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January 1983

RKER.83.024

INVESTIGATION OF CORES FROM WELL 31/2-7,
NORWAY

- Mercury capillary pressure -

by

J.A. van Benten

Sponsor: Shell Forus



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KONINKLIJKE / SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM

RIJSWIJK, THE NETHERLANDS

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KONINKLIJKE/SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM

RIJSWIJK, THE NETHERLANDS

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KEYWORDS

Well 31/2-7, Norway, mercury capillary pressure, pore-size distribution.

INVESTIGATION OF CORES FROM WELL 31/2-7, NORWAY
- Mercury/air capillary pressure -

Ref.: Telex for 110809, dated 11-8-1982, from Shell Forus, to
KSEPL, Rijswijk.

INTRODUCTION

Mercury/air capillary pressure measurements were carried out on core samples from well 31/2-7, Norway.

The samples consisted of frozen core material. Owing to the low degree of cementation between the grains of the samples, cleaning with various solvents proved to be impossible. Therefore, the frozen samples were only dried in a vacuum oven for 4 hours at 100°C, after which the capillary pressure curves were measured. The mercury capillary pressure measurements were carried out according to Shell Method Series 2165-1 in an automatic pore-injectivity apparatus (Autopore 9200). The porosity values in the curve plots were calculated on the assumption that at the highest pressure applied (60 000 psia) the pore volume was completely filled with mercury. Estimated permeabilities as given in the figures were derived from the shape of the capillary-pressure curves when plotted as log pressure versus log mercury saturation (%Vb), applying a statistical approach. Due to the poor condition of the samples 1-5 (almost unconsolidated) and the resulting shape of the capillary pressure curves, the permeability of these samples could not be calculated adequately.

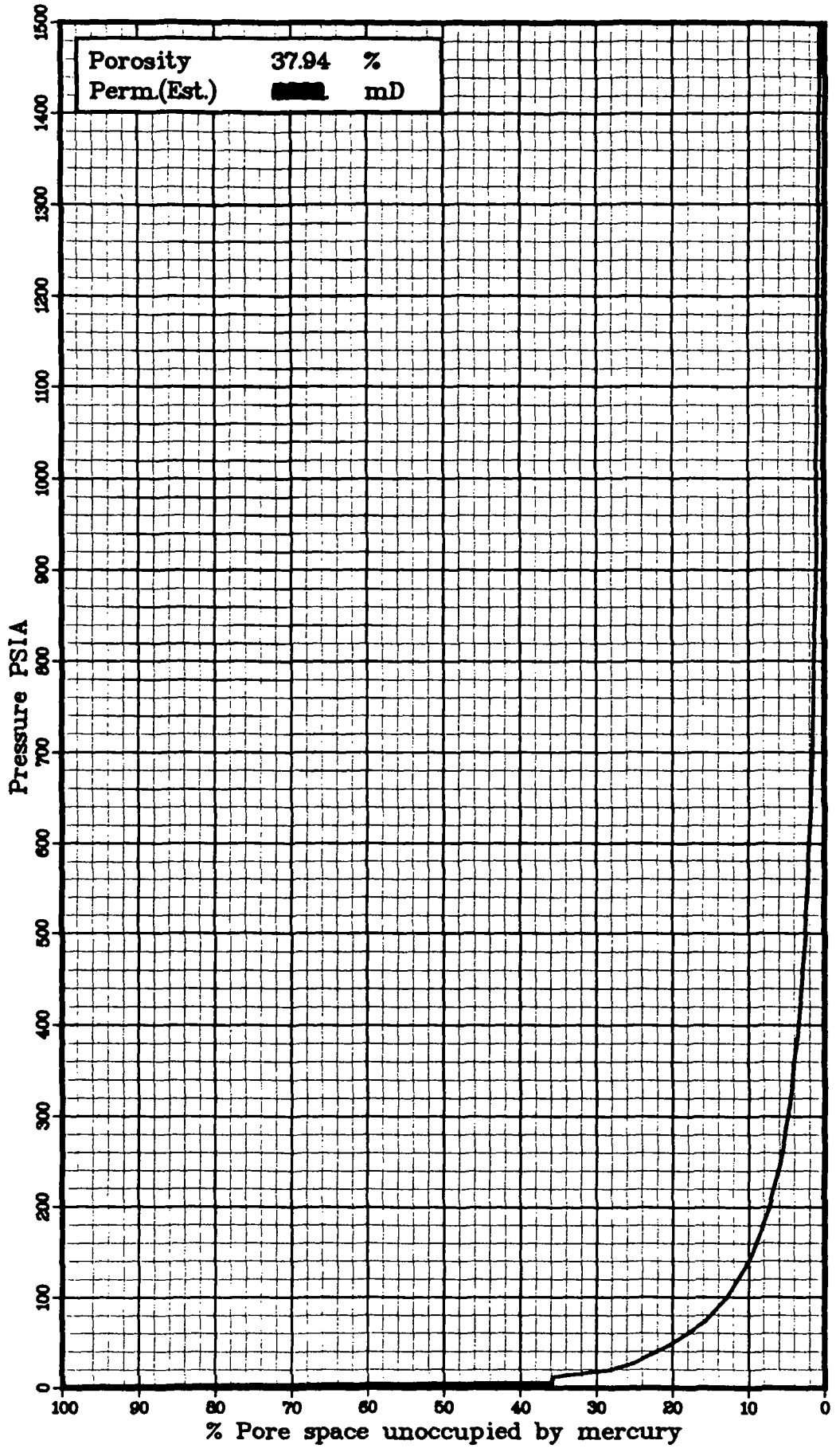
Pore-size distributions were calculated from the mercury injection results, assuming 480 dynes per cm for the surface tension and 140° for the contact angle of the air/mercury system used.

The mercury/air capillary pressure and pore size distribution data are given in Table I and Figs. 1-42.

TABLE I Mercury/Air Capillary Pressure Data from Well 31/2-7

Sample Number	Depth (m.)	Porosity (% BV)	Perm. (mD) (Est.)	Percent Pore Space Unoccupied by Mercury vs Pressure (PSIA)									
				10	20	30	40	50	60	70	80	90	
1	1567.50	37.9	-	140.	49.	18.	6.	5.	5.	4.	3.		
2	1575.70	35.9	-	11.	6.	4.	4.	3.	3.	3.	2.		
3	1577.70	35.7	-	43.	15.	9.	6.	6.	5.	5.	4.		
4	1589.00	33.1	-	18.	8.	5.	4.	4.	3.	3.	2.		
5	1592.40	33.2	-	30.	12.	8.	6.	5.	4.	4.	3.		
6A	1603.60	27.4	33.	2100.	764.	373.	192.	110.	70.	47.	34.		
6B	1603.60	26.6	14.	2550.	926.	463.	246.	139.	86.	58.	41.		
7A	1605.60	27.4	14.	2570.	918.	455.	252.	143.	87.	58.	41.		
7B	1605.60	27.2	11.	3150.	1150.	590.	346.	192.	120.	77.	55.		
8A	1609.70	32.5	99.	1480.	543.	255.	130.	71.	44.	26.	18.		
8B	1609.70	32.3	94.	1300.	467.	215.	108.	61.	33.	20.	15.		
9A	1612.60	25.5	11.	3620.	1100.	527.	289.	167.	106.	72.	52.		
9B	1612.60	26.5	110.	3930.	1130.	528.	286.	156.	96.	67.	47.		
10A	1614.70	26.6	54.	3720.	1190.	585.	330.	193.	121.	78.	54.		
10B	1614.70	25.7	16.	5130.	1840.	943.	574.	375.	249.	166.	102.		
11A	1620.50	23.3	3.5	4040.	1410.	743.	443.	275.	166.	106.	70.		
11B	1620.50	27.5	3.3	4610.	1640.	849.	510.	321.	192.	126.	83.		
12A	1627.50	26.1	8.8	4600.	1460.	706.	411.	250.	150.	94.	62.		
12B	1627.50	26.0	15.	6040.	1830.	878.	510.	315.	200.	126.	66.		

Remark: Estimated permeabilities as given in the table and figures were derived from the shape of the capillary pressure curves when plotted as log pressure versus log mercury saturation (%Vb), according to Thomeer. The permeability of the samples 1 - 5 could not be estimated.



Mercury capillary pressure curve

WELL 31/2-7

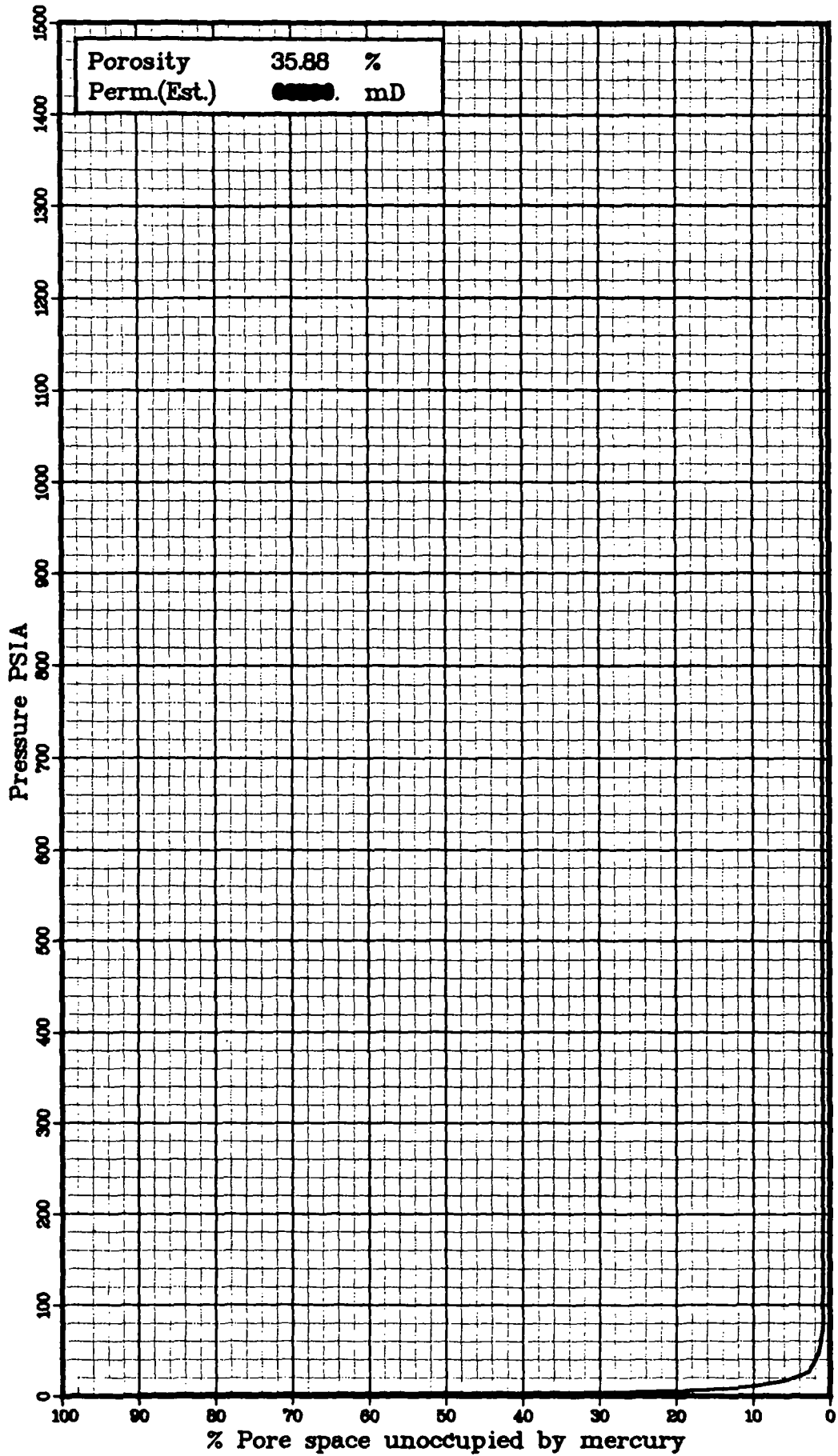
RKER 83.024

SAMPLE 1

DEPTH 1567.50 METER

author: bur
design:

fig. 1



Mercury capillary pressure curve

WELL 31/2-7

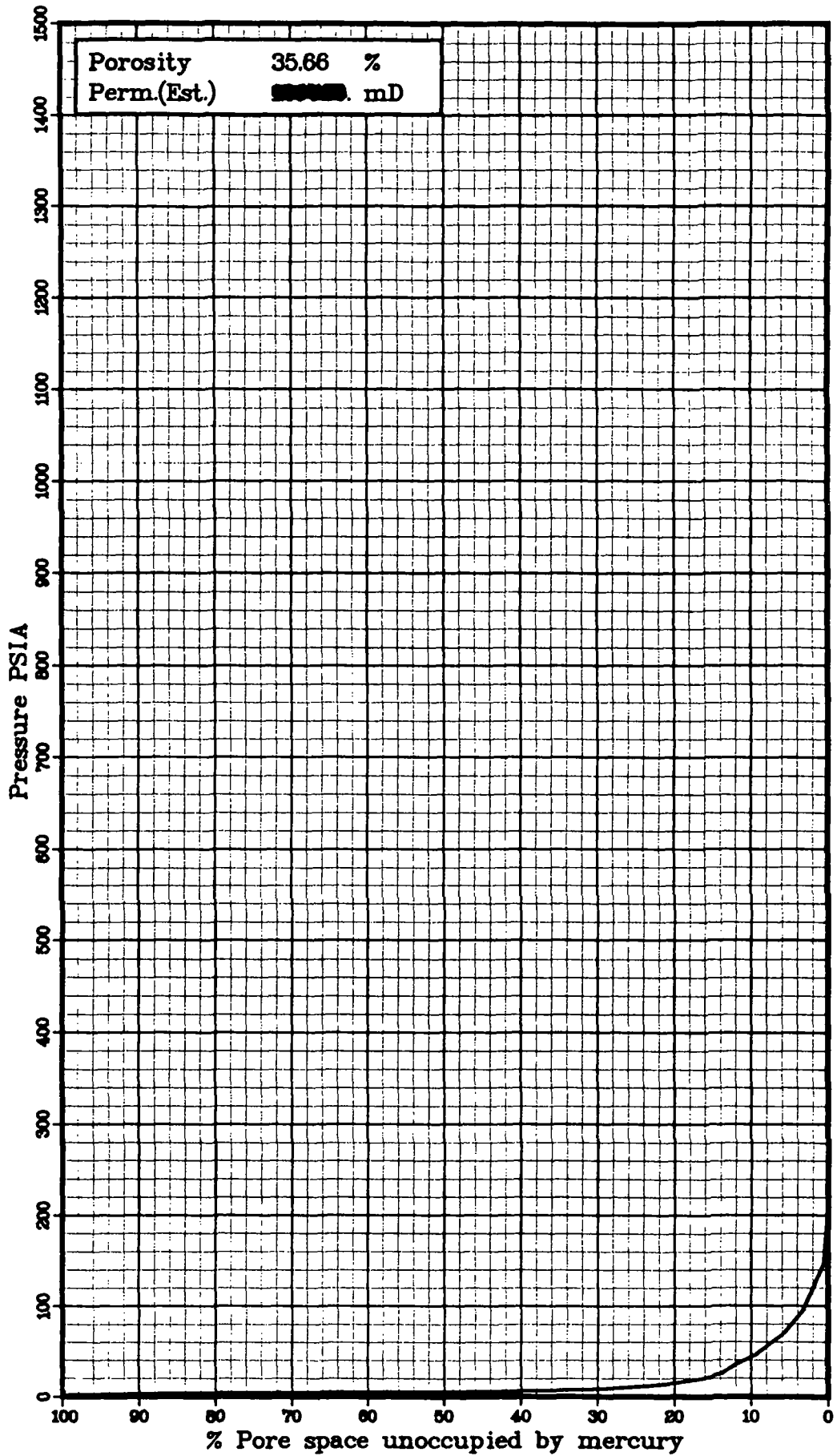
RKER 83.024

SAMPLE 2

DEPTH 1575.70 METER

author: bur
design:

fig. 2



Mercury capillary pressure curve

WELL 31/2-7

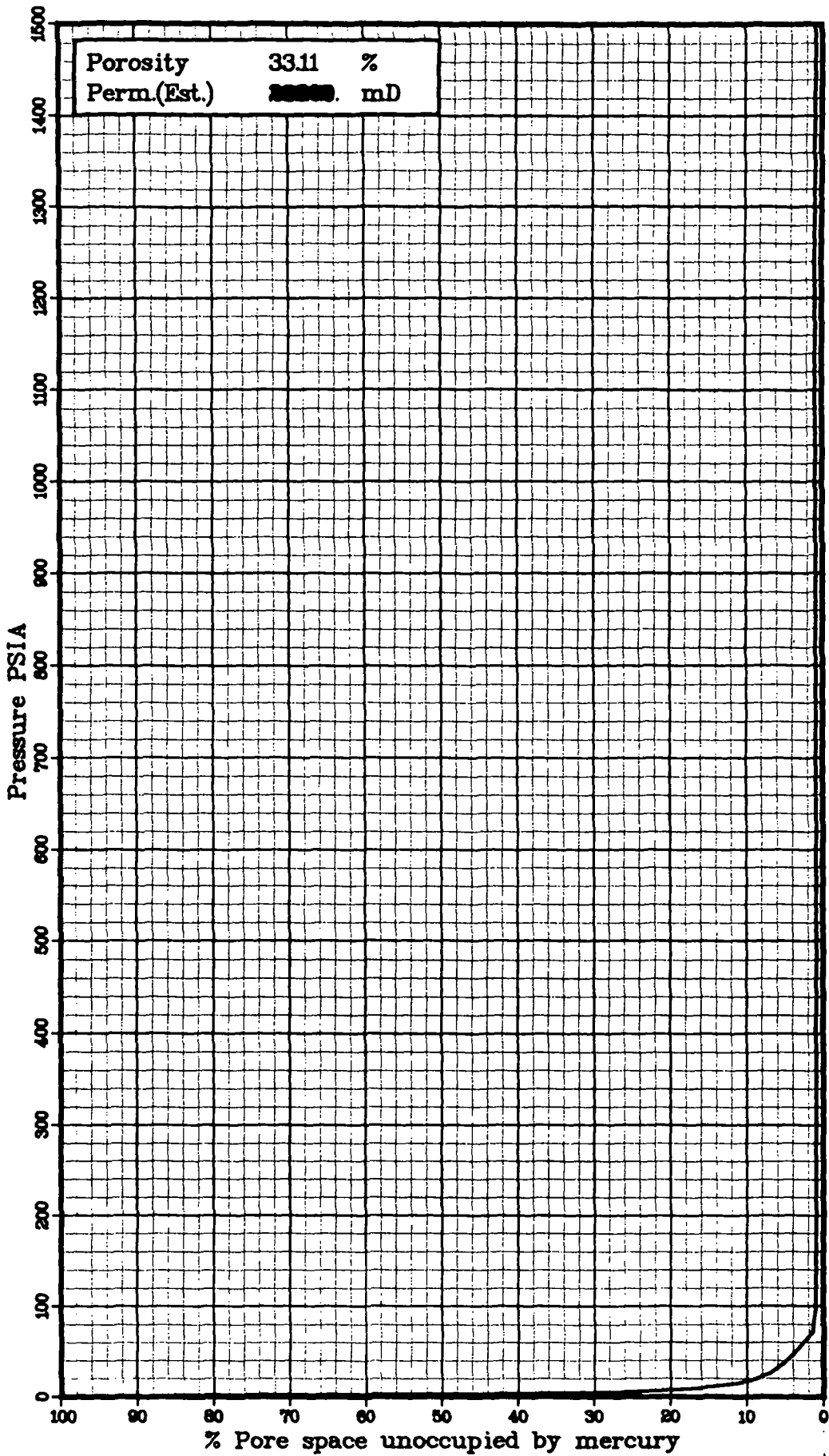
SAMPLE 3

DEPTH 1577.70 METER

author: bar
design:

RKER 83.024

fig. 3



Mercury capillary pressure curve

WELL 31/2-7

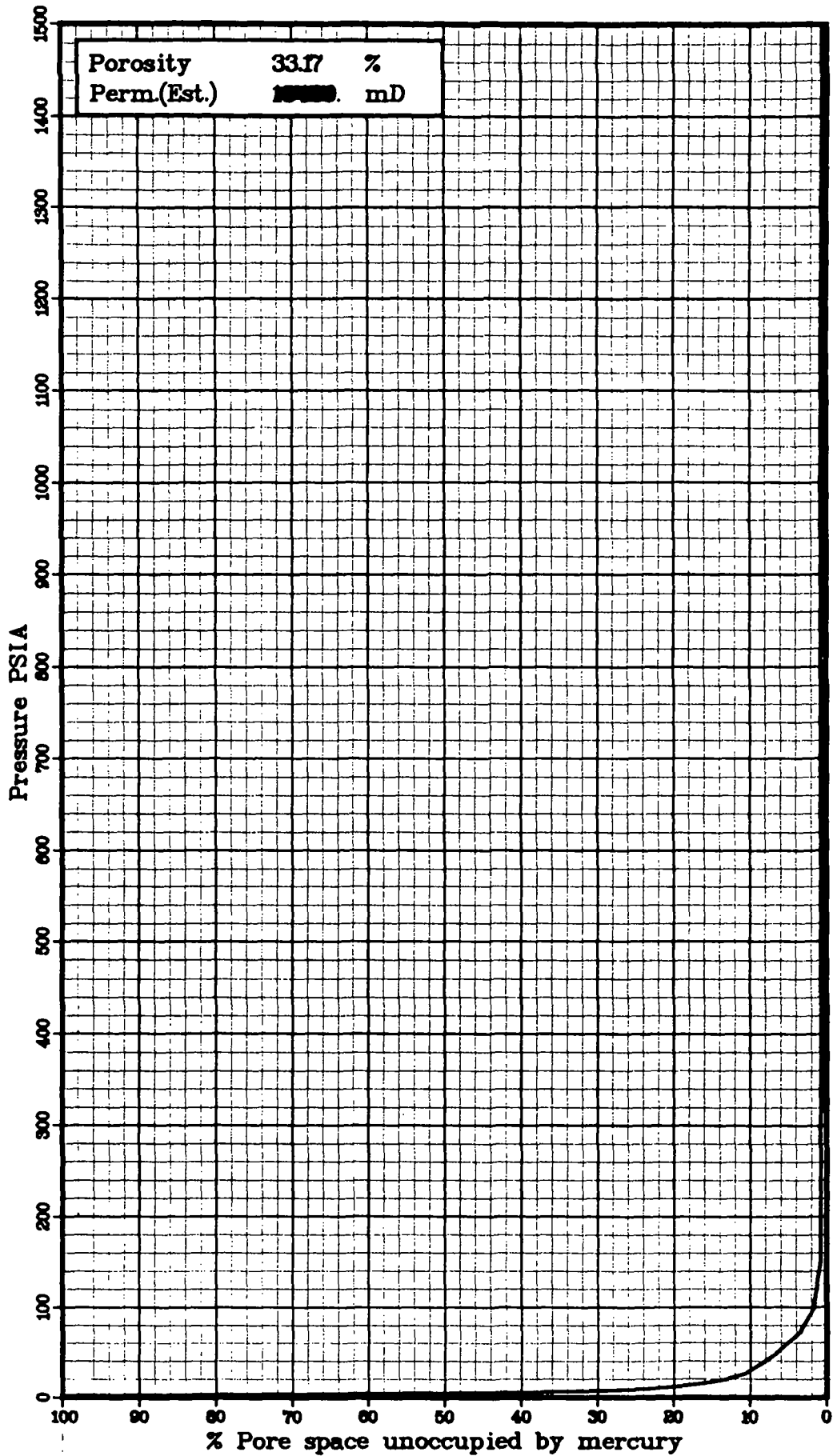
RKER 83.024

SAMPLE 4

DEPTH 1589.00 METER

author: bur
design:

fig. 4



Mercury capillary pressure curve

WELL 31/2-7

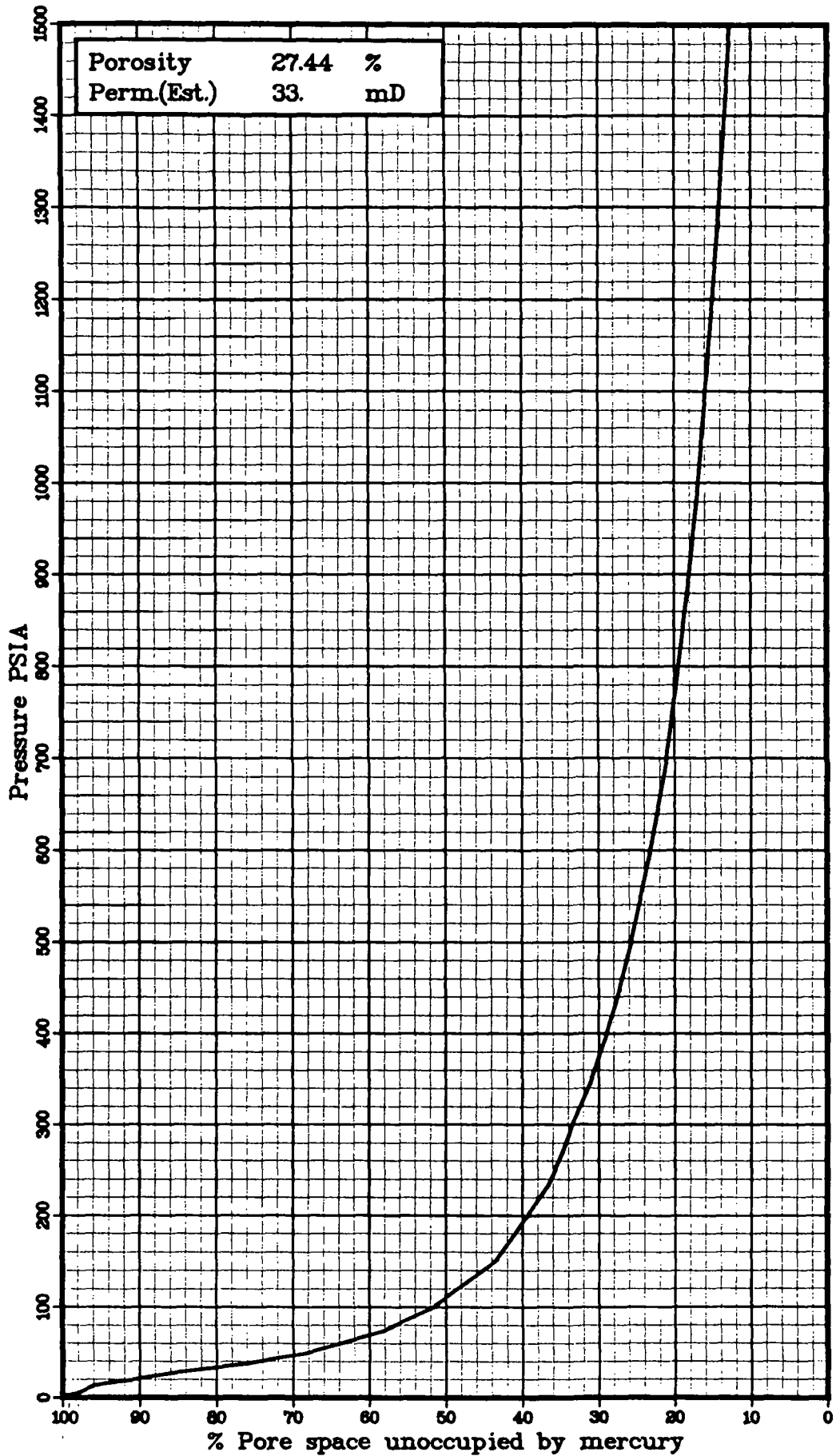
SAMPLE 5

DEPTH 1592.40 METER

author: bur
design:

RKER 83.024

fig. 5



Mercury capillary pressure curve

WELL 31/2-7

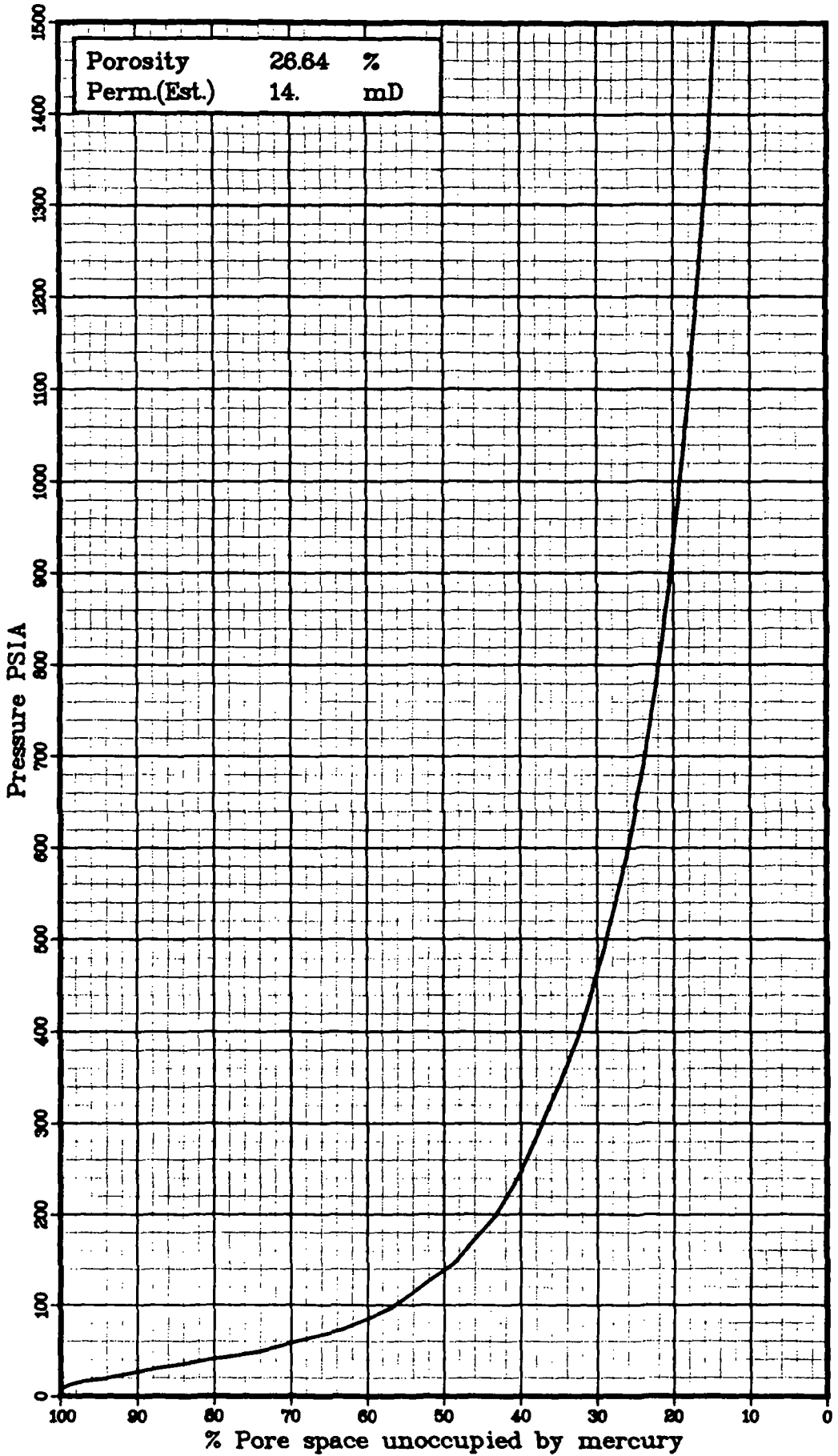
RKER 83.024

SAMPLE 6A

DEPTH 1803.60 METER

author: bur
design:

fig. 6



Mercury capillary pressure curve

WELL 31/2-7

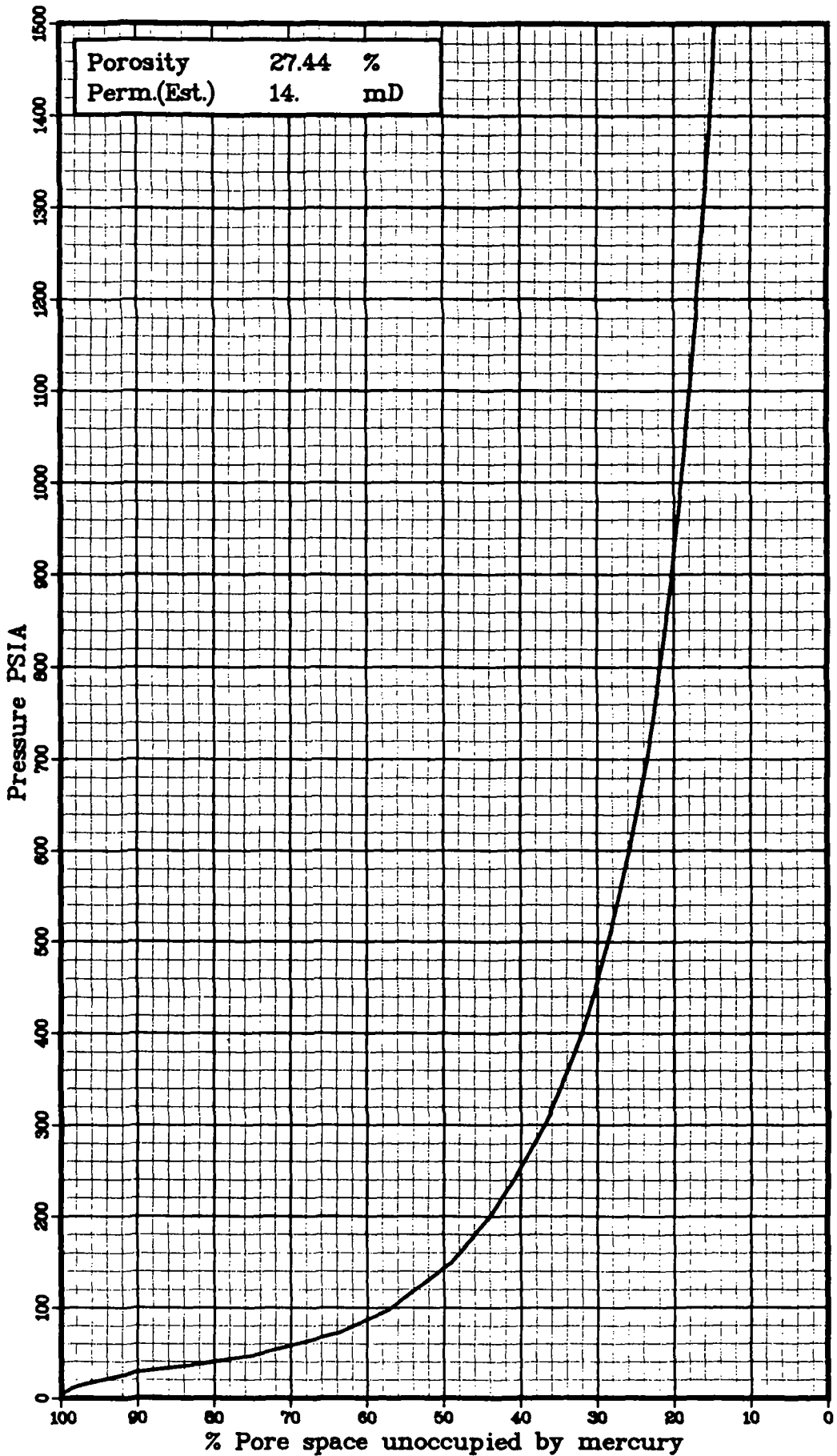
SAMPLE 6B

DEPTH 1603.60 METER

RKER 83.024

author: bur
design:

fig. 7



Mercury capillary pressure curve

WELL 31/2-7

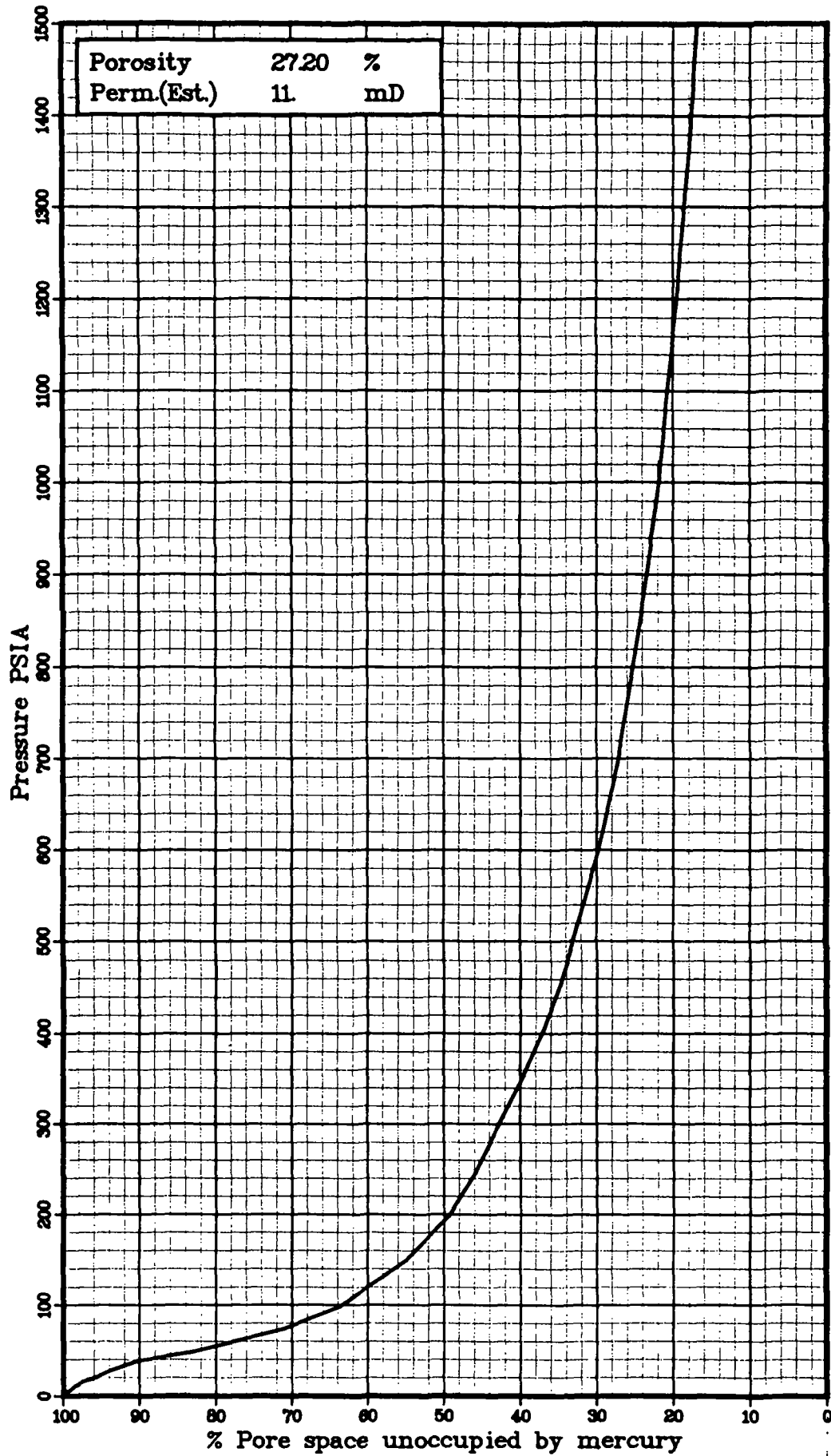
SAMPLE 7A

DEPTH 1605.60 METER

author: bur
design:

RKER 83.024

fig. 8



Mercury capillary pressure curve

WELL 31/2-7

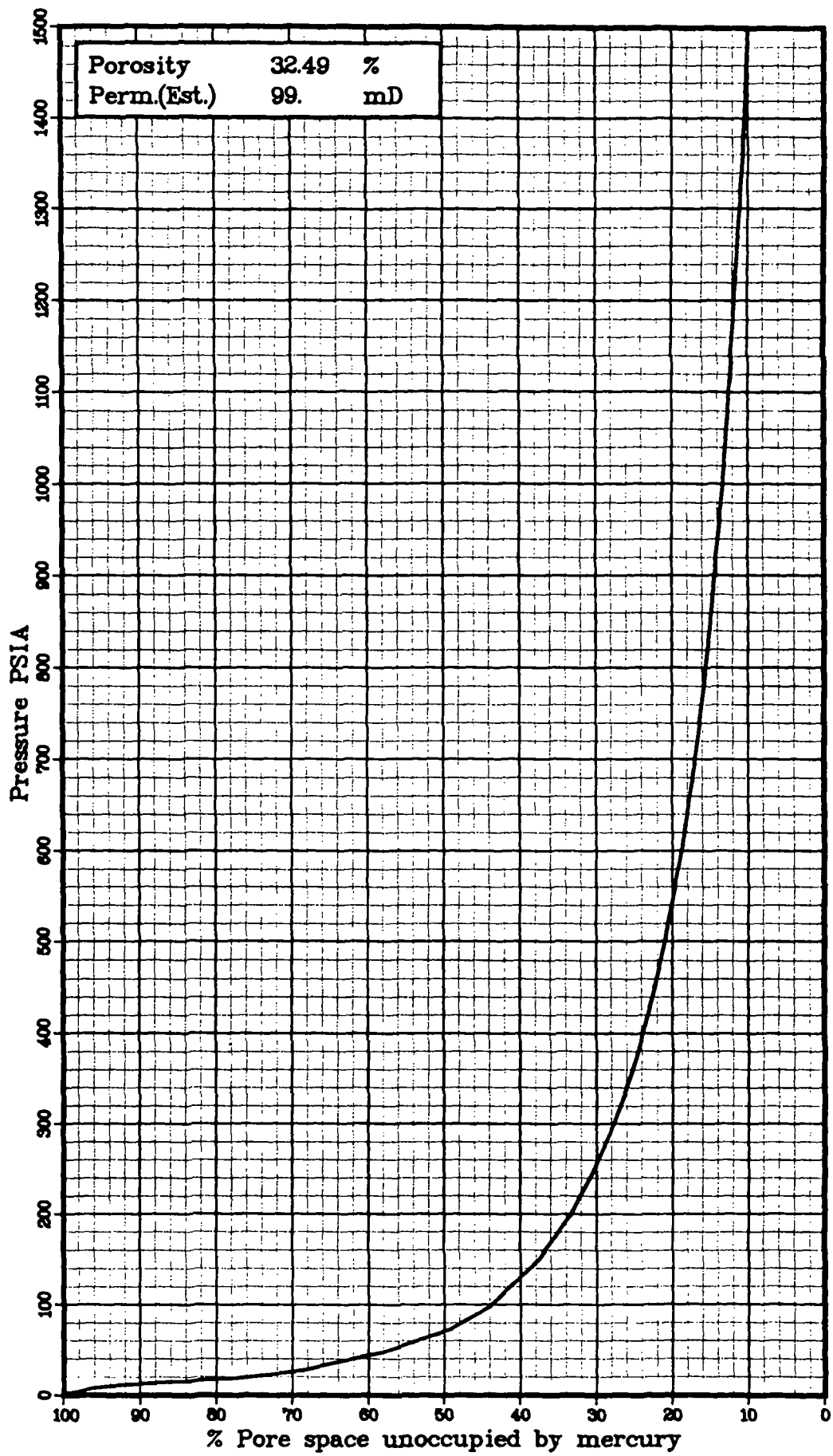
SAMPLE 7B

DEPTH 1605.60 METER

author: bur
design:

RKER 83.024

fig.9'



Mercury capillary pressure curve

WELL 31/2-7

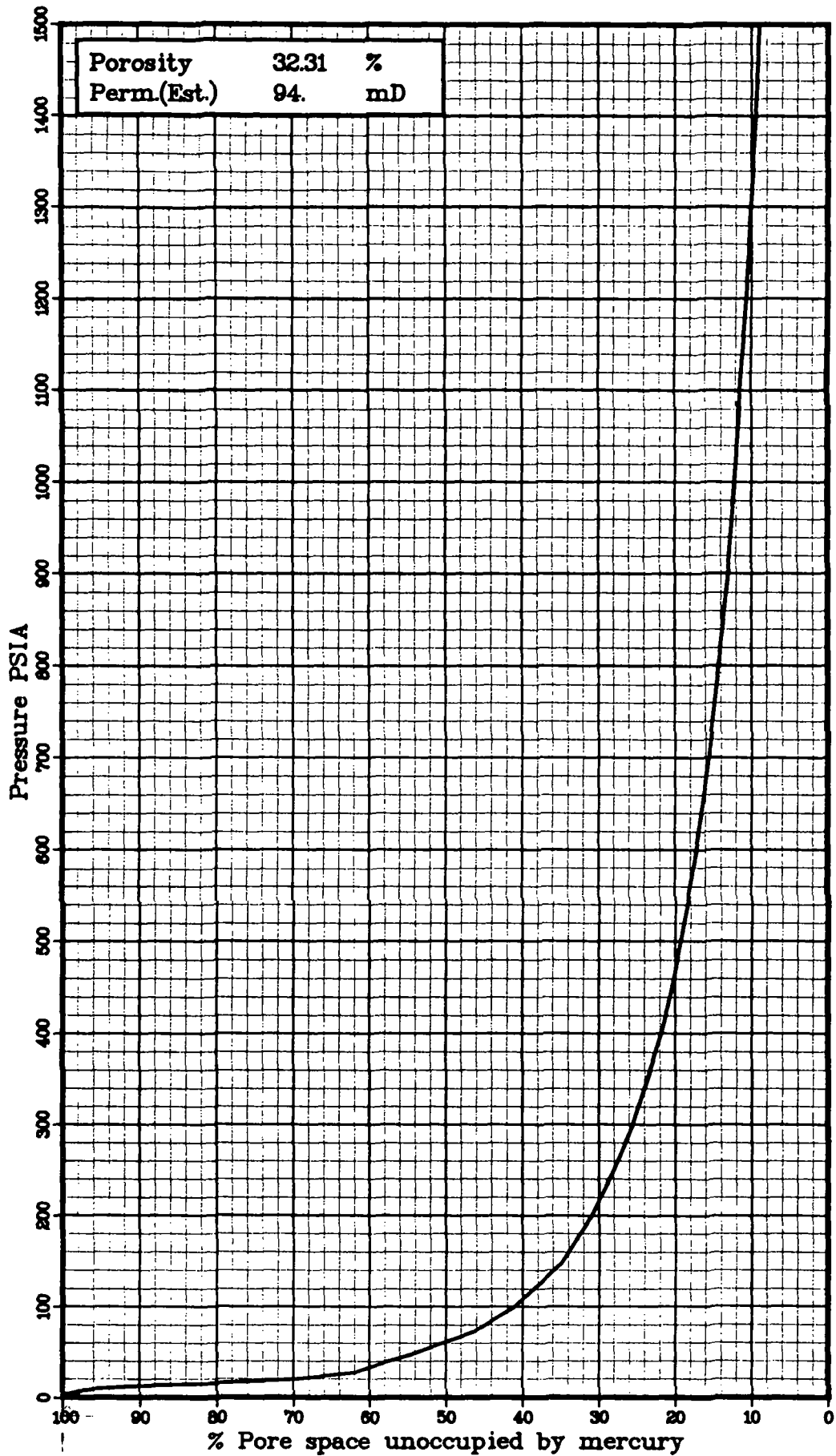
SAMPLE 8A

DEPTH 1609.70 METER

RKER 83.024

author: bur
design:

fig. 10



Mercury capillary pressure curve

WELL 31/2-7

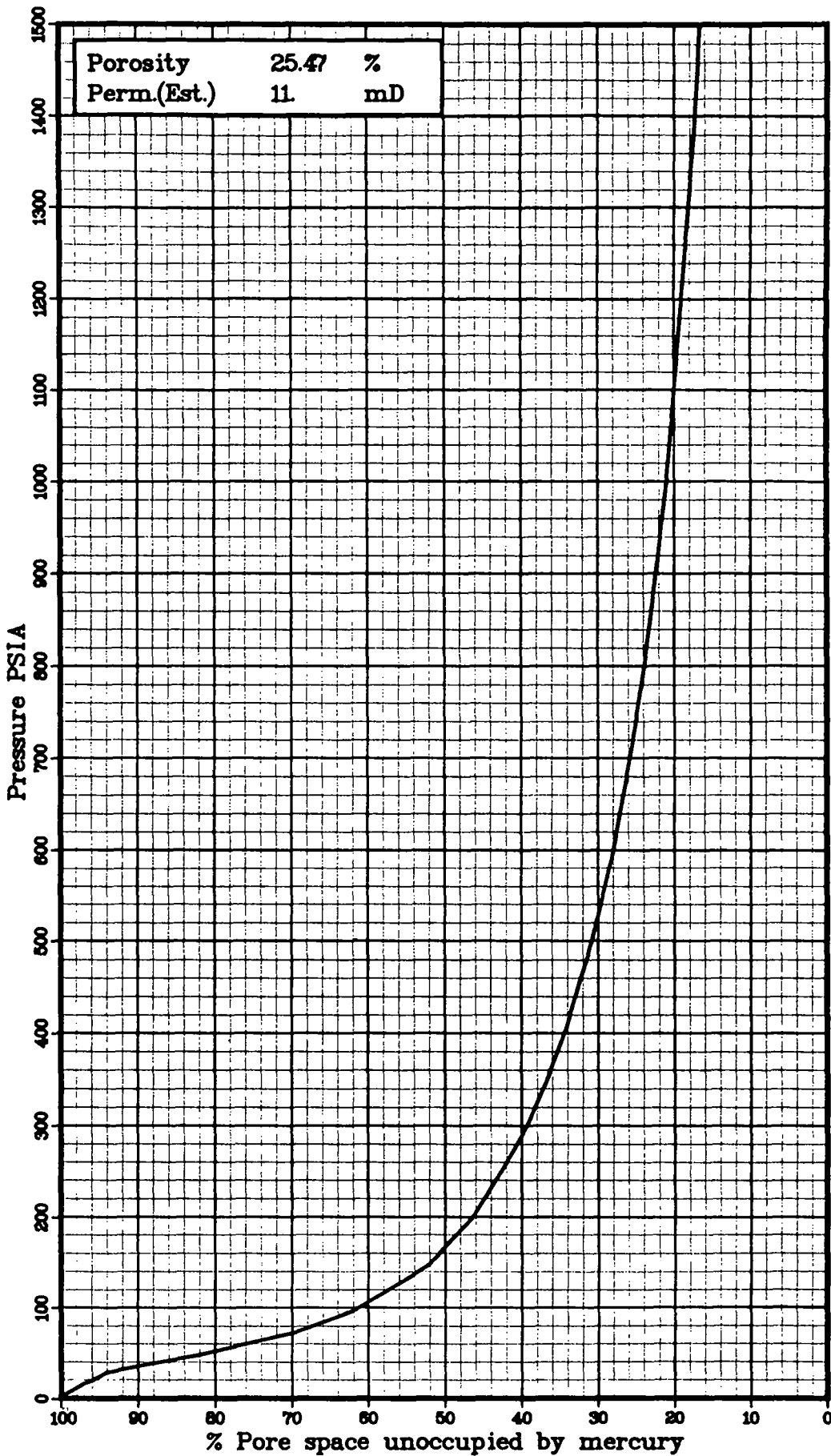
RKER 83.024

SAMPLE 8B

DEPTH 1609.70 METER

author: bos.
design:

fig. 11



Mercury capillary pressure curve

WELL 31/2-7

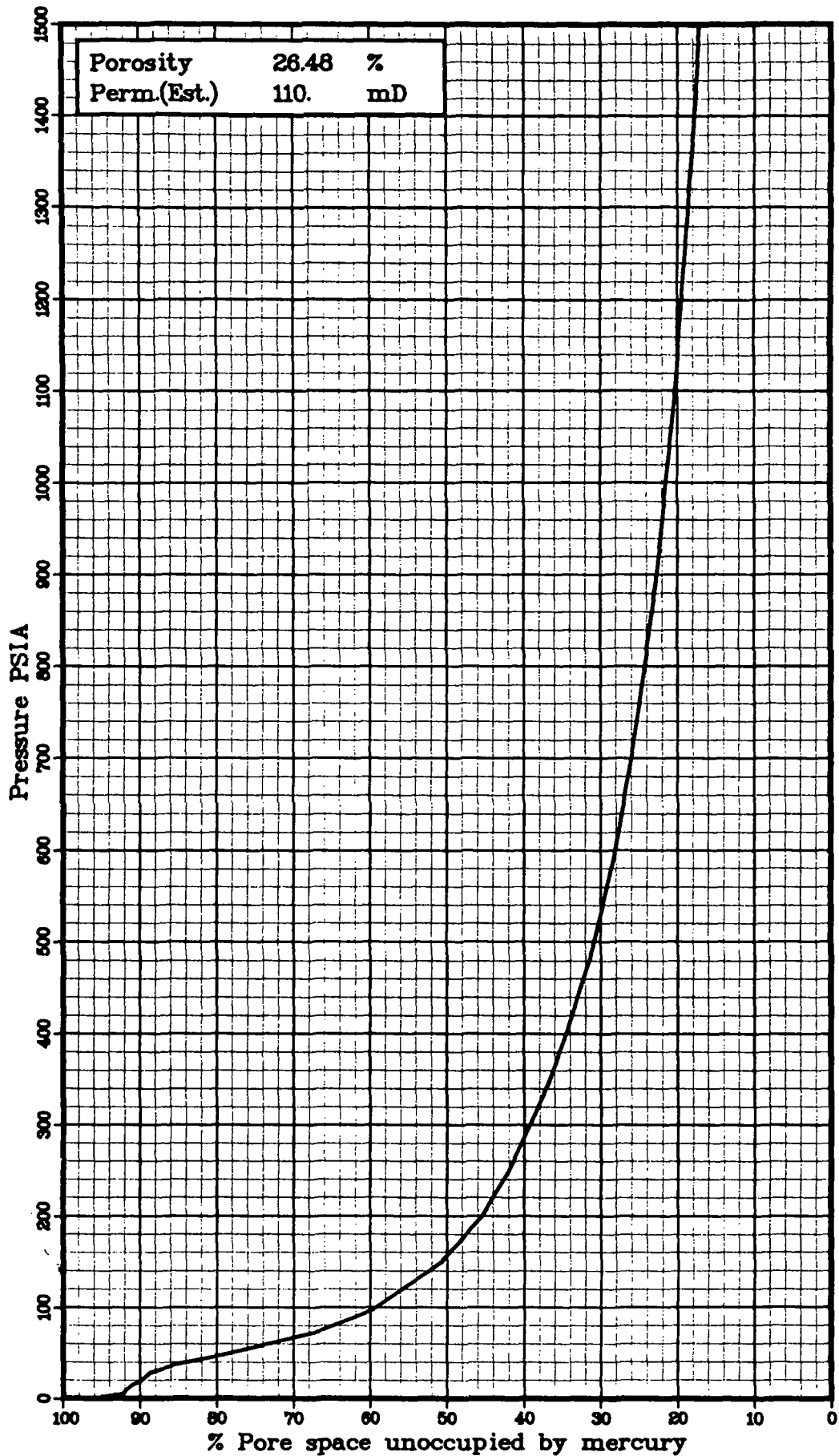
SAMPLE 9A

DEPTH 1612.60 METER

RKER 83.024

author: bur
design:

fig. 12



Mercury capillary pressure curve

WELL 31/2-7

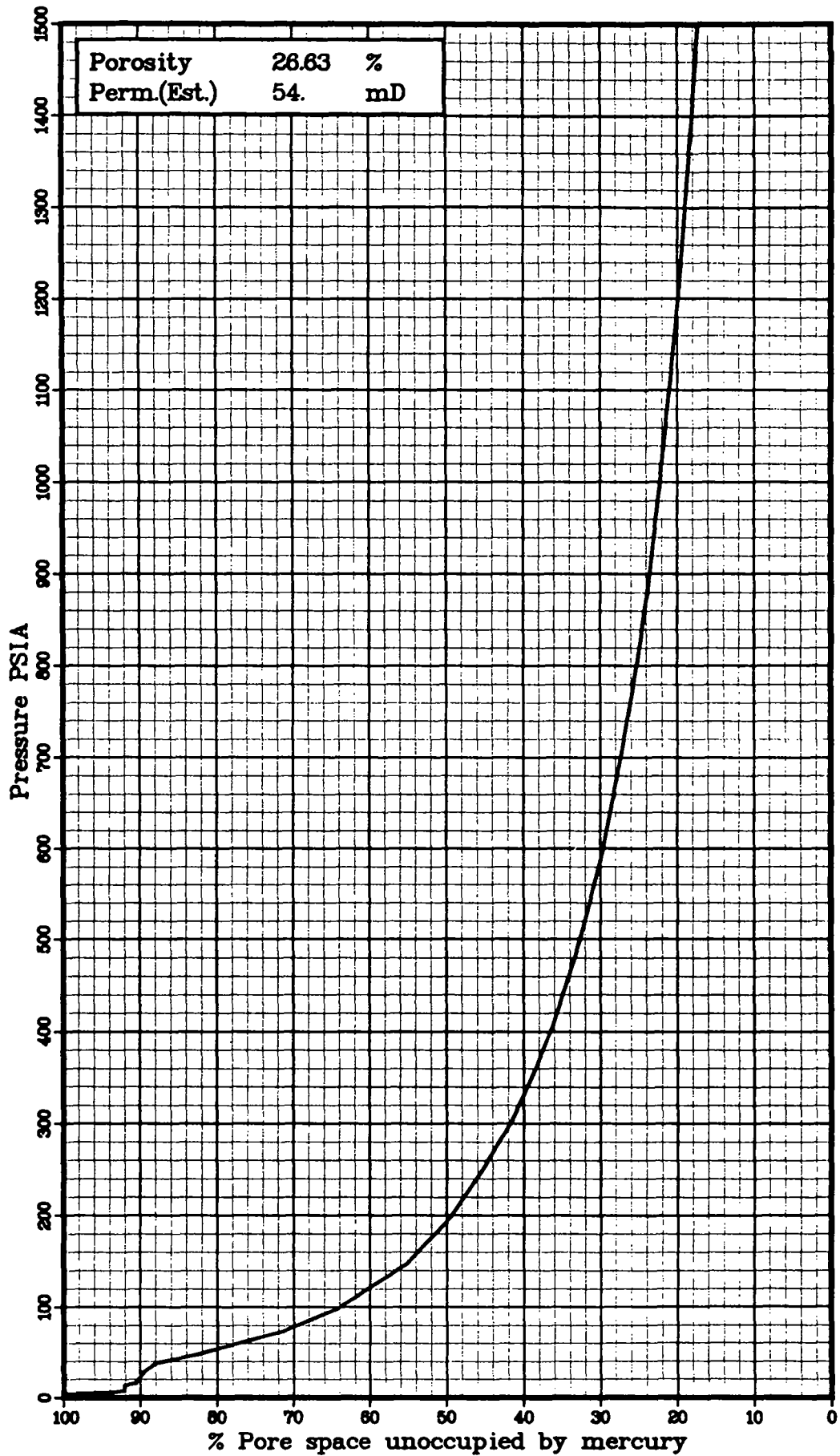
RKER 83.024

SAMPLE 9B

DEPTH 1612.60 METER

author: bur
design:

fig.13



Mercury capillary pressure curve

WELL 31/2-7

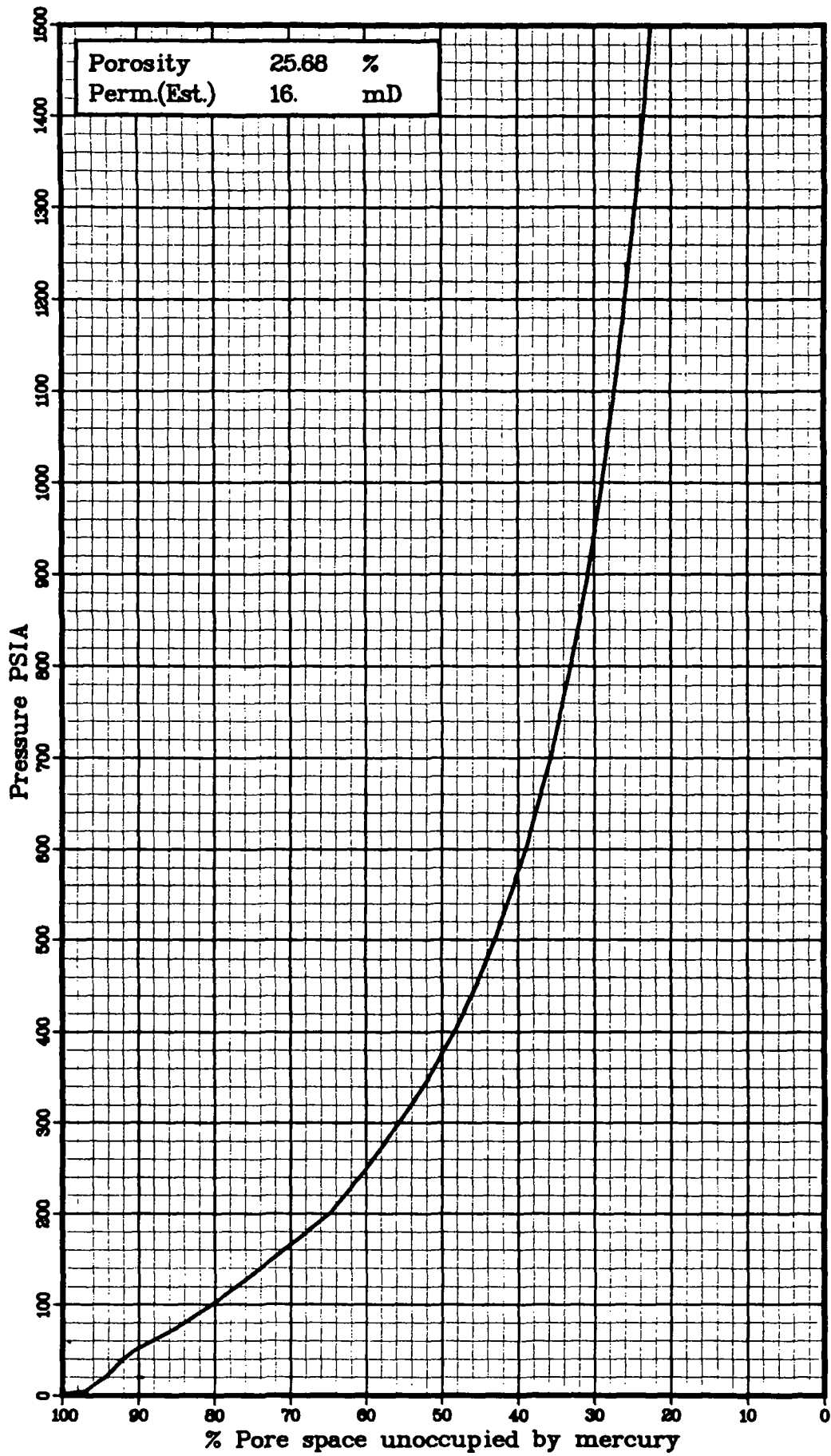
RKER 83.024

SAMPLE 10A

DEPTH 1614.70 METER

author: bur
design:

fig. 14



Mercury capillary pressure curve

WELL 31/2-7

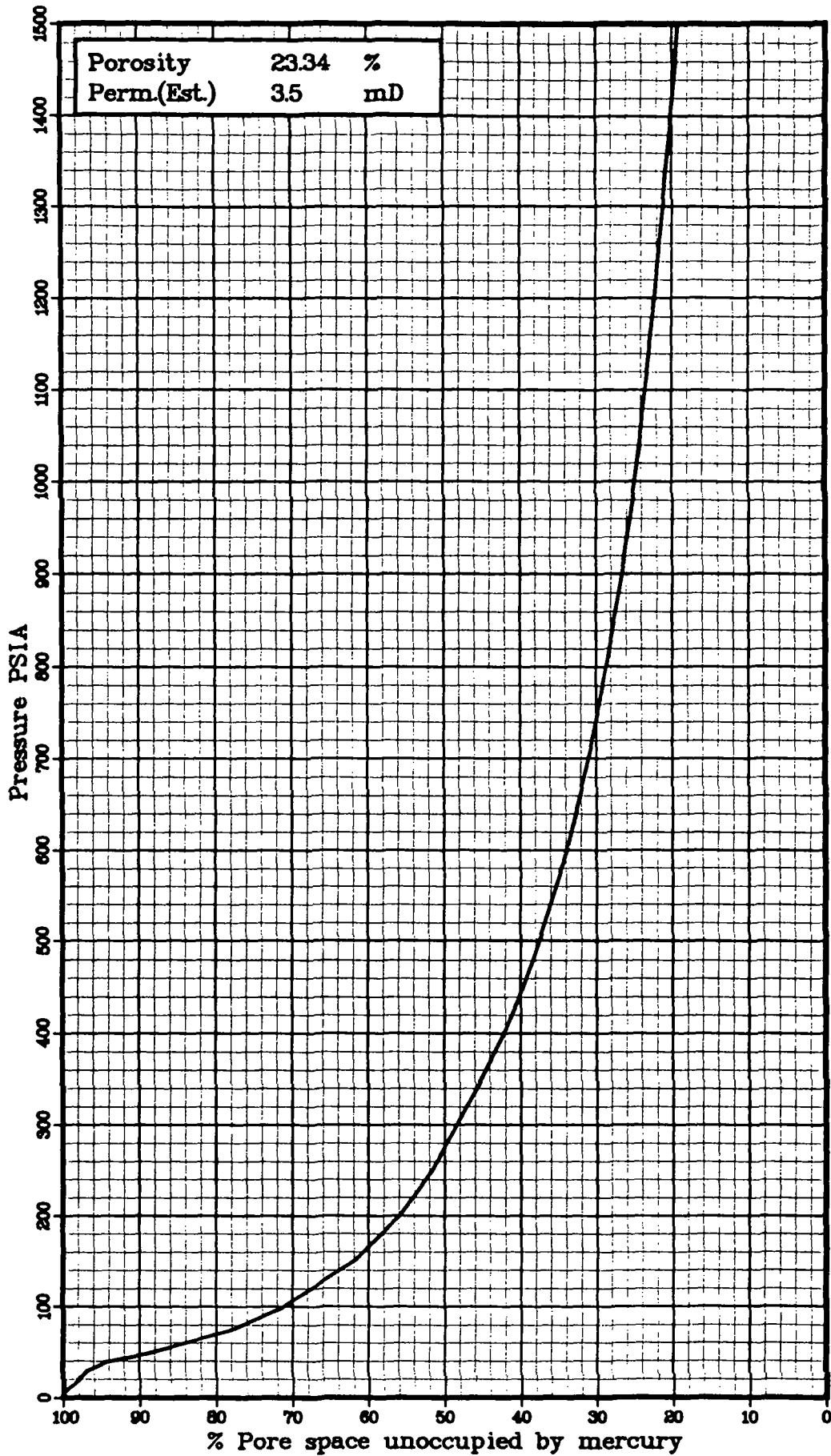
RKER 83.024

SAMPLE 10B

DEPTH 1614.70 METER

author: bor
design:

fig. 15



Mercury capillary pressure curve

WELL 31/2-7

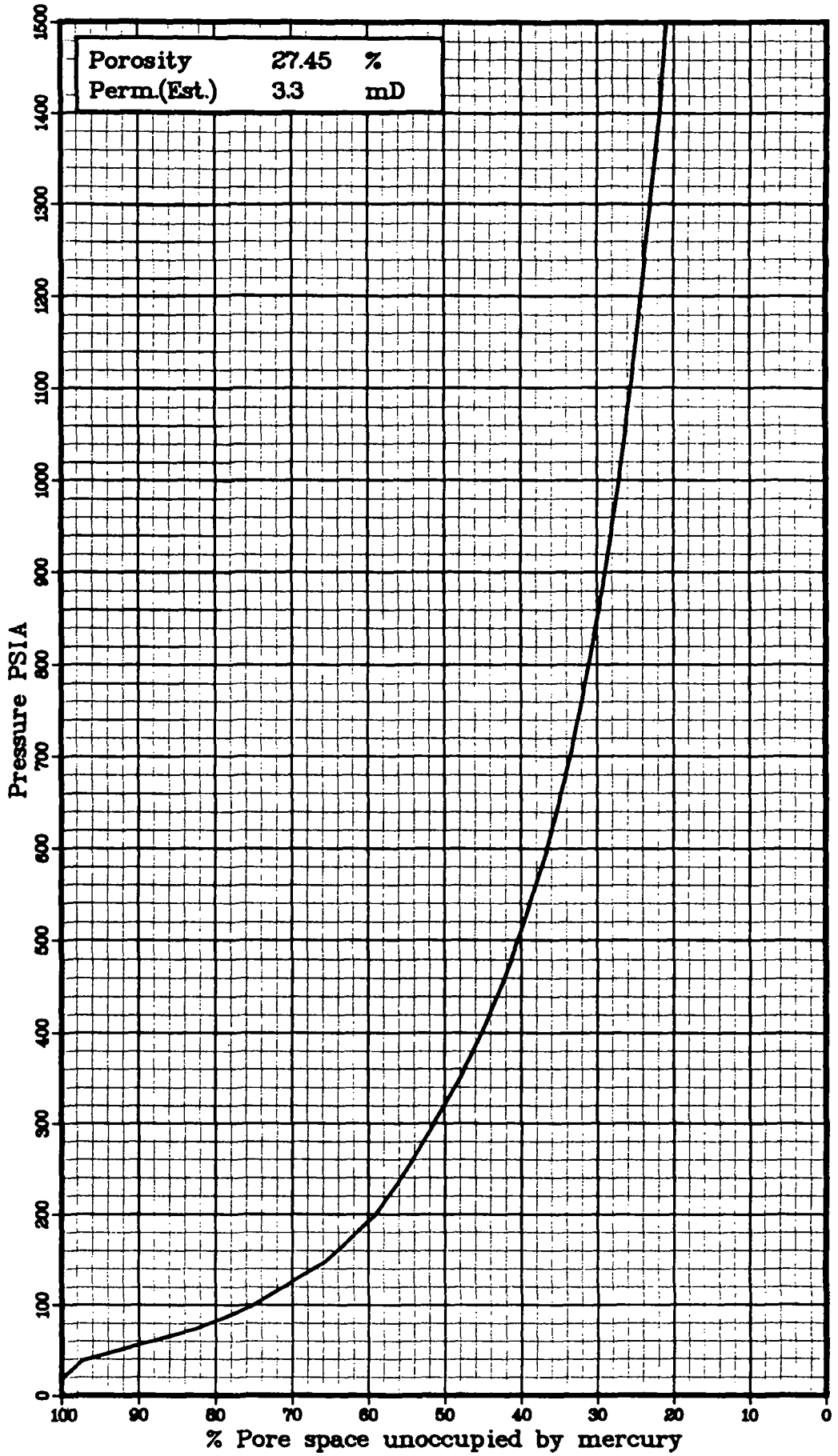
RKER 83.024

SAMPLE 11A

DEPTH 1620.50 METER

author: bur
design:

fig. 16



Mercury capillary pressure curve

WELL 31/2-7

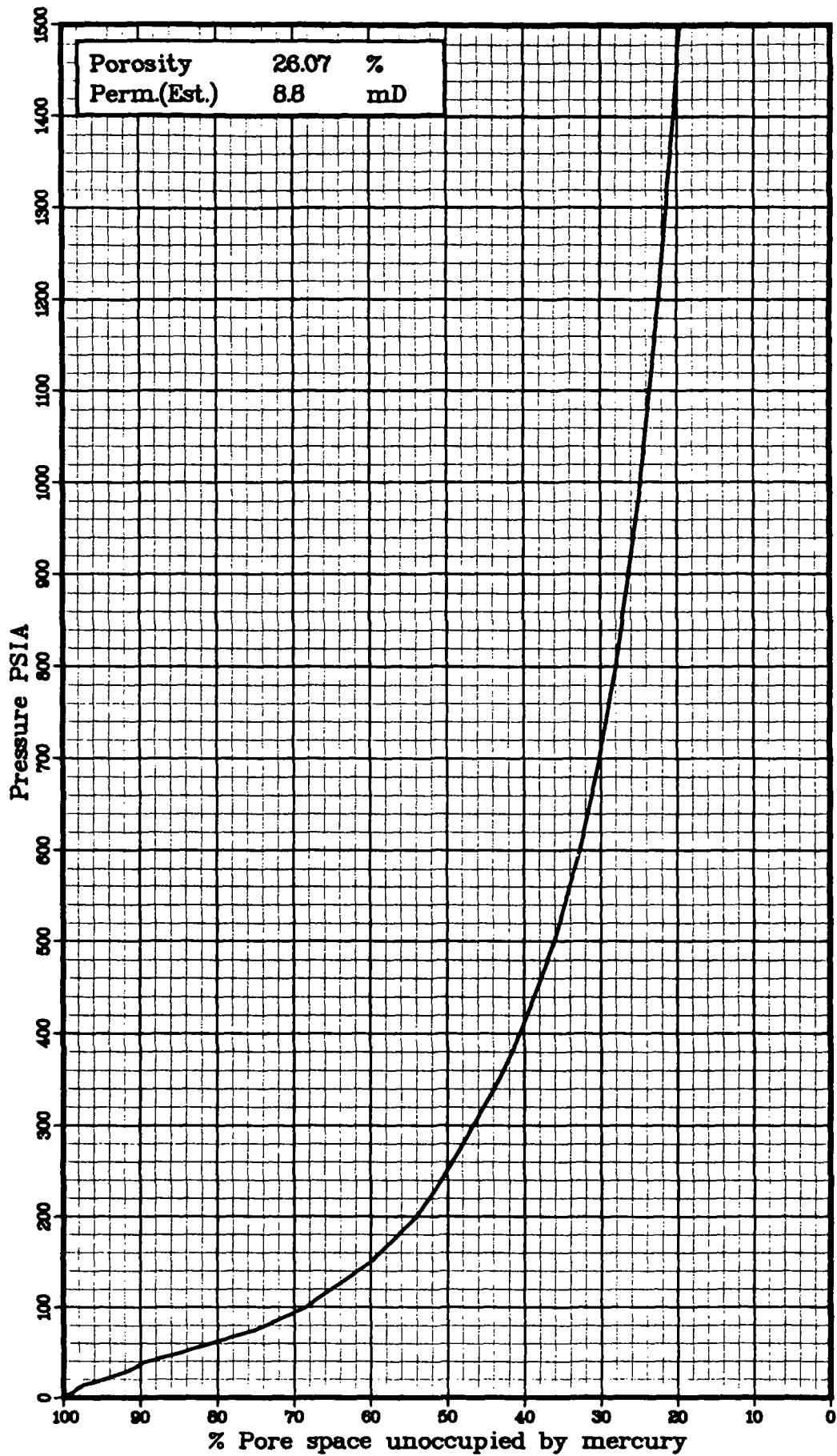
SAMPLE 11B

DEPTH 1620.50 METER

author: bar
design:

RKER 83.024

fig.17



Mercury capillary pressure curve

WELL 31/2-7

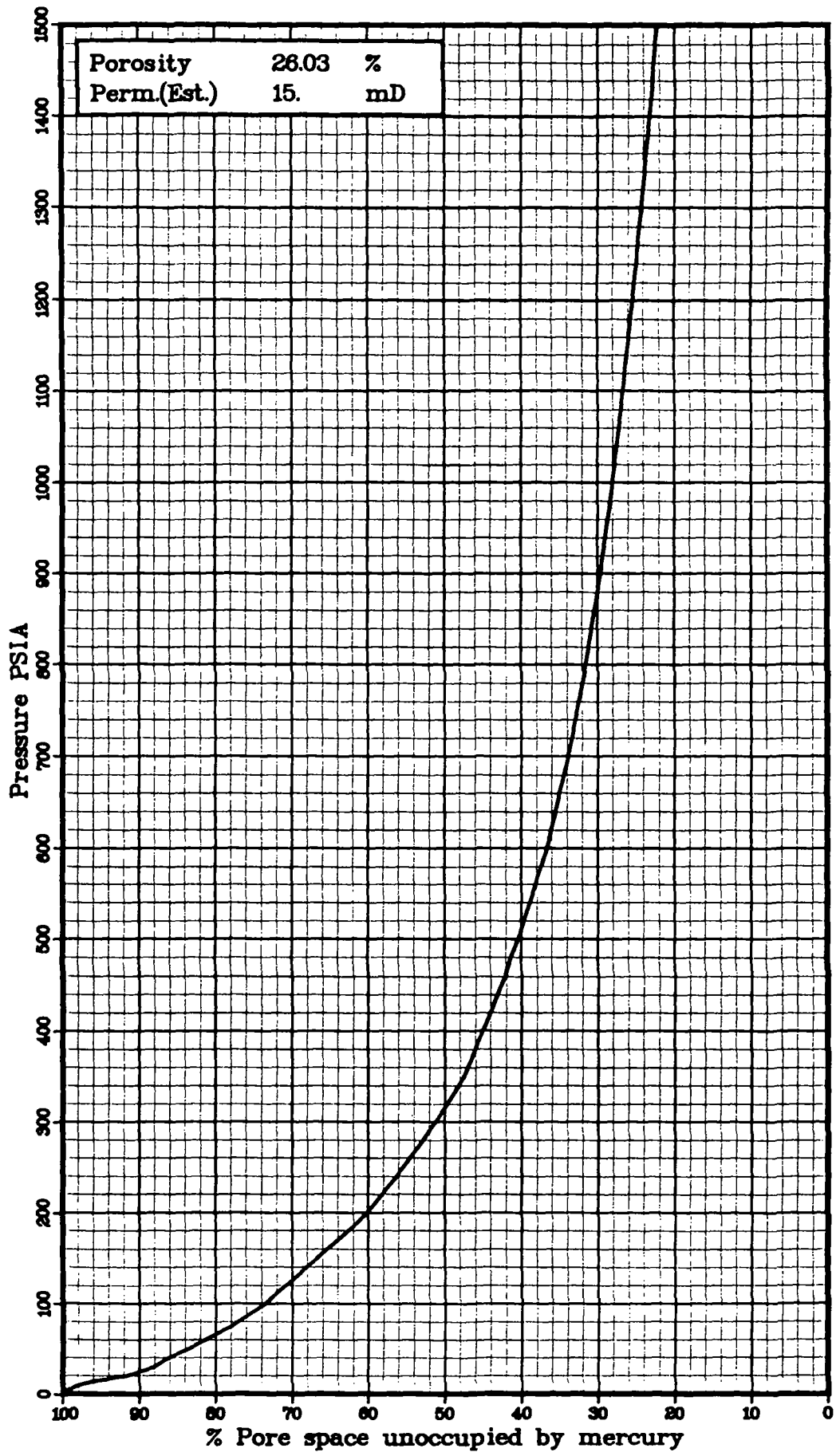
RKER 83.024

SAMPLE 12A

DEPTH 1627.50 METER

author: bar
design:

fig. 18



Mercury capillary pressure curve

WELL 31/2-7

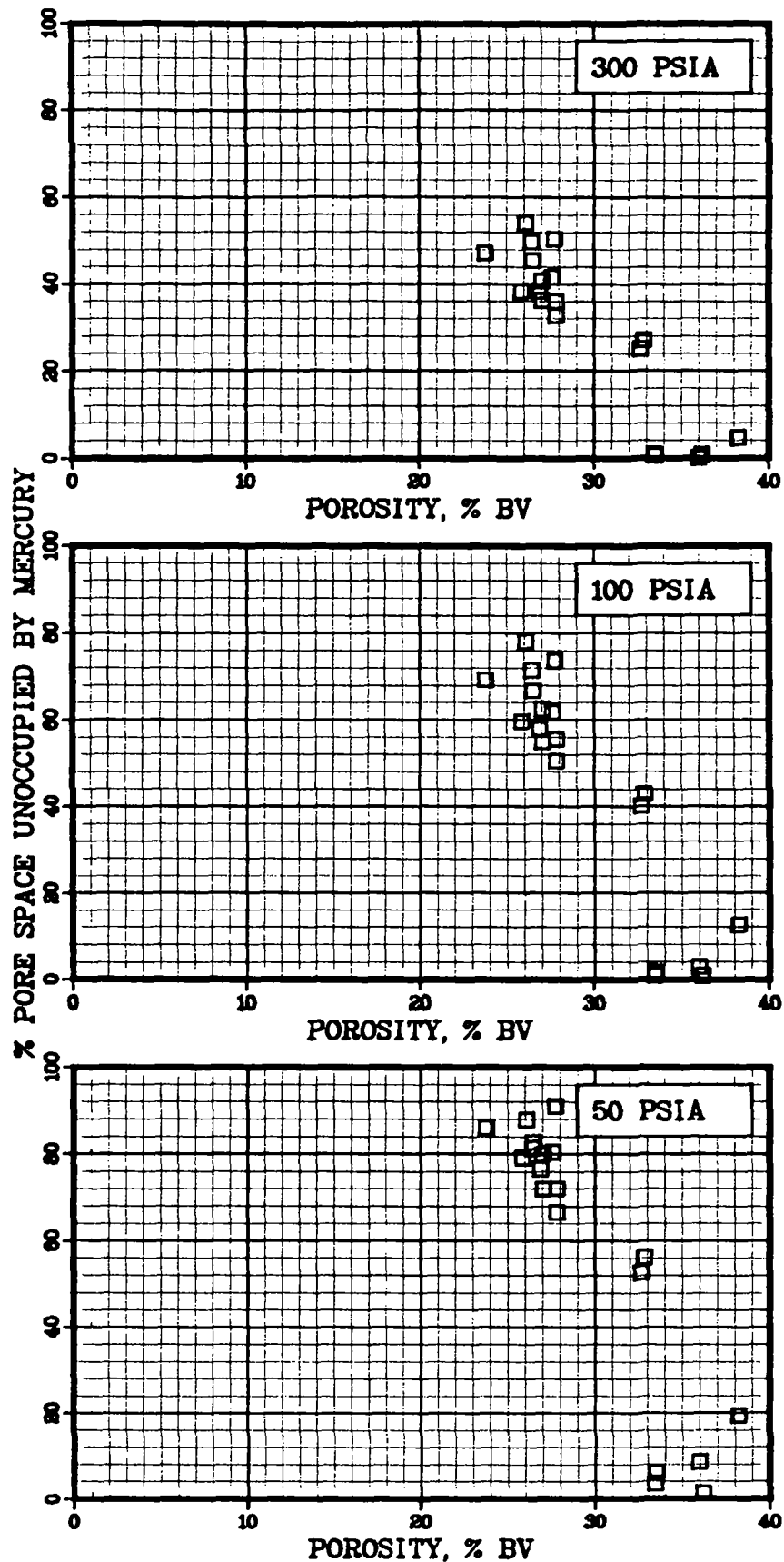
SAMPLE 12B

DEPTH 1627.50 METER

author: bur
design:

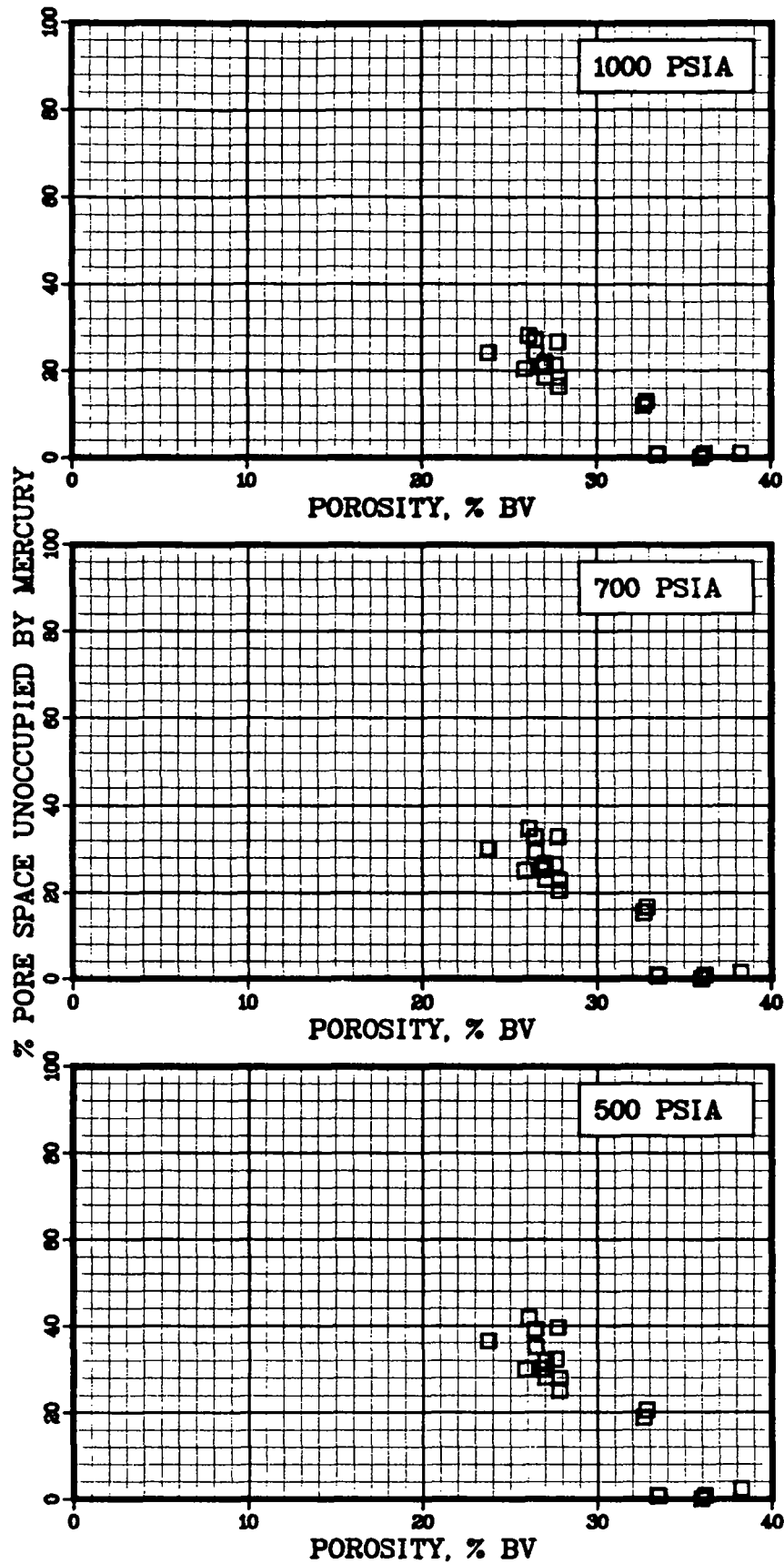
RKER 83.024

fig. 19

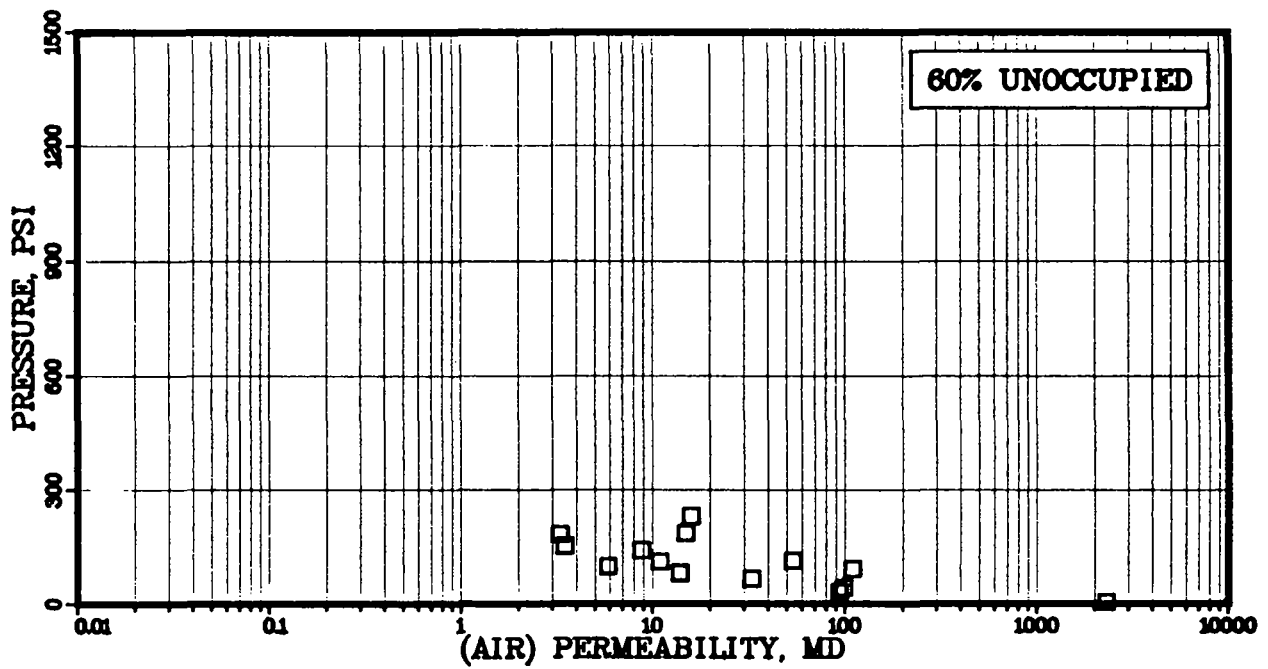
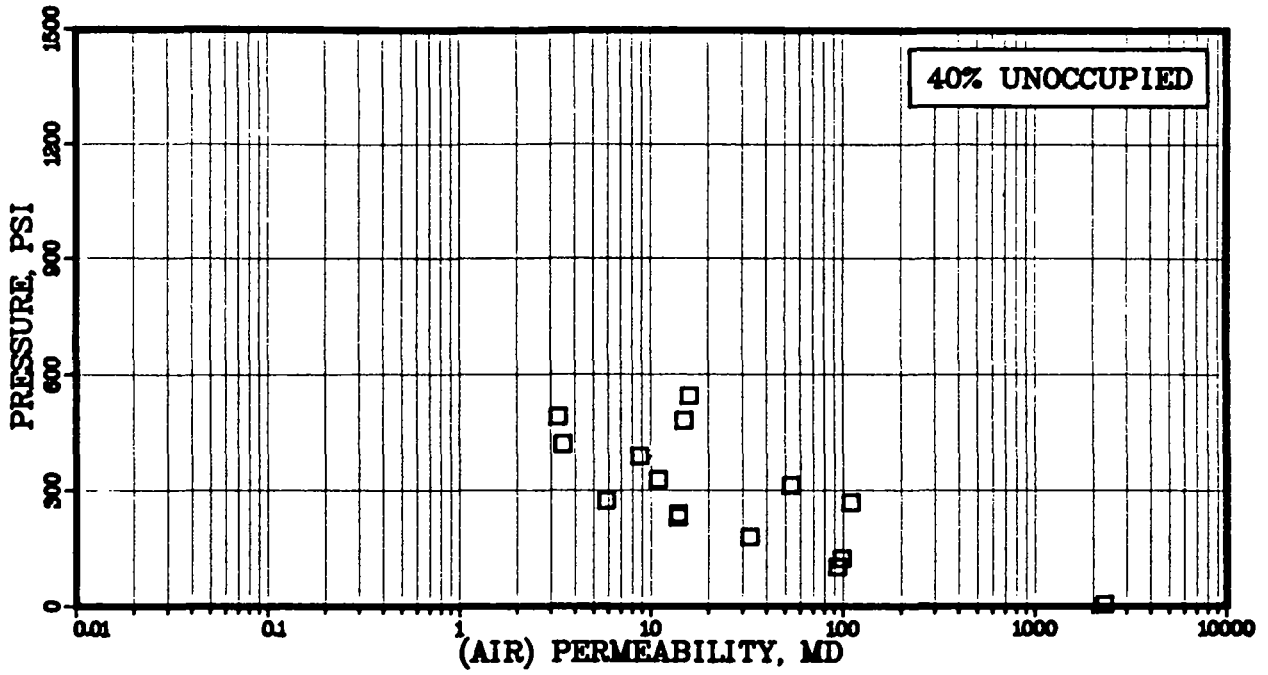


PERCENTAGE OF PORE SPACE UNOCCUPIED BY MERCURY VERSUS, POROSITY AT CAPILLARY PRESSURES OF 50, 100 AND 300 PSIA FOR CORE SAMPLES FROM WELL 31/2-7

RKER 83.024

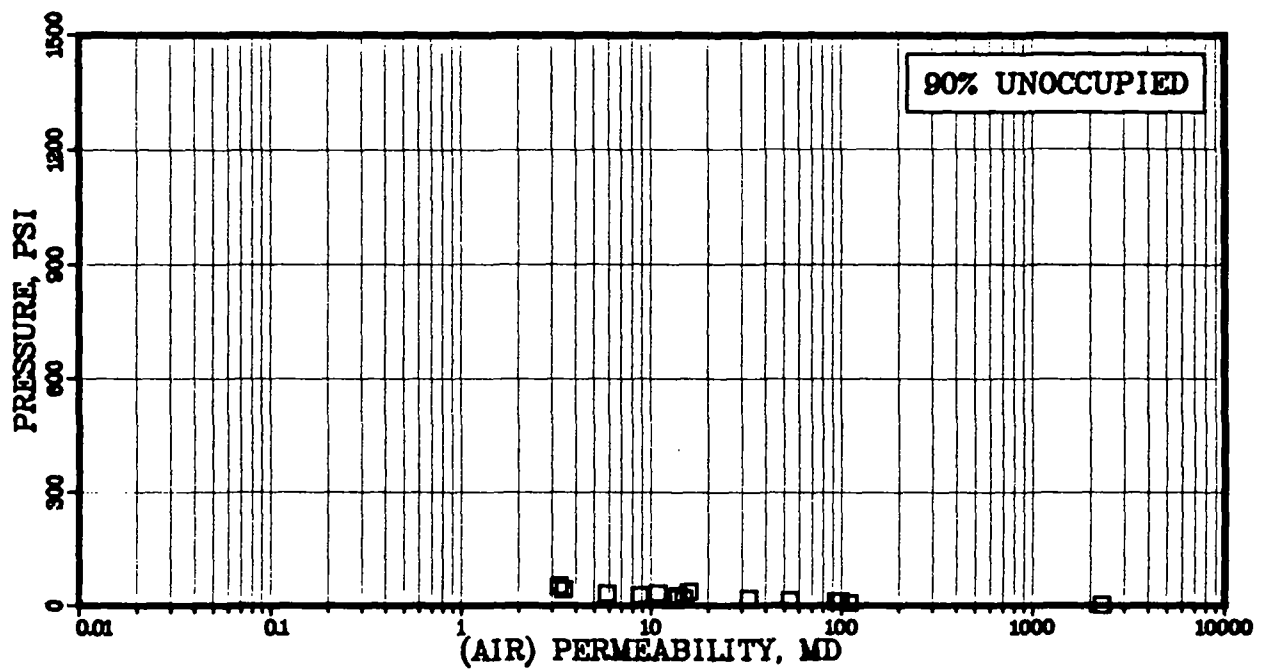
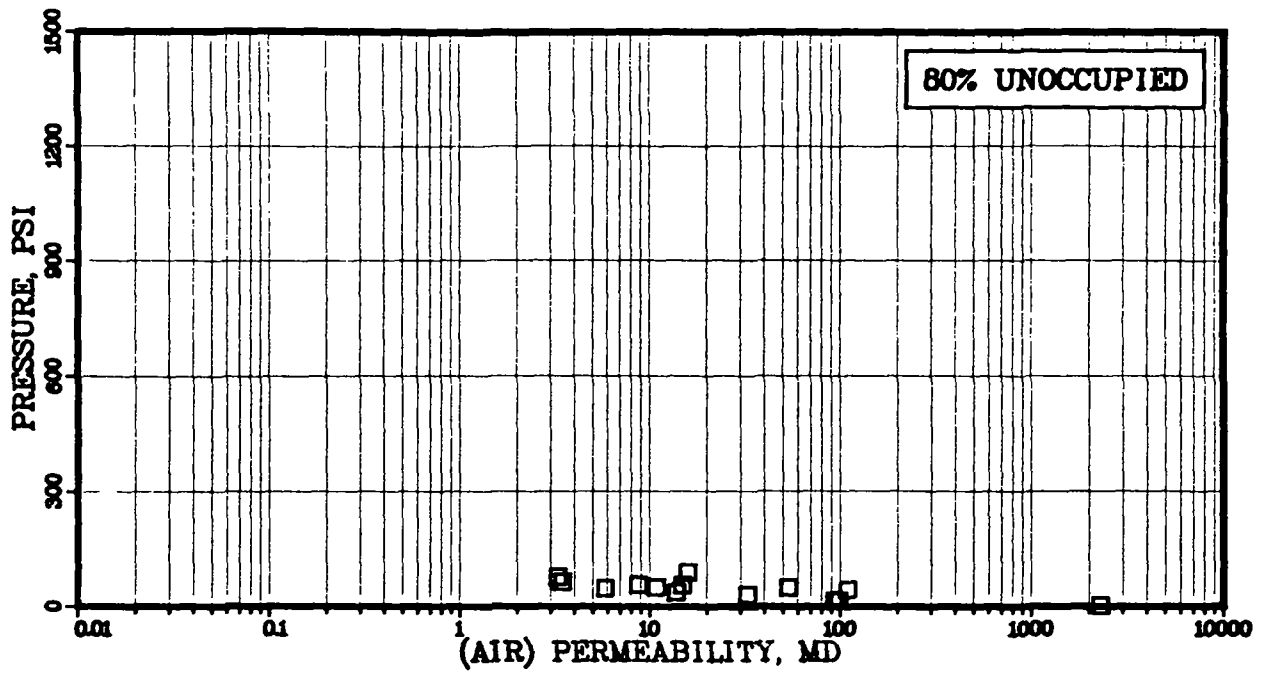


PERCENTAGE OF PORE SPACE UNOCCUPIED BY MERCURY VERSUS, POROSITY AT CAPILLARY PRESSURES OF 500, 700 AND 1000 PSIA FOR CORE SAMPLES FROM WELL 31/2-7



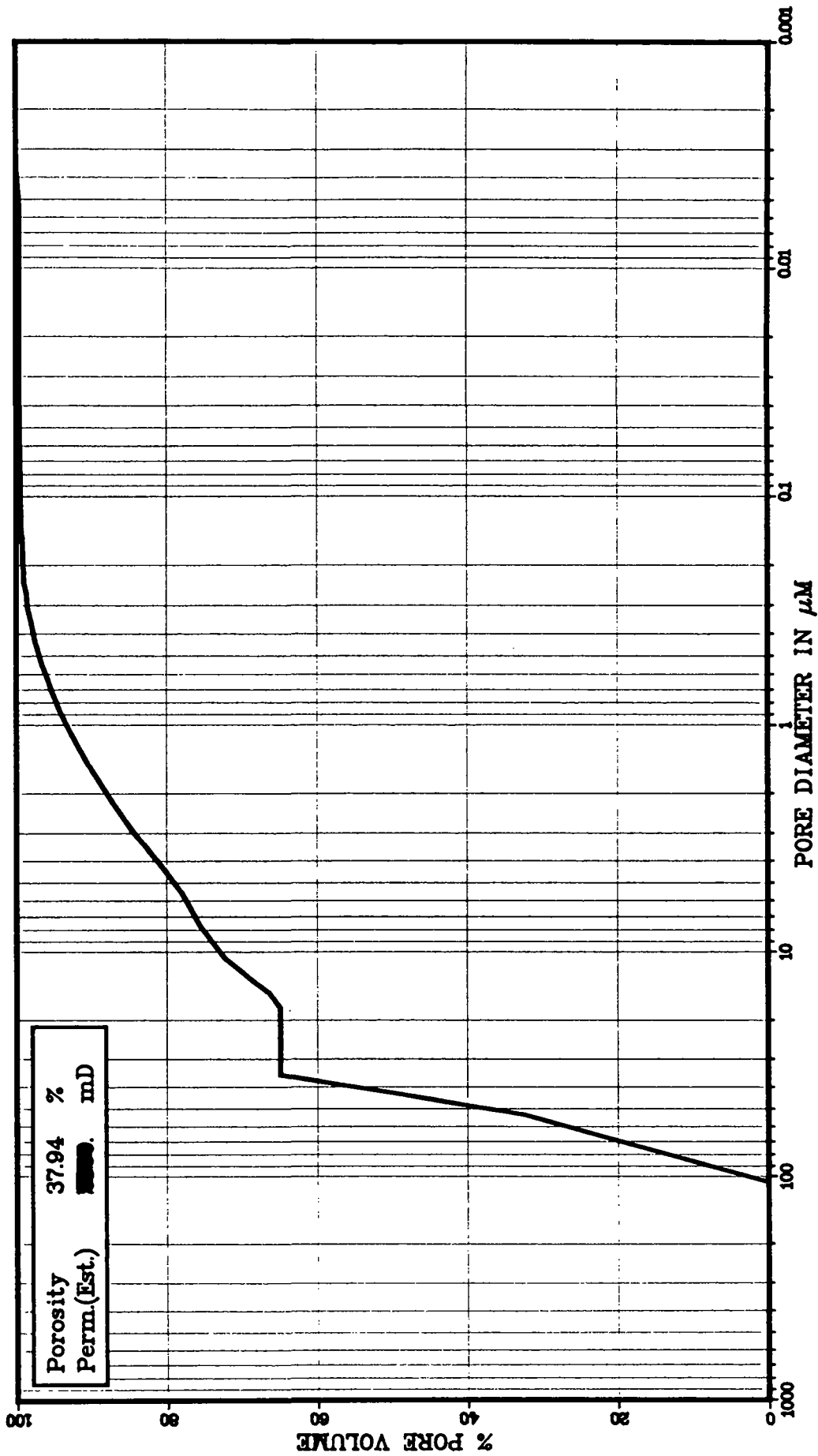
MERCURY/AIR CAPILLARY PRESSURE VERSUS
 (AIR) PERMEABILITY AT 60% AND 40% OF PORE SPACE
 UNOCCUPIED BY MERCURY FOR WELL 31/2-7

RKER 83.024



MERCURY/AIR CAPILLARY PRESSURE VERSUS
 (AIR) PERMEABILITY AT 90% AND 80% OF PORE SPACE
 UNOCCUPIED BY MERCURY FOR WELL 31/2-7

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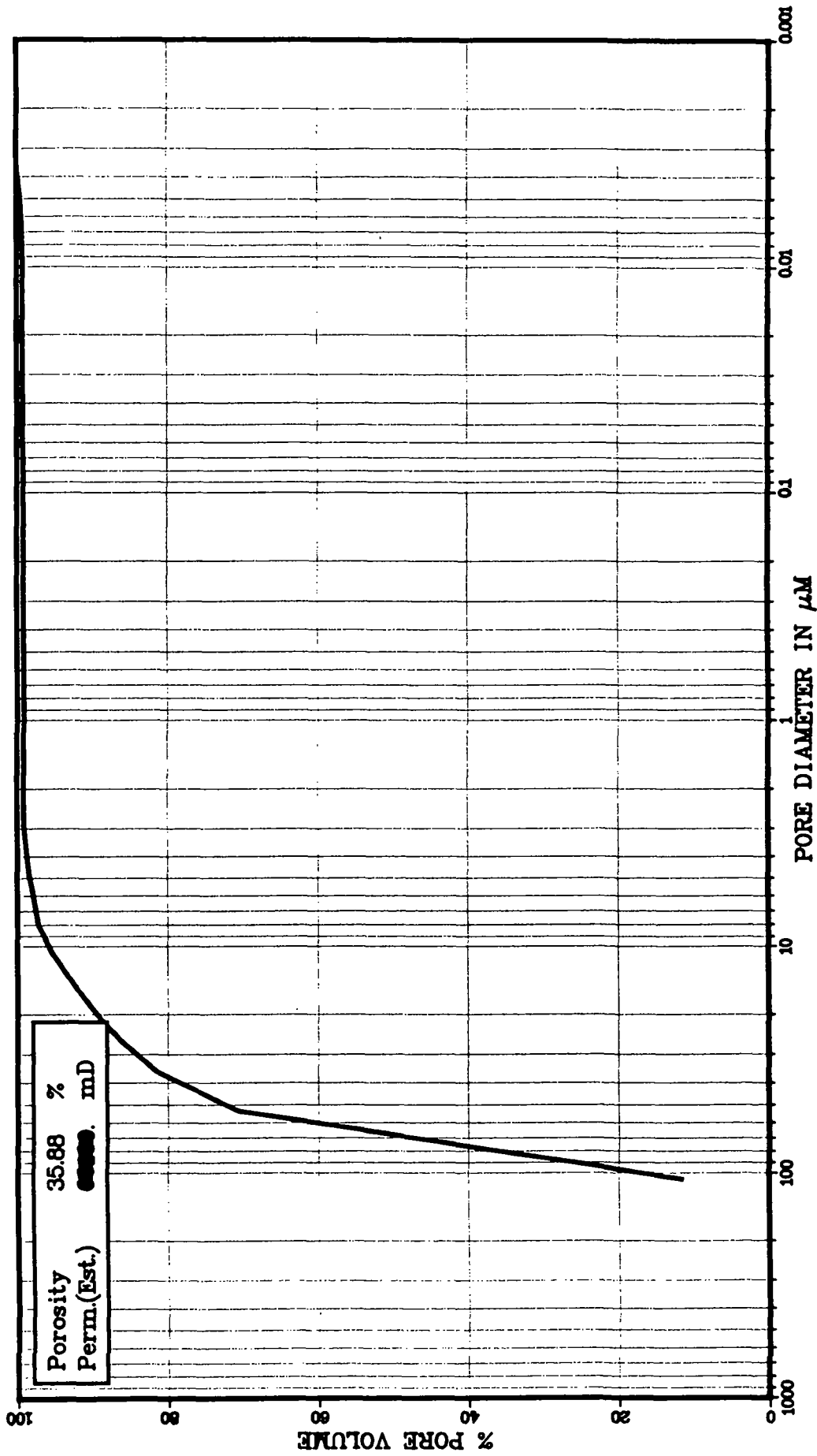
Pore Size Distribution

WELL 31/2-7 SAMPLE 1 DEPTH 1567.50 METER

RKER 83.024

author: bur
design:

fig. 24



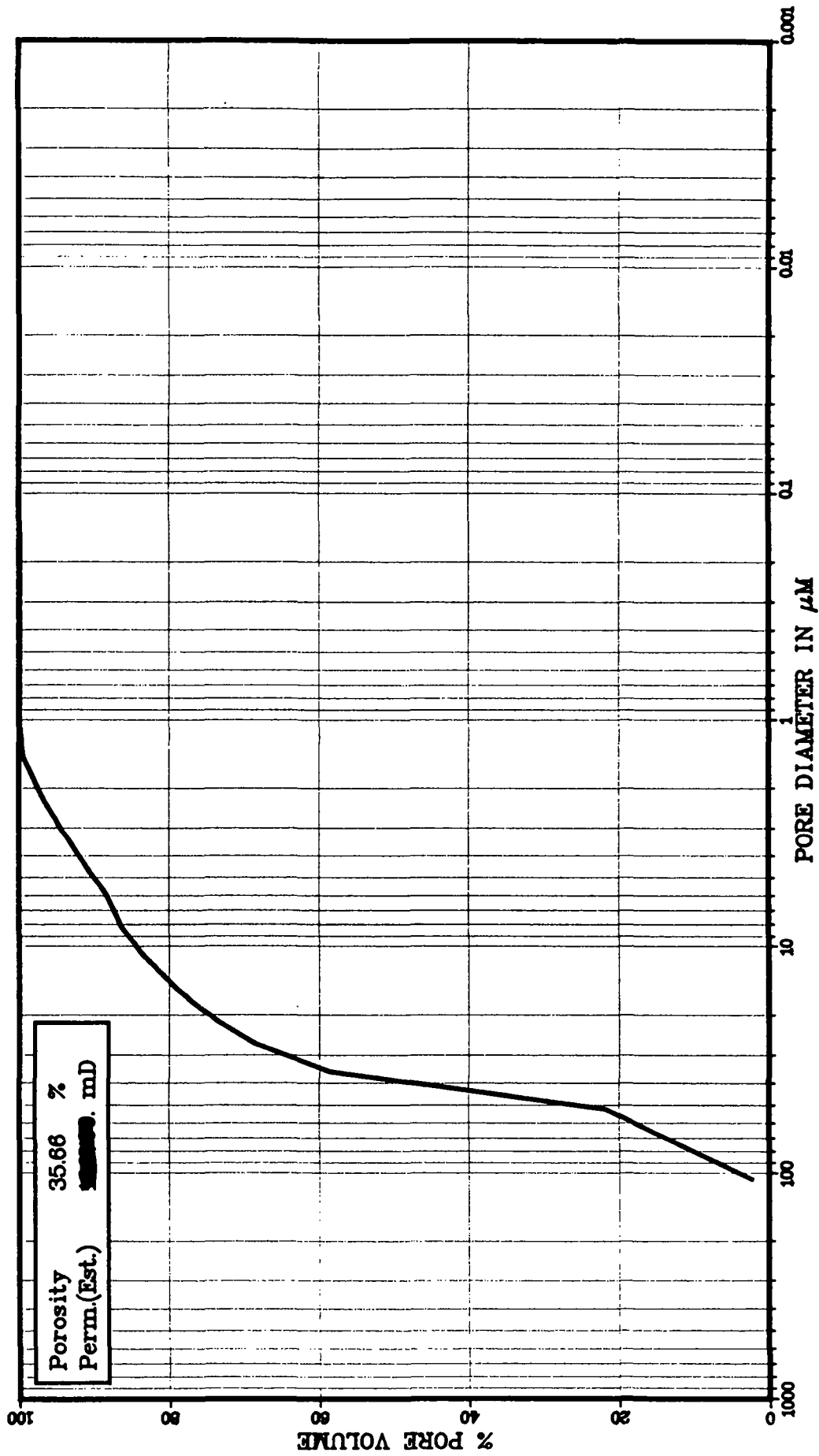
RKER 83.024

Pore Size Distribution

WELL 31/2-7

SAMPLE 2

DEPTH 1575.70 METER



RKER 83.024

Pore Size Distribution

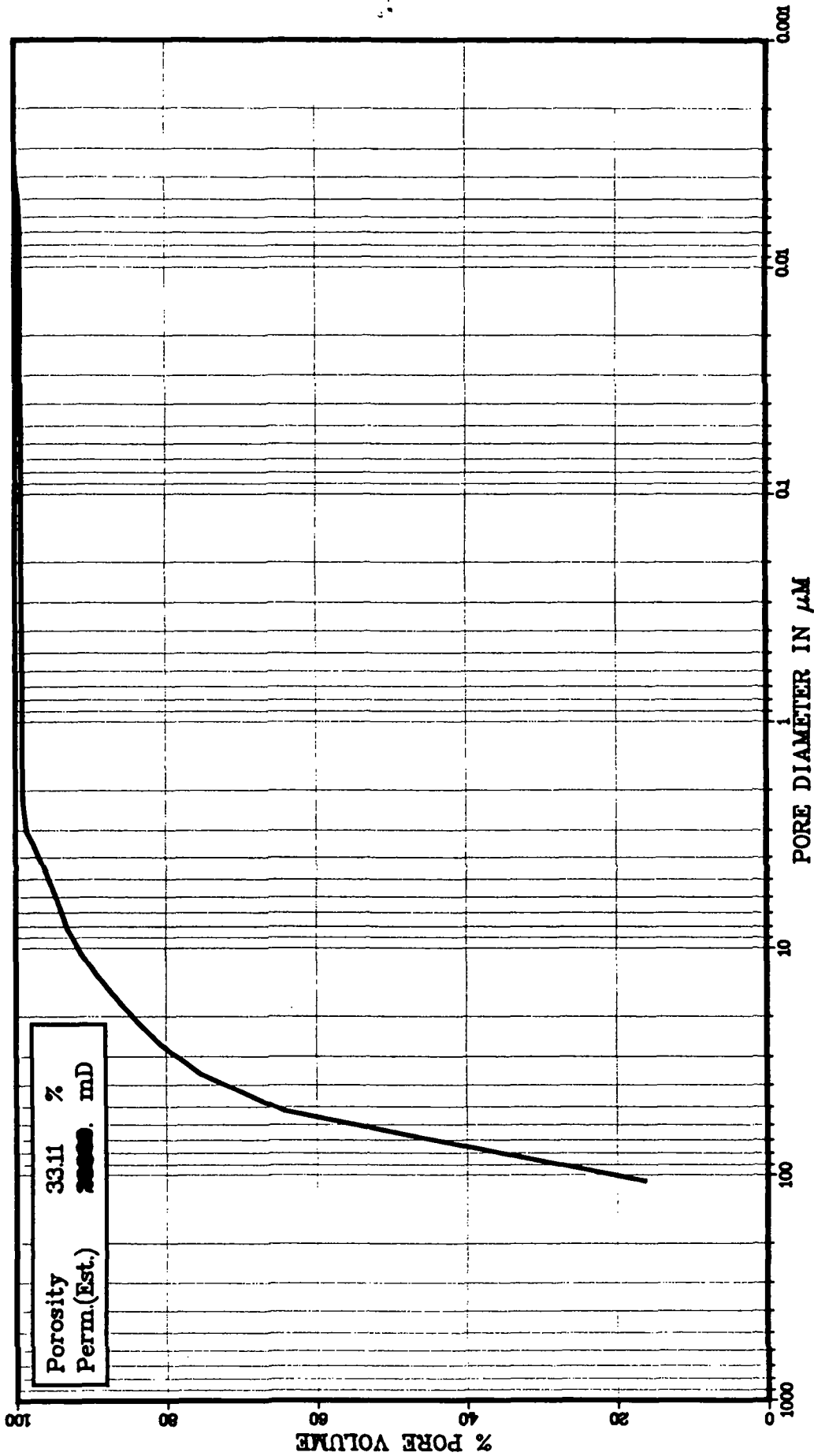
DEPTH 1577.70 METER

SAMPLE 3

WELL 31/2-7

author: bur
design:

fig. 26



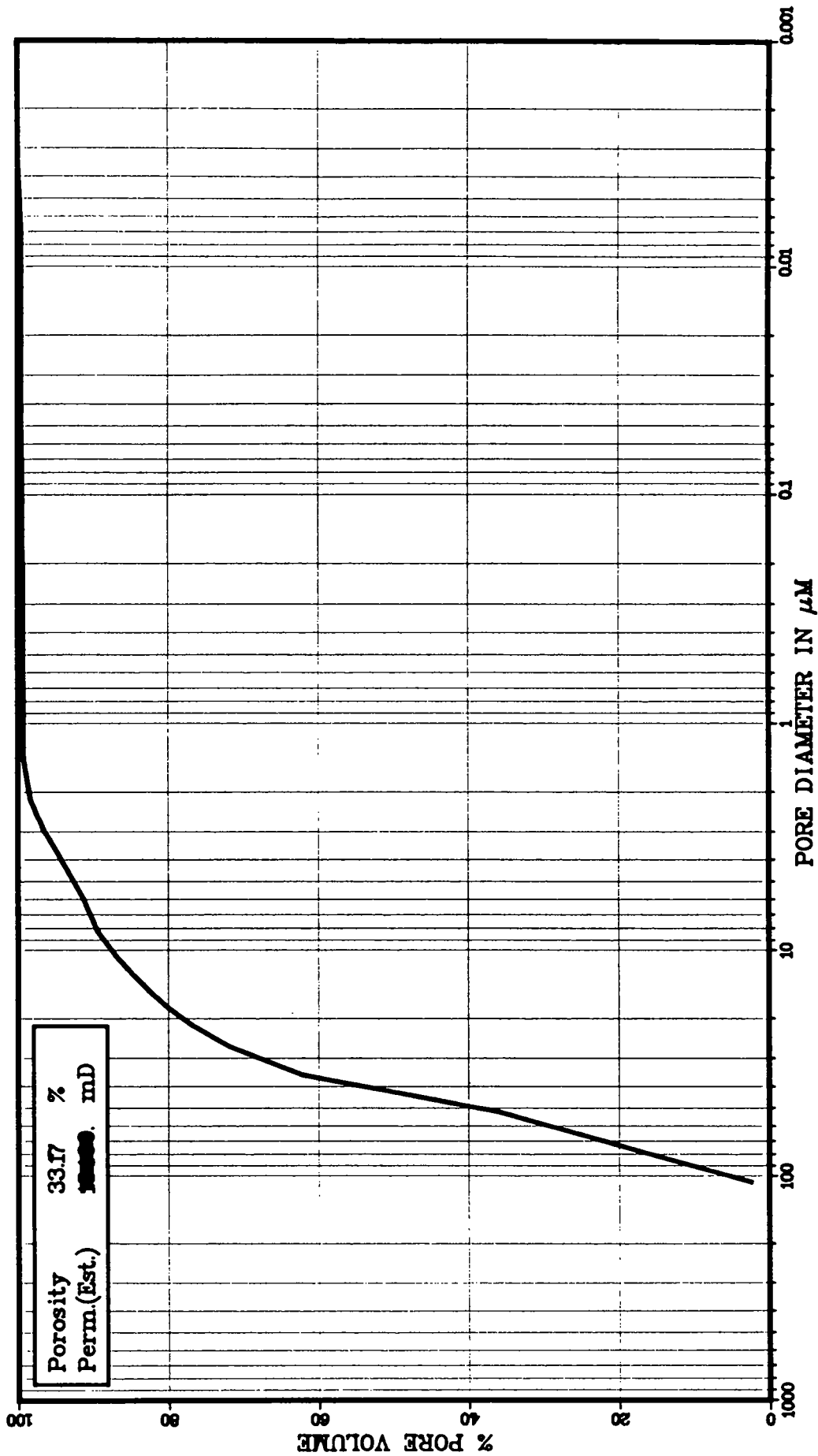
Pore Size Distribution

WELL 31/2-7 SAMPLE 4 DEPTH 1589.00 METER

RKER 83.024

author: bur
design:

fig. 27



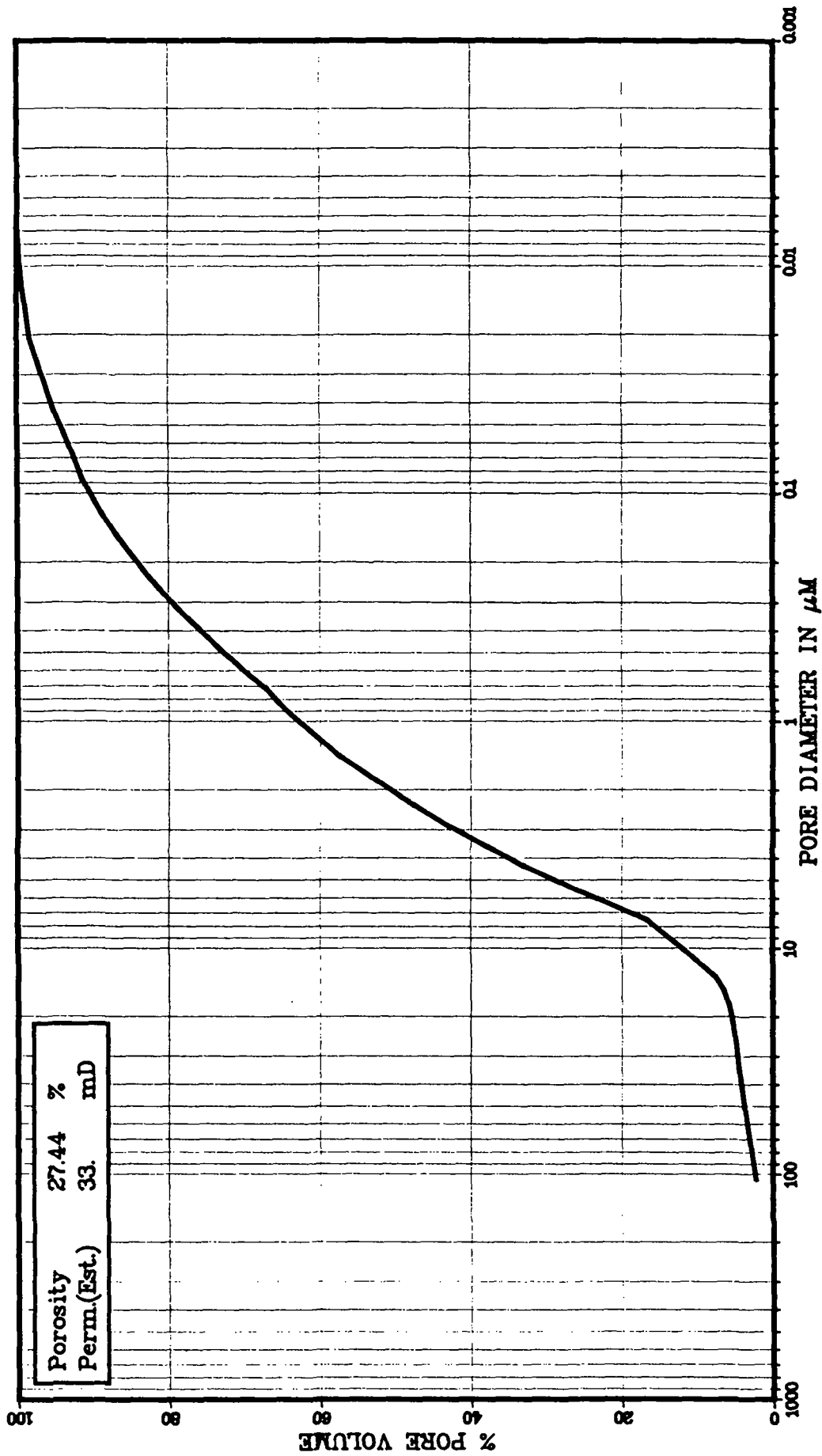
Pore Size Distribution

WELL 31/2-7 SAMPLE 5 DEPTH 1592.40 METER

RKER 83.024

author: bur
design:

fig. 28



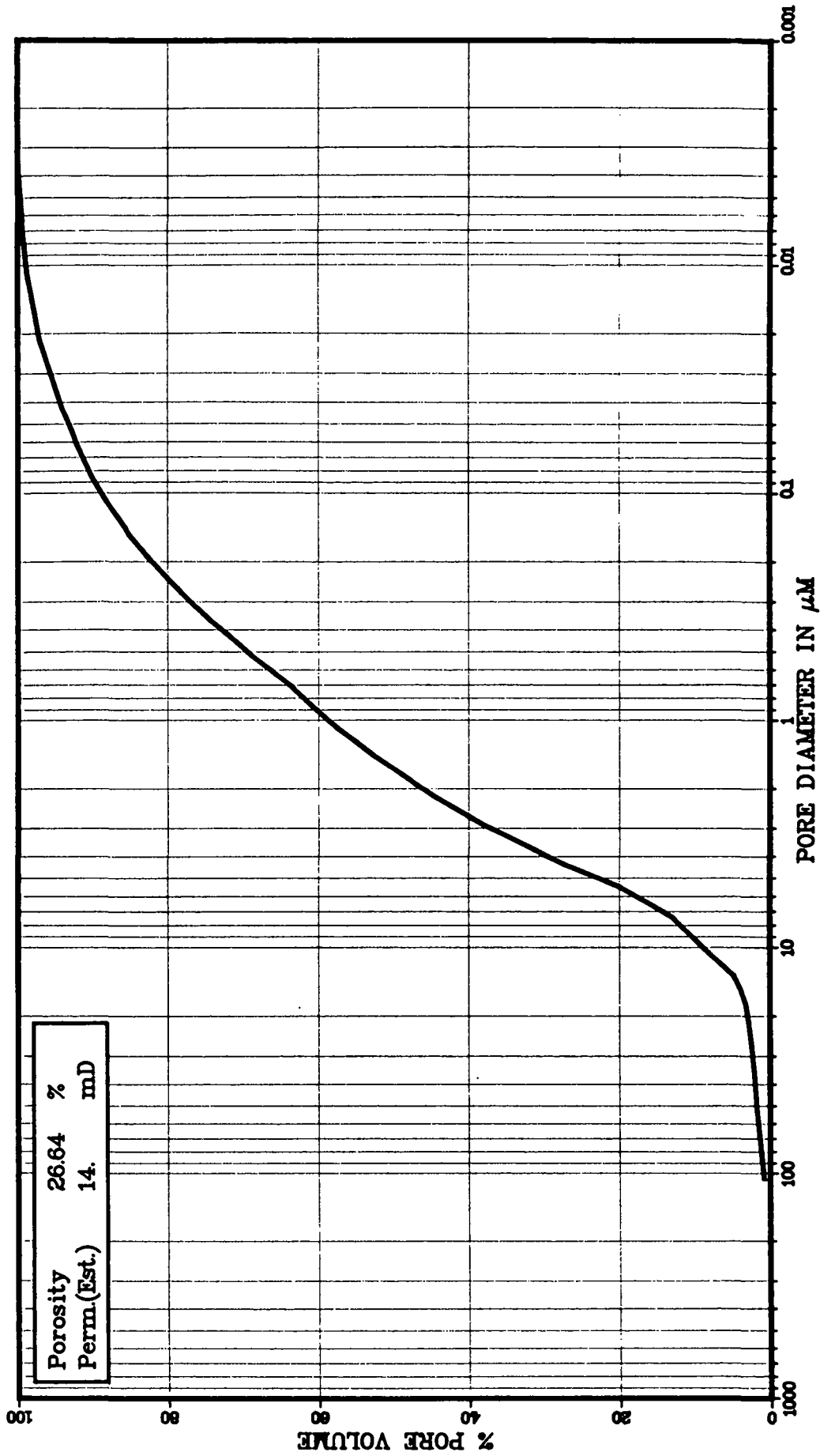
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Pore Size Distribution

WELL 31/2-7 SAMPLE 6A DEPTH 1603.60 METER

author: bur
design:

fig. 29



RKER 83.024

Pore Size Distribution

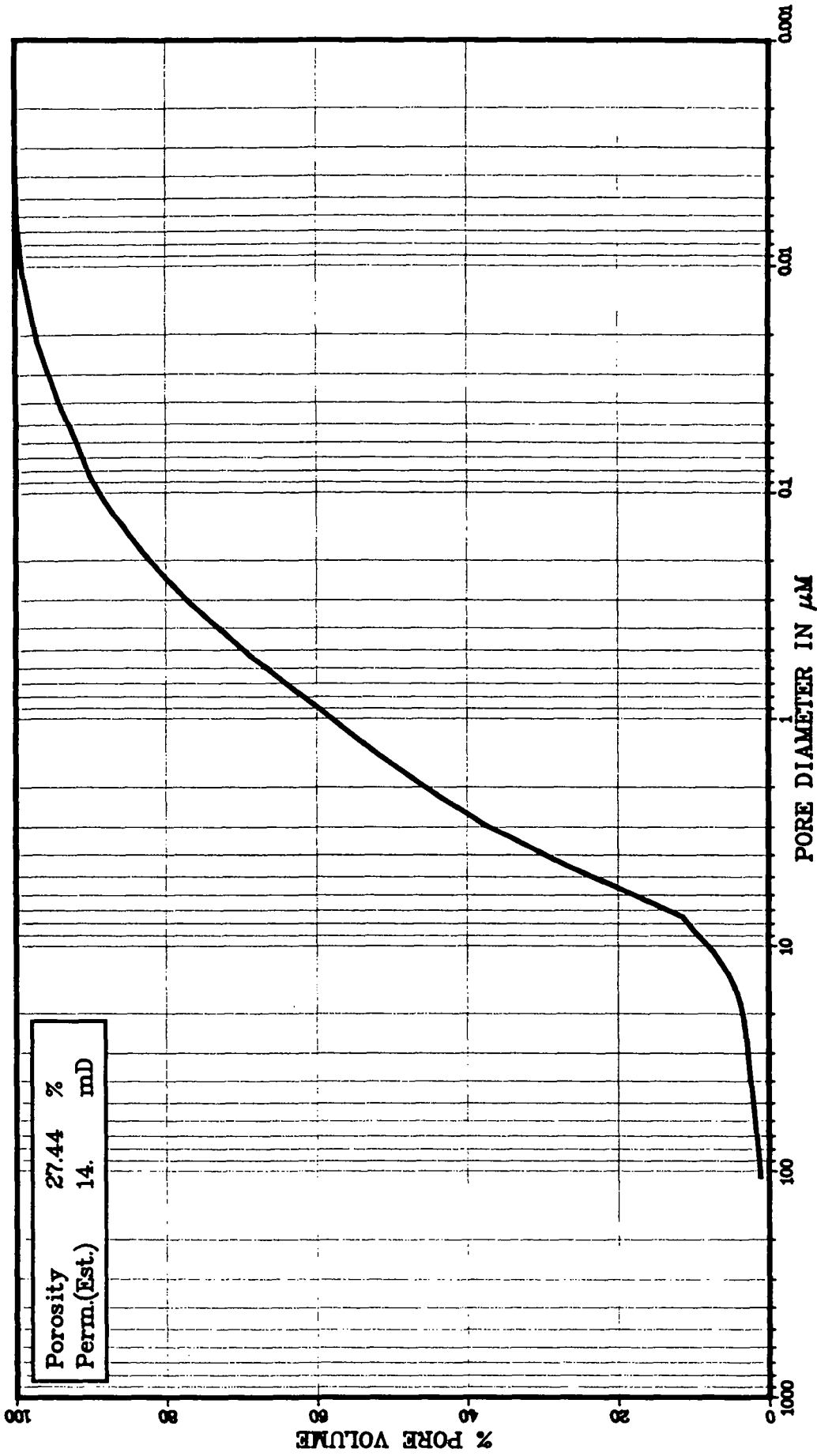
DEPTH 160360 METER

SAMPLE 6B

WELL 31/2-7

author: bur
design:

fig. 30



RKER 83.024

Pore Size Distribution

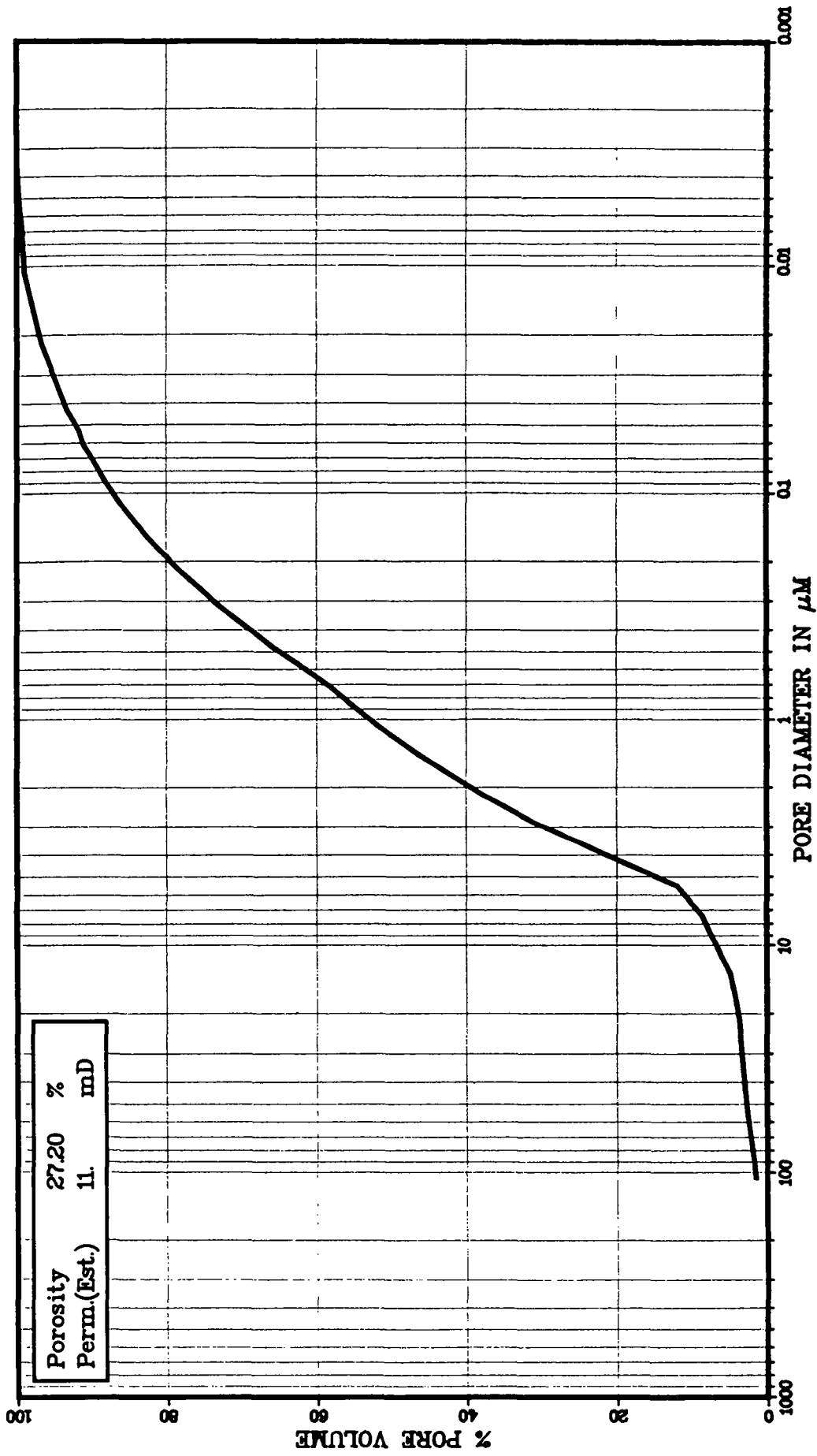
DEPTH 1605.60 METER

SAMPLE 7A

WELL 31/2-7

author: bur
design:

fig. 31



RKER 83.024

Pore Size Distribution

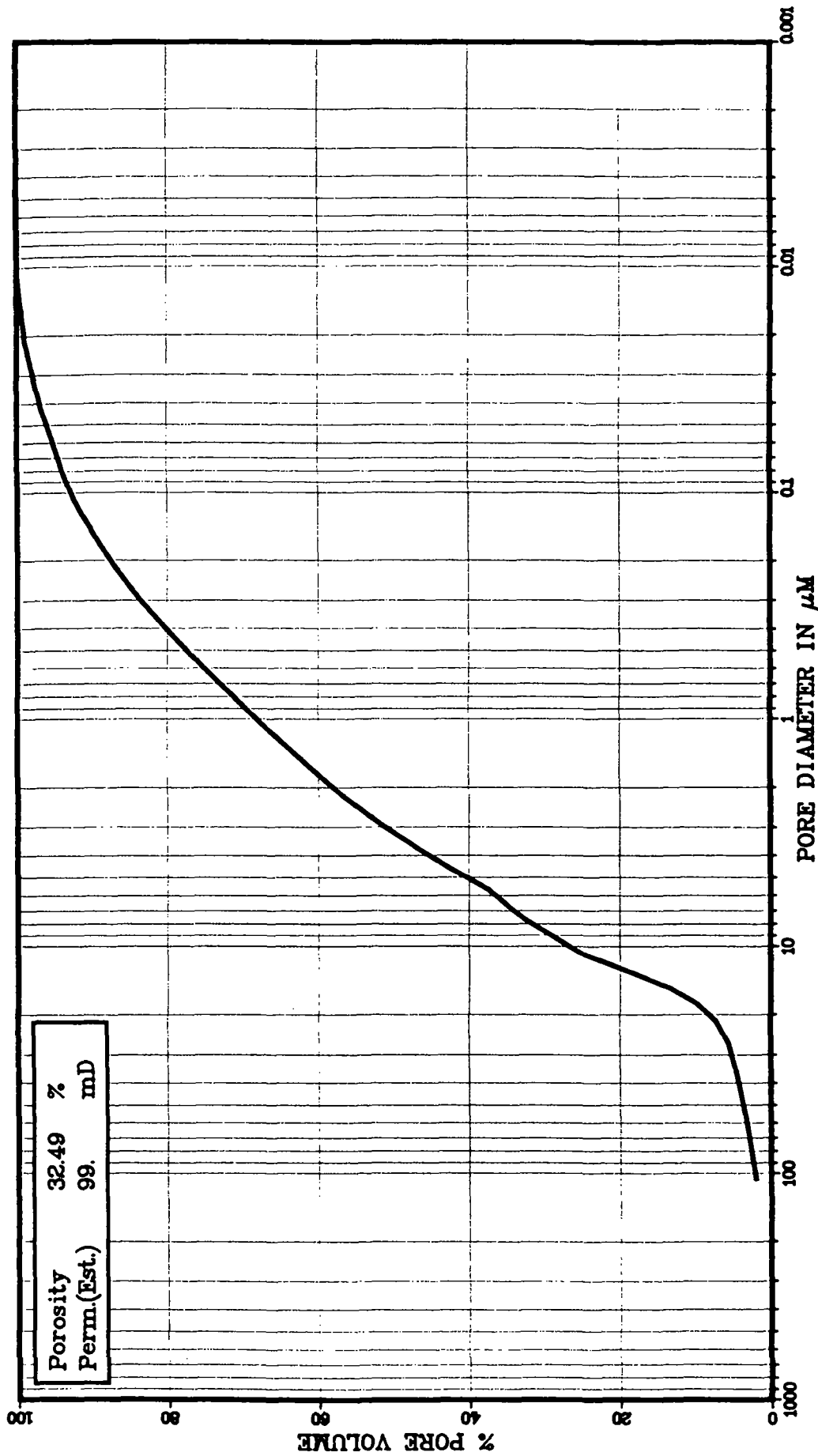
DEPTH 1605.60 METER

SAMPLE 7B

WELL 31/2-7

author: bur
design:

fig. 32



RKER 83.024

Pore Size Distribution

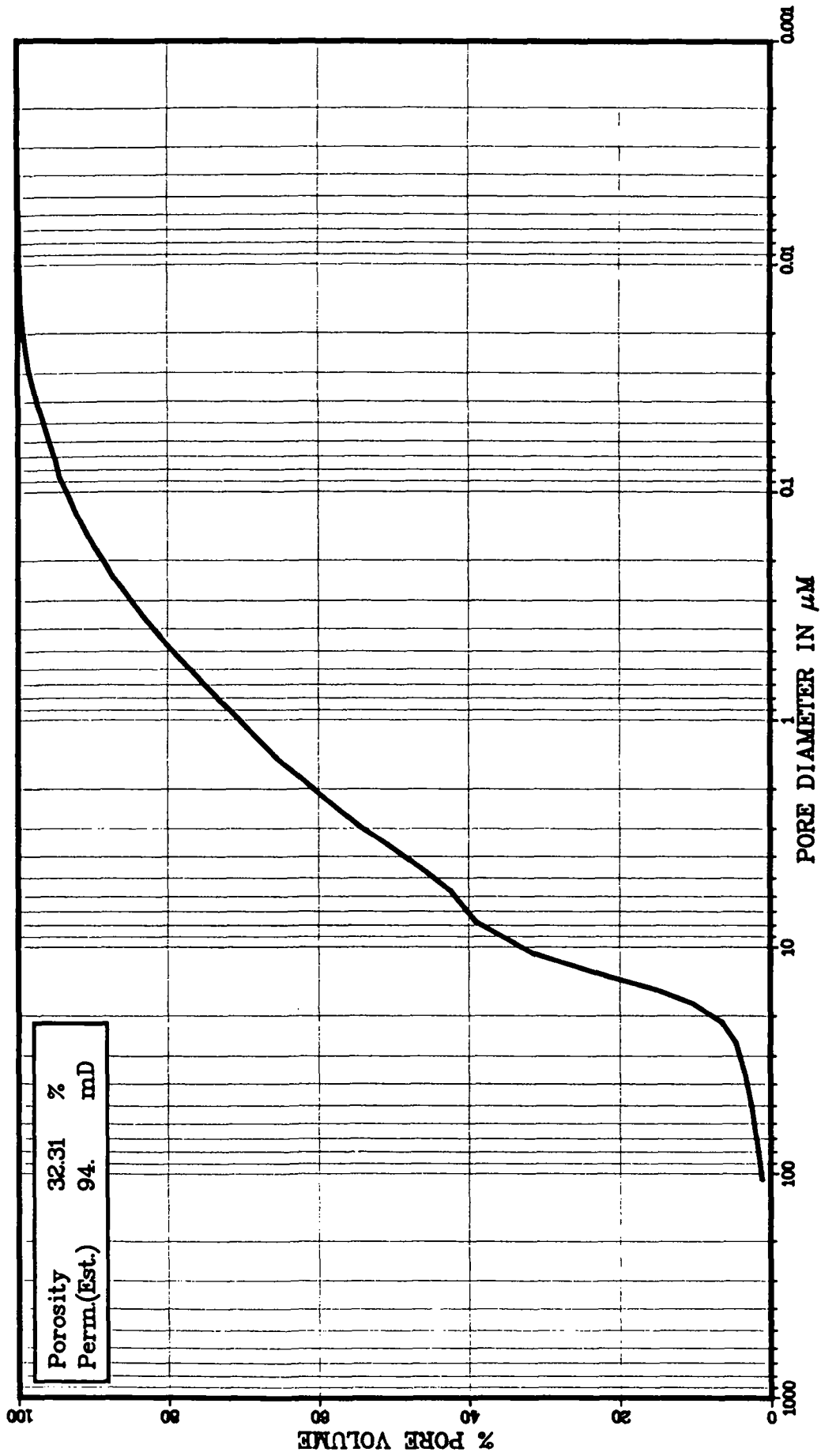
DEPTH 1609.70 METER

SAMPLE 8A

WELL 31/2-7

author: bur
design:

fig. 33



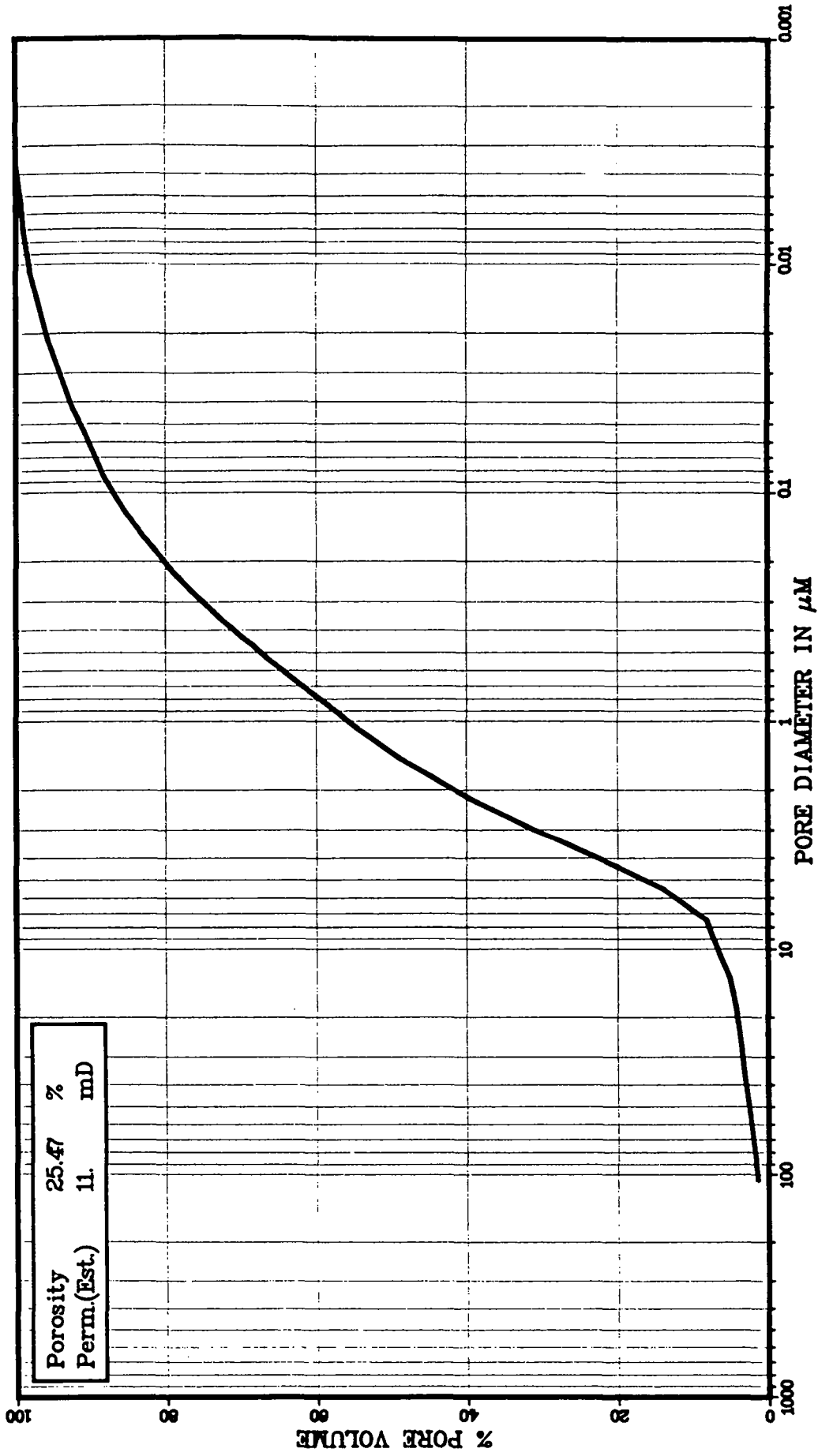
RKER 83.024

Pore Size Distribution

WELL 31/2-7 SAMPLE 8B DEPTH 1609.70 METER

author: bur
design:

fig. 34



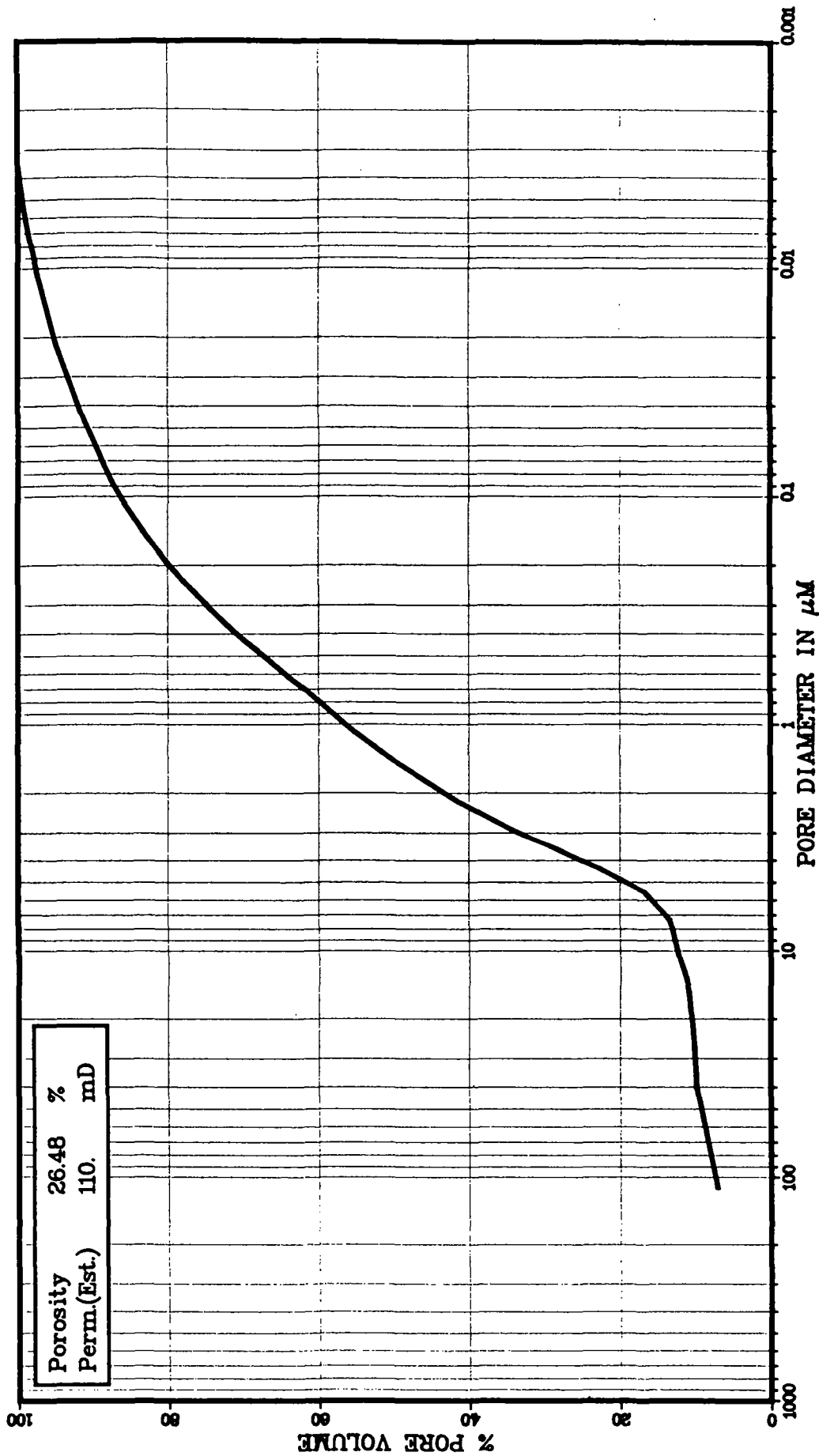
RKER 83.024

Pore Size Distribution

DEPTH 1612.60 METER

SAMPLE 9A

WELL 31/2-7



Pore Size Distribution

DEPTH 1612.60 METER

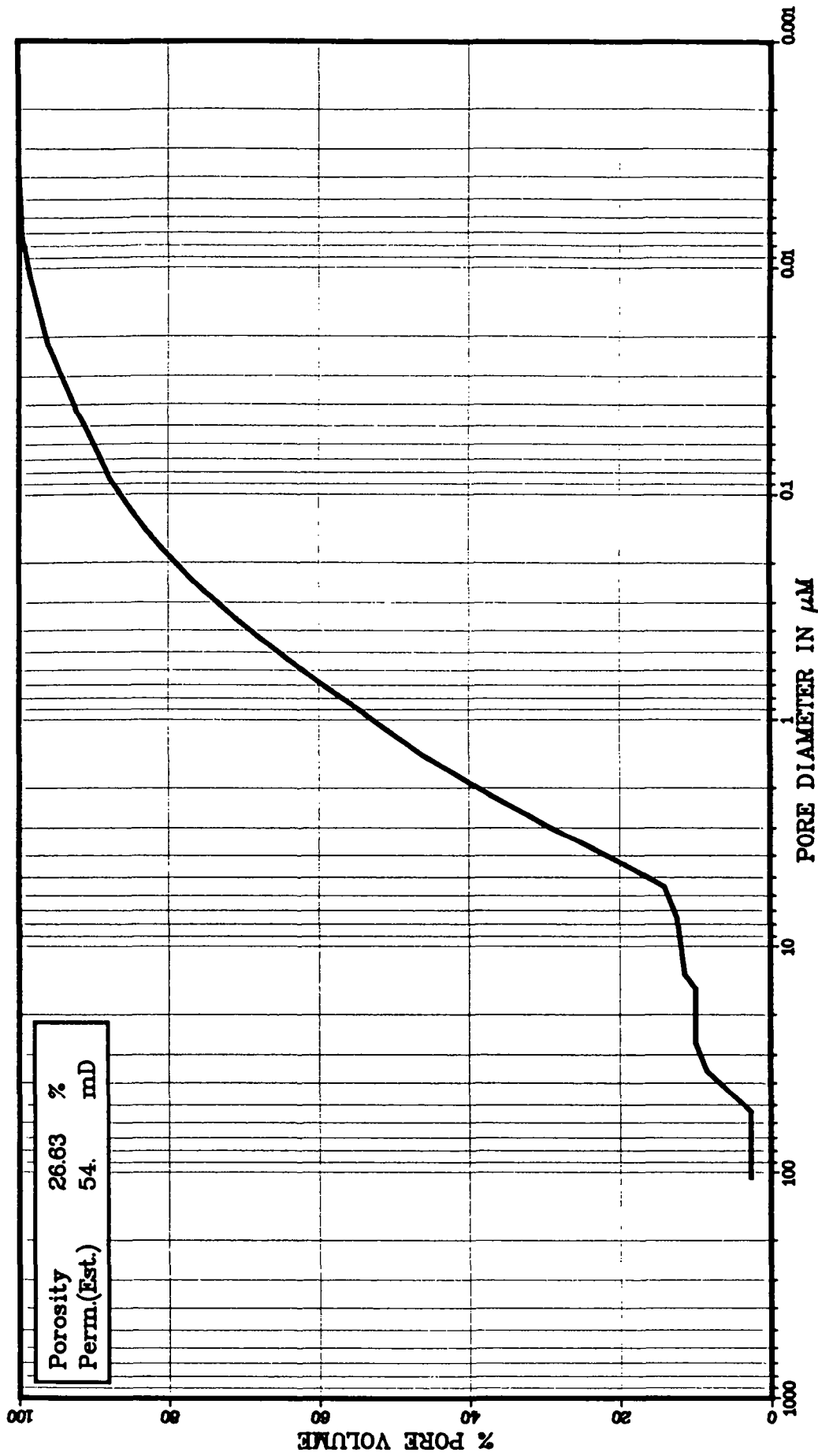
SAMPLE 9B

WELL 31/2-7

RKER 83.024

author: bur
design:

fig. 26



RKER 83.024

Pore Size Distribution

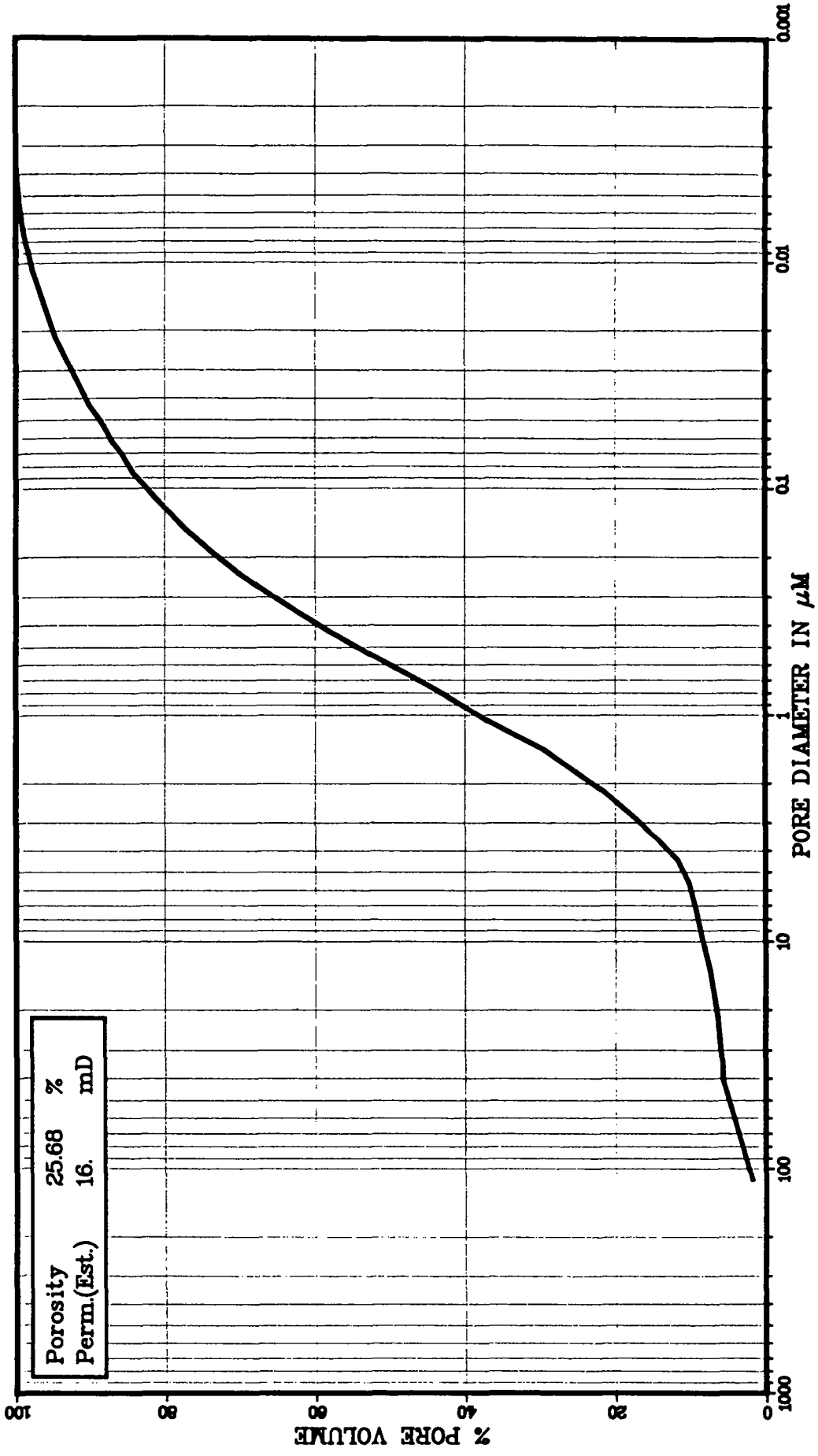
DEPTH 1614.70 METER

SAMPLE 10A

WELL 31/2-7

author: bur
design:

fig. 37



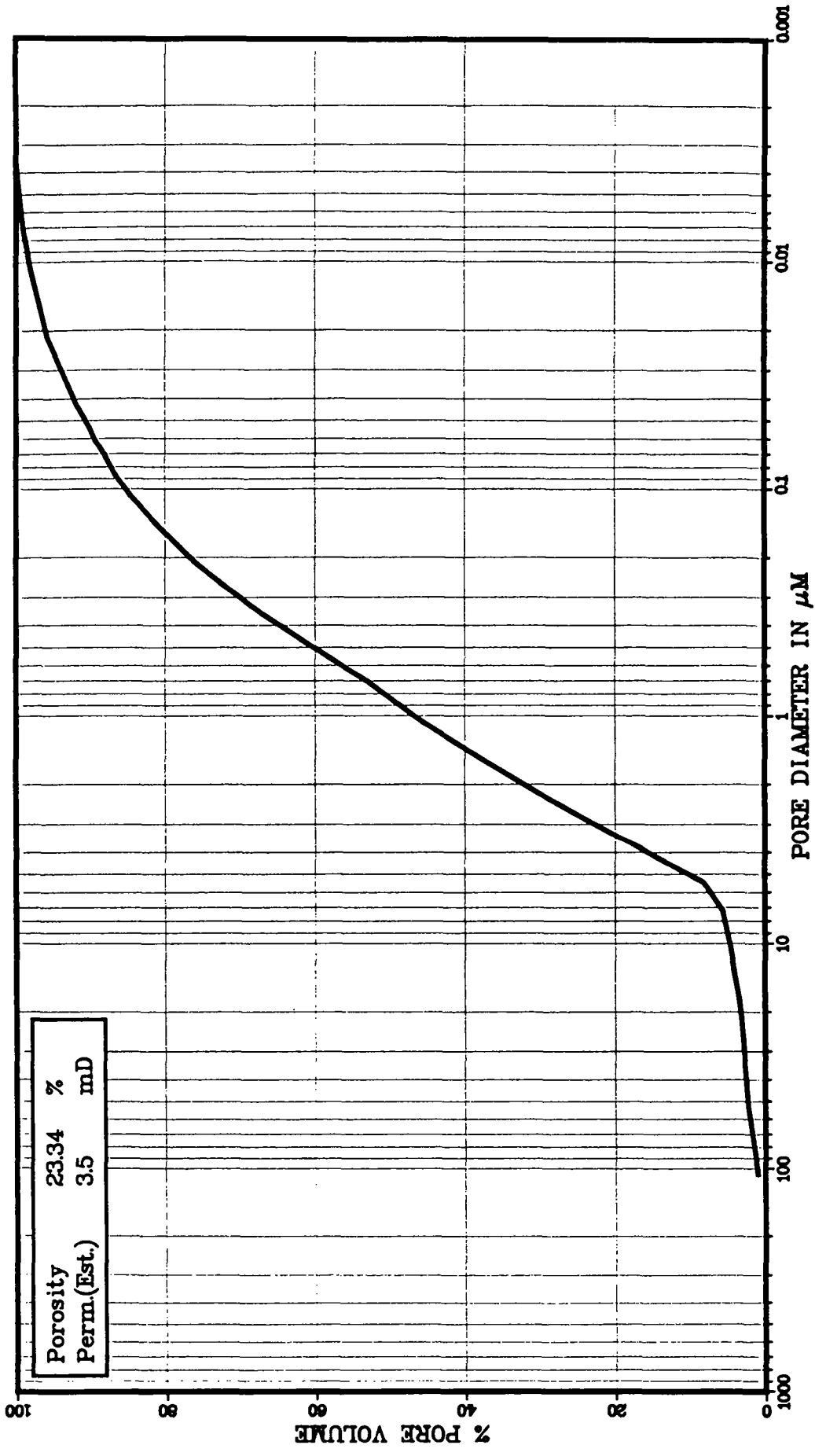
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Pore Size Distribution

WELL 31/2-7 SAMPLE 10B DEPTH 1614.70 METER

author: bur
design:

fig. 38



Porosity 23.34 %
 Perm.(Est.) 3.5 mD

RKER 83.024

Pore Size Distribution

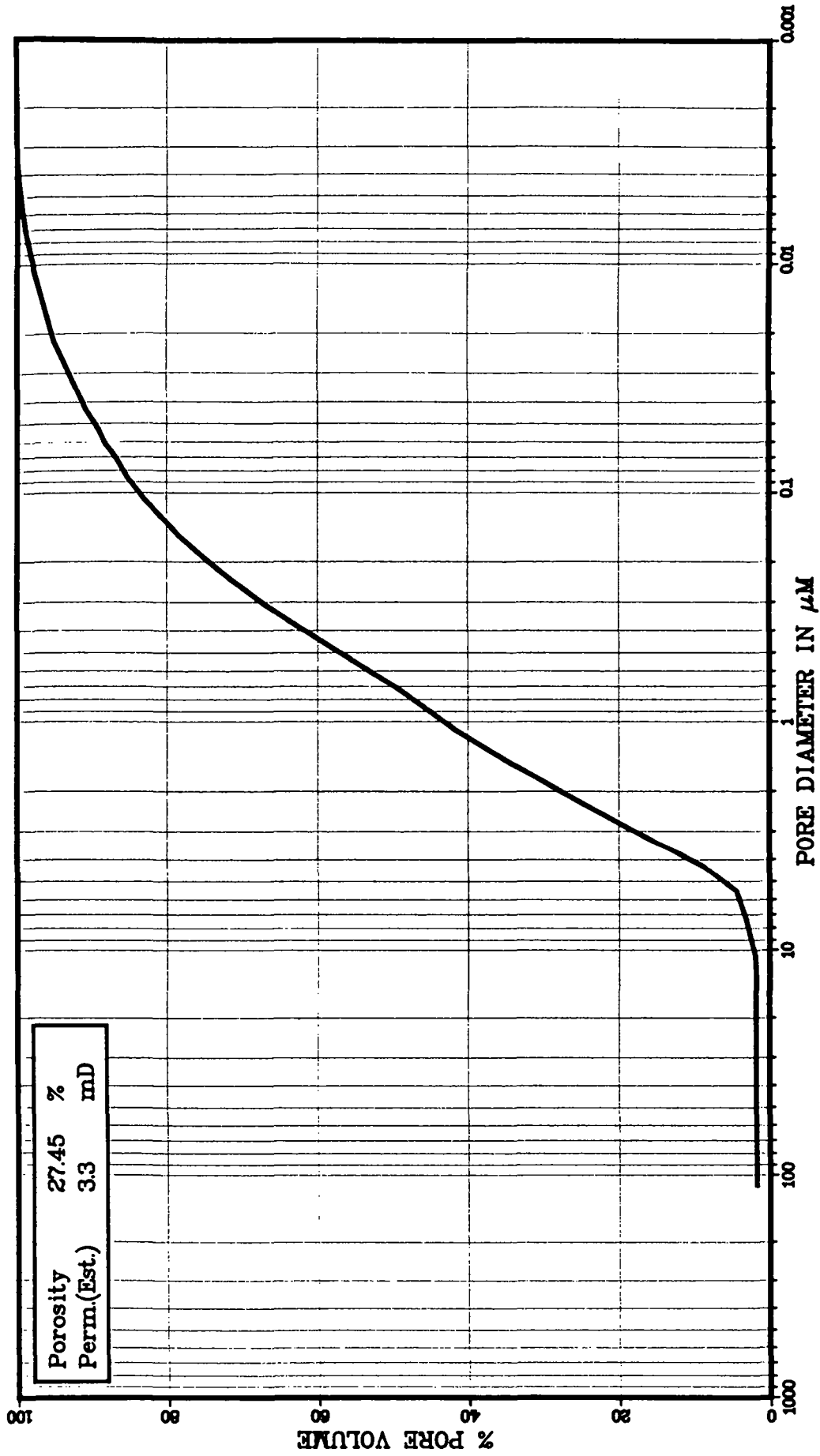
DEPTH 1620.50 METER

SAMPLE 11A

WELL 31/2-7

author: bur
 design:

fig. 39



RKER 83.024

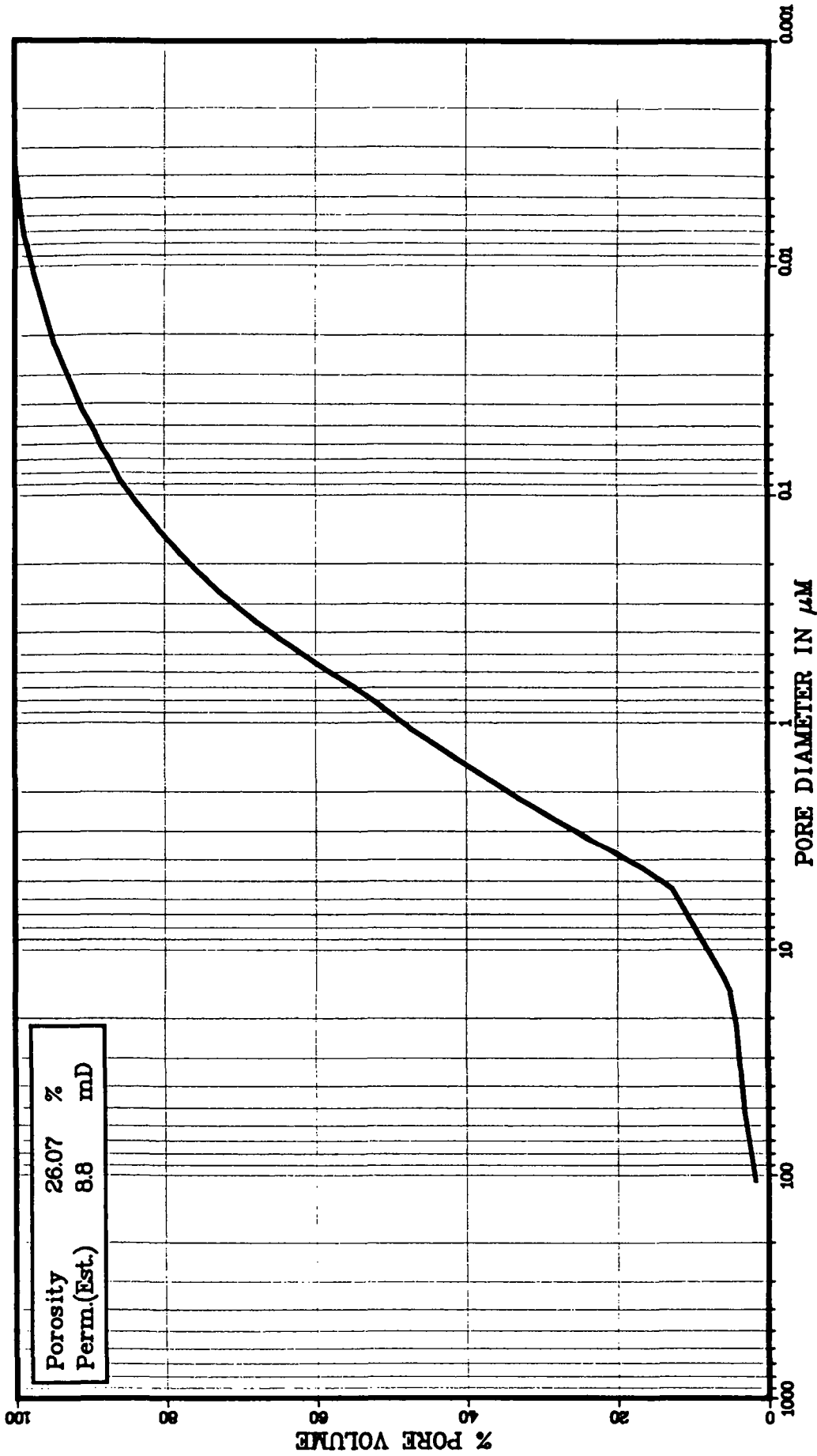
Pore Size Distribution

SAMPLE 11B DEPTH 1620.50 METER

WELL 31/2-7

author: bur
design:

fig. 50



RKER 83.024

Pore Size Distribution

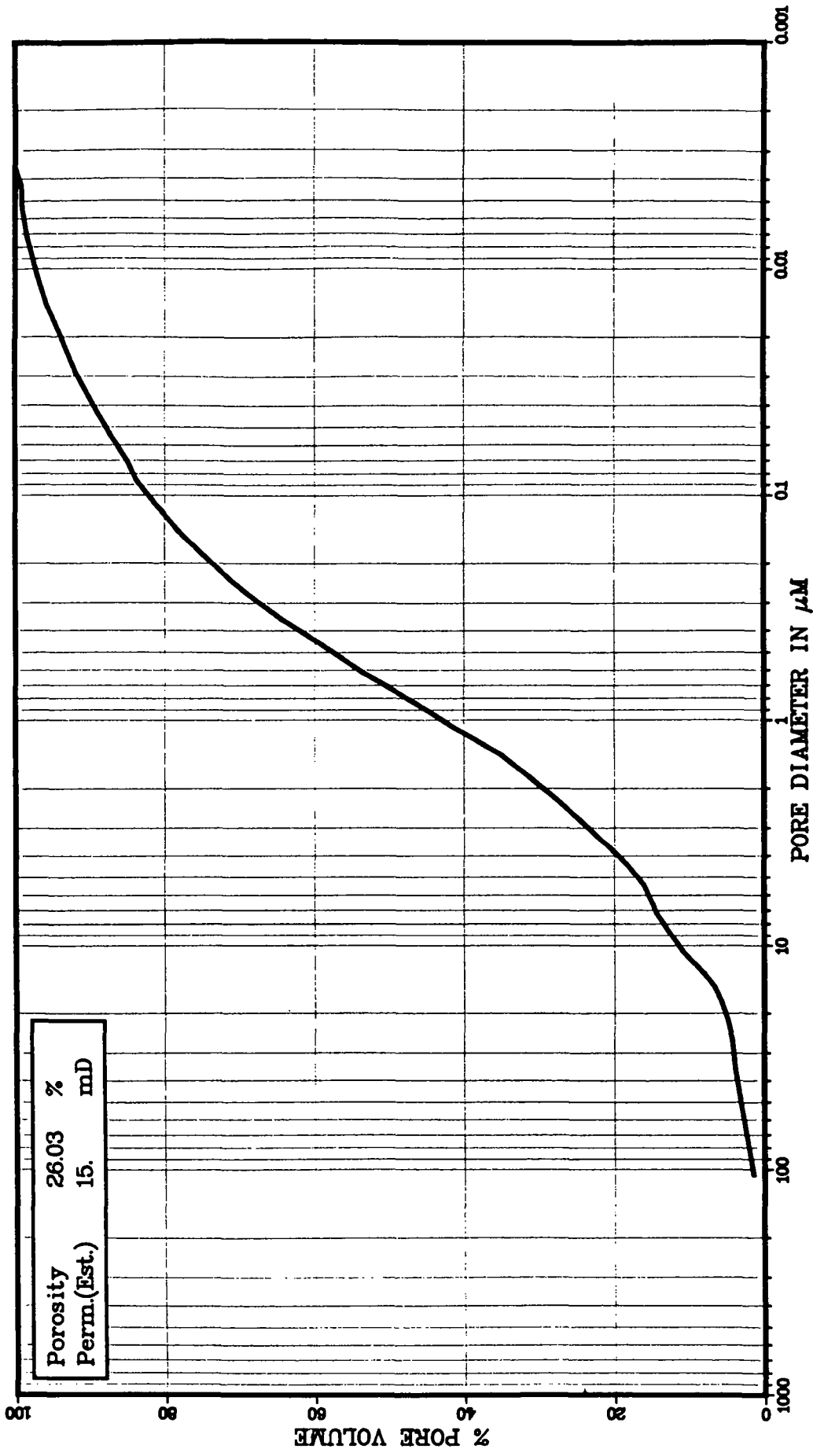
DEPTH 1627.50 METER

SAMPLE 12A

WELL 31/2-7

author: bur
design:

fig. 4'



RKER 83.024

Pore Size Distribution

SAMPLE 12B DEPTH 1627.50 METER

WELL 31/2-7

author: bur
design:

fig. 4*

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