

OILFIELD RESEARCH LABORATORIES

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

December 1, 1980

4 - Way Oil Company
% Dorwin Jackson
R.R. 1, Box 116
Bronson, Kansas 66716

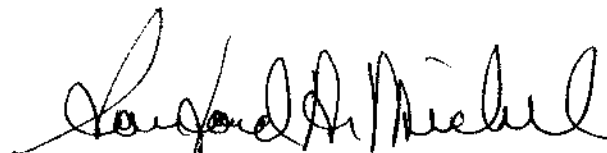
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Charles Thummel Lease, Well No. 1, located in Wilson County, Kansas and submitted to our laboratory on September 23, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/(BRP)/mkf

4 c to Bronson, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company 4-Way Oil Co. Lease Charles Thummel Well No. 1

Location 165' WEL & 330' NSL, W $\frac{1}{4}$

Section 21 Twp. 30S Rge. 17E County Wilson State Kansas

Elevation, Feet	-
Name of Sand	Peru
Top of Core	484.0
Bottom of Core	492.7
Top of Sand	484.0
Bottom of Sand	(Tested) 492.0
Total Feet of Permeable Sand	5.8
Total Feet of Floodable Sand	2.0

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

	Feet	Cum. Ft.
8 - 20	3.8	3.8
20 & Above	2.0	5.8

Average Permeability Millidarcys	19.1
Average Percent Porosity	17.9
Average Percent Oil Saturation	23.1
Average Percent Water Saturation	54.9
Average Oil Content, Bbls./A. Ft.	324.
Total Oil Content, Bbls./Acre	1,879.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	129.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	257.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section

This core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as the circulating fluid while taking this core.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
484.0 - 484.8	Grayish light brown slightly calcareous sandstone.
484.8 - 490.4	Light brown slightly calcareous sandstone.
490.4 - 492.7	Grayish light brown slightly calcareous shaly sandstone.

LABORATORY FLOODING TESTS

The upper portion of the sand in this core responded to laboratory flooding tests, as a total recovery of 257 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 36.5 to 27.5, or represents an average recovery of 9.0 percent. The weighted average effective permeability of the samples is 0.83 millidarcys, while the average initial fluid production pressure is 30.0 pounds per square inch (See Table V).

CALCULATED RECOVERY

The results of the laboratory testing indicate that efficient primary and waterflooding operation in the vicinity of this well should recover approximately 610 barrels of oil per acre. This is an average recovery of 303 barrels per acre foot from the 2.0 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.03
Reservoir water saturation, percent, estimated	35.0
Average porosity, percent	18.3
Oil saturation after flooding, percent	27.5
Performance factor, percent, estimated	60.0
Net floodable pay sand, feet	2.0

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company 4-Way Oil Company Lease Charles Thummel Well No. 1

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	484.5	16.7	19	58	77	246	11.	0.8	0.8	197	8.80
2	485.5	18.0	31	43	74	433	32.	1.0	1.8	433	32.00
3	487.5	18.8	42	38	80	613	27.	1.0	2.8	613	27.00
4	488.5	17.3	22	56	78	295	16.	1.0	3.8	295	16.00
5	489.5	18.8	13	58	71	190	19.	1.0	4.8	190	19.00
6	491.5	17.7	11	77	88	151	8.0	1.0	5.8	151	8.00

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	4-Way Oil Co.		Lease	Charles Thummel		Well No.	1	
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
484.0 - 492.0	5.8	17.9	23.1	19.1	110.80	54.9	324	1,879

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company 4-Way Oil Company Lease Charles Thummel Well No. 1

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	484.5	17.0	21	277	0	0	21	75	277	246	3.60	25
2	485.5	18.0	31	433	3	42	28	67	391	44	0.75	30
3	487.5	18.5	42	603	15	215	27	70	388	51	0.90	30
4	488.5	17.5	24	326	0	0	24	70	326	44	0.60	25
5	489.5	18.3	15	213	0	0	15	83	213	190	3.60	20
6	491.5	18.0	11	154	0	0	11	86	154	102	1.80	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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

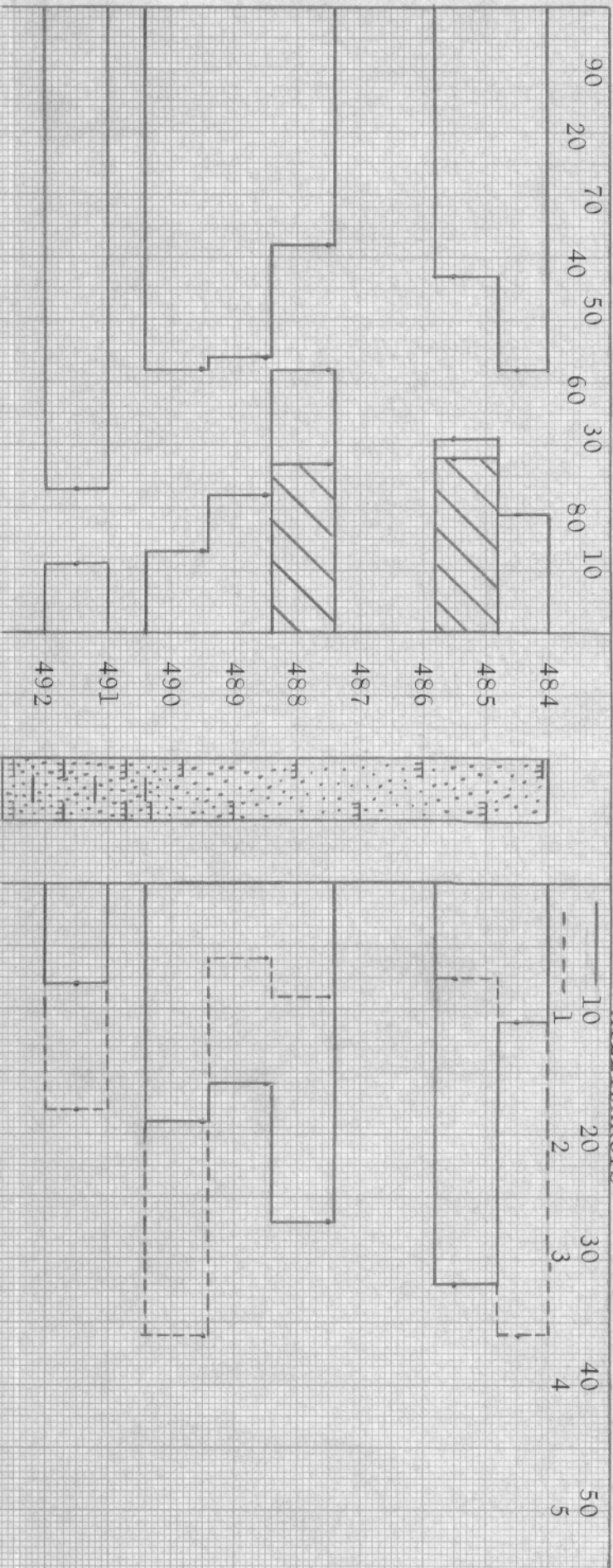
TABLE V

Company	4-Way Oil Company	Lease	Charles Thummel	Well No.	1
Depth Interval, Feet	484.0 - 492.0				
Feet of Core Analyzed	2.0				
Average Percent Porosity	18.3				
Average Percent Original Oil Saturation	36.5				
Average Percent Oil Recovery	9.0				
Average Percent Residual Oil Saturation	27.5				
Average Percent Residual Water Saturation	68.5				
Average Percent Total Residual Fluid Saturation	96.0				
Average Original Oil Content, Bbls./A. Ft.	519.				
Average Oil Recovery, Bbls./A. Ft.	129.				
Average Residual Oil Content, Bbls./A. Ft.	390.				
Total Original Oil Content, Bbls./Acre	1,036.				
Total Oil Recovery, Bbls./Acre	257.				
Total Residual Oil Content, Bbls./Acre	779.				
Average Effective Permeability, Millidarcys	0.83				
Average Initial Fluid Production Pressure, p.s.i.	30.0				

NOTE: Only those samples which recovered oil were used in calculating

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

PERMEABILITY, IN MILLIDARCYS
----- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



KEY:

CALCAREOUS SANDSTONE

SHALY CALCAREOUS SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

4-WAY OIL COMPANY

THUMMEL LEASE

WILSON COUNTY, KANSAS

WELL NO. 1

DEPTH INTERVAL, FEET FEET OF CORE ANALYZED AVERAGE PERCENT POROSITY AVG. OIL SATURATION PERCENT AVG. WATER SATURATION PERCENT PERMEABILITY, MILLIDARCYS AVERAGE PERMEABILITY, MILLIDARCYS CALCULATED OIL RECOVERY BBLs. / ACRE