

# OILFIELD RESEARCH LABORATORIES

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April 26, 1982

Lincoln 77  
3633 O Street  
Suite 4  
P.O. Box 30538  
Lincoln, Nebraska 68510

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Remer Lease, Well No. 5, Coffey County, Kansas, and submitted to our laboratory on April 21, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES



Sanford A. Michel

SAM/tem

4 c to Lincoln, NE  
1 c to Topeka, KS

- REGISTERED ENGINEERS -

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

**Oilfield Research Laboratories**  
**GENERAL INFORMATION & SUMMARY**

Company Lincoln 77 Lease Remer Well No. 5  
 Location 330' SNL & 330' EWL, SE $\frac{1}{4}$  NW NW SE $\frac{1}{4}$   
 Section 28 Twp. 22S Rge. 16E County Coffey State Kansas

Elevation, Feet .....

Name of Sand..... Lower Squirrel

Top of Core ..... 998.0

Bottom of Core ..... 1013.0

Top of Sand ..... (Tested) ..... 1003.0

Bottom of Sand ..... 1011.4

Total Feet of Permeable Sand ..... 6.9

Total Feet of Floodable Sand ..... 4.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	2.4	2.4
30 - 65	4.0	6.4
200 - 205	0.5	6.9

Average Permeability Millidarcys ..... 44.9

Average Percent Porosity ..... 18.7

Average Percent Oil Saturation ..... 52.9

Average Percent Water Saturation ..... 21.4

Average Oil Content, Bbls./A. Ft. .... 774.

Total Oil Content, Bbls./Acre ..... 5343.

Average Percent Oil Recovery by Laboratory Flooding Tests ..... 12.8

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. .... 197.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre ..... 885.

Total Calculated Oil Recovery, Bbls./Acre ..... See "Calculated Recovery" Section.

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The core was sampled and the samples sealed in plastic bags by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
998.0 - 1002.0	Gray shale
1002.0 - 1003.0	Grayish brown very shaly sandstone.
1003.0 - 1003.5	Dark brown sandstone.
1003.5 - 1004.0	Gray and brown laminated shale and sandstone.
1004.0 - 1006.0	Dark brown sandstone.
1006.0 - 1007.0	Brown shaly sandstone.
1007.0 - 1008.0	Dark brown sandstone.
1008.0 - 1009.0	Dark brown sandstone with scattered shale partings.
1009.0 - 1010.0	Grayish brown very shaly sandstone.
1010.0 - 1011.4	Light brown shaly sandstone.
1011.4 - 1013.0	Gray shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 885 barrels of oil per acre was obtained from 4.5 feet of sand. The weighted average percent oil saturation was reduced from 58.7 to 45.9, or represents an average recovery of 12.8 percent. The weighted average effective permeability of the samples is 3.00 millidarcys, while the average initial fluid production pressure is 21.0 pounds per square inch (See Table V).

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By observing the data given in Table IV, you will note that of the 8 samples tested, 5 produced water and oil. This indicates that approximately 63 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 1,610 barrels of oil per acre. This is an average recovery of 358 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	19.7
Oil saturation after flooding, percent	45.9
Performance factor, percent, estimated	60.0
Net floodable sand, feet	4.5

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease Remer Well No. 5

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	1003.4	23.2	56	15	71	1008	203.	0.5	0.5	504	101.50
2	1004.3	19.5	63	13	76	953	60.	1.0	1.5	953	60.00
3	1005.8	19.2	51	20	71	760	31.	1.0	2.5	760	31.00
4	1007.4	18.6	61	15	76	880	62.	1.0	3.5	880	62.00
5	1008.5	19.7	61	16	77	932	52.	1.0	4.5	932	52.00
6	1009.7	17.3	33	35	68	443	0.42	1.0	5.5	443	0.42
7	1010.4	16.4	49	29	78	623	2.0	1.0	6.5	623	2.00
8	1011.2	17.0	47	30	77	620	1.9	0.4	6.9	248	0.76

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Lincoln 77 Lease Remer Well No. 5

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Total Oil Content Bbls./Acre
1003.0 - 1009.0	4.5	19.7	58.7	15.9	68.1	306.50	4,029
1009.0 - 1011.4	2.4	16.9	42.0	31.7	1.3	3.18	1,314
1003.0 - 1011.4	6.9	18.7	52.9	21.4	44.9	309.68	5,343

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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			
1	1003.4	23.1	56	1004	15	269	41	45	432	5.47	15
2	1004.3	19.4	63	948	16	241	47	47	112	1.87	25
3	1005.8	19.3	51	764	9	135	42	49	208	2.70	20
4	1007.4	18.7	61	885	12	174	49	46	188	2.69	25
5	1008.5	19.8	61	937	13	200	48	45	246	3.52	20
6	1009.7	16.8	34	443	0	0	34	34	0	IMP.	-
7	1010.4	16.3	49	620	0	0	49	30	0	IMP.	-
8	1011.2	17.5	46	625	0	0	46	31	0	IMP.	-

Company Lincoln 77 Lease Remer Well No. 5

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

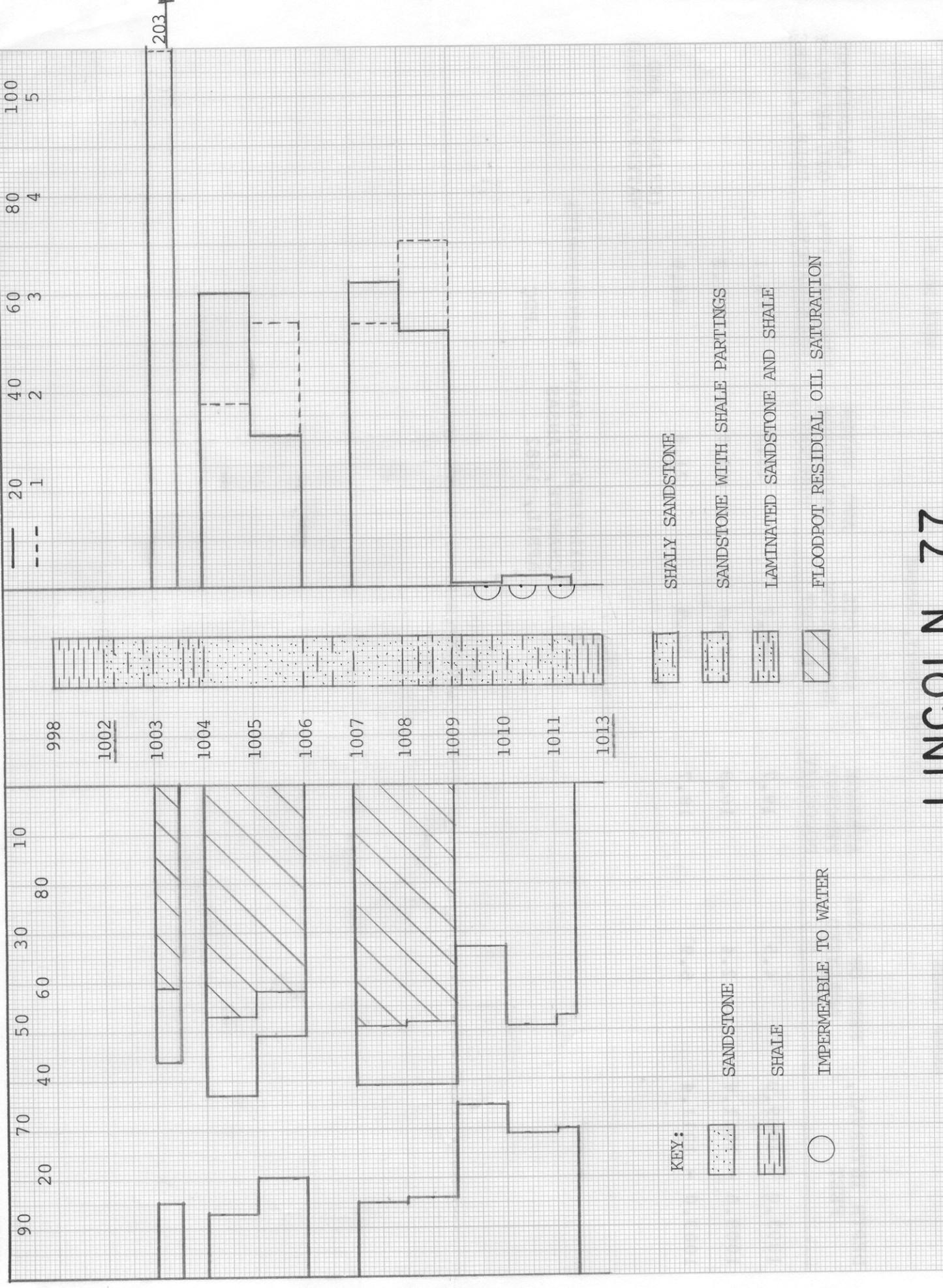
TABLE V

Company	Lincoln 77	Lease	Remer	Well No.	5
Depth Interval, Feet	1003.0 - 1009.0				
Feet of Core Analyzed	4.5				
Average Percent Porosity	19.7				
Average Percent Original Oil Saturation	58.7				
Average Percent Oil Recovery	12.8				
Average Percent Residual Oil Saturation	45.9				
Average Percent Residual Water Saturation	46.6				
Average Percent Total Residual Fluid Saturation	92.5				
Average Original Oil Content, Bbls./A. Ft.	897.				
Average Oil Recovery, Bbls./A. Ft.	197.				
Average Residual Oil Content, Bbls./A. Ft.	700.				
Total Original Oil Content, Bbls./Acre	4,037.				
Total Oil Recovery, Bbls./Acre	885.				
Total Residual Oil Content, Bbls./Acre	3,152.				
Average Effective Permeability, Millidarcys	3.0				
Average Initial Fluid Production Pressure, p.s.i.	21.0				

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

PERMEABILITY, IN MILLIDARCYS  
 EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS

WATER SAT., PERCENT  
 OIL SAT., PERCENT



KEY:  
 SANDSTONE  
 SHALE  
 IMPERMEABLE TO WATER

SHALY SANDSTONE  
 SANDSTONE WITH SHALE PARTINGS  
 LAMINATED SANDSTONE AND SHALE  
 FLOODPOT RESIDUAL OIL SATURATION

LINCOLN 77

REMER LEASE

COFFEY COUNTY, KANSAS

WELL NO. 5

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
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1003.0 - 1009.0

4.5

19.7

58.7

15.9

68.1

1009.0 - 1011.4

2.4

16.9

42.0

31.7

1.3

1003.0 - 1011.4

6.9

18.7

52.9

21.4

44.9

1610

(PRIMARY AND  
WATERFLOODING)

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CHANUTE, KANSAS  
APRIL, 1982  
PDC