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CRC VOLATILITY PROGRAM ON THE EFFECT OF OXYGENATED FUELS AND ALTITUDE ON COLD-START DRIVEABILITY AT LOW AMBIENT TEMPERATURES

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COORDINATING RESEARCH COUNCIL

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**CRC VOLATILITY PROGRAM ON THE EFFECT OF OXYGENATED
FUELS AND ALTITUDE ON COLD-START DRIVEABILITY AT
LOW AMBIENT TEMPERATURES
(CRC Project No. CM-118-88)**

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Prepared by the

1988 Analysis Panel of the CRC Volatility Group

January 1990

Automotive Vehicle Fuel, Lubricant, and Equipment Research Committee

of the

Coordinating Research Council, Inc.

ABSTRACT

The 1988 CRC driveability program investigated the effects of altitude and fuel oxygenates at low ambient temperature upon cold-start driveability with vehicles equipped with various fuel systems. This program was conducted because of the use of gasoline-oxygenate blends to reduce ambient air carbon monoxide levels. The test program was divided into two phases. A high-altitude phase was conducted near Denver, Colorado, from January 11 through February 10, 1988, at an altitude of 5,486 feet; and a low-altitude phase was conducted in Brainerd, Minnesota, from March 4 through March 31, 1988, at an altitude of 1,226 feet. Test temperatures were 10°F to 40°F. Twenty-four vehicles chosen to represent a variety of engines and fuel systems tested twelve test fuels, including hydrocarbon-only fuels, gasoline-ethanol blends, and gasoline-MTBE blends. The altitude change between the two sites was found to have no statistically significant effect on driveability for the overall fleet. Driveability performance decreased statistically significantly with declining ambient temperatures. For the overall fleet, the oxygenate-containing fuels evaluated performed poorer than hydrocarbon-only fuels at a statistically significant level. In the throttle-body-injected and new carbureted vehicle groups, however, only the matched-volatility ethanol blends gave poorer driveability performance than the hydrocarbon-only fuels at a statistically significant level. In port-fuel-injected vehicles, none of the oxygenate-containing fuels gave different performance than the hydrocarbon-only fuels at a statistically significant level. For the old carbureted vehicle group, all the oxygenate blends gave poorer performance than the hydrocarbon-only fuels at a statistically significant level. The effect of volatility level was statistically significant; as expected, increasing T₁₀ and/or T₅₀ gave poorer performance.

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TABLE OF CONTENTS

ABSTRACT.....	i
I. Introduction.....	1
II. Summary and Conclusions.....	1
III. Test Vehicles.....	2
IV. Test Fuels.....	3
V. Test Facilities.....	4
VI. Test Conditions.....	4
VII. Test Design.....	4
VIII. Test Procedure.....	5
IX. Discussion of Results.....	5
A. Simple Total Weighted Demerit Averages.....	6
B. Data Transformation.....	7
C. Analysis of Variance.....	7
D. Fuel Distillation Effects.....	15
X. Cycle Analysis.....	16

TABLES

Table I	- Test Vehicles.....	19
Table II	- Vehicle Mechanical Problems.....	20
Table III	- Results of Analyses for the 1988 CRC Driveability Program Fuels.....	21
Table IV	- Average Run Temperatures.....	22
Table V	- Average Total Weighted Demerits (Rater-Adjusted) High-Altitude Phase (Denver).....	23
Table VI	- Average Total Weighted Demerits (Rater-Adjusted) Low-Altitude Phase (Brainerd).....	24
Table VII	- Effect of Altitude on Rater-Adjusted Total Weighted Demerits.....	25
Table VIII	- Effect of Oxygenates on Rater-Adjusted Total Weighted Demerits (High-Altitude Phase).....	26
Table IX	- Effect of Oxygenates on Rater-Adjusted Total Weighted Demerits (Low-Altitude Phase).....	27

TABLE OF CONTENTS (continued)

FIGURES

Figure 1	- Fuel Distillation, Low Volatility Series.....	28
Figure 2	- Fuel Distillation, Medium Volatility Series....	29
Figure 3	- Fuel Distillation, High Volatility Series.....	30
Figure 4	- Test Site: High-Altitude Phase.....	31
Figure 5	- Test Site: Low-Altitude Phase.....	32
Figure 6	- Distribution of TWD by cycle.....	33
Figure 7	- Analysis of SQRTWD by Fuel and Cycle.....	34

APPENDICES

Appendix A	- Membership of the 1988 CRC Driveability Analysis Panel
Appendix B	- Participants in the 1988 CRC Driveability Program
Appendix C	- 1988 CRC Volatility Program on the Effect of Oxygenated Fuels and Altitude on Driveability at Low Ambient Temperatures
Appendix D	- Test Schedule
Appendix E	- Preliminary Report on the 1988 CRC Volatility Program on the Effect of Oxygenated Fuels and Altitude on Driveability at Low Ambient Temperatures
Appendix F	- Individual Laboratory Fuel Property Data
Appendix G	- Raw Data
Appendix H	- SAS Program, Code, and Output

I. INTRODUCTION

The 1988 CRC driveability program investigated the effects of altitude and fuel oxygenates at low ambient temperature upon cold-start driveability with vehicles equipped with carbureted, throttle-body-injected, and port-fuel-injected fuel delivery systems. This program was conducted because of the use of gasoline-oxygenate blends to reduce ambient air carbon monoxide levels. Although several CRC programs have been conducted in recent years to investigate the effect of oxygenated fuels on driveability, there is limited information on the effects of oxygenated blends at altitude. Most of the recent CRC work has concentrated on closed-loop, fuel-injected vehicles. Since Colorado has been at the forefront of the movement to require the use of oxygenated fuels during winter months, and since the Denver area has a high percentage of open-loop vehicles, the test fleet for the 1988 program also included a number of pre-1980 open-loop vehicles.

The test program was divided into two phases: a high-altitude phase was conducted near Denver, Colorado, from January 11 through February 10, 1988, at an altitude of 5,486 feet; and a low-altitude phase was conducted in Brainerd, Minnesota, from March 4 through March 31, 1988, at an altitude of 1,226 feet. Test temperatures were 10°F to 40°F.

Members of the Data Analysis Panel and participants in the test program are shown in Appendices A and B, respectively. Appendix C outlines the proposed program as approved by the CRC Volatility Group, and Appendix D details the fuel/vehicle assignments for each test day. A preliminary report on the test program, issued in May 1988, is attached to this report as Appendix E.

II. SUMMARY AND CONCLUSIONS

Analysis of the data provided the following conclusions:

- The altitude change between the two sites had no significant effect on driveability. For the fleet, demerits at high altitude were only 5 percent higher than at low altitude.
- Over the range of 10°F to 40°F, the temperature effect for the pre-1980 carbureted vehicles at 363 average total weighted demerits (TWD's) was a decrease of 4.9 TWD's per degree Fahrenheit increase in ambient temperature. The effect for the new model vehicles at an average TWD level of 70 was a decrease of 1.3 TWD's per degree Fahrenheit increase in ambient temperature, which was significantly different from the pre-1980 vehicle effect.

- For the overall fleet, the hydrocarbon-only fuels performed better than the oxygenate-containing fuels at a statistically significant level. The splash-blended ethanol (3.5 wt.% oxygen) and matched-volatility MTBE (2 wt.% oxygen) were not different from each other at a statistically significant level, but were better than the matched-volatility ethanol blends at a statistically significant level. These effects occurred independently of vehicle type.
- The effect of volatility level was significant. As expected, increasing T_{10} and/or T_{50} gave poorer performance. This effect occurred independently of oxygenate.
- Within current-model vehicles, port-fuel-injected vehicles provided the best performance, followed by throttle-body-injected, and carbureted vehicles; however, these differences were not statistically significant.
- The pre-1980 carbureted vehicles gave much poorer performance than current-model carbureted or fuel-injected vehicles. This difference was found to be highly significant.
- Within each vehicle group, large vehicle-to-vehicle variability in performance was found.

The results found in this study are a technical indication of driveability using trained raters. The test was not designed to predict how the statistical significance of any difference found relates to customer perception of the performance of the fuels.

III. TEST VEHICLES

The test fleet is shown in Table I. Fifteen of the vehicles were 1987 or 1988 model years with closed-loop (feedback) fuel metering systems. Included in this group were five port-fuel-injected (PFI), four throttle-body-injected (TBI), and six carbureted vehicles. Of the PFI vehicles, one was turbocharged and another was equipped with a four-valve engine. An additional six vehicles were 1978 or 1979 model years with open-loop metering systems. Throughout the report, the six 1987 or 1988 model-year carbureted vehicles will be referred to as "new" carbureted vehicles, and the 1978 or 1979 vehicles as "old" carbureted vehicles. The three additional vehicles shown in Table I were used to develop rater correction factors. All 1987/1988 vehicles were equipped with air-conditioning, Federal emission control devices, and automatic transmissions.

The PFI vehicles were designated as Vehicle Numbers 2, 5, 10, 14, 18, and 23. The TBI vehicles were Numbers 1, 9, 13, 21, and 24. The new carbureted vehicles were Numbers 3, 7, 11, 15, 17, 19, and 22; and the old carbureted vehicles were Numbers 4, 6, 8, 12, 16, and 20.

Each vehicle was prepared for testing by installing fuel tank drains, fuel tank drain hoses, fuel tank thermocouples, manifold vacuum taps, vacuum lines, and new spark plugs, and cleaning the port fuel injectors by a local contract garage facility and local dealerships. All vehicles passed the tailpipe emissions tests conducted by the State of Colorado Emissions Laboratory. Prior to on-site testing, the engine oil was changed in each vehicle with fresh commercial 5W-30 engine oil. At the completion of the program, the vehicles were returned to the dealer for removal of all test equipment.

No additional mechanical work was performed on the vehicles unless it was necessary for the continuance of the test program. Consequently, all of the vehicles were tested in an "as-received" condition, with no attempt made to correct malfunctioning emission devices or fuel delivery system deficiencies. The results of an on-site inspection of the vehicles are shown in Table II.

IV. TEST FUELS

The test fuels consisted of four fuel types: hydrocarbon-only (Fuels 1-3); hydrocarbon plus 10 vol.% ethanol (Fuels 4-6); hydrocarbon plus 11 vol.% volume methyl tertiary-butyl ether (MTBE) (Fuels 7-9); and hydrocarbon plus ethanol splash blends (Fuels 10-12). With the exception of the splash blends, each of the blends matched the T_{10} and T_{50} distillation temperatures and Reid vapor pressure to the corresponding hydrocarbon-only blend. Splash blends were blends of Fuels 1-3 plus ethanol.

Table III shows test fuel properties averaged across results from the laboratories of four of the participating companies. Samples were obtained from the same drum source on the same date following the conclusion of the low-altitude vehicle testing. Distillation curves for the low, medium, and high volatility fuels are shown in Figures 1, 2, and 3, respectively. Individual laboratory results are shown in Appendix F.

Participating laboratory results surprisingly showed MTBE at about 1% in the "non-MTBE" fuels. No MTBE was intentionally added to these blends. In any case, it has been assumed that these low MTBE levels had no appreciable impact on the overall conclusions.

V. TEST FACILITIES

The high-altitude phase of the program was conducted at the Front Range Airport near Denver, Colorado, at an altitude of 5,486 feet. The test facility was paved, offered access to local roads for vehicle preconditioning, and allowed overnight parking for the test vehicles adjacent to the test course. The test course was laid out on two taxiways, as shown in Figure 4.

The low-altitude phase of the program was conducted at Brainerd International Raceway in Brainerd, Minnesota, at an altitude of 1,226 feet. A schematic of the test site is shown in Figure 5. The facilities included a drive-through fuel/equipment storage and vehicle refueling shed, office space, overnight parking for the test vehicles adjacent to the track, and the track. Driveability tests were conducted on the straightaway of the track, with vehicle preconditioning for the next day's testing accomplished by driving four laps around the three-mile track.

Snow removal equipment was available at both locations and used when required.

VI. TEST CONDITIONS

The average run temperatures for the high- and low-altitude phases of the program were 26.7°F and 28.5°F, respectively. Table IV shows average run temperatures for the twelve fuels by the four fuel delivery systems. For the fleet at high altitudes, the matched-volatility 10 vol.% ethanol and the matched-volatility 11 vol.% MTBE fuels had slightly higher run temperatures than the hydrocarbon-only fuel by 6°F and 10°F, respectively. The average run temperature for the splash-blended 10 vol.% ethanol fuels was similar to the hydrocarbon-only fuels (22°F hydrocarbon-only, 24°F splash-blended ethanol). For the fleet at low altitudes, average temperatures for the four fuel compositions were consistent and ranged from 27°F to 31°F.

VII. TEST DESIGN

The statistically designed test program was divided into two phases: a high-altitude phase and a low-altitude phase. The same test vehicles were used for both phases and were divided into three groups: red, blue, and yellow. The assignment of vehicles to each group was approximately equal based upon the various fuel delivery systems. Each rater was assigned the same vehicles for both phases. Raters 1 and 2 were the same individuals for both phases. Rater 3 participated in the high-altitude phase, while Rater 4 participated in the low-altitude phase. Both Raters 3 and 4 were assigned the same vehicles. Each vehicle group was assigned a different fuel for each test day. All fuels

were tested twice in the high-altitude phase. With the exceptions of Fuels 2, 4, and 8, all fuels were tested twice in the low-altitude phase. Time constraints in this phase precluded duplicate testing of all fuels. Details of this test program are given in Appendix C, while fuel/vehicle assignments for each test day are shown in Appendix D. Three vehicles were also tested each day, one vehicle per rater, using the same test fuel (Fuel 3) for determining rater severity levels.

VIII. TEST PROCEDURE

The test procedure for both the high- and low-altitude phases was the CRC Cold-Start and Warmup Driveability Procedure. The driving procedure was preceded by draining the test vehicle's fuel tank, adding the prescribed amount of test fuel, and disconnecting the battery power to the electronic control module for a minimum of one minute to clear any adaptive memory. The adaptive memory was reprogrammed to the new fuel using the following driving procedure. All vehicles were "warmed up" by driving fifteen miles using a schedule that included steady states of 25, 35, 45, and 55 miles per hour each for a quarter-mile, and a full stop with a moderate acceleration up to 55 miles per hour. The vehicles were then driven the last two cycles of the Cold-Start and Warmup Driveability Procedure. Driveability malfunctions were recorded for these two cycles and appear as "warm" demerits in Appendix G. These demerits were not used in the computations of this study, but were recorded to assist with the diagnosis of any performance problems with the vehicles. The vehicles were then parked and allowed to soak overnight at ambient temperatures. All vehicles were started the next day using an external battery source in order to eliminate the variability of starting demerits due to a weak battery. After start-up, the vehicles were driven the first six cycles of the Cold-Start and Warmup Driveability Procedure. Driveability malfunctions were recorded for the series of engine idles, accelerations and decelerations, and constant speed cruises; these malfunctions appear as "cold" demerits in Appendix G. Cold-start driveability analysis is based on these six cycles as in previous test programs. A detailed description of the test procedure and rating system is given in Appendix C.

IX. DISCUSSION OF RESULTS

A complete set of overall test data for both the high- and low-altitude phases may be found in Appendix G. This appendix summarizes the data collected from the individual data sheets. The analysis of data performed as described in the following sections used this data base.

A. Simple Total Weighted Demerit Averages

Average cold total weighted demerit (TWD) data for the program are presented in Tables V through IX. In each table, the numbers shown are the averages of TWD values which include the following rater correction factor to account for the difference in severity between Raters 3 and 4:

$$\text{Rater 3 TWD adjustment} = (\sqrt{\text{TWD}} + 1.89)^2$$

In all other respects, the averages shown represent the averages of raw TWD values.

Tables V and VI show the average high- and low-altitude results, respectively, for each fuel in each of the four fuel-system categories: old carbureted, new carbureted, TBI, and PFI. Averages are shown for each of the four fuel compositions and for the average of all twelve fuels. It is clear from the grand fuel averages at each test site that the old carbureted vehicles demonstrated four or five times the TWD's associated with any of the other three vehicle classifications. This is true for each fuel composition at either test site.

Table VII shows the differences (Denver minus Brainerd) between Tables V and VI. Values indicate differences due to the two test sites. Positive values would indicate poorer driveability at Denver (high-altitude site). The twelve-fuel averages at the bottom of the table indicate extremely minor differences in three of the four vehicle categories. The difference of 26 TWD's shown for the new carbureted vehicles indicates the possibility that altitude performance was poorer for this group of vehicles. Some of the individual fuel-composition-by-vehicle-group cell averages also indicate differences in performance which could be considered appreciable. In most of these cases, the average differences shown for each of the three fuels do not show a clear effect.

Table VIII and Table IX show the effects of each of the three oxygenate blends for Denver and Brainerd, respectively. Shown are the individual delta values determined by subtracting TWD values of Fuels 1, 2, and 3 (hydrocarbon-only) from the comparable oxygenated fuel. Positive values indicate that oxygenated fuels had more demerits than the corresponding hydrocarbon-only fuel. In general, the three-fuel average delta for each fuel composition indicates appreciable differences for each of the oxygenates in the old carbureted vehicle classification. Of course, since TWD values were higher with these vehicles, it is reasonable to assume that TWD differences due to oxygenates will be larger in these vehicles. The Denver assessment of 11 vol.% MTBE in the old carbureted vehicles indicates somewhat lesser degradation in performance (12.1 TWD's) than either the Denver or Brainerd data with the other two oxygenates. The data indicate, however, that the MTBE runs in Denver were conducted at ambient temperatures 10°F higher than the hydrocarbon-only fuel runs. It is believed that this scheduling anomaly accounts for the low-delta TWD value for MTBE in Denver.

A second observation from Tables VIII and IX is that the delta values for the matched-volatility ethanol blends in most cases are appreciable even in the TBI and PFI vehicle categories.

B. DATA TRANSFORMATION

Data were analyzed in terms of the square root of the total weighted demerits (TWD). This will be referred to as SQRTWD. The data were transformed in this way for several reasons:

- The fitting error of the model was normalized across the entire range of TWD values.
- By using square root of TWD, the predicted (fitted) values were positive numbers.

C. ANALYSIS OF VARIANCE

The levels of statistical significance found in this analysis relate to the observations made during the study using trained raters. This program was not designed to correlate customer response with the response of the trained raters.

1. Rater Correction

The results were analyzed using SAS¹. The specific procedure used for the analysis was the General Linear Model (GLM) procedure. The first analysis done was a correction for the third rater. Vehicles 22, 23, and 24, were run on Fuel 3, and each was rated by all three raters at Denver and at Brainerd; however, only two raters (1 and 2) were common to both sites. Rater 3 was found to produce lower TWD's than raters 1 and 2 at Denver, while Rater 4 was much closer to Raters 1 and 2 at Brainerd. An analysis of variance was performed to find the effect of the different Rater 3 on SQRTWD. The model used to analyze the rater effects utilized run temperature, rater, site, rater-by-site interaction, and vehicle as parameters. This analysis yielded a correction of 1.89 in SQRTWD to be added to Rater 3 at the high-altitude site. All subsequent analysis of the data used this rater correction.

1. SAS Institute, Inc., "SAS User's Guide: Basics, Version 5 Edition," 1985.

SAS Institute, Inc., "SAS User's Guide: Statistics, Version 5 Edition," 1985.

Rater Correction

	<u>SortWD</u>	<u>TWD</u>
Rater 1	10.037	100.74
Rater 2	10.550	111.30
Rater 3	7.886	62.19
Rater 3 (corrected)	9.776	95.57
Rater 4	9.777	95.58

2. Full Model Analysis

The initial analysis of variance allowed only for main effects and two-factor interactions. It excluded, however, the error effect terms of the interaction of the vehicle (vehicle group) with the other main variables. This gives overly optimistic significance values, as it uses only the residual error for all the error terms in the analysis. It does, however, find the terms which are not significant so that they can be dropped in a second analysis. The following interactions were found to be not significant:

site * oxygenate
site * volatility
oxygenate * volatility
oxygenate * vehicle group

This means that the differences between oxygenates are not statistically different at Denver and at Brainerd; the volatility effects are not statistically different at Denver than at Brainerd; and in each volatility class, the oxygenate effects are not statistically different.

3. Reduced Model Analysis - Second Pass

The effects which were not found to be statistically significant in the full model were deleted and a second analysis was run. This analysis was designed to test the statistical significance of the interaction of each of the main effects of the model with the vehicle (vehicle group) term. This term is a "nested" term because each vehicle is associated (or nested within) with only one vehicle group. This analysis gave the following observations:

- Run temperature (air temperature at start of run) effects: Only vehicle group interacts with run temperature; oxygenate and site interaction with run temperature are not significant.

- Site * vehicle group interaction is not significant.
- Volatility * vehicle group interaction is not significant.
- Vehicle group is highly significant.
- Volatility and oxygenate are highly significant effects.
- Significant error terms of the form (X) * vehicle (vehicle group) are:

site * vehicle (vehicle group)
volatility * vehicle (vehicle group)

These results led to the third pass. The third pass model deleted all terms that were not significant except for "site."

4. Reduced Model Analysis - Third Pass

The effects of all significant variables (and site) are discussed in terms of the Least Square Means (LSM) for each factor level. Least Square Means are a method of averaging, performed by the GLM procedure, which averages the effect over all the other test variables in the model. The SAS program, code, and output for this analysis appear in Appendix H.

a) Run Temperature

Although the program was not designed to evaluate test temperature, a significant effect was found. All vehicle groups were responsive to test temperature. The response of SQRTWD to temperature for each of the vehicle groups is shown in the following table:

New PFI	-0.06	SQRTWD/DEG F
New TBI	-0.08	SQRTWD/DEG F
New Carbureted	-0.10	SQRTWD/DEG F
Average New Vehicle	-0.08	SQRTWD/DEG F
Old Carbureted	-0.13	SQRTWD/DEG F

The standard error of the pairwise differences is 0.018 SQRTWD/DEG F.

Over the range of 10°F to 40°F, the temperature effect for the pre-1980 vehicles (old carbureted) at 363 average TWD's was a decrease of 4.9 TWD's per degree Fahrenheit increase in ambient temperature. The effect for the new vehicles at an average TWD level of 70 was a decrease of 1.3 TWD's per degree Fahrenheit increase in ambient temperature, which was significantly different from the pre-1980 vehicle effect ($p < 0.01$).

The effect is calculated by taking the SQRTWD at the average demerit level in question and subtracting the response factor given above from it. This quantity is then squared and subtracted from the square of SQRTWD (the TWD).

In equation form:

$$\Delta \text{TWD/deg F} = \text{TWD} - [(\text{SQRTWD}) - x]^2$$

where x = the response factor from the above table

b) Site

The difference in TWD's at high altitude (Denver, 5486 feet) and at low altitude (Brainerd, 1226 feet) was not significant ($p = 0.395$). The following table shows the results:

<u>SITE</u>	<u>SQRTWD</u>	<u>TWD</u>
Denver	11.54	133
Brainerd	11.26	127

The standard error for the difference is 0.33 SQRTWD.

The effect of site, broken up by vehicle group is as follows:

	Denver		Brainerd	
	<u>SQRTWD</u>	<u>TWD</u>	<u>SQRTWD</u>	<u>TWD</u>
New PFI	6.92	48	7.23	52
New TBI	8.86	78	8.55	73
New Carbureted	10.02	100	8.66	75
Old Carbureted	18.91	358	19.30	372

The difference between the two sites was statistically significant ($p < 0.001$) only with the new carbureted vehicles.

The three rater vehicles were also evaluated for site effects. The results are as follows:

<u>Vehicle</u>	<u>Denver</u>		<u>Brainerd</u>	
	<u>SORTWD</u>	<u>TWD</u>	<u>SORTWD</u>	<u>TWD</u>
22	15.67	245	11.38	130
23	5.75	33	5.86	31
24	12.29	151	9.78	96

Site was statistically significant ($p < 0.001$) for Vehicles 22 and 24. The large vehicle-to-vehicle variability found in the program, however, makes any discussion of vehicle or vehicle-group effects inconclusive.

c) Oxygenate

The average TWD's by oxygenate-type were:

<u>OXYGENATE</u>	<u>SORTWD</u>	<u>TWD</u>
Hydrocarbon-Only	10.48	110
11% Matched-Volatility MTBE	11.04	122
10% Matched-Volatility Ethanol	11.71	137
10% Splash-Blended Ethanol	10.84	118

For volatility-matched fuels, average TWD's were: 110 for hydrocarbon-only fuels; 122 for 11 vol.% matched-volatility MTBE fuels; and 137 for 10 vol.% matched-volatility ethanol fuels. Each of these values was significantly different ($p < 0.01$) from each other.

Average TWD's were 137 for the 10 vol.% matched-volatility ethanol fuels and 118 for the 10 vol.% splash-blended ethanol fuels. This difference was significantly different ($p < 0.01$).

Average TWD's for the 10 vol.% splash-blended ethanol fuels were 118. The splash-blended ethanol fuels performed significantly poorer ($p < 0.01$) than the hydrocarbon-only fuels (TWD = 110). Volatility-adjusted MTBE blends were not significantly different from splash-blended ethanol ($p = 0.155$).

Despite the oxygenate-vehicle group term's not being significant, it is of interest to calculate the oxygenate effect by vehicle group:

NEW CARBURETED

<u>OXYGENATE</u>	<u>SORTWD</u>	<u>TWD</u>
Hydrocarbon-Only	8.78	77
11% Matched-Volatility MTBE	9.32	87
10% Matched-Volatility Ethanol	10.30	106
10% Splash-Blended Ethanol	9.03	81

In the new carbureted group, only the 10 vol.% matched-volatility gasoline-ethanol blend was significantly different from each of the other three fuels.

PFI

<u>OXYGENATE</u>	<u>SORTWD</u>	<u>TWD</u>
Hydrocarbon-Only	6.92	48
11% Matched-Volatility MTBE	7.19	52
10% Matched-Volatility Ethanol	7.53	57
10% Splash-Blended Ethanol	6.63	44

In the PFI group, the 10 vol.% matched-volatility gasoline-ethanol blend was significantly different from the 10 vol.% splash-blended gasoline-ethanol blend. No other combinations were significantly different.

TBI

<u>OXYGENATE</u>	<u>SORTWD</u>	<u>TWD</u>
Hydrocarbon-Only	8.38	70
11% Matched-Volatility MTBE	8.63	74
10% Matched-Volatility Ethanol	9.53	91
10% Splash-Blended Ethanol	8.32	69

In the TBI group, only the 10 vol.% matched-volatility gasoline-ethanol blend was significantly different from the other three fuels.

OLD CARBURETED

<u>OXYGENATE</u>	<u>SORTWD</u>	<u>TWD</u>
Hydrocarbon-only	17.90	320
11% Matched-Volatility MTBE	19.15	367
10% Matched-Volatility Ethanol	19.93	397
10% Splash-Blended Ethanol	19.34	374

In the old carbureted group, the 10 vol.% matched-volatility gasoline-ethanol blend was significantly different from the hydrocarbon-only fuel and the 11 vol.% matched-volatility gasoline-MTBE blend. The hydrocarbon-only fuel was significantly different from all the other fuels.

d) Volatility

The three fuels used in each oxygenate group were divided into three volatility classes. T_{10} values of 110°F were labeled as low, while T_{10} values of 140°F were labeled as high. T_{50} values of 200°F were labeled as low, while T_{50} values of 230°F were labeled as high. The average SORTWD and TWD's for the three volatility levels of the test fuels are shown in the following table:

<u>VOLATILITY</u>			<u>SORTWD</u>	<u>TWD</u>
T_{10}/T_{50}	T_{10}	T_{50}		
Low/Low	110	200	10.24	105
Low/High	110	230	11.19	125
High/High	140	230	12.77	163

All the differences were significant ($p < 0.001$). The standard error of the pairwise differences was 0.30 units of SORTWD. As expected, increasing T_{10} and/or T_{50} gave poorer performance. The effects shown above were independent of oxygenate and vehicle group. It is of interest, however, to calculate the above averages by vehicle group:

NEW CARBURETED

<u>VOLATILITY</u>			<u>SortWD</u>	<u>TWD</u>
<u>T₁₀/T₅₀</u>	<u>T₁₀</u>	<u>T₅₀</u>		
Low/Low	110	200	8.02	64
Low/High	110	230	9.15	84
High/High	140	230	10.82	117

All the above differences were significant in this group.

PFI

<u>VOLATILITY</u>			<u>SortWD</u>	<u>TWD</u>
<u>T₁₀/T₅₀</u>	<u>T₁₀</u>	<u>T₅₀</u>		
Low/Low	110	200	6.42	41
Low/High	110	230	6.74	45
High/High	140	230	7.91	63

For the PFI vehicles, demerit levels with the low/low fuel series and the low/high fuel series were not significantly different. The high/high fuel series was significantly different from the other two fuel series.

TBI

<u>VOLATILITY</u>			<u>SortWD</u>	<u>TWD</u>
<u>T₁₀/T₅₀</u>	<u>T₁₀</u>	<u>T₅₀</u>		
Low/Low	110	200	7.45	56
Low/High	110	230	8.38	70
High/High	140	230	10.17	103

All differences for the TBI vehicles were significant.

OLD CARBURETED

<u>VOLATILITY</u>			<u>SortWD</u>	<u>TWD</u>
<u>T₁₀/T₅₀</u>	<u>T₁₀</u>	<u>T₅₀</u>		
Low/Low	110	200	17.39	302
Low/High	110	230	19.15	367
High/High	140	230	20.57	423

All the differences among the three volatility levels were significantly different for the old carbureted vehicles.

e) Vehicle Group

The SQRTWD and TWD's by vehicle group are shown in the following table:

<u>VEHICLE GROUP</u>	<u>SQRTWD</u>	<u>TWD</u>
PFI	7.05	50
TBI	8.66	75
NEW CARB	9.30	86
OLD CARB	19.06	363

The standard error of pairwise differences was 1.19 units of SQRTWD. Only the old carbureted vehicles were highly significantly different from all the others ($p < 0.0001$). The highest significance level between any of the new car types is between new carbureted and PFI at 93 percent ($p < 0.07$).

D. FUEL DISTILLATION EFFECTS

A regression analysis was performed to evaluate the effects of the fuel parameters which were measured. The actual distillation results were used for the analysis. Two models were constructed. The first used each oxygenate type separately; the second used the oxygen content of the fuel.

Several models were constructed with the T_{30} distillation parameter, all yielding a negative term for T_{30} . This negative term occurs because the effect of the oxygenates is large at T_{30} . The test design did not control the T_{30} of the fuel.

Another caution in interpreting the models presented here is that the T_{10} and T_{50} terms were not fully investigated. The high T_{10} , low T_{50} combination was not tested.

1. T_{10} , T_{50} , and Oxygenate Type Analysis

A linear regression using the SAS GLM procedure on the oxygenate type, T_{10} , and T_{50} data yielded the following equation:

$$\begin{aligned} \text{SQRTWD} = & -0.77 \\ & -0.61 \text{ (Hydrocarbon-Only)} \\ & +0.00 \text{ (11\% Matched-Volatility MTBE)} \\ & +0.44 \text{ (10\% Matched-Volatility Ethanol)} \\ & +0.56 \text{ (10\% Splash-Blended Ethanol)} \\ & +0.046 T_{10} \\ & +0.029 T_{50} \end{aligned}$$

The R^2 for this model is 0.980; the standard error is 0.23.

2. T₁₀, T₅₀, and Percent Oxygen Analysis

An analysis using the SAS GLM procedure on the percent oxygen in the fuel, T₁₀, and T₅₀ data yielded the following equation:

$$\begin{aligned} \text{SQRTWD} = & -1.15 \\ & +0.31(\text{Mass \% Oxygen in Fuel}) \\ & +0.047 \text{ T}_{10} \\ & +0.027 \text{ T}_{50} \end{aligned}$$

The R² for this model is 0.979; the standard error is 0.20.

E. CYCLE ANALYSIS

An investigation was made of the relative contribution of each part of the driving cycle to determine if the test length could be shortened.

The SQRTWD results were sorted into groups by driving cycle. The cycles were defined as the starting procedure, called Cycle 0, and each line of driving maneuvers on the data sheet. This yielded a total of seven cycles. The results were then sorted by vehicle group. The data were then normalized by dividing each group's average SQRTWD in each cycle by that group's total SQRTWD. These results are shown in Figure 6. For all four vehicle groups, the first driving cycle had the highest SQRTWD total. The number of demerits decreased sharply for the TBI and new carbureted vehicles. The old carbureted and PFI vehicles also decreased, but not as rapidly.

An analysis of the SQRTWD results by fuel and driving cycle are shown in Figure 7. The twelve different fuels all follow the same pattern. One fuel, Fuel 10, was slightly higher at Cycle 1 and slightly lower at Cycle 2. Overall, all fuels fall in the same range.

Based on these observations, it appears that it may be possible in the future to delete the last two cycles without loss of discrimination among the various vehicle groups or fuels. Similar analyses by oxygenate type and by volatility level would be required, however, before any conclusions are drawn concerning the number of cycles in the driving procedure.

T A B L E S
AND
F I G U R E S

TABLE I

TEST VEHICLES

<u>Model Year</u>	<u>Make/Model</u>	<u>Displacement, Liters</u>	<u>Fuel System</u>
1987	Chevrolet Caprice	5.0	Carbureted
1987	Plymouth Horizon	2.2	Carbureted
1988	Chrysler Fifth Avenue	5.2	Carbureted
1987	Honda Civic	1.5	Carbureted
1987	Ford Escort	1.9	Carbureted
1987	Nissan Sentra	1.6	Carbureted
1988	Chevrolet Astro	4.3	Throttle-Body-Injected
1987	Mercury Cougar	3.8	Throttle-Body-Injected
1987	Chrysler LeBaron	2.5	Throttle-Body-Injected
1987	Buick Century	2.5	Throttle-Body-Injected
1987	Buick LeSabre	3.8	Port-Fuel-Injected
1987	Ford Aerostar	3.0	Port-Fuel-Injected
1987	Ford LTD Crown Victoria	5.0	Port-Fuel-Injected
1987	Chrysler LeBaron (turbo)	2.2	Port-Fuel-Injected
1987	Toyota Camry (four-valve)	2.0	Port-Fuel-Injected
1978	Dodge Van	5.9	Carbureted
1979	Ford Fairmont	2.3	Carbureted
1979	Plymouth Volare	5.2	Carbureted
1979	Dodge Pickup Truck	5.9	Carbureted
1979	Pontiac LeMans	3.8	Carbureted
1979	Ford Van	5.0	Carbureted
<u>Rater Comparison Vehicles:</u>			
1987	Dodge Charger	2.2	Carbureted
1987	Toyota Camry (four-valve)	2.0	Port-Fuel-Injected
1987	Buick Century	2.5	Throttle-Body-Injected

TABLE II

VEHICLE MECHANICAL PROBLEMS*

<u>Vehicle</u>	<u>Vehicle Group</u>	<u>Problem</u>	<u>Evaluated Cause</u>
4	Old Carbureted	Acceleration stalls	Tank pickup plugged
6	Old Carbureted	Acceleration stalls	No heated air to carburetor, electric choke modified, and no EGR
8	Old Carbureted	No-starts & acceleration stalls	Choke misadjusted, no heated air to carburetor, and no forward gear when cold
12	Old Carbureted	Down on power - no major problem	Loose timing chain and carburetor misadjusted
15	New Carbureted	Deceleration stalls	Pump cavitation due to slosh on turnaround
16	Old Carbureted	No-starts & acceleration stalls	Choke inoperative, accelerator pump poor, and no heated air to carburetor
20	Old Carbureted	No-starts & acceleration stalls	Choke modified, no heated air to carburetor, and no EGR

* All vehicles listed in this table, except Vehicle 4, were evaluated at the end of the program to determine the probable cause of these chronic problems. With the exception of Vehicle 4, no attempt was made to repair these vehicles, as this would have changed the conditions under which the data were being collected. Vehicle 4, however, was repaired when it became evident that the plugged fuel tank pickup was preventing completion of the runs.

TABLE III

RESULTS OF ANALYSES FOR THE 1988 CRC DRIVEABILITY PROGRAM FUELS

Summary

	1	2	3	4	5	6	7	8	9	10	11	12
RVP, psi	13.4	13.6	9.8	13.7	13.3	9.5	13.8	13.4	9.5	13.9	13.5	10.6
Dist, % Evap., °F												
IBP	81	79	88	83	84	101	80	81	87	84	84	94
5 vol. %	99	97	120	104	106	129	100	99	125	106	106	120
10 vol. %	109	108	138	111	114	142	106	107	141	109	112	133
20 vol. %	128	134	177	128	133	155	126	132	173	122	130	148
30 vol. %	149	163	204	142	147	172	147	158	198	134	143	158
40 vol. %	173	198	222	158	165	214	173	192	217	145	156	183
50 vol. %	200	234	235	204	233	238	203	228	234	170	193	224
60 vol. %	230	264	250	243	260	250	234	256	248	213	244	243
70 vol. %	269	289	274	265	277	268	265	277	268	253	273	265
80 vol. %	311	310	308	297	302	300	310	302	301	306	301	303
90 vol. %	339	333	329	330	335	332	342	329	332	336	327	328
95 vol. %	353	346	342	343	346	346	357	344	349	348	344	339
EP	394	383	384	382	381	386	402	385	377	388	391	384
T(V/L=20), °F	114	120	146	114	116	142	118	122	146	113	116	134
FIA, %												
Aromatics	30	45	33	30	29	38	34	33	38	32	40	34
Olefins	2	3	3	2	2	2	2	2	2	2	3	3
Saturates	68	52	64	68	69	60	64	65	60	66	57	63
Oxygenate Content, %												
Ethanol	<0.1	<0.1	<0.1	9.3	8.8	9.4	<0.1	<0.1	<0.1	7.9	9.8	9.9
MTBE	1.0	1.0	1.4	0.9	0.8	0.8	11.4	10.4	11.3	1.0	1.1	1.2

TABLE IV

AVERAGE RUN TEMPERATURES
(Degrees Fahrenheit)

Hydrocarbon-only			Hydrocarbon + 10 vol.% Ethanol			Hydrocarbon + 11 vol.% MTBE			Hydrocarbon + 10 vol.% Ethanol		
(Matched-Volatility)			(Matched-Volatility)			(Matched-Volatility)			(Splash-Blended)		
1	2	3	4	5	6	7	8	9	10	11	12

High-Altitude Phase

<u>Fuel System</u>												
Old Carbureted	26	18	23	31	20	34	32	32	18	22	32	32
New Carbureted	25	20	24	31	19	34	32	30	21	20	32	32
TBI	26	17	23	32	20	34	32	33	19	23	31	31
PFI	27	18	23	31	21	34	32	34	18	23	32	32
Average	26	18	23	31	20	34	32	32	19	22	32	32
Average by fuel composition	22			28				32		24		

Low-Altitude Phase

<u>Fuel System</u>												
Old Carbureted	32	25	26	30	26	28	28	29	23	28	31	31
New Carbureted	31	23	28	34	25	30	29	26	24	26	32	32
TBI	32	26	24	29	27	27	29	32	23	30	30	30
PFI	33	28	24	27	23	27	28	31	23	29	31	31
Average	32	26	26	30	25	28	28	30	23	28	31	31
Average by fuel composition	28			28				27		31		

TABLE V

AVERAGE TOTAL WEIGHTED DEMERITS (RATER-ADJUSTED)

High-Altitude Phase (Denver)

<u>Fuel Number</u>	<u>Fuel-System Type</u>			
	<u>Old Carbureted</u>	<u>New Carbureted</u>	<u>TBI</u>	<u>PFI</u>
<u>Hydrocarbon-Only</u>				
1	263.4	74.1	60.2	39.4
2	385.4	115.3	80.7	73.1
3	403.3	127.4	98.1	67.2
	_____	_____	_____	_____
Average	350.7	105.6	79.6	59.9
<u>Matched-Volatility Ethanol</u>				
4	305.7	95.0	67.4	37.5
5	439.6	127.6	106.0	68.6
6	441.0	154.6	118.4	57.6
	_____	_____	_____	_____
Average	395.4	125.7	97.2	54.6
<u>Matched-Volatility MTBE</u>				
7	279.0	84.9	55.9	40.8
8	333.5	92.8	69.2	50.3
9	403.4	114.2	106.6	79.5
	_____	_____	_____	_____
Average	338.6	97.3	77.2	56.9
<u>Splash-Blended Ethanol</u>				
10	370.2	69.3	64.8	43.3
11	405.0	97.0	78.6	42.1
12	392.7	132.9	96.5	67.4
	_____	_____	_____	_____
Average	389.3	99.7	80.0	50.9
Grand Average	368.5	107.1	83.5	55.6

NOTE: Not corrected for temperature.

TABLE VI

AVERAGE TOTAL WEIGHTED DEMERITS (RATER-ADJUSTED)

Low-Altitude Phase (Brainerd)

<u>Fuel Number</u>	<u>Fuel-System Type</u>			
	<u>Old Carbureted</u>	<u>New Carbureted</u>	<u>TBI</u>	<u>PFI</u>
<u>Hydrocarbon-Only</u>				
1	263.7	46.0	49.0	60.5
2	341.0	92.0	68.4	41.0
3	385.0	87.9	104.7	61.3
	—	—	—	—
Average	329.9	75.4	74.0	54.4
<u>Matched-Volatility Ethanol</u>				
4	364.5	62.6	58.8	92.8
5	376.1	85.3	72.8	60.7
6	463.5	120.1	133.6	81.4
	—	—	—	—
Average	401.3	89.3	88.4	78.3
<u>Matched-Volatility MTBE</u>				
7	341.3	52.5	57.7	45.0
8	386.3	74.4	58.4	48.4
9	446.9	113.4	99.4	68.0
	—	—	—	—
Average	392.4	80.1	71.8	53.6
<u>Splash-Blended Ethanol</u>				
10	253.1	49.1	46.7	39.4
11	394.3	78.7	67.9	46.4
12	442.7	104.6	86.1	56.1
	—	—	—	—
Average	363.4	77.4	66.9	47.3
Grand Average	371.8	80.6	75.3	58.4

NOTE: Not corrected for temperature.

TABLE VII

EFFECT OF ALTITUDE ON RATER-ADJUSTED TOTAL WEIGHTED DEMERITS

(Denver Minus Brainerd)

<u>Fuel Number</u>	<u>Fuel-System Type</u>			
	<u>Old Carbureted</u>	<u>New Carbureted</u>	<u>TBI</u>	<u>PFI</u>
<u>Hydrocarbon-Only</u>				
1	-0.3	28.1	11.2	-21.1
2	44.4	23.1	12.3	32.1
3	18.2	39.5	-6.6	5.9
	—	—	—	—
Average	20.8	30.2	5.6	5.5
<u>Matched-Volatility Ethanol</u>				
4	-58.8	32.4	8.6	-55.3
5	63.5	42.3	33.2	7.9
6	-22.5	34.5	-15.2	-23.8
	—	—	—	—
Average	- 5.9	36.4	8.8	-23.7
<u>Matched-Volatility MTBE</u>				
7	-62.3	32.4	-1.8	-4.2
8	-52.8	18.4	1.9	10.8
9	-43.5	0.8	7.2	11.5
	—	—	—	—
Average	-53.8	17.2	5.4	3.3
<u>Splash-Blended Ethanol</u>				
10	117.1	20.2	18.1	3.9
11	10.7	18.3	10.7	-4.3
12	-50.0	28.3	10.4	11.3
	—	—	—	—
Average	25.9	22.3	13.1	3.6
Grand Average	- 2.0	26.5	8.2	-2.8

NOTE: Not corrected for temperature.

TABLE VIII

EFFECT OF OXYGENATES ON RATER-ADJUSTED TOTAL WEIGHTED DEMERITS

High-Altitude Phase (Denver)

<u>Fuel</u>	<u>Fuel-System Type</u>			
	<u>Old</u> <u>Carbureted</u>	<u>New</u> <u>Carbureted</u>	<u>TBI</u>	<u>PFI</u>
<u>Effect of 10% Matched-Volatility Ethanol</u>				
4 - 1	42.3	20.9	7.2	-1.9
5 - 2	54.2	12.3	25.3	-4.5
6 - 3	37.7	27.2	20.3	-9.6
	—	—	—	—
Average	44.7	20.1	17.6	-5.3
<u>Effect of 11% Matched-Volatility MTBE</u>				
7 - 1	15.6	10.8	4.3	1.4
8 - 2	-51.9	-22.5	-11.5	-22.8
9 - 3	0.1	-13.2	8.5	12.3
	—	—	—	—
Average	12.1	-8.3	-2.4	-3.0
<u>Effect of 10% Splash-Blended Ethanol</u>				
10 - 1	106.8	-4.8	4.6	3.9
11 - 2	19.6	-18.3	-2.1	-3.1
12 - 3	-10.6	5.5	-1.6	0.2
	—	—	—	—
Average	38.7	-5.9	0.4	-9.0

NOTE: Not corrected for temperature.

TABLE IX

EFFECT OF OXYGENATES ON RATER-ADJUSTED TOTAL WEIGHTED DEMERITS

Low-Altitude Phase (Brainerd)

<u>Fuel</u>	<u>Fuel-System Type</u>			
	<u>Old</u> <u>Carbureted</u>	<u>New</u> <u>Carbureted</u>	<u>TBI</u>	<u>PFI</u>
<u>Effect of 10% Matched-Volatility Ethanol</u>				
4 - 1	100.8	16.6	9.8	32.3
5 - 2	35.1	-6.9	4.4	19.7
6 - 3	78.5	32.2	28.9	20.1
Average	71.4	13.9	14.4	33.9
 <u>Effect of 11% Matched-Volatility MTBE</u>				
7 - 1	77.6	6.5	8.7	-15.5
8 - 2	45.3	-17.8	-10.0	7.4
9 - 3	61.9	25.5	-5.3	6.7
Average	57.4	4.7	-2.2	-0.8
 <u>Effect of 10% Splash-Blended Ethanol</u>				
10 - 1	-10.6	3.1	-2.3	-21.1
11 - 2	53.3	-13.5	-0.5	5.4
12 - 3	57.7	16.7	-18.6	-5.2
Average	33.5	2.0	-7.1	-7.1

NOTE: Not corrected for temperature.

FIGURE 1

FUEL DISTILLATION

LOW VOLATILITY SERIES

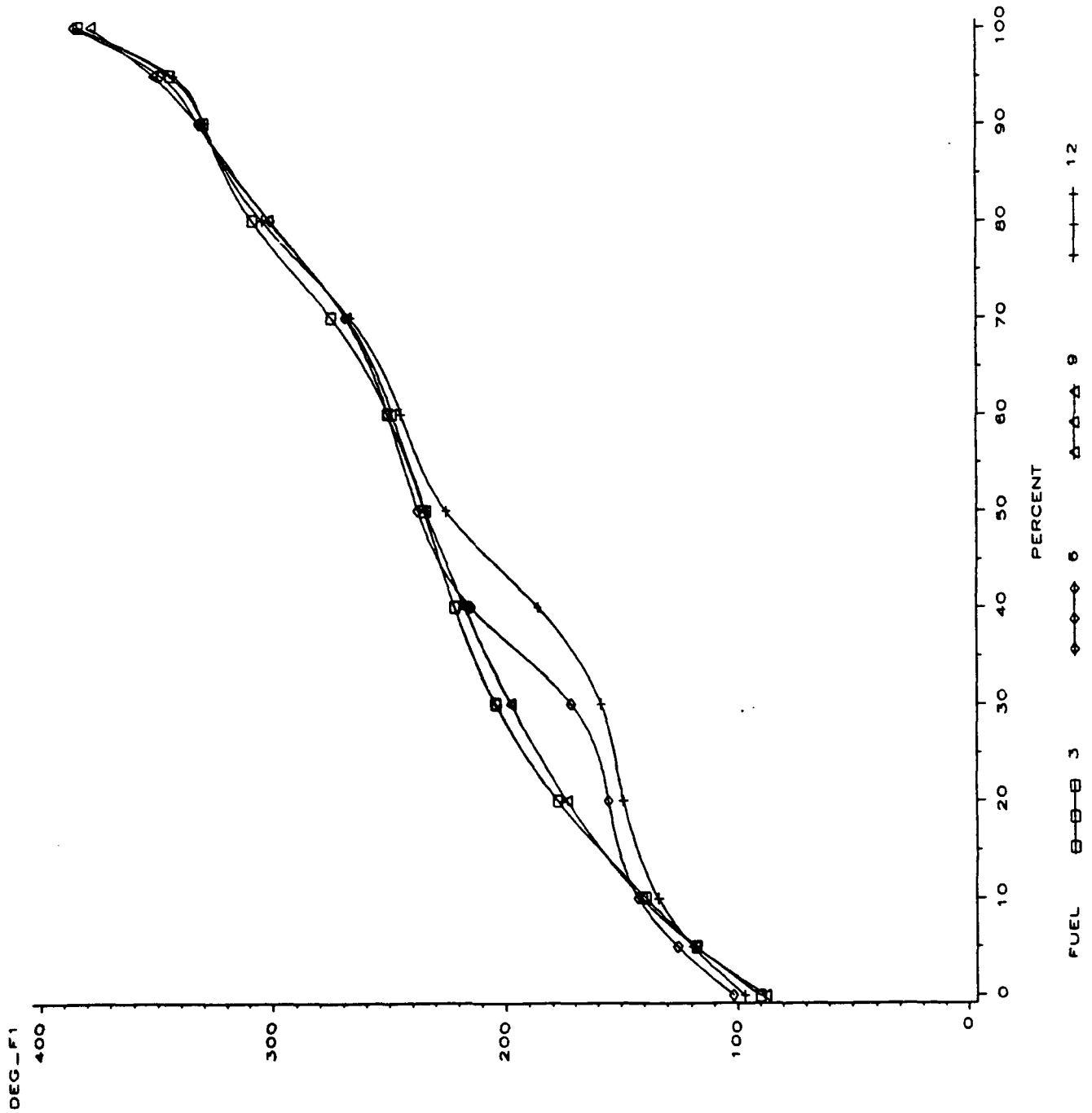


FIGURE 2

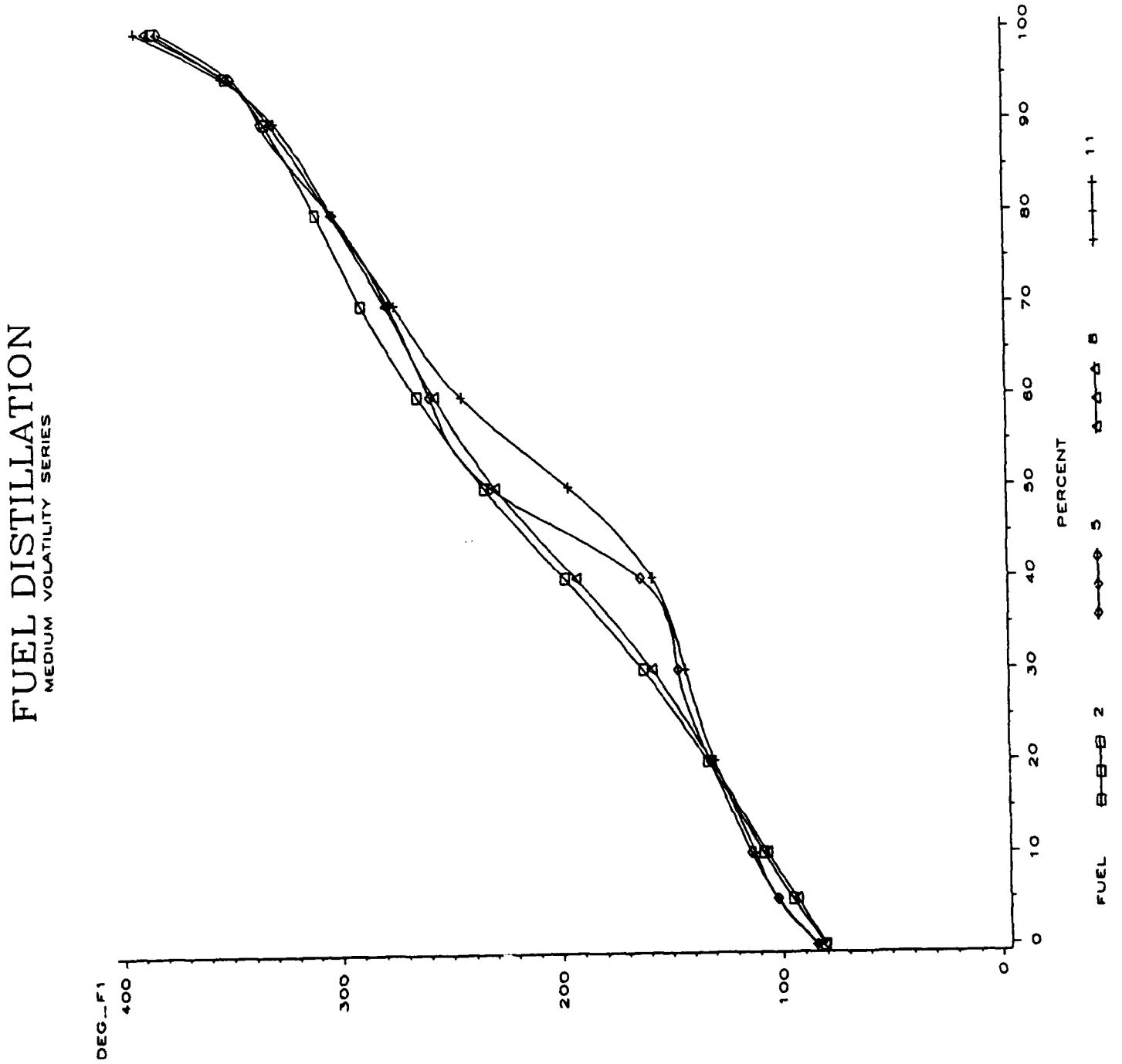
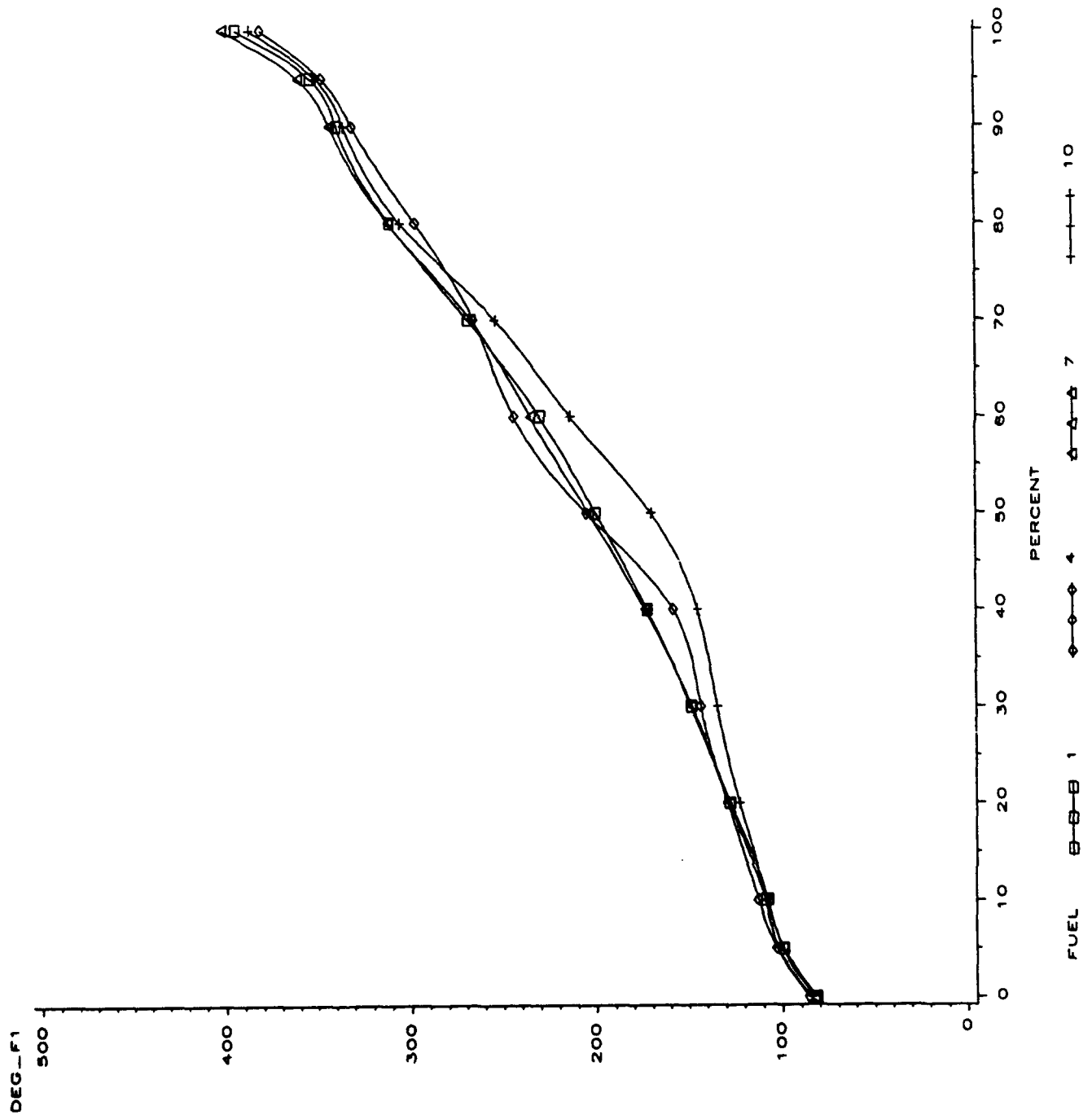
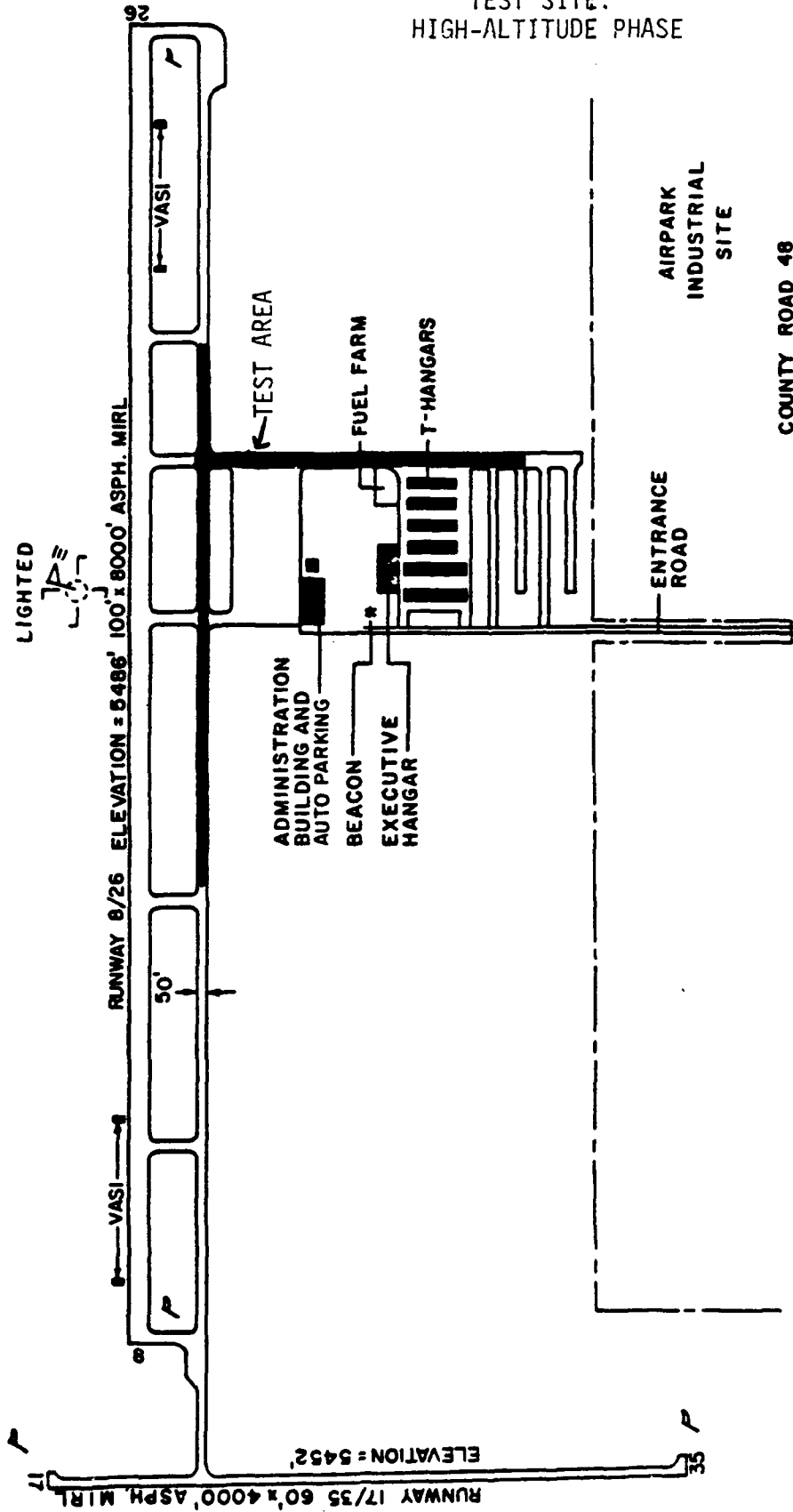


FIGURE 3

FUEL DISTILLATION HIGH VOLATILITY SERIES



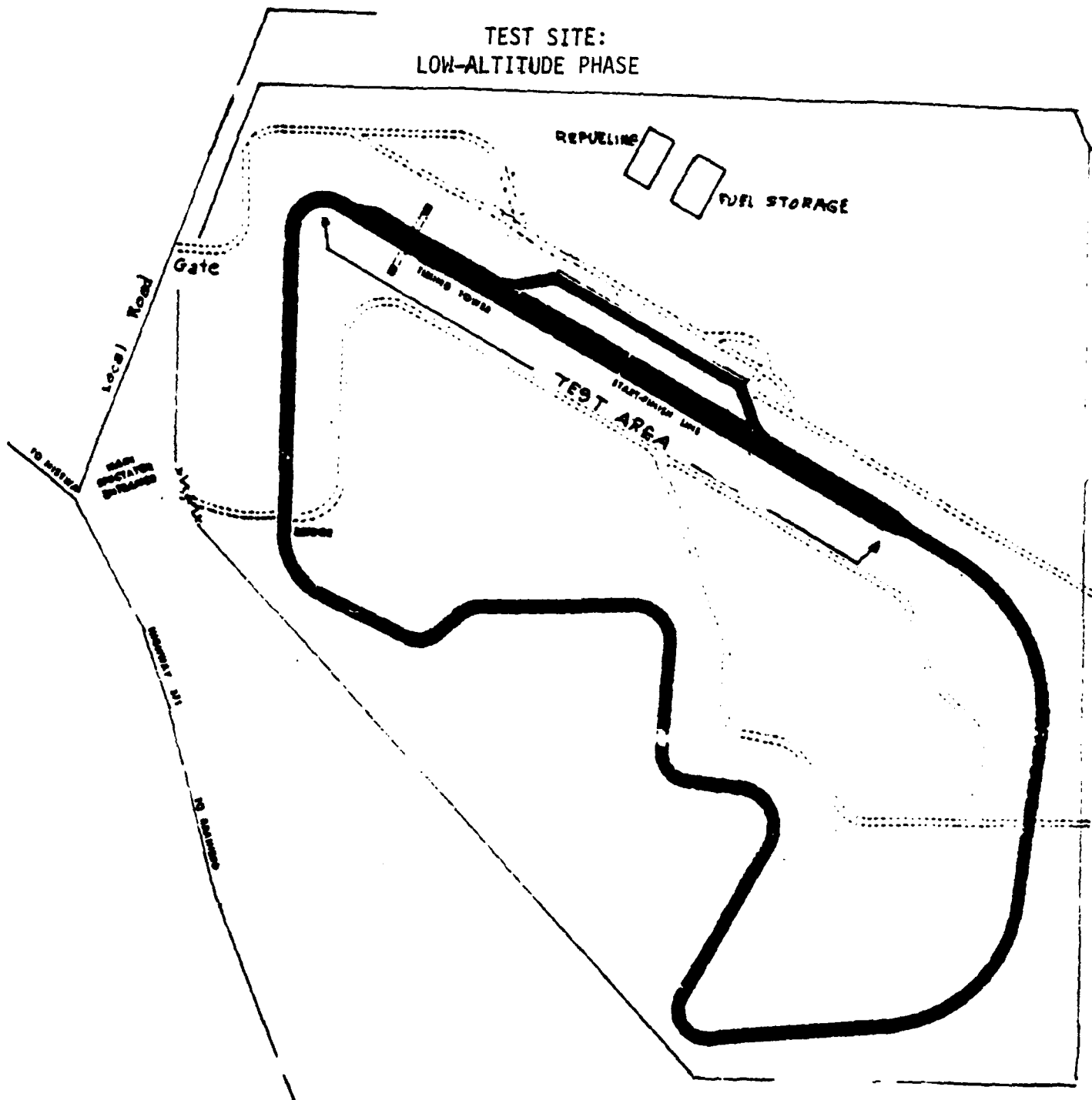
TEST SITE:
HIGH-ALTITUDE PHASE



FRONT RANGE AIRPORT
(Denver, Colorado)

FIGURE 5

TEST SITE:
LOW-ALTITUDE PHASE



BRainerd INTERNATIONAL RACEWAY

FIGURE 6
DISTRIBUTION OF TWD BY CYCLE

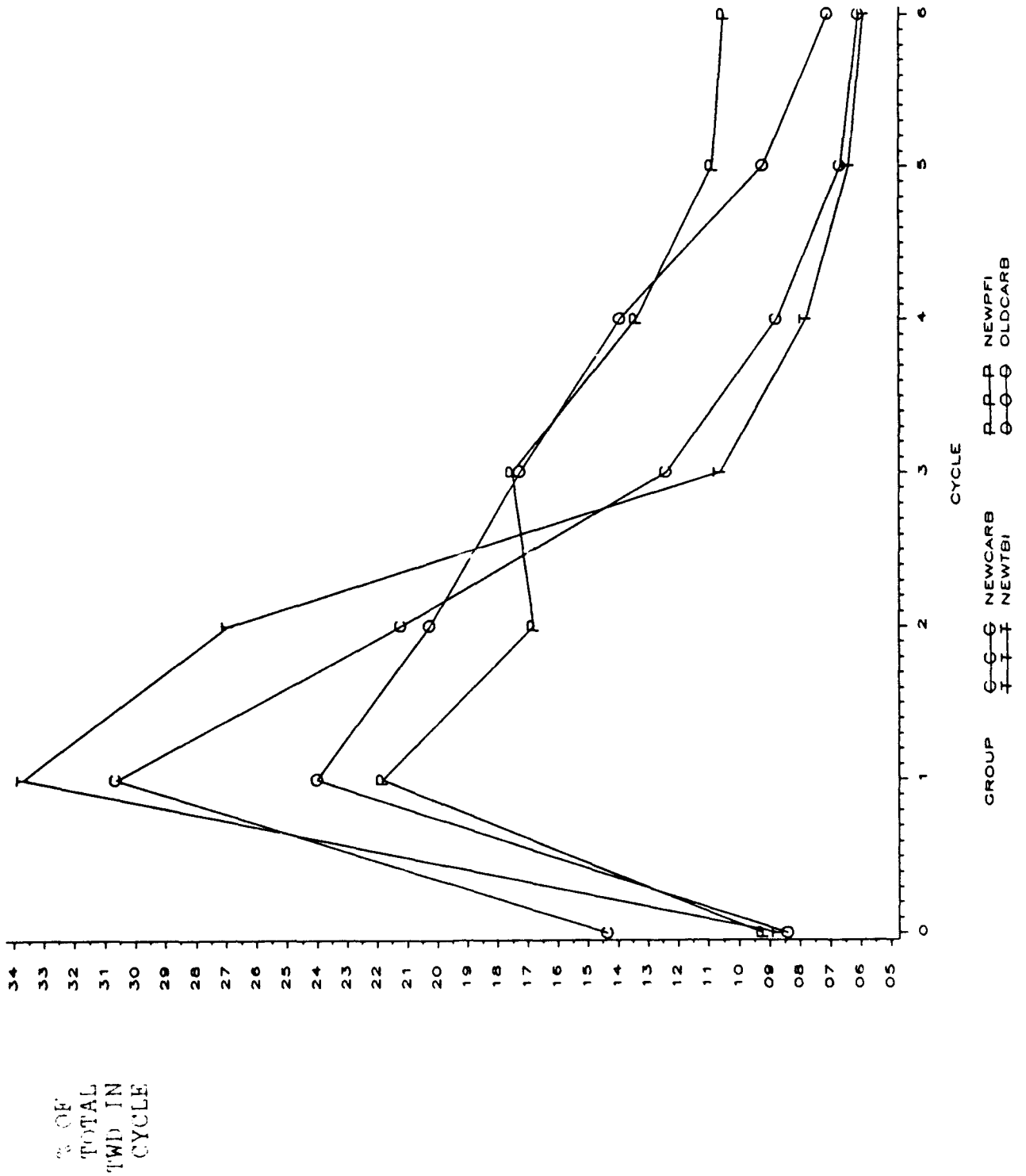
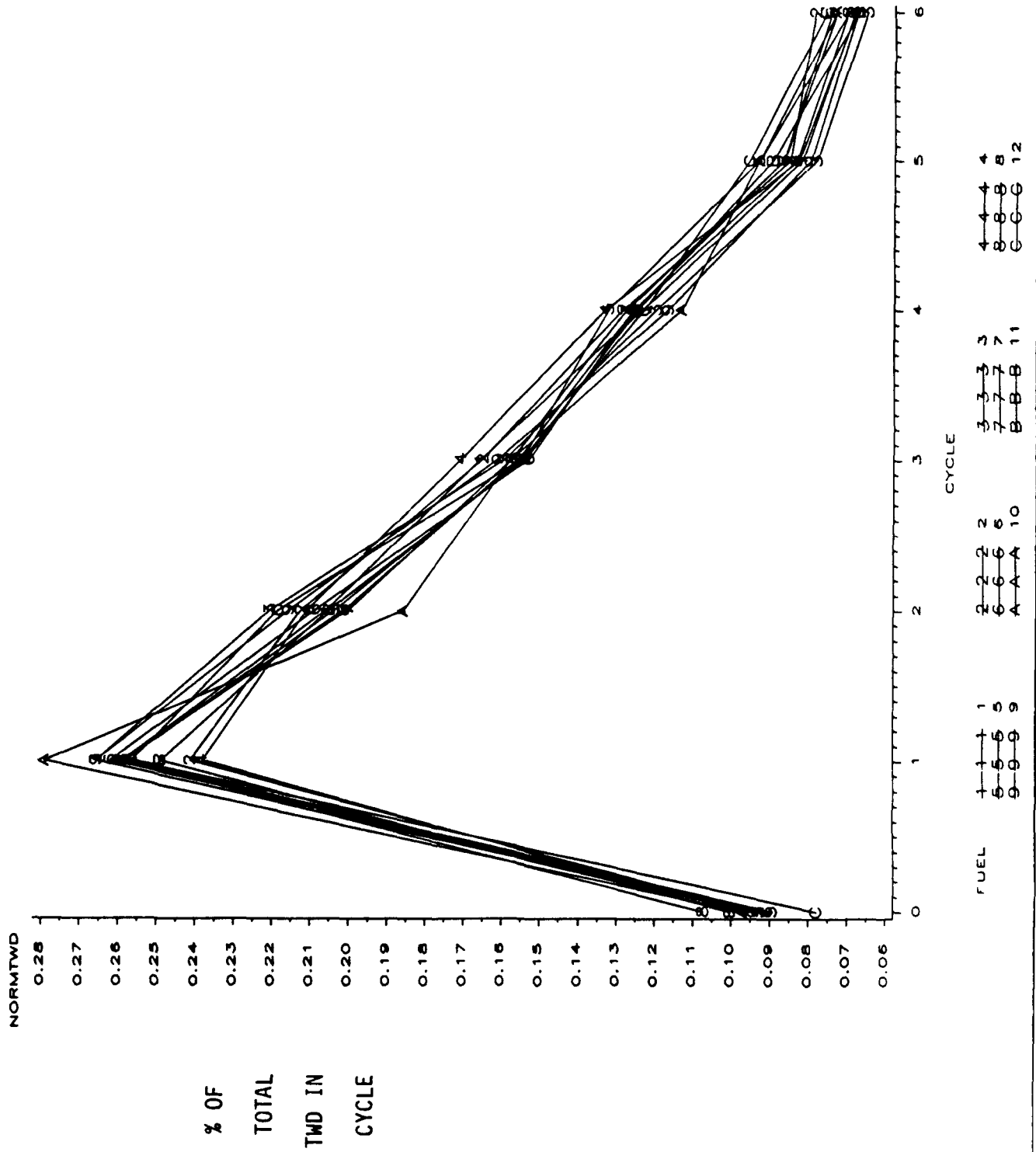


FIGURE 7
ANALYSIS OF SQRD BY FUEL AND CYCLE



APPENDIX A

MEMBERSHIP

OF THE

1988 CRC DRIVEABILITY ANALYSIS PANEL

**MEMBERSHIP OF THE
1988 CRC DRIVEABILITY ANALYSIS PANEL**

<u>NAME</u>	<u>AFFILIATION</u>
P. A. Yaccarino, Leader	General Motors Research Laboratories
D. A. Barker	Shell Development Company
J. H. Baudino	AutoResearch Laboratories, Inc.
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E. D. Steinke	Sun Refining & Marketing Company
J. H. Steury	Amoco Oil Company
L. J. Sumansky	Mobil Research & Development Corporation
C. T. Valade	Chrysler Corporation

APPENDIX B

PARTICIPANTS IN THE

1988 CRC DRIVEABILITY PROGRAM

**PARTICIPANTS IN THE
1988 CRC VOLATILITY PROGRAM ON THE EFFECT OF OXYGENATED FUELS AND
ALTITUDE ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES**

<u>Name</u>	<u>Company</u>	<u>Participation: High-Altitude Phase</u>	<u>Participation: Low-Altitude Phase</u>
Bill Allen	Volvo of North America	X	
Dave Barker	Shell Development Company	X	X
Jack Baudino	AutoResearch Labs, Inc.	X	
Don Burnett	Phillips 66 Company		X
Ed Carhart	Texaco Inc.	X	X
John Deffner	Chevron Research Company	X	
Jimmy Douglass	Shell Development Company		X
Dave Essmann	Consultant		X
Beth Evans	Coordinating Res. Council		X
Art Feyers	Chrysler Corporation	X	
John Graham	Chevron Research Company	X	X
Keith Houser	Chevron Research Company	X	
Scott Jorgensen	GM Research Laboratories	X	X
Toshio Kobayashi	Nissan Research & Develop.	X	
Doug McCorkell	Unocal Corporation	X	
Sterling McFee	Marathon Petroleum Co.	X	
Jim Macias	Shell Development Company	X	
Dick Nelson	Consultant		X
Francis O'Neill	Colorado Dept. of Health	X	
Dennis Poma	Amoco Oil Company		X
Doug Rathe	Shell Development Company	X	
Dick Robison	Colorado Dept. of Health	X	
E. H. Schanerberger	Ford Motor Company	X	X
Lieu Steinke	Sun Refining & Marketing	X	
John Steury	Amoco Oil Company	X	
Linda Sumansky	Mobil Research & Develop.	X	
Dave Swiderski	Chrysler Corporation		X
Vince Thomas	Amoco Oil Company		X
Chuck Valade	Chrysler Corporation	X	X
Greg Van Meveren	AutoResearch Labs, Inc.		X
Phil Yaccarino	GM Research Laboratories	X	X

APPENDIX C

**1988 CRC VOLATILITY PROGRAM ON THE
EFFECT OF OXYGENATED FUELS AND ALTITUDE
ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES**

C-1

COORDINATING RESEARCH COUNCIL

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Not to be Published

**1988 CRC VOLATILITY PROGRAM
ON THE
EFFECT OF OXYGENATED FUELS AND ALTITUDE
ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES**

(CRC Project No. CM-118-88)

**Prepared by the
CRC-Automotive Volatility Group**

November 1987

CRC-AUTOMOTIVE 1988 VOLATILITY PROGRAM

EFFECT OF OXYGENATED FUELS AND ALTITUDE **ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES**

Objective

The objective of the 1988 CRC Volatility Group program is to determine the effects of altitude and fuel oxygenates at low ambient temperatures upon trained-rater cold-start driveability of closed- and open-loop vehicles. The program will compare the relationship, at altitude, between driveability and the 10 and 50 percent distillation temperatures for hydrocarbon-only and hydrocarbon/oxygenate (ethanol and MTBE) blends.

Introduction

There has been much discussion and proposed legislation in many states concerning the use of oxygenated fuels to reduce ambient CO levels. Several metropolitan areas are in the process of requiring the use of oxygenated fuels during the winter months. Denver, Colorado, is at the forefront of this movement. They are planning a phase-in of their program over several years and are inviting comment on any problems which may be associated with the proposal. The Denver area has a high percentage of vehicles which are open-loop-controlled. Based upon past experience, these open-loop vehicles should have the greatest reduction of CO with the use of oxygenated fuels in high-altitude areas.

The CRC Volatility Group has run several programs in recent years to investigate the effect of oxygenated fuels on driveability. Most of the recent Volatility Group work has concentrated on closed-loop, fuel-injected vehicles. There is no recent information, however, on the effects of oxygenated blends at altitude.

Test Temperatures

The test temperature will be targeted for 15-40°F. This is the range of temperature found in Denver during the winter (January) when the use of oxygenated fuels will be required.

Test Fuels

The test fuels will consist of four fuel compositions [hydrocarbon-only, hydrocarbon + 10 vol% ethanol (volatility-matched), hydrocarbon + 10 vol% ethanol (splash-blended), and hydrocarbon + 11 vol% methyl-tertiary-butyl-ether (MTBE, volatility-matched)]. The fuels provide independent variation in two volatility parameters: 10% and 50% distillation temperatures. The term "volatility-matched" refers to the 10% and 50% distillation temperatures.

The fuel set design would require twelve fuels (three for each of the four fuel compositions). The specifications for the test fuels are shown in Table C-I.

The fuel supplier will provide the following inspections:

- Rvp, psi (Dry Method, Modification of D 323)
- Distillation (D 86)
- API Gravity (D 287)
- T_v/L=20 (Hg Modification of D 2533)
- FIA (Hydrocarbon-Only Fuels)
- Benzene, vol% (GC)
- Alcohol Content, vol% (GC)
- Calculated Latent Heat of Vaporization
- Net Heating Value (Modified D 240)
- H/C Ratio (Combustion Method)

Test Vehicles

Tests will be conducted with fifteen 1988 model-year cars and light trucks. These vehicles will all have closed-loop (feedback) fuel-metering systems. Five vehicles will have throttle-body fuel-injection (TBI), five will have port-fuel-injection (PFI), and five will be carburetted. Five open-loop vehicles (drawn from late-model trucks and pre-1980 vehicles) will also be tested. All vehicles will have automatic transmissions. The proposed vehicle list is shown in Table C-II.

Vehicle preparation will include:

- 1) Thorough mechanical inspection.
- 2) Verification of the proper operation of all emission-control and driveability-related devices. This should include a check of idle tailpipe emissions and a check of trouble codes in computer-equipped vehicles. Choke settings of carburetted vehicles will be measured and set to specification.

- 3) Replacement of PFI injectors. If this is not possible, some verification of proper injector flow will be required (i.e., pressure-drop test).
- 4) Installation of manifold vacuum tap.
- 5) Installation of thermocouple in the fuel tank.
- 6) Installation of fuel tank drain.
- 7) Installation of device to cut off power to the electronic control module (ECM). This may be a switch in the electrical feed to the ECM.

Before the testing begins, each vehicle should be run through the driveability procedure with a fuel known to produce few demerits to insure proper vehicle operation.

Test Procedure

The basic test procedure will be the CRC Cold Start and Warmup Driveability Procedure as previously run in 1986/1987.

Many of the closed-loop-controlled vehicles have the ability to update their cold-start and open-loop calibration by using information "learned" during closed-loop operation. This is called adaptive learning. To ensure that all vehicles have adapted to the test fuel, the following procedure modifications will be made:

- Immediately after refueling, disconnect battery power to the ECM for one minute. This will clear any adaptive memory.
- During the fifteen-mile warmup, run the vehicle through a variety of driving conditions (i.e., do not run a constant speed).

Cold start driveability analysis will be based on the initial six cycles as in the previous test programs. The last two cycles will be analyzed separately to indicate warmed-up driveability malfunctions. The test procedure and rating system are included as Attachment A.

Program Duration and Manpower Requirement

Each phase of the program (altitude and sea level) will run for four and one-half weeks. Nine participants are required to be on-site at all times. It is desirable for continuity that raters participate for the full program time of four and one-half weeks.

Test Location and Timing

The high-altitude portion of the program will be conducted from January 11, 1988, through February 10, 1988, at the Front Range Airport, Watkins, Colorado (just outside of Denver). The facility is paved and will offer access to a local highway for vehicle preparation. Snow-removal will be provided by the airport.

The low-altitude portion of the program will be conducted from February 29, 1988, through March 30, 1988, at Brainerd International Raceway, Brainerd, Minnesota. To provide an ice-free and dry surface, salting and sanding of the track will be allowed. Offices and indoor shop areas are also available for our use.

Test Design

There are a total of twenty-seven days (including Saturdays) available for on-site testing for each phase. It should be noted that an "off" day is not really "off," because the vehicle must be prepared for the following day. If all possible days are included, there are thirty-one days available.

A minimum of three days will be needed for setup, rater training, and cleanup.

The test plan will be broken down into two phases:

- I. Twelve test days, all vehicles, Fuels 1-12.
- II. Beginning with the thirteenth day, repeat all vehicles, all fuels except Fuels 1, 4, 7, and 10.

The first twelve days will randomize the order of fuel testing. The vehicle fleet will be broken up into three groups: A, B, and C. The groups will have a mixture of all fuel system types. Raters will be permanently assigned to a vehicle. The test order will be as follows:

<u>DAY</u>	<u>GROUP A</u>	<u>GROUP B</u>	<u>GROUP C</u>
PHASE I			
1	1	5	9
2	10	2	6
3	7	11	3
4	4	8	12
5	11	1	4
6	8	10	1
7	2	4	7
8	12	3	5
9	6	7	2
10	9	12	10
11	5	6	8
12	3	9	11

Beginning with the thirteenth day, all vehicles will be tested on the same fuel, in case testing has to be truncated due to weather. Fuels will be selected on a random basis, excluding Fuels 1, 4, 7, and 10, which will not be repeated unless time allows.

TABLE C-I
TEST FUEL DESIGN LEVELS

<u>Fuel</u>	<u>10% Dist.</u>	<u>50% Dist.</u>
HYDROCARBON-ONLY		
1	110	200
2	110	230
3	140	230
HYDROCARBON + 10 VOL.% ETHANOL (Volatility-Matched)		
4	110	200
5	110	230
6	140	230
HYDROCARBON + 11 VOL.% MTBE (Volatility-Matched)		
7	110	200
8	110	230
9	140	230
HYDROCARBON + 10 VOL.% ETHANOL (Splashed)		
10	Fuel 1 with 10% Ethanol	
11	Fuel 2 with 10% Ethanol	
12	Fuel 3 with 10% Ethanol	

Fuels 1 through 9 shall have a 330°F 90% distillation temperature. Tolerances shall be +5°F on distillation temperatures.

Minimum delta T₁₀ and T₅₀ values are also specified as follows:

- a) T₁₀ for Fuel 3 shall be at least 25°F higher than Fuels 1 and 2.
- b) T₁₀ for Fuel 6 shall be at least 25°F higher than Fuels 4 and 5.
- c) T₁₀ for Fuel 9 shall be at least 25°F higher than Fuels 7 and 8.
- d) T₅₀ for Fuels 2 and 3 shall be at least 25°F higher than Fuel 1.
- e) T₅₀ for Fuels 5 and 6 shall be at least 25°F higher than Fuel 4.
- f) T₅₀ for Fuels 8 and 9 shall be at least 25°F higher than Fuel 7.

RVP ranges for all fuels are specified below:

<u>Fuel</u>	<u>RVP, psi</u>
1, 2, 4, 5, 7, 8, 3, 6, 9,	13.5 ±0.5 Maximum possible with T ₁₀ @ 140°F

All fuels shall be unleaded and have a minimum (R+M)/2 octane rating of 88. Fuels shall exhibit no phase separation at 0°F.

Fuels shall contain no more than 3% Benzene.

Fuels shall not exceed the ASTM maximum endpoint specification of 437°F.

Fuels shall not contain more than 40% aromatic.

Fuels shall contain an antioxidant and a corrosion inhibitor.

Ethanol shall be denatured with unleaded gasoline (CDA Formula #20).

TABLE C-II

TEST VEHICLES

<u>Manufacturer</u>	<u>Displacement</u>	<u>Fuel System</u>
General Motors	2.5 Liter	TBI
General Motors	4.3 Liter	TBI
Ford	3.8 Liter	TBI
Chrysler	2.5 Liter	TBI
AMC	1.7 Liter	TBI
General Motors	3.8 Liter	PFI
Ford	3.0 Liter	PFI
Ford	5.0 Liter	PFI
Chrysler (Turbo)	2.2 Liter	PFI
Toyota	2.0 Liter	PFI
General Motors	5.0 Liter	CARB
Chrysler	2.2 Liter	CARB
Chrysler	5.2 Liter	CARB
Honda	1.5 Liter	CARB
Nissan	1.6 Liter	CARB

Two light-duty trucks and three passenger cars with carburetted, open-loop fuel systems will be used.

ATTACHMENT A**CRC COLD START AND WARMUP DRIVEABILITY PROCEDURE****TEST PROCEDURE AND DATA RECORDING**

- A. Record all necessary test information at the top of the data sheet.
- B. Start engine per Owner's Manual Procedure. Record start time.
- C. If engine fails to start after 15 seconds of cranking, stop cranking. Follow Owner's Manual procedure for this situation. Begin cranking and record total cranking time until engine starts.
- D. Record idle quality in "Neutral" or "Park" immediately after start; foot should be removed from accelerator pedal.
- E. If engine stalls, repeat Steps B and C. Record number of stalls and starting time of required restarts.
- F. Allow engine to idle 15 seconds. Apply brakes (right foot), shift to normal drive range, and record idle quality. If engine stalls, restart immediately. Do not record restart time. Record number of stalls. Idle 5 seconds in "Drive".

This completes the start-up portion of the procedure. Note that space on the data sheet has only been provided for two restart times at any idle condition. If three stalls occur at any condition, record the three stalls, restart (without recording time) and proceed to the next scheduled condition.

- G. After 5 seconds in "Drive" (Step F), make a light throttle (Lt. th) acceleration from 0-25 mph at constant throttle opening beginning at the predetermined manifold vacuum.* Cruise at 25 mph. At the 0.2 mile marker open throttle to the detent position and accelerate from 25 to 35 mph at constant throttle in high gear. Decelerate to a stop, and at the 0.3 mile marker make a WOT acceleration from 0 to 35 mph. Decelerate to 10 mph and at mile marker 0.4 accelerate at light throttle from 10 to 25 mph. Definitions of light throttle, detent, and WOT accelerations are attached.

* Marked on vacuum gauge.

- H. During the above maneuvers, observe and record the severity of any of the following malfunctions (see attached definitions):

1. Hesitation
2. Stumble
3. Surge
4. Stall
5. Backfire

Record maneuvering stalls on the data sheet in the appropriate column: accelerating or decelerating.

- I. At the 0.5 mile marker, brake moderately to a stop on the right side of the roadway. Idle for 30 seconds in Drive. Record idle quality and number of stalls.
- J. Perform Steps G, H, and I three times (1.5 miles). The mile marker for the beginning of each maneuver is indicated on the data sheet.
- K. At mile marker 1.5, after completing the 30-second idle, make a crowd acceleration (constant predetermined vacuum) from 0-45 mph. Four tenths of a mile is provided for this maneuver. Decelerate from 45 to 25 mph at the 1.9 mile marker, and open throttle to detent position and accelerate from 25 to 35 mph. At 2.0 miles decelerate to a stop and accelerate from 0 to 35 mph at WOT. At 2.1 miles decelerate to 10 mph and accelerate from 10 to 25 mph at light throttle. Rate and record malfunctions in these maneuvers as in Step H. Idle 30 seconds in Drive as in Step I.
- L. Perform Step K one time. Appropriate mile markers for the start of each maneuver are shown on the data sheet.

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 an 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 one inch Hg greater than the initial power cut-in vacuum obtained from carburetor flow curves. However, if a 0-25 mph light throttle maneuver (car warmed up) cannot be completed in 0.1 mile, vacuum is decreased in steps of one inch Hg until the 0-25 maneuver can be completed in 0.1 mile. The selected vacuum is posted in each car.
2. 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.
3. Detent - All detent accelerations are begun by opening the throttle to the downshift position as indicated by transmission shift characteristic curves. Manifold vacuum corresponding to this point at 25 mph is posted in each car. 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.

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 occurring during acceleration or cruise.

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 layman.
3. Heavy (H) - A level of malfunction severity that is pronounced and obvious to both test driver and layman.

Enter a T, M, or H 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 indicate that the maneuver was performed and operation was satisfactory during that maneuver.

DEMERIT CALCULATION SYSTEM

A numerical value for driveability during the CRC test is obtained by assigning demerits to operating malfunctions as shown on Page C-19. Depending upon the type of malfunction, demerits are assigned in various ways. Demerits for poor starting are obtained by subtracting two seconds from the measured starting time. The number of stalls which occur during idle as well as during driving maneuvers are counted separately and assigned demerits as shown on Page C-19. 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.

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 on Page C-19 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.

METHOD FOR CALCULATING TOTAL WEIGHTED DEMERITS (TWD)

Demerits for Poor Starting:

$$\text{Demerits} = \text{Starting Time(s)} - 2$$

Demerits for Stalls:

$$\text{Demerits} = (\text{No. of Idle Stalls}) \times 8 + (\text{No. of Maneuvering or Decelerating Stalls}) \times 32$$

Demerits for Malfunctions Rated Subjectively:

Demerits for Subjective Ratings

Trace	= 1
Moderate	= 2
Heavy	= 4

Weighting Factors for Each Malfunction

Idle Roughness	= 1
Surge	= 4
Backfire, Stumble, Hesitation	= 6

$$\text{Weighted Demerits} = \text{Demerits} \times \text{Weighting Factor}$$

Calculation:

$$\text{Total Weighted Demerits} = \text{Weighted Demerits} + \text{Demerits for Stalls} + \text{Demerits for Poor Starting}$$

NOTE: When more than one malfunction occurs in a driving maneuver, only the malfunction giving the highest weighted demerits is counted.

CRC Driveability Data Sheet

Temperatures				
Soak	Run	Fuel tank	X1	X2

Run no.	Car	Fuel	Rater	Date	Time

Starting time, sec.				Idle N.		Idle Dr.	
Initial	Restart 1	Restart 2	Restart 3	Ruf. stalls	Ruf. stalls	Ruf. stalls	Ruf. stalls

[illegible]

1.5		0-45 Crowd		1.9		25-35 Derent		2.0		0-35 WOT		2.1		10-25 Lt. Th.		2.2 Idle		Temperatures	
Stalls		Stalls		Stalls		Stalls		Stalls		Stalls		Stalls		Stalls		Stalls		Stalls	
2.2		2.6		3.3		4.0		4.7		3.6		4.3		5.0					
2.9		3.4		4.1		4.8		4.9		2.7		2.8		3.5		2.9			
3.6		4.2		4.9		5.0		5.1		3.2		3.8		4.5		3.1			
4.3		5.0		5.1		5.2		5.3		3.9		4.6		5.2		3.7			
5.0		5.7		5.8		5.9		6.0		4.0		4.7		5.3		3.8			
5.7		6.4		6.5		6.6		6.7		4.1		4.8		5.4		3.9			
6.4		7.1		7.2		7.3		7.4		4.2		4.9		5.5		4.0			
7.1		7.8		7.9		8.0		8.1		4.3		5.0		5.6		4.1			
7.8		8.5		8.6		8.7		8.8		4.4		5.1		5.7		4.2			
8.5		9.2		9.3		9.4		9.5		4.5		5.2		5.8		4.3			
9.2		9.9		10.0		10.1		10.2		4.6		5.3		5.9		4.4			
9.9		10.6		10.7		10.8		10.9		4.7		5.4		6.0		4.5			
10.6		11.3		11.4		11.5		11.6		4.8		5.5		6.1		4.6			
11.3		12.0		12.1		12.2		12.3		4.9		5.6		6.2		4.7			
12.0		12.7		12.8		12.9		13.0		5.0		5.7		6.3		4.8			
12.7		13.4		13.5		13.6		13.7		5.1		5.8		6.4		4.9			
13.4		14.1		14.2		14.3		14.4		5.2		5.9		6.5		5.0			
14.1		14.8		14.9		15.0		15.1		5.3		6.0		6.6		5.1			
14.8		15.5		15.6		15.7		15.8		5.4		6.1		6.7		5.2			
15.5		16.2		16.3		16.4		16.5		5.5		6.2		6.8		5.3			
16.2		16.9		17.0		17.1		17.2		5.6		6.3		6.9		5.4			
16.9		17.6		17.7		17.8		17.9		5.7		6.4		7.0		5.5			
17.6		18.3		18.4		18.5		18.6		5.8		6.5		7.1		5.6			
18.3		19.0		19.1		19.2		19.3		5.9		6.6		7.2		5.7			
19.0		19.7		19.8		19.9		20.0		6.0		6.7		7.3		5.8			
19.7		20.4		20.5		20.6		20.7		6.1		6.8		7.4		5.9			
20.4		21.1	</																

Comments:

APPENDIX D

TEST SCHEDULE

TEST SCHEDULE - DENVER

The test plan will be broken down into three phases:

- I. 12 test days, all vehicles, all 12 fuels
- II. 9 test days, all vehicles, a repeat of fuels 2,3,5,6,8,9,11,12
- III. 3 test days, all vehicles, a repeat of fuels 1,4,7,10

Everyday each rater will test one of the rater comparison vehicles.

Testing will proceed through the three phases as time and weather permit.

Phase I randomizes the order of fuel testing. The car fleet will be broken up into three groups, Red, Blue, and Yellow. The groups will have a mixture of all fuel system types. Raters will be permanently assigned to a vehicle. Phases II and III will test only one fuel per day. The test order will be as follows:

<u>DAY</u>	<u>CAR GROUP - FUEL</u>		
1	RED 1	BLUE 5	YELLOW 9
2	BLUE 2	YELLOW 6	RED 10
3	YELLOW 3	RED 7	BLUE 11
4	BLUE 8	YELLOW 12	RED 4
5	RED 11	BLUE 1	YELLOW 4
6	YELLOW 1	RED 8	BLUE 10
7	BLUE 4	RED 2	YELLOW 7
8	YELLOW 5	BLUE 3	RED 12
9	RED 6	YELLOW 2	BLUE 7
10	BLUE 12	RED 9	YELLOW 10
11	RED 5	YELLOW 8	BLUE 6
12	YELLOW 11	BLUE 9	RED 3

PHASE II

<u>DAY</u>	<u>FUEL</u>	<u>CAR GROUP</u>		
13	9	BLUE	YELLOW	RED
14	8	YELLOW	BLUE	RED
15	6	RED	YELLOW	BLUE
16	12	BLUE	RED	YELLOW
17	2	RED	BLUE	YELLOW
18	5	YELLOW	RED	BLUE
19	3	RED	YELLOW	BLUE
20	11	BLUE	YELLOW	RED

PHASE III

21	10	YELLOW	BLUE	RED
22	1	YELLOW	RED	BLUE
23	4	BLUE	RED	YELLOW
24	7	RED	BLUE	YELLOW

TEST SCHEDULE BRAINERD

The test plan will be broken down into three phases:

- I. 12 test days, all vehicles, all 12 fuels
- II. 8 test days, all vehicles, a repeat of fuels 1,3,5,6,7,9,10,12
- III. 4 test days, all vehicles, a repeat of fuels 2,4,8,11

Everyday each rater will test one of the rater comparison vehicles.

Testing will proceed through the three phases as time and weather permit.

Phase I randomizes the order of fuel testing. The car fleet will be broken up into three groups, Red, Blue, and Yellow. The groups will have a mixture of all fuel system types. Raters will be permanently assigned to a vehicle. Phases II and III will test only one fuel per day. The test order will be as follows:

DAYCAR GROUP - FUELPHASE I

1	RED 1	BLUE 5	YELLOW 9
2	BLUE 2	YELLOW 6	RED 10
3	YELLOW 3	RED 7	BLUE 11
4	BLUE 8	YELLOW 12	RED 4
5	RED 11	BLUE 1	YELLOW 4
6	YELLOW 1	RED 8	BLUE 10
7	BLUE 4	RED 2	YELLOW 7
8	YELLOW 5	BLUE 3	RED 12
9	RED 6	YELLOW 2	BLUE 7
10	BLUE 12	RED 9	YELLOW 10
11	RED 5	YELLOW 8	BLUE 6
12	YELLOW 11	BLUE 9	RED 3

PHASE II

<u>DAY</u>	<u>FUEL</u>	<u>CAR GROUP</u>		
13	6	BLUE	YELLOW	RED
14	1	YELLOW	BLUE	RED
15	10	RED	YELLOW	BLUE
16	12	BLUE	RED	YELLOW
17	9	RED	BLUE	YELLOW
18	5	YELLOW	RED	BLUE
19	7	RED	YELLOW	BLUE
20	3	BLUE	YELLOW	RED

PHASE III

21	11	YELLOW	BLUE	RED
22	8	YELLOW	RED	BLUE
23	2	BLUE	RED	YELLOW
24	4	RED	BLUE	YELLOW

APPENDIX E

PRELIMINARY REPORT ON THE 1988 CRC VOLATILITY PROGRAM ON THE EFFECT OF OXYGENATED FUELS AND ALTITUDE ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES

COORDINATING RESEARCH COUNCIL

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Society of Automotive Engineers, Inc.

**1988 CRC VOLATILITY PROGRAM ON THE
EFFECT OF OXYGENATED FUELS AND ALTITUDE
ON DRIVEABILITY AT LOW AMBIENT TEMPERATURES**

(CRC Project No. CM-118-88)

MAY 1988

INTRODUCTION

The 1988 CRC driveability program investigated the effects of altitude and fuel oxygenates at low ambient temperature upon cold-start driveability with vehicles equipped with various fuel delivery systems. This program was conducted because of the use of gasoline-oxygenate blends to reduce ambient air carbon monoxide levels. The test program was divided into two phases. A high-altitude phase was conducted near Denver, Colorado, from January 11 through February 10, 1988, at an altitude of 5,486 feet; and a low-altitude phase was conducted in Brainerd, Minnesota, from March 4 through March 31, 1988, at an altitude of 1,226 feet. Test temperatures were 10°F to 40°F.

The test fleet of twenty-four vehicles (shown in Table I) was chosen to represent a variety of engines and fuel delivery systems. Fifteen of the vehicles were 1987 or 1988 models with closed-loop fuel metering systems. Included in this group were port-fuel-injected, throttle-body-injected, and carbureted vehicles. Six vehicles were pre-1980 open-loop carbureted vehicles. Three vehicles were used to develop rater correction factors.

The twelve test fuels consisted of three volatility levels of the following four fuel compositions: hydrocarbon-only; hydrocarbon plus 10 percent by volume ethanol (matched-volatility); hydrocarbon plus 11 percent by volume methyl tertiary-butyl ether (MTBE) (matched-volatility); and hydrocarbon plus 10 percent by volume ethanol (splash-blended). The term "matched-volatility" refers to a fuel which is targeted to have the same Reid vapor pressure and 10 and 50 percent distillation temperatures as the corresponding hydrocarbon-only fuel. These matched-volatility fuels had independent variation in the 10 and 50 percent distillation temperatures. The 90 percent distillation temperature was held constant for all the matched-volatility fuels. The term "splash-blended" refers to the addition of ethanol to the hydrocarbon-only fuels with no volatility adjustment. Specifications for the test fuels are shown in Table II.

The test procedure used in this program was the CRC Cold-Start and Warmup Driveability Procedure. Driveability malfunctions were recorded for the series of engine idles, accelerations and decelerations, and constant speed cruises over the first few miles of vehicle operation. Cold-start driveability malfunctions (hesitation, stumble, surge, backfire, stall, idle quality) were rated for severity. Each of the malfunctions was assigned a demerit level weighted for its relative importance; i.e., higher demerits indicate poorer driveability performance. Analysis of the data was based upon total weighted demerits (TWD's) as defined in the test procedure.

CONCLUSIONS

Analysis of the data provided the following conclusions:

- The altitude change between the two sites had no significant effect on driveability. For the fleet, demerits at high altitude were only 5 percent higher than at low altitude.
- Driveability performance decreased significantly with declining ambient temperatures. The temperature effect for the pre-1980 vehicles was about four times that found in current-model vehicles.
- The oxygenate-containing fuels evaluated performed significantly poorer than hydrocarbon-only fuels. Splash-blended ethanol (3.5 percent by weight oxygen) and matched-volatility MTBE (2 percent by weight oxygen) were not significantly different from each other, but were significantly poorer in performance than hydrocarbon-only fuels and significantly better in performance than matched-volatility ethanol blends. This effect occurred independently of vehicle type.
- The effect of volatility level was significant. As expected, increasing T_{10} and/or T_{50} gave poorer performance. This effect occurred independently of oxygenate.
- Within current-model vehicles, port-fuel-injected vehicles provided the best performance, followed by throttle-body-injected, and carbureted vehicles.
- The pre-1980 carbureted vehicles gave much poorer performance than current-model carbureted or fuel-injected vehicles. This difference was found to be highly significant.
- Within each vehicle group, large vehicle-to-vehicle variability in performance was found.

DATA SUMMARY

Statistical analysis of the data was used to quantify the results. The numerical values that were used to illustrate the effects of the experimental variables on vehicle driveability were statistically derived averages. This averaging was done over the levels of the other test variables using an analysis of variance technique at the 99 percent confidence level ($p = 0.01$). These values were based upon 1,073 valid tests, with TWD's adjusted to 25°F ambient air temperature.

The average TWD's were 133 at high altitude (5,486 feet) and were 127 at low-altitude (1,226 feet). This difference in TWD's is not significant ($p = 0.40$). One vehicle group tested, the current-model carbureted, had an average TWD at low altitude of 75 and at high altitude, an average TWD of 100. This effect, however, is inconclusive due to overall vehicle to vehicle variability ($p < 0.15$).

The average run temperatures for the high- and low-altitude phases of the program were 26.7°F and 28.5°F, respectively, which were in good agreement with the mean target temperature of 25°F. All vehicle groups were responsive to test temperature. Over the range of 10°F to 40°F, the temperature effect for the pre-1980 vehicles was a decrease of 4.9 TWD's per degree Fahrenheit increase in ambient temperature. The effect for the current-model vehicles was a decrease of 1.3 TWD's per degree Fahrenheit increase in temperature, which was significantly different from the pre-1980 vehicle effect ($p < 0.01$).

The average TWD's by oxygenate-type were:

Hydrocarbon-Only Fuels	-	110
11% Matched-Volatility MTBE	-	122
10% Matched-Volatility Ethanol	-	137
10% Splash-Blended Ethanol	-	118

The effect of vehicle type on these oxygenate-type averages was not significant.

For volatility-matched fuels, average TWD's were: 110 for hydrocarbon-only fuels; 122 for 11 percent by volume matched-volatility MTBE fuels; and 137 for 10 percent by volume matched-volatility ethanol fuels. These values were significantly different ($p < 0.01$).

Average TWD's were 137 for the 10 percent by volume matched-volatility ethanol fuels and 118 for the 10 percent by volume splash-blended ethanol fuels. These differences in demerits were significantly different ($p < 0.01$).

Average TWD's for the 10 percent by volume splash-blended ethanol fuels were 118. The splash-blended ethanol fuels performed significantly poorer ($p < 0.01$) than the hydrocarbon-only fuels (TWD's = 110).

Volatility-adjusted MTBE blends were not significantly different from splash-blended ethanol ($p < 0.01$).

The twelve test fuels were classified into three volatility levels. Target T_{10} values were 110°F and 140°F; target T_{50} values were 200°F and 230°F. The combinations tested and the average TWD's were:

<u>T_{10}</u>	<u>T_{50}</u>	<u>TWD</u>
Low	Low	105
Low	High	125
High	High	163

All differences were significant ($p < 0.001$). This occurred independently of oxygenate. As expected, increasing T_{10} and/or T_{50} gave poorer performance.

The average TWD's within the vehicle groups were:

Port-Fuel-Injected	-	50
Throttle-Body-Injected	-	75
Current-Model Carbureted	-	86
Pre-1980 Carbureted	-	363

The difference between the port-fuel-injected vehicles and current-model carbureted vehicles was significant at the 93 percent confidence level ($p < 0.07$). The differences between all current-model vehicles and pre-1980 vehicles were highly significant ($p < 0.0001$).

Members of the 1988 CRC Volatility Analysis Panel:

P. A. Yaccarino, Leader	General Motors Research Laboratories
D. A. Barker	Shell Development Company
J. H. Baudino	AutoResearch Laboratories, Inc.
J. P. Graham	Chevron Research Company
L. Painter	Consultant
R. M. Reuter	Texaco Inc.
E. H. Schanerberger	Ford Motor Company
E. D. Steinke	Sun Refining and Marketing Company
J. H. Steury	Amoco Oil Company
L. J. Sumansky	Mobil Research and Development Corp.
C. T. Valade	Chrysler Corporation

TABLE I

TEST VEHICLES

<u>Model Year</u>	<u>Make/Model</u>	<u>Displacement, Liters</u>	<u>Fuel System</u>
1987	Chevrolet Caprice	5.0	Carbureted
1987	Plymouth Horizon	2.2	Carbureted
1987	Chrysler Fifth Avenue	5.2	Carbureted
1987	Honda Civic	1.5	Carbureted
1987	Ford Escort	1.9	Carbureted
1987	Nissan Sentra	1.6	Carbureted
1988	Chevrolet Astro	4.3	Throttle-Body-Injected
1987	Mercury Cougar	3.8	Throttle-Body-Injected
1987	Chrysler LeBaron	2.5	Throttle-Body-Injected
1987	Buick Century	2.5	Throttle-Body-Injected
1987	Buick LeSabre	3.8	Port-Fuel-Injected
1987	Ford Aerostar	3.0	Port-Fuel-Injected
1987	Ford LTD Crown Victoria	5.0	Port-Fuel-Injected
1987	Chrysler LeBaron (turbo)	2.2	Port-Fuel-Injected
1987	Toyota Camry (four-valve)	2.0	Port-Fuel-Injected
1978	Dodge Van	5.9	Carbureted
1979	Ford Fairmont	2.3	Carbureted
1979	Plymouth Volare	5.2	Carbureted
1979	Dodge Pickup Truck	5.9	Carbureted
1979	Pontiac LeMans	3.8	Carbureted
1979	Ford Van	5.0	Carbureted

Rater Comparison Vehicles:

1987	Dodge Charger	2.2	Carbureted
1987	Toyota Camry (four-valve)	2.0	Port-Fuel-Injected
1987	Buick Century	2.5	Throttle-Body-Injected

TABLE II
TEST FUEL DESIGN LEVELS

<u>Fuel</u>	<u>10% Dist.</u>	<u>50% Dist.</u>
HYDROCARBON-ONLY		
1	110	200
2	110	230
3	140	230
HYDROCARBON + 10 VOL.% ETHANOL (Volatility-Matched)		
4	110	200
5	110	230
6	140	230
HYDROCARBON + 11 VOL.% MTBE (Volatility-Matched)		
7	110	200
8	110	230
9	140	230
HYDROCARBON + 10 VOL.% ETHANOL (Splashed)		
10	Fuel 1 with 10% Ethanol	
11	Fuel 2 with 10% Ethanol	
12	Fuel 3 with 10% Ethanol	

Fuels 1 through 9 shall have a 330°F 90% distillation temperature. Tolerances shall be +5°F on distillation temperatures.

Minimum delta T_{10} and T_{50} values are also specified as follows:

- a) T_{10} for Fuel 3 shall be at least 25°F higher than Fuels 1 and 2.
- b) T_{10} for Fuel 6 shall be at least 25°F higher than Fuels 4 and 5.
- c) T_{10} for Fuel 9 shall be at least 25°F higher than Fuels 7 and 8.
- d) T_{50} for Fuels 2 and 3 shall be at least 25°F higher than Fuel 1.
- e) T_{50} for Fuels 5 and 6 shall be at least 25°F higher than Fuel 4.
- f) T_{50} for Fuels 8 and 9 shall be at least 25°F higher than Fuel 7.

RVP ranges for all fuels are specified below:

<u>Fuel</u>	<u>RVP, psi</u>
1, 2, 4, 5, 7, 8,	13.5 +0.5
3, 6, 9,	Maximum possible with T_{10} @ 140°F

All fuels shall be unleaded and have a minimum (R+M)/2 octane rating of 88.
 Fuels shall exhibit no phase separation at 0°F.
 Fuels shall contain no more than 3% Benzene.
 Fuels shall not exceed the ASTM maximum endpoint specification of 437°F.
 Fuels shall not contain more than 40% aromatic.
 Fuels shall contain an antioxidant and a corrosion inhibitor.
 Ethanol shall be denatured with unleaded gasoline (CDA Formula #20).

APPENDIX F
INDIVIDUAL LABORATORY
FUEL PROPERTY DATA

. APPENDIX F

RESULTS OF ANALYSES FOR THE 1988 CRC DRIVEABILITY PROGRAM FUELS

Individual Laboratory Results

Lab	Fuel 1				Fuel 2				Fuel 3				Fuel 4			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
RVP, psi	12.6	13.4	14.0	13.5	13.1	13.8	13.6	13.7	9.6	10.4	9.0	10.1	13.4	14.0	13.6	13.7
Dist, % Evap. @ of																
IBP	84	-	82	78	82	-	80	76	88	-	90	86	84	-	84	82
5 vol. %	99	-	-	-	97	-	-	-	120	-	-	-	104	-	-	-
10 vol. %	112	107	110	106	110	106	106	110	143	134	144	133	114	109	115	108
20 vol. %	130	128	129	127	134	132	132	136	180	177	180	172	132	127	130	124
30 vol. %	150	149	149	147	163	162	160	167	206	205	205	200	140	144	143	143
40 vol. %	174	174	172	171	198	198	195	202	222	222	223	219	160	156	157	159
50 vol. %	200	201	201	199	234	232	234	238	235	236	236	232	206	206	198	208
60 vol. %	230	231	230	229	264	261	264	269	250	251	251	247	246	242	245	240
70 vol. %	270	268	273	266	288	286	290	292	278	274	276	270	285	262	268	264
80 vol. %	313	307	316	308	310	308	312	311	310	305	313	306	298	294	297	302
90 vol. %	337	334	344	340	330	328	336	339	328	326	334	329	334	326	333	326
95 vol. %	351	355	-	-	348	345	-	-	340	344	-	-	344	342	-	-
EP	393	392	405	386	392	391	358	391	384	372	394	386	382	377	392	378
T(V/L)=20, °F	-	110	118	-	-	120	120	-	-	147	146	-	-	113	116	-
FIA, %																
Aromatics	35	27	29	-	46	38	52	-	36	31	33	-	34	27	29	-
Olefins	2	3	2	-	3	3	4	-	3	3	3	-	2	3	2	-
Saturates	63	70	69	-	51	59	44	-	61	66	64	-	61	70	69	-
Oxygenate Content, %																
Ethanol	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	9.2	9.3	9.5	-
MTBE	0.9	1.0	1.0	-	1.0	1.0	1.1	-	1.3	1.3	1.5	-	0.8	0.8	1.0	-

APPENDIX F (Continued)

F-2

Results of ANALYSES FOR THE 1988 CRC DRIVEABILITY PROGRAM FUELS

Individual Laboratory Results

Lab	Fuel 5				Fuel 6				Fuel 7				Fuel 8			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
RVP, psi	12.8	13.6	13.4	13.3	9.4	10.2	8.8	9.6	13.0	13.8	14.3	13.8	12.8	13.1	13.8	13.7
Dist. % Evap. @ of																
IBP	86	-	84	83	99	-	104	99	84	-	78	77	82	-	83	77
5 vol.%	106	-	-	-	129	-	-	-	100	-	-	-	99	-	-	-
10 vol.%	118	113	115	111	146	140	142	142	112	107	101	103	112	104	111	102
20 vol.%	135	132	134	131	152	150	156	156	130	127	126	123	136	130	133	127
30 vol.%	144	143	148	147	176	168	172	170	150	148	144	145	162	157	162	153
40 vol.%	171	164	162	162	216	214	220	206	176	174	171	170	196	191	196	185
50 vol.%	225	232	240	234	240	236	239	236	206	205	200	200	232	229	231	222
60 vol.%	264	258	261	255	250	249	252	251	236	235	233	231	258	255	259	252
70 vol.%	276	276	280	276	268	266	270	269	270	264	265	262	277	275	281	276
80 vol.%	300	300	305	302	304	297	302	297	313	308	313	307	303	299	306	300
90 vol.%	337	329	338	335	331	328	339	330	342	336	347	343	330	326	333	328
95 vol.%	347	345	-	-	349	342	-	-	358	356	-	-	347	342	-	-
EP	383	376	382	383	382	382	394	387	405	397	408	397	387	380	388	385
T(V/L)=20, °F	-	115	118	-	-	136	149	-	-	119	118	-	-	124	121	-
FIA, %																
Aromatics	33	27	28	-	41	34	38	-	38	31	32	-	35	29	36	-
Olefins	2	2	1	-	2	2	3	-	2	2	2	-	2	2	3	-
Saturates	65	71	71	-	57	64	59	-	60	67	66	-	63	69	61	-
Oxygenate Content, %																
Ethanol	8.6	9.2	8.7	-	9.3	9.0	9.9	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
MTBE	1.1	0.7	0.7	-	0.6	0.8	0.9	-	11.3	11.8	11.2	-	10.2	10.5	10.6	-

APPENDIX F (Continued)

RESULTS OF ANALYSES FOR THE 1988 CRC DRIVEABILITY PROGRAM FUELS

Individual Laboratory Results

Lab	Fuel 9				Fuel 10				Fuel 11				Fuel 12			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
RVP, psi	9.0	9.9	9.6	9.4	13.6	14.2	14.0	13.7	13.2	13.9	13.4	13.4	10.3	11.0	10.5	10.8
Dist, % Evap. @ of IBP	86	-	88	86	86	-	86	79	84	-	86	82	92	-	98	93
5 vol.%	125	-	-	-	106	-	-	-	106	-	-	-	120	-	-	-
10 vol.%	146	138	142	139	112	107	111	105	114	112	114	109	137	129	134	131
20 vol.%	176	172	173	172	126	120	123	121	132	129	131	128	147	147	148	148
30 vol.%	200	198	196	198	136	134	135	133	142	144	144	143	158	158	157	157
40 vol.%	218	218	216	216	146	144	145	146	157	156	156	157	190	182	186	173
50 vol.%	234	234	234	233	176	164	174	165	198	197	183	194	226	222	225	224
60 vol.%	248	250	248	247	218	214	221	198	246	242	249	239	246	243	243	240
70 vol.%	268	268	268	266	261	254	262	235	274	273	275	271	266	266	266	262
80 vol.%	302	299	306	298	300	300	314	302	300	299	305	299	304	298	310	301
90 vol.%	332	328	336	330	336	330	342	334	328	324	330	327	329	324	332	328
95 vol.%	347	351	-	-	349	346	-	-	344	343	-	-	340	338	-	-
EP	386	385	354	382	388	386	398	382	388	387	403	386	384	377	394	380
T(V/L)=20, °F	-	147	146	-	-	111	115	-	-	114	117	-	-	128	139	-
FIA, %																
Aromatics	39	33	41	-	36	28	32	-	42	35	42	-	38	31	32	-
Olefins	2	2	3	-	2	2	3	-	2	3	4	-	4	3	3	-
Saturates	59	65	56	-	62	70	65	-	56	62	54	-	58	66	65	-
Oxygenate Content, %																
Ethanol	<0.1	<0.1	<0.1	-	7.7	8.0	7.9	-	9.4	10.1	9.8	-	9.7	9.8	10.1	-
MTBE	11.0	11.5	11.4	-	0.9	1.0	1.0	-	1.0	1.1	1.1	-	1.1	1.2	1.2	-

APPENDIX 6

RAW DATA

GLOSSARY FOR RAW DATA

FUEL = Fuel Number
 VEH = Vehicle Number
 RUN = Chronological Test Day
 RATER = Designation for Individual Rater

Temperatures

SOAK = Overnight Soak Temperature
 RUN = Ambient Temperature at Beginning of Individual Test
 TNK1 through TNK7 = Fuel Tank Temperatures Taken at Seven Times During Cold-Start and Driveaway Cycle

Malfunctions

HES = Number of Hesitation Demerits During Cold-Start and Driveaway Cycle
 STUM = Number of Stumble Demerits During Cold-Start and Driveaway Cycle
 SRG = Number of Surge Demerits During Cold-Start and Driveaway Cycle
 BKFR = Number of Backfire Demerits During Cold-Start and Driveaway Cycle
 ACL STL = Number of Acceleration Stall Demerits During Cold-Start and Driveaway Cycle
 DCL STL = Number of Deceleration Stall Demerits During Cold-Start and Driveaway Cycle
 INIT START = Number of Initial Starting Demerits During Cold-Start and Driveaway Cycle
 RSTRT1 through RSTRT3 = Number of Restarting Demerits (for first three weeks) During Cold-Start and Driveaway Cycle
 IDL NEUT RUF = Number of Idle Demerits in Neutral Gear During Cold-Start and Driveaway Cycle
 IDL NEUT STL = Number of Stall Demerits While Idling in Neutral Gear During Cold-Start and Driveaway Cycle
 IDL DRV RUF = Number of Idle Demerits in Drive Gear During Cold-Start and Driveaway Cycle
 IDL DRV STL = Number of Stall Demerits While Idling in Drive Gear During Cold-Start and Driveaway Cycle
 CLD TWD = Total Weighted Demerits for Cold-Start and Driveaway Cycle
 WRM TWD = Total Weighted Demerits for Warmed-up Cycle

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

FUEL VEH RUN RATER			DATE	TEMPERATURES										ACLDCL INIT										IDL*NEUT										IDL*DRV									
				SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRG	BAFR	STL	STL	STRT	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	RUF	STL	RUF	STL	TWD												
2	5	17	2	2/01/88	10	11	13	14	14	15	15	16	18	0	24	52	0	0	0	3	0	0	0	1	0	5	8	93															
2	6	7	3	1/20/88	2	18	11	26	30	24	0	22	31	24	168	0	48	128	0	1	0	0	4	8	24	16	421																
2	6	17	3	2/01/88	10	11	10	10	11	12	13	15	16	12	90	0	48	288	0	2	0	0	2	8	18	8	476																
★	2	7	7	1/20/88	2	23	15	16	17	20	24	26	29	192	0	0	0	96	224	0	0	0	4	8	28	120	672																
2	7	17	1	2/01/88	10	14	9	9	11	13	17	21	23	36	0	0	0	32	32	11	0	0	4	0	28	24	167																
2	8	2	2	1/13/88	7	14	10	12	13	14	16	17	19	150	96	52	0	0	13	0	0	0	4	0	14	0	329																
2	9	2	3	1/13/88	7	16	15	0	0	0	0	0	0	18	0	0	0	0	0	1	0	0	1	0	7	0	27																
2	9	17	3	2/01/88	10	14	11	11	12	13	14	16	18	18	0	0	0	0	0	0	0	0	1	0	7	0	26																
2	10	2	1	1/13/88	7	14	8	10	11	12	14	16	18	0	0	4	0	0	0	0	0	0	0	0	0	0	4																
2	10	17	1	2/01/88	10	14	9	10	11	12	13	15	16	0	0	0	0	0	0	0	0	0	2	0	5	0	7																
2	11	2	2	1/13/88	7	20	14	14	15	15	16	18	19	30	36	32	0	0	0	0	0	0	1	0	2	0	101																
2	11	17	2	2/01/88	10	14	14	14	15	16	17	19	20	36	108	64	0	0	4	0	0	0	2	0	6	0	220																
2	12	2	3	1/13/88	7	16	16	17	18	21	22	25	28	18	18	0	24	192	0	1	0	0	0	16	0	269																	
2	12	17	3	2/01/88	10	14	13	13	15	15	17	20	22	0	0	0	96	160	0	3	0	0	4	0	20	0	283																
2	13	2	1	1/13/88	7	16	12	13	13	15	17	19	21	72	0	16	0	0	0	0	0	0	2	0	11	0	101																
2	13	17	1	2/01/88	10	14	11	12	13	14	17	18	20	66	0	0	0	0	0	0	0	0	4	0	21	0	91																
2	14	2	2	1/13/88	7	24	15	16	17	19	22	24	27	42	24	8	0	0	0	0	0	0	2	0	6	0	82																
2	14	17	2	2/01/88	10	14	14	14	16	18	21	23	26	30	36	40	0	0	0	0	0	0	1	0	10	0	117																
2	15	9	3	1/22/88	7	29	28	28	29	29	30	31	0	24	0	0	0	0	0	0	0	0	4	8	16	8	60																
2	15	17	3	2/01/88	10	14	12	12	13	13	14	16	18	24	6	0	0	0	13	0	0	0	4	0	16	8	71																
2	16	9	1	1/22/88	7	29	24	25	26	26	26	27	28	234	0	0	0	64	0	13	13	0	4	8	22	0	358																
2	16	17	1	2/01/88	10	14	12	12	12	13	13	14	15	186	0	0	0	128	0	13	6	0	4	24	28	16	405																
2	17	9	2	1/22/88	7	31	24	25	27	28	30	32	33	0	6	24	0	0	0	0	0	0	0	10	0	40																	
2	17	17	2	2/01/88	10	14	15	16	17	19	20	23	24	0	12	24	0	0	0	0	0	1	0	13	0	50																	
2	18	9	3	1/22/88	7	31	27	28	30	31	32	34	36	6	6	0	0	0	0	0	0	1	0	12	0	25																	
2	18	17	3	2/01/88	10	15	0	15	17	18	19	22	24	31	6	0	16	0	0	0	0	0	1	0	18	0	44																
2	19	9	1	1/22/88	7	31	26	26	27	28	29	31	31	0	0	0	0	0	0	3	0	0	4	0	24	8	39																
2	19	17	1	2/01/88	10	15	13	13	14	15	16	19	20	0	0	0	0	0	0	2	1	0	1	24	10	24	273																
2	20	9	2	1/22/88	7	31	24	25	28	30	33	32	39	84	30	32	0	64	0	2	1	0	1	2	0	21	24	414															
2	20	17	2	2/01/88	10	15	15	16	19	25	32	34	39	162	102	32	0	32	32	6	0	1	0	2	0	21	24	414															
2	21	9	3	1/22/88	7	31	26	28	30	30	32	33	35	0	30	0	0	0	0	0	0	0	2	8	14	0	54																
2	21	17	3	2/01/88	10	15	0	0	0	0	0	24	25	0	78	0	0	0	0	0	0	0	2	16	14	0	110																
3	1	12	1	1/26/88	11	16	15	17	20	23	25	29	31	78	48	0	0	0	0	0	0	2	0	12	16	156																	
3	1	19	1	2/03/88	16	23	20	21	24	26	29	31	33	60	0	0	0	0	0	0	0	4	0	16	8	88																	
3	2	12	2	1/26/88	11	18	18	21	23	24	27	30	34	60	24	44	0	0	1	0	0	0	0	1	0	130																	
3	2	19	2	2/03/88	16	23	22	24	27	30	32	34	38	6	60	36	0	0	0	0	0	0	0	3	0	105																	
3	3	12	3	1/26/88	11	18	17	18	18	19	20	22	24	72	0	0	0	0	1	0	0	1	0	7	0	81																	
3	3	19	3	2/03/88	16	23	21	21	21	22	24	25	27	36	24	0	0	0	1	0	0	1	0	7	8	77																	
3	4	12	1	1/26/88	11	18	16	16	16	17	17	18	19	186	0	0	160	0	1	0	0	4	0	24	0	375																	
3	4	19	1	2/03/88	16	25	0	0	0	0	0	0	0	174	0	0	160	0	3	0	0	4	0	22	0	363																	
3	5	12	2	1/26/88	11	18	20	21	21	22	23	25	27	12	6	68	0	0	2	0	0	0	0	6	8	102																	
3	5	19	2	2/03/88	16	25	23	25	25	26	27	28	29	12	0	40	0	0	13	0	0	0	0	5	16	86																	
3	6	12	3	1/26/88	11	18	17	18	19	20	21	23	24	36	114	0	72	192	0	1	0	0	4	8	20	8	455																
3	6	19	3	2/03/88	16	25	22	23	24	25	27	29	30	48	72	0	48	288	0	1	0	0	2	8	18	8	493																
3	7	12	1	1/26/88	11	18	17	17	18	20	23	25	28	132	6	0	0	0	8	0	0	4	8	20	8	178																	
3	7	19	1	2/03/88	16	25	21	22	24	26	29	32	34	114	12	0	0	0	0	0	0	4	0	24	8	170																	
3	8	8	2	1/21/88	6	18	16	16	17	17	18	20	21	102	30	44	0	32	0	13																							

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

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4	5	23	2	2/08/88	22	31	27	28	29	30	31	32	34	0	6	48	0	0	0	1	0	0	0	0	0	2	0	7	8	72	
4	6	4	3	1/15/88	32	42	37	39	39	40	41	42	84	120	0	0	128	0	0	0	0	0	0	0	4	8	24	8	376		
4	6	23	3	2/08/88	22	31	28	30	30	31	32	34	35	30	126	0	48	160	0	1	0	0	0	0	2	8	16	16	407		
4	7	4	1	1/15/88	32	42	39	39	40	41	43	44	46	36	48	0	0	0	0	0	0	0	0	0	4	8	26	0	122		
4	7	23	1	2/08/88	22	31	0	0	0	0	0	0	0	0	48	0	0	0	0	6	0	0	0	0	4	0	26	8	92		
4	8	7	2	1/20/88	2	23	26	27	27	27	28	28	29	42	48	48	0	32	0	13	4	0	0	0	4	24	15	8	238		
4	8	23	2	2/08/88	22	29	25	25	26	26	27	27	29	78	18	40	0	64	0	1	0	0	0	0	0	0	8	3	16	228	
4	9	7	3	1/20/88	2	23	27	26	26	26	27	27	28	0	0	0	0	0	0	0	0	0	0	0	1	0	7	0	8		
4	9	23	3	2/08/88	22	24	28	28	28	29	30	31	32	6	0	0	0	0	0	0	0	0	0	0	1	0	9	0	16		
4	10	7	1	1/20/88	2	23	17	17	18	19	19	20	22	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	5		
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4	11	7	2	1/20/88	2	23	26	26	26	26	27	28	29	24	24	108	0	0	0	0	0	0	0	0	1	0	9	0	166		
4	11	23	2	2/08/88	22	30	26	26	27	27	28	30	31	6	78	40	0	0	0	2	0	0	0	0	1	0	2	0	129		
4	12	7	3	1/20/88	2	23	22	22	23	23	24	25	27	30	6	16	30	96	0	1	0	0	0	0	4	0	22	0	205		
4	12	23	3	2/08/88	22	31	29	29	30	31	32	34	35	12	0	0	0	128	0	1	0	0	0	0	4	0	22	0	167		
4	13	7	1	1/20/88	2	24	17	17	18	20	22	23	24	36	0	4	0	0	0	0	0	0	0	0	4	0	15	0	59		
4	13	23	1	2/08/88	22	31	0	0	0	0	0	0	0	0	24	6	0	0	0	0	0	0	0	0	4	0	28	0	62		
4	14	7	2	1/20/88	2	24	19	20	22	24	26	29	31	30	18	44	0	0	0	0	0	0	0	0	1	0	14	0	107		
4	14	23	2	2/08/88	22	37	27	27	28	30	32	34	36	6	24	0	0	0	0	0	0	0	0	0	1	0	10	0	47		
4	15	5	3	1/16/88	30	23	24	24	24	24	25	26	26	42	18	0	0	0	0	0	0	0	0	0	4	16	13	8	101		
4	15	23	3	2/08/88	22	31	29	30	31	32	33	34	35	6	12	0	0	0	0	0	0	0	0	0	2	8	14	8	50		
4	16	5	1	1/16/88	30	27	26	26	26	26	27	27	28	28	264	0	24	96	0	13	0	0	0	0	4	16	28	24	469		
4	16	23	1	2/08/88	22	37	30	30	31	31	32	32	34	36	0	0	0	32	0	13	3	0	0	0	4	0	28	16	192		
4	17	5	2	1/16/88	30	24	23	24	25	28	28	30	31	54	6	36	0	0	0	0	0	0	0	0	2	0	14	0	112		
4	17	23	2	2/08/88	22	37	29	30	33	33	35	37	38	0	18	44	0	0	0	0	0	0	0	0	1	0	12	0	75		
4	18	5	3	1/16/88	30	24	23	24	26	28	30	33	35	0	18	0	0	0	0	0	0	0	0	0	1	0	10	0	29		
4	18	23	3	2/08/88	22	37	30	33	34	35	36	39	41	6	0	0	0	0	0	0	0	0	0	0	1	0	12	0	19		
4	19	5	1	1/16/88	30	24	26	26	26	26	27	28	30	31	60	0	12	0	0	0	1	0	0	0	1	0	13	0	87		
4	19	23	1	2/08/88	22	37	31	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4	0	28	8	43		
4	20	5	2	1/16/88	30	25	24	25	31	33	47	45	58	252	0	52	0	0	0	2	0	0	0	0	2	0	15	24	347		
4	20	23	2	2/08/88	22	37	35	39	42	51	62	56	70	54	78	36	0	0	0	13	0	0	0	0	2	8	14	24	229		
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4	21	23	3	2/08/88	22	37	32	34	36	37	39	42	43	0	18	0	0	0	0	0	0	0	0	0	2	0	14	0	34		
5	1	11	1	1/25/88	2	20	9	12	15	18	20	23	26	48	54	0	0	0	0	0	0	0	0	0	2	0	9	8	121		
5	1	18	1	2/02/88	10	16	13	15	17	19	21	24	26	30	24	0	0	0	0	0	0	0	0	0	4	0	13	8	79		
5	2	11	2	1/25/88	2	20	14	16	19	21	24	27	29	24	12	52	0	0	0	0	0	0	0	0	2	8	11	0	109		
5	2	18	2	2/02/88	10	16	13	14	17	19	22	25	28	2	96	16	0	0	0	0	0	0	0	0	4	0	12	0	140		
5	3	11	3	1/25/88	2	20	10	11	13	14	15	17	19	54	24	0	0	0	0	0	0	0	0	0	2	0	8	8	96		
5	3	18	3	2/02/88	10	16	17	17	18	18	19	21	22	16	30	0	0	0	0	0	0	0	0	0	1	8	7	8	90		
5	4	11	1	1/25/88	2	21	10	11	11	12	13	14	15	288	24	0	0	96	0	3	0	0	0	0	4	0	22	0	437		
5	4	18	1	2/02/88	10	16	0	0	0	0	0	0	0	174	0	0	24	128	12	2	0	0	0	0	4	0	24	0	388		
5	5	11	2	1/25/88	2	21	15	16	17	18	19	21	22	6	36	48	0	0	0	0	0	0	0	0	1	0	13	8	112		
5	5	18	2	2/02/88	10	16	14	14	15	16	16	18	19	6	16	0	0	0	0	2	0	0	0	0	0	0	1	8	39		
5	6	11	3	1/25/88	2	21	12	14	15	16	18	19	21	60	114	0	24	320	0	1	0	0	0	0	4	8	26	16	573		
5	6	18	3	2/02/88	10	16	18	19	20	20	21	23	25	48	60	16	24	320	0	1	0	0	0	0	2	8	18	16	513		
5	7	11	1	1/25/88	2	22	13	14	16	0	0	0	0	108	30	0	0	0	32	0	0	0	0	0	2	8	20	16	216		
5	7	18	1	2/02/88	10	19	14	15	16	18	21	23	26	192	0	0	0	0	0	10	0	0	0	0	4	0	28	8	242		
5	8	1	2	1/12/88	16	28	24	25	25	26	27	29	30	222	66	60	0	32	0	13	0	0	0	0	4	0	18	0	415		
5	8	18	2	2/02/88	10	16	15	16	16	17	19	19	21	90	96	32	0	96	0	0	0	0	0	0	2	0	5	8	329		
5	9	1	3	1/12/88	16	26	24	25	25	26	27	28	30	0	6	0	0	0	0	0	0	0	0	1	0	7	0	14			

9. 10/1/1914

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

***** TEMPERATURES *****																													
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	HES	STUM	SRG	BAFR	STL	STL	START	RSTR1	RSTR2	RSTR3	RUF	SIL	IDL*NEUT	IDL*DRV	CLD	TWD
6	14	11	2	1/25/88	2	31	24	25	27	30	33	36	40	24	24	32	0	0	0	1	0	0	0	2	0	11	0	94	
6	14	15	2	1/29/88	37	42	40	40	41	43	46	47	50	12	12	20	0	0	0	0	0	0	0	2	0	12	0	58	
6	15	2	3	1/13/88	7	18	16	16	17	18	20	21	23	0	30	8	0	32	0	13	0	0	4	24	11	0	122		
6	15	15	3	1/29/88	37	42	36	36	36	37	37	38	39	24	30	0	0	0	0	0	0	0	2	0	15	0	71		
6	16	2	1	1/13/88	7	21	15	16	16	17	19	20	22	252	0	16	0	160	32	13	0	0	1	0	26	48	548		
6	16	15	1	1/29/88	37	42	36	36	36	37	37	38	39	126	0	0	0	64	0	13	2	3	1	4	16	28	8	265	
6	17	2	2	1/13/88	7	25	17	17	19	22	24	27	30	6	18	20	0	0	0	1	0	0	0	0	14	0	59		
6	17	15	2	1/29/88	37	42	37	38	38	39	41	42	43	6	24	12	0	0	0	0	0	0	0	0	6	0	48		
6	18	2	3	1/13/88	7	21	18	20	24	26	28	32	34	24	6	0	0	0	0	0	0	0	1	8	11	0	50		
6	18	15	3	1/29/88	37	42	37	39	41	42	42	46	47	0	0	0	24	0	0	0	0	0	1	0	12	0	37		
6	19	2	1	1/13/88	7	18	15	15	15	17	18	20	21	54	24	8	0	32	0	5	0	0	2	0	15	8	148		
6	19	15	1	1/29/88	37	42	37	37	38	38	39	40	41	48	0	0	0	0	0	0	0	0	4	0	26	8	86		
6	20	2	2	1/13/88	7	23	18	18	25	22	34	36	48	198	84	60	0	32	32	10	0	1	3	4	24	15	24	487	
6	20	15	2	1/29/88	37	42	40	44	46	53	65	63	77	168	84	12	0	64	0	13	0	0	2	8	18	24	393		
6	21	2	3	1/13/88	7	28	22	24	26	29	30	34	36	0	36	0	0	32	0	13	0	0	1	24	13	0	119		
6	21	15	3	1/29/88	37	42	37	38	39	41	42	44	45	0	60	0	0	0	0	0	0	0	2	0	14	0	76		
7	1	3	1	1/14/88	19	30	27	29	31	34	36	38	40	48	0	0	0	0	0	0	0	0	1	0	10	0	59		
7	1	24	1	2/09/88	19	34	27	29	31	33	35	38	39	24	24	0	0	0	0	0	0	0	4	0	22	0	74		
7	2	3	2	1/14/88	17	30	26	27	29	32	34	38	41	6	30	24	0	0	0	0	0	0	0	0	10	0	70		
7	2	24	2	2/09/88	19	34	28	30	33	35	37	39	42	6	48	20	0	0	0	0	0	0	0	0	0	0	74		
7	3	3	3	1/14/88	19	30	27	28	28	29	30	32	34	6	6	0	0	0	0	0	0	0	1	0	8	0	21		
7	3	24	3	2/09/88	19	34	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	1	8	8	0	29		
7	4	3	1	1/14/88	19	30	27	27	28	28	29	30	30	162	48	0	0	32	0	0	2	0	4	8	11	0	267		
7	4	24	1	2/09/88	19	34	0	0	0	0	0	0	0	132	0	0	0	96	0	2	0	4	0	28	0	262			
7	5	3	2	1/14/88	17	30	25	26	27	28	30	32	34	0	18	36	0	0	0	0	0	1	0	3	0	58			
7	5	24	2	2/09/88	19	34	29	30	31	32	33	34	0	6	36	0	0	0	0	0	0	0	0	0	0	42			
7	6	3	3	1/14/88	19	32	29	29	30	31	33	34	36	0	258	0	0	64	0	0	0	0	4	8	22	8	364		
7	6	24	3	2/09/88	19	34	0	0	0	0	0	0	0	36	114	0	54	32	0	1	0	0	2	8	20	8	275		
7	7	3	1	1/14/88	19	35	30	31	32	35	38	40	44	72	18	4	0	0	0	0	0	0	4	8	21	8	135		
7	7	24	1	2/09/88	19	34	29	29	30	31	33	35	37	78	0	0	0	0	0	0	0	0	4	0	26	0	108		
7	8	9	2	1/22/88	7	28	25	25	26	26	27	28	29	78	12	32	0	32	32	11	0	0	1	24	6	0	229		
7	8	24	2	2/09/88	19	34	31	31	32	33	34	34	35	42	48	24	0	32	0	2	0	0	2	0	11	0	161		
7	9	9	3	1/22/88	7	28	27	28	29	29	30	30	32	12	0	0	0	0	0	0	0	0	1	0	8	0	21		
7	9	24	3	2/09/88	19	34	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	1	0	11	0	18		
7	10	9	1	1/22/88	7	28	23	24	24	26	26	28	29	0	0	0	0	0	0	0	0	0	1	0	0	0	1		
7	10	24	1	2/09/88	19	34	29	29	30	32	33	35	37	0	0	0	0	0	0	0	0	0	4	0	4	0	8		
7	11	9	2	1/22/88	7	28	26	26	27	27	28	30	30	6	6	64	0	0	0	0	0	0	1	0	4	0	81		
7	11	24	2	2/09/88	19	34	31	32	32	33	34	35	36	30	72	36	0	0	0	1	0	0	1	0	11	0	151		
7	12	9	3	1/22/88	7	28	27	29	30	31	33	34	0	0	0	0	48	192	0	0	0	0	4	0	22	0	266		
7	12	24	3	2/09/88	19	34	0	0	0	0	0	0	0	12	0	0	0	64	0	0	0	0	4	0	22	0	150		
7	13	9	1	1/22/88	7	28	24	25	26	27	28	29	30	0	0	0	0	0	0	0	0	0	4	0	28	0	32		
7	13	24	1	2/09/88	19	34	30	31	32	33	35	36	38	12	0	0	0	0	0	0	0	0	4	0	26	0	42		
7	14	9	2	1/22/88	7	29	23	24	26	28	30	31	33	6	6	16	0	0	0	0	0	0	0	0	5	0	33		
7	14	24	2	2/09/88	19	34	32	33	34	36	38	40	43	6	6	20	0	0	0	0	0	0	0	0	7	0	39		
7	15	7	3	1/20/88	2	25	18	19	21	22	23	24	25	6	0	0	0	32	0	0	0	0	4	16	22	16	96		
7	15	24	3	2/09/88	19	34	0	0	0	0	0	0	0	12	0	0	0	0	2	0	0	0	2	2	16	16	0	50	
7	16	7	1	1/20/88	2	25	18	19	19	20	21	22	138	24	0	0	128	0	13	3	4	1	4	8	18	16	357		
7	16	24	1	2/09/88	19	36	30	31	31	32	33	34	36	0	0	0	32	0	13	0	2	0	4	24	28	8	147		
7	17	7	2	1/20/88	2	26	22	24	26	27	30	31	54	36	44	0	0	0	0	0	0	0	0	0	11	0	145		
7	17	24	2	2/09/88	19	36	33	34	36	38	41	42	18	6	28	0	0	0	0	0	0	0	0	0	8	0	60		
7	18	7	3	1/20/88	2	26	20	22	25	27	28	30	32	0	0	0	0	0	0	0	0	2	0	15	0	17			

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

[illegible]

Page: 9

SUMMARY OF COLD DEMERITS BY CRITERIA - DENVER

TEMPERATURES										ACLD DCL INIT										RSTRT1 RSTRT2 RSTRT3 RUF STL IDL*NEUT IDL*DRV CLD										
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TKN6	TKN7	HE'S	STUM	SRG	BRFR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	IDL*NEUT	IDL*DRV	CLD	TWD	
10	6	21	3	2/05/88	8	12	13	12	13	14	16	17	20	72	36	0	96	256	0	1	0	0	0	0	2	0	18	8	489	
10	7	2	1	1/13/88	7	34	25	26	28	31	35	38	41	42	12	4	0	0	0	0	0	0	0	4	0	13	0	75		
10	7	21	1	2/05/88	8	12	10	10	12	14	17	21	24	72	6	0	0	32	0	0	0	0	0	4	8	24	0	146		
10	8	6	2	1/18/88	15	18	19	19	20	20	20	20	20	108	96	44	0	32	32	13	0	0	0	4	24	13	8	374		
10	8	21	2	2/05/88	8	9	10	11	13	13	14	16	17	48	60	36	0	96	0	1	0	0	0	2	0	6	24	273		
10	9	6	3	1/18/88	15	19	18	18	18	19	20	20	20	0	0	0	0	0	0	0	0	0	0	2	0	7	0	9		
10	9	21	3	2/05/88	8	10	11	10	11	12	14	16	18	6	0	0	0	0	0	0	0	0	0	1	0	8	0	15		
10	10	6	1	1/18/88	15	19	20	20	20	21	22	24	26	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3		
10	10	21	1	2/05/88	8	10	9	9	10	11	12	13	16	0	0	0	0	0	0	0	0	0	4	0	6	0	10			
10	11	6	2	1/18/88	15	19	18	19	19	20	21	22	23	6	36	64	0	0	0	3	0	0	0	1	0	4	0	114		
10	11	21	2	2/05/88	8	10	12	12	13	14	16	18	20	0	24	24	0	0	0	0	0	0	0	0	0	0	0	49		
10	12	6	3	1/18/88	15	19	18	18	19	20	21	21	22	0	0	0	0	0	0	1	0	0	0	4	0	28	0	33		
10	12	21	3	2/05/88	8	10	11	12	13	15	17	19	21	0	12	0	12	192	0	1	0	0	0	2	0	18	0	237		
10	13	6	1	1/18/88	15	19	19	20	20	21	22	23	24	24	18	0	0	0	0	0	0	0	0	4	0	9	0	55		
10	13	21	1	2/05/88	8	10	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	4	0	26	0	90		
10	14	6	2	1/18/88	15	17	20	21	22	23	26	27	18	18	48	0	0	0	0	0	0	0	0	0	0	5	0	89		
10	14	21	2	2/05/88	8	10	11	12	13	15	17	21	25	6	12	8	0	0	0	0	0	0	0	0	0	3	0	29		
10	15	10	3	1/23/88	30	37	37	37	38	38	38	39	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	14	0	15
10	15	21	3	2/05/88	8	9	0	0	0	0	0	0	0	48	6	0	0	0	0	0	0	1	0	4	8	18	8	94		
10	16	10	1	1/23/88	30	36	36	36	36	36	36	36	37	192	0	0	0	160	0	13	5	0	0	4	24	28	8	269		
10	16	21	1	2/05/88	8	9	0	0	0	0	0	0	0	240	0	0	0	0	0	13	0	0	0	4	8	28	24	482		
10	17	10	2	2/05/88	8	9	10	11	12	15	17	17	20	12	30	24	0	0	0	0	0	0	0	1	0	10	0	97		
10	17	21	2	2/05/88	8	9	10	11	12	15	17	17	20	12	30	24	0	0	0	0	0	0	0	4	0	12	0	82		
10	18	10	3	1/23/88	30	36	37	38	39	40	40	42	44	0	6	0	0	0	0	0	0	0	0	1	0	11	0	18		
10	18	21	3	2/05/88	8	9	10	12	12	14	16	17	19	0	6	0	0	0	0	0	0	0	0	1	0	13	0	20		
10	19	10	1	1/23/88	30	36	35	35	35	35	35	36	37	0	0	0	0	0	0	0	0	0	0	2	0	14	0	16		
10	19	21	1	2/05/88	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	26	0	30			
10	20	10	2	1/23/88	30	36	35	37	37	45	45	60	55	132	42	48	0	0	0	1	0	0	0	4	24	13	16	280		
10	20	21	2	2/05/88	8	9	9	12	19	20	21	35	37	222	96	32	0	32	0	2	0	0	0	1	24	19	24	452		
10	21	10	3	1/23/88	30	36	36	37	38	39	40	40	43	0	6	0	0	0	0	0	0	0	0	1	0	14	0	21		
10	21	21	3	2/05/88	8	9	9	11	12	14	17	17	20	0	24	0	0	0	0	1	0	0	0	2	16	14	0	57		
11	1	5	1	1/16/88	30	26	30	30	32	34	36	38	40	36	54	0	0	0	0	0	0	0	0	1	0	11	0	102		
11	1	20	1	2/04/88	15	18	19	21	23	25	28	31	33	30	24	0	0	0	0	0	0	0	0	4	0	18	0	76		
11	2	5	2	1/16/88	30	26	28	28	29	32	33	35	37	18	6	48	0	0	0	0	0	0	0	2	0	9	8	91		
11	2	20	2	2/04/88	15	22	19	22	24	26	30	33	35	18	30	16	0	0	0	0	0	0	0	1	8	1	0	74		
11	3	5	3	1/16/88	30	26	28	27	26	27	27	28	29	18	12	0	0	0	0	0	0	0	0	1	8	8	0	47		
11	3	20	3	2/04/88	15	22	19	20	20	21	23	25	26	30	18	0	0	0	0	0	0	0	0	2	0	7	8	65		
11	4	5	1	1/16/88	30	24	30	29	29	29	29	29	29	234	0	0	0	128	0	3	0	0	0	2	0	11	0	378		
11	4	20	1	2/04/88	15	22	0	0	0	0	0	0	0	294	0	0	0	128	0	2	0	0	0	4	0	28	0	456		
11	5	5	2	1/16/88	30	23	27	27	28	28	28	30	30	18	6	44	0	0	0	1	0	0	0	4	0	6	0	79		
11	5	20	2	2/04/88	15	22	21	22	23	24	24	26	27	6	16	0	0	0	0	3	0	0	0	0	0	3	0	34		
11	6	5	3	1/16/88	30	24	27	26	26	26	27	28	29	72	72	0	48	192	0	0	0	0	0	4	8	22	24	442		
11	6	20	3	2/04/88	15	22	20	20	22	23	24	26	27	42	102	0	24	192	32	1	0	0	0	2	8	20	8	431		
11	7	5	1	1/16/88	30	24	28	28	28	29	31	32	34	102	54	8	0	0	0	0	0	0	0	4	8	19	0	195		
11	7	20	1	2/04/88	15	22	20	20	22	24	27	28	31	48	0	0	0	32	0	10	0	0	0	4	0	26	16	136		
11	8	3	2	1/14/88	17	34	30	31	32	34	35	37	40	37	102	36	40	0	32	0	13	0	0	4	8	12	24	271		
11	8	20	2	2/04/88	15	15	17	18	18	19	21	22	23	42	54	40	0	160	32	0	0	0	0	4	16	6	24	378		
11	9	3	3	1/14/88	17	34	33	33	33	34	35	37	40	0	0	0	0	0	0	0	0	0	0	1	0	7	0	8		
11	9	20	3	2/04/88	15	15	14	14	14	16	17	18	20	12	0	0	0	0	0	0	0	0	0	1	0	9	0	22		
11	10	3	1	1/14/88	19	37	31	32	33	34	36	38	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11	10	20	1	2/04/88	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	5	0	9			

* Run excluded from data analysis.

[illegible]

SUMMARY OF WARM DEMERITS BY CRITERIA - DENVER

SUMMARY OF WARM DEMERITS BY CRITERIA - DENVER

TEMPERATURES										ACLDCL 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SUMMARY OF WARM DEMERITS BY CRITERIA - DENVER

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FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRG	BKFR	STL	START	RSTR1	RSTR2	RSTR3	RUF	STL	RUF	STL	TWD
===== TEMPERATURES =====																											
3	23	6	3	1/18/88										0	0	0	0	0	0					0	0	0	0
3	23	7	2	1/20/88										0	0	0	0	0	0					0	0	0	0
3	23	8	1	1/21/88										0	0	0	0	0	0					0	0	0	0
3	23	9	3	1/22/88										0	0	0	0	0	0					0	0	0	0
3	23	10	2	1/23/88										0	0	0	0	0	0					0	0	0	0
3	23	11	1	1/24/88										0	0	0	0	0	0					0	0	0	0
3	23	12	3	1/26/88										0	0	0	0	0	0					0	0	0	0
3	23	13	2	1/27/88										0	0	0	0	0	0					0	0	0	0
3	23	14	1	1/28/88										0	0	0	0	0	0					0	0	0	0
3	23	15	3	1/29/88										0	0	0	0	0	0					0	0	0	0
3	23	16	2	1/30/88										0	0	0	0	0	0					0	0	0	0
3	23	17	1	2/01/88										0	0	0	0	0	0					0	0	0	0
3	23	18	3	2/02/88										0	0	0	0	0	0					0	0	0	0
3	23	19	2	2/03/88										0	0	0	0	0	0					0	0	0	0
3	23	20	1	2/04/88										0	0	0	0	0	0					0	0	0	0
3	23	21	3	2/05/88										0	0	0	0	0	0					0	0	0	0
3	23	22	2	2/06/88										0	0	0	0	0	0					0	0	0	0
3	23	23	2	2/08/88										0	0	0	0	0	0					0	0	0	0
3	23	24	3	2/09/88										0	0	0	0	0	0					0	0	0	0
3	24	1	3	1/12/88										0	0	0	0	0	0					4	0	0	4
3	24	2	2	1/13/88										0	6	8	0	0	0					2	0	0	16
3	24	3	1	1/14/88										0	0	0	0	0	0					0	0	0	0
3	24	4	3	1/15/88										0	0	0	0	0	0					0	0	0	0
3	24	5	2	1/16/88										0	0	0	0	0	0					0	0	0	0
3	24	6	1	1/18/88										0	0	0	0	0	0					0	0	0	0
3	24	7	3	1/19/88										0	0	0	0	0	0					0	0	0	0
3	24	8	2	1/21/88										0	0	0	0	0	0					0	0	0	0
3	24	9	1	1/22/88										0	0	0	0	0	0					0	0	0	0
3	24	10	3	1/23/88										0	0	0	0	0	0					0	0	0	0
3	24	11	2	1/25/88										0	0	0	0	0	0					0	0	0	0
3	24	12	1	1/26/88										0	0	0	0	0	0					0	0	0	0
3	24	13	3	1/26/88										0	0	0	0	0	0					0	0	0	0
3	24	14	2	1/28/88										0	0	0	0	0	0					0	0	0	0
3	24	15	1	1/29/88										0	0	0	0	0	0					0	0	0	0
3	24	16	3	1/30/88										0	0	0	0	0	0					0	0	0	0
3	24	17	2	2/01/88										0	0	0	0	0	0					0	0	0	0
3	24	18	1	2/02/88										0	0	0	0	0	0					0	0	0	0
3	24	19	3	2/03/88										0	0	0	0	0	0					0	0	0	0
3	24	20	2	2/04/88										0	0	0	0	0	0					0	0	0	0
3	24	21	1	2/05/88										0	0	0	0	0	0					0	0	0	0
3	24	22	3	2/06/88										0	0	0	0	0	0					0	0	0	0
3	24	23	1	2/08/88										0	0	0	0	0	0					0	0	0	0
3	24	24	1	2/09/88										0	0	0	0	0	0					8	0	8	0
4	1	4	1	1/15/88										0	0	0	0	0	0					0	0	0	0
4	1	23	1	2/08/88										0	0	0	0	0	0					1	0	1	0
4	2	4	2	1/15/88										6	12	4	0	0	0					3	0	25	0
4	2	23	2	2/08/88										0	12	12	0	0	0					1	0	25	0
4	3	4	3	1/15/88										0	0	0	0	0	0					2	0	2	0
4	3	23	3	2/08/88										0	0	0	0	0	0					0	0	0	0
4	4	4	4	1/15/88										0	0	0	0	0	0					0	0	0	0
4	4	23	1	2/08/88										0	0	0	0	0	0					4	0	4	0

SUMMARY OF WARM DEMERITS BY CRITERIA - DENVER

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5	14	18	2	2/02/88	12	0	4	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
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8	6	6	3	1/18/88										0	18	0	0	0	0	0								8	0	26									
8	6	14	3	1/28/88										0	18	0	0	0	0	0								8	0	26									
8	7	6	1	1/18/88										0	0	0	0	0	0	0								1	0	1									
8	7	14	1	1/28/88										0	0	0	0	0	0	0								2	0	2									
8	8	4	2	1/15/88										18	0	0	0	0	0	0								2	0	20									
8	8	14	2	1/28/88										12	18	20	0	0	0	0								2	0	52									
8	9	4	3	1/15/88										0	0	0	0	0	0	0								2	0	2									
8	9	14	3	1/28/88										0	0	0	0	0	0	0								2	0	2									
8	10	4	1	1/15/88										0	0	0	0	0	0	0								0	0	0									
8	10	14	1	1/28/88										0	0	0	0	0	0	0								0	0	0									
8	11	4	2	1/15/88										0	0	8	0	0	0	0								1	0	9									
8	11	14	2	1/28/88										0	12	8	0	0	0	0								2	0	22									
8	12	4	3	1/15/88										0	48	0	0	0	0	0								8	0	56									
8	12	14	3	1/28/88										0	24	0	0	0	32	0								8	0	64									
8	13	4	1	1/15/88										0	0	0	0	0	0	0								0	0	0									
8	13	14	1	1/28/88										0	0	0	0	0	0	0								3	0	3									
8	14	4	2	1/15/88										0	0	0	0	0	0	0								2	0	2									
8	14	14	2	1/28/88										0	0	20	0	0	0	0								2	0	22									
8	15	11	3	1/25/88										0	0	0	0	0	0	0								4	0	4									
8	15	14	3	1/28/88										0	0	0	0	0	0	0								4	0	4									
8	16	11	1	1/25/88										0	0	0	0	0	0	0								8	0	8									
8	16	14	1	1/28/88										0	0	0	0	0	0	0								8	0	8									
8	17	11	2	1/25/88										12	24	0	0	0	0	0								3	0	39									
8	17	14	2	1/28/88										0	12	12	0	0	0	0								2	0	26									
8	18	11	3	1/25/88										0	0	0	0	0	0	0								2	0	2									
8	18	14	3	1/28/88										0	0	0	0	0	0	0								0	0	0									
8	19	11	1	1/25/88										C	0	0	0	0	0	0								0	0	0									
8	19	14	1	1/28/88										18	0	0	0	0	32	0								2	0	52									
8	20	11	2	1/25/88										24	18	0	0	0	0	0								2	0	44									
8	20	14	2	1/28/88										6	6	8	0	0	0	0								2	0	22									
8	21	11	3	1/25/88										0	0	0	0	0	0	0								4	0	4									
8	21	14	3	1/28/88										0	0	0	0	0	0	0								4	0	4									
9	1	10	1	1/23/88										0	0	0	0	0	0	0								0	0	0									

SUMMARY OF WARM DEMERITS BY CRITERIA - DENVER

FUEL VEH	RUN RATE	DATE	SOAK RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HS	STUM	SRG	BKFR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	RUF	STL	TWD
9	1	13	1	1/1/88											0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	10	2	1/21/88											0	6	8	0	0	0	0	0	0	0	0	0	16
9	2	13	2	1/27/88											0	6	12	0	0	0	0	0	0	0	0	0	19
9	3	10	3	1/23/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	3	13	3	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	4	10	1	1/23/88											0	0	0	0	0	0	0	0	0	0	0	0	4
9	4	13	1	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	4
9	5	10	2	1/23/88											0	6	8	0	0	0	0	0	0	0	0	0	15
9	5	13	2	1/27/88											0	0	24	0	0	0	0	0	0	0	0	0	26
9	6	10	3	1/23/88											0	12	0	0	0	0	0	0	0	0	0	0	20
9	6	13	3	1/27/88											0	12	0	0	0	0	0	0	0	0	0	0	16
9	7	10	1	1/23/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	7	13	1	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	8	12	2	1/26/88											30	12	20	0	0	0	0	0	0	0	0	0	62
9	8	13	2	1/27/88											30	24	12	0	0	0	0	0	0	0	0	0	67
9	9	12	3	1/26/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	9	13	3	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	10	12	1	1/26/88											0	0	0	0	0	0	0	0	0	0	0	0	0
9	10	13	1	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	0
9	11	12	2	1/26/88											6	18	12	0	0	0	0	0	0	0	0	0	37
9	11	13	2	1/27/88											6	0	24	0	0	0	0	0	0	0	0	0	34
9	12	12	3	1/26/88											0	0	0	0	24	0	32	0	0	0	0	0	64
9	12	13	3	1/27/88											0	24	0	0	0	0	32	0	0	0	0	0	64
9	13	12	1	1/26/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	13	13	1	1/27/88											6	0	0	0	0	0	0	0	0	0	0	0	8
9	14	12	2	1/26/88											0	30	8	0	0	0	0	0	0	0	0	0	40
9	14	13	2	1/27/88											0	12	8	0	0	0	0	0	0	0	0	0	23
9	15	1	3	1/12/88											0	0	0	0	0	0	0	0	0	0	0	0	3
9	15	13	3	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	4
9	16	1	1	1/12/88											12	0	0	0	0	0	0	0	0	0	0	0	14
9	16	13	1	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	8
9	17	1	2	1/12/88											0	0	0	0	0	0	0	0	0	0	0	0	40
9	17	13	2	1/27/88											0	36	0	0	0	0	0	0	0	0	0	0	8
9	18	1	3	1/12/88											6	6	16	0	0	0	0	0	0	0	0	0	32
9	18	13	3	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	19	1	1	1/12/88											0	0	0	0	0	0	0	0	0	0	0	0	0
9	19	13	1	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	2
9	20	1	2	1/12/88											36	60	8	0	0	0	0	0	0	0	0	0	106
9	20	13	2	1/27/88											48	30	12	0	0	0	0	0	0	0	0	0	92
9	21	1	3	1/12/88											0	0	0	0	0	0	0	0	0	0	0	0	4
9	21	13	3	1/27/88											0	0	0	0	0	0	0	0	0	0	0	0	4
10	1	2	1	1/13/88											0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	21	1	2/05/88											0	0	0	0	0	0	0	0	0	0	0	0	2
10	2	2	2	1/13/88											12	0	20	0	0	0	0	0	0	0	0	0	34
10	2	21	2	2/05/88											0	12	8	0	0	0	0	0	0	0	0	0	21
10	3	2	3	1/13/88											0	0	0	0	0	0	0	0	0	0	0	0	2
10	3	21	3	2/05/88											0	0	0	0	0	0	0	0	0	0	0	0	2
10	4	21	1	2/05/88											0	0	0	0	0	0	0	0	0	0	0	0	4
10	5	2	2	1/13/88											0	0	20	0	0	0	0	0	0	0	0	0	21
10	5	21	2	2/05/88											0	0	12	0	0	0	0	0	0	0	0	0	12
10	6	2	3	1/13/88											0	0	0	0	0	0	0	0	0	0	0	0	6

TEMPERATURES										ACL DCL INIT										IDL*NEUT IDL*DRV WRH									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRG	BKFR	STL	STL	START	RSIRT1	RSIRT2	RSIRT3	RUF	STL	RUF	STL	TWD	
10	6	21	3	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
10	7	2	1	1/13/88										0	0	0	0	0	0	0					2	0	2	0	2
10	7	21	1	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
10	8	6	2	1/18/88										6	0	12	0	0	0	0					0	0	18	0	18
10	8	21	2	2/05/88										0	6	16	0	0	0	0					0	0	22	0	22
10	9	6	3	1/18/88										0	0	0	0	0	0	0					2	0	2	0	2
10	9	21	3	2/05/88										0	0	0	0	0	0	0					2	0	2	0	2
10	10	6	1	1/18/88										0	0	0	0	0	0	0					0	0	0	0	0
10	10	21	1	2/05/88										0	0	0	0	0	0	0					0	0	0	0	0
10	11	6	2	1/18/88										0	30	0	0	0	0	0					0	0	0	0	0
10	11	21	2	2/05/88										12	0	12	0	0	0	0					2	0	32	0	32
10	12	6	3	1/18/88										0	24	0	0	32	0	0					8	0	64	0	64
10	12	21	3	2/05/88										0	36	0	24	0	0	0					8	0	68	0	68
10	13	6	1	1/18/88										0	0	0	0	0	0	0					2	0	2	0	2
10	13	21	1	2/05/88										0	0	0	0	0	0	0					6	0	6	0	6
10	14	6	2	1/18/88										24	0	0	0	0	0	0					1	0	25	0	25
10	14	21	2	2/05/88										0	0	16	0	0	0	0					3	0	19	0	19
10	15	10	3	1/23/88										0	0	0	0	0	0	0					4	0	4	0	4
10	15	21	3	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
10	16	10	1	1/23/88										0	0	0	0	0	0	0					8	0	8	0	8
10	16	21	1	2/05/88										0	0	0	0	0	0	0					8	0	8	0	8
10	17	10	2	1/23/88										0	12	8	0	0	0	0					4	0	24	0	24
10	17	21	2	2/05/88										0	6	12	0	0	0	0					4	0	22	0	22
10	18	10	3	1/23/88										0	0	0	0	0	0	0					2	0	2	0	2
10	18	21	3	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
10	19	10	1	1/23/88										0	0	0	0	0	0	0					2	0	2	0	2
10	19	21	1	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
10	20	10	2	1/23/88										60	30	4	0	0	0	0					1	0	95	0	95
10	20	21	2	2/05/88										18	12	12	0	0	0	0					2	0	44	0	44
10	21	10	3	1/23/88										0	0	0	0	0	0	0					4	0	4	0	4
10	21	21	3	2/05/88										0	0	0	0	0	0	0					4	0	4	0	4
11	1	5	1	1/16/88										0	0	0	0	0	0	0					0	0	0	0	0
11	1	20	1	2/04/88										0	0	0	0	0	0	0					1	0	1	0	1
11	2	5	2	1/16/88										0	12	12	0	0	0	0					2	0	26	0	26
11	2	20	2	2/04/88										0	0	0	0	0	0	0					0	0	0	0	0
11	3	5	3	1/16/88										0	0	0	0	0	0	0					2	0	2	0	2
11	3	20	3	2/04/88										0	0	0	0	0	0	0					2	0	2	0	2
11	4	5	1	1/16/88										0	0	0	0	0	0	0					4	0	4	0	4
11	4	20	1	2/04/88										0	0	0	0	0	0	0					4	0	4	0	4
11	5	5	2	1/16/88										0	0	20	0	0	0	0					2	0	22	0	22
11	5	20	2	2/04/88										0	0	0	0	0	0	0					0	0	0	0	0
11	6	5	3	1/16/88										0	12	0	0	0	0	0					8	0	20	0	20
11	6	20	3	2/04/88										0	12	0	0	0	0	0					6	0	18	0	18
11	7	5	1	1/16/88										0	0	0	0	0	0	0					2	0	2	0	2
11	7	20	1	2/04/88										0	0	0	0	0	0	0					4	0	4	0	4
11	8	3	2	1/14/88										12	12	8	0	0	0	0					2	0	34	0	34
11	8	20	2	2/04/88										0	6	16	0	0	0	0					2	0	26	0	26
11	9	3	3	1/14/88										0	0	0	0	0	0	0					2	0	2	0	2
11	9	20	3	2/04/88										0	0	0	0	0	0	0					2	0	2	0	2
11	10	3	1	1/14/88										0	0	0	0	0	0	0					0	0	0	0	0
11	10	20	1	2/04/88										0	0	0	0	0	0	0					0	0	0	0	0

TEMPERATURES										ACL DCL INIT										IDL*NEUT IDL*DRV WRM									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRC	BKFR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	TWD	
11	11	3	2	1/14/88										0	24	8	0	0	0					1	0	33			
11	11	20	2	2/04/88										12	0	4	0	0	0					0	0	16			
11	12	3	3	1/14/88										0	54	0	0	0	0					8	0	62			
11	12	20	3	2/04/88										0	48	0	0	0	0					8	0	56			
11	13	3	1	1/14/88										0	0	0	0	0	0					0	0	0			
11	13	20	1	2/04/88										0	0	0	0	0	0					6	0	6			
11	14	3	2	1/14/88										0	0	12	0	0	0					2	0	14			
11	14	20	2	2/04/88										12	12	0	0	0	0					2	0	26			
11	15	12	3	1/26/88										0	0	0	0	0	0					4	0	4			
11	15	20	3	2/04/88										0	0	0	0	0	0					4	0	4			
11	16	12	1	1/26/88										0	0	0	0	0	0					6	0	38			
11	16	20	1	2/04/88										0	0	0	0	0	0					8	0	8			
11	17	12	2	1/26/88										0	0	32	0	0	0					4	0	36			
11	17	20	2	2/04/88										6	0	12	0	0	0					2	0	20			
11	18	12	3	1/26/88										0	0	0	0	0	0					3	0	3			
11	18	20	3	2/04/88										0	0	0	0	0	0					2	0	2			
11	19	12	1	1/26/88										6	0	0	0	0	0					1	0	7			
11	19	20	1	2/04/88										0	0	0	0	0	0					2	0	2			
11	20	12	2	1/26/88										6	12	28	0	0	0					1	0	47			
11	20	20	2	2/04/88										48	0	0	0	0	0					2	0	50			
11	21	12	3	1/26/88										0	0	0	0	0	0					4	0	4			
11	21	20	3	2/04/88										0	0	0	0	0	0					4	0	4			
12	1	8	1	1/21/88										12	0	0	0	0	0					6	0	50			
12	1	16	1	1/30/88										0	0	0	0	0	0					0	0	0			
12	2	8	2	1/21/88										0	30	4	0	0	0					2	0	36			
12	2	16	2	1/30/88										0	6	8	0	0	0					2	0	16			
12	3	8	3	1/21/88										0	0	0	0	0	0					2	0	2			
12	3	16	3	1/30/88										0	0	0	0	0	0					2	0	2			
12	4	8	1	1/21/88										0	0	0	0	0	0					2	0	2			
12	4	16	1	1/30/88										0	0	0	0	0	0					4	0	4			
12	5	8	2	1/21/88										0	0	16	0	0	0					1	0	17			
12	5	16	2	1/30/88										0	12	4	0	0	0					2	0	18			
12	6	8	3	1/21/88										0	18	0	0	0	0					8	0	26			
12	6	16	3	1/30/88										12	0	0	0	0	0					8	0	20			
12	7	8	1	1/21/88										0	0	0	0	0	0					0	0	0			
12	7	16	1	1/30/88										0	0	0	0	0	0					2	0	2			
12	8	10	2	1/23/88										24	12	4	0	0	0					2	0	42			
12	8	16	2	1/30/88										12	0	20	0	0	0					0	0	32			
12	9	10	3	1/23/88										0	0	0	0	0	0					2	0	2			
12	9	16	3	1/30/88										0	0	0	0	0	0					2	0	2			
12	10	10	1	1/23/88										0	0	0	0	0	0					0	0	0			
12	10	16	1	1/30/88										0	0	0	0	0	0					0	0	0			
12	11	10	2	1/23/88										18	6	4	0	0	0					2	0	30			
12	11	16	2	1/30/88										6	12	20	0	0	0					3	0	41			
12	12	10	3	1/23/88										0	48	0	0	0	0					8	0	56			
12	12	16	3	1/30/88										6	24	0	0	0	32					8	0	70			
12	13	10	1	1/23/88										0	0	0	0	0	0					2	0	2			
12	13	16	1	1/30/88										0	0	0	0	0	0					3	0	3			
12	14	10	2	1/23/88										6	6	8	0	0	0					1	0	21			
12	14	16	2	1/30/88										0	0	0	0	0	0					2	0	2			
12	15	4	3	1/15/88										0	0	0	0	0	0					4	0	4			

TEMPERATURES									
FUEL	VEH	RUN	RATE	DATE	SOAK	RUN	TNK1	TNK2	TNK3
TNK4	TNK5	TNK6	TNK7	HES	STUM	SRC	BKER	STL	STL
START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	RUF	STL
IDL*NEUT	IDL*DRV	WRM							
ACL	DCL	INIT							
12	15	16	3	1/30/88			0	0	0
12	16	4	1	1/15/88			0	0	0
12	16	16	1	1/30/88			0	0	0
12	17	4	2	1/15/88			0	18	12
12	17	16	2	1/30/88			0	6	8
12	18	4	3	1/15/88			0	0	0
12	18	16	3	1/30/88			0	0	0
12	19	4	1	1/15/88			0	0	0
12	19	16	1	1/30/88			0	0	0
12	20	4	2	1/15/88			48	12	4
12	20	16	2	1/30/88			24	0	16
12	21	4	3	1/15/88			0	0	0
12	21	16	3	1/30/88			0	0	0

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

FUEL		VEH	RUN	RATE	DATE	TEMPERATURES										ACCL										INIT										IDLE										NEUT										DRV										COLD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
			SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	HES	STUM	SRC	BKFR	STL	STL	START	RSTR1	RSTR2	RSTR3	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP	STL	RUP</

FUEL	VH	RIN	RATER	DATE	TEMPERATURES										ACLDCL INIT										RSTRT1	RSTRT2	RSTRT3	RUF	STL	IDL-NEUL	IDL-DRY	CUL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
					SOAK	RUN	1NK1	1NK2	1NK3	1NK4	1NK5	1NK6	1NK7	1NK8	1NK9	1NK10	STUM	SRG	BKFR	STL	STL	STL	STL	STL									STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL	STL

* Run made with Fuel 7 rather than with Fuel 2.

FUEL		VEH	RUN	RATE	DATE	SOAK	RUN	TKN1	TKN2	TKN3	TKN4	TKN5	TKN6	TKN7	HES	STUM	SRC	BFGR	STL	STL	START	RSRT1	RSRT2	RSRT3	RUF	STL	IDL*NEUT	IDL*DRV	CLD	
3	20	53	2	3/07/88	31	33	31	36	40	48	56	62	62	42	150	24	0	192	0	4	2	1	0	0	4	16	16	24	475	
3	20	70	2	3/30/88	21	30	33	36	43	48	59	60	70	12	108	32	0	224	0	6	0	0	0	0	2	24	16	8	432	
3	21	53	3	3/07/88	31	33	35	36	38	40	42	45	47	42	6	0	0	0	0	0	0	0	0	0	0	0	7	0	55	
3	21	70	3	3/30/88	21	31	29	31	33	36	38	41	43	54	6	0	0	0	0	0	0	0	0	0	0	0	13	0	73	
3	22	51	1	3/05/88	20	31	0	0	0	0	0	0	0	84	0	0	32	0	0	0	0	0	0	0	2	0	20	0	138	
3	22	52	3	3/06/88	33	41	33	33	34	35	37	38	40	60	12	0	0	0	0	0	0	0	0	0	0	0	8	0	80	
3	22	53	2	3/07/88	31	40	32	33	33	35	37	38	40	54	24	24	0	0	0	0	0	0	0	0	0	0	3	0	105	
3	22	54	1	3/09/88	24	35	27	27	28	29	30	31	33	72	0	0	0	0	0	0	0	0	0	0	2	0	16	0	90	
3	22	55	3	3/10/88	32	38	36	36	37	38	40	41	43	66	30	12	24	0	0	5	0	0	0	0	0	0	6	0	143	
3	22	56	2	3/11/88	31	34	31	31	31	33	34	35	36	36	24	16	0	0	0	0	0	0	0	0	2	8	3	0	89	
3	22	57	1	3/13/88	8	14	11	10	11	12	14	16	17	36	42	0	32	0	6	0	0	0	0	0	4	0	18	8	146	
3	22	58	3	3/14/88	3	19	13	13	15	17	18	20	22	48	60	16	0	32	10	0	0	0	0	0	1	0	17	0	184	
3	22	59	2	3/15/88	12	22	17	17	18	20	22	25	26	12	42	56	0	0	32	1	0	0	0	0	1	0	6	0	150	
3	22	60	1	3/19/88	17	27	22	22	23	25	27	28	30	66	18	0	0	0	5	0	0	0	0	0	4	0	17	0	110	
3	22	61	3	3/20/88	11	17	15	16	17	18	20	21	22	12	54	4	0	32	32	5	0	0	0	0	0	0	11	0	150	
3	22	62	2	3/21/88	10	16	9	9	10	11	13	15	17	54	36	60	0	0	32	6	0	0	0	0	4	0	12	0	204	
3	22	63	1	3/22/88	24	34	27	28	29	31	32	34	36	48	36	0	0	0	0	0	0	0	0	0	4	0	18	0	106	
3	22	64	3	3/23/88	30	35	0	0	0	0	0	0	0	66	24	0	0	0	0	0	0	0	0	0	0	0	7	0	97	
3	22	65	2	3/24/88	33	38	36	37	38	39	41	42	44	54	30	32	0	0	0	0	0	0	0	0	1	0	7	0	124	
3	22	66	1	3/25/88	32	35	35	35	36	37	39	40	41	60	24	0	0	0	0	0	0	0	0	0	4	0	17	0	105	
3	22	67	3	3/26/88	15	20	10	19	20	22	24	26	27	60	24	0	0	0	64	5	0	0	0	0	2	8	12	0	175	
3	22	68	2	3/28/88	29	36	36	36	37	38	40	42	44	54	12	56	0	0	0	1	0	0	0	0	2	0	6	0	131	
3	22	69	1	3/29/88	21	31	26	27	27	28	30	31	33	48	54	0	0	0	0	0	0	0	0	0	4	0	20	0	126	
3	22	70	3	3/30/88	21	34	28	29	30	33	35	37	40	60	24	8	0	0	0	0	0	0	0	0	0	0	11	0	103	
3	22	71	2	3/31/88	18	28	27	27	29	30	32	33	34	78	18	56	0	0	32	5	0	0	0	0	4	0	10	0	203	
3	23	51	2	3/05/88	20	31	0	0	0	0	0	0	0	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	24	
3	23	52	1	3/06/88	33	41	36	37	38	39	40	42	44	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6	
3	23	53	3	3/07/88	31	40	0	0	0	0	0	0	0	24	12	4	0	0	0	0	0	0	0	0	0	0	6	0	46	
3	23	54	2	3/09/88	24	35	27	28	29	30	32	35	37	0	6	20	0	0	0	0	0	0	0	0	0	1	0	27		
3	23	55	1	3/10/88	32	38	33	35	36	38	40	41	6	0	0	0	0	0	0	0	0	0	0	0	2	0	6	0	14	
3	23	56	3	3/11/88	31	34	33	34	35	36	38	39	41	30	12	4	0	0	0	0	0	0	0	0	0	0	4	0	50	
3	23	57	2	3/13/88	8	14	9	11	12	13	16	18	21	6	6	40	0	0	0	0	0	0	0	0	0	0	5	0	57	
3	23	58	1	3/14/88	8	9	11	13	15	16	19	20	22	24	0	0	0	0	0	0	0	0	0	0	2	0	13	0	39	
3	23	59	3	3/15/88	12	22	18	20	21	22	24	27	29	6	18	0	0	0	0	3	0	0	0	0	0	0	8	0	35	
3	23	60	2	3/19/88	17	27	24	25	28	28	28	28	29	12	6	20	0	0	0	0	0	0	0	0	0	0	3	0	41	
3	23	61	1	3/20/88	11	17	12	13	13	14	15	16	18	18	0	0	0	0	0	0	0	0	0	0	2	0	8	0	28	
3	23	62	3	3/21/88	10	15	11	13	14	16	17	19	20	18	24	0	0	0	0	1	0	0	0	0	2	0	9	0	54	
3	23	63	2	3/22/88	24	34	0	0	0	0	0	0	0	6	12	28	0	0	0	0	0	0	0	0	0	1	0	5	0	52
3	23	64	1	3/23/88	30	35	30	31	31	32	33	34	35	30	0	0	0	0	0	0	0	0	0	0	2	0	9	0	41	
3	23	65	3	3/24/88	23	38	35	36	38	39	40	42	44	6	6	0	0	0	0	0	0	0	0	0	0	0	8	0	20	
3	23	66	2	3/25/88	32	35	33	36	37	38	39	40	41	18	6	4	0	0	0	0	0	0	0	0	0	0	2	0	30	
3	23	67	1	3/26/88	15	20	16	17	17	18	18	20	22	36	0	0	0	0	0	0	0	0	0	0	2	0	8	0	46	
3	23	68	3	3/28/88	29	36	34	35	36	37	38	39	41	6	12	0	0	0	0	0	0	0	0	0	0	0	8	0	26	
3	23	69	2	3/29/88	21	31	28	30	31	32	33	34	37	0	0	24	0	0	0	0	0	0	0	0	0	0	3	0	27	
3	23	70	1	3/30/88	21	34	25	28	30	30	32	35	36	72	0	0	0	0	0	0	0	0	0	0	2	0	10	0	84	
3	24	51	3	3/05/88	20	32	0	0	0	0	0	0	0	42	6	0	0	0	0	0	0	0	0	0	0	0	4	0	52	
3	24	52	2	3/06/88	33	41	33	34	35	36	38	39	41	42	30	8	0	0	0	0	0	0	0	0	0	0	0	0	80	
3	24	53	1	3/07/88	31	40	32	32	33	34	36	37	39	78	0	0	0	0	0	0	0	0	0	0	4	0	28	0	110	
3	24	54	3	3/09/88	24	35	0	0	0	0	0	0	0	36	6	4	0	0	0	0	0	0	0	0	1	0	7	0	54	
3	24	55	2	3/10/88	32	38	33	35	36	38	39	42	43	36	6	16	0	0	0	0	0	0	0	0	2	0	2	0	62	
3	24	56	1	3/11/88	31	34	31	31	32	33	34	35	37	54	0	0	0	0	0	0	0	0	0	0	4	0	20	0	78	
3	24	57	3	3/13/88	8	14	10	14	15	16	18	19	21	42	6	0	24	0	0	0	0	0	0	0	0	0	16	12	0	101

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

***** TEMPERATURES *****																												
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HE'S	STUM	SRG	BKFR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	IDL*NEUT	IDL*DRV	CLD
3	24	58	2	3/14/88	8	20	12	14	16	18	20	22	25	24	48	32	0	32	0	0	0	0	0	1	16	12	0	165
3	24	59	1	3/15/88	12	22	15	18	20	21	22	25	26	60	0	0	0	0	0	1	0	0	4	8	22	0	95	
3	24	60	3	3/19/88	17	27	0	24	26	26	28	29	30	30	0	4	0	32	0	0	0	0	1	0	12	0	79	
3	24	61	2	3/20/88	11	17	15	16	16	17	17	18	20	0	24	24	0	32	0	1	0	0	2	0	10	0	93	
3	24	62	1	3/21/88	10	15	8	8	9	10	12	13	42	24	0	0	64	0	1	0	0	0	4	16	14	0	165	
3	24	63	3	3/22/88	24	34	30	31	32	34	35	37	38	24	6	0	0	32	0	0	0	0	0	0	13	0	75	
3	24	64	2	3/23/88	30	35	33	34	35	36	37	38	39	54	18	16	0	0	0	1	0	0	2	0	4	0	95	
3	24	65	1	3/24/88	33	38	34	35	35	36	37	37	36	0	0	0	0	32	0	0	0	0	0	0	14	0	82	
3	24	66	3	3/25/88	32	35	34	34	34	35	35	36	37	36	0	0	0	32	0	0	0	0	2	8	7	0	106	
3	24	67	2	3/26/88	15	20	15	17	18	20	21	23	25	54	18	16	0	0	0	1	0	0	0	4	0	21	0	127
3	24	68	1	3/28/88	29	36	34	34	35	35	36	37	39	102	0	0	0	0	0	0	0	0	0	0	16	0	76	
3	24	69	3	3/29/88	21	31	27	29	29	31	32	34	36	54	6	0	0	0	0	0	0	0	0	2	0	10	0	123
3	24	70	2	3/30/88	21	34	29	32	33	35	36	38	40	24	18	36	0	32	0	1	0	0	0	2	0	10	0	123
3	24	71	1	3/31/88	18	28	0	0	0	0	0	0	0	66	24	0	0	0	0	0	0	0	4	0	18	0	112	
4	1	54	1	3/09/88	24	37	32	34	37	39	42	44	47	12	0	0	0	0	0	0	0	0	2	0	14	0	28	
4	2	54	2	3/09/88	24	37	31	35	38	41	45	50	55	0	42	28	0	0	32	0	0	0	0	0	4	32	138	
4	3	54	3	3/09/88	24	27	35	35	37	39	41	44	46	12	12	0	0	0	0	0	0	0	0	0	6	0	30	
4	4	54	1	3/09/88	24	37	0	0	0	0	0	0	0	132	24	0	24	96	0	2	0	0	4	0	26	0	308	
4	5	54	2	3/09/88	24	38	33	33	35	36	38	40	41	0	0	16	0	0	0	1	0	0	1	0	2	0	20	
4	6	54	3	3/09/88	24	38	35	37	38	40	42	45	48	180	18	16	48	96	0	0	0	0	2	8	28	8	404	
4	7	54	1	3/09/88	24	38	33	34	36	39	42	47	49	24	0	0	0	0	0	0	0	0	2	0	16	0	42	
4	8	57	2	3/13/88	8	14	14	14	16	18	19	20	21	114	78	56	0	96	64	0	0	0	4	24	12	32	480	
4	9	57	3	3/13/88	8	15	15	16	17	19	20	22	24	36	30	0	0	0	0	0	0	0	0	0	0	1	0	67
4	10	57	1	3/13/88	8	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6	
4	11	57	2	3/13/88	8	16	18	16	17	18	20	21	23	0	48	48	6	0	0	3	0	0	2	0	6	0	113	
4	12	57	3	3/13/88	8	16	18	17	20	21	24	26	30	66	0	16	0	192	0	2	0	0	4	0	20	0	300	
4	13	57	1	3/13/88	8	16	13	15	17	18	20	23	25	42	12	0	0	0	0	0	0	0	4	8	18	0	84	
4	14	57	2	3/13/88	8	18	13	14	16	19	22	27	30	6	12	40	0	0	0	0	0	0	0	0	11	0	69	
4	15	55	3	3/10/88	32	37	35	35	36	36	38	39	41	42	36	12	0	0	0	0	0	0	0	0	17	8	115	
4	16	55	1	3/10/88	32	37	33	33	34	34	35	36	38	90	0	0	0	96	32	13	0	0	4	16	28	24	303	
4	17	55	2	3/10/88	32	37	35	36	37	40	41	44	46	6	6	32	0	0	0	0	0	0	0	0	9	0	53	
4	18	55	3	3/10/88	32	37	35	37	37	38	40	42	44	204	0	20	0	0	0	0	0	0	0	0	7	0	231	
4	19	55	1	3/10/88	32	37	34	34	35	36	38	40	42	0	0	0	0	0	0	0	0	0	2	0	11	0	13	
4	20	55	2	3/10/88	32	38	39	40	47	48	60	61	74	84	84	28	0	128	0	7	0	0	0	24	13	24	192	
4	21	55	3	3/10/88	32	38	37	39	40	42	44	47	50	42	12	4	0	0	0	0	0	0	0	0	4	0	62	
5	1	61	1	3/20/88	11	16	8	10	13	15	19	21	24	78	0	0	0	0	0	0	0	0	2	0	16	0	96	
5	1	68	1	3/28/88	29	35	33	35	37	39	41	43	45	36	36	0	0	0	0	0	0	0	4	0	18	0	94	
5	2	61	2	3/20/88	11	15	13	13	16	18	20	25	28	6	36	32	0	0	0	1	0	0	1	0	5	0	81	
5	2	68	2	3/28/88	29	35	37	35	38	41	45	48	53	0	24	36	0	0	0	0	0	0	2	0	9	0	71	
5	3	61	3	3/20/88	11	15	14	15	16	17	19	21	23	84	6	4	0	0	0	1	0	0	2	8	6	8	119	
5	3	68	3	3/28/88	29	36	35	36	37	38	40	42	44	54	0	0	0	0	0	0	0	0	0	0	6	0	58	
5	4	61	1	3/20/88	11	16	0	0	0	0	0	0	0	0	234	0	0	128	0	2	1	0	4	8	22	0	399	
5	4	68	1	3/28/88	29	35	0	0	0	0	0	0	0	0	210	0	0	24	64	0	1	0	4	0	28	0	131	
5	5	61	2	3/20/88	11	15	12	12	12	13	14	15	16	6	0	36	24	0	0	11	0	0	1	0	2	0	80	
5	5	68	2	3/28/88	29	36	36	37	38	39	40	42	43	6	0	28	0	32	0	1	0	0	2	0	6	0	75	
5	6	61	3	3/20/88	11	16	13	14	15	16	18	21	23	198	24	0	12	224	0	2	0	0	1	8	26	16	511	
5	6	68	3	3/28/88	29	36	36	35	35	36	37	39	41	180	12	0	0	192	0	1	0	0	2	8	26	32	453	
5	7	61	1	3/20/88	11	16	10	10	12	16	20	24	27	60	12	0	0	0	0	11	0	0	4	0	21	8	116	
5	7	68	1	3/28/88	29	36	33	33	33	35	38	42	45	47	42	6	0	0	0	0	0	0	4	0	16	8	76	
5	8	51	2	3/05/88	20	23	0	0	0	0	0	0	0	102	84	40	0	96	0	0	0	0	4	24	10	24	384	

[illegible]

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

FUEL VEH		RUN RATE	DATE	SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	HES	STUM	SRG	BKFR	STL	STL	STRT	RSTR1	RSTR2	RSTR3	RUF	STL	NEUT	IDL*NEUT	IDL*DRV	CILD	TWD
6	13	61	1	3/20/88	11	17	14	15	17	19	21	23	204	0	0	0	0	0	0	1	0	0	4	8	17	8	242		
6	13	63	1	3/22/88	24	30	25	26	27	29	31	34	36	168	0	0	0	0	0	0	0	0	4	0	22	8	202		
6	14	61	2	3/20/88	11	17	16	18	20	22	26	30	34	30	6	24	0	0	0	1	0	0	4	0	17	24	106		
6	14	63	2	3/22/88	24	32	0	0	0	0	0	18	6	36	0	0	0	0	0	0	0	0	4	0	15	0	79		
6	15	52	3	3/06/88	33	38	32	33	34	35	37	39	78	12	4	0	0	0	1	0	0	0	0	0	10	8	113		
6	15	63	3	3/22/88	24	32	29	29	30	31	32	35	36	12	54	0	32	0	1	0	0	4	8	16	8	135			
6	16	52	1	3/06/88	33	38	34	34	35	35	36	37	39	180	0	0	128	0	13	0	0	4	8	28	24	385			
6	16	63	1	3/22/88	24	32	25	27	27	28	30	30	72	0	0	192	0	13	0	0	0	4	0	28	16	325			
6	17	52	2	3/06/88	33	39	33	34	36	37	39	41	44	30	12	36	0	0	1	0	0	1	0	11	0	91			
6	17	63	2	3/22/88	24	32	0	0	0	0	0	6	6	36	0	0	0	0	0	0	0	1	0	25	0	74			
6	18	52	3	3/06/88	33	39	32	34	36	38	41	42	46	102	24	16	0	32	0	0	0	0	0	9	0	183			
6	18	63	3	3/22/88	24	32	29	29	30	32	34	36	38	60	6	8	0	0	0	0	0	0	0	8	0	82			
6	19	52	1	3/06/88	33	39	35	36	36	37	39	41	44	6	0	0	0	0	0	0	0	2	0	12	0	20			
6	20	52	2	3/06/88	33	40	36	40	44	52	56	62	65	24	156	36	0	224	0	0	0	0	16	15	16	487			
6	20	63	2	3/22/88	24	32	0	0	0	0	0	0	144	24	0	256	0	13	0	0	0	16	15	8	476				
6	21	52	3	3/06/88	33	40	33	35	37	39	42	44	48	16	0	0	32	0	0	0	0	0	0	8	0	76			
6	21	63	3	3/22/88	24	32	30	31	33	36	37	41	43	18	24	0	32	0	1	0	0	0	0	8	0	83			
7	1	53	1	3/07/88	31	33	30	32	35	37	40	42	44	0	24	0	0	0	0	0	0	2	0	15	0	41			
7	1	69	1	3/29/88	21	30	23	24	27	29	32	35	36	60	24	0	0	0	0	0	0	4	0	15	0	103			
7	2	53	2	3/07/88	31	33	29	31	33	36	38	42	48	0	18	28	0	0	0	0	0	0	0	1	0	47			
7	2	69	2	3/29/88	21	30	22	25	27	30	32	35	39	6	18	60	0	0	0	0	0	0	0	7	0	91			
7	3	53	3	3/07/88	31	35	33	34	35	36	38	39	41	18	12	0	0	0	0	0	0	2	0	2	0	34			
7	3	69	3	3/29/88	21	30	26	27	28	29	30	32	33	42	0	0	0	0	0	0	0	1	8	4	0	55			
7	4	53	1	3/07/88	31	35	0	0	0	0	0	0	126	0	0	160	0	1	0	0	0	4	0	16	0	307			
7	4	69	1	3/29/88	21	30	0	0	0	0	0	0	264	0	0	64	0	1	1	0	0	4	8	28	0	370			
7	5	53	2	3/07/88	31	36	30	31	32	33	34	36	38	0	0	28	0	0	1	0	0	0	0	0	0	29			
7	5	69	2	3/29/88	21	30	23	24	25	26	27	28	31	12	12	48	0	0	1	0	0	1	0	5	0	79			
7	6	53	3	3/07/88	31	37	34	35	35	37	38	41	42	186	24	4	160	0	0	0	0	0	8	26	8	416			
7	6	69	3	3/29/88	21	30	27	28	29	30	32	34	36	156	36	0	96	0	1	0	0	2	8	26	8	333			
7	7	53	1	3/07/88	31	36	30	32	34	37	41	45	47	0	0	0	0	0	0	0	0	2	0	20	0	22			
7	7	69	1	3/29/88	21	30	24	25	27	29	33	36	39	42	12	0	0	0	1	0	0	4	0	18	0	77			
7	8	59	2	3/15/88	12	21	14	16	17	19	21	22	24	6	54	64	0	64	32	0	0	4	24	7	16	271			
7	8	69	2	3/29/88	21	31	24	28	30	30	32	33	35	54	30	80	0	32	32	0	0	1	0	6	16	251			
7	9	59	3	3/15/88	12	22	18	19	20	21	20	26	28	42	6	4	0	0	0	0	0	0	0	3	0	55			
7	9	69	3	3/29/88	21	31	29	29	31	32	33	35	38	12	0	0	0	0	0	0	0	0	0	1	0	13			
7	10	59	1	3/15/88	12	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	5			
7	10	69	1	3/29/88	21	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6			
7	11	59	2	3/15/88	12	22	16	16	18	19	22	24	27	6	12	60	0	0	0	0	0	2	0	4	0	84			
7	11	69	2	3/29/88	21	31	30	29	30	31	34	35	37	12	18	48	0	0	1	0	0	1	0	6	0	86			
7	12	59	3	3/15/88	12	22	20	20	23	25	29	32	36	36	0	4	24	192	0	1	0	0	4	0	28	0	289		
7	12	69	3	3/29/88	21	31	27	28	31	33	35	38	41	24	0	80	0	192	0	2	0	0	4	16	28	0	346		
7	13	59	1	3/15/88	12	22	18	17	18	20	22	25	28	6	0	0	0	0	0	0	0	4	0	24	0	34			
7	13	69	1	3/29/88	21	31	27	28	29	30	32	34	37	84	12	0	0	0	0	0	0	4	0	24	0	124			
7	14	69	2	3/29/88	21	31	27	29	31	33	38	40	45	0	12	28	0	0	0	0	0	0	0	11	0	51			
7	15	57	3	3/13/88	8	20	17	18	20	21	22	24	26	12	36	0	0	0	3	0	0	0	0	4	0	55			
7	15	69	3	3/29/88	21	31	28	28	29	29	31	33	35	24	42	0	0	0	0	0	0	2	0	22	8	98			
7	16	57	1	3/13/88	8	20	14	15	16	17	18	19	20	162	0	0	96	0	13	0	0	4	8	28	16	327			
7	16	69	1	3/29/88	21	31	25	25	26	27	28	30	32	24	0	30	64	0	13	0	1	0	4	24	28	24	314		
7	17	57	2	3/13/88	8	20	16	16	18	20	23	24	27	0	30	32	0	0	0	0	0	0	0	11	0	73			
7	17	69	2	3/29/88	21	31	0	0	0	0	0	0	6	6	60	0	0	0	0	0	0	1	0	11	0	84			
7	18	57	3	3/13/88	8	20	18	20	22	23	24	27	31	30	6	12	0	0	0	0	0	0	0	2	0	50			

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

FUEL			VEH	RUN	RATER	DATE	SOAK	TEMPERATURES							ACLDCL										INIT				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR				RSTR			
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SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

G-40

TEMPERATURES										ACLDCL INIT										IDL*NEUT										IDL*DRV									
FUEL	VEH	RUN	RATR	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRG	BKFR	STL	STL	STL	STL	STRT3	RUF	STL	RUF	STL	TWD	CLD											
9	12	62	3	3/21/88	10	24	0	23	25	0	30	34	39	72	0	36	36	160	0	5	0	0	0	4	0	28	96	437											
9	12	67	3	3/26/88	15	20	19	19	21	22	25	27	30	102	24	16	0	192	0	8	0	0	0	4	24	28	0	398											
9	13	62	1	3/21/88	10	24	18	19	20	23	25	28	30	54	0	0	0	0	0	0	0	0	0	4	0	14	8	80											
9	13	67	1	3/26/88	15	20	17	17	18	19	20	22	25	174	0	0	0	0	0	0	0	0	0	4	0	18	8	204											
9	14	62	2	3/21/88	10	24	20	22	26	28	33	38	41	0	40	0	0	0	0	0	0	0	2	8	3	0	53												
9	14	67	2	3/26/88	15	20	19	20	22	25	28	32	35	0	12	28	0	0	0	0	0	0	2	0	14	0	56												
9	15	51	3	3/05/88	20	28	0	0	0	0	0	0	42	0	4	0	32	0	0	0	0	1	0	12	8	99													
9	15	67	3	3/26/88	15	20	20	20	21	22	23	25	27	72	24	4	0	0	0	1	0	0	1	24	18	8	152												
9	16	51	1	3/05/88	20	28	0	0	0	0	0	0	126	0	0	0	64	32	13	0	0	0	4	24	28	40	331												
9	16	67	1	3/26/88	15	20	15	15	15	15	16	17	18	168	0	0	160	0	13	8	0	0	4	8	28	24	413												
9	17	51	2	3/05/88	20	29	0	0	0	0	0	0	18	6	36	0	0	0	0	0	0	0	1	0	12	0	73												
9	17	67	2	3/26/88	15	20	0	0	0	0	0	0	6	30	20	0	0	0	0	0	0	0	1	0	13	0	70												
9	18	51	3	3/05/88	20	29	0	0	0	0	0	0	84	0	8	0	0	0	0	0	0	0	0	0	10	16	118												
9	18	67	3	3/26/88	15	20	20	21	22	24	25	26	29	54	0	4	0	0	0	0	0	0	0	2	0	24	0	26											
9	19	51	1	3/05/88	20	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	13	0	42												
9	19	67	1	3/26/88	15	20	16	16	16	17	19	20	23	24	0	0	0	0	0	1	0	0	0	4	0	24	13	8											
9	20	51	2	3/05/88	20	30	0	0	0	0	0	0	72	102	20	0	224	0	4	2	1	2	0	24	13	8	472												
9	20	67	2	3/26/88	15	20	18	21	23	32	30	43	0	36	192	28	0	224	0	6	0	0	2	24	23	16	551												
9	21	51	3	3/05/88	20	30	0	0	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	6	0	72												
9	21	67	3	3/26/88	15	20	19	21	22	24	26	28	32	60	0	0	0	0	0	1	0	0	1	24	16	0	102												
10	1	52	1	3/06/88	33	39	36	37	40	43	46	48	50	24	12	0	0	0	0	0	0	0	2	0	14	0	52												
10	1	65	1	3/24/88	33	37	35	35	37	39	41	43	45	42	0	0	0	0	0	0	0	0	2	0	14	0	58												
10	2	52	2	3/06/88	33	40	33	35	37	38	41	44	47	0	18	12	0	0	0	0	0	0	0	0	0	0	30												
10	2	65	2	3/24/88	33	37	33	36	37	40	42	48	52	0	18	28	0	0	0	0	0	0	2	0	11	0	59												
10	3	52	3	3/06/88	33	40	0	0	0	0	0	0	12	6	0	0	0	0	0	0	0	0	1	0	3	0	22												
10	3	65	3	3/24/88	33	37	36	36	37	38	40	42	43	18	0	0	0	0	0	0	0	0	2	8	5	0	33												
*10	4	52	1	3/06/88	0	0	0	0	0	0	0	0	0	0	0	0	32	0	9	0	0	0	4	0	4	0	49												
10	4	65	1	3/24/88	33	37	0	0	0	0	0	0	108	0	0	0	64	0	1	0	0	0	4	0	28	0	205												
10	5	52	2	3/06/88	33	40	34	35	36	37	38	39	41	0	12	24	0	0	0	0	0	0	0	0	0	0	36												
10	5	65	2	3/24/88	33	37	35	36	37	38	40	41	43	0	6	44	0	0	0	0	0	0	1	0	9	0	60												
10	6	52	3	3/06/88	33	40	34	35	36	37	39	41	44	156	30	4	24	96	0	0	0	0	0	8	26	8	352												
10	6	65	3	3/24/88	33	37	36	36	37	38	39	41	43	198	0	0	32	0	1	0	0	0	4	8	28	8	279												
10	7	52	1	3/06/88	33	40	37	38	39	42	45	49	52	0	6	0	0	0	0	0	0	0	2	0	20	0	28												
10	7	65	1	3/24/88	33	37	34	34	36	39	41	44	47	6	6	0	0	0	0	0	0	0	4	0	17	0	33												
10	8	56	2	3/11/88	31	35	31	31	31	33	33	35	35	18	54	36	0	32	32	0	0	0	4	24	8	8	216												
10	8	65	2	3/24/88	33	37	37	37	38	39	41	43	44	54	6	44	0	32	32	0	0	0	2	0	5	0	175												
10	9	56	3	3/11/88	31	35	33	33	34	35	36	38	39	12	0	0	0	0	0	0	0	0	0	0	2	0	14												
10	9	65	3	3/24/88	33	37	36	36	38	39	40	42	45	6	0	0	0	0	0	0	0	0	0	0	1	0	7												
10	10	56	1	3/11/88	31	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3												
10	10	65	1	3/24/88	33	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6												
10	11	56	2	3/11/88	31	35	30	31	31	33	35	37	39	6	54	24	0	0	0	1	0	0	2	0	2	0	89												
10	11	65	2	3/24/88	33	37	37	38	39	40	42	44	45	0	12	52	0	0	0	2	0	0	2	0	6	0	74												
10	12	56	3	3/11/88	31	35	33	33	34	36	38	42	44	24	24	0	160	0	1	0	0	0	4	0	24	0	237												
10	12	65	3	3/24/88	33	38	35	36	37	39	41	43	46	168	0	12	0	32	0	1	0	0	4	0	28	8	253												
10	13	56	1	3/11/88	31	35	32	32	33	34	35	38	39	0	0	0	0	0	0	0	0	0	4	0	19	0	23												
10	13	65	1	3/24/88	33	38	34	35	36	38	39	42	44	18	0	0	0	0	0	0	0	0	4	0	13	0	35												
10	14	56	2	3/11/88	31	35	31	31	32	35	37	41	44	6	6	24	0	0	0	0	0	0	0	0	8	0	44												
10	14	65	2	3/24/88	33	38	37	38	39	42	44	48	51	6	5	28	0	0	0	0	0	0	1	0	10	0	51												
10	15	60	3	3/19/88	17	26	0	24	25	26	28	30	32	54	48	0	0	0	0	0	0	0	0	0	18	0	120												
10	15	65	3	3/24/88	33	38	35	36	37	38	39	41	43	0	36	4	0	0	0	0	0	0	0	0	26	0	66												
10	16	60	1	3/19/88	17	26	22	22	23	24	25	26	26	108	0	0	64	0	13	0	0	0	0	24	24	24	257												

Page 8

* Run excluded from data analysis.

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

TEMPERATURES										ACLDCL INIT										IDL*NEUT										IDL*DRV									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	INK1	INK2	INK3	INK4	INK5	INK6	INK7	HES	STUM	SRG	AKFR	STL	JTL	START	RSTR1	RSTR2	RSTR3	RUF	STL	RUF	STL	TWD	CLD										
10	16	65	1	3/24/88	33	38	34	35	35	36	36	37	38	66	0	0	0	32	0	13	0	0	0	4	16	28	8	167											
10	17	60	2	3/19/88	17	26	0	0	0	0	0	0	0	12	30	56	0	0	0	0	0	0	0	2	0	22	0	122											
10	17	65	2	3/24/88	33	38	0	0	0	0	0	0	0	6	36	44	0	0	0	0	0	0	1	0	13	0	100												
10	18	60	3	3/19/88	17	26	25	26	27	28	29	32	33	42	12	0	0	0	32	0	0	0	0	0	0	10	0	96											
10	18	65	3	3/24/88	33	38	35	37	39	40	42	45	45	18	0	0	0	0	0	0	0	0	0	0	0	7	0	25											
10	19	60	1	3/19/88	17	26	22	22	23	24	26	28	31	0	0	0	0	0	0	0	0	0	2	0	14	0	16												
10	19	65	1	3/24/88	33	38	35	35	35	36	37	39	40	0	0	0	0	0	0	0	0	0	4	0	11	0	15												
10	20	60	2	3/19/88	17	26	23	27	30	37	39	52	56	78	96	40	0	128	32	2	0	0	0	8	16	8	408												
10	20	65	2	3/24/88	33	38	38	40	46	48	56	61	71	66	84	24	0	64	0	1	1	1	2	24	13	16	296												
10	21	60	3	3/19/88	17	26	25	25	28	30	32	33	37	30	0	0	0	0	0	0	0	0	0	0	0	6	0	36											
10	21	65	3	3/24/88	33	38	36	38	39	41	43	46	47	12	0	0	0	0	0	0	0	0	0	0	0	11	0	23											
11	1	55	1	3/10/88	32	33	32	33	35	38	40	43	45	18	12	0	0	0	0	0	0	0	2	0	18	0	50												
11	1	71	1	3/31/88	18	26	0	0	0	0	0	0	0	84	30	0	0	0	0	0	0	0	4	0	15	0	133												
11	2	55	2	3/10/88	32	33	32	34	36	39	41	45	49	0	42	36	0	0	0	0	0	0	0	0	5	0	83												
11	2	71	2	3/31/88	18	28	25	28	29	32	36	40	44	0	6	44	0	0	0	0	0	0	0	0	6	0	56												
11	3	55	3	3/10/88	32	33	35	35	35	37	38	40	42	48	0	0	0	0	0	0	0	0	0	0	3	0	51												
11	3	71	3	3/31/88	18	28	25	26	26	27	29	30	32	48	0	0	0	0	0	1	0	0	0	0	8	3	0	60											
11	4	55	1	3/10/88	32	35	0	0	0	0	0	0	0	156	0	0	24	128	0	2	0	0	4	0	28	0	318												
11	4	71	1	3/31/88	18	26	0	0	0	0	0	0	0	300	0	0	24	128	0	2	0	0	4	0	28	0	486												
11	5	55	2	3/10/88	32	35	32	33	34	35	36	37	39	0	0	40	0	0	0	0	0	0	4	0	3	0	47												
11	5	71	2	3/31/88	18	28	25	26	27	28	30	32	34	0	6	32	0	0	0	2	0	0	0	0	3	0	43												
11	6	55	3	3/10/88	32	35	34	35	35	36	38	40	41	198	48	12	0	160	0	2	0	0	0	0	24	32	476												
11	6	71	3	3/31/88	18	28	25	25	27	28	30	32	34	174	36	8	0	224	0	1	0	0	4	8	24	8	487												
11	7	55	1	3/10/88	32	36	32	33	35	38	43	47	50	0	6	0	0	0	0	4	0	0	4	0	16	0	30												
11	7	71	1	3/31/88	18	27	0	0	0	0	0	0	0	24	48	0	0	0	5	0	0	0	4	0	19	8	108												
11	8	53	2	3/07/88	31	38	30	31	32	33	34	36	37	30	78	72	0	64	0	0	0	0	4	24	6	24	302												
11	8	71	2	3/31/88	18	27	21	25	26	28	30	32	33	60	66	44	0	96	32	0	0	0	2	16	11	0	327												
11	9	53	3	3/07/88	31	38	34	35	36	36	36	38	38	12	6	0	0	0	0	0	0	0	0	0	2	0	20												
11	9	71	3	3/31/88	18	24	21	21	23	24	26	29	32	30	0	0	0	0	0	0	0	0	0	0	0	1	0	31											
11	10	53	1	3/07/88	31	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	4												
11	10	71	1	3/31/88	18	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	6												
11	11	53	2	3/07/88	31	38	30	31	32	34	35	38	39	24	0	44	0	0	0	1	0	0	0	0	0	0	69												
11	11	71	2	3/31/88	18	24	19	21	23	25	28	29	31	18	6	52	0	32	0	1	0	0	1	0	2	0	112												
11	12	53	3	3/07/88	31	39	36	38	38	38	41	41	42	24	0	0	0	192	0	1	0	0	2	0	24	0	243												
11	12	71	3	3/31/88	18	27	24	25	26	28	32	34	37	0	80	48	192	0	2	0	9	1	4	24	28	0	388												
11	13	53	1	3/07/88	31	39	32	32	33	35	37	40	42	0	0	0	0	0	0	0	0	0	4	0	20	0	24												
11	13	71	1	3/31/88	18	26	0	0	0	0	0	0	0	144	0	0	0	0	0	0	0	0	4	0	20	0	168												
11	14	53	2	3/07/88	31	39	32	32	34	36	39	42	46	0	0	12	0	0	0	0	0	0	0	0	8	0	20												
11	14	71	2	3/31/88	18	25	22	23	26	28	32	36	40	6	6	24	0	0	0	2	0	0	2	0	12	0	50												
11	15	62	3	3/21/88	10	15	15	16	16	18	19	22	24	30	78	4	0	0	0	2	0	0	4	24	24	16	182												
11	15	71	3	3/31/88	18	26	26	26	26	26	28	30	32	24	90	0	0	0	0	0	0	0	1	8	20	8	151												
11	16	62	1	3/21/88	10	15	8	9	10	12	14	15	246	24	0	0	96	0	13	0	0	0	4	24	28	16	451												
11	16	71	1	3/31/88	18	24	0	0	0	0	0	0	0	144	0	0	96	0	13	1	1	1	4	24	28	24	336												
11	17	62	2	3/21/88	10	17	0	0	0	0	0	0	0	6	0	40	0	0	0	0	0	0	2	0	14	0	62												
11	17	71	2	3/31/88	18	26	0	0	0	0	0	0	0	6	6	64	0	0	0	0	0	0	1	0	13	0	90												
11	18	62	3	3/21/88	10	20	15	18	18	20	21	24	26	42	12	4	0	0	0	0	0	0	0	0	13	0	71												
11	18	71	3	3/31/88	18	25	25	26	27	29	35	36	36	72	0	4	0	0	0	0	0	0	0	0	13	0	89												
11	19	62	1	3/21/88	10	20	9	10	12	14	16	18	21	0	0	0	0	0	0	0	0	0	2	0	13	0	15												
11	19	71	1	3/31/88	18	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	13	0	25												
11	20	62	2	3/21/88	10	17	20	23	29	33	42	45	54	102	138	44	0	96	0	2	0	0	4	24	22	16	448												
11	20	71	2	3/31/88	18	26	27	31	40	44	51	59	68	84	76	0	224	32	0	1	?	?	1	24	23	8	492												

SUMMARY OF COLD DEMERITS BY CRITERIA - BRAINERD

TEMPERATURES										ACCL DCL INIT										IOI*NEUT										IDL*DRV									
FUEL	VEH	RUN	RATR	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HFS	STUM	SRG	BKFR	STL	STL	START	RSTR1	RSTR2	RSTR3	RUF	STL	RUF	STL	TWD											
11	21	62	3	3/21/88	10	20	17	19	21	24	26	30	32	60	6	0	0	0	0	0	0	0	0	0	4	0	14	0	84										
11	21	71	3	3/31/88	18	26	26	27	29	31	34	35	39	36	12	0	0	0	0	0	0	0	0	0	0	0	14	0	62										
11	23	71	3	3/31/88	18	28	28	28	29	29	32	34	36	12	0	4	0	0	0	0	0	0	0	0	0	0	8	0	25										
12	1	58	1	3/14/88	8	16	11	12	15	17	20	22	24	66	0	0	0	0	0	0	0	0	0	2	0	16	16	100											
12	1	66	1	3/25/88	32	36	36	38	40	42	45	47	48	54	12	0	0	0	0	0	0	0	0	2	0	16	8	92											
12	2	58	2	3/14/88	8	19	10	12	14	17	19	22	27	6	42	44	0	0	0	3	0	0	0	2	0	8	0	105											
12	2	66	2	3/25/88	32	35	37	38	39	41	42	46	49	0	6	16	0	0	0	1	0	0	0	1	0	4	0	28											
12	3	58	3	3/14/88	8	18	16	16	18	19	21	23	25	90	12	0	0	0	0	1	0	0	0	1	0	8	8	120											
12	3	66	3	3/25/88	32	36	33	34	34	35	36	37	39	78	0	0	0	0	0	0	0	0	0	0	0	5	8	91											
12	4	58	1	3/14/88	8	18	0	0	0	0	0	0	0	204	0	0	24	192	32	3	0	0	0	4	0	28	0	487											
12	4	66	1	3/25/88	32	36	0	0	0	0	0	0	0	198	0	0	24	64	0	2	0	0	0	4	0	28	0	320											
12	5	58	2	3/14/88	8	19	11	11	12	13	14	15	17	12	0	36	0	0	0	0	0	0	0	2	8	3	8	69											
12	5	66	2	3/25/88	32	35	34	35	35	36	37	38	40	0	12	4	0	0	0	6	0	0	0	0	0	8	0	0	30										
12	6	58	3	3/14/88	8	19	13	13	16	17	20	22	25	204	12	16	0	352	32	2	1	0	0	2	0	26	40	687											
12	6	66	3	3/25/88	32	35	34	34	34	34	35	36	38	168	0	0	0	256	0	0	0	0	0	4	8	28	24	488											
12	7	58	1	3/14/88	8	19	11	12	14	18	21	25	28	30	18	0	0	0	32	0	0	0	0	4	8	24	8	124											
12	7	66	1	3/25/88	32	36	35	35	37	39	42	44	46	0	30	0	0	0	0	0	0	0	0	4	0	19	0	53											
12	8	60	2	3/19/88	17	25	0	22	23	24	25	26	27	90	144	48	0	128	0	6	0	0	0	0	8	6	24	454											
12	8	66	2	3/25/88	32	36	35	37	38	38	40	41	42	30	42	68	0	64	32	0	0	0	0	1	0	5	0	242											
12	9	60	3	3/19/88	17	25	0	25	25	27	28	30	32	66	6	0	0	0	0	0	0	0	0	0	0	4	0	76											
12	9	66	3	3/25/88	32	36	33	33	33	34	35	36	38	42	0	0	0	0	0	0	0	0	0	0	0	4	0	46											
12	10	60	1	3/19/88	17	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	5											
12	10	66	1	3/25/88	32	36	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	2	0	3	0	29											
12	11	60	2	3/19/88	17	25	24	26	26	27	29	31	32	30	30	72	0	96	0	1	0	0	0	2	0	6	0	237											
12	11	66	2	3/25/88	32	35	37	37	38	38	39	40	42	18	18	60	0	32	0	1	0	0	0	4	0	7	0	140											
12	12	60	3	3/19/88	17	25	0	26	27	29	34	36	42	138	0	8	24	224	64	3	0	0	0	2	0	28	96	587											
12	12	66	3	3/25/88	32	36	33	33	34	35	36	38	41	96	0	52	0	224	0	1	0	0	0	4	24	28	0	429											
12	13	60	1	3/19/88	17	25	21	21	23	24	27	29	31	162	0	0	0	0	0	0	0	0	0	4	0	20	0	186											
12	13	66	1	3/25/88	32	36	37	37	37	38	40	41	44	144	0	0	0	0	0	0	0	0	0	4	0	20	0	168											
12	14	60	2	3/19/88	17	26	25	25	26	28	30	33	36	0	12	60	0	0	0	0	0	0	0	2	0	22	0	96											
12	14	66	2	3/25/88	32	35	36	37	40	41	44	46	49	6	16	0	0	0	0	0	0	0	0	2	0	6	0	36											
12	15	54	3	3/09/88	24	36	0	0	0	0	0	0	0	72	18	0	0	0	0	0	0	0	0	0	0	15	8	113											
12	15	66	3	3/25/88	32	35	33	33	33	33	34	35	37	60	24	4	0	0	0	0	0	0	0	0	0	20	8	116											
12	16	54	1	3/09/88	24	37	30	31	32	33	34	36	36	180	0	0	0	256	0	13	0	0	0	4	0	28	32	513											
12	16	66	1	3/25/88	32	35	35	36	36	36	37	38	38	108	0	0	0	64	0	13	0	0	0	4	8	28	8	233											
12	17	54	2	3/09/88	24	37	31	32	35	38	40	44	46	6	6	24	0	0	0	0	0	0	0	0	0	10	0	46											
12	17	66	2	3/25/88	32	35	0	0	0	0	0	0	0	0	12	12	0	0	0	1	0	0	0	0	0	12	0	37											
12	18	54	3	3/09/88	24	37	0	0	0	0	0	0	0	138	18	12	0	0	0	0	0	0	0	0	0	8	0	176											
12	18	66	3	3/25/88	32	35	33	34	34	37	36	40	40	30	0	0	0	0	0	0	0	0	0	0	0	10	0	40											
12	19	54	1	3/09/88	24	37	32	31	32	33	36	38	41	6	30	0	0	0	0	0	0	0	0	2	0	9	0	47											
12	19	66	1	3/25/88	32	35	36	36	36	37	38	39	40	0	0	0	0	0	0	0	0	0	0	4	0	18	0	22											
12	20	54	2	3/09/88	24	37	37	45	50	58	65	74	76	0	180	28	0	256	0	0	0	0	0	4	16	20	24	528											
12	20	66	2	3/25/88	32	35	35	35	42	43	55	55	66	0	144	24	0	192	0	0	0	0	0	0	1	24	14	16	415										
12	21	54	3	3/09/88	24	37	32	36	38	40	44	47	50	48	0	0	0	0	0	0	0	0	0	0	0	4	0	52											
12	21	66	3	3/25/88	32	35	33	34	36	37	38	40	43	48	0	0	0	0	0	0	0	0	0	0	0	13	0	61											

SUMMARY OF WARM DEMERITS BY CRITERIA - BRAINERD

===== TEMPERATURES =====										===== ACCL DCL INIT =====										===== IDL*NEUT IDL*DRV WRN =====									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SGK	BKPR	STL	STRT	RSRT1	RSRT2	RSRT3	RUF	STL	RUF	STL	TWD		
1	1	51	1	3/05/88										0	0	0	0	0	0					2	0	2			
1	1	64	1	3/23/88										0	0	0	0	0	0					2	0	2			
1	2	51	2	3/05/88										0	0	0	0	0	0					2	0	2			
1	2	64	2	3/23/88										0	0	8	0	0	0					2	0	10			
1	3	51	3	3/05/88										0	0	0	0	0	0					0	0	0			
1	3	64	3	3/23/88										0	0	0	0	0	0					0	0	0			
1	4	51	1	3/05/88										0	0	0	0	0	0					4	0	4			
1	4	64	1	3/23/88										0	0	0	0	0	0					8	0	8			
1	5	51	2	3/05/88										0	0	0	0	0	0					4	0	4			
1	5	64	2	3/23/88										12	0	0	0	0	0					2	0	2			
1	6	51	3	3/05/88										0	6	0	0	0	0					4	0	16			
1	6	64	3	3/23/88										0	0	0	0	0	0					8	0	14			
1	7	51	1	3/05/88										0	0	0	0	0	0					4	0	4			
1	7	64	1	3/23/88										0	0	0	0	0	0					2	0	2			
1	8	55	2	3/10/88										0	0	16	0	0	0					2	0	18			
1	8	64	2	3/23/88										12	0	8	0	0	0					1	0	21			
1	9	55	3	3/10/88										0	0	0	0	0	0					1	0	1			
1	9	64	3	3/23/88										0	0	0	0	0	0					0	0	0			
1	10	55	1	3/10/88										0	0	0	0	0	0					0	0	0			
1	10	64	1	3/23/88										0	0	0	0	0	0					0	0	0			
1	11	55	2	3/10/88										0	6	12	0	0	0					0	0	18			
1	11	64	2	3/23/88										6	0	12	0	0	0					2	0	20			
1	12	55	3	3/10/88										12	0	8	0	32	0					8	0	60			
1	12	64	3	3/23/88										42	12	0	0	32	0					8	0	94			
1	13	55	1	3/10/88										0	0	0	0	0	0					2	0	2			
1	13	64	1	3/23/88										6	0	0	0	0	0					2	0	8			
1	14	55	2	3/10/88										0	0	0	0	0	0					2	0	2			
1	14	64	2	3/23/88										0	0	0	0	0	0					2	0	2			
1	15	56	3	3/11/88										12	12	4	0	0	0					4	0	32			
1	15	64	3	3/23/88										12	0	0	0	0	0					4	0	16			
1	16	56	1	3/11/88										0	0	0	0	0	0					2	0	2			
1	16	64	1	3/23/88										0	0	0	0	0	0					8	0	8			
1	17	56	2	3/11/88										0	0	0	0	0	0					8	0	8			
1	17	64	2	3/23/88										12	24	8	0	0	0					3	0	47			
1	18	56	3	3/11/88										6	12	0	0	0	0					4	0	22			
1	18	64	3	3/23/88										0	0	0	0	0	0					1	0	1			
1	19	56	1	3/11/88										0	6	0	0	0	0					1	0	7			
1	19	64	1	3/23/88										0	0	0	0	0	0					2	0	2			
1	20	56	2	3/11/88										0	0	0	0	0	0					2	0	2			
1	20	64	2	3/23/88										24	6	8	0	0	0					0	0	38			
1	21	56	3	3/11/88										18	12	16	0	0	0					4	0	50			
1	21	64	3	3/23/88										0	0	0	0	0	0					2	0	2			
1	21	57	1	3/13/88										0	0	0	0	0	0					2	0	2			
2	1	57	1	3/13/88										0	0	0	0	0	0					1	0	1			
2	2	57	2	3/13/88										6	0	16	0	0	0					0	0	22			
2	3	57	3	3/13/88										0	0	0	0	0	0					1	0	1			
2	4	57	1	3/13/88										0	0	0	0	0	0					8	0	8			
2	5	57	2	3/13/88										0	0	0	0	0	0					0	0	0			
2	6	57	3	3/13/88										48	0	0	0	0	0					8	0	56			
2	7	57	1	3/13/88										0	0	0	0	0	0					2	0	2			
2	8	52	2	3/06/88										24	6	0	0	0	0					2	0	32			
?	9	52	3	3/06/88										0	0	0	0	0	0					0	0	0			

SUMMARY OF WARM DEMERITS BY CRITERIA - BRAINERD

FUEL VEH RUN RATER		DATE	SOAK RUN INK1 INK2 INK3 INK4 INK5 INK6 INK7				RES STUM SRG BKFR STL STL START RSIRT1 RSIRT2 RSIRT3				RUF STL RUF STL TWD				IDLA*NEUT IDLA*DRV WRN						
			TEMPERATURES				ACL DCL INIT														
3	20	53	2	3/07/88						0	18	0	0	0	64	0			1	0	83
3	20	70	2	3/30/88						24	0	8	0	32	0				1	0	65
3	21	53	3	3/07/88						0	0	0	0	0	0				2	0	2
3	21	70	3	3/30/88						0	0	0	0	0	0				4	0	4
3	22	51	1	3/05/88						0	0	0	0	0	0				0	0	0
3	22	52	3	3/06/88						0	0	0	0	0	0				0	0	0
3	22	53	2	3/07/88						0	0	0	0	0	0				0	0	0
3	22	54	1	3/09/88						0	0	0	0	0	0				0	0	0
3	22	55	3	3/10/88						0	0	0	0	0	0				0	0	0
3	22	56	2	3/11/88						0	0	0	0	0	0				0	0	0
3	22	57	1	3/13/88						0	0	0	0	0	0				0	0	0
3	22	58	3	3/14/88						0	0	0	0	0	0				0	0	0
3	22	59	2	3/15/88						0	0	0	0	0	0				0	0	0
3	22	60	1	3/19/88						0	0	0	0	0	0				2	0	2
3	22	61	3	3/20/88						0	0	0	0	0	0				0	0	0
3	22	62	2	3/21/88						0	0	0	0	0	0				0	0	0
3	22	63	1	3/22/88						0	0	0	0	0	0				0	0	0
3	22	64	3	3/23/88						0	0	0	0	0	0				0	0	0
3	22	65	2	3/24/88						0	0	0	0	0	0				0	0	0
3	22	66	1	3/25/88						0	0	0	0	0	0				0	0	0
3	22	67	3	3/26/88						0	0	0	0	0	0				0	0	0
3	22	68	2	3/28/88						0	0	0	0	0	0				0	0	0
3	22	69	1	3/29/88						0	0	0	0	0	0				0	0	0
3	22	70	3	3/30/88						0	0	0	0	0	0				0	0	0
3	22	71	2	3/31/88						0	0	0	0	0	0				0	0	0
3	23	51	2	3/05/88						0	0	0	0	0	0				0	0	0
3	23	52	1	3/06/88						0	0	0	0	0	0				0	0	0
3	23	53	3	3/07/88						0	0	0	0	0	0				1	0	1
3	23	54	2	3/09/88						0	0	0	0	0	0				0	0	0
3	23	55	1	3/10/88						0	0	0	0	0	0				0	0	0
3	23	56	3	3/11/88						0	0	0	0	0	0				0	0	0
3	23	57	2	3/13/88						0	0	0	0	0	0				0	0	0
3	23	58	1	3/14/88						0	0	0	0	0	0				0	0	0
3	23	59	3	3/15/88						0	0	0	0	0	0				0	0	0
3	23	60	2	3/19/88						0	0	0	0	0	0				0	0	0
3	23	61	1	3/20/88						6	6	8	0	0	0				1	0	21
3	23	62	3	3/21/88						0	0	0	0	0	0				0	0	0
3	23	63	2	3/22/88						0	0	0	0	0	0				0	0	0
3	23	64	1	3/23/88						0	0	0	0	0	0				0	0	0
3	23	65	3	3/24/88						0	0	0	0	0	0				0	0	0
3	23	66	2	3/25/88						0	0	0	0	0	0				0	0	0
3	23	67	1	3/26/88						0	0	0	0	0	0				0	0	0
3	23	68	3	3/28/88						0	0	0	0	0	0				0	0	0
3	23	69	2	3/29/88						0	0	0	0	0	0				0	0	0
3	23	70	1	3/30/88						0	0	0	0	0	0				0	0	0
3	24	51	3	3/05/88						0	0	0	0	0	0				0	0	0
3	24	52	2	3/06/88						0	0	0	0	0	0				0	0	0
3	24	53	1	3/07/88						0	0	0	0	0	0				0	0	0
3	24	54	3	3/09/88						0	0	0	0	0	0				0	0	0
3	24	55	2	3/10/88						0	0	0	0	0	0				0	0	0
3	24	56	1	3/11/88						0	0	0	0	0	0				0	0	0
3	24	57	3	3/13/88						0	0	0	0	0	0				0	0	0

SUMMARY OF WARM DEFERITS BY CRITERIA - BRAINERD

TEMPERATURES										ACLDCL INIT										IDL*NEUT IDL*DRV WRM									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	INK1	INK2	INK3	INK4	INK5	INK6	INK7	HES	STUM	SRC	BKPR	STL	STL	STRT1	RSTR1	RSTR2	RSTR3	RUF	STL	RUF	STL	TWD	TWD
3	24	58	2	3/14/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	59	1	3/15/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	60	3	3/19/88										0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
3	24	61	2	3/20/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	62	1	3/21/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	63	3	3/22/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	64	2	3/23/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	65	1	3/24/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	66	3	3/25/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	67	2	3/26/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	68	1	3/28/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	69	3	3/29/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	70	2	3/30/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	24	71	1	3/31/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	54	1	3/09/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	2	54	2	3/09/88										0	12	4	0	0	0	0	0	0	0	0	0	0	0	0	16
4	3	54	3	3/09/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	4	54	1	3/09/88										0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0
4	5	54	2	3/09/88										0	12	12	0	0	0	0	0	0	0	0	0	0	0	24	0
4	6	54	3	3/09/88										30	0	4	0	0	0	0	0	0	0	8	0	42	0	0	0
4	7	54	1	3/09/88										0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	0
4	8	57	2	3/13/88										12	12	16	0	0	0	0	0	0	2	0	42	0	0	0	0
4	9	57	3	3/13/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	10	57	1	3/13/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	11	57	2	3/13/88										0	12	16	0	0	0	0	0	0	4	0	32	0	0	0	0
4	12	57	3	3/13/88										24	0	0	0	0	32	0	0	0	8	0	64	0	0	0	0
4	13	57	1	3/13/88										0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0
4	14	57	2	3/13/88										0	0	16	0	0	0	0	0	2	0	18	0	0	0	0	0
4	15	55	3	3/10/88										6	6	0	0	0	0	0	0	2	0	14	0	0	0	0	0
4	16	55	1	3/10/88										0	0	0	0	0	0	0	0	8	0	8	0	0	0	0	0
4	17	55	2	3/10/88										0	18	0	0	0	0	0	0	2	0	20	0	0	0	0	0
4	18	55	3	3/10/88										6	0	0	0	0	0	0	0	2	0	8	0	0	0	0	0
4	19	55	1	3/10/88										0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
4	20	55	2	3/10/88										12	12	12	0	0	0	0	0	3	0	39	0	0	0	0	0
4	21	55	3	3/10/88										0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
5	1	61	1	3/20/88										0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
5	1	68	1	3/28/88										0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0
5	2	61	2	3/20/88										0	0	4	0	0	0	0	6	0	6	0	0	0	0	0	0
5	2	68	2	3/28/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	61	3	3/20/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	68	3	3/28/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	4	61	1	3/20/88										0	0	0	0	0	0	0	8	0	8	0	0	0	0	0	0
5	4	68	1	3/28/88										0	0	4	0	0	0	0	4	0	4	0	0	0	0	0	0
5	5	61	2	3/20/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	5	68	2	3/28/88										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	6	61	3	3/20/88										24	0	0	0	0	0	0	4	0	28	0	0	0	0	0	0
5	6	68	3	3/28/88										24	12	0	0	0	0	0	6	0	42	0	0	0	0	0	0
5	7	61	1	3/20/88										0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0
5	7	68	1	3/28/88										0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0
5	8	51	2	3/05/88										0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0

FUEL VEH	RUN RATE	DATE	SOAK RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	HE'S	STUM	SR	BKFR	STL	STL	START	RSIRT1	RSIRT2	RSIRT3	RUF	STL	RUF	STL	IDL*NEUT	IDL*DRV	WRH
5	8	68	2	3/28/88							12	0	16	0	0	0	0					1	0	29			
5	9	51	3	3/05/88							0	0	0	0	0	0	0					0	0	0			
5	9	68	3	3/28/88							0	0	0	0	0	0	0					1	0	1			
5	10	51	1	3/05/88							0	0	0	0	0	0	0					0	0	0			
5	10	68	1	3/28/88							0	0	0	0	0	0	0					0	0	0			
5	11	51	2	3/05/88							0	0	0	0	0	0	0					4	0	4			
5	11	68	2	3/28/88							12	0	20	0	0	0	0					2	0	34			
5	12	51	3	3/05/88							48	0	8	0	0	0	0					6	0	62			
5	12	68	3	3/28/88							48	0	0	48	0	0	0					8	0	104			
5	13	51	1	3/05/88							0	0	0	0	0	0	0					4	0	4			
5	13	68	1	3/28/88							0	0	0	0	0	0	0					2	0	2			
5	14	51	2	3/05/88							0	0	0	0	0	0	0					3	0	3			
5	14	68	2	3/28/88							0	0	0	0	0	0	0					2	0	2			
5	15	58	3	3/14/88							0	0	0	0	0	0	0					2	0	2			
5	15	68	3	3/28/88							0	0	0	0	0	0	0					4	0	4			
5	16	58	1	3/14/88							0	0	0	0	0	0	0					8	0	8			
5	16	68	1	3/28/88							0	0	0	0	0	0	0					8	0	8			
5	17	58	2	3/14/88							6	6	12	0	0	0	0					4	0	28			
5	17	68	2	3/28/88							0	0	8	0	0	0	0					4	0	12			
5	18	58	3	3/14/88							6	0	0	0	0	0	0					2	0	8			
5	18	68	3	3/28/88							0	0	0	0	0	0	0					0	0	0			
5	19	58	1	3/14/88							0	0	0	0	0	0	0					0	0	0			
5	19	68	1	3/28/88							0	0	0	0	0	0	0					2	0	2			
5	20	58	2	3/14/88							48	6	8	0	0	0	0					4	0	66			
5	20	68	2	3/28/88							48	12	8	0	0	0	0					2	0	70			
5	21	58	3	3/14/88							0	0	0	0	0	0	0					2	0	2			
5	21	68	3	3/28/88							0	0	0	0	0	0	0					2	0	2			
6	1	59	1	3/15/88							0	0	0	0	0	0	0					2	0	2			
6	1	63	1	3/22/88							0	0	0	0	0	0	0					1	0	1			
6	2	59	2	3/15/88							0	6	16	0	0	0	0					2	0	24			
6	2	63	2	3/22/88							0	0	4	0	0	0	0					2	0	6			
6	3	59	3	3/15/88							0	0	0	0	0	0	0					2	0	2			
6	3	63	3	3/22/88							0	0	0	0	0	0	0					0	0	0			
6	4	59	1	3/15/88							0	0	0	0	0	0	0					0	0	0			
6	4	63	1	3/22/88							0	0	0	0	0	0	0					8	0	8			
6	5	59	2	3/15/88							6	0	0	0	0	0	0					0	0	6			
6	5	63	2	3/22/88							0	0	0	0	0	0	0					0	0	0			
6	6	59	3	3/15/88							48	6	0	0	0	0	0					6	0	60			
6	6	63	3	3/22/88							0	24	0	0	0	0	0					8	0	32			
6	7	59	1	3/15/88							0	6	0	0	0	0	0					3	0	9			
6	7	63	1	3/22/88							0	0	0	0	0	0	0					2	0	2			
6	8	61	2	3/20/88							24	18	8	0	0	0	0					2	0	52			
6	8	63	2	3/22/88							0	12	20	0	0	0	0					2	0	34			
6	9	61	3	3/20/88							0	0	0	0	0	0	0					1	0	1			
6	9	63	3	3/22/88							0	0	0	0	0	0	0					0	0	0			
6	10	61	1	3/20/88							0	0	0	0	0	0	0					0	0	0			
6	10	63	1	3/22/88							0	0	0	0	0	0	0					0	0	0			
6	11	61	2	3/20/88							0	12	16	0	0	0	0					0	0	28			
6	11	63	2	3/22/88							6	0	8	0	0	0	0					0	0	14			
6	12	61	3	3/20/88							96	0	0	0	0	0	0					8	24	256			
6	12	63	3	3/22/88							72	0	4	0	0	0	0					8	0	116			

FUEL	VEH	RUN	RATE	DATE	SOAK	RUN	IN1	IN2	IN3	IN4	IN5	IN6	IN7	HES	STUM	SRG	BKFR	STL	STL	INIT	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	WMD
6	13	61	1	3/20/88										6	0	0	0	0	0	0					2	0	0	8
6	13	63	1	3/22/88										12	0	0	0	0	0	0					2	0	0	14
6	14	61	2	3/20/88										6	0	8	0	0	0	0					4	0	0	18
6	14	63	2	3/22/88										12	0	0	0	0	0	0					2	0	0	14
6	15	52	3	3/06/88										0	6	0	0	0	0	0					2	0	0	8
6	15	63	3	3/22/88										0	6	0	0	0	0	0					2	0	0	8
6	16	52	1	3/06/88										0	0	0	0	0	0	0					8	0	0	8
6	16	63	1	3/22/88										0	0	0	0	0	0	0					8	0	0	8
6	17	52	2	3/06/88										0	6	24	0	0	0	0					3	0	0	33
6	17	63	2	3/22/88										0	12	16	0	0	0	0					4	0	0	32
6	18	52	3	3/06/88										18	0	0	0	0	0	0					2	0	0	20
6	18	63	3	3/22/88										0	0	0	0	0	0	0					2	0	0	2
6	19	52	1	3/06/88										0	0	0	0	0	0	0					4	0	0	4
6	20	52	2	3/06/88										0	6	12	0	0	0	64					2	0	0	84
6	20	63	2	3/22/88										0	24	12	0	64	0	0					4	0	0	104
6	21	52	3	3/06/88										0	0	0	0	0	0	0					2	0	0	2
6	21	63	3	3/22/88										0	0	0	0	0	0	0					2	0	0	2
7	1	53	1	3/07/88										0	0	0	0	0	0	0					0	0	0	0
7	1	69	1	3/29/88										0	0	0	0	0	0	0					0	0	0	0
7	2	53	2	3/07/88										0	0	8	0	0	0	0					0	0	0	8
7	2	69	2	3/29/88										0	24	0	0	0	0	0					0	0	0	24
7	3	53	3	3/07/88										0	0	0	0	0	0	0					1	0	0	1
7	3	69	3	3/29/88										0	0	0	0	0	0	0					0	0	0	0
7	4	53	1	3/07/88										0	0	0	0	0	0	0					4	0	0	4
7	4	69	1	3/29/88										0	0	0	0	0	0	0					8	0	0	8
7	5	53	2	3/07/88										12	0	0	0	0	0	0					0	0	0	12
7	5	69	2	3/29/88										0	0	0	0	0	0	0					0	0	0	0
7	6	53	3	3/07/88										24	0	0	0	0	0	0					8	0	0	32
7	6	69	3	3/29/88										0	0	0	0	0	0	0					8	0	0	8
7	7	53	1	3/07/88										0	0	0	0	0	0	0					2	0	0	2
7	7	69	1	3/29/88										0	0	0	0	0	0	0					1	0	0	1
7	8	59	2	3/15/88										6	0	8	0	0	0	0					2	0	0	16
7	8	69	2	3/29/88										12	12	8	0	0	0	0					0	0	0	32
7	9	59	3	3/15/88										0	0	0	0	0	0	0					0	0	0	0
7	9	69	3	3/29/88										0	0	0	0	0	0	0					0	0	0	0
7	10	59	1	3/15/88										0	0	0	0	0	0	0					0	0	0	0
7	10	69	1	3/29/88										0	0	0	0	0	0	0					0	0	0	0
7	11	59	2	3/15/88										0	18	0	0	0	0	0					2	0	0	20
7	11	69	2	3/29/88										0	6	8	0	0	0	0					2	0	0	16
7	12	59	3	3/15/88										54	0	0	0	0	32	0					8	0	0	94
7	12	69	3	3/29/88										0	0	0	0	64	0	0					8	0	0	72
7	13	59	1	3/15/88										0	0	0	0	0	0	0					2	0	0	2
7	13	69	1	3/29/88										0	0	0	0	0	0	0					2	0	0	2
7	14	69	2	3/29/88										12	0	0	0	0	0	0					0	0	0	12
7	15	57	3	3/13/88										18	6	0	0	0	0	0					4	0	0	28
7	15	69	3	3/29/88										0	0	0	0	0	0	0					4	0	0	4
7	16	57	1	3/13/88										24	0	0	0	0	0	0					8	0	0	32
7	16	69	1	3/29/88										0	0	0	0	0	0	0					8	0	0	8
7	17	57	2	3/13/88										0	12	8	0	0	0	0					2	0	0	22
7	17	69	2	3/29/88										0	12	0	0	0	0	0					4	0	0	16
7	18	57	3	3/13/88										6	0	0	0	0	0	0					2	0	0	8

SUMMARY OF WARM DEMERITS BY CRITERIA - BRAINERD

TEMPERATURES										ACCL DCL INIT										IDL*NEUT										IDL*DRV									
FURL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	IR.S	STUM	SRG	BKPR	STL	STL	STRT	RSTRT1	RSTRT2	RSTRT3	RUP	STL	RUP	STL	TMD	WFM										
7	18	69	3	3/29/88											0	0	0	0	0	0									2	0	2								
7	19	57	1	3/13/88											0	0	0	0	0	0									2	0	2								
7	19	69	1	3/29/88											0	0	0	0	0	0									1	0	1								
7	20	57	2	3/13/88											24	0	12	0	0	0									0	0	36								
7	20	69	2	3/29/88											12	12	0	0	0	0									0	0	24								
7	21	57	3	3/13/88											0	0	0	0	0	0									2	0	2								
7	21	69	3	3/29/88											0	0	0	0	0	0									2	0	2								
8	1	56	1	3/11/88											0	0	0	0	0	0									1	0	1								
8	2	56	2	3/11/88											0	18	16	0	0	0									3	0	37								
8	3	56	3	3/11/88											0	0	0	0	0	0									0	0	0								
8	4	56	1	3/11/88											0	0	0	0	0	0									4	0	4								
8	5	56	2	3/11/88											0	6	4	0	0	0									0	0	10								
8	6	56	3	3/11/88											24	0	0	0	0	0									6	0	30								
8	7	56	1	3/11/88											0	0	0	0	0	0									3	0	3								
8	8	54	2	3/09/88											6	0	4	0	0	0									0	0	10								
8	9	54	3	3/09/88											0	6	0	0	0	0									0	0	6								
8	10	54	1	3/09/88											0	0	0	0	0	0									0	0	0								
8	11	54	2	3/09/88											0	6	8	0	0	0									0	0	14								
8	12	54	3	3/09/88											36	0	12	0	32	0									8	0	88								
8	13	54	1	3/09/88											0	0	0	0	0	0									2	0	2								
8	14	54	2	3/09/88											12	0	4	0	0	0									3	0	19								
8	15	61	3	3/20/88											12	6	4	0	0	0									3	0	25								
8	16	61	1	3/20/88											0	0	0	0	0	0									8	0	8								
8	17	61	2	3/20/88											6	0	8	0	0	0									2	0	16								
8	18	61	3	3/20/88											12	0	0	0	0	0									2	0	14								
8	19	61	1	3/20/88											0	0	0	0	0	0									2	0	2								
8	20	61	2	3/20/88											36	30	8	0	0	0									2	0	76								
8	21	61	3	3/20/88											0	0	0	0	0	0									2	0	2								
9	1	60	1	3/19/88											0	0	0	0	0	0									2	0	2								
9	1	67	1	3/26/88											0	0	0	0	0	0									1	0	1								
9	2	60	2	3/19/88											0	12	4	0	0	0									2	0	18								
9	2	67	2	3/26/88											0	0	0	0	0	0									0	0	0								
9	3	60	3	3/19/88											6	0	0	0	0	0									0	0	6								
9	3	67	3	3/26/88											0	0	0	0	0	0									2	0	2								
9	4	60	1	3/19/88											0	0	0	0	0	0									8	0	8								
9	4	67	1	3/26/88											0	0	0	0	0	0									8	0	8								
9	5	60	2	3/19/88											0	0	0	0	0	0									0	0	0								
9	5	67	2	3/26/88											0	0	0	0	0	0									0	0	0								
9	6	60	3	3/19/88											6	12	0	0	0	0									4	0	22								
9	6	67	3	3/26/88											12	6	0	0	0	0									8	0	26								
9	7	60	1	3/19/88											6	0	0	0	0	0									2	0	8								
9	7	67	1	3/26/88											0	0	0	0	0	0									1	0	1								
9	8	62	2	3/21/88											12	24	8	0	0	0									1	0	45								
9	8	67	2	3/26/88											12	0	0	0	0	0									0	0	12								
9	9	62	3	3/21/88											0	0	0	0	0	0									1	0	1								
9	9	67	3	3/26/88											0	0	0	0	0	0									0	0	0								
9	10	62	1	3/21/88											0	0	0	0	0	0									0	0	0								
9	10	67	1	3/26/88											0	0	0	0	0	0									0	0	0								
9	11	62	2	3/21/88											0	12	12	0	0	0									0	0	24								
9	11	67	2	3/26/88											12	0	0	0	0	0									0	0	12								

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SUMMARY OF WARM DEMERITS BY CRITERIA - BRAINERD

TEMPERATURES										ACLDCL INIT										IDL*NEUT										IDL*DRV									
FUEL	VEH	RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRC	BKFR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	RUF	STL	RUF	STL	TWD											
10	16	65	1	3/24/88										0	0	0	0	0	0	0					8	0	8	0	8										
10	17	60	2	3/19/88										0	0	8	0	0	0	0					4	0	12	0	12										
10	17	65	2	3/24/88										0	0	4	0	0	0	0					4	0	8	0	8										
10	18	60	3	3/19/88										0	0	0	0	0	0	0					0	0	0	0	0										
10	18	65	3	3/24/88										0	0	0	0	0	0	0					1	0	1	0	1										
10	19	60	1	3/19/88										0	0	0	0	0	0	0					0	0	0	0	0										
10	19	65	1	3/24/88										0	0	0	0	0	0	0					2	0	2	0	2										
10	20	60	2	3/19/88										18	0	20	0	0	0	0					3	0	41	0	41										
10	20	65	2	3/24/88										24	0	4	0	0	0	0					2	0	30	0	30										
10	21	60	3	3/19/88										0	0	4	0	0	0	0					0	0	4	0	4										
10	21	65	3	3/24/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	1	55	1	3/10/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	1	71	1	3/31/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	2	55	2	3/10/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	2	71	2	3/31/88										0	24	12	0	0	0	0					3	0	39	0	39										
11	3	55	3	3/10/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	3	71	3	3/31/88										6	0	0	0	0	0	0					0	0	0	0	0										
11	4	55	1	3/10/88										0	0	0	0	0	0	0					4	0	4	0	4										
11	4	71	1	3/31/88										0	0	0	0	0	0	0					8	0	8	0	8										
11	5	55	2	3/10/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	5	71	2	3/31/88										0	12	4	0	0	0	0					1	0	17	0	17										
11	6	55	3	3/10/88										48	0	0	12	0	0	0					8	0	68	0	68										
11	6	71	3	3/31/88										0	12	0	0	0	0	0					8	0	20	0	20										
11	7	55	1	3/10/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	7	71	1	3/31/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	8	53	2	3/07/88										6	6	16	0	0	0	0					0	0	28	0	28										
11	8	71	2	3/31/88										24	12	12	0	0	0	0					2	0	50	0	50										
11	9	53	3	3/07/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	9	71	3	3/31/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	10	53	1	3/07/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	10	71	1	3/31/88										0	0	0	0	0	0	0					0	0	0	0	0										
11	11	53	2	3/07/88										0	0	12	0	0	0	0					0	0	12	0	12										
11	11	71	2	3/31/88										12	18	12	0	0	0	0					4	0	46	0	46										
11	12	53	3	3/07/88										36	0	4	0	0	0	0					8	0	48	0	48										
11	12	71	3	3/31/88										36	0	16	48	32	0	0					8	0	140	0	140										
11	13	53	1	3/07/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	13	71	1	3/31/88										12	0	0	0	0	0	0					2	0	14	0	14										
11	14	53	2	3/07/88										0	18	0	0	0	0	0					2	0	20	0	20										
11	14	71	2	3/31/88										12	0	0	0	0	0	0					4	0	16	0	16										
11	15	62	3	3/21/88										6	0	0	0	0	0	0					4	0	10	0	10										
11	15	71	3	3/31/88										0	6	0	0	0	0	0					4	0	10	0	10										
11	16	62	1	3/21/88										0	0	0	0	0	0	0					8	0	8	0	8										
11	16	71	1	3/31/88										0	0	0	0	0	0	0					8	0	8	0	8										
11	17	62	2	3/21/88										0	18	4	0	0	0	0					4	0	26	0	26										
11	17	71	2	3/31/88										0	24	8	0	0	0	0					4	0	36	0	36										
11	18	62	3	3/21/88										0	0	4	0	0	0	0					3	0	7	0	7										
11	18	71	3	3/31/88										6	0	0	0	0	0	0					2	0	8	0	8										
11	19	62	1	3/21/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	19	71	1	3/31/88										0	0	0	0	0	0	0					2	0	2	0	2										
11	20	62	2	3/21/88										12	6	16	0	0	0	0					4	0	38	0	38										
11	20	71	2	3/31/88										18	12	8	0	0	0	0					2	0	40	0	40										

SUMMARY OF WARM DEMERITS BY CRITERIA - BRAINERD

FUEL VEH	RUN RATE	DATE	SOAK RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	HES	STUM	SRG	BKPR	STL	STL	START	RSTRT1	RSTRT2	RSTRT3	IDL*NEUT	IDL*NEUT	IDL*DRV	WRM
11	21	62	3	3/21/88							0	0	0	0	0	0	0				1	0	1	0
11	21	71	3	3/31/88							0	0	0	0	0	0	0				3	0	3	0
11	23	71	3	3/31/88							0	0	0	0	0	0	0				0	0	0	0
12	1	58	1	3/14/88							0	0	0	0	0	0	0				0	0	0	0
12	1	66	1	3/25/88							0	0	0	0	0	0	0				1	0	1	0
12	2	58	2	3/14/88							6	0	16	0	0	0	0				0	0	22	0
12	2	66	2	3/25/88							0	42	4	0	0	0	0				2	0	48	0
12	3	58	3	3/14/88							0	0	0	0	0	0	0				1	0	1	0
12	3	66	3	3/25/88							0	0	0	0	0	0	0				0	0	0	0
12	4	58	1	3/14/88							0	0	0	0	0	0	0				8	0	8	0
12	4	66	1	3/25/88							0	0	0	0	0	0	0				2	0	2	0
12	5	58	2	3/14/88							0	0	0	0	0	0	0				0	0	0	0
12	5	66	2	3/25/88							0	0	0	0	0	0	0				0	0	0	0
12	6	58	3	3/14/88							36	0	0	0	0	0	0				8	0	44	0
12	6	66	3	3/25/88							12	0	0	0	0	0	0				8	0	20	0
12	7	58	1	3/14/88							0	0	0	0	0	0	0				2	0	2	0
12	7	66	1	3/25/88							0	0	0	0	0	0	0				2	0	2	0
12	8	60	2	3/19/88							12	12	8	0	0	0	0				0	0	32	0
12	8	66	2	3/25/88							12	0	8	0	0	0	0				0	0	20	0
12	9	60	3	3/19/88							0	0	0	0	0	0	0				0	0	0	0
12	9	66	3	3/25/88							0	0	0	0	0	0	0				0	0	0	0
12	10	60	1	3/19/88							0	0	0	0	0	0	0				0	0	0	0
12	10	66	1	3/25/88							0	0	0	0	0	0	0				0	0	0	0
12	11	60	2	3/19/88							12	0	16	0	0	0	0				0	0	0	0
12	11	66	2	3/25/88							12	12	0	0	0	0	0				1	0	29	0
12	12	60	3	3/19/88							12	0	16	0	0	0	32				0	0	24	0
12	12	66	3	3/25/88							84	0	0	0	0	0	0				4	16	176	0
12	13	60	1	3/19/88							6	0	0	0	0	0	0				8	0	92	0
12	13	66	1	3/25/88							0	0	0	0	0	0	0				1	0	7	0
12	14	60	2	3/19/88							0	0	0	0	0	0	0				2	0	2	0
12	14	66	2	3/25/88							12	6	4	0	0	0	0				4	0	26	0
12	15	54	3	3/09/88							12	12	0	0	0	0	0				2	0	26	0
12	15	66	3	3/25/88							0	6	0	0	0	0	0				2	0	8	0
12	16	54	1	3/09/88							0	0	0	0	0	0	0				1	0	1	0
12	16	66	1	3/25/88							0	0	0	0	0	0	0				8	0	8	0
12	17	54	2	3/09/88							0	0	0	0	0	0	0				1	0	21	0
12	17	66	2	3/25/88							0	0	20	0	0	0	0				4	0	24	0
12	18	54	3	3/09/88							18	0	0	0	0	0	0				3	0	21	0
12	18	66	3	3/25/88							0	0	0	0	0	0	0				1	0	1	0
12	19	54	1	3/09/88							0	0	0	0	0	0	0				2	0	2	0
12	19	66	1	3/25/88							0	0	0	0	0	0	0				1	0	1	0
12	20	54	2	3/09/88							0	48	12	0	64	0	0				2	0	126	0
12	20	66	2	3/25/88							6	42	4	0	64	0	0				0	0	116	0
12	21	54	3	3/09/88							0	0	0	0	0	0	0				2	0	2	0
12	21	66	3	3/25/88							0	0	0	0	0	0	0				2	0	2	0

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATER		DATE	SOAK RUN							TEMPERATURES							DRIVING CYCLE							TOTAL			
			TK1	TK2	TK3	TK4	TK5	TK6	TK7	0	1	2	3	4	5	6	0->3	4->6									
1	1	1	1/12/88	16	26	21	24	27	29	32	35	37	4	34	31	6	0	1	75	1	76						
1	1	22	1/2/06/88	4	29	17	20	23	26	30	32	35	8	28	26	1	1	1	63	3	66						
1	2	1	2/12/88	16	29	19	21	22	25	27	31	36	0	24	20	26	10	10	70	30	100						
1	2	22	2/2/06/88	4	29	22	23	26	29	32	36	40	0	13	1	1	4	4	6	15	14						
1	3	1	3/12/88	16	29	19	0	0	0	22	24	26	2	7	7	1	1	1	17	3	20						
1	3	22	3/2/06/88	4	29	0	23	24	26	28	29	32	3	7	7	1	1	1	18	3	21						
1	4	1	1/12/88	16	32	22	22	23	24	24	24	24	5	46	79	67	67	24	6	197							
1	4	22	1/2/06/88	4	29	0	0	0	0	0	0	0	8	42	48	28	52	14	2	126							
1	5	1	2/12/88	16	29	20	21	21	21	22	23	25	0	6	7	5	10	10	4	18	24						
1	5	22	2/1/06/88	4	18	24	24	26	27	29	31	33	4	1	0	10	6	4	4	15	14						
1	6	1	3/12/88	16	29	21	21	22	23	25	27	29	24	84	72	58	38	14	14	238	66						
1	6	22	3/2/06/88	4	32	0	0	0	0	0	0	0	14	56	96	50	58	2	8	216	284						
1	7	1	1/12/88	16	29	0	0	0	0	0	0	0	14	32	18	18	20	13	7	82	40						
1	7	22	1/2/06/88	4	32	25	26	27	28	29	30	32	1	1	0	0	0	0	2	5	6						
1	8	5	2/16/88	30	23	23	23	24	24	25	25	26	19	58	35	43	23	11	5	155	39						
1	8	22	2/2/06/88	4	32	28	30	31	32	34	35	36	6	38	42	22	4	11	0	108	15						
1	9	5	3/16/88	30	23	24	24	23	23	24	24	26	2	7	1	1	2	1	1	11	4						
1	9	22	3/2/06/88	4	35	0	0	0	0	0	0	0	2	1	1	1	2	2	2	5	6						
1	10	5	1/16/88	30	23	26	27	27	28	29	30	32	1	1	0	0	0	0	2	0	2						
1	10	22	1/2/06/88	4	32	26	27	28	30	32	34	37	6	2	0	0	0	0	0	8	0						
1	11	5	2/16/88	30	23	24	23	23	24	25	26	27	2	13	14	17	17	23	27	46	67						
1	11	22	2/2/06/88	4	35	31	32	33	34	36	37	39	4	29	20	22	16	16	73	54	127						
1	12	5	3/16/88	30	23	22	22	23	25	26	30	31	6	28	36	26	42	70	28	96	140						
1	12	22	3/2/06/88	4	35	0	0	0	0	0	0	0	8	28	4	26	34	32	14	66	80						
1	13	5	1/16/88	30	23	26	26	26	27	28	30	31	6	22	2	7	8	1	2	37	11						
1	13	22	1/2/06/88	4	35	29	30	32	33	35	36	38	8	4	4	4	2	2	2	20	6						
1	14	5	2/16/88	30	24	25	25	26	27	30	31	34	3	7	5	14	4	4	10	29	18						
1	14	22	2/2/06/88	4	35	31	32	35	37	39	41	43	2	7	5	17	5	7	9	31	21						
1	15	6	3/18/88	15	18	18	18	18	18	18	19	21	38	14	2	2	2	1	2	56	5						
1	15	22	3/2/06/88	4	21	14	0	0	0	0	0	0	12	14	2	2	2	2	2	36	6						
1	16	6	1/18/88	15	18	20	20	20	20	21	21	22	46	76	64	52	46	4	4	238	54						
1	16	22	1/2/06/88	4	21	11	12	13	14	15	16	17	54	108	54	22	4	4	4	238	12						
1	17	6	2/18/88	15	18	16	17	18	20	24	24	26	0	51	28	28	13	16	12	107	41						
1	17	22	2/2/06/88	4	21	18	20	21	23	25	27	29	0	24	11	13	6	2	6	48	14						
1	18	6	3/18/88	15	17	18	18	19	21	24	25	29	3	2	2	2	2	2	2	6	27						
1	18	22	3/2/06/88	4	25	0	0	0	0	0	0	0	3	2	2	14	2	1	1	21	4						
1	19	6	1/18/88	15	17	21	20	21	21	23	24	26	14	26	10	4	10	14	2	54	26						
1	19	22	1/2/06/88	4	25	16	17	18	20	21	23	25	8	4	2	2	2	2	2	16	6						
1	20	6	2/18/88	15	17	16	19	22	32	29	44	37	61	80	102	64	42	19	34	307	95						
1	20	22	2/2/06/88	4	25	28	32	34	48	58	53	64	13	108	48	17	19	13	5	186	37						
1	21	6	3/18/88	15	17	16	17	19	20	23	23	27	4	8	14	8	2	2	2	34	6						
1	21	22	3/2/06/88	4	29	0	0	0	0	0	0	0	4	14	8	2	2	2	2	28	6						
2	1	7	1/20/88	2	18	12	14	17	18	21	23	25	11	28	58	38	20	2	2	135	24						
2	1	17	1/2/01/88	10	11	8	10	12	14	17	19	22	16	13	13	1	6	0	0	43	6						
2	2	7	2/20/88	2	19	15	16	19	20	23	26	28	0	1	21	15	27	13	21	37	61						
2	2	17	2/2/01/88	10	14	13	15	17	19	22	25	29	4	37	11	11	17	17	5	63	39						
2	3	7	3/20/88	2	20	17	17	18	19	20	21	23	10	4	68	7	13	1	1	89	15						
2	3	17	3/2/01/88	10	11	8	9	10	12	14	15	15	12	13	1	25	1	1	1	51	3						
2	4	7	1/20/88	2	20	16	16	17	17	17	18	19	8	34	82	106	98	32	38	230	168						
2	4	17	1/2/01/88	10	11	0	0	0	0	0	0	0	11	68	92	84	60	50	14	255	124						

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATE			DATE	SOAK RUN										TEMPERATURES										DRIVING CYCLE										TOTAL
				2	5	7	2	1/20/88	2	20	16	17	18	18	19	21	22	18	26	27	19	12	16	19	90	0->3	4->6							
2	5	7	2	1/20/88	2	20	16	17	18	18	19	21	22	18	26	27	19	12	16	19	90	47	137											
2	5	17	2	2/01/88	10	11	13	14	14	15	15	16	18	13	15	19	15	12	9	10	62	31	93											
2	6	7	3	1/20/88	2	18	11	26	30	24	0	22	31	25	92	74	92	52	12	74	283	138	421											
2	6	17	3	2/01/88	10	11	10	10	11	12	13	15	16	22	124	116	82	58	40	34	344	132	476											
2	7	7	1	1/20/88	2	23	15	16	17	20	24	26	29	24	52	76	116	156	128	120	268	404	672											
2	7	17	1	2/01/88	10	14	9	9	11	13	17	21	23	27	84	34	4	4	10	4	149	18	167											
2	8	2	2	1/13/88	7	14	10	12	13	14	16	17	19	21	86	64	52	36	33	37	223	106	329											
2	9	2	3	1/13/88	7	16	15	0	0	0	0	0	0	3	13	7	1	1	1	1	24	3	27											
2	9	17	3	2/01/88	10	14	11	11	12	13	14	16	18	2	13	7	1	1	1	1	23	3	26											
2	10	2	1	1/13/88	7	14	8	10	11	12	13	14	16	18	0	4	0	0	0	0	4	0	4											
2	10	17	1	2/01/88	10	14	9	10	11	12	13	15	16	4	2	1	0	0	0	0	7	0	7											
2	11	2	2	1/13/88	7	20	14	14	15	15	16	18	19	2	5	22	28	10	14	20	57	44	101											
2	11	17	2	2/01/88	10	14	14	14	15	16	17	19	20	8	36	49	29	40	33	25	122	98	220											
2	12	2	3	1/13/88	7	16	16	17	18	21	22	25	28	1	36	36	34	52	70	40	107	162	269											
2	12	17	3	2/01/88	10	14	13	13	15	15	17	20	22	11	36	28	34	58	58	58	109	174	283											
2	13	2	1	1/13/88	7	16	12	13	13	15	17	19	21	4	48	27	13	7	1	1	92	9	101											
2	13	17	1	2/01/88	10	14	11	12	13	14	17	18	20	8	58	16	4	2	2	1	86	5	91											
2	14	2	2	1/13/88	7	24	15	16	17	19	22	24	27	6	30	12	1	13	16	4	49	33	82											
2	14	17	2	2/01/88	10	14	14	14	16	18	21	23	26	5	45	11	27	5	15	9	88	29	117											
2	15	9	3	1/22/88	7	29	28	28	29	29	30	31	24	26	2	2	2	2	2	2	54	6	60											
2	15	17	3	2/01/88	10	14	12	12	13	13	14	16	18	29	26	2	2	8	2	2	59	12	71											
2	16	9	1	1/22/88	7	29	24	25	26	26	26	27	28	42	116	74	76	32	14	4	308	50	358											
2	16	17	1	2/01/88	10	14	12	12	12	13	13	14	15	67	92	84	36	52	52	22	279	126	405											
2	17	9	2	1/22/88	7	31	24	25	27	28	30	32	33	0	11	5	6	6	6	6	22	18	40											
2	17	17	2	2/01/88	10	14	15	16	17	19	20	23	24	2	12	8	6	10	10	2	28	22	50											
2	18	9	3	1/22/88	7	31	27	28	30	31	32	34	36	3	2	8	2	2	1	7	15	10	25											
2	18	17	3	2/01/88	10	15	0	15	17	18	19	22	24	3	2	14	2	1	1	21	4	25	4	25										
2	19	9	1	1/22/88	7	31	26	26	27	28	29	31	31	8	18	10	2	2	2	38	6	44	39											
2	19	17	1	2/01/88	10	15	13	13	14	15	16	19	20	19	4	4	4	4	2	2	31	8	39											
2	20	9	2	1/22/88	7	31	24	25	28	30	33	32	39	54	90	50	28	22	8	21	222	51	273											
2	20	17	2	2/01/88	10	15	15	16	19	25	32	34	39	35	104	66	84	50	28	47	289	125	414											
2	21	9	3	1/22/88	7	31	26	28	30	30	32	33	35	12	8	26	2	2	2	48	6	54												
2	21	17	3	2/01/88	10	15	0	0	0	0	0	24	25	20	26	56	2	2	2	104	6	110												
3	1	12	1	1/26/88	11	16	15	17	20	23	25	29	31	22	50	62	7	13	1	1	141	15	156											
3	1	19	1	2/03/88	16	23	20	21	24	26	29	31	33	16	28	32	8	1	1	2	84	4	88											
3	2	12	2	1/26/88	11	18	18	21	23	24	27	30	34	1	51	20	20	8	26	4	92	38	130											
3	2	19	2	2/03/88	16	23	22	24	27	30	32	34	38	0	30	16	20	13	13	13	66	39	105											
3	3	12	3	1/26/88	11	18	17	18	18	19	20	22	24	3	25	37	13	1	1	1	78	3	81											
3	3	19	3	2/03/88	16	23	21	21	21	22	24	25	27	11	25	7	31	1	1	1	74	3	77											
3	4	12	1	1/26/88	11	18	16	16	16	17	17	18	19	9	68	60	108	84	32	14	245	130	375											
3	4	19	1	2/03/88	16	25	0	0	0	0	0	0	0	11	60	92	60	88	38	14	223	140	363											
3	5	12	2	1/26/88	11	18	20	21	21	22	23	25	27	10	24	24	17	9	13	5	75	27	102											
3	5	19	2	2/03/88	16	25	23	25	25	26	27	28	29	29	21	12	9	5	5	5	71	15	86											
3	6	12	3	1/26/88	11	18	17	18	19	20	21	23	24	25	116	92	82	64	38	38	315	140	455											
3	6	19	3	2/03/88	16	25	22	23	24	25	27	29	30	21	104	92	90	70	58	58	307	186	493											
3	7	12	1	1/26/88	11	18	17	17	18	20	23	25	28	20	64	58	20	10	4	2	162	16	178											
3	7	19	1	2/03/88	16	25	21	22	24	26	29	32	34	24	52	52	16	14	10	2	144	26	170											
3	8	8	2	1/21/88	6	18	16	16	17	17	18	20	21	69	47	39	51	47	20	8	206	75	281											
3	8	19	2	2/03/88	16	25	27	29	30	31	32	33	34	36	93	87	53	39	16	18	269	73	342											
3	9	8	3	1/21/88	6	18	18	18	19	19	20	21	22	3	25	25	7	1	1	1	60	3	63											

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH			RUN	RATER	DATE	SOAK RUN										TEMPERATURES										DRIVING CYCLE										TOTAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
						3	9	19	3	2/03/88	16	26	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	0	0	0	0	0	0	0	0	0	0	0	

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL	VEH	RUN	RATER	DATE	TEMPERATURES							DRIVING CYCLE							TOTAL				
					SOAK	RUN	IN1	IN2	IN3	IN4	IN5	IN6	IN7	0	1	2	3	4		5	6	0->3	4->6
3	23	3	3	1/14/88	19	40	30	32	33	34	36	38	40	2	2	2	1	1	1	1	7	3	10
3	23	4	2	1/15/88	32	42	38	40	41	42	43	45	46	0	0	0	0	0	0	0	0	0	0
3	23	5	1	1/16/88	30	24	27	28	28	30	31	33	34	1	2	8	6	0	0	0	17	0	17
3	23	6	3	1/18/88	15	19	18	19	20	21	22	23	25	4	2	2	2	2	2	2	10	6	16
3	23	7	2	1/20/88	2	29	22	23	25	26	27	29	31	0	20	18	11	16	6	16	49	38	87
3	23	8	1	1/21/88	6	22	19	21	21	22	22	23	24	3	1	2	2	1	0	1	8	2	10
3	23	9	3	1/22/88	7	32	26	27	27	28	28	29	30	3	2	4	4	2	2	2	13	6	19
3	23	10	2	1/23/88	30	36	36	36	37	37	37	38	39	0	12	14	14	16	6	10	40	32	72
3	23	11	1	1/24/88	2	30	19	20	20	21	22	23	25	4	2	2	8	0	0	0	16	0	16
3	23	12	3	1/26/88	11	11	14	14	14	15	15	16	16	4	2	2	2	2	2	2	10	6	16
3	23	13	2	1/27/88	20	40	32	33	33	34	35	36	37	3	8	5	14	8	10	0	30	18	48
3	23	14	1	1/28/88	29	40	35	36	36	37	37	38	39	4	7	14	0	0	0	0	25	0	25
3	23	15	3	1/29/88	37	42	38	39	39	39	40	41	41	2	2	2	2	2	2	2	8	6	14
3	23	16	2	1/30/88	30	38	31	33	33	34	34	36	37	0	1	12	12	10	4	0	25	14	39
3	23	17	1	2/01/88	10	15	11	12	13	13	14	15	16	8	2	10	6	0	0	0	26	0	26
3	23	18	3	2/02/88	10	19	17	18	19	19	20	21	23	3	2	2	2	2	2	2	9	6	15
3	23	19	2	2/03/88	16	26	24	25	26	26	27	28	29	0	6	10	15	10	10	4	31	24	55
3	23	20	1	2/04/88	15	22	19	20	20	21	22	23	24	4	28	16	4	6	0	0	52	6	58
3	23	21	3	2/05/88	8	9	0	0	0	0	0	0	0	4	2	2	2	2	2	2	10	6	16
3	23	22	2	2/06/88	4	31	27	29	30	31	32	35	36	2	1	6	11	8	4	4	20	16	36
3	23	23	2	2/08/88	22	37	29	31	32	33	33	35	36	0	0	10	10	10	4	10	20	24	44
3	23	24	3	2/09/88	19	38	0	0	0	0	0	0	0	3	2	2	2	2	2	2	9	6	15
3	24	1	3	1/12/88	16	33	26	28	29	31	33	35	38	11	26	26	2	2	1	1	65	4	69
3	24	2	2	1/13/88	7	33	22	25	26	28	29	31	33	10	32	38	15	5	12	10	95	27	122
3	24	3	1	1/14/88	19	40	31	33	33	34	36	38	39	3	26	32	8	5	7	1	69	13	82
3	24	4	3	1/15/88	32	42	42	40	41	41	43	44	45	4	26	38	14	2	2	2	82	6	88
3	24	5	2	1/16/88	30	25	25	26	27	27	28	27	27	12	34	41	17	15	1	1	104	17	121
3	24	6	1	1/18/88	15	17	20	20	22	22	23	24	26	38	38	50	8	2	2	2	134	6	140
3	24	7	3	1/19/88	2	28	23	23	24	26	27	29	30	19	26	62	14	14	2	2	121	18	139
3	24	8	2	1/21/88	6	22	19	21	22	23	24	25	27	39	41	23	5	1	7	130	13	143	
3	24	9	1	1/22/88	7	32	26	26	26	27	27	28	28	25	42	46	8	2	2	2	121	6	127
3	24	10	3	1/23/88	30	36	37	37	38	38	38	39	39	3	26	32	2	14	2	2	63	18	81
3	24	11	2	1/25/88	2	32	24	25	25	26	27	28	30	20	80	74	54	17	13	15	228	45	273
3	24	12	1	1/26/88	11	11	14	14	14	15	15	16	16	46	74	82	38	44	14	8	240	66	306
3	24	13	3	1/26/88	20	37	32	33	34	34	35	36	36	4	34	38	2	2	8	2	78	12	90
3	24	14	2	1/28/88	29	40	36	37	37	37	38	39	39	4	26	37	17	5	5	7	84	17	101
3	24	15	1	1/29/88	37	42	38	39	39	40	40	41	42	8	68	76	4	4	4	4	156	12	168
3	24	16	3	1/30/88	30	38	0	0	0	0	0	0	0	4	46	14	2	8	2	2	66	12	78
3	24	17	2	2/01/88	10	15	14	15	15	16	17	18	19	12	74	52	15	10	10	10	153	30	183
3	24	18	1	2/02/88	10	19	15	16	17	18	18	20	22	46	68	88	52	4	16	2	254	22	276
3	24	19	3	2/03/88	16	25	25	26	26	27	26	27	28	4	82	62	14	2	2	2	162	6	168
3	24	20	2	2/04/88	15	22	20	22	22	23	24	25	26	4	58	29	1	5	11	7	92	23	115
3	24	21	1	2/05/88	8	9	0	0	0	0	0	0	0	35	68	72	46	2	2	2	221	6	227
3	24	22	3	2/06/88	4	31	0	0	0	0	0	0	0	0	58	32	2	2	2	2	92	6	98
3	24	23	1	2/08/88	22	37	0	32	34	34	35	36	37	17	36	40	10	2	2	2	103	6	109
3	24	24	1	2/09/88	19	38	31	33	34	34	35	36	37	16	60	28	4	4	4	4	108	12	120
4	1	4	1	1/15/88	32	40	37	38	40	43	45	48	50	3	26	44	7	0	0	0	80	0	80
4	1	23	1	2/08/88	22	31	0	0	0	0	0	0	0	8	40	22	2	8	2	1	72	11	83
4	2	4	2	1/15/88	12	42	37	39	40	43	45	49	52	0	0	0	0	0	0	0	0	0	0
4	2	23	2	2/08/88	22	31	27	29	32	33	35	38	41	1	0	20	19	16	8	6	40	30	70

SUMMARY OF COLD DEFICITS BY DRIVING CYCLE - DENVER

FUEL	VEH	RUN	RATE	DATE	TEMPERATURES							DRIVING CYCLE							TOTAL					
					SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	0	1	2	3	4		5	6	0->3	4->6	
4	3	4	3	1/15/88	32	42	37	38	38	39	40	42	43	3	13	1	7	1	1	1	1	24	3	27
4	3	23	3	2/08/88	22	31	28	29	29	30	31	33	34	2	13	7	1	1	1	1	1	23	3	26
4	4	4	1	1/15/88	32	42	37	35	37	38	38	39	39	13	60	76	70	56	19	1	219	76	295	
4	4	23	1	2/08/88	22	31	0	0	0	0	0	0	0	10	60	84	64	52	14	2	218	68	286	
4	5	4	2	1/15/88	32	42	37	38	39	40	41	42	43	2	0	4	4	4	4	4	10	12	22	
4	5	23	2	2/08/88	22	31	27	28	29	30	31	32	34	13	9	9	10	15	12	4	41	31	72	
4	6	4	3	1/15/88	32	42	37	39	39	40	41	41	42	24	116	72	78	40	32	14	290	86	376	
4	6	23	3	2/08/88	22	31	28	30	30	31	32	34	35	29	94	116	64	58	20	26	303	104	407	
4	7	4	1	1/15/88	32	42	39	39	40	41	43	44	46	16	40	34	16	10	4	2	106	16	122	
4	7	23	1	2/08/88	22	31	0	0	0	0	0	0	0	22	52	4	4	4	4	2	82	10	92	
4	8	7	2	1/20/88	2	23	26	27	27	28	28	29	29	57	68	28	15	27	22	21	168	70	238	
4	8	23	2	2/08/88	22	29	25	25	26	26	27	27	28	25	63	51	37	28	20	4	176	52	228	
4	9	7	3	1/20/88	2	23	27	26	26	26	27	27	28	2	1	1	1	1	1	1	5	3	8	
4	9	23	3	2/08/88	22	29	28	28	28	29	30	31	32	2	7	1	1	2	1	2	11	5	16	
4	10	7	1	1/20/88	2	23	17	17	18	19	19	20	22	3	1	1	0	0	0	0	5	0	5	
4	10	23	1	2/08/88	22	29	0	0	0	0	0	0	0	6	2	1	0	0	0	0	9	0	9	
4	11	7	2	1/20/88	2	23	26	26	26	26	27	28	29	2	24	29	48	28	14	21	103	63	166	
4	11	23	2	2/08/88	22	30	26	26	27	27	28	30	31	4	10	20	32	16	22	25	66	63	129	
4	12	7	3	1/20/88	2	23	22	22	23	23	24	25	27	9	10	4	26	34	70	52	49	156	205	
4	12	23	3	2/08/88	22	31	29	29	30	31	32	34	35	9	4	4	36	34	40	40	53	114	167	
4	13	7	1	1/20/88	2	24	17	17	18	20	22	23	24	6	28	16	6	1	1	1	56	3	59	
4	13	23	1	2/08/88	22	31	0	0	0	0	0	0	0	8	28	4	4	10	4	4	44	18	62	
4	14	7	2	1/20/88	2	24	19	20	22	24	26	29	31	2	20	11	14	20	24	16	47	60	107	
4	14	23	2	2/08/88	22	37	27	27	28	30	32	34	36	3	7	9	10	8	1	9	29	18	47	
4	15	5	3	1/16/88	30	23	24	24	24	24	25	26	26	32	38	8	7	7	1	8	85	16	101	
4	15	23	3	2/08/88	22	31	29	30	31	32	33	34	35	20	8	2	8	2	8	2	38	12	50	
4	16	5	1	1/16/88	30	23	27	26	26	26	27	27	28	53	116	92	88	82	22	16	349	120	469	
4	16	23	1	2/08/88	22	37	30	30	31	31	32	32	34	40	36	52	28	28	4	4	156	36	192	
4	17	5	2	1/16/88	30	24	23	24	25	28	28	30	31	4	18	18	22	16	16	18	62	50	112	
4	17	23	2	2/08/88	22	37	29	30	33	33	35	37	38	2	11	22	6	6	10	18	41	34	75	
4	18	5	3	1/16/88	30	24	23	24	26	28	30	33	35	2	2	2	14	1	7	1	20	9	29	
4	18	23	3	2/08/88	22	37	30	33	34	35	36	39	41	2	2	2	8	2	2	1	14	5	19	
4	19	5	1	1/16/88	30	24	26	26	26	27	28	30	31	6	32	38	8	1	1	1	84	3	87	
4	19	23	1	2/08/88	22	37	31	0	0	34	34	36	38	19	4	4	4	4	4	4	31	12	43	
4	20	5	2	1/16/88	30	25	24	25	31	33	47	45	58	30	64	90	70	47	19	27	254	93	347	
4	20	23	2	2/08/88	22	37	35	39	42	51	62	6	70	49	58	46	18	30	16	12	171	58	229	
4	21	5	3	1/16/88	30	24	24	26	28	30	31	34	34	4	14	12	2	2	2	2	52	6	58	
4	21	23	3	2/08/88	22	37	32	34	36	37	39	42	43	4	14	8	2	2	2	2	28	6	34	
5	1	11	1	1/25/88	2	20	9	12	15	18	20	23	26	14	40	37	24	0	6	0	115	6	121	
5	1	18	1	2/02/88	10	16	13	15	17	19	21	24	26	16	26	26	8	1	1	1	76	3	79	
5	2	11	2	1/25/88	2	20	14	16	19	21	24	27	29	12	34	10	7	21	9	16	63	46	109	
5	2	18	2	2/02/88	10	16	13	14	17	19	22	25	28	8	41	17	22	26	13	13	88	52	140	
5	3	11	3	1/25/88	2	20	10	11	13	14	15	17	19	12	13	13	49	7	1	1	87	9	96	
5	3	18	3	2/02/88	10	16	17	17	18	18	19	21	22	18	13	19	37	1	1	1	87	3	90	
5	4	11	1	1/25/88	2	21	10	11	11	12	13	14	15	11	72	96	84	86	62	26	263	174	437	
5	4	18	1	2/02/88	10	16	0	0	0	0	0	0	0	10	68	72	72	84	62	20	222	166	388	
5	5	11	2	1/25/88	2	21	15	16	17	18	19	21	22	13	19	18	18	16	13	15	68	44	112	
5	5	18	2	2/02/88	10	16	14	14	15	16	16	18	19	10	8	10	1	4	6	0	29	10	39	
5	6	11	3	1/25/88	2	21	12	14	15	16	18	19	21	25	136	132	96	72	66	46	389	184	573	
5	6	18	3	2/02/88	10	16	18	19	20	20	21	23	25	21	116	132	74	78	46	46	343	170	513	

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH		RUN RATE	DATE	TEMPERATURES										DRIVING CYCLE										TOTAL			
			SOAK	RUN	TK1	TK2	TK3	TK4	TK5	TK6	TK7	0	1	2	3	4	5	6	0->3	4->6	TOTAL						
5	7	11	1	1/25/88	2	22	13	14	16	0	0	22	74	44	14	40	14	8	154	62	216						
5	7	18	1	2/02/88	10	19	14	15	16	18	21	23	26	26	88	58	28	10	4	200	42	242					
5	8	1	2	1/12/88	16	28	24	25	25	26	27	29	30	21	124	114	56	42	40	18	315	100	415				
5	8	18	2	2/02/88	10	16	15	16	16	17	19	19	21	12	125	50	54	48	23	17	241	88	329				
5	9	1	3	1/12/88	16	26	24	25	25	26	27	28	30	2	7	1	1	1	1	11	3	14					
5	9	18	3	2/02/88	10	19	19	19	20	21	22	23	25	2	8	7	1	2	2	2	18	6	24				
5	10	1	1	1/12/88	16	29	26	28	29	30	31	33	36	0	0	0	0	0	0	0	0	0					
5	10	18	1	2/02/88	10	19	15	16	17	18	19	22	23	6	2	1	0	0	0	0	9	0					
5	11	1	2	1/12/88	16	28	27	28	29	29	31	33	35	3	32	13	7	12	8	24	55	44	99				
5	11	18	2	2/02/88	10	19	16	17	19	20	22	24	26	6	17	17	22	8	10	5	62	21	85				
5	12	1	3	1/12/88	16	29	28	29	30	33	36	39	43	8	28	36	36	72	48	108	168	276					
5	12	18	3	2/02/88	10	19	19	20	22	24	26	28	31	8	36	36	34	40	58	40	114	138	252				
5	13	1	1	1/12/88	16	28	0	0	0	0	0	0	0	6	74	12	8	26	7	1	100	34	134				
5	13	18	1	2/02/88	10	19	16	17	18	19	22	23	25	16	76	52	4	4	16	2	148	22	170				
5	14	1	2	1/12/88	16	28	25	26	27	30	32	36	39	0	0	2	18	14	8	55	20	77	97				
5	14	18	2	2/02/88	10	19	17	17	19	21	24	27	31	6	17	12	9	37	6	44	49	93					
5	15	8	3	1/21/88	6	20	19	19	20	20	21	22	22	48	26	2	2	2	8	78	12	90					
5	15	18	3	2/02/88	10	14	17	16	17	17	18	19	20	28	38	2	2	2	2	70	6	76					
5	16	8	1	1/21/88	6	21	20	20	21	21	22	23	25	57	116	96	80	40	4	349	48	397					
5	16	18	1	2/02/88	10	14	11	12	12	12	13	14	15	54	116	84	36	68	60	28	290	156	446				
5	17	8	2	1/21/88	6	22	20	20	21	22	23	24	25	0	7	21	19	15	15	21	47	51	98				
5	17	18	2	2/02/88	10	14	12	12	16	16	17	19	21	2	11	22	20	16	12	6	55	34	89				
5	18	8	3	1/21/88	6	22	20	22	22	23	25	26	28	3	14	2	2	1	1	1	21	3	24				
5	18	18	3	2/02/88	10	16	17	17	19	20	22	23	25	3	2	2	2	20	1	1	9	22	31				
5	19	8	1	1/21/88	6	22	20	21	21	22	23	24	25	6	20	4	8	2	2	2	38	6	44				
5	19	18	1	2/02/88	10	16	0	0	0	0	0	0	0	24	26	22	4	4	2	4	76	10	86				
5	20	8	2	1/21/88	6	22	22	27	34	33	31	46	40	50	138	44	90	70	73	29	322	172	494				
5	20	18	2	2/02/88	10	16	12	15	17	28	36	39	51	45	108	108	60	62	24	41	321	127	448				
5	21	8	3	1/21/88	6	22	23	24	24	26	28	29	30	20	26	26	2	2	2	2	74	6	80				
5	21	18	3	2/02/88	10	16	16	17	19	20	22	25	27	28	66	26	8	2	2	128	6	134					
6	1	9	1	1/22/88	7	19	25	27	30	32	34	36	39	16	52	52	8	2	2	1	128	5	133				
6	1	15	1	1/29/88	37	39	37	38	41	43	45	47	49	16	64	32	12	0	0	1	124	1	125				
6	2	9	2	1/22/88	7	31	26	29	31	32	34	36	39	5	4	4	0	7	11	4	13	22	35				
6	2	15	2	1/29/88	37	39	37	39	41	43	45	47	50	3	11	9	5	7	7	10	28	24	52				
6	3	9	3	1/22/88	7	37	29	29	30	30	31	32	33	10	25	43	37	7	1	1	115	9	124				
6	3	15	3	1/29/88	37	39	0	0	0	0	0	0	0	10	25	19	7	1	1	1	61	3	64				
6	4	9	1	1/22/88	7	31	27	27	27	28	28	29	29	10	92	78	116	96	62	32	296	190	486				
6	4	15	1	1/29/88	37	39	0	0	0	0	0	0	0	21	60	72	70	64	40	14	223	118	341				
6	5	9	2	1/22/88	7	31	28	28	29	30	30	32	32	24	11	5	13	5	5	4	53	14	67				
6	5	15	2	1/29/88	37	39	38	38	39	40	40	42	43	23	12	10	1	1	1	1	46	13	59				
6	6	9	3	1/22/88	7	31	35	35	35	35	35	36	37	33	108	132	104	90	60	60	377	210	587				
6	6	15	3	1/29/88	37	39	0	0	0	0	0	0	0	29	140	92	82	58	58	38	343	154	497				
6	7	9	1	1/22/88	7	31	28	28	29	30	32	34	36	24	100	46	50	40	26	2	220	68	288				
6	7	15	1	1/29/88	37	42	36	36	37	38	40	42	45	16	70	76	4	10	4	4	166	18	184				
6	8	11	2	1/25/88	2	26	21	23	24	25	27	28	30	72	140	70	75	51	41	39	357	131	488				
6	8	15	2	1/29/88	37	42	38	39	39	40	41	42	43	67	138	69	55	39	21	33	329	93	422				
6	9	11	3	1/25/88	2	28	22	22	23	24	26	27	29	11	25	25	13	1	1	1	74	3	77				
6	9	15	3	1/29/88	37	42	38	38	38	39	40	40	42	2	32	26	1	2	2	2	61	6	67				
6	10	11	1	1/25/88	2	28	18	19	21	22	23	25	27	12	13	0	0	0	0	0	25	0	25				
6	10	15	1	1/29/88	37	42	17	38	39	39	40	42	44	14	26	2	0	0	6	0	42	6	48				

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH		RUN	RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	DRIVING CYCLE											TOTAL	
TEMPERATURES															0	1	2	3	4	5	6	0->3	4->6	TOTAL		
6	11	11	2	1/25/88	2	29	24	25	26	27	29	31	33	11	73	51	26	14	8	8	161	30	191			
6	11	15	2	1/29/88	37	42	39	39	40	41	42	44	4	33	50	16	5	13	8	103	26	129				
6	12	11	3	1/25/88	2	29	23	24	26	28	30	33	37	10	36	28	34	66	46	34	108	146	254			
6	12	15	3	1/29/88	37	42	38	38	39	40	41	43	44	7	28	36	34	70	40	36	105	146	251			
6	13	11	1	1/25/88	2	29	21	21	22	24	26	28	30	32	92	62	8	8	8	2	194	18	212			
6	13	15	1	1/29/88	37	42	38	38	39	40	41	43	44	16	64	28	2	4	2	8	110	14	124			
6	14	11	2	1/25/88	2	31	24	25	27	30	33	36	40	7	24	23	7	9	15	9	61	33	94			
6	14	15	2	1/29/88	37	42	40	40	41	43	46	47	50	4	11	16	1	8	8	10	32	26	58			
6	15	2	3	1/13/88	7	18	16	16	17	18	20	21	23	45	34	14	7	7	9	6	100	22	122			
6	15	15	3	1/29/88	37	42	36	36	36	37	37	38	39	6	50	8	2	2	1	2	66	5	71			
6	16	2	1	1/13/88	7	21	15	16	16	17	19	20	22	18	112	114	140	96	34	34	384	164	548			
6	16	15	1	1/29/88	37	42	36	36	36	37	37	38	39	51	60	60	58	28	4	4	229	36	265			
6	17	2	2	1/13/88	7	25	17	17	19	22	24	27	30	1	10	6	16	12	12	2	33	26	59			
6	17	15	2	1/29/88	37	42	37	38	38	39	41	42	43	0	13	11	11	5	1	7	35	13	48			
6	18	2	3	1/13/88	7	21	18	20	24	26	28	32	34	11	8	8	8	1	7	7	35	15	50			
6	18	15	3	1/29/88	37	42	37	39	41	42	42	46	47	3	2	2	26	2	1	1	33	4	37			
6	19	2	1	1/13/88	7	18	15	15	15	17	18	20	21	19	58	20	40	2	8	1	137	11	148			
6	19	15	1	1/29/88	37	42	37	37	38	38	39	40	41	16	16	28	16	4	4	2	76	10	86			
6	20	2	2	1/13/88	7	23	18	18	25	22	34	36	48	70	100	98	78	42	59	40	346	141	487			
6	20	15	2	1/29/88	37	42	40	44	46	53	65	63	77	49	84	46	64	86	35	29	243	150	393			
6	21	2	3	1/13/88	7	28	22	24	26	29	30	34	36	39	34	38	2	2	2	2	113	6	119			
6	21	15	3	1/29/88	37	42	37	38	39	41	42	44	45	4	26	32	8	2	2	2	70	6	76			
7	1	3	1	1/14/88	19	30	27	29	31	34	36	38	40	5	26	26	1	0	0	1	58	1	59			
7	1	24	1	2/09/88	19	34	27	29	31	33	35	38	39	8	28	28	4	2	2	2	68	6	74			
7	2	3	2	1/14/88	17	30	26	27	29	32	34	38	41	2	6	12	11	9	13	17	31	39	70			
7	2	24	2	2/09/88	19	34	28	30	33	35	37	39	42	0	0	20	16	6	16	16	36	38	74			
7	3	3	3	1/14/88	19	30	27	28	29	30	32	34	36	3	7	7	1	1	1	1	18	3	21			
7	3	24	3	2/09/88	19	34	0	0	0	0	0	0	0	11	7	7	1	1	1	1	26	3	29			
7	4	3	1	1/14/88	19	30	27	27	28	28	29	30	30	18	74	81	61	31	1	1	234	33	267			
7	4	24	1	2/09/88	19	34	0	0	0	0	0	0	0	10	72	60	60	28	16	16	202	60	262			
7	5	3	2	1/14/88	17	30	25	26	27	28	30	32	34	2	12	8	13	13	0	10	35	23	58			
7	5	24	2	2/09/88	19	34	29	30	31	31	32	33	34	0	8	8	8	6	4	8	24	18	42			
7	6	3	3	1/14/88	19	32	29	29	30	31	33	34	36	24	100	76	66	58	26	14	266	98	364			
7	6	24	3	2/09/88	19	34	0	0	0	0	0	0	0	23	58	34	82	32	32	14	197	78	275			
7	7	3	1	1/14/88	19	35	30	31	32	35	38	40	44	24	34	14	20	28	8	7	92	43	135			
7	7	24	1	2/09/88	19	34	29	29	30	31	33	35	37	8	52	4	16	16	8	4	80	28	108			
7	8	9	2	1/22/88	7	28	25	25	26	26	27	28	29	38	67	43	14	35	23	9	162	67	229			
7	8	24	2	2/09/88	19	34	31	31	32	33	34	34	35	8	81	24	27	9	7	5	140	21	161			
7	9	9	3	1/22/88	7	28	27	28	29	29	30	30	32	2	13	1	2	1	1	1	17	4	21			
7	9	24	3	2/09/88	19	34	0	0	0	0	0	0	0	2	7	2	2	2	1	2	13	5	18			
7	10	9	1	1/22/88	7	28	23	24	24	26	26	28	29	1	0	0	0	0	0	0	1	0	1			
7	10	24	1	2/09/88	19	34	29	29	30	32	33	35	37	6	2	0	0	0	0	0	8	0	8			
7	11	9	2	1/22/88	7	28	26	26	27	27	28	30	30	2	13	1	9	12	20	24	25	56	81			
7	11	24	2	2/09/88	19	34	31	32	32	33	34	35	36	3	49	15	8	26	36	14	75	76	151			
7	12	9	3	1/22/88	7	28	27	29	30	31	31	33	34	8	36	36	36	58	58	34	116	150	266			
7	12	24	3	2/09/88	19	34	0	0	0	0	0	0	0	8	16	4	26	36	26	34	54	96	150			
7	13	9	1	1/22/88	7	28	24	25	26	27	28	29	30	2	4	4	4	4	4	4	20	12	32			
7	13	24	1	2/09/88	19	34	30	31	32	33	35	36	38	8	16	4	4	4	2	4	32	10	42			
7	14	9	2	1/22/88	7	29	23	24	26	28	30	31	33	0	1	0	11	9	7	5	12	21	33			
7	14	24	2	2/09/88	19	34	32	33	34	36	38	40	43	0	1	9	11	8	9	1	21	18	39			

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATER			DATE	TEMPERATURES							DRIVING CYCLE							TOTAL				
				SOAK	RUN	IN1	IN2	IN3	IN4	IN5	IN6	IN7	0	1	2	3	4	5	6	0->3	4->6	
7	15	7	3	1/20/88	2	25	18	19	21	22	23	24	25	24	36	26	4	2	2	2	90	6
7	15	24	3	2/09/88	19	34	0	0	0	0	0	0	0	26	14	2	2	2	2	44	6	
7	16	7	1	1/20/88	2	25	18	19	19	19	20	21	22	49	58	58	60	94	28	10	225	132
7	16	24	1	2/09/88	19	36	30	31	31	31	32	33	34	55	36	40	4	4	4	135	12	
7	17	7	2	1/20/88	2	26	22	22	24	26	27	30	31	0	25	34	20	22	28	16	79	66
7	17	24	2	2/09/88	19	36	33	34	36	36	38	41	42	0	15	11	11	12	6	5	37	23
7	18	7	3	1/20/88	2	26	20	22	25	27	28	30	32	6	2	2	2	2	2	1	12	5
7	18	24	3	2/09/88	19	38	0	0	0	0	0	0	0	3	2	2	14	2	2	2	21	6
7	19	7	1	1/20/88	2	26	19	19	20	21	22	23	25	8	2	14	4	1	2	2	28	5
7	19	24	1	2/09/88	19	38	32	32	33	34	35	37	38	16	4	4	4	4	4	28	12	
7	20	7	2	1/20/88	2	26	21	23	26	33	38	41	49	61	82	66	42	62	22	93	251	
7	20	24	2	2/09/88	19	38	43	44	45	51	59	72	29	64	66	41	15	5	16	200	36	
7	21	7	3	1/20/88	2	27	21	23	25	28	30	32	33	4	2	2	2	2	2	10	6	
7	21	24	3	2/09/88	19	38	0	0	0	0	0	0	0	4	8	2	2	2	2	16	6	
8	1	6	1	1/18/88	15	17	20	20	23	25	28	31	33	6	50	32	2	1	1	1	90	3
8	1	14	1	1/28/88	29	38	34	36	39	41	43	45	47	8	60	38	12	0	0	0	118	0
8	2	6	2	1/18/88	15	17	18	19	21	22	26	28	31	8	30	28	10	12	12	10	76	34
8	2	14	2	1/28/88	29	38	35	36	38	40	42	45	47	2	19	11	8	8	1	9	40	18
8	3	6	3	1/18/88	15	17	17	16	17	18	19	19	21	6	1	1	25	1	1	1	33	3
8	3	14	3	1/28/88	29	38	35	35	36	37	38	39	41	11	7	1	7	1	1	1	26	3
8	4	6	1	1/18/88	15	17	20	20	20	20	20	20	20	10	50	74	68	81	73	61	202	215
8	4	14	1	1/28/88	29	38	0	0	0	0	0	0	0	10	52	84	64	38	2	2	210	42
8	5	6	2	1/18/88	15	17	18	19	19	20	21	22	23	7	15	17	16	5	1	13	55	19
8	5	14	2	1/28/88	29	40	36	36	37	38	38	40	41	12	5	9	4	9	4	8	30	21
8	6	6	3	1/18/88	15	17	17	17	18	18	19	21	21	25	108	60	60	40	16	2	253	58
8	6	14	3	1/28/88	29	40	34	35	35	36	37	38	39	23	100	90	52	58	58	14	265	130
8	7	6	1	1/18/88	15	17	19	19	20	22	24	26	28	53	56	26	1	14	4	4	136	22
8	7	14	1	1/28/88	29	40	35	35	36	37	39	41	43	24	52	4	10	10	2	2	132	14
8	8	4	2	1/15/88	12	40	34	34	34	35	36	37	38	29	124	78	78	38	22	34	309	94
8	8	14	2	1/28/88	29	38	34	34	34	35	36	37	38	39	118	82	69	39	14	14	308	67
8	9	4	3	1/15/88	12	40	34	34	35	35	36	37	38	2	1	7	1	2	1	1	11	4
8	9	14	3	1/28/88	29	38	36	35	36	37	37	38	0	2	7	1	1	1	1	1	11	3
8	10	4	1	1/15/88	12	40	36	36	37	38	38	40	42	1	1	0	0	0	0	0	2	0
8	10	14	1	1/28/88	29	38	33	34	35	36	36	38	39	6	2	1	0	0	0	0	9	0
8	11	4	2	1/15/88	12	34	34	34	35	35	36	38	39	5	33	37	17	15	13	22	92	50
8	11	14	2	1/28/88	29	38	35	36	36	37	37	39	40	4	11	1	14	9	7	27	30	43
8	12	4	3	1/15/88	12	38	35	35	36	37	37	38	41	43	4	10	10	36	46	28	60	120
8	12	14	3	1/28/88	29	38	35	36	37	37	38	40	41	6	28	10	34	40	34	34	78	108
8	13	4	1	1/15/88	12	39	36	36	37	38	39	40	43	6	26	20	8	1	1	0	60	2
8	13	14	1	1/28/88	29	38	34	34	35	36	37	38	39	8	22	4	2	4	4	2	36	10
8	14	4	2	1/15/88	12	39	36	36	38	39	42	44	46	3	7	9	19	10	5	11	38	26
8	14	14	2	1/28/88	29	38	36	37	38	39	41	42	44	4	5	15	10	6	9	5	34	20
8	15	11	3	1/25/88	2	19	15	15	16	16	18	19	20	56	26	2	2	8	2	8	86	18
8	15	14	3	1/28/88	29	38	32	32	32	32	32	33	34	6	14	2	2	2	2	7	24	6
8	16	11	1	1/25/88	2	19	14	14	15	16	17	18	20	51	116	72	84	52	28	4	123	84
8	16	14	1	1/28/88	29	38	31	32	32	33	33	34	35	56	92	28	28	16	10	4	204	30
8	17	11	2	1/25/88	2	22	17	17	19	21	23	25	27	4	16	26	22	16	16	16	68	48
8	17	14	2	1/28/88	29	38	34	35	36	39	40	41	42	0	9	5	5	5	13	13	19	31
8	18	11	3	1/25/88	2	24	18	19	21	24	25	28	29	3	2	2	4	1	1	2	21	4
8	18	14	3	1/28/88	29	38	31	32	35	36	38	41	42	3	2	2	8	2	1	2	15	5

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATE		DATE	SOAK RUN							TEMPERATURES							DRIVING CYCLE							TOTAL
			TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6						
8	19	11	1	1/25/88	2	25	18	19	20	20	22	23	25	6	20	4	26	1	1	56	3	59		
8	19	14	1	1/28/88	29	38	33	33	33	34	35	36	32	4	4	4	2	2	44	8	52			
8	20	11	2	1/25/88	2	24	25	30	33	40	49	46	51	53	60	52	61	64	38	33	226	135	361	
8	20	14	2	1/28/88	29	38	35	37	41	50	58	57	70	37	70	60	34	25	19	8	201	52	253	
8	21	11	3	1/25/88	2	26	19	21	22	25	26	29	30	28	8	8	2	2	2	46	6	52		
8	21	14	3	1/28/88	29	38	34	35	36	38	38	41	41	4	8	20	2	2	2	34	6	40		
9	1	10	1	1/23/88	30	37	37	38	39	42	44	45	48	14	50	28	19	1	1	111	3	114		
9	1	13	1	1/27/88	20	37	31	32	34	36	38	40	42	16	50	38	8	0	2	1	112	3	115	
9	2	10	2	1/23/88	30	37	36	37	38	40	42	43	47	12	33	13	17	15	9	15	75	39	114	
9	2	13	2	1/27/88	20	37	32	34	37	39	41	44	48	11	49	8	17	11	17	14	65	42	127	
9	3	10	3	1/23/88	30	37	37	37	37	37	38	39	40	10	13	19	7	1	1	1	49	3	52	
9	3	13	3	1/27/88	20	37	32	33	33	34	35	37	38	8	13	7	7	1	1	1	35	3	38	
9	4	10	1	1/23/88	30	37	35	35	35	35	35	35	35	10	66	82	88	50	8	2	246	60	306	
9	4	13	1	1/27/88	20	37	0	0	0	0	0	0	0	10	60	92	78	46	14	2	240	62	302	
9	5	10	2	1/23/88	30	37	36	36	37	37	38	39	40	24	11	9	9	19	13	9	53	41	94	
9	5	13	2	1/27/88	20	37	33	34	34	35	37	38	39	12	23	9	9	9	5	5	53	23	76	
9	6	10	3	1/23/88	30	37	38	37	37	37	38	39	40	40	132	104	70	46	38	14	346	98	444	
9	6	13	3	1/27/88	20	37	33	34	34	35	36	37	39	24	124	124	90	64	58	38	362	160	522	
9	7	10	1	1/23/88	30	37	36	36	36	38	39	41	43	8	52	50	8	2	1	118	11	129		
9	7	13	1	1/27/88	20	37	33	33	34	35	38	40	42	16	52	40	10	14	4	118	20	138		
9	8	12	2	1/26/88	11	18	16	17	17	18	20	21	22	66	129	102	85	37	41	25	382	103	485	
9	8	13	2	1/27/88	20	33	29	30	31	31	32	33	34	91	105	99	48	33	16	22	343	71	414	
9	9	12	3	1/26/88	11	14	18	16	17	18	19	20	21	4	26	25	25	1	1	1	80	3	83	
9	9	13	3	1/27/88	20	33	27	27	28	29	30	31	33	2	25	25	7	2	1	1	59	4	63	
9	10	12	1	1/26/88	11	14	13	13	14	15	16	18	20	14	2	1	0	0	0	17	0	17		
9	10	13	1	1/27/88	20	33	27	27	28	29	31	33	35	4	2	0	0	0	0	6	0	6		
9	11	12	2	1/2/88	11	16	18	18	19	19	21	23	25	5	72	58	34	42	22	30	169	94	263	
9	11	13	2	1/27/88	20	37	31	31	32	33	34	36	37	2	60	18	14	16	8	17	94	41	135	
9	12	12	3	1/26/88	11	16	17	17	18	20	22	24	25	8	36	28	34	58	34	106	150	256		
9	12	13	3	1/27/88	20	37	26	27	29	31	33	35	37	6	36	36	34	66	40	34	112	140	252	
9	13	12	1	1/26/88	11	15	14	15	15	16	18	20	21	16	52	19	14	7	13	8	101	28	129	
9	13	13	1	1/27/88	20	37	29	29	30	32	33	35	36	8	44	20	2	14	4	8	74	26	100	
9	14	12	2	1/26/88	11	18	20	20	21	22	26	29	31	8	47	32	14	13	13	14	101	40	141	
9	14	13	2	1/27/88	20	37	31	32	33	34	37	38	41	5	41	8	6	16	4	10	60	30	90	
9	15	1	3	1/12/88	16	28	25	25	26	27	29	31	33	30	26	14	8	7	7	78	21	99		
9	15	13	3	1/27/88	20	37	30	30	31	32	33	34	36	20	14	14	2	2	2	2	50	6	56	
9	16	1	1	1/12/88	16	29	23	23	24	25	26	27	29	19	114	82	118	26	14	2	333	42	375	
9	16	13	1	1/27/88	20	37	28	28	29	29	30	31	32	65	36	48	84	28	16	16	233	54	287	
9	17	1	2	1/12/88	16	29	24	25	27	30	32	35	38	0	7	14	10	10	12	6	31	28	59	
9	17	13	2	1/27/88	20	37	32	32	34	35	36	39	39	1	20	24	24	16	6	12	69	34	103	
9	18	1	3	1/12/88	16	31	26	26	28	30	32	34	36	3	8	20	19	1	1	1	50	3	53	
9	18	13	3	1/27/88	20	37	31	32	34	36	37	40	41	2	2	14	8	1	1	1	26	3	29	
9	19	1	1	1/12/88	16	31	29	29	30	31	32	34	37	12	32	14	2	2	2	2	60	6	66	
9	19	13	1	1/27/88	20	37	30	30	31	31	32	34	35	16	22	4	2	2	2	2	44	6	50	
9	20	1	2	1/12/88	16	31	34	35	38	47	50	69	68	43	124	104	68	86	41	339	195	534		
9	20	13	2	1/27/88	20	37	36	38	43	45	55	69	69	32	52	70	88	68	45	21	242	134	376	
9	21	1	3	1/12/88	16	29	25	27	30	32	35	38	40	11	26	38	2	2	2	2	77	6	83	
9	21	13	3	1/27/88	20	37	31	34	35	37	40	40	40	4	26	38	2	2	2	2	70	6	76	
10	1	2	1	1/13/88	7	23	17	21	24	26	29	33	35	14	37	19	0	0	6	70	6	76		

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATER			DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	TEMPERATURES							DRIVING CYCLE							TOTAL
1	2	1											0	1	2	3	4	5	6	0->3	4->6						
10	1	21	1	2/05/88	8	10	8	10	13	15	18	20	23	8	28	28	2	1	0	0	66	1					
10	2	2	2	1/13/88	7	33	21	24	26	29	32	36	40	0	14	8	9	1	7	7	31	15					
10	2	21	2	2/05/88	8	10	11	13	15	17	21	24	27	0	37	22	0	9	13	25	59	47					
10	3	2	3	1/13/88	7	34	23	24	25	26	28	30	33	2	7	7	1	1	1	1	17	3					
10	3	21	3	2/05/88	8	10	12	11	12	13	14	16	18	10	13	13	19	1	1	1	55	3					
10	4	21	1	2/05/88	8	12	0	0	0	0	0	0	0	10	60	92	108	72	44	8	270						
10	5	2	2	1/13/88	7	38	23	24	25	27	28	30	32	3	0	0	9	5	5	12	19						
10	5	21	2	2/05/88	8	12	12	13	13	14	15	17	18	2	16	8	4	4	0	24	30						
10	6	2	3	1/13/88	7	34	23	24	26	27	29	31	33	32	72	98	56	26	26	8	258						
10	6	21	3	2/05/88	8	12	13	12	13	14	16	17	20	13	124	116	82	70	52	32	335						
10	7	2	1	1/13/88	7	34	25	26	28	31	35	38	41	6	20	13	6	14	8	8	45						
10	7	21	1	2/05/88	8	12	10	10	12	14	17	21	24	16	84	28	4	8	4	2	132						
10	8	6	2	1/18/88	15	18	19	19	19	20	20	20	20	53	140	69	41	33	15	23	303						
10	8	21	2	2/05/88	8	9	10	11	13	13	14	16	17	29	146	39	21	16	8	14	235						
10	9	6	3	1/18/88	15	19	18	18	18	18	19	20	20	3	1	1	1	1	1	1	6						
10	9	21	3	2/05/88	8	10	11	10	11	12	14	16	18	2	8	1	1	1	1	1	12						
10	10	6	1	1/18/88	15	19	20	20	20	21	22	24	26	3	0	0	0	0	0	3	0						
10	10	21	1	2/05/88	8	10	9	9	10	11	12	13	16	6	2	2	0	0	0	0	10						
10	11	6	2	1/18/88	15	19	18	19	19	20	21	22	23	5	15	19	19	20	18	18	58						
10	11	21	2	2/05/88	8	10	12	12	13	14	16	18	20	1	4	4	8	10	12	10	17						
10	12	6	3	1/18/88	15	19	18	18	19	20	21	21	22	9	4	4	4	4	4	4	21						
10	12	21	3	2/05/88	8	10	11	12	13	15	17	19	21	7	36	34	34	46	34	46	111						
10	13	6	1	1/18/88	15	19	19	20	20	21	22	23	24	6	38	1	7	1	1	1	52						
10	13	21	1	2/05/88	8	10	0	0	0	0	0	0	0	8	52	16	4	4	2	4	80						
10	14	6	2	1/18/88	15	17	20	20	21	22	23	26	27	0	17	15	19	13	15	10	51						
10	14	21	2	2/05/88	8	10	11	12	13	15	17	21	25	0	16	5	0	7	0	1	21						
10	15	10	3	1/23/88	30	37	37	37	37	38	38	38	39	3	2	2	2	2	2	2	9						
10	15	21	3	2/05/88	8	9	0	0	0	0	0	0	0	26	52	2	2	2	8	2	82						
10	16	10	1	1/23/88	30	36	36	36	36	36	36	36	37	53	64	34	40	46	28	4	191						
10	16	21	1	2/05/88	8	9	0	0	0	0	0	0	0	58	116	72	64	116	40	16	310						
10	17	10	2	1/23/88	30	36	37	37	37	38	39	40	40	2	15	23	17	14	14	12	57						
10	17	21	2	2/05/88	8	9	10	11	12	15	17	17	20	6	24	22	11	11	6	2	63						
10	18	10	3	1/23/88	30	36	37	38	39	40	40	42	44	2	2	2	2	7	2	1	8						
10	18	21	3	2/05/88	8	9	10	12	12	14	16	17	19	3	2	2	8	2	2	1	15						
10	19	10	1	1/23/88	30	36	35	35	35	35	35	36	37	6	2	2	2	2	1	1	12						
10	19	21	1	2/05/88	8	9	0	0	0	0	0	0	0	6	4	4	4	4	4	4	18						
10	20	10	2	1/23/88	30	36	35	37	37	45	45	60	55	49	58	46	40	21	33	33	193						
10	20	21	2	2/05/88	8	9	9	12	19	20	21	35	37	51	92	72	78	76	42	41	293						
10	21	10	3	1/23/88	30	36	36	37	38	39	40	40	43	3	3	8	2	2	2	2	15						
10	21	21	3	2/05/88	8	9	9	11	12	14	17	17	20	21	26	2	2	2	2	2	51						
11	1	5	1	1/16/88	30	26	30	30	32	34	36	38	40	5	26	38	7	19	1	6	76						
11	1	20	1	2/04/88	15	18	19	21	23	25	28	31	33	8	34	28	2	1	2	1	72						
11	2	5	2	1/16/88	30	26	28	28	29	32	33	35	37	11	16	17	15	9	10	13	59						
11	2	20	2	2/04/88	15	22	19	22	24	26	30	33	35	10	18	16	4	4	10	12	48						
11	3	5	3	1/16/88	30	26	28	27	26	27	27	28	29	11	13	13	7	1	1	1	44						
11	3	20	3	2/04/88	15	22	19	20	20	21	23	25	26	11	13	19	19	1	1	1	62						
11	4	5	1	1/16/88	30	24	30	29	29	29	29	29	29	7	58	89	86	75	49	14	240						
11	4	20	1	2/04/88	15	22	0	0	0	0	0	0	0	10	60	84	108	108	76	10	262						
11	5	5	2	1/16/88	30	23	27	27	28	28	28	30	30	6	19	13	19	9	9	4	57						
11	5	20	2	2/04/88	15	22	21	22	23	24	24	26	27	3	5	11	5	4	6	0	24						

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - DENVER

FUEL VEH RUN RATE		DATE	TEMPERATURES										DRIVING CYCLE										TOTAL
			SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6			
11	6	5	3	1/16/88	30	24	27	26	26	26	27	28	29	32	116	144	66	20	32	32	358	84	442
11	6	20	3	2/04/88	15	22	20	20	22	23	24	26	27	23	112	98	70	46	50	32	303	128	431
11	7	5	1	1/16/88	30	24	28	28	28	29	31	32	34	16	52	34	20	34	26	13	122	73	195
11	7	20	1	2/04/88	15	22	20	20	22	24	27	28	31	26	44	40	16	4	4	2	126	10	136
11	8	3	2	1/14/88	17	34	30	30	31	32	34	35	37	53	70	62	31	25	17	13	216	55	271
11	8	20	2	2/04/88	15	15	17	18	18	19	21	22	23	48	129	91	48	18	28	16	316	62	378
11	9	3	3	1/14/88	17	34	33	33	33	34	35	37	40	2	1	1	1	1	1	5	3	8	
11	9	20	3	2/04/88	15	15	14	14	14	16	17	18	20	2	7	7	1	2	2	1	17	5	22
11	10	3	1	1/14/88	19	37	31	32	33	34	36	38	40	0	0	0	0	0	0	0	0	0	0
11	10	20	1	2/04/88	15	15	0	0	0	0	0	0	0	6	2	1	0	0	0	0	9	0	9
11	11	3	2	1/14/88	17	37	32	33	34	35	36	38	40	5	7	15	9	10	14	11	36	35	71
11	11	20	2	2/04/88	15	18	18	19	20	21	23	24	1	15	6	22	4	16	0	44	20	64	64
11	12	3	3	1/14/88	19	40	34	34	36	37	40	43	47	8	28	36	36	72	46	42	108	160	268
11	12	20	3	2/04/88	15	18	15	15	17	18	19	22	24	7	28	4	26	60	64	40	65	164	229
11	13	3	1	1/14/88	19	40	33	33	34	36	38	40	43	8	14	12	14	8	1	1	48	10	58
11	13	20	1	2/04/88	15	18	14	15	16	17	19	21	23	8	76	28	2	4	2	4	114	10	124
11	14	3	2	1/14/88	17	40	31	32	34	36	39	42	45	0	1	0	1	9	11	5	2	25	27
11	14	20	2	2/04/88	15	15	16	17	17	19	22	24	27	5	1	8	5	5	7	17	19	29	48
11	15	12	3	1/26/88	11	12	14	14	14	14	14	15	16	44	26	2	1	7	2	8	73	17	90
11	15	20	3	2/04/88	15	18	15	16	16	17	18	19	21	25	26	8	2	2	2	2	61	6	67
11	16	12	1	1/26/88	11	12	14	14	15	15	15	15	16	69	116	66	88	96	40	22	339	158	497
11	16	20	1	2/04/88	15	18	0	0	0	16	0	0	0	55	84	84	72	64	22	4	295	90	385
11	17	12	2	1/26/88	11	12	17	17	18	18	20	22	24	2	9	15	18	14	13	14	44	41	85
11	17	20	2	2/04/88	15	18	20	20	22	23	25	28	29	2	7	10	16	6	6	6	35	18	53
11	18	12	3	1/26/88	11	12	14	15	17	18	20	22	24	3	2	2	2	2	1	2	9	5	14
11	18	20	3	2/04/88	15	18	17	18	21	22	23	26	28	3	2	2	8	1	1	2	15	4	19
11	19	12	1	1/26/88	11	12	14	13	14	14	15	17	18	14	32	8	1	1	6	1	55	8	63
11	19	20	1	2/04/88	15	18	17	17	18	19	21	23	25	16	4	4	4	4	4	4	28	12	40
11	20	12	2	1/26/88	11	12	16	19	19	27	39	40	55	53	124	72	82	36	46	37	331	119	450
11	20	20	2	2/04/88	15	18	23	25	27	35	45	40	54	50	84	88	66	70	20	17	288	107	395
11	21	12	3	1/26/88	11	12	14	16	17	19	20	23	22	28	26	32	2	2	2	2	88	6	94
11	21	20	3	2/04/88	15	18	19	20	22	23	24	29	30	12	26	20	2	2	2	2	60	6	66
12	1	8	1	1/21/88	6	20	19	20	23	25	28	29	31	14	26	37	7	7	0	0	84	7	91
12	1	16	1	1/30/88	30	31	31	33	35	38	39	41	43	16	52	26	8	1	1	0	102	2	104
12	2	8	2	1/21/88	6	19	16	17	18	20	22	24	28	0	50	45	12	15	17	15	107	47	154
12	2	16	2	1/30/88	30	33	30	31	34	35	37	41	44	4	18	19	20	5	11	17	61	33	94
12	3	8	3	1/21/88	6	20	15	15	16	17	18	20	21	11	25	31	49	1	1	1	116	3	119
12	3	16	3	1/30/88	30	31	0	0	0	0	0	0	0	11	25	13	7	1	1	1	56	3	59
12	4	8	1	1/21/88	6	19	19	19	19	19	19	19	20	12	72	64	114	94	80	32	262	206	468
12	4	16	1	1/30/88	30	33	0	0	0	0	0	0	0	9	60	84	84	48	26	26	237	100	337
12	5	8	2	1/21/88	6	19	16	16	16	17	18	19	20	22	21	9	12	12	8	5	64	25	89
12	5	16	2	1/30/88	30	33	31	31	32	33	34	35	36	23	16	13	9	9	8	9	61	26	87
12	6	8	3	1/21/88	6	19	18	17	18	19	20	22	25	25	124	172	92	64	58	32	413	154	567
12	6	16	3	1/30/88	30	33	0	0	0	0	0	0	0	22	124	140	82	58	58	38	368	154	522
12	7	8	1	1/21/88	6	18	18	18	20	21	23	28	30	26	116	70	50	58	28	2	262	88	350
12	7	16	1	1/30/88	30	33	31	32	33	35	37	39	42	16	76	34	4	16	4	2	130	22	152
12	8	10	2	1/23/88	30	35	35	35	36	36	36	36	35	70	88	60	48	28	33	19	266	80	346
12	8	16	2	1/30/88	30	31	29	29	29	30	31	31	32	30	126	53	53	53	37	33	262	123	385
12	9	10	1	1/23/88	30	35	17	37	37	37	37	38	38	2	25	13	2	1	1	1	42	3	45
12	9	16	3	1/30/88	30	31	29	29	29	30	31	32	33	2	25	25	8	2	1	1	60	4	64

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH RUN RATE			DATE		TEMPERATURES										DRIVING CYCLE										TOTAL	
					SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6				
1	1	51	1	3/05/88	20	21	0	0	0	0	0	0	0	0	4	26	25	1	1	9	9	56	19	75		
1	1	64	1	3/23/88	30	35	29	31	33	36	39	41	43	6	16	8	2	1	1	1	32	3	35			
1	2	51	2	3/05/88	20	21	0	0	0	0	0	0	0	2	16	14	18	15	17	15	50	47	97			
1	2	64	2	3/23/88	30	35	14	36	38	41	43	48	53	0	10	16	10	1	1	6	36	8	44			
1	3	51	3	3/05/88	20	21	0	0	0	0	0	0	0	8	25	13	1	12	6	6	47	24	71			
1	3	64	3	3/23/88	30	35	0	0	0	0	0	0	0	2	1	19	1	0	0	0	23	0	23			
1	4	51	1	3/05/88	20	22	0	0	0	0	0	0	0	5	60	76	52	60	16	4	193	80	273			
1	4	64	1	3/23/88	30	35	0	0	0	0	0	0	0	8	68	66	84	4	4	4	226	12	238			
1	5	51	2	3/05/88	20	22	0	0	0	0	0	0	0	0	12	12	12	0	14	4	36	18	54			
1	5	64	2	3/23/88	30	35	33	33	34	35	37	39	40	1	4	4	4	4	4	0	13	8	21			
1	6	51	3	3/05/88	20	22	0	0	0	0	0	0	0	19	114	90	56	16	19	31	279	66	345			
1	6	64	3	3/23/88	30	35	0	0	0	0	0	0	0	24	92	64	72	28	26	252	82	334				
1	7	51	1	3/05/88	20	22	0	0	0	0	0	0	0	14	16	4	4	2	1	2	38	5	43			
1	7	64	1	3/23/88	30	35	30	32	36	40	43	46	48	8	4	4	2	2	2	1	18	5	23			
1	8	55	2	3/10/88	32	36	33	34	35	36	37	39	41	48	61	45	44	19	4	12	198	35	233			
1	8	64	2	3/23/88	30	32	33	33	34	35	37	38	40	28	98	46	22	5	18	16	194	39	233			
1	9	55	3	3/10/88	32	36	35	35	36	37	39	40	43	1	7	0	6	0	6	6	14	12	26			
1	9	64	3	3/23/88	30	32	0	0	0	0	0	0	0	1	13	6	6	6	0	0	26	6	32			
1	10	55	1	3/10/88	32	36	0	0	0	0	0	0	0	4	1	0	0	0	0	0	5	0	5			
1	10	64	1	3/23/88	30	32	0	0	0	0	0	0	0	4	1	0	0	0	0	0	6	0	6			
1	11	55	2	3/10/88	32	36	35	35	35	37	39	41	43	5	22	11	9	8	14	8	47	30	77			
1	11	64	2	3/23/88	30	32	33	33	34	36	38	40	43	2	10	4	10	4	9	8	26	21	47			
1	12	55	3	3/10/88	32	36	36	36	37	40	42	46	49	8	62	36	36	40	46	42	142	128	270			
1	12	64	3	3/23/88	30	35	0	0	0	0	0	0	0	33	20	40	36	68	44	64	129	176	305			
1	13	55	1	3/10/88	32	37	34	34	35	37	39	41	44	8	4	2	2	14	8	14	16	36	52			
1	13	64	1	3/23/88	30	35	29	29	30	32	34	38	41	8	10	2	2	8	2	2	22	12	34			
1	14	55	2	3/10/88	32	37	34	35	37	39	42	46	49	0	14	13	6	12	6	10	33	28	61			
1	14	64	2	3/23/88	30	35	33	34	36	38	42	46	49	2	5	12	8	0	7	1	27	8	35			
1	15	56	3	3/11/88	31	33	33	33	33	34	35	37	38	2	10	42	14	19	8	2	68	29	97			
1	15	64	3	3/23/88	30	32	0	0	0	0	0	0	0	5	4	32	20	2	2	2	61	6	67			
1	16	56	1	3/11/88	31	34	31	31	32	32	32	33	35	61	84	34	42	28	10	10	221	48	269			
1	16	64	1	3/23/88	30	32	28	28	29	29	30	31	32	53	68	28	28	4	4	4	177	12	189			
1	17	56	2	3/11/88	31	33	31	32	33	35	37	39	41	0	22	14	16	12	6	12	52	30	82			
1	17	64	2	3/23/88	30	32	0	0	0	0	0	0	0	2	9	6	12	10	8	4	29	22	51			
1	18	56	3	3/11/88	31	34	33	34	36	36	38	40	0	0	31	34	65	43	23	19	130	85	215			
1	18	64	3	3/23/88	30	32	0	0	0	0	0	0	0	0	7	14	25	19	19	7	46	45	91			
1	19	56	1	3/11/88	31	33	30	31	32	32	34	36	38	4	2	1	1	1	1	1	8	3	11			
1	19	64	1	3/23/88	30	32	29	29	31	32	35	37	4	2	2	2	1	1	1	1	9	3	12			
1	20	56	2	3/11/88	31	34	31	33	36	42	47	57	57	60	56	36	30	44	11	0	182	55	237			
1	20	64	2	3/23/88	30	32	33	35	41	48	55	62	69	32	64	42	50	35	7	13	188	55	243			
1	21	56	3	3/11/88	31	34	33	34	36	38	41	44	46	1	25	36	0	1	7	1	62	9	71			
1	21	64	3	3/23/88	30	32	0	0	0	0	0	0	0	0	24	13	1	1	1	1	38	3	41			
2	1	57	1	3/13/88	8	17	13	14	17	20	23	25	27	8	28	38	8	2	2	2	82	6	88			
2	2	57	2	3/13/88	8	18	14	17	20	23	26	27	33	0	13	4	8	10	10	8	25	28	53			
2	3	57	3	3/13/88	8	18	17	18	19	21	23	24	26	17	24	18	1	1	0	1	60	2	62			
2	4	57	1	3/13/88	8	18	0	0	0	0	0	0	0	11	60	84	100	64	10	4	255	78	333			
2	5	57	2	3/13/88	8	20	14	15	16	18	20	22	23	10	9	5	9	5	4	8	33	17	50			
2	6	57	3	3/13/88	8	18	18	18	20	21	24	26	29	25	100	154	92	82	22	16	171	120	491			
2	7	57	1	3/13/88	8	20	15	15	16	21	21	27	29	16	52	10	2	8	1	1	80	10	90			
2	8	52	2	3/06/88	33	36	31	32	33	34	35	36	38	49	76	29	27	20	4	14	181	38	219			

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH RUN RATER			DATE	SOAK RUN										TEMPERATURES										DRIVING CYCLE										TOTAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
				3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3</

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL	VEH	RUN	RATER	DATE	SOAK RUN							TEMPERATURES							DRIVING CYCLE							TOTAL
					TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6						
3	19	53	1	3/07/88	31	33	30	31	32	33	36	37	4	1	2	1	1	1	1	8	3	11				
3	19	70	1	3/30/88	21	28	25	25	27	28	30	32	35	4	4	2	2	2	2	12	6	18				
3	20	53	2	3/07/88	31	33	31	36	40	48	56	62	62	55	96	92	68	73	47	44	311					
5	20	70	2	3/30/88	21	30	33	36	43	48	59	60	70	42	100	82	60	66	45	37	284					
3	21	53	3	3/07/88	31	33	35	36	38	40	42	45	47	0	26	25	1	1	1	52	3	55				
3	21	70	3	3/30/88	21	31	29	31	33	36	38	41	43	1	26	32	8	2	2	67	6	73				
3	22	51	1	3/05/88	20	31	0	0	0	0	0	0	0	6	60	28	16	26	1	1	110					
3	22	52	3	3/06/88	33	41	33	33	34	35	37	38	40	0	25	13	19	8	7	57	23	80				
3	22	53	2	3/07/88	31	40	32	33	33	35	37	38	40	0	22	17	33	16	11	6	72	33				
3	22	54	1	3/09/88	24	35	27	27	28	29	30	31	33	6	34	26	8	7	1	74	16	90				
3	22	55	3	3/10/88	32	38	36	36	37	38	40	41	43	6	29	19	31	29	13	16	85	58				
3	22	56	2	3/11/88	31	34	31	31	31	33	34	35	36	11	39	7	10	4	12	6	67	22				
3	22	57	1	3/13/88	8	14	11	10	11	12	14	16	17	22	42	28	8	44	1	1	100	46				
3	22	58	3	3/14/88	8	19	13	13	15	17	18	20	22	13	52	28	38	38	8	7	131	53				
3	22	59	2	3/15/88	12	22	17	17	18	20	22	25	26	3	48	19	23	29	14	14	93	57				
3	22	60	1	3/19/88	17	27	22	22	23	25	27	28	30	11	52	16	20	8	2	1	99	11				
3	22	61	3	3/20/88	11	17	15	16	17	18	20	21	22	6	66	14	30	14	13	7	116	34				
3	22	62	2	3/21/88	10	16	9	9	10	11	13	15	17	14	58	30	21	53	14	14	123	81				
3	22	63	1	3/22/88	24	34	27	28	29	31	32	34	36	8	28	16	26	14	13	1	78	28				
3	22	64	3	3/23/88	30	35	0	0	0	0	0	0	0	1	25	25	13	25	7	1	64	33				
3	22	65	2	3/24/88	33	38	36	37	38	39	41	42	44	2	30	17	43	15	11	6	92	32				
3	22	66	1	3/25/88	32	35	35	35	36	37	39	40	41	8	28	28	26	7	7	1	90	15				
3	22	67	3	3/26/88	15	20	19	20	22	24	26	27	17	34	32	46	26	13	7	129	46					
3	22	68	2	3/28/88	29	36	36	36	37	38	40	42	44	4	33	25	39	17	5	8	101	30				
3	22	69	1	3/29/88	21	31	26	27	27	28	30	31	33	8	52	16	26	14	2	8	102	24				
3	22	70	3	3/30/88	21	34	28	29	30	33	35	37	40	1	40	26	26	8	1	1	93	10				
3	22	71	2	3/31/88	18	28	27	27	29	30	32	33	34	10	68	14	33	49	11	18	125	78				
3	23	51	2	3/05/88	20	31	0	0	0	0	0	0	0	0	6	6	6	0	6	0	18	6				
3	23	52	1	3/06/88	33	41	36	37	38	39	40	42	44	4	1	1	0	0	0	0	6	0				
3	23	53	3	3/07/88	31	40	0	0	0	0	0	0	0	1	8	7	17	7	0	6	33	13				
3	23	54	2	3/09/88	24	35	27	28	29	30	32	35	37	0	1	8	8	4	6	0	17	10				
3	23	55	1	3/10/88	32	38	33	35	35	36	38	40	41	4	2	1	7	0	0	0	14	0				
3	23	56	3	3/11/88	31	34	33	34	35	36	38	39	41	1	8	7	16	6	6	6	32	18				
3	23	57	2	3/13/88	8	14	9	11	12	13	16	18	21	0	10	14	19	10	4	0	43	14				
3	23	58	1	3/14/88	8	9	11	13	15	16	19	20	22	6	10	8	7	7	1	0	31	8				
3	23	59	3	3/15/88	12	22	18	20	21	22	24	27	29	5	14	2	1	6	7	0	22	13				
3	23	60	2	3/19/88	17	27	24	25	28	28	28	28	29	0	6	21	4	4	6	27	14					
3	23	61	1	3/20/88	11	17	12	13	13	14	15	16	18	6	2	8	12	0	0	28	0					
3	23	62	3	3/21/88	10	15	11	13	14	16	17	19	20	5	8	8	7	7	13	6	28	26				
3	23	63	2	3/22/88	24	34	0	0	0	0	0	0	0	2	13	10	13	10	4	0	38	14				
3	23	64	1	3/23/88	30	35	30	31	31	32	33	34	35	4	26	2	7	1	1	0	39	2				
3	23	65	3	3/24/88	23	38	35	36	38	39	40	42	44	0	8	8	1	1	1	1	17	3				
3	23	66	2	3/25/88	32	35	33	36	37	38	39	40	41	0	6	7	11	0	0	6	24	6				
3	23	67	1	3/26/88	15	20	16	17	17	18	18	20	22	4	8	14	8	6	0	6	34	12				
3	23	68	3	3/28/88	29	36	34	35	36	37	38	39	41	1	7	8	7	1	1	1	23	3				
3	23	69	2	3/29/88	21	31	28	30	31	32	33	34	37	0	5	2	12	4	4	0	19	8				
3	23	70	1	3/30/88	21	34	25	28	30	32	35	36	4	26	16	26	6	0	6	72	12					
3	24	51	3	3/05/88	20	32	0	0	0	0	0	0	0	0	25	19	7	0	1	0	51	1				
3	24	52	2	3/06/88	33	41	33	34	35	36	38	39	41	0	24	24	10	12	4	6	58	22				
3	24	53	1	3/07/88	31	40	32	32	33	34	36	37	39	8	52	28	10	4	4	98	12					
3	24	54	3	3/09/88	24	35	0	0	0	0	0	0	0	2	2	4	1	8	0	1	53	1				

SUMMARY OF COLD DEFICITS BY DRIVING CYCLE - BRAINERD

FUEL VEH			DATE	SOAK RUN										TEMPERATURES										DRIVING CYCLE										TOTAL
VEH	RUN	RATER		TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6															
3	24	55	2	3/10/88	32	38	33	35	36	38	39	42	43	4	34	16	8	0	0	0	62	0	62											
3	24	56	1	3/11/88	31	34	31	31	32	33	34	35	37	8	28	34	2	2	2	2	72	6	78											
3	24	57	3	3/13/88	8	14	12	14	15	16	18	19	21	18	32	26	14	8	2	1	90	11	101											
3	24	58	2	3/14/88	8	20	12	14	16	18	20	22	25	18	66	39	8	6	18	10	131	34	165											
3	24	59	1	3/15/88	12	22	15	18	20	21	22	25	26	17	28	28	16	2	2	2	89	6	95											
3	24	60	3	3/19/88	17	27	0	24	26	26	28	29	30	3	38	26	8	2	1	1	75	4	79											
3	24	61	2	3/20/88	11	17	15	16	16	17	17	18	20	5	42	33	10	1	1	1	90	3	93											
3	24	62	1	3/21/88	10	15	8	8	9	10	12	13	25	66	38	32	2	1	1	1	161	4	165											
3	24	63	3	3/22/88	24	34	30	31	32	34	35	37	38	2	34	32	2	2	2	1	70	5	75											
3	24	64	2	3/23/88	30	35	33	34	35	36	37	38	39	4	31	41	9	4	0	6	85	10	95											
3	24	65	1	3/24/88	33	38	34	35	35	36	37	37	38	4	26	76	4	4	2	2	110	8	118											
3	24	66	3	3/25/88	32	35	34	34	34	35	35	36	37	2	34	38	2	2	2	2	76	6	82											
3	24	67	2	3/26/88	15	20	15	17	18	20	21	23	25	12	29	47	11	1	1	5	99	7	106											
3	24	68	1	3/28/88	29	36	34	34	35	35	36	37	39	8	34	64	16	2	2	1	122	5	127											
3	24	69	3	3/29/88	21	31	27	29	29	31	32	34	36	2	28	38	2	2	2	2	70	6	76											
3	24	70	2	3/30/88	21	34	29	32	33	35	36	38	40	4	41	40	16	10	11	1	101	22	123											
3	24	71	1	3/31/88	18	28	0	0	0	0	0	0	0	8	28	26	38	8	2	2	100	12	112											
4	1	54	1	3/09/88	24	37	32	34	37	39	42	44	47	6	16	2	2	1	1	0	26	2	28											
4	2	54	2	3/09/88	24	37	31	35	38	41	45	50	55	0	12	20	45	40	5	16	77	61	138											
4	3	54	3	3/09/88	24	37	35	35	37	39	41	44	46	1	13	1	1	7	0	7	16	14	30											
4	4	54	1	3/09/88	24	37	0	0	0	0	0	0	0	10	80	96	76	28	16	2	262	46	308											
4	5	54	2	3/09/88	24	38	33	33	35	36	38	40	41	3	1	8	4	0	4	0	16	4	20											
4	6	54	3	3/09/88	24	38	35	37	38	40	42	45	48	22	92	92	82	62	38	16	288	116	404											
4	7	54	1	3/09/88	24	38	33	34	36	39	42	47	49	4	28	2	2	2	2	2	36	6	42											
4	8	57	2	3/13/88	8	14	14	14	16	18	19	20	21	56	164	122	85	27	18	8	427	53	480											
4	9	57	3	3/13/88	8	15	15	16	17	19	20	22	24	0	25	12	12	12	0	6	49	18	67											
4	10	57	1	3/13/88	8	14	0	0	0	0	0	0	0	4	1	1	0	0	0	0	6	0	6											
4	11	57	2	3/13/88	8	16	18	16	17	18	20	21	23	6	19	13	8	39	17	11	46	67	113											
4	12	57	3	3/13/88	8	16	18	17	20	21	24	26	30	10	50	42	34	58	48	58	136	164	300											
4	13	57	1	3/13/88	8	16	13	15	17	18	20	23	25	16	16	14	14	14	8	2	60	24	84											
4	14	57	2	3/13/88	8	18	13	14	16	19	22	27	30	0	17	16	10	10	6	10	43	26	69											
4	15	55	3	3/10/88	32	37	35	35	36	36	38	39	41	12	14	32	14	17	8	18	72	43	115											
4	16	55	1	3/10/88	32	37	33	33	34	34	35	36	38	61	92	72	60	10	4	4	285	18	303											
4	17	55	2	3/10/88	32	37	35	36	37	40	41	44	46	0	11	9	14	6	12	1	34	19	53											
4	18	55	3	3/10/88	32	37	35	37	37	38	40	42	44	1	29	54	72	40	22	13	156	75	231											
4	19	55	1	3/10/88	32	37	34	34	35	36	38	40	42	4	2	2	2	1	1	1	10	3	13											
4	20	55	2	3/10/88	32	38	39	40	47	48	60	61	74	55	102	76	52	45	34	28	285	107	392											
4	21	55	3	3/10/88	32	38	37	39	40	42	44	47	50	0	29	19	1	7	6	0	49	13	62											
5	1	61	1	3/20/88	11	16	8	10	13	15	19	21	24	6	40	44	2	2	1	1	92	4	96											
5	1	68	1	3/26/88	29	35	33	35	37	39	41	43	45	8	28	46	2	2	1	7	84	10	94											
5	2	61	2	3/20/88	11	15	13	13	16	18	20	25	28	3	39	11	10	9	4	5	63	18	81											
5	2	68	2	3/28/88	29	35	37	35	38	41	45	48	53	4	26	15	15	9	1	1	60	11	71											
5	3	61	3	3/20/88	11	15	14	15	16	17	19	21	23	21	25	41	25	0	1	6	112	7	119											
5	3	68	3	3/28/88	29	36	35	36	37	38	40	42	44	10	26	31	1	0	0	0	68	0	68											
5	4	61	1	3/20/88	11	16	0	0	0	0	0	0	0	19	36	84	116	86	50	8	255	144	399											
5	4	68	1	3/28/88	29	35	0	0	0	0	0	0	0	9	84	76	78	40	34	10	247	84	331											
5	5	61	2	3/20/88	11	15	12	12	13	14	15	16	17	13	11	8	8	28	8	4	40	40	80											
5	5	68	2	3/28/88	29	36	36	37	38	39	40	42	43	4	37	15	9	5	5	0	65	10	75											
5	6	61	3	3/20/88	11	16	13	14	15	16	18	21	23	23	116	88	116	72	58	38	343	168	511											

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH		RUN RATE	DATE	SOAK RUN										TEMPERATURES										DRIVING CYCLE										TOTAL
5	6	8	3	3/28/88	29	36	36	35	35	36	37	39	41	23	148	100	70	40	40	32	341	112	453											
5	7	61	1	3/20/88	11	16	10	10	12	16	20	24	27	27	52	16	4	13	2	2	99	17	116											
5	7	68	1	3/28/88	29	36	33	33	35	38	42	45	47	6	28	18	2	2	13	7	54	22	76											
5	8	51	2	3/05/88	20	23	0	0	0	0	0	0	0	56	113	83	77	13	27	15	329	55	384											
5	8	68	2	3/28/88	29	36	37	38	39	40	41	43	44	32	86	77	39	13	0	6	234	19	253											
5	9	51	3	3/05/88	20	23	0	0	0	0	0	0	0	0	24	6	4	0	6	12	34	18	52											
5	9	68	3	3/28/88	29	36	34	35	36	37	39	41	43	0	25	13	1	0	0	0	39	0	39											
5	10	51	1	3/05/88	20	24	0	0	0	0	0	0	0	3	1	0	0	0	0	4	0	4												
5	10	68	1	3/28/88	29	0	0	0	0	0	0	0	0	4	1	0	0	0	0	5	0	5												
5	11	51	2	3/05/88	20	25	0	0	0	0	0	0	0	6	37	21	10	4	21	15	74	40	114											
5	11	68	2	3/28/88	29	36	37	37	37	39	40	42	44	3	21	4	4	1	7	1	32	9	41											
5	12	51	3	3/05/88	20	25	0	0	0	0	0	0	0	7	54	34	34	42	48	38	129	128	257											
5	12	68	3	3/28/88	29	36	35	35	36	38	40	44	48	2	36	36	48	48	36	122	132	254												
5	13	51	1	3/05/88	20	27	0	0	0	0	0	0	0	8	14	14	8	8	8	44	24	68												
5	13	68	1	3/28/88	29	36	34	35	36	36	38	41	44	8	4	2	14	14	7	13	28	34	62											
5	14	51	2	3/05/88	20	28	0	0	0	0	0	0	0	11	0	12	5	9	17	12	28	38	66											
5	14	68	2	3/28/88	29	36	36	37	39	41	44	48	51	2	9	21	29	6	8	12	61	26	87											
5	15	58	3	3/14/88	8	10	10	10	11	12	13	15	17	52	46	34	16	32	22	14	148	68	216											
5	15	68	3	3/28/88	29	36	35	35	36	37	38	40	40	20	14	30	14	8	2	2	78	12	90											
5	16	58	1	3/14/88	8	10	6	6	7	7	9	10	12	53	116	92	76	76	16	16	337	108	445											
5	16	68	1	3/28/88	29	36	33	32	32	33	34	35	36	47	84	52	52	22	4	4	235	30	265											
5	17	58	2	3/14/88	8	11	5	6	9	11	14	16	19	2	16	34	22	15	9	4	74	28	102											
5	17	68	2	3/28/88	29	36	0	0	0	0	0	0	0	4	6	18	18	22	14	8	46	44	90											
5	18	58	3	3/14/88	8	12	10	12	14	16	17	19	22	0	20	26	34	20	12	5	80	37	117											
5	18	68	3	3/28/88	29	36	34	36	37	39	41	45	48	1	14	8	2	7	1	1	25	9	34											
5	19	58	1	3/14/88	8	12	8	8	9	9	11	13	15	16	4	4	2	2	1	1	26	4	30											
5	19	68	1	3/28/88	29	36	32	34	34	35	36	38	41	4	2	2	2	1	1	1	10	3	13											
5	20	58	2	3/14/88	8	12	11	14	16	26	23	37	36	49	116	104	94	86	62	62	363	210	573											
5	20	68	2	3/28/88	29	36	37	38	43	46	55	66	70	37	104	68	52	74	44	36	261	154	415											
5	21	58	3	3/14/88	8	13	11	13	16	17	20	20	25	6	28	36	1	1	1	1	71	3	74											
5	21	68	3	3/28/88	29	36	35	36	38	41	44	46	50	0	26	20	2	2	2	1	48	5	53											
6	1	59	1	3/15/88	12	17	12	13	17	19	22	24	27	17	76	74	14	19	1	1	181	21	202											
6	1	63	1	3/22/88	24	32	25	28	30	33	36	38	41	16	76	50	8	1	1	1	150	3	153											
6	2	59	2	3/15/88	12	17	11	13	15	17	19	23	28	6	46	29	9	11	10	8	90	29	119											
6	2	63	2	3/22/88	24	34	0	0	0	0	0	0	0	6	19	8	10	14	4	4	43	22	65											
6	3	59	3	3/15/88	12	18	13	17	17	18	20	22	25	13	58	66	25	31	7	7	162	45	207											
6	3	63	3	3/22/88	24	33	29	30	31	32	34	36	39	10	31	24	12	0	0	0	77	0	77											
6	4	59	1	3/15/88	12	19	0	0	0	0	0	0	0	11	68	116	116	96	58	22	311	176	487											
6	4	63	1	3/22/88	24	34	0	0	0	0	0	0	0	9	84	116	108	84	40	4	317	128	445											
6	5	59	2	3/15/88	12	19	12	12	13	14	15	16	17	10	21	8	24	8	4	8	63	20	83											
6	5	63	2	3/22/88	24	34	0	0	0	0	0	0	0	23	9	0	4	12	6	4	36	22	58											
6	6	59	3	3/15/88	12	19	17	16	19	20	23	25	29	45	156	132	68	92	34	90	401	216	617											
6	6	63	3	3/22/88	24	34	32	33	34	35	37	40	43	22	148	140	68	72	40	28	378	140	518											
6	7	59	1	3/15/88	12	20	13	14	16	19	23	26	29	28	52	40	16	20	2	2	136	24	160											
6	7	63	1	3/22/88	24	34	26	27	29	33	37	40	43	8	50	28	26	2	2	1	112	5	117											
6	8	61	2	3/20/88	11	17	11	20	22	23	25	27	28	94	85	97	80	47	31	47	356	127	483											
6	8	63	2	3/22/88	24	29	26	30	31	33	34	36	38	9	161	67	65	43	32	32	302	107	409											
6	9	61	3	3/20/88	11	17	16	17	17	19	20	22	24	11	32	33	31	22	1	0	107	23	130											
6	9	63	3	3/22/88	24	29	28	29	31	32	34	36	36	2	39	30	13	0	0	4	84	4	88											
6	10	61	1	3/20/88	11	17	0	0	0	0	0	0	0	17	1	0	0	0	0	0	18	0	18											

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH RUN RATE			DATE	SOAK RUN							TEMPERATURES							DRIVING CYCLE							TOTAL			
				TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6	TOTAL								
6	10	63	1	3/22/88	24	29	0	0	0	0	6	33	0	0	0	0	0	39	0	39								
6	11	61	2	3/20/88	11	17	20	22	24	11	76	41	33	26	9	13	161	48	209									
6	11	63	2	3/22/88	24	29	29	31	33	36	38	5	43	48	16	23	13	14	112	50	162							
6	12	61	3	3/20/88	11	17	16	17	20	0	28	33	36	18	68	60	84	132	140	100	230	372	602					
6	12	63	3	3/22/88	24	29	28	30	31	33	35	39	41	10	68	44	64	60	44	60	186	164	350					
6	13	61	1	3/20/88	11	17	14	15	17	19	21	23	25	52	52	38	25	25	25	167	75	242						
6	13	63	1	3/22/88	24	30	25	26	27	29	31	34	36	16	52	28	28	26	26	124	78	202						
6	14	61	2	3/20/88	11	17	16	18	20	22	26	30	34	33	29	6	16	6	12	4	84	22	106					
6	14	63	2	3/22/88	24	32	0	0	0	0	8	16	18	16	5	10	6	58	21	79								
6	15	52	3	3/06/88	33	38	32	33	34	35	37	39	39	13	26	29	12	13	7	13	80	33	113					
6	15	63	3	3/22/88	24	32	29	30	31	32	35	36	38	25	48	32	14	8	7	1	119	16	135					
6	16	52	1	3/06/88	33	38	34	34	35	36	37	39	45	116	68	48	52	40	16	277	108	385						
6	16	63	1	3/22/88	24	32	25	27	27	27	28	30	30	37	92	60	68	60	4	4	257	68	325					
6	17	52	2	3/06/88	33	39	33	34	36	37	39	41	44	3	22	22	10	6	17	11	57	34	91					
6	17	63	2	3/22/88	24	32	0	0	0	0	2	12	8	8	12	14	18	30	44	74	74	74						
6	18	52	3	3/06/88	33	39	32	34	36	38	41	42	46	0	25	70	33	25	23	7	128	55	183					
6	18	63	3	3/22/88	24	32	29	30	32	34	36	38	0	14	12	17	25	7	7	43	39	82						
6	19	52	1	3/06/88	33	39	35	36	36	37	39	41	44	6	8	2	1	1	1	17	3	20						
6	20	52	2	3/06/88	33	40	36	40	44	52	56	62	65	32	128	68	56	54	65	84	284	203	487					
6	20	63	2	3/22/88	24	32	0	0	0	0	37	110	88	70	37	61	73	305	171	476								
6	21	52	3	3/06/88	33	40	33	35	37	39	42	44	48	0	34	38	1	0	1	2	73	3	76					
6	21	63	3	3/22/88	24	32	30	31	33	36	37	41	43	2	34	43	1	1	1	80	3	83						
7	1	53	1	3/07/88	31	33	30	32	35	37	40	42	44	6	16	14	2	1	1	38	3	41						
7	1	69	1	3/29/88	21	30	23	24	27	29	32	35	36	8	28	32	26	7	1	1	94	9	103					
7	2	53	2	3/07/88	31	33	29	31	33	36	38	42	48	0	4	4	14	11	10	12	35	47						
7	2	69	2	3/29/88	21	30	22	25	27	30	32	35	39	1	17	19	25	9	11	9	62	29	91					
7	3	53	3	3/07/88	31	35	33	34	35	36	38	39	41	3	13	6	0	6	0	22	12	34						
7	3	69	3	3/29/88	21	30	26	27	28	29	30	32	33	11	25	19	0	0	0	55	0	55						
7	4	53	1	3/07/88	31	35	0	0	0	0	9	80	90	96	32	0	0	275	32	307								
7	4	69	1	3/29/88	21	30	0	0	0	0	18	72	96	100	64	16	4	286	84	370								
7	5	53	2	3/07/88	31	36	30	31	32	33	34	36	38	1	12	4	12	0	0	29	0	29						
7	5	69	2	3/29/88	21	30	23	24	25	26	27	28	31	2	21	17	13	5	8	53	26	79						
7	6	53	3	3/07/88	31	37	34	35	35	37	38	41	42	20	106	106	90	34	32	28	322	94	416					
7	6	69	3	3/29/88	21	30	27	28	29	30	32	34	36	23	92	108	58	34	4	14	281	52	333					
7	7	53	1	3/07/88	31	36	30	32	34	37	41	45	47	4	4	4	2	2	2	16	6	22						
7	7	69	1	3/29/88	21	30	24	25	27	29	33	36	39	9	34	16	8	2	7	1	67	10	77					
7	8	59	2	3/15/88	12	21	14	16	17	19	21	22	24	48	125	29	31	12	18	8	233	38	271					
7	8	69	2	3/29/88	21	31	24	28	30	33	35	38	41	18	110	51	37	13	14	8	216	35	251					
7	9	59	3	3/15/88	12	22	18	19	20	21	20	26	28	1	41	6	0	6	1	0	48	7	55					
7	9	69	3	3/29/88	21	31	29	29	31	32	33	35	38	0	13	0	0	0	0	13	0	13						
7	10	59	1	3/15/88	12	22	0	0	0	0	4	1	0	0	0	0	0	0	0	5	0	5						
7	10	69	1	3/29/88	21	31	0	0	0	0	4	2	0	0	0	0	0	0	0	6	0	6						
7	11	59	2	3/15/88	12	22	16	16	18	19	22	24	27	3	15	21	4	8	17	16	43	41	84					
7	11	69	2	3/29/88	21	31	30	29	30	31	34	35	37	2	21	33	8	5	8	9	64	22	86					
7	12	59	3	3/15/88	12	22	20	20	23	25	29	32	36	9	40	36	36	60	60	48	121	168	289					
7	12	69	3	3/29/88	21	31	27	28	31	33	35	38	41	26	68	44	36	52	72	48	174	172	346					
7	13	59	1	3/15/88	12	22	18	17	18	20	22	25	28	8	4	4	4	10	2	2	20	14	34					
7	13	69	1	3/29/88	21	31	27	28	29	30	32	34	37	8	16	16	16	28	26	14	56	68	124					
7	14	69	2	3/29/88	21	31	27	29	31	33	38	40	45	0	5	18	14	6	2	6	37	14	51					
7	15	57	3	3/13/88	8	20	17	18	20	21	22	24	26	5	14	12	12	6	6	0	43	12	55					

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH RUN RATER				DATE	TEMPERATURES							DRIVING CYCLE											TOTAL
				SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6		
7	15	69	3	3/29/88	21	31	28	28	29	29	31	33	35	14	28	28	10	8	8	2	80	18	98
7	16	57	1	3/13/88	8	20	14	15	16	17	18	19	20	45	116	66	28	52	10	10	255	72	327
7	16	69	1	3/29/88	21	31	25	25	26	27	27	28	30	70	116	64	52	4	4	4	302	12	314
7	17	57	2	3/13/88	8	20	16	16	18	20	23	24	27	0	19	16	12	10	8	8	47	26	73
7	17	69	2	3/29/88	21	31	0	0	0	0	0	0	0	2	23	17	10	12	10	10	52	32	84
7	18	57	3	3/13/88	8	20	18	20	22	23	24	27	31	0	1	0	11	16	16	6	12	38	50
7	18	69	3	3/29/88	21	31	28	29	30	31	34	36	37	2	14	10	1	5	5	9	27	19	46
7	19	57	1	3/13/88	8	22	18	18	19	20	22	23	26	6	2	2	2	2	1	12	5	17	1
7	19	69	1	3/29/88	21	31	26	27	27	28	30	32	34	4	2	2	1	1	0	0	9	1	10
7	20	57	2	3/13/88	8	22	23	28	27	35	38	52	52	34	120	116	78	66	42	32	348	140	488
7	20	69	2	3/29/88	21	31	26	27	35	39	49	50	60	34	92	72	68	66	36	23	266	125	391
7	21	57	3	3/13/88	8	22	18	19	23	25	28	30	32	0	14	13	1	0	0	7	28	7	35
7	21	69	3	3/29/88	21	31	29	30	31	33	36	38	40	2	14	20	2	2	2	2	38	6	44
8	1	56	1	3/11/88	31	34	32	33	36	38	40	43	45	8	28	2	2	2	2	1	40	5	45
8	2	56	2	3/11/88	31	34	30	31	34	36	40	43	48	0	10	6	14	40	10	10	30	60	90
8	3	56	3	3/11/88	31	34	34	34	34	35	36	38	40	2	25	50	7	7	0	0	84	7	91
8	4	56	1	3/11/88	31	34	0	0	0	0	0	0	0	10	68	116	76	34	4	36	270	74	344
8	5	56	2	3/11/88	31	35	30	31	32	33	34	36	38	4	4	5	5	11	5	0	18	16	34
8	6	56	3	3/11/88	31	35	33	33	34	34	36	38	40	20	148	124	108	70	40	28	400	138	538
8	7	56	1	3/11/88	31	35	31	31	33	36	39	42	44	4	10	2	2	2	2	2	18	6	24
8	8	54	2	3/09/88	24	36	29	30	31	32	34	35	37	48	136	110	28	25	17	5	322	47	369
8	9	54	3	3/09/88	24	36	0	0	0	0	0	0	0	1	25	13	0	4	0	0	39	4	43
8	10	54	1	3/09/88	24	36	0	0	0	0	0	0	0	4	1	0	0	0	0	0	5	0	5
8	11	54	2	3/09/88	24	36	11	31	32	33	35	37	40	2	36	14	10	4	0	12	62	16	78
8	12	54	3	3/09/88	24	36	0	0	0	0	0	0	0	8	62	34	48	58	48	36	152	142	294
8	13	54	1	3/09/88	24	36	30	30	31	33	36	39	42	8	16	10	2	2	7	7	36	16	52
8	14	54	2	3/09/88	24	36	31	32	34	36	40	45	49	0	17	6	10	4	8	8	33	20	53
8	15	61	3	3/20/88	11	17	14	14	15	16	18	20	23	56	28	30	14	17	14	2	128	33	161
8	16	61	1	3/20/88	11	17	11	10	10	11	12	13	14	53	92	60	36	36	16	4	241	56	297
8	17	61	2	3/20/88	11	17	0	0	0	0	0	0	0	2	14	20	10	10	22	6	46	38	84
8	18	61	3	3/20/88	11	17	15	16	16	18	20	22	24	1	2	8	18	7	11	13	29	31	60
8	19	61	1	3/20/88	11	17	11	12	14	16	19	22	24	8	2	2	2	2	1	1	14	4	18
8	20	61	2	3/20/88	11	17	11	15	21	28	35	46	48	44	100	70	68	88	62	44	282	194	476
8	21	61	3	3/20/88	11	17	14	17	19	22	25	28	30	6	28	26	2	2	2	2	62	6	68
9	1	60	1	3/19/88	17	25	20	22	25	28	31	33	36	16	40	50	14	1	1	1	120	3	123
9	1	67	1	3/26/88	15	21	16	16	18	20	23	26	28	16	52	52	38	2	2	1	158	5	163
9	2	60	2	3/19/88	17	26	22	25	28	31	34	38	44	19	19	8	20	12	5	6	66	23	89
9	2	67	2	3/26/88	15	21	15	19	20	23	24	28	33	4	18	19	5	9	5	4	46	18	64
9	3	60	3	3/19/88	17	26	24	25	26	28	29	30	32	11	50	43	7	0	0	0	111	0	111
9	3	67	3	3/26/88	15	21	18	18	20	20	22	23	25	11	49	80	30	6	0	0	170	6	176
9	4	60	1	3/19/88	17	26	0	0	0	0	0	0	0	12	92	104	106	88	10	16	314	114	428
9	4	67	1	3/26/88	15	21	0	0	0	0	0	0	0	10	74	84	108	76	40	34	276	150	426
9	5	60	2	3/19/88	17	27	25	26	26	27	28	29	31	22	19	10	8	4	8	4	59	16	75
9	5	67	2	3/26/88	15	21	16	16	19	20	21	22	24	23	15	15	9	14	28	8	62	50	112
9	6	60	3	3/19/88	17	27	25	27	28	29	30	32	34	23	148	108	72	58	52	52	351	162	513
9	6	67	3	3/26/88	15	21	19	19	20	21	24	25	28	25	140	124	100	84	32	40	389	156	545
9	7	60	1	3/19/88	17	27	21	22	23	27	32	35	39	16	52	16	2	8	2	2	86	12	98
9	7	67	1	3/26/88	15	20	14	15	16	19	23	25	28	18	60	28	4	4	2	2	110	8	118
9	8	62	2	3/21/88	10	22	21	23	24	25	27	30	31	27	153	81	57	34	14	26	318	94	412

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

TEMPERATURES											DRIVING CYCLE										TOTAL	
FUEL VEH RUN RATER	DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6	TOTAL		
9 8 67	2	3/26/88	15	20	18	20	21	22	23	24	25	33	154	86	58	41	41	29	331	111	442	
9 9 62	3	3/21/88	10	24	20	21	23	25	27	29	31	1	33	25	0	0	0	0	59	0	59	
9 9 67	3	3/26/88	15	20	19	20	20	21	23	25	27	1	28	24	12	0	0	0	65	0	65	
9 10 62	1	3/21/88	10	24	0	0	0	0	0	0	0	15	1	0	0	0	0	16	0	16		
9 10 67	1	3/26/88	15	20	0	0	0	0	0	0	0	5	33	0	0	0	0	38	0	38		
9 11 62	2	3/21/88	10	24	22	22	24	25	27	29	31	6	69	29	21	12	4	16	125	32	157	
9 11 67	2	3/26/88	15	20	18	19	20	21	23	24	27	4	69	21	32	15	8	14	126	37	163	
9 12 62	3	3/21/88	10	24	0	23	25	0	30	34	39	13	48	84	60	64	100	68	205	232	437	
9 12 67	3	3/26/88	15	20	19	19	21	22	25	27	30	40	60	44	68	84	42	60	212	186	398	
9 13 62	1	3/21/88	10	24	18	19	20	23	25	28	30	16	2	26	14	2	13	7	58	22	80	
9 13 67	1	3/26/88	15	20	17	17	18	19	20	22	25	16	52	32	26	26	26	126	78	204		
9 14 62	2	3/21/88	10	24	20	22	26	28	33	38	41	12	12	8	9	4	0	8	41	12	53	
9 14 67	2	3/26/88	15	20	19	20	22	25	28	32	35	6	11	9	12	6	2	10	38	18	56	
9 15 51	3	3/05/88	20	28	0	0	0	0	0	0	0	13	34	18	13	7	7	78	21	99		
9 15 67	3	3/26/88	15	20	20	20	21	22	23	25	27	38	52	30	14	8	2	8	134	18	152	
9 16 51	1	3/05/88	20	28	0	0	0	0	0	0	0	69	84	92	68	10	4	4	313	18	331	
9 16 67	1	3/26/88	15	20	15	15	15	16	17	18	18	61	116	90	80	52	10	4	347	66	413	
9 17 51	2	3/05/88	20	29	0	0	0	0	0	0	0	2	12	13	14	12	18	2	41	32	73	
9 17 67	2	3/26/88	15	20	0	0	0	0	0	0	0	2	22	6	6	18	8	36	34	70		
9 18 51	3	3/05/88	20	29	0	0	0	0	0	0	0	1	22	20	29	28	17	1	72	46	118	
9 18 67	3	3/26/88	15	20	20	21	22	24	25	26	29	2	20	20	17	1	7	1	59	9	68	
9 19 51	1	3/05/88	20	30	0	0	0	0	0	0	0	6	4	4	4	2	2	18	8	26	42	
9 19 67	1	3/26/88	15	20	16	16	16	17	19	20	23	9	2	26	2	1	1	1	39	3	42	
9 20 51	2	3/05/88	20	30	0	0	0	0	0	0	0	41	116	76	56	74	53	56	289	183	472	
9 20 67	2	3/26/88	15	20	18	21	27	32	30	43	0	50	102	66	86	88	67	92	304	247	551	
9 21 51	3	3/05/88	20	30	0	0	0	0	0	0	0	0	25	37	8	0	1	1	70	2	72	
9 21 67	3	3/26/88	15	20	19	21	27	24	26	28	32	28	28	32	8	2	2	96	6	102		
10 1 52	1	3/06/88	33	39	36	37	40	43	46	48	50	6	28	14	1	1	1	1	49	3	52	
10 1 65	1	3/24/88	33	37	35	35	37	39	41	43	45	4	34	14	2	2	1	1	54	4	58	
10 2 52	2	3/06/88	33	40	33	35	37	38	41	44	47	0	0	8	6	6	4	14	16	30	30	
10 2 65	2	3/24/88	33	37	33	36	37	40	42	48	52	3	15	11	9	8	6	7	38	21	59	
10 3 52	3	3/06/88	33	40	0	0	0	0	0	0	0	2	13	1	6	0	0	0	22	0	22	
10 3 65	3	3/24/88	33	37	36	36	37	38	40	42	43	12	13	7	1	0	0	0	33	0	33	
10 4 52	1	3/06/88	0	0	0	0	0	0	0	0	0	17	32	0	0	0	0	0	49	0	49	
10 4 65	1	3/24/88	33	37	0	0	0	0	0	0	0	9	60	60	64	4	4	4	193	12	205	
10 5 52	2	3/06/88	33	40	34	35	36	37	38	39	41	0	8	8	14	0	0	6	30	6	36	
10 5 65	2	3/24/88	33	37	35	36	37	38	40	41	43	1	13	10	6	8	9	13	30	30	60	
10 6 52	3	3/06/88	33	40	34	35	36	37	39	41	44	20	124	80	46	26	28	28	270	82	352	
10 6 65	3	3/24/88	33	37	36	36	37	38	39	41	43	25	40	52	84	34	28	16	201	78	279	
10 7 52	1	3/06/88	33	40	37	38	39	42	45	49	52	4	4	4	10	2	2	2	22	6	28	
10 7 65	1	3/24/88	33	37	34	34	36	39	41	44	47	6	10	4	8	2	2	1	28	5	33	
10 8 56	2	3/11/88	31	35	31	31	31	33	33	35	35	40	106	35	19	6	4	6	200	16	216	
10 8 65	2	3/24/88	33	37	37	37	37	38	39	41	43	44	3	88	35	27	14	8	0	153	22	175
10 9 56	3	3/11/88	31	35	33	33	34	35	36	38	39	1	12	1	0	0	0	0	14	0	14	
10 9 65	3	3/24/88	33	37	36	36	38	39	40	42	45	1	6	0	0	0	0	0	7	0	7	
10 10 56	1	3/11/88	31	35	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	3	
10 10 65	1	3/24/88	33	37	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6	0	6	
10 11 56	2	3/11/88	31	35	30	31	31	33	35	37	39	4	10	4	16	16	17	22	34	55	89	
10 11 65	2	3/24/88	33	37	37	38	39	40	42	44	45	5	13	13	14	5	15	9	45	29	74	
10 12 56	3	3/11/88	31	35	33	33	34	36	38	42	44	9	36	36	36	48	28	115	122	237		

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FILE#	L	VEH	RUN	RATER	DATE	SOAK RUN							TEMPERATURES							DRIVING CYCLE							TOTAL
						TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4	5	6	0->3	4->6						
10	12	65	3	3/24/88	33	38	35	36	37	39	41	43	46	17	52	28	28	36	60	32	125	128	253				
10	13	56	1	3/11/88	31	35	32	32	33	34	35	38	39	8	4	4	2	2	1	2	18	5	23				
10	13	65	1	3/24/88	33	38	34	35	36	38	39	42	44	8	14	2	2	1	7	1	26	9	35				
10	14	56	2	3/11/88	31	35	31	31	32	35	37	41	44	0	4	14	6	2	6	12	24	20	44				
10	14	65	2	3/24/88	33	38	37	38	39	42	44	48	51	2	5	10	12	6	15	1	29	22	51				
10	15	60	3	3/19/88	17	26	0	24	25	26	28	30	32	4	32	28	20	14	14	8	84	36	120				
10	15	65	3	3/24/88	33	38	35	36	37	38	39	41	43	4	4	20	16	2	10	10	44	22	66				
10	16	60	1	3/19/88	17	26	22	22	22	23	24	25	26	53	72	56	64	4	4	4	245	12	257				
10	16	65	1	3/24/88	33	38	34	35	35	36	37	38	39	45	48	34	28	4	4	4	155	12	167				
10	17	60	2	3/19/88	17	26	0	0	0	0	0	0	0	4	38	14	18	20	12	16	74	48	122				
10	17	65	2	3/24/88	33	38	0	0	0	0	0	0	0	2	24	10	20	22	8	14	56	44	100				
10	18	60	3	3/19/88	17	26	25	26	27	28	29	32	33	0	2	14	25	8	46	1	41	55	96				
10	18	65	3	3/24/88	33	38	35	37	39	40	42	45	45	0	14	2	1	0	1	7	17	8	25				
10	19	60	1	3/19/88	17	26	22	22	23	24	26	28	31	4	4	2	2	2	1	1	12	4	16				
10	19	65	1	3/24/88	33	38	35	35	35	36	37	39	40	6	2	2	2	1	1	1	12	3	15				
10	20	60	2	3/19/88	17	26	23	27	30	37	39	52	56	18	112	88	86	42	29	33	304	104	408				
10	20	65	2	3/24/88	33	38	38	40	46	48	56	61	71	46	76	54	50	38	21	11	226	70	296				
10	21	60	3	3/19/88	17	26	25	25	28	30	32	33	37	0	13	19	1	1	1	1	33	3	36				
10	21	65	3	3/24/88	33	38	36	38	39	41	43	46	47	0	14	2	2	2	2	1	18	5	23				
11	1	55	1	3/10/88	32	33	32	33	35	38	40	43	45	6	22	14	2	2	2	2	44	6	50				
11	1	71	1	3/31/88	18	26	0	0	0	0	0	0	0	8	52	38	26	7	1	1	124	9	133				
11	2	55	2	3/10/88	32	33	32	34	36	39	41	45	49	1	18	17	11	11	9	16	47	36	83				
11	2	71	2	3/31/88	18	28	25	28	29	32	36	40	44	0	5	15	14	14	0	8	34	22	56				
11	3	55	3	3/10/88	32	33	35	35	35	37	38	40	42	1	24	24	1	1	0	0	50	1	51				
11	3	71	3	3/31/88	18	28	25	26	26	27	29	30	32	10	24	24	1	1	0	0	59	1	60				
11	4	55	1	3/10/88	32	35	0	0	0	0	0	0	0	10	72	104	84	40	4	4	270	48	318				
11	4	71	1	3/31/88	18	26	0	0	0	0	0	0	0	10	60	108	116	76	76	40	294	192	486				
11	5	55	2	3/10/88	32	35	32	33	34	35	36	37	39	5	13	5	8	4	4	4	31	16	47				
11	5	71	2	3/31/88	18	28	25	26	27	28	30	32	34	2	8	8	5	15	5	0	23	20	43				
11	6	55	3	3/10/88	32	35	34	35	35	36	38	40	41	14	148	104	114	34	34	28	380	96	476				
11	6	71	3	3/31/88	18	28	25	25	27	28	30	32	34	25	156	120	88	50	22	26	389	98	487				
11	7	55	1	3/10/88	32	36	32	33	35	38	43	47	50	12	2	2	8	2	2	2	24	6	30				
11	7	71	1	3/31/88	18	27	0	0	0	0	0	0	0	21	28	4	14	26	2	13	67	41	108				
11	8	53	2	3/07/88	31	38	30	31	32	33	34	36	37	56	130	44	42	10	8	12	272	30	302				
11	8	71	2	3/31/88	18	27	21	25	26	28	30	32	33	20	146	78	46	15	17	5	290	37	327				
11	9	53	3	3/07/88	31	38	34	35	36	36	36	38	38	1	12	0	0	6	1	0	13	7	20				
11	9	71	3	3/31/88	18	24	21	21	23	24	26	29	32	1	30	0	0	0	0	0	31	0	31				
11	10	53	1	3/07/88	31	38	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4	0	4				
11	10	71	1	3/31/88	18	25	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6	0	6				
11	11	53	2	3/07/88	31	38	30	31	32	34	35	38	39	1	28	8	4	4	12	12	41	28	69				
11	11	71	2	3/31/88	18	24	19	21	23	25	28	29	31	2	41	20	16	8	13	12	79	33	112				
11	12	53	3	3/07/88	31	39	36	38	38	38	41	41	42	7	34	34	36	48	42	42	111	132	243				
11	12	71	3	3/31/88	18	27	24	25	26	28	32	34	37	44	68	44	44	68	52	68	200	188	388				
11	13	53	1	3/07/88	31	39	32	32	33	35	37	40	42	8	4	4	2	2	2	2	18	6	24				
11	13	71	1	3/31/88	18	26	0	0	0	0	0	0	0	8	28	28	26	26	26	26	90	78	168				
11	14	53	2	3/07/88	31	39	32	32	34	36	39	42	46	0	4	9	2	2	2	1	15	5	20				
11	14	71	2	3/31/88	18	25	22	23	26	28	32	36	40	3	5	6	18	6	6	6	12	18	50				
11	15	62	3	3/21/88	10	15	15	16	16	18	19	22	24	50	28	32	28	22	8	14	138	44	182				
11	15	71	3	3/31/88	18	26	26	26	26	26	26	26	30	21	28	28	26	14	20	14	101	48	151				
11	16	62	1	3/21/88	10	15	8	9	9	10	12	14	15	61	140	96	76	52	22	4	173	78	451				

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL	VEH	RUN	RATER	DATE	TEMPERATURES							DRIVING CYCLE							TOTAL					
					SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	0	1	2	3	4		5	6	0->3	4->6	
11	16	71	1	3/31/88	18	24	0	0	0	0	0	0	0	0	72	116	84	28	28	4	4	300	36	336
11	17	62	2	3/21/88	10	17	0	0	0	0	0	0	0	0	4	16	6	14	10	6	6	40	22	62
11	17	71	2	3/31/88	18	26	0	0	0	0	0	0	0	0	2	24	14	10	16	14	10	50	40	90
11	18	62	3	3/21/88	10	20	15	18	18	20	23	24	26	2	8	14	18	14	14	1	4	29	71	141
11	18	71	3	3/31/88	18	25	25	25	26	27	29	35	34	2	14	20	20	14	8	11	56	33	89	248
11	19	62	1	3/21/88	10	20	9	10	12	14	16	18	21	6	2	2	2	1	1	1	12	3	15	25
11	19	71	1	3/31/88	18	25	0	0	0	0	0	0	0	16	2	2	2	1	1	1	22	3	25	148
11	20	62	2	3/21/88	10	17	20	23	29	33	42	45	54	50	98	96	56	74	40	34	300	148	448	
11	20	71	2	3/31/88	18	26	27	27	31	40	44	57	59	46	114	94	44	76	64	54	298	194	492	
11	21	62	3	3/21/88	10	20	17	19	21	24	26	30	32	5	28	38	2	7	2	2	73	11	84	
11	21	71	3	3/31/88	18	26	26	27	29	31	34	35	39	2	26	26	2	2	2	2	56	6	12	
11	23	71	3	3/31/88	18	28	28	28	29	29	32	34	36	3	2	11	7	1	1	0	23	2	25	
12	1	58	1	3/14/88	8	16	11	12	15	17	20	22	24	22	28	38	8	2	1	1	96	4	100	
12	1	66	1	3/25/88	32	36	36	38	40	42	45	47	48	14	40	26	2	2	1	7	82	10	92	
12	2	58	2	3/14/88	8	19	10	12	14	17	19	22	27	7	42	15	12	7	5	17	76	29	105	
12	2	66	2	3/25/88	32	35	37	38	39	41	42	46	49	2	5	11	4	0	1	5	22	6	28	
12	3	58	3	3/14/88	8	18	16	16	18	19	21	23	25	11	26	31	37	14	1	0	105	15	120	
12	3	66	3	3/25/88	32	36	33	34	34	35	36	37	39	10	25	49	7	0	0	0	91	0	91	
12	4	58	1	3/14/88	8	18	0	0	0	0	0	0	0	11	100	116	116	88	40	16	343	144	487	
12	4	66	1	3/25/88	32	36	0	0	0	0	0	0	0	10	60	90	88	58	10	4	248	72	320	
12	5	58	2	3/14/88	8	19	11	11	12	13	14	15	17	19	13	8	4	9	4	12	44	25	69	
12	5	66	2	3/25/88	32	35	34	35	35	36	37	38	40	14	6	10	0	0	0	0	30	0	30	
12	6	58	3	3/14/88	8	19	13	13	16	17	20	22	25	31	148	180	96	92	84	56	455	232	687	
12	6	66	3	3/25/88	32	35	34	34	34	34	35	36	38	24	140	132	84	52	28	28	380	108	488	
12	7	58	1	3/14/88	8	19	11	12	14	18	21	25	28	24	60	10	4	16	8	2	98	26	124	
12	7	66	1	3/25/88	32	36	35	35	37	39	42	44	46	8	4	16	8	14	2	1	36	17	53	
12	8	60	2	3/19/88	17	25	0	22	23	24	25	26	27	38	146	118	53	49	30	20	355	99	454	
12	8	66	2	3/25/88	32	36	35	37	38	38	40	41	42	2	94	61	49	22	8	6	206	36	242	
12	9	60	3	3/19/88	17	25	0	25	25	27	28	30	32	0	30	31	7	7	0	1	68	8	76	
12	9	66	3	3/25/88	32	36	33	33	33	34	35	36	38	1	25	13	6	1	0	0	45	1	46	
12	10	60	1	3/19/88	17	25	0	0	0	0	0	0	0	4	1	0	0	0	0	0	5	0	5	
12	10	66	1	3/25/88	32	36	0	0	0	0	0	0	0	4	25	0	0	0	0	0	29	0	29	
12	11	60	2	3/19/88	17	25	24	26	26	27	29	31	32	4	106	49	20	13	23	22	179	58	237	
12	11	66	2	3/25/88	32	35	37	37	38	38	39	40	42	7	42	27	15	25	12	12	91	49	140	
12	12	60	3	3/19/88	17	25	0	26	27	29	34	36	42	9	36	92	104	92	140	114	241	346	587	
12	12	66	3	3/25/88	32	36	33	33	34	35	36	38	41	33	52	60	52	92	80	60	197	232	429	
12	13	60	1	3/19/88	17	25	21	21	23	24	27	29	31	8	28	56	14	28	26	26	106	80	186	
12	13	66	1	3/25/88	32	36	37	37	37	38	40	41	44	4	28	26	28	26	26	26	90	78	168	
12	14	60	2	3/19/88	17	26	25	25	26	28	30	33	36	6	20	20	18	16	8	8	64	32	96	
12	14	66	2	3/25/88	32	35	36	37	40	41	44	46	49	3	6	6	4	5	7	5	19	17	36	
12	15	54	3	3/09/88	24	36	0	0	0	0	0	0	0	12	32	32	32	20	7	8	2	96	17	113
12	15	66	3	3/25/88	32	35	33	33	33	33	34	35	37	12	28	32	14	14	8	8	86	30	116	
12	16	54	1	3/09/88	24	37	30	31	32	33	34	36	36	45	124	80	68	92	76	28	317	196	513	
12	16	66	1	3/25/88	32	35	35	36	36	36	37	38	38	37	48	84	52	4	4	4	221	12	233	
12	17	54	2	3/09/88	24	37	31	32	35	38	40	44	46	0	10	2	14	8	2	10	26	20	46	
12	17	66	2	3/25/88	32	35	0	0	0	0	0	0	0	1	8	12	6	2	2	6	27	10	37	
12	18	54	3	3/09/88	24	37	0	0	0	0	0	0	0	1	32	37	51	19	17	19	121	55	176	
12	18	66	3	3/25/88	32	35	33	34	34	37	36	40	40	1	26	4	1	7	1	0	32	8	40	
12	19	54	1	3/09/88	24	37	32	31	32	33	36	38	41	4	14	25	1	1	1	1	44	3	47	
12	19	66	1	3/25/88	32	35	16	16	16	17	18	19	20	8	4	2	2	2	2	2	16	6	22	

SUMMARY OF COLD DEMERITS BY DRIVING CYCLE - BRAINERD

FUEL VEH RUN RATE		DATE	SOAK	RUN	TNK1	TNK2	TNK3	TNK4	TNK5	TNK6	TNK7	DRIVING CYCLE										TOTAL	
												0	1	2	3	4	5	6	0->3	4->6			
12	20	54	2	3/09/88	24	37	37	45	50	58	65	74	76	48	128	80	74	82	67	49	330	198	528
12	20	66	2	3/25/88	32	35	35	35	42	43	55	55	66	42	64	76	74	49	67	43	256	159	415
12	21	54	3	3/09/88	24	37	32	36	38	40	44	47	50	1	26	24	0	1	0	0	51	1	52
12	21	66	3	3/25/88	32	35	33	34	36	37	38	40	43	1	26	26	2	2	2	2	55	6	61

APPENDIX H

SAS PROGRAM, CODE, AND OUTPUT

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
VEHGRP	4	NEWCARB NEWPFI NEWTBI OLDCARB
SITE	2	BRAINERD DENVER
VEHICLE	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
OXY	4	ETOH ETOH_S HC MTBE
VOLATIL	3	0 1 2

NUMBER OF OBSERVATIONS IN DATA SET = 938

NOTE: ALL DEPENDENT VARIABLES ARE CONSISTENT WITH RESPECT TO THE
PRESENCE OR ABSENCE OF MISSING VALUES. HOWEVER,
ONLY 937 OBSERVATIONS CAN BE USED IN THIS ANALYSIS.

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DEPENDENT VARIABLE: SORTCOLD

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	90	27695.64249005	307.72936100	131.16
ERROR	846	1984.84466517	2.34615209	PR > F
CORRECTED TOTAL	936	29680.48715523		0.0001

R-SQUARE	C.V.	ROOT MSE	SORTCOLD MEAN
0.933126	13.4028	1.53171541	11.42836307

SOURCE	DF	TYPE IV SS	F VALUE	PR > F
RUNTEMP	1	456.59185143	194.61	0.0001
RUNTEMP*VEHGRP	3	39.57982910	5.62	0.0008
VEHICLE(VEHGRP)	17	2532.26261962	63.49	0.0001
SITE	1	18.17499910	7.75	0.0055
SITE*VEHICLE(VEHGRP)	20	481.51019018	10.26	0.0001
OXY	3	180.86151943	25.70	0.0001
VOLATIL	2	1051.99696983	224.20	0.0001
VEHIC*VOLAT(VEHGR)	40	325.46445954	3.47	0.0001
VEHGRP	3	20521.71395802	2915.66	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	21.12692283 B	45.58	0.0001	0.46354602
RUNTEMP	-0.12919879 B	-10.73	0.0001	0.01204046
RUNTEMP*VEHGRP				
NEWCARB	0.03326254 B	1.86	0.0634	0.01789142
NEWPFI	0.06815899 B	3.89	0.0001	0.01751563
NEWTBI	0.05165611 B	2.94	0.0034	0.01758040
OLDCARB	0.00000000 B			
VEHICLE(VEHGRP)				
3 NEWCARB	-10.02296075 B	-15.72	0.0001	0.63742224
7 NEWCARB	-7.08243994 B	-10.83	0.0001	0.65370384
11 NEWCARB	-7.70199818 B	-12.09	0.0001	0.63684093
15 NEWCARB	-9.80374995 B	-15.32	0.0001	0.64011285
19 NEWCARB	-11.78008713 B	-18.27	0.0001	0.64491734
2 NEWPFI	-11.52537962 B	-18.09	0.0001	0.63713664

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SORTCOLD

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
5 NEWPFI	-12.03601057 B	-18.89	0.0001	0.63712568
10 NEWPFI	-17.12484731 B	-26.84	0.0001	0.63811045
14 NEWPFI	-11.68821245 B	-18.34	0.0001	0.63722766
18 NEWPFI	-13.41432374 B	-20.92	0.0001	0.64136198
1 NEWTBI	-9.83590175 B	-15.45	0.0001	0.63675905
9 NEWTBI	-11.75206288 B	-18.46	0.0001	0.63675719
13 NEWTBI	-9.00633040 B	-14.14	0.0001	0.63681960
17 NEWTBI	-12.40244366 B	-19.32	0.0001	0.64178874
21 NEWTBI	-9.65161158 B	-14.98	0.0001	0.64421157
4 OLDCARB	-1.10527353 B	-1.74	0.0824	0.63568092
6 OLDCARB	3.58490363 B	5.66	0.0001	0.63391982
8 OLDCARB	-1.20244066 B	-1.89	0.0595	0.63728722
12 OLDCARB	-2.36410222 B	-3.72	0.0002	0.63619043
16 OLDCARB	-0.96361998 B	-1.53	0.1273	0.63140425
20 OLDCARB	0.00000000 B			
BRAINERD	1.68806596 B	3.68	0.0002	0.45868965
DENVER	0.00000000 B			
BRAINERD 3 NEWCARB	-2.23024129 B	-3.44	0.0006	0.64881797
BRAINERD 7 NEWCARB	-5.63170665 B	-8.59	0.0001	0.65564327
BRAINERD 11 NEWCARB	-2.32539086 B	-3.58	0.0004	0.64889144
BRAINERD 15 NEWCARB	-0.89121060 B	-1.37	0.1702	0.64916763
BRAINERD 19 NEWCARB	-4.69606309 B	-7.19	0.0001	0.65280530
DENVER 3 NEWCARB	0.00000000 B			
DENVER 7 NEWCARB	0.00000000 B			
DENVER 11 NEWCARB	0.00000000 B			

SITE

SITE*VEHICLE(VEHGRP)

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM

H-4

DENVER	0.0000000 B	.	.	.
15 NEWCARB	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
19 NEWCARB	0.0000000 B	.	.	.
BRAINERD 2 NEWPFI	-2.13083404 B	-3.28	0.0011	0.64876153
BRAINERD 5 NEWPFI	-2.34249516 B	-3.61	0.0003	0.64919855
BRAINERD 10 NEWPFI	-1.21009156 B	-1.85	0.0647	0.65413508
BRAINERD 14 NEWPFI	-2.38221435 B	-3.67	0.0003	0.64882034
BRAINERD 18 NEWPFI	0.95068302 B	1.47	0.1432	0.64876579
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
BRAINERD 1 NEWTBI	-1.86310963 B	-2.87	0.0042	0.64937151
BRAINERD 9 NEWTBI	-2.05137911 B	-3.16	0.0016	0.64896036
BRAINERD 13 NEWTBI	-1.22341586 B	-1.89	0.0598	0.64900814
BRAINERD 17 NEWTBI	-1.51088316 B	-2.33	0.0201	0.64874244
BRAINERD 21 NEWTBI	-3.69978900 B	-5.70	0.0001	0.64861304
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
DENVER	0.0000000 B	.	.	.
BRAINERD 4 OLDCARB	-1.19412374 B	-1.82	0.0691	0.65597456
BRAINERD 6 OLDCARB	-2.73485424 B	-4.31	0.0001	0.64844511
BRAINERD 8 OLDCARB	-1.33023151 B	-2.04	0.0414	0.65133967
BRAINERD 12 OLDCARB	-0.30582452 B	-0.47	0.6391	0.65185334
BRAINERD 16 OLDCARB	-2.49850168 B	-3.85	0.0001	0.64840295
BRAINERD 20 OLDCARB				

NAME	QTY	UNIT	PRICE	AMOUNT	TAX	TOTAL
OXY						
DENVER	0.00000000	B				
4 OLCARB						
DENVER	0.00000000	B				
6 OLCARB						
DENVER	0.00000000	B				
8 OLCARB						
DENVER	0.00000000	B				
12 OLCARB						
DENVER	0.00000000	B				
16 OLCARB						
DENVER	0.00000000	B				
20 OLCARB						
DENVER	0.00000000	B				
ETOH	0.67308590	B	4.69	0.0001	0.14358196	
ETOH_S	-0.20060578	B	-1.42	0.1547	0.14083716	
HC	-0.56254583	B	-3.86	0.0001	0.14585918	
MTBE	0.00000000	B				
0	-3.14840830	B	-5.70	0.0001	0.55242057	
1	-1.86237170	B	-3.23	0.0013	0.57638742	
2	0.00000000	B				
3 0 NEWCARB	-0.40667822	B	-0.52	0.6030	0.78157455	
3 1 NEWCARB	0.13168711	B	0.16	0.8703	0.80630987	
3 2 NEWCARB	0.00000000	B				
7 0 NEWCARB	0.01321903	B	0.02	0.9866	0.78813702	
7 1 NEWCARB	0.61661382	B	0.75	0.4523	0.82004762	
7 2 NEWCARB	0.00000000	B				
11 0 NEWCARB	0.17621312	B	0.23	0.8213	0.78009106	
11 1 NEWCARB	-1.16022630	B	-1.44	0.1500	0.80524218	
11 2 NEWCARB	0.00000000	B				
15 0 NEWCARB	1.22080695	B	1.56	0.1185	0.78125321	
15 1 NEWCARB	1.05159509	B	1.29	0.1975	0.81613349	
15 2 NEWCARB	0.00000000	B				
19 0 NEWCARB	0.73972271	B	0.94	0.3476	0.78713139	
19 1 NEWCARB	-0.40231371	B	-0.49	0.6239	0.82024387	
19 2 NEWCARB	0.00000000	B				
2 0 NEWPFI	1.91846922	B	2.45	0.0143	0.78171020	
VEHIC-VOLAT(VEHGR)						

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SORTCOLD

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
2 1 NEWPFI	1.60672953 B	1.99	0.0465	0.80574781
2 2 NEWPFI	0.00000000 B			
5 0 NEWPFI	1.27612097 E	1.63	0.1028	0.78143422
5 1 NEWPFI	1.02944139 B	1.28	0.2018	0.80580750
5 2 NEWPFI	0.00000000 B			
10 0 NEWPFI	1.39448824 B	1.79	0.0742	0.78013647
10 1 NEWPFI	-0.10092587 B	-0.12	0.9014	0.81431404
10 2 NEWPFI	0.00000000 B			
14 0 NEWPFI	1.58140033 B	2.03	0.0430	0.78023383
14 1 NEWPFI	0.54329751 B	0.67	0.5000	0.80524041
14 2 NEWPFI	0.00000000 B			
18 0 NEWPFI	2.57353299 B	3.30	0.0010	0.78096797
18 1 NEWPFI	0.31356143 B	0.39	0.7002	0.81402293
18 2 NEWPFI	0.00000000 B			
1 0 NEWTBI	0.37685124 B	0.48	0.6300	0.78196619
1 1 NEWTBI	-0.00601756 B	-0.01	0.9940	0.80535072
1 2 NEWTBI	0.00000000 B			
9 0 NEWTBI	-0.39981085 B	-0.51	0.6085	0.78025413
9 1 NEWTBI	-0.99340347 B	-1.23	0.2177	0.80529069
9 2 NEWTBI	0.00000000 B			
13 0 NEWTBI	-1.79726853 B	-2.30	0.0215	0.78017532
13 1 NEWTBI	-1.14206786 B	-1.42	0.1566	0.80353225
13 2 NEWTBI	0.00000000 B			
17 0 NEWTBI	4.01050890 B	5.13	0.0001	0.78139902
17 1 NEWTBI				

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM

17 2 NEWTB1	1.52158646 B	1.86	0.0625	0.81588253
21 0 NEWTB1	0.00000000 B			
21 1 NEWTB1	0.17937037 B	0.23	0.8185	0.78156271
21 2 NEWTB1	0.62901922 B	0.77	0.4412	0.81637881
4 0 OLDCARB	0.00000000 B			
4 1 OLDCARB	0.53029686 B	0.66	0.5069	0.79868020
4 2 OLDCARB	0.88294708 B	1.11	0.2690	0.79822290
6 0 OLDCARB	0.00000000 B			
6 1 OLDCARB	-0.32126407 B	-0.41	0.6823	0.78464399
6 2 OLDCARB	0.09508673 B	0.12	0.9052	0.79844274
8 0 OLDCARB	0.00000000 B			
8 1 OLDCARB	-1.18179644 B	-1.51	0.1304	0.78065994
8 2 OLDCARB	0.49841549 B	0.61	0.5432	0.81944885
12 0 OLDCARB	0.00000000 B			
12 1 OLDCARB	0.61526263 B	0.78	0.4353	0.78832960
12 2 OLDCARB	0.20168871 B	0.25	0.8036	0.81070452
16 0 OLDCARB	0.00000000 B			
16 1 OLDCARB	0.51895635 B	0.67	0.5054	0.77883802
16 2 OLDCARB	0.72899560 B	0.92	0.3589	0.79408969
20 0 OLDCARB	0.00000000 B			
20 1 OLDCARB	0.00000000 B			
20 2 OLDCARB	0.00000000 B			
NEWCARB	0.00000000 B			
NEWPFI	0.00000000 B			
NEWTBI	0.00000000 B			
OLDCARB	0.00000000 B			

VEHGRP

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SORTCOLD

NOTE: THE X'X MATRIX HAS BEEN DEEMED SINGULAR AND A GENERALIZED INVERSE HAS BEEN EMPLOYED TO SOLVE THE NORMAL EQUATIONS. THE ABOVE ESTIMATES REPRESENT ONLY ONE OF MANY POSSIBLE SOLUTIONS TO THE NORMAL EQUATIONS. ESTIMATES FOLLOWED BY THE LETTER B ARE BIASED AND DO NOT ESTIMATE THE PARAMETER BUT ARE BLUE FOR SOME LINEAR COMBINATION OF PARAMETERS (OR ARE ZERO). THE EXPECTED VALUE OF THE BIASED ESTIMATORS MAY BE OBTAINED FROM THE GENERAL FORM OF ESTIMABLE FUNCTIONS. FOR THE BIASED ESTIMATORS, THE STD ERR IS THAT OF THE BIASED ESTIMATOR AND THE T VALUE TESTS HO: E(BIASED ESTIMATOR) = 0. ESTIMATES NOT FOLLOWED BY THE LETTER B ARE BLUE FOR THE PARAMETER.

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM

GENERAL LINEAR MODELS PROCEDURE

LEAST SQUARES MEANS
STANDARD ERRORS AND PROBABILITIES CALCULATED
USING THE TYPE IV MS FOR SITE*VEHICLE(VEHGRP) AS AN ERROR TERM

SITE	SORTCOLD LSMEAN	PROB > T LSMEAN1=LSMEAN2	HO:
BRAINERD	11.2599419	0.3952	
DENVER	11.5414796		

	SORTCOLD LSMEAN	PROB > T LSMEAN1=LSMEAN2	HO:
BRAINERD	11.2599419	0.3952	
DENVER	11.5414796		

OXY	SORTCOLD LSMEAN	PROB > T I/J	HO: LSMEAN(1)=LSMEAN(J) 1 2 3 4
ETOH	11.7135590	1	0.0001 0.0001 0.0001
ETOH_S	10.8398673	2	0.0001 0.0111 0.1547
HC	10.4779272	3	0.0001 0.0111 0.0001
MTBE	11.0404731	4	0.0001 0.1547 0.0001

NOTE: TO ENSURE OVERALL PROTECTION LEVEL, ONLY PROBABILITIES
ASSOCIATED WITH PRE-PLANNED COMPARISONS SHOULD BE USED.

STANDARD ERRORS AND PROBABILITIES CALCULATED
USING THE TYPE IV MS FOR VEHIC*VOLAT(VEHGR) AS AN ERROR TERM

VOLATIL	SORTCOLD LSMEAN	PROB > T I/J	HO: LSMEAN(1)=LSMEAN(J) 1 2 3
0	10.2398814	1	0.0003 0.0001
1	11.1938851	2	0.0003 0.0001
2	12.7683658	3	0.0001 0.0001

NOTE: TO ENSURE OVERALL PROTECTION LEVEL, ONLY PROBABILITIES
ASSOCIATED WITH PRE-PLANNED COMPARISONS SHOULD BE USED.

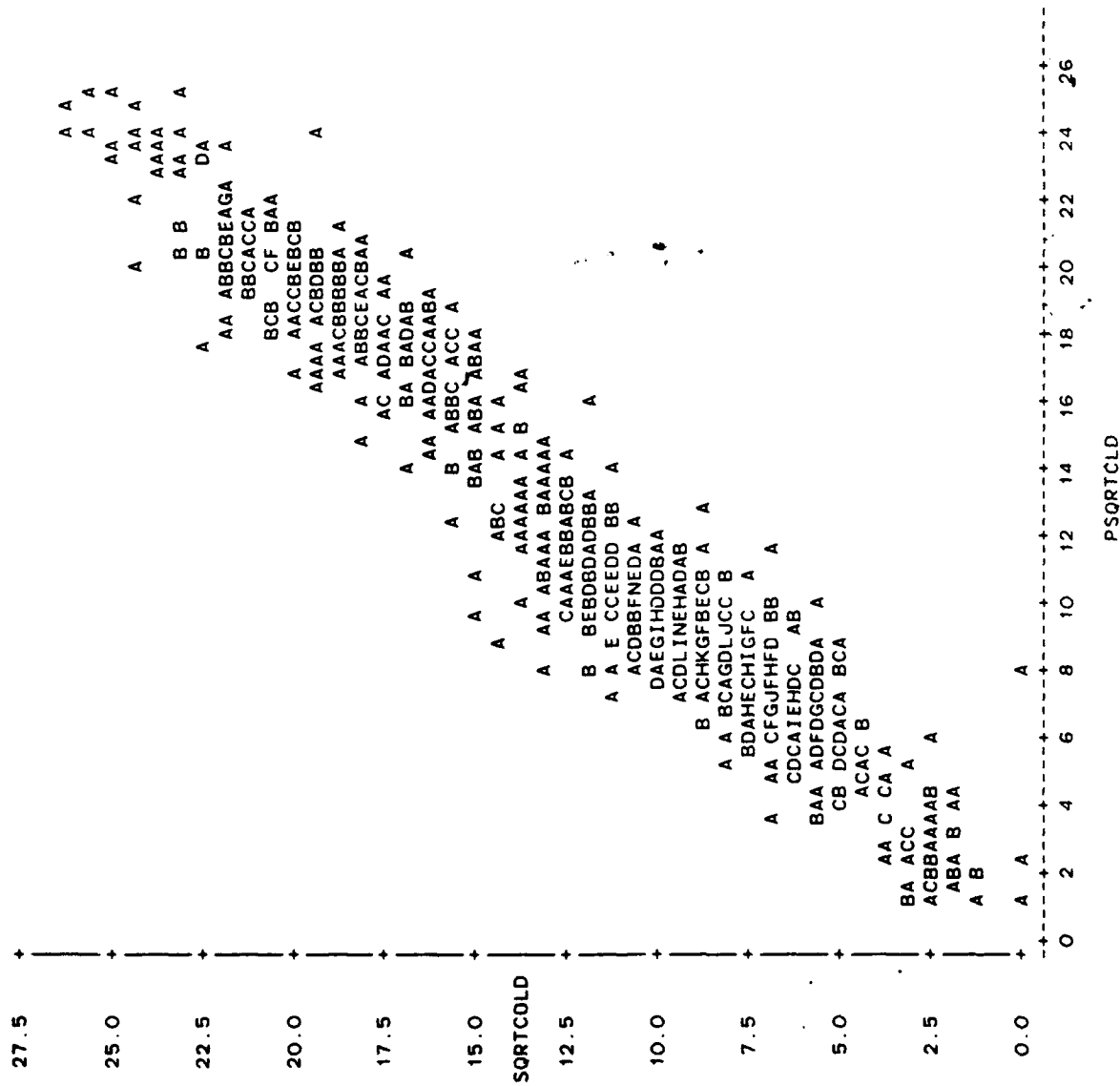
STANDARD ERRORS AND PROBABILITIES CALCULATED
USING THE TYPE IV MS FOR VEHICLE(VEHGRP) AS AN ERROR TERM

VEHGRP	SORTCOLD LSMEAN	PROB > T I/J	HO: LSMEAN(1)=LSMEAN(J) 1 2 3 4
NEWCARB	9.2973184	1	0.0702 0.5922 0.0001
NEWPFI	7.0543624	2	0.0702 0.1821 0.0001
NEWTBI	8.6643523	3	0.5922 0.1821 0.0001
OLDCARB	19.0557934	4	0.0001 0.0001 0.0001

NOTE: TO ENSURE OVERALL PROTECTION LEVEL, ONLY PROBABILITIES
ASSOCIATED WITH PRE-PLANNED COMPARISONS SHOULD BE USED.

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.
THIRD PASS AT GLM
OBSERVED & RESIDUALS VS. FITTED RESULTS - COLD TWO

PLOT OF SORTCOLD*PSORTCLD LEGEND: A = 1 OBS, B = 2 OBS, ETC.

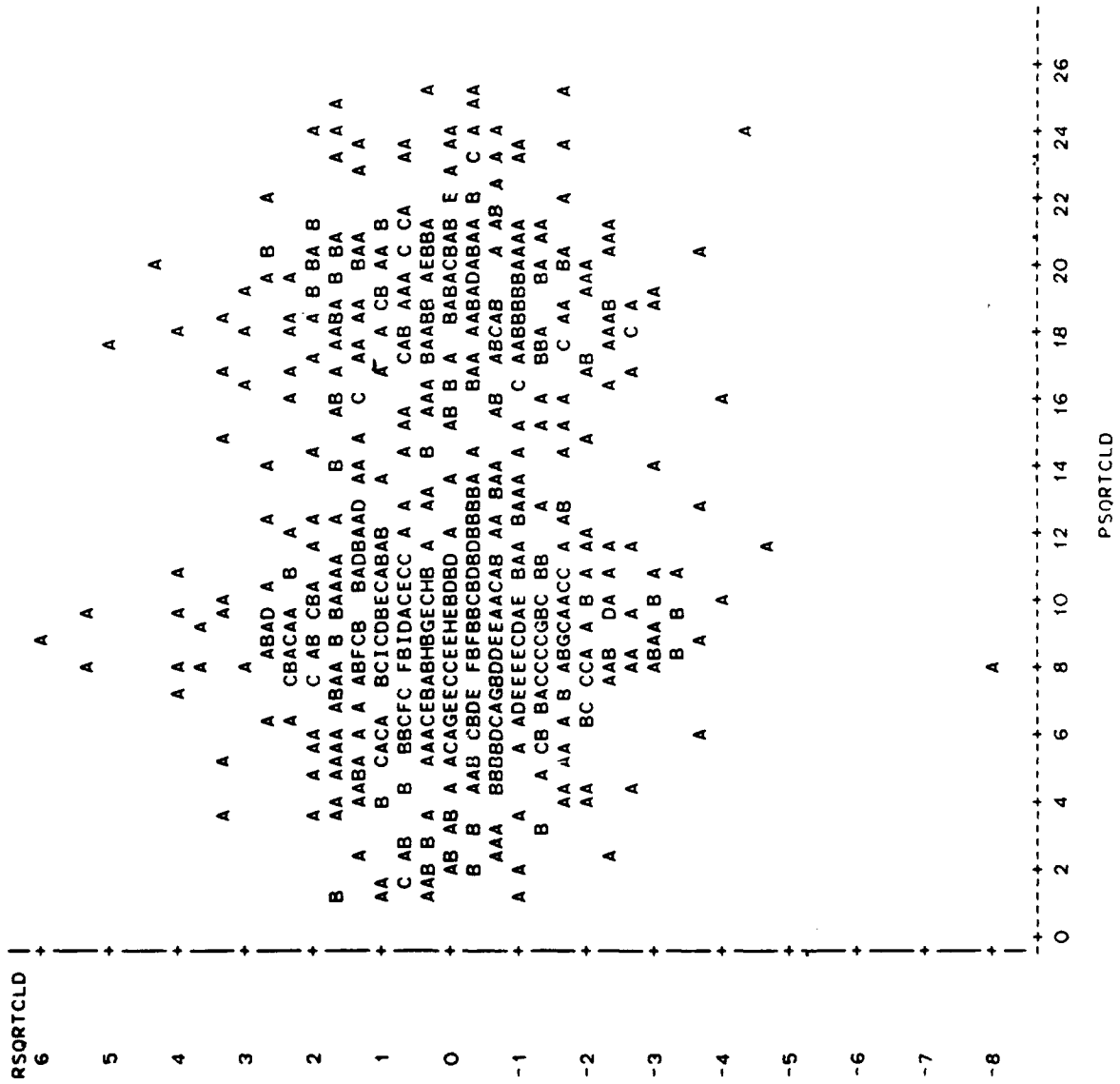


NOTE: 1 OBS HAD MISSING VALUES

CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS
ANALYSIS FOR FUEL, SITE EFFECTS, ETC.

THIRD PASS AT GLM
OBSERVED & RESIDUALS VS. FITTED RESULTS - COLD TWO

PLOT OF RSQRTCLD*PSQRTCLD LEGEND: A = 1 OBS, B = 2 OBS, ETC.



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SAS(R) LOG  CMS SAS 5.16      VM/CMS CMS USER CRC1

NOTE: COPYRIGHT (C) 1984,1986 SAS INSTITUTE INC., CARY, N.C. 27511, U.S.A.
NOTE: CMS SAS RELEASE 5.16 AT EDS - GM RESEARCH (09461030).

NOTE: CPUID  VERSION = FF  SERIAL = 171469  MODEL = 3090

NOTE: SAS OPTIONS SPECIFIED ARE:
      LEAVE=0

1 *****
2
3 CRCDMRO6  SAS- "THIRD" PASS AT GLM
4
5 *****
6 OPTIONS NOCENTER LINESIZE=80;
7 TITLE1 'CRC 1988 DRIVEABILITY STUDY - ALTITUDE & OXYGENATE EFFECTS';
8 TITLE2 'ANALYSIS FOR FUEL, SITE EFFECTS, ETC.';
9 TITLE3 'THIRD PASS AT GLM';
10 PROC GLM DATA=CRC.DMRANALY;
11 CLASS VEHGRP SITE VEHICLE OXY VOLATIL;
12 MODEL SORTCOLD = RUNTEMP RUNTEMP*VEHGRP
13     VEHICLE(VEHGRP)
14     SITE SITE*VEHICLE(VEHGRP)
15     OXY
16     VOLATIL VOLATIL*VEHICLE(VEHGRP)
17     VEHGRP
18     / SS4 SOLUTION;
19 LSMEANS SITE / PDIFF E=SITE*VEHICLE(VEHGRP);
20 LSMEANS OXY / PDIFF;
21 LSMEANS VOLATIL / PDIFF E=VOLATIL*VEHICLE(VEHGRP);
22 LSMEANS VEHGRP / PDIFF E=VEHICLE(VEHGRP);
23 OUTPUT OUT=CRC.DMRGLMB P=PSORTCLD R=RSORTCLD;
NOTE: THE DATA SET CRC.DMRGLMB HAS 938 OBSERVATIONS AND 66 VARIABLES.
NOTE: THE PROCEDURE GLM USED 6.20 SECONDS AND 464K
      AND PRINTED PAGES 1 TO 9.

24 PROC PLOT DATA = CRC.DMRGLMB;
25 TITLE4 'OBSERVED & RESIDUALS VS. FITTED RESULTS - COLD TWD';
26 PLOT (SORTCOLD RSORTCLD)*PSORTCLD;
NOTE: THE PROCEDURE PLOT USED 0.23 SECONDS AND 400K
      AND PRINTED PAGES 10 TO 11.
NOTE: SAS USED 464K MEMORY.

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SAS(R) LOG CMS SAS 5.16 VM/CMS CMS USER CRC1

NOTE: SAS INSTITUTE INC.
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