

OILFIELD RESEARCH LABORATORIES

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

March 5, 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. 8, located in Franklin County, Kansas and submitted to our laboratory on January 7, 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 Co. Lease Kirchhoffer Well No. 8

Location _____

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

Elevation, Feet - - - - -

Name of Sand - - - - - Squirrel

Top of Core - - - - - 722.0

Bottom of Core - - - - - 737.2

Top of Sand - - - - - 724.1

Bottom of Sand - - - - - 737.2

Total Feet of Permeable Sand - - - - - 11.0

Total Feet of Floodable Sand - - - - - 5.4

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	2.1	2.1
30 - 60	4.6	6.7
60 - 90	2.3	9.0
90 & Above	2.0	11.0

Average Permeability Millidarcys - - - - - 49.6

Average Percent Porosity - - - - - 19.7

Average Percent Oil Saturation - - - - - 47.1

Average Percent Water Saturation - - - - - 38.4

Average Oil Content, Bbls./A. Ft. - - - - - 776.

Total Oil Content, Bbls./Acre - - - - - 9,153.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 13.6

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 232.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,253.

Total Calculated Oil Recovery, Bbls./Acre - - - - - 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.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
722.0 - 724.1	Gray sandy shale.
724.1 - 726.2	Light brown and gray laminated sandstone and shale.
726.2 - 727.1	Dark brown sandstone.
727.1 - 727.9	Brown very shaly sandstone.
727.9 - 730.6	Brown sandstone.
730.6 - 731.5	Brown and gray laminated sandstone and shale.
731.5 - 732.7	Dark brown sandstone.
732.7 - 733.1	Gray sandy shale.
733.1 - 737.2	Dark brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,253 barrels of oil per acre was obtained from 5.4 feet of sand. The weighted average percent oil saturation was reduced from 57.2 to 43.6, or represents an average recovery of 13.6 percent. The weighted average effective permeability of the samples is 3.58 millidarcys, while the average initial fluid production pressure is 30.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 13 samples tested, 6 produced water and oil, and 3 samples produced water only. This indicates that approximately 46 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 1,510 barrels of oil per acre. This is an average recovery of 279 barrels per acre foot from 5.4 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	22.1
Oil saturation after flooding, percent	43.6
Performance factor, percent, estimated	50.0
Net floodable sand, feet	5.4

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Ajax Drilling Company Lease Kirchhoffer Well No. 8

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	724.5	12.9	10	75	85	100	0.58	1.0	1.0	100	0.58
2	725.6	8.7	9	83	92	61	0.20	1.1	2.1	67	0.22
3	726.5	22.5	46	36	82	803	39.	0.9	3.0	723	35.10
4	727.4	20.5	50	38	88	795	Imp.	0.8	3.8	636	0.00
5	728.5	20.9	58	30	88	940	34.	1.0	4.8	940	34.00
6	729.4	20.7	65	27	92	1044	56.	1.0	5.8	1044	56.00
7	730.4	24.0	57	28	85	1061	31.	0.7	6.5	743	21.70
8	731.7	18.7	41	50	91	595	77.	0.5	7.0	298	38.50
9	732.5	22.4	54	29	83	938	65.	0.7	7.7	657	45.50
10	733.4	21.1	55	28	83	900	44.	1.0	8.7	900	44.00
11	734.6	22.0	61	22	83	1041	99.	1.0	9.7	1041	99.00
12	735.5	22.7	57	22	79	1004	92.	1.0	10.7	1004	92.00
13	736.5	21.3	55	27	82	909	72.	1.1	11.8	1000	79.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Ajax Drilling Company		Lease	Kirchhoffer		Well No.	8
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
	724.1 - 727.9	3.0	12.0	35.90			
	727.9 - 737.2	8.0	63.7	509.90			
	724.1 - 737.2	11.0	49.6	545.80			

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
724.1 - 727.9	3.8	15.6	26.7	60.3	402	1,526
727.9 - 737.2	8.0	21.6	56.8	28.0	953	7,627
724.1 - 737.2	11.8	19.7	47.1	38.4	776	9,153

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Ajax Drilling Company				Lease		Kirchhoffer				Well No.		8	
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	724.5	12.8	10	99	0	0	10	76	99	Imp.	0	-				
2	725.6	8.7	9	61	0	0	9	84	61	Imp.	0	-				
3	726.5	22.3	46	796	0	0	46	52	796	0.75	30	40				
4	727.4	20.6	50	799	0	0	50	40	799	Imp.	0	-				
5	728.5	21.0	58	945	16	261	42	50	684	0.60	10	50				
6	729.4	20.8	65	1049	0	0	65	31	1049	5.25	238	30				
7	730.4	23.8	57	1052	15	277	42	55	775	4.20	212	30				
8	731.7	19.1	40	593	0	0	40	57	593	Imp.	0	-				
9	732.5	22.6	54	947	14	245	40	49	702	3.45	174	25				
10	733.4	21.1	55	900	14	229	41	50	671	1.95	108	25				
11	734.6	22.0	61	1041	14	239	47	48	802	3.30	200	25				
12	735.5	22.7	57	1004	9	158	48	47	846	8.10	370	25				
13	736.5	21.4	55	913	0	0	55	43	913	8.10	356	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

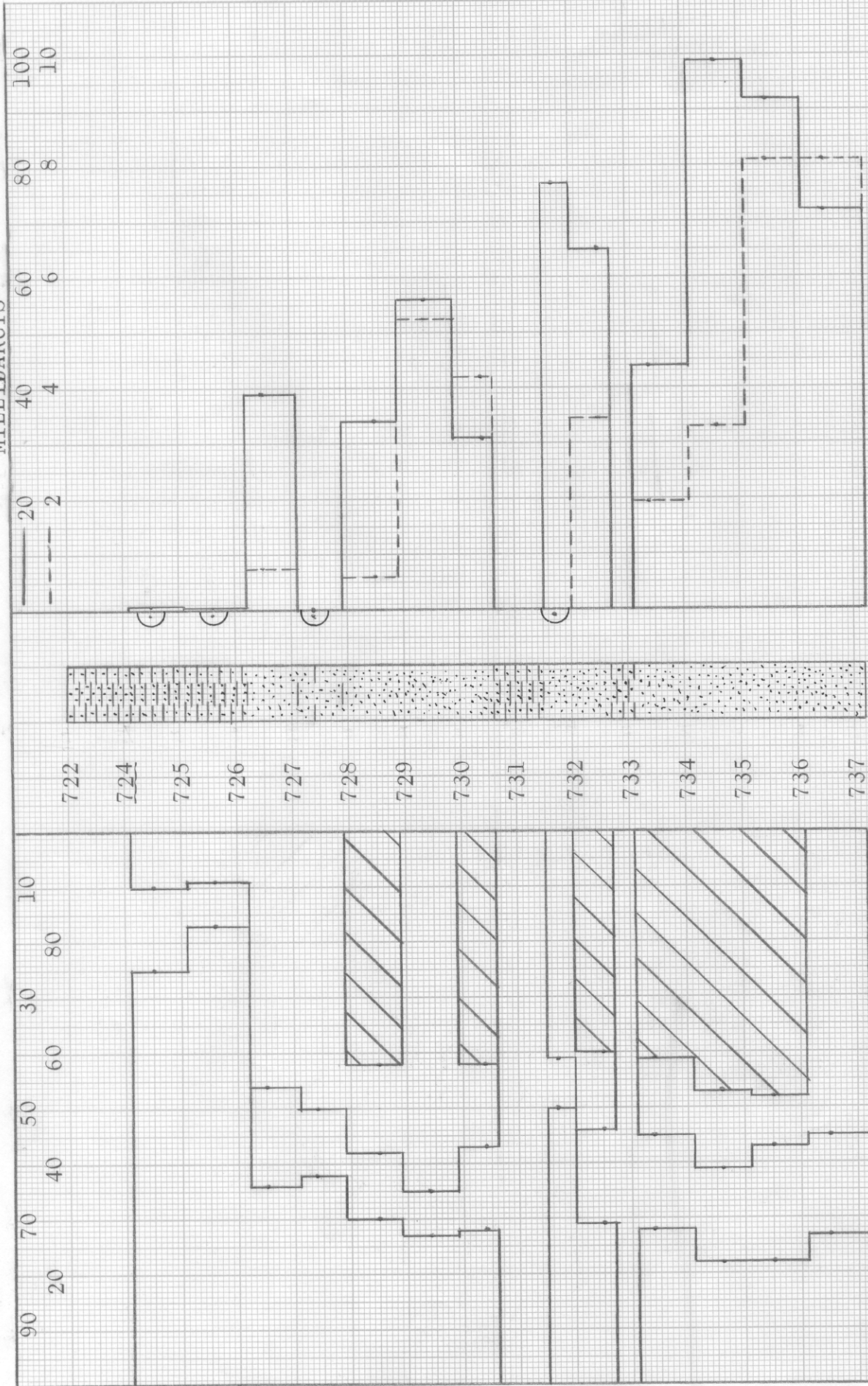
TABLE V

Company	Ajax Drilling Company	Lease	Kirchhoffer	Well No.	8
Depth Interval, Feet	724.1 - 737.2				
Feet of Core Analyzed	5.4				
Average Percent Porosity	22.1				
Average Percent Original Oil Saturation	57.2				
Average Percent Oil Recovery	13.6				
Average Percent Residual Oil Saturation	43.6				
Average Percent Residual Water Saturation	49.6				
Average Percent Total Residual Fluid Saturation	93.2				
Average Original Oil Content, Bbls./A. Ft.	980.				
Average Oil Recovery, Bbls./A. Ft.	232.				
Average Residual Oil Content, Bbls./A. Ft.	748.				
Total Original Oil Content, Bbls./Acre	5,290.				
Total Oil Recovery, Bbls./Acre	1,253.				
Total Residual Oil Content, Bbls./Acre	4,037.				
Average Effective Permeability, Millidarcys	3.58				
Average Initial Fluid Production Pressure, p.s.i.	30.0				

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

WATER SAT., PERCENT → OIL SAT., PERCENT ←

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



KEY:

- SANDSTONE
- SANDY SHALE
- SHALY SANDSTONE
- LAMINATED SANDSTONE AND SHALE
- FLOODPOT RESIDUAL OIL SATURATION
- IMPERMEABLE TO WATER

KEY:



SANDSTONE



SANDY SHALE



SHALY SANDSTONE



LAMINATED SANDSTONE AND SHALE



FLOODPOT RESIDUAL OIL SATURATION



IMPERMEABLE TO WATER

AJAX DRILLING COMPANY

KIRCHHOFFER LEASE

FRANKLIN COUNTY, KANSAS

WELL NO. 8

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBLs. / ACRE
724.1 - 727.9	3.8	15.6	26.7	60.3	12.0	
727.9 - 737.2	8.0	21.6	56.8	28.0	63.7	
724.1 - 737.2	11.8	19.7	47.1	38.4	49.6	1510 (PRIMARY AND WATERFLOODING)

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CHANUTE, KANSAS
MARCH, 1981

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