HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-48

Gray 20

Oct. 4, 1979 - DRK

GRAY #20

HCO #48 CORE

185 - 203.7

185 - 194.7

SANDSTONE, FNG, BROWN, LOCALLY MICACEOUS; SPARSE CARBONIZED PLANT FRAGMENTS; INTERVAL RELATIVELY UNIFORM AND MASSIVE WITH NO OBVIOUS SHALE LAMINAE OR ORIGINAL BEDDING FEATURES; CORE OOZING RELATIVELY SMALL AMOUNT OF FREE OIL; CORE APPEARS SOMEWHAT "DRY".

194.7 - 195

SHALE, GRAY; CARBONIZED PLANT FRAGMENTS AT BOTTOM OF INTERVAL.

195 - 200.5

SANDSTONE, FNG, BROWN TO GRAY-BROWN, LOCALLY MICACEOUS; CARBONIZED PLANT FRAGMENTS SCATTERED FROM 195 TO 197; GOOD OIL ODOR BUT LITTLE FREE OIL; CORE APPEARS TO BE "WATER WET".

200.5 - 201.8

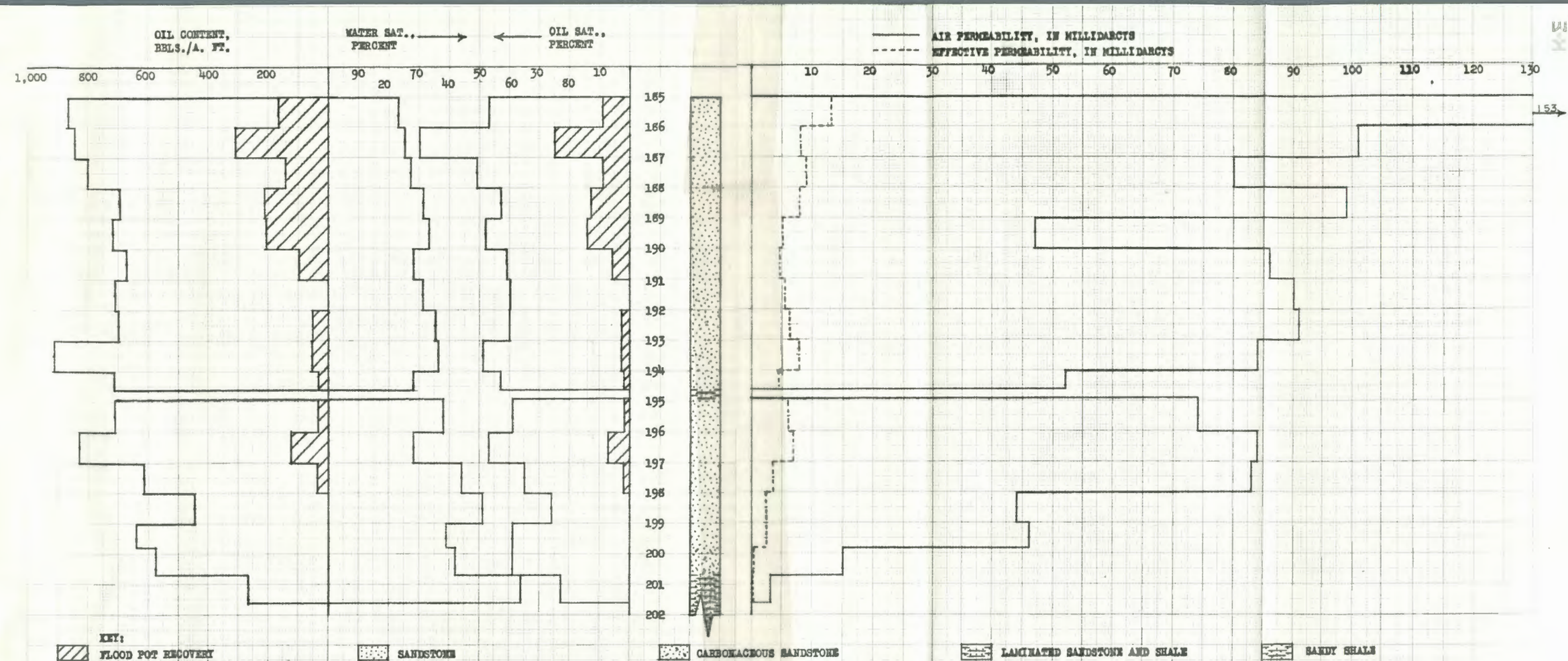
SANDSTONE, FNG, BROWN TO GRAY-BROWN, SHALEY, WITH ABUNDANT CLOSELY-SPACED SHALE LAMINAE AND LENSES; 1/4" TO 1/2" SHALE PEBBLES FROM 200.5 TO 200.7; OIL ODOR; WATER WET.

GRAY #20 HCO #48 CORE (Cont.)

201.8 – 203.7

SHALE, GRAY; CLOSELY – SPACED NEARLY HORIZONTAL SILTY BROWN LAMINAE THROUGH-OUT INTERVAL; CARBONACEOUS LAMINAE AND CARBONIZED PLANT FRAGMENTS FROM 203.5 TO 203.7.

END CORE HCO #48



HICKORY CREEK OIL COMPANY

— LEASE — WELL NO. HCO-48

— COUNTY, —

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY, BBLS./ACRE
185.0 - 191.0	6.0	20.2	50.0	27.6	767	4,603	94.3	
191.0 - 201.6	10.3	21.7	38.2	39.6	651	6,702	62.3	
185.0 - 201.6	16.3	21.1	42.5	35.4	694	11,305	74.1	3,860 (PRIMARY & WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
OCTOBER, 1979 KL

OILFIELD RESEARCH LABORATORIES

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

October 17, 1979

Hickory Creek Oil Company
1128 Main Street
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-48, and submitted to our laboratory on October 4, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

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-48

Location –

Section – Twp. – Rge. – County – State –

Name of Sand	–
Top of Core	185.0
Bottom of Core	203.7
Top of Sand	185.0
Bottom of Sand	201.6
Total Feet of Permeable Sand	16.3
Total Feet of Floodable Sand	11.7

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 – 20	1.8	1.8
20 – 50	2.8	4.6
50 – 80	1.7	6.3
80 – 110	9.0	15.3
110 – 160	1.0	16.3

Average Permeability Millidarcys	94.3
Average Percent Porosity	21.1
Average Percent Oil Saturation	42.5
Average Percent Water Saturation	35.4
Average Oil Content, Bbls./A. Ft.	694.
Total Oil Content, Bbls./Acre	11,305.
Average Percent Oil Recovery by Laboratory Flooding Tests	8.1
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	125.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,459.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" section
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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:

Depth Interval, Feet	Description
185.0 - 194.6	Dark brown sandstone.
194.6 - 194.9	Gray sandy shale.
194.9 - 199.8	Dark brown sandstone.
199.8 - 200.7	Brown slightly carbonaceous sandstone.
200.7 - 201.6	Brown and gray laminated sandstone and shale.
201.6 - 203.7	Gray sandy shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,459 barrels of oil per acre was obtained from 11.7 feet of sand. The weighted average percent oil saturation was reduced from 46.2 to 38.1, or represents an average recovery of 8.1 percent. The weighted average effective permeability of the samples is 7.78 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 12 produced water and oil, and 5 samples produced water only. This indicates that approximately 71 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 3,860 barrels of oil per acre.

This is an average recovery of 330 barrels per acre foot from 11.7 feet of floodable sand analyzed in this core.

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

Original formation volume factor	1.03
Reservoir water saturation, percent	20.0
Average porosity, percent	21.5
Oil saturation after flooding, percent	38.1
Performance factor, percent	50.0
Net floodable pay sand, feet	11.7

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - GRAY 20 Well No. HCO-48

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	185.6	23.8	47	23	70	868	153.	1.0	1.0	868	153.00
2	186.5	15.5	70	25	95	842	101.	1.0	2.0	842	101.00
3	187.5	20.3	51	27	78	803	80.	1.0	3.0	803	80.00
4	188.5	20.9	43	31	74	697	99.	1.0	4.0	697	99.00
5	189.5	19.3	48	33	81	719	47.	1.0	5.0	719	47.00
6	190.5	21.2	41	28	69	674	86.	1.0	6.0	674	86.00
7	191.5	22.9	40	31	71	711	90.	1.0	7.0	711	90.00
8	192.5	22.6	40	35	75	701	91.	1.0	8.0	701	91.00
9	193.5	24.1	49	36	85	916	84.	1.0	9.0	916	84.00
10	194.5	21.4	43	28	71	714	52.	0.6	9.6	428	31.20
11	195.5	23.5	39	38	77	711	74.	1.1	10.7	782	81.40
12	196.5	22.8	47	28	75	831	84.	1.0	11.7	831	84.00
13	197.5	22.6	35	44	79	614	83.	1.0	12.7	614	83.00
14	198.5	22.2	26	51	77	448	44.	1.0	13.7	448	44.00
15	199.5	21.2	39	39	78	641	46.	0.8	14.5	513	36.80
16	200.5	19.1	39	42	81	578	15.	0.9	15.4	520	13.50
17	201.5	14.8	23	64	87	264	3.1	0.9	16.3	238	2.79
	3289.6	358.2		603			1232.1				

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease – Well No. HCO-48

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
185.0 - 191.0	6.0	94.3	566.00
191.0 - 201.6	10.3	62.3	641.69
185.0 - 201.6	16.3	74.1	1,207.69

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
185.0 - 191.0	6.0	20.2	50.0	27.8	767	4,603.
191.0 - 201.6	10.3	21.7	38.1	39.8	651	6,702.
185.0 - 201.6	16.3	21.1	42.5	35.4	694	11,305.

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - Gray 20 Well No. HCO-48

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	185.6	23.6	47	861	9	165	38	56	696	229	13.10	20
2	186.5	15.9	70	863	25	308	45	50	555	245	8.10	25
3	187.5	20.3	51	803	9	142	42	54	661	333	9.00	25
4	188.5	21.1	43	704	13	213	30	65	491	203	7.87	25
5	189.5	19.0	48	708	14	206	34	62	502	347	5.10	25
6	190.5	20.9	41	665	6	97	35	60	568	181	4.50	30
7	191.5	~~22.4~~	40	695	0	0	40	54	695	285	~~5.40~~	15
8	192.5	22.9	40	711	3	53	37	56	658	357	6.22	15
9	193.5	23.9	49	909	3	56	46	51	853	342	7.87	15
10	194.5	21.9	43	731	2	34	41	65	697	305	4.57	15
11	195.5	23.4	39	708	2	36	37	58	672	509	6.00	15
12	196.5	22.9	47	835	7	124	40	56	711	332	6.90	15
13	197.5	22.6	35	614	2	35	33	64	579	249	3.45	15
14	198.5	22.2	26	448	0	0	26	70	448	184	2.25	15
15	199.5	21.4	39	647	0	0	39	55	647	156	2.40	15
16	200.5	19.5	39	590	0	0	39	56	590	17	0.25	35
17	201.5	15.0	24	279	0	0	24	70	279	8	0.22	50
							5 or 10 = 38.5	626			93.2	

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 Hickory Creek Oil Company Lease - Well No. HCO-48

Depth Interval, Feet	185.0 - 191.0	191.0 - 201.6	185.0 - 201.6
Feet of Core Analyzed	6.0	5.7	11.7
Average Percent Porosity	20.1	23.0	21.5
Average Percent Original Oil Saturation	50.0	42.0	46.2
Average Percent Oil Recovery	12.7	3.2	8.1
Average Percent Residual Oil Saturation	37.3	38.8	38.1
Average Percent Residual Water Saturation	57.8	57.9	57.9
Average Percent Total Residual Fluid Saturation	95.1	96.7	96.0
Average Original Oil Content, Bbls./A. Ft.	768.	753.	760.
Average Oil Recovery, Bbls./A. Ft.	189.	58.	125.
Average Residual Oil Content, Bbls./A. Ft.	579.	695.	635.
Total Original Oil Content, Bbls./Acre	4,604.	4,286	8,890.
Total Oil Recovery, Bbls./Acre	1,131.	328.	1,459.
Total Residual Oil Content, Bbls./Acre	3,473.	3,958.	7,431.
Average Effective Permeability, Millidarcys	7.95	7.77	7.78
Average Initial Fluid Production Pressure, p.s.i.	25.0	15.0	20.0

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