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DATA TRANSMITTAL

DATE: March 29, 2012

TO: **Manitoba, Science, Technology, Energy and Mines**
Dept. of Industry, Economic Development and Mines
Petroleum Branch
Box 1359
227 King Street West
Virden, MB R0M 2C0

Attention: Jan Schwindt

RE: **Virden/Routledge reservoir engineering study**

DESCRIPTION OF DATA

As requested, please find the following information enclosed for your files:

One report representing the following locations:

- **100-03-16-009-25-W1-00 (April 6, 2011)** Routledge Unit 1 #1925
- **100-15-28-009-25-W1-00 (April 6, 2011)** Routledge Unit #1 #985

PLEASE NOTE: A copy of this transmittal is on file in our office.
Please direct all inquiries regarding testing information to BJ Leong-Holloway at (403) 298-4408.

1 copy sent to Upg
Apr. 2/2012
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PROVINCE OF MANITOBA
PETROLEUM BRANCH
APR 02 2012
VIRDEN OFFICE

ENERPLUS CORPORATION
The Dome Tower, Suite 3000
333 – 7th Avenue SW
Calgary, Alberta T2P 2Z1

T. 403-298-2200 F. 403-298-2211
www.enerplus.com

Weatherford®
LABORATORIES

ENERPLUS CORPORATION
ROUTLEDGE AREA, LODGEPOLE FORMATION
RESERVOIR ENGINEERING STUDY

Prepared for

enerPLUS

Prepared by

Weatherford Laboratories (Canada) Ltd.
1338 – 36th Avenue N.E.
Calgary, AB T2E 6T6
Ph: 1-403-736-3500 Fax: 1-403-291-0481

www.weatherfordlabs.com

April 6, 2011

Weatherford File #: 2010-0022NE

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SUMMARY

Study Objective

At the request of Kevin Sinnott of Enerplus Corporation, Weatherford Laboratories (Canada) Ltd. (Weatherford) conducted a reservoir engineering study using reservoir material from the Lodgepole formation of the Routledge area. The study was initiated to obtain capillary pressure data by using the mercury injection method and electrical properties measurement to better define the geological characteristics of the reservoir.

Conclusions

The following conclusions are provided to enhance understanding of the laboratory data and to offer additional insight relative to Weatherford Laboratories experience with laboratory and field processes. They represent our interpretation as to possible mechanisms and physical phenomena that may be occurring within the laboratory models that have been studied. These laboratory experiments are microscale representations of the field scenario; however macroscale phenomena may override behaviour exhibited in the laboratory. A more thorough development of these conclusions is presented in the "Discussion" section of the report.

1. Seven (7) end trims were subjected to mercury injection capillary pressure testing for drainage cycles. The samples were selected from 2 different wells and the preparation is listed as:
    - Three samples were from well 03-16-009-25W1M
    - Four samples were from well 15-28-009-22W1M

    The results are summarized on the following tables:

SUMMARY OF MERCURY INJECTION CAPILLARY PRESSURE TEST RESULTS

Sample I.D.	Sample Depth (ft)	Routine Air Permeability (mD)	Helium Porosity (fraction)	* Median Pore Throat Size (µm)	Pore Throat Types			‡ Threshold Intrusion Pressure (kPa)	** Estimated Swir (percent)
					Micropores Pore Dia < 1 micron	Mesopores Pore Dia 1-3 micron	Macropores Pore Dia >3 micron		
Well: 03-16-009-25 W1M									
SP2(3-16)	633.3744	12.4	0.103	0.327	65.8%	14.9%	19.3%	28.0	53.3%
SP5(3-16)	637.9464	22.3	0.132	4.254	10.9%	30.3%	58.8%	34.9	4.2%
SP7(3-16)	644.8044	27.1	0.163	1.287	35.7%	28.3%	36.0%	41.7	2.5%
Well: 15-28-009-25 W1M									
SP9(15-28)	628.8024	6.35	0.122	2.024	36.5%	45.8%	17.7%	69.3	10.0%
SP10(15-28)	629.2596	0.235	0.067	1.247	35.0%	64.3%	0.7%	138	5.8%
SP11(15-28)	630.174	17.4	0.156	3.011	8.2%	61.2%	30.6%	89.9	1.6%
SP13(15-28)	632.46	11.5	0.134	3.114	9.9%	52.3%	37.8%	89.9	3.0%

Note:

* Median Pore Throat Size: Pore throat diameter at 50% mercury saturation of pore volume.

‡ Threshold pressures are converted from air/mercury to air/water system using published values of air/water interfacial tension.

** Swir estimated by an asymptotic line drawn along the upper and lower part of the "Height of Transition" curve and its intercept on the X axis.

2. Formation resistivity factors (FRF) were measured on two samples from well 03-16-009-25 W1M. The composite cementation exponent (m) for all samples is 1.97.

The results are presented in the following table:

FORMATION RESISTIVITY FACTOR MEASUREMENTS
Well: 03-16-009-25W1M

Sample I.D	Depth (m)	Air Permeability (mD)	NOB Porosity (fraction)	Formation Resistivity Factor	Cementation Exponent m'
SP2(03-16)	633.4	12.363	0.085	147.10	2.03
SP7B(03-16)	644.8	27.119	0.154	32.58	1.87
Composite Cementation Exponent for all Samples:					**1.97**

3. Resistivity index measurements were also conducted on the same previous samples by equilibrium method using a porous plate for desaturation. The composite saturation exponent for all samples is 1.85. The results are presented on the table below:

RESISTIVITY INDEX MEASUREMENTS
Well: 03-16-009-25W1M

Sample I.D	Depth (m/ft)	Air Permeability (mD)	NOB Porosity (fraction)	Saturation Exponent 'n'
SP2(03-16)	633.4	12.363	0.085	1.72
SP7B(03-16)	644.8	27.119	0.154	2.75
Composite Saturation Exponent for all Samples:				**1.85**

4. Formation resistivity factors (FRF) were measured on three samples from well 15-28-009-25 W1. The composite cementation exponent (m) for all samples is 1.77. The results are presented in the following table:

FORMATION RESISTIVITY FACTOR MEASUREMENTS
Well: 15-28-009-25 W1M

Sample I.D	Depth (m)	Air Permeability (mD)	NOB Porosity (fraction)	Formation Resistivity Factor	Cementation Exponent m'
SP9(15-28)	628.80	6.348	0.112	80.06	2.00
SP10(15-28)	629.26	0.235	0.053	140.29	1.69
SP11(15-28)	630.17	17.357	0.137	28.04	1.67
Composite Cementation Exponent for all Samples:					**1.77**

5. Resistivity index measurements were also conducted on the same previous samples by equilibrium method using a porous plate for desaturation. The composite saturation exponent for all samples is 1.74. The results are presented in the table below:

RESISTIVITY INDEX MEASUREMENTS
Well: 15-28-009-25 W1M

Sample I.D	Depth (m/ft)	Air Permeability (mD)	NOB Porosity (fraction)	Saturation Exponent 'n'
SP9(15-28)	628.80	6.348	0.112	1.80
SP10(15-28)	629.26	0.235	0.053	2.33
SP11(15-28)	630.17	17.357	0.137	1.59
Composite Saturation Exponent for all Samples:				**1.74**

DISCUSSION

Core materials from wells 03-16-009-25W1M, and 15-28-009-25W1M were selected to represent the Lodgepole formation in the Routledge area. Test core plugs were drilled from sections of the core. Routine permeability and porosity were run on the cleaned samples. The results of the routine core analysis are presented in Tables 1 and 2 and Figures 1 and 2. Following the routine test, capillary pressure tests by mercury injection were conducted on each of the selected samples. Samples from well 03-16-009-25W1M and 15-028-00925W1M were also selected for the electrical properties measurements.

Mercury Injection Capillary Pressure Testing

Seven (7) end trims were selected for mercury injection capillary pressure testing. The air-mercury capillary pressure data were converted to air-water capillary pressure data using interfacial tension and contact angles for a typical air-water system. The individual sample results are presented in Tables 3 to 16 and Figures 3 to 37.

The graphical results presented for each test sample includes:

(1.) Air - mercury capillary pressure curve
(2.) Derived air-water capillary pressure curve
(3.) Pore throat size distribution profile
(4.) Pore throat size classification
(5.) Derived transition zone height for an air-water system

A summary of the data analysis is shown:

SUMMARY OF MERCURY INJECTION CAPILLARY PRESSURE TEST RESULTS

Sample I.D.	Sample Depth (ft)	Routine Air Permeability (mD)	Helium Porosity (fraction)	* Median Pore Throat Size (µm)	Pore Throat Types			‡ Threshold Intrusion Pressure (kPa)	** Estimated Swir (percent)
					Micropores Pore Dia < 1 micron	Mesopores Pore Dia 1-3 micron	Macropores Pore Dia >3 micron		
Well: 03-16-009-25 W1M									
SP2(3-16)	633.3744	12.4	0.103	0.327	65.8%	14.9%	19.3%	28.0	53.3%
SP5(3-16)	637.9464	22.3	0.132	4.254	10.9%	30.3%	58.8%	34.9	4.2%
SP7(3-16)	644.8044	27.1	0.163	1.287	35.7%	28.3%	36.0%	41.7	2.5%
Well: 15-28-009-25 W1M									
SP9(15-28)	628.8024	6.35	0.122	2.024	36.5%	45.8%	17.7%	69.3	10.0%
SP10(15-28)	629.2596	0.235	0.067	1.247	35.0%	64.3%	0.7%	138	5.8%
SP11(15-28)	630.174	17.4	0.156	3.011	8.2%	61.2%	30.6%	89.9	1.6%
SP13(15-28)	632.46	11.5	0.134	3.114	9.9%	52.3%	37.8%	89.9	3.0%

Note:

* Median Pore Throat Size: Pore throat diameter at 50% mercury saturation of pore volume.

‡ Threshold pressures are converted from air/mercury to air/water system using published values of air/water interfacial tension.

** Swir estimated by an asymptotic line drawn along the upper and lower part of the "Height of Transition" curve and its intercept on the X axis.

Formation Resistivity Factor (FRF) Measurements – Well: 03-16-009-25 W1M

Two samples from well 03-16-009-25 W1M were mounted in an FRF core holder at three incrementally increasing overburden pressures to determine pore volume reduction. The results show a range in cementation exponent "m" from 1.87 to 2.03 and the Formation Resistivity Factor (FRF) ranged from 32.58 to 147.1.

The formation resistivity factors (FRF) of the core samples are summarized as follows:

$$FRF = (1.00)\ \emptyset^{-1.97},\ \text{Cementation factor (m)} = 1.97$$

All of the FRF measurements are tabulated in Table 17. Graphical plots of the FRF as a function of porosity are shown in Figure 40.

Resistivity Index (RI) Measurements – Well: 03-16-009-25 W1M

Following the formation factor measurements, the samples were placed in a porous plate desaturation cell. The samples were placed in capillary contact with a porous plate saturated with the same synthetic formation brine as the samples were saturated with. Humidified nitrogen was used to desaturate the samples at six (6) incrementally increasing capillary pressures. Once equilibrium for each capillary pressure was achieved at each point, the samples were mounted in a core holder at net overburden pressure and resistivity was measured. The resistivity index was calculated by dividing the desaturated resistivity by the 100% saturated resistivity to derive resistivity index (RI). The log of RI was plotted against the log of saturation to derive the saturation exponent "n".

For the samples from well 03-16-009-25 W1M, the range in saturation exponent "n" was 1.72 to 2.75. The composite saturation exponent "n" for all samples was 1.85. This was derived by plotting all the samples and regressing the data to a single line. The result is as follows:

$$RI = S_w^{-1.85},\ \text{Saturation exponent (n)} = 1.85$$

The Saturation exponents (n) for each individual sample are shown on Table 18. The plot of the RI vs. water saturation (S_w) is shown in Figure 41.

Formation Resistivity Factor (FRF) Measurements – Well: 15-28-009-25 W1M

Two samples from well 15-28-009-25 W1M were mounted in an FRF core holder at three incrementally increasing overburden pressures to determine pore volume reduction. The results show a range in cementation exponent "m" from 1.67 to 2.00 and the Formation Resistivity Factor (FRF) ranged from 28.04 to 140.29.

The formation resistivity factors (FRF) of the core samples are summarized as follows:

$$FRF = (1.00)\ \emptyset^{-1.77},\ \text{Cementation factor (m)} = 1.77$$

All of the FRF measurements are tabulated in Table 19. Graphical plots of the FRF as a function of porosity are shown in Figure 42.

Resistivity Index (RI) Measurements – Well: 15-28-009-25 W1M

Following the formation factor measurements, the samples were placed in a porous plate desaturation cell. The samples were placed in capillary contact with a porous plate saturated with the same synthetic formation brine as the samples were saturated with. Humidified nitrogen was used to desaturate the samples at six (6) incrementally increasing capillary pressures. Once equilibrium for each capillary pressure was achieved at each point, the samples were mounted in a core holder at net overburden pressure and resistivity was measured. The resistivity index was calculated by dividing the desaturated resistivity by the 100% saturated resistivity to derive resistivity index (RI). The log of RI was plotted against the log of saturation to derive the saturation exponent "n".

For the samples from well 15-28-009-25 W1M, the range in saturation exponent "n" was 1.59 to 2.33. The composite saturation exponent "n" for all samples was 1.74. This was derived by plotting all the samples and regressing the data to a single line. The result is as follows:

$$RI = S_w^{-1.74},\ \text{Saturation exponent (n)} = 1.74$$

The Saturation exponents (n) for each individual sample are shown on Table 20. The plot of the RI vs. water saturation (S_w) is shown in Figure 43.

Formation Resistivity Factor (FRF) and Resistivity Index (RI) Measurements Comparison for Well 03-16-009-25 W1M and 15-28-009-25 W1M

At the request of Kevin Sinnott of Enerplus Corporation comparison plots for both wells were created: the FRF as a function of porosity is shown in Figure 44; and the RI vs. water saturation (S_w) is shown in Figure 45.

PROCEDURES AND EQUIPMENT

Core Handling and Preparation

Core materials destined for the capillary pressure tests were initially cleaned using toluene and methanol to remove any residual fluid saturation. If applicable, the pore volume of each test piece was measured to facilitate "penetrometer" selection for the mercury injection tests.

Mercury Injection Capillary Pressure Test Apparatus

Air-mercury capillary pressure tests were performed using an automated Micromeritics Autopore 9220 instrument with a maximum mercury intrusion pressure of 414 MPa (60,000 psia). The cleaned and dried samples were placed in a specially designed penetrometer and evacuated under vacuum. Mercury was then injected at multiple pre-determined pressure levels up to 414 MPa. At each equilibrium pressure level, the volume of mercury intrusion is determined by the change in capacitance of the penetrometer reference cell.

Mercury Injection Capillary Pressure Data Calculation

The air-mercury capillary pressure data produced by the Micromeritics instrument were used to calculate the pore entry radius with the following equation:

where: Ri	=	Pore radius, microns
Pc	=	Capillary pressure, in psi
T	=	Interfacial Tension, Dynes/cm
θ	=	Contact angle, degrees
C	=	Conversion constant = 0.145

For the air/mercury system in the test instrument, the contact angle θ is 130 degrees and the interfacial tension T is 485 dynes/cm.

The air-mercury capillary pressure data produced by the Miromeritics instrument were then converted to air-water capillary pressure data using interfacial tension and contact angles for a typical air-water system. The values used were 72 dynes/cm for the air/water IFT and the contact angle was 0 degree. Using the equation below and the parameters mentioned above, we arrive at a scaling ratio of 1/4.33 for conversion of the air/mercury capillary pressure values

to air/water capillary pressure values.

$$Pcr = \frac{\sigma.cos\theta\ air/water}{\sigma.cos\theta\ air/mercury}.Pcl$$

where: σ = IFT (dynes/cm)
θ = Contact angle

In addition, a transitional height chart is provided in the data presentation using the following equation for the calculation of the transitional height above free water level.

$$H = \frac{P_{cr}}{(\rho_w - \rho_h)g} - Conformance\ \% = \frac{P_{cl} * \frac{(\sigma\cos\theta)_R}{(\sigma\cos\theta)_L}}{(\rho_w - \rho_h)\,g} - Conformance\ \%$$

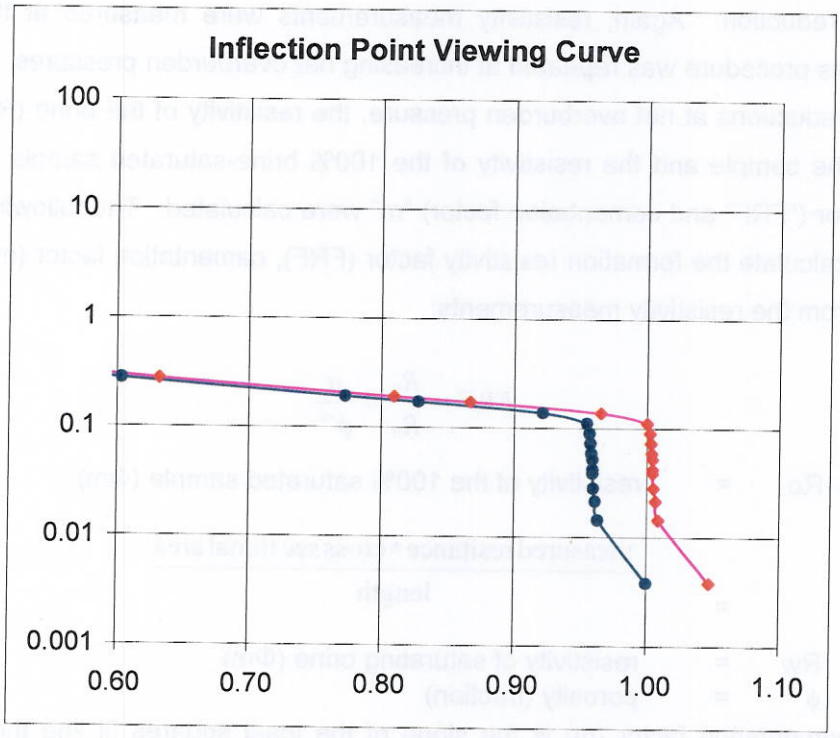
where Pcl = Capillary pressure lab, Pa
Pcr = Capillary pressure reservoir, Pa
σcosθR = Interfacial tension x cosine of contact angle (reservoir)
Air/water θ = 0°
Air/water IFT = 72 dynes/cm
σcosθL = Interfacial tension x cosine of contact angle (lab)
Air/mercury θ = 130°
Air/mercury IFT = 485 dynes/cm
ρw-ρh = Density difference of the water and the gas phase**

** For our calculations, a density differential of 999.999 kg/m^3 was used for air/water systems.

If reservoir data of gas/oil or water/oil IFT and oil/rock contact angle are available, the laboratory air/mercury data can be deduced to represent reservoir conditions.

Perhaps the most important correction made to the data is known as the conformance correction. Other terms for this correction include packing correction, closure correction or surface effect correction. Whatever the nomenclature, the correction is applied to account for the non-wetting nature of mercury. As we surround a sample with mercury, it takes some application of pressure for the mercury to "conform" around the rough surfaces of the sample.

The data, when plotted, will show a definite inflection point at the lower capillary pressures. This is the conformance that needs to be removed from the dataset, as it is not injected pore volume. Below is an illustration of the conformance correction. The blue line is the raw data. The red line is the conformance corrected data.



This conformance correction is shown in the summary data table for each sample as the "Conformance Correction Volume" as well as the "Conformance Correction (percent of P.V.).

Formation Resistivity Factor Measurement

The formation resistivity factor (FRF) measurements were taken at multiple net overburden pressures in order to facilitate data adjustments as pore pressure decreases and to be utilized for associated calculations. Starting with cleaned samples, the cores were then pressure-saturated with the synthetic formation brine. The compositional analysis of the used brine is presented on Appendix A. The samples were allowed to stabilize under brine over several days (5) to ensure ionic equilibration.

Once the brine saturation reached equilibrium, the samples were mounted in the

electrical resistivity core holder at a minimum confining pressure. The samples were flushed with five (5) pore volumes of simulated formation brine at a low rate to ensure 100% saturation. A number of resistivity measurements were taken across the samples until the readings were stable (no changes in resistivity readings for 1-2 hours). The net overburden pressure was then increased and the brine expulsion (squeeze out) measurements were taken to calculate the pore volume reduction. Again, resistivity measurements were measured at this point until stabilized. This procedure was repeated at increasing net overburden pressures. Based on the pore volume reductions at net overburden pressure, the resistivity of the brine (Rw), the length and area of the sample and the resistivity of the 100% brine-saturated sample, the formation resistivity factor ("FRF" and cementation factor) "m" were calculated. The following relationship was used to calculate the formation resistivity factor (FRF), cementation factor (m) and porosity constant (a) from the resistivity measurements:

$$FRF = \frac{R_o}{R_w} = \frac{a}{\phi^m}$$

where Ro = resistivity of the 100% saturated sample (Φm)

$$= \frac{\text{measured resitance} * \text{cross sec tional area}}{\text{length}}$$

Rw = resistivity of saturating brine (Φm)

ϕ = porosity (fraction)

The cementation factor (m) is the slope of the least squares fit line through the data points on a log-log plot of FRF versus NOB porosity.

Resistivity Index Measurements

At the conclusion of the formation resistivity factor (FRF) measurements, the samples were incrementally de-saturated to irreducible water saturation using a porous plate. The samples were mounted in a specially designed resistivity index electrical cell at net overburden pressure. Electrical resistivity was measured across the core to derive the resistivity index. Resistivity index is defined by the following relation:

$$RI = \frac{Rt}{Ro}$$

Where Rt is the resistivity of the rock system at some value of water saturation and Ro is the resistivity of the rock when saturated with water having a resistivity of Rw.

TABLE 1
PHYSICAL CORE PARAMETERS
03-16-009-25 W1M

Sample I.D.	Well Location	Depth (m)	Air Permeability (mD)*	Porosity (fraction)	Grain Density (kg/m^3)
SP5	03-16-009-25 W1M	631.85	6.287	0.136	2692
SP2	03-16-009-25 W1M	633.37	12.4	0.103	2689
SP6	03-16-009-25 W1M	633.98	0.22	0.075	2700
SP3	03-16-009-25 W1M	634.44	59.0	0.099	2669
SP7**	03-16-009-25 W1M	637.34		0.108	2703
SP4	03-16-009-25 W1M	637.64	9.07	0.122	2692
SP5B	03-16-009-25 W1M	637.95	22.3	0.132	2699
SP8	03-16-009-25 W1M	639.01	1.85	0.130	2701
SP6	03-16-009-25 W1M	642.52	3.27	0.134	2704
SP9	03-16-009-25 W1M	642.52	0.157	0.067	2690
SP10	03-16-009-25 W1M	643.43	0.395	0.105	2742
SP11	03-16-009-25 W1M	644.04	0.028	0.080	2733
SP7B	03-16-009-25 W1M	644.80	27.1	0.163	2708
SP12	03-16-009-25 W1M	646.18	0.876	0.094	2703
SP13	03-16-009-25 W1M	649.28	0.005	0.030	2696

*Permeability measured at 800 psi overburden pressure
** Sample fractured

TABLE 2
PHYSICAL CORE PARAMETERS
15-28-009-25 W1M

Sample I.D.	Well Location	Depth (m)	Air Permeability (mD)*	Porosity (fraction)	Grain Density (kg/m^3)
SP1	15-28-009-25 W1M	621.79	0.069	0.075	2719
SP2	15-28-009-25 W1M	623.62	1.73	0.093	2701
SP3	15-28-009-25 W1M	625.75	0.044	0.054	2696
SP8	15-28-009-25 W1M	625.75	0.898	0.081	2687
SP4	15-28-009-25 W1M	627.28	4.90	0.113	2704
SP9	15-28-009-25 W1M	628.80	6.35	0.122	2683
SP10	15-28-009-25 W1M	629.26	0.235	0.067	2740
SP11	15-28-009-25 W1M	630.17	17.4	0.156	2700
SP12	15-28-009-25 W1M	630.94	15.2	0.161	2703
SP13	15-28-009-25 W1M	632.46	11.5	0.134	2732

*Permeability measured at 800 psi overburden pressure

TABLE 3
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Routine Core Analysis Air Permeability : 12.36 mD
Routine Core Analysis Porosity (fraction): 0.103

Mercury Injection Test Sample Data	
Sample Weight (g):	14.200
Corrected sample porosity (fraction):	0.069
Grain Density (g/cc):	2.73
Conformance Correction Vol. (cc):	0.062
Total Pore Surface Area (m^2):	12.16
Median Pore Diameter (micron):	0.327
Conformance Correction (percent of P.V.):	13.9%
* Threshold Pressure (kPa):	28.0
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	19.3%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	14.9%
Micropores (pore throat dia. < 1.0 microns):	65.8%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 4
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Air Permeability : 12.36 mD
Porosity (fraction): 0.103

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.028	0.006	1.00	44.5	0.000
0.035	0.008	0.989	35.7	0.162
0.042	0.010	0.982	29.9	0.323
0.049	0.011	0.960	25.6	0.487
0.056	0.013	0.949	22.5	0.647
0.062	0.014	0.938	20.0	0.810
0.069	0.016	0.923	18.0	0.972
0.090	0.021	0.901	13.9	1.46
0.110	0.025	0.886	11.3	1.94
0.138	0.032	0.875	9.04	2.59
0.172	0.040	0.857	7.24	3.40
0.193	0.045	0.850	6.47	3.88
0.347	0.080	0.813	3.60	7.50
0.452	0.104	0.791	2.76	10.0
0.556	0.128	0.766	2.24	12.4
0.621	0.143	0.751	2.01	14.0
0.798	0.184	0.722	1.56	18.1
0.965	0.223	0.696	1.29	22.1
1.20	0.278	0.663	1.04	27.7
1.56	0.360	0.626	0.800	36.1
1.90	0.439	0.597	0.657	44.1
2.31	0.533	0.571	0.541	53.6
2.93	0.677	0.538	0.426	68.3
3.70	0.854	0.509	0.337	86.4
4.47	1.03	0.484	0.279	104
5.51	1.27	0.451	0.226	129
6.87	1.59	0.414	0.182	161
8.59	1.98	0.370	0.145	202
10.6	2.45	0.322	0.118	249
13.2	3.05	0.260	0.095	310
16.6	3.84	0.198	0.075	390
20.2	4.67	0.147	0.062	475
24.9	5.74	0.106	0.050	585
33.1	7.64	0.066	0.038	778
38.5	8.89	0.048	0.032	906
48.8	11.3	0.029	0.026	1147
59.1	13.7	0.018	0.021	1391
72.1	16.7	0.011	0.017	1698
90.1	20.8	0.007	0.014	2119
112	25.9	0.004	0.011	2641
137	31.6	0.000	0.009	3217

TABLE 5
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Routine Core Analysis Air Permeability : 22.31 mD
Routine Core Analysis Porosity (fraction): 0.132

Mercury Injection Test Sample Data	
Sample Weight (g):	16.250
Corrected sample porosity (fraction):	0.099
Grain Density (g/cc):	2.69
Conformance Correction Vol. (cc):	0.049
Total Pore Surface Area (m^2):	2.57
Median Pore Diameter (micron):	4.254
Conformance Correction (percent of P.V.):	6.8%
* Threshold Pressure (kPa):	34.9
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	58.7%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	30.3%
Micropores (pore throat dia. < 1.0 microns):	10.9%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 6
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.035	0.008	1.00	35.7	0.000
0.042	0.010	0.998	29.9	0.160
0.049	0.011	0.995	25.6	0.325
0.056	0.013	0.993	22.5	0.485
0.062	0.014	0.993	20.0	0.647
0.069	0.016	0.990	18.0	0.810
0.090	0.021	0.983	13.9	1.29
0.110	0.025	0.956	11.3	1.78
0.138	0.032	0.925	9.0	2.42
0.172	0.040	0.871	7.24	3.23
0.193	0.045	0.810	6.47	3.72
0.343	0.079	0.414	3.64	7.25
0.447	0.103	0.292	2.79	9.70
0.551	0.127	0.226	2.26	12.2
0.615	0.142	0.200	2.03	13.7
0.792	0.183	0.156	1.57	17.8
0.960	0.222	0.129	1.30	21.8
1.20	0.277	0.109	1.04	27.4
1.55	0.359	0.092	0.802	35.8
1.89	0.437	0.080	0.658	43.8
2.30	0.531	0.073	0.542	53.3
2.93	0.676	0.063	0.426	68.1
3.69	0.853	0.056	0.338	86.1
4.46	1.03	0.049	0.280	104
5.50	1.27	0.041	0.227	129
6.87	1.59	0.036	0.182	161
8.59	1.98	0.029	0.145	201
10.6	2.45	0.027	0.118	249
13.2	3.05	0.022	0.095	310
16.6	3.84	0.017	0.075	390
20.2	4.67	0.012	0.062	475
24.9	5.74	0.010	0.050	585
33.1	7.64	0.005	0.038	777
38.5	8.89	0.002	0.032	906
48.8	11.3	0.000	0.026	1147

TABLE 7
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Routine Core Analysis Air Permeability : 27.12 mD
Routine Core Analysis Porosity (fraction): 0.163

Mercury Injection Test Sample Data	
Sample Weight (g):	19.080
Corrected sample porosity (fraction):	0.154
Grain Density (g/cc):	2.71
Conformance Correction Vol. (cc):	0.061
Total Pore Surface Area (m^2):	4.98
Median Pore Diameter (micron):	1.287
Conformance Correction (percent of P.V.):	4.5%
* Threshold Pressure (kPa):	41.7
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	36.0%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	28.3%
Micropores (pore throat dia. < 1.0 microns):	35.7%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 8
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.042	0.010	1.00	29.9	0.000
0.049	0.011	0.999	25.6	0.165
0.056	0.013	0.996	22.5	0.325
0.062	0.014	0.991	20.0	0.487
0.069	0.016	0.976	18.0	0.650
0.090	0.021	0.926	13.9	1.13
0.110	0.025	0.814	11.3	1.62
0.138	0.032	0.735	9.04	2.26
0.172	0.040	0.697	7.24	3.07
0.193	0.045	0.679	6.47	3.56
0.344	0.079	0.642	3.63	7.11
0.450	0.104	0.627	2.77	9.61
0.556	0.128	0.617	2.24	12.1
0.619	0.143	0.609	2.02	13.6
0.796	0.184	0.578	1.57	17.8
0.961	0.222	0.506	1.30	21.6
1.21	0.279	0.358	1.03	27.5
1.55	0.357	0.213	0.806	35.4
1.89	0.436	0.141	0.660	43.5
2.30	0.532	0.096	0.541	53.3
2.92	0.674	0.065	0.427	67.7
3.64	0.842	0.046	0.342	84.8
4.50	1.04	0.034	0.277	105
5.50	1.27	0.025	0.227	128
6.88	1.59	0.018	0.181	161
8.75	2.02	0.010	0.143	205
10.6	2.46	0.007	0.117	250
13.2	3.06	0.004	0.094	311
16.7	3.86	0.001	0.075	393
20.1	4.65	0.000	0.062	473

TABLE 9
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Routine Core Analysis Air Permeability : 6.35 mD
Routine Core Analysis Porosity (fraction): 0.122

Mercury Injection Test Sample Data	
Sample Weight (g):	18.070
Corrected sample porosity (fraction):	0.110
Grain Density (g/cc):	2.69
Conformance Correction Vol. (cc):	0.034
Total Pore Surface Area (m^2):	7.03
Median Pore Diameter (micron):	2.024
Conformance Correction (percent of P.V.):	4.0%
* Threshold Pressure (kPa):	69.3
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	17.7%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	45.8%
Micropores (pore throat dia. < 1.0 microns):	36.5%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 10
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.069	0.016	1.00	18.0	0.000
0.090	0.021	0.996	13.9	0.485
0.110	0.025	0.991	11.3	0.968
0.138	0.032	0.983	9.04	1.61
0.172	0.040	0.972	7.24	2.42
0.193	0.045	0.961	6.47	2.91
0.344	0.079	0.825	3.62	6.47
0.448	0.103	0.641	2.78	8.92
0.553	0.128	0.535	2.26	11.4
0.615	0.142	0.491	2.03	12.8
0.792	0.183	0.431	1.58	17.0
0.957	0.221	0.398	1.30	20.9
1.21	0.279	0.366	1.03	26.8
1.55	0.357	0.318	0.807	34.8
1.89	0.436	0.281	0.660	42.8
2.30	0.532	0.247	0.541	52.6
2.92	0.674	0.210	0.427	67.1
3.64	0.841	0.177	0.342	84.1
4.50	1.04	0.149	0.277	104
5.49	1.27	0.123	0.227	128
6.88	1.59	0.100	0.181	160
8.74	2.02	0.076	0.143	204
10.6	2.46	0.058	0.117	249
13.2	3.06	0.043	0.094	310
16.7	3.86	0.030	0.075	392
20.1	4.65	0.022	0.062	472
24.9	5.76	0.013	0.050	586
33.0	7.63	0.006	0.038	776
38.4	8.88	0.004	0.032	903
48.7	11.3	0.000	0.026	1145

TABLE 11
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Routine Core Analysis Air Permeability : 0.235 mD
Routine Core Analysis Porosity (fraction): 0.067

Mercury Injection Test Sample Data	
Sample Weight (g):	21.340
Corrected sample porosity (fraction):	0.071
Grain Density (g/cc):	2.76
Conformance Correction Vol. (cc):	0.053
Total Pore Surface Area (m^2):	4.14
Median Pore Diameter (micron):	1.247
Conformance Correction (percent of P.V.):	8.2%
* Threshold Pressure (kPa):	137.9
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	0.7%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	64.3%
Micropores (pore throat dia. < 1.0 microns):	35.0%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 12
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.138	0.032	1.00	9.04	0.647
0.172	0.040	0.996	7.24	1.46
0.193	0.045	0.996	6.46	1.94
0.352	0.081	0.996	3.55	5.68
0.449	0.104	0.996	2.78	7.96
0.552	0.128	0.982	2.26	10.4
0.619	0.143	0.961	2.01	12.0
0.799	0.185	0.749	1.56	16.2
0.967	0.223	0.530	1.29	20.2
1.21	0.278	0.351	1.03	25.8
1.54	0.357	0.244	0.807	33.8
1.89	0.438	0.190	0.658	42.0
2.31	0.534	0.154	0.540	51.8
2.92	0.675	0.122	0.427	66.2
3.73	0.861	0.097	0.335	85.1
4.61	1.07	0.079	0.270	106
5.63	1.30	0.065	0.222	130
6.83	1.58	0.054	0.183	158
8.68	2.00	0.039	0.144	202
10.7	2.47	0.032	0.117	249
13.3	3.07	0.025	0.094	311
16.8	3.87	0.018	0.074	392
20.2	4.67	0.014	0.062	473
25.0	5.78	0.007	0.050	586
33.2	7.66	0.004	0.038	778
38.5	8.89	0.004	0.032	904
48.8	11.3	0.000	0.026	1145

TABLE 13
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Routine Core Analysis Air Permeability : 17.36 mD
Routine Core Analysis Porosity (fraction): 0.156

Mercury Injection Test Sample Data	
Sample Weight (g):	19.190
Corrected sample porosity (fraction):	0.139
Grain Density (g/cc):	2.72
Conformance Correction Vol. (cc):	0.056
Total Pore Surface Area (m^2):	2.72
Median Pore Diameter (micron):	3.011
Conformance Correction (percent of P.V.):	4.6%
* Threshold Pressure (kPa):	89.9
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	30.6%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	61.2%
Micropores (pore throat dia. < 1.0 microns):	8.2%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 14
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.090	0.021	1.00	13.9	0.000
0.110	0.025	0.998	11.3	0.483
0.138	0.032	0.993	9.04	1.13
0.172	0.040	0.980	7.24	1.94
0.193	0.045	0.963	6.46	2.42
0.350	0.081	0.696	3.56	6.13
0.444	0.103	0.427	2.81	8.34
0.546	0.126	0.282	2.28	10.7
0.613	0.142	0.227	2.03	12.3
0.794	0.183	0.147	1.57	16.6
0.963	0.222	0.110	1.29	20.6
1.20	0.278	0.082	1.04	26.2
1.54	0.356	0.060	0.808	34.2
1.89	0.437	0.047	0.659	42.5
2.31	0.533	0.037	0.540	52.3
2.92	0.674	0.028	0.427	66.6
3.73	0.861	0.022	0.335	85.6
4.61	1.07	0.017	0.270	106
5.63	1.30	0.013	0.222	130
6.83	1.58	0.010	0.183	159
8.68	2.00	0.007	0.144	202
10.7	2.47	0.005	0.117	250
13.3	3.07	0.003	0.094	311
16.8	3.87	0.003	0.074	392
20.2	4.67	0.002	0.062	474
25.0	5.78	0.002	0.050	587
33.2	7.66	0.002	0.038	779
38.5	8.89	0.002	0.032	904
48.8	11.3	0.000	0.026	1146

TABLE 15
MERCURY INJECTION CAPILLARY PRESSURE TEST SUMMARY

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Routine Core Analysis Air Permeability : 11.47 mD
Routine Core Analysis Porosity (fraction): 0.134

Mercury Injection Test Sample Data	
Sample Weight (g):	17.700
Corrected sample porosity (fraction):	0.127
Grain Density (g/cc):	2.74
Conformance Correction Vol. (cc):	0.046
Total Pore Surface Area (m^2):	2.74
Median Pore Diameter (micron):	3.114
Conformance Correction (percent of P.V.):	4.6%
* Threshold Pressure (kPa):	89.9
Pore throat size distribution:	
Macropores (pore throat dia. > 3.0 microns):	37.8%
Mesopores (pore throat dia. 1.0 - 3.0 microns):	52.3%
Micropores (pore throat dia. < 1.0 microns):	9.9%

Conversion Factors for Data Calculation	
Mercury Density (g/cc):	13.5335
Air / Mercury Interfacial Tension (dynes/cm):	485
Air / Mercury Contact Angle (degree):	130
Air / Water Interfacial Tension (dynes/cm):	72
Air / Water Contact Angle (degree):	0.0
Water Density for transitional height calculation (kg/m^3):	1000
Air Density for transitional height calculation (kg/m^3):	0.0010

* Threshold pressure - pressure at which mercury first enters the pore system.

TABLE 16
MERCURY INJECTION CAPILLARY PRESSURE DATA

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

Air/Mercury Capillary Pressure (MPa)	Derived Air / Water Capillary Pressure (MPa)	Wetting Phase Saturation (fraction)	Pore Throat Diameter (Microns)	Height of Transition (m)
0.090	0.021	1.00	13.9	0.000
0.110	0.025	0.998	11.3	0.483
0.138	0.032	0.996	9.04	1.13
0.172	0.040	0.993	7.24	1.94
0.193	0.045	0.989	6.46	2.42
0.359	0.083	0.624	3.47	6.34
0.451	0.104	0.379	2.77	8.50
0.555	0.128	0.262	2.25	11.0
0.623	0.144	0.221	2.00	12.5
0.792	0.183	0.157	1.58	16.5
0.964	0.223	0.127	1.29	20.6
1.20	0.278	0.099	1.04	26.2
1.56	0.359	0.077	0.802	34.5
1.89	0.436	0.064	0.660	42.4
2.32	0.535	0.052	0.538	52.4
2.94	0.679	0.043	0.424	67.1
3.70	0.855	0.034	0.337	85.0
4.53	1.05	0.028	0.275	105
5.50	1.27	0.022	0.227	127
6.85	1.58	0.019	0.182	159
8.70	2.01	0.015	0.143	203
10.6	2.46	0.011	0.117	248
13.3	3.06	0.007	0.094	310
16.7	3.86	0.006	0.075	391
20.0	4.63	0.004	0.062	470
24.9	5.75	0.004	0.050	584
33.1	7.65	0.002	0.038	777
38.4	8.88	0.002	0.032	903
48.7	11.3	0.000	0.026	1145

TABLE 17
FORMATION RESISTIVITY FACTOR MEASUREMENTS
Well: 03-16-009-25W1M

Sample I.D	Depth (m)	Air Permeability (mD)	NOB Porosity (fraction)	Formation Resistivity Factor	Cementation Exponent m'
SP2(03-16)	633.4	12.363	0.085	147.10	2.03
SP7B(03-16)	644.8	27.119	0.154	32.58	1.87
Composite Cementation Exponent for all Samples:					**1.97**

TABLE 18
RESISTIVITY INDEX MEASUREMENTS
Well: 03-16-009-25W1M

Sample I.D	Depth (m/ft)	Air Permeability (mD)	NOB Porosity (fraction)	Saturation Exponent 'n'
SP2(03-16)	633.4	12.363	0.085	1.72
SP7B(03-16)	644.8	27.119	0.154	2.75
Composite Saturation Exponent for all Samples:				**1.85**

TABLE 19
FORMATION RESISTIVITY FACTOR MEASUREMENTS
Well: 15-28-009-25 W1M

Sample I.D	Depth (m)	Air Permeability (mD)	NOB Porosity (fraction)	Formation Resistivity Factor	Cementation Exponent m'
SP9(15-28)	628.80	6.348	0.112	80.06	2.00
SP10(15-28)	629.26	0.235	0.053	140.29	1.69
SP11(15-28)	630.17	17.357	0.137	28.04	1.67
Composite Cementation Exponent for all Samples:					**1.77**

FIGURE 4
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Air Permeability : 12.36 mD
Porosity (fraction): 0.103

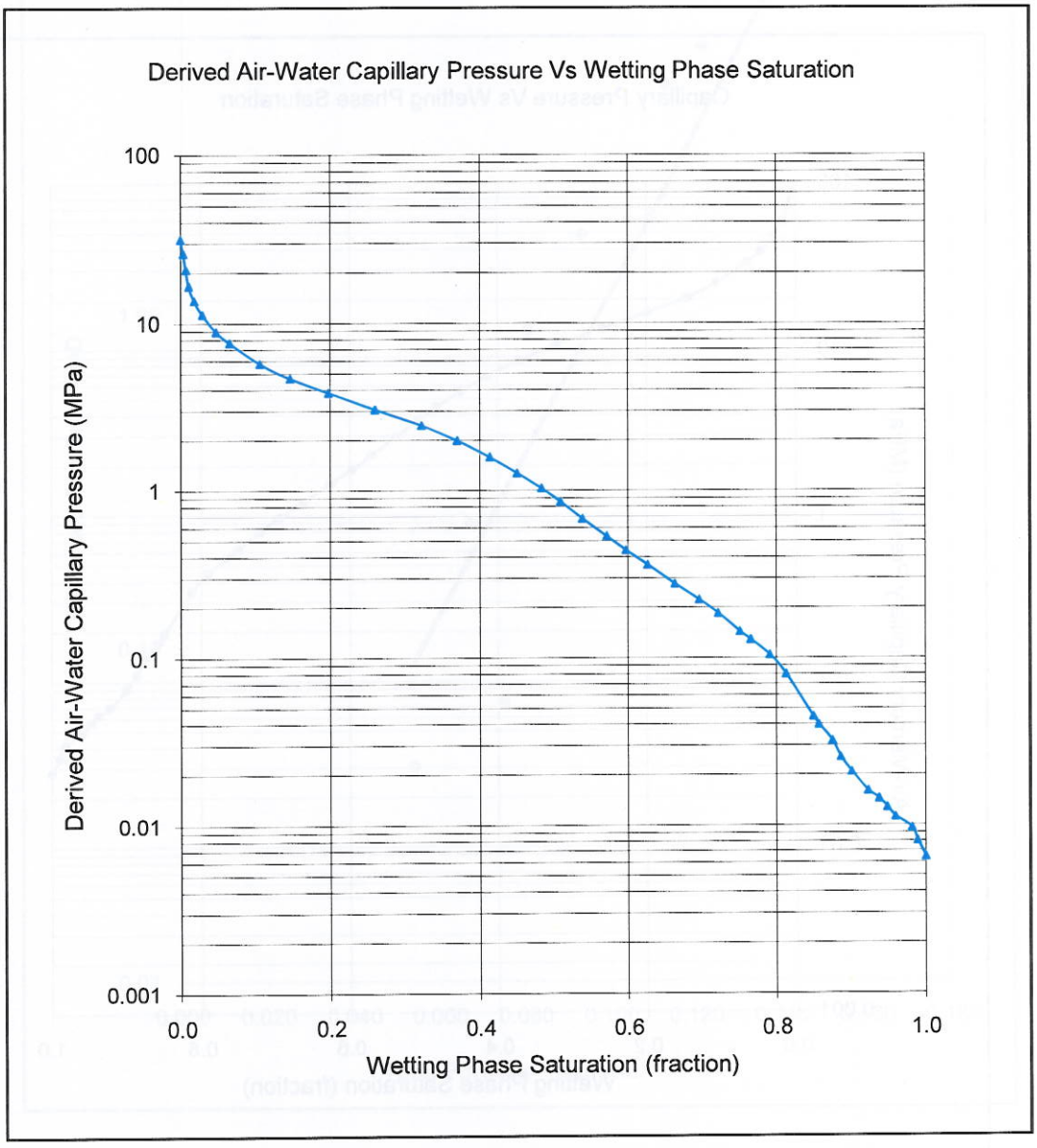


FIGURE 5
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Air Permeability : 12.36 mD
Porosity (fraction): 0.103

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	19.3%
	Mesopores (1 - 3 micron diameter) =	14.9%
	Micropores (< 1 micron diameter) =	65.8%

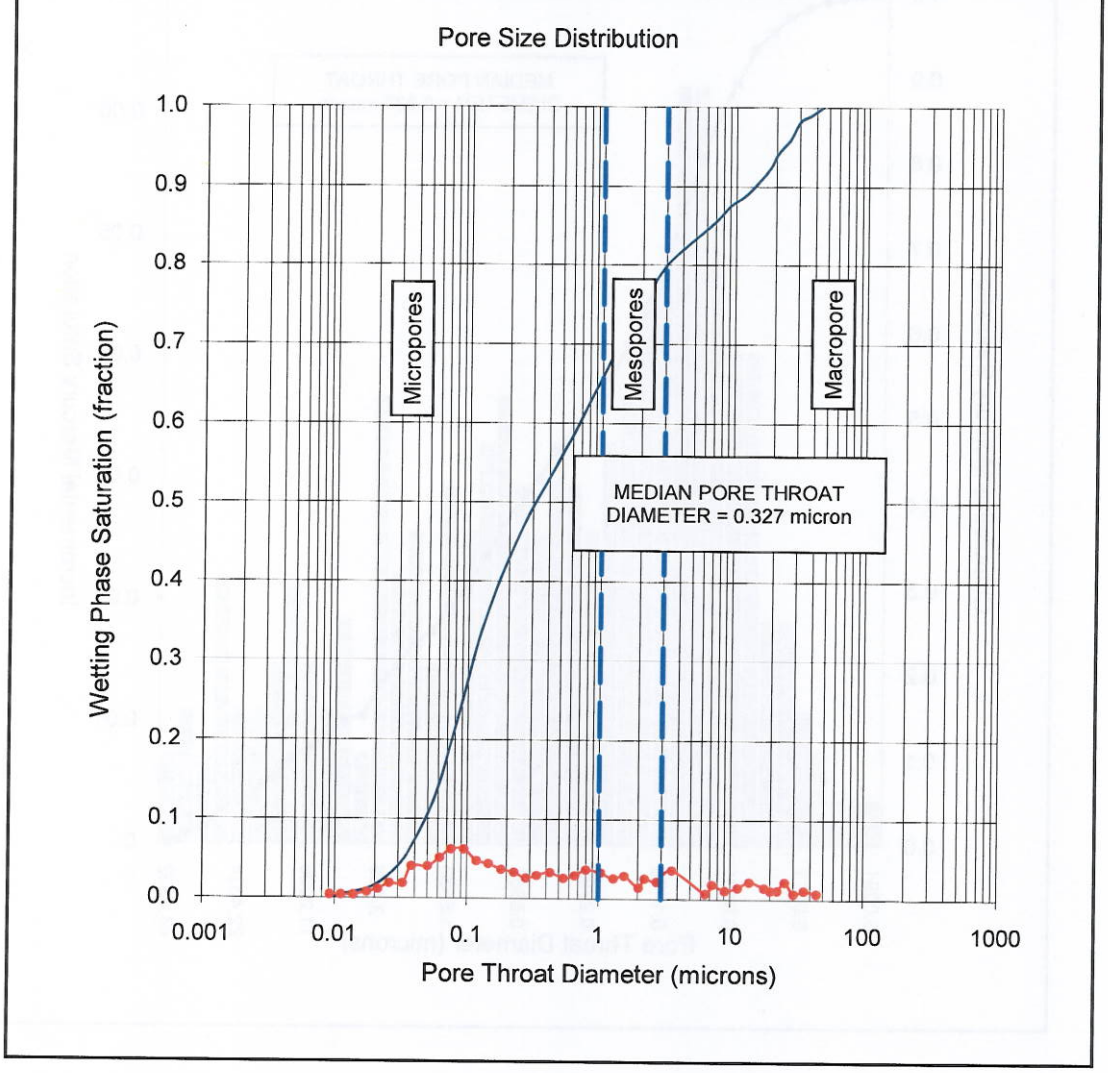


FIGURE 6
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Air Permeability : 12.36 mD
Porosity (fraction): 0.103

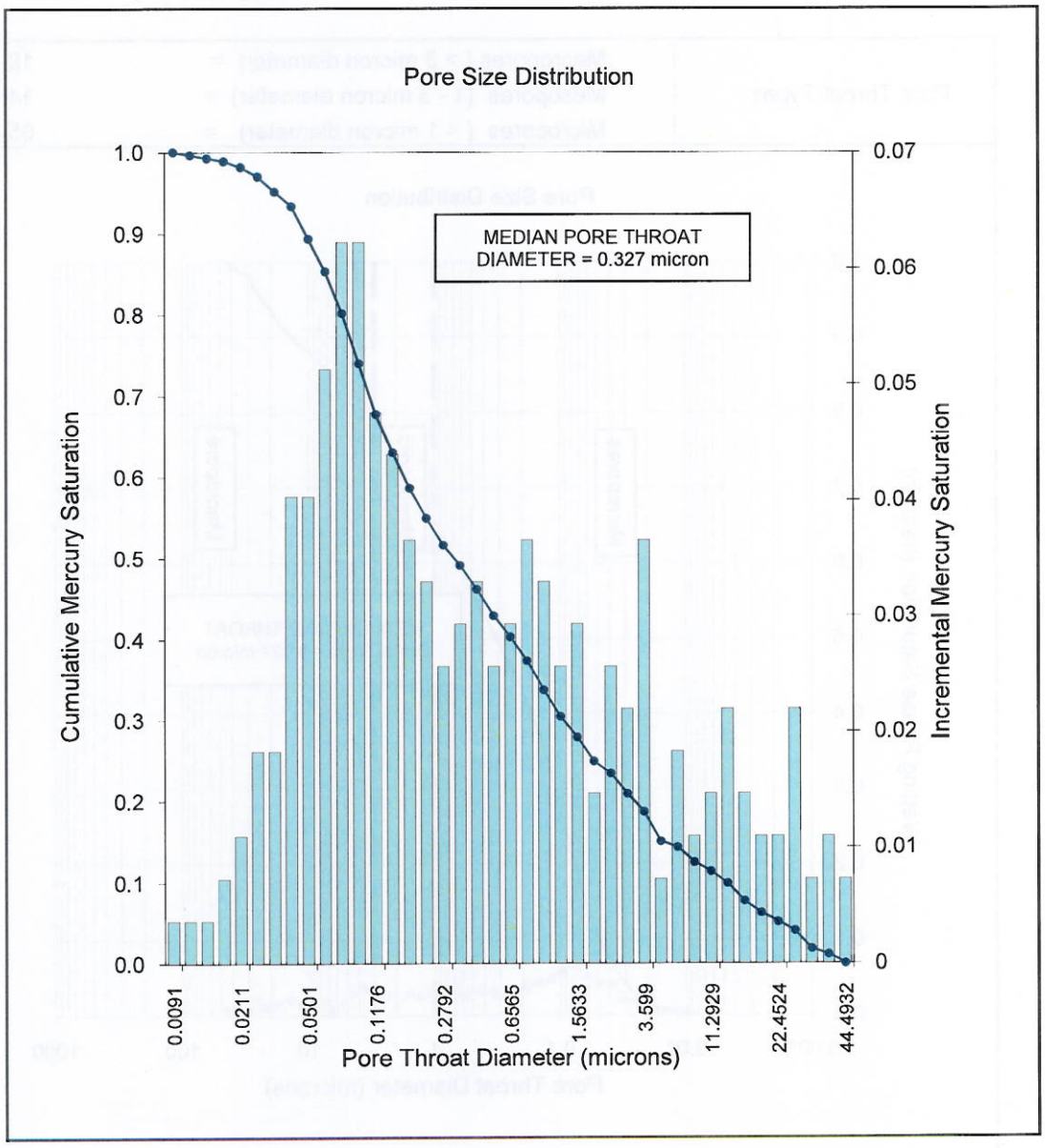


FIGURE 7
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP2
Core Depth: 633.37 m

Air Permeability : 12.36 mD
Porosity (fraction): 0.103

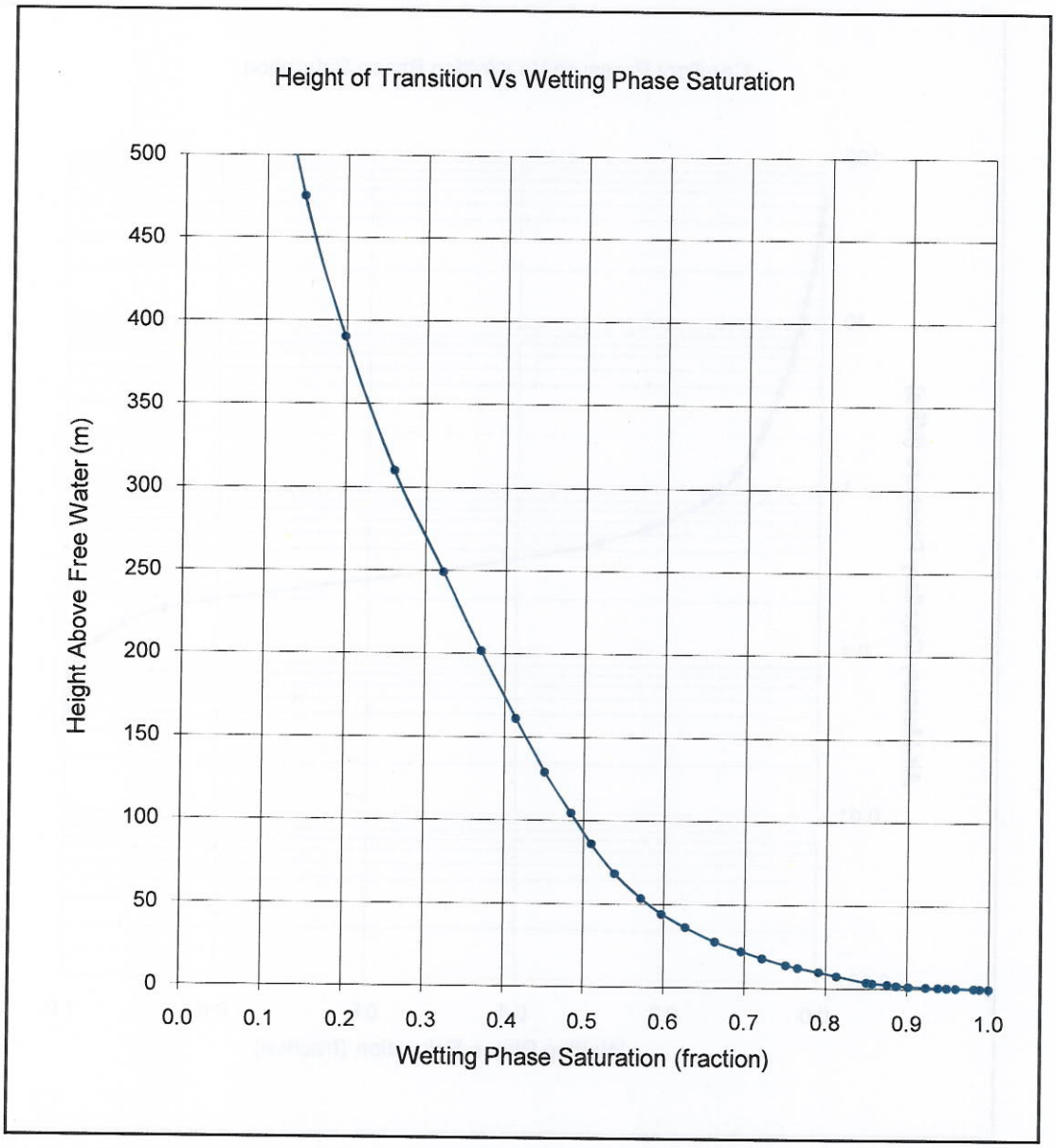


FIGURE 8
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

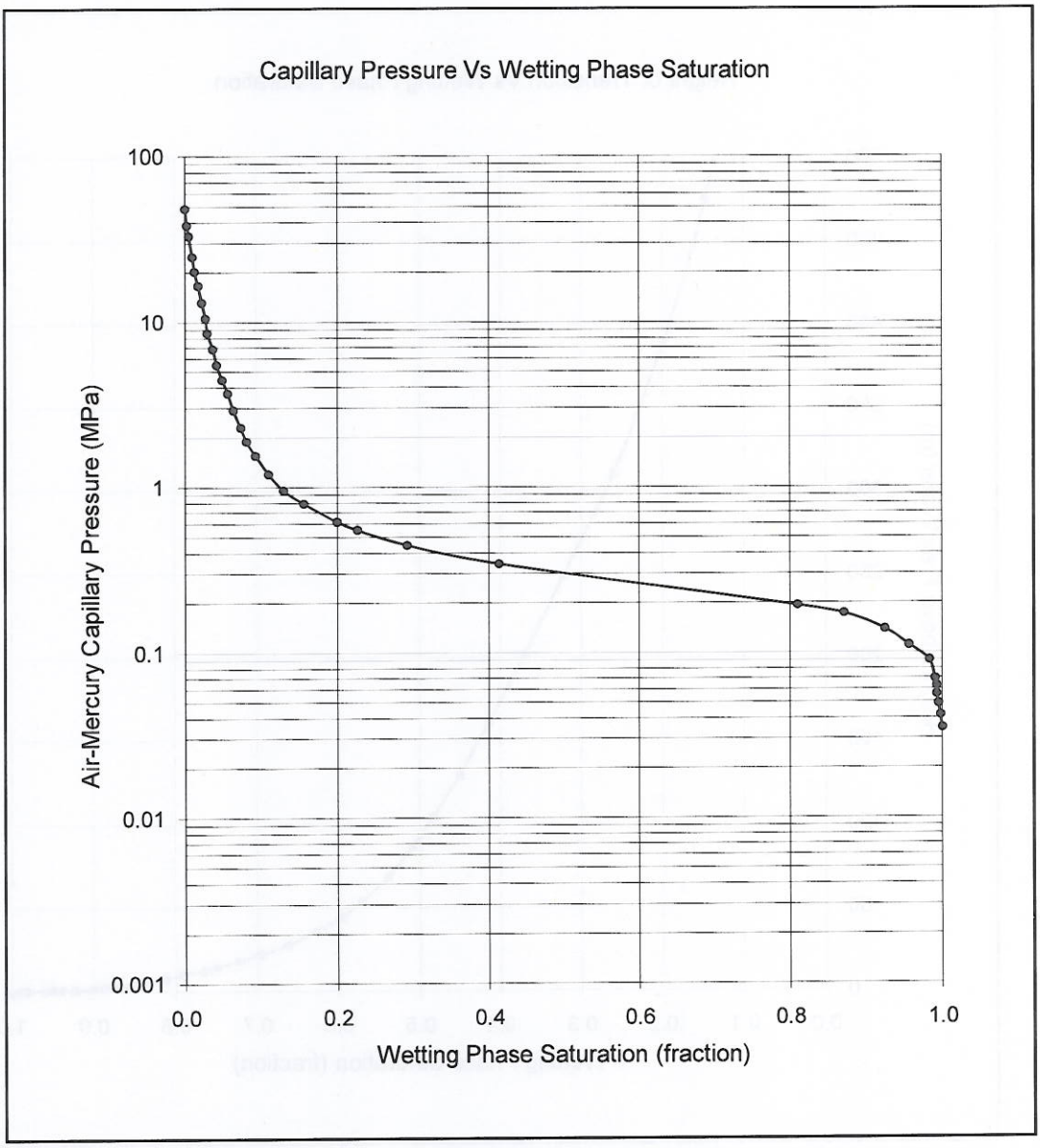


FIGURE 9
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

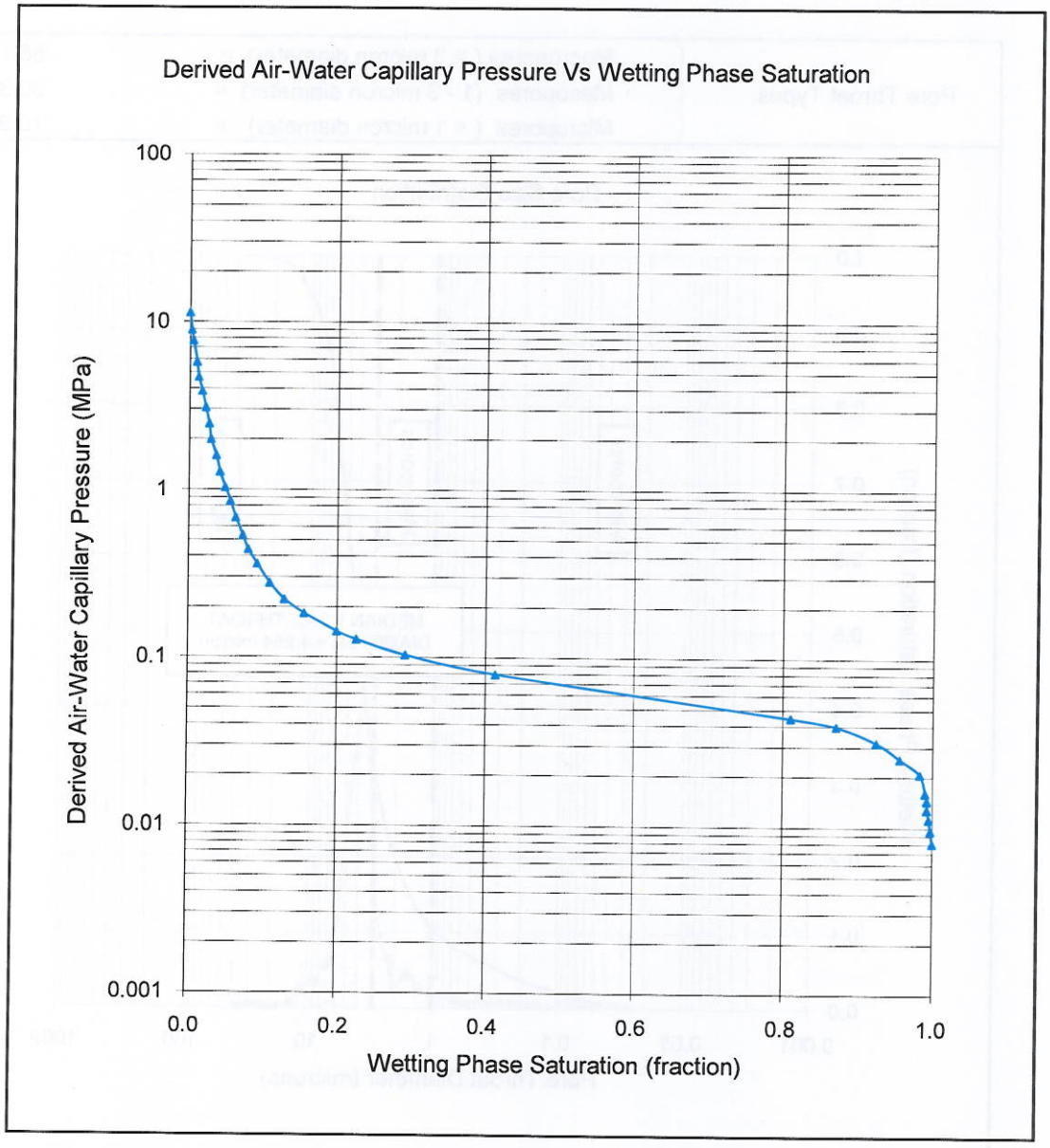


FIGURE 10
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	58.7%
	Mesopores (1 - 3 micron diameter) =	30.3%
	Micropores (< 1 micron diameter) =	10.9%

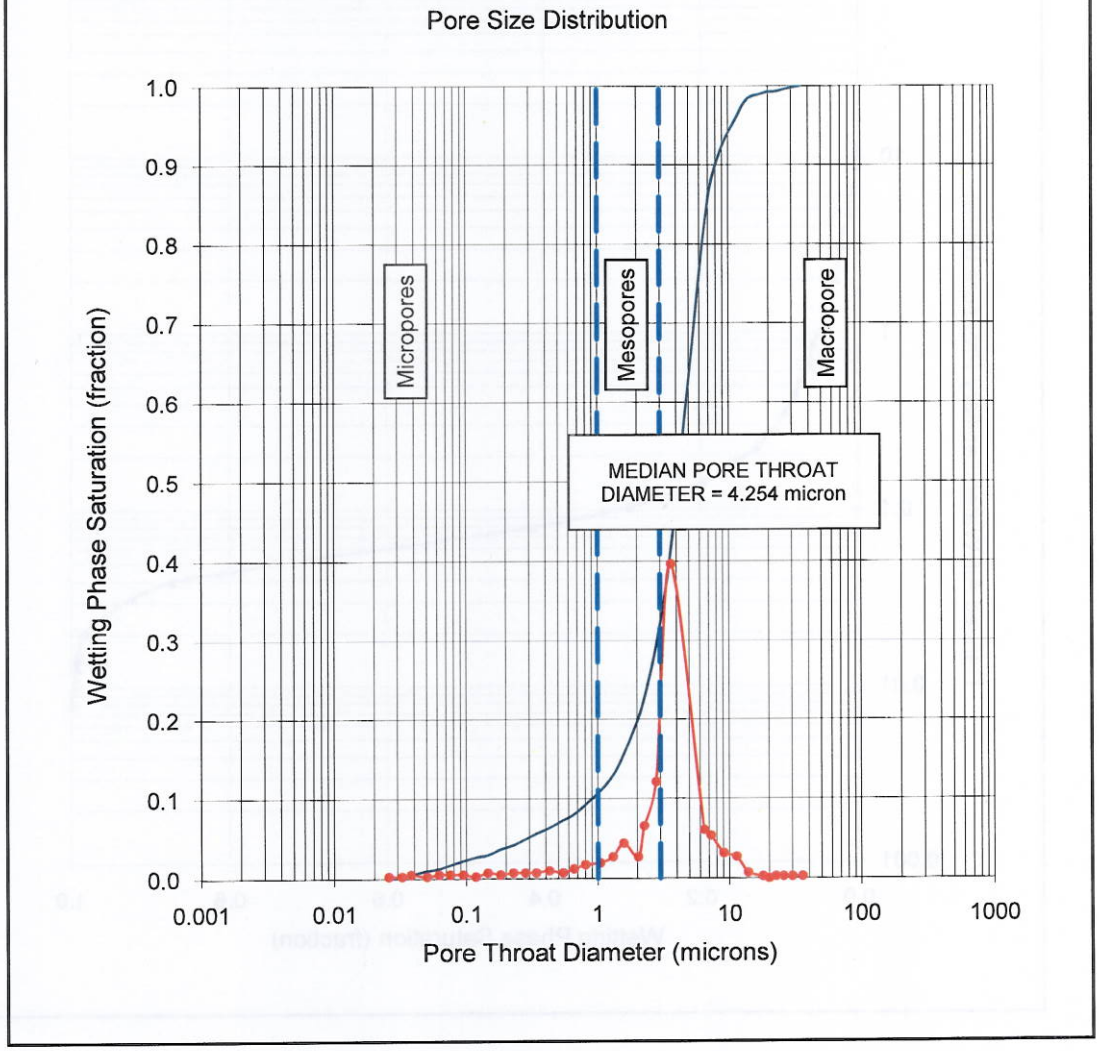


FIGURE 11
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

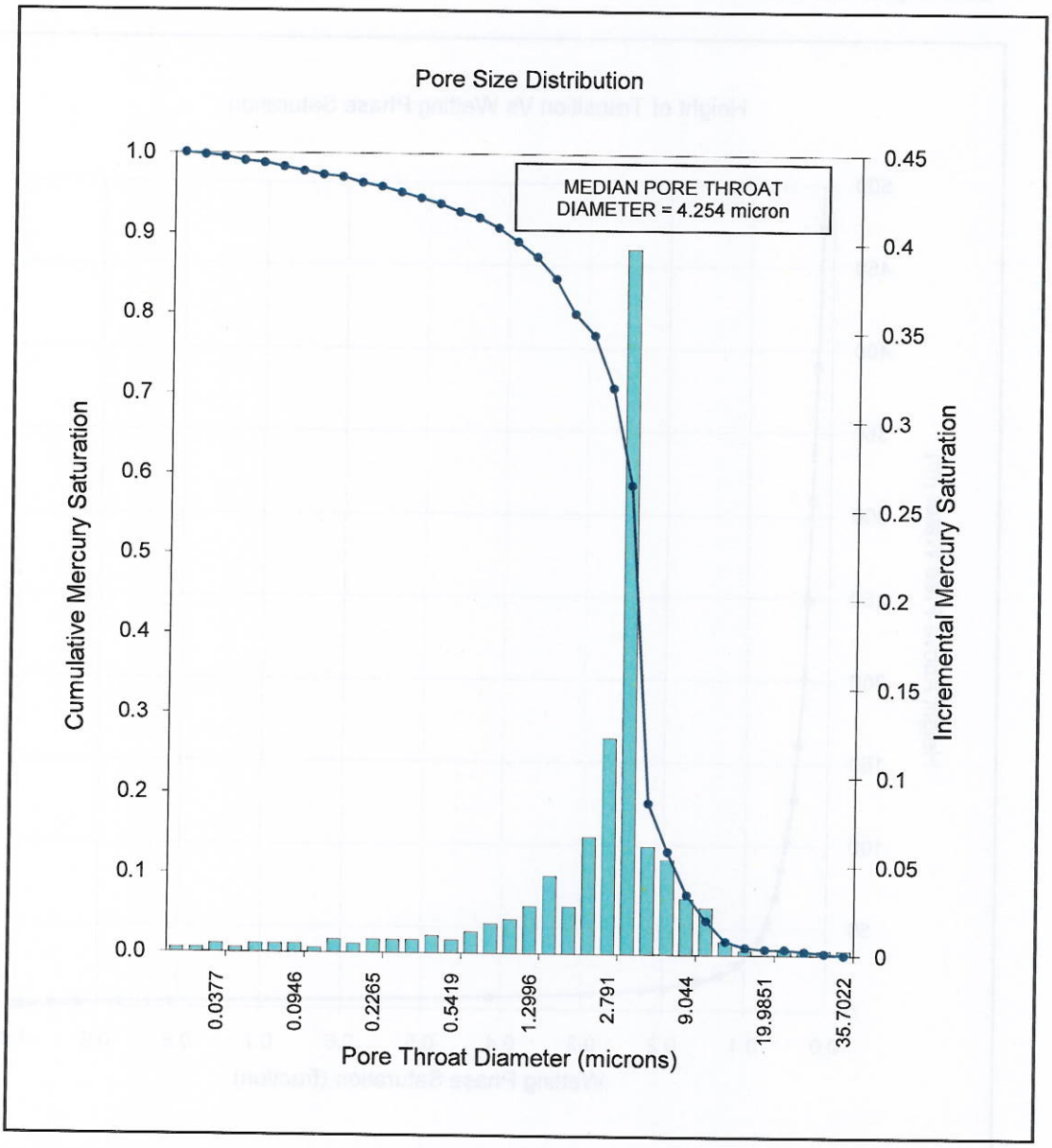


FIGURE 12
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP5
Core Depth: 637.95 m

Air Permeability : 22.31 mD
Porosity (fraction): 0.132

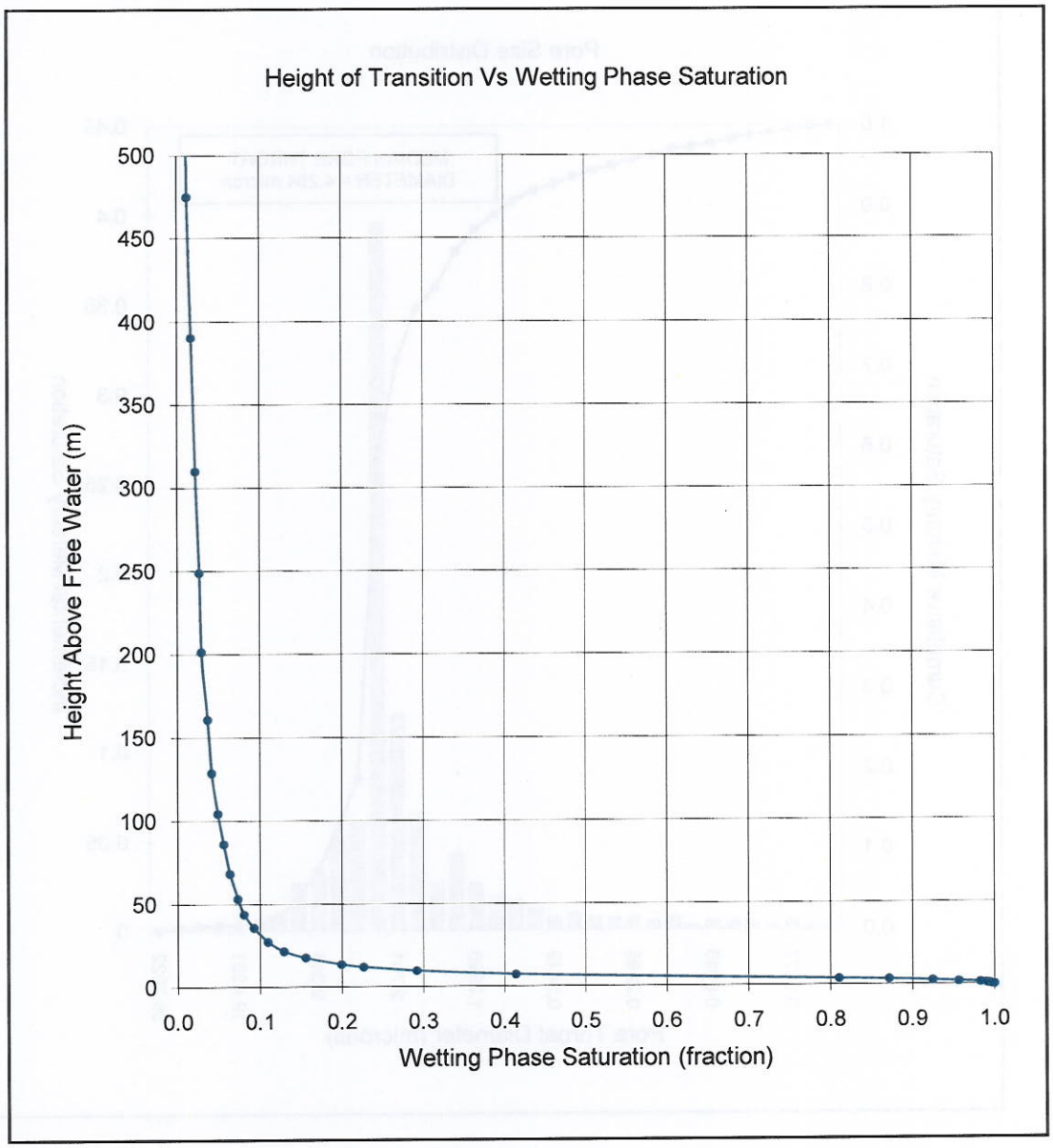


FIGURE 13
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

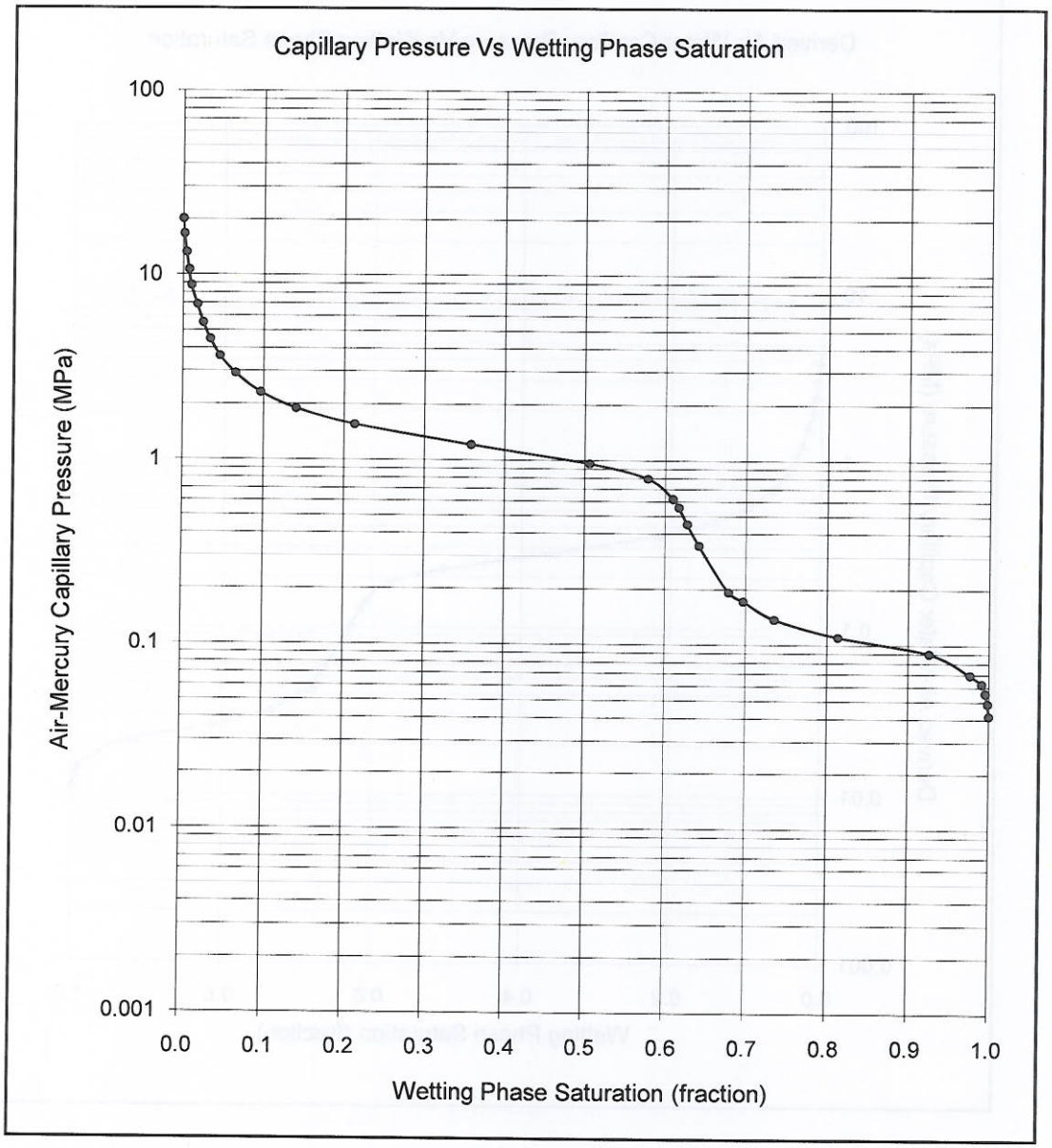


FIGURE 14
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

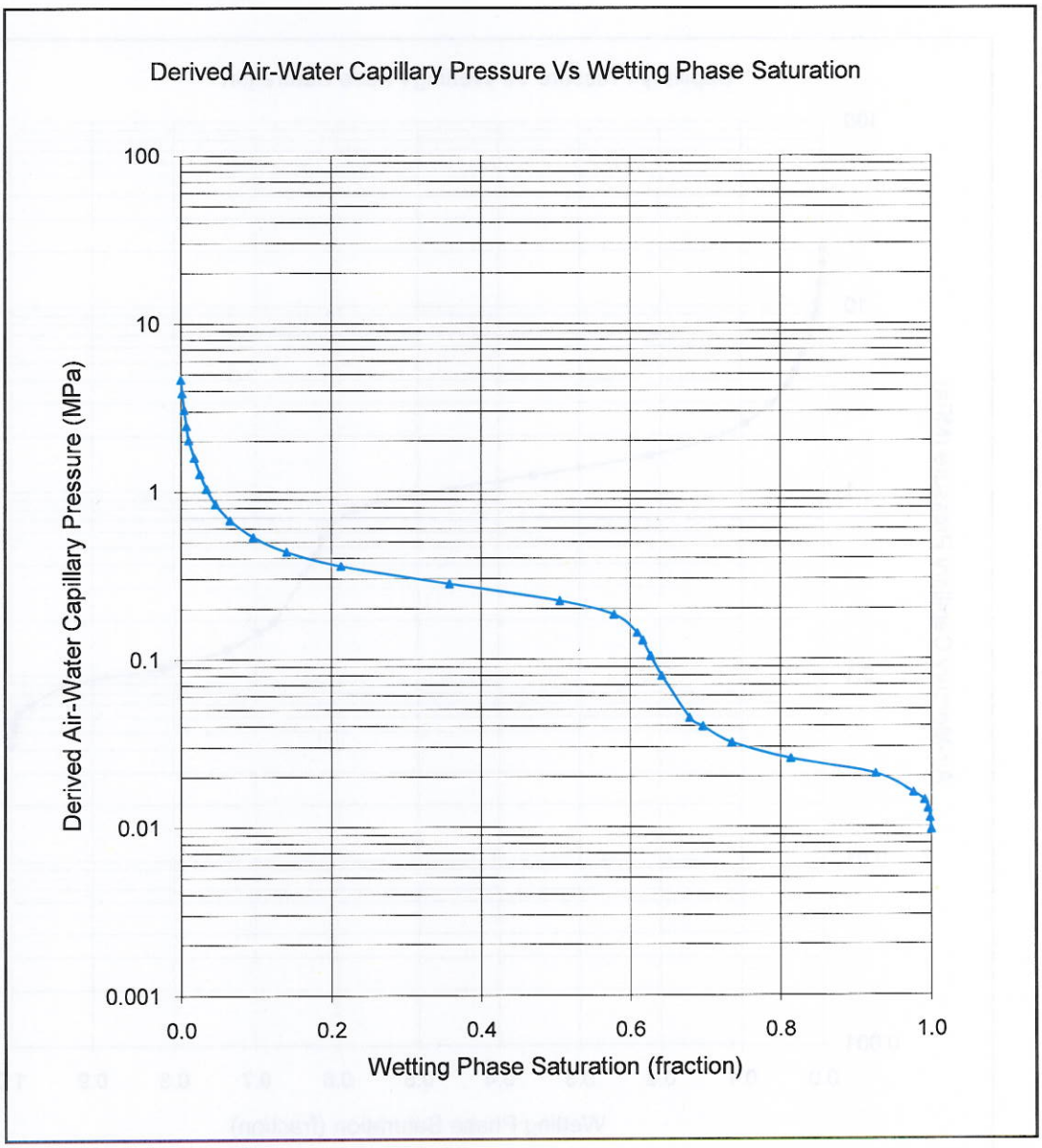


FIGURE 15
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	36.0%
	Mesopores (1 - 3 micron diameter) =	28.3%
	Micropores (< 1 micron diameter) =	35.7%

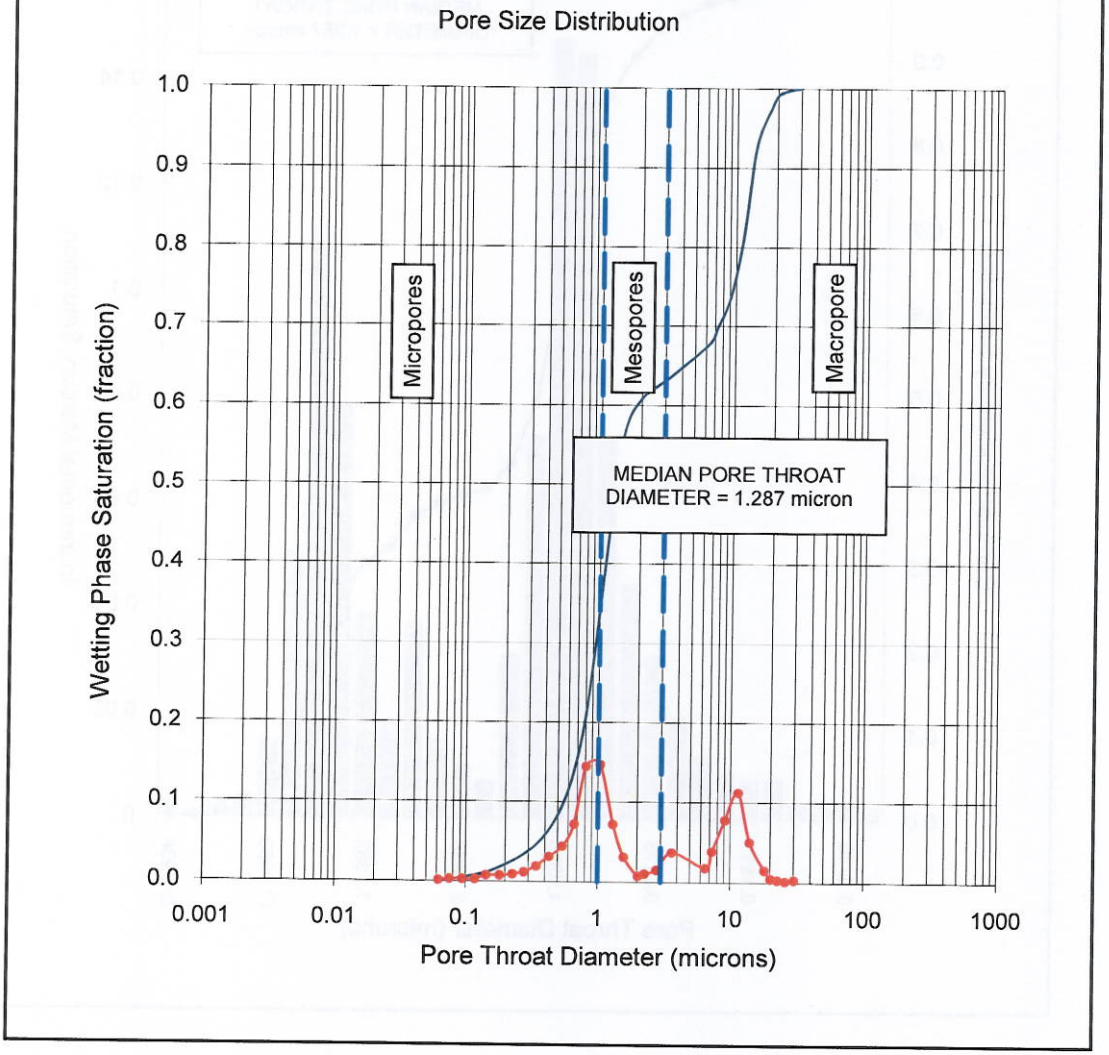


FIGURE 16
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

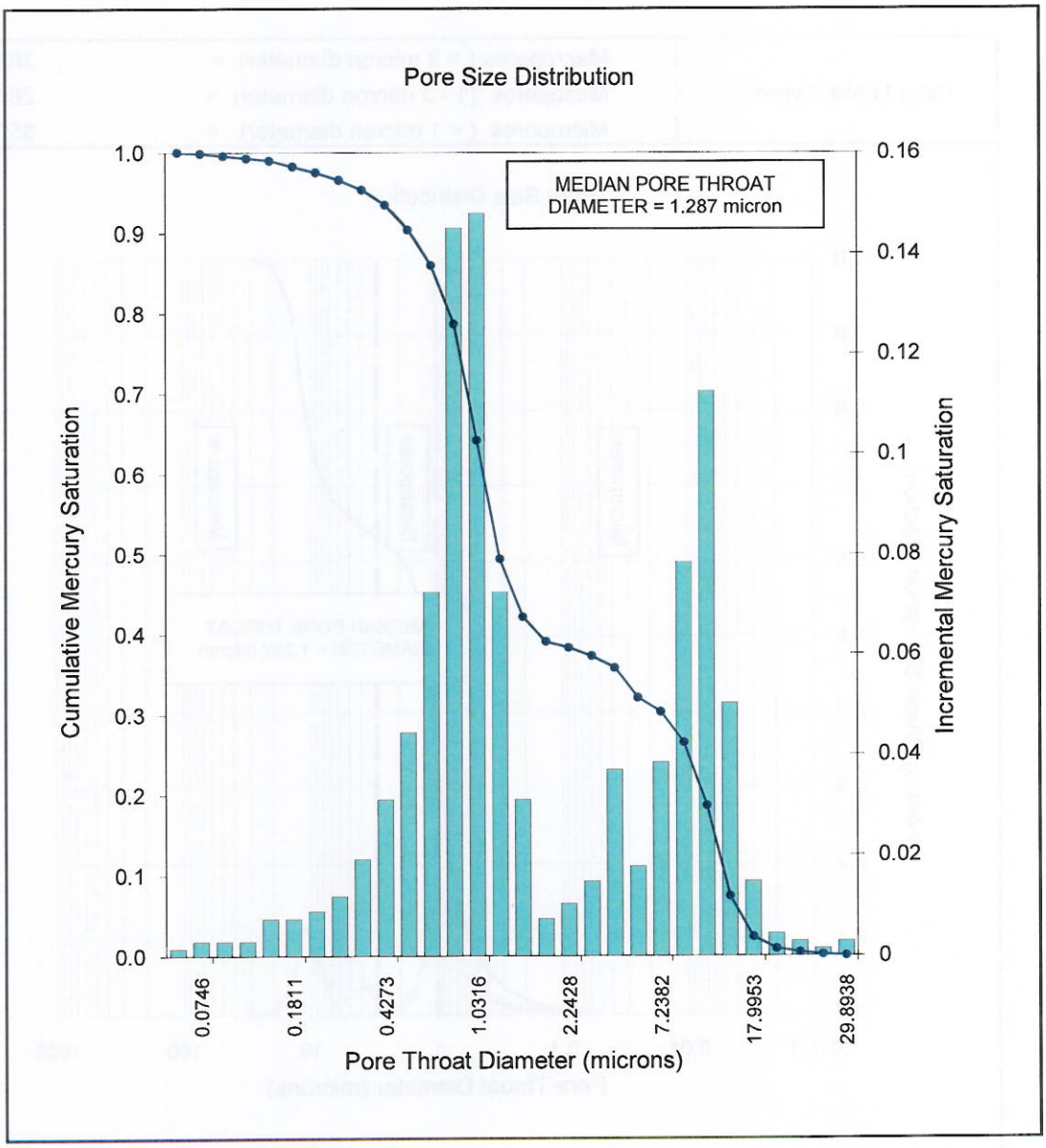


FIGURE 17
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 03-16-009-25 W1M
Core I.D.: SP7
Core Depth: 644.8 m

Air Permeability : 27.12 mD
Porosity (fraction): 0.163

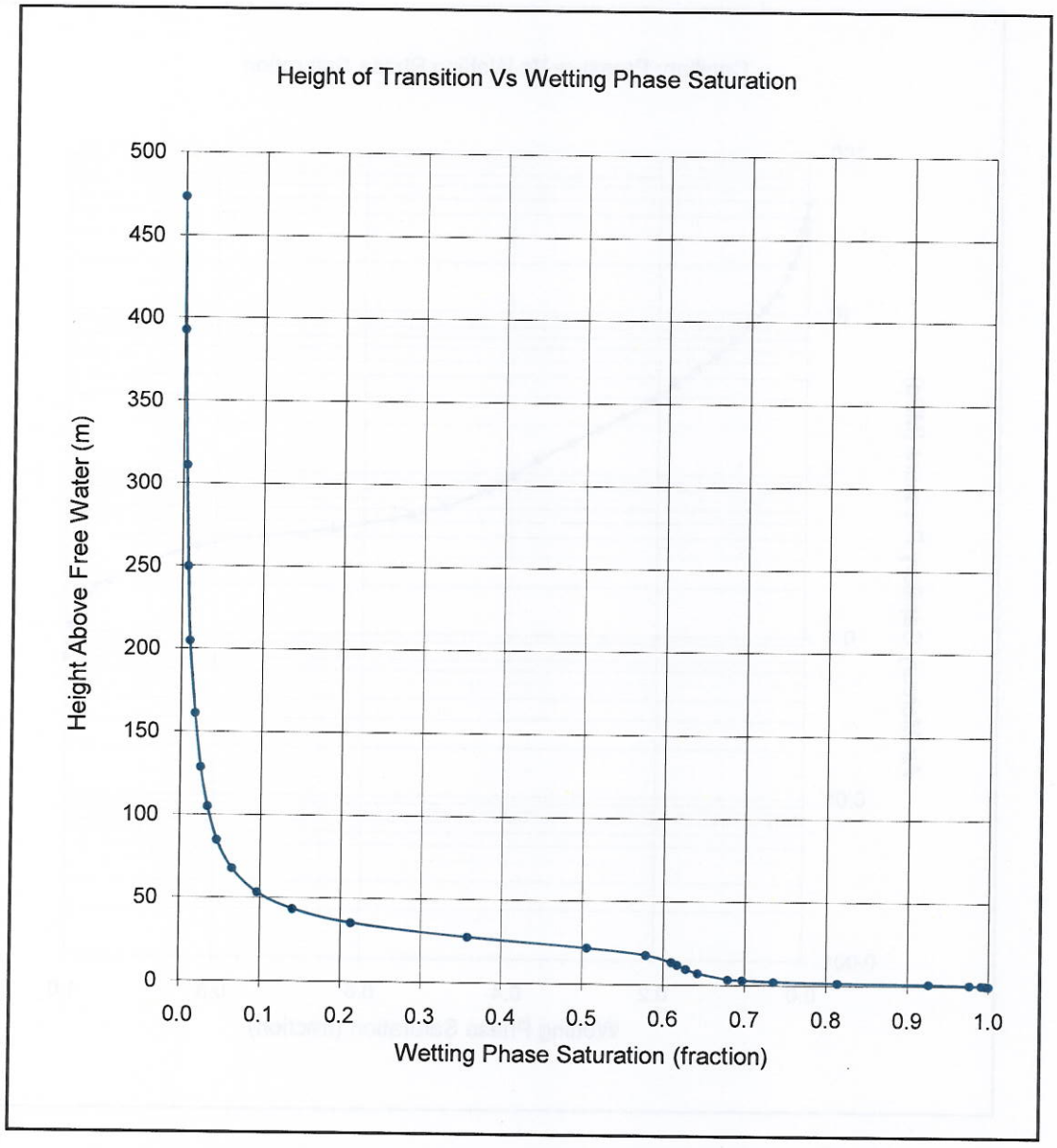


FIGURE 18
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

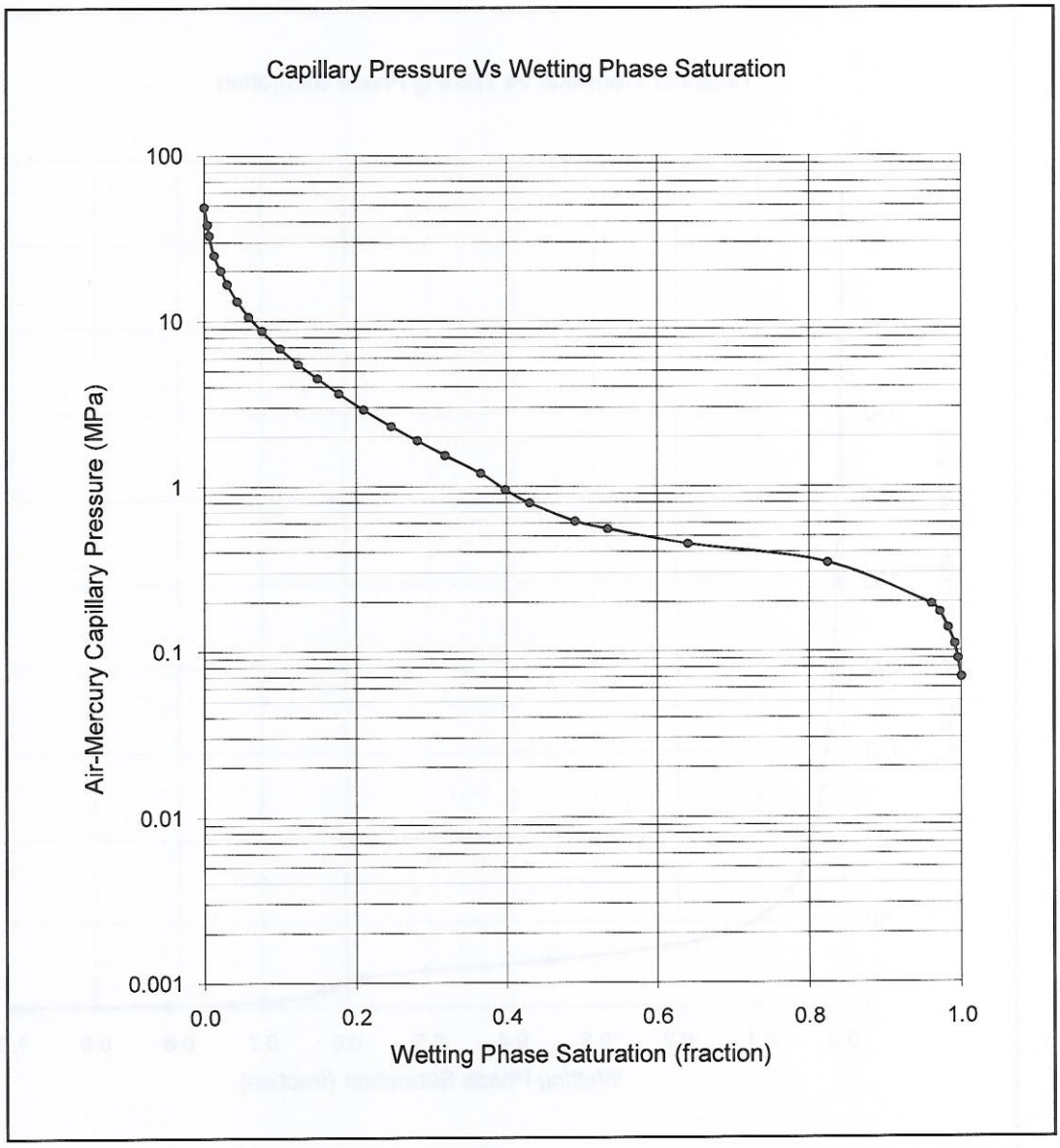


FIGURE 19
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

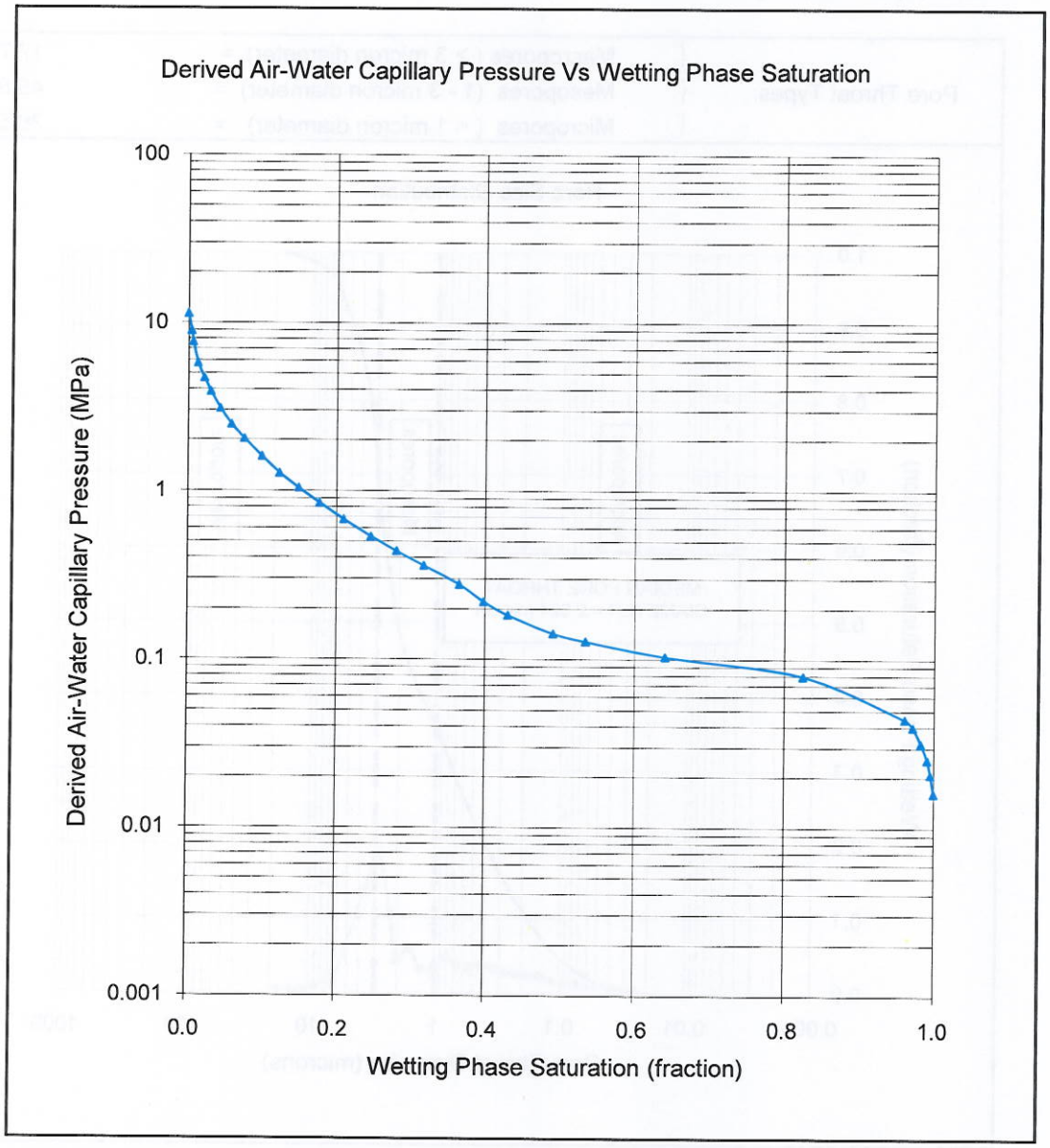


FIGURE 20
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	17.7%
	Mesopores (1 - 3 micron diameter) =	45.8%
	Micropores (< 1 micron diameter) =	36.5%

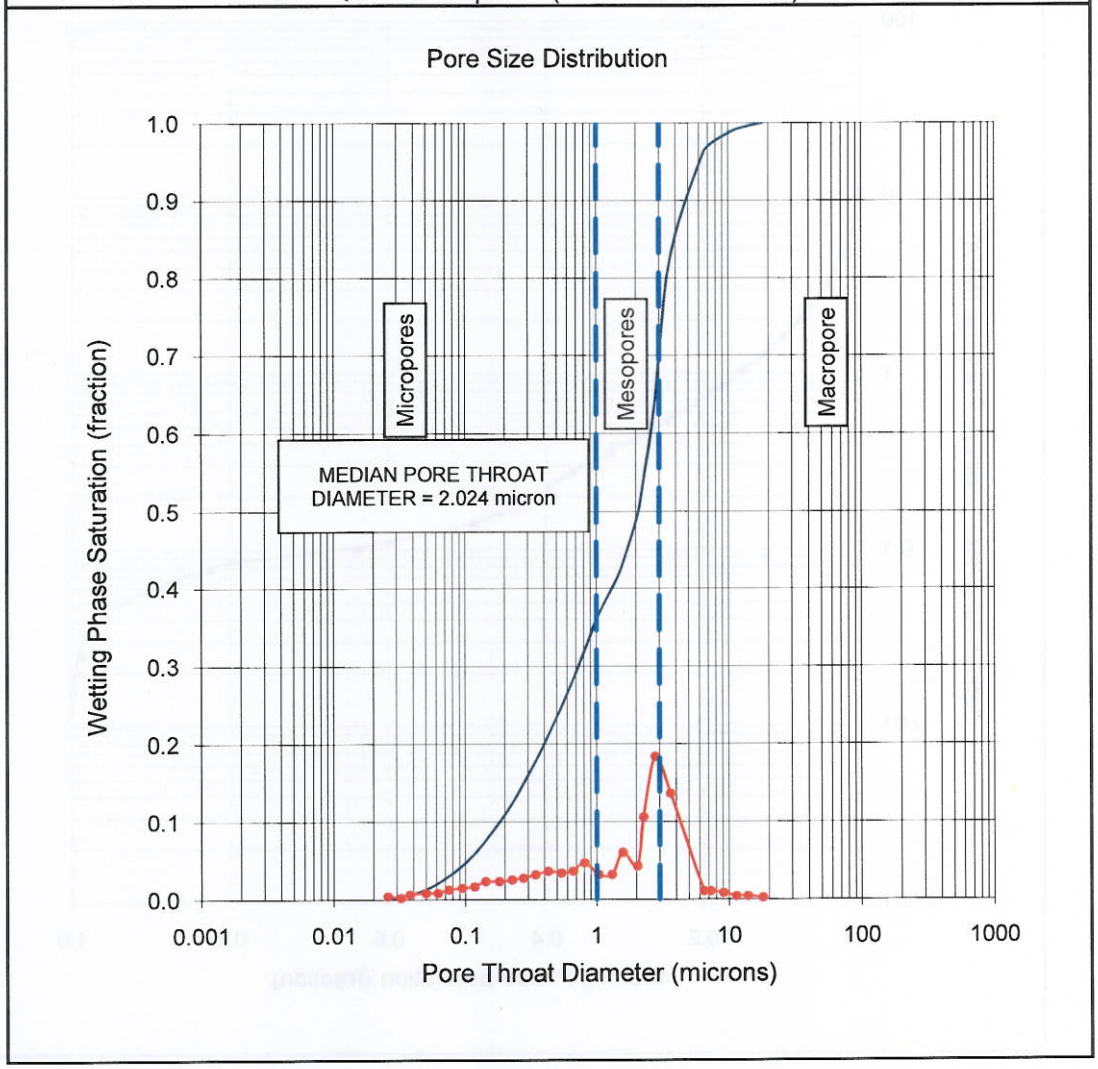


FIGURE 21
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

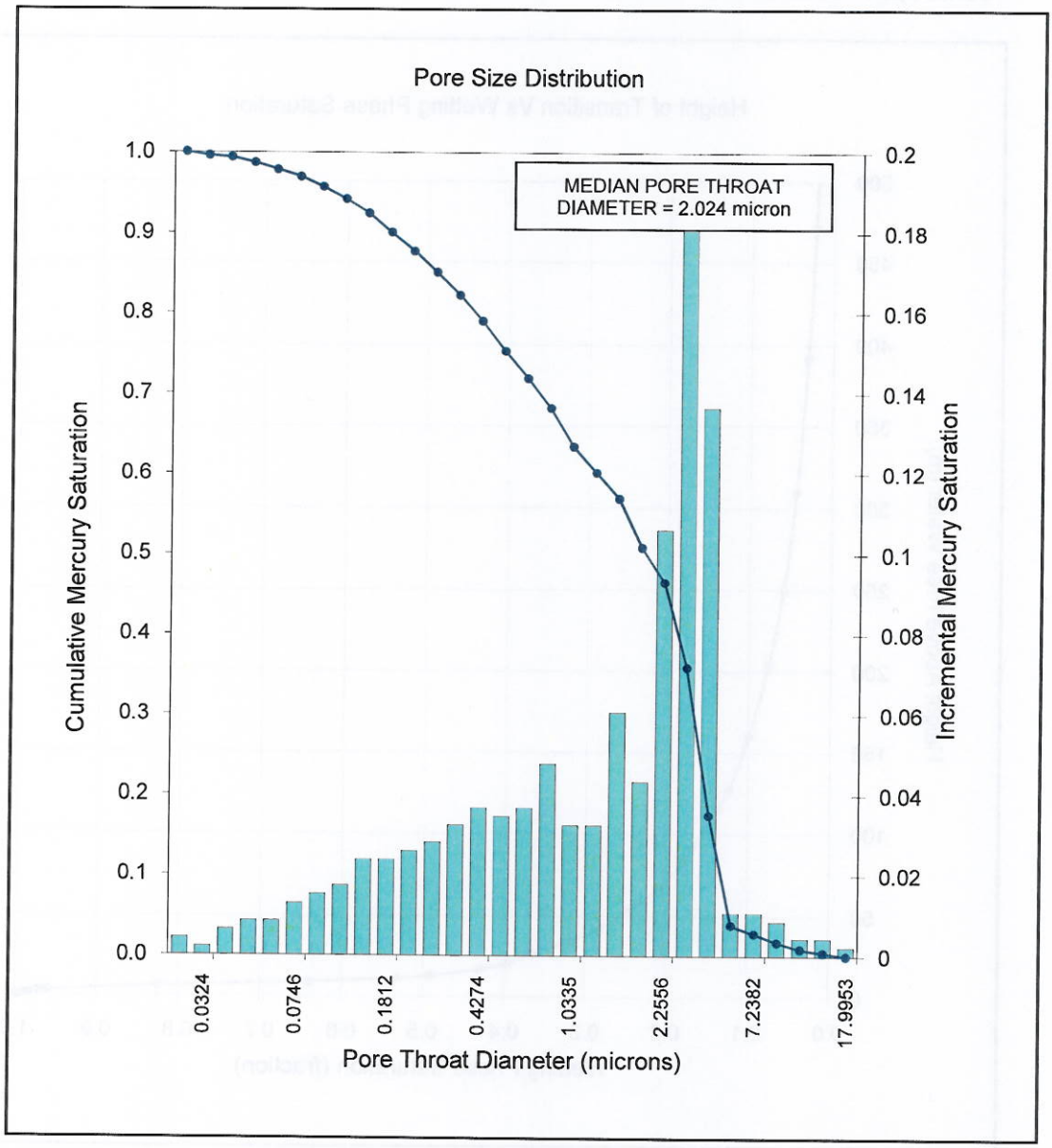


FIGURE 22
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP9
Core Depth: 628.8 m

Air Permeability : 6.35 mD
Porosity (fraction): 0.122

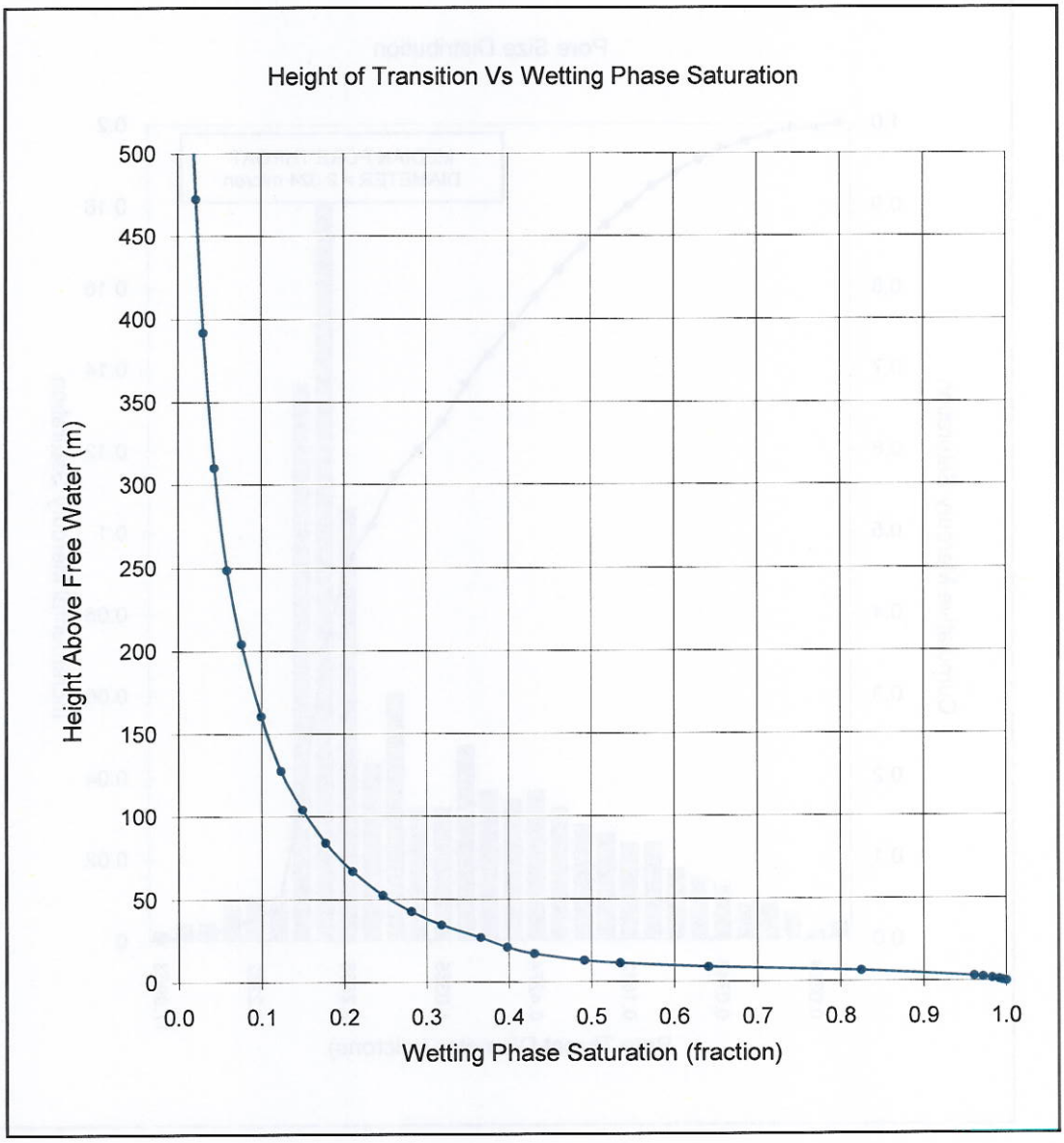


FIGURE 23
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

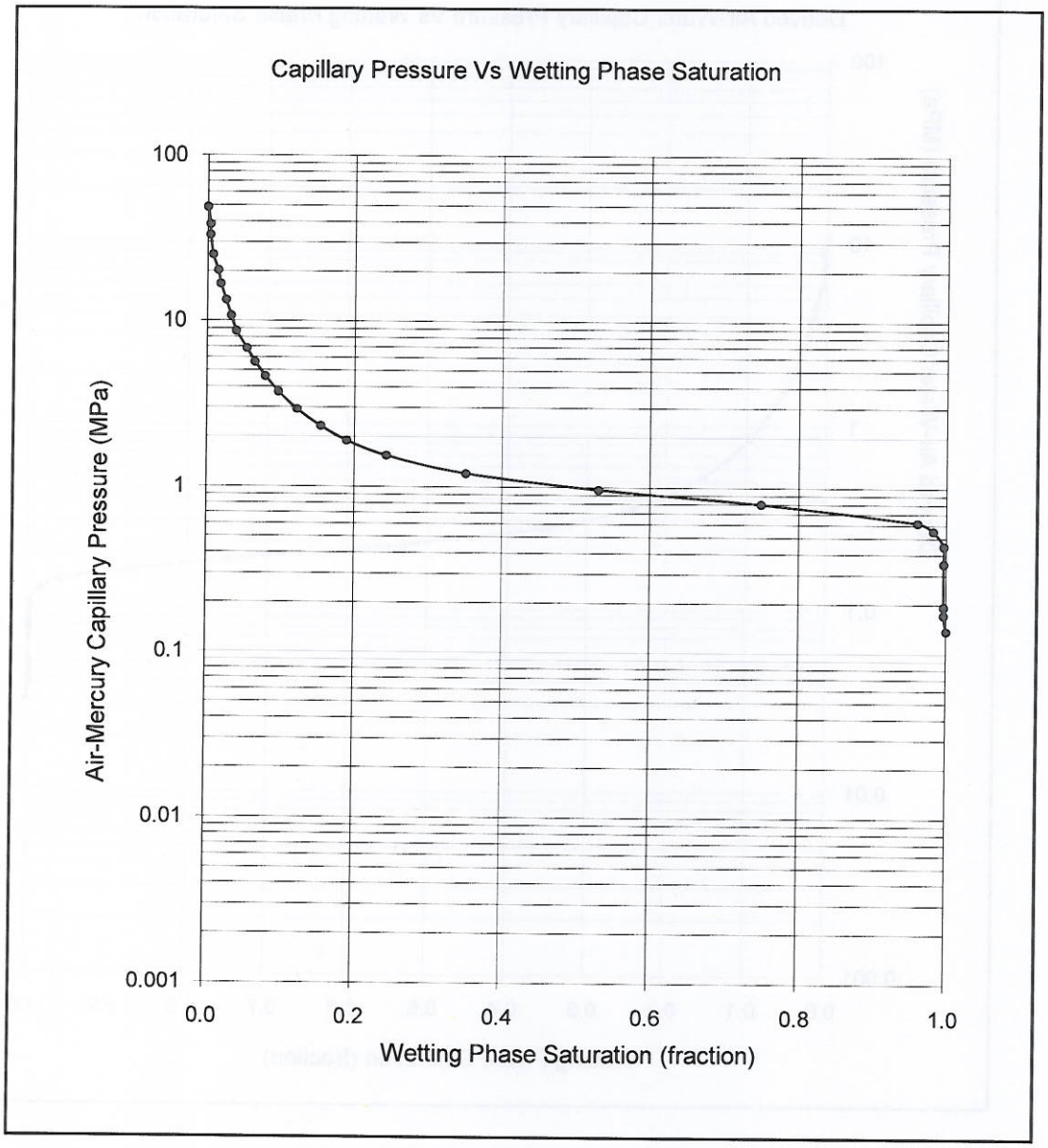


FIGURE 24
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

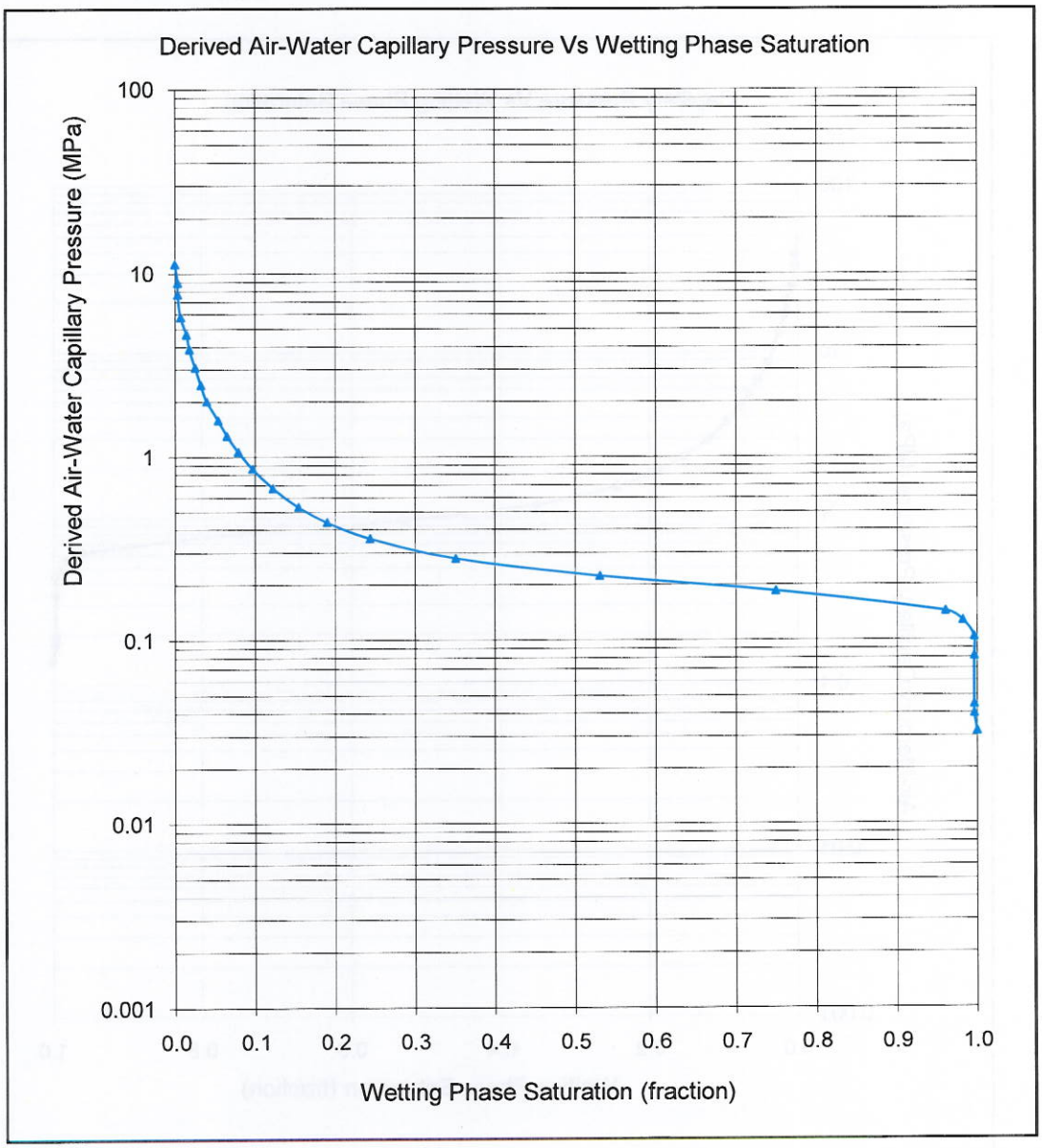


FIGURE 25
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	0.7%
	Mesopores (1 - 3 micron diameter) =	64.3%
	Micropores (< 1 micron diameter) =	35.0%

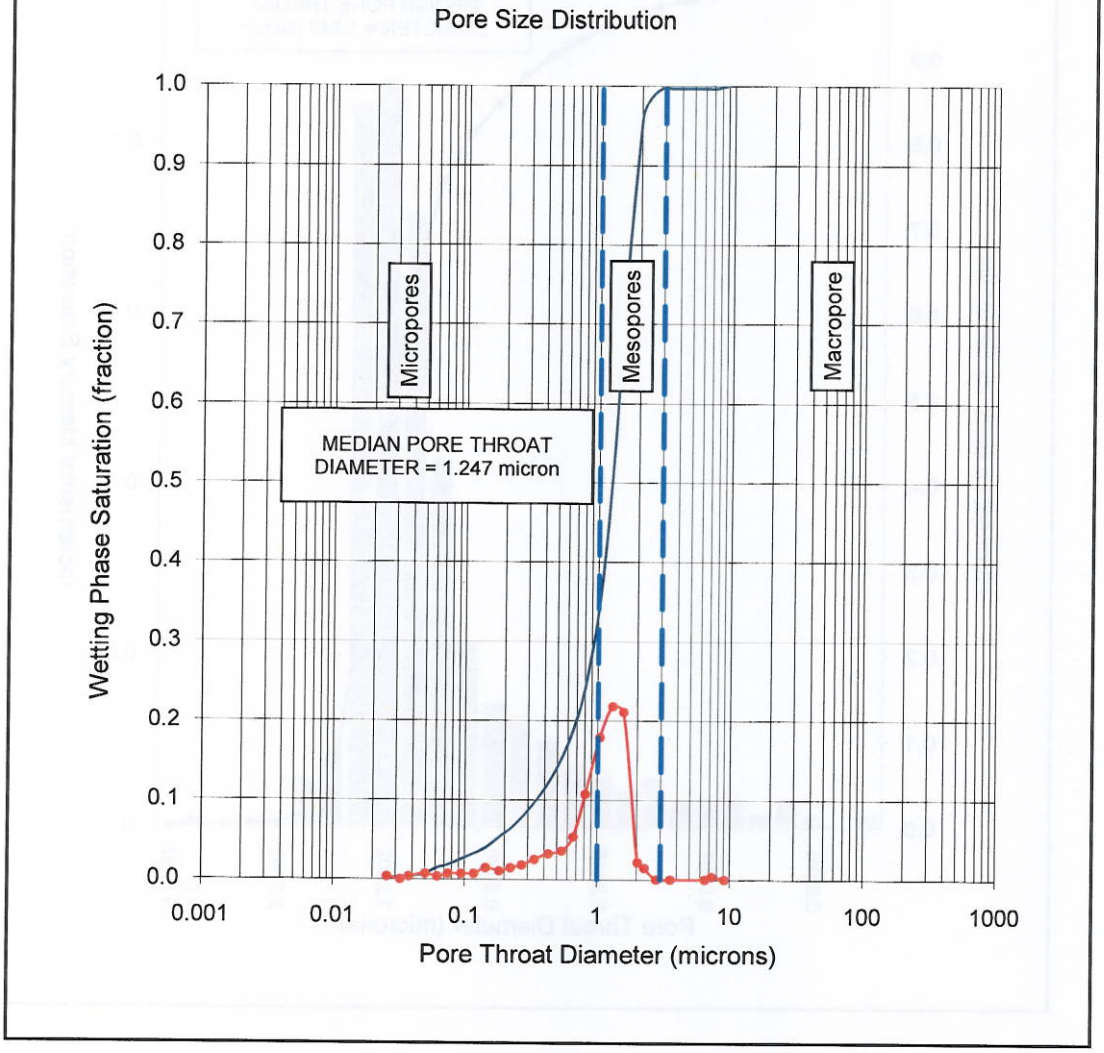


FIGURE 26
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

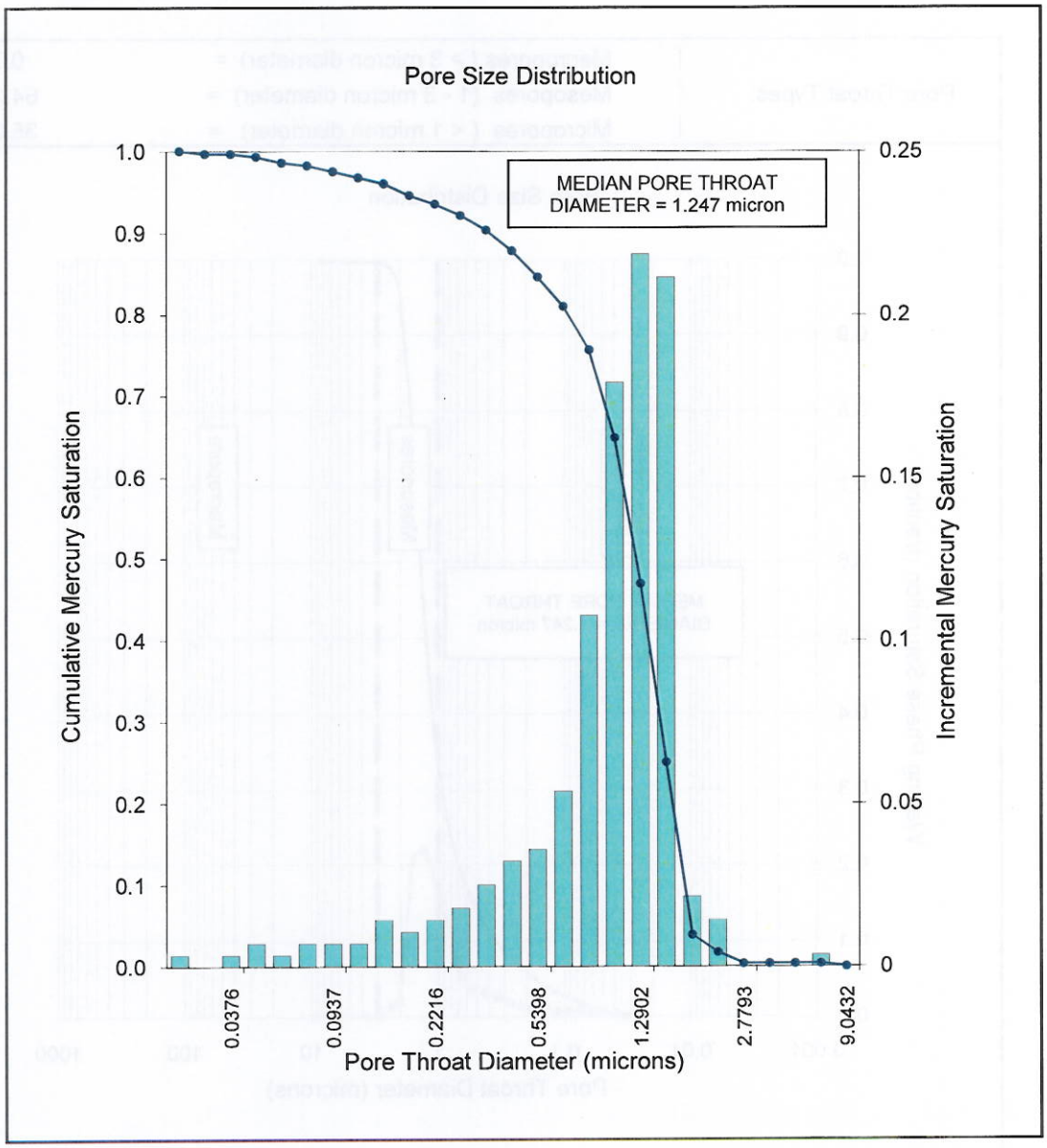


FIGURE 27
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP10
Core Depth: 629.26 m

Air Permeability : 0.235 mD
Porosity (fraction): 0.067

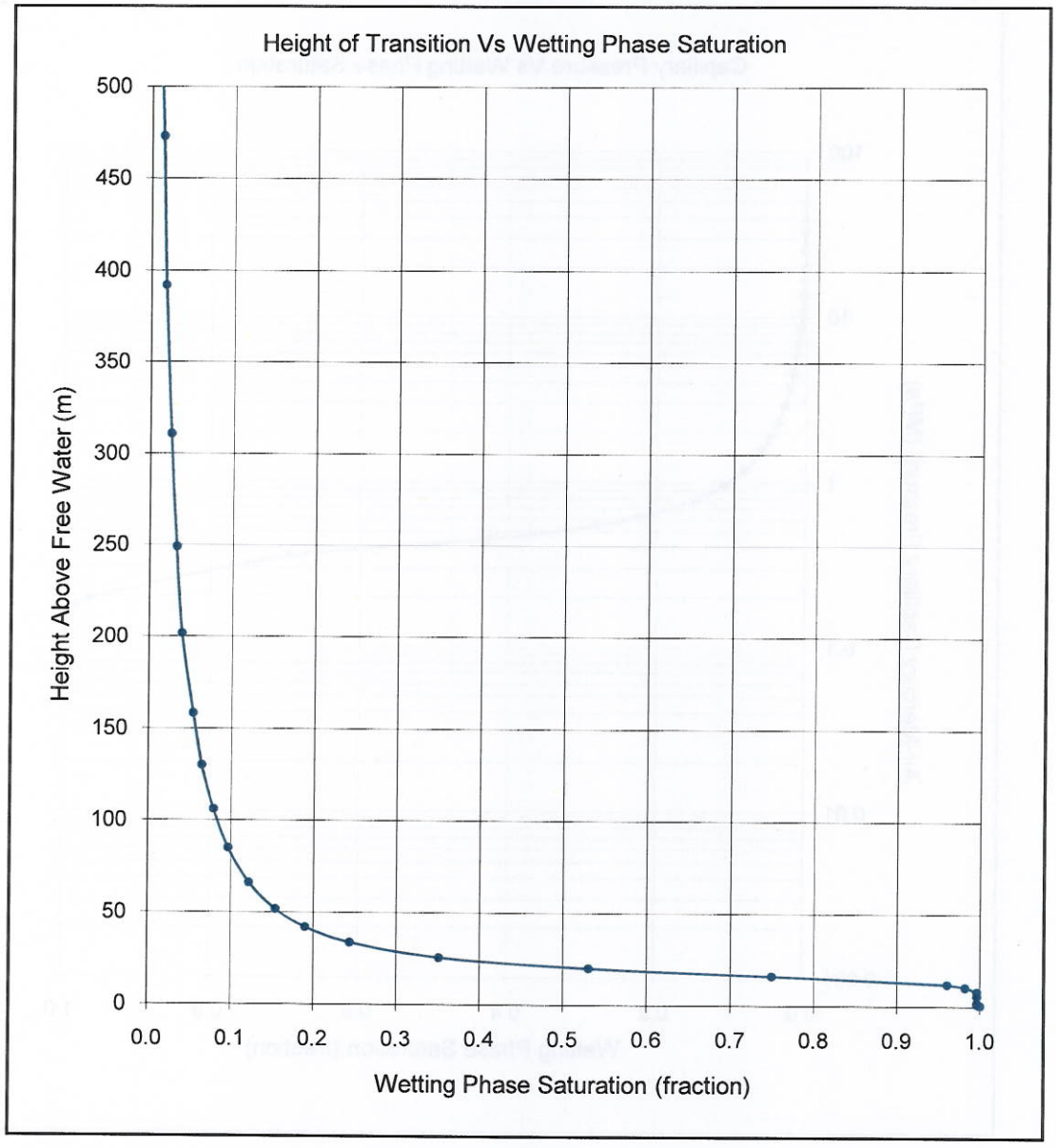


FIGURE 28
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

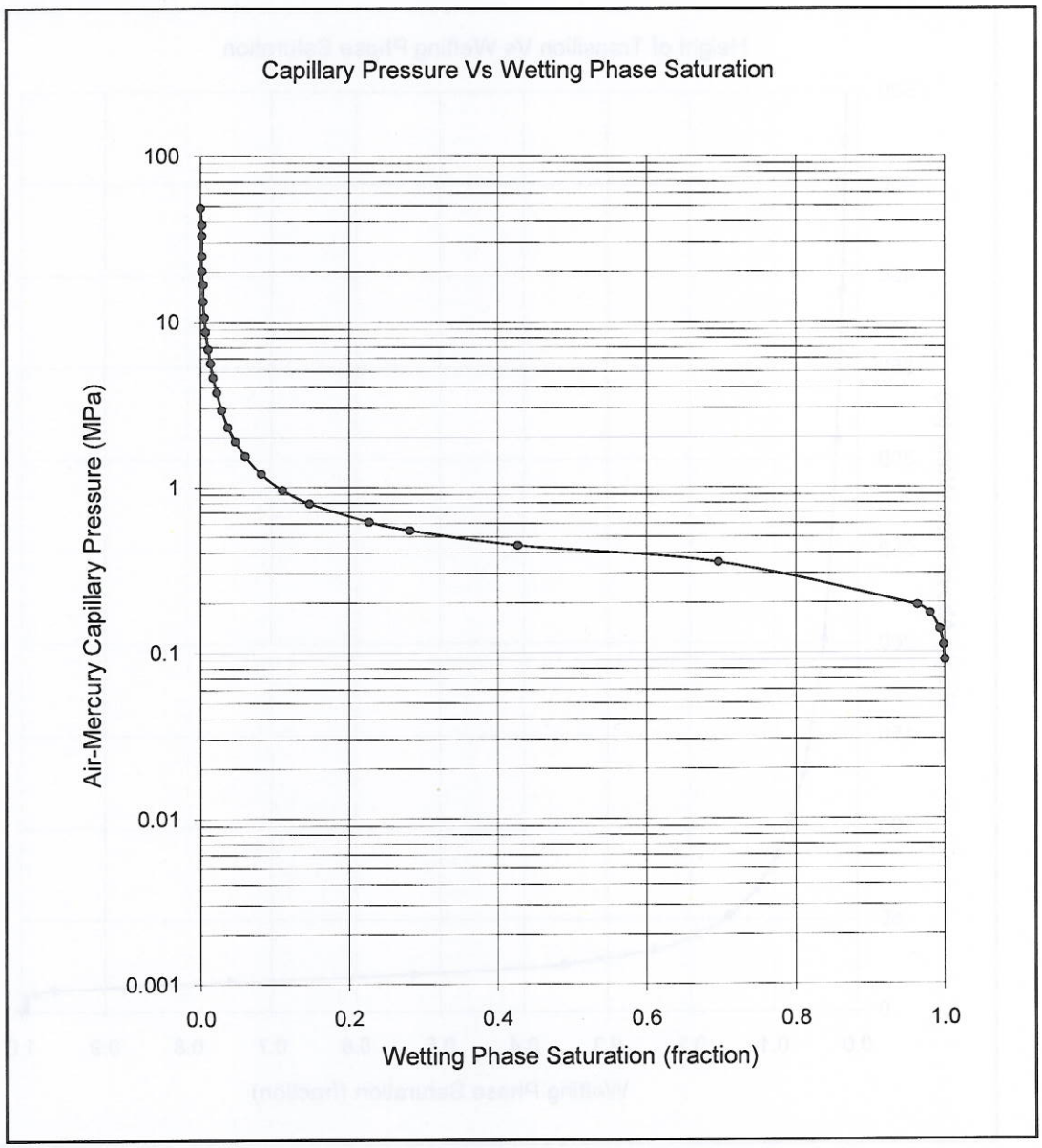


FIGURE 29
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

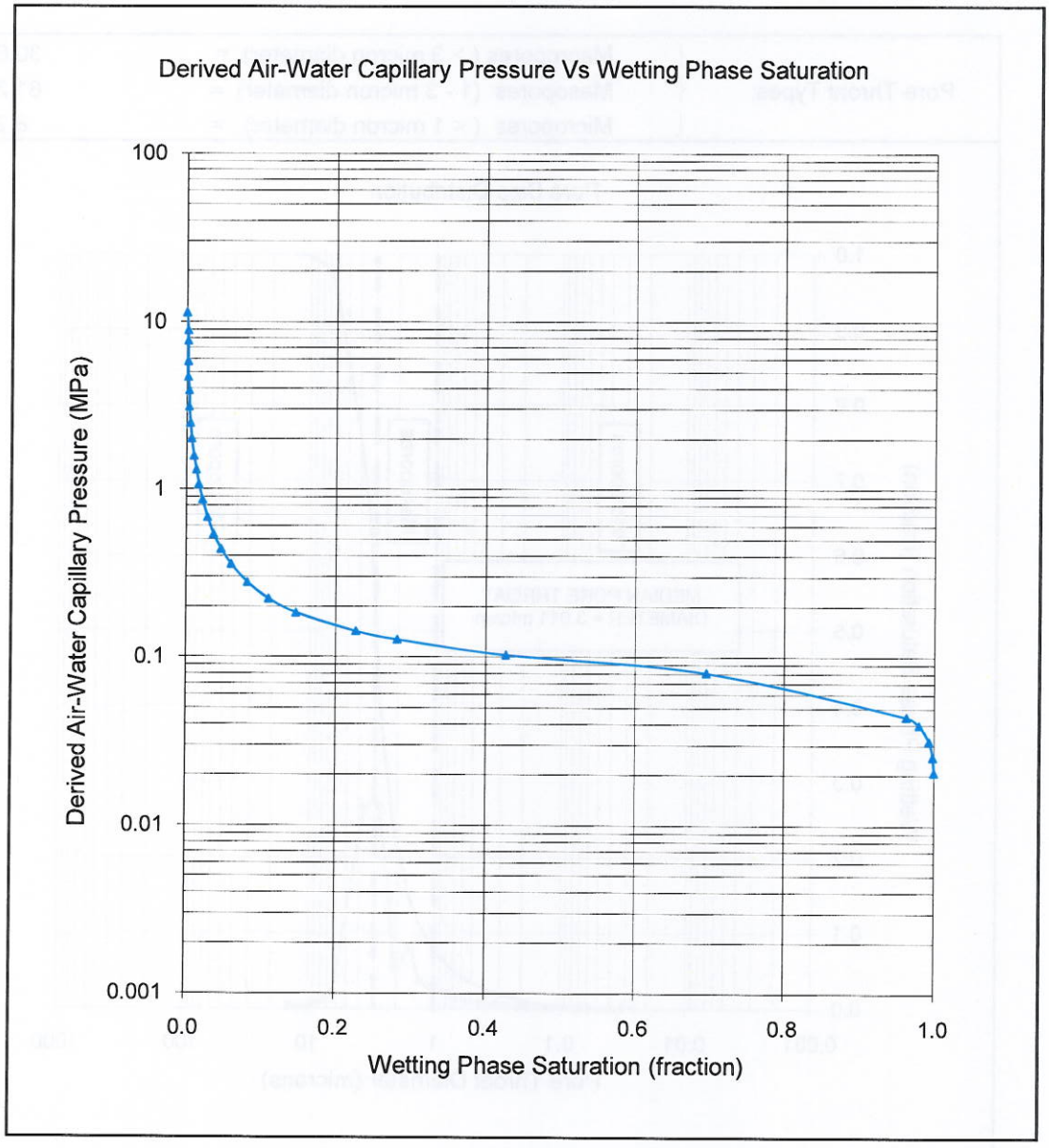


FIGURE 30
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	30.6%
	Mesopores (1 - 3 micron diameter) =	61.2%
	Micropores (< 1 micron diameter) =	8.2%

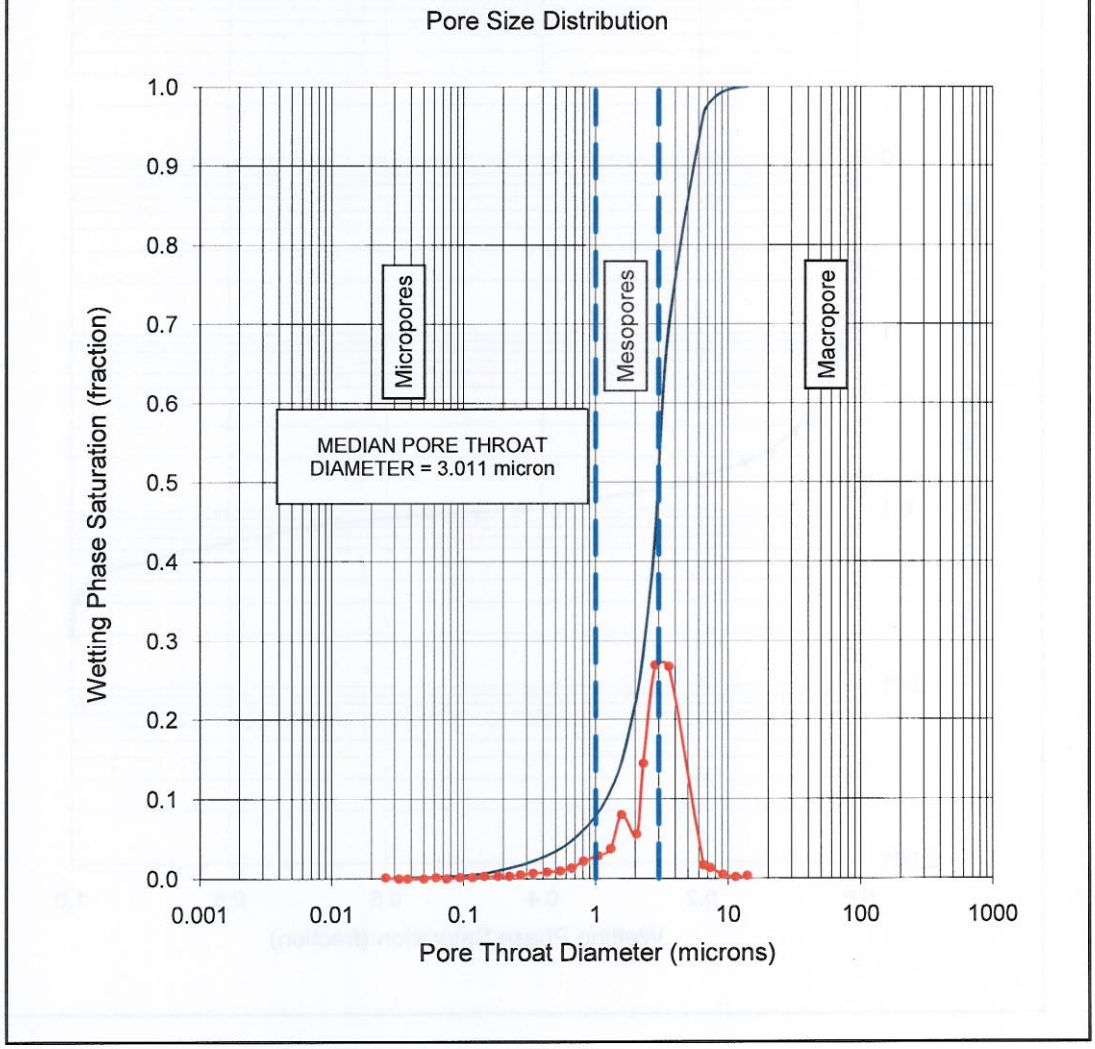


FIGURE 31
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

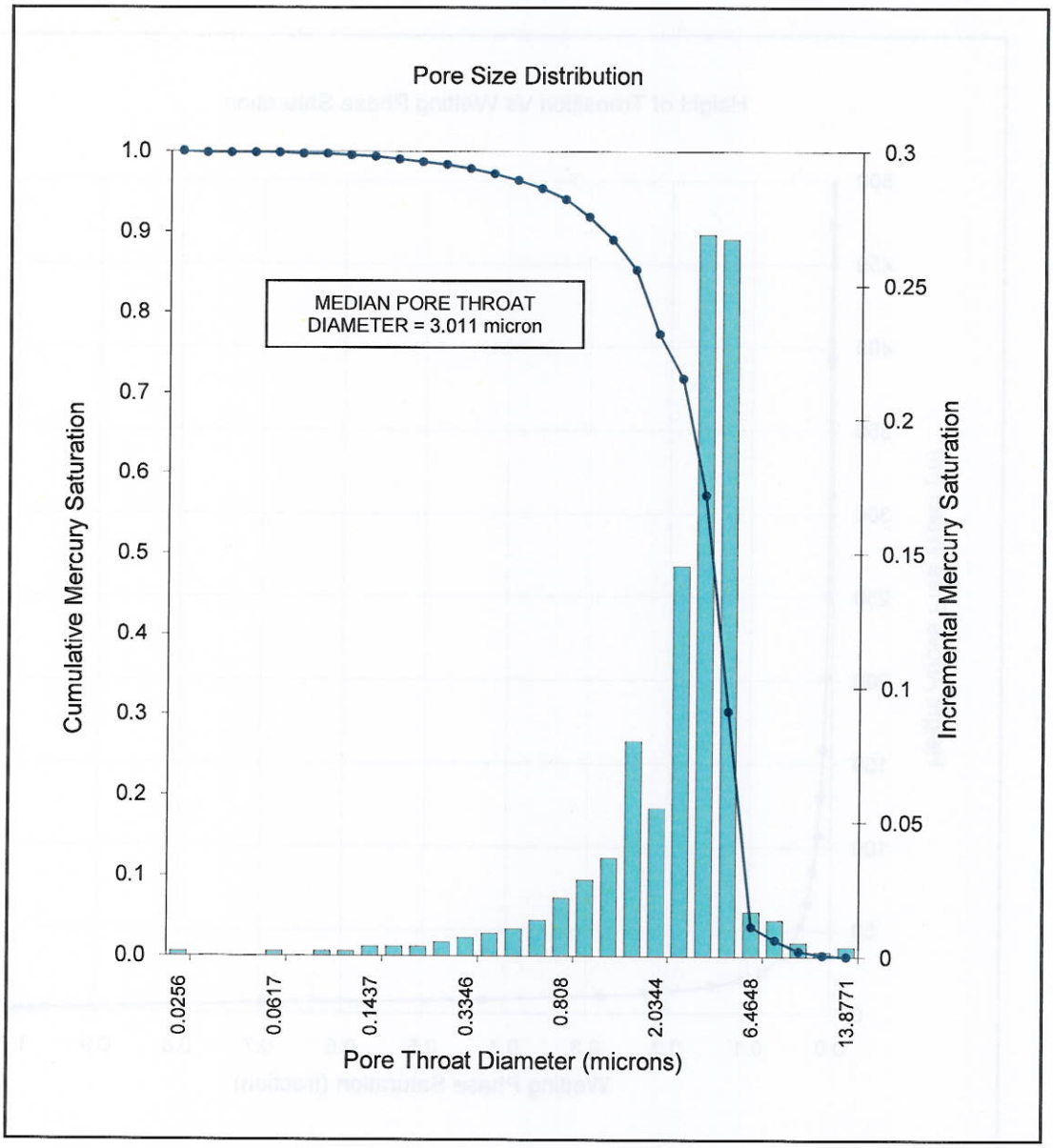


FIGURE 32
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP11
Core Depth: 630.17 m

Air Permeability : 17.36 mD
Porosity (fraction): 0.156

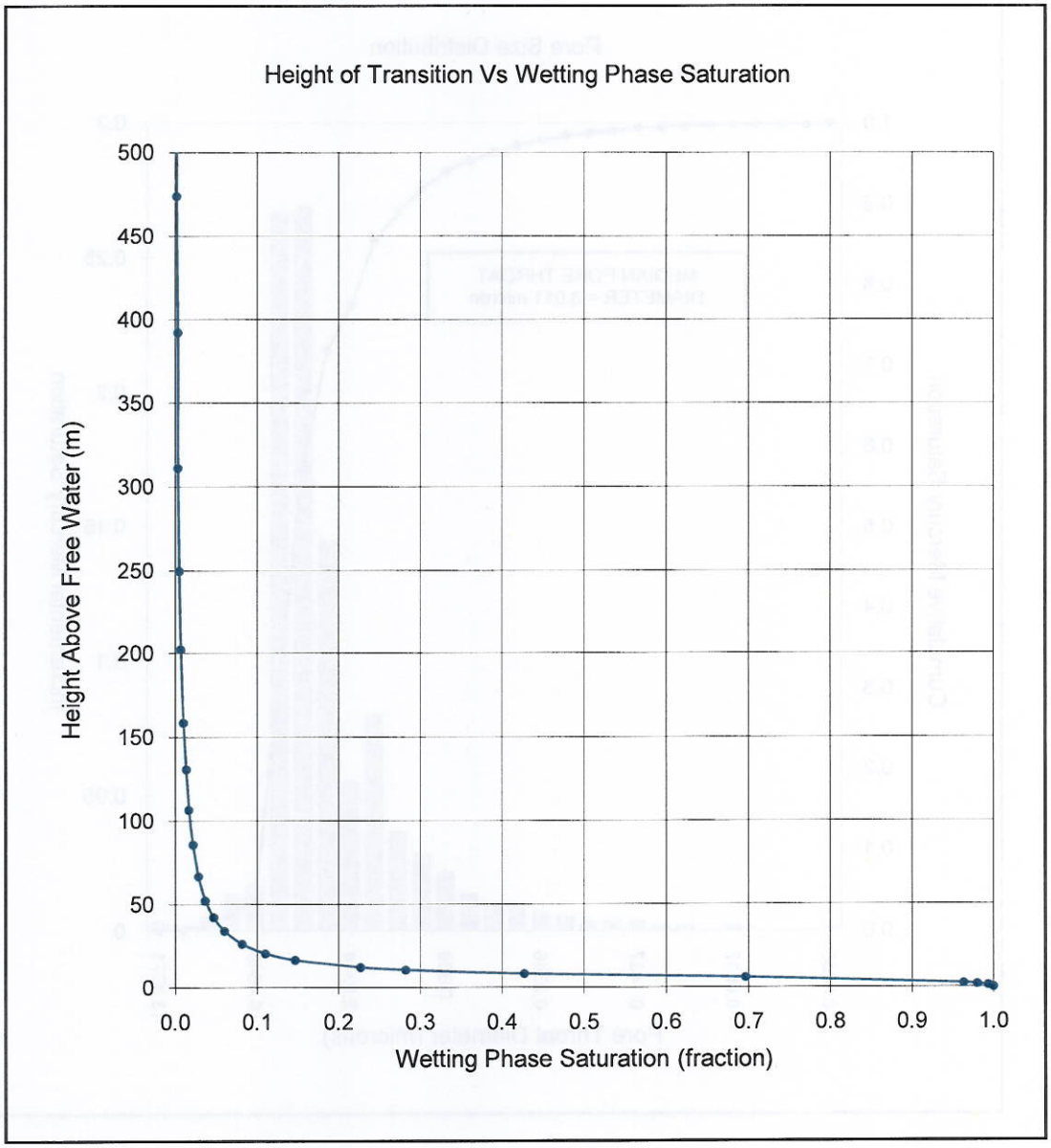


FIGURE 33
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

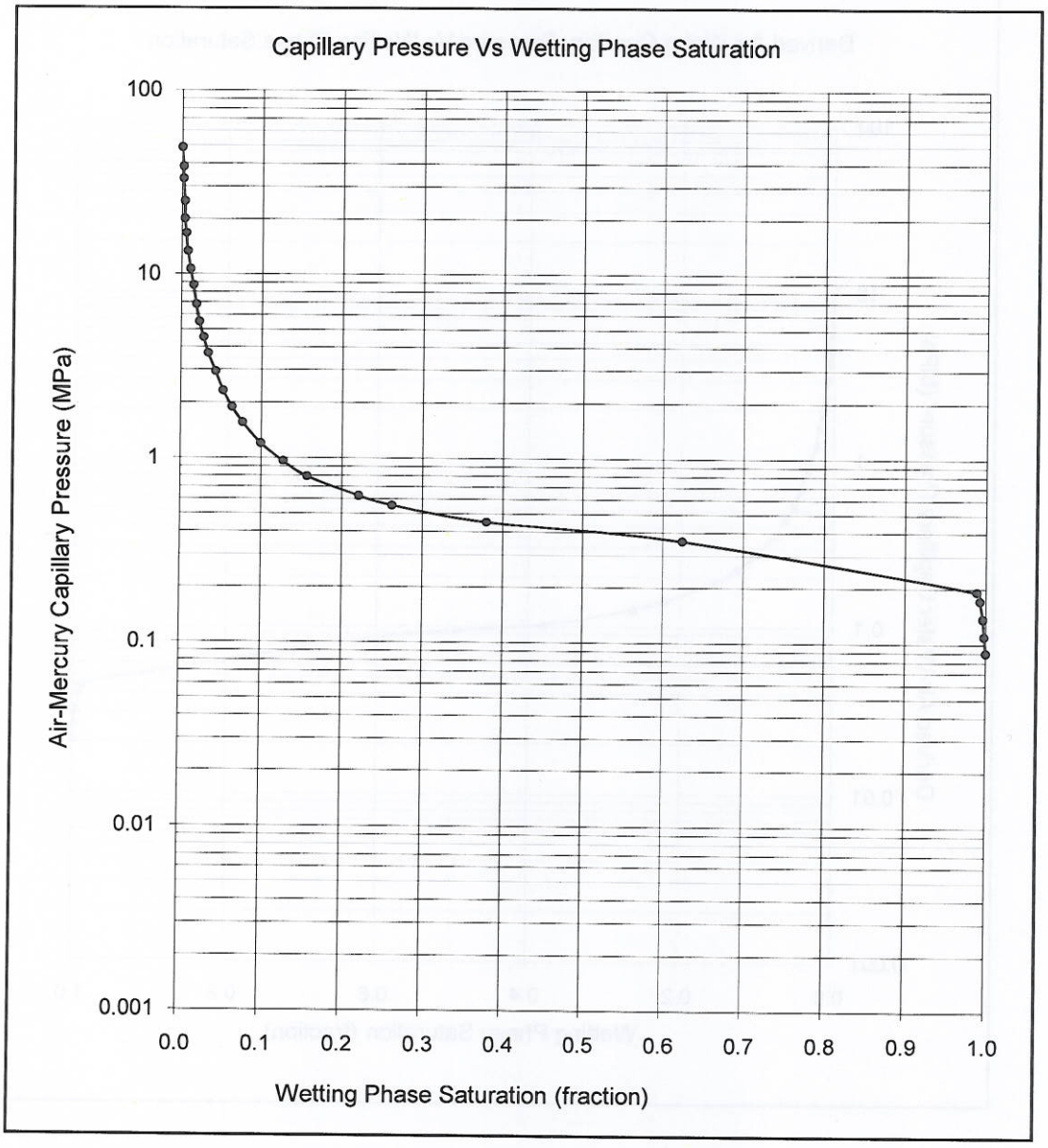


FIGURE 34
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

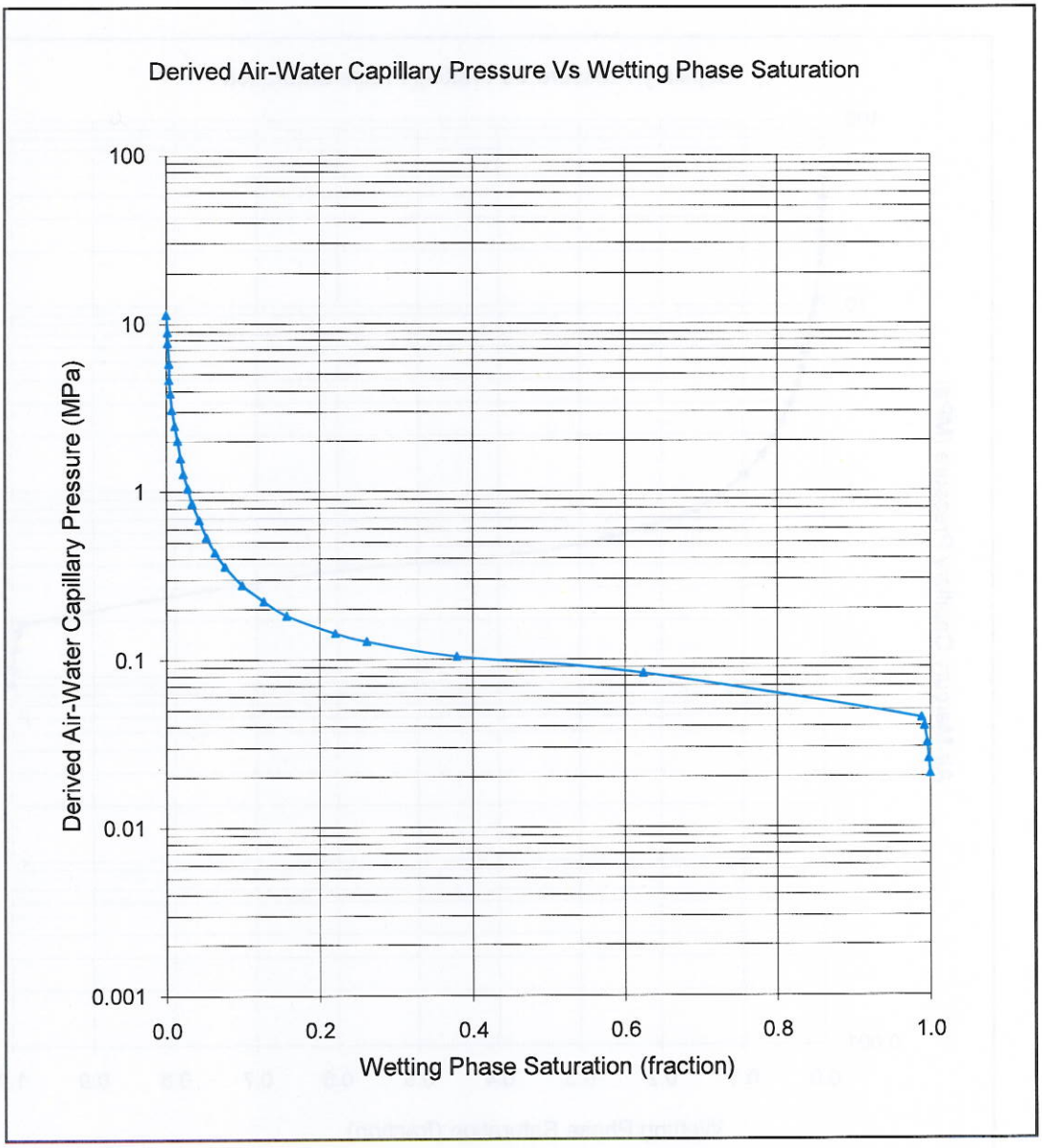


FIGURE 35
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

Pore Throat Types:		
	Macropores (> 3 micron diameter) =	37.8%
	Mesopores (1 - 3 micron diameter) =	52.3%
	Micropores (< 1 micron diameter) =	9.9%

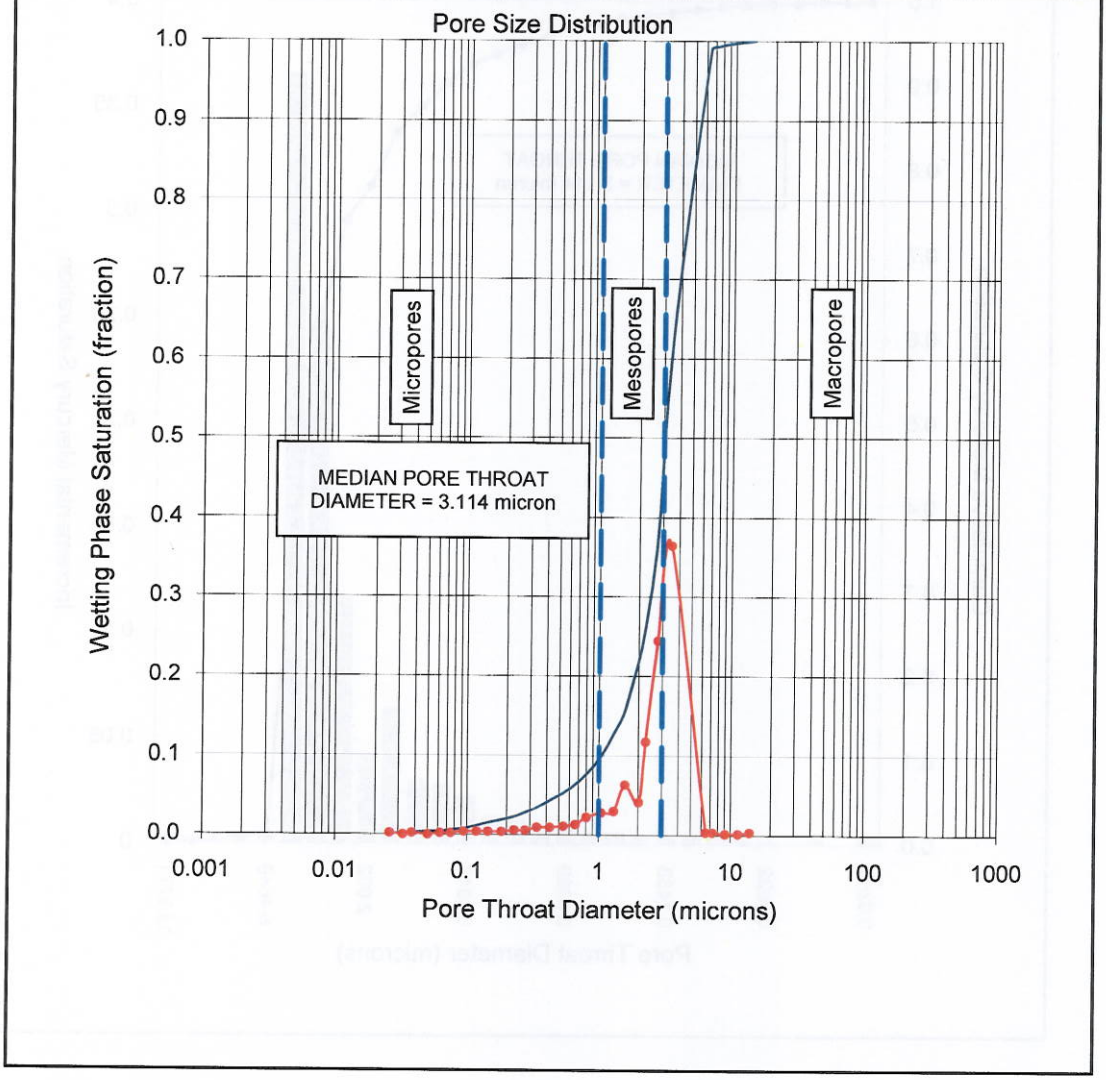


FIGURE 36
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

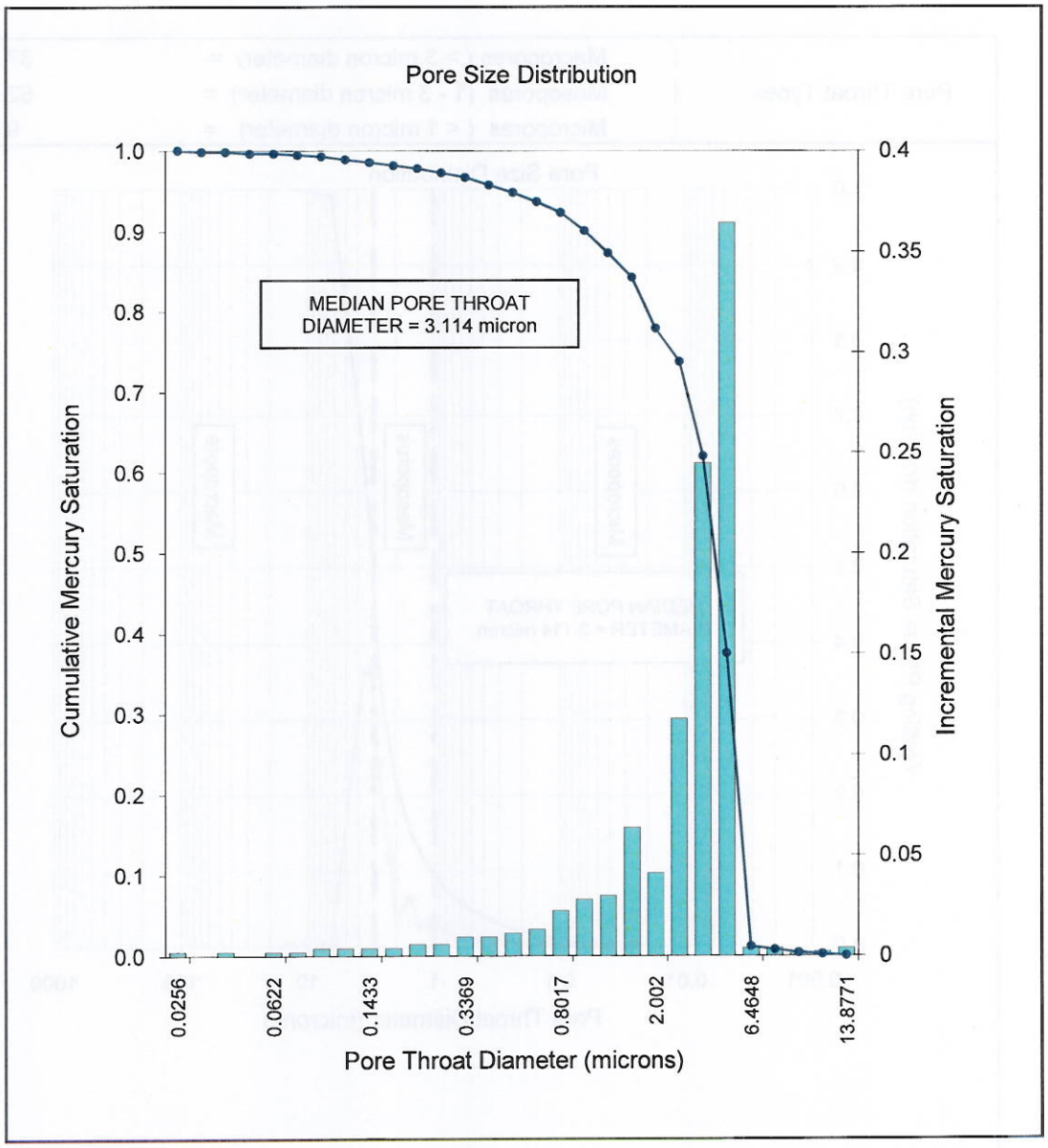


FIGURE 37
MERCURY INJECTION CAPILLARY PRESSURE

Well Location: 15-28-009-25 W1M
Core I.D.: SP13
Core Depth: 632.46 m

Air Permeability : 11.47 mD
Porosity (fraction): 0.134

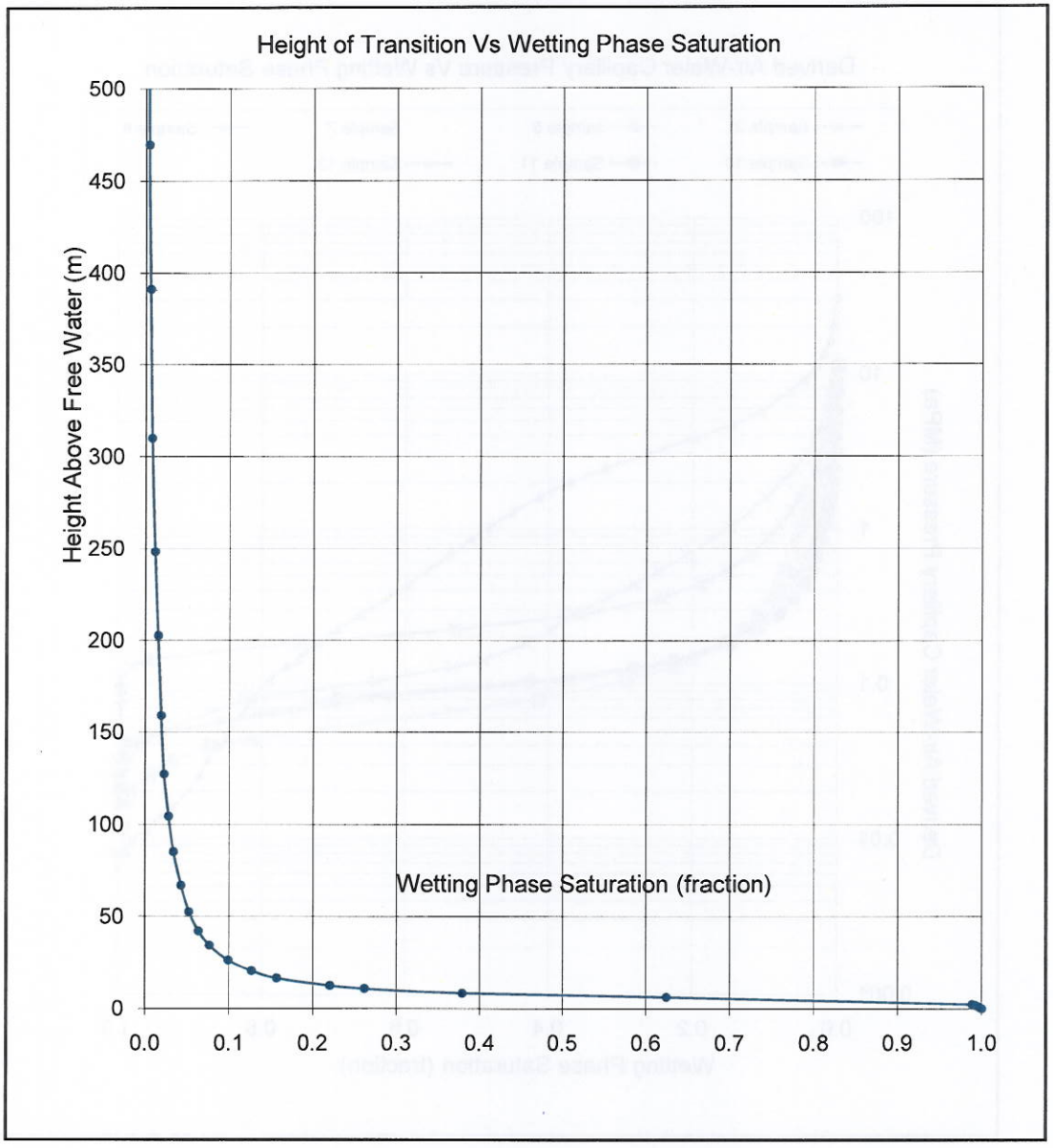


FIGURE 38

SUMMARY OF MERCURY INJECTION CAPILLARY PRESSURE FOR SCALLION FORMATION

Well Location: 03-16-009-25 W1M, 15-28-009-25 W1M
Core I.D.: SP2, SP5, SP7, SP9, SP10, SP11, SP13
Core Depth:

Air Permeability:
Porosity (fraction):

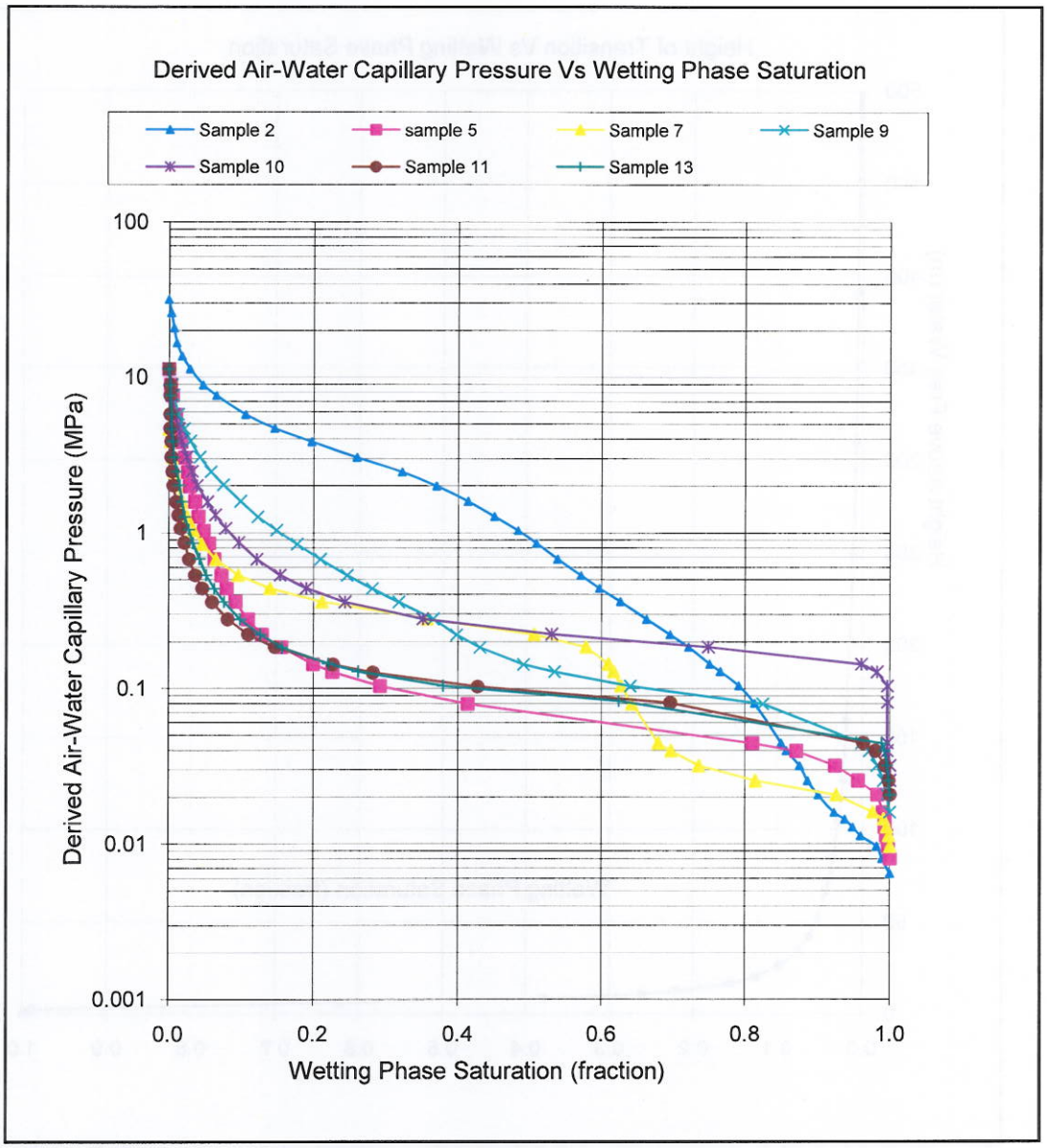


FIGURE 39
SUMMARY OF MERCURY INJECTION CAPILLARY PRESSURE FOR SCALLION FORMATION

Well Location: 03-16-009-25 W1M, 15-28-009-25 W1M
Core I.D.: SP2, SP5, SP7, SP9, SP10, SP11, SP13 Air Permeability:
Core Depth: Porosity (fraction):

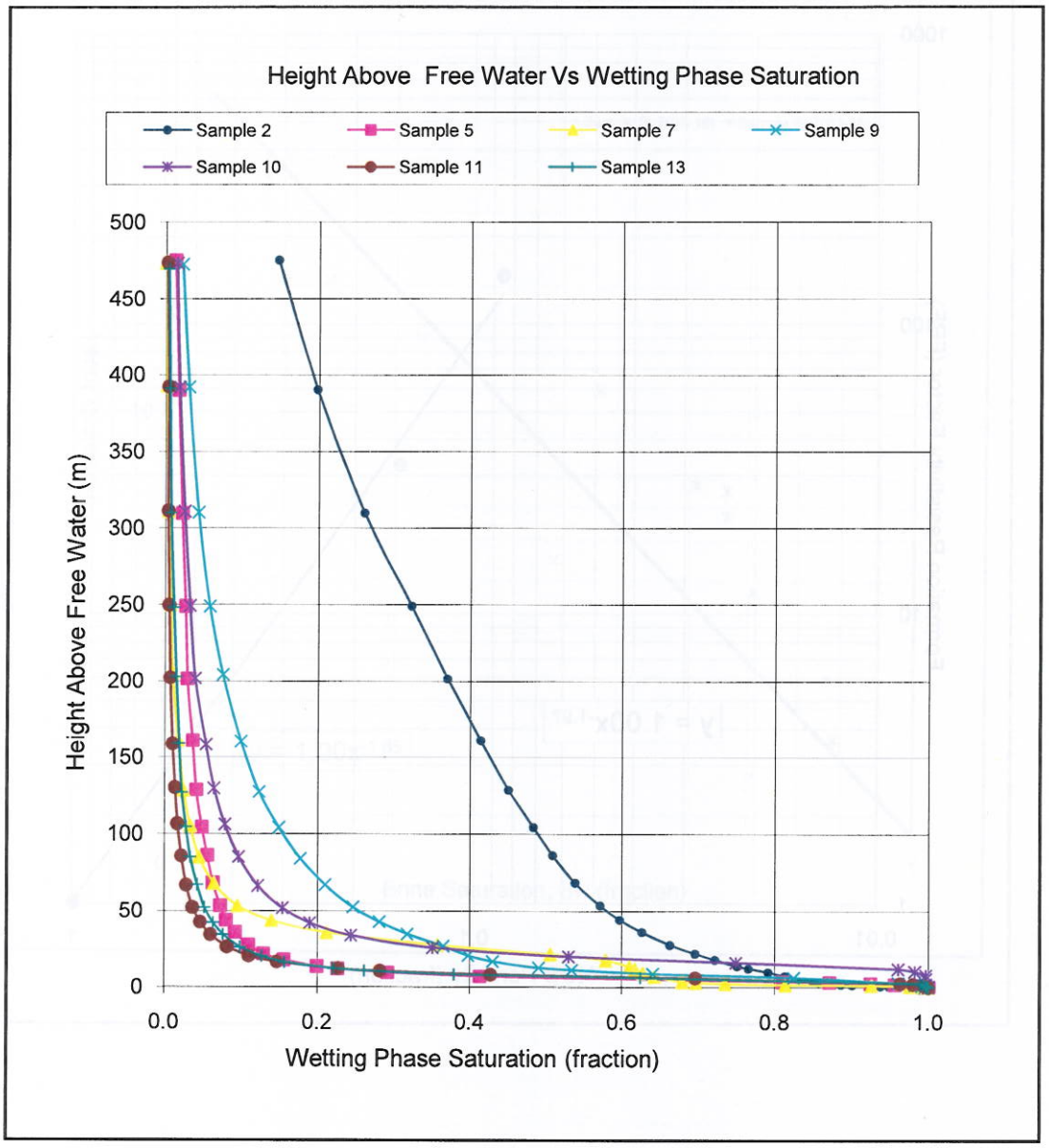


FIGURE 42
FORMATION RESISTIVITY FACTOR (FRF) COMPOSITE PLOT
Well: 15-28-009-25 W1M

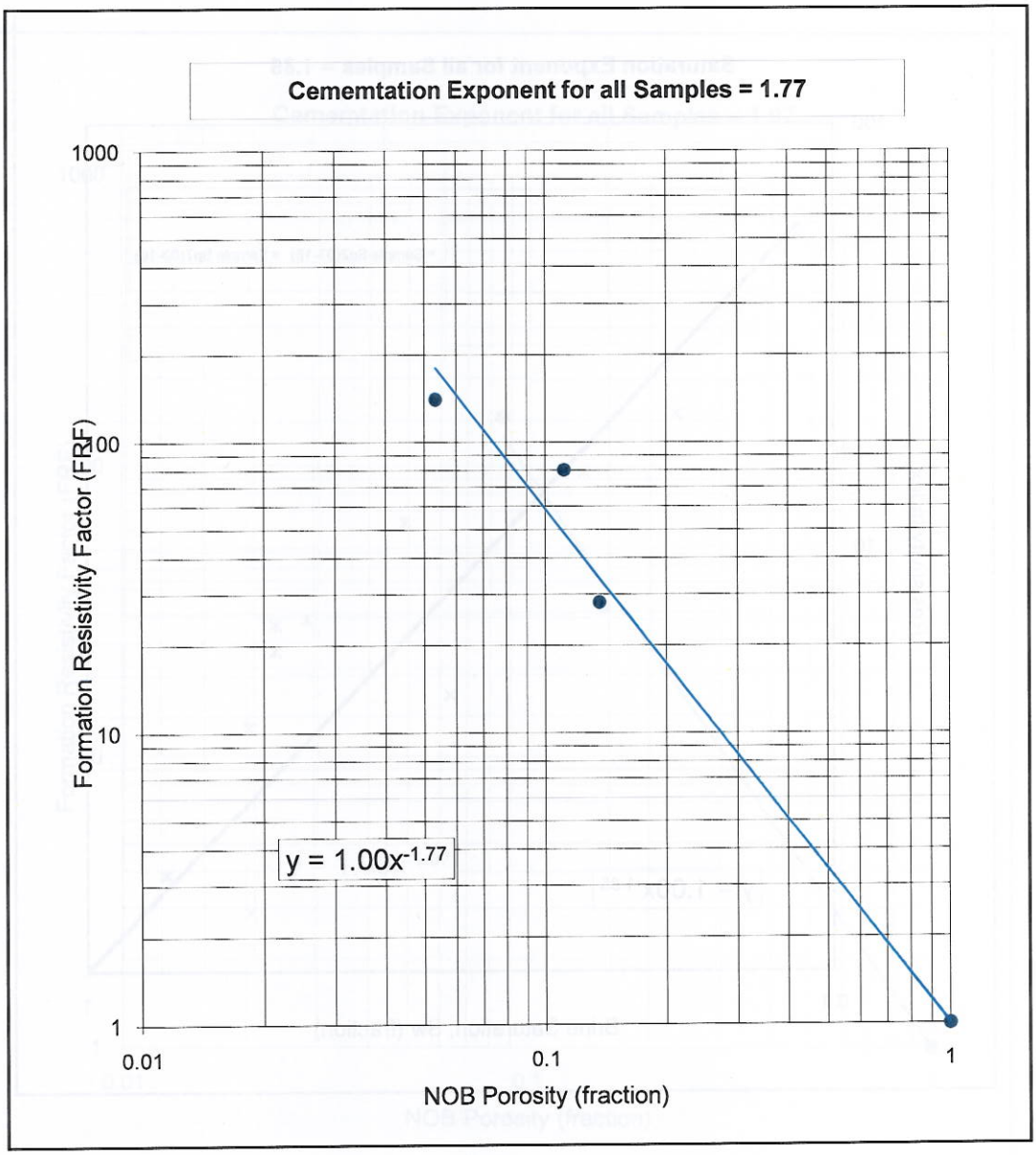


FIGURE 43
RESISTIVITY INDEX (RI) COMPOSITE PLOT
Well: 15-28-009-25 W1M

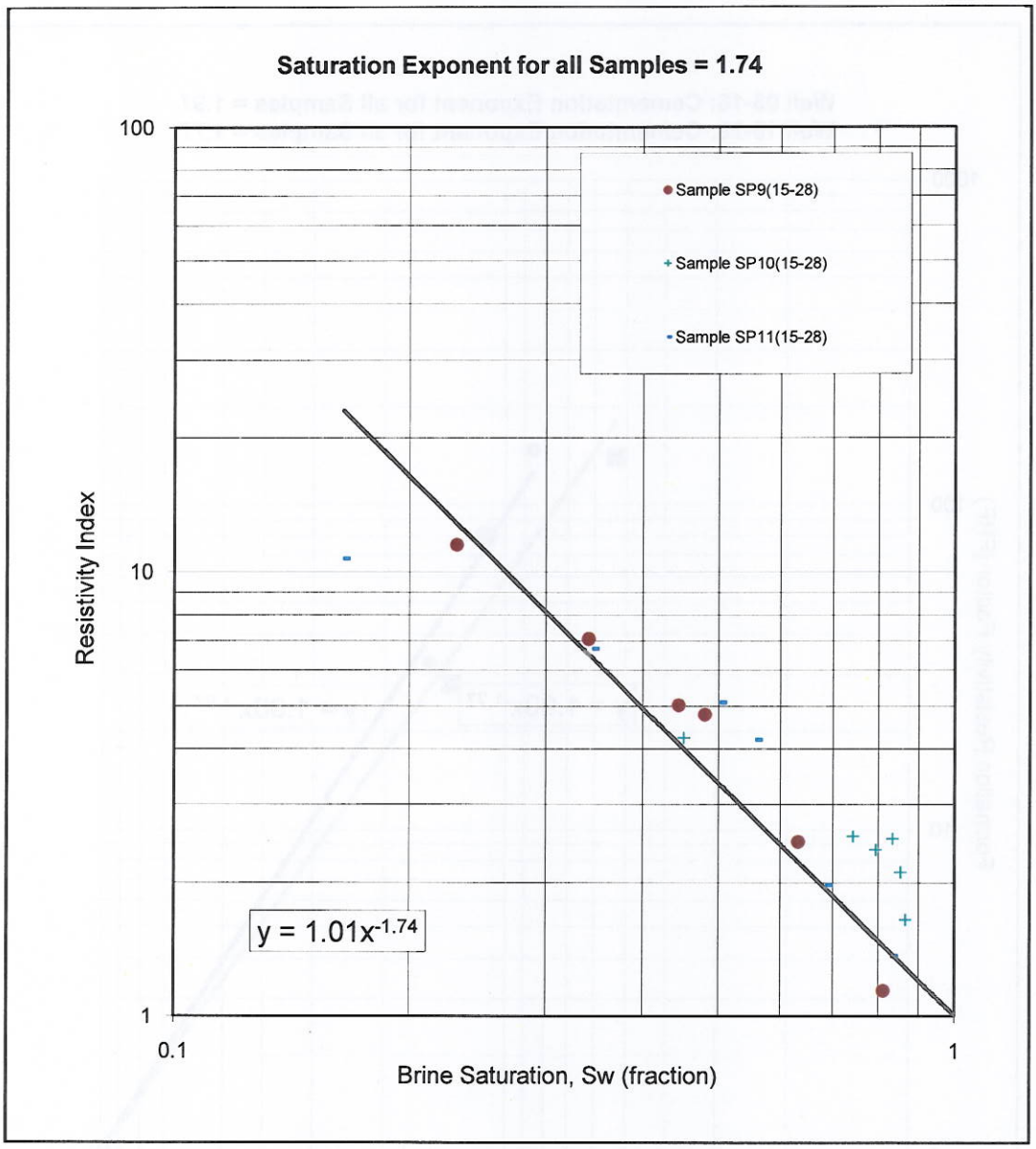


FIGURE 44
FORMATION RESISTIVITY FACTOR (FRF) COMPOSITE PLOT
Well: 03-16-009-25W1M and 15-28-009-25 W1M

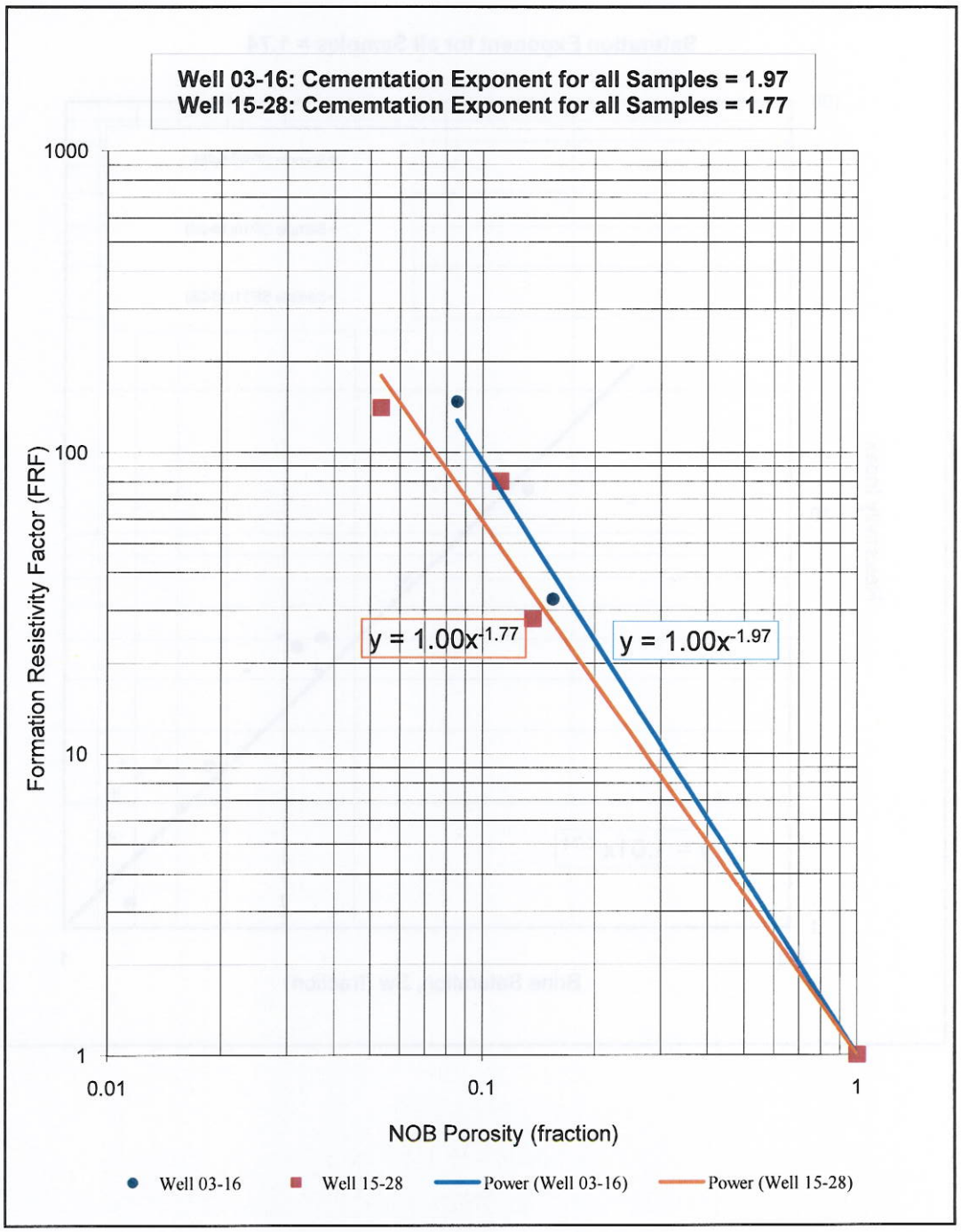
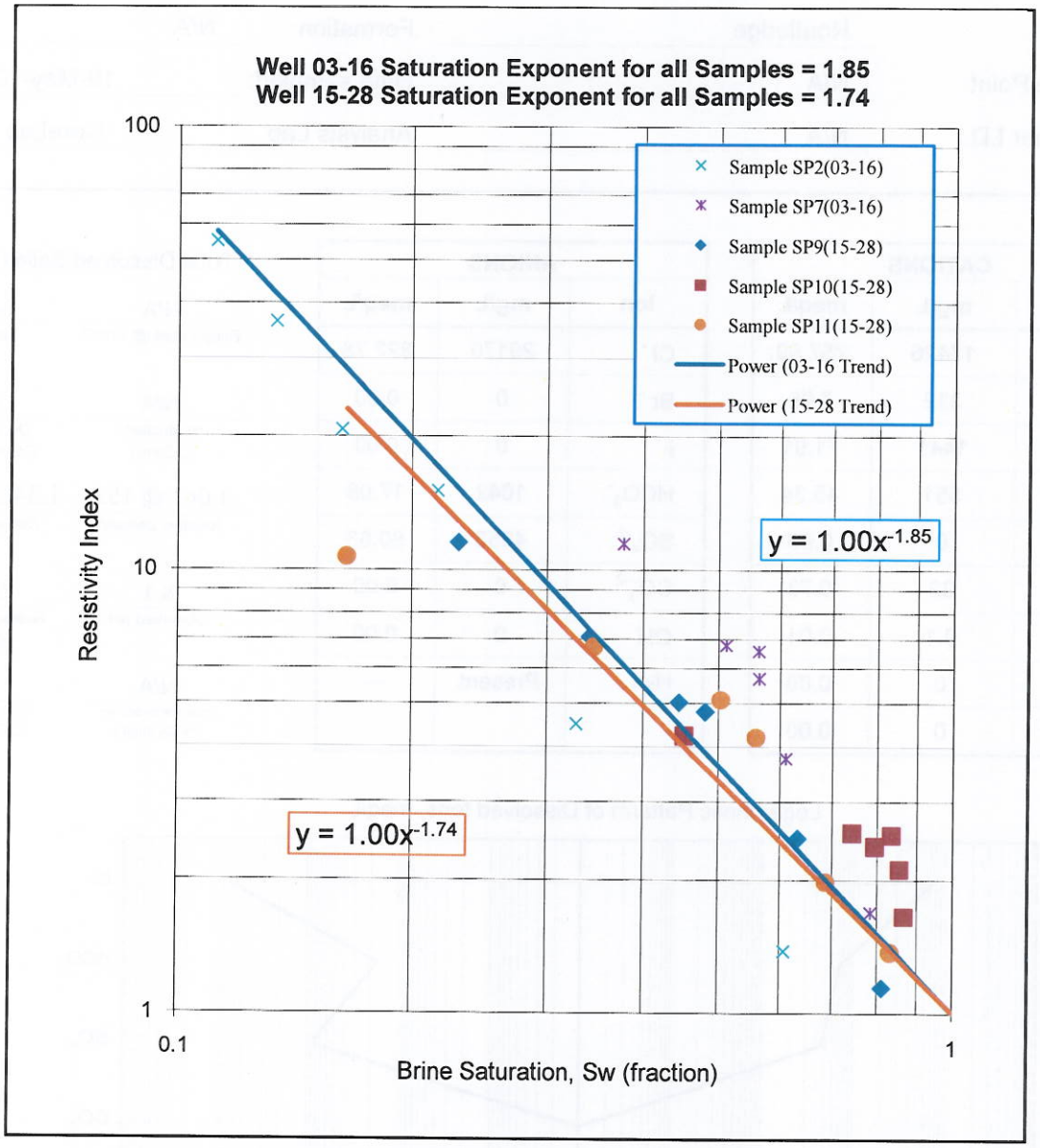


FIGURE 45
RESISTIVITY INDEX (RI) COMPOSITE PLOT
Well: 03-16-009-25W1M and 15-28-009-25 W1M



APPENDIX A
WATER COMPOSITIONAL ANALYSIS

Operator:	Enerplus Corporation	Date:	01-Jun-10
Well Name:	16-17-009-25 W1M	File # :	2010-0022NE
Field:	Routledge	Formation:	N/A
Sample Point:	N/A	Date sampled:	19-May-10
Container I.D.:	N/A	Analysis Lab:	CoreLab

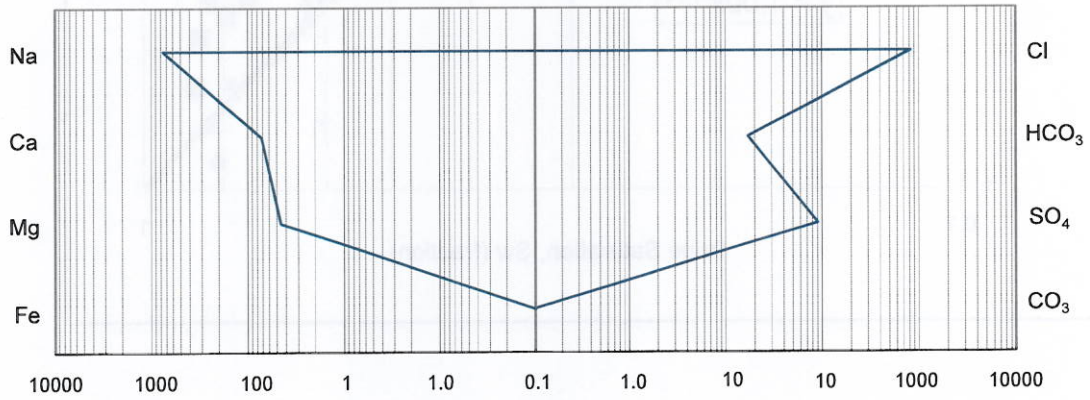
CATIONS		
Ion	mg/L	meq/L
Na^{+}	17426	757.99
K^{+}	312	7.98
Ca^{+2}	1441	71.91
Mg^{+2}	551	45.34
Ba^{+2}	0	0.00
Sr^{+2}	32	0.73
Fe^{+3}	0.1	0.01
B^{+3}	0	0.00
Mn^{+3}	0	0.00

ANIONS		
Ion	mg/L	meq/L
Cl^{-}	29170	822.78
Br^{-}	0	0.00
I^{-}	0	0.00
HCO_3^{-}	1042	17.08
SO_4^{-2}	4353	90.63
CO_3^{-2}	0	0.00
OH^{-}	0	0.00
H_2S	Present	---

Total Dissolved Solid (mg/L)

N/A Evaporated @ 110°C	54327 Calculated
N/A conductivity (uS/cm)	N/A Oil & Grease Content (mg/L)
1.041 @ 15.6 Relative Density	1.3429 @ 21C Refractive Index
8.1 Observed pH	0.132 Resistivity ohm.m @25°C
N/A Total Hardness As $CaCO_3$ (mg/L)	N/A Total Alkalinity As $CaCO_3$ (mg/L)

Logarithmic Patterm of Dissolved Ions, meq/L



Remarks: