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K & A
LABORATORIES

20-11-11
15-187-20684
93272 HDC 0061

September 27, 1993

Amoco Production Company
1670 Broadway
Denver, Colorado 80202

Attention: Mr. Van Leighton

Re: Final Report
Standard Core Analysis and
Mercury Injection Capillary
Pressure Tests
Charter Production Company
Well No. 1 Tapscott
Lower Morrow Formation
Stanton County, Kansas
API Well No. 1518720684 ?
K&A Job No. 93-5121-03

Gentlemen:

This report presents the final results of the standard core analysis and mercury injection capillary pressure tests performed on samples supplied from the referenced core material. A summary of these test results and the procedures used are presented below.

The standard core analysis test results are presented in tabular form on page 3. These results include air permeabilities, helium porosities, and grain densities. A crossplot of helium porosities versus air permeabilities is also provided.

Mercury injection capillary pressure test results are presented on pages 5 through 20. These tests indicated endpoint mercury saturations (at a final injection pressure of 20,000 psia) which ranged from 73.7 to 100.0 percent pore volume, and averaged 93.8 percent pore volume. In general, no correlation was observed between endpoint saturations and air permeabilities or porosities. Test results, including individual pore throat-size histograms, are presented in tabular and graphical form.

The procedures used for these tests are as follows: upon sample arrival, each sample was trimmed and cleaned with hot toluene and methanol using soxhlet-type extractors. All samples were then oven dried for 24 hours at a temperature of 220° Fahrenheit. After allowing the samples to cool in desiccators, an air permeability and helium porosity were measured for each sample.

Air permeabilities were measured using steady-state flow techniques at a confining pressure of 400 psi. Helium porosities were measured at room conditions using a Boyles' Law doubled-celled helium porosimeter. Bulk volumes were measured using an Archimedes mercury immersion technique.

After sample selection, mercury was injected into each sample using pressures that ranged from 1 to 20,000 psia. From the resulting data, capillary pressure relationships and pore throat-size distributions were computed. Test results are presented in tabular and graphical form.

The conditions, under which this report is presented, are described immediately following this report. We request that the report be used in its entirety if reproductions are to be made. Please contact us if you have any questions concerning these data, or if we may be of further service.

Respectfully Submitted,

K&A LABORATORIES

K & A Laboratories

JMC/bw

K & A LABORATORIES

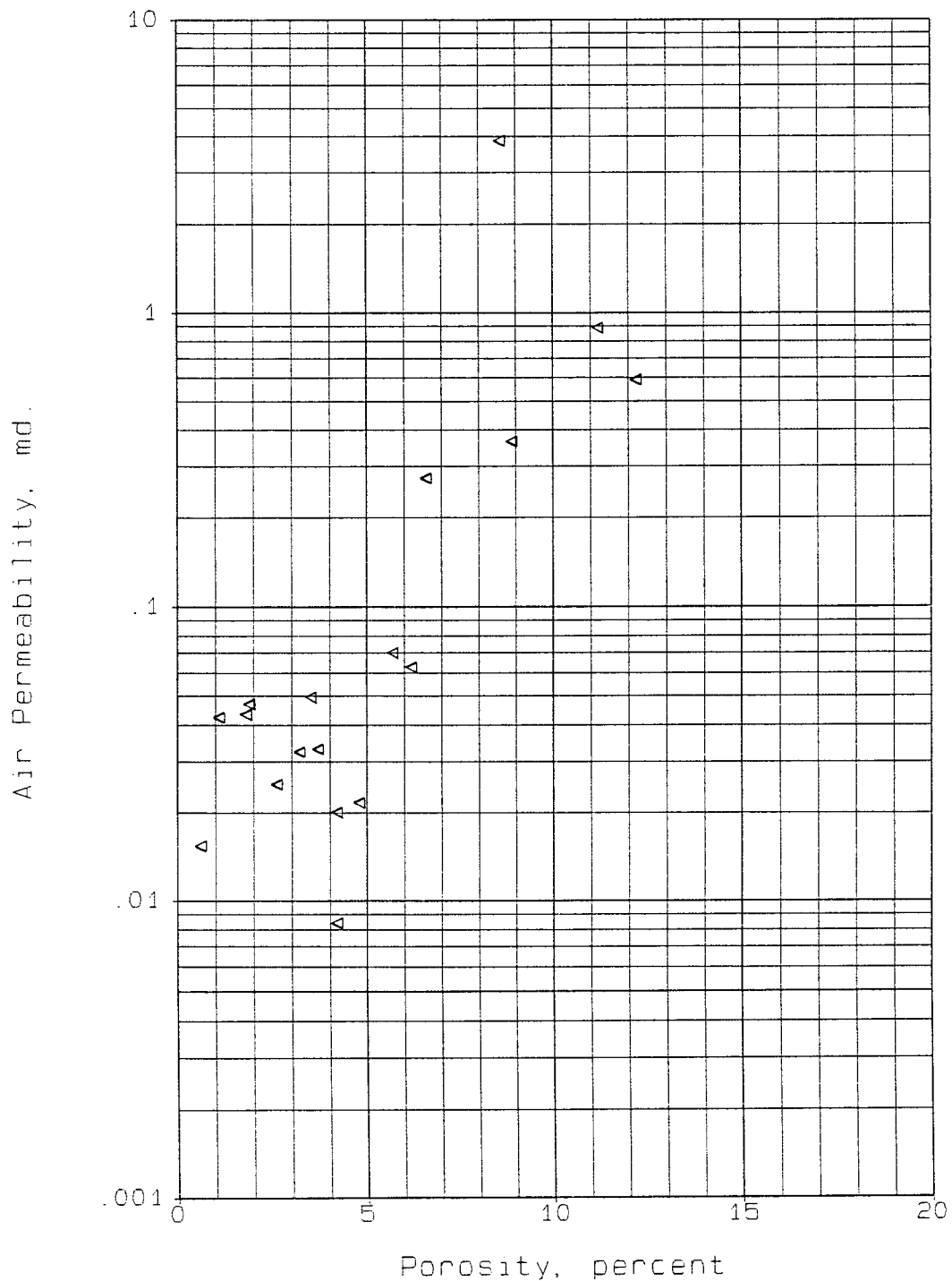
STANDARD CORE ANALYSIS SUMMARY

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

<u>Sample Number</u>	<u>Depth, feet</u>	<u>Air Permeability, md</u>	<u>Porosity, percent</u>	<u>Grain Density, gm/cc</u>
1	5,594.	0.0495	3.5	2.76
2	5,595.	0.0331	3.7	2.79
3M	5,596.	0.0324	3.2	2.78
4	5,597.	0.0251	2.6	2.68
5M	5,598.	0.0469	1.9	2.69
6	5,599.	0.0433	1.8	2.70
7	5,600.	0.0424	1.1	2.70
8	5,601.	0.0154	0.6	2.70
9	5,608.	0.00840	4.2	2.87
10	5,609.	0.0700	5.7	2.77
11M	5,610.	0.0217	4.8	2.78
12M	5,611.	3.86	8.6	2.75
13	5,612.	0.273	6.6	2.72
14	5,613.	0.0626	6.2	2.74
15	5,614.	0.887	11.2	2.67
16M	5,615.	0.591	12.2	2.68
17	5,616.	0.364	8.9	2.70
18	5,617.	0.0201	4.2	2.70

AIR PERMEABILITY VS. POROSITY CROSSPLOT

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684



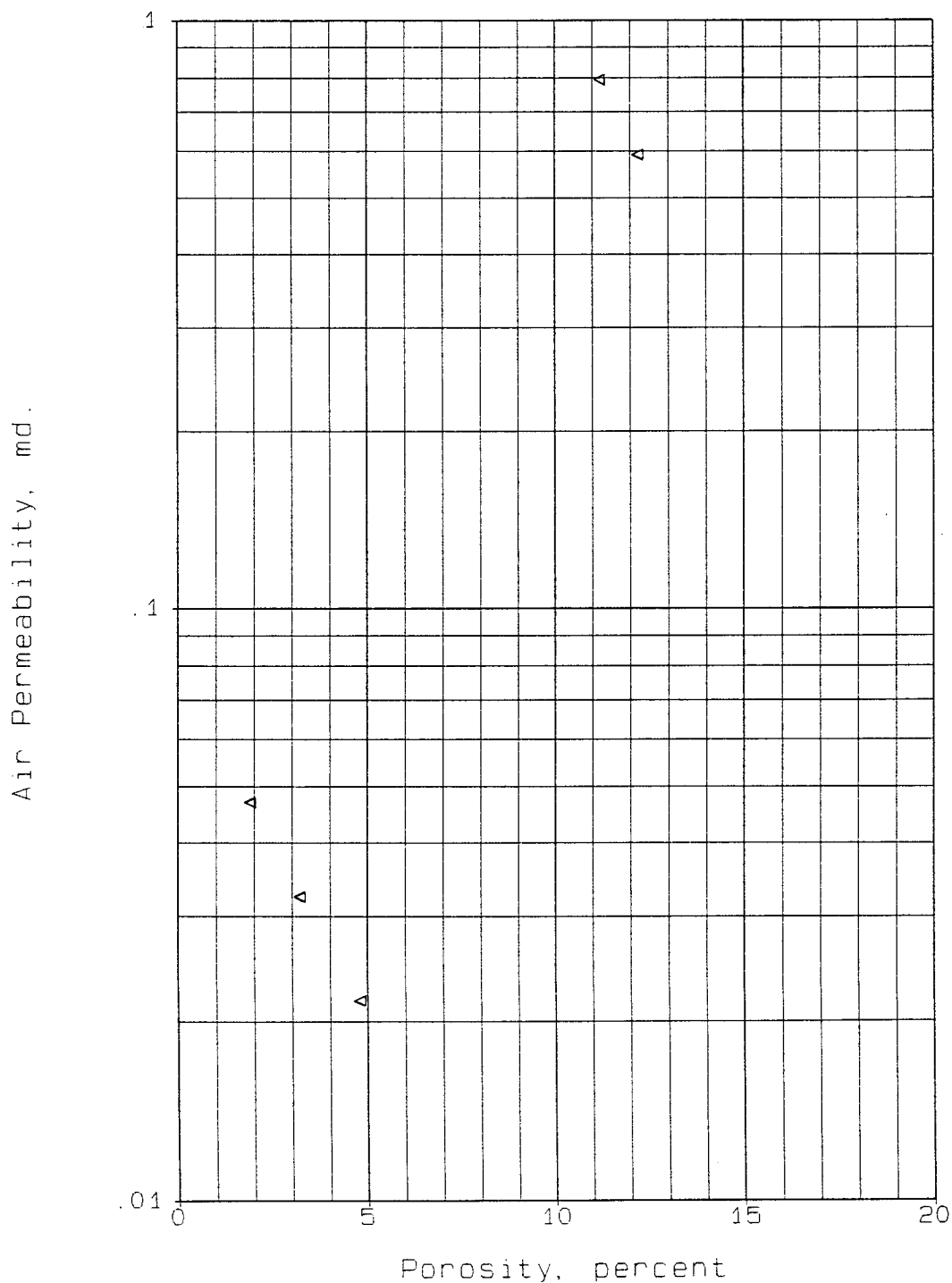
SUMMARY OF HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

<u>Sample Number</u>	<u>Depth, feet</u>	<u>Porosity, percent</u>	<u>Air Permeability, md.</u>	<u>Endpoint Mercury Saturation at 20,000 psia (%)</u>
3M	5596	3.2	0.0324	100.0
5M	5598	1.9	0.0469	100.0
11M	5610	4.8	0.0217	95.3
15M	5614	11.2	0.794	73.7
16M	5615	12.2	0.591	100.0

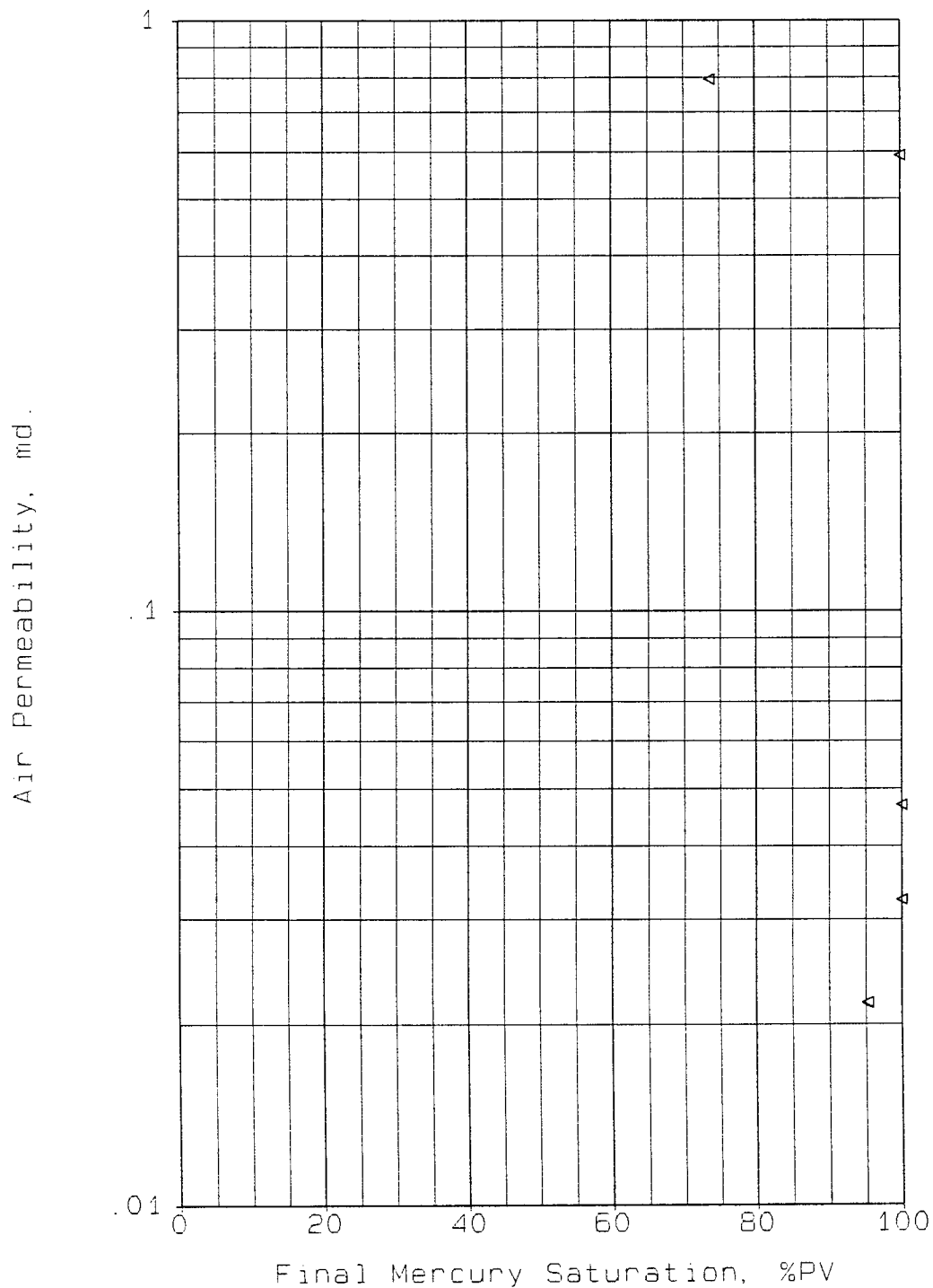
AIR PERMEABILITY VS. POROSITY CROSSPLOT

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684



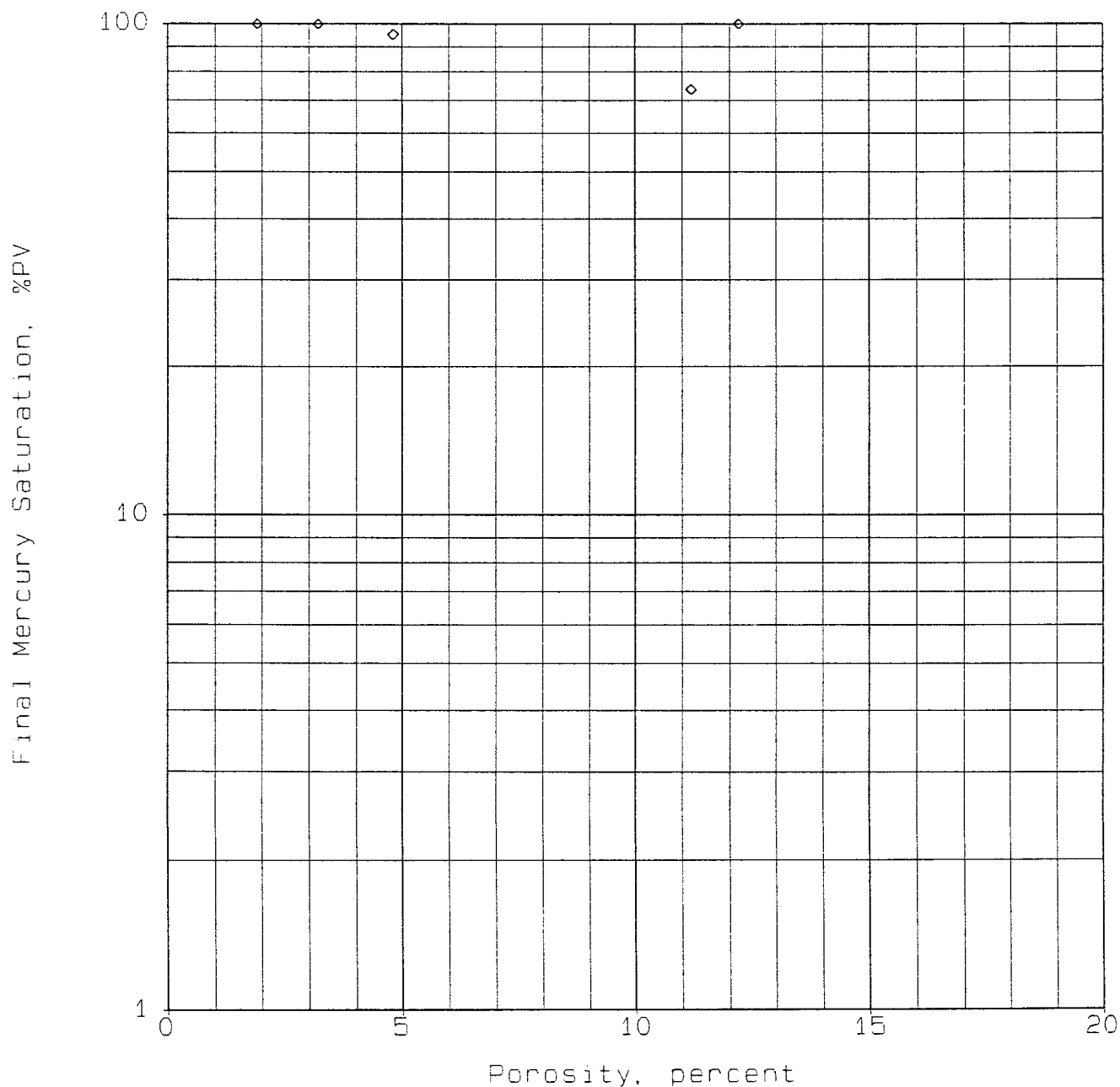
FINAL MERCURY SATURATION VS. AIR PERMEABILITY RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684



POROSITY VS. FINAL MERCURY SATURATION RESULTS

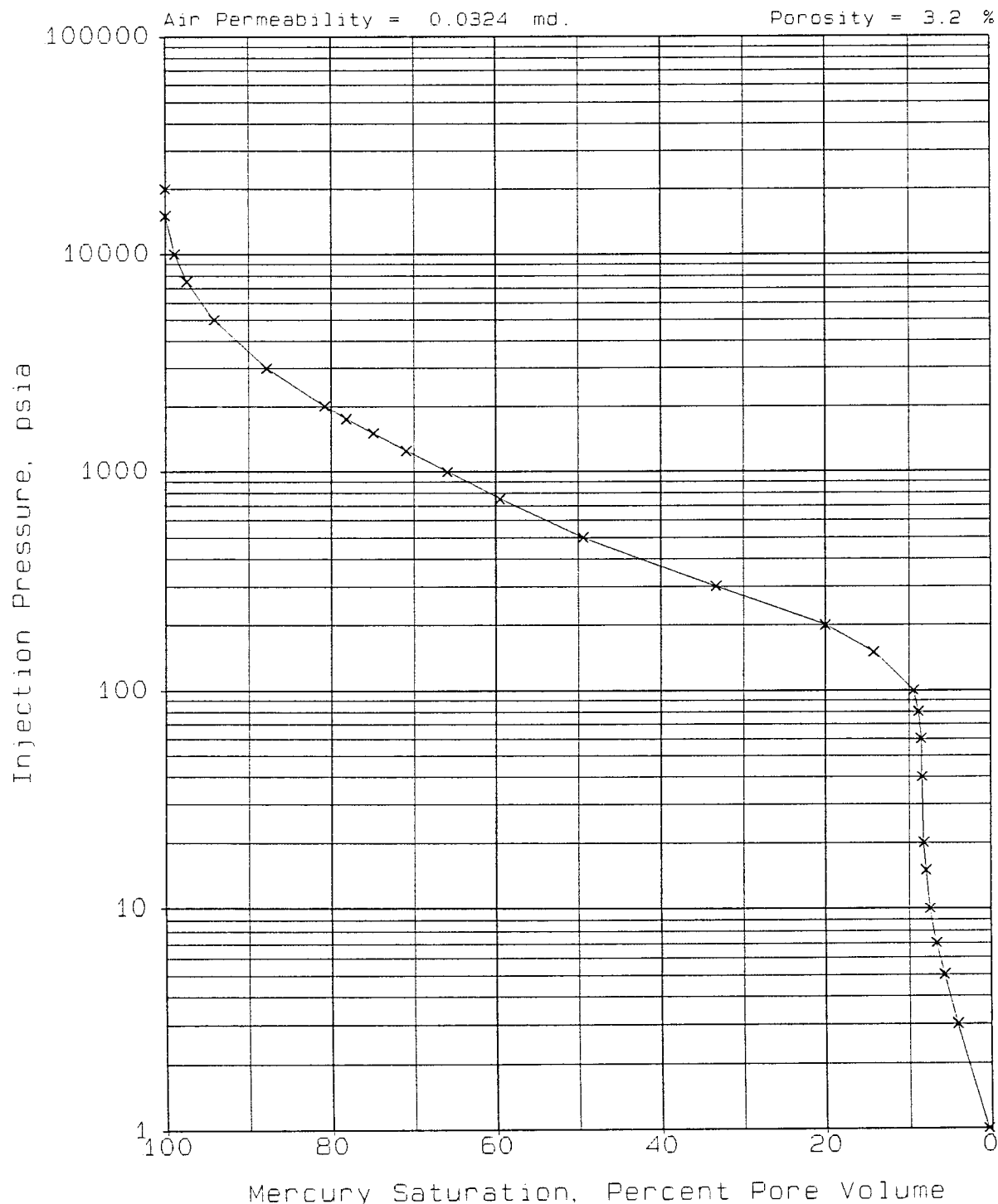
CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684



HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number: 3M

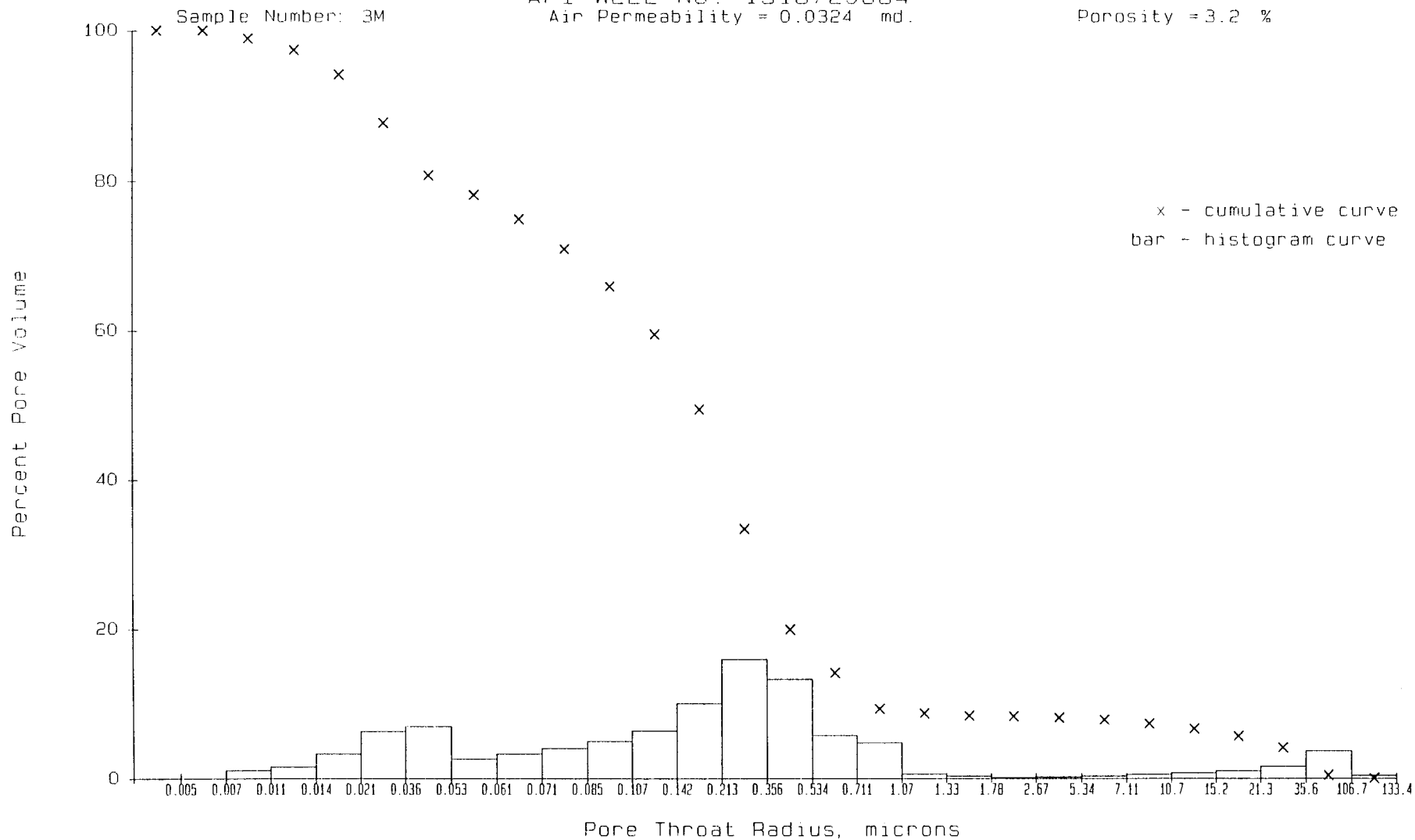


Any interpretations or opinions derived from these data are subject to the conditions described elsewhere in this report.

COMPOSITE PORE SIZE DISTRIBUTION RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684
Air Permeability = 0.0324 md.

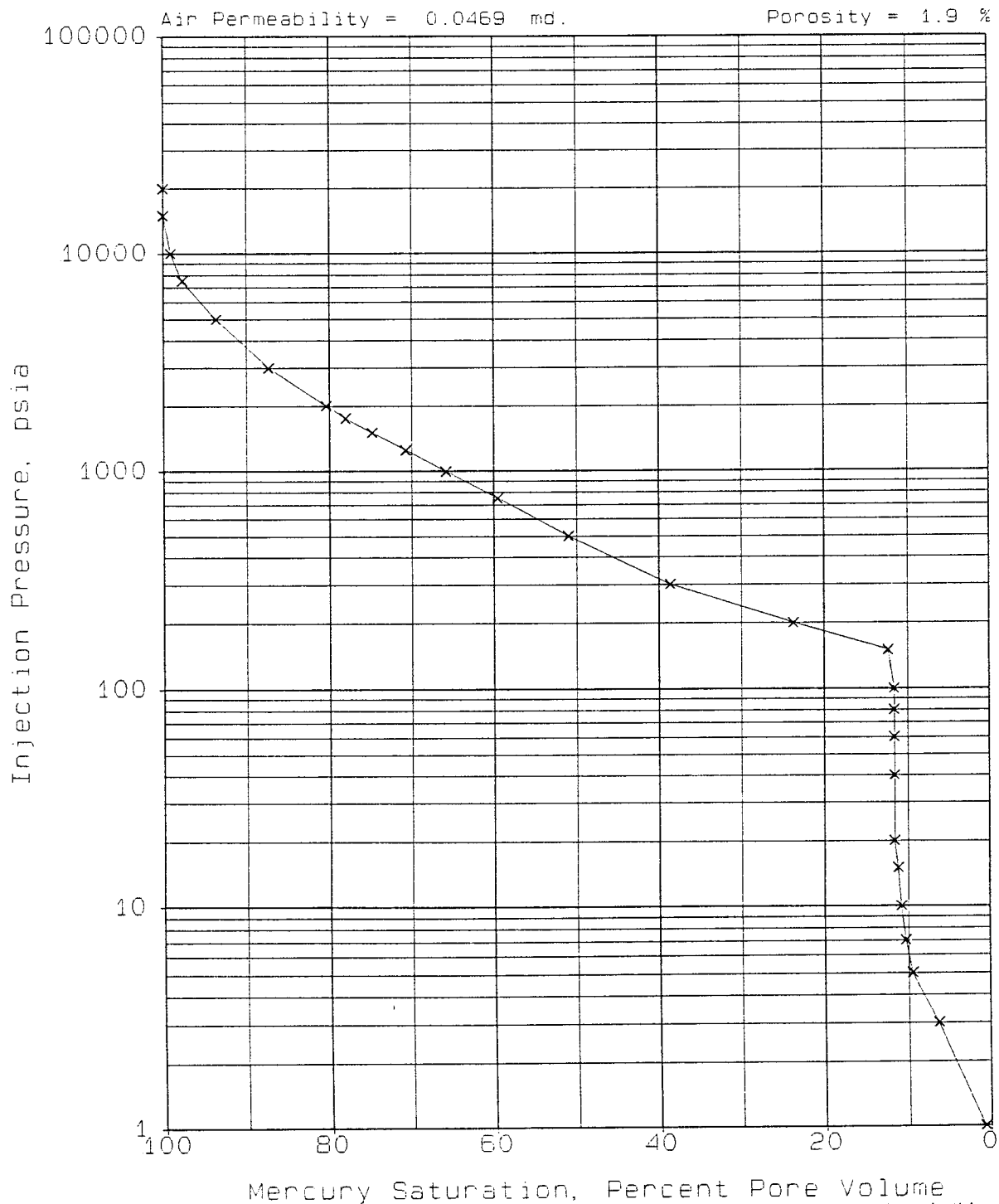
Porosity = 3.2 %



HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number: 5M

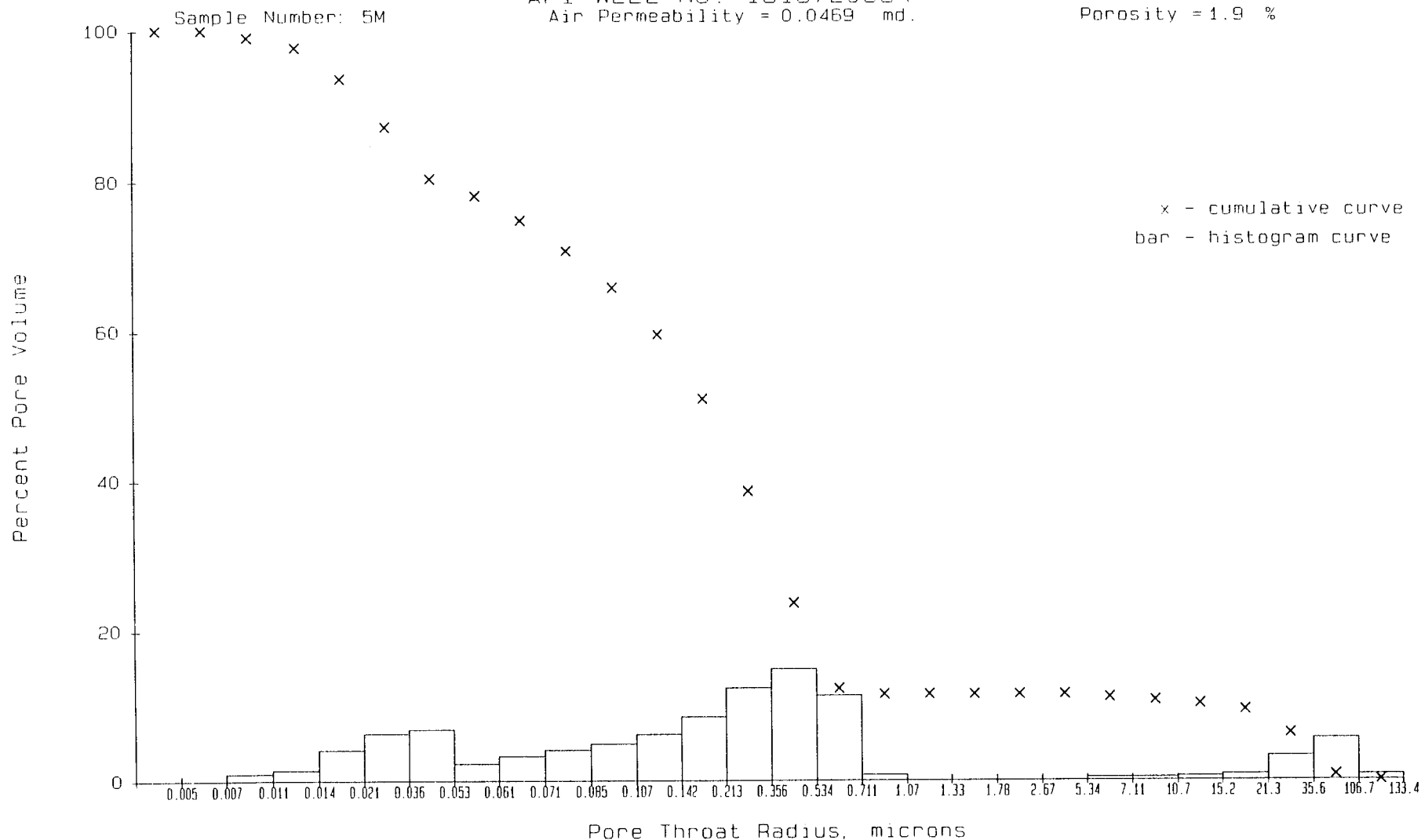


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COMPOSITE PORE SIZE DISTRIBUTION RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684
Air Permeability = 0.0469 md.

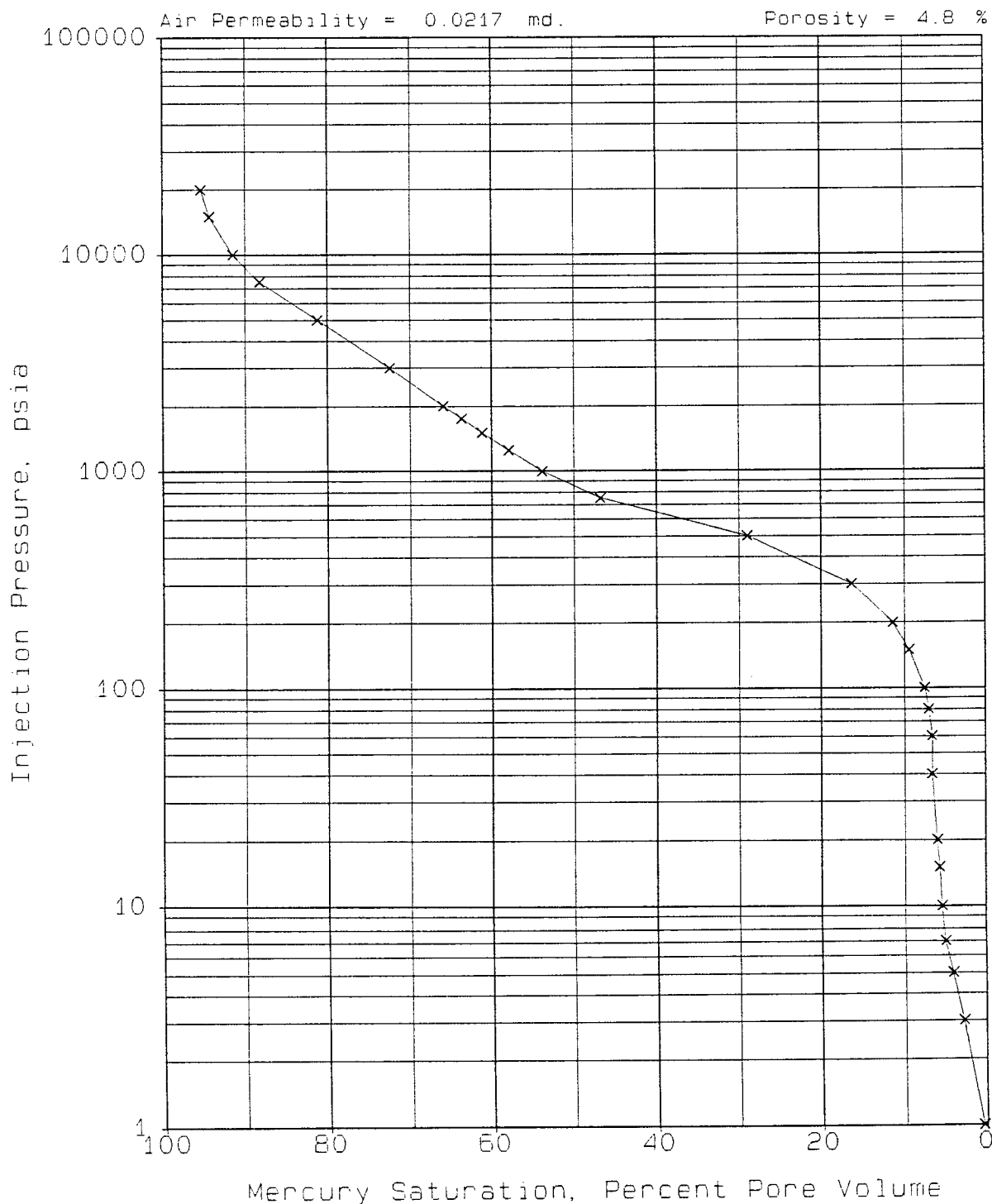
Porosity = 1.9 %



HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number: 11M



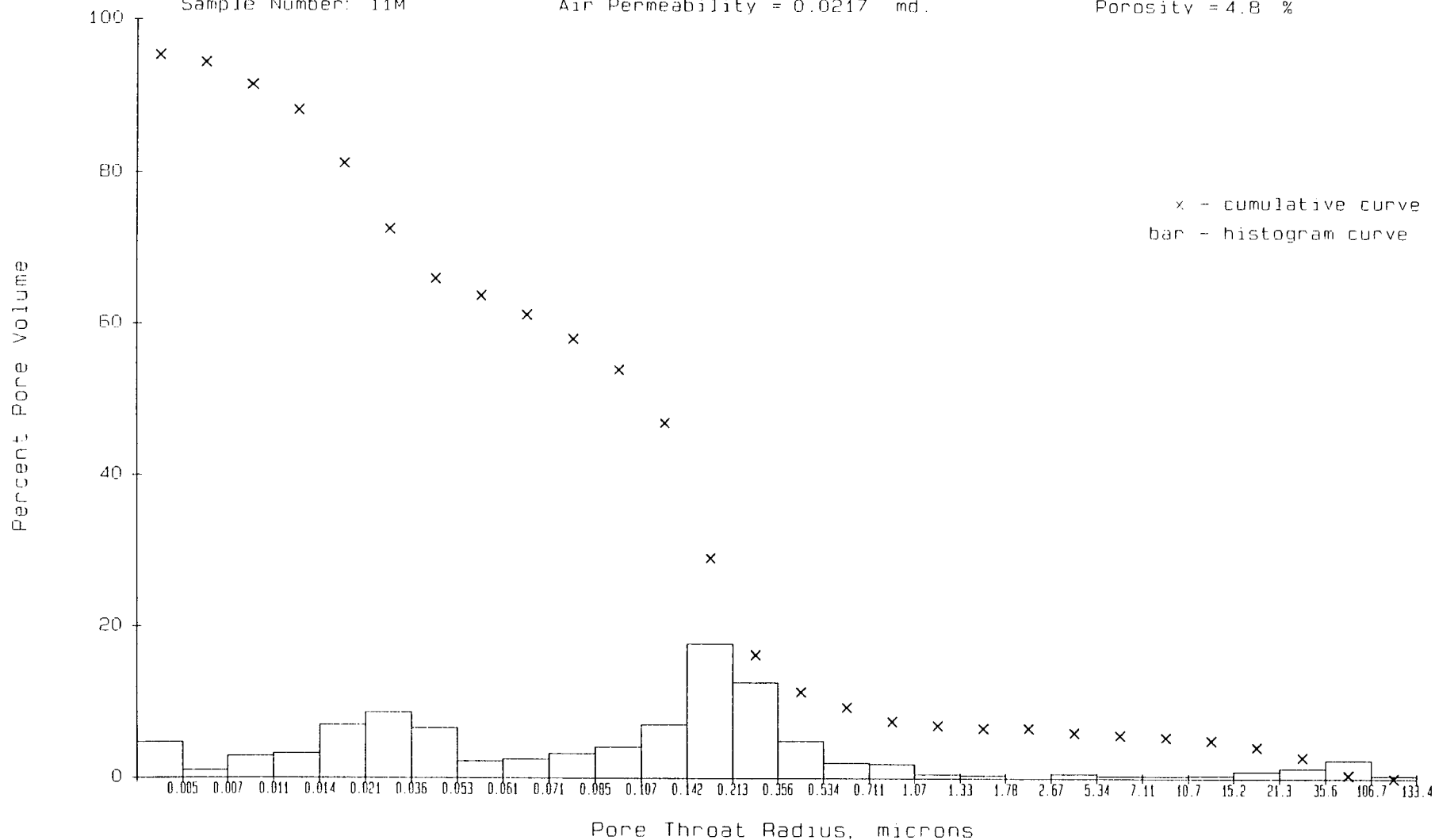
Any interpretations or opinions derived from these data are subject to the conditions described elsewhere in this report.

COMPOSITE PORE SIZE DISTRIBUTION RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684
Air Permeability = 0.0217 md.

Sample Number: 11M

Porosity = 4.8 %



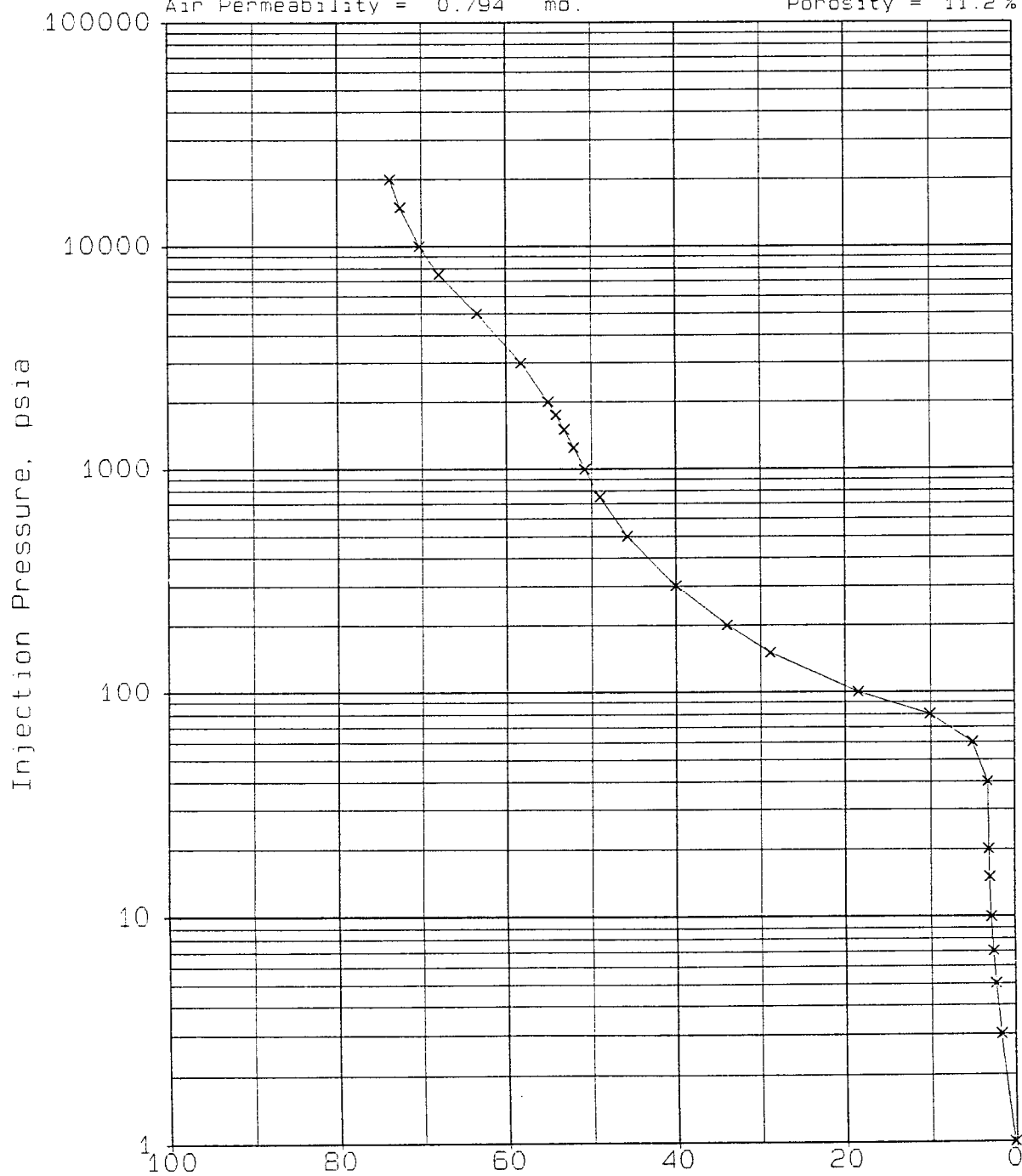
HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number: 15M

Air Permeability = 0.794 md.

Porosity = 11.2 %

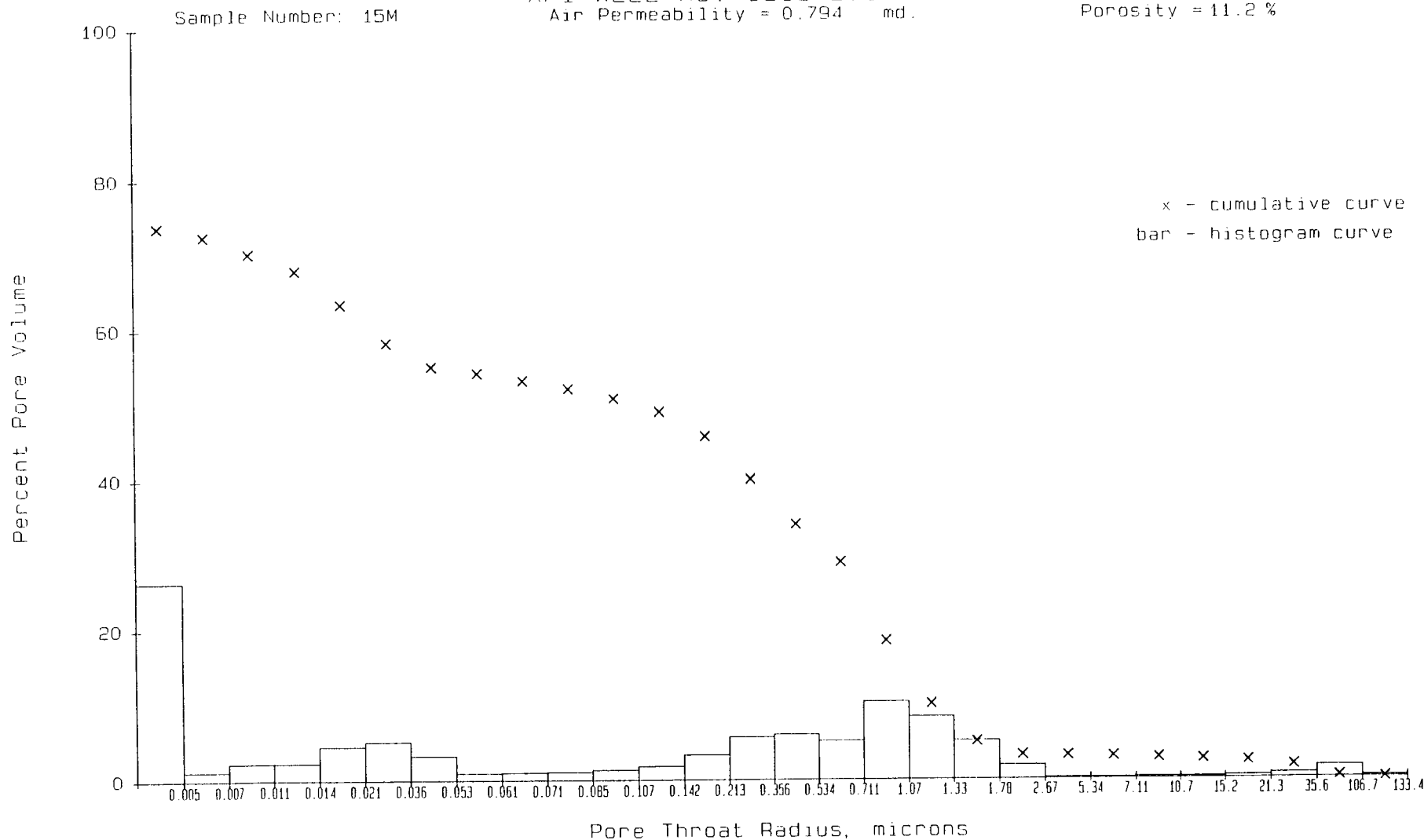


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COMPOSITE PORE SIZE DISTRIBUTION RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684
Air Permeability = 0.794 md.

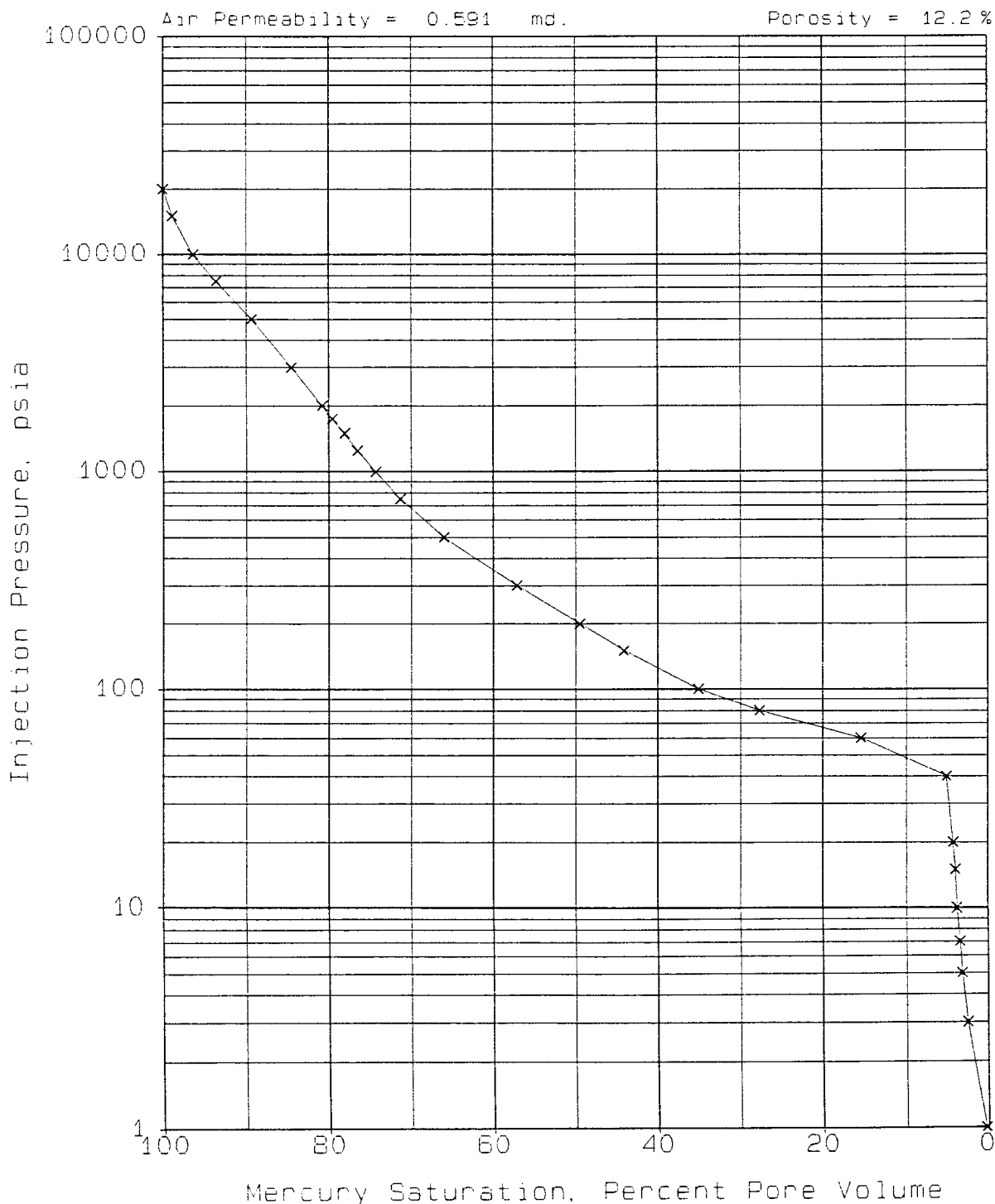
Porosity = 11.2 %



HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number: 16M

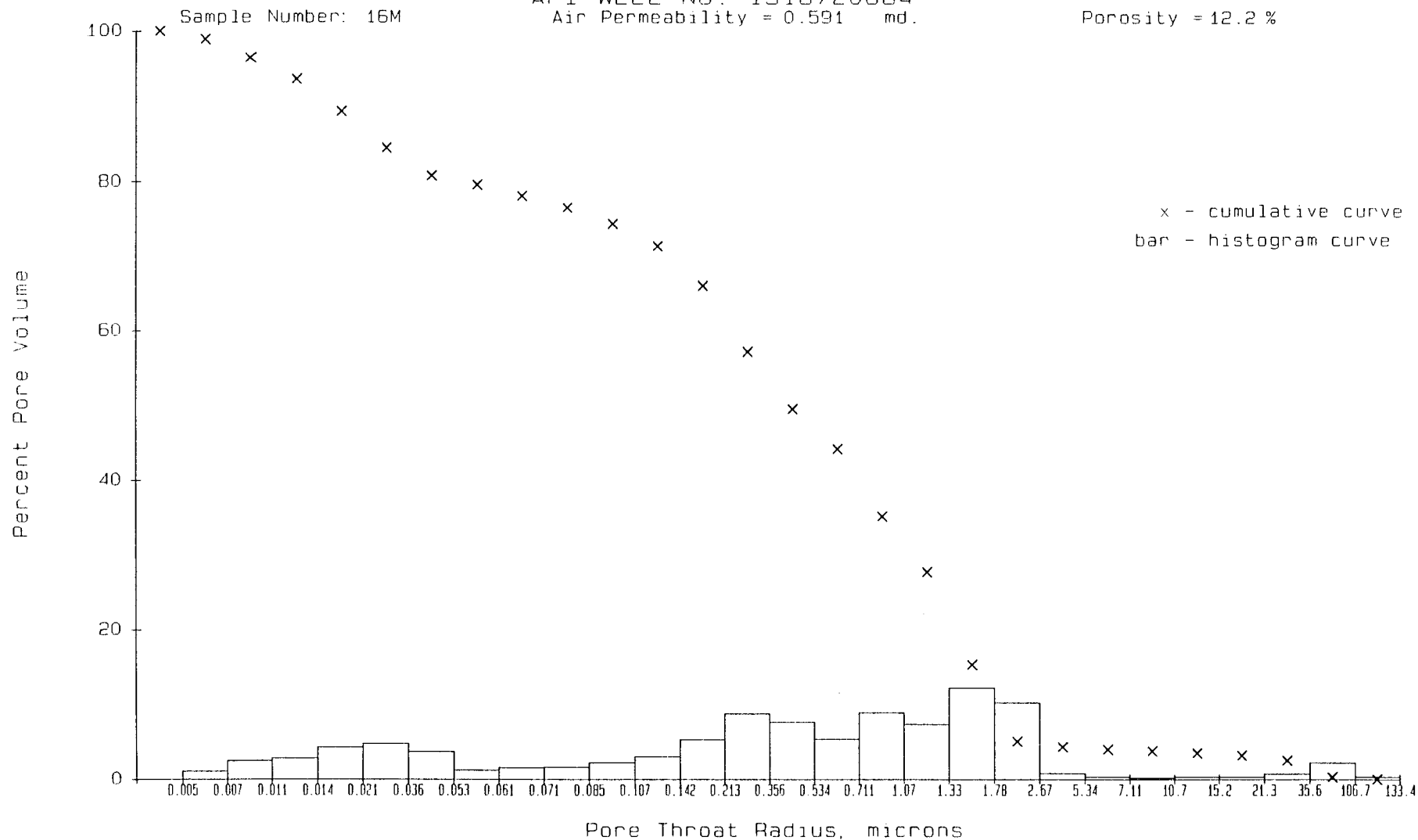


Any interpretations or opinions derived from these data are subject to the conditions described elsewhere in this report.

COMPOSITE PORE SIZE DISTRIBUTION RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684
Air Permeability = 0.591 md.

Porosity = 12.2 %



HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number:	3M	5M	11M
Depth, feet:	5596	5598	5610
Air Permeability, md.:	0.0324	0.0469	0.0217
Porosity, percent:	3.2	1.9	4.8

<u>Injection</u> <u>Pressure (psia)</u>	<u>Mercury</u> <u>Saturation (%PV)</u>	<u>Mercury</u> <u>Saturation (%PV)</u>	<u>Mercury</u> <u>Saturation (%PV)</u>
0	0.0	0.0	0.0
1	0.4	0.7	0.4
3	4.1	6.3	2.8
5	5.7	9.5	4.1
7	6.7	10.3	5.0
10	7.4	10.8	5.4
15	7.9	11.2	5.7
20	8.2	11.6	6.0
40	8.4	11.6	6.6
60	8.5	11.6	6.6
80	8.8	11.6	7.0
100	9.4	11.6	7.5
150	14.2	12.3	9.4
200	20.0	23.7	11.4
300	33.4	38.6	16.3
500	49.4	51.0	29.0
750	59.5	59.6	46.8
1000	65.9	65.8	53.9
1250	70.9	70.7	58.0
1500	74.9	74.8	61.2
1750	78.2	78.1	63.7
2000	80.8	80.4	65.9
3000	87.8	87.3	72.5
5000	94.1	93.6	81.2
7500	97.4	97.7	88.2
10000	98.9	99.1	91.4
15000	100.0	100.0	94.3
20000	100.0	100.0	95.3

HIGH PRESSURE MERCURY INJECTION TEST RESULTS

CHARTER PRODUCTION COMPANY
WELL #1 TAPSCOTT
LOWER MORROW FORMATION
STANTON COUNTY, KANSAS
API WELL NO. 1518720684

Sample Number:	15M	16M
Depth, feet:	5614	5615
Air Permeability, md.:	0.794	0.591
Porosity, percent:	11.2	12.2

<u>Injection Pressure (psia)</u>	<u>Mercury Saturation (%PV)</u>	<u>Mercury Saturation (%PV)</u>
0	0.0	0.0
1	0.2	0.3
3	1.7	2.5
5	2.3	3.2
7	2.6	3.5
10	2.8	3.8
15	3.0	4.0
20	3.1	4.3
40	3.2	5.1
60	5.0	15.4
80	10.1	27.7
100	18.5	35.1
150	28.9	44.1
200	34.0	49.5
300	40.0	57.2
500	45.7	66.0
750	49.0	71.3
1000	50.8	74.3
1250	52.1	76.5
1500	53.2	78.1
1750	54.2	79.6
2000	55.1	80.8
3000	58.3	84.5
5000	63.4	89.3
7500	67.9	93.6
10000	70.2	96.4
15000	72.5	98.9
20000	73.7	100.0

CONDITIONS AND QUALIFICATIONS

K&A Laboratories will endeavor to provide accurate and reliable laboratory measurements of the cores provided by the client. The results of any core analysis are necessarily affected by the condition in which the core is received and the selection of the samples to be analyzed. In the absence of direction by the client, K&A Laboratories will utilize its best geological and engineering judgment in selecting the samples to be analyzed. It should be recognized that most cores do not have uniform properties and that selection of truly representative samples is rarely possible. Unless otherwise directed, the samples will normally be selected from the highest quality segments. Thus, use of the properties measured in this report in reservoir calculations could result in an overestimation in reservoir volume and/or deliverability. K&A Laboratories assumes no responsibility nor offers any guarantee of the productivity or performance of any oil or gas well or hydrocarbon recovery process based upon the data presented in this report.