



OILFIELD RESEARCH LABORATORIES

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

November 15, 1967

Mr. C. L. Carlock
Box 18701 - Shartel Station
Oklahoma City, Oklahoma 73118

Dear Sir:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Jones Lease, Well No. 2, Chautauqua County, Kansas, and submitted to our laboratory on November 9, 1967.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:bjo

4 c. - Oklahoma City, Oklahoma
1 c. - Sedan, Kansas
1 c. - Independence, Kansas

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GENERAL INFORMATION & SUMMARY

Company C. L. Carlock Lease Jones Well No. 2

Location NE, SW, NE

Section 20 Twp. 13S Rge. 11E County Chautauqua State Kansas

Name of Sand	- - - - -	Peru
Top of Core	- - - - -	1253.0
Bottom of Core	- - - - -	1280.0
Top of Sand	- - - - -	1254.9
Bottom of Sand	- - (Cored) - - - - -	1280.0
Total Feet of Permeable Sand	- - - - -	19.7
Total Feet of Floodable Sand	- - - - -	-

Distribution of Permeable Sand: Permeability Range Millidarcys

	Feet	Cum. Ft.
0 - 1	7.0	7.0
1 - 5	5.7	12.7
5 - 10	3.6	16.3
10 & above	3.4	19.7

Average Permeability Millidarcys	- - - - -	6.3
Average Percent Porosity	- - - - -	15.6
Average Percent Oil Saturation	- - - - -	24.5
Average Percent Water Saturation	- - - - -	60.4
Average Oil Content, Bbls./A. Ft.	- - - - -	297.
Total Oil Content, Bbls./Acre	- - - - -	7,453.
Average Percent Oil Recovery by Laboratory Flooding Tests	- - - - -	3.1
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	- - - - -	42.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	- - - - -	150.
Total Calculated Oil Recovery, Bbls./Acre (Primary)	- - - - -	1,422.
Packer Setting, Feet	- - - - -	
Viscosity, Centipoises @	- - - - -	
A. P. I. Gravity, degrees @ 60 °F	- - - - -	
Elevation, Feet	- - - - -	

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GENERAL INFORMATION & SUMMARY

Company C. L. Carlock Lease Jones Well No. 2

Location NE, SW, NE

Section 20 Twp 33S Rge. 11E County Chautauqua State Kansas

Name of ~~Sand~~ Lime - - - - - Pawnee

Top of Core - - - - - 1438.0

Bottom of Core - - - - - 1452.2

Top of ~~sand~~ Lime (Received) - - - - - 1438.0

Bottom of ~~sand~~ Lime (Received) - - - - - 1452.2

Total Feet of Permeable ~~sand~~ Lime - - - - - 4.0

Total Feet of Floodable ~~sand~~ Lime - - - - - -

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

Average Permeability Millidarcys - - - - - 0.53

Average Percent Porosity - - - - - 9.7

Average Percent Oil Saturation - - - - - 26.8

Average Percent Water Saturation - - - - - 43.6

Average Oil Content, Bbls./A. Ft. - - - - - 205.

Total Oil Content, Bbls./Acre - - - - - 1,126.

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

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

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

Total Calculated Oil Recovery, Bbls./Acre - - - - -

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 and lime in this well. This well was drilled in a virgin area. The Peru sand was sampled by Oilfield Research Laboratories and the Pawnee lime was sampled by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

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

1253.0 - 1254.9 - Hard gray shaly limestone.
1254.9 - 1262.0 - Grayish light brown shaly sandstone.
1262.0 - 1267.0 - Brown slightly shaly sandstone.
1267.0 - 1280.0 - Grayish light brown shaly sandstone.

PAWNEE LIME

1438.0 - 1441.8 - Hard light brown limestone.
1441.8 - 1442.5 - Hard gray limestone.
1442.5 - 1445.5 - Hard light brown limestone.
1445.5 - 1446.2 - Hard gray limestone.
1446.2 - 1450.5 - Hard brownish gray limestone.
1450.5 - 1452.2 - Hard dark gray limestone containing some fossils.

PERU SAND

Coring was started in the Peru Sand at a depth of 1253.0 feet in hard gray shaly limestone and completed at 1280.0 feet in grayish light brown shaly sandstone. This core shows a total of 25.1 feet of 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 11.6 and 1.7 millidarcys respectively; the overall average being 6.3 (See Table III). By observing the data given on

the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from Imp. to a maximum of 52.0 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly low weighted average percent oil saturation, namely, 24.5. The weighted average percent oil saturation of the upper and lower sections is 24.0 and 25.0 respectively. The weighted average percent water saturation of the upper and lower sections is 58.9 and 61.8 respectively; the overall average being 60.4 (See Table III). This gives an overall weighted average total fluid saturation of 84.9 percent.

The weighted average oil content of the upper and lower sections is 275 and 317 barrels per acre foot respectively; the overall average being 297. The total oil content, as shown by this core, is 7,453 barrels per acre. (See Table III).

LABORATORY FLOODING TESTS

When taking into consideration that the sand in the core has a fairly low oil saturation and permeability, one would not expect very much oil to be recovered by laboratory flooding tests.

A total recovery of 150 barrels of oil per acre was obtained from 3.6 feet of sand. The weighted average percent oil saturation was reduced from 28.0 to 24.9, or represents an average recovery of 3.1 percent. The weighted average effective permeability of the samples is 0.67 millidarcys, while the average initial fluid production pressure is 38.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 25 samples tested, 8 produced water and 4 oil. This indicates that approximately 32 percent of the sand represented by these

samples will take water.

CONCLUSION

On the basis of the above data, we estimate that approximately 1,422 barrels of oil per acre or an average of 112 barrels per foot can be recovered from the area, represented by this core, by efficient primary production methods. Chances are, some water will be produced along with the oil.

Due to the fact that the core shows a high water saturation and a low permeability, it is doubtful whether the sand area, represented by this core, has a good waterflood potential. This can be determined by additional drilling and coring.

The core shows a shaly sand section having a fairly low oil saturation, a high water saturation and a low permeability.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company C. L. Carlock Lease Jones Well No. 2

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			Ft.	Cum. Ft.		
1	1255.1	15.7	21	56	PERU SAND	Imp.	0.7	0.7	179	0.75
2	1256.1	12.7	27	56	255	Imp.	1.0	1.7	260	0.00
3	1257.1	14.5	18	78	250	0.08	1.0	2.7	202	0.48
4	1258.1	17.1	27	57	358	1.0	1.0	3.7	358	1.00
5	1259.1	10.6	25	55	205	0.21	1.0	4.7	205	0.31
6	1260.1	9.9	25	62	200	5.5	1.0	5.7	200	5.90
7	1261.1	12.9	32	60	320	Imp.	1.4	7.1	448	0.00
8	1262.5	17.9	26	51	347	8.9	0.6	7.7	208	5.34
9	1263.1	15.7	18	60	219	5.2	1.0	8.7	219	8.20
10	1264.1	17.9	28	51	389	12.0	1.0	9.7	389	52.00
11	1265.1	18.4	15	48	214	10.0	1.0	10.7	214	20.00
12	1266.1	17.9	23	53	319	13.0	1.4	12.1	447	18.20
13	1267.1	15.0	26	50	303	0.37	0.5	12.7	182	0.22
14	1268.1	15.9	22	51	271	Imp.	1.0	13.7	271	0.00
15	1269.1	17.1	20	57	398	0.68	1.0	14.7	398	0.58
16	1270.1	16.5	20	55	384	5.7	1.0	15.7	384	5.70
17	1271.1	17.3	28	54	384	3.1	1.0	16.7	384	3.10
18	1272.1	17.3	29	55	254	3.1	1.0	17.7	254	3.10
19	1273.1	15.8	22	57	410	2.9	1.0	18.7	410	2.70
20	1274.1	17.3	22	54	452	1.5	1.0	19.7	452	1.70
21	1275.1	16.3	20	57	255	0.47	1.0	20.7	255	0.47
22	1276.1	15.1	21	57	246	0.24	1.0	21.7	246	0.24
23	1277.1	15.8	22	56	417	0.31	1.0	22.7	417	0.31
24	1278.1	15.0	20	55	202	Imp.	1.0	23.7	202	0.00
25	1279.1	15.8	15	50	184	0.32	1.4	25.1	257	0.45

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company C. L. Carlock Lease Jones Well No. 2

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.		
PAWNEE LIME											
26	1438.7	11.4	39	42	81	345	1.1	1.0	1.0	345	1.10
27	1439.7	10.5	18	37	55	147	0.34	1.0	2.0	147	0.34
28	1441.5	6.3	25	42	67	122	Imp.	1.0	3.0	122	0.00
29	1442.8	14.1	27	32	59	296	0.48	0.5	3.5	148	0.24
P-29	1443.4	-	-	-	-	-	0.28	0.5	4.0	-	0.14
30	1444.7	8.8	31	50	81	212	0.30	1.0	5.0	212	0.30
P-30	1448.7	-	-	-	-	-	Imp.	1.0	6.0	-	0.00
31	1449.5	9.3	21	53	74	152	Imp.	1.0	7.0	152	0.00

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	C. L. Carlock	Lease	Jones	Well No.	2
Depth Interval, Feet	Fect of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
		<u>PERU SAND</u>			
1254.9 - 1267.0	9.7	11.6	112.20		
1267.0 - 1280.0	11.0	1.7	18.67		
1254.9 - 1280.0	20.7	6.3	130.87		
		<u>PAWNEE LIME</u>			
1438.0 - 1450.0	4.0	0.53	2.12		
Depth Interval, Feet	Fect of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Total Oil Content Bbls./Acre
		<u>PERU SAND</u>			
1254.9 - 1267.0	12.1	15.0	24.0	58.9	3,330.
1267.0 - 1280.0	13.0	16.2	25.0	61.8	4,123.
1254.9 - 1280.0	25.1	15.6	24.5	60.4	7,453.
		<u>PAWNEE LIME</u>			
1438.0 - 1450.0	5.5	9.7	26.8	43.6	1,126.

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			C. L. Carlock			Lease			Jones			Well No.			2		
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	1255.1	15.2	20	236	0	PERU SAND	20	60	0	Imp.	-						
2	1256.1	12.7	24	237	0	0	24	63	0	Imp.	-						
3	1257.1	14.2	20	220	0	0	20	78	0	Imp.	-						
4	1258.1	16.6	25	322	0	0	25	63	0	Imp.	-						
5	1259.1	11.0	22	188	0	0	22	73	0	Imp.	-						
6	1260.1	9.5	23	169	0	0	23	75	0	Imp.	-						
7	1261.1	12.6	29	284	0	0	29	66	0	Imp.	-						
8	1262.5	18.2	25	353	2	28	23	64	21	0.50	30						
9	1263.1	16.0	20	249	0	0	20	64	5	0.20	50						
10	1264.1	17.9	28	359	2	28	26	70	65	1.70	20						
11	1265.1	18.7	17	247	0	0	17	75	31	0.80	30						
12	1266.1	17.5	21	285	0	0	21	69	9	0.30	50						
13	1267.1	14.7	23	262	0	0	23	72	0	Imp.	-						
14	1268.1	15.4	20	239	0	0	20	68	0	Imp.	-						
15	1269.1	16.8	28	365	0	0	28	65	0	Imp.	-						
16	1270.1	16.2	30	377	3	38	27	67	2	0.10	50						
17	1271.1	17.3	28	376	5	67	23	65	6	0.30	50						
18	1272.1	16.8	19	248	0	0	19	67	2	0.10	50						
19	1273.1	16.0	30	372	0	0	30	62	0	Imp.	-						
20	1274.1	17.1	31	411	0	0	31	61	0	Imp.	-						
21	1275.1	16.2	22	277	0	0	22	73	0	Imp.	-						
22	1276.1	15.5	19	229	0	0	19	78	0	Imp.	-						
23	1277.1	16.5	29	371	0	0	29	67	0	Imp.	-						
24	1278.1	13.4	18	187	0	0	18	80	0	Imp.	-						
25	1279.1	15.5	13	156	0	0	13	70	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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	C. L. Carlock	Lease	Jones	Well No.	2
Depth Interval, Feet	1262.0 - 1271.6				
Feet of Core Analyzed	3.6				
Average Percent Porosity	17.3				
Average Percent Original Oil Saturation	28.0				
Average Percent Oil Recovery	3.1				
Average Percent Residual Oil Saturation	24.9				
Average Percent Residual Water Saturation	66.8				
Average Percent Total Residual Fluid Saturation	91.7				
Average Original Oil Content, Bbls./A. Ft.	377.				
Average Oil Recovery, Bbls./A. Ft.	42.				
Average Residual Oil Content, Bbls./A. Ft.	335.				
Total Original Oil Content, Bbls./Acre	1,354.				
Total Oil Recovery, Bbls./Acre	150.				
Total Residual Oil Content, Bbls./Acre	1,204.				
Average Effective Permeability, Millidarcys	0.67				
Average Initial Fluid Production Pressure, p.s.i.	38.3				

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