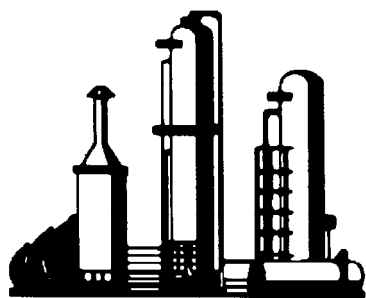


Final Report 1996 American Petroleum Institute/ National Petroleum Refiners Association Survey of Refining Operations and Product Quality

JULY 1997



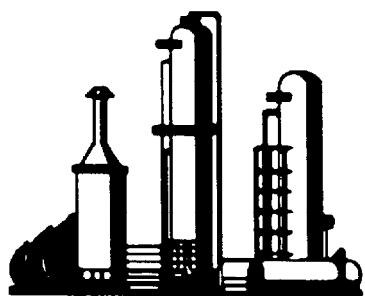
**National Petroleum
Refiners Association**



**American
Petroleum
Institute**

Final Report 1996 American Petroleum Institute/ National Petroleum Refiners Association Survey of Refining Operations and Product Quality

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1996 API/NPRA SURVEY OF
REFINING OPERATIONS AND PRODUCT QUALITY
TABLE OF CONTENTS

	Page
SURVEY PURPOSE.....	1
 SCOPE OF WORK	
Task 1: Tracking	1
Task 2: Data Base	1
Task 3: Respondents' Sample Representation	2
Task 4: Data Summaries	2
 DATA ANALYSIS	
Gasoline Properties	2
Motor Gasoline, MB - PADD Aggregate Comparison of Survey with EIA's <i>Petroleum Supply Monthly</i> Data (table)	3
Jet Fuel and Other Kerosene	3
Total Kerosenes, MB - PADD Aggregate Comparison of Survey with EIA's <i>Petroleum Supply Monthly</i> Data (table)	3
No. 2 Distillates (Diesel/Heating Oil)	3
Total Distillate FO, MB - PADD Aggregate Comparison of Survey with EIA's <i>Petroleum Supply Monthly</i> Data (table)	4
Process Facilities	4
Crude Capacity, KB/SD - PADD Aggregate Comparison of Survey with <i>Oil and Gas Journal</i> Data (table)	4
Feedstocks, Intermediates and Blendstocks	4
Distillate Blending Data	5
Distillation Values (°F) for Straight-Run Material, Total US excluding California (table)	6
 APPENDIX A	
Gasoline Properties	Table 1
 APPENDIX B	
Jet Fuel/Kerosene Properties	Table 2A
 APPENDIX C	
No. 2 Distillates Properties (Diesel/Heating Oil)	Table 2B

APPENDIX D

Process Facilities	Table 3
--------------------------	---------

APPENDIX E

Feedstocks, Intermediates and Blendstocks	Table 4A
Distillation Data of Catalytic Cracking Gasoline	Table 4A Supplemental

APPENDIX F

Distillate Blending Data	Table 4B
--------------------------------	----------

APPENDIX G

Blank Data Input Forms

Gasoline Properties	Table 1
Table 1 Instructions	
Jet Fuel/Kerosene Properties	Table 2A
Table 2A Instructions	
No. 2 Distillate Properties - Diesel/Heating Oil	Table 2B
Table 2B Instructions	
Process Facilities	Table 3
Table 3 Instructions	
Feedstocks, Intermediates and Blendstocks	Table 4A
Table 4A Instructions	
Distillate Blending Data	Table 4B
Table 4B Instructions	

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

I. SURVEY PURPOSE

The refining industry has relied in the past on industry surveys to collect information about current product quality and process facilities. Given changes in crude slate, process configurations and product specifications that have taken place since the 1989 survey of the National Petroleum Refiners Association (NPRA), a new survey was commissioned to provide current information.

A survey of industry refining data was conducted for the period May 1 through August 31, 1996. It includes information on domestically produced gasoline and diesel product quality as well as domestic refining capacity and operating data.

The blank data input forms found in Appendix G were used to collect the necessary information. These forms were designed by experts from the American Petroleum Institute (API) and NPRA with input from the contractor. API and NPRA distributed these forms to their member companies in August 1996 with instructions to complete and return the forms to the contractor chosen for data base management. No party other than the contractor saw the raw, disaggregated data. The objectives of contractor were to: 1) respond to all industry questions in regard to completing the data input forms, 2) receive and validate the data, and 3) aggregate the data, all the while maintaining confidentiality of individual refinery and company information.

II. SCOPE OF WORK

The required work for this survey was divided into four tasks as explained below:

Task 1: Tracking

The contractor was the point-of-contact for all questions about the data input forms. While the API and NPRA each designated a person from the association's staff to respond to questions from the companies, all issues related to data input instructions were resolved by the contractor, when possible.

The contractor was also responsible for advising the API which member companies and refineries had responded to the survey. API and NPRA staff in turn relied on this information to solicit maximum practical participation from the industry. Information regarding the identity of participants was not shared with API or NPRA member companies. The data reporting period was closed on January 6, 1997.

Task 2: Data Base

As input forms were received from the refineries, the contractor entered the data into a Paradox data base which had been previously designed to hold and aggregate the data. Paradox is a relational data base well-suited for

- 2 -

multi-refinery studies of this size. The contractor relied upon an extensive background in designing data base systems using Paradox Application Language (PAL) to record, calculate, and report client data.

Data validation consisted of three steps. First, all data initially entered into the data base were independently verified for accuracy by another individual in the contractor's office. Second, using a statistical program, the contractor identified outlying values for each variable. Data points outside three standard deviations of the average were reviewed and either corrected or removed from the data base. A third validation step consisted of comparing Petroleum Administration for Defense District (PADD) aggregated data from this survey with the data reported for May through August 1996 in the *Petroleum Supply Monthly* issued by the Energy Information Administration (EIA). Comparisons are noted later in this report.

The contractor has maintained individual refinery data as confidential information. No part of a refinery's submission will be made available to any other party. The results of the survey have been aggregated to eliminate the possibility that any individual refinery data might be recognized.

Task 3: Respondents' Sample Representation

To provide information on the actual representation of the survey respondents, the contractor has calculated the percentage of crude distillation capacity, gasoline production, and distillate production included in the survey by PADD. These percentages have been calculated using the information reported in *Petroleum Supply Monthly*, issued by the EIA, as representative of the entire industry for the period May through August, 1996. Summaries of these analyses appear below.

Task 4: Data Summaries

The contractor has aggregated the data by seven (7) geographic areas: PADDs 1 through 4 individually, PADD 5 (excluding California), the Total United States (excluding California), and California. Each aggregation consists of the data summarized on a set of input forms similar to that supplied by each refinery. All aggregations are volume-weighted averages.

III. DATA ANALYSIS

Gasoline Properties

Table 1 of the survey (Appendix A) requested that refineries supply gasoline volume and properties sorted by type (Conventional, Reformulated, or Sub-Octane) and by grade (Regular, Mid-Grade, or Premium). Most of the data are reportable to the US Environmental Protection Agency (EPA) as "Reformulated Gasoline and Anti-Dumping Batch Report," Form 3520-20C. Except where noted in the instructions, definitions for

- 3 -

gasoline properties in this survey were the same as used by refineries to complete the EPA batch reports.

One notable problem encountered during data validation was inconsistent reporting of gasoline volumes when requested as a sort by Sulfur Level, or by Drivability Index (DI), or by Reid Vapor Pressure (RVP). The highest level of closure with total volume can be found with the sort by Sulfur Level. The lowest level of closure with total volume can be found with the sort by DI. The data tables indicate sub-total volumes for each sort, so one can exercise judgment as to the magnitude of under-reported volume.

Reconciliation by PADD with *Petroleum Supply Monthly* data is illustrated below:

PADD	---- Motor Gasoline, MB ----		Percent of EIA
	1996 Survey	EIA	
1	51.3	97.2	52.8
2	204.0	226.5	90.1
3	392.1	432.1	90.7
4	28.2	31.8	88.7
5	133.0	163.0	81.6
Total	807.6	950.6	85.0

The above table indicates that the 1996 survey captured information on 85.0 percent of gasoline produced in the US during the survey period.

Jet Fuel and Other Kerosene

Table 2A of the survey (Appendix B) requested that refineries supply volume and properties for two categories of No. 1 distillate products: Jet Fuels and All Other Kerosene Products. Reconciliation by PADD with *Petroleum Supply Monthly* data is illustrated below:

PADD	---- Total Kerosenes, MB ----		Percent of EIA
	1996 Survey	EIA	
1	5.3	9.6	55.2
2	24.1	26.3	91.6
3	92.9	93.4	99.5
4	3.3	3.5	94.3
5	37.5	52.2	71.8
Total	163.1	185.0	88.2

No. 2 Distillates (Diesel/Heating Oil)

Table 2B of the survey (Appendix C) requested that refineries supply volume and properties for six categories of No. 2 distillate products. Four of the requested properties were only sporadically reported by respondents: Cetane Improver Level,

- 4 -

Cetane Number (additized), Pour Point (additized), and Polynuclear Aromatics. Except for California, these four properties were not reported by enough refineries to constitute statistically valid averages, and they have been suppressed from the data summaries. Reconciliation by PADD with *Petroleum Supply Monthly* data is illustrated below:

PADD	--- Total Distillate FO, MB ---		Percent of EIA
	1996 Survey	EIA	
1	23.5	46.1	51.0
2	84.0	98.5	85.3
3	153.2	180.4	84.9
4	14.9	17.6	84.7
5	38.5	54.5	70.6
Total	314.1	397.1	79.1

Process Facilities

Table 3 of the survey (Appendix D) requested that respondents supply capacity and utilization data for twenty-seven possible process units. These data summaries will permit subsequent analysis of the gasoline and distillate data along with refinery characteristic data, such as the degree of conversion or hydrotreating capacity as a percent of crude distillation capacity. The data on process facilities will also permit construction and validation of linear programming (LP) models for each PADD in order to study industry limits or marginal production costs. Reconciliation by PADD with *Oil and Gas Journal (O&GJ)* data is illustrated below:

PADD	--- Crude Capacity, KB/SD ---		Percent of O&GJ
	1996 Survey	O&GJ	
1	772	1,662	46.5
2	3,249	3,375	96.3
3	6,646	6,934	95.8
4	433	513	84.4
5	2,219	2,871	77.3
Total	13,319	15,355	86.7

Feedstocks, Intermediates and Blendstocks

Table 4A of the survey (Appendix E) requested that refineries supply volume and quality data for Crude Oils, Catalytic Cracking Feeds, Catalytic Cracking Gasoline, Coker Gasoline, Cat-Cracked Naphtha Hydrotreater Feeds/Products, and Hydrogen Burned as Fuel Gas.

Crude Oil data have been collected by three different sulfur levels (Low, Medium and High) and two different gravity levels (Light and Heavy).

Catalytic Cracking Feed data were reported by refineries for as many as four distinct streams. These data were aggregated as one stream for each geographic region.

Catalytic Cracking Gasoline data were reported by refineries for as many as four distinct streams. These data were aggregated as one stream for each geographic region. Subsequent review of these data revealed that a more meaningful reporting of the data would be to divide the gasoline into three categories: Full-Range, Heavy, and Light Gasoline. The sort criteria were based on distillation data such that Light Gasoline has T90 < 270° F and T10 < 150° F. Heavy Gasoline has T10 > 170° F. All other distillations were considered to be Full-Range. These three-gasoline sorts are provided in Appendix E as "Table 4A Supplemental" found immediately after Table 4A.

Data for Coker Gasoline (blended directly to gasoline) were not widely reported by the industry. There were only enough respondents to provide average data for California and PADDs 1 and 3. The data for Total US (excluding California) actually includes some data which could not be revealed by individual PADD because of an insufficient number of respondents.

Cat-Cracked Naphtha Hydrotreater data were also not widely reported by the industry. Due to insufficient number of respondents, only data for California and Total US (excluding California) are reported.

The last part of this section requested that refineries estimate their daily consumption of fuel gas that is hydrogen-rich gas (at least fifty volume percent hydrogen). The data are expressed as thousand of standard cubic feet per day of pure hydrogen.

Distillate Blending Data

Table 4B (Appendix F) of the survey requested typical distillate blendstock properties and recipes as volume percents summing to 100. The blendstock properties and recipes requested were for the same categories of No. 1 and No. 2 distillate fuels covered by Tables 2A and 2B (Appendices B and C), namely: Jet Fuel, All Other Kerosene, EPA (Low Sulfur) Diesel, Railroad Diesel, Other Off-Road Diesel, CARB Diesel, Heating Oil, and Marine Diesel. The possible blendstock categories were divided among:

- Straight-Run Material
- Cracked, Unhydrotreated
- Non-Cracked, Hydrotreated
- Cracked and Hydrotreated
- Hydrocracked
- Coker Streams, Unhydrotreated
- Coker Streams, Hydrotreated
- Raffinate from Aromatic Extraction

For each of the above categories (except for Raffinate), there were four possible types: Naphtha, Light Distillate, Heavy Distillate, and Light Gas Oil. Typical distillation ranges were provided on the data input forms; however, more instructive are the actual distillation values provided by the respondents. For example, shown on the following page are average distillation values (°F) for Straight-Run Material for Total US (excluding California).

- 6 -

Distillation, °F	Naphtha	Light Distillate	Heavy Distillate	Light Gas Oil
T10	325	360	466	421
T50	393	421	540	547
T90	452	477	601	618

This table illustrates the definitional overlap provided by many respondents. Overall, Naphtha is very heavy and not dissimilar to the material reported as Light Distillate. The front-end distillation for Light Gas Oil is actually lighter than the front-end of Heavy Distillate.

Another definitional problem observed with this section was the reporting of unmeasurable properties. For example, several respondents blend distillate products upstream of a hydrotreater. The properties of the final (hydrotreated) product are well-known. However, this section requested that data be supplied for individual blendstocks. How can one report distinct properties for one of several commingled blendstocks after hydrotreating?

When asked for clarification, the contractor recommended that respondents report blendstock properties at the point of blending, even if a hydrotreater is an additional processing step downstream of the blending point. The significance of this problem is not known. However, it is likely that the average blendstock sulfur is higher than that reported for the corresponding final products on Tables 2A and 2B (Appendices B and C).

APPENDIX A—GASOLINE PROPERTIES

PADD 1
Number of Refineries: 9

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Octane (R+M)/2	87.3	89.4	93.0	87.1			87.2	89.0	93.0	
Total Volume, K Barrels	13,643	45	2,870	110	0	0	24,060	719	9,857	0
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur										
100-199	1,297	12	1,165	0			3,353	0	4,812	
200-299	4,885	0	489	50			7,775	530	1,733	
300-399	937	0	721	0			4,811	128	479	
400-499	870	0	303	0			2,225	6	1,120	
500-700	646	0	129	0			940	0	832	
Greater Than 700 ppm Sulfur	2,090	0	63	60			1,259	0	625	
Sum	2,920	33	0	0			3,699	0	0	
	13,645	45	2,870	110			24,062	664	9,601	
Sulfur, ppm	386	710	178	390			320	184	184	
Olefins, Volume Percent	21.6	26.8	14.4	22.9			20.7	22.3	15.6	
Aromatics, Volume Percent	25.1	34.2	34.3	17.9			19.0	19.3	26.2	
Benzene, Volume Percent	1.05	1.64	0.76	0.43			0.57	0.48	0.49	
Oxygen, Weight Percent	0.12	0.22	0.31	2.05			2.04	2.12	2.16	
API Gravity	58.8	56.5	55.4	58.9			59.1	58.7	56.5	

PADD 1
Number of Refineries: 9

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Reformulated VOC Control Region 1			Reformulated VOC Control Region 2		
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium
Reid Vapor Pressure, psia	6.7			7.9	8.1	8.0
Distillation, °F						
T10	141			132	133	135
T50	196			198	201	208
T90	334			341	328	322
E200 (if measured)	52.0			47.4	49.6	45.3
E300 (if measured)	82.1			74.9	83.8	82.0
Volume By Drivability Index (DI)						
Report K Barrels By DI						
Less Than 1,150 DI	110			15,880	654	5,791
1,150-1,199	0			7,134	65	2,904
1,200-1,249	0			955	0	911
1,250-1,300	0			91	0	251
Greater Than 1,300 DI	0			0	0	0
Sum	110			24,060	719	9,857
Drivability Index	1,134			1,133	1,132	1,150



PADD 1
Number of Refineries: 9

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---			----- RVP 7.0 to 7.8 psia -----			- RVP Greater Than 7.8 psia -			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Total Volume, K Barrels	0	0	0	151	0	71	13,492	45	2,799	0
Reid Vapor Pressure, psia				7.7		7.4	8.7	8.6	8.6	
Distillation, °F										
T10				127		134	127	125	131	
T50				209		222	211	212	227	
T90				333		323	340	338	331	
E200 (if measured)				47.2		38.0	46.3	45.6	38.2	
E300 (if measured)				80.5		82.4	80.1	82.0	81.0	
Volume By Drivability Index (DI)										
Report K Barrels By DI				127		0	5,559	11	210	
Less Than 1,150 DI				0		31	4,931	34	975	
1,150-1,199				0		40	2,068	0	1,036	
1,200-1,249				24		0	934	0	553	
1,250-1,300				0		0	0	0	25	
Greater Than 1,300 DI				151		71	13,492	45	2,799	
Sum										
Drivability Index				1,151		1,189	1,164	1,162	1,206	

PADD 2
Number of Refineries: 25

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Reformulated VOC Control Region 1			Reformulated VOC Control Region 2		
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium
Reid Vapor Pressure, psia	-	-	-	7.9	7.9	7.9
Distillation, °F						
T10	-	-	-	131	134	132
T50	-	-	-	196	203	214
T90	-	-	-	338	335	322
E200 (if measured)	-	-	-	51.5	50.1	44.0
E300 (if measured)	-	-	-	82.1	83.4	83.9
Volume By Drivability Index (DI)						
Report K Barrels By DI				10,627	1,289	3,025
Less Than 1,150 DI	-	-	-	2,987	506	1,809
1,150-1,199	-	-	-	4,545	389	1,784
1,200-1,249	-	-	-	173	0	250
1,250-1,300	-	-	-	93	0	0
Greater Than 1,300 DI	-	-	-	18,425	2,184	6,868
Sum	-	-	-	1,122	1,144	1,160
Drivability Index	-	-	-			



PADD 2
Number of Refineries: 25

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---			----- RVP 7.0 to 7.8 psia -----			- RVP Greater Than 7.8 psia -			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Total Volume, K Barrels	4,552	55	1,286	15,029	1,219	4,030	121,723	1,863	22,463	4,160
Reid Vapor Pressure, psia	6.7	6.7	6.7	7.5	7.3	7.5	8.7	8.7	8.7	8.9
Distillation, °F										
T10	138	136	141	131	129	135	124	123	132	125
T50	221	226	228	209	212	230	207	214	225	196
T90	338	330	317	341	332	322	338	329	321	326
E200 (if measured)	41.0	40.0	33.8	46.1	-	30.4	46.8	43.7	38.3	52.1
E300 (if measured)	79.3	79.7	85.9	80.4	-	83.6	80.5	80.7	84.5	82.5
Volume By Drivability Index (DI)										
Report K Barrels By DI	0	0	0	6,175	417	210	69,464	774	5,721	3,544
Less Than 1,150 DI	1,425	0	366	6,469	742	1,231	40,728	926	7,068	334
1,150-1,199	2,942	55	803	2,358	78	1,955	12,229	113	8,057	199
1,200-1,249	152	0	103	348	18	580	827	50	1,735	0
1,250-1,300	33	0	14	0	0	134	17	0	40	0
Greater Than 1,300 DI	4,552	55	1,286	15,350	1,255	4,110	123,265	1,863	22,621	4,077
Sum										
Drivability Index	1,210	1,213	1,214	1,165	1,162	1,216	1,143	1,155	1,194	1,102

PADD 3
Number of Refineries: 42

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Octane (R+M)/2	87.2	89.2	93.0	87.3		93.2	87.3		93.1	86.0
Total Volume, K Barrels	234,319	3,904	71,963	45,997	0	18,009	10,018	0	7,530	396
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur										
100-199	10,756	157	39,641	1,711		4,495	602		3,632	31
200-299	36,173	878	19,176	10,116		3,686	5,729		1,615	0
300-399	54,141	1,042	7,148	7,638		3,740	2,041		1,468	93
400-499	31,090	257	4,335	5,656		3,712	1,030		608	182
500-700	22,455	288	1,376	10,205		1,765	616		50	90
Greater Than 700 ppm Sulfur	30,387	871	271	6,480		551	0		156	0
Sum	48,283	410	15	4,187		60	0		0	0
	233,285	3,903	71,962	45,993		18,009	10,018		7,529	396
Sulfur, ppm	428	372	122	378		230	206		146	319
Olefins, Volume Percent	15.5	14.5	6.1	13.9		8.5	13.3		7.1	8.2
Aromatics, Volume Percent	32.1	29.8	33.6	21.7		28.2	18.7		28.4	23.5
Benzene, Volume Percent	0.93	0.97	0.86	0.70		0.61	0.58		0.63	1.30
Oxygen, Weight Percent	0.04	0.07	0.24	1.88		2.14	1.92		1.86	2.91
API Gravity	58.4	56.3	55.7	58.1		55.8	60.2		57.4	59.8

PADD 3
Number of Refineries: 42

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	----- Reformulated ----- ----- VOC Control Region 1 -----			----- Reformulated ----- ----- VOC Control Region 2 -----		
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium
Reid Vapor Pressure, psia	7.1		7.0	7.9		7.9
Distillation, °F						
T10	137		140	131		127
T50	196		216	197		207
T90	334		320	344		315
E200 (if measured)	51.8		42.4	50.6		45.2
E300 (if measured)	81.9		82.6	81.4		81.3
Volume By Drivability Index (DI)						
Report K Barrels By DI	31,071		4,421	4,695		4,162
Less Than 1,150 DI	9,173		6,737	3,530		2,483
1,150-1,199	1,990		4,256	133		833
1,200-1,249	530		1,262	0		51
1,250-1,300	115		76	0		0
Greater Than 1,300 DI	42,879		16,752	8,358		7,529
Sum						
Drivability Index	1,128		1,182	1,131		1,135



PADD 4
Number of Refineries: 12

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Octane (R+M)/2	85.8	88.3	91.3							83.9
Total Volume, K Barrels	22,861	857	4,378	0	0	0	0	0	0	132
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur										
100-199	3,335	82	2,424							0
200-299	7,609	449	754							0
300-399	5,458	269	571							5
400-499	1,202	44	244							0
500-700	1,386	13	267							25
Greater Than 700 ppm Sulfur	1,970	0	112							36
Sum	1,901	0	0							66
	22,861	857	4,372							132
Sulfur, ppm	281	182	144							695
Olefins, Volume Percent	13.8	12.2	6.8							24.3
Aromatics, Volume Percent	26.5	23.6	28.9							28.3
Benzene, Volume Percent	1.47	1.12	1.64							1.19
Oxygen, Weight Percent	0.06	0.01	0.12							3.27
API Gravity	59.7	61.1	58.4							61.2

PADD 4
Number of Refineries: 12

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

Reformulated VOC Control Region 1		Reformulated VOC Control Region 2	
Regular	Mid-Grade	Regular	Mid-Grade

Reid Vapor Pressure, psia

Distillation, °F

T10

T50

T90

E200 (if measured)

E300 (if measured)

Volume By Drivability Index (DI)

Report K Barrels By DI

Less Than 1,150 DI

1,150-1,199

1,200-1,249

1,250-1,300

Greater Than 1,300 DI

Sum

Drivability Index

PADD 4
Number of Refineries: 12

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---			----- RVP 7.0 to 7.8 psia -----			- RVP Greater Than 7.8 psia -			Sub- Octane
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	
Total Volume, K Barrels	0	0	35	3,739	648	1,417	19,074	194	2,964	132
Reid Vapor Pressure, psia			6.9	7.6	7.5	7.5	8.7	8.6	8.7	8.6
Distillation, °F										
T10			135	131	138	138	124	141	133	122
T50			224	200	208	219	202	213	225	189
T90			313	313	315	303	325	312	315	326
E200 (if measured)			34.8	50.4	45.2	35.8	49.7	42.8	34.9	54.7
E300 (if measured)			86.4	86.4	87.8	88.7	83.7	86.8	86.4	83.9
Volume By Drivability Index (DI)										
Report K Barrels By DI			0	2,979	339	395	15,383	92	581	132
Less Than 1,150 DI			25	499	280	695	2,747	102	965	0
1,150-1,199			0	47	29	194	151	0	737	0
1,200-1,249			10	0	0	76	26	0	578	0
1,250-1,300			0	0	0	0	0	0	0	0
Greater Than 1,300 DI			35	3,525	648	1,360	18,307	194	2,861	132
Sum			1,189	1,108	1,146	1,168	1,120	1,162	1,194	1,078
Drivability Index										

PADD 5 (excluding California)
Number of Refineries: 7

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Octane (R+M)/2	87.2	89.2	92.1							84.2
Total Volume, K Barrels	15,656	391	4,666	0	0	0	-	0	-	2,564
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur	1,391	91	2,124							45
100-199	837	54	1,134							172
200-299	2,494	34	870							90
300-399	1,208	150	473							195
400-499	1,007	62	55							379
500-700	2,309	0	0							1,003
Greater Than 700 ppm Sulfur	6,410	0	10							679
Sum	15,656	391	4,666							2,563
Sulfur, ppm	529	229	152							536
Olefins, Volume Percent	12.6	14.0	6.1							5.7
Aromatics, Volume Percent	29.0	19.4	29.1							29.6
Benzene, Volume Percent	2.04	0.74	1.56							2.12
Oxygen, Weight Percent	0	0	0							0
API Gravity	57.8	64.0	57.4							57.1

PADD 5 (excluding California)
Number of Refineries: 7

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Regular	Reformulated Mid- Grade	VOC Control Region 1	Regular	Reformulated Mid- Grade	VOC Control Region 2	Premium
Reid Vapor Pressure, psia	-	-	-	-	-	-	-
Distillation, °F	-	-	-	-	-	-	-
T10	-	-	-	-	-	-	-
T50	-	-	-	-	-	-	-
T90	-	-	-	-	-	-	-
E200 (if measured)	-	-	-	-	-	-	-
E300 (if measured)	-	-	-	-	-	-	-
Volume By Drivability Index (DI)	-	-	-	-	-	-	-
Report K Barrels By DI	-	-	-	-	-	-	-
Less Than 1,150 DI	-	-	-	-	-	-	-
1,150-1,199	-	-	-	-	-	-	-
1,200-1,249	-	-	-	-	-	-	-
1,250-1,300	-	-	-	-	-	-	-
Greater Than 1,300 DI	-	-	-	-	-	-	-
Sum	-	-	-	-	-	-	-
Drivability Index	-	-	-	-	-	-	-

PADD 5 (excluding California)
Number of Refineries: 7

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---			----- RVP 7.0 to 7.8 psia -----			- RVP Greater Than 7.8 psia -			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Total Volume, K Barrels	75	0	105	6,342	0	1,786	9,239	391	2,775	2,564
Reid Vapor Pressure, psia	6.5		6.1	7.4		7.5	9.1	10.0	9.7	8.4
Distillation, °F										
T10	146		153	135		149	124	117	129	127
T50	214		229	211		229	202	187	221	200
T90	334		324	341		331	327	294	309	342
E200 (if measured)	43.8		32.6	45.5		30.8	48.0	-	31.6	51.0
E300 (if measured)	79.9		83.2	79.7		81.4	81.0	-	81.2	80.0
Volume By Drivability Index (DI)										
Report K Barrels By DI										
Less Than 1,150 DI	0		0	1,448		0	7,183	352	604	1,719
1,150-1,199	50		0	3,516		0	1,700	39	432	789
1,200-1,249	25		60	1,102		305	216	0	1,228	56
1,250-1,300	0		45	253		1,481	151	0	501	0
Greater Than 1,300 DI	0		0	23		0	0	0	10	0
Sum	75		105	6,342		1,786	9,250	391	2,775	2,564
Drivability Index	1,194		1,240	1,177		1,239	1,119	1,033	1,166	1,129

TOTAL US (excluding California)
Number of Refineries: 95

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub-Octane
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	
Octane (R+M)/2	87.1	89.1	92.8	87.3		93.1	87.3	89.1	92.9	84.7
Total Volume, K Barrels	427,199	8,343	111,982	46,891	0	18,781	54,475	2,984	26,375	6,326
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur										
100-199	31,715	816	57,406	1,801		4,495	6,455	0	12,445	76
200-299	71,047	1,619	31,685	10,166		3,824	14,049	550	5,159	1,225
300-399	86,640	1,967	11,450	7,736		3,963	10,394	442	2,712	659
400-499	64,257	990	5,758	5,656		4,034	5,630	742	2,824	1,518
500-700	47,758	575	2,189	10,600		1,854	4,263	593	1,589	1,001
Greater Than 700 ppm Sulfur	57,789	1,758	2,695	6,742		551	5,313	557	1,389	1,102
Sum	69,071	618	791	4,187		60	8,371	45	0	745
	428,277	8,343	111,974	46,888		18,781	54,475	2,929	26,118	6,326
Sulfur, ppm	400	350	142	382		235	353	353	175	407
Olefins, Volume Percent	14.1	13.5	6.3	13.9		8.5	15.3	12.7	9.6	14.1
Aromatics, Volume Percent	30.3	29.8	32.3	21.8		27.8	20.5	25.2	25.9	24.8
Benzene, Volume Percent	1.18	1.30	0.98	0.70		0.62	0.70	0.69	0.69	1.72
Oxygen, Weight Percent	0.06	0.03	0.27	1.88		2.15	2.38	3.12	2.25	1.78
API Gravity	58.4	57.1	56.2	58.1		56.0	58.9	56.9	57.6	58.8

TOTAL US (excluding California)
Number of Refineries: 95

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Reformulated VOC Control Region 1			Reformulated VOC Control Region 2		
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium
Reid Vapor Pressure, psia	7.1		7.1	7.9	8.0	7.9
Distillation, °F						
T10	137		140	132	134	133
T50	197		217	197	202	209
T90	334		320	339	334	319
E200 (if measured)	52.1		42.2	51.4	49.9	45.7
E300 (if measured)	82.4		82.7	81.8	83.6	83.8
Volume By Drivability Index (DI)						
Report K Barrels By DI						
Less Than 1,150 DI	31,182		4,421	32,932	1,943	14,081
1,150-1,199	9,459		6,917	13,651	571	7,196
1,200-1,249	2,488		4,848	5,632	389	3,529
1,250-1,300	530		1,262	264	0	551
Greater Than 1,300 DI	115		76	93	0	0
Sum	43,774		17,524	52,572	2,903	25,357
Drivability Index	1,129		1,182	1,127	1,141	1,147



TOTAL US (excluding California)
Number of Refineries: 95

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---			----- RVP 7.0 to 7.8 psia -----			- RVP Greater Than 7.8 psia -			Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Total Volume, K Barrels	21,023	605	9,873	101,846	4,251	34,701	304,857	3,463	66,675	7,302
Reid Vapor Pressure, psia	6.8	6.9	6.9	7.5	7.5	7.5	8.7	8.8	8.7	8.7
Distillation, °F										
T10	138	131	147	134	133	139	125	126	131	126
T50	219	221	231	215	217	233	205	215	230	197
T90	339	332	318	343	337	325	338	328	323	333
E200 (if measured)	40.9	40.0	33.2	44.7	45.4	33.1	47.4	43.5	37.4	51.5
E300 (if measured)	78.8	79.7	83.6	78.6	79.2	81.1	80.4	81.5	83.0	81.6
Volume By Drivability Index (DI)										
Report K Barrels By DI			157	20,089	1,212	842	160,595	1,304	9,114	5,641
Less Than 1,150 DI	374	0		36,833	1,791	5,451	89,046	1,467	17,611	1,236
1,150-1,199	5,987	550	2,313	31,467	370	12,429	33,564	350	25,173	262
1,200-1,249	8,377	55	4,175	8,602	583	10,863	5,538	273	12,647	0
1,250-1,300	3,417	0	1,861	656	192	2,102	379	69	1,214	0
Greater Than 1,300 DI	423	0	1,367	97,647	4,148	31,687	289,122	3,463	65,759	7,139
Sum	18,578	605	9,873							
Drivability Index	1,204	1,191	1,231	1,182	1,186	1,234	1,136	1,159	1,197	1,112

CALIFORNIA
Number of Refineries: 10

TABLE 1 (PAGE 1 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	Conventional			Reformulated			Reformulated			Sub-Octane
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium	
Octane (R+M)/2	87.8		92.2	87.8	89.5	92.2				
Total Volume, K Barrels	15,294	0	3,921	66,556	6,802	17,151	0	0	0	0
Volume By Sulfur Level										
Report K Barrels By Sulfur Level (ppm)										
Less Than 100 ppm Sulfur	7,522		2,882	66,564	6,802	17,151				
100-199	3,573		978	0	0	0				
200-299	3,637		61	0	0	0				
300-399	548		0	0	0	0				
400-499	81		0	0	0	0				
500-700	0		0	0	0	0				
Greater Than 700 ppm Sulfur	0		0	0	0	0				
Sum	15,361		3,921	66,564	6,802	17,151				
Sulfur, ppm	132		57	20	20	18				
Olefins, Volume Percent	13.4		5.3	4.0	3.5	3.6				
Aromatics, Volume Percent	32.9		36.2	23.0	23.5	22.8				
Benzene, Volume Percent	0.75		0.68	0.60	0.49	0.38				
Oxygen, Weight Percent	0.11		0.73	2.03	2.12	2.21				
API Gravity	54.9		54.1	59.1	59.4	59.7				

CALIFORNIA
Number of Refineries: 10

TABLE 1 (PAGE 2 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	----- Reformulated ----- ----- VOC Control Region 1 -----			----- Reformulated ----- ----- VOC Control Region 2 -----		
	Regular	Mid-Grade	Premium	Regular	Mid-Grade	Premium
Reid Vapor Pressure, psia	6.8	6.8	6.8			
Distillation, °F						
T10	138	138	138			
T50	195	196	205			
T90	303	300	300			
E200 (if measured)	51.9	52.6	48.4			
E300 (if measured)	88.6	90.1	88.8			
Volume By Drivability Index (DI)						
Report K Barrels By DI						
Less Than 1,150 DI	60,291	6,678	15,771			
1,150-1,199	779	124	1,380			
1,200-1,249	0	0	0			
1,250-1,300	0	0	0			
Greater Than 1,300 DI	0	0	0			
Sum	61,070	6,802	17,151			
Drivability Index	1,096	1,094	1,120			



CALIFORNIA
Number of Refineries: 10

TABLE 1 (PAGE 3 OF 3)

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

GASOLINE PROPERTIES

	--- RVP Less Than 7.0 psia ---		----- RVP 7.0 to 7.8 psia -----		- RVP Greater Than 7.8 psia -		Sub- Octane
	Regular	Mid- Grade	Premium	Regular	Mid- Grade	Premium	
Total Volume, K Barrels	5,609	0	2,231	4,228	0	961	0
Reid Vapor Pressure, psia	6.7		6.8	7.5		7.4	
Distillation, °F							
T10	139		140	133		137	
T50	226		237	229		235	
T90	338		332	346		332	
E200 (if measured)	39.0		32.2	40.3		33.7	
E300 (if measured)	77.1		78.2	74.6		78.6	
Volume By Drivability Index (DI)							
Report K Barrels By DI							
Less Than 1,150 DI	342		173	185		0	0
1,150-1,199	979		163	227		47	0
1,200-1,249	1,984		339	2,615		516	97
1,250-1,300	1,820		1,339	1,124		398	127
Greater Than 1,300 DI	20		217	0		0	0
Sum	5,145		2,231	4,151		961	224
Drivability Index	1,224		1,254	1,233		1,245	1,262



APPENDIX B—JET FUEL/KEROSENE PROPERTIES

PADD 1
Number of Refineries: 9

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	4,393	908
API Gravity	44.6	42.2
Sulfur, ppmw	919	278
Freeze Point, °F	(44)	(46)
Smoke Point, mm	23	24
Naphthalenes, Volume Percent	2.0	2.6
Aromatics, Volume Percent	16.8	16.0
Distillation, °F		
T10	348	378
T30	-	-
T50	405	420
T70	-	-
T90	490	470

PADD 2
Number of Refineries: 25

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	22,772	1,318
API Gravity	42.9	44.4
Sulfur, ppmw	863	215
Freeze Point, °F	(49)	(48)
Smoke Point, mm	23	22
Naphthalenes, Volume Percent	1.5	1.9
Aromatics, Volume Percent	17.3	20.2
Distillation, °F		
T10	349	352
T30	378	-
T50	407	406
T70	439	-
T90	478	459

PADD 3
Number of Refineries: 42

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	86,764	6,151
API Gravity	43.0	41.8
Sulfur, ppmw	705	240
Freeze Point, °F	(48)	(45)
Smoke Point, mm	22	21
Naphthalenes, Volume Percent	1.8	2.0
Aromatics, Volume Percent	18.1	18.9
Distillation, °F		
T10	357	377
T30	393	407
T50	405	420
T70	442	454
T90	466	484

PADD 4
Number of Refineries: 12

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	2,739	604
API Gravity	44.3	45.2
Sulfur, ppmw	332	374
Freeze Point, °F	(47)	(56)
Smoke Point, mm	25	22
Naphthalenes, Volume Percent	1.2	0.4
Aromatics, Volume Percent	16.6	23.6
Distillation, °F		
T10	356	327
T30	-	-
T50	404	382
T70	-	-
T90	469	463

PADD 5 (excluding California)
Number of Refineries: 7

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	11,080	0
API Gravity	43.4	
Sulfur, ppmw	380	
Freeze Point, °F	(51)	
Smoke Point, mm	22	
Naphthalenes, Volume Percent	2.0	
Aromatics, Volume Percent	17.7	
Distillation, °F		
T10	347	
T30	-	
T50	404	
T70	-	
T90	482	

TOTAL US (excluding California)
Number of Refineries: 95

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	127,748	8,980
API Gravity	43.2	42.4
Sulfur, ppmw	704	249
Freeze Point, °F	(48)	(47)
Smoke Point, mm	22	21
Naphthalenes, Volume Percent	1.7	2.0
Aromatics, Volume Percent	17.9	18.8
Distillation, °F		
T10	354	370
T30	387	407
T50	405	415
T70	440	454
T90	470	478

CALIFORNIA
Number of Refineries: 10

TABLE 2A

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

JET FUEL/KEROSENE PROPERTIES

	Jet Fuels	All Other Kerosene
Volume, K Barrels	26,453	0
API Gravity	41.2	
Sulfur, ppmw	584	
Freeze Point, °F	(54)	
Smoke Point, mm	20	
Naphthalenes, Volume Percent	1.7	
Aromatics, Volume Percent	18.9	
Distillation, °F		
T10	353	
T30	-	
T50	411	
T70	-	
T90	484	

APPENDIX C—NO. 2 DISTILLATES PROPERTIES (DIESEL/HEATING OIL)

PADD 1
Number of Refineries: 9

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

NO. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Off-Road	CARB		
Volume, K Barrels	12,479	-	0	0	11,068	0
API Gravity	34.6	-	-	-	32.6	-
Sulfur, Weight Percent	0.034	-	-	-	0.138	-
Nitrogen, ppmw (CARB only)	-	-	-	-	-	-
Cetane Number (clear)	-	-	-	-	-	-
Cetane Improver, ppmv	0	-	-	-	-	-
Cetane Number (additized)	-	-	-	-	(6)	-
Pour Point, °F (additized)	(10)	-	-	-	0	-
Pour Point Depressant, ppmw	7	-	-	-	-	-
Distillation, °F						
T10	426	-	-	-	434	-
T30 (if available)	458	-	-	-	492	-
T50	497	-	-	-	517	-
T70 (if available)	549	-	-	-	545	-
T90	609	-	-	-	613	-
Aromatics, Volume Percent	28.9	-	-	-	-	-
Polynuclear Aromatics (typical), Volume Percent	-	-	-	-	-	-

PADD 2
Number of Refineries: 25

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

NO. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation		Heating Oil	Marine
		Railroad	Other Off-Road	CARB	
Volume, K Barrels	60,948	1,482	19,485	0	
API Gravity	34.2	34.6	33.9		2,125
Sulfur, Weight Percent	0.035	0.425	0.333		35.8
Nitrogen, ppmw (CARB only)	-	-	-		0.127
Cetane Number (clear)	42.9	-	-		-
Cetane Improver, ppmw	83	-	6		-
Cetane Number (additized)	-	-	-		-
Pour Point, °F (additized)	(10)	(3)	(9)		(1)
Pour Point Depressant, ppmw	47	47	80		0
Distillation, °F					
T10	427	422	425		427
T30 (if available)	470	452	479		469
T50	505	504	508		510
T70 (if available)	549	544	559		557
T90	600	597	604		603
Aromatics, Volume Percent	25.8	-	26.8		-
Polynuclear Aromatics (typical), Volume Percent	-	-	-		-

PADD 3
Number of Refineries: 42

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

NO. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Off-Road	CARB		
Volume, K Barrels	104,469	1,812	28,880	0	16,507	1,509
API Gravity	34.3	34.8	34.4		32.1	33.1
Sulfur, Weight Percent	0.036	0.325	0.280		0.176	0.521
Nitrogen, ppmw (CARB only)	-	-	-		-	-
Cetane Number (clear)	43.8	-	46.7		-	-
Cetane Improver, ppmv	2	0	76		-	0
Cetane Number (additized)	-	-	-		-	-
Pour Point, °F (additized)	(2)	(1)	4		(6)	(6)
Pour Point Depressant, ppmw	7	0	0		0	0
Distillation, °F						
T10	436	416	434		427	451
T30 (if available)	478	473	463		485	471
T50	514	517	518		518	531
T70 (if available)	557	549	544		569	541
T90	610	613	615		620	628
T90	37.0	-	30.4		-	-
Aromatics, Volume Percent	-	-	-		-	-
Polynuclear Aromatics (typical), Volume Percent	-	-	-		-	-

PADD 4
Number of Refineries: 12

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

No. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Off-Road	CARB		
Volume, K Barrels	11,044	1,392	2,058	0	386	0
API Gravity	36.2	33.0	37.5		35.2	
Sulfur, Weight Percent	0.033	0.281	0.191		0.232	
Nitrogen, ppmw (CARB only)	-	-	-		-	
Cetane Number (clear)	-	-	-		-	
Cetane Improver, ppmv	12	0	0		-	
Cetane Number (additized)	-	-	-		-	
Pour Point, °F (additized)	0	8	5		1	
Pour Point Depressant, ppmw	11	14	14		0	
Distillation, °F						
T10	405	447	386		415	
T30 (if available)	435	480	417		-	
T50	495	523	482		505	
T70 (if available)	519	544	505		-	
T90	598	616	573		600	
Aromatics, Volume Percent	27.1	-	-		-	
Polynuclear Aromatics (typical), Volume Percent	-	-	-		-	

PADD 5 (excluding California)
Number of Refineries: 7

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

NO. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Off-Road	CARB		
Volume, K Barrels	7,454	0	3,018	0	2,233	0
API Gravity	33.8		34.9		32.2	
Sulfur, Weight Percent	0.028		0.279		0.356	
Nitrogen, ppmw (CARB only)	-		-		-	
Cetane Number (clear)	46.5		-		-	
Cetane Improver, ppmv	0		0		-	
Cetane Number (additized)	-		-		-	
Pour Point, °F (additized)	(2)		24		(4)	
Pour Point Depressant, ppmw	0		0		0	
Distillation, °F						
T10	432		489		434	
T30 (if available)	472		538		488	
T50	521		554		526	
T70 (if available)	554		576		562	
T90	611		619		613	
Aromatics, Volume Percent	-		-		-	
Polynuclear Aromatics (typical), Volume Percent	-		-		-	

TOTAL US (excluding California)
Number of Refineries: 95

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

No. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Other Off-Road	CARB		
Volume, K Barrels	196,394	4,710	53,441	0	32,319	2,509
API Gravity	34.4	34.3	34.4		32.6	33.9
Sulfur, Weight Percent	0.035	0.342	0.295		0.172	0.479
Nitrogen, ppmw (CARB only)	-	-	-		-	-
Cetane Number (clear)	44.1	43.8	47.4		-	-
Cetane Improver, ppmv	27	0	43		-	0
Cetane Number (additized)	-	-	-		-	-
Pour Point, °F (additized)	(5)	1	1		(5)	(5)
Pour Point Depressant, ppmw	19	19	30		0	0
Distillation, °F						
T10	431	425	432		430	442
T30 (if available)	471	468	472		485	471
T50	510	514	516		518	522
T70 (if available)	551	546	551		561	541
T90	606	608	610		616	613
Aromatics, Volume Percent	32.3	-	31.3		-	-
Polynuclear Aromatics (typical), Volume Percent	5.2	-	2.6		-	-

CALIFORNIA
Number of Refineries: 10

TABLE 2B

1996 API/NPRA SURVEY OF REFINING OPERATIONS AND PRODUCT QUALITY

FOR MAY 1, 1996 - AUGUST 31, 1996

NO. 2 DISTILLATE PROPERTIES

DIESEL/HEATING OIL

	EPA (Low Sulfur)	Transportation			Heating Oil	Marine
		Railroad	Off-Road	CARB		
Volume, K Barrels	8,642	0	1,153	16,045	0	0
API Gravity	33.6		30.8	36.5		
Sulfur, Weight Percent	0.020		0.322	0.014		
Nitrogen, ppmw (CARB only)	-		-	109		
Cetane Number (clear)	42.6		44.4	50.1		
Cetane Improver, ppmv	183		0	274		
Cetane Number (additized)	-		-	53.8		
Pour Point, °F (additized)	6		4	8		
Pour Point Depressant, ppmw	0		0	0		
Distillation, °F						
T10	447		498	440		
T30 (if available)	-		-	-		
T50	525		556	531		
T70 (if available)	-		-	-		
T90	612		620	623		
Aromatics, Volume Percent	28.8		24.0	18.2		
Polynuclear Aromatics (typical), Volume Percent	4.5		5.0	2.8		

APPENDIX D—PROCESS FACILITIES