

CRC Report No. 668

**2014 CRC HOT-FUEL-HANDLING
PROGRAM**

Final Report

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2014 CRC HOT-FUEL-HANDLING PROGRAM

(CRC Project No. CM-138-13-1)

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Prepared by the
CRC Volatility Group

March 2015

CRC Performance Committee
of the
Coordinating Research Council

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ABSTRACT

The 2014 CRC Hot-Fuel-Handling Program was conducted at the General Motors Desert Proving Grounds (GMDPG-Y) in Yuma, Arizona, March 10 through May 10, 2014, and July 14 through August 16, 2014. The objective of the program was to determine the effects of fuel volatility on vehicle driveability performance at low altitude under hot ambient temperature conditions (ranging from a nominal 69°F for Class E to a nominal 110°F for Classes AA, A, and B) for all ASTM D4814 volatility classes. The test fleet of 16 late-model and 2 older vehicles, all equipped with fuel-injection systems, was selected from a larger fleet of 40 1998 – 2014 vehicles. The test fuel matrix design consisted of 16 test fuels with varying levels of vapor pressure, T₅₀, and TVL20. Fuel characteristics of the 16 test fuels covered ASTM D4814 Classes AA through E. The fuels were designed to push the volatility boundaries of gasoline containing up to 15 volume percent ethanol by maximizing vapor pressure, while minimizing TVL20 and T₅₀.

For the fuels and vehicles tested in this program:

- No statistically significant differences were observed in vehicle driveability Total Weighted Demerits (TWD) for ASTM compliant vapor pressure fuels and those with 1 psi higher vapor pressure tested in the same volatility class.
- No statistically significant differences in TWD were observed for ASTM Classes D and E fuels with T₅₀ of 150°F versus 145°F.

ACRONYMS AND ABBREVIATIONS

ASTM	ASTM, International
CRC	Coordinating Research Council
DVPE	Dry Vapor Pressure Equivalent
FFV	Flexible Fuel Vehicle
GMDPG-Y	General Motors Desert Proving Grounds – Yuma
HFH	Hot Fuel Handling
Ln LS Means	Natural Logarithm Least Squares Means
LS Means	Least Squares Means
mph	Miles per hour
NCWM	National Conference on Weights and Measures
PFI	Port Fuel Injection
psi	Pounds per square inch
SIDI	Spark Ignition Direct Injection
temp3	Temperature during third soak
T ₅₀	Fifty percent evaporated distillation point
TVL20	Temperature for a vapor to liquid ratio of 20:1
TWD	Total Weighted Demerits
WOT	Wide Open Throttle

I. INTRODUCTION

The CRC Volatility Group conducted a program in 2014 to assess the effect of current ASTM D4814⁽¹⁾ gasoline volatility property limits for fuel Classes AA through E [vapor pressure, 50% evaporated point (T_{50}), and temperature for a vapor-liquid ratio of 20 (TVL20)] on hot-fuel-handling (HFH) driveability performance in a group of 1999 - 2014 vehicles. The program also assessed higher vapor pressure limits currently permitted by the National Conference on Weights & Measures (NCWM) and by state waivers for ethanol-blended fuels containing up to 15 volume percent ethanol, as well as T_{50} slightly lower than current ASTM minimum limits, but occasionally observed in the field. The program included three vapor pressure levels for each ambient test temperature window in order to assess potential non-linear driveability effects; evaluated 10 and 15 volume percent ethanol blends; and utilized a variety of vehicle hardware content, fuel system designs, and model years.

The NCWM decided in 2012 that the model gasoline regulation in NIST Handbook 130⁽²⁾ should reference ASTM D4814 only, and remove all exceptions and waivers currently allowed for gasoline blended with ethanol. By taking this approach, the 1 psi waiver given for 10 volume percent non-VOC gasoline-ethanol blends by many of the states that adopt in part or in whole NIST Handbook 130 would be eliminated. ASTM D4814 does not address the vapor pressure effects from ethanol blending and continues to cite the original “neat” vapor pressure limits put in place before the introduction of ethanol into gasoline. The US marketplace has observed a steady increase in ethanol blending since the early 1990s, with refiners relying on the vapor pressure waiver to produce these fuels. Elimination of the waiver for a 1 psi increase from ethanol blending would result in significant reduction of light components in the present gasoline blending pool. After much deliberation at its July 2012 Annual Meeting, the NCWM continued to allow for the 1 psi waiver (reduced to 0.5 psi for Class E) until May 1, 2016 or sooner, if the ASTM D4814 specifications are modified to reflect the higher vapor pressure. This decision by the state regulators started the clock ticking for the aggressive development and implementation of a driveability project by CRC to generate data that could be used by ASTM in determining whether the ASTM D4814 specifications can be revised to include the higher vapor pressures currently allotted by waiver.

Recent CRC Reports Nos. 658 and 659^(3,4) detail the effects of D4814 gasoline limits on T_{50} , TVL20, and ethanol content on vehicle HFH driveability, both at sea level and altitude. CRC Report 658 focused primarily on Classes D-4 and E-5 gasolines at sea level, while CRC Report 659 was primarily focused on Classes A-1, B-2, and C-3 gasolines at high altitude. To further understand volatility effects on modern vehicle HFH performance, the present driveability study was planned to set the vapor pressure (dry vapor pressure equivalent or DVPE) parameter of a series of carefully designed test fuels to its maximum limit, while simultaneously setting the blends' T_{50} and TVL20 parameters to their minimum D4814 limits or lower. These properties were selected to stress the volatility of the ethanol-blended gasoline to the

extremes of volatility limits. All other test fuel parameters were held as constant as reasonably possible from blend to blend and are consistent with fuels observed in the US gasoline market. The test fuels contained either 10 or 15 volume percent ethanol.

The 2014 CRC Hot-Fuel-Handling Program was conducted at the General Motors Desert Proving Grounds (GMDPG-Y) in Yuma, Arizona during two periods, March 10 through May 10, 2014, and July 14 through August 16, 2014. There were 18 late-model and older vehicles selected from a larger fleet of 40 1998 – 2014 vehicles. The test fuel design consisted of 16 test fuels: 11 with 10 volume percent ethanol, and 5 with 15 volume percent ethanol. A separate high volatility fuel for screening the test vehicles was also designed. Fuel characteristics of the 16 test fuels covering ASTM D4814 Classes AA through E and of the screening fuel were measured by multiple laboratories and reported.

Members of the Data Analysis Panel and participants in the program are shown in Appendices A and B, respectively. Appendix C outlines the program as approved by the CRC Performance Committee. The demerit rating system and the draining and flushing procedures used are also included in Appendix C.

II. CONCLUSIONS

The conclusions below are based on statistical significance. However, “statistical significance” does not necessarily imply “practical significance”. “Statistical significance” refers to whether the observed change in Total Weighted Demerits determined by trained raters is different than would be expected by chance based upon statistical principles. “Practical significance” deals with whether the change in Total Weighted Demerits would be meaningful to a non-trained rater. An effect can be statistically significant, but not noticeable to a non-trained rater. For example, some of the workers at the Yuma test program that were non-trained raters commented that they did not observe vehicle performance issues while riding along in a test vehicle.

The conclusions from the 2014 CRC Hot-Fuel-Handling Program are:

- No statistically significant differences in Total Weighted Demerits (TWD) were observed for ASTM compliant vapor pressure fuels and those with 1 psi higher vapor pressure tested in the same volatility class for the fuels and vehicles tested in this program.
- No statistically significant differences in TWD were observed for ASTM Classes D and E fuels with 150°F vs. 145°F T_{50} .
- No statistically significant differences in TWD were observed between older vehicles (Pre-2005) and newer models (2013-2014).

- No statistically significant differences in TWD were observed for overall test fleet and port-fuel-injection (PFI) subset for ethanol content (E10 and E15 evaluated). The two spark-ignition-direct-injection (SIDI) vehicles evaluated show statistically significant effects for the high vapors pressure (16 psi) fuels only.
- The overall range of TWD for the vehicles in this test fleet were lower than those observed on prior hot fuel handling projects of this type, while differences in TWD between the sets of seasonal fuels are noted.
- Irrespective of the vapor pressure classes, further conclusions are:
 - TWD differences observed between fuels depended on raters.
 - TWD differences observed between fuels depended on ambient temperature ranges.
 - TWD differences observed between raters depended on vehicles.
 - TWD increased as maximum ambient temperature increases across volatility classes.
 - TWD increased as vehicle fuel rail temperature during the third soak of procedure increases.
 - Test site wind speeds effect on TWD up to 20 mph were not statistically significant for this study.
- Further conclusions concerning vehicles are:
 - A linear model relating vehicle TWD to DVPE shows vehicle, rater, vehicle*rater, DVPE, DVPE*rater, maximum ambient temp., and fuel rail temp³ were statistically significant factors that influenced TWD.
 - Analysis of the DVPE effect on individual vehicle driveability showed statistically significant effects for three vehicles ($p < 0.05$), and marginally statistically significant ($p < 0.10$) for one additional vehicle in the eighteen vehicle test fleet.
 - Cars had statistically significant higher TWD than trucks.
 - Port Fuel Injection (PFI) vehicles had statistically significant higher TWD than Spark Ignition Direct Injection (SIDI) vehicles.
 - Naturally aspirated vehicle engines had no statistically significant TWD difference than turbocharged vehicle engines.
 - Flexible Fuel Vehicles (FFVs) had no statistically significant TWD difference than conventional fuel vehicles. FFV sample size in this program is small (3) and all were classified as trucks.
 - Increases in Fuel System Pressure showed statistically significant increases in TWD.
 - As Load Factor (weight of vehicle per engine size) increased, TWD showed a statistically significant increase, irrespective of vapor pressure within a volatility class.

III. TEST VEHICLES

The final test fleet of 18 vehicles was screened from a larger fleet of 40 vehicles. The 40 vehicles were screened for fuel sensitivity by testing them first on their tank fuel and

then testing them on a specially-designed screening fuel (designated as Fuel 17) with a target vapor pressure of 17 psi, a target T_{50} of 140°F, a target TVL20 of 94°F, and a target ethanol content of 10 volume percent. Those vehicles that showed no scale of sensitivity between the two fuels were returned to the rental agency or private owner. The final decisions on the test vehicles also took into account wide representation of makes and models, production volume, engine displacement size, mechanical condition, and fuel sensitivity.

The 40-vehicle fleet included six 1998 through 2005 port-fuel-injected vehicles, fourteen 2013 port-fuel-injected vehicles, three 2013 gasoline-direct-injection vehicles, twelve 2014 port-fuel-injected vehicles, and five 2014 gasoline-direct-injection vehicles. There were nine General Motors, seven Chryslers, six Fords, five Toyotas, four Hyundais, three Nissans, three Volkswagens, two Kias, and one Mazda in the final test fleet. All 40 vehicles in the fleet were equipped with air conditioning and automatic transmissions. There were four flexible-fuel vehicles. Engine displacements ranged from 1.5 to 5.7 liters. The 18 vehicles in the final fleet are shown in Table 1 including two older vehicles (1999 and 2003). A complete description of the 40-vehicle fleet is presented in Table D-1 of Appendix D.

IV. TEST FUELS

The test fuel matrix design consisted of 16 test fuels with varying levels of vapor pressure, T_{50} , and TVL20. The fuels meet ASTM D4814 requirements except for the volatility properties under investigation. The volatility parameters (vapor pressure, TVL20, and T_{50}) were set at the extremes of the limits for the ASTM volatility class designations with vapor pressure at the maximum limits, along with TVL20 and T_{50} at their minimum levels. In some instances, these parameters were allowed to exceed the current specification limits. The fuel inspection matrix is presented in Table C-2 of Appendix C. Fuels in current ASTM D4814 gasoline volatility Classes AA through E comprised the matrix, as well as fuels with higher vapor pressure limits permitted by the NCWM and state waivers for ethanol-blended fuels containing up to 15 volume percent ethanol. Fuels were also represented with T_{50} slightly lower than current ASTM limits, but occasionally observed in the field. The matrix included three vapor pressure levels for each ambient test temperature window in order to assess potential non-linear driveability effects, and evaluated 15 volume percent ethanol blends relative to 10 volume percent ethanol blends. The older 1999 vehicle was not tested on 15 volume percent ethanol fuel blends, as federal regulations prohibit the use of such fuels in light-duty vehicles older than the 2001 model year.

Average dry vapor pressure equivalent (DVPE), TVL20, distillation temperatures, ethanol content, and other property inspection results as determined by the supplier and Fuel Acceptance Panel Laboratories are shown in Table 2. Individual test results obtained by each laboratory are shown in Table E-1 of Appendix E. Additional inspections provided on-site are also shown in Table E-2 of Appendix E.

V. TEST SITE

The test program was conducted at the General Motors Desert Proving Grounds in Yuma, Arizona. The altitude of the Proving Grounds is approximately sea level. A paved, level test road within the Proving Grounds was closed off and used as the test track for vehicle driveability evaluations performed by three raters. The office and fueling area were located near the GM fueling station, which was several miles away from the CRC test track. One container which had been purchased by CRC for equipment storage and converted into a refrigerated fuel storage container was used for constant-temperature fuel storage and fuel dispensing, and a fuel storage room located in the GM fueling facility and cooled by swamp coolers was used as an auxiliary storage area. Lower vapor-pressure fuels were also stored outside under a canopy during the cooler weather. The GM fueling facility also provided a Grabner Vapor Pressure Unit, a D86 Distillation Apparatus, and an operator to obtain measurements from the drum and vehicle samples. A small office trailer was rented. Three roofless wooden sheds for hot-soaking a vehicle were used, each capable of holding two vehicles. The sheds were set up approximately one-third of a mile from each other to allow for the three raters to safely test the vehicles at the same time. The defueling/flushing/refueling/sampling area was located at the GM fueling station, as were the fuel and vehicle storage, and the office trailer.

The program was conducted from March 10 through May 10, 2014, and July 14 through August 16, 2014. The week of March 10 was used to receive equipment, unpack, construct the soak sheds, prepare the test site, and prepare the vehicles for testing. The week of March 17 was used for vehicle screening for fuel sensitivity, and the core program was conducted the remainder of the time. The target ambient testing temperature windows were 65°F – 80°F, 80°F – 90°F, 90°F – 100°F, and 100°F – 120°F. Actual test temperatures ranged from 65°F – 117°F.

VI. TEST PROGRAM

A. Test Procedure

The test procedure used in this program is the same as that used in the 2010 and prior CRC hot-fuel-handling programs. In this test procedure, after switching fuels, the test vehicle is warmed-up for 15 miles. This consists of a route where the vehicle is driven at 15 mph, 25 mph, 35 mph, 45 mph, and 55 mph on private or lightly travelled roads for a nominal half-hour schedule before bringing it to the soak sheds. The test vehicle is then parked in a soak shed for 20 minutes with the ignition off. The engine is then restarted after the 20-minute soak. Recording of data for calculation of total weighted demerits (TWDs) begins when the engine is restarted. The starting time, idle quality, and the occurrences of any stalls are recorded. The

vehicle is accelerated at wide-open-throttle (WOT) to 35 mph. Driveability malfunctions, such as hesitation, surge, stumble, stall, or backfire, and their severity are recorded using the procedure shown in Appendix C. The test vehicle is then returned and parked in a soak shed. The transmission is shifted into park and the engine is idled for 20 minutes. The idle quality is assessed, and if the engine stalls, the stall is recorded and an attempt to restart the engine is made immediately. If the engine continues to stall after three restarts, the test is aborted. At the end of the 20-minute idle test period, the transmission is shifted into drive, and the idle quality and any stalls are recorded. The vehicle is then slowly driven from the soak shed and accelerated at light-throttle to 35 mph. Driveability malfunctions and their severity are recorded. The vehicle is driven back to the soak shed and parked with the engine off for 20 minutes. The starting time is recorded, and idle quality and number of stalls are recorded. The vehicle is accelerated out of the soak shed at light-throttle to 35 mph. Driveability malfunctions and their severity are recorded. This concludes the testing sequence.

B. Fueling and Sampling

All test fuel, prior to being used to supply the test vehicles, was stored in drums in the 70°F refrigerated fuel storage container for at least 24 hours prior to being opened. The fuel was delivered to the test vehicles through metered dispensing pumps installed inside the refrigerated container for the summer program. The only portion of the fuel delivery system exposed to hot ambient temperatures was the fuel delivery hose. Samples for each test fuel were taken for distillation and vapor pressure tests from multiple drums of each fuel when a drum was opened. The samples were analyzed using a Grabner DVPE and distillation instruments provided by General Motors.

Six vehicles of varying hardware technology were selected for sampling after testing each fuel throughout the program. Each of these vehicles was sampled on each fuel, with random duplicate sampling after being tested again on that fuel. The only exception to this protocol was the 1999 vehicle which was not tested on fuels containing 15 volume percent ethanol. After each test, the fuel from the vehicle tank was sampled through a valve on the fuel rail. Chilled one-quart bottles were filled with the fuel. The samples were immediately placed in a refrigerator. The samples were then removed for evaluation from the refrigerator, opened for air saturation as required by ASTM D5191, and then tested in the Grabner instrument and also tested for TVL20. The inspection results for the end-of-test vehicle samples are shown in Table E-3 of Appendix E.

C. Test Plan

The plan was to test the Classes C, D, and E fuels during the spring time frame when the ambient temperatures would be below 100°F, and Classes B, A, and AA fuels

during the summer when ambient temperatures would be above 100°F. Because Yuma had an early summer with unusually high ambient temperatures during the first phase of the program, testing on Class C fuels was deferred to the summer phase.

The target ambient testing temperature windows were 65°F – 80°F, 80°F – 90°F, 90°F – 100°F, and 100°F – 120°F.

Initially, the statistician had developed a two-thirds factorial statistical test with some duplicates. Because of the logistical constraints (ensuring that the right vehicle was tested by the correct rater on the correct fuel at the proper temperature), it quickly became apparent that it would be more efficient and more data would be collected in the same amount of time if all vehicle/fuel combinations were tested by all raters. This not only allowed a more robust data set, but it allowed a more continuous test flow, since the raters did not have to “sit out” tests while waiting for the right vehicle to be available. This protocol also allowed for more duplicates than the statistician had originally planned.

The weather pattern in Yuma is such that cloud cover and ambient temperatures do not always match the forecast. Testing would have to proceed with the on-site Program Manager’s attempts to predict two and one-half hours in advance whether there would be cloud cover and/or appropriate testing temperatures. Cloud cover affects the sun-load on the vehicle, and testing must be aborted under frequent or continuous cloud cover. Since fuel classes were changed at specific ambient temperatures, and one hour prior to preconditioning and testing had to be allotted for fuel flushing and changeover, it was up to the on-site Program Manager to predict as accurately as possible exactly when the ambient temperature would move from one fuel class to another. High winds were another unforeseen difficulty to be taken into account. Early in the first phase of the program, high winds severely damaged the soak sheds and canopies, and threatened to damage the vehicles being tested when the soak shed doors would slam against them. Experience taught that winds above 20 mph were potentially damaging for testing. Therefore, no testing was done above this wind speed.

D. Data Worksheets

The data from the vehicle data sheets were summarized each day and entered into an Excel spreadsheet for each test. Information such as testing date, vehicle, fuel, and rater was given, and for each sequence of the test, start-of-test ambient temperature, and driveability malfunctions and their severity were recorded and entered into a computer summary sheet. A summary of the data is presented in Appendix F for the test vehicles.

VII. DISCUSSION OF RESULTS

A. Data Set Analysis

A statistician was consulted to design the program. A two-thirds factorial design was originally developed. However, because of scheduling concerns, a full factorial design was actually used with each vehicle/fuel combination tested three or four times with all three raters evaluating all vehicle and fuel combinations. This resulted in 1306 tests.

The final data set is shown in Table F-1 and separated into four groups based on the program target ambient temperature ranges (65-80°F, 80-90°F, 90-100°F, and 100-120°F) and listed by fuel number within each temperature group. Each temperature group was analyzed separately and where appropriate, an analysis was made across all temperature groups. The SAS® System was used to calculate least squares means (LS Means) demerit values for each vehicle and for each fuel within a temperature group and across groups. Factors that had statistically significant effects on TWD were included in the final model. The final model included effects for fuel within each temperature range group, vehicle, rater, vehicle x rater interactions, fuel x vehicle interactions, maximum ambient run temperature, fuel rail temperature after third hot soak, and the overall temperature range. Ethanol content was not a design variable and was not an overall statistically significant term. As is common with driveability data, the total weighted demerits (TWD) values were log transformed due to the wide range of vehicle/fuel TWDs (0 - 58). Log transformation of the data leads to a data set that is more normally distributed and has approximately constant variance. For ease of interpretation, the charts referenced in the discussion below are plotted using “TWD LS Means” rather than “Ln TWD LS Means.” Statistically significant differences have p-values of 0.05 or less at the 95% confidence level. Differences with p-values of 0.10-0.06 are considered marginally statistically significant. The data set was initially inspected for outliers and none were found.

The final data were corrected using the model variables. Table 3 presents the LS Means corrected natural log TWD and LS Means TWD for each fuel by temperature grouping across all vehicles. Table 4 presents the LS Means corrected natural log TWD and LS Means TWD for all fuels for each vehicle. The average maximum ambient run temperatures for the temperature range groupings were 77, 86, 98 and 107°F. The regression analyses are on file at the CRC offices and are available upon request.

Figure 1 graphically presents the TWD LS Means from Table 3 for each fuel within each temperature range group averaged across all test vehicles. The x-axis fuel codes show the temperature range and fuel number. Also shown are the upper and lower 95% confidence limits for each mean. Differences in demerits are observed between the sets of seasonal fuels with the higher volatility “winter” fuels exhibiting slightly higher TWDs than the lower volatility “summer” fuels. However, the overall range of TWD for the vehicles in this test fleet, as shown in Figure 1, were lower than those observed

on prior CRC projects of this type^{3,4}. Figure 2, based on Table 4, shows the TWD LS Means for each vehicle averaged across all fuel temperature range groups.

B. Fuel Property Effect Analysis

Using the TWD data from Table 3, SAS® GLM regression analyses were undertaken against fuel property variables of vapor pressure, T_{50} , and TVL20.

1. Vapor Pressure

Figure 3 shows that as vapor pressure increases, TWD LS Means significantly increases when evaluated over the entire range of vapor pressure covered in the study (p-slope = 0.0105). The shaded bow tie area represents the upper and lower 95% confidence limits around the linear correlation line. From the regression model, the independent effect of a 1 psi increase in vapor pressure can be developed. The results are shown in Figure 4. Also shown are the upper and lower 95% confidence limits for each vapor pressure TWD LS Means. The effect of a 1 psi vapor pressure increase for ASTM D4814 volatility classes A through E (9.0, 10.0, 11.5, 13.5, and 15.0 maximum psi limits) can be observed. The comparisons show no statistically significant differences in TWD for ASTM compliant vapor pressure fuels and those with 1 psi higher vapor pressure tested in the same volatility class for the fuels and vehicles tested in this program. It is noted that in 2 of 5 cases, the 1 psi higher vapor pressure fuels exhibited directionally higher average TWD values than the current ASTM vapor pressure compliant fuels. In 1 of 5 cases, the 1 psi higher vapor pressure fuels exhibited directionally lower TWD means than the ASTM vapor pressure compliant fuels. In 2 of 5 cases, the TWD means were similar between the fuels.

2. T_{50}

Figure 5 shows that as T_{50} increases, statistically significant decreases to TWD LS Means are observed when evaluated over the entire range of T_{50} covered in the study (p-slope = 0.0077). For this program, the distillation property “ T_{50} minimum” was only comparatively evaluated for ASTM D4814 volatility classes D and E. The T_{50} results comparing 145°F with 150°F are shown in Figure 6. From this comparison, it is concluded that there are no statistically significant differences in TWD for ASTM Classes D and E fuels with T_{50} at 150°F or 145°F.

3. TVL20

Figure 7 shows that as TVL20 increases, TWD LS Means show statistically significant decreases when evaluated over the entire range of TVL20 covered in the study (p-slope = 0.0073). Figure 8 shows that for this fuel set, TVL20 and vapor pressure are highly correlated ($R^2 = 0.988$). Also shown on Figure 8 are the ASTM D4814 minimum class TVL20 limits and the maximum class vapor pressure limits. Selecting the point where the various TVL20 limits cross the correlation line relative to the vapor pressure class shows whether TVL20 or vapor pressure is the controlling fuel

specification with respect to hot-fuel-handling. In some instances, TVL20 is the constraining factor and restricts the vapor pressure increase to less than a full 1 psi. Data from this test program show that the fuels evaluated with 1 psi higher vapor pressure (and corresponding lower TV/L=20) do not have significantly higher TWDs when compared to the ASTM compliant fuels in the program.

C. Vehicle Effect Analysis

The test fleet vehicles were of different mechanical designs and calibrations which allowed an assessment of how some of these different variables affected driveability.

1. Vehicle Effects - General

Table 5 was developed from the linear model relating the natural log of vehicle TWD and vapor pressure (DVPE) and shows the significant factors (p-values/Prob >F) effecting the response; vehicle, rater, vehicle*rater, DVPE, DVPE*rater, maximum ambient temperature, and fuel rail temperature 3. The F-factors show the relative influence of each of the factors to the model.

Table 6 shows the individual vehicle vapor pressure (DVPE) effects and which test vehicles exhibit statistically significant effects by vapor pressure level. The DVPE effect in Table 6 is the amount of increase in Ln TWD per unit increase in DVPE. Analysis of the DVPE effect on individual vehicle driveability showed statistically significant effects for three vehicles ($p < 0.05$), and marginally statistically significant ($p < 0.10$) for one additional vehicle in the eighteen vehicle test fleet.

2. Older Vehicles

Figure 9 compares TWD LS Means of two older vehicles (1999 and 2003) with results from 16 newer vehicles (2013 and 2014). There is no statistically significant difference in TWD between older vehicles (Pre-2005) and newer models.

3. Cars vs. Trucks

Figure 10 compares TWD LS Means of 15 cars with that of 3 trucks. The cars as a group have statistically significantly higher TWD than trucks.

4. PFI vs. SIDI

Figure 11 compares the TWD means of 16 port fuel injected (PFI) equipped engines with that of 2 spark-ignition direct-injection (SIDI) engines. The PFI vehicles have statistically significant higher TWD than SIDI vehicles. A more detailed breakdown of PFI and SIDI, ethanol content, and vapor pressure is shown in Figure 12. No statistically significant differences in TWD were apparent for the overall test fleet and PFI subset for ethanol content (E10 and E15 evaluated). The two SIDI vehicles evaluated show statistically significant higher TWD for ethanol content at the highest

vapor pressure fuels tested (16 psi), but no statistically significant differences at the lowest vapor pressure fuels (8 psi).

5. Naturally Aspirated vs. Turbocharged

Figure 13 compares the TWD LS Means results for 16 naturally aspirated engines with those of 2 turbocharged engines. The TWD for the naturally aspirated engines was not statistically significantly different than the TWD for the turbocharged engines.

6. FFV vs. Conventional Fuel Vehicles

Figure 14 compares TWD LS Means for conventional-fuel cars, conventional-fuel trucks, and flexible-fuel vehicle (FFV) trucks. FFVs showed no statistically significant TWD difference than conventional vehicles. The FFV sample size was small (3) and all were classified as trucks.

7. Fuel Pump Outlet Pressure

Figure 15 shows the effect of an increasing TWD LS Mean with increasing fuel system outlet pressure. This effect is statistically significant.

8. Load Factor

Figure 16 shows that increases in curb weight load factor have a statistically significant effect on increases in TWD LS Mean irrespective of vapor pressure in each volatility class.

9. Emissions Control Technology

Figure 17 compares various emissions control technologies described in Table 1. Although statistically significant TWD differences between Federal Emissions Control Technologies are observed, there are no clear trends noted. Sample sizes were small and the specific emission control technology classification was not well defined for some vehicles.

D. Temperature and Wind Effects

Several temperature variables and wind speed were investigated in the program.

1. Ambient Temperature

Figure 18 shows that increases in TWD are statistically significant as Maximum Ambient Temperature increases across all vehicles, raters and fuels included in the study.

2. Temperature Range Groups

Differences in TWD LS Mean values between fuels depends on ambient temperature range groupings. Figure 19 plots the TWD LS Mean value for the fuels tested within each of the four ambient temperature ranges evaluated in the study. It shows less TWD at higher ambient temperature ranges.

3. Fuel Rail Temperature

Figure 20 shows that TWD LS Means have statistically significant increases as fuel rail temperature during third soak of the test procedure increases.

4. Wind Speed

Figure 21 shows that wind speed of up to 20 mph at the test site is not statistically significant for this study with a low slope of -0.005 TWD change/mph. Above 20 mph, the wind was deemed unsafe for operation and testing was suspended.

E. Rater Comparison

In this program, all vehicle/fuel combinations were tested by all raters. The statistical analyses were normalized for the differences in raters. Figure 22 shows for each rater their TWD LS Means and the upper and lower 95% confidence limits for each rater. All three raters were statistically significantly different from each other. As a result, TWD differences between fuels depend on raters.

Figure 23 shows how the three raters compared across the test vehicle fleet. The results show that TWD differences between Raters depend on Vehicles.

F. Fuel Weathering

Fuel samples were obtained from six vehicles chosen from the fleet at the end of each selected test run and analyzed on-site for vapor pressure and TVL20. Drums were also tested on-site for vapor pressure and TVL20. Taking the difference between the drum values and the end-of-test values for each vehicle provides the fuel weathering for each run. The final data set is shown in Table E-3.

A SAS® System regression of the weathering data showed the significant fuel variables to be the initial fuel vapor pressure or initial TVL20 and the maximum ambient temperature during a test. The spring and summer test programs with very different ambient temperatures and fuel volatilities were sufficiently different to require separate models.

Linear models were developed for the vapor pressure (DVPE) loss and for natural logarithms for TVL20. The resulting vapor pressure spring and summer models for calculating loss directly in psi for all six vehicles are shown in Table 7. Individual vehicle losses can also be calculated. Table 7 also shows the spring and summer Ln TVL20 models. Individual vehicle effects, as well as for all six vehicles can be calculated and converted to TVL20 in °F.

Figure 24 graphically shows vapor pressure model losses for the two average spring test temperatures as a function of initial vapor pressure. Current ASTM D4814 vapor pressure maximum limits are shown as points on the lines for information. Figure 25 is a similar vapor pressure graph for the summer vapor pressure model for the two average summer temperatures. Figure 26 shows the calculated TVL20 increase with an increase in temperature using the spring Ln TVL20 model. Current D4814 minimum TVL20 limits are shown as points on the lines for information. Figure 27 is a similar graph for the summer Ln TVL20 model.

The technique used to collect the samples for inspection may have resulted in higher values for weathering. The hot fuel was collected directly in chilled containers rather than being first chilled through a cooling coil which is the historic procedure.

VIII. Lessons Learned

A. General to Hot Fuel Handling Projects

Timing is essential for preconditioning the vehicles to allow the raters to test two vehicles at a time. Preconditioning should be designed such that a vehicle is received at a soak shed every 30 minutes. If this timing varies by even a few minutes, the raters are forced into a situation of testing both vehicles simultaneously, even though the vehicles are at different stages of testing.

HFH test fuels should be maintained at a nominal 70°F temperature for at least 48 hours prior to testing, which requires some type of refrigerated fuel storage. As a matter of safety, fuels must not be stored in direct sunlight during high-temperature HFH programs. CRC owns an equipment storage trailer which is equipped with an explosion-proof refrigeration system. This trailer has been traditionally used for pre-test storage of the fuels. A working capacity of the trailer is 30 – 40 drums of fuel.

It is imperative that the fuel dispensing pumps and hoses be kept in the refrigerated trailer during high temperatures (above 90°F ambient) to prevent vapor lock in the pumps and hoses. Vehicle flushing and fueling must be performed in close proximity to the fuel storage trailer in order for the fuel dispensing pump hoses to be able to reach the vehicles while remaining at a cooler temperature.

CRC possesses ice chests which have been equipped with copper coils through which vehicle fuel samples can be circulated when sampling during an HFH program. A constant supply of ice packed around these coils allows the vehicle fuel samples to be chilled as they are being taken, which is the proper way to take samples. These ice chests fitted with the copper coils should be used any time vehicle fuel sampling is conducted.

It is strongly recommended that the ice chest sampling hardware, the fuel dispensing pumps, and the fuel pressure gauges used during defueling and flushing be either refurbished, rebuilt, or replaced prior to their next use.

B. Specific to Vehicles in this HFH Program

There were three vehicles with push-button ignition switches. It was agreed that the raters were to begin timing the start cycle at the instant they pushed the button to start. One of the three started immediately, just like a keyed ignition switch. The second started relatively quickly, but the third took some time to engage. This resulted in relatively lengthy start times for the third vehicle which resulted in slightly higher demerits for this maneuver. Unlike the cold-start summary Excel program, the HFH summary does not calculate demerits based on tenths of seconds for start times. The HFH summary rounds start times to whole seconds.

The majority of demerits resulted from idle quality. Maneuvering demerits tended not to be as frequent, and seemed to result mostly from stumbles and surges.

C. Test Track – Yuma vs. Yakima

A wind-speed of over 20 mph was found to be potentially damaging to personnel, vehicles, and equipment, causing testing to be halted. Despite precautions such as tie-downs and weights, winds over 20 mph actually blew portions of soak sheds apart, slammed shed doors into personnel, and potentially slammed shed doors into vehicles during accelerations. Depending upon the direction of the wind, it is even recommended that testing be suspended during wind speeds of 15 mph or above.

Yuma, Arizona was found to be windy a good portion of the time, especially during the spring session, with winds sometimes well in excess of 20 mph. As noted, testing could not be performed during these excessively high winds. Yuma also was found to have cloud cover that could interrupt or suspend testing. Any testing with reduced or non-existent solar load is not useful to the data set. Yuma was found to have high heat-load, and is an excellent test site for ambient temperature windows encompassing 90⁰F to approximately 115⁰F. The GM Desert Proving Grounds in Yuma also offer an excellent facility and support for a field test program.

Yakima, Washington has been found in the past to have less wind and clouds than Yuma, but also a lower heat-load. Yakima would be useful for field testing in ambient temperatures of 85⁰F to 95⁰F, with some excursions up to 100⁰F+. While the facility and support are more professional at the GM Proving Grounds than in Yakima, there is a good facility and support base in Yakima with Renegade Raceways.

D. Interpretation of TWD Magnitude – Baseline Level for HFH Program

“Noise” is the level of demerits below which a trained rater cannot discern. The raters agreed that the threshold for noise was very vehicle-dependent, because the demerit totals were very vehicle-dependent. The raters were unable to agree on a definite number that would be the noise threshold, but they did all agree that the threshold for this fleet is lower than observed previously. It was the opinion of the field supervisor that the discernible level for demerits by a trained rater in this Hot Fuel Handling program is above 11 TWD.

The noise threshold for HFH demerits tends to be lower than for cold-start demerits because of the differences in the testing procedures. There are many more opportunities in the cold-start procedure for vehicle malfunctions than in the HFH procedure, which allows for more TWDs, and thus a higher level of noise in general.

E. Future Program Statistical Design

A two-thirds factorial HFH test program for a fleet containing 18 vehicles is virtually impossible to conduct. It quickly became apparent that it was necessary to run through all 18 vehicles (full factorial) and then to start over with the same sets (or “flights”) of three vehicles in order to have time to precondition, test, bring the vehicle back to the fueling area, and flush with the new fuel. There was insufficient time to complete the flushing under a two-thirds factorial program.

If individual vehicle effects are sought for statistical consideration in future programs, a minimum of two vehicles per Brand/Model/Year need to be included in the test program experimental design. All repeat testing of the vehicles will need to be fully randomized, along with completely repeating the fuel flushing procedures, vehicle conditioning, and test procedure testing. These changes will enable a vehicle paired t-test analysis or similar analysis for statistical significance fuel effect within a vehicle.

IX. ACKNOWLEDGEMENT

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TABLES

AND

FIGURES

Table 1
Test Fleet

Year	Make	Model	Veh. Series	State	Plate	Vin #	Mileage	Engine Disp. (L)	Cylinders	PFI or DI?	Fuel System Pressure @ Idle	Boosted?	FFV?	FWD, AWD, 4WD?	Curb Wt. Load Factor (kg/L)	Emissions Cat. - Fed.	Emissions Cat. - CARB
1999	BUICK	CENTURY	--	AZ	AFN7610	2G4WY52M2X1458276	129,298	3.1	6	PFI	37	No	No	FWD	484	"Meets 1999"	"Meets 1999"
2003	CHEVY	IMPALA	LS	AZ	793MBM	2G1WH52K439273217	62,042	3.8	6	PFI	45	No	No	FWD	412	T2	NLEV
2014	CHEVY	CRUZE	LT	AZ	ATT7139	1G1PC5SB8E7273244	1,553	1.4	4	PFI	43	Turbo	No	FWD	979	T2	ULEV Qualified
2013	CHEVY	TAHOE	--	WA	ALW8115	1GNSKBE02DR318900	20,410	5.3	8	PFI	58	No	FFV	4x4	481	T2	ULEV Qual.
2014	CHRYSLER	200	--	CA	7EKJ312	1C3CCBAB8EN212868	2,050	2.4	4	PFI	60	No	No	FWD	626	California Only	SULEV II - PZEV Qual.
2013	DODGE	CHALLENGER	--	CA	7ACX568	2C3CDYAG7DH649621	26,847	3.6	6	PFI	60	No	No	RWD	482	T2 B4	ULEV II Qualified
2013	DODGE	DART	SXT	CA	7A0H031	1C3CDFBA4DD318510	21,956	2.0	4	PFI	59	No	No	FWD	722	T2 B4	ULEV II Qualified
2014	FORD	MUSTANG	--	CA	7BFZ316	1ZUBP8EM8E5243237	22,809	3.7	6	PFI	55	No	No	RWD	433	T2 B4	ULEV II Qualified
2014	FORD	ESCAPE	SE	TX	CHM4622	1FMCU9GX2EU46143	20,258	1.6	4	GDI	60 (30 - 90)	Turbo	No	FWD	1003	T2 B5	Not For Sale in Calif.
2013	FORD	FUSION	SE	CA	6ZFM734	3FA6P0H78DR249181	21,179	2.5	4	PFI	59	No	No	FWD	612	T2 B5	ULEV II
2014	FORD	FIESTA	SE	AZ	356ZED	3FADP4EJ9EM121514	8,913	1.6	4	PFI	58	No	No	FWD	705	T2 B4	ULEV II Qualified
2013	INFINITY	G37	--	AZ	BAL4093	JN1CV6AP4DM302227	27,027	3.7	6	PFI	54	No	No	FWD	423	T2 B5	LEV2 - ULEV
2014	JEEP	GRAND CHEROKEE	Limited	AZ	BEC6520	1C4RJEBG0EC410881	1,939	3.6	6	PFI	61	No	FFV	RWD	572	T2 B4	ULEV II Qual.
2013	KIA	OPTIMA	--	TX	BWW3704	5XXGM4A7XDG198984	27,767	2.4	4	GDI	69	No	No	FWD	600	T2 B5	ULEV II
2013	MAZDA	2	--	AZ	ALZ2047	JM1DE1KZ1D0159975	17,031	1.5	4	PFI	58	No	No	FWD	681	T2 B5	ULEV II
2013	NISSAN	SENTRA	SV	TX	BZZ4952	3N1AB7AP1DL708398	23,008	1.8	4	PFI	51	No	No	FWD	697	T2 B5	LEV2 - LEV
2013	TOYOTA	COROLLA	LE	NV	934YXY	5YFBU4EE8DP196872	16,904	1.8	4	PFI	49	No	No	FWD	673	T2 B5	ULEV II
2013	VOLKS	GOLF	--	NM	125SBN	WVWDB7AJXDW133492	18,602	2.5	4	PFI	60	No	No	FWD	538	T2 B3	PZEV

Summary	15 Cars	14 PFI / 1 DISI	1 Turbo / 14 NA	0 FFV / 15 conv	13 FWD / 2 RWD
	3 Trucks	2 PFI / 1 DISI	1 Turbo / 2 NA	2 FFV / 1 Conv	1 RWD / 2 FWD / 1 4x4

Table 2
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF1-E10	E-TF2-E10	E-TF3-E10	E-TF4-E15	E-TF5-E15	E-TF6-E10	E-TF7-E10	E-TF8-E15	E-TF9-E10	E-TF10-E10	E-TF11-E10	E-TF12-E10	E-TF13-E10	E-TF14-E10	E-TF15-E15	E-TF16-E15	E-TF17-E10
Property	ASTM Test Method	Units																	
API Gravity@60°F	D1298/D287	API	62.7	63.2	65.3	63.7	64.9	64.5	60.6	61.9	59.8	59.4	58.8	59.1	55.9	55.8	56.0	55.9	65.5
Research Octane Number	D2699	RON	94.0	93.8	92.2	94.5	94.2	92.8	94.2	95.7	95.8	95.9	96.4	96.0	94.5	94.5	100.5	100.9	93.3
Motor Octane Number	D2700	MON	84.6	84.4	83.9	85.1	85.5	84.2	84.9	85.7	85.6	86.0	86.4	86.1	84.4	84.2	88.9	88.8	85.0
Antiknock Index, (R+M)/2	D2699/D2700	AKI	89.3	89.1	88.1	89.8	89.8	88.5	89.6	90.6	90.7	90.9	91.4	91.1	89.4	89.4	94.7	94.9	89.1
Ethanol Content	D5599	vol %	9.8	9.8	10.0	14.8	14.6	9.8	9.9	14.8	9.8	9.8	10.4	9.5	10.1	10.0	15.2	14.9	10.0
DVPE Vapor Pressure	D5191	psi	15.9	15.2	15.9	15.8	15.8	14.4	13.3	14.3	12.3	11.3	11.1	9.8	9.0	8.0	9.9	9.1	17.0
Temperature V/L=20 (TVL20)	D5188	°F	100.6	104.2	98.6	99.8	98.6	105.3	110.3	106.3	114.9	118.7	120.2	126.8	130.6	132.4	129.2	132.3	95.3
Sulfur Content	D2622/D7039	ppm	19.1	19.2	15.1	15.1	16.0	16.6	17.9	18.6	11.2	11.0	9.2	8.4	10.8	10.7	7.5	5.4	16.8
FIA (uncorrected)	D1319																		
Saturates		vol %	71.2	70.7	73.9	73.5	77.2	73.4	65.5	71.9	68.9	71.5	67.1	73.1	59.5	58.5	65.5	67.1	74.0
Aromatics		vol %	23.6	23.4	19.5	19.5	16.9	20.9	29.8	22.9	25.2	24.2	27.6	23.3	33.4	34.7	29.8	29.4	21.4
Olefins		vol %	5.2	5.9	6.6	6.9	5.8	5.7	4.7	5.1	5.9	4.3	5.3	3.5	7.2	6.8	4.7	3.5	4.6
FIA (corrected for oxygenates)	D1319																		
Saturates		vol %	63.1	62.3	66.0	63.8	67.2	65.5	58.6	61.2	61.3	64.5	60.2	66.1	53.2	52.8	57.4	57.0	64.2
Aromatics		vol %	22.0	22.1	17.9	20.7	14.7	19.2	27.1	21.9	23.4	21.9	25.1	21.1	30.3	31.3	26.2	26.6	19.5
Olefins		vol %	5.7	5.7	6.4	5.9	5.1	5.5	4.3	4.5	5.5	3.9	4.8	3.2	6.3	6.1	4.1	3.5	6.2
Benzene	D3606	vol %	1.2	1.1	0.9	0.9	1.0	1.0	1.2	1.2	0.6	0.5	0.7	0.4	0.8	0.8	0.4	0.4	1.6
D86 Distillation	D86																		
Initial Boiling Point		°F	79.3	76.8	76.5	75.0	76.9	79.7	82.5	79.6	81.8	85.8	84.9	94.4	92.8	97.1	89.4	94.5	75.1
5% Evaporated		°F	89.9	91.0	86.7	87.1	89.4	92.3	98.4	93.5	102.2	109.3	107.8	118.0	117.7	121.8	115.9	122.4	84.3
10% Evaporated		°F	98.6	100.7	94.3	95.6	96.7	100.3	106.4	102.4	112.5	118.6	118.2	126.1	125.7	127.9	129.2	133.6	91.3
20% Evaporated		°F	111.6	114.3	106.4	109.5	108.9	111.9	118.1	115.0	127.9	132.2	133.3	137.3	136.3	135.9	146.2	148.7	101.6
30% Evaporated		°F	125.1	127.5	119.7	124.8	122.1	124.0	128.9	127.1	141.6	143.0	146.1	145.7	145.9	144.7	156.3	157.4	112.7
40% Evaporated		°F	138.1	139.7	133.6	139.4	135.4	135.4	139.6	138.6	151.8	151.0	154.9	151.7	153.9	152.9	161.6	162.3	124.6
50% Evaporated		°F	149.5	150.3	146.0	151.4	147.4	145.8	149.5	149.2	169.2	168.0	179.6	180.9	187.0	184.5	175.7	183.2	138.3
60% Evaporated		°F	160.4	170.8	155.5	159.5	157.1	155.1	171.1	158.1	220.2	213.3	220.7	212.4	227.0	226.0	229.6	231.8	151.8
70% Evaporated		°F	232.3	234.1	220.7	174.0	165.4	218.6	229.0	168.6	241.4	234.1	235.3	231.2	249.7	247.8	243.6	245.9	186.7
80% Evaporated		°F	273.7	274.9	262.6	261.2	250.4	256.2	262.2	259.5	267.8	259.3	254.0	235.0	277.7	276.6	267.1	270.6	254.9
90% Evaporated		°F	320.1	321.0	317.6	315.5	309.7	310.7	310.2	310.7	321.9	313.0	300.8	309.4	326.1	324.8	325.9	330.8	308.2
95% Evaporated		°F	356.1	356.4	357.9	355.2	351.9	351.7	341.1	344.4	354.4	346.2	345.9	342.8	358.7	359.6	335.4	358.0	346.1
Final Boiling Point		°F	400.0	399.0	409.2	409.0	405.4	404.1	387.3	392.5	405.3	394.3	397.8	391.7	406.8	407.5	396.7	398.8	391.0
Residue		vol %	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.0	0.0	0.0	1.0	1.0	1.1	1.1	1.0	1.1	1.4
Loss		vol %	2.3	2.8	1.1	1.1	2.4	1.9	2.4	1.0	1.1	1.7	1.0	1.1	0.9	2.2	1.8	2.6	
Recovered		vol %	96.4	96.2	2.7	2.6	2.1	96.5	97.1	96.6	1.9	1.3	97.1	98.0	97.8	98.0	96.7	97.2	95.9
Oxidation Stability	D525	Minutes	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	
Lead Content	D3237	g/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper Corrosion	D130		1A	1A	1A	1A	1A	1A	1A										
Silver Corrosion	D7671		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Solvent Washed Gum	D381	mg/100 mL	0.8	0.5	<0.5	1.4	1.4	<0.5	0.8	1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	>240	<0.5	<0.5
Unwashed Gum	D381	mg/100 mL	5.0	4.0	3.4	3.4	3.4	3.2	5.2	4.8	4.0	4.2	4.4	4.2	4.6	5.4	4.8	4.4	4.6

Table 3
LS Means by Fuel and Temperature Range

Fuel Code	E-TF1-E10	E-TF2-E10	E-TF3-E10	E-TF4-E15	E-TF5-E15	E-TF7-E10	E-TF6-E10	E-TF7-E10	E-TF8-E15	E-TF10-E10
Temperature Range, °F	65-80	65-80	65-80	65-80	65-80	65-80	80-90	80-90	80-90	80-90
Ln TWD LS Mean	2.88	2.98	3.00	2.98	3.07	2.83	2.87	2.83	2.90	2.89
TWD LS Mean	17.8	19.8	20.2	19.7	21.5	17.0	17.6	16.9	18.2	18.0
Fuel Code	E-TF9-E10	E-TF10-E10	E-TF12-E10	E-TF11-E10	E-TF12-E10	E-TF13-E10	E-TF14-E10	E-TF15-E15	E-TF16-E15	
Temperature Range, °F	90-100	90-100	90-100	100-120	100-120	100-120	100-120	100-120	100-120	
Ln TWD LS Mean	2.45	2.66	2.60	2.55	2.59	2.46	2.56	2.50	2.45	
TWD LS Mean	11.6	14.2	13.5	12.8	13.3	11.7	13.0	12.2	11.5	

Table 4
LS Mean by Vehicle

Vehicle No.	LS Mean	
	Ln TWD	TWD
2	2.47	11.8
4	2.78	16.2
5	2.35	10.5
6	2.47	11.8
7	2.78	16.2
9	2.41	11.1
13	2.61	13.6
14	2.63	13.9
19	3.27	26.3
20	3.02	20.6
21	2.81	16.6
23	3.15	23.3
24	2.64	14.0
26	2.46	11.7
27	2.85	17.3
33	2.81	16.6
36	2.53	12.5
39	2.49	12.1

Table 5
Vehicle Driveability Linear Model

Effect Tests					
Source	Nparm	DF	Sum of Squares		Prob > F
			F Ratio		
Vehicle	17	17	16.366584	9.0371	<.0001*
Rater	2	2	9.949686	46.6983	<.0001*
Vehicle*Rater	34	34	35.206778	9.7201	<.0001*
DVPE	1	1	2.115460	19.8576	<.0001*
DVPE*Rater	2	2	8.864013	41.6028	<.0001*
DVPE*Vehicle	17	17	11.335133	6.2589	<.0001*
maxambT	1	1	0.596803	5.6021	0.0181*
railtemp3	1	1	0.433148	4.0659	0.0440*

Table 6
Individual Vehicle DVPE Effects

Vehicle	DVPE Estimate	P-value
2	0.1471	0
4	0.0168	0.49
5	0.0352	0.35
6	0.0023	0.94
7	0.0102	0.7
9	0.0481	0.25
13	0.0939	0.01
14	-0.0235	0.44
19	0.0537	0.04
20	-0.0069	0.78
21	0.0324	0.13
23	0.0301	0.1
24	0.0621	0.01
26	0.0153	0.66
27	0.0282	0.23
33	0.0194	0.52
36	0.0487	0.24
39	0.0051	0.86
Overall	0.0314	0

Table 7
Vapor Pressure and TVL20 Weathering Equations

Spring	Vapor Pressure Change	Spring	LnTVL20 Increase	
Prediction Expression		Prediction Expression		
	4.13967858945152 + -0.1250284925731 * DVPEInitial + -0.0404957222771 * AmbientTempforVehicleEOT + Match[Vehicle] { 2 ⇒ -0.4085791751764 6 ⇒ 0.37453272352891 9 ⇒ -0.6050813345333 19 ⇒ 0.40330201484308 26 ⇒ 0.24743393397548 39 ⇒ -0.0116081626378 else ⇒ .}		0.96307221315503 + -0.0300370902443 * TVL20Initial + 0.04259170984932 * AmbientTempforVehicleEOT 2 + Match[Vehicle] { 2 ⇒ 0.58509531242157 6 ⇒ -0.762613256326 9 ⇒ 0.69054528104974 19 ⇒ -0.6064058224565 26 ⇒ -0.1498491846845 39 ⇒ 0.24322766999568 else ⇒ .}	
RSquare Adj	0.709047	RSquare Adj	0.643625	
Source	DF	Sum of Squares	F Ratio	Prob > F
DVPEInitial	1	1.5883001	22.2955	<.0001*
AmbientTempf orVehicleEOT	1	3.5211082	49.427	<.0001*
Vehicle	5	9.6760497	27.1652	<.0001*
Source	DF	Sum of Squares	F Ratio	Prob > F
TVL20Initial	1	2.157251	11.3054	0.0013*
AmbientTemp forVehicleEOT	1	3.963961	20.7738	<.0001*
Vehicle	5	22.392167	23.47	<.0001*

Note: Removed 4 Outliers

Summer	Vapor Pressure Change	Summer	LnTVL20 Increase	
Prediction Expression		Prediction Expression		
	7.56632964711458 + -0.437557957113 * DVPEInitial + -0.0413219282346 * AmbientTempforVehicleEOT + Match[Vehicle] { 2 ⇒ -0.501607349296 6 ⇒ 0.51886036383113 9 ⇒ -1.0665170891435 19 ⇒ 0.66205863982961 26 ⇒ 0.41711675155153 39 ⇒ -0.0299113167728 else ⇒ .}		5.97668232784451 + -0.0761280826759 * TVL20Initial + 0.04956602974647 * AmbientTempforVehicleEOT 2 + Match[Vehicle] { 2 ⇒ 0.52798156227111 6 ⇒ -0.5094269894695 9 ⇒ 0.83527325203516 19 ⇒ -0.6396006219246 26 ⇒ -0.293518015746 39 ⇒ 0.07929081283387 else ⇒ .}	
RSquare Adj	0.839024	RSquare Adj	0.808533	
Source	DF	Sum of Squares	F Ratio	Prob > F
DVPEInitial	1	17.487724	166.4518	<.0001*
AmbientTempf orVehicleEOT	1	2.440802	23.2321	<.0001*
Vehicle	5	20.904528	39.7947	<.0001*
Source	DF	Sum of Squares	F Ratio	Prob > F
TVL20Initial	1	10.466847	117.0907	<.0001*
AmbientTemp forVehicleEOT	1	3.021032	33.7957	<.0001*
Vehicle	5	15.500487	34.6802	<.0001*

Note: Removed 2 Outliers

Figure 1
Fuel by Ambient Temperature Range Grouping
Total Weighted Demerit Comparison

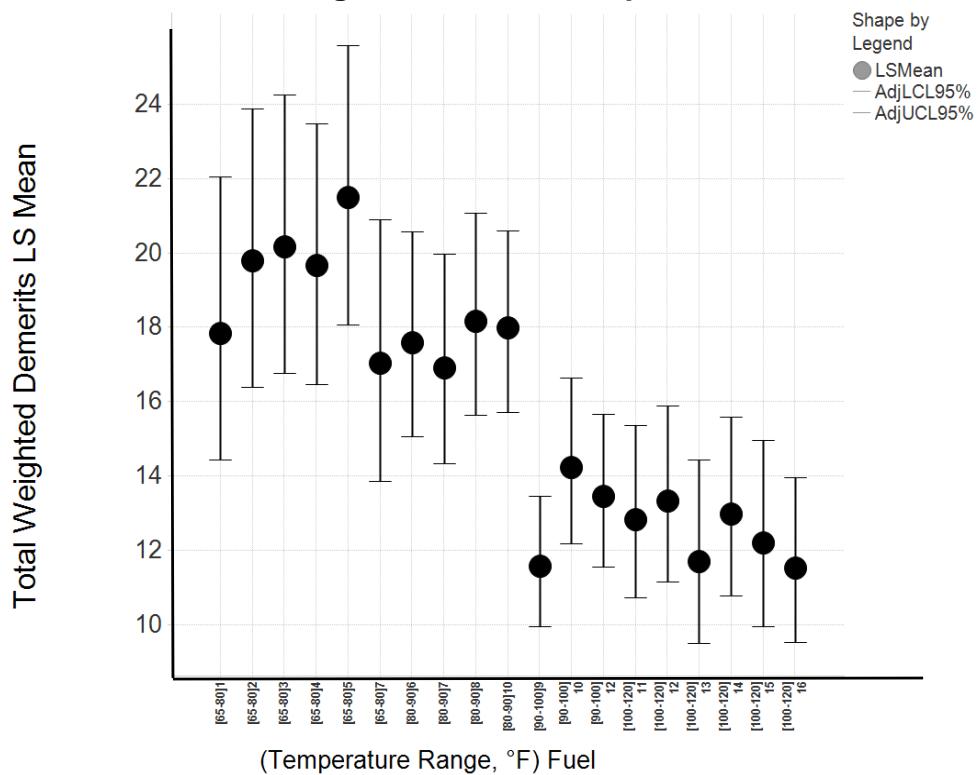


Figure 2
Vehicle Total Weighted Demerits Comparison

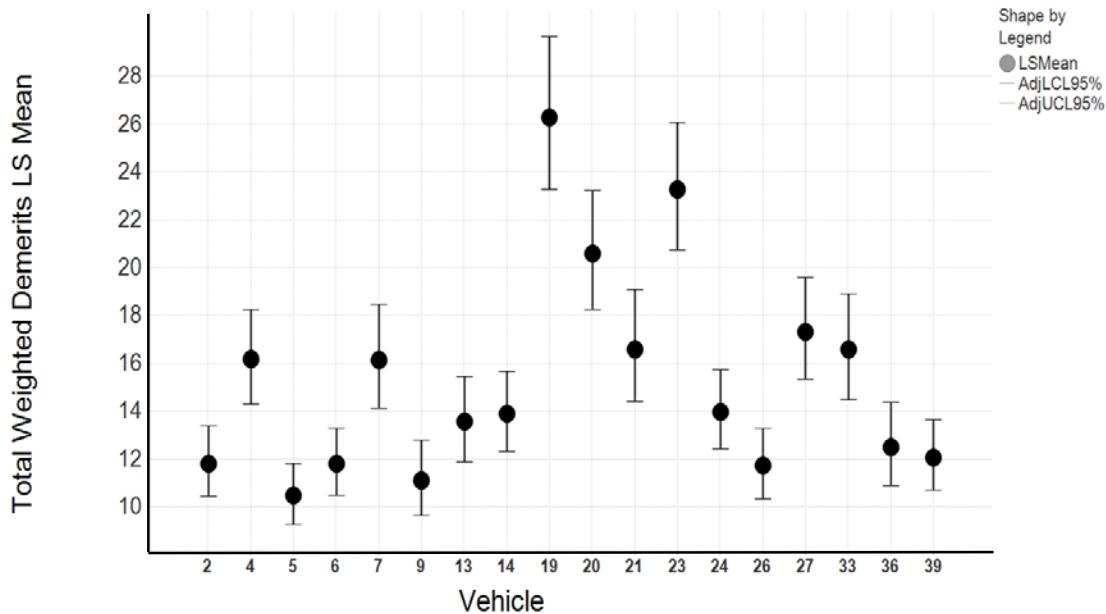


Figure 3
Effect of Vapor Pressure (DVPE) on Total Weighted Demerits

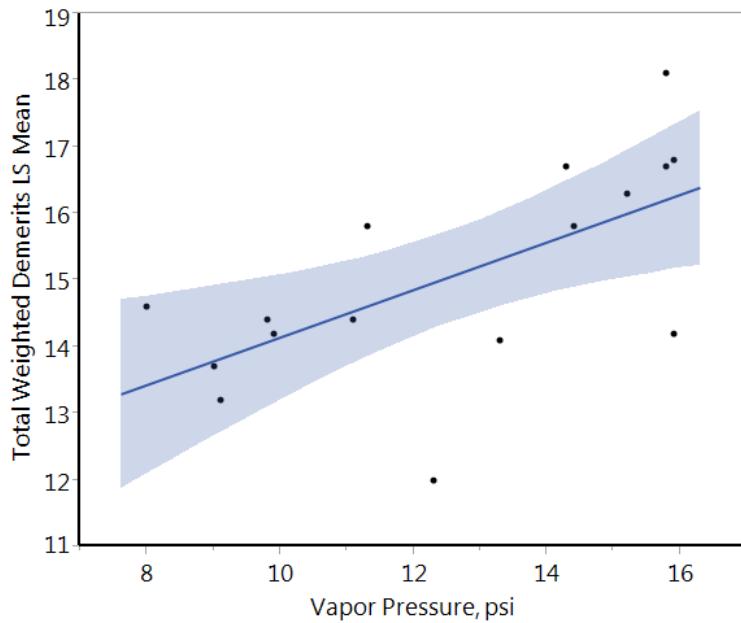


Figure 4
Effect of 1 PSI Vapor Pressure Change on Total Weighted Demerits

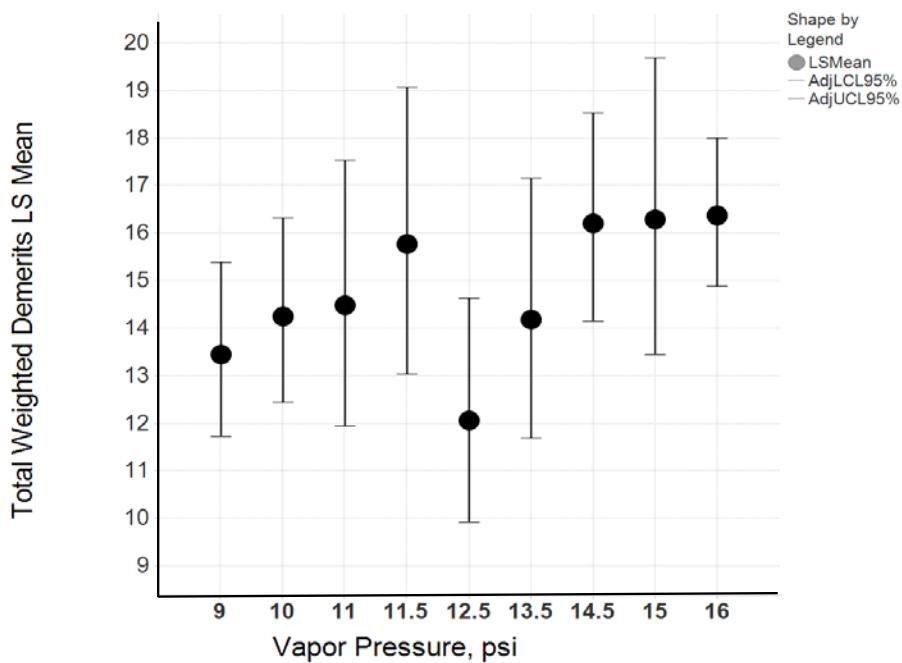


Figure 5 Revised
Effect of T50 on Total Weighted Demerits

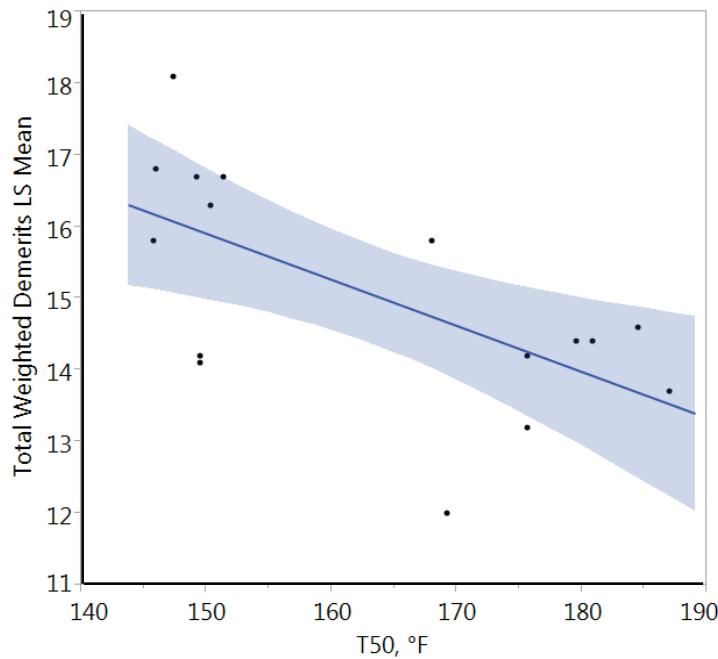


Figure 6
Driveability Comparison of 145 °F and 150 °F T50
for ASTM D4814 Class D and E Fuels

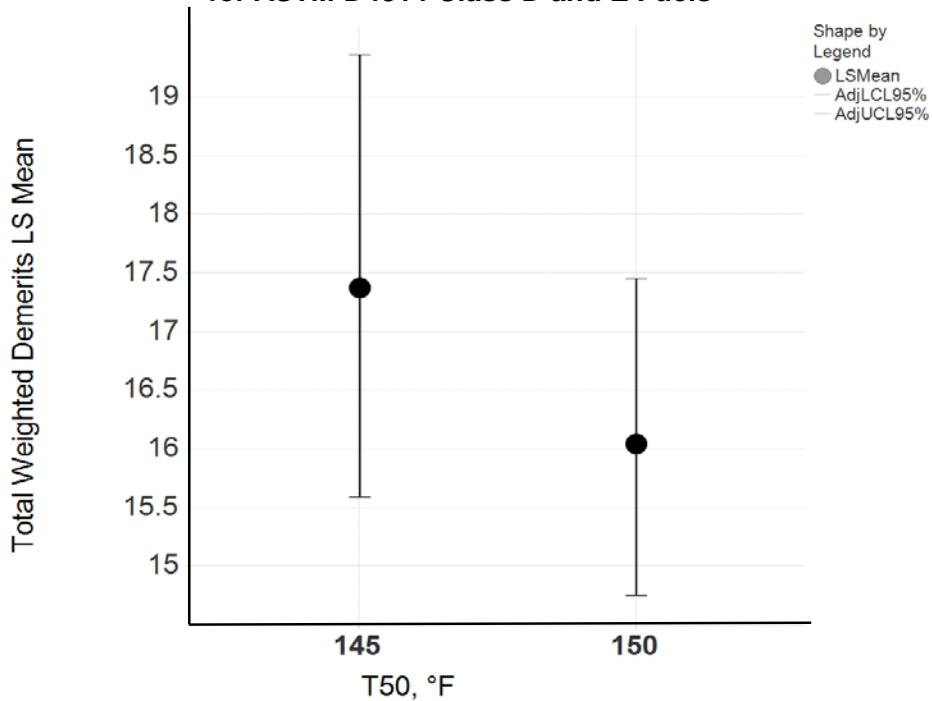


Figure 7
Effect of TVL20 on Total Weighted Demerits

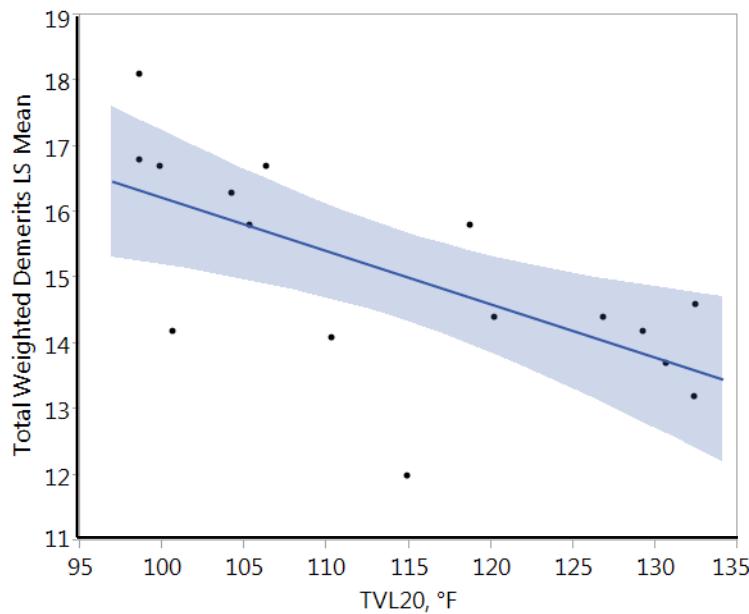


Figure 8
Correlation Between Vapor Pressure and TVL20

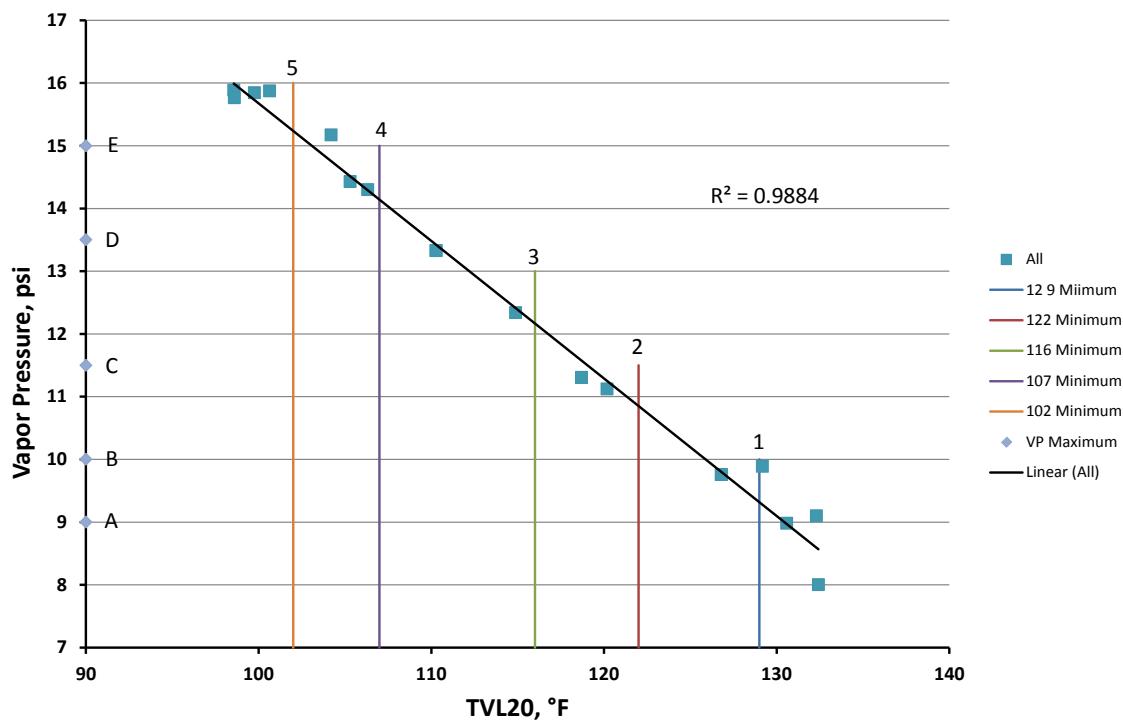


Figure 9
Driveability Comparison of Older and Newer Vehicles

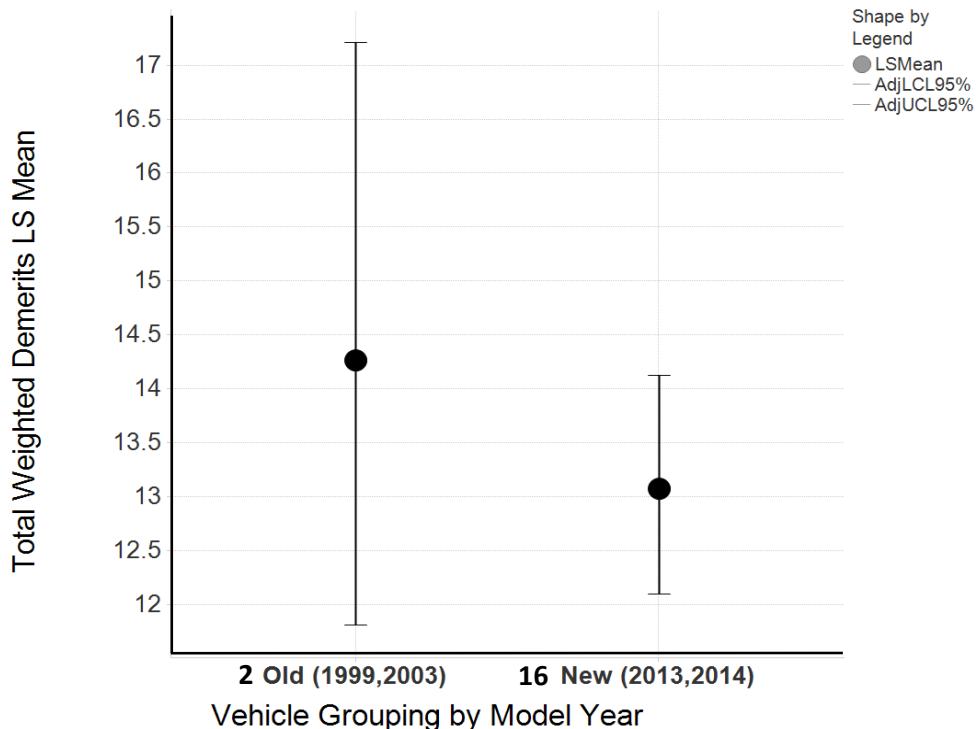


Figure 10
Driveability Comparison of Cars and Trucks

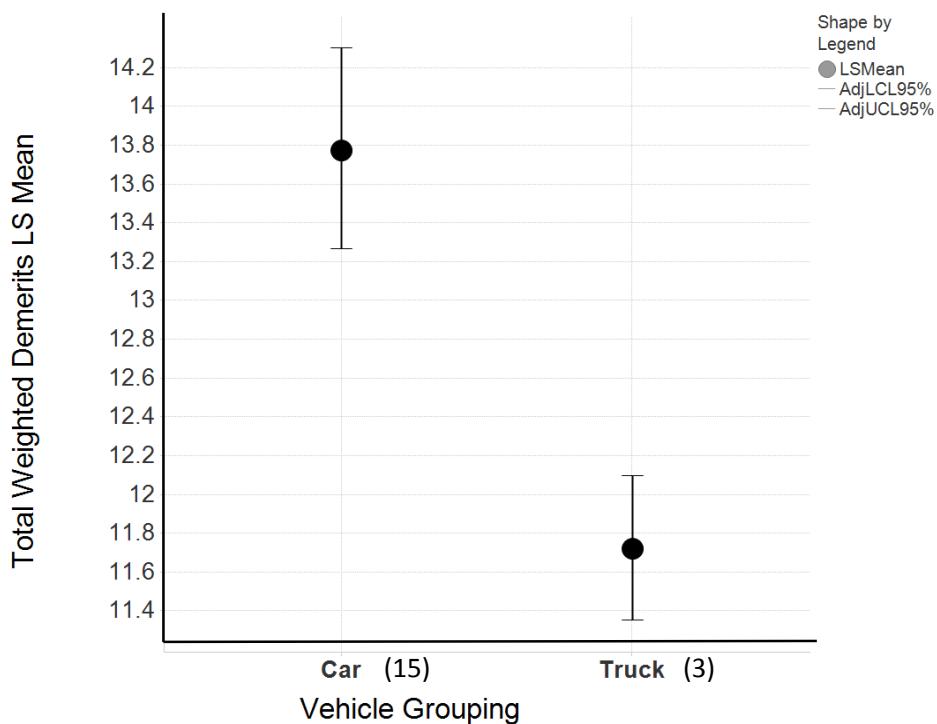


Figure 11
Driveability Comparison of PFI and SIDI Vehicles

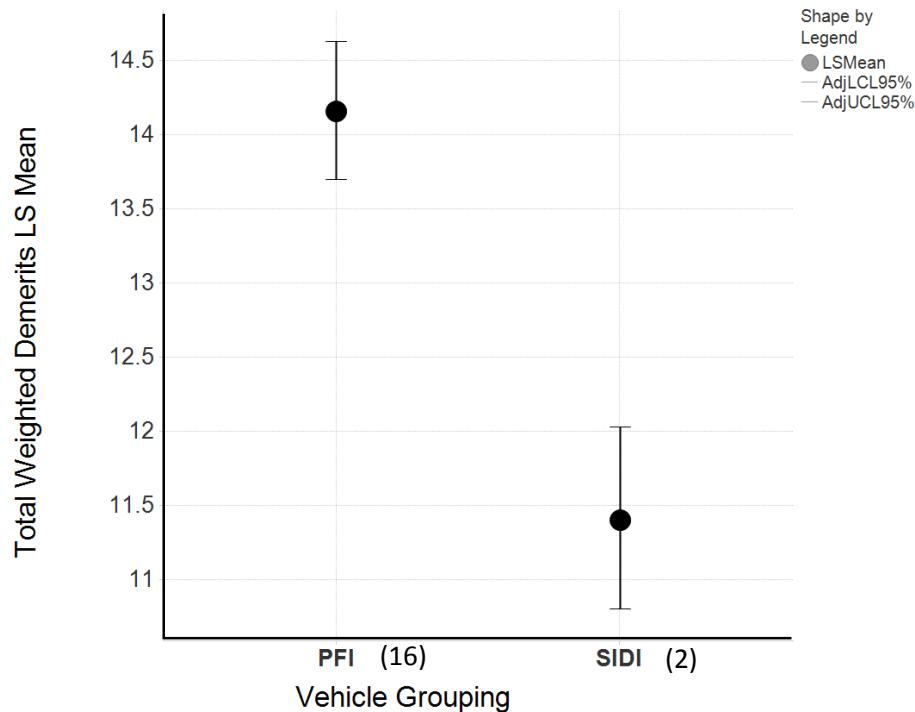


Figure 12
Effect of Vehicle Grouping, Ethanol Content, and Vapor Pressure on Driveability

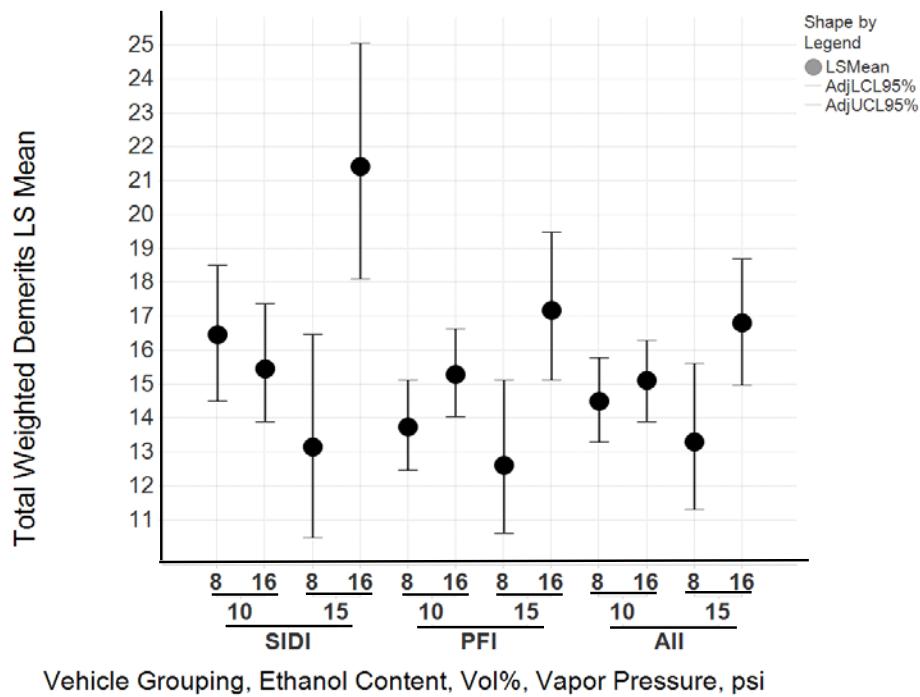


Figure 13
Driveability Comparison of Naturally Aspirated and Turbocharged Vehicles

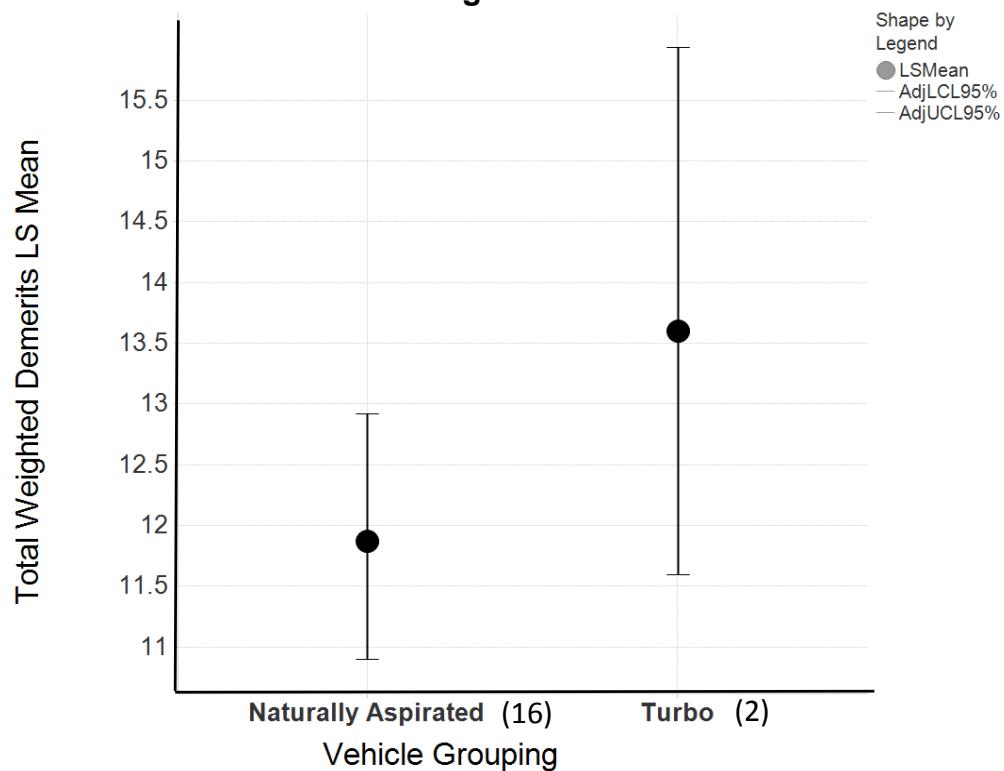


Figure 14
Driveability Comparison of Conventional-Fuel and Flexible-Fuel Vehicles

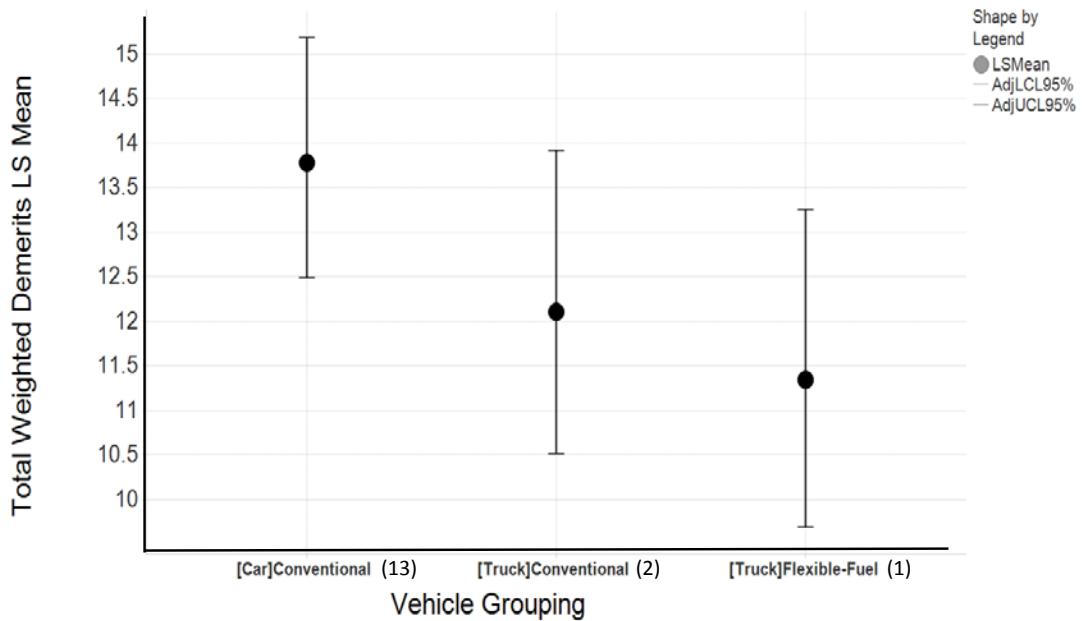


Figure 15
Effect of Fuel Pump Outlet Pressure on Driveability

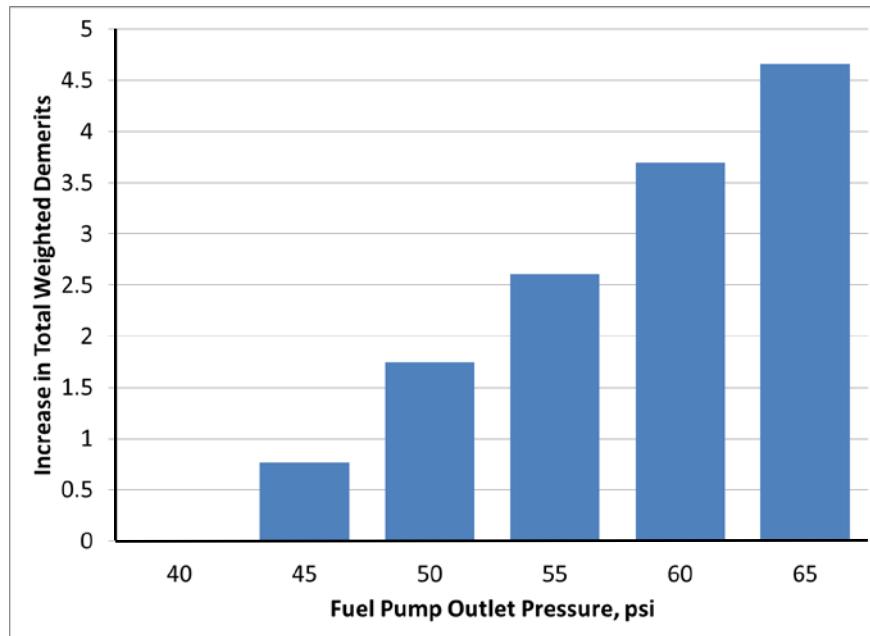


Figure 16
Effect of Curb Weight Load Factor on Driveability

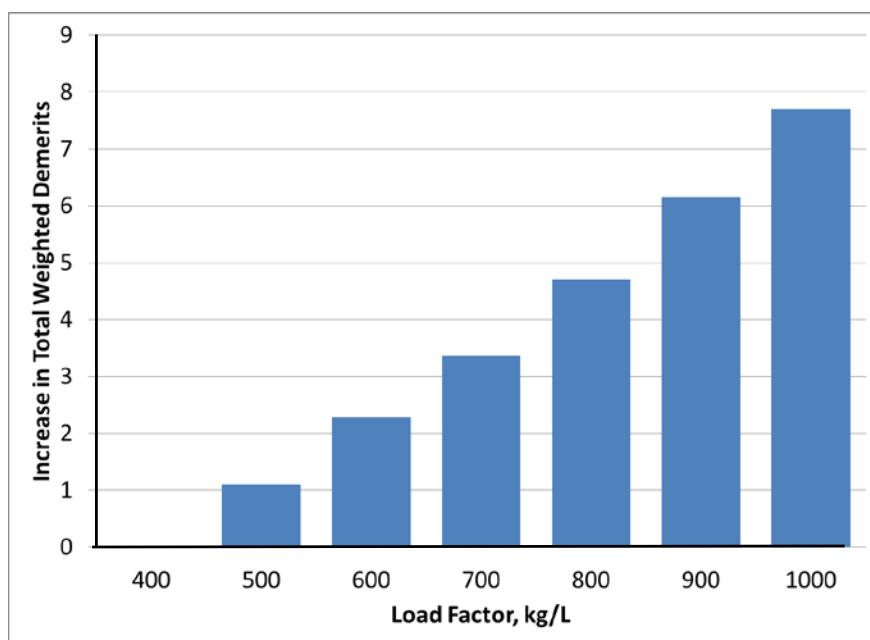


Figure 17
Effect of Emissions Control Technology on Driveability

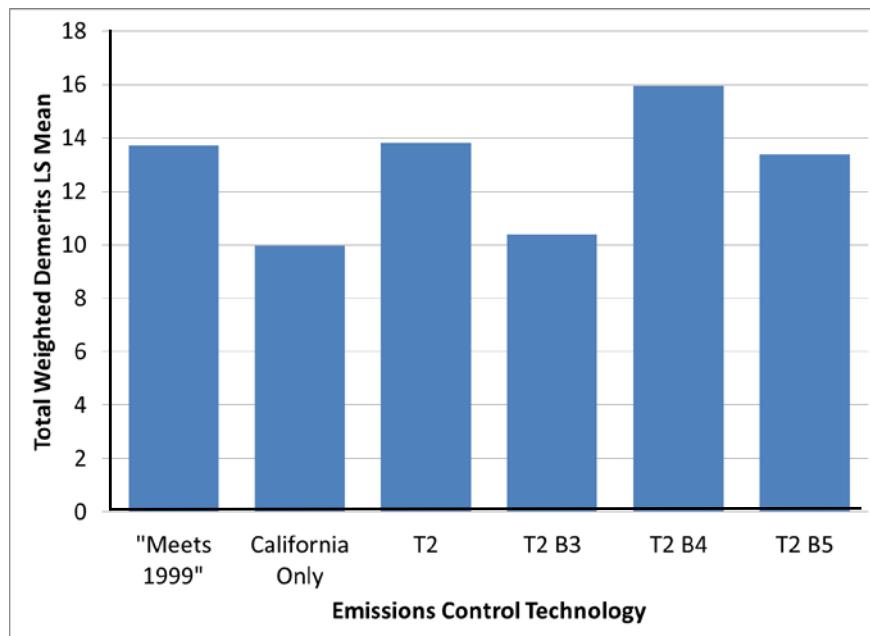


Figure 18
Effect of Maximum Ambient Temperature on Driveability

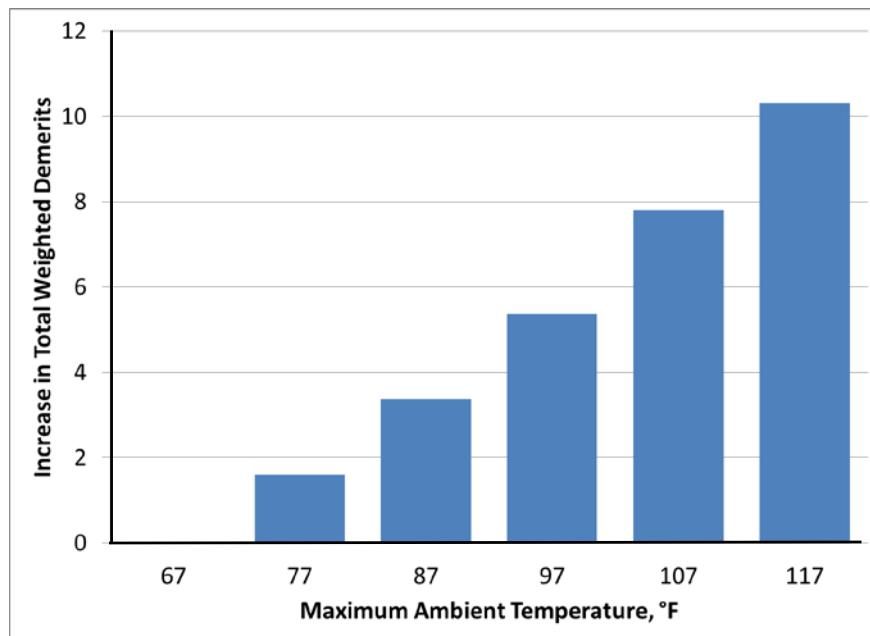


Figure 19
Effect of Temperature Range Grouping on Driveability

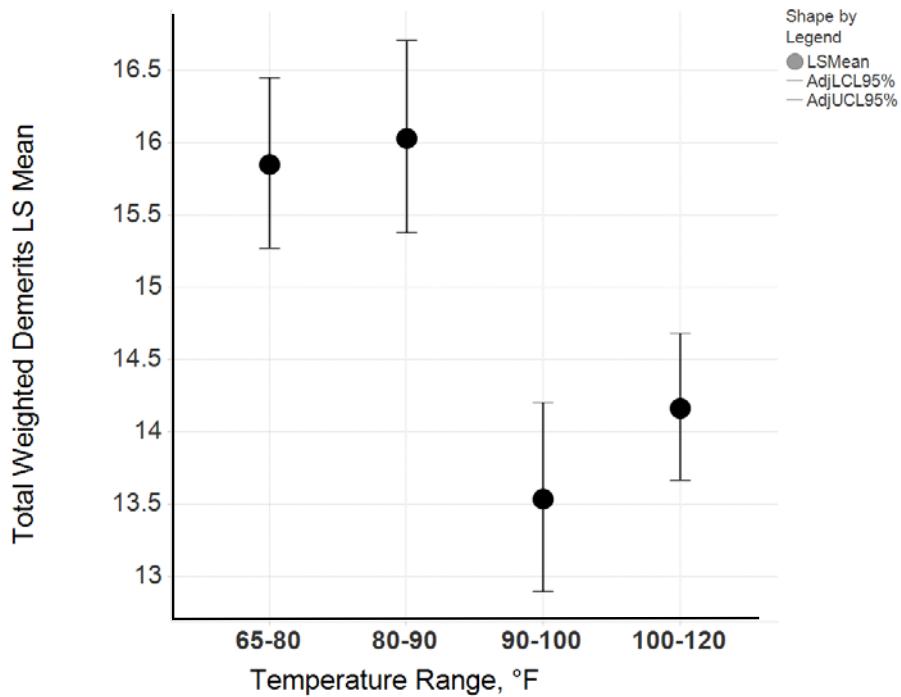


Figure 20
Effect of Fuel Rail Temperature on Driveability

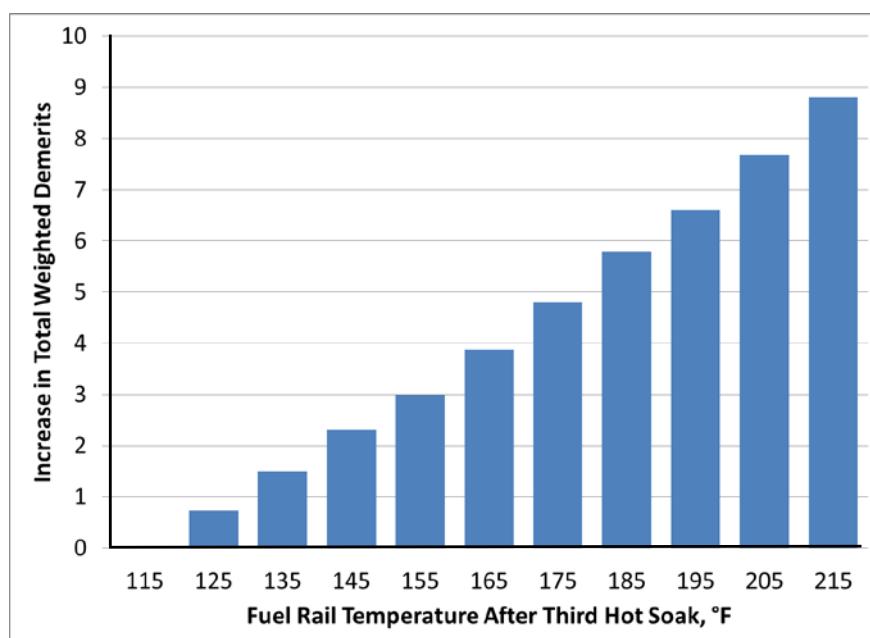


Figure 21
Effect of Test Site Wind Speed on Driveability

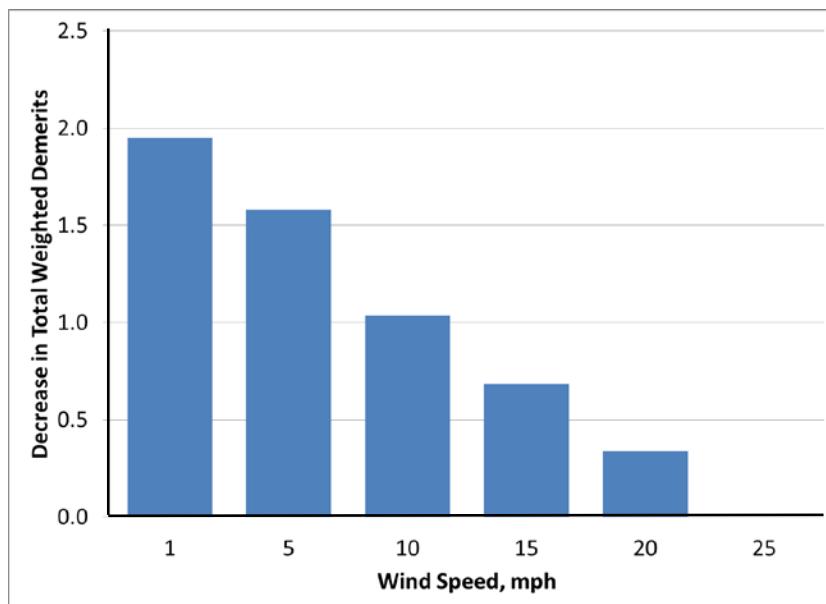


Figure 22
Comparison of Rater Total Weighted Demerit Ratings

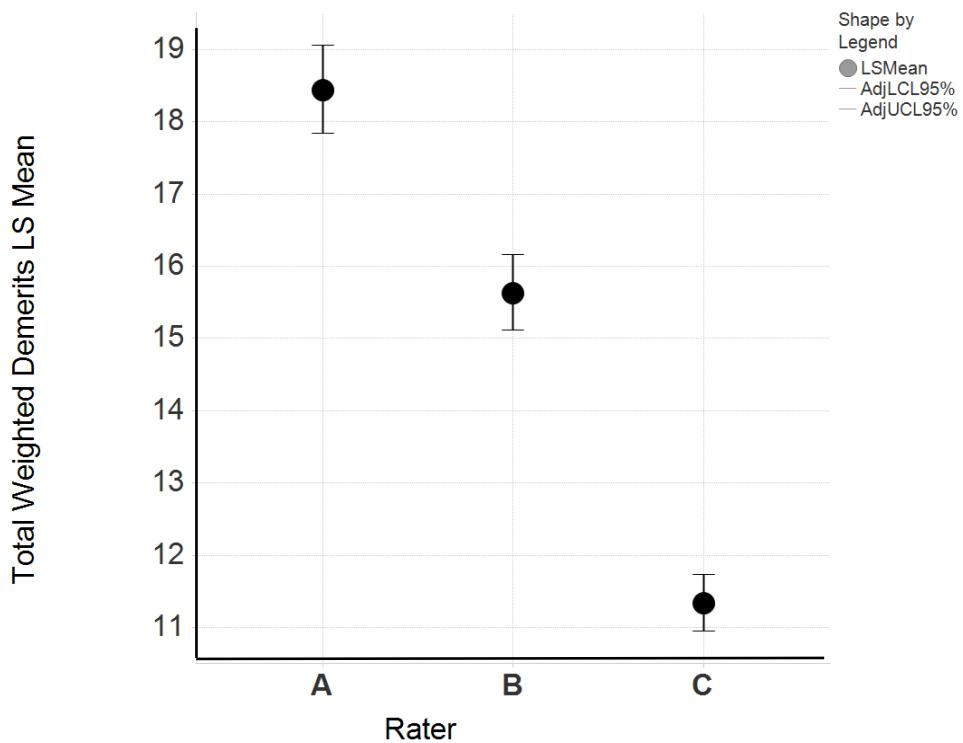


Figure 23
Comparison of Rater Total Weighted Demerit Ratings by Vehicle

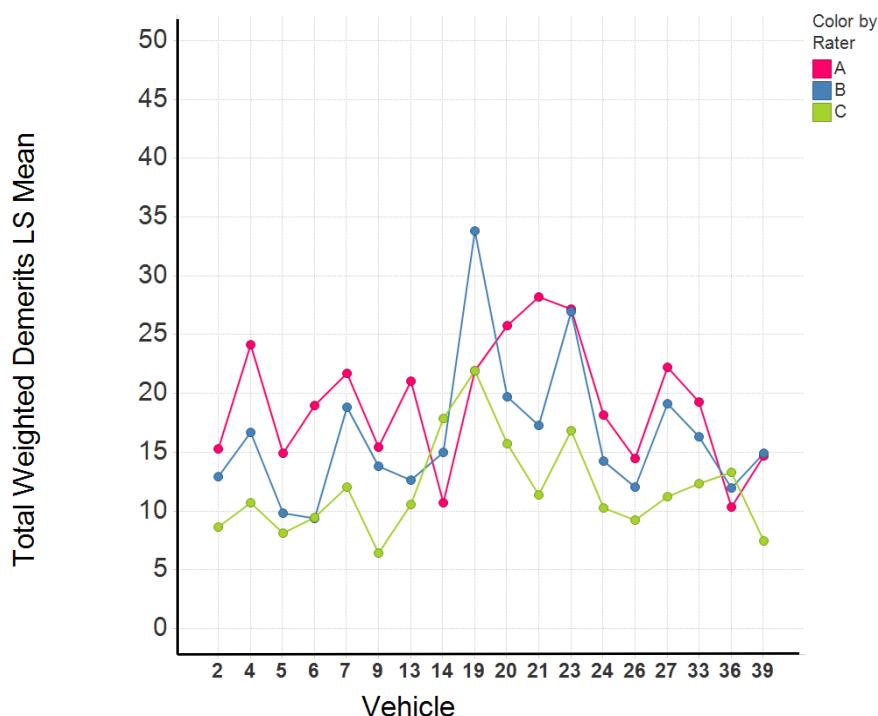


Figure 24
Loss in Vapor Pressure as a Function of Initial Vapor Pressure and Spring Ambient Temperatures

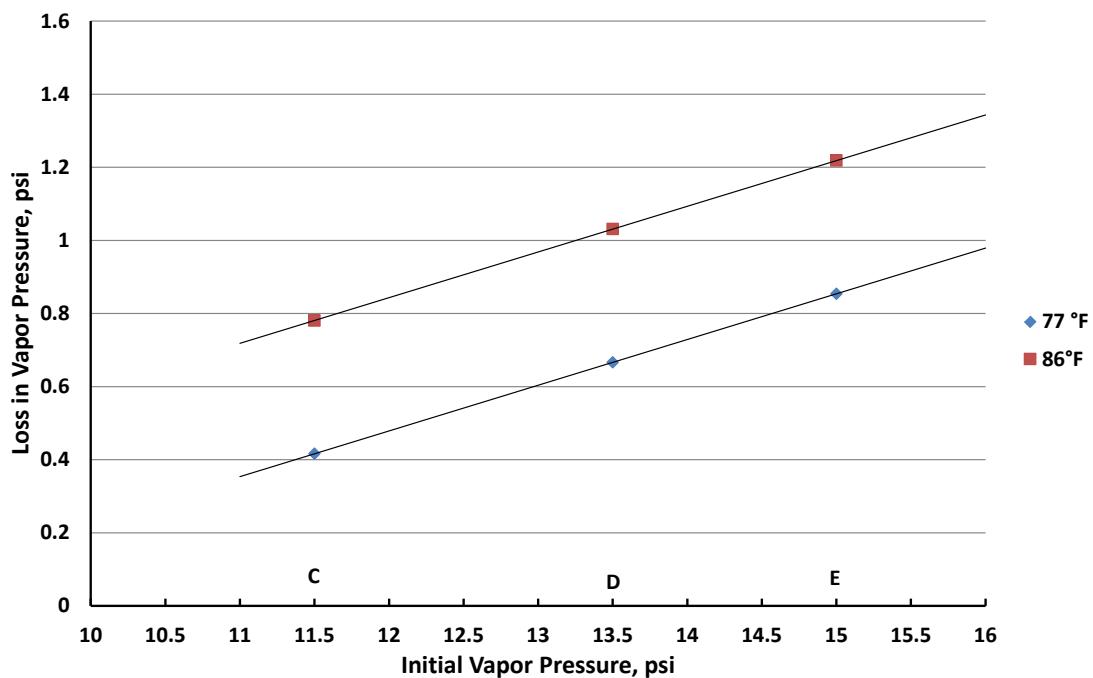


Figure 25
Loss in Vapor Pressure as a Function of Initial Vapor Pressure and Summer Ambient Temperatures

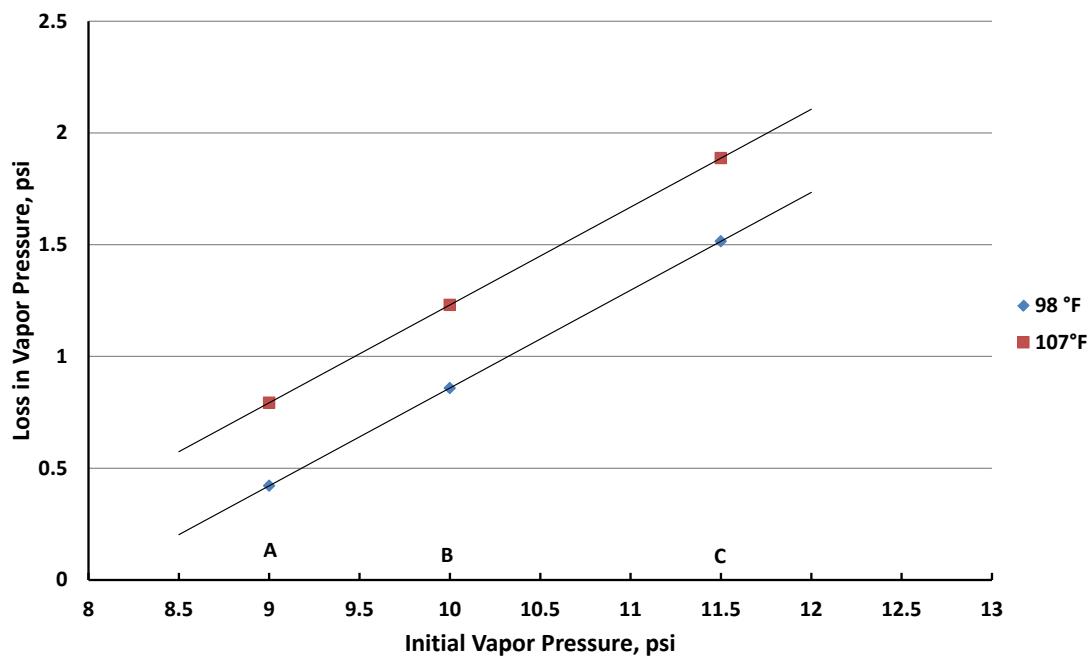


Figure 26
Increase in TVL20 as a Function of Initial TVL20 and Spring Ambient Temperatures

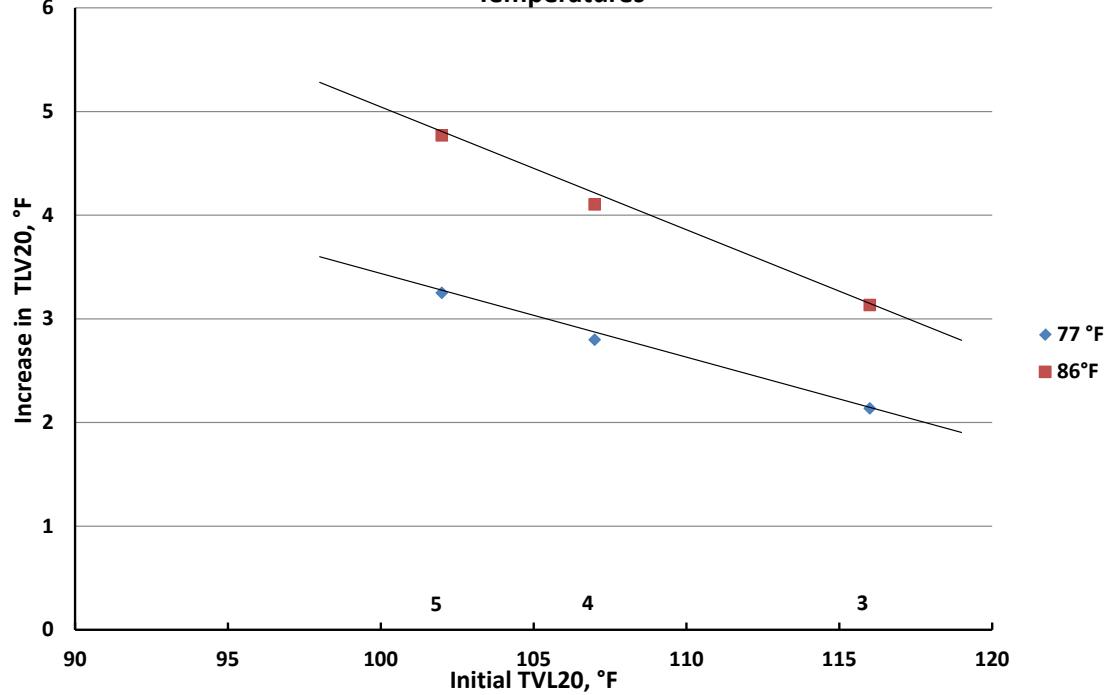
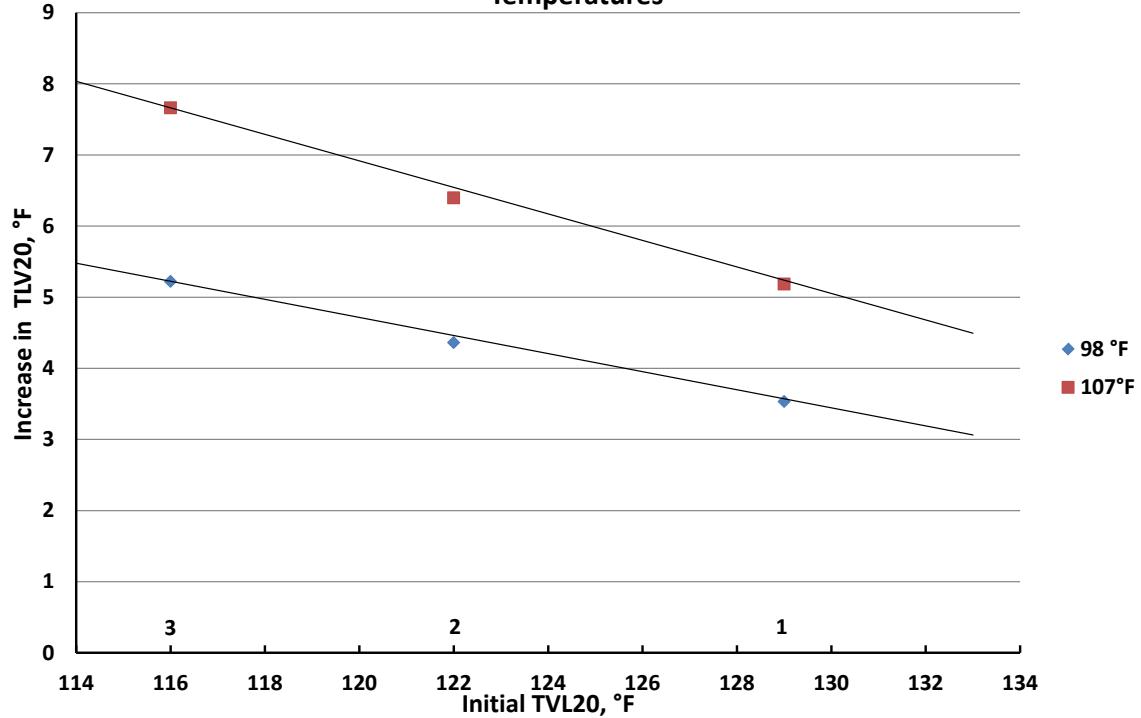


Figure 27
Increase in TVL20 as a Function of Initial TVL20 and Summer Ambient Temperatures



APPENDIX A

MEMBERS OF THE 2014 CRC HOT-FUEL-HANDLING PROGRAM DATA ANALYSIS PANEL

Appendix A

Members Of The 2014 CRC Hot-Fuel-Handling Program Data Analysis Panel

Name	Affiliation
Russ Lewis, Leader	Marathon Petroleum Company
Bill Studzinski, Leader	General Motors
Bruce Alexander	BP Global Fuels Technology
Beth Evans	Evans Research Consultants
Jeff Farenback-Brateman	ExxonMobil Research & Engineering
Anindya Ghosal	Shell Global Solutions (US) Inc.
Lew Gibbs	Consultant
Asim Iqbal	Chrysler
Jerry Horn	Chevron Products Company
Ron Osman	Flint Hills Resources
Jenny Sigelko	Volkswagen
Marie Valentine	Toyota

APPENDIX B

ON-SITE PARTICIPANTS IN THE 2014 CRC HOT-FUEL-HANDLING PROGRAM

Appendix B

On-Site Participants in the 2014 CRC Hot-Fuel-Handling Program

Name	Affiliation
Harold “Archie” Archibald	Evans Research Consultants
Frank Banach	Consultant
Scott Berkhous	ExxonMobil
Roger Bledsoe	Marathon Petroleum Company
Matt Boland	ExxonMobil
Ken Burt	General Motors
Jake Camp	BP
Bryan Campbell	Chevron
Lance Campbell	Marathon Petroleum Company
Yingxi Chen	BP
David Dahlin	Chevron
John Eckstrom	BP
Karthik Eticala	ExxonMobil
Beth Evans	Evans Research Consultants
Mark Winston Galant	General Motors
Jose Garcia	Chevron
Pat Geng	General Motors
Rich George	BP
Anindya Ghosal	Shell Global Solutions (US)
Bryan Giran	Sunoco
Mark Hartman	Consultant
Louis Jackson	ExxonMobil
Carl Jewitt	Jewitt & Associates
Jon Jones	Chevron
Phil Krysinski	Consultant
David Lax	API
Russ Lewis	Marathon Petroleum Company
Mike Lynch	ExxonMobil
Justin Pletzke	General Motors
Jim Sheridan	Marathon Petroleum Company
Steve Simms	Consultant
Bill Studzinski	GM Powertrain
Marie Valentine	Toyota

APPENDIX C

2014 CRC HOT-FUEL-HANDLING PROGRAM

CRC VOLATILITY GROUP PROGRAM

Program Ballot Supporting Information

Title: 2014 CRC Hot-Fuel Handling Vehicle Driveability Program testing Maximum ASTM D4814 Volatility Class Gasoline Blends (Max. RVP, Min. T50, Min. TVL20)

Objectives: Evaluate HFH Vehicle Driveability Performance of a fleet of conventional test vehicles, MYs 1998 – 2014 using a test fuel matrix including current D4814 volatility class maximum Vapor Pressure limits plus and minus 1 PSI and T50 and TVL20 parameters set to their minimums.

Deliverables: CRC Volatility Group Report with conclusions and supporting statistical data analysis assessing the effect of the current ASTM D4814 gasoline volatility class T50, and TVL20 limits on vehicle HFH driveability, along with higher VP limits permitted by NCWM and state waivers for ethanol blended fuels containing up to 10 vol% ethanol. The fuel matrix, shown below, includes a couple blends with T50 values slightly lower than current ASTM limits for Class D and E fuels, but occasionally observed in the field.

The program includes 3 RVP levels for each ambient test temperature window in order to assess potential non-linear driveability effects, evaluates E15 blends relative to E10 blends, and utilizes a variety of vehicle hardware content, fuel system designs, and model years.

Background: The National Conference on Weights & Measures (NCWM) in 2012 decided that the model gasoline regulation in NIST Handbook 130 should reference ASTM D4814 only and remove all exceptions/waivers. By taking this approach, the 1 psi waiver given for 10% ethanol-gasoline blends by many of the states that adopt in part or in whole NIST Handbook 130 would be eliminated. ASTM D4814 does not address the vapor pressure effects from ethanol blending and continues to cite the original “neat” vapor pressure limits put in place before the introduction of ethanol into gasoline. The U.S. marketplace has observed a steady increase in ethanol blending since the early 1990s with refiners relying on the vapor pressure waiver to produce these fuels. Elimination of the 1 psi increase from ethanol blending would result in significant reduction of the present gasoline blending pool. After much deliberation at the July 2012 Annual Meeting, NCWM continued to allow for the 1 psi waiver (reduced to 0.5 psi for Class E) until May 1, 2016 or sooner, if the ASTM D4814 specifications are modified to reflect the higher vapor pressure. This decision by the state regulators started the clock for the development and implementation of a very aggressive driveability project by CRC to generate data for use by ASTM in determining whether the specifications can be revised to include the higher vapor pressures currently allowed by waiver.

Test plan: Recent CRC Performance Committee reports (No. 658 and 659) detail the effects of D4814 Class D and E gasoline T50, TVL20, and ethanol content effects on vehicle hot-fuel handling (HFH) driveability, both at Sea Level and Altitude. To further understand volatility effects on modern vehicle HFH performance for all D4814 volatility classes, an additional HFH vehicle driveability study is planned that will set the VP (DVPE) parameter of a series of carefully designed test fuels to its maximum limit, while simultaneously setting the blend's T50 and TVL20 parameters to their minimum D4814 limits or lower. All other test fuel parameters will be held as constant as reasonably possible from blend to blend and consistent with the U.S. gasoline market. The test fuels will contain 10 vol% ethanol, but blends containing 15 v% ethanol could be included, if funding is available and testing of these fuels is deemed necessary. Additional Test Details are shown below.

This revised program will account for all volatility classes (AA through E) and will investigate potential non-linear effects in each temperature range. An on-site review of the General Motors Proving Grounds in Yuma, Arizona was conducted, cost quoted, and included in the drafted budget below. This facility has the resources and the weather required to run a project of this magnitude as well as enables CRC to lower the total cost of the program by utilizing their trained contract drivers for conditioning compared to reimbursed company volunteers.

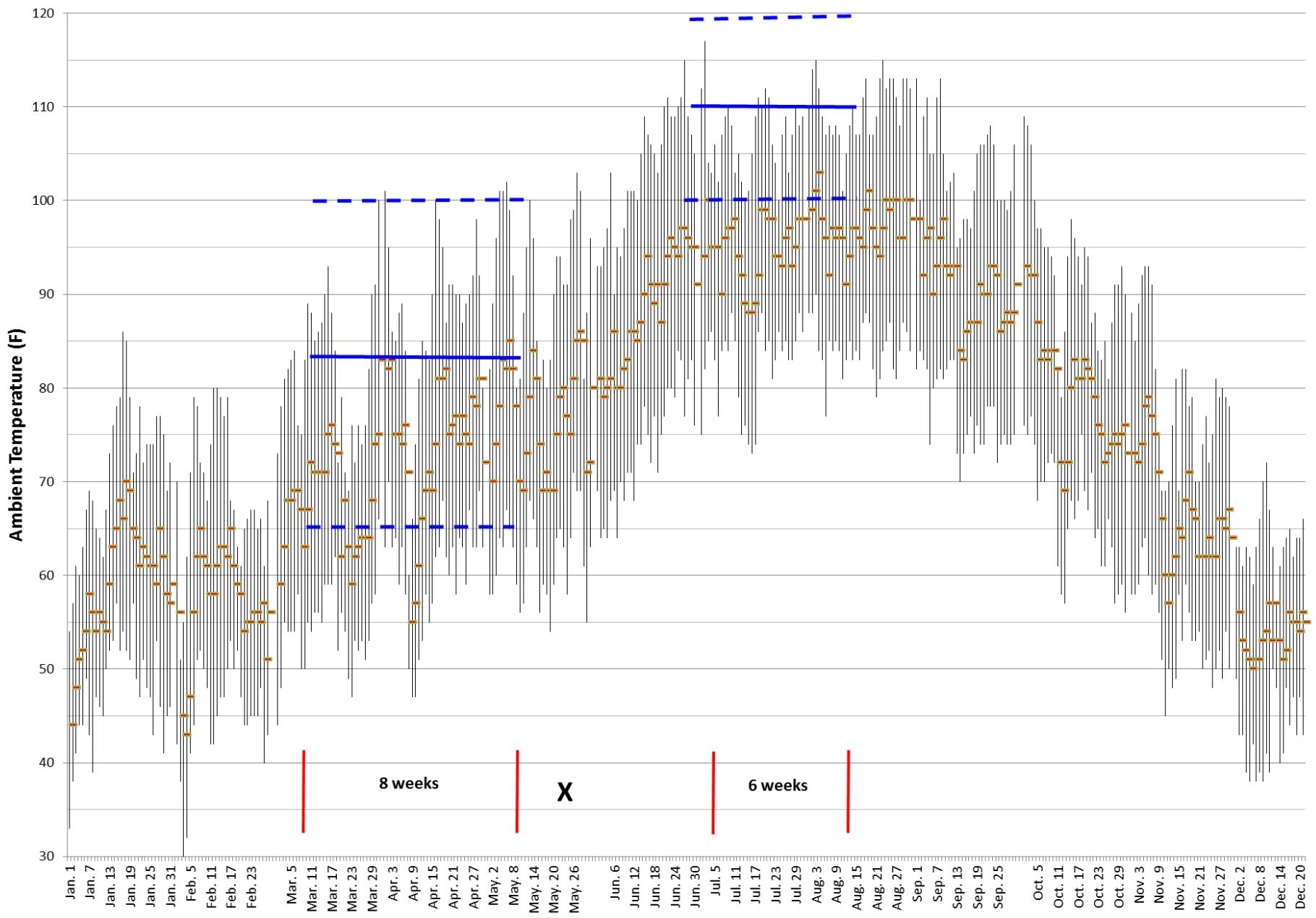
Summary of Program

- Evaluate maximum gasoline vapor pressure with and without the 1 psi waiver, along with minimum T50 and TVL20 limits, for current model year vehicles and older conventional vehicles.
- Vehicles will be divided into 3 groups: PFI from 1998-2005; PFI from 2006 – 2013; DI from 2013+
- Test program divided into two distinct periods – March through May for Classes C through E; July through August for Classes AA through B.
- Two-thirds factorial approach to be utilized with 2 of the 3 raters evaluating each fuel on each vehicle. Confirmed with statistician to be most effective approach. .
- 16 Test Fuels (11 are E10; 5 are E15) and 1 Screening Fuel to be utilized. See Table 2.
- One fuel from the immediate lower volatility class will be evaluated at the test temperature for the higher volatility material to examine non-linear effects.
- Target Octane Ratings: 87 AKI for Classes D & E, 88.5 AKI for AA, A, B, C because of elevated test temps and avoiding confounding driveability data with octane effects.
- Testing to be conducted at GM Proving Grounds in Yuma, AZ between March and August 2014.

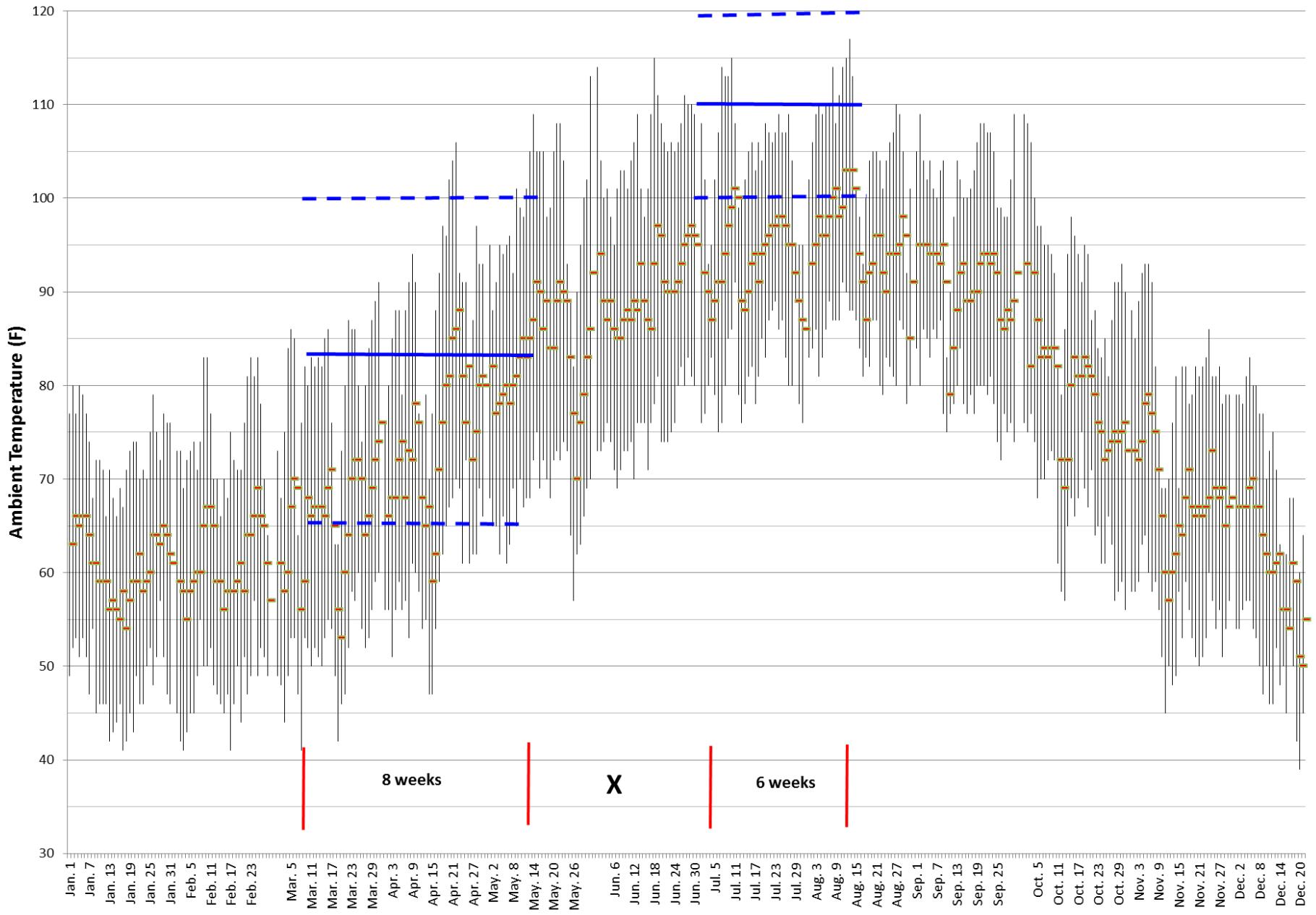
Table 2 – Fuel Properties Matrix

CRC Summer 2014 - HFH Program									
	+0.2 psi/-0.3 psi from target	+2°F/-3°F from target	+0.4 vol%/-0.5 vol% from target	+/-3°F from target	+/- 0.5 AKI from target of 89 AKI; If constrained by T50, please advise				
^Vapor Pressure and T50 are critical limits; whereas TVL20 is a target limit									
*Fuel Code	VP, psi	T50, °F	EtOH Content, Vol%	TVL20, °F	AKI	Total Gallons of Each Fuel	VP Class	Test Temp.	Projected Test Dates
E-TF1-E10	16 (15.7 to 16.0)	150 (147 to 152)	10 (9.5 to 10.4)	100 (97 to 103)	89 (88.5 to 89.5)	1140	E max + 1 psi	65 - 75 F	Mar 15 - June 1
E-TF2-E10	15 (14.7 to 15.0)	150 (147 to 152)	10 (9.5 to 10.4)	103 (100 to 106)	89 (88.5 to 89.5)	1140	E max	65 - 75 F	Mar 15 - June 1
E-TF3-E10	16 (15.7 to 16.2)	145 (142 to 147)	10 (9.5 to 10.4)	99 (96 to 102)	89 (88.5 to 89.5)	1140	E max + 1 psi	65 - 75 F	Mar 15 - June 1
E-TF4-E15	16 (15.7 to 16.2)	150 (147 to 152)	15 (14.5 to 15.4)	100 (97 to 103)	89 (88.5 to 89.5)	1140	E max + 1 psi	65 - 75 F	Mar 15 - June 1
E-TF5-E15	16 (15.7 to 16.2)	145 (142 to 147)	15 (14.5 to 15.4)	99 (96 to 102)	89 (88.5 to 89.5)	1140	E max + 1 psi	65 - 75 F	Mar 15 - June 1
D-TF7-E10**	13.5 (13.2 to 13.7)	150 (147 to 152)	10 (9.5 to 10.4)	110 (107 to 113)	89 (88.5 to 89.5)	1140	D + 0	65 - 75 F	Mar 15 - June 1
D-TF6-E10	14.5 (14.2 to 14.7)	145 (142 to 147)	10 (9.5 to 10.4)	107 (104 to 110)	89 (88.5 to 89.5)	1140	D + 1	80 - 90 F	Mar 15 - June 1
D-TF7-E10	13.5 (13.2 to 13.7)	150 (147 to 152)	10 (9.5 to 10.4)	110 (107 to 113)	89 (88.5 to 89.5)	1140	D + 0	80 - 90 F	Mar 15 - June 1
D-TF8-E15	14.5 (14.2 to 14.7)	150 (147 to 152)	15 (14.5 to 15.4)	107 (104 to 110)	89 (88.5 to 89.5)	1140	D + 1	80 - 90 F	Mar 15 - June 1
C-TF10-E10**	11.5 (11.2 to 11.7)	170 (167 to 172)	10 (9.5 to 10.4)	119 (116 to 122)	89 (88.5 to 89.5)	1140	C + 0	80 - 90 F	Mar 15 - June 1
C-TF9-E10	12.5 (12.2 to 12.7)	170 (167 to 172)	10 (9.5 to 10.4)	115 (112 to 118)	89 (88.5 to 89.5)	1140	C + 1	90 - 100 F	Mar 15 - June 1
C-TF10-E10	11.5 (11.2 to 11.7)	170 (167 to 172)	10 (9.5 to 10.4)	119 (116 to 122)	89 (88.5 to 89.5)	1140	C + 0	90 - 100 F	Mar 15 - June 1
B-TF12-E10**	10 (9.7 to 10.2)	180 (177 to 182)	10 (9.5 to 10.4)	127 (124 to 130)	89 (88.5 to 89.5)	1140	B + 0 / A + 1	90 - 100 F	Mar 15 - June 1
B-TF11-E10	11 (10.7 to 11.2)	180 (177 to 182)	10 (9.5 to 10.4)	123 (120 to 126)	89 (88.5 to 89.5)	1140	B + 1	100 - 120 F	Jul 7 - Aug ?
B-TF12-E10	10 (9.7 to 10.2)	180 (177 to 182)	10 (9.5 to 10.4)	127 (124 to 130)	89 (88.5 to 89.5)	1140	B + 0 / A + 1	100 - 120 F	Jul 7 - Aug ?
A-TF13-E10	9 (8.7 to 9.2)	190 (187 to 192)	10 (9.5 to 10.4)	134 (131 to 137)	89 (88.5 to 89.5)	1140	A + 0 / AA + 1	100 - 120 F	Jul 7 - Aug ?
AA-TF14-E10	8 (7.7 to 8.2)	190 (187 to 192)	10 (9.5 to 10.4)	139 (136 to 142)	89 (88.5 to 89.5)	1140	AA + 0	100 - 120 F	Jul 7 - Aug ?
A-TF15-E15	10 (9.7 to 10.2)	180 (177 to 182)	15 (14.5 to 15.4)	127 (124 to 130)	89 (88.5 to 89.5)	1140	A + 1	100 - 120 F	Jul 7 - Aug ?
AA-TF16-E15	9 (8.7 to 9.2)	190 (187 to 192)	15 (14.5 to 15.4)	134 (131 to 137)	89 (88.5 to 89.5)	1140	AA + 1	100 - 120 F	Jul 7 - Aug ?
E-SF17-E10***	17 (16.7 to 17.2)	140 (137 to 142)	10 (9.5 to 10.4)	94 (91 to 97)	89 (88.5 to 89.5)	2400	E + 2	65 - 75 F	Mar 15 - June 1

2011 Yuma, AZ Temperatures (Min - Max -Mean)



2012 Yuma, AZ Temperatures (Min - Max -Mean)



Hot-Fuel-Handling Test Procedure

Version: 2-09-2014

1. Drain vehicle fuel tank. Fill tank to 40% percent capacity with test fuel. Record start of test information on data form. Set vehicle air conditioning on normal (fan speed one lower than high) with windows down about one inch for entire test duration. (This ensures a constant load on the a/c and engine.)
2. Drive a preconditioning cycle. Proceed to entrance of test track and go to the respective soak shed. (See preconditioning procedure.)
3. Park vehicle (back into) in soak shed.
4. Turn engine off and soak for 20 minutes.
5. After 20 minutes, restart engine. Record starting time, idle quality, and the occurrence of any stalls. If engine stalls, restart immediately and record starting time and idle quality. Shift transmission into drive and record idle quality and any occurrence of stalls.
6. Accelerate vehicle at wide-open-throttle to 35 mph. Record any vehicle driveability malfunctions (power loss, surge, stumble, stall, etc.) and severity.
7. Proceed to end of test track. Turn around and drive back to soak shed at 50 mph. Park vehicle (back into) in soak shed.
8. Shift transmission into park and idle for 20 minutes. If engine stalls, record stall incident and idle soak time. Attempt to restart engine immediately. If engine starts and continues to run, continue test. If engine continues to stall after three restart attempts, restart vehicle by any appropriate means and abort test. Obtain fuel sample if test is aborted.
9. After 20-minute soak at idle, record idle quality. Shift to drive and record idle quality and any incidence of stalls and restarting.
10. Accelerate at light-throttle* to 35 mph. Record any vehicle driveability malfunctions (power loss, surge, stumble, stall, etc.) and severity.
11. Proceed to end of test track. Turn around and drive back to soak shed at 50 mph. Park vehicle (back into) in soak shed.
12. Turn engine off and soak for 20 minutes.
13. After 20 minutes, restart engine. Record starting time, idle quality, and the occurrence of any stalls. If engine stalls, restart immediately and record starting time and idle quality. Shift transmission into drive and record idle quality and any occurrence of stalls.
14. Accelerate at light-throttle* to 35 mph. Record any vehicle driveability malfunctions (power loss, surge, stumble, stall, etc.) and severity.
15. End of test. Obtain vehicle fuel tank sample if needed.

*Light-throttle acceleration is defined as the vacuum gauge reading for the initial throttle position required to attain 25 mph in 9 seconds.

DEFINITIONS AND EXPLANATIONS

Test Run

Operation of a car throughout the prescribed sequence of operating conditions and/or maneuvers for a single test fuel.

Maneuver

A specified single vehicle operation or change of operating conditions (such as idle, acceleration, or cruise) that constitutes one segment of the driveability driving schedule.

Cruise

Operation at a prescribed constant vehicle speed with a fixed throttle position on a level road.

Wide Open Throttle (WOT) Acceleration

"Floorboard" acceleration through the gears from prescribed starting speed. Rate at which throttle is depressed is to be as fast as possible without producing tire squeal or appreciable slippage.

Part-Throttle (PT) Acceleration

An acceleration made at any defined throttle position, or consistent change in throttle position, less than WOT. Several PT accelerations are used. They are:

1. **Light Throttle (Lt. Th)** - All light-throttle accelerations are begun by opening the throttle to an initial manifold vacuum and maintaining *constant throttle position* throughout the remainder of the acceleration. The vacuum selected is the vacuum setting necessary to reach 25 mph in 9 seconds. The vacuum setting should be determined when the vehicle is cold. The vacuum setting is posted in each vehicle.
2. **Moderate Throttle (Md. Th)** - Moderate-throttle accelerations are begun by immediately depressing the throttle to the position that gives the pre-specified vacuum and maintaining a *constant throttle position* throughout the acceleration. The moderate-throttle vacuum setting is determined by taking the mean of the vacuum observed during WOT acceleration and the vacuum prescribed for light-throttle acceleration. This setting is to be posted in the vehicle.
3. **Crowd** - An acceleration made at a constant intake manifold vacuum. To maintain *constant vacuum*, the throttle-opening must be continually increased with increasing engine speed. Crowd accelerations are performed at the same vacuum prescribed for the light-throttle acceleration.

4. Detent - All detent accelerations are begun by opening the throttle to just above the downshift position as indicated by transmission shift characteristic curves. Manifold vacuum corresponding to this point at 25 mph is posted in each vehicle. *Constant throttle position* is maintained to 35 mph in this maneuver.

Malfunctions

1. Stall

Any occasion during a test when the engine stops with the ignition on. Three types of stall, indicated by location on the data sheet, are:

- a. Stall; idle - Any stall experienced when the vehicle is not in motion, or when a maneuver is not being attempted.
- b. Stall; maneuvering - Any stall which occurs during a prescribed maneuver or attempt to maneuver.
- c. Stall; decelerating - Any stall which occurs while decelerating between maneuvers.

2. Idle Roughness

An evaluation of the idle quality or degree of smoothness while the engine is idling. Idle quality may be rated using any means available to the lay customer. The rating should be determined by the worst idle quality experienced during the idle period.

3. Backfire

An explosion in the induction or exhaust system.

4. Hesitation

A temporary lack of vehicle response to opening of the throttle.

5. Stumble

A short, sharp reduction in acceleration after the vehicle is in motion.

6. Surge

Cyclic power fluctuations.

Malfunction Severity Ratings

The number of stalls encountered during any maneuver are to be listed in the appropriate data sheet column. Each of the other malfunctions must be rated by severity and the letter designation entered on the data sheet. The following definitions of severity are to be applied in making such ratings.

1. Trace (T) - A level of malfunction severity that is just discernible to a test driver but not to most laymen.
2. Moderate (M) - A level of malfunction severity that is probably noticeable to the average laymen.
3. Heavy (H) - A level of malfunction severity that is pronounced and obvious to both test driver and layman.
4. Extreme (E) - A level of malfunction severity more severe than "Heavy" at which the lay driver would not have continued the maneuver, but taken some other action.

Enter a T, M, H, or E in the appropriate data block to indicate both the occurrence of the malfunction and its severity. More than one type of malfunction may be recorded on each line. If no malfunctions occur, enter a dash (-) to indicated that the maneuver was performed and operation was satisfactory during the maneuver.

DEMERIT CALCULATION SYSTEM

A numerical value for driveability during the CRC test is obtained by assigning demerits to operating malfunctions as shown. Depending upon the type of malfunction, demerits are assigned in various ways. Demerits for poor starting are obtained by subtracting one second from the measured starting time and multiplying by 4. The number of stalls which occur during idle as well as during driving maneuvers are counted separately and assigned demerits as shown. The multiplying x factors of 8 and 32 for idle and maneuvering stalls, respectively, account for the fact that stalls are very undesirable, especially during car maneuvers. A maximum of three total Idle Park stalls and No-Starts are permitted. A maximum of three Idle Drive stalls are permitted.

Other malfunctions, such as hesitation, stumble, surge, idle roughness, and backfire, are rated subjectively by the driver on a scale of trace, moderate, or heavy. For these malfunctions, a certain number of demerits is assigned to each of the subjective ratings. However, since all malfunctions are not of equal importance, the demerits are multiplied by the weighting factors shown to yield weighted demerits.

Finally, weighted demerits, demerits for stalls, and demerits for poor starting are summed to obtain total weighted demerits (TWD), which are used as an indication of driveability during the test. As driveability deteriorates, TWD increases.

A restriction is applied in the totaling of demerits to insure that a stall results in the highest possible number of demerits within a given maneuver. When more than one malfunction occurs during a maneuver, demerits are counted for only the malfunction which had the largest number of weighted demerits. Another restriction is that for each idle period, no more than 3 idle stalls are counted.

When all the factors are multiplied together the following chart of demerit levels is generated.

Demerit levels for: Hesitation/Stumble/Surge/Backfire/Stall

Maneuver	Stall	Extreme	Heavy	Medium	Trace	Clear
<u>Light Throttle</u>	50	16	8	4	2	0
<u>Medium Throttle</u>	100	32	16	8	4	0
<u>WOT</u>	100	32	16	8	4	0
<u>Detent</u>	50	16	8	4	2	0
<u>Crowd</u>	50	16	8	4	2	0

For Idle Roughness

Extreme	Heavy	Medium	Trace	Clear
8	4	2	1	0

For Idle Stalls

<u>Idle-in-Park</u>	<u> Starting-in-Drive</u>	<u> Other Idle (after moderate throttle or at end of test)</u>
<u>7 each</u>	<u> </u>	<u>28</u>

For Starting

No Start	 Slow Start
<u>25 each</u>	<u> t-1*5</u>

The Start time, t, is in seconds.

Only the results (start, start + stall, no-start) of the first three starting attempts in park count toward demerits.

Only the first stall in drive prior to maneuvering counts toward demerits

Only the first stall in each maneuver, or in each idle subsequent to the start of the maneuver is counted toward demerits.

Only the highest weighted demerit score from each maneuver is counted.

CRC 2014 GMDPG Hot Fuel Handling Test

General information

Vehicle	Fuel	Rater	Date	start warmup	warmup ambient
Test start time					
Test start ambient temp					

20 minute engine off soak

Start					End of soak temp	
Time/NS	Park stall	Park Idle	Drive stall	Drive idle		
restart 1					Temperature	
Time/NS	Park stall	Park Idle	Drive stall	Drive idle	Underhood	
					Fuel Rail	
restart 2					Fuel Tank	
Time/NS	Park stall	Park Idle	Drive stall	Drive idle		
WOT 0-35						
Hesitation	Stumble	Surge	Backfire	Stall		

20 minute engine Idle soak

End of soak temp						
Park stall	Park Idle	Drive stall	Drive idle			
Light throttle 0-35					Underhood	
Hesitation	Stumble	Surge	Backfire	Stall	Fuel Rail	
					Fuel Tank	

20 minute engine off soak

End of soak temp						
Start						
Time/NS	Park stall	Park Idle	Drive stall	Drive idle		
restart 1					Temperature	
Time/NS	Park stall	Park Idle	Drive stall	Drive idle	Underhood	
					Fuel Rail	
restart 2					Fuel Tank	
Time/NS	Park stall	Park Idle	Drive stall	Drive idle		
Light throttle 0-35						
Hesitation	Stumble	Surge	Backfire	Stall		

END OF TEST

Ambient temp

FUELING AND DEFUELING PROCEDURE

VEHICLE PREPARATION

Used test fuel from the vehicle is drained just before the fuel rail. The fuel line is disconnected at the OEM quick-disconnect to the fuel rail, and a Hansen fitting with hose is inserted between the fuel line and the fuel rail. During defueling, a tee is inserted between the two fittings, with one end of the tee leading to the “slop” fuel drum.

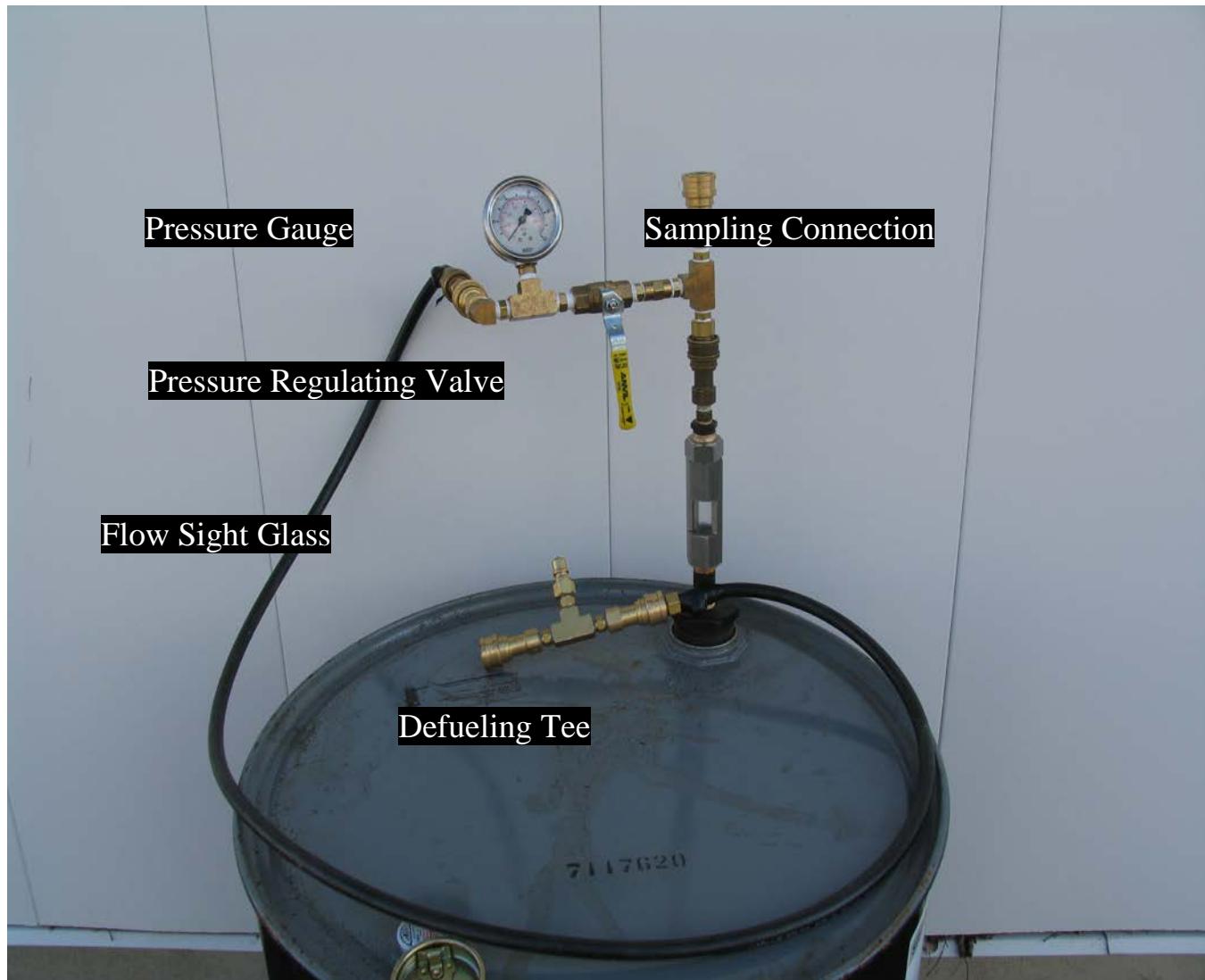
The next step in vehicle preparation is to install voltmeter leads to either the throttle-position-sensor (TPS) or the accelerator pedal, whichever is appropriate. The wires are routed into the passenger compartment of the vehicle to allow the rater to attach a voltmeter during testing. These wires should be long enough to allow either the rater or the observer to be able to read the voltmeter.

DEFUELING PROCEDURE

The fuel is drained into a “slop” drum. This draining system is a closed system, and requires the vehicle engine to be running during the draining procedure. The large bung of the “slop” drum is removed and replaced with a bung that has a two-foot stainless steel tube welded through it. The top of the tube has a Swedgelock fitting on it which attaches to a Hansen coupler. Atop the coupler is an apparatus which has a pressure gauge, a regulating valve, and a sight glass, along with an extra Hansen fitting to obtain fuel samples. During defueling, this apparatus is connected to the vehicle’s fuel line via the tee inserted as described above.

The small bung of the drum is removed and replaced by a bung with a float arrangement fabricated to indicate when the drum is full. This float arrangement has corks mounted on a rod on the underside of the small bung and a flag mounted on the same rod on the top-side of the small bung. As the fuel level in the drum rises, it pushes the corks up, which in turn pushes the flag up. This notifies the defueling personnel that the drum is full and must be changed.

Following is the procedure for draining and flushing the fuel system:



FUEL TANK FLUSHING PROCEDURE

Precautionary notes:

- 1. When draining the vehicle fuel tank, the vehicle engine is running, and the pressure to keep the engine running is regulated at the “slop” drum.***
- 2. Some vehicles require that the accelerator pedal be depressed to keep the engine running. An adjustable rod may be used to do this.***
- 3. Use a UL approved ground strap to ground defueling equipment to the fuel injector rail or fuel line fitting for all fuel draining.***

Flushing Procedure:

1. When a vehicle comes in from testing, the defueling apparatus is connected to the vehicle, and the engine is started so the fuel will flow. The flow to the “slop” drum is controlled by the regulating valve.
2. If a fuel sample is required, allow fuel to be drained for one minute through the draining apparatus on the “slop” drum before taking a fuel sample. Fuel from the vehicle should also be drained through the sampling line to ensure that the sample is not contaminated. A sample can then be taken from the sampling port on the draining apparatus.
3. Completely drain the vehicle’s fuel tank, at which time the engine will shut down.
4. Remove the fill cap, add four gallons of the next test fuel to the vehicle fuel tank, and replace the fill cap.
5. Start and idle the vehicle for a total of 2 minutes.
6. Completely drain the fuel tank through the draining apparatus, at which time the engine will shut down.
7. Remove the fill cap, add four gallons of the next test fuel to the vehicle fuel tank, and replace the fill cap.
8. Start and idle the vehicle for a total of 2 minutes. From approximately 15 seconds into the idle for a period of 30 seconds, rock the rear end of the vehicle from side to side. This task will require one person on each side of the vehicle.
9. Completely drain the fuel tank through the draining apparatus, at which time the engine will shut down.
10. When the vehicle is ready, remove the fill cap, add four or five gallons as required of the test fuel to the vehicle fuel tank, and replace the fill cap.

FUELING PROCEDURE

The vehicles are fueled out of a 55-gallon drum of test fuel, using a portable dispensing pump. This dispensing pump has been fabricated by mounting the motor and gauge on a hand-truck. The dispensing pump is service station quality. The large bung of the drum is removed, and a steel pipe is inserted into the drum. The top of the pipe has the male side of the Hansen coupler on it and is connected to the female side of the coupler on the dispensing pump inlet hose. The small bung is loosened just enough to keep the drum from collapsing while fuel is being pumped out of it.

Ground straps are used throughout the fueling and defueling process to avoid static electricity.

APPENDIX D

LISTING OF SCREENED VEHICLES

Table D-1
List of Screened Vehicles
CRC 2014 Volatility Program

Selected	Year	Make	Model	Veh. Series	State	Plate	Vin #	Mileage	Engine Disp. (L)	Cylinders	PFI or DI?	Fuel System Pressure @ Idle (psi)	Boosted?	FFV?	FWD, AWD, 4WD?	Curb Wt. Load Factor (kg/L)	Emissions Cat. - Fed.	Emissions Cat. - CARB
	1998	BUICK	PARK AVENUE	Ultra	AZ	BCC7951	1GYCU5219W4610190	114,130	3.8	6	PFI	41	SC	No	FWD	466		
*	1999	BUICK	CENTURY	--	AZ	AFN7610	2G4WY52M2X1458276	129,298	3.1	6	PFI	37	No	No	FWD	484	"Meets 1999"	"Meets 1999"
*	2003	CHEVY	IMPALA	LS	AZ	793MBM	2G1WH52K439273217	62,042	3.8	6	PFI	45	No	No	FWD	412	T2	NLEV
	2014	CHEVY	SONIC	LT	AZ	ATT7934	1G1JC6SH5E4106180	12,808	1.8	4	PFI	57	No	No	FWD	674	T2	ULEV
*	2014	CHEVY	CRUZE	LT	AZ	ATT7139	1G1PC5SB8E7273244	1,553	1.4	4	PFI	43	Turbo	No	FWD	979	T2	ULEV Qualified
	2014	CHEVY	IMPALA	LTZ	AZ	ATK1332	2G1WC5E35E1108667	10,314	3.6	6	GDI	55	No	FFV	FWD	451	T2	ULEV Qualified
*	2013	CHEVY	TAHOE	--	WA	ALW8115	1GNSKBE02DR318900	20,410	5.3	8	PFI	58	No	FFV	4x4	481	T2	ULEV Qual.
	2013	CHEVY	MALIBU	LT	CA	7BMC234	1G11E5SA5DF326123	16,043	2.5	4	GDI	47	No	No	FWD	620	T2	PZEV
*	2014	CHRYSLER	200	--	CA	7EKJ312	1C3CCBAB8EN212868	2,050	2.4	4	PFI	60	No	No	FWD	626	California Only	SULEV II - PZEV Qual.
*	2013	DODGE	CHALLENGER	--	CA	7ACX568	2C3CDYAG7DH649621	26,847	3.6	6	PFI	60	No	No	RWD	482	T2 B4	ULEV II Qualified
*	2013	DODGE	DART	SXT	CA	7A0H031	1C3CDFAA4DD318510	21,956	2.0	4	PFI	59	No	No	FWD	722	T2 B4	ULEV II Qualified
	2005	DODGE	GRAND CARAVAN	SXT	OH	341YCZ	2D4GP4L65R574527	130,300	3.8	6	PFI	57	No	No	FWD	511	T2 B5	LEV II
	2014	DODGE	CARAVAN	SXT	TX	CKK2120	2C4RDGCG2ER153621	15,220	3.6	6	PFI	61	No	FFV	FWD	554	T2 B4	ULEV Qual.
	2004	FORD	MUSTANG	GT	AZ	AMZD082	1FAFP42X8F4120841	123,418	4.6	8	PFI	32	No	No	RWD	333	T2 B8	ULEV
*	2014	FORD	MUSTANG	--	CA	7BFZ316	1ZUBP8EM8E5243237	22,809	3.7	6	PFI	55	No	No	RWD	433	T2 B4	ULEV II Qualified
*	2014	FORD	ESCAPE	SE	TX	CHM4622	1FMCU9GX2EUAA46143	20,258	1.6	4	GDI	60 (30 - 90)	Turbo	No	FWD	1003	T2 B5	Not For Sale in Calif.
	2001	FORD	ZX2	--	AZ	AVX5280	3FAFP11391R157845	142,189	2.0	4	PFI	33	No	No	FWD	557	NLEV	LEV
*	2013	FORD	FUSION	SE	CA	6ZFM734	3FA6P0H78DR249181	21,179	2.5	4	PFI	59	No	No	FWD	612	T2 B5	ULEV II
*	2014	FORD	FIESTA	SE	AZ	356ZED	3FADP4EJ0EM121514	8,913	1.6	4	PFI	58	No	No	FWD	705	T2 B4	ULEV II Qualified
	2014	GMC	ACADIA	SLT	AZ	BECC8233	1GKKVRKD4EJ290568	319	3.6	6	GDI	54	No	No	AWD	606	T2 LDT	ULEV Qual.
	2013	HYUNDAI	ELANTRA	--	NM	987SBD	5NPDH4AE5DH339468	14,471	2.0	4	PFI	53	No	No	FWD	604	T2 B5	ULEV II
	2013	HYUNDAI	ACCENT	--	IL	S328052	KMHCT4AE4XD0493640	14,349	1.6	4	GDI	69	No	No	FWD	690	T2 B5	ULEV II
	2013	HYUNDAI	TUCSON	--	AZ	ATK2787	KM8JUCAC1DU752156	10,228	2.4	4	PFI	53	No	No	AWD	619	California Only	SULEV II (PZEV)
	2014	HYUNDAI	SONATA	--	AZ	ATT7912	5NPB84ACXEH853113	7,771	2.4	4	GDI	70	No	No	FWD	594	T2 B5	ULEV II
*	2013	INFINITY	G37	--	AZ	BAL4093	JN1CV6AP4DM302227	27,027	3.7	6	PFI	54	No	No	FWD	423	T2 B5	LEV2 - ULEV
*	2014	JEEP	GRAND CHEROKEE	Limited	AZ	BEC6520	1C4RJEBG0EC410881	1,939	3.6	6	PFI	61	No	FFV	RWD	572	T2 B4	ULEV II Qual.
*	2013	KIA	OPTIMA	--	TX	BWW3704	5XKGM4A7XDG198984	27,767	2.4	4	GDI	69	No	No	FWD	600	T2 B5	ULEV II
	2014	KIA	CADENZA	--	AZ	ALJ6549	KNALN4D71E5136514	18,509	3.3	6	GDI	68	No	No	FWD	489	T2 B5	ULEV II
*	2013	MAZDA	2	--	AZ	ALZ2047	JM1DE1KZ1D0159975	17,031	1.5	4	PFI	58	No	No	FWD	681	T2 B5	ULEV II
	2014	NISSAN	ALTIMA	S	AZ	AMW5883	1N4AL3AP5EN214295	14,482	2.5	4	PFI	54	No	No	FWD	561	T2 B5	LEV2 - LEV
*	2013	NISSAN	SENTRA	SV	TX	BZZ4952	3N1AB7AP1DL708398	23,008	1.8	4	PFI	51	No	No	FWD	697	T2 B5	LEV2 - LEV
	2014	RAM	B2500	SLT	AZ	CG14688	3C6TR5DT3EG195073	1,231	5.7	8	PFI	60	No	No	4x4	526	HDV	ULEV II MDV
*	2013	TOYOTA	COROLLA	LE	NV	934YXY	5YFBU4EE8DP196872	16,904	1.8	4	PFI	49	No	No	FWD	673	T2 B5	ULEV II
	2014	TOYOTA	SIENNA	LE	CA	7CMB089	5TDKK3DC4ES412987	7,857	3.5	6	PFI	59	No	No	FWD	552	T2 B5	ULEV
	2014	TOYOTA	CAMRY	LE	AZ	APR0175	4T4BF1FK5ER374448	3,768	2.5	4	PFI	60	No	No	FWD	561	T2 B5	ULEV II
	2013	TOYOTA	RAV4	LE	CA	7AKK270	2T3ZFREV0DW019423	20,237	2.5	4	PFI	50	No	No	FWD	600	T2 B5	ULEV II
	2014	TOYOTA	YARIS	LE	AZ	ATK2701	JTDKTUD31ED574716	15,749	1.5	4	PFI	49	No	No	FWD	693	T2 B5	ULEV II
*	2013	VOLKS	GOLF	--	NM	125SBN	WVWDB7AJXDW133492	18,602	2.5	4	PFI	60	No	No	FWD	538	T2 B3	PZEV
	2013	VOLKS	JETTA	SE	CA	7AOG941	3VWDP7AJXDM293628	20,504	2.5	4	PFI	60	No	No	FWD	549	T2 B3	PZEV
	2013	VOLKS	PASSAT	--	CA	6YSJ421	1VWAP7A30DC063702	29,962	2.5	4	PFI	59	No	No	FWD	570	T2 B3	PZEV

APPENDIX E

**DETAILED INDIVIDUAL LABORATORY FUEL INSPECTIONS,
DETAILED HYDROCARBON ANALYSIS, ON-SITE TEST FUEL
INSPECTIONS, AND END-OF-TEST VEHICLE FUEL SAMPLE
INSPECTIONS**

Table E-1
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF1-E10						E-TF2-E10					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	63.2	62.7	63	62.3	62.3	62.7	62.3	66.2	64.5	61.7	61.6	63.2
Research Octane Number	D2699	RON	93.9	94.4	93.8	94.0	93.8	94.0	93.2	94.3	93.7	94.0	93.8	93.8
Motor Octane Number	D2700	MON	85.0	85.0	84.8	84.0	84.4	84.6	84.7	84.7	84.6	84.0	84.2	84.4
Antiknock Index, (R+M)/2	D2699/D2700	AKI	89.4	89.7	89.3	89.0	89.1	89.3	89.0	89.5	89	89.0	89.0	89.1
Ethanol Content	D5599	vol %	9.77	10.39	9.16	9.59	9.95	9.8	9.67	10.50	9.5	9.44	9.76	9.8
DVPE Vapor Pressure	D5191	psi	16.07	15.51	16.02	15.80	15.98	15.9	15.05	14.58	15.12	15.02	16.10	15.2
Temperature V/L=20 (TVL20)	D5188	°F	101.2	101.7	98.7	99	102.6	100.6	102.5	106.8	102.6	102	107.1	104.2
Sulfur Content	D2622/D7039	ppm	18.1	19.9	20.3	19	18	19.1	18.9	18.1	21.2	19	19	19.2
FIA (uncorrected)	D1319													
Saturates		vol %	68.44	76.6	68.7			71.2		72.8	73.1	66.2		70.7
Aromatics		vol %	25.95	19.8	24.9			23.6		22.3	21.1	26.9		23.4
Olefins		vol %	5.60	3.6	6.4			5.2		4.9	5.8	6.9		5.9
FIA (corrected for oxygenates)	D1319													
Saturates		vol %	61.3	69.6	62.3	59.0	63.1		65.2	66.2	60.0	58.0	62.3	
Aromatics		vol %	23.3	18	22.6	24.0	22.0		20.0	19.1	24.4	24.9	22.1	
Olefins		vol %	5.0	3.3	5.8	8.7	5.7		4.3	5.2	6.3	7.0	5.7	
Benzene	D3606	vol %		1.42	1.13	1.14	1.05	1.2		1.34	1.12	1.08	1.04	1.1
D86 Distillation	D86													
Initial Boiling Point		°F	85.1	86.9	75.1	78.7	70.9	79.3	80.1	76.2	76.5	78.8	72.5	76.8
1% Evaporated		°F		86.9	80.6	78.7			82.1		76.2	83.6	78.8	79.5
2% Evaporated		°F		86.9	84.2	78.7			83.3		76.2	87.8	78.8	80.9
3% Evaporated		°F		86.9	86.9	78.7			84.2		76.2	90.6	78.8	81.9
4% Evaporated		°F		86.9	88.7	86.3			87.3		76.2	92.7	89.0	86.0
5% Evaporated		°F	92.1	86.9	90.9	88.5	91.1	89.9	89.3	84.5	94.7	91.7	95.0	91.0
6% Evaporated		°F	92.1	92.4	90.5			91.7		88.7	96.3	94.1		93.0
7% Evaporated		°F		95.0	94.1	92.4			93.8		91.2	98	96.0	95.1
8% Evaporated		°F		96.8	95.5	94.0			95.4		93.5	99.8	98.1	97.1
9% Evaporated		°F		98.6	96.8	95.5			97.0		95.6	101.1	99.7	98.8
10% Evaporated		°F	98.6	100.2	98.3	97.0	99.0	99.6	99.2	97.4	102.3	101.4	103.4	100.7
11% Evaporated		°F		101.4	99.5	98.5			99.8		99.2	103.9	102.6	101.9
12% Evaporated		°F		102.8	101	99.7			101.2		100.8	105.2	104.1	103.4
13% Evaporated		°F		104.2	102.1	101.2			102.5		102.1	106.6	105.5	104.7
14% Evaporated		°F		105.5	103.6	102.6			103.9		103.9	108	106.8	106.2
15% Evaporated		°F		106.9	105	103.8			105.2		105.2	109.5	108.1	107.6
16% Evaporated		°F		108.0	106.4	104.8			106.4		106.7	110.7	109.4	108.9
17% Evaporated		°F		109.1	107.8	106.1			107.7		107.9	112.1	110.6	110.2
18% Evaporated		°F		110.3	109.2	107.3			108.9		108.9	113.5	111.9	111.4
19% Evaporated		°F		111.6	110.4	108.7			110.2		110.0	114.9	113.2	112.7
20% Evaporated		°F	110.8	112.9	111.9	110.0	112.5	111.6	112.6	111.4	116.3	114.5	116.9	114.3
21% Evaporated		°F		114.1	113.2	111.5			112.9		112.6	117.7	115.7	115.3
22% Evaporated		°F		115.3	114.7	112.6			114.2		113.8	118.7	116.9	116.5
23% Evaporated		°F		116.5	115.9	114.1			115.5		115.1	120.5	118.3	118.0
24% Evaporated		°F		117.7	117.5	115.5			116.9		116.5	121.8	119.4	119.2
25% Evaporated		°F		118.9	119	116.8			118.2		117.8	123.2	120.7	120.6
26% Evaporated		°F		120.2	120.3	118.1			119.5		119.0	124.3	122.1	121.8
27% Evaporated		°F		121.4	121.6	119.6			120.9		120.6	125.7	123.4	123.2
28% Evaporated		°F		122.9	122.6	120.8			122.1		122.0	127.3	124.5	124.6
29% Evaporated		°F		124.0	124.5	122.3			123.6		123.4	128.5	125.9	125.9
30% Evaporated		°F	124.0	125.1	126.1	123.6	126.5	125.1	125.7	124.8	130	127.3	129.7	127.5
31% Evaporated		°F		126.8	127.5	125.0			126.4		125.9	131.1	128.5	128.5
32% Evaporated		°F		128.0	129	126.5			127.8		127.5	132.3	129.8	129.9
33% Evaporated		°F		129.1	130.4	127.9			129.1		128.7	133.8	131.0	131.2
34% Evaporated		°F		130.6	131.6	129.2			130.5		129.9	134.7	132.2	132.3
35% Evaporated		°F		131.9	132.7	130.5			131.7		130.8	136.5	133.4	133.6
36% Evaporated		°F		133.1	134.2	131.8			133.0		132.7	137.5	134.6	134.9
37% Evaporated		°F		134.2	135.8	133.4			134.5		133.6	138.6	135.7	136.0
38% Evaporated		°F		135.1	136.8	134.7			135.5		135.0	140	136.8	137.3
39% Evaporated		°F		136.6	138.1	135.9			136.9		136.4	141.2	138.1	138.6
40% Evaporated		°F	136.9	137.8	139.4	137.2	139.1	138.1	137.9	137.4	142.1	139.3	141.8	139.7

41% Evaporated		°F		138.7	140.2	138.4		139.1		138.8	143	140.2		140.7
42% Evaporated		°F		139.7	141.6	139.7		140.3		139.8	144.3	141.5		141.9
43% Evaporated		°F		141.0	142.6	140.7		141.4		141.3	145.3	142.3		143.0
44% Evaporated		°F		141.9	143.9	141.8		142.5		142.3	146.4	143.5		144.1
45% Evaporated		°F		143.4	145.4	143.0		143.9		143.6	147.4	144.5		145.2
46% Evaporated		°F		144.5	146.6	143.9		145.0		144.9	148.2	145.6		146.2
47% Evaporated		°F		145.6	147.4	145.1		146.0		146.2	149.6	146.6		147.5
48% Evaporated		°F		146.8	148.4	146.3		147.2		147.3	150.3	147.4		148.3
49% Evaporated		°F		147.8	149.5	147.3		148.2		148.4	151.2	148.4		149.3
50% Evaporated		°F	148.6	148.9	150.6	148.5	150.7	149.5	148.7	149.6	152.1	149.5	151.8	150.3
51% Evaporated		°F		149.5	151.4	149.5		150.1		150.5	153.1	150.4		151.3
52% Evaporated		°F		150.4	152.1	150.8		151.1		151.1	153.7	151.0		151.9
53% Evaporated		°F		151.3	153.4	151.3		152.0		152.1	154.6	151.8		152.8
54% Evaporated		°F		152.5	154.4	152.3		153.1		152.9	155.3	152.7		153.6
55% Evaporated		°F		153.2	155.1	153.1		153.8		153.4	156	153.3		154.2
56% Evaporated		°F		154.2	155.6	154.1		154.6		154.7	157.1	154.9		155.6
57% Evaporated		°F		155.5	156.9	154.8		155.7		155.7	160.3	155.9		157.3
58% Evaporated		°F		157.1	158.1	155.8		157.0		155.7	165.4	158.5		159.9
59% Evaporated		°F		157.9	160.4	156.9		158.4		156.2	172.8	164.4		164.5
60% Evaporated		°F	159.1	160.7	165.1	157.7	159.3	160.4	165.1	158.9	185.3	171.0	173.7	170.8
61% Evaporated		°F		165.2	174	162.1		167.1		165.4	195.2	179.1		179.9
62% Evaporated		°F		173.1	187.3	170.4		176.9		176.8	203.1	187.6		189.2
63% Evaporated		°F		184.2	197.3	179.8		187.1		188.8	211.7	195.5		198.7
64% Evaporated		°F		194.7	207.2	191.0		197.6		197.6	217	202.7		205.8
65% Evaporated		°F		203.4	214.2	200.3		206.0		203.3	222.2	209.0		211.5
66% Evaporated		°F		209.8	220.7	207.7		212.7		208.3	227	215.0		216.8
67% Evaporated		°F		217.0	225.9	214.9		219.3		212.9	231.1	220.0		221.3
68% Evaporated		°F		221.8	229.7	220.3		223.9		217.4	235.1	224.3		225.6
69% Evaporated		°F		226.4	234.7	225.5		228.9		222.2	240.5	228.9		230.5
70% Evaporated		°F	231.3	230.6	238.9	229.9	230.8	232.3	230.6	225.7	244.2	233.1	236.7	234.1
71% Evaporated		°F		235.1	243.3	233.7		237.4		231.2	247.5	237.2		238.6
72% Evaporated		°F		238.9	247.8	237.4		241.4		236.8	250.8	241.5		243.0
73% Evaporated		°F		243.0	251.5	241.6		245.4		241.9	254.4	245.5		247.3
74% Evaporated		°F		247.4	255.3	245.5		249.4		246.9	258.3	249.5		251.6
75% Evaporated		°F		251.8	259.1	249.9		253.6		247.5	262.4	253.2		254.4
76% Evaporated		°F		255.8	263	253.9		257.6		251.1	266.6	257.4		258.4
77% Evaporated		°F		259.9	266.8	258.1		261.6		257.9	270.8	261.1		263.3
78% Evaporated		°F		263.7	269.2	262.6		265.2		261.6	274.9	265.2		267.2
79% Evaporated		°F		267.5	273.5	267.1		269.4		265.5	277.8	269.6		271.0
80% Evaporated		°F	271.6	271.7	280.1	271.1	273.8	273.7	271.6	270.9	282.5	273.4	276.2	274.9
81% Evaporated		°F		276.1	285.3	275.5		279.0		275.3	287.3	278.1		280.2
82% Evaporated		°F		280.5	289.6	279.7		283.3		280.4	290.7	282.5		284.5
83% Evaporated		°F		284.6	293.3	284.0		287.3		284.8	295.7	286.5		289.0
84% Evaporated		°F		289.2	298.2	288.2		291.9		289.0	300.9	291.1		293.7
85% Evaporated		°F		293.3	303.9	292.5		296.6		293.0	305.8	295.7		298.2
86% Evaporated		°F		298.5	305.8	297.1		300.5		297.4	305	300.2		300.9
87% Evaporated		°F		303.8	311.3	301.7		305.6		299.1	314	305.2		306.1
88% Evaporated		°F		308.8	319.3	307.2		311.8		305.4	321.2	309.8		312.1
89% Evaporated		°F		314.1	325.9	312.0		317.3		309.1	327.1	315.0		317.1
90% Evaporated		°F	318.7	318.9	331.7	316.1	315.1	320.1	318.8	316.4	330.4	320.5	318.8	321.0
91% Evaporated		°F		322.1	336.5	322.3		327.0		321.6	334.9	326.3		327.6
92% Evaporated		°F		330.5	341.5	329.4		333.8		327.7	342.8	332.0		334.2
93% Evaporated		°F		336.9	348.5	335.8		340.4		334.7	352.7	335.3		340.9
94% Evaporated		°F		343.8	360.2	342.4		348.8		341.2	362.9	344.4		349.5
95% Evaporated		°F	354.4	351.4	372.9	349.9	351.9	356.1	350.8	347.9	375.9	353.0	354.5	356.4
96% Evaporated		°F		361.1	395	359.3		371.8		357.4	393.7	361.8		371.0
97% Evaporated		°F		372.5		371.3		371.9		368.6		373.2		370.9
98% Evaporated		°F		389.9		390.1		390.0		385.2		389.3		387.3
99% Evaporated		°F												
Final Boiling Point		°F	401.9	399.7	398.6	400.1	399.5	400.0	399.7	394.0	401.6	398.2	401.6	399.0
Residue		vol %	1.5	1.1	0.7	1.1	1.1	1.1	1.1	1.1	0.7	1.1	1.0	1.0
Loss		vol %	1.8	3.7	2.1	2.9	1.1	2.3	3.3	4.6	2.1	2.9	1.1	2.8
Recovered		vol %	96.7	95.2	97.2	96.0	97.0	96.4	95.6	94.3	97.2	96.0	97.8	96.2
Oxidation Stability	D525	Minutes	>240						>240	>240				>240
Lead Content	D3237	g/L	<0.001						<0.001	<0.001				<0.001
Copper Corrosion	D130		1A	62					1A	1A				1A
Silver Corrosion	D7671		0						0.0	0				0.0
Solvent Washed Gum	D381	mg/100 mL	0.8						0.8	0.5				0.5
Unwashed Gum	D381	mg/100 mL	5.0						5.0	4.0				4.0

CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF3-E10						E-TF4-E15					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	65.4	64.2	66.9	65.0	64.8	65.3	64.1	63.5	63.8	63.5	63.4	63.7
Research Octane Number	D2699	RON	92.4	92.8	91.9	92.0	91.8	92.2	94.5	94.9	94.1	94.6		94.5
Motor Octane Number	D2700	MON	84.7	83.8	84.2	83.4	83.6	83.9	85.5	84.5	85.2	85.4	84.7	85.1
Antiknock Index, (R+M)/2	D2699/D2700	AKI	88.6	88.3	88	87.7	87.7	88.1	90.0	89.7	89.6	90.0		89.8
Ethanol Content	D5599	vol %	9.94	10.35	9.9	9.5	10.5	10.0	14.75	15.49	14.4	14.54	14.96	14.8
DVPE Vapor Pressure	D5191	psi	15.94	15.43	16.1	15.99	15.97	15.9	15.86	15.64	16.1	15.84	15.78	15.8
Temperature V/L=20 (TVL20)	D5188	°F	97.4	99.0	98.5	97	100.9	98.6	98.2	100.9	99.2	98	102.5	99.8
Sulfur Content	D2622/D7039	ppm	8.7	17.1	14.6	18	17	15.1	14.6	16.2	13.9	15	16	15.1
FIA (uncorrected)	D1319													
Saturates		vol %		71.84	78	72.0		73.9		70.64	78.2	71.8		73.5
Aromatics		vol %		20.95	16.5	20.9		19.5		21.10	16.3	21.2		19.5
Olefins		vol %		7.22	5.5	7.1		6.6		8.26	5.5	7.0		6.9
FIA (corrected for oxygenates)	D1319													
Saturates		vol %		64.40	70.2	65.2	64.3	66.0		59.70	66.9	65.0	64.3	64.0
Aromatics		vol %		18.78	14.9	19.0	19.0	17.9		17.83	13.9	19.2	19.0	17.5
Olefins		vol %		6.47	5.5	6.4	7.3	6.4		6.98	4.7	6.3	7.3	6.3
Benzene	D3606	vol %		1.04	0.85	0.85	0.78	0.9		1.0	0.85	0.82		0.9
D86 Distillation	D86													
Initial Boiling Point		°F	78.0	79.0	73.1	77.5	75.1	76.5	77.7	76.2	73	76.0	71.9	75.0
1% Evaporated		°F		79.0	75.7	77.5		77.4		76.2	73.9	76.0		75.4
2% Evaporated		°F		79.0	78.3	77.5		78.3		76.2	74.9	76.0		75.7
3% Evaporated		°F		79.0	81	77.5		79.2		80.4	75.9	76.0		77.4
4% Evaporated		°F		84.8	84	84.8		84.5		84.0	81.3	84.2		83.2
5% Evaporated		°F		86.2	86.5	86.3	87.4	87.0	86.7	88.3	86.4	84.3	87.4	89.0
6% Evaporated		°F		88.5	88.2	89.2		88.6		88.5	86.9	89.1		88.2
7% Evaporated		°F		90.2	89.9	90.9		90.3		90.5	88.6	91.2		90.1
8% Evaporated		°F		91.6	91.4	92.5		91.8		92.0	90.7	93.0		91.9
9% Evaporated		°F		93.0	92.7	93.9		93.2		93.4	92.4	94.8		93.5
10% Evaporated		°F		93.8	94.2	93.8	95.3	94.5	94.3	96.1	94.8	93.8	96.2	96.9
11% Evaporated		°F		95.3	95.1	96.6		95.7		96.1	95.3	97.6		96.3
12% Evaporated		°F		96.3	96.5	97.9		96.9		97.8	97	99.1		98.0
13% Evaporated		°F		97.5	97.7	99.1		98.1		98.9	98.4	100.5		99.3
14% Evaporated		°F		98.5	98.7	100.5		99.2		100.4	99.8	101.9		100.7
15% Evaporated		°F		99.6	100	101.6		100.4		101.7	101.2	103.3		102.1
16% Evaporated		°F		100.7	101	102.6		101.4		102.9	102.6	104.7		103.4
17% Evaporated		°F		101.6	102.2	103.8		102.5		104.0	104	106.0		104.7
18% Evaporated		°F		102.7	103.5	104.9		103.7		105.1	105.4	107.3		105.9
19% Evaporated		°F		103.9	104.7	106.3		105.0		106.5	106.5	108.9		107.3
20% Evaporated		°F		106.1	105.1	105.9	107.5	107.2	106.4	110.1	107.9	108.2	110.3	111.2
21% Evaporated		°F		106.5	107.2	108.7		107.5		109.3	110	111.5		110.3
22% Evaporated		°F		107.6	108.8	109.9		108.8		110.9	111.5	113.0		111.8
23% Evaporated		°F		108.7	110.3	111.2		110.1		112.2	112.8	114.7		113.2
24% Evaporated		°F		109.7	111.5	112.5		111.2		113.9	114.5	116.2		114.9
25% Evaporated		°F		110.9	113	113.7		112.5		115.7	116.1	117.6		116.5
26% Evaporated		°F		112.8	114.4	115.1		114.1		117.2	118	119.1		118.1
27% Evaporated		°F		114.3	115.8	116.5		115.5		118.6	119.3	120.6		119.5
28% Evaporated		°F		115.7	117.3	117.7		116.9		119.9	120.9	122.3		121.0
29% Evaporated		°F		117.1	118.4	119.1		118.2		121.7	122.8	123.8		122.8
30% Evaporated		°F		119.6	118.5	119.6	120.5	120.4	119.7	124.9	122.6	124.2	125.4	126.8
31% Evaporated		°F		119.6	120.8	121.8		120.7		124.8	125.8	126.9		125.8
32% Evaporated		°F		121.1	122.5	123.2		122.3		126.4	127.2	128.3		127.3
33% Evaporated		°F		122.7	123.9	124.5		123.7		128.5	128.6	129.8		129.0
34% Evaporated		°F		123.9	125.6	125.9		125.1		129.5	129.9	131.2		130.2
35% Evaporated		°F		124.1	127.2	127.2		126.2		130.9	131.6	132.7		131.7
36% Evaporated		°F		124.7	128.5	128.7		127.3		132.3	133.4	134.2		133.3
37% Evaporated		°F		127.4	129.9	130.0		129.1		134.2	134.7	135.5		134.8
38% Evaporated		°F		128.3	131.4	131.4		130.4		135.5	136.5	136.9		136.3
39% Evaporated		°F		130.1	132.7	132.7		131.8		136.6	138	138.2		137.6
40% Evaporated		°F		133.6	131.7	133.8	134.1	134.7	133.6	139.3	138.4	139.3	139.7	140.1

41% Evaporated		°F		133.5	135.1	135.6		134.7		139.5	140.4	141.0		140.3
42% Evaporated		°F		135.4	136.4	136.6		136.1		141.1	142	142.1		141.7
43% Evaporated		°F		136.6	137.4	138.0		137.3		142.7	143	143.4		143.0
44% Evaporated		°F		138.0	139.2	139.2		138.8		143.8	144.5	144.6		144.3
45% Evaporated		°F		139.5	140.3	140.3		140.0		145.1	145.5	145.7		145.4
46% Evaporated		°F		140.5	141.4	141.6		141.2		146.4	147	147.1		146.8
47% Evaporated		°F		141.9	143	142.5		142.5		147.8	148.3	147.9		148.0
48% Evaporated		°F		143.5	143.9	143.8		143.7		148.7	149.1	149.0		148.9
49% Evaporated		°F		143.6	145.2	144.8		144.5		150.1	150.3	149.9		150.1
50% Evaporated		°F	145.9	145.7	145.9	145.8	146.9	146.0	151.0	151.3	151.5	151.0	152.4	151.4
51% Evaporated		°F		147.3	147	147.2		147.2		151.9	152.6	152.0		152.2
52% Evaporated		°F		148.7	148.4	148.1		148.4		153.0	153	152.8		152.9
53% Evaporated		°F		149.7	149.4	149.1		149.4		154.3	154	153.7		154.0
54% Evaporated		°F		150.4	150.5	150.0		150.3		154.5	155.1	154.6		154.7
55% Evaporated		°F		151.5	151.5	151.1		151.4		155.7	155.9	155.4		155.7
56% Evaporated		°F		152.1	152.5	151.9		152.2		156.4	157	156.2		156.5
57% Evaporated		°F		152.6	153.3	152.5		152.8		157.0	157.6	157.0		157.2
58% Evaporated		°F		153.7	154	153.6		153.8		158.2	157.9	157.6		157.9
59% Evaporated		°F		153.4	155.2	154.4		154.3		159.1	158.9	158.2		158.7
60% Evaporated		°F	155.3	155.0	156	155.3	156.0	155.5	159.1	159.8	159.7	159.0	159.9	159.5
61% Evaporated		°F		155.0	156.5	156.5		156.0		160.5	160.4	159.5		160.1
62% Evaporated		°F		156.8	157.5	158.9		157.7		161.2	160.9	160.4		160.8
63% Evaporated		°F		162.2	158.5	164.8		161.8		161.8	161.6	160.8		161.4
64% Evaporated		°F		171.4	163	174.8		169.7		162.3	162.1	161.4		161.9
65% Evaporated		°F		183.1	180.2	185.1		182.8		162.9	162.6	162.0		162.5
66% Evaporated		°F		194.9	194.5	194.9		194.8		163.6	163.1	162.6		163.1
67% Evaporated		°F		202.4	203.7	202.9		203.0		164.8	163.5	163.2		163.8
68% Evaporated		°F		209.1	211.2	209.9		210.1		166.7	164.3	165.1		165.4
69% Evaporated		°F		214.4	217.2	215.9		215.8		169.1	164.7	167.9		167.2
70% Evaporated		°F	219.9	219.0	221.7	220.5	222.5	220.7	173.5	174.8	165	176.3	180.3	174.0
71% Evaporated		°F		221.6	225.3	225.2		224.0		196.2	179.5	196.0		190.6
72% Evaporated		°F		226.2	229.6	229.3		228.4		212.8	207.8	212.1		210.9
73% Evaporated		°F		229.9	235.3	233.4		232.9		223.7	223.5	221.7		223.0
74% Evaporated		°F		234.5	239.6	237.3		237.1		228.7	230	229.9		229.5
75% Evaporated		°F		239.2	243.8	241.2		241.4		233.9	235.2	236.4		235.2
76% Evaporated		°F		245.3	246.6	245.4		245.8		239.4	240.5	241.7		240.5
77% Evaporated		°F		249.6	248.9	250.1		249.5		245.3	244.7	246.6		245.5
78% Evaporated		°F		254.6	254.4	254.6		254.5		250.7	249.4	251.6		250.6
79% Evaporated		°F		255.5	259.3	259.2		258.0		254.9	255.3	256.5		255.6
80% Evaporated		°F	263.3	258.0	264.1	263.8	264.0	262.6	260.2	259.4	258.9	264.5	262.9	261.2
81% Evaporated		°F		265.4	269.2	268.1		267.6		264.4	265.2	265.8		265.1
82% Evaporated		°F		270.9	273.9	272.9		272.6		269.9	270.9	270.5		270.4
83% Evaporated		°F		275.7	277.1	277.7		276.8		274.6	275.8	275.1		275.2
84% Evaporated		°F		280.5	282.3	282.5		281.8		280.5	280.1	279.2		279.9
85% Evaporated		°F		286.8	289.3	288.0		288.0		286.6	287.7	284.5		286.3
86% Evaporated		°F		293.5	294.8	293.4		293.9		290.1	293.2	290.9		291.4
87% Evaporated		°F		293.3	299.9	298.5		297.2		295.2	298.1	296.6		296.3
88% Evaporated		°F		302.6	305.1	304.2		304.0		302.8	300.4	302.3		301.8
89% Evaporated		°F		311.0	311.4	310.8		311.1		310.0	303.9	308.6		307.5
90% Evaporated		°F	316.4	318.7	316.9	317.1	318.7	317.6	315.9	313.8	315.5	316.0	316.1	315.5
91% Evaporated		°F		325.2	324	324.3		324.5		319.9	324.6	322.6		322.4
92% Evaporated		°F		332.0	330.1	331.5		331.2		326.5	332	329.2		329.2
93% Evaporated		°F		339.9	340.1	338.1		339.4		334.7	339.3	334.8		336.3
94% Evaporated		°F		348.6	350.4	346.7		348.6		342.7	345.9	345.1		344.6
95% Evaporated		°F	357.2	356.5	359.4	357.0	359.3	357.9	354.7	353.2	352.4	356.2	359.4	355.2
96% Evaporated		°F		369.4	369.3	370.2		369.6		363.2	367.2	369.1		366.5
97% Evaporated		°F		383.2	384.8	383.0		383.7		377.9	383.2	380.8		380.6
98% Evaporated		°F		401.5	402.8	403.9		402.7		398.4	402	403.8		401.4
99% Evaporated		°F												
Final Boiling Point		°F	410.4	404.5	408.6	413.4	409.2	409.2	412.2	406.2	408	410.8	408.0	409.0
Residue	vol %	1.1	1.1	1	1.1	1.1	1.1	1.1	1.1	1	1.1	1.1	1.1	1.1
Loss	vol %	3.3	3.0	1.7	3.1	2.5	1.1	2.5	3.0	1.7	3.1	2.5	1.1	
Recovered	vol %	95.6	95.9	97.3	95.8	96.4	2.7	96.4	95.9	97.3	95.8	96.4	2.6	
Oxidation Stability	D525	Minutes	>240					>240	>240				>240	
Lead Content	D3237	g/L	<0.001					<0.001	<0.001				<0.001	
Copper Corrosion	D130		1A					1A	1A				1A	
Silver Corrosion	D7671		0					0.0	0				0.0	
Solvent Washed Gum	D381	mg/100 mL	<0.5					<0.5	1.4				1.4	
Unwashed Gum	D381	mg/100 mL	3.4					3.4	3.4				3.4	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF5-E15						E-TF6-E10					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	64.1	64.6	66.1	64.9	65.0	64.9	63.7	62.7	69.4	63.4	63.4	64.5
Research Octane Number	D2699	RON	94.5	94.4	94.1	94.0	93.8	94.2	93.0	93.1	92.6	93.0	92.4	92.8
Motor Octane Number	D2700	MON	85.5	87.1	85.3	85.0	84.6	85.5	84.6	84.1	84.2	84.5	83.8	84.2
Antiknock Index, (R+M)/2	D2699/D2700	AKI	90.0	90.8	89.7	89.5	89.2	89.8	88.8	88.6	88.4	88.8	88.1	88.5
Ethanol Content	D5599	vol %	14.75	15.08	14.28	13.94	14.88	14.6	9.63	10.50	9.6	9.49	9.93	9.8
DVPE Vapor Pressure	D5191	psi	15.86	15.78	15.8	15.56	15.82	15.8	14.53	14.30	14.6	14.31	14.40	14.43
Temperature V/L=20 (TVL20)	D5188	°F	98.2	101.2	98.7	98	96.9	98.6	104.8	107.5	103.9	104	106.3	105.3
Sulfur Content	D2622/D7039	ppm	14.6	15.8	17.4	16	16	16.0	15.2	17.5	18.2	16	16	16.6
FIA (uncorrected)	D1319													
Saturates		vol %		73.7	81.6	76.3		77.2		72.26	76	71.9		73.4
Aromatics		vol %		19.9	13.1	17.8		16.9		22.71	18.3	21.7		20.9
Olefins		vol %		6.4	5.3	5.6		5.8		5.03	5.7	6.4		5.7
FIA (corrected for oxygenates)	D1319													
Saturates		vol %		62.6	70	69.1		67.2		64.67	68.9	65.2	63.2	65.5
Aromatics		vol %		16.9	11.2	16.1		14.7		20.33	16.6	19.6	20.3	19.2
Olefins		vol %		5.4	4.6	5.4		5.1		4.50	5.2	5.8	6.5	5.5
Benzene	D3606	vol %		1.16	0.96	0.91		1.0		1.19	0.93	0.94	1.06	1.0
D86 Distillation	D86													
Initial Boiling Point		°F	77.7	78.4	75.8	78.8	73.6	76.9	85.1	79.8	78.6	80.7	74.5	79.7
1% Evaporated		°F		78.4	78	78.8		78.4		79.8	80	80.7		80.2
2% Evaporated		°F		82.8	80.3	78.8		80.6		79.8	81.5	80.7		80.7
3% Evaporated		°F		86.4	82.6	78.8		82.6		79.8	83	88.3		83.7
4% Evaporated		°F		88.6	85.8	85.6		86.7		88.2	87.5	91.1		88.9
5% Evaporated		°F	88.3	90.4	88.1	88.3	91.7	89.4	95.0	91.2	90.3	93.7	91.2	92.3
6% Evaporated		°F	92.1	90	90.1			90.7		93.8	92.9	95.8		94.2
7% Evaporated		°F	93.6	91.5	91.8			92.3		95.4	94.7	97.5		95.9
8% Evaporated		°F	94.9	92.7	93.3			93.6		97.0	96.1	99.1		97.4
9% Evaporated		°F	96.2	94	94.7			95.0		98.8	97.7	100.3		98.9
10% Evaporated		°F	96.1	97.4	95.3	96.1	98.6	96.7	100.8	100.3	99.2	101.7	99.4	100.3
11% Evaporated		°F	98.5	96.5	97.5			97.5		101.5	100.4	102.9		101.6
12% Evaporated		°F	99.9	97.8	98.8			98.8		102.6	101.7	104.0		102.8
13% Evaporated		°F	101	98.9	99.9			99.9		103.8	103.1	105.2		104.0
14% Evaporated		°F	102.2	100	101.2			101.1		104.9	104.4	106.4		105.2
15% Evaporated		°F	103	101.2	102.3			102.2		106.0	105.7	107.6		106.4
16% Evaporated		°F	104.1	102.3	103.3			103.2		107.1	106.9	108.3		107.4
17% Evaporated		°F	105.3	103.6	104.4			104.4		108.2	108.2	109.2		108.5
18% Evaporated		°F	106.6	104.8	105.4			105.6		109.2	109.5	110.3		109.7
19% Evaporated		°F	107.7	105.9	106.7			106.8		110.5	110.8	111.5		110.9
20% Evaporated		°F	110.1	108.8	107	107.9	110.9	108.9	112.1	111.5	112	112.7	111.4	111.9
21% Evaporated		°F		110.0	108.3	108.9		109.1		112.9	113.1	113.8		113.3
22% Evaporated		°F		111.3	109.6	110.1		110.3		114.0	114.3	114.7		114.3
23% Evaporated		°F		112.6	110.8	111.4		111.6		114.8	115.5	116.0		115.4
24% Evaporated		°F		113.9	112.2	112.6		112.9		116.2	116.6	117.1		116.6
25% Evaporated		°F		115.1	113.5	113.9		114.2		117.2	118	118.4		117.9
26% Evaporated		°F		116.3	114.7	115.2		115.4		118.7	119.3	119.6		119.2
27% Evaporated		°F		117.7	115.9	116.5		116.7		120.1	120.5	120.8		120.5
28% Evaporated		°F		119.1	117.3	117.8		118.1		121.4	121.8	121.9		121.7
29% Evaporated		°F		120.2	118.6	119.2		119.3		122.6	123	123.1		122.9
30% Evaporated		°F	124.9	121.6	120	120.5	123.7	122.1	124.0	123.7	124.3	124.1	123.9	124.0
31% Evaporated		°F		122.9	121.2	121.6		121.9		125.0	125.5	125.3		125.3
32% Evaporated		°F		124.3	122.6	123.0		123.3		125.9	126.7	126.4		126.3
33% Evaporated		°F		125.7	124.1	124.2		124.7		127.5	128	127.6		127.7
34% Evaporated		°F		126.9	125.3	125.5		125.9		128.6	129.2	128.7		128.8
35% Evaporated		°F		128.4	126.7	126.7		127.3		129.8	130.4	129.7		130.0
36% Evaporated		°F		129.7	128	128.1		128.6		130.9	131.5	130.8		131.1
37% Evaporated		°F		131.0	129.5	129.5		130.0		131.8	132.6	131.8		132.1
38% Evaporated		°F		132.1	130.7	130.9		131.2		133.0	133.8	133.0		133.3
39% Evaporated		°F		133.3	132.2	132.3		132.6		134.2	135	134.1		134.4
40% Evaporated		°F	139.3	134.7	133.5	133.5	136.0	135.4	135.7	135.3	136	135.3	134.7	135.4

41% Evaporated		°F		136.0	134.7	134.9		135.2		136.2	137.3	136.3		136.6
42% Evaporated		°F		137.3	136.1	136.1		136.5		137.4	138.2	137.4		137.7
43% Evaporated		°F		138.5	137.5	137.4		137.8		138.8	139.3	138.4		138.8
44% Evaporated		°F		139.8	138.4	138.7		139.0		139.9	140.6	139.3		139.9
45% Evaporated		°F		140.8	139.7	139.8		140.1		140.8	141.5	140.2		140.8
46% Evaporated		°F		141.7	140.9	141.1		141.2		142.0	142.3	141.3		141.9
47% Evaporated		°F		143.1	142.3	142.1		142.5		143.3	143.3	142.4		143.0
48% Evaporated		°F		144.1	143.4	143.3		143.6		144.4	144.4	143.6		144.1
49% Evaporated		°F		145.2	144.7	144.5		144.8		145.3	145.6	144.4		145.1
50% Evaporated		°F	151.0	146.3	145.9	145.5	148.5	147.4	145.6	146.3	146.3	145.2	145.6	145.8
51% Evaporated		°F		147.6	147	146.6		147.1		147.4	147.1	146.1		146.9
52% Evaporated		°F		148.5	147.7	147.8		148.0		148.2	148.2	146.9		147.8
53% Evaporated		°F		149.6	149.4	148.9		149.3		149.0	149	148.0		148.7
54% Evaporated		°F		150.7	150.6	149.8		150.4		149.7	150.1	148.8		149.5
55% Evaporated		°F		151.7	151.5	150.8		151.3		150.8	150.7	149.7		135.4
56% Evaporated		°F		152.4	152.6	151.9		152.3		151.3	151.9	150.4		151.2
57% Evaporated		°F		153.5	153.7	152.9		153.4		151.0	152.4	151.7		151.7
58% Evaporated		°F		154.3	154.6	153.7		154.2		152.2	152.9	152.9		152.7
59% Evaporated		°F		155.2	155.5	154.5		155.1		152.4	154.2	154.3		153.6
60% Evaporated		°F	159.1	156.3	156.3	155.4	158.3	157.1	156.2	153.9	155.2	156.3	153.8	155.1
61% Evaporated		°F		157.1	157.2	156.2		156.8		153.8	157.7	160.7		157.4
62% Evaporated		°F		157.8	158.1	157.1		157.7		160.0	162.8	167.2		163.3
63% Evaporated		°F		158.6	158.9	157.9		158.5		168.6	170.9	175.1		171.5
64% Evaporated		°F		159.2	159.5	158.8		159.2		179.4	181.6	183.5		181.5
65% Evaporated		°F		159.9	160.1	159.5		159.8		188.8	190.7	191.3		190.3
66% Evaporated		°F		160.6	161	159.9		160.5		195.3	198.3	197.8		197.1
67% Evaporated		°F		161.2	161.8	160.6		161.2		202.4	205.5	203.4		203.8
68% Evaporated		°F		161.7	162.3	161.2		161.7		207.5	210.8	208.7		209.0
69% Evaporated		°F		162.5	162.7	161.7		162.3		212.0	215.5	213.7		213.7
70% Evaporated		°F	173.5	163.1	163.3	162.2	165.1	165.4	221.4	215.5	220.1	217.6	218.5	218.6
71% Evaporated		°F		163.2	164.2	162.9		163.4		219.4	224	221.7		221.7
72% Evaporated		°F		166.0	164.3	163.6		164.6		223.0	227.9	225.8		225.6
73% Evaporated		°F		174.0	164.3	167.8		168.7		227.0	232.1	229.7		229.6
74% Evaporated		°F		200.1	171.6	184.3		185.3		229.4	235.1	233.5		232.7
75% Evaporated		°F		216.2	205.8	204.9		209.0		235.3	238.1	236.8		236.7
76% Evaporated		°F		225.7	222.4	220.0		222.7		238.9	241.1	240.6		240.2
77% Evaporated		°F		232.8	228.7	229.2		230.2		235.7	244.9	244.3		241.6
78% Evaporated		°F		239.0	234	235.2		236.1		241.6	249.1	248.6		246.4
79% Evaporated		°F		243.9	240.3	240.4		241.5		248.9	253	252.4		251.4
80% Evaporated		°F	260.2	248.7	245.7	247.1	250.2	250.4	258.1	254.6	255.1	256.6	256.5	256.2
81% Evaporated		°F		254.7	251.7	252.3		252.9		259.3	259	261.2		259.8
82% Evaporated		°F		259.6	256.2	257.5		257.8		264.4	264.7	265.5		264.9
83% Evaporated		°F		264.1	260.8	262.9		262.6		269.0	270.7	269.8		269.8
84% Evaporated		°F		269.1	266.9	269.3		268.4		270.8	275.9	274.2		273.6
85% Evaporated		°F		273.2	273.6	274.6		273.8		275.5	281.4	279.0		278.6
86% Evaporated		°F		278.8	279.4	279.5		279.2		282.9	286.7	284.0		284.5
87% Evaporated		°F		285.9	285.9	285.7		285.8		289.3	292.5	290.0		290.6
88% Evaporated		°F		294.2	292.3	292.0		292.8		295.7	298.1	296.9		296.9
89% Evaporated		°F		301.9	298.6	298.8		299.8		300.6	304.1	303.5		302.7
90% Evaporated		°F	315.9	309.2	306.1	306.0	311.4	309.7	312.4	308.1	311.7	310.8	310.4	310.7
91% Evaporated		°F		313.7	314.5	313.6		313.9		315.9	319.2	318.0		317.7
92% Evaporated		°F		320.6	321.3	322.3		321.4		323.3	326.5	326.0		325.3
93% Evaporated		°F		330.8	330.1	329.4		330.1		332.7	330.4	334.5		332.5
94% Evaporated		°F		341.0	337.5	339.3		339.3		338.7	342.2	339.9		340.3
95% Evaporated		°F	354.7	352.2	348	350.2	354.4	351.9	352.4	348.4	352.9	351.5	353.3	351.7
96% Evaporated		°F		362.3	356	362.6		360.3		360.0	365.2	363.2		362.8
97% Evaporated		°F		379.5	373.8	379.5		377.6		374.7	378.4	377.8		377.0
98% Evaporated		°F		397.4	395.9	399.9		397.7		393.0	398	396.2		395.7
99% Evaporated		°F												
Final Boiling Point		°F	412.2	401.5	403.5	403.8	405.8	405.4	405.9	396.4	408	408.2	402.2	404.1
Residue	vol %	1.1	1.1	1	1.1	1.1	1.1	405.4	1.0	1.1	1	1.1	1.1	1.1
Loss	vol %	2.5	1.8	1.9	3.1	1.0	1.1	2.1	3.1	2.1	2.4	2.5	2.4	
Recovered	vol %	96.4	97.1	97.1	95.8	97.9	2.1	96.9	95.8	96.9	96.5	96.5	96.5	96.5
Oxidation Stability	D525	Minutes	>240					>240	>240					>240
Lead Content	D3237	g/L	<0.001					<0.001	<0.001					<0.001
Copper Corrosion	D130		1A					1A	1A					1A
Silver Corrosion	D7671		0					0.0	0					0.0
Solvent Washed Gum	D381	mg/100 mL	1.4	66				1.4	<0.5					<0.5
Unwashed Gum	D381	mg/100 mL	3.4					3.4	3.2					3.2

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF7-E10						E-TF8-E15					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	60.4	59.3	62.8	60.1	60.2	60.6	61.8	60.8	63.9	61.5	61.5	61.9
Research Octane Number	D2699	RON	92.8	94.8	94.5	94.6	94.5	94.2	96.1	96.0	95.8	94.0	96.6	95.7
Motor Octane Number	D2700	MON	85.4	84.4	85.1	85.0	84.7	84.9	86.0	85.1	85.6	86.5	85.4	85.7
Antiknock Index, (R+M)/2	D2699/D2700	AKI	89.1	89.6	89.8	89.8	89.6	89.6	91.0	90.6	90.7	90.3	90.5	90.6
Ethanol Content	D5599	vol %	9.78	10.44	9.6	9.69	9.74	9.9	14.99	15.65	14.2	14.65	14.7	14.8
DVPE Vapor Pressure	D5191	psi	13.50	13.05	13.5	13.24	13.34	13.3	14.36	14.18	14.4	14.26	14.30	14.3
Temperature V/L=20 (TVL20)	D5188	°F	110.0	110.9	109.5	109	112	110.3	106.0	107.7	105.5	104	108.4	106.3
Sulfur Content	D2622/D7039	ppm	16.2	18.3	19.2	18	18	17.9	16.9	18.6	20.4	18	19	18.6
FIA (uncorrected)	D1319													
Saturates		vol %	65.86	65.9	64.8			65.5		69.44	77.5	68.9		71.9
Aromatics		vol %	30.16	29.2	30.1			29.8		25.52	18.2	25.1		22.9
Olefins		vol %	3.99	4.9	5.1			4.7		5.04	4.3	5.9		5.1
FIA (corrected for oxygenates)	D1319													
Saturates		vol %	59.0	59.5	58.7	57.4		58.6		58.6	66.5	62.5	57.4	61.2
Aromatics		vol %	27.0	26.4	27.3	27.8		27.1		21.5	15.6	22.8	27.8	21.9
Olefins		vol %	3.6	4.4	4.6	4.7		4.3		4.3	3.7	5.4	4.7	4.5
Benzene	D3606	vol %		1.48	1.18	1.20	1.09	1.2		1.37	1.1	1.11	1.10	1.2
D86 Distillation	D86													
Initial Boiling Point		°F	85.5	83.1	83	83.7	77.0	82.5	80.1	82.3	79.7	79.4	76.3	79.6
1% Evaporated		°F		83.1	85.9	83.7			84.2		82.3	79.8	79.4	80.5
2% Evaporated		°F		83.1	88.8	88.7			86.9		82.3	80	79.4	80.6
3% Evaporated		°F		83.1	91.8	94.5			89.8		82.3	80.2	86.5	83.0
4% Evaporated		°F		91.8	95.3	97.6			94.9		82.3	86.9	90.6	86.6
5% Evaporated		°F	100.0	95.0	97.8	99.8	99.6	98.4	95.5	91.7	90.7	93.9	95.9	93.5
6% Evaporated		°F		97.4	99.7	101.9			99.7		94.2	93.4	96.1	94.6
7% Evaporated		°F		99.6	101.6	103.5			101.6		96.4	95.5	98.0	96.6
8% Evaporated		°F		101.3	103.2	105.0			103.2		98.3	97.7	99.9	98.6
9% Evaporated		°F		102.8	104.5	106.2			104.5		99.8	99.3	101.4	100.2
10% Evaporated		°F	107.2	104.5	105.6	107.6	107.1	106.4	103.4	101.3	100.8	102.9	103.7	102.4
11% Evaporated		°F		106.0	107.2	108.9			107.4		103.0	102.3	104.2	103.2
12% Evaporated		°F		107.3	108.7	110.0			108.7		104.5	104	105.6	104.7
13% Evaporated		°F		108.6	109.8	111.3			109.9		105.7	105.3	106.9	106.0
14% Evaporated		°F		109.6	111.1	112.3			111.0		107.0	106.5	108.2	107.2
15% Evaporated		°F		110.8	112.2	113.3			112.1		108.2	107.9	109.4	108.5
16% Evaporated		°F		112.0	113.1	114.5			113.2		109.4	109.2	110.5	109.7
17% Evaporated		°F		113.1	114.3	115.5			114.3		110.6	110.6	111.6	110.9
18% Evaporated		°F		114.3	115.5	116.5			115.4		111.8	111.9	112.8	112.2
19% Evaporated		°F		115.1	116.7	117.6			116.5		112.9	112.9	114.0	113.3
20% Evaporated		°F	118.8	116.2	117.9	118.7	119.0	118.1	115.8	113.9	114.3	115.1	116.1	115.0
21% Evaporated		°F		117.4	119.1	119.9			118.8		115.0	115.4	116.3	115.6
22% Evaporated		°F		118.6	120.2	120.9			119.9		116.2	116.5	117.4	116.7
23% Evaporated		°F		119.6	121.3	122.1			121.0		117.2	117.9	118.7	117.9
24% Evaporated		°F		120.5	122.4	123.0			122.0		118.3	119.5	120.0	119.3
25% Evaporated		°F		121.6	123.5	124.1			123.1		119.7	120.8	121.2	120.6
26% Evaporated		°F		123.1	124.7	125.2			124.3		121.1	122.1	122.4	121.9
27% Evaporated		°F		124.2	125.8	126.2			125.4		122.2	123.2	123.5	123.0
28% Evaporated		°F		125.0	127.1	127.4			126.5		123.5	124.5	124.6	124.2
29% Evaporated		°F		126.1	128.3	128.2			127.5		124.9	125.9	125.8	125.5
30% Evaporated		°F	129.0	127.3	129.5	129.4	129.4	128.9	127.7	125.8	127	127.1	128.0	127.1
31% Evaporated		°F		128.7	130.6	130.5			129.9		127.0	128.1	128.3	127.8
32% Evaporated		°F		129.9	131.6	131.4			131.0		128.4	129.7	129.3	129.1
33% Evaporated		°F		131.0	132.6	132.4			132.0		129.5	130.8	130.6	130.3
34% Evaporated		°F		132.0	133.6	133.4			133.0		130.8	132.1	131.6	131.5
35% Evaporated		°F		133.0	134.7	134.6			134.1		132.3	133.1	132.8	132.7
36% Evaporated		°F		134.3	135.9	135.7			135.3		133.3	134.3	134.0	133.9
37% Evaporated		°F		135.3	136.9	136.7			136.3		134.5	135.6	135.0	135.0
38% Evaporated		°F		136.6	138.1	137.6			137.4		135.6	136.7	136.4	136.2
39% Evaporated		°F		137.9	139.2	138.7			138.6		136.6	137.9	137.3	137.3
40% Evaporated		°F	139.1	138.9	140.3	139.6	140.1	139.6	139.2	137.7	138.8	138.5	138.7	138.6

41% Evaporated		°F		140.1	141	140.5		140.5		139.1	140	139.5		139.5
42% Evaporated		°F		141.0	142.1	141.7		141.6		140.5	141.4	140.5		140.8
43% Evaporated		°F		142.2	142.8	142.6		142.5		141.5	142.3	141.6		141.8
44% Evaporated		°F		143.3	144	143.7		143.7		142.5	143.2	142.8		142.8
45% Evaporated		°F		144.5	145	144.9		144.8		143.6	144.3	143.9		143.9
46% Evaporated		°F		145.5	146.1	145.6		145.7		144.7	145.4	144.7		144.9
47% Evaporated		°F		146.5	147	146.6		146.7		145.5	146.4	145.9		145.9
48% Evaporated		°F		147.3	147.9	147.6		147.6		146.8	147.6	146.9		147.1
49% Evaporated		°F		148.2	149.2	148.6		148.7		148.0	148.6	148.1		148.2
50% Evaporated		°F	148.6	149.3	150.2	149.4	150.1	149.5	149.6	149.1	149.5	149.0	148.9	149.2
51% Evaporated		°F		150.3	150.9	150.5		150.6		149.9	150.6	150.0		150.2
52% Evaporated		°F		151.1	151.7	151.8		151.5		150.8	151.7	151.0		151.2
53% Evaporated		°F		151.9	152.4	152.6		152.3		152.1	152.6	151.8		152.2
54% Evaporated		°F		152.8	153.4	152.9		153.0		152.7	153.4	152.9		153.0
55% Evaporated		°F		153.8	154.4	154.3		154.2		153.7	154.2	143.6		150.5
56% Evaporated		°F		155.1	155.4	155.9		155.5		154.5	155.1	154.4		154.7
57% Evaporated		°F		156.3	157.1	159.2		157.5		155.7	156	155.2		155.6
58% Evaporated		°F		158.1	159.5	164.1		160.6		156.6	156.9	156.1		156.5
59% Evaporated		°F		161.2	163.8	169.7		164.9		157.3	157.6	156.8		157.2
60% Evaporated		°F	169.3	166.2	169.8	176.1	173.9	171.1	158.1	158.0	158.3	157.6	158.3	158.1
61% Evaporated		°F		174.0	177.7	182.6		178.1		158.7	158.9	158.3		158.6
62% Evaporated		°F		183.5	187	189.5		186.7		159.3	159.7	159.0		159.3
63% Evaporated		°F		192.4	195.2	196.6		194.7		160.2	160.3	159.5		160.0
64% Evaporated		°F		200.3	202.5	202.2		201.7		160.6	161	160.3		160.6
65% Evaporated		°F		206.8	208.3	207.7		207.6		161.3	162	161.1		161.5
66% Evaporated		°F		212.0	213.5	213.2		212.9		161.8	162.1	161.8		161.9
67% Evaporated		°F		215.7	217.9	217.4		217.0		162.5	162.9	162.7		162.7
68% Evaporated		°F		219.6	222	221.8		221.1		161.7	163.6	162.9		162.7
69% Evaporated		°F		223.3	225.7	226.0		225.0		161.5	163	165.8		163.4
70% Evaporated		°F	229.1	226.8	229.2	229.6	230.1	229.0	172.7	161.2	165.5	172.1	171.4	168.6
71% Evaporated		°F		229.8	232.9	232.6		231.8		169.1	169.1	184.3		174.2
72% Evaporated		°F		233.2	235.8	236.0		235.0		199.8	192.3	201.7		197.9
73% Evaporated		°F		236.6	239.3	239.6		238.5		215.4	214.2	214.3		214.6
74% Evaporated		°F		239.6	242.8	243.1		241.8		224.3	225.9	224.5		224.9
75% Evaporated		°F		242.7	246	246.3		245.0		231.4	232.8	232.4		232.2
76% Evaporated		°F		246.4	248.8	249.4		248.2		235.9	239.8	238.7		238.1
77% Evaporated		°F		249.8	252.2	252.5		251.5		241.7	245.5	244.4		243.9
78% Evaporated		°F		253.7	255.1	255.8		254.9		243.7	250.2	249.6		247.8
79% Evaporated		°F		257.0	258.3	259.1		258.1		248.7	254.6	255.2		252.8
80% Evaporated		°F	262.4	260.2	262.4	262.3	263.7	262.2	260.2	256.6	259	259.8	261.7	259.5
81% Evaporated		°F		263.7	266.2	266.1		265.3		263.9	263.7	264.5		264.0
82% Evaporated		°F		267.6	269.7	269.9		269.1		268.3	267.7	268.7		268.2
83% Evaporated		°F		271.9	273.8	274.2		273.3		267.5	272.1	273.5		271.0
84% Evaporated		°F		276.7	278.2	278.7		277.9		273.3	278	277.9		276.4
85% Evaporated		°F		281.0	282.4	283.6		282.3		281.6	283.8	282.8		282.7
86% Evaporated		°F		285.5	287.3	288.9		287.2		285.8	288.7	287.6		287.4
87% Evaporated		°F		291.3	291.7	294.2		292.4		292.1	293.5	292.6		292.7
88% Evaporated		°F		296.1	297.9	299.3		297.8		297.2	298.7	298.2		298.0
89% Evaporated		°F		303.2	304.6	305.5		304.4		303.2	304.1	303.9		303.7
90% Evaporated		°F	311.9	305.4	310.2	311.1	312.3	310.2	311.2	309.6	310.3	310.2	312.0	310.7
91% Evaporated		°F		314.5	314.9	314.0		314.5		311.7	315.6	315.4		314.2
92% Evaporated		°F		321.9	323.1	322.8		322.6		321.5	322.3	320.5		321.4
93% Evaporated		°F		327.4	329.1	329.0		328.5		328.5	328.4	329.2		328.7
94% Evaporated		°F		332.8	334.9	335.0		334.2		335.2	334.1	336.8		335.4
95% Evaporated		°F	341.4	338.2	341.2	342.2	342.5	341.1	344.7	343.0	342.6	345.7	345.8	344.4
96% Evaporated		°F		346.2	347	349.9		347.7		351.1	352.6	353.0		352.2
97% Evaporated		°F		356.3	357.1	359.1		357.5		363.1	364.4	365.9		364.5
98% Evaporated		°F		373.4	374.2	375.3		374.3		379.9	380.5	384.5		381.6
99% Evaporated		°F				383.6								
Final Boiling Point		°F	391.3	381.5	389.4	390.1	384.4	387.3	393.7	388.2	393	396.7	391.1	392.5
Residue	vol %	1.1	1.1	0.8	1.1	1.1	1.0	1.1	1.1	0.8	1.1	1.0	1.0	
Loss	vol %	1.7	3.4	1.7	1.8	0.7	1.9	1.8	4.0	2.5	2.6	1	2.4	
Recovered	vol %	97.2	95.5	97.5	97.1	98.3	97.1	97.1	94.9	96.7	96.3	98	96.6	
Oxidation Stability	D525	Minutes	>240					>240	>240				>240	
Lead Content	D3237	g/L	<0.001					<0.001	<0.001				<0.001	
Copper Corrosion	D130		1A					1A	1A				1A	
Silver Corrosion	D7671		0					0.0	0				0.0	
Solvent Washed Gum	D381	mg/100 mL	0.8	68				0.8	1				1.0	
Unwashed Gum	D381	mg/100 mL	5.2					5.2	4.8				4.8	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF9-E10						E-TF10-E10						
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average	
Laboratory															
Property	ASTM Test Method	Units													
API Gravity@60°F	D1298/D287	API	60.0	59.5	59.9	59.8		59.8	59.6	59.3	59.5	59.3	59.3	59.4	
Research Octane Number	D2699	RON	96.0	96.1	95.7	95.4		95.8	96.0	96.1	95.8	95.8	95.8	95.9	
Motor Octane Number	D2700	MON	85.6	85.3	86.1	85.6	85.6	85.6	86.5	85.5	86.7	86.0	85.4	86.0	
Antiknock Index, (R+M)/2	D2699/D2700	AKI	90.8	90.7	90.9	90.5		90.7	91.2	90.8	91.2	90.9	90.6	90.9	
Ethanol Content	D5599	vol %	9.73	10.18	9.7	9.5	9.77	9.8	9.73	10.08	9.8	9.58	9.73	9.8	
DVPE Vapor Pressure	D5191	psi	12.55	12.14	12.3	12.28	12.42	12.3	11.22	11.37	11.28	11.24	11.41	11.3	
Temperature V/L=20 (TVL20)	D5188	°F	113.7	116.7	114.6	114	115.4	114.9	119.6	121.3	119.7	119	113.9	118.7	
Sulfur Content	D2622/D7039	ppm	10.5	12.9	10.7	10	12	11.2	9.8	11.2	12.2	12	10	11.0	
FIA (uncorrected)	D1319														
Saturates		vol %	66.92	72.2	67.7			68.9		69.50	74.7	70.3		71.5	
Aromatics		vol %	26.21	22.7	26.7			25.2		25.90	22.1	24.7		24.2	
Olefins		vol %	6.87	5.1	5.6			5.9		4.60	3.2	5.0		4.3	
FIA (corrected for oxygenates)	D1319														
Saturates		vol %	60.11	65.2	61.3	58.5	61.3		62.49	67.4	63.7		64.5		
Aromatics		vol %	23.54	20.5	24.2	25.5	23.4		23.29	19.9	22.4		21.9		
Olefins		vol %	6.17	4.6	5.1	6.1	5.5		4.14	2.9	4.6		3.9		
Benzene	D3606	vol %		0.62	0.53	0.82	0.56	0.6		0.61	0.49	0.52		0.5	
D86 Distillation	D86														
Initial Boiling Point		°F	83.0	78.6	80.9	85.9	80.5	81.8	87.2	86.4	84.8	89.8	80.7	85.8	
1% Evaporated		°F		78.6	84.6	85.9			83.0		86.4	89.5	89.8	88.6	
2% Evaporated		°F		78.6	88.3	85.9			84.3		98.0	94.3	96.9	96.4	
3% Evaporated		°F		92.9	92.1	98.2			94.4		102.8	100.6	104.7	102.7	
4% Evaporated		°F		97.0	97.2	102.0			98.7		106.8	104.4	107.6	106.3	
5% Evaporated		°F	99.8	100.9	100.3	104.9	104.9	102.2	108.6	109.7	106.9	110.3	111.1	109.3	
6% Evaporated		°F	104.2	102.6	107.3			104.7		111.7	109.1	112.2		111.0	
7% Evaporated		°F	106.4	105	109.2			106.9		113.6	111.5	114.1		113.1	
8% Evaporated		°F	108.4	107	111.0			108.8		115.3	113.5	115.8		114.9	
9% Evaporated		°F	110.1	108.8	112.5			110.5		116.9	115.2	117.4		116.5	
10% Evaporated		°F	112.0	111.7	110.9	114.2	113.9	112.5	118.3	118.6	117	118.9	120.3	118.6	
11% Evaporated		°F	113.4	112.7	115.7			113.9		120.1	118.5	120.3		119.6	
12% Evaporated		°F	114.9	114.4	117.4			115.6		121.6	120.1	121.8		121.2	
13% Evaporated		°F	116.2	115.8	118.8			116.9		123.2	121.6	123.2		122.7	
14% Evaporated		°F	117.9	117.6	120.4			118.6		124.6	123	124.6		124.1	
15% Evaporated		°F	119.4	119.1	121.7			120.1		125.9	124.2	125.7		125.3	
16% Evaporated		°F	120.9	120.5	123.2			121.5		127.0	125.6	127.0		126.5	
17% Evaporated		°F	122.0	122.2	124.6			122.9		128.3	127.2	128.3		127.9	
18% Evaporated		°F	123.5	123.9	126.1			124.5		129.8	128.5	129.5		129.3	
19% Evaporated		°F	125.1	125.2	127.6			126.0		131.0	129.7	130.7		130.5	
20% Evaporated		°F	127.6	126.6	127	129.0	129.5	127.9	131.5	132.2	131.3	131.9	134.2	132.2	
21% Evaporated		°F	128.3	129	130.4			129.2		133.7	132.1	133.1		133.0	
22% Evaporated		°F	130.2	130.6	131.9			130.9		134.9	133.4	134.3		134.2	
23% Evaporated		°F	131.1	131.7	133.4			132.1		136.0	135	135.6		135.5	
24% Evaporated		°F	133.1	133.7	134.9			133.9		137.1	136.2	136.6		136.6	
25% Evaporated		°F	134.9	135	136.2			135.4		138.3	137.3	137.8		137.8	
26% Evaporated		°F	136.3	136	137.4			136.6		139.2	138.5	139.1		138.9	
27% Evaporated		°F	137.0	137.4	138.7			137.7		140.2	139.9	139.8		140.0	
28% Evaporated		°F	138.5	138.4	139.9			138.9		141.3	141	140.8		141.0	
29% Evaporated		°F	139.5	140.1	141.1			140.2		142.3	141.9	141.9		142.0	
30% Evaporated		°F	141.0	140.4	141.4	142.2	143.0	141.6	142.1	143.2	142.9	142.7	144.1	143.0	
31% Evaporated		°F		142.5	142.6	143.5			142.9		144.2	143.7	143.6		143.8
32% Evaporated		°F		143.7	144	144.6			144.1		144.9	144.5	144.5		144.6
33% Evaporated		°F		144.5	145.1	145.5			145.0		145.8	145.8	145.3		145.6
34% Evaporated		°F		145.0	146.1	146.6			145.9		146.5	146.5	145.1		146.0
35% Evaporated		°F		146.8	147.2	147.5			147.2		147.4	147.1	145.7		146.7
36% Evaporated		°F		148.2	148.6	148.6			148.5		148.0	148.1	147.5		147.9
37% Evaporated		°F		149.2	149.4	149.3			149.3		148.6	148.9	148.5		148.7
38% Evaporated		°F		150.1	150.1	150.1			150.1		149.5	149.8	149.3		149.5
39% Evaporated		°F		150.9	151.2	150.9			151.0		150.2	150.6	149.8		150.2
40% Evaporated		°F	151.3	151.7	151.9	151.9	152.4	151.8	150.1	150.9	151.4	150.8	151.9	151.0	

41% Evaporated		°F		152.4	152.6	152.6		152.5		151.6	151.9	151.2		151.6
42% Evaporated		°F		153.2	153.2	153.3		153.2		152.4	152.8	151.5		152.2
43% Evaporated		°F		154.1	154.4	154.3		154.3		153.0	153.3	152.4		152.9
44% Evaporated		°F		154.6	155	155.0		154.9		154.0	154.1	153.3		153.8
45% Evaporated		°F		155.5	155.9	155.7		155.7		154.5	154.9	153.7		154.4
46% Evaporated		°F		156.9	156.5	157.2		156.9		156.0	156.2	155.0		155.7
47% Evaporated		°F		157.5	158	159.3		158.3		157.9	157.3	157.4		157.5
48% Evaporated		°F		158.8	159.2	162.9		160.3		161.1	159.3	160.2		160.2
49% Evaporated		°F		161.6	161.6	167.5		163.6		164.4	161.3	163.8		163.2
50% Evaporated		°F	169.5	166.7	164.4	173.6	171.8	169.2	168.5	169.1	164.5	169.1	168.8	168.0
51% Evaporated		°F		173.4	169.3	180.5		174.4		174.7	169.4	175.1		173.1
52% Evaporated		°F		182.2	177.9	187.7		182.6		180.2	177.7	181.3		179.7
53% Evaporated		°F		190.0	187.7	193.5		190.4		186.7	185.3	186.6		186.2
54% Evaporated		°F		198.1	196	199.4		197.8		192.5	191.3	191.8		191.9
55% Evaporated		°F		203.7	202.2	204.4		203.4		197.1	196.7	196.5		196.8
56% Evaporated		°F		208.0	206.6	208.8		207.8		201.8	200.8	200.9		201.2
57% Evaporated		°F		211.8	210.4	212.1		211.4		205.3	204.8	204.3		204.8
58% Evaporated		°F		215.1	214.1	215.6		214.9		208.9	208.1	207.7		208.2
59% Evaporated		°F		219.0	216	218.4		217.8		211.6	210.8	210.2		210.9
60% Evaporated		°F	218.8	221.6	218.4	220.4	221.6	220.2	211.5	214.5	213.2	212.8	214.4	213.3
61% Evaporated		°F		223.0	221.3	222.8		222.4		217.0	215.8	215.1		216.0
62% Evaporated		°F		224.0	223.3	225.1		224.1		218.9	217.9	217.1		218.0
63% Evaporated		°F		225.7	225	227.2		226.0		221.0	220	219.2		220.1
64% Evaporated		°F		227.8	226.8	229.5		228.0		222.8	222.3	221.3		222.1
65% Evaporated		°F		229.7	229.3	231.3		230.1		224.8	224.4	223.3		224.2
66% Evaporated		°F		231.5	232.7	233.6		232.6		226.7	226.7	225.5		226.3
67% Evaporated		°F		232.6	234.9	235.9		234.5		228.7	228.7	228.0		228.5
68% Evaporated		°F		233.8	236.8	238.1		236.2		230.7	230.6	230.3		230.5
69% Evaporated		°F		237.3	239.1	240.3		238.9		232.5	232.5	232.2		232.4
70% Evaporated		°F	240.9	240.1	240.8	242.4	242.6	241.4	232.2	234.7	234.5	234.5	234.7	234.1
71% Evaporated		°F		240.8	242.4	244.6		242.6		236.8	237	236.9		236.9
72% Evaporated		°F		243.7	244.7	246.9		245.1		239.3	239.1	238.9		239.1
73% Evaporated		°F		247.2	245.8	249.2		247.4		241.6	241.4	241.1		241.4
74% Evaporated		°F		249.6	248.6	251.8		250.0		243.9	243.9	243.6		243.8
75% Evaporated		°F		251.5	251.8	254.5		252.6		246.1	245.7	245.9		245.9
76% Evaporated		°F		254.6	255.1	257.2		255.6		248.4	246.4	248.4		247.7
77% Evaporated		°F		258.0	257.9	259.7		258.5		250.6	249.5	250.9		250.3
78% Evaporated		°F		261.1	260.4	262.7		261.4		253.2	252.5	253.8		253.2
79% Evaporated		°F		262.3	263.3	265.8		263.8		255.7	255.1	256.9		255.9
80% Evaporated		°F	268.0	265.6	266.1	269.7	269.8	267.8	259.0	258.9	258.4	260.2	259.8	259.3
81% Evaporated		°F		269.9	269.3	273.2		270.8		261.8	261.5	263.5		262.3
82% Evaporated		°F		274.2	273.3	277.5		275.0		265.7	265.4	266.9		266.0
83% Evaporated		°F		278.8	278.3	282.0		279.7		269.4	270	271.1		270.2
84% Evaporated		°F		283.8	283.8	287.2		284.9		273.5	274.1	275.6		274.4
85% Evaporated		°F		288.3	289.1	292.4		289.9		278.2	278.9	280.3		279.1
86% Evaporated		°F		294.7	294.9	297.9		295.8		283.5	283.9	286.0		284.5
87% Evaporated		°F		301.9	301.5	304.3		302.6		290.2	290.4	291.3		290.6
88% Evaporated		°F		308.5	308.7	310.9		309.4		297.1	297.8	298.8		297.9
89% Evaporated		°F		315.2	315.4	317.7		316.1		303.1	305.7	305.7		304.8
90% Evaporated		°F	321.7	321.9	321.7	322.8	321.3	321.9	312.2	312.4	313.5	313.1	313.6	313.0
91% Evaporated		°F		326.4	328.2	326.1		326.9		319.6	317.7	320.3		319.2
92% Evaporated		°F		332.7	329.7	334.6		332.3		326.9	327	323.4		325.8
93% Evaporated		°F		337.4	337.8	341.5		338.9		333.0	333.9	331.4		332.8
94% Evaporated		°F		342.3	346.1	347.9		345.4		338.8	340.9	338.4		339.4
95% Evaporated		°F	354.5	351.7	353.9	355.5	356.6	354.4	345.2	345.7	347.4	345.7	346.9	346.2
96% Evaporated		°F		362.7	362.7	365.4		363.6		354.9	355.5	354.9		355.1
97% Evaporated		°F		375.2	374.3	378.9		376.1		367.6	366	366.4		366.7
98% Evaporated		°F		392.4	389.4	396.4		392.7		386.8	384.2	386.1		385.7
99% Evaporated		°F		402										
Final Boiling Point		°F	406.7	401.6	403.1	410.5	404.5	405.3	393.5	393.4	393	397.6	393.8	394.3
Residue	vol %	1.1	1.1	0.6	1.1	1.1		1.1	1.1	1	1.1	1.0		
Loss	vol %	2.5	2.0	1.9	2.0	1.0	1.0	1.5	1.4	1.4	1.7	0.6	1.1	
Recovered	vol %	96.4	96.9	97.5	96.9	97.9	1.9	97.4	97.5	97.3	97.2	98.4	1.3	
Oxidation Stability	D525	Minutes	>240					>240	>240				>240	
Lead Content	D3237	g/L	<0.001					<0.001	<0.001				<0.001	
Copper Corrosion	D130		1A					1A	1A				1A	
Silver Corrosion	D7671		0					0.0	0				0.0	
Solvent Washed Gum	D381	mg/100 mL	<0.5		70			<0.5	<0.5				<0.5	
Unwashed Gum	D381	mg/100 mL	4.0					4.0	4.2				4.2	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF11-E10						E-TF12-E10					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	58.9	58.6	59.3	58.6	58.7	58.8	59.3	59	59.2	58.9	59.1	59.1
Research Octane Number	D2699	RON	96.0	96.7	96.4	96.6	96.4	96.4	96.4	96.1	95.9	96.0	95.8	96.0
Motor Octane Number	D2700	MON	86.4	85.7	86.8	86.5	86.4	86.4	86.0	85.6	86.8	86.2	85.9	86.1
Antiknock Index, (R+M)/2	D2699/D2700	AKI	91.2	91.2	91.6	91.6	91.4	91.4	91.2	90.85	91.4	91.1	90.9	91.1
Ethanol Content	D5599	vol %	10.03	11.15	10.2	10.15	10.51	10.4	9.64	9.74	9.58	9.26	9.51	9.5
DVPE Vapor Pressure	D5191	psi	11.08	11.06	11.14	11.13	11.20	11.1	9.72	9.81	9.74	9.62	9.90	9.8
Temperature V/L=20 (TVL20)	D5188	°F	118.7	121.5	120.2	120	120.5	120.2	125.8	127.4	127.5	127	126.3	126.8
Sulfur Content	D2622/D7039	ppm	8.9	9.15	9.1	10	9	9.2	7.7	8.2	9.2	9	8	8.4
FIA (uncorrected)	D1319													
Saturates		vol %		66.4		67.9		67.1		70.7	76.5	72.1		73.1
Aromatics		vol %		27.8		27.4		27.6		24.8	21	24.2		23.3
Olefins		vol %		5.8		4.8		5.3		4.5	2.5	3.6		3.5
FIA (corrected for oxygenates)	D1319													
Saturates		vol %		59.0		61.5		60.2		63.8	69.2	65.4		66.1
Aromatics		vol %		24.7	25.9	24.8		25.1		22.4	18.9	22.0		21.1
Olefins		vol %		5.2	4.8	4.3		4.8		4.1	2.3	3.3		3.2
Benzene	D3606	vol %		0.71	0.7	0.69		0.7		0.41	0.34	0.35		0.4
D86 Distillation	D86													
Initial Boiling Point		°F	86.9	81.8	81.7	90.7	83.4	84.9	100.8	92.5	92.3	95.2	91.3	94.4
1% Evaporated		°F		81.8	81.7	90.7			84.7		92.5	95.8	95.2	94.5
2% Evaporated		°F		81.8	81.7	100.4			88.0		106.8	99.3	108.6	104.9
3% Evaporated		°F		95.3	98.2	105.9			99.8		111.3	108.3	113.3	111.0
4% Evaporated		°F		101.8	103	108.8			104.5		115.3	112.4	116.1	114.6
5% Evaporated		°F	106.8	106.3	107.1	111.4	107.6	107.8	118.2	117.3	115.1	118.4	121.2	118.0
6% Evaporated		°F		109.7		113.5			111.6		119.2	117.4	120.1	118.9
7% Evaporated		°F		112.0		115.1			113.6		121.2	119.3	121.7	120.7
8% Evaporated		°F		114.4		116.9			115.6		122.9	121.5	123.1	122.5
9% Evaporated		°F		115.8		118.7			117.3		124.5	123	124.6	124.0
10% Evaporated		°F	117.2	117.8	117.8	120.2	118.2	118.2	125.4	125.9	124.3	126.0	129.0	126.1
11% Evaporated		°F		119.4		121.7			120.6		127.2	125.7	127.4	126.8
12% Evaporated		°F		121.2		123.2			122.2		128.7	127.1	128.4	128.1
13% Evaporated		°F		122.9		124.6			123.7		129.8	128.6	129.5	129.3
14% Evaporated		°F		124.1		126.1			125.1		131.1	129.8	130.6	130.5
15% Evaporated		°F		125.5	126.5	127.0			126.3		132	130.9	131.8	131.6
16% Evaporated		°F		126.3		128.4			127.3		133.2	132.3	132.8	132.8
17% Evaporated		°F		127.7		129.6			128.7		134.3	133.2	133.8	133.8
18% Evaporated		°F		129.1		131.0			130.0		135.3	134.3	134.9	134.8
19% Evaporated		°F		130.6		132.3			131.4		136.3	135.5	135.8	135.9
20% Evaporated		°F	132.7	131.9	134.2	133.7	134.1	133.3	136.2	137.2	136.5	136.8	139.8	137.3
21% Evaporated		°F		133.7		135.2			134.5		138.1	137.6	137.8	137.8
22% Evaporated		°F		135.3		136.6			135.9		139	138.4	138.6	138.7
23% Evaporated		°F		136.4		137.9			137.2		139.8	139.5	139.5	139.6
24% Evaporated		°F		137.7		139.1			138.4		140.7	140.5	140.5	140.6
25% Evaporated		°F		138.8	141.1	140.5			140.1		141.3	141.5	141.5	141.4
26% Evaporated		°F		140.2		141.8			141.0		142.3	142.3	142.2	142.3
27% Evaporated		°F		141.6		142.9			142.3		142.8	143	143.0	142.9
28% Evaporated		°F		142.5		144.2			143.4		143.7	143.7	143.6	143.7
29% Evaporated		°F		143.9		145.2			144.6		144.7	144.5	144.3	144.5
30% Evaporated		°F	145.8	145.0	147.1	146.0	146.5	146.1	145.2	145.3	145.2	145.0	147.8	145.7
31% Evaporated		°F		146.1		147.1			146.6		145.8	145.9	145.3	145.7
32% Evaporated		°F		146.9		148.2			147.6		146.2	146.6	146.0	146.3
33% Evaporated		°F		147.8		149.1			148.5		146.9	147.4	146.6	147.0
34% Evaporated		°F		148.8		150.1			149.4		147.5	148	147.2	147.6
35% Evaporated		°F		149.8	151.9	150.8			150.8		148.4	148.6	147.9	148.3
36% Evaporated		°F		150.9		151.7			151.3		149.1	149.3	148.6	149.0
37% Evaporated		°F		151.6		152.5			152.1		149.5	149.9	148.9	149.4
38% Evaporated		°F		152.1		153.3			152.7		150.2	150.5	149.6	150.1
39% Evaporated		°F		152.7		154.0			153.3		150.6	150.9	150.5	150.7
40% Evaporated		°F		154.6	153.4	156.1	155.2	155.3	154.9	151.9	151.2	151.6	151.0	153.0

41% Evaporated		°F		154.2		155.6		154.9		152.1	152.1	151.5		151.9
42% Evaporated		°F		155.7		156.6		156.1		153.2	152.4	152.9		152.8
43% Evaporated		°F		156.4		157.8		157.1		154.4	153.3	153.8		153.8
44% Evaporated		°F		156.6		158.7		157.7		156.1	154.2	155.5		155.3
45% Evaporated		°F		157.7	161	160.6		159.8		158.3	155.4	158.1		157.3
46% Evaporated		°F		159.6		163.1		161.4		161.6	157.9	151.7		157.1
47% Evaporated		°F		162.5		166.7		164.6		165.7	161.1	166.1		164.3
48% Evaporated		°F		167.2		171.1		169.1		170.6	164.9	171.3		168.9
49% Evaporated		°F		170.1		177.0		173.6		176.2	170.2	176.5		174.3
50% Evaporated		°F	179.6	176.4	179.1	183.1	179.8	179.6	180.3	181.2	176.8	181.6	184.5	180.9
51% Evaporated		°F		182.5		189.5		186.0		185.8	183.1	186.0		185.0
52% Evaporated		°F		188.9		195.4		192.2		190.2	187.9	190.2		189.4
53% Evaporated		°F		195.2		200.3		197.7		193.9	192	193.6		193.2
54% Evaporated		°F		200.9		205.1		203.0		197.7	195.6	197.2		196.8
55% Evaporated		°F		205.1	209.1	208.7		207.6		200.7	198.9	199.9		199.8
56% Evaporated		°F		209.2		212.0		210.6		203.4	201.6	202.7		202.6
57% Evaporated		°F		212.2		214.6		213.4		205.8	204.8	205.2		205.3
58% Evaporated		°F		215.3		217.0		216.1		208.1	206.9	207.5		207.5
59% Evaporated		°F		217.5		219.0		218.3		210.3	209.6	209.2		209.7
60% Evaporated		°F	220.7	219.3	221.6	220.4	221.5	220.7	211.6	212.7	212	211.3	214.2	212.4
61% Evaporated		°F		220.5		222.2		221.4		214.6	214.1	213.2		214.0
62% Evaporated		°F		222.5		223.6		223.0		216.5	215.6	215.3		215.8
63% Evaporated		°F		223.9		225.2		224.6		218.5	217.6	217.1		217.7
64% Evaporated		°F		225.4		227.0		226.2		220.2	219.6	219.1		219.6
65% Evaporated		°F		227.0	228.8	228.2		228.0		221.8	222	221.2		221.7
66% Evaporated		°F		228.4		229.5		228.9		224	223	223.0		223.3
67% Evaporated		°F		229.9		231.2		230.6		225.8	224.6	225.1		225.2
68% Evaporated		°F		231.1		233.0		232.1		227.8	226.7	226.6		227.0
69% Evaporated		°F		232.2		234.5		233.3		229.3	228	228.5		228.6
70% Evaporated		°F	236.0	233.8	235.5	236.0	235.3	235.3	230.4	231.5	230.3	230.8	233.0	231.2
71% Evaporated		°F		235.6		237.6		236.6		233.8	232.4	232.3		232.8
72% Evaporated		°F		236.7		239.3		238.0		236.1	235	234.4		235.2
73% Evaporated		°F		237.4		240.8		239.1		237.7	237.2	236.3		237.1
74% Evaporated		°F		239.7		242.4		241.0		239.2	239.4	238.8		239.1
75% Evaporated		°F		241.6	243.8	244.2		243.2		241.4	241.3	241.6		241.4
76% Evaporated		°F		242.9		245.8		244.4		244.2	243.8	243.9		244.0
77% Evaporated		°F		245.1		247.8		246.5		246.8	245.9	246.5		246.4
78% Evaporated		°F		245.9		249.9		247.9		249.6	248.6	249.4		249.2
79% Evaporated		°F		248.4		252.5		250.4		252.3	251.3	152.2		218.6
80% Evaporated		°F	254.1	251.7	255.2	254.8	254.0	254.0	254.5	254.6	254.3	155.3	256.2	235.0
81% Evaporated		°F		254.4		257.2		255.8		257.5	257.2	158.1		224.3
82% Evaporated		°F		256.9		260.0		258.5		260.5	260.2	261.3		260.7
83% Evaporated		°F		258.8		263.0		260.9		264	263.5	264.8		264.1
84% Evaporated		°F		261.7		266.8		264.2		267.8	268.1	268.8		268.2
85% Evaporated		°F		265.8	270.8	271.1		269.2		272.3	273.1	273.5		273.0
86% Evaporated		°F		270.8		276.0		273.4		277.4	278	278.8		278.1
87% Evaporated		°F		275.3		281.2		278.3		283.8	283.4	284.7		284.0
88% Evaporated		°F		280.4		286.6		283.5		291.5	290	292.2		291.2
89% Evaporated		°F		287.1		293.8		290.5		298.7	297.7	300.8		299.1
90% Evaporated		°F	302.8	295.3	300.3	302.4	303.1	300.8	310.1	307.7	308	309.8	311.2	309.4
91% Evaporated		°F		304.4	309.3	312.0		308.6		316.2	316.1	316.7		316.3
92% Evaporated		°F		314.5	318.4	321.3		318.1		323.7	319	323.3		322.0
93% Evaporated		°F		323.4	327.2	326.8		325.8		329.7	329.4	329.5		329.5
94% Evaporated		°F		332.5	335.5	338.1		335.4		336.5	336.2	336.0		336.2
95% Evaporated		°F	347.5	340.6	344.5	348.1	348.9	345.9	343.6	343	342.9	342.7	342.0	342.8
96% Evaporated		°F		352.7	352.6	359.5		354.9		351.8	351	351.2		351.3
97% Evaporated		°F		365.3	367.2	374.7		369.1		363.4	360.9	363.3		362.5
98% Evaporated		°F		381.6	384.3	396.1		387.3		382.4	377	384.3		381.2
99% Evaporated		°F				398								
Final Boiling Point		°F	402.1	385.6	399.3	404.7	397.2	397.8	392.4	389.3	388.1	395.5	393.3	391.7
Residue	vol %	1.1	1.1	0.5	1.1	1.1	1.0	0.9	1.1	0.8	1.1	0.9	1.0	
Loss	vol %	2.1	2.3	1.8	1.5	0.9	1.7	1.2	1.3	1.1	1.2	0	1.0	
Recovered	vol %	96.8	96.3	97.7	97.4	97.3	97.1	97.9	97.6	97.9	97.7	99.1	98.0	
Oxidation Stability	D525	Minutes	>240					>240	>240				>240	
Lead Content	D3237	g/L	<0.001					<0.001	<0.001				<0.001	
Copper Corrosion	D130		1A					1A	1A				1A	
Silver Corrosion	D7671		0					0.0	0				0.0	
Solvent Washed Gum	D381	mg/100 mL	<0.5	72				<0.5	<0.5				<0.5	
Unwashed Gum	D381	mg/100 mL	4.4					4.4	4.2				4.2	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF13-E10						E-TF14-E10					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	56.1	56.0	56.0	55.8	55.8	55.9	56.0	55.7	55.9	55.7	55.7	55.8
Research Octane Number	D2699	RON	94.4	94.8	94.4	94.6	94.4	94.5	94.6	94.6	94.4	94.4	94.5	94.5
Motor Octane Number	D2700	MON	84.9	84.3	84.5	84.0	84.1	84.4	84.5	84		84.0	84.1	84.2
Antiknock Index, (R+M)/2	D2699/D2700	AKI	89.6	89.55	89.4	89.3	89.3	89.4	89.6	89.3		89.2	89.3	89.4
Ethanol Content	D5599	vol %	9.62	10.62	9.75	9.93	10.41	10.1	9.67	10.03	9.65	9.88	10.8	10.0
DVPE Vapor Pressure	D5191	psi	8.85	9.02	8.99	8.95	9.09	9.0	7.90	8.04	7.9	8.01	8.16	8.0
Temperature V/L=20 (TVL20)	D5188	°F	128.9	131.2	131.1	132	129.7	130.6	132.2	134.1	133.6	134	128.2	132.4
Sulfur Content	D2622/D7039	ppm	10.6	11	9.2	12	11	10.8	10.5	11	8.9	12	11	10.7
FIA (uncorrected)	D1319													
Saturates		vol %	58.56		60.4			59.5		58.19		58.9		58.5
Aromatics		vol %	33.93		32.8			33.4		34.86		34.5		34.7
Olefins		vol %	7.50		6.8			7.2		6.95		6.7		6.8
FIA (corrected for oxygenates)	D1319													
Saturates		vol %	52.34	52.5	54.7			53.2		52.35		53.3		52.8
Aromatics		vol %	30.33	31	29.7			30.3		31.36		31.2		31.3
Olefins		vol %	6.70	6.1	6.2			6.3		6.25		6.0		6.1
Benzene	D3606	vol %		0.85	0.82	0.82		0.8		0.83	0.83	0.81		0.8
D86 Distillation	D86													
Initial Boiling Point		°F	94.8	91.9	88.8	97.7	90.8	92.8	100.1	95.58	93.1	101.2	95.3	97.1
1% Evaporated		°F		91.9	88.8	97.7			92.8		95.58		101.2	98.4
2% Evaporated		°F		104.6	105.7	110.8			107.0		104.3		116.1	110.2
3% Evaporated		°F		109.6	110.6	115.0			111.7		110.4		119.3	114.9
4% Evaporated		°F		113.3	114	117.9			115.1		116.2		121.9	119.1
5% Evaporated		°F	118.1	116.9	116.6	120.1	116.8	117.7	123.1	119.15	121.5	124.1	121.0	121.8
6% Evaporated		°F		118.9		121.9			120.4		121.2		125.5	123.4
7% Evaporated		°F		120.8		123.4			122.1		122.83		126.5	124.7
8% Evaporated		°F		122.0		124.6			123.3		123.75		127.5	125.6
9% Evaporated		°F		123.4		125.9			124.7		125.01		128.4	126.7
10% Evaporated		°F	126.0	124.6	125.7	127.1	125.1	125.7	128.7	125.97	128.2	129.2	127.2	127.9
11% Evaporated		°F		125.4		128.1			126.7		127.12		130.0	128.6
12% Evaporated		°F		125.3		129.2			127.3		127.78		130.7	129.2
13% Evaporated		°F		127.3		130.3			128.8		128.02		131.4	129.7
14% Evaporated		°F		128.0		130.9			129.4		128.19		131.7	129.9
15% Evaporated		°F		129.5	131.4	131.9			130.9		129.17	131.9	132.4	131.2
16% Evaporated		°F		130.3		132.7			131.5		129.7		133.1	131.4
17% Evaporated		°F		131.8		133.8			132.8		131.15		133.6	132.4
18% Evaporated		°F		132.3		134.7			133.5		131.98		134.5	133.2
19% Evaporated		°F		134.1		135.7			134.9		133.6		135.4	134.5
20% Evaporated		°F	136.7	134.7	137.1	136.8	136.4	136.3	136.5	134.1	137	136.3	135.7	135.9
21% Evaporated		°F		135.6		138.0			136.8		135.19		127.2	131.2
22% Evaporated		°F		136.8		138.8			137.8		135.94		137.9	136.9
23% Evaporated		°F		138.1		139.7			138.9		137.1		138.7	137.9
24% Evaporated		°F		139.5		140.8			140.1		138.2		139.5	138.9
25% Evaporated		°F		140.8	142.2	141.8			141.6		139.48		140.4	139.9
26% Evaporated		°F		141.6		142.7			142.1		140.53		141.3	140.9
27% Evaporated		°F		142.7		143.5			143.1		141.14		142.2	141.7
28% Evaporated		°F		143.2		144.4			143.8		142.2		142.8	142.5
29% Evaporated		°F		143.7		145.3			144.5		143.03		143.8	143.4
30% Evaporated		°F	145.8	145.2	146.5	145.9	146.1	145.9	144.8	143.74	145.7	144.6	144.7	144.7
31% Evaporated		°F		145.8		146.8			146.3		144.7		145.5	145.1
32% Evaporated		°F		146.5		147.7			147.1		145.44		146.4	145.9
33% Evaporated		°F		147.5		148.5			148.0		145.94		147.0	146.5
34% Evaporated		°F		148.3		149.2			148.8		146.85		147.6	147.2
35% Evaporated		°F		149.0	150.7	150.0			149.9		147.73		148.7	148.2
36% Evaporated		°F		150.1		150.7			150.4		148.8		149.2	149.0
37% Evaporated		°F		150.9		151.7			151.3		149.57		150.1	149.8
38% Evaporated		°F		152.2		152.4			152.3		150.38		151.1	150.7
39% Evaporated		°F		153.1		153.0			153.1		151.18		151.9	151.5
40% Evaporated		°F		153.9	153.5	154.3	153.9	153.9	152.7	152.08	154.2	152.6	152.8	152.9

41% Evaporated		°F		154.6		154.4		154.5		152.94		153.2		153.1
42% Evaporated		°F		155.4		155.4		155.4		153.77		153.5		153.6
43% Evaporated		°F		156.2		155.9		156.0		155.1		154.8		154.9
44% Evaporated		°F		158.0		157.9		158.0		156.8		156.5		156.6
45% Evaporated		°F		159.7	160.9	160.8		160.5		157.8		159.7		158.8
46% Evaporated		°F		163.2		164.9		164.0		159.9		163.7		161.8
47% Evaporated		°F		168.0		170.1		169.0		163.37		169.0		166.2
48% Evaporated		°F		173.2		175.9		174.6		166.79		174.8		170.8
49% Evaporated		°F		178.6		182.5		180.6		171.55		181.0		176.3
50% Evaporated		°F	187.1	184.9	187.6	188.6	187.0	187.0	187.6	173.94	189.2	186.9	184.9	184.5
51% Evaporated		°F		190.6		194.7		192.7		179.96		193.0		186.5
52% Evaporated		°F		196.5		200.3		198.4		188.81		198.5		193.7
53% Evaporated		°F		201.8		205.4		203.6		196.14		203.8		200.0
54% Evaporated		°F		206.6		209.8		208.2		201.23		208.1		204.7
55% Evaporated		°F		210.5	213.5	213.6		212.5		205.24		212.2		208.7
56% Evaporated		°F		214.0		216.7		215.4		209.31		216.0		212.7
57% Evaporated		°F		217.3		219.9		218.6		212.2		219.1		215.7
58% Evaporated		°F		220.3		222.8		221.6		215.44		221.8		218.6
59% Evaporated		°F		223.1		225.3		224.2		217.84		224.6		221.2
60% Evaporated		°F	226.9	225.5	228.1	227.6	226.7	227.0	227.5	220.73	227.6	227.5	226.9	226.0
61% Evaporated		°F		227.6		229.8		228.7		223.9		229.9		226.9
62% Evaporated		°F		230.1		232.1		231.1		226.19		232.2		229.2
63% Evaporated		°F		232.2		234.4		233.3		227.8		234.5		231.2
64% Evaporated		°F		234.5		236.7		235.6		229.47		236.5		233.0
65% Evaporated		°F		236.4	239.7	238.9		238.3		232.79		238.4		235.6
66% Evaporated		°F		238.9		240.9		239.9		235.62		240.5		238.1
67% Evaporated		°F		240.7		243.3		242.0		236.22		242.9		239.6
68% Evaporated		°F		243.4		245.9		244.7		235.96		245.3		240.6
69% Evaporated		°F		245.4		247.9		246.6		239.94		247.6		243.8
70% Evaporated		°F	250.1	247.4	250.8	250.3	249.9	249.7	250.1	241.86	249.4	249.9		247.8
71% Evaporated		°F		249.8		253.0		251.4		245.31		252.0		248.7
72% Evaporated		°F		252.6		255.7		254.1		245.88		254.5		250.2
73% Evaporated		°F		255.6		258.0		256.8		249.02		256.7		252.9
74% Evaporated		°F		258.0		260.3		259.1		252.58		259.1		255.8
75% Evaporated		°F		260.9	262.8	263.2		262.3		255.72		261.9		258.8
76% Evaporated		°F		263.2		266.0		264.6		259.17		264.8		262.0
77% Evaporated		°F		265.8		269.3		267.5		263.48		267.9		265.7
78% Evaporated		°F		269.1		272.1		270.6		267.32		270.7		269.0
79% Evaporated		°F		271.6		275.6		273.6		270.46		274.1		272.3
80% Evaporated		°F	277.9	274.6	278.3	279.3	278.3	277.7	277.9	273.48	278.1	277.1	276.5	276.6
81% Evaporated		°F		278.9		283.2		281.1		277.4		281.0		279.2
82% Evaporated		°F		282.8		287.5		285.2		282.01		285.2		283.6
83% Evaporated		°F		286.0		291.7		288.9		286.03		289.7		287.9
84% Evaporated		°F		290.5		296.0		293.3		289.77		294.4		292.1
85% Evaporated		°F		295.2	299.2	301.3		298.6		295.54	299.2	299.3		298.0
86% Evaporated		°F		300.1		306.2		303.1		300.43		304.5		302.5
87% Evaporated		°F		305.6		311.6		308.6		306.04		309.5		307.8
88% Evaporated		°F		310.3		316.9		313.6		311.37		315.4		313.4
89% Evaporated		°F		317.7		322.2		320.0		317.22		320.7		319.0
90% Evaporated		°F	327.3	324.2	326.1	327.5	325.5	326.1	326.7	321.82	325	324.2	326.5	324.8
91% Evaporated		°F		329.8	331.5	332.8		331.4		325.74		332.4		329.1
92% Evaporated		°F		334.8	338.4	339.2		337.5		329.66		339.1		334.4
93% Evaporated		°F		339.9	342.8	346.0		342.9		338.5		344.8		341.7
94% Evaporated		°F		346.6	349.8	353.7		350.0		347.24		350.6		348.9
95% Evaporated		°F	359.3	354.7	358	362.1	359.3	358.7	360.8	356.34	361.1	360.0	359.6	359.6
96% Evaporated		°F		365.4	368.5	372.7		368.9		365.88		371.5		368.7
97% Evaporated		°F		377.6	381.2	385.5		381.4		377.65		383.3		380.5
98% Evaporated		°F		392.7	399.9	403.1		398.6		396.19		403.9		400.0
99% Evaporated		°F												
Final Boiling Point		°F	410.2	398.7	406.2	411.2	407.6	406.8	411.0	400	408.6	412.4	405.5	407.5
Residue	vol %	1.1	1.1	0.9	1.1	1.1	1.1	1.1	1.1	1	1.1	1.1	1.1	1.1
Loss	vol %	1.4	1.3	1.0	0.9	0.9	1.1	1.0	1.7	0.6	0.7	0.7	0.9	
Recovered	vol %	97.5	97.6	98.1	98.0	98.0	97.8	97.9	97.2	98.4	98.2	98.2	98.0	
Oxidation Stability	D525	Minutes	>240				>240	>240					>240	
Lead Content	D3237	g/L	<0.001				<0.001	<0.001					<0.001	
Copper Corrosion	D130		1A				1A	1A					1A	
Silver Corrosion	D7671		0				0.0	0					0.0	
Solvent Washed Gum	D381	mg/100 mL	<0.5	74			<0.5	>240					>240	
Unwashed Gum	D381	mg/100 mL	4.6				4.6	5.4					5.4	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF15-E15						E-TF16-E15					
			Supplier	Chevron	MPC	FHR	BP	Average	Supplier	Chevron	MPC	FHR	BP	Average
Laboratory														
Property	ASTM Test Method	Units												
API Gravity@60°F	D1298/D287	API	56.2	55.9	56.1	56.0	55.9	56.0	56.0	55.9	55.9	55.7	55.8	55.9
Research Octane Number	D2699	RON	100.8	100.4	100.6	100.0	100.8	100.5	101.0	100.5	100.9	101.0	101.2	100.9
Motor Octane Number	D2700	MON	89.9	87.7	89.2	89.2	88.4	88.9	89.0	89.0	89.5	88.0	88.7	88.8
Antiknock Index, (R+M)/2	D2699/D2700	AKI	95.4	94.05	94.9	94.6	94.6	94.7	95.0	94.8	95.2	94.5	94.95	94.9
Ethanol Content	D5599	vol %	14.65	15.21	15.81	14.73	15.38	15.2	14.98	15.3	14.12	14.58	15.67	14.9
DVPE Vapor Pressure	D5191	psi	9.85	9.9	9.83	9.87	10.00	9.9	9.04	9.1	9.08	9.10	9.18	9.1
Temperature V/L=20 (TVL20)	D5188	°F	126.9	130.3	128.5	128	132.2	129.2	132.0	134.8	133.7	133	128.2	132.3
Sulfur Content	D2622/D7039	ppm	5.8	6.45	5.2	14	6	7.5	5.3	5.4	5.4	5	6	5.4
FIA (uncorrected)	D1319													
Saturates		vol %	64.23		66.7		65.5		66.0		68.2		67.1	
Aromatics		vol %	30.48		29.2		29.8		29.8		28.9		29.4	
Olefins		vol %	5.29		4.1		4.7		4.2		2.9		3.5	
FIA (corrected for oxygenates)	D1319													
Saturates		vol %	54.46		60.4		57.4		55.9		53.2		61.8	
Aromatics		vol %	25.84		26.5		26.2		25.2		28.5		26.1	
Olefins		vol %	4.49		3.7		4.1		3.5		4.2		2.7	
Benzene	D3606	vol %	0.39	0.39	0.39		0.4		0.4	0.34	0.36		0.4	
D86 Distillation	D86													
Initial Boiling Point		°F	92.0	85.9	89.4	95.4	84.2	89.4	102.2	90.2	90.9	101.8	87.6	94.5
1% Evaporated		°F		85.9		95.4		90.7		90.2		101.8		96.0
2% Evaporated		°F		85.9		95.4		90.7		90.2		101.8		96.0
3% Evaporated		°F		85.9		109.6		97.8		111.7		115.4		113.6
4% Evaporated		°F		104.6		115.1		109.8		118.5		120.4		119.5
5% Evaporated		°F	115.5	110.7	117.8	118.9	116.6	115.9	122.9	123.6	120.2	123.3	122.1	122.4
6% Evaporated		°F		117.0		121.9		119.4		126.3		126.1		126.2
7% Evaporated		°F		120.9		124.2		122.5		128.5		128.2		128.3
8% Evaporated		°F		123.5		126.3		124.9		130.5		130.5		130.5
9% Evaporated		°F		126.0		128.3		127.2		132.1		132.4		132.3
10% Evaporated		°F	128.0	128.2	129.9	130.4	129.6	129.2	133.7	133.6	132.6	134.2	134.1	133.6
11% Evaporated		°F		130.2		132.0		131.1		135.1		135.9		135.5
12% Evaporated		°F		132.2		134.0		133.1		136.6		137.4		137.0
13% Evaporated		°F		133.9		135.5		134.7		138.3		139.0		138.7
14% Evaporated		°F		135.6		137.4		136.5		140.1		140.6		140.4
15% Evaporated		°F	137.3	139.3	139.0		138.5		141.7	142.2	142.1		142.0	
16% Evaporated		°F		139.1		140.0		139.6		142.8		143.2		143.0
17% Evaporated		°F		141.0		141.5		141.2		143.7		144.5		144.1
18% Evaporated		°F		142.4		143.1		142.7		144.9		146.0		145.5
19% Evaporated		°F		143.8		144.3		144.1		146.4		147.0		146.7
20% Evaporated		°F	145.4	145.0	147.2	145.8	147.5	146.2	148.8	147.8	149	148.4	149.5	148.7
21% Evaporated		°F		146.4		147.1		146.7		148.8		149.5		149.1
22% Evaporated		°F		147.5		148.6		148.1		149.8		150.5		150.2
23% Evaporated		°F		148.8		149.6		149.2		150.9		151.5		151.2
24% Evaporated		°F		149.9		150.8		150.3		151.8		152.5		152.2
25% Evaporated		°F		150.9		151.8		151.3		152.9		153.4		153.2
26% Evaporated		°F		152.1		152.7		152.4		153.5		154.5		154.0
27% Evaporated		°F		152.8		153.7		153.3		154.4		155.1		154.7
28% Evaporated		°F		153.9		154.4		154.1		155.1		155.8		155.5
29% Evaporated		°F		154.6		155.3		155.0		155.8		156.5		156.1
30% Evaporated		°F	156.0	155.5	156.8	156.1	157.1	156.3	157.6	156.3	157.9	157.1	157.9	157.4
31% Evaporated		°F		156.2		156.7		156.4		156.9		157.8		157.4
32% Evaporated		°F		156.7		157.4		157.1		157.5		158.3		157.9
33% Evaporated		°F		157.5		158.0		157.7		158.1		158.8		158.5
34% Evaporated		°F		158.1		158.7		158.4		159.0		159.6		159.3
35% Evaporated		°F		157.9		159.2		158.6		159.4		160.0		159.7
36% Evaporated		°F		158.7		159.7		159.2		159.8		160.6		160.2
37% Evaporated		°F		159.4		160.2		159.8		160.4		161.1		160.8
38% Evaporated		°F		159.5		160.7		160.1		160.7		161.4		161.1
39% Evaporated		°F		159.1		161.4		160.2		161.2		161.7		161.4
40% Evaporated		°F	161.9	160.5	161.9	161.7	161.9	161.6	162.3	161.9	162.5	162.3	162.5	162.3

41% Evaporated		°F		161.1		162.4		161.7		162.3		162.8		162.5
42% Evaporated		°F		161.3		162.6		162.0		162.9		163.1		163.0
43% Evaporated		°F		161.7		163.5		162.6		163.1		163.8		163.5
44% Evaporated		°F		162.1		163.5		162.8		163.7		164.4		164.1
45% Evaporated		°F		162.3		164.3		163.3		164.9		165.4		165.2
46% Evaporated		°F		162.6		165.2		163.9		166.6		166.8		166.7
47% Evaporated		°F		163.2		166.8		165.0		168.9		168.8		168.8
48% Evaporated		°F		163.2		168.9		166.0		171.1		172.4		171.7
49% Evaporated		°F		165.7		173.0		169.4		176.1		177.8		177.0
50% Evaporated		°F	177.0	168.3	178.5	178.5	176.0	175.7	188.8	182.4	176.3	185.6	182.8	183.2
51% Evaporated		°F		174.2		186.6		180.4		188.3		195.5		191.9
52% Evaporated		°F		185.8		197.0		191.4		195.7		204.4		200.1
53% Evaporated		°F		195.1		205.2		200.1		204.3		212.4		208.4
54% Evaporated		°F		203.4		212.3		207.8		211.8		217.8		214.8
55% Evaporated		°F		209.7		217.4		213.5		217.1		222.0		219.6
56% Evaporated		°F		215.5		221.2		218.4		220.0		225.6		222.8
57% Evaporated		°F		220.0		224.3		222.1		222.3		227.6		225.0
58% Evaporated		°F		222.0		226.6		224.3		225.2		228.2		226.7
59% Evaporated		°F		224.1		228.4		226.3		227.2		230.4		228.8
60% Evaporated		°F	230.3	225.6	231.3	230.2	230.8	229.6	234.3	227.1	232.7	232.6	232.2	231.8
61% Evaporated		°F		226.9		231.3		229.1		223.9		234.2		229.0
62% Evaporated		°F		228.0		232.5		230.2		230.1		235.6		232.8
63% Evaporated		°F		230.0		234.3		232.1		233.1		236.5		234.8
64% Evaporated		°F		231.0		236.2		233.6		236.2		238.3		237.3
65% Evaporated		°F		232.1		237.9		235.0		231.6		239.8		235.7
66% Evaporated		°F		231.5		239.9		235.7		232.0		241.5		236.7
67% Evaporated		°F		232.3		241.6		237.0		236.1		243.2		239.6
68% Evaporated		°F		234.1		242.7		238.4		240.2		244.7		242.5
69% Evaporated		°F		238.4		242.8		240.6		243.2		246.2		244.7
70% Evaporated		°F	244.5	241.6	245.5	243.8	242.8	243.6	246.6	245.1	244.5	247.8	245.4	245.9
71% Evaporated		°F		241.6		246.4		244.0		245.4		249.7		247.5
72% Evaporated		°F		244.0		248.8		246.4		246.4		251.2		248.8
73% Evaporated		°F		246.5		251.0		248.8		248.6		253.0		250.8
74% Evaporated		°F		249.3		252.9		251.1		250.8		255.1		252.9
75% Evaporated		°F		251.9		254.8		253.3		253.1		257.1		255.1
76% Evaporated		°F		253.5		257.1		255.3		256.3		259.5		257.9
77% Evaporated		°F		255.8		259.3		257.6		259.4		262.2		260.8
78% Evaporated		°F		259.2		262.2		260.7		261.9		265.2		263.6
79% Evaporated		°F		261.8		265.5		263.7		264.6		268.2		266.4
80% Evaporated		°F	268.1	264.1	267.7	268.4	267.4	267.1	272.3	268.3	270.7	271.8	270.0	270.6
81% Evaporated		°F		267.9		272.0		269.9		273.2		275.7		274.4
82% Evaporated		°F		271.2		276.0		273.6		277.3		280.2		278.8
83% Evaporated		°F		276.7		280.7		278.7		281.8		285.7		283.7
84% Evaporated		°F		282.0		285.5		283.7		287.3		291.6		289.5
85% Evaporated		°F		284.3	292	291.2		289.2		293.5	294.4	297.8		295.2
86% Evaporated		°F		290.2		298.4		294.3		300.9		304.4		302.6
87% Evaporated		°F		299.7		305.6		302.7		307.1		311.6		309.4
88% Evaporated		°F		306.9		313.1		310.0		313.7		319.6		316.7
89% Evaporated		°F		314.8		321.1		318.0		321.1		325.9		323.5
90% Evaporated		°F	327.5	321.9	326.3	327.8	325.9	325.9	334.1	328.2	329.4	331.3	331.2	330.8
91% Evaporated		°F		326.7		332.6		329.7		333.9		335.3		334.6
92% Evaporated		°F		333.3		337.5		335.4		337.2		341.2		339.2
93% Evaporated		°F		339.6		343.8		341.7		341.0		347.3		344.1
94% Evaporated		°F		346.3		350.0		348.2		347.0		352.6		349.8
95% Evaporated		°F	355.3	352.7	355.5	356.7	256.8	335.4	361.0	354.7	357.2	359.2	358.0	
96% Evaporated		°F		360.7		364.6		362.6		362.3		367.1		364.7
97% Evaporated		°F		369.7		375.1		372.4		371.0		377.9		374.5
98% Evaporated		°F		384.1		390.1		387.1		386.3		393.3		389.8
99% Evaporated		°F												
Final Boiling Point		°F	398.9	388.9	398	401.3	396.6	396.7	403.5	392.8	397.3	400.8	399.5	398.8
Residue	vol %	1.1	1.1	0.8	1.1	1.1	1.0	1.3	1.1	0.6	1.2	1.1	1.1	
Loss	vol %	2.2	3.5	1.5	2.4	1.5	2.2	1.3	2.0	1.9	2.4	1.2	1.8	
Recovered	vol %	96.7	95.4	97.7	96.5	97.4	96.7	97.4	96.9	97.5	96.4	97.7	97.2	
Oxidation Stability	D525	Minutes	>240					>240	>240				>240	
Lead Content	D3237	g/L	<0.001					<0.001	<0.001				<0.001	
Copper Corrosion	D130		1A					1A	1A				1A	
Silver Corrosion	D7671		0					0.0	0				0.0	
Solvent Washed Gum	D381	mg/100 mL	<0.5	76				<0.5	<0.5				<0.5	
Unwashed Gum	D381	mg/100 mL	4.8					4.8	4.4				4.4	

Table E-1 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Project Fuel Inspections

Fuel Code			E-TF17-E10					
Laboratory			Supplier	Chevron	MPC	FHR	BP	Average
Property	ASTM Test Method	Units						
API Gravity@60°F	D1298/D287	API	66.7	61.7	66.8	66.3	66.0	65.5
Research Octane Number	D2699	RON	93.2	93.9	93.1	93.4	93.0	93.3
Motor Octane Number	D2700	MON	85.2	84.9	85	85.0	84.8	85.0
Antiknock Index, (R+M)/2	D2699/D2700	AKI	89.2	89.4	89	89.2	88.9	89.1
Ethanol Content	D5599	vol %	10.10	10.66	9.71	9.5	10.04	10.0
DVPE Vapor Pressure	D5191	psi	16.93	16.72	17.17	17.05	17.00	17.0
Temperature V/L=20 (TVL20)	D5188	°F	94.6	96.7	93.6	93	98.6	95.3
Sulfur Content	D2622/D7039	ppm	13.5	20.2	18.4	18	14	16.8
FIA (uncorrected)	D1319							
Saturates		vol %		66.0	81.5	74.4		74.0
Aromatics		vol %		27.8	15.7	20.7		21.4
Olefins		vol %		6.2	2.7	4.9		4.6
FIA (corrected for oxygenates)	D1319							
Saturates		vol %		59.0	73.6	67.4	56.7	64.2
Aromatics		vol %		24.8	14.2	18.8	20.2	19.5
Olefins		vol %		5.5	2.5	4.4	12.6	6.2
Benzene	D3606	vol %		1.38	1.07	3.00	0.99	1.6
D86 Distillation	D86							
Initial Boiling Point		°F	77.5	74.0	74.1	77.5	72.6	75.1
1% Evaporated		°F		74.0	80.4	77.5		77.3
2% Evaporated		°F		74.0	82.7	77.5		78.1
3% Evaporated		°F		74.0	84.5	81.7		80.1
4% Evaporated		°F		74.0	86	84.0		81.3
5% Evaporated		°F	83.1	79.9	87.6	85.8	84.9	84.3
6% Evaporated		°F		82.5	88.7	87.2		86.1
7% Evaporated		°F		84.5	89.7	88.3		87.5
8% Evaporated		°F		86.2	90.9	89.7		88.9
9% Evaporated		°F		87.6	91.8	90.8		90.1
10% Evaporated		°F	90.5	89.0	92.7	91.8	92.3	91.3
11% Evaporated		°F		90.3	93.7	92.8		92.3
12% Evaporated		°F		91.4	94.7	94.0		93.4
13% Evaporated		°F		92.6	95.6	95.0		94.4
14% Evaporated		°F		93.5	96.6	96.1		95.4
15% Evaporated		°F		94.5	97.5	97.1		96.4
16% Evaporated		°F		95.6	98.6	97.9		97.4
17% Evaporated		°F		96.7	99.5	99.0		98.4
18% Evaporated		°F		97.6	100.5	99.9		99.3
19% Evaporated		°F		98.7	101.6	100.9		100.4
20% Evaporated		°F	100.2	99.9	102.6	101.9	103.3	101.6
21% Evaporated		°F		100.7	103.5	103.1		102.4
22% Evaporated		°F		101.7	104.7	104.0		103.5
23% Evaporated		°F		102.7	105.7	105.0		104.5
24% Evaporated		°F		104.0	106.9	106.1		105.7
25% Evaporated		°F		105.1	108.2	107.1		106.8
26% Evaporated		°F		106.3	109.3	108.4		108.0
27% Evaporated		°F		107.5	110.7	109.5		109.2
28% Evaporated		°F		108.4	111.9	110.3		110.2
29% Evaporated		°F		109.5	112.7	111.5		111.2
30% Evaporated		°F	111.6	110.6	113.7	112.7	114.8	112.7
31% Evaporated		°F		111.6	114.8	113.8		113.4
32% Evaporated		°F		113.0	115.7	114.9		114.5
33% Evaporated		°F		114.3	117.1	116.2		115.9
34% Evaporated		°F		115.4	117.8	117.4		116.9
35% Evaporated		°F		116.9	119.3	118.8		118.3
36% Evaporated		°F		117.9	121	119.7		119.5
37% Evaporated		°F		118.8	122.3	121.0		120.7
38% Evaporated		°F		120.8	123.6	122.2		122.2
39% Evaporated		°F		121.9	124.7	123.3		123.3
40% Evaporated		°F	123.6	122.5	125.3	124.9	126.9	124.6

41% Evaporated		°F		124.2	127.1	126.1		125.8
42% Evaporated		°F		125.7	128.8	127.9		127.5
43% Evaporated		°F		127.6	130.8	129.1		129.2
44% Evaporated		°F		129.0	131.8	130.1		130.3
45% Evaporated		°F		130.3	133.1	131.6		131.7
46% Evaporated		°F		131.7	134.5	132.9		133.0
47% Evaporated		°F		133.3	136	134.2		134.5
48% Evaporated		°F		134.8	136.8	135.3		135.6
49% Evaporated		°F		136.5	138.3	136.8		137.2
50% Evaporated		°F	137.1	137.5	139.5	138.0	139.2	138.3
51% Evaporated		°F		138.8	141.7	139.4		140.0
52% Evaporated		°F		140.3	143.2	140.6		141.4
53% Evaporated		°F		141.6	144	141.5		142.4
54% Evaporated		°F		143.1	145.4	143.2		143.9
55% Evaporated		°F		144.7	146.8	144.1		145.2
56% Evaporated		°F		145.9	148.1	145.8		146.6
57% Evaporated		°F		147.2	150.1	147.7		148.3
58% Evaporated		°F		148.8	151.7	149.0		149.8
59% Evaporated		°F		150.2	152.6	150.2		151.0
60% Evaporated		°F	150.4	151.2	153.2	151.4	152.9	151.8
61% Evaporated		°F		152.3	154.5	152.8		153.2
62% Evaporated		°F		153.5	155.5	153.8		154.3
63% Evaporated		°F		154.3	157	154.9		155.4
64% Evaporated		°F		155.4	158.6	156.0		156.7
65% Evaporated		°F		155.9	157.5	157.6		157.0
66% Evaporated		°F		157.4	159.1	157.5		158.0
67% Evaporated		°F		157.4	167.2	159.3		161.3
68% Evaporated		°F		157.6	184.6	165.0		169.1
69% Evaporated		°F		161.2	201.4	175.2		179.3
70% Evaporated		°F	174.2	172.2	212.2	187.4	187.5	186.7
71% Evaporated		°F		190.6	218.1	199.0		202.6
72% Evaporated		°F		202.5	223.1	208.1		211.2
73% Evaporated		°F		212.0	228.6	215.9		218.8
74% Evaporated		°F		218.2	233	222.7		224.6
75% Evaporated		°F		222.4	238	228.9		229.8
76% Evaporated		°F		227.9	244	233.6		235.2
77% Evaporated		°F		231.0	249.5	238.5		239.7
78% Evaporated		°F		237.2	253.9	243.7		244.9
79% Evaporated		°F		243.0	258.9	248.8		250.2
80% Evaporated		°F	252.9	249.2	263.9	253.6	254.8	254.9
81% Evaporated		°F		254.4	268.9	258.7		260.7
82% Evaporated		°F		255.0	271.2	263.6		263.3
83% Evaporated		°F		262.1	277.7	268.8		269.5
84% Evaporated		°F		268.6	283.7	273.4		275.2
85% Evaporated		°F		272.4	288.5	278.6		279.8
86% Evaporated		°F		278.2	295.5	283.9		285.9
87% Evaporated		°F		285.5	302.6	289.3		292.5
88% Evaporated		°F		288.6	308.9	294.7		297.4
89% Evaporated		°F		296.1	315.3	300.5		304.0
90% Evaporated		°F	305.8	301.5	319.5	306.8	307.6	308.2
91% Evaporated		°F		302.9	327.9	310.5		313.8
92% Evaporated		°F		307.1	334.8	318.3		320.1
93% Evaporated		°F		315.1	344.8	325.8		328.6
94% Evaporated		°F		323.4	357.5	334.6		338.5
95% Evaporated		°F	343.6	329.6	371.9	342.8	342.8	346.1
96% Evaporated		°F		336.8	388.7	353.1		359.5
97% Evaporated		°F		348.1		365.7		356.9
98% Evaporated		°F		358.9		384.3		371.6
99% Evaporated		°F		377.2				
Final Boiling Point		°F	394.2	386.3	388.8	394.3	391.3	391.0
Residue		vol %	3.0	1.1	0.8	1.1	1.1	1.4
Loss		vol %	1.1	4.3	2.3	2.8	2.7	2.6
Recovered		vol %	95.9	94.6	96.9	96.1	96.2	95.9
Oxidation Stability	D525	Minutes	>240				>240	
Lead Content	D3237	g/L	<0.001				<0.001	
Copper Corrosion	D130		1A					1A
Silver Corrosion	D7671		0					0.0
Solvent Washed Gum	D381	mg/100 mL	0.5	78				0.5
Unwashed Gum	D381	mg/100 mL	4.6					4.6

Table E-2
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

Compositional Breakdown of Liquid by Class

NOTE: Asterisks mean no compounds of that Class & C# are in the dictionary, e.g., C5 aromatics.

NOTE: A "0" entry means no peaks of Class & C# found; a "0.000" entry means < 10 PPM found.

E-TF1-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.156	****	0.058	****	****	10.972	****	11.187
C4	10.147	1.543	0.203	****	****	0	****	11.893
C5	7.749	10.869	2.118	0.485	****	0	****	21.221
C6	3.926	7.152	1.652	2.385	1.182	0	****	16.295
C7	1.159	4.699	0.774	1.346	5.482	0	****	13.459
C8	0.383	3.341	0.387	0.810	6.502	0	0.024	11.447
C9	0.140	1.278	0.005	0.304	5.724	0	0.162	7.612
C10	0.069	0.621	0	0.061	3.499	0	0.274	4.524
C11	0.081	0.130	0	0	1.079	0	0.280	1.571
C12+	0.024	0.055	0	0	0.092	0	0.620	0.790
Total	23.835	29.689	5.196	5.389	23.560	10.972	1.360	100.000

E-TF2-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.195	****	0.074	****	****	10.663	****	10.933
C4	8.345	1.692	0.216	****	****	0	****	10.252
C5	8.031	10.167	2.192	0.501	****	0	****	20.891
C6	4.062	7.393	1.692	2.475	1.152	0	****	16.773
C7	1.203	4.876	0.828	1.397	5.711	0	****	14.016
C8	0.402	3.461	0.400	0.843	6.770	0	0.024	11.900
C9	0.145	1.363	0.005	0.306	5.840	0	0.186	7.846
C10	0.071	0.643	0	0.066	3.646	0	0.299	4.725
C11	0.084	0.160	0	0	1.150	0	0.299	1.694
C12+	0.029	0.064	0	0	0.104	0	0.774	0.970
Total	22.567	29.818	5.407	5.588	24.373	10.663	1.583	100.000

E-TF3-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.046	****	0.003	****	****	10.932	****	10.982
C4	11.290	0.912	0.407	****	****	0	****	12.610
C5	6.552	12.446	2.342	0.418	****	0	****	21.758
C6	3.473	6.929	1.844	2.594	0.872	0	****	15.714
C7	1.287	4.680	0.843	1.919	3.521	0	****	12.249
C8	0.565	4.683	0.446	1.075	4.566	0	0.025	11.359
C9	0.239	1.931	0.007	0.383	4.359	0	0.229	7.147
C10	0.116	0.894	0	0.093	3.065	0	0.390	4.559
C11	0.107	0.226	0	0	1.377	0	0.367	2.077
C12+	0.074	0.070	0	0	0.202	0	1.200	1.545
Total	23.749	32.771	5.893	6.483	17.961	10.932	2.210	100.000

Table E-2 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

E-TF4-E15

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.054	****	0.003	****	****	15.872	****	15.929
C4	11.836	0.960	0.418	****	****	0	****	13.214
C5	6.317	9.567	2.292	0.402	****	0	****	18.578
C6	3.323	6.643	1.762	2.487	0.833	0	****	15.048
C7	1.229	4.462	0.803	1.833	3.387	0	****	11.714
C8	0.528	4.469	0.423	1.026	4.357	0	0.024	10.826
C9	0.230	1.845	0.006	0.360	4.172	0	0.217	6.831
C10	0.111	0.860	0	0.090	2.943	0	0.373	4.377
C11	0.101	0.217	0	0	1.327	0	0.353	1.998
C12+	0.071	0.068	0	0	0.195	0	1.151	1.485
Total	23.800	29.091	5.706	6.199	17.214	15.872	2.118	100.000

E-TF5-E15

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.032	****	0.003	****	****	16.349	****	16.384
C4	10.272	0.709	0.323	****	****	0	****	11.304
C5	6.678	12.737	1.958	1.712	****	0	****	23.085
C6	3.341	7.270	1.528	2.531	0.928	0	****	15.598
C7	1.262	4.250	0.713	1.906	3.039	0	****	11.170
C8	0.525	4.036	0.375	0.972	3.830	0	0.021	9.759
C9	0.220	1.630	0.005	0.405	3.614	0	0.266	6.140
C10	0.102	0.617	0	0.073	2.527	0	0.320	3.640
C11	0.089	0.180	0	0	1.139	0	0.305	1.713
C12+	0.059	0.043	0	0	0.160	0	0.945	1.207
Total	22.581	31.472	4.905	7.599	15.237	16.349	1.857	100.000

D-TF6-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.048	****	0.002	****	****	10.575	****	10.625
C4	9.075	0.863	0.380	****	****	0	****	10.318
C5	7.120	10.565	2.102	3.225	****	0	****	23.012
C6	3.535	8.295	1.578	2.673	0.977	0	****	17.059
C7	1.332	4.514	0.746	2.009	5.860	0	****	14.461
C8	0.556	4.298	0.389	1.038	4.097	0	0.022	10.399
C9	0.233	1.765	0.006	0.342	4.355	0	0.213	6.915
C10	0.111	0.797	0	0.078	2.756	0	0.350	4.092
C11	0.095	0.193	0	0	1.211	0	0.323	1.821
C12+	0.062	0.075	0	0	0.145	0	1.014	1.298
Total	22.168	31.365	5.204	9.365	19.400	10.575	1.922	100.000

Table E-2 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

D-TF7-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygen-ates	Not Classified	Total Per Carbon
C3-	0.098	****	0.036	****	****	10.746	****	10.880
C4	5.864	1.078	0.145	****	****	0	****	7.086
C5	8.257	10.957	1.565	2.587	****	0	****	23.367
C6	3.834	8.081	1.190	2.527	1.233	0	****	16.865
C7	1.256	4.237	0.571	1.620	10.248	0	****	17.932
C8	0.417	2.769	0.295	0.789	4.952	0	0.016	9.237
C9	0.147	1.067	0.013	0.215	4.414	0	0.160	6.015
C10	0.078	0.528	0	0.046	2.914	0	3.197	6.763
C11	0.064	0.101	0	0	0.823	0	0.212	1.201
C12+	0.019	0.043	0	0	0.069	0	0.522	0.653
Total	20.035	28.861	3.815	7.784	24.651	10.746	4.107	100.000

D-TF8-E15

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygen-ates	Not Classified	Total Per Carbon
C3-	0.116	****	0.042	****	****	16.144	****	16.302
C4	7.123	1.277	0.173	****	****	0	****	8.573
C5	7.942	10.088	1.886	2.533	****	0	****	22.450
C6	3.839	7.979	1.450	2.408	1.142	0	****	16.819
C7	1.174	4.433	0.681	1.432	4.913	0	****	12.633
C8	0.388	3.036	0.331	0.775	5.761	0	0.020	10.311
C9	0.139	1.141	0.004	0.261	5.049	0	0.160	6.754
C10	0.065	0.538	0	0.056	3.087	0	0.251	3.997
C11	0.072	0.134	0	0	0.959	0	0.244	1.408
C12+	0.022	0.040	0	0	0.082	0	0.610	0.754
Total	20.881	28.666	4.568	7.465	20.992	16.144	1.285	100.000

C-TF9-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygen-ates	Not Classified	Total Per Carbon
C3-	0.040	****	0.003	****	****	10.256	****	10.300
C4	7.913	0.768	0.340	****	****	0	****	9.021
C5	4.367	7.158	1.929	0.660	****	0	****	14.115
C6	3.096	6.220	1.507	2.088	0.540	0	****	13.451
C7	0.907	5.033	0.711	1.339	9.670	0	****	17.660
C8	0.407	12.347	0.332	0.846	3.827	0	0.020	17.779
C9	0.186	2.054	0.008	0.448	6.515	0	0.273	9.483
C10	0.133	0.947	0	0.106	2.937	0	0.394	4.517
C11	0.104	0.460	0	0	1.250	0	0.513	2.327
C12+	0.063	0.054	0	0	0.172	0	1.057	1.345
Total	17.217	35.041	4.830	5.488	84.910	10.256	2.257	100.000

Table E-2 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

C-TF10-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.049	****	0.012	****	****	10.682	****	10.744
C4	6.739	0.680	0.220	****	****	0	****	7.639
C5	3.930	6.454	1.430	2.246	****	0	****	14.060
C6	4.629	7.462	1.156	2.764	0.513	0	****	16.524
C7	0.736	6.348	0.519	1.099	11.260	0	****	19.962
C8	0.296	11.774	0.244	0.620	3.150	0	0.016	16.101
C9	0.129	1.628	0.006	0.334	6.570	0	0.211	8.878
C10	0.098	0.724	0	0.085	2.261	0	0.279	3.447
C11	0.077	0.389	0	0	0.894	0	0.384	1.743
C12+	0.040	0.038	0	0	0.111	0	0.712	0.902
Total	16.724	35.497	3.588	7.148	24.760	10.682	1.602	100.000

B-TF11-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.002	****	0	****	****	11.043	****	11.044
C4	7.834	0.050	0.074	****	****	0	****	7.958
C5	4.925	6.986	1.394	0.340	****	0	****	13.645
C6	2.604	5.744	1.113	1.893	0.710	0	****	12.064
C7	1.044	4.661	0.513	1.203	14.662	0	****	22.083
C8	0.434	14.514	0.273	0.709	3.857	0	0.031	19.818
C9	0.181	2.013	0.007	0.389	3.778	0	0.216	6.583
C10	0.100	0.611	0	0.107	2.360	0	0.307	3.485
C11	0.093	0.761	0	0	0.947	0	0.554	2.355
C12+	0.042	0.043	0	0	0.114	0	0.765	0.963
Total	17.258	35.382	3.375	4.641	26.429	11.043	1.873	100.000

B-TF12-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.019	****	0.002	****	****	10.474	****	10.494
C4	5.135	0.412	0.188	****	****	0	****	5.734
C5	2.723	5.017	1.140	3.630	****	0	****	12.509
C6	5.616	8.931	0.938	2.926	0.352	0	****	18.762
C7	0.589	7.273	0.404	0.960	11.941	0	****	21.167
C8	0.248	13.645	0.191	0.517	2.240	0	0.023	16.862
C9	0.114	1.631	0.006	0.297	6.714	0	0.178	8.938
C10	0.095	0.774	0	0.089	1.836	0	0.254	3.048
C11	0.070	0.429	0	0	0.774	0	0.430	1.703
C12+	0.037	0.034	0	0	0.100	0	0.611	0.782
Total	14.644	38.144	2.868	8.418	32.957	10.474	1.495	100.000

Table E-2 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

A-TF13-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.003	****	0	****	****	11.179	****	11.181
C4	3.435	0.056	0.123	****	****	0	****	3.614
C5	6.219	7.472	2.261	0.458	****	0	****	16.411
C6	3.525	6.668	1.826	2.498	0.851	0	****	15.366
C7	1.394	5.292	0.881	1.484	11.386	0	****	20.436
C8	0.595	6.869	0.425	1.015	6.061	0	0.027	14.992
C9	0.257	2.084	0.007	0.497	6.008	0	0.263	9.115
C10	0.133	0.864	0	0.096	3.698	0	0.394	5.184
C11	0.122	0.262	0	0	1.378	0	0.470	2.232
C12+	0.067	0.082	0	0	0.161	0	1.160	1.469
Total	15.748	29.648	5.523	6.048	29.542	11.179	2.313	100.000

AA-TF14-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.002	****	0	****	****	11.508	****	11.509
C4	0.457	0.048	0.108	****	****	0	****	0.612
C5	5.840	11.436	1.791	0.440	****	0	****	19.506
C6	3.430	6.455	1.803	2.448	0.834	0	****	14.970
C7	1.371	5.126	0.788	1.458	12.073	0	****	20.815
C8	0.587	6.705	0.405	1.001	6.001	0	0.027	14.726
C9	0.254	2.128	0.007	0.493	5.934	0	0.260	9.076
C10	0.129	0.850	0	0.053	3.654	0	0.429	5.114
C11	0.119	0.267	0	0	1.373	0	0.468	2.228
C12+	0.066	0.054	0	0	0.173	0	1.149	1.442
Total	12.254	33.070	4.901	5.892	30.042	11.508	2.333	100.000

A-TF15-E15

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygenates	Not Classified	Total Per Carbon
C3-	0.001	****	0	****	****	15.307	****	15.308
C4	6.878	0.069	0.049	****	****	0	****	6.997
C5	2.747	4.319	0.981	0.200	****	0	****	8.247
C6	1.585	4.356	0.793	1.113	0.397	0	****	8.244
C7	0.630	3.731	0.406	0.667	13.697	0	****	19.131
C8	0.272	19.842	0.164	0.468	2.792	0	0.021	23.560
C9	0.120	2.592	0.007	0.352	6.719	0	0.246	10.036
C10	0.099	0.886	0	0.105	3.222	0	0.278	4.590
C11	0.093	0.751	0	0	1.125	0	0.868	2.836
C12+	0.032	0.077	0	0	0.099	0	0.842	1.050
Total	12.459	36.623	2.400	2.907	28.051	15.307	2.254	100.000

Table E-2 Cont'd.
CRC 2014 Hot Fuel Handling Driveability Program Detailed Hydrocarbon Analyses

AA-TF16-E15

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygen-ates	Not Classified	Total Per Carbon
C3-	0.001	****	0	****	****	16.348	****	16.349
C4	5.749	0.116	0.047	****	****	0	****	5.912
C5	2.630	4.498	0.931	0.195	****	0	****	8.254
C6	1.472	4.401	0.733	1.029	0.369	0	****	8.005
C7	0.577	3.775	0.350	0.611	11.520	0	****	16.832
C8	0.246	22.078	0.164	0.415	2.508	0	0.019	25.431
C9	0.109	2.721	0.007	0.180	7.185	0	0.247	10.448
C10	0.093	0.775	0	0.108	3.255	0	0.266	4.497
C11	0.093	1.159	0	0	1.115	0	0.950	3.317
C12+	0.026	0.075	0	0	0.084	0	0.769	0.955
Total	10.997	39.598	2.233	2.538	26.036	16.348	2.251	100.000

E-SF17-E10

1. By Volume% and Carbon Number:								
C#	N-Para	I-Para	Olefin	Naphth	Aromat	Oxygen-ates	Not Classified	Total Per Carbon
C3-	0.155	****	0.058	****	****	10.832	****	11.045
C4	10.830	1.362	0.171	****	****	0	****	12.362
C5	7.476	18.550	1.707	0.459	****	0.027	****	28.219
C6	3.577	6.616	1.334	2.262	1.080	0	****	14.869
C7	1.110	4.118	0.622	1.368	4.814	0	****	12.032
C8	0.372	2.858	0.326	0.728	5.293	0	0.019	9.596
C9	0.133	1.090	0.004	0.251	4.684	0	0.130	6.292
C10	0.063	0.519	0	0.051	2.826	0	0.219	3.678
C11	0.068	0.121	0	0	0.859	0	0.217	1.265
C12+	0.020	0.044	0	0	0.068	0	0.511	0.642
Total	23.803	35.278	4.223	5.119	19.623	10.859	1.095	100.000

Table E-3
Weathering Data
Spring

Vehicle	Fuel ID	Fuel Class/ Tested Class	DVPE (PSI) Change	Initial DVPE (PSI)	Ambient Temp for Vehicle at End of Test (F)	TVL20 (F) Increase	TVL20 (F) Initial	Ambient Temp for Vehicle at End of Test (F)
2	D-TF1-E10	E/E	-0.66	15.91	71	3.13	98.17	71
2	E-TF3-E10	E/E	-0.70	15.85	68	2.97	98.13	68
2	E-TF4-E15	E/E	-3.98	15.80	78	18.2	98.80	78
2	E-TF5-E15	E/E	-1.28	15.74	76	5.4	98.20	76
2	E-TF2-E10	E/E	-0.83	15.00	67	4	102.3	67
2	D-TF6-E10	D/D	-1.74	14.54	80	8.3	103.8	80
2	D-TF8-E15	D/D	-2.32	14.36	93	9.87	105.03	93
2	D-TF7-E10	D/E	-0.68	13.41	71	3.67	108.9	71
2	D-TF7-E10	D/D	-1.17	13.41	80	5.37	108.9	80
2	D-TF7-E10	D/E	-0.67	13.41	74	2.77	108.9	74
2	E-TF7-E10	D/D	-1.69	13.41	80	6.37	108.9	80
2	C-TF10-E10	C/C	-1.00	11.43	85	4.87	119.83	85
6	D-TF7-E10	D/E	-0.11	13.41	74	0.87	108.9	74
6	D-TF7-E10	D/D	-0.38	13.41	80	1.37	108.9	80
6	D-TF6-E10	D/D	-0.59	14.54	78	1.7	103.8	78
6	D-TF7-E10	D/E	-0.20	13.41	74	1.27	108.9	74
6	D-TF7-E10	D/E	-0.25	13.41	76	0.87	108.9	76
6	E-TF1-E10	E/E	-0.40	15.91	69	2.03	98.17	69
6	E-TF2-E10	E/E	-0.36	15.00	66	2.1	102.3	66
6	E-TF3-E10	E/E	-0.25	15.85	76	0.67	98.13	76
6	D-TF8-E15	D/D	-0.29	14.36	80	0.57	105.03	80
6	D-TF8-E15	D/D	-1.33	14.36	90	6.87	105.03	90
6	E-TF4-E15	E/E	-0.63	15.80	82	3.1	98.80	82
6	C-TF10-E10	C/C	-0.10	11.43	90	0.57	119.83	90
6	E-TF5-E15	E/E	-0.66	15.74	75	2.3	98.20	75
9	D-TF7-E10	D/E	-1.03	13.41	72	4.37	108.9	72
9	D-TF7-E10	D/D	-2.38	13.41	80	10.77	108.9	80
9	D-TF6-E10	D/D	-2.29	14.54	84	9.5	103.8	84
9	D-TF1-E10	E/E	-0.97	15.91	71	4.43	98.17	71
9	E-TF7-E10	D/E	-0.67	13.41	67	2.77	108.9	67
9	E-TF1-E10	E/E	-1.29	15.91	77	5.23	98.17	77
9	E-TF2-E10	E/E	-1.81	15.00	76	7.5	102.3	76
9	E-TF3-E10	E/E	-1.34	15.85	74	5.77	98.13	74
9	C-TF10-E10	C/C	-1.94	11.43	92	9.07	119.83	92
9	C-TF10-E10	C/C	-1.02	11.43	86	4.17	119.83	86

Vehicle	Fuel ID	Fuel Class/ Tested Class	DVPE (PSI) Change	Initial DVPE (PSI)	Ambient Temp for Vehicle at End of Test (F)	TVL20 (F) Increase	TVL20 (F) Initial	Ambient Temp for Vehicle at End of Test (F)
19	D-TF1-E10	D/E	-0.25	13.41	71	1.37	108.9	71
19	D-TF7-E10	D/D	-0.54	13.41	82	2.37	108.9	82
19	D-TF7-E10	D/E	-0.27	13.41	75	1.77	108.9	75
19	D-TF6-E10	D/D	-0.45	14.54	79	2	103.8	79
19	E-TF1-E10	E/E	-0.29	15.91	67	0.83	98.17	67
19	E-TF2-E10	E/E	-0.31	15.00	79	1.7	102.3	79
19	E-TF2-E10	E/E	-0.39	15.00	77	1.5	102.3	77
19	E-TF2-E10	E/E	-0.36	15.00	69	1.6	102.3	69
19	D-TF8-E15	D/D	-0.71	14.36	76	3.07	105.03	76
19	E-TF3-E10	E/E	-0.49	15.85	83	1.87	98.13	83
19	E-TF4-E15	E/E	-0.42	15.80	77	1.9	98.80	77
19	E-TF4-E15	E/E	-0.42	15.80	76	1.5	98.80	76
19	C-TF10-E10	C/C	-0.28	11.43	88	1.97	119.83	88
19	E-TF5-E15	E/E	-0.38	15.74	77	1	98.20	77
26	D-TF7-E10	D/E	-0.47	13.41	79	2.87	108.9	79
26	D-TF7-E10	D/D	-0.56	13.41	82	2.97	108.9	82
26	D-TF7-E10	D/E	-0.41	13.41	72	2.27	108.9	72
26	D-TF6-E10	D/D	-0.72	14.54	80	1.6	103.8	80
26	E-TF1-E10	E/E	-0.52	15.91	71	2.43	98.17	71
26	E-TF2-E10	E/E	-0.70	15.00	76	3.4	102.3	76
26	D-TF7-E10	D/D	-0.77	13.41	81	3.17	108.9	81
26	D-TF8-E15	D/D	-0.35	14.36	79	1.57	105.03	79
26	E-TF3-E10	E/E	-0.98	15.85	76	4.07	98.13	76
26	E-TF3-E10	E/E	-0.79	15.85	87	3.17	98.13	87
26	E-TF4-E15	E/E	-2.09	15.80	79	8.7	98.80	79
26	C-TF10-E10	C/C	-0.43	11.43	92	2.47	119.83	92
26	E-TF5-E15	E/E	-0.63	15.74	74	2.2	98.20	74
39	D-TF7-E10	D/E	-0.64	13.41	79	3.77	108.9	79
39	D-TF7-E10	D/E	-0.64	13.41	74	3.17	108.9	74
39	D-TF6-E10	D/D	-1.36	14.54	80	6.4	103.8	80
39	D-TF6-E10	D/D	-1.38	14.54	86	5.3	103.8	86
39	E-TF1-E10	E/E	-0.69	15.91	71	2.93	98.17	71
39	E-TF2-E10	E/E	-0.96	15.00	84	5.5	102.3	84
39	D-TF7-E10	D/D	-0.83	13.41	84	3.77	108.9	84
39	D-TF8-E15	D/D	-0.89	14.36	75	3.97	105.03	75
39	E-TF4-E15	E/E	-2.79	15.80	85	12.4	98.80	85
39	C-TF10-E10	C/C	-0.61	11.43	84	3.67	119.83	84
39	E-TF5-E15	E/E	-1.31	15.74	81	5.7	98.80	81
39	E-TF5-E15	E/E	-0.55	15.74	80	2.7	98.20	80

Table E-3 Cont'd.
Weathering Data
Summer

Vehicle	Fuel ID	Fuel Class/ Tested Class	DVPE (PSI)	DVPE (PSI)	Ambient Temp for Vehicle at End of Test (F)	TVL20 (F)	TVL20 (F)	Ambient Temp for Vehicle at End of Test (F)
2	C-TF10-E10	C/C	-2.43	11.31	99	12.8	119.7	99
2	B-TF11-E10	B/B	-2.61	11.21	107	14.1	119.9	107
2	C-TF10-E10	C/C	-1.37	11.31	93	6.2	119.7	93
2	C-TF9-E10	C/C	-2.51	12.41	95	11.2	114.5	95
2	A-TF13-E10	A/A	-0.94	9.14	104	5.1	129.7	104
2	AA-TF16-E15	AA/AA	-1.66	9.14	116	10.3	131.2	116
2	AA-TF16-E15	AA/AA	-1.49	9.14	110	8.6	131.2	110
2	A-TF15-E15	A/A	-1.85	9.96	99	8.9	128.0	99
2	B-TF12-E10	B/C	-1.00	9.83	94	4.5	126.0	94
2	B-TF12-E10	B/B	-1.12	9.83	102	6.5	126.0	102
2	AA-TF14-E10	AA/AA	-0.30	8.14	100	2.5	133.2	100
6	C-TF10-E10	C/C	-1.68	11.31	98	5.2	119.7	98
6	B-TF11-E10	B/B	-1.29	11.21	107	6.7	119.9	107
6	A-TF13-E10	A/A	-0.31	9.14	108	1.7	129.7	108
6	C-TF9-E10	C/C	-1.08	12.41	105	5.4	114.5	105
6	AA-TF16-E15	AA/AA	-0.49	9.14	115	3.7	131.2	115
6	A-TF15-E15	A/A	-0.81	9.96	110	4.6	128.0	110
6	A-TF15-E15	A/A	-1.04	9.96	113	5.5	128.0	113
6	B-TF12-E10	B/C	-0.18	9.83	97	0.6	126.0	97
6	B-TF12-E10	B/B	-0.41	9.83	107	2.7	126.0	107
6	AA-TF14-E10	AA/AA	-0.07	8.14	106	0.9	133.2	106
9	C-TF10-E10	C/C	-3.45	11.31	100	17.7	119.7	100
9	B-TF11-E10	B/B	-3.19	11.21	104	17.2	119.9	104
9	A-TF13-E10	A/A	-2.13	9.14	106	11.3	129.7	106
9	C-TF9-E10	C/C	-3.17	12.41	98	14.7	114.5	98
9	B-TF12-E10	B/C	-1.83	9.83	100	10.8	126.0	100
9	B-TF12-E10	B/B	-1.31	9.83	102	7.7	126.0	102
9	B-TF12-E10	B/B	-1.72	9.83	104	9.5	126.0	104
9	AA-TF14-E10	AA/AA	-0.71	8.14	103	5.7	133.2	103

Vehicle	Fuel ID	Fuel Class/ Tested Class	DVPE (PSI)	DVPE (PSI)	Ambient Temp for Vehicle at End of Test (F)	TVL20 (F)	TVL20 (F)	Ambient Temp for Vehicle at End of Test (F)
19	B-TF11-E10	B/B	-0.92	11.21	100	3.7	119.9	100
19	C-TF10-E10	C/C	-0.57	11.31	98	10.4	119.7	98
19	B-TF11-E10	B/B	-0.59	11.21	102	3.3	119.9	102
19	C-TF9-E10	C/C	-0.97	12.41	100	4.3	114.5	100
19	A-TF13-E10	A/A	-0.29	9.14	109	1.7	129.7	109
19	AA-TF16-E15	AA/AA	-0.47	9.14	115	3.5	131.2	115
19	AA-TF16-E15	AA/AA	-0.30	9.14	99	2.8	131.2	99
19	A-TF15-E15	A/A	-0.49	9.96	107	2.7	128.0	107
19	B-TF12-E10	B/C	-0.22	9.83	97	1.8	126.0	97
19	B-TF12-E10	B/C	-0.23	9.83	100	1.8	126.0	100
19	B-TF12-E10	B/B	-0.36	9.83	108	1.7	126.0	108
19	AA-TF14-E10	AA/AA	-0.14	8.14	106	1.5	133.2	106
26	C-TF10-E10	C/C	-1.02	11.31	100	5.7	119.7	100
26	B-TF11-E10	B/B	-0.84	11.21	102	4.2	119.9	102
26	A-TF13-E10	A/A	-0.64	9.14	106	3.7	129.7	106
26	C-TF9-E10	C/C	-1.47	12.41	106	7.3	114.5	106
26	A-TF13-E10	A/A	-0.71	9.14	110	3.9	129.7	110
26	C-TF9-E10	C/C	-1.20	12.41	99	6.3	114.5	99
26	AA-TF16-E15	AA/AA	-0.41	9.14	103	2.7	131.2	103
26	A-TF15-E15	A/A	-1.01	9.96	109	4.9	128.0	109
26	A-TF15-E15	A/A	-1.07	9.96	109	5.6	128.0	109
26	B-TF12-E10	B/C	-0.41	9.83	98	3	126.0	98
26	B-TF12-E10	B/B	-0.60	9.83	106	3.8	126.0	106
26	B-TF12-E10	B/B	-0.55	9.83	106	3.5	126.0	106
26	AA-TF14-E10	AA/AA	-0.12	8.14	106	1.4	133.2	106
26	AA-TF14-E10	AA/AA	-0.38	8.14	110	1.6	133.2	110
39	C-TF10-E10	C/C	-1.68	11.31	100	6.7	119.7	100
39	B-TF11-E10	B/B	-1.97	11.21	109	10.5	119.9	109
39	A-TF13-E10	A/A	-0.76	9.14	106	4	129.7	106
39	A-TF13-E10	A/A	-1.02	9.14	109	5.8	129.7	109
39	C-TF9-E10	C/C	-2.02	12.41	105	9.9	114.5	105
39	AA-TF16-E15	AA/AA	-0.81	9.14	103	5.9	131.2	103
39	A-TF15-E15	A/A	-1.75	9.96	113	8.3	128.0	113
39	B-TF12-E10	B/C	-0.29	9.83	94	2.3	126.0	94
39	B-TF12-E10	B/B	-0.80	9.83	107	4.8	126.0	107
39	B-TF12-E10	B/B	-0.91	9.83	104	5	126.0	104
39	AA-TF14-E10	AA/AA	-0.45	8.14	107	2.2	133.2	107
39	AA-TF14-E10	AA/AA	-0.28	8.14	102	2.5	133.2	102

APPENDIX F

VEHICLE TOTAL WEIGHTED DEMERIT SUMMARY

Table F-1
Test Data -- 65 to 80 °F

Vehicle	Fuel	Rater	Date	REDUCED DATA									
				TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class E -- 65 to 80	2	1B	27-Mar-14	15	76	12.1	135.4	145.6	141.1	99.9	136.1	162.4	76
	2	1C	1-Apr-14	14	76	12.2	137.9	151.0	152.4	102.8	153.6	158.2	76
	2	1A	26-Mar-14	8	71	2.8	127.2	139.4	135.8	97.0	134.2	148.5	71
	4	1C	27-Mar-14	6	73	12.1	110.4	148.2	130.4	133.2	108.6	153.4	73
	4	1A	1-Apr-14	24	78	10.7	122.2	153.6	130.4	140.2	99.5	147.1	78
	4	1B	26-Mar-14	18	74	2.8	106.2	143.5	129.3	131.1	107.5	147.6	74
	5	1A	27-Mar-14	7	74	12.1	113.1	123.5	143.9	140.4	150.6	151.4	74
	5	1C	3-Apr-14	12	70	6.0	129.4	121.0	158.6	141.0	147.2	148.0	70
	5	1B	3-Apr-14	7	79	2.7	145.8	136.3	153.2	152.9	155.5	164.0	77
	5	1C	26-Mar-14	11	71	2.8	109.0	126.2	132.4	138.6	119.2	139.2	71
	6	1B	27-Mar-14	7	78	9.0	98.2	141.2	168.0	162.5	112.1	163.9	78
	6	1C	1-Apr-14	9	76	10.1	97.8	134.6	157.0	156.8	108.2	146.4	76
	6	1A	27-Mar-14	12	69	8.7	99.2	124.5	133.7	143.8	115.1	139.9	69
	7	1C	27-Mar-14	9	77	14.8	127.6	146.6	139.4	161.0	151.0	167.2	77
	7	1B	1-Apr-14	18	79	10.7	140.0	163.1	140.0	163.1	118.2	166.7	77
	7	1A	3-Apr-14	20	67	5.4	150.7	144.7	145.7	167.4	158.4	176.1	67
	7	1B	26-Mar-14	20	75	1.9	135.1	148.3	158.3	172.9	150.0	178.9	75
	9	1A	27-Mar-14	14	74	9.0	115.1	140.3	175.6	112.2	154.8	160.3	74
	9	1B	1-Apr-14	12	78	10.1	104.0	138.5	158.7	103.9	111.4	146.4	77
	9	1C	26-Mar-14	7	71	1.9	102.8	134.0	171.0	110.8	122.2	148.2	71
	13	1C	27-Mar-14	8	75	9.0	118.8	168.0	154.2	149.2	119.8	170.2	75
	13	1B	1-Apr-14	15	79	5.8	104.7	170.6	164.3	162.3	120.0	177.7	79
	13	1A	26-Mar-14	25	72	1.9	101.3	163.4	147.6	139.3	114.3	166.2	72
	14	1A	27-Mar-14	7	75	14.8	98.4	152.7	120.5	180.2	91.2	145.1	75
	14	1C	3-Apr-14	14	69	5.4	102.4	155.6	139.2	191.6	106.2	156.2	69
	14	1B	27-Mar-14	8	70	8.7	87.3	148.8	111.2	184.5	92.6	145.6	70
	19	1A	27-Mar-14	19	75	9.8	90.2	131.1	133.4	134.0	90.3	135.8	75
	19	1A	1-Apr-14	22	76	10.1	100.7	130.3	112.6	125.3	102.7	127.9	75
	19	1B	3-Apr-14	35	71	5.4	97.5	130.8	108.6	119.8	115.2	137.4	71
	19	1C	27-Mar-14	9	67	8.7	104.2	116.2	104.6	114.8	89.0	116.0	67
	20	1B	27-Mar-14	20	78	14.0	112.5	122.6	159.7	155.4	112.1	135.8	78
	20	1B	1-Apr-14	22	79	12.2	110.4	119.3	147.7	152.6	115.4	132.3	72
	20	1A	3-Apr-14	19	67	6.0	124.5	114.4	149.4	143.2	124.5	126.3	67
	20	1C	3-Apr-14	15	76	2.7	139.2	131.2	159.8	153.6	147.2	148.4	76
	20	1A	27-Mar-14	18	69	8.4	106.5	114.4	148.4	143.2	116.7	127.3	69
	21	1C	27-Mar-14	15	76	9.8	167.4	170.2	170.2	162.8	176.8	179.8	76
	21	1A	1-Apr-14	42	76	5.8	168.2	171.6	171.0	166.2	181.7	183.4	75
	21	1B	27-Mar-14	23	72	8.4	156.6	163.4	169.7	163.1	178.0	179.0	72
	23	1B	27-Mar-14	30	77	14.8	121.2	136.6	151.9	152.0	110.1	152.5	76
	23	1A	1-Apr-14	28	78	12.2	134.2	134.5	165.1	123.6	142.7	123.6	77
	23	1C	27-Mar-14	9	65	8.4	131.1	125.6	145.2	130.6	135.4	138.2	65
	24	1C	27-Mar-14	8	77	7.8	98.4	136.0	152.6	147.4	128.0	146.0	77
	24	1C	1-Apr-14	8	76	5.8	111.6	141.2	154.2	145.6	117.6	148.4	76
	24	1A	3-Apr-14	18	73	6.6	120.3	137.5	137.6	139.0	125.9	146.6	73
	24	1B	27-Mar-14	19	74	13.6	104.5	133.5	128.0	131.5	131.8	140.4	74
	26	1B	27-Mar-14	15	79	7.8	118.4	146.9	141.8	155.0	130.0	158.8	77
	26	1C	3-Apr-14	9	72	6.6	129.6	142.2	138.2	148.9	132.8	156.0	72
	26	1A	27-Mar-14	12	71	13.6	102.1	138.1	142.2	144.1	110.9	150.5	71
	27	1B	27-Mar-14	15	79	15.0	100.8	136.7	98.4	153.1	139.9	162.4	79
	27	1A	1-Apr-14	25	76	12.9	102.5	134.8	180.4	142.3	119.8	157.3	76
	27	1B	3-Apr-14	22	71	6.0	103.1	133.7	153.6	122.1	136.3	144.7	71
	27	1C	27-Mar-14	5	71	13.6	110.2	127.4	146.8	129.0	121.8	141.0	71
	33	1A	27-Mar-14	21	77	7.8	123.5	126.3	122.6	130.0	121.1	139.4	77
	33	1C	1-Apr-14	14	75	10.7	100.6	121.8	116.1	125.2	97.4	137.2	75
	33	1B	27-Mar-14	23	75	10.4	127.5	119.2	123.0	129.8	135.9	143.5	75
	36	1C	27-Mar-14	10	77	15.0	115.8	119.8	117.6	120.2	123.8	127.0	77
	36	1B	1-Apr-14	10	78	12.9	124.1	118.7	112.4	121.3	118.1	128.9	78
	36	1A	27-Mar-14	4	72	10.4	112.3	115.0	113.0	114.1	118.7	125.2	72
	39	1A	27-Mar-14	12	78	15.0	139.4	137.0	162.7	153.3	141.9	146.5	76
	39	1C	1-Apr-14	9	74	12.9	130.0	130.6	159.9	146.4	137.6	143.0	74
	39	1B	3-Apr-14	19	74	6.6	136.5	129.9	147.7	141.9	147.7	144.5	74
	39	1C	27-Mar-14	11	71	10.4	131.1	128.6	158.2	141.6	138.6	141.2	71

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class E -- 65 to 80	2	2A	28-Mar-14	20	67	2.1	148.5	148.7	152.3	101.3	174.8	173.7	67
	2	2B	28-Mar-14	14	86	6.5	155.0	158.7	155.4	111.7	172.8	173.1	85
	2	2C	3-Apr-14	13	73	5.6	140.2	146.8	137.6	101.6	162.2	162.4	73
	2	2A	24-Apr-14	26	84	1.6	165.8	165.2	145.8	108.2	170.8	168.5	84
	4	2C	28-Mar-14	11	79	6.5	133.2	154.9	148.2	150.6	139.2	163.8	79
	4	2A	3-Apr-14	25	78	5.0	136.9	152.3	139.2	141.4	143.3	162.2	78
	4	2B	28-Mar-14	13	72	2.1	128.7	143.5	121.6	125.2	133.8	154.1	72
	4	2C	24-Apr-14	11	82	1.2	143.2	157.8	142.2	145.0	150.0	165.2	82
	5	2C	28-Mar-14	14	66	2.1	137.6	122.0	159.4	146.6	157.4	156.0	66
	5	2B	28-Mar-14	11	89	7.0	144.2	137.4	156.1	155.4	160.0	165.4	89
	5	2A	5-Apr-14	18	69	7.5	127.7	122.5	154.6	97.9	129.1	126.3	69
	6	2A	28-Mar-14	17	66	2.8	110.6	137.6	165.3	164.9	116.1	161.3	66
	6	2C	28-Mar-14	7	81	7.0	116.2	143.2	171.0	166.0	126.0	164.6	81
	6	2B	3-Apr-14	18	76	5.6	101.1	137.8	173.1	165.6	136.6	167.8	76
	6	2B	24-Apr-14	13	85	1.6	129.2	150.7	166.7	171.6	143.8	171.9	85
	7	2C	28-Mar-14	12	67	2.8	151.4	147.2	150.2	170.6	166.0	178.4	67
	7	2A	28-Mar-14	25	79	6.5	157.4	155.7	154.9	175.1	164.3	182.4	79
	7	2C	3-Apr-14	11	78	9.2	163.0	162.6	157.6	175.2	171.0	181.6	78
	7	2B	5-Apr-14	30	71	7.5	142.5	150.1	143.6	171.2	154.5	176.5	71
	7	2B	5-Apr-14	30	71	7.5	142.5	150.1	143.6	171.2	154.5	176.5	71
	9	2B	28-Mar-14	11	72	2.8	129.7	129.5	163.2	112.2	144.3	155.6	72
	9	2A	28-Mar-14	24	79	7.0	130.8	144.0	184.6	124.1	160.9	166.0	79
	9	2C	3-Apr-14	9	76	6.9	125.6	142.6	176.4	119.0	152.0	158.4	76
	9	2C	24-Apr-14	15	83	2.0	143.0	145.8	177.4	118.2	163.4	165.8	83
	13	2A	28-Mar-14	21	74	3.8	125.5	165.2	141.7	139.9	137.4	168.5	74
	13	2B	31-Mar-14	16	76	0.6	123.3	161.0	147.6	138.3	113.0	167.5	76
	13	2C	3-Apr-14	9	76	5.0	128.4	165.8	157.2	148.0	129.4	171.4	76
	13	2A	24-Apr-14	56	85	2.0	137.0	170.6	159.7	151.9	143.4	175.5	85
	14	2C	28-Mar-14	15	75	3.8	112.1	157.6	139.9	190.0	112.4	157.6	75
	14	2A	31-Mar-14	9	73	1.1	117.7	170.5	144.1	194.7	94.9	159.0	73
	14	2B	3-Apr-14	16	79	2.7	118.3	172.2	152.4	191.5	127.7	169.8	79
	19	2B	28-Mar-14	20	79	3.8	116.1	129.9	147.3	155.0	134.2	159.9	79
	19	2A	31-Mar-14	28	77	4.0	111.7	128.8	128.5	127.3	105.2	135.9	77
	19	2B	3-Apr-14	34	79	3.2	130.9	114.4	141.1	128.4	142.4	172.8	79
	19	2C	5-Apr-14	18	69	7.5	111.4	127.0	102.0	115.0	108.4	126.4	69
	19	2C	5-Apr-14	18	69	7.5	111.4	127.0	102.0	115.0	108.4	126.4	69
	20	2B	28-Mar-14	19	79	3.6	141.4	130.4	157.6	152.1	144.9	151.3	79
	20	2C	31-Mar-14	16	75	0.6	139.2	136.0	156.2	152.1	140.0	147.0	75
	20	2A	3-Apr-14	28	79	4.2	142.9	142.3	160.2	163.3	148.1	148.8	79
	21	2A	28-Mar-14	32	75	3.6	163.5	167.8	169.9	165.1	180.6	182.0	75
	21	2B	31-Mar-14	23	79	4.0	162.1	169.1	172.3	168.6	175.1	181.3	79
	21	2A	3-Apr-14	42	74	5.6	163.5	165.1	169.8	165.5	177.5	179.3	74
	21	2C	3-Apr-14	12	79	4.2	166.4	172.6	168.6	163.4	180.2	183.2	76
	21	2C	3-Apr-14	12	79	4.2	166.4	172.6	168.6	163.4	180.2	183.2	76
	23	2C	28-Mar-14	13	73	3.6	143.8	138.6	162.6	151.4	151.6	157.8	73
	23	2B	31-Mar-14	28	79	6.2	110.5	133.2	163.5	151.2	156.1	160.4	79
	23	2A	3-Apr-14	32	72	6.9	151.5	141.5	159.1	150.5	154.1	156.3	72
	23	2B	24-Apr-14	32	83	2.0	150.1	138.8	163.4	168.3	157.8	164.4	83
	24	2B	28-Mar-14	17	81	1.9	135.9	145.8	166.5	161.2	144.0	158.1	81
	24	2C	31-Mar-14	8	76	4.0	124.6	141.6	148.2	150.4	141.6	151.2	76
	24	2A	3-Apr-14	18	79	2.7	127.0	143.4	150.9	146.2	131.9	151.7	79
	24	2C	24-Apr-14	15	86	4.0	139.0	148.8	160.8	158.4	150.4	160.8	86
	26	2A	28-Mar-14	10	76	1.9	126.9	146.5	150.8	152.7	141.2	160.2	76
	26	2C	31-Mar-14	9	78	6.2	128.2	147.8	158.2	151.2	146.4	160.6	78
	26	2B	3-Apr-14	17	79	4.2	116.8	150.7	149.0	156.6	127.4	162.7	79
	27	2C	28-Mar-14	8	79	1.9	146.9	135.2	148.2	153.1	151.0	154.0	79
	27	2A	31-Mar-14	13	74	0.6	130.8	132.7	191.0	138.2	143.5	156.6	74
	27	2B	3-Apr-14	23	79	9.2	129.3	139.2	157.5	142.4	138.8	158.7	79
	33	2A	28-Mar-14	26	74	3.2	136.2	121.9	115.8	123.3	138.6	136.9	74
	33	2C	31-Mar-14	18	74	1.1	138.2	123.0	128.4	136.4	140.6	147.8	74
	33	2B	3-Apr-14	20	78	6.9	138.8	127.1	119.7	131.0	142.4	144.6	78
	33	2A	24-Apr-14	18	84	4.0	149.2	129.6	120.3	128.4	151.8	140.3	84
	36	2C	28-Mar-14	10	78	3.2	132.8	122.6	118.8	127.2	132.2	134.6	78
	36	2B	31-Mar-14	17	75	1.1	136.7	111.4	103.8	112.7	133.1	127.5	75
	36	2A	3-Apr-14	7	79	9.2	135.9	120.5	116.4	123.3	133.4	132.0	79
	39	2B	28-Mar-14	9	81	3.2	151.2	138.5	151.1	149.9	160.5	154.6	81
	39	2A	31-Mar-14	12	78	6.2	138.2	133.7	158.1	149.0	158.2	154.6	78
	39	2C	3-Apr-14	11	79	3.2	141.6	135.8	154.0	145.8	139.6	145.2	79
	39	2B	24-Apr-14	16	86	4.0	155.6	144.6	153.8	158.1	164.2	158.4	86

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class E -- 65 to 80	2	3 A	5-Apr-14	29	68	8.4	150.1	151.4	165.3	144.8	164.7	164.5	68
	2	3 B	7-Apr-14	35	79	3.5	159.2	157.5	142.3	102.2	161.3	160.1	79
	2	3 C	9-Apr-14	30	78	5.8	159.8	158.2	142.8	106.4	166.0	167.2	78
	4	3 C	5-Apr-14	12	71	8.4	130.2	150.0	131.2	133.4	139.4	157.4	71
	4	3 C	5-Apr-14	11.5	80	9.2	139.8	157.4	143.4	147.4	144.0	163.0	80
	4	3 A	7-Apr-14	27	75	3.5	137.1	151.4	130.8	135.2	133.8	158.0	75
	5	3 A	8-Apr-14	13	78	1.2	143.0	131.9	156.5	150.0	150.9	159.7	78
	5	3 C	9-Apr-14	9	80	5.8	145.6	135.0	151.2	151.0	156.6	163.2	80
	5	3 B	12-Apr-14	8.5	79	3.7	146.9	137.3	147.8	151.0	154.6	161.7	79
	6	3 B	5-Apr-14	14	76	8.0	115.5	135.0	161.7	159.8	107.1	158.3	76
	6	3 C	7-Apr-14	14	76	3.5	119.8	140.6	171.8	168.4	126.8	160.2	76
	6	3 A	9-Apr-14	17	79	5.8	122.4	142.1	183.9	167.6	131.2	167.8	79
	7	3 C	8-Apr-14	6.5	78	1.2	159.4	154.4	167.4	175.0	156.0	180.0	78
	7	3 B	9-Apr-14	26.5	80	5.8	154.4	161.1	174.4	151.3	181.5	168.3	80
	7	3 A	12-Apr-14	29.5	80	5.3	157.4	155.3	149.8	174.7	173.0	181.1	80
	9	3 C	5-Apr-14	7	74	8.0	131.4	139.6	0.0	112.4	0.0	146.8	74
	9	3 A	5-Apr-14	20	80	8.9	0.0	140.1	0.0	124.9	142.3	166.9	80
	9	3 B	7-Apr-14	17	79	3.9	134.5	139.6	189.2	118.7	150.8	161.2	79
	13	3 A	5-Apr-14	19	71	8.0	120.2	165.8	138.7	130.1	113.2	166.4	71
	13	3 C	7-Apr-14	10	78	3.9	135.2	168.1	154.2	147.4	129.4	169.3	78
	13	3 B	9-Apr-14	12	83	5.8	128.4	167.4	149.9	145.6	135.5	174.6	83
	14	3 B	5-Apr-14	17	73	8.4	112.7	165.3	149.8	169.0	124.3	171.7	73
	14	3 C	8-Apr-14	16	78	3.6	120.8	169.4	152.6	196.0	120.4	168.8	78
	14	3 A	12-Apr-14	8	76	3.7	126.1	171.9	140.6	189.0	107.7	162.2	76
	19	3 C	7-Apr-14	23	83	4.6	95.5	123.5	118.8	131.5	114.8	129.8	83
	19	3 B	8-Apr-14	36.5	81	1.2	115.4	135.7	149.2	156.7	128.6	165.1	81
	19	3 A	14-Apr-14	18	76	7.1	98.5	119.9	116.7	127.4	106.8	131.1	76
	20	3 A	5-Apr-14	21	67	7.0	128.2	123.5	155.8	149.6	134.2	130.2	67
	20	3 B	5-Apr-14	24	83	8.9	146.7	139.6	163.5	160.7	147.7	153.1	83
	20	3 C	12-Apr-14	16	75	3.7	142.2	140.4	151.4	149.4	131.0	140.0	75
	21	3 B	5-Apr-14	19	75	7.0	163.3	168.4	170.4	165.4	177.6	183.6	75
	21	3 B	5-Apr-14	20.5	81	6.6	167.0	172.4	170.6	166.3	137.8	148.7	81
	21	3 A	7-Apr-14	28	76	3.9	161.1	169.1	170.0	165.7	179.4	181.9	76
	23	3 C	5-Apr-14	19	70	7.0	140.3	146.0	158.4	149.6	154.1	154.8	70
	23	3 C	5-Apr-14	19.5	80	8.9	150.0	142.9	178.0	155.3	160.1	164.9	80
	23	3 B	7-Apr-14	28	85	4.6	131.9	139.8	161.8	154.9	161.8	166.2	85
	24	3 A	5-Apr-14	22.5	79	6.6	137.6	144.7	165.7	155.3	111.7	147.2	79
	24	3 C	7-Apr-14	17.5	84	6.2	123.3	143.7	149.1	152.5	132.6	153.6	84
	24	3 B	12-Apr-14	20.5	78	7.6	124.6	141.3	149.4	144.5	135.3	149.6	78
	26	3 A	5-Apr-14	13	79	9.2	145.1	158.0	153.6	154.2	138.5	166.0	79
	26	3 B	7-Apr-14	19	87	6.2	134.1	144.1	154.6	154.0	133.8	161.5	87
	26	3 C	12-Apr-14	5	83	5.3	141.2	147.0	160.2	153.6	141.4	161.0	83
	27	3 C	5-Apr-14	16.5	79	6.6	143.0	139.2	209.1	153.0	164.4	153.6	79
	27	3 B	12-Apr-14	20	85	5.3	142.3	138.8	162.1	144.6	158.0	161.4	85
	27	3 A	7-Apr-14	22	80	4.6	134.3	135.0	154.7	143.0	124.4	154.2	80
	33	3 B	8-Apr-14	15.5	82	3.6	125.0	144.3	127.4	119.3	143.3	144.6	82
	33	3 A	9-Apr-14	16.5	80	5.8	138.3	127.5	119.5	128.4	143.6	141.4	80
	33	3 C	12-Apr-14	13.5	84	4.5	142.2	131.0	122.4	129.0	150.4	142.0	84
	36	3 A	8-Apr-14	9.5	79	3.6	131.2	124.8	111.2	120.0	133.9	132.5	79
	36	3 B	14-Apr-14	15	82	7.1	138.7	128.2	115.3	122.7	133.1	134.6	82
	36	3 C	15-Apr-14	13.5	72	3.1	129.4	118.0	103.4	113.2	76.4	126.6	72
	39	3 B	5-Apr-14	26	82	9.2	117.5	146.8	170.4	170.5	182.7	182.8	82
	39	3 B	12-Apr-14	12	84	4.5	147.9	143.5	156.7	150.1	161.6	151.4	84
	39	3 A	7-Apr-14	9.5	79	6.2	142.0	133.8	152.3	142.4	147.0	141.4	79
	4	3 B	15-Apr-14	23	77	3.1	129.3	146.6	124.3	128.8	136.8	149.1	77
	9	3 A	12-Apr-14	8	80	4.5	143.9	143.7	176.5	125.7	175.9	167.8	80
	19	3 A	15-Apr-14	22	71	3.1	112.1	126.5	102.4	114.3	114.0	131.8	71
	20	3 B	15-Apr-14	27	78	1.2	141.2	137.3	159.9	150.1	149.9	151.1	78
	21	3 C	12-Apr-14	17	77	7.6	165.4	173.0	172.4	167.4	183.8	186.0	77
	23	3 A	12-Apr-14	32	77	7.6	143.1	145.2	162.2	156.3	150.6	161.8	77
	24	3 C	14-Apr-14	13.5	78	10.7	122.6	142.0	148.2	152.2	109.6	142.4	78
	26	3 A	14-Apr-14	8	77	10.7	111.1	145.1	144.6	151.0	102.6	151.9	77
	39	3 C	14-Apr-14	8	77	7.1	143.2	136.4	154.4	145.2	150.1	145.8	77
	9	3 C	15-Apr-14	8	72	1.2	123.8	137.4	176.2	119.4	153.0	158.8	72
	23	3 B	14-Apr-14	38	81	10.7	140.5	146.8	147.4	153.3	143.8	153.6	81
	39	3 A	15-Apr-14	10	72	1.2	144.2	131.3	140.0	132.3	152.2	142.4	72

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class D -- 65 to 80	2	4A	15-Apr-14	24	78	1.5	161.1	159.9	141.4	103.5	168.5	164.0	78
	2	4B	16-Apr-14	33	85	3.8	156.8	159.3	146.6	107.3	172.1	170.7	85
	2	4C	21-Apr-14	23	81	1.5	164.2	161.2	145.2	109.0	172.6	169.0	81
	2	4C	22-Apr-14	16	84	0.5	158.6	156.4	151.8	108.6	176.8	171.4	84
	4	4C	16-Apr-14	9.5	76	4.0	132.2	152.0	131.0	133.6	142.2	159.2	76
	4	4A	17-Apr-14	22	74	10.1	129.8	148.5	127.8	131.9	137.9	156.6	74
	4	4B	21-Apr-14	26	84	1.5	141.6	154.7	143.1	148.4	148.8	170.0	84
	4	4A	22-Apr-14	32.5	87	0.5	141.4	153.1	144.1	147.7	149.5	165.9	87
	5	4C	15-Apr-14	8	80	1.5	146.8	137.4	157.2	153.6	163.2	161.4	80
	5	4B	17-Apr-14	17	76	10.1	135.8	131.0	147.0	146.6	0.0	0.0	76
	5	4A	23-Apr-14	14	71	1.3	135.2	126.5	147.7	141.8	122.9	139.8	71
	5	4A	23-Apr-14	11	79	8.7	128.7	132.2	151.8	147.2	141.3	154.4	79
	6	4B	15-Apr-14	11	82	1.5	124.1	126.1	168.8	171.4	138.9	173.3	82
	6	4A	17-Apr-14	16	76	9.1	87.2	132.3	166.6	159.7	126.4	156.5	76
	6	4C	23-Apr-14	8	73	1.3	104.1	130.2	162.6	158.2	109.2	150.4	73
	6	4B	23-Apr-14	6	83	8.7	105.7	142.9	162.9	163.9	118.2	164.1	83
	7	4C	15-Apr-14	12	80	1.1	162.2	157.0	155.4	177.6	169.4	182.6	80
	7	4A	17-Apr-14	23	80	6.3	150.8	154.6	156.1	174.4	167.8	180.3	80
	7	4B	23-Apr-14	25	74	1.3	147.2	147.6	148.2	168.7	160.3	176.9	74
	7	4C	23-Apr-14	15.5	82	8.7	146.0	153.6	156.6	165.6	152.8	173.8	82
	13	4A	15-Apr-14	55	78	1.1	135.0	0.0	155.9	147.0	138.1	171.5	78
	13	4B	17-Apr-14	21	78	9.1	124.4	163.8	152.2	144.1	119.7	170.5	78
	13	4C	23-Apr-14	11	73	2.2	162.8	120.2	143.0	139.4	116.4	165.6	73
	14	4A	16-Apr-14	7	76	4.0	126.9	176.1	160.9	198.0	129.4	172.5	76
	14	4C	17-Apr-14	12	74	10.1	91.8	152.0	131.4	194.2	124.2	172.4	74
	14	4B	23-Apr-14	20	75	2.2	109.6	171.2	141.4	196.7	103.4	162.2	75
	14	4C	24-Apr-14	18	76	3.0	115.8	166.0	144.8	196.2	131.8	176.2	76
	19	4B	16-Apr-14	44.5	77	4.0	113.2	133.8	118.8	124.2	117.2	140.6	77
	19	4C	17-Apr-14	31	76	9.1	95.0	129.4	112.2	123.0	116.8	136.8	76
	19	4A	23-Apr-14	10	72	2.2	109.5	123.5	107.5	120.2	94.4	117.2	72
	19	4B	24-Apr-14	31.5	79	3.0	113.2	131.2	140.1	122.8	126.1	136.3	79
	20	4C	16-Apr-14	18	79	3.3	142.0	138.0	151.8	150.6	145.0	151.2	79
	20	4A	17-Apr-14	24	80	5.1	126.3	132.6	158.5	154.8	138.2	150.0	80
	20	4B	23-Apr-14	27	78	9.6	144.4	139.0	148.8	149.3	123.2	140.7	78
	20	4A	23-Apr-14	30	79	3.0	132.6	128.8	152.3	147.7	145.4	146.7	79
	21	4B	15-Apr-14	27	82	1.1	161.5	172.7	172.7	169.9	179.0	186.7	82
	21	4C	17-Apr-14	15.5	80	6.3	172.0	178.0	173.4	168.8	180.4	183.6	80
	21	4A	23-Apr-14	28	76	9.6	158.2	161.8	165.1	162.1	167.0	172.2	76
	21	4B	24-Apr-14	23	80	6.2	163.9	171.1	169.4	166.4	174.6	184.0	80
	23	4A	16-Apr-14	25	77	3.3	141.4	138.2	155.1	150.6	153.9	159.2	77
	23	4B	17-Apr-14	40.5	81	6.3	136.1	138.1	156.7	145.7	143.3	152.9	81
	23	4C	23-Apr-14	14	79	9.6	132.5	132.9	164.9	143.3	145.1	145.5	79
	24	4C	16-Apr-14	14	83	3.8	136.6	145.4	160.0	152.4	147.4	156.6	83
	24	4A	21-Apr-14	22	80	0.8	134.9	144.6	163.3	153.6	145.8	158.2	80
	24	4B	22-Apr-14	18	88	2.5	137.8	144.0	153.3	152.3	145.7	158.8	88
	24	4B	23-Apr-14	10	80	12.4	106.1	142.8	154.6	150.4	115.7	153.8	80
	26	4B	16-Apr-14	12.5	79	3.3	148.1	140.6	147.4	150.6	125.7	162.7	79
	26	4C	17-Apr-14	10.5	80	5.1	137.4	150.0	153.8	154.6	143.8	161.8	80
	26	4A	23-Apr-14	6.5	76	12.4	105.3	143.2	143.3	147.7	109.4	153.8	76
	26	4C	24-Mar-14	10	77	6.2	136.0	142.0	151.6	152.0	153.0	160.4	77
	27	4A	16-Apr-14	17	84	3.8	145.4	139.4	172.5	137.5	144.9	153.9	84
	27	4B	17-Apr-14	21.5	81	5.1	113.7	114.0	170.6	113.7	145.1	113.7	81
	27	4C	23-Apr-14	10.5	77	12.4	103.2	133.0	160.0	132.4	134.6	150.6	77
	27	4A	24-Apr-14	15.5	77	6.2	137.5	132.4	177.1	136.7	151.6	156.2	77
	33	4C	16-Apr-14	15.5	84	3.8	143.2	131.6	123.2	131.8	147.2	144.0	84
	33	4A	21-Apr-14	14.5	81	1.5	138.9	126.6	115.5	124.4	143.7	138.4	81
	33	4B	22-Apr-14	29	86	2.5	139.4	126.9	115.5	128.3	142.5	142.8	86
	33	4C	23-Apr-14	5	80	12.3	114.6	122.4	117.4	125.4	125.8	134.4	80
	36	4B	16-Apr-14	23.5	85	3.8	78.0	122.0	76.9	131.3	88.1	137.6	85
	36	4C	21-Apr-14	9.5	80	0.8	138.0	127.4	119.2	123.8	141.0	136.2	80
	36	4A	22-Apr-14	12	85	0.5	142.6	122.2	114.0	118.5	140.2	133.4	85
	36	4B	23-Apr-14	11	82	12.3	118.4	128.3	121.3	127.2	121.6	136.1	82
	39	4A	16-Apr-14	11	84	3.8	153.0	140.1	158.5	149.6	164.0	155.3	84
	39	4B	21-Apr-14	13	82	0.8	154.3	141.2	155.4	145.9	161.6	152.3	82
	39	4C	22-Apr-14	10.5	82	2.5	149.2	137.4	157.0	148.2	161.0	154.0	82
	39	4A	23-Apr-14	15	81	12.3	138.7	135.5	156.8	148.1	145.5	145.1	81

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class D -- 65 to 80	2	5C	28-Apr-14	15	76	2.3	150.6	151.4	143.6	100.6	159.6	164.0	76
	2	5A	7-May-14	28	72	8.0	141.3	147.0	143.2	99.4	155.2	160.4	72
	2	5B	7-May-14	33	82	15.0	151.7	154.7	151.5	102.5	167.2	165.6	82
	4	5A	28-Apr-14	27	78	2.3	133.8	149.0	126.5	130.5	135.3	155.7	78
	4	5C	7-May-14	15.5	66	4.5	124.8	144.6	120.4	125.4	131.4	153.2	66
	4	5B	7-May-14	31	80	12.0	123.6	145.7	143.8	146.5	136.1	162.4	80
	5	5B	28-Apr-14	15	75	2.3	138.4	128.9	146.9	149.5	154.7	160.7	75
	5	5C	2-May-14	7	78	1.3	146.0	129.8	154.2	151.2	161.4	160.0	78
	5	5A	3-May-14	25	88	1.3	142.2	130.0	161.7	152.0	158.2	162.4	88
	5	5C	5-May-14	7	80	1.8	144.8	132.8	153.0	150.4	157.8	158.8	80
	5	5A	7-May-14	23	68	7.0	131.5	123.2	148.0	143.2	149.5	155.9	68
	6	5C	28-Apr-14	5	75	2.8	115.8	137.4	169.4	166.6	120.2	164.2	75
	6	5A	2-May-14	25	80	1.3	123.2	142.9	175.6	168.7	137.0	168.5	80
	6	5B	3-May-14	19	89	1.3	118.1	144.4	166.2	168.5	135.7	168.2	89
	6	5B	7-May-14	20	74	4.0	96.0	131.1	168.5	163.3	114.2	156.9	74
	7	5A	25-Apr-14	18.5	80	3.4	165.0	154.0	168.1	175.5	172.3	182.7	78
	7	5C	1-May-14	9	78	20.0	109.4	147.0	144.2	156.8	114.2	160.0	78
	7	5B	2-May-14	27	81	1.3	160.1	149.2	152.8	174.6	171.6	182.1	81
	7	5C	5-May-14	15	80	1.8	160.6	154.8	153.4	175.8	170.8	182.2	80
	7	5B	7-May-14	32	68	7.0	147.6	143.9	145.3	166.9	154.3	176.8	68
	13	5A	28-Apr-14	23	78	2.8	124.6	167.2	147.2	141.2	132.8	170.0	78
	13	5C	2-May-14	11	80	1.2	133.2	170.0	160.6	151.8	140.8	175.0	80
	13	5B	3-May-14	29	89	0.8	140.1	168.3	160.1	154.2	138.0	176.5	89
	13	5B	7-May-14	25	76	8.0	113.9	164.4	142.5	140.8	132.5	168.4	76
	14	5A	25-Apr-14	5	76	4.1	126.8	173.5	154.7	196.5	133.0	173.1	76
	14	5B	28-Apr-14	15	76	2.8	121.6	169.9	155.3	194.7	126.0	172.3	76
	14	5C	2-May-14	22	87	1.3	133.0	177.2	164.8	200.4	129.6	177.0	87
	14	5A	5-May-14	11	79	1.8	126.0	174.6	153.7	195.2	129.2	172.5	79
	14	5C	7-May-14	22	75	8.0	82.4	146.6	107.4	179.4	93.0	146.4	75
	19	5C	25-Apr-14	27.5	77	4.1	100.2	132.2	118.2	126.6	126.8	140.4	77
	19	5A	28-Apr-14	32.5	79	4.1	104.6	130.1	114.9	125.1	107.6	127.7	79
	19	5B	2-May-14	48	83	1.2	119.8	132.5	122.0	131.3	138.6	148.5	83
	19	5A	7-May-14	22	76	10.0	96.3	130.1	133.3	135.5	99.6	139.2	76
	20	5B	25-Apr-14	20	77	4.1	136.6	135.5	154.7	156.7	147.1	152.1	77
	20	5C	28-Apr-14	13	80	4.1	133.2	123.8	163.0	155.8	129.6	129.8	80
	20	5A	2-May-14	32	83	1.2	143.7	137.5	159.8	154.6	150.7	153.3	83
	20	5A	7-May-14	16	76	8.0	127.2	126.1	152.1	149.1	135.0	137.1	76
	21	5A	25-Apr-14	36	80	3.8	160.4	170.3	166.5	163.2	173.2	182.6	80
	21	5C	28-Apr-14	16.5	80	3.0	168.4	172.4	170.6	166.0	177.0	176.4	80
	21	5B	2-May-14	30	89	1.3	164.6	178.9	171.6	179.4	171.8	184.2	89
	21	5B	7-May-14	23.5	78	10.0	160.5	166.1	177.4	166.2	186.4	187.5	78
	23	5B	25-Apr-14	26.5	77	3.8	144.1	139.4	154.0	149.2	152.6	157.1	77
	23	5A	28-Apr-14	20.5	79	3.0	136.3	135.9	156.7	143.0	148.1	149.5	76
	23	5C	2-May-14	20	86	0.8	146.7	142.2	168.2	156.8	162.6	163.8	86
	23	5B	7-May-14	36.5	68	4.5	128.5	129.0	136.9	137.6	136.7	146.1	68
	23	5C	7-May-14	19	75	10.0	132.7	133.6	159.2	141.8	121.3	147.8	75
	24	5B	25-Apr-14	22.5	80	2.0	131.5	147.7	160.6	153.7	148.1	158.9	80
	24	5A	1-May-14	6.5	77	25.0	90.7	118.5	76.8	136.7	98.2	128.7	77
	24	5C	3-May-14	11	83	1.3	0.0	142.0	163.4	153.4	145.4	156.4	83
	24	5A	5-May-14	22	79	1.8	135.8	140.4	150.7	147.0	148.7	155.1	79
	24	5C	7-May-14	13	67	7.0	119.6	130.0	149.0	140.0	131.4	147.2	67
	26	5C	25-Apr-14	8	74	3.8	130.8	143.0	147.8	150.2	148.2	158.2	74
	26	5B	28-Apr-14	25	80	4.1	122.3	144.8	151.3	151.0	135.1	160.7	80
	26	5A	2-May-14	19	89	1.3	138.8	144.4	146.4	151.7	151.4	160.7	89
	26	5A	7-May-14	13.5	73	4.0	124.1	142.7	150.2	145.6	131.2	155.6	73
	27	5C	25-Apr-14	12.5	79	2.0	145.3	141.1	208.0	145.1	152.1	162.1	79
	27	5B	1-May-14	21.5	80	25.0	92.7	121.8	119.2	119.1	98.3	120.7	80
	27	5A	2-May-14	24	89	0.8	140.0	141.2	199.2	146.3	161.1	164.1	89
	27	5A	7-May-14	16	68	4.5	96.8	125.3	173.5	116.1	135.7	138.7	68
	27	5C	7-May-14	8	77	12.0	96.6	132.4	174.0	137.4	128.8	147.2	77
	33	5B	25-Apr-14	18	83	3.4	140.9	124.0	115.5	124.8	142.6	140.1	83
	33	5A	1-May-14	9	76	20.0	95.3	109.3	116.4	118.0	107.4	120.2	76
	33	5C	3-May-14	15	84	0.8	137.8	129.0	121.1	126.4	143.8	140.4	84
	33	5B	5-May-14	21	82	1.8	143.1	123.3	121.2	129.9	140.8	143.9	82
	33	5C	7-May-14	7	71	8.0	131.2	117.6	133.6	131.2	131.4	143.8	71
	33	5A	7-May-14	15	79	12.0	126.3	124.0	117.0	126.9	131.5	137.7	79
	36	5A	25-Apr-14	14	79	2.0	133.8	124.8	122.1	125.0	140.5	139.3	78
	36	5C	1-May-14	10	79	25.0	92.4	107.2	120.4	124.4	98.8	114.6	79
	36	5B	2-May-14	22	89	0.8	144.7	130.4	125.9	132.7	146.3	143.8	89
	36	5B	5-May-14	19.5	83	1.8	137.5	125.5	118.1	123.5	131.0	132.6	83
	36	5C	7-May-14	14	72	4.0	122.6	118.2	108.6	113.2	121.6	126.4	72
	39	5C	25-Apr-14	7	81	3.4	149.9	141.6	155.4	147.4	155.2	151.2	81
	39	5B	1-May-14	34	80	20.0	134.4	130.6	142.0	135.4	136.0	137.1	80
	39	5A	3-May-14	17	84	0.8	150.7	141.5	157.6	151.7	164.2	155.6	84
	39	5B	7-May-14	30	74	8.0	138.7	129.0	142.2	134.3	137.1	139.6	74
	39	5A	7-May-14	18	79	15.0	145.5	136.4	169.1	156.4	153.2	155.0	79

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class E -- 65 to 80	2	7A	21-Mar-14	15	71	4.4	158.5	156.7	141.3	106.2	166.5	163.9	71
	2	7B	22-Mar-14	11	74	6.2	132.6	151.9	142.7	106.5	158.6	164.7	74
	2	7C	29-Mar-14	14	75	6.4	149.4	148.0	144.2	103.6	160.8	165.2	75
	2	7A	1-Apr-14	14	74	4.3	154.1	152.5	153.9	107.2	170.2	170.5	74
	4	7B	21-Mar-14	12	71	4.4	136.4	154.4	134.4	136.9	138.6	157.8	71
	4	7B	22-Mar-14	25	73	5.5	124.2	145.6	138.6	140.6	139.0	159.6	73
	4	7A	29-Mar-14	26	74	6.4	132.7	147.6	135.1	136.3	132.3	158.0	74
	4	7C	1-Apr-14	10.5	71	6.1	103.0	145.2	125.2	127.8	130.8	150.2	71
	5	7A	21-Mar-14	4	72	6.4	141.4	128.1	151.5	150.4	155.1	161.1	72
	5	7C	22-Mar-14	6	73	6.2	126.4	133.0	159.0	147.8	156.2	161.6	73
	5	7C	25-Mar-14	11	75	4.8	143.2	128.2	154.0	152.1	157.2	160.4	75
	5	7B	29-Mar-14	6.5	77	6.4	140.0	161.6	149.0	163.3	149.9	150.9	77
	5	7B	1-Apr-14	6.5	78	12.6	137.2	132.0	150.3	151.2	145.6	160.6	78
	5	7B	3-Apr-14	13	79	7.4	147.0	138.0	159.9	153.2	160.7	163.4	79
	6	7A	25-Mar-14	24	76	4.8	120.7	143.0	169.3	165.9	133.8	167.5	76
	6	7B	24-Mar-14	8	74	3.2	121.8	144.0	162.4	162.6	130.8	163.2	74
	6	7B	21-Mar-14	10	75	4.5	124.2	149.4	162.0	167.5	120.4	174.6	75
	6	7C	1-Apr-14	10	65	7.9	103.6	131.0	170.6	160.2	127.4	162.0	65
	7	7C	21-Mar-14	5	72	6.4	156.4	161.1	178.4	178.6	173.0	197.2	72
	7	7A	22-Mar-14	17.5	74	6.2	161.1	150.8	160.0	174.6	164.1	181.8	74
	7	7A	29-Mar-14	29	79	6.1	159.2	154.0	149.5	175.2	171.9	182.7	79
	7	7B	1-Apr-14	22	74	6.1	154.4	151.9	140.9	167.4	144.8	175.1	74
	9	7C	21-Mar-14	2	72	4.4	140.2	139.5	164.0	115.0	149.4	155.2	72
	9	7C	22-Mar-14	4	75	10.0	97.4	146.2	117.8	117.4	147.8	160.0	75
	9	7B	29-Mar-14	14	78	5.4	131.7	134.7	164.8	113.7	138.6	156.8	78
	9	7A	1-Apr-14	6	67	7.9	129.4	132.3	156.1	112.9	140.3	150.0	67
	13	7B	22-Mar-14	12	72	5.3	162.0	161.8	144.4	140.6	168.7	168.5	72
	13	7B	25-Mar-14	11	78	4.8	128.4	166.8	149.8	142.6	134.4	169.2	78
	13	7A	21-Mar-14	30	76	5.6	126.7	167.9	160.5	152.2	140.5	174.6	76
	13	7C	1-Apr-14	11	67	8.8	121.4	162.2	141.4	135.2	128.4	167.0	67
	14	7B	21-Mar-14	9	72	6.4	169.9	170.1	148.0	196.1	128.2	166.0	72
	14	7A	22-Mar-14	17	75	10.0	120.0	168.3	147.4	192.7	103.5	158.2	75
	14	7C	29-Mar-14	15	75	5.4	115.6	170.0	147.8	192.2	129.6	171.6	75
	14	7C	1-Apr-14	15	73	12.6	92.1	142.0	117.0	185.2	93.8	142.0	73
	19	7C	22-Mar-14	11	71	3.5	119.2	131.4	109.2	118.2	104.0	134.4	71
	19	7C	21-Mar-14	10.5	75	4.5	114.2	130.4	130.6	127.8	114.4	137.2	75
	19	7A	29-Mar-14	12	76	5.4	109.5	125.0	113.4	122.0	104.5	131.7	76
	19	7B	1-Apr-14	28.5	68	7.9	105.9	129.1	99.1	119.3	110.5	133.4	68
	20	7A	22-Mar-14	27	71	3.5	140.7	134.8	152.4	148.6	140.4	140.2	71
	20	7A	21-Mar-14	22	75	4.5	142.0	142.5	155.7	154.0	145.8	150.8	75
	20	7C	29-Mar-14	12	79	6.5	148.6	145.4	159.8	155.6	146.6	154.2	79
	20	7B	1-Apr-14	20	77	4.3	127.4	121.5	151.1	148.0	125.3	136.3	77
	21	7B	22-Mar-14	25	71	3.5	161.6	167.4	167.4	162.0	174.4	176.0	71
	21	7B	21-Mar-14	12	76	5.6	161.6	168.2	170.1	170.8	179.2	180.0	76
	21	7C	29-Mar-14	11	79	6.1	163.6	173.2	176.0	169.4	181.0	185.8	79
	21	7A	1-Apr-14	44.5	71	8.8	157.9	166.7	136.7	159.4	173.5	180.5	71
	23	7A	24-Mar-14	21	71	1.7	139.7	139.1	168.0	151.5	164.2	161.8	71
	23	7B	25-Mar-14	28.5	75	0.6	139.5	136.0	156.0	151.0	150.6	157.9	75
	23	7A	21-Mar-14	40	79	7.9	151.5	147.7	154.6	154.2	152.8	159.8	79
	23	7C	1-Apr-14	15	71	4.3	134.2	133.8	157.4	144.0	151.6	151.0	71
	24	7C	24-Mar-14	9	71	1.7	124.6	128.2	167.4	159.2	144.4	156.4	71
	24	7A	25-Mar-14	22	73	0.6	128.3	138.6	149.1	140.9	139.5	151.5	73
	24	7C	21-Mar-14	5	76	5.6	130.6	143.2	163.0	153.4	141.0	154.6	76
	24	7B	1-Apr-14	15	73	8.8	112.2	130.9	137.4	139.5	129.4	174.3	73
	26	7A	22-Mar-14	22	72	5.7	141.8	135.7	160.3	148.3	125.8	158.5	72
	26	7B	22-Mar-14	12.5	77	9.5	125.9	143.1	153.6	154.8	132.1	163.8	77
	26	7C	21-Mar-14	5	79	7.9	131.0	146.6	159.0	154.6	129.4	160.0	79
	26	7A	1-Apr-14	12.5	75	12.6	104.7	142.2	143.8	148.1	127.1	155.7	75
	27	7C	24-Mar-14	5	72	3.2	140.6	134.4	156.4	136.4	99.8	152.6	72
	27	7A	22-Mar-14	23.5	77	9.5	146.5	135.5	197.2	144.0	152.4	160.9	77
	27	7B	29-Mar-14	23	79	6.5	140.7	142.6	163.2	143.7	156.1	160.0	79
	33	7C	22-Mar-14	3.5	70	5.7	133.8	121.0	123.4	131.6	142.0	144.6	70
	33	7C	22-Mar-14	7	77	9.5	138.6	129.8	118.0	125.8	143.2	140.2	77
	33	7B	29-Mar-14	25	79	6.1	139.2	126.3	125.0	133.0	139.4	144.9	79
	33	7A	1-Apr-14	32	72	6.1	121.3	119.4	117.4	125.7	132.9	141.6	72
	36	7C	25-Mar-14	4	74	0.6	134.6	118.2	107.4	115.2	137.6	127.6	74
	36	7B	24-Mar-14	14	74	1.7	139.0	123.0	126.0	131.0	130.0	134.0	74
	36	7A	22-Mar-14	13	73	5.5	132.6	119.5	115.5	118.6	133.5	133.2	73
	39	7C	22-Mar-14	4	74	5.5	140.4	134.8	154.4	142.0	142.4	143.6	74
	39	7A	24-Mar-14	14	69	3.2	150.3	138.2	151.6	143.3	151.0	145.8	69
	39	7B	21-Mar-14	18	79	7.9	139.5	139.6	159.6	149.6	153.3	152.8	79
	39	7A	29-Mar-14	26	79	6.5	149.2	139.7	151.8	142.7	156.2	146.4	79

Table F-1 Cont'd.
Test Data -- 80 to 90 °F

Vehicle	Fuel	Rater	Date	REDUCED DATA									
				TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class D -- 80 to 90	2	6C	22-Mar-14	11	80	9.0	163.6	162.8	147.0	110.2	171.4	168.4	80
	2	6A	25-Mar-14	20	85	5.3	158.1	158.2	154.7	108.3	168.7	167.2	85
	2	6A	25-Mar-14	22	90	10.1	154.8	159.3	142.4	113.3	165.4	163.4	90
	2	6B	31-Mar-14	23	86	9.9	142.3	159.0	147.9	107.1	147.8	165.9	86
	4	6A	25-Mar-14	37	80	4.1	135.6	155.0	138.8	141.6	137.8	161.1	80
	4	6C	25-Mar-14	8	88	8.7	140.2	160.4	154.2	155.6	140.6	169.4	88
	4	6B	31-Mar-14	18	86	10.1	134.4	154.8	150.2	156.6	132.2	164.4	85
	5	6B	22-Mar-14	16	80	7.6	141.0	141.8	159.0	156.6	151.2	161.2	80
	5	6C	25-Mar-14	15	88	5.3	122.2	144.0	161.6	156.8	128.2	161.2	88
	5	6A	31-Mar-14	13.5	85	10.1	121.6	139.4	163.1	157.4	154.7	166.4	85
	5	6B	7-Apr-14	9.5	91	11.4	142.8	138.4	161.7	151.1	163.9	167.4	91
	6	6B	22-Mar-14	16	80	10.1	91.4	151.4	164.8	169.0	142.4	169.8	80
	6	6A	25-Mar-14	28	87	5.3	109.7	149.6	163.2	168.1	120.3	164.3	87
	6	6B	29-Mar-14	15	88	10.6	141.2	155.2	164.6	166.3	143.0	172.2	87
	6	6C	31-Mar-14	9	84	13.1	108.6	144.2	160.6	166.2	104.2	155.8	83
	7	6A	22-Mar-14	20	80	7.6	167.4	156.2	151.7	174.6	160.5	180.1	80
	7	6B	25-Mar-14	27	88	5.3	159.3	167.8	152.1	177.2	165.8	183.8	88
	7	6B	25-Mar-14	20.5	93	10.1	144.8	166.3	150.9	174.7	165.4	181.1	92
	7	6C	31-Mar-14	13	83	9.9	128.4	156.0	152.8	167.0	141.4	171.0	83
	9	6A	25-Mar-14	22	84	3.9	134.5	144.7	182.5	119.3	158.2	164.7	84
	9	6C	25-Mar-14	4	90	9.2	114.6	151.6	158.4	123.4	112.4	155.2	90
	9	6B	31-Mar-14	15	85	13.1	122.2	148.4	169.6	121.0	141.5	163.5	85
	13	6C	22-Mar-14	4	80	10.1	114.6	170.6	166.4	155.0	138.2	175.8	80
	13	6B	25-Mar-14	17	90	5.3	145.9	175.9	161.5	152.4	137.8	179.4	90
	13	6C	29-Mar-14	11	90	10.6	147.2	176.6	169.2	159.8	149.2	178.6	90
	13	6A	31-Mar-14	26	84	13.1	133.4	172.7	160.9	154.9	112.3	174.6	84
	14	6C	25-Mar-14	11	82	3.9	126.4	171.4	118.4	187.0	115.2	168.2	82
	14	6B	25-Mar-14	9	92	9.2	121.4	179.0	148.6	201.0	131.2	173.4	91
	14	6A	31-Mar-14	11	84	11.0	98.1	156.7	143.5	193.5	109.8	153.3	84
	14	6C	7-Apr-14	21.5	87	11.4	126.8	165.0	158.4	195.2	127.6	161.6	87
	19	6B	22-Mar-14	31	80	5.8	118.0	139.0	130.0	140.0	129.0	150.0	80
	19	6A	25-Mar-14	24	89	8.7	112.5	146.3	166.4	164.1	121.9	163.0	89
	19	6C	31-Mar-14	24	83	11.0	88.4	126.4	127.6	140.6	93.8	131.8	83
	20	6C	22-Mar-14	11	80	5.8	141.4	144.0	172.2	175.0	162.0	162.0	80
	20	6B	25-Mar-14	24	92	8.7	138.8	140.6	170.7	167.0	136.1	157.0	91
	20	6A	31-Mar-14	24	83	5.8	135.0	140.5	166.5	164.3	123.1	148.6	83
	21	6A	22-Mar-14	33	80	10.1	167.7	175.3	170.8	167.5	177.4	183.6	80
	21	6C	25-Mar-14	16	85	5.3	168.4	173.0	170.8	165.4	170.8	182.2	85
	21	6C	25-Mar-14	22.5	91	10.1	168.8	179.8	178.0	171.4	185.2	188.0	91
	21	6B	31-Mar-14	24	84	16.9	169.6	172.6	171.4	169.4	181.6	183.2	84
	23	6A	22-Mar-14	26	80	5.8	146.5	145.0	162.1	156.6	156.9	162.0	80
	23	6C	25-Mar-14	20	85	7.0	147.8	147.2	171.6	157.8	164.2	159.8	85
	23	6B	31-Mar-14	29.5	85	5.8	118.6	142.9	173.0	161.4	139.1	168.0	84
	24	6B	22-Mar-14	10	80	10.0	134.6	144.0	156.4	153.2	139.4	155.0	80
	24	6A	25-Mar-14	28	90	9.2	122.1	144.7	166.8	162.2	148.5	159.0	90
	24	6C	31-Mar-14	9	84	16.9	123.2	148.4	159.4	158.4	143.6	156.2	83
	26	6C	25-Mar-14	7	80	4.1	149.0	148.4	154.4	151.6	123.6	159.2	80
	26	6B	25-Mar-14	8	91	8.7	122.8	154.3	154.3	157.6	142.3	168.3	91
	26	6A	31-Mar-14	21	84	9.9	109.7	152.8	158.9	154.6	117.8	166.2	84
	27	6B	25-Mar-14	21	85	3.9	130.4	137.4	157.3	142.0	145.5	157.8	85
	27	6C	25-Mar-14	11	90	8.7	120.4	141.2	131.8	133.2	144.9	152.4	90
	27	6B	31-Mar-14	29.5	85	11.0	113.9	135.6	113.3	120.6	119.3	140.2	84
	27	6A	31-Mar-14	24	86	16.9	123.6	144.3	127.8	152.6	128.6	154.9	86
	33	6B	25-Mar-14	9	84	4.1	146.2	135.0	116.7	130.6	144.6	145.2	84
	33	6A	25-Mar-14	11	87	8.7	140.2	133.7	130.9	135.6	146.4	149.3	87
	33	6C	31-Mar-14	11	85	10.1	132.6	133.4	124.8	131.8	140.0	146.0	83
	36	6C	22-Mar-14	10	80	7.6	140.4	128.2	131.4	133.2	144.6	141.4	80
	36	6A	25-Mar-14	8	86	7.0	142.8	131.4	128.9	134.5	139.2	142.5	86
	36	6A	29-Mar-14	15	89	10.6	146.4	136.2	132.8	136.2	150.9	146.0	88
	36	6B	7-Apr-14	19.5	95	5.5	146.2	134.5	136.5	139.8	140.5	147.9	95
	39	6A	22-Mar-14	18	80	9.0	156.6	145.4	164.8	157.6	166.3	161.2	80
	39	6B	25-Mar-14	9	86	7.0	150.6	141.6	160.2	152.8	148.0	152.1	86
	39	6C	31-Mar-14	6.5	82	5.8	150.0	144.8	170.0	158.6	150.6	157.4	82

Vehicle	Fuel	Rater	Date	TWD	REDUCED DATA									
					max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T	
Class D -- 80 to 90	2	7C	21-Mar-14	5	80	4.7	154.2	158.4	154.2	113.0	166.2	168.0	80	
	2	7B	29-Mar-14	21.5	86	2.4	157.3	168.0	154.1	144.8	175.4	177.3	86	
	2	7A	31-Mar-14	10	80	7.9	153.1	154.9	144.4	108.8	160.3	163.0	80	
	4	7A	21-Mar-14	23	80	4.7	144.9	156.7	145.2	148.8	142.7	166.3	80	
	4	7B	31-Mar-14	20	82	7.9	136.9	152.6	141.3	143.3	129.8	162.3	82	
	4	7C	3-Apr-14	13	80	7.4	137.2	156.4	148.0	150.0	146.4	167.4	80	
	5	7B	21-Mar-14	5.5	80	4.7	148.3	141.0	161.7	161.7	154.8	167.0	80	
	5	7C	29-Mar-14	5	83	2.4	150.4	141.2	162.4	156.2	160.4	163.8	83	
	5	7A	31-Mar-14	9	82	8.3	125.7	134.4	153.9	150.5	158.7	161.5	82	
	6	7C	21-Mar-14	7	80	5.4	107.6	152.8	163.6	166.2	121.0	167.6	80	
	6	7B	29-Mar-14	10	86	3.8	129.4	151.8	155.6	168.4	146.4	178.0	86	
	6	7A	31-Mar-14	22	82	12.2	114.8	141.5	167.8	165.4	131.9	158.7	82	
	7	7B	21-Mar-14	18	80	5.4	161.6	154.8	154.4	173.2	171.4	182.0	80	
	7	7A	29-Mar-14	29	88	3.6	167.6	158.7	147.1	169.9	173.4	179.7	88	
	7	7C	31-Mar-14	8	80	7.9	150.4	153.8	159.8	170.6	166.4	175.8	80	
	7	7B	7-Apr-14	30	89	10.2	146.8	156.4	153.5	147.7	168.5	182.5	89	
	9	7A	21-Mar-14	20	80	5.4	123.6	149.9	157.5	124.0	157.8	162.0	80	
	9	7C	29-Mar-14	7	86	4.4	152.8	149.2	181.2	131.0	152.2	171.0	86	
	9	7B	31-Mar-14	9	81	8.3	124.2	140.3	177.7	121.4	152.6	162.6	81	
	13	7C	21-Mar-14	7	82	4.5	135.8	172.6	166.0	158.6	143.2	177.8	82	
	13	7A	28-Mar-14	22	81	3.9	137.7	173.5	156.5	152.2	129.5	173.1	81	
	13	7C	29-Mar-14	14	83	3.8	134.2	165.8	158.4	148.8	139.0	172.8	83	
	13	7B	31-Mar-14	21	83	13.8	118.9	170.0	161.2	157.4	119.3	178.6	83	
	14	7B	21-Mar-14	16.5	82	4.5	127.6	177.5	157.5	197.0	132.0	168.4	82	
	14	7C	28-Mar-14	13	84	3.9	111.8	162.2	154.4	199.4	132.8	169.2	84	
	14	7A	29-Mar-14	23	84	2.4	118.4	172.8	155.4	197.9	120.9	172.3	84	
	19	7A	21-Mar-14	19	82	4.5	126.7	138.9	135.5	142.2	136.0	145.9	82	
	19	7C	28-Mar-14	21	82	4.5	116.2	134.9	141.1	141.4	122.8	146.2	82	
	19	7B	29-Mar-14	30	88	4.4	124.1	144.5	132.8	143.6	120.7	150.6	88	
	20	7C	21-Mar-14	7	81	7.7	142.4	128.0	176.8	174.2	164.2	159.1	81	
	20	7B	28-Mar-14	23	88	3.9	154.0	151.5	177.0	173.3	158.3	162.6	83	
	20	7A	29-Mar-14	36	87	4.4	151.5	147.8	170.0	166.6	148.8	162.2	87	
	21	7A	21-Mar-14	29.5	82	7.7	174.0	179.6	188.2	179.6	193.6	198.7	82	
	21	7B	28-Mar-14	18	86	4.5	165.3	171.3	172.0	169.1	178.3	187.2	83	
	21	7C	31-Mar-14	12	82	13.8	173.0	174.2	169.6	164.4	174.6	180.6	82	
	23	7B	21-Mar-14	31	81	7.7	143.6	144.0	171.6	161.6	162.1	167.8	81	
	23	7A	28-Mar-14	20	83	4.5	151.3	148.2	170.1	160.1	156.3	166.4	83	
	23	7C	29-Mar-14	12	84	4.8	145.2	146.2	159.8	154.2	156.4	161.8	84	
	24	7B	21-Mar-14	15	82	10.8	143.9	151.7	157.0	158.2	155.9	160.4	82	
	24	7C	28-Mar-14	12	87	2.1	132.0	151.0	164.4	158.8	143.0	161.4	87	
	24	7B	29-Mar-14	21	86	4.8	138.4	148.2	166.9	155.9	149.9	167.7	86	
	24	7A	31-Mar-14	15	82	13.8	132.4	148.5	170.1	163.4	143.3	159.0	82	
	26	7C	21-Mar-14	8.5	82	10.8	139.6	152.4	155.2	154.2	140.6	160.8	82	
	26	7B	28-Mar-14	16.5	86	2.1	150.4	158.9	150.3	153.9	151.6	163.8	85	
	26	7A	29-Mar-14	16	81	4.8	138.2	147.4	150.8	152.1	156.9	161.3	81	
	27	7A	21-Mar-14	33	82	10.8	139.8	137.7	114.8	120.6	110.8	140.4	82	
	27	7C	21-Mar-14	7	80	6.4	140.2	143.2	206.0	151.0	134.2	166.4	80	
	27	7A	28-Mar-14	28	93	9.0	143.8	143.0	165.9	152.9	155.7	163.8	93	
	27	7B	29-Mar-14	14.5	90	3.6	138.3	148.0	116.8	128.0	150.4	147.9	90	
	33	7A	21-Mar-14	23	80	9.4	138.6	125.8	121.3	125.2	144.3	141.4	80	
	33	7C	28-Mar-14	8	84	9.0	142.8	132.4	166.2	147.4	144.2	143.2	84	
	33	7B	31-Mar-14	19	85	12.2	130.0	133.5	119.0	135.5	134.5	141.7	85	
	33	7C	7-Apr-14	18	89	10.2	134.6	129.6	127.4	131.6	138.2	138.4	89	
	36	7B	21-Mar-14	10	80	9.4	125.8	120.8	128.8	130.8	140.4	135.2	80	
	36	7A	29-Mar-14	10	82	3.8	146.2	127.2	120.8	126.8	146.8	139.4	82	
	36	7A	28-Mar-14	12	84	2.1	142.9	133.6	123.3	128.9	140.2	137.8	84	
	36	7C	31-Mar-14	8	84	12.2	137.6	128.6	118.2	124.8	129.9	134.4	84	
	39	7C	29-Mar-14	14	88	3.6	153.2	143.8	162.8	154.6	162.0	157.2	88	
	39	7A	28-Mar-14	20	84	2.1	142.9	133.6	123.3	128.9	140.2	137.8	84	
	39	7B	28-Mar-14	14	84	9.0	157.3	147.3	170.8	159.6	166.7	161.8	84	

Vehicle	Fuel	Rater	Date	REDUCED DATA									
				TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class D -- 80 to 90	2	7C	21-Mar-14	5	80	4.7	154.2	158.4	154.2	113.0	166.2	168.0	80
	2	7B	29-Mar-14	21.5	86	2.4	157.3	168.0	154.1	144.8	175.4	177.3	86
	2	7A	31-Mar-14	10	80	7.9	153.1	154.9	144.4	108.8	160.3	163.0	80
	4	7A	21-Mar-14	23	80	4.7	144.9	156.7	145.2	148.8	142.7	166.3	80
	4	7B	31-Mar-14	20	82	7.9	136.9	152.6	141.3	143.3	129.8	162.3	82
	4	7C	3-Apr-14	13	80	7.4	137.2	156.4	148.0	150.0	146.4	167.4	80
	5	7B	21-Mar-14	5.5	80	4.7	148.3	141.0	161.7	161.7	154.8	167.0	80
	5	7C	29-Mar-14	5	83	2.4	150.4	141.2	162.4	156.2	160.4	163.8	83
	5	7A	31-Mar-14	9	82	8.3	125.7	134.4	153.9	150.5	158.7	161.5	82
	6	7C	21-Mar-14	7	80	5.4	107.6	152.8	163.6	166.2	121.0	167.6	80
	6	7B	29-Mar-14	10	86	3.8	129.4	151.8	155.6	168.4	146.4	178.0	86
	6	7A	31-Mar-14	22	82	12.2	114.8	141.5	167.8	165.4	131.9	158.7	82
	7	7B	21-Mar-14	18	80	5.4	161.6	154.8	154.4	173.2	171.4	182.0	80
	7	7A	29-Mar-14	29	88	3.6	167.6	158.7	147.1	169.9	173.4	179.7	88
	7	7C	31-Mar-14	8	80	7.9	150.4	153.8	159.8	170.6	166.4	175.8	80
	7	7B	7-Apr-14	30	89	10.2	146.8	156.4	153.5	147.7	168.5	182.5	89
	9	7A	21-Mar-14	20	80	5.4	123.6	149.9	157.5	124.0	157.8	162.0	80
	9	7C	29-Mar-14	7	86	4.4	152.8	149.2	181.2	131.0	152.2	171.0	86
	9	7B	31-Mar-14	9	81	8.3	124.2	140.3	177.7	121.4	152.6	162.6	81
	13	7C	21-Mar-14	7	82	4.5	135.8	172.6	166.0	158.6	143.2	177.8	82
	13	7A	28-Mar-14	22	81	3.9	137.7	173.5	156.5	152.2	129.5	173.1	81
	13	7C	29-Mar-14	14	83	3.8	134.2	165.8	158.4	148.8	139.0	172.8	83
	13	7B	31-Mar-14	21	83	13.8	118.9	170.0	161.2	157.4	119.3	178.6	83
	14	7B	21-Mar-14	16.5	82	4.5	127.6	177.5	157.5	197.0	132.0	168.4	82
	14	7C	28-Mar-14	13	84	3.9	111.8	162.2	154.4	199.4	132.8	169.2	84
	14	7A	29-Mar-14	23	84	2.4	118.4	172.8	155.4	197.9	120.9	172.3	84
	19	7A	21-Mar-14	19	82	4.5	126.7	138.9	135.5	142.2	136.0	145.9	82
	19	7C	28-Mar-14	21	82	4.5	116.2	134.9	141.1	141.4	122.8	146.2	82
	19	7B	29-Mar-14	30	88	4.4	124.1	144.5	132.8	143.6	120.7	150.6	88
	20	7C	21-Mar-14	7	81	7.7	142.4	128.0	176.8	174.2	164.2	159.1	81
	20	7B	28-Mar-14	23	88	3.9	154.0	151.5	177.0	173.3	158.3	162.6	83
	20	7A	29-Mar-14	36	87	4.4	151.5	147.8	170.0	166.6	148.8	162.2	87
	21	7A	21-Mar-14	29.5	82	7.7	174.0	179.6	188.2	179.6	193.6	198.7	82
	21	7B	28-Mar-14	18	86	4.5	165.3	171.3	172.0	169.1	178.3	187.2	83
	21	7C	31-Mar-14	12	82	13.8	173.0	174.2	169.6	164.4	174.6	180.6	82
	23	7B	21-Mar-14	31	81	7.7	143.6	144.0	171.6	161.6	162.1	167.8	81
	23	7A	28-Mar-14	20	83	4.5	151.3	148.2	170.1	160.1	156.3	166.4	83
	23	7C	29-Mar-14	12	84	4.8	145.2	146.2	159.8	154.2	156.4	161.8	84
	24	7B	21-Mar-14	15	82	10.8	143.9	151.7	157.0	158.2	155.9	160.4	82
	24	7C	28-Mar-14	12	87	2.1	132.0	151.0	164.4	158.8	143.0	161.4	87
	24	7B	29-Mar-14	21	86	4.8	138.4	148.2	166.9	155.9	149.9	167.7	86
	24	7A	31-Mar-14	15	82	13.8	132.4	148.5	170.1	163.4	143.3	159.0	82
	26	7C	21-Mar-14	8.5	82	10.8	139.6	152.4	155.2	154.2	140.6	160.8	82
	26	7B	28-Mar-14	16.5	86	2.1	150.4	158.9	150.3	153.9	151.6	163.8	85
	26	7A	29-Mar-14	16	81	4.8	138.2	147.4	150.8	152.1	156.9	161.3	81
	27	7A	21-Mar-14	33	82	10.8	139.8	137.7	114.8	120.6	110.8	140.4	82
	27	7C	21-Mar-14	7	80	6.4	140.2	143.2	206.0	151.0	134.2	166.4	80
	27	7A	28-Mar-14	28	93	9.0	143.8	143.0	165.9	152.9	155.7	163.8	93
	27	7B	29-Mar-14	14.5	90	3.6	138.3	148.0	116.8	128.0	150.4	147.9	90
	33	7A	21-Mar-14	23	80	9.4	138.6	125.8	121.3	125.2	144.3	141.4	80
	33	7C	28-Mar-14	8	84	9.0	142.8	132.4	166.2	147.4	144.2	143.2	84
	33	7B	31-Mar-14	19	85	12.2	130.0	133.5	119.0	135.5	134.5	141.7	85
	33	7C	7-Apr-14	18	89	10.2	134.6	129.6	127.4	131.6	138.2	138.4	89
	36	7B	21-Mar-14	10	80	9.4	125.8	120.8	128.8	130.8	140.4	135.2	80
	36	7A	29-Mar-14	10	82	3.8	146.2	127.2	120.8	126.8	146.8	139.4	82
	36	7A	28-Mar-14	12	84	2.1	142.9	133.6	123.3	128.9	140.2	137.8	84
	36	7C	31-Mar-14	8	84	12.2	137.6	128.6	118.2	124.8	129.9	134.4	84
	39	7C	29-Mar-14	14	88	3.6	153.2	143.8	162.8	154.6	162.0	157.2	88
	39	7A	28-Mar-14	20	84	2.1	142.9	133.6	123.3	128.9	140.2	137.8	84
	39	7B	28-Mar-14	14	84	9.0	157.3	147.3	170.8	159.6	166.7	161.8	84
	36	8B	12-Apr-14	16	91	2.7	147.2	132.7	125.1	132.6	134.4	140.4	91
	36	8A	12-Apr-14	7	89	14.1	134.8	136.3	129.5	133.1	136.1	141.4	89
	39	8A	5-Apr-14	10	75	8.8	143.9	133.6	150.4	141.8	144.3	144.8	75
	39	8C	7-Apr-14	6	95	8.6	159.6	153.4	175.4	165.2	163.8	161.8	95
	39	8B	8-Apr-14	21.5	96	3.1	154.1	146.4	164.3	156.2	166.7	163.5	96
	39	8B	12-Apr-14	19	90	14.1	148.1	138.2	169.3	162.2	151.0	147.5	90
	39	8A	15-Apr-14	13	86	0.6	157.7	146.4	157.0	150.6	163.6	155.0	86

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class D -- 80 to 90	2	10C	25-Apr-14	9	85	5.0	154.8	159.0	159.7	115.8	163.4	167.9	85
	2	10C	17-Apr-14	10	85	10.5	159.8	160.2	159.2	120.0	178.0	174.4	85
	2	10A	2-May-14	16	91	0.9	166.5	162.9	155.5	118.9	175.0	172.7	91
	2	10B	24-Apr-14	19.5	91	5.6	154.8	166.0	151.2	120.0	164.3	174.6	91
	4	10C	17-Apr-14	13.5	88	0.9	146.6	160.8	157.0	158.4	156.2	169.0	88
	4	10B	24-Apr-14	22	93	3.1	147.7	164.5	161.2	165.2	157.3	175.1	93
	4	10A	16-Apr-14	24	90	3.9	148.1	161.0	152.4	155.7	154.9	169.5	90
	4	10A	25-Apr-14	33.5	84	5.0	146.4	152.1	142.2	144.1	147.2	161.5	84
	4	10B	2-May-14	27	92	0.9	145.6	156.5	151.6	154.5	146.9	168.5	92
	5	10C	21-Apr-14	10	89	3.1	153.0	143.0	160.6	158.2	167.6	165.4	89
	5	10A	24-Apr-14	16	87	0.5	152.5	140.7	161.6	155.1	161.2	165.5	87
	5	10A	17-Apr-14	17.5	87	0.9	151.0	147.4	164.6	161.9	159.4	168.3	87
	5	10B	16-Apr-14	21	93	3.9	151.9	140.7	158.4	156.3	161.4	162.0	93
	5	10B	25-Apr-14	10.5	84	5	137.9	132	160.3	154.9	143.4	160	84
	6	10C	21-Apr-14	9	90	2.9	131.0	152.6	164.8	168.0	139.8	168.6	90
	6	10C	24-Apr-14	14	88	4.1	131.4	155.8	168.2	170.8	148.6	170.2	87
	6	10B	17-Apr-14	16	91	6.9	123.4	154.6	156.5	166.5	134.8	164.6	91
	6	10A	16-Apr-14	24	90	3.9	123.5	149.7	158.2	168.7	151.4	169.5	90
	6	10A	25-Apr-14	24	84	5	115.2	149	167.2	167.3	132.4	164.7	84
	7	10C	16-Apr-14	16.5	90	3.9	165.2	160.2	167.2	178.6	178.8	183.8	90
	7	10A	28-Apr-14	22	85	8.0	148.6	153.5	153.3	167.3	155.2	176.3	85
	7	10B	24-Apr-14	24	89	0.5	168.7	155.2	165.6	175.6	178.8	186.1	89
	7	10B	21-Apr-14	26.5	90	3.1	173.7	158.6	161.7	179.7	175.8	185.7	90
	9	10C	16-Apr-14	4.5	92	7.3	141.6	154.8	184.4	130.4	154.2	170.4	92
	9	10A	24-Apr-14	14	91	5.6	158.0	156.7	197.8	131.5	148.8	172.9	91
	9	10A	21-Apr-14	18	89	3.1	145.5	150.9	178.1	132.3	178.8	177.8	89
	9	10B	17-Apr-14	27	86	10.5	139.3	150.5	187.2	130.6	149.3	167.2	86
	9	10C	25-Apr-14	9	86	5	129.6	147.1	173.6	126.3	158	164.5	86
	13	10C	23-Apr-14	10	84	15.3	125.2	167.6	153.4	155.8	116.9	171.6	84
	13	10C	17-Apr-14	11	90	6.9	129.6	174.2	174.4	165.0	139.0	180.2	90
	13	10A	21-Apr-14	19	91	2.9	133.6	173.1	167.1	159.1	146.1	179.3	91
	13	10B	16-Apr-14	21	90	3.9	132.3	174.8	170.3	163.8	146.7	182.7	90
	14	10A	23-Apr-14	6	81	15.3	110.8	158.2	136.7	191.7	104.5	147.8	80
	14	10A	16-Apr-14	11	91	7.3	141.2	180.7	162.1	199.8	141.9	178.8	91
	14	10C	21-Apr-14	17	93	1.4	105.6	171.4	168.4	202.0	118.0	173.0	93
	14	10B	17-Apr-14	21	90	0.9	118.8	171.0	162.4	199.0	141.8	176.0	90
	14	10C	24-Apr-14	19	90	1.4	132.6	175.8	158.6	198.2	123.4	176.6	90
	19	10C	21-Apr-14	13.5	93	4.4	132.8	148.0	160.2	155.8	128.4	161.8	93
	19	10A	17-Apr-14	22.5	88	6.9	131.2	146.8	146.0	148.2	123.7	153.8	88
	19	10B	23-Apr-14	30	85	15.3	124.6	136.1	128.1	142.1	111.5	145.5	85
	19	10B	16-Apr-14	47	96	5.4	130.8	152.6	151.1	162.8	142.5	168.7	96
	19	10A	24-Apr-14	30	89	1.4	135.1	152.3	138.1	146.4	133.6	155.9	89
	20	10C	23-Apr-14	15	85	8.4	133.6	128.2	169.4	163.2	129.4	134.6	85
	20	10B	16-Apr-14	29	93	7.3	153.2	149.9	179.3	174.1	162.1	164.6	93
	20	10A	21-Apr-14	32	95	1.4	152.1	153.9	176.4	171.8	167.9	166.7	95
	20	10B	24-Apr-14	35	90	1.4	150.6	146.7	177.7	174.4	157.3	165.1	90
	21	10C	16-Apr-14	13	90	3.9	169.8	175.0	175.0	170.7	181.6	186.2	90
	21	10B	21-Apr-14	24	95	1.4	171.8	180.4	175.0	176.1	182.6	187.6	95
	21	10A	23-Apr-14	25.5	81	8.4	165.7	171.7	168.4	166.5	169.2	172.1	81
	21	10A	24-Apr-14	31.5	91	4.1	170.2	178.5	171.5	169.1	182.0	186.2	91
	23	10C	16-Apr-14	12.5	92	5.4	149.4	149.0	172.0	161.1	164.4	167.8	92
	23	10C	24-Apr-14	18	90	5.6	154.6	158.8	175.5	168.1	169.2	172.2	90
	23	10B	23-Apr-14	29	86	8.4	131.3	141.9	163.7	156.7	155.5	163.6	86
	23	10A	21-Apr-14	32	94	4.4	155.3	154.2	175.5	176.7	165.3	171.2	93
	24	10C	23-Apr-14	7	85	9.3	0.0	148.2	0.0	164.2	0.0	153.6	85
	24	10B	28-Apr-14	13	86	9.0	126.3	145.1	167.1	158.1	148.6	151.7	86
	24	10A	24-Apr-14	18	90	3.1	138.9	151.6	171.6	164.1	158.5	164.9	90
	24	10A	17-Apr-14	20	85	10.5	139.2	148.7	165.0	155.0	149.5	161.5	85
	26	10C	23-Apr-14	11	83	15.3	124.8	149.6	145.4	155.6	116.2	158.8	83
	26	10A	16-Apr-14	17	91	5.4	145.0	158.3	157.2	159.9	159.3	166.2	91
	26	10B	21-Apr-14	19.5	92	2.9	130.8	149.1	152.8	160.2	153.7	169.4	92
	26	10B	24-Apr-14	22.5	91	4.1	139.6	152.1	156.5	159.6	139.8	168.6	91
	27	10C	28-Apr-14	10.5	81	9.0	114.6	136.0	163.0	149.2	152.0	159.4	81
	27	10C	24-Apr-14	13.5	90	3.1	146.2	144.8	119.2	126.0	157.8	147.4	90
	27	10B	21-Apr-14	16	96	4.4	140.0	144.8	129.9	135.1	138.2	153.6	96
	27	10A	23-Apr-14	24.5	84	9.3	120.2	135.7	111.5	119.3	122.1	139.2	84
	33	10C	17-Apr-14	11.5	86	8.0	142.8	132.6	122.8	131.4	147.4	145.4	86
	33	10A	23-Apr-14	14.5	83	15.3	131.0	126.3	124.4	132.1	116.5	131.7	83
	33	10B	28-Apr-14	19.5	84	8.0	136.2	130.4	114.7	124.6	136.8	140.9	84
	36	10A	28-Apr-14	8	84	9.0	111.3	125.1	124.8	128.1	125.8	132.3	84
	36	10C	24-Apr-14	13	88	0.5	139.0	128.6	132.2	136.0	150.2	145.8	88
	36	10B	23-Apr-14	14.5	88	9.3	137.1	0.0	129.8	137.4	133.8	144.1	88
	36	10B	17-Apr-14	23	88	8.0	130.6	113.7	140.5	113.7	144.4	113.7	88
	39	10C	28-Apr-14	5	80	8.0	142.2	138.6	160.2	152.4	151.8	149.4	80
	39	10A	17-Apr-14	15	84	8.0	155.6	141.2	160.1	149.6	163.4	155.7	84
	39	10B	23-Apr-14	26.5	87	15.3	152.7	142.0	169.6	161.4	139.3	150.2	87

Table F-1 Cont'd.
Test Data -- 90 to 100 °F

Vehicle	Fuel	Rater	Date	REDUCED DATA									
				TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class C -- 90 to 100	2	9C	21-Jul-14	5	95	7.5	169	166.2	151	122	175.2	173.2	95
	2	9A	23-Jul-14	16	103	1.3	154.3	165.1	144	119.4	151.5	167.4	103
	2	9B	25-Jul-14	12	99	5.7	154.2	166.4	146.1	117.7	150.8	164.1	99
	2	9A	30-Jul-14	9	97	4.4	168.6	167.7	143	119.2	172.5	171.3	97
	4	9A	21-Jul-14	26.5	95	7.5	157.2	168.6	162.1	173.5	153.2	174	95
	4	9C	23-Jul-14	11	103	1.3	153.2	168.4	162.8	169.2	176.6	153.2	103
	4	9B	25-Jul-14	29.5	98	5.8	141.9	167	161.9	165.8	141.7	173.5	98
	4	9C	30-Jul-14	12	99	4.8	151.8	166.2	165.6	165	159.8	176.6	99
	5	9B	21-Jul-14	4	96	7.5	150	144.9	167.9	162.6	165.2	169.7	96
	5	9C	23-Jul-14	7	103	3.5	157	152.2	179	169	171.6	173.8	103
	5	9A	25-Jul-14	8	96	5.7	129.2	149.8	160	163.9	159.2	170.6	96
	5	9C	31-Jul-14	5	92	1.2	155.6	149	166	163	166.2	171	92
	6	9C	21-Jul-14	6	95	7	142.4	159.8	173.8	173.4	173.2	145.8	95
	6	9B	23-Jul-14	8	105	1.3	133.1	158.2	167	168.4	133.7	170.7	105
	6	9A	25-Jul-14	13	98	5.8	130	156.3	174.3	174.2	130.8	170.8	98
	6	9A	29-Jul-14	14	96	2.2	125.3	157.8	175.3	176.2	153.6	175.5	96
	6	9B	31-Jul-14	0.5	94	1.2	139.1	154.7	165.2	169.9	144.4	177.7	94
	7	9A	21-Jul-14	24	94	7	172.1	163.4	165.3	175.1	177.3	182.7	94
	7	9B	23-Jul-14	25.5	105	3.5	175.2	164.7	156.3	175.8	179	183.5	105
	7	9C	25-Jul-14	12	98	5.8	171	165.4	156.4	175.4	177.6	181	98
	7	9B	28-Jul-14	5	102	5.5	163.4	166.2	157.1	172.1	172.6	180.8	102
	9	9B	21-Jul-14	8	98	7	150.1	158.1	161.1	136.3	166.5	156.5	98
	9	9A	23-Jul-14	8	100	3.5	158.2	161.8	167.2	140.2	165.7	172.5	100
	9	9C	25-Jul-14	9	96	5.7	153.4	157	161.2	139	151.6	167.2	96
	13	9C	21-Jul-14	13	99	4.8	151.8	178.2	178.2	164.8	152.8	181.2	99
	13	9A	26-Jul-14	16	96	10	119	178.4	166.8	159.5	139.8	179.5	96
	13	9B	28-Jul-14	11	100	1.9	146.4	181.4	176.6	166.9	153.9	184.4	100
	14	9A	21-Jul-14	8	98	4.8	137.8	179.6	159.2	196.9	119.9	173.4	98
	14	9C	26-Jul-14	15	95	10	111.4	160.2	157	199.2	127.4	169.6	95
	14	9B	28-Jul-14	6	104	5.3	148.9	184.9	173	201.2	148.5	184.2	104
	14	9A	31-Jul-14	9	93	1.9	141.7	182.1	170.9	200.9	149.7	187.6	93
	19	9B	21-Jul-14	35	100	4.8	131.1	150.3	149.9	157.1	133	158.3	100
	19	9C	26-Jul-14	18.5	97	9.6	111.4	133.6	145.2	149.6	123.8	153.4	97
	19	9A	28-Jul-14	32.5	98	1.3	130.6	150.2	142.8	151	132.6	162.4	98
	20	9C	21-Jul-14	18	100	5.4	158.2	150.2	181.6	176.2	166.2	166	100
	20	9A	22-Jul-14	21	100	2.7	156.3	154.9	180.1	174.7	170	172.4	100
	20	9B	26-Jul-14	13	98	10	144.4	145.1	177.3	176	140.7	147.4	98
	21	9A	21-Jul-14	17.5	99	5.4	180.7	190.1	178.4	175.5	187.5	190.6	99
	21	9B	30-Jul-14	12	99	4.8	173.2	181.1	179.4	175.4	183.6	190.8	99
	21	9C	28-Jul-14	9	96	1.9	171.8	181.4	178.6	173	182.4	191	96
	21	9B	29-Jul-14	19	98	1.3	179.1	184.9	180.3	176.4	190.7	197.3	98
	23	9B	21-Jul-14	20.5	102	5.4	159.9	157.1	162.3	167.4	156.5	167.8	102
	23	9A	26-Jul-14	22.5	96	9.6	129.2	154.2	169.9	164.7	159.8	166.8	96
	23	9C	28-Jul-14	18	97	1.3	152.8	160	176	168.8	165.6	173.4	97
	23	9C	31-Jul-14	16.5	93	1.9	153.6	155.8	172.8	164.8	164.2	169.8	93
	24	9C	21-Jul-14	9.5	104	8	125.2	155.6	160.4	158.6	147.2	161.6	104
	24	9B	26-Jul-14	16.5	98	9.6	132.3	152	159.6	160.2	149.7	159.3	98
	24	9A	28-Jul-14	22	98	1.9	153.2	154.7	172.3	163.9	162	167	98
	24	9C	30-Jul-14	11.5	98	4.4	151	154.2	162.6	160.6	161	166.4	98
	26	9B	21-Jul-14	8.5	106	8	138.2	162.8	157.2	167.2	143.1	170.9	106
	26	9C	22-Jul-14	9	99	2.7	150.4	158.2	158.8	161.4	169.4	165.6	99
	26	9A	28-Jul-14	12	100	5.3	163	161.6	159.5	162	153.3	169.7	100
	26	9A	29-Jul-14	20.5	97	1.3	140.1	157.3	157.5	158.3	162	166.5	97
	26	9B	30-Jul-14	4.5	99	4.4	163.3	155.6	154	160.6	160.1	164.4	99
	27	9A	21-Jul-14	21.5	100	8	133.2	146.7	139.4	141.6	156.1	153.4	100
	27	9C	22-Jul-14	12	100	2.2	156.6	147	140	141.6	172.4	158.6	100
	27	9B	28-Jul-14	13.5	99	1.3	155.7	148.8	127.2	135.7	148.9	152.2	99
	33	9C	21-Jul-14	11	102	5.4	146	143	143.4	148.8	153.2	158.8	102
	33	9B	22-Jul-14	10.5	102	2.7	147.8	137.3	150.5	151.7	160.9	159.1	102
	33	9A	28-Jul-14	17.5	99	5.5	146.4	142.4	143.9	147.3	157.8	156.9	99
	33	9B	29-Jul-14	19	100	2.2	146.8	137.5	136.4	142.7	153.2	152.7	100
	33	9A	31-Jul-14	17.5	93	1.2	143.3	134.7	134.9	139.7	151.2	149.3	93
	36	9B	21-Jul-14	9	105	5.4	138.8	141.1	155.9	154.1	140.3	152.1	105
	36	9A	22-Jul-14	6	100	2.2	105.3	144.3	102.9	149.9	115.1	156.7	100
	36	9C	28-Jul-14	16	102	5.3	151	143.8	151.2	151	154.2	157	102
	36	9C	29-Jul-14	14	96	2.2	139.4	134.6	93	153	110.6	157.2	96
	36	9A	30-Jul-14	12	99	4.8	145.8	136.7	147.6	147.9	107.6	153.8	99
	39	9A	21-Jul-14	12	100	5.4	164.7	158.6	169.9	164.3	165.1	162.5	100
	39	9B	22-Jul-14	16	105	2.2	167	155.8	178	170.6	179.1	173.8	105
	39	9C	28-Jul-14	6	103	5.5	167.2	156.2	169.8	165	175.4	166	103
	39	9C	29-Jul-14	8	96	1.3	159.8	153.4	177.6	168.4	171.2	169.8	96
	39	9B	31-Jul-14	4.5	95	1.9	164.5	154.5	174.5	167.5	171	169.9	95

				REDUCED DATA									
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class C -- 90 to 100	2	10 C	14-Jul-14	9	99	4.5	170	170.2	154.2	126.2	171	173	99
	2	10 B	15-Jul-14	24.5	100	0.7	171.2	169.6	143.9	124	170.4	171	100
	2	10 A	17-Jul-14	12	93	7.3	133.7	158.4	156.3	119.4	174.3	173.3	93
	4	10 A	14-Jul-14	28.5	100	4.5	161.9	170.3	167.2	169.5	165.8	179.6	100
	4	10 C	16-Jul-14	11.5	97	4.2	156	168	163.4	164.2	162.2	175.4	97
	4	10 B	17-Jul-14	15	94	7.3	129.9	159.6	158.6	160.9	155.3	170	94
	4	10 B	18-Jul-14	13	99	3.9	155.8	165	160	166.2	154.3	177.4	99
	5	10 B	14-Jul-14	33.5	100	4.5	168.7	159.2	167.4	169.1	164.9	173.1	100
	5	10 A	16-Jul-14	23	95	4.2	154.4	150.5	166.4	165.6	163.9	173.5	95
	5	10 C	17-Jul-14	6.5	96	7.3	154.8	149.8	167.6	162.8	160.2	161.4	96
	5	10 A	18-Jul-14	16	98	2.6	160.2	152.1	168.6	172.2	174.2	176.5	98
	6	10 C	14-Jul-14	11	98	4.5	137.6	161.4	168.4	174.2	151.2	174.2	98
	6	10 B	16-Jul-14	13	98	4.2	138	163.3	171.4	172.2	143.9	175.5	98
	6	10 A	17-Jul-14	20	96	6.6	118.1	157	168.5	168.5	138.8	171.2	96
	6	10 C	18-Jul-14	8	97	2.6	141	161.4	165.8	168.8	146.6	174	96
	7	10 A	14-Jul-14	25.5	98	4.5	166.3	167.6	164.1	176.1	175.5	185.4	98
	7	10 B	16-Jul-14	23.5	105	7.2	178.1	164.1	169.1	177.8	182.1	186.6	105
	7	10 C	17-Jul-14	12.5	97	6.6	172.2	163.8	166.4	175.8	181.6	182.8	97
	7	10 C	19-Jul-14	13.5	104	8.4	164.4	164.8	170.8	177.8	177.6	184.8	104
	9	10 B	14-Jul-14	38	100	4.5	146.2	165.1	171.8	145.3	153.9	175.2	100
	9	10 C	17-Jul-14	5	100	7.4	130.8	158.6	174.6	125.2	132.8	169.6	100
	9	10 A	18-Jul-14	15	93	4.1	158.6	158.6	159.9	139.1	159.6	168.9	93
	9	10 A	19-Jul-14	16	100	8.4	159.8	161.9	166	139	145.5	169.8	100
	13	10 C	15-Jul-14	11	98	2.7	150.2	180.2	167.6	166.2	159.2	182.8	98
	13	10 A	19-Jul-14	8	100	7.5	138.2	182	171.9	167.5	156.8	185.4	100
	13	10 B	18-Jul-14	8	98	3.5	143.9	178.1	171.4	164.3	149.4	182.6	98
	14	10 A	15-Jul-14	17	96	2.7	135.1	182.4	167.7	199.2	152.2	184.6	96
	14	10 B	19-Jul-14	17	103	7.5	146.8	186.9	175.1	200.6	132.5	183.4	103
	14	10 C	18-Jul-14	17	94	4.1	140	184.2	162	199	146.6	184.8	94
	19	10 B	15-Jul-14	47	98	2.7	138.8	154.3	163.5	162.1	144.6	169	98
	19	10 C	16-Jul-14	23	102	7.2	143	156.2	172.8	170.4	150.4	171	102
	19	10 A	18-Jul-14	24	96	3.5	132.7	147.7	153.6	156.9	131.6	164	96
	19	10 B	19-Jul-14	35.5	105	8.4	123.6	154.7	166.6	170.6	150.1	166.2	105
	20	10 C	15-Jul-14	20	99	0.7	160.4	153.6	181.2	175.4	165.2	171.2	99
	20	10 A	16-Jul-14	26	101	7.2	156.3	155.9	178.2	177	165.8	169.7	101
	20	10 B	18-Jul-14	13.5	103	2.6	151.7	154.8	181.2	179.2	163.6	169	103
	20	10 C	19-Jul-14	13	99	9.8	134.4	146.8	181.6	174.6	146.2	160.4	99
	21	10 A	15-Jul-14	27	99	0.7	175.4	185.1	181.1	176.9	186.9	191.1	99
	21	10 B	19-Jul-14	12	102	7.9	173.8	184.4	169.1	167.2	181	185.5	102
	21	10 C	18-Jul-14	10	93	3.5	169.6	181.2	177.2	170.4	181	188.2	93
	23	10 C	16-Jul-14	20	95	3	151.4	156.6	170.2	167	161.8	171.2	95
	23	10 B	17-Jul-14	28.5	103	7.6	153	154.9	164.5	167.9	151.8	169.6	103
	23	10 A	18-Jul-14	28	97	3.9	157.8	158.8	164.7	168.7	158.3	171.9	97
	23	10 A	19-Jul-14	27	97	7.9	147.2	158.8	159.2	164.4	147.8	165.5	97
	24	10 C	15-Jul-14	7	101	1.6	155.4	159	170.4	167	162.8	169	101
	24	10 A	16-Jul-14	8	95	3	146	157.2	169.3	164.5	158.4	170.2	95
	24	10 B	17-Jul-14	8	102	7.4	153.1	136.8	162.2	136.8	138.4	136.8	102
	26	10 A	15-Jul-14	14	100	1.6	157.4	156.8	160.6	163	163.9	170	100
	26	10 B	16-Jul-14	8	99	3	141.5	155.2	161.1	158	158.1	178	99
	26	10 C	18-Jul-14	9	97	3.9	145.8	156.8	160.4	0	167.6	166.4	97
	26	10 C	19-Jul-14	9	98	7.9	122.2	161.6	164	164.6	127.6	170.2	98
	27	10 B	15-Jul-14	21.5	102	1.6	155.6	152.9	149.7	151.2	165.9	166.6	102
	27	10 A	17-Jul-14	29.5	100	7.6	143.8	147.5	139.1	141.6	148.1	158.9	100
	27	10 C	19-Jul-14	12.5	102	7.5	152.2	153.4	148.4	147.6	166.2	160	102
	33	10 C	15-Jul-14	18.5	101	2	147	139.8	145.8	149.4	161.6	158.6	101
	33	10 A	16-Jul-14	20.5	100	6.2	151.4	142	141.8	146.5	159.6	154.9	100
	33	10 B	17-Jul-14	18.5	99	6.6	148.6	140.2	139.6	144.6	155.4	154.1	99
	33	10 B	19-Jul-14	5.5	102	9.8	149.3	140	139.5	144.1	155.1	153.8	102
	36	10 A	15-Jul-14	13	103	2	156.6	146.2	97.5	160.1	163	164.1	103
	36	10 B	16-Jul-14	15	101	6.2	155.7	215.8	158.8	215.8	156.1	215.8	101
	36	10 C	17-Jul-14	10.5	101	7.6	142.2	140.8	160.8	156.2	149.8	158.2	101
	36	10 A	19-Jul-14	12	99	9.8	137.5	142.2	87.9	150.6	94.6	152.1	99
	39	10 B	15-Jul-14	22	100	2	165.1	168.4	169.1	161.8	172.8	166.4	100
	39	10 C	16-Jul-14	9	101	6.2	164.2	156.2	182.6	171.8	176.8	172	101
	39	10 A	17-Jul-14	17.5	99	7.4	156.6	151	180.9	172.1	162.9	165.1	99
	39	10 B	18-Jul-14	16.5	94	4.1	160.3	150.6	167.9	162.8	167.3	165.2	94

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class B -- 90 to 100	2	12A	4-Aug-14	16	94	3	167.9	166.5	151.4	125.3	172.7	171.7	94
	2	12C	5-Aug-14	6	98	0.3	168.6	168.4	151	127.2	173.2	170	98
	2	12C	4-Aug-14	5	100	11.2	173.4	172.2	157.2	130	168.8	169.6	100
	2	12B	6-Aug-14	11	99	2.3	164.3	160	153.6	121.4	173.5	172.5	99
	4	12C	4-Aug-14	14	97	4.7	152.8	165.2	164.2	164.8	162.4	175.6	97
	4	12A	5-Aug-14	27	97	0.3	150.2	163.4	156.3	158.2	159.7	172.2	97
	4	12A	4-Aug-14	24.5	100	1.8	154.5	171.2	166	168	152.9	177.9	100
	4	12B	6-Aug-14	17.5	99	1.5	151.6	162.9	160.4	162.9	158.6	175	99
	5	12C	1-Aug-14	7	94	11.7	122.4	147	176.8	162.4	107.2	153.2	94
	5	12A	4-Aug-14	19	90	2.9	149.5	143.7	162.5	158	165.9	165.8	90
	5	12B	4-Aug-14	3.5	100	6.4	159.3	155.8	175.6	171.2	175.7	178.7	100
	5	12A	6-Aug-14	22.5	100	3.7	156.2	151.2	170.3	164.7	172.1	172.5	100
	6	12B	1-Aug-14	6.5	97	11.7	118.3	156.3	162.6	167.1	125.6	162.8	97
	6	12C	4-Aug-14	8	92	2.9	134.6	152.6	159.4	166.6	142.6	165.4	92
	6	12A	4-Aug-14	18	98	6.4	130.6	162	164.1	170	144.7	169.5	98
	6	12B	6-Aug-14	10	100	3.7	140.5	159	163.8	169.9	148.7	173.5	100
	7	12A	4-Aug-14	22.5	98	5.5	172.4	162.9	169.3	176.4	176.4	181.9	98
	7	12B	5-Aug-14	20.5	99	0.3	171.1	161.4	143.2	169.4	172.9	178.4	99
	7	12C	4-Aug-14	13	100	6.9	174.6	166	157.2	172.2	172	180.4	99
	7	12C	6-Aug-14	12	99	4.7	0	164.2	170.2	179.4	182.2	186.2	99
	9	12B	4-Aug-14	9	100	5.5	166.4	166.7	163.2	138.5	150.6	168.5	100
	9	12C	5-Aug-14	6	97	0.8	155.2	158.4	141.4	140.8	166.2	171	97
	9	12A	4-Aug-14	24	102	6.9	159.2	166.7	166.5	140.9	144.3	170.7	102
	9	12A	6-Aug-14	20	99	4.7	150.4	161.1	166.2	137.6	159.7	169.5	99
	13	12C	4-Aug-14	9	98	5.5	146.4	179.8	165.2	165.6	151.8	181	98
	13	12A	5-Aug-14	24	98	0.8	143.9	176.8	170.7	164.7	151.7	181.3	98
	13	12B	4-Aug-14	11	99	6.9	156.8	0	173.1	165.5	159	182.8	99
	13	12B	6-Aug-14	10	102	4.7	139.6	180.3	173	168.2	151.8	184.6	102
	14	12A	1-Aug-14	10	93	11.7	119.7	166.2	154.4	194.4	117.7	162.5	93
	14	12C	4-Aug-14	19.5	92	0.8	130.2	173.4	161.8	197.6	129.2	168.4	92
	14	12B	4-Aug-14	24	100	10.9	139.8	181.4	162.1	196.9	140.7	183.4	100
	19	12B	4-Aug-14	31.5	97	4.7	131.2	150.4	144.1	155.2	137.5	161.6	97
	19	12C	5-Aug-14	24	98	1.1	137	153.4	156.8	158.2	128.2	163.8	98
	19	12C	4-Aug-14	23	101	1.8	132.6	152.8	168.6	170.2	150.6	167.4	101
	19	12A	6-Aug-14	14	97	2.3	132.8	147.8	145.8	151.4	141.5	160.5	97
	20	12A	4-Aug-14	22	94	4.7	155.4	149.5	174.7	172.9	156.8	161.8	94
	20	12B	5-Aug-14	17	99	0.8	153.6	154	178.8	175.8	167.6	171.8	99
	20	12B	4-Aug-14	16	100	1.8	156.5	157.7	180.9	178.1	141.8	161.4	99
	20	12C	6-Aug-14	14	95	2.3	159.6	156.2	180.4	174.6	167.8	166.8	95
	21	12C	4-Aug-14	10	97	5	174.2	179.8	178.4	174	187.8	191.2	97
	21	12A	5-Aug-14	35	99	1.1	175.2	185.5	175.4	174.8	185.1	189.3	99
	21	12B	4-Aug-14	14	100	11.2	177.8	189.2	174.5	169.3	183.1	186.2	99
	23	12C	1-Aug-14	19.5	94	11.7	144.2	156.6	176	168	148.8	170.4	94
	23	12B	4-Aug-14	19	93	0.8	145.6	149.5	166.8	163.3	162.9	168.3	93
	23	12A	4-Aug-14	36	99	10.9	160.4	164.3	162.8	164.3	164.6	167.6	99
	24	12B	4-Aug-14	14	97	5	149.9	154.2	157.3	157.9	154.4	164.9	96
	24	12A	5-Aug-14	21	99	2.6	150.4	153.8	164.5	164.3	164.4	168.5	99
	24	12A	4-Aug-14	22	100	11.2	147.1	157.8	158.1	158.9	149.8	163.5	100
	24	12C	6-Aug-14	9	96	1.5	144	150.8	175.4	166	156.4	165.8	96
	26	12C	4-Aug-14	13	98	5.5	138.6	157.2	162	164	159.6	169.4	98
	26	12B	5-Aug-14	3	101	1.1	156.6	157.9	158.6	161.1	146	168.2	101
	26	12A	4-Aug-14	12	100	5	137.7	161.3	159.3	161.4	161.1	167.2	100
	27	12A	4-Aug-14	24.5	98	5.5	155.3	150.2	139.3	140.9	147.7	158.8	98
	27	12B	5-Aug-14	16	100	2.6	159.7	147.4	130.3	135.8	158.6	152.6	100
	27	12B	4-Aug-14	21	100	5	128.9	152	135.2	140.1	157.6	150	98
	27	12C	6-Aug-14	11.5	99	3.7	155.8	149	135.6	137.2	170.2	156.2	99
	33	12A	1-Aug-14	29	95	11.7	139.7	138.2	138.7	142.6	148.2	153.8	95
	33	12B	4-Aug-14	14.5	93	2.9	141.3	132.1	127.6	134.2	145.3	145.7	93
	33	12C	4-Aug-14	11	100	6.4	147.8	142.8	143.2	145.2	156	154.4	100
	36	12B	4-Aug-14	12.5	99	5.5	146.1	139.1	153.6	150	151.6	155.2	99
	36	12C	5-Aug-14	12	97	2.6	151.4	140.6	150.6	150	157.4	155.8	97
	36	12C	4-Aug-14	11	101	5	144.4	141.2	154.6	151.8	146.6	155.8	101
	36	12A	6-Aug-14	12	96	1.5	143.1	133.5	147.4	145.5	148.9	152.3	96
	39	12B	1-Aug-14	11.5	94	11.7	158.9	152.2	168.9	167.2	154.6	158.9	94
	39	12A	4-Aug-14	14	93	0.8	148.3	143.2	170.3	161.8	166.4	161.4	93
	39	12C	4-Aug-14	6.5	100	10.9	163	155.6	169.6	162.8	168.8	162.2	100

Table F-1 Cont'd.
Test Data -- 100 to 120 °F

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class B -- 100 to 120	2	11B	15-Jul-14	27	107	7.1	176.1	174.7	156.4	128.9	172.5	174.5	107
	2	11A	16-Jul-14	16	101	3.5	171.8	172.5	155.7	126.5	177.8	175.3	101
	2	11C	17-Jul-14	5	105	11.4	169.8	170	148.2	125	160	165.6	105
	2	11A	18-Jul-14	14	101	1.4	170.4	170	156.8	125.5	178	175.7	99
	4	11C	15-Jul-14	9	104	1.6	161.6	171	171	172	166.2	180	104
	4	11A	16-Jul-14	16	103	4.1	164.2	179.1	171	173.6	166.4	180.5	103
	4	11B	17-Jul-14	3.5	106	11.4	151.9	136.8	173.7	136.8	162	136.8	106
	5	11A	15-Jul-14	16.5	106	1.6	159.1	156.6	172.7	169.5	168.4	176.1	106
	5	11B	16-Jul-14	14	108	4.1	144.3	160.6	172.2	172.3	173.2	178.2	108
	5	11C	17-Jul-14	8	106	8.2	159.2	161.8	170.6	173.2	178.8	178.4	106
Class B -- 100 to 120	6	11B	15-Jul-14	11.5	107	5.4	143.8	169.3	171.6	176.5	156.5	179.9	107
	6	11C	16-Jul-14	7.5	105	4.1	142.4	168.4	175.4	180.4	154.2	173	105
	6	11A	17-Jul-14	22	104	11.4	125.7	167	168.4	171.9	135.3	170.2	104
	7	11C	15-Jul-14	19	105	5.2	181	166.8	180.6	171	188.4	190.6	105
	7	11C	16-Jul-14	28.5	106	7.5	179.6	172	181.2	183.2	190.6	190.8	106
	7	11A	17-Jul-14	22	102	8.2	177.3	171.2	165.1	177.9	170.8	185.5	102
	7	11B	18-Jul-14	15	103	4.9	172.3	177.5	154.8	177.5	177.1	182.6	102
	9	11A	15-Jul-14	18	105	5.2	159.3	168.4	181.2	149.1	178	180.5	105
	9	11A	16-Jul-14	19	104	3.3	164.8	162.5	166.8	142.3	155.2	174.3	104
	9	11B	17-Jul-14	10	107	7.1	161.3	164.4	176.8	142.7	145.2	170	106
Class B -- 100 to 120	9	11C	18-Jul-14	8	105	4.9	160.8	167	178.6	140.4	159.8	171	105
	13	11C	14-Jul-14	15	99	4.5	150.8	183.2	178.4	167.6	154	184.4	99
	13	11A	15-Jul-14	22	107	5.5	156.1	184.5	172.2	169.1	160.1	186.8	107
	13	11B	16-Jul-14	10.5	106	3.3	145.7	183.9	171	161.3	133.2	186.4	106
	13	11B	17-Jul-14	10	106	12.6	139.2	183.3	175.9	167.4	145.4	185.7	106
	13	11C	17-Jul-14	20	108	11.6	145.8	183.8	180.4	173.4	143.6	188.2	108
	14	11A	14-Jul-14	24	101	4.5	133.6	178	158.2	194.8	133.4	177.3	99
	14	11B	15-Jul-14	27	107	5.5	151.3	189.1	177.7	203.1	150.3	189.6	107
	14	11C	16-Jul-14	23	104	3.5	145.6	183.6	178.2	202.2	150.2	185.8	104
	14	11C	17-Jul-14	20	103	12.6	131.6	177.2	174.6	203	146.8	180.8	103
Class B -- 100 to 120	14	11A	17-Jul-14	15	105	11.6	128.7	180.6	174.5	200.7	142.7	181.2	105
	14	11B	18-Jul-14	14	104	4.9	141.3	202.8	176.4	202.8	151	202.8	104
	19	11B	14-Jul-14	42	101	4.5	134.9	159.1	167.6	171.5	139.1	169.4	100
	19	11C	15-Jul-14	27	107	5.5	144	161.4	168.4	170.2	145.4	170	107
	19	11A	16-Jul-14	20	109	7.5	118	158.8	183.7	181.7	142.6	174.6	109
	19	11A	17-Jul-14	24	102	9.7	136.8	153.8	169.5	166.6	140.1	161.1	102
	19	11B	17-Jul-14	31	108	9.3	143.9	163.5	170.1	172	135.9	165.8	108
	20	11A	14-Jul-14	28	100	4.5	156.7	157.8	183.1	178.9	164.4	168.9	99
	20	11C	15-Jul-14	21	106	7.1	146.8	160.8	184.2	179	164.8	172	106
	20	11B	16-Jul-14	10	108	7.5	143	150.6	188	181.6	163.6	165.6	107
Class B -- 100 to 120	20	11B	17-Jul-14	17.5	104	9.7	139.3	136.8	183.5	136.8	167.1	136.8	104
	20	11C	17-Jul-14	19	107	9.3	142.2	147.2	167.2	163.2	136.4	154	107
	21	11B	14-Jul-14	26	102	4.5	183.3	186.7	182.7	178.3	189.6	196	102
	21	11A	15-Jul-14	23.5	107	7.1	188.2	193.7	170.3	169.1	0	0	107
	21	11C	16-Jul-14	6	104	3.3	181.6	187	183.2	174.6	191.2	195.8	104
	21	11A	17-Jul-14	30	102	12.6	184.6	189.3	184.7	175.4	189.1	180.3	102
	21	11B	17-Jul-14	21	108	11.6	191.6	193.8	189.9	185.4	200	202.9	108
	23	11B	15-Jul-14	35	106	1.6	163.2	164.2	161.8	167.2	165.4	170.3	106
	23	11C	16-Jul-14	19	106	6.1	164.2	168	162.4	167.2	152.8	168.4	106
	23	11A	17-Jul-14	24	105	7.1	151.1	169.5	160.9	167.7	135.5	164.1	105
Class B -- 100 to 120	24	11C	14-Jul-14	8	100	4.5	158	160.6	167	164.4	149.8	165	100
	24	11B	15-Jul-14	23	107	4.3	163.3	171.2	172.3	172.7	147.6	173.4	105
	24	11A	16-Jul-14	15	105	6.1	150.2	160.7	168.9	166.6	152.6	168.3	105
	24	11B	17-Jul-14	12.5	107	8.2	142.6	161	165.3	167.2	147	165.2	107
	24	11C	18-Jul-14	7.5	101	4.9	151.2	157.4	164.2	163.6	153.2	163.8	101
	26	11A	15-Jul-14	22	108	4.3	150.6	167	166.8	168.2	147.9	175.4	108
	26	11B	16-Jul-14	18	110	6.1	163.3	139.8	167	166.5	174.2	147.5	110
	26	11C	17-Jul-14	9	102	9.7	137.6	161.2	159.2	162.8	140.8	168.8	102
	26	11A	17-Jul-14	14.5	106	9.4	127.1	170.2	162.1	166.8	137.1	173.1	106
	27	11C	15-Jul-14	9	109	4.3	162.8	157.8	164	157.6	143.6	165	109
Class B -- 100 to 120	27	11B	16-Jul-14	15	105	3.5	151.2	153	142	146.8	162.7	162.4	105
	27	11A	17-Jul-14	24.5	105	8.2	159.3	158	154.7	155.9	156.8	169.5	103
	27	11C	18-Jul-14	12.5	98	1.4	149.6	150.8	149.2	150	176.4	165.8	98
	33	11C	16-Jul-14	13	109	6.8	148.4	155.2	159.2	157.4	161	160.8	109
	33	11B	17-Jul-14	19.5	106	8.2	153.1	146.6	141.1	149.4	147.3	156.4	106
	33	11A	18-Jul-14	15.5	101	4.9	148.3	141.9	145.9	147.5	159.7	156.9	101
	36	11A	16-Jul-14	7	106	6.8	154.7	155.3	165.4	162.9	151.2	165.5	106
	36	11C	17-Jul-14	15.5	108	8.2	147.8	146	159.6	156.4	153	161.6	108
	36	11B	18-Jul-14	2	104	1.4	147.2	144	157	157.2	151.2	158.5	100
	39	11B	16-Jul-14	11.5	109	6.8	165.1	148.8	172.8	148.8	165.8	148.8	109
Class B -- 100 to 120	39	11C	17-Jul-14	4	108	7.1	165	159.2	176	167.2	164	164.2	108
	39	11A	18-Jul-14	8	102	4.9	167	159.2	172.5	165.8	173.4	167.5	102

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class B -- 100 to 120	2	12 A	5-Aug-14	20	102.0	4	166.5	174	152.8	127.6	166.1	178.4	102
	2	12 B	7-Aug-14	8	102.0	10.4	167.7	167.9	151.1	129	166.5	168.9	102
	2	12 C	6-Aug-14	6	104.0	5.8	169.4	169.4	147.6	126.4	172.4	173.2	104
	4	12 C	5-Aug-14	12.5	103.0	4	153.2	171.8	173.2	175	163.8	179.8	103
	4	12 B	7-Aug-14	17	106.0	10	142.1	169.5	173.5	174.4	151.7	181.7	106
	4	12 A	6-Aug-14	24.5	104.0	9.1	161.5	173.3	172.3	173.5	164	181.9	104
	5	12 C	5-Aug-14	10	101.0	4.1	145.2	156	173.6	168.6	172	174	101
	5	12 C	5-Aug-14	11	106.0	9.9	158.2	162.8	174	172.2	168.2	176.6	106
	5	12 A	6-Aug-14	26	107.0	8.5	130.8	161.5	177.8	172.3	170.3	177.3	107
	5	12 B	7-Aug-14	8.5	106.0	4.2	141.1	153.5	168.4	169.5	166.6	170.4	106
	6	12 A	5-Aug-14	22	100.0	4.1	139.1	166	172	172.7	150.1	173.2	100
	6	12 A	5-Aug-14	20	107.0	9.9	144.6	167.5	176.5	177.3	152.4	175.7	107
	6	12 C	6-Aug-14	10	106.0	8.5	145.2	162.8	177	177.6	143.4	171.2	106
	6	12 C	7-Aug-14	12	99.0	3.2	131.6	147.2	162.4	159.4	141.6	159.6	99
	6	12 B	7-Aug-14	15	105.0	11.7	138.5	169.9	176.5	183.4	146.3	179.4	105
	7	12 B	5-Aug-14	19.5	104.0	4	173.3	170	156.1	174.1	172.6	182.2	104
	7	12 C	7-Aug-14	18	107.0	4.2	151.8	154.2	157.4	164	169.4	171	107
	7	12 A	6-Aug-14	25.5	107.0	10.8	171.2	171.7	168.3	179.4	181.2	186.8	107
	9	12 B	5-Aug-14	9	104.0	5.4	156.8	166.2	171.5	144	159.3	173.3	104
	9	12 A	7-Aug-14	24	97.0	3.8	156.5	164.1	166.5	138.4	150.4	170.5	97
	9	12 C	6-Aug-14	6	108.0	10.8	158.4	170.2	190.2	152	145.2	184.8	108
	9	12 B	7-Aug-14	19.5	105.0	5.2	146.1	169.5	147	174	155.9	177.1	105
	13	12 C	5-Aug-14	11	103.0	5.4	146.4	181.2	174.8	170	142.2	185.6	103
	13	12 A	7-Aug-14	19	102.0	4.6	158.5	183.5	170.1	164.4	162.5	181.8	102
	13	12 B	6-Aug-14	14	108.0	10.8	143.3	184.8	172.8	169.6	146.4	187.2	108
	14	12 B	5-Aug-14	13	102.0	4.1	138.1	179.4	172.1	197.3	145.3	180.1	102
	14	12 B	5-Aug-14	17.5	108.0	9.9	134.2	182	169.4	198.5	139.3	181.5	108
	14	12 C	6-Aug-14	18	103.0	5.7	133.8	176.2	167	197.8	113.2	171.4	103
	14	12 A	6-Aug-14	8	107.0	6.2	120.1	172.6	162.8	195.9	123.8	169.1	107
	14	12 C	7-Aug-14	24	105.0	10	119.4	157.6	149	175.2	129.2	159.6	104
	19	12 A	5-Aug-14	22	105.0	8.7	116.6	159.6	170.9	171	142.4	167.7	105
	19	12 C	7-Aug-14	29.5	102.0	4.6	134.4	143.2	152.8	152.6	137.6	151.8	102
	19	12 B	6-Aug-14	43	108.0	5.8	144.6	169.6	157.6	159.6	145.5	165.6	108
	20	12 A	5-Aug-14	34	102.0	5.4	158	157.1	185.3	181.4	155.2	171.8	102
	20	12 B	7-Aug-14	19.5	100.0	3.8	156.4	154.1	178.7	175.4	164.4	169.9	100
	20	12 A	6-Aug-14	22	104.0	5.8	156.3	159.3	179.2	176.4	158.4	167.7	104
	20	12 C	7-Aug-14	17	107.0	11.7	148.2	149.2	169.4	166.2	160.6	162.6	107
	21	12 C	5-Aug-14	11.5	107.0	8.7	190.8	190.6	172.2	169	180	184.4	107
	21	12 A	6-Aug-14	31.5	103.0	5.7	179.8	184.7	172.5	170.8	184.2	189.9	103
	21	12 C	6-Aug-14	15.5	107.0	6.2	186.8	189.8	175.8	171	181.8	186.2	107
	21	12 B	7-Aug-14	18	105.0	4.6	175.3	179.8	170.5	165	180.9	184.7	105
	23	12 C	5-Aug-14	15	100.0	6.3	152.6	160.4	160	163.2	155.8	164.8	100
	23	12 C	5-Aug-14	19.5	107.0	13.1	153.8	161.4	162.2	169.4	162.4	167.8	107
	23	12 B	6-Aug-14	24	105.0	5.7	154.9	158.1	164.4	166	165	169.1	104
	23	12 B	6-Aug-14	34.5	109.0	6.2	152.9	161.1	156.6	165.5	152.3	164.9	108
	23	12 A	7-Aug-14	26	99.0	3.2	158.8	157.2	165.7	166.3	164.5	169.7	99
	23	12 A	7-Aug-14	38	105.0	4.2	145.6	168.4	164.1	167.1	161.7	170.4	105
	24	12 B	5-Aug-14	8.5	105.0	8.7	145.8	162.9	167.7	166.5	160.6	172.5	105
	24	12 C	7-Aug-14	12	99.0	3.8	137.2	142.6	150.2	147.2	141.6	149.8	99
	24	12 B	6-Aug-14	13.5	108.0	9.1	151.5	161.5	163.9	166.2	159.6	170	108
	24	12 A	7-Aug-14	18	105.0	11.7	149.3	163.7	168.7	168.7	156.4	170.5	105
	26	12 B	5-Aug-14	7	106.0	8.7	153	166.5	161	164.3	144.2	169.5	106
	26	12 A	6-Aug-14	19	103.0	6	142.7	162.6	163.2	164	157	169.3	103
	26	12 C	6-Aug-14	10	106.0	4.5	143.2	166	168.6	167.2	159.2	174.2	106
	26	12 A	7-Aug-14	24	107.0	5.2	147.1	164	163.2	165.4	153.7	172.1	107
	27	12 C	5-Aug-14	12	106.0	8.7	151.2	157.4	155.4	154.6	158.4	168.8	106
	27	12 A	7-Aug-14	18.5	101.0	10.4	153.7	150.1	141.1	143.7	156	157.9	101
	27	12 B	6-Aug-14	12	108.0	8.5	147.3	158.4	139.4	149.2	150.9	158.8	107
	33	12 A	5-Aug-14	24.5	100.0	6.3	147.7	142	144.2	145.6	138.6	145.6	100
	33	12 A	5-Aug-14	11	107.0	13.1	157.1	150.4	148.8	153	159.3	161.8	107
	33	12 B	6-Aug-14	8.5	106.0	6	142.9	141.1	143.3	169.1	154.3	154.1	106
	33	12 B	6-Aug-14	10	108.0	4.5	152.8	153	147.7	159.1	152.6	163.4	108
	33	12 C	7-Aug-14	8	103.0	10.4	136.4	133.2	133.6	136.6	141.6	144.4	103
	36	12 A	5-Aug-14	8	104.0	8.7	149.8	150.4	162.3	160.5	153.5	164.4	104
	36	12 B	7-Aug-14	6.5	100.0	2.2	145.5	137.6	153.1	151.3	144.8	155.2	100
	36	12 C	6-Aug-14	13	106.0	9.1	140.6	138.6	147.6	154.8	157.8	160.6	106
	36	12 C	7-Aug-14	15.5	107.0	5.2	135.6	140	149.4	148.2	155.4	163.6	107
	39	12 B	5-Aug-14	15	102.0	6.3	164.4	155.7	167.2	163.8	163.5	164.4	102
	39	12 B	5-Aug-14	22.5	107.0	13.1	172.6	163.5	167.1	166.1	170	169.7	107
	39	12 C	6-Aug-14	10.5	104.0	6	167.2	158	184	169.2	173	171.6	104
	39	12 A	6-Aug-14	14	107.0	4.5	165.4	162.1	172.5	165.7	156.5	169.4	107
	39	12 A	7-Aug-14	17	105.0	10	154.8	155	177.3	165.8	166.9	166.1	105

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class A -- 100 to 120	2	13C	19-Jul-14	7	104	4.6	169.4	171.4	153.6	132.2	173.2	173	104
	2	13A	21-Jul-14	12	104	6.4	169.2	169	150.7	129.6	167	165.7	104
	2	13B	22-Jul-14	4	110	1.8	171.5	170.9	154.1	130.1	175.9	173.7	110
	2	13C	22-Jul-14	6	113	8.8	171.4	173	164	135.4	175.6	178.6	113
	4	13A	19-Jul-14	20.5	103	4.6	161.2	174.2	172	172.7	171.2	182.8	103
	4	13B	21-Jul-14	10	110	6.4	154.8	172.6	177.2	179.8	150.6	180.6	110
	4	13C	22-Jul-14	10.5	107	1.8	169.8	162.4	172.6	172.4	170.8	181.8	107
	4	13A	22-Jul-14	20.5	111	8.8	157.8	179.9	173.1	174.7	172.3	184.9	111
	5	13B	19-Jul-14	14.5	106	4.6	155.4	156.5	172	170.4	172.9	163.9	106
	5	13C	21-Jul-14	8.5	105	6.4	161.6	161.2	175	172.2	142	175.2	105
	5	13A	22-Jul-14	11.5	106	1.8	160.1	157.4	173.5	172.5	177.5	178.4	106
	5	13B	22-Jul-14	12	116	8.8	167.3	167.6	172.3	173.7	180	179.7	116
	6	13A	19-Jul-14	17	105	7.8	123.6	166.3	175.5	175	151.2	175.8	105
	6	13B	21-Jul-14	9	107	9.2	141.3	166.5	172.2	179.2	152.7	175.4	107
	6	13C	22-Jul-14	8	108	2.6	147.2	163.4	181	179.2	155.8	181.2	108
	6	13C	22-Jul-14	14	114	1.6	151	170	177	183	156.8	180	114
	7	13C	19-Jul-14	16.5	109	6.3	173	169.6	171.6	178.6	181.2	185.8	109
	7	13A	21-Jul-14	25	103	9.2	174.3	171.2	164.9	178.6	179.4	185.7	103
	7	13B	22-Jul-14	16	110	2.6	177.3	166.3	178.5	185.5	192.5	193.7	110
	7	13B	22-Jul-14	13.5	116	1.6	184.6	179.9	191.3	185.6	193.2	192.6	116
	9	13A	19-Jul-14	12	109	6.3	162.2	167.2	174.4	147.8	171.5	177.1	109
	9	13C	21-Jul-14	4	106	9.2	145.2	169	182.2	147.4	167.4	179.8	106
	9	13B	22-Jul-14	7.5	110	3.1	168.3	164	172.3	145.6	176.2	176	108
	9	13B	22-Jul-14	12	117	2.2	172.1	176.7	187	153.5	177.2	183.8	115
	13	13C	19-Jul-14	14	109	1.8	142.6	185.4	172.6	168.4	149.6	184.4	109
	13	13B	21-Jul-14	20	111	12.6	143.6	185.8	172.5	171.3	145.6	187.1	111
	13	13A	22-Jul-14	13	107	2.6	156.1	183.8	171.1	166.7	158.1	185	107
	13	13A	22-Jul-14	26	114	1.6	164.3	187.2	178.3	172.5	144.5	188.4	113
	14	13A	19-Jul-14	11	108	1.8	158.6	191.4	188	198.5	162	192.3	107
	14	13C	21-Jul-14	22	108	12.6	136.2	179	164.8	197.4	137.8	173.6	108
	14	13B	22-Jul-14	23	111	5.7	147.9	187.3	177.7	203.3	154.4	187.1	111
	14	13B	22-Jul-14	25	115	4.8	148.2	183	176.9	198.3	147.1	187	114
	19	13B	19-Jul-14	36	108	6.3	146.7	159.8	162.5	166.1	142.2	170.4	108
	19	13A	21-Jul-14	22	106	12.6	132.4	155.1	161.4	166.3	130.8	161.7	106
	19	13C	22-Jul-14	27.5	109	3.1	141.2	157.4	155.8	163.4	140.8	165	109
	19	13C	22-Jul-14	33	114	2.2	131.4	159.6	176.2	172.4	155.8	170.8	113
	20	13A	19-Jul-14	26	106	12.5	164.6	164.4	182.9	179.4	172.8	173.5	106
	20	13C	21-Jul-14	14	108	5.8	149.4	158	184.4	181.4	171	174.2	108
	20	13C	23-Jul-14	19	108	6.8	150.8	150.6	182	178.8	164.4	164.8	108
	21	13B	19-Jul-14	18.5	110	10.6	192	187.6	172.4	171	186.9	182.3	110
	21	13A	21-Jul-14	20.5	107	5.8	190.2	193.5	174.6	172.5	185.7	189.5	107
	21	13C	22-Jul-14	10.5	108	5.7	183.2	188	176	172.8	182	188	108
	21	13C	22-Jul-14	12	114	4.8	191.4	193	182.2	178	190.8	192.8	114
	23	13C	19-Jul-14	19	108	10.6	156.8	165.6	158.6	162.6	157.8	166.2	108
	23	13B	21-Jul-14	22.5	110	5.8	154.4	165.7	162.8	167	162.8	169.1	110
	23	13A	22-Jul-14	30	109	3.1	168.6	166.6	159.9	164.7	166.4	168.9	109
	23	13A	22-Jul-14	28	115	2.2	166.6	171.5	165.1	170.5	166.8	172.3	114
	24	13B	19-Jul-14	9.5	108	7.8	140.3	158.8	161.4	165.1	147.7	165.6	108
	24	13C	21-Jul-14	8	109	8.5	148.4	162.4	163.2	163.4	149.8	167.4	109
	24	13A	22-Jul-14	17	107	5.7	154.6	160.1	173.5	170	174.5	175.4	107
	24	13A	22-Jul-14	15.5	114	4.8	155.4	166.8	180.1	178.8	175.2	180.2	113
	26	13A	19-Jul-14	10	106	10.6	143.3	166.4	166.3	166.9	164.6	173.6	106
	26	13B	21-Jul-14	13	110	8.5	145.5	167.2	165	169.1	168.8	174.9	110
	26	13A	23-Jul-14	17.5	107	4.1	149	163.2	160.5	161.7	156.1	170	107
	27	13B	19-Jul-14	27.5	109	1.8	164.2	160.9	149.1	155.3	171.2	168.4	109
	27	13A	21-Jul-14	30	109	8.5	168.5	161.8	150.5	153.2	158.1	163.2	109
	27	13C	23-Jul-14	12	109	4.1	161.2	150.4	139.6	141.8	163.2	159	109
	33	13B	19-Jul-14	17.5	108	12.5	145.9	150.2	155.1	155.9	161.1	161.8	108
	33	13C	21-Jul-14	14	110	7.5	162.2	158	147.2	151	154	159.6	110
	33	13B	23-Jul-14	23	110	4.1	149.8	143.4	140.5	144.1	154.4	154.6	110
	36	13C	19-Jul-14	21	107	12.5	154.8	149.8	157	155.4	157.8	157.4	107
	36	13B	21-Jul-14	13.5	109	7.5	143.5	148.1	145.4	156.3	146.8	158.7	109
	36	13A	23-Jul-14	6	106	6.8	105.1	145.4	158.1	160.7	150.1	160.3	106
	39	13C	19-Jul-14	5	106	7.8	161.4	157.8	178.4	166.4	173	166.2	106
	39	13A	21-Jul-14	11.5	109	7.5	166.8	162.2	168.1	162.2	166.2	164.6	109
	39	13B	23-Jul-14	5	110	6.8	170.4	162.1	167.2	161.9	174.1	169.5	110

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class AA -- 100 to 120	2	14C	8-Aug-14	6	100.0	7.9	166.8	170.4	159.8	133	175	172.2	100
	2	14A	8-Aug-14	14	106.0	9.7	167.1	173.3	154.2	134	173.7	172.4	105
	2	14B	14-Aug-14	3.5	106.0	14.5	155.1	169.1	155.2	135	156.8	173.7	106
	2	14C	14-Aug-14	7	107.0	11	166.8	169.8	165.2	132.6	169.4	172.4	107
	4	14A	8-Aug-14	22.5	101.0	7.9	158.7	169.5	164.2	165.9	163.2	169.9	101
	4	14B	8-Aug-14	17.5	106.0	9.7	154.4	176.3	174.6	175.4	154.3	182.3	106
	4	14C	14-Aug-14	11	104.0	14.5	154.2	169	169.2	169.6	167.2	177.6	104
	4	14A	14-Aug-14	24.5	107.0	11	155.2	172.9	174.6	175.3	189.2	192.3	106
	5	14B	8-Aug-14	11.5	102.0	7.9	159.5	157	173.1	170.4	171.2	175.6	102
	5	14C	8-Aug-14	8	106.0	9.7	138.6	160.8	177.6	173.2	147.8	175.4	106
	5	14A	14-Aug-14	20.5	103.0	14.5	137.5	156.9	169.5	167.5	160.7	173.5	103
	5	14B	14-Aug-14	9.5	108.0	11	173.6	182.9	171.6	179.7	159.4	177.3	108
	6	14C	8-Aug-14	8	100.0	7.7	138.4	159.8	172.8	179.4	145.6	177.4	100
	6	14A	8-Aug-14	24	106.0	6.2	136	169.1	179	183.1	150.8	181	106
	6	14B	14-Aug-14	9	107.0	11.9	140.7	160.9	175.5	175.9	158.2	177.7	107
	6	14C	14-Aug-14	12	106.0	2.7	146.2	168.4	182.6	182.2	148.2	182.6	106
	7	14A	8-Aug-14	22	101.0	7.7	177.3	163.8	167.6	178.3	181.2	185.1	101
	7	14B	8-Aug-14	21	106.0	6.2	174	171.3	163.5	179.3	180	185.3	106
	7	14C	14-Aug-14	16.5	103.0	11.9	177.4	167.2	176.4	182.4	182.6	189.2	103
	7	14A	14-Aug-14	26.5	108.0	2.7	177.3	173.6	183.2	186.6	164.3	180.3	108
	9	14B	8-Aug-14	16	103.0	7.7	157.8	168.9	167.3	142.9	154.4	173.4	103
	9	14C	8-Aug-14	8	107.0	6.2	137.4	169.2	183.4	151.4	174.2	181.6	107
	9	14A	14-Aug-14	24	103.0	11.9	159.7	162.3	187.9	146.5	170.8	180.6	103
	9	14B	14-Aug-14	21	106.0	2.7	146.4	169.4	173.4	147.1	161.6	173.1	106
	13	14C	8-Aug-14	10	104.0	2.9	145.4	183.4	167.6	163.6	134.8	181.8	104
	13	14B	9-Aug-14	5	104.0	8.5	150.3	183.4	172.4	162.4	145.7	187.5	103
	13	14A	10-Aug-14	22	112.0	6	157	185.7	169.1	168.6	157.1	186.1	112
	13	14C	14-Aug-14	15	107.0	8.3	152.4	180	170.8	167.2	148.6	177.2	107
	14	14A	8-Aug-14	10	102.0	2.9	139.6	179	164.6	196.1	133.7	174.5	102
	14	14C	9-Aug-14	22	103.0	8.5	122.8	169	166.6	196.8	138.2	175.6	103
	14	14B	11-Aug-14	22	111.0	6	151.2	188.7	177.2	201	145	185.2	111
	14	14A	14-Aug-14	16	108.0	8.3	137.3	179.3	161.8	193	135.8	170.3	108
	19	14B	8-Aug-14	33.5	106.0	2.9	141.6	158.4	156.7	152.7	148.1	165.1	106
	19	14A	9-Aug-14	30	103.0	8.5	136.5	147.6	166.3	164.9	142.4	163	103
	19	14C	11-Aug-14	27	111.0	6	134.2	147.2	165.6	165.4	153.6	168.4	111
	19	14B	14-Aug-14	46	109.0	8.3	139.6	160.2	168.6	176.4	142.4	168.4	109
	20	14C	8-Aug-14	19	102.0	6.3	155.8	154.4	177.8	173.4	156.6	164.8	102
	20	14B	9-Aug-14	23	104.0	10.8	143.1	146	179	173.8	147.3	156.2	104
	20	14A	11-Aug-14	32	110.0	6	148.8	160.5	191.9	187.1	160.6	172.1	104
	20	14C	14-Aug-14	15	105.0	4.2	166.6	157.4	189	181.8	170.6	177.2	103
	21	14A	8-Aug-14	33.5	102.0	6.3	184.9	189.3	171.1	168.7	183.4	187.4	102
	21	14C	9-Aug-14	13	104.0	10.8	177.2	183.6	173	167.6	182.4	185.6	104
	21	14B	11-Aug-14	14	111.0	6	187.2	189.1	175.5	175	187.2	185.6	108
	21	14A	14-Aug-14	33.5	105.0	4.2	182.8	188.9	170.8	168.9	182.3	186.7	104
	23	14B	8-Aug-14	23.5	103.0	6.3	156.1	153.1	156.8	163.4	153.4	166.1	103
	23	14A	9-Aug-14	26	102.0	10.8	160.4	161.2	163.2	163.7	157.8	167.9	102
	23	14C	10-Aug-14	17.5	110.0	6	159.6	168.2	164.8	163.8	139.6	166	108
	23	14B	14-Aug-14	19.5	108.0	4.2	166	167.5	179.9	176.6	155.1	183.6	108
	24	14C	8-Aug-14	14	105.0	96	146.6	161.6	170.4	167.4	144.6	167.6	105
	24	14B	9-Aug-14	10	106.0	10.6	140.5	159.2	162.6	163.8	150.2	161.7	106
	24	14A	11-Aug-14	20	109.0	6	156.3	163.2	169.1	167.6	154.1	170.1	109
	24	14C	14-Aug-14	9	105.0	4.6	153.2	159	176.4	171	161.8	170.6	105
	26	14A	8-Aug-14	8	106.0	9.8	158.6	169.1	163.7	164.9	166	170.4	106
	26	14C	9-Aug-14	9	103.0	10.6	135.8	162.6	166.6	165.2	162	169.8	103
	26	14B	10-Aug-14	15	112.0	6	158.4	170.5	187.4	186.1	165.7	189	110
	26	14A	14-Aug-14	12	107.0	4.6	139	164.8	165.8	165.2	143.7	173.9	107
	27	14B	8-Aug-14	11.5	106.0	9.8	147.5	154.2	140.8	145.2	141.4	159.4	106
	27	14A	9-Aug-14	24	104.0	10.6	156.5	150.3	141.4	142.8	160.7	158.6	104
	27	14C	10-Aug-14	13	111.0	6	173.2	158.6	158.2	155.4	162	170.6	111
	27	14B	14-Aug-14	19	106.0	4.6	141.3	161.6	153.6	163.5	145.5	165.3	106
	33	14C	8-Aug-14	11.5	106.0	13.1	156.2	149.4	150.4	154.6	157	161.2	106
	33	14B	9-Aug-14	11.5	106.0	6.7	148.4	143.3	139.7	149.3	145	154.3	104
	33	14A	11-Aug-14	24	110.0	8	159.1	157.2	151.9	157.8	160.1	165.4	105
	33	14A	14-Aug-14	16.5	105.0	9.8	158.6	149.9	146.2	150.6	159.8	159.8	103
	36	14A	8-Aug-14	11	106.0	13.1	0	152.3	167.4	164.3	153.4	165.6	106
	36	14C	9-Aug-14	15	104.0	6.7	148.4	147.6	161.8	160.2	162.8	166.2	104
	36	14B	10-Aug-14	13	110.0	8	154.2	155.9	153.3	157.2	156.6	161.4	105
	36	14B	14-Aug-14	10.5	106.0	9.8	161.6	153.9	145.6	156.2	160	161	106
	39	14B	8-Aug-14	16.5	107.0	13.1	166	162.5	167.7	161.3	163.7	161.9	107
	39	14A	9-Aug-14	18	105.0	6.7	167.4	158.7	166.9	161	168.1	164.8	105
	39	14C	10-Aug-14	7	110.0	8	170.2	163	181	174	173.4	173.8	107
	39	14C	14-Aug-14	10	103.0	9.8	166.6	158.4	167	160.6	169	163	102

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class A -- 100 to 120	2	15 C	29-Jul-14	5	99.0	5.8	174.4	171.2	151.6	128.2	171.8	171.2	99
	2	15 A	29-Jul-14	16	110.0	6.5	179.8	177.1	159	134	180.7	176.8	110
	2	15 B	30-Jul-14	5	115.0	7.1	179.9	178.3	159.7	130.7	183.3	181	115
	2	15 A	15-Aug-14	12	106.0	6.3	175.4	172.1	152.5	131.5	177.8	169.3	106
	4	15 A	29-Jul-14	28.5	101.0	5.8	158.1	177.5	161.5	165.1	163.9	178.5	101
	4	15 B	29-Jul-14	9	113.0	6.5	167.4	175.8	177.6	178.3	165.9	184.3	113
	4	15 C	30-Jul-14	9.5	112.0	5.9	166.2	175.6	175.8	175.4	183.4	170.6	112
	4	15 C	15-Aug-14	13	105.0	14	163	172.2	173.4	172.8	164.4	180.2	105
	5	15 B	29-Jul-14	5.5	105.0	5.8	158	152.4	169	167.9	175	175.4	105
	5	15 C	29-Jul-14	8	110.0	6.5	165	167	176.4	175.2	166.6	178.8	109
	5	15 C	30-Jul-14	3.5	104.0	3.1	157.2	152	166.7	174.8	170.8	173	104
	5	15 A	30-Jul-14	25	114.0	4.8	160.7	166.9	172.9	173.6	171.8	178.3	114
	6	15 A	29-Jul-14	24	110.0	5.5	149.9	170.1	178.6	182.8	162.5	185.8	110
	6	15 B	30-Jul-14	4.5	105.0	3.1	142.1	162.8	172.4	173.1	140.9	176.4	105
	6	15 C	30-Jul-14	11	113.0	4.8	148.2	167.4	176.6	182.4	139.4	180.4	113
	6	15 A	15-Aug-14	22	105.0	14	159	174.1	170.5	175.5	144.2	178.2	105
	7	15 C	29-Jul-14	13.5	100.0	4.5	177	167.2	181	180.4	184.2	188.6	100
	7	15 A	29-Jul-14	28	112.0	7	186.4	176.4	173.9	186.2	188.4	191.8	110
	7	15 B	30-Jul-14	10.5	111.0	4.5	155.1	167.8	168.7	179.3	173.3	186.5	111
	7	15 B	30-Jul-14	13	117.0	11.6	179.9	177.6	174.4	186.6	183.3	195.5	117
	13	15 A	29-Jul-14	24	102.0	4.5	151.4	182.4	168.5	164.6	154.6	183.2	102
	13	15 B	29-Jul-14	6	112.0	7	156.8	185.9	178.4	174.3	152.5	190.7	110
	13	15 C	30-Jul-14	14	109.0	4.5	151.2	182.6	184.4	183.4	158.8	189	109
	13	15 A	30-Jul-14	26	115.0	11.6	152.6	188.1	183.8	175.6	172.2	190	115
	13	15 C	15-Aug-14	17	103.0	6	154.2	181	168.2	165.2	159	182.8	103
	14	15 B	29-Jul-14	14	106.0	4.5	150	188.8	173.8	199	154.2	186.2	106
	14	15 C	29-Jul-14	22	111.0	7	144	183.2	181.8	200.2	150.8	187.2	111
	14	15 C	30-Jul-14	24	104.0	3.6	138.2	180	168.8	198.6	147.6	184	104
	14	15 A	30-Jul-14	16	113.0	6.1	148	186.4	186.4	198.2	153.6	184	113
	14	15 B	15-Aug-14	12	105.0	6	151.2	189	175.2	203.7	142.9	185.1	105
	19	15 C	29-Jul-14	21	107.0	2.5	141.2	158	175.2	173.6	156	173.2	107
	19	15 A	29-Jul-14	32	113.0	6.7	144.7	161.5	166.7	169.5	137.3	169.5	113
	19	15 B	30-Jul-14	19	109.0	4.2	137.8	154.1	167.2	168.4	151.1	170.6	109
	19	15 A	30-Jul-14	20.5	116.0	5.7	134.4	165.3	187.1	187.7	150.9	187	116
	20	15 A	29-Jul-14	42	107.0	2.5	159.8	157.4	184.9	178.5	163.7	168.9	107
	20	15 B	29-Jul-14	12	114.0	6.7	152.2	162.8	190.8	186.1	161.7	175.5	114
	20	15 C	30-Jul-14	18	109.0	4.2	152.8	0	186.4	179.6	164.8	165.6	109
	20	15 B	30-Jul-14	8	115.0	5.7	164.9	161.4	187.2	192.9	170.8	158.3	115
	21	15 B	29-Jul-14	14.5	109.0	3.9	184.9	187.1	170.5	169.5	180.9	186.3	109
	21	15 A	30-Jul-14	34	111.0	5.9	188.9	193.9	174.8	174	188.2	191.6	111
	21	15 C	15-Aug-14	12	101.0	5.5	175.2	180.6	175.2	169.8	183	188.2	101
	21	15 C	15-Aug-14	11	105.0	6.3	186.2	189.8	179.8	174.2	184.2	190	105
	23	15 B	29-Jul-14	17.5	107.0	2.5	159.6	159.8	156.7	163.3	162.3	167.7	107
	23	15 C	29-Jul-14	23	110.0	6.7	147.8	166	164.2	167	164.8	168.2	110
	23	15 A	30-Jul-14	30	105.0	3.6	158.6	157.4	160	163.5	163.2	166	105
	23	15 C	30-Jul-14	18.5	113.0	6.1	161	168	172.8	174.2	173.2	174.8	112
	23	15 A	15-Aug-14	32	104.0	6	161.7	161.5	163.5	166.2	148.5	168.3	104
	24	15 C	29-Jul-14	10.5	107.0	3.3	155.4	159.2	167.4	170.2	159.6	171.6	107
	24	15 B	29-Jul-14	10.5	109.0	4.1	152	166.7	173.5	176.5	166	176	109
	24	15 A	30-Jul-14	26	111.0	7.1	149.3	162.2	170.1	168.3	157.2	174	111
	24	15 B	15-Aug-14	17.5	104.0	14	148.5	160.5	164.7	165.8	159.9	170.1	104
	26	15 A	29-Jul-14	28	109.0	3.9	162.7	163.1	163.4	166	144.5	170.9	109
	26	15 C	30-Jul-14	11	109.0	7.1	147.2	165.4	169	169.8	158.6	174.6	109
	26	15 B	15-Aug-14	13.5	104.0	6.3	146.3	170	163.2	170.7	163.5	173.5	103
	27	15 B	29-Jul-14	18.5	108.0	3.3	159	153.7	141.6	146.6	175.7	162.1	108
	27	15 A	29-Jul-14	24.5	113.0	4.1	163.7	160	163.9	162.1	176.5	173.8	113
	27	15 A	30-Jul-14	22.5	108.0	4.5	159.7	156.1	144.7	147.7	172.7	160.6	108
	27	15 C	30-Jul-14	12.5	113.0	11.6	174.4	163.8	160.8	158.6	174	170.2	113
	33	15 B	29-Jul-14	13.5	111.0	5.5	160.8	153.2	145.6	153	158.5	160.5	111
	33	15 A	30-Jul-14	24	103.0	3.1	149.7	139.9	140.8	145.7	151.6	150.6	103
	33	15 B	30-Jul-14	9	117.0	4.8	157.6	154.3	147.8	155.1	162.1	163.1	117
	33	15 C	15-Aug-14	11	101.0	5.2	144.4	139.4	144.4	146	161.6	156.4	101
	36	15 C	29-Jul-14	20	109.0	5.5	149.8	149.2	164	162.2	157.2	162.8	109
	36	15 B	30-Jul-14	22	115.0	5.9	0	154.8	154.5	157.7	159.3	160	115
	36	15 A	15-Aug-14	16	102.0	5.5	158	144.7	155.8	155.9	160.5	159.7	102
	39	15 C	29-Jul-14	7	107.0	3.9	170.4	164	178.4	170.4	174.8	169.6	107
	39	15 B	30-Jul-14	15	105.0	3.6	167.9	156.3	165.3	159.4	174.4	165	105
	39	15 B	30-Jul-14	17	117.0	6.1	172	166.5	175.2	168.8	175.6	171.1	113
	39	15 A	15-Aug-14	25	102.0	5.2	161.2	151.5	168	161.5	171.1	164.2	102

REDUCED DATA													
Vehicle	Fuel	Rater	Date	TWD	max amb T	wind speed	1st air temp	1st rail temp	2nd air temp	2nd rail temp	3rd air temp	3rd rail temp	end amb T
Class AA -- 100 to 120	2	16C	23-Jul-14	5	116	8	171.8	172.6	162.2	137	179.6	178.8	116
	2	16B	25-Jul-14	2	110	8.9	164.7	172.1	156.2	132.5	169.3	173.1	110
	2	16A	26-Jul-14	14	102	8.3	171.8	173.7	153.3	132.5	169.6	162.5	102
	2	16B	28-Jul-14	7.5	105	4.5	158.2	172.9	156.6	133.3	168.2	175.4	105
	4	16A	23-Jul-14	22.5	117	8	168.3	180.1	178.1	180.3	172.6	187.5	117
	4	16C	25-Jul-14	11	107	10.1	163.6	171.8	180.4	179	171	183.6	107
	4	16B	26-Jul-14	16.5	103	9.7	146.7	165.8	168.7	171.4	148.6	178.5	103
	4	16C	28-Jul-14	11	103	4.5	162	171	172.4	171.8	167.4	179.6	103
	5	16C	23-Jul-14	10	116	6.5	166.2	167.4	181.4	179.2	180.6	184.2	116
	5	16A	25-Jul-14	16	108	8.9	144.5	162.8	175.8	174	174.8	180.2	108
	5	16B	26-Jul-14	2.5	106	8.3	142.3	151.2	169.8	166.6	154	175.9	106
	5	16A	28-Jul-14	18	104	4.5	165.4	160.5	174.6	173	178.3	179.1	104
	6	16B	23-Jul-14	7.5	116	8	151	172.7	181	182.6	163.8	186.4	115
	6	16A	25-Jul-14	18	106	10.1	139.8	166.6	174.8	179.5	155.5	177.7	106
	6	16A	26-Jul-14	26	102	9.7	141.9	164.3	165.7	170.6	131.6	169.3	102
	6	16C	28-Jul-14	12	103	4.5	118.2	164.2	166	171	142.4	173	103
	7	16B	23-Jul-14	17.5	117	6.5	189.1	177.6	177.9	186.4	191.3	192	117
	7	16B	25-Jul-14	21.5	110	10.1	173.8	169.7	173	182.4	181.1	188.8	110
	7	16C	26-Jul-14	12	102	9.7	166.4	167	159.8	174.8	179	181.2	102
	7	16A	28-Jul-14	25	107	4.5	179.8	169.5	175.1	182.6	188.4	188.7	107
	13	16C	23-Jul-14	10	110	7.6	152.6	181.4	167.2	168.6	161.6	184.8	110
	13	16A	25-Jul-14	8	100	11.9	135.4	178.3	176.7	165.3	148.6	181.5	100
	13	16B	25-Jul-14	11.5	111	4.8	154.5	186.5	177.4	172.8	155.5	184.4	109
	13	16C	26-Jul-14	9	105	9.9	154	181.2	172.6	168.2	156	183.2	105
	13	16B	28-Jul-14	8	107	3.5	155.3	182.8	185.6	177.2	158.1	193.1	107
	14	16A	23-Jul-14	14	113	7.6	132.3	177.5	164.6	200.5	140.1	182	113
	14	16B	25-Jul-14	15	101	11.9	129.3	171.6	170	202.2	132.1	172.9	101
	14	16C	25-Jul-14	23	111	4.8	0	183.4	177.2	202.2	146.4	180.8	111
	14	16A	26-Jul-14	23	107	9.9	123.1	177.8	165.5	198.1	143.5	179.5	107
	14	16C	28-Jul-14	28	111	7	137.8	183.4	171.4	198.8	145.2	179.8	111
	19	16B	23-Jul-14	26	115	7.6	149.6	157.2	170.4	167.9	149.6	167.4	115
	19	16C	25-Jul-14	20	99	11.9	134.4	146.6	178.2	167.6	123.6	162.8	99
	19	16A	25-Jul-14	27	109	4.8	137.5	156.3	169.1	169.5	141.3	167	109
	19	16A	26-Jul-14	26	107	5.9	124.8	155.7	179.2	175.8	156.5	175.9	107
	19	16B	28-Jul-14	19	108	6.2	141.5	157.6	165.8	170.1	144.5	173	108
	20	16B	25-Jul-14	17.5	104	9.1	151.8	147.1	183.6	178.2	152.3	157.6	104
	20	16C	25-Jul-14	14	111	8.8	163.2	162.8	189.8	186.4	143	160.6	111
	20	16B	26-Jul-14	23	108	9.9	155.6	153.6	181.2	177.8	154.6	164.7	108
	20	16A	28-Jul-14	24	102	4.5	156.7	158	179.4	175.8	160.1	170.5	102
	21	16C	23-Jul-14	10	113	8.3	186.2	190.6	181.4	178.4	190.2	192.6	113
	21	16A	25-Jul-14	23	100	10.6	180.4	182.9	175	168.1	184.1	185.4	100
	21	16B	25-Jul-14	12.5	110	9.7	182.6	188.8	176.1	175	184.3	187.5	110
	21	16A	26-Jul-14	30	99	7.6	179.4	182.3	167.6	165.3	180	182.8	99
	21	16C	28-Jul-14	11.5	105	3.5	182.8	187.8	172	169	181.6	186.4	105
	23	16A	23-Jul-14	22	114	8.3	168.3	168.9	163.4	168.3	164.1	170.3	114
	23	16B	25-Jul-14	17.5	102	10.6	153.9	157.6	158.1	168.3	155.7	165	102
	23	16C	25-Jul-14	19.5	113	9.7	160.6	168.2	165.2	170	158.8	171.8	113
	23	16B	26-Jul-14	24	110	5.9	162.9	164.2	158.7	162.5	160.8	165.3	110
	23	16C	28-Jul-14	20	104	6.2	161	169.6	157.4	163.4	151.8	166	104
	24	16B	23-Jul-14	7	116	8.3	161.3	165.6	177.5	175.5	176.1	180	116
	24	16C	25-Jul-14	11	101	10.6	144.4	148.2	166.6	161.4	154.2	160.4	101
	24	16A	25-Jul-14	30	109	9.7	157.6	163.2	176.5	174.8	170.8	175	109
	24	16C	26-Jul-14	13	106	5.9	149.6	155.6	173.4	171.8	160	170.8	106
	24	16A	28-Jul-14	22	106	3.5	152.2	158.6	167.1	167.1	165.1	170.2	106
	26	16C	25-Jul-14	13.5	103	9.7	130.2	162.2	158.2	161	152.6	165.8	103
	26	16A	25-Jul-14	27.5	115	8.9	165	165.1	165.1	167.3	137.6	171	115
	26	16B	26-Jul-14	13	101	7.6	126.1	129.7	158.4	157.3	137.6	169.3	101
	26	16A	28-Jul-14	14	106	7	158.1	166.9	165.8	167.4	154.8	173.3	106
	27	16A	25-Jul-14	30	101	9.7	154.5	157.9	150.8	150.3	161.8	163.9	101
	27	16B	25-Jul-14	13.5	113	8.9	164.7	159.8	156.6	158.8	142.3	164.4	113
	27	16C	26-Jul-14	12.5	100	11	111.4	149	145.2	144.2	168.6	156.8	100
	27	16A	28-Jul-14	32.5	105	6.2	163.2	160.2	148.9	157.3	166.4	168.1	105
	33	16B	25-Jul-14	17	104	9.7	133.8	139.4	149.8	150	145.6	155.6	104
	33	16C	25-Jul-14	17	112	8.9	159.6	154.4	154.2	156.2	159.4	141.2	111
	33	16A	26-Jul-14	17.5	100	11	139.5	139	143.2	148.1	153.5	157.1	100
	33	16C	28-Jul-14	13	107	4.5	153.6	150.2	153	154.4	160.8	162.9	107
	36	16C	25-Jul-14	19.5	103	9.1	130.6	140.2	157.6	155	145.8	159.4	103
	36	16A	25-Jul-14	18	115	8.8	113.4	155.3	107.7	165.2	116.1	165.4	115
	36	16B	26-Jul-14	0	100	11	100.1	142.1	100.3	154	104.8	154.3	100
	36	16B	28-Jul-14	9.5	111	7	154.2	152.4	148.5	157	147.9	152.3	111
	39	16A	25-Jul-14	18	103	9.1	161.5	153.8	164.3	157.6	164.7	157.8	103
	39	16B	25-Jul-14	11	112	8.8	172.2	164.1	178.8	173.1	166.6	163.7	109
	39	16C	26-Jul-14	4	100	7.6	145.2	144	180.2	168.6	164.8	161.6	100
	39	16B	28-Jul-14	5.5	106	4.5	171.9	162.4	175.5	168.8	178.1	176.6	106