

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

October 28, 1981

Salshanna Petroleum
401 Oak Street
Iola, Kansas 66749

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Massoth Lease, Well No. 5, located in Woodson County, Kansas and submitted to our laboratory on October 21, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

A handwritten signature in black ink, appearing to read "Sanford A. Michel". The signature is fluid and cursive, with the first name "Sanford" being more prominent and the last name "Michel" following in a similar style.

Sanford A. Michel

SAM/kas

5 c to Iola, Kansas

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GENERAL INFORMATION & SUMMARY

Company Salshanna Petroleum Lease Massoth Well No. 5
 Location 825' FNL & 410' FEL W $\frac{1}{2}$, SW $\frac{1}{4}$
 Section 15 Twp. 25S Rge. 17E County Woodson State Kansas

Elevation, Feet

Name of Sand.....

Squirrel

Top of Core

802.0

Bottom of Core

808.0

Top of Sand

802.0

Bottom of Sand

807.4

Total Feet of Permeable Sand

5.4

Total Feet of Floodable Sand

4.5

Distribution of Permeable Sand: Permeability Range Millidarcys

Feet

Cum. Ft.

0 - 7

2.3

2.3

35 - 51

3.1

5.4

Average Permeability Millidarcys

26.3

Average Percent Porosity

16.3

Average Percent Oil Saturation

60.6

Average Percent Water Saturation

10.9

Average Oil Content, Bbls./A. Ft.

771.

Total Oil Content, Bbls./Acre

4,166.

Average Percent Oil Recovery by Laboratory Flooding Tests

15.7

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.

223.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre

1,005.

Total Calculated Oil Recovery, Bbls./Acre

See "Calculated Recovery"
Section

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.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
802.0 - 802.9	Grayish brown calcareous shaly sandstone.
802.9 - 805.5	Dark brown sandstone.
805.5 - 806.9	Dark brown calcareous slightly shaly sandstone.
806.9 - 807.4	Dark brown calcareous sandstone with shale partings.
807.4 - 808.0	Gray shale with brown sandstone partings.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,005 barrels of oil per acre was obtained from 4.5 feet of sand. The weighted average percent oil saturation was reduced from 60.2 to 44.5, or represents an average recovery of 15.7 percent. The weighted average effective permeability of the samples is 2.74 millidarcys, while the average initial fluid production pressure is 21.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 6 samples tested, 5 produced water and oil. This indicates that approximately 83 percent of the sand represented by these samples is floodable pay sand.

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CALCULATED RECOVERY

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 1,230 barrels of oil per acre. This is an average recovery of 273 barrels per acre foot from 4.5 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.06
Reservoir water saturation, percent, estimated	10.0
Average porosity, percent	17.4
Oil saturation after flooding, percent	44.5
Performance factor, percent, estimated	50.0
Net floodable sand, feet	4.5

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	802.5	11.0	61	7	68	521	0.78	0.9	0.9	469	0.70
2	803.4	19.9	58	7	65	895	50.	1.0	1.9	895	50.00
3	804.6	20.3	68	9	77	1071	38.	1.0	2.9	1071	38.00
4	805.4	18.5	61	7	68	876	35.	0.6	3.5	526	21.00
5	806.4	14.1	59	14	73	645	6.6	1.4	4.9	903	9.24
6	807.3	14.4	54	25	79	603	46.	0.5	5.4	302	23.00

Company Salshanna Petroleum Lease Massoth Well No. 5

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Salshanna Petroleum	Lease	Massoth	Well No.	5
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
802.0 - 807.4	5.4	26.3	141.94			
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
802.0 - 807.4	5.4	16.3	60.6	10.9	771	4,166

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Salshanna Petroleum Lease Massoth Well No. 5

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	802.5	11.2	60	521	0	0	60	9	521	0	Imp.	-
2	803.4	20.0	58	900	21	325	37	51	575	170	3.22	20
3	804.6	20.1	68	1060	24	374	44	34	686	206	4.05	20
4	805.4	18.5	61	875	11	158	50	29	717	58	0.90	25
5	806.4	14.3	58	643	10	111	48	39	532	69	1.66	15
6	807.3	14.5	54	607	10	112	44	43	495	222	4.42	25

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

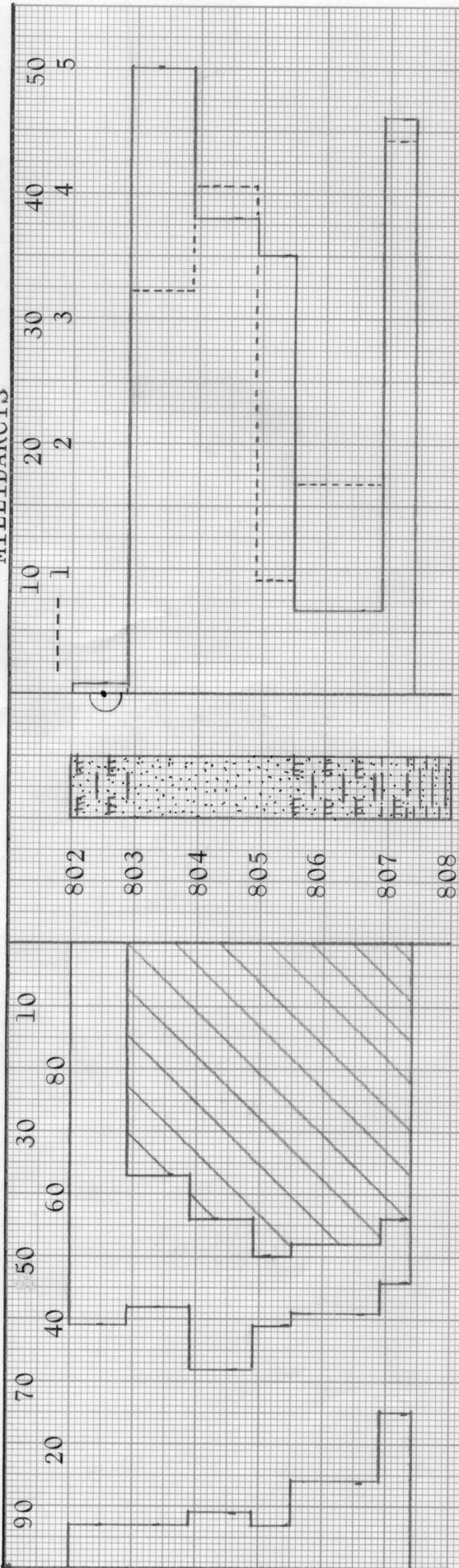
TABLE V

Company	Lease	Massoth	Well No.
Salshanna Petroleum			5
Depth Interval, Feet	802.0 - 807.4		
Feet of Core Analyzed	4.5		
Average Percent Porosity	17.4		
Average Percent Original Oil Saturation	60.2		
Average Percent Oil Recovery	15.7		
Average Percent Residual Oil Saturation	44.5		
Average Percent Residual Water Saturation	39.7		
Average Percent Total Residual Fluid Saturation	84.2		
Average Original Oil Content, Bbls./A. Ft.	819.		
Average Oil Recovery, Bbls./A. Ft.	223.		
Average Residual Oil Content, Bbls./A. Ft.	596.		
Total Original Oil Content, Bbls./Acre	3,689.		
Total Oil Recovery, Bbls./Acre	1,005.		
Total Residual Oil Content, Bbls./Acre	2,684.		
Average Effective Permeability, Millidarcys	2.74		
Average Initial Fluid Production Pressure, p.s.i.	21.0		

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

WATER SAT., ———> OIL SAT., ———< PERCENT PERCENT

———— PERMEABILITY, IN MILLIDARCS
 - - - - - EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



KEY:

SHALY CALCAREOUS SANDSTONE

SANDSTONE

CALCAREOUS SANDSTONE WITH SHALE PARTINGS

SHALE WITH SANDSTONE PARTINGS

FLOODPOT RESIDUAL OIL SATURATION

IMPERMEABLE TO WATER

SALSHANNA PETROLEUM

MASSOTH LEASE

WELL NO. 5

WOODSON COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBLs. / ACRE
802.0 - 807.4	5.4	16.3	60.6	10.9	26.3	1230 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
OCTOBER, 1981

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