OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

December 6, 1966

Jackson Brothers
514 North Main
Eureka, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Jackson-Covert Lease, Well No. 3, Greenwood County, Kansas, and submitted to our laboratory on November 29, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:rf

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GENERAL INFORMATION & SUMMARY

Company Jackson Bros. Lease Jackson-Covert Well No. 3

Location SE NW NE

Section 4 Twp. 23S Rge. 10E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2481.0
Bottom of Core	2496.0
Top of Oil Sand	2484.6
Bottom of Sand	2494.7
Total Feet of Permeable Sand	10.7
Total Feet of Floodable Sand	9.1

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	3.1	3.1
5 - 10	2.6	5.7
10 - 15	2.0	7.7
15 & above	3.0	10.7

Average Permeability Millidarcys	10.8
Average Percent Porosity	17.0
Average Percent Oil Saturation	23.8
Average Percent Water Saturation	65.6
Average Oil Content, Bbls./A. Ft.	312.
Total Oil Content, Bbls./Acre	3,336.
Average Percent Oil Recovery by Laboratory Flooding Tests	5.5
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	75.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	602.
Total Calculated Oil Recovery, Bbls./Acre	2,065.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. This well was drilled in a virgin area. The core was exposed to air for some time before being sampled by an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
2481.0 - 2484.0	Gray shale with a vertical fracture from 2481.0 to 2482.3.
2484.0 - 2494.7	Grayish brown, fine grained, silty sandstone.
2494.7 - 2496.0	Black shale.

Coring was started at a depth of 2481.0 feet in gray shale and completed at 2496.0 feet in black shale. This core shows a total of 10.7 feet of sandstone. For the most part, the pay is made up of grayish brown, fine grained, silty sandstone.

PERMEABILITY

The weighted average permeability of the cored section is 10.8 millidarcys (See Table III). By observing the data given on the core-graph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 1.6 to a maximum of 29. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a low weighted average percent oil saturation, namely, 23.8. The weighted average percent water saturation of the cored section is 65.6 (See Table III). This gives an overall weighted average total fluid saturation of 89.4 percent.

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 VI and VII. From the data given in these tables and on the coregraph, it is evident that some flushing of the sand did occur during the cutting of the core. The chloride content of the sand in this core is lower than the average for the Bartlesville sand in this area.

The weighted average oil content of the cored section is 312 barrels per acre foot; while the total oil content, as shown by this core, is 3,336 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Due to the fact that the sand in the core has a low oil saturation one would expect very little, if any, oil to be recovered by laboratory flooding tests. A total recovery of 602 barrels of oil per acre was obtained from 8.0 feet of sand. The weighted average percent oil saturation was reduced from 25.6 to 20.1, or represents an average recovery of 5.5 percent. The weighted average effective permeability of the samples is 0.58 millidarcys, while the average initial fluid production pressure is 32.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, all produced water and 8 oil. This indicates that approximately 73 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a com-

paratively uniform effective permeability.

CONCLUSION

On the basis of the above data, we estimate that approximately 2,065 barrels of oil per acre or an average of 237 barrels per acre-foot can be recovered from the area, represented by this core, by efficient primary and waterflood operations. The following data and assumptions were used in calculating the above oil recovery value:

Original formation volume factor	1.20
Irreducible water saturation, percent	45.0
Primary recovery, estimated, percent	None
Present oil saturation, percent	45.8
Average porosity, percent	17.4
Oil saturation after flooding, percent	20.1
Performance factor	0.55
Net floodable pay sand, feet	9.1

This core shows a somewhat silty sand section having a low oil saturation, a high water saturation and a low average permeability.

Chances are, the low oil and high water saturations are partly due to flushing of the core during the coring operation. The high total fluid saturation indicates very little fluid was lost during the period when the core was exposed to air.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Bros. Lease Jackson-Covert Well No. 3

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	2184.1	15.7	7	87	94	85	6.5	0.6	0.6	51	3.90
2	2185.1	17.9	29	58	87	403	21.	1.0	1.6	403	21.00
3	2186.1	17.6	32	64	96	436	17.	1.0	2.6	436	17.00
4	2187.1	16.7	20	68	88	258	8.3	1.0	3.6	258	8.30
5	2188.1	16.3	27	67	94	341	8.1	1.0	4.6	341	8.10
6	2189.1	14.2	21	78	99	231	2.4	1.0	5.6	231	2.40
7	2190.1	17.2	26	61	87	347	10.	1.0	6.6	347	10.00
8	2191.1	16.6	24	69	93	309	4.4	1.0	7.6	309	4.40
9	2192.1	16.5	25	68	93	320	10.	1.0	8.6	320	10.00
10	2193.1	19.0	22	58	80	324	29.	1.0	9.6	324	29.00
11	2194.1	18.5	20	55	75	287	1.6	1.1	10.7	316	1.76
								Total--------		3,336	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Bros. Lease Jackson-Covert Well No. 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2484.0 - 2494.7	10.7	10.8	115.86

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
2484.0 - 2494.7	10.7	17.0	23.8	65.6	312	3,336

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Bros. Lease Jackson-Covert Well No. 3

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	2184.1	15.2	9	106	0	0	9	87	106	2	0.10	50
2	2185.1	18.2	29	410	8	113	21	70	297	34	0.80	30
3	2186.1	18.0	32	447	10	140	22	76	307	29	0.60	30
4	2187.1	17.1	20	266	1	14	19	77	252	29	0.60	30
5	2188.1	16.0	27	336	2	25	25	72	311	8	0.20	50
6	2189.1	14.7	23	262	0	0	23	76	262	19	0.50	30
7	2190.1	16.9	26	341	8	105	18	78	236	21	0.50	30
8	2191.1	17.0	24	317	4	53	20	75	264	11	0.30	30
9	2192.1	16.9	25	328	6	79	19	75	249	24	0.40	30
10	2193.1	18.7	22	320	5	73	17	74	247	18	1.30	30
11	2194.1	18.1	22	309	0	0	22	63	309	7	0.20	50

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 Jackson Bros. Lease Jackson-Covert Well No. 3

Depth Interval, Feet	2184.0 - 2194.7
Feet of Core Analyzed	8.0
Average Percent Porosity	17.4
Average Percent Original Oil Saturation	25.6
Average Percent Oil Recovery	5.5
Average Percent Residual Oil Saturation	20.1
Average Percent Residual Water Saturation	74.6
Average Percent Total Residual Fluid Saturation	94.7
Average Original Oil Content, Bbls./A. Ft.	345.
Average Oil Recovery, Bbls./A. Ft.	75.
Average Residual Oil Content, Bbls./A. Ft.	270.
Total Original Oil Content, Bbls./Acre	2,765.
Total Oil Recovery, Bbls./Acre	602.
Total Residual Oil Content, Bbls./Acre	2,163.
Average Effective Permeability, Millidarcys	0.58
Average Initial Fluid Production Pressure, p.s.i.	32.5

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 Jackson Bros. Lease Jackson-Covert Well No. 3

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2484.1	79,300			
2	2485.1	87,100			
3	2486.1	66,400			
4	2487.1	69,700			
5	2488.1	76,700			
6	2489.1	74,500			
7	2490.1	67,600			
8	2491.1	65,050			
9	2492.1	80,600			
10	2493.1	70,900			
11	2494.1	76,450			

Note: ppm — parts per million

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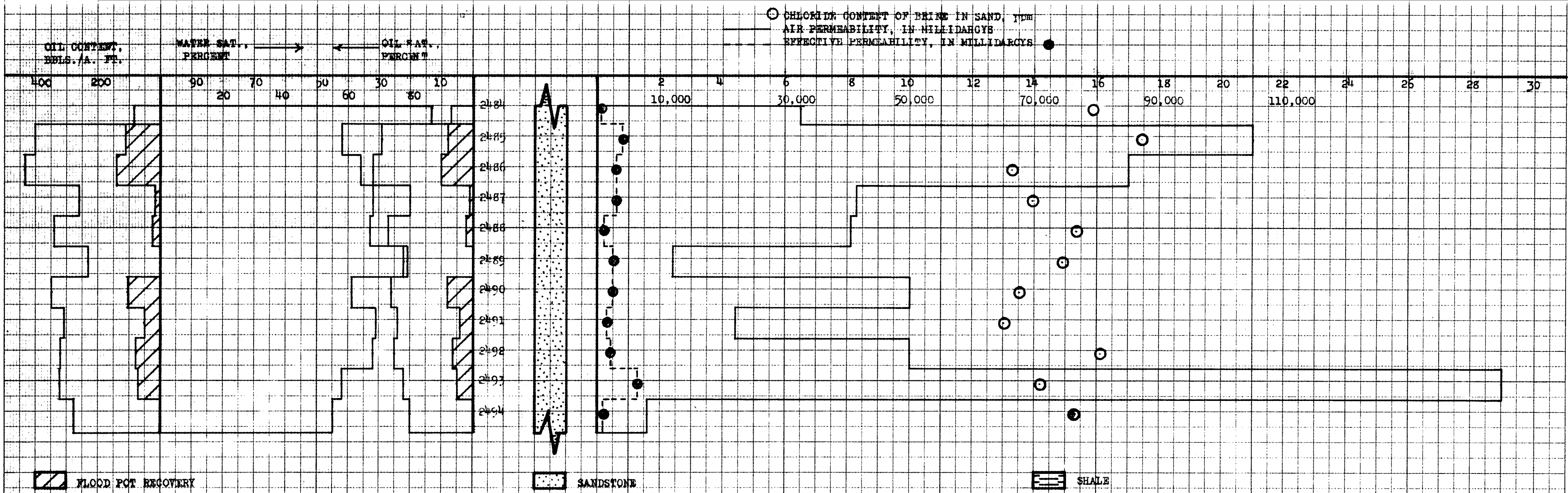
SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Jackson Bros. Lease Jackson-Covert Well No. 3

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2484.0 - 2494.7	73,855		

Note: ppm — parts per million.



JACKSON BROTHERS

JACKSON-COVERT LEASE WELL NO. 3

GREENWOOD COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY, BBLS./ACRE
2484.0 - 2494.7	10.7	17.0	23.8	65.6	312	3,336	10.8	2,065

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
DECEMBER, 1966