ALBERTA MOTOR GASOLINE SURVEYS

1939 to 1947

by

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The Gasoline and Oil Testing Laboratory of the Research Council of Alberta was established in 1939 by the Provincial Government Department of Trade and Industry, for the Government testing of petroleum products produced or sold within the Province. In 1943 the laboratory was taken over by the Research Council of Alberta and the work integrated with other Council activities.

The initial work of the laboratory involved a survey of the different kinds of gasoline marketed in the Province with a view to adopting a standard specification which all gasoline sold in Alberta would be called upon to satisfy. A standard specification for gasoline was adopted on March 12, 1941 by Order in Council amending the Fuel Oil Licensing Act of 1936, by the addition of Part VI, Standards. The Order in Council was published in the Alberta Gazette of March 12, 1941.

Late in 1941 the quality of gasoline sold in the Dominion of Canada was specified by the Dominion Oil Controller, Department of Munitions and Supply, and thus the Alberta regulations were rendered non-active during the war period. On August 15th, 1945 the Dominion regulations were rescinded and the Alberta regulations once more came into force. These regulations have since been revised and the latest values are those shown in Table 3, and in the tabular statements which follow.

In the years 1939, 1940 and 1941, samples of gasoline for test purposes were taken by inspectors of the Department of Trade and Industry. Both Premium and Regular grades were sampled. From 1942 to 1945, samples were obtained through other Government Departments both Provincial and Dominion. Owing to the Gasoline and Oil Laboratory being called on to carry out more urgent work during the war period, only Premium grade samples and a few samples

of Regular grade gasoline were tested. The samples of Regular grade gasoline were too few in number to yield results of any significance and are not included in the tabular statements which follow. In 1945 a method of systematic sampling was agreed upon with the Provincial Secretary's Department. Since then the samples have been purchased by fuel oil inspectors who travel in all populated parts of the Province. With but few exceptions, the gasolines marketed by practically all the oil companies operating in the Province have since been sampled during the summer and winter months.

The standard test methods of the American Society for Testing Materials (A.S.T.M.) have been used throughout. The designation of these are; Octane number, A.S.T.M. method D 357, otherwise known as the motor method; Tetraethyl lead, A.S.T.M. method D 526; Reid vapour pressure, A.S.T.M. method D 323; Gravity at 60 degrees Fahrenheit in Degrees A.P.I., A.S.T.M. method D 287; Distillation range in degrees Fahrenheit on a basis of percentage evaporation, A.S.T.M. method D 86; Sulphur content, A.S.T.M. method D 90; Gum content, A.S.T.M. method D 381; Corrosion, A.S.T.M. method D 130.

The values obtained are tabulated in Table 1 for Premium grade and in Table 2 for Regular grade gasoline. Variations in octane number are shown graphically in Figure 1.

Variations other than the normal seasonal ones between summer and winter grades of gasoline are evident. In 1939 the average octane rating of Premium grade gasoline was slightly higher than 78. Between 1939 and the winter of 1941 to 1942, octane values declined steadily. Thereafter the octane values increased until the summer of 1943 when a sharp decline set in, the lowest value occurring during the winter of 1944 to 1945 when the average was 73.9. Following the war, values again increased rapidly and a value of 77.2 was reached in 1946. Since then the values have again declined. Although no data are available for Regular grade gasolines marketed between 1941 and 1945,

it is probable that Regular grade gasoline would show the same trend. The above mentioned fluctuations were due mainly to the varying supply of tetra-ethyl lead made available for use in gasoline for civilian use.

The overall volatility of both Premium and Regular grade gasolines has also changed during and since the war period. This is indicated by the distillation test data and to a minor degree to those for vapour pressure and gravity. During the war a large proportion of the more volatile constituents which normally are present in gasoline were diverted to increase the supply of aviation fuel and other essential war materials. Since 1945 the percentage proportions at the usual temperatures have shown a gradual increase, indicating a return to pre-war volatility.

It has been thought desirable to include in this report more detailed information which has been obtained during the summer survey of gasoline in 1947. Table 4 shows the average, maximum and minimum values obtained for each test for both Premium and Regular grades of gasoline. Table 5 and Table 6 list complete analytical data on all samples of Premium and Regular grade gasolines respectively.

Recently a number of companies have been adding solvent oil as a top cylinder lubricant to gasoline. In the standard A.S.T.M. gum test this material remains with the gum as a mixed residue. Accordingly some doubts arise as to the suitability of this method for the determination of gum content in such samples. When solvent oil has been suspected of being present the results obtained are given separately as gum plus oil.

The companies whose products were tested during the summer of 1947 are shown in Table 7. It was not possible for inspection to cover gasoline marketed by all the oil companies operating within the Province.

Table 1

Seasonal Average Analyses
Premium Gasoline

Test	W 1939 1940	S 1940	S 1941	W 1941 1942	S 1942	W 1942 1943	S 1943	W 1943 1944	S 1944	W 1944 1945	S 1945	F 1945	W 1945 1946	S 1946	W 1946 1947	S 1947
Octane Number	78.3	77.4	76.6	75.6	76.2	76.3	77.0	75.4	75.3	73.9	74.1	76.4	77.1	77.2	76.1	75.9
Tetraethyl lead															1.96	2.70
Vapour Pressure	10.5	8.5	8.5	10.6	8.8	9.9	8.5	9.2	9.1	9.4	7.1	8.5	9.1	8.7	9.9	7.7
Gravity	63.3	60.0	60.3							60.4	59.6	60.7	62.0	61.8	62.8	60.4
Distillation Range																
I.B.P.	91	101	92							90	98	93	93	94	89	96
10%	127	139	133	131	142	130	138	131	131	124	138	129	125	128	120	137
50%	229	245	246	240	247	239	248	251	249	244	241	235	223	232	230	238
90%	342	350	354	340	350	353	357	364	367	356	352	350	343	338	335	341
E.P.	389	400	403							408	401	401	397	392	388	396
Sulphur	0.06	0.05	0.05	0.04	0.04	0.06	0.07	0.04	0.07	0.06	0.04	0.04	0.05	0.06	0.05	0.06
Gum	2.0	0.9	1.7	2.2	1.3	1.3	2.2	1.4	3.6	2.8	3.4	1.8	2.8	3.9	2.3	2.7

S - Summer F - Fall W - Winter

Table 2

Seasonal Average Analyses
Regular Gasoline

Test	W 1939 1940	S 1940	S 1941	W 1944 1945	S 1945	F 1945	W 1945 1946	S 1946	W 1946 1947	S 1947
Octane Number	71.2	69.9	70.8	70.2	69.8	69.7	72.0	72.9	72.9	72.5
Tetraethyl Lead									1.46	1.63
Vapour Pressure	10.3	8.7	8.1	8.9	6.9	7.2	8.7	8.3	9.3	7.6
Gravity	62.3	60.0	59.1	60.1	59.1	59.4	60.6	60.9	61.4	60.5
Distillation Range I.B.P.	93	100	92	92	98	101	95	96	91	95
10%	131	141	138	127	140	140	131	131	125	137
50%	241	249	262	247	247	241	236	239	238	242
90%	356	360	362	353	355	349	347	342	340	343
E.P.	401	404	403	408	402	399	400	395	393	397
Sulphur	0.07	0.06	0.06	0.06	0.04	0.04	0.05	0.05	0.05	0.06
Gum	1.9	0.9	2.0	3.0	2.7	3.2	3.4	5.6	3.5	4.7

S - Summer F - Fall W - Winter

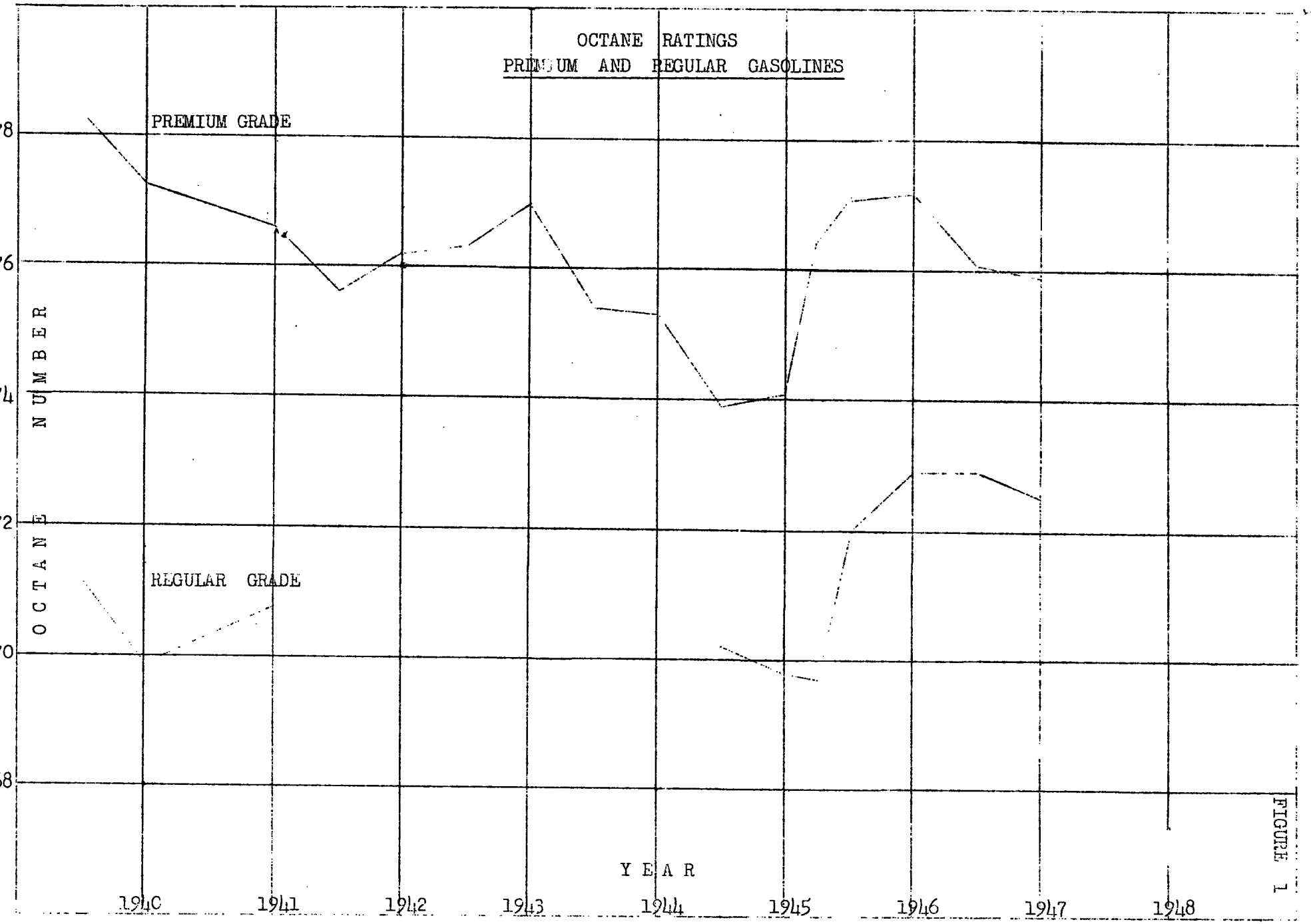
OCTANE RATINGS
PREMIUM AND REGULAR GASOLINES
PREMIUM GRADE
REGULAR GRADE
78
76
74
72
70
68
OCTANE NUMBER
1940
1941
1942
1943
1944
1945
1946
1947
1948
YEAR

FIGURE 1

Table 3

Alberta Specifications for Gasoline

Premium and Regular Grades

Test		Specification Value
Octane number	Premium Regular	Minimum 75 Minimum 70
Appearance		Clear
Corrosion		Nil
Reid vapour pressure lbs.	Summer Winter	Maximum 10 Maximum 13
Sulphur percent		Maximum 0,15
Gum milligrams per 100 cc.		Maximum 7
Freezing point degrees F.		Maximum - 60
Tetraethyl lead cc/I.g.		Maximum 3.6
Distillation range degrees F. Distilled basis		
10 percent	Summer Winter	Maximum 155 Maximum 140
50 percent	Summer Winter	Maximum 260 Maximum 255
90 percent		Maximum 370
Loss percent		Maximum 2.5
Colour	Premium Regular	Red Other than red
Time periods	Summer Winter	May through Sept. Nov. through Mar.

Table 4.

Summary of Analyses
Premium and Regular Grades of Gasoline

Summer 1947

Tests	Premium Gasoline			Regular Gasoline		
	Ave.	Max.	Min.	Ave.	Max.	Min.
	Total samples 45			Total samples 38		
Octane Number	75.9	79.9	71.2	72.5	74.4	67.5
Tetraethyl Lead c.c./I.G.	2.70	4.27	1.88	1.63	2.61	0.07
Vapour Pressure Lbs.	7.7	9.0	2.3	7.6	8.9	4.6
Gravity °A.P.I.	60.4	62.3	54.1	60.5	67.7	57.9
Distillation Range °F I.B.P.	96	136	88	95	110	88
10%	137	198	122	137	165	123
50%	238	277	226	242	261	223
90%	341	381	330	343	361	328
E.P.	396	439	383	397	412	387
Sulphur %	0.058	0.12	0.02	0.059	0.12	0.02
Gum Mgs./100 C.C.	2.7	5.4	1.4	4.7	16.2	1.2
Gum plus Oil mgs./ 100 C.C.	9.9	20.2	5.2	9.9	19.4	6.2
Corrosion	Nil			Nil		
Colour	Red			Yellow		

Table 5.

Summary of Data of Gasoline Survey Analysis
Premium Gasoline - Summer 1947

Co.	Octane No.	Tetra-ethyl Lead	Vapour Pressure	Gravity	Distillation Range					Sulphur	Gum	Gum + Oil	Corrosion
					I.B.P.	10%	50%	90%	E.P.				
Alta. Specs	Min. 75	Max. 3.6	Max. 10			Max. 155	Max. 260	Max. 370		Max. 0.15	Max. 7		Nil
A	75.0	2.78	7.5	60.5	94	126	245	346	394	0.06	1.8		Nil
C	75.5	3.57	8.0	59.7	92	136	257	348	394	0.06		5.2	Nil
C	77.4	3.31	7.6	59.5	95	139	267	350	400	0.06		5.2	Nil
C	77.0	3.25	8.3	61.2	93	132	237	340	390	0.07	2.8		Nil
C	75.4	2.30	7.4	60.5	96	138	239	343	396	0.06	1.8		Nil
C	75.7	2.08	7.7	62.2	95	135	230	338	387	0.06	2.0		Nil
C	75.3	3.66	8.9	62.3	92	124	235	344	388	0.07	1.4		Nil
D	77.0	3.77	5.0	56.3	108	164	253	342	409	0.05	5.4		
D	76.9	3.36	6.1	57.4	97	154	248	341	404	0.06		13.0	Nil
E	75.3	2.77	7.2	60.0	99	138	236	343	399	0.05		8.6	Nil
E	77.0	3.44	8.4	61.3	91	130	228	344	398	0.04		10.6	Nil
E	76.0	3.10	8.5	61.4	89	128	229	338	395	0.07		9.4	Nil
F	77.5	2.37	7.6	60.6	92	134	238	338	386	0.08		8.2	Nil
F	73.3	1.88	7.9	60.3	89	134	243	362	425	0.04		11.0	Nil
F	76.8	2.81	7.8	61.2	91	132	234	338	392	0.05	1.4		Nil
F	79.9	2.10	7.0	58.7	94	137	229	336	385	0.12	5.0		Nil
F	77.2	2.65	6.9	59.5	96	142	240	331	387	0.08	3.2		Nil
F	77.8	2.23	7.2	59.3	95	137	236	332	384	0.09		8.6	Nil
F	76.2	2.35	7.6	59.9	100	129	240	336	387	0.11	3.2		Nil
F	76.1	2.41	7.2	59.6	104	142	242	330	385	0.07	5.2		Nil
G	76.1	2.53	8.0	58.9	97	139	246	381	439	0.07		8.6	Nil
G	76.0	2.36	7.7	61.5	98	136	231	340	399	0.04		5.2	Nil
H	75.9	3.54	7.8	60.4	100	134	231	332	394	0.07			Nil
I	73.9	1.97	8.8	61.0	90	130	238	340	390	0.05		10.6	Nil
I	76.0	1.95	8.8	61.6	88	130	235	340	398	0.02		7.6	Nil
I	75.3	2.19	8.0	61.9	94	130	231	338	391	0.02		8.0	Nil
I	75.5	2.10	7.6	61.8	95	128	228	338	396	0.04		5.2	Nil
I	75.8	2.53	8.0	61.3	94	123	230	338	389	0.02	3.2		Nil
I	75.6	2.67	8.0	61.3	92	136	233	341	401	0.03	3.0		Nil
I	75.9	2.97	8.7	61.2	90	130	228	339	392	0.06		10.6	Nil
I	75.5	2.84	7.6	61.2	93	141	233	343	398	0.03		13.6	Nil
I	76.1	2.95	8.1	61.4	94	131	229	342	395	0.06		5.2	Nil
J	75.5	2.36	7.5	61.0	93	134	233	338	403	0.07	3.0		Nil
K	75.7	2.36	8.3	59.9	92	136	249	358	405	0.06	4.8		Nil
K	75.9	2.26	8.1	61.1	100	142	231	338	396	0.03		11.6	Nil
K	76.7	2.78	7.8	61.1	99	136	227	334	396	0.05	1.6		Nil
K	76.7	2.89	8.1	60.5	92	145	237	330	383	0.05	2.0		Nil
L	73.8	2.13	7.2	59.3	96	143	241	340	391	0.04		17.0	Nil
L	75.1	1.99	6.0	59.3	100	149	240	342	404	0.06		18.6	Nil
L	75.4	2.77	9.0	61.2	96	122	233	334	386	0.10		20.2	Nil
L	75.8	3.52	8.8	60.6	99	138	230	344	400	0.06	7.0		Nil
M	71.2	4.27	2.3	54.1	136	198	277	354	403	0.06	26.4		Nil
M	75.7	2.34	7.7	60.8	94	133	234	338	389	0.07	1.8		Nil
M	77.0	2.25	7.7	61.9	94	134	226	333	387	0.06	1.8		Nil
M	75.5	2.81	8.9	61.3	95	130	244	345	394	0.08	2.6		Nil

Note: Values underlined do not conform to Alberta Specifications

Table 6.

Summary of Data of Gasoline Survey Analysis
Regular Gasoline - Summer 1947

Co.	Octane No.	Tetra-ethyl Lead	Vapour Pressure	Gravity	Distillation Range					Sulphur	Gum	Gum + Oil	Corrosion
					I.B.P.	10%	50%	90%	E.P.				
Alta. Specs.	Min. 70	Max. 3.6	Max. 10			Max. 155	Max. 260	Max. 370		Max. 0.15	Max. 7		Nil
A	69.8	2.13	7.1	59.5	100	140	255	346	394	0.04	2.6		Nil
B	67.5	0.07	7.9	67.7	93	141	255	361	404	0.10	16.2		Nil
C	71.4	2.28	7.6	59.4	92	137	261	350	399	0.06	1.8		Nil
C	73.7	2.46	7.6	60.9	92	136	251	346	395	0.06	1.6		Nil
C	72.3	1.24	7.2	61.2	92	138	240	340	392	0.02	2.2		Nil
C	69.5	1.94	4.6	58.0	110	165	254	345	395	0.05	9.6		Nil
C	71.7	1.10	7.4	61.3	95	141	237	341	396	0.05		9.4	Nil
C	71.1	1.60	6.5	59.8	104	148	251	348	394	0.07	4.6		Nil
D	72.1	1.12	6.7	57.9	101	147	241	336	406	0.05	3.4		Nil
D	72.4	1.45	7.0	60.3	95	143	233	336	407	0.03	2.6		Nil
E	74.4	2.14	8.3	61.7	90	131	231	338	395	0.03	10.0		Nil
E	74.2	2.49	7.8	61.6	94	135	227	341	403	0.04		9.4	Nil
E	71.3	1.27	8.0	60.0	89	131	243	345	402	0.05		7.6	Nil
F	73.0	1.39	7.4	58.6	95	142	257	361	412	0.08	4.4		Nil
F	73.4	1.50	7.4	58.2	95	141	253	356	407	0.08		8.8	Nil
F	74.5	1.11	7.5	58.7	98	140	244	336	395	0.12	1.4		Nil
F	73.6	1.31	7.8	58.7	90	137	249	349	402	0.11	5.0		Nil
F	71.1	0.95	6.8	58.3	94	143	254	355	406	0.10	4.4		Nil
F	74.8	0.71	8.0	59.7	99	131	228	332	387	0.06	3.0		Nil
F	72.5	1.15	7.8	59.1	92	134	253	356	398	0.07	4.4		Nil
F	70.3	0.78	7.6	58.4	96	140	256	359	407	0.11	7.4		Nil
H	73.9	2.47	7.5	61.7	100	136	225	336	391	0.06	7.4		Nil
I	71.3	1.52	7.7	60.2	88	123	243	340	394	0.03		19.4	Nil
I	72.6	1.57	7.9	61.1	95	133	237	336	392	0.03		11.0	Nil
I	73.9	1.83	8.9	61.6	90	127	229	337	388	0.02	3.6		Nil
I	73.9	2.14	8.0	61.4	92	130	231	338	394	0.04	10.0		Nil
I	73.9	2.56	8.0	61.7	95	133	224	339	405	0.05		12.0	Nil
I	74.1	2.61	8.0	61.7	98	135	225	330	403	0.06		12.4	Nil
J	71.2	1.51	8.6	61.4	89	131	248	347	394	0.05	1.4		Nil
K	73.1	1.23	7.3	60.3	97	143	233	328	391	0.05	5.2		Nil
K	70.3	1.03	8.1	60.1	92	141	245	336	391	0.04	2.0		Nil
L	74.0	1.58	8.2	61.0	94	132	223	336	390	0.02	11.4		Nil
L	74.0	1.65	8.0	62.7	95	134	239	338	397	0.03	6.0		Nil
L	73.0	1.83	8.6	61.8	95	128	234	331	393	0.11		6.2	Nil
L	73.0	2.41	8.0	61.2	98	134	230	340	390	0.05	8.0		Nil
M	71.7	1.81	7.4	60.3	91	136	247	344	395	0.07	2.0		Nil
M	71.3	1.39	7.2	60.1	97	140	248	342	390	0.06	1.2		Nil
M	72.1	2.49	8.9	59.9	91	134	248	345	392	0.08	2.2		Nil

Note: Values underlined do not conform to Alberta Specifications.

Table 7

Companies
Samples Tested - Summer 1947

Bell Refining Company

Big West Refining Company

British American Oil Co.

Canada Western Distributors

Canadian Oil Company

Gas and Oil Products Company

Great West Distributors

Imperial Oil Company

Lion Oil Company

Maple Leaf Petroleum Co.

McColl Frontenac Oil Co.

North Star Oil Company

Seventy Seven Oil Company