

OILFIELD RESEARCH LABORATORIES

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

August 19, 1982

Lowe & Roberts
Colonial Building
Olathe, Kansas 66061

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Williams I Lease, Well No. 11, located in Johnson County, Kansas and submitted to our laboratory on August 12, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/rmc

3 c to Olathe, Kansas
2 c to Elmer Sieg, Ottawa, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Lowe & Roberts Lease Williams I Well No. 11
 Location _____
 Section 19 Twp. 14S Rge. 24E County Johnson State Kansas

Elevation, Feet

Name of Sand	THIRD SQUIRREL
Top of Core	717.0
Bottom of Core	726.0
Top of Sand	717.0
Bottom of Sand	726.0
Total Feet of Permeable Sand	6.6
Total Feet of Floodable Sand	5.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	1.8	1.8
22 - 26	1.9	3.7
76 - 138	2.9	6.6

Average Permeability Millidarcys	53.7
Average Percent Porosity	21.4
Average Percent Oil Saturation	36.9
Average Percent Water Saturation	41.3
Average Oil Content, Bbls./A. Ft.	646.
Total Oil Content, Bbls./Acre	4,906.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	174.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,012.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section

The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as a drilling fluid.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
717.0 - 718.0	Gray very shaly sandstone.
718.0 - 719.0	Grayish brown shaly sandstone.
719.0 - 719.5	Brown sandstone.
719.5 - 720.0	Grayish brown very shaly sandstone.
720.0 - 720.6	Brown sandstone with gray shale nodules.
720.6 - 722.0	Brown sandstone.
722.0 - 722.8	Brown sandstone with scattered gray shale nodules.
722.8 - 723.7	Brown sandstone.
723.7 - 724.0	Alternate layers gray shale and brown sandstone.
724.0 - 726.0	Dark brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,012 barrels of oil per acre was obtained from 5.8 feet of sand. The weighted average percent oil saturation was reduced from 44.0 to 34.3, or represents an average recovery of 9.7 percent. The weighted average effective permeability of the samples

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is 1.12 millidarcys, while the average initial fluid production pressure is 27.1 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 7 produced water and oil. This indicates that approximately 78. percent of the sand represented by these samples is floodable pay sand.

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 2,420 barrels of oil per acre. This is an average recovery of 416 barrels per acre foot from 5.8 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
Average porosity, percent	23.3
Oil saturation after flooding, percent	34.3
Performance factor, percent, estimated	55.0
Net floodable sand, feet	5.8

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lowe & Roberts Lease Williams I Well No. 11

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	717.5	15.2	2	95	97	24	Imp.	1.0	1.0	24	0.00
2	718.6	20.7	49	29	78	787	4.7	1.0	2.0	787	4.70
3	719.4	21.2	47	31	78	773	22.	0.5	2.5	387	11.00
4	720.7	22.6	33	50	83	579	25.	0.7	3.2	405	17.50
5	721.5	22.5	37	40	77	646	24.	0.7	3.9	452	16.80
6	722.4	16.5	29	61	90	371	3.9	0.8	4.7	297	3.12
7	723.5	24.3	45	22	67	848	76.	0.9	5.6	763	68.40
8	724.6	25.1	50	21	71	974	137.	1.0	6.6	974	137.00
9	725.4	24.5	43	22	65	817	96.	1.0	7.6	817	96.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lowe & Roberts	Lease	Williams I	Well No.	11
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
	717.0 - 722.8	3.7	14.4	53.12	
	722.8 - 726.0	2.9	103.9	301.40	
	717.0 - 726.0	6.6	53.7	354.52	

	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
	717.0 - 722.8	4.7	19.4	31.2	53.5	500	2,352
	722.8 - 726.0	2.9	24.7	46.0	21.7	881	2,554
	717.0 - 726.0	7.6	21.4	36.9	41.3	646	4,906

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lowe & Roberts Lease Williams I Well No. 11

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	717.5	15.7	2	24	0	0	2	94	24	0	Imp.	-
2	718.6	20.8	49	791	10	161	39	45	630	16	0.22	30
3	719.4	21.3	47	777	13	215	34	52	562	24	0.33	30
4	720.7	22.7	33	581	4	70	29	57	511	16	0.22	30
5	721.5	22.4	37	643	7	122	30	55	521	26	0.33	30
6	722.4	17.0	28	369	0	0	28	62	369	0	Imp.	-
7	723.5	24.4	45	852	12	227	33	54	625	114	1.50	20
8	724.6	25.2	50	978	9	176	41	52	802	70	1.05	25
9	725.4	24.6	43	821	12	229	31	62	592	184	3.30	25

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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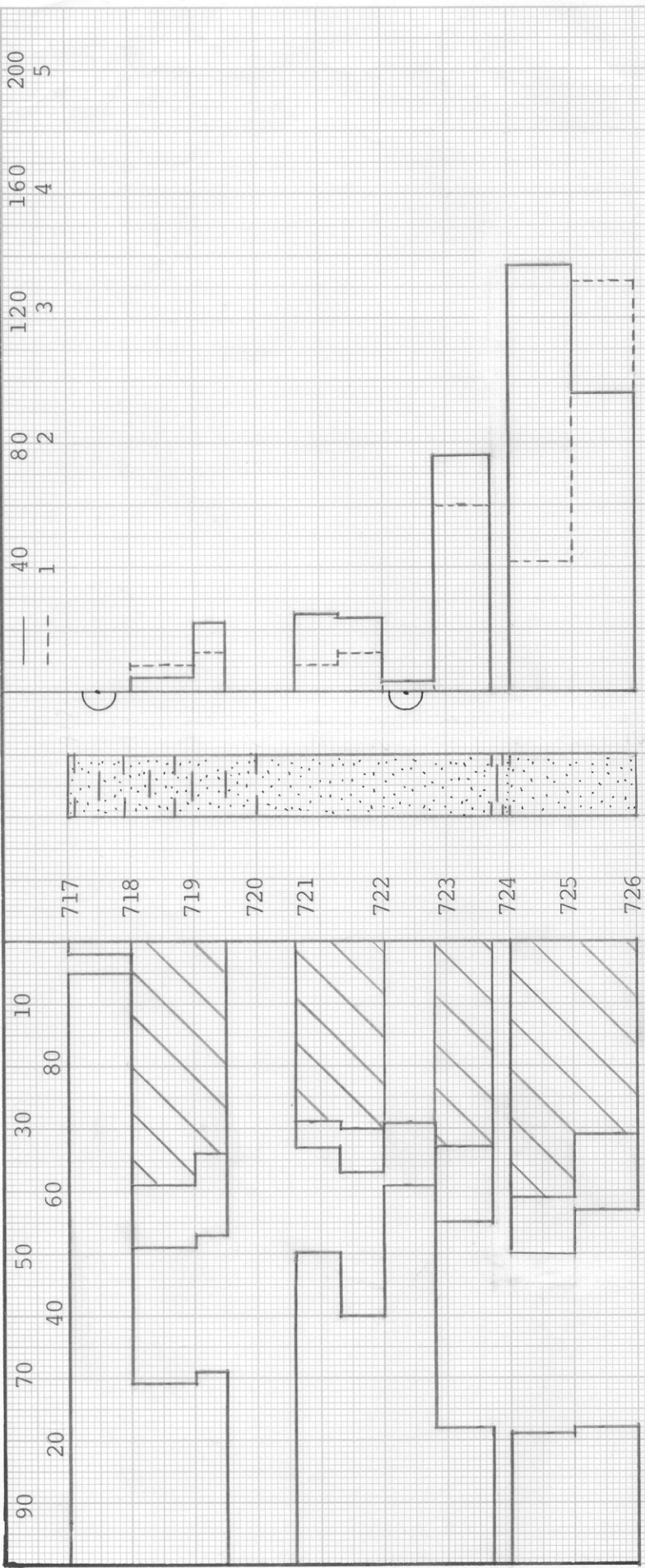
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lowe & Roberts		Lease	Williams I	Well No.	11
Depth Interval, Feet	717.0 - 722.8	722.8 - 726.0	717.0 - 726.0			
Feet of Core Analyzed	2.9	2.9	5.8			
Average Percent Porosity	21.8	24.8	23.3			
Average Percent Original Oil Saturation	41.9	46.1	44.0			
Average Percent Oil Recovery	8.3	11.0	9.7			
Average Percent Residual Oil Saturation	33.6	35.1	34.3			
Average Percent Residual Water Saturation	51.5	56.1	53.8			
Average Percent Total Residual Fluid Saturation	85.1	91.2	88.1			
Average Original Oil Content, Bbls./A. Ft.	702.	885.	793.			
Average Oil Recovery, Bbls./A. Ft.	139.	210.	174.			
Average Residual Oil Content, Bbls./A. Ft.	563.	675.	619.			
Total Original Oil Content, Bbls./Acre	2,037.	2,566.	4,603.			
Total Oil Recovery, Bbls./Acre	403.	609.	1,012.			
Total Residual Oil Content, Bbls./Acre	1,634.	1,957.	3,591.			
Average Effective Permeability, Millidarcys	0.27	2.00	1.12			
Average Initial Fluid Production Pressure, p.s.i.	30.0	23.3	27.1			

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

WATER SAT., PERCENT —————> <———— OIL SAT., PERCENT
 ————— EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS
 - - - - - PERMEABILITY, IN MILLIDARCS



KEY:
 [Pattern] SANDSTONE
 [Pattern] IMPERMEABLE TO WATER
 [Pattern] SHALY SANDSTONE
 [Pattern] ALTERNATE LAYERS OF SANDSTONE AND SHALE
 [Pattern] FLOODPOT RESIDUAL OIL SATURATION

LOWE & ROBERTS

WILLIAMS I LEASE
 JOHNSON COUNTY, KANSAS
 WELL NO. 11

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBLs. / ACRE
717.0 - 722.8	4.7	19.4	31.2	53.5	14.4	

WELL NO. 11

JOHNSON COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
717.0 - 722.8	4.7	19.4	31.2	53.5	14.4	
722.8 - 726.0	2.9	24.7	46.0	21.7	103.9	
717.0 - 726.0	7.6	21.4	36.9	41.3	53.7	2420 (PRIMARY AND WATERFLOODING)

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CHANUTE, KANSAS
AUGUST, 1982
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