

OILFIELD RESEARCH LABORATORIES

July 30, 1952

Franco Central Oil Company
512 Fourth National Bank Building
Wichita, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" Rotary core taken from the Hughes Lease, Well No. C-5, Butler County, Kansas, and submitted to our laboratory on July 23, 1952.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:mm

C.C.

FRANCO CENTRAL OIL COMPANY

CORE ANALYSIS REPORT

HUGHES LEASE

WELL NO. 0-5

BUTLER COUNTY, KANSAS

OILFIELD RESEARCH LABORATORIES

CHANDLER, KANSAS

JULY 29, 1952

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Franco Central Oil Company Lease Hughes Well No. C-5

Location 330' East of West Line and 460' North of South Line, E₂, S₂

Section 9 Twp. 26S Rge. 8E County Butler State Kansas

Name of Sand Bartlesville

Top of Core 2445.00

Bottom of Core 2505.00

Top of ^{Pay} Sand 2448.10

Bottom of Sand ?

Total Feet of Permeable Sand (Analyzed) 54.72

Total Feet of Floodable Sand (Analyzed) 49.77

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 & above

11.75
7.87
12.10
7.30
6.55
9.13

11.75
19.62
31.72
39.02
45.57
54.72

Average Permeability Millidarcys 39.21

Average Percent Porosity 19.33

Average Percent Oil Saturation 27.26

Average Percent Water Saturation 67.39

Average Oil Content, Bbls./A. Ft. 407.

Total Oil Content, Bbls./Acre 22,704.

Average Percent Oil Recovery by Laboratory Flooding Tests 4.38

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 67.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 3,332.

Total Calculated Oil Recovery, Bbls./Acre -

Packer Setting, Feet

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Elevation, Feet

Fresh water was used in making up the circulating fluid used in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
2445.00 - 2445.40	- Gray fine grained micaceous calcareous sandstone.
2445.40 - 2446.95	- Gray fine grained micaceous slightly shaley sandstone.
2446.95 - 2447.60	- Gray sandy shale.
2447.60 - 2448.10	- Light brown fine grained micaceous sandstone.
2448.10 - 2450.65	- Brown fine grained micaceous sandstone.
2450.65 - 2451.90	- Light brown fine grained micaceous sandstone.
2451.90 - 2452.40	- Gray sandy shale.
2452.40 - 2455.50	- Light brown fine grained micaceous sandstone.
2455.50 - 2456.10	- Light brown fine grained micaceous slightly conglomeratic sandstone.
2456.10 - 2456.40	- Light brown fine grained laminated micaceous shaley sandstone.
2456.40 - 2464.32	- Light brown fine grained micaceous sandstone.
2464.32 - 2464.95	- Grayish light brown fine grained micaceous sandstone.
2464.95 - 2471.35	- Light brown fine grained micaceous sandstone.
2471.35 - 2471.65	- Light brown fine grained micaceous shaley sandstone.
2471.65 - 2472.05	- Light brown fine grained micaceous sandstone.
2472.05 - 2474.85	- Brown fine grained micaceous sandstone.
2474.85 - 2481.60	- Light brown fine grained micaceous sandstone.
2481.60 - 2482.20	- Light brown fine grained micaceous conglomeratic sandstone.

2482.20 - 2484.00 - Light brown fine grained micaceous sandstone.

2484.00 - 2485.00 - Loss.

2485.00 - 2499.10 - Light brown fine grained micaceous sandstone.

2499.10 - 2499.70 - Sandy limestone.

2499.70 - 2503.80 - Light brown fine grained micaceous calcareous sandstone.

2503.80 - 2505.00 - Loss.

Coring was started at a depth of 2445.00 feet in fine grained micaceous calcareous sandstone and completed at 2505.00 feet. There were two losses in the core, one extending from 2484.00 to 2485.00 feet and the other from 2503.80 to 2505.00 feet. This core shows a total of 56.05 feet of sandstone. For the most part, the pay is made up of fine grained micaceous sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into four sections. The weighted average permeability of the four sections with respect to increasing depth is 7.22, 34.29, 61.79 and 16.54 respectively; the overall average being 39.21 (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a fairly irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a low weighted average percent oil saturation, namely, 27.26. The weighted average percent oil saturation of the four sections with respect to increasing depth is 5.33, 28.38, 27.27 and 28.21 respectively. The weighted average percent water saturation of the corresponding four sections is

81.08, 64.55, 59.22 and 64.55 respectively; the overall average being 67.39 (See Table IV). This gives an overall weighted average total fluid saturation of 94.65 percent. It is apparent that that part of the cored section extending from 2445.00 to 2447.00 feet is gas sand.

In an effort to determine 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 noticeable that the sand was badly flushed during coring, as most of same has a low chloride content.

The weighted average oil content of the four sections with respect to increasing depth is 88, 427, 415 and 362 barrels per acre foot respectively; the overall average being 407. The total oil content, as shown by this core, is 22,704 barrels per acre (See Table IV).

LABORATORY FLOODING TESTS

When taking into consideration that this core shows a fairly low percent oil saturation, the sand responded very well to laboratory flooding tests as a total recovery of 3,332 barrels of oil per acre was obtained from 49.77 feet of sand. The weighted average percent oil saturation was reduced from 27.20 to 22.82, or represents an average recovery of 4.38 percent. The weighted average effective permeability of the samples is 5.65 millidarcys, while the average initial fluid production pressure is 6.9 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 57 samples tested, all produced water and 51 oil. This indicates that all of the sand represented by these samples will take water. The tests also show that the sand has a fairly uniform effective permeability.

CONCLUSION

On the basis of the above data, it is evident that the sand area represented by this core is pressured up from water entering the surrounding injection wells and probably from some water that was discharged into the salt water disposal well, as the sand shows a high total fluid saturation. Inasmuch as the sand is badly flushed by drilling water, naturally, the water saturation shown by the analysis is high as no doubt considerable drilling water penetrated the sand during coring. No calculated recovery is given for the area represented by this core, because it is evident that the sand is pressured up and, if so, the recovery value would not be reliable. Inasmuch as the gas sand has a very high water saturation, it is evident that this zone may produce some free water. For this reason, it is suggested that the casing be set at a depth of 2448.00 feet.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
2451.0 - 2503.0	52.0	3 $\frac{1}{2}$	2.0	104.0

Recommended Casing Point - - - 2448.0 feet.

Oilfield Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	2445.05	0.53	0.40	0.40	0.21
2	2445.45	13.	0.30	0.70	3.00
3	2445.90	3.2	0.45	1.15	1.44
4	2446.35	12.	0.45	1.60	5.40
5	2446.85	8.9	0.35	1.95	3.12
6	2447.75	40.	0.50	2.45	20.00
7	2448.22	55.	0.35	2.80	19.25
8	2448.68	28.	0.45	3.25	12.60
9	2449.12	23.	0.45	3.70	10.35
10	2449.60	60.	0.50	4.20	34.50
11	2450.15	41.	0.80	5.00	32.80
12	2450.75	26.	0.25	5.25	6.50
13	2451.10	52.	0.40	5.65	20.80
14	2451.55	15.	0.40	6.05	6.00
15	2451.85	11.	0.20	6.25	2.20
16	2452.75	40.	0.50	6.75	20.00
17	2453.20	17.	0.60	7.35	10.30
18	2453.88	19.	0.60	7.95	11.40
19	2454.35	19.	0.50	8.45	9.50
20	2454.80	21.	0.40	8.85	8.40
21	2455.25	29.	0.50	9.35	14.50
22	2455.77	38.	0.60	9.95	22.80
23	2456.25	1.8	0.30	10.25	0.55
24	2456.82	20.	0.60	10.85	12.00
25	2457.30	18.	0.50	11.35	9.00
26	2457.75	4.5	0.50	11.85	2.25
27	2458.25	8.3	0.50	12.35	4.15
28	2458.75	20.	0.50	12.85	10.00
29	2459.22	15.	0.40	13.25	6.00
30	2459.68	27.	0.50	13.75	13.50
31	2460.25	35.	0.55	14.30	19.25
32	2460.70	31.	0.45	14.75	13.95
33	2461.20	34.	0.60	15.35	20.40
34	2461.85	30.	0.55	15.90	16.50
35	2462.33	40.	0.55	16.45	22.00
36	2462.85	30.	0.50	16.95	15.00
37	2463.38	42.	0.50	17.45	21.00
38	2463.85	34.	0.45	17.90	15.30
39	2464.25	28.	0.27	18.17	7.56
40	2465.00	14.	0.25	18.42	3.50

Oilfield Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	2465.42	21.	0.45	18.87	9.45
42	2465.88	14.	0.45	19.32	6.30
43	2466.35	29.	0.50	19.82	14.50
44	2466.82	23.	0.40	20.22	9.20
45	2467.25	70.	0.50	20.72	35.00
46	2467.78	31.	0.50	21.22	15.50
47	2468.27	15.	0.50	21.72	7.50
48	2468.77	53.	0.50	22.22	26.50
49	2469.30	3.	0.50	22.72	16.50
50	2469.77	43.	0.45	23.17	19.35
51	2470.17	69.	0.50	23.67	34.50
52	2470.73	58.	0.55	24.22	31.90
53	2471.26	1.8	0.35	24.57	35.60
54	2471.75	89.	0.40	27.97	35.60
55	2472.35	27.	0.55	25.52	11.00
56	2472.92	17.	0.55	26.07	9.35
57	2473.45	35.	0.55	26.62	19.25
58	2473.93	27.	0.50	27.12	13.50
59	2474.45	30.	0.65	27.77	19.50
60	2474.90	26.	0.30	28.07	7.80
61	2475.38	40.	0.45	28.52	18.00
62	2475.88	37.	0.45	28.97	16.65
63	2476.28	41.	0.45	29.42	18.45
64	2476.80	36.	0.60	30.02	21.60
65	2477.32	38.	0.50	30.52	19.00
66	2477.80	32.	0.45	30.97	17.10
67	2478.32	36.	0.55	31.52	19.80
68	2478.88	25.	0.45	31.97	15.75
69	2479.28	22.	0.45	32.42	16.65
70	2479.76	39.	0.60	33.02	23.40
71	2480.38	38.	0.55	33.57	20.90
72	2480.85	46.	0.45	34.02	20.70
73	2481.46	29.	0.50	34.52	14.50
74	2481.93	87.	0.60	35.12	52.20
75	2482.35	81.	0.40	35.52	32.40
76	2482.81	45.	0.45	35.97	20.25
77	2483.35	35.	0.55	36.52	19.25
78	2483.85	40.	0.40	36.92	16.00
79	2485.40	56.	0.55	37.47	30.80
80	2485.80	84.	0.50	37.97	42.00

Oilfield Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Franco Central Oil Company Lease Hughes Well No. C-5

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
81	2486.32	50.	0.50	38.47	25.00
82	2486.52	44.	0.50	38.97	22.00
83	2487.32	46.	0.45	39.42	20.70
84	2487.75	51.	0.50	39.92	25.50
85	2488.32	56.	0.60	40.52	33.60
86	2488.85	55.	0.55	41.07	30.25
87	2489.45	57.	0.50	41.57	26.50
88	2489.85	60.	0.45	42.02	27.00
89	2490.36	71.	0.60	42.62	42.60
90	2490.95	113.	0.50	43.12	56.50
91	2491.42	113.	0.45	43.57	50.85
92	2491.85	71.	0.45	44.02	31.95
93	2492.47	62.	0.60	44.62	37.20
94	2492.90	58.	0.50	45.12	29.00
95	2493.45	61.	0.50	45.62	30.50
96	2493.96	44.	0.55	46.17	24.20
97	2494.55	58.	0.55	46.72	31.90
98	2495.03	39.	0.55	47.27	21.45
99	2495.57	25.	0.40	47.67	10.00
100	2495.95	28.	0.35	48.02	9.80
101	2496.20	13.	0.30	48.32	3.90
102	2496.60	39.	0.50	48.82	19.50
103	2497.35	95.	0.60	49.42	57.00
104	2497.75	62.	0.50	49.92	31.00
105	2498.25	105.	0.50	50.42	52.50
106	2498.78	80.	0.60	51.02	48.00
107	2499.28	Imp.	0.60	51.62	0.00
109	2500.30	4.2	0.40	52.02	1.68
110	2500.75	4.7	0.45	52.47	2.12
111	2501.20	5.2	0.55	53.02	2.86
112	2501.85	7.9	0.60	53.62	4.74
113	2502.35	14.	0.50	54.12	8.00
114	2502.88	53.	0.50	54.62	26.50
115	2503.35	5.2	0.40	55.02	2.08
116	2503.75	44.	0.30	55.32	12.20

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
2445.00 - 2446.95	1.95	7.22	14.07
2447.60 - 2484.00	34.97	34.29	1,199.14
2485.00 - 2499.10	14.10	61.79	871.20
2500.10 - 2503.80	3.70	16.54	61.18
2445.00 - 2503.80	54.72	39.21	2,145.59

Oil Field Research Laboratories
RESULTS OF SATURATION TESTS

TABLE III

Company Franko Central Oil Company Lease Hughes Well No. 0-5

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	2445.25	17.3	8.9	70.5	79.4	154	0.40	0.40	62
2	2446.10	20.4	4.4	93.7	88.1	70	1.55	1.95	109
4	2448.50	20.4	35.8	60.0	95.8	567	0.80	2.75	454
5	2449.35	21.4	40.7	58.8	99.1	670	0.95	3.70	637
6	2450.50	20.5	35.6	64.0	99.6	566	0.80	4.50	453
7	2451.35	19.7	28.5	67.0	95.5	436	1.25	5.75	545
8	2452.55	22.0	30.8	68.7	99.5	525	0.70	6.45	368
9	2453.55	21.6	24.5	67.5	92.0	410	1.00	7.45	410
10	2454.55	20.6	29.6	60.5	90.1	473	0.90	8.35	426
Fill	2455.43	21.9	28.7	-	-	628	0.50	8.85	314
11	2455.56	16.9	37.6	59.5	97.1	408	0.60	9.45	292
12	2455.55	18.1	28.9	62.6	91.7	406	0.60	10.05	244
13	2456.55	19.0	28.0	63.3	91.3	413	1.00	11.05	413
14	2457.65	19.3	26.4	68.1	94.5	395	1.00	12.05	395
15	2458.50	19.3	28.4	63.7	92.1	485	1.00	13.05	425
16	2459.45	19.7	27.9	67.3	95.2	426	1.05	14.10	447
17	2460.55	19.1	30.4	64.7	95.1	450	1.05	15.15	473
	2461.60								

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Franco Central Oil Company Lease Hughes Well No. 0-5

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.	
18	2462.60	19.8	27.7	58.3	86.0	426	1.00	16.15	426
19	2463.65	18.4	31.2	64.0	95.2	445	1.22	17.37	543
20	2464.65	16.9	19.9	75.9	95.8	261	0.63	18.00	164
21	2465.65	18.6	28.5	68.1	96.6	411	1.15	19.15	473
22	2466.60	18.3	27.6	66.1	93.9	392	0.95	20.10	372
23	2467.50	20.1	26.0	63.7	89.7	405	0.95	21.05	385
24	2468.55	17.1	25.7	66.0	91.7	341	1.05	22.10	358
25	2469.55	18.9	23.2	63.5	86.7	340	0.95	23.05	323
26	2470.50	20.3	25.7	70.0	95.7	405	1.35	24.40	547
27	2471.50	18.0	44.0	53.0	97.0	615	0.70	25.10	431
28	2472.60	17.9	24.0	69.8	93.8	333	1.10	26.20	366
29	2473.70	19.3	32.1	66.4	98.5	480	1.05	27.25	504
30	2474.70	19.3	26.6	66.9	93.5	198	0.65	27.90	259
31	2475.65	19.3	26.5	63.3	89.8	397	1.25	29.15	496
32	2476.60	18.9	24.4	68.6	93.0	358	1.00	30.15	358
33	2477.55	19.0	24.8	67.8	92.6	265	1.00	31.15	365
34	2478.65	19.3	25.3	66.0	91.3	379	1.00	32.15	379

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Pranco Central Oil Company Lease Hughes Well No. 0-5

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.	
35	2479.55	19.3	23.4	58.5	91.9	501	1.00	33.15	501
36	2480.65	19.6	25.3	61.7	87.0	385	1.00	34.15	385
37	2481.53	19.6	21.6	60.8	82.4	329	0.50	34.65	165
37	2481.67	18.3	23.3	-	-	331	0.60	35.25	199
38	2482.60	18.9	23.6	58.9	82.5	346	0.85	36.10	294
39	2483.60	18.5	24.6	52.5	77.1	354	0.95	37.05	336
40	2485.15	19.1	31.6	54.4	86.0	470	0.60	37.65	282
41	2486.10	20.8	33.3	54.0	87.5	538	0.90	38.55	484
42	2487.10	18.7	29.1	61.4	90.5	423	1.10	39.65	465
43	2488.10	20.0	30.9	67.2	98.1	480	1.00	40.65	480
44	2489.15	19.8	29.6	60.3	89.9	455	1.05	41.70	478
45	2490.15	20.4	24.0	60.3	84.3	380	0.95	42.65	361
46	2491.15	20.2	29.2	59.6	88.8	458	1.05	43.70	481
47	2492.20	19.3	21.8	59.0	80.8	327	1.05	44.75	343
48	2493.20	19.7	23.1	60.7	83.8	353	1.00	45.75	353
49	2494.20	19.5	25.8	58.8	84.6	391	1.00	46.75	391
50	2495.30	19.2	25.6	69.0	94.6	382	1.10	47.85	420

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Franco Central Oil Company Lease Hughes Well No. 0-5

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.	
51	2496.40	18.5	28.3	55.9	84.2	407	1.20	49.05	488
52	2497.55	19.9	28.2	55.0	83.2	436	1.10	50.15	480
53	2498.55	20.0	25.6	57.5	83.1	398	1.00	51.15	398
54	2499.55	15.1	24.7	64.2	88.9	289	0.60	51.75	173
55	2500.55	18.2	30.4	63.0	93.4	429	1.30	53.05	558
56	2501.55	14.9	28.0	70.5	98.5	324	1.10	54.15	356
57	2502.60	16.3	28.4	66.5	93.9	360	1.00	55.15	360
58	2503.55	17.5	26.9	57.0	83.9	366	0.70	55.85	256
						Total	- - - -	- - - -	22,704

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company	Franco Central Oil Company			Lease	Figures	Well No.	0-5
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	
2445.00 - 2446.95	1.95	19.74	5.33	81.08	88	171	
2448.10 - 2449.00	34.15	19.29	28.38	64.55	427	14,590	
2489.00 - 2490.10	15.05	19.56	27.27	59.22	415	6,240	
2499.10 - 2503.80	4.70	16.55	28.21	64.55	362	1,703	
2445.00 - 2503.80	55.85	19.33	27.26	67.39	407	22,704	

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Franco Central Oil Company Lease Hughes Well No. 0-5

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	2445.25	17.1	7.6	101	0.0	0	7.6	91.0	101	32	0.700	5
2	2446.10	20.1	5.7	89	0.0	0	5.7	91.4	89	78	1.72	10
4	2448.50	20.5	34.3	546	13.3	212	21.0	78.3	334	154	5.80	15
5	2449.35	21.4	38.7	643	18.1	301	20.6	77.7	342	134	9.33	10
6	2450.50	20.5	35.2	560	13.6	216	21.6	78.0	344	195	9.90	5
7	2451.35	19.5	27.9	422	2.4	36	25.5	71.5	386	29	0.595	15
8	2452.55	22.2	29.2	504	7.0	121	22.2	73.3	383	199	5.40	5
9	2453.55	21.4	23.4	390	3.2	54	20.2	77.6	336	245	4.99	5
10	2454.55	20.8	27.9	450	7.4	119	20.5	62.5	331	139	7.60	5
11	2455.43	21.9	28.7	488	7.7	131	21.0	74.3	357	173	10.98	5
12	2456.55	18.3	27.3	388	2.8	40	24.5	70.9	348	54	1.07	15
13	2457.45	19.0	26.5	392	1.5	22	25.0	67.6	370	85	1.21	5
14	2458.50	19.0	25.2	371	3.0	44	22.2	72.0	327	203	3.90	5
15	2459.45	19.0	26.3	388	4.9	72	21.4	74.0	316	210	5.75	5
16	2460.55	19.8	26.8	411	5.3	81	21.5	75.0	330	222	5.95	5
17	2461.60	18.8	29.7	434	7.4	108	22.3	71.5	328	198	6.87	5
18	2462.60	19.7	27.8	425	6.2	95	21.6	76.0	330	222	7.30	5
19	2463.65	18.5	29.8	428	6.8	98	23.0	73.8	330	162	5.85	10
20	2464.65	17.0	20.8	274	0.0	0	20.8	72.4	274	15	0.187	15
21	2465.65	18.6	26.7	385	3.7	53	23.0	75.0	332	243	3.84	5
22	2466.60	18.1	26.3	370	2.4	34	23.9	75.0	336	48	1.00	15
23	2467.50	20.3	24.9	393	3.1	49	21.8	74.5	344	156	6.68	5
24	2468.55	17.6	25.2	337	4.3	59	20.9	78.6	278	74	1.37	10
25	2469.55	18.6	22.1	319	3.1	45	19.0	73.5	274	205	7.15	5
26	2470.50	20.7	24.1	387	2.9	47	21.2	78.5	340	196	10.08	5
27	2471.50	18.0	42.2	590	0.0	0	42.2	56.6	590	9	0.167	5
28	2472.60	18.2	23.0	325	2.1	30	20.9	74.3	295	78	1.49	5
29	2473.70	19.3	31.1	467	5.4	81	25.7	73.6	386	161	4.24	5
30	2474.70	19.1	27.3	404	3.8	56	23.5	75.5	348	242	5.15	5
31	2475.65	19.0	25.1	370	2.3	34	22.8	76.4	336	199	4.36	5
32	2476.60	19.1	25.1	372	4.3	64	20.8	71.0	308	178	5.65	5
33	2477.55	19.2	22.8	340	1.9	28	20.9	72.7	312	143	8.50	5

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Franco Central Oil Company

Lease Hughes

Well No. 0-5

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.			
34	2478.65	19.4	25.1	378	2.7	41	22.4	73.9	337	177	5.05	5
35	2479.55	19.0	32.6	481	9.3	137	23.3	73.0	344	194	10.20	5
36	2480.65	19.8	25.5	392	4.0	62	21.5	73.5	330	220	8.40	5
37	2481.68	18.3	23.3	369	2.6	37	20.7	73.0	332	238	6.15	10
38	2482.60	18.6	25.0	361	2.6	38	22.4	74.1	323	174	3.74	5
39	2483.60	18.4	24.0	343	2.7	39	21.3	72.3	304	201	4.58	5
40	2485.15	19.5	30.5	462	5.7	86	24.8	68.7	376	182	4.78	5
41	2486.10	20.7	32.0	514	8.1	130	23.9	70.5	384	206	5.60	10
42	2487.10	18.9	27.4	403	3.8	56	23.6	70.6	347	206	5.25	5
43	2488.10	20.0	29.5	459	5.2	81	24.3	68.5	378	146	3.26	5
44	2489.15	19.5	28.2	427	7.6	115	20.6	72.0	312	198	6.43	5
45	2490.15	20.3	24.4	385	2.2	35	22.2	68.4	350	197	7.50	5
46	2491.15	20.4	28.3	448	1.9	30	26.4	67.3	418	145	7.24	10
47	2492.20	19.7	22.0	335	1.1	16	20.9	70.2	319	180	8.10	5
48	2493.20	19.6	21.9	333	0.4	6	21.5	69.2	327	205	8.95	5
49	2494.20	19.5	24.7	374	1.0	15	23.7	67.9	359	150	3.74	5
50	2495.30	19.3	25.0	374	1.2	18	23.8	68.4	356	231	5.85	5
51	2496.40	18.8	26.9	393	2.9	42	24.0	65.3	351	137	3.45	15
52	2497.55	19.9	26.5	410	2.9	45	23.6	69.4	365	168	10.86	5
53	2498.55	20.0	23.6	366	2.2	34	21.4	72.8	332	168	10.45	5
54	2499.55	14.8	25.5	293	0.0	0	25.5	67.4	293	3	0.049	35
55	2500.35	18.4	29.0	415	4.4	63	24.6	68.5	352	158	3.60	10
56	2501.55	14.8	26.7	307	0.0	0	26.7	71.3	307	18	0.295	20
57	2502.60	16.3	29.9	378	4.1	52	25.8	68.9	326	62	0.723	10
58	2503.55	17.8	25.4	352	1.7	24	23.7	70.4	328	198	7.49	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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company	Franco Central Oil Company	Lease	2485.00 - 2499.10	2499.70 - 2503.80	2448.10 - 2503.80	Well No.	0-5
Depth Interval, Feet	2448.10 - 2484.00	2485.00 - 2499.10	2499.70 - 2503.80	2448.10 - 2503.80			
Feet of Core Analyzed	32.67	14.10	3.00	49.77			
Average Percent Porosity	19.40	19.70	17.53	19.38			
Average Percent Original Oil Saturation	27.45	26.37	28.47	27.20			
Average Percent Oil Recovery	4.96	3.19	3.67	4.38			
Average Percent Residual Oil Saturation	22.49	23.18	24.80	22.82			
Average Percent Residual Water Saturation	73.98	69.19	69.07	72.33			
Average Percent Total Residual Fluid Saturation	96.47	92.37	93.87	95.15			
Average Original Oil Content, Bbls./A. Ft.	409.	404.	388.	406.			
Average Oil Recovery, Bbls./A. Ft.	76.	49.	50.	67.			
Average Residual Oil Content, Bbls./A. Ft.	333.	355.	338.	339.			
Total Original Oil Content, Bbls./Acre	13,373.	5,690.	1,164.	20,227.			
Total Oil Recovery, Bbls./Acre	2,491.	690.	151.	3,332.			
Total Residual Oil Content, Bbls./Acre	10,882.	5,000.	1,013.	16,895.			
Average Effective Permeability, Millidarcys	5.45	6.57	3.55	3.65			
Average Initial Fluid Production Pressure, p.s.i.	6.8	6.4	10.0	6.9			

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 Franco Central Oil Company Lease Hughes Well No. 0-5

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2445.25	22,200			
2	2446.10	31,000			
4	2448.50	52,400			
5	2449.35	49,000			
6	2450.50	48,000			
7	2451.35	63,100			
8	2452.55	77,400			
9	2453.55	43,000			
10	2454.55	47,500			
11	2455.56	45,200			
12	2456.55	56,900			
13	2457.45	61,400			
14	2458.50	55,700			
15	2459.45	53,500			
16	2460.55	26,600			
17	2461.60	17,400			
18	2462.60	9,880			
19	2463.65	9,870			
20	2464.65	33,300			
21	2465.65	45,000			
22	2466.60	61,500			
23	2467.50	32,200			
24	2468.55	51,500			
25	2469.55	24,200			
26	2470.50	50,200			
27	2471.50	34,100			
28	2472.60	61,600			
29	2473.70	53,300			
30	2474.70	43,300			
31	2475.65	26,000			
32	2476.60	11,900			
33	2477.55	12,100			
34	2478.65	7,290			
35	2479.55	6,750			
36	2480.65	6,300			
37	2481.55	9,650			
38	2482.60	6,200			
39	2483.60	4,770			
40	2485.15	4,420			

Oil Field Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
41	2486.10	2,660			
42	2487.10	4,730			
43	2488.10	3,980			
44	2489.15	3,840			
45	2490.15	4,150			
46	2491.15	5,030			
47	2492.20	4,040			
48	2493.20	5,090			
49	2494.20	4,520			
50	2495.30	38,900			
51	2496.40	7,860			
52	2497.55	5,330			
53	2498.55	11,250			
54	2499.55	15,170			
55	2500.55	56,300			
56	2501.55	69,500			
57	2502.60	41,700			
58	2503.55	26,600			

Note: ppm - parts per million.

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Franco Central Oil Company Lease Hughes Well No. 0-5

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2445.00 - 2446.95	29,195		
2448.10 - 2484.00	35,098		
2485.00 - 2499.10	7,043		
2499.10 - 2503.80	46,609		
2445.00 - 2503.80	28,858		

Note: ppm - parts per million.