OILFIELD RESEARCH LABORATORIES
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December 12, 1979

Somerset Energy, Incorporated
1203 Iowa Street
Lawrence, Kansas 66044

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Miller Lease, Well No. 4-W-O, Miami County, Kansas, and submitted to our laboratory on November 16, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

SAM/tem
5 c to Lawrence, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Miller Well No. 4-W-O

Location -

Section 29 Twp. 18S Rge. 23E County Miami State Kansas

Name of Sand	Peru
Top of Core	-
Bottom of Core	-
Top of Sand	-
Bottom of Sand	-
Total Feet of Permeable Sand	3.8
Total Feet of Floodable Sand	1.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	1.0	1.0
10 - 30	1.1	2.1
70 - 100	1.7	3.8

Average Permeability Millidarcys	43.9
Average Percent Porosity	17.5
Average Percent Oil Saturation	45.5
Average Percent Water Saturation	44.9
Average Oil Content, Bbls./A. Ft.	624.
Total Oil Content, Bbls./Acre	2,373.
Average Percent Oil Recovery by Laboratory Flooding Tests	16.1
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	240.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	384.
Total Calculated Oil Recovery, Bbls./Acre	-
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.

Inasmuch as the client did not furnish the laboratory with the depth of the core, no depths, depth intervals, or calculated recovery is given.

FORMATION CORED

Brown slightly calcareous sandstone.

Gray and light brown laminated shale and slightly calcareous sandstone.

Brown slightly calcareous sandstone laminated with shale partings.

Gray and light brown laminated shale and slightly calcareous sandstone.

Dark brown laminated slightly calcareous sandstone.

Gray and light brown laminated shale and slightly calcareous sandstone.

Gray laminated sandy shale.

Dark brown slightly calcareous sandstone.

Gray limestone.

Gray and light brown laminated shale and slightly calcareous sandstone.

Gray sandy shale.

LABORATORY FLOODING TESTS

At the request of the client, two samples were subjected to floodpot testing. These samples responded to laboratory flooding tests, as a total recovery of 384 barrels of oil per acre was obtained from 1.6 feet of sand. The weighted average percent oil saturation was reduced from 46.6 to 30.5, or represents an average

recovery of 16.1 percent. The weighted average effective permeability of the samples is 1.97 millidarcys, while the average initial fluid production pressure is 35.0 pounds per square inch (See Table V).

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated Lease Miller Well No. 4-W-O

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	-	18.5	42	43	85	603	1.7	0.4	0.4	241	0.68
2	-	17.8	31	58	89	428	2.3	0.6	1.0	257	1.38
3	-	16.7	31	61	92	402	17.	0.8	1.8	322	13.60
4	-	18.9	56	35	91	821	78.	1.0	2.8	821	78.00
5	-	12.9	18	74	92	180	29.	0.3	3.1	54	8.70
6	-	17.1	73	18	91	968	92.	0.7	3.8	678	64.40

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Somerset Energy, Incorporated Lease Miller Well No. 4-W-O

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
-	3.8	43.9	166.76

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
-	3.8	17.5	45.5	44.9	624	2,373

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Somerset Energy, Incorporated Lease Miller Well No. 4-W-O

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.			
2	-	18.2	31	438	3	43	28	66	395	20	0.75	40
4	-	19.2	56	834	24	358	32	65	476	161	2.70	30

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 Somerset Energy, Incorporated Lease Miller Well No. 4-W-O

Depth Interval, Feet	-
Feet of Core Analyzed	1.6
Average Percent Porosity	18.8
Average Percent Original Oil Saturation	46.6
Average Percent Oil Recovery	16.1
Average Percent Residual Oil Saturation	30.5
Average Percent Residual Water Saturation	65.4
Average Percent Total Residual Fluid Saturation	95.9
Average Original Oil Content, Bbls./A. Ft.	686.
Average Oil Recovery, Bbls./A. Ft.	240.
Average Residual Oil Content, Bbls./A. Ft.	446.
Total Original Oil Content, Bbls./Acre	1097.
Total Oil Recovery, Bbls./Acre	384.
Total Residual Oil Content, Bbls./Acre	713.
Average Effective Permeability, Millidarcys	1.97
Average Initial Fluid Production Pressure, p.s.i.	35.0

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 Miller Well No. 4-W-O

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
1		19,175			
2		17,841			
3		17,523			
4		13,600			
5		13,934			
6		19,295			

Note: ppm — parts per million