

MACK C. COLT

CORE ANALYSIS REPORT

COCHRAN LEASE

WELL NO. 1-AO

ANDERSON COUNTY, KANSAS

2



OILFIELD RESEARCH LABORATORIES

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November 4, 1960

Mack C. Colt
Iola, Kansas

Dear Sir:

Enclosed herewith is the report of the analysis of the 3" Rotary core samples taken from the Cochran Lease, Well No. 1-AO, Anderson County, Kansas, and submitted to our laboratory by Mr. Charles Chauncy on October 29, 1960.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. McElrea
Carl L. McElrea

CLM:db

1 c. - Mrs. John L. Rich

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company	Mack C. Colt		Lease	Cochran	Well No.	1-AO
Location	590' from N Line, 610' from E Line, NE					
Section	9	Twp.	22S	Rge.	21E	County Anderson State Kansas
Name of Sand						Bartlesville
Top of Core						721.6
Bottom of Core						765.0
Top of Sand	(According to driller)					721.4
Floodable						
Bottom of Sand						745.1
Total Feet of Permeable Sand						34.8
Total Feet of Floodable Sand						8.9
Distribution of Permeable Sand:						
Permeability Range						
Millidarcys						
0 - 5	9.9					9.9
5 - 25	7.1					17.0
25 - 50	2.7					19.7
50 - 75	7.0					26.7
75 & above	8.1					34.8
Average Permeability Millidarcys						51.7
Average Percent Porosity						19.0
Average Percent Oil Saturation						44.1
Average Percent Water Saturation						33.8
Average Oil Content, Bbls./A. Ft.						562.
Total Oil Content, Bbls./Acre						25,260.
Average Percent Oil Recovery by Laboratory Flooding Tests						5.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.						91.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre						813.
Total Calculated Oil Recovery, Bbls./Acre						-
Packer Setting, Feet						
Viscosity, Centipoises @						
A. P. I. Gravity, degrees @ 60 °F						
Elevation, Feet						1021.5

Water base mud was used as the circulating fluid during the coring of the sand.

The core was sampled and the samples were sealed in cans by a representative of Mack C. Colt.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
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721.6 - 722.4	- Laminated shaley sandstone.
722.4 - 723.7	- Brown slightly shaley sandstone.
723.7 - 727.5	- Laminated sandstone and shale.
727.5 - 730.6	- Brown sandstone.
730.6 - 731.1	- Shale.
731.1 - 732.6	- Brown laminated micaceous shaley sandstone.
732.6 - 742.4	- Brown slightly shaley sandstone.
742.4 - 746.5	- Brown to dark slightly carbonaceous slightly shaley sandstone.
746.5 - 760.2	- Dark carbonaceous micaceous sandstone.
760.2 - 765.0	- Shale discarded at well.

Sampling was started at a depth of 721.6 feet in laminated shaley sandstone and completed at 760.2 feet in dark carbonaceous micaceous sandstone. This core shows a total of 34.3 feet of sandstone. For the most part, the pay is made up of brown slightly shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 18.9, 90.3 and 13.4 millidarcys respectively; the overall average being 51.7 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 0.61 to a

maximum of 182 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 44.1. The weighted average percent oil saturation of the upper, middle and lower sections is 28.3, 38.2 and 57.1 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 53.5, 33.1 and 26.7 respectively; the overall average being 33.8 (See Table III). This gives an overall weighted average total fluid saturation of 77.9 percent. This total fluid saturation indicates some fluid was lost during coring, part of which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 344, 609 and 846 barrels per acre foot respectively; the overall average being 662. The total oil content, as shown by this core, is 25,260 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Part of the sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 813 barrels of oil per acre was obtained from 8.9 feet of sand. The weighted average percent oil saturation was reduced from 39.6 to 34.2, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 8.29 millidarcys, while the average initial fluid production pressure is 25.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 29 samples tested, 16 produced water and 6 oil. This indicates that approximately 21 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a very wide variation in effective permeability.

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CONCLUSION

The analysis results show a thin section of sand responded to laboratory flooding tests. A total of 8.9 feet of sand in the interval extending from the depth of 728.7 to 745.1 feet responded favorably.

The analysis results indicate that the oil saturation of the permeable sand is at or near residual values. However, the water saturation is near normal in that section of the core, rather than the high water saturation that would be expected in a watered-out zone.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Mack C. Colt Lease Cochran Well No. 1-AO

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			Ft.	Cum. Ft.		
1	721.7	15.5	28	55	83	9.1	0.9	0.9	302	8.19
2	723.1	20.0	29	37	66	44.	1.3	2.2	584	57.20
3	724.3	14.2	30	54	84	0.61	1.3	3.5	429	0.79
4	725.6	14.3	26	60	86	Imp.	1.2	4.7	341	0.00
5	726.9	14.4	28	62	90	Imp.	1.3	6.0	406	0.00
6	728.1	18.9	38	33	71	109.	1.2	7.2	670	130.80
7	729.3	21.1	37	36	73	64.	1.9	9.1	1,150	121.60
9	732.1	16.0	32	36	68	15.	1.5	10.6	595	22.50
10	733.2	22.4	30	33	63	121.	1.3	11.9	677	157.30
11	734.6	21.7	33	34	67	73.	1.3	13.2	722	94.90
12	735.7	21.8	36	34	70	149.	1.3	14.5	792	193.70
13	737.4	21.1	45	29	74	182.	1.5	16.0	1,105	273.00
14	738.7	22.7	40	31	74	126.	1.5	17.5	1,056	189.00
15	740.3	16.8	40	37	77	63.	1.5	19.0	1,784	94.50
16	741.7	20.7	38	28	66	63.	1.4	20.4	854	88.20
17	743.1	22.0	46	30	76	33.	1.4	21.8	1,100	46.20
18	744.5	21.2	42	36	78	102.	1.3	23.1	1,898	132.60
19	745.8	19.2	54	28	82	23.	1.4	24.5	1,126	32.20
20	747.1	17.4	54	37	91	22.	1.1	25.6	1,802	24.20
21	748.1	18.1	66	29	95	4.1	1.0	26.6	926	4.10
22	749.2	20.0	52	25	77	20.	1.0	27.6	806	20.00
23	750.1	22.5	64	18	82	22.	1.2	28.8	1,338	26.40
24	751.5	18.5	62	24	86	1.4	1.3	30.1	1,157	1.82
25	752.8	17.0	55	27	82	3.8	0.9	31.0	1,652	3.42
26	753.2	19.6	59	21	80	4.1	1.2	32.2	1,079	4.92

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Mack C. Colt Lease Cochran Well No. 1-AO

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.		
27	755.1	19.1	60	22	82	888	3.5	1.4	33.6	1,244	4.90
28	756.1	10.7	25	73	98	207	Imp.	0.9	34.5	186	0.00
29	756.9	20.4	57	19	76	902	1.8	1.0	35.5	902	1.80
30	758.2	20.1	60	22	82	935	3.8	1.2	36.7	1,122	4.56
31	759.1	19.5	66	17	83	998	66.	0.9	37.6	898	59.40
32	760.0	19.0	63	19	82	929	3.2	0.6	38.2	557	1.92
								Total-	- - -	25,260	

CENTRO RESERVA LUBRICACIONES

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III - B

Company <u>Mack C. Colt</u>	Lease <u>Cochran</u>	Well No. <u>1-AO</u>
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Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Mfd.
721.6 - 725.0	3.5	18.9	66.18
727.5 - 745.1	17.1	90.3	1,544.30
745.1 - 760.2	14.2	13.4	189.64
721.6 - 760.2	34.8	51.7	1,800.12

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
721.6 - 727.5	6.0	15.7	28.3	53.5	344	2,062
727.5 - 745.1	17.1	20.5	38.2	33.1	609	10,403
745.1 - 760.2	15.1	18.8	57.1	26.7	846	12,795
721.6 - 760.2	38.2	19.0	44.1	33.8	662	25,260

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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		Volumes of Water Recovered cc*	Effective Permeability Millidarcys*	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
2	723.1	19.6	32	486	0	0	32	57	15	0.555	35
3	724.3	13.8	26	278	0	0	26	65	0	Imp.	50+
5	726.9	14.2	31	341	0	0	31	63	0	Imp.	50+
6	728.1	19.2	41	610	0	0	41	55	10	0.295	35
7	729.3	20.8	37	597	2	32	35	61	32	1.02	25
9	732.1	16.4	35	445	0	0	35	60	2	0.102	45
10	733.2	22.2	31	533	0	0	31	66	106	4.88	25
11	734.6	21.6	32	536	0	0	32	65	28	0.722	30
12	735.7	22.3	36	622	4	69	32	66	345	8.80	30
13	737.4	21.6	45	754	11	184	34	64	1,027	20.78	20
14	738.7	22.6	40	701	9	158	31	64	601	16.12	20
15	740.3	17.3	40	536	0	0	40	58	26	0.517	30
16	741.7	20.5	38	604	1	16	37	58	44	1.12	30
17	743.1	21.5	49	817	0	0	49	43	19	0.413	40
18	744.5	21.0	42	684	6	98	36	59	99	2.68	30
19	745.8	19.7	52	794	0	0	52	35	13	0.250	45
20	747.1	17.8	50	690	0	0	50	40	6	0.100	45
21	748.1	18.7	63	914	0	0	63	28	0	Imp.	50+
22	749.2	19.8	55	845	0	0	55	38	0	Imp.	50+
23	750.1	21.9	62	1,052	0	0	62	26	53	1.02	30
24	751.5	18.2	61	861	0	0	61	32	0	Imp.	50+
25	752.8	17.4	58	783	0	0	58	34	0	Imp.	50+
26	753.2	19.1	58	859	0	0	58	36	0	Imp.	50+
27	755.1	18.7	56	812	0	0	56	39	0	Imp.	50+
28	756.1	11.3	22	193	0	0	22	74	0	Imp.	50+
29	756.9	19.8	54	829	0	0	54	26	0	Imp.	50+
30	758.2	20.3	61	961	0	0	61	38	0	Imp.	50+
31	759.1	19.1	63	933	0	0	63	35	0	Imp.	50+
32	760.0	19.0	67	987	0	0	67	22	0	Imp.	50+

Notes: cc—cubic centimeter.

*—Volumes of water recovered at the time of maximum oil recovery.

Well No. 1-AO

Cochran

Lease

Mack C. Colt

Company

TABLE V

Company Mack C. Colt Lease Cochran Well No. 1-AO

Depth Interval, Feet 728.7 - 745.1

Feet of Core Analyzed 8.9

Average Percent Porosity 21.4

Average Percent Original Oil Saturation 39.6

Average Percent Oil Recovery 5.4

Average Percent Residual Oil Saturation 34.2

Average Percent Residual Water Saturation 62.0

Average Percent Total Residual Fluid Saturation 96.2

Average Original Oil Content, Bbls./A. Ft. 657.

Average Oil Recovery, Bbls./A. Ft. 91.

Average Residual Oil Content, Bbls./A. Ft. 566.

Total Original Oil Content, Bbls./Acre 5,860.

Total Oil Recovery, Bbls./Acre 813.

Total Residual Oil Content, Bbls./Acre 5,047.

Average Effective Permeability, Millidarcys 8.29

Average Initial Fluid Production Pressure, p.s.i. 25.8

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

Cochran 1-A0

- 715- 719 SS. vy fn gr. well sorted, w/ interl. of biot. minute ripple vy.
IN RIDDLE It sat
- 728.7 1bid w/ fair sat
- 730.2 1bid w/ good sat, L to subbed sh pebs. in basal 3"
- 730.7 Sh. med gr w/ slickens ss dike
- 732.5 SS. vy fn gr. w/ dessem & laminar biot., good sat.
- 733.0 Sh med gr. w/ highly irreg flowage of ^{& inclusions} vy fn gr. ss.
- 734.9 SS. vy fn gr. w 20° X strat. & interl. of biot. good sat
- 740.1 SS " " " lam ^{& biot} & interstr. w/ sh (horiz) It sat
- 744.7 SS " " " w/ scat. flat pebs. siltst & sid. good sat
- 746.7 SS " " " finly dessem. biot. & dead oil sat
- 748.2 SS " " " w/ scat ^{sid} sm pebs. & interstr. & sid grs, dead oil sat
- 748.5 SS " " " w/ large irreg. nodules of dead oil or coal
- 748.7 Cgl. sid pebs, rd flattened & subL in shape in a matrix of
silty vy fn gr. ss. dead oil sat
- 750 SS. vy fn gr silty dead oil sat irreg sid inclusions &
coaly mat. in basal 6"
- 754 Sh med gr "pencil cone" fissile

1023

752

273



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



1670



1673

Cochran-JAO

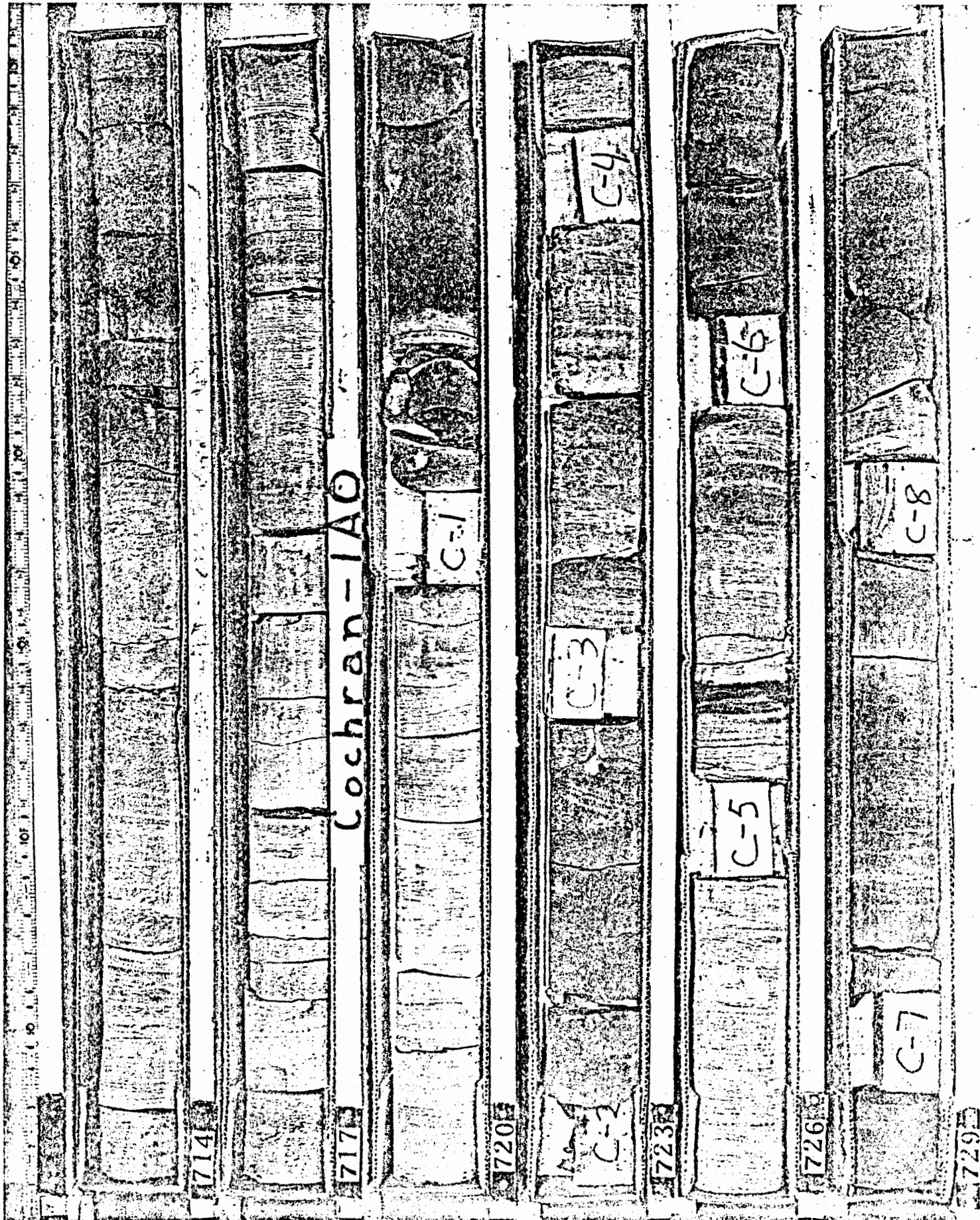


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1679





Cochran-1A0

C-1

C-3

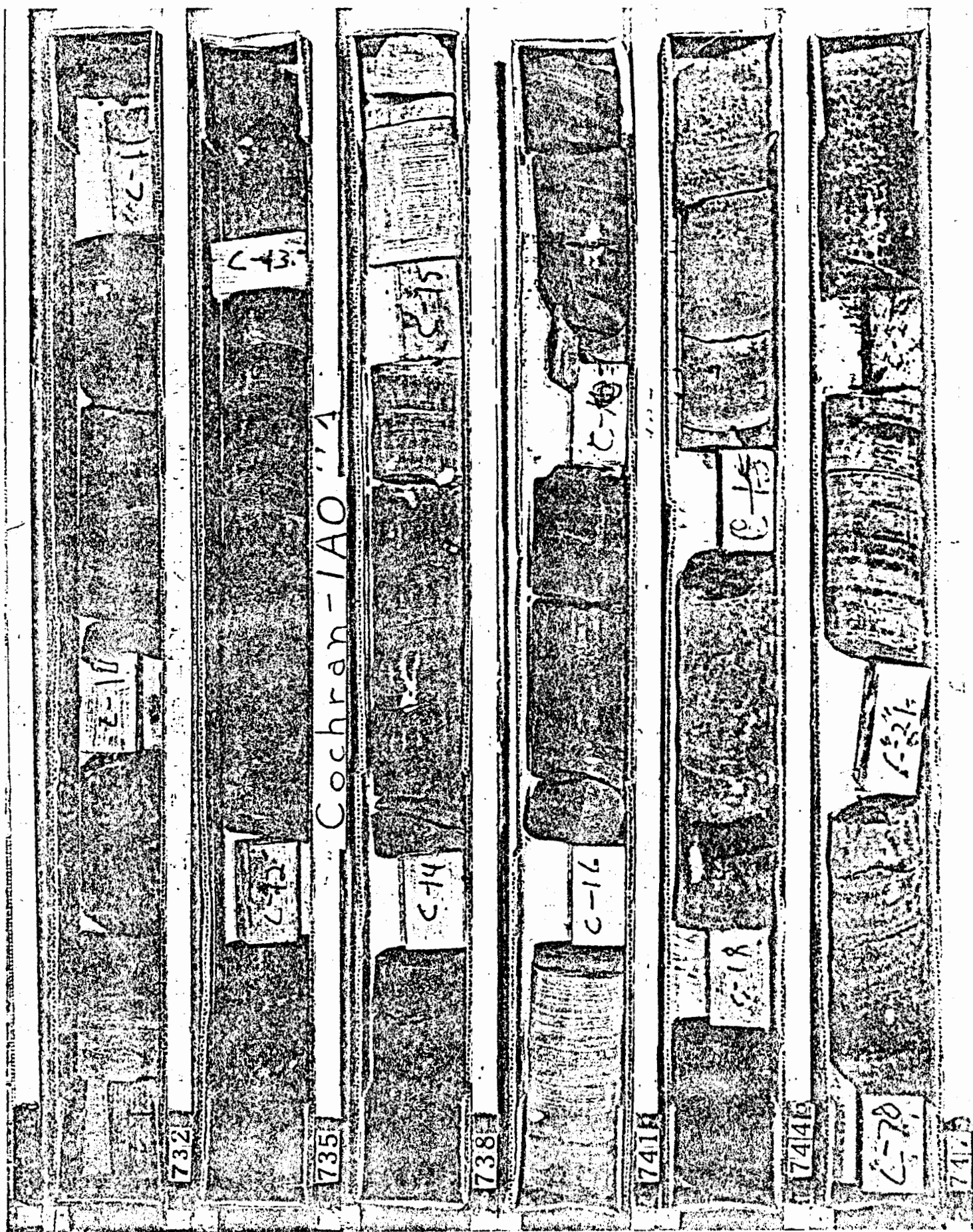
C-4

C-5

C-6

C-8

C-7



732

C-43

735 Cochran-IAO 114

C-14

738

C-16

741

C-18

744

C-28

C-21

747

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



1750

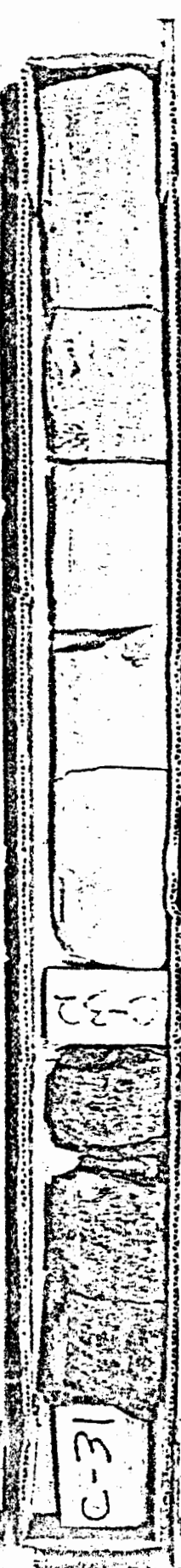


Cochran-IAO

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1759

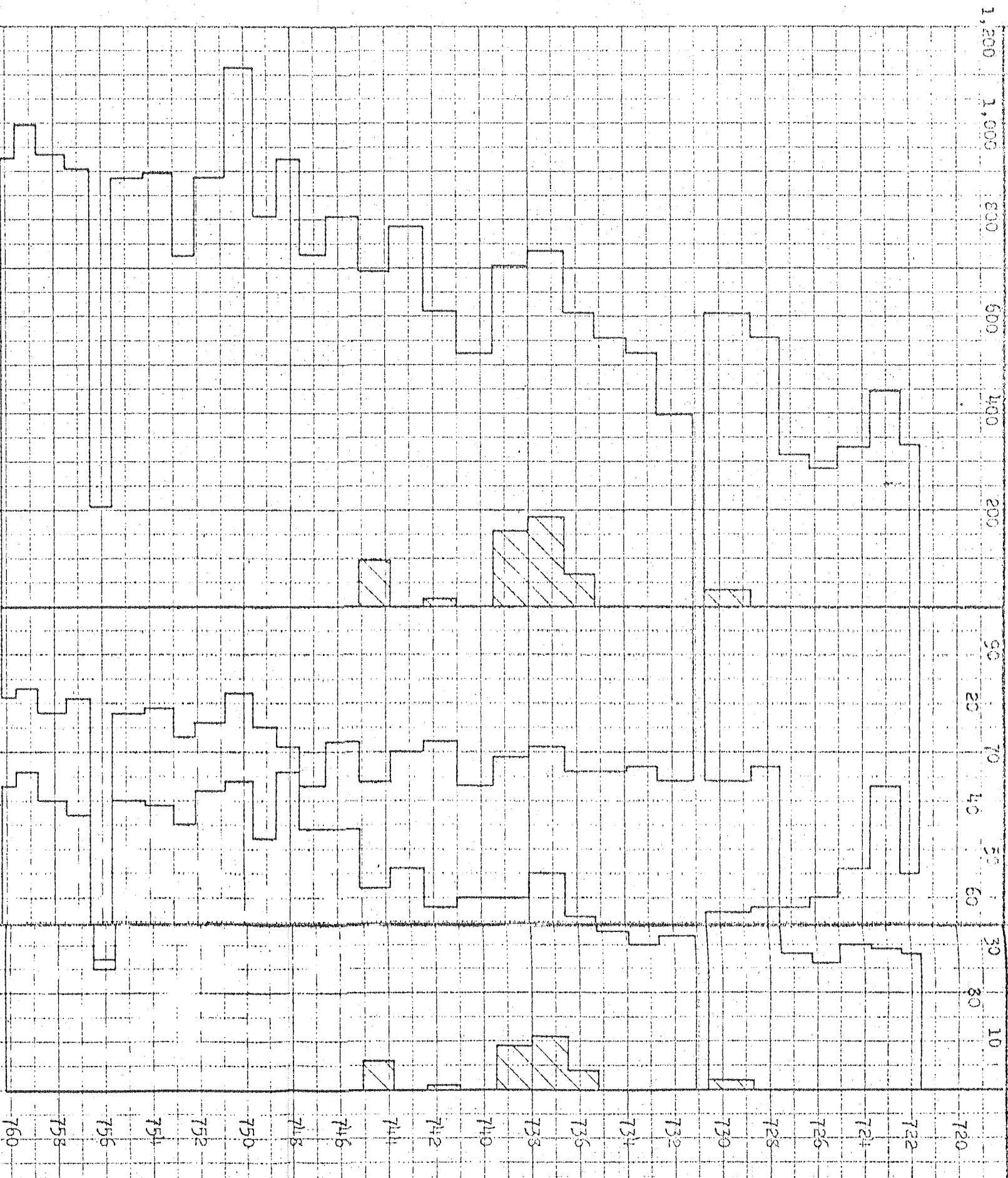


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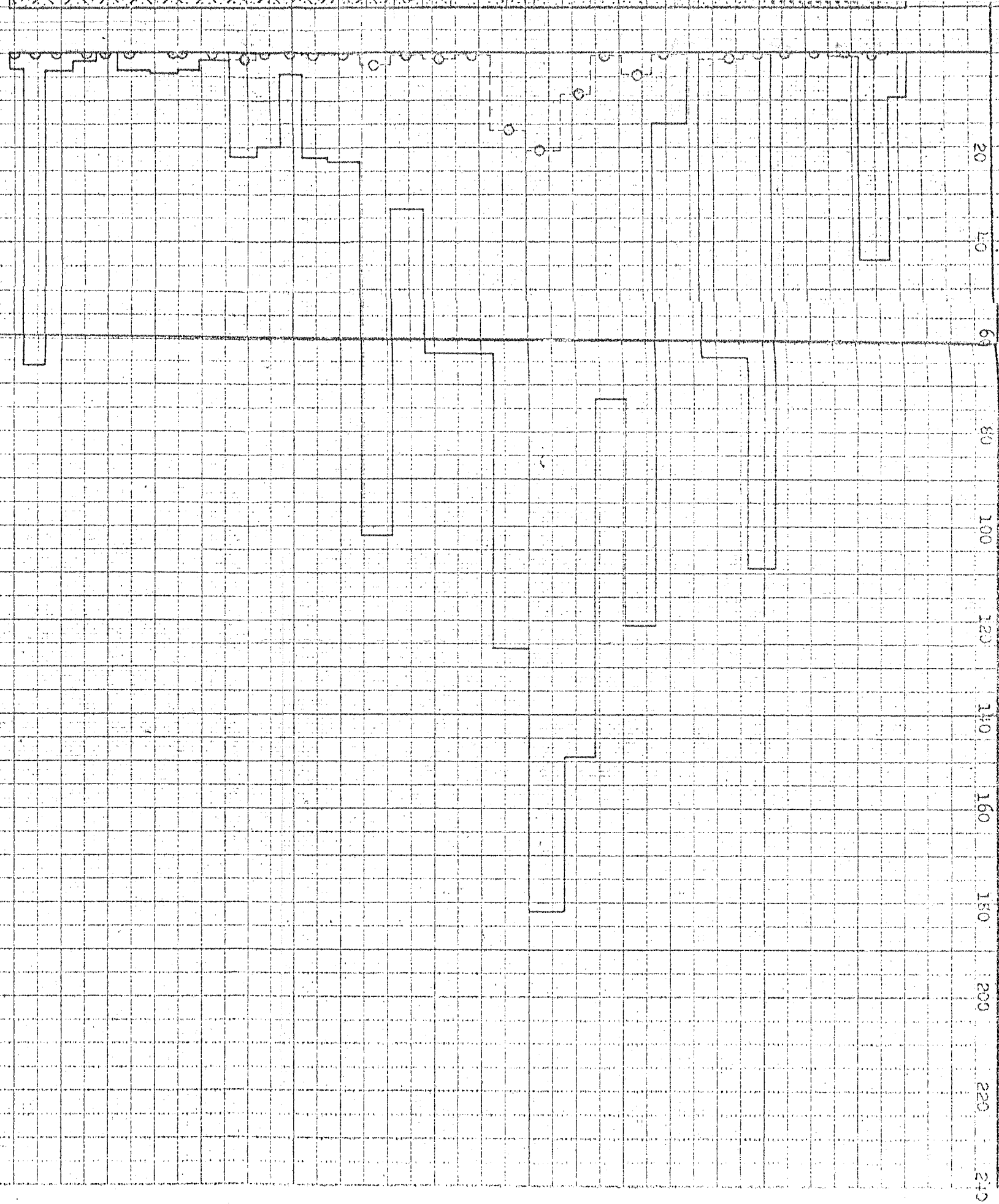
OIL CONTENT,
BBLS./A. FT.

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT



--- EFFECTIVE PERMEABILITY, IN MILLIDARCS, O
--- AIR PERMEABILITY, IN MILLIDARCS



ROCK

DEEP SANDSTONE

ZONE AND SHALE

C.C. COLT

WELL NO. 1-1A0

COUNTY, KANSAS

FORMATION	AVG. OIL CONTENT BBLS./A. FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY, BBLS./ACRE
53.5	344	2,062	18.9	
33.2	609	10,403	90.3	
26.7	845	12,795	13.4	
33.8	652	25,269	51.7	

Oil and Gas Consultants, Inc.