OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

January 29, 1966

Brazos Oil & Gas Company
P.O. Box 22468
Houston, Texas

Attn: Mr. G.P. Huston

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the A.E. Johnson Lease, Well No. 10, Douglas County, Kansas, and submitted to our laboratory on January 24, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

BRP:rf

8 c. - Houston, Texas
1 c. - Chanute, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

Location 467' SNL & 2375' EWL, NW

Section 1 Twp. 15S Rge. 20E County Douglas State Kansas

Name of Sand	Squirrel
Top of Core	807.0
Bottom of Core	868.0
Top of Sand (Analyzed)	812.5
Bottom of Sand (Analyzed)	859.6
Total Feet of Permeable Sand	37.4
Total Feet of Floodable Sand	16.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	11.6	11.6
10 - 50	18.8	30.4
50 - 100	5.0	35.4
100 & above	2.0	37.4

Average Permeability Millidarcys	29.8
Average Percent Porosity	20.7
Average Percent Oil Saturation	41.3
Average Percent Water Saturation	45.3
Average Oil Content, Bbls./A. Ft.	655.
Total Oil Content, Bbls./Acre	24,503.
Average Percent Oil Recovery by Laboratory Flooding Tests	11.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	202.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	3,386.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	5,250.
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 cans 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:

Depth Interval, Feet	Description
807.0 - 812.5	Sandy shale.
812.5 - 820.0	Gray shaly sandstone.
820.0 - 829.6	Light brown, shaly sandstone.
829.6 - 840.7	Brown, slightly laminated, slightly shaly sandstone.
840.7 - 841.3	Gray sandy limestone.
841.3 - 849.0	Brown, laminated, shaly sandstone.
849.0 - 851.0	Loss.
851.0 - 858.3	Grayish brown, laminated, shaly sandstone.
858.3 - 860.0	Dark carbonaceous sandstone.
860.0 - 867.0	Shale.
867.0 - 868.0	Loss.

Coring was started at a depth of 807.0 feet in sandy shale and completed at 868.0 feet, the bottom of the core being lost. For the most part, the pay is made up of brown, slightly laminated, slightly 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 37.6, 37.4 and 4.4 millidarcys respectively; the overall average being 29.8 (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 0.62 to a maximum of 135. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 41.3. The weighted average percent oil saturation of the upper, middle and lower sections is 24.1, 50.6 and 40.8 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 59.1, 37.4 and 46.0 respectively; the overall average being 45.3 (See Table III). This gives an overall weighted average total fluid saturation of 86.6 percent.

The weighted average oil content of the upper, middle and lower sections is 361, 832 and 612 barrels per acre foot respectively; the overall average being 655. The total oil content, as shown by this core, is 24,503 barrels per acre of which 14,067 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 3,386 barrels of oil per acre was obtained from 16.8 feet of sand. The weighted average percent oil saturation was reduced from 49.7 to 37.8, or represents an average recovery of 11.9 percent. The weighted average effective permeability of the samples is 1.22 millidarcys, while the average initial fluid production pressure is 35.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 37 samples tested, 23 produced water and 16 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

The results of the laboratory tests indicate that efficient primary and secondary operations in the vicinity of this well should recover approximately 5,250 barrels of oil per acre or an average of 295 barrels per acre foot from the 17.8 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.06
Reservoir water saturation, percent	25.0
Average porosity, percent	21.7
Oil saturation after flooding, percent	37.8
Performance factor, percent	50.0
Net floodable pay sand, feet	17.8

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.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

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	813.1	21.2	18	70	88	296	11.	1.0	1.0	296	11.00
2	816.1	16.7	28	52	80	362	0.95	1.0	2.0	362	0.95
3	820.1	21.1	21	62	83	344	30.	1.0	3.0	344	30.00
4	823.1	19.6	18	68	86	274	8.3	1.0	4.0	274	8.30
5	824.1	19.6	21	63	84	319	33.	1.0	5.0	319	33.00
6	825.1	23.2	17	61	78	306	49.	1.0	6.0	306	49.00
7	826.1	22.0	19	64	83	324	42.	1.0	7.0	324	42.00
8	827.1	23.8	25	57	82	461	60.	1.0	8.0	461	60.00
9	828.1	23.2	35	46	81	629	74.	1.0	9.0	629	74.00
10	829.1	19.5	39	48	87	590	68.	1.0	10.0	590	68.00
11	830.1	21.0	46	39	85	749	123.	1.0	11.0	749	123.00
12	831.1	23.6	50	35	85	915	68.	1.0	12.0	915	68.00
13	832.1	24.3	55	35	90	1,037	135.	1.0	13.0	1,037	135.00
14	833.1	22.9	56	33	89	994	41.	1.0	14.0	994	41.00
15	834.1	21.3	62	29	91	1,024	21.	1.0	15.0	1,024	21.00
16	835.1	20.1	50	36	86	779	11.	1.0	16.0	779	11.00
17	836.1	22.4	58	28	86	1,008	14.	1.0	17.0	1,008	14.00
18	837.1	20.4	50	35	85	790	15.	1.0	18.0	790	15.00
19	838.1	18.1	61	34	95	855	15.	1.0	19.0	855	15.00
20	839.1	20.7	52	34	86	834	22.	1.0	20.0	834	22.00
21	840.1	22.1	52	32	84	891	22.	1.1	21.1	981	24.20
22	842.1	21.6	53	39	92	887	28.	1.3	22.4	1,152	36.40
23	843.1	20.7	49	41	90	786	24.	1.0	23.4	786	24.00
24	844.1	20.0	34	45	79	527	23.	1.0	24.4	527	23.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Brazos Oil & Gas Co. Lease A.E. Johnson Well No. 10

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.		
25	845.1	18.9	45	43	88	659	6.3	1.0	25.4	659	6.30
26	846.1	21.0	57	38	95	928	23.	1.0	26.4	928	23.00
27	847.1	21.8	40	46	86	676	61.	1.0	27.4	676	61.00
28	848.1	20.2	43	48	91	674	29.	1.4	28.8	943	40.60
29	851.1	19.3	50	44	94	748	2.1	0.6	29.4	449	1.26
30	852.1	18.3	29	56	85	411	8.8	1.0	30.4	411	8.80
31	853.1	20.1	40	46	86	624	2.7	1.0	31.4	624	2.70
32	854.1	20.6	38	48	86	606	8.3	1.0	32.4	606	8.30
33	855.1	19.9	42	47	89	647	4.3	1.0	33.4	647	4.30
34	856.1	18.8	39	50	89	569	6.4	1.0	34.4	569	6.40
35	857.1	16.7	39	52	91	506	4.2	1.0	35.4	506	4.20
36	858.1	19.2	37	43	80	551	1.6	0.7	36.1	386	1.12
37	859.1	20.3	52	31	83	818	0.62	1.3	37.4	1,063	0.81
								Total------		24,503	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
812.5 - 829.6	10.0	37.6	376.25
829.6 - 849.0	18.8	37.4	703.50
851.0 - 859.6	8.6	4.4	37.89
812.5 - 859.6	37.4	29.8	1,117.64

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
812.5 - 829.6	10.0	21.0	24.1	59.1	361	3,605
829.6 - 849.0	18.6	21.2	50.6	37.4	832	15,637
851.0 - 859.6	8.6	19.3	40.8	46.0	612	5,261
812.5 - 859.6	37.2	20.7	41.3	45.3	655	24,503

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

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.			
1	813.1	21.0	20	326	0	0	20	71	326	0	Imp.	-
2	816.1	16.8	28	364	0	0	28	51	364	0	Imp.	-
3	820.1	21.1	21	343	0	0	21	77	343	86	1.74	20
4	823.1	20.0	20	310	0	0	20	79	310	44	0.774	20
5	824.1	19.9	21	324	0	0	21	72	324	20	0.386	30
6	825.1	22.8	18	318	0	0	18	70	318	53	1.16	20
7	826.1	22.5	18	314	0	0	18	77	314	108	2.42	20
8	827.1	24.2	25	469	0	0	25	63	469	33	0.484	20
9	828.1	23.7	35	643	5	92	30	60	551	54	0.870	20
10	829.1	20.0	39	604	7	108	32	61	496	40	0.870	30
11	830.1	21.5	46	766	16	266	30	67	500	364	8.70	20
12	831.1	23.2	50	900	14	252	36	62	648	176	4.06	30
13	832.1	24.0	55	1023	16	298	39	58	725	46	0.774	20
14	833.1	22.6	56	981	23	403	33	61	578	35	0.774	30
15	834.1	21.2	62	1020	31	510	31	65	510	11	0.194	40
16	835.1	19.8	50	768	0	0	50	38	768	0	Imp.	-
17	836.1	22.0	58	989	16	273	42	55	716	3	0.097	50
18	837.1	20.1	50	778	11	171	39	55	607	4	0.097	50
19	838.1	18.4	62	884	0	0	62	35	884	0	Imp.	-
20	839.1	20.4	52	823	9	142	43	54	681	4	0.097	50
21	840.1	21.7	52	874	11	185	41	56	689	5	0.100	50
22	842.1	22.1	53	909	8	137	45	49	772	19	0.386	40
23	843.1	21.2	49	806	11	181	38	58	625	13	0.290	40
24	844.1	20.2	35	549	0	0	35	63	549	11	0.290	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.

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

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.			
25	845.1	18.7	46	666	0	0	46	44	666	0	Imp.	-
26	846.1	21.4	57	944	10	166	47	50	778	27	0.580	30
27	847.1	22.3	40	691	3	52	37	61	639	69	1.84	30
28	848.1	20.5	43	683	4	64	39	60	619	18	0.484	40
29	851.1	19.5	52	785	0	0	52	45	785	0	Imp.	-
30	852.1	18.3	29	411	0	0	29	58	411	0	Imp.	-
31	853.1	20.0	42	651	0	0	42	49	651	0	Imp.	-
32	854.1	20.8	36	581	0	0	36	51	581	0	Imp.	-
33	855.1	19.9	43	664	0	0	43	48	664	0	Imp.	-
34	856.1	18.6	40	576	0	0	40	49	576	0	Imp.	-
35	857.1	16.6	40	514	0	0	40	52	514	0	Imp.	-
36	858.1	19.0	35	516	0	0	35	45	516	0	Imp.	-
37	859.1	20.5	54	857	0	0	54	30	857	0	Imp.	-

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 V

Company Brazos Oil & Gas Company Lease A.E. Johnson Well No. 10

Depth Interval, Feet	812.5 - 829.6	829.6 - 849.0	812.5 - 849.0
Feet of Core Analyzed	2.0	14.8	16.8
Average Percent Porosity	21.9	21.7	21.7
Average Percent Original Oil Saturation	37.0	51.4	49.7
Average Percent Oil Recovery	6.0	12.7	11.9
Average Percent Residual Oil Saturation	31.0	38.7	37.8
Average Percent Residual Water Saturation	60.5	44.6	46.5
Average Percent Total Residual Fluid Saturation	91.5	83.3	84.3
Average Original Oil Content, Bbls./A. Ft.	624.	866.	837.
Average Oil Recovery, Bbls./A. Ft.	100.	216.	202.
Average Residual Oil Content, Bbls./A. Ft.	524.	650.	635.
Total Original Oil Content, Bbls./Acre	1,247.	12,820.	14,067.
Total Oil Recovery, Bbls./Acre	200.	3,186.	3,386.
Total Residual Oil Content, Bbls./Acre	1,047.	9,634.	10,681.
Average Effective Permeability, Millidarcys	0.870	1.27	1.22
Average Initial Fluid Production Pressure, p.s.i.	25.0	37.1	35.6

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