

July 16, 1952

Alf M. Landon
National Bank of Topeka Bldg.
Topeka, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the 3" Rotary core taken from the Scott Johnson Lease, Well No. 8, Greenwood County, Kansas, and submitted to our laboratory on July 10, 1952.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:or
c.c.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Alf M. Landon Lease Scott Johnson Well No. 8

Location _____

Section 15 Twp. 24S Rge. 12E County Greenwood State Kansas

Name of Sand Bartlesville

Top of Core 1590.00

Bottom of Core 1614.00

Top of Sand ?

Bottom of Sand ?

Total Feet of Permeable Sand (Analyzed) 17.00

Total Feet of Floodable Sand (Analyzed) 9.65

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
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0 - 4	7.20	7.20
4 - 8	4.10	11.30
8 - 16	4.05	15.35
16 & above	1.65	17.00

Average Permeability Millidarcys 6.50

Average Percent Porosity 16.90

Average Percent Oil Saturation 38.78

Average Percent Water Saturation 35.47

Average Oil Content, Bbls./A. Ft. 512.

Total Oil Content, Bbls./Acre 8,708.

Average Percent Oil Recovery by Laboratory Flooding Tests 8.61

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 121.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 1,217.

Total Calculated Oil Recovery, Bbls./Acre 2,450.

Packer Setting, Feet

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Elevation, Feet

Fresh water was used in making up the circulating fluid used in the coring of the sand in this well. It is understood that this well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
1590.00 - 1590.25	- Light brown fine grained laminated micaceous carbonaceous shaley sandstone.
1590.25 - 1591.30	- Brown fine grained micaceous sandstone.
1591.30 - 1592.50	- Light brown fine grained slightly laminated micaceous carbonaceous sandstone, containing cross bedded shale laminations.
1592.50 - 1592.70	- Brown fine grained micaceous sandstone.
1592.70 - 1593.00	- Cross bedded laminated sandstone and shale.
1593.00 - 1593.50	- Brown fine grained micaceous sandstone.
1593.50 - 1594.10	- Cross bedded laminated sandstone and shale.
1594.10 - 1594.35	- Light brown fine grained slightly laminated micaceous carbonaceous sandstone.
1594.35 - 1594.65	- Cross bedded laminated carbonaceous sandstone.
1594.65 - 1594.80	- Light brown fine grained micaceous sandstone.
1594.80 - 1595.30	- Light brown fine grained micaceous sandstone containing cross bedded carbon laminations.
1595.30 - 1595.40	- Gray sandy shale.
1595.40 - 1595.60	- Light brown fine grained micaceous sandstone containing cross bedded carbon laminations.
1595.60 - 1596.45	- Light brown fine grained micaceous slightly shaley sandstone.
1596.45 - 1596.60	- Laminated sandstone and shale.
1596.60 - 1598.80	- Light brown fine grained micaceous shaley sandstone.

- 1598.80 - 1599.20 - Light brown fine grained micaceous calcareous sandstone.
- 1599.20 - 1599.45 - Sandy carbonaceous shale.
- 1599.45 - 1600.40 - Light brown fine grained micaceous sandstone containing slightly laminated cross bedded carbon laminations.
- 1600.40 - 1602.90 - Light brown fine grained micaceous sandstone.
- 1602.90 - 1606.50 - Brown fine grained micaceous sandstone.
- 1606.50 - 1607.00 - Brown fine grained slightly laminated micaceous carbonaceous sandstone.
- 1607.00 - 1607.27 - Light brown fine grained micaceous sandstone.
- 1607.27 - 1608.00 - Light brown fine grained slightly laminated micaceous carbonaceous sandstone.
- 1608.00 - 1608.15 - Finely laminated carbonaceous shaley sandstone.
- 1608.15 - 1608.50 - Light brown fine grained slightly laminated micaceous carbonaceous sandstone.
- 1608.50 - 1611.00 - Brown fine grained micaceous sandstone.
- 1611.00 - 1611.25 - Light brown fine grained laminated micaceous carbonaceous sandstone.
- 1611.25 - 1611.50 - Hard light brown carbonaceous sandstone.
- 1611.50 - 1613.00 - Brown fine grained micaceous sandstone.
- 1613.00 - 1614.00 - Light brown fine grained micaceous sandstone.

Coring was started at a depth of 1590.00 feet in fine grained laminated micaceous carbonaceous shaley sandstone and completed at 1614.00 feet in fine grained micaceous sandstone. This core shows a total of 22.25 feet of sandstone. For the most part, the pay is made up of fine grained micaceous sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and

lower sections is 4.66 and 7.33 millidarcys respectively; the overall average being 6.50 (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile and is comparatively tight.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 38.78. The weighted average percent oil saturation of the upper and lower sections is 34.80 and 40.18 respectively. The weighted average percent water saturation of the upper and lower sections is 46.00 and 30.64 respectively; the overall average being 35.47 (See Table IV). This gives an overall weighted average total fluid saturation of 74.25 percent. This low total fluid saturation indicates that an appreciable amount of fluid was lost during coring, which was probably oil.

In an effort to determine whether or not any flushing of the sand occurred during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in these tables and on the coregraph, it is evident that some flushing of the sand did occur during coring. However, we are of the opinion that most of the oil lost during coring was due to the expansion of gas carried in solution by the oil.

The weighted average oil content of the upper and lower sections is 397 and 552 barrels per acre foot respectively; the overall average being 512. The total oil content, as shown by this core, is 8,708 barrels per acre (See Table IV).

LABORATORY FLOODING TESTS

The sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 1,217 barrels of oil per acre was obtained from 10.05 feet of sand. The weighted average percent oil saturation was reduced from 36.90 to 28.29, or represents an average recovery of 8.61 percent. The weighted average effective permeability of the samples is 0.874 millidarcys, while the average initial fluid production pressure is 39.0 pounds per square inch (See Table VI). By observing the data given in Table V, you will note that of the 16 samples tested, 9 produced water and 10 oil. This indicates that approximately 62 percent of the sand represented by these samples will take water.

CONCLUSION

From a study of the above data, it is evident that an efficient water flood within the vicinity of this well will recover approximately 2,450 barrels of oil per acre, or an average of 254 barrels per acre foot from the 9.65 feet of floodable sand analyzed. In calculating this recovery, an allowance was made for oil lost during coring, and it was assumed that the true water saturation of the sand is 35 percent and that the well was drilled in virgin territory.

The principle drawback of the sand in this core is the fact that it has a wide variation in permeability.

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Alf M. Landon Lease Johnson Well No. 8

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	1590.65	20.	0.65	0.65	13.00
2	1591.95	16.	0.40	1.05	6.40
3	1591.75	Imp.	0.80	1.85	0.00
4	1592.60	12.	0.20	2.05	2.40
5	1594.25	1.1	0.25	2.30	0.28
6	1594.74	1.2	0.15	2.45	0.18
7	1595.65	1.0	0.30	2.75	0.30
8	1596.15	0.54	0.55	3.30	0.30
9	1596.63	0.35	0.60	3.90	0.21
10	1597.56	0.50	0.60	4.50	0.30
11	1598.15	0.44	0.60	5.10	0.26
12	1598.67	0.57	0.40	5.50	0.23
13	1599.13	Imp.	0.40	5.90	0.00
14	1600.09	1.4	0.60	6.50	0.84
15	1600.73	5.1	0.50	7.00	2.55
16	1601.04	1.2	0.40	7.40	0.48
17	1601.46	3.1	0.35	7.75	1.09
18	1601.87	1.5	0.60	8.35	0.90
19	1602.60	1.1	0.65	9.00	0.72
20	1603.00	12.	0.40	9.40	4.80
21	1603.63	1.4	0.55	9.95	0.77
22	1604.10	12.	0.45	10.40	5.40
23	1604.63	11.	0.50	10.90	5.50
24	1604.95	9.6	0.30	11.20	2.88
25	1605.30	6.1	0.40	11.60	2.44
26	1605.80	9.7	0.60	12.20	5.82
27	1606.35	7.8	0.40	12.60	3.12
28	1607.10	Imp.	0.27	12.87	0.00
29	1607.31	Imp.	0.73	13.60	0.00
30	1608.30	1.6	0.35	13.95	0.56
31	1609.07	10.	0.70	14.65	7.00
32	1609.37	8.8	0.60	15.25	5.28
33	1610.14	4.6	0.60	15.85	2.76
34	1610.75	31.	0.60	16.45	18.60
35	1611.10	1.7	0.25	16.70	0.43
36	1611.75	4.9	0.40	17.10	1.96
37	1612.10	14.	0.30	17.40	4.20
38	1612.35	4.6	0.80	18.20	3.68
39	1613.05	7.3	0.20	18.40	1.46
40	1613.37	4.2	0.80	19.20	3.36

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Alf M. Landon Lease Scott Johnson Well No. 8

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
1590.25 - 1600.40	5.30	4.66	24.70
1600.40 - 1614.00	11.70	7.33	85.76
1590.25 - 1614.00	17.00	6.50	110.46

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RESULTS OF SATURATION TESTS

TABLE III

Company Alf M. Landon Lease Scott Johnson Well No. 8

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation		Oil Content Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water		Total	Ft.	
1	1590.13	13.7	28.2	51.2	300	0.25	0.25	75
P-1	1590.35	16.1	28.0	79.4	349	1.05	1.30	367
2	1593.25	17.0	36.9	73.1	486	0.50	1.80	243
3	1597.25	15.1	37.4	86.4	437	2.20	4.00	960
4	1598.90	8.4	40.0	78.4	261	0.40	4.40	104
5	1600.90	16.9	34.2	82.3	448	1.25	5.65	561
6	1602.25	16.1	39.6	73.3	495	1.25	6.90	618
7	1603.90	18.1	45.8	69.8	644	1.60	8.50	1,031
8	1605.10	18.3	36.6	68.4	520	2.00	10.50	1,040
9	1606.75	14.5	32.0	72.3	360	0.50	11.00	1,180
10	1607.75	16.8	38.3	77.9	500	1.00	12.00	500
11	1608.70	17.6	37.1	70.7	506	0.70	12.70	354
12	1609.75	19.2	44.5	75.1	661	1.00	13.70	661
13	1610.75	19.9	43.5	71.4	671	0.80	14.50	537
14	1611.75	17.7	45.7	89.5	628	0.75	15.25	472
15	1612.75	18.6	48.5	81.3	700	0.75	16.00	525
16	1613.75	16.6	37.3	75.8	480	1.00	17.00	480
						Total	- - - -	8,708

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SUMMARY OF SATURATION TESTS

TABLE IV

Company	Lease	Well No.							
Alf H. Landon	Scott Johnson	8	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
			1590.00 - 1599.20	4.40	14.86	34.80	46.00	397	1,749
			1600.40 - 1614.00	12.60	17.61	40.18	34.64	552	6,959
			1590.00 - 1614.00	17.00	16.90	38.78	35.47	512	8,708

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RESULTS OF LABORATORY TESTS

TABLE

Company Alf M. Landon

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.
1	1590.35	16.1	26.0	349	3.6	47
2	1593.25	17.2	35.5	474	7.7	103
3	1597.25	15.0	36.6	486	0.0	0
4	1598.90	8.6	41.7	518	0.0	0
5	1600.90	17.0	34.4	454	0.0	0
6	1602.25	16.1	38.4	480	3.4	43
7	1603.90	18.2	45.6	612	0.0	0
8	1605.10	18.3	35.2	500	9.6	136
9	1606.75	15.0	32.6	380	0.0	0
10	1607.75	16.6	36.3	468	3.6	46
11	1608.70	17.4	34.6	468	7.4	100
12	1609.75	18.9	42.8	629	17.0	250
13	1610.75	19.7	41.4	653	20.5	314
14	1611.75	17.5	44.1	599	15.4	209
15	1612.75	18.5	49.3	710	0.0	0
16	1613.75	17.0	35.5	469	1.3	17

Notes: cc - cubic centimeter.
 * - Volume of water recovered at the time of test.
 ** - Determined by passing water through sample.

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ORY FLOODING TESTS

LE V

Lease Scott Johnson Well No. 8

Residual Saturation			Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
% Oil	% Water	Bbls./A. Ft.			
24.2	67.4	302	116	3.67	80
27.8	68.0	371	1	0.049	50
36.6	58.0	426	0	Imp.	50 ^f
41.7	43.3	518	0	Imp.	50 ^f
34.4	54.0	454	2	0.100	50
35.0	50.5	437	0	0.015	50
43.6	45.7	612	1	0.100	50
25.6	63.7	364	34	1.03	30
32.6	59.2	380	0	Imp.	50 ^f
32.7	53.7	422	0	0.012	50
27.2	58.0	368	5	0.295	50
25.8	71.2	379	24	0.590	20
20.9	71.8	319	90	2.30	20
28.7	47.4	390	2	0.197	50
49.3	33.1	710	0	Imp.	50 ^f
34.2	42.4	452	0	0.006	50

Maximum oil recovery,
which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company	Lease	Well No.
Alf M. Landon	Scott Johnson	8
	1590.00	1601.65
Depth Interval, Feet	1599.20	1614.00
Feet of Core Analyzed	1.55	8.50
Average Percent Porosity	16.45	17.69
Average Percent Original Oil Saturation	30.45	38.07
Average Percent Oil Recovery	5.10	9.25
Average Percent Residual Oil Saturation	25.35	28.82
Average Percent Residual Water Saturation	65.68	57.82
Average Percent Total Residual Fluid Saturation	91.03	86.64
Average Original Oil Content, Bbls./A. Ft.	390.	523.
Average Oil Recovery, Bbls./A. Ft.	65.	131.
Average Residual Oil Content, Bbls./A. Ft.	325.	392.
Total Original Oil Content, Bbls./Acre	604.	4,449.
Total Oil Recovery, Bbls./Acre	101.	1,116.
Total Residual Oil Content, Bbls./Acre	503.	3,333.
Average Effective Permeability, Millidarcys	2.52	0.574
Average Initial Fluid Production Pressure, p.s.i.	35.0	40.0
		39.0

NOTE: Only those samples which recovered oil were used in calculating the above averages.

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Alf Landon Lease Johnson Well No. 8

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation	
			Connate	Drilling & Foreign
			Total	
1	1590.13	47,900		
2	1593.25	50,000		
3	1597.25	43,000		
4	1598.90	65,900		
5	1600.90	31,800		
6	1602.25	51,600		
7	1603.90	65,000		
8	1605.10	44,000		
9	1606.75	43,200		
10	1607.75	41,400		
11	1608.70	46,500		
12	1609.75	39,400		
13	1610.75	46,700		
14	1611.75	37,200		
15	1612.75	44,400		
16	1613.75	40,800		

Note: ppm - parts per million.

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Alf Landon Lease Johnson Well No. 8

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
1590.00 - 1599.20	47,145		
1600.40 - 1614.00	45,283		
1590.00 - 1614.00	45,674		

Note: ppm - parts per million.