



OILFIELD RESEARCH LABORATORIES

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

June 14, 1979

Oaks Petroleum, Inc.
Rt. 2
Stoystown, Pennsylvania 15563

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary cores taken from the Armstrong Lease, Well No. LO-5, Franklin County, Kansas, and submitted to our laboratory on June 7, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

SAM:km
3 c to Stoystown, Pennsylvania
1 c to Ottawa, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Oaks Petroleum, Inc. Lease Armstrong Well No. 10-5

Location 880' NSL & 1,485' WEL NW $\frac{1}{4}$

Section 22 Twp. 17S Rge. 21E County Franklin State Kansas

Name of Sand	Peru
Top of Core	346.0
Bottom of Core	366.0
Top of Sand	347.7
Bottom of Sand	364.0
Total Feet of Permeable Sand	15.1
Total Feet of Floodable Sand	12.8

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 100	7.3	7.3
100 - 300	4.8	12.1
300 - 600	2.0	14.1
600 & Above	1.0	15.1

Average Permeability Millidarcys	169.5
Average Percent Porosity	21.1
Average Percent Oil Saturation	31.9
Average Percent Water Saturation	46.6
Average Oil Content, Bbls./A. Ft.	534.
Total Oil Content, Bbls./Acre	8,067.
Average Percent Oil Recovery by Laboratory Flooding Tests	7.2
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	124.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,582.
Total Calculated Oil Recovery, Bbls./Acre	4,350.
(Primary & Waterflooding)	
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Oaks Petroleum, Inc. Lease Armstrong Well No. LO-5

Location 880' NSL & 1,485' WEL NW $\frac{1}{4}$

Section 22 Twp. 17S Rge. 21E County Franklin State Kansas

Name of Sand - - - - - Upper Squirrel

Top of Core - - - - - 510.0

Bottom of Core - - - - - 521.0

Top of Sand - - - - - 510.0

Bottom of Sand - - - - - 514.4

Total Feet of Permeable Sand - - - - - 3.8

Total Feet of Floodable Sand - - - - -

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10
10 - 20

0.4
3.4

0.4
3.8

Average Permeability Millidarcys - - - - - 13.4

Average Percent Porosity - - - - - 19.0

Average Percent Oil Saturation - - - - - 41.7

Average Percent Water Saturation - - - - - 37.2

Average Oil Content, Bbls./A. Ft. - - - - - 620.

Total Oil Content, Bbls./Acre - - - - - 2,355.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - -

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

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

Total Calculated Oil Recovery, Bbls./Acre - - - - -

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

A. P. I. Gravity, degrees @ 60 °F - - - - -

Elevation, Feet - - - - -

The cores were sampled by a representative of Oilfield Research Laboratories. The drilling fluid consisted of fresh water mud. The cores were reported to be from a non-virgin area.

Per instructions of the client, only the Peru sand was subjected to floodpot testing.

FORMATION CORED

The detailed log of the formation cored is as follows:

PERU SAND

<u>Depth Interval, Feet</u>	<u>Description</u>
346.0 - 347.7	Hard white and gray slightly laminated limestone and shale.
347.7 - 348.7	Light brown slightly shaly calcareous sandstone.
348.7 - 352.0	Dark brown calcareous sandstone.
352.0 - 352.3	White limestone.
352.3 - 355.0	Dark brown calcareous sandstone.
355.0 - 356.0	Dark brown very calcareous sandstone.
356.0 - 356.9	White limestone.
356.9 - 364.0	Dark brown slightly calcareous sandstone.
364.0 - 365.0	White limestone.
365.0 - 366.0	Gray conglomeratic shale.

UPPER SQUIRREL SAND

<u>Depth Interval, Feet</u>	<u>Description</u>
510.0 - 511.2	Dark brown sandstone.
511.2 - 511.6	Dark brown slightly laminated shaly sandstone.
511.6 - 511.8	Gray sandy shale.

<u>Depth Interval, Feet</u>	<u>Description</u>
511.8 - 512.2	Dark brown slightly laminated shaly sandstone.
512.2 - 514.4	Dark brown sandstone.
514.4 - 521.0	Gray sandy shale.

LABORATORY FLOODING TESTSPERU SAND

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,582 barrels of oil per acre was obtained from 12.8 feet of sand. The weighted average percent oil saturation was reduced from 34.8 to 27.6, or represents an average recovery of 7.2 percent. The weighted average effective permeability of the samples is 3.95 millidarcys, while the average initial fluid production pressure is 16.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested, 15 produced water and 13 oil. This indicates that approximately 87 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERYPERU SAND

It would appear from a study of the data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 4,350 barrels of oil per acre. This is an average recovery of 340 barrels per acre foot from 12.8 feet of floodable sand analyzed in this core.

OILFIELD RESEARCH LABORATORIES

- 5 -

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

Original formation volume factor	1.03
Reservoir water saturation, percent	30.0
Average porosity, percent	21.7
Oil saturation after flooding, percent	27.6
Performance factor, percent	50.0
Net floodable pay sand, feet	12.8

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Oaks Petroleum, Inc. Lease Armstrong Well No. 10-5

PERU SAND

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	348.4	13.8	9	80	89	96	3.5	1.0	1.0	96	3.50
2	349.4	19.8	21	41	62	323	89.	1.3	2.3	420	115.70
3	350.4	20.6	24	51	75	384	54.	1.0	3.3	384	54.00
4	351.4	21.5	27	47	74	450	58.	1.0	4.3	450	58.00
5	352.5	26.5	29	40	69	596	111.	0.7	5.0	417	77.70
6	353.2	24.7	35	33	68	671	195.	1.0	6.0	671	195.00
7	354.8	14.3	41	44	85	455	73.	1.0	7.0	455	73.00
8	355.3	11.0	44	33	77	376	22.	1.0	8.0	376	2.00
9	357.7	17.7	25	46	71	343	102.	1.1	9.1	377	112.20
10	358.7	28.6	49	41	90	1,087	335.	1.0	10.1	1087	335.00
11	359.7	24.1	44	37	81	823	216.	1.0	11.1	823	216.00
12	360.3	26.4	36	43	78	717	370.	1.0	12.1	717	370.00
13	361.4	25.8	33	49	82	661	207.	1.0	13.1	661	207.00
14	362.8	25.4	35	49	84	690	651.	1.0	14.1	690	651.00
15	363.5	18.4	31	65	96	443	70.	1.0	15.1	443	70.00

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Oaks Petroleum, Inc. Lease Armstrong Well No. LO-5

UPPER SQUIRREL SAND

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	510.3	19.7	38	40	78	581	19.	1.2	1.2	697	22.80
2	511.5	15.2	23	67	90	271	3.9	0.4	1.6	108	1.56
3	512.7	20.3	42	29	71	661	14.	0.8	2.4	529	11.20
4	513.5	18.8	50	31	81	729	11.	1.4	3.8	1021	15.40

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Oaks Petroleum, Inc.	Lease	Armstrong	Well No.	LO-5
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
<u>PERU SAND</u>					
347.7 - 356.0	8.0	74.9	598.90		
356.9 - 364.0	7.1	276.2	1961.20		
347.7 - 364.0	15.1	169.5	2560.10		
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Total Oil Content Bbls./Acre
347.7 - 356.0	8.0	18.8	28.5	46.2	3,269
356.9 - 364.0	7.1	23.7	35.9	47.1	4,798
347.7 - 364.0	15.1	21.1	31.9	46.6	8,067

Oilfield Research Laboratories
SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Oaks Petroleum, Inc.	Lease	Armstrong	Well No.	LO-5
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
<u>UPPER SQUIRREL SAND</u>					
510.0 - 514.4	3.8	13.4	50.96		
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Total Oil Content Bbls./Acre
510.0 - 514.4	3.8	19.0	41.7	37.2	2,355

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Oaks Petroleum, Inc. Lease Armstrong Well No. LO-5

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc ^a	Effective Permeability Millidarcys ^{aa}	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	348.4	14.3	11	121	0	PERU SAND	11	75	35	0.56	20
2	349.4	19.8	21	323	0	0	21	61	38	0.80	20
3	350.4	21.1	24	393	2	33	22	57	15	0.30	25
4	351.4	21.5	27	451	4	67	23	61	20	0.44	15
5	352.5	26.1	29	587	6	122	23	73	157	4.30	15
6	353.2	24.7	35	671	12	230	23	68	171	5.40	10
7	354.8	14.8	41	471	15	172	26	63	56	1.11	15
8	355.3	11.5	44	393	6	54	38	49	35	0.60	15
9	357.7	17.2	25	334	2	26	23	73	30	0.62	20
10	358.7	28.2	49	1072	10	219	39	53	175	4.60	15
11	359.7	23.6	44	805	10	183	34	58	28	0.60	25
12	360.3	26.0	35	706	8	161	27	68	401	9.30	15
13	361.4	25.4	33	650	9	178	24	70	225	4.60	15
14	362.8	25.0	35	679	5	97	30	67	262	5.60	15
15	363.5	18.9	31	455	5	74	26	65	322	14.37	15

Notes: cc—cubic centimeter.

a.—Volume of water recovered at the time of maximum oil recovery.

aa.—Determined by passing water through sample which still contains residual oil.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Oaks Petroleum, Inc.	Lease	Armstrong	Well No.	LO-5
Depth Interval, Feet	347.7 - 356.0	PERU SAND		356.9 - 364.0	347.7 - 364.0
Feet of Core Analyzed	5.7	7.1			12.8
Average Percent Porosity	19.6	23.4			21.7
Average Percent Original Oil Saturation	33.6	35.8			34.8
Average Percent Oil Recovery	7.6	6.9			7.2
Average Percent Residual Oil Saturation	26.0	28.9			27.6
Average Percent Residual Water Saturation	61.3	65.0			63.3
Average Percent Total Residual Fluid Saturation	87.3	93.9			90.9
Average Original Oil Content, Bbls./A. Ft.	490.	667.			588.
Average Oil Recovery, Bbls./A. Ft.	113.	133.			124.
Average Residual Oil Content, Bbls./A. Ft.	377.	534.			464.
Total Original Oil Content, Bbls./Acre	2,789.	4,735.			7,524.
Total Oil Recovery, Bbls./Acre	641.	941.			1,582.
Total Residual Oil Content, Bbls./Acre	2,148.	3,794.			5,942.
Average Effective Permeability, Millidarcys	1.91	5.60			3.95
Average Initial Fluid Production Pressure, p.s.i.	15.8	17.1			16.5

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