



OILFIELD RESEARCH LABORATORIES

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Chanute, Kansas

March 11, 1965

K-K Drilling Company
P.O. Box 556
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Reuben Willis Lease, Well No. 2, Neosho County, Kansas, and submitted to our laboratory on March 7, 1965.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

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GENERAL INFORMATION & SUMMARY

Company K-K Drilling Co. Lease Reuben Willis Well No. 2

Location _____

Section _____ Twp. _____ Rge. _____ County Neosho State Kansas

Name of Sand	-	Bartlesville
Top of Core	-	850.0
Bottom of Core	-	896.0
Top of Sand	(Analyzed)	860.0
Bottom of Sand	(Analyzed)	891.6
Total Feet of Permeable Sand	-	28.0
Total Feet of Floodable Sand	-	11.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	10.2	10.2
10 - 50	9.0	19.2
50 - 71	8.8	28.0

Average Permeability Millidarcys	-	28.3
Average Percent Porosity	-	16.6
Average Percent Oil Saturation	-	38.4
Average Percent Water Saturation	-	39.5
Average Oil Content, Bbls./A. Ft.	-	499.
Total Oil Content, Bbls./Acre	-	13,996.
Average Percent Oil Recovery by Laboratory Flooding Tests	-	7.5
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-	107.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-	1,260.
Total Calculated Oil Recovery, Bbls./Acre	(Primary & Secondary)	4,370.
Packer Setting, Feet	-	
Viscosity, Centipoises @	-	
A. P. I. Gravity, degrees @ 60 °F	-	
Elevation, Feet	-	

Fresh water mud was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in plastic bags by a representative of Oilfield Research Laboratories. The well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
850.0 - 860.0	Laminated sandstone and shale.
860.0 - 870.2	Grayish light brown, laminated, shaly sandstone.
870.2 - 871.6	Light brown, slightly shaly sandstone.
871.6 - 875.0	Brown, slightly shaly sandstone.
875.0 - 879.6	Brown, laminated, shaly sandstone.
879.6 - 891.6	Grayish brown to dark, laminated, shaly, slightly carbonaceous sandstone.
891.6 - 893.0	Dark, carbonaceous, conglomeratic sandstone.
893.0 - 896.0	Loss.

Coring was started at a depth of 850.0 feet in laminated sandstone and shale and completed at 896.0 feet, the bottom of the core being lost. For the most part, the pay is made up of brown, shaly 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 3.8, 40.4 and 26.6 millidarcys respectively; the overall average being 28.3 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a rather irregular permeability profile. The permeability of the sand varies from 0.25 to a maximum of 71. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 38.4. The weighted average percent oil saturation of the upper, middle and lower sections is 30.0, 40.8 and 41.6 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 48.6, 35.7 and 38.9 respectively; the overall average being 39.5 (See Table III). This gives an overall weighted average total fluid saturation of 77.9 percent. This somewhat low total fluid saturation indicates some fluid was lost during coring; the majority of this loss was probably oil.

The weighted average oil content of the upper, middle and lower sections is 347, 556 and 528 barrels per acre foot respectively; the overall average being 499. The total oil content, as shown by this core, is 13,996 barrels per acre of which 6,826 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,260 barrels of oil per acre was obtained from 11.8 feet of sand. The weighted average percent oil saturation was reduced from 41.1 to 33.6, or represents an average recovery of 7.5 percent. The weighted average effective permeability of the samples is 1.15 millidarcys, while the average initial fluid production pressure is 35.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 28 samples tested, 16 produced water and 12 oil. This indicates that approximately 43 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide variation in effective permeability to water.

CONCLUSION

Based on the results of the laboratory tests, it appears that efficient primary and secondary operations in the vicinity of this well should recover approximately 1,630 and 2,740 barrels of oil per acre. These are average recoveries of 76 and 232 barrels per acre foot respectively. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.05
Reservoir water saturation, percent	25.0
Expected primary recovery, estimated, percent	6.0
Average porosity, percent	18.2
Oil saturation after flooding, percent	33.6
Performance factor, percent	50.0
Net floodable pay sand, feet	11.8

This core shows a pay sand section having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water. The secondary recovery value was calculated assuming that satisfactory water injection rates will be maintained throughout the flood life of the property.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company K-K Drilling Co. Lease Reuben Willis Well No. 2

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	860.5	16.3	37	40	77	467	0.99	1.0	1.0	467	0.99
2	862.1	11.8	30	68	98	274	0.25	1.0	2.0	274	0.25
3	863.1	14.1	25	57	82	274	3.0	1.0	3.0	274	3.00
4	864.0	15.2	30	46	76	354	13.	1.0	4.0	354	13.00
5	868.1	16.5	34	39	73	435	1.7	1.0	5.0	435	1.70
6	869.3	15.1	26	44	70	305	4.0	1.6	6.6	488	6.40
7	870.4	19.5	29	38	67	439	68.	0.4	7.0	179	27.20
8	871.1	19.2	34	34	68	507	62.	1.0	8.0	507	62.00
9	872.1	19.4	43	29	72	648	71.	1.0	9.0	648	71.00
10	873.1	19.1	43	28	71	637	63.	1.0	10.0	637	63.00
11	874.1	19.1	45	24	69	668	57.	1.4	11.4	935	79.80
12	875.1	13.7	34	48	82	362	1.5	0.6	12.0	218	0.90
13	876.1	18.6	51	35	86	736	22.	1.0	13.0	736	22.00
14	877.1	17.0	42	33	75	555	8.4	1.0	14.0	555	8.40
15	878.1	17.2	40	36	76	535	8.1	1.0	15.0	535	8.10
16	879.1	18.3	35	38	73	497	23.	1.0	16.0	497	23.00
17	880.1	17.0	33	47	80	436	60.	1.0	17.0	436	60.00
18	881.1	16.3	40	36	76	506	59.	1.0	18.0	506	59.00
19	882.1	17.3	45	40	85	605	34.	1.0	19.0	605	34.00
20	883.1	14.9	46	37	83	533	62.	1.0	20.0	533	62.00
21	884.1	15.2	41	44	85	485	1.1	1.0	21.0	485	1.10
22	885.1	18.5	41	35	76	590	35.	1.0	22.0	590	35.00
23	886.1	16.3	49	40	89	620	3.2	1.0	23.0	620	3.20
24	887.1	16.2	46	33	79	579	40.	1.0	24.0	579	40.00
25	888.1	15.7	36	44	80	439	16.	1.0	25.0	439	16.00
26	889.1	16.9	40	38	78	525	27.	1.0	26.0	525	27.00
27	890.1	15.3	41	47	88	487	51.	1.0	27.0	487	51.00
28	891.1	15.3	38	35	73	452	14.	1.0	28.0	452	14.00
								Total	-----	13,996	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company K-K Drilling Company Lease Reuben Willis Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
860.0 - 870.2	6.6	3.8	25.34
870.2 - 884.6	14.4	40.4	581.50
884.6 - 891.6	7.0	26.6	186.20
860.0 - 891.6	28.0	28.3	793.04

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
860.0 - 870.2	6.6	14.9	30.0	48.6	347	2,292
870.2 - 884.6	14.4	17.5	40.8	35.7	556	8,012
884.6 - 891.6	7.0	16.3	41.6	38.9	528	3,692
860.0 - 891.6	28.0	16.6	38.4	39.5	499	13,996

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company K-K Drilling Company Lease Reuben Willis Well No. 2

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Field Production Pressure Lbs./Sq./In.
			%	Ebbl./A. Ft.	%	Ebbl./A. Ft.	% Oil	% Water	Ebbl./A. Ft.			
1	860.5	16.5	37	473	0	0	37	41	473	0	Imp.	-
2	862.1	11.4	32	283	0	0	32	67	283	0	Imp.	-
3	863.1	14.1	25	273	0	0	25	59	273	0	Imp.	-
4	864.0	15.5	31	373	0	0	31	45	373	0	Imp.	-
5	868.1	16.3	33	417	0	0	33	41	417	0	Imp.	-
6	869.3	15.1	26	304	0	0	26	46	304	0	Imp.	-
7	870.4	19.7	29	443	2	31	27	55	412	78	2.90	30
8	871.1	19.7	34	519	6	92	28	40	427	13	0.500	40
9	872.1	19.8	43	660	11	169	32	48	491	28	1.00	30
10	873.1	19.5	43	650	9	136	34	55	514	25	1.00	40
11	874.1	19.6	45	684	7	106	38	53	578	23	0.900	30
12	875.1	13.5	36	376	0	0	36	47	376	0	Imp.	-
13	876.1	18.8	51	744	16	233	35	42	511	4	0.400	50
14	877.1	16.8	44	572	0	0	44	35	572	0	Imp.	-
15	878.1	17.2	39	520	0	0	39	38	520	0	Imp.	-
16	879.1	18.0	35	488	3	42	32	52	446	8	0.500	50
17	880.1	17.5	33	447	3	41	30	58	406	48	1.90	30
18	881.1	16.8	40	521	7	91	33	54	430	42	1.60	30
19	882.1	17.8	45	621	11	152	34	57	469	85	3.00	20
20	883.1	15.3	46	546	7	83	39	46	463	25	0.900	30
21	884.1	15.6	41	496	5	61	36	51	435	6	0.300	50
22	885.1	18.4	41	585	0	0	41	37	585	0	Imp.	-
23	886.1	16.0	51	632	0	0	51	39	632	0	Imp.	-
24	887.1	16.4	46	584	0	0	46	36	584	0	Imp.	-
25	888.1	16.0	36	446	0	0	36	47	446	25	1.10	40
26	889.1	17.3	39	523	0	0	39	43	523	20	0.800	40
27	890.1	15.3	42	498	0	0	42	47	498	55	1.90	30
28	891.1	15.5	38	456	0	0	38	48	456	13	0.500	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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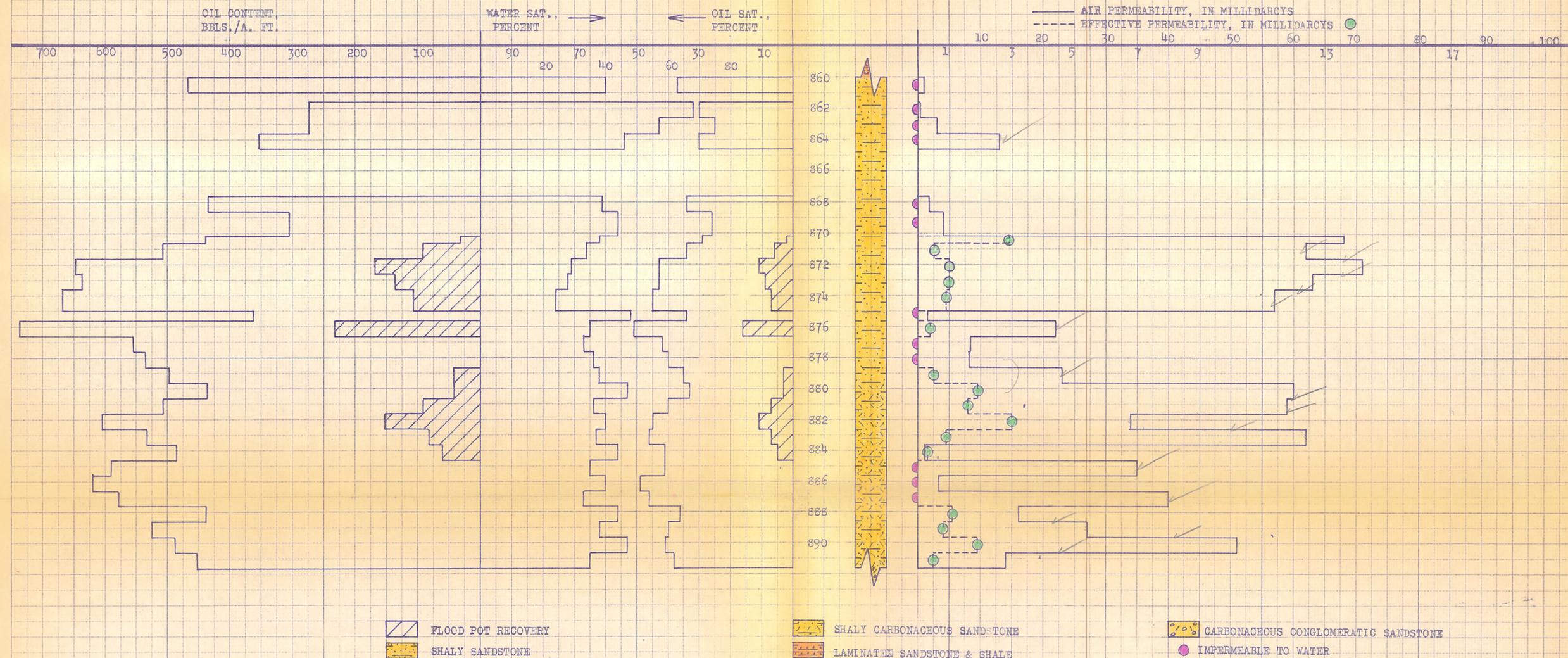
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company <u>K-K Drilling Co.</u>	Lease <u>Reuben Willis</u>	Well No. <u>2</u>
Depth Interval, Feet	870.2 - 884.6	
Feet of Core Analyzed	11.8	
Average Percent Porosity	18.2	
Average Percent Original Oil Saturation	41.1	
Average Percent Oil Recovery	7.5	
Average Percent Residual Oil Saturation	33.6	
Average Percent Residual Water Saturation	10.8	
Average Percent Total Residual Fluid Saturation	84.4	
Average Original Oil Content, Bbls./A. Ft.	578.	
Average Oil Recovery, Bbls./A. Ft.	107.	
Average Residual Oil Content, Bbls./A. Ft.	471.	
Total Original Oil Content, Bbls./Acre	6,826.	
Total Oil Recovery, Bbls./Acre	1,260.	
Total Residual Oil Content, Bbls./Acre	5,566.	
Average Effective Permeability, Millidarcys	1.15	
Average Initial Fluid Production Pressure, p.s.i.	35.8	

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

K-M STANDARD CROSS SECTION MILLIMETERS



K-K DRILLING COMPANY

REUBEN WILLIS LEASE WELL NO. 2
NEOSHO COUNTY, KANSAS

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 PERMPABILITY MILLIDARCYs	CALCULATED OIL RECOVERY, BBLs./ACRE
860.0 - 870.2	6.6	14.9	30.0	48.6	34.7	2,292	3.8	
870.2 - 884.6	14.4	17.5	40.8	35.7	556	8,012	40.4	
884.6 - 891.6	7.0	16.3	41.6	33.9	528	3,692	26.6	
860.0 - 891.6	28.0	16.6	38.4	39.5	409	13,906	28.3	4,370 (Primary & Secondary)

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