

OILFIELD RESEARCH LABORATORIES

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

January 20, 1981

R. E. Gramly
730½ North Penn.
Independence, Kansas 67301

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Elsheimer Lease, Well No. 14, located in Montgomery County, Kansas and submitted to our laboratory on December 2, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Independence, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

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GENERAL INFORMATION & SUMMARY

Company R. E. Gramly Lease Elsheimer Well No. 14

Location -

Section 3 Twp. 35S Rge. 14E County Montgomery State Kansas

Elevation, Feet -

Name of Sand - Bartlesville

Top of Core - 1346.0

Bottom of Core - 1365.7

Top of Sand - 1346.0

Bottom of Sand - 1365.7

Total Feet of Permeable Sand - 13.3

Total Feet of Floodable Sand - 8.1

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	3.1	3.1
5 - 20	4.2	7.3
20 - 30	3.0	10.3
30 & Above	3.0	13.3

Average Permeability Millidarcys - 18.0

Average Percent Porosity - 14.8

Average Percent Oil Saturation - 36.4

Average Percent Water Saturation - 35.5

Average Oil Content, Bbls./A. Ft. - 413.

Total Oil Content, Bbls./Acre - 5,494.

Average Percent Oil Recovery by Laboratory Flooding Tests - 4.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - 49.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - 395.

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 and salt water were 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>
1346.0 - 1347.1	Brown sandstone.
1347.1 - 1349.6	Light brown slightly calcareous shaly sandstone.
1356.0 - 1363.1	Light brown slightly calcareous sandstone.
1363.1 - 1365.7	Light brown and gray laminated slightly calcareous sandstone and shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 395 barrels of oil per acre was obtained from 8.1 feet of sand. The weighted average percent oil saturation was reduced from 35.7 to 31.7, or represents an average recovery of 4.0 percent. The weighted average effective permeability of the samples is 2.54 millidarcys, while the average initial fluid production pressure is 30.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 8 produced water and oil, and 3 samples produced water only. This indicates that approximately 57 percent of the sand represented by these samples is floodable pay sand.

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 1,860 barrels of oil per acre. This is an average recovery of 230 barrels per acre foot from 8.1 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.08
Reservoir water saturation, percent, estimated	25.0
Average porosity, percent	15.7
Oil saturation after flooding, percent	31.7
Performance factor, percent, estimated	50.0
Net floodable sand, feet	8.1

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company		R. E. Gramly		Lease		Elsheimer		Well No.		14	
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	1346.5	14.5	33	48	79	371	17.	1.1	1.1	408	18.70
2	1347.5	15.0	33	38	71	384	3.2	1.0	2.1	384	3.20
3	1348.5	13.0	39	29	68	393	3.2	1.0	3.1	393	3.20
4	1349.4	13.7	35	38	73	372	1.6	0.5	3.6	186	0.80
5	1356.5	14.9	47	27	74	543	21.	1.0	4.6	543	21.00
6	1357.6	18.3	41	30	71	582	43.	1.0	5.6	582	43.00
7	1358.5	16.4	32	39	71	407	36.	1.0	6.6	407	36.00
8	1359.5	17.2	30	29	59	400	28.	1.0	7.6	400	28.00
9	1360.5	15.6	35	38	73	424	22.	1.0	8.6	424	22.00
10	1361.5	16.1	33	37	70	412	31.	1.0	9.6	412	31.00
11	1362.5	14.5	30	44	74	338	16.	1.1	10.7	372	17.60
12	1363.6	14.2	39	38	77	430	8.0	1.0	11.7	430	8.00
13	1364.5	9.3	51	24	75	368	5.0	1.0	12.7	368	5.00
14	1365.5	13.7	29	39	68	308	2.3	0.6	13.3	185	1.38

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	R. E. Gramly	Lease	Elsheimer	Well No.	14
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
	1346.0 - 1365.7	13.3	18.0	238.88	
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Oil Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
	1346.0 - 1365.7	13.3	36.4	413	5,494

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			R. E. Gramly			Lease			Elsheimer			Well No. 14		
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	1346.5	15.0	32	372	0	0	32	61	117	2.40	25			
2	1347.5	15.1	33	375	3	35	30	50	6	0.45	45			
3	1348.5	12.7	40	394	0	0	40	30	0	Imp.	-			
4	1349.4	13.8	35	375	0	0	35	40	0	Imp.	-			
5	1356.5	14.9	47	543	8	92	35	49	12	0.30	50			
6	1357.6	18.2	41	579	7	99	34	51	246	6.30	20			
7	1358.5	16.6	32	412	2	26	30	65	237	6.60	20			
8	1359.5	16.8	31	404	0	0	31	55	18	0.60	45			
9	1360.5	15.7	35	426	3	37	32	58	150	3.45	30			
10	1361.5	16.0	33	410	3	37	30	59	76	1.50	25			
11	1362.5	14.5	30	337	2	22	28	62	63	1.20	25			
12	1363.6	14.5	39	439	4	45	35	51	37	0.75	30			
13	1364.5	9.6	50	372	0	0	50	37	7	0.22	50			
14	1365.5	13.4	30	312	0	0	30	41	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.

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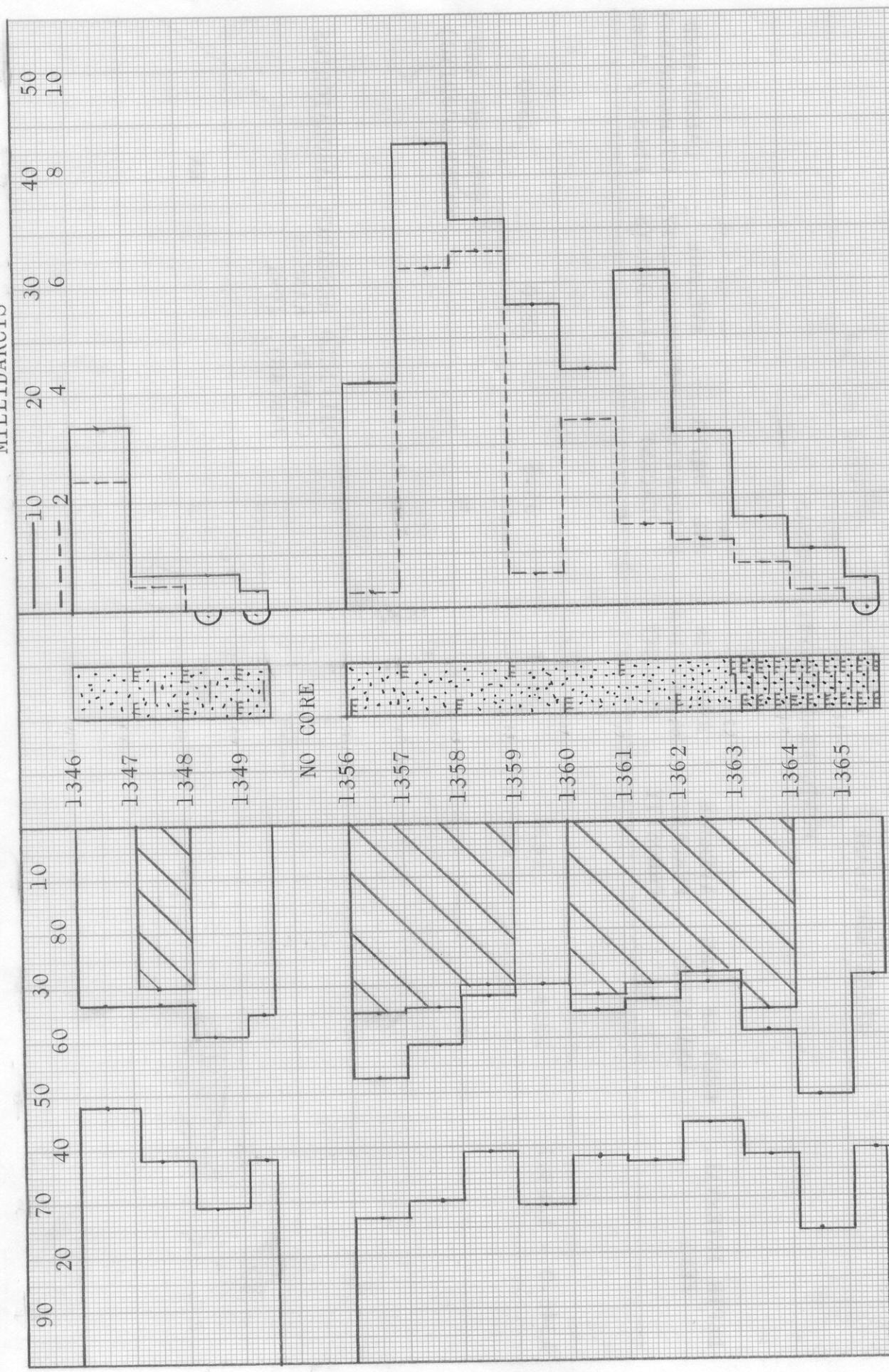
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	R. E. Gramly	Lease	Elsheimer	Well No.	14
Depth Interval, Feet	1346.0 - 1365.7				
Feet of Core Analyzed	8.1				
Average Percent Porosity	15.7				
Average Percent Original Oil Saturation	35.7				
Average Percent Oil Recovery	4.0				
Average Percent Residual Oil Saturation	31.7				
Average Percent Residual Water Saturation	55.7				
Average Percent Total Residual Fluid Saturation	87.4				
Average Original Oil Content, Bbls./A. Ft.	440.				
Average Oil Recovery, Bbls./A. Ft.	49.				
Average Residual Oil Content, Bbls./A. Ft.	391.				
Total Original Oil Content, Bbls./Acre	3,565.				
Total Oil Recovery, Bbls./Acre	395.				
Total Residual Oil Content, Bbls./Acre	3,170.				
Average Effective Permeability, Millidarcys	2.5				
Average Initial Fluid Production Pressure, p.s.i.	30.6				

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

WATER SAT., PERCENT $\rightarrow$ $\leftarrow$ OIL SAT., PERCENT
 PERMEABILITY, IN MILLIDARCS $\rightarrow$ $\leftarrow$ EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS
 PERMEABILITY, IN MILLIDARCS
 EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



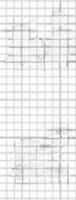
KEY:

- SHALY CALCAREOUS SANDSTONE
- CALCAREOUS SANDSTONE
- LAMINATED CALCAREOUS SANDSTONE AND SHALE
- PERMEABILITY TO WATER
- PERMEABILITY
- OIL SATURATION

SANDSTONE



IMPERMEABLE TO WATER



R. E. GRAMLY

ELSHEIMER LEASE

WELL NO. 14

MONTGOMERY 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
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1346.0 - 1365.7	13.3	14.8	36.4	35.5	18.0	1860
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(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
JANUARY, 1981

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