

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Jackson Bros. Lease Barrier Well No. 36

Location 330' N #4 & 330' S #25, NE SE

Section 3 Twp. 26S Rge. 8E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2430.0
Bottom of Core	2508.0
Top of Sand	2450.2
Bottom of Sand	2508.0
(Analyzed)	
Total Feet of Permeable Sand	32.3
Total Feet of Floodable Sand	14.2

**Distribution of Permeable Sand:**  
Permeability Range  
Millidarcys

	Feet	Cum. Ft.	
0 - 1	6.9	6.9	
1 - 5	8.2	15.1	
5 - 10	7.0	22.1	
10 - 20	3.8	25.9	
20 - 50	4.0	29.9	
50 & above	2.4	32.3	
Average Permeability Millidarcys	102		13.9
Average Percent Porosity			16.3
Average Percent Oil Saturation			19.5
Average Percent Water Saturation			69.5
Average Oil Content, Bbls./A. Ft.			250.
Total Oil Content, Bbls./Acre			10,352.
Average Percent Oil Recovery by Laboratory Flooding Tests			4.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.			68.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre			966.
Total Calculated Oil Recovery, Bbls./Acre	(Primary & Secondary)		3,230.
Packer Setting, Feet			
Viscosity, Centipoises @			
A. P. I. Gravity, degrees @ 60 °F			
Elevation, Feet			

3-26-8E

Barrier 36

**Oilfield Research Laboratories**

**SUMMARY OF WATER DIFFERENTIATION TESTS**

**TABLE VII**

Company Jackson Bros. Lease Barrier Well No. 36

<u>Depth Interval, Feet</u>	<u>Chloride Content of Brine in Sand, ppm</u>	<u>Average Percent Connate Water</u>	<u>Average Percent Drilling &amp; Foreign Water</u>
2450.2 - 2488.6	95,100		
2488.6 - 2508.0	86,400		
2450.2 - 2508.0	91,200		

Note: ppm -- parts per million.

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Acid Solubility Tests

TABLE VIII

Company Jackson Bros. Lease Barrier Well No. 36

<u>Sample No.</u>	<u>Depth Interval, Feet</u>	<u>Acid Solubility, Percent</u>
1	1823.1	86
2	1824.1	82
3	1825.1	86
4	1826.1	89
5	1827.1	85
6	1828.1	87
7	1829.1	89
8	1830.1	91
9	1831.1	90
10	1832.1	91

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## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lease	Barrier	Well No.
Jackson Bros.	1923.0 - 1928.6	-OSWEGO-	36 -BARTLESVILLE-
Depth Interval, Feet	2488.6 - 2508.0		
Feet of Core Analyzed	3.0		14.2
Average Percent Porosity	21.8		17.9
Average Percent Original Oil Saturation	36.6		24.1
Average Percent Oil Recovery	7.3		4.9
Average Percent Residual Oil Saturation	29.3		19.2
Average Percent Residual Water Saturation	50.3		72.6
Average Percent Total Residual Fluid Saturation	79.6		91.8
Average Original Oil Content, Bbls./A. Ft.	616.		335.
Average Oil Recovery, Bbls./A. Ft.	126.		68.
Average Residual Oil Content, Bbls./A. Ft.	490.		267.
Total Original Oil Content, Bbls./Acre	1,849.		4,758.
Total Oil Recovery, Bbls./Acre	378.		966.
Total Residual Oil Content, Bbls./Acre	1,471.		3,792.
Average Effective Permeability, Millidarcys	2.23		1.31
Average Initial Fluid Production Pressure, p.s.i.	20.0		38.6

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

# Oilfield Research Laboratories



## GENERAL INFORMATION & SUMMARY

elevation

Company Jackson Bros. Lease Barrier Well No. 36

Location 330' N #4 & 330' S #25, NE SE (390 N SL 1075 W EL)

Section 3 Twp. 26S Rge. 8E County Greenwood State Kansas

Name of Lime	Oswego
Top of Core	1823.0
Bottom of Core	1835.0
Top of Lime (Analyzed)	1823.0
Bottom of Lime (Tested)	1832.4
Total Feet of Permeable Lime	4.6
Total Feet of Floodable Lime	3.0

**Distribution of Permeable Lime**

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	2.6	2.6
20 & above	2.0	4.6

Average Permeability Millidarcys	41.0
Average Percent Porosity	14.2
Average Percent Oil Saturation	28.0
Average Percent Water Saturation	58.2
Average Oil Content, Bbls./A. Ft.	320.
Total Oil Content, Bbls./Acre	3,007.
Average Percent Oil Recovery by Laboratory Flooding Tests	7.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	126.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	378.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	930.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

-OSWEGO-

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

#### FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
1823.0 - 1827.6	Brown, slightly sandy limestone.
1827.6 - 1832.4	Gray limestone.
1832.4 - 1835.0	Gray calcareous shale.

Coring was started at a depth of 1823.0 feet in sandy limestone and completed at 1835.0 feet in calcareous shale. This core shows a total of 9.4 feet of limestone. For the most part, the pay is made up of brown, slightly sandy limestone.

#### PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 41.0 and 0.0 millidarcys respectively; the overall average being 41.0 (See Table III). By observing the data given on the core-graph, it is noticeable that the core has an irregular permeability profile. The permeability varies from impermeable to a maximum of 87. millidarcys.

#### PERCENT SATURATION & OIL CONTENT

This core shows a good weighted average percent oil saturation, namely, 28.0. The weighted average percent oil saturation of the upper and lower sections is 31.2 and 25.0 respectively. The weighted

average percent water saturation of the upper and lower sections is 50.2 and 65.9 respectively; the overall average being 58.2 (See Table III). This gives an overall weighted average total fluid saturation of 86.2 percent.

The weighted average oil content of the upper and lower sections is 524 and 125 barrels per acre foot respectively; the overall average being 320. The total oil content, as shown by this core, is 3,007 barrels per acre of which 1,849 barrels are in the pay section (See Table III).

#### LABORATORY FLOODING TESTS

The upper portion of this core responded to laboratory flooding tests, as a total recovery of 378 barrels of oil per acre was obtained from 3.0 feet. The weighted average percent oil saturation was reduced from 36.6 to 29.3, or represents an average recovery of 7.3 percent. The weighted average effective permeability of the samples is 2.23 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 6 samples tested, 3 produced water and oil. This indicates that approximately 50 percent of the core represented by these samples is floodable pay lime. The tests also show that the core has a fairly uniform 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

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Bros. Lease Barrier Well No. 36

-OSWECO-

Depth Interval, Feet	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent OI Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
1823.0 - 1827.6	1823.0 - 1827.6	4.6	21.8	31.2	50.2	524	2,408
1827.6 - 1832.4	1827.6 - 1832.4	0.0	6.9	25.0	65.9	125	599
1823.0 - 1832.4	1823.0 - 1832.4	4.6				189.50	
1823.0 - 1832.4	1823.0 - 1832.4	9.4	14.2	28.0	58.2	320	3,007

Average Permeability, Millidarcys

Permeability Capacity Ft. x Md.

well should recover approximately 930 barrels of oil per acre or an average of 310 barrels per acre foot from the 3.0 feet of pay analyzed in this core.

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

Original formation volume factor	1.11
Reservoir water saturation, percent	30.0
Average porosity, percent	21.8
Oil saturation after flooding, percent	29.3
Performance factor, percent	50.0
Net floodable pay, feet	3.0

This core shows a thin limy pay section having a good oil saturation, a moderate water saturation and a fairly uniform effective permeability to water. This lime is as high as 91 percent acid soluble.

-BARTLESVILLE-

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 non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
2430.0 - 2450.2	- Sandy shale.
2450.2 - 2454.3	- Grayish light brown, sandy shale.

- 2454.3 - 2457.4 - Grayish light brown, shaly sandstone.  
2457.4 - 2460.0 - Gray shale.  
2460.0 - 2463.0 - Gray shaly sandstone.  
2463.0 - 2465.5 - Gray sandy shale.  
2465.5 - 2470.8 - Gray shaly sandstone.  
2470.8 - 2473.5 - Dark sandy shale.  
2473.5 - 2476.0 - Gray shaly sandstone.  
2476.0 - 2479.0 - Light brown, shaly sandstone.  
2479.0 - 2479.8 - Gray sandy shale.  
2479.8 - 2490.6 - Grayish light brown, laminated, shaly sandstone.  
2490.6 - 2500.4 - Light brown, slightly shaly sandstone.  
2500.4 - 2502.8 - Grayish light brown, shaly sandstone.  
2502.8 - 2508.0 - Light brown sandstone.

Coring was started at a depth of 2430.0 feet in sandy shale and completed at 2508.0 feet in sandstone. For the most part, the pay is made up of light brown, slightly shaly 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 1.3 and 22.2 millidarcys respectively; the overall average being 13.9 (See Table III). By observing the data given on the core-graph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from impermeable to a maximum of 97. millidarcys.

#### PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly low weighted average percent

oil saturation, namely, 19.5. The weighted average percent oil saturation of the upper and lower sections is 17.3 and 22.0 respectively. The weighted average percent water saturation of the upper and lower sections is 74.4 and 64.1 respectively; the overall average being 69.5 (See Table III). This gives an overall weighted average total fluid saturation of 89.0 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 appears that, for the most part, very little flushing occurred.

The weighted average oil content of the upper and lower sections is 204 and 303 barrels per acre foot respectively; the overall average being 250. The total oil content, as shown by this core, is 10,352 barrels per acre of which 4,758 barrels are in the pay sand section (See Table III).

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 966 barrels of oil per acre was obtained from 14.2 feet of sand. The weighted average percent oil saturation was reduced from 24.1 to 19.2, or represents an average recovery of 4.9 percent. The weighted average effective permeability of the samples is 1.31 millidarcys, while the average initial fluid production pressure is 38.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 41 samples tested, 19 produced water and 14 oil. This indicates that approximately 34 percent of the sand represented by these samples

is floodable pay sand. The tests also show that the sand has a fairly uniform effective permeability to water.

#### CONCLUSION

The results of the laboratory tests indicate that efficient primary and secondary operations in the vicinity of this well should recover approximately 3,230 barrels of oil per acre or an average of 202 barrels per acre foot from 16.0 feet of floodable pay sand. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.23
Reservoir water saturation, percent	45.0
Average porosity, percent	17.9
Oil saturation after flooding, percent	19.2
Performance factor, percent	50.0
Net floodable pay sand, feet	16.0

This core shows a pay sand section having a fairly good oil saturation, a moderate water saturation and fairly uniform effective permeability to water.

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Bros. Lease Barrier Well No. 36

-BARTLESVILLE-

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
2450.2 - 2488.6	22.0	15.0	17.3	74.4	204	4,473
2488.6 - 2508.0	19.4	17.7	22.0	64.1	303	5,879
2450.2 - 2508.0	41.4	16.3	19.5	69.5	250	10,352

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Bros.

Lease

Barrier

Well No.

36

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			
1	1823.1	25.0	20	388	0	0	20	70	5	0.200	50
2	1824.1	21.0	21	342	0	0	21	70	0	Imp.	-
3	1825.1	25.0	42	813	11	213	31	39	49	1.00	20
4	1826.1	16.7	39	504	7	91	32	45	110	2.00	20
5	1827.1	23.7	29	532	4	74	25	67	159	3.70	20
6	1828.1	9.0	18	126	0	0	18	76	0	Imp.	-
--OSWEGO--											
--BARTLESVILLE--											
1	2451.1	13.8	22	236	0	0	22	71	0	Imp.	-
2	2452.1	12.3	14	134	0	0	14	81	0	Imp.	-
3	2453.1	14.4	17	190	0	0	17	80	0	Imp.	-
4	2454.1	12.6	15	146	0	0	15	81	0	Imp.	-
5	2455.1	16.7	30	388	0	0	30	66	0	Imp.	-
6	2456.1	15.1	24	281	0	0	24	72	0	Imp.	-
7	2457.1	16.0	22	273	0	0	22	72	0	Imp.	-
8	2460.1	16.0	19	236	0	0	19	78	0	Imp.	-
9	2466.1	16.7	11	142	0	0	11	87	0	Imp.	-
10	2469.1	13.4	11	114	0	0	11	83	0	Imp.	-
11	2476.1	16.2	25	314	0	0	25	71	0	Imp.	-
12	2477.1	13.7	23	244	0	0	23	57	0	Imp.	-
13	2478.1	15.0	18	209	0	0	18	80	0	Imp.	-
14	2480.1	12.9	9	90	0	0	9	87	0	Imp.	-
15	2481.1	14.5	17	191	0	0	17	77	0	Imp.	-
16	2482.1	14.5	24	270	0	0	24	73	0	Imp.	-
17	2483.1	16.2	16	201	0	0	16	73	0	Imp.	-

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.

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Bros. Lease Barrier Well No. 36

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			
18	2484.1	16.3	9	114	0	0	9	78	0	Imp.	-
19	2485.1	17.6	20	273	0	0	20	63	0	Imp.	-
20	2486.1	15.8	14	171	0	0	14	73	0	Imp.	-
21	2487.1	13.5	14	147	0	0	14	75	0	Imp.	-
22	2488.1	16.5	10	128	0	0	10	89	9	0.300	30
23	2489.1	16.8	18	234	26	26	16	78	4	0.200	50
24	2490.1	16.8	17	221	26	26	15	75	6	0.200	50
25	2491.1	17.0	21	277	53	53	17	74	8	0.200	50
26	2492.1	14.2	26	286	66	66	20	70	7	0.200	50
27	2493.1	17.2	27	360	67	67	22	66	8	0.300	50
28	2494.1	17.9	33	457	139	139	23	67	6	0.200	50
29	2495.1	18.7	27	391	131	131	18	70	27	0.800	30
30	2496.1	18.2	24	338	71	71	19	74	10	0.400	30
31	2497.1	18.9	29	425	117	117	21	68	15	0.400	40
32	2498.1	17.8	19	262	28	28	17	67	15	0.500	40
33	2499.1	18.2	23	324	0	0	23	65	16	0.400	40
34	2500.1	16.9	24	314	0	0	24	74	10	0.400	50
35	2501.1	17.4	15	202	0	0	15	74	20	0.500	40
36	2502.1	17.2	12	160	0	0	12	87	21	0.600	20
37	2503.1	17.6	24	328	82	82	18	77	9	0.300	40
38	2504.1	15.2	16	189	0	0	16	83	0	Imp.	-
39	2505.1	19.1	19	282	30	30	17	78	30	0.800	40
40	2506.1	19.4	25	376	60	60	21	77	171	4.70	10
41	2507.1	20.0	27	419	62	62	23	75	249	6.80	10

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.

**Oilfield Research Laboratories**  
**RESULTS OF WATER DIFFERENTIATION TESTS**  
**TABLE VI**

Company Jackson Bros. Lease Barrier Well No. 36

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation	
			Connate	Drilling & Foreign
1	2451.1	74,100		
2	2452.1	89,750		
3	2453.1	78,950		
4	2454.1	90,700		
5	2455.1	94,400		
6	2456.1	96,600		
7	2457.1	92,200		
8	2460.1	85,300		
9	2466.1	92,200		
10	2469.1	98,300		
11	2476.1	97,000		
12	2477.1	119,750		
13	2478.1	105,750		
14	2480.1	101,100		
15	2481.1	90,600		
16	2482.1	101,200		
17	2483.1	102,800		
18	2484.1	103,800		
19	2485.1	95,800		
20	2486.1	96,900		
21	2487.1	101,600		
22	2488.1	92,350		
23	2489.1	110,750		
24	2490.1	109,800		
25	2491.1	96,100		
26	2492.1	104,700		
27	2493.1	97,850		
28	2494.1	98,650		
29	2495.1	93,300		
30	2496.1	89,200		
31	2497.1	85,100		
32	2498.1	95,700		
33	2499.1	103,900		
34	2500.1	96,700		
35	2501.1	109,000		
36	2502.1	109,700		
37	2503.1	88,000		
38	2504.1	99,600		
39	2505.1	54,600		

Note: ppm — parts per million

**Oilfield Research Laboratories**  
**RESULTS OF WATER DIFFERENTIATION TESTS**

**TABLE VI**

Company Jackson Bros. Lease Barrier Well No. 36

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate      Drilling & Foreign      Total
40	2506.1	15,100	
41	2507.1	9,820	

Note: ppm -- parts per million

## JACKSON BROS. BARRIER NO. 36

3-26S-8E

