

OILFIELD RESEARCH LABORATORIES

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

April 30, 1980

Hickory Creek Oil Company
P.O. Box 379
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-143, and submitted to our laboratory on March 25, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/tem

4 c to Parsons, Kansas
1 c to Chanute, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease - Well No. HCO-143

Location -

Section - Twp. - Rge. - County - State -

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 195.5

Bottom of Core - - - - - 253.5

Top of Sand - - - - - 195.5

Bottom of Sand - - - - - 252.7

Total Feet of Permeable Sand - - - - - 41.0

Total Feet of Floodable Sand - - - - - 17.7

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 50 26.1 26.1

50 - 100 7.1 33.2

100 - 200 4.3 37.5

200 - 300 3.5 41.0

Average Permeability Millidarcys - - - - - 58.1

Average Percent Porosity - - - - - 19.9

Average Percent Oil Saturation - - - - - 37.6

Average Percent Water Saturation - - - - - 46.5

Average Oil Content, Bbls./A. Ft. - - - - - 581.

Total Oil Content, Bbls./Acre - - - - - 24,752.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 4.3

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 63.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,120.

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

-2-

The core was sampled and the samples sealed in plastic bags by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
195.5 - 204.0	Brown sandstone.
204.0 - 205.2	Hard gray limestone.
205.2 - 206.0	Hard brown calcareous sandstone.
206.0 - 206.7	Hard gray limestone.
206.7 - 209.0	Brown slightly calcareous sandstone.
212.0 - 213.1	Brown very calcareous sandstone.
213.1 - 218.0	Brown slightly calcareous sandstone.
218.0 - 219.7	Brown sandstone.
219.7 - 224.2	Black carbonaceous shaly sandstone.
224.2 - 240.4	Brown slightly calcareous sandstone.
240.4 - 244.2	Black carbonaceous sandstone.
244.2 - 245.4	Black carbonaceous sandstone with coal streaks.
245.4 - 249.8	Gray sandy shale.
249.8 - 250.6	Gray shaly sandstone.
250.6 - 251.9	Gray laminated sandstone and shale.
251.9 - 252.7	Gray shaly sandstone.
252.7 - 253.5	Gray sandy shale.

4 11

-3-

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,120 barrels of oil per acre was obtained from 17.8 feet of sand. The weighted average percent oil saturation was reduced from 43.9 to 39.6, or represents an average recovery of 4.3 percent. The weighted average effective permeability of the samples is 7.04 millidarcys, while the average initial fluid production pressure is 17.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 26 samples tested, 11 produced water and oil, and 11 samples produced water only. This indicates that approximately 42 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 3,920 barrels of oil per acre. This is an average recovery of 220 barrels per acre foot from 17.8 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	25.0 / 40.5
Average porosity, percent	19.0 / 24.2
Oil saturation after flooding, percent	39.6 / 37.4

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4 22

-4-

Performance factor, percent, estimated

45.0

Net floodable sand, feet

17.8

7

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE I-B

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	195.6	21.9	44	33	748	166.	0.5	0.5	374	83.00
2	196.5	24.6	42	39	802	84.	1.5	2.0	1203	126.00
4	198.5	22.5	35	29	611	18.	1.5	3.5	917	27.00
5	199.7	19.5	38	48	575	143.	1.5	5.0	863	214.50
7	201.5	22.4	36	41	626	266.	1.5	6.5	939	399.00
8	202.5	26.1	33	46	668	225.	2.0	8.5	1336	450.00
10	205.8	5.6	9	71	39	Imp.	0.8	9.3	31	0.00
11	207.5	18.5	40	50	574	110.	2.3	11.6	1320	253.00
13	212.6	15.3	69	29	819	0.17	1.1	12.7	901	0.19
14	213.5	19.2	51	40	760	12.	1.4	14.1	1064	16.80
16	215.6	20.4	32	59	506	18.	1.5	15.6	759	27.00
18	217.5	22.3	28	61	484	50.	2.0	17.6	968	100.00
20	219.6	22.3	25	54	433	28.	1.7	19.3	736	47.60
22	221.4	16.0	47	37	583	6.7	2.3	21.6	1341	15.41
24	223.5	21.6	48	31	804	7.4	2.2	23.8	1769	16.28
27	226.7	20.7	42	38	675	28.	2.0	25.8	1350	56.00
29	228.3	22.5	36	53	628	27.	2.0	27.8	1256	54.00
31	230.6	22.6	36	54	631	37.	2.0	29.8	1262	74.00
34	233.3	17.8	30	58	414	54.	2.0	31.8	828	108.00
36	235.4	16.9	52	45	682	54.	2.0	33.8	1364	108.00
38	237.3	17.4	40	51	534	28.	2.0	35.8	1068	56.00
40	239.6	17.4	32	57	432	25.	2.4	38.2	1037	60.00
42	241.5	20.1	50	43	780	56.	1.6	39.8	1248	89.60
45	244.3	24.9	27	18	522	1.1	1.2	41.0	626	1.32
46	250.4	15.8	10	47	123	0.61	0.8	41.8	98	0.49
47	252.6	12.6	12	71	118	Imp.	0.8	42.6	94	0.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Hickory Creek Oil Company	Lease	Well No.	HCO-143
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
195.5 - 209.0	10.8	143.8	1552.50	
212.0 - 252.7	30.2	27.5	830.69	
195.5 - 252.7	41.0	58.1	2383.19	

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
195.5 - 209.0	11.6	21.0	35.7	44.5	602	6,983
212.0 - 252.7	31.0	19.5	38.3	47.2	573	17,769
195.5 - 252.7	42.6	19.9	37.6	46.5	581	24,752

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Hickory Creek Oil Company		Lease		Well No.		HCO-143			
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.
			%	Bbbs./A. Ft.	%	Bbbs./A. Ft.	% Oil	% Water			
1	195.6	22.2	44	758	10	172	34	586	398	13.35	15
2	196.5	24.4	42	795	4	76	38	719	381	11.83	10
4	198.5	22.0	35	597	3	51	32	546	243	3.52	15
5	199.7	19.9	38	587	4	62	34	525	376	12.00	10
7	201.5	22.5	36	628	0	0	36	628	262	23.24	10
8	202.5	26.0	33	666	0	0	33	666	187	38.98	10
10	205.8	5.9	9	41	0	0	9	41	0	Imp.	10
11	207.5	19.0	40	590	5	74	35	516	446	11.00	10
13	212.6	15.1	69	808	10	117	59	691	6	0.15	50
14	213.5	19.0	51	752	0	0	51	752	7	0.15	50
16	215.6	20.0	32	497	2	31	30	466	446	10.00	10
18	217.5	22.3	28	484	0	0	28	484	317	25.11	10
20	219.6	22.0	25	427	0	0	25	427	361	7.65	10
22	221.4	16.3	47	594	4	51	43	543	13	0.22	45
24	223.5	21.6	48	804	0	0	48	804	70	0.90	20
27	226.7	20.4	42	665	0	0	42	665	79	1.12	20
29	228.3	22.0	36	614	0	0	36	614	418	6.15	10
31	230.6	22.5	36	628	0	0	36	628	223	19.50	10
34	233.3	18.0	30	419	0	0	30	419	432	7.95	10
36	235.4	16.9	52	682	5	66	47	616	458	6.60	10
38	237.3	17.0	40	528	3	40	37	488	575	7.05	10
40	239.6	17.7	32	439	0	47	32	439	541	6.90	10
42	241.5	20.2	50	784	3	0	47	737	438	5.85	10
45	244.3	24.5	28	532	0	0	28	532	0	Imp.	10
46	250.4	16.0	10	124	0	0	10	124	0	Imp.	10
47	252.6	13.0	11	111	0	0	11	111	0	Imp.	10

219.22

508.12 = 21.2

Notes: cc—cubic centimeter.

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	Hickory Creek Oil Company	Lease	Well No.	HCO-143
Depth Interval, Feet	195.5 - 209.0	212.0 - 252.7	195.5 - 252.7	
Weight of Core Analyzed	7.3	10.5	17.8	
Average Percent Porosity	21.1	17.5	19.0	
Average Percent Original Oil Saturation	39.2	47.3	43.9	
Average Percent Oil Recovery	4.5	4.2	4.3	
Average Percent Residual Oil Saturation	34.7	43.1	39.6	
Average Percent Residual Water Saturation	59.3	51.2	54.5	
Average Percent Total Residual Fluid Saturation	94.0	94.3	94.1	
Average Original Oil Content, Bbls./A. Ft.	645.	636.	639.	
Average Oil Recovery, Bbls./A. Ft.	74.	55.	63.	
Average Residual Oil Content, Bbls./A. Ft.	571.	581.	576.	
Total Original Oil Content, Bbls./Acre	4,705.	6,675.	11,380.	
Total Oil Recovery, Bbls./Acre	540.	580.	1,120.	
Total Residual Oil Content, Bbls./Acre	4,165.	6,095.	10,260.	
Average Effective Permeability, Millidarcys	10.00	4.98	7.04	
Average Initial Fluid Production Pressure, p.s.i.	12.0	22.5	17.7	

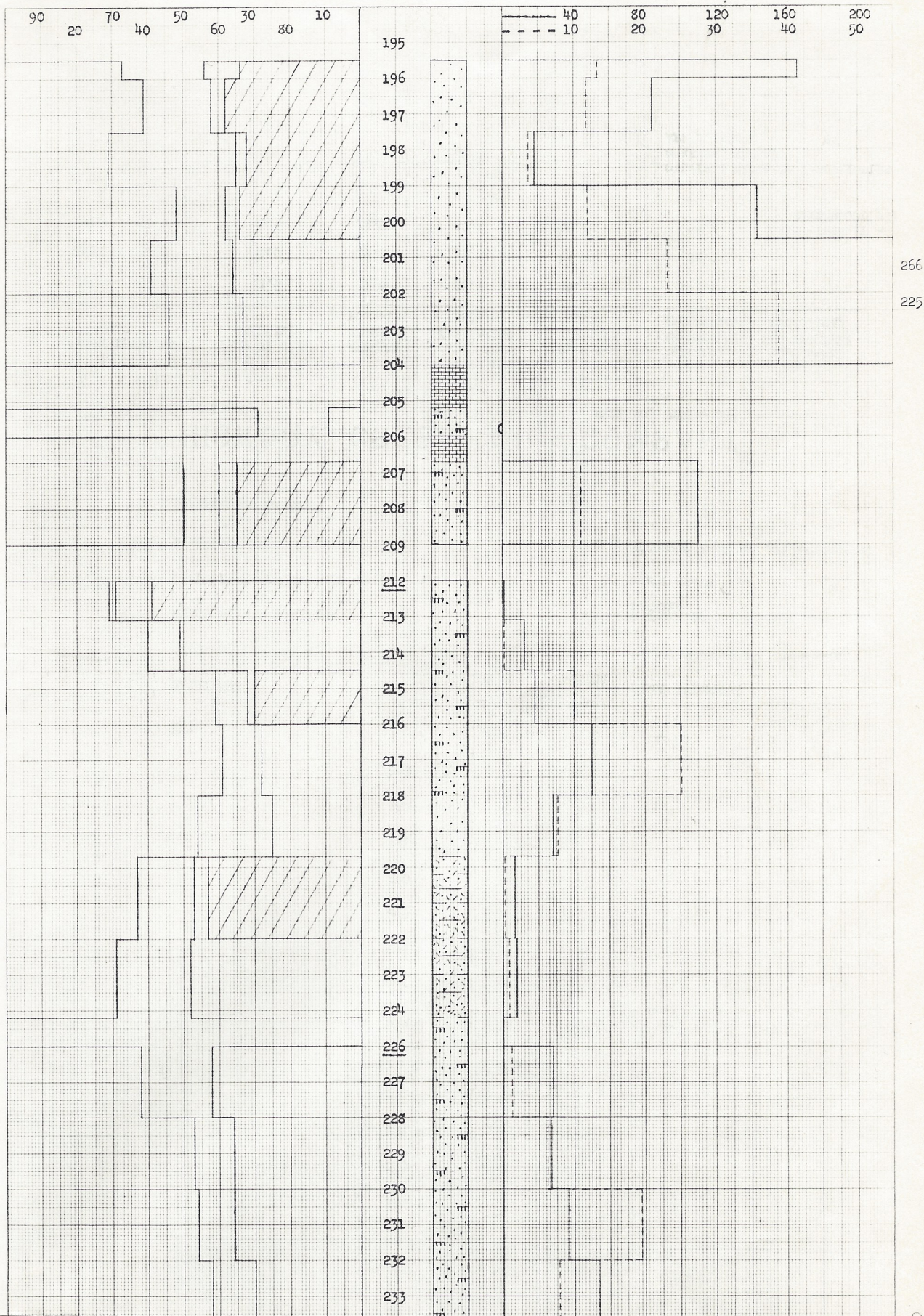
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

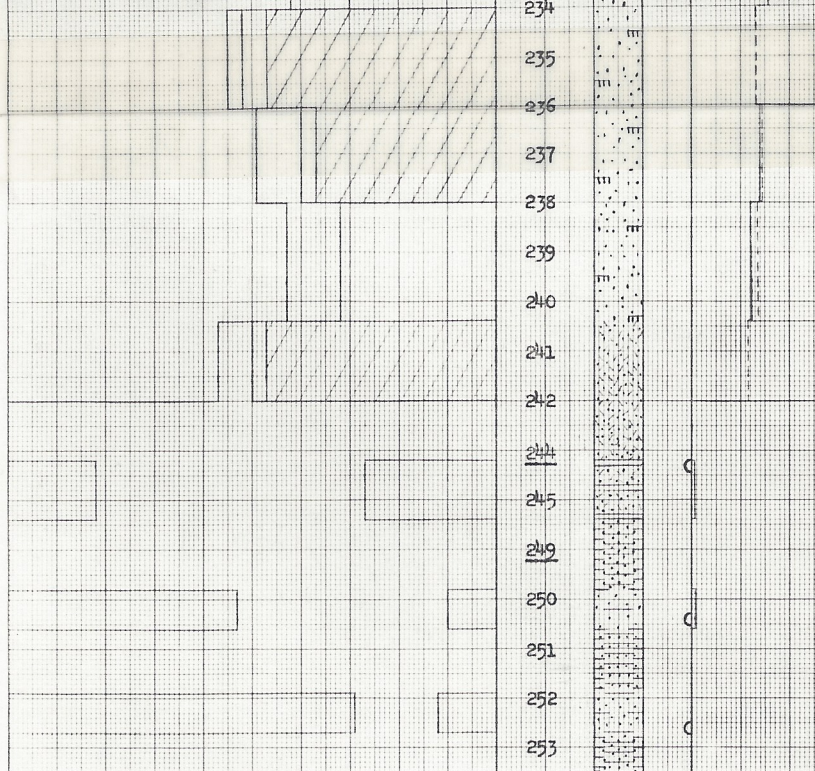
PERMEABILITY, IN MILLIDARCYS

EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



266

225



KEY:

	SANDSTONE		SHALY SANDSTONE
	CALCAREOUS SANDSTONE		CARBONACEOUS SHALY SANDSTONE
	CARBONACEOUS SANDSTONE		CARBONACEOUS SANDSTONE WITH COAL STREAKS
	LAMINATED SANDSTONE AND SHALE		SANDY SHALE
	LIMESTONE		FLOODPOT RESIDUAL OIL SATURATION
	IMPERMEABLE TO WATER		

HICKORY CREEK OIL COMPANY

-- LEASE

WELL NO. HCC - 143

-- COUNTY, --

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. PERMEABILITY, MILLIDARCY	CALCULATED OIL RECOVERY BBL./ACRE
195.5 - 209.0	11.6	21.0	35.7	44.5	143.8	
212.0 - 252.7	31.0	19.5	38.3	47.2	27.5	
195.5 - 252.7	42.6	19.9	37.6	46.5	58.1	3,920 (PRIMARY & WATERFLOODING)

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CHANUTE, KANSAS
APRIL, 1960. HR