OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

July 8, 1966

22-19-22E

Robert A. Mason
100 Park Avenue Building
Room 505
Oklahoma City, Oklahoma

Dear Sir:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Day Lease, Well No. P-1, Linn County, Kansas, and submitted to our laboratory on July 2, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP:rf

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P-1

Day

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Robert A. Mason Lease Day Well No. P-1

Location

Section Twp. Rge. County Linn State Kansas

Name of Sand	Squirrel
Top of Core	491.0
Bottom of Core	506.0
Top of Sand (Analyzed)	491.0
Bottom of Sand	505.7
Total Feet of Permeable Sand	13.7
Total Feet of Floodable Sand	12.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	1.0	1.0
10 - 50	11.0	12.0
50 & above	1.7	13.7

Average Permeability Millidarcys	31.2
Average Percent Porosity	19.3
Average Percent Oil Saturation	45.6
Average Percent Water Saturation	40.3
Average Oil Content, Bbls./A. Ft.	689.
Total Oil Content, Bbls./Acre	10,106.
Average Percent Oil Recovery by Laboratory Flooding Tests	18.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	290.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	3,683.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	4,390.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Water was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in plastic bags by a representative of the client. The well was drilled in non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
491.0 - 493.0	Laminated sandstone and shale.
493.0 - 505.7	Dark brown, slightly shaly sandstone.
505.7 - 506.0	Shale.

Coring was started at a depth of 491.0 feet in laminated sandstone and shale and completed at 506.0 feet in shale. For the most part, the pay is made up of dark brown, slightly shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 19.1 and 54.6 millidarcys respectively; the overall average being 31.2 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a fairly uniform permeability profile. The permeability of the sand varies from impermeable to a maximum of 86. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 45.6. The weighted average percent oil

saturation of the upper and lower sections is 44.0 and 49.2 respectively. The weighted average percent water saturation of the upper and lower sections is 39.9 and 41.2 respectively, the overall average being 40.3 (See Table III). This gives an overall weighted average total fluid saturation of 85.9 percent.

The weighted average oil content of the upper and lower sections is 657 and 751 barrels per acre foot respectively; the overall average being 689. The total oil content, as shown by this core, is 10,106 barrels per acre of which 9,220 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 3,683 barrels of oil per acre was obtained from 12.7 feet of sand. The weighted average percent oil saturation was reduced from 47.0 to 28.2, or represents an average recovery of 18.8 percent. The weighted average effective permeability of the samples is 1.63 millidarcys, while the average initial fluid production pressure is 26.9 pounds per square inch (See Table V)

By observing the data given in Table IV, you will note that of the 15 samples tested, 13 produced water and oil. This indicates that approximately 87 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide variation in effective permeability to water.

CONCLUSION

The results of the laboratory tests indicate that efficient

primary and secondary operations in the vicinity of this well should recover approximately 4,390 barrels of oil per acre or an average of 345 barrels per acre foot from the 12.7 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.04
Reservoir water saturation, percent	25.0
Average porosity, percent	19.8
Oil saturation after flooding, percent	28.2
Performance factor, percent	50.0
Net floodable pay sand, feet	12.7

This core shows a pay sand section having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

Any primary oil already recovered from the area, represented by this core, should be subtracted from the above calculated recovery values.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Robert A. Mason Lease Day Well No. P-1

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	491.5	17.6	25	58	83	341	0.41	1.0	1.0	341	0.41
2	492.5	16.0	47	45	92	583	Imp.	1.0	2.0	583	0.00
3	493.5	17.9	51	38	89	707	13.	1.0	3.0	707	13.00
4	494.5	19.5	44	49	93	665	17.	1.0	4.0	665	17.00
5	495.5	19.4	43	44	87	646	14.	1.0	5.0	646	14.00
6	496.5	18.5	29	48	77	415	27.	1.0	6.0	415	27.00
7	497.5	20.4	45	41	86	711	12.	1.0	7.0	711	12.00
8	498.5	19.8	42	33	75	644	26.	1.0	8.0	644	26.00
9	499.5	21.1	59	20	79	964	39.	1.0	9.0	964	39.00
10	500.5	21.0	55	23	78	896	23.	1.0	10.0	896	23.00
11	501.5	20.4	43	46	89	679	43.	1.0	11.0	679	43.00
12	502.5	18.6	39	57	96	562	44.	1.0	12.0	562	44.00
13	503.5	18.2	59	32	91	832	46.	1.0	13.0	832	46.00
14	504.5	20.6	47	40	87	751	86.	1.0	14.0	751	86.00
15	505.5	21.4	61	27	88	1,012	54.	0.7	14.7	710	37.80
								Total		10,106	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Robert A. Mason Lease Day Well No. P-1

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
491.0 - 501.0	9.0	19.1	171.41
501.0 - 505.7	4.7	54.6	256.80
491.0 - 505.7	13.7	31.2	428.21

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
491.0 - 501.0	10.0	19.1	44.0	39.9	657	6,572
501.0 - 505.7	4.7	19.8	49.2	41.2	751	3,534
491.0 - 505.7	14.7	19.3	45.6	40.3	689	10,106

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Robert A. Mason Lease Day Well No. P-1

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	491.5	17.4	27	364	0	0	27	59	364	0	Imp.	-
2	492.5	16.0	46	570	0	0	46	47	570	0	Imp.	-
3	493.5	18.3	51	724	18	255	33	64	469	3	0.167	50
4	494.5	20.0	44	682	14	217	30	69	465	45	0.833	30
5	495.5	19.0	43	634	15	221	28	66	413	19	0.370	30
6	496.5	18.9	29	425	4	59	25	70	366	87	2.00	30
7	497.5	19.9	45	694	22	339	23	70	355	64	1.17	20
8	498.5	19.7	42	641	18	275	24	74	366	36	0.666	30
9	499.5	20.9	59	956	31	502	28	66	454	68	1.17	20
10	500.5	20.7	55	883	31	497	24	74	386	87	1.58	30
11	501.5	20.8	43	693	11	177	32	67	516	126	2.84	30
12	502.5	19.0	39	575	14	206	25	69	369	123	2.17	20
13	503.5	18.7	59	856	33	479	26	73	377	126	2.66	20
14	504.5	21.0	47	765	19	309	28	70	456	224	3.83	20
15	505.5	20.9	61	989	13	210	48	47	779	102	1.67	20

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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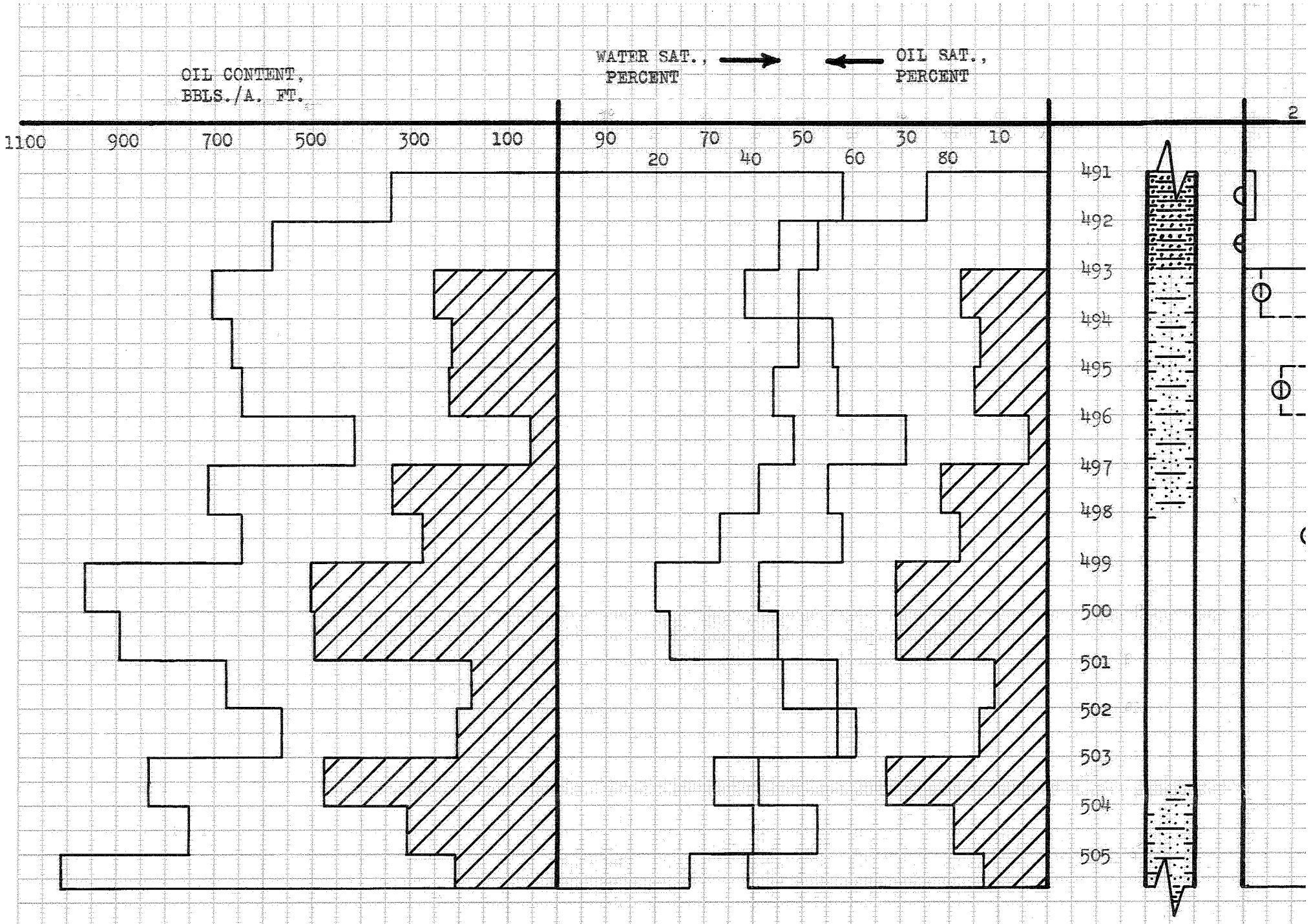
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Robert A. Mason Lease Day Well No. P-1

Depth Interval, Feet	491.0 - 501.0	501.0 - 505.7	491.0 - 505.7
Feet of Core Analyzed	8.0	4.7	12.7
Average Percent Porosity	19.7	20.0	19.8
Average Percent Original Oil Saturation	46.0	49.1	47.0
Average Percent Oil Recovery	19.1	18.3	18.8
Average Percent Residual Oil Saturation	26.9	30.8	28.2
Average Percent Residual Water Saturation	69.0	66.3	68.0
Average Percent Total Residual Fluid Saturation	95.9	97.1	96.2
Average Original Oil Content, Bbls./A. Ft.	705.	767.	725.
Average Oil Recovery, Bbls./A. Ft.	296.	280.	290.
Average Residual Oil Content, Bbls./A. Ft.	409.	487.	435.
Total Original Oil Content, Bbls./Acre	5,639.	3,581.	9,220.
Total Oil Recovery, Bbls./Acre	2,365.	1,318.	3,683.
Total Residual Oil Content, Bbls./Acre	3,274.	2,263.	5,537.
Average Effective Permeability, Millidarcys	0.995	2.70	1.63
Average Initial Fluid Production Pressure, p.s.i.	30.0	22.0	26.9

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



FLOOD POT RECOVERY

LAMINATED SANDSTONE & SHA

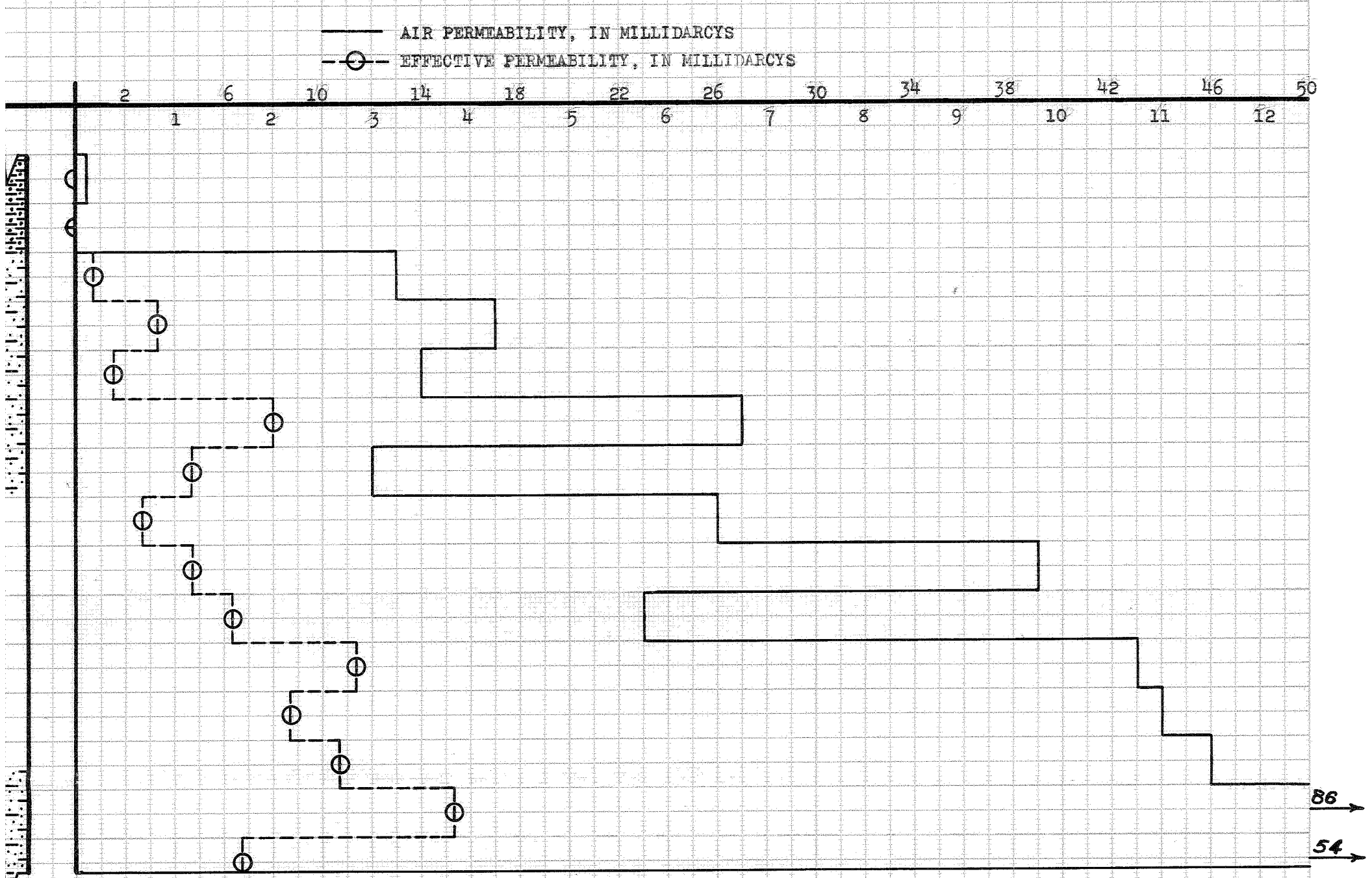
SHALY SANDSTONE

R. A. MA

DAY LEASE

LINN COUNTY, KANS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT
491.0 - 501.0	10.0	19.1	44.0	39.9
501.0 - 505.7	4.7	19.8	49.2	41.2
491.0 - 505.7	14.7	19.3	45.6	40.3



COVERY

NDSTONE & SHALE

ONE

SHALE

IMPERMEABLE TO AIR

IMPERMEABLE TO WATER

A. MASON

WELL NO. P-1

COUNTY, KANSAS

G. WATER TURATION ERCENT	AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY, BBLS./ACRE
39.9	657	6,572	19.1	
41.2	751	3,534	54.6	
40.3	689	10,106	31.2	4,390 (Primary & Secondary)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
JULY, 1966