

CORE ANALYSIS RESULTS

Company THUNDERBIRD DRILLING COMPANY Formation ARBUCKLE File CP-1-6289
Well TOBIAS NO. 2 Core Type DIAMOND Date Report 4-12-67
Field TOBIAS Drilling Fluid WATER BASE MUD Analysts KUHLMAN
County RICE State KANSAS Elev. 1679' DF Location NW NW SW SEC 25-20S-9W

Lithological Abbreviations

SAND-SO SHALE-SH LIME-LM	DOLOMITE-DOL CHERT-CH GYPSUM-GYP	ANHYDRITE-ANHY CONGLOMERATE-CONG FOSSILIFEROUS-FOSS	SANDY-SOY SHALY-SHY LIMY-LMY	FINE-FN MEDIUM-MED COARSE-CSE	CRYSTALLINE-XLN GRAIN-GRN GRANULAR-GRNL	BROWN-BRN GRAY-GY VUGGY-VGY	FRACTURED-FRAC LAMINATION-LAM STYLOLITIC-STY	SLIGHTLY VERY-V/ WITH-W/
SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYs		POROSITY PER CENT	RESIDUAL SATURATION PER CENT PORE		VERTICAL PERM	SAMPLE DESCRIPTION AND REMARKS
		PERM. MAX.	PERM. 90°		OIL	TOTAL WATER		

5	3288.0-88.7	11.3	1.6				0.2	
11	3294.5-95.9	5.3	2.4				0.6	
19	3307.7-09.2	51.1	19.4				0.5	
25	3315.5-17.1	6.7	6.1				0.7	
30	3322.3-23.3	4.8	4.2				0.4	
42	3338.0-40.0	18.7	7.1				1.3	
45	3342.4-43.8	4.0	1.9				0.6	
52	3351.1-51.9	4.1	3.9				0.5	
54	3353.0-54.0	5.9	4.5				8.3	
62	3363.6-65.1	8.8	5.9				3.1	
64	3366.5-68.0	0.3	<0.1				0.3	

THIS IS A FINAL REPORT.

DISTRIBUTION: 6CC: THUNDERBIRD DRILLING COMPANY
ATTN: MR. ED BLINCOE
400 NORTH WOODLAWN
WICHITA, KANSAS

Combined Permeability Tests: THUNDERBIRD DRILLING COMPANY
TOBIAS NO. 2 WELL

DEPTH	LENGTH OF SAMPLE IN FEET	PERMEABILITY MAXIMUM	PERMEABILITY 90°	PERMEABILITY VERTICAL
* 3287.4	.41	3.5	3.5	<0.1
3288.0-88.7	.49	11.3	1.6	0.2
* 3289	.27	396.9	42.0	2.8
3294.5-95.9	.42	5.3	2.4	0.6
* 3297	.41	144.2	69.2	3.4
3307.7-09.2	.47	51.1	19.4	0.5
* 3310	.44	10.7	7.1	0.8
3315.5-17.1	.42	6.7	6.1	0.7
* 3319	.35	171.8	11.7	4.9
3322.3-23.3	.60	4.8	4.2	0.4
* 3328	.61	513.1	513.1	9.1
3338.0-40.0	.33	18.7	7.1	1.3
* 3339	.40	0.2	0.2	<0.1
3342.4-43.8	.44	4.0	1.9	0.6
* 3348	.54	13.8	12.9	0.2
3351.1-41.9	.32	4.1	3.9	0.5
3353.0-54.0	.29	5.9	4.5	8.3
3363.6-65.1	.43	8.8	5.9	3.1
3366.5-68.0	.40	0.3	<0.1	0.3
* 3367	.39	0.4	0.4	<0.1

WEIGHTED AVERAGES

FOR ABOVE	8.43	71.8	46.6	1.9
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WEIGHTED AVERAGES

FOR	17.4	113	45.6
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(ORIGINAL WHOLE CORE
DATA) FOR SAME DEPTHS

* Date measured 9-28-67
Other values measured 4-12-67

CORE ANALYSIS RESULTS

File Cop

Company THUNDERBIRD DRILLING COMPANY Formation ARBUCKLE File CP-1-6445
Well TOBIAS NO. 2 Core Type DIAMOND Date Report 9-28-67
Field TOBIAS Drilling Fluid WATER BASE MUD Analysts BOYLE
County RICE State KANSAS Elev. 1679'DF Location NW NW SW SEC 25-20S-9W

Lithological Abbreviations

SAND-SO SHALE-SH LINE-LH DOLOMITE-DOL CHERT-CH GYPSUM-GYP ANHYDRITE-ANHY CONGLOMERATE-CONG FOSSILIFEROUS-FOSS SANDY-SDY SHALY-SHY LIMY-LHY FINE-FN MEDIUM-MED COARSE-CSE CRYSTALLINE-XLN GRAIN-GRN GRAHULAR-GRNL BROWN-BRN GRAY-GY VUGGY-VGY FRACTURED-FRAC LAMINATION-LAM STYLCLITIC-STY SLIGHTLY-V/ VERY-V/ WITH-W/

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCY		POROSITY PER CENT	RESIDUAL SATURATION PER CENT PORE		VERTICAL PERM	SAMPLE DESCRIPTION AND REMARKS
		PERM. MAX.	PERM. 90°		OIL	TOTAL WATER		
1	3287.4	3.5	3.5				<0.1	Dol, sl/vuggy
2	3289	396.9	42.0				2.8	Dol, vuggy, frac, sty
3	3297	144.2	69.2				3.4	Dol, vuggy, frac, sty
4	3310	10.7	7.1				0.8	Dol, sl/vuggy, frac
5	3319	171.8	11.7				4.9	Dol, vuggy, vert frac
6	3328	513.1	513.1				9.1	Dol, vuggy, vert frac
7	3339	0.2	0.2				<0.1	Dol, sl/vuggy, sty
8	3348	13.8	12.9				0.2	Dol, sl/vuggy, frac
	3354							Unsuitable for whole core permeability
9	3367	0.4	0.4				<0.1	Dol, sl/vuggy

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ATTN: MR. ED BLINCOE
400 NORTH WOODLAWN
WICHITA, KANSAS 67200

PRELIMINARY REPORT
From Okla. City Lab
MAILED FROM OKLA. CITY

CORE LABORATORIES, INC.



Petroleum Reservoir Engineering

COMPANY THUNDERBIRD DRILLING, INC. FIELD TOBIAS FILE CP-1-4395
L TOBIAS NO. 2 COUNTY RICE DATE 5-2-62
LOCATION - STATE KANSAS ELEV. 1679' DF

CORE-GAMMA CORRELATION

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

VERTICAL SCALE: 5" = 100'

CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY

RADIATION INCREASE →

COREGRAPH

TOTAL WATER ———

PERCENT TOTAL WATER

80 60 40 20 0

PERMEABILITY ———

MILLIDARCS

POROSITY ———

PERCENT

OIL SATURATION ———

PERCENT PORE SPACE

0 20 40 60 80

ARBUCKLE

3284

3300

3350

PRELIMINARY REPORT
From Okla. City Lab.



PRELIMINARY REPORT
From Okla. City Lab.

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

CP-1-4395

COMPANY THUNDERBIRD DRILLING, INC. DATE ON 4-28-62 FILE NO. CP-10-807
WELL TOBIAS NO. 2 DATE OFF 5-2-62 ENGRS. WELBORNE
FIELD TOBIAS FORMATION ARBUCKLE ELEV. 1679' DF
COUNTY RICE STATE KANSAS DRLG. FLD. WATER BASE MUDCORES DIAMOND
LOCATION REMARKS SAMPLED BY CLI ENGINEER AS DIRECTED BY THE CLIENT.

Special Analysis CORE REPORT



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PERMEABILITY, Maximum $\circ - \circ$

MILLIDARCY

160 120 80 40 0

TOTAL WATER $\circ - \circ$

PERCENT PORE SPACE

80 60 40 20

POROSITY $\times - \times - \times$

PERCENT

40 30 20 10 0

OIL SATURATION $\times - \times - \times$

PERCENT PORE SPACE

0 20 40 60 80

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCY		POROSITY %	RESIDUAL SATURATION PORE SPACE		Vertical Fracture	PERMEABILITY, Maximum $\circ - \circ$ MILLIDARCY	TOTAL WATER $\circ - \circ$ PERCENT PORE SPACE	POROSITY $\times - \times - \times$ PERCENT	OIL SATURATION $\times - \times - \times$ PERCENT PORE SPACE
		MAX	90°		OIL	TOTAL WATER					
1	3284.0-85.5	158	147	12.8	10.9	43.7					
2	85.5-86.3	9.5	7.9	12.8	12.5	50.7					
3	86.3-87.0	13	12	11.3	5.3	69.9					
4	87.0-88.0	91	5.1	9.3	4.7	70.9					
5	88.0-88.7	176	11.3	54	7.6	71.8	0.2				
6	88.7-90.0	15	14	7.2	6.9	48.6					
7	90.0-91.6	402 *		7.6	5.7	63.1					
8	91.6-92.1	0.7	0.2	9.5	2.8	88.4					
9	92.1-93.6	1.7	1.6	6.5	6.6	67.6					
10	93.6-94.5	7.3	5.8	9.0	3.7	67.7					
11	94.5-95.9	5.3	4.9	8.6	5.8	58.1	0.6				
12	95.9-96.5	109	27	11.1	9.0	48.6					
13	96.5-97.4	222	217	13.6	13.2	43.3					
14	97.4-98.7	13	9.0	10.2	11.7	50.0					
15	98.7-99.8	2220	112	9.2	5.4	53.2					
16	99.8-01.1	28	23	8.7	9.1	50.5					
17	3301.1-02.0	25*		4.3	11.6	67.4					

Special Analysis

CORE REPORT



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PERMEABILITY, Maximum $\circ - \circ$

MILLIDARCYs

160 120 80 40 0

TOTAL WATER $\circ - \circ$

PERCENT PORE SPACE

80 60 40 20

POROSITY X---X

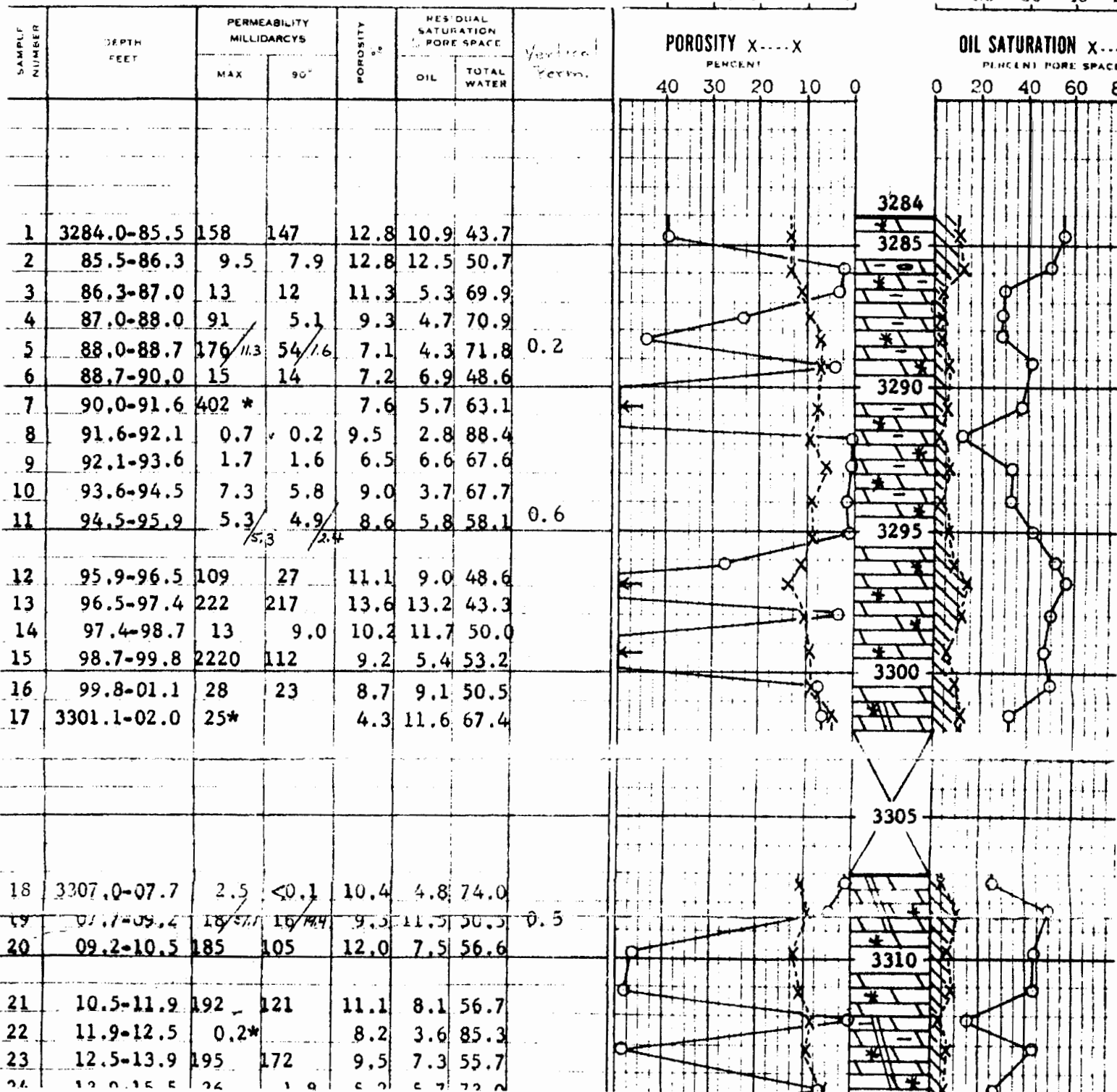
PERCENT

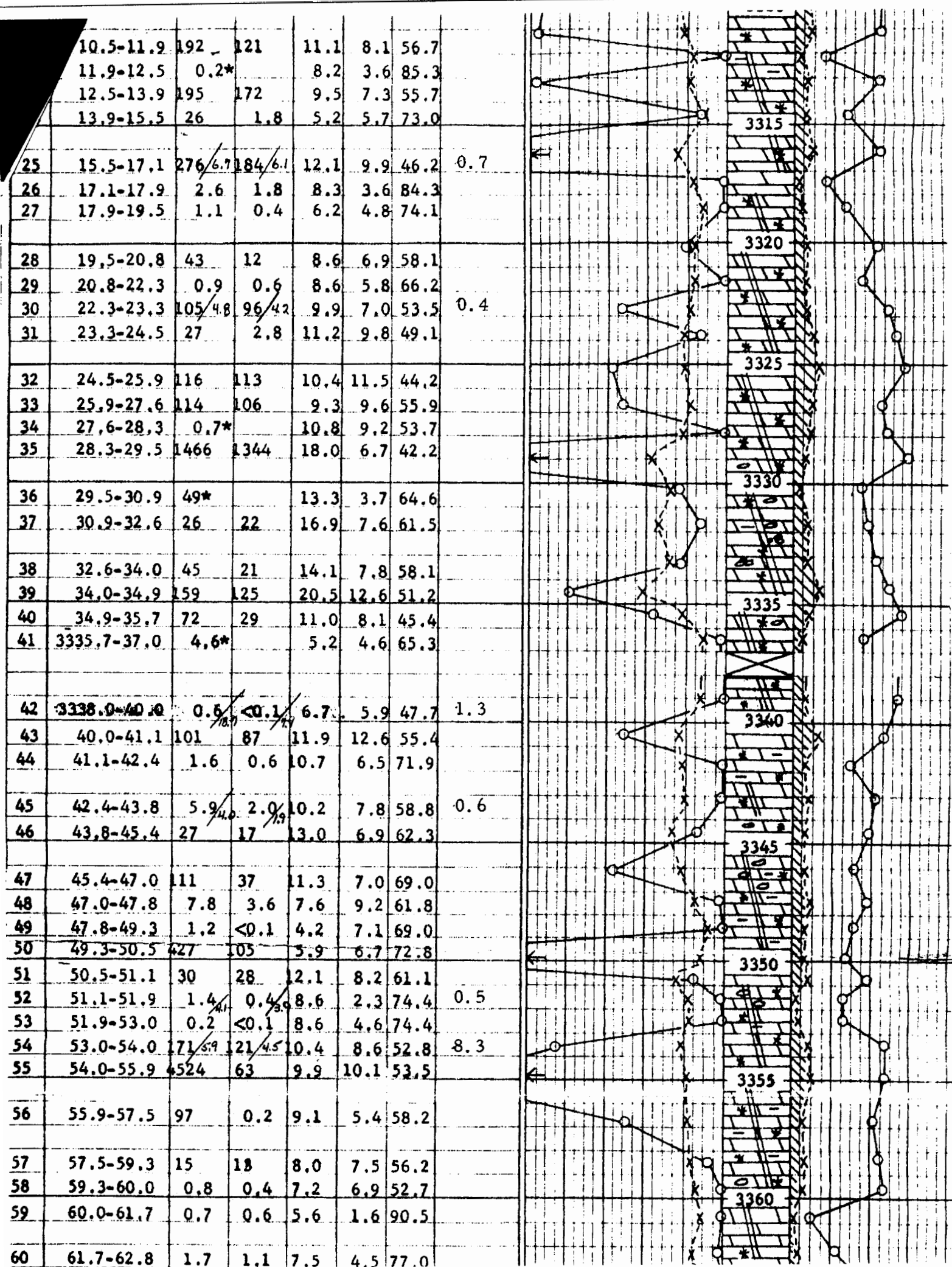
40 30 20 10 0

OIL SATURATION X---X

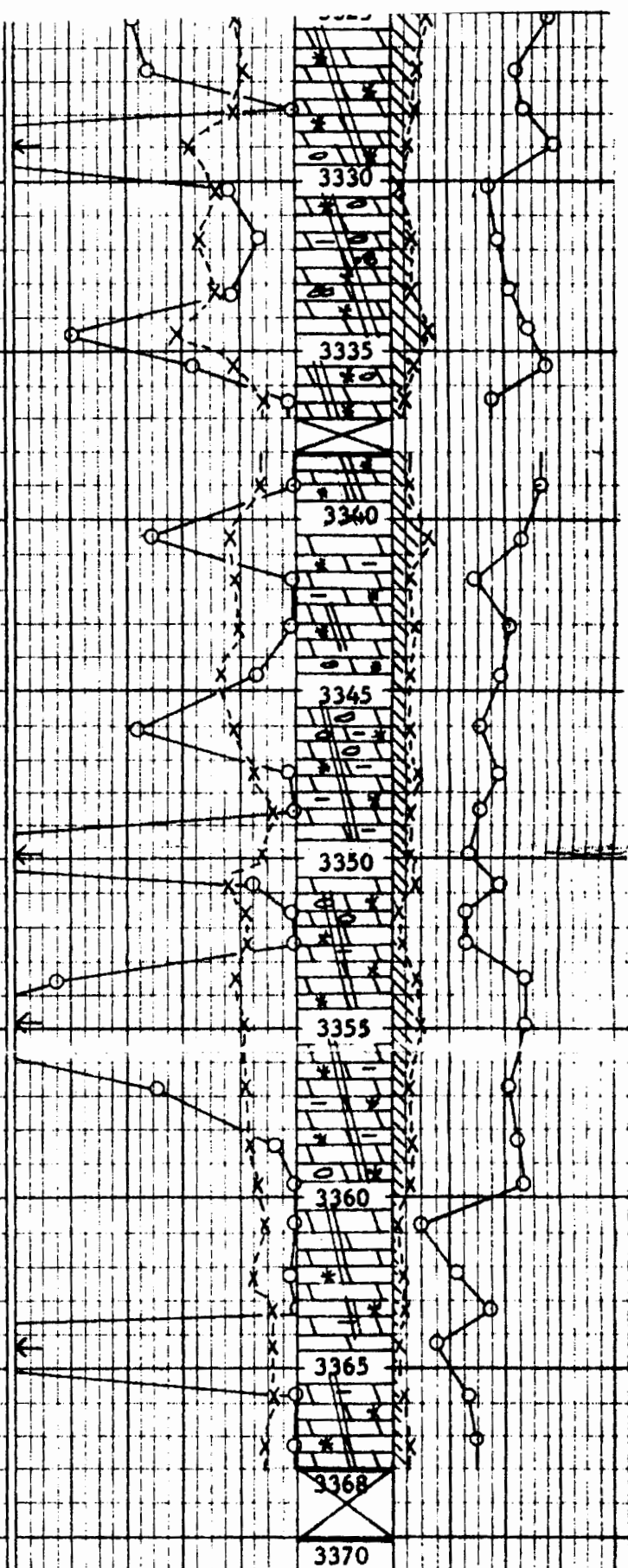
PERCENT PORE SPACE

0 20 40 60 80





32	24.5-25.9	116	113	10.4	11.5	44.2	
33	25.9-27.6	114	106	9.3	9.6	55.9	
34	27.6-28.3	0.7*		10.8	9.2	53.7	
35	28.3-29.5	1466	1344	18.0	6.7	42.2	
36	29.5-30.9	49*		13.3	3.7	64.6	
37	30.9-32.6	26	22	16.9	7.6	61.5	
38	32.6-34.0	45	21	14.1	7.8	58.1	
39	34.0-34.9	159	125	20.5	12.6	51.2	
40	34.9-35.7	72	29	11.0	8.1	45.4	
41	3335.7-37.0	4.6*		5.2	4.6	65.3	
42	3338.9-40.0	0.5 ^{10.7}	<0.1 ^{1.4}	6.7	5.9	47.7	1.3
43	40.0-41.1	101	87	11.9	12.6	55.4	
44	41.1-42.4	1.6	0.6	10.7	6.5	71.9	
45	42.4-43.8	5.9 ^{11.0}	2.0 ^{1.9}	10.2	7.8	58.8	0.6
46	43.8-45.4	27	17	13.0	6.9	62.3	
47	45.4-47.0	111	37	11.3	7.0	69.0	
48	47.0-47.8	7.8	3.6	7.6	9.2	61.8	
49	47.8-49.3	1.2	<0.1	4.2	7.1	69.0	
50	49.3-50.5	427	103	5.9	6.7	72.8	
51	50.5-51.1	30	28	12.1	8.2	61.1	
52	51.1-51.9	1.4 ^{11.1}	0.4 ^{1.3}	8.6	2.3	74.4	0.5
53	51.9-53.0	0.2	<0.1	8.6	4.6	74.4	
54	53.0-54.0	171 ^{15.9}	21 ^{1.5}	10.4	8.6	52.8	8.3
55	54.0-55.9	4524	63	9.9	10.1	53.5	
56	55.9-57.5	97	0.2	9.1	5.4	58.2	
57	57.5-59.3	15	18	8.0	7.5	56.2	
58	59.3-60.0	0.8	0.4	7.2	6.9	52.7	
59	60.0-61.7	0.7	0.6	5.6	1.6	90.5	
60	61.7-62.8	1.7	1.1	7.5	4.5	77.0	
61	62.8-63.6	<0.1	<0.1	4.0	5.0	66.0	
62	63.6-65.1	148 ^{18.6}	100 ^{1.9}	3.9	2.5	86.5	3.1
63	65.1-66.5	0.2	0.2	4.0	4.2	73.1	
64	3366.5-68.0	1.4 ^{10.3}	0.4 ^{1.1}	5.3	6.9	70.0	0.3



* DENOTES MATRIX PERMEABILITY.