



# OILFIELD RESEARCH LABORATORIES

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January 23, 1980

James E. Russell Petroleum, Inc.  
P.O. Box 2618  
Abilene, Texas 79604

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the C. McGhee Lease, Well No. 14, Anderson County, Kansas, and submitted to our laboratory on December 27, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

  
Sanford A. Michel

SAM/tem  
3 c to Abilene, Texas  
2 c to Chanute, Kansas

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Inc.

Company James E. Russell Petroleum, Inc. Lease C. McGhee Well No. 14

Location 1100' NSL & 660' WEL

Section 10 Twp. 23S Rge. 19E County Anderson State Kansas

Elevation, Feet Datum: Mean Sea Level (Ground Level) 1058.4

Name of Sand	Squirrel
Top of Core	720.0
Bottom of Core	760.3
Top of Sand	720.0
Bottom of Sand	754.9
Total Feet of Permeable Sand	26.5
Total Feet of Floodable Sand	1.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	7.3	7.3
1 - 5	14.3	21.6
5 - 10	4.9	26.5

Average Permeability Millidarcys	2.9
Average Percent Porosity	14.9
Average Percent Oil Saturation	36.1
Average Percent Water Saturation	43.0
Average Oil Content, Bbls./A. Ft.	431.
Total Oil Content, Bbls./Acre	14,088.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	59.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	112.
Total Calculated Oil Recovery, Bbls./Acre	112.

See "Calculated Recovery" Section.

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The core was sampled by a representative of Oilfield Research Laboratories. Fresh water mud was used as a drilling fluid. The core was from a virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
720.0 - 726.8	First oil show; sandstone and shale, brown and gray laminated.
726.8 - 728.0	Sandstone, brown, shaly.
728.0 - 730.0	Sandstone and shale, brown and gray, laminated.
730.0 - 731.0	Sandstone, brown, shaly.
731.0 - 733.2	Sandstone and shale, brown and gray, laminated.
733.2 - 734.1	Sandstone, brown, shaly.
734.1 - 734.4	Shale, gray, sandy.
734.4 - 737.2	Sandstone, brown, shaly
737.2 - 737.4	Shale, gray, sandy.
737.4 - 738.0	Sandstone, brown, shaly.
738.0 - 738.3	Shale, gray, sandy.
738.3 - 739.6	Sandstone, brown, shaly.
739.6 - 740.0	Shale, gray, sandy.
740.0 - 744.3	Sandstone, brown, shaly.
744.3 - 747.7	Sandstone, brownish gray, very shaly.
747.7 - 748.7	Sandstone, brown slightly shaly.
748.7 - 749.4	Shale, brownish gray, sandy.

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<u>Depth Interval, Feet</u>	<u>Description</u>
749.4 - 749.8	Sandstone, brown, shaly.
749.8 - 750.1	Shale, gray, sandy.
750.1 - 751.6	Sandstone, brown, shaly.
751.6 - 753.7	Sandstone, brownish gray, shaly, slightly calcareous.
753.7 - 754.9	Sandstone, gray, conglomeratic, slightly carbonaceous.
754.9 - 755.4	Shale, hard gray, fossiliferous, calcareous, sandy.
755.4 - 758.0	Shale, gray, sandy.
758.0 - 760.3	Shale, gray, calcareous

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 119 barrels of oil per acre was obtained from 1.9 feet of sand. The weighted average percent oil saturation was reduced from 42.1 to 37.5, or represents an average recovery of 4.6 percent. The weighted average effective permeability of the samples is 0.61 millidarcys, while the average initial fluid production pressure is 43.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 35 samples tested, 3 produced water and oil. This indicates that approximately 9 percent of the sand represented by these samples is floodable pay sand.

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Please note that the coregraph now presents residual oil saturation instead of recovery, as in the past.

### 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 450 barrels of oil per acre. This is an average recovery of 236 barrels per acre foot from 1.9 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.05
Reservoir water saturation, percent, estimated	20.0
Primary reserves, estimated, percent	4.0
Average porosity, percent	15.7
Oil saturation after flooding, percent	37.5
Performance factor, percent, estimated	50.0
Net floodable pay sand, feet	1.9

A primary and waterflood recovery is herewith presented:

Average porosity for pay sand (730.0 - 753.7)	14.7
Net pay sand thickness	20.6
Estimated primary reserves, as a percent of porosity	4.0%
Estimated primary reserves, barrels per acre foot	46.
Estimated primary reserves, barrels per acre	950.
Estimated waterflood reserves, barrels per acre	720.
Estimated total reserves, barrels per acre	1,670.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company James E. Russell Petroleum, Inc.

Lease C. McGhee

Well No. 14

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	720.5	15.1	20	43	234	3.0	1.0	1.0	234	3.00
2	721.5	10.4	19	72	153	Imp.	1.0	2.0	153	0.00
3	722.5	14.6	37	52	419	0.95	1.0	3.0	419	0.95
4	723.5	13.4	19	69	198	0.58	1.0	4.0	198	0.58
5	724.5	17.8	26	36	359	0.40	1.0	5.0	359	0.40
6	725.5	14.2	28	53	309	Imp.	1.0	6.0	309	0.00
7	726.5	14.6	29	55	329	3.1	0.8	6.8	263	2.48
8	727.5	16.0	28	41	348	9.3	1.2	8.0	418	11.16
9	728.5	9.9	7	90	54	Imp.	1.0	9.0	54	0.00
10	729.5	13.5	24	62	251	Imp.	1.0	10.0	251	0.00
11	730.5	14.7	29	49	331	4.1	1.0	11.0	331	4.10
12	731.5	12.1	36	61	338	0.36	1.0	12.0	338	0.36
13	732.5	12.2	21	71	199	2.4	1.2	13.2	239	2.88
14	733.5	15.9	29	35	358	1.4	0.9	14.1	322	1.26
15	734.5	18.0	26	33	363	1.1	1.0	15.1	363	1.10
16	735.5	15.9	26	46	321	1.3	1.0	16.1	321	1.30
17	736.5	17.3	32	39	430	2.5	0.8	16.9	344	2.00
18	737.5	14.7	34	43	388	3.1	0.6	17.5	233	1.86
19	738.5	16.3	32	38	405	3.1	0.7	18.2	284	2.17
20	739.5	17.5	48	23	652	2.7	0.6	18.8	391	1.62
21	740.5	17.4	48	27	648	6.8	1.0	19.8	648	6.80
22	741.5	12.3	23	67	220	2.6	1.0	20.8	220	2.60
23	742.5	14.6	53	35	600	2.2	1.0	21.8	600	2.20
24	743.5	17.4	51	26	688	9.4	1.3	23.1	894	12.22
25	744.5	14.7	47	28	536	0.43	0.7	23.8	375	0.30
26	745.5	16.0	51	27	633	1.0	1.0	24.8	633	1.00
27	746.5	10.5	30	67	244	Imp.	1.0	25.8	244	0.00
28	747.5	17.7	44	25	604	1.7	0.7	26.5	423	1.19
29	748.5	15.8	49	30	601	8.3	1.0	27.5	601	8.30

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Well No. 14

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.		
30	749.5	15.3	59	24	700	5.7	0.4	27.9	280	2.28
31	750.5	17.4	54	22	729	1.5	1.0	28.9	729	1.50
32	751.5	15.8	56	23	686	0.57	0.5	29.4	343	0.29
33	752.5	17.3	60	22	805	1.3	1.0	30.4	805	1.30
34	753.5	15.4	52	23	621	0.41	1.1	31.5	683	0.45
35	754.5	14.3	59	15	655	Imp.	1.2	32.7	786	0.00

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	James E. Russell Petroleum, Incorporated	Lease	C. McGhee	Well No.	14					
Depth Interval, Feet	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Oil Saturation	Average Percent Water Saturation	Average Porosity	Feet of Core Analyzed	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
720.0 - 730.0	720.0 - 730.0	6.0	3.1	18.57	23.7	57.0	14.0	10.0	266	2,658
730.0 - 754.9	730.0 - 754.9	20.5	2.9	59.08	41.6	36.8	15.4	22.7	504	11,430
720.0 - 754.9	720.0 - 754.9	26.5	2.9	77.65	36.1	43.0	14.9	32.7	431	14,088

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company James E. Russell Petroleum, Incorporated Lease C. McGhee Well No. 14

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.	%	Bbls./A. Ft.	%	Bbls./A. Ft.			
1	720.5	15.4	239	0	0	20	239	62	239	0	Imp.	-
2	721.5	10.9	152	0	0	18	152	74	152	0	Imp.	-
3	722.5	14.4	413	0	0	37	413	54	413	0	Imp.	-
4	723.5	13.4	198	0	0	19	198	72	198	0	Imp.	-
5	724.5	17.6	355	0	0	26	355	40	355	0	Imp.	-
6	725.5	14.3	311	0	0	28	311	53	311	0	Imp.	-
7	726.5	14.4	324	2	22	27	324	64	302	10	0.37	50
8	727.5	15.5	349	0	0	29	349	45	349	0	Imp.	-
9	728.5	10.1	55	0	0	7	55	89	55	0	Imp.	-
10	729.5	13.7	255	0	0	24	255	64	255	0	Imp.	-
11	730.5	14.4	355	0	0	30	355	50	355	0	Imp.	-
12	731.5	12.6	342	0	0	35	342	64	342	0	Imp.	-
13	732.5	12.2	199	0	0	21	199	71	199	0	Imp.	-
14	733.5	16.2	364	0	0	29	364	43	364	0	Imp.	-
15	734.5	17.9	361	0	0	26	361	40	361	0	Imp.	-
16	735.5	16.2	314	0	0	25	314	50	314	0	Imp.	-
17	736.5	17.0	422	0	0	32	422	44	422	0	Imp.	-
18	737.5	15.1	387	0	0	33	387	50	387	0	Imp.	-
19	738.5	16.3	405	0	0	32	405	45	405	0	Imp.	-
20	739.5	17.9	667	7	97	41	667	43	570	17	0.30	40
21	740.5	17.5	652	0	0	48	652	36	652	0	Imp.	-
22	741.5	12.3	218	0	0	22	218	68	218	0	Imp.	-
23	742.5	14.5	596	0	0	53	596	35	596	0	Imp.	-
24	743.5	17.1	677	0	0	51	677	20	677	0	Imp.	-
25	744.5	15.0	547	0	0	47	547	30	547	0	Imp.	-
26	745.5	15.8	625	0	0	51	625	30	625	0	Imp.	-
27	746.5	11.0	256	0	0	30	256	67	256	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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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company James E. Russell Petroleum, Incorporated Lease C. McGhee Well No. 14

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			
28	747.5	17.5	44	597	0	0	44	31	0	Imp.	-
29	748.5	15.6	49	593	0	0	49	32	0	Imp.	-
30	749.5	15.5	59	709	0	0	59	27	0	Imp.	-
31	750.5	17.2	54	721	0	0	54	25	0	Imp.	-
32	751.5	15.4	56	669	6	72	50	31	54	1.33	40
33	752.5	17.0	60	791	0	0	60	23	0	Imp.	-
34	753.5	15.3	52	617	0	0	52	24	0	Imp.	-
35	754.5	14.5	59	664	0	0	59	21	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	James E. Russell Petroleum, Incorporated	Lease	C. McGhee	Well No.	14
Depth Interval, Feet	720.0 - 730.0	730.0 - 754.9	720.0 - 754.9		
Feet of Core Analyzed	0.8	1.1	1.9		
Average Percent Porosity	14.4	16.7	15.7		
Average Percent Original Oil Saturation	29.0	51.7	42.1		
Average Percent Oil Recovery	2.0	6.6	4.6		
Average Percent Residual Oil Saturation	27.0	45.1	37.5		
Average Percent Residual Water Saturation	64.0	37.6	48.7		
Average Percent Total Residual Fluid Saturation	91.0	82.7	86.2		
Average Original Oil Content, Bbls./A. Ft.	324.	668.	523.		
Average Oil Recovery, Bbls./A. Ft.	22.	86.	59.		
Average Residual Oil Content, Bbls./A. Ft.	302.	582.	464.		
Total Original Oil Content, Bbls./Acre	260.	734.	994.		
Total Oil Recovery, Bbls./Acre	18.	94.	112.		
Total Residual Oil Content, Bbls./Acre	242.	640.	882.		
Average Effective Permeability, Millidarcys	0.37	0.77	0.61		
Average Initial Fluid Production Pressure, p.s.i.	50.0	40.0	43.3		

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