

OILFIELD RESEARCH LABORATORIES

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

March 2, 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. 7, located in Franklin County, Kansas and submitted to our laboratory on January 20, 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

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Ajax Drilling Co. Lease Kirchhoffer Well No. 7

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 - - - - - 761.3

Top of Sand - - - - - 727.0

Bottom of Sand - - - - - 761.3

Total Feet of Permeable Sand - - - - - 30.8

Total Feet of Floodable Sand - - - - - 4.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	6.6	6.6
20 - 40	8.1	14.7
40 - 80	6.8	21.5
80 - 120	2.6	24.1
120 - 160	4.9	29.0
170 & Above	1.8	30.8

Average Permeability Millidarcys - - - - - 64.8

Average Percent Porosity - - - - - 18.6

Average Percent Oil Saturation - - - - - 45.1

Average Percent Water Saturation - - - - - 41.6

Average Oil Content, Bbls./A. Ft. - - - - - 684.

Total Oil Content, Bbls./Acre - - - - - 12,446.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 9.4

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 164.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 739.

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

The core was sampled by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
727.0 - 733.2	Brown and gray laminated sandstone and shale.
733.2 - 734.8	Brown slightly calcareous sandstone.
734.8 - 736.1	Brown and gray laminated slightly calcareous sandstone and shale.
736.1 - 737.6	Brown slightly calcareous sandstone.
737.6 - 738.4	Grayish light brown shaly sandstone.
738.4 - 747.6	Dark brown slightly calcareous sandstone.
747.6 - 748.1	Gray sandy shale.
748.1 - 750.9	Brown slightly calcareous sandstone.
750.9 - 752.2	Gray and brown laminated slightly calcareous sandstone and shale.
752.2 - 756.7	Light brown slightly calcareous sandstone.
756.7 - 761.3	Light brown and gray laminated sandstone and shale.

LABORATORY FLOODING TESTS

At the request of the client, air permeability tests only were performed on sample numbers 20 through 34; therefore flooding susceptibility tests were performed on sample numbers one through nineteen. These samples responded to laboratory flooding tests, as a total recovery of 739 barrels of oil per acre was obtained from 4.5 feet of sand. The weighted average percent oil saturation was reduced from 56.7 to 47.3, or represents an average recovery of 9.4 percent. The weighted average effective permeability of the samples is 4.49

millidarcys, while the average initial fluid production pressure is 32.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 19 samples tested, 5 produced water and oil, and 7 samples produced water only. This indicates that approximately 26 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 1,140 barrels of oil per acre. This is an average recovery of 254 barrels per acre foot from 4.5 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	22.7
Oil saturation after flooding, percent	47.3
Performance factor, percent, estimated	50.0
Net floodable sand, feet	4.5

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Ajax Drilling Co. Lease Kirchhoffer Well No. 7

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			Ft.	Cum. Ft.		
1	727.5	17.5	27	58	367	13.	1.0	1.0	367	13.00
2	728.5	17.3	42	53	564	2.1	1.0	2.0	564	2.10
3	729.4	17.6	32	63	437	3.3	1.0	3.0	437	3.30
4	730.5	16.2	34	60	427	Imp.	1.0	4.0	427	0.00
5	731.5	6.5	33	61	166	1.9	1.0	5.0	166	1.90
6	732.5	7.1	25	70	138	Imp.	1.2	6.2	166	0.00
7	733.5	21.7	46	39	774	84.	1.0	7.2	774	84.00
8	734.4	21.9	57	32	968	97.	0.6	7.8	581	58.20
9	735.5	20.7	58	30	931	9.4	1.3	9.1	1210	12.22
10	736.6	21.7	51	29	859	123.	0.9	10.0	773	110.70
11	737.4	23.4	47	33	853	280.	0.6	10.6	512	168.00
12	737.7	25.0	55	26	1067	170.	0.6	11.2	640	102.00
13	739.5	24.8	55	23	1058	128.	1.0	12.2	1058	128.00
14	740.4	21.9	64	19	1087	34.	1.0	13.2	1087	34.00
15	741.7	20.8	57	32	920	28.	1.0	14.2	920	28.00
16	742.5	20.4	52	28	823	137.	1.0	15.2	823	137.00
17	743.5	19.2	62	32	924	141.	1.0	16.2	924	141.00
18	744.4	18.7	44	40	638	35.	1.0	17.2	638	35.00
19	745.5	18.8	26	45	379	78.	1.0	18.2	379	78.00
20	746.5					71.	1.0	19.2		71.00
21	747.5					236.	0.6	19.8		141.60
22	748.7					60.	1.0	20.8		60.00
23	749.5					137.	1.0	21.8		137.00
24	750.7					39.	0.8	22.6		31.20
25	751.8					5.8	1.3	23.9		7.54
26	752.5					60.	1.0	24.9		60.00
27	753.5					99.	1.0	25.9		99.00
28	754.5					27.	1.0	26.9		27.00
29	755.7					33.	1.0	27.9		33.00
30	756.5					58.	0.5	28.4		29.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

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TABLE 1-B

Company Ajax Drilling Co. Lease Kirchhoffer Well No. 7

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.		
31	757.5						58.	1.3	29.7		75.40
32	758.5						22.	1.0	30.7		22.00
33	759.6						40.	1.0	31.7		40.00
34	760.5						20.	1.3	33.0		26.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Lease		Well No.	
Ajax Drilling Co.		Kirchhoffer		7	
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
727.0 - 736.1	6.9	25.3	174.72		
736.1 - 746.0	9.1	105.7	961.70		
746.0 - 761.3	14.8	58.1	859.74		
727.0 - 761.3	30.8	64.8	1,996.16		

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
727.0 - 736.1	9.1	16.0	38.9	52.3	516	4,692
736.1 - 746.0	9.1	21.2	51.3	30.8	852	7,754
727.0 - 746.0	18.2	18.6	45.1	41.6	684	12,446

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Ajax Drilling Co. Lease Kirchhoffer Well No. 7

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.
			%	Bbbls./A. Ft.	%	Bbbls./A. Ft.	% Oil	% Water			
1	727.5	17.1	28	371	0	0	28	59	0	Imp.	-
2	728.5	17.4	42	567	0	0	42	53	0	Imp.	-
3	729.4	17.2	33	440	0	0	33	62	0	Imp.	-
4	730.5	16.2	34	427	0	0	34	61	0	Imp.	-
5	731.5	6.4	33	164	0	0	33	61	0	Imp.	-
6	732.5	7.2	25	140	0	0	25	70	0	Imp.	-
7	733.5	21.7	46	774	0	0	46	44	34	0.75	35
8	734.4	22.0	57	973	0	0	57	36	34	0.90	40
9	735.5	20.8	58	936	0	0	58	32	0	Imp.	-
10	736.6	21.8	51	863	4	68	47	44	98	1.95	35
11	737.4	23.5	47	857	0	0	47	44	222	10.31	20
12	738.7	24.8	55	1058	6	115	49	43	232	8.55	25
13	739.5	24.7	55	1054	11	211	44	42	180	10.00	20
14	740.4	22.0	64	1092	11	188	53	43	82	2.85	30
15	741.7	20.8	57	920	13	210	44	46	14	0.45	50
16	742.5	20.6	52	831	0	0	52	36	90	3.00	40
17	743.5	19.1	62	919	0	0	62	34	130	4.05	40
18	744.4	19.2	43	641	0	0	43	55	18	0.50	40
19	745.5	18.8	26	379	0	0	26	70	266	6.45	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

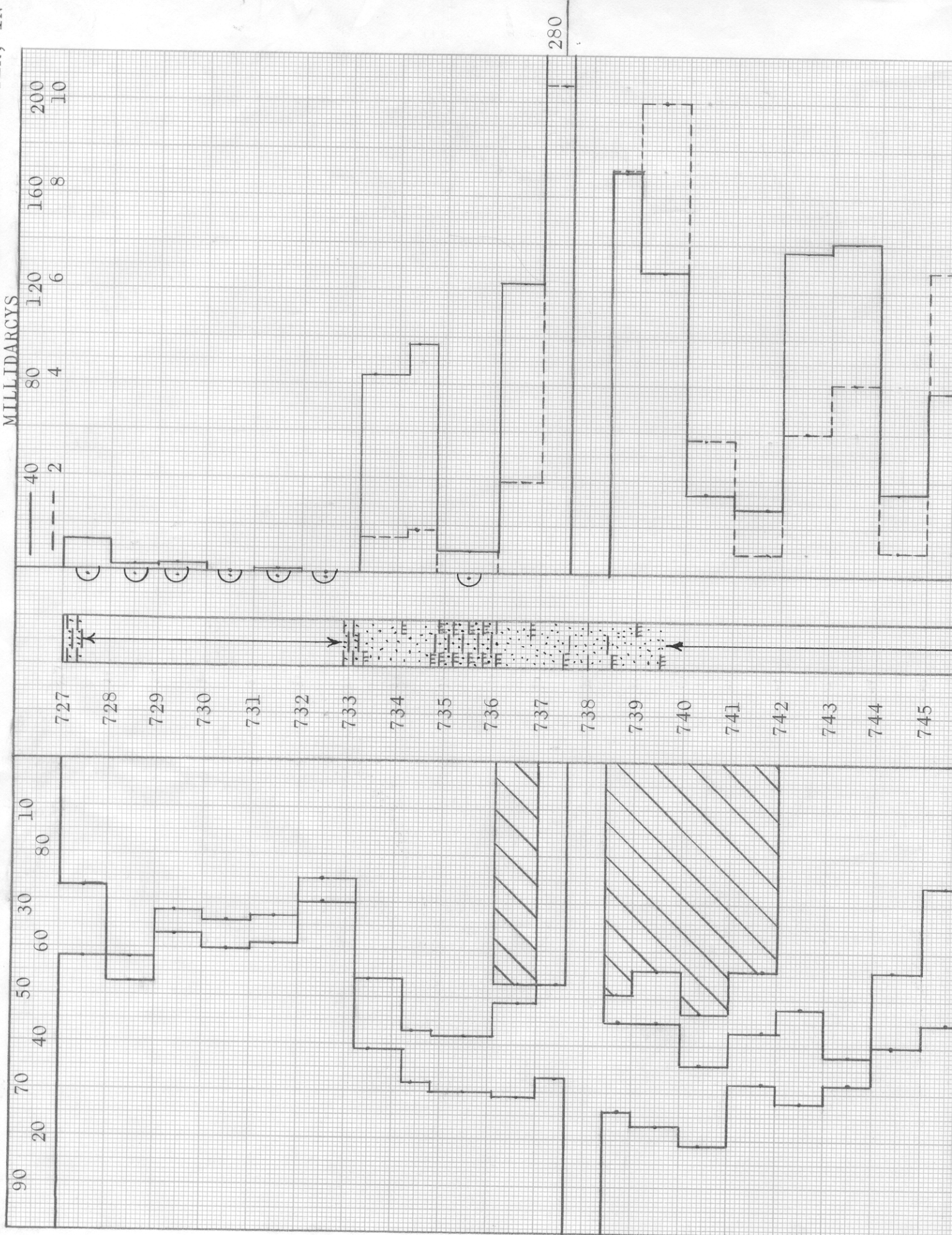
Company	Ajax Drilling Co.	Lease	Kirchhoffer	Well No.	7
Depth Interval, Feet	736.1 - 746.0				
Feet of Core Analyzed	4.5				
Average Percent Porosity	22.7				
Average Percent Original Oil Saturation	56.7				
Average Percent Oil Recovery	9.4				
Average Percent Residual Oil Saturation	47.3				
Average Percent Residual Water Saturation	43.6				
Average Percent Total Residual Fluid Saturation	90.9				
Average Original Oil Content, Bbls./A. Ft.	995.				
Average Oil Recovery, Bbls./A. Ft.	164.				
Average Residual Oil Content, Bbls./A. Ft.	831.				
Total Original Oil Content, Bbls./Acre	4,478.				
Total Oil Recovery, Bbls./Acre	739.				
Total Residual Oil Content, Bbls./Acre	3,739.				
Average Effective Permeability, Millidarcys	4.49				
Average Initial Fluid Production Pressure, p.s.i.	32.0				

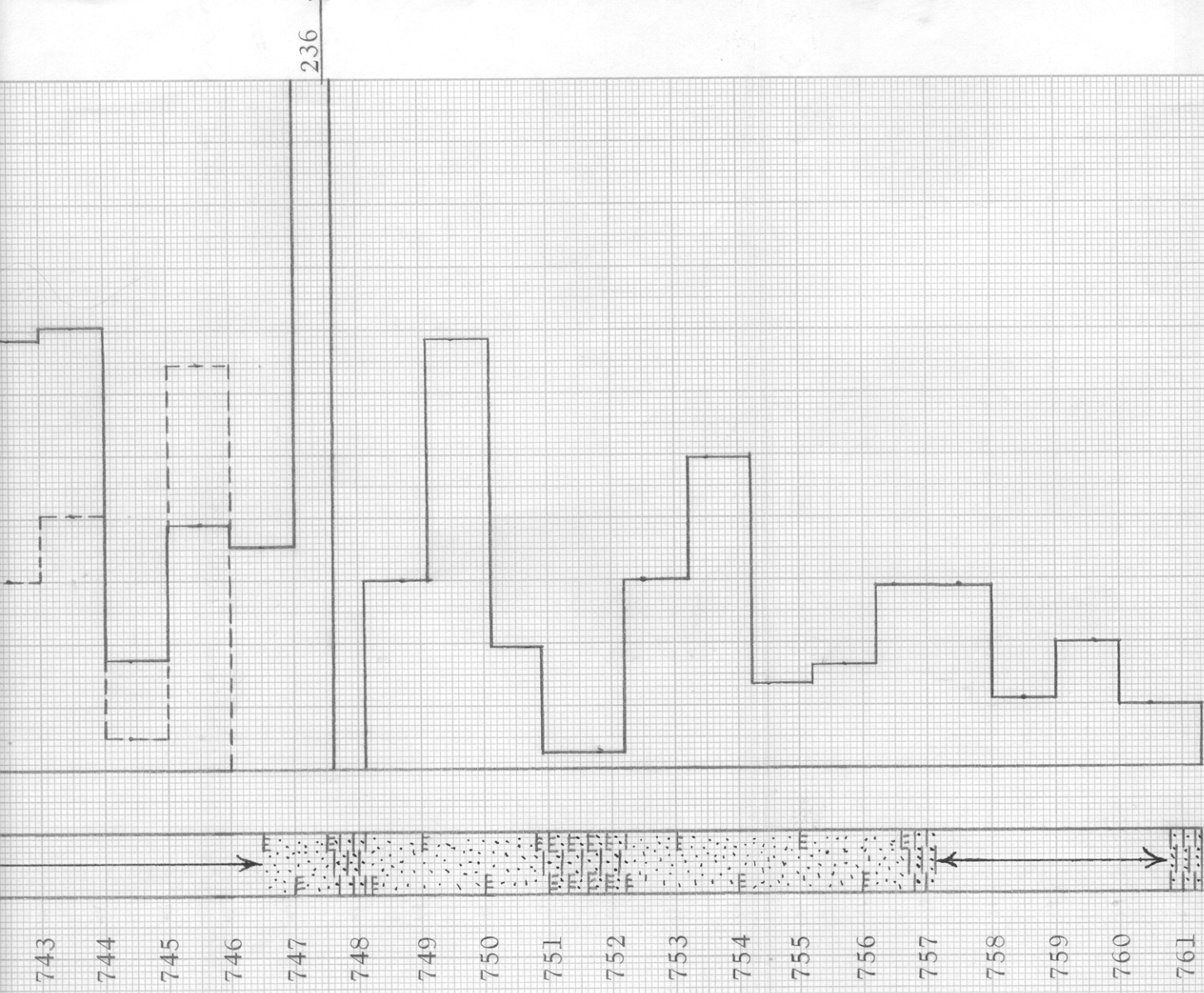
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN
MILLIDARCYS





LAMINATED SANDSTONE AND SHALE

KEY:

KEY:



LAMINATED SANDSTONE AND SHALE



SANDY SHALE



LAMINATED CALCAREOUS SANDSTONE AND SHALE



SHALY SANDSTONE



FLOODPOT RESIDUAL OIL SATURATION



CALCAREOUS SANDSTONE



IMPERMEABLE TO WATER

AJAX DRILLING COMPANY

KIRCHHOFFER LEASE

WELL NO. 7

FRANKLIN COUNTY, KANSAS

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
727.0 - 736.1	9.1	16.0	38.9	52.3	25.3	
736.1 - 746.0	9.1	21.2	51.3	30.8	105.7	
727.0 - 746.0	18.2	18.6	45.1	41.6	58.1	1140 (PRIMARY AND WATERFLOODING)
727.0 - 761.3	30.8				64.8	

OILFIELD RESEARCH LABORATORIES,
CHANUTE, KANSAS
MARCH, 1981

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