June 7, 1950

Mr. F. W. Black
Paola, Kansas

Dear Sir:

Enclosed herewith is the report of the analysis made on the Keystone barrel core taken from the F. W. Black Lease, Well No. 1-B, Miami County, Kansas, and submitted to our laboratory on June 1, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:dt

F. M. BLACK

CORE ANALYSIS REPORT

F. M. BLACK LEASE WELL NO. 1-B

MIAMI COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

JUNE 7, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company F. W. Black Lease F. W. Black Well No. 1B

Location N½ of NW¼

Section 24 Twp. 17 Rge. 21 County Miami State Kansas

Name of Sand	Peru
Top of Core	372.00
Bottom of Core	386.10
Top of Pay Sand	378.75
Bottom of Sand	382.90
Total Feet of Permeable Sand	10.35

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	1.20	1.20
10 - 100	3.30	4.50
100 - 150	0.40	4.90
150 - 200	0.70	5.60
200 - 250	0.85	6.45
250 & above	3.90	10.35

Average Permeability, Millidarcys	169.29
Average Percent Porosity	22.38
Average Percent Oil Saturation	21.19
Average Percent Water Saturation	53.03
Average Oil Content, Bbls./A. Ft.	374.
Total Oil Content, Bbls./Acre	3,718.
Average Percent Oil Recovery by Laboratory Flooding Tests	7.61
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	134.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	409.
Total Calculated Oil Recovery, Bbls./Acre	900.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	

Fresh water was used as a circulating fluid in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, feet	Description
372.00 - 372.80	Hard light brown fine grained micaceous calcareous sandstone.
372.80 - 372.40	Sandy limestone.
372.40 - 372.85	Soft light brown fine grained micaceous calcareous sandstone.
372.85 - 373.40	Light brown fine grained micaceous calcareous sandstone.
373.40 - 374.10	Soft light brown fine grained micaceous calcareous sandstone.
374.10 - 374.45	Hard light brown fine grained micaceous calcareous sandstone.
374.45 - 374.70	Limestone.
374.70 - 375.90	Light brown fine grained micaceous calcareous sandstone.
375.90 - 376.00	Sandy limestone.
376.00 - 378.75	Soft light brown fine grained micaceous calcareous sandstone.
378.75 - 382.90	Soft brown fine grained micaceous slightly shaley calcareous sandstone.
382.90 - 383.30	Gray sandy shale.
383.30 - 383.65	Brown fine grained laminated micaceous shaley sandstone.
383.65 - 383.80	Sandy limestone.
383.80 - 385.03	Gray shale.
385.03 - 386.10	Limestone.

Coring was started at a depth of 372.00 feet in hard fine grained micaceous calcareous sandstone and completed at 386.10 in hard limestone. This core shows a total of 10.30 feet of sandstone. For the most part,

the sand body is made up of soft fine grained micaceous calcareous sandstone.

PERMEABILITY

The sand in this core is very loose; having an overall weighted average permeability of 169.23 millidarcys (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a fairly uniform permeability profile.

PERCENT SATURATION & OIL CONTENT

The sand in this core has a low weighted average percent oil saturation, namely, 21.19. The overall weighted average percent water saturation is 53.03 (See Table IV). This gives an overall weighted average total fluid saturation of 74.22 percent. This low total fluid saturation indicates that an appreciable amount of fluid was lost during coring which was probably oil.

In order to get some idea of the degree of flushing of the sand during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in Table VII and on the coregraph, it is evident that considerable flushing of the sand did occur during coring.

The weighted average oil content of the sand is 374 barrels per acre foot while the total oil content, as shown by this core, is 3,718 barrels per acre (See Table IV). By observing the data given on the coregraph, it is noticeable that the upper part of the sand section has a very low oil content and is probably gas sand.

LABORATORY FLOODING TESTS

The pay sand in this core responded fairly well to laboratory

flooding tests as a total recovery of 409 barrels of oil per acre was obtained from 3.05 feet of sand. The weighted average percent oil saturation was reduced from 34.30 to 26.69, or represents an average recovery of 7.61 percent. The weighted average effective permeability of the samples is 20.10 millidarcys while the average initial fluid production pressure is 11.7 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 10 samples tested, 9 took water and 3 produced oil. These tests indicate that only a small portion of the sand section is pay sand.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 900 barrels of oil per acre. In calculating this recovery, an allowance was made for oil lost during coring, and it is assumed that the true water saturation of the pay sand is 35 percent.

The principle drawback of this core is the fact that it contains only 3.05 feet of good floodable sand. Furthermore, the upper part of the cored section is apparently gas sand and has a high effective permeability. We are not including a shot recommendation in this report as it is doubtful whether you would want to complete this well unless other parts of the lease have a thicker pay sand section.

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company F. W. Black Lease F. W. Black Well No. 1-B

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	372.06	0.78	0.20	0.20	0.16
2	372.50	158.	0.45	0.65	71.10
3	372.90	48.	0.25	0.90	12.00
4	373.35	72.	0.30	1.20	21.60
5	373.68	254.	0.70	1.90	177.80
6	374.22	8.2	0.35	2.25	2.87
7	374.72	77.	0.20	2.45	15.40
8	375.10	249.	0.40	2.85	99.60
9	375.55	348.	0.60	3.45	208.80
10	376.07	192.	0.25	3.70	48.00
11	376.45	336.	0.35	4.05	117.60
12	376.75	283.	0.30	4.35	84.90
13	377.12	34.	0.45	4.80	15.30
14	377.61	416.	0.40	5.20	166.40
15	377.92	277.	0.35	5.55	96.95
16	378.25	143.	0.40	5.95	57.20
17	378.68	267.	0.35	6.30	93.45
18	379.14	70.	0.45	6.75	31.50
19	379.50	313.	0.45	7.20	140.85
20	380.05	226.	0.45	7.65	101.70
21	380.40	58.	0.40	8.05	23.20
22	380.78	254.	0.40	8.45	101.60
23	381.23	19.	0.35	8.80	6.65
24	381.50	3.4	0.35	9.15	1.19
25	381.87	10.	0.45	9.60	4.50
26	382.37	38.	0.45	10.05	17.10
27	382.82	1.5	0.30	10.35	0.45

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company F. W. Black Lease F. W. Black Well No. 1-B

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
372.40 - 383.65	10.15	169.23	1,717.71

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RESULTS OF SATURATION TESTS

TABLE III

Company F. W. Black Lease F. W. Black Well No. 1-B

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
1	372.75	19.4	4.6	61.2	65.8	70	0.45	0.45	32
2	373.85	21.4	8.7	62.3	71.0	145	1.25	1.70	181
3	375.39	21.2	12.5	55.6	68.1	206	1.20	2.90	248
4	376.32	19.4	7.0	64.2	71.2	106	0.90	3.80	96
5	377.48	25.4	13.9	58.5	72.4	274	1.10	4.90	302
6	378.57	25.0	20.0	54.4	74.4	389	0.85	5.75	330
7	379.72	25.0	33.1	44.2	77.3	642	1.55	7.30	995
8	381.05	24.1	34.1	42.0	76.1	638	1.30	8.60	830
9	382.21	19.1	37.2	46.7	83.9	552	1.20	9.80	662
9-10	383.58	13.8	25.8	-	-	277	0.15	9.95	42
								Total - -	3,718

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company F. W. Black Lease F. W. Black Well No. 1-B

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
372.40-383.65	9.95	22.38	21.19	53.03	374	3,718

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Company F. E. Black Lease F

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A.
1	372.61	20.5	4.3	68	0.0	0
2	374.04	19.2	7.1	106	0.0	0
3	375.22	21.0	16.7	272	0.0	0
4	376.17	18.9	9.5	139	0.0	0
5	377.32	25.4	13.7	276	0.0	0
6	378.43	25.5	20.4	401	0.0	0
7	379.88	25.3	32.8	644	5.9	116
8	380.92	25.9	35.3	710	6.7	135
9	382.08	19.0	36.1	552	11.1	164
10	383.58	13.8	25.8	277	0.0	0

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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ATORY FLOODING TESTS

ABLE V

. W. Black Well No. 1-B

Ft.	Residual Saturation			Volume of Water Recovered cc*	[redacted] Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
	% Oil	% Water	Bbls./A. Ft.			
	4.3	81.4	68	259.5	27.00	5
	7.1	79.5	106	142	15.20	5
	16.7	55.8	272	107	Fractured	5
	9.5	87.5	139	122	20.40	5
	13.7	69.5	270	121.5	38.60	5
	20.4	68.6	401	148	16.70	10
	26.9	70.6	528	377	29.90	10
	28.6	65.7	575	125	17.10	10
	25.0	71.2	368	57.5	5.18	15
	25.8	60.4	277	0	Imp.	50+

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company F. W. Black Lease F. W. Black Well No. 1-B

Depth, Interval, Feet	378.75 - 382.60
Feet of Core Analyzed	3.05
Average Percent Porosity	23.54
Average Percent Original Oil Saturation	74.30
Average Percent Oil Recovery	7.61
Average Percent Residual Oil Saturation	26.69
Average Percent Residual Water Saturation	69.77
Average Percent Total Residual Fluid Saturation	96.46
Average Original Oil Content, Bbls./A. Ft.	624.
Average Oil Recovery, Bbls./A. Ft.	134.
Average Residual Oil Content, Bbls./A. Ft.	490.
Total Original Oil Content, Bbls./Acre	1,905.
Total Oil Recovery, Bbls./Acre	409.
Total Residual Oil Content, Bbls./Acre	1,496.
Average Effective Permeability, Millidarcys	20.10
Average Initial Fluid Production Pressure, p.s.i.	11.7

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

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VII

Company F. W. Black Lease F. W. Black Well No. 1-B

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
1	372.75	2,580			
2	373.85	5,600			
3	375.39	10,200			
4	376.32	3,010			
5	377.48	3,090			
6	378.57	5,790			
7	379.72	4,710			
8	381.05	3,410			
9	382.21	9,640			

Note: ppm - parts per million.

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company F. W. Black Lease F. W. Black Well No. 1-B

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
372.40 - 382.90	5,583		

Note: ppm - parts per million