

OILFIELD RESEARCH LABORATORIES

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

March 13, 1981

Ajax Drilling Company
166 Harbor Drive # 2
Key Biscayne, Florida 33149

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Kirchhoffer Lease, Well No. 9, located in Franklin County, Kansas and submitted to our laboratory on January 9, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

4 c to Key Biscayne, Florida
1 c to Rantoul, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Ajax Drilling Company Lease Kirchhoffer Well No. 9

Location _____

Section 29 Twp. 15S Rge. 22E County Franklin State Kansas

Elevation, Feet - - - - -

Name of Sand - - - - - Squirrel

Top of Core - - - - - 727.0

Bottom of Core - - - - - 738.0

Top of Sand - - - - - 730.7

Bottom of Sand - - - - - 738.0

Total Feet of Permeable Sand - - - - - 7.3

Total Feet of Floodable Sand - - - - - 2.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	3.2	3.2
45 - 65	1.9	5.1
70 & Above	2.2	7.3

Average Permeability Millidarcys - - - - - 41.7

Average Percent Porosity - - - - - 19.6

Average Percent Oil Saturation - - - - - 52.3

Average Percent Water Saturation - - - - - 37.7

Average Oil Content, Bbls./A. Ft. - - - - - 804.

Total Oil Content, Bbls./Acre - - - - - 5,869.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 6.9

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 118.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 343.

Total Calculated Oil Recovery, Bbls./Acre - - - - - See "Calculated Recovery" Section

The core was sampled by a representative of Oilfield Research Laboratories. 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>
727.0 - 730.7	Gray sandy shale.
730.7 - 732.2	Dark brown slightly calcareous sandstone.
732.2 - 732.9	Dark brown slightly calcareous slightly shaly sandstone.
732.9 - 736.1	Dark brown slightly calcareous sandstone.
736.1 - 738.0	Grayish brown slightly calcareous conglomeratic shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 343 barrels of oil per acre was obtained from 2.9 feet of sand. The weighted average percent oil saturation was reduced from 52.3 to 45.4, or represents an average recovery of 6.9 percent. The weighted average effective permeability of the samples is 3.19 millidarcys, while the average initial fluid production pressure is 33.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 7 samples tested, 3 produced water and oil, and 1 sample produced water only. This indicates that approximately 43 percent of the sand represented by these samples is floodable pay sand.

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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 700 barrels of oil per acre. This is an average recovery of 242 barrels per acre foot from 2.9 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	25.0
Average porosity, percent	21.8
Oil saturation after flooding, percent	45.4
Performance factor, percent, estimated	55.0
Net floodable sand, feet	2.9

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Ajax Drilling Company Lease Kirchhoffer Well No. 9

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	731.4	21.2	58	38	96	954	17.	1.5	1.5	1431	25.50
2	732.5	19.8	52	38	90	799	8.3	0.7	2.2	559	5.81
3	733.5	18.6	58	28	86	837	62.	1.0	3.2	837	62.00
4	734.5	22.1	53	30	83	909	74.	1.0	4.2	909	74.00
5	735.5	22.6	52	35	87	912	70.	1.2	5.4	1094	84.00
6	736.4	16.9	49	44	93	642	11.	1.0	6.4	642	11.00
7	737.5	14.2	40	53	93	441	47.	0.9	7.3	397	42.30

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Ajax Drilling Company	Lease	Kirchhoffer	Well No.	9
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
730.7 - 738.0	7.3	41.7	304.61		
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
730.7 - 738.0	7.3	19.6	52.3	37.7	804
					5,869

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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			
1	731.4	21.7	57	960	0	0	57	39	0	Imp.	-
2	732.5	19.9	52	803	5	77	47	50	197	3.60	25
3	733.5	18.4	58	828	0	0	58	40	16	1.20	50
4	734.5	22.2	53	913	7	121	46	42	186	4.20	40
5	735.5	22.6	52	912	8	140	44	51	103	2.10	35
6	736.4	16.5	50	640	0	0	50	45	0	Imp.	-
7	737.5	14.1	40	438	0	0	40	53	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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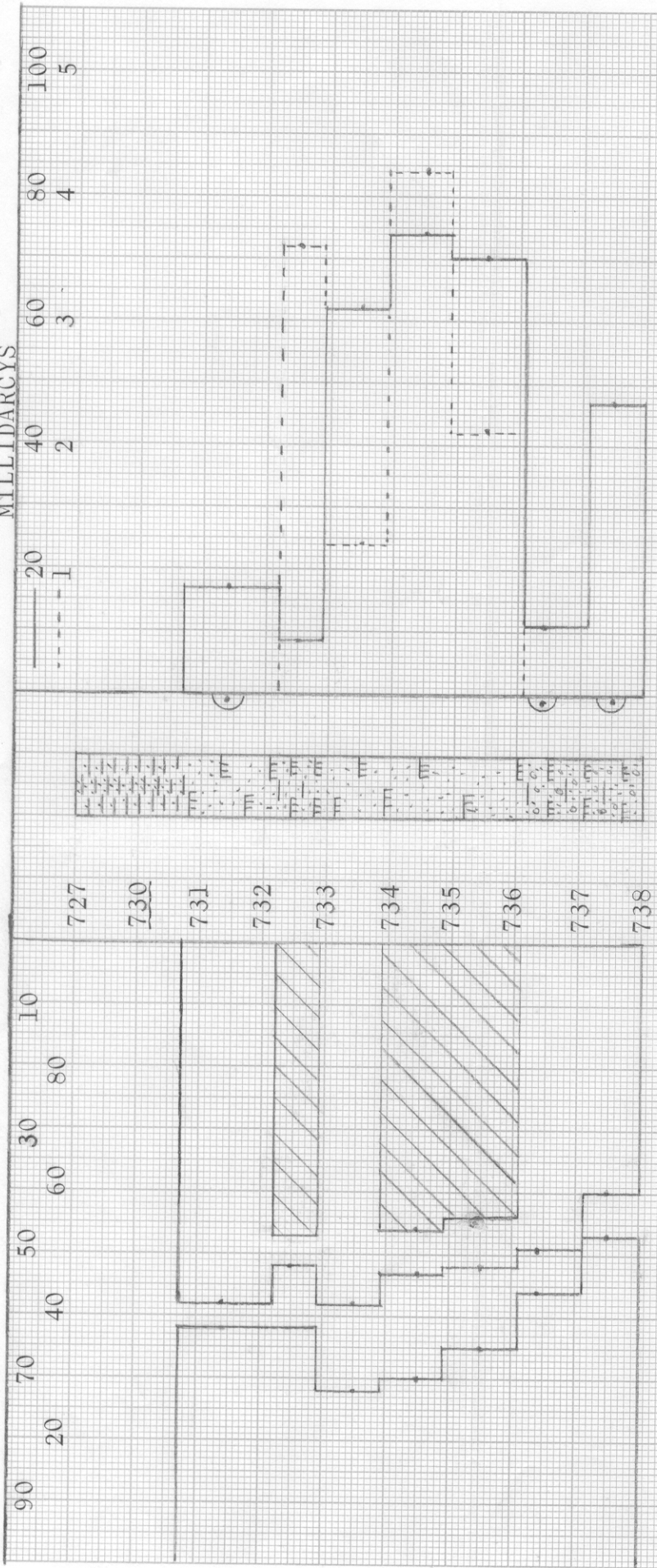
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lease	Well No.
Ajax Drilling Company	Kirchhoffer	9
Depth Interval, Feet	730.7 - 738.0	
Feet of Core Analyzed	2.9	
Average Percent Porosity	21.8	
Average Percent Original Oil Saturation	52.3	
Average Percent Oil Recovery	6.9	
Average Percent Residual Oil Saturation	45.4	
Average Percent Residual Water Saturation	47.7	
Average Percent Total Residual Fluid Saturation	93.1	
Average Original Oil Content, Bbls./A. Ft.	886.	
Average Oil Recovery, Bbls./A. Ft.	118.	
Average Residual Oil Content, Bbls./A. Ft.	768.	
Total Original Oil Content, Bbls./Acre	2,569.	
Total Oil Recovery, Bbls./Acre	343.	
Total Residual Oil Content, Bbls./Acre	2,226.	
Average Effective Permeability, Millidarcys	3.19	
Average Initial Fluid Production Pressure, p.s.i.	33.3	

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

WATER SAT., PERCENT	OIL SAT., PERCENT	PERMEABILITY, IN MILLIDARCS	EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS
0.0	100	100	100
10	90	100	100
20	80	100	100
30	70	100	100
40	60	100	100
50	50	100	100
60	40	100	100
70	30	100	100
80	20	100	100
90	10	100	100
100	0	100	100



KEY:

	SANDY SHALE		CALCAREOUS SANDSTONE
	CONGLOMERATIC SANDSTONE		SHALY CALCAREOUS SANDSTONE
	FLOODPOT RESIDUAL OIL SATURATION		IMPERMEABLE TO WATER

AJAX DRILLING COMPANY

KIRCHHOFFER LEASE
FRANKLIN COUNTY, KANSAS
WELL NO. 9

DEPTH INTERVAL,	AVERAGE	AVC OIL	AVERAGE	AVERAGE
24.00-24.25				
24.25-24.50				
24.50-24.75				
24.75-25.00				
25.00-25.25				
25.25-25.50				
25.50-25.75				
25.75-26.00				
26.00-26.25				
26.25-26.50				
26.50-26.75				
26.75-27.00				
27.00-27.25				
27.25-27.50				
27.50-27.75				
27.75-28.00				
28.00-28.25				
28.25-28.50				
28.50-28.75				
28.75-29.00				
29.00-29.25				
29.25-29.50				
29.50-29.75				
29.75-30.00				
30.00-30.25				
30.25-30.50				
30.50-30.75				
30.75-31.00				
31.00-31.25				
31.25-31.50				
31.50-31.75				
31.75-32.00				
32.00-32.25				
32.25-32.50				
32.50-32.75				
32.75-33.00				
33.00-33.25				
33.25-33.50				
33.50-33.75				
33.75-34.00				
34.00-34.25				
34.25-34.50				
34.50-34.75				
34.75-35.00				
35.00-35.25				
35.25-35.50				
35.50-35.75				
35.75-36.00				
36.00-36.25				
36.25-36.50				
36.50-36.75				
36.75-37.00				
37.00-37.25				
37.25-37.50				
37.50-37.75				
37.75-38.00				
38.00-38.25				
38.25-38.50				
38.50-38.75				
38.75-39.00				
39.00-39.25				
39.25-39.50				
39.50-39.75				
39.75-40.00				
40.00-40.25				
40.25-40.50				
40.50-40.75				
40.75-41.00				
41.00-41.25				
41.25-41.50				
41.50-41.75				
41.75-42.00				
42.00-42.25				
42.25-42.50				
42.50-42.75				
42.75-43.00				
43.00-43.25				
43.25-43.50				
43.50-43.75				
43.75-44.00				
44.00-44.25				
44.25-44.50				
44.50-44.75				
44.75-45.00				
45.00-45.25				
45.25-45.50				
45.50-45.75				
45.75-46.00				
46.00-46.25				
46.25-46.50				
46.50-46.75				
46.75-47.00				

CONGLOMERATIC SHALY CALCAREOUS SANDSTONE
FLOODPOT RESIDUAL OIL SATURATION
IMPERMEABLE TO WATER

AJAX DRILLING COMPANY

KIRCHHOFFER LEASE
FRANKLIN COUNTY, KANSAS
WELL NO. 9

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
730.7 - 738.0	7.3	19.6	52.3	37.7	41.7	700 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
MARCH, 1981

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