

15-001-270280

JAMES E. RUSSELL PETROLEUM, INC.

CORE ANALYSIS REPORT

NELSON LEASE

WELL NO. RW-4

ALLEN COUNTY, KANSAS

21-26-21 E

Core
Available



OILFIELD RESEARCH LABORATORIES

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

February 15, 1983

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

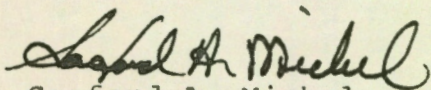
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Nelson Lease, Well No. RW-4, located in Allen County, Kansas and submitted to our laboratory on February 8, 1983.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


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-4
 Location 1370' EWL & 1175' SNL, SW $\frac{1}{4}$
 Section 21 Twp. 26S Rge. 21E County Allen State Kansas

Elevation, Feet Datum: Mean Sea Level (Ground Level) 1050.0
 Name of Sand..... Bartlesville
 Top of Core 620.0
 Bottom of Core 681.5
 Top of Sand 657.0
 Bottom of Sand 667.0
 Total Feet of Permeable Sand 7.6
 Total Feet of Floodable Sand 7.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
8 - 14	1.5	1.5
17 - 41	5.0	6.5
150 - 155	1.1	7.6

Average Permeability Millidarcys 39.3
 Average Percent Porosity 21.4
 Average Percent Oil Saturation 42.9
 Average Percent Water Saturation..... 40.2
 Average Oil Content, Bbls./ A. Ft..... 713.
 Total Oil Content, Bbls./ Acre..... 5,416.
 Average Percent Oil Recovery by Laboratory Flooding Tests..... 13.5
 Average Oil Recovery by Laboratory Flooding Tests, Bbls./ A. Ft. 224.
 Total Oil Recovery by Laboratory Flooding Tests, Bbls./ Acre 1,704.

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The core was sampled by a representative of Oilfield Research Laboratories. Salt water mud with 2% KCl was used as a drilling fluid. The core was from a non-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
620.0 - 623.5	Shale, gray.
623.5 - 624.0	Shale, slightly calcareous, fossiliferous, gray.
624.0 - 624.3	Coal.
624.3 - 638.3	Shale, gray.
638.3 - 639.0	Limestone, fossiliferous, black.
639.0 - 650.0	No core.
650.0 - 652.0	Limestone, fossiliferous, black.
652.0 - 653.0	Ground up core, limestone, fossiliferous, black.
653.0 - 653.5	Limestone, fossiliferous, black. - <i>black shale fissile</i>
653.5 - 655.6	Coal.
655.6 - 657.0	Shale, gray. - <i>not obviously underlay</i>
657.0 - 659.6	Sandstone, brown.
659.6 - 660.4	Shale, gray.
660.4 - 662.1	Sandstone, brown.
662.1 - 662.4	Shale, slightly sandy, gray.
662.4 - 662.6	Sandstone, slightly shaly, brown.
662.6 - 662.9	Coal. <i>not really coal</i>
662.9 - 663.3	Sandstone, brown.
663.3 - 663.9	Shale, gray.
663.9 - 667.0	Sandstone, brown.

<u>Depth Interval, Feet</u>	<u>Description</u>
667.0 - 667.7	Coal. <i>green matrix</i>
667.7 - 669.7	Shale, slightly sandy, slightly calcareous, conglomeratic, gray.
669.7 - 678.0	Shale, gray.
678.0 - 681.5	Ground up, shale, gray.

PRIMARY RECOVERY

A detailed analysis of the core data would indicate that the pay sand section is from interval 657.0 feet to 667.0 feet. Assuming seven percent (7%) primary recovery, a well in this area should produce approximately 72 barrels of oil per acre foot, or 550 barrels per acre from 7.6 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 203 barrels per acre foot, or 1,540 barrels per acre. These recovery values are based on seven percent (7%) primary recovery, 7.6 feet of floodable sand within the pay section (interval 657.0 feet to 667.0 feet), and normal dispersed sweep efficiency of 50 percent.

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Oil Recovery Barrels Stock Tank	PRIMARY AND SECONDARY		
	Solution Gas Energy	Increase By Waterflood	Total
Barrels per Acre Foot	72	203	275
Barrels per Acre	550	1540	2090

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

	<u>Original</u>	<u>At Waterflood Conditions</u>
Formation Volume factor, estimated	1.05	1.02
Reservoir water saturation, percent, estimated	35.0	35.0
Average porosity, percent	21.4	21.4
Oil saturation after flooding, percent	-	29.4
Performance factor, percent, estimated	-	50.0
Net pay, feet	7.6	7.6

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,704 barrels of oil per acre was obtained from 7.6 feet of sand. The weighted average percent oil saturation was reduced from 42.9 to 29.4, or represents an average recovery of 13.5 percent. The weighted average effective permeability of the samples is 1.28 millidarcys, while the average initial fluid production pressure is 27.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 9 produced water and oil. This indicates that 100 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-4

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	657.5	20.0	50	37	87	776	17.	1.0	1.0	776	17.00
2	658.6	21.4	40	46	86	664	17.	1.0	2.0	664	17.00
3	659.4	17.6	35	43	78	478	11.	0.6	2.6	287	6.60
4	660.5	20.6	38	44	82	607	17.	1.0	3.6	607	17.00
5	661.5	23.1	50	36	86	896	13.	0.7	4.3	627	9.10
6	662.5	17.2	35	49	84	467	8.5	0.2	4.5	93	1.70
7	664.5	24.1	39	37	76	729	153.	1.1	5.6	802	168.30
8	665.5	21.2	41	41	82	674	22.	1.0	6.6	674	22.00
9	666.4	22.4	51	36	87	886	40.	1.0	7.6	886	40.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-4

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
657.0 - 667.0	7.6	39.3	298.70

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
657.0 - 667.0	7.6	21.4	42.9	40.2	713	5,416

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company James E. Russell Petroleum, Inc. Lease Nelson Well No. RW-4

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	657.5	20.1	50	780	23	359	27	70	421	208	2.77	20
2	658.6	21.5	40	667	14	234	26	64	433	120	1.80	25
3	659.4	17.6	35	478	8	109	27	63	369	74	1.12	25
4	660.5	20.5	38	604	11	175	27	67	429	16	0.30	35
5	661.5	23.0	50	892	15	268	35	56	624	24	0.37	35
6	662.5	17.3	35	470	7	94	28	65	376	44	0.67	30
7	664.5	24.0	39	726	10	186	29	64	540	116	1.65	25
8	665.5	21.3	41	678	11	182	30	59	496	96	1.42	25
9	666.4	22.3	51	882	16	277	35	56	605	38	0.52	30

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

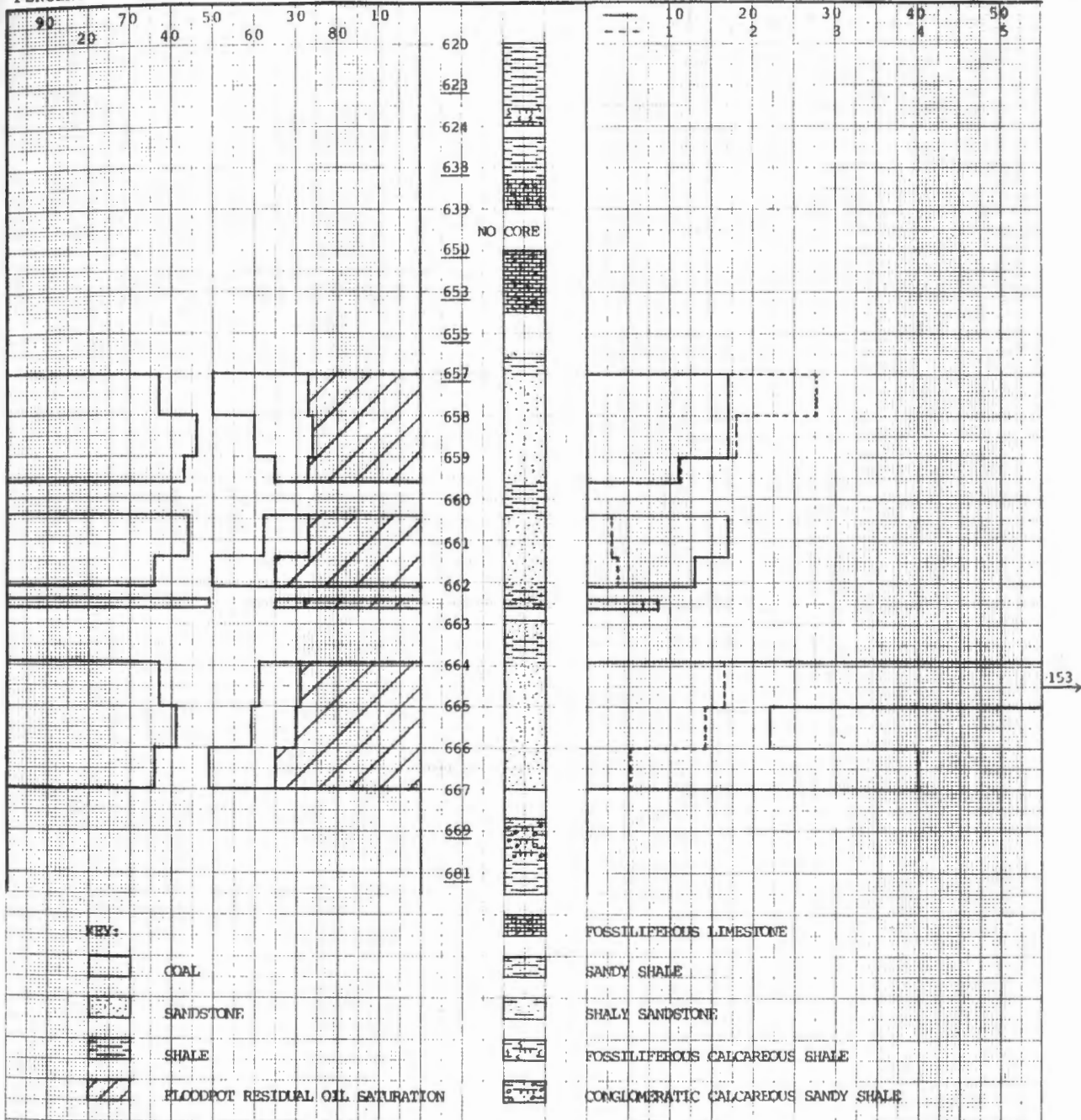
Company	James E. Russell Petroleum, Inc.	Lease	Nelson	Well No.	RW-4
Depth Interval, Feet	657.0 - 666.0				
Feet of Core Analyzed	7.6				
Average Percent Porosity	21.4				
Average Percent Original Oil Saturation	42.9				
Average Percent Oil Recovery	13.5				
Average Percent Residual Oil Saturation	29.4				
Average Percent Residual Water Saturation	62.7				
Average Percent Total Residual Fluid Saturation	92.1				
Average Original Oil Content, Bbls./A. Ft.	712.				
Average Oil Recovery, Bbls./A. Ft.	224.				
Average Residual Oil Content, Bbls./A. Ft.	488.				
Total Original Oil Content, Bbls./Acre	5,415.				
Total Oil Recovery, Bbls./Acre	1,704.				
Total Residual Oil Content, Bbls./Acre	3,711.				
Average Effective Permeability, Millidarcys	1.28				
Average Initial Fluid Production Pressure, p.s.i.	27.8				

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

WATER SAT., PERCENT

OIL SAT., PERCENT

— PERMEABILITY, IN MILLIDARCYS
 --- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



KEY:

- COAL
- SANDSTONE
- SHALE
- FLOODPOT RESIDUAL OIL SATURATION

- FOSSILIFEROUS LIMESTONE
- SANDY SHALE
- SHALY SANDSTONE
- FOSSILIFEROUS CALCAREOUS SHALE
- CONGLOMERATIC CALCAREOUS SANDY SHALE

JAMES E. RUSSELL PETROLEUM, INC.

NELSON LEASE

ALLEN COUNTY, KANSAS

WELL NO. RW-4

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBL. /ACRE
657.0 - 667.0	7.6	21.4	42.9	40.2	39.3	PRIMARY 550 WATERFLOODING 1540

NOTE: ELEVATION, FEET - DATUM: MEAN SEA LEVEL (GROUND LEVEL)

1050.0

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 CHANUTE, KANSAS
 FEBRUARY, 1983
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