

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

August 9, 1966

27-25-17E

Link Oil Company
c/o Mr. Lee Bentley
434 Kennedy Building
Tulsa, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the White Lease, Well No. 1, Woodson County, Kansas, and submitted to our laboratory on August 3, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

BRP:rf

5 c.

White 1

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Link Oil Company Lease White Well No. 1

Location NW NE SW

Section 27 Twp. 25S Rge. 17E County Woodson State Kansas

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 905.0

Bottom of Core - - - - - 961.7

Top of Sand - - - - (Tested) - - - - 905.0

Bottom of Sand - - - - (Tested) - - - - 957.1

Total Feet of Permeable Sand - - - - - 47.6

Total Feet of Floodable Sand (Analyzed) - - - - - 8.0

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.	
0 - 1	5.0	5.0	
1 - 10	14.6	19.6	
10 - 20	8.0	27.6	
20 - 50	9.0	36.6	
50 - 100	7.0	43.6	
100 & above	4.0	47.6	
Average Permeability Millidarcys - - - - -			33.4
Average Percent Porosity - - - - -			18.4
Average Percent Oil Saturation - - - - -			32.1
Average Percent Water Saturation - - - - -			47.6
Average Oil Content, Bbls./A. Ft. - - - - -			461.
Total Oil Content, Bbls./Acre - - - - -			21,496.
Average Percent Oil Recovery by Laboratory Flooding Tests - - - - -			4.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - -			62.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - -			495.
Total Calculated Oil Recovery, Bbls./Acre Eoot - (Primary & Secondary)			262.
Packer Setting, Feet - - - - -			
Viscosity, Centipoises @ - - - - -			
A. P. I. Gravity, degrees @ 60 °F - - - - -			
Elevation, Feet - - - - -			

Fresh water mud was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u>	<u>Description</u>
<u>Feet</u>	

905.0 - 911.6	- Grayish light brown, slightly shaly sandstone.
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911.6 - 927.6	- Gray and brown, shaly sandstone.
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927.6 - 938.6	- Brown, slightly shaly sandstone.
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938.6 - 941.6	- Light brown, laminated, shaly sandstone.
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941.6 - 948.6	- Dark carbonaceous, slightly shaly sandstone.
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948.6 - 961.7	- Gray, carbonaceous, shaly sandstone.
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Coring was started at a depth of 905.0 feet in sandstone and completed at 961.7 feet also in sandstone. For the most part, the pay is made up of brown, slightly shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 21.2, 54.8 and 34.5 millidarcys respectively; the overall average being 33.4 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from impermeable to a maximum of 207 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 32.1. The weighted average percent oil saturation of the upper, middle and lower sections is 26.0, 37.2 and 38.2 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 54.1, 38.6 and 42.5 respectively; the overall average being 47.6 (See Table III). This gives an overall weighted average total fluid saturation of 79.7 percent.

The weighted average oil content of the upper, middle and lower sections is 348, 565 and 571 barrels per acre foot respectively; the overall average being 461. The total oil content, as shown by this core, is 21,496 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Selected samples of the core were subjected to flood pot tests. These samples responded to laboratory flooding tests, as a total recovery of 495 barrels of oil per acre was obtained from 8.0 feet of sand. The weighted average percent oil saturation was reduced from 37.4 to 33.4, or represents an average recovery of 4.0 percent. The weighted average effective permeability of the samples is 1.39 millidarcys, while the average initial fluid production pressure is 40.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 10 produced water and 8 oil. This indicates that approximately 57 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide

variation in effective permeability to water.

CONCLUSION

Based on the results of the laboratory tests it appears that efficient primary and secondary operations in the vicinity of this well should recover approximately 262 barrels of oil per acre foot. This recovery value was calculated using the following data and assumptions:

Original formation volume factor	1.05
Reservoir water saturation, percent	30.0
Average porosity, percent	19.4
Oil saturation after flooding, percent	33.4
Performance factor, percent	50.0

This core shows a pay sand section (927.6 to 938.6) having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Sample No.	Depth, Feet	Effective Porosity Percent	Link Oil Company		Lease		White		Well No.	
			Percent Saturation		Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water			Ft.	Cum. Ft.		
1	905.1	22.2	12	55	206	3.2	0.6	0.6	124	1.92
2	906.1	16.5	22	67	281	4.9	1.0	1.6	281	4.90
3	907.1	19.8	16	54	246	20.	1.0	2.6	246	20.00
4	908.1	17.7	12	62	165	39.	1.0	3.6	165	39.00
5	909.1	18.0	24	59	335	24.	1.0	4.6	335	24.00
6	910.1	13.3	28	65	288	0.98	1.0	5.6	288	0.98
7	911.1	15.7	16	72	195	207.	1.0	6.6	195	207.00
8	912.1	18.8	27	38	394	Imp.	1.0	7.6	394	0.00
9	913.1	16.6	28	59	360	0.62	1.0	8.6	360	0.62
10	914.1	17.9	29	40	402	0.42	1.0	9.6	402	0.42
11	915.1	16.7	37	45	479	6.3	1.0	10.6	479	6.30
12	916.1	14.2	17	81	187	0.93	1.0	11.6	187	0.93
13	917.1	17.1	24	51	318	6.3	1.0	12.6	318	6.30
14	918.1	15.7	28	58	341	0.71	1.0	13.6	341	0.71
15	919.1	17.9	37	44	514	8.2	1.0	14.6	514	8.20
16	920.1	15.7	16	71	195	Imp.	1.0	15.6	195	0.00
17	921.1	19.0	30	42	441	9.1	1.0	16.6	441	9.10
18	922.1	17.9	30	42	416	17.	1.0	17.6	416	17.00
19	923.1	19.7	32	39	489	64.	1.0	18.6	489	64.00
20	924.1	19.4	36	39	541	15.	1.0	19.6	541	15.00
21	925.1	17.1	35	48	464	4.7	1.0	20.6	464	4.70
22	926.1	14.8	35	62	401	3.1	1.0	21.6	401	3.10
23	927.1	15.9	23	50	284	4.8	1.0	22.6	284	4.80
24	928.1	21.9	32	36	544	78.	1.0	23.6	544	78.00
25	929.1	20.2	42	36	656	62.	1.0	24.6	656	62.00
26	930.1	20.6	34	39	542	44.	1.0	25.6	542	44.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company			Link Oil Company			Lease			White			Well No.			1		
Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.						
			Oil	Water	Total			Ft.	Cum. Ft.								
27	931.1	19.8	36	36	72	552	101.	1.0	26.6	552	101.00						
28	932.1	17.8	37	42	79	510	12.	1.0	27.6	510	12.00						
29	933.1	17.8	37	42	79	510	60.	1.0	28.6	510	60.00						
30	934.1	17.6	36	46	82	491	10.	1.0	29.6	491	10.00						
31	935.1	18.3	41	36	77	581	82.	1.0	30.6	581	82.00						
32	936.1	20.9	43	31	74	696	40.	1.0	31.6	696	40.00						
33	937.1	20.8	34	41	75	549	78.	1.0	32.6	549	78.00						
34	938.1	20.3	37	40	77	582	35.	1.0	33.6	582	35.00						
35	939.1	19.0	30	40	70	441	33.	1.0	34.6	441	33.00						
36	940.1	18.7	37	45	82	536	46.	1.0	35.6	536	46.00						
37	941.1	19.4	28	48	76	421	122.	1.0	36.6	421	122.00						
38	942.1	21.5	33	42	75	550	44.	1.0	37.6	550	44.00						
39	943.1	17.0	30	50	80	395	13.	1.0	38.6	395	13.00						
40	944.1	19.6	40	41	81	608	139.	1.0	39.6	608	139.00						
41	945.1	19.7	35	37	72	534	62.	1.0	40.6	534	62.00						
42	946.1	19.8	48	41	89	736	11.	1.0	41.6	736	11.00						
43	947.1	19.6	50	38	88	759	8.2	1.0	42.6	759	8.20						
44	948.1	18.5	44	45	89	631	16.	1.0	43.6	631	16.00						
45	949.1	20.1	36	39	75	560	23.	1.0	44.6	560	23.00						
46	950.1	19.5	47	35	82	711	1.2	1.0	45.6	711	1.20						
47	952.1	18.4	38	52	90	541	5.7	1.0	46.6	541	5.70						
48	954.1						4.1	1.0	47.6		4.10						
49	956.1						14.	1.0	48.6		14.00						
50	957.1						9.6	1.0	49.6		9.60						
Total										21,496							

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Link Oil Company	Lease	White	Well No.	1		
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
	905.0 - 927.6	20.6	21.2	438.98			
	927.6 - 938.6	11.0	54.8	602.00			
	938.6 - 957.6	16.0	34.5	551.80			
	905.0 - 957.6	47.6	33.4	1,592.78			
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
	905.0 - 927.6	22.6	17.2	26.0	54.1	348	7,860
	927.6 - 938.6	11.0	19.6	37.2	38.6	565	6,213
	938.6 - 952.6	13.0	19.3	38.2	42.5	571	7,423
	905.0 - 952.6	46.6	18.4	32.1	47.6	461	21,496

Oilfield Research Laboratories
RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Link Oil Company		Lease		White		Well No.		1	
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc ^a	Effective Permeability mDarcy ^{oo}	Initial Yield Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
5	909.1	18.4	24	342	0	0	24	64	7	0.200	50
11	915.1	16.4	37	470	2	25	35	63	6	0.200	50
14	918.1	15.6	29	351	0	0	29	60	0	Imp.	-
17	921.1	18.7	30	435	0	0	30	44	0	Imp.	-
20	924.1	19.0	36	531	2	29	34	65	8	0.300	50
23	927.1	16.1	25	312	0	0	25	51	0	Imp.	-
26	930.1	21.0	34	553	4	65	30	64	221	6.30	20
29	933.1	18.0	37	516	2	28	35	54	10	0.300	50
32	936.1	20.9	43	696	12	195	31	57	30	1.20	40
35	939.1	19.2	30	446	0	0	30	58	7	0.300	50
38	942.1	21.3	33	544	2	33	31	63	50	1.50	30
41	945.1	20.1	35	545	3	47	32	51	37	1.20	30
44	948.1	18.7	44	639	5	73	39	53	3	0.100	50
47	952.1	18.1	39	547	0	0	39	53	0	Imp.	-

Notes: cc—cubic centimeter.

a.—Volume of water recovered at the time of maximum oil recovery.

oo.—Determined by passing water through sample which still contains residual oil.

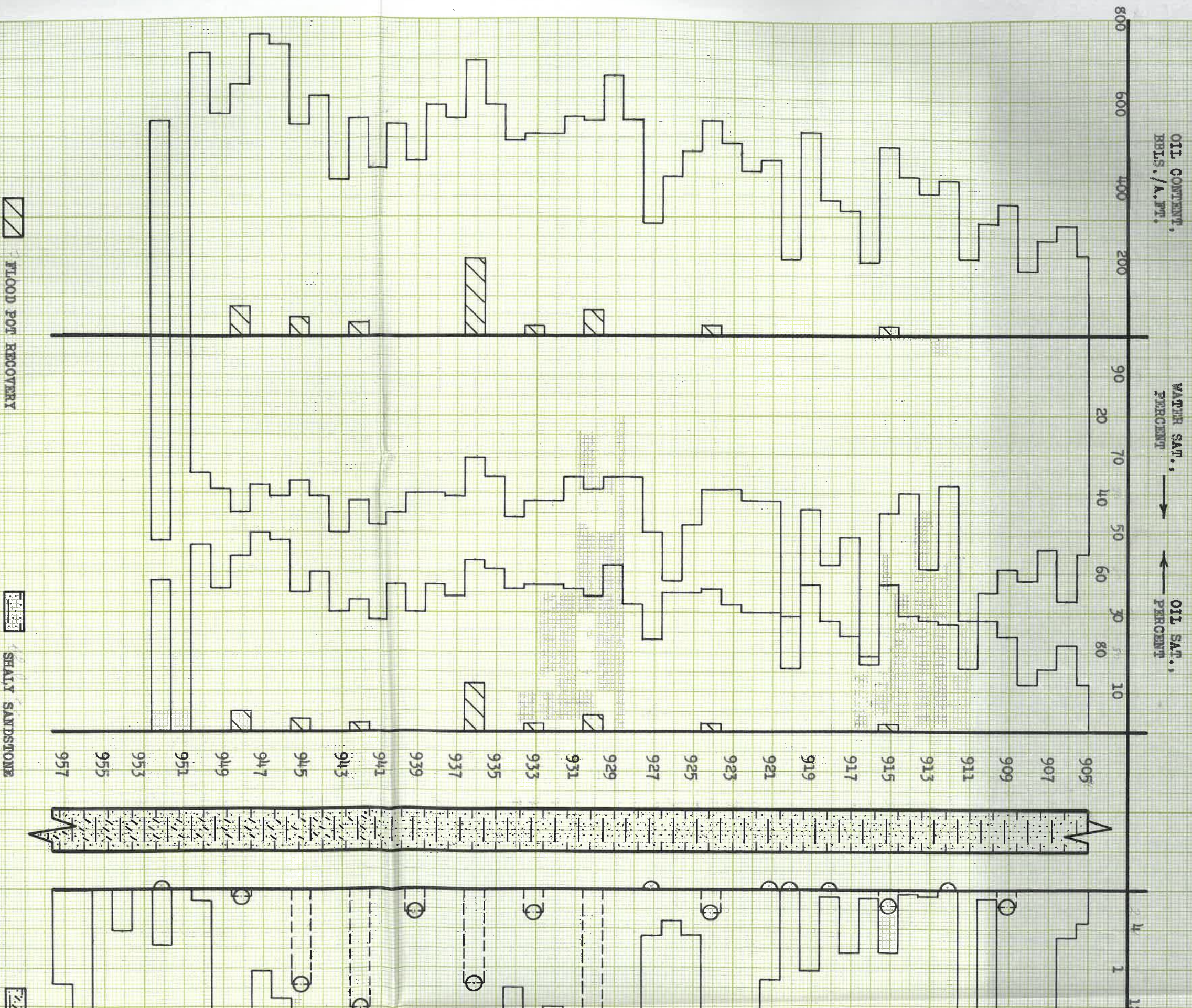
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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Link Oil Company	Lease	White	Well No.
Depth Interval, Feet		908.6 - 952.6		1
Feet of Core Analyzed		8.0		
Average Percent Porosity		19.4		
Average Percent Original Oil Saturation		37.4		
Average Percent Oil Recovery		4.0		
Average Percent Residual Oil Saturation		33.4		
Average Percent Residual Water Saturation		58.8.		
Average Percent Total Residual Fluid Saturation		92.2		
Average Original Oil Content, Bbls./A. Ft.		562.		
Average Oil Recovery, Bbls./A. Ft.		62.		
Average Residual Oil Content, Bbls./A. Ft.		500.		
Total Original Oil Content, Bbls./Acre		4,494.		
Total Oil Recovery, Bbls./Acre		495.		
Total Residual Oil Content, Bbls./Acre		3,999.		
Average Effective Permeability, Millidarcys		1.39		
Average Initial Fluid Production Pressure, p.s.i.		40.0		

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



LINK OIL

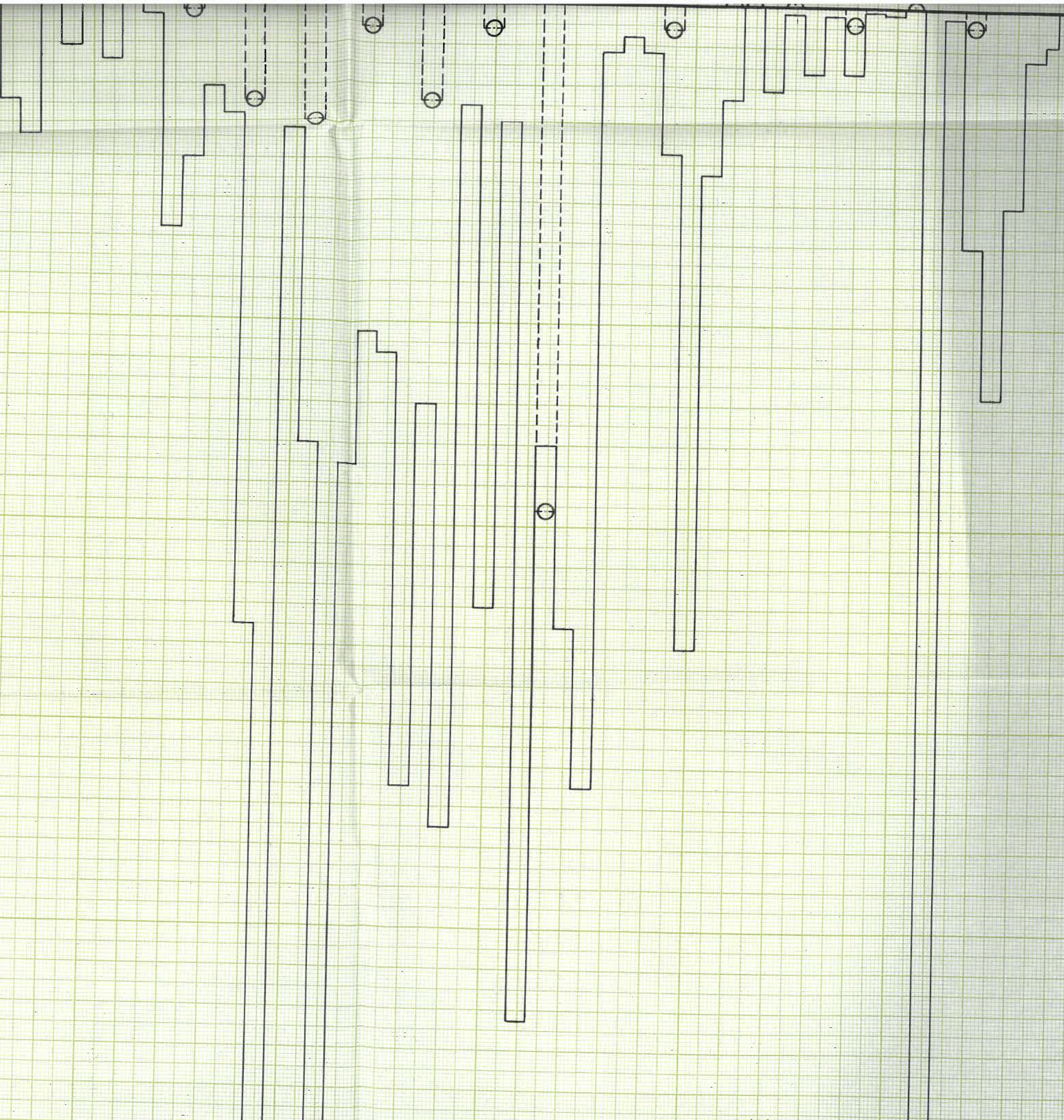
WHITE LEASE

WOODSON CO

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WAT SATURATION PERCENT
905.0 - 927.6	22.6	17.2	26.0	54.1
927.6 - 938.6	11.0	19.6	37.2	38.6
938.6 - 952.6	13.0	19.3	38.2	42.5
905.0 - 952.6	46.6	18.4	32.1	47.6

AIR PERMEABILITY, IN MILLIDARCS
---○--- EFFECTIVE PERMEABILITY, IN MILLIDARCS

1 12 20 28 36 44 52 60 68 76 84 92 100 108



2A

SEALY CARBONACEOUS SANDSTONE

○ IMPERMEABLE TO AIR

○ IMPERMEABLE TO WATER

OIL COMPANY

WELL NO. 1

LEASE
WOODSON COUNTY, KANSAS

IL	AVG. WATER	AVG. OIL	TOTAL OIL	AVG. AIR	CALCULATED
ION	SATURATION	CONTENT	CONTENT	PERMEABILITY,	OIL RECOVERY,
P	PERCENT	BBLs./A.Ft.	BBLs./ACRE	MILLIDARCS	BBLs./ACRE Ft.

54.1	348	7,860	21.2
38.6	565	6,213	54.8
42.5	571	7,423	34.5
47.6	461	21,496	33.4

262 (Primary & Secondary)

OILFIELD RESEARCH LABORATORIES
CHANDLER, KANSAS
AUGUST, 1966