OILFIELD RESEARCH LABORATORIES

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

August 2, 1976

Carmel Energy, Inc.
Suite 400
9235 Katy Freeway
Houston, Texas 77024

Gentlemen:

Enclosed herewith are the results of tests run on the Rotary core taken from the Clinkenbeard Lease, Well No. 18, Allen County, Kansas, and submitted to our laboratory on July 26, 1976.

The sand in the core extending from 865 - 883 feet showed considerable bleeding of oil. The oil was also foamy like it contained considerable gas.

This core was sampled by a representative of Oilfield Research Laboratories.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:vm

10 c to Houston, Texas.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Carmel Energy, Inc. Lease Clinkenbeard Well No. 18

Location 514.3'NSL & 471.6'WEL, E½ SE¼

Section 3 Twp. 24S Rge. 18E County Allen State Kansas

Name of Sand	Bartlesville
Top of Core	865.0
Bottom of Core	911.0
Oil Top of Sand	868.9
Bottom of Sand (Cored)	911.0
Total Feet of Permeable Sand	37.6
Total Feet of Floodable Sand	

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 500	6.2	6.2
500 - 750	13.4	19.6
750 - 1000	5.0	24.6
1000 - 1500	5.0	29.6
1500 & above	8.0	37.6

Average Permeability Millidarcys	915.9
Average Percent Porosity	23.7
Average Percent Oil Saturation	43.8
Average Percent Water Saturation	23.9
Average Oil Content, Bbls./A. Ft.	814.
Total Oil Content, Bbls./Acre	30,594.
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	

OILFIELD RESEARCH LABORATORIES

-LOG-

Company Carmel Energy, Inc. Lease Clinkenbeard Well No. 18

Depth Interval, Feet	Description
865.0 - 865.3	Light brown sandstone.
865.3 - 868.9	Gray sandy shale.
868.9 - 870.3	Dark brown fine grained shaly sandstone.
870.3 - 881.9	Dark brown medium grained sandstone.
881.9 - 882.0	Shale.
882.0 - 883.0	Loss.
883.0 - 886.0	Soft dark sandstone.
886.0 - 886.3	Gray shaly sandstone.
886.3 - 887.1	Dark sandstone.
887.1 - 888.8	Gray sandy limestone.
888.8 - 896.0	Soft dark sandstone.
896.0 - 897.0	Loss.
897.0 - 901.8	Dark soft sandstone.
901.8 - 902.2	Gray calcareous shale containing an angular fracture.
902.2 - 911.0	Soft dark sandstone containing an angular fracture.

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VERTICAL

RESULTS OF PERMEABILITY AND POROSITY TESTS

TABLE I A

Company Carmel Energy, Inc. Lease Clinkenbeard Well No. 18

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.	Percent Porosity
			Ft.	Cum. Ft.		
1	869.7	382.				
2	870.6	664.				
3	871.3	710.				
4	872.3	489.				
5	837.7	643.				
6	874.7	815.				
7	875.3	617.				
8	876.3	170.				
9	877.7	599.				
10	878.7	127.				
11	879.7	873.				
12	880.3	1,111.				
13	881.3	226.				
14	883.3	1,198.				
15	884.3	719.				
16	885.3	546.				
17	886.7	1,362.				
18	889.7	2.5				
19	890.3	143.				
20	891.3	2,367.				
21	892.3	1,290.				
22	893.7	1,512.				
23	894.3	253.				
24	895.3	556.				
25	897.3	1,815.				
26	898.3	2,450.				
27	899.3	1,775.				
28	900.3	1,291.				
29	901.3	747.				
30	902.7	1,103.				
31	903.7	98.				
32	904.3	3,065.				
33	905.7	935.				
34	906.3	1,168.				
35	907.3	219.				
36	908.7	1,202.				
37	909.3	85.				
38	910.7	545.				

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Carmel Energy, Inc. Lease Clinkenbeard Well No. 18

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	869.5	17.2	52	20	72	694	93.	1.4	1.4	972	130.20
2	870.5	26.1	39	30	69	790	611.	0.7	2.1	553	427.30
3	871.5	23.4	44	22	66	799	679.	1.0	3.1	799	679.00
4	872.5	21.3	49	18	67	810	576.	1.0	4.1	810	576.00
5	873.5	20.2	53	18	71	831	509.	1.0	5.1	831	509.00
6	874.5	20.9	45	25	70	730	754.	1.0	6.1	730	754.00
7	875.5	19.1	55	17	72	815	643.	1.0	7.1	815	643.00
8	876.5	22.3	50	13	63	873	940.	1.0	8.1	873	940.00
9	877.5	22.8	50	18	68	885	531.	1.0	9.1	885	531.00
10	878.5	18.0	37	30	67	517	207.	1.0	10.1	517	207.00
11	879.5	23.2	41	22	63	738	727.	1.0	11.1	738	727.00
12	880.5	14.9	65	27	92	760	33.	1.0	12.1	760	33.00
13	881.5	20.8	50	19	69	807	679.	0.9	13.0	726	611.00
14	883.5	26.2	41	33	74	833	1803.	1.0	14.0	833	1803.00
15	884.5	22.5	38	47	85	664	846.	1.0	15.0	664	846.00
16	885.5	23.0	42	35	77	749	556.	1.0	16.0	749	556.00
17	886.5	20.1	44	30	74	960	694.	0.8	16.8	768	555.00
18	889.5	27.9	41	40	81	887	541.	1.2	18.0	1153	649.00
19	890.5	29.3	38	33	71	864	1888.	1.0	19.0	864	1888.00
20	891.5	29.4	43	31	74	981	1515.	1.0	20.0	981	1515.00
21	892.5	28.1	40	30	70	872	264.	1.0	21.0	872	264.00
22	893.5	26.0	44	24	68	888	1532.	1.0	22.0	888	1532.00
23	894.5	26.3	44	27	71	898	1704.	1.0	23.0	898	1704.00
24	895.5	20.4	46	31	77	728	944.	1.0	24.0	728	944.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Carmel Energy, Inc. **Lease** Clinkenbeard **Well No.** 18

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mil.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
25	897.5	27.3	40	31	71	847	2273.	1.0	25.0	847	2273.00
26	898.5	25.5	45	28	73	890	611.	1.0	26.0	890	611.00
27	899.5	25.5	43	25	68	851	1037.	1.0	27.0	851	1037.00
28	900.5	25.7	42	28	70	837	1453.	1.0	28.0	837	1453.00
29	901.5	20.4	42	29	71	665	349.	0.8	28.8	532	279.25
30	902.5	22.3	42	27	69	726	746.	0.8	29.6	581	597.00
31	903.5	25.4	48	22	70	946	971.	1.0	30.6	946	971.00
32	904.5	29.4	37	28	65	844	1867.	1.0	31.6	844	1867.00
33	905.5	23.0	35	25	60	625	460.	1.0	32.6	625	460.00
34	906.5	23.7	40	18	58	736	1073.	1.0	33.6	736	1073.00
35	907.5	25.1	32	26	58	623	680.	1.0	34.6	623	680.00
36	908.5	23.0	36	30	66	643	1200.	1.0	35.6	643	1200.00
37	909.5	28.5	39	24	63	862	1524.	1.0	36.6	862	1524.00
38	910.5	26.7	42	29	71	870	1390.	1.0	37.6	870	1390.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

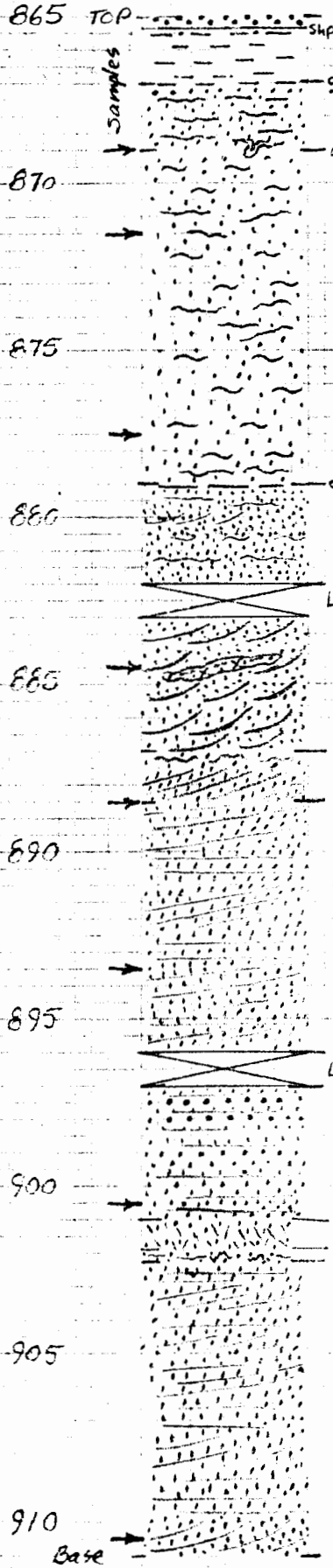
Company Carmel Energy, Inc. Lease Clinkenbeard Well No. 18

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
868.9 - 877.0	8.1	575.1	4,658.50
877.0 - 890.0	9.9	658.4	6,518.00
890.0 - 911.0	19.6	1,186.8	23,262.25
868.9 - 911.0	37.6	915.9	34,438.75

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
868.9 - 877.0	8.1	20.9	48.9	20.0	850	6,883
877.0 - 890.0	9.9	22.3	45.3	30.6	787	7,793
890.0 - 911.0	19.6	25.6	40.9	27.3	812	15,918
868.9 - 911.0	37.6	23.7	43.8	23.9	814	30,594

CARMEL ENERGY 18-Clinkenbeard Allen Co., KS

SE SE SE 3-24-18E IOLA FIELD (Carlyle)



SS, tan (LOS) M-VF, hd, cem., wacke, carb., horiz. bed. (LOS = lt. oil stain)

Sh, m. brn./blk. streaks, lamin., carb., slakes when wet

SS, gy-wht-tan (LOS), v. shly – thin lamin. & partings, sid. cem. in SS, horiz. sli. irreg. lamin., some distort. (compac.) at sd-sh cont.

SS, dk. brn. (HOS), VF-F, sub-horiz. paral. lamin. and ripple x-lam. (HOS = hvy. oil stn)

Sh, gy & SS, wht, interlam., carb.

SS, dk brn, (v. HOS) VF-F, sub-horiz. lam. & thin set of incl. lam. separ. by irreg. wavy lamin. and ripple x-lam.

SS, v. dk. brn (v. HOS), C – F, trough x-beds, sid. clyst. lithicl. at 884'

SS, lt. gy, v. hd, calcite cem., M-F, incl. planar lamin., irreg. shly. lam. at top

SS, dk. brn (v. HOS) C – F, incl. par. lamin. w/ few sets of horiz. lam., soft – friable in part.

SS, dk brn (VHOS) C-F, sub-horiz. parallel bedded, soft, friable

SS, dk brn (VHOS) M-F, as above except lamin. interrupted by 1mm-diam, 1cm-long tube-like, near-vertical struct.?

SS, lt. gy, hd, hard, calc. cem., thin, wavy shale lamin., stylolitic cont. of sh. partings.

SS, dk brn (VHOS) C-F, altern. sub-horiz. and sli. incl. sli. irreg. lamin. (low ampl. trough x-bed sets?), soft, friable in part.

From: ERDA Progress Reviews #10, E.O.R. April '77
John Sperry, Carmel Energy, Inc. "Vapor Therm" Process

Air-Compressor Problems

A 4-stage air compressor package is used in this project, taking air at atmospheric pressure into the 1st stage and discharging air at 850 to 900 psig from the 4th stage. The 1st and 2nd stages are handled in an Ingersoll-Rand compressor driven by a 525-hp Waukesha natural-gas-fired engine modified to burn propane if the natural gas supply fails. The 3rd and 4th stages are handled in a Clark compressor, which is also driven by a Waukesha engine modified in a similar manner. Both machines were completely overhauled and then were satisfactorily test run under full load and at full speed for a 12-hour period prior to shipping to the field site. On Jan. 3, after running at near full load for 7 hours, the Clark compressor automatically shut down because of high discharge temperature on the 3rd stage. The Vapor Therm Unit was drained and secured, then full attention was directed to the compressor. All of the symptoms indicated bad valves on the 4th stage were causing the 3rd stage to do too much work and to operate at too high a compression ratio which, in turn, caused an excessively high discharge temperature. Inspection and testing of the valves and rings on the 4th stage indicated no apparent problems. However, the valves were lapped, new gaskets were installed, and the valves and piston put back into the compressor. On subsequent testing, the high-temperature problem occurred again. Further investigation revealed the problem to be one caused by the very low temperatures of the ambient air, ranging from 10° F below zero to 10° F above zero. With both engines running at the same RPM, the actual quantity of air entering the 1st stage cylinder at 0° F was in excess of the quantity of air that could be handled by the 4th stage. The solution to the problem was to run the second engine which handled the 3rd and 4th compression stages 100 RPM faster than the first engine which drove the 1st and 2nd stages. This operating technique was tried and was found to be correct.

Future Work

Production will continue, and individual well production rates will be measured to establish the production decline curve. It is expected that the second injection cycle will begin about Apr. 1. During this second injection cycle, a downhole, in-situ emulsion breaker will be injected with the steam and inert gas to prevent the emulsion blocks which apparently have occurred.

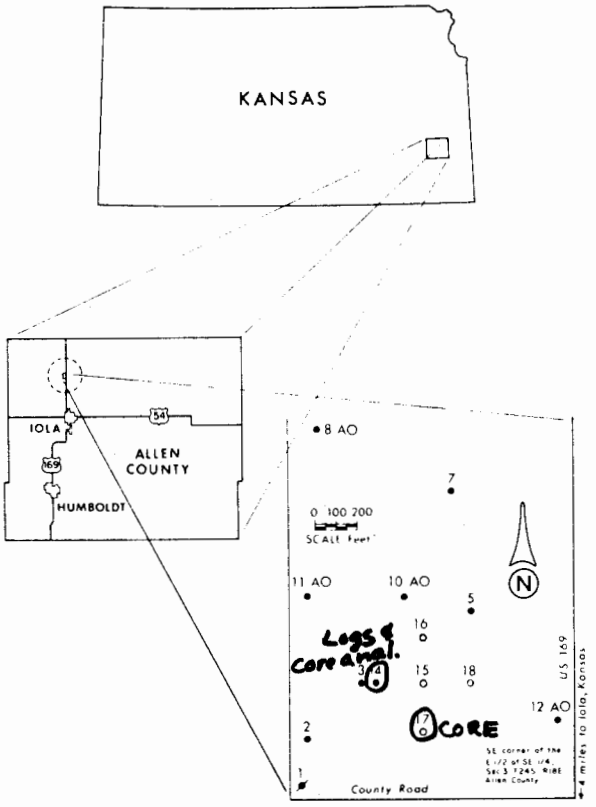
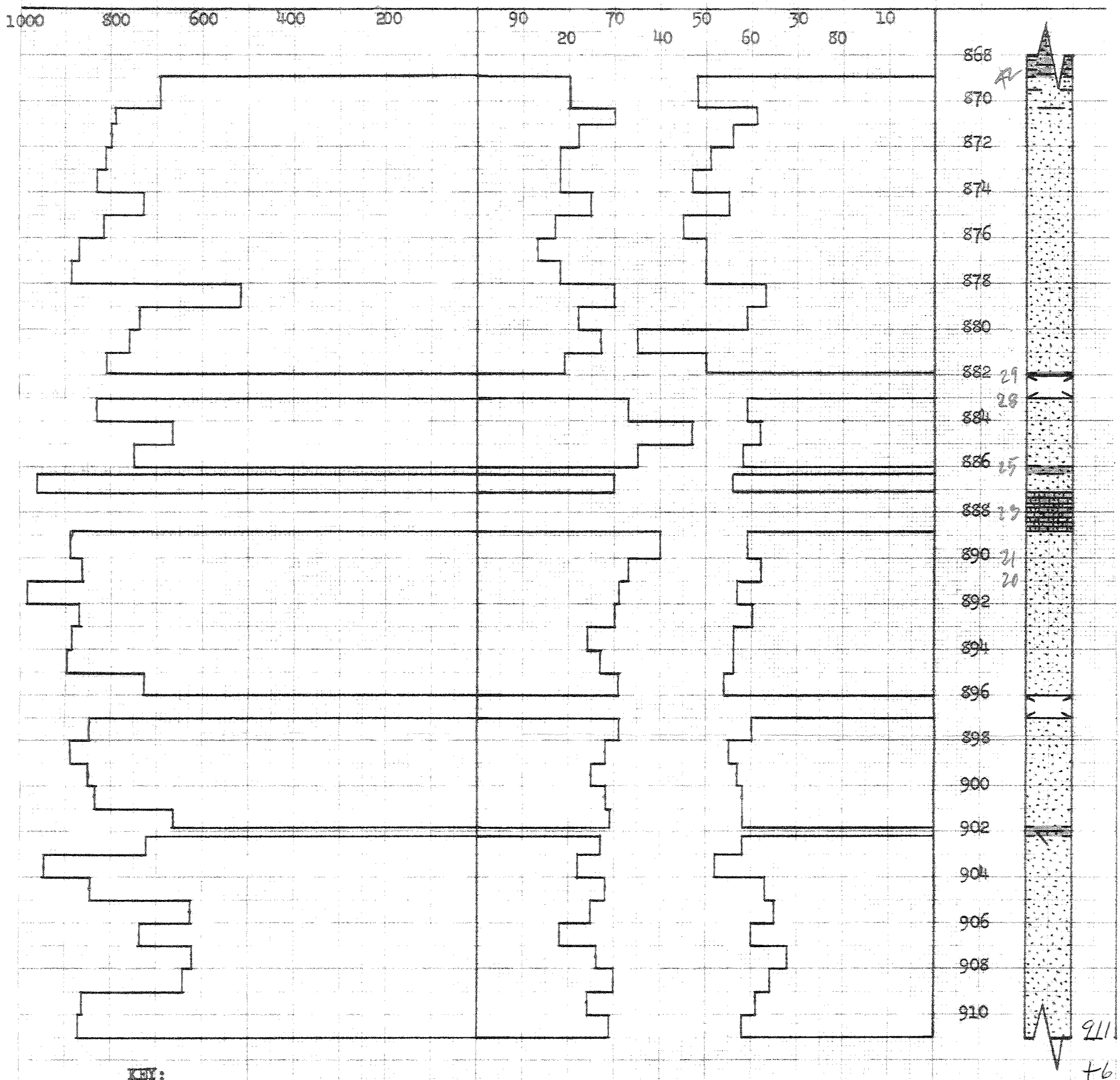


Figure 1. - *Site map of Vapor Therm project area, Clinkenbeard lease, Allen Co., Kansas.*



KEY:

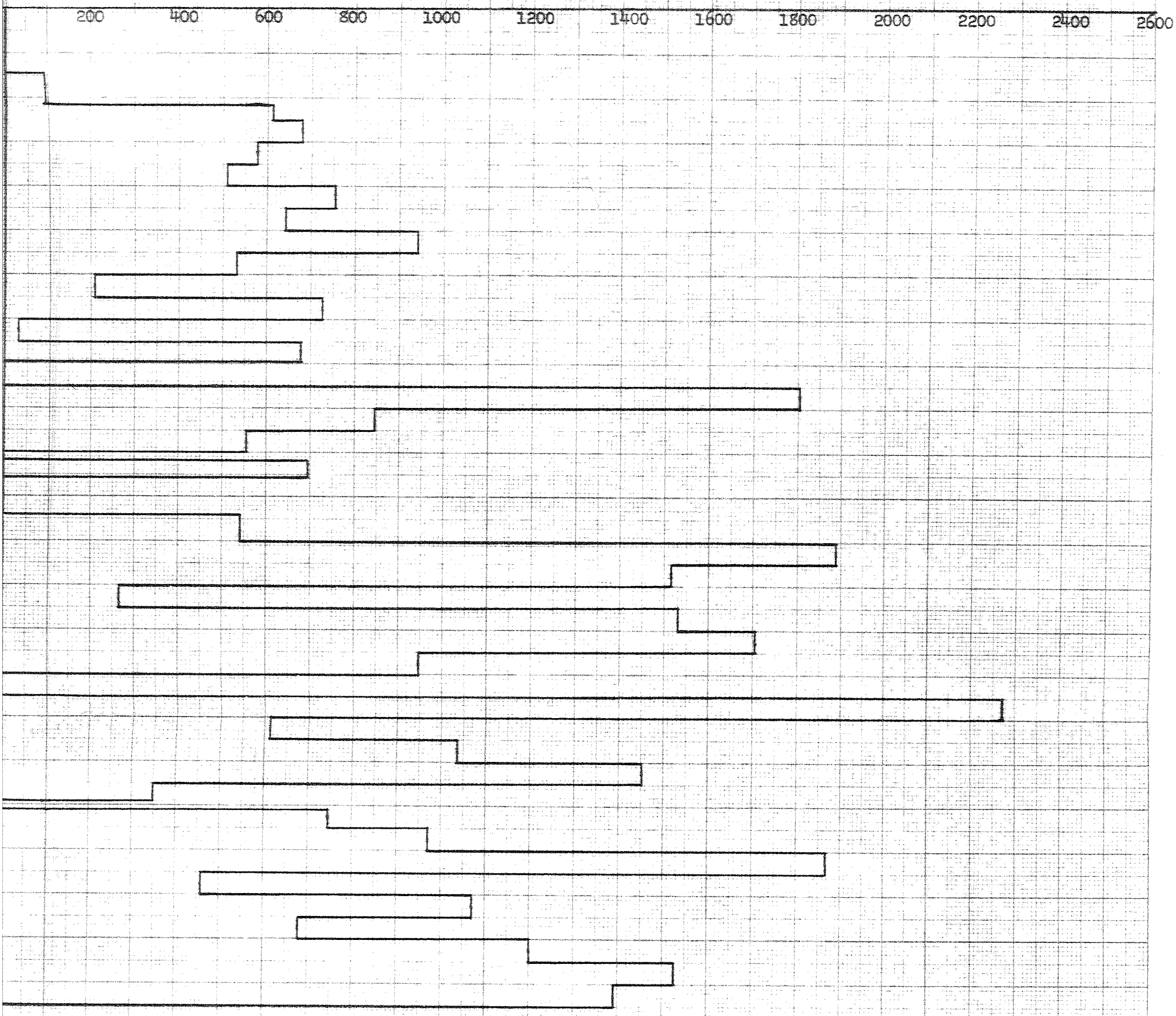
- SANDSTONE
- SHALY SANDSTONE
- CALCAREOUS SHALE
- SANDY LIMESTONE
- SANDY SHALE
- SHALE

CARMEL E

CLINKENBEARD LEASE

ALL

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT
868.9 - 877.0	8.1	20.9	48.9
877.0 - 890.0	9.9	22.3	45.3
890.0 - 911.0	19.6	25.6	40.9
868.9 - 911.0	37.6	23.7	43.8



7' ABOVE SEA LEVEL

LOSS

FORMATION CONTAINING AN ANGULAR FRACTURE

NERGY, INC.

WELL NO. 18

N COUNTY, KANSAS

AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLS./A. FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS
20.0	850	6,883	575.1
30.6	787	7,793	658.4
27.3	812	15,918	1,186.8
23.9	814	30,594	915.9

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
AUGUST, 1976.