

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

October 21, 1966

San Juan Petroleum, Inc.
703 Monongahela Building
Morgantown, West Virginia 26505

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Camac Lease, Well No. 2-S, Allen County, Kansas, and submitted to our laboratory on October 18, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

Carl L. Pate

CLP:rf

3 c.- Morgantown, W. Virginia
2 c.- Ft. Scott, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company San Juan Petroleum, Inc. Lease Camac Well No. 2-S

Location NE $\frac{1}{4}$

Section 34 Twp 24S Rge 21E County Allen State Kansas

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 679.0

Bottom of Core - - - - - 696.0

Top of Sand - - (Cored) - - - - - 679.0

Bottom of Sand - - - - - 688.2

Total Feet of Permeable Sand - - - - - 8.1

Total Feet of Floodable Sand - - - - - 8.3

Distribution of Permeable Sand: Permeability Range Millidarcys

Feet

Cum. Ft.

0 - 50	1.0	1.0
50 - 100	3.1	4.1
100 - 200	2.0	6.1
200 & above	2.0	8.1

Average Permeability Millidarcys - - - - - 151.7

Average Percent Porosity - - - - - 20.0

Average Percent Oil Saturation - - - - - 41.1

Average Percent Water Saturation - - - - - 42.5

Average Oil Content, Bbls./A. Ft. - - - - - 650.

Total Oil Content, Bbls./Acre - - - - - 5,519.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 14.1

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 221.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,834.

Total Calculated Oil Recovery, Bbls./Acre - (Primary & Secondary) 2,697.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

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

Elevation, Feet - - - - -

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. The core was sampled by an employee of Oilfield Research Laboratories. This well was drilled in a semi-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
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679.0 - 683.2	- Dark brown, fine grained, slightly carbonaceous sandstone with a shale streak at 681.2.
683.2 - 683.8	- Gray shale.
683.8 - 688.2	- Dark brown, fine grained sandstone.
688.2 - 688.7	- Gray shale.
688.7 - 689.7	- Coal.
689.7 - 691.0	- Gray shale.
691.0 - 696.0	- Shale (discarded at well)

Coring was started at a depth of 679.0 feet in dark brown, fine grained, slightly carbonaceous sandstone and completed at 696.0 feet in shale. This core shows a total of 8.5 feet of sandstone. For the most part, the pay is made up of dark brown, fine grained to slightly carbonaceous sandstone.

PERMEABILITY

The weighted average permeability of the cored section is 151.7 millidarcys (See Table III). By observing the data given on the core-graph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 7.8 to a maximum of 384. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 41.1. The weighted average percent water saturation of the cored section is 42.5 (See Table III). This gives an overall weighted average total fluid saturation of 83.6 percent.

The weighted average oil content of the cored section is 650 barrels per acre foot respectively. The total oil content, as shown by this core, is 5,519 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded very well to laboratory flooding tests, as a total recovery of 1,834 barrels of oil per acre was obtained from 8.3 feet of sand. The weighted average percent oil saturation was reduced from 41.2 to 27.1, or represents an average recovery of 14.1 percent. The weighted average effective permeability of the samples is 8.28 millidarcys, while the average initial fluid production pressure is 18.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, all produced water and oil. This indicates that all 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.

CONCLUSION

From a study of the enclosed data we estimate that approximately 2,697 barrels of oil per acre or an average of 325 barrels per acre foot can be recovered from the area, represented by this core, by

efficient primary and waterflooding methods. Any primary oil that has been recovered from this area would have to be subtracted from the above estimate. The following data and assumptions were used in calculating the above oil recovery value:

Original formation volume factor	1.05
Present formation volume factor	1.01
Irreducible water saturation, percent	32.0
Primary recovery, estimated, percent	None
Present oil saturation, percent	65.4
Average porosity, percent	20.1
Oil saturation after flooding, percent	27.1
Performance factor	0.55
Net floodable pay sand, feet	8.3

This core shows a thin clean sand section having a good oil saturation, a moderate water saturation and a good average permeability.

Special care should be exercised in completing water-injection wells in this area, otherwise, water will channel through the coal layer below the sand section.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company San Juan Petroleum Inc. Lease Camac Well No. 2-S

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	679.1	19.9	34	46	80	525	51.	0.6	0.6	315	30.60
2	680.1	18.1	34	52	86	467	89.	1.0	1.6	467	89.00
3	681.1	18.4	48	37	85	684	54.	0.9	2.5	616	48.60
4	682.1	22.0	43	43	86	734	108.	1.0	3.5	734	108.00
5	683.1	18.4	46	34	80	657	71.	0.6	4.1	494	42.60
6	684.1	20.1	42	35	77	654	22.	0.8	4.9	524	17.60
7	685.1	20.8	41	42	83	662	130.	1.0	5.9	662	130.00
8	686.1	20.6	41	43	84	655	377.	1.0	6.9	655	377.00
9	687.1	21.6	42	44	86	703	384.	1.0	7.9	703	384.00
F-10	687.9	20.9	42	-	-	681	-	0.4	8.3	272	-
10	688.1	15.5	32	55	87	384	7.8	0.2	8.5	77	1.56
								Total	-----	5,519	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company San Juan Petroleum, Inc. Lease Camac Well No. 2-S

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
679.0 - 688.2	8.1	151.7	1,228.96

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
679.0 - 688.2	8.3	20.0	41.1	42.5	650	5,519

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company San Juan Petroleum, Inc. Lease Camac Well No. 2-S

Sample No.	Depth, Feet	Effective Purity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc ^a	Effective Permeability Millidarcys ^{oo}	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	679.1	19.5	34	515	7	106	27	63	409	33	0.92	30
2	680.1	18.6	34	491	9	130	25	59	361	78	1.65	20
3	681.1	18.0	48	671	14	196	34	60	475	55	0.70	25
4	682.1	21.7	43	724	16	270	27	67	454	55	2.84	20
5	683.1	18.6	46	665	15	217	31	64	448	76	2.56	20
6	684.1	19.8	42	645	14	215	28	63	430	142	4.00	20
7	685.1	20.9	41	665	14	227	27	67	438	135	2.47	20
8	686.1	20.9	41	665	17	276	24	69	389	426	23.35	10
9	687.1	21.2	42	691	18	296	24	67	395	372	29.00	10
10	687.9	20.9	42	681	16	259	26	66	422	398	8.88	10

Notes: cc—cubic centimeter.

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

^{oo}—Determined by passing water through sample which still contains residual oil.

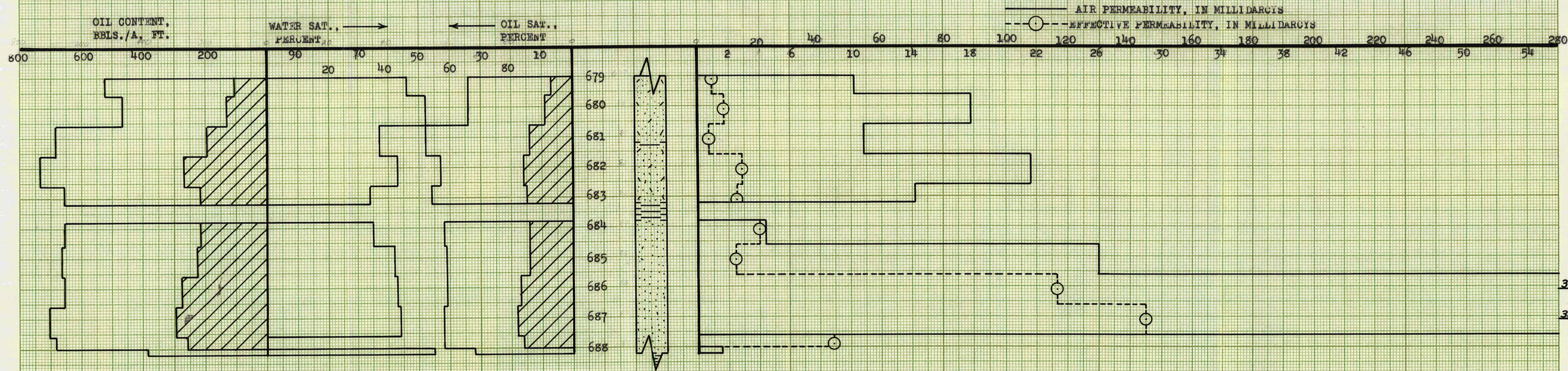
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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	San Juan Petroleum, Inc.	Lease	Camac	Well No.	2-S
Depth Interval, Feet	679.0 - 688.0				
Feet of Core Analyzed	8.3				
Average Percent Porosity	20.1				
Average Percent Original Oil Saturation	41.2				
Average Percent Oil Recovery	14.1				
Average Percent Residual Oil Saturation	27.1				
Average Percent Residual Water Saturation	64.2				
Average Percent Total Residual Fluid Saturation	91.3				
Average Original Oil Content, Bbls./A. Ft.	639.				
Average Oil Recovery, Bbls./A. Ft.	221.				
Average Residual Oil Content, Bbls./A. Ft.	418.				
Total Original Oil Content, Bbls./Acre	5,304.				
Total Oil Recovery, Bbls./Acre	1,834.				
Total Residual Oil Content, Bbls./Acre	3,470.				
Average Effective Permeability, Millidarcys	8.28				
Average Initial Fluid Production Pressure, p.s.i.	18.4				

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



FLOOD POT RECOVERY

CARBONACEOUS SANDSTONE

SANDSTONE

SHALE

SAN JUAN PETROLEUM, INC.

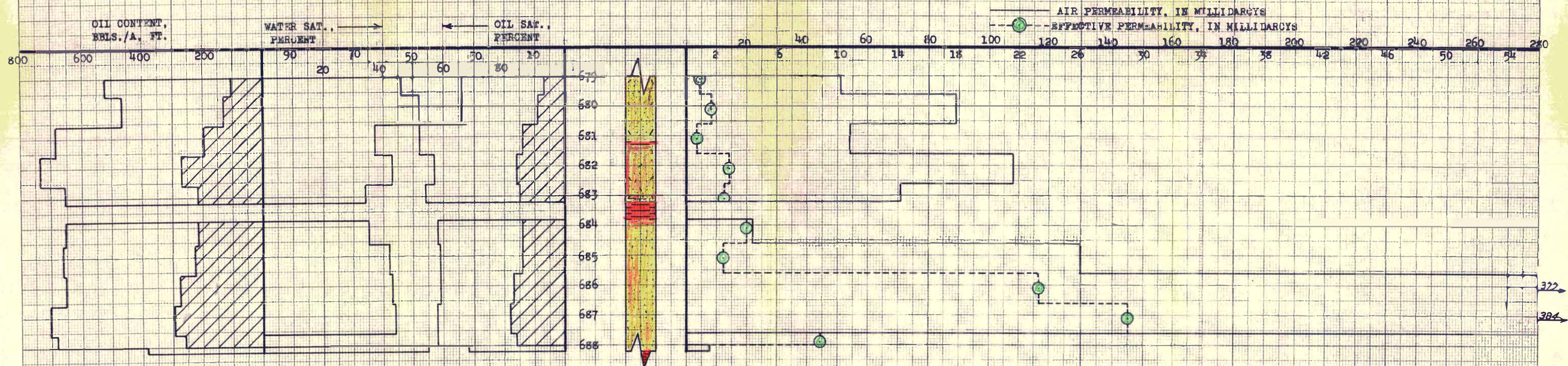
CAMAC LEASE

ALLEN COUNTY, KANSAS

WELL NO. 2-S

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLs./A.FT.	TOTAL OIL CONTENT BBLs./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYs	CALCULATED OIL RECOVERY, BBLs./ACRE
679.0 - 688.2	8.3	20.0	41.1	42.5	650	5,519	151.7	2,697 (Primary & Secondary)

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CHANUTE, KANSAS
OCTOBER, 1966



FLOOD POT RECOVERY
 CARBONACEOUS SANDSTONE
 SANDSTONE
 SHALE

SAN JUAN PETROLEUM, INC.

CAMAC LEASE ALLEN COUNTY, KANSAS WELL NO. 2-8

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY, PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLs./A. FT.	TOTAL CONTENT BBLs./ACRE	PERMEABILITY, MILLIDARCYS	OIL RECOVERY, BBLs./ACRE
679.0 - 688.2	8.3	20.0	41.1	42.5	650	5,519	151.7	2,697 (Primary & Secondary)

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