

OILFIELD RESEARCH LABORATORIES

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

November 9, 1981

H & J Production, Inc.
1012 Baltimore
Suite 600
Kansas City, Missouri 64105

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Burt-Dunbar Lease, Well No. 9-B, located in Montgomery County, Kansas and submitted to our laboratory on October 29, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/mkf

5 c to Kansas City, Mo.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company H & J Production, Inc. Lease Burt-Dunbar Well No. 9-B
 Location 800' EWL & 950' NSL S $\frac{1}{2}$, NW $\frac{1}{4}$, N $\frac{1}{2}$, SW $\frac{1}{4}$
 Section 10 Twp. 35S Rge. 15E County Montgomery State Kansas

Elevation, Feet

Name of Sand.....

BARTLESVILLE SAND

Top of Core

1162.0

Bottom of Core

1203.3

Top of Sand

1162.0

Bottom of Sand

1203.3

Total Feet of Permeable Sand

40.3

Total Feet of Floodable Sand

18.1

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	11.7	11.7
10 - 50	14.6	26.3
65 - 100	10.0	36.3
125 - 155	4.0	40.3

Average Permeability Millidarcys

42.4

Average Percent Porosity

16.9

Average Percent Oil Saturation

30.0

Average Percent Water Saturation.....

43.7

Average Oil Content, Bbls./A. Ft.

392.

Total Oil Content, Bbls./Acre.....

16,194.

Average Percent Oil Recovery by Laboratory Flooding Tests.....

3.2

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

42.

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

752.

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 Oilfield Research Laboratories. The core was reported to be from a non-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, <u>Feet</u>	<u>Description</u>
1162.0 - 1162.8	Grayish brown slightly shaly sandstone.
1162.8 - 1169.1	Brown sandstone.
1169.1 - 1170.0	Grayish light brown shaly sandstone.
1170.0 - 1171.0	Grayish light brown sandstone.
1171.0 - 1182.0	Grayish light brown shaly sandstone.
1182.0 - 1203.3	Brown slightly calcareous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 752 barrels of oil per acre was obtained from 18.1 feet of sand. The weighted average percent oil saturation was reduced from 36.0 to 32.8, or represents an average recovery of 3.2 percent. The weighted average effective permeability of the samples is 8.46 millidarcys, while the average initial fluid production pressure is 22.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 41 samples tested, 18 produced water and oil, and 19 produced water only. This indicates that approximately 44 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 3,770 barrels of oil per acre. This is an average recovery of 208 barrels per acre foot from 18.1 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.10
Reservoir water saturation, percent, estimated	30.0
Average porosity, percent	17.4
Oil saturation after flooding, percent	32.8
Performance factor, percent, estimated	50.0
Net floodable sand, feet	18.1

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-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	Total			Ft.	Cum. Ft.		
1	1162.4	19.3	34	47	81	509	8.2	0.8	0.8	407	6.56
2	1163.5	16.0	38	58	96	472	18.	1.3	2.1	614	23.40
3	1164.5	16.7	29	40	69	376	38.	1.0	3.1	376	38.00
4	1165.6	18.3	32	42	74	454	17.	1.0	4.1	454	17.00
5	1166.5	16.3	32	51	83	405	23.	1.0	5.1	405	23.00
6	1167.5	18.5	28	41	69	402	22.	1.0	6.1	402	22.00
7	1168.4	17.8	41	36	77	566	22.	1.0	7.1	566	22.00
8	1169.6	10.6	22	55	77	181	0.54	0.9	8.0	163	0.49
9	1170.7	17.3	22	38	60	295	18.	1.0	9.0	295	18.00
10	1171.4	16.6	24	63	87	309	6.6	1.0	10.0	309	6.60
11	1172.5	12.4	17	17	34	164	1.6	1.0	11.0	164	1.60
12	1173.4	16.5	34	38	72	435	9.6	1.0	12.0	435	9.60
13	1174.5	14.6	47	37	84	532	2.7	1.0	13.0	532	2.70
14	1175.4	14.7	39	43	89	445	2.8	1.0	14.0	445	2.80
15	1176.7	14.8	36	38	74	413	2.4	1.0	15.0	413	2.40
16	1177.5	14.0	34	46	80	369	1.0	1.0	16.0	369	1.00
17	1178.4	6.0	35	60	95	163	Imp.	1.0	17.0	163	0.00
18	1179.4	14.4	30	45	75	335	3.8	1.0	18.0	335	3.80
19	1180.6	12.9	44	36	88	440	2.2	1.0	19.0	440	2.20
20	1181.4	15.3	21	42	63	249	6.5	1.0	20.0	249	6.50
21	1182.3	17.8	32	26	58	442	20.	1.0	21.0	442	20.00
22	1183.5	19.4	37	57	94	557	68.	1.0	22.0	557	68.00
23	1184.5	18.9	27	44	71	396	97.	1.0	23.0	396	97.00
24	1185.4	19.6	42	27	69	639	152.	1.0	24.0	639	152.00
25	1186.7	17.9	33	56	89	458	45.	1.0	25.0	458	45.00
26	1187.5	17.8	32	55	87	442	46.	1.0	26.0	442	46.00
27	1188.5	20.1	32	49	81	499	131	1.0	27.0	499	131.00
28	1189.5	18.1	34	43	77	477	74	1.0	28.0	477	74.00
29	1190.6	18.1	20	46	66	281	71.	1.0	29.0	281	71.00
30	1191.5	23.9	35	48	83	649	65.	1.0	30.0	649	65.00

Company H & J Production, Inc.

Lease

Burt-Dunbar

Well No.

9-B

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company H & J Production, Inc. Lease Burt-Dunbar Well No. 9-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	Total			Ft.	Cum. Ft.		
31	1192.5	15.7	39	31	70	475	22.	1.0	31.0	475	22.00
32	1193.5	19.5	25	37	62	378	126.	1.0	32.0	378	126.00
33	1194.6	18.5	17	47	64	244	66.	1.0	33.0	244	66.00
34	1195.4	17.1	20	50	71	265	29.	1.0	34.0	265	29.00
35	1196.5	18.6	37	34	71	534	82.	1.0	35.0	534	82.00
36	1197.6	18.2	26	38	64	367	133.	1.0	36.0	367	133.00
37	1198.6	18.6	18	43	61	260	92.	1.0	37.0	260	92.00
38	1199.4	18.2	21	48	69	297	67.	1.0	38.0	297	67.00
39	1200.4	18.3	20	45	65	284	68.	1.0	39.0	284	68.00
40	1201.7	17.3	20	47	67	268	18.	1.0	40.0	268	18.00
41	1202.6	18.4	24	46	70	343	22.	1.3	41.3	446	28.60

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	H & J Production, Inc.	Lease	Burt-Dunbar	Well No.	9-B	
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
	1162.0 - 1169.1	7.1	21.4	151.96		
	1169.1 - 1185.0	14.9	16.3	242.69		
	1185.0 - 1193.0	8.0	75.8	606.00		
	1193.0 - 1203.3	10.3	68.9	709.60		
	1162.0 - 1203.3	40.3	42.4	1,710.25		
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
	1162.0 - 1169.1	7.1	33.6	45.5	454	3,224
	1169.1 - 1185.0	15.9	31.4	42.7	359	5,707
	1185.0 - 1193.0	8.0	33.4	44.4	490	3,920
	1193.0 - 1203.3	10.3	22.8	43.6	325	3,343
	1162.0 - 1203.3	41.3	30.0	43.7	392	16,194

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company H & J Production, Inc.

Lease Burt-Dunbar

Well No. 9-B

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	1162.4	19.3	34	509	2	30	32	60	479	56	0.97	30
2	1163.5	16.1	38	475	4	50	34	63	425	352	7.80	20
3	1164.5	16.5	29	371	0	0	29	59	371	266	4.72	20
4	1165.6	18.2	32	452	2	28	30	48	424	92	1.42	20
5	1166.5	16.3	32	405	2	25	30	63	380	256	5.02	25
6	1167.5	18.2	29	409	2	28	27	54	381	284	7.12	20
7	1168.4	17.7	41	563	6	82	35	46	481	60	0.90	25
8	1169.6	10.7	22	183	0	0	22	60	183	10	0.15	35
9	1170.7	17.4	22	297	0	0	22	53	297	158	3.00	15
10	1171.4	16.7	24	311	0	0	24	67	311	90	1.95	25
11	1172.5	12.2	18	170	0	0	18	80	170	0	Imp.	-
12	1173.4	16.5	34	435	3	38	31	55	397	24	0.37	30
13	1174.5	14.7	47	536	12	137	35	53	399	15	0.22	35
14	1175.4	14.6	39	442	2	23	37	55	419	30	0.45	30
15	1176.7	14.9	36	416	2	23	34	45	393	14	0.22	45
16	1177.5	13.7	35	372	0	0	35	47	372	0	Imp.	-
17	1178.4	5.9	35	160	0	0	35	60	160	0	Imp.	-
18	1179.4	14.9	29	335	0	0	29	52	335	10	0.15	50
19	1180.6	13.1	43	437	4	41	39	53	396	20	0.30	35
20	1181.4	15.3	21	249	0	0	21	60	249	20	0.37	45
21	1182.3	17.7	32	439	0	0	32	44	439	354	17.14	10
22	1183.5	19.4	37	557	2	30	35	51	527	338	13.87	15
23	1184.5	19.0	27	398	0	0	27	50	398	314	13.92	10
24	1185.4	19.1	43	637	0	0	43	32	637	0	Imp.	-
25	1186.7	18.0	33	461	3	42	30	61	419	274	15.85	15
26	1187.5	17.8	32	442	2	28	30	59	414	316	21.49	10
27	1188.5	19.9	32	494	2	31	30	58	463	196	24.74	10
28	1189.5	18.2	34	480	2	28	32	49	452	254	18.49	15
29	1190.6	18.3	20	284	0	0	20	65	284	286	12.37	15

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

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			H & J Production, Inc.			Lease			Burt-Dunbar			Well No.			9-B		
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.					
30	1191.5	23.7	35	644	2	37	33	58	607	14.99	15						
31	1192.5	15.8	39	478	0	0	31	51	478	4.35	25						
32	1193.5	19.5	25	378	0	0	25	57	378	17.24	15						
33	1194.6	18.4	17	243	0	0	17	66	243	20.78	15						
34	1195.4	17.3	20	268	0	0	20	59	268	17.69	10						
35	1196.5	18.1	38	534	3	42	35	46	492	16.79	10						
36	1197.6	18.3	26	369	0	0	26	52	369	23.56	10						
37	1198.6	18.5	18	258	0	0	18	59	258	11.80	15						
38	1199.4	18.0	21	293	0	0	21	69	293	20.24	10						
39	1200.4	18.4	20	285	0	0	20	55	285	22.99	15						
40	1201.7	16.8	21	274	0	0	21	60	274	3.82	25						
41	1202.6	18.8	23	335	0	0	23	60	335	18.99	10						

Company H & J Production, Inc. Lease Burt-Dunbar Well No. 9-B

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

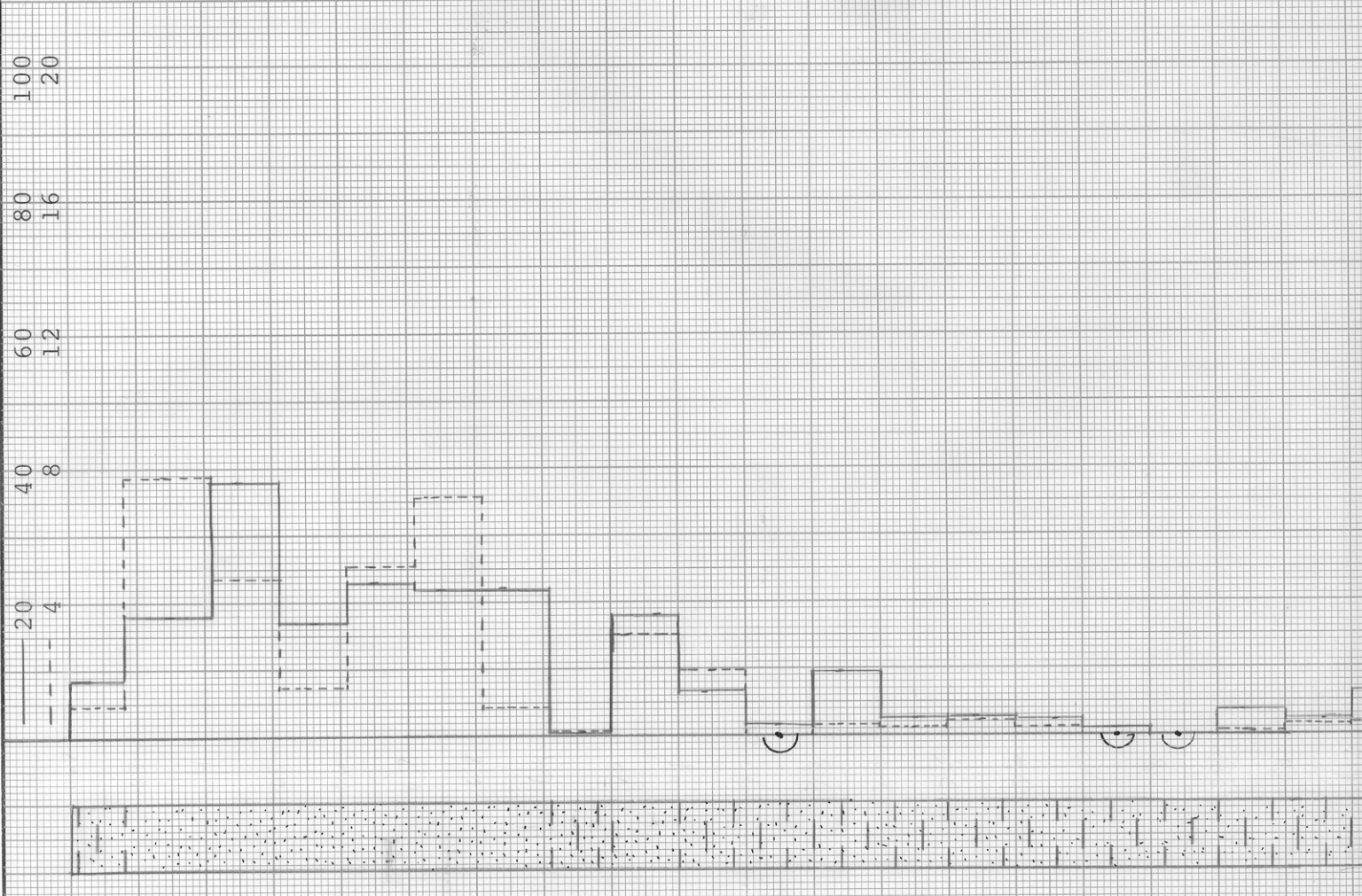
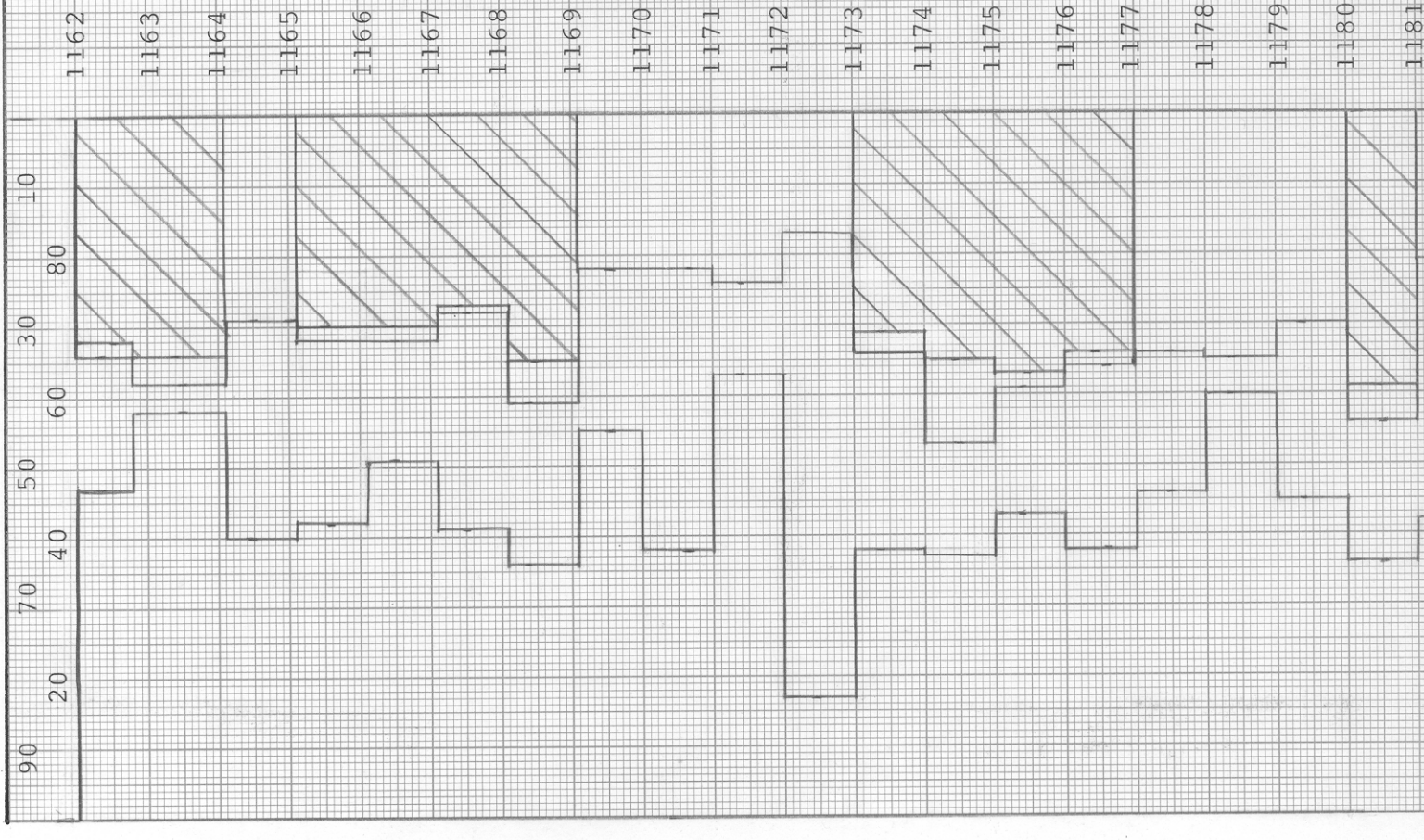
TABLE V

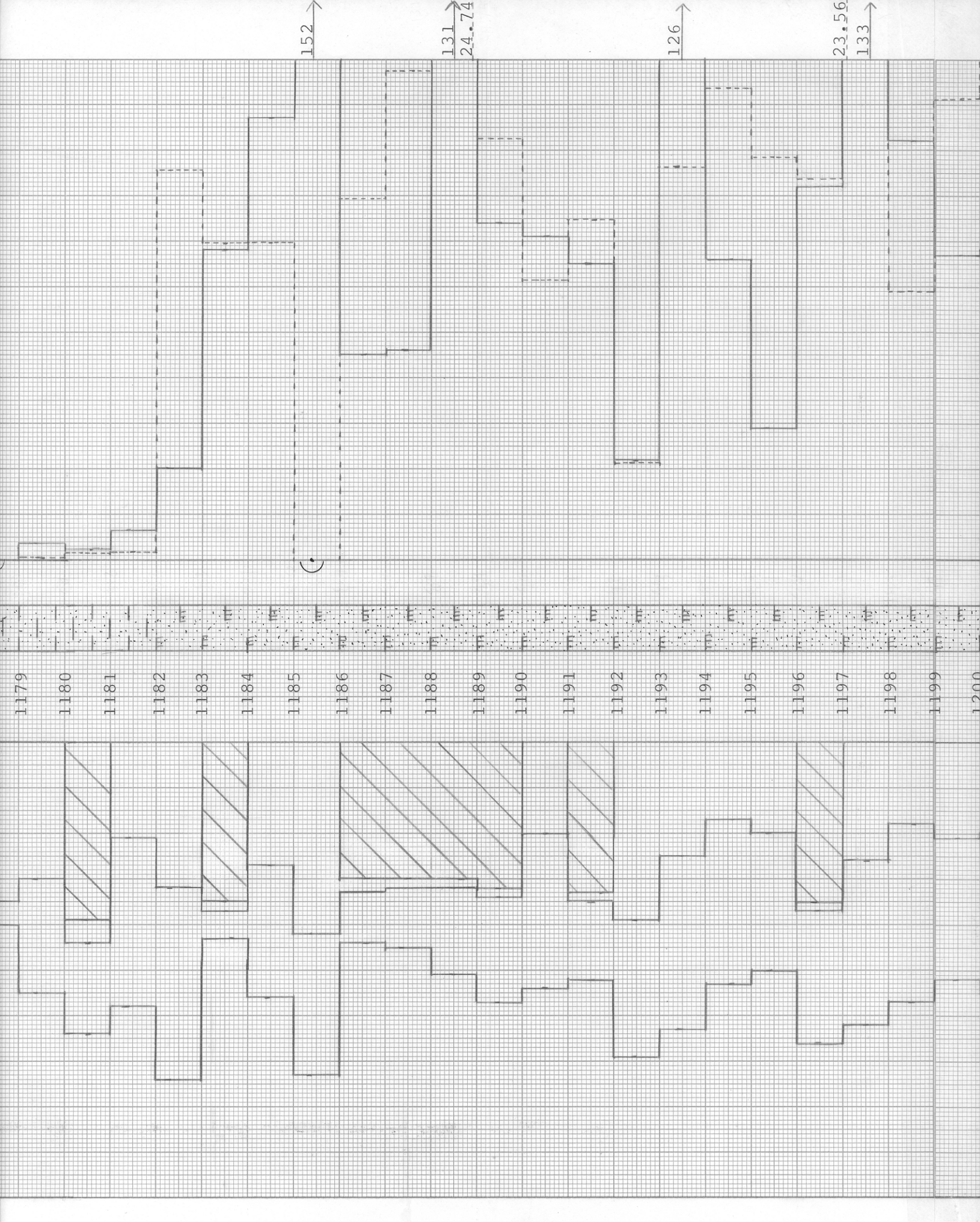
Company	H & J Production, Inc.	Lease	Burt-Dunbar	Well No.	9-B
Depth Interval, Feet	1162.0-1169.1	1169.1-1185.0	1185.0-1193.0	1193.0-1203.3	1162.0-1203.3
Feet of Core Analyzed	6.1	6.0	5.0	1.0	18.1
Average Percent Porosity	17.5	15.5	19.5	18.1	17.4
Average Percent Original Oil Saturation	34.5	39.4	33.2	38.0	36.0
Average Percent Oil Recovery	3.1	4.2	2.2	3.0	3.2
Average Percent Residual Oil Saturation	31.4	35.2	31.0	35.0	32.8
Average Percent Residual Water Saturation	55.9	52.0	57.0	46.0	54.4
Average Percent Total Residual Fluid Saturation	87.3	87.2	88.0	81.0	87.2
Average Original Oil Content, Bbbls./A. Ft.	468.	471.	504.	534.	483.
Average Oil Recovery, Bbbls./A. Ft.	41.	49.	33.	42.	42.
Average Residual Oil Content, Bbbls./A. Ft.	427.	422.	471.	492.	441.
Total Original Oil Content, Bbbls./Acre	2,854.	2,823.	2,521.	534.	8,732.
Total Oil Recovery, Bbbls./Acre	252.	292.	166.	42.	752.
Total Residual Oil Content, Bbbls./Acre	2,602.	2,531.	2,355.	492.	7,980.
Average Effective Permeability, Millidarcys	4.16	2.57	19.11	16.79	8.46
Average Initial Fluid Production Pressure, p.s.i.	23.3	31.7	13.0	10.0	22.5

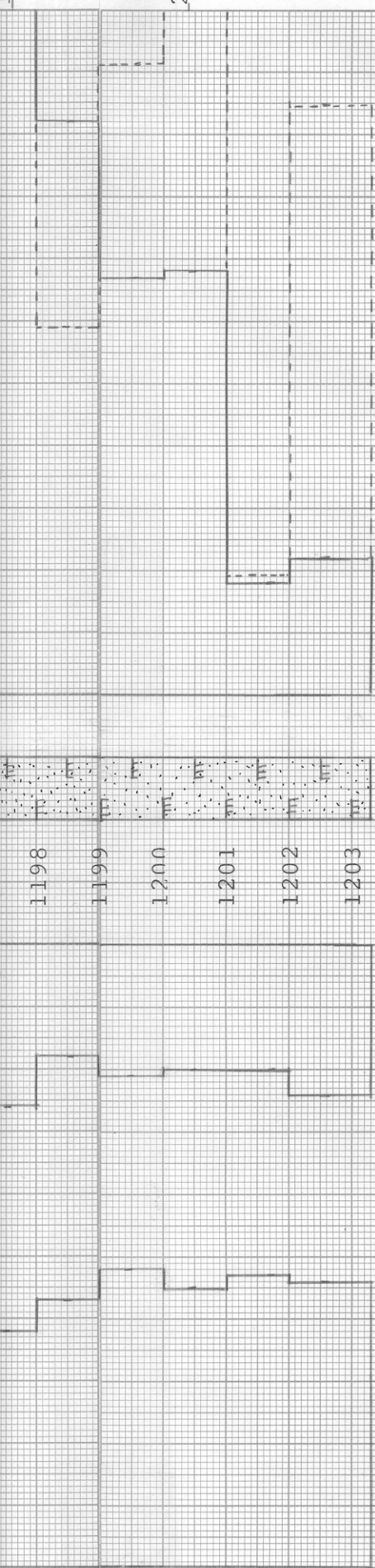
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT., PERCENT
OIL SAT., PERCENT

PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS







KEY:

SHALY SANDSTONE

SANDSTONE

CALCAREOUS SANDSTONE



IMPERMEABLE TO WATER

FLOODPOT RESIDUAL OIL SATURATION

H & J PRODUCTION, INC.

BURT - DUNBAR LEASE

MONTGOMERY COUNTY, KANSAS

WELL NO. 9-B

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
1162.0 - 1169.1	7.1	17.4	33.6	45.5	21.4	
1169.1 - 1185.0	15.9	14.8	31.4	42.7	16.3	
1185.0 - 1193.0	8.0	18.9	33.4	44.4	75.8	
1193.0 - 1203.3	10.3	18.3	22.8	43.6	68.9	
1162.0 - 1203.3	41.3	16.9	30.0	43.7	42.4	3770

(PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
NOVEMBER, 1981

PDC