Odaffer 3-D 14-21-20E

October 28, 1950

Deep Rock Oil Corporation
Atlas Life Building
Tulsa, Oklahoma

Attention: Mr. T. F. Lowry

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" rotary core taken from the Odaffer Lease, Well No. 3-D, Anderson County, Kansas, and submitted to our laboratory on October 5, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:mm
c.c. to Mr. Neil Henderson
Mr. Jack McQueeney

DEEP ROCK OIL CORPORATION

CORE ANALYSIS REPORT

ODAFFER LEASE WELL NO. 3-D

ANDERSON COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

OCTOBER 28, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Location 945' North of South Line and 660' East of West Line, NW

Section 14 Twp. 21 Rge. 20 County Anderson State Kansas

Name of Sand	Squirrel
Top of Core	774.53
Bottom of Core	816.88
Top of Sand (Pay)	777.70
Bottom of Sand	812.20
Total Feet of Permeable Sand	29.43

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	3.38	3.38
5 - 10	8.13	11.51
10 - 20	4.54	16.05
20 - 40	4.89	20.94
40 - 80	7.49	28.43
80 & above	1.00	29.43

Average Permeability, Millidarcys	26.50
Average Percent Porosity	19.37
Average Percent Oil Saturation	46.18
Average Percent Water Saturation	36.83
Average Oil Content, Bbls./A. Ft.	692.
Total Oil Content, Bbls./Acre	20,810.
Average Percent Oil Recovery by Laboratory Flooding Tests	16.26
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	248.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	7,311.
Total Calculated Oil Recovery, Bbls./Acre	4,900.
Packer Setting, Feet	778.00
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	

Note: The above averages are for that part of the sand section extending from the packer setting to the top of the cement plug.

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
774.53 - 774.74	Light brown fine grained micaceous sandstone.
774.74 - 775.00	Gray shale.
775.00 - 775.70	Brown fine grained slightly laminated micaceous shaley sandstone.
775.70 - 775.80	Gray sandy shale.
775.80 - 776.05	Brown fine grained micaceous sandstone.
776.05 - 776.15	Gray sandy shale.
776.15 - 777.00	Brown fine grained slightly laminated micaceous shaley sandstone.
777.00 - 777.70	Brown fine grained micaceous sandstone.
777.70 - 778.80	Brown fine grained laminated micaceous shaley sandstone.
778.80 - 779.10	Brown fine grained micaceous sandstone.
779.10 - 780.00	Brown fine grained laminated micaceous shaley sandstone.
780.00 - 781.35	Finely laminated sandy shale.
781.35 - 782.49	Brown fine grained micaceous sandstone.
782.49 - 782.70	Brown fine grained micaceous shaley sandstone.
782.70 - 782.90	Laminated sandy shale.
782.90 - 784.05	Brown fine grained slightly laminated micaceous shaley sandstone.
784.05 - 784.20	Laminated sandytone and shale.
784.20 - 785.13	Brown fine grained slightly laminated micaceous shaley sandstone.
785.13 - 785.60	Brown fine grained micaceous sandstone.
785.60 - 786.00	Finely laminated sandstone and shale.

786.00 - 786.70 - Brown fine grained slightly laminated micaceous shaley sandstone.

786.70 - 786.85 - Laminated sandstone and shale.

786.85 - 787.03 - Gray sandy shale.

787.03 - 788.35 - Brown fine grained laminated micaceous shaley sandstone.

788.35 - 789.20 - Brown fine grained slightly laminated micaceous shaley sandstone.

789.20 - 789.30 - Laminated sandstone and shale.

789.30 - 789.60 - Brown fine grained laminated micaceous shaley sandstone.

789.60 - 789.90 - Laminated shaley sandstone.

789.90 - 791.03 - Brown fine grained laminated micaceous shaley sandstone.

791.03 - 791.65 - Brown fine grained micaceous sandstone.

791.65 - 791.99 - Brown fine grained slightly laminated micaceous shaley sandstone.

791.99 - 792.16 - Gray sandy shale.

792.16 - 793.40 - Brown fine grained micaceous slightly shaley sandstone.

793.40 - 795.75 - Brown fine grained finely laminated micaceous carbonaceous shaley sandstone.

795.75 - 796.80 - Brown fine grained micaceous shaley sandstone.

796.80 - 797.32 - Gray sandy shale.

797.32 - 800.10 - Brown fine grained laminated micaceous shaley sandstone.

800.10 - 802.70 - Brown fine grained micaceous sandstone.

802.70 - 812.20 - Dark brown fine grained micaceous sandstone.

812.20 - 815.35 - Gray shale.

815.35 - 816.88 - Lost.

Coring was started at a depth of 774.53 feet in fine grained micaceous sandstone and completed at 816.88 feet; probably in shale. There was a loss in the bottom of the core extending from 815.35 to 816.88 feet. This core shows a total of 35.15 feet of sandstone. For the most part,

the pay is made up of fine grained micaceous to shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections are 80.76, 14.06 and 49.71 millidarcys respectively; while that of the pay sand, or that part of the cored section extending from the packer setting to the top of the cement plug, is 38.50 millidarcys (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The sand in this core has a good weighted average percent oil saturation, namely, 46.18. The weighted average percent oil saturation of the upper, middle and lower sections are 36.98, 47.49 and 47.19 respectively. The weighted average percent water saturation of the upper, middle and lower section are 60.16, 37.52 and 34.19 respectively while that of the pay sand is 36.83 (See Table IV). This gives an overall weighted average total fluid saturation of 83.01 percent.

In an effort 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 these tables and on the coregraph, it is evident that salt water was used as a circulating fluid in the coring of the sand in this well and, as a result, the data is of little value.

The weighted average oil content of the upper, middle and lower sections are 418, 671 and 771 barrels per acre foot respectively while that of the pay sand is 692. The total oil content, as shown by this core, is 21,967 barrels per acre of which 20,810 barrels are in the pay

sand section (See Table IV).

LABORATORY FLOODING TESTS

The pay sand in this core responded very well to laboratory flooding tests as a total recovery of 7,211 barrels of oil per acre was obtained from 29.16 feet of sand. The weighted average percent oil saturation was reduced from 45.63 to 29.37, or represents an average recovery of 16.26 percent. The weighted average effective permeability of the samples is 4.54 millidarcys while the average initial fluid production pressure is 16.1 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 29 samples tested, all took water and produced oil. This indicates that all of the sand represented by these samples is floodable. The tests also show that the sand has a comparatively wide variation in effective permeability. In other words, the lower part of the cored section has a considerable high effective permeability. The data indicates that the top part of the cored section is a partially depleted oil zone.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 4,900 barrels of oil per acre. In calculating this recovery, an allowance was made for oil lost during coring and it was assumed that the sand is not pressured up. The reason why the calculated recovery is considerably lower than the flood pot recovery is due to the fact that the sand has a comparatively wide variation in effective permeability. In an effort to improve this condition, the upper or tighter part of the cored section was shot more heavily than the lower section.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
783.00 - 801.00	18.0	4	2.5	45.0
801.00 - 811.00	10.0	3	1.5	15.0
Total	28.0			60.0

Recommended Packer Setting 778.00 feet
Note: Plug hole back to 812.00 feet

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	774.65	19.	0.21	0.21	3.99
2	775.03	16.	0.70	0.91	11.20
3	775.86	25.	0.25	1.16	6.25
4	776.32	32.	0.50	1.66	16.00
5	777.10	34.	0.55	2.21	18.70
6	777.28	35.	0.50	2.71	17.50
7	778.15	9.4	0.65	3.36	6.11
8	778.58	9.5	0.45	3.81	4.28
9	778.98	50.	0.30	4.11	15.00
10	779.26	5.2	0.90	5.01	4.68
11	781.40	14.	0.15	5.16	2.10
12	781.60	27.	0.40	5.56	10.80
13	782.24	30.	0.59	6.15	17.70
14	782.56	3.7	0.21	6.36	0.78
15	782.95	12.	0.50	6.86	6.00
16	783.86	15.	0.65	7.51	9.75
17	784.85	10.	0.93	8.44	9.30
18	785.25	53.	0.47	8.91	24.91
19	785.90	1.6	0.40	9.31	0.64
20	786.78	2.5	0.15	9.46	0.38
21	787.10	1.5	0.17	9.63	0.26
22	787.30	5.2	0.60	10.23	3.12
23	788.10	2.5	0.55	10.78	1.38
24	788.53	8.7	0.85	11.63	7.40
25	789.25	1.8	0.10	11.73	0.18
26	789.40	4.9	0.30	12.03	1.47
27	790.47	8.0	0.70	12.73	5.60
28	790.77	11.	0.43	13.16	4.73
29	791.30	50.	0.62	13.78	31.00
30	791.97	6.6	0.34	14.12	2.24
31	792.50	7.4	0.54	14.66	4.00
32	792.94	15.	0.45	15.11	6.75
33	793.30	29.	0.25	15.36	5.75
34	793.98	8.7	0.65	16.01	5.66
35	794.13	9.3	0.45	16.46	4.19
36	794.75	3.7	0.35	16.81	1.30
37	795.03	Imp.	0.50	17.31	0.00
38	795.73	0.73	0.40	17.71	0.29
39	795.90	0.51	0.75	18.46	0.38
40	797.50	10.	0.28	18.74	2.80

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	797.72	5.4	0.60	19.34	3.24
42	798.47	9.6	0.35	19.69	3.36
43	798.66	9.8	0.35	20.04	3.43
44	799.12	8.6	0.60	20.64	5.16
45	799.77	18.	0.60	21.24	10.80
46	800.17	33.	0.25	21.49	8.25
47	800.53	17.	0.55	22.04	9.35
48	801.28	40.	0.55	22.59	22.00
49	801.65	36.	0.55	23.14	19.80
50	802.36	50.	0.70	23.84	35.00
51	802.80	53.	0.60	24.44	31.80
52	803.56	25.	0.45	24.89	11.25
53	803.95	59.	0.45	25.34	26.55
54	804.36	21.	0.30	25.64	6.30
55	804.68	47.	0.50	26.14	23.50
56	805.27	42.	0.40	26.54	16.80
57	805.60	111.	0.40	26.94	44.40
58	805.95	96.	0.60	27.54	57.60
59	806.72	39.	0.45	27.99	17.55
60	806.95	64.	0.40	28.39	25.60
61	807.58	28.	0.50	28.89	14.00
62	807.94	26.	0.55	29.44	14.30
63	808.55	72.	0.40	29.84	28.80
64	808.82	26.	0.30	30.14	7.80
65	809.13	8.7	0.40	30.54	3.48
66	809.70	65.	0.50	31.04	32.50
67	810.22	52.	0.70	31.74	36.40
68	810.85	29.	0.70	32.44	20.30
69	811.64	69.	0.90	33.34	62.10

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Deep Rock Oil Corporation Lease Odeffer Well No. 380

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
775.00 - 780.00	4.80	20.78	99.72
781.35 - 801.30	16.93	14.08	238.45
801.30 - 812.20	10.90	49.71	541.83
778.00 - 812.00	29.43	26.50	779.93

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Deep Rock Oil Corporation Lease Oliffer Well No. 3-D

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	775.35	20.3	25.1	61.8	86.9	396	0.70	0.70	277
2	776.55	21.6	23.4	66.6	90.0	392	0.95	1.65	372
3	777.55	19.6	28.0	55.7	83.7	426	0.60	2.25	256
P-3	777.85	20.5	24.6	-	-	392	1.40	3.65	549
4	779.62	18.2	35.4	54.8	90.2	500	0.90	4.55	450
6	781.81	21.4	27.1	54.8	81.9	456	1.35	5.90	607
7	783.24	18.2	30.7	37.6	68.3	434	1.15	7.05	499
8	784.35	18.5	47.4	39.1	86.5	682	1.40	8.45	955
9	786.25	17.5	52.8	34.0	86.8	717	0.70	9.15	502
10	787.55	17.9	51.7	34.2	85.9	719	1.32	10.47	949
11	788.72	19.3	51.3	29.8	81.1	769	0.85	11.32	654
12	790.02	17.3	55.3	36.7	92.0	743	1.03	12.35	765
13	791.51	20.8	45.9	37.7	83.6	740	0.62	12.97	459
P-13	791.78	19.4	42.5	-	-	641	0.34	13.31	218
14	793.78	17.5	34.0	38.5	83.5	612	1.74	15.05	1,065
15	794.32	16.3	50.2	32.0	82.8	635	0.85	15.90	540
16	795.22	16.5	50.5	34.5	85.0	647	1.00	16.90	647
17	796.20	16.3	52.5	38.6	91.1	665	1.05	17.95	700
18	797.95	18.1	52.3	38.5	90.8	734	1.18	19.13	865

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Deep Rock Oil Corporation Lease Oleffer Well No. 3-D

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.	
19	799.30	19.1	57.7	33.1	90.8	855	1.60	20.73	1,368
20	800.75	19.4	48.0	37.1	85.1	723	1.20	21.93	868
21	801.91	21.5	42.3	32.6	74.9	706	1.40	23.33	989
22	803.11	21.4	51.3	31.3	82.6	852	1.30	24.63	1,108
23	804.85	22.0	44.9	38.6	83.5	766	1.50	26.13	1,149
24	806.15	21.2	52.2	32.7	84.9	858	1.20	27.33	1,031
25	807.12	21.6	61.7	26.0	87.7	1,037	0.90	28.23	933
26	808.11	21.8	44.3	37.8	82.1	750	1.10	29.33	825
27	809.31	21.1	45.7	32.0	75.7	716	1.10	30.43	788
28	810.40	19.2	43.4	39.4	82.8	646	0.90	31.33	581
29	811.08	19.9	42.8	37.6	80.4	662	0.80	32.13	530
30	811.88	18.2	47.3	33.8	81.1	668	0.70	32.83	468
							Total - - - - -		21,967

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

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
775.00-780.00	4.55	20.13	26.99	60.16	418	1,904
781.35-801.30	17.38	18.31	47.49	37.52	671	11,661
801.30-812.20	10.90	21.00	47.19	34.19	771	8,402
778.00-812.00	30.08	19.37	46.18	36.83	692	20,810

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Deep Rock Oil Corporation Lease Oldfer Well No. 8-D

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.
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	773.55	21.2	53.2	302	1.7	10	21.5	75.0	384	186.5	0.07	5
2	776.65	21.7	53.5	396	2.3	37	21.3	67.2	389	180	0.74	5
3	777.05	20.5	54.6	392	4.0	64	20.6	74.0	388	181	6.16	5
4	779.65	18.9	55.5	469	6.1	90	27.2	66.0	399	94.5	0.991	20
6	788.09	21.5	56.7	546	6.7	118	20.0	77.9	434	189.5	7.48	5
7	793.55	19.0	58.2	416	3.4	50	24.6	71.2	306	48	2.07	20
8	794.65	18.8	46.7	664	17.5	249	29.2	66.2	415	61	1.71	20
9	796.35	18.1	50.8	713	26.4	371	24.4	67.2	342	86	1.04	15
10	797.85	18.0	50.7	708	30.1	421	30.6	66.6	427	82	0.824	15
11	799.05	19.9	40.6	751	21.2	389	27.4	64.2	403	41	1.76	15
12	790.35	17.8	54.4	726	24.6	388	29.6	68.5	398	14	0.575	15
13	791.77	19.4	42.5	641	13.5	204	29.0	68.5	437	59	2.09	15
14	795.75	18.0	43.5	604	9.7	136	33.5	61.4	468	55	1.04	20
15	794.85	18.5	49.9	660	9.0	115	40.2	53.9	585	1	0.093	40
16	795.30	16.2	48.7	616	12.4	156	37.5	57.0	470	2.5	0.231	30
17	796.60	18.3	55.8	606	7.8	91	45.6	51.0	577	1	0.087	40
18	798.83	18.7	50.6	737	8.3	121	42.3	49.6	616	13.5	0.705	25
19	799.68	18.6	57.7	836	26.0	376	31.7	62.4	466	17	0.849	15
20	801.05	18.9	49.0	705	10.0	147	38.0	53.0	556	43	1.14	20
21	808.16	20.6	43.7	699	15.7	267	27.0	69.9	455	137.5	5.69	15
22	805.58	20.6	53.9	883	24.6	397	29.1	60.5	466	114	9.68	10
23	805.10	21.9	44.1	751	21.3	363	28.6	70.1	366	151	10.24	5
24	806.45	22.4	49.5	881	19.7	345	29.8	66.7	518	250	18.22	15
25	807.59	22.0	60.9	1,040	39.4	673	21.5	70.5	367	103	10.65	5
26	808.35	21.6	44.0	736	17.0	285	27.0	66.0	453	68	7.56	10
27	809.60	21.9	42.5	725	18.8	320	25.8	67.2	408	200	16.00	10
28	810.00	19.2	43.8	653	18.8	300	25.0	67.7	375	186	5.66	10
29	811.36	19.7	44.3	681	17.3	265	27.2	71.4	416	103.5	9.39	10
30	812.10	18.1	45.8	666	27.8	391	21.0	67.6	293	164	4.68	10

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.

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Depth Interval, Feet	775.00-780.00	781.35-801.30	801.30-812.20	778.00-812.00
Feet of Core Analyzed	3.95	16.76	10.90	29.16
Average Percent Porosity	20.53	18.34	20.98	19.42
Average Percent Original Oil Saturation	26.08	46.61	47.34	45.63
Average Percent Oil Recovery	3.65	14.24	21.67	16.26
Average Percent Residual Oil Saturation	22.43	32.37	25.67	29.37
Average Percent Residual Water Saturation	70.91	62.49	67.62	64.97
Average Percent Total Residual Fluid Saturation	93.34	94.86	93.29	94.34
Average Original Oil Content, Bbls./A. Ft.	413.	650.	772.	680.
Average Oil Recovery, Bbls./A. Ft.	57.	202.	353.	248.
Average Residual Oil Content, Bbls./A. Ft.	356.	448.	419.	432.
Total Original Oil Content, Bbls./Acre	1,633.	10,892.	8,418.	20,044.
Total Oil Recovery, Bbls./Acre	226.	3,383.	3,855.	7,311.
Total Residual Oil Content, Bbls./Acre	1,407.	7,509.	4,563.	12,733.
Average Effective Permeability, Millidarcys	6.19	1.47	9.41	4.54
Average Initial Fluid Production Pressure, p.s.i.	8.8	20.7	10.0	16.1

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

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTATION TESTS

TABLE VII

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	775.35	13,200			
2	776.55	13,200			
3	777.55	13,300			
4	779.62	21,800			
6	781.81	12,100			
7	783.24	19,000			
8	784.35	20,800			
9	786.25	25,000			
10	787.55	26,500			
11	788.72	24,100			
12	790.02	19,400			
13	791.51	20,000			
14	793.78	22,200			
15	794.32	26,000			
16	795.22	23,000			
17	796.20	25,300			
18	797.95	16,800			
19	799.30	21,900			
20	800.75	20,400			
21	801.91	20,400			
22	803.11	21,200			
23	804.85	17,400			
24	806.15	20,600			
25	807.12	27,400			
26	808.11	18,200			
27	809.31	42,200			
28	810.40	16,200			
29	811.08	15,200			
30	811.88	20,200			

Note: ppm = parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTATION TESTS

TABLE VIII

Company Deep Rock Oil Corporation Lease Odaffer Well No. 3-D

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
775.00 - 780.00	15,670		
781.35 - 801.80	21,256		
801.80 - 812.20	21,916		
778.00 - 812.00	21,532		

Note: ppm - parts per million