OILFIELD RESEARCH LABORATORIES

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

May 3, 1982

Miller Brothers Production Company
427 South Parker
Olathe, Kansas 66061

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Boehm Lease, Well No. 4, located in Johnson County, Kansas and submitted to our laboratory on April 28, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Olathe, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Miller Brothers Production Co. Lease Boehm Well No. 4

Location

Section 19 Twp. 14S Rge. 24E County Johnson State Kansas

Elevation, Feet	
Name of Sand	Lower Squirrel
Top of Core	676.1
Bottom of Core	694.4
Top of Sand	677.1
Bottom of Sand	694.4
Total Feet of Permeable Sand	17.0
Total Feet of Floodable Sand	16.4

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 25	1.8	1.8
25 - 50	5.0	6.8
50 - 100	6.8	13.6
108 - 189	3.4	17.0

Average Permeability Millidarcys	74.3
Average Percent Porosity	23.3
Average Percent Oil Saturation	44.2
Average Percent Water Saturation	33.3
Average Oil Content, Bbls./A. Ft.	808.
Total Oil Content, Bbls./Acre	13,737.
Average Percent Oil Recovery by Laboratory Flooding Tests	13.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	255.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	4,184.
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:

Depth Interval, Feet	Description
676.1 - 677.1	Gray shale.
677.1 - 677.7	Gray shaly sandstone.
677.7 - 680.5	Brown sandstone.
680.5 - 680.8	Gray shale.
680.8 - 691.0	Dark brown sandstone.
691.0 - 694.4	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 4,184 barrels of oil per acre was obtained from 16.4 feet of sand. The weighted average percent oil saturation was reduced from 45.4 to 31.6, or represents an average recovery of 13.8 percent. The weighted average effective permeability of the samples is 4.29 millidarcys, while the average initial fluid production pressure is 23.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 16 produced water and oil. This indicates that approximately 94 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 6,670 barrels of oil per acre. This is an average recovery of 406 barrels per acre foot from 16.4 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	23.5
Oil saturation after flooding, percent	31.6
Performance factor, percent, estimated	50.0
Net floodable sand, feet	16.4

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Miller Brothers Production Company Lease Boehm Well No. 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	677.4	16.1	12	84	96	150	3.3	0.6	0.6	90	1.98
2	678.6	22.7	32	38	70	564	36.	1.0	1.6	564	36.00
3	679.4	24.4	36	33	69	682	92.	0.8	2.4	546	73.60
4	680.2	23.3	42	33	75	759	47.	1.0	3.4	759	47.00
5	681.5	20.7	41	48	89	658	23.	1.2	4.6	790	27.60
6	682.5	23.0	47	32	79	839	56.	1.0	5.6	839	56.00
7	683.5	25.4	48	30	78	946	84.	1.0	6.6	946	84.00
8	684.5	24.3	52	24	76	980	84.	1.0	7.6	980	84.00
9	685.5	24.4	53	27	80	1003	62.	1.0	8.6	1003	62.00
10	686.5	23.6	49	30	79	897	42.	1.0	9.6	897	42.00
11	687.5	23.5	45	32	74	820	108.	1.0	10.6	820	108.00
12	688.5	22.0	32	38	70	546	62.	1.0	11.6	546	62.00
13	689.5	23.4	46	30	76	835	84.	1.0	12.6	835	84.00
14	690.5	25.3	59	15	74	1158	169.	1.0	13.6	1158	169.00
15	691.5	22.2	45	34	79	775	31.	1.0	14.6	775	31.00
16	692.5	22.6	54	30	84	947	31.	1.0	15.6	947	31.00
17	693.5	25.4	45	28	73	887	188.	1.4	17.0	1242	263.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Miller Brothers Production Company Lease Boehm Well No. 4

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
677.1 - 694.4	17.0	74.3	1262.38

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
677.1 - 694.4	17.0	23.3	44.2	33.3	808	13,737

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Miller Brothers Production Company Lease Boehm Well No. 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	677.4	16.3	12	152	0	0	12	85	152	0	Imp.	-
2	678.6	22.6	32	561	3	53	29	62	508	112	1.95	30
3	679.4	24.5	36	684	6	114	30	65	570	112	2.25	30
4	680.2	23.2	42	756	11	198	31	64	558	246	4.50	25
5	681.5	20.8	41	662	11	178	30	61	484	30	0.60	35
6	682.5	22.9	47	835	15	266	32	62	569	98	1.65	25
7	683.5	25.3	48	942	19	373	29	46	569	186	3.07	20
8	684.5	24.2	52	976	20	375	32	59	601	79	2.85	20
9	685.5	24.3	53	999	24	452	29	65	547	248	4.35	20
10	686.5	23.7	49	901	14	257	35	61	644	64	1.12	25
11	687.5	23.6	45	824	16	293	29	68	531	208	3.60	20
12	688.5	22.2	32	551	4	69	28	66	482	302	4.50	20
13	689.5	23.5	46	839	15	273	31	60	566	328	5.40	20
14	690.5	25.4	59	1163	25	493	34	57	670	384	9.30	20
15	691.5	22.4	45	782	8	139	37	53	643	224	3.67	30
16	692.5	22.8	54	955	19	336	35	54	619	266	9.74	20
17	693.5	25.3	45	883	11	216	34	52	667	286	8.66	20

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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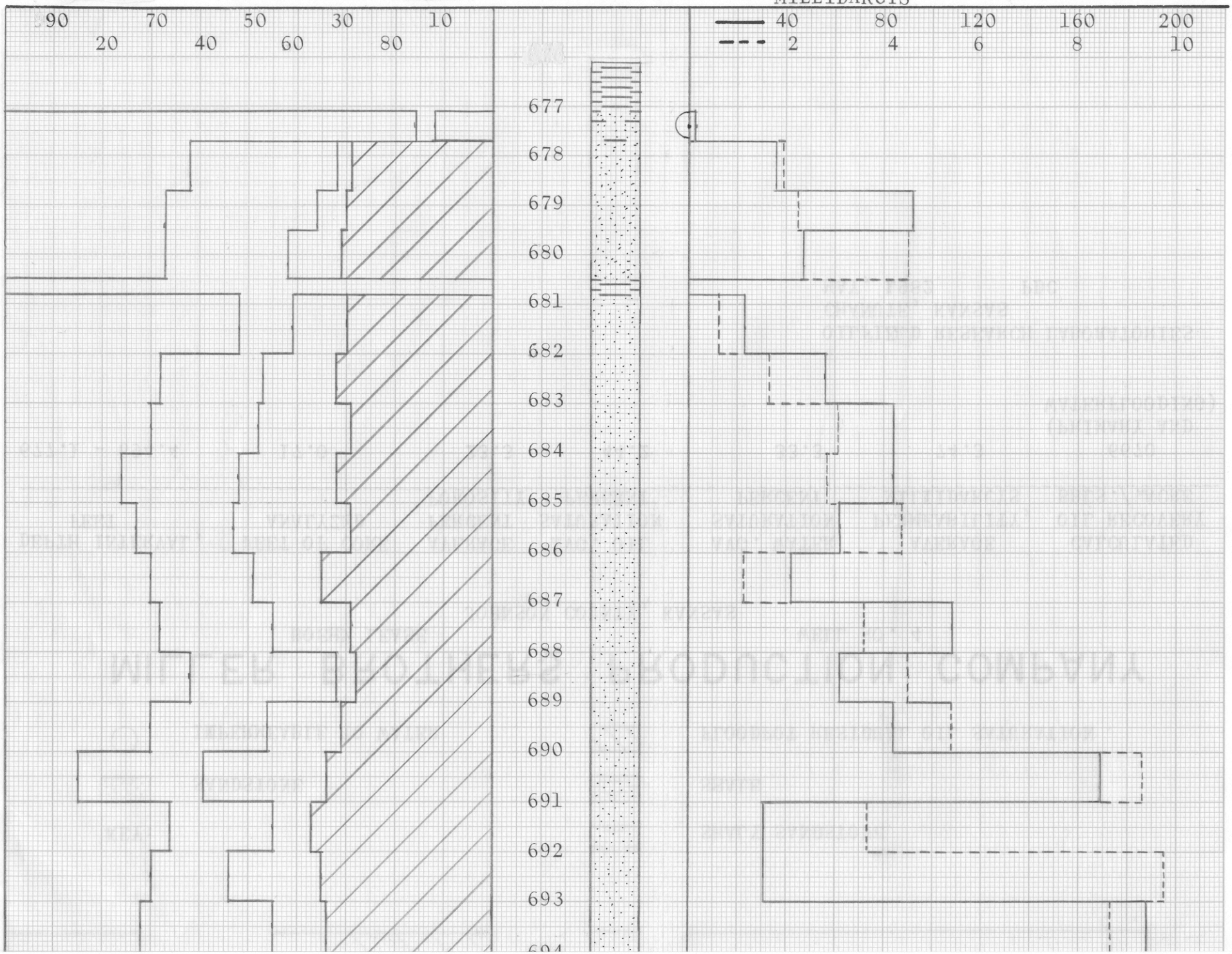
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Miller Brothers Production Company Lease Boehm Well No. 4

Depth Interval, Feet	677.1 - 694.4
Feet of Core Analyzed	16.4
Average Percent Porosity	23.5
Average Percent Original Oil Saturation	45.4
Average Percent Oil Recovery	13.8
Average Percent Residual Oil Saturation	31.6
Average Percent Residual Water Saturation	59.5
Average Percent Total Residual Fluid Saturation	91.1
Average Original Oil Content, Bbls./A. Ft.	833.
Average Oil Recovery, Bbls./A. Ft.	255.
Average Residual Oil Content, Bbls./A. Ft.	578.
Total Original Oil Content, Bbls./Acre	13,662.
Total Oil Recovery, Bbls./Acre	4,184.
Total Residual Oil Content, Bbls./Acre	9,478.
Average Effective Permeability, Millidarcys	4.29
Average Initial Fluid Production Pressure, p.s.i.	23.8

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


WATER SAT., PERCENT
90
70
50
30
10
20
40
60
80
OIL SAT., PERCENT
PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS
40
80
120
160
200
2
4
6
8
10
677
678
679
680
681
682
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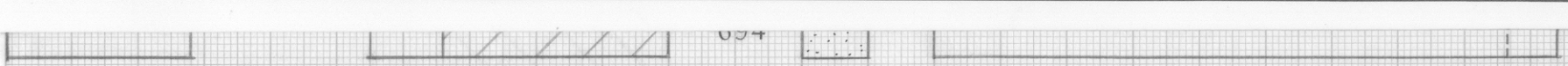

KEY:

SANDSTONE

IMPERMEABLE TO WATER

SHALY SANDSTONE

SHALE

FLOODPOT RESIDUAL OIL SATURATION

MILLER BROTHERS PRODUCTION COMPANY

BOEHM LEASE WELL NO. 4

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
677.1 - 694.4	17.0	23.3	44.2	33.3	74.3	6670 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
MAY, 1982 PDC