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OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

Core Available

RW5

February 4, 1983

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 Nelson Lease, Well No. RW-5, located in Allen County, Kansas and submitted to our laboratory on January 26, 1983.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

Sanford A. Michel

SAM/rmc

3 c to Abilene, Texas
2 c to Chanute, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-5

Location 1395' WEL & 420' SNL, SW¼

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

Elevation, Feet Datum: Mean Sea Level (Ground Level)	1048.7
Name of Sand	Bartlesville
Top of Core	636.0
Bottom of Core	689.6
Top of Sand	647.0
Bottom of Sand (Tested)	668.8
Total Feet of Permeable Sand	21.8
Total Feet of Floodable Sand	13.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	4.9	4.9
5 - 10	3.0	7.9
10 - 20	7.8	15.7
26 - 40	6.1	21.8

Average Permeability Millidarcys	15.4
Average Percent Porosity	15.6
Average Percent Oil Saturation	56.0
Average Percent Water Saturation	37.7
Average Oil Content, Bbls./A. Ft.	692.
Total Oil Content, Bbls./Acre	15,077.
Average Percent Oil Recovery by Laboratory Flooding Tests	19.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	249.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	3,465.

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 non-virgin area.

Core about 1' above log

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet		Description
636.0 - 647.0		Shale, gray, containing 2 vertical fractures.
647.0 - 649.5	2.5	Sandstone, shaly, brown with gray shale partings.
649.5 - 654.6	5.1	Sandstone, brown.
654.6 - 657.0	2.4	Sandstone and shale, laminated, gray and brown.
657.0 - 664.0	7	Sandstone, brown.
664.0 - 665.0	1	Sandstone, slightly shaly, brown with scattered gray shale and mica partings.
665.0 - 666.0	1	Sandstone, shaly, brown.
666.0 - 667.0	1	Sandstone, slightly shaly, brown.
667.0 - 668.8	1.8	Sandstone, brown.
668.8 - 668.9	0.9	Coal. ← probably clast
668.9 - 669.1		Sandstone, brown with coal partings.
669.1 - 669.3		Coal.
669.3 - 669.5		Shale, gray.
669.5 - 669.7		Coal.
669.7 - 673.0	3.3	Shale, slightly sandy, gray. underclay Not retained below 671.2
673.0 - 677.0	4	Shale, slightly sandy, slightly calcareous, gray.
677.0 - 681.4	4.4	Shale, dark gray.
681.4 - 683.0	1.6	No core. — underclay
683.0 - 683.6	.6	Shale, gray.
683.6 - 685.8	2.2	Limestone, slightly sandy, gray. ← dk blue marker
685.8 - 689.6	3.8	Shale, slightly sandy, gray.

PRIMARY RECOVERY

A detailed analysis of the core data would indicate that the pay sand section is from interval 647.0 feet to 668.8 feet. Assuming seven percent (7%) primary recovery, a well in this area should produce approximately 65 barrels of oil per acre foot, or 1,420 barrels per acre from 21.8 feet of pay sand by primary methods. These recovery estimates assume a pressured, virgin reservoir.

Any oil previously produced from the area represented by this core must be deducted from the above estimates.

WATERFLOOD RECOVERY

The estimated additional oil recovery from a well in this vicinity by waterflood is approximately 169 barrels per acre foot, or 2,350 barrels per acre. These recovery values are based on seven percent (7%) primary recovery, 13.9 feet of floodable sand within the pay section (interval 647.0 feet to 668.8 feet), and normal dispersed sweep efficiency of 50 percent.

	PRIMARY AND SECONDARY		
Oil Recovery Barrels Stock Tank	Solution Gas Energy	Increase By Waterflood	Total
Barrels per Acre Foot	65	169	234
Barrels per Acre	1420	2350	3770

The primary and waterflood recovery values were calculated using the following data and assumptions:

	Original	At Waterflood Conditions
Formation volume factor, estimated	1.05	1.02
Reservoir water saturation, percent, estimated	20.0	20.0
Average porosity, percent	15.6	16.5
Oil saturation after flooding, percent	-	41.4
Performance factor, percent, estimated	-	50.0
Net pay, feet	21.8	13.9

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 3,465 barrels of oil per acre was obtained from 13.9 feet of sand. The weighted average percent oil saturation was reduced from 61.1 to 41.4, or represents an average recovery of 19.7 percent. The weighted average effective permeability of the samples is 1.27 millidarcys, while the average initial fluid production pressure is 26.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 22 samples tested, 14 produced water and oil, and 1 sample water only. This indicates that approximately 64 percent of the sand represented by these samples is floodable pay sand.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-5

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	647.5	13.0	29	54	83	293	3.9	1.0	1.0	293	3.90
2	648.5	16.1	37	51	88	462	3.6	1.0	2.0	462	3.60
3	649.4	13.6	59	29	88	623	2.1	0.5	2.5	312	1.05
4	650.6	17.1	63	34	97	836	36.	1.2	3.7	1003	43.20
5	651.5	16.1	38	58	96	475	39.	0.9	4.6	428	35.10
6	652.5	18.0	40	58	98	559	27.	1.0	5.6	559	27.00
7	653.5	18.8	70	24	94	1021	31.	1.0	6.6	1021	31.00
8	654.5	19.0	78	13	91	1150	12.	1.0	7.6	1150	12.00
9	655.4	9.4	37	60	97	270	0.85	1.4	9.0	378	1.19
10	656.3	10.9	38	60	98	321	0.26	1.0	10.0	321	0.26
11	657.5	16.2	54	38	92	679	19.	1.0	11.0	679	19.00
12	658.4	16.8	73	22	95	951	16.	1.0	12.0	951	16.00
13	659.4	15.6	69	23	92	835	26.	1.0	13.0	835	26.00
14	660.4	16.3	69	26	95	873	27.	1.0	14.0	873	27.00
15	661.5	16.9	56	29	85	734	19.	1.0	15.0	734	19.00
16	662.5	15.0	68	30	98	791	11.	1.0	16.0	791	11.00
17	663.4	15.2	73	22	95	861	12.	1.0	17.0	861	12.00
18	664.5	16.1	65	30	95	812	9.6	1.0	18.0	812	9.60
19	665.6	15.1	56	41	97	656	5.0	1.0	19.0	656	5.00
20	666.4	15.6	60	33	93	726	6.0	1.0	20.0	726	6.00
21	667.5	16.2	53	42	95	666	17.	1.0	21.0	666	17.00
22	668.3	17.2	53	44	97	707	12.	0.8	21.8	566	9.60

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-5

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
647.0 - 649.5	2.5	3.4	8.55
649.5 - 657.0	7.5	20.0	149.75
657.0 - 668.8	11.8	15.0	177.20
647.0 - 668.8	21.8	15.4	335.50

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
647.0 - 649.5	2.5	14.4	38.2	47.8	427	1,067
649.5 - 657.0	7.5	15.3	51.7	44.3	648	4,860
657.0 - 668.8	11.8	16.0	62.6	31.5	775	9,150
647.0 - 668.8	21.8	15.6	56.0	37.7	692	15,077

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-5

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	647.5	13.5	28	293	0	0	28	56	293	0	Imp.	-
2	648.5	15.6	38	460	0	0	38	51	460	0	Imp.	-
3	649.4	13.6	59	623	0	0	59	30	623	0	Imp.	-
4	650.6	17.2	63	841	27	360	36	61	481	218	2.55	10
5	651.5	16.2	38	478	3	38	35	62	440	304	3.67	15
6	652.5	18.0	40	559	5	70	35	63	489	196	2.25	10
7	653.5	18.9	70	1026	21	308	49	46	718	212	2.32	10
8	654.5	19.4	77	1159	0	0	77	15	1159	0	Imp.	-
9	655.4	9.8	36	274	0	0	36	61	274	0	Imp.	-
10	656.3	10.6	39	321	0	0	39	59	321	0	Imp.	-
11	657.5	16.5	53	678	0	0	53	38	678	0	Imp.	-
12	658.4	16.7	73	946	34	440	39	59	506	22	0.45	30
13	659.4	15.7	69	840	28	341	41	58	499	110	1.65	25
14	660.4	16.4	69	878	30	382	39	57	496	132	1.80	20
15	661.5	16.8	56	730	17	222	39	56	508	56	0.75	25
16	662.5	15.0	68	791	30	349	38	60	442	14	0.15	40
17	663.4	15.1	73	855	30	351	43	54	504	4	0.08	50
18	664.5	16.0	65	807	22	273	43	53	534	14	0.30	45
19	665.6	15.2	56	660	0	0	57	41	660	24	0.37	35
20	666.4	15.6	60	726	12	145	48	50	581	2	0.08	50
21	667.5	16.1	53	662	6	75	47	49	587	58	0.82	25
22	668.3	17.3	53	711	4	54	49	50	657	52	0.75	20

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, Inc. Lease Nelson Well No. RW-5

Depth Interval, Feet	649.5 - 657.0	657.0 - 668.8	649.5 - 668.8
Feet of Core Analyzed	4.1	9.8	13.9
Average Percent Porosity	17.6	16.0	16.5
Average Percent Original Oil Saturation	53.6	64.2	61.1
Average Percent Oil Recovery	14.9	21.7	19.7
Average Percent Residual Oil Saturation	38.7	42.5	41.4
Average Percent Residual Water Saturation	58.0	54.7	55.7
Average Percent Total Residual Fluid Saturation	96.7	97.2	97.1
Average Original Oil Content, Bbls./A. Ft.	738.	796.	779.
Average Oil Recovery, Bbls./A. Ft.	206.	267.	249.
Average Residual Oil Content, Bbls./A. Ft.	532.	529.	530.
Total Original Oil Content, Bbls./Acre	3,024.	7,804.	10,828.
Total Oil Recovery, Bbls./Acre	844.	2,621.	3,465.
Total Residual Oil Content, Bbls./Acre	2,180.	5,183.	7,363.
Average Effective Permeability, Millidarcys	2.67	0.682	1.27
Average Initial Fluid Production Pressure, p.s.i.	11.3	33.0	26.8

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