

# OILFIELD RESEARCH LABORATORIES

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

June 5, 1980

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

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-166, and submitted to our laboratory on April 30, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

  
Sanford A. Michel

SAM/kas  
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-166

Location ---

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

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 182.0

Bottom of Core - - - - - 202.3

Top of Sand - - - - - 186.3

Bottom of Sand - - - - - 202.3

Total Feet of Permeable Sand - - - - - 14.2

Total Feet of Floodable Sand - - - - - 6.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	1.5	1.5
50 - 100	6.2	7.7
100 - 150	5.5	13.2
150 - 200	1.0	14.2

Average Permeability Millidarcys - - - - - 90.5

Average Percent Porosity - - - - - 20.7

Average Percent Oil Saturation - - - - - 28.9

Average Percent Water Saturation - - - - - 49.3

Average Oil Content, Bbls./A. Ft. - - - - - 463.

Total Oil Content, Bbls./Acre - - - - - 7,405.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 5.7

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 94.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 649.

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

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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>
182.0 - 186.3	Gray sandy shale.
186.3 - 187.1	Brown and gray laminated sandstone and shale.
187.1 - 187.8	Brown shaly sandstone.
187.8 - 195.6	Brown slightly calcareous sandstone.
195.6 - 197.4	Grayish brown hard calcareous sandstone.
197.4 - 202.3	Brown slightly calcareous sandstone.

## LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 649 barrels of oil per acre was obtained from 6.9 feet of sand. The weighted average percent oil saturation was reduced from 35.4 to 29.7, or represents an average recovery of 5.7 percent. The weighted average effective permeability of the samples is 7.97 millidarcys, while the average initial fluid production pressure is 17.9 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 16 samples tested, 7 produced water and oil, and 6 samples produced water only. This indicates that approximately 44 percent of the sand represented by these samples is floodable pay sand.

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LONS 20

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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 2,810 barrels of oil per acre. This is an average recovery of 407 barrels per acre foot from 6.9 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 / 39.6 ✓
Average porosity, percent	✓ 22.1
Oil saturation after flooding, percent	✓ 29.7
Performance factor, percent, estimated	✓ 55.0
Net floodable sand, feet	✓ 6.9

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease LONG 20 Well No. HCO-166

3104, 341 785 1269.76

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	186.5	14.8	13	74	87	149	0.26	0.8	0.8	119	0.21
2	187.5	24.5	31	27	58	589	5.5	0.7	1.5	412	3.85
3	188.5	23.0	37	29	66	660	125.	1.2	2.7	792	150.00
4	189.5	24.3	34	35	69	641	130.	1.0	3.7	641	130.00
5	190.5	22.6	40	35	75	701	72.	1.0	4.7	701	72.00
6	191.5	22.5	32	55	87	559	140.	1.0	5.7	559	140.00
7	192.5	17.2	45	48	93	601	84.	1.0	6.7	601	84.00
8	193.5	21.2	27	48	75	444	53.	1.0	7.7	444	53.00
9	194.5	22.0	30	51	81	512	80.	1.0	8.7	512	80.00
10	195.5	23.8	26	55	81	480	71.	0.6	9.3	288	42.60
11	196.5	8.0	30	59	89	186	Imp.	1.8	11.1	335	0.00
12	197.5	23.1	21	49	70	376	40.	0.6	11.7	226	24.00
13	198.5	22.3	25	51	76	433	169.	1.0	12.7	433	169.00
14	199.5	22.4	17	69	86	295	123.	1.0	13.7	295	123.00
15	200.5	24.2	18	51	69	338	54.	1.0	14.7	338	54.00
16	201.5	25.1	28	49	77	545	123.	1.3	16.0	709	159.90

189.5' 193' 189.5' 193' 1 2 SHOTS 5/10/73

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease --- Well No. HCO-166

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
186.3 - 194.0	7.7	82.2	633.06
194.0 - 202.3	6.5	100.4	652.50
186.3 - 202.3	14.2	90.5	1285.56

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
186.3 - 194.0	7.7	21.4	33.1	43.4	554.	4,269
194.0 - 202.3	8.3	20.0	25.1	54.7	378.	3,136
186.3 - 202.3	16.0	20.7	28.9	49.3	463.	7,405

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease LONG 20 Well No. HCO-166

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc <sup>o</sup>	Effective Permeability Millidarcys <sup>oo</sup>	Initial Fluid Production Pressure Lbs./Sq./In.	
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water				Bbls./A. Ft.
1	186.5	15.0	13	151	0	0	13	76	151	0	Imp.	-
2	187.5	24.3	31	584	3	57	28	64	527	251	17.71	10
3	188.5	22.9	37	657	7	124	30	57	533	155	3.20	20
4	189.5	24.3	34	641	3	57	31	60	584	332	27.13	10
5	190.5	22.3	40	692	7	121	33	62	571	77	1.60	25
6	191.5	22.5	32	559	4	70	28	70	489	367	7.00	15
7	192.5	17.7	45	618	13	179	32	63	439	65	1.30	25
8	193.5	21.4	27	448	2	33	25	71	415	77	1.70	20
9	194.5	22.3	30	519	0	0	30	66	519	136	2.60	20
10	195.5	23.6	26	476	0	0	26	61	476	285	12.66	15
11	196.5	8.1	30	189	0	0	30	60	189	0	Imp.	-
12	197.5	23.0	21	375	0	0	21	52	375	0	Imp.	-
13	198.5	22.2	25	431	0	0	25	72	431	357	18.28	10
14	199.5	22.7	17	299	0	0	17	76	299	231	22.50	10
15	200.5	24.1	18	337	0	0	18	76	337	310	14.57	10
16	201.5	24.9	28	541	0	0	28	64	541	329	10.40	10

Notes: cc—cubic centimeter.

°—Volume of water recovered at the time of maximum oil recovery.

oo—Determined by passing water through sample which still contains residual oil.

~~187.5'~~  
~~189.5'~~  
~~191.5'~~  
~~193.5'~~  
193'

500  
1.7  
= 29.6

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## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Hickory Creek Oil Company	Lease	-	Well No.	HCO-166
Depth Interval, Feet	186.3 - 194.0				
Feet of Core Analyzed	6.9				
Average Percent Porosity	22.1				
Average Percent Original Oil Saturation	35.4				
Average Percent Oil Recovery	5.7				
Average Percent Residual Oil Saturation	29.7				
Average Percent Residual Water Saturation	63.7				
Average Percent Total Residual Fluid Saturation	93.4				
Average Original Oil Content, Bbls./A. Ft.	602.				
Average Oil Recovery, Bbls./A. Ft.	94.				
Average Residual Oil Content, Bbls./A. Ft.	508.				
Total Original Oil Content, Bbls./Acre	4,156.				
Total Oil Recovery, Bbls./Acre	649.				
Total Residual Oil Content, Bbls./Acre	3,507.				
Average Effective Permeability, Millidarcys	7.97				
Average Initial Fluid Production Pressure, p.s.i.	17.9				

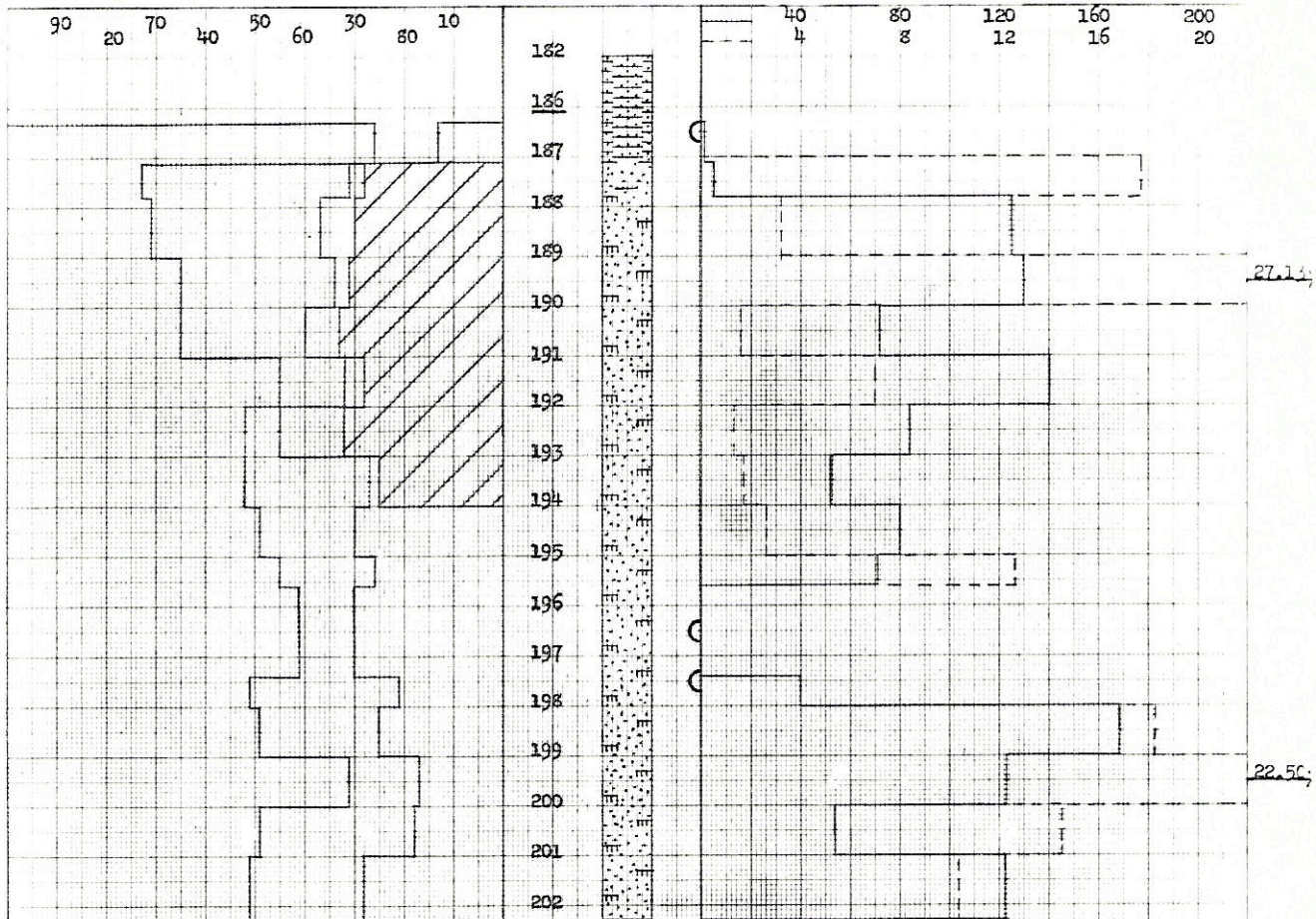
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT., PERCENT →

← OIL SAT., PERCENT

PERMEABILITY, IN MILLIDARCYs

----- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYs



KEY:

SANDY SHALE

SHALY SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

LAMINATED SANDSTONE & SHALE

CALCAREOUS SANDSTONE

IMPERMEABLE TO WATER

# HICKORY CREEK OIL COMPANY

LEASE

COUNTY,

WELL NO. HCO-166

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY MILLIDARCYs	CALCULATED OIL RECOVERY BELS./ACRE
186.3 - 194.0	7.7	21.4	33.1	43.4	82.2	
194.0 - 202.3	8.3	20.0	25.1	54.7	100.4	
186.3 - 202.3	16.0	20.7	28.9	49.3	90.5	2310 (PRIMARY & WATERFLOODING)

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 CHANUTE, KANSAS  
 JUNE, 1930

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