

# OILFIELD RESEARCH LABORATORIES

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- REGISTERED ENGINEERS -

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January 11, 1958

Creek Oil & Gas Company, Inc.  
P. O. Box 377  
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the 3" Rotary core taken from the Wells Lease, Well No. 15, Neosho County, Kansas, and submitted to our laboratory on December 28, 1957, by Mr. Jack McKelvey and Mr. Larry Smith.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

*Carl L. McElrea*  
Carl L. McElrea

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# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Creek Oil & Gas Company, Inc Lease Wells Well No. 15

Location 3,390' N. of S. Line & 1,250' E. of W. Line

Section 27 Twp. 28S Rge. 18E County Neosho State Kansas

Name of Sand	-	Bartlesville
Top of Core	-	782.0
Bottom of Core	-	822.0
Pay		
Top of Sand	-	800.5
Pay		
Bottom of Sand	-	812.5
Total Feet of Permeable Sand	-	22.7
Total Feet of Floodable Sand	-	5.2

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	5.0	5.0
5 - 10	3.0	8.0
10 - 20	5.3	13.3
20 - 30	3.0	16.3
30 - 40	3.3	19.6
40 & above	3.1	22.7

Average Permeability Millidarcys	-	19.4
Average Percent Porosity	-	16.2
Average Percent Oil Saturation	-	35.3
Average Percent Water Saturation	-	43.5
Average Oil Content, Bbls./A. Ft.	-	456.
Total Oil Content, Bbls./Acre	-	17,793.
Average Percent Oil Recovery by Laboratory Flooding Tests	-	6.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-	99.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-	517.
Total Calculated Oil Recovery, Bbls./Acre	-	1,000.
Packer Setting, Feet	-	
Viscosity, Centipoises @	-	
A. P. I. Gravity, degrees @ 60 °F	-	
Elevation, Feet	-	973.0

Water was used as the circulating fluid during the coring of the sand.

This core was sampled and the samples were sealed in cans by a representative of the client.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
782.0 - 796.2	Laminated sandstone and shale.
796.2 - 805.6	Brown fine grained laminated micaceous shaley sandstone.
805.6 - 809.7	Brown to dark fine grained micaceous slightly shaley sandstone.
809.7 - 810.1	Laminated shale and sandstone.
810.1 - 814.5	Brown to dark fine grained micaceous slightly shaley sandstone.
814.5 - 816.2	Laminated sandstone and shale.
816.2 - 821.0	Dark fine grained laminated micaceous carbonaceous shaley sandstone.
821.0 - 821.3	Coal.
821.3 - 822.0	Hard brown shale.

Coring was started at a depth of 782.0 feet in laminated sandstone and shale and completed at 822.0 feet in hard brown shale. This core shows a total of 22.7 feet of sandstone. For the most part, the pay is made up of fine grained micaceous slightly 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 is 10.2, 24.2 and 16.6 millidarcys respectively; the overall

average being 19.4 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from 1.9 to a maximum of 74 millidarcys.

#### PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 35.3. The weighted average percent oil saturation of the upper, middle and lower sections is 28.8, 44.9 and 35.6 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 51.0, 32.4 and 42.7 respectively; the overall average being 43.5 (See Table III). This gives an overall weighted average total fluid saturation of 78.8 percent. This total fluid saturation indicates some fluid was lost during coring which was probably oil.

The weighted average oil content of the upper, middle and lower sections is 320, 650 and 479 barrels per acre foot respectively; the overall average being 456. The total oil content, as shown by this core, is 17,793 barrels per acre (See Table III).

#### LABORATORY FLOODING TESTS

Produced brine, to which 8,340 parts per million of Fludex WF-1 had been added, was supplied by the client for use as the flooding medium during the laboratory tests.

The sand in this core did not respond too satisfactorily to laboratory flooding tests, as a total recovery of 517 barrels of oil per acre was obtained from 5.2 feet of sand. The weighted average percent oil saturation was reduced from 48.0 to 41.4, or represents an average

recovery of 6.6 percent. The weighted average effective permeability of the samples is 1.00 millidarcys, while the average initial fluid production pressure is 42.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 23 samples tested, 16 produced water and 5 oil. This indicates that approximately 22 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand is for the most part comparatively tight.

#### CONCLUSION

From a study of the enclosed data, we believe that an efficient water-flood, within the vicinity of this well, will recover approximately 1,000 barrels of oil per acre, or an average of 192 barrels of oil per acre foot from the 5.2 feet of floodable pay sand analyzed, provided that the sand will take the required volume of water satisfactorily. In calculating this recovery, an allowance was made for oil lost during coring and it was assumed that the primary production and true water saturation of the sand are 8 and 32 percent respectively. In these calculations, an allowance was also made for permeability distribution but not for sweep efficiency.

The results of the analysis show 5.2 feet of floodable pay sand in the interval extending from a depth of 800.5 to 812.5 feet. Principal drawback of the core is the fact that the tests indicate that the sand in the cored section is for the most part very tight.

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**RESULTS OF PERMEABILITY TESTS**  
**TABLE I**

Company Creek Oil & Gas Company, Inc. Lease                      Wells                      Well No. 15

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	796.8	13.	0.8	0.8	10.40
2	797.3	15.	0.5	1.3	7.50
3	797.8	30.	0.5	1.8	15.00
4	798.3	4.7	0.5	2.3	2.35
5	798.8	2.7	0.5	2.8	1.35
6	799.3	4.7	0.5	3.3	2.35
7	799.8	4.1	0.5	3.8	2.05
8	800.3	6.0	0.5	4.3	3.00
9	800.8	10.	0.5	4.8	5.00
10	801.3	1.9	0.5	5.3	0.95
11	801.8	25.	0.5	5.8	12.50
12	802.3	2.6	0.5	6.3	1.30
13	802.8	2.5	0.5	6.8	1.25
14	803.3	12.	0.5	7.3	6.00
15	803.8	4.4	0.5	7.8	2.20
16	804.3	5.4	0.5	8.3	2.70
17	804.8	1.9	0.5	8.8	0.95
18	805.3	18.	0.6	9.4	10.80
19	805.8	8.7	0.4	9.8	3.48
20	806.3	31.	0.5	10.3	15.50
21	806.8	43.	0.5	10.8	21.50
22	807.3	33.	0.5	11.3	16.50
23	807.8	32.	0.5	11.8	16.00
24	808.3	74.	0.5	12.3	37.00
25	808.8	41.	0.5	12.8	20.40
26	809.3	47.	0.7	13.5	32.90
27	809.8	12.	0.4	13.9	4.80
28	810.3	43.	0.4	14.3	17.20
29	810.8	41.	0.5	14.8	20.50
30	811.3	25.	0.5	15.3	12.50
31	811.8	25.	0.5	15.8	12.50
32	812.3	32.	0.5	16.3	16.00
33	812.8	21.	0.5	16.8	10.50
34	813.3	9.9	0.5	17.3	4.95
35	813.8	9.3	0.5	17.8	4.65
36	814.3	11.	0.5	18.3	5.50
37	816.3	39.	0.3	18.6	11.70
38	816.8	35.	0.5	19.1	17.50
39	817.3	19.	0.5	19.6	9.50
40	817.8	10.	0.5	20.1	5.00
41	818.3	11.	0.5	20.6	5.50
42	818.8	25.	0.5	21.1	12.50
43	819.3	23.	0.5	21.6	11.50
44	819.8	4.2	0.5	22.1	2.10
45	820.3	8.5	0.6	22.7	5.10

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## RESULTS OF SATURATION TESTS

### TABLE II

Company Creek Oil & Gas Company, Inc. Lease Wells Well No. 15

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	782.1	14.9	47	27	74	544	0.5	0.5	272
2	783.0	14.2	41	45	86	452	1.0	1.5	452
3	784.0	14.4	47	46	93	525	1.0	2.5	525
4	785.0	12.2	13	65	78	123	1.0	3.5	123
5	786.0	11.4	20	66	86	177	1.0	4.5	177
6	787.0	12.2	36	54	90	341	1.0	5.5	341
7	788.0	13.1	29	53	82	295	1.0	6.5	295
8	789.0	13.4	27	54	81	281	1.0	7.5	281
9	790.0	14.4	25	51	76	280	1.0	8.5	280
10	791.0	12.2	25	66	91	236	1.0	9.5	236
11	792.0	13.4	26	55	81	271	1.0	10.5	271
12	793.0	16.6	31	40	71	395	1.0	11.5	395
13	794.0	12.5	19	65	84	184	1.0	12.5	184
14	795.0	14.0	21	49	70	228	1.0	13.5	228
15	796.0	12.2	27	56	83	256	0.7	14.2	179
16	797.0	18.1	28	34	62	394	1.3	15.5	512
17	798.0	15.3	23	57	80	273	1.0	16.5	273
18	799.0	17.0	41	36	77	541	1.0	17.5	541
19	800.0	14.9	30	44	74	347	1.0	18.5	347
20	801.0	16.5	45	36	81	576	1.0	19.5	576
21	802.0	14.7	33	43	76	377	1.0	20.5	377
22	803.0	15.3	34	40	74	404	1.0	21.5	404
23	804.0	16.4	46	36	82	585	1.0	22.5	585
24	805.0	17.8	34	36	70	470	1.1	23.6	517
25	806.0	18.0	50	25	75	699	0.9	24.5	629
26	807.0	20.6	53	23	76	848	1.0	25.5	848

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**RESULTS OF SATURATION TESTS**

**TABLE II**

Company Creek Oil & Gas Company, Inc. Lease Wells Well No. 15

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.	
27	808.0	19.6	37	31	68	563	1.0	26.5	563
28	809.0	21.4	51	25	76	847	1.2	27.7	1,016
29	810.0	17.2	50	39	89	668	0.4	28.1	267
30	811.0	20.8	60	25	85	969	1.4	29.5	1,356
31	812.0	19.6	44	38	82	670	1.0	30.5	670
32	813.0	19.9	43	30	73	665	1.0	31.5	665
33	814.0	20.5	34	33	67	540	1.0	32.5	540
34	815.0	12.6	31	58	89	303	1.0	33.5	303
35	816.0	16.5	32	49	81	410	0.7	34.2	287
36	817.0	19.3	33	45	78	495	1.3	35.5	644
37	818.0	17.9	23	51	74	320	1.0	36.5	320
38	819.0	18.8	34	48	82	496	1.0	37.5	496
39	820.0	17.3	48	34	82	545	1.5	39.0	818
							Total	- - - -	17,793

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Creek Oil & Gas Company, Inc. Lease Wells Well No. 15

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
796.2 - 800.5	4.3	10.2	44.00
800.5 - 812.5	12.0	24.2	290.43
812.5 - 820.6	6.4	16.6	106.00
796.2 - 820.6	22.7	19.4	440.43

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
782.0 - 800.5	18.5	14.1	28.8	51.0	320	5,912
800.5 - 812.5	12.0	18.4	44.9	32.4	650	7,808
812.5 - 821.0	8.5	17.9	35.6	42.7	479	4,073
782.0 - 821.0	39.0	16.2	35.3	43.5	456	17,793

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**RESULTS OF LABORATORY FLOODING TESTS**

**TABLE IV**

Company Creek Oil & Gas Company, Inc. Lease Wells Well No. 15

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.			
16	797.0	17.8	30	415	0	0	30	61	415	9	0.203	50
17	798.0	15.5	22	265	0	0	22	61	265	0	Imp.	50+
18	799.0	16.8	43	560	0	0	43	47	560	0	Imp.	50+
19	800.0	15.2	28	330	0	0	28	52	330	0	Imp.	50+
20	801.0	16.7	45	583	1	13	44	47	570	12	0.400	40
21	802.0	14.4	32	358	0	0	32	53	358	0	Imp.	50+
22	803.0	15.5	35	421	0	0	35	48	421	0	Imp.	50+
23	804.0	16.3	46	582	8	101	38	51	481	20	0.717	40
24	805.0	17.6	33	451	0	0	33	61	451	13	0.550	40
25	806.0	17.8	48	663	0	0	48	45	663	15	0.605	40
26	807.0	20.6	53	848	2	32	51	45	816	22	0.711	50
27	808.0	19.3	38	570	0	0	38	52	570	21	0.700	50
28	809.0	21.5	51	851	11	183	40	51	668	86	2.09	40
29	810.0	17.0	48	633	0	0	48	44	633	0	Imp.	50+
30	811.0	20.5	58	923	0	0	58	34	923	11	0.305	40
31	812.0	19.4	44	663	10	151	34	54	512	43	0.863	40
32	813.0	19.8	45	692	0	0	45	50	692	19	0.507	40
33	814.0	20.2	33	518	0	0	33	61	518	11	0.303	40
34	815.0	12.5	29	282	0	0	29	67	282	0	Imp.	50+
35	816.0	16.4	34	433	0	0	34	55	433	5	0.198	50
36	817.0	19.1	33	490	0	0	33	59	490	31	0.600	40
37	818.0	17.6	22	300	0	0	22	70	300	2	0.098	50
38	819.0	18.6	34	491	0	0	34	59	491	18	0.295	40

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.

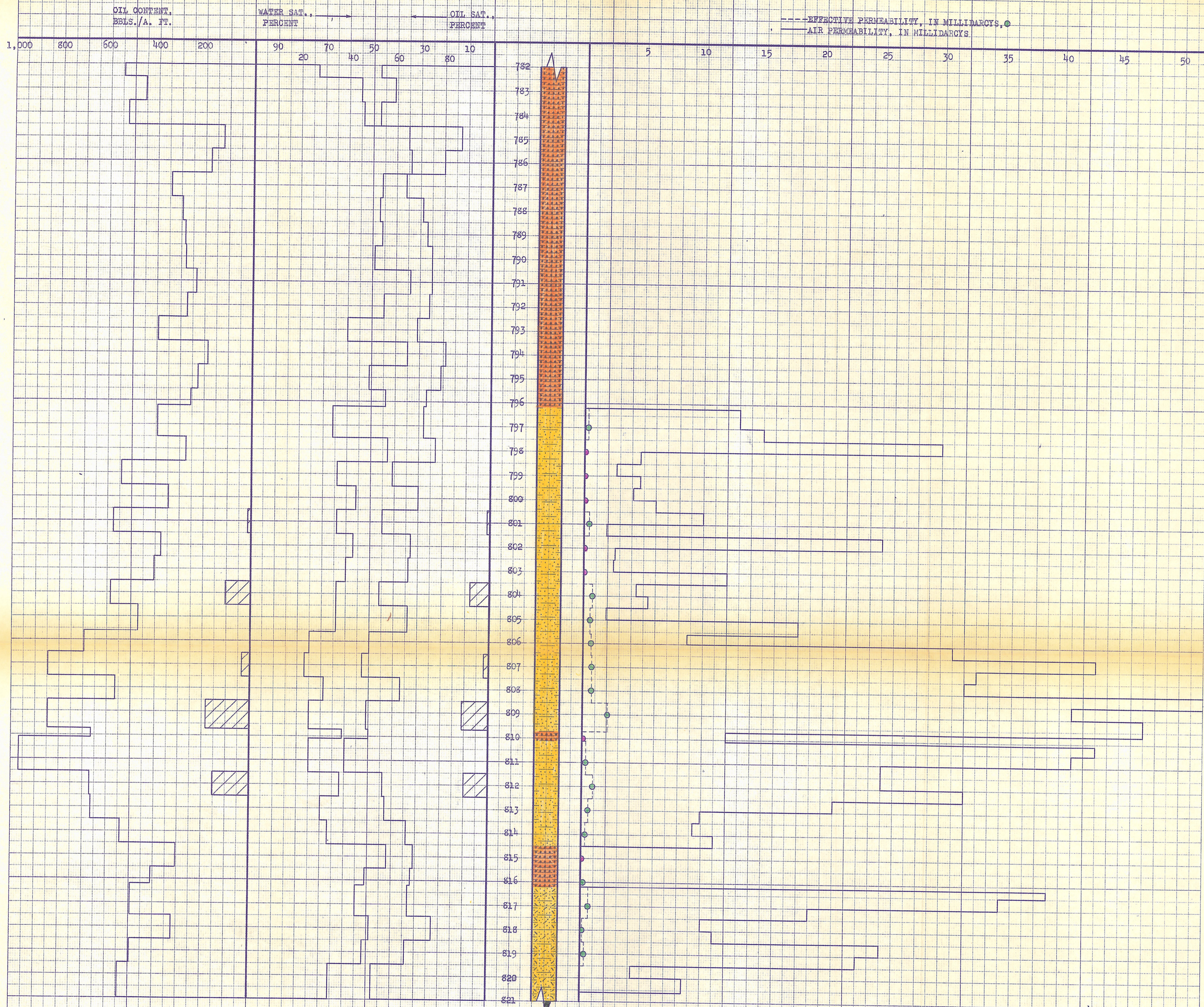
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## SUMMARY OF LABORATORY FLOODING TESTS

### TABLE V

Company	Creek Oil & Gas Company, Inc.	Lease	Wells	Well No.	15
Depth Interval, Feet	800.5 - 812.5				
Feet of Core Analyzed	5.2				
Average Percent Porosity	19.0				
Average Percent Original Oil Saturation	48.0				
Average Percent Oil Recovery	6.6				
Average Percent Residual Oil Saturation	41.4				
Average Percent Residual Water Saturation	49.7				
Average Percent Total Residual Fluid Saturation	91.1				
Average Original Oil Content, Bbls./A. Ft.	712.				
Average Oil Recovery, Bbls./A. Ft.	99.				
Average Residual Oil Content, Bbls./A. Ft.	613.				
Total Original Oil Content, Bbls./Acre	3,698.				
Total Oil Recovery, Bbls./Acre	517.				
Total Residual Oil Content, Bbls./Acre	3,181.				
Average Effective Permeability, Millidarcys	1.00				
Average Initial Fluid Production Pressure, p.s.i.	42.0				

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



KEY:

- FLOOD POT RECOVERY
- SHALEY SANDSTONE
- CARBONACEOUS SHALEY SANDSTONE
- LAMINATED SANDSTONE AND SHALE
- SHALE
- COAL
- IMPERMEABLE TO WATER

### CREEK OIL & GAS COMPANY, INCORPORATED

WELLS LEASE

NEOSHO COUNTY, KANSAS

WELL NO. 15

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLs./A. FT.	TOTAL OIL CONTENT BBLs./ACRE	AVG. AIR PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY, BBLs./ACRE
782.0 - 800.5	18.5	14.1	28.8	51.0	320	5,912	10.2	
800.5 - 812.5	12.0	18.4	44.9	32.4	650	7,808	24.2	
812.5 - 821.0	8.5	17.9	35.6	42.7	479	4,073	16.5	
782.0 - 821.0	39.0	16.2	35.3	43.5	1,456	17,793	19.4	1,000

OILFIELD RESEARCH LABORATORIES  
CHANUTE, KANSAS  
JANUARY, 1958

STANDARD OIL COMPANY  
KANSAS CITY, MISSOURI

KEEFE & ESSER CO.  
MADE IN U.S.A.

STANDARD OIL COMPANY  
KANSAS CITY, MISSOURI