



OILFIELD RESEARCH LABORATORIES

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November 28, 1979

Somerset Energy, Incorporated
P.O. Box 449
Moran, Kansas 66755

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Big Lake Lease, Well No. S-108, Miami County, Kansas, and submitted to our laboratory on November 7, 1979.

Your business is greatly appreciated.

Very truly yours,

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Benjamin R. Pearman

SAM/tem
5 c to Moran, Kansas

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GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Big Lake Well No. S-108

Location 350' SNL & 1900' WEL

Section 29 Twp. 16S Rge. 24E County Miami State Kansas

Name of Sand	Big Lake
Top of Core	357.0
Bottom of Core	387.0
Top of Sand	357.0
Bottom of Sand	380.0
Total Feet of Permeable Sand	17.8
Total Feet of Floodable Sand	2.5

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 20
20 - 100
100 - 300
300 - 1000
1000 & Above

6.9
1.6
5.0
3.3
1.0

6.9
8.5
13.5
16.8
17.8

Average Permeability Millidarcys	297.1
Average Percent Porosity	16.1
Average Percent Oil Saturation	23.5
Average Percent Water Saturation	66.1
Average Oil Content, Bbls./A. Ft.	290.
Total Oil Content, Bbls./Acre	6,039.
Average Percent Oil Recovery by Laboratory Flooding Tests	11.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	178.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	445.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as a drilling fluid. The core was reported to be from a non-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
357.0 - 360.0	Calcareous sandstone.
360.0 - 363.9	Light brown laminated calcareous sandstone and shale.
363.9 - 364.5	Light brown slightly calcareous sandstone.
364.5 - 367.8	Light brown sandstone.
367.8 - 380.0	Light brown slightly calcareous sandstone.
380.0 - 387.0	Gray shale.

LABORATORY FLOODING TESTS

At the request of the client, several samples were subjected to laboratory flooding tests.

These samples responded to laboratory flooding tests, as a total recovery of 445 barrels of oil per acre was obtained from 2.5 feet of sand. The weighted average percent oil saturation was reduced from 37.6 to 26.2 or represents an average recovery of 11.4 percent. The weighted average effective permeability of the samples is 10.98 millidarcys, while the average initial fluid production pressure is 15.0 pounds per square inch (See Table V).

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CALCULATED RECOVERY

(CLIENT SELECTED SAMPLES)

The results of the laboratory tests indicate that efficient primary and waterflood operations in the vicinity of this well should recover approximately 263 barrels of oil per acre foot.

This recovery value was calculated using the following data and assumptions:

Original formation volume factor, estimated	1.03
Reservoir water saturation, percent, estimated	35.0
Average porosity, percent	20.4
Oil saturation after flooding, percent	26.2
Performance factor, percent, estimated	45.0
Net floodable sand, feet, tested	2.5

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-108

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	357.7	12.7	23	72	95	227	11.	1.0	1.0	227	11.00
2	358.7	3.5	30	65	95	81	Imp.	1.0	2.0	81	0.00
3	359.7	3.8	42	54	96	124	2.8	1.0	3.0	124	2.80
4	360.7	9.8	15	80	95	114	Imp.	1.0	4.0	114	0.00
5	362.0	16.2	13	80	93	163	8.9	1.9	5.9	310	16.91
6	363.0	9.3	10	86	96	72	Imp.	1.0	6.9	72	0.00
7	364.3	16.3	32	64	96	405	26.	0.6	7.5	243	15.60
8	365.4	18.5	43	51	94	617	49.	1.0	8.5	617	49.00
9	366.0	22.7	35	51	86	616	926.	1.0	9.5	616	926.00
10	367.2	21.9	17	79	96	289	611.	1.3	10.8	376	794.30
11	370.4	21.0	34	60	94	554	181.	1.5	12.3	831	271.50
12	372.1	21.6	11	82	93	184	1703.	1.0	13.3	184	1703.00
13	373.0	13.4	27	39	66	281	296.	1.0	14.3	281	296.00
14	374.0	19.2	16	64	80	238	7.1	1.0	15.3	238	7.10
15	374.7	25.6	29	59	88	576	679.	1.0	16.3	576	679.00
16	376.2	11.2	15	53	68	130	8.2	1.0	17.3	130	8.20
17	377.0	14.1	28	55	83	306	13.	1.0	18.3	306	13.00
18	378.2	19.2	29	56	85	432	203	1.0	19.3	432	203.00
19	379.3	20.1	12	83	95	187	195.	1.5	20.8	281	292.50

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Somerset Energy, Incorporated	Lease	Big Lake	Well No.	S-108	
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
357.0 - 363.9	3.9	7.9	30.71			
363.9 - 375.5	9.4	504.4	4,741.20			
375.5 - 380.0	4.5	114.8	516.70			
357.0 - 380.0	17.8	297.1	5,288.61			
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
357.0 - 363.9	6.9	10.1	21.0	73.8	134	928
363.9 - 375.5	9.4	20.3	27.0	61.4	421	3,962
375.5 - 380.0	4.5	16.6	20.0	64.1	255	1,149
357.0 - 380.0	20.8	16.1	23.5	66.1	290	6,039

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Somerset Energy, Incorporated			Lease Big Lake			Well No. S-108						
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.
8	365.4	19.0	43	634	15	221	28	64	413	308	17.89	15
10	367.2	22.3	17	294	0	0	17	74	294	253	21.86	10
11	370.4	21.4	34	564	9	149	25	72	415	389	6.37	15
13	373.0	13.0	27	272	0	0	27	70	272	6	0.15	50
16	376.2	11.0	16	137	0	0	16	79	137	12	0.22	30
19	379.3	20.6	12	192	0	0	12	84	192	105	1.42	20

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.

Company Somerset Energy, Incorporated

Lease Big Lake

Well No. S-108

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Somerset Energy, Incorporated	Lease	Big Lake	Well No.	S-108
Depth Interval, Feet	363.9 - 375.5				
Feet of Core Analyzed	2.5				
Average Percent Porosity	20.4				
Average Percent Original Oil Saturation	37.6				
Average Percent Oil Recovery	11.4				
Average Percent Residual Oil Saturation	26.2				
Average Percent Residual Water Saturation	68.8				
Average Percent Total Residual Fluid Saturation	95.0				
Average Original Oil Content, Bbls./A. Ft.	592.				
Average Oil Recovery, Bbls./A. Ft.	178.				
Average Residual Oil Content, Bbls./A. Ft.	414.				
Total Original Oil Content, Bbls./Acre	1,481.				
Total Oil Recovery, Bbls./Acre	445.				
Total Residual Oil Content, Bbls./Acre	1,036.				
Average Effective Permeability, Millidarcys	10.98				
Average Initial Fluid Production Pressure, p.s.i.	15.0				

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

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VI

Company Somerset Energy, Inc. Lease Big Lake Well No. S-108

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate Drilling & Foreign Total
1	357.7	13,500.	
2	358.7	40,147.	
3	359.7	31,015.	
4	360.7	12,049.	
5	362.0	10,392.	
6	363.0	11,857.	
7	364.3	14,362.	
8	365.4	17,430.	
9	366.0	13,184.	
10	367.2	12,202.	
11	370.4	16,273.	
12	372.1	10,950.	
13	373.0	16,392.	
14	374.0	12,805.	
15	374.7	13,825.	
16	376.2	15,702.	
17	377.0	13,522.	
18	378.2	9,135.	
19	379.3	12,829.	