

OILFIELD RESEARCH LABORATORIES

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January 29, 1981

Moore Oil Company
P. O. Box 6122
Leawood, Kansas 66206

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Wilson Lease, Well No. 102, located in Miami County, Kansas and submitted to our laboratory on December 18, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Leawood, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Moore Oil Company Lease Wilson Well No. 102

Location 1100' WEL & 395' SNL E $\frac{1}{2}$ NE $\frac{1}{4}$

Section 26 Twp. 26S Rge. 21E County Miami State Kansas

Elevation, Feet - - - - -

Name of Sand - - - - - Squirrel

Top of Core - - - - - 642.0

Bottom of Core - - - - - 689.4

Top of Sand - - - - - (Tested) 643.2

Bottom of Sand - - - - - 686.9

Total Feet of Permeable Sand - - - - - 32.6

Total Feet of Floodable Sand - - - - - 20.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	8.3	8.3
20 - 40	12.4	20.7
40 - 60	5.9	26.6
60 - 80	2.0	28.6
80 & Above	4.0	32.6

Average Permeability Millidarcys - - - - - 39.9

Average Percent Porosity - - - - - 20.8

Average Percent Oil Saturation - - - - - 41.6

Average Percent Water Saturation - - - - - 43.0

Average Oil Content, Bbls./A. Ft. - - - - - 672.

Total Oil Content, Bbls./Acre - - - - - 21,910.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 8.2

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 133.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 2,775.

Total Calculated Oil Recovery, Bbls./Acre - - - - - See "Calculated Recovery" Section

The core was sampled and the samples sealed in plastic bags by a representative of the client. Salt water mud was used as a drilling fluid.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
642.0 - 643.2	Light brown and gray laminated slightly calcareous sandstone and shale.
643.2 - 653.8	Brown slightly calcareous sandstone.
653.8 - 655.1	Brown slightly calcareous slightly shaly sandstone.
655.1 - 657.7	Brown slightly calcareous sandstone.
657.7 - 659.0	Light brown and gray laminated sandstone and shale.
659.0 - 662.4	Brown slightly calcareous sandstone.
662.4 - 666.0	Brown and gray laminated slightly calcareous sandstone and shale.
666.0 - 678.4	Brown slightly calcareous sandstone.
678.4 - 679.0	Light brown and gray laminated slightly calcareous sandstone and shale.
679.0 - 685.5	Brown slightly calcareous sandstone.
685.5 - 686.0	Grayish brown calcareous conglomeratic shaly sandstone.
686.0 - 686.9	Brown carbonaceous calcareous sandstone.
686.9 - 688.4	Gray sandy shale.
688.4 - 689.4	Gray fossiliferous calcareous limestone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,775 barrels of oil per acre was obtained from 20.9 feet of sand. The weighted average percent oil saturation was reduced from 41.3 to 33.1, or represents an average recovery of 8.2 percent. The weighted average effective permeability of the samples is 4.27 millidarcys, while the average initial fluid production pressure is 25.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 29 samples tested, 18 produced water and oil, and 10 samples produced water only. This indicates that approximately 62 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 5,890 barrels of oil per acre. This is an average recovery of 282 barrels per acre foot from 20.9 feet of floodable sand analyzed in this core.

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These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.04
Reservoir water saturation, percent, estimated	30.0
Average porosity, percent	21.2
Oil saturation after flooding, percent	33.1
Performance factor, percent, estimated	50.0
Net floodable sand, feet	20.9

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Moore Oil Company Lease Wilson Well No. 102

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.		
1	644.2	19.1	44	54	98	652	13.	1.8	1.8	1174	23.40
2	645.8	19.9	39	47	86	602	12.	1.0	2.8	602	12.00
3	646.5	20.4	47	38	85	744	23.	1.0	3.8	744	23.00
4	649.9	19.4	47	49	96	707	17.	1.0	4.8	707	17.00
5	652.4	20.7	36	53	89	578	20.	1.5	6.3	867	30.00
6	654.4	18.3	41	52	93	582	9.7	1.3	7.6	757	12.61
7	656.1	21.3	41	48	89	678	18.	1.6	9.2	1085	28.80
8	656.9	21.8	38	41	79	643	28.	1.0	10.2	643	28.00
9	662.3	22.6	36	46	82	631	56.	1.0	11.2	631	56.00
10	663.7	22.1	43	40	83	737	1.2	1.6	12.8	1179	1.92
11	664.8	22.6	42	39	81	736	50.	1.0	13.8	736	50.00
12	665.8	14.4	29	33	62	324	39.	1.0	14.8	324	39.00
13	666.6	21.3	36	44	80	595	67.	1.0	15.8	595	67.00
14	667.4	21.4	45	36	81	747	35.	1.0	16.8	747	35.00
15	668.5	15.4	39	53	92	466	31.	1.0	17.8	466	31.00
16	669.2	21.8	37	41	78	626	84.	1.0	18.8	626	84.00
17	670.3	22.8	33	49	82	584	87.	1.0	19.8	584	87.00
18	671.4	22.6	43	40	83	754	60.	1.0	20.8	754	60.00
19	672.5	20.6	52	42	94	831	44.	1.0	21.8	831	44.00
20	673.1	21.2	37	42	79	609	40.	1.0	22.8	609	40.00
21	674.3	21.7	42	42	84	707	39.	1.4	24.2	990	54.60
22	676.1	19.8	40	49	89	614	49.	1.0	25.2	614	49.00
23	677.1	24.1	38	36	74	711	143.	1.0	26.2	711	143.00
24	678.3	22.0	35	43	78	597	27.	1.0	27.2	597	27.00
25	681.1	23.2	37	42	79	666	123.	1.0	28.2	666	123.00
26	682.3	21.3	42	44	86	694	25.	1.0	29.2	694	25.00
27	684.1	23.1	44	38	82	789	22.	1.5	30.7	1184	33.00
28	685.3	20.3	61	25	86	961	38.	1.0	31.7	961	38.00
29	686.8	18.6	64	23	87	924	41.	0.9	32.6	832	36.90

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Moore Oil Company Lease Wilson Well No. 102

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
643.2 - 686.9	32.6	39.9	1299.23

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
643.2 - 686.9	32.6	20.8	41.6	43.0	672	21,910

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Moore Oil Company Lease Wilson Well No. 102

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	644.2	19.2	44	655	12	179	32	65	476	54	1.05	35
2	645.8	19.9	39	602	7	108	32	61	494	15	0.30	40
3	646.5	20.4	47	744	14	222	33	59	522	74	1.20	30
4	649.9	19.6	47	715	13	198	34	60	517	130	2.10	25
5	652.4	20.8	36	581	6	97	30	66	484	322	9.00	20
6	654.4	18.3	41	582	0	0	41	54	582	0	Imp.	-
7	656.1	21.3	41	678	8	132	33	57	546	60	1.05	30
8	656.9	21.6	38	628	5	83	33	58	545	120	1.65	25
9	662.3	22.1	37	634	0	0	37	60	634	80	1.65	25
10	663.7	22.0	43	734	12	205	31	60	529	37	0.75	25
11	664.8	22.4	42	730	10	174	32	64	556	213	4.35	20
12	665.8	14.9	28	324	0	0	28	70	324	221	4.20	25
13	666.6	21.4	36	598	2	33	34	62	565	260	8.10	20
14	667.4	21.4	45	747	11	183	34	62	564	240	5.25	25
15	668.5	15.5	39	469	0	0	39	53	469	74	1.50	30
16	669.2	21.9	37	629	0	0	37	55	629	155	3.00	25
17	670.3	22.8	33	584	2	35	31	67	549	166	9.93	30
18	671.4	22.8	43	761	10	177	33	63	584	290	8.50	20
19	672.5	20.5	52	827	17	270	35	60	557	289	5.70	25
20	673.1	21.2	37	609	4	66	33	62	543	270	8.40	20
21	674.3	21.5	42	701	5	83	37	60	618	294	5.85	25
22	676.1	20.0	40	621	3	47	37	61	574	116	2.40	25
23	677.1	23.9	38	705	3	56	35	58	649	252	4.80	25
24	678.3	22.1	35	600	0	0	35	61	600	206	10.49	20
25	681.1	23.4	37	672	0	0	37	60	672	210	10.31	15
26	682.3	21.3	42	694	0	0	42	54	694	149	2.70	15
27	684.1	22.9	44	782	0	0	44	51	782	261	4.50	20
28	685.3	20.4	61	965	0	0	61	26	965	254	12.18	15
29	686.8	18.4	64	914	0	0	64	27	914	257	4.95	25

Notes: cc—cubic centimeter.

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

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

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Moore Oil Company	Lease	Wilson	Well No.	102
Depth Interval, Feet	643.2 - 686.9				
Feet of Core Analyzed	20.9				
Average Percent Porosity	21.2				
Average Percent Original Oil Saturation	41.3				
Average Percent Oil Recovery	8.2				
Average Percent Residual Oil Saturation	33.1				
Average Percent Residual Water Saturation	61.4				
Average Percent Total Residual Fluid Saturation	94.5				
Average Original Oil Content, Bbls./A. Ft.	678.				
Average Oil Recovery, Bbls./A. Ft.	133.				
Average Residual Oil Content, Bbls./A. Ft.	545.				
Total Original Oil Content, Bbls./Acre	14,162.				
Total Oil Recovery, Bbls./Acre	2,775.				
Total Residual Oil Content, Bbls./Acre	11,387.				
Average Effective Permeability, Millidarcys	4.27				
Average Initial Fluid Production Pressure, p.s.i.	25.8				

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

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VI

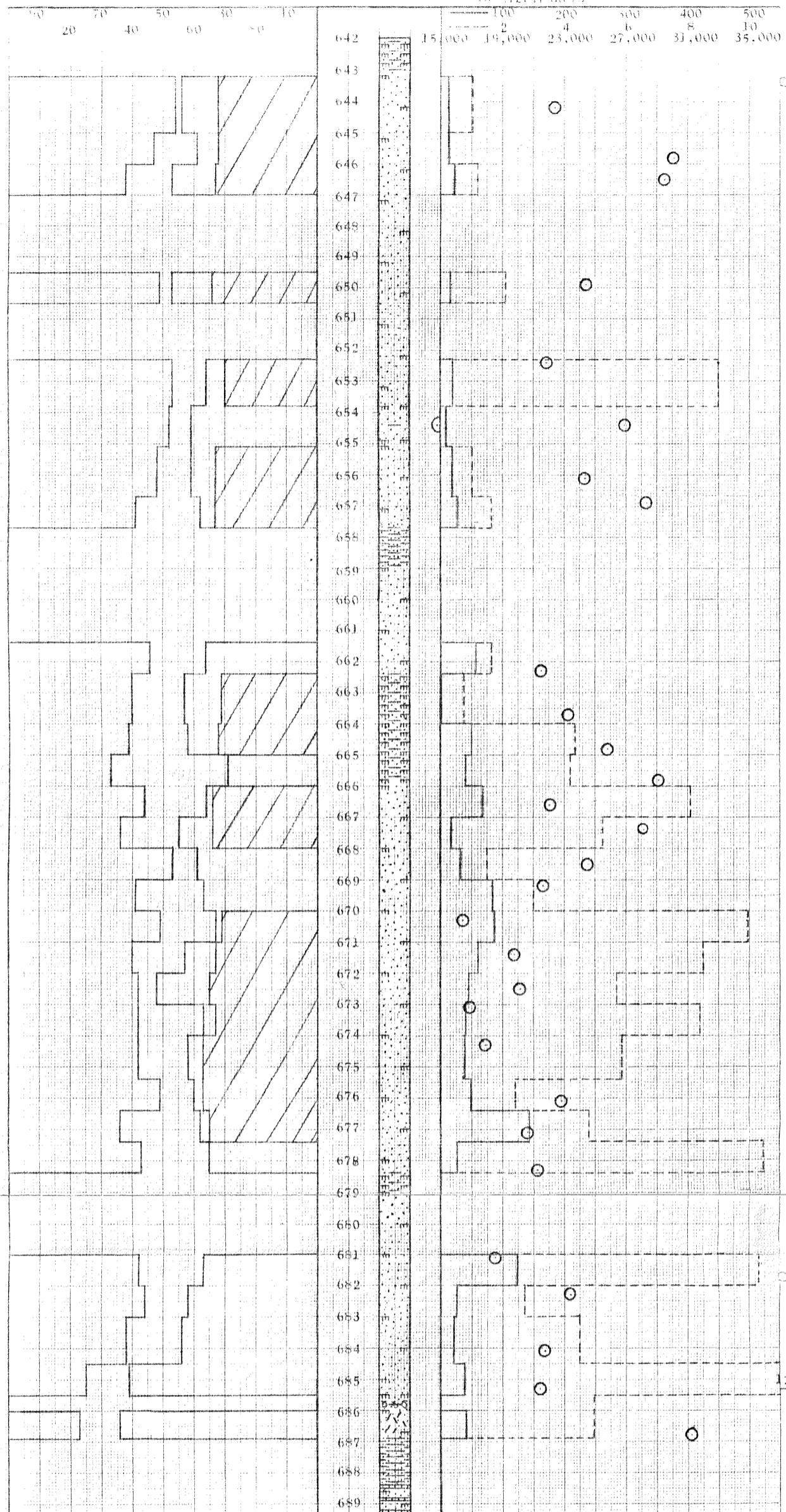
Company Moore Oil Company Lease Wilson Well No. 102

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation	
			Connate	Drilling & Foreign
			Total	
1	644.2	22,430		
2	645.8	30,111		
3	646.5	29,550		
4	649.9	24,402		
5	652.4	21,877		
6	654.4	26,932		
7	656.1	24,351		
8	656.9	28,370		
9	662.3	21,547		
10	663.7	24,305		
11	664.8	25,825		
12	665.8	29,146		
13	666.6	22,042		
14	667.4	28,165		
15	668.5	24,582		
16	669.2	21,656		
17	670.3	16,471		
18	671.4	19,739		
19	672.5	20,165		
20	673.1	16,815		
21	674.3	17,934		
22	676.1	22,817		
23	677.1	20,624		
24	678.3	21,295		
25	681.1	18,580		
26	682.3	23,400		
27	684.1	21,767		
28	685.3	21,406		
29	686.8	31,216		

Note: ppm — parts per million

WATER SAL. PERCENT ← → OH SAL. PERCENT

○ CHLORIDE CONTENT OF BRINE IN SAND, ppm.
 — PERMEABILITY, IN MILLIDARCS
 - - - EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



- KEY:
- LAMINATED CALCAREOUS SANDSTONE
 - SHALY CALCAREOUS SANDSTONE
 - SHALY CALCAREOUS CONGLOMERATIC SANDSTONE
 - SANDY SHALE
 - FLOODPOT RESIDUAL OIL SATURATION
 - CALCAREOUS SANDSTONE
 - LAMINATED SANDSTONE & SHALE
 - CALCAREOUS CARBONACEOUS SANDSTONE
 - FOSSILIFEROUS CALCAREOUS LIMESTONE
 - IMPERMEABLE TO WATER

MOORE OIL COMPANY

WILSON LEASE MIAMI COUNTY, KANSAS WELL NO. 102

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY MILLIDARCS	CALCULATED OIL RECOVERY BBL./ACRE
643.2 - 686.9	32.0	20.8	41.6	43.0	39.9	5,890 (PRIMARY & WATERFLOODING)