethylbutane	00075-83-2	1.11	0.6716	0.746			
acetone	00067-64-1	0.35	0.6373	0.225			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.6215	0.696			
Ethanol	00064-17-5	1.45	0.6020	0.872			
2,4-Dimethylpentane	00108-08-7	1.46	0.4654	0.679			
n-Hexane	00110-54-3	1.13	0.4590	0.521			
2,4-Dimethylhexane	00589-43-5	1.61	0.4559	0.732			
2,3-Dimethylpentane	00565-59-3	1.25	0.4450	0.556			
1,3-Butadiene	00106-99-0	12.45	0.4071	5.070			
Methylcyclopentane	00096-37-7	2.05	0.3997	0.819			
2-Methylhexane	00591-76-4	1.09	0.3961	0.430			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.3739	1.193			
Formaldehyde	00050-00-0	9.59	0.2364	2.268			
benzaldehyde	00100-52-7	-0.71	0.0656	-0.047			
Acrolein	00107-02-8	7.37	0.0548	0.404			
n-butyraldehyde	00123-72-8	5.85	0.0231	0.135			
2-Butanone (MEK)	00078-93-3	1.45	0.0216	0.031			
Methacrolein	000078-85-3	5.96	0.0185	0.110			
Hexaldehyde	00066-25-1	4.26	0.0136	0.058			
		Total	71.7205	127.6906	1.780		
			69.4112	116.5018	1.678	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E59 - US06 - Test 6044							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	33.0535	0.458			
Ethylene	00074-85-1	8.88	3.3884	30.104			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.1109	4.215			
Ethane	00074-84-0	0.26	3.0843	0.811			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.4691	1.762			
4-Methyloctane	02216-34-4	0.85	1.2378	1.050			
Toluene	00108-88-3	3.93	1.1343	4.452			
acetaldehyde	00075-07-0	6.46	1.1086	7.166			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.7086	0.991			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.6880	0.724			
n-Pentane	00109-66-0	1.21	0.5854	0.711			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.5724	4.546			
3-Methylpentane	00096-14-0	1.69	0.5121	0.866			
Benzene	00071-43-2	0.69	0.4952	0.344			
acetone	00067-64-1	0.35	0.4799	0.169			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.3718	0.353			
Formaldehyde	00050-00-0	9.59	0.2127	2.041			
Acrolein	00107-02-8	7.37	0.0437	0.322			
2-Butanone (MEK)	00078-93-3	1.45	0.0299	0.043			
benzaldehyde	00100-52-7	-0.71	0.0267	-0.019			
Methacrolein	000078-85-3	5.96	0.0253	0.151			
n-butyraldehyde	00123-72-8	5.85	0.0171	0.100			
Hexaldehyde	00066-25-1	4.26	0.0159	0.068			
Propionaldehyde	00123-38-6	6.96	0.0047	0.033			
		Total	52.3764	61.4582	1.173		
			50.4119	51.3856	1.019	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E85 - US06 - Test 5826							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	19.0067	0.263			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.0045	8.135			
acetaldehyde	00075-07-0	6.46	4.9519	32.007			
Ethylene	00074-85-1	8.88	2.2100	19.635			
Ethane	00074-84-0	0.26	1.4561	0.383			
2,2-Dimethylpropane	00463-82-1	0.65	0.9859	0.637			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.5254	2.821			
n-Pentane	00109-66-0	1.21	0.4711	0.572			
2,3,3-Trimethylpentane	00560-21-4	0.95	0.4101	0.388			
t-1,2-Dimethylcyclopentane	00822-50-4	1.06	0.3710	0.392			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.3554	0.398			
Formaldehyde	00050-00-0	9.59	0.3468	3.327			
acetone	00067-64-1	0.35	0.3241	0.114			
2-Butanone (MEK)	00078-93-3	1.45	0.0433	0.063			
n-butyraldehyde	00123-72-8	5.85	0.0387	0.226			
Propionaldehyde	00123-38-6	6.96	0.0346	0.241			
Hexaldehyde	00066-25-1	4.26	0.0289	0.123			
Methacrolein	000078-85-3	5.96	0.0254	0.151			
Crotonaldehyde	004170-30-3	9.34	0.0161	0.150			
benzaldehyde	00100-52-7	-0.71	0.0057	-0.004			
Acrolein	00107-02-8	7.37	0.0057	0.042			
		Total	37.6174	70.0666	1.863		
			31.7962	33.6255	1.058	w/o aldehydes	
No MIR available, use weighted average of 1.0579							
	aldehydes						

Vehicle 8001 - Fuel E6 - UC - Test 5750							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	26.7422	0.370			
Ethylene	00074-85-1	8.88	10.0872	89.618			
Unknown #2		3.37	7.6191	25.704			
Propene	00115-07-1	11.57	6.3023	72.942			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.2425	8.458			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	6.1158	7.334			
Ethane	00074-84-0	0.26	4.7329	1.244			
Toluene	00108-88-3	3.93	4.6054	18.076			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.2881	34.053			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.2651	25.322			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.6550	2.796			
2-Methylhexane	00591-76-4	1.09	2.3967	2.601			
Benzene	00071-43-2	0.69	2.3166	1.609			
Acetylene (Ethyne)	00074-86-2	0.95	2.2900	2.166			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.1003	3.372			
3-Methylpentane	00096-14-0	1.69	1.7298	2.925			
2,3-Dimethylbutane	00079-29-8	0.90	1.6121	1.449			
Formaldehyde	00050-00-0	9.59	1.6074	15.421			
2,2-Dimethylbutane	00075-83-2	1.11	1.5941	1.771			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.4715	1.396			
n-Pentane	00109-66-0	1.21	1.4305	1.738			
t-2-Butene	00624-64-6	15.20	1.2626	19.188			
3-Me-1-Hexene	03404-61-3	4.27	1.1343	4.848			
acetaldehyde	00075-07-0	6.46	1.0281	6.645			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.0069	7.437			
t-3-Heptene	14686-14-7	6.17	0.9075	5.599			
ortho-Xylene	00095-47-6	7.58	0.8482	6.426			
n-Hexane	00110-54-3	1.13	0.8377	0.951			
acetone	00067-64-1	0.35	0.7710	0.272			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.7516	4.035			
Methylcyclopentane	00096-37-7	2.05	0.7370	1.511			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.7226	2.306			
1,3-Butadiene	00106-99-0	12.45	0.7104	8.848			
Acrolein	00107-02-8	7.37	0.2718	2.002			
Propionaldehyde	00123-38-6	6.96	0.0942	0.655			
2-Butanone (MEK)	00078-93-3	1.45	0.0652	0.095			
Hexaldehyde	00066-25-1	4.26	0.0202	0.086			
n-butyraldehyde	00123-72-8	5.85	0.0200	0.117			
Methacrolein	000078-85-3	5.96	0.0164	0.098			
Valeraldehyde	000110-62-3	4.98	0.0117	0.058			
benzaldehyde	00100-52-7	-0.71	0.0081	-0.006			
		Total	112.4300	391.5341	3.482		
			108.5159	366.0908	3.374	w/o aldehydes	
No MIR available, use weighted average of 3.3736							
	aldehydes						

Vehicle 8001 - Fuel E32 - UC - Test 5929							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	28.6512	0.397			
Ethanol	00064-17-5	1.45	15.7026	22.753			
Ethylene	00074-85-1	8.88	8.7142	77.420			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.7943	6.496			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.4392	5.323			
Acetylene (Ethyne)	00074-86-2	0.95	4.3887	4.151			
Toluene	00108-88-3	3.93	3.7804	14.838			
Ethane	00074-84-0	0.26	3.5453	0.932			
Propene	00115-07-1	11.57	3.3351	38.600			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.3271	26.421			
acetaldehyde	00075-07-0	6.46	3.2889	21.258			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.2028	3.079			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.1636	2.278			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.9102	14.814			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.7993	13.289			
Benzene	00071-43-2	0.69	1.5943	1.107			
Formaldehyde	00050-00-0	9.59	1.3036	12.507			
3-Methylpentane	00096-14-0	1.69	1.2985	2.196			
n-Pentane	00109-66-0	1.21	1.2735	1.547			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.2677	1.203			
2,3-Dimethylbutane	00079-29-8	0.90	1.1790	1.060			
n-Hexane	00110-54-3	1.13	0.8735	0.991			
1,3-Butadiene	00106-99-0	12.45	0.8615	10.729			
2,4-Dimethylhexane	00589-43-5	1.61	0.8330	1.337			
2,2-Dimethylbutane	00075-83-2	1.11	0.8139	0.904			
acetone	00067-64-1	0.35	0.7521	0.265			
2,3-Dimethylpentane	00565-59-3	1.25	0.7429	0.927			
2-Methylhexane	00591-76-4	1.09	0.7123	0.773			
Acrolein	00107-02-8	7.37	0.2453	1.807			
2-Butanone (MEK)	00078-93-3	1.45	0.1053	0.153			
Propionaldehyde	00123-38-6	6.96	0.0798	0.555			
benzaldehyde	00100-52-7	-0.71	0.0347	-0.025			
n-butyraldehyde	00123-72-8	5.85	0.0324	0.189			
Valeraldehyde	000110-62-3	4.98	0.0137	0.068			
Hexaldehyde	00066-25-1	4.26	0.0066	0.028			
		Total	106.0666	290.3734	2.738		
			100.2041	253.5671	2.531	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E59 - UC - Test 6045							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	30.7859	44.608			
Methane	00074-82-8	0.01	25.2085	0.349			
Ethylene	00074-85-1	8.88	7.0716	62.826			
acetaldehyde	00075-07-0	6.46	5.3096	34.319			
Ethane	00074-84-0	0.26	3.3105	0.870			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.3677	18.802			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.2603	2.710			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.2469	3.044			
Toluene	00108-88-3	3.93	2.1947	8.614			
Formaldehyde	00050-00-0	9.59	1.4861	14.257			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.2127	1.277			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2062	1.686			
t-2-Butene	00624-64-6	15.20	1.1329	17.218			
n-Pentane	00109-66-0	1.21	0.9207	1.119			
Benzene	00071-43-2	0.69	0.9052	0.629			
2,3-Dimethylbutane	00079-29-8	0.90	0.7209	0.648			
acetone	00067-64-1	0.35	0.7151	0.252			
1,3-Butadiene	00106-99-0	12.45	0.6747	8.403			
Acrolein	00107-02-8	7.37	0.2308	1.700			
2-Butanone (MEK)	00078-93-3	1.45	0.1332	0.193			
Propionaldehyde	00123-38-6	6.96	0.0716	0.498			
benzaldehyde	00100-52-7	-0.71	0.0362	-0.026			
n-butyraldehyde	00123-72-8	5.85	0.0172	0.101			
Valeraldehyde	000110-62-3	4.98	0.0140	0.070			
Hexaldehyde	00066-25-1	4.26	0.0097	0.041			
		Total	90.2430	224.2089	2.485		
			82.2195	172.8031	2.102	w/o aldehydes	
	aldehydes						

Vehicle 8001 - Fuel E85 - UC - Test 5835							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	34.4507	0.477			
Ethanol	00064-17-5	1.45	19.0945	27.667			
acetaldehyde	00075-07-0	6.46	6.3997	41.365			
Ethylene	00074-85-1	8.88	3.8169	33.911			
2,2-Dimethylpropane	00463-82-1	0.65	2.0802	1.345			
Formaldehyde	00050-00-0	9.59	1.5259	14.639			
Unknown #2		1.16	1.4634	1.699			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.4508	1.966			
Cyclopentane	00287-92-3	2.24	0.7899	1.767			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.7474	5.520			
2,3,3-Trimethylpentane	00560-21-4	0.95	0.7081	0.670			
acetone	00067-64-1	0.35	0.3609	0.127			
Acrolein	00107-02-8	7.37	0.1123	0.827			
Propionaldehyde	00123-38-6	6.96	0.0652	0.454			
2-Butanone (MEK)	00078-93-3	1.45	0.0408	0.059			
Crotonaldehyde	004170-30-3	9.34	0.0313	0.293			
n-butyraldehyde	00123-72-8	5.85	0.0307	0.180			
Valeraldehyde	000110-62-3	4.98	0.0219	0.109			
benzaldehyde	00100-52-7	-0.71	0.0185	-0.013			
Hexaldehyde	00066-25-1	4.26	0.0113	0.048			
		Total	73.2204	133.1111	1.818		
			64.6019	75.0227	1.161	w/o aldehydes	
No MIR available, use weighted average of 1.1613							
	aldehydes						

Vehicle 8001 - Fuel E6 - RL Cold - Test 25716					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Methanol	00067-56-1	0.66	19.03	12.506	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.08	32.391	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.76	4.506	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.68	3.874	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.94	22.830	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.27	2.543	
Toluene	00108-88-3	3.93	2.03	7.948	
n-Pentane	00109-66-0	1.21	1.98	2.411	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.86	2.602	
3-Methylpentane	00096-14-0	1.69	1.83	3.088	
2,2-Dimethylbutane	00075-83-2	1.11	1.68	1.869	
Methane	00074-82-8	0.01	1.68	0.023	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.68	1.590	
3-Methylnonane	005911-04-6	0.66	1.27	0.830	
Ethylbenzene	00100-41-4	2.96	1.00	2.965	
Benzene	00071-43-2	0.69	1.00	0.692	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.92	2.934	
2-Methylhexane	00591-76-4	1.09	0.87	0.940	
2,3-Dimethylpentane	00565-59-3	1.25	0.85	1.059	
2,3-Dimethylbutane	00079-29-8	0.90	0.62	0.558	
n-Butane	00106-97-8	1.08	0.58	0.629	
ortho-Xylene	00095-47-6	7.58	0.57	4.335	
2,4-Dimethylpentane	00108-08-7	1.46	0.48	0.697	
Methylcyclopentane	00096-37-7	2.05	0.47	0.959	
2-Methyl-1-butene	00563-46-2	6.38	0.43	2.735	
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.39	0.523	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.32	1.722	
t-2-Pentene	00646-04-8	15.20	0.23	3.529	
2-Methyl-2-butene	00513-35-9	14.20	0.20	2.789	
n-Heptane	00142-82-5	0.97	0.17	0.167	
n-Hexane	00110-54-3	1.13	0.07	0.080	
		Total	58.9	126.3	2.144

Vehicle 8001 - Fuel E32 - RL Cold - Test 25751					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
	DNA				

Vehicle 8001 - Fuel E59 - RL Cold - Test 25770					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	35.56	51.530	
n-Propylbenzene	00103-65-1	1.96	30.83	60.409	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.74	6.429	
Unknown #22		3.41	4.71	16.055	
Acetylene (Ethyne)	00074-86-2	0.95	3.64	3.444	
Toluene	00108-88-3	3.93	3.63	14.251	
Ethylene	00074-85-1	8.88	3.36	29.882	
n-Butane	00106-97-8	1.08	2.80	3.019	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.59	20.053	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.46	19.504	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.31	2.431	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	1.91	8.384	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.87	2.248	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.25	1.744	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.07	1.015	
n-Pentane	00109-66-0	1.21	1.02	1.245	
3-Methylpentane	00096-14-0	1.69	0.88	1.491	
2,3-Dimethylbutane	00079-29-8	0.90	0.88	0.792	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.77	1.242	
2-Methyl-1-butene	00563-46-2	6.38	0.76	4.835	
ortho-Xylene	00095-47-6	7.58	0.76	5.722	
2,2-Dimethylbutane	00075-83-2	1.11	0.73	0.813	
c-2-Pentene	00627-20-3	10.28	0.71	7.348	
n-Heptane	00142-82-5	0.97	0.67	0.648	
n-Hexane	00110-54-3	1.13	0.67	0.757	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.64	2.053	
Methylcyclopentane	00096-37-7	2.05	0.36	0.732	
2-Methylhexane	00591-76-4	1.09	0.24	0.256	
2-Methyl-2-butene	00513-35-9	14.20	0.22	3.074	
Cyclohexane	00110-82-7	1.14	0.15	0.167	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.14	0.768	
2,4-Dimethylpentane	00108-08-7	1.46	0.13	0.188	
		Total	112.5	272.5	2.423
No MIR available, use average of 3.41					

Vehicle 8001 - Fuel E85 - RL Cold - Test 25722					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	39.12	56.677	
t-2-Butene	00624-64-6	15.20	6.45	98.093	
Ethylene	00074-85-1	8.88	4.85	43.094	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.70	6.365	
Unknown #22		4.40	3.94	17.344	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.10	24.608	
n-Hexane	00110-54-3	1.13	2.74	3.111	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.50	3.491	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.35	17.372	
n-Butane	00106-97-8	1.08	1.87	2.015	
c-2-Butene	00590-18-1	14.26	1.70	24.313	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.42	1.590	
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.38	16.198	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.36	1.485	
2,2-DiMeHexane	00590-73-8	0.94	0.95	0.895	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.90	1.075	
Benzene	00071-43-2	0.69	0.88	0.612	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.88	3.863	
Methylcyclohexane	00108-87-2	1.56	0.86	1.332	
n-Decane	00124-18-5	0.59	0.71	0.419	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.47	5.524	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.39	3.048	
2,2-Dimethylbutane	00075-83-2	1.11	0.35	0.394	
Methylcyclopentane	00096-37-7	2.05	0.30	0.610	
Cyclopentene	00142-29-0	6.69	0.28	1.854	
3-Methylpentane	00096-14-0	1.69	0.20	0.343	
2,3-Dimethylpentane	00565-59-3	1.25	0.20	0.253	
Toluene	00108-88-3	3.93	0.19	0.745	
n-Heptane	00142-82-5	0.97	0.18	0.173	
Cyclohexane	00110-82-7	1.14	0.18	0.203	
2-Methyl-2-butene	00513-35-9	14.20	0.16	2.316	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.16	0.841	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.13	0.119	
Ethylbenzene	00100-41-4	2.96	0.06	0.180	
		Total	85.9	340.6	3.964
No MIR available, use average of 4.40					

Vehicle 8001 - Fuel E85 Repeat - RL Cold - Test 25733					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	94.09	136.334	
Ethylene	00074-85-1	8.88	17.61	156.427	
2,3,5-Trimethylhexane	01069-53-0	1.12	7.93	8.881	
Acetylene (Ethyne)	00074-86-2	0.95	7.36	6.964	
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.35	8.607	
Toluene	00108-88-3	3.93	3.50	13.744	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.12	24.184	
n-Decane	00124-18-5	0.59	3.03	1.787	
2-Methylheptane	00592-27-8	0.97	2.01	1.947	
Indan	00496-11-7	3.23	1.87	6.049	
n-Pentane	00109-66-0	1.21	1.34	1.626	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.32	1.840	
n-Undecane	01120-21-4	0.52	1.28	0.668	
3-Methyl-c-2-pentene	00922-62-3	12.52	1.27	15.848	
3-Methylheptane	00589-81-1	1.12	1.23	1.382	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.12	1.180	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.89	4.935	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.87	1.040	
n-Heptane	00142-82-5	0.97	0.82	0.797	
Methylcyclopentane	00096-37-7	2.05	0.80	1.648	
Cyclohexane	00110-82-7	1.14	0.76	0.869	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.76	0.724	
Cyclopentene	00142-29-0	6.69	0.74	4.964	
2,3-Dimethylbutane	00079-29-8	0.90	0.72	0.647	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.70	7.362	
n-Hexane	00110-54-3	1.13	0.68	0.770	
ortho-Xylene	00095-47-6	7.58	0.60	4.560	
3-Methylpentane	00096-14-0	1.69	0.60	1.009	
2,2-DiMeHexane	00590-73-8	0.94	0.58	0.548	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.53	2.326	
t-2-Hexene	04050-45-7	8.55	0.52	4.467	
2-Methyl-2-butene	00513-35-9	14.20	0.52	7.330	
Methylcyclohexane	00108-87-2	1.56	0.43	0.675	
n-Propylbenzene	00103-65-1	1.96	0.43	0.849	
2,2-Dimethylbutane	00075-83-2	1.11	0.40	0.446	
2,4-Dimethylhexane	00589-43-5	1.61	0.38	0.612	
Benzene	00071-43-2	0.69	0.34	0.237	
2,4-Dimethylpentane	00108-08-7	1.46	0.33	0.479	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.29	2.133	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.28	3.264	
2,3-DiMeHexane & 2,3-MeEtPentan	00584-94-1+	1.09	0.25	0.278	
Ethylbenzene	00100-41-4	2.96	0.23	0.668	
n-Octane	00111-65-9	0.80	0.21	0.169	
2-Methylhexane	00591-76-4	1.09	0.21	0.223	

Vehicle 8001 - Fuel E85 Repeat - RL Cold - Test 25733 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2,3-Dimethylpentane	00565-59-3	1.25	0.14	0.179	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.12	0.193	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.02	0.133	
		Total	169.6	442.0	2.606

Vehicle 8001 - Fuel E6 - RL Hot - Test 25716					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethylene	00074-85-1	8.88	12.13	107.763	
2,3,5-Trimethylhexane	01069-53-0	1.12	7.57	8.478	
Acetylene (Ethyne)	00074-86-2	0.95	6.96	6.583	
Toluene	00108-88-3	3.93	6.68	26.216	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.97	7.154	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.86	45.455	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.85	46.481	
Methane	00074-82-8	0.01	5.60	0.078	
2,2,5-Trimethylhexane	03522-94-9	1.05	4.82	5.078	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.54	6.149	
n-Pentane	00109-66-0	1.21	4.28	5.201	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.79	5.304	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.51	25.912	
Cyclohexane	00110-82-7	1.14	3.41	3.881	
Benzene	00071-43-2	0.69	2.34	1.623	
2-Methylhexane	00591-76-4	1.09	2.30	2.494	
3-Methylnonane	05911-04-6	0.66	2.29	1.502	
3-Methylpentane	00096-14-0	1.69	2.25	3.807	
t-2-Butene	00624-64-6	15.20	2.12	32.160	
2-Methyl-1,3-butadiene	00078-79-5	10.48	2.03	21.285	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.01	1.908	
2,3-Dimethylbutane	00079-29-8	0.90	1.88	1.689	
2,3-Dimethylpentane	00565-59-3	1.25	1.68	2.097	
2,4-Dimethylpentane	00108-08-7	1.46	1.63	2.374	
Methylcyclohexane	00108-87-2	1.56	1.57	2.449	
2,4-Dimethylhexane	00589-43-5	1.61	1.53	2.462	
1,3-Butadiene	00106-99-0	12.45	1.45	18.035	
2,2-Dimethylbutane	00075-83-2	1.11	1.32	1.463	
Ethylbenzene	00100-41-4	2.96	1.23	3.657	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.20	3.836	
Methylcyclopentane	00096-37-7	2.05	1.09	2.237	
n-Hexane	00110-54-3	1.13	0.94	1.066	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.84	1.355	
Cyclopentene	00142-29-0	6.69	0.83	5.569	
n-Heptane	00142-82-5	0.97	0.76	0.734	
ortho-Xylene	00095-47-6	7.58	0.51	3.901	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.51	5.986	
n-Butane	00106-97-8	1.08	0.47	0.511	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.40	4.638	
2-Methyl-1-butene	00563-46-2	6.38	0.38	2.393	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.25	0.270	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.17	0.941	
n-Propylbenzene	00103-65-1	1.96	0.15	0.296	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.09	0.696	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.08	0.405	
		Total	117.3	433.6	3.697

Vehicle 8001 - Fuel E32 - RL Hot - Test 25751					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	45.54	65.991	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	15.80	116.672	
Ethylene	00074-85-1	8.88	11.69	103.866	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.82	54.178	
t-2-Butene	00624-64-6	15.20	6.43	97.648	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	6.06	7.271	
2,3-Dimethylbutane	00079-29-8	0.90	5.67	5.099	
2,2,5-Trimethylhexane	03522-94-9	1.05	5.38	5.664	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.44	6.016	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.07	5.683	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.72	28.848	
2,4-Dimethylhexane	00589-43-5	1.61	3.58	5.743	
1,3-Butadiene	00106-99-0	12.45	3.56	44.293	
Naphthalene	00091-20-3	3.28	3.23	10.607	
2,3,5-Trimethylhexane	01069-53-0	1.12	3.08	3.447	
Benzene	00071-43-2	0.69	2.80	1.943	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.54	2.405	
3-Methylpentane	00096-14-0	1.69	2.48	4.193	
2-Methylheptane	00592-27-8	0.97	2.47	2.386	
n-Decane	00124-18-5	0.59	2.18	1.288	
n-Pentane	00109-66-0	1.21	2.16	2.627	
Toluene	00108-88-3	3.93	2.05	8.037	
3-Methyl-t-2-pentene	00616-12-6	11.66	1.94	22.647	
n-Octane	00111-65-9	0.80	1.94	1.546	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.87	2.045	
2,4-Dimethylpentane	00108-08-7	1.46	1.63	2.373	
1,2,3-Trimethylbenzene	00526-73-8	11.94	1.60	19.068	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	1.58	11.192	
ortho-Xylene	00095-47-6	7.58	1.55	11.715	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.54	4.905	
Methylcyclopentane	00096-37-7	2.05	1.44	2.953	
Unknown #16		4.52	1.31	5.920	
Indan	00496-11-7	3.23	1.03	3.335	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.03	1.646	
2-Methyl-1,3-butadiene	00078-79-5	10.48	1.02	10.705	
2-Methylhexane	00591-76-4	1.09	0.94	1.015	
n-Butane	00106-97-8	1.08	0.93	0.999	
c-2-Butene	00590-18-1	14.26	0.81	11.493	
2,2-Dimethylbutane	00075-83-2	1.11	0.78	0.865	
2,3-Dimethylpentane	00565-59-3	1.25	0.71	0.890	
2-Methyl-2-pentene	00625-27-4	11.03	0.70	7.705	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.52	2.775	
n-Heptane	00142-82-5	0.97	0.48	0.465	
2-Methyl-2-butene	00513-35-9	14.20	0.45	6.350	

Vehicle 8001 - Fuel E32 - RL Hot - Test 25751 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethylbenzene	00100-41-4	2.96	0.44	1.292	
n-Hexane	00110-54-3	1.13	0.42	0.482	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.37	1.645	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.27	3.227	
Cyclohexane	00110-82-7	1.14	0.22	0.248	
		Total	173.2	723.4	4.176
No MIR available, use average of 4.52					

Vehicle 8001 - Fuel E59 - RL Hot - Test 25770					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	68.71	99.566	
2-Methylbutane (Isopentane)	00078-78-4	1.35	10.87	14.729	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	8.59	63.417	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	6.96	8.346	
Toluene	00108-88-3	3.93	6.85	26.899	
1-Butyne	00107-00-6	6.05	5.64	34.107	
Ethylene	00074-85-1	8.88	5.29	46.957	
n-Butane	00106-97-8	1.08	4.98	5.361	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	4.65	20.436	
2,2,5-Trimethylhexane	03522-94-9	1.05	4.53	4.771	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.03	4.514	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.77	29.213	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.64	28.902	
2,3-Dimethylbutane	00079-29-8	0.90	3.46	3.112	
n-Pentane	00109-66-0	1.21	3.43	4.168	
1,3-Butadiene	00106-99-0	12.45	3.14	39.084	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.10	4.329	
c-2-Butene	00590-18-1	14.26	2.97	42.301	
Unknown #22		4.79	2.92	14.020	
3-Methylpentane	00096-14-0	1.69	2.73	4.618	
Unknown #16		4.79	2.50	12.008	
1,3,5-Trimethylbenzene	00108-67-8	11.75	2.50	29.438	
n-Heptane	00142-82-5	0.97	2.35	2.269	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	2.27	12.557	
n-Decane	00124-18-5	0.59	2.24	1.321	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.75	1.907	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.74	9.348	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.69	5.406	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	1.66	8.795	
c-1,3-Dimethylcyclopentane	02532-58-3	4.79	1.66	7.958	
1,2,3-Trimethylbenzene	00526-73-8	11.94	1.65	19.647	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.63	2.619	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.62	1.533	
n-Propylbenzene	00103-65-1	1.96	1.48	2.892	
n-Hexane	00110-54-3	1.13	1.44	1.635	
2,2-Dimethylbutane	00075-83-2	1.11	1.31	1.453	
2,2-DiMeHexane	00590-73-8	0.94	1.23	1.162	
Indan	00496-11-7	3.23	1.22	3.946	
1,3-Dimethyl-2-Ethylbenzene	02870-04-4	10.16	1.08	10.979	
2-Methylheptane	00592-27-8	0.97	1.05	1.013	
Methylcyclopentane	00096-37-7	2.05	1.03	2.110	
Cyclohexane	00110-82-7	1.14	1.03	1.171	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.00	11.734	
2-Methyl-1-butene	00563-46-2	6.38	0.95	6.079	

Vehicle 8001 - Fuel E59 - RL Hot - Test 25770 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methyl-2-butene	00513-35-9	14.20	0.91	12.913	
2-Methylhexane	00591-76-4	1.09	0.90	0.978	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.79	5.603	
ortho-Xylene	00095-47-6	7.58	0.76	5.722	
t-2-Butene	00624-64-6	15.20	0.69	10.530	
c-2-Pentene	00627-20-3	10.28	0.67	6.903	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.65	6.838	
Methylcyclohexane	00108-87-2	1.56	0.60	0.927	
2,4-Dimethylpentane	00108-08-7	1.46	0.58	0.845	
2,3-Dimethylpentane	00565-59-3	1.25	0.58	0.723	
Unknown #17		4.79	0.58	2.762	
Ethylbenzene	00100-41-4	2.96	0.54	1.592	
Benzene	00071-43-2	0.69	0.24	0.164	
t-2-Pentene	00646-04-8	10.47	0.17	1.815	
		Total	207.0	716.1	3.460
No MIR available, use average of 4.79					

Vehicle 8001 - Fuel E85 - RL Hot - Test 25722					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	90.26	130.785	
Ethylene	00074-85-1	8.88	9.30	82.598	
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.10	8.269	
Methane	00074-82-8	0.01	5.79	0.080	
2,3,5-Trimethylhexane	01069-53-0	1.12	5.68	6.359	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.42	43.023	
t-2-Butene	00624-64-6	15.20	5.24	79.585	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.98	38.605	
Acetylene (Ethyne)	00074-86-2	0.95	4.15	3.929	
Benzene	00071-43-2	0.69	2.34	1.627	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.01	2.810	
n-Decane	00124-18-5	0.59	1.77	1.047	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.40	16.340	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.31	9.651	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.30	1.564	
Toluene	00108-88-3	3.93	1.26	4.964	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.02	1.077	
n-Hexane	00110-54-3	1.13	0.95	1.083	
n-Pentane	00109-66-0	1.21	0.80	0.968	
Methylcyclopentane	00096-37-7	2.05	0.67	1.383	
2-Methyl-2-butene	00513-35-9	14.20	0.65	9.262	
3-Methylpentane	00096-14-0	1.69	0.65	1.099	
2,2-DiMeHexane	00590-73-8	0.94	0.63	0.597	
Ethylbenzene	00100-41-4	2.96	0.59	1.739	
2,4-Dimethylhexane	00589-43-5	1.61	0.53	0.859	
Cyclopentene	00142-29-0	6.69	0.50	3.311	
n-Heptane	00142-82-5	0.97	0.48	0.460	
c-2-Pentene	00627-20-3	10.28	0.43	4.402	
2,2-Dimethylbutane	00075-83-2	1.11	0.40	0.441	
t-2-Pentene	00646-04-8	10.47	0.39	4.058	
2,3-Dimethylbutane	00079-29-8	0.90	0.37	0.328	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.33	1.461	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.29	0.278	
Cyclohexane	00110-82-7	1.14	0.22	0.248	
2,4-Dimethylpentane	00108-08-7	1.46	0.16	0.236	
2-Methylhexane	00591-76-4	1.09	0.12	0.132	
2,3-Dimethylpentane	00565-59-3	1.25	0.10	0.126	
		Total	158.6	464.8	2.931

Vehicle 8001 - Fuel E85 Repeat - RL Hot - Test 25733					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	192.51	278.948	
Ethylene	00074-85-1	8.88	33.99	301.940	
2-Methylbutane (Isopentane)	00078-78-4	1.35	30.53	41.363	
Toluene	00108-88-3	3.93	7.09	27.824	
n-Pentane	00109-66-0	1.21	5.44	6.608	
		Total	269.6	656.7	2.436

Vehicle 8001 - Fuel E6 - HS - Test 7298					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Methane	00074-82-8	0.01	5.73	0.079	
n-Butane	00106-97-8	1.08	4.81	5.184	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.65	2.232	
n-Pentane	00109-66-0	1.21	1.28	1.555	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.27	1.778	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.09	8.430	
Toluene	00108-88-3	3.93	1.00	3.929	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.96	1.016	
3-Methylpentane	00096-14-0	1.69	0.76	1.290	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.64	0.766	
n-Hexane	00110-54-3	1.13	0.59	0.665	
2,3-Dimethylbutane	00079-29-8	0.90	0.56	0.506	
2,2-Dimethylbutane	00075-83-2	1.11	0.56	0.619	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.40	2.127	
2-Methylheptane	00592-27-8	0.97	0.38	0.371	
2,3-Dimethylpentane	00565-59-3	1.25	0.36	0.452	
2-Methylhexane	00591-76-4	1.09	0.36	0.393	
2,4-Dimethylhexane	00589-43-5	1.61	0.35	0.560	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.34	1.069	
Cyclohexane	00110-82-7	1.14	0.33	0.373	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.33	0.309	
2-Methyl-2-butene	00513-35-9	1.61	0.29	0.463	
Methylcyclopentane	00096-37-7	2.05	0.28	0.564	
3-Methylnonane	005911-04-6	0.66	0.20	0.132	
2,4-Dimethylpentane	00108-08-7	1.46	0.20	0.291	
Benzene	00071-43-2	0.69	0.20	0.137	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.18	0.290	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.18	0.192	
n-Heptane	00142-82-5	0.97	0.16	0.154	
t-2-Hexene	04050-45-7	8.55	0.16	1.328	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.15	1.833	
c-2-Pentene	00627-20-3	10.28	0.14	1.411	
n-Octane	00111-65-9	0.80	0.12	0.094	
2-Methyl-1-butene	00563-46-2	6.38	0.11	0.701	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.10	0.541	
1-Methylcyclopentene	00693-89-0	12.45	0.08	1.025	
2-Methyl-2-pentene	00625-27-4	11.03	0.07	0.734	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.06	0.673	
Cyclopentene	00142-29-0	6.69	0.03	0.208	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.02	0.134	
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	0.01	0.083	
		Total	26.5	44.7	1.688

Vehicle 8001 - Fuel E32 - HS - Test 7457					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	14.23	20.615	
n-Propylbenzene	00103-65-1	1.96	9.21	18.050	
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.07	4.155	
n-Pentane	00109-66-0	1.21	1.29	1.566	
n-Decane	00124-18-5	0.59	1.15	0.679	
t-2-Butene	00624-64-6	15.20	1.03	15.644	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.01	7.848	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.91	1.266	
Methane	00074-82-8	0.01	0.81	0.011	
Methylcyclopentane	00096-37-7	2.05	0.69	1.412	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.56	0.672	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.54	0.604	
ortho-Xylene	00095-47-6	7.58	0.47	3.541	
n-Nonane	00111-84-2	0.68	0.38	0.260	
n-Octane	00111-65-9	0.80	0.38	0.302	
2,4-Dimethylpentane	00108-08-7	1.46	0.38	0.548	
3-Methylheptane	00589-81-1	1.12	0.35	0.398	
2-Methyl-2-butene	00513-35-9	14.20	0.33	4.751	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.32	0.340	
n-Hexane	00110-54-3	1.13	0.32	0.365	
2,3-Dimethylbutane	00079-29-8	0.90	0.31	0.279	
Toluene	00108-88-3	3.93	0.30	1.190	
2-Methyl-2-pentene	00625-27-4	11.03	0.30	3.275	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.29	0.277	
3-Methylpentane	00096-14-0	1.69	0.29	0.483	
c-1,3-Dimethylcyclopentane	02532-58-3	3.81	0.29	1.086	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.27	1.505	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.24	1.608	
2,2-Dimethylbutane	00075-83-2	1.11	0.24	0.270	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.22	0.696	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.20	2.354	
2-Methylheptane	00592-27-8	0.97	0.17	0.162	
t-2-Hexene	04050-45-7	8.55	0.17	1.421	
2,3-Dimethylpentane	00565-59-3	1.25	0.16	0.204	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.16	0.170	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.15	1.783	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.14	0.229	
2-Methylhexane	00591-76-4	1.09	0.14	0.151	
Benzene	00071-43-2	0.69	0.13	0.093	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.12	1.486	
Cyclohexane	00110-82-7	1.14	0.11	0.128	
Indan	00496-11-7	3.23	0.09	0.281	
t-1,2-Dimethylcyclopentane	00822-50-4	3.81	0.07	0.267	
2,4-Dimethylhexane	00589-43-5	1.61	0.02	0.029	

Vehicle 8001 - Fuel E32 - HS - Test 7457 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
t-2-Pentene	00646-04-8	10.47	0.01	0.064	
Methylcyclohexane	00108-87-2	1.56	0.01	0.009	
		Total	42.0	102.5	2.440
No MIR available, use average of 3.81					

Vehicle 8001 - Fuel E59 - HS - Test 7534					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	16.93	24.527	
Benzene	00071-43-2	0.69	0.06	0.043	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.06	2.790	
2,3-Dimethylbutane	00079-29-8	0.90	0.13	0.117	
ortho-Xylene	00095-47-6	7.58	0.61	4.599	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.14	0.774	
3-Methylpentane	00096-14-0	1.69	0.36	0.602	
Methylcyclopentane	00096-37-7	2.05	0.24	0.486	
n-Butane	00106-97-8	1.08	0.16	0.171	
2,4-Dimethylpentane	00108-08-7	1.46	0.10	0.140	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.62	4.811	
Toluene	00108-88-3	3.93	1.40	5.492	
n-Pentane	00109-66-0	1.21	1.15	1.400	
n-Hexane	00110-54-3	1.13	0.34	0.391	
Cyclohexane	00110-82-7	1.14	0.19	0.213	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.25	0.791	
n-Heptane	00142-82-5	0.97	0.03	0.027	
2-Methyl-2-butene	00513-35-9	14.20	0.27	3.876	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.53	0.638	
3-Methyl-1-butene	00563-45-1	6.85	9.12	62.542	
2,3-Dimethylpentane	00565-59-3	1.25	0.19	0.239	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.29	0.277	
2-Methylhexane	00591-76-4	1.09	0.19	0.202	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.47	18.228	
t-2-Pentene	00646-04-8	10.47	0.48	5.064	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.68	0.947	
		Total	39.0	139.4	3.575

Vehicle 8001 - Fuel E85 - HS - Test 7355					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	13.84	20.058	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.81	3.804	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.50	11.622	
Toluene	00108-88-3	3.93	1.38	5.418	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.83	2.634	
Methane	00074-82-8	0.01	0.81	0.011	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.81	6.428	
ortho-Xylene	00095-47-6	7.58	0.79	5.967	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.66	4.845	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.57	0.639	
2-Methylhexane	00591-76-4	1.09	0.39	0.422	
2,3-Dimethylpentane	00565-59-3	1.25	0.37	0.459	
3,3-Dimethylpentane	00562-49-2	1.12	0.35	0.387	
2,2-DiMeHexane	00590-73-8	0.94	0.34	0.324	
t-1,2-Dimethylcyclopentane	00822-50-4	2.76	0.31	0.861	
Cyclohexane	00110-82-7	1.14	0.29	0.332	
n-Octane	00111-65-9	0.80	0.28	0.223	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.26	0.315	
n-Nonane	00111-84-2	0.68	0.21	0.144	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.20	0.193	
c-1,3-Dimethylcyclopentane	02532-58-3	2.76	0.20	0.546	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.19	0.202	
Methylcyclohexane	00108-87-2	1.56	0.15	0.231	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.14	0.746	
n-Pentane	00109-66-0	1.21	0.14	0.168	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.13	0.727	
Benzene	00071-43-2	0.69	0.10	0.068	
n-Heptane	00142-82-5	0.97	0.09	0.086	
n-Propylbenzene	00103-65-1	1.96	0.03	0.063	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.03	0.042	
t-2-Pentene	00646-04-8	10.47	0.02	0.225	
2,4-Dimethylpentane	00108-08-7	1.46	0.02	0.031	
		Total	28.2	68.2	2.416
No MIR available, use average of 2.76					

Vehicle 8001 - Fuel E85 Repeat - HS - Test 7383					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	9.52	12.898	
2-Methylpropane	00075-28-5	1.18	8.37	9.847	
Ethanol	00064-17-5	1.45	3.92	5.679	
Toluene	00108-88-3	3.93	1.54	6.044	
n-Pentane	00109-66-0	1.21	1.52	1.848	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.70	0.834	
n-Propylbenzene	00103-65-1	1.96	0.62	1.215	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.43	3.326	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.26	1.938	
Cyclohexane	00110-82-7	1.14	0.20	0.230	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.20	0.191	
ortho-Xylene	00095-47-6	7.58	0.20	1.487	
Benzene	00071-43-2	0.69	0.16	0.112	
2,3-Dimethylpentane	00565-59-3	1.25	0.16	0.194	
2-Methylhexane	00591-76-4	1.09	0.15	0.166	
2,4-Dimethylpentane	00108-08-7	1.46	0.15	0.222	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.14	0.435	
n-Heptane	00142-82-5	0.97	0.13	0.125	
Methylcyclohexane	00108-87-2	1.56	0.10	0.159	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.10	0.101	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.08	0.124	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.07	0.359	
t-2-Pentene	00646-04-8	10.47	0.07	0.685	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.05	0.305	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.05	0.431	
2,2-DiMeHexane	00590-73-8	0.94	0.03	0.026	
		Total	28.9	49.0	1.694

Vehicle 8001 - Fuel E6 - DHB Day 1 - Test 7301					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	70.57	95.616	
n-Pentane	00109-66-0	1.21	17.47	21.229	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	16.42	22.958	
Toluene	00108-88-3	3.93	11.73	46.056	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	9.49	11.375	
3-Methylpentane	00096-14-0	1.69	9.10	15.382	
2,3-Dimethylbutane	00079-29-8	0.90	7.91	7.105	
n-Hexane	00110-54-3	1.13	6.32	7.174	
Methylcyclohexane	00108-87-2	1.56	5.95	9.250	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.46	42.347	
Methylcyclopentane	00096-37-7	2.05	5.38	11.024	
2,2-Dimethylbutane	00075-83-2	1.11	4.60	5.116	
Benzene	00071-43-2	0.69	3.32	2.303	
2,4-Dimethylpentane	00108-08-7	1.46	3.13	4.575	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.10	3.263	
2,2-Dimethylpropane	00463-82-1	0.65	3.03	1.958	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.94	2.787	
2-Methylhexane	00591-76-4	1.09	2.84	3.079	
Cyclohexane	00110-82-7	1.14	2.68	3.053	
2,3-Dimethylpentane	00565-59-3	1.25	2.27	2.828	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.25	7.173	
2-Methyl-2-butene	00513-35-9	1.61	2.08	3.344	
2,4-Dimethylhexane	00589-43-5	1.61	1.92	3.087	
t-2-Pentene	00646-04-8	10.47	1.57	16.470	
n-Heptane	00142-82-5	0.97	1.56	1.506	
c-2-Pentene	00627-20-3	10.28	1.52	15.615	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.44	2.310	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	7.07	1.42	10.049	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.41	1.536	
2-Methyl-1-butene	00563-46-2	6.38	1.29	8.230	
ortho-Xylene	00095-47-6	7.58	1.17	8.877	
3-Methylnonane	005911-04-6	0.66	1.11	0.727	
3-Methyl-t-2-pentene	00616-12-6	11.66	1.04	12.156	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.94	4.995	
2,4-Dimethylheptane	02213-23-2	1.26	0.94	1.184	
3-Methylheptane	00589-81-1	1.12	0.92	1.039	
2-Methylheptane	00592-27-8	0.97	0.92	0.890	
t-1,2-Dimethylcyclopentane	00822-50-4	4.33	0.90	3.901	
Ethylbenzene	00100-41-4	2.96	0.86	2.541	
t-2-Hexene	04050-45-7	8.55	0.86	7.316	
t-2-Butene	00624-64-6	15.20	0.85	12.971	
n-Octane	00111-65-9	0.80	0.80	0.637	
1,3-Butadiene	00106-99-0	12.45	0.75	9.280	
2-Methyl-2-pentene	00625-27-4	11.03	0.74	8.147	

Vehicle 8001 - Fuel E6 - DHB Day 1 - Test 7301 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.73	9.081	
c-1,3-Dimethylcyclopentane	02532-58-3	4.33	0.72	3.107	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.61	0.687	
1-Methylcyclopentene	00693-89-0	12.45	0.59	7.396	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.59	4.623	
c-1,3-Dimethylcyclohexane	00638-04-0	4.33	0.53	2.317	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.53	3.530	
3-Methyloctane	02216-33-3	0.88	0.51	0.453	
1,3-Diethylbenzene	00141-93-5	7.08	0.48	3.401	
Ethylcyclohexane	01678-91-7	1.35	0.46	0.614	
n-Propylbenzene	00103-65-1	1.96	0.44	0.866	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.44	5.115	
2,2-Dimethylpentane	00590-35-2	1.04	0.42	0.439	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.41	2.356	
t-3-Heptene	14686-14-7	6.17	0.38	2.357	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.36	1.368	
c-2-Heptene	06443-92-1	7.08	0.34	2.433	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.31	2.514	
Cyclopentene	00142-29-0	6.69	0.29	1.920	
Unknown #5		4.33	0.27	1.149	
n-Nonane	00111-84-2	0.68	0.23	0.159	
Indan	00496-11-7	3.23	0.22	0.722	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.19	1.008	
Unknown #8		4.33	0.17	0.753	
1,2,3,5-Tetramethylbenzene	00527-53-7	9.26	0.17	1.579	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.16	1.316	
Methane	00074-82-8	0.01	0.14	0.002	
Isobutylbenzene	00538-93-2	4.33	0.10	0.453	
		Total	233.8	524.2	2.242
No MIR available, use average of 4.33					

Vehicle 8001 - Fuel E32 - DHB Day 1 - Test 7460					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	128.78	186.594	
2-Methylbutane (Isopentane)	00078-78-4	1.35	45.89	62.181	
n-Pentane	00109-66-0	1.21	17.14	20.825	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	11.96	16.722	
3-Methylpentane	00096-14-0	1.69	6.42	10.861	
n-Hexane	00110-54-3	1.13	5.53	6.279	
2,3-Dimethylbutane	00079-29-8	0.90	5.37	4.830	
Methylcyclopentane	00096-37-7	2.05	3.85	7.900	
n-Butane	00106-97-8	1.08	3.68	3.964	
Benzene	00071-43-2	0.69	3.39	2.351	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.16	3.787	
Toluene	00108-88-3	3.93	2.82	11.061	
2,2-Dimethylbutane	00075-83-2	1.11	2.61	2.899	
Methane	00074-82-8	0.01	2.34	0.032	
Cyclohexane	00110-82-7	1.14	2.12	2.413	
2,2-DiMeHexane	00590-73-8	0.94	1.87	1.759	
2-Methyl-2-butene	00513-35-9	14.20	1.73	24.502	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.63	1.823	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.57	5.017	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.54	11.920	
Methylcyclohexane	00108-87-2	1.56	1.52	2.371	
2-Methylhexane	00591-76-4	1.09	1.46	1.580	
t-2-Pentene	00646-04-8	10.47	1.28	13.382	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.25	1.318	
Unknown #22		1.78	1.24	2.208	
2,4-Dimethylpentane	00108-08-7	1.46	1.21	1.768	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.19	9.432	
2,3-Dimethylpentane	00565-59-3	1.25	0.94	1.168	
t-1,2-Dimethylcyclopentane	00822-50-4	1.78	0.92	1.637	
n-Decane	00124-18-5	0.59	0.87	0.513	
2-Methyl-1-butene	00563-46-2	6.38	0.84	5.368	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.76	4.033	
c-1,3-Dimethylcyclopentane	02532-58-3	1.78	0.73	1.304	
n-Heptane	00142-82-5	0.97	0.69	0.667	
2,4-Dimethylhexane	00589-43-5	1.61	0.68	1.096	
t-2-Hexene	04050-45-7	8.55	0.67	5.688	
n-Octane	00111-65-9	0.80	0.60	0.474	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.56	6.499	
2,4-Dimethylheptane	02213-23-2	1.26	0.53	0.673	
Unknown #16		1.78	0.51	0.911	
c-2-Pentene	00627-20-3	10.28	0.47	4.863	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.47	5.559	
2-Methyl-2-pentene	00625-27-4	11.03	0.45	4.960	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.43	0.405	

Vehicle 8001 - Fuel E32 - DHB Day 1 - Test 7460 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.43	2.812	
4-Methyloctane	02216-34-4	0.85	0.41	0.349	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.40	0.635	
3-Methylheptane	00589-81-1	1.12	0.40	0.444	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.39	2.236	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.37	1.430	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	7.07	0.36	2.513	
1,3-Diethylbenzene	00141-93-5	7.08	0.35	2.488	
c-2-Butene	00590-18-1	14.26	0.35	4.998	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.33	0.356	
ortho-Xylene	00095-47-6	7.58	0.32	2.451	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.30	1.671	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.29	3.601	
Ethylbenzene	00100-41-4	2.96	0.23	0.674	
Cyclopentene	00142-29-0	6.69	0.23	1.516	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.20	1.568	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.20	0.873	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.20	2.064	
2-Methylpropane	00075-28-5	1.18	0.15	0.177	
		Total	279.5	506.9	1.813
No MIR available, use average of 4.27					

Vehicle 8001 - Fuel E59 - DHB Day 1 - Test 7535					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	145.83	211.300	
2-Methylbutane (Isopentane)	00078-78-4	1.35	37.38	50.640	
n-Pentane	00109-66-0	1.21	12.86	15.620	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	8.30	11.602	
Toluene	00108-88-3	3.93	6.34	24.872	
n-Butane	00106-97-8	1.08	6.21	6.688	
n-Hexane	00110-54-3	1.13	5.14	5.828	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.57	5.478	
3-Methylpentane	00096-14-0	1.69	4.09	6.908	
2,3-Dimethylbutane	00079-29-8	0.90	3.96	3.560	
Methylcyclopentane	00096-37-7	2.05	3.32	6.811	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.61	19.292	
2,2-DiMeHexane	00590-73-8	0.94	2.11	1.989	
Benzene	00071-43-2	0.69	2.09	1.452	
t-2-Butene	00624-64-6	15.20	1.95	29.688	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.89	2.116	
Cyclohexane	00110-82-7	1.14	1.72	1.952	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.71	13.277	
2,2-Dimethylbutane	00075-83-2	1.11	1.71	1.895	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.68	5.351	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.59	1.678	
2-Methylhexane	00591-76-4	1.09	1.55	1.680	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.45	1.381	
2,4-Dimethylpentane	00108-08-7	1.46	1.40	2.039	
2,3-Dimethylpentane	00565-59-3	1.25	1.34	1.671	
2,4-Dimethylhexane	00589-43-5	1.61	1.32	2.113	
2-Methyl-2-butene	00513-35-9	14.20	1.29	18.337	
Methylcyclohexane	00108-87-2	1.56	1.14	1.770	
n-Heptane	00142-82-5	0.97	0.91	0.883	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.87	10.942	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.82	1.313	
t-2-Hexene	04050-45-7	8.55	0.77	6.572	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.75	3.962	
2,4-Dimethylheptane	02213-23-2	1.26	0.70	0.884	
2-Methylheptane	00592-27-8	0.97	0.67	0.645	
c-2-Pentene	00627-20-3	10.28	0.66	6.808	
t-1,2-Dimethylcyclopentane	00822-50-4	4.07	0.64	2.598	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.61	7.061	
ortho-Xylene	00095-47-6	7.58	0.59	4.475	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.57	3.757	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.54	0.585	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.53	4.221	
Ethylbenzene	00100-41-4	2.96	0.50	1.488	
Methane	00074-82-8	0.01	0.50	0.007	

Vehicle 8001 - Fuel E59 - DHB Day 1 - Test 7535 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.50	2.180	
n-Octane	00111-65-9	0.80	0.49	0.392	
n-Decane	00124-18-5	0.59	0.46	0.271	
2-Methyl-2-pentene	00625-27-4	11.03	0.46	5.054	
c-1,3-Dimethylcyclopentane	02532-58-3		0.43	0.000	
3-Methylheptane	00589-81-1	1.12	0.38	0.431	
2-Methyl-1-butene	00563-46-2	6.38	0.37	2.389	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.33	3.860	
t-2-Pentene	00646-04-8	10.47	0.31	3.297	
Cyclopentene	00142-29-0	6.69	0.18	1.199	
		Total	281.1	532.3	1.894
No MIR available, use average of 4.07					

Vehicle 8001 - Fuel E85 - DHB Day 1 - Test 7357					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	218.91	317.201	
2-Methylbutane (Isopentane)	00078-78-4	1.35	62.42	84.568	
n-Pentane	00109-66-0	1.21	17.14	20.821	
n-Butane	00106-97-8	1.08	7.97	8.587	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	5.06	7.070	
Toluene	00108-88-3	3.93	5.01	19.668	
Propene	00115-07-1	11.57	4.68	54.151	
n-Hexane	00110-54-3	1.13	4.41	5.005	
2,2-DiMeHexane	00590-73-8	0.94	3.03	2.848	
3-Methylpentane	00096-14-0	1.69	2.80	4.729	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.02	2.417	
Methylcyclopentane	00096-37-7	2.05	1.93	3.962	
Benzene	00071-43-2	0.69	1.73	1.201	
2,3-Dimethylbutane	00079-29-8	0.90	1.59	1.432	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.46	17.052	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.44	11.432	
2,2-Dimethylbutane	00075-83-2	1.11	1.34	1.492	
2-Methyl-1-butene	00563-46-2	6.38	1.28	8.162	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.27	9.837	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.26	1.416	
t-2-Pentene	00646-04-8	10.47	1.25	13.064	
2,4-Dimethylheptane	02213-23-2	1.26	1.23	1.550	
Cyclohexane	00110-82-7	1.14	1.06	1.200	
2-Methyl-2-butene	00513-35-9	14.20	0.98	13.967	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.97	1.021	
Methylcyclohexane	00108-87-2	1.56	0.95	1.478	
Cyclopentane	00287-92-3	2.24	0.84	1.877	
2-Methylhexane	00591-76-4	1.09	0.84	0.908	
2,4-Dimethylpentane	00108-08-7	1.46	0.81	1.175	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.74	0.705	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.73	9.090	
2,4-Dimethylhexane	00589-43-5	1.61	0.72	1.160	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.71	2.280	
1,3-Butadiene	00106-99-0	12.45	0.70	8.656	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.68	7.982	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.64	1.027	
n-Heptane	00142-82-5	0.97	0.64	0.614	
c-2-Pentene	00627-20-3	10.28	0.61	6.302	
c-2-Butene	00590-18-1	14.26	0.58	8.274	
4-Methyloctane	02216-34-4	0.85	0.53	0.451	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.53	2.309	
n-Octane	00111-65-9	0.80	0.51	0.404	
2,3-Dimethylpentane	00565-59-3	1.25	0.51	0.632	
Indan	00496-11-7	3.23	0.49	1.578	

Vehicle 8001 - Fuel E85 - DHB Day 1 - Test 7357 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.48	2.546	
Unknown #22		4.59	0.44	2.025	
t-2-Hexene	04050-45-7	8.55	0.42	3.573	
Ethylbenzene	00100-41-4	2.96	0.42	1.236	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.39	2.878	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.36	2.564	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.36	4.142	
t-1,2-Dimethylcyclopentane	00822-50-4	4.59	0.35	1.617	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.33	2.209	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.33	0.364	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.33	1.832	
c-1,3-Dimethylcyclopentane	02532-58-3	4.59	0.29	1.342	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.29	3.454	
2-Methylheptane	00592-27-8	0.97	0.28	0.275	
2-Methyl-2-pentene	00625-27-4	11.03	0.28	3.112	
c-2-Heptene	06443-92-1	7.08	0.26	1.807	
3-Methyloctane	02216-33-3	0.88	0.20	0.178	
n-Propylbenzene	00103-65-1	1.96	0.20	0.391	
3-Methylheptane	00589-81-1	1.12	0.20	0.221	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.19	1.041	
Cyclopentene	00142-29-0	6.69	0.19	1.257	
c-1,3-Dimethylcyclohexane	00638-04-0	4.59	0.18	0.812	
		Total	371.7	709.6	1.909
No MIR available, use average of 4.59					

Vehicle 8001 - Fuel E85 Repeat - DHB Day 1 - Test 7386					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	213.52	309.382	
2-Methylbutane (Isopentane)	00078-78-4	1.35	33.32	45.143	
n-Pentane	00109-66-0	1.21	12.23	14.862	
Propene	00115-07-1	11.57	4.68	54.151	
n-Propylbenzene	00103-65-1	1.96	4.57	8.958	
Toluene	00108-88-3	3.93	4.49	17.606	
n-Butane	00106-97-8	1.08	4.40	4.740	
n-Hexane	00110-54-3	1.13	4.14	4.696	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.04	5.643	
2,2-DiMeHexane	00590-73-8	0.94	2.77	2.608	
3-Methylpentane	00096-14-0	1.69	2.61	4.412	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.03	2.436	
Benzene	00071-43-2	0.69	1.92	1.334	
Methylcyclopentane	00096-37-7	2.05	1.76	3.609	
2,3-Dimethylbutane	00079-29-8	0.90	1.14	1.028	
t-2-Pentene	00646-04-8	10.47	1.02	10.699	
2,4-Dimethylhexane	00589-43-5	1.61	1.02	1.636	
Methylcyclohexane	00108-87-2	1.56	0.98	1.517	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.97	11.409	
2-Methyl-1-butene	00563-46-2	6.38	0.97	6.207	
2-Methylhexane	00591-76-4	1.09	0.94	1.024	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.94	7.252	
2-Methyl-2-butene	00513-35-9	14.20	0.90	12.745	
Cyclohexane	00110-82-7	1.14	0.88	0.998	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.82	6.551	
ortho-Xylene	00095-47-6	7.58	0.81	6.110	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.76	0.725	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.75	0.792	
n-Heptane	00142-82-5	0.97	0.75	0.725	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.68	2.178	
2,4-Dimethylheptane	02213-23-2	1.26	0.67	0.848	
2,4-Dimethylpentane	00108-08-7	1.46	0.62	0.903	
Cyclopentane	00287-92-3	2.24	0.61	1.371	
2,2-Dimethylbutane	00075-83-2	1.11	0.59	0.660	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.58	3.072	
2,3-Dimethylpentane	00565-59-3	1.25	0.52	0.652	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.52	6.474	
c-2-Pentene	00627-20-3	10.28	0.46	4.699	
Indan	00496-11-7	3.23	0.45	1.465	
c-2-Butene	00590-18-1	14.26	0.45	6.435	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.42	2.761	
t-2-Hexene	04050-45-7	8.55	0.39	3.305	
Ethylbenzene	00100-41-4	2.96	0.39	1.144	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.38	2.127	

Vehicle 8001 - Fuel E85 Repeat - DHB Day 1 - Test 7386 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
n-Octane	00111-65-9	0.80	0.36	0.287	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.32	3.716	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.31	0.340	
t-1,2-Dimethylcyclopentane	00822-50-4	4.46	0.29	1.275	
2-Methyl-2-pentene	00625-27-4	11.03	0.28	3.112	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.26	0.293	
Cyclopentene	00142-29-0	6.69	0.24	1.571	
2-Methylheptane	00592-27-8	0.97	0.22	0.211	
c-1,3-Dimethylcyclopentane	02532-58-3	4.46	0.21	0.931	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.11	0.467	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.11	1.249	
		Total	320.6	600.5	1.873
No MIR available, use average of 4.46					

Vehicle 8001 - Fuel E6 - DHB Total - Test 7301					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	130.23	176.441	
Ethanol	00064-17-5	1.45	45.66	66.162	
n-Pentane	00109-66-0	1.21	33.41	40.594	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	31.99	44.717	
Toluene	00108-88-3	3.93	19.83	77.827	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	18.09	21.690	
3-Methylpentane	00096-14-0	5.65	17.63	99.660	
2,3-Dimethylbutane	00079-29-8	0.90	15.20	13.662	
n-Hexane	00110-54-3	1.13	12.41	14.076	
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	11.89	67.174	
Methylcyclopentane	00096-37-7	2.05	10.24	20.987	
Methylcyclohexane	00108-87-2	1.56	9.79	15.233	
2,2-Dimethylbutane	00075-83-2	1.11	9.34	10.379	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	7.27	56.377	
Benzene	00071-43-2	0.69	5.78	4.011	
2,4-Dimethylpentane	00108-08-7	1.46	5.77	8.425	
2,2,5-Trimethylhexane	03522-94-9	1.05	5.62	5.917	
2-Methylhexane	00591-76-4	1.09	5.45	5.918	
2,3,4-Trimethylpentane	00565-75-3	0.95	5.36	5.082	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	4.70	15.011	
Cyclohexane	00110-82-7	1.14	4.41	5.020	
2,2-Dimethylpropane	00463-82-1	0.65	4.39	2.837	
2,3-Dimethylpentane	00565-59-3	1.25	4.33	5.408	
2-Methyl-2-butene	00513-35-9	1.61	4.15	6.667	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.12	4.613	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	3.95	21.232	
2,4-Dimethylhexane	00589-43-5	1.61	3.51	5.640	
2-Methyl-1-butene	00563-46-2	6.38	3.23	20.603	
t-2-Pentene	00646-04-8	10.47	3.15	32.986	
n-Heptane	00142-82-5	0.97	2.84	2.745	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.42	3.884	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	2.27	12.015	
c-2-Pentene	00627-20-3	10.28	2.11	21.695	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	2.11	2.304	
3-Methyl-t-2-pentene	00616-12-6	11.66	1.99	23.147	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	7.07	1.76	12.462	
t-1,2-Dimethylcyclopentane	00822-50-4	4.28	1.72	7.382	
2-Methylheptane	00592-27-8	0.97	1.71	1.656	
t-2-Hexene	04050-45-7	8.55	1.69	14.483	
3-Methyl-c-2-pentene	00922-62-3	12.52	1.64	20.500	
ortho-Xylene	00095-47-6	7.58	1.57	11.921	
3-Methylheptane	00589-81-1	1.12	1.55	1.746	
c-1,3-Dimethylcyclopentane	02532-58-3	4.28	1.48	6.344	
2-Methyl-2-pentene	00625-27-4	11.03	1.39	15.336	

Vehicle 8001 - Fuel E6 - DHB Total - Test 7301 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2,4-Dimethylheptane	02213-23-2	1.26	1.39	1.753	
Cyclopentene	00142-29-0	6.69	1.32	8.846	
Ethylbenzene	00100-41-4	2.96	1.29	3.830	
1,3-Butadiene	00106-99-0	12.45	1.25	15.624	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.22	8.036	
3,3-Dimethyl-1-butene	00558-37-2	5.68	1.19	6.772	
3-Methylnonane	005911-04-6	0.66	1.19	0.780	
n-Octane	00111-65-9	0.80	1.19	0.944	
1-Methylcyclopentene	00693-89-0	12.45	1.15	14.369	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	1.04	8.149	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.84	4.866	
c-1,3-Dimethylcyclohexane	00638-04-0	4.28	0.81	3.480	
2,2-Dimethylpentane	00590-35-2	1.04	0.70	0.735	
Ethylcyclohexane	01678-91-7	1.35	0.70	0.941	
c-2-Heptene	06443-92-1	7.08	0.68	4.836	
3-Methyloctane	02216-33-3	0.88	0.65	0.576	
3-Me-1-Hexene	03404-61-3	4.28	0.62	2.642	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.53	4.480	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.52	5.475	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.44	5.171	
n-Propylbenzene	00103-65-1	1.96	0.43	0.841	
Unknown #3		4.28	0.43	1.823	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.42	0.444	
Unknown #5		4.28	0.41	1.750	
1,1-Dimethylcyclohexane	00590-66-9	1.12	0.41	0.455	
Unknown #6	.	4.28	0.41	1.750	
t-3-Heptene	14686-14-7	6.17	0.39	2.410	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.37	2.389	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.36	0.307	
Unknown #1		4.28	0.32	1.382	
1,3-Diethylbenzene	00141-93-5	7.08	0.31	2.222	
Indan	00496-11-7	3.23	0.31	1.008	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.28	1.076	
3,3-Dimethylhexane	00563-16-6	1.15	0.28	0.323	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	4.28	0.27	1.173	
t-2-Butene	00624-64-6	15.20	0.24	3.696	
Unknown #8		4.28	0.24	1.024	
n-Nonane	00111-84-2	0.68	0.17	0.116	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.09	0.524	
		Total	494.1	1159.0	2.346
No MIR available, use average of 4.28					

Vehicle 8001 - Fuel E32 - DHB Total - Test 7460					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	319.96	463.612	
2-Methylbutane (Isopentane)	00078-78-4	1.35	94.28	127.743	
n-Pentane	00109-66-0	1.21	34.74	42.202	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	26.82	37.484	
3-Methylpentane	00096-14-0	1.69	14.57	24.637	
n-Hexane	00110-54-3	1.13	12.78	14.500	
2,3-Dimethylbutane	00079-29-8	0.90	12.22	10.983	
Toluene	00108-88-3	3.93	11.19	43.924	
Propene	00115-07-1	11.57	8.57	99.160	
Methylcyclopentane	00096-37-7	2.05	8.45	17.324	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	7.41	8.886	
Methane	00074-82-8	0.01	6.91	0.096	
n-Butane	00106-97-8	1.08	6.56	7.064	
Benzene	00071-43-2	0.69	6.45	4.478	
2,2-Dimethylbutane	00075-83-2	1.11	5.93	6.588	
2-Methyl-2-butene	00513-35-9	14.20	4.36	61.821	
Cyclohexane	00110-82-7	1.14	3.93	4.472	
2,4-Dimethylpentane	00108-08-7	1.46	3.33	4.866	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.27	25.367	
Methylcyclohexane	00108-87-2	1.56	3.27	5.080	
t-2-Pentene	00646-04-8	10.47	3.23	33.840	
2-Methylhexane	00591-76-4	1.09	2.95	3.200	
2,2-DiMeHexane	00590-73-8	0.94	2.70	2.537	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.52	2.819	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.45	7.809	
2,3-Dimethylpentane	00565-59-3	1.25	2.34	2.925	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.23	2.347	
2-Methyl-1-butene	00563-46-2	6.38	2.14	13.635	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.92	15.232	
n-Heptane	00142-82-5	0.97	1.85	1.787	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	1.71	9.051	
Ethylene	00074-85-1	8.88	1.67	14.833	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.65	1.565	
t-2-Hexene	04050-45-7	8.55	1.62	13.886	
2,4-Dimethylhexane	00589-43-5	1.61	1.60	2.568	
c-2-Pentene	00627-20-3	10.28	1.53	15.725	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.53	17.887	
t-1,2-Dimethylcyclopentane	00822-50-4	4.60	1.41	6.471	
3-Methyl-t-2-pentene	00616-12-6	11.66	1.34	15.585	
n-Octane	00111-65-9	0.80	1.19	0.949	
c-1,3-Dimethylcyclopentane	02532-58-3	4.60	1.19	5.460	
1-Methylcyclopentene	00693-89-0	12.45	1.12	13.996	
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.12	13.132	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.09	5.851	

Vehicle 8001 - Fuel E32 - DHB Total - Test 7460 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methyl-2-pentene	00625-27-4	11.03	0.98	10.845	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.93	1.500	
c-1,3-Dimethylcyclohexane	00638-04-0	4.60	0.85	3.913	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.85	5.584	
Unknown #9		4.60	0.83	3.799	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.80	0.877	
3-Methylheptane	00589-81-1	1.12	0.80	0.903	
ortho-Xylene	00095-47-6	7.58	0.78	5.873	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.74	4.294	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.74	9.304	
2,4-Dimethylheptane	02213-23-2	1.26	0.74	0.934	
Unknown #16		4.60	0.71	3.279	
Cyclopentene	00142-29-0	6.69	0.67	4.508	
n-Decane	00124-18-5	0.59	0.67	0.397	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.66	4.910	
Unknown #22	.	4.60	0.65	3.014	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.61	4.795	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.60	2.650	
4-Methyloctane	02216-34-4	0.85	0.57	0.485	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.50	1.929	
Indan	00496-11-7	3.23	0.48	1.548	
Ethylbenzene	00100-41-4	2.96	0.47	1.384	
c-2-Heptene	06443-92-1	7.08	0.46	3.290	
1,3-Diethylbenzene	00141-93-5	7.08	0.45	3.220	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.44	1.696	
Unknown #5		4.60	0.41	1.871	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.38	2.089	
c-2-Butene	00590-18-1	14.26	0.36	5.173	
n-Nonane	00111-84-2	0.68	0.36	0.245	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.35	3.691	
2,2-Dimethylpentane	00590-35-2	1.04	0.34	0.357	
1-Nonene	00124-11-8	2.49	0.30	0.757	
Unknown #1		4.60	0.25	1.130	
t-3-Heptene	14686-14-7	6.17	0.23	1.416	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.22	1.873	
2-Methylheptane	00592-27-8	0.97	0.16	0.152	
3-Methyloctane	02216-33-3	0.88	0.12	0.108	
		Total	659.6	1337.2	2.027
No MIR available, use average of 4.60					

Vehicle 8001 - Fuel E59 - DHB Total - Test 7535					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	328.70	476.283	
2-Methylbutane (Isopentane)	00078-78-4	1.35	85.38	115.675	
n-Pentane	00109-66-0	1.21	29.11	35.371	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	18.06	25.246	
Toluene	00108-88-3	3.93	12.37	48.561	
n-Hexane	00110-54-3	1.13	10.44	11.846	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	9.62	11.532	
n-Butane	00106-97-8	1.08	9.45	10.174	
3-Methylpentane	00096-14-0	1.69	9.13	15.438	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	6.98	51.562	
2,3-Dimethylbutane	00079-29-8	0.90	6.89	6.190	
Methylcyclopentane	00096-37-7	2.05	6.23	12.769	
Benzene	00071-43-2	0.69	4.64	3.222	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.18	32.386	
2,2-Dimethylbutane	00075-83-2	1.11	3.85	4.278	
2,2-DiMeHexane	00590-73-8	0.94	3.63	3.419	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.59	3.782	
Cyclohexane	00110-82-7	1.14	3.46	3.941	
2,3,5-Trimethylhexane	01069-53-0	1.12	3.36	3.766	
2,4-Dimethylpentane	00108-08-7	1.46	3.15	4.596	
2-Methylhexane	00591-76-4	1.09	2.98	3.237	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.94	2.787	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.77	8.832	
2-Methyl-2-butene	00513-35-9	14.20	2.73	38.754	
2,3-Dimethylpentane	00565-59-3	1.25	2.45	3.053	
Propene	00115-07-1	11.57	2.25	26.047	
2,4-Dimethylhexane	00589-43-5	1.61	2.19	3.518	
n-Heptane	00142-82-5	0.97	2.14	2.071	
Methylcyclohexane	00108-87-2	1.56	1.92	2.980	
Cyclopentane	00287-92-3	2.24	1.85	4.129	
t-2-Pentene	00646-04-8	10.47	1.77	18.589	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.57	2.516	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.49	17.399	
2-Methyl-1-butene	00563-46-2	6.38	1.44	9.209	
3-Methylheptane	00589-81-1	1.12	1.43	1.605	
t-2-Hexene	04050-45-7	8.55	1.35	11.569	
c-2-Pentene	00627-20-3	10.28	1.31	13.505	
n-Decane	00124-18-5	0.59	1.25	0.737	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.23	9.776	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	1.20	6.361	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	1.19	6.592	
2,4-Dimethylheptane	02213-23-2	1.26	1.17	1.477	
t-1,2-Dimethylcyclopentane	00822-50-4	4.69	1.06	4.957	
3-Methyl-t-2-pentene	00616-12-6	11.66	1.02	11.850	

Vehicle 8001 - Fuel E59 - DHB Total - Test 7535 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.99	4.333	
2-Methylheptane	00592-27-8	0.97	0.96	0.931	
c-1,3-Dimethylcyclopentane	02532-58-3	4.69	0.94	4.425	
ortho-Xylene	00095-47-6	7.58	0.92	6.952	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.91	11.337	
4-Methyloctane	02216-34-4	0.85	0.85	0.721	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.83	0.908	
c-1,3-Dimethylcyclohexane	00638-04-0	4.69	0.82	3.835	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.79	9.345	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.78	4.204	
n-Octane	00111-65-9	0.80	0.77	0.610	
2-Methyl-2-pentene	00625-27-4	11.03	0.74	8.133	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.72	4.731	
1-Methylcyclopentene	00693-89-0	12.45	0.67	8.389	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.67	5.608	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.62	4.883	
Ethylbenzene	00100-41-4	2.96	0.62	1.826	
Cyclopentene	00142-29-0	6.69	0.54	3.596	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.50	4.022	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.42	1.606	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.40	2.289	
c-2-Butene	00590-18-1	14.26	0.35	5.030	
t-3-Heptene	14686-14-7	6.17	0.16	0.985	
		Total	620.9	1190.3	1.917
No MIR available, use average of 4.69					

Vehicle 8001 - Fuel E85 - DHB Total - Test 7357					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	430.16	623.289	
2-Methylbutane (Isopentane)	00078-78-4	1.35	110.80	150.121	
n-Pentane	00109-66-0	1.21	31.32	38.047	
n-Butane	00106-97-8	1.08	13.72	14.771	
Propene	00115-07-1	11.57	12.00	138.910	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	9.84	13.760	
n-Hexane	00110-54-3	1.13	8.49	9.629	
Toluene	00108-88-3	3.93	8.36	32.830	
3-Methylpentane	00096-14-0	1.69	5.91	10.000	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.38	42.693	
2,2-DiMeHexane	00590-73-8	0.94	5.19	4.888	
Methylcyclopentane	00096-37-7	2.05	3.94	8.085	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.93	4.718	
2,3-Dimethylbutane	00079-29-8	0.90	3.33	2.989	
Benzene	00071-43-2	0.69	3.26	2.266	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.76	3.088	
2-Methyl-2-butene	00513-35-9	14.20	2.24	31.825	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	2.10	24.577	
Cyclohexane	00110-82-7	1.14	1.95	2.222	
t-2-Pentene	00646-04-8	10.47	1.95	20.441	
2,2-Dimethylbutane	00075-83-2	1.11	1.89	2.097	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.87	14.504	
Cyclopentane	00287-92-3	2.24	1.76	3.934	
2-Methyl-1-butene	00563-46-2	6.38	1.65	10.494	
Methylcyclohexane	00108-87-2	1.56	1.60	2.487	
n-Heptane	00142-82-5	0.97	1.59	1.536	
2,4-Dimethylheptane	02213-23-2	1.26	1.58	1.998	
2-Methylhexane	00591-76-4	1.09	1.55	1.684	
2,4-Dimethylpentane	00108-08-7	1.46	1.49	2.179	
2,4-Dimethylhexane	00589-43-5	1.61	1.47	2.362	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.40	1.331	
Methane	00074-82-8	0.01	1.40	0.019	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.37	4.356	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.27	1.343	
3-Methyl-c-2-pentene	00922-62-3	12.52	1.15	14.386	
2,3-Dimethylpentane	00565-59-3	1.25	1.13	1.404	
c-2-Pentene	00627-20-3	10.28	1.00	10.282	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.97	1.561	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.94	4.982	
Cyclopentene	00142-29-0	6.69	0.81	5.448	
t-2-Hexene	04050-45-7	8.55	0.78	6.699	
2-Methylheptane	00592-27-8	0.97	0.70	0.681	
Unknown #14		4.52	0.66	2.990	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.66	7.895	

Vehicle 8001 - Fuel E85 - DHB Total - Test 7357 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
4-Methyloctane	02216-34-4	0.85	0.64	0.541	
t-1,2-Dimethylcyclopentane	00822-50-4	4.52	0.63	2.863	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.61	7.066	
n-Octane	00111-65-9	0.80	0.58	0.461	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.57	0.626	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.57	2.491	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.56	3.951	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.56	4.099	
Indan	00496-11-7	3.23	0.54	1.747	
3-Methylheptane	00589-81-1	1.12	0.54	0.602	
Ethylbenzene	00100-41-4	2.96	0.51	1.515	
c-2-Butene	00590-18-1	14.26	0.50	7.125	
c-1,3-Dimethylcyclopentane	02532-58-3	4.52	0.47	2.125	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.46	3.072	
1c-2t-3-TriMeCyPentane	15890-40-1	4.52	0.41	1.851	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.40	1.561	
2-Methyl-2-pentene	00625-27-4	11.03	0.39	4.323	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.39	3.108	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.38	4.442	
c-2-Heptene	06443-92-1	7.08	0.33	2.313	
1-Butyne	00107-00-6	6.05	0.29	1.755	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.29	1.603	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.28	1.526	
n-Propylbenzene	00103-65-1	1.96	0.25	0.494	
c-1,3-Dimethylcyclohexane	00638-04-0	4.52	0.24	1.091	
Unknown #5		4.52	0.23	1.018	
Unknown #13		4.52	0.17	0.772	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.16	0.134	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.12	0.666	
ortho-Xylene	00095-47-6	7.58	0.09	0.708	
		Total	709.5	1351.4	1.905
No MIR available, use average of 4.52					

Vehicle 8001 - Fuel E85 Repeat - DHB Total - Test 7386					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	448.52	649.894	
2-Methylbutane (Isopentane)	00078-78-4	1.35	70.40	95.388	
n-Pentane	00109-66-0	1.21	25.08	30.469	
n-Butane	00106-97-8	1.08	8.49	9.144	
Propene	00115-07-1	11.57	8.34	96.531	
n-Hexane	00110-54-3	1.13	8.28	9.392	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	8.25	11.533	
Toluene	00108-88-3	3.93	7.83	30.725	
3-Methylpentane	00096-14-0	1.69	5.37	9.077	
2,2-DiMeHexane	00590-73-8	0.94	4.97	4.678	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.68	4.409	
Methylcyclopentane	00096-37-7	2.05	3.41	6.992	
Benzene	00071-43-2	0.69	2.95	2.047	
2,3-Dimethylbutane	00079-29-8	0.90	2.43	2.186	
Methane	00074-82-8	0.01	2.26	0.031	
n-Heptane	00142-82-5	0.97	2.01	1.943	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.93	15.301	
Cyclohexane	00110-82-7	1.14	1.91	2.175	
ortho-Xylene	00095-47-6	7.58	1.84	13.946	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.83	14.188	
2-Methyl-2-butene	00513-35-9	14.20	1.75	24.880	
2-Methylhexane	00591-76-4	1.09	1.64	1.776	
Cyclopentane	00287-92-3	2.24	1.60	3.573	
Methylcyclohexane	00108-87-2	1.56	1.55	2.407	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.50	17.538	
n-Propylbenzene	00103-65-1	1.96	1.46	2.869	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.44	1.362	
t-2-Pentene	00646-04-8	10.47	1.42	14.922	
2-Methyl-1-butene	00563-46-2	6.38	1.37	8.745	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.30	1.371	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.30	4.135	
2,4-Dimethylpentane	00108-08-7	1.46	1.25	1.821	
2,4-Dimethylhexane	00589-43-5	1.61	1.19	1.903	
2,3-Dimethylpentane	00565-59-3	1.25	1.11	1.391	
n-Octane	00111-65-9	0.80	1.11	0.887	
2,2-Dimethylbutane	00075-83-2	1.11	1.07	1.186	
2,4-Dimethylheptane	02213-23-2	1.26	0.96	1.220	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.95	1.068	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.81	4.318	
Cyclopentene	00142-29-0	6.69	0.77	5.133	
c-2-Butene	00590-18-1	14.26	0.75	10.726	
t-2-Hexene	04050-45-7	8.55	0.73	6.208	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.70	3.816	
c-2-Pentene	00627-20-3	10.28	0.67	6.910	

Vehicle 8001 - Fuel E85 Repeat - DHB Total - Test 7386 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	0.65	0.628	
4-Methyloctane	02216-34-4	0.85	0.61	0.518	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.57	0.620	
t-1,2-Dimethylcyclopentane	00822-50-4	4.23	0.52	2.206	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.50	5.899	
Indan	00496-11-7	3.23	0.48	1.559	
Ethylbenzene	00100-41-4	2.96	0.47	1.406	
3-Methylheptane	00589-81-1	1.12	0.46	0.522	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.46	3.037	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.44	5.177	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.43	5.428	
n-Nonane	00111-84-2	0.68	0.42	0.290	
1,3-Diethylbenzene	00141-93-5	7.08	0.42	2.942	
Unknown #19		4.23	0.41	1.757	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.41	2.290	
2-Methyl-2-pentene	00625-27-4	11.03	0.39	4.323	
c-1,3-Dimethylcyclopentane	02532-58-3	4.23	0.39	1.659	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.39	3.108	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.38	0.618	
1c-2t-3-TriMeCyPentane	15890-40-1	4.23	0.33	1.387	
c-1,3-Dimethylcyclohexane	00638-04-0	4.23	0.28	1.204	
c-2-Heptene	06443-92-1	7.08	0.28	1.988	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.27	1.055	
t-1,4-Dimethylcyclohexane	02207-04-7	4.23	0.24	1.000	
t-4-Octene	14850-23-8	4.69	0.23	1.082	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.21	2.245	
n-Undecane	01120-21-4	0.52	0.16	0.081	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.15	0.129	
Styrene	00100-42-5	1.66	0.12	0.196	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.10	0.539	
2,2-Dimethylpentane	00590-35-2	1.04	0.09	0.095	
		Total	659.5	1195.2	1.812
No MIR available, use average of 4.23					

Vehicle 8002									
Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present	
FTP	E6	5901	346.7	95.1	329.6	992.2	3.011	70	
Phase 1	E32	5889	380.7	100.0	380.8	1118.7	2.938	67	
	E59	5828	314.6	113.5	356.9	878.4	2.461	49	
	E85	5907	433.0	126.6	548.1	1314.4	2.398	40	
FTP	E6	5901	23.2	51.1	11.9	10.4	0.875	7	
Phase 2	E32	5889	29.4	89.6	26.4	23.8	0.903	14	
	E59	5828	34.5	70.0	24.1	2.5	0.105	8	
	E85	5907	48.9	81.4	39.8	21.2	0.532	7	
FTP	E6	5901	5.0	694.5	34.7	10.8	0.312	15	
Phase 3	E32	5889	53.8	80.9	43.5	26.3	0.606	18	Includes aldehydes
	E59	5828	56.8	88.8	50.4	30.4	0.604	16	
	E85	5907	68.8	70.4	48.5	15.1	0.311	13	
US06	E6	5902	104.4	94.0	98.1	261.0	2.660	51	
	E32	5890	77.8	99.2	77.2	156.6	2.029	39	
	E59	5829	73.3	100.6	73.8	139.8	1.896	33	
	E85	5908	46.8	90.9	42.5	18.4	0.434	19	
UC	E6	5903	141.2	81.5	115.1	297.3	2.582	40	
	E32	5891	128.3	95.2	122.1	307.1	2.515	41	
	E59	5830	171.3	96.3	164.9	460.1	2.790	39	
	E85	5911	137.7	111.9	154.1	340.4	2.209	24	

Vehicle 8002 - Fuel E6 - FTP Phase 1 - Test 5901							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	56.2404	0.779			
Ethylene	00074-85-1	8.88	29.2891	260.214			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	21.4757	25.752			
2-Methylbutane (Isopentane)	00078-78-4	1.35	16.3191	22.111			
Toluene	00108-88-3	3.93	16.0403	62.959			
Acetylene (Ethyne)	00074-86-2	0.95	15.1231	14.305			
Propene	00115-07-1	11.57	11.9446	138.246			
Ethane	00074-84-0	0.26	11.7580	3.091			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	10.8104	15.111			
2,2,5-Trimethylhexane	03522-94-9	1.05	10.1279	10.665			
Ethanol	00064-17-5	1.45	9.3574	13.559			
Benzene	00071-43-2	0.69	8.4602	5.874			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	8.4436	67.052			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	7.7439	60.057			
3-Methylpentane	00096-14-0	1.69	6.3214	10.689			
2,3,4-Trimethylpentane	00565-75-3	0.95	6.1828	5.866			
2,3-Dimethylbutane	00079-29-8	0.90	5.3294	4.790			
n-Pentane	00109-66-0	1.21	5.0809	6.173			
2,2-Dimethylbutane	00075-83-2	1.11	4.0337	4.482			
2,4-Dimethylpentane	00108-08-7	1.46	3.8655	5.641			
n-Hexane	00110-54-3	1.13	3.6599	4.153			
2,4-Dimethylhexane	00589-43-5	1.61	3.6476	5.856			
Methylcyclopentane	00096-37-7	2.05	3.2701	6.703			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	3.2327	10.315			
2-Methylhexane	00591-76-4	1.09	3.1943	3.466			
2,3-Dimethylpentane	00565-59-3	1.25	3.1529	3.936			
Propyne	00074-99-7	6.67	2.8927	19.292			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.4216	3.888			
Methylcyclohexane	00108-87-2	1.56	2.2711	3.532			
ortho-Xylene	00095-47-6	7.58	2.0746	15.717			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.0478	10.995			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.8299	1.998			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.6418	1.839			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.5987	11.808			
3-Methylheptane	00589-81-1	1.12	1.4721	1.655			
n-Heptane	00142-82-5	0.97	1.4634	1.413			
Cyclohexane	00110-82-7	1.14	1.4208	1.616			
2-Methyl-2-butene	00513-35-9	14.20	1.4042	19.932			
Unknown #16		2.99	1.3267	3.962			
2-Methylheptane	00592-27-8	0.97	1.2807	1.239			
3,5-Dimethylheptane	00926-82-9	1.42	1.2007	1.709			
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.1209	13.176			
Ethylbenzene	00100-41-4	2.96	1.1198	3.318			
acetone	00067-64-1	0.35	1.0904	0.384			
t-2-Butene	00624-64-6	15.20	1.0704	16.268			
Formaldehyde	00050-00-0	9.59	1.0445	10.020			
c-2-Butene	00590-18-1	14.26	0.9643	13.750			
n-Octane	00111-65-9	0.80	0.9503	0.757			
Cyclopentadiene	00542-92-7	6.89	0.9448	6.510			
acetaldehyde	00075-07-0	6.46	0.9387	6.067			
t-1,2-Dimethylcyclopentane	00822-50-4	2.99	0.8991	2.685			
1-Nonene	00124-11-8	2.49	0.8829	2.201			
4-Methyloctane	02216-34-4	0.85	0.8447	0.717			
1,4-Dimethyl-2-Ethylbenzene	01758-88-9	7.54	0.8354	6.297			
1-Ethyl-2-Methylbenzene	00611-14-3	5.30	0.8128	4.307			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.8077	3.549			
2-Methyl-1-butene	00563-46-2	6.38	0.7710	4.918			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.7542	8.827			

Vehicle 8002 - Fuel E6 - FTP Phase 1 - Test 5901							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.7036	7.376			
Unknown #13		2.99	0.7012	2.094			
Indan	00496-11-7	3.23	0.6951	2.248			
c-1,3-Dimethylcyclopentane	02532-58-3	2.99	0.6896	2.059			
Acrolein	00107-02-8	7.37	0.1788	1.317			
2-Butanone (MEK)	00078-93-3	1.45	0.1440	0.209			
Propionaldehyde	00123-38-6	6.96	0.0654	0.455			
benzaldehyde	00100-52-7	-0.71	0.0411	-0.029			
Valeraldehyde	000110-62-3	4.98	0.0331	0.165			
Hexaldehyde	00066-25-1	4.26	0.0192	0.082			
n-butyraldehyde	00123-72-8	5.85	0.0039	0.023			
Glyoxal	00107-22-2	12.59	0.0037	0.046			
		Total	329.5820	992.2331	3.011		
			326.0191	973.4931	2.986	w/o aldehydes	
No MIR available, use weighted average of 2.9859							
	aldehydes						

Continued...

Vehicle 8002 - Fuel E6 - FTP Phase 2 - Test 5901							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	10.4900	0.145			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.2677	9.363			
Formaldehyde	00050-00-0	9.59	0.0904	0.867			
benzaldehyde	00100-52-7	-0.71	0.0112	-0.008			
n-butyraldehyde	00123-72-8	5.85	0.0031	0.018			
acetone	00067-64-1	0.35	0.0028	0.001			
2-Butanone (MEK)	00078-93-3	1.45	0.0006	0.001			
		Total	11.8658	10.3874	0.875		
			11.7577	9.5085	0.809	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E6 - FTP Phase 3 - Test 5901							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	26.9220	0.373			
Ethane	00074-84-0	0.26	2.8694	0.754			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.4970	1.795			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.4533	1.969			
Toluene	00108-88-3	3.93	0.8013	3.145			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.7684	1.074			
acetone	00067-64-1	0.35	0.1652	0.058			
Formaldehyde	00050-00-0	9.59	0.1031	0.989			
acetaldehyde	00075-07-0	6.46	0.0732	0.473			
2-Butanone (MEK)	00078-93-3	1.45	0.0274	0.040			
benzaldehyde	00100-52-7	-0.71	0.0147	-0.010			
Propionaldehyde	00123-38-6	6.96	0.0103	0.071			
Acrolein	00107-02-8	7.37	0.0070	0.051			
Hexaldehyde	00066-25-1	4.26	0.0055	0.024			
n-butyraldehyde	00123-72-8	5.85	0.0048	0.028			
		Total	34.7226	10.8345	0.312		
			34.3113	9.1104	0.266	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E32 - FTP Phase 1 - Test 5889							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	66.0815	0.915			
Ethanol	00064-17-5	1.45	50.4069	73.038			
Ethylene	00074-85-1	8.88	34.0225	302.267			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	19.9737	23.951			
2-Methylbutane (Isopentane)	00078-78-4	1.35	16.6044	22.497			
Toluene	00108-88-3	3.93	15.5104	60.879			
Acetylene (Ethyne)	00074-86-2	0.95	13.0305	12.325			
Propene	00115-07-1	11.57	11.5555	133.742			
Ethane	00074-84-0	0.26	11.1789	2.938			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	10.2536	14.332			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	9.7927	77.766			
2,2,5-Trimethylhexane	03522-94-9	1.05	9.4810	9.984			
Benzene	00071-43-2	0.69	8.4475	5.866			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	8.3110	64.456			
3-Methylpentane	00096-14-0	1.69	5.9762	10.105			
2,3,4-Trimethylpentane	00565-75-3	0.95	5.8918	5.590			
n-Pentane	00109-66-0	1.21	5.2660	6.398			
2,3-Dimethylbutane	00079-29-8	0.90	4.8317	4.342			
n-Hexane	00110-54-3	1.13	3.7692	4.277			
2,4-Dimethylpentane	00108-08-7	1.46	3.6153	5.276			
2,2-Dimethylbutane	00075-83-2	1.11	3.6013	4.002			
acetaldehyde	00075-07-0	6.46	3.4008	21.981			

Vehicle 8002 - Fuel E32 - FTP Phase 1 - Test 5889	Continued...						
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2,4-Dimethylhexane	00589-43-5	1.61	3.3760	5.420			
2,3-Dimethylpentane	00565-59-3	1.25	3.2440	4.049			
Methylcyclopentane	00096-37-7	2.05	3.1889	6.537			
2-Methylhexane	00591-76-4	1.09	3.1588	3.428			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.8923	9.229			
Methylcyclohexane	00108-87-2	1.56	2.3040	3.584			
ortho-Xylene	00095-47-6	7.58	2.2554	17.087			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.2551	16.656			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.2386	3.594			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.1937	11.778			
1,3-Butadiene	00106-99-0	12.45	1.8422	22.943			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.6901	1.846			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.6440	1.842			
Cyclohexane	00110-82-7	1.14	1.5666	1.782			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.4980	17.534			
Ethylbenzene	00100-41-4	2.96	1.4453	4.282			
3-Methylheptane	00589-81-1	1.12	1.3849	1.557			
t-2-Butene	00624-64-6	15.20	1.3462	20.458			
2-Methyl-2-butene	00513-35-9	14.20	1.2938	18.366			
Unknown #16		2.89	1.2761	3.691			
2-Methylheptane	00592-27-8	0.97	1.2659	1.224			
n-Heptane	00142-82-5	0.97	1.2495	1.207			
Unknown #13		2.89	1.2070	3.491			
acetone	00067-64-1	0.35	1.1400	0.402			
Formaldehyde	00050-00-0	9.59	1.1340	10.879			
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.1125	13.078			
n-Octane	00111-65-9	0.80	1.0078	0.802			
t-1,2-Dimethylcyclopentane	00822-50-4	2.89	0.9500	2.748			
c-2-Butene	00590-18-1	14.26	0.8895	12.684			
2-Methyl-1-butene	00563-46-2	6.38	0.8625	5.502			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.8450	3.713			
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.8275	4.586			
3,5-Dimethylheptane	00926-82-9	1.42	0.8130	1.157			
Indan	00496-11-7	3.23	0.8090	2.617			
4-Methyloctane	02216-34-4	0.85	0.8034	0.682			
1-Nonene	00124-11-8	2.49	0.8024	2.000			
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.7464	5.286			
c-1,3-Dimethylcyclopentane	02532-58-3	2.89	0.7212	2.086			
2-Butanone (MEK)	00078-93-3	1.45	0.1599	0.232			
Acrolein	00107-02-8	7.37	0.1416	1.043			
benzaldehyde	00100-52-7	-0.71	0.0732	-0.052			
Propionaldehyde	00123-38-6	6.96	0.0710	0.494			
Hexaldehyde	00066-25-1	4.26	0.0222	0.094			
n-butyraldehyde	00123-72-8	5.85	0.0190	0.111			
Glyoxal	00107-22-2	12.59	0.0012	0.015			
		Total	380.7708	1118.6706	2.938		
			374.6079	1083.4706	2.892	w/o aldehydes	
No MIR available, use weighted average of 2.8924							
	aldehydes						

Vehicle 8002 - Fuel E32 - FTP Phase 2 - Test 5889							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.8265	0.289			
Ethanol	00064-17-5	1.45	2.9130	4.221			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.2146	9.420			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.0605	7.832			
Formaldehyde	00050-00-0	9.59	0.1421	1.363			
acetone	00067-64-1	0.35	0.0734	0.026			
acetaldehyde	00075-07-0	6.46	0.0707	0.457			
benzaldehyde	00100-52-7	-0.71	0.0134	-0.010			
2-Butanone (MEK)	00078-93-3	1.45	0.0129	0.019			
Acrolein	00107-02-8	7.37	0.0112	0.083			
Propionaldehyde	00123-38-6	6.96	0.0091	0.063			
Glyoxal	00107-22-2	12.59	0.0018	0.022			
n-butyraldehyde	00123-72-8	5.85	0.0017	0.010			
Hexaldehyde	00066-25-1	4.26	0.0015	0.006			
		Total	26.3523	23.8014	0.903		
			26.0146	21.7614	0.837	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E32 - FTP Phase 3 - Test 5889							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	32.6922	0.453			
Ethane	00074-84-0	0.26	2.8509	0.749			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.7881	2.423			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.6190	1.941			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.8368	6.490			
Toluene	00108-88-3	3.93	0.8256	3.241			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.8094	1.131			
Ethylene	00074-85-1	8.88	0.7302	6.488			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7056	0.670			
acetone	00067-64-1	0.35	0.2542	0.090			
acetaldehyde	00075-07-0	6.46	0.1456	0.941			
Formaldehyde	00050-00-0	9.59	0.1447	1.388			
2-Butanone (MEK)	00078-93-3	1.45	0.0463	0.067			
Propionaldehyde	00123-38-6	6.96	0.0148	0.103			
Acrolein	00107-02-8	7.37	0.0105	0.078			
n-butyraldehyde	00123-72-8	5.85	0.0103	0.060			
benzaldehyde	00100-52-7	-0.71	0.0086	-0.006			
Hexaldehyde	00066-25-1	4.26	0.0083	0.035			
		Total	43.5013	26.3407	0.606		
			42.8581	23.5857	0.550	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E59 - FTP Phase 1 - Test 5828							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	93.2725	1.292			
Ethanol	00064-17-5	1.45	90.0322	130.454			
Ethylene	00074-85-1	8.88	37.2506	330.946			
2-Methylbutane (Isopentane)	00078-78-4	1.35	19.9109	26.977			
Acetylene (Ethyne)	00074-86-2	0.95	12.1124	11.457			
Ethane	00074-84-0	0.26	11.6317	3.057			
Propene	00115-07-1	11.57	8.2253	95.199			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	8.1933	9.825			
Toluene	00108-88-3	3.93	7.3853	28.988			
acetaldehyde	00075-07-0	6.46	6.8364	44.188			
Benzene	00071-43-2	0.69	5.5115	3.827			
2,2-Dimethylpropane	00463-82-1	0.65	5.4903	3.549			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.7294	6.611			
1,3-Butadiene	00106-99-0	12.45	4.5756	56.987			
n-Pentane	00109-66-0	1.21	3.9079	4.748			
2,2,5-Trimethylhexane	03522-94-9	1.05	3.6743	3.869			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.9214	22.656			
3-Methylpentane	00096-14-0	1.69	2.8487	4.817			
2,3-Dimethylbutane	00079-29-8	0.90	2.4071	2.163			
2,2-Dimethylbutane	00075-83-2	1.11	2.2397	2.489			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.1557	2.045			
n-Hexane	00110-54-3	1.13	2.0221	2.294			
Formaldehyde	00050-00-0	9.59	1.5494	14.865			
2,4-Dimethylpentane	00108-08-7	1.46	1.4772	2.156			
t-2-Butene	00624-64-6	15.20	1.4541	22.098			
Methylcyclopentane	00096-37-7	2.05	1.4276	2.926			
2,4-Dimethylhexane	00589-43-5	1.61	1.3111	2.105			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.2668	4.042			
2-Methylhexane	00591-76-4	1.09	1.2649	1.373			
2,3-Dimethylpentane	00565-59-3	1.25	1.2408	1.549			
3-Methylnonane	05911-04-6	0.66	1.1096	0.728			
c-2-Butene	00590-18-1	14.26	1.0302	14.691			
Methylcyclohexane	00108-87-2	1.56	0.9429	1.467			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.8952	1.437			
Cyclohexane	00110-82-7	1.14	0.8717	0.991			
n-Butane	00106-97-8	1.08	0.7906	0.851			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.7558	0.825			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7085	0.794			
ortho-Xylene	00095-47-6	7.58	0.6784	5.139			
acetone	00067-64-1	0.35	0.4784	0.169			
2-Butanone (MEK)	00078-93-3	1.45	0.1175	0.170			
Acrolein	00107-02-8	7.37	0.0896	0.660			
Propionaldehyde	00123-38-6	6.96	0.0578	0.403			
Methacrolein	000078-85-3	5.96	0.0238	0.142			
n-butyraldehyde	00123-72-8	5.85	0.0227	0.133			
Hexaldehyde	00066-25-1	4.26	0.0187	0.080			
benzaldehyde	00100-52-7	-0.71	0.0141	-0.010			
Valeraldehyde	000110-62-3	4.98	0.0117	0.058			
Glyoxal	00107-22-2	12.59	0.0061	0.077			
		Total	356.9494	878.3578	2.461		
			347.7230	817.4240	2.351	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E59 - FTP Phase 2 - Test 5828							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.8945	0.331			
Formaldehyde	00050-00-0	9.59	0.1956	1.876			
acetaldehyde	00075-07-0	6.46	0.0339	0.219			
n-butyraldehyde	00123-72-8	5.85	0.0078	0.045			
Valeraldehyde	000110-62-3	4.98	0.0036	0.018			
Propionaldehyde	00123-38-6	6.96	0.0034	0.024			
Acrolein	00107-02-8	7.37	0.0026	0.019			
benzaldehyde	00100-52-7	-0.71	0.0016	-0.001			
		Total	24.1431	2.5319	0.105		
			23.8945	0.3310	0.014	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E59 - FTP Phase 3 - Test 5828							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	41.4544	0.574			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	2.7242	15.396			
Acetylene (Ethyne)	00074-86-2	0.95	1.9306	1.826			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.6995	1.904			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.1577	6.216			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.8523	1.022			
Formaldehyde	00050-00-0	9.59	0.2084	1.999			
acetaldehyde	00075-07-0	6.46	0.1794	1.159			
acetone	00067-64-1	0.35	0.1257	0.044			
2-Butanone (MEK)	00078-93-3	1.45	0.0239	0.035			
n-butyraldehyde	00123-72-8	5.85	0.0167	0.098			
benzaldehyde	00100-52-7	-0.71	0.0137	-0.010			
Propionaldehyde	00123-38-6	6.96	0.0117	0.081			
Hexaldehyde	00066-25-1	4.26	0.0077	0.033			
Acrolein	00107-02-8	7.37	0.0050	0.036			
Glyoxal	00107-22-2	12.59	0.0014	0.017			
		Total	50.4121	30.4310	0.604		
			49.8187	26.9382	0.541	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E85 - FTP Phase 1 - Test 5907							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	221.5146	320.969			
Methane	00074-82-8	0.01	122.1069	1.691			
Ethylene	00074-85-1	8.88	60.4655	537.196			
2-Methylbutane (Isopentane)	00078-78-4	1.35	38.4421	52.085			
acetaldehyde	00075-07-0	6.46	17.6781	114.265			
n-Butane	00106-97-8	1.08	13.1228	14.132			
Ethane	00074-84-0	0.26	11.4265	3.003			
Acetylene (Ethyne)	00074-86-2	0.95	8.4770	8.018			
n-Pentane	00109-66-0	1.21	5.0811	6.173			
Propene	00115-07-1	11.57	4.9433	57.213			
Toluene	00108-88-3	3.93	4.5901	18.016			
Formaldehyde	00050-00-0	9.59	3.8146	36.596			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.6669	4.397			
1,3-Butadiene	00106-99-0	12.45	3.2708	40.737			
Benzene	00071-43-2	0.69	2.9801	2.069			
c-2-Butene	00590-18-1	1.09	2.9356	3.206			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.8417	3.972			
n-Hexane	00110-54-3	1.13	2.3131	2.625			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.1662	16.800			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.7964	21.026			
t-2-Butene	00624-64-6	15.20	1.7824	27.088			
3-Methylpentane	00096-14-0	1.69	1.7063	2.885			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.4025	1.477			
2,3-Dimethylbutane	00079-29-8	0.90	1.3536	1.216			
2,2-Dimethylbutane	00075-83-2	1.11	1.0866	1.207			
Methylcyclopentane	00096-37-7	2.05	0.9717	1.992			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9697	0.920			
2-Methyl-1-butene	00563-46-2	6.38	0.7717	4.922			
3-Methylnonane		0.66	0.7651	0.502			
2-Methylhexane	00591-76-4	1.09	0.7594	0.824			
acetone	00067-64-1	0.35	0.7560	0.267			
Cyclohexane	00110-82-7	1.14	0.7361	0.837			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.6942	2.215			
Acrolein	00107-02-8	7.37	0.4126	3.040			
2-Butanone (MEK)	00078-93-3	1.45	0.0992	0.144			
benzaldehyde	00100-52-7	-0.71	0.0975	-0.069			
Propionaldehyde	00123-38-6	6.96	0.0858	0.597			
Hexaldehyde	00066-25-1	4.26	0.0181	0.077			
n-butyraldehyde	00123-72-8	5.85	0.0064	0.037			
Glyoxal	00107-22-2	12.59	0.0038	0.048			
		Total	548.1125	1314.4172	2.398		
			525.1404	1159.4164	2.208	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E85 - FTP Phase 2 - Test 5907							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	31.3427	0.434			
2-Methylbutane (Isopentane)	00078-78-4	1.35	7.0084	9.496			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.1892	8.783			
Formaldehyde	00050-00-0	9.59	0.2566	2.462			
benzaldehyde	00100-52-7	-0.71	0.0034	-0.002			
Valeraldehyde	000110-62-3	4.98	0.0024	0.012			
n-butyraldehyde	00123-72-8	5.85	0.0001	0.000			
		Total	39.8027	21.1844	0.532		
			39.5403	18.7130	0.473	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E85 - FTP Phase 3 - Test 5907							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	43.1468	0.598			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.8786	5.255			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.7257	5.360			
acetaldehyde	00075-07-0	6.46	0.2941	1.901			
acetone	00067-64-1	0.35	0.1707	0.060			
Formaldehyde	00050-00-0	9.59	0.1664	1.597			
2-Butanone (MEK)	00078-93-3	1.45	0.0352	0.051			
Propionaldehyde	00123-38-6	6.96	0.0131	0.091			
Acrolein	00107-02-8	7.37	0.0108	0.079			
n-butyraldehyde	00123-72-8	5.85	0.0083	0.049			
Hexaldehyde	00066-25-1	4.26	0.0072	0.031			
benzaldehyde	00100-52-7	-0.71	0.0060	-0.004			
Valeraldehyde	000110-62-3	4.98	0.0057	0.029			
		Total	48.4687	15.0958	0.311		
			47.7512	11.2129	0.235	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E6 - US06 - Test 5902							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	36.8023	0.510			
Ethylene	00074-85-1	8.88	7.1279	63.327			
Ethane	00074-84-0	0.26	4.6865	1.232			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.0345	5.466			
Propene	00115-07-1	11.57	3.9500	45.717			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.8709	4.642			
Toluene	00108-88-3	3.93	3.1683	12.436			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.1230	24.800			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.0774	2.188			
acetone	00067-64-1	0.35	2.0502	0.723			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.0398	2.851			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.8509	14.355			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.6213	1.816			
Benzene	00071-43-2	0.69	1.4843	1.031			
Ethanol	00064-17-5	1.45	1.3009	1.885			
acetaldehyde	00075-07-0	6.46	1.1891	7.686			
2,3-Dimethylbutane	00079-29-8	0.90	1.1403	1.025			
3-Methylpentane	00096-14-0	1.69	1.1270	1.906			
n-Pentane	00109-66-0	1.21	1.0990	1.335			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.0959	1.040			
2,2-Dimethylbutane	00075-83-2	1.11	0.8319	0.924			
Formaldehyde	00050-00-0	9.59	0.6752	6.478			
2-Methyl-2-butene	00513-35-9	14.20	0.6592	9.358			
2,4-Dimethylhexane	00589-43-5	1.61	0.6527	1.048			
n-Hexane	00110-54-3	1.13	0.6519	0.740			
2,4-Dimethylpentane	00108-08-7	1.46	0.6478	0.945			
n-Decane	00124-18-5	0.59	0.6029	0.356			
Methylcyclopentane	00096-37-7	2.05	0.5833	1.196			
c-2-Butene	00590-18-1	14.26	0.5756	8.208			
2,3-Dimethylpentane	00565-59-3	1.25	0.5677	0.709			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.5664	1.807			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.5661	4.181			
2-Methylhexane	00591-76-4	1.09	0.5319	0.577			
t-2-Butene	00624-64-6	15.20	0.5211	7.919			
ortho-Xylene	00095-47-6	7.58	0.5044	3.822			
Cyclopentene	00142-29-0	6.69	0.4950	3.310			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.4592	2.466			
1-Butyne	00107-00-6	6.05	0.4507	2.726			
Ethylbenzene	00100-41-4	2.96	0.4425	1.311			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.4207	0.675			
2-Methyl-1-butene	00563-46-2	6.38	0.3951	2.520			
Methylcyclohexane	00108-87-2	1.56	0.3934	0.612			
2,3-DiMeHexane & 2,3-MeEtPentan	00584-94-1+	1.09	0.3676	0.401			
2-Butanone (MEK)	00078-93-3	1.45	0.2404	0.349			
Acrolein	00107-02-8	7.37	0.2010	1.197			
Methacrolein	000078-85-3	5.96	0.1408	0.839			
benzaldehyde	00100-52-7	-0.71	0.0736	-0.052			
Propionaldehyde	00123-38-6	6.96	0.0329	0.229			
n-butyraldehyde	00123-72-8	5.85	0.0182	0.107			
Hexaldehyde	00066-25-1	4.26	0.0181	0.077			
Glyoxal	00107-22-2	12.59	0.0091	0.000			
		Total	98.1360	261.0033	2.660		
			93.4874	243.3723	2.603	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E32 - US06 - Test 5890							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	35.7386	0.495			
Ethylene	00074-85-1	8.88	4.7633	42.319			
Ethane	00074-84-0	0.26	3.8938	1.023			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.6049	4.884			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.8312	3.395			
acetaldehyde	00075-07-0	6.46	2.1179	13.689			
Toluene	00108-88-3	3.93	1.9314	7.581			
Propene	00115-07-1	11.57	1.7654	20.433			
Ethanol	00064-17-5	1.45	1.7484	2.533			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.7079	13.563			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.6308	1.827			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.4781	1.557			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.3927	1.947			
acetone	00067-64-1	0.35	1.1461	0.404			
Benzene	00071-43-2	0.69	0.9295	0.645			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.9168	7.110			
n-Pentane	00109-66-0	1.21	0.9012	1.095			
3-Methylpentane	00096-14-0	1.69	0.8689	1.469			
2,3-Dimethylbutane	00079-29-8	0.90	0.8446	0.759			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.8313	4.463			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7853	0.745			
2,2-Dimethylbutane	00075-83-2	1.11	0.6455	0.717			
t-2-Butene	00624-64-6	15.20	0.5548	8.431			
2,4-Dimethylhexane	00589-43-5	1.61	0.5510	0.885			
c-2-Butene	00590-18-1	14.26	0.5435	7.751			
n-Hexane	00110-54-3	1.13	0.5137	0.583			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.4422	1.411			
2,4-Dimethylpentane	00108-08-7	1.46	0.4379	0.639			
2,3-Dimethylpentane	00565-59-3	1.25	0.4227	0.528			
2-Methylhexane	00591-76-4	1.09	0.4158	0.451			
Methylcyclopentane	00096-37-7	2.05	0.3971	0.814			
Formaldehyde	00050-00-0	9.59	0.1340	1.286			
Acrolein	00107-02-8	7.37	0.0989	0.728			
2-Butanone (MEK)	00078-93-3	1.45	0.0883	0.128			
benzaldehyde	00100-52-7	-0.71	0.0478	-0.034			
Methacrolein	000078-85-3	5.96	0.0407	0.242			
Hexaldehyde	00066-25-1	4.26	0.0116	0.050			
Propionaldehyde	00123-38-6	6.96	0.0111	0.077			
n-butyraldehyde	00123-72-8	5.85	0.0001	0.001			
		Total	77.1852	156.6249	2.029		
			73.4885	140.0532	1.906	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E59 - US06 - Test 5829							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	38.6496	0.535			
acetaldehyde	00075-07-0	6.46	5.7836	37.383			
Ethylene	00074-85-1	8.88	5.1614	45.856			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.0570	5.497			
Ethane	00074-84-0	0.26	3.7024	0.973			
2,3,5-Trimethylhexane	01069-53-0	1.12	2.0935	2.345			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.5835	1.899			
Ethanol	00064-17-5	1.45	1.3426	1.945			
Toluene	00108-88-3	3.93	1.1756	4.614			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.9438	1.319			
2,2-Dimethylpropane	00463-82-1	0.65	0.9368	0.606			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9315	5.001			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.8655	0.911			
n-Pentane	00109-66-0	1.21	0.7967	0.968			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.7888	6.264			
acetone	00067-64-1	0.35	0.6148	0.217			
3-Methylpentane	00096-14-0	1.69	0.5578	0.943			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.5530	4.289			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.4797	0.455			
Benzene	00071-43-2	0.69	0.4759	0.330			
Formaldehyde	00050-00-0	9.59	0.4697	4.506			
2,3-Dimethylbutane	00079-29-8	0.90	0.4084	0.367			
2,2-Dimethylbutane	00075-83-2	1.11	0.3994	0.444			
t-2-Butene	00624-64-6	15.20	0.3739	5.682			
c-2-Butene	00590-18-1	14.26	0.3557	5.073			
Propionaldehyde	00123-38-6	6.96	0.0636	0.443			
Acrolein	00107-02-8	7.37	0.0554	0.408			
2-Butanone (MEK)	00078-93-3	1.45	0.0477	0.069			
Methacrolein	000078-85-3	5.96	0.0374	0.223			
Valeraldehyde	000110-62-3	4.98	0.0283	0.141			
n-butyraldehyde	00123-72-8	5.85	0.0147	0.086			
Hexaldehyde	00066-25-1	4.26	0.0144	0.061			
benzaldehyde	00100-52-7	-0.71	0.0127	-0.009			
		Total	73.7750	139.8452	1.896		
			66.6326	96.3171	1.445	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E85 - US06 - Test 5908							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	33.3167	0.462			
2,3,5-Trimethylhexane	01069-53-0	1.12	2.0435	2.289			
Ethane	00074-84-0	0.26	1.6008	0.421			
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.9420	1.276			
n-Decane	00124-18-5	0.59	0.9123	0.539			
Ethylene	00074-85-1	8.88	0.8095	7.192			
Ethanol	00064-17-5	1.45	0.7194	1.042			
Unknown #22		0.35	0.5601	0.196			
n-Propylbenzene	00103-65-1	1.96	0.5447	1.067			
acetaldehyde	00075-07-0	6.46	0.5055	3.268			
acetone	00067-64-1	0.35	0.4163	0.147			
2-Butanone (MEK)	00078-93-3	1.45	0.0551	0.080			
n-butyraldehyde	00123-72-8	5.85	0.0291	0.170			
benzaldehyde	00100-52-7	-0.71	0.0242	-0.017			
Methacrolein	000078-85-3	5.96	0.0209	0.124			
Hexaldehyde	00066-25-1	4.26	0.0167	0.071			
Propionaldehyde	00123-38-6	6.96	0.0082	0.057			
Acrolein	00107-02-8	7.37	0.0069	0.051			
Valeraldehyde	000110-62-3	4.98	0.0023	0.011			
		Total	42.5343	18.4467	0.434		
			41.4489	14.4841	0.349	w/o aldehydes	
No MIR available, use weighted average of 0.3494							
	aldehydes						

Vehicle 8002 - Fuel E6 - UC - Test 5903							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	33.5514	0.465			
Ethylene	00074-85-1	8.88	11.2327	99.795			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	6.4788	7.769			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.2901	8.522			
Acetylene (Ethyne)	00074-86-2	0.95	6.1172	5.786			
Ethane	00074-84-0	0.26	5.7575	1.513			
Toluene	00108-88-3	3.93	4.9147	19.290			
Propene	00115-07-1	11.57	4.2965	49.727			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.4549	4.829			
2,2,5-Trimethylhexane	03522-94-9	1.05	3.1085	3.273			
Benzene	00071-43-2	0.69	3.0779	2.137			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.9501	23.427			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.4175	18.749			
3-Methylpentane	00096-14-0	1.69	2.0587	3.481			
2,3-Dimethylbutane	00079-29-8	0.90	1.9047	1.712			
n-Pentane	00109-66-0	1.21	1.8435	2.240			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.7619	1.672			
Ethanol	00064-17-5	1.45	1.5766	2.284			
2,2-Dimethylbutane	00075-83-2	1.11	1.5575	1.731			
2,4-Dimethylhexane	00589-43-5	1.61	1.1383	1.828			
n-Hexane	00110-54-3	1.13	1.1114	1.261			
2,4-Dimethylpentane	00108-08-7	1.46	1.1050	1.612			
Methylcyclopentane	00096-37-7	2.05	1.0308	2.113			
2,3-Dimethylpentane	00565-59-3	1.25	0.9525	1.189			
1,3-Butadiene	00106-99-0	12.45	0.8411	10.476			
2-Methylhexane	00591-76-4	1.09	0.8162	0.886			
acetaldehyde	00075-07-0	6.46	0.7527	4.865			
acetone	00067-64-1	0.35	0.7317	0.258			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.6985	2.229			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6605	4.879			
Formaldehyde	00050-00-0	9.59	0.6330	6.073			
2-Butanone (MEK)	00078-93-3	1.45	0.0801	0.116			
n-butyraldehyde	00123-72-8	5.85	0.0555	0.325			
benzaldehyde	00100-52-7	-0.71	0.0481	-0.034			
Propionaldehyde	00123-38-6	6.96	0.0477	0.332			
Acrolein	00107-02-8	7.37	0.0251	0.185			
Methacrolein	000078-85-3	5.96	0.0152	0.091			
Valeraldehyde	000110-62-3	4.98	0.0130	0.065			
Glyoxal	00107-22-2	12.59	0.0078	0.099			
Hexaldehyde	00066-25-1	4.26	0.0074	0.031			
		Total	115.1221	297.2800	2.582		
			112.7050	284.8759	2.528	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E32 - UC - Test 5891							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	36.7882	0.510			
Ethanol	00064-17-5	1.45	11.6627	16.899			
Ethylene	00074-85-1	8.88	10.3624	92.063			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.9891	9.469			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.5058	6.602			
Ethane	00074-84-0	0.26	4.8776	1.282			
Toluene	00108-88-3	3.93	4.4439	17.442			
Acetylene (Ethyne)	00074-86-2	0.95	3.8102	3.604			
Propene	00115-07-1	11.57	3.3732	39.041			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.8698	4.011			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.8314	2.982			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.8149	22.353			
Benzene	00071-43-2	0.69	2.4552	1.705			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.3883	18.522			
acetaldehyde	00075-07-0	6.46	2.3215	15.005			
n-Pentane	00109-66-0	1.21	1.8487	2.246			
3-Methylpentane	00096-14-0	1.69	1.6642	2.814			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5592	1.479			
2,3-Dimethylbutane	00079-29-8	0.90	1.4074	1.265			
2,2-Dimethylbutane	00075-83-2	1.11	1.1761	1.307			
n-Hexane	00110-54-3	1.13	1.0897	1.236			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.0588	5.685			
Formaldehyde	00050-00-0	9.59	1.0427	10.003			
2,4-Dimethylhexane	00589-43-5	1.61	0.9829	1.578			
Methylcyclopentane	00096-37-7	2.05	0.8978	1.840			
Propane	00074-98-6	0.46	0.8836	0.404			
2,4-Dimethylpentane	00108-08-7	1.46	0.8652	1.263			
t-2-Butene	00624-64-6	15.20	0.8469	12.871			
2,3-Dimethylpentane	00565-59-3	1.25	0.8129	1.015			
2-Methylhexane	00591-76-4	1.09	0.7712	0.837			
1,3-Butadiene	00106-99-0	12.45	0.6769	8.430			
acetone	00067-64-1	0.35	0.6757	0.238			
2-Butanone (MEK)	00078-93-3	1.45	0.1036	0.150			
benzaldehyde	00100-52-7	-0.71	0.0672	-0.048			
n-butyraldehyde	00123-72-8	5.85	0.0537	0.314			
Propionaldehyde	00123-38-6	6.96	0.0431	0.300			
Acrolein	00107-02-8	7.37	0.0218	0.161			
Methacrolein	000078-85-3	5.96	0.0160	0.095			
Valeraldehyde	000110-62-3	4.98	0.0101	0.050			
Hexaldehyde	00066-25-1	4.26	0.0061	0.026			
Glyoxal	00107-22-2	12.59	0.0020	0.025			
		Total	122.0776	307.0769	2.515		
			117.7142	280.7564	2.385	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E59 - UC - Test 5830							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	46.9839	0.651			
Ethanol	00064-17-5	1.45	23.9428	34.693			
Ethylene	00074-85-1	8.88	17.2646	153.385			
acetaldehyde	00075-07-0	6.46	10.0174	64.749			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.4917	8.795			
Ethane	00074-84-0	0.26	5.3128	1.396			
Acetylene (Ethyne)	00074-86-2	0.95	5.2452	4.961			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.1881	6.221			
Propene	00115-07-1	11.57	4.6074	53.325			
Toluene	00108-88-3	3.93	4.2452	16.662			
2,2-Dimethylpropane	00463-82-1	0.65	3.0315	1.960			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.7088	3.786			
Formaldehyde	00050-00-0	9.59	2.5922	24.869			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.5677	20.390			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.5449	2.680			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.1483	16.661			
n-Pentane	00109-66-0	1.21	2.0341	2.471			
Benzene	00071-43-2	0.69	1.9393	1.347			
3-Methylpentane	00096-14-0	1.69	1.6057	2.715			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5247	1.447			
2,3-Dimethylbutane	00079-29-8	0.90	1.3148	1.182			
n-Hexane	00110-54-3	1.13	1.2106	1.374			
2,2-Dimethylbutane	00075-83-2	1.11	1.1464	1.274			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.0408	3.321			
t-2-Butene	00624-64-6	15.20	0.9371	14.242			
2,4-Dimethylhexane	00589-43-5	1.61	0.9180	1.474			
2,4-Dimethylpentane	00108-08-7	1.46	0.9077	1.325			
Methylcyclopentane	00096-37-7	2.05	0.9020	1.849			
2-Methylhexane	00591-76-4	1.09	0.8632	0.937			
Methylcyclohexane	00108-87-2	1.56	0.8565	1.332			
2,3,5-Trimethylhexane	01069-53-0	5.43	0.8447	4.590			
2,3-Dimethylpentane	00565-59-3	1.25	0.7969	0.995			
3-Methylnonane	05911-04-6	0.66	0.7578	0.497			
Acrolein	00107-02-8	7.37	0.2147	1.582			
Propionaldehyde	00123-38-6	6.96	0.1079	0.751			
benzaldehyde	00100-52-7	-0.71	0.0647	-0.046			
n-butyraldehyde	00123-72-8	5.85	0.0265	0.155			
Valeraldehyde	000110-62-3	4.98	0.0221	0.110			
Hexaldehyde	00066-25-1	4.26	0.0020	0.009			
		Total	164.9306	460.1150	2.790		
			151.8831	367.9370	2.423	w/o aldehydes	
	aldehydes						

Vehicle 8002 - Fuel E85 - UC - Test 5911							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	65.0962	0.902			
Ethanol	00064-17-5	1.45	38.0662	55.157			
Ethylene	00074-85-1	8.88	14.5803	129.537			
acetaldehyde	00075-07-0	6.46	11.1827	72.281			
Ethane	00074-84-0	0.26	5.1417	1.351			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.1048	5.561			
Acetylene (Ethyne)	00074-86-2	0.95	3.5560	3.364			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.1807	25.258			
Formaldehyde	00050-00-0	9.59	2.3172	22.230			
Toluene	00108-88-3	3.93	1.3452	5.280			
Propene	00115-07-1	11.57	1.2030	13.923			
n-Pentane	00109-66-0	1.21	1.1635	1.414			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.0556	1.266			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.7046	0.985			
Benzene	00071-43-2	0.69	0.6910	0.480			
acetone	00067-64-1	0.35	0.4103	0.145			
Propionaldehyde	00123-38-6	6.96	0.0735	0.512			
benzaldehyde	00100-52-7	-0.71	0.0493	-0.035			
n-butyraldehyde	00123-72-8	5.85	0.0482	0.282			
Acrolein	00107-02-8	7.37	0.0437	0.322			
2-Butanone (MEK)	00078-93-3	1.45	0.0392	0.057			
Methacrolein	000078-85-3	5.96	0.0110	0.065			
Hexaldehyde	00066-25-1	4.26	0.0090	0.038			
Valeraldehyde	000110-62-3	4.98	0.0072	0.036			
		Total	154.0800	340.4098	2.209		
			139.8887	244.4770	1.748	w/o aldehydes	
	aldehydes						

Vehicle 8003									
Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present	
FTP	E6	5831	285.1	81.5	232.2	923.3	3.976	63	
Phase 1	E32	5758	184.0	99.1	182.3	591.7	3.246	53	
	E59	5914	265.7	129.0	342.8	769.8	2.246	29	
	E85	6010	259.4	126.5	328.2	716.7	2.184	30	
FTP	E6	5831	6.6	184.9	12.2	48.4	3.964	12	
Phase 2	E32	5758	23.0	79.8	18.3	27.1	1.475	10	
	E59	5914	21.0	73.1	15.4	20.7	1.346	9	
	E85	6010	24.4	124.4	30.4	26.5	0.872	6	
FTP	E6	5831	22.1	36.6	8.1	10.0	1.232	10	
Phase 3	E32	5758	30.1	84.2	25.3	28.9	1.143	10	Includes aldehydes
	E59	5914	29.3	70.1	20.5	2.7	0.131	7	
	E85	6010	30.5	107.0	32.6	24.6	0.755	13	
US06	E6	5832	46.0	70.1	32.2	86.4	2.679	35	
	E32	5760	11.0	135.9	14.9	18.1	1.213	13	
	E59	5915	33.6	143.2	48.1	133.6	2.776	24	
	E85	6011	29.3	92.7	27.2	48.9	1.801	14	
UC	E6	5837	78.3	70.7	55.3	170.5	3.082	35	
	E32	5767	72.8	97.1	70.7	214.9	3.040	34	
	E59	5916	107.5	126.9	136.4	315.0	2.310	22	
	E85	6014	94.7	127.7	120.9	309.6	2.560	17	
RL - Cold	E6	25728	37.0	60.3	22.3	84.4	3.783	24	
	E32	25719	52.1	69.4	36.1	206.8	5.728	27	
	E59	25747	111.4	21.8	24.3	95.7	3.945	11	
	E85	25762	55.0	45.4	25.0	55.8	2.232	8	
RL - Total	E6	25728	37.7	110.2	41.5	138.0	3.325	30	
	E32	25719	35.6	152.0	54.2	302.8	5.590	27	
	E59	25747	126.9	40.4	51.3	289.1	5.638	20	
	E85	25762	128.0	31.8	40.7	177.2	4.357	13	
HS	E6	7369	12.6	98.0	12.3	39.1	3.177	30	
	E32	7306	29.7	23.5	7.0	21.6	3.097	27	
	E59	7453	37.9	92.2	34.9	57.7	1.652	30	
	E85	7510	8.4	190.2	16.0	67.7	4.220	36	
DHB - Day 1	E6	7371	206.3	111.7	230.4	516.3	2.241	86	
	E32	7308	206.8	75.5	156.2	333.6	2.136	54	
	E59	7454	358.2	67.5	241.9	553.4	2.287	61	
	E85	7513	289.0	83.2	240.4	500.7	2.082	60	
DHB - Total	E6	7371	527.4	105.4	555.6	1132.5	2.038	95	
	E32	7308	532.5	82.9	441.2	933.6	2.116	89	
	E59	7454	740.8	93.5	692.9	1516.3	2.188	104	
	E85	7513	636.1	84.6	538.3	1076.8	2.000	60	

Vehicle 8003 - Fuel E6 - FTP Phase 1 - Test 5831							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	26.1000	0.362			
Ethylene	00074-85-1	8.88	19.9721	177.439			
Toluene	00108-88-3	3.93	14.3789	56.437			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	14.2408	113.089			
2-Methylbutane (Isopentane)	00078-78-4	1.35	13.7898	18.684			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	13.6965	16.424			
Propene	00115-07-1	11.57	10.1090	117.000			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	9.1278	70.790			
Benzene	00071-43-2	0.69	7.6396	5.305			
2,2,5-Trimethylhexane	03522-94-9	1.05	7.5687	7.970			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	6.8893	9.630			
Ethane	00074-84-0	0.26	5.7943	1.523			
3-Methylpentane	00096-14-0	1.69	4.1034	6.938			
2,3,4-Trimethylpentane	00565-75-3	0.95	4.0263	3.820			
Acetylene (Ethyne)	00074-86-2	0.95	3.7767	3.572			
2,2-Dimethylbutane	00075-83-2	1.11	3.7115	4.124			
t-2-Butene	00624-64-6	15.20	3.5802	54.410			
n-Pentane	00109-66-0	1.21	3.5642	4.330			
2,3-Dimethylbutane	00079-29-8	0.90	3.5243	3.167			
3-Methylnonane	005911-04-6	0.66	2.8901	1.895			
n-Hexane	00110-54-3	1.13	2.4821	2.816			
1,3-Butadiene	00106-99-0	12.45	2.4682	30.741			
Methylcyclopentane	00096-37-7	2.05	2.4452	5.012			
2,4-Dimethylpentane	00108-08-7	1.46	2.3886	3.486			
2,4-Dimethylhexane	00589-43-5	1.61	2.3286	3.739			
c-2-Butene	00590-18-1	14.26	2.2550	32.156			
2-Methylhexane	00591-76-4	1.09	2.2438	2.435			
ortho-Xylene	00095-47-6	7.58	2.2158	16.787			
2,3-Dimethylpentane	00565-59-3	1.25	2.1087	2.632			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.9908	6.352			
Ethylbenzene	00100-41-4	2.96	1.8424	5.458			
2-Methyl-2-butene	00513-35-9	14.20	1.7035	24.181			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.6553	2.657			
Methylcyclohexane	00108-87-2	1.56	1.6491	2.565			
Cyclohexane	00110-82-7	1.14	1.5845	1.802			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.4956	1.633			
Formaldehyde	00050-00-0	9.594	1.4347	13.764			
acetaldehyde	00075-07-0	6.464	1.4010	9.055			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.2840	9.484			
acetone	00067-64-1	0.353	1.2428	0.438			
Styrene	00100-42-5	1.66	1.2024	1.998			
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.1948	14.045			
2-Methyl-1,3-butadiene	00078-79-5	10.48	1.1488	12.043			
3-Methylheptane	00589-81-1	1.12	1.1408	1.283			
2-Methyl-1-butene	00563-46-2	6.38	1.1110	7.086			
n-Octane	00111-65-9	0.80	0.9552	0.761			
Ethylcyclohexane	01678-91-7	1.35	0.8966	1.206			
n-Heptane	00142-82-5	0.97	0.8854	0.855			
Cyclopentene	00142-29-0	6.69	0.8566	5.727			
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.8298	4.598			
2-Methylheptane	00592-27-8	0.97	0.8181	0.791			

Vehicle 8003 - Fuel E6 - FTP Phase 1 - Test 5831 Continued...							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
1,4-Diethylbenzene	00105-05-5	4.39	0.8113	3.560			
4-Methyloctane	02216-34-4	0.85	0.7770	0.659			
3-Methyl-1-butene	00563-45-1	6.85	0.7100	4.867			
n-Nonane	00111-84-2	0.68	0.6949	0.474			
t-2-Pentene	00646-04-8	10.47	0.6628	6.941			
2-Butanone (MEK)	00078-93-3	1.45	0.5205	0.755			
Propionaldehyde	00123-38-6	6.959	0.1306	0.909			
benzaldehyde	00100-52-7	-0.712	0.0641	-0.046			
Methacrolein	000078-85-3	5.956	0.0537	0.320			
n-butyraldehyde	00123-72-8	5.853	0.0322	0.188			
Glyoxal	00107-22-2	12.59	0.0135	0.169			
Acrolein	00107-02-8	7.366	0.0057	0.042			
		Total	232.2	923.3	3.976		
		Total	227.3	897.7	3.949	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - FTP Phase 2 - Test 5831							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	3.2636	0.045			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.3414	12.571			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	1.8371	10.382			
Unknown #2		3.89	1.7086	6.654			
t-3-Hexene & c-3-Hexene	13269-52-8+07642-09-3	7.43	1.5044	11.178			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	1.3280	5.835			
Formaldehyde	00050-00-0	9.59	0.1591	1.526			
acetone	00067-64-1	0.35	0.0205	0.007			
acetaldehyde	00075-07-0	6.46	0.0162	0.105			
benzaldehyde	00100-52-7	-0.71	0.0127	-0.009			
Propionaldehyde	00123-38-6	6.96	0.0086	0.060			
n-butyraldehyde	00123-72-8	5.85	0.0047	0.027			
		Total	12.2049	48.3823	3.964		
		Total	11.9831	46.6654	3.894	w/o aldehydes	
No MIR available, use weighted average of 3.8943							
	aldehydes						

Vehicle 8003 - Fuel E6 - FTP Phase 3 - Test 5831							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	5.9390	0.082			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.2454	6.687			
acetone	00067-64-1	0.35	0.5285	0.186			
Formaldehyde	00050-00-0	9.59	0.2159	2.071			
acetaldehyde	00075-07-0	6.46	0.0825	0.533			
Propionaldehyde	00123-38-6	6.96	0.0283	0.197			
2-Butanone (MEK)	00078-93-3	1.45	0.0253	0.037			
n-butyraldehyde	00123-72-8	5.85	0.0117	0.069			
Glyoxal	00107-22-2	12.59	0.0063	0.079			
Acrolein	00107-02-8	7.37	0.0031	0.023			
		Total	8.0860	9.9643	1.232		
		Total	7.1844	6.7693	0.942	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 1 - Test 5758							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	36.2372	0.50			
Ethylene	00074-85-1	8.88	19.7354	175.34			
2-Methylbutane (Isopentane)	00078-78-4	1.35	14.6433	19.84			
Ethanol	00064-17-5	1.45	13.1353	19.03			
Propene	00115-07-1	11.6	8.3797	96.99			
Acetylene (Ethyne)	00074-86-2	0.95	8.0617	7.63			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	7.6952	9.23			
Ethane	00074-84-0	0.26	7.0886	1.86			
Toluene	00108-88-3	3.93	6.7206	26.38			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.0533	40.13			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	3.9380	5.50			
2,2,5-Trimethylhexane	03522-94-9	1.05	3.6059	3.80			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.5783	27.75			
Benzene	00071-43-2	0.69	3.2247	2.24			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	2.9512	12.97			
acetaldehyde	00075-07-0	6.46	2.6674	17.24			
3-Methylpentane	00096-14-0	1.69	2.5027	4.23			
2,2-Dimethylbutane	00075-83-2	1.11	2.3009	2.56			
n-Pentane	00109-66-0	1.21	2.2312	2.71			
2,3-Dimethylbutane	00079-29-8	0.9	2.0356	1.83			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.0055	1.90			
2,2-Dimethylpropane	00463-82-1	0.65	1.9534	1.26			
2,4-Dimethylpentane	00108-08-7	1.46	1.6500	2.41			
n-Hexane	00110-54-3	1.13	1.4295	1.62			
Formaldehyde	00050-00-0	9.59	1.3376	12.83			
t-2-Butene	00624-64-6	15.2	1.3001	19.76			
Methylcyclopentane	00096-37-7	2.05	1.2846	2.63			

Vehicle 8003 - Fuel E32 - FTP Phase 1 - Test 5758					Continued...		
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2,4-Dimethylhexane	00589-43-5	1.61	1.2792	2.05			
Cyclohexane	00110-82-7	1.14	1.2412	1.41			
c-2-Butene	00590-18-1	14.3	1.1546	16.46			
2,3-Dimethylpentane	00565-59-3	1.25	1.0828	1.35			
2-Methyl-1-butene	00563-46-2	6.38	1.0700	6.82			
ortho-Xylene	00095-47-6	7.58	1.0432	7.90			
1,3-Butadiene	00106-99-0	12.5	1.0424	12.98			
2-Methylhexane	00591-76-4	1.09	1.0366	1.12			
acetone	00067-64-1	0.35	1.0151	0.36			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.9325	1.50			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.8912	0.97			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.8805	2.81			
Methylcyclohexane	00108-87-2	1.56	0.8486	1.32			
2-Methyl-2-butene	00513-35-9	14.2	0.7554	10.72			
Ethylbenzene	00100-41-4	2.96	0.6857	2.03			
2-Butanone (MEK)	00078-93-3	1.45	0.3745	0.54			
Propionaldehyde	00123-38-6	6.96	0.1107	0.77			
benzaldehyde	00100-52-7	-0.71	0.0377	-0.03			
n-butyraldehyde	00123-72-8	5.85	0.0365	0.21			
Valeraldehyde	000110-62-3	4.98	0.0146	0.07			
Glyoxal	00107-22-2	12.6	0.0093	0.12			
Acrolein	00107-02-8	7.37	0.0036	0.03			
		Total	182.3	591.7	3.246		
		Total	176.7	559.6	3.167	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 2 - Test 5758							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	12.2757	0.17			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	5.8248	25.59			
Formaldehyde	00050-00-0	9.59	0.1007	0.97			
acetone	00067-64-1	0.35	0.0758	0.03			
2-Butanone (MEK)	00078-93-3	1.45	0.0224	0.03			
n-butyraldehyde	00123-72-8	5.85	0.0143	0.08			
Propionaldehyde	00123-38-6	6.96	0.0102	0.07			
acetaldehyde	00075-07-0	6.46	0.0098	0.06			
Acrolein	00107-02-8	7.37	0.0073	0.05			
benzaldehyde	00100-52-7	-0.71	0.0069	0.00			
		Total	18.3	27.1	1.475		
		Total	18.1	25.8	1.423	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 3 - Test 5758							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	13.1629	0.18			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	4.3398	19.07			
n-Decane	00124-18-5	0.59	2.1854	1.29			
Ethane	00074-84-0	0.26	2.0311	0.53			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.3562	1.84			
Methylcyclopentane	00096-37-7	2.05	0.7910	1.62			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.7153	0.86			
acetone	00067-64-1	0.35	0.1776	0.06			
Formaldehyde	00050-00-0	9.59	0.1652	1.58			
acetaldehyde	00075-07-0	6.46	0.1040	0.67			
Propionaldehyde	00123-38-6	6.96	0.0078	0.05			
2-Butanone (MEK)	00078-93-3	1.45	0.0070	0.01			
Glyoxal	00107-22-2	12.59	0.0024	0.03			
		Total	25.0	27.8	1.110		
		Total	24.6	25.4	1.033	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 1 - Test 5914							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	174.4535	252.779			
Methane	00074-82-8	0.01	70.9256	0.983			
Ethylene	00074-85-1	8.88	27.5606	244.858			
Acetylene (Ethyne)	00074-86-2	0.95	13.4089	12.683			
acetaldehyde	00075-07-0	6.46	10.7015	69.171			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	7.7006	61.152			
Ethane	00074-84-0	0.26	5.7316	1.507			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.3954	7.310			
Toluene	00108-88-3	3.93	3.4595	13.579			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.9111	3.491			
Propene	00115-07-1	11.57	2.1945	25.399			
Formaldehyde	00050-00-0	9.59	2.0137	19.318			
Benzene	00071-43-2	0.69	1.8134	1.259			
1,3-Butadiene	00106-99-0	12.45	1.6510	20.562			
n-Pentane	00109-66-0	1.21	1.6392	1.992			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.6052	2.244			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.5785	12.242			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.3960	1.470			
n-Hexane	00110-54-3	1.13	1.2090	1.372			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.0713	7.913			
3-Methylpentane	00096-14-0	1.69	0.9945	1.682			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.8734	0.829			

Vehicle 8003 - Fuel E59 - FTP Phase 1 - Test 5914 Continued...							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
n-Butane	00106-97-8	1.08	0.8090	0.871			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.7368	3.956			
acetone	00067-64-1	0.35	0.6243	0.220			
2-Butanone (MEK)	00078-93-3	1.45	0.1987	0.288			
Propionaldehyde	00123-38-6	6.96	0.0759	0.528			
benzaldehyde	00100-52-7	-0.71	0.0244	-0.017			
Glyoxal	00107-22-2	12.59	0.0096	0.121			
		Total	342.8	769.8	2.246		
		Total	329.1	680.1	2.067	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 2 - Test 5914							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	12.5515	0.174			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.5239	18.641			
Formaldehyde	00050-00-0	9.59	0.1713	1.643			
acetone	00067-64-1	0.35	0.0678	0.024			
acetaldehyde	00075-07-0	6.46	0.0232	0.150			
benzaldehyde	00100-52-7	-0.71	0.0092	-0.007			
2-Butanone (MEK)	00078-93-3	1.45	0.0085	0.012			
Propionaldehyde	00123-38-6	6.96	0.0047	0.033			
Glyoxal	00107-22-2	12.59	0.0007	0.009			
		Total	15.4	20.7	1.346		
		Total	15.1	18.8	1.248	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 3 - Test 5914							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.0799	0.278			
acetone	00067-64-1	0.35	0.1776	0.063			
Formaldehyde	00050-00-0	9.59	0.1652	1.585			
acetaldehyde	00075-07-0	6.46	0.1040	0.672			
Propionaldehyde	00123-38-6	6.96	0.0078	0.054			
2-Butanone (MEK)	00078-93-3	1.45	0.0070	0.010			
Glyoxal	00107-22-2	12.59	0.0024	0.030			
		Total	20.5439	2.6918	0.131		
		Total	20.0799	0.2782	0.014	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 1 - Test 6010							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	179.2652	259.751			
Methane	00074-82-8	0.01	56.9542	0.789			
Ethylene	00074-85-1	8.88	24.2293	215.261			
Ethane	00074-84-0	0.26	12.5483	3.298			
acetaldehyde	00075-07-0	6.46	9.7352	62.925			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.7426	53.544			
n-Propylbenzene	00103-65-1	1.96	6.2811	12.309			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.4474	7.381			
Toluene	00108-88-3	3.93	4.5857	17.999			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.6584	3.188			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.0468	15.874			
Formaldehyde	00050-00-0	9.59	1.8106	17.371			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.6066	8.626			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.6018	1.687			
Propane	00074-98-6	0.46	1.5805	0.722			
n-Pentane	00109-66-0	1.21	1.5129	1.838			
Benzene	00071-43-2	0.69	1.4621	1.015			
1,3-Butadiene	00106-99-0	12.45	1.4179	17.660			
n-Butane	00106-97-8	1.08	1.3460	1.450			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2777	1.786			
n-Hexane	00110-54-3	1.13	1.0677	1.212			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9696	0.920			
3-Methylpentane	00096-14-0	1.69	0.7299	1.234			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.6483	7.621			
acetone	00067-64-1	0.35	0.3922	0.138			
2-Butanone (MEK)	00078-93-3	1.45	0.1913	0.277			
Propionaldehyde	00123-38-6	6.96	0.0762	0.531			
n-butyraldehyde	00123-72-8	5.85	0.0157	0.092			
Glyoxal	00107-22-2	12.59	0.0121	0.152			
Acrolein	00107-02-8	7.37	0.0024	0.018			
		Total	328.2	716.7	2.184		
		Total	316.0	635.2	2.010	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 2 - Test 6010							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	18.5776	0.257			
n-Propylbenzene	00103-65-1	1.96	10.5933	20.759			
Toluene	00108-88-3	3.93	1.0234	4.017			
Formaldehyde	00050-00-0	9.59	0.1303	1.250			
acetaldehyde	00075-07-0	6.46	0.0270	0.175			
Propionaldehyde	00123-38-6	6.96	0.0008	0.005			
		Total	30.4	26.5	0.872		
		Total	30.2	25.0	0.829	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 3 - Test 6010							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.1021	0.320			
n-Propylbenzene	00103-65-1	1.96	4.9141	9.630			
Toluene	00108-88-3	3.93	1.8855	7.401			
Ethane	00074-84-0	0.26	1.5677	0.412			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.8105	4.352			
Formaldehyde	00050-00-0	9.59	0.1538	1.475			
acetaldehyde	00075-07-0	6.46	0.1162	0.751			
acetone	00067-64-1	0.35	0.0500	0.018			
Propionaldehyde	00123-38-6	6.96	0.0189	0.131			
n-butyraldehyde	00123-72-8	5.85	0.0090	0.053			
Glyoxal	00107-22-2	12.59	0.0067	0.085			
2-Butanone (MEK)	00078-93-3	1.45	0.0008	0.001			
Acrolein	00107-02-8	7.37	0.0005	0.004			
		Total	32.6	24.6	0.755		
		Total	32.3	22.1	0.685	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - US06 - Test 5832							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	7.6255	0.106			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.4826	2.977			
Ethylene	00074-85-1	8.88	2.0383	18.109			
Toluene	00108-88-3	3.93	2.0323	7.977			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	6.31	1.6133	10.178			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.3565	1.428			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.1698	1.635			
Ethane	00074-84-0	0.26	1.1287	0.297			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.0718	8.313			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.9042	1.013			
acetaldehyde	00075-07-0	6.46	0.8862	5.728			
acetone	00067-64-1	0.35	0.8779	0.310			
Benzene	00071-43-2	0.69	0.8053	0.559			
n-Pentane	00109-66-0	1.21	0.7562	0.919			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7423	0.704			
3-Methylpentane	00096-14-0	1.69	0.7183	1.214			
2,2-Dimethylbutane	00075-83-2	1.11	0.6598	0.733			
Formaldehyde	00050-00-0	9.59	0.6462	6.200			
2,3-Dimethylbutane	00079-29-8	0.90	0.6113	0.549			
t-2-Butene	00624-64-6	15.20	0.5700	8.662			
2,4-Dimethylpentane	00108-08-7	1.46	0.4318	0.630			
3-Methylnonane	05911-04-6	0.66	0.4158	0.273			
2,4-Dimethylhexane	00589-43-5	1.61	0.3967	0.637			
n-Hexane	00110-54-3	1.13	0.3790	0.430			
Methylcyclopentane	00096-37-7	2.05	0.3735	0.766			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.3651	1.960			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	0.3529	1.994			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.3504	0.383			
2-Butanone (MEK)	00078-93-3	1.45	0.2093	0.303			
Methacrolein	000078-85-3	5.96	0.0940	0.560			
benzaldehyde	00100-52-7	-0.71	0.0646	-0.046			
Propionaldehyde	00123-38-6	6.96	0.0611	0.425			
Glyoxal	00107-22-2	12.59	0.0237	0.299			
n-butyraldehyde	00123-72-8	5.85	0.0099	0.058			
Acrolein	00107-02-8	7.37	0.0093	0.069			
		Total	32.2	86.4	2.679		
		Total	29.4	72.4	2.468	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - US06 - Test 5760							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	9.7717	0.135			
Ethane	00074-84-0	0.26	1.2608	0.331			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.8750	3.845			
Cyclopentene	00142-29-0	6.69	0.8186	5.473			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	3.64	0.7783	2.831			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.5050	0.566			
acetone	00067-64-1	0.35	0.4041	0.142			
Formaldehyde	00050-00-0	9.59	0.3724	3.573			
acetaldehyde	00075-07-0	6.46	0.0898	0.581			
Glyoxal	00107-22-2	12.59	0.0356	0.449			
Propionaldehyde	00123-38-6	6.96	0.0280	0.195			
benzaldehyde	00100-52-7	-0.71	0.0066	-0.005			
Valeraldehyde	000110-62-3	4.98	0.0019	0.010			
		Total	14.9	18.1	1.213		
		Total	14.0	13.2	0.941	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - US06 - Test 5915							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	18.8562	0.261			
acetaldehyde	00075-07-0	6.46	6.0040	38.808			
Ethanol	00064-17-5	1.45	5.8926	8.538			
Ethylene	00074-85-1	8.88	3.7855	33.632			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.3643	3.203			
Toluene	00108-88-3	3.93	1.3341	5.237			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.3229	10.505			
Ethane	00074-84-0	0.26	1.2863	0.338			
Formaldehyde	00050-00-0	9.59	0.8513	8.167			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.7772	0.932			
n-Pentane	00109-66-0	1.21	0.6808	0.827			
acetone	00067-64-1	0.35	0.6629	0.234			
n-Butane	00106-97-8	1.08	0.6366	0.686			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.5903	4.360			
Propene	00115-07-1	11.57	0.5529	6.400			
meta- & para-Xylenes	00108-38-3+00106-42-3	4.17	0.5334	2.226			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.4931	0.689			
t-2-Butene	00624-64-6	15.20	0.3651	5.548			
n-Hexane	00110-54-3	1.13	0.3533	0.401			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.3437	1.846			
Benzene	00071-43-2	0.69	0.3208	0.223			
Propionaldehyde	00123-38-6	6.96	0.0505	0.352			
benzaldehyde	00100-52-7	-0.71	0.0374	-0.027			
Glyoxal	00107-22-2	12.59	0.0142	0.179			
		Total	48.1	133.6	2.776		
		Total	40.5	85.9	2.120	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - US06 - Test 6011							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	16.0959	0.223			
acetaldehyde	00075-07-0	6.46	2.3703	15.321			
Ethylene	00074-85-1	8.88	2.3646	21.008			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.5362	2.081			
Ethane	00074-84-0	0.26	1.4340	0.377			
Ethanol	00064-17-5	1.45	0.9850	1.427			
n-Propylbenzene	00103-65-1	1.96	0.9636	1.888			
1,2,4,5-Tetramethylbenzene	00095-93-2	9.26	0.4946	4.580			
acetone	00067-64-1	0.35	0.4776	0.168			
Toluene	00108-88-3	3.93	0.3718	1.459			
2-Butanone (MEK)	00078-93-3	1.45	0.0352	0.051			
Propionaldehyde	00123-38-6	6.96	0.0224	0.156			
Glyoxal	00107-22-2	12.59	0.0134	0.169			
Acrolein	00107-02-8	7.37	0.0043	0.032			
		Total	27.2	48.9	1.801		
		Total	24.2	33.0	1.363	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - UC - Test 5837							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	9.6786	0.134			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.1486	4.975			
Ethylene	00074-85-1	8.88	4.0456	35.942			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.9987	5.418			
Toluene	00108-88-3	3.93	3.4949	13.718			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.4897	19.771			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.3780	3.324			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.0721	2.182			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.9950	15.472			
Benzene	00071-43-2	0.69	1.9684	1.367			
Ethane	00074-84-0	0.26	1.8376	0.483			
Propene	00115-07-1	11.57	1.7520	20.278			
Acetylene (Ethyne)	00074-86-2	0.95	1.6930	1.601			
3-Methylpentane	00096-14-0	1.69	1.3025	2.202			
Formaldehyde	00050-00-0	9.59	1.2805	12.285			
2,3-Dimethylbutane	00079-29-8	0.90	1.1678	1.049			
2,2-Dimethylbutane	00075-83-2	1.11	1.1411	1.268			
n-Pentane	00109-66-0	1.21	1.1268	1.369			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.0865	1.031			
t-2-Butene	00624-64-6	15.20	0.9206	13.990			
3-Methylnonane	05911-04-6	0.66	0.8995	0.590			
acetaldehyde	00075-07-0	6.46	0.8847	5.718			
2,4-Dimethylpentane	00108-08-7	1.46	0.7882	1.150			
Methylcyclopentane	00096-37-7	2.05	0.7492	1.536			
n-Hexane	00110-54-3	1.13	0.7421	0.842			
2,4-Dimethylhexane	00589-43-5	1.61	0.7021	1.127			
2-Butanone (MEK)	00078-93-3	1.45	0.4437	0.643			
acetone	00067-64-1	0.35	0.3272	0.115			
Propionaldehyde	00123-38-6	6.96	0.0772	0.537			
benzaldehyde	00100-52-7	-0.71	0.0631	-0.045			
Methacrolein	000078-85-3	5.96	0.0257	0.153			
n-butyraldehyde	00123-72-8	5.85	0.0188	0.110			
Valeraldehyde	000110-62-3	4.98	0.0163	0.081			
Acrolein	00107-02-8	7.37	0.0056	0.041			
Glyoxal	00107-22-2	12.59	0.0051	0.065			
		Total	55.3	170.5	3.082		
		Total	52.2	150.8	2.890	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - UC - Test 5767							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.5462	0.285			
2-Methylbutane (Isopentane)	00078-78-4	1.35	9.8500	13.346			
Ethylene	00074-85-1	8.88	6.7132	59.642			
t-1,2-Dimethylcyclopentane	00822-50-4	2.78	3.0489	8.462			
Ethane	00074-84-0	0.26	2.8123	0.739			
acetaldehyde	00075-07-0	6.46	2.7514	17.784			
Toluene	00108-88-3	3.93	2.5224	9.900			
Unknown #2		2.78	1.8792	5.216			
Acetylene (Ethyne)	00074-86-2	0.95	1.7718	1.676			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.6861	13.390			
t-1,4-Dimethylcyclohexane	02207-04-7	2.78	1.4479	4.019			
1-Methylcyclopentene	00693-89-0	12.45	1.4247	17.744			
Formaldehyde	00050-00-0	9.59	1.3330	12.789			
n-Pentane	00109-66-0	1.21	1.3088	1.590			
Cyclopentene	00142-29-0	6.69	1.2091	8.084			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.0777	8.358			
2-Methylhexane	00591-76-4	1.09	1.0241	1.111			
Cyclopentadiene	00542-92-7	6.89	0.9679	6.669			
3-Methylpentane	00096-14-0	1.69	0.9527	1.611			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.9476	1.521			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.8375	0.795			
2,2-Dimethylpentane	00590-35-2	1.04	0.7981	0.832			
Cyclopentane	00287-92-3	2.24	0.7816	1.749			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.7385	5.454			
2,2-Dimethylpropane	00463-82-1	0.65	0.7293	0.471			
c-2-Butene	00590-18-1	14.26	0.6925	9.874			
2-Butanone (MEK)	00078-93-3	1.45	0.3510	0.509			
acetone	00067-64-1	0.35	0.2696	0.095			
Propionaldehyde	00123-38-6	6.96	0.1010	0.703			
benzaldehyde	00100-52-7	-0.71	0.0559	-0.040			
Valeraldehyde	000110-62-3	4.98	0.0282	0.140			
n-butyraldehyde	00123-72-8	5.85	0.0188	0.110			
Glyoxal	00107-22-2	12.59	0.0183	0.231			
Acrolein	00107-02-8	7.37	0.0078	0.058			
		Total	70.7	214.9	3.040		
		Total	65.8	182.5	2.775	w/o aldehydes	
No MIR available, use weighted average of 2.7755							
	aldehydes						

Vehicle 8003 - Fuel E59 - UC - Test 5916							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	62.2983	90.269			
Methane	00074-82-8	0.01	35.0423	0.485			
Ethylene	00074-85-1	8.88	10.1343	90.037			
acetaldehyde	00075-07-0	6.46	9.2633	59.874			
Acetylene (Ethyne)	00074-86-2	0.95	5.2560	4.972			
Ethane	00074-84-0	0.26	2.6474	0.696			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.3722	18.838			
Toluene	00108-88-3	3.93	1.7837	7.001			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.7625	2.388			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.5295	1.834			
Formaldehyde	00050-00-0	9.59	1.5233	14.614			
Propene	00115-07-1	11.57	1.0098	11.687			
1,3-Butadiene	00106-99-0	12.45	0.8267	10.296			
Benzene	00071-43-2	0.69	0.6283	0.436			
Propionaldehyde	00123-38-6	6.96	0.0719	0.500			
acetone	00067-64-1	0.35	0.0609	0.021			
Glyoxal	00107-22-2	12.59	0.0482	0.606			
2-Butanone (MEK)	00078-93-3	1.45	0.0479	0.070			
n-butyraldehyde	00123-72-8	5.85	0.0253	0.148			
Acrolein	00107-02-8	7.37	0.0211	0.155			
Valeraldehyde	000110-62-3	4.98	0.0177	0.088			
benzaldehyde	00100-52-7	-0.71	0.0121	-0.009			
		Total	136.4	315.0	2.310		
		Total	125.3	238.9	1.907	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - UC - Test 6014							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	51.6943	74.904			
Methane	00074-82-8	0.01	29.7058	0.412			
Ethylene	00074-85-1	8.88	12.2370	108.718			
acetaldehyde	00075-07-0	6.46	10.2252	66.092			
Ethane	00074-84-0	0.26	5.8180	1.529			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.0879	2.829			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.0848	16.556			
n-Propylbenzene	00103-65-1	1.96	2.0294	3.977			
Formaldehyde	00050-00-0	9.59	1.8482	17.731			
Toluene	00108-88-3	3.93	1.0950	4.298			
Propane	00074-98-6	0.46	1.0586	0.484			
1,3-Butadiene	00106-99-0	12.45	0.8832	11.000			
Propionaldehyde	00123-38-6	6.96	0.1191	0.829			
benzaldehyde	00100-52-7	-0.71	0.0145	-0.010			
Glyoxal	00107-22-2	12.59	0.0141	0.177			
n-butyraldehyde	00123-72-8	5.85	0.0104	0.061			
Acrolein	00107-02-8	7.37	0.0036	0.027			
		Total	120.9	309.6	2.560		
		Total	108.7	224.7	2.067	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - RL Cold - Test 25728					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	3.32	10.609	
Styrene	00100-42-5	1.66	2.08	3.455	
2-Methylhexane	00591-76-4	1.09	1.82	1.970	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.57	12.157	
2,2-DiMeHexane	00590-73-8	0.94	1.56	1.470	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.52	12.102	
Ethylbenzene	00100-41-4	2.96	1.50	4.438	
1,3,5-Trimethylbenzene	00108-67-8	11.8	1.49	17.459	
n-Butane	00106-97-8	1.08	1.28	1.377	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.94	4.996	
2-Methylheptane	00592-27-8	0.97	0.85	0.825	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.85	0.896	
n-Decane	00124-18-5	0.59	0.63	0.374	
Cyclohexane	00110-82-7	1.14	0.54	0.609	
2,3-Dimethylpentane	00565-59-3	1.25	0.46	0.573	
2-Methyl-2-butene	00513-35-9	14.2	0.42	5.952	
Methylcyclohexane	00108-87-2	1.56	0.36	0.556	
Indan	00496-11-7	3.23	0.27	0.866	
t-2-Pentene	00646-04-8	10.5	0.22	2.311	
n-Heptane	00142-82-5	0.97	0.19	0.186	
Methylcyclopentane	00096-37-7	2.05	0.17	0.351	
Benzene	00071-43-2	0.69	0.12	0.084	
ortho-Xylene	00095-47-6	7.58	0.10	0.726	
2,4-Dimethylpentane	00108-08-7	1.46	0.07	0.096	
		Total	22.3	84.4	3.783

Vehicle 8003 - Fuel E32 - RL Cold - Test 25719					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	6.53	48.230	
3-Methylnonane	05911-04-6	0.66	6.03	3.956	
t-2-Butene	00624-64-6	15.2	3.52	53.541	
1,3-Butadiene	00106-99-0	12.5	3.50	43.637	
n-Pentane	00109-66-0	1.21	2.86	3.475	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.73	3.059	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	1.88	11.837	
Methylcyclopentane	00096-37-7	2.05	1.85	3.786	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.32	15.400	
2,4-Dimethylhexane	00589-43-5	1.61	1.02	1.638	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.76	0.835	
Benzene	00071-43-2	0.69	0.71	0.494	
Ethylbenzene	00100-41-4	2.96	0.48	1.424	
t-2-Pentene	00646-04-8	10.5	0.47	4.887	
n-Heptane	00142-82-5	0.97	0.42	0.408	
Cyclopentene	00142-29-0	6.69	0.38	2.510	
2-Methyl-1-butene	00563-46-2	6.38	0.33	2.121	
2,2-Dimethylbutane	00075-83-2	1.11	0.22	0.248	
Toluene	00108-88-3	3.93	0.22	0.860	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.22	0.347	
t-2-Hexene	04050-45-7	8.55	0.18	1.532	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.17	0.174	
c-2-Pentene	00627-20-3	10.3	0.13	1.323	
ortho-Xylene	00095-47-6	7.58	0.06	0.445	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.05	0.048	
2-Methyl-2-pentene	00625-27-4	11	0.04	0.474	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.03	0.141	
		Total	36.1	206.8	5.728

Vehicle 8003 - Fuel E59 - RL Cold - Test 25747					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	9.83	14.243	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	3.75	43.922	
Naphthalene	00091-20-3	3.28	3.60	11.830	
Ethylbenzene	00100-41-4	2.96	3.13	9.262	
2,2-DiMeHexane	00590-73-8	0.94	1.21	1.136	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.68	0.712	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.64	7.540	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.59	4.720	
Unknown #22		3.95	0.47	1.860	
Methylcyclohexane	00108-87-2	1.56	0.25	0.395	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.11	0.123	
		Total	24.3	95.7	3.945
No MIR available, use weighted average of 3.9450					

Vehicle 8003 - Fuel E85 - RL Cold - Test 25762					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	18.70	27.100	
Unknown #23		2.23	2.61	5.819	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.31	10.370	
Ethylbenzene	00100-41-4	2.96	0.83	2.471	
2-Methyl-2-butene	00513-35-9	14.20	0.60	8.542	
2-Methylhexane	00591-76-4	1.05	0.49	0.516	
1-Methyl-3-Ethylbenzene	00620-14-4	1.09	0.24	0.256	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.23	0.748	
		Total	25.0	55.8	2.232
No MIR available, use weighted average of 2.2318					

Vehicle 8003 - Fuel E6 - RL Total - Test 25728					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylpropane	00075-28-5	1.18	6.25	7.350	
1-Butyne	00107-00-6	6.05	4.15	25.077	
2,2-DiMeHexane	00590-73-8	0.94	3.66	3.444	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.46	27.455	
n-Butane	00106-97-8	1.08	3.22	3.467	
Benzene	00071-43-2	0.69	2.69	1.866	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.17	16.813	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.81	13.347	
1,3,5-Trimethylbenzene	00108-67-8	11.8	1.34	15.713	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.30	1.455	
Styrene	00100-42-5	1.66	1.20	1.989	
n-Decane	00124-18-5	0.59	1.13	0.670	
n-Octane	00111-65-9	0.8	1.10	0.876	
2,4-Dimethylhexane	00589-43-5	1.61	0.90	1.443	
Unknown #22		3.32	0.88	2.916	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.86	1.028	
Toluene	00108-88-3	3.93	0.60	2.362	
Methylcyclohexane	00108-87-2	1.56	0.59	0.915	
Ethylbenzene	00100-41-4	2.96	0.56	1.648	
n-Hexane	00110-54-3	1.13	0.53	0.597	
n-Nonane	00111-84-2	0.68	0.50	0.344	
2-Methylhexane	00591-76-4	1.09	0.48	0.522	
ortho-Xylene	00095-47-6	7.58	0.48	3.631	
n-Propylbenzene	00103-65-1	1.96	0.41	0.802	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.38	0.401	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.36	0.341	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.20	0.628	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.17	0.761	
n-Heptane	00142-82-5	0.97	0.13	0.124	
2,3-Dimethylpentane	00565-59-3	1.25	0.04	0.055	
		Total	41.5	138.0	3.325
No MIR available, use weighted average of 3.3249					

Vehicle 8003 - Fuel E32 - RL Total - Test 25719					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	10.53	77.790	
3-Methylnonane	05911-04-6	0.66	9.73	6.381	
t-2-Butene	00624-64-6	15.2	5.68	86.357	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.79	5.367	
1,3-Butadiene	00106-99-0	12.5	4.03	50.158	
n-Pentane	00109-66-0	1.21	3.71	4.513	
Methylcyclopentane	00096-37-7	2.05	2.57	5.259	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	2.44	15.372	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.83	21.388	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.34	1.465	
2,4-Dimethylhexane	00589-43-5	1.61	1.17	1.882	
n-Heptane	00142-82-5	0.97	0.90	0.868	
Benzene	00071-43-2	0.69	0.82	0.568	
Cyclopentene	00142-29-0	6.69	0.80	5.341	
Ethylbenzene	00100-41-4	2.96	0.67	1.978	
2-Methyl-1-butene	00563-46-2	6.38	0.54	3.421	
t-2-Pentene	00646-04-8	10.5	0.54	5.617	
t-2-Hexene	04050-45-7	8.55	0.38	3.260	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.38	0.609	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.35	0.371	
Toluene	00108-88-3	3.93	0.28	1.116	
2,2-Dimethylbutane	00075-83-2	1.11	0.26	0.285	
c-2-Pentene	00627-20-3	10.3	0.18	1.838	
ortho-Xylene	00095-47-6	7.58	0.08	0.578	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.07	0.067	
2-Methyl-2-pentene	00625-27-4	11	0.07	0.765	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.03	0.184	
		Total	54.2	302.8	5.590

Vehicle 8003 - Fuel E59 - RL Total - Test 25747					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	13.51	19.577	
t-2-Butene	00624-64-6	15.2	6.22	94.514	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	5.35	62.639	
Naphthalene	00091-20-3	3.28	4.26	13.981	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.12	32.680	
n-Decane	00124-18-5	0.59	2.65	1.568	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.57	2.877	
2,2-DiMeHexane	00590-73-8	0.94	2.35	2.212	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	1.76	12.469	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.69	1.779	
1,2,3,5-Tetramethylbenzene	00527-53-7	9.26	1.40	12.983	
2-Methylpropane	00075-28-5	1.18	1.08	1.273	
c-2-Butene	00590-18-1	14.3	1.00	14.202	
1-Butyne	00107-00-6	6.05	0.73	4.390	
n-Octane	00111-65-9	0.8	0.68	0.539	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.58	7.292	
Unknown #22		5.64	0.56	3.142	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.36	0.343	
2,4-Dimethylhexane	00589-43-5	1.61	0.32	0.519	
2,3-Dimethylpentane	00565-59-3	1.25	0.09	0.110	
		Total	51.3	289.1	5.638
No MIR available, use weighted average of 5.6381					

Vehicle 8003 - Fuel E85 - RL Total - Test 25762					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	16.24	23.530	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	8.76	64.672	
Unknown #22	.	4.36	6.29	27.398	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.61	20.739	
2,2-DiMeHexane	00590-73-8	0.94	1.97	1.858	
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.27	14.982	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.96	1.049	
2-Methyl-2-butene	00513-35-9	14.20	0.90	12.813	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.52	4.033	
t-2-Pentene	00646-04-8	10.47	0.37	3.827	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.30	0.952	
Benzene	00071-43-2	0.69	0.28	0.191	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.21	1.177	
		Total	40.7	177.2	4.357
No MIR available, use weighted average of 4.3566					

Vehicle 8003 - Fuel E6 - HS - Test 7369					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	3.62	5.246	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.02	1.384	
t-2-Butene	00624-64-6	15.2	0.71	10.756	
2,2-DiMeHexane	00590-73-8	0.94	0.66	0.620	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.54	0.652	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.54	2.839	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.50	0.702	
n-Pentane	00109-66-0	1.21	0.48	0.588	
Methylcyclohexane	00108-87-2	1.56	0.45	0.697	
2-Methyl-2-butene	00513-35-9	14.2	0.45	6.348	
3-Methylpentane	00096-14-0	1.69	0.44	0.742	
Toluene	00108-88-3	3.93	0.38	1.496	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.34	0.360	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.33	0.361	
ortho-Xylene	00095-47-6	7.58	0.32	2.389	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.25	0.241	
2,3-Dimethylbutane	00079-29-8	0.9	0.25	0.223	
Methylcyclopentane	00096-37-7	2.05	0.21	0.428	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.20	1.566	
n-Butane	00106-97-8	1.08	0.13	0.136	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.09	0.490	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.08	0.136	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.07	0.397	
n-Heptane	00142-82-5	0.97	0.07	0.065	
2-Methylhexane	00591-76-4	1.09	0.06	0.062	
Cyclohexane	00110-82-7	1.14	0.05	0.058	
2,3-Dimethylpentane	00565-59-3	1.25	0.03	0.036	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.02	0.073	
2,4-Dimethylhexane	00589-43-5	1.61	0.02	0.027	
2,4-Dimethylpentane	00108-08-7	1.46	0.01	0.017	
		Total	12.3	39.1	3.177

Vehicle 8003 - Fuel E32 - HS - Test 7306					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-2-Butene	00624-64-6	0.69	0.81	0.563	
2,3,5-Trimethylhexane	01069-53-0	0.01	0.63	0.009	
t-2-Pentene	00646-04-8	0.26	0.58	0.152	
2,4,4-Trimethyl-2-Pentene	00107-40-4	8.88	0.57	5.032	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	0.95	0.52	0.490	
2,4-Dimethylhexane	00589-43-5	0.46	0.48	0.218	
c-2-Butene	00590-18-1	6.67	0.45	3.013	
ortho-Xylene	00095-47-6	1.18	0.35	0.411	
Toluene	00108-88-3	1.11	0.34	0.382	
2,3,4-Trimethylpentane	00565-75-3	1.35	0.32	0.437	
2,2-Dimethylbutane	00075-83-2	10.5	0.25	2.606	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	7.58	0.25	1.877	
2,2,5-Trimethylhexane	03522-94-9	5.37	0.24	1.309	
2-Methylhexane	00591-76-4	1.69	0.18	0.313	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	2.05	0.18	0.369	
Cyclohexane	00110-82-7	1.08	0.18	0.190	
2,3-Dimethylpentane	00565-59-3	12.5	0.14	1.785	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	6.05	0.14	0.845	
3-Methylpentane	00096-14-0	6.3	0.08	0.526	
2,4-Dimethylpentane	00108-08-7	1.46	0.06	0.081	
n-Pentane	00109-66-0	3.93	0.05	0.207	
Benzene	00071-43-2	1.56	0.04	0.060	
2-Methyl-1-butene	00563-46-2	3.93	0.04	0.147	
Methylcyclopentane	00096-37-7	1.14	0.04	0.041	
Cyclopentene	00142-29-0	11.6	0.03	0.315	
n-Heptane	00142-82-5	7.94	0.03	0.215	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	6.69	0.00	0.031	
		Total	7.0	21.6	3.097

Vehicle 8003 - Fuel E59 - HS - Test 7453					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	12.04	17.439	
n-Butane	00106-97-8	0.95	7.41	7.033	
2-Methylbutane (Isopentane)	00078-78-4	1.09	5.69	6.170	
Toluene	00108-88-3	1.11	3.59	3.992	
t-2-Butene	00624-64-6	0.69	1.45	1.004	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	6.05	1.09	6.600	
n-Pentane	00109-66-0	3.93	0.64	2.524	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.62	4.787	
3-Methylpentane	00096-14-0	6.3	0.34	2.157	
2,3,4-Trimethylpentane	00565-75-3	1.35	0.32	0.433	
ortho-Xylene	00095-47-6	1.18	0.26	0.302	
t-2-Pentene	00646-04-8	0.26	0.22	0.057	
2-Methyl-2-butene	00513-35-9	10.5	0.16	1.629	
2,3,5-Trimethylhexane	01069-53-0	0.01	0.14	0.002	
2,2-DiMeHexane	00590-73-8	0.94	0.13	0.121	
Cyclohexane	00110-82-7	1.08	0.13	0.135	
Methylcyclopentane	00096-37-7	1.14	0.12	0.141	
2,2,5-Trimethylhexane	03522-94-9	5.37	0.12	0.655	
2-Methylhexane	00591-76-4	1.69	0.11	0.184	
2,3-Dimethylpentane	00565-59-3	12.5	0.09	1.067	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.06	0.304	
Methylcyclohexane	00108-87-2	1.56	0.05	0.084	
c-2-Butene	00590-18-1	6.67	0.04	0.291	
n-Heptane	00142-82-5	7.94	0.03	0.259	
2,4-Dimethylpentane	00108-08-7	1.46	0.03	0.043	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.02	0.118	
2,4-Dimethylhexane	00589-43-5	0.46	0.02	0.010	
2,2-Dimethylbutane	00075-83-2	10.5	0.01	0.110	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	6.69	0.01	0.058	
Ethylbenzene	00100-41-4	2.96	0.00	0.000	
		Total	34.9	57.7	1.652

Vehicle 8003 - Fuel E85 - HS - Test 7510					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	4.74	6.861	
1,3-Dimethyl-2-Ethylbenzene	02870-04-4	10.2	1.07	10.828	
t-2-Butene	00624-64-6	15.2	1.05	15.934	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.92	7.173	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.83	0.930	
1-Dodecene	00112-41-4	1.56	0.55	0.865	
n-Undecane	01120-21-4	0.52	0.51	0.269	
c-2-Butene	00590-18-1	14.3	0.49	7.036	
1-Undecene	00821-95-4	1.77	0.47	0.828	
n-Butane	00106-97-8	1.08	0.43	0.463	
Unknown #18		4.22	0.43	1.800	
2,2-DiMeHexane	00590-73-8	0.94	0.40	0.373	
n-Decane	00124-18-5	0.59	0.38	0.225	
n-Propylbenzene	00103-65-1	1.96	0.33	0.644	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.27	0.299	
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.27	0.367	
t-1,2-Dimethylcyclopentane	00822-50-4	4.22	0.26	1.102	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.25	0.401	
t-2-Hexene	04050-45-7	8.55	0.24	2.051	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.22	0.710	
2,4-Dimethylhexane	00589-43-5	1.61	0.22	0.357	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.22	0.205	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.21	1.652	
Methylcyclohexane	00108-87-2	1.56	0.20	0.315	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.20	2.352	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.17	0.731	
n-Octane	00111-65-9	0.8	0.15	0.118	
Ethylbenzene	00100-41-4	2.96	0.14	0.403	
ortho-Xylene	00095-47-6	7.58	0.11	0.832	
Cyclohexane	00110-82-7	1.14	0.08	0.093	
Methylcyclopentane	00096-37-7	2.05	0.07	0.145	
2-Methyl-2-butene	00513-35-9	14.2	0.06	0.796	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.04	0.443	
2,2-Dimethylbutane	00075-83-2	1.11	0.03	0.038	
3-Methylpentane	00096-14-0	1.69	0.02	0.038	
n-Pentane	00109-66-0	1.21	0.01	0.014	
		Total	16.0	67.7	4.220
No MIR available, use weighted average of 4.2203					

Vehicle 8003 - Fuel E6 - DHB Day 1 - Test 7371					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	41.84	60.623	
2-Methylbutane (Isopentane)	00078-78-4	1.35	35.23	47.731	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	15.38	21.501	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	12.57	15.073	
n-Pentane	00109-66-0	1.21	10.67	12.961	
2,3-Dimethylbutane	00079-29-8	0.9	8.79	7.897	
3-Methylpentane	00096-14-0	1.69	8.39	14.193	
2,2-DiMeHexane	00590-73-8	0.94	7.26	6.833	
Toluene	00108-88-3	3.93	5.89	23.124	
2,2-Dimethylbutane	00075-83-2	1.11	5.80	6.440	
n-Hexane	00110-54-3	1.13	4.59	5.211	
Methylcyclopentane	00096-37-7	2.05	4.16	8.521	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.52	3.706	
2,4-Dimethylpentane	00108-08-7	1.46	3.39	4.944	
2,3-Dimethylpentane	00565-59-3	1.25	3.24	4.050	
2-Methylhexane	00591-76-4	1.09	3.11	3.371	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.72	2.583	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.59	8.258	
Cyclohexane	00110-82-7	1.14	2.43	2.761	
2,4-Dimethylhexane	00589-43-5	1.61	2.42	3.891	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.37	18.401	
Benzene	00071-43-2	0.69	2.23	1.546	
Methylcyclohexane	00108-87-2	1.56	2.09	3.258	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.89	3.041	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.55	19.353	
t-2-Butene	00624-64-6	15.2	1.53	23.324	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.47	10.839	
t-2-Pentene	00646-04-8	10.5	1.31	13.703	
2-Methyl-2-butene	00513-35-9	14.2	1.22	17.387	
ortho-Xylene	00095-47-6	7.58	1.20	9.068	
3,5-Dimethylheptane	00926-82-9	1.42	1.18	1.681	
n-Butane	00106-97-8	1.08	1.15	1.240	
Ethylbenzene	00100-41-4	2.96	1.14	3.391	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	1.08	5.728	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.99	1.107	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.97	1.063	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.97	7.700	
1,3-Butadiene	00106-99-0	12.5	0.97	12.074	
t-1,2-Dimethylcyclopentane	00822-50-4	2.24	0.94	2.115	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.87	10.277	
Indan	00496-11-7	3.23	0.87	2.821	
2-Methyl-1-butene	00563-46-2	6.38	0.85	5.398	
t-2-Hexene	04050-45-7	8.55	0.81	6.886	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.76	3.320	

Vehicle 8003 - Fuel E6 - DHB Day 1 - Test 7371 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
n-Heptane	00142-82-5	0.97	0.73	0.706	
2-Methylheptane	00592-27-8	0.97	0.72	0.701	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.72	8.383	
c-2-Pentene	00627-20-3	10.3	0.67	6.926	
3-Methyloctane	02216-33-3	0.88	0.67	0.595	
2-Methyl-2-pentene	00625-27-4	11	0.65	7.157	
c-1,3-Dimethylcyclopentane	02532-58-3	2.24	0.65	1.454	
3-Methylheptane	00589-81-1	1.12	0.63	0.707	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.57	3.184	
2,4-Dimethylheptane	02213-23-2	1.26	0.57	0.722	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.50	2.863	
n-Octane	00111-65-9	0.8	0.49	0.392	
4-Methyloctane	02216-34-4	0.85	0.49	0.418	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.47	5.530	
n-Nonane	00111-84-2	0.68	0.43	0.296	
n-Propylbenzene	00103-65-1	1.96	0.43	0.841	
c-1,3-Dimethylcyclohexane	00638-04-0	2.24	0.41	0.922	
c-2-Heptene	06443-92-1	7.08	0.41	2.889	
2,2-Dimethylpentane	00590-35-2	1.04	0.38	0.397	
3,3-Dimethylhexane	00563-16-6	1.15	0.38	0.435	
n-Decane	00124-18-5	0.59	0.34	0.200	
c-2-Butene	00590-18-1	14.3	0.31	4.361	
1c-2t-3-TriMeCyPentane	15890-40-1	2.24	0.29	0.660	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.29	0.302	
1,4-Diethylbenzene	00105-05-5	4.39	0.28	1.232	
Unknown #6	.	2.24	0.27	0.611	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.26	3.057	
Unknown #16		2.24	0.26	0.573	
t-2-Nonene	06434-78-2	2.24	0.25	0.562	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.24	1.911	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.24	1.956	
Unknown #13		2.24	0.23	0.511	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	0.23	1.437	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.22	0.853	
Cyclopentene	00142-29-0	6.69	0.21	1.374	
3,3-Dimethylpentane	00562-49-2	1.12	0.20	0.228	
1-Nonene	00124-11-8	2.49	0.17	0.412	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.16	1.111	
Unknown #20		2.24	0.14	0.323	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.14	0.119	
Unknown #5		2.24	0.13	0.299	
Unknown #15		2.24	0.11	0.256	
		Total	230.4	516.3	2.241
No MIR available, use weighted average of 2.2411					

Vehicle 8003 - Fuel E32 - DHB Day 1 - Test 7308					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	35.73	51.779	
2-Methylbutane (Isopentane)	00078-78-4	1.35	35.17	47.652	
Methylcyclohexane	00108-87-2	1.56	10.94	17.016	
n-Pentane	00109-66-0	1.21	7.22	8.767	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	6.63	9.274	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	5.57	6.685	
Toluene	00108-88-3	3.93	4.38	17.209	
3-Methylpentane	00096-14-0	1.69	3.34	5.639	
2,3-Dimethylbutane	00079-29-8	0.9	3.28	2.946	
2,2-Dimethylbutane	00075-83-2	1.11	2.70	2.995	
n-Hexane	00110-54-3	1.13	2.51	2.850	
3,5-Dimethylheptane	00926-82-9	1.42	2.25	3.205	
Methylcyclopentane	00096-37-7	2.05	2.11	4.329	
Cyclohexane	00110-82-7	1.14	2.00	2.274	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.90	2.005	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.75	13.565	
2,4-Dimethylpentane	00108-08-7	1.46	1.61	2.346	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.37	1.532	
n-Butane	00106-97-8	1.08	1.33	1.430	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.26	1.200	
2,2-Dimethylpentane	00590-35-2	1.04	1.23	1.285	
2-Methylhexane	00591-76-4	1.09	1.22	1.323	
2,4-Dimethylhexane	00589-43-5	1.61	1.19	1.914	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.10	3.523	
2,3-Dimethylpentane	00565-59-3	1.25	1.03	1.290	
3-Methyloctane	02216-33-3	0.88	1.03	0.914	
Benzene	00071-43-2	0.69	1.00	0.695	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.97	11.384	
ortho-Xylene	00095-47-6	7.58	0.94	7.111	
c-2-Butene	00590-18-1	14.3	0.90	12.878	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.89	1.423	
t-2-Pentene	00646-04-8	10.5	0.88	9.255	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.86	4.563	
t-2-Butene	00624-64-6	15.2	0.86	13.055	
2-Methyl-1-butene	00563-46-2	6.38	0.79	5.039	
2-Methyl-2-butene	00513-35-9	14.2	0.70	9.883	
n-Heptane	00142-82-5	0.97	0.68	0.654	
c-2-Pentene	00627-20-3	10.3	0.67	6.883	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.64	5.044	
t-2-Hexene	04050-45-7	8.55	0.61	5.253	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.58	0.635	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.51	5.982	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.48	5.651	
2,4-Dimethylheptane	02213-23-2	1.26	0.47	0.595	

Vehicle 8003 - Fuel E32 - DHB Day 1 - Test 7308 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-1,2-Dimethylcyclopentane	00822-50-4	2.14	0.44	0.948	
c-1,3-Dimethylcyclohexane	00638-04-0	2.14	0.44	0.934	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.35	4.442	
2-Methyl-2-pentene	00625-27-4	11	0.35	3.819	
3-Methylheptane	00589-81-1	1.12	0.33	0.367	
c-1,3-Dimethylcyclopentane	02532-58-3	2.14	0.31	0.665	
Ethylbenzene	00100-41-4	2.96	0.30	0.877	
2-Methylheptane	00592-27-8	0.97	0.30	0.286	
Cyclopentene	00142-29-0	6.69	0.04	0.290	
3-Methylnonane	005911-04-6	0.66	0.03	0.020	
		Total	156.2	333.6	2.136
No MIR available, use weighted average of 2.1357					

Vehicle 8003 - Fuel E59 - DHB Day 1 - Test 7454					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	99.27	143.847	
2-Methylbutane (Isopentane)	00078-78-4	1.35	26.22	35.519	
n-Butane	00106-97-8	1.08	16.81	18.105	
Toluene	00108-88-3	3.93	9.06	35.553	
n-Pentane	00109-66-0	1.21	6.66	8.095	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	6.64	9.283	
n-Hexane	00110-54-3	1.13	5.85	6.635	
2,2-DiMeHexane	00590-73-8	0.94	5.61	5.278	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	5.46	6.552	
3-Methylpentane	00096-14-0	1.69	5.25	8.873	
Benzene	00071-43-2	0.69	3.33	2.312	
2,3-Dimethylbutane	00079-29-8	0.9	3.21	2.885	
2-Methyl-2-butene	00513-35-9	14.2	2.74	38.941	
t-2-Butene	00624-64-6	15.2	2.64	40.187	
Methylcyclopentane	00096-37-7	2.05	2.44	4.991	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.38	2.502	
t-2-Pentene	00646-04-8	10.5	2.33	24.386	
2-Methyl-1-butene	00563-46-2	6.38	1.90	12.101	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.90	2.123	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.85	1.755	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.70	13.148	
Cyclohexane	00110-82-7	1.14	1.58	1.793	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.48	17.337	
Methylcyclohexane	00108-87-2	1.56	1.48	2.301	
2-Methylhexane	00591-76-4	1.09	1.40	1.520	
2,2-Dimethylbutane	00075-83-2	1.11	1.38	1.532	
2,4-Dimethylpentane	00108-08-7	1.46	1.31	1.911	
ortho-Xylene	00095-47-6	7.58	1.26	9.542	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.17	14.684	
c-2-Pentene	00627-20-3	10.3	1.17	12.025	
2,3-Dimethylpentane	00565-59-3	1.25	1.14	1.428	
3,5-Dimethylheptane	00926-82-9	1.42	1.04	1.485	
2,4-Dimethylhexane	00589-43-5	1.61	1.01	1.615	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.00	3.189	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.82	0.897	
n-Heptane	00142-82-5	0.97	0.76	0.732	
2-Methyl-2-pentene	00625-27-4	11	0.74	8.204	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.67	4.428	
n-Decane	00124-18-5	2.49	0.67	1.666	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.67	5.289	
t-2-Hexene	04050-45-7	8.55	0.63	5.417	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.63	7.327	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.63	1.004	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.61	3.246	

Vehicle 8003 - Fuel E59 - DHB Day 1 - Test 7454 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
c-2-Butene	00590-18-1	14.3	0.52	7.449	
Cyclopentene	00142-29-0	6.69	0.52	3.466	
3-Methylheptane	00589-81-1	1.12	0.49	0.554	
2-Methylheptane	00592-27-8	0.97	0.47	0.450	
t-1,2-Dimethylcyclopentane	00822-50-4	2.29	0.46	1.042	
c-1,3-Dimethylcyclopentane	02532-58-3	2.29	0.37	0.851	
Indan	00496-11-7	3.23	0.36	1.167	
2,2-Dimethylpentane	00590-35-2	1.04	0.35	0.368	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.33	1.430	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.32	1.716	
2,4-Dimethylheptane	02213-23-2	1.26	0.30	0.380	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.27	1.476	
1c-2t-3-TriMeCyPentane	15890-40-1	2.29	0.24	0.538	
Unknown #16		2.29	0.22	0.498	
n-Octane	00111-65-9	0.8	0.13	0.105	
n-Propylbenzene	00103-65-1	1.96	0.11	0.206	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.01	0.070	
		Total	241.9	553.4	2.287
No MIR available, use weighted average of 2.2875					

Vehicle 8003 - Fuel E85 - DHB Day 1 - Test 7513					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	124.91	180.989	
2-Methylbutane (Isopentane)	00078-78-4	1.35	26.55	35.976	
n-Butane	00106-97-8	1.08	14.97	16.117	
2,2-DiMeHexane	00590-73-8	0.94	6.01	5.659	
Toluene	00108-88-3	3.93	5.69	22.346	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	5.05	37.273	
n-Pentane	00109-66-0	1.21	4.69	5.696	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.34	6.068	
n-Hexane	00110-54-3	1.13	3.78	4.291	
Cyclohexane	00110-82-7	1.14	3.02	3.433	
3-Methylpentane	00096-14-0	1.69	2.55	4.314	
2,3-Dimethylbutane	00079-29-8	0.90	2.43	2.188	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.34	2.811	
Benzene	00071-43-2	0.69	2.23	1.550	
2-Methyl-2-butene	00513-35-9	14.20	2.05	29.119	
Methylcyclopentane	00096-37-7	2.05	1.71	3.509	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.61	1.800	
t-2-Pentene	00646-04-8	10.47	1.43	14.977	
2-Methyl-1-butene	00563-46-2	6.38	1.33	8.472	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.23	9.548	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.19	9.461	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.16	13.541	
Methylcyclohexane	00108-87-2	1.56	1.08	1.678	
2,4-Dimethylpentane	00108-08-7	1.46	1.08	1.574	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.96	4.213	
2,4-Dimethylhexane	00589-43-5	1.61	0.95	1.530	
n-Heptane	00142-82-5	0.97	0.93	0.903	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.91	10.717	
c-2-Pentene	00627-20-3	10.28	0.88	9.031	
2,3-Dimethylpentane	00565-59-3	1.25	0.84	1.048	
2,2-Dimethylbutane	00075-83-2	1.11	0.76	0.841	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.74	0.783	
2-Methylhexane	00591-76-4	1.09	0.72	0.778	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.71	0.676	
n-Decane	00124-18-5	0.59	0.69	0.407	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.68	3.781	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.66	2.102	
Cyclopentene	00142-29-0	6.69	0.65	4.314	
ortho-Xylene	00095-47-6	7.58	0.55	4.146	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.54	2.868	
t-2-Hexene	04050-45-7	8.55	0.45	3.826	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.42	0.682	
3,5-Dimethylheptane	00926-82-9	1.42	0.42	0.595	
c-2-Butene	00590-18-1	14.26	0.40	5.648	

Vehicle 8003 - Fuel E85 - DHB Day 1 - Test 7513 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-1,2-Dimethylcyclopentane	00822-50-4	2.08	0.36	0.752	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.34	4.005	
Ethylbenzene	00100-41-4	2.96	0.32	0.955	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.31	2.063	
2-Methylheptane	00592-27-8	0.97	0.31	0.300	
c-1,3-Dimethylcyclopentane	02532-58-3	2.08	0.30	0.618	
1c-2t-3-TriMeCyPentane	15890-40-1	2.08	0.28	0.589	
2,2-Dimethylpentane	00590-35-2	1.04	0.28	0.294	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.26	3.257	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.24	0.267	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.24	2.809	
3-Methylheptane	00589-81-1	1.12	0.23	0.263	
n-Octane	00111-65-9	0.80	0.23	0.182	
2-Methyl-2-pentene	00625-27-4	11.03	0.19	2.124	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.16	0.853	
1,1-Dimethylcyclohexane	00590-66-9	1.12	0.07	0.077	
		Total	240.4	500.7	2.082
No MIR available, use weighted average of 2.0825					

Vehicle 8003 - Fuel E6 - DHB Total - Test 7371					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	94.10	127.489	
Ethanol	00064-17-5	1.45	72.51	105.058	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	44.27	61.873	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	40.38	48.419	
n-Pentane	00109-66-0	1.21	29.00	35.231	
3-Methylpentane	00096-14-0	1.69	25.16	42.541	
2,3-Dimethylbutane	00079-29-8	0.9	23.58	21.188	
Toluene	00108-88-3	3.93	15.94	62.553	
2,2-Dimethylbutane	00075-83-2	1.11	15.46	17.179	
n-Hexane	00110-54-3	1.13	13.37	15.168	
2,2-DiMeHexane	00590-73-8	0.94	13.06	12.289	
Methylcyclopentane	00096-37-7	2.05	12.35	25.320	
2,4-Dimethylpentane	00108-08-7	1.46	10.43	15.226	
2,2,5-Trimethylhexane	03522-94-9	1.05	10.00	10.535	
2-Methylhexane	00591-76-4	1.09	8.78	9.527	
2,3-Dimethylpentane	00565-59-3	1.25	8.61	10.745	
2,3,4-Trimethylpentane	00565-75-3	0.95	8.58	8.137	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	7.49	23.892	
Cyclohexane	00110-82-7	1.14	6.07	6.898	
2,4-Dimethylhexane	00589-43-5	1.61	6.00	9.628	
Methylcyclohexane	00108-87-2	1.56	4.86	7.555	
Benzene	00071-43-2	0.69	4.44	3.082	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	4.13	6.637	
2-Methyl-2-butene	00513-35-9	14.2	3.81	54.056	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.05	23.686	
3-Methyl-c-2-pentene	00922-62-3	12.5	2.93	36.676	
n-Heptane	00142-82-5	0.97	2.85	2.755	
t-2-Pentene	00646-04-8	10.5	2.66	27.872	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	2.42	12.803	
t-1,2-Dimethylcyclopentane	00822-50-4	2.04	2.38	4.853	
3,5-Dimethylheptane	00926-82-9	1.42	2.35	3.345	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	2.33	2.547	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.09	15.405	
t-2-Butene	00624-64-6	15.2	2.02	30.761	
2-Methylheptane	00592-27-8	0.97	2.02	1.955	
t-2-Hexene	04050-45-7	8.55	1.94	16.591	
c-1,3-Dimethylcyclopentane	02532-58-3	2.04	1.90	3.868	
2-Methyl-1-butene	00563-46-2	6.38	1.80	11.470	
n-Butane	00106-97-8	1.08	1.79	1.929	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.76	20.548	
3-Methylheptane	00589-81-1	1.12	1.74	1.954	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.73	1.936	
ortho-Xylene	00095-47-6	7.58	1.52	11.541	
2-Methyl-2-pentene	00625-27-4	11	1.50	16.520	

Vehicle 8003 - Fuel E6 - DHB Total - Test 7371 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
c-2-Pentene	00627-20-3	10.3	1.49	15.340	
n-Octane	00111-65-9	0.8	1.37	1.091	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.28	14.956	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.27	10.115	
Ethylbenzene	00100-41-4	2.96	1.23	3.647	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.99	7.728	
c-1,3-Dimethylcyclohexane	00638-04-0	2.04	0.90	1.825	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.83	0.872	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.81	4.696	
Unknown #25		2.04	0.80	1.629	
1-Methylcyclopentene	00693-89-0	12.5	0.79	9.861	
2,4-Dimethylheptane	02213-23-2	1.26	0.77	0.979	
1c-2t-3-TriMeCyPentane	15890-40-1	2.04	0.75	1.535	
3-Methyloctane	02216-33-3	0.88	0.74	0.651	
Unknown #5		2.04	0.72	1.462	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.71	2.734	
4-Methyloctane	02216-34-4	0.85	0.70	0.595	
t-4-Octene	14850-23-8	4.69	0.69	3.234	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.68	2.991	
Unknown #9		2.04	0.68	1.383	
c-2-Heptene	06443-92-1	7.08	0.60	4.240	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.59	6.974	
Cyclopentene	00142-29-0	6.69	0.59	3.942	
3,3-Dimethylhexane	00563-16-6	1.15	0.56	0.640	
Indan	00496-11-7	3.23	0.55	1.788	
1-Nonene	00124-11-8	2.49	0.54	1.351	
2,2-Dimethylpentane	00590-35-2	1.04	0.52	0.547	
1,1-Dimethylcyclohexane	00590-66-9	1.12	0.52	0.583	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.51	3.332	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.49	3.955	
3,3-Dimethylpentane	00562-49-2	1.12	0.49	0.543	

Vehicle 8003 - Fuel E6 - DHB Total - Test 7371 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
c-2-Butene	00590-18-1	14.3	0.48	6.819	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.46	2.561	
Unknown #8		2.04	0.41	0.839	
Unknown #18		2.04	0.40	0.822	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	0.39	2.473	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.39	3.287	
t-3-Heptene	14686-14-7	6.17	0.39	2.388	
n-Nonane	00111-84-2	0.68	0.38	0.257	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.35	2.490	
t-2-Nonene	06434-78-2	2.04	0.35	0.709	
Unknown #16		2.04	0.33	0.682	
t-1,4-Dimethylcyclohexane	02207-04-7	2.04	0.32	0.646	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.04	0.28	0.578	
Unknown #13		2.04	0.24	0.488	
Unknown #23		2.04	0.22	0.451	
1-Heptene	00592-76-7	4.29	0.21	0.909	
n-Propylbenzene	00103-65-1	1.96	0.21	0.415	
Unknown #1		2.04	0.19	0.397	
c-2-Octene	07642-04-8	2.04	0.19	0.385	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.09	0.469	
		Total	555.6	1132.5	2.038
No MIR available, use weighted average of 2.0385					

Vehicle 8003 - Fuel E32 - DHB Total - Test 7308					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	92.66	125.542	
Ethanol	00064-17-5	1.45	91.64	132.787	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	21.42	29.940	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	19.49	23.373	
Methylcyclohexane	00108-87-2	1.56	19.45	30.256	
n-Pentane	00109-66-0	1.21	18.48	22.458	
3-Methylpentane	00096-14-0	1.69	12.51	21.157	
2,3-Dimethylbutane	00079-29-8	0.9	10.72	9.633	
Toluene	00108-88-3	3.93	10.34	40.566	
2,2-Dimethylbutane	00075-83-2	1.11	8.73	9.700	
2,2-Dimethylpropane	00463-82-1	0.65	8.56	5.533	
n-Hexane	00110-54-3	1.13	8.00	9.082	
2,3,5-Trimethylhexane	01069-53-0	1.12	7.19	8.058	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	6.23	33.472	
Methylcyclopentane	00096-37-7	2.05	6.23	12.773	
2,2,5-Trimethylhexane	03522-94-9	1.05	5.25	5.524	
2,4-Dimethylpentane	00108-08-7	1.46	4.79	6.987	
2,3,4-Trimethylpentane	00565-75-3	0.95	4.49	4.256	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	4.16	13.262	
2-Methylhexane	00591-76-4	1.09	4.11	4.462	
2-Methyl-1-butene	00563-46-2	6.38	4.00	25.506	
2,3-Dimethylpentane	00565-59-3	1.25	3.86	4.824	
3,5-Dimethylheptane	00926-82-9	1.42	3.73	5.314	
Cyclohexane	00110-82-7	1.14	3.47	3.952	
2,4-Dimethylhexane	00589-43-5	1.61	3.26	5.238	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.66	20.655	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.62	30.626	
Benzene	00071-43-2	0.69	2.53	1.755	
2-Methyl-2-butene	00513-35-9	14.2	2.52	35.729	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	2.29	12.129	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.21	3.545	
t-2-Pentene	00646-04-8	10.5	2.08	21.828	
2,2-Dimethylpentane	00590-35-2	1.04	2.04	2.128	
3-Methyloctane	02216-33-3	0.88	1.98	1.749	
n-Heptane	00142-82-5	0.97	1.81	1.747	
c-2-Butene	00590-18-1	14.3	1.56	22.238	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.55	1.694	
c-2-Pentene	00627-20-3	10.3	1.38	14.224	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.37	15.944	
ortho-Xylene	00095-47-6	7.58	1.34	10.179	
t-1,2-Dimethylcyclopentane	00822-50-4	2.12	1.29	2.729	
3-Me-1-Hexene	03404-61-3	2.12	1.29	2.719	
Cyclopentene	00142-29-0	6.69	1.21	8.116	
t-2-Hexene	04050-45-7	8.55	1.20	10.247	

Vehicle 8003 - Fuel E32 - DHB Total - Test 7308 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	1.15	1.108	
c-1,3-Dimethylcyclopentane	02532-58-3	2.12	1.11	2.344	
2-Methyl-2-pentene	00625-27-4	11	1.10	12.126	
c-2-Heptene	06443-92-1	7.08	0.96	6.793	
3,3-Dimethyl-1-butene	00558-37-2	5.68	0.96	5.453	
2,4-Dimethylheptane	02213-23-2	1.26	0.93	1.173	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.93	11.592	
n-Octane	00111-65-9	0.8	0.89	0.709	
1,3-Butadiene	00106-99-0	12.5	0.88	10.942	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.83	5.460	
c-1,3-Dimethylcyclohexane	00638-04-0	2.12	0.81	1.722	
3-Methylheptane	00589-81-1	1.12	0.77	0.862	
t-2-Butene	00624-64-6	15.2	0.75	11.449	
3,3-Dimethylhexane	00563-16-6	1.15	0.75	0.867	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.72	4.151	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.66	5.136	
3-Methylnonane	005911-04-6	0.66	0.64	0.421	
Styrene	00100-42-5	1.66	0.63	1.040	
1-Methylcyclopentene	00693-89-0	12.5	0.60	7.420	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.56	2.144	
Unknown #25		2.12	0.54	1.139	
Ethylbenzene	00100-41-4	2.96	0.52	1.531	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.48	5.594	
Unknown #3		2.12	0.46	0.980	
1-Heptene	00592-76-7	4.29	0.41	1.741	
Unknown #20		2.12	0.37	0.782	
t-3-Heptene	14686-14-7	6.17	0.33	2.009	
n-Nonane	00111-84-2	0.68	0.31	0.213	
Unknown #14		2.12	0.30	0.624	
n-Propylbenzene	00103-65-1	1.96	0.29	0.567	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.28	1.567	

Vehicle 8003 - Fuel E32 - DHB Total - Test 7308 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Unknown #5		2.12	0.27	0.577	
n-Undecane	01120-21-4	0.52	0.27	0.141	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.27	2.232	
1,2,3,5-Tetramethylbenzene	00527-53-7	9.26	0.26	2.406	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.25	1.744	
Ethylcyclohexane	01678-91-7	1.35	0.22	0.291	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.22	0.228	
3,3-Dimethylpentane	00562-49-2	1.12	0.18	0.203	
Unknown #12		2.12	0.18	0.382	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.12	0.15	0.321	
n-Butylbenzene	00104-51-8	2.29	0.13	0.298	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.09	0.696	
3-Methyl-1-butene	00563-45-1	6.85	0.08	0.520	
Indan	00496-11-7	3.23	0.07	0.225	
		Total	441.2	933.6	2.116
No MIR available, use weighted average of 2.1158					

Vehicle 8003 - Fuel E59 - DHB Total - Test 7454					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	289.25	419.122	
2-Methylbutane (Isopentane)	00078-78-4	1.35	73.50	99.586	
n-Butane	00106-97-8	1.08	43.66	47.021	
Toluene	00108-88-3	3.93	22.55	88.499	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	20.22	28.261	
n-Pentane	00109-66-0	1.21	18.87	22.926	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	16.90	20.263	
n-Hexane	00110-54-3	1.13	15.92	18.070	
3-Methylpentane	00096-14-0	1.69	15.25	25.794	
2,2-DiMeHexane	00590-73-8	0.94	12.87	12.116	
2,3-Dimethylbutane	00079-29-8	0.9	10.08	9.056	
Benzene	00071-43-2	0.69	7.45	5.175	
Methylcyclopentane	00096-37-7	2.05	7.32	14.996	
2-Methyl-2-butene	00513-35-9	14.2	7.21	102.288	
t-2-Butene	00624-64-6	15.2	5.62	85.368	
2,3,4-Trimethylpentane	00565-75-3	0.95	5.50	5.214	
t-2-Pentene	00646-04-8	10.5	5.40	56.505	
2,2,5-Trimethylhexane	03522-94-9	1.05	5.39	5.677	
Cyclohexane	00110-82-7	1.14	4.97	5.658	
2,2-Dimethylbutane	00075-83-2	1.11	4.94	5.492	
2-Methylhexane	00591-76-4	1.09	4.47	4.849	
2,4-Dimethylpentane	00108-08-7	1.46	4.43	6.459	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	4.04	12.894	
2,3,5-Trimethylhexane	01069-53-0	1.12	3.89	4.356	
2-Methyl-1-butene	00563-46-2	6.38	3.77	24.030	
2,3-Dimethylpentane	00565-59-3	1.25	3.71	4.631	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.60	27.940	
Methylcyclohexane	00108-87-2	1.56	3.56	5.543	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.53	28.032	
c-2-Pentene	00627-20-3	10.3	3.13	32.195	
2,4-Dimethylhexane	00589-43-5	1.61	2.69	4.326	
2-Methylpropane	00075-28-5	1.18	2.63	3.096	
n-Heptane	00142-82-5	0.97	2.58	2.493	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.47	28.895	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.97	3.162	
3,5-Dimethylheptane	00926-82-9	1.42	1.97	2.799	
t-2-Hexene	04050-45-7	8.55	1.80	15.400	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.76	22.026	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.65	1.799	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	1.64	8.685	
2-Methyl-2-pentene	00625-27-4	11	1.58	17.390	
Cyclopentene	00142-29-0	6.69	1.55	10.362	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.54	18.012	
c-2-Butene	00590-18-1	14.3	1.48	21.119	

Vehicle 8003 - Fuel E59 - DHB Total - Test 7454 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	1.46	1.408	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.37	9.065	
t-1,2-Dimethylcyclopentane	00822-50-4	2.19	1.31	2.857	
ortho-Xylene	00095-47-6	7.58	1.28	9.675	
c-1,3-Dimethylcyclopentane	02532-58-3	2.19	1.26	2.750	
n-Decane	00124-18-5	0.59	1.25	0.741	
1-Methylcyclopentene	00693-89-0	12.5	1.04	12.928	
Unknown #16		2.19	1.03	2.244	
3-Methylheptane	00589-81-1	1.12	1.02	1.151	
3-Methyloctane	02216-33-3	0.88	1.02	0.899	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.88	5.107	
Indan	00496-11-7	3.23	0.84	2.712	
Unknown #22	.	2.19	0.80	1.747	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.72	3.877	
2,2-Dimethylpentane	00590-35-2	1.04	0.71	0.742	
2,4-Dimethylheptane	02213-23-2	1.26	0.69	0.877	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.19	0.68	1.494	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.68	2.991	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.67	0.704	
Styrene	00100-42-5	1.66	0.67	1.108	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.66	7.792	
4-Methyloctane	02216-34-4	0.85	0.66	0.562	
3,3-Dimethylpentane	00562-49-2	1.12	0.64	0.718	
n-Octane	00111-65-9	0.8	0.64	0.510	
t-3-Heptene	14686-14-7	6.17	0.62	3.822	
Unknown #13		2.19	0.62	1.354	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.60	3.346	
c-1,3-Dimethylcyclohexane	00638-04-0	2.19	0.58	1.259	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.57	4.493	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.56	2.178	
1c-2t-3-TriMeCyPentane	15890-40-1	2.19	0.56	1.222	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.55	3.876	
1-Nonene	00124-11-8	2.49	0.52	1.295	
3,3-Dimethylhexane	00563-16-6	1.15	0.51	0.588	
Unknown #14		2.19	0.44	0.955	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.41	3.284	
Unknown #5		2.19	0.39	0.847	
t-2-Nonene	06434-78-2	2.19	0.36	0.798	
c-2-Heptene	06443-92-1	7.08	0.34	2.427	
n-Nonane	00111-84-2	0.68	0.34	0.233	
2,2-Dimethyloctane	15869-87-1	0.76	0.34	0.259	
1,4-Diisopropylbenzene	00100-18-5	2.19	0.34	0.739	

Vehicle 8003 - Fuel E59 - DHB Total - Test 7454 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1,4-Diisopropylbenzene	00100-18-5	2.19	0.34	0.739	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.33	2.178	
1,2-Dimethyl-4-Ethylbenzene	00934-80-5	7.54	0.33	2.508	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.33	3.458	
Unknown #1		2.19	0.31	0.672	
Unknown #8		2.19	0.30	0.659	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.27	3.180	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.24	1.973	
1,3-Diethylbenzene	00141-93-5	7.08	0.20	1.390	
n-Propylbenzene	00103-65-1	1.96	0.19	0.371	
3-Methylnonane	005911-04-6	0.66	0.19	0.124	
t-1,4-Dimethylcyclohexane	02207-04-7	2.19	0.18	0.400	
1,4-Diethylbenzene	00105-05-5	4.39	0.18	0.786	
Ethylbenzene	00100-41-4	2.96	0.18	0.527	
t-4-Octene	14850-23-8	4.69	0.16	0.731	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.15	0.129	
sec-Butylbenzene	00135-98-8	2.29	0.14	0.327	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.14	0.765	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	0.14	0.871	
		Total	692.9	1516.3	2.188
No MIR available, use weighted average of 2.1883					

Vehicle 8003 - Fuel E85 - DHB Total - Test 7513					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	322.77	467.685	
2-Methylbutane (Isopentane)	00078-78-4	1.35	54.30	73.571	
n-Butane	00106-97-8	1.08	27.40	29.512	
2,2-DiMeHexane	00590-73-8	0.94	11.02	10.373	
n-Pentane	00109-66-0	1.21	10.92	13.272	
Toluene	00108-88-3	3.93	10.21	40.075	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	8.12	11.347	
n-Hexane	00110-54-3	1.13	7.62	8.643	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	6.52	48.177	
Cyclohexane	00110-82-7	1.14	5.47	6.221	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.24	6.281	
3-Methylpentane	00096-14-0	1.69	4.91	8.304	
2,3-Dimethylbutane	00079-29-8	0.90	4.57	4.107	
Benzene	00071-43-2	0.69	3.73	2.593	
2-Methyl-2-butene	00513-35-9	14.20	3.72	52.763	
Methylcyclopentane	00096-37-7	2.05	3.09	6.336	
t-2-Butene	00624-64-6	15.20	2.93	44.572	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.90	22.995	
t-2-Pentene	00646-04-8	10.47	2.88	30.123	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	2.24	26.176	
2-Methyl-1-butene	00563-46-2	6.38	1.92	12.230	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.88	2.110	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.76	1.852	
Methylcyclohexane	00108-87-2	1.56	1.75	2.714	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.65	12.815	
2,4-Dimethylpentane	00108-08-7	1.46	1.49	2.170	
c-2-Pentene	00627-20-3	10.28	1.48	15.253	
3-Methyl-c-2-pentene	00922-62-3	12.52	1.48	18.500	
2,3-Dimethylpentane	00565-59-3	1.25	1.44	1.797	
2-Methylhexane	00591-76-4	1.09	1.37	1.481	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.35	4.322	
2,2-Dimethylbutane	00075-83-2	1.11	1.28	1.419	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.23	1.171	
n-Heptane	00142-82-5	0.97	1.22	1.179	
2,4-Dimethylhexane	00589-43-5	1.61	1.18	1.896	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.96	11.270	
ortho-Xylene	00095-47-6	7.58	0.93	7.012	
n-Decane	00124-18-5	0.59	0.86	0.507	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.84	3.696	
3,5-Dimethylheptane	00926-82-9	1.42	0.83	1.182	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.77	1.239	
c-2-Butene	00590-18-1	14.26	0.74	10.608	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.74	3.915	
1c-2t-3-TriMeCyPentane	15890-40-1	2.00	0.72	1.436	

Vehicle 8003 - Fuel E85 - DHB Total - Test 7513 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-2-Hexene	04050-45-7	8.55	0.70	5.961	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.66	7.645	
2-Methyl-2-pentene	00625-27-4	11.03	0.63	6.947	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.61	4.895	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.51	3.369	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.51	0.552	
2,4-Dimethylheptane	02213-23-2	1.26	0.50	0.638	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.50	2.909	
Ethylbenzene	00100-41-4	2.96	0.48	1.432	
t-1,2-Dimethylcyclopentane	00822-50-4	2.00	0.48	0.957	
Cyclopentene	00142-29-0	6.69	0.47	3.166	
2-Methylheptane	00592-27-8	0.97	0.46	0.447	
2,2-Dimethylpentane	00590-35-2	1.04	0.39	0.410	
c-1,3-Dimethylcyclopentane	02532-58-3	2.00	0.39	0.770	
n-Octane	00111-65-9	0.80	0.34	0.269	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.28	1.516	
		Total	538.3	1076.8	2.000
No MIR available, use weighted average of 2.0002					

Vehicle 8004										
Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present		
FTP	E6	5997	208.5	100.3	209.1	662.6	3.169	59		
Phase 1	E32	5854	216.2	83.5	180.5	530.4	2.938	51		
	E59	6036	234.4	123.0	288.3	769.4	2.669	44		
	E85	5861	209.4	85.7	179.4	434.0	2.419	34		
FTP	E6	5997	20.9	124.4	26.0	13.4	0.513	8		
Phase 2	E32	5854	21.4	124.5	26.6	21.5	0.806	8		
	E59	6036	18.1	121.8	22.0	27.4	1.243	5		
	E85	5861	31.8	33.4	10.6	3.4	0.316	10		
FTP	E6	5997	43.9	102.8	45.1	66.2	1.467	15		
Phase 3	E32	5854	34.1	65.4	22.3	23.1	1.037	11	Includes aldehydes	
	E59	6036	33.2	105.0	34.9	25.6	0.735	12		
	E85	5861	39.0	108.9	42.5	33.8	0.797	11		
US06	E6	5998	99.8	97.5	97.3	143.9	1.480	40		
	E32	5855	67.1	77.6	52.1	97.0	1.862	37		
	E59	6029	82.3	96.9	79.7	107.1	1.343	31		
	E85	5862	48.2	86.3	41.6	65.9	1.585	18		
UC	E6	5999	131.6	100.3	132.0	297.6	2.254	42		
	E32	5856	91.1	91.9	83.7	178.3	2.131	32		
	E59	6030	109.7	107.9	118.4	240.4	2.030	24		
	E85	5868	82.7	132.6	109.7	288.1	2.628	21		
RL - Cold	E6	25743	232.7	72.4	168.4	578.4	3.434	56		
	E32	25720	57.25	52.9	30.3	55.9	1.845	2		
	E59	25765	107.2	71.7	76.9	237.8	3.093	36		
	E85	25731	39.38	225.5	88.8	286.1	3.222	50		
RL - Total	E6	25743	299.3	68.2	204.1	677.6	3.319	68		
	E32	25720	91.27	40.3	36.8	75.8	2.059	2		
	E59	25765	196.6	68.4	134.6	430.0	3.196	39		
	E85	25731	91.9	141.0	129.5	504.5	3.896	44		
HS	E6	7444	29.3	58.6	17.2	41.6	2.426	43		
	E32	7320	18.0	62.9	11.3	49.2	4.354	27		
	E59	7518	18.2	101.2	18.5	36.0	1.949	4		
	E85	7376	10.1	121.4	12.3	26.0	2.115	25		
DHB - Day 1	E6	7445	317.4	108.1	343.1	803.2	2.341	87		
	E32	7322	233.3	83.0	193.7	448.2	2.314	60		
	E59	7520	356.9	84.3	300.8	646.4	2.149	59		
	E85	7377	328.9	97.9	322.0	602.7	1.872	63		
DHB - Total	E6	7445	659.0	100.0	659.0	1497.2	2.272	96		
	E32	7322	440.2	84.5	372.0	861.0	2.315	79		
	E59	7520	708.4	75.4	534.2	994.9	1.862	64		
	E85	7377	657.8	94.5	621.4	1159.7	1.866	70		

Vehicle 8003 - Fuel E6 - FTP Phase 1 - Test 5997							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	41.7176	0.578			
Ethylene	00074-85-1	8.88	19.9298	177.063			
Ethane	00074-84-0	0.26	13.7997	3.627			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	10.0638	12.068			
Toluene	00108-88-3	3.93	9.7049	38.092			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	9.6959	71.612			
Propane	00074-98-6	0.46	8.4662	3.870			
Ethanol	00064-17-5	1.45	7.2141	10.453			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.5880	52.316			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.4677	8.763			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	5.7292	8.008			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.4999	42.654			
2,2,5-Trimethylhexane	03522-94-9	1.05	4.9656	5.229			
Benzene	00071-43-2	0.69	3.8535	2.676			
3-Methylpentane	00096-14-0	1.69	3.2124	5.432			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.9553	2.804			
2,3-Dimethylbutane	00079-29-8	0.90	2.6017	2.338			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.3829	12.794			
Formaldehyde	00050-00-0	9.59	2.3319	22.371			
n-Pentane	00109-66-0	1.21	2.1177	2.573			
1,3-Butadiene	00106-99-0	12.45	2.0501	25.533			
2,4-Dimethylpentane	00108-08-7	1.46	2.0335	2.968			
n-Hexane	00110-54-3	1.13	1.9616	2.226			
2,2-Dimethylbutane	00075-83-2	1.11	1.8218	2.024			
acetaldehyde	00075-07-0	6.46	1.7220	11.130			
2,4-Dimethylhexane	00589-43-5	1.61	1.7012	2.731			
2-Methylhexane	00591-76-4	1.09	1.6845	1.828			
2,3-Dimethylpentane	00565-59-3	1.25	1.6646	2.078			
Methylcyclopentane	00096-37-7	2.05	1.6256	3.332			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.4373	4.586			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.3961	16.341			
ortho-Xylene	00095-47-6	7.58	1.3954	10.572			
Propyne	00074-99-7	6.67	1.3527	9.022			
t-2-Butene	00624-64-6	15.20	1.2947	19.677			
Methylcyclohexane	00108-87-2	1.56	1.2437	1.934			
acetone	00067-64-1	0.35	1.2366	0.436			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.1339	1.820			
Ethylbenzene	00100-41-4	2.96	1.0487	3.107			
1,3,5-Trimethylbenzene	00108-67-8	11.75	1.0102	11.875			
2-Methyl-2-butene	00513-35-9	14.20	0.9429	13.385			
2-Butanone (MEK)	00078-93-3	1.45	0.9311	1.350			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.8537	0.956			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.7793	0.851			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.7521	3.305			
Cyclopentene	00142-29-0	6.69	0.7227	4.832			
Cyclohexane	00110-82-7	1.14	0.7199	0.819			
n-Octane	00111-65-9	0.80	0.7197	0.573			
n-Heptane	00142-82-5	0.97	0.7195	0.695			
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.7181	7.528			
2-Methylheptane	00592-27-8	0.97	0.7006	0.678			

Vehicle 8003 - Fuel E6 - FTP Phase 1 - Test 5997	Continued...						
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Cyclopentadiene	00542-92-7	6.89	0.6882	4.742			
Unknown #16		3.09	0.6793	2.100			
3-Methylheptane	00589-81-1	1.12	0.6744	0.758			
benzaldehyde	00100-52-7	-0.71	0.1503	-0.107			
Propionaldehyde	00123-38-6	6.96	0.1215	0.846			
Methacrolein	000078-85-3	5.96	0.0406	0.242			
Glyoxal	00107-22-2	12.59	0.0326	0.410			
n-butyraldehyde	00123-72-8	5.85	0.0143	0.084			
Acrolein	00107-02-8	7.37	0.0050	0.037			
		Total	209.1	662.6	3.169		
		Total	202.5	625.8	3.091	w/o aldehydes	
No MIR available, use weighted average of 3.0906							
	aldehydes						

Vehicle 8003 - Fuel E6 - FTP Phase 2 - Test 5997							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	19.7811	0.274			
n-Propylbenzene	00103-65-1	1.96	6.0850	11.924			
Formaldehyde	00050-00-0	9.59	0.1133	1.087			
benzaldehyde	00100-52-7	-0.71	0.0125	-0.009			
Propionaldehyde	00123-38-6	6.96	0.0025	0.018			
Acrolein	00107-02-8	7.37	0.0025	0.018			
Glyoxal	00107-22-2	12.59	0.0021	0.026			
acetaldehyde	00075-07-0	6.46	0.0018	0.012			
		Total	26.0	13.4	0.513		
		Total	25.9	12.2	0.472	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - FTP Phase 3 - Test 5997							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	30.0508	0.416			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	6.0714	44.842			
Ethane	00074-84-0	0.26	2.4032	0.632			
Toluene	00108-88-3	3.93	2.2158	8.697			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.1867	1.423			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.0191	1.381			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9920	5.326			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.7837	1.095			
Formaldehyde	00050-00-0	9.59	0.1527	1.465			
acetone	00067-64-1	0.35	0.0953	0.034			
acetaldehyde	00075-07-0	6.46	0.0834	0.539			
2-Butanone (MEK)	00078-93-3	1.45	0.0346	0.050			
Propionaldehyde	00123-38-6	6.96	0.0151	0.105			
Glyoxal	00107-22-2	12.59	0.0133	0.167			
Acrolein	00107-02-8	7.37	0.0045	0.033			
		Total	45.1	66.2	1.467		
		Total	44.7	63.8	1.427	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 1 - Test 5854							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	31.6264	0.44			
Ethanol	00064-17-5	1.45	22.1393	32.08			
Ethylene	00074-85-1	8.88	11.9477	106.15			
Ethane	00074-84-0	0.26	9.8595	2.59			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	8.6286	10.35			
Toluene	00108-88-3	3.93	7.9783	31.32			
2-Methylbutane (Isopentane)	00078-78-4	1.35	7.1353	9.67			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.6938	45.22			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.6249	6.46			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.4120	34.22			
2,2,5-Trimethylhexane	03522-94-9	1.05	4.3884	4.62			
acetaldehyde	00075-07-0	6.46	4.2826	27.68			
Benzene	00071-43-2	0.69	3.7474	2.60			
Propene	00115-07-1	11.57	3.7402	43.29			
n-Butane	00106-97-8	1.08	2.7793	2.99			
3-Methylpentane	00096-14-0	1.69	2.7696	4.68			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.6832	2.55			
n-Pentane	00109-66-0	1.21	2.6229	3.19			
2,3-Dimethylbutane	00079-29-8	0.90	2.5469	2.29			

Vehicle 8003 - Fuel E32 - FTP Phase 1 - Test 5854			Continued...				
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Formaldehyde	00050-00-0	9.59	2.5373	24.34			
2,2-Dimethylbutane	00075-83-2	1.11	2.3228	2.58			
Methylcyclopentane	00096-37-7	2.05	2.0370	4.18			
n-Hexane	00110-54-3	1.13	1.8386	2.09			
2,4-Dimethylpentane	00108-08-7	1.46	1.8315	2.67			
acetone	00067-64-1	0.35	1.5644	0.55			
2,4-Dimethylhexane	00589-43-5	1.61	1.5591	2.50			
2-Methylhexane	00591-76-4	1.09	1.5556	1.69			
2,3-Dimethylpentane	00565-59-3	1.25	1.5360	1.92			
3-Methylnonane	005911-04-6	0.66	1.5230	1.00			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.4904	4.76			
ortho-Xylene	00095-47-6	7.58	1.4087	10.67			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.3700	10.12			
1,3-Butadiene	00106-99-0	12.45	1.2894	16.06			
Methylcyclohexane	00108-87-2	1.56	1.1551	1.80			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.1481	1.84			
t-2-Butene	00624-64-6	15.20	1.1161	16.96			
Ethylbenzene	00100-41-4	2.96	1.1125	3.30			
c-2-Butene	00590-18-1	14.26	1.0901	15.54			
n-Heptane	00142-82-5	0.97	0.9772	0.94			
2-Methyl-1-butene	00563-46-2	6.38	0.9148	5.83			
2-Methyl-2-butene	00513-35-9	14.20	0.8885	12.61			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.8359	0.94			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.7456	0.81			
Cyclohexane	00110-82-7	1.14	0.7393	0.84			
2-Butanone (MEK)	00078-93-3	1.45	0.7198	1.04			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.6614	7.77			
Styrene	00100-42-5	1.66	0.6608	1.10			
Propionaldehyde	00123-38-6	6.96	0.1182	0.82			
benzaldehyde	00100-52-7	-0.71	0.0804	-0.06			
Methacrolein	000078-85-3	5.96	0.0644	0.38			
Glyoxal	00107-22-2	12.59	0.0330	0.42			
		Total	180.5	530.4	2.938		
		Total	171.1	475.2	2.777	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 2 - Test 5854							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2-Methylbutane (Isopentane)	00078-78-4	1.35	13.9496	18.90			
Methane	00074-82-8	0.01	12.4244	0.17			
Formaldehyde	00050-00-0	9.59	0.2117	2.03			
acetaldehyde	00075-07-0	6.46	0.0239	0.15			
n-butyraldehyde	00123-72-8	5.85	0.0092	0.05			
Propionaldehyde	00123-38-6	6.96	0.0089	0.06			
Glyoxal	00107-22-2	12.6	0.0047	0.06			
Acrolein	00107-02-8	7.37	0.0032	0.02			
		Total	26.6	21.5	0.806		
		Total	26.4	19.1	0.723	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - FTP Phase 3 - Test 5854							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	16.6081	0.23			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.6673	4.97			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.7321	5.41			
c-2-Butene	00590-18-1	14.3	0.7102	10.13			
acetone	00067-64-1	0.35	0.3241	0.11			
Formaldehyde	00050-00-0	9.59	0.1746	1.67			
acetaldehyde	00075-07-0	6.46	0.0520	0.34			
Propionaldehyde	00123-38-6	6.96	0.0168	0.12			
n-butyraldehyde	00123-72-8	5.85	0.0079	0.05			
Glyoxal	00107-22-2	12.6	0.0061	0.08			
Acrolein	00107-02-8	7.37	0.0030	0.02			
		Total	22.3	23.1	1.037		
		Total	21.7	20.7	0.955	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 1 - Test 6036							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	94.1718	136.453			
Methane	00074-82-8	0.01	56.1742	0.778			
Ethylene	00074-85-1	8.88	27.3957	243.392			
Ethane	00074-84-0	0.26	16.8767	4.436			
acetaldehyde	00075-07-0	6.46	11.4182	73.803			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	8.9352	70.956			
2-Methylbutane (Isopentane)	00078-78-4	1.35	7.8148	10.588			
Toluene	00108-88-3	3.93	5.9796	23.470			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.8362	6.998			
Propane	00074-98-6	0.46	4.8201	2.203			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.6744	27.139			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.5350	4.941			
Formaldehyde	00050-00-0	9.59	3.3706	32.337			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.6682	20.693			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.5662	2.702			
Benzene	00071-43-2	0.69	2.5018	1.737			
n-Butane	00106-97-8	1.08	2.3107	2.488			
3-Methylpentane	00096-14-0	1.69	2.2791	3.854			
1,3-Butadiene	00106-99-0	12.45	2.1010	26.168			
n-Pentane	00109-66-0	1.21	1.9923	2.421			
2,2-Dimethylbutane	00075-83-2	1.11	1.7028	1.892			
Unknown #2		2.43	1.6944	4.126			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.6286	1.545			
n-Hexane	00110-54-3	1.13	1.5977	1.813			
2-Butanone (MEK)	00078-93-3	1.45	1.4464	2.097			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3737	7.375			
2,4-Dimethylpentane	00108-08-7	1.46	1.2240	1.786			
2-Methylhexane	00591-76-4	1.09	1.0573	1.147			
t-2-Butene	00624-64-6	15.20	1.0250	15.578			
acetone	00067-64-1	0.35	1.0249	0.361			
Methylcyclopentane	00096-37-7	2.05	0.9871	2.023			
2,3-Dimethylpentane	00565-59-3	1.25	0.9841	1.228			
2,4-Dimethylhexane	00589-43-5	1.61	0.9627	1.546			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.9603	3.064			
Cyclopentene	00142-29-0	6.69	0.8868	5.929			
ortho-Xylene	00095-47-6	7.58	0.8163	6.185			
Methylcyclohexane	00108-87-2	1.56	0.7872	1.224			
2-Methyl-2-butene	00513-35-9	14.20	0.7208	10.231			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.6824	1.096			
Propionaldehyde	00123-38-6	6.96	0.1192	0.829			
Methacrolein	000078-85-3	5.96	0.0794	0.473			
benzaldehyde	00100-52-7	-0.71	0.0685	-0.049			
Glyoxal	00107-22-2	12.59	0.0180	0.227			
n-butyraldehyde	00123-72-8	5.85	0.0177	0.103			
		Total	288.3	769.4	2.669		
		Total	270.7	659.2	2.435	w/o aldehydes	
No MIR available, use weighted average of 2.4350							
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 2 - Test 6036							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	17.2458	0.239			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.2440	23.960			
2,3-Dimethylbutane	00079-29-8	0.90	1.3392	1.204			
Formaldehyde	00050-00-0	9.59	0.2031	1.948			
n-butyraldehyde	00123-72-8	5.85	0.0088	0.052			
		Total	22.0	27.4	1.243		
		Total	21.8	25.4	1.164	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - FTP Phase 3 - Test 6036							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	27.0438	0.375			
Toluene	00108-88-3	3.93	3.0938	12.143			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.5297	8.213			
Ethane	00074-84-0	0.26	1.2346	0.325			
2,3-Dimethylbutane	00079-29-8	0.90	0.8441	0.759			
acetone	00067-64-1	0.35	0.5667	0.200			
Formaldehyde	00050-00-0	9.59	0.2450	2.351			
2-Butanone (MEK)	00078-93-3	1.45	0.1445	0.210			
acetaldehyde	00075-07-0	6.46	0.1103	0.713			
Propionaldehyde	00123-38-6	6.96	0.0244	0.170			
n-butyraldehyde	00123-72-8	5.85	0.0120	0.070			
Glyoxal	00107-22-2	12.59	0.0074	0.093			
		Total	34.9	25.6	0.735		
		Total	33.7	21.8	0.646	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 1 - Test 5861							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	53.5662	0.742			
Ethanol	00064-17-5	1.45	26.9162	39.001			
2-Methylbutane (Isopentane)	00078-78-4	1.35	22.5133	30.503			
acetaldehyde	00075-07-0	6.46	15.7577	101.852			
Ethylene	00074-85-1	8.88	15.3953	136.777			
n-Butane	00106-97-8	1.08	10.2760	11.066			
Ethane	00074-84-0	0.26	5.1239	1.347			
Formaldehyde	00050-00-0	9.59	3.6611	35.124			
Toluene	00108-88-3	3.93	3.5594	13.971			
t-1,2-Dimethylcyclopentane	00822-50-4	1.86	3.0713	5.717			
Propane	00074-98-6	0.46	1.7469	0.799			
n-Pentane	00109-66-0	1.21	1.6153	1.962			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.5524	12.328			
Benzene	00071-43-2	0.69	1.2342	0.857			
t-1,4-Dimethylcyclohexane	02207-04-7	1.86	1.2232	2.277			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2108	1.693			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.1742	1.003			
n-Hexane	00110-54-3	1.13	1.0707	1.215			
acetone	00067-64-1	0.35	1.0269	0.362			
2-Butanone (MEK)	00078-93-3	1.45	1.0155	1.472			
3-Methylnonane	005911-04-6	0.66	0.9735	0.638			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.9162	1.471			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.8395	0.797			
3-Me-1-Hexene	03404-61-3	4.27	0.8188	3.500			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.7930	9.282			
2-Methyl-1-butene	00563-46-2	6.38	0.7817	4.986			
t-2-Butene	00624-64-6	15.20	0.6964	10.583			
3-Methylpentane	00096-14-0	1.69	0.6742	1.140			
Propionaldehyde	00123-38-6	6.96	0.1228	0.855			
Methacrolein	000078-85-3	5.96	0.0386	0.230			
Glyoxal	00107-22-2	12.59	0.0229	0.288			
benzaldehyde	00100-52-7	-0.71	0.0222	-0.016			
n-butyraldehyde	00123-72-8	5.85	0.0150	0.088			
Acrolein	00107-02-8	7.37	0.0072	0.053			
		Total	179.4	434.0	2.419		
		Total	157.7	293.7	1.862	w/o aldehydes	
No MIR available, use weighted average of 1.8616							
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 2 - Test 5861							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	10.2070	0.141			
Formaldehyde	00050-00-0	9.59	0.2861	2.745			
acetaldehyde	00075-07-0	6.46	0.0312	0.202			
Acrolein	00107-02-8	7.37	0.0233	0.171			
Glyoxal	00107-22-2	12.59	0.0015	0.019			
acetone	00067-64-1	0.35	0.0324	0.011			
Propionaldehyde	00123-38-6	6.96	0.0010	0.007			
n-butyraldehyde	00123-72-8	5.85	0.0091	0.053			
2-Butanone (MEK)	00078-93-3	1.45	0.0084	0.012			
benzaldehyde	00100-52-7	-0.71	0.0146	-0.010			
		Total	10.6	3.4	0.316		
		Total	10.2	0.1	0.014	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - FTP Phase 3 - Test 5861							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.5040	0.284			
Ethanol	00064-17-5	1.45	11.7348	17.003			
2-Methylbutane (Isopentane)	00078-78-4	1.35	9.2747	12.566			
acetone	00067-64-1	0.35	0.4815	0.170			
Formaldehyde	00050-00-0	9.59	0.2589	2.484			
acetaldehyde	00075-07-0	6.46	0.1519	0.982			
Propionaldehyde	00123-38-6	6.96	0.0267	0.186			
2-Butanone (MEK)	00078-93-3	1.45	0.0185	0.027			
Glyoxal	00107-22-2	12.59	0.0073	0.092			
Acrolein	00107-02-8	7.37	0.0036	0.027			
n-butyraldehyde	00123-72-8	5.85	0.0007	0.004			
		Total	42.5	33.8	0.797		
		Total	41.5	29.9	0.719	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - US06 - Test 5998							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	42.6803	0.591			
Ethane	00074-84-0	0.26	6.6815	1.756			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.0532	6.847			
Ethylene	00074-85-1	8.88	4.7363	42.079			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.6785	5.610			
n-Propylbenzene	00103-65-1	1.96	3.0032	5.885			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.4530	3.429			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.1809	2.297			
Toluene	00108-88-3	3.93	2.1625	8.488			
Propane	00074-98-6	0.46	1.9485	0.891			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.5717	12.481			
3-Methylpentane	00096-14-0	1.69	1.3995	2.366			
2,3-Dimethylbutane	00079-29-8	0.90	1.3749	1.236			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.3508	1.513			
n-Pentane	00109-66-0	1.21	1.3204	1.604			
2,2-Dimethylbutane	00075-83-2	1.11	1.1996	1.333			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.1283	1.071			
Benzene	00071-43-2	0.69	1.0774	0.748			
acetone	00067-64-1	0.35	1.0237	0.361			
acetaldehyde	00075-07-0	6.46	1.0196	6.590			
n-Hexane	00110-54-3	1.13	0.8000	0.908			
Formaldehyde	00050-00-0	9.59	0.7458	7.155			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.7381	5.724			
2,4-Dimethylpentane	00108-08-7	1.46	0.7324	1.069			
2,4-Dimethylhexane	00589-43-5	1.61	0.6926	1.112			
2,3-Dimethylpentane	00565-59-3	1.25	0.6142	0.767			
Methylcyclopentane	00096-37-7	2.05	0.6043	1.239			
1,2,4,5-Tetramethylbenzene	00095-93-2	9.26	0.5893	5.457			
2-Methylhexane	00591-76-4	1.09	0.5374	0.583			
n-Decane	00124-18-5	0.59	0.5315	0.314			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.5098	1.627			
2-Butanone (MEK)	00078-93-3	1.45	0.4759	0.690			
Cyclopentene	00142-29-0	6.69	0.4658	3.114			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.4620	0.742			
1,3-Butadiene	00106-99-0	12.45	0.3449	4.296			
Propionaldehyde	00123-38-6	6.96	0.1177	0.819			
Methacrolein	000078-85-3	5.96	0.1068	0.636			
benzaldehyde	00100-52-7	-0.71	0.1053	-0.075			
Glyoxal	00107-22-2	12.59	0.0410	0.516			
Acrolein	00107-02-8	7.37	0.0062	0.046			
		Total	97.3	143.9	1.480		
		Total	93.6	127.2	1.358	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E32 - US06 - Test 5855							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	16.7352	0.232			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.2879	5.810			
2,3,5-Trimethylhexane	01069-53-0	1.12	4.0361	4.521			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.0429	3.649			
Ethylene	00074-85-1	8.88	1.8180	16.152			
Toluene	00108-88-3	3.93	1.6524	6.486			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.6386	1.726			
Ethane	00074-84-0	0.26	1.5614	0.410			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.3906	1.944			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3743	7.379			
acetaldehyde	00075-07-0	6.46	1.1359	7.342			
n-Pentane	00109-66-0	1.21	0.9957	1.210			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9751	0.925			
2,3-Dimethylbutane	00079-29-8	0.90	0.9730	0.874			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.9605	7.627			
acetone	00067-64-1	0.35	0.9541	0.336			
3-Methylpentane	00096-14-0	1.69	0.8913	1.507			
2,2-Dimethylbutane	00075-83-2	1.11	0.7750	0.861			
Benzene	00071-43-2	0.69	0.7098	0.493			
2,4-Dimethylhexane	00589-43-5	1.61	0.5752	0.924			
2,4-Dimethylpentane	00108-08-7	1.46	0.5699	0.832			
Propene	00115-07-1	11.57	0.5585	6.464			
2,3-Dimethylpentane	00565-59-3	1.25	0.5242	0.654			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	0.4804	2.715			
n-Hexane	00110-54-3	1.13	0.4800	0.545			
2-Methylhexane	00591-76-4	1.09	0.4606	0.500			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.4531	5.326			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.4162	3.228			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.3880	2.866			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.3774	1.204			
Methylcyclohexane	00108-87-2	1.56	0.3622	0.563			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.3425	0.550			
Formaldehyde	00050-00-0	9.59	0.0662	0.635			
Methacrolein	000078-85-3	5.96	0.0437	0.260			
benzaldehyde	00100-52-7	-0.71	0.0391	-0.028			
Propionaldehyde	00123-38-6	6.96	0.0299	0.208			
Acrolein	00107-02-8	7.37	0.0059	0.043			
		Total	52.1	97.0	1.862		
		Total	49.8	88.2	1.770	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - US06 - Test 6029							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	43.5348	0.603			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.8570	6.581			
Ethane	00074-84-0	0.26	4.7594	1.251			
Ethylene	00074-85-1	8.88	3.7152	33.007			
Toluene	00108-88-3	3.93	3.0058	11.798			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.2430	2.690			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.8383	2.059			
Ethanol	00064-17-5	1.45	1.6189	2.346			
acetaldehyde	00075-07-0	6.46	1.5926	10.294			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2058	1.685			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.1158	5.991			
n-Pentane	00109-66-0	1.21	1.0888	1.323			
n-Decane	00124-18-5	0.59	1.0142	0.599			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.8515	0.897			
Benzene	00071-43-2	0.69	0.8094	0.562			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.8030	6.228			
2,3-Dimethylbutane	00079-29-8	0.90	0.7681	0.690			
3-Methylpentane	00096-14-0	1.69	0.7392	1.250			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.6666	5.293			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.5738	0.544			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.5207	3.846			
2,2-Dimethylbutane	00075-83-2	1.11	0.5132	0.570			
n-Hexane	00110-54-3	1.13	0.4856	0.551			
2,4-Dimethylpentane	00108-08-7	1.46	0.3820	0.557			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.3743	4.399			
2,3-Dimethylpentane	00565-59-3	1.25	0.3716	0.464			
Propionaldehyde	00123-38-6	6.96	0.0827	0.575			
acetone	00067-64-1	0.35	0.0776	0.027			
benzaldehyde	00100-52-7	-0.71	0.0520	-0.037			
2-Butanone (MEK)	00078-93-3	1.45	0.0450	0.065			
Formaldehyde	00050-00-0	9.59	0.0358	0.343			
		Total	79.7	107.1	1.343		
		Total	77.9	95.8	1.230	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - US06 - Test 5862							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.7814	0.288			
2,3,5-Trimethylhexane	01069-53-0	1.12	5.1567	5.777			
acetaldehyde	00075-07-0	6.46	3.8256	24.727			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.6535	4.950			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.9299	10.362			
Ethane	00074-84-0	0.26	1.2918	0.340			
Ethylene	00074-85-1	8.88	1.0456	9.290			
acetone	00067-64-1	0.35	0.9642	0.340			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	0.5605	3.167			
Toluene	00108-88-3	3.93	0.5281	2.073			
n-Pentane	00109-66-0	1.21	0.5213	0.633			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.4993	0.599			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.4912	0.687			
Formaldehyde	00050-00-0	9.59	0.2401	2.304			
benzaldehyde	00100-52-7	-0.71	0.0329	-0.023			
Valeraldehyde	000110-62-3	4.98	0.0321	0.160			
Propionaldehyde	00123-38-6	6.96	0.0233	0.162			
n-butyraldehyde	00123-72-8	5.85	0.0136	0.080			
		Total	41.6	65.9	1.585		
		Total	36.5	38.2	1.047	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E6 - UC - Test 5999							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	43.0176	0.596			
Ethane	00074-84-0	0.26	10.9206	2.870			
Ethylene	00074-85-1	8.88	7.7044	68.448			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	7.5237	55.569			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	6.2982	7.552			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.6128	7.605			
Toluene	00108-88-3	3.93	4.3979	17.262			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.6349	5.081			
Ethanol	00064-17-5	1.45	3.1546	4.571			
Propane	00074-98-6	0.46	3.1259	1.429			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.9595	3.117			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.8616	22.724			
3-Methylpentane	00096-14-0	1.69	2.2870	3.867			
Benzene	00071-43-2	0.69	2.0902	1.451			
Formaldehyde	00050-00-0	9.59	2.0571	19.735			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.9076	14.794			
2,3-Dimethylbutane	00079-29-8	0.90	1.8955	1.703			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.7604	1.670			
n-Pentane	00109-66-0	1.21	1.6614	2.018			
acetaldehyde	00075-07-0	6.46	1.5794	10.208			
2,2-Dimethylbutane	00075-83-2	1.11	1.4924	1.658			
2,4-Dimethylpentane	00108-08-7	1.46	1.1271	1.645			
acetone	00067-64-1	0.35	1.1039	0.389			
n-Hexane	00110-54-3	1.13	1.0870	1.233			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.0556	3.369			
2-Butanone (MEK)	00078-93-3	1.45	1.0316	1.496			
Methylcyclopentane	00096-37-7	2.05	0.9898	2.029			
Ethylbenzene	00100-41-4	2.96	0.9799	2.903			
2,4-Dimethylhexane	00589-43-5	1.61	0.9478	1.522			
2,3-Dimethylpentane	00565-59-3	1.25	0.9293	1.160			
2-Methylhexane	00591-76-4	1.09	0.8973	0.974			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.7333	3.937			
1,3-Butadiene	00106-99-0	12.45	0.7124	8.872			
Unknown #10		2.10	0.7104	1.492			
c-2-Butene	00590-18-1	14.26	0.7091	10.112			
Methylcyclohexane	00108-87-2	1.56	0.7078	1.101			
benzaldehyde	00100-52-7	-0.71	0.1377	-0.098			
Propionaldehyde	00123-38-6	6.96	0.1029	0.716			
Methacrolein	000078-85-3	5.96	0.0536	0.319			
Glyoxal	00107-22-2	12.59	0.0286	0.360			
n-butyraldehyde	00123-72-8	5.85	0.0192	0.112			
Valeraldehyde	000110-62-3	4.98	0.0016	0.008			
		Total	132.0	297.6	2.254		
		Total	125.9	264.3	2.100	w/o aldehydes	
No MIR available, use weighted average of 2.0997							
	aldehydes						

Vehicle 8003 - Fuel E32 - UC - Test 5856							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	22.7517	32.967			
Methane	00074-82-8	0.01	17.6634	0.245			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.6288	7.626			
Ethylene	00074-85-1	8.88	3.7054	32.920			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.1956	3.832			
acetaldehyde	00075-07-0	6.46	2.9242	18.901			
Ethane	00074-84-0	0.26	2.8932	0.760			
Toluene	00108-88-3	3.93	2.8661	11.249			
Formaldehyde	00050-00-0	9.59	1.9518	18.725			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.8529	14.714			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.7447	13.531			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.6863	1.776			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.6106	2.251			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.3266	1.486			
Benzene	00071-43-2	0.69	1.3074	0.908			
n-Pentane	00109-66-0	1.21	1.0939	1.329			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.0009	0.950			
3-Methylpentane	00096-14-0	1.69	0.9486	1.604			
2,2-Dimethylpropane	00463-82-1	0.65	0.8591	0.555			
2,4-Dimethylpentane	00108-08-7	1.46	0.8078	1.179			
3-Methylnonane	005911-04-6	0.66	0.8070	0.529			
2,2-Dimethylbutane	00075-83-2	1.11	0.7936	0.882			
2,3-Dimethylbutane	00079-29-8	0.90	0.7928	0.712			
n-Hexane	00110-54-3	1.13	0.7816	0.887			
2,2-Dimethylpentane	00590-35-2	1.04	0.7524	0.785			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6983	5.157			
2-Butanone (MEK)	00078-93-3	1.45	0.5898	0.855			
acetone	00067-64-1	0.35	0.4707	0.166			
benzaldehyde	00100-52-7	-0.71	0.0874	-0.062			
Propionaldehyde	00123-38-6	6.96	0.0752	0.523			
Glyoxal	00107-22-2	12.59	0.0253	0.318			
n-butyraldehyde	00123-72-8	5.85	0.0146	0.086			
		Total	83.7	178.3	2.131		
		Total	77.6	138.8	1.790	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E59 - UC - Test 6030							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	39.1183	0.542			
Ethanol	00064-17-5	1.45	31.4015	45.500			
n-Propylbenzene	00103-65-1	1.96	8.1983	16.066			
Ethylene	00074-85-1	8.88	7.9264	70.421			
Ethane	00074-84-0	0.26	5.3971	1.419			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.7241	5.046			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.1047	3.723			
Formaldehyde	00050-00-0	9.59	2.9008	27.829			
Toluene	00108-88-3	3.93	2.6634	10.454			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.4399	19.376			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.4963	2.092			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.3456	1.417			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.2989	10.074			
n-Pentane	00109-66-0	1.21	1.1761	1.429			
Ethylbenzene	00100-41-4	2.96	0.8870	2.628			
3-Methylpentane	00096-14-0	1.69	0.8717	1.474			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.8708	0.826			
1,3-Butadiene	00106-99-0	12.45	0.8674	10.803			
2,3-Dimethylbutane	00079-29-8	0.90	0.8273	0.744			
Benzene	00071-43-2	0.69	0.8098	0.562			
Cyclopentene	00142-29-0	6.69	0.7525	5.031			
Glyoxal	00107-22-2	12.59	0.1328	1.673			
n-butyraldehyde	00123-72-8	5.85	0.1188	0.695			
acetaldehyde	00075-07-0	6.46	0.0908	0.587			
		Total	118.4	240.4	2.030		
		Total	115.2	209.6	1.820	w/o aldehydes	
	aldehydes						

Vehicle 8003 - Fuel E85 - UC - Test 5868							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	37.8940	54.907			
Methane	00074-82-8	0.01	27.7019	0.384			
n-Propylbenzene	00103-65-1	1.96	11.0300	21.615			
acetaldehyde	00075-07-0	6.46	10.7077	69.211			
Ethylene	00074-85-1	8.88	6.8316	60.694			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.8614	3.877			
Formaldehyde	00050-00-0	9.59	2.8470	27.313			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.1225	16.855			
Toluene	00108-88-3	3.93	1.4319	5.620			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.0659	8.267			
Ethane	00074-84-0	0.26	1.0025	0.264			
Cyclopentene	00142-29-0	6.69	0.8969	5.997			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.8667	1.039			
n-Pentane	00109-66-0	1.21	0.8630	1.048			
1,3-Butadiene	00106-99-0	12.45	0.7299	9.091			
2-Butanone (MEK)	00078-93-3	1.45	0.5865	0.850			
Propionaldehyde	00123-38-6	6.96	0.1061	0.739			
benzaldehyde	00100-52-7	-0.71	0.0538	-0.038			
Valeraldehyde	000110-62-3	4.98	0.0215	0.107			
Glyoxal	00107-22-2	12.59	0.0173	0.218			
n-butyraldehyde	00123-72-8	5.85	0.0137	0.080			
		Total	109.7	288.1	2.628		
		Total	95.3	189.7	1.990	w/o aldehydes	
	aldehydes						

Vehicle 8004 Fuel E6 - RL Cold - Test 25743					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	15.30	113.025	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	11.63	90.233	
Propane	00074-98-6	0.46	10.31	4.713	
Toluene	00108-88-3	3.93	10.24	40.196	
2,2,5-Trimethylhexane	03522-94-9	1.05	9.44	9.944	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	8.27	9.922	
2-Methylbutane (Isopentane)	00078-78-4	1.35	8.00	10.842	
n-Butane	00106-97-8	1.08	7.98	8.599	
Ethanol	00064-17-5	1.45	7.33	10.624	
Ethylene	00074-85-1	8.88	5.91	52.465	
2-Methylpropane	00075-28-5	1.18	5.88	6.915	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.22	4.723	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.62	28.711	
2,3,4-Trimethylpentane	00565-75-3	0.95	3.30	3.132	
Methylcyclohexane	00108-87-2	1.56	3.17	4.931	
ortho-Xylene	00095-47-6	7.58	2.87	21.771	
2-Methylheptane	00592-27-8	0.97	2.79	2.703	
4-Methyloctane	02216-34-4	0.85	2.78	2.354	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.48	3.465	
2,3-Dimethylbutane	00079-29-8	0.90	2.44	2.189	
1,3-Butadiene	00106-99-0	12.45	2.37	29.544	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	2.26	12.529	
2,4-Dimethylhexane	00589-43-5	1.61	1.86	2.994	
3-Methylheptane	00589-81-1	1.12	1.80	2.029	
1-Nonene	00124-11-8	2.49	1.73	4.319	
Ethylbenzene	00100-41-4	2.96	1.66	4.921	
n-Decane	00124-18-5	0.59	1.60	0.944	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.58	1.730	
Methylcyclopentane	00096-37-7	2.05	1.58	3.237	
3-Methylpentane	00096-14-0	1.69	1.57	2.660	
n-Undecane	01120-21-4	0.52	1.55	0.811	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	1.48	10.504	
Unknown #22		3.43	1.47	5.045	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.42	4.526	
n-Pentane	00109-66-0	1.21	1.27	1.544	
3-Methyl-c-2-pentene	00922-62-3	12.52	1.18	14.761	
n-Nonane	00111-84-2	0.68	1.17	0.800	
2,4-Dimethylpentane	00108-08-7	1.46	1.14	1.662	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.13	13.209	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.11	1.783	
2-Methyl-1,3-butadiene	00078-79-5	10.48	1.05	11.035	
t-1,2-Dimethylcyclopentane	00822-50-4	3.21	1.05	3.373	
2,3-Dimethylpentane	00565-59-3	1.25	1.01	1.261	
n-Heptane	00142-82-5	0.97	0.97	0.934	

Vehicle 8004 - Fuel E6 - RL Cold - Test 25743 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylhexane	00591-76-4	1.09	0.88	0.956	
Methane	00074-82-8	0.01	0.87	0.012	
n-Octane	00111-65-9	0.80	0.64	0.508	
Benzene	00071-43-2	0.69	0.63	0.440	
n-Propylbenzene	00103-65-1	1.96	0.38	0.746	
Indan	00496-11-7	3.23	0.37	1.211	
2-Methyl-1-butene	00563-46-2	6.38	0.37	2.350	
2,2-Dimethylbutane	00075-83-2	1.11	0.35	0.394	
Cyclohexane	00110-82-7	1.14	0.34	0.383	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.24	1.046	
2-Methyl-2-pentene	00625-27-4	11.03	0.23	2.555	
n-Hexane	00110-54-3	1.13	0.13	0.147	
		Total	168.4	578.4	3.434
No MIR available, use weighted average of 3.4337					

Vehicle 8004 - Fuel E32 - RL Cold - Test 25720					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	**00078-78-4**	**1.35**	**24.52**	**33.222**	
Toluene	**00108-88-3**	**3.93**	**5.78**	**22.704**	
		Total	**30.3**	**55.9**	**1.845**

Vehicle 8004 - Fuel E59 - RL Cold - Test 25765					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	30.78	44.598	
n-Butane	00106-97-8	1.08	4.57	4.925	
Unknown #22			4.00	0.000	
Propane	00074-98-6	0.46	3.69	1.689	
1,3,5-Trimethylbenzene	00108-67-8	11.8	2.92	34.304	
ortho-Xylene	00095-47-6	7.58	2.69	20.352	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.09	15.420	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.07	16.403	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.97	15.269	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.75	1.848	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.61	8.662	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	1.57	8.678	
1,2,3-Trimethylbenzene	00526-73-8	11.9	1.54	18.411	
2,2-Dimethylbutane	00075-83-2	1.11	1.35	1.495	
Indan	00496-11-7	3.23	1.21	3.925	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.14	1.362	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.13	1.071	
2,2-DiMeHexane	00590-73-8	0.94	1.08	1.018	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.06	12.402	
t-2-Hexene	04050-45-7	8.55	1.05	8.934	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.90	3.961	
2,3-Dimethylbutane	00079-29-8	0.9	0.86	0.769	
2,4-Dimethylhexane	00589-43-5	1.61	0.75	1.203	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.70	2.247	
2-Methylhexane	00591-76-4	1.09	0.66	0.718	
n-Heptane	00142-82-5	0.97	0.65	0.625	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.60	0.969	
2,3-Dimethylpentane	00565-59-3	1.25	0.45	0.559	
2-Methyl-1-butene	00563-46-2	6.38	0.41	2.611	
Toluene	00108-88-3	3.93	0.36	1.426	
Benzene	00071-43-2	0.69	0.33	0.232	
Ethylbenzene	00100-41-4	2.96	0.29	0.853	
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.24	0.330	
Cyclohexane	00110-82-7	1.14	0.21	0.238	
n-Pentane	00109-66-0	1.21	0.13	0.162	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.06	0.090	
		Total	76.9	237.8	3.093
No MIR available, use weighted average of 3.2626					

Vehicle 8004 - Fuel E85 - RL Cold - Test 25731					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	23.84	34.547	
Ethylene	00074-85-1	8.88	7.77	69.060	
n-Butane	00106-97-8	1.08	5.70	6.136	
2,3,5-Trimethylhexane	01069-53-0	1.12	5.57	6.235	
1-Butyne	00107-00-6	6.05	4.49	27.176	
Acetylene (Ethyne)	00074-86-2	0.95	4.41	4.167	
Unknown #22		3.22	2.50	8.056	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.10	2.847	
2-Methylpropane	00075-28-5	1.18	2.10	2.466	
n-Decane	00124-18-5	0.59	1.99	1.176	
2-Methylheptane	00592-27-8	0.97	1.96	1.900	
Unknown #5		3.22	1.53	4.932	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.49	11.039	
2,2-DiMeHexane	00590-73-8	0.94	1.46	1.378	
n-Undecane	01120-21-4	0.52	1.37	0.714	
Methylcyclohexane	00108-87-2	1.56	1.35	2.106	
t-2-Hexene	04050-45-7	8.55	1.34	11.430	
c-2-Butene	00590-18-1	14.3	1.33	18.979	
n-Propylbenzene	00103-65-1	1.96	1.32	2.590	
Benzene	00071-43-2	0.69	1.28	0.889	
n-Hexane	00110-54-3	1.13	1.17	1.327	
Toluene	00108-88-3	3.93	1.14	4.489	
n-Octane	00111-65-9	0.8	1.11	0.881	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.04	6.838	
Methylcyclopentane	00096-37-7	2.05	1.01	2.077	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.90	3.940	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.71	7.464	
Cyclopentene	00142-29-0	6.69	0.65	4.327	
t-2-Butene	00624-64-6	15.2	0.62	9.439	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.60	0.716	
3-Methylpentane	00096-14-0	1.69	0.55	0.933	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.53	1.686	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.42	2.274	
t-2-Pentene	00646-04-8	10.5	0.40	4.187	

Vehicle 8004 - Fuel E85 - RL Cold - Test 25731 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Indan	00496-11-7	3.23	0.39	1.268	
c-2-Pentene	00627-20-3	10.3	0.38	3.882	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.37	4.274	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.35	0.494	
2,3-Dimethylbutane	00079-29-8	0.9	0.24	0.218	
2-Methyl-2-butene	00513-35-9	14.2	0.22	3.153	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.22	0.346	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.14	0.148	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	0.13	0.527	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.11	0.119	
2-Methyl-1-butene	00563-46-2	6.38	0.11	0.708	
n-Heptane	00142-82-5	0.97	0.11	0.104	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.09	1.003	
ortho-Xylene	00095-47-6	7.58	0.07	0.548	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.06	0.810	
2,4-Dimethylpentane	00108-08-7	1.46	0.04	0.064	
		Total	88.8	286.1	3.222
No MIR available, use weighted average of 3.2217					

Vehicle 8004 - Fuel E6 - RL Total - Test 25743					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	12.98	50.941	
Toluene	00108-88-3	3.93	11.11	43.624	
2,2,5-Trimethylhexane	03522-94-9	1.05	10.34	10.893	
2-Methylbutane (Isopentane)	00078-78-4	1.35	10.10	13.681	
n-Butane	00106-97-8	1.08	9.20	9.903	
2,3,5-Trimethylhexane	01069-53-0	1.12	9.09	10.185	
Ethanol	00064-17-5	1.45	8.27	11.981	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	7.95	9.534	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.45	51.218	
Ethylene	00074-85-1	8.88	5.41	48.093	
2-Methylpropane	00075-28-5	1.18	4.70	5.532	
2,3,4-Trimethylpentane	00565-75-3	0.95	4.42	4.197	
3-Methylpentane	00096-14-0	1.69	4.29	7.252	
2,3-Dimethylbutane	00079-29-8	0.9	4.27	3.835	
ortho-Xylene	00095-47-6	7.58	4.03	30.515	
Acetylene (Ethyne)	00074-86-2	0.95	3.83	3.619	
1,3-Butadiene	00106-99-0	12.5	3.59	44.739	
Unknown #16		3.32	3.45	11.449	
2-Methylheptane	00592-27-8	0.97	3.19	3.087	
Methylcyclopentane	00096-37-7	2.05	3.16	6.474	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.97	34.734	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	2.80	3.916	
n-Pentane	00109-66-0	1.21	2.79	3.385	
3-Methyl-c-2-pentene	00922-62-3	12.5	2.74	34.266	
2,2-DiMeHexane	00590-73-8	0.94	2.60	2.446	
Benzene	00071-43-2	0.69	2.40	1.664	
3-Methylheptane	00589-81-1	1.12	2.31	2.598	
2,4-Dimethylhexane	00589-43-5	1.61	2.31	3.701	
4-Methyloctane	02216-34-4	0.85	2.26	1.914	
1,4-Dimethyl-2-Ethylbenzene	01758-88-9	7.54	2.24	16.875	
n-Decane	00124-18-5	0.59	2.18	1.288	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.17	15.996	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.06	6.584	
Unknown #5		3.32	1.95	6.459	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.91	3.061	
c-1,3-Dimethylcyclohexane	00638-04-0	3.32	1.90	6.316	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.87	2.043	
2-Methyl-1-butene	00563-46-2	6.38	1.82	11.612	
Ethylbenzene	00100-41-4	2.96	1.81	5.357	
n-Undecane	01120-21-4	0.52	1.80	0.939	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	1.79	12.707	
n-Nonane	00111-84-2	0.68	1.78	1.215	
Methylcyclohexane	00108-87-2	1.56	1.61	2.498	
3-Methyloctane	02216-33-3	0.88	1.58	1.397	

Vehicle 8004 - Fuel E6 - RL Total - Test 25743 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Nonene	00124-11-8	2.49	1.56	3.876	
2-Methyl-1,3-butadiene	00078-79-5	10.5	1.52	15.890	
c-2-Heptene	06443-92-1	7.08	1.42	10.052	
t-2-Nonene	06434-78-2	3.32	1.38	4.572	
c-2-Butene	00590-18-1	14.3	1.34	19.146	
4-Methyl-t-2-pentene	00674-76-0	8.04	1.33	10.665	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.33	8.764	
c-2-Pentene	00627-20-3	10.3	1.26	12.923	
Indan	00496-11-7	3.23	1.19	3.862	
n-Octane	00111-65-9	0.80	1.17	0.929	
2,4-Dimethylpentane	00108-08-7	1.46	1.14	1.662	
2-Methylhexane	00591-76-4	1.09	1.05	1.143	
2,3-Dimethylpentane	00565-59-3	1.25	0.95	1.181	
c-1,3-Dimethylcyclopentane	02532-58-3	3.32	0.84	2.796	
3,5-Dimethylheptane	00926-82-9	1.42	0.81	1.157	
t-1,2-Dimethylcyclopentane	00822-50-4	3.32	0.70	2.323	
Cyclohexane	00110-82-7	1.14	0.69	0.790	
2,2-Dimethylbutane	00075-83-2	1.11	0.67	0.739	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.64	3.561	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	3.32	0.61	2.010	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.51	2.678	
n-Heptane	00142-82-5	0.97	0.32	0.304	
2-Methyl-2-pentene	00625-27-4	11.03	0.25	2.788	
n-Hexane	00110-54-3	1.13	0.02	0.024	
		Total	204.1	677.6	3.319
No MIR available, use weighted average of 3.3193					

Vehicle 8004 - Fuel E32 - RL Total - Test 25720					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	**00078-78-4**	**1.35**	**26.71**	**36.196**	
Toluene	**00108-88-3**	**3.93**	**10.09**	**39.585**	
		Total	**36.8**	**75.8**	**2.059**

Vehicle 8004 - Fuel E59 - RL Total - Test 25765					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	39.41	57.109	
n-Propylbenzene	00103-65-1	1.96	13.94	27.311	
Unknown #22		3.20	7.60	24.275	
1,3,5-Trimethylbenzene	00108-67-8	11.8	5.17	60.798	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.58	36.334	
Propane	00074-98-6	0.46	4.43	2.027	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.39	5.945	
n-Butane	00106-97-8	1.08	4.33	4.661	
2,3,5-Trimethylhexane	01069-53-0	1.12	3.14	3.519	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	3.01	16.178	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.98	23.149	
2,3-Dimethylbutane	00079-29-8	0.9	2.78	2.499	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.74	32.099	
Toluene	00108-88-3	3.93	2.74	10.737	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.70	3.238	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.58	2.715	
Indan	00496-11-7	3.23	2.40	7.775	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.21	2.101	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	2.14	9.382	
n-Decane	00124-18-5	0.59	2.10	1.239	
2,2-DiMeHexane	00590-73-8	0.94	2.06	1.939	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.92	14.194	
1,2,3-Trimethylbenzene	00526-73-8	11.9	1.80	21.527	
t-2-Hexene	04050-45-7	8.55	1.63	13.937	
ortho-Xylene	00095-47-6	7.58	1.57	11.901	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	1.35	7.494	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	1.35	1.884	
2,4-Dimethylhexane	00589-43-5	1.61	1.02	1.637	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.88	9.215	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.87	2.791	
Benzene	00071-43-2	0.69	0.82	0.572	
3-Methylpentane	00096-14-0	1.69	0.81	1.375	
2-Methyl-1-butene	00563-46-2	6.38	0.75	4.810	
2,2-Dimethylbutane	00075-83-2	1.11	0.66	0.735	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.50	0.802	
n-Pentane	00109-66-0	1.21	0.49	0.592	
Ethylbenzene	00100-41-4	2.96	0.31	0.913	
Methylcyclohexane	00108-87-2	1.56	0.29	0.445	
2,4-Dimethylpentane	00108-08-7	1.46	0.09	0.125	
		Total	134.6	430.0	3.196
No MIR available, use weighted average of 3.1957					

Vehicle 8003 - Fuel E85 - RL Total - Test 25731					
Non Zero Mass Species Sorted By VOC					
4 Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	33.60	48.683	
2,3,5-Trimethylhexane	01069-53-0	1.12	17.51	19.613	
Ethylene	00074-85-1	8.88	9.07	80.569	
n-Decane	00124-18-5	0.59	7.54	4.453	
t-2-Butene	00624-64-6	15.2	6.77	102.819	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.96	6.716	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	4.93	57.654	
n-Butane	00106-97-8	1.08	4.64	4.998	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	3.41	22.510	
2,2-DiMeHexane	00590-73-8	0.94	3.32	3.121	
Benzene	00071-43-2	0.69	2.76	1.920	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.39	12.840	
3-Methyl-c-2-pentene	00922-62-3	12.5	2.35	29.423	
Methylcyclopentane	00096-37-7	2.05	1.90	3.890	
Toluene	00108-88-3	3.93	1.86	7.305	
n-Hexane	00110-54-3	1.13	1.74	1.979	
n-Propylbenzene	00103-65-1	1.96	1.60	3.142	
t-2-Hexene	04050-45-7	8.55	1.53	13.089	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	1.44	5.664	
Indan	00496-11-7	3.23	1.35	4.359	
c-2-Butene	00590-18-1	14.3	1.13	16.132	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.12	13.074	
n-Pentane	00109-66-0	1.21	1.07	1.304	
2-Methylpropane	00075-28-5	1.18	1.05	1.233	
n-Octane	00111-65-9	0.8	0.95	0.755	
n-Nonane	00111-84-2	0.68	0.95	0.646	
2-Methyl-1-butene	00563-46-2	6.38	0.80	5.100	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.73	7.690	
n-Heptane	00142-82-5	0.97	0.71	0.688	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.64	0.770	
2,4-Dimethylpentane	00108-08-7	1.46	0.64	0.931	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.62	7.321	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.60	0.833	
Methylcyclohexane	00108-87-2	1.56	0.55	0.855	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.50	0.471	
Cyclohexane	00110-82-7	0.8	0.50	0.395	
Ethylbenzene	00100-41-4	2.96	0.41	1.212	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.38	0.403	
3-Methylpentane	00096-14-0	1.69	0.35	0.597	
Cyclopentene	00142-29-0	6.69	0.32	2.164	
c-2-Pentene	00627-20-3	10.3	0.31	3.197	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.27	3.271	
2,3-Dimethylbutane	00079-29-8	0.9	0.11	0.099	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.11	0.571	
		Total	129.5	504.5	3.896

Vehicle 8003 - Fuel E6 - HS - Test 7444					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	2.99	4.327	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	1.60	6.296	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.28	1.732	
Toluene	00108-88-3	3.93	1.03	4.035	
n-Pentane	00109-66-0	1.21	0.97	1.183	
2,2-DiMeHexane	00590-73-8	0.94	0.96	0.901	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.68	0.815	
2-Methylheptane	00592-27-8	0.97	0.58	0.562	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.54	0.754	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.54	0.567	
Unknown #16		2.43	0.52	1.255	
c-1,3-Dimethylcyclopentane	02532-58-3	2.43	0.45	1.100	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.41	4.876	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.41	0.464	
Benzene	00071-43-2	0.69	0.41	0.286	
Methylcyclohexane	00108-87-2	1.56	0.31	0.485	
2-Methylpropane	00075-28-5	1.18	0.28	0.334	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.28	2.242	
3-Methylpentane	00096-14-0	1.69	0.24	0.402	
2-Methylhexane	00591-76-4	1.09	0.24	0.257	
2,3-Dimethylpentane	00565-59-3	1.25	0.23	0.289	
2,3-Dimethylbutane	00079-29-8	0.9	0.22	0.198	
2-Methyl-2-pentene	00625-27-4	11	0.21	2.314	
Propane	00074-98-6	0.46	0.20	0.092	
2,2-Dimethylbutane	00075-83-2	1.11	0.17	0.192	
2,4-Dimethylpentane	00108-08-7	1.46	0.16	0.236	
ortho-Xylene	00095-47-6	7.58	0.15	1.159	
2,4-Dimethylhexane	00589-43-5	1.61	0.14	0.218	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.13	0.124	
Indan	00496-11-7	3.23	0.13	0.412	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.12	0.661	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.11	1.256	
Cyclohexane	00110-82-7	1.14	0.09	0.103	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.07	0.109	
n-Decane	00124-18-5	0.59	0.06	0.033	
n-Heptane	00142-82-5	0.97	0.05	0.044	
t-2-Hexene	04050-45-7	8.55	0.05	0.388	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.03	0.180	
Ethylbenzene	00100-41-4	2.96	0.03	0.101	
n-Octane	00111-65-9	0.8	0.03	0.024	
t-2-Butene	00624-64-6	15.2	0.02	0.353	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.02	0.112	
c-2-Butene	00590-18-1	14.3	0.01	0.166	
		Total	17.2	41.6	2.426
No MIR available, use weighted average of 2.4262					

Vehicle 8004 - Fuel E32 - HS - Test 7320					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Toluene	00108-88-3	3.93	1.29	5.070	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.88	6.487	
n-Propylbenzene	00103-65-1	1.96	0.86	1.690	
Unknown #12		4.35	0.64	2.784	
3-Methylnonane	005911-04-6	0.66	0.60	0.394	
c-2-Octene	07642-04-8	4.35	0.59	2.560	
2-Methyl-1,3-butadiene	00078-79-5	10.48	0.57	6.027	
t-1,4-Dimethylcyclohexane	02207-04-7	4.35	0.56	2.460	
Unknown #11		4.35	0.56	2.460	
c-1,3-Dimethylcyclopentane	02532-58-3	4.35	0.56	2.417	
Cyclohexane	00110-82-7	1.14	0.54	0.619	
Methylindan	27133-93-3	4.35	0.46	2.022	
Cyclopentane	00287-92-3	1.46	0.45	0.662	
3,3-Dimethylpentane	00562-49-2	4.35	0.42	1.844	
Ethylbenzene	00100-41-4	2.96	0.38	1.112	
Methylcyclohexane	00108-87-2	1.56	0.30	0.462	
Unknown #15		4.35	0.28	1.211	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.27	2.164	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.25	0.396	
c-2-Pentene	00627-20-3	10.28	0.21	2.127	
3-Methyl-c-2-pentene	00922-62-3	12.52	0.17	2.106	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.30	0.16	0.862	
2,2-Dimethylpentane	00590-35-2	1.04	0.11	0.119	
1-Heptene	00592-76-7	4.29	0.08	0.330	
Cyclopentadiene	00542-92-7	6.89	0.07	0.448	
1-Methylcyclopentene	00693-89-0	12.45	0.02	0.273	
1,3-Butadiene	00106-99-0	12.45	0.01	0.075	
		Total	11.3	49.2	4.354
No MIR available, use weighted average of 4.3541					

Vehicle 8004 - Fuel E59 - HS - Test 7518					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	15.75	22.817	
Toluene	00108-88-3	3.93	1.60	6.271	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.90	6.622	
n-Pentane	00109-66-0	1.21	0.22	0.263	
		Total	18.5	36.0	1.949

Vehicle 8004 - Fuel E85 - HS - Test 7376					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	6.75	9.780	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.19	1.331	
2,2-DiMeHexane	00590-73-8	0.94	0.78	0.735	
n-Decane	00124-18-5	0.59	0.61	0.358	
Toluene	00108-88-3	3.93	0.40	1.552	
3-Methylheptane	00589-81-1	1.12	0.29	0.326	
n-Propylbenzene	00103-65-1	1.96	0.28	0.558	
Methylcyclohexane	00108-87-2	1.56	0.28	0.432	
Cyclopentene	00142-29-0	6.69	0.26	1.771	
2-Methyl-2-pentene	00625-27-4	11	0.22	2.435	
Benzene	00071-43-2	0.69	0.22	0.152	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.17	0.235	
ortho-Xylene	00095-47-6	7.58	0.12	0.916	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.11	0.118	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.10	0.556	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.10	0.455	
c-2-Butene	00590-18-1	14.3	0.10	1.408	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.10	1.159	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.06	0.726	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.05	0.381	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.04	0.064	
t-2-Hexene	04050-45-7	8.55	0.03	0.242	
2,4-Dimethylpentane	00108-08-7	1.46	0.02	0.025	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.02	0.213	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.01	0.096	
		Total	12.3	26.0	2.115

Vehicle 8004 - Fuel E6 - DHB Day 1 - Test 7445					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	54.10	73.303	
Ethanol	00064-17-5	1.45	48.39	70.117	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	22.58	31.556	
n-Pentane	00109-66-0	1.21	20.02	24.318	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	17.82	21.370	
Toluene	00108-88-3	3.93	13.36	52.448	
3-Methylpentane	00096-14-0	1.69	11.89	20.097	
2,3-Dimethylbutane	00079-29-8	0.9	10.97	9.861	
2,2-DiMeHexane	00590-73-8	0.94	8.79	8.272	
n-Hexane	00110-54-3	1.13	8.76	9.944	
Methylcyclopentane	00096-37-7	2.05	6.38	13.071	
2,2,5-Trimethylhexane	03522-94-9	1.05	6.23	6.560	
2,2-Dimethylbutane	00075-83-2	1.11	6.17	6.853	
2,3,4-Trimethylpentane	00565-75-3	0.95	4.86	4.613	
2,4-Dimethylpentane	00108-08-7	1.46	4.68	6.824	
2-Methylhexane	00591-76-4	1.09	4.63	5.026	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	4.60	18.057	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	4.26	13.599	
Propene	00115-07-1	11.6	4.05	46.869	
2,3-Dimethylpentane	00565-59-3	1.25	4.01	5.010	
Benzene	00071-43-2	0.69	3.72	2.581	
Cyclohexane	00110-82-7	1.14	3.46	3.931	
n-Butane	00106-97-8	1.08	3.33	3.583	
n-Propylbenzene	00103-65-1	1.96	3.16	6.191	
2,4-Dimethylhexane	00589-43-5	1.61	3.16	5.068	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.87	33.595	
2-Methyl-2-butene	00513-35-9	14.2	2.59	36.822	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.54	4.078	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	2.47	16.330	
n-Heptane	00142-82-5	0.97	2.43	2.350	
Methylcyclohexane	00108-87-2	1.56	2.42	3.766	
t-2-Pentene	00646-04-8	10.5	2.23	23.395	
c-1,3-Dimethylcyclopentane	02532-58-3	2.34	1.73	4.040	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.59	12.607	
t-1,2-Dimethylcyclopentane	00822-50-4	2.34	1.54	3.606	
ortho-Xylene	00095-47-6	7.58	1.50	11.382	
n-Octane	00111-65-9	0.8	1.43	1.136	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.40	1.563	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.25	15.707	
t-2-Hexene	04050-45-7	8.55	1.23	10.496	
2-Methyl-1-butene	00563-46-2	0.95	1.20	1.136	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.18	8.679	
3-Methylheptane	00589-81-1	14.3	1.15	16.384	
2-Methylheptane	00592-27-8	0.97	1.13	1.089	

Vehicle 8003 - Fuel E6 - DHB Day 1 - Test 7445					
Non Zero Mass Species Sorted By VOC				Continued...	
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.04	1.137	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.02	11.919	
Unknown #16		2.34	1.00	2.342	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.97	5.158	
c-2-Pentene	00627-20-3	10.3	0.96	9.916	
Ethylbenzene	00100-41-4	2.96	0.96	2.834	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.87	4.798	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.87	4.649	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.86	6.740	
3,5-Dimethylheptane	00926-82-9	1.42	0.85	1.206	
3,3-Dimethylpentane	00562-49-2	1.12	0.83	0.933	
3-Methyloctane	02216-33-3	0.88	0.77	0.677	
4-Methyloctane	02216-34-4	0.85	0.77	0.649	
1-Nonene	00124-11-8	2.49	0.76	1.893	
1-Methylcyclopentene	00693-89-0	12.5	0.76	9.406	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.75	8.869	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.72	4.163	
c-2-Heptene	06443-92-1	7.08	0.71	5.035	
2,4-Dimethylheptane	02213-23-2	1.26	0.71	0.893	
Unknown #22	.	2.34	0.69	1.610	
t-3-Heptene	14686-14-7	6.17	0.68	4.226	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.64	7.679	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.63	4.101	
c-1,3-Dimethylcyclohexane	00638-04-0	2.34	0.62	1.445	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.52	0.547	
Indan	00496-11-7	3.23	0.51	1.653	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.48	1.837	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.47	2.065	
t-2-Nonene	06434-78-2	2.34	0.46	1.070	
3,3-Dimethylhexane	00563-16-6	1.15	0.42	0.479	
n-Nonane	00111-84-2	0.68	0.41	0.277	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.40	2.818	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.38	3.203	
2,2-Dimethylpentane	00590-35-2	1.04	0.38	0.392	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.34	0.33	0.781	
t-1,4-Dimethylcyclohexane	02207-04-7	2.34	0.29	0.677	
Unknown #1		2.34	0.28	0.662	
2-Methyl-2-pentene	00625-27-4	11	0.28	3.103	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.24	1.957	
Unknown #8		2.34	0.23	0.534	
Unknown #6		2.34	0.13	0.299	
Unknown #5		2.34	0.12	0.286	
c-2-Butene	00590-18-1	14.3	0.07	1.029	
		Total	343.1	803.2	2.341
No MIR available, use weighted average of 2.3414					

Vehicle 8004 - Fuel E32 - DHB Day 1 - Test 7322					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	50.95	73.819	
n-Pentane	00109-66-0	1.21	14.44	17.548	
2-Methylbutane (Isopentane)	00078-78-4	1.35	13.37	18.118	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	12.65	17.681	
Methylcyclohexane	00108-87-2	1.56	10.07	15.662	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	7.47	8.953	
3-Methylpentane	00096-14-0	1.69	7.00	11.840	
Toluene	00108-88-3	3.93	6.43	25.245	
2,3-Dimethylbutane	00079-29-8	0.9	5.61	5.043	
n-Hexane	00110-54-3	1.13	5.39	6.113	
Methylcyclopentane	00096-37-7	2.05	4.23	8.673	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.74	3.933	
2,2-Dimethylbutane	00075-83-2	1.11	3.48	3.866	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.73	8.723	
2,4-Dimethylpentane	00108-08-7	1.46	2.65	3.873	
2-Methylhexane	00591-76-4	1.09	2.65	2.875	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	2.65	10.383	
Cyclohexane	00110-82-7	1.14	2.60	2.952	
2,4-Dimethylhexane	00589-43-5	1.61	2.25	3.610	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.11	2.006	
Benzene	00071-43-2	0.69	2.00	1.392	
2,3-Dimethylpentane	00565-59-3	1.25	1.99	2.482	
n-Butane	00106-97-8	1.08	1.81	1.954	
2-Methyl-2-butene	00513-35-9	14.2	1.66	23.522	
t-2-Pentene	00646-04-8	10.5	1.63	17.093	
3-Methylheptane	00589-81-1	14.3	1.52	21.627	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.30	15.256	
n-Heptane	00142-82-5	0.97	1.04	1.004	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.03	8.185	
2,2-Dimethylpentane	00590-35-2	1.04	1.01	1.058	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.97	12.129	
t-2-Hexene	04050-45-7	8.55	0.83	7.076	
c-2-Pentene	00627-20-3	10.3	0.79	8.081	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.78	0.879	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.77	9.027	
2-Methyl-2-pentene	00625-27-4	11	0.75	8.327	
1-Methylcyclopentene	00693-89-0	12.5	0.74	9.238	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.74	3.896	
c-1,3-Dimethylcyclohexane	00638-04-0	2.31	0.73	1.683	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.71	5.558	
n-Octane	00111-65-9	0.8	0.69	0.549	

Vehicle 8004 - Fuel E32 - DHB Day 1 - Test 7322 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.64	0.703	
t-1,2-Dimethylcyclopentane	00822-50-4	2.31	0.61	1.410	
2-Methyl-1-butene	00563-46-2	0.95	0.61	0.575	
Cyclopentene	00142-29-0	6.69	0.60	4.032	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.59	4.776	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.59	3.893	
c-2-Butene	00590-18-1	14.3	0.55	7.902	
c-1,3-Dimethylcyclopentane	02532-58-3	2.31	0.55	1.262	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.49	2.835	
ortho-Xylene	00095-47-6	7.58	0.46	3.500	
2,4-Dimethylheptane	02213-23-2	1.26	0.44	0.561	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.29	0.309	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.28	0.451	
2-Methylheptane	00592-27-8	0.97	0.26	0.252	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.24	2.875	
Ethylbenzene	00100-41-4	2.96	0.24	0.700	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.16	1.218	
Methane	00074-82-8	0.01	0.09	0.001	
3-Methylnonane	005911-04-6	0.66	0.03	0.020	
		Total	193.7	448.2	2.314
No MIR available, use weighted average of 2.3138					

Vehicle 8004 - Fuel E59 - DHB Day 1 - Test 7520					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	136.55	197.852	
Benzene	00071-43-2	0.69	40.62	28.205	
2,2-Dimethylbutane	00075-83-2	1.11	13.81	15.342	
2-Methylbutane (Isopentane)	00078-78-4	1.35	10.73	14.533	
2,3-Dimethylbutane	00079-29-8	0.9	7.49	6.728	
ortho-Xylene	00095-47-6	7.58	6.80	51.530	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	6.33	34.008	
3-Methylpentane	00096-14-0	1.69	6.07	10.256	
Methylcyclopentane	00096-37-7	2.05	5.95	12.200	
Ethylbenzene	00100-41-4	2.96	5.56	16.466	
n-Propylbenzene	00103-65-1	1.96	5.17	10.129	
n-Butane	00106-97-8	1.08	3.88	4.177	
2,4-Dimethylpentane	00108-08-7	1.46	3.40	4.959	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.86	22.149	
1,3,5-Trimethylbenzene	00108-67-8	11.8	2.81	33.048	
Methylcyclohexane	00108-87-2	1.56	2.44	3.791	
Toluene	00108-88-3	3.93	2.40	9.403	
n-Pentane	00109-66-0	1.21	2.34	2.844	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.18	25.532	
n-Hexane	00110-54-3	1.13	1.87	2.123	
Cyclohexane	00110-82-7	1.14	1.78	2.028	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.76	5.632	
n-Octane	00111-65-9	0.8	1.75	1.390	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.61	12.821	
Cyclopentene	00142-29-0	6.69	1.61	10.742	
n-Heptane	00142-82-5	0.97	1.60	1.549	
2-Methyl-2-butene	00513-35-9	14.2	1.55	21.942	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.34	1.613	
2-Methyl-1-butene	00563-46-2	6.38	1.14	7.286	
2,3-Dimethylpentane	00565-59-3	1.25	1.09	1.366	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.94	0.893	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.89	0.974	
2,4-Dimethylhexane	00589-43-5	1.61	0.87	1.404	
3-Methylheptane	00589-81-1	1.12	0.85	0.961	
c-2-Butene	00590-18-1	14.3	0.83	11.836	
2,2-DiMeHexane	00590-73-8	0.94	0.71	0.671	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.70	2.691	
2-Methylhexane	00591-76-4	1.09	0.70	0.755	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.68	1.084	
2-Methylheptane	00592-27-8	0.97	0.67	0.652	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.66	3.491	

Vehicle 8004 - Fuel E59 - DHB Day 1 - Test 7520 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.65	7.568	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.62	4.574	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.61	2.666	
2-Methyl-2-pentene	00625-27-4	11	0.60	6.608	
c-2-Pentene	00627-20-3	10.3	0.59	6.090	
c-1,3-Dimethylcyclohexane	00638-04-0	2.15	0.57	1.215	
t-2-Pentene	00646-04-8	10.5	0.55	5.709	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.48	2.781	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.46	0.644	
t-1,2-Dimethylcyclopentane	00822-50-4	2.15	0.37	0.803	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.36	4.562	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.36	0.402	
2,4-Dimethylheptane	02213-23-2	1.26	0.35	0.437	
c-1,3-Dimethylcyclopentane	02532-58-3	2.15	0.33	0.708	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.33	0.345	
t-2-Hexene	04050-45-7	8.55	0.30	2.557	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.22	1.455	
1c-2t-3-TriMeCyPentane	15890-40-1	2.15	0.11	0.236	
		Total	300.8	646.4	2.149
No MIR available, use weighted average of 2.1487					

Vehicle 8004 - Fuel E85 - DHB Day 1 - Test 7377					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	206.89	299.779	
2-Methylbutane (Isopentane)	00078-78-4	1.35	32.41	43.909	
2,2-DiMeHexane	00590-73-8	0.94	10.25	9.648	
n-Pentane	00109-66-0	1.21	10.12	12.293	
Propene	00115-07-1	11.6	4.70	54.368	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	4.44	6.203	
Toluene	00108-88-3	3.93	3.78	14.823	
n-Hexane	00110-54-3	1.13	3.42	3.881	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.76	3.312	
n-Butane	00106-97-8	1.08	2.66	2.860	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.64	2.962	
3-Methylpentane	00096-14-0	1.69	2.49	4.212	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	2.42	16.007	
Benzene	00071-43-2	0.69	2.28	1.586	
2,3-Dimethylbutane	00079-29-8	0.9	2.28	2.051	
Methylcyclopentane	00096-37-7	2.05	2.22	4.559	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.74	13.810	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	1.30	5.087	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.28	4.077	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.13	1.188	
Methylcyclohexane	00108-87-2	1.56	1.07	1.664	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.06	12.364	
2,2-Dimethylbutane	00075-83-2	1.11	1.01	1.120	
Cyclohexane	00110-82-7	1.14	0.91	1.039	
2,4-Dimethylpentane	00108-08-7	1.46	0.85	1.240	
2-Methylhexane	00591-76-4	1.09	0.81	0.875	
n-Decane	00124-18-5	0.59	0.75	0.445	
n-Heptane	00142-82-5	0.97	0.72	0.696	
2,3-Dimethylpentane	00565-59-3	1.25	0.71	0.890	
2-Methyl-1-butene	00563-46-2	0.95	0.71	0.672	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.68	0.646	
t-2-Pentene	00646-04-8	10.5	0.67	7.069	
2-Methyl-2-butene	00513-35-9	14.2	0.63	8.953	
2,4-Dimethylheptane	02213-23-2	1.26	0.60	0.760	
2,4-Dimethylhexane	00589-43-5	1.61	0.59	0.947	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.57	3.046	
1,3-Butadiene	00106-99-0	12.5	0.57	7.113	
4-Methyloctane	02216-34-4	0.85	0.57	0.484	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.56	6.994	
c-1,3-Dimethylcyclopentane	02532-58-3	1.87	0.48	0.905	
n-Octane	00111-65-9	0.8	0.47	0.376	
1c-2t-3-TriMeCyPentane	15890-40-1	1.87	0.47	0.884	
t-1,2-Dimethylcyclopentane	00822-50-4	1.87	0.46	0.868	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.43	0.697	

Vehicle 8004 - Fuel E85 - DHB Day 1 - Test 7377 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.43	2.373	
3-Methylheptane	00589-81-1	14.3	0.38	5.455	
t-2-Hexene	04050-45-7	8.55	0.37	3.169	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.35	1.899	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.35	4.071	
2-Methyl-2-pentene	00625-27-4	11.03	0.33	3.615	
Naphthalene	00091-20-3	3.28	0.29	0.958	
c-2-Pentene	00627-20-3	10.28	0.28	2.901	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.25	2.964	
ortho-Xylene	00095-47-6	7.58	0.25	1.866	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.22	2.553	
n-Propylbenzene	00103-65-1	1.96	0.18	0.360	
Indan	00496-11-7	3.23	0.18	0.573	
Cyclopentene	00142-29-0	6.69	0.17	1.150	
2-Methylheptane	00592-27-8	0.97	0.14	0.136	
c-2-Heptene	06443-92-1	7.08	0.13	0.895	
Ethylbenzene	00100-41-4	2.96	0.06	0.175	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.05	0.055	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.05	0.218	
		Total	322.0	602.7	1.872
No MIR available, use weighted average of 1.8717					

Vehicle 8004 - Fuel E6 - DHB Total - Test 7445					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	110.28	149.418	
Ethanol	00064-17-5	1.45	78.40	113.596	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	49.13	68.676	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	41.56	49.840	
n-Pentane	00109-66-0	1.21	40.28	48.942	
3-Methylpentane	00096-14-0	1.69	26.50	44.809	
Toluene	00108-88-3	3.93	25.26	99.142	
2,3-Dimethylbutane	00079-29-8	0.9	23.87	21.453	
n-Hexane	00110-54-3	1.13	18.06	20.490	
2,2-DiMeHexane	00590-73-8	0.94	15.03	14.148	
Methylcyclopentane	00096-37-7	2.05	14.25	29.213	
2,2-Dimethylbutane	00075-83-2	1.11	14.13	15.697	
2,2,5-Trimethylhexane	03522-94-9	1.05	13.19	13.894	
Propene	00115-07-1	11.6	13.07	151.258	
2,4-Dimethylpentane	00108-08-7	1.46	10.74	15.677	
2,3,4-Trimethylpentane	00565-75-3	0.95	10.38	9.849	
2-Methylhexane	00591-76-4	1.09	9.66	10.478	
2,3-Dimethylpentane	00565-59-3	1.25	8.63	10.771	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	8.44	26.917	
2,4-Dimethylhexane	00589-43-5	1.61	7.06	11.342	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	6.92	27.153	
Benzene	00071-43-2	0.69	6.65	4.618	
Cyclohexane	00110-82-7	1.14	6.44	7.326	
2-Methyl-2-butene	00513-35-9	14.2	4.92	69.789	
Methylcyclohexane	00108-87-2	1.56	4.91	7.631	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	4.90	7.870	
n-Heptane	00142-82-5	0.97	4.39	4.240	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	4.27	28.193	
t-2-Pentene	00646-04-8	10.5	3.16	33.148	
t-1,2-Dimethylcyclopentane	00822-50-4	2.27	2.92	6.635	
n-Butane	00106-97-8	1.08	2.74	2.952	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.72	21.573	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.63	2.948	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	2.59	2.825	
t-2-Hexene	04050-45-7	8.55	2.55	21.778	
3-Methyl-c-2-pentene	00922-62-3	12.5	2.50	31.279	
3-Methylheptane	00589-81-1	14.3	2.44	34.786	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	2.38	12.609	
c-1,3-Dimethylcyclopentane	02532-58-3	2.27	2.37	5.394	
3-Methyl-t-2-pentene	00616-12-6	11.7	2.17	25.351	
2-Methylheptane	00592-27-8	0.97	2.03	1.965	
2-Methyl-1-butene	00563-46-2	0.95	1.87	1.778	
n-Octane	00111-65-9	0.8	1.87	1.487	
n-Propylbenzene	00103-65-1	1.96	1.83	3.591	

Vehicle 8004 - Fuel E6 - DHB Total - Test 7445 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
c-2-Pentene	00627-20-3	10.3	1.80	18.464	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.73	9.264	
ortho-Xylene	00095-47-6	7.58	1.56	11.797	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.56	18.205	
1-Methylcyclopentene	00693-89-0	12.5	1.44	17.891	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	1.36	10.651	
Ethylbenzene	00100-41-4	2.96	1.33	3.939	
2-Methyl-2-pentene	00625-27-4	11	1.32	14.560	
c-1,3-Dimethylcyclohexane	00638-04-0	2.27	1.21	2.741	
2,4-Dimethylheptane	02213-23-2	1.26	1.12	1.414	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.11	8.222	
4-Methyloctane	02216-34-4	0.85	1.02	0.861	
3,5-Dimethylheptane	00926-82-9	1.42	0.98	1.391	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.95	3.673	
Unknown #16		2.27	0.93	2.110	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.91	5.284	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.90	5.004	
c-2-Heptene	06443-92-1	7.08	0.90	6.350	
Indan	00496-11-7	3.23	0.86	2.794	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.78	0.826	
1,1-Dimethylcyclohexane	00590-66-9	1.12	0.73	0.818	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.73	8.712	
3-Methyloctane	02216-33-3	0.88	0.72	0.636	
Unknown #13		2.27	0.67	1.518	
Unknown #5		2.27	0.65	1.478	
1-Nonene	00124-11-8	2.49	0.65	1.609	
1c-2t-3-TriMeCyPentane	15890-40-1	2.27	0.63	1.427	
3,3-Dimethylpentane	00562-49-2	1.12	0.61	0.679	
2,2-Dimethylpentane	00590-35-2	1.04	0.61	0.633	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.27	0.61	1.377	
n-Nonane	00111-84-2	0.68	0.60	0.407	
2,2-Dimethyloctane	15869-87-1	0.76	0.59	0.447	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.57	6.688	
t-2-Nonene	06434-78-2	2.27	0.55	1.245	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.53	3.441	
3,3-Dimethylhexane	00563-16-6	1.15	0.51	0.585	
t-1,4-Dimethylcyclohexane	02207-04-7	2.27	0.46	1.049	

Vehicle 8004 - Fuel E6 - DHB Total - Test 7445 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-3-Heptene	14686-14-7	6.17	0.46	2.818	
t-4-Octene	14850-23-8	4.69	0.46	2.139	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.45	3.781	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.45	1.957	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.3	0.40	2.543	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.39	2.774	
Unknown #6	.	2.27	0.33	0.758	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.30	2.435	
Unknown #7		2.27	0.28	0.644	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.26	2.709	
Unknown #1		2.27	0.25	0.567	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.24	0.208	
Unknown #8		2.27	0.23	0.531	
Cyclopentene	00142-29-0	6.69	0.15	0.972	
c-2-Butene	00590-18-1	14.3	0.12	1.661	
		Total	659.0	1497.2	2.272
No MIR available, use weighted average of 2.2719					

Vehicle 8004 - Fuel E32 - DHB Total - Test 7322					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	96.90	140.401	
n-Pentane	00109-66-0	1.21	26.69	32.424	
2-Methylbutane (Isopentane)	00078-78-4	1.35	25.82	34.980	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	24.82	34.693	
Methylcyclohexane	00108-87-2	1.56	16.58	25.792	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	16.47	19.750	
3-Methylpentane	00096-14-0	1.69	14.13	23.900	
Toluene	00108-88-3	3.93	11.57	45.397	
2,3-Dimethylbutane	00079-29-8	0.9	11.11	9.984	
n-Hexane	00110-54-3	1.13	10.32	11.706	
Methylcyclopentane	00096-37-7	2.05	7.79	15.970	
Propene	00115-07-1	11.6	7.16	82.823	
2,2-Dimethylbutane	00075-83-2	1.11	6.23	6.918	
2,2,5-Trimethylhexane	03522-94-9	1.05	6.18	6.509	
2,4-Dimethylpentane	00108-08-7	1.46	4.87	7.101	
2-Methylhexane	00591-76-4	1.09	4.50	4.881	
2,3,4-Trimethylpentane	00565-75-3	0.95	4.33	4.109	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	4.12	13.147	
2,4-Dimethylhexane	00589-43-5	1.61	4.03	6.466	
Cyclohexane	00110-82-7	1.14	3.91	4.447	
2,3-Dimethylpentane	00565-59-3	1.25	3.69	4.604	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	3.41	13.393	
Benzene	00071-43-2	0.69	3.29	2.285	
n-Butane	00106-97-8	1.08	3.04	3.278	
2-Methyl-2-butene	00513-35-9	14.2	3.00	42.638	
t-2-Pentene	00646-04-8	10.5	2.42	25.377	
n-Heptane	00142-82-5	0.97	2.27	2.196	
2,2-Dimethylpentane	00590-35-2	1.04	2.25	2.348	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.88	2.101	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.66	13.196	
3-Methylheptane	00589-81-1	14.3	1.62	23.156	
t-2-Hexene	04050-45-7	8.55	1.49	12.779	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.44	16.838	
1,1-Dimethylcyclohexane	00590-66-9	1.12	1.42	1.589	
c-1,3-Dimethylcyclopentane	02532-58-3	2.31	1.40	3.246	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.39	2.233	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	1.35	7.172	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.34	16.823	
c-2-Pentene	00627-20-3	10.3	1.34	13.794	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.31	15.329	
c-1,3-Dimethylcyclohexane	00638-04-0	2.31	1.20	2.775	
t-1,2-Dimethylcyclopentane	00822-50-4	2.31	1.18	2.722	
2-Methyl-2-pentene	00625-27-4	11	1.16	12.785	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.12	1.221	

Vehicle 8004 - Fuel E32 - DHB Total - Test 7322 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	1.07	8.394	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.02	6.756	
1-Methylcyclopentene	00693-89-0	12.5	1.01	12.554	
n-Octane	00111-65-9	0.8	0.95	0.760	
2-Methyl-1-butene	00563-46-2	0.95	0.94	0.888	
2,4-Dimethylheptane	02213-23-2	1.26	0.85	1.070	
2-Methylheptane	00592-27-8	0.97	0.77	0.741	
c-2-Heptene	06443-92-1	7.08	0.72	5.121	
4-Methyloctane	02216-34-4	0.85	0.67	0.565	
Ethylcyclohexane	01678-91-7	1.35	0.61	0.817	
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	0.60	3.408	
Cyclopentene	00142-29-0	6.69	0.60	4.032	
t-3-Heptene	14686-14-7	6.17	0.59	3.643	
c-2-Butene	00590-18-1	14.3	0.58	8.326	
3,3-Dimethylhexane	00563-16-6	1.15	0.55	0.636	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.52	3.008	
ortho-Xylene	00095-47-6	7.58	0.51	3.879	
2,4,4-TMe-1- & 2,3-DMe-2-Pentene	00107-39-1+10574-37-5	6.54	0.51	3.334	
3-Methyloctane	02216-33-3	0.88	0.50	0.444	
Ethylbenzene	00100-41-4	2.96	0.48	1.429	
3-Me-t-3-Hexene & t-2-Heptene	03899-36-3+14686-13-6	8.38	0.48	4.028	
n-Nonane	00111-84-2	0.68	0.47	0.321	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.44	0.461	
n-Propylbenzene	00103-65-1	1.96	0.43	0.844	
Unknown #17		2.31	0.42	0.982	
3-Methylnonane	005911-04-6	0.66	0.41	0.270	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.41	1.557	
3-Ethyl-c-2-Pentene	00816-79-5	9.76	0.29	2.835	
Unknown #9		2.31	0.27	0.615	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.25	1.848	
3,3-Dimethylpentane	00562-49-2	1.12	0.23	0.256	
Styrene	00100-42-5	1.66	0.22	0.361	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.19	1.038	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.31	0.17	0.395	
Unknown #5		2.31	0.05	0.116	
		Total	372.0	861.0	2.315
No MIR available, use weighted average of 2.3145					

Vehicle 8004 - Fuel E59 - DHB Total - Test 7520					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	227.00	328.910	
2-Methylbutane (Isopentane)	00078-78-4	1.35	83.09	112.575	
n-Pentane	00109-66-0	1.21	27.05	32.863	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	21.69	30.311	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	15.35	18.402	
Toluene	00108-88-3	3.93	12.73	49.976	
3-Methylpentane	00096-14-0	1.69	12.02	20.329	
2,2-DiMeHexane	00590-73-8	0.94	11.52	10.839	
n-Hexane	00110-54-3	1.13	10.74	12.183	
2,3-Dimethylbutane	00079-29-8	0.9	10.44	9.383	
n-Butane	00106-97-8	1.08	7.90	8.503	
Methylcyclopentane	00096-37-7	2.05	6.75	13.845	
2,2-Dimethylbutane	00075-83-2	1.11	5.69	6.322	
2,2,5-Trimethylhexane	03522-94-9	1.05	4.53	4.769	
2,4-Dimethylpentane	00108-08-7	1.46	4.48	6.532	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.21	4.718	
2,3,4-Trimethylpentane	00565-75-3	0.95	3.77	3.573	
Cyclohexane	00110-82-7	1.14	3.67	4.171	
2-Methylhexane	00591-76-4	1.09	3.64	3.951	
2,3-Dimethylpentane	00565-59-3	1.25	3.51	4.384	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	3.33	10.621	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.12	24.185	
2,4-Dimethylhexane	00589-43-5	1.61	2.85	4.571	
2-Methyl-2-butene	00513-35-9	14.2	2.83	40.225	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	2.69	17.745	
Benzene	00071-43-2	0.69	2.52	1.747	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.46	3.947	
n-Heptane	00142-82-5	0.97	2.27	2.193	
t-2-Pentene	00646-04-8	10.5	2.20	23.014	
Methylcyclohexane	00108-87-2	1.56	2.07	3.227	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.86	14.739	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.77	20.750	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.54	19.221	
ortho-Xylene	00095-47-6	7.58	1.36	10.276	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.26	9.334	
2-Methyl-1-butene	00563-46-2	6.38	1.20	7.633	
3-Methyl-t-2-pentene	00616-12-6	11.7	1.15	13.412	
t-2-Hexene	04050-45-7	8.55	1.15	9.834	
t-1,2-Dimethylcyclopentane	00822-50-4	1.86	1.06	1.971	
3-Methylheptane	00589-81-1	1.12	1.03	1.159	
c-2-Pentene	00627-20-3	10.3	1.01	10.345	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.99	5.256	
c-1,3-Dimethylcyclopentane	02532-58-3	1.86	0.96	1.789	
2-Methyl-2-pentene	00625-27-4	11	0.93	10.304	

Vehicle 8004 - Fuel E59 - DHB Total - Test 7520 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	0.93	0.896	
2,4-Dimethylheptane	02213-23-2	1.26	0.89	1.128	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.81	0.880	
c-1,3-Dimethylcyclohexane	00638-04-0	1.86	0.80	1.484	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.76	4.084	
n-Decane	00124-18-5	0.59	0.76	0.449	
n-Octane	00111-65-9	0.8	0.66	0.524	
3 & 4-Methyl-1-Pentenes	00691-37-2+00760-20-3	5.78	0.62	3.583	
1-Methylcyclopentene	00693-89-0	12.5	0.58	7.251	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.56	4.408	
1c-2t-3-TriMeCyPentane	15890-40-1	1.86	0.54	1.011	
Ethylbenzene	00100-41-4	2.96	0.50	1.491	
Cyclopentene	00142-29-0	6.69	0.50	3.321	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.46	1.779	
c-2-Heptene	06443-92-1	7.08	0.42	2.958	
2,2-Dimethylpentane	00590-35-2	1.04	0.39	0.410	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.23	1.000	
c-2-Butene	00590-18-1	14.3	0.16	2.326	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.15	1.760	
2,2,3-Trimethylbutane	00464-06-2	1.05	0.15	0.153	
		Total	534.2	994.9	1.862
No MIR available, use weighted average of 1.8624					

Vehicle 8004 - Fuel E85 - DHB Total - Test 7377					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	399.99	579.568	
2-Methylbutane (Isopentane)	00078-78-4	1.35	66.06	89.507	
n-Pentane	00109-66-0	1.21	20.18	24.516	
2,2-DiMeHexane	00590-73-8	0.94	16.95	15.953	
Propene	00115-07-1	11.6	12.00	138.941	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	9.47	13.235	
n-Hexane	00110-54-3	1.13	6.95	7.886	
Toluene	00108-88-3	3.93	6.33	24.843	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.87	6.06	11.307	
n-Butane	00106-97-8	1.08	5.75	6.194	
3-Methylpentane	00096-14-0	1.69	5.14	8.684	
2,3-Dimethylbutane	00079-29-8	0.9	4.57	4.111	
2,3,5-Trimethylhexane	01069-53-0	1.12	4.32	4.836	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	3.83	25.305	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.82	30.338	
Methylcyclopentane	00096-37-7	2.05	3.41	6.992	
Benzene	00071-43-2	0.69	2.85	1.976	
2,2-Dimethylbutane	00075-83-2	1.11	2.04	2.265	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.96	2.063	
Cyclohexane	00110-82-7	1.14	1.93	2.193	
2,4-Dimethylpentane	00108-08-7	1.46	1.69	2.473	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.63	5.214	
meta- & para-Xylenes	00108-38-3+00106-42-3	3.93	1.59	6.235	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.56	1.484	
n-Heptane	00142-82-5	0.97	1.44	1.392	
Methylcyclohexane	00108-87-2	1.56	1.41	2.197	
2-Methyl-1-butene	00563-46-2	6.38	1.41	8.999	
2-Methyl-2-butene	00513-35-9	14.2	1.39	19.791	
2-Methylhexane	00591-76-4	1.09	1.36	1.476	
t-2-Pentene	00646-04-8	10.5	1.18	12.401	
2,3-Dimethylpentane	00565-59-3	1.25	1.17	1.458	
4-Methyloctane	02216-34-4	0.85	1.14	0.967	
n-Decane	00124-18-5	0.59	1.08	0.637	
Methane	00074-82-8	0.01	1.02	0.014	
2,4-Dimethylheptane	02213-23-2	1.26	0.99	1.250	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.98	12.306	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.95	11.116	
2,4-Dimethylhexane	00589-43-5	1.61	0.92	1.481	
n-Octane	00111-65-9	0.8	0.80	0.636	
1c-2t-3-TriMeCyPentane	15890-40-1	1.87	0.79	1.470	
Cyclopentene	00142-29-0	1.2	0.76	0.915	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.76	4.042	
t-2-Hexene	04050-45-7	8.55	0.68	5.787	
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.68	2.584	

Vehicle 8004 - Fuel E85 - DHB Total - Test 7377 Continued...					
Non Zero Mass Species Sorted By VOC					
Evap Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
t-1,2-Dimethylcyclopentane	00822-50-4	1.87	0.66	1.239	
1,2,3-Trimethylbenzene	00526-73-8	0.95	0.65	0.612	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.64	1.033	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.57	6.702	
2-Methyl-2-pentene	00625-27-4	11	0.56	6.223	
c-1,3-Dimethylcyclopentane	02532-58-3	1.87	0.53	0.993	
3-Methylheptane	00589-81-1	1.12	0.49	0.550	
ortho-Xylene	00095-47-6	7.58	0.49	3.686	
c-2-Pentene	00627-20-3	11	0.48	5.310	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.46	2.466	
c-2-Heptene	06443-92-1	7.08	0.45	3.207	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.45	2.511	
c-2-Butene	00590-18-1	14.3	0.43	6.068	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.39	0.430	
n-Propylbenzene	00103-65-1	1.96	0.38	0.740	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.37	2.937	
2-Methylheptane	00592-27-8	0.97	0.34	0.326	
n-Undecane	01120-21-4	0.52	0.33	0.170	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.30	1.152	
Ethylbenzene	00100-41-4	2.96	0.29	0.858	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.26	1.145	
Unknown #23		1.87	0.23	0.433	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.20	1.569	
1-Nonene	00124-11-8	2.49	0.19	0.466	
Indan	00496-11-7	3.23	0.15	0.494	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.12	1.386	
		Total	621.4	1159.7	1.866
No MIR available, use weighted average of 1.8663					

Vehicle 8005										
Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present		
FTP	E6	5884	186.5	100.3	187.1	716.2	3.828	54		
Phase 1	E32	5842	265.4	100.1	265.6	802.0	3.019	56		
	E59	5816	274.8	118.1	324.5	965.9	2.977	48		
	E85	5892	207.6	117.9	244.7	638.4	2.609	30		
FTP	E6	5884	23.2	64.3	14.9	1.9	0.130	9		
Phase 2	E32	5842	25.1	100.1	25.1	39.8	1.582	15		
	E59	5816	31	59.4	18.4	10.3	0.561	14		
	E85	5892	37.3	122.8	45.8	40.6	0.886	10		
FTP	E6	5884	33.8	61.2	20.7	4.0	0.194	9		
Phase 3	E32	5842	32	89.4	28.6	12.9	0.451	13	Includes aldehydes	
	E59	5816	33	74.6	24.6	63.0	2.560	11		
	E85	5892	39.5	110.9	43.8	25.8	0.589	14		
US06	E6	5885	56.2	92.9	52.2	107.3	2.055	33		
	E32	5843	60.9	88.5	53.9	122.5	2.274	35		
	E59	5817	59.4	95.4	56.7	177.0	3.124	29		
	E85	5893	41.3	100.9	41.7	101.7	2.441	18		
UC	E6	5886	73.3	91.9	67.4	183.8	2.729	28		
	E32	5844	100.9	94.3	95.2	253.9	2.668	33		
	E59	5818	105.5	124.6	131.4	371.2	2.825	34		
	E85	5895	79.8	127.7	101.9	280.4	2.752	19		

Vehicle 8005 - Fuel E6 - FTP Phase 1 - Test 5884				
Non Zero Mass Species Sorted By VOC				
Exhaust Speciation				
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi
Methane	00074-82-8	0.01	35.1467	0.487
Ethylene	00074-85-1	8.88	22.3092	198.202
Propene	00115-07-1	11.57	10.9097	126.267
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	9.0159	10.811
Acetylene (Ethyne)	00074-86-2	0.95	8.5627	8.099
Toluene	00108-88-3	3.93	8.5624	33.608
Ethane	00074-84-0	0.26	7.8912	2.074
Ethanol	00064-17-5	1.45	7.5397	10.925
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	7.2139	57.287
2-Methylbutane (Isopentane)	00078-78-4	1.35	7.0264	9.520
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	4.6325	6.475
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.4319	34.371
Benzene	00071-43-2	0.69	4.2730	2.967
2,2,5-Trimethylhexane	03522-94-9	1.05	4.1285	4.348
2,3,4-Trimethylpentane	00565-75-3	0.95	2.5130	2.384
3-Methylpentane	00096-14-0	1.69	2.3204	3.923
n-Pentane	00109-66-0	1.21	2.1925	2.664
2,3-Dimethylbutane	00079-29-8	10.48	2.1455	22.491
1,3-Butadiene	00106-99-0	12.45	1.9029	23.700
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.8533	13.688
2,4-Dimethylhexane	00589-43-5	1.61	1.8375	2.950
2,4-Dimethylpentane	00108-08-7	1.46	1.7756	2.591
Propyne	00074-99-7	6.67	1.6477	10.989
n-Hexane	00110-54-3	1.13	1.6323	1.852
2,2-Dimethylbutane	00075-83-2	1.11	1.5931	1.770
2-Methylhexane	00591-76-4	1.09	1.5911	1.727
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.5079	4.812
2,3-Dimethylpentane	00565-59-3	1.25	1.4832	1.851
Methylcyclopentane	00096-37-7	2.05	1.3024	2.670
Formaldehyde	00050-00-0	9.59	1.2671	12.156
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.1441	13.391
ortho-Xylene	00095-47-6	7.58	1.1004	8.337
acetaldehyde	00075-07-0	6.46	1.0507	6.791
2-Methyl-2-butene	00513-35-9	14.20	1.0273	14.583
Methylcyclohexane	00108-87-2	1.56	0.9717	1.511
t-2-Butene	00624-64-6	15.20	0.9641	14.652
Propane	00074-98-6	0.46	0.9460	0.432
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9265	4.975
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.9015	0.984
Ethylbenzene	00100-41-4	2.96	0.8933	2.647
Cyclohexane	00110-82-7	1.14	0.8671	0.986
acetone	00067-64-1	0.35	0.8372	0.295
c-2-Butene	00590-18-1	14.26	0.8208	11.705
2,3,5-Trimethylhexane	01069-53-0	1.12	0.8059	0.903
3-Methylheptane	00589-81-1	1.12	0.8052	0.905
Cyclopentadiene	00542-92-7	6.89	0.7785	5.364
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.7461	1.198
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.6355	7.470
2-Butanone (MEK)	00078-93-3	1.45	0.4957	0.719

Vehicle 8005 - Fuel E6 - FTP Phase 1 - Test 5884					Continued...		
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Propionaldehyde	00123-38-6	6.96	0.0712	0.495			
benzaldehyde	00100-52-7	-0.71	0.0688	-0.049			
n-butyraldehyde	00123-72-8	5.85	0.0153	0.090			
Glyoxal	00107-22-2	12.59	0.0134	0.169			
Acrolein	00107-02-8	7.37	0.0007	0.005			
		Total	187.1	716.2	3.828		
		Total	183.3	695.5	3.795	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E6 - FTP Phase 2 - Test 5884							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	13.4169	0.186			
Ethane	00074-84-0	0.26	1.2980	0.341			
Formaldehyde	00050-00-0	9.59	0.1433	1.374			
acetone	00067-64-1	0.35	0.0443	0.016			
2-Butanone (MEK)	00078-93-3	1.45	0.0152	0.022			
		Total	14.92	1.94	0.130		
		Total	14.71	0.527	0.036	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E6 - FTP Phase 3 - Test 5884							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	17.3764	0.241			
Ethane	00074-84-0	0.26	2.1511	0.565			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.7040	0.844			
Formaldehyde	00050-00-0	9.59	0.1815	1.741			
acetone	00067-64-1	0.35	0.1656	0.058			
acetaldehyde	00075-07-0	6.46	0.0657	0.425			
2-Butanone (MEK)	00078-93-3	1.45	0.0354	0.051			
Propionaldehyde	00123-38-6	6.96	0.0059	0.041			
Glyoxal	00107-22-2	12.59	0.0031	0.039			
		Total	20.7	4.0	0.194		
		Total	20.2	1.650	0.082	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E32 - FTP Phase 1 - Test 5842				
Non Zero Mass Species Sorted By VOC				
Exhaust Speciation				
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi
Methane	00074-82-8	0.01	49.1251	0.681
Ethanol	00064-17-5	1.45	36.1181	52.334
Ethylene	00074-85-1	8.88	29.2026	259.446
Acetylene (Ethyne)	00074-86-2	0.95	16.8330	15.922
2-Methylbutane (Isopentane)	00078-78-4	1.35	15.9147	21.563
Toluene	00108-88-3	3.93	10.1444	39.817
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	9.7957	11.746
Propene	00115-07-1	11.57	9.4228	109.059
Ethane	00074-84-0	0.26	8.0599	2.119
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	5.3791	42.716
2,2,5-Trimethylhexane	03522-94-9	1.05	5.3015	5.583
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	5.2653	7.360
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.4368	34.409
n-Pentane	00109-66-0	1.21	3.9051	4.744
Benzene	00071-43-2	0.69	3.7920	2.633
acetaldehyde	00075-07-0	6.46	3.7913	24.505
2,3,4-Trimethylpentane	00565-75-3	0.95	3.2145	3.050
3-Methylpentane	00096-14-0	1.69	2.7508	4.651
2,3-Dimethylbutane	00079-29-8	0.90	2.6913	2.419
2,2-Dimethylbutane	00075-83-2	1.11	2.3876	2.653
n-Hexane	00110-54-3	1.13	2.3733	2.693
2,2-Dimethylpropane	00463-82-1	0.65	1.9366	1.252
2,4-Dimethylhexane	00589-43-5	1.61	1.8548	2.978
3-Methylnonane	005911-04-6	0.66	1.7970	1.186
2-Methylhexane	00591-76-4	1.09	1.7729	1.924
Methylcyclopentane	00096-37-7	2.05	1.6823	3.448
Formaldehyde	00050-00-0	9.59	1.6704	16.025
2,4-Dimethylpentane	00108-08-7	1.46	1.5645	2.283
Propyne	00074-99-7	6.67	1.5207	10.142
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.4754	2.369
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.4525	4.635
acetone	00067-64-1	0.35	1.2559	0.443
ortho-Xylene	00095-47-6	7.58	1.2457	9.437
t-2-Butene	00624-64-6	15.20	1.2309	18.706
2,3-Dimethylpentane	00565-59-3	1.25	1.1779	1.470
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	1.0618	12.427
Methylcyclohexane	00108-87-2	1.56	1.0351	1.610
Cyclohexane	00110-82-7	1.14	1.0222	1.163
1,3-Butadiene	00106-99-0	12.45	1.0021	12.481
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9944	7.345
c-2-Butene	00590-18-1	14.26	0.9758	13.915
3-Methylheptane	00589-81-1	1.12	0.9618	1.081
2-Methyl-2-butene	00513-35-9	14.20	0.8796	12.485
n-Heptane	00142-82-5	0.97	0.8756	0.846
2-Methylheptane	00592-27-8	0.97	0.8662	0.838
n-Butane	00106-97-8	1.08	0.8135	0.876
Ethylbenzene	00100-41-4	2.96	0.7666	2.271
2-Methyl-1-butene	00563-46-2	6.38	0.7247	4.623
n-Octane	00111-65-9	0.80	0.7134	0.568
Styrene	00100-42-5	1.66	0.6147	1.022

Vehicle 8005 - Fuel E32 - FTP Phase 1 - Test 5842				Continued...			
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2-Butanone (MEK)	00078-93-3	1.45	0.5699	0.826			
Propionaldehyde	00123-38-6	6.96	0.1081	0.752			
benzaldehyde	00100-52-7	-0.71	0.0451	-0.032			
Methacrolein	000078-85-3	5.96	0.0306	0.182			
Acrolein	00107-02-8	7.37	0.0213	0.157			
Glyoxal	00107-22-2	12.59	0.0113	0.142			
		Total	265.6	802.0	3.019		
		Total	258.1	759.0	2.940	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E32 - FTP Phase 2 - Test 5842							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	16.8306	0.233			
Toluene	00108-88-3	3.93	2.8198	11.068			
Ethylene	00074-85-1	8.88	1.7804	15.818			
n-Pentane	00109-66-0	1.21	1.0904	1.325			
3-Methylnonane	005911-04-6	0.66	1.0683	0.700			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.0274	7.588			
Formaldehyde	00050-00-0	9.59	0.2559	2.455			
acetone	00067-64-1	0.35	0.1556	0.055			
acetaldehyde	00075-07-0	6.46	0.0443	0.286			
2-Butanone (MEK)	00078-93-3	1.45	0.0224	0.033			
benzaldehyde	00100-52-7	-0.71	0.0118	-0.008			
Acrolein	00107-02-8	7.37	0.0114	0.084			
Propionaldehyde	00123-38-6	6.96	0.0098	0.068			
Glyoxal	00107-22-2	12.59	0.0042	0.053			
n-butyraldehyde	00123-72-8	5.85	0.0005	0.003			
		Total	25.1	39.8	1.582		
		Total	24.6	36.7	1.492	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E32- FTP Phase 3 - Test 5842							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.1543	0.321			
Toluene	00108-88-3	3.93	1.6110	6.323			
Ethane	00074-84-0	0.26	1.3440	0.353			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.8392	1.173			
n-Pentane	00109-66-0	1.21	0.8236	1.001			
acetone	00067-64-1	0.35	0.4185	0.148			
Formaldehyde	00050-00-0	9.59	0.2585	2.480			
acetaldehyde	00075-07-0	6.46	0.0983	0.636			
Propionaldehyde	00123-38-6	6.96	0.0250	0.174			
Acrolein	00107-02-8	7.37	0.0185	0.136			
2-Butanone (MEK)	00078-93-3	1.45	0.0143	0.021			
n-butyraldehyde	00123-72-8	5.85	0.0094	0.055			
Glyoxal	00107-22-2	12.59	0.0066	0.083			
		Total	28.6	12.9	0.451		
		Total	27.8	9.171	0.330	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E59 - FTP Phase 1 - Test 5816							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	87.0225	126.093			
Methane	00074-82-8	0.01	61.9055	0.858			
Ethylene	00074-85-1	8.88	37.7510	335.393			
2-Methylbutane (Isopentane)	00078-78-4	1.35	32.5740	44.134			
Acetylene (Ethyne)	00074-86-2	0.95	11.4629	10.843			
Ethane	00074-84-0	0.26	9.0371	2.375			
acetaldehyde	00075-07-0	6.46	9.0320	58.379			
Propene	00115-07-1	11.57	8.7547	101.325			
2,2-Dimethylpropane	00463-82-1	0.65	7.3148	4.729			
Toluene	00108-88-3	3.93	6.0947	23.922			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.2196	6.259			
1,3-Butadiene	00106-99-0	12.45	4.9343	61.455			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.3068	25.646			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.9330	3.089			
Benzene	00071-43-2	0.69	2.8457	1.976			
n-Pentane	00109-66-0	1.21	2.8363	3.446			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.7862	3.895			
c-2-Butene	00590-18-1	14.26	2.0110	28.677			
t-2-Butene	00624-64-6	15.20	1.9168	29.131			
2,3-Dimethylbutane	00079-29-8	0.90	1.7057	1.533			
Formaldehyde	00050-00-0	9.59	1.6110	15.456			
3-Methylpentane	00096-14-0	1.69	1.5990	2.704			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5637	1.484			

Vehicle 8005 - Fuel E59 - FTP Phase 1 - Test 5816							
Continued...							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
2-Methyl-1-butene	00563-46-2	6.38	1.4574	9.296			
2,2-Dimethylbutane	00075-83-2	1.11	1.3909	1.546			
n-Hexane	00110-54-3	1.13	1.2067	1.369			
ortho-Xylene	00095-47-6	7.58	1.1944	9.049			
acetone	00067-64-1	0.35	1.1127	0.392			
2,4-Dimethylhexane	00589-43-5	1.61	1.0749	1.726			
Methylcyclopentane	00096-37-7	2.05	0.9830	2.015			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9527	7.037			
Ethylbenzene	00100-41-4	2.96	0.8746	2.591			
2,4-Dimethylpentane	00108-08-7	1.46	0.8599	1.255			
n-Butane	00106-97-8	1.08	0.7954	0.857			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.7814	1.254			
2-Methyl-2-butene	00513-35-9	14.20	0.7459	10.588			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.7287	8.566			
2-Methylhexane	00591-76-4	1.09	0.7049	0.765			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.6947	3.053			
Cyclohexane	00110-82-7	1.14	0.6848	0.779			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.6832	2.180			
c-2-Pentene	00627-20-3	10.28	0.6623	6.809			
2-Butanone (MEK)	00078-93-3	1.45	0.4241	0.615			
Propionaldehyde	00123-38-6	6.96	0.1228	0.854			
benzaldehyde	00100-52-7	-0.71	0.0500	-0.036			
Glyoxal	00107-22-2	12.59	0.0261	0.329			
Methacrolein	000078-85-3	5.96	0.0249	0.148			
Acrolein	00107-02-8	7.37	0.0045	0.033			
		Total	324.5	965.9	2.977		
		Total	312.1	889.7	2.851	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E59 - FTP Phase 2 - Test 5816							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	10.5368	0.146			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.4591	3.332			
2-Methylpropane	00075-28-5	1.18	2.3915	2.814			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	1.3732	1.173			
3-Methylnonane	005911-04-6	0.66	1.3297	0.878			
Formaldehyde	00050-00-0	9.59	0.1617	1.551			
acetone	00067-64-1	0.35	0.0990	0.035			
acetaldehyde	00075-07-0	6.46	0.0320	0.207			
Propionaldehyde	00123-38-6	6.96	0.0182	0.127			
benzaldehyde	00100-52-7	-0.71	0.0129	-0.009			
Glyoxal	00107-22-2	12.59	0.0048	0.061			
n-butyraldehyde	00123-72-8	5.85	0.0026	0.015			
Acrolein	00107-02-8	7.37	0.0020	0.015			
2-Butanone (MEK)	00078-93-3	1.45	0.0009	0.001			
		Total	18.424	10.345	0.561		
		Total	18.090	8.342	0.461	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E59 - FTP Phase 3 - Test 5816							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	13.7653	0.191			
1,2,3,4-TetMeBenzene & Amylbenz	00488-23-3+00538-68-1	5.65	4.4041	24.890			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.8584	9.978			
2-Methyl-1,3-butadiene	00078-79-5	10.48	1.5778	16.540			
2,3,5-Trimethylhexane	01069-53-0	1.12	1.1769	1.318			
t-3-Hexene & c-3-Hexene	13269-52-8+07642-09-3	7.43	0.9145	6.794			
acetone	00067-64-1	0.35	0.5453	0.192			
Formaldehyde	00050-00-0	9.59	0.2151	2.063			
acetaldehyde	00075-07-0	6.46	0.1201	0.776			
Propionaldehyde	00123-38-6	6.96	0.0363	0.253			
n-butyraldehyde	00123-72-8	5.85	0.0081	0.047			
		Total	24.622	63.043	2.560		
		Total	23.697	59.711	2.520	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E85 - FTP Phase 1 - Test 5892							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	87.3100	126.510			
Methane	00074-82-8	0.01	66.5774	0.922			
Ethylene	00074-85-1	8.88	29.1504	258.982			
acetaldehyde	00075-07-0	6.46	12.2025	78.873			
2-Methylbutane (Isopentane)	00078-78-4	1.35	8.5674	11.608			
Ethane	00074-84-0	0.26	7.6849	2.020			
Acetylene (Ethyne)	00074-86-2	0.95	4.8329	4.571			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.6948	37.282			
Propene	00115-07-1	11.57	2.1992	25.453			
Formaldehyde	00050-00-0	9.59	2.1328	20.462			
Toluene	00108-88-3	3.93	2.0600	8.086			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.9357	2.321			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.8089	14.029			
n-Pentane	00109-66-0	1.21	1.7212	2.091			
Benzene	00071-43-2	0.69	1.3180	0.915			
1,3-Butadiene	00106-99-0	12.45	1.2729	15.854			
n-Hexane	00110-54-3	1.13	1.2594	1.429			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.1835	1.654			
3-Methylpentane	00096-14-0	1.69	1.0612	1.794			
2,3-Dimethylbutane	00079-29-8	0.90	0.9996	0.898			
c-2-Butene	00590-18-1	14.26	0.9683	13.808			
2-Butanone (MEK)	00078-93-3	1.45	0.8820	1.279			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.7815	4.196			
n-Propylbenzene	00103-65-1	1.96	0.7460	1.462			
n-Butane	00106-97-8	1.08	0.7157	0.771			
acetone	00067-64-1	0.35	0.4681	0.165			
Propionaldehyde	00123-38-6	6.96	0.1123	0.781			
Valeraldehyde	000110-62-3	4.98	0.0218	0.109			
benzaldehyde	00100-52-7	-0.71	0.0198	-0.014			
Glyoxal	00107-22-2	12.59	0.0081	0.103			
		Total	244.7	638.4	2.609		
		Total	228.8	536.7	2.345	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E85 - FTP Phase 2 - Test 5892							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	28.1729	0.390			
Ethanol	00064-17-5	1.45	10.1855	14.758			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.2386	4.388			
n-Propylbenzene	00103-65-1	1.96	1.5946	3.125			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.3482	10.456			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.0603	5.693			
Formaldehyde	00050-00-0	9.59	0.1609	1.544			
acetaldehyde	00075-07-0	6.46	0.0317	0.205			
acetone	00067-64-1	0.35	0.0016	0.001			
Acrolein	00107-02-8	7.37	0.0009	0.006			
		Total	45.8	40.6	0.886		
		Total	45.6	38.8	0.851	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E85 - FTP Phase 3 - Test 5892							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	32.5105	0.450			
Ethanol	00064-17-5	1.45	3.7391	5.418			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.5477	2.097			
Ethane	00074-84-0	0.26	1.5411	0.405			
n-Propylbenzene	00103-65-1	1.96	0.8819	1.728			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.8763	6.796			
Propane	00074-98-6	0.46	0.8665	0.396			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.7121	0.854			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6551	4.838			
Formaldehyde	00050-00-0	9.59	0.1910	1.832			
acetone	00067-64-1	0.35	0.1448	0.051			
acetaldehyde	00075-07-0	6.46	0.1231	0.796			
Glyoxal	00107-22-2	12.59	0.0080	0.100			
Propionaldehyde	00123-38-6	6.96	0.0057	0.040			
		Total	43.8	25.8	0.589		
		Total	43.3	23.0	0.530	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E6 - US06 - Test 5885							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	19.1546	0.265			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.2981	4.469			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.1312	3.755			
Ethylene	00074-85-1	8.88	3.1244	27.758			
Ethane	00074-84-0	0.26	3.0781	0.809			
Toluene	00108-88-3	3.93	1.7836	7.001			
Propene	00115-07-1	11.57	1.7783	20.582			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.6484	2.304			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.6091	1.694			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.2425	9.867			
2,3-Dimethylbutane	00079-29-8	0.90	1.1813	1.062			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9976	0.947			
3-Methylpentane	00096-14-0	1.69	0.9631	1.628			
n-Pentane	00109-66-0	1.21	0.9601	1.167			
Benzene	00071-43-2	0.69	0.9259	0.643			
2,2-Dimethylbutane	00075-83-2	1.11	0.8334	0.926			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.7556	5.860			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7460	0.836			
n-Hexane	00110-54-3	1.13	0.7077	0.803			
acetaldehyde	00075-07-0	6.46	0.5811	3.756			
2,4-Dimethylpentane	00108-08-7	1.46	0.5298	0.773			
acetone	00067-64-1	0.35	0.4983	0.176			
2,4-Dimethylhexane	00589-43-5	1.61	0.4884	0.784			
Methylcyclopentane	00096-37-7	2.05	0.4557	0.934			
2,3-Dimethylpentane	00565-59-3	1.25	0.4540	0.567			
2-Methylhexane	00591-76-4	1.09	0.4456	0.484			
t-2-Butene	00624-64-6	15.20	0.4022	6.113			
n-Propylbenzene	00103-65-1	1.96	0.3409	0.668			
Acrolein	00107-02-8	7.37	0.0419	0.309			
Propionaldehyde	00123-38-6	6.96	0.0305	0.213			
benzaldehyde	00100-52-7	-0.71	0.0181	-0.013			
Glyoxal	00107-22-2	12.59	0.0114	0.144			
Formaldehyde	00050-00-0	9.59	0.0052	0.050			
		Total	52.222	107.331	2.055		
		Total	51.036	102.697	2.012	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E32 - US06 - Test 5843							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.7520	0.287			
Ethylene	00074-85-1	8.88	4.4067	39.151			
acetaldehyde	00075-07-0	6.46	4.2099	27.211			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.0423	4.122			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.5339	3.038			
Ethane	00074-84-0	0.26	2.2270	0.585			
acetone	00067-64-1	0.35	1.4433	0.509			
Toluene	00108-88-3	3.93	1.4195	5.572			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.3278	1.856			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.1565	1.218			
n-Pentane	00109-66-0	1.21	0.9489	1.153			
3-Methylpentane	00096-14-0	1.69	0.9136	1.545			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.8726	0.978			
2,3-Dimethylbutane	00079-29-8	0.90	0.8046	0.723			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.8038	6.233			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.7975	6.333			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.6871	0.652			
t-2-Butene	00624-64-6	15.20	0.6135	9.323			
2,2-Dimethylbutane	00075-83-2	1.11	0.5513	0.613			
Benzene	00071-43-2	0.69	0.4967	0.345			
2,4-Dimethylhexane	00589-43-5	1.61	0.4626	0.743			
2,4-Dimethylpentane	00108-08-7	1.46	0.4509	0.658			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.4258	2.286			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.4195	1.338			
n-Hexane	00110-54-3	1.13	0.4178	0.474			
Methylcyclopentane	00096-37-7	2.05	0.4066	0.833			
2,3-Dimethylpentane	00565-59-3	1.25	0.3854	0.481			
2-Methylhexane	00591-76-4	1.09	0.3728	0.405			
Formaldehyde	00050-00-0	9.59	0.2763	2.651			
Propionaldehyde	00123-38-6	6.96	0.0631	0.439			
2-Butanone (MEK)	00078-93-3	1.45	0.0573	0.083			
Methacrolein	000078-85-3	5.96	0.0572	0.341			
benzaldehyde	00100-52-7	-0.71	0.0313	-0.022			
Acrolein	00107-02-8	7.37	0.0184	0.135			
Glyoxal	00107-22-2	12.59	0.0155	0.195			
		Total	53.9	122.5	2.274		
		Total	47.7	90.9	1.907	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E59 - US06 - Test 5817							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	16.9363	0.235			
acetaldehyde	00075-07-0	6.46	9.1689	59.265			
Ethanol	00064-17-5	1.45	7.4953	10.861			
Ethylene	00074-85-1	8.88	4.5039	40.014			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.6999	3.658			
Ethane	00074-84-0	0.26	1.8197	0.478			
2,2-Dimethylpropane	00463-82-1	0.65	1.4499	0.937			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.2650	1.517			
acetone	00067-64-1	0.35	1.2183	0.430			
Propene	00115-07-1	11.57	1.1725	13.570			
Toluene	00108-88-3	3.93	1.0700	4.200			
Formaldehyde	00050-00-0	9.59	1.0406	9.984			
1,3-Butadiene	00106-99-0	12.45	0.9046	11.266			
n-Pentane	00109-66-0	1.21	0.7556	0.918			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.6948	0.971			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.6596	5.115			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.6366	0.670			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.5772	3.099			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.5442	0.610			
Unknown #2		2.36	0.5270	1.245			
3-Methylpentane	00096-14-0	1.69	0.4320	0.731			
Benzene	00071-43-2	0.69	0.4041	0.281			
t-2-Butene	00624-64-6	15.20	0.3762	5.718			
2-Butanone (MEK)	00078-93-3	1.45	0.0871	0.126			
Propionaldehyde	00123-38-6	6.96	0.0848	0.590			
Methacrolein	000078-85-3	5.96	0.0604	0.360			
benzaldehyde	00100-52-7	-0.71	0.0546	-0.039			
Acrolein	00107-02-8	7.37	0.0146	0.107			
Glyoxal	00107-22-2	12.59	0.0078	0.099			
		Total	56.66	177.01	3.124		
		Total	44.92	106.09	2.362	w/o aldehydes	
No MIR available, use weighted average 2.3616							
	aldehydes						

Vehicle 8005 - Fuel E85 - US06 - Test 5893							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	18.9348	0.262			
acetaldehyde	00075-07-0	6.46	6.6762	43.152			
Ethanol	00064-17-5	1.45	4.8991	7.099			
Ethylene	00074-85-1	8.88	2.7790	24.690			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.7831	2.416			
Ethane	00074-84-0	0.26	1.5550	0.409			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.4715	11.686			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7309	0.819			
1-Butyne	00107-00-6	6.05	0.5533	3.347			
Toluene	00108-88-3	3.93	0.4564	1.791			
3-Methylnonane	005911-04-6	0.66	0.4319	0.283			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.3936	0.472			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.3639	1.954			
acetone	00067-64-1	0.35	0.2844	0.100			
Formaldehyde	00050-00-0	9.59	0.2661	2.553			
Propionaldehyde	00123-38-6	6.96	0.0527	0.367			
Acrolein	00107-02-8	7.37	0.0376	0.277			
Glyoxal	00107-22-2	12.59	0.0052	0.066			
		Total	41.67	101.74	2.441		
		Total	34.35	55.23	1.608	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E6 - UC - Test 5886							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	22.8527	0.317			
Ethylene	00074-85-1	8.88	6.3733	56.623			
Acetylene (Ethyne)	00074-86-2	0.95	3.5796	3.386			
Ethane	00074-84-0	0.26	3.4083	0.896			
Toluene	00108-88-3	3.93	3.0949	12.148			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.8847	3.459			
Propene	00115-07-1	11.57	2.7913	32.306			
Ethanol	00064-17-5	1.45	2.7858	4.036			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.3316	2.455			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.2026	2.984			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.0583	15.963			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.9568	15.540			
Benzene	00071-43-2	0.69	1.6891	1.173			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.6671	2.330			
Formaldehyde	00050-00-0	9.59	1.2663	12.148			
2,3-Dimethylbutane	00079-29-8	0.90	1.0236	0.920			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.8417	0.799			
2,2-Dimethylbutane	00075-83-2	1.11	0.8147	0.905			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.8147	4.374			
acetaldehyde	00075-07-0	6.46	0.8068	5.215			
3-Methylpentane	00096-14-0	5.30	0.7896	4.183			
acetone	00067-64-1	0.35	0.6765	0.238			
2-Butanone (MEK)	00078-93-3	1.45	0.4696	0.681			
Propionaldehyde	00123-38-6	6.96	0.0734	0.511			
benzaldehyde	00100-52-7	-0.71	0.0664	-0.047			
n-butyraldehyde	00123-72-8	5.85	0.0171	0.100			
Glyoxal	00107-22-2	12.59	0.0119	0.150			
Acrolein	00107-02-8	7.37	0.0038	0.028			
		Total	67.35	183.82	2.729		
		Total	63.96	164.80	2.577	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E32 - UC - Test 5844							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	32.7888	0.454			
Ethylene	00074-85-1	8.88	10.4593	92.924			
Ethanol	00064-17-5	1.45	9.8339	14.249			
Acetylene (Ethyne)	00074-86-2	0.95	6.4455	6.097			
Propene	00115-07-1	11.57	3.7908	43.875			
Ethane	00074-84-0	0.26	3.5812	0.941			
acetaldehyde	00075-07-0	6.46	3.3711	21.789			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.1443	3.770			
Toluene	00108-88-3	3.93	2.4493	9.614			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.0237	2.742			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.8528	2.590			
Formaldehyde	00050-00-0	9.59	1.7060	16.367			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.5204	12.073			
n-Pentane	00109-66-0	1.21	1.3935	1.693			
t-1,4-Dimethylcyclohexane	02207-04-7	2.40	1.2790	3.069			
Benzene	00071-43-2	0.69	1.1056	0.768			
3-Methylpentane	00096-14-0	1.69	1.0728	1.814			
2,2-Dimethylbutane	00075-83-2	1.11	0.9908	1.101			
2,3-Dimethylbutane	00079-29-8	0.90	0.9795	0.880			
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.8748	0.747			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7394	0.702			
t-2-Butene	00624-64-6	15.20	0.7361	11.187			
2,4-Dimethylhexane	00589-43-5	1.61	0.7342	1.179			
n-Hexane	00110-54-3	1.13	0.7149	0.811			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7017	0.786			
2-Butanone (MEK)	00078-93-3	1.45	0.3452	0.500			
acetone	00067-64-1	0.35	0.3355	0.118			
Propionaldehyde	00123-38-6	6.96	0.0985	0.685			
benzaldehyde	00100-52-7	-0.71	0.0414	-0.029			
Acrolein	00107-02-8	7.37	0.0337	0.248			
Valeraldehyde	000110-62-3	4.98	0.0151	0.075			
n-butyraldehyde	00123-72-8	5.85	0.0049	0.029			
Glyoxal	00107-22-2	12.59	0.0022	0.028			
		Total	95.17	253.88	2.668		
		Total	89.21	214.06	2.399	w/o aldehydes	
No MIR available, use weighted average 2.3995							
	aldehydes						

Vehicle 8005 - Fuel E59 - UC - Test 5818							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	36.3708	0.504			
Ethanol	00064-17-5	1.45	35.6482	51.653			
Ethylene	00074-85-1	8.88	12.3706	109.905			
acetaldehyde	00075-07-0	6.46	6.0507	39.110			
Acetylene (Ethyne)	00074-86-2	0.95	5.9553	5.633			
Ethane	00074-84-0	0.26	4.0307	1.059			
Propene	00115-07-1	11.57	2.7932	32.328			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.6933	14.461			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.5356	3.040			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.2826	17.703			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.2536	3.053			
Toluene	00108-88-3	3.93	2.2052	8.655			
t-2-Butene	00624-64-6	15.20	1.8869	28.676			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.6628	2.324			
n-Pentane	00109-66-0	1.21	1.5684	1.906			
1,3-Butadiene	00106-99-0	12.45	1.4975	18.651			
Formaldehyde	00050-00-0	9.59	1.4289	13.708			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.2838	1.352			
3-Methylpentane	00096-14-0	1.69	1.0212	1.727			
2,3-Dimethylbutane	00079-29-8	0.90	1.0132	0.911			
2,2-Dimethylpropane	00463-82-1	0.65	0.8693	0.562			
2,2-Dimethylbutane	00075-83-2	1.11	0.8278	0.920			
ortho-Xylene	00095-47-6	7.58	0.7440	5.636			
Benzene	00071-43-2	0.69	0.7320	0.508			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7083	0.672			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6821	5.038			
2-Butanone (MEK)	00078-93-3	1.45	0.0737	0.107			
Propionaldehyde	00123-38-6	6.96	0.0644	0.448			
Methacrolein	000078-85-3	5.96	0.0599	0.357			
Glyoxal	00107-22-2	12.59	0.0318	0.400			
benzaldehyde	00100-52-7	-0.71	0.0243	-0.017			
Valeraldehyde	000110-62-3	4.98	0.0207	0.103			
n-butyraldehyde	00123-72-8	5.85	0.0158	0.092			
Acrolein	00107-02-8	7.37	0.0032	0.023			
		Total	131.41	371.21	2.825		
		Total	123.64	316.88	2.563	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E85 - UC - Test 5895							
Top Fifty Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	33.9415	0.470			
Ethanol	00064-17-5	1.45	33.8825	49.095			
acetaldehyde	00075-07-0	6.46	9.8590	63.725			
Ethylene	00074-85-1	8.88	9.4918	84.329			
Ethane	00074-84-0	0.26	3.2862	0.864			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.5543	20.284			
Formaldehyde	00050-00-0	9.59	2.0335	19.509			
Acetylene (Ethyne)	00074-86-2	0.95	1.7132	1.620			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.5736	2.132			
t-2-Butene	00624-64-6	15.20	1.0729	16.306			
Propene	00115-07-1	11.57	0.9943	11.508			
1,3-Butadiene	00106-99-0	12.45	0.7319	9.115			
2-Butanone (MEK)	00078-93-3	1.45	0.5243	0.760			
Propionaldehyde	00123-38-6	6.96	0.0872	0.607			
acetone	00067-64-1	0.35	0.0834	0.029			
benzaldehyde	00100-52-7	-0.71	0.0522	-0.037			
Glyoxal	00107-22-2	12.59	0.0023	0.028			
Acrolein	00107-02-8	7.37	0.0020	0.015			
n-butyraldehyde	00123-72-8	5.85	0.0007	0.004			
		Total	101.89	280.36	2.752		
		Total	89.24	195.72	2.193	w/o aldehydes	
	aldehydes						

Vehicle 8005 - Fuel E85 - US06 - Test 5893					
Top Fifty Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Methane	00074-82-8	0.01	18.93481	0.262	
Ethanol	00064-17-5	1.45	4.89910	7.099	
Ethylene	00074-85-1	8.88	2.77902	24.690	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.78310	2.416	
Ethane	00074-84-0	0.26	1.55505	0.409	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.47151	11.686	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.73087	0.819	
1-Butyne	00107-00-6	6.05	0.55329	3.347	
Toluene	00108-88-3	3.93	0.45636	1.791	
3-Methylnonane	005911-04-6	0.66	0.43195	0.283	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.39355	0.472	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.36394	1.954	
acetone	00067-64-1	0.35	0.00142	0.000	
benzaldehyde	00100-52-7	-0.71	0.00006	0.000	
Formaldehyde	00050-00-0	9.59	0.00006	0.001	
Acrolein	00107-02-8	7.37	0.00001	0.000	
acetaldehyde	00075-07-0	6.46	0.00001	0.000	
Methacrolein	00078-85-3	5.96	0.00000	0.000	
		Total	34.35	55.23	1.608

Vehicle 8005 - Fuel E6 - UC - Test 5886					
Top Fifty Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Methane	00074-82-8	0.01	22.85268	0.317	
Ethylene	00074-85-1	8.88	6.37333	56.623	
Acetylene (Ethyne)	00074-86-2	0.95	3.57958	3.386	
Ethane	00074-84-0	0.26	3.40832	0.896	
Toluene	00108-88-3	3.93	3.09489	12.148	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.88471	3.459	
Propene	00115-07-1	11.57	2.79129	32.306	
Ethanol	00064-17-5	1.45	2.78576	4.036	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.33157	2.455	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.20260	2.984	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.05830	15.963	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.95685	15.540	
Benzene	00071-43-2	0.69	1.68910	1.173	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.66714	2.330	
2,3-Dimethylbutane	00079-29-8	0.90	1.02356	0.920	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.84172	0.799	
2,2-Dimethylbutane	00075-83-2	1.11	0.81471	0.905	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.81466	4.374	
3-Methylpentane	00096-14-0	5.30	0.78957	4.183	
Formaldehyde	00050-00-0	9.59	0.00042	0.004	
acetone	00067-64-1	0.35	0.00027	0.000	
benzaldehyde	00100-52-7	-0.71	0.00022	0.000	
Crotonaldehyde	04170-30-3	9.34	0.00015	0.001	
Acrolein	00107-02-8	7.37	0.00002	0.000	
Hexaldehyde	00066-25-1	4.26	0.00002	0.000	
Propionaldehyde	00123-38-6	6.96	0.00001	0.000	
Methacrolein	00078-85-3	5.96	0.00000	0.000	
acetaldehyde	00075-07-0	6.46	0.00000	0.000	
		Total	63.96	164.80	2.577

Vehicle 8005 - Fuel E32 - UC - Test 5844					
Top Fifty Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Methane	00074-82-8	0.01	32.78883	0.454	
Ethylene	00074-85-1	8.88	10.45926	92.924	
Ethanol	00064-17-5	1.45	9.83392	14.249	
Acetylene (Ethyne)	00074-86-2	0.95	6.44555	6.097	
Propene	00115-07-1	11.57	3.79082	43.875	
Ethane	00074-84-0	0.26	3.58123	0.941	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.14427	3.770	
Toluene	00108-88-3	3.93	2.44932	9.614	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.02370	2.742	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.85278	2.590	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.52036	12.073	
n-Pentane	00109-66-0	1.21	1.39354	1.693	
t-1,4-Dimethylcyclohexane	02207-04-7	2.40	1.27897	3.069	
Benzene	00071-43-2	0.69	1.10563	0.768	
3-Methylpentane	00096-14-0	1.69	1.07280	1.814	
2,2-Dimethylbutane	00075-83-2	1.11	0.99076	1.101	
2,3-Dimethylbutane	00079-29-8	0.90	0.97948	0.880	
2-MeOctane & 2,3-DiMeHeptane	03074-71-3+03221-61-2	0.85	0.87479	0.747	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.73938	0.702	
t-2-Butene	00624-64-6	15.20	0.73608	11.187	
2,4-Dimethylhexane	00589-43-5	1.61	0.73416	1.179	
n-Hexane	00110-54-3	1.13	0.71492	0.811	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.70165	0.786	
acetone	00067-64-1	0.35	0.00113	0.000	
Formaldehyde	00050-00-0	9.59	0.00058	0.006	
benzaldehyde	00100-52-7	-0.71	0.00012	0.000	
Crotonaldehyde	04170-30-3	9.34	0.00012	0.001	
Acrolein	00107-02-8	7.37	0.00003	0.000	
Hexaldehyde	00066-25-1	4.26	0.00001	0.000	
acetaldehyde	00075-07-0	6.46	0.00001	0.000	
n-butyraldehyde	00123-72-8	5.85	0.00001	0.000	
Propionaldehyde	00123-38-6	6.96	0.00000	0.000	
Methacrolein	00078-85-3	5.96	0.00000	0.000	
		Total	89.21	214.07	2.400
No MIR available, use weighted average 2.3995					

Vehicle 8005 - Fuel E59 - UC - Test 5818					
Top Fifty Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Methane	00074-82-8	0.01	36.37082	0.504	
Ethanol	00064-17-5	1.45	35.64824	51.653	
Ethylene	00074-85-1	8.88	12.37061	109.905	
Acetylene (Ethyne)	00074-86-2	0.95	5.95530	5.633	
Ethane	00074-84-0	0.26	4.03072	1.059	
Propene	00115-07-1	11.57	2.79317	32.328	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.69329	14.461	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.53559	3.040	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.28260	17.703	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.25360	3.053	
Toluene	00108-88-3	3.93	2.20520	8.655	
t-2-Butene	00624-64-6	15.20	1.88687	28.676	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.66280	2.324	
n-Pentane	00109-66-0	1.21	1.56841	1.906	
1,3-Butadiene	00106-99-0	12.45	1.49749	18.651	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.28382	1.352	
3-Methylpentane	00096-14-0	1.69	1.02118	1.727	
2,3-Dimethylbutane	00079-29-8	0.90	1.01317	0.911	
2,2-Dimethylpropane	00463-82-1	0.65	0.86929	0.562	
2,2-Dimethylbutane	00075-83-2	1.11	0.82782	0.920	
ortho-Xylene	00095-47-6	7.58	0.74399	5.636	
Benzene	00071-43-2	0.69	0.73199	0.508	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.70828	0.672	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.68208	5.038	
acetone	00067-64-1	0.35	0.00201	0.001	
Formaldehyde	00050-00-0	9.59	0.00048	0.005	
Crotonaldehyde	04170-30-3	9.34	0.00002	0.000	
Acrolein	00107-02-8	7.37	0.00002	0.000	
Valeraldehyde	00110-62-3	4.98	0.00002	0.000	
Methacrolein	00078-85-3	5.96	0.00001	0.000	
Hexaldehyde	00066-25-1	4.26	0.00001	0.000	
n-butyraldehyde	00123-72-8	5.85	0.00001	0.000	
Propionaldehyde	00123-38-6	6.96	0.00001	0.000	
acetaldehyde	00075-07-0	6.46	0.00000	0.000	
		Total	123.64	316.88	2.563

Vehicle 8005 - Fuel E85 - UC - Test 5895					
Top Fifty Species Sorted By VOC					
Exhaust Speciation					
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi	
Methane	00074-82-8	0.01	33.94154	0.470	
Ethanol	00064-17-5	1.45	33.88253	49.095	
Ethylene	00074-85-1	8.88	9.49185	84.329	
Ethane	00074-84-0	0.26	3.28619	0.864	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.55426	20.284	
Acetylene (Ethyne)	00074-86-2	0.95	1.71316	1.620	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.57357	2.132	
t-2-Butene	00624-64-6	15.20	1.07294	16.306	
Propene	00115-07-1	11.57	0.99428	11.508	
1,3-Butadiene	00106-99-0	12.45	0.73187	9.115	
acetone	00067-64-1	0.35	0.00325	0.001	
Formaldehyde	00050-00-0	9.59	0.00067	0.006	
Crotonaldehyde	04170-30-3	9.34	0.00017	0.002	
Acrolein	00107-02-8	7.37	0.00003	0.000	
benzaldehyde	00100-52-7	-0.71	0.00003	0.000	
Hexaldehyde	00066-25-1	4.26	0.00002	0.000	
Methacrolein	00078-85-3	5.96	0.00000	0.000	
acetaldehyde	00075-07-0	6.46	0.00000	0.000	
Propionaldehyde	00123-38-6	6.96	0.00000	0.000	
		Total	89.25	195.73	2.193

Vehicle 8006									
Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present	
FTP	E6	5988	155.3	95.7	148.6	420.4	2.829	43	
Phase 1	E32	6016	158.6	101.9	161.6	331.4	2.050	33	
	E59	6052	204.9	100.4	205.8	465.9	2.265	35	
	E85	5937	268.1	117.5	314.9	715.5	2.272	26	
FTP	E6	5988	28.4	109.2	31.0	39.2	1.265	11	
Phase 2	E32	6016	39.2	125.6	49.2	42.4	0.860	6	
	E59	6052	51.5	87.6	45.1	2.3	0.052	7	
	E85	5937	53.7	82.4	44.2	30.7	0.695	9	
FTP	E6	5988	41.9	83.2	34.9	43.9	1.259	13	
Phase 3	E32	6016	48.3	90.0	43.5	62.9	1.446	10	Includes aldehydes
	E59	6052	54.0	87.5	47.3	9.6	0.203	9	
	E85	5937	57.0	89.0	50.8	36.9	0.726	9	
US06	E6	5989	55.3	90.6	50.1	101.0	2.018	28	
	E32	6017	55.4	99.9	55.3	103.7	1.874	30	
	E59	6053	44.7	101.0	45.2	86.0	1.904	21	
	E85	5938	38.8	141.0	54.7	150.1	2.745	21	
UC	E6	5992	77.0	103.9	80.0	118.9	1.487	26	
	E32	6019	90.2	83.1	74.9	63.6	0.849	17	
	E59	6056	97.0	100.8	97.8	202.2	2.068	22	
	E85	5942	121.3	111.1	134.8	299.8	2.224	19	

Vehicle 8006 - Fuel E6 - FTP Phase 1 - Test 5988							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	47.6385	0.660			
Ethylene	00074-85-1	8.88	13.7393	122.064			
Ethane	00074-84-0	0.26	8.3461	2.194			
Toluene	00108-88-3	3.93	7.9022	31.017			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.5585	7.531			
Ethanol	00064-17-5	1.45	5.2776	7.647			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.1618	6.190			
Acetylene (Ethyne)	00074-86-2	0.95	4.7417	4.485			
Propene	00115-07-1	11.57	4.4452	51.449			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.1263	32.767			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.9611	30.720			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	3.1925	17.141			
Benzene	00071-43-2	0.69	3.1116	2.161			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.7399	3.830			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.5571	2.693			
n-Propylbenzene	00103-65-1	1.96	1.8636	3.652			
3-Methylpentane	00096-14-0	1.69	1.7402	2.942			
n-Pentane	00109-66-0	1.21	1.6307	1.981			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.5313	11.310			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5240	1.446			
2,3-Dimethylbutane	00079-29-8	0.90	1.5200	1.366			
2,2-Dimethylbutane	00075-83-2	1.11	1.3565	1.507			
Formaldehyde	00050-00-0	9.59	1.2336	11.835			
1,3-Butadiene	00106-99-0	12.45	1.1449	14.259			
n-Butane	00106-97-8	1.08	1.0546	1.136			
n-Hexane	00110-54-3	1.13	0.9986	1.133			
2,4-Dimethylpentane	00108-08-7	1.46	0.9487	1.384			
ortho-Xylene	00095-47-6	7.58	0.9302	7.047			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.8662	10.182			
Methylcyclopentane	00096-37-7	2.05	0.8363	1.714			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.8162	3.586			
Ethylbenzene	00100-41-4	2.96	0.7621	2.258			
2,3-Dimethylpentane	00565-59-3	1.25	0.7337	0.916			
2,4-Dimethylhexane	00589-43-5	1.61	0.7264	1.166			
Cyclopentene	00142-29-0	6.69	0.7069	4.726			
1-Methyl-4-Isobutylbenzene	05161-04-6	3.82	0.7042	2.691			
2-Methylhexane	00591-76-4	1.09	0.6825	0.741			
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.6643	3.681			
acetaldehyde	00075-07-0	6.46	0.6625	4.282			
acetone	00067-64-1	0.35	0.2941	0.104			
Propionaldehyde	00123-38-6	6.96	0.0623	0.433			
benzaldehyde	00100-52-7	-0.71	0.0614	-0.044			
Glyoxal	00107-22-2	12.59	0.0297	0.374			
		Total	148.6	420.4	2.829		
			146.2	403.4	2.758	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E6 - FTP Phase 2 - Test 5988							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	19.6467	0.272			
n-Propylbenzene	00103-65-1	1.96	3.9115	7.665			
Toluene	00108-88-3	3.93	1.8889	7.414			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.4881	7.990			
Ethylene	00074-85-1	8.88	1.4584	12.957			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.3755	1.864			
Ethane	00074-84-0	0.26	1.1726	0.308			
Formaldehyde	00050-00-0	9.59	0.0780	0.749			
acetaldehyde	00075-07-0	6.46	0.0030	0.020			
acetone	00067-64-1	0.35	0.0007	0.000			
Glyoxal	00107-22-2	12.59	0.0004	0.005			
		Total	31.0	39.2	1.265		
			30.9	38.5	1.243	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E6 - FTP Phase 3 - Test 5988							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	21.3845	0.296			
Toluene	00108-88-3	3.93	3.7812	14.841			
Ethane	00074-84-0	0.26	2.5646	0.674			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.7382	2.355			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.6155	8.674			
n-Propylbenzene	00103-65-1	1.96	1.3581	2.661			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.7923	0.950			
Ethylene	00074-85-1	8.88	0.7595	6.747			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6762	4.994			
Formaldehyde	00050-00-0	9.59	0.1283	1.231			
acetaldehyde	00075-07-0	6.46	0.0567	0.366			
Glyoxal	00107-22-2	12.59	0.0077	0.097			
Propionaldehyde	00123-38-6	6.96	0.0021	0.015			
		Total	34.9	43.9	1.259		
			34.7	42.2	1.217	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E32 - FTP Phase 1 - Test 6016							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	57.4389	0.796			
Ethanol	00064-17-5	1.45	21.2942	30.855			
Ethane	00074-84-0	0.26	18.0880	4.754			
Ethylene	00074-85-1	8.88	15.3810	136.650			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.6965	7.718			
Toluene	00108-88-3	3.93	4.9500	19.429			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.2528	5.100			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.0868	32.454			
Propane	00074-98-6	0.46	4.0234	1.839			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.4886	3.479			
acetaldehyde	00075-07-0	6.46	2.2070	14.265			
Benzene	00071-43-2	0.69	2.0461	1.421			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.0294	15.739			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.9473	2.051			
n-Pentane	00109-66-0	1.21	1.8132	2.203			
3-Methylpentane	00096-14-0	1.69	1.5036	2.542			
Formaldehyde	00050-00-0	9.59	1.3930	13.364			
2,3-Dimethylbutane	00079-29-8	0.90	1.3899	1.249			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3050	7.007			
1,3-Butadiene	00106-99-0	12.45	1.2313	15.335			
2,2-Dimethylbutane	00075-83-2	1.11	1.1948	1.328			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.0521	0.998			
n-Hexane	00110-54-3	1.13	0.9230	1.047			
2,4-Dimethylpentane	00108-08-7	1.46	0.7584	1.107			
n-Butane	00106-97-8	1.08	0.7072	0.762			
Methylcyclopentane	00096-37-7	2.05	0.7025	1.440			
2-Methylhexane	00591-76-4	1.09	0.6854	0.744			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.6475	4.783			
acetone	00067-64-1	0.35	0.2264	0.080			
Propionaldehyde	00123-38-6	6.96	0.0622	0.433			
benzaldehyde	00100-52-7	-0.71	0.0468	-0.033			
n-butyraldehyde	00123-72-8	5.85	0.0260	0.152			
Glyoxal	00107-22-2	12.59	0.0215	0.271			
		Total	161.6	331.4	2.050		
		Total	157.6	302.8	1.921	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E32 - FTP Phase 2 - Test 6016							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	38.8880	0.539			
Ethane	00074-84-0	0.26	5.8311	1.533			
Ethylene	00074-85-1	8.88	4.4174	39.246			
Formaldehyde	00050-00-0	9.59	0.1007	0.966			
Propionaldehyde	00123-38-6	6.96	0.0050	0.035			
Glyoxal	00107-22-2	12.59	0.0040	0.050			
		Total	49.2	42.4	0.860		
		Total	49.1	41.3	0.841	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E32 - FTP Phase 3 - Test 6016							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	30.4126	0.421			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	4.9333	36.436			
Ethane	00074-84-0	0.26	3.8048	1.000			
Toluene	00108-88-3	3.93	2.0480	8.039			
Ethylene	00074-85-1	8.88	1.0690	9.497			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9307	4.997			
Formaldehyde	00050-00-0	9.59	0.1882	1.805			
acetaldehyde	00075-07-0	6.46	0.0809	0.523			
Glyoxal	00107-22-2	12.59	0.0098	0.124			
Propionaldehyde	00123-38-6	6.96	0.0035	0.024			
		Total	43.5	62.9	1.446		
			43.2	60.4	1.398	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E59 - FTP Phase 1 - Test 6052							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	69.6453	0.965			
Ethanol	00064-17-5	1.45	60.0577	87.022			
Ethylene	00074-85-1	8.88	17.2410	153.175			
Ethane	00074-84-0	0.26	11.8232	3.108			
Toluene	00108-88-3	3.93	4.6811	18.373			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.5985	6.230			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.4003	34.943			
acetaldehyde	00075-07-0	6.46	4.0056	25.890			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.7186	4.459			
Propene	00115-07-1	11.57	2.8990	33.552			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.2726	17.625			
1-Octene	00111-66-0	3.14	1.9899	6.251			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.8396	2.571			
Benzene	00071-43-2	0.69	1.6040	1.114			
2,3,3-Trimethylpentane	00560-21-4	0.95	1.5659	1.481			
n-Pentane	00109-66-0	1.21	1.5421	1.873			
Formaldehyde	00050-00-0	9.59	1.5062	14.450			
1,3-Butadiene	00106-99-0	12.45	1.3604	16.943			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3538	7.269			
3-Methylpentane	00096-14-0	1.69	1.0316	1.744			
n-Hexane	00110-54-3	1.13	0.9640	1.094			
c-2-Butene	00590-18-1	14.26	0.9594	13.681			
2,3-Dimethylbutane	00079-29-8	0.90	0.9198	0.827			
2,2-Dimethylbutane	00075-83-2	1.11	0.8537	0.949			
2,4-Dimethylhexane	00589-43-5	1.61	0.8139	1.307			
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.7552	5.917			
n-Butane	00106-97-8	1.08	0.7471	0.805			
acetone	00067-64-1	0.35	0.1841	0.065			
ortho-Xylene	00095-47-6	7.58	0.1783	1.351			
2-Butanone (MEK)	00078-93-3	1.45	0.1198	0.174			
Propionaldehyde	00123-38-6	6.96	0.0508	0.354			
benzaldehyde	00100-52-7	-0.71	0.0279	-0.020			
Glyoxal	00107-22-2	12.59	0.0201	0.253			
n-butyraldehyde	00123-72-8	5.85	0.0141	0.083			
Acrolein	00107-02-8	7.37	0.0088	0.065			
		Total	205.8	465.9	2.265		
			199.8	424.6	2.125	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E59 - FTP Phase 2 - Test 6052							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	43.2923	0.600			
Propane	00074-98-6	0.46	1.6402	0.750			
Formaldehyde	00050-00-0	9.59	0.0802	0.769			
2-Butanone (MEK)	00078-93-3	1.45	0.0286	0.041			
acetone	00067-64-1	0.35	0.0256	0.009			
acetaldehyde	00075-07-0	6.46	0.0226	0.146			
Glyoxal	00107-22-2	12.59	0.0006	0.007			
		Total	45.1	2.3	0.052		
			44.9	1.3	0.030	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E59 - FTP Phase 3 - Test 6052							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	42.1386	0.584			
Ethane	00074-84-0	0.26	2.4995	0.657			
Toluene	00108-88-3	3.93	1.3141	5.158			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.0808	1.464			
Formaldehyde	00050-00-0	9.59	0.1132	1.086			
acetaldehyde	00075-07-0	6.46	0.0790	0.511			
2-Butanone (MEK)	00078-93-3	1.45	0.0156	0.023			
Glyoxal	00107-22-2	12.59	0.0089	0.113			
Propionaldehyde	00123-38-6	6.96	0.0013	0.009			
		Total	47.3	9.6	0.203		
			47.0	7.9	0.167	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E85 - FTP Phase 1 - Test 5937							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	130.4997	189.091			
Methane	00074-82-8	0.01	93.0411	1.289			
Ethylene	00074-85-1	8.88	28.4882	253.098			
Ethane	00074-84-0	0.26	10.2607	2.697			
acetaldehyde	00075-07-0	6.46	9.2244	59.623			
Acetylene (Ethyne)	00074-86-2	0.95	8.3796	7.926			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	8.0374	63.826			
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.5389	6.150			
Toluene	00108-88-3	3.93	2.9826	11.707			
n-Butane	00106-97-8	1.08	2.6017	2.802			
Formaldehyde	00050-00-0	9.59	2.3491	22.537			
Propene	00115-07-1	11.57	2.2522	26.067			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.5900	12.331			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.5532	11.472			
Benzene	00071-43-2	0.69	1.5087	1.048			
1,3-Butadiene	00106-99-0	12.45	1.4417	17.956			
n-Pentane	00109-66-0	1.21	1.3540	1.645			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.1937	1.431			
t-2-Butene	00624-64-6	15.20	1.0082	15.321			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9247	4.965			
n-Hexane	00110-54-3	1.13	0.8045	0.913			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.7158	1.000			
acetone	00067-64-1	0.35	0.1128	0.040			
Propionaldehyde	00123-38-6	6.96	0.0380	0.264			
benzaldehyde	00100-52-7	-0.71	0.0225	-0.016			
Glyoxal	00107-22-2	12.59	0.0215	0.271			
		Total	314.9	715.5	2.272		
			303.2	632.7	2.087	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E85 - FTP Phase 2 - Test 5937							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	35.7209	0.495			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.1649	23.375			
Ethanol	00064-17-5	1.45	2.2581	3.272			
Ethane	00074-84-0	0.26	1.5603	0.410			
n-Butane	00106-97-8	1.08	1.3201	1.422			
Formaldehyde	00050-00-0	9.59	0.1534	1.472			
acetaldehyde	00075-07-0	6.46	0.0410	0.265			
acetone	00067-64-1	0.35	0.0099	0.004			
Glyoxal	00107-22-2	12.59	0.0027	0.034			
		Total	44.2	30.7	0.695		
			44.0	29.0	0.658	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E85 - FTP Phase 3 - Test 5937							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	38.8298	0.538			
Toluene	00108-88-3	3.93	3.6129	14.181			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.0464	4.128			
Ethane	00074-84-0	0.26	2.5673	0.675			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.4106	7.574			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.9316	6.881			
acetaldehyde	00075-07-0	6.46	0.1798	1.162			
Formaldehyde	00050-00-0	9.59	0.1656	1.589			
Glyoxal	00107-22-2	12.59	0.0099	0.125			
		Total	50.8	36.9	0.726		
			50.4	34.0	0.674	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E6 - US06 - Test 5989							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	22.4662	0.311			
Ethane	00074-84-0	0.26	2.8737	0.755			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.8016	3.796			
Ethylene	00074-85-1	8.88	2.6475	23.521			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.2695	2.721			
Formaldehyde	00050-00-0	9.59	1.5861	15.217			
Toluene	00108-88-3	3.93	1.4644	5.748			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2697	1.775			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.9999	1.053			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.9980	7.925			
Propene	00115-07-1	11.57	0.8930	10.336			
Cyclopentene	00142-29-0	6.69	0.8845	5.913			
2,3-Dimethylbutane	00079-29-8	0.90	0.8780	0.789			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.8703	0.975			
Benzene	00071-43-2	0.69	0.7845	0.545			
n-Pentane	00109-66-0	1.21	0.7790	0.946			
3-Methylpentane	00096-14-0	1.69	0.7469	1.263			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.6830	5.297			
2,2-Dimethylbutane	00075-83-2	1.11	0.6512	0.724			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.6210	0.589			
acetaldehyde	00075-07-0	6.46	0.5946	3.843			
n-Decane	00124-18-5	0.59	0.5312	0.314			
n-Hexane	00110-54-3	1.13	0.4097	0.465			
acetone	00067-64-1	0.35	0.4019	0.142			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.3882	2.084			
1,2,4,5-Tetramethylbenzene	00095-93-2	9.26	0.3869	3.583			
benzaldehyde	00100-52-7	-0.71	0.1548	-0.110			
Glyoxal	00107-22-2	12.59	0.0420	0.529			
		Total	50.1	101.0	2.018		
			47.3	81.4	1.722	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E32 - US06 - Test 6017							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	24.2118	0.335			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.2472	4.400			
Ethylene	00074-85-1	8.88	3.0241	26.867			
Ethane	00074-84-0	0.26	2.7029	0.710			
Ethanol	00064-17-5	1.45	2.2422	3.249			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.1054	2.525			
acetaldehyde	00075-07-0	6.46	1.7664	11.418			
Toluene	00108-88-3	3.93	1.4471	5.680			
Formaldehyde	00050-00-0	9.59	1.3492	12.943			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.1800	1.649			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.0817	8.590			
Propane	00074-98-6	0.46	1.0352	0.473			
n-Propylbenzene	00103-65-1	1.96	1.0221	2.003			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.9902	1.043			
n-Pentane	00109-66-0	1.21	0.8187	0.995			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7497	0.840			
1,2,4,5-Tetramethylbenzene	00095-93-2	9.26	0.7382	6.837			
3-Methylpentane	00096-14-0	1.69	0.6864	1.161			
2,3-Dimethylbutane	00079-29-8	0.90	0.6607	0.594			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.6444	0.611			
meta- & para-Xylenes	00108-38-3+00106-42-3	4.17	0.6441	2.689			
Benzene	00071-43-2	0.69	0.6286	0.436			
2,2-Dimethylbutane	00075-83-2	1.11	0.5644	0.627			
n-Hexane	00110-54-3	1.13	0.4306	0.489			
Methylcyclopentane	00096-37-7	2.05	0.3729	0.764			
1,3-Butadiene	00106-99-0	12.45	0.3619	4.507			
acetone	00067-64-1	0.35	0.3399	0.120			
benzaldehyde	00100-52-7	-0.71	0.1547	-0.110			
Glyoxal	00107-22-2	12.59	0.0656	0.826			
Propionaldehyde	00123-38-6	6.96	0.0561	0.390			
		Total	55.3	103.7	1.874		
			51.6	78.1	1.513	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E59 - US06 - Test 6053							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	25.7894	0.357			
Ethylene	00074-85-1	8.88	2.5271	22.452			
acetaldehyde	00075-07-0	6.46	2.4296	15.704			
Ethanol	00064-17-5	1.45	2.3504	3.406			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.0943	2.838			
Ethane	00074-84-0	0.26	2.0436	0.537			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.8403	13.592			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.0424	1.250			
Formaldehyde	00050-00-0	9.59	0.7958	7.634			
Toluene	00108-88-3	3.93	0.7092	2.784			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.6904	5.482			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.5367	0.750			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.4547	0.479			
n-Pentane	00109-66-0	1.21	0.4451	0.541			
Cyclopentene	00142-29-0	6.69	0.4105	2.745			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.3904	0.437			
1,3-Butadiene	00106-99-0	12.45	0.3433	4.276			
acetone	00067-64-1	0.35	0.1650	0.058			
2-Butanone (MEK)	00078-93-3	1.45	0.0548	0.079			
Glyoxal	00107-22-2	12.59	0.0418	0.526			
Propionaldehyde	00123-38-6	6.96	0.0061	0.043			
		Total	45.2	86.0	1.904		
			41.7	61.9	1.486	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E85 - US06 - Test 5938							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.7709	0.329			
Ethanol	00064-17-5	1.45	9.1110	13.202			
acetaldehyde	00075-07-0	6.46	6.4410	41.632			
Ethylene	00074-85-1	8.88	3.9695	35.267			
Formaldehyde	00050-00-0	9.59	1.9277	18.494			
Ethane	00074-84-0	0.26	1.8437	0.485			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.4670	11.650			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.2716	1.723			
1-Butyne	00107-00-6	6.05	0.9113	5.513			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7359	0.824			
t-2-Butene	00624-64-6	15.20	0.6728	10.225			
Acetylene (Ethyne)	00074-86-2	0.95	0.5606	0.530			
n-Decane	00124-18-5	0.59	0.5108	0.302			
Toluene	00108-88-3	3.93	0.4575	1.796			
Cyclopentene	00142-29-0	6.69	0.3988	2.666			
1,3-Butadiene	00106-99-0	12.45	0.3771	4.696			
benzaldehyde	00100-52-7	-0.71	0.1529	-0.109			
n-butyraldehyde	00123-72-8	5.85	0.0388	0.227			
Glyoxal	00107-22-2	12.59	0.0369	0.465			
Propionaldehyde	00123-38-6	6.96	0.0275	0.191			
acetone	00067-64-1	0.35	0.0119	0.004			
		Total	54.7	150.1	2.745		
			46.1	89.2	1.937	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E6 - UC - Test 5992							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	35.6537	0.494			
n-Propylbenzene	00103-65-1	1.96	8.2142	16.097			
Ethane	00074-84-0	0.26	5.2593	1.382			
Ethylcyclohexane	01678-91-7	1.35	5.1052	6.868			
Ethylene	00074-85-1	8.88	4.0305	35.808			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.1664	4.290			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.5300	3.034			
Propane	00074-98-6	0.46	1.7489	0.799			
Ethanol	00064-17-5	1.45	1.6179	2.344			
Toluene	00108-88-3	3.93	1.5989	6.276			
Formaldehyde	00050-00-0	9.59	1.4743	14.144			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.3084	1.829			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.2092	9.602			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.1243	1.184			
Benzene	00071-43-2	0.69	1.0171	0.706			
n-Pentane	00109-66-0	1.21	0.8453	1.027			
2,3-Dimethylbutane	00079-29-8	0.90	0.8250	0.741			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.7995	6.200			
2,2-Dimethylbutane	00075-83-2	1.11	0.7289	0.810			
3-Methylpentane	00096-14-0	1.69	0.7073	1.196			
acetaldehyde	00075-07-0	6.46	0.5612	3.628			
acetone	00067-64-1	0.35	0.3043	0.107			
benzaldehyde	00100-52-7	-0.71	0.0887	-0.063			
n-butyraldehyde	00123-72-8	5.85	0.0255	0.149			
Propionaldehyde	00123-38-6	6.96	0.0173	0.120			
Glyoxal	00107-22-2	12.59	0.0093	0.117			
		Total	80.0	118.9	1.487		
			77.5	100.7	1.299	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E32 - UC - Test 6019							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	50.7340	0.703			
Ethanol	00064-17-5	1.45	8.0794	11.707			
n-Propylbenzene	00103-65-1	1.96	4.1444	8.121			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.1976	2.978			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.0952	2.512			
Toluene	00108-88-3	3.93	1.9200	7.536			
acetaldehyde	00075-07-0	6.46	1.7133	11.074			
Formaldehyde	00050-00-0	9.59	1.6386	15.721			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.0940	1.529			
n-Pentane	00109-66-0	1.21	0.7133	0.867			
acetone	00067-64-1	0.35	0.2858	0.101			
benzaldehyde	00100-52-7	-0.71	0.1372	-0.098			
2-Butanone (MEK)	00078-93-3	1.45	0.0712	0.103			
Propionaldehyde	00123-38-6	6.96	0.0558	0.388			
n-butyraldehyde	00123-72-8	5.85	0.0462	0.270			
Acrolein	00107-02-8	7.37	0.0089	0.065			
Glyoxal	00107-22-2	12.59	0.0052	0.066			
		Total	74.9	63.6	0.849		
			71.0	36.0	0.507	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E59 - UC - Test 6056							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	44.9320	0.622			
Ethanol	00064-17-5	1.45	15.2496	22.096			
Ethane	00074-84-0	0.26	9.6236	2.530			
Ethylene	00074-85-1	8.88	6.1334	54.491			
acetaldehyde	00075-07-0	6.46	4.2403	27.408			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	4.1374	30.558			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.5042	3.393			
Formaldehyde	00050-00-0	9.59	1.5793	15.151			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.5437	12.259			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.5356	1.841			
Toluene	00108-88-3	3.93	1.4989	5.883			
Propene	00115-07-1	11.57	1.1961	13.844			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.9635	1.347			
n-Pentane	00109-66-0	1.21	0.7533	0.915			
Benzene	00071-43-2	0.69	0.7462	0.518			
1,3-Butadiene	00106-99-0	12.45	0.7098	8.840			
acetone	00067-64-1	0.35	0.2892	0.102			
benzaldehyde	00100-52-7	-0.71	0.0564	-0.040			
Propionaldehyde	00123-38-6	6.96	0.0447	0.311			
2-Butanone (MEK)	00078-93-3	1.45	0.0122	0.018			
Glyoxal	00107-22-2	12.59	0.0045	0.057			
Acrolein	00107-02-8	7.37	0.0036	0.027			
		Total	97.8	202.2	2.068		
			91.5	159.1	1.739	w/o aldehydes	
	aldehydes						

Vehicle 8006 - Fuel E85 - UC - Test 5942							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	54.8969	0.760			
Ethanol	00064-17-5	1.45	38.2628	55.442			
Ethylene	00074-85-1	8.88	10.2999	91.507			
acetaldehyde	00075-07-0	6.46	8.3652	54.070			
Ethane	00074-84-0	0.26	5.0293	1.322			
n-Propylbenzene	00103-65-1	1.96	3.4339	6.729			
Formaldehyde	00050-00-0	9.59	3.0225	28.997			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.9026	23.050			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.7411	3.714			
Acetylene (Ethyne)	00074-86-2	0.95	1.4528	1.374			
Propene	00115-07-1	11.57	1.1591	13.416			
1,3-Butadiene	00106-99-0	12.45	0.8268	10.297			
n-Butane	00106-97-8	1.08	0.8156	0.878			
Toluene	00108-88-3	3.93	0.7166	2.812			
Cyclopentene	00142-29-0	6.69	0.6685	4.469			
benzaldehyde	00100-52-7	-0.71	0.0918	-0.065			
Propionaldehyde	00123-38-6	6.96	0.0854	0.595			
Glyoxal	00107-22-2	12.59	0.0328	0.413			
acetone	00067-64-1	0.35	0.0122	0.004			
		Total	134.8	299.8	2.224		
			123.2	215.8	1.751	w/o aldehydes	
	aldehydes						

Vehicle 8007

Test	Fuel	Test No.	Bag THC mg/mi	GC as % of THC	GC VOC mg/mi	Ozone mg/mi	Reactivity	Species Present	
FTP	E6	5945	176.6	90.4	159.7	567.6	3.554	44	
Phase 1	E32	6094	237.2	95.8	227.2	579.0	2.549	52	
	E59	6040	212.8	110.4	234.9	559.0	2.379	31	
	E85	6064	279.4	101.9	284.6	604.0	2.122	24	
FTP	E6	5945	23.2	110.7	25.7	8.7	0.337	11	
Phase 2	E32	6094	34.9	69.4	24.2	52.6	2.174	14	
	E59	6040	24.9	75.7	18.8	1.515	0.080	7	
	E85	6064	33.9	64.0	21.7	1.545	0.071	5	
FTP	E6	5945	36.0	75.0	27.0	22.5	0.834	11	
Phase 3	E32	6094	46.9	60.5	28.4	42.6	1.502	14	Includes aldehydes
	E59	6040	37.0	86.9	32.1	14.3	0.444	11	
	E85	6064	41.0	74.7	30.6	19.9	0.651	10	
US06	E6	5946	68.7	88.3	60.7	156.1	2.573	37	
	E32	6095	94.6	92.9	87.9	188.0	2.139	44	
	E59	6041	51.5	122.1	62.9	128.5	2.042	35	
	E85	6065	51.0	99.8	50.9	101.6	1.995	14	
UC	E6	5976	82.7	94.6	78.2	153.5	1.963	29	
	E32	6098	103.6	95.5	99.0	263.3	2.660	40	
	E59	6042	94.4	98.9	93.4	201.1	2.153	19	No aldehydes
	E85	6069	106.9	105.4	112.7	252.9	2.244	22	
RL - Cold	E6	25739	59.2	53.0	31.4	140.2	4.469	31	
	E32	25800	106.9	105.8	113.0	553.8	4.899	50	
	E59	25772	99.5	68.3	68.0	197.7	2.907	30	
	E85	25786	69.5	103.4	71.9	183.3	2.549	22	
RL - Total	E6	25739	92.3	47.6	43.9	211.6	4.816	28	
	E32	25800	174.6	85.1	148.5	683.1	4.599	51	
	E59	25772	162.5	80.4	130.6	478.0	3.660	35	
	E85	25786	145.1	64.1	93.1	264.4	2.841	30	
HS	E6	7404	15.2	62.3	9.4	14.5	1.538	18	
	E32	7706	13.8	285.5	39.4	207.5	5.272	60	
	E59	7542	24.3	131.1	31.9	68.8	2.157	31	
	E85	7592	24.4	47.1	11.5	46.0	4.006	20	
DHB - Day 1	E6	7405	113.1	94.8	107.2	276.9	2.583	58	
	E32	7709	107.5	79.9	85.9	235.3	2.740	56	
	E59	7543	135.3	83.7	113.2	218.2	1.927	37	
	E85	7594	104.1	82.6	86.1	221.5	2.574	60	
DHB - Total	E6	7405	186.1	104.6	194.7	491.8	2.526	72	
	E32	7709	192.2	89.3	171.6	429.6	2.504	62	
	E59	7543	242.9	72.0	174.8	329.6	1.886	43	
	E85	7594	168.4	94.4	158.9	334.1	2.103	63	

Vehicle 8007 - Fuel E6 - FTP Phase 1 - Test 5945							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	35.6875	0.494			
Ethylene	00074-85-1	8.88	18.9528	168.383			
Propene	00115-07-1	11.57	8.9737	103.861			
Toluene	00108-88-3	3.93	8.1274	31.900			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	7.0239	8.423			
2-Methylbutane (Isopentane)	00078-78-4	1.35	6.7097	9.091			
Acetylene (Ethyne)	00074-86-2	0.95	6.6647	6.304			
Ethane	00074-84-0	0.26	6.6279	1.742			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.6064	52.463			
Ethanol	00064-17-5	1.45	6.5206	9.448			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.6143	35.786			
2,2,5-Trimethylhexane	03522-94-9	1.05	3.6821	3.877			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.6733	5.134			
Benzene	00071-43-2	0.69	3.3774	2.345			
3-Methylpentane	00096-14-0	1.69	2.1618	3.655			
1,3-Butadiene	00106-99-0	12.45	2.0687	25.765			
n-Pentane	00109-66-0	1.21	2.0417	2.481			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.0196	1.916			
2,3-Dimethylbutane	00079-29-8	0.90	1.8989	1.707			
2,2-Dimethylbutane	00075-83-2	1.11	1.6061	1.785			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.4519	7.795			
Propane	00074-98-6	0.46	1.3677	0.625			
2,4-Dimethylpentane	00108-08-7	1.46	1.2768	1.863			
ortho-Xylene	00095-47-6	7.58	1.2479	9.454			
Methylcyclopentane	00096-37-7	2.05	1.1320	2.320			
n-Hexane	00110-54-3	1.13	1.1246	1.276			
2-Methylhexane	00591-76-4	1.09	1.0936	1.187			
t-2-Butene	00624-64-6	15.20	1.0779	16.381			
2,3-Dimethylpentane	00565-59-3	1.25	1.0305	1.286			
2,4-Dimethylhexane	00589-43-5	1.61	1.0299	1.654			
Propyne	00074-99-7	6.67	1.0098	6.735			
Ethylbenzene	00100-41-4	2.96	0.9297	2.754			
Formaldehyde	00050-00-0	9.59	0.9110	8.740			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.8966	2.861			
acetaldehyde	00075-07-0	6.46	0.8776	5.673			
2-Methyl-2-butene	00513-35-9	14.20	0.8015	11.377			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.7853	1.261			
Cyclohexane	00110-82-7	1.14	0.7786	0.886			
Cyclopentadiene	00542-92-7	6.89	0.7343	5.059			
Methylcyclohexane	00108-87-2	1.56	0.7174	1.116			
acetone	00067-64-1	0.35	0.2639	0.093			
Propionaldehyde	00123-38-6	6.96	0.0538	0.374			
benzaldehyde	00100-52-7	-0.71	0.0463	-0.033			
Glyoxal	00107-22-2	12.59	0.0207	0.261			
		Total	159.7	567.6	3.554		
			157.5	552.5	3.507	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E6 - FTP Phase 2 - Test 5945							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	20.3355	0.282			
Propane	00074-98-6	0.46	1.7492	0.800			
Ethane	00074-84-0	0.26	1.1701	0.308			
2-Methylpropane	00075-28-5	1.18	1.1355	1.336			
Toluene	00108-88-3	3.93	1.1007	4.320			
Formaldehyde	00050-00-0	9.59	0.1453	1.394			
acetaldehyde	00075-07-0	6.46	0.0181	0.117			
acetone	00067-64-1	0.35	0.0146	0.005			
benzaldehyde	00100-52-7	-0.71	0.0118	-0.008			
Glyoxal	00107-22-2	12.59	0.0067	0.085			
Propionaldehyde	00123-38-6	6.96	0.0021	0.014			
		Total	25.7	8.7	0.337		
			25.5	7.0	0.276	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E6 - FTP Phase 3 - Test 5945							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	17.9057	0.248			
Ethane	00074-84-0	0.26	2.1978	0.578			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.7224	2.334			
Toluene	00108-88-3	3.93	1.6103	6.321			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.5837	1.899			
Ethylene	00074-85-1	8.88	0.9112	8.095			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	0.8442	1.180			
Formaldehyde	00050-00-0	9.59	0.1217	1.167			
acetaldehyde	00075-07-0	6.46	0.0856	0.553			
Glyoxal	00107-22-2	12.59	0.0093	0.117			
Propionaldehyde	00123-38-6	6.96	0.0032	0.022			
		Total	27.0	22.5	0.834		
			26.8	20.7	0.771	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E32 - FTP Phase 1 - Test 6094							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	49.6311	71.91			
Methane	00074-82-8	0.01	39.9054	0.55			
2-Methylbutane (Isopentane)	00078-78-4	1.35	15.4402	20.92			
Toluene	00108-88-3	3.93	11.4017	44.75			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	9.6109	11.52			
Ethylene	00074-85-1	8.88	9.1888	81.64			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	7.4516	59.17			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.6319	43.68			
Ethane	00074-84-0	0.26	5.5973	1.47			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	5.1329	7.17			
2,2,5-Trimethylhexane	03522-94-9	1.05	4.4975	4.74			
n-Pentane	00109-66-0	1.21	4.2504	5.16			
acetaldehyde	00075-07-0	6.46	4.2029	27.17			
Benzene	00071-43-2	0.69	3.2416	2.25			
3-Methylpentane	00096-14-0	1.69	3.0099	5.09			
2,3-Dimethylbutane	00079-29-8	0.9	2.9718	2.67			
2,3,4-Trimethylpentane	00565-75-3	0.95	2.9556	2.80			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.7051	14.52			
Formaldehyde	00050-00-0	9.59	2.5881	24.83			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.4573	18.15			
n-Hexane	00110-54-3	1.13	2.2301	2.53			
Propane	00074-98-6	0.46	2.1625	0.99			
2,2-Dimethylbutane	00075-83-2	1.11	1.9262	2.14			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.8042	5.76			
2,4-Dimethylhexane	00589-43-5	1.61	1.7389	2.79			
2,4-Dimethylpentane	00108-08-7	1.46	1.7212	2.51			
2,3-Dimethylpentane	00565-59-3	1.25	1.7094	2.13			
Methylcyclopentane	00096-37-7	2.05	1.7003	3.49			
2-Methylhexane	00591-76-4	1.09	1.6738	1.82			
ortho-Xylene	00095-47-6	7.58	1.5205	11.52			
Cyclohexane	00110-82-7	1.14	1.2473	1.42			
Ethylbenzene	00100-41-4	2.96	1.1786	3.49			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.1770	1.89			
1,3,5-Trimethylbenzene	00108-67-8	11.8	1.1759	13.82			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	1.1364	4.99			
Methylcyclohexane	00108-87-2	1.56	1.0473	1.63			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.9772	1.07			
2-Methyl-2-butene	00513-35-9	14.2	0.9218	13.08			
2-Methyl-1-butene	00563-46-2	6.38	0.8523	5.44			
n-Heptane	00142-82-5	0.97	0.8464	0.82			
3-Methylheptane	00589-81-1	1.12	0.7890	0.89			
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.7768	8.14			
Unknown #16		2.39	0.7615	1.82			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.7392	0.83			
c-2-Butene	00590-18-1	14.3	0.7277	10.38			
t-2-Butene	00624-64-6	15.2	0.7157	10.88			
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.7066	3.92			
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.6488	7.59			

Vehicle 8007 - Fuel E32 - FTP Phase 1 - Test 6094				Continued...			
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
acetone	00067-64-1	0.35	0.4760	0.17			
benzaldehyde	00100-52-7	-0.71	0.1044	-0.07			
Propionaldehyde	00123-38-6	6.96	0.0992	0.69			
Glyoxal	00107-22-2	12.6	0.0245	0.31			
		Total	227.2	579.0	2.549		
			219.7	526.0	2.394	w/o aldehydes	
No MIR available, use weighted average of 2.3940							
	aldehydes						

Vehicle 8007 - Fuel E32 - FTP Phase 2 - Test 6094							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	9.9175	0.14			
Toluene	00108-88-3	3.93	4.1350	16.23			
Ethanol	00064-17-5	1.45	3.5188	5.10			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.4723	25.65			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.5046	1.80			
n-Pentane	00109-66-0	1.21	1.3901	1.69			
Formaldehyde	00050-00-0	9.59	0.1868	1.79			
acetone	00067-64-1	0.35	0.0222	0.01			
acetaldehyde	00075-07-0	6.46	0.0166	0.11			
benzaldehyde	00100-52-7	-0.71	0.0111	-0.01			
Valeraldehyde	000110-62-3	4.98	0.0073	0.04			
Glyoxal	00107-22-2	12.6	0.0018	0.02			
Propionaldehyde	00123-38-6	6.96	0.0013	0.01			
n-butyraldehyde	00123-72-8	5.85	0.0010	0.01			
		Total	24.2	52.6	2.174		
			23.9	50.6	2.114	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E32 - FTP Phase 3 - Test 6094							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	13.5902	0.19			
Toluene	00108-88-3	3.93	2.8219	11.08			
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.0244	2.74			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.8834	2.26			
Ethanol	00064-17-5	1.45	1.6956	2.46			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.6307	12.04			
n-Pentane	00109-66-0	1.21	1.4058	1.71			
Ethane	00074-84-0	0.26	1.0272	0.27			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.9812	5.27			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.9013	1.26			
Formaldehyde	00050-00-0	9.59	0.2096	2.01			
acetaldehyde	00075-07-0	6.46	0.1744	1.13			
Glyoxal	00107-22-2	12.6	0.0125	0.16			
Propionaldehyde	00123-38-6	6.96	0.0067	0.05			
		Total	28.4	42.6	1.502		
			28.0	39.3	1.405	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E59 - FTP Phase 1 - Test 6040							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	87.5904	126.916			
Methane	00074-82-8	0.01	57.8294	0.801			
Ethylene	00074-85-1	8.88	21.7387	193.134			
Ethane	00074-84-0	0.26	8.4981	2.234			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	7.1931	57.122			
acetaldehyde	00075-07-0	6.46	6.6445	42.948			
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.9541	8.067			
1-Methyl-3-Ethylbenzene	00620-14-4	5.54	5.0444	27.954			
Toluene	00108-88-3	3.93	4.4489	17.462			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.1121	4.931			
Propane	00074-98-6	0.46	3.9359	1.799			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.3029	17.860			
Benzene	00071-43-2	0.69	2.2658	1.573			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.2637	2.384			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.1774	3.043			
1,3-Butadiene	00106-99-0	12.45	1.7225	21.453			
n-Pentane	00109-66-0	1.21	1.7088	2.076			
Formaldehyde	00050-00-0	9.59	1.4660	14.064			
3-Methylpentane	00096-14-0	1.69	1.3480	2.279			
2,3-Dimethylbutane	00079-29-8	0.90	1.1380	1.023			
n-Hexane	00110-54-3	1.13	1.0909	1.238			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9655	0.916			
2,2-Dimethylbutane	00075-83-2	1.11	0.9352	1.039			
2,4-Dimethylhexane	00589-43-5	1.61	0.8318	1.335			
2-Methylhexane	00591-76-4	1.09	0.6831	0.741			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.6766	3.633			
acetone	00067-64-1	0.35	0.2310	0.081			
Propionaldehyde	00123-38-6	6.96	0.0594	0.413			
Glyoxal	00107-22-2	12.59	0.0373	0.470			
benzaldehyde	00100-52-7	-0.71	0.0282	-0.020			
2-Butanone (MEK)	00078-93-3	1.45	0.0026	0.004			
		Total	234.9	559.0	2.379		
			226.5	501.0	2.212	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E59 - FTP Phase 2 - Test 6040							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	18.6581	0.258			
Formaldehyde	00050-00-0	9.59	0.1112	1.067			
acetone	00067-64-1	0.35	0.0376	0.013			
acetaldehyde	00075-07-0	6.46	0.0225	0.146			
2-Butanone (MEK)	00078-93-3	1.45	0.0068	0.010			
Glyoxal	00107-22-2	12.59	0.0014	0.018			
Propionaldehyde	00123-38-6	6.96	0.0005	0.004			
		Total	18.8	1.5	0.080		
			18.7	0.3	0.014	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E59 - FTP Phase 3 - Test 6040							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	24.2399	0.336			
n-Propylbenzene	00103-65-1	1.96	2.8789	5.642			
Ethane	00074-84-0	0.26	2.3042	0.606			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.8808	1.056			
2-Methylbutane (Isopentane)	00078-78-4	1.35	0.7823	1.060			
Toluene	00108-88-3	3.93	0.6378	2.503			
acetaldehyde	00075-07-0	6.46	0.2737	1.769			
Formaldehyde	00050-00-0	9.59	0.1166	1.119			
acetone	00067-64-1	0.35	0.0172	0.006			
Glyoxal	00107-22-2	12.59	0.0136	0.171			
2-Butanone (MEK)	00078-93-3	1.45	0.0030	0.004			
		Total	32.1	14.3	0.444		
			31.7	11.2	0.353	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E85 - FTP Phase 1 - Test 6064							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Ethanol	00064-17-5	1.45	129.0610	187.006			
Methane	00074-82-8	0.01	77.0093	1.067			
Ethylene	00074-85-1	8.88	15.5751	138.374			
acetaldehyde	00075-07-0	6.46	13.8851	89.749			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	10.3974	82.567			
2-Methylbutane (Isopentane)	00078-78-4	1.35	8.2295	11.150			
Ethane	00074-84-0	0.26	6.4185	1.687			
Toluene	00108-88-3	3.93	5.0448	19.801			
n-Butane	00106-97-8	1.08	3.4408	3.705			
n-Pentane	00109-66-0	1.21	2.0539	2.495			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.9579	10.512			
Formaldehyde	00050-00-0	9.59	1.9396	18.608			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.8670	14.480			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	1.3827	1.658			
Benzene	00071-43-2	0.69	1.3153	0.913			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.1673	1.632			
n-Hexane	00110-54-3	1.13	1.0774	1.222			
c-2-Butene	00590-18-1	14.26	0.9851	14.047			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.8052	0.848			
3-Methylpentane	00096-14-0	1.69	0.6993	1.182			
Propionaldehyde	00123-38-6	6.96	0.1220	0.849			
acetone	00067-64-1	0.35	0.1051	0.037			
Glyoxal	00107-22-2	12.59	0.0294	0.370			
n-butyraldehyde	00123-72-8	5.85	0.0058	0.034			
		Total	284.6	604.0	2.122		
			268.5	494.3	1.841	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E85 - FTP Phase 2 - Test 6064							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	21.5814	0.299			
Formaldehyde	00050-00-0	9.59	0.1267	1.215			
2-Butanone (MEK)	00078-93-3	1.45	0.0045	0.006			
Glyoxal	00107-22-2	12.59	0.0018	0.023			
Propionaldehyde	00123-38-6	6.96	0.0002	0.001			
		Total	21.7	1.5	0.071		
			21.6	0.3	0.014	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E85 - FTP Phase 3 - Test 6064							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	25.7206	0.356			
Toluene	00108-88-3	3.93	2.2658	8.893			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.3213	7.094			
Ethane	00074-84-0	0.26	0.8482	0.223			
acetaldehyde	00075-07-0	6.46	0.2254	1.457			
Formaldehyde	00050-00-0	9.59	0.1563	1.500			
acetone	00067-64-1	0.35	0.0288	0.010			
Propionaldehyde	00123-38-6	6.96	0.0167	0.116			
Glyoxal	00107-22-2	12.59	0.0164	0.207			
n-butyraldehyde	00123-72-8	5.85	0.0127	0.074			
		Total	30.6	19.9	0.651		
			30.2	16.6	0.549	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E6 - US06 - Test 5946							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	19.0383	0.264			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.8814	5.259			
Ethylene	00074-85-1	8.88	3.5759	31.769			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	3.5142	4.214			
Ethane	00074-84-0	0.26	3.2090	0.843			
Toluene	00108-88-3	3.93	2.4324	9.547			
Propene	00115-07-1	11.57	1.9637	22.728			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.9255	2.691			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.9058	15.134			
Formaldehyde	00050-00-0	9.59	1.6704	16.025			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.6697	1.758			
acetaldehyde	00075-07-0	6.46	1.2129	7.840			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.1472	8.897			
3-Methylpentane	00096-14-0	1.69	1.1085	1.874			
Ethanol	00064-17-5	1.45	1.0853	1.573			
n-Pentane	00109-66-0	1.21	1.0352	1.258			
2,3-Dimethylbutane	00079-29-8	0.90	0.9965	0.896			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.9773	0.927			
2,2-Dimethylbutane	00075-83-2	1.11	0.7972	0.886			
Benzene	00071-43-2	0.69	0.7085	0.492			
2,4-Dimethylhexane	00589-43-5	1.61	0.6117	0.982			
2,4-Dimethylpentane	00108-08-7	1.46	0.5836	0.852			
2,3-Dimethylpentane	00565-59-3	1.25	0.5835	0.728			
2-Methylhexane	00591-76-4	1.09	0.5677	0.616			
n-Hexane	00110-54-3	1.13	0.5671	0.643			
Methylcyclopentane	00096-37-7	2.05	0.5309	1.088			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.4865	3.593			
1,3-Butadiene	00106-99-0	12.45	0.4438	5.527			
acetone	00067-64-1	0.35	0.4113	0.145			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.3887	0.624			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.3871	1.235			
1-Butyne	00107-00-6	6.05	0.3822	2.312			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.3663	0.410			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.3466	1.861			
benzaldehyde	00100-52-7	-0.71	0.0813	-0.058			
Glyoxal	00107-22-2	12.59	0.0333	0.419			
Propionaldehyde	00123-38-6	6.96	0.0322	0.224			
		Total	60.7	156.1	2.573		
			57.2	131.5	2.298	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E32 - US06 - Test 6095							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.8491	0.330			
2-Methylbutane (Isopentane)	00078-78-4	1.35	8.6897	11.774			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	5.2458	6.290			
Ethanol	00064-17-5	1.45	4.9256	7.137			
Toluene	00108-88-3	3.93	4.4233	17.362			
acetaldehyde	00075-07-0	6.46	4.0705	26.310			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	3.0012	4.195			
n-Pentane	00109-66-0	1.21	2.4282	2.950			
Ethylene	00074-85-1	8.88	2.3474	20.855			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.2632	2.383			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.7689	14.047			
3-Methylpentane	00096-14-0	1.69	1.7491	2.958			
2,3-Dimethylbutane	00079-29-8	0.90	1.7353	1.559			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.6735	12.979			
Ethane	00074-84-0	0.26	1.5405	0.405			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.5299	1.452			
Formaldehyde	00050-00-0	9.59	1.1394	10.931			
n-Hexane	00110-54-3	1.13	1.1363	1.289			
2,2-Dimethylbutane	00075-83-2	1.11	1.1246	1.250			
Benzene	00071-43-2	0.69	1.0869	0.755			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.0494	5.634			
2,4-Dimethylpentane	00108-08-7	1.46	0.9399	1.372			
2,4-Dimethylhexane	00589-43-5	1.61	0.9094	1.460			
Methylcyclopentane	00096-37-7	2.05	0.8864	1.817			
2,3-Dimethylpentane	00565-59-3	1.25	0.8696	1.086			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.8122	5.999			
2-Methylhexane	00591-76-4	1.09	0.7818	0.848			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.6739	2.150			
Methylcyclohexane	00108-87-2	1.56	0.6048	0.941			
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.5422	0.870			
Cyclohexane	00110-82-7	1.14	0.4795	0.545			
Propene	00115-07-1	11.57	0.4701	5.441			
ortho-Xylene	00095-47-6	7.58	0.4660	3.530			
n-Heptane	00142-82-5	0.97	0.4492	0.434			
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.3977	4.675			
2,3,5-Trimethylhexane	01069-53-0	1.12	0.3938	0.441			
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.3652	0.399			
Ethylbenzene	00100-41-4	2.96	0.3482	1.032			
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.3433	1.508			
acetone	00067-64-1	0.35	0.2442	0.086			
benzaldehyde	00100-52-7	-0.71	0.0771	-0.055			
Methacrolein	000078-85-3	5.96	0.0364	0.217			
Propionaldehyde	00123-38-6	6.96	0.0226	0.157			
Glyoxal	00107-22-2	12.59	0.0166	0.209			
		Total	87.9	188.0	2.139		
			82.3	150.2	1.824	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E59 - US06 - Test 6041							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	25.3408	0.351			
Ethanol	00064-17-5	1.45	4.2982	6.228			
acetaldehyde	00075-07-0	6.46	3.5717	23.086			
Ethylene	00074-85-1	8.88	3.3767	30.000			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.2311	4.378			
Ethane	00074-84-0	0.26	2.6120	0.687			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.4791	2.973			
n-Propylbenzene	00103-65-1	1.96	1.7326	3.395			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2067	1.687			
Toluene	00108-88-3	3.93	1.1220	4.404			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.9947	7.899			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.9922	7.695			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.9713	1.023			
Formaldehyde	00050-00-0	9.59	0.8844	8.484			
2-Methylpropane	00075-28-5	1.18	0.8133	0.957			
2,3,4-Trimethylpentane	00565-75-3	0.95	0.7982	0.757			
2,3-Dimethylbutane	00079-29-8	0.90	0.7892	0.709			
Propane	00074-98-6	0.46	0.7431	0.340			
3-Methylpentane	00096-14-0	1.69	0.7419	1.255			
n-Pentane	00109-66-0	1.21	0.6875	0.835			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.6669	3.581			
n-Hexane	00110-54-3	1.13	0.6450	0.732			
Benzene	00071-43-2	0.69	0.5265	0.366			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.5174	3.821			
1,2,4,5-Tetramethylbenzene	00095-93-2	9.26	0.4437	4.109			
2,4-Dimethylpentane	00108-08-7	1.46	0.4251	0.620			
2,4-Dimethylhexane	00589-43-5	1.61	0.4193	0.673			
1,3-Butadiene	00106-99-0	12.45	0.4169	5.192			
2,2-Dimethylbutane	00075-83-2	1.11	0.4157	0.462			
2,3-Dimethylpentane	00565-59-3	1.25	0.4003	0.500			
Methylcyclopentane	00096-37-7	2.05	0.3995	0.819			
acetone	00067-64-1	0.35	0.1719	0.061			
benzaldehyde	00100-52-7	-0.71	0.0271	-0.019			
Glyoxal	00107-22-2	12.59	0.0261	0.328			
Propionaldehyde	00123-38-6	6.96	0.0108	0.075			
		Total	62.9	128.5	2.042		
			58.2	96.4	1.657	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E85 - US06 - Test 6065							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	30.4907	0.422			
acetaldehyde	00075-07-0	6.46	6.8253	44.117			
Ethanol	00064-17-5	1.45	5.3395	7.737			
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.9238	2.606			
Ethylene	00074-85-1	8.88	1.7806	15.819			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.1558	9.179			
Ethane	00074-84-0	0.26	0.8861	0.233			
Formaldehyde	00050-00-0	9.59	0.8792	8.435			
n-Pentane	00109-66-0	1.21	0.4695	0.570			
1,3-Butadiene	00106-99-0	12.45	0.4392	5.470			
c-2-Butene	00590-18-1	14.26	0.3503	4.996			
Toluene	00108-88-3	3.93	0.3439	1.350			
Glyoxal	00107-22-2	12.59	0.0473	0.595			
Acrolein	00107-02-8	7.37	0.0104	0.076			
		Total	50.9	101.6	1.995		
			43.2	48.4	1.121	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E6 - UC - Test 5976							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	25.5614	0.354			
n-Propylbenzene	00103-65-1	1.96	7.1804	14.071			
Ethane	00074-84-0	0.26	6.4567	1.697			
Ethylene	00074-85-1	8.88	5.7213	50.830			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.1643	4.994			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.9637	5.370			
Toluene	00108-88-3	3.93	3.2568	12.783			
Propane	00074-98-6	0.46	2.7953	1.278			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.0063	15.932			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.9023	2.659			
2,2,5-Trimethylhexane	03522-94-9	1.05	1.7783	1.873			
Formaldehyde	00050-00-0	9.59	1.4094	13.521			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.3681	10.610			
3-Methylpentane	00096-14-0	1.69	1.2685	2.145			
n-Pentane	00109-66-0	1.21	1.2312	1.496			
2,2-Dimethylbutane	00075-83-2	1.11	1.1110	1.234			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.1032	1.047			
2,3-Dimethylbutane	00079-29-8	0.90	1.0680	0.960			
Benzene	00071-43-2	0.69	1.0656	0.740			
n-Hexane	00110-54-3	1.13	0.8520	0.967			
acetaldehyde	00075-07-0	6.46	0.8512	5.502			
2,4-Dimethylpentane	00108-08-7	1.46	0.7456	1.088			
2,4-Dimethylhexane	00589-43-5	1.61	0.7015	1.126			
acetone	00067-64-1	0.35	0.3561	0.126			
2-Butanone (MEK)	00078-93-3	1.45	0.1040	0.151			
benzaldehyde	00100-52-7	-0.71	0.0819	-0.058			
Propionaldehyde	00123-38-6	6.96	0.0630	0.439			
Glyoxal	00107-22-2	12.59	0.0387	0.487			
Acrolein	00107-02-8	7.37	0.0127	0.094			
		Total	78.2	153.5	1.963		
			75.3	133.3	1.770	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E32 - UC - Test 6098							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	23.2627	0.322			
Ethanol	00064-17-5	1.45	12.4614	18.056			
2-Methylbutane (Isopentane)	00078-78-4	1.35	9.9954	13.543			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	4.6976	5.633			
Toluene	00108-88-3	3.93	4.6169	18.121			
Ethylene	00074-85-1	8.88	4.0170	35.689			
acetaldehyde	00075-07-0	6.46	4.0157	25.956			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	2.8737	4.017			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.5516	20.263			
n-Pentane	00109-66-0	1.21	2.3456	2.850			
2,2,5-Trimethylhexane	03522-94-9	1.05	2.2041	2.321			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.1048	16.324			
2,3-Dimethylbutane	00079-29-8	10.48	1.9122	20.046			
Formaldehyde	00050-00-0	9.59	1.7046	16.354			
Ethane	00074-84-0	0.26	1.6383	0.431			
Benzene	00071-43-2	0.69	1.6195	1.125			
Acetylene (Ethyne)	00074-86-2	0.95	1.6188	1.531			
3-Methylpentane	00096-14-0	1.69	1.5763	2.665			
2,3,4-Trimethylpentane	00565-75-3	0.95	1.3613	1.292			
n-Hexane	00110-54-3	1.13	1.1685	1.326			
2,2-Dimethylbutane	00075-83-2	1.11	1.1003	1.223			
1,3-Butadiene	00106-99-0	12.45	1.0606	13.209			
2,4-Dimethylpentane	00108-08-7	1.46	0.9148	1.335			
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.8862	4.758			
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.8677	2.769			
2,3-Dimethylpentane	00565-59-3	1.25	0.8668	1.082			
Methylcyclopentane	00096-37-7	2.05	0.8421	1.726			
Propene	00115-07-1	11.57	0.8333	9.645			
2-Methylhexane	00591-76-4	1.09	0.8286	0.899			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.8184	6.045			
2,4-Dimethylhexane	00589-43-5	1.61	0.7860	1.262			
2-Methyl-2-butene	00513-35-9	14.20	0.7128	10.118			
acetone	00067-64-1	0.35	0.3443	0.121			
2-Butanone (MEK)	00078-93-3	1.45	0.1330	0.193			
benzaldehyde	00100-52-7	-0.71	0.0901	-0.064			
Propionaldehyde	00123-38-6	6.96	0.0858	0.597			
n-butyraldehyde	00123-72-8	5.85	0.0237	0.139			
Valeraldehyde	000110-62-3	4.98	0.0187	0.093			
Glyoxal	00107-22-2	12.59	0.0187	0.236			
Acrolein	00107-02-8	7.37	0.0086	0.063			
		Total	99.0	263.3	2.660		
			92.5	219.6	2.373	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E59 - UC - Test 6042							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	42.7814	0.593			
Ethanol	00064-17-5	1.45	14.0552	20.366			
Ethylene	00074-85-1	8.88	8.9284	79.323			
Ethane	00074-84-0	0.26	4.6963	1.234			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.8833	5.261			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.4194	19.213			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	2.1804	2.615			
Acetylene (Ethyne)	00074-86-2	0.95	2.1559	2.039			
Propene	00115-07-1	11.57	1.7556	20.319			
Toluene	00108-88-3	3.93	1.4182	5.566			
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.40	1.2766	1.784			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.2505	9.236			
Propane	00074-98-6	0.46	1.1618	0.531			
n-Pentane	00109-66-0	1.21	1.0982	1.334			
t-2-Butene	00624-64-6	15.20	0.9649	14.664			
Benzene	00071-43-2	0.69	0.9289	0.645			
2,2,5-Trimethylhexane	03522-94-9	1.05	0.8814	0.928			
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.8561	6.639			
1,3-Butadiene	00106-99-0	12.45	0.7078	8.815			
		Total	93.4	201.1	2.153	w/o aldehydes	
No aldehydes Measured - No Primary Bag, Secondary Bag had no data							

Vehicle 8007 - Fuel E85 - UC - Test 6069							
Non Zero Mass Species Sorted By VOC							
Exhaust Speciation							
Species	CAS No.	MIR	Composite VOC mg/mi	Ozone mg/mi			
Methane	00074-82-8	0.01	47.5312	0.658			
Ethanol	00064-17-5	1.45	28.7898	41.716			
acetaldehyde	00075-07-0	6.46	13.0779	84.531			
Ethylene	00074-85-1	8.88	5.7795	51.347			
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.9602	31.449			
2-Methylbutane (Isopentane)	00078-78-4	1.35	3.6789	4.985			
Formaldehyde	00050-00-0	9.59	1.7763	17.041			
Ethane	00074-84-0	0.26	1.6599	0.436			
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.6332	12.062			
Acetylene (Ethyne)	00074-86-2	0.95	0.9765	0.924			
n-Pentane	00109-66-0	1.21	0.8652	1.051			
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.20	0.8520	1.022			
Toluene	00108-88-3	3.93	0.8354	3.279			
n-Butane	00106-97-8	1.08	0.8302	0.894			
acetone	00067-64-1	0.35	0.1709	0.060			
Propionaldehyde	00123-38-6	6.96	0.1157	0.805			
2-Butanone (MEK)	00078-93-3	1.45	0.0498	0.072			
Glyoxal	00107-22-2	12.59	0.0290	0.365			
benzaldehyde	00100-52-7	-0.71	0.0283	-0.020			
Acrolein	00107-02-8	7.37	0.0149	0.110			
Valeraldehyde	000110-62-3	4.98	0.0091	0.045			
n-butyraldehyde	00123-72-8	5.85	0.0041	0.024			
		Total	112.7	252.9	2.244		
			97.4	149.8	1.538	w/o aldehydes	
	aldehydes						

Vehicle 8007 - Fuel E6 - RL Cold - Test 25739					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Methane	00074-82-8	0.01	8.86	0.123	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	4.55	53.230	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.41	26.462	
c-1,3-Dimethylcyclopentane	02532-58-3	4.47	2.01	8.979	
n-Butane	00106-97-8	1.08	1.54	1.656	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.21	9.636	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.05	1.419	
2-Methyl-1-butene	00563-46-2	6.38	0.97	6.214	
2,2-Dimethylpentane	00590-35-2	1.04	0.95	0.989	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.75	7.892	
2-Methylhexane	00591-76-4	1.09	0.64	0.694	
Indan	00496-11-7	3.23	0.63	2.043	
2,2-DiMeHexane	00590-73-8	0.94	0.54	0.508	
2,4-Dimethylhexane	00589-43-5	1.61	0.47	0.763	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.42	0.505	
2-Methylheptane	00592-27-8	0.97	0.36	0.350	
c-2-Pentene	00627-20-3	10.3	0.35	3.642	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.30	1.603	
t-2-Pentene	00646-04-8	10.5	0.29	3.015	
n-Pentane	00109-66-0	1.21	0.27	0.332	
t-2-Hexene	04050-45-7	8.55	0.24	2.032	
Methylcyclopentane	00096-37-7	2.05	0.24	0.487	
3-Methylheptane	00589-81-1	1.12	0.23	0.254	
t-1,2-Dimethylcyclopentane	00822-50-4	4.47	0.21	0.948	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.20	2.323	
2-Methyl-2-pentene	00625-27-4	11	0.17	1.907	
Methylcyclohexane	00108-87-2	1.56	0.17	0.264	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.13	1.511	
2,4-Dimethylpentane	00108-08-7	1.46	0.07	0.097	
Ethylbenzene	00100-41-4	2.96	0.06	0.192	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.06	0.104	
		Total	31.4	140.2	4.469
No MIR available, use weighted average of 4.4687					

Vehicle 8007 - Fuel E32 - RL Cold - Test 25800					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	15.98	118.018	
Methane	00074-82-8	0.01	11.68	0.162	
Ethylene	00074-85-1	8.88	6.43	57.145	
2-Methylbutane (Isopentane)	00078-78-4	1.35	5.81	7.877	
Unknown #22		4.90	5.02	24.584	
t-2-Butene	00624-64-6	15.20	4.62	70.180	
Acetylene (Ethyne)	00074-86-2	0.95	4.53	4.284	
n-Heptane	00142-82-5	0.97	4.21	4.061	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	3.91	31.058	
1,3,5-Trimethylbenzene	00108-67-8	11.8	3.83	45.055	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	3.43	4.110	
t-1,2-Dimethylcyclopentane	00822-50-4	4.90	3.26	15.974	
Cyclohexane	00110-82-7	1.14	3.18	3.614	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.30	12.376	
1,2,3-Trimethylbenzene	00526-73-8	11.9	2.23	26.590	
2,4-Dimethylhexane	00589-43-5	1.61	2.22	3.565	
Toluene	00108-88-3	3.93	2.15	8.455	
Methylcyclopentane	00096-37-7	2.05	2.06	4.220	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.79	1.952	
n-Butane	00106-97-8	1.08	1.78	1.922	
t-2-Hexene	04050-45-7	8.55	1.68	14.349	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.59	2.556	
n-Undecane	01120-21-4	0.52	1.49	0.779	
2-Methyl-1,3-butadiene	00078-79-5	10.5	1.36	14.274	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.25	1.183	
4-Methyl-t-2-pentene	00674-76-0	8.04	1.19	9.535	
2,2-Dimethylbutane	00075-83-2	1.11	1.18	1.307	
1,3-Butadiene	00106-99-0	12.5	1.01	12.613	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.92	1.281	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.90	11.205	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.87	4.624	
2-Methyl-1-butene	00563-46-2	6.38	0.83	5.276	
Ethylbenzene	00100-41-4	2.96	0.74	2.188	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.73	0.766	
2-Methylheptane	00592-27-8	0.97	0.66	0.637	
ortho-Xylene	00095-47-6	7.58	0.65	4.956	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.65	4.288	
2,4-Dimethylpentane	00108-08-7	1.46	0.64	0.933	
2,3-Dimethylbutane	00079-29-8	0.9	0.55	0.494	
2,3-Dimethylpentane	00565-59-3	1.25	0.55	0.684	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.52	4.060	

Vehicle 8007 - Fuel E32 - RL Cold - Test 25800 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Benzene	00071-43-2	0.69	0.49	0.338	
2-Methylhexane	00591-76-4	1.09	0.37	0.397	
2,2-DiMeHexane	00590-73-8	0.94	0.34	0.317	
c-2-Pentene	00627-20-3	10.3	0.32	3.307	
3-Methylpentane	00096-14-0	1.69	0.32	0.542	
n-Hexane	00110-54-3	1.13	0.30	0.338	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.22	2.594	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.21	1.148	
2-Methyl-2-butene	00513-35-9	14.2	0.11	1.631	
		Total	113.0	553.8	4.899
No MIR available, use weighted average of 4.8990					

Vehicle 8007 - Fuel E59 - RL Cold - Test 25772					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	26.74	38.751	
Ethylene	00074-85-1	8.88	4.32	38.392	
Unknown #18		2.91	3.29	9.573	
n-Butane	00106-97-8	1.08	3.14	3.379	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.63	20.908	
ortho-Xylene	00095-47-6	7.58	2.24	16.980	
2,2-DiMeHexane	00590-73-8	0.94	2.22	2.086	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.11	2.223	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.98	2.375	
Ethylbenzene	00100-41-4	2.96	1.73	5.138	
Toluene	00108-88-3	3.93	1.70	6.657	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.69	13.112	
2,4-Dimethylhexane	00589-43-5	1.61	1.55	2.484	
2-Methylbutane (Isopentane)	00078-78-4	1.35	1.54	2.081	
4-Methyloctane	02216-34-4	0.85	1.22	1.034	
Methylcyclohexane	00108-87-2	1.56	1.13	1.757	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.98	0.931	
n-Pentane	00109-66-0	1.21	0.96	1.163	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.89	1.000	
c-2-Pentene	00627-20-3	10.3	0.84	8.678	
2-Methyl-1-butene	00563-46-2	6.38	0.76	4.832	
Methylcyclopentane	00096-37-7	2.05	0.76	1.549	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.75	1.051	
n-Nonane	00111-84-2	0.68	0.73	0.498	
n-Heptane	00142-82-5	0.97	0.65	0.628	
t-2-Pentene	00646-04-8	10.5	0.50	5.214	
2-Methyl-2-butene	00513-35-9	14.2	0.28	3.994	
2,3-Dimethylbutane	00079-29-8	0.9	0.26	0.232	
Indan	00496-11-7	3.23	0.23	0.758	
2,3-Dimethylpentane	00565-59-3	1.25	0.17	0.214	
		Total	68.0	197.7	2.907
No MIR available, use weighted average of 2.9072					

Vehicle 8007 - Fuel E85 - RL Cold - Test 25786					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
n-Propylbenzene	00103-65-1	1.96	28.71	56.253	
Ethanol	00064-17-5	1.45	19.50	28.259	
Methane	00074-82-8	0.01	5.23	0.072	
n-Butane	00106-97-8	1.08	2.33	2.513	
1,2,3-Trimethylbenzene	00526-73-8	11.9	1.74	20.801	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.63	1.721	
2-Methyl-2-butene	00513-35-9	14.2	1.52	21.536	
2,2-DiMeHexane	00590-73-8	0.94	1.42	1.340	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.36	10.824	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	1.29	5.663	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.28	9.910	
Indan	00496-11-7	3.23	1.27	4.100	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.24	9.167	
Methylcyclohexane	00108-87-2	1.56	0.93	1.439	
2,4-Dimethylhexane	00589-43-5	1.61	0.77	1.244	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.55	2.947	
ortho-Xylene	00095-47-6	7.58	0.44	3.297	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.27	0.437	
Toluene	00108-88-3	3.93	0.13	0.506	
Benzene	00071-43-2	0.69	0.12	0.082	
Ethylbenzene	00100-41-4	2.96	0.10	0.306	
c-2-Pentene	00627-20-3	10.3	0.09	0.891	
		Total	71.9	183.3	2.549

Vehicle 8007 - Fuel E6 - RL Total - Test 25739					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Propane	00074-98-6	0.46	16.18	7.396	
t-2-Butene	00624-64-6	15.2	6.74	102.393	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	4.16	32.226	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.24	17.817	
3-Methylheptane	00589-81-1	1.12	1.74	1.958	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.58	1.769	
2-Methylheptane	00592-27-8	0.97	1.24	1.203	
2,2-DiMeHexane	00590-73-8	0.94	1.17	1.097	
3,5-Dimethylheptane	00926-82-9	1.42	1.13	1.606	
2-Methylpropane	00075-28-5	1.18	1.08	1.275	
Ethylbenzene	00100-41-4	2.96	0.93	2.750	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.59	3.183	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.59	7.078	
c-2-Butene	00590-18-1	14.3	0.55	7.901	
t-2-Hexene	04050-45-7	8.55	0.48	4.063	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.47	1.834	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.42	4.937	
2,2-Dimethylbutane	00075-83-2	1.11	0.36	0.403	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.32	0.333	
2-Methyl-2-pentene	00625-27-4	11	0.30	3.337	
Unknown #14		4.82	0.30	1.428	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.29	0.321	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.27	1.194	
n-Propylbenzene	00103-65-1	1.96	0.26	0.511	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.24	1.259	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.17	2.015	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.11	0.173	
Cyclopentene	00142-29-0	6.69	0.02	0.144	
		Total	43.9	211.6	4.816

Vehicle 8007 - Fuel E32 - RL Total - Test 25800					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylbutane (Isopentane)	00078-78-4	1.35	14.42	19.533	
Methane	00074-82-8	0.01	14.10	0.195	
Ethylene	00074-85-1	8.88	12.49	110.928	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	11.84	87.414	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	6.27	49.807	
Acetylene (Ethyne)	00074-86-2	0.95	6.04	5.713	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	5.18	27.810	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	5.03	38.978	
Toluene	00108-88-3	3.93	4.64	18.196	
2,2-Dimethylpropane	00463-82-1	0.65	4.35	2.811	
n-Heptane	00142-82-5	0.97	3.60	3.475	
t-2-Butene	00624-64-6	15.2	3.52	53.420	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	3.45	18.260	
Unknown #22	.	4.6	3.15	14.505	
Cyclohexane	00110-82-7	1.14	3.09	3.513	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.99	3.590	
1,3,5-Trimethylbenzene	00108-67-8	11.8	2.87	33.791	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	2.35	2.568	
2,4-Dimethylhexane	00589-43-5	1.61	2.31	3.709	
2-Methyl-1,3-butadiene	00078-79-5	10.5	2.19	22.932	
t-2-Hexene	04050-45-7	8.55	2.13	18.175	
c-2-Butene	00590-18-1	14.3	2.02	28.830	
1,3-Butadiene	00106-99-0	12.5	1.98	24.625	
2-Methyl-1-butene	00563-46-2	6.38	1.98	12.605	
Methylcyclohexane	00108-87-2	1.56	1.89	2.947	
1,2,3-Trimethylbenzene	00526-73-8	11.9	1.66	19.788	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.60	1.517	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.57	2.520	
Ethylbenzene	00100-41-4	2.96	1.52	4.508	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.38	1.458	
n-Octane	00111-65-9	0.8	1.36	1.086	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	1.35	1.889	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	1.25	8.280	
2,2-Dimethylbutane	00075-83-2	1.11	1.25	1.385	
Benzene	00071-43-2	0.69	1.21	0.838	
n-Hexane	00110-54-3	1.13	1.05	1.196	
ortho-Xylene	00095-47-6	7.58	0.93	7.053	
2,3-Dimethylbutane	00079-29-8	0.9	0.92	0.823	
3-Methylheptane	00589-81-1	1.12	0.87	0.978	
2,3-Dimethylpentane	00565-59-3	1.25	0.87	1.084	
3-Methylpentane	00096-14-0	1.69	0.80	1.356	

Vehicle 8007 - Fuel E32 - RL Total - Test 25800 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
n-Butane	00106-97-8	1.08	0.79	0.846	
2-Methylhexane	00591-76-4	1.09	0.75	0.818	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.70	3.875	
Methylcyclopentane	00096-37-7	2.05	0.67	1.376	
n-Pentane	00109-66-0	1.21	0.61	0.747	
Cyclopentadiene	00542-92-7	6.89	0.61	4.180	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.38	4.409	
n-Propylbenzene	00103-65-1	1.96	0.32	0.618	
2-Methyl-2-butene	00513-35-9	14.2	0.14	1.957	
2,4-Dimethylpentane	00108-08-7	1.46	0.14	0.200	
		Total	148.5	683.1	4.599
No MIR available, use weighted average of 4.5986					

Vehicle 8007 - Fuel E59 - RL Total - Test 25772					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	45.66	66.156	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	10.68	78.864	
Toluene	00108-88-3	3.93	5.86	23.004	
2,2-DiMeHexane	00590-73-8	0.94	5.69	5.352	
Ethylene	00074-85-1	8.88	5.52	49.057	
1,3-Butadiene	00106-99-0	12.5	5.03	62.659	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	4.73	37.564	
Acetylene (Ethyne)	00074-86-2	0.95	4.30	4.067	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.01	5.429	
2,2,5-Trimethylhexane	03522-94-9	1.05	3.05	3.209	
n-Butane	00106-97-8	1.08	2.96	3.186	
ortho-Xylene	00095-47-6	7.58	2.74	20.792	
Benzene	00071-43-2	0.69	2.62	1.820	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.48	2.969	
1,2,3-Trimethylbenzene	00526-73-8	11.9	2.43	29.024	
n-Undecane	01120-21-4	0.52	2.23	1.165	
n-Pentane	00109-66-0	1.21	2.14	2.596	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.83	2.048	
1,3,5-Trimethylbenzene	00108-67-8	11.8	1.79	21.013	
Ethylbenzene	00100-41-4	2.96	1.78	5.261	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.66	12.865	
Methylcyclohexane	00108-87-2	1.56	1.44	2.236	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.26	6.782	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.22	1.159	
2-Methyl-1-butene	00563-46-2	6.38	1.21	7.731	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	1.18	1.652	
2,2-Dimethylbutane	00075-83-2	1.11	0.80	0.886	
Indan	00496-11-7	3.23	0.80	2.578	
Methylcyclopentane	00096-37-7	2.05	0.73	1.506	
2-Methyl-2-butene	00513-35-9	14.2	0.67	9.524	
n-Heptane	00142-82-5	0.97	0.59	0.567	
Cyclohexane	00110-82-7	1.14	0.57	0.645	
2,3-Dimethylbutane	00079-29-8	0.9	0.54	0.483	
t-2-Pentene	00646-04-8	10.5	0.39	4.080	
2,3-Dimethylpentane	00565-59-3	1.25	0.04	0.054	
		Total	130.6	478.0	3.660

Vehicle 8007 - Fuel E85 - RL Total - Test 25786					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	35.67	51.682	
n-Propylbenzene	00103-65-1	1.96	23.63	46.307	
Ethylene	00074-85-1	8.88	5.53	49.126	
n-Butane	00106-97-8	1.08	3.41	3.673	
Methane	00074-82-8	0.01	3.23	0.045	
2,2-DiMeHexane	00590-73-8	0.94	2.49	2.345	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.61	12.775	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.50	11.644	
c-2-Pentene	00627-20-3	10.3	1.41	14.484	
Toluene	00108-88-3	3.93	1.33	5.232	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.29	1.354	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	1.24	1.360	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.17	8.638	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.13	13.210	
Indan	00496-11-7	3.23	0.94	3.037	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.88	3.880	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.86	10.258	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.74	3.973	
Benzene	00071-43-2	0.69	0.71	0.493	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.69	7.284	
c-2-Butene	00590-18-1	1.12	0.69	0.780	
Methylcyclohexane	00108-87-2	1.56	0.64	0.992	
Ethylbenzene	00100-41-4	2.96	0.54	1.593	
n-Pentane	00109-66-0	1.21	0.45	0.542	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.37	0.352	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.36	4.208	
t-2-Pentene	00646-04-8	10.5	0.24	2.497	
2-Methyl-1-butene	00563-46-2	6.38	0.22	1.382	
2-Methyl-2-butene	00513-35-9	14.2	0.09	1.231	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.02	0.034	
		Total	93.1	264.4	2.841

Vehicle 8007 - Fuel E6 - HS - Test 7404					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Methane	00074-82-8	0.01	3.67	0.051	
Ethanol	00064-17-5	1.45	1.95	2.819	
2,2-DiMeHexane	00590-73-8	0.94	0.67	0.627	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.56	4.356	
Methylcyclohexane	00108-87-2	1.56	0.46	0.723	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.33	1.058	
2,2-Dimethylbutane	00075-83-2	1.11	0.27	0.299	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.25	0.263	
Indan	00496-11-7	3.23	0.21	0.664	
2-Methylheptane	00592-27-8	0.97	0.20	0.196	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.20	2.335	
Ethylbenzene	00100-41-4	2.96	0.18	0.540	
2-Methylhexane	00591-76-4	1.09	0.13	0.145	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.13	0.137	
n-Heptane	00142-82-5	0.97	0.07	0.072	
2,4-Dimethylhexane	00589-43-5	1.61	0.06	0.101	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.06	0.091	
2,3-Dimethylpentane	00565-59-3	1.25	0.05	0.058	
		Total	9.4	14.5	1.538

Vehicle 8007 - Fuel E32 - HS - Test 7706					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	9.61	70.956	
2-Methylbutane (Isopentane)	00078-78-4	1.35	2.87	3.895	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.76	21.431	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	2.21	11.884	
Propane	00074-98-6	0.46	2.17	0.993	
Unknown #22	.	5.27	0.91	4.822	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.86	10.136	
n-Hexane	00110-54-3	1.13	0.83	0.940	
Cyclohexane	00110-82-7	1.14	0.82	0.928	
Ethylbenzene	00100-41-4	2.96	0.81	2.398	
2-Methyl-2-pentene	00625-27-4	11	0.75	8.285	
3-Methylpentane	00096-14-0	1.69	0.75	1.269	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.74	8.835	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.61	0.856	
ortho-Xylene	00095-47-6	7.58	0.57	4.348	
t-2-Butene	00624-64-6	15.2	0.55	8.330	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.53	2.798	
4-Methyl-t-2-pentene	00674-76-0	8.04	0.52	4.151	
Indan	00496-11-7	3.23	0.48	1.555	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.47	0.524	
n-Nonane	00111-84-2	0.68	0.45	0.309	
t-2-Hexene	04050-45-7	8.55	0.42	3.561	
n-Octane	00111-65-9	0.8	0.41	0.329	
n-Pentane	00109-66-0	1.21	0.40	0.489	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.40	4.652	
n-Undecane	01120-21-4	0.52	0.39	0.204	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.36	0.376	
2,3-Dimethylbutane	00079-29-8	0.9	0.35	0.318	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.34	4.012	
Toluene	00108-88-3	3.93	0.34	1.325	
Methylcyclohexane	00108-87-2	1.56	0.34	0.521	
Unknown #21		5.27	0.33	1.745	
Unknown #25		5.27	0.33	1.717	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.32	0.350	
2-Methylheptane	00592-27-8	0.97	0.31	0.298	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.30	0.359	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.29	1.580	
t-1,2-Dimethylcyclopentane	00822-50-4	5.27	0.28	1.462	
2-Methyl-1-butene	00563-46-2	6.38	0.28	1.768	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.23	2.938	
1,3-Diethylbenzene	00141-93-5	7.08	0.23	1.643	

Vehicle 8007 - Fuel E32 - HS - Test 7706					Continued...
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
3-Methyl-1-butene	00563-45-1	6.85	0.23	1.569	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.20	0.895	
2,2-Dimethylbutane	00075-83-2	1.11	0.18	0.206	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.18	0.175	
2,4-Dimethylpentane	00108-08-7	1.46	0.18	0.262	
c-1,3-Dimethylcyclopentane	02532-58-3	5.27	0.18	0.928	
n-Heptane	00142-82-5	0.97	0.17	0.159	
Methylcyclopentane	00096-37-7	2.05	0.16	0.325	
Styrene	00100-42-5	1.66	0.16	0.258	
n-Propylbenzene	00103-65-1	1.96	0.14	0.266	
1,4-Diethylbenzene	00105-05-5	4.39	0.13	0.574	
2-Methylhexane	00591-76-4	1.09	0.11	0.123	
Unknown #8		5.27	0.10	0.511	
3-Methylheptane	00589-81-1	1.12	0.09	0.104	
Cyclopentene	00142-29-0	6.69	0.07	0.470	
c-2-Butene	00590-18-1	14.3	0.05	0.773	
2,3-Dimethylpentane	00565-59-3	1.25	0.04	0.052	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.03	0.248	
t-2-Pentene	00646-04-8	10.5	0.03	0.315	
		Total	39.4	207.5	5.272
No MIR available, use weighted average of 5.2722					

Vehicle 8007 - Fuel E59 - HS - Test 7542					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
n-Butane	00106-97-8	1.08	8.36	9.006	
Ethanol	00064-17-5	1.45	6.21	8.995	
2-Methylbutane (Isopentane)	00078-78-4	1.35	4.19	5.675	
Toluene	00108-88-3	3.93	2.01	7.878	
n-Hexane	00110-54-3	1.13	1.02	1.154	
n-Pentane	00109-66-0	1.21	0.86	1.039	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	0.79	1.103	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.78	5.748	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.78	0.931	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.74	5.710	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.58	0.649	
Cyclohexane	00110-82-7	1.14	0.57	0.651	
3-Methylpentane	00096-14-0	1.69	0.49	0.829	
2,2-DiMeHexane	00590-73-8	0.94	0.46	0.428	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.44	2.383	
2-Methyl-2-butene	00513-35-9	14.2	0.33	4.673	
Methylcyclopentane	00096-37-7	2.05	0.32	0.660	
2,3-Dimethylbutane	00079-29-8	0.9	0.32	0.284	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.29	0.271	
Benzene	00071-43-2	0.69	0.26	0.181	
t-2-Pentene	00646-04-8	10.5	0.25	2.616	
n-Heptane	00142-82-5	0.97	0.23	0.226	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.22	0.699	
2-Methylhexane	00591-76-4	1.09	0.21	0.223	
2,4-Dimethylpentane	00108-08-7	1.46	0.20	0.295	
2,3-Dimethylpentane	00565-59-3	1.25	0.20	0.253	
Ethylbenzene	00100-41-4	2.96	0.19	0.561	
ortho-Xylene	00095-47-6	7.58	0.16	1.250	
2-Methyl-1-butene	00563-46-2	6.38	0.15	0.978	
c-2-Pentene	00627-20-3	10.3	0.14	1.459	
c-2-Butene	00590-18-1	14.3	0.14	1.942	
		Total	31.9	68.8	2.157

Vehicle 8007 - Fuel E85 - HS - Test 7592					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	4.45	6.442	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.36	24.846	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.96	1.075	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.65	5.063	
2,2-DiMeHexane	00590-73-8	0.94	0.39	0.372	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.24	1.072	
3-Methyl-t-2-pentene	00616-12-6	11.66	0.19	2.184	
n-Pentane	00109-66-0	1.21	0.18	0.213	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.18	0.970	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.14	1.617	
n-Octane	00111-65-9	0.80	0.14	0.109	
n-Heptane	00142-82-5	0.97	0.13	0.127	
2,2-Dimethylbutane	00075-83-2	1.11	0.11	0.123	
t-2-Pentene	00646-04-8	10.47	0.11	1.130	
Methylcyclohexane	00108-87-2	1.56	0.10	0.159	
Indan	00496-11-7	3.23	0.04	0.139	
Benzene	00071-43-2	0.69	0.04	0.029	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.04	0.062	
c-2-Pentene	00627-20-3	10.28	0.02	0.175	
ortho-Xylene	00095-47-6	7.58	0.01	0.045	
		Total	11.5	46.0	4.006

Vehicle 8007 - Fuel E6 - DHB Day 1 - Test 7405					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	31.19	45.200	
2-Methylbutane (Isopentane)	00078-78-4	1.35	10.77	14.591	
Toluene	00108-88-3	3.93	5.83	22.884	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	4.77	5.717	
2,2-DiMeHexane	00590-73-8	0.94	4.47	4.212	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	4.21	5.879	
n-Pentane	00109-66-0	1.21	4.15	5.041	
t-2-Butene	00624-64-6	15.2	3.84	58.325	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.44	18.909	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.28	2.405	
3-Methylpentane	00096-14-0	1.69	2.17	3.673	
2,3-Dimethylbutane	00079-29-8	0.9	2.13	1.912	
n-Hexane	00110-54-3	1.13	1.90	2.157	
Benzene	00071-43-2	0.69	1.87	1.297	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.80	1.704	
Methylcyclopentane	00096-37-7	2.05	1.34	2.752	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.32	9.739	
2,2-Dimethylbutane	00075-83-2	1.11	1.15	1.281	
2-Methylhexane	00591-76-4	1.09	1.08	1.175	
2,3-Dimethylpentane	00565-59-3	1.25	1.08	1.345	
3,5-Dimethylheptane	00926-82-9	1.42	1.04	1.481	
n-Heptane	00142-82-5	0.97	1.04	1.001	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.99	1.108	
2,4-Dimethylpentane	00108-08-7	1.46	0.98	1.427	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.98	3.121	
2,4-Dimethylhexane	00589-43-5	1.61	0.96	1.546	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.90	7.153	
ortho-Xylene	00095-47-6	7.58	0.85	6.458	
3-Methylheptane	00589-81-1	1.12	0.75	0.841	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.65	1.051	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.62	0.681	
Cyclohexane	00110-82-7	1.14	0.58	0.659	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.57	3.041	
t-1,2-Dimethylcyclopentane	00822-50-4	2.58	0.52	1.346	
t-2-Hexene	04050-45-7	8.55	0.47	4.027	
Ethylbenzene	00100-41-4	2.96	0.46	1.363	
2-Methyl-2-butene	00513-35-9	14.2	0.43	6.065	
c-1,3-Dimethylcyclopentane	02532-58-3	2.58	0.41	1.049	
Methylcyclohexane	00108-87-2	1.56	0.40	0.628	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.40	4.947	
Propane	00074-98-6	0.46	0.39	0.177	

Vehicle 8007 - Fuel E6 - DHB Day 1 - Test 7405 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	0.39	0.373	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.35	4.040	
n-Octane	00111-65-9	0.8	0.31	0.248	
c-1,3-Dimethylcyclohexane	00638-04-0	2.58	0.29	0.748	
2-Methylpropane	00075-28-5	1.18	0.27	0.320	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.22	0.979	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.22	2.620	
2-Methyl-2-pentene	00625-27-4	11	0.17	1.911	
Cyclopentene	00142-29-0	6.69	0.17	1.153	
2-Methyl-1-butene	00563-46-2	6.38	0.17	1.097	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.12	0.665	
t-2-Pentene	00646-04-8	10.47	0.11	1.104	
c-2-Butene	00590-18-1	14.26	0.09	1.346	
c-2-Pentene	00627-20-3	10.28	0.06	0.570	
Indan	00496-11-7	3.23	0.05	0.158	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.70	0.02	0.188	
n-Propylbenzene	00103-65-1	1.96	0.01	0.021	
		Total	107.2	276.9	2.583
No MIR available, use weighted average of 2.5830					

Vehicle 8007 - Fuel E32 - DHB Day 1 - Test 7709					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	22.73	32.941	
2-Methylbutane (Isopentane)	00078-78-4	1.35	15.38	20.843	
Methylcyclohexane	00108-87-2	1.56	4.32	6.724	
Toluene	00108-88-3	3.93	3.69	14.475	
n-Pentane	00109-66-0	1.21	3.62	4.393	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	2.96	21.864	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.58	3.091	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	2.47	3.451	
3-Me-1-Hexene	03404-61-3	4.27	1.86	7.929	
3-Methylpentane	00096-14-0	1.69	1.35	2.277	
n-Hexane	00110-54-3	1.13	1.33	1.508	
2,2,5-Trimethylhexane	03522-94-9	1.05	1.31	1.384	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.27	9.860	
c-2-Butene	00590-18-1	14.3	1.20	17.119	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.18	13.813	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.97	0.919	
2,3-Dimethylbutane	00079-29-8	0.9	0.97	0.869	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.95	3.021	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.84	4.506	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.80	6.375	
Methylcyclopentane	00096-37-7	2.05	0.78	1.590	
2-Methylhexane	00591-76-4	1.09	0.75	0.816	
Benzene	00071-43-2	0.69	0.71	0.491	
c-1,3-Dimethylcyclopentane	02532-58-3	2.74	0.70	1.925	
3,5-Dimethylheptane	00926-82-9	1.42	0.60	0.856	
2-Methyl-1-butene	00563-46-2	6.38	0.59	3.756	
2,3-Dimethylpentane	00565-59-3	1.25	0.57	0.716	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.54	0.868	
t-2-Pentene	00646-04-8	10.5	0.54	5.623	
ortho-Xylene	00095-47-6	7.58	0.52	3.927	
n-Heptane	00142-82-5	0.97	0.51	0.491	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.49	0.535	
2,4-Dimethylpentane	00108-08-7	1.46	0.46	0.670	
2,4-Dimethylhexane	00589-43-5	1.61	0.46	0.733	
2-Methyl-2-butene	00513-35-9	14.2	0.39	5.490	
c-2-Pentene	00627-20-3	10.3	0.37	3.798	
t-1,2-Dimethylcyclopentane	00822-50-4	2.74	0.37	1.001	
t-2-Hexene	04050-45-7	8.55	0.36	3.076	
2,2-Dimethylbutane	00075-83-2	1.11	0.35	0.394	
n-Octane	00111-65-9	0.8	0.32	0.259	
Ethylbenzene	00100-41-4	2.96	0.32	0.949	

Vehicle 8007 - Fuel E32 - DHB Day 1 - Test 7709 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
2-Methylheptane	00592-27-8	0.97	0.32	0.309	
n-Butane	00106-97-8	1.08	0.31	0.335	
n-Propylbenzene	00103-65-1	1.96	0.28	0.554	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.27	3.146	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.25	2.983	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.25	3.167	
t-2-Nonene	06434-78-2	2.74	0.23	0.618	
3-Methylheptane	00589-81-1	1.12	0.22	0.246	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.21	0.238	
c-1,3-Dimethylcyclohexane	00638-04-0	2.74	0.20	0.557	
2-Methyl-2-pentene	00625-27-4	11	0.20	2.233	
1-Methylcyclopentene	00693-89-0	12.5	0.20	2.461	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.20	0.858	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.17	0.894	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.12	1.398	
		Total	85.9	235.3	2.740
No MIR available, use weighted average of 2.7396					

Vehicle 8007 - Fuel E59 - DHB Day 1 - Test 7543					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	53.86	78.043	
2-Methylbutane (Isopentane)	00078-78-4	1.35	14.39	19.493	
2,2-DiMeHexane	00590-73-8	0.94	4.97	4.683	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	4.55	33.586	
n-Butane	00106-97-8	1.08	4.33	4.659	
n-Pentane	00109-66-0	1.21	3.96	4.809	
Toluene	00108-88-3	3.93	2.92	11.469	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	2.59	3.616	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.04	2.289	
n-Hexane	00110-54-3	1.13	1.76	1.998	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.73	2.076	
2,3-Dimethylbutane	00079-29-8	0.9	1.37	1.230	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.36	10.565	
3-Methylpentane	00096-14-0	1.69	1.30	2.205	
Cyclohexane	00110-82-7	1.14	1.22	1.384	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.01	8.009	
Methylcyclopentane	00096-37-7	2.05	0.79	1.623	
2,4-Dimethylhexane	00589-43-5	1.61	0.76	1.224	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.73	2.323	
Methylcyclohexane	00108-87-2	1.56	0.65	1.013	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.63	0.600	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.63	0.664	
2,4-Dimethylpentane	00108-08-7	1.46	0.60	0.883	
n-Heptane	00142-82-5	0.97	0.58	0.556	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.56	0.897	
2,2-Dimethylbutane	00075-83-2	1.11	0.54	0.596	
2,3-Dimethylpentane	00565-59-3	1.25	0.50	0.628	
2-Methylhexane	00591-76-4	1.09	0.45	0.494	
Benzene	00071-43-2	0.69	0.43	0.297	
Indan	00496-11-7	3.23	0.42	1.363	
ortho-Xylene	00095-47-6	7.58	0.37	2.812	
2-Methyl-2-butene	00513-35-9	14.2	0.34	4.757	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.26	3.216	
t-2-Hexene	04050-45-7	8.55	0.25	2.107	
Ethylbenzene	00100-41-4	2.96	0.24	0.718	
t-2-Pentene	00646-04-8	10.5	0.08	0.849	
2-Methyl-1-butene	00563-46-2	6.38	0.07	0.448	
		Total	113.2	218.2	1.927

Vehicle 8007 - Fuel E85 - DHB Day 1 - Test 7594					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	38.90	56.370	
2-Methylbutane (Isopentane)	00078-78-4	1.35	9.53	12.913	
2,2-DiMeHexane	00590-73-8	0.94	3.92	3.690	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	3.71	27.426	
n-Pentane	00109-66-0	1.21	3.12	3.788	
Toluene	00108-88-3	3.93	3.02	11.843	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	2.44	28.530	
1-Butyne	00107-00-6	6.05	1.77	10.733	
n-Butane	00106-97-8	1.08	1.64	1.762	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	1.26	1.758	
2,3-Dimethylbutane	00079-29-8	0.9	1.12	1.010	
n-Hexane	00110-54-3	1.13	0.84	0.951	
3,5-Dimethylheptane	00926-82-9	1.42	0.82	1.170	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	0.82	6.373	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	0.72	0.865	
Methylcyclohexane	00108-87-2	1.56	0.62	0.959	
3-Methylpentane	00096-14-0	1.69	0.59	0.991	
Methylcyclopentane	00096-37-7	2.05	0.54	1.109	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.50	0.548	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.50	0.527	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.46	0.440	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.46	2.464	
t-2-Pentene	00646-04-8	10.5	0.45	4.705	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.44	3.501	
Cyclohexane	00110-82-7	1.14	0.44	0.496	
2-Methyl-1-butene	00563-46-2	6.38	0.42	2.658	
Isopropylbenzene (Cumene)	00098-82-8	2.57	0.38	0.989	
ortho-Xylene	00095-47-6	7.58	0.35	2.643	
Benzene	00071-43-2	0.69	0.34	0.236	
2-Methylheptane	00592-27-8	0.97	0.32	0.311	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.32	1.009	
Cyclopentene	00142-29-0	6.69	0.31	2.074	
2,4-Dimethylhexane	00589-43-5	1.61	0.29	0.470	
2,2-Dimethylbutane	00075-83-2	1.11	0.29	0.320	
2-Methyl-2-butene	00513-35-9	14.2	0.29	4.072	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.27	0.436	
c-1,3-Dimethylcyclohexane	00638-04-0	2.57	0.26	0.676	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.26	3.060	
2,4-Dimethylpentane	00108-08-7	1.46	0.25	0.368	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.24	0.268	
1c-2t-3-TriMeCyPentane	15890-40-1	2.57	0.22	0.562	

Vehicle 8007 - Fuel E85 - DHB Day 1 - Test 7594 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.20	1.443	
c-2-Pentene	00627-20-3	10.3	0.20	2.059	
n-Heptane	00142-82-5	0.97	0.19	0.187	
2-Methyl-1,3-butadiene	00078-79-5	10.5	0.18	1.929	
c-2-Butene	00590-18-1	14.3	0.18	2.624	
c-2-Heptene	06443-92-1	7.08	0.17	1.236	
2,4-Dimethylheptane	02213-23-2	1.26	0.16	0.207	
2-Methylhexane	00591-76-4	1.09	0.16	0.174	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.15	1.714	
t-1,2-Dimethylcyclopentane	00822-50-4	2.57	0.13	0.344	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.13	1.541	
n-Octane	00111-65-9	0.8	0.13	0.104	
n-Decane	00124-18-5	0.59	0.13	0.075	
Ethylbenzene	00100-41-4	2.96	0.11	0.337	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.10	1.249	
2,3-Dimethylpentane	00565-59-3	1.25	0.09	0.114	
t-2-Hexene	04050-45-7	8.55	0.08	0.718	
n-Propylbenzene	00103-65-1	1.96	0.06	0.112	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.05	0.264	
		Total	86.1	221.5	2.574
No MIR available, use weighted average of 2.5737					

Vehicle 8007 - Fuel E6 - DHB Total - Test 7405					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	51.67	74.868	
2-Methylbutane (Isopentane)	00078-78-4	1.35	20.51	27.790	
Toluene	00108-88-3	3.93	10.41	40.872	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	8.40	10.077	
n-Pentane	00109-66-0	1.21	7.90	9.603	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	7.69	10.752	
2,2-DiMeHexane	00590-73-8	0.94	7.64	7.196	
t-2-Butene	00624-64-6	15.2	4.68	71.070	
3-Methylpentane	00096-14-0	1.69	4.21	7.121	
2,2,5-Trimethylhexane	03522-94-9	1.05	4.00	4.209	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	3.84	29.742	
2,3-Dimethylbutane	00079-29-8	0.9	3.75	3.367	
n-Hexane	00110-54-3	1.13	3.61	4.094	
Benzene	00071-43-2	0.69	3.38	2.350	
2,3,4-Trimethylpentane	00565-75-3	0.95	2.96	2.806	
Methylcyclopentane	00096-37-7	2.05	2.86	5.871	
Methane	00074-82-8	0.01	2.33	0.032	
2-Methylhexane	00591-76-4	1.09	2.24	2.429	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	2.01	6.419	
2,4-Dimethylpentane	00108-08-7	1.46	1.95	2.839	
2,3-Dimethylpentane	00565-59-3	1.25	1.90	2.366	
2,2-Dimethylbutane	00075-83-2	1.11	1.88	2.089	
2,4-Dimethylhexane	00589-43-5	1.61	1.87	3.006	
Cyclohexane	00110-82-7	1.14	1.66	1.890	
3,5-Dimethylheptane	00926-82-9	1.42	1.50	2.141	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.43	11.390	
2,3,5-Trimethylhexane	01069-53-0	1.12	1.35	1.514	
2-Methyl-2-butene	00513-35-9	14.2	1.23	17.406	
3-Methyl-c-2-pentene	00922-62-3	12.5	1.21	15.181	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	1.14	1.833	
Methylcyclohexane	00108-87-2	1.56	1.13	1.761	
n-Heptane	00142-82-5	0.97	1.12	1.085	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.06	5.717	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	1.05	7.773	
2-Methylheptane	00592-27-8	0.97	0.97	0.943	
3-Methylheptane	00589-81-1	1.12	0.92	1.038	
c-1,3-Dimethylcyclohexane	00638-04-0	2.53	0.90	2.264	
Ethylbenzene	00100-41-4	2.96	0.80	2.370	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.75	3.987	
Cyclopentene	00142-29-0	6.69	0.73	4.901	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.73	8.580	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.72	0.786	
c-1,3-Dimethylcyclopentane	02532-58-3	2.53	0.71	1.792	
t-2-Hexene	04050-45-7	8.55	0.71	6.063	

Vehicle 8007 - Fuel E6 - DHB Total - Test 7405 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
ortho-Xylene	00095-47-6	7.58	0.70	5.305	
t-1,2-Dimethylcyclopentane	00822-50-4	2.53	0.70	1.759	
t-2-Pentene	00646-04-8	4.77	0.66	3.151	
t-1,3 & c-1,4-DiMeCyHexane	02207-03-6+00624-29-3	2.53	0.65	1.631	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.62	7.260	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.59	4.187	
n-Octane	00111-65-9	0.80	0.57	0.451	
1,3,5-Trimethylbenzene	00108-67-8	11.75	0.55	6.477	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.51	3.362	
4-Methyloctane	02216-34-4	0.85	0.50	0.424	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.49	2.149	
2-Methyl-1-butene	00563-46-2	6.38	0.44	2.796	
2,4-Dimethylheptane	02213-23-2	1.26	0.42	0.536	
2-Methyl-2-pentene	00625-27-4	11.03	0.42	4.599	
c-2-Heptene	06443-92-1	7.08	0.40	2.821	
c-2-Pentene	00627-20-3	10.28	0.34	3.537	
1-Nonene	00124-11-8	2.49	0.33	0.826	
1-MeCyHexene & 4-MeHeptane	00591-49-1+00589-53-7	3.86	0.32	1.226	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.30	2.374	
Unknown #5		2.53	0.30	0.759	
n-Propylbenzene	00103-65-1	1.96	0.30	0.587	
2-Methylpropane	00075-28-5	1.18	0.27	0.320	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.27	1.475	
Unknown #16		2.53	0.23	0.591	
Indan	00496-11-7	3.23	0.09	0.295	
2,4,4-Trimethyl-2-Pentene	00107-40-4	6.30	0.09	0.569	
1,2,3-Trimethylbenzene	00526-73-8	11.94	0.08	0.961	
n-Nonane	00111-84-2	0.68	0.02	0.016	
		Total	194.7	491.8	2.526
No MIR available, use weighted average of 2.5260					

Vehicle 8007 - Fuel E32 - DHB Total - Test 7709					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	59.61	86.374	
2-Methylbutane (Isopentane)	00078-78-4	1.35	21.29	28.847	
Methylcyclohexane	00108-87-2	1.56	7.27	11.312	
n-Pentane	00109-66-0	1.21	6.63	8.057	
Toluene	00108-88-3	3.93	6.16	24.171	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	5.45	40.219	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	5.09	7.118	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	4.77	5.721	
1-Butyne	00107-00-6	6.05	3.01	18.182	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.85	22.100	
3-Methylpentane	00096-14-0	1.69	2.83	4.777	
n-Hexane	00110-54-3	1.13	2.66	3.023	
2,2,5-Trimethylhexane	03522-94-9	1.05	2.42	2.552	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	2.19	3.518	
2,3-Dimethylbutane	00079-29-8	0.9	2.10	1.888	
Methylcyclopentane	00096-37-7	2.05	2.05	4.195	
3-Me-1-Hexene	03404-61-3	4.27	1.80	7.713	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	1.76	20.589	
2-Methyl-1-butene	00563-46-2	6.38	1.65	10.531	
2,3,4-Trimethylpentane	00565-75-3	0.95	1.63	1.547	
t-3-Heptene	14686-14-7	6.17	1.39	8.606	
3,5-Dimethylheptane	00926-82-9	1.42	1.39	1.981	
2,2-Dimethylpropane	00463-82-1	0.65	1.34	0.863	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	1.28	10.134	
n-Butane	00106-97-8	1.08	1.23	1.320	
Benzene	00071-43-2	0.69	1.18	0.816	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.11	5.973	
2,4-Dimethylpentane	00108-08-7	1.46	1.08	1.574	
2-Methylhexane	00591-76-4	1.09	1.03	1.115	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.98	3.131	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.95	1.032	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.94	1.057	
3,3-Dimethylpentane	00562-49-2	1.12	0.84	0.944	
2-Methyl-2-butene	00513-35-9	14.2	0.83	11.799	
2,3-Dimethylpentane	00565-59-3	1.25	0.82	1.024	
t-2-Pentene	00646-04-8	10.5	0.82	8.585	
2,2-Dimethylbutane	00075-83-2	1.11	0.74	0.827	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.69	3.664	
c-2-Pentene	00627-20-3	10.3	0.68	7.003	
3-Methylheptane	00589-81-1	1.12	0.63	0.704	
2-Methylheptane	00592-27-8	0.97	0.61	0.589	
c-1,3-Dimethylcyclohexane	00638-04-0	2.50	0.60	1.512	
Ethylbenzene	00100-41-4	2.96	0.58	1.715	
n-Undecane	01120-21-4	0.52	0.56	0.293	

Vehicle 8007 - Fuel E32 - DHB Total - Test 7709 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
ortho-Xylene	00095-47-6	7.58	0.54	4.118	
t-2-Hexene	04050-45-7	8.55	0.47	3.989	
n-Nonane	00111-84-2	0.68	0.44	0.300	
t-1,2-Dimethylcyclopentane	00822-50-4	2.50	0.42	1.040	
2-Methyl-2-Hexene & c-3-Heptene	02738-19-4+07642-10-6	7.84	0.41	3.209	
2,4-Dimethylheptane	02213-23-2	1.26	0.41	0.514	
n-Propylbenzene	00103-65-1	1.96	0.40	0.776	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.39	4.926	
c-1,3-Dimethylcyclopentane	02532-58-3	2.50	0.39	0.986	
t-2-Butene	00624-64-6	15.2	0.39	5.964	
n-Octane	00111-65-9	0.8	0.38	0.306	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.33	3.802	
2-Methyl-2-pentene	00625-27-4	11	0.29	3.163	
1-Methylcyclopentene	00693-89-0	12.5	0.27	3.419	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.18	2.141	
Cyclopentene	00142-29-0	6.69	0.18	1.200	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.08	0.372	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.06	0.699	
		Total	171.6	429.6	2.504
No MIR available, use weighted average of 2.5043					

Vehicle 8007 - Fuel E59 - DHB Total - Test 7543					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	86.53	125.383	
2-Methylbutane (Isopentane)	00078-78-4	1.35	23.44	31.756	
2,2-DiMeHexane	00590-73-8	0.94	6.86	6.461	
n-Pentane	00109-66-0	1.21	6.85	8.321	
Toluene	00108-88-3	3.93	4.39	17.234	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	4.33	6.047	
n-Butane	00106-97-8	1.08	3.39	3.652	
n-Hexane	00110-54-3	1.13	3.09	3.508	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	2.93	3.508	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	2.75	21.815	
2,3,5-Trimethylhexane	01069-53-0	1.12	2.55	2.856	
3-Methylpentane	00096-14-0	1.69	2.46	4.156	
2,3-Dimethylbutane	00079-29-8	0.9	2.28	2.045	
Propene	00115-07-1	11.6	2.06	23.890	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	1.50	11.615	
Cyclohexane	00110-82-7	1.14	1.49	1.694	
Methylcyclopentane	00096-37-7	2.05	1.42	2.913	
n-Heptane	00142-82-5	0.97	1.35	1.299	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	1.34	4.287	
Benzene	00071-43-2	0.69	1.19	0.827	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.97	0.920	
2-Methylhexane	00591-76-4	1.09	0.95	1.034	
Methylcyclohexane	00108-87-2	1.56	0.90	1.396	
2,2-Dimethylbutane	00075-83-2	1.11	0.88	0.977	
2,4-Dimethylpentane	00108-08-7	1.46	0.87	1.273	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.86	0.910	
2,3-Dimethylpentane	00565-59-3	1.25	0.83	1.042	
2,4-Dimethylhexane	00589-43-5	1.61	0.76	1.215	
2-Methyl-2-butene	00513-35-9	14.2	0.61	8.593	
3,5-Dimethylheptane	00926-82-9	1.42	0.56	0.797	
2-Methyl-1-pentene & 1-Hexene	00592-41-6+00763-29-1	5.3	0.56	2.945	
t-2-Hexene	04050-45-7	8.55	0.51	4.348	
ortho-Xylene	00095-47-6	7.58	0.51	3.851	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.44	0.712	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.40	4.647	
Ethylbenzene	00100-41-4	2.96	0.39	1.161	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.34	4.201	
2-Methylheptane	00592-27-8	0.97	0.33	0.321	
n-Octane	00111-65-9	0.8	0.30	0.239	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.26	3.050	
2-Methyl-1-butene	00563-46-2	6.38	0.21	1.345	
t-2-Pentene	00646-04-8	10.5	0.10	1.076	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	0.05	0.256	
		Total	174.8	329.6	1.886

Vehicle 8007 - Fuel E85 - DHB Total - Test 7594					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Ethanol	00064-17-5	1.45	83.02	120.291	
2-Methylbutane (Isopentane)	00078-78-4	1.35	16.99	23.013	
2,2-DiMeHexane	00590-73-8	0.94	7.85	7.386	
n-Pentane	00109-66-0	1.21	5.36	6.513	
Toluene	00108-88-3	3.93	4.39	17.216	
n-Butane	00106-97-8	1.08	2.70	2.909	
1-Butyne	00107-00-6	6.05	2.65	16.037	
meta- & para-Xylenes	00108-38-3+00106-42-3	7.76	2.47	19.118	
n-Hexane	00110-54-3	1.13	2.22	2.519	
2-MePentane & 4-Me-c-2-Pentene	00691-38-3+00107-83-5	1.4	2.18	3.043	
Benzene	00071-43-2	0.69	2.01	1.393	
3,5-Dimethylheptane	00926-82-9	1.42	1.73	2.464	
2,2,4-TriMePentane (IsoOctane)	00540-84-1	1.2	1.73	2.073	
Cyclohexane	00110-82-7	1.14	1.39	1.583	
1,2,4-TriMeBenz & t-Butylbenzene	00095-63-6+00098-06-6	5.37	1.22	6.561	
3-Methylpentane	00096-14-0	1.69	1.01	1.709	
2,3-Dimethylbutane	00079-29-8	0.9	0.97	0.869	
Propene	00115-07-1	11.6	0.83	9.570	
2,3,5-Trimethylhexane	01069-53-0	1.12	0.78	0.872	
Methylcyclopentane	00096-37-7	2.05	0.78	1.593	
ortho-Xylene	00095-47-6	7.58	0.74	5.633	
1-Pentene & 2-Butyne	00109-67-1+00503-17-3	11.7	0.71	8.308	
2-Methylpropene & 1-Butene	00115-11-7+00106-98-9	7.94	0.68	5.362	
Cyclohexene & 3-Methylhexane	00110-83-8+00589-34-4	3.19	0.66	2.121	
2-Methyl-2-butene	00513-35-9	14.2	0.66	9.373	
n-Heptane	00142-82-5	0.97	0.64	0.623	
t-2-Pentene	00646-04-8	10.5	0.62	6.519	
2-Methyl-1-butene	00563-46-2	6.38	0.62	3.936	
2,3,4-Trimethylpentane	00565-75-3	0.95	0.59	0.564	
Methylcyclohexane	00108-87-2	1.56	0.59	0.919	
2,2,5-Trimethylhexane	03522-94-9	1.05	0.55	0.579	
2-Methylhexane	00591-76-4	1.09	0.55	0.593	
Ethylbenzene	00100-41-4	2.96	0.54	1.591	
2,2-Dimethylbutane	00075-83-2	1.11	0.45	0.499	
1,2,3-Trimethylbenzene	00526-73-8	11.9	0.44	5.266	
2,4-Dimethylheptane	02213-23-2	1.26	0.41	0.523	
2,3-Dimethylpentane	00565-59-3	1.25	0.41	0.508	
1,3,5-Trimethylbenzene	00108-67-8	11.8	0.41	4.764	
2,3-DiMeHexane & 2,3-MeEtPentane	00584-94-1+	1.09	0.40	0.441	
2,4-Dimethylhexane	00589-43-5	1.61	0.40	0.638	
1-Ethyl-2-Methylbenzene	00611-14-3	5.54	0.39	2.180	
2,5-DiMeHexane & EtCyPentane	00592-13-2+01640-89-7	1.61	0.36	0.579	
3-Methyl-t-2-pentene	00616-12-6	11.7	0.35	4.041	
n-Octane	00111-65-9	0.8	0.34	0.274	

Vehicle 8007 - Fuel E85 - DHB Total - Test 7594 Continued...					
Non Zero Mass Species Sorted By VOC					
Evaporative Speciation					
Species	CAS No.	MIR	Composite VOC mg	Ozone mg	
Cyclopentene	00142-29-0	6.69	0.34	2.250	
2,4-Dimethylpentane	00108-08-7	1.46	0.33	0.485	
t-2-Hexene	04050-45-7	8.55	0.33	2.783	
Indan	00496-11-7	3.23	0.32	1.043	
c-2-Hexene & 3-MeCyclopentene	07688-21-3+01120-62-3	6.61	0.29	1.908	
1-Methyl-2-Propylbenzene	01074-17-5	5.43	0.27	1.468	
3-Methylheptane	00589-81-1	1.12	0.27	0.301	
c-2-Pentene	00627-20-3	10.3	0.25	2.560	
t-1,2-Dimethylcyclopentane	00822-50-4	2.10	0.25	0.518	
1-Methyl-3-Propylbenzene	01074-43-7	7.08	0.23	1.655	
n-Propylbenzene	00103-65-1	1.96	0.23	0.448	
2-Methyl-2-pentene	00625-27-4	11	0.22	2.375	
2-Methylheptane	00592-27-8	0.97	0.18	0.174	
1c-2t-3-TriMeCyPentane	15890-40-1	2.10	0.17	0.356	
c-1,3-Dimethylcyclopentane	02532-58-3	2.10	0.14	0.298	
c-2-Heptene	06443-92-1	7.08	0.14	0.981	
3-Methyl-c-2-pentene	00922-62-3	12.5	0.14	1.709	
1-Methyl-4-Ethylbenzene	00622-96-8	4.39	0.04	0.183	
1-Methyl-3-Ethylbenzene	00620-14-4	7.39	0.01	0.044	
		Total	158.9	334.1	2.103
No MIR available, use weighted average of 2.1026					

Appendix IV - Miscellaneous

Appendix IV is added with a number of relevant documents that pertain to the object of this study and may provide the reader with additional insights, or serve as a refresher. The documents are;

- Background – The Renewable Fuels Standard and the Energy Policy Act
- Background – Corporate Average Fuel Economy (CAFÉ) Credits
- Part 600—Fuel Economy of Motor Vehicles;

There are 5 pages in this appendix.

Background – The Renewable Fuels Standard and the Energy Policy Act

The Energy Policy Act of 2005 amended the Clean Air Act to establish a Renewable Fuel Standard (RFS) program. The U.S. Congress gave EPA the responsibility to coordinate with the U.S. Department of Energy, the U.S. Department of Agriculture, and stakeholders to design and implement this first-of-its-kind program. Three months after the Energy Policy Act of 2005 was signed, in December 2005, EPA set a statutory default standard that required that 2.78 percent of the gasoline sold or dispensed in calendar year 2006 be renewable fuel. Today's rulemaking establishes a comprehensive RFS program for 2007 through 2012 and beyond.
A renewable fuel is defined in the Energy Policy Act as a motor vehicle fuel that is produced from plant or animal products or wastes, as opposed to fossil fuel sources. Renewable fuels include ethanol, biodiesel and other motor vehicle fuels made from renewable sources. The program grants credit for both renewable fuels blended into conventional gasoline or diesel and those used in their neat (unblended) form as motor vehicle fuel.

Any party that produces gasoline for use in the U.S., including refiners, importers, and blenders (other than oxygenate blenders), is considered an obligated party under the RFS program. All obligated parties are expected to meet the renewable fuel standard beginning in 2007, with two important exceptions. First, small refiners and small refineries are exempt from meeting the renewable fuel requirements through 2010. Second, all gasoline producers located in Alaska, Hawaii, and noncontiguous U.S. territories are exempt from the RFS program indefinitely. These states and territories may opt into the program, however, and all of the refiners (except for small refiners and refineries), importers, and blenders located therein will then be subject to the renewable fuel standard.

Due to the certainty provided to investors by the RFS program, production capacity for ethanol and other renewable fuels has significantly increased since the Energy Policy Act was signed, and the construction of new and expanded facilities is projected to continue. As a result, nationwide volumes of renewable fuel already greatly exceed the RFS requirements. By 2012, nationwide volumes are projected to reach over 11 billion gallons, compared to the 7.5 billion gallons required.

Background – Corporate Average Fuel Economy (CAFÉ) Credits
There are a significant number of vehicles ("Flex-Fuel") in current use today[1] that are capable of operating on gasoline, or high level blends of ethanol, up to 85% by volume, known as E85. FFVs are available today in most vehicle classes, including compacts, sedans, and light duty trucks. While E85 is not commonly available (1900 of 170,000 stations offer it), the number of

[1] The Renewable Fuels Association web-site (www.rfa.org) offered that the number of flex-fuel vehicles on the road as of February 2010 was over 7 million vehicles

E-85 fueling stations are increasing nationwide. These "Flex-Fuel" vehicles were offered to consumers, usually at no cost increase, to take advantage of a Corporate Average Fuel Economy (CAFÉ) credit offered by the Congress starting as far back as model year 1993. The CAFÉ rating for those vehicles is the average of the fuel economy on gasoline, and the fuel economy on the alternative fuel, divided by .15. For example, this calculation procedure turns a dual fuel vehicle that averages 25 mpg on gasoline with the above 100 mpg alternative fuel to attain the 40 mpg value for CAFE purposes. For model years 1993-2014, the maximum CAFE increase for flex-fuel vehicles in a manufacturer's passenger car or light truck fleet is 1.2 mpg.

The CAFE law provides for special treatment of vehicle fuel economy calculations for dedicated alternative fuel vehicles and dual-fuel vehicles. The fuel economy of a dedicated alternative fuel vehicle is determined by dividing its fuel economy in equivalent miles per gallon of gasoline or diesel fuel by 0.15[2]. Thus a 15 mpg dedicated alternative fuel vehicle would be rated as 100 mpg. For dual-fuel vehicles (vehicles that can use the alternative fuel and gasoline or diesel interchangeably), the rating is the average of the fuel economy on gasoline or diesel and the fuel economy on the alternative fuel vehicle divided by .15. For example, this calculation procedure turns a dual fuel vehicle that averages 25 mpg on gasoline or diesel with the above 100 mpg alternative fuel to attain the 40 mpg value for CAFE purposes. Several limitations are established for CAFE credits for dual fuel vehicles. For MYs 1993-2004, the maximum CAFE increase attributable to dual fueled vehicles in a manufacturer's passenger car or light truck fleet was 1.2 mpg.

The Alternative Motor Fuels Act (AMFA) directed the Secretary of Transportation, in consultation with the EPA Administrator and the Secretary of Energy, to conduct a study and submit a report to Congress evaluating the success of the policy decision to offer CAFE credit calculation incentives for dual-fuel and gaseous dual-fuel vehicles. The report was transmitted to Congress in March 2002.

The statutory language also requires that the Department of Transportation either extend the incentive program for dual-fuel vehicles beyond MY 2004 for up to four more years with a maximum allowable increase in average fuel economy for a manufacturer of 0.9 miles per gallon; or issue a Federal Register notice that justifies termination of the incentive program. In March 2002, NHTSA issued an NPRM proposing to extend the availability of the CAFE credit incentive for dual-fueled vehicles for four years, through the end of the 2008 model year.

---

[2] Title 40: Protection of Environment; **PART 600—FUEL ECONOMY OF MOTOR VEHICLES;** Subpart F—Fuel Economy Regulations for Model Year 1978 Passenger Automobiles and for 1979 and Later Model Year Automobiles (Light Trucks and Passenger Automobiles)—Procedures for Determining Manufacturer's Average Fuel Economy; § 600.510-08 Calculation of average fuel economy (c)(2)(v)(B); (B) The combined model type fuel economy value for operation on alcohol fuel as determined in §600.208(b)(5)(ii) divided by 0.15 provided the requirements of §600.510(g) are met…

Title 40: Protection of Environment;
PART 600—FUEL ECONOMY OF MOTOR VEHICLES;
Subpart F—Fuel Economy Regulations for Model Year 1978 Passenger Automobiles and for 1979 and Later Model Year Automobiles (Light Trucks and Passenger Automobiles)—Procedures for Determining Manufacturer's Average Fuel Economy;

§ 600.510-08 Calculation of average fuel economy (c)(2)(v)(B); (B) The combined model type fuel economy value for operation on alcohol fuel as determined in §600.208(b)(5)(ii) divided by 0.15 provided the requirements of §600.510(g) are met…

(v) For alcohol dual fuel model types, for model years 1993 through 2019, the harmonic average of the following two terms; the result rounded to the nearest 0.1 mpg:

(A) The combined model type fuel economy value for operation on gasoline or diesel fuel as determined in §600.208(b)(5)(i); and
(B) The combined model type fuel economy value for operation on alcohol fuel as determined in §600.208(b)(5)(ii) divided by 0.15 provided the requirements of §600.510(g) are met…

(g)(1) Alcohol dual fuel automobiles and natural gas dual fuel automobiles must provide equal or greater energy efficiency while operating on alcohol or natural gas as while operating on gasoline or diesel fuel to obtain the CAFE credit determined in paragraphs (c)(2)(v) and (vi) of this section. The following equation must hold true:
$E_{alt}/E_{pet} >$ or $= 1$
Where:
$E_{alt} = [FE_{alt}/(NHV_{alt} \times D_{alt})] \times 10^6$ = energy efficiency while operating on alternative fuel rounded to the nearest 0.01 miles/million BTU.
$E_{pet} = [FE_{pet}/(NHV_{pet} \times D_{pet})] \times 10^6$ = energy efficiency while operating on gasoline or diesel (petroleum) fuel rounded to the nearest 0.01 miles/million BTU.
FE_{alt} is the fuel economy [miles/gallon for liquid fuels or miles/100 standard cubic feet for gaseous fuels] while operated on the alternative fuel as determined in §600.113–08(a) and (b);
FE_{pet} is the fuel economy [miles/gallon] while operated on petroleum fuel (gasoline or diesel) as determined in §600.113(a) and (b);
NHV_{alt} is the net (lower) heating value [BTU/lb] of the alternative fuel;
NHV_{pet} is the net (lower) heating value [BTU/lb] of the petroleum fuel;
D_{alt} is the density [lb/gallon for liquid fuels or lb/100 standard cubic feet for gaseous fuels] of the alternative fuel;
D_{pet} is the density [lb/gallon] of the petroleum fuel.

(i) The equation must hold true for both the FTP city and HFET highway fuel economy values for each test of each test vehicle.
(ii)(A) The net heating value for alcohol fuels shall be determined per ASTM D 240–92 "Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from

the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*.

(B) The density for alcohol fuels shall be determined per ASTM D 1298–85 (Reapproved 1990) "Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. Copies may be inspected at U.S. EPA Headquarters Library, EPA West Building, Constitution Avenue and 14th Street, NW., Room 3340, Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*
(iii) The net heating value and density of gasoline are to be determined by the manufacturer in accordance with §600.113(f).

(2) [Reserved]

(3) Alcohol dual fuel passenger automobiles and natural gas dual fuel passenger automobiles manufactured during model years 1993 through 2019 must meet the minimum driving range requirements established by the Secretary of Transportation (49 CFR part 538) to obtain the CAFE credit determined in paragraphs (c)(2)(v) and (vi) of this section.

Appendix V. Statistical Analysis of Main Program Data

The following comprehensive statistical analysis was performed by James P. Uihlein of Chevron to add statistical weight to the findings and trends quoted in the report. The authors thank Jim for his efforts in this endeavor.

Overview – The four fuels tested in the E-80 program allow two important questions to be addressed:

1. Is there a trend in emissions as fuels go from low ethanol content to high ethanol content?
2. Given that these vehicles are calibrated for and certified on the endpoint fuels (E6 and E85 in this study), are emissions for the intermediate (E32 and E59) consistent with those of the endpoint fuels?

Typically, these questions would be answered by fitting a model that includes terms for the effect of Vehicles, Fuels, and Fuel x Vehicle interactions; this model could then be used to perform statistical tests on the averages for the individual fuels and combinations of the fuels. Unfortunately, the presence of only one observation per fuel and vehicle combination means that fitting the above model uses up all of the available degrees of freedom, leaving none for the determination of an error term for use in the statistical tests.

An alternative approach is to reduce the number of terms in the model by not including the Fuel x Vehicle interactions. However, there is a concern based on past experience in the evaluation of emissions data that the interaction terms could be large relative to the actual experimental error, which would lead to erroneous conclusions based on the statistical tests.

Instead, it was decided to take advantage of the fact that the fuels can be related to one another based on their ethanol content. Rather than modeling fuels as four distinct class variables as in the above models, the chosen model uses ethanol content as a continuous variable. Furthermore, a quadratic model based on ethanol content is employed in order to answer both of the required questions: the first order ethanol term is aimed at the first question, while the second order term primarily answers the second question. The resulting model includes fixed effect terms for the intercept, Ethanol and Ethanol Squared, and random effect terms for intercept x Vehicle and Ethanol x Vehicle interactions.

However, the interpretation of this model is not completely straightforward. There are four potential outcomes when fitting this model:

1. Neither the first nor second order term is significant.
2. The first order term is significant, but the second order term is not.
3. The second order term is significant, but the first order term is not.
4. Both the first and second order terms are significant.

Interpretation of three of the four outcomes is straightforward. For #1, there was no significant relationship observed between ethanol content and the emission being evaluated (i.e., the answer to both questions is “no”). For #2, a consistent trend in emissions was determined to be

significant. For #4, both an overall trend and an inconsistency between the endpoint and intermediate fuels were determined to be significant.

Outcome #3 requires further analysis. While the presence of a significant second order effect clearly shows an inconsistency between the endpoint and intermediate fuels, the non-significance of the first order effect does not necessarily indicate that no significant overall trend was observed. This is because the second order term can at times capture some of the linear trend, making the first order term appear to be less significant (note that this phenomenon is one of the justifications for maintaining hierarchy in polynomial models). Therefore, a test of the difference between the endpoint fuels was performed in order to make a determination of the significance of the overall trend; in this case, the estimated difference between the E85 and E6 result was tested to determine whether it was significantly different than zero.

It should be noted that the relatively small sample size and number of tests may have been a factor in some trends not being found to be statistically significant. In particular, the effects that were significant at the 90% confidence level, but not at the 95% level, could have benefited from additional testing.

General Notes on Regressions – All regressions were performed using a mixed model with fixed effects of the form:

$$Emission = Intercept + a * Ethanol + b * Ethanol^2$$

Random effects representing the interactions between the vehicles and both the intercept and first order ethanol content were also included. In cases where the estimated G matrix was not positive definite (indicating that a covariance parameter converged to zero), the model was re-run without the Vehicle x Ethanol random effect.

Due to the small number of vehicles, there was some concern about use of a mixed model instead of a fixed effects model. However, comparison of conclusions based on mixed models with those based on fixed effects models did not reveal substantial differences. Therefore, mixed model results are reported here since the vehicles are more appropriately treated as having been randomly selected from the larger population of FFVs.

The dependent variable "Emission" was either the actual measurement or a transformed value as indicated below. Ethanol content values were standardized, and Ethanol^2 values were calculated from the standardized values in order to minimize the correlation between the linear and quadratic terms. The analysis used the average ethanol content values reported in Table 3 for the E6 and E85 fuels; the ethanol contents for the E32 and E59 fuels were calculated from the E6 and E85 fuels based on the blend ratios of 2:1 and 1:2, respectively.

Exhaust Emissions Data – Modeled emissions measurements included THC, NMHC, NMOG, CO, NOX, acetaldehyde, formaldehyde, and fuel economy. The independent variable for all models used the natural log transformation of the emissions measurements, except for fuel economy. Only composite emissions results were analyzed.

Table V-1 contains the p-values for the linear and quadratic ethanol effects obtained from the modeling of the exhaust emissions. Instances in which the variable was significant at the 95% confidence level (i.e., $p < 0.05$) are highlighted. In addition, instances in which the variable was

significant at the 90% confidence level, but not the 95% confidence level are marked with an asterisk. The column labeled “linear check” contains the p-value for the test of the estimated difference between the measurements for E85 and E6 for the cases in which the quadratic term was either significant or near significant, but the linear term was not.

Table V-1. P-Values for Exhaust Emissions

a. Unified Cycle

Emission	Unified Cycle Linear	Unified Cycle Quadratic	Unified Cycle Linear Check
THC	0.9261	0.1704	
NMHC	0.4080	0.0518 *	0.3899
NMOG	0.3224	0.7947	
CO	0.4025	0.0594 *	0.3842
NOX	0.0642 *	0.9118	
Fuel Economy	<0.0001	0.8902	
Acetaldehyde	0.0001	0.8791	
Formaldehyde	0.0313	0.8083	

b. FTP

Emission	FTP Linear	FTP Quadratic	FTP Linear Check
THC	0.1439	0.5713	
NMHC	0.9744	0.4479	
NMOG	0.0978 *	0.7522	
CO	0.5592	0.3287	
NOX	0.5315	0.4538	
Fuel Economy	<0.0001	0.5608	
Acetaldehyde	<0.0001	0.0015	
Formaldehyde	0.0094	0.6698	

c. US06

Emission	US06 Linear	US06 Quadratic	US06 Linear Check
THC	0.0129	0.9411	
NMHC	0.0290	0.8246	
NMOG	0.0054	0.6352	
CO	0.4847	0.5704	
NOX	0.3085	0.0658 *	0.2861
Fuel Economy	<0.0001	0.3773	
Acetaldehyde	0.0019	0.4467	
Formaldehyde	0.4503	0.2944	

Evaporative Emissions Data – Modeled emissions measurements included Running Loss, Hot Soak, and each day of the 2-day diurnal emissions. None of the evaporative emissions measurements were transformed for modeling.

Table V-2 contains the p-values for the linear and quadratic ethanol effects obtained from the modeling of the evaporative emissions. Instances in which the variable was significant at the 95% confidence level (i.e., $p < 0.05$) are highlighted. In addition, instances in which the variable was significant at the 90% confidence level, but not the 95% confidence level are marked with an asterisk. The column labeled "linear check" contains the p-value for the test of the estimated difference between the measurements for E85 and E6 for the cases in which the quadratic term was either significant or near significant, but the linear term was not.

Table V-2. P-Values for Evaporative Emissions

	Unified Cycle		
Emission	**Linear**	**Quadratic**	**Linear Check**
Running Loss	**0.8150**	**0.9218**	
Hot Soak	**0.6100**	**0.0605 ***	**0.6100**
Diurnal Day 1	**0.0286**	**0.8313**	
Diurnal Day 2	**0.2021**	**0.6865**	

Summary of Findings - Several linear trends across all ethanol contents were found to be significant at the 95% confidence level. However, no quadratic effects were significant at the 95% confidence level (although some were significant at 90%). The presence of quadratic effects would have indicated an inconsistency between the endpoint ethanol contents (i.e., the ones for which the vehicles were calibrated) and the intermediate ethanol contents.